TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Ben Campbell – Senior Project Manager	**Date:**	February 7, 2023
Client:	YG – Land Development Branch	**Memo No.:**	001
From:	Myles Plaunt, CET	**File:**	704-ENG.WARC04344-01
Subject:	Geotechnical Support – Lot Infill Lot 27-2 – Dredge Pond Subdivision – Dawson City, Yukon		

1.0 INTRODUCTION

At the request of Mr. Ben Campbell, Senior Project Manager, Government of Yukon – Community Services – Land Development Branch, Tetra Tech Canada Inc. (Tetra Tech) has completed a geotechnical assessment of Lot 27-2 located along Pay Dirt Way in the Dredge Pond Subdivision, Dawson City, Yukon.

Authorization to proceed with this project was in the form of the executed Government of Yukon Consultant Services Agreement C00069118. This memorandum is subject to Tetra Tech's Limitations on the Use of this Document, which is attached in Appendix A.

2.0 SITE CONDITIONS

2.1 Location & Site Details

The Dredge Pond Subdivision is located along the north side of the Klondike Highway at km 708. The subdivision is accessed on Eureka Drive and Lot 27-2 is located along Pay Dirt Way.

Lot 27-2 is 0.42 ha (1.0 acre) in size, which by Yukon Government standards is considered small for country residential development. However, it meets the local zoning requirements and the geotechnical conditions at the site will support the intended level of development.

This office has been involved in numerous projects in Dawson City that involve development in areas underlain by dredge tailings and the recommendations presented below are based on sites with similar conditions.

2.2 Terrain and Vegetation

Lot 27-2 has micro terrain features throughout. In general, 27-2 sits lower than Lot 27-1 to the west and Lot 28 to the east. As is common in areas where dredge tailings have been placed, the terrain features are the result of the method of deposition and how the tailings piles have been reworked since being placed. Close to the rear lot line, there is a pond.

Much of the lot is clear of vegetation but the northeast quadrant is tree covered with immature deciduous regrowth.

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2.3 Geotechnical Conditions

An in-house data search has established that Tetra Tech has not completed any testholes in this subdivision. However, Google Map Street View imagery provides sufficient proof that the entire lot is underlain by granular tailings.

Based on knowledge gained from geotechnical evaluations of similar sites, the geotechnical conditions throughout the site are assumed to include:

- Coarse granular tailings (from dredging operations) exist throughout Lot 27-2. The thickness of the tailings is likely variable but at least 4.0 m. Standard Penetration Testing (SPT) of the tailings on other projects has established that they are loose and require improvement in advance of foundation construction.
- Below the tailings, it is assumed that there are alluvial sediments associated with the Klondike River.
- Groundwater can be seen in the pond at the back of the lot and along the Klondike Highway behind lots 26, 27-1, 27-2 and 28. The actual elevation of ponds throughout the subdivision is variable and directly dependent upon fluctuations in water levels in the Klondike River.
- Isolated pockets of permafrost have been encountered on other projects. This must be considered when choosing a foundation system.

2.4 Site Drainage

Lots throughout the Dredge Pond Subdivision are well drained since they are underlain by free draining dredge tailings. However, since Lot 27-2 is lower than the lots on either side, mitigative steps may be required to control surface runoff.

3.0 DEVELOPMENT POTENTIAL

Development potential for this lot is good as there are no serious geotechnical constraints associated with this site. However, some clearing and significant site grading may be required in advance of foundation construction and on-site sewage disposal system installation.

Lot development should include a planning component that takes advantage of the on-site granular materials and pregrading must include the compaction of all exposed surfaces and wherever fill is placed.

4.0 RESIDENTIAL FOUNDATION RECOMMENDATIONS

The dredge tailings are considered acceptable as foundation soils for conventional shallow foundation systems, including strip and spread footings and thickened monolithic slab-on-grade foundations. During site grading, backfilling the pond at the back of the lot is an option but foundation construction on this portion of the site is not recommended.

According to building codes, any new building constructed with below grade foundations must adhere to standards for drainage. The relevant standards include:

- Permanent Wood Foundations, as outlined in CAN/CSA S-406-92, Construction of Preserved Wood Foundations and identified in the National Building Code of Canada (NBCC 2020).

- Concrete Foundations, also described in NBCC 2020, Section 9.14, identifies the minimum requirements for foundation drainage, drainage tile and associated piping, granular drainage layers, drainage disposal, and control of surface runoff.

There are prescriptive measures based on the relevant CSA and NBCC specifications listed above; however, since the foundations are likely to be constructed on free draining soils, the prescriptive measure requirements of these standards can be waived.

It is important that building pads be properly compacted after lot grading has been completed. Ideally, a large vibratory drum compactor should be used for all grading and building pad preparation. The final lift under all foundation elements should be a 150 mm thick lift of 20 mm crushed basecourse aggregate to ensure there are no point pressures from cobble sized pieces exerted on the underside of the footings.

4.1 Perimeter Insulation and Lot Grading

For frost heave to occur, there must be sub-zero temperatures and frost susceptible soils that have been allowed to become saturated. Since the granular soils underlying the site are considered free-draining and non-frost susceptible, additional (beyond local building code requirements) perimeter insulation will not be required for Lot 27-2

Since Lot 27-2 sits lower than the adjoining lots, it is important that all building pads be constructed to ensure that surface water is directed around and away from all foundations.

Along with surface drainage control, it is important that structures have functioning rain gutters and downspouts installed to minimize potential for water to make its way down along the foundation wall and under the footings

5.0 ON-SITE SEWAGE DISPOSAL SYSTEM

All systems installed in the Yukon must comply with the "*Sewage Disposal System Regulation*" and specifically, Section 21 – *Design Specifications For The Septic Tank and Soil Absorption System.* Additionally, designs must be reflective of the information presented in *CSA B65-12 – Installation Code For Decentralized Wastewater Systems*.

Included in the *Design Specifications For The Septic Tank and Soil Absorption System,* pages 35 and 36 provide design and installation details for absorption beds systems installed in dredge tailings. The key components of this installation are:

- At least 1.8 m of filter sand will be required beneath the drain rock layer. This must be considered when establishing grade from the septic tank.
- The filter sand layer will have to extend 1.8 m out from all perimeter piping.
- A geotextile silt barrier must be installed under the filter sand, up along all sides and across the top of the absorption field.
- Cover over the absorption field should be a non-free draining (fine grained) material that extends at least 600 mm beyond the perimeter of the field.
- Setback distances from lot lines (5 m); driveways (5 m); buildings (6 m); water supply wells and surface water bodies (30 m); and groundwater (1.2 m) will all apply to system installation on this lot.

The lot owner or septic system installer will likely be asked to submit a sample of the accepting soil (which in this case will be a filter sand sample) so that testing can confirm the textural classification of the soil and compliance with the filter sand gradation specification.

6.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Government of Yukon and their agents. Tetra Tech Canada Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Government of Yukon, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document, attached in the Appendix A.

7.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

704-ENG.WARC04344-01

PROFESSIONAL ENGINEER
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Attachments: Appendix A - Limitations on the Use of this Document
Site Plan Showing Lot location

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
SIGNATURE
Date
PERMIT NUMBER PP003
Association of Professional Engineers of Yukon

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL – YUKON GOVERNMENT

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the use of TETRA TECH's Client, its officers, employees, agents, representatives, successors and assigns (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH. Any changes to the conclusions, opinions, and recommendations presented in TETRA TECH's Professional Document must be authorized by TETRA TECH.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems, as per agreed project deliverable formats. TETRA TECH makes no representation about the compatibility of these files with the Client's future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be brought to the attention of TETRA TECH within a reasonable time.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, and subject to the standard of care herein, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage, except where TETRA TECH has subcontracted for such information.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to make, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the Client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

1.8 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.9 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.10 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.11 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.12 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.13 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.14 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.15 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.16 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

1.17 DESIGN PARAMETERS

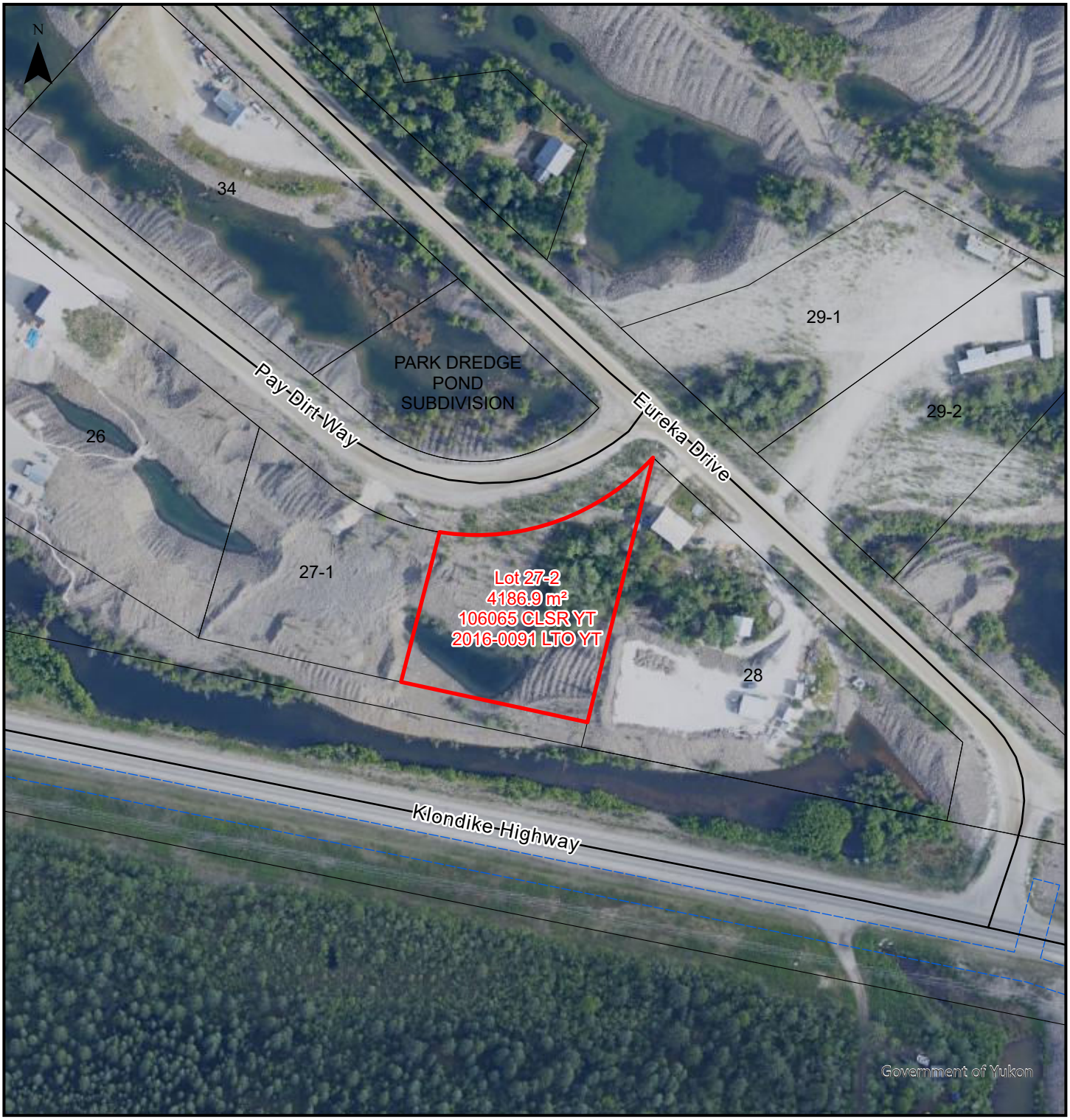
Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.18 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.19 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

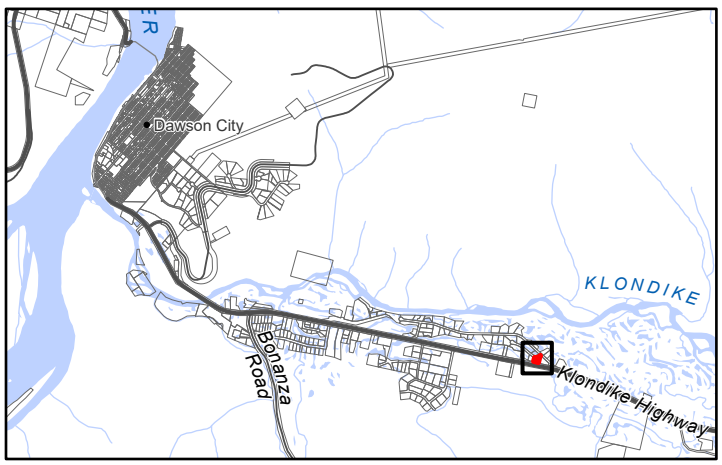
This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.



Lot 27-2 Dredge Pond Subdivision
Dawson City

- Lot 27-2 - zoned Country Residential
- Surveyed Parcels
- Surveyed Easements

Yukon



May 04, 2022