GEOTECHNICAL ASSESSMENT

Lot 18 Block 47, Plan 2008-0003 LTO
Watson Lake, YT

Prepared For:

Yukon Government Community Services
Land Development Branch

January 25, 2024

CAP File: WEC0012

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1. INTRODUCTION

CAP Engineering (CAP) was retained by Yukon Government (YG), Department of Community Services - Land Development Branch under a standing offer agreement (SOA 2021/22-260-3), to conduct a desktop geotechnical assessment for Lot 18 Block 47, Plan 2008-0003 LTO in Watson Lake, which is approximately 470 km southeast of Whitehorse. The purpose of the assessment is to provide geotechnical analysis and familiarization on the ground to determine the lot's suitability for construction of a residential dwelling.

Authorization to proceed with the work was granted on July 17th, 2023, by Ibrahim Taleb, YG Project Manager.

2. METHODOLOGY

2.1 Literature Review

The following information was reviewed as part of the geotechnical evaluation:

- Gartner Lee Limited – Yukon Groundwater and Ground Source Heat Potential Inventory – 2003
- 12.0 Building M0086 - Watson Lake RCMP Residence Report (March 2006)
- 2020 National Building Code of Canada Seismic Hazard Tool (https://seismescanada.rncan.gc.ca/hazard-alea/interpolat/nbc2020-cnb2020-en.php)
- Government of Yukon - Design Requirements and Technical Standards – 2017
- Wood Preservation Canada – Permanent Wood Foundation – 2023
- Tetra Tech – Geotechnical Evaluation: Watson Lake Infrastructure Improvements (January 2022)
- Yukon Geological Survey and Cryogeographic Consulting – Biophysical Map of Watson Lake Area (NTS 105A/2), Yukon (1:50,000 scale) – 2005
- Yukon Geological Survey and Cryogeographic Consulting – Surficial Geology of Watson Lake Area (NTS 105A/2), Yukon (1:50,000 scale) – 2005
- GeoYukon
  - [yLp\FGp] = 1st terrain classification (50-100% of the map unit) – Lacustrine material with shell fragments on gentle sloping terrain; 2nd terrain classification (30-45% of the map unit) – Glaciofluvial material on gentle sloping terrain
  - Bedrock Geology: Major Rock Type – argillite/siltstone
  - Water Wells: Multiple points on GeoYukon are located near the lot in Watson Lake where water well drilling, or investigations took place.
  - Contaminated Sites:
    - Approximately 460 m northwest of the lot, Yukon Government staff observed multiple areas of dark staining at various locations on the site. No soil samples were collected (2021).
    - Approximately 700 m southeast of the lot, a hydrocarbon spill occurred on a lot in 2013. A limited Phase II ESA, which collected sediment samples from the spill area and groundwater samples from nearby drinking water wells was completed. Test pits were excavated, and sediment samples were collected and found to contain PHC concentrations above the applicable standards. Private residential drinking water wells were sampled and found to contain PHC, however, they were below the applicable standards.

- Approximately 500 m southeast of the lot, an excavation was performed by an environmental consultant in 2007 to remove and relocate PHC-contaminated material. The cause of the spill was a leaking fuel storage tank. Approximately 60 m^3 of PHC-contaminated material was relocated to a permitted land treatment facility. Contaminated material remained beneath the building and passive ventilation systems were installed to allow the removal of soil vapour issues in the residence. Confirmatory sample results indicate that the soil remaining at the site, excluding beneath the building, is below CSR-RL standards.

3. SITE CONDITIONS

3.1 Site Description

Lot 18 Block 47 is located near the Alaska Highway in Watson Lake. The site location is partially covered with forests. There is approximately a 5 m change in elevation from Stubenburg Blvd. to the southeast corner of the lot with an approximate grade of 3-4% sloping down and away from Stubenburg Blvd. Lot 18 Block 47 has an area of approximately 6,508 m^2 (0.65 ha). For a visual reference, please refer to Appendix A.

The vegetation in Watson Lake primarily consists of several types of plants, including sedges, grasses, horsetail, aquatic plants, and moss. These plants are typically found in areas near the margins of lakes or ponds, as well as in former lake basins. The soils in these areas are generally characterized as poor to very poorly drained, and they have a fine-textured composition, often referred to as gleysols. This type of soil is prone to waterlogging due to its poor drainage, which is why it is suitable for the growth of these specific types of vegetation, which are adapted to wet and aquatic environments.

3.2 Subsurface Soil Conditions and Water Table Summary

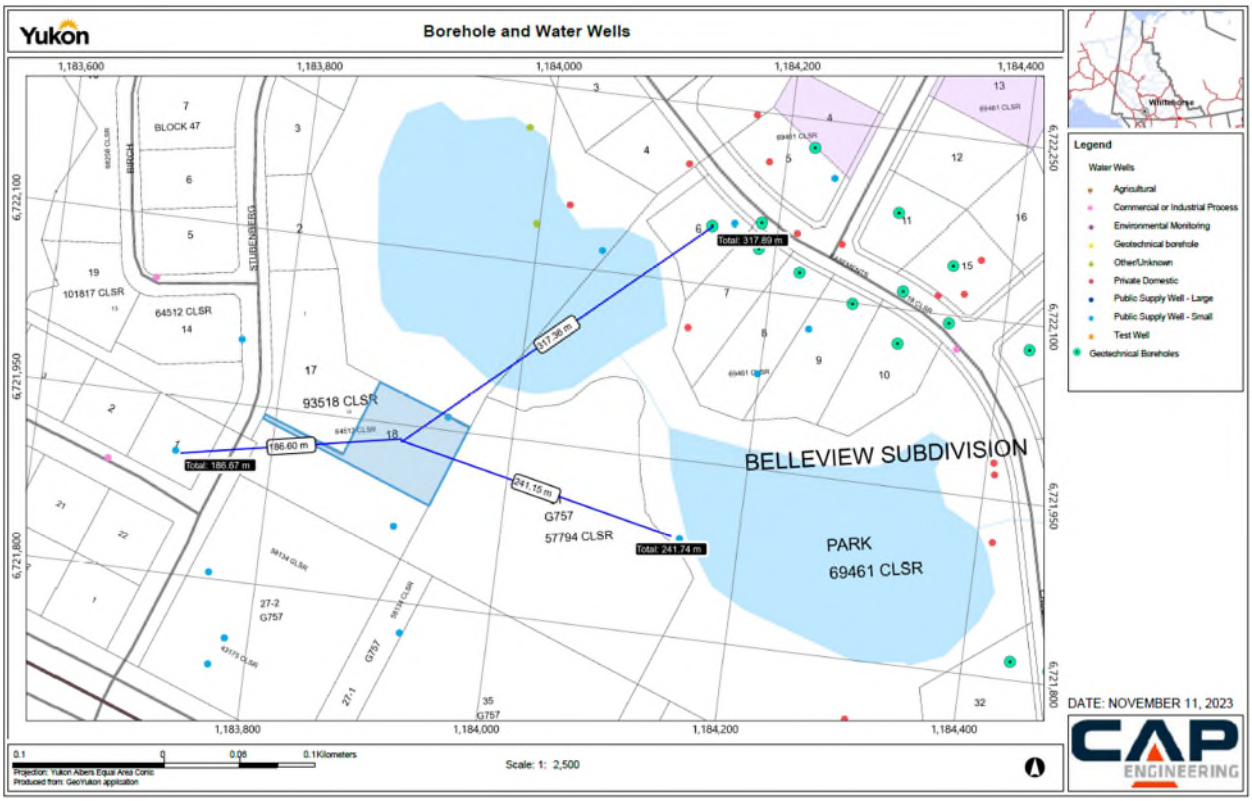
According to the above-noted references, the landscape north and south of the town features regional slopes leading to hills covered with till. In the town itself, there are deposits of glaciofluvial sand and gravel that extend to depths of 30 m below the surface at the municipal well. Since these glaciofluvial deposits are believed to have been formed in an ice-contact environment, they are likely to be varied in composition, including a mix of boulders, sand, gravel, and silt. These glaciofluvial sediments serve as the town's water-supply aquifer.

The subsurface characteristics of this lot were summarized using two boreholes, two test pits, and one water well. The topmost layer consists of the glaciofluvial sand and gravel soils up to 6.1 m below ground surface (bgs). No seasonal frost or permafrost are present on the borehole and test pit logs. One water well was drilled on Lot 18, but it did not show any valuable information. Ground water was not encountered in any of the borehole or test pits. The water well shows that the static water level is present at a depth of 9.5 m bgs. There was a percolation test completed in one of the test pits within the sand/gravel layer at a depth of 1.5 m to 1.8 m bgs with an average percolation rate of 0.1 min/25 mm.

The location of the lot and boreholes/test pits/water well as well as the borehole/test pit/water well data used for this report is included in Appendix B. Borehole tests were conducted extensively in the town of Watson Lake, covering different plots. The borehole, test pits and water well data selected is relevant to the study, verifying that the information obtained was the closest available date to the lot mentioned in this report.

For a visual representation of the locations of the boreholes and water wells, please refer to Figure A below.

Figure A: Plan Borehole and Water Well Locations



3.2.1 Bedrock

The closest exposed bedrock is found along the Alaska Highway and is identified as Tertiary age basalt. On the hills located to the north of the town, the bedrock is described as metasediments, including materials like chert, phyllite, and argillite. The closest bedrock encountered beneath the town itself is at a depth of 44 m (Gartner Lee Limited 2003).

3.2.2 Permafrost and Seasonal Frost

According to the borehole records, permafrost is not present in the town or the vicinity. Based on the regional climate data, seasonal frost can likely exceed 3.0 m along cleared roadways.

3.2.3 Climate

In Watson Lake, the summers are long and comfortable, the winters are frigid and snowy, and it is mostly cloudy year-round. Over the year, the temperature typically varies from -26°C to 22°C and is rarely below -41°C or above 27°C.

3.2.4 Limitations of Data

As noted earlier in the report, there was one water well conducted in the vicinity of the lot; however, the information retrieved from this well was insufficient for comprehensive analysis. Additionally, none of the

previously conducted boreholes and test pits mentioned in the report were specifically located within the boundaries of Lot 18.

Despite the limited data directly from the lot, the information presented in Appendix B, which includes data from nearby boreholes and a water well, were utilized to formulate geotechnical recommendations for this site.

3.3 Seismic Considerations

National Building Code of Canada (NBCC) 2020 Part 9 only requires structures to have a site classification for a single-family dwelling when Sa (0.2) is above 1.2. The online Canada Seismic Hazard Tool designates Lot 18 in Watson Lake to have a Sa (0.2) of 0.494, therefore no seismic consideration is required.

4. RECOMMENDATIONS

4.1 Site Suitability

The site is deemed suitable for future residential construction and development purposes as per the residential zoning outlined by YG. A single-family residential dwelling would be recommended based on lot size and the neighborhood.

It is essential to ensure compliance with the applicable building standards to guarantee the feasibility of the construction. Adhering to specific guidelines and building codes will help mitigate potential risks and ensure the longevity of the structures.

Before commencing construction, it is essential to remove all trees and organic materials within the building footprint.

For any parking areas, it is assumed that a gravel structure will be used. If there is a preference for a concrete or paved driveway, it is recommended that a geotechnical firm be consulted to ensure proper base preparation and pavement structure.

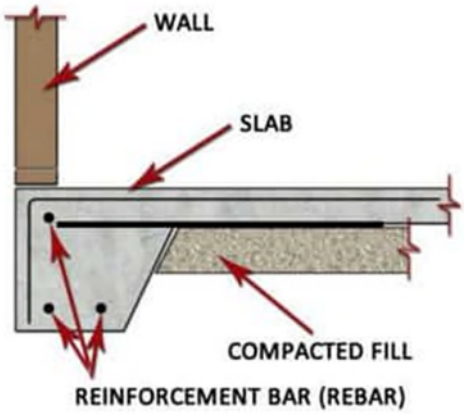
4.2 Foundation Recommendations

The areas near the lot do not indicate frost susceptible soils or permafrost so it will be possible to build using conventional foundations including monolithic slab, strip and pad, or permanent wood foundations. Details about these foundation types are found below. The depth of excavation below the building will be determined by the materials encountered during the excavation process. Concrete foundations are considered more efficient and safer compared to other foundation materials. However, successful construction will depend on adhering to the relevant standards.

Monolithic Foundation

A monolithic slab refers to a type of concrete slab that is cast as a single unit and usually maintains a consistent thickness throughout its entire depth. Nonetheless, variations can occur based on the locality, where the outer portion might be constructed with increased thickness to counter frost heaving and offer improved structural support for external walls. See Figure B.

Figure B: Monolithic Foundation



Strip and Pad/Spread Foundations

Strip foundations are versatile and can be used for various subsoils, but they are most effective for soils with decent bearing capacity. They work well for structures with relatively light loads, such as many commercial buildings with a few stories. In these cases, mass concrete strip foundations can be used. However, if the situation is different and requires stronger support, reinforced concrete may be required.

Pad foundations are generally shallow, but their depth can be adjusted based on the ground conditions. These foundations are spread-out platforms made of concrete in shapes such as rectangles, squares, or circles. They are designed to carry specific point loads, like the weight of columns or groups of columns in a building's structure. The load is then spread out by the foundation to the soil or rock below. It is also worth noting that pad foundations can also be used to support ground beams in some cases. See Figures C and D.

Figure C: Strip Foundation

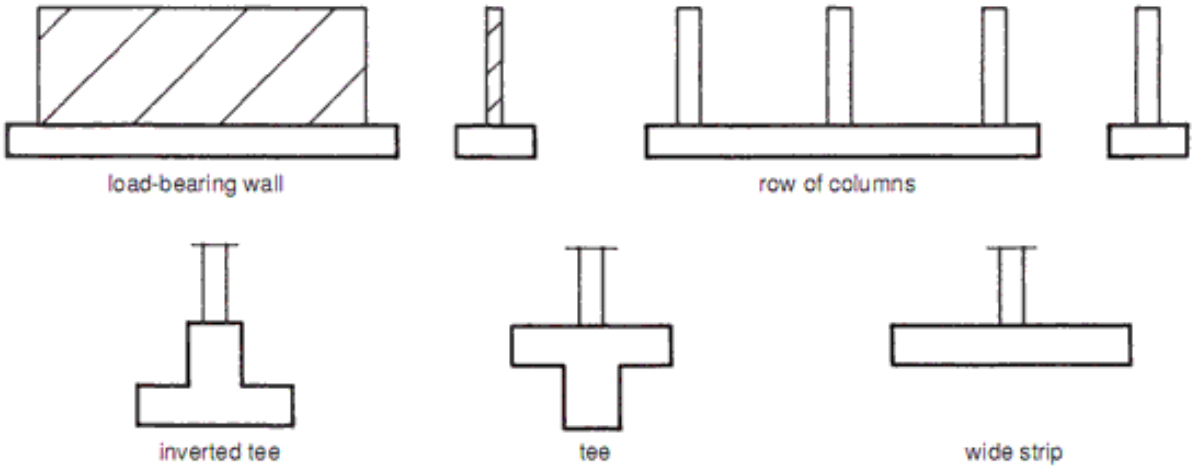
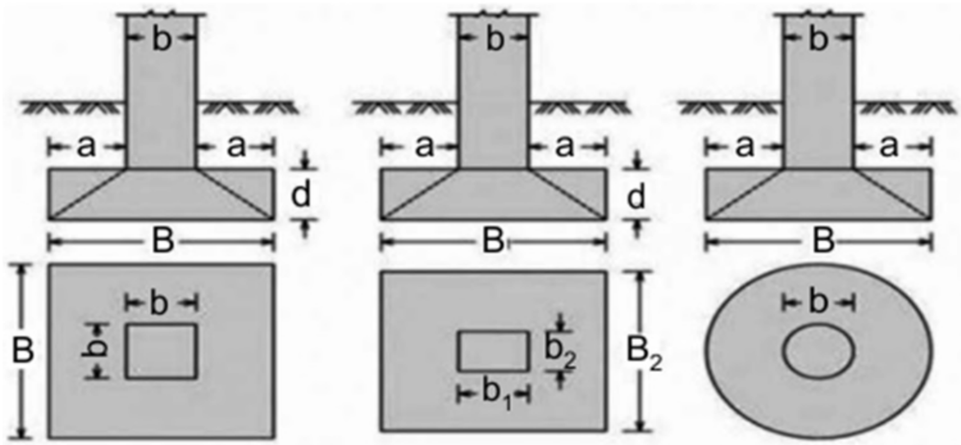


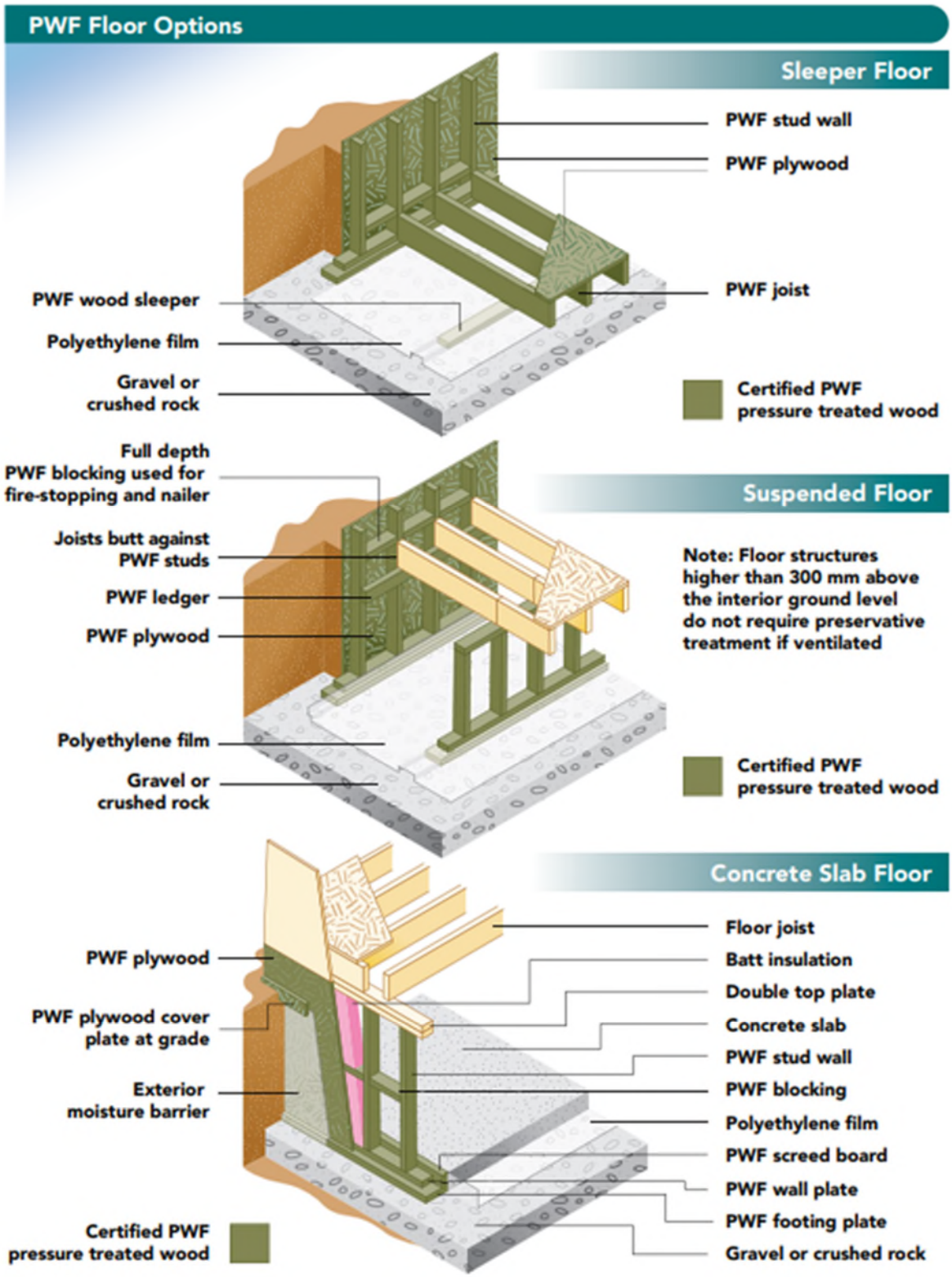
Figure D: Pad/Spread Foundation



<u>Permanent Wood Foundation</u>

A permanent wood foundation (PWF) is an in-ground engineered construction system designed to turn a home's foundation into useable living space. A below-grade stud wall constructed of preservative treated plywood and lumber supports the structure and encloses the living space. PWFs are suitable for all types of light-frame construction covered under Part 9 (Housing and Small Buildings) of the National Building Code of Canada, under clauses 9.15.2.4.(1) and 9.16.5.1.(1). This includes single-family detached houses, townhouses, low-rise apartments, and institutional and commercial buildings. In addition, the recently revised CSA S406 standard, Specification of permanent wood foundations for housing and small buildings, allows for three-storey construction supported by PWF. See Figure E.

Figure E: Permanent Wood Foundation



4.3 Perimeter Insulation and Lot Grading

It is suspected that the lot developer will encounter non-frost-susceptible soils beneath the building foundation; however, in the event there are frost susceptible soils in this area it is necessary to remove those soils or protect the foundation using insulation. It is common practice in the Northern communities of the Yukon to install frost protection to an equivalent of 2.5 m and 3.0 m depth for heated structures and unheated structures respectively that are in contact with the ground such as slab on grade, strip footings, or basements. This means consideration for additional insulation should be considered when there is less than 3.0 m of foundation wall backfill or frost susceptible material within the upper 3.0 m. A general rule for insulation is that 25 mm of rigid (SM Styrofoam) insulation is equivalent to 300 mm of soil cover. When considering unheated structures built on shallow foundations it is common to see an equivalent of 3.5 m of frost protection depending on the type of structure.

Soil in contact with shallow foundations can freeze to the foundation, developing a substantial ad freeze bond. Backfill soil that is frost susceptible can heave and transmit uplift forces to the foundation. It is best practice to backfill foundation walls with a non-frost susceptible material and ensure this material is well drained to reduce or eliminate any uplift forces.

The rigid insulation sheets should be placed with a minimum soil cover of 300 mm on top and extend at least 1.2 m out from the structure. A sheet of vertical insulation should be fastened to the exterior wall above the horizontal insulation up to the insulated exterior wall.

The Yukon communities do not have standard details for lot drainage; therefore, it is common practice to use the City of Whitehorse Servicing Standard Manual (COWSSM) when constructing and developing in the communities. COWSSM Standard Detail Drawing D2.0 shows lot drainage requirements for houses on lots less than 6% overall lot slope. This detail is included in Appendix C and should be considered during the design phase. It is also good practice to ensure the lot does not drain onto neighbouring lots.

Site grading is to be carried out and maintained to ensure water is directed away from all building structures to prevent the accumulation of surface water at the building under the National Building Code of Canada.

4.4 Sewage Disposal Systems

While the town of Watson Lake has water and wastewater treatment infrastructure for many areas of town, this lot does not have water and sewer infrastructure nearby as per details provided by the YG Project Manager. An investigation (percolation test and soil test) should be conducted to determine what kind of septic system can be used to follow the Design Specifications for Sewage Disposal Systems (DSSDS) put forth by the Government of Yukon. Before installing a septic field, the soil type, depth of the water table, lot size, and bedrock depth are needed. A minimum elevation difference of 1.2 m between the drain tile and any impermeable layer or groundwater is recommended.

On-site sewage disposal systems are used to treat wastewater from a building not connected to a municipal sewer system. As per the DSSDS, “No person shall construct, install, enlarge, rebuild, substantially repair, or connect to an existing system, any sewage disposal system or any thereof, or cause the same to be done, without first obtaining a written permit from a health officer.”

The size of the required field will be dependent on the number of bedrooms and the percolation rate of water into the soil. The percolation rate of 0.1 min/25 mm from the nearby test pit indicates well draining soils in the area. It is necessary to dig test hole(s) where the septic system is intended to be built. Within

the test hole, a sample is collected, and a percolation test is conducted at the elevation where the water is expected to drain into the ground. The steps for installing an approved sewage disposal system in the Yukon are attached in Appendix D.

YG Environmental Health Services recommends that septic fields should be the primary option. As it is a requirement to provide locations for two septic fields, it is more difficult to accomplish this for lots less than one hectare. Unserviced smaller lots (less than one hectare) are better suited for engineered septic systems due to the space requirements for septic fields and the high pump-out cost for holding tanks. Holding tanks are advised to be used as a last resort after other options have been explored.

5. CONCLUSION AND LIMITATIONS

Based on the desktop geotechnical assessment conducted, Lot 18 Block 47 within Watson Lake is deemed suitable for residential construction, assuming the developer adheres to specific construction methods and standards for the Yukon and Watson Lake area.

If conditions encountered during initial foundation preparation differ from the information provided, it is recommended that the developer to consult a qualified geotechnical engineer during design and construction to confirm ground conditions and to ensure the proposed design meets Yukon construction standards. This will ensure the foundation type(s) on this lot are well suited to the insitu ground conditions for the proposed structures.

By implementing these recommendations and conducting further on-site investigations as needed, the Yukon Government can ensure this proactive approach will result in resilient and sustainable infrastructure that can withstand the unique environmental conditions of the region.

This report and its contents are intended for the sole use of the Yukon Government and its agents. CAP Engineering does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained in the report when the report is used or relied upon by any other party or for projects outside the subject area. Any such unauthorized use of this report is at the sole risk of the user. CAP has exercised a fair level of care and skill consistent with that put into practice by members of the engineering and science professions currently practicing under similar conditions, subject to time limits and physical constraints applicable to this report.

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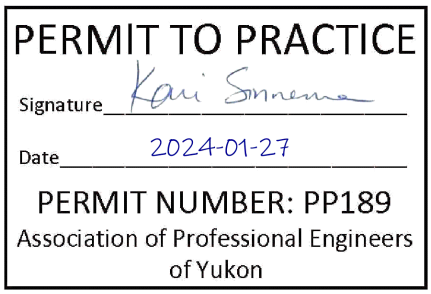
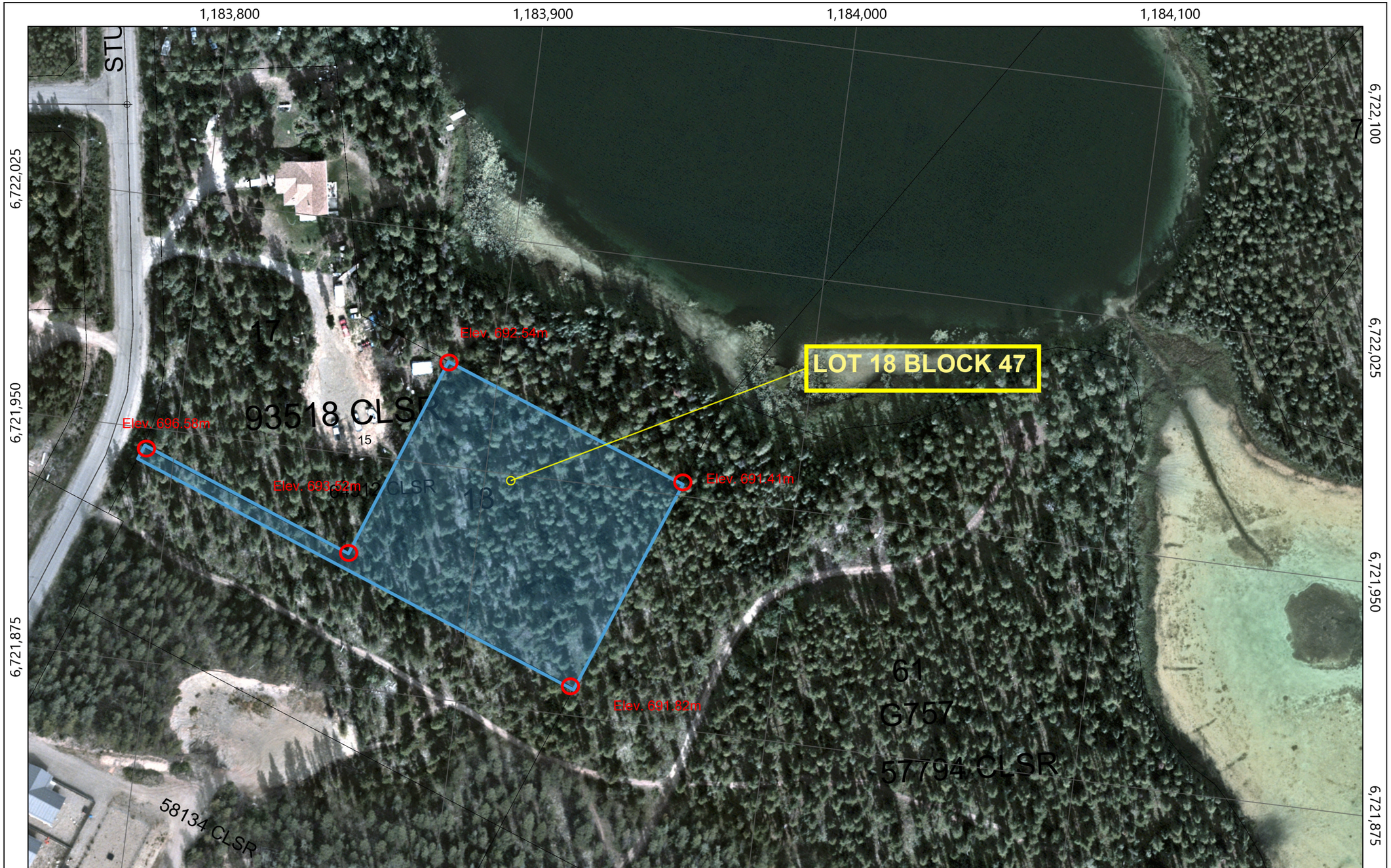


APPENDIX A

SITE MAP

Yukon

Lot 18 Block 47 of Watson Lake



Legend

- Lot Boundary
- Elevation

Total lot area is 6507.68ssqm.

Elevations came from Airborne liDAR data from year 2015 in GeoYukon

0.1 0 0.03 0.1 Kilometers

Projection: Yukon Albers Equal Area Conic
Produced from: GeoYukon application

Scale: 1: 1,250

Date: NOVEMBER 01, 2023

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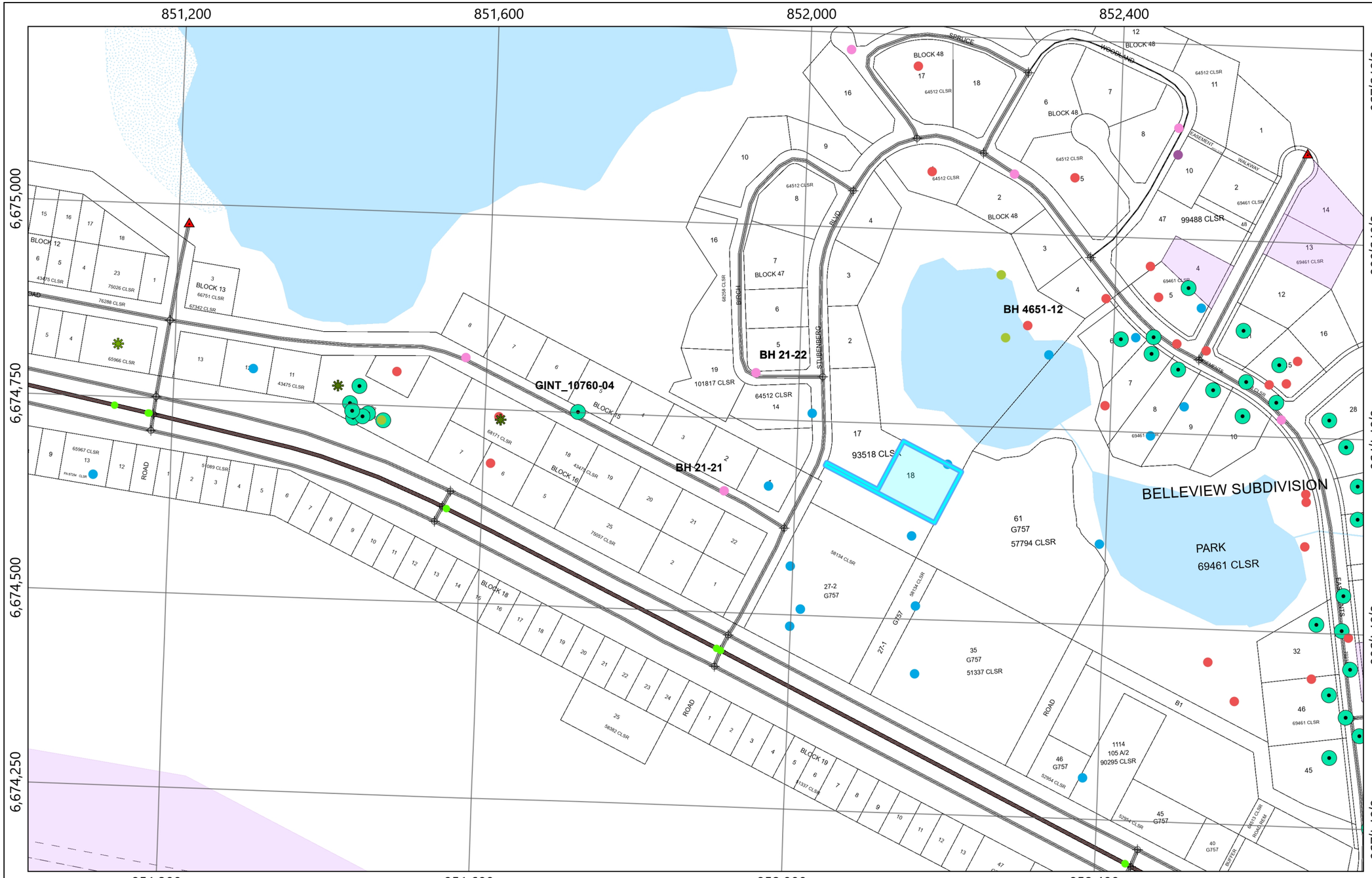
APPENDIX B

BOREHOLE AND TEST PIT DATA

Lot 18 Block 47 - Borehole and Water well



Legend

Water Wells
- Agricultural
- Commercial or Industrial Process
- Environmental Monitoring
- Geotechnical borehole
- Other/Unknown
- Private Domestic
- Public Supply Well - Large
- Public Supply Well - Small
- Test Well

Geotechnical Boreholes

Geotechnical Reports Point

Geotechnical Reports Line

Permafrost Reports Point

Notes

0.3 0 0.13 0.3 Kilometers

Projection: Yukon Albers Equal Area Conic
Produced from: GeoYukon application

Scale: 1: 5,000

Date Printed: 22-Jan-2024

Borehole No: **BH21-21**

Project: Watson Lake Infrastructure Upgrades	Project No: [redacted]
Location: Wye Drive	
Watson Lake, Yukon	UTM: 518182 E; 6657840 N; Z 9

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	Depth (ft)
0								0
	Solid stem auger	SAND AND GRAVEL - trace silt, fine to coarse grained sand, subangular to subrounded gravel, damp, greyish brown	Unfrozen					1
1					SA77	2.4		3
		- larger subrounded to rounded gravel and cobbles						4
2		- (Gravel - 46%; Sand - 48%; Silt & Clay - 6%)			SA78	2.7		7
3		- wet			SA79	11.1		12
4								13
5					SA80	3.5		17
6		END OF BOREHOLE (6.10 metres) Note: Target depth reached						20
7								23
8								26
9								30
10								32

[redacted]	
Contractor: [redacted]	Completion Depth: 6.1 m
Equipment Type: Truck mounted	Start Date: 2021 October 21
Logged By: [redacted]	Completion Date: 2021 October 21
Reviewed By: [redacted]	Page 1 of 1

Borehole No: **BH21-22**

Project: Watson Lake Infrastructure Upgrades	Project No: [redacted]
Location: Birch Crescent	
Watson Lake, Yukon	UTM: 518231 E; 6657989 N; Z 9

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit / Moisture Content / Liquid Limit (20 40 60 80)	Depth (ft)
0		BITUMINOUS SURFACE TREATMENT	Seasonal frost					0
		SAND AND GRAVEL - trace silt, fine to coarse grained sand, subangular to subrounded sand, damp, greyish brown	Unfrozen					1
1	Solid stem auger				SA81	3.1		3
2		- (Gravel - 40%; Sand - 55%; Silt & Clay - 5%)			SA82	3.2		7
3		- less gravel, occasional cobbles			SA83	3.3		11
4								13
5								16
6		- moist			SA84	9		19
		END OF BOREHOLE (6.10 metres) slough - 3.05 metres at completion Note: Target depth reached						20
7								23
8								26
9								29
10								32

[redacted]

Contractor: [redacted]	Completion Depth: 6.1 m
Equipment Type: Truck mounted	Start Date: 2021 October 21
Logged By: [redacted]	Completion Date: 2021 October 21
Reviewed By: [redacted]	Page 1 of 1

BELLEVIEW SUBDIVISION	CLIENT: [redacted]	BOREHOLE NO: 4561-12
LOT #6	DRILL: JOHN DEERE 410 BACKHOE	PROJECT [redacted]
WATSON LAKE, YUKON		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

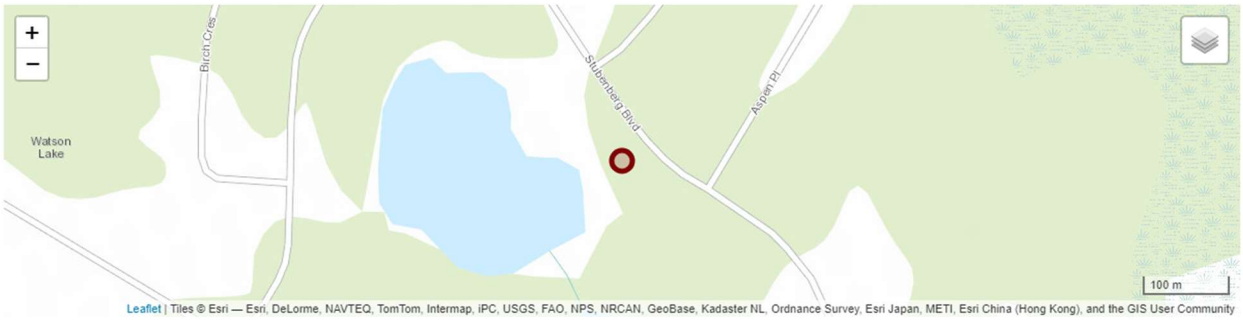
BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND ICE DESCRIPTION AND COMMENTS	BULK DENSITY (kg/m³) 1400 1600 1800 2000 / SPT (N) 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	CLAY (%) 20 40 60 80 / SILT (%) 20 40 60 80 / SAND (%) 20 40 60 80 / GRAVEL (%) 20 40 60 80	Depth (ft)
0	PEAT MOSS(PT)-root mat, and organic silt						0
	GRAVEL(GP/GW)-sandy, trace to some silt, orangish brown		1				
	SAND(SP)-100 mm lens of trace gravel, trace silt; fine grained uniform; dry						
1	GRAVEL AND SAND(GP)-clean; subrounded to subangular, smooth gravel; coarse to medium grained sand; interbedded with medium bedded lenses of sand, lenses 150 mm thick; damp to moist; compact(est.); greyish brown		2				5
2							
			3				10
3							
4							15
	END OF TEST PIT 4.3 m NOTE: Ground water not encountered prior to reaching maximum boom travel of backhoe.						
5							16

[redacted]

LOGGED BY: [redacted]	COMPLETION DEPTH: 4.3m
REVIEWED BY:	COMPLETE: 1986-08-11
DRAWING NO: 4561-12	Page 1 of 1

GINT_4561-12



Soil description | Samples | Metadata

Top depth (m)	Bottom depth (m)	Boundary	Soil description
0.00	0.10	NA	PEAT MOSS(PT)-root mat, and organic silt
0.10	0.50	0	GRAVEL(GP/GW)-sandy, trace to some silt, orangish brown
0.50	0.60	0	SAND(SP)-100 mm lens of trace gravel, trace silt; fine grained uniform; dry
0.60	4.30	0	GRAVEL AND SAND(GP)-clean; subrounded to subangular, smooth gravel; coarse to medium grained sand; interbedded with medium bedded lenses of sand, lenses 150 mm thick; damp to moist; compact(est.); greyish brown
4.30	4.50	0	NA
4.50	4.70	NA	END OF TEST PIT 4.3 m
4.70	4.70	NA	NOTE: Ground water not encountered prior to reaching maximum boom travel of backhoe.

Soil description | Samples | Metadata

Sample

Sample number	Top depth (m)	Bottom depth (m)	Type
1	0.40	0.50	G
2	1.10	1.30	G
3	2.60	2.80	G

Soil description | Samples | Metadata

Site id	Project name	Location description	Hole depth (m)	Start date	End date	Client
GINT_4561-12	BELLEVIEW SUBDIVISION	LOT #6, WATSON LAKE, YUKON	4.30	1986-08-11 00:00:00	1986-08-11 00:00:00	GOVERNMENT OF YUKON

GINT_10760-04

Soil description | Samples | Metadata

Top depth (m)	Bottom depth (m)	Boundary	Soil description
0.00	0.10	NA	SURFICIAL GRAVEL FILL
0.10	0.30	0	SILT-sandy, rootlets throughout, moist, medium brown
0.30	1.50	0	GRAVEL-sandy, trace of silt to clean, occasional cobbles and boulders to 250 mm, sand is medium to coarse grained, gravel is well graded, subrounded, damp, compact(est.), greyish brown
1.50	3.30	NA	-percolation test performed from 1.5 - 1.8 m Average of 3 tests yields a percolation rate of 0.1 min/25 mm
3.30	3.50	0	NA
3.50	3.70	NA	END OF TESTPIT 3.3 m
3.70	3.70	NA	NOTE: Excavated outside of fence at front of lot (see Drawing No 10760-A-02)

Soil description | Samples | Metadata

Show USC code descriptions

Sample

Sample number	Top depth (m)	Bottom depth (m)	Type	USC code
1	0.40	0.60	G	NA
2	1.00	1.20	G	NA
3	2.00	2.20	G	NA
4	3.00	3.20	G	GW

Soil description | Samples | Metadata

Site id	Project name	Location description	Elevation (m)	Hole depth (m)	Start date	End date	Client
GINT_10760-04	SEWAGE DISPOSAL SYSTEM EVALUATION	LOT 5; BLOCK 15, WATSON LAKE, YUKON	97.39	3.30	1991-09-04 00:00:00	1991-09-04 00:00:00	STANLEY ASSOCIATES ENG. LTD.

Table M0086-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0086	**R.C.M.P. Housing**	**Watson Lake**	6657739	518261	695

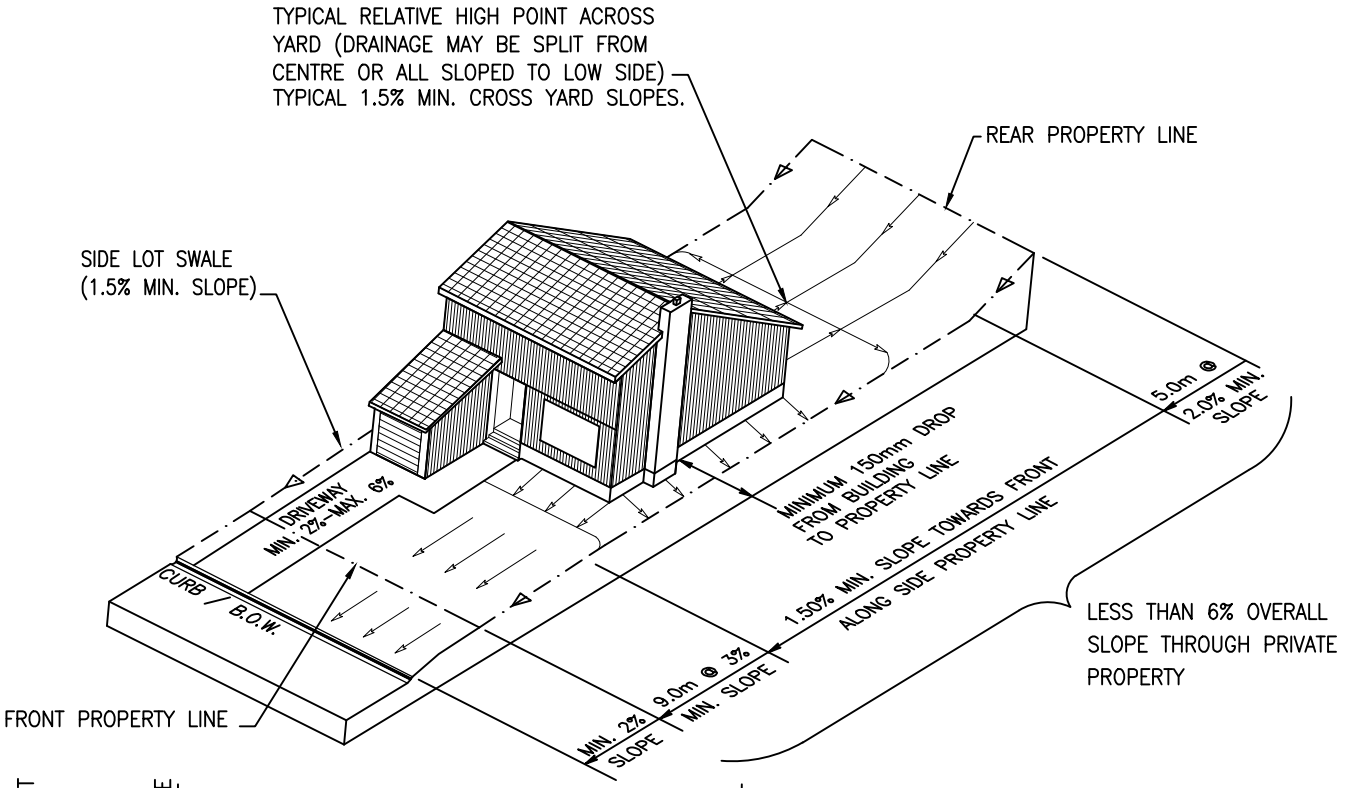
Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	14.3 m below grade	Unknown	Jet pump		9.5 m below grade

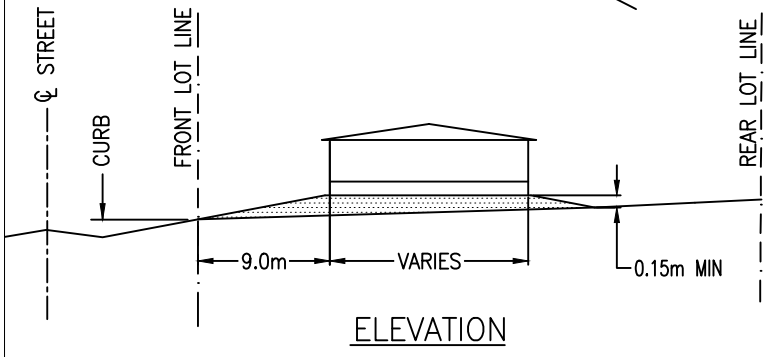
Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
M0086, M0087, M0088 septic field	Located inside basement	Greater than 60 m	Basement AST's	15 m	UST at 105 m
M0092 septic field at 110 m			AST 1	70 m	4 other wells on property at approximately 60 m, 85 m, 85m (abandonned), and 100 m
M0126 and M00127 septic at 90 m			AST 2	100 m	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.6 below grade	No		Unlikely	Ground above wellhead enclosure is relatively flat.	

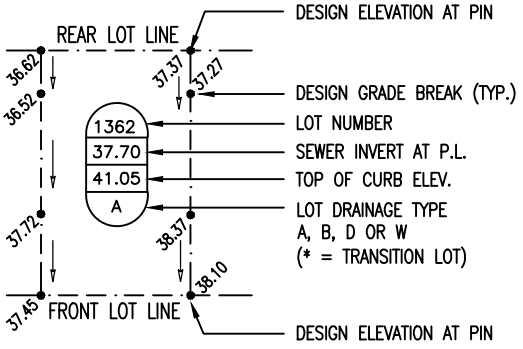
APPENDIX C

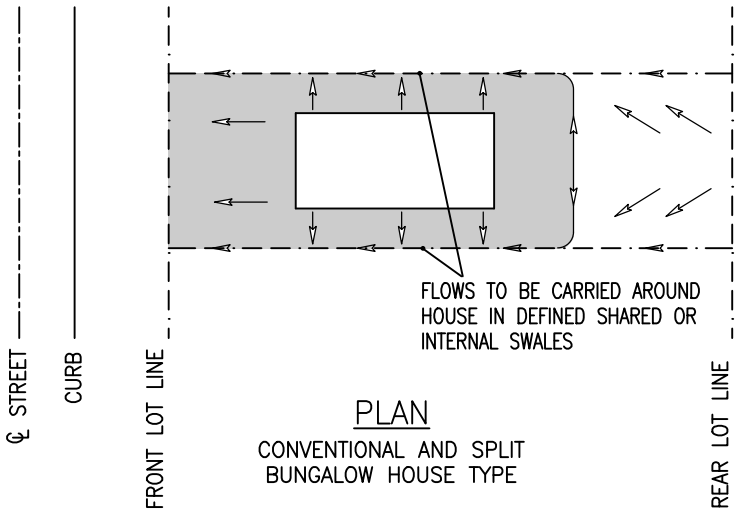
CITY OF WHITEHORSE LOT DRAINAGE DETAIL DRAWINGS





ELEVATION





PLAN

CONVENTIONAL AND SPLIT BUNGALOW HOUSE TYPE

NOTES:

1. SITE GRADING TO BE CARRIED OUT AND MAINTAINED TO ENSURE WATER IS DIRECTED AWAY FROM ALL BUILDINGS TO PREVENT ACCUMULATION OF SURFACE WATER AT THE BUILDING STRUCTURE IN ACCORDANCE WITH THE NATIONAL BUILDING CODE OF CANADA.
2. LANDSCAPING TO BE INSTALLED IN A MANNER THAT MAINTAINS MINIMUM SITE GRADES.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. ALL ROOF LEADERS ARE TO BE DIRECTED TOWARDS THE FRONT OF THE LOT.
5. ALL DESIGN ELEVATIONS ARE TO BE INDICATED AT LOT CORNERS AND GRADE BREAKS ALONG PROPERTY LINE.

Whitehorse
THE WILDERNESS CITY
Engineering Department

TYPICAL URBAN LOT DRAINAGE TYPE 'A' – REAR TO FRONT DRAINAGE LESS THAN 6% OVERALL LOT SLOPE

STD DWG

D2.0

DATE: JANUARY, 2020

APPENDIX D

STEPS FOR INSTALLING AN APPROVED SEWAGE DISPOSAL SYSTEM IN THE YUKON

Application Submission Requirements

Please be advised that applications must be received at least 48 hours in advance of planned receipt of the permit.

As a minimum, the following must be submitted to Environmental Health Services along with an *Application For A Permit To Install A Septic System*:

- A site plan drawing showing a profile of the system layout, including septic tank, absorption system, plus a the location and horizontal distances between all system components, water supply, structures and lot boundaries.
- An 8-cup soil sample from the percolation test hole from the depth at which the soil absorption system will be installed.
- Where applicable, the pump-up system design rationale and specifications for:
  - pump selection
  - controls (level switch settings)
  - force main (type, diameter, class, insulation)
  - height and distance for effluent transfer from tank to absorption system

Designs for septic systems can be completed by the homeowner, contractor or an engineering consultant.

A permit must be issued prior to installing any part of the system.

Permitting

If all necessary data is supplied and the proposed system is deemed suitable, a ***Permit to Install a Sewage Disposal System*** will be issued. Note that the permit is also subject to compliance with federal, territorial and municipal laws, including subdivision prospectus agreements.

After the sewage disposal permit has been issued, a building permit for new house construction may be issued by the municipal or territorial government. An occupancy permit will not be issued by the Building Department until final approval to use the septic system is obtained from Environmental Health Services.

> *Once a permit has been issued there can be no alteration to the sewage disposal system or other work it refers to without the approval of a health officer.*
> *S.11 Sewage Disposal Systems Regulation*

Installation

It is very important that a septic system be installed carefully and in strict accordance with the approved design. Failure to do so may result in problems with the system. The septic tank must be installed and suitably bedded, design grades for building sewers must be adhered to, and care must be taken to ensure the absorption bed components are installed according to the approved design and design specifications.

Before backfilling a septic system, the owner or agent must contact Environmental Health Services at least 72 hours before a final inspection is required. An inspection may be scheduled by a health officer. The system may not be backfilled until permission is granted by Environmental Health Services.

Photographic Record of the Stages of Installation Required

The *Sewage Disposal Systems Regulation (s.13(1)(a)* requires a photographic record of the stages of installation to be provided to a Health Officer within 30 days of installation of the sewage disposal system.

The photographic submission requirements must be met, regardless of whether a health officer completes an inspection during the system installation.

All photographs must be marked with the permit number and the legal description of the property on which the sewage disposal system was installed. **Please refer to the list below** and **add the relevant number from the list to the photograph so as to confirm what is depicted in the photograph**. Several listed items may be shown in a single photograph; in such case please add all relevant numbers to that photograph.

Delays in issuing Approval to Use may occur if the photographs do not clearly depict all stages of installation of the sewage disposal system, or if the record is incomplete.

Septic Tanks and Sewage Holding Tanks

If a septic tank or sewage holding tank will be installed, submit photos depicting the:

1. Certification marking or label on septic tank or sewage holding tank (e.g., CAN/CSA-B66).
2. Volume marking(s) on the septic tank or sewage holding tank (e.g., stencil on the tank).
3. Excavation with bedding material at base (prior to placement of tank).
4. Excavation containing the septic tank or sewage holding tank.
5. Bedding material (e.g., pea gravel) surrounding tank.
6. Trench between septic tank or sewage holding tank and the building to which it will be/is connected – must show pipe in place with flex coupler.
7. The septic tank or sewage holding tank covered with soil to original ground level showing all clean-outs and observation pipes, and relationship to building that it services (if present) or other distinguishing permanent landmark(s).

If a septic tank will be installed, submit a photo depicting the:

8. Pipe with flex coupler in place in trench between septic tank and soil absorption system.

If a sewage holding tank will be installed, submit photos depicting the:

9. High level alarm and automatic water shut-off.
10. Floats attached to float tree within the tank. If the tank will be installed in a location with high ground water or an area prone to flooding, submit a picture depicting the:
11. Anchoring harnesses, turnbuckles, and cables in place and attached to tank as per manufacturer's requirements.
12. "Deadmen" or concrete pad used for anchoring purposes as per manufacturer's requirements.

Soil Absorption System

If a soil absorption system will be installed, submit a photo depicting the:

13. Excavation for the soil absorption system that shows the soil profile.

If installing a soil absorption system in **"fast soils"** (less than 5 minutes per inch percolation rate) submit photos depicting the:

14. Filter sand and its depth – a tape measure or similar device must appear in the picture.

If installing a soil absorption system using **drain rock**, submit a picture depicting the:

15. Drain rock and its depth – a tape measure or similar device should appear in the picture. For trenches, show width and depth.
16. Perforated pipe(s) laid out on the drain rock - the total length of the pipes and width between the pipes must be clear and easy to determine - a tape measure or similar device should appear in the picture. If soil absorption system is installed in sections, a picture of each stage of installation of the pipe must be provided.
17. Solid header and footer pipes. A level should appear in the picture to show that these have been installed level.
18. Cleanout and monitor standpipes in place.
19. Perforated pipe(s) covered with drain rock.
20. Drain rock covered with geotextile or rigid insulation.
21. Soil absorption system covered with soil to original ground level showing all clean-outs, observation pipes, and relationship to building that it services (if present) or other distinguishing permanent landmark(s).

If installing a soil absorption system using **chambers**, submit a picture depicting the:

22. Chambers (the area and width must be clear and easy to determine) – if installed in sections, a picture of each stage of installation of the chambers must be provided.
23. Layer of geotextile cloth laid beneath first section of chamber (unless product-specific splash plate, gravel, perforated piping or other method is used, if so provide photo showing that).
24. Monitor and clean-out pipes in place extending from chambers.
25. Header pipe feeding each chamber run.
26. Soil absorption system covered with soil to original ground level showing all clean-outs, observation pipes, and relationship to building that it services (if present) or other distinguishing permanent landmark(s).

Pump-Up and Raised Soil Absorption Systems

If the sewage disposal system is to contain a mechanical pump (inside your septic tank) that discharges sewage to a raised soil absorption system, submit photos depicting the:

27. Pump on mount or stand in septic tank.
28. Floats in place attached to float tree.
29. Force-main exiting man-way.
30. Force-main mounded or otherwise elevated (to ensure that the pipe drains completely back to pump chamber).
31. Insulation of the force-main (if/when burial depth is less than four feet).
32. Vacuum breaker (to prevent back-siphoning)
33. Frost lid or other suitable insulating method of man-way.
34. Warning indicator system and automatic water shut-off systems in place.

Note: Please include photographs that show any part of the installation of the sewage disposal system not described above.

Getting Your System Approved

Within 30 days of the installation of the system, the following information shall be provided to a Health Officer:

- *Septic Tank and Sewage Holding Tank Installation Declaration* form;
- *Notification of Installation and Undertaking to Maintain a Sewage Disposal System* form, or *Notification of Installation and Undertaking to Maintain a Sewage Holding Tank* form;
- *Electrical Assurance* forms completed by a certified electrician;
- Photographic Record of the stages of installation;
- Other documentation as requested by the Health Officer (e.g., septic or holding tank CSA approval, *Notification of Abandonment and Reclamation of a Sewage Disposal System* form, receipts for purchase).

> ***Provided that the Health Officer is satisfied that all requirements have been met, written approval to use the sewage disposal system shall be issued by the Health Officer.***
> *13(2) Sewage Disposal Systems Regulation*

Records of installation and a letter of approval will help in future sale of the property and in the processing of financing arrangements.