March 13th, 2024

SERVICING BRIEF

1804, 1798, & 1788 UPLAND STREET, PRINCE GEORGE, BC

Client: Lithium One Homes Ltd.
L&M Project No.: 1554-07
City File No.: RZ100811

L&M Engineering Limited
1210 Fourth Avenue, Prince George, BC V2L 3J4
Phone: (250) 562-1977

Permit to Practice Number: 1002375

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B – CoPG Water Modelling (WM000187)
C – HydroCAD Storm Modelling
D – SoilTech Geotechnical Assessment

1.0 INTRODUCTION

On behalf of Lithium One Homes Ltd., L&M Engineering is pleased to provide you with this Servicing Brief in support of the rezoning application RZ100811. The developer is proposing to amend the Official Community Plan (OCP) and Zoning Bylaw to facilitate the development of multi-family residential housing. The rezoning application proposes to rezone the property from **RM4: Multiple Residential** to **RM5: Multiple Residential**. The purpose of the rezoning is to allow for higher density housing than the existing RM4 zone permits. The proposed RM5 zone allows for a residential density of 125 dwelling units per hectare. Additionally, an OCP amendment from "Neighbourhood Residential" to "Neighbourhood Centre, Corridor" is required to facilitate the proposed rezoning.

This Servicing Brief has been prepared to summarize the existing utilities in the surrounding area and demonstrate how the property can be serviced with municipal water, sanitary, and storm infrastructure. A conceptual site plan for the development is enclosed in Appendix A.

2.0 BACKGROUND DATA AND REPORTS

L&M Engineering has reviewed the following reports in relation to the subject property development:

- City of Prince George – 2017 Sanitary Sewer Services Master Plan prepared by AECOM;
- City of Prince George – 2014 Water Service Network Plan prepared by Opus Dayton Knight;
- City of Prince George – Development Services Department: Design Guidelines; and
- PG Map

3.0 SUBJECT PROPERTY

The subject properties are located at 1788, 1798, and 1804 Upland Street with a combined area of 0.2 ha (0.5 acres).

The PIDs for the subject properties are:

- PID: 011-857-480
- PID: 011-857-536
- PID: 010-074-414
- PID: 010-074-422
- PID: 011-234-814
- PID: 010-074-368
- PID: 010-074-333

4.0 DESIGN POPULATION

The subject site is situated in a well-established area of Prince George, surrounded by various developed land uses. The existing land uses consist of single-family homes, multi-family homes and commercial.

The design population for the site is calculated as follows:

Multiple Residential – RM5

- The maximum allowable density for RM5 is 125 dwellings/hectare. The property area is 0.2ha which yields a maximum of 25 dwelling units.

- Using a factor of 2.4 people/unit (Central Bowl, per CoPG Design Guidelines), this yields a design population of **60 people**.

5.0 WATER DISTRIBUTION SYSTEM

5.1 Existing System

L&M conducted a review of the existing municipal water main infrastructure in the vicinity of the subject property. The City's water main network includes two twinned mains on Upland Street. One main is a 150mmø cast iron main and the other is a 350mmø cast iron main. PG Map indicates that the proposed development has three water services that enter the subject properties. According to the lot history sheets one service is a 19mmø copper pipe, one is a 13mmø copper pipe, and one is a 13mmø pipe without a listed material type.

The water network also includes a fire hydrant located in front of 1788 Upland Street.

The system is part of Pressure Zone 1, which obtains its static pressure from the Carney Hill Reservoir (PW805) at a Top Water Elevation (TWL) = 630.0m.

5.2 Domestic Water Demands

The domestic water demand has been calculated utilizing rates published in the City of Prince George Draft Design Guidelines. Table 1 outlines the calculation of the domestic water demand.

Table 1: Estimated Water Demand					
ADD (l/c/d)	475	CoPG Design Guidelines Section 3.1.3			
MDD Factor	3.1	CoPG Design Guidelines Section 3.1.4 Table 3.1.1			
PHD Factor	4.25	CoPG Design Guidelines Section 3.1.4 Table 3.1.1			
Location	**Population**	**ADD (L/s)**	**MDD (L/s)**	**PHD (L/s)**	**Node Elevation (m)**
Node 1	58	0.32	0.98	1.35	571.28

5.3 Fire Protection Demands

In addition to the domestic water demand, an allowance for fire protection must be made. The City of Prince George Draft Design Guidelines recommends minimum fire protection design flows based on land use. The recommended Apartments/Townhouses land use design fire flow is 125 L/s.

The document titled *Water Supply for Public Fire Protection*, produced by the Fire Underwriters Survey is the de-facto standard in Canada for establishing fire protection requirements in municipal water works system design. This document presents a fire flow estimate that accounts for factors such as building construction, total floor area, material combustibility, automatic sprinkling, building separation, and occupancy. The design fire flow requirement of 125 L/s may require adjustment at the time of detailed design development to ensure an adequate design fire flow is utilized for the site.

5.4 Water Modelling Results

L&M Engineering submitted design parameters to the City of Prince George for water modelling. The City's Water Model was analyzed under Average Day Demand (ADD), Maximum Day Demand (MDD) and Peak Hour Demand (PHD) conditions. Maximum Day conditions represent the highest recorded daily demand on the water system, and Peak Hour flow conditions represent the highest demand on the system during the course of a day.

The City completed water modelling (WM000187) for the network along Upland Street and produced a report dated February 21st, 2024. The modelling indicates that the water main can achieve an available fire flow of 608.60 L/s in front of the proposed development. The report also indicates that the water main on Upland Street can achieve a pressure of 83.20psi during ADD and 78.90 psi during PHD at the subject property. The CoPG Design Guidelines indicate that the minimum system pressure during PHD conditions is 40 psi; therefore, the existing main can provide the required system pressure.

The Water Modelling Report is attached in Appendix B.

5.5 Proposed Water Servicing

It is recommended to service the development with a new 100mmø water service. The three existing services entering the property should be removed or abandoned at the time of development. The existing hydrant adjacent to the subject property can remain at its current location as it meets the fire flow requirements for the development.

6.0 SANITARY COLLECTION SYSTEM

6.1 Existing System

The existing sanitary system in the vicinity of the subject site consists of a 200mmø gravity main that traverses from Upland Street to 17th Avenue to Spruce Street and then through the Parkland Place commercial area. From there the sewage enters a trunk main on 12th Avenue that directs flows to the PW103 lift station adjacent to Brownridge & Company Insurance.

PGMap indicates that there are three 100mmø services that enter the subject properties. One is listed as asbestos concrete, while the other two service's materials are not listed.

6.2 Existing Capacity

L&M Engineering reviewed the *City of Prince George 2017 Sanitary Sewer Services Master Plan* (prepared by AECOM) for information related to the capacity of the existing sanitary system. The study reviewed the existing, zoning, and OCP model scenarios for the sanitary network. Both the existing and OCP models indicate that there are no immediate capacity issues are present in the area nearby the site.

The 2017 Sanitary Master Plan indicates that all pipes between the subject site and the PW103 lift station have an available capacity of at least 8.30 L/s. The available capacity of the lift station (PW103) is approximated to 18 L/s during the existing scenario.

6.3 Sanitary Design Flows

The City of Prince George Design Guidelines (Section 4.2) outline the procedure required to determine the sanitary sewer design flows. The calculation for the subject property's design flow is summarized in Table 2.

Table 2: Estimated Sewage Design Flow Demands			
Variable	**Result**		**Notes**
No of Units	25		
People per Unit	2.4		Refer to Table 2.10.1 CoPG Design Guidelines
Population	60	people	Refer to Section 4.0 CoPG Design Population
Domestic Avg Daily per Capita	380	l/d	Refer to Section 4.2.2.6 CoPG Design Guidelines
Total Avg. Daily Flow	22,800	l/d	= Population * Avg. Flow per Capita
Peak Factor	4.30		Harman Equation
Total Peak Design Flow (Qs)	98,040	l/d	=Total Avg. Daily Design Flow * Peak Factor
Total Peak Design Flow (Qs)	1.13	l/s	=Total Avg. Daily Design Flow * Peak Factor
Infiltration and Inflow			
Development Area	0.2	ha	
Infiltration Rate	11,200	l/ha/d	Refer to section 4.2.2.4 (11,200 L/ha)
Infiltration (Qi)	2,240	l/d	= Development Area x Infiltration Rate
Infiltration (Qi)	0.03	l/s	= Development Area x Infiltration Rate
Total Design Flow (Qs + Qi)	100,280	l/d	(Qs + Qi)
Total Design Flow (Qs + Qi)	**1.16**	l/s	(Qs + Qi)

As shown in Table 2, developing the subject property to the maximum density of 25 dwelling units will produce a peak flow of 1.16 L/s. Based on the information provided in the 2017 Sanitary Master Plan, all of the downstream pipes between the subject property and PW103 have the available capacity to accommodate the development.

6.4 Proposed Sanitary Servicing

It is recommended to remove or abandon the existing services that enter the property. It is estimated that the existing services are approximately 63 years old and near the end of their lifecycle.

The 2018 British Columbia Plumbing Code (BCPC) was used to approximate the size of the new sanitary service. Using BCPC Table 2.4.9.3 in conjunction with a preliminary building plan provided by the developer, the fixture units were calculated for the proposed development. Table 3 summarizes the fixture unit calculation.

Table 3 - Sanitary Fixture Units			
	Quantity	**Hydraulic Load, Fixture Units**	**Total**
2-Bedroom Units			
Bathroom Group	1	6	6
Washing Machine	1	2	2
Kitchen Sink	1	1.5	1.5
Dishwasher	1	1.5	1.5
Total Fixture Units per 2-Bedroom Townhouse			**11**
3-Bedroom Units			
Bathroom Group	2	6	12
Washing Machine	1	2	2
Kitchen Sink	1	1.5	1.5
Dishwasher	1	1.5	1.5
Water Closet	1	4	4
Lavatory	1	1	1
Total Fixture Units per 3-Bedroom Townhouse			**22**

The preliminary site plan for this development includes 12 2-bedroom units and 12 3-bedroom units. This equates to a total of 396 fixture units for entire development. Table 2.4.10.6.-C in the BCPC indicates that a 150mmø service will be required. In order to install a new 150mmø service into the property, an overbuild manhole will be required over the main on Upland Street. During the detailed design stage of the project, the service sizing calculation should be recalculated based on a finalized number of fixture units.

7.0 STORM WATER SYSTEM

7.1 Existing System

The existing storm infrastructure in the vicinity of the subject site consists of a 450mmø main on Upland Street. Upland Street is complete with curb and gutter and utilizes catch basins to collect the surface runoff from the surrounding lots and asphalt road surface.

The gravel laneway located behind the subject properties appears to have minimal storm infrastructure. PG Map indicates that there is one catch basin located in the laneway approximately 105m south of the subject properties. The catch basin then drains into the storm main on Upland Street.

7.2 Proposed Storm Servicing

SoilTech Consulting Ltd. prepared a Geotechnical Assessment dated March 4th, 2024 (Enclosed in Appendix D). The report indicates that the natural subsurface conditions are relatively free-draining and are suitable for ground infiltration. The design infiltration rate to be used for the development is $1x10^{-4}$ m/s (360 mm/hr).

As part of the City of Prince George offsite requirements, the developer will be responsible for paving the laneway along the property frontage. The proposed plan is to install four infiltration galleries to collect the storm runoff. Two should be located onsite in the asphalt parking lot and collect the water from the building's roof, the concrete sidewalk along the building and the parking lot surface. The other two infiltration galleries should be located in the paved laneway behind the site to collect the municipal runoff within the laneway. The storm management system was modelled using the hydrograph method utilizing HydroCAD 10.0 software. The hydrograph method was modelled based on the following:

- Infiltration galleries were designed to satisfy 10-year design storm level-of-service requirement.
- Rainfall intensity duration frequency information for the 10-year return period from the rainfall data for Prince George.
- Concentration Time: 5 minutes for entire system
- CN value: 98, used for asphalt, concrete sidewalk, and building roofs

Table 4 summarizes the approximate dimensions for the proposed infiltration galleries.

Table 4: Infiltration Gallery Sizing

Drain Rock					Available Storage (m^3)
Height (m)	Side Slope (m)	Bottom Dia. (m)	Top Dia. (m)	Volume (m^3)	
Parking Lot Infiltration Gallery (Requires 2)					
1.8	1:1	2.4	6.0	26.5	7.9
Laneway Infiltration Gallery (Requires 2)					
0.9	1:1	2.1	3.9	6.6	2.0

The infiltration gallery design dimensions should be confirmed during the detailed design phase of the project, once the site layout has been finalized. The HydroCAD modelling results are enclosed in Appendix C.

8.0 SUMMARY

In summary, the proposed development located at 1788, 1798, and 1804 Upland Street in Prince George, BC, can be adequately serviced with the nearby water, sanitary, and storm infrastructure. The City conducted water modelling that indicated the existing water network surrounding the development could sufficiently meet the fire flow and pressure requirements outlined in the City of Prince George's Design Guidelines.

The existing sanitary network surrounding the site has the capacity to accommodate the development and onsite infiltration can be used to manage the storm runoff. Additional infiltration galleries can be installed to manage the runoff generated by the laneway.

9.0 CLOSURE

This Servicing Brief has been prepared for the City of Prince George and Lithium One Homes Ltd. as the intended users. Any use which a third party makes of this report or any reliance on or decisions to be made based on it are the responsibility of such third parties. L&M Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this study. The information and data contained within this document represent L&M Engineering Limited's professional judgement in accordance with the knowledge and information available to L&M Engineering Limited at the time of the report preparation. No other warranty, expressed or implied, is made.

Sincerely,

L&M ENGINEERING LTD

Prepared by:

PERMIT TO PRACTICE
NO 1002375
2024-03-14

Tanner Fjellstrom, P. Eng.
Associate

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APPENDIX A

Conceptual Site Plan

CIVIC ADDRESSES & LEGAL DESCRIPTIOS
1788 UPLAND STREET
LT 12 BLK 277 DL 343 PL 1268
PID: 011857536
LT 11 BLK 277 DL 343 PL 1268
PID: 011857480
LT PCL A BLK 277 DL 343 PL 1268 (D4138)
PID: 011234814

1798 UPLAND STREET
LOT C BLK 319 DL 343 PL 1268 (63402M)
PID: 010074333
LOT 20 BLK 319 DL 343 PL 1268
PID: 010074422

1804 UPLAND STREET
LOT 19 BLK 319 DL 343 PL 1268
PID: 010074414
LOT 18 BLK 319 DL 343 PL 1268
PID: 010074368

EXISTING ZONING
RM4

PROPOSED ZONING
RM5

RM5 MINIMUM SETBACKS
FRONT YARD: 4.5m
SIDE YARD: 3.0m
REAR YARD: 6.0m

DEVELOPMENT AREA
0.2 ha (0.5 acres)

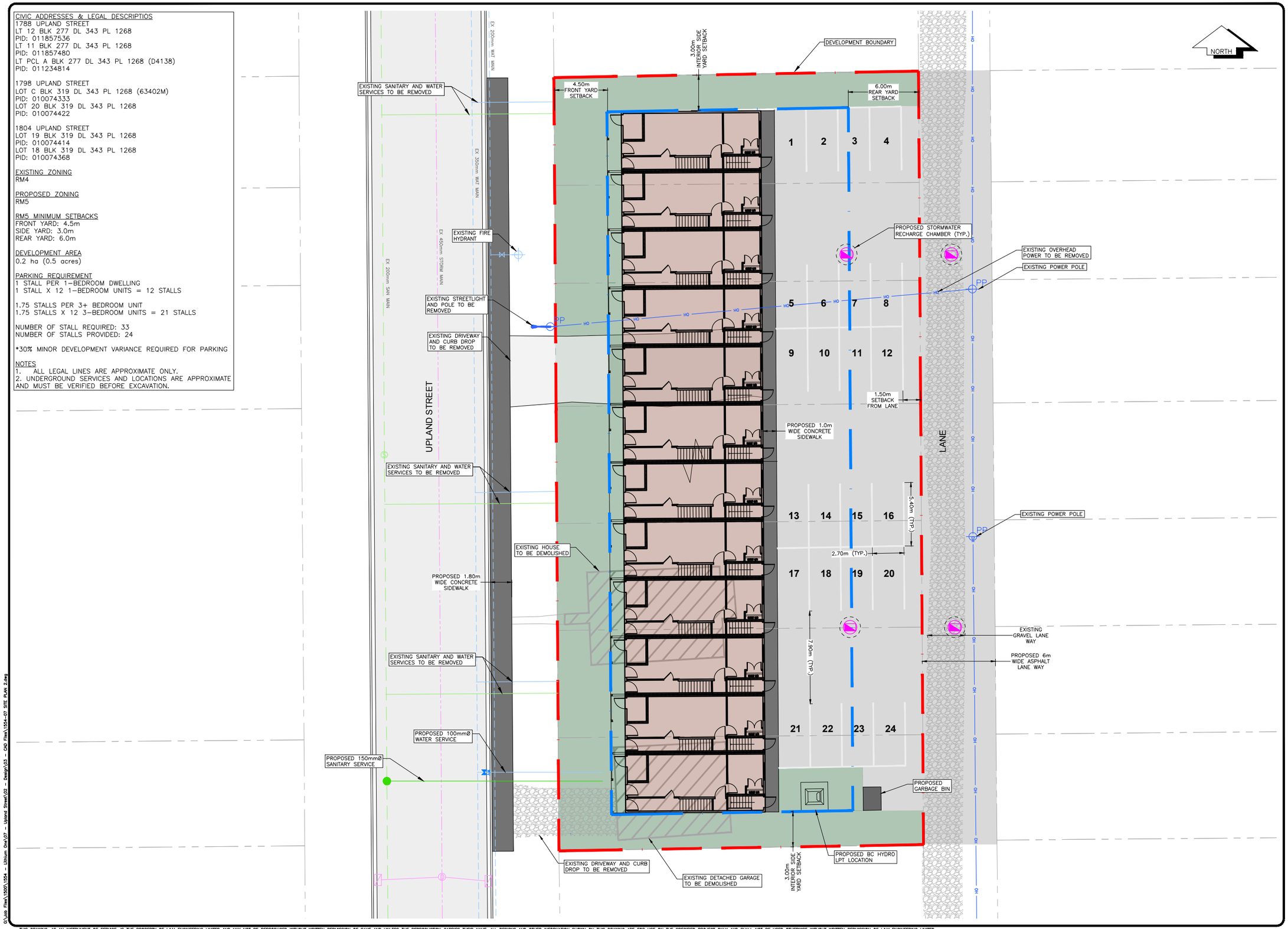
PARKING REQUIREMENT
1 STALL PER 1–BEDROOM DWELLING
1 STALL X 12 1–BEDROOM UNITS = 12 STALLS

1.75 STALLS PER 3+ BEDROOM UNIT
1.75 STALLS X 12 3–BEDROOM UNITS = 21 STALLS

NUMBER OF STALL REQUIRED: 33
NUMBER OF STALLS PROVIDED: 24

*30% MINOR DEVELOPMENT VARIANCE REQUIRED FOR PARKING

NOTES
1. ALL LEGAL LINES ARE APPROXIMATE ONLY.
2. UNDERGROUND SERVICES AND LOCATIONS ARE APPROXIMATE AND MUST BE VERIFIED BEFORE EXCAVATION.



LEGEND

EXISTING

- EX. TEST PIT & DRILL HOLE
- EX. BENCHMARK & SURVEY HUBS
- EX. IP's & ISM's
- EX. LEGAL LINE
- EX. LEGAL R.O.W. & EASEMENT
- EX. SANITARY & MANHOLE
- EX. SANITARY FORCE MAIN
- EX. STORM & MANHOLE
- EX. SINGLE & DOUBLE CATCHBASIN c/w CB LEADS
- EX. CATCHBASIN MANHOLE
- EX. CULVERT
- EX. FIRE HYDRANT & VALVE ASSEMBLY
- EX. WATERMAIN & VALVE
- EX. BLOW-OFF ASSEMBLY
- EX. CURB STOP
- EX. ROAD & SIDEWALK
- EX. ROAD SIGN(s)
- EX. SHOULDER
- EX. TOP OF SLOPE
- EX. TOE OF SLOPE
- EX. DITCH or SWALE
- EX. FENCE
- EX. OVERHEAD LINES
- EX. UNDERGROUND LINES
- EX. POWER POLE & ANCHOR
- EX. GAS MAIN

PROPOSED

- PR. LEGAL LINE
- PR. LEGAL R.O.W. & EASEMENT
- DEVELOPMENT BOUNDARY
- RM5 ZONE SETBACKS
- PR. SANITARY & MANHOLE
- PR. STORM & MANHOLE
- PR. SINGLE & DOUBLE CATCHBASIN c/w CB LEADS
- PR. CATCHBASIN MANHOLE
- PR. CULVERT
- PR. DITCH or SWALE
- PR. FIRE HYDRANT & VALVE ASSEMBLY
- PR. WATERMAIN & VALVE
- PR. GRAVEL SHOULDER
- PR. ASPHALT
- PR. CURB & SIDEWALK
- PR. ROAD SIGN(s)

NO.	DATE (D/M/Y)	REVISION	BY

NOT FOR CONSTRUCTION

L&M ENGINEERING LIMITED

CITY OF PRINCE GEORGE
Development Services

CONSULTANTS PROJECT No.:	1554–07
DRAWN:	MLH
CHECKED:	JRB
ENGINEER:	JRB
DATE:	MARCH 2024
SCALES:	HORZ. 1:150
SCALES:	VERT. 1:150

LITHIUM ONE HOMES LTD.
1804, 1798 & 1788 UPLAND ST
24–UNIT TOWNHOUSE DEVELOPMENT

CONCEPTUAL SITE PLAN

DRAWING No.
C001

0 4.5 9 Meters

G:\Job Files\1500\1554 - Lithium One\07 - Upland Street\02 - Design\03 - CAD Files\1554-07 SITE PLAN 2.dwg

APPENDIX B

City of Prince George Water Modelling

(WM000187)

CITY OF PRINCE GEORGE
Infrastructure and Public Works

1100 Patricia Boulevard, Prince George, BC V2L 3V9
Telephone (250) 561-7511 Fax (250) 612-5603

MEMO

To: **Megan Hickey**
L&M Engineering
mhickey@lmengineering.bc.ca

From: **Alex Childs**
250-614-7807
Alex.Childs@princegeorge.ca

Date: **February 21st, 2024**

Subject: **WM000187 Water Modelling for 1788, 1798, 1804 Upland Street PIDs: 011-234-814, 010-074-333, 010-074-368**
Total number of pages (including this sheet): 4 Original WILL NOT follow by mail.

Megan Hickey,

Water modelling has been carried out for 1788, 1798, 1804 Upland Street PIDs: 011-234-814, 010-074-333, 010-074-368 under the conditions provided by yourself via the attached email sent February 7th, 2024. As requested, the scenario has been evaluated at the location shown on the attached map. Please note that the City's records indicate that the watermain parallel to the 350mm main is a 150mm main rather than the 200mm main shown in PGMap. Therefore, the analysis has been completed with the proposed connection to the 350mm main running parallel to a 150mm main.

The results of the modelling are outlined in Table 1. The available fire flow at Node 1 meets the City guidelines of at least 125l/s with a minimum residual pressure of 20psi for multi-family development.

Table 1: Modelling Scenarios for 1788, 1798, 1804 Upland Street PIDs: 011-234-814, 010-074-333, 010-074-368

Node	Modelling Node #	Pressure During ADD	Pressure During PHD	Design Fire Flow During MDD
Node 1	1763	83.20 PSI	78.90 PSI	608.60 l/s

Keep in mind that the values provided are at the proposed main and any losses within the service connections must be considered by the designer.

Modelling has been carried out using the most recent version of the City's water model, analyzed under Average Day Demands (ADD), Maximum Day Demands (MDD), and Peak Hour Demands (PHD). Average Day represents the expected average demand over the entire year. Maximum Day represents the average demand during the expected highest demand day of the year. Peak Hour represents the expected highest single-hour average demand with a 3-year return period. Fire Flows given are Design Fire Flows, representing the highest flow that can be drawn from a hydrant under Maximum Day Demand, without reducing pressure at any point in the network below 20 PSI.

Regards,

Prepared by
Alex Childs, P.Eng,
Development Engineer

Reviewed by
Al Clark, P.Eng.
City Engineer

CC: Jon LaFontaine, Utilities Manager
Mandy Stanker, Manager Development Services

From: Megan Hickey
To: devserv
Cc: Childs, Alex; Clark, Alan; Morrison, Donald; jas@lithiumone.com; Jason Boyes
Subject: Water Modelling Request - 1788, 1798, & 1804 Upland Street
Date: Wednesday, February 7, 2024 3:49:38 PM
Attachments: image001.png
Water Modelling - 1788, 1798, 1804 Upland Street.pdf

To whom this may concern,

L&M is requesting water modelling for properties located at 1788, 1798, & 1804 Upland Street. The owner has ac active rezoning application submitted (RZ100811) to rezone the properties to RM5, and we would like to request water modelling to ensure the flows and pressures are sufficient for a multi-family development. Following the rezoning, the properties will be consolidated. We are proposing to service the development via the existing 350mm diameter water main in Upland Street.

Attached is a marked-up PDF detailing the proposed system demands. Can you please model the following scenarios:

1. Pressure during ADD scenario
2. Pressure during PHD scenario
3. Available Fire Flow during MDD scenario (Include hydrant curve for Node 1)

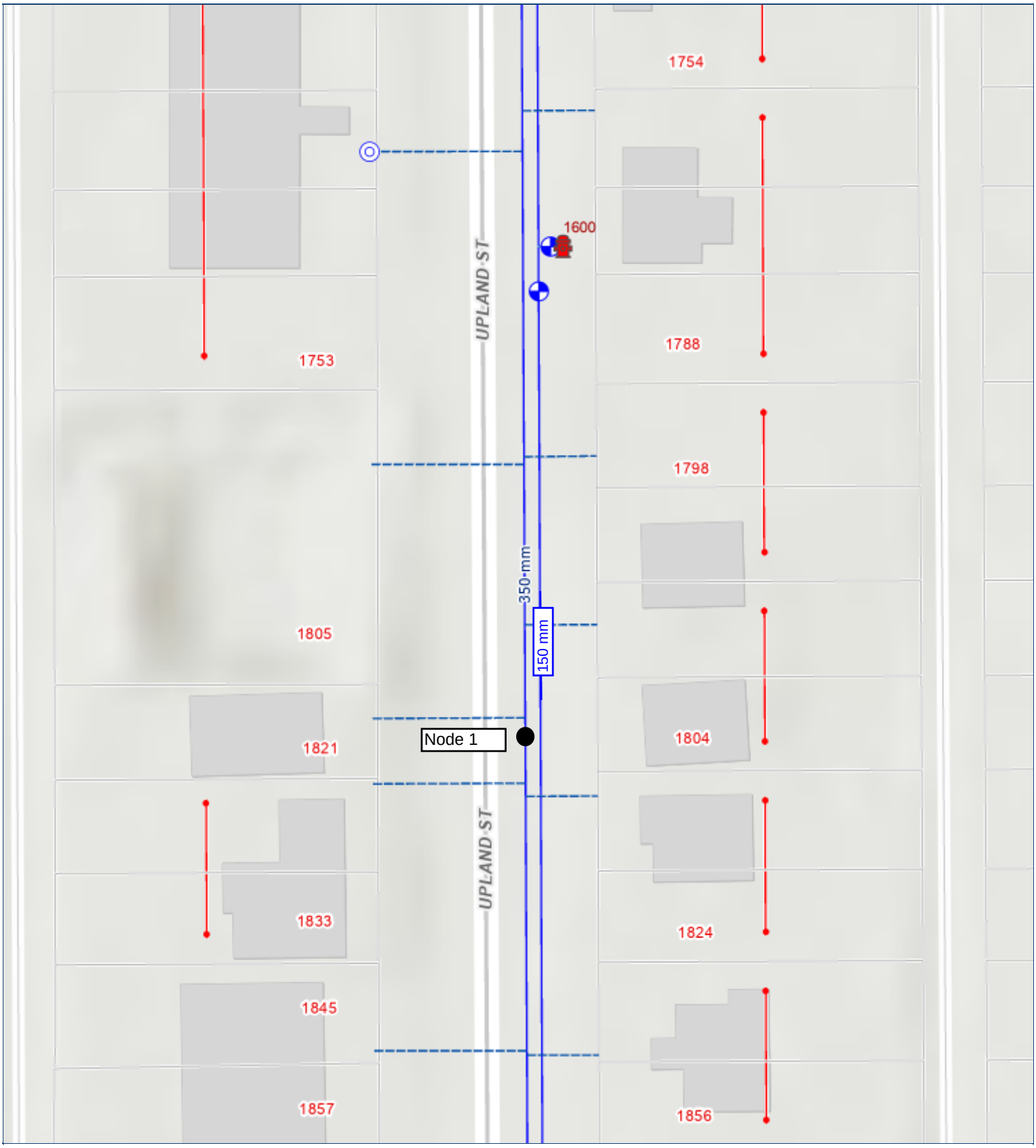
Let us know if there are any questions.

Sincerely,

Megan Hickey, BPl
Planner
L&M Engineering Limited
1210 4th Avenue
Prince George, BC V2L 3J4
Phone: 250-562-1977
mhickey@lmengineering.bc.ca

Table 1: Estimated Water Demand					
ADD (l/c/d)	475	CoPG Design Guidelines Section 3.1.3			
MDD Factor	3.1	CoPG Design Guidelines Section 3.1.4 Table 3.1.1			
PHD Factor	4.25	CoPG Design Guidelines Section 3.1.4 Table 3.1.1			
Location	**Population**	**ADD (L/s)**	**MDD (L/s)**	**PHD (L/s)**	**Node Elevation (m)**
Scenario 1					
Node 1	58	0.32	0.98	1.35	571.28

Node Map



CITY OF PRINCE GEORGE

Notes:

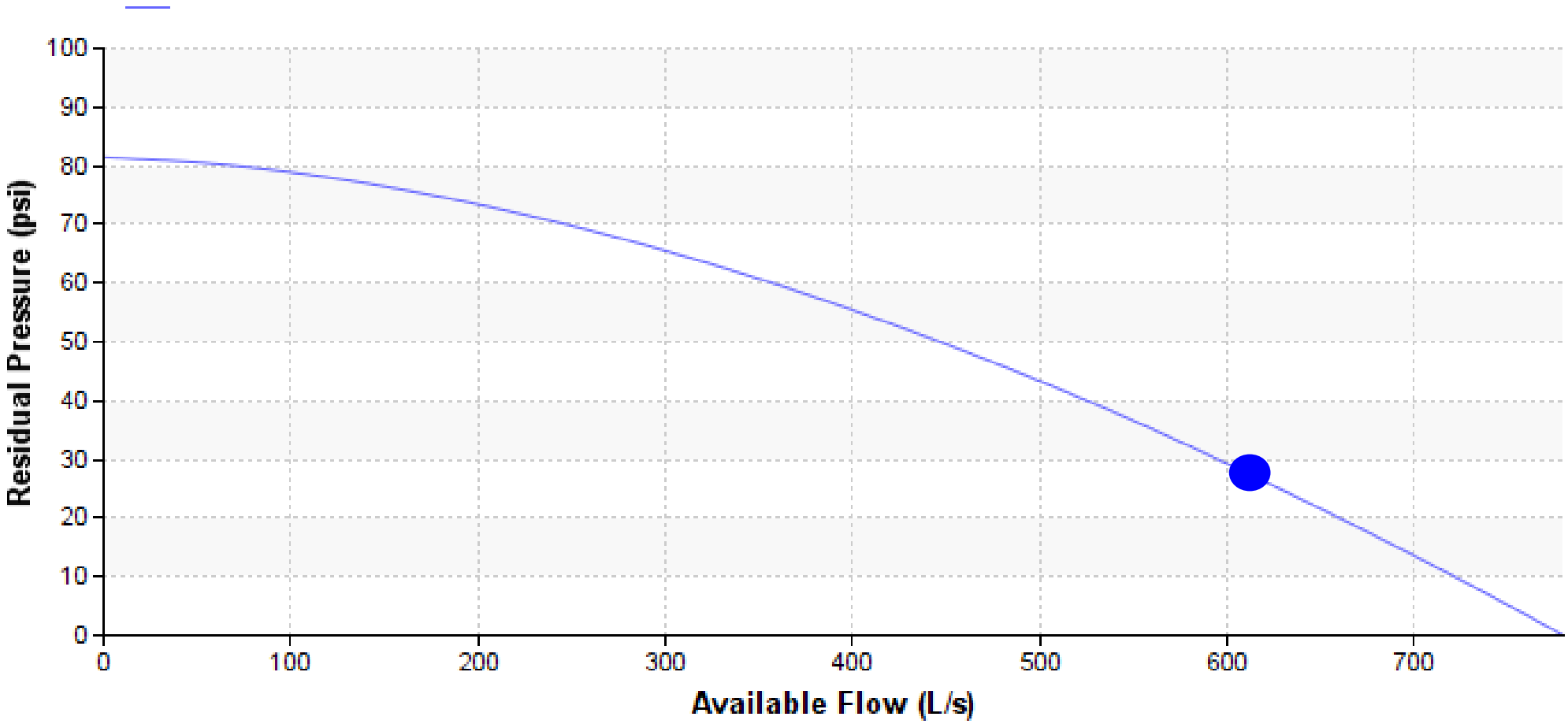
Please note the watermain sizes are 350mm and 150mm.

0 5 10 m

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. This map should not be used for: navigation, a plan of survey, routes, nor locations.

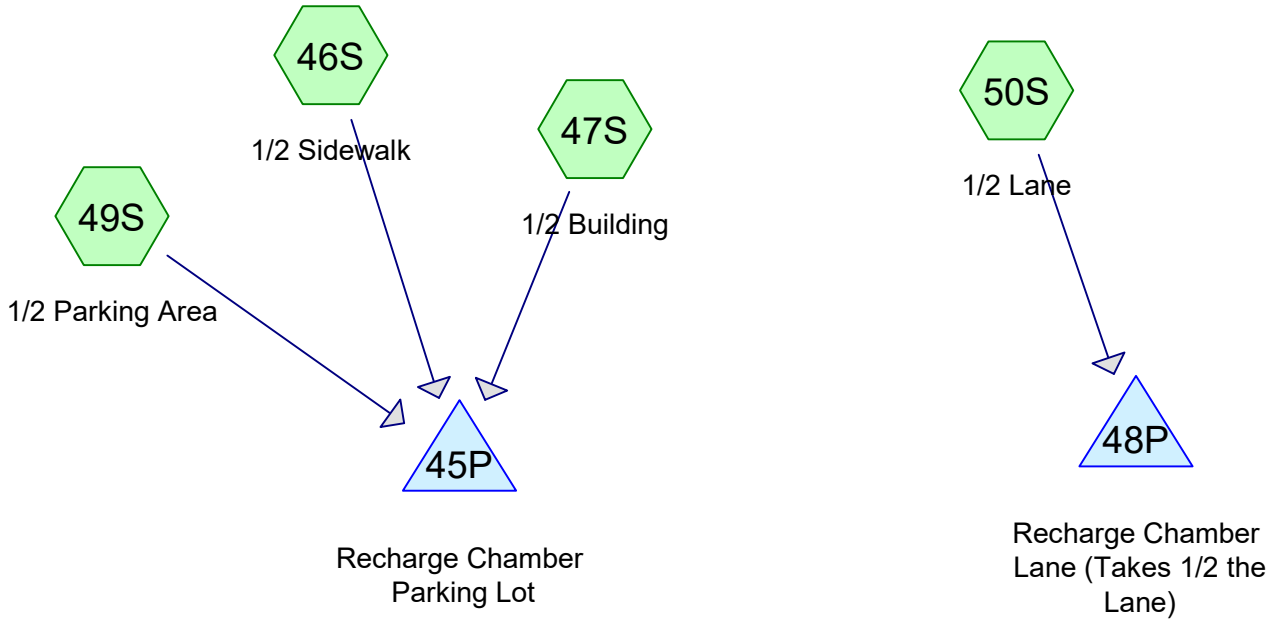
Printed: February 20, 2024 12:14

Hydrant Curve for Node 1



APPENDIX C

HydroCAD Storm Modelling



Subcat Reach Pond Link

Routing Diagram for Recharge Chamber Design (10 Yr)
Prepared by Tanner Fjellstrom, Printed 2024-03-13

Area Listing (all nodes)

Area (hectares)	CN	Description (subcatchment-numbers)
0.0559	98	Paved parking, HSG A (49S, 50S)
0.0355	98	Roofs, HSG A (47S)
0.0035	98	Unconnected pavement, HSG A (46S)
0.0949	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (hectares)	Soil Group	Subcatchment Numbers
0.0949	HSG A	46S, 47S, 49S, 50S
0.0000	HSG B	
0.0000	HSG C	
0.0000	HSG D	
0.0000	Other	
0.0949		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (hectares)	HSG-B (hectares)	HSG-C (hectares)	HSG-D (hectares)	Other (hectares)	Total (hectares)	Ground Cover	Subcatchment Numbers
0.0559	0.0000	0.0000	0.0000	0.0000	0.0559	Paved parking	49S, 50S
0.0355	0.0000	0.0000	0.0000	0.0000	0.0355	Roofs	47S
0.0035	0.0000	0.0000	0.0000	0.0000	0.0035	Unconnected pavement	46S
0.0949	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0949**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 46S: 1/2 Sidewalk Runoff Area=35.0 m² 100.00% Impervious Runoff Depth=32 mm
Tc=5.0 min CN=98 Runoff=0.0005 m³/s 0.001 Ml

Subcatchment 47S: 1/2 Building Runoff Area=355.0 m² 100.00% Impervious Runoff Depth=32 mm
Tc=5.0 min CN=98 Runoff=0.0050 m³/s 0.012 Ml

Subcatchment 49S: 1/2 Parking Area Runoff Area=355.0 m² 100.00% Impervious Runoff Depth=32 mm
Tc=5.0 min CN=98 Runoff=0.0050 m³/s 0.012 Ml

Subcatchment 50S: 1/2 Lane Runoff Area=204.0 m² 100.00% Impervious Runoff Depth=32 mm
Tc=5.0 min CN=98 Runoff=0.0029 m³/s 0.007 Ml

Pond 45P: Recharge Chamber Parking Peak Elev=101.707 m Storage=7.2 m³ Inflow=0.0106 m³/s 0.024 Ml
Outflow=0.0027 m³/s 0.024 Ml

Pond 48P: Recharge Chamber Lane Peak Elev=100.765 m Storage=1.5 m³ Inflow=0.0029 m³/s 0.007 Ml
Outflow=0.0010 m³/s 0.007 Ml

Total Runoff Area = 0.0949 ha Runoff Volume = 0.031 Ml Average Runoff Depth = 32 mm
0.00% Pervious = 0.0000 ha 100.00% Impervious = 0.0949 ha

Summary for Subcatchment 46S: 1/2 Sidewalk

[49] Hint: Tc<2dt may require smaller dt

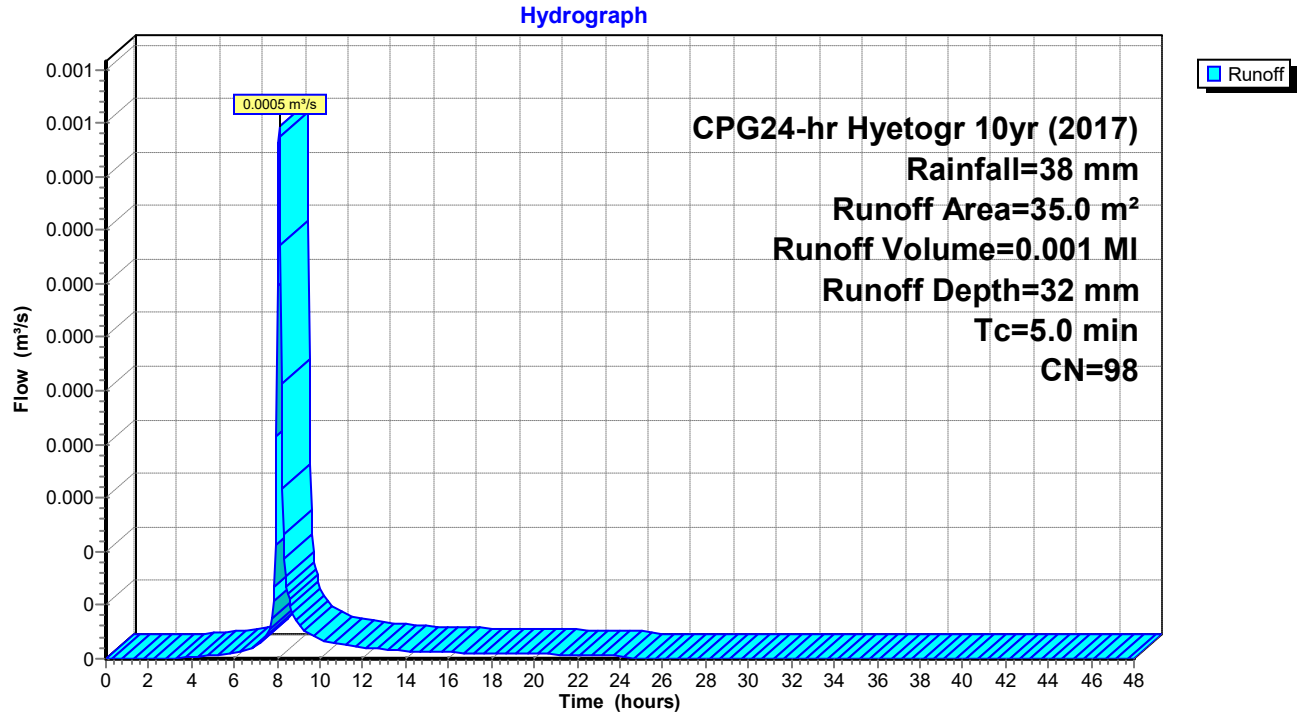
Runoff = 0.0005 m³/s @ 8.08 hrs, Volume= 0.001 Ml, Depth= 32 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
CPG24-hr Hyetogr 10yr (2017) Rainfall=38 mm

Area (m²)	CN	Description
35.0	98	Unconnected pavement, HSG A
35.0		100.00% Impervious Area
35.0		100.00% Unconnected

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
5.0					**Direct Entry,**

Subcatchment 46S: 1/2 Sidewalk



Summary for Subcatchment 47S: 1/2 Building

[49] Hint: Tc<2dt may require smaller dt

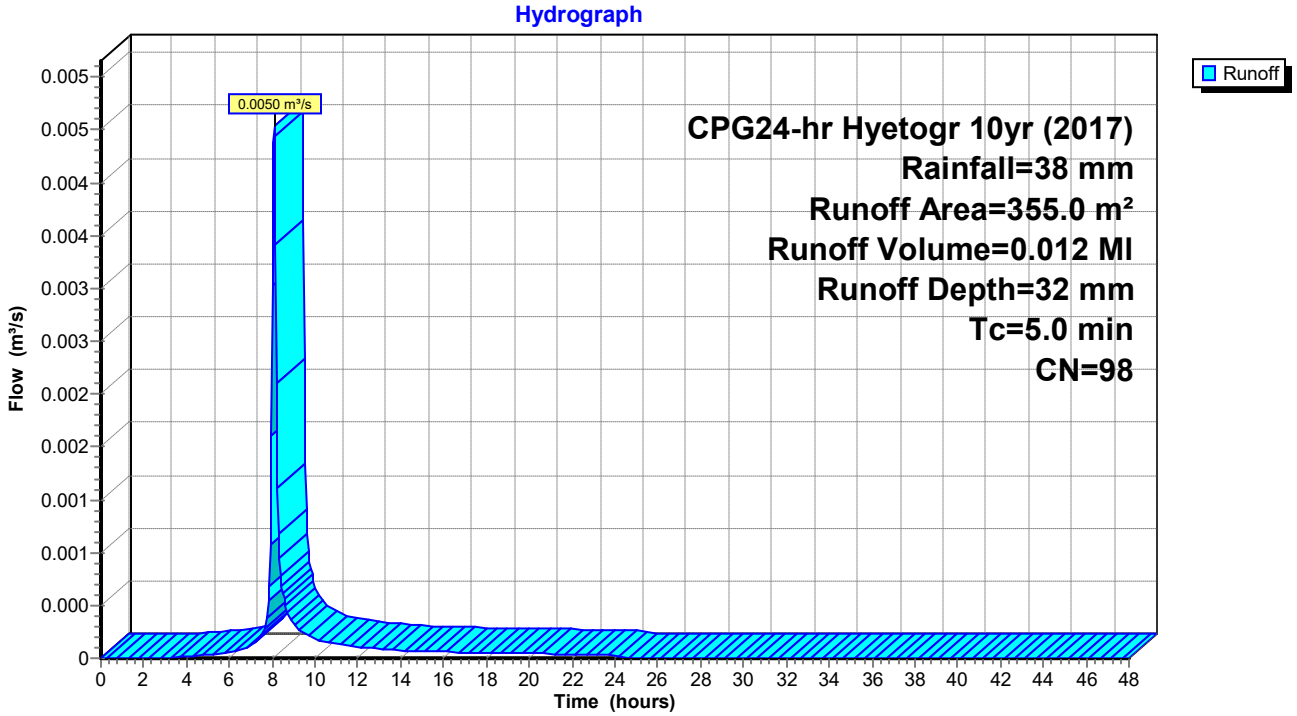
Runoff = 0.0050 m³/s @ 8.08 hrs, Volume= 0.012 Ml, Depth= 32 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
CPG24-hr Hyetogr 10yr (2017) Rainfall=38 mm

Area (m²)	CN	Description
355.0	98	Roofs, HSG A
355.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
5.0					**Direct Entry,**

Subcatchment 47S: 1/2 Building



Summary for Subcatchment 49S: 1/2 Parking Area

[49] Hint: Tc<2dt may require smaller dt

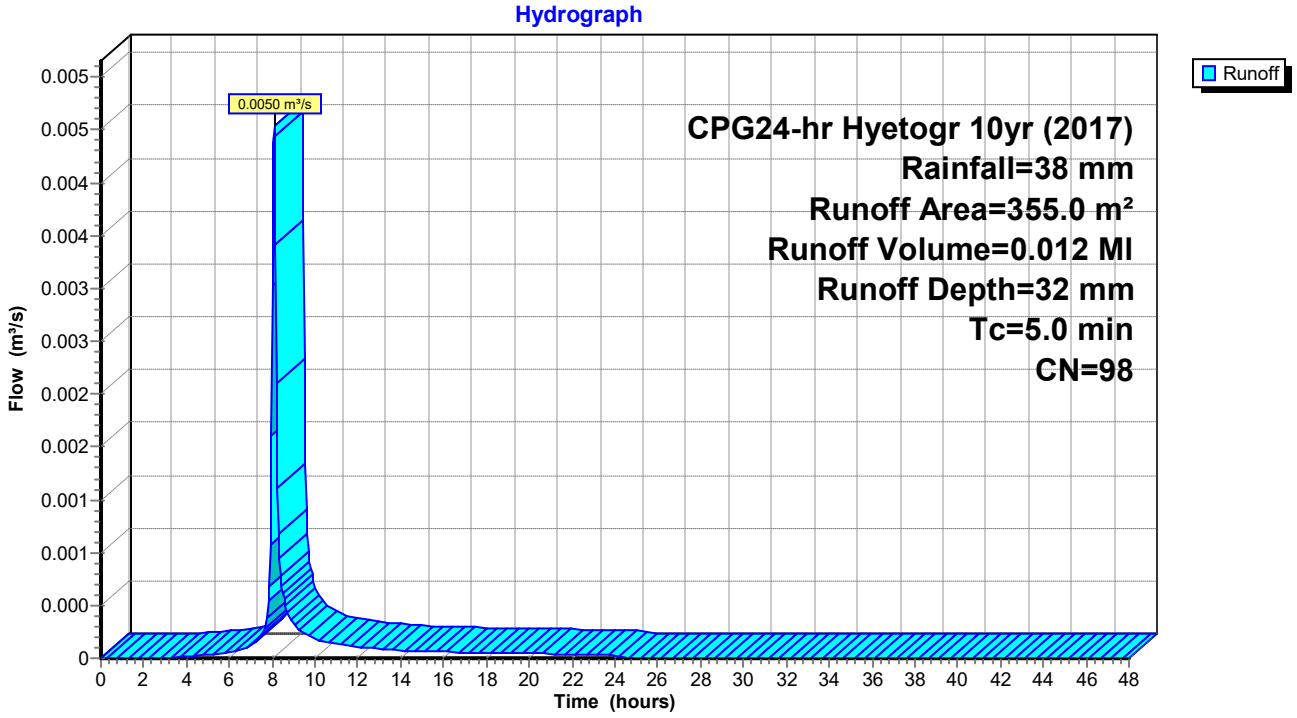
Runoff = 0.0050 m³/s @ 8.08 hrs, Volume= 0.012 Ml, Depth= 32 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
CPG24-hr Hyetogr 10yr (2017) Rainfall=38 mm

Area (m²)	CN	Description
355.0	98	Paved parking, HSG A
355.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
5.0					**Direct Entry,**

Subcatchment 49S: 1/2 Parking Area



Summary for Subcatchment 50S: 1/2 Lane

[49] Hint: Tc<2dt may require smaller dt

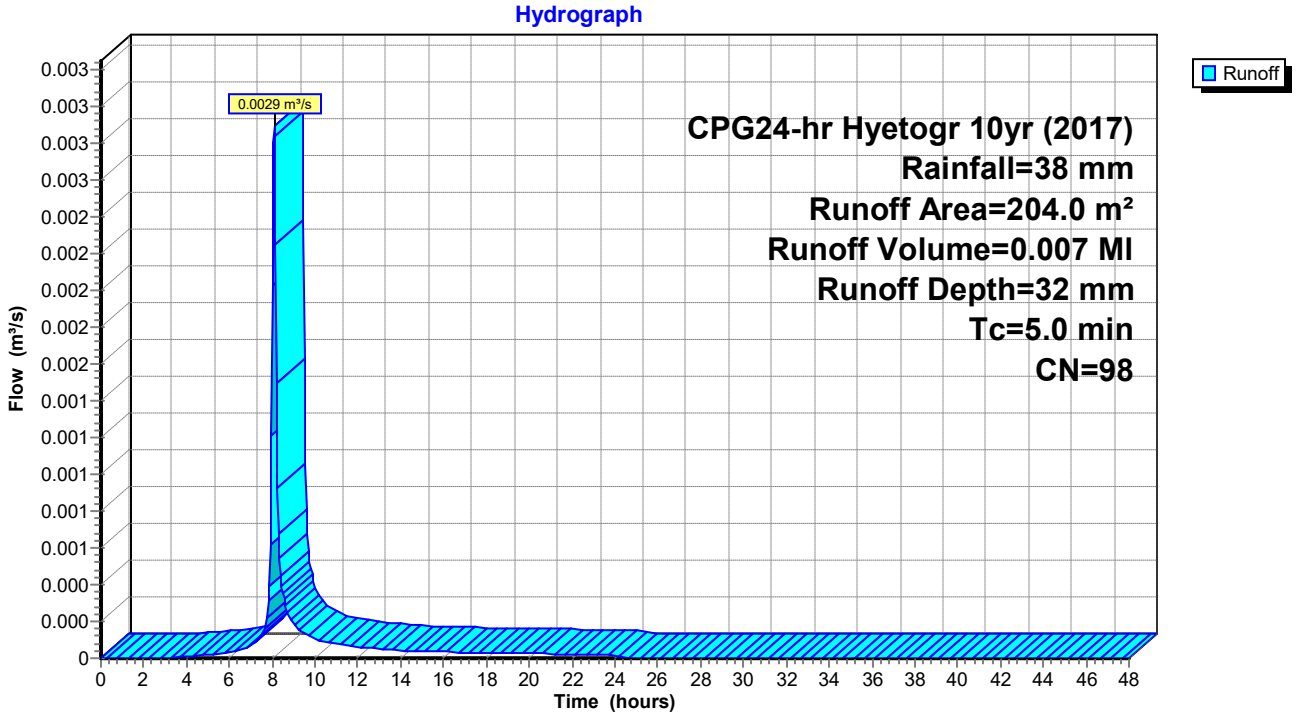
Runoff = 0.0029 m³/s @ 8.08 hrs, Volume= 0.007 Ml, Depth= 32 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
CPG24-hr Hyetogr 10yr (2017) Rainfall=38 mm

Area (m²)	CN	Description
204.0	98	Paved parking, HSG A
204.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
5.0					**Direct Entry,**

Subcatchment 50S: 1/2 Lane



Summary for Pond 45P: Recharge Chamber Parking Lot

Inflow Area = 0.0745 ha,100.00% Impervious, Inflow Depth = 32 mm
Inflow = 0.0106 m³/s @ 8.08 hrs, Volume= 0.024 Ml
Outflow = 0.0027 m³/s @ 8.30 hrs, Volume= 0.024 Ml, Atten= 75%, Lag= 13.0 min
Discarded = 0.0027 m³/s @ 8.30 hrs, Volume= 0.024 Ml

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 101.707 m @ 8.30 hrs Surf.Area= 26.5 m² Storage= 7.2 m³

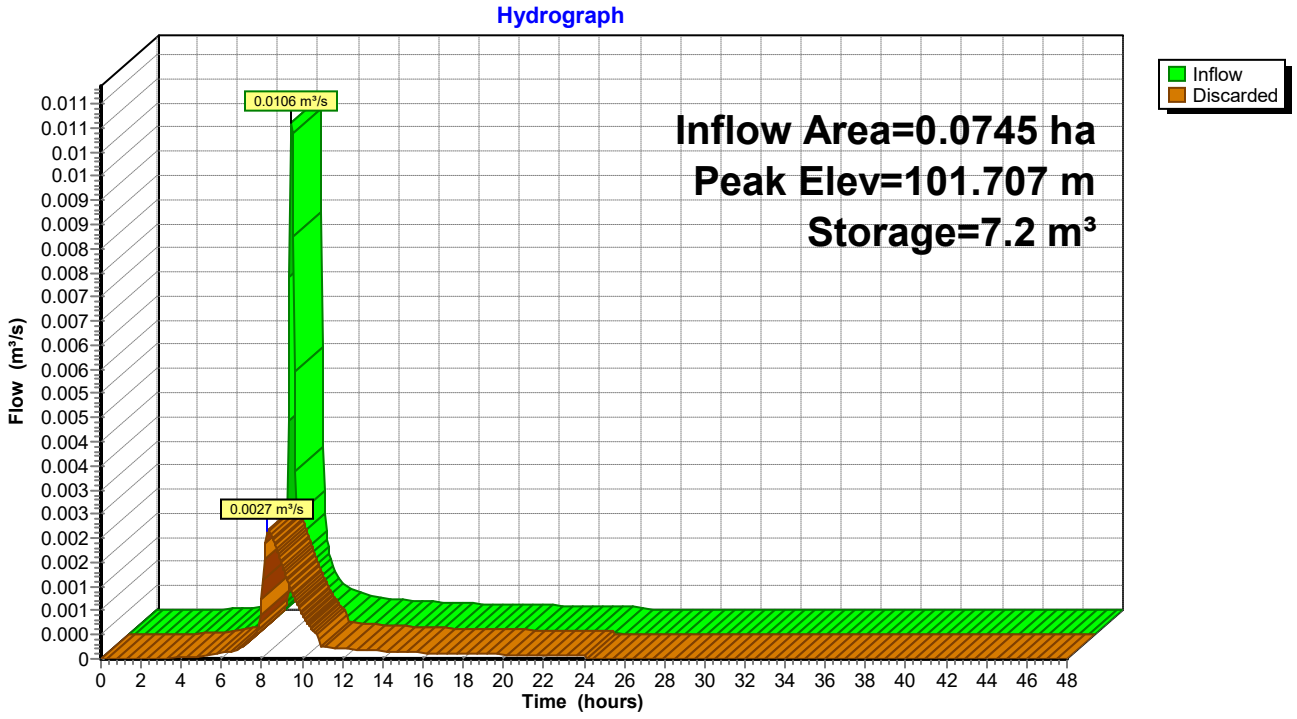
Plug-Flow detention time= 21.7 min calculated for 0.024 Ml (100% of inflow)
Center-of-Mass det. time= 21.7 min (634.8 - 613.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	7.9 m³	**2.40 mD x 1.80 mH Vertical Cone/Cylinder Z=1.0** 26.5 m³ Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.000 m	**360.00 mm/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.0027 m³/s @ 8.30 hrs HW=101.706 m (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0027 m³/s)

Pond 45P: Recharge Chamber Parking Lot



Summary for Pond 48P: Recharge Chamber Lane (Takes 1/2 the Lane)

Inflow Area = 0.0204 ha,100.00% Impervious, Inflow Depth = 32 mm
Inflow = 0.0029 m³/s @ 8.08 hrs, Volume= 0.007 Ml
Outflow = 0.0010 m³/s @ 8.25 hrs, Volume= 0.007 Ml, Atten= 64%, Lag= 10.1 min
Discarded = 0.0010 m³/s @ 8.25 hrs, Volume= 0.007 Ml

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 100.765 m @ 8.25 hrs Surf.Area= 10.4 m² Storage= 1.5 m³

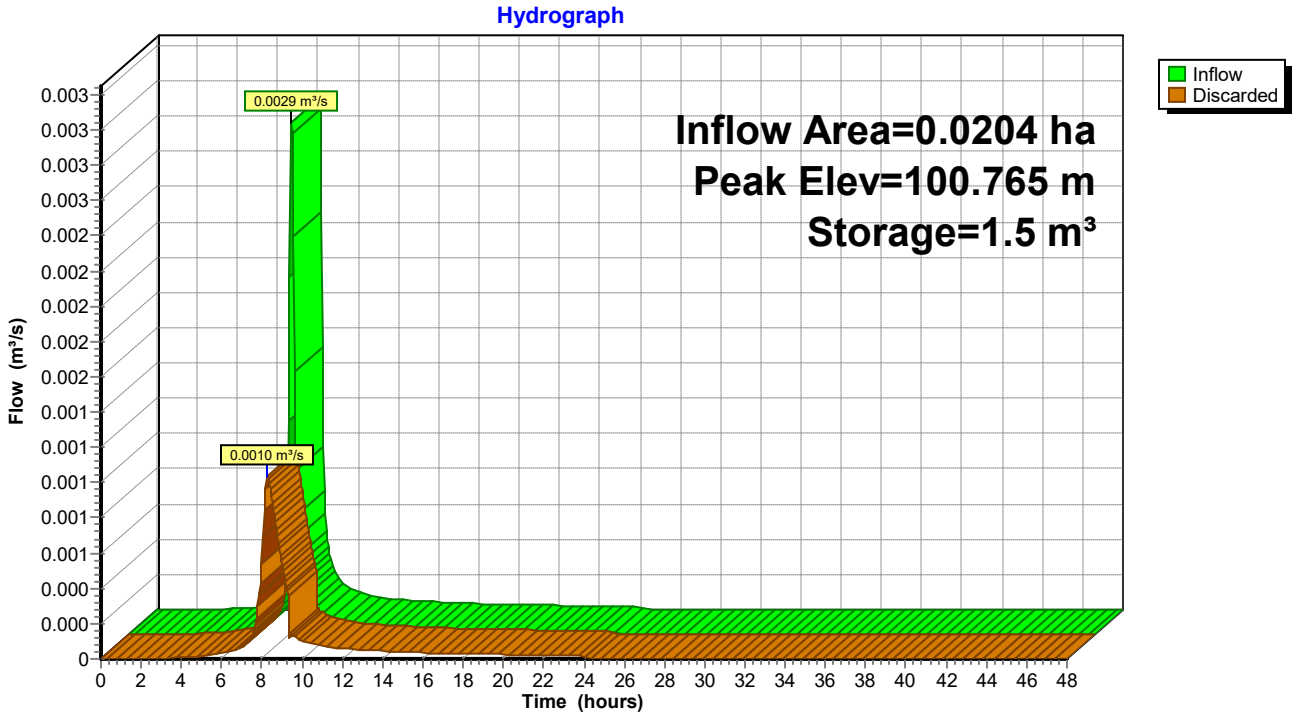
Plug-Flow detention time= 9.5 min calculated for 0.007 Ml (100% of inflow)
Center-of-Mass det. time= 9.4 min (622.5 - 613.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	2.0 m³	**2.10 mD x 0.90 mH Vertical Cone/Cylinder Z=1.0** 6.6 m³ Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.000 m	**360.00 mm/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.0010 m³/s @ 8.25 hrs HW=100.765 m (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0010 m³/s)

Pond 48P: Recharge Chamber Lane (Takes 1/2 the Lane)



APPENDIX D

SoilTech Consulting Ltd.
Geotechnical Assessment

Geotechnical Assessment:

Upland Street Multifamily Development

Prepared for:
Lithium One Homes Ltd.

March 4, 2024

Project Manager: Hans Jorgensen, P. Eng.
Project Number: 24-H-006

SoilTech Consulting Ltd

Version History		
Revision	Description	Date
1	Draft for preliminary design as groundwater monitoring still in progress	March 4, 2024

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1. Introduction

Lithium One Homes Ltd. retained SoilTech Consulting Ltd. (SoilTech) to conduct a geotechnical assessment for a multifamily development encompassing 1788, 1798, and 1804 Upland Street, Prince George, BC. The legal descriptions of the properties are:

- PARCEL A, BLOCK 277, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, (D4138), PID: 011-234-814
- LOT 11, BLOCK 277, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, PID: 011-857-480
- LOT 12, BLOCK 277, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, PID: 011-857-536
- LOT C, BLOCK 319, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, (63402M, PID: 010-074-333
- LOT 20, BLOCK 319, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, PID: 010-074-422
- LOT 19, BLOCK 319, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, PID: 010-074-414
- LOT 18, BLOCK 319, PLAN PGP1268, DISTRICT LOT 343, CARIBOO LAND DISTRICT, PID: 010-074-368

To conduct this assessment, we have:

- Reviewed the proposed development plans.
- Carried out a site assessment of the property and surrounding area including:
  - A desktop study of internal project information, and public data relevant to the development, geology, and water conditions at the site.
  - A field assessment including a site investigation and site reconnaissance.
- Determined the subsurface conditions.

Based on the assessment findings, we have provided geotechnical analysis, discussion, and recommendations for:

- The anticipated subsurface conditions in the development area
- Site Seismic Classification Estimate
- Radon Gas
- General site preparation
- Re-use of in-situ soils
- Building site preparation including Structural Fill
- Shallow foundations
- Grade supported floor slabs
- Foundation drainage and backfill
- Frost penetration and protection
- Pavement structures
- Stormwater disposal through ground infiltration
- Temporary excavations

2. Project Description

The provided preliminary plans indicate development will consist of and involve:

- A three and half-storey row town house building.
- Paved parking areas on the Upland Street and alley way sides of the building.
- Buried water, sanitary, storm, electrical, and communication services.
- Infiltration galleries for stormwater disposal.

3. Site Assessment

To assess the site, we carried out a desktop study and a field assessment. For the desktop study we reviewed:

- Conceptual drawings for the building and development:
- Internal information on nearby SoilTech projects.
- Government of Canada Open Maps – Surficial Geology.
- Government of Canada Earthquakes Canada.
- Geological Survey of Canada Bulletin 196 and Map 1288A.
- PGMap imagery and data.
- Google Earth Imagery.

The field assessment was carried out on February 13 and 14, 2024 and included a borehole and test pit subsurface investigation.

3.1 Site Description and Background

The development area consists of seven residential lots. The lots have previously been developed. Historical development included houses, garages, buried services and other related infrastructure. Most of the buildings were demolished prior to our assessment. A house and garage were still present on 1798 and 1804 Upland Street at the time of our investigation but they will be demolished prior to the start of the proposed development. There is undocumented fill on the site from previous development, earthworks, and demolition work.

3.2 Geological Background

The surficial geology of the Prince George area can be attributed to a few major events following the Fraser Glaciation, the last period of ice sheet glaciation in BC.

- Glaciers in this area advanced from high elevations in the Coastal Mountains moving eastward along the interior plateau. The advancing glaciers bulldozed and grinded the earth beneath them depositing lodgement till.
- As glaciers began to melt and retreated, gravels, sands, and silts were deposited by ice-marginal, sub-glacial, and fluvial meltwater channels. North of the river confluence glacial ice stagnated during late de-glaciation producing kettle lakes and kame deposits.
- This episode of melting was largely dammed by stagnant ice to the south in near Stoner/Red Rock. This caused a large glacial lake to form over the much Prince George and the surrounding area depositing silts, clays, and fine sand.
- With continuous melting the glacial dam burst, draining this glacial lake through the lowlands in the south. This ancestor to the Fraser River eroded existing lake sediments and glacial till, while depositing gravels and sands.
- Downward stepping terraces indicate that active channel floors were progressively lowered by fluvial erosion and waning river volume. These terraces are typically formed of lacustrine clay and silt, or lodgement till, with variable overlying gravels and sands.

Interpretation of the investigation data, public lidar data and surficial geology mapping indicate this site is within a large historical river terrace. The rate of meltwater flow in the subject area created fluvial deposits of layered gravel and sand with minor silt.

3.3 Site Investigation

We carried out a subsurface investigation on the subject property January 13 and 14, 2024. Subsurface conditions were reviewed in two boreholes (BH23-01 and BH23-02) and twelve test pits (TP24-01 to TP24-12) at the locations shown in Figure 1. The boreholes were advanced with a truck mounted drill rig via ODEX method (Uncharted Drilling Solutions Inc.) and the test pits were excavated with a John Deere 160G (Nortek Contracting Ltd.) under the direction of our field personnel. A ground water monitoring well was installed in BH24-01 and is detailed in Section 3.4.1.

We observed and recorded subsurface conditions at each investigation location as were excavated. Split spoon Standard Penetration Tests (SPT) were conducted at select depths in the boreholes. Soil samples were collected from the SPT sampler and excavated soil at select depths. The samples were submitted to our laboratory for soil index tests. Following our review and sample collection the boreholes were backfilled with the excavated soil.

We classified the soil conditions in accordance with the Modified Unified Soil Classification System (MUSCS). Soil index tests were carried out on select samples to determine soil properties and to confirm our field observations. The observed soil and groundwater conditions, sampling depths, field measurements and index test results are detailed in the borehole and test pit logs in **Appendix A**. Detailed laboratory reports for the soil index tests are in **Appendix B**.

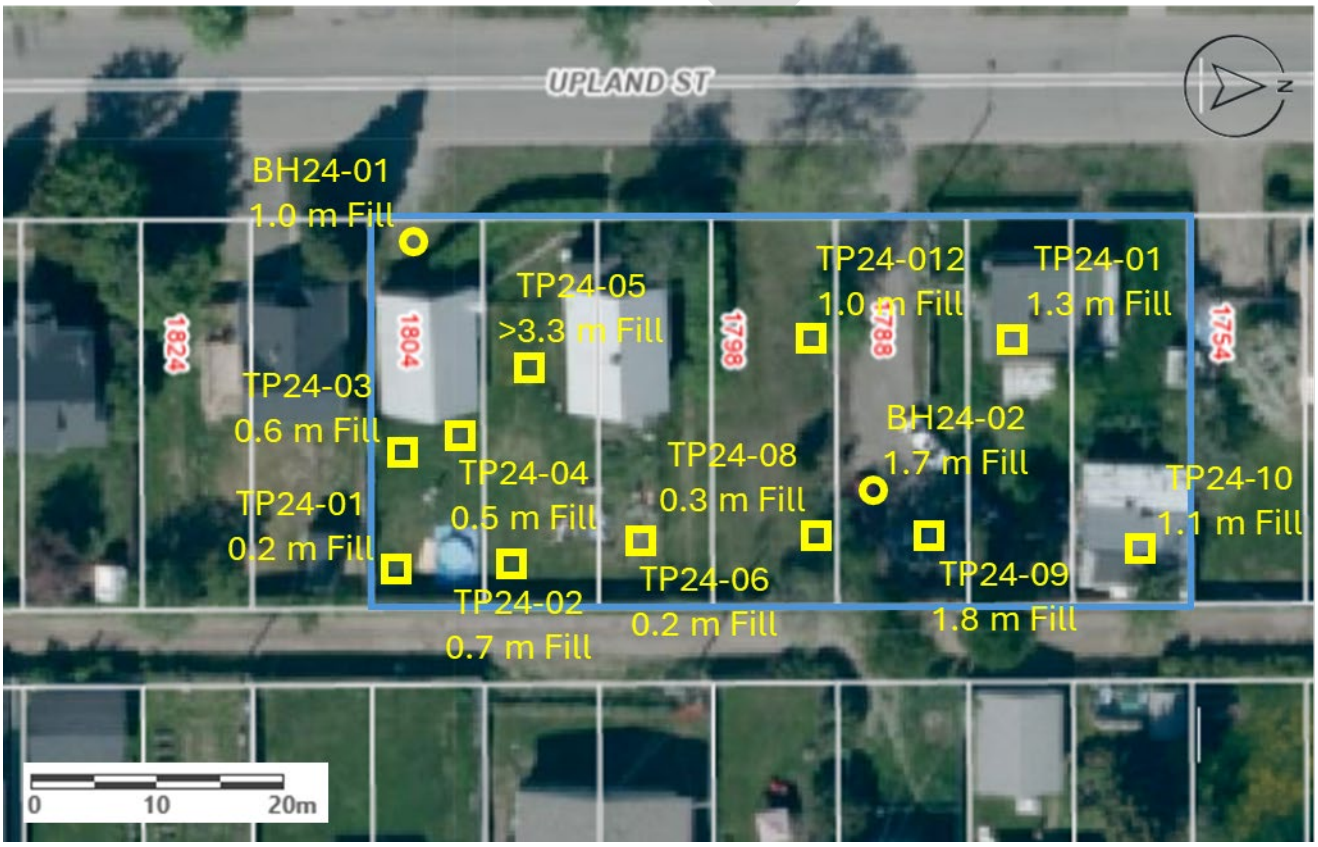


Figure 1. The development area and investigation locations with depth of fill, shown on 2022 Google Earth Imagery

3.4 Subsurface Conditions

Undocumented fill with mixed garbage and construction debris is present throughout the development area. The depth of the undocumented fill is variable. Figure 1 shows a map of the depth of undocumented fill we observed in each of the investigation locations.

The natural subsurface conditions below consisted of well consolidated layered gravel and sand with minor silt over glacial lake sediment. The upper layer of soil was generally damp until groundwater was encountered at 4.5 m.

3.4.1 Groundwater Monitoring

At the time of drilling, groundwater was encountered in both boreholes at 4.5 m. The groundwater table in the area fluctuates seasonally and was near its lowest levels at the time of our investigation. A groundwater monitoring well was installed in BH24-01 to monitor the groundwater level fluctuations. SoilTech will continue to monitor the well up to the start of construction and throughout construction of the development. **Groundwater monitoring is still in progress at the time writing this draft report.**

4. Discussion and Recommendations

Subsurface conditions at the site are suitable for the proposed development with the following considerations:

- The anticipated natural soil conditions in the development area at the anticipated foundation and infrastructure depths consist of well consolidated gravel.
- During the spring melt and period of high precipitation the ground water could affect excavation and other earthworks at the site. Deeper earthworks should be scheduled during period when the water table is low or dewatering may be required.
- The natural gravel and sand have high permeability and are non-frost susceptible.
- The natural gravel found at the site is suitable for all types of fill.
- Disturbed soil and undocumented fill are not suitable for support of building foundations, buried services, or roads.
- The natural soil will provide adequate support for conventional shallow foundations.
- Foundations should bear on competent natural soil or Structural Fill.
- Perimeter foundation drainage systems are not required for the anticipated conditions.
- The natural gravel and Structural Fill gravel are non-frost susceptible so foundations and structural elements soil do not require frost protection.
- The pavement structure should be constructed over an adequately prepared subgrade consisting of the natural soil or adequately compacted fill.
- Sidewalls of excavation in the natural gravel and sand may be prone to ravelling and sloughing thus require shallower safe excavation slope angles.

4.1 Anticipated Subsurface Conditions

We expect most of the development will take place within the thick upper layer well consolidated gravel. The groundwater table is shallow (less than 5 m below the surface) and varies seasonally. During the spring melt and period of high precipitation the ground water could affect excavation and other earthworks at the site. Considerations for development within these subsurface conditions are as follows:

- The natural soil will provide adequate bearing support for foundations and other structure elements.
- The gravel has moderate to high permeability.

- The gravel is non-frost susceptible.
- The natural gravel is suitable for common fill, Structural Fill, subgrade fill, and sub-base fill for the road structures.
- Dewatering may be required if earthworks are carried out during period of high groundwater.

4.2 Radon Gas

Buildings in the Prince George area have a moderate risk of exceeding radon related radiation concentrations of the recommended 200 Bq/m^3 (6% to 30% of households exceed 200 Bq/m^3). Radon Gas concentrations are typically highest in structures built over permeable soil such as the anticipated conditions for the subject property. We recommend installing a radon gas collection system for the building and carrying out testing to determine whether an active or passive exhaust system is required to expel the collected gas.

4.3 Site Seismic Classification

Based on our investigation, field measurements, referenced water wells, and knowledge of subsurface conditions in the area we estimate the site is no worse than Seismic Class D as defined in Table 4.1.8.4.-A of the 2018 British Columbia Code. The 2020 National Building Code seismic model, based on Site Class D with a probability of 2% exceedance in 50 years (1 in 2475 years), produced the following seismic values for the site:

- A Peak Ground Acceleration (PGA) of 0.0825(g, 9.81 m/s^2)
- A Peak Ground Velocity (PGV) of 0.188 m/s
- A Spectral Acceleration (Sa) of 0.0735

4.4 General Site Preparation

Topsoil, undocumented fill, disturbed soils, soft/wet fine-grained soil, organic soil, and deleterious materials (wood, and construction debris, etc.) should be removed below roads, drive aisles, parking areas, sidewalks, building areas etc. and any other areas sensitive to settlement. Areas below buildings and other structural elements should be prepared as described in Section 4.5. Prepare road subgrades and pavement structures as detailed in Section 4.10. General site grading should include considerations for drainage and grading as discussed in Sections 4.8 and 4.10. To achieve the desired site grades and elevations, areas may have to be raised with common, subgrade or Structural Fill.

Common fill can be used in landscaped areas. The native soil at the site may be suitable for common fill if adequately moisture conditioned for compaction. Alternatively, approved imported soil can be used. To minimize settlement common and erosion fill should be placed in uniform layers and compacted to 95% SPD.

4.5 Building Site Preparation

Existing fill (undocumented), soft wet fine-grained soil and deleterious or organic soil are not considered suitable for the support of load bearing structures and should be removed from below building foundations and grade-supported floor slabs. Use an excavator equipped with a clean up bucket to minimize the disturbance to the bearing soil surface. If the soil at the base of the excavation is disturbed or loose, it may need to be compacted prior to the installation of the formwork or Structural Fill. If the resulting excavation is below the design elevation, raise the grade to the desired elevation with Structural

Fill as detailed in Section 4.5.1. The prepared foundation grade bearing surfaces should consist of undisturbed natural soil or compacted Structural Fill placed over natural soil.

4.5.1 Structural Fill

Structural Fill consists of well compacted granular material meeting specifications for Select Granular Subbase (SGSB) or Crushed Base Course (CBC) as detailed in Section 4.10.1 or other material approved by the engineer of record. Some of the existing gravel at the site is suitable to be used as Structural Fill. Structural Fill should:

- Be installed over competent natural soil.
- Extend laterally from the sides of the footings by a horizontal distance equal to the depth of fill below the footings to allow for a 45° (1 horizontal to 1 vertical, 1H:1V) distribution of stress through the compacted fill or until competent natural soil is encountered in the sidewalls of the excavation (Figure 2).
- Place the fill in maximum 300 mm thick layers, or less (dependent on the compaction equipment utilized).
- Be compacted to 100% SPD.

Alternatively, a lean concrete mix with a minimum compressive strength of 10 MPa can be used in place of Structural Fill. The concrete should extend a minimum of 0.3 m horizontal distance where it bears on the natural soil from the edge of the footing or structure element as shown in Figure 2. It can be installed using formwork or pouring against the soil sidewalls of the excavation.

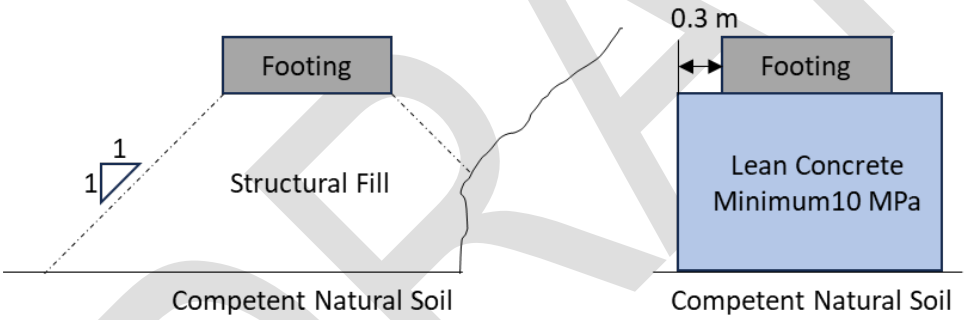


Figure 2. Structural Fill and lean concrete installation detail

4.6 Spread Footing Foundations

Conventional spread footings area suitable for the proposed building development. Building foundations can bear on undisturbed natural soil or Structural Fill placed over natural soil. The bearing surface for foundations should be prepared as detailed in Section 4.5.

Table 1. Factored Bearing Resistance Values based on Bearing Surface

Bearing Surface	Ultimate Limit State (ULS)[1]	Serviceability Limit State (SLS)[2]
Natural Gravel or Structural Fill	300	200

[1]The ultimate resistance factor values were calculated using a geotechnical resistance factor of 0.5
[2]For settlements less than 25 mm

Design footings bearing using the factored bearing capacity values listed in Table 1. Use minimum footing sizes for strip and pad footings as recommended in the current BC Building Code. Provide a minimum

cover of 0.3 m over interior footings and 1.2 m over exterior perimeter or isolated exterior footings, measured from the base of the footing to the final surface elevation.

4.7 Grade Supported Slabs or Raft Foundations

Prepare areas below structural and floor slabs as described in Section 4.5. A 100 mm thick level course of CBC should be implemented as a capillary break and to help achieve a flat level grade. If radon protection measures are required below the floor slabs the radon rock can replace the CBC layer. Radon projection systems should be install as recommended in the current BC Building Code.

4.8 Foundation Drainage and Backfill

The natural gravel stratum has moderate to high permeability and will allow any water that infiltrates the foundation soil to dissipate relatively quickly. Perimeter foundation drain systems are not required.

The type of backfill and level of compaction will depend on the intended use of the area next to the foundation. Building foundations can be backfilled following the recommendations for general site preparation in Section 4.4. To minimize the infiltration of water into the foundation backfill and the bearing soil below:

- Foundation backfill should be compacted to at least 95% SPD.
- The surrounding exterior grade sloped away from the foundation at a minimum 2%.
- The final surface should be hard-surfaced or landscape to discourage the infiltration of water.

4.9 Frost Penetration and Protection

Frost penetration depth is based on the air-freezing index and mean annual temperature for the site. For the Prince George, BC area the air freezing index is 928 Degree-Days °C, the mean annual temperature is 3.4 °C and the estimated maximum frost penetration depth is 2.4 m. The natural soil conditions at the expected foundation depths and within the expected frost penetration depth will consist of gravel and sand with low concentration of silt and clay. Such soil has low potential for frost heave thus there is no minimum depth of soil cover required for frost protection. Elements and materials sensitive to freezing will still require frost protection measures.

4.10 Pavement Structures

The site-specific traffic volumes are unknown. The parking areas area intended to support loads from passenger vehicles and infrequent heavy truck traffic. We evaluated the structure using the design methods and guidelines from the AASHTO 1993 Pavement Design Method and Ministry of Transportation and Infrastructure (MoTI) design guidelines Technical Circular T-01/15. The recommended pavement structures for the road, drive aisles, and parking areas is detailed in Table 2.

Table 2. Recommended Pavement Structures

Pavement Component	Layer Thickness
Mix C Hot Mix Asphalt	65 mm
Crushed Base Coarse (CBC)	150 mm
Select Granular Subbase (SGSB)	300 mm
Total	515 mm

The pavement structure's design is based on it being supported by an adequately prepared subgrade as described in Section 0. Use aggregates meeting the requirements detailed in Section 4.10.1 and asphalt meeting the specifications detailed in the current MoTI Standard Specifications for Highway Construction. We recommend extending the pavement structures below any curbs and sidewalks.

4.10.1 Aggregates

Table 3. Aggregate Gradation Specifications

Particle Size (mm)	Percent Passing	
	CBC[1]	SGSB
75	–	95 – 100
37.5	–	–
25	100	–
19	80 – 100	35 – 100
9.5	50 – 85	–
4.75	35 – 70	15 – 60
2.36	25 – 50	–
1.18	15 – 35	–
0.300	5 – 20	3 – 15
0.075	0 – 5	0 – 5

[1] CBC to have minimum 60% one-face fracture by mass

Aggregates should withstand the deleterious effects of exposure to freeze-thaw, water, and general construction such as placing, grading, packing etc. Use aggregates that meet the Aggregate Quality specifications detailed in Section 202.04 of the current MoTI Standard Specifications for Highway Construction. For CBC use a crushed material with a minimum 60% one-face fracture by mass on particles larger than 4.75 mm. The SGSB can be a processed or pit run gravel. Gradation specifications for the aggregates can be found in Table 3.

4.10.2 Pavement Structure Construction

Apply the following recommendations and specifications to the construction of the pavement structures:

- Install the pavement structure over the prepared subgrade.
- Place SGSB and CBC in a maximum 300 mm thick layers and compact to 100% SPD. Bring the soil to near optimum moisture content for compaction where required.
- Proof-roll the CBC layer and repair any soft areas before placing any concrete or asphalt.
- Place the asphalt surface as per the supplier's recommended procedures and compact it to a minimum average degree of compaction of 97% for roads when comparing the in-situ density to the measured 75 Blow Marshall briquette density for the mix with no single measured location less than 95%.

4.10.3 Subgrade Preparation

The prepared subgrade should consist of component natural soil or adequately compacted fill of a similar consistency. The natural gravel found at the site is suitable for subgrade fill. We recommend the following to prepare the subgrade:

- Remove any undocumented fill, organic soil, deleterious materials, soft wet fine-grained soil, and disturbed soil from below the proposed paved area. Extend the excavation beyond the edges of the pavement equal to the depth of the fill required below the pavement.
- Raise the grade of low areas to the design subgrade elevation with compacted soil that has similar properties and gradations to the surrounding subgrade soils.
- Place the fill material in uniform layers not exceeding 200 mm for fine-grained soil and 300 mm for granular soil.
- Compact the initial layers to 97% SPD and the final 300 mm of subgrade fill to 100% SPD. Bring the soil to near the optimum moisture content for compaction where required.
- Crown the subgrade at a minimum 2% slope away from the road centerline.
- Proof-roll the subgrade and repair any soft areas prior to installing the pavement structure.

4.11 Stormwater Infiltration Galleries

The natural subsurface conditions are relatively free-draining and are favourable for stormwater disposal through ground infiltration. System should be installed in the natural gravel and/or sand layer. Desing infiltration systems using a hydraulic conductivity of 1×10^{-4} m/s. Infiltration galleries should be at least 5 m from building foundations.

4.12 Temporary Excavations

We recommend using slopes of 1 Horizonal to 1 Vertical (1H:1V) or shallower for excavations in the natural soil or adequately compacted fill. Measures should be taken to prevent erosion of side excavation slopes. Groundwater or surface water encountered during construction should be directed away from excavations. Prevent water ponding in excavations. Flatter excavation slopes may be required if very loose sandy, soft soil, fill, seepage, etc. is encountered in excavations or if unfavourable weather conditions are encountered. Consult a qualified engineer if such conditions are encountered or if excavation deeper than 5 m is required.

Care should be taken when excavating near all types of existing structures and foundations. Maintain a 2H:1V slope from the base of the structure to the base of excavations. If excavations are required to be closer to an existing structure a qualified engineer should be consulted as temporary construction support may be required.

5. Review and Quality Assurance

This assessment and our recommendations are based on preliminary site plans and conversations with the Client. The final design drawings should be reviewed by SoilTech to confirm the intentions of the geotechnical design recommendations included in this report have been incorporated and are appropriate for the development. Subsurface conditions should be confirmed during construction. If the conditions (i.e., soil, groundwater, etc.) encountered during construction differ from those in our assessment they should be reviewed as alternate or additional recommendations may be required.

The foundation design and bearing surfaces during construction should be reviewed by SoilTech prior to installing foundation components to verify conditions and that they are adequate to support the proposed

foundation. Testing should be completed on the Structural Fill to confirm it meets the required gradation and adequate compaction has been achieved. To issue applicable Building Code Schedules, the excavation for and installation of Structural Fill below foundations should be reviewed by SoilTech.

During the subgrade preparation and construction of the pavement structure have SoilTech review excavations, fill materials, fill placement and compaction, proof rolls and the installation of any geotextile and geogrid products. Depending on weather and site conditions, materials may need to be placed in smaller lift thicknesses, dried, or have water added to achieve recommended degree of compaction. Testing should be completed on pipe bedding, subgrade fill, pavement structure layers and the materials used to confirm specifications are met.

6. Limitations

This assessment was limited to the references used in our desktop study and the scope of our site investigation. The discussion and recommendations provide are bases on the necessary assumption subsurface conditions across the site are consistent with our findings. If conditions encountered at the site are inconsistent with the findings described above, they should be reviewed by SoilTech or another qualified professional as alternate recommendations or design parameters may be required.

7. Closure

This assessment has been completed by a qualified professional registered with the Engineering and Geoscientists of British Columbia. The information discussed in this report is based on SoilTech's interpretation and understanding of current site conditions and the referenced documents. This report has been completed for the exclusive use of the recipient and their agents. We take not responsibly for any damages suffered from any use or reliance of information contained within this report by third parties or for use other than the intended purpose.

If there are any questions or if additional information is required, please contact the undersigned.

Sincerely,

Reviewed by,

Paul Nielsen, AScT

Hans Jorgensen, P. Eng.

Appendix A:

Investigation Logs

Modified Unified Classification System for Soils

Major Division			Group		Soil Description	Classification Criteria
Coarse Grained Soils more than 50% larger than 75 µm dual symbols used for soils with 5 to 12% fines	**Gravels**	Clean Gravels < 5% fines	GW		Well graded gravels and sandy gravels with trace or no fines	$C_u = D_{60}/D_{10} > 4$ $C_C=(D_{30})^2/D_{10}D_{60}$= 1 to 3
			GP		Poorly graded gravels and sandy gravels with trace or no fines	Not meeting GW requirements
		Dirty Gravels > 12% fines	GM		Silty gravels and silty sandy gravels	Plasticity below A-Line or $I_p < 4$
			GC		Clayey gravesl and clayey sandy gravels	Plasticity below A-Line or $I_p < 7$
	Sands	Clean Sands < 5% fines	SW		Well graded sands and gravelly sands with trace to no fines	$C_u = D_{60}/D_{10} > 4$ $C_C=(D_{30})^2/D_{10}D_{60}$= 1 to 3
			SP		Poorly graded sands and gravelly sands with trace to no fines	Not meeting SW requirements
		Dirty Sands > 12% fines	SM		Silty sands and sand/silt mixtures	Plasticity below A-Line or $I_p < 4$
			SC		Clayey sands and sand/clay mixtures	Plasticity below A-Line or $I_p < 7$
Fine Grained Soils more than 50% smaller then 75 µm	**Silts**	$W_L < 50\%$	ML		Inorganic silts and sandy silts with slight plasticity	Based on Placitity Chart (see below)
		$W_L > 50\%$	MH		Inorganic silts with high plasticity	
	Clays	$W_L < 30\%$	CL		Inorganic clay and silty clays with low plasticity	
		$30\% < W_L < 50\%$	CI		Inorganic clay and silty clays with intermediate plasticity	
		$W_L > 30\%$	CH		Inorganic clay and silty clays with high plasticity	
	Organic Silts and Clays	$W_L < 50\%$	OL		Organic silts and silty clays with low plasticity	
		$W_L > 50\%$	OH		Organic silts and silty clays with high plasticity	
	Highly Organic		PT		Peat and other highly organic soils	

Soil Components

Fraction	Size	Weight Percentage	Description
Gravel			
Coarse	75 mm to 19 mm		
Fine	19 mm to 4.75 mm	35 - 50	and
Sand			
Coarse	4.75 mm to 2 mm	20 - 35	y/ey
Medium	2 mm to 425 µm		
Fine	425 µm to 75 µm	10 - 20	some
Silt or Clay	< 75 µm		
Cobbles	200 mm to 75 mm	1 - 10	trace
Boulders	> 200 mm		

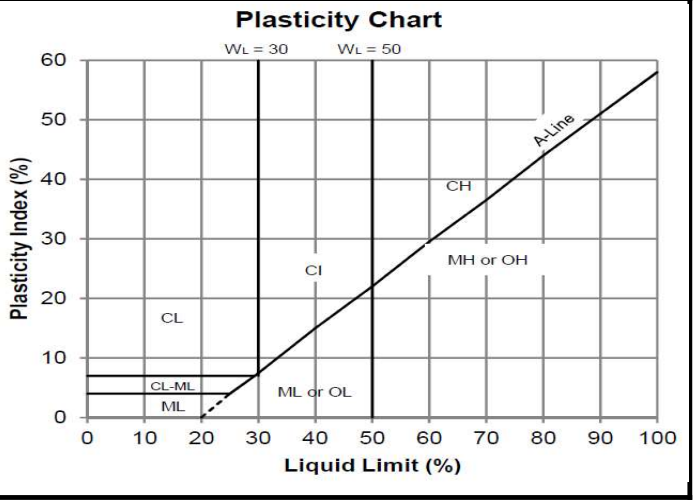
Relative Moisture

Coarse Grained	
Dry	Non-cohesive and free running
Moist	Darker colour and sticks together
Wet	Darker colour, sticks together and free water forms

Fine Grained	
Moist, dry of plastic limit	hard, friable and powdery
Moist, near plastic limit	Can be moulded
Moist, wet of plastic limit	Usually weak and free water forms
Wet, near liquid limit	
Wet of plastic limtic	

Relative Density and Consistency

Cohesionless		Cohesive	
Relative Density	**SPT Value (N)**	**Consistency**	**Undrained Shear Strength (kPa)**
Very Loose	0 - 4	Very Soft	0 - 10
Loose	4 - 10	Soft	10 - 25
Compact	10 - 30	Firm	25 - 50
Dense	30 - 50	Stiff	50 - 100
Very Dense	> 50	Very Stiff	100 - 200
		Hard	> 200



SoilTech Consulting Ltd

BH24-01

Client:	Lithium One Homes	**Date Started:**	February 13, 2024
Project Number:	24-H-006	**Date Finished:**	February 13, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Uncharted Drilling Solutions Ltd.	**Location:**	See Figure 1
Equip./Method:	Truck Rig/Odex	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits: Plastic Limit	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen to 0.3 m depth								
1		**GW:** Gravel, sandy, trace silt and clay, very dense, moist, brown								
		- Gravel 56.9%, Sand 39.1%, Silt and Clay 4.0%	SPT	80	55		2.1			
2										
3			SPT	75	74		2.5			
4		- groundwater table at 4.5 m								
		SM: Sand and Silt, trace clay, compact, wet, grey	SPT	100	21		31.9			
5		- Sand 51.7%, Silt and Clay 48.3%								
6										

SoilTech Consulting Ltd

BH24-01

Client:	Lithium One Homes	**Date Started:**	February 13, 2024
Project Number:	24-H-006	**Date Finished:**	February 13, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Uncharted Drilling Solutions Ltd.	**Location:**	See Figure 1
Equip./Method:	Truck Rig/Odex	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
6			SPT	100	23		30.4			
7										
8			SPT	100	29		27.3			
9		**ML:** Silt,trace sand and clay**,** very stiff, low plasticity, wet near plastic limit, grey - Sand 8.9%, Silt 83.2%, Clay 7.9%	SPT	100	29		27.2	25	32	7
10										
11										

End of borehole at 11.1 m
Groundwater table encountered at 4.2 m
Groundwater Monitoring Well installed

SoilTech Consulting Ltd

BH24-02

Client:	Lithium One Homes	**Date Started:**	February 13, 2024
Project Number:	24-H-006	**Date Finished:**	February 13, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Uncharted Drilling Solutions Ltd.	**Location:**	See Figure 1
Equip./Method:	Truck Rig/Odex	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits: Plastic Limit	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen to 0.3 m depth								
1		- organic layer								
		SM: Sand and silt, trace clay, compact, non-plastic, moist, brown with minor orange and rust coloured mottling	SPT	80	16		14.3			
2		**GW:** Gravel and Sand, trace silt and clay, very dense, moist, brown								
3		- Gravel 49.6%, Sand 44.9%, Silt and Clay 5.5%	SPT		74		2.1			
4		- Groundwater table at 4.5 m								
		SM: Sand and Silt, trace clay, loose, wet, grey	SPT	100	9		30.6			
5										
6										

SoilTech Consulting Ltd

BH24-02

Client:	Lithium One Homes	**Date Started:**	February 13, 2024
Project Number:	24-H-006	**Date Finished:**	February 13, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Uncharted Drilling Solutions Ltd.	**Location:**	See Figure 1
Equip./Method:	Truck Rig/Odex	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
6		- compact	SPT	100	19		30.6			
7										
8			SPT	100	30		29.7			
9		**ML:** Silt, some clay,trace sand**,** very stiff to hard, low plasticity, wet near plastic limit, grey	SPT	100	37		29.6			
10										
11										
12										

SoilTech Consulting Ltd

BH24-02

Client:	Lithium One Homes	**Date Started:**	February 13, 2024
Project Number:	24-H-006	**Date Finished:**	February 13, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Uncharted Drilling Solutions Ltd.	**Location:**	See Figure 1
Equip./Method:	Truck Rig/Odex	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
12		- Sand 0.8%, Silt 86.8%, Clay 12.4%	SPT	100	30		29.4	26	36	10
13										
14										

End of borehole at 14.9 m due to heaving sand
Ground water encountered at 4.5 m
Backfilled with grout and excavated material

SoilTech Consulting Ltd

TP24-01

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen to 0.3 m depth								
		SM: Sand, silty, trace clay, loose to compact (inferred), moist, brown, rootlets								
		GW: Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering	Bulk				5.0			
1		End of test pit at 1.0 m No groundwater or seepage encountered Test pit backfilled with excavated material								

SoilTech Consulting Ltd

TP24-02

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen until 0.3 m depth								
		-black organic layer from 0.6 m to GW interface								
		GW: Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering	Bulk				2.4			
1		End of test pit at 1.0 m								
		No seepage or groundwater encountered								
		Test pit backfilled with excavated material								

SoilTech Consulting Ltd

TP24-03

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen until 0.3 m -organic layer from 0.6 m to SM interface								
		SM: Sand, silty, trace clay, inferred loose to compact, non-plastic, moist, brown, rootlets								
1		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								

End of test pit at 1.0 m
No groundwater or seepage encountered
Test pit backfilled with excavated materials

SoilTech Consulting Ltd

TP24-04

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen until 0.3 m -organic layer from 0.5 m to SM interface								
		SM: Sand, silty, trace clay, inferred loose to compact, non-plastic, moist, brown -Sand 72.1%, Silt and Clay 27.9%	Bulk				19.1			
1		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								

End of test pit at 1.2 m
No groundwater or seepage encountered
Test pit backfilled with excavated material

SoilTech Consulting Ltd

TP24-05

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, deletrious materials (glass, bricks, bottles, wood and construction debris), frozen to 0.3 m depth - sloughing								
1		- glass and construction debris - 100 mm diameter section of black pipe								
2		- wood and construction debris up to 3.3 m								
3										

End of test pit at 3.3 m
Unable to determine full extent of fill due to sloughing and proximity to exsiting structures
No groundwater or seepage encountered
Test pit backfilled with excavated material

SoilTech Consulting Ltd

TP24-06

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

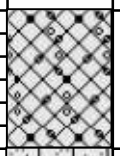
Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen to 0.3 m depth								
		GW: Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								
1										
2										
3		- Gravel 66.8%, Sand 32.6%, Silt and Clay 0.6%	Bulk				3.2			

End test pit at 3.5 m due to sloughing
No groundwater or seepage encountered
Test pit backfilled with excavated materials

SoilTech Consulting Ltd

TP24-07

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen until 0.3 m								
		**SM:** Sand and silt, trace clay, inferred loose to compact, non-plastic, moist, brown with minor orange and rust coloured mottling, rootlets - Sand 52%, Silt 43.6%, Clay 4.4%	Bulk				20.1			
1		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								
		End of test pit at 1.3 m No groundwater or seepage encountered Test pit backfilled with excavated material								

SoilTech Consulting Ltd

TP24-08

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Sand, silty, trace gravel and clay, loose (inferred), moist, brown, frozen to 0.3 m depth								
		GW: Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering	Bulk				2.7			
1										

End of test pit at 1.1 m
No groundwater or seepage encountered
Test pit backfilled with excavated material

SoilTech Consulting Ltd

TP24-09

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

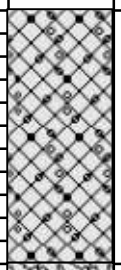
Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits: Plastic Limit	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticy Index
0		**Asphalt:** 100 mm thick								
		Fill: Gravel, sandy, some silt, trace clay, loose (inferred), moist, brown, constrcution debris, frozen to 0.8 m depth								
1		- black ogranic layer from 1.7 m to SM interface								
		SM: Sand and silt, trace clay, inferred loose to compact, non-plastic, moist, brown with minor orange and rust coloured mottling								
2		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								
3		- Gravel 57.2%, Sand 40.3%, Silt and Clay 2.5%	Bulk				3.7			

End of test pit at 3.4 m
No groundwater or seepage encountered
Test pit backfilled with excavated material

SoilTech Consulting Ltd

TP24-10

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Gravel, sandy, trace silt and clay, loose (inferred), moist, brown, construction debris, frozen to 0.3 m depth								
		- concrete debris								
1		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								

End of test pit at 1.5 m
No groundwater or sepage encountered
Test pit backfiled with excavated materal

SoilTech Consulting Ltd

TP24-11

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Gravel, sandy, trace silt and clay, loose (inferred), moist, brown, frozen until 0.3 m, construction debris - abandoned 100 mm diameter sanitary pipe								
1		**GW:** Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								

End of test pit at 1.6 m
No groundwater or sepage encountered
Test pit backfiled with excavated materal

SoilTech Consulting Ltd

TP24-12

Client:	Lithium One Homes	**Date Started:**	February 14, 2024
Project Number:	24-H-006	**Date Finished:**	February 14, 2024
Project:	Upland Street Townhouse Development	**Logged By:**	PN
Subcontractor:	Nortek Contracting Ltd.	**Location:**	See Figure 1
Equip./Method:	Mechanical Excavation with Brandt 160G	**Elevation:**	Existing Ground

Depth (m)	Graphic Log	Stratigraphic Description	Sample Type	% Recovery	Blow Counts (N Value)	Pocket Pen (kPa)	Moisture Content (%)	Atterberg Limits		
								Plastic Limit	Liquid Limit	Plasticy Index
0		**Fill:** Gravel, sandy, trace silt and clay, loose (inferred), moist, brown, frozen until 0.3 m, construction debris								
1		**GW**: Gravel, sandy, trace silt and clay, compact to dense (inferred), moist, brown, visible layering								

End of test pit at 1.3 m
No groundwater or sepage encountered
Test pit backfiled with excavated materal

Appendix B:

Soil Index Test Reports

SoilTech Consulting Ltd

1215 Babine Road, Prince George, BC, V2N 6E1
778-349-5574
mail@soiltech.ca

Liquid Limit, Plastic Limit and Plasticity Index of Soils

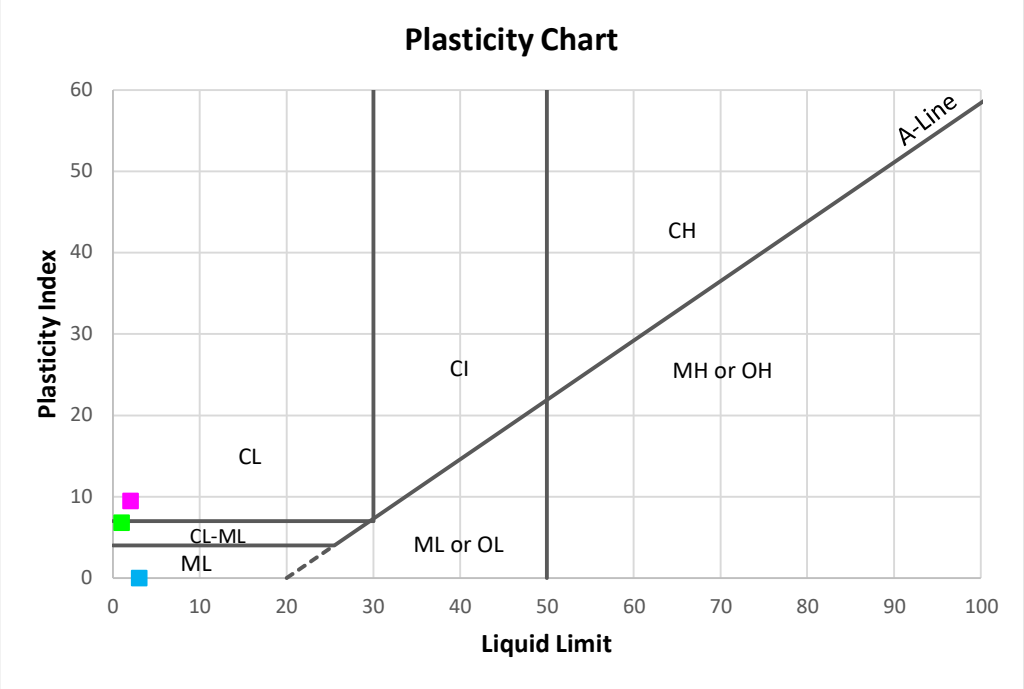
Reference ASTM D4318

Project Details

Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**Location**	Prince George, BC

Sample Details

Sample Date	February 13, 2024	**Test Date**	February 14, 2024
Sampled By	PN	**Tested By**	SD



Symbol	Sample ID	Location	Depth (m)	Passing 425 µm (%)	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Type
■		BH24-01	9.44	100	27	32	25	7	ML
■		BH24-02	12.8	100	29	36	26	10	CL
■		TP24-07	0.7	99.7	20	ND	NP	N/A	SM

NP - Non-Plastic result
ND - Not Determined

1215 Babine Road, Prince George, BC, V2N 6E1
250-301-5024
hans@soiltech.ca

Particle Size Distribution Analysis

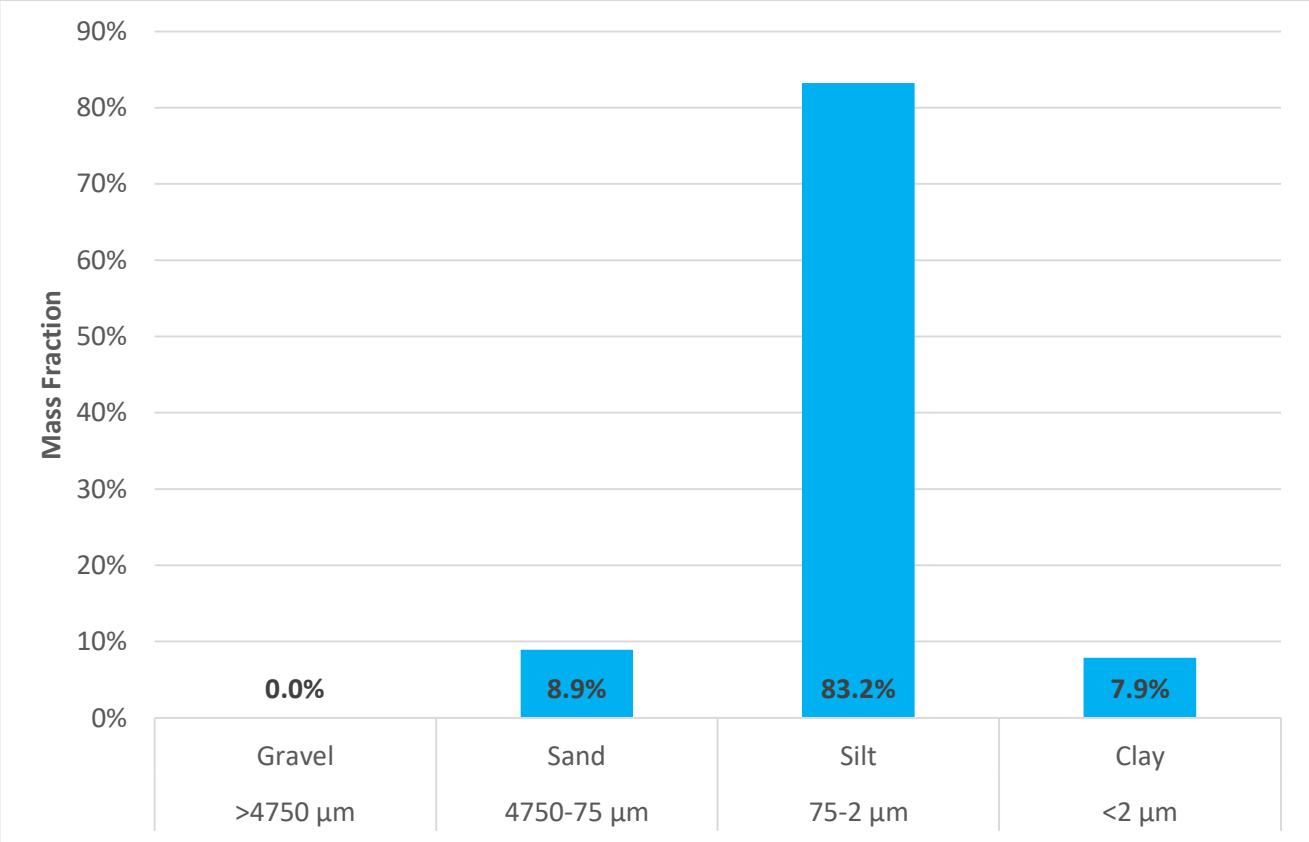
Reference ISO 13317-1 and ISO 13317-2.

Project Details

Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**PSD Report No.**	1

Sample Details

Source	BH24-01	**Sampling Date**	February 13, 2024
Location	9.5 m depth	**Date Received**	February 13, 2024
Description	Silt	**Date Tested**	February 23, 2024
Sampled By	PN	**Tested By**	SD



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Particle Size Distribution Analysis

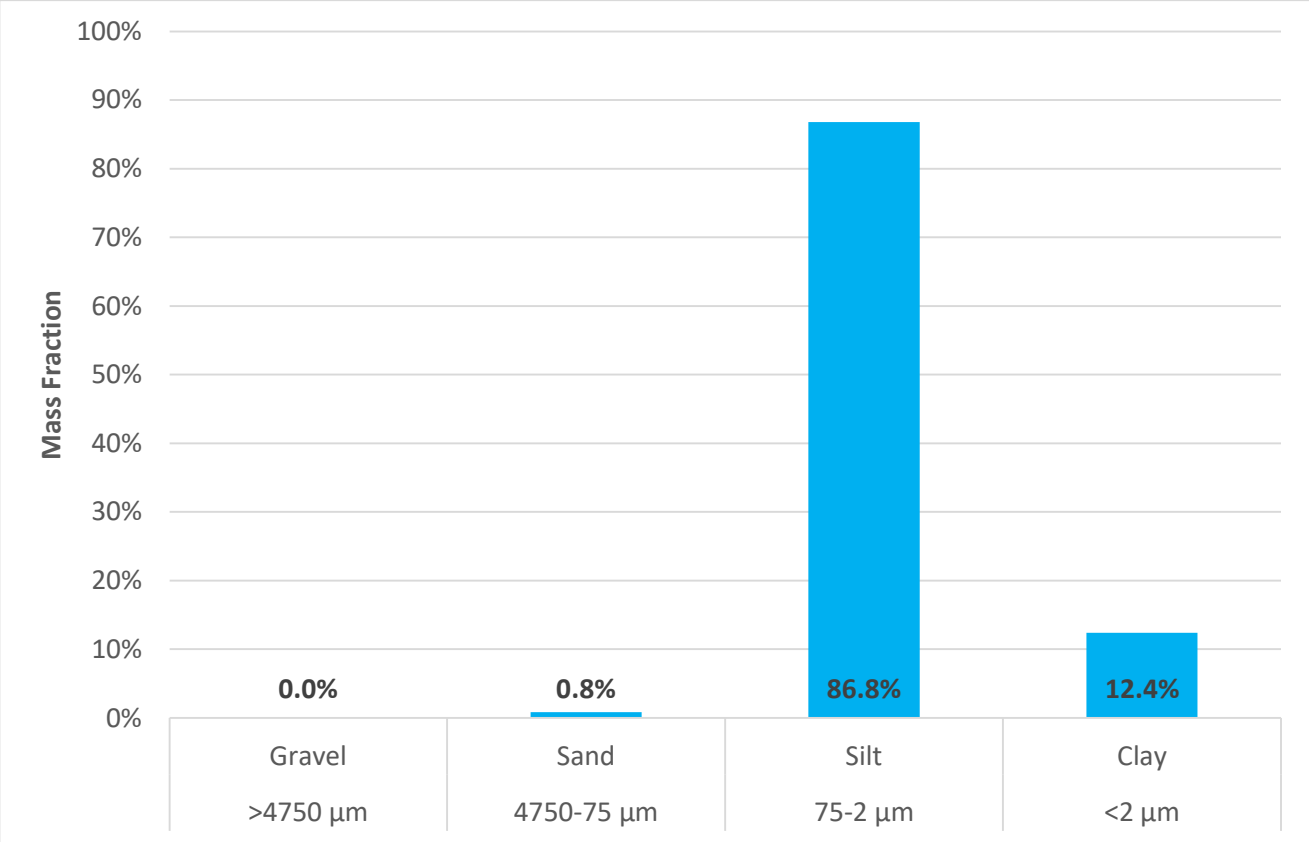
Reference ISO 13317-1 and ISO 13317-2.

Project Details

Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**PSD Report No.**	1

Sample Details

Source	BH24-02	**Sampling Date**	February 13, 2024
Location	12.2 m depth	**Date Received**	February 13, 2024
Description	Silt	**Date Tested**	February 23, 2024
Sampled By	PN	**Tested By**	SD



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Particle Size Distribution Analysis

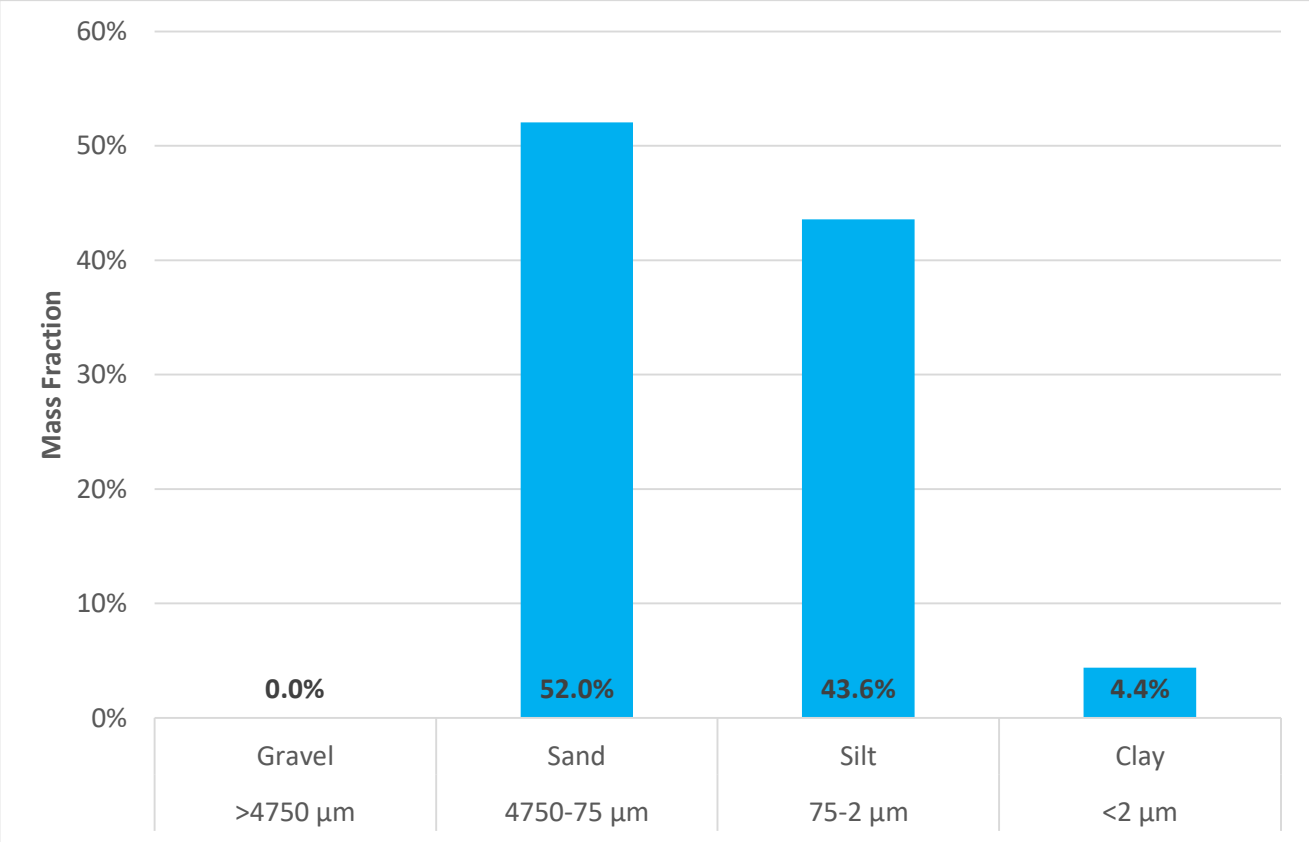
Reference ISO 13317-1 and ISO 13317-2.

Project Details

Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**PSD Report No.**	1

Sample Details

Source	TP24-07	**Sampling Date**	February 13, 2024
Location	0.7 m	**Date Received**	February 13, 2024
Description	Silt	**Date Tested**	February 23, 2024
Sampled By	PN	**Tested By**	SD



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Sieve Analysis

Reference ASTM C117 and C136

Project Details

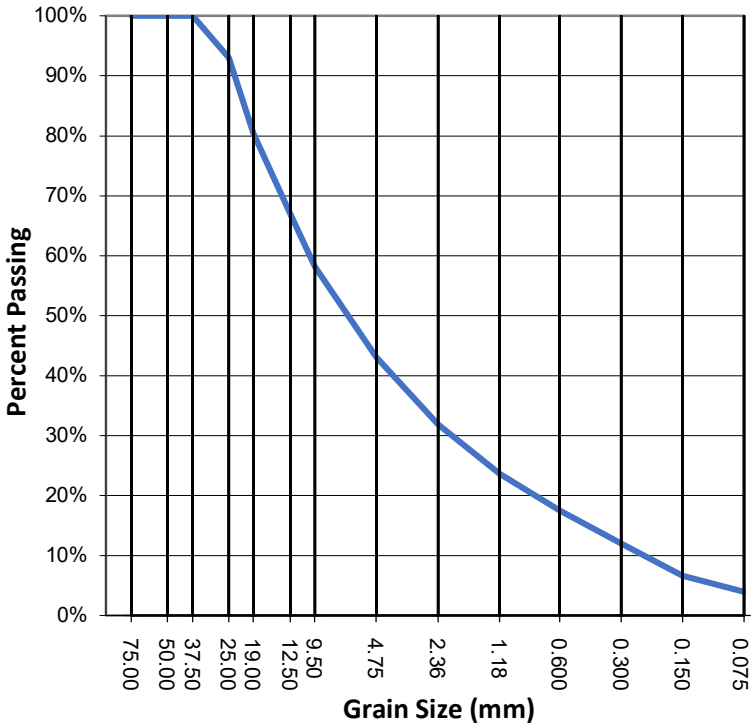
Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**Sieve Report No.**	SI1

Sample Details

Supplier	Existing	**Sampling Date**	February 13, 2024
Source	BH24-01	**Date Received**	February 15, 2024
Location	1.6 m depth	**Date Tested**	February 15, 2024
Description	Gravel	**Sampled By**	PN
Specification		**Tested By**	SD

Sieve Size (mm)	Percent Passing	Specifications	
		Min	Max
75.0	100.0%		
50.0	100.0%		
37.5	100.0%		
25.0	93.0%		
19.0	80.4%		
12.5	67.0%		
9.5	58.2%		
4.75	43.1%		
2.36	31.9%		
1.18	23.7%		
0.600	17.5%		
0.300	12.0%		
0.150	6.6%		
0.075	4.0%		

Moisture Content 2.1%



Comments

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Sieve Analysis

Reference ASTM C117 and C136

Project Details

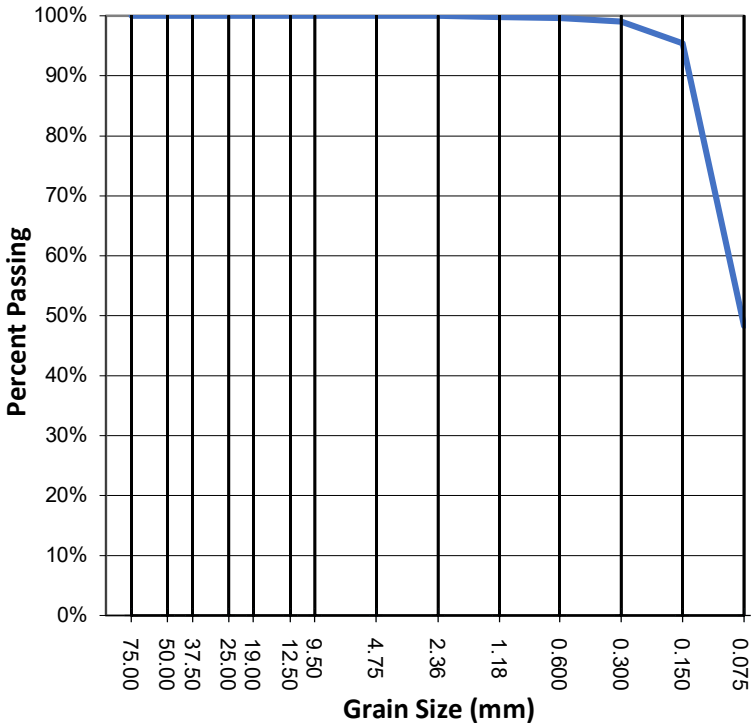
Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**Sieve Report No.**	SI2

Sample Details

Supplier	Existing	**Sampling Date**	February 13, 2024
Source	BH24-01	**Date Received**	February 15, 2024
Location	4.6 m depth	**Date Tested**	February 15, 2024
Description	Sand	**Sampled By**	PN
Specification		**Tested By**	SD

Sieve Size (mm)	Percent Passing	Specifications	
		Min	Max
75.0	100.0%		
50.0	100.0%		
37.5	100.0%		
25.0	100.0%		
19.0	100.0%		
12.5	100.0%		
9.5	100.0%		
4.75	100.0%		
2.36	100.0%		
1.18	99.8%		
0.600	99.6%		
0.300	99.0%		
0.150	95.5%		
0.075	48.3%		

Moisture Content 31.9%



Comments

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Sieve Analysis

Reference ASTM C117 and C136

Project Details

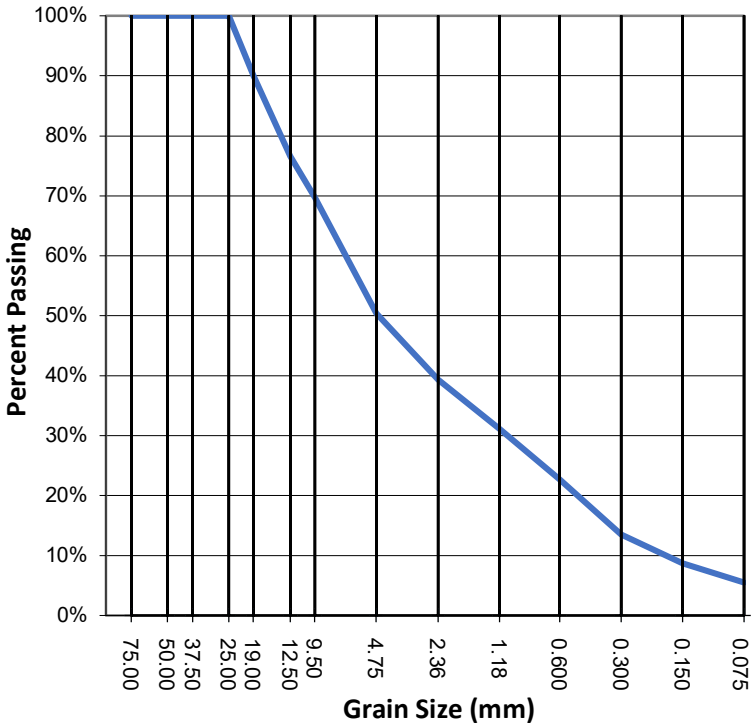
Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**Sieve Report No.**	SI3

Sample Details

Supplier	Existing	**Sampling Date**	February 13, 2024
Source	BH24-02	**Date Received**	February 15, 2024
Location	3.1 m depth	**Date Tested**	February 15, 2024
Description	Gravel	**Sampled By**	PN
Specification		**Tested By**	SD

Sieve Size (mm)	Percent Passing	Specifications	
		Min	Max
75.0	100.0%		
50.0	100.0%		
37.5	100.0%		
25.0	100.0%		
19.0	90.0%		
12.5	76.6%		
9.5	69.7%		
4.75	50.4%		
2.36	39.4%		
1.18	31.1%		
0.600	22.7%		
0.300	13.5%		
0.150	8.7%		
0.075	5.5%		

Moisture Content 2.8%



Comments

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Sieve Analysis

Reference ASTM C117 and C136

Project Details

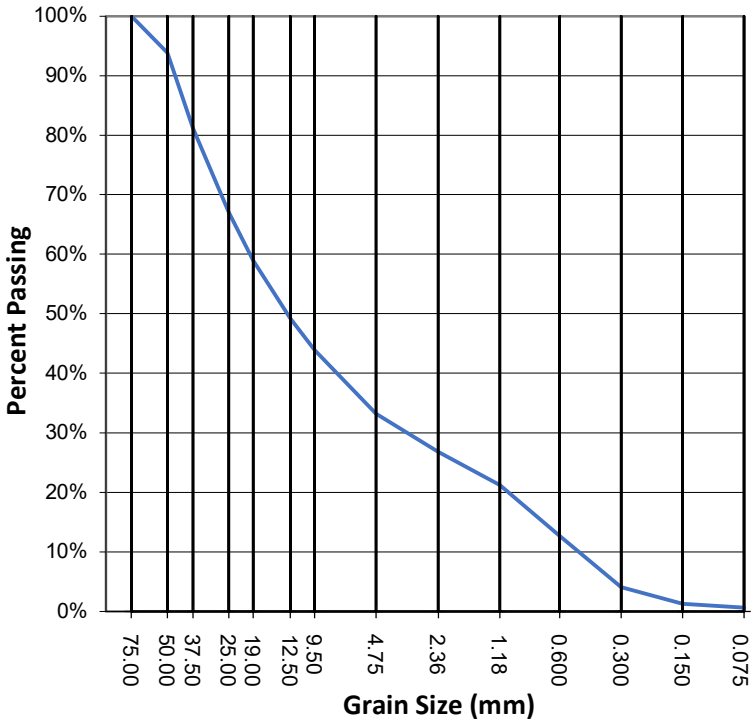
Client	Lithium One Homes	**Project No.**	24-H-006
Project	Upland Street Townhouse Development	**Sieve Report No.**	SI4

Sample Details

Supplier	Existing	**Sampling Date**	February 14, 2024
Source	TP24-06	**Date Received**	February 15, 2024
Location	3.0 m depth	**Date Tested**	February 15, 2024
Description	Gravel	**Sampled By**	PN
Specification		**Tested By**	SD

Sieve Size (mm)	Percent Passing	Specifications	
		Min	Max
75.0	100.0%		
50.0	93.9%		
37.5	81.2%		
25.0	67.0%		
19.0	58.9%		
12.5	49.2%		
9.5	43.9%		
4.75	33.2%		
2.36	26.8%		
1.18	21.2%		
0.600	12.7%		
0.300	4.1%		
0.150	1.2%		
0.075	0.6%		

Moisture Content 3.2%



Comments