



Granular Materials Resource Study, Hamlet of Taloyoak, Nunavut

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Table of Contents

| | |
|--|----|
| Executive Summary | i |
| 1.0 Introduction and Project Objective | 2 |
| 2.0 Taloyoak Background | 3 |
| 3.0 Aggregate Resources Assessment | 4 |
| 3.1 Phase I – Desk Top Study and Review of Available Information | 4 |
| 3.2 Phase II - Interviews with Local Officials and Stakeholders | 4 |
| 3.3 Phase III - Test Pits Investigation and Sampling, Laboratory Testing and Reporting | 4 |
| 4.0 Phase 1 Desktop Study and Review of Available Information | 5 |
| 4.1 Surficial Geology of Taloyoak | 5 |
| 4.2 Bedrock Geology of Taloyoak | 5 |
| 4.3 Geotechnical Investigations Undertaken by EXP in Taloyoak | 5 |
| 4.3.1 Review of Existing Aggregate Resources, Hamlet of Taloyoak, Nu, EXP Project OTT-00254843-A0, Dated December 3, 2020, Prepared for Government of Nunavut | 5 |
| 4.3.2 Arena Ice Rink Foundation Upgrade, Taloyoak, Nunavut, EXP Project OTT-00214647-A0, Dated February 12, 2014, Prepared for Community and Government Services, Government of Nunavut | 6 |
| 4.3.3 Geotechnical Investigation, Solid Waste Management Facility Feasibility Study, Hamlet of Taloyoak, Nunavut, EXP Project No. BRM-0060677-A0, Dated December 22, 2020, Prepared for Community and Government Services, Government of Nunavut | 6 |
| 5.0 Phase II – Interviews with Local Officials and Stakeholders | 8 |
| 5.1 Interview with Hamlet SOA | 8 |
| 5.2 Interview with Ashoona, Hamlet’s Transport Manager | 8 |
| 5.3 Interview with Manuel, Site Supervisor for Kudlik Construction | 8 |
| 5.4 Interview with Henry Lawson | 9 |
| 6.0 Phase III – Test Pit Investigation, Sampling, Laboratory Testing and Reporting | 10 |
| 6.1 Procedure | 10 |
| 6.2 Site 1 Kudlik Rock Quarry (Figure 6) | 10 |
| 6.3 Site 2 Location of Airport Stockpile (Figure 8) | 11 |
| 6.4 Site 3 (Figure 7) | 11 |
| 6.4.1 Soil Description | 11 |
| 6.4.2 Laboratory Testing | 11 |
| 6.4.3 Estimation of Quantity of Granular Material | 11 |
| 6.5 Site 4 (Figure 18) | 14 |
| 6.5.1 Soil Description | 14 |

| | | |
|--------|---|----|
| 6.5.2 | Laboratory Test Results | 14 |
| 6.5.3 | Estimation of Quantity of Granular Material..... | 15 |
| 6.6 | Site 5 (Figure 22)..... | 16 |
| 6.6.1 | Soil Description | 16 |
| 6.6.2 | Laboratory Test Results | 16 |
| 6.6.3 | Estimation of Quantity of Granular Material..... | 16 |
| 6.7 | Site 6 (Figure 27)..... | 17 |
| 6.7.1 | Soil Description | 18 |
| 6.7.2 | Laboratory Test Results | 18 |
| 6.7.3 | Estimation of Quantity of Granular Material..... | 18 |
| 6.8 | Site 7 (Figure 31)..... | 19 |
| 6.8.1 | Soil Description | 19 |
| 6.8.2 | Laboratory Test Results | 19 |
| 6.8.3 | Estimation of Quantity of Granular Material..... | 19 |
| 6.9 | Site 8 (Figure 35)..... | 20 |
| 6.9.1 | Site and Soil Description | 20 |
| 6.9.2 | Laboratory Test Results | 21 |
| 6.9.3 | Estimation of Quantity of Granular Material..... | 21 |
| 6.10 | Site 9 (Figure 38)..... | 22 |
| 6.10.1 | Geotechnical Conditions..... | 22 |
| 6.10.2 | Laboratory Test Results | 22 |
| 6.10.3 | Estimation of Quantity of Granular Material..... | 22 |
| 7.0 | Hamlet's Granular Needs | 26 |
| 8.0 | Hamlet's Equipment Needs..... | 27 |
| 9.0 | List of Equipment Available in the Hamlet of Taloyoak | 28 |
| 10.0 | Conclusions..... | 29 |
| 11.0 | Limitation of Liability, Scope of Report, and Third-Party Reliance..... | 30 |
| 12.0 | Signatures..... | 31 |

List of Tables

| | |
|--|----|
| Table 1: Site 3 Test Pit Logs | 12 |
| Table 2: Site 3 Results of Laboratory Test | 14 |
| Table 3: Site 4 Test Pit Logs | 15 |
| Table 4: Site 4 Area 4 Results of Laboratory Test..... | 16 |
| Table 5: Site 5 Test Pit Logs | 17 |
| Table 6: Site 5 Results of Laboratory Test | 17 |
| Table 7: Site 6 Test Pit Logs | 18 |
| Table 8: Site 6 Results of Laboratory Test | 19 |
| Table 9: Site 7 Test Pit Logs | 20 |
| Table 10: Site 7 Results of Laboratory Test | 20 |
| Table 11: Site 8 Test Pit Logs | 21 |
| Table 12: Site 8 Results of Laboratory Test | 21 |
| Table 13: Site 9 Test Pit Logs | 23 |
| Table 14: Area 9 Results of Laboratory Test..... | 25 |
| Table 15: Estimated Volume of Sand and Gravel Potentially Available from Sites 3 to 9..... | 29 |

List of Figures

| |
|---|
| Figure 1 – Site Location Plan |
| Figure 2 – Taloyoak Study Area Map |
| Figure 3 – Surficial Geology of Taloyoak |
| Figure 4 – Bedrock Geology of Taloyoak |
| Figure 5 – Aggregate Source Locations |
| Figure 6 – Aggregate Source Location Site 1 |
| Figure 7 – Aggregate Source Location Site 3 |
| Figures 8 to 17 – Grain Size Analyses of Samples from Site 3 |
| Figure 18 – Aggregate Source Location Site 4 |
| Figures 19 to 21 – Grain Size Analyses of Samples from Site 4 |
| Figure 22 – Aggregate Source Location Site 5 |
| Figures 23 to 26 – Grain Size Analyses of Samples from Site 5 |
| Figure 27 – Aggregate Source Location Site 6 |
| Figures 28 to 30 – Grain Size Analyses of Samples from Site 6 |
| Figure 31 – Aggregate Source Location Site 7 |

Figures 32 to 34 – Grain Size Analyses of Samples from Site 7

Figure 35 - Aggregate Source Location Site 8

Figures 36 & 37 – Grain Size Analyses of Samples from Site 8

Figure 38 - Aggregate Source Location Site 9

Figures 39 to 44 - Grain Size Analyses of Samples from Site 9

List of Appendices

Appendix A: Site Photographs

Appendix B: Hamlet's Response to EXP's Questionnaire

Distribution List

Executive Summary

A geotechnical investigation was undertaken in the Hamlet of Taloyoak, Nunavut with a view to evaluate the extent of granular materials available in the Hamlet for construction purposes. This investigation was authorized by the Hamlet of Taloyoak under EXP's Standing Offer Agreement with the Government of Nunavut, 2022-41.

The purpose of the investigation was to undertake a study for the determination, development and evaluation of existing and new quarries/borrow pits within the municipal boundary of the Hamlet of Taloyoak.

The work done comprised of a desktop review of available information, interviews with local officials and other stakeholders, test pit investigation, sampling, laboratory testing, estimating the quantities, and reporting.

A total of eight sites were reviewed and/or investigated, i.e., Sites 1, 3, 4, 5, 6, 7, 8 and 9. Site 1 is a rock quarry whereas all the other sites comprise of gravel pits and/or deposits. The investigation comprised of excavating a total of 52 test pits at the sites with a rubber-tired backhoe and in some cases manually.

The test pits met refusal to excavation on boulders or permafrost except in some cases the test pits were terminated on reaching the groundwater table. The test pits were logged, representative soil samples were obtained and placed in polyethylene bags, visually examined, logged and identified. On completion of the fieldwork, the samples were transported to the EXP laboratory in Ottawa, Ontario. Samples were visually examined and test pit logs prepared. Laboratory testing comprised of determining the moisture content of all the samples and grain size analyses and Atterberg Limit tests were performed on selected samples.

The quantity of granular materials available from each site was computed based on the numbers of test pits excavated and the depths to which the test pits could be advanced. The potential quantity of material that can be retrieved from each source has been summarized below.

| Site Location | EXP Estimate |
|--------------------------------|--------------------------------|
| Site 1 – Kudlik bedrock quarry | ~30,000 – 35,000—cubic metres— |
| Site 3 | ~130,000 cubic metres |
| Site 4 | ~34,000 cubic metres |
| Sites 5 & 7 | ~20,000 cubic metres |
| Site 9 | ~22,000 cubic metres |

It is noted that the investigation by EXP was limited due to the unavailability of adequate construction equipment for undertaking the fieldwork and due to time constraints. However, EXP considers that potentially higher quantities of material are available from the areas investigated, especially from Sites 5, 7 and 9. In conclusion, there is an ample quantity of granular materials available in the Hamlet for their use and lack of availability of the material is not expected to be a consideration in the foreseeable future.

These and other related considerations have been discussed in detail in the accompanying report.

This executive summary is a brief synopsis of the report and should not be read in lieu of reading the report in its entirety.

1.0 Introduction and Project Objective

It is understood that as part of the engineering consulting services, EXP is required to evaluate aggregate sources within the Hamlet of Taloyoak, Nunavut to update the previous review completed by EXP in 2023 under project number OTT-00254483-A0, dated December 3, 2020. This review was visual and did not include any sampling or testing of the material from the existing gravel pits or deposits. Site location is shown on Figure 1 and the approximate study area is shown on Figure 2.

2.0 Taloyoak Background

Taloyoak or Talurjuack, formerly known as Spence Bay, is located on Boothia Peninsula, Kitikmeot Region, in Nunavut, Canada. It is located at Longitude 93° 31'W, Latitude 69° 32'N at Elevation 28 m. The community is situated 460 km east of the regional centre of Cambridge Bay, 1224 km northeast of Yellowknife, Northwest Territory. Taloyoak is the northernmost community in mainland Canada. It has a population of 1,076. Taloyoak is surrounded by tundra and the ground is black / gray.

The summer temperatures in Taloyoak range from 5°C to 20°C. The snow begins to fall in late September or early October. Winter days have four hours of sunlight and temperatures that range from -15°C to -35°C. With winter windchill, it can feel like -50°C. Based on the Environment Canada Canadian Climate Normals, 1981-2010, the average annual high temperature is 10.7°C and the average annual low temperature is -17.9°C. The average yearly precipitation is 187.4 mm and average annual rainfall is 80.9 mm.

3.0 Aggregate Resources Assessment

The aggregate search and assessment work at the Hamlet was completed independently of the other studies required as part of the engineering consulting services. It consisted of the following activities:

- Gather information on existing and potential new granular resources and assess the accessibility of each of these resources within the Hamlet;
- Investigate and locate potential suitable sources of granular material by test pit excavation and sampling of accessible materials;
- Conduct basic laboratory testing on the recovered samples to further classify the materials; inclusive of grain size analyses and undertaking Atterberg limit tests.
- Establish the quantity of material that would be available from each of the existing sources as well as any potential new sources identified;
- Establish the potential use of the existing material by the Hamlet;
- Establish if any equipment such as screener, crusher, loader, etc. is available locally and provide recommendations for the procurement of any new equipment that may be required for the crushing operation.
- Provide a complete report of the investigation for each site. Each report will include but is not limited to a map showing the location of existing and potential new sources, access to each potential site, estimated quantity of materials available, their type or grade, and estimated processing required.

The geotechnical assessment and investigation was undertaken in three phases as outlined below.

3.1 Phase I – Desk Top Study and Review of Available Information

The first phase comprised of a review of all available background information including surficial geology maps, aerial photographs and available geotechnical studies previously completed (if any). This review identified (i) areas that were currently or have been previously quarried (ii) areas of potential new sources and (iii) areas that require detailed field investigation and sampling.

3.2 Phase II - Interviews with Local Officials and Stakeholders

The second phase was completed prior to our departure and/or on the first day of arrival of the technician to each site. This phase comprised of conducting interviews with people who were familiar with this site, and contractors who worked or visited the site for gathering any related information regarding existing and potential sources.

3.3 Phase III - Test Pits Investigation and Sampling, Laboratory Testing and Reporting

Based on the results from the Phase I and II investigative work mentioned above, a detailed field investigation was designed and completed to locate and sample potential aggregate sources. Laboratory testing was undertaken on selected samples. The quantity of material available from each site was computed and a comprehensive geotechnical investigation report was prepared discussing all the aspects listed previously.

The three phases have been discussed in detail in subsequent sections of the report.

4.0 Phase 1 Desktop Study and Review of Available Information

4.1 Surficial Geology of Taloyoak

A map of the surficial geology of Boothia Peninsula is given in Figure 3. It identifies surficial materials and associated landforms left by retreat of the last glaciers. It indicates that the surficial soil in the northwestern part of Taloyoak consists of thick and continuous till blanket. In the southeast part of Taloyoak, the surficial soil consists of a till veneer which is thin and discontinuous and may include extensive areas of rock outcrop. The till is a sediment that has been transported and deposited by or from glacier ice with little or no sorting by water. It is composed of a wide range of clast sizes, including varying proportions of boulders, cobbles, sand, silty and clay.

4.2 Bedrock Geology of Taloyoak

The till is expected to be underlain by rocks of the Boothia Complex which comprises of granite, granitoid gneiss, lesser Paragneiss, local marble, calcite, etc. (Figure 4).

4.3 Geotechnical Investigations Undertaken by EXP in Taloyoak

4.3.1 Review of Existing Aggregate Resources, Hamlet of Taloyoak, Nu, EXP Project OTT-00254843-A0, Dated December 3, 2020, Prepared for Government of Nunavut

The work done consisted of a review of the background documents provided by Community and Government Services, visual review of six existing granular sources, photo documentation of each site, assessing estimation of the area available at each site for granular source extraction, and documentation of the findings in a geotechnical report.

The sites were visited by a representative of EXP accompanied by a representative from the Hamlet. The following observations were made.

Site 1 is a Kudlik rock quarry located on Middle Lake Road. The quarry comprises of a rock ridge with a height of 0 m to 6 m. It measures approximately 250 m by 100 m in plan. The quarry has been in operation for some years and part of the ridge has been excavated to the existing ground surface. The crusher in the quarry has been used for the last three years and appears to be in good condition.

Site 2 is an area used to stockpile aggregate for maintenance of the airport runway. Sites 1 and 2 were not investigated.

Site 3 comprises of an old borrow pit which has been abandoned for almost 20 years. Based on a review of the site area, it was considered that this source may contain sufficient sand and gravel to satisfy the Hamlet's requirement for several years.

Site 4 is located between the dump and the sewage lagoon west of the airport runway. It comprises of a sand and gravel pit which has been occasionally used by the Hamlet for screening to produce sand.

Site 5 is the Hamlet borrow pit located on Water Plant Road. It has been used since 1980s to produce granular material required for construction of housing pads and roadway subgrade. The pit has 8 m to 10 m high vertical banks which are cut and directly loaded on trucks for use in the Hamlet. It was considered that this area may contain sufficient material to last for the next 20 years.

Site 6 was identified as a 20 m by 100 m clay pit located off the Water Plant Road. It is understood that in the past, the clay was stripped and used from this source as needed.

Site 7 is reported to be a clay pit located east of the Hamlet borrow pit (Site 5) near Water Plant Road. This pit is approximately 50 square metres in area and has been used for years.

4.3.2 Arena Ice Rink Foundation Upgrade, Taloyoak, Nunavut, EXP Project OTT-00214647-A0, Dated February 12, 2014, Prepared for Community and Government Services, Government of Nunavut

EXP carried out a geotechnical investigation for upgrading the Ice Rink Foundation of the Arena in Taloyoak, Nunavut. This work was authorized by Mr. Patricio Fuentes, Regional Project Manager, on September 4, 2013.

The project terms of reference required upgrading the foundation of the ice rink from a sand surface to a concrete slab-on-grade underlain by horizontal thermosyphons. The rink previously relied heavily on ground and outside temperatures to make and maintain the ice. As a result, the rink could be only used for a few months in the year and the quality of the ice was marginal. The investigation comprised of drilling 3 boreholes in the existing rink area to depths ranging from 3.1 m to 4.3 m using an electric drill rig. The subsurface conditions at the borehole locations comprised of an approximately 0.3 m thick surficial layer of fill, underlain by till to the depth of the investigation. The fill/till is predominantly sand and gravel with varying amounts of silt and some cobbles and boulders. The active layer was completely frozen at the time of the investigation and bedrock was not encountered. The thermal modeling to determine the feasibility of using thermosyphons to extend the use of rink ice was undertaken by Naviq Consulting Inc. (Naviq).

The investigation concluded that upgrade of the arena foundation is feasible. The Naviq report indicated that the concrete slab-on-grade surface would reach -5°C about 2 weeks sooner with thermosyphons than without them and the quality of the ice surface would also be improved.

The Naviq report also indicated that installing a horizontal layer of insulation below the thermosyphons has no significant effect on the production of good quality ice in either fall or spring. However, the existing fill materials and native soils at the site are considered to be frost susceptible and may also be thaw unstable due to the fines content and potential presence of excess ice. Therefore, the report recommended that a layer of horizontal insulation be installed directly beneath the proposed thermosyphon bedding sand to protect the underlying permafrost soils during construction and curing of the concrete slab-on-grade. Further alterations to the proposed cross-section included in the Design Brief were recommended. The recommended cross-section could reduce the required excavation/replacement to about 0.75 m, depending on the depth to frozen soils at the time of construction. The report recommended that the potential to alter the cross-section should be evaluated and discussed with the thermosyphon designer to assure that the design intent is fully appreciated and met.

4.3.3 Geotechnical Investigation, Solid Waste Management Facility Feasibility Study, Hamlet of Taloyoak, Nunavut, EXP Project No. BRM-0060677-A0, Dated December 22, 2020, Prepared for Community and Government Services, Government of Nunavut

A geotechnical investigation was undertaken at three potential landfill Site Nos. 11, 5 and 6 for Solid Waste Management Facility to be located in the Hamlet of Taloyoak, Nunavut. This work was authorized by the Government of Nunavut's Department of Community and Government Services.

The geotechnical investigation was carried out between August 15 and 20, 2020 and comprised of drilling/excavating thirteen boreholes and test pits. Eight boreholes were drilled to a depth of 3.7 m to 6 m and five test pits were excavated on the three potential sites, each to a depth of 1.5 m. The boreholes were drilled using a locally available air track drill.

The geotechnical investigation at Site 11 comprised of drilling eight (8) boreholes to 3.7 m to 6.1 m depth each and excavating five (5) test pits to refusal on permafrost or boulders at 1.37 m to 1.5 m depth. The investigation revealed that the predominant surficial soil is poorly to well graded sand and silty sand which extends to 3.7 m to 6 m depth. It is underlain by inferred bedrock or boulders in some boreholes. The permeability of the on-site soils was estimated to vary from 1×10^{-4} to 4×10^{-2} cm/s. On this basis, the soil has been classified as of low to medium permeability. The groundwater at Site 11 varied from 1.5 m to 3 m depth except in low-lying areas where it was higher.

Only very limited investigation could be undertaken on Sites 5 and 6 as these sites were not accessible to vehicular traffic. The field work for Site 5 comprised of manually augering two boreholes to 1.4 m depth each where refusal was met on permafrost. The boreholes indicated that the predominant soil at the site is silty sand with trace to some clay. Its permeability

was estimated to vary from 1×10^{-5} to 2.25×10^{-5} cm/s. The groundwater was encountered at 0.45 m depth in one of the boreholes and at ground surface in the other borehole.

The investigation on Site 6 comprised of manually augering two boreholes to refusal at 0.45 m to 1.4 m depth. The investigation revealed that the predominant soil at the site in one of the boreholes was silty sand with trace to some clay. Its permeability was estimated as 1.6×10^{-5} to 2.25×10^{-5} cm/s. In the other borehole, fine to coarse sand with some organics was encountered. Its permeability was estimated as 9×10^{-2} cm/s. Groundwater was recorded at 0.2 m depth to 0.07 m depth at this site.

The investigation revealed that all three sites generally met the area and topography requirements and site geology. Permafrost was expected to be somewhat more stable at Site 11 compared to Sites 5 and 6 due to more permeable soils. The shallow groundwater observed at all three sites was seasonal and therefore not a consideration for Class 2 sites. All the sites were located sufficient distances away from water bodies and coastal areas or seashore. They were also located sufficient distances above the sea level.

The prime difference between the three sites from a geotechnical perspective was that Site 11 contained more permeable soils compared to Sites 5 and 6. Therefore, the permafrost was expected to be more stable. The other difference between the three sites was that Site 11 was located closer to the community (1.6 km) whereas Sites 5 and 6 were located 4.8 km and 6.1 km away from the community. Site 11 was partially accessible by an existing gravel road whereas Sites 5 and 6 were not accessible to vehicular traffic. Construction of the roadways to Site 5 or 6 and refuse transporting costs during landfill operations were expected to be much higher compared to Site 11. Therefore, it was considered that Site 11 was the preferred site from a geotechnical perspective, although the final decision may depend on other considerations.

5.0 Phase II – Interviews with Local Officials and Stakeholders

5.1 Interview with Hamlet SOA

During the site visit, EXP's senior technologist, Stefan Bilan, met with Janice, Hamlet's SOA. She informed Stefan:

- (1) A new large loader arrived on site on September 20, 2024, and that the old loader was also in working condition
- (2) The other equipment that the Hamlet owns consists of a large loader, a small loader, 3 trucks, D3 power excavator, grader and a compactor.
- (3) The Hamlet is in need of a hoe ram, ripper and crushing plant. This will enable the Hamlet to break up oversized boulders with the hoe ram to crushable size, crush them at the crusher plant and make aggregate for use in the Hamlet. She said that approximately 50 to 70 percent of the oversized waste rock stockpiles at all the pits could be broken down and used.
- (4) The Hamlet uses approximately 2,000 m³ of crushed sand and gravel each year for maintenance of the roadways, pad toppings, etc.

5.2 Interview with Ashoona, Hamlet's Transport Manager

Stefan Bilan also met with Hamlet's Transport Manager to discuss the investigation work. Mr. Ashoona took Stefan on a tour of Sites 3, 4, 5, 1, 8 and 9 to familiarize Stefan with the Hamlet layout. Stefan was advised as follows:

- (1) Site 3 has not been used in about 20 years. The Hamlet can only use a loader to retrieve material from this area. They do not have a hoe ram to break the boulders.
- (2) Site 4 is the Hamlet's pit. The Hamlet uses this site to screen the material to produce 19 mm sand and gravel. The Hamlet processes approximately 2,000 cubic meters per year to maintain the roadways, for building housing pads, and installing culverts.
- (3) Site 5 comprises of sand and gravel deposit and the Hamlet has screened this material and used it for years as fill for housing pads and construction of road embankments.
- (4) Site 1 is a Kudlik rock quarry. The rock was drilled and blasted in 2012 by Kudlik and has been used for the last 12 years to produce material for maintenance of the airport runway. Kudlik uses a maximum of 500 m³ to 1,000 m³ of material from this quarry per year. The rock ridge extends north and south of the existing quarry and can be drilled and blasted in the future to produce granular materials.
- (5) Site 8 comprises of very fine silty sand with little gravel and the Hamlet does not use material from this source.
- (6) Site 9 is the area from where Kudlik obtained 3/8 inch gravel for use at the new sewage lagoon currently under construction. Kudlik has also stockpiled 3/8 inch clear stone and 3/8 inch sand and gravel at the site for Hamlet's future use for construction of culverts and housing pad toppings.

5.3 Interview with Manuel, Site Supervisor for Kudlik Construction

Stefan also met with Manuel of Kudlik Construction who took Stefan on a tour of all the sites. Manuel provided the following information.

- (1) Site 1 - Kudlik Rock Quarry
 - a. Manuel informed Stefan that approximately 12,000 cubic metres of rock was crushed to 19 mm (¾ inch) size this summer for the roadways to the new sewage lagoon and to top the perimeter of the lagoon berms.
 - b. The upper floor of the quarry contains a large quantity of blasted rock in addition to approximately 30,000 cubic meters of oversized boulders which can be hoe-rammed to produce crushable sizes.

- (2) Site 3 has not been used for 20 years either by the Hamlet or by Kudlik. The area contains a number of stockpiles of oversized boulders.
- (3) Site 4 is the Hamlet pit which the Hamlet uses for screening the sand and gravel. Kudlik does not use any material from this source as they do not want to deplete the Hamlet's stock. The site has been used for more than 10 years.
- (4) Site 5, Kudlik (Pilitak) used approximately 100,000 cubic metres of oversized material and sand and gravel from this site over the last two summers to prepare a laydown area for construction of a new school and Kudlik camp located south of Site 5.
- (5) Site 6. Kudlik explored this area in 2023 but did not find any clay. However, they encountered a 100 m by 20 m boulder filled area with a boulder base. It is considered that this is likely the old clay pit which was backfilled with boulder fill and abandoned. Kudlik indicated this oversized material can be hoe-rammed and crushed to produce sand and gravel.
- (6) Site 7. The boundary between Sites 5 and 7 is not well defined. For the purpose of this report, it was assumed that the boundary between the two is located just east of Test Pit 5-7. Site 7 contains sand and gravel similar to Site 5. A 20 m diameter pit (old clay pit) was encountered by Kudlik (in the vicinity of Test Pit 7-3) but Kudlik did not find any clay.
- (7) Site 8. Kudlik stripped the site of tundra and topsoil and excavated to 1 m depth with a view to obtain 3/8 inch gravel for use at the new sewage lagoon site. However, Kudlik did not find a sufficient quantity of gravel in the material as it consisted mainly of silty sand to very fine sand. They abandoned this area and moved to Area 9 in search of the gravel.
- (8) Site 9. Kudlik retrieved sand and gravel to be used as fill for construction of the berms and roadways and 9.5 mm (3/8 inch) gravel to be used as cover for the sewage lagoon liner from this site. On completion, Kudlik screened 9.5 mm (3/8 inch) clear stone and 9.5 mm (3/8 inch) sand and gravel and left the two stockpiles on the site for Hamlet's use.

5.4 Interview with Henry Lawson

Stefan also met with Henry Lawson who is a local general contractor. Mr. Lawson informed Stefan that he undertakes small scale contracts for culvert replacement, pads for housing, and trenching. He uses approximately 1,000 cubic metres of the sand and gravel material per year.

6.0 Phase III – Test Pit Investigation, Sampling, Laboratory Testing and Reporting

6.1 Procedure

A total of nine sites were reviewed / investigated in the Hamlet of Taloyoak. The locations of these sites have been described below and are shown on Figure 5.

Site 1 comprises of an existing Kudlik rock quarry located off Middle Lake Road in the north central part of the Hamlet of Taloyoak.

Site 2 is located east of the runway and is used to stockpile processed aggregates for maintenance of the runway, taxiway, and apron.

Site 3 is a sand and gravel deposit which is located approximately perpendicular to the airport runway on northeast side of the runway.

Site 4 is an extension of the sand and gravel deposit of Site 3 and is located southwest of the runway between the dump and the existing sewage lagoon.

Site 5 comprises of Hamlet Borrow Pit located off Water Plant Road.

Site 6 is reported to be an old clay pit located west of Site 5.

Site 7 comprises of a clay pit located east of Site 5. The boundary between Site 5 and Site 7 was not well defined. It was assumed that Test Pit 5-7 defines the boundary between the two sites.

Site 8. Kudlik Construction has stripped this area of tundra and excavated to 1 m depth in search of 9.5 mm (3/8 inch) gravel. However, the percentage of 9.5 mm (3/8 inch) gravel that they could retrieve was very low. Therefore, they abandoned this area.

Site 9 is the area from where Kudlik retrieved 9.5 mm (3/8 inch) gravel and sand and gravel for the new sewage lagoon site.

Seven potential aggregate sources (Sites 3 to 9, inclusive) were investigated by excavating 52 test pits within the land owned by the Hamlet of Taloyoak. The test pits were excavated with a rubber tired excavator or manually to refusal on permafrost or on boulders at a depth of 0.8 m to 2.3 m. The fieldwork was supervised by a geotechnician from EXP. All the test pits were logged and select soil samples were placed in plastic bags, logged and identified. All the test pits were backfilled on completion.

The samples were transported to the EXP laboratory in the City of Ottawa for examination by a geotechnical engineer and for laboratory testing. Laboratory testing consisted of performing moisture content tests, grain size analyses, and Atterberg Limit tests on selected samples.

The results of the investigation at each of the seven sites (Site 3 to Site 9, inclusive) have been discussed in Sections 7.4 to 7.10 of the report.

6.2 Site 1 Kudlik Rock Quarry (Figure 6)

Site 1 is an existing rock quarry owned by Kudlik. It comprises of a rock ridge approximately 200 m long, 100 m wide and 0 m to 6 m high. It has been in operation for more than 12 years. The original volume of the ridge was estimated as 60,000 to 70,000 cubic metres approximately assuming an average height of 3 m to 3.5 m. It is estimated that approximately 50 percent of the rock has already been excavated from the ridge for production of aggregates. The additional quantity of rock available from the quarry was estimated as 30,000 to 35,000 cubic meters. The rock ridge extends north and south of the quarry which can be drilled and blasted for future use when necessary. (Photos 1 to 4, Appendix A)

6.3 Site 2 Location of Airport Stockpile (Figure 8)

Site 2 is used by the Hamlet to stockpile aggregate from maintenance of the airport runway, taxiway and apron. The location of the stockpile is shown on Figure 8. No investigative work was undertaken on this site. The volume of the stockpile of the aggregate on the site at the time of the EXP visit is estimated as 2700 cubic metres approximately.

6.4 Site 3 (Figure 7)

Site 3 is located northeast of the runway. It comprises of a sand and gravel ridge which is approximately 800 m long and 70 m to 170 m wide. The ridge is approximately 1 to 3 m high (i.e., above the surrounding ground surface). Middle Lake Road is located along the northeast side of the ridge in the southern half of the ridge. Subsequently, the road traverses through the northern half of the ridge and divides the ridge into approximately two halves.

A total of fifteen (15) test pits were excavated in this area to a depth of 0.6 m to 2.3 m. In all the test pits, refusal to excavation with a rubber-tired backhoe was met on permafrost. The exception to this is Test Pits 3-13 and 3-14. In Test Pit 13, boulder rubble fill was encountered to 1.2 m depth with water table at 0.6 m depth. In Test Pit 3-14, boulder rubble fill was encountered at 0.6 m depth with the water table at 0.3 m depth. It is likely that this area was at one time used to extract sand and gravel and the excavation was backfilled with oversized boulders and rubble. In addition, it was observed that this site contained ten large stockpiles of granular material approximately 1.5 m to 3.0 m in height and approximately 20 smaller stockpiles. The dimensions of these stockpiles were estimated to facilitate computation of their volume. (Photos 5 to 14)

6.4.1 Soil Description

A review of test pit logs (Table 1) indicates that the predominant material encountered was sand and gravel which extended to the refusal depth in all the test pits. The exception to this is Test Pits 3-10 and 3-12 to 3-14. Tundra and fill was encountered to 0.9 m depth in Test Pit 3-10 and to 0.6 m depth in Test Pit 3-12. The tundra and fill was underlain by sand and gravel to 1.8 m depth in Test Pit 3-10 and to 2.3 m depth in Test Pit 3-12. In Test Pits 3-13 and 3-14, boulder fill was encountered to refusal depth of 1.2 m and 0.6 m respectively. It is reported that this location was previously used to extract sand and gravel and that the excavation was backfilled with boulders.

6.4.2 Laboratory Testing

The results of the moisture content, grain size analyses, and Atterberg Limit Tests performed on ten soil samples from this area are given on Table 2. The gradations of the samples have been plotted on Figures 8 to 17 inclusive. A review of this table indicates that this material comprises of 0 to 2 percent clay and silt (except Sample Nos. 3-1-3 and Sample No. 3-9-12 which contained 24 percent and 35 percent clay and silt respectively), 34 to 98 percent sand, and 0 to 65 percent gravel. It is noted that the grain size analyses were performed on material passing 75 mm sieve and are not representative of the total material encountered in the test pits. During the fieldwork, it was estimated that this material contained up to 30 percent cobbles and boulders.

All the samples were non-plastic and it was not possible to perform liquid limit or plastic limit tests on the samples. The natural moisture content of the samples varied from 2.0 percent to 14.8 percent.

6.4.3 Estimation of Quantity of Granular Material

The volume of sand and gravel deposit present at this site was estimated. The following assumptions were made.

- (1) The length of this area is approximately 800 m. Its width varies from 70 m to 170 m.
- (2) The depth of granular materials present in this area was estimated by excavating 15 test pits to a depth of 0.6 m to 2.3 m. The test pits extended to refusal depth to excavation with a rubber-tired backhoe on permafrost or boulders.
- (3) It is reported that part of the site had previously been excavated to extract granular materials. The extent of this area is not known. However, Test Pits 3-13 and 3-14 encountered boulder fill and high groundwater table (water

level at 0.6 m and 0.3 m depth respectively). It is considered likely that these test pits were located in the previously excavated area. The quantity of material that may have been excavated from this area was assumed to be proportional to the number of test pits that encountered the boulder fill, i.e., approximately 15 percent.

- (4) An approximately 6 m high ridge is located in the northeast corner of the site. This ridge is up to 6 m high relative to the surrounding grade on east side. The length and average width of the ridge was estimated as 190 m and 35 m respectively. The volume of granular material in the ridge was estimated assuming the average height of the ridge as 3 m.
- (5) This area contained 9 large stockpiles of material (volume equal to or greater than 75 cubic metres) and 20 smaller stockpiles. The total volume of material contained in the stockpiles was estimated as ~5,000 cubic metres.

The total volume of granular material potentially available from this area was estimated as 130,000 cubic metres broken down as follows.

| | | |
|---|---|----------------------|
| Total volume of material investigated | = | 121,000 cubic metres |
| Total volume of ridge | = | 20,000 cubic metres |
| Total volume of stockpiles | = | 5,000 cubic metres |
| Estimated volume of material previously excavated | = | -16,000 cubic metres |
| Estimated volume of material potentially available from this site | = | 130,000 cubic metres |

Site Photos 5 to 14 have been included in Appendix A

Table 1: Site 3 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|------------|---|
| 3-1 | 15W0477581 7715579 | 0 - 0.3 | Sand and gravel, dark brown, some roots |
| | | 0.3 - 1.5 | Sand with gravel, light brown, slightly moist |
| | | 1.5 - 2.0 | Silty sand, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-2 | 15W0477512 7715612 | 0 - 0.6 | Sand and gravel, dark brown, some roots, damp |
| | | 0.6 - 1.8 | Sand and gravel, light brown, approximately 20% cobbles and boulders |
| | | 1.8 - 2.0 | Sand and gravel, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-3 | 15W0477737 7715803 | 0 - 0.6 | Sand and gravel, dark brown, some roots |
| | | 0.6 - 2.1 | Sand and gravel, light brown |
| | | 2.1 - 2.3 | Sand and gravel, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-4 | 15W0477799 7715876 | 0 - 0.4 | Sand and gravel, dark brown, some roots, damp |
| | | 0.4 - 1.0 | Sand and gravel, light brown, damp |
| | | 1.0 - 1.5 | Silty sand, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-5 | 15W0477853 7715891 | 0 - 0.15 | Fill, sand and gravel, brown |
| | | 0.15 - 0.3 | Black tundra |
| | | 0.3 - 1.2 | Sand and gravel, brown, moist, approximately 10% cobbles and boulders |
| | | 1.2 - 1.8 | Sand, grey, moist |
| | | 1.8 - 2.0 | Sand and gravel, grey, frozen |
| | | | Refusal to excavation on permafrost |

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-------------|--|
| 3-6 | 15W0477892 7715995 | 0 - 0.45 | Fill, sand from screening |
| | | 0.45 - 0.6 | Black tundra |
| | | 0.6 - 1.5 | Sand, grey, moist |
| | | 1.5 - 1.65 | Sand, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-7 | 15W0477973 7716081 | 0 - 2.1 | Sand and gravel, brown, moist, 30% cobbles and boulders (screenable and crushable) |
| | | | Refusal to excavation on permafrost |
| 3-8 | 15W0477974 7716059 | 0 - 0.45 | Sand and gravel, dark brown, some roots, moist |
| | | 0.45 - 1.8 | Sand and gravel, light brown, damp, 10% cobbles and boulders |
| | | 1.8 - 2.0 | Sand and gravel, grey, frozen |
| | | | Refusal to excavation on permafrost |
| 3-9 | 15W0477953 7715991 | 0 - 0.4 | Sand and gravel, dark brown, damp, some roots |
| | | 0.4 - 2.0 | Sand and gravel, light brown, 10% cobbles and boulders |
| | | 2.0 - 2.1 | Sand and gravel, grey, frozen |
| | | | Test pit backfilled on completion |
| 3-10 | 15W0477903 7715910 | 0 - 0.025 | Tundra, roots, dark brown |
| | | 0.025 - 0.9 | Sand with gravel, light brown, damp |
| | | 0.9 - 0.925 | Tundra |
| | | 0.925 - 1.8 | Silty sand, grey, moist, partly frozen |
| | | | Test pit backfilled on completion |
| 3-11 | 15W047772 7715776 | 1 - 1.5 | Sand and gravel, 10% boulders |
| | | | Refusal on a boulder |
| | | | Test pit backfilled on completion |
| 3-12 | 15W0477732 7715764 | 0 - 0.3 | Reworked sand and gravel, brown |
| | | 0.3 - 0.6 | Fill, sand and gravel, grey |
| | | 0.6 - 0.9 | Sand, light brown |
| | | 0.9 - 1.4 | Sand and fine gravel, light brown |
| | | 1.4 - 2.3 | Sand and gravel, grey, coarse gravel to frozen sand and gravel, grey |
| | | | Test pit backfilled on completion |
| 3-13 | 15W0477659 7715694 | 0 - 1.2 | Boulders (oversized material backfilled in old excavation area) |
| | | | Water at 0.6 m depth |
| | | | Test pit backfilled on completion |
| 3-14 | 15W0477566 7715650 | 0 - 0.6 | Boulder backfill in old excavation area |
| | | | Water level at 0.3 m depth |
| | | | Test pit backfilled on completion |
| 3-15 | 15W0477542 7715651 | 0 - 1.67 | Sand and gravel, approximately 10% boulders |
| | | | Refusal on a boulder |
| | | | Test pit backfilled on completion |

Table 2: Site 3 Results of Laboratory Test

| TP & Sample# | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|--------------|------------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 3-1-2 | 0.3 - 1.5 | 1 | 80 | 19 | 0 | Not Plastic | | SP | 2.6 |
| 3-1-3 | 1.5 - 2.0 | 24 | 76 | 0 | 0 | Not Plastic | | SM | 14.1 |
| 3-6 | 0.6 - 1.67 | 1 | 98 | 1 | 0 | Not Plastic | | SP | 4.4 |
| 3-7 | 0.6 - 1.65 | 2 | 43 | 55 | 0 | Not Plastic | | GP | 3.7 |
| 3-8 | 0 - 2.0 | 0 | 35 | 65 | 0 | Not Plastic | | GP | 13.5 |
| 3-9-2 | 0.4 - 2.0 | 35 | 65 | 0 | 0 | Not Plastic | | SM | 14.8 |
| 3-10 | 0 - 1.8 | 2 | 88 | 10 | 0 | Not Plastic | | SP | 3.7 |
| 3-11 | 0 - 1.5 | 2 | 34 | 64 | 0 | Not Plastic | | GW | 4.5 |
| 3-12-2 | 0.3 - 0.6 | 0 | 56 | 44 | 0 | Not Plastic | | SP | 2.0 |
| 3-12-4 | 0.9 - 1.37 | 0 | 43 | 57 | 0 | Not Plastic | | GP | 2.7 |

6.5 Site 4 (Figure 18)

Site 4 is located between the airport runway and the road that goes from the dump to the sewage lagoon. It is an extension of Site 3 with the runway dividing the two sites. It is approximately 360 m long (north-south direction) and 0 m to 110 m wide (east-west direction). It is bounded by rock ridges to the north and south, a lake to the east, and the main roadway from the dump to the sewage lagoon. The lake is situated at a higher level compared to the gravel pit.

This site has been used by the Hamlet for the last 20+ years to extract sand and gravel for their use. The northwest part of the site has been excavated to just above the groundwater table (Test Pits 4-2 and 4-3). It was estimated that approximately 20 percent of the area has been excavated to just above the groundwater table. The remaining 80 percent of the area is extractable.

6.5.1 Soil Description

The investigation in Site 4 comprised of excavating 6 test pits (Test Pits 4-4-1 to 4-4-6) to refusal on permafrost at a depth of 1.37 m to 2.0 m below the existing ground surface. A review of Table 3 indicates that approximately 15 mm to 65 mm of tundra was encountered in Test Pits 4-4 and 4-5. Beneath the tundra in Test Pit 4-4 and from the ground surface in Test Pits 4-1 and 4-2, sand and gravel extended to a depth of 0.9 m to 1.67 m. This stratum contains 2 to 7 percent clay and silt, 44 to 69 percent sand, and 24 to 54 percent gravel. Its natural moisture content was determined to vary from 4.5 to 6.5 percent (Table 4). It is non-plastic.

The sand and gravel in Test Pit 4-1, the tundra in Test Pit 4-4, and from the existing ground surface in Test Pit 4-6, fine sand to silty sand extends to a depth of 0.76 m to 1.5 m. This stratum comprised of 34 percent clay and silt and 66 percent sand. It had a moisture content of 15-9 percent.

6.5.2 Laboratory Test Results

Laboratory testing consisted of performing natural moisture content, grain size analyses, and Atterberg Limit tests on three select samples. The results of the laboratory tests are given on Table 4. The results of the grain size analyses have been plotted on Figures 19 to 21 inclusive. A review of this table indicates that the sand and gravel stratum consisted of 2 to 7 percent silt and clay, 44 to 69 percent sand, and 24 to 54 percent gravel. Its moisture content varied from 4.5 to 4.6 percent. This stratum was non-plastic.

The fine sand to silty sand stratum comprised of 34 percent clay and silt, and 68 percent sand. This stratum was also non-plastic. It had a moisture content of 15.9 percent. Water level was recorded at a depth of 0.3 m in Test Pit 4-2 and at 1.5 m depth in Test Pit 4-3.

6.5.3 Estimation of Quantity of Granular Material

The quantity of granular material that likely can be obtained from this source was estimated. The following assumptions were made.

- (1) Area of the gravel deposit was computed based on the pink area shown on Figure 18.
- (2) The depth of granular material was computed based on the average depth to which the test pits could be excavated.
- (3) It was assumed that approximately 20 percent of the area in the vicinity of Test Pits 4-2 and 4-3 that has been excavated to just above the groundwater table will not yield additional material. It is noted that although retrieving the material from below the groundwater is feasible, it would require dewatering the site which may be difficult due to the proximity of the lake to the site. This lake is reported to be at a higher elevation compared to the gravel pit. Consequently, it is possible that continuous seepage of water from the lake into the gravel pit may result due to the differential hydrostatic pressure head.

The quantity of granular material that can potentially be retrieved from this pit was estimated as 45,000 cubic meters based on the refusal depths of the test pits. This volume was reduced by 20 percent for reasons stated above. It is therefore considered that an additional 34,000 cubic meters of granular material may potentially be retrievable from this source barring any dewatering problems as the excavation approaches the lake. (Photos 15 to 20, Appendix A)

Table 3: Site 4 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|---------------|--|
| 4-1 | 15W0477319 7715451 | 0 – 0.9 | Sand and gravel, brown, damp |
| | | 0.9 - 1.5 | Silty sand, grey, frozen |
| | | | Test pit backfilled on completion |
| 4-2 | 15W0477242 7715340 | 0 - 1.67 | Sand and gravel, brown, moist |
| | | | Permafrost at 1.67 m depth |
| | | | Water level at 0.3 m depth |
| | | | Test pit backfilled on completion |
| 4-3 | 15W0477341 7715254 | 0 - 1.2 | Sand, light brown, some gravel |
| | | 1.2 - 2.0 | Sand and gravel, brown, wet |
| | | | Water at 1.5 m depth |
| | | | Test pit backfilled on completion |
| 4-4 | 15W4477282 7715265 | 0.025 – 0.075 | 25 mm to 75 mm tundra |
| | | 0.075 - 0.75 | Fine grained sand, moist |
| | | 0.75 - 1.5 | Sand and gravel, grey, moist |
| | | | Permafrost at 1.5 m depth |
| | | | Test pit backfilled on completion |
| 4-5 | 15W0477292 7715208 | 0 - 0.015 | Tundra |
| | | 0.015 – 1.2 | Sand and gravel, brown, damp, occasional cobbles |
| | | 1.2 - 1.37 | Sand and gravel, grey |
| | | | Permafrost at 1.37 m depth |
| | | | Test pit backfilled on completion |
| 4-6 | 15W0477270 7715165 | 0-0.6 | Fine sand, brown, damp |
| | | 0.6-1.35 | Silty sand with gravel, grey, damp |
| | | 1.35-1.5 | Sand and gravel, grey |
| | | | Permafrost 1.5 m depth |
| | | | Test pit backfilled on completion |

Table 4: Site 4 Area 4 Results of Laboratory Test

| TP & Sample # | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|---------------|-----------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 4-1-1 | 0 – 0.9 | 7 | 69 | 24 | 0 | Not Plastic | - | SP-SM | 4.6 |
| 4-1-2 | 0.9 – 1.5 | 34 | 66 | 0 | 0 | Not Plastic | - | SM | 15.9 |
| 4-2 | 0 – 1.67 | 2 | 44 | 54 | 0 | Not Plastic | - | GW | 4.5 |

6.6 Site 5 (Figure 22)

Site 5 is an old Hamlet borrow pit located in the west end of the gravel deposit shown on Figure 22. The boundary of this area is not well defined. Therefore, for the purpose of this report, it was assumed that the eastern boundary of the site is at Test Pit 5-7 and that the remainder of the sand and gravel deposit east of Test Pit 5-7 is Site 7. It is reported that from this area, Kudlik Construction excavated approximately 100,000 cubic metres of oversized boulders and sand and gravel over a couple of years for construction of a staging platform and camp for the staff for construction of a new school nearby. It is reported that the sand and gravel deposit in this area contains frequent cobbles and boulders and is frozen. As a result, large excavator and rippers were used by Kudlik to excavate the material in stages by peeling off the exposed material as it thawed. Subsequent to completion of removal of the materials, Kudlik regraded the area into an upper plateau and a lower plateau to maximize its thaw potential as it has a south exposure.

6.6.1 Soil Description

A total of seven test pits (Test Pits 5-1 to 5-7) were excavated in this area with a rubber-tired excavator. The test pit logs have been presented on Table 5. A review of this table indicates that the soil stratigraphy comprises of sand and gravel with cobbles and boulders. The presence of cobbles and boulders varied from 10 to 30 percent. The test pits met refusal on cobbles and boulders at a depth of 0.9 m to 1.5 m.

6.6.2 Laboratory Test Results

Laboratory testing was performed on four samples of soil passing the 75 mm sieve. The tests consisted of determining natural moisture content, grain size analyses, and performing Atterberg Limit tests. The test results have been presented on Table 6.

A review of Table 6 indicates that samples comprised of 12 to 17 percent clay and silt, 44 to 56 percent sand, and 27 to 42 percent gravel. Grain size plots are given on Figures 23 to 26 inclusive. All the samples were non-plastic and it was not possible to perform liquid limit tests. The natural moisture content of the samples varied from 4.8 to 7.0 percent.

6.6.3 Estimation of Quantity of Granular Material

The quantity of the granular material that can potentially be retrieved from this area was estimated. The following assumptions were made.

- (1) The area under consideration was limited to the area covered by the test pits excavated, i.e., Test Pits 5-1 to 5-7 inclusive.
- (2) The depth of the deposit was limited to depth at which refusal to excavation was met in the test pits, i.e., 0.9 m to 1.5 m.

The total volume of granular material computed was 5,000 cubic meters approximately. It is noted that the investigation was limited as the material is difficult to excavate as it is bouldery and frozen, lack of adequate excavator, and time limitations. As noted previously, with adequate equipment and no time constraints, substantially greater quantity of material can be obtained from this area using the procedure used by Kudlik Construction. Site Photos 21 to 26 have been included in Appendix A.

Table 5: Site 5 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-----------|---|
| 5-1 | 15W0478961 7715068 | 0 - 0.9 | Sand and gravel, grey, damp, 30% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-2 | 15W0478989 7715049 | 0 - 1.5 | Sand and gravel, grey |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-3 | 15W0479008 7715072 | 0 - 1.2 | Sand and gravel, grey, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-4 | 15W0479021 7715048 | 0 - 1.5 | Sand and gravel, grey approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-5 | 15W0478982 7715041 | 0 - 0.9 | Sand and gravel, grey, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-6 | 15W0479008 7715034 | 0 - 0.9 | Silty sand and gravel, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 5-7 | 15W0479055 7715068 | 0 - 0.9 | Sand and gravel, approximately 10% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |

Table 6: Site 5 Results of Laboratory Test

| TP & Sample # | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|---------------|-----------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 5-1 | 0 - 0.9 | 12 | 48 | 40 | 0 | Not Plastic | - | SM | 4.9 |
| 5-2 | 0 - 1.5 | 14 | 51 | 35 | 0 | Not Plastic | - | SM | 4.9 |
| 5-5 | 0 - 0.9 | 17 | 56 | 27 | 0 | Not Plastic | - | SM | 7.0 |
| 5-6 | 0 - 0.9 | 14 | 44 | 42 | 0 | Not Plastic | - | SM | 4.8 |

6.7 Site 6 (Figure 27)

Site 6 is located northwest of Site 5. This site was investigated as it was reported to be a clay source. The site comprises of 100 m by 20 m approximately. Four test pits (Test Pits 6-1 to 6-4 inclusive) were excavated in this area. These test pits met refusal at a depth of 0.6 m to 1.5 m. Representative soil samples were obtained. Refusal to excavation was met on cobbles and boulders in all the test pits and the test pits were backfilled.

6.7.1 Soil Description

The test pit logs have been presented on Table 7. A review of this table indicates that this area contains silty sand and gravel with cobbles and boulders. The percentage of cobbles and boulders was estimated to vary from 20 to 30 percent. All the test pits were dry on completion except Test Pit 6-4 where the water level was at the ground surface.

6.7.2 Laboratory Test Results

The soil samples retrieved from the test pits were subjected to moisture content, grain size analyses, and Atterberg Limit tests. The results of the laboratory testing have been presented on Table 8. Grain size plots have been included as Figures 28 to 30. A review of this table indicates the soil samples comprise of 9 to 20 percent silt and clay, 52 to 59 percent sand, and 28 to 32 percent gravel. However, the percentage of clay in the samples was only 1 to 2 percent. All the samples were non-plastic and liquid limit tests could not be performed on the samples as groove closed prior to 25 blows. The moisture content of the samples varied from 7.1 to 7.8 percent.

It is noted that laboratory tests were performed on a portion of the soil samples that passed through the 75 mm sieve. They are therefore not representative of the observations made in the field.

6.7.3 Estimation of Quantity of Granular Material

The quantity of the granular material that can be retrieved from this area was calculated. The following assumptions were made.

- (1) The area taken into consideration for computation of the granular quantities was limited to the area shown enclosed by Test Pits 6-1 to 6-4 inclusive.
- (2) The thickness of the granular deposit retrievable was assumed to be equal to the depth investigated.

On this basis, the total quantity of granular material was computed as 1800 cubic metres approximately. It is noted that clay was not encountered in this area. Information received from the site indicated that this area was previously investigated by Kudlik Construction in search of clay but they also did not find any. (Photos 27 to 29, Appendix A)

Table 7: Site 6 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-----------|---|
| 6-1 | 15W0478900 7715102 | 0 – 1.5 | Silty sand and gravel, grey, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 6-2 | 15W0478899 7715115 | 0 – 0.9 | Silty sand and gravel, grey, approximately 30% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 6-3 | 15W0478839 7715125 | 0 – 0.6 | Silty sand and gravel, brown, water at surface |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 6-4 | 15W0478826 7715114 | 0 – 0.6 | Silty sand and gravel, approximately 20% cobbles and boulders, water at surface |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |

Table 8: Site 6 Results of Laboratory Test

| TP# | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|-----|-----------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 6-1 | 0 – 1.5 | 9 | 59 | 32 | 0 | Not Plastic | - | SP-SM | 7.2 |
| 6-3 | 0 – 0.6 | 20 | 52 | 28 | 0 | Not Plastic | - | SM | 7.8 |
| 6-4 | 0 – 0.6 | 14 | 55 | 31 | 0 | Not Plastic | - | SM | 7.1 |

6.8 Site 7 (Figure 31)

This site is situated on the sand and gravel deposit located along Water Plant Road adjacent to the Hamlet pit (Site 5). It was assumed that the western boundary of this area is just east of Test Pit 5-7 located on Site 5. It was also assumed that the remainder of the sand and gravel deposit (pink area shown on Figure 31) comprises Site 7. The site visit and information received from the site personnel revealed that the clay pit was located in the northeast part of the site. A total of five test pits (Test Pits 7-1 to 7-5 inclusive) were excavated in this area. Test Pit 7-3 was excavated at the location reported to be a clay pit. An approximately 20 m diameter pit was located at this site. Test Pits 7-4 and 7-5 were excavated manually on the side of a small sand and gravel ridge located in Site 7. The test pits met refusal to excavation with a rubber-tired excavator or to manual excavation at a depth of 0.6 to 1.5 m. All the test pits were backfilled on completion.

6.8.1 Soil Description

The geotechnical conditions encountered in the five test pits excavated have been summarized on Test Pit Logs, Table 9. A review of this table indicates that the predominant material is sand and gravel with cobbles and boulders. The presence of cobbles and boulders was estimated to vary from 10 to 20 percent approximately.

6.8.2 Laboratory Test Results

Three of the soil samples from Test Pits 7-1, 7-3 and 7-4 were subjected to natural moisture content, grain size analyses on material passing 75 mm screen, and Atterberg Limit tests. The test results have been summarized on Table 10. Grain size results have been plotted on Figures 32 to 34 inclusive. A review of this table indicates that the recovered samples comprised of 9 to 20 percent clay and silt, 47 to 63 percent sand, and 23 to 35 percent gravel. Sample 7-3 located in the vicinity of the clay pit contained only 3 percent clay. All the samples tested were non-plastic. Liquid Limit tests could not be performed on these samples. The moisture content of the samples varied from 4.2 to 8.6 percent.

It has been reported that Kudlik Construction had also investigated the clay pit by excavating with a backhoe. However, Kudlik could not find any clay. It is considered likely that the clay deposit has been depleted from this area.

6.8.3 Estimation of Quantity of Granular Material

The quantity of sand and gravel present on Site 7 was estimated based on the following assumptions.

- (1) The area used for computation purposes was limited to the area bounded by Test Pits 7-1, 7-3, 7-4 and 7-5.
- (2) The depth of the granular deposit was assumed equal to the average depth to which the test pits could be excavated.

The total quantity of sand and gravel contained in the area investigated was computed as 15,000 cubic metres approximately. It is noted that the investigated area comprises only about 20 percent of the total area of Site 7. It was assumed therefore that potentially a much larger quantity of sand and gravel is potentially available from this site (estimated as 75,000 cubic metres approximately on pro-rata basis). (Photos 30 to 34, Appendix A)

Table 9: Site 7 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-----------|--|
| 7-1 | 15W0479115 7715048 | 0 – 1.5 | Silty sand and gravel, brown, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 7-2 | 15W0479185 7115063 | 0 – 1.5 | Silty sand and gravel, brown, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 7-3 | 15W0479316 | 0 – 1.5 | Silty sand and gravel, grey, approximately 20% cobbles and boulders |
| | | | Refusal to excavation on boulders |
| | | | Test pit backfilled on completion |
| 7-4 | 15W0479184 7715010 | 0 – 0.6 | Silty sand and gravel with approximately 10% cobbles and boulders |
| | | | Test pit dug manually 0.6 m into the side of a 6 m high bank |
| | | | Test pit backfilled on completion |
| 7-5 | 15W0479155 7714996 | 0 – 0.6 | Silty sand with gravel, approximately 10% cobbles and boulders |
| | | | Test pit dug manually 0.6 m into the side of a 4 m high bank |
| | | | Test pit backfilled on completion |

Table 10: Site 7 Results of Laboratory Test

| TP# | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|-----|-----------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 7-1 | 0 – 1.5 | 18 | 47 | 35 | 0 | Not Plastic | - | SM | 4.5 |
| 7-3 | 0 – 1.5 | 20 | 57 | 23 | 0 | Not Plastic | - | SM | 8.6 |
| 7-4 | 0 – 0.6 | 9 | 63 | 28 | 0 | Not Plastic | - | SP-SM | 4.2 |

6.9 Site 8 (Figure 35)

Site 8 is located on Middle Lake Road approximately 350 m north of the rock quarry (Site 1). It has been reported that approximately 0.3 m of tundra and topsoil was scraped off from the site and was stockpiled on the south and east sides of the site. In addition, the area was stripped of approximately 1.0 m of sand. Kudlik screened the sand from the site to procure 9.5 mm (3/8 inch) gravel for use at the new sewage lagoon which is currently under construction. However, Kudlik found that the sand was very fine and silty and did not contain a sufficient quantity of 9.5 mm (3/8 inch) inch gravel. Therefore, Kudlik abandoned this site and obtained the gravel from Site 9.

Since the sand was reported to be very fine and silty, only limited investigation was undertaken at the site. The investigation comprised of excavating 4 test pits (Test Pits 8-1 to 8-4) to a depth of 0.9 to 1.5 m. The test pits were logged, sampled, and backfilled.

6.9.1 Site and Soil Description

The test pit logs have been tabulated on Table 11. The soils encountered in this area consisted primarily of silty fine sand with very little gravel. The water table was encountered at a depth of 0.45 m to 0.75 m except Test Pit 8-2 which was dry. Permafrost was encountered in Test Pits 8-1 at 1.2 m depth and at 1.5 m depth in Test Pit 8-2. In Test Pits 8-3 and 8-4, the permafrost was encountered at a depth of 0.9 m below the ground surface.

6.9.2 Laboratory Test Results

Soil samples from Test Pit 8-1 and 8-4 were subjected to natural moisture content, grain size analyses and Atterberg Limit tests. The test results have been summarized on Table 12. A review of this table indicates that the samples tested comprised of 1 to 3 percent silt, 62 to 90 percent sand, and 7 to 37 percent gravel (Figures 36 and 37).

6.9.3 Estimation of Quantity of Granular Material

The quantity of the granular material that can be obtained from this source was estimated. The following assumptions were made.

- (1) The area used to compute the quantity was limited to the area confined by Test Pits 8-1 to 8-4 inclusive.
- (2) The depth of the deposit was assumed to be equivalent to the depth of excavation of the test pits.

On this basis, the total volume of material that will be potentially available from this source was estimated as 7,300 cubic meters approximately.

It was reported that this area predominantly contains silty sand to very fine sand with little gravel and has been abandoned by the Hamlet and Kudlik as not suitable for construction purposes. (Photos 35 to 38, Appendix A)

Table 11: Site 8 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|------------|--|
| 8-1 | 15W0478804 7717083 | 0 – 1.06 | Sand, brown, moist |
| | | 1.06 – 1.2 | Sand, grey, wet |
| | | | Permafrost at 1.2 m depth |
| | | | Water at 0.75 m depth |
| | | | Test pit backfilled on completion |
| 8-2 | 15W0478815 7717011 | 0 – 0.6 | Sand and gravel, brown, moist |
| | | 0.6 – 1.5 | Silty sand, grey, wet |
| | | | Permafrost at 1.5 m depth |
| | | | Test pit backfilled on completion |
| 8-3 | 15W0478715 7716975 | 0 – 0.6 | Sand, brown, moist |
| | | 0.6 – 0.9 | Sand, grey, wet |
| | | | Permafrost at 0.9 m depth |
| | | | Water level at 0.45 m depth |
| | | | Test pit backfilled on completion |
| 8-4 | 15W0478715 7716975 | 0 – 0.45 | Sand and gravel, brown, moist Water at a 0.45 m depth |
| | | 0.45 – 0.9 | Sand, grey, wet |
| | | | Permafrost at 0.9 m depth |
| | | | Test pit backfilled on completion |

Table 12: Site 8 Results of Laboratory Test

| TP & Sample # | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|---------------|-----------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 8-1-1 | 0 – 1.0 | 3 | 90 | 7 | 0 | Not Plastic | - | SP | 14.9 |
| 8-4-1 | 0 – 0.45 | 1 | 62 | 37 | 0 | Not Plastic | - | SP | 8.1 |

6.10 Site 9 (Figure 38)

This site is located off Middle Lake Road approximately 800 m northeast of Site 8. The Middle Lake Road is located approximately 100 m west of Site 9 and the river is located approximately 150 m east of the site. EXP was informed that Kudlik Construction had been working on this site for the last two years to borrow sand and gravel and to screen 9.5 mm (3/8 inch) gravel that they needed for construction of the sewage lagoon. It is reported that Kudlik procured 20,000 cubic metres of 9.5 mm (3/8 inch) gravel and 30,000 cubic metres of 19 mm (3/4 inch) sand and gravel for the construction of a new sewage lagoon. Kudlik left behind stockpiles of 9.5 mm gravel and 9.5 mm sand and gravel for the Hamlet's use. As a result, an excavation, a stockpile of the waste material, stockpiles of 9.5 mm gravel and 9.5 mm sand and gravel, and a construction shack was located in the west part of Site 9 (Photograph 7486). Therefore, the investigation was limited to the east half of Site 9.

Figure 38 defines the site area (shown in pink). However, this investigation was extended beyond this area in the northeast direction to determine if additional granular material will potentially be available from this area (i.e., area of Test Pits 9-6, 9-7, 9-8, 9-10, and 9-11).

The investigation comprised of excavating a total of 11 test pits to a depth of 0.3 m to 2.1 m below the ground surface. Test Pits 9-1 to 9-5 inclusive were excavated with a rubber-tired excavator. Test Pits 9-6 to 9-11 were dug manually since the backhoe was not accessible in this area. The test pits were logged and representative soil samples were obtained, preserved in polyethylene bags and identified. Water level observations were made in the test pits. The test pits were backfilled on completion.

6.10.1 Geotechnical Conditions

The geotechnical conditions encountered in the test pits have been tabulated on Table 13, Test Pit Logs. A review of this table indicates that the surficial soil in the vicinity of the Test Pits 9-1, 9-7, 9-8, and 9-9 is fill and tundra organics which extended to a depth of 0.1 m to 0.4 m. Approximately 25 mm of surficial tundra was encountered in Test Pits 9-10 and 9-11.

The fill and tundra in Test Pits 9-1 and 9-7 to 9-11 are underlain by sand which extended to a depth of 0.3 m to 1.37 m.

The surficial soil encountered in Test Pits 9-2 to 9-4 and 9-6 was sand and gravel which extended to a depth of 0.6 m in Test Pit 9-2 and to the entire depth investigated in the other test pits (Test Pits 9-3, 9-4 and 9-6). The test pits were terminated either on the permafrost or when groundwater was encountered. The groundwater was encountered in Test Pits 9-6 to 9-10 inclusive at a depth of 0.15 m to 1.0 m below the existing ground surface.

6.10.2 Laboratory Test Results

Laboratory testing comprised of undertaking natural moisture content, grain size analyses, and Atterberg Limit tests on six selected soil samples from this area. The test results have been tabulated on Table 14. A review of this table indicates that the sand samples comprised of 1 to 5 percent clay and silt and 95 to 99 percent sand. These samples were non-plastic and it was not possible to perform liquid limit tests on these samples. The moisture content of the sand stratum varied from 2.6 to 9.8 percent.

The sand and gravel stratum comprised of 0 to 3 percent clay and silt, 34 to 68 percent sand, and 32 to 64 percent gravel. Atterberg Limit tests could not be performed on samples from this stratum as the soil was non-plastic. The moisture content of this stratum varied from 3.2 to 10.2 percent (Figures 39 to 44 inclusive).

6.10.3 Estimation of Quantity of Granular Material

The quantity of the granular material that will likely be available from this source was estimated. The following assumptions were made:

- (1) The site area used in computation of the granular materials was bounded by Test Pits 9-2, 9-6, 9-7, 9-10, 9-11, 9-1 and 9-2.

- (2) The depth of granular materials was assumed to be equal to the depth of the test pits excavated as indicated on Table 13. The test pits were terminated either on permafrost or on encountering the groundwater.

The quantity of granular material in the area investigated was computed as 22,000 cubic meters. It is noted that the computed quantity of sand and gravel that would potentially be available from this area is relatively low compared to the extent of area investigated. The reasons for this are:

- (1) Test Pits 9-6 to 9-11 were manually excavated as this area was not accessible to the excavator. Therefore, the depth to which the excavations could be undertaken was very limited.
- (2) The groundwater table in the area was high which also limited the excavation depth of the test pits.

It is considered that a much greater quantity of sand and gravel would likely be available from this area provided vehicular access to this area can be provided and the area is dewatered. Providing access to the area and dewatering of the site may have cost implications.

It is noted that due to time constraints and lack of access to mechanical equipment, only part of the area located northeast of the sand and gravel deposit shown in pink on Figure 38 was investigated. Based on the visual observations and information received from others, it is considered that similar deposit is likely to be present up to the ridge located at the northeast end of the site (identified as coordinates 15W0479686, 7717822 on Figure 38). (Photos 39 to 44, Appendix A)

Table 13: Site 9 Test Pit Logs

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-------------|--|
| 9-1 | 15W0479308 7717600 | 0 – 0.1 | Fill sand from screening operations |
| | | 0.1 – 0.4 | 25 mm organics 300 mm sand and gravel, brown, moist 100 mm of old organic tundra |
| | | 0.4 – 1.2 | Sand, brown, moist |
| | | | Permafrost at 1.2 m |
| | | | Test pit backfilled on completion |
| 9-2 | 15W0479259 7717567 | 0 – 0.6 | Sand and gravel, brown, moist |
| | | 0.6 – 1.67 | Sand, grey |
| | | | Permafrost at 1.76 m depth |
| | | | Test pit backfilled on completion |
| 9-3 | 15W0479273 7717548 | 0 – 2.1 | Sand and gravel, approximately 10% cobbles and boulders |
| | | | Permafrost at 2.1 m depth |
| | | | Test pit backfilled on completion |
| 9-4 | 15W0479306 7717578 | 0 – 1.67 | Sand and gravel, grey, moist, approximately 10% cobbles and boulders |
| | | | Permafrost at 1.67 m depth |
| | | | Test pit backfilled on completion |
| 9-5 | 15W0479335 7717585 | 0 – 0.45 | Sand, brown, moist |
| | | 0.45 – 1.37 | Sand, grey, moist |
| | | | Permafrost at 1.37 m depth |
| | | | Test pit backfilled on completion |
| 9-6* | 15W0479292 7717511 | 0 – 0.3 | Sand and gravel, poorly graded |
| | | 0.3 – 0.6 | Poorly graded gravel with sand |
| | | | Water level at 0.45 m depth |
| | | | Test pit terminated |
| | | | Test pit backfilled on completion |

| Test Pit # | Coordinates | Depth (m) | Soil Description |
|------------|-----------------------|-----------|--------------------------------------|
| 9-7* | 15W0479412 7717468 | 0 – 0.3 | 50 mm sand fill |
| | | | 50 m organic tundra |
| | | | 200 mm sand, grey, wet |
| | | | Water at 150 mm below ground surface |
| | | | Test pit terminated |
| 9-8* | 15W0479433 7717492 | 0 – 0.45 | Test pit backfilled on completion |
| | | | 100 mm sand fill |
| | | | 50 mm organics |
| | | | 300 mm sand, brown, wet |
| | | | Water at 300 mm depth |
| 9-9* | 15W0479340 7717556 | 0 – 0.45 | Test pit terminated |
| | | | Test pit backfilled on completion |
| | | | 100 mm sand fill, brown, moist |
| | | | 50 mm organics |
| | | | 300 mm sand, brown, wet |
| 9-10* | 15W0479501 7717612 | 0 – 1.07 | Water level at 0.45 m depth |
| | | | Test pit terminated |
| | | | Test pit backfilled on completion |
| | | | 25 mm tundra |
| | | | 150 mm white sand |
| 9-11 | 15W0479503 7717724 | 0 – 1.07 | 150 mm red brown sand |
| | | | 740 mm sand, brown |
| | | | Water at 1.0 m depth |
| | | | Test pit terminated |
| | | | Test pit backfilled on completion |
| 9-11 | 15W0479503 7717724 | 0 – 1.07 | 25 mm tundra |
| | | | Sand, light brown, moist |
| | | | Permafrost at 1.0 m depth |
| | | | Test pit terminated |
| | | | Test pit backfilled on completion |

* Manually excavated test pit

Table 14: Area 9 Results of Laboratory Test

| TP & Sample # | Depth (m) | Grain Size Analyses (%) | | | Atterberg Limits (%) | | | USCS Classification | Natural Moisture Content (%) |
|---------------|------------|-------------------------|------|--------|----------------------|---------------|------------------|---------------------|------------------------------|
| | | Clay & Silt | Sand | Gravel | Liquid Limit | Plastic Limit | Plasticity Index | | |
| 9-2-1 | 0 – 0.6 | 3 | 46 | 51 | 0 | Not Plastic | - | GP | 3.7 |
| 9-2-2 | 0.6 – 1.67 | 1 | 99 | 0 | 0 | Not Plastic | - | SP | 2.6 |
| 9-3 | 0 – 2.1 | 2 | 34 | 64 | 0 | Not Plastic | - | GP | 3.2 |
| 9-6-1 | 0 – 0.3 | 0 | 68 | 32 | 0 | Not Plastic | - | SP | 5.6 |
| 9-6-2 | 0.3 – 0.6 | 1 | 66 | 33 | 0 | Not Plastic | - | GP | 10.2 |
| 9-10 | 0 – 1.07 | 5 | 95 | 0 | 0 | Not Plastic | - | SP | 9.8 |

7.0 Hamlet's Granular Needs

SOA for the Hamlet of Taloyoak indicated that the Hamlet uses approximately 2,000 cubic metres of crushed sand and gravel material for construction of housing pads and maintenance of roadways. In addition to the above, the Hamlet needs variable quantity of sand and gravel material for construction of roadway embankments and for general grading purposes.

8.0 Hamlet's Equipment Needs

During the site visit, Stefan Bilan (EXP senior geotechnologist) met with Janice, SOA and Hamlet's Manager of Transportation. The SOA advised Stefan that their new loader arrived September 20, 2024 and that the old small loader is still in working condition.

She indicated that the Hamlet needs a ripper, a hoe ram, and a crushing plant. The ripper would enable the Hamlet to rip the permafrost and advance its thawing, thereby facilitating the extraction of the granular material. The hoe ram will help them to break down the oversized rock pieces and boulders to crushable size. The crusher would crush the small boulders and cobbles to produce the aggregate. This will enable them to use up the waste stockpiles of the oversized material to produce aggregate.

9.0 List of Equipment Available in the Hamlet of Taloyoak

(1) Equipment owned by the Hamlet

- 1 new large loader
- 1 small loader
- 3 trucks
- 1 D3 dozer / extractor
- 1 grader
- 1 compactor

(2) Equipment owned by Kudlik Construction

- 1 grader
- 2 excavators
- 1 compactor
- 1 D9 dozer
- 1 large loader
- 1 crushing plant
- 2 rock trucks
- 1 rubber-tired backhoe

(3) Equipment owned by Henry Lawson, General Construction

- 1 backhoe
- 1 small excavator
- 3 dump trucks

10.0 Conclusions

The total quantity of sand and gravel material potentially available from the seven sites investigated (i.e., Sites 3 to 9 inclusive) may be summarized as follows.

Table 15: Estimated Volume of Sand and Gravel Potentially Available from Sites 3 to 9

| Site # | Estimated Volume of Sand and Gravel Potentially Available from the Site (m ³) | Remarks |
|--------|---|---|
| 3 | 130,000 | |
| 4 | 34,000 | Retrieving the material would require site dewatering in some areas. Retrieval of all the material may not be possible due to the proximity of the site to the lake. |
| 5 | 5,000 | Potentially considerably greater quantity of material available from the site but would require time dependent staged excavation by peeling of thawed material with large excavator and rippers |
| 6 | 1,800 | Site investigated in search of clay but clay was not encountered. Quantity computed based on 4 test pits excavated. |
| 7 | 15,000 | Only approximately 20% of the site was investigated. Potentially 60,000 to 70,000 cubic metres of material available from this site on pro-rata basis. |
| 8 | 7,300 | Material silty sand to very fine sand and was deemed as unsuitable for construction by Hamlet and Kudlik |
| 9 | 22,000 | Potentially much higher volume of material available from this area provided the site is extended in the northeast direction. Would require access to the site to mechanical equipment and site dewatering. |

In conclusion, it is considered that potentially a large quantity of granular materials is available in the Hamlet. Although there is only one rock quarry, it can be expanded in the future to the north and south directions as the rock ridge is considerably wider than the area currently being quarried.

11.0 Limitation of Liability, Scope of Report, and Third-Party Reliance

Basis of Report

This report ("Report") is based on site conditions known or inferred by the investigation undertaken as of the date of the Report. Should changes occur which potentially impact the condition of the site the recommendations of EXP may require re-evaluation.

Reliance on Information Provided

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspection, limited site investigation, information provided to EXP by the Client and others, and on certain assumptions. The Report has been prepared for the specific purpose of estimating quantities of granular materials available in the Hamlet. The estimated quantities are subject to considerable error for reasons stated in the report. EXP has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of any misstatements, omissions, misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to exp. If new information about the environmental conditions at the Site is found, the information should be provided to EXP so that it can be reviewed and revisions to the conclusions and/or recommendations can be made, if warranted.

Standard of Care

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

Complete Report

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to EXP by the Client, communications between EXP and the Client, other reports, proposals or documents prepared by EXP for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. EXP is not responsible for use by any party of portions of the Report.

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The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the written consent of EXP. Any use of the Report, or any portion of the Report, by a third party are the sole responsibility of such third party. EXP is not responsible for damages suffered by any third party resulting from unauthorised use of the Report.

Report Format

Where EXP has submitted both electronic file and a hard copy of the Report, or any document forming part of the Report, only the signed and sealed hard copy shall be the original documents for record and working purposes. In the event of a dispute or discrepancy, the hard copy shall govern. Electronic files transmitted by EXP utilize specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems. Regardless of format, the documents described herein are EXP's instruments of professional service and shall not be altered without the written consent of EXP.

12.0 Signatures

We trust this report meets your current needs. If you have any questions pertaining to the investigation undertaken by EXP, please do not hesitate to contact the undersigned.

DRAFT

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Senior Engineer, Geotechnical Services
Earth and Environment

DRAFT

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Manager, Senior Engineer, Geotechnical Services
Earth and Environment

EXP Services Inc.

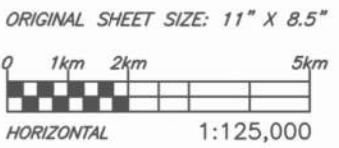
Hamlet of Taloyoak
Granular Materials Resource Study, Hamlet of Taloyoak, Nunavut
Government of Nunavut SOA 2022-41
OTT-24008122-A0
December 12, 2024

Figures

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SOURCE MAP: Open Street Map (2024)

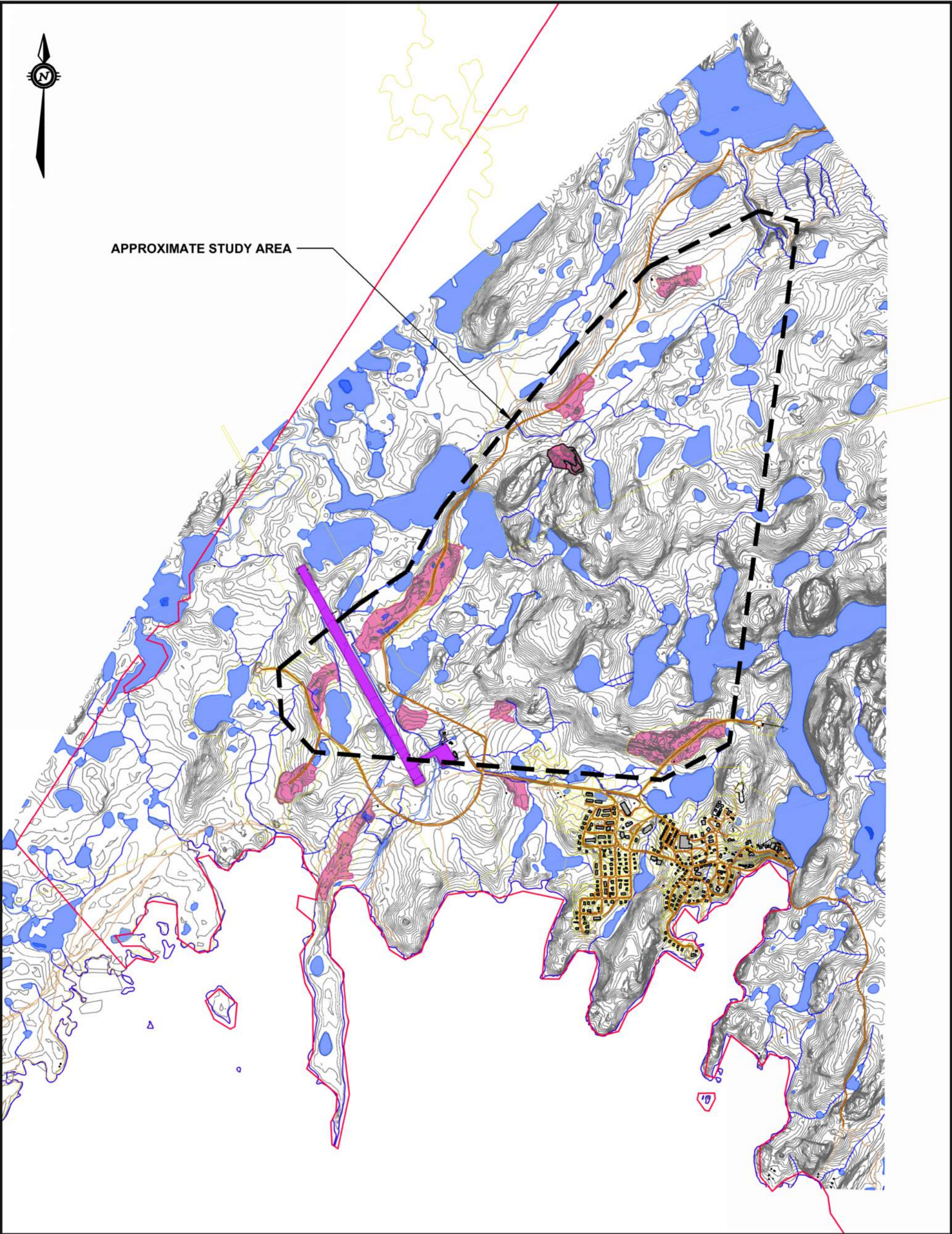


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| DRAWN | AS |
| DATE | AUGUST 2024 |
| FILE NO | OTT-24008122-A0 |

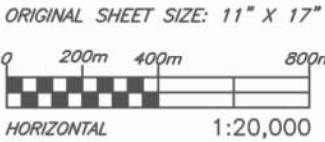
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| GRANULAR MATERIALS RESOURCES STUDY |
| TALOYOAK, NUNAVUT, CANADA |
| SITE LOCATION PLAN |

| | |
|-----------|-----------|
| SCALE | 1:125,000 |
| SKETCH NO | |
| FIG | 1 |



LEGEND

- | | | | |
|--|----------------------------------|--|---------------------|
| | MUNICIPAL BOUNDARY (APPROXIMATE) | | GRAVEL ROAD |
| | QUARRY | | TRAIL |
| | WATER | | PARCELS |
| | AIRPORT / RUNWAY | | BUILDINGS FOOTPRINT |



BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

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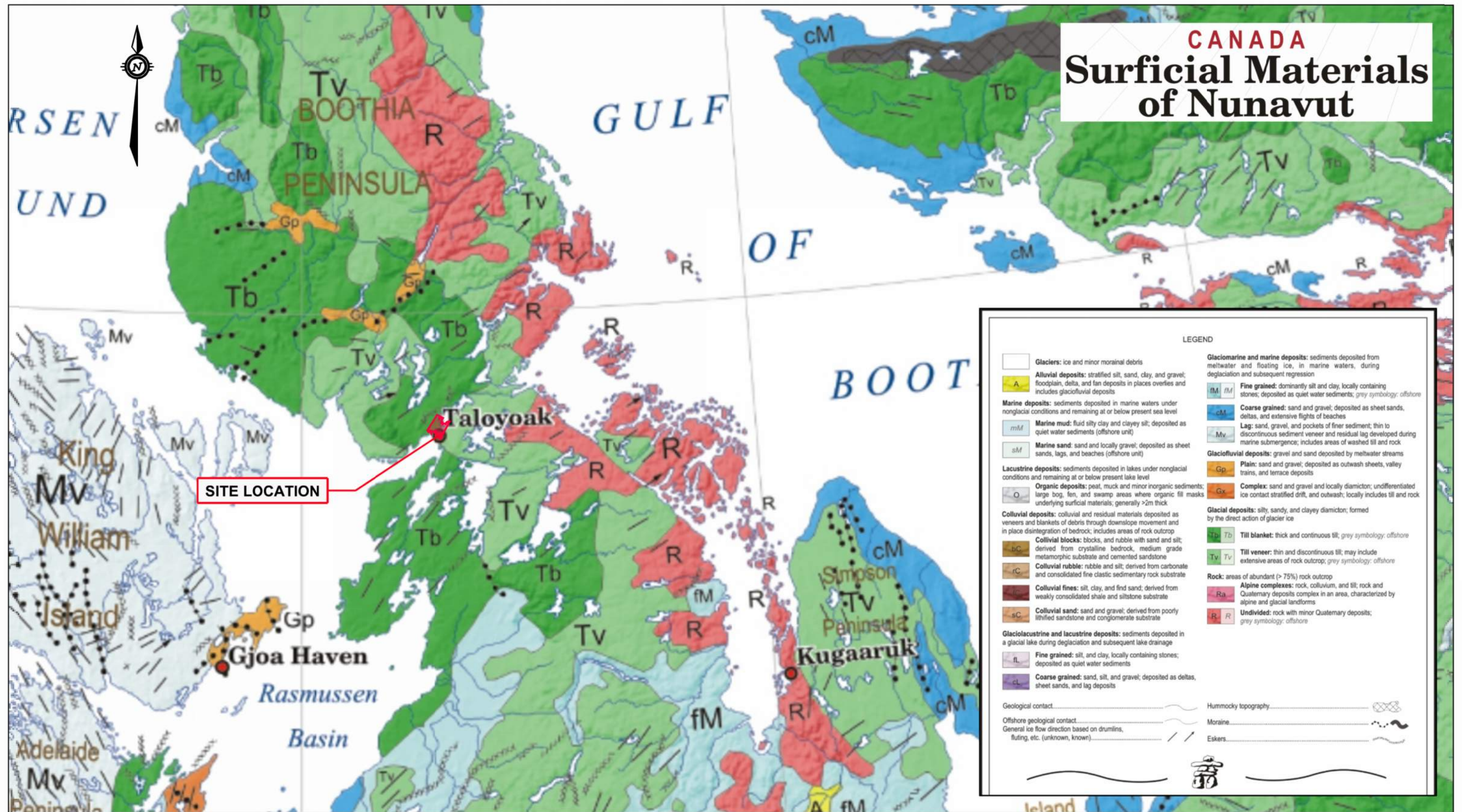


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| GRANULAR MATERIALS RESOURCES STUDY |
| TALOYOAK, NUNAVUT, CANADA |
| TALOYOAK, NUNAVUT MAP LIMIT OF STUDY AREA |

| |
|-------------------|
| SCALE 1:20,000 |
| SKETCH NO |
| FIG 2 |

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HORIZONTAL 1:1,500,000

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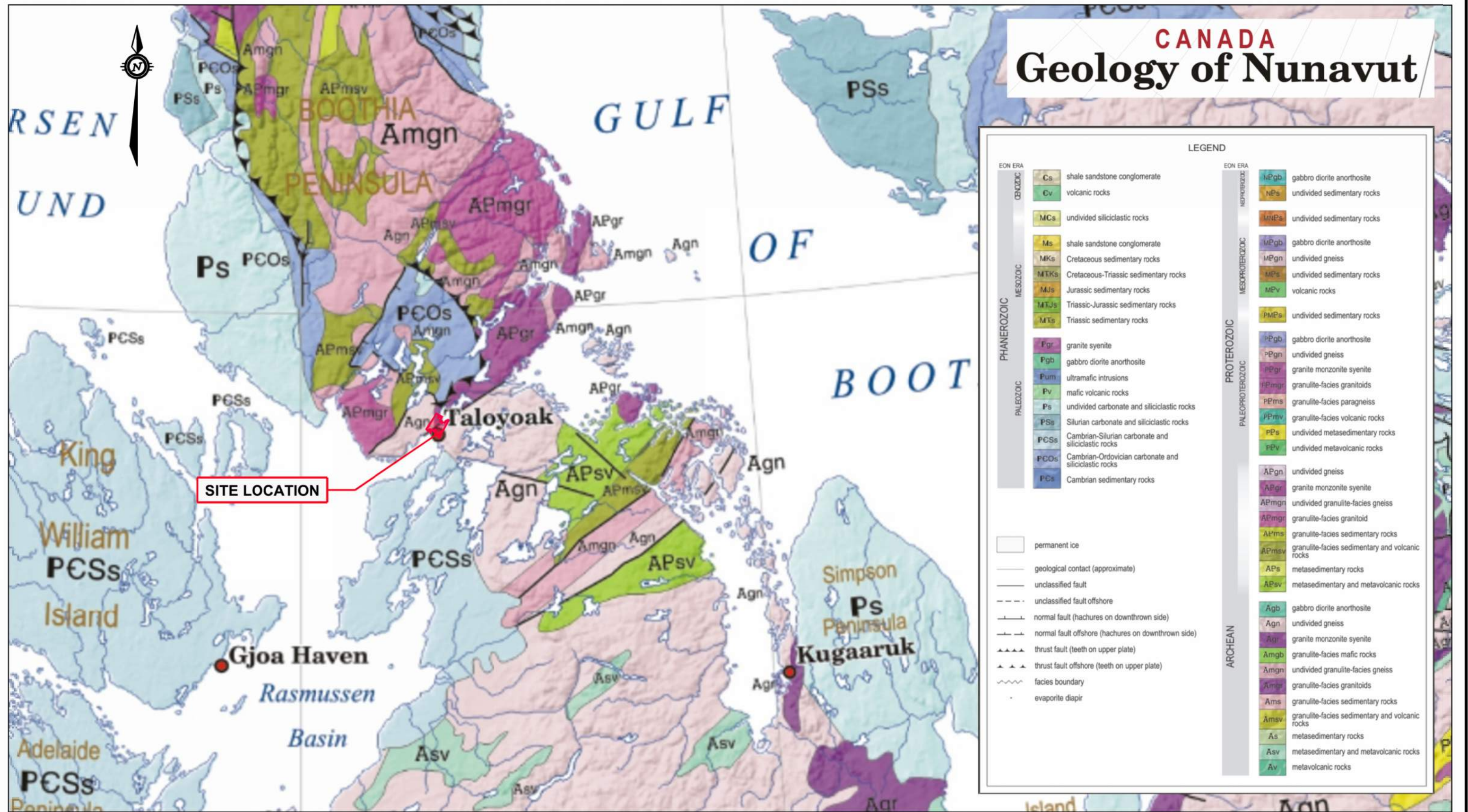


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GRANULAR MATERIALS RESOURCES STUDY
TALOYOAK, NUNAVUT, CANADA
TALOYOAK, NU
SURFICIAL GEOLOGY MAP

SCALE 1:1,500,000
SKETCH NO
FIG 3

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ORIGINAL SHEET SIZE: 17" X 11"

0 15km 30km 60km

HORIZONTAL 1:1,500,000

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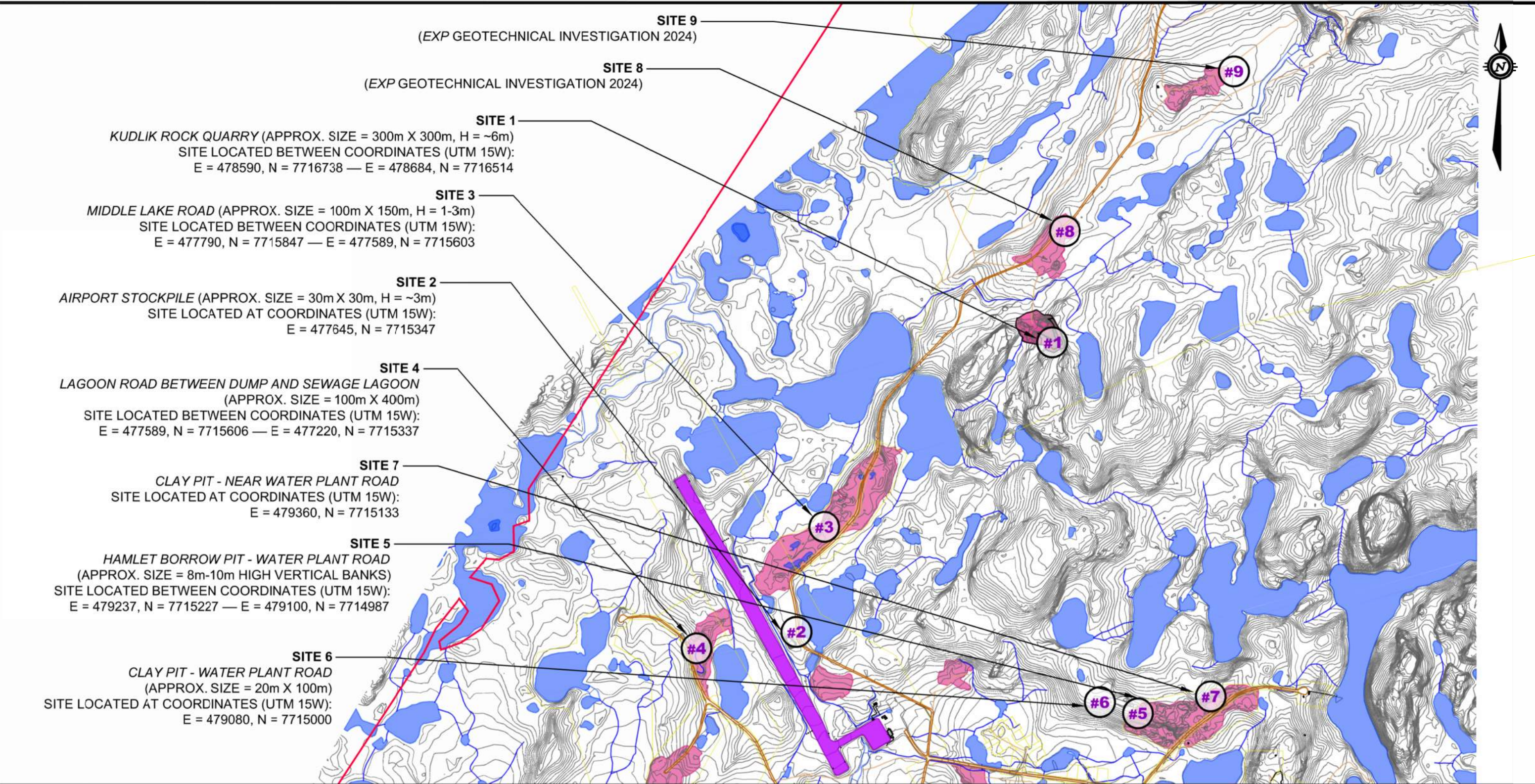


DESIGN IT/SA
DRAWN AS
DATE NOVEMBER 2024
FILE NO OTT-24008122-A0

GRANULAR MATERIALS RESOURCES STUDY
TALOYOAK, NUNAVUT, CANADA
TALOYOAK, NU
BEDROCK GEOLOGY MAP

SCALE 1:1,500,000
SKETCH NO
FIG 4

File name: E:\OTT-24008122-A0\60 Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
Last Saved: Nov 26, 2024 10:43 AM Last Plotted: Dec 11, 2024 12:31 PM Plotted by: Severa




LEGEND

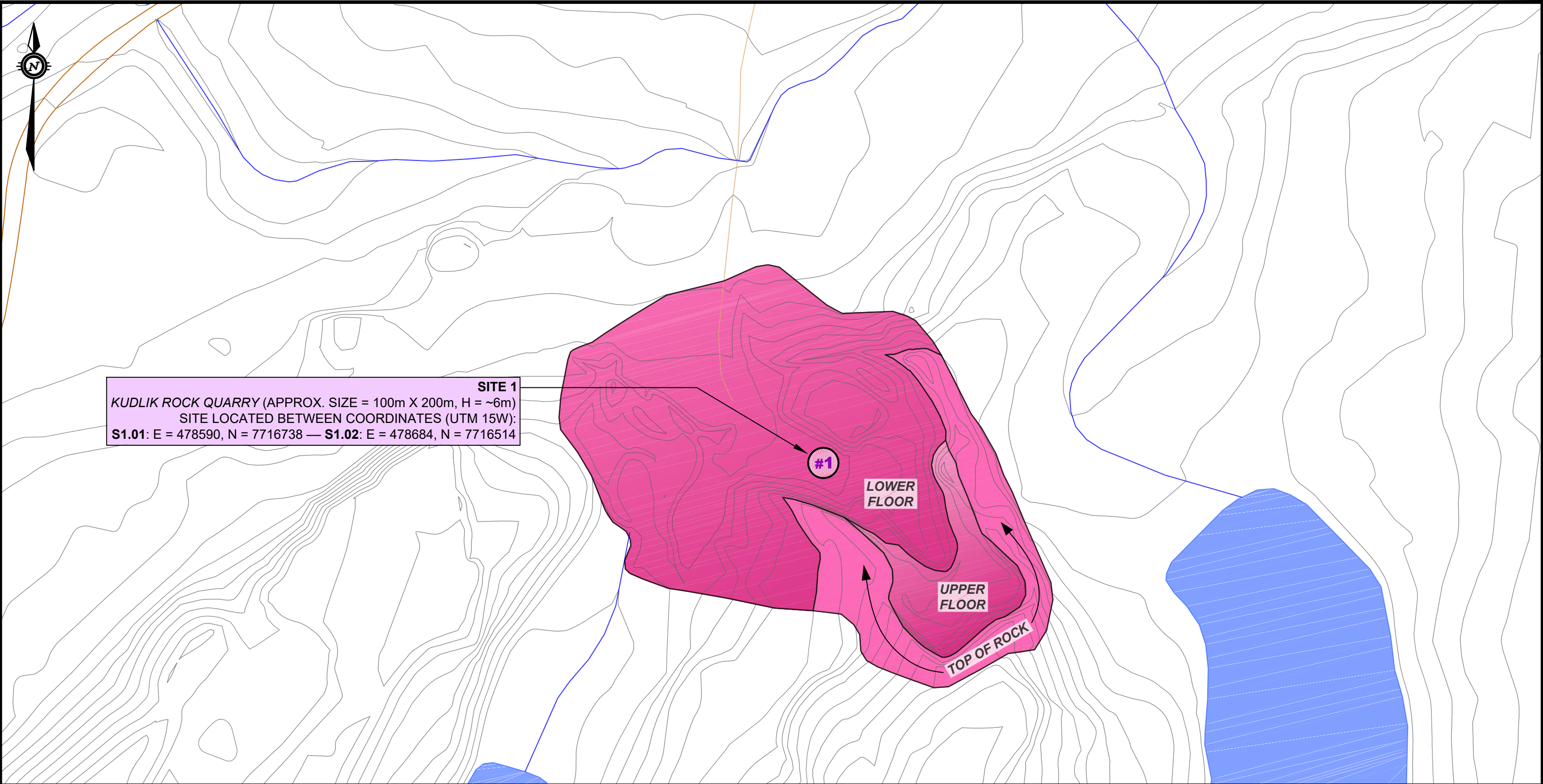
- MUNICIPAL BOUNDARY (APPROXIMATE)
- QUARRY
- WATER
- AIRPORT / RUNWAY
- GRAVEL ROAD
- TRAIL
- PARCELS
- BUILDINGS FOOTPRINTS

#1 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

ORIGINAL SHEET SIZE: 11" X 17"
0 150m 300m 600m
HORIZONTAL 1:15,000

| | | | | | |
|--|--|---------|-----------------|--|-------------------|
| BASE DRAWINGS SOURCE: GOVERNMENT OF NUNAVUT COMMUNITY & GOVERNMENT SERVICES PLANNING & LANDS DIVISION |  exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com | DESIGN | IT/SA/SB | GRANULAR MATERIALS RESOURCES STUDY TALOYOAK, NUNAVUT, CANADA AGGREGATE RESOURCE LOCATIONS HAMLET OF TALOYOAK, NUNAVUT MAP | SCALE 1:15,000 |
| | | DRAWN | AS | | SKETCH NO |
| | | DATE | DECEMBER 2024 | | FIG 5 |
| | | FILE NO | OTT-24008122-A0 | | |

Filename: E:\OTT\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
Last Saved: Nov 25, 2024 1:04 PM Last Plotted: Nov 25, 2024 1:07 PM Plotted by: SeverA



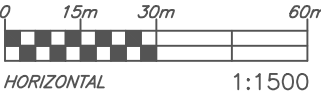
LEGEND

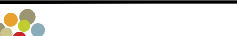
- QUARRY
- WATER

- GRAVEL ROAD
- TRAIL

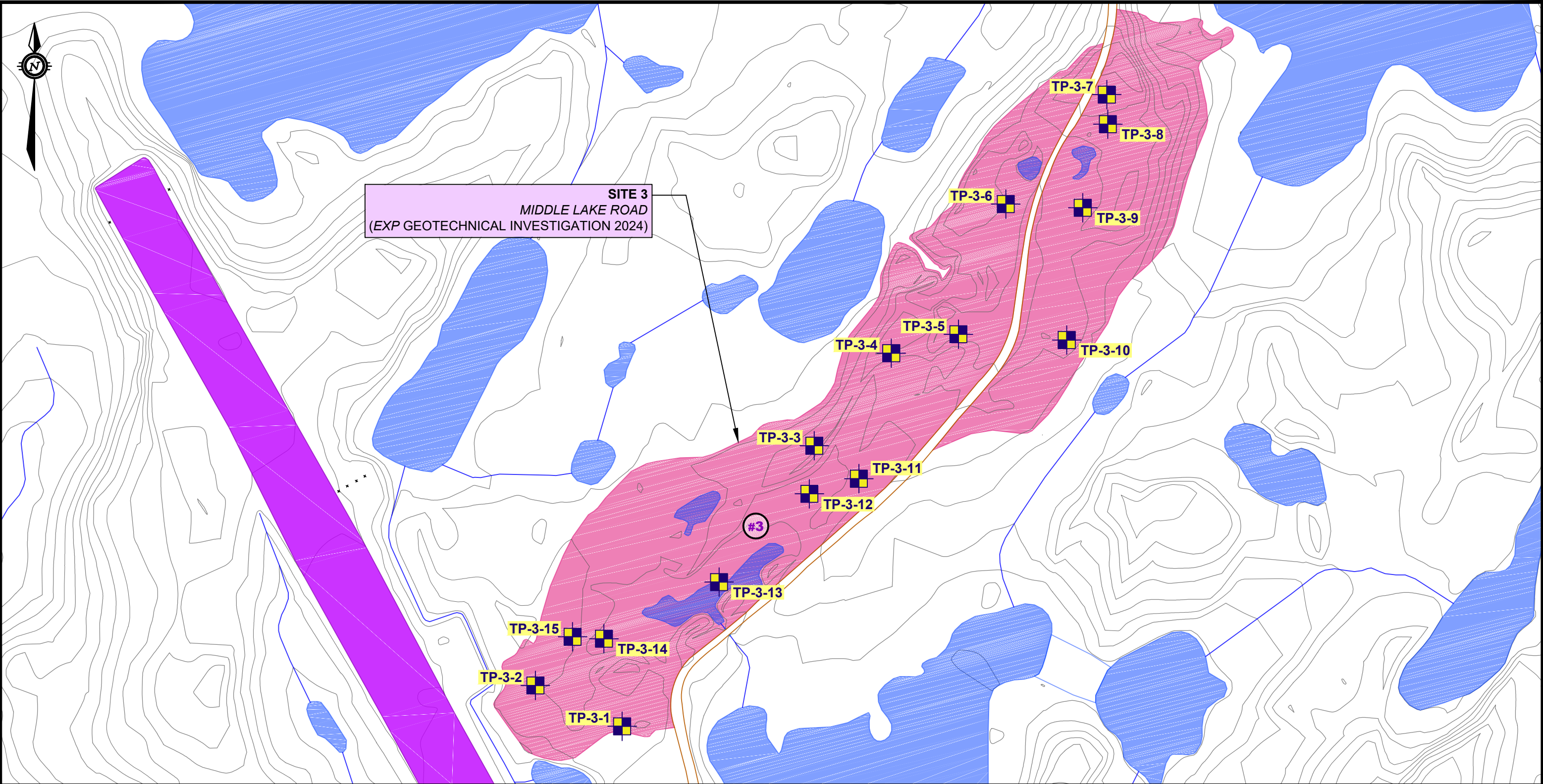
#1 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020)

ORIGINAL SHEET SIZE: 17" X 11"



| | | | | | | |
|--|--|---|---------|-----------------|---|---------------------------|
| BASE DRAWINGS SOURCE: GOVERNMENT OF NUNAVUT COMMUNITY & GOVERNMENT SERVICES PLANNING & LANDS DIVISION | exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com |  | DESIGN | IT/SA | GRANULAR MATERIALS RESOURCES STUDY | SCALE |
| | | | DRAWN | AS | | TALOYOAK, NUNAVUT, CANADA |
| | | | DATE | OCTOBER 2024 | AGGREGATE RESOURCE LOCATIONS SITE #1 | SKETCH NO |
| | | | FILE NO | OTT-24008122-A0 | | FIG 6 |

Filename: E:\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
Last Saved: Nov 25, 2024 1:09 PM
Last Plotted: Nov 25, 2024 1:09 PM
Plotted by: SeverA



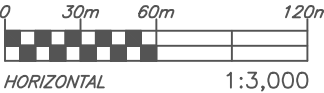
LEGEND


- QUARRY
- WATER
- AIRPORT / RUNWAY

- GRAVEL ROAD
- TRAIL
- BUILDINGS FOOTPRINTS
- TEST PIT AND SAMPLE NUMBER AND LOCATION

#3 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

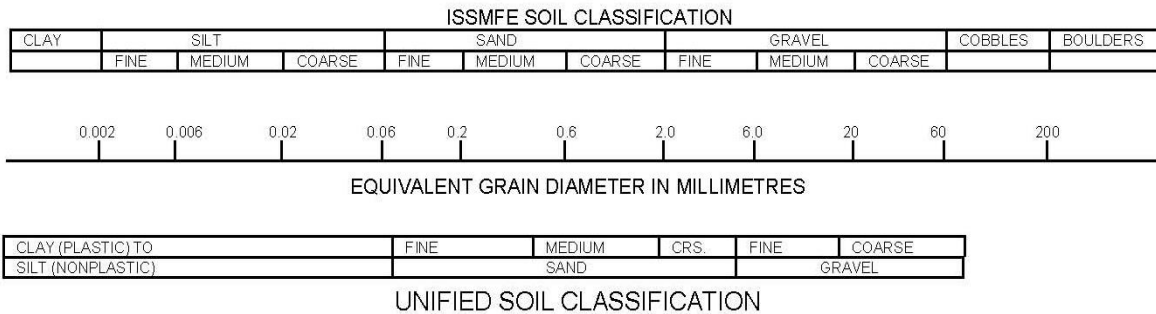
ORIGINAL SHEET SIZE: 17" X 11"



| | | | | |
|--|---|-------------------------|---|---------------|
| BASE DRAWINGS SOURCE: GOVERNMENT OF NUNAVUT COMMUNITY & GOVERNMENT SERVICES PLANNING & LANDS DIVISION | <div>exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com</div> <div></div> | DESIGN IT/SA/SB | GRANULAR MATERIALS RESOURCES STUDY TALOYOAK, NUNAVUT, CANADA | SCALE 1:3,000 |
| | | DRAWN AS | | SKETCH NO |
| | | DATE OCTOBER 2024 | AGGREGATE RESOURCE LOCATIONS SITE #3 | FIG 7 |
| | | FILE NO OTT-24008122-A0 | | |

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.



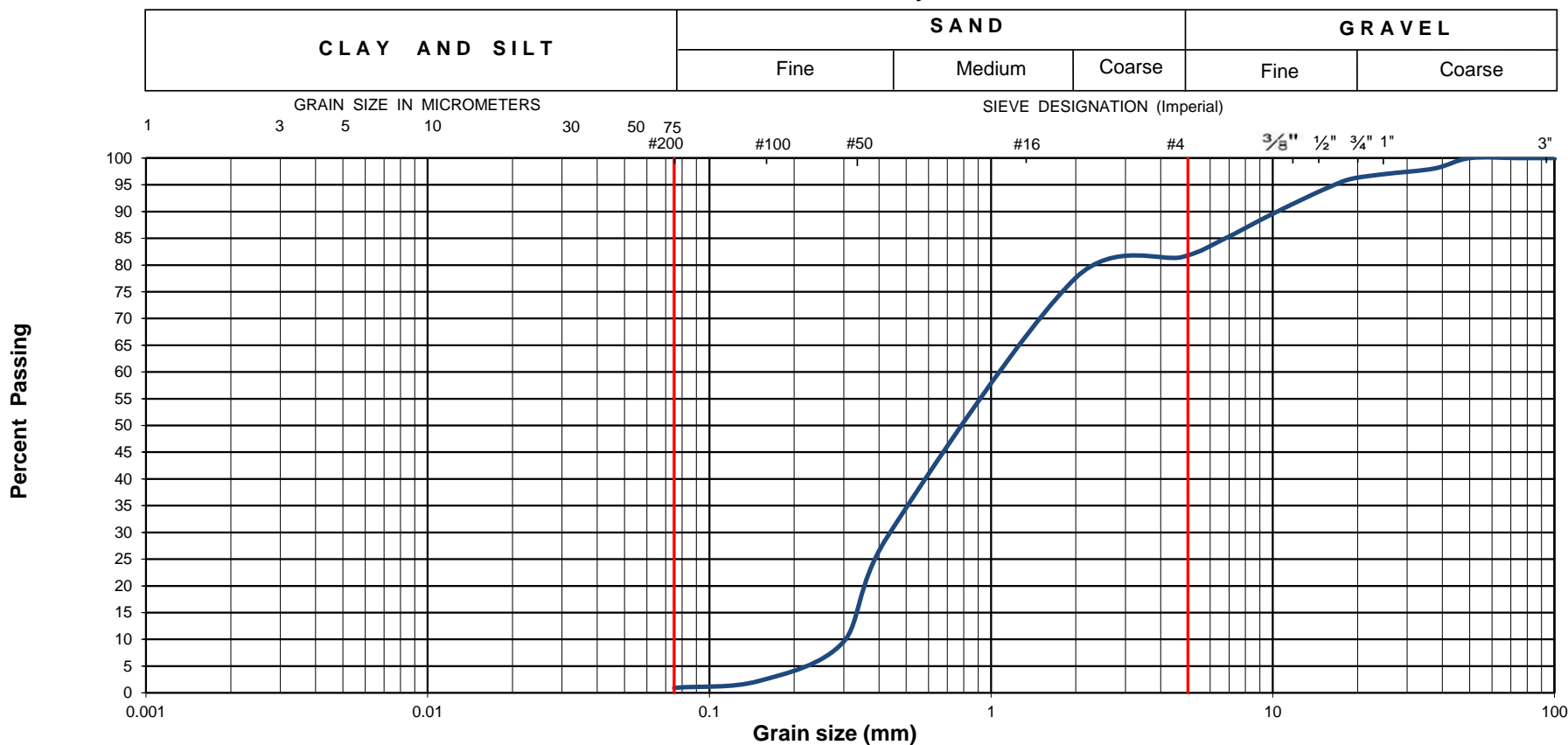
2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.
3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



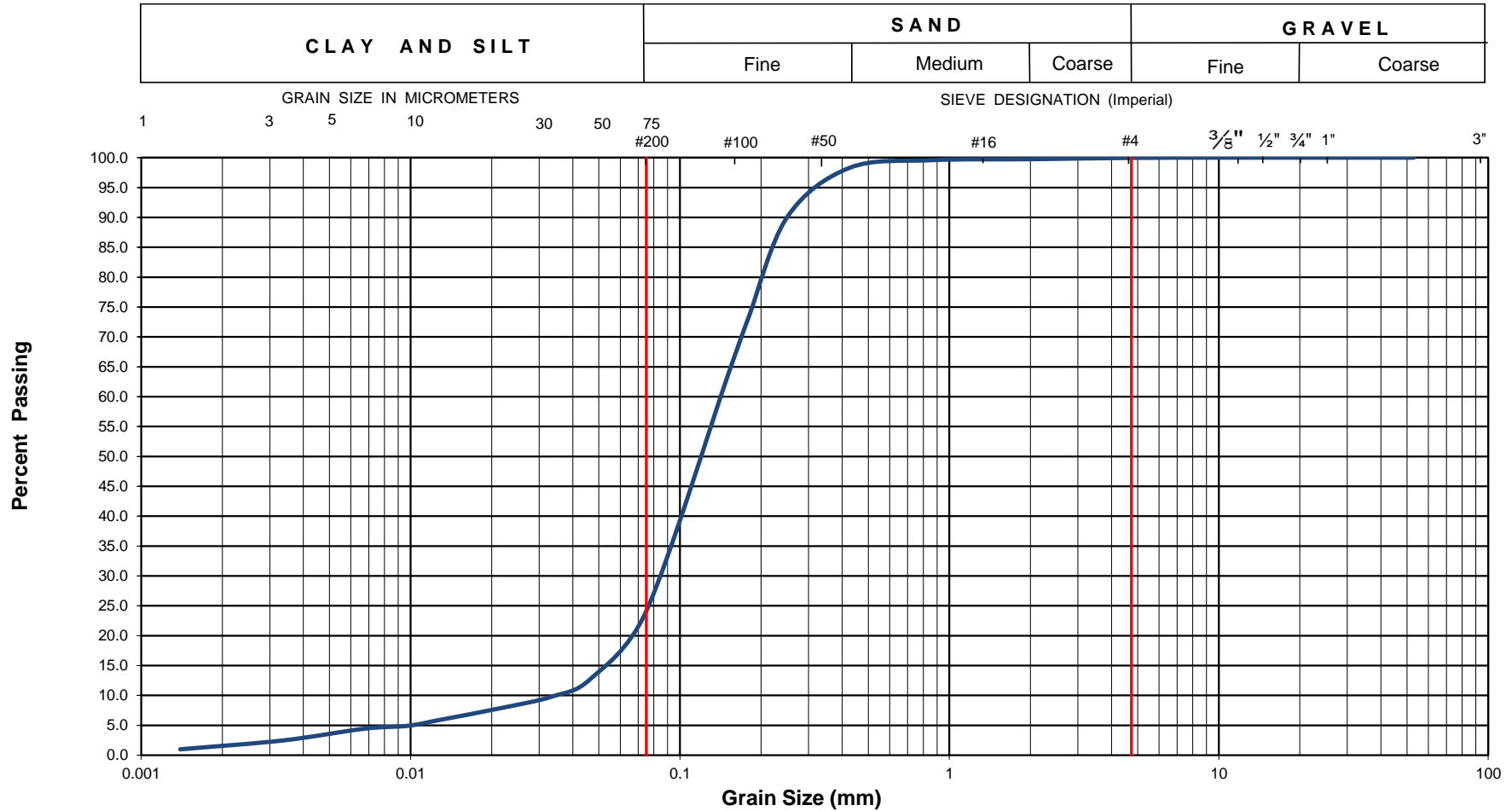
| | | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-------|-----------------|-----------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-1-2 | Depth (m) : | 0.3 - 1.5 |
| Sample Composition : | | Gravel (%) | 19 | Sand (%) | 80 | Silt & Clay (%) | 1 |
| Sample Description : | Poorly Graded Sand with Gravel (SP) | | | | | Figure : | 8 |



Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | | | | | |
|----------------------|--------------------------|---|--------|--------|----------|-------------|------------|-------|-------------|-----------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : Granular Search, Hamlet of Taloyoak, Nunavut | | | | | | | | |
| Client : | Hamlet of Taloyoak | Project Location : Hamlet of Taloyoak, Nunavut | | | | | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | | Site 3 | | Sample No.: | | 3-1-3 | Depth (m) : | 1.5 - 2.0 |
| Sample Description : | % Silt and Clay | 24 | % Sand | 76 | % Gravel | 0 | Figure : 9 | | | |
| Sample Description : | Silty Sand (SM) | | | | | | | | | |

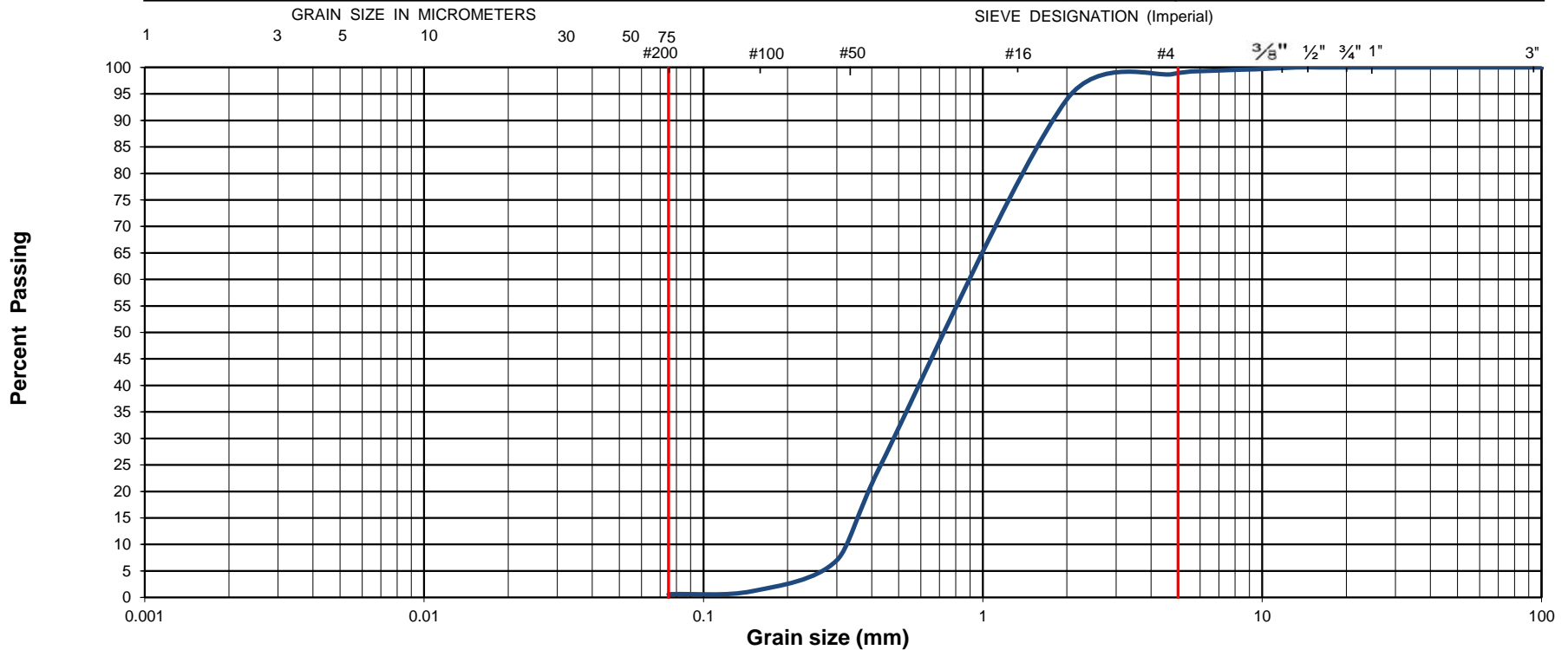


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | | |
|----------------------|--------------------------|--------------------|---|----------|-----|-----------------|------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-6 | Depth (m) : | 0.6 - 1.67 |
| Sample Composition : | | Gravel (%) | 1 | Sand (%) | 98 | Silt & Clay (%) | 1 |
| Sample Description : | Poorly Graded Sand (SP) | | | | | Figure : | 10 |

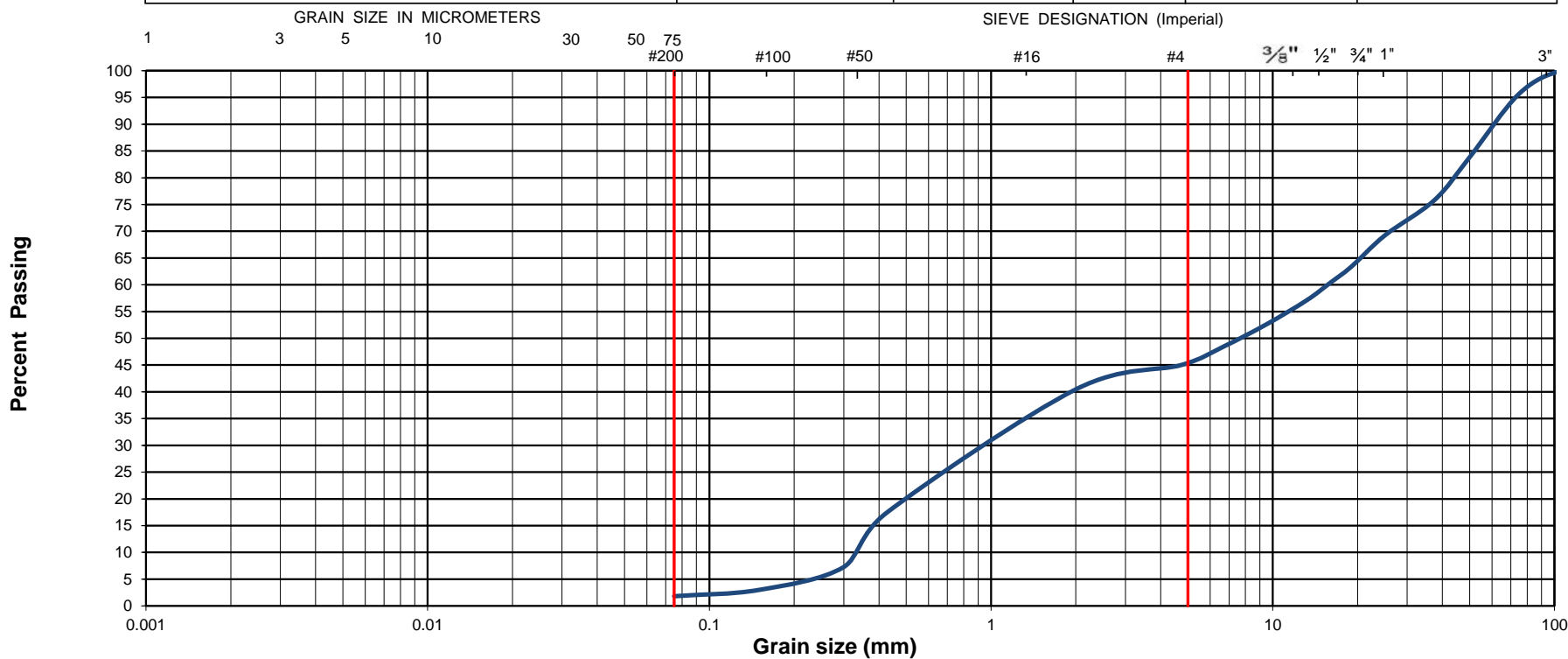


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-----|------------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-7 | Depth (m) : 0.6 - 1.65 |
| Sample Composition : | | Gravel (%) | 55 | Sand (%) | 43 | Silt & Clay (%) 2 |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | Figure : 11 |

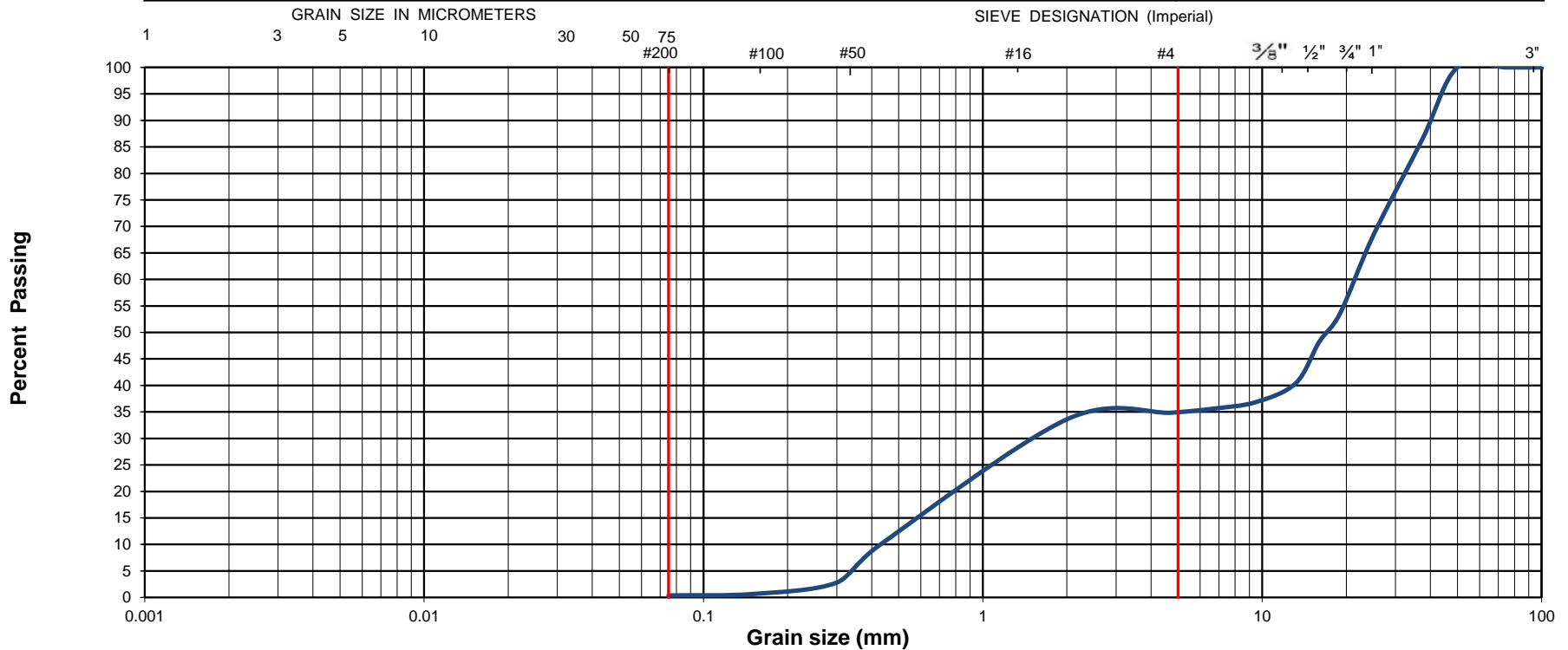


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | | | | | | | |
|----------------------|-------------------------------------|--|--|--------|--|----------|--|-----|--|-----------------|----------|----|
| EXP Project No.: | OTT-24008122-A0 | Project Name : Granular Search, Hamlet of Taloyoak Nunavut | | | | | | | | | | |
| Client : | Hamlet of Taloyoak | Project Location : Hamlet of Taloyoak, Nunavut | | | | | | | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | | Site 3 | | Sample: | | 3-8 | | Depth (m) : | 0 - 2.0 | |
| Sample Composition : | | Gravel (%) | | 65 | | Sand (%) | | 35 | | Silt & Clay (%) | 0 | |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | | | | | | Figure : | 12 |

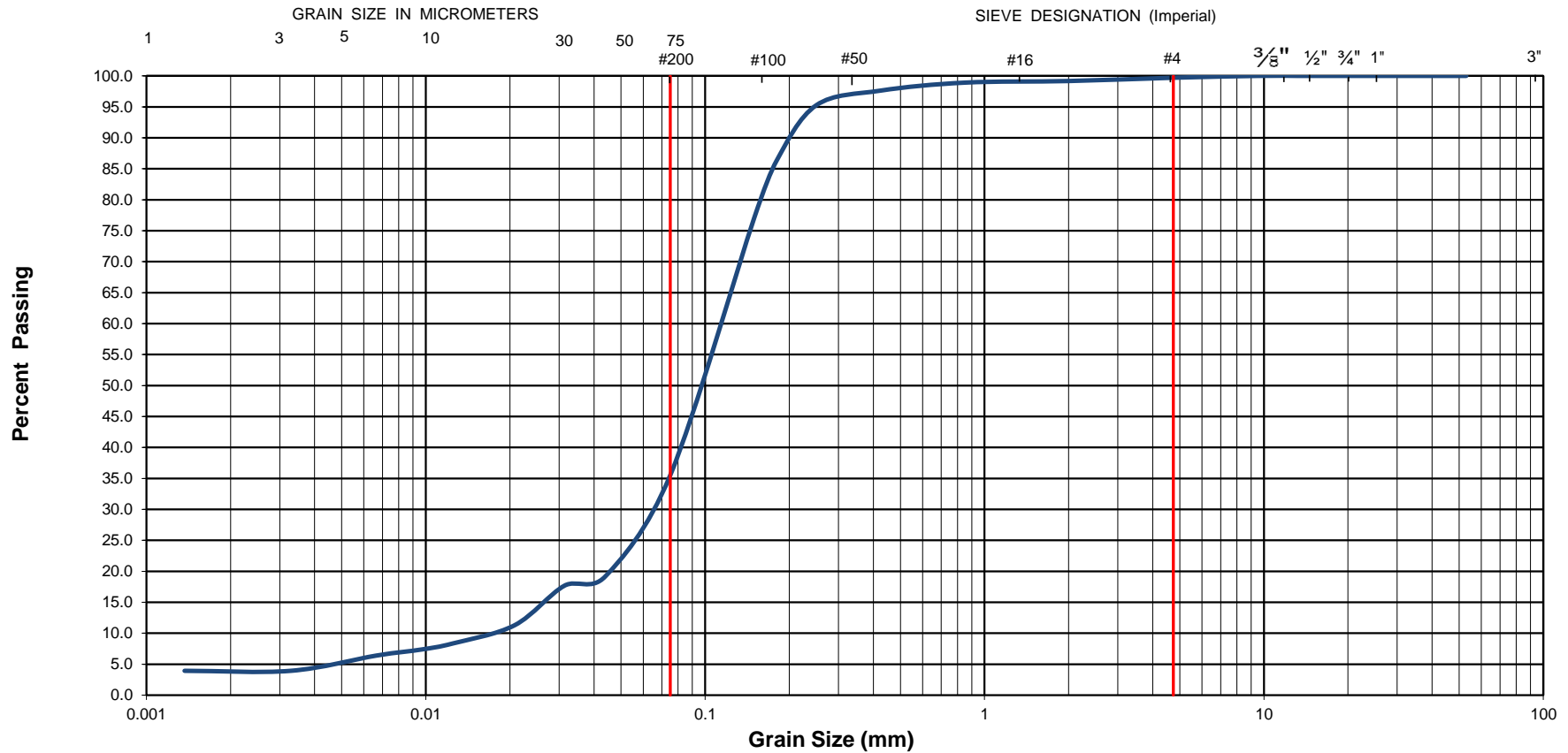


Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



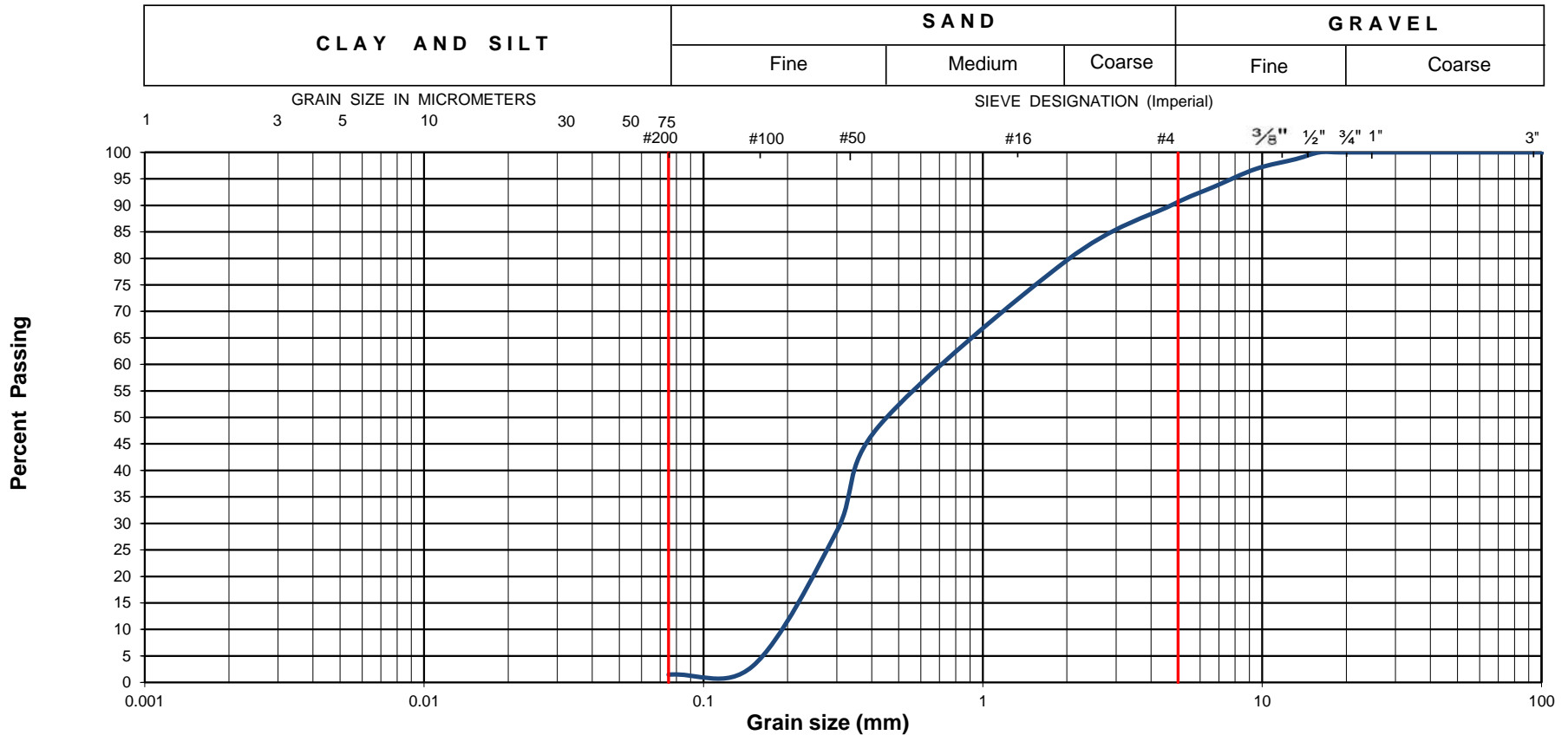
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|----------------------|--------------------------|--------------------|--|-------------|----------|-----------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak, Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample No.: | 3-9-2 | Depth (m) : 0.4 - 2.0 |
| Sample Description : | % Silt and Clay | 35 | % Sand | 65 | % Gravel | 0 |
| Sample Description : | Silty Sand (SM) | | | | | Figure : 13 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | | |
|----------------------|--------------------------|--------------------|---|----------|------|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-10 | Depth (m) : | 0 - 1.8 |
| Sample Composition : | | Gravel (%) | 10 | Sand (%) | 88 | Silt & Clay (%) | 2 |
| Sample Description : | Poorly Graded Sand (SP) | | | | | Figure : | 14 |

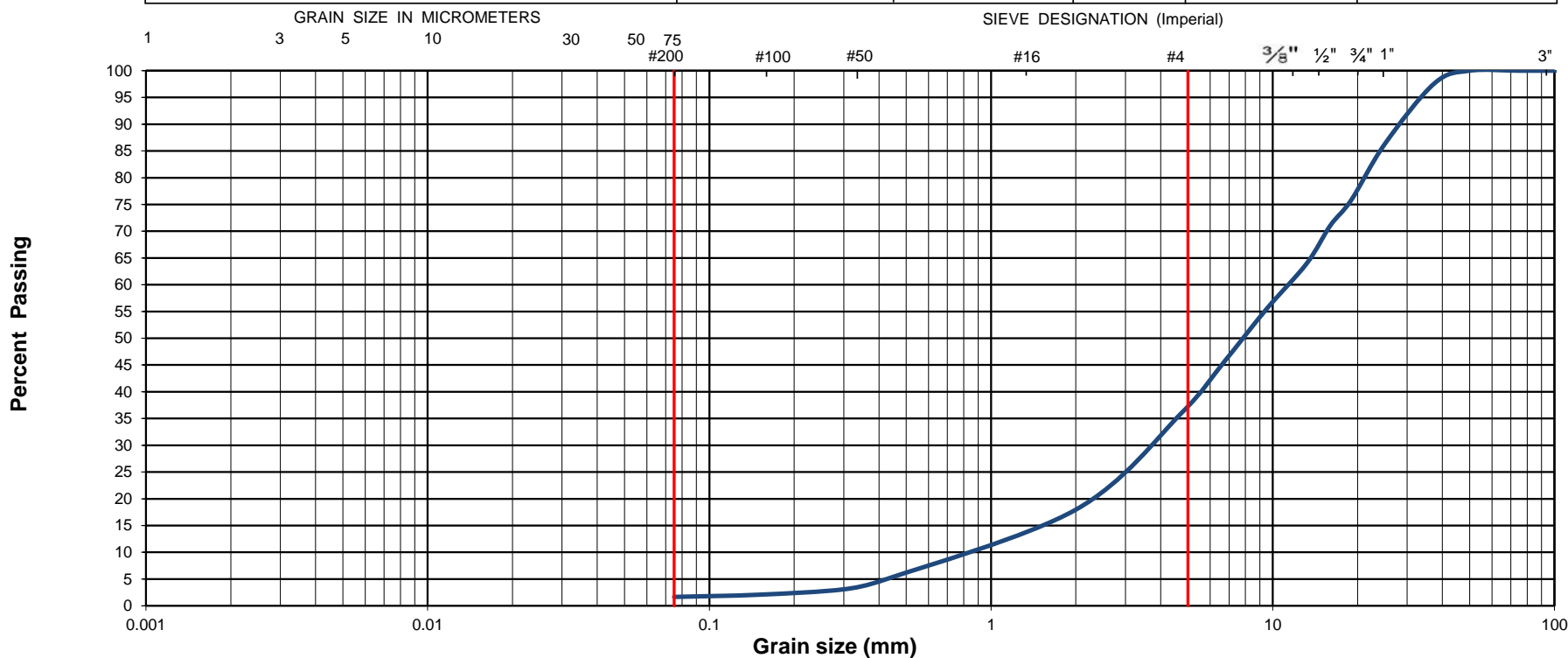


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



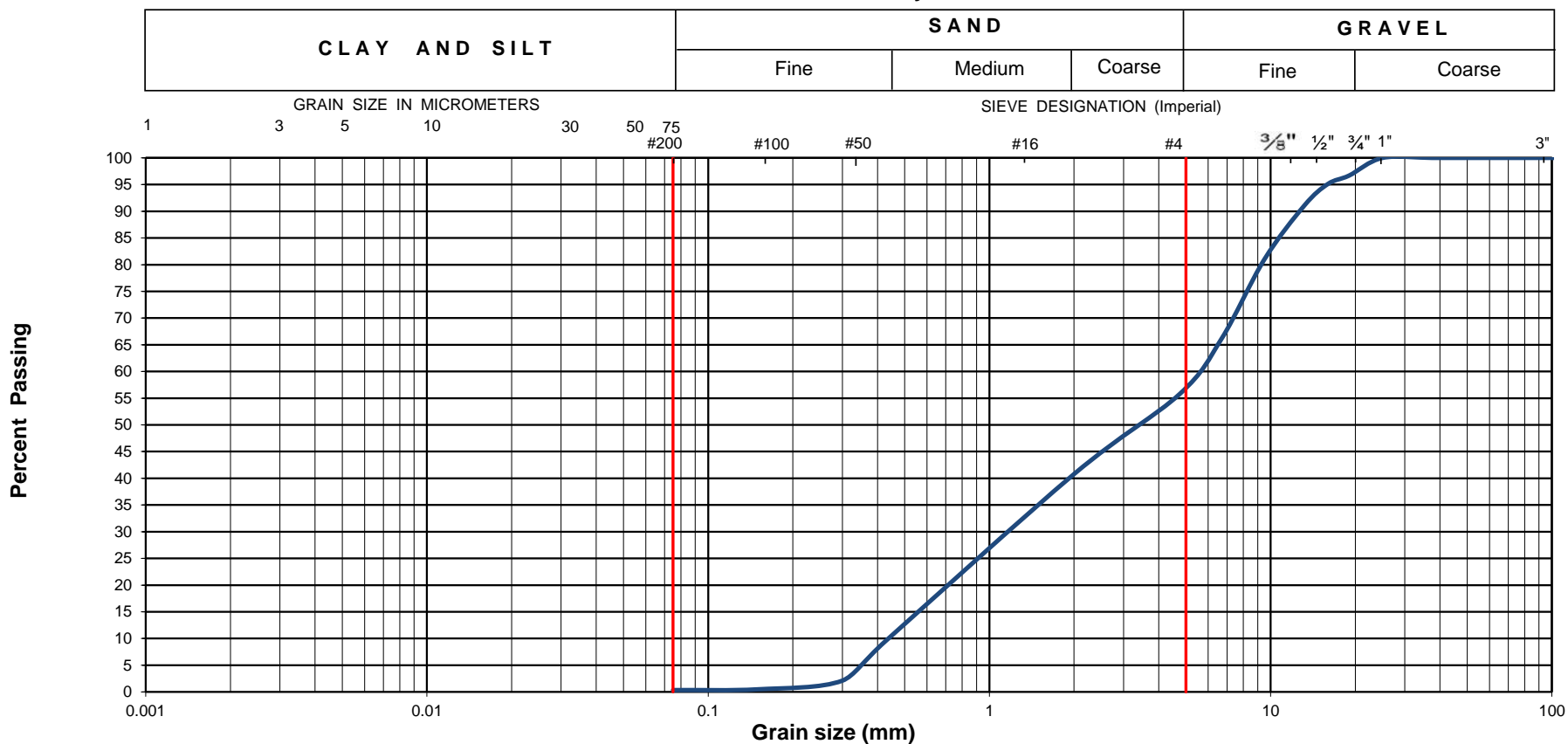
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|----------------------|-----------------------------------|--------------------|----|---|---------|-----------------|------|-------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | | Granular Search, Hamlet of Taloyoak Nunavut | | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | | Hamlet of Taloyoak, Nunavut | | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | | Site 3 | Sample: | | 3-11 | Depth (m) : | 0 - 1.5 |
| Sample Composition : | | Gravel (%) | 64 | Sand (%) | 34 | Silt & Clay (%) | 2 | Figure : | 15 |
| Sample Description : | Well Graded Gravel with Sand (GW) | | | | | | | | |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|--------|-----------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-12-2 | Depth (m) : 0.3 - 0.6 |
| Sample Composition : | | Gravel (%) | 44 | Sand (%) | 56 | Silt & Clay (%) 0 |
| Sample Description : | Poorly Graded Sand with Gravel (SP) | | | | | Figure : 16 |

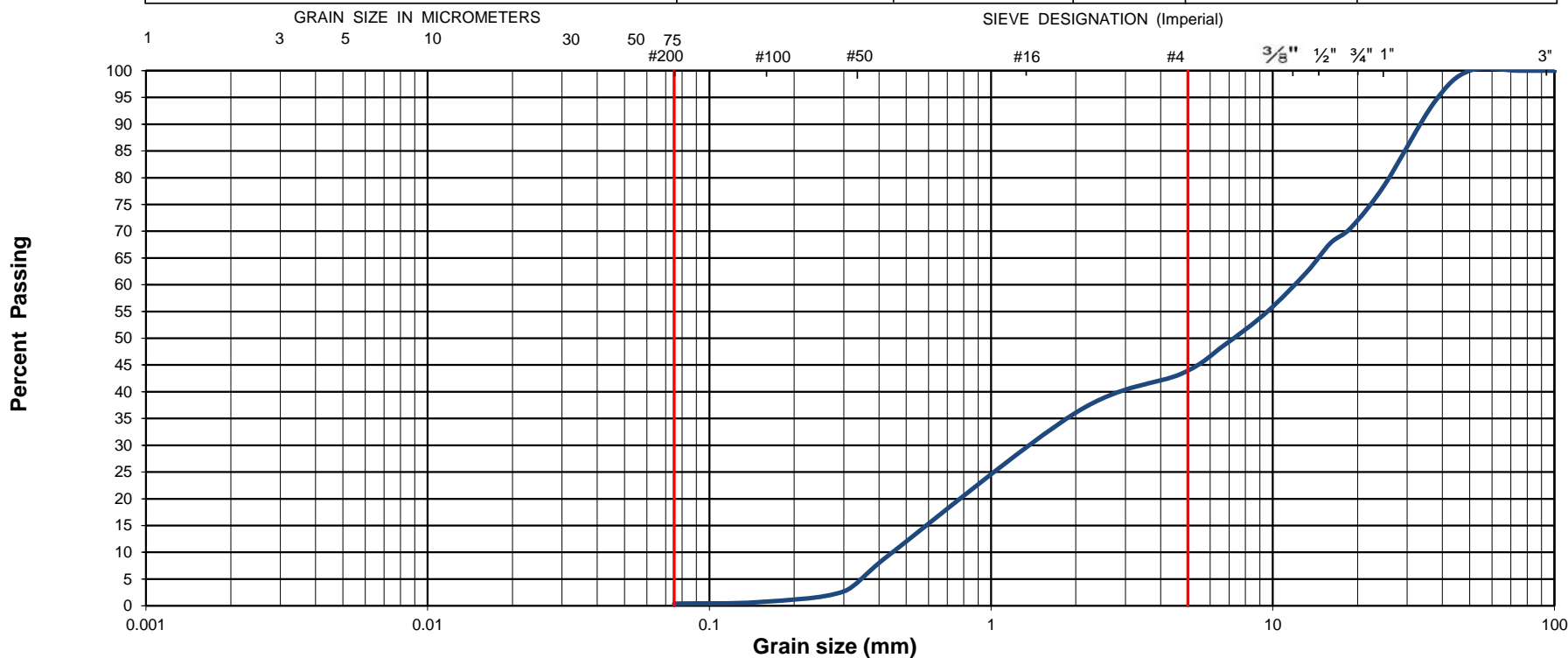


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

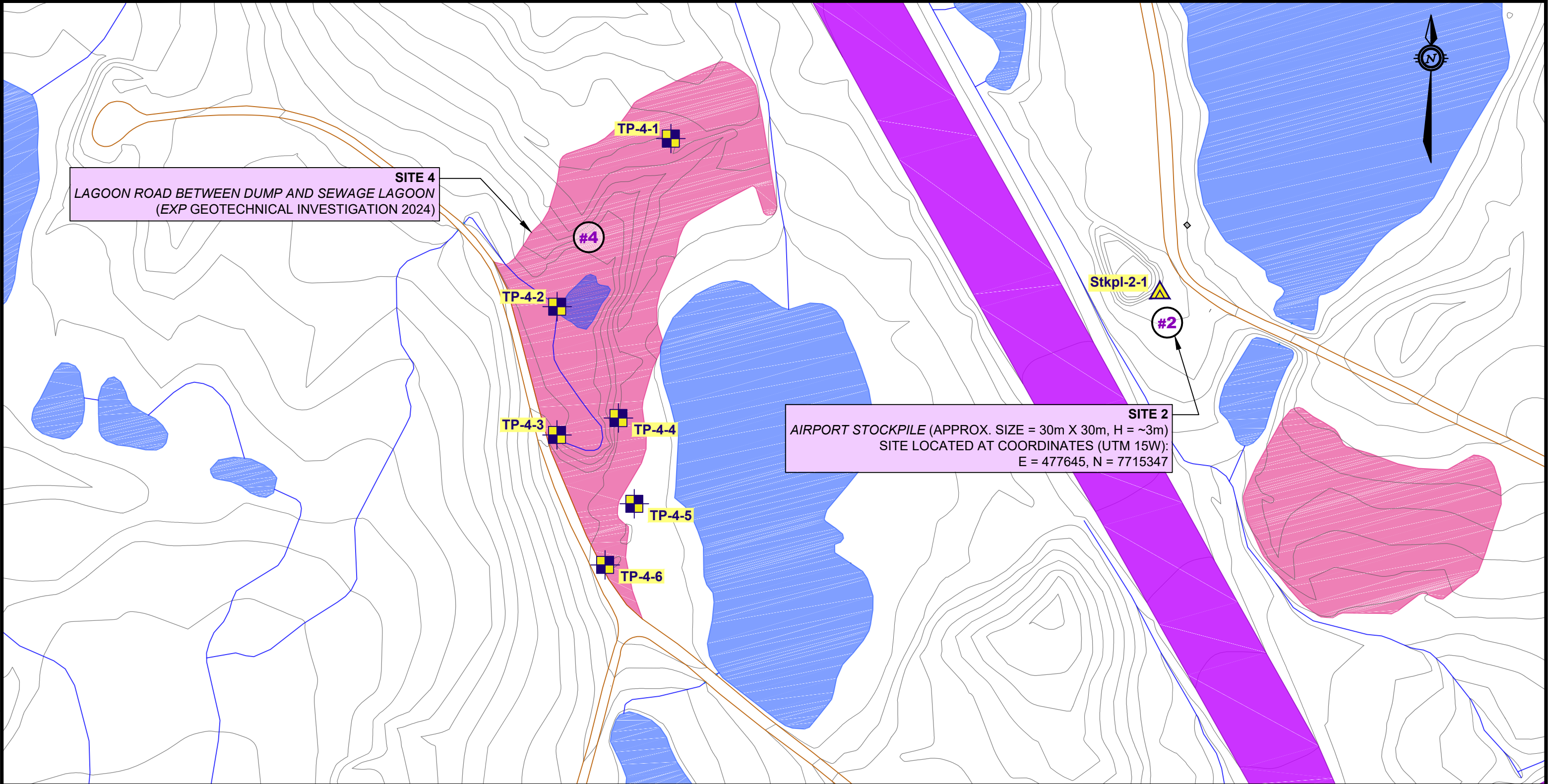
Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|--------|------------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 3 | Sample: | 3-12-4 | Depth (m) : 0.9 - 1.37 |
| Sample Composition : | | Gravel (%) | 57 | Sand (%) | 43 | Silt & Clay (%) 0 |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | Figure : 17 |

Filename: E:\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
Last Saved: Nov 25, 2024 1:09 PM Last Plotted: Nov 25, 2024 1:10 PM Plotted by: SeverA

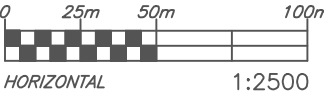


LEGEND

- QUARRY
- WATER
- AIRPORT / RUNWAY
- STOCKPILE NUMBER AND LOCATION
- GRAVEL ROAD
- TRAIL
- BUILDINGS FOOTPRINTS
- TEST PIT AND SAMPLE NUMBER AND LOCATION

#4 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

ORIGINAL SHEET SIZE: 17" X 11"



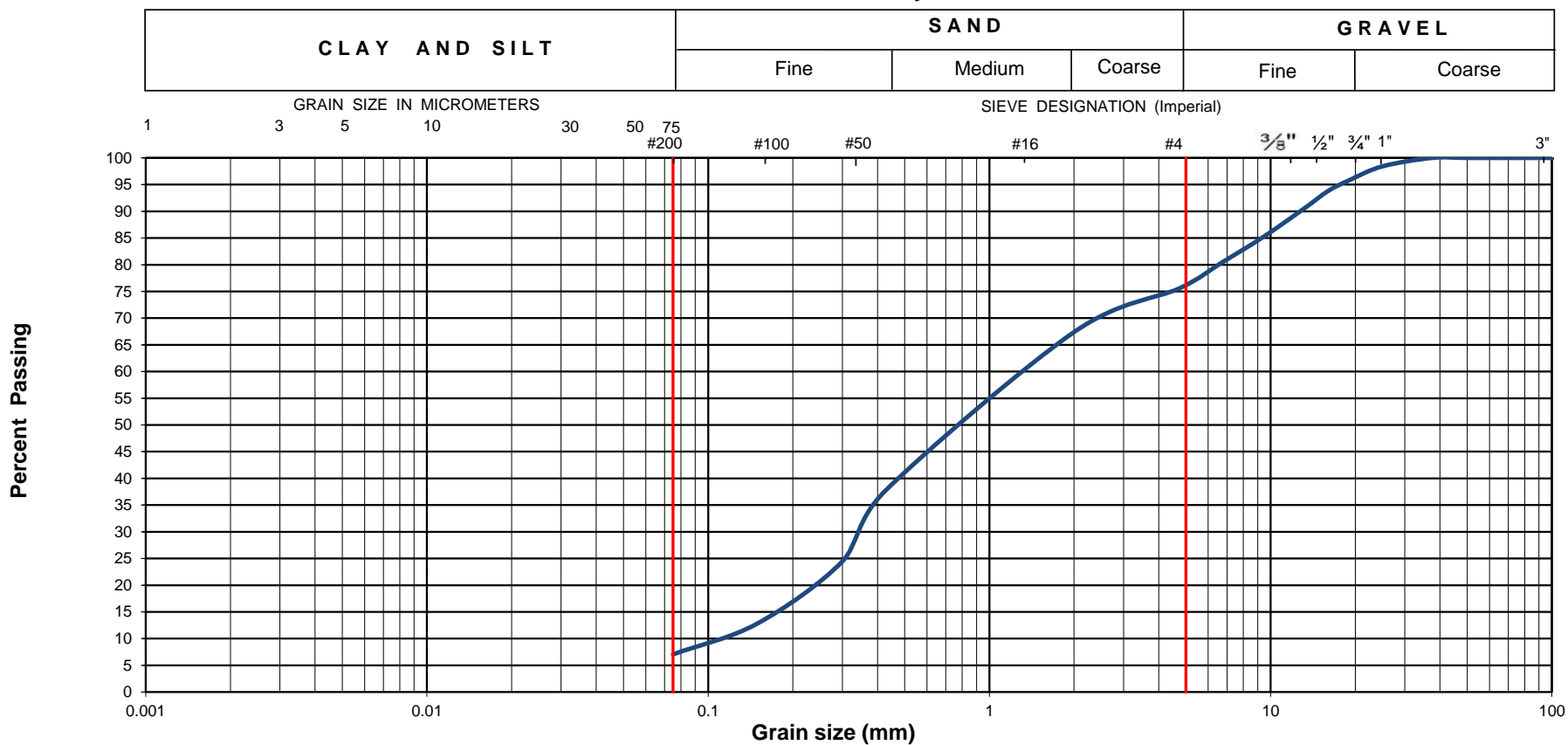
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|--|---|--|---------|-----------------|--|----------------------------|
| BASE DRAWINGS SOURCE: GOVERNMENT OF NUNAVUT COMMUNITY & GOVERNMENT SERVICES PLANNING & LANDS DIVISION | exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com | | DESIGN | IT/SA | GRANULAR MATERIALS RESOURCES STUDY | SCALE 1:2,500 |
| | | | DRAWN | AS | | |
| | | | DATE | NOVEMBER 2024 | TALOYOAK, NUNAVUT, CANADA AGGREGATE RESOURCE LOCATIONS SITES #2 & #4 | SKETCH NO FIG 18 |
| | | | FILE NO | OTT-24008122-A0 | | |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | | |
|----------------------|---|--------------------|---|----------|-------|-----------------|-------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 4 | Sample: | 4-1-1 | Depth (m) : | 0 - 0.9 |
| Sample Composition : | | Gravel (%) | 24 | Sand (%) | 69 | Silt & Clay (%) | 7 |
| Sample Description : | Poorly Graded Sand with Silt and Gravel (SP-SM) | | | | | | Figure : 19 |

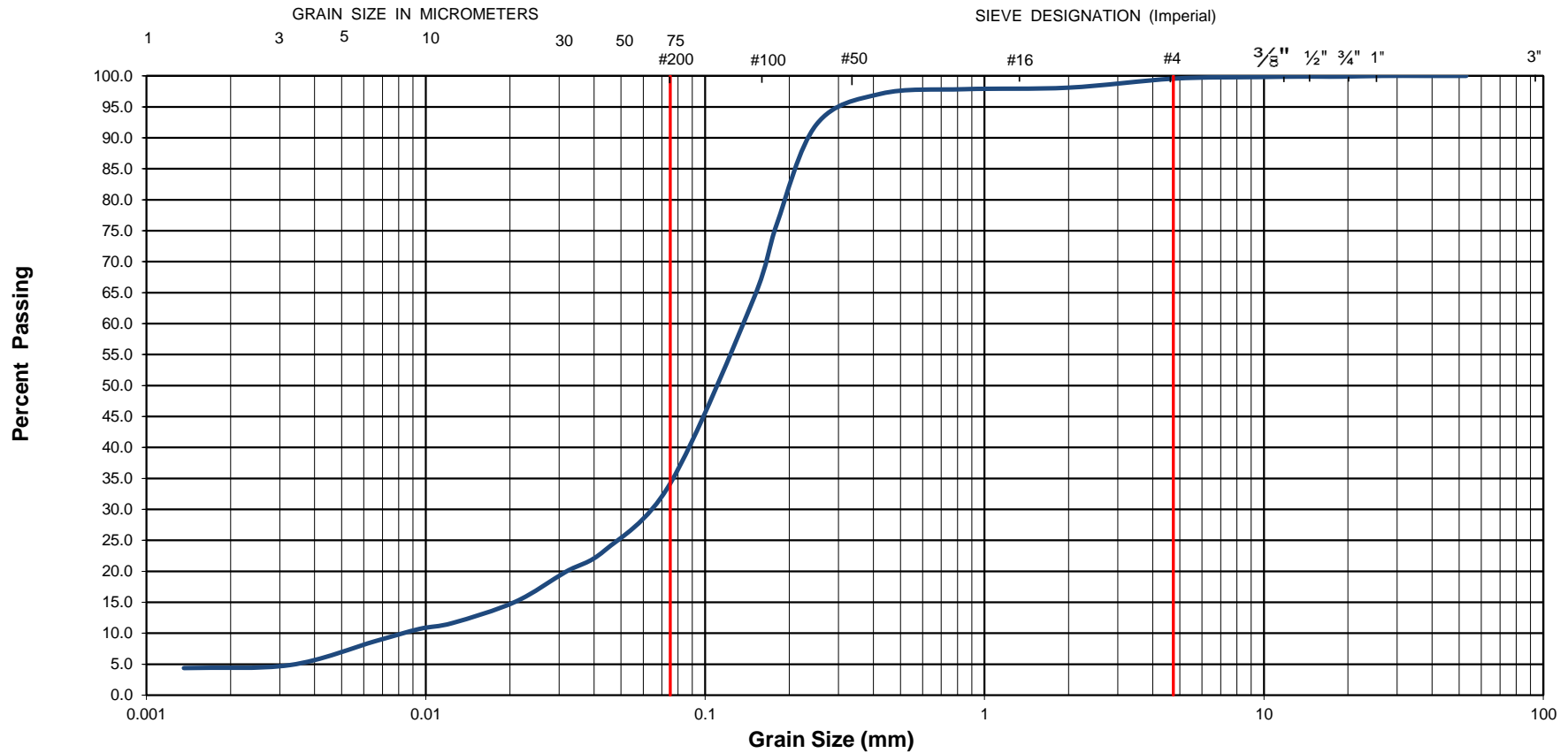


Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



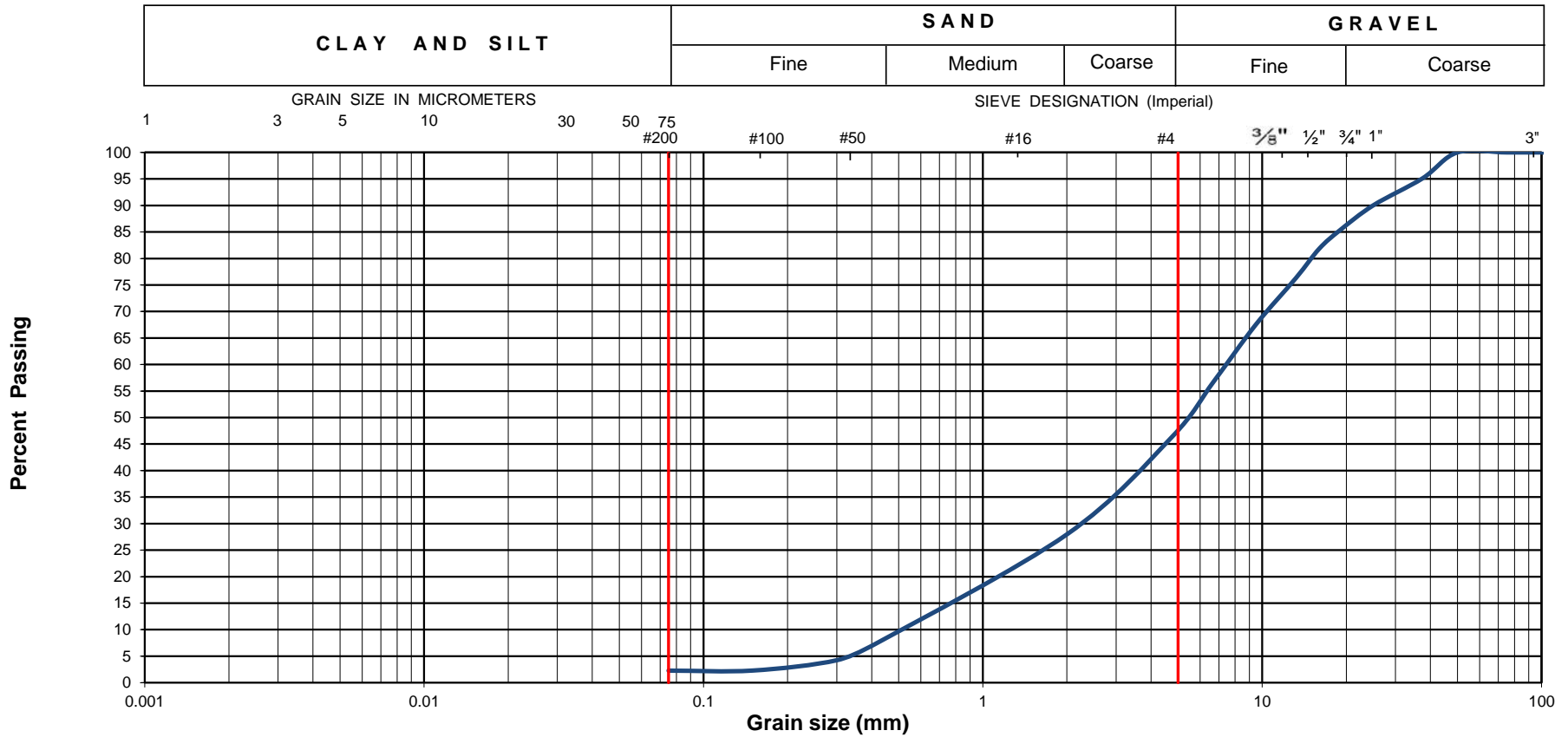
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|----------------------|--------------------------|--------------------|--|-------------|----------|-----------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak, Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 4 | Sample No.: | 4-1-2 | Depth (m) : 0.9 - 1.5 |
| Sample Description : | % Silt and Clay | 34 | % Sand | 66 | % Gravel | 0 |
| Sample Description : | Silty Sand (SM) | | | | | Figure : 20 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

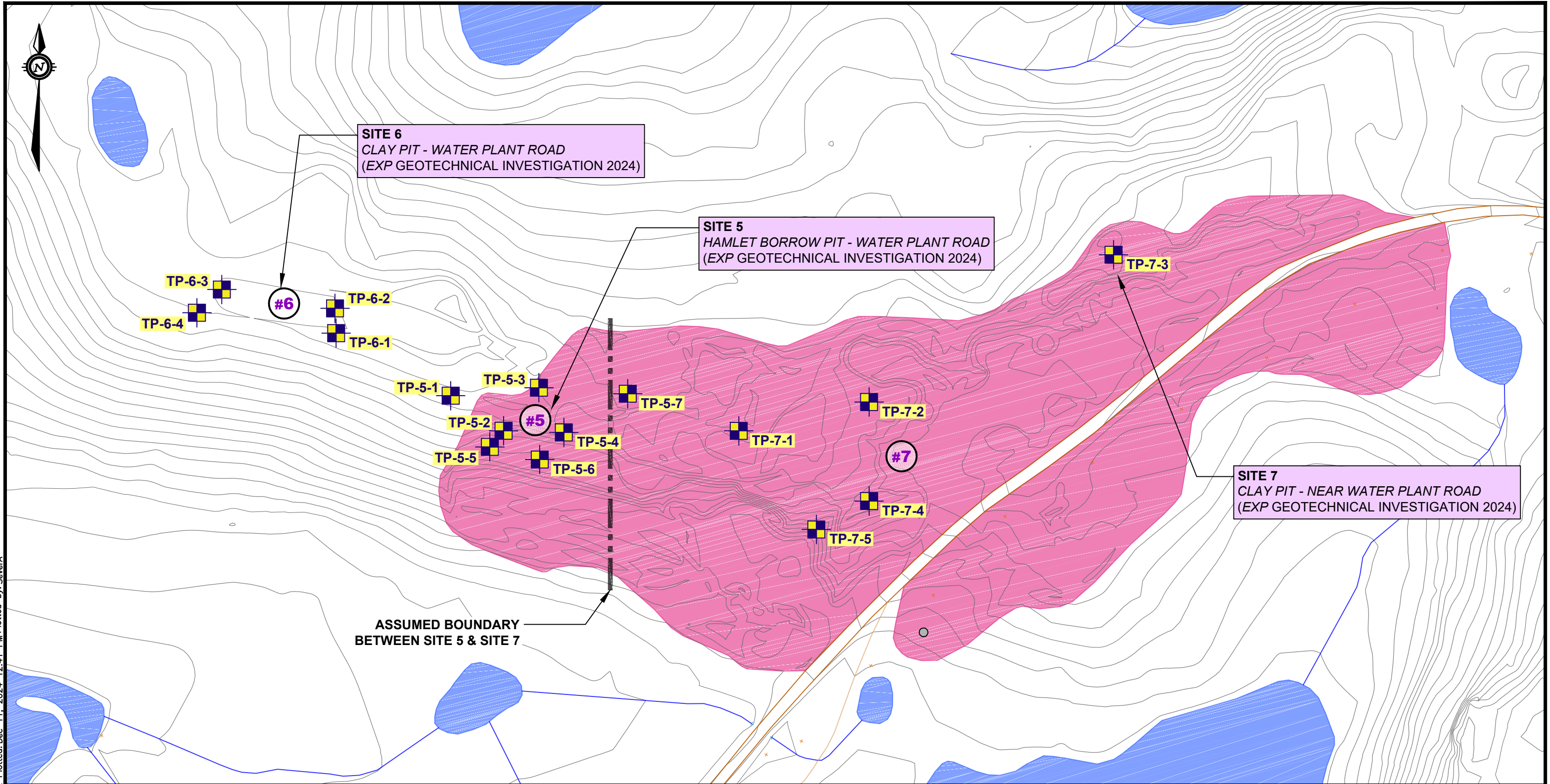
EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | |
|----------------------|-----------------------------------|--------------------|---|----------|-----|----------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 4 | Sample: | 4-2 | Depth (m) : 0 - 1.67 |
| Sample Composition : | | Gravel (%) | 54 | Sand (%) | 44 | Silt & Clay (%) 2 |
| Sample Description : | Well Graded Gravel with Sand (GW) | | | | | Figure : 21 |

Filename: E:\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
Last Saved: Dec 11, 2024 12:40 PM
Last Plotted: Dec 11, 2024 12:41 PM
Plotted by: SeverA



LEGEND

QUARRY
 WATER

GRAVEL ROAD
 TRAIL

BUILDINGS FOOTPRINTS

TP-5-1 TEST PIT AND SAMPLE NUMBER AND LOCATION

#5 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com



DESIGN IT/SA
DRAWN AS
DATE DECEMBER 2024
FILE NO OTT-24008122-A0

GRANULAR MATERIALS RESOURCES STUDY
TALOYOAK, NUNAVUT, CANADA
AGGREGATE RESOURCE LOCATIONS
SITE #5

SCALE
1:2,000
SKETCH NO
FIG 22

ORIGINAL SHEET SIZE: 17" X 11"

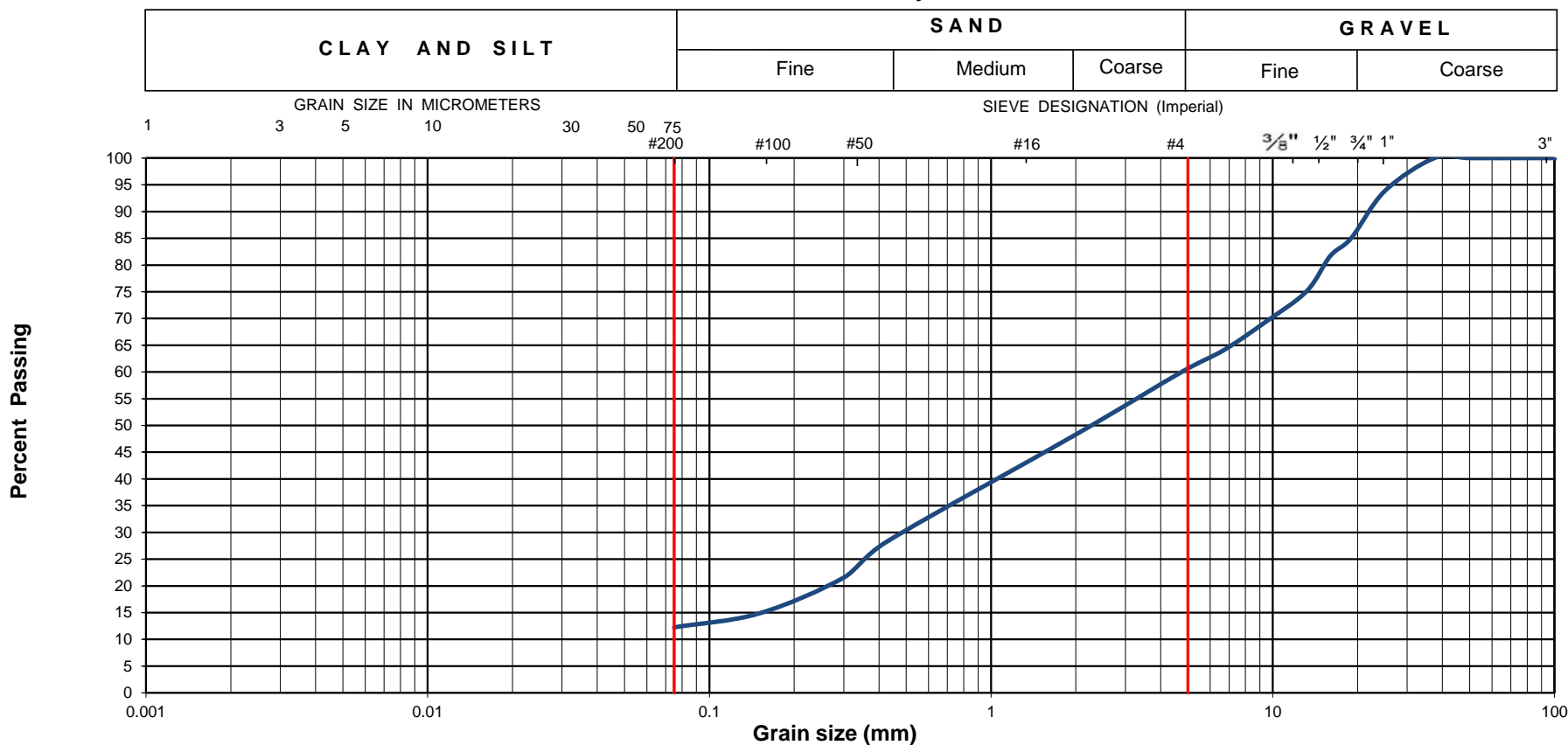
HORIZONTAL 1:2000



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



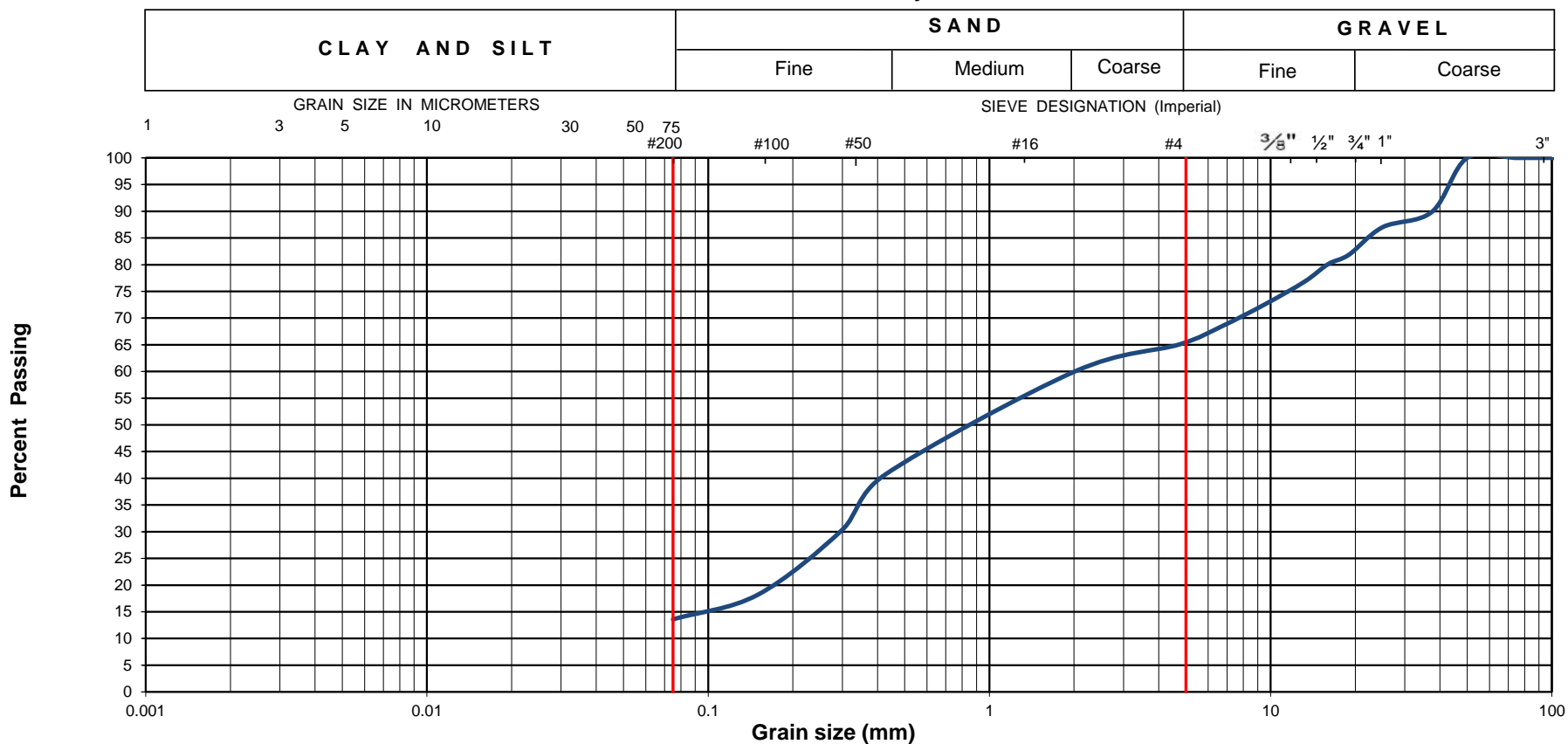
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|----------------------|--------------------------|--------------------|---|----------|-----|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 5 | Sample: | 5-1 | Depth (m) : | 0 - 0.9 |
| Sample Composition : | | Gravel (%) | 40 | Sand (%) | 48 | Silt & Clay (%) | 12 |
| Sample Description : | Sand and Gravel (SM) | | | | | Figure : | 23 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



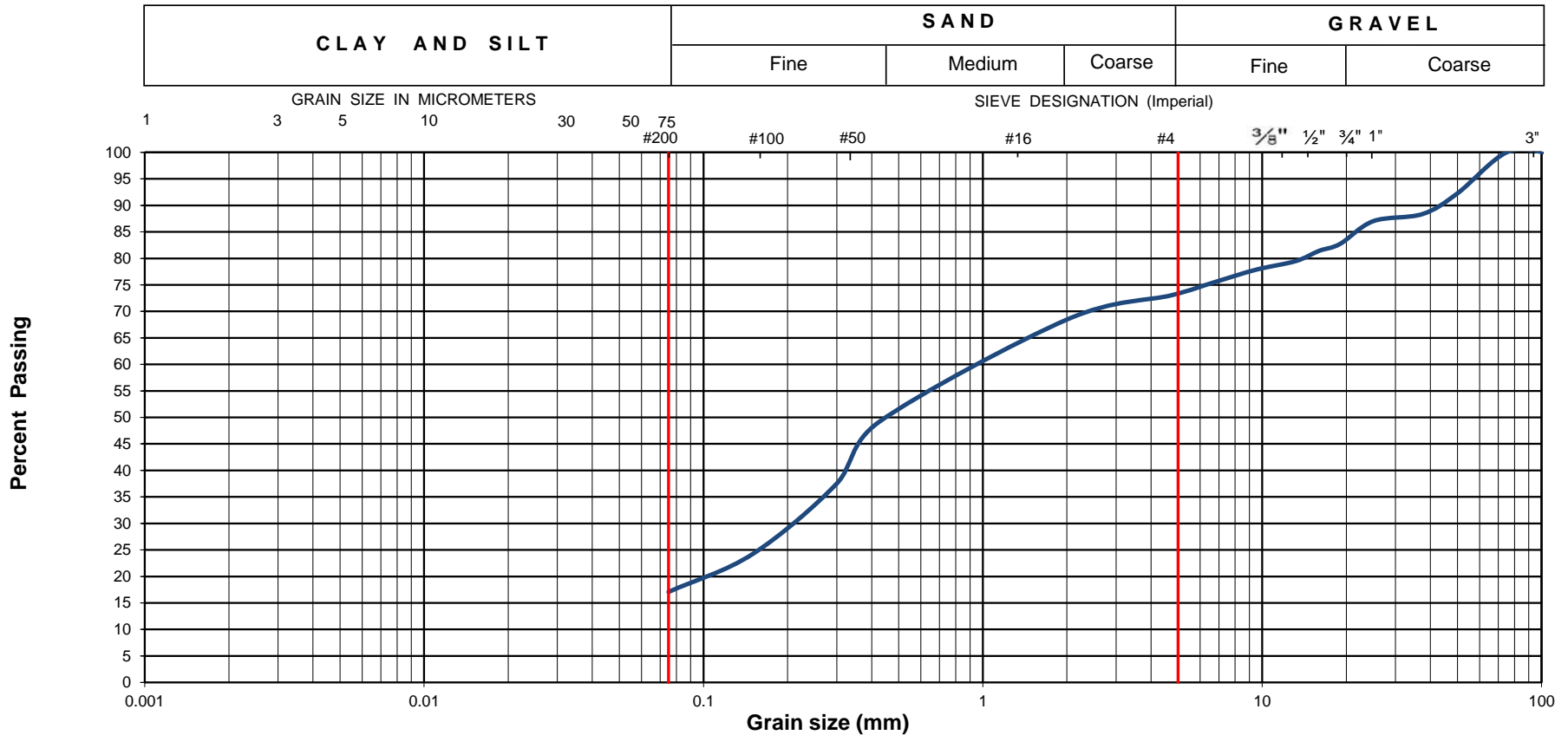
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|----------------------|-----------------------------|--------------------|---|----------|-----|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 5 | Sample: | 5-2 | Depth (m) : | 0 - 1.5 |
| Sample Composition : | | Gravel (%) | 35 | Sand (%) | 51 | Silt & Clay (%) | 14 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | Figure : | 24 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



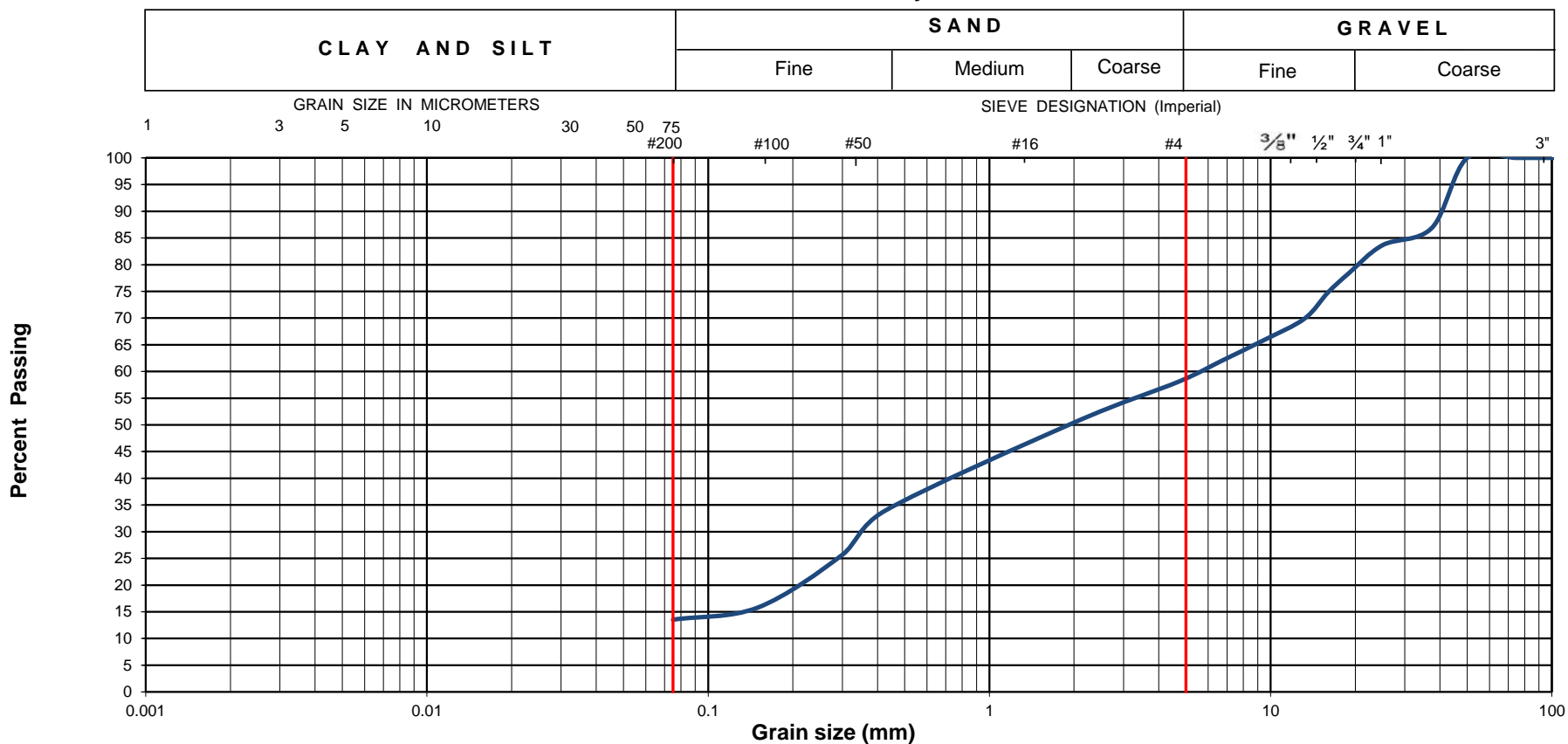
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|----------------------|-----------------------------|--------------------|---|----------|-----|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 5 | Sample: | 5-5 | Depth (m) : | 0 - 0.9 |
| Sample Composition : | | Gravel (%) | 27 | Sand (%) | 56 | Silt & Clay (%) | 17 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | Figure : | 25 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

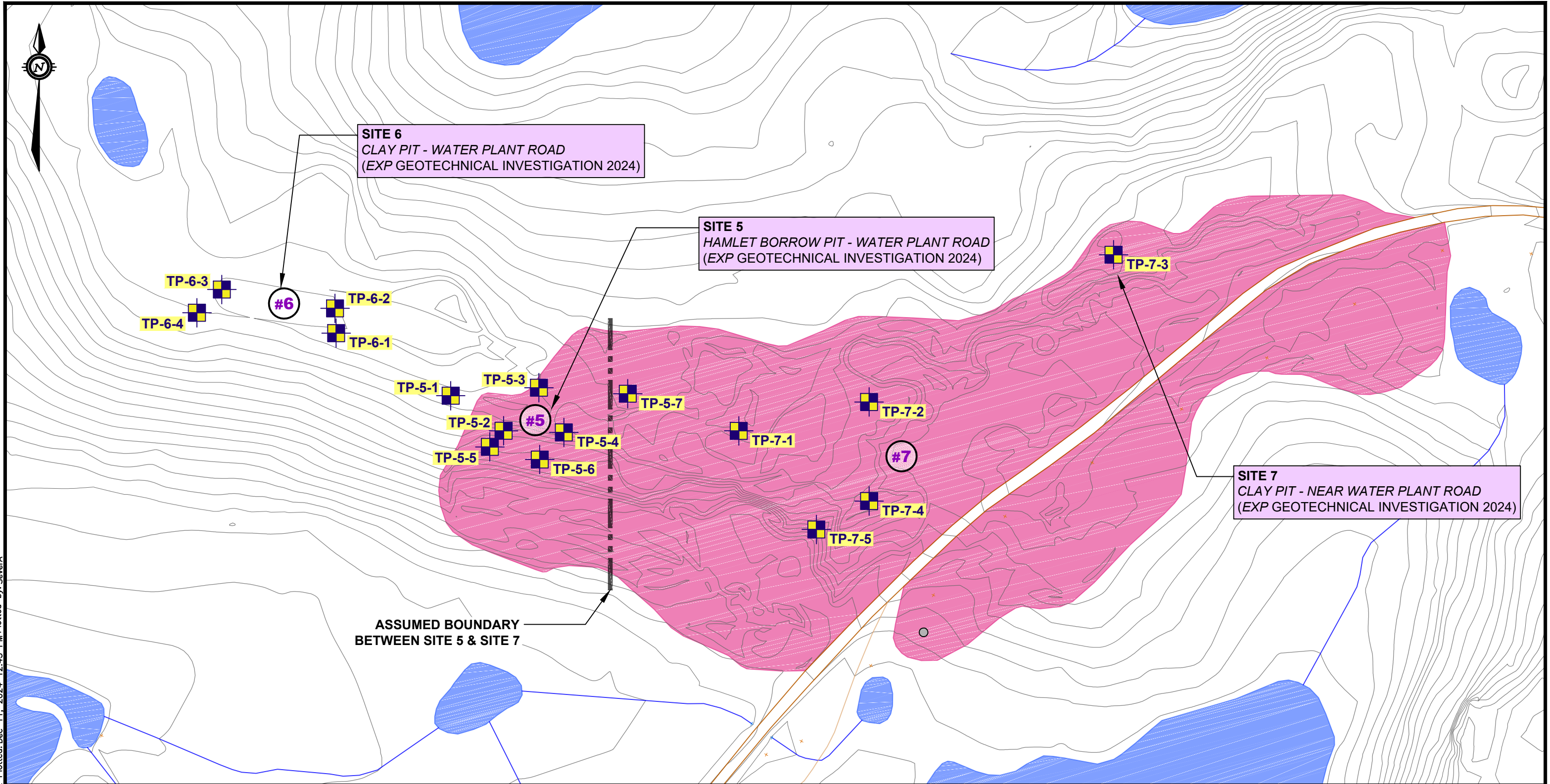
EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

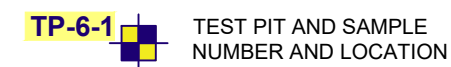
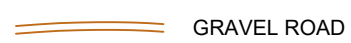
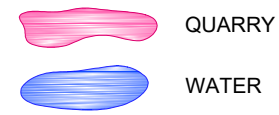


| | | | | | | | |
|----------------------|-----------------------------|--------------------|---|----------|-----|-----------------|-------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 5 | Sample: | 5-6 | Depth (m) : | 0 - 0.9 |
| Sample Composition : | | Gravel (%) | 42 | Sand (%) | 44 | Silt & Clay (%) | 14 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | | Figure : 26 |

Filename: E:\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
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LEGEND



#6 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
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DRAWN AS
DATE DECEMBER 2024
FILE NO OTT-24008122-A0

GRANULAR MATERIALS RESOURCES STUDY
TALOYOAK, NUNAVUT, CANADA
AGGREGATE RESOURCE LOCATIONS
SITE #6

SCALE
1:2,000
SKETCH NO
FIG 27

ORIGINAL SHEET SIZE: 17" X 11"
0 20m 40m 80m
HORIZONTAL 1:2000

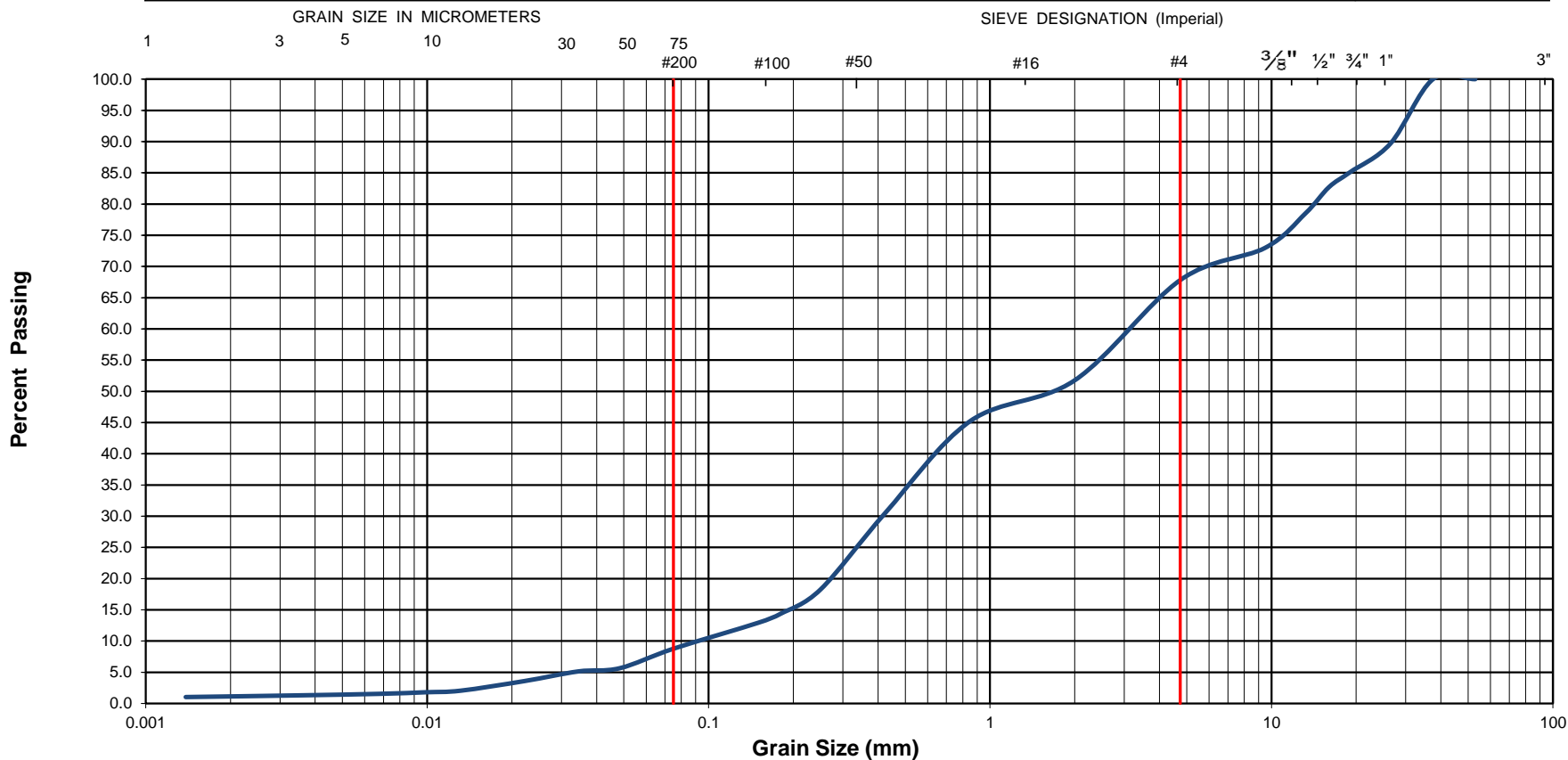


Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | |
|----------------------|---|--------------------|--|-------------|----------|---------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak, Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 6 | Sample No.: | 6-1 | Depth (m) : 0 - 1.5 |
| Sample Description : | % Silt and Clay | 9 | % Sand | 59 | % Gravel | 32 |
| Sample Description : | Poorly Graded Sand with Silt and Gravel (SP-SM) | | | | | Figure : 28 |

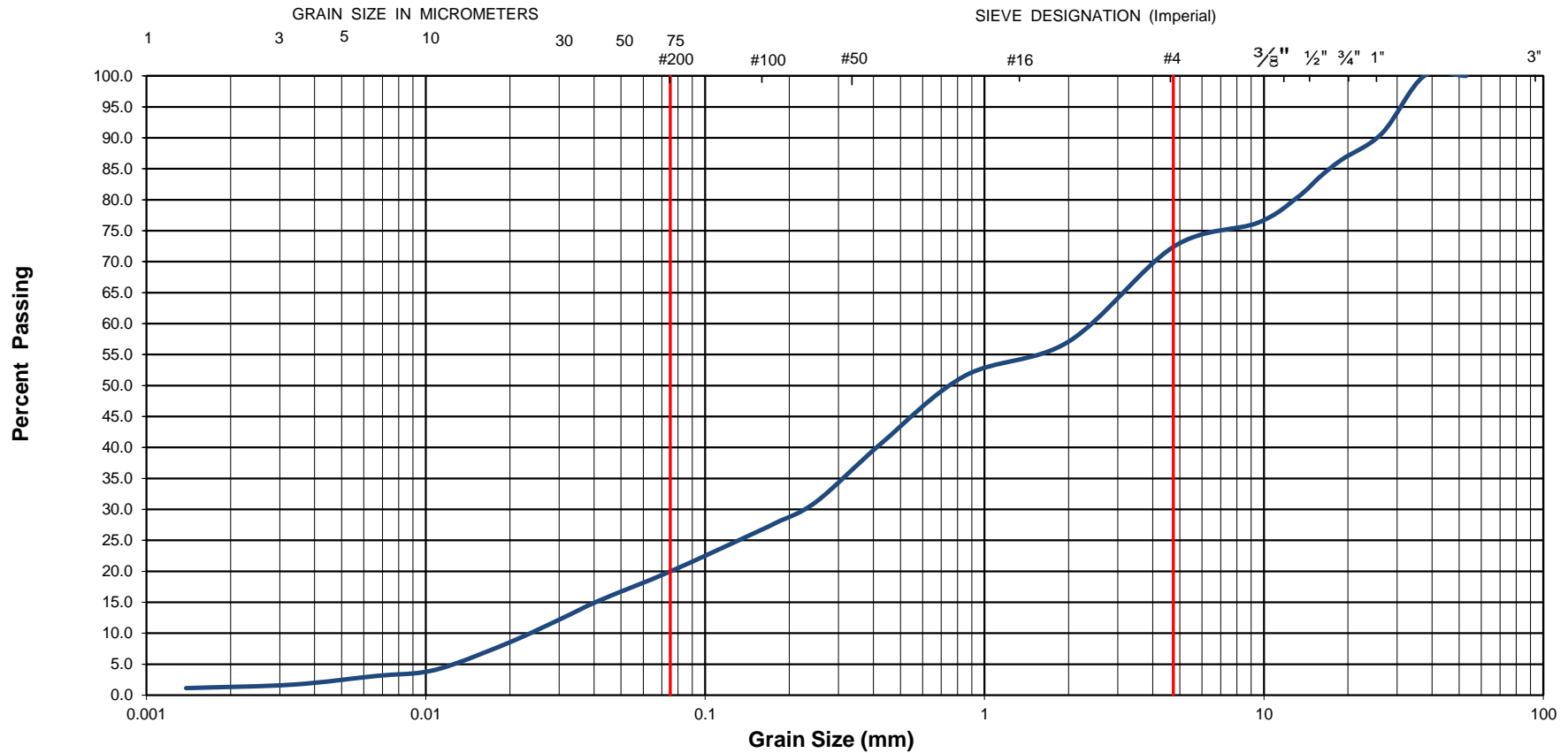


Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |

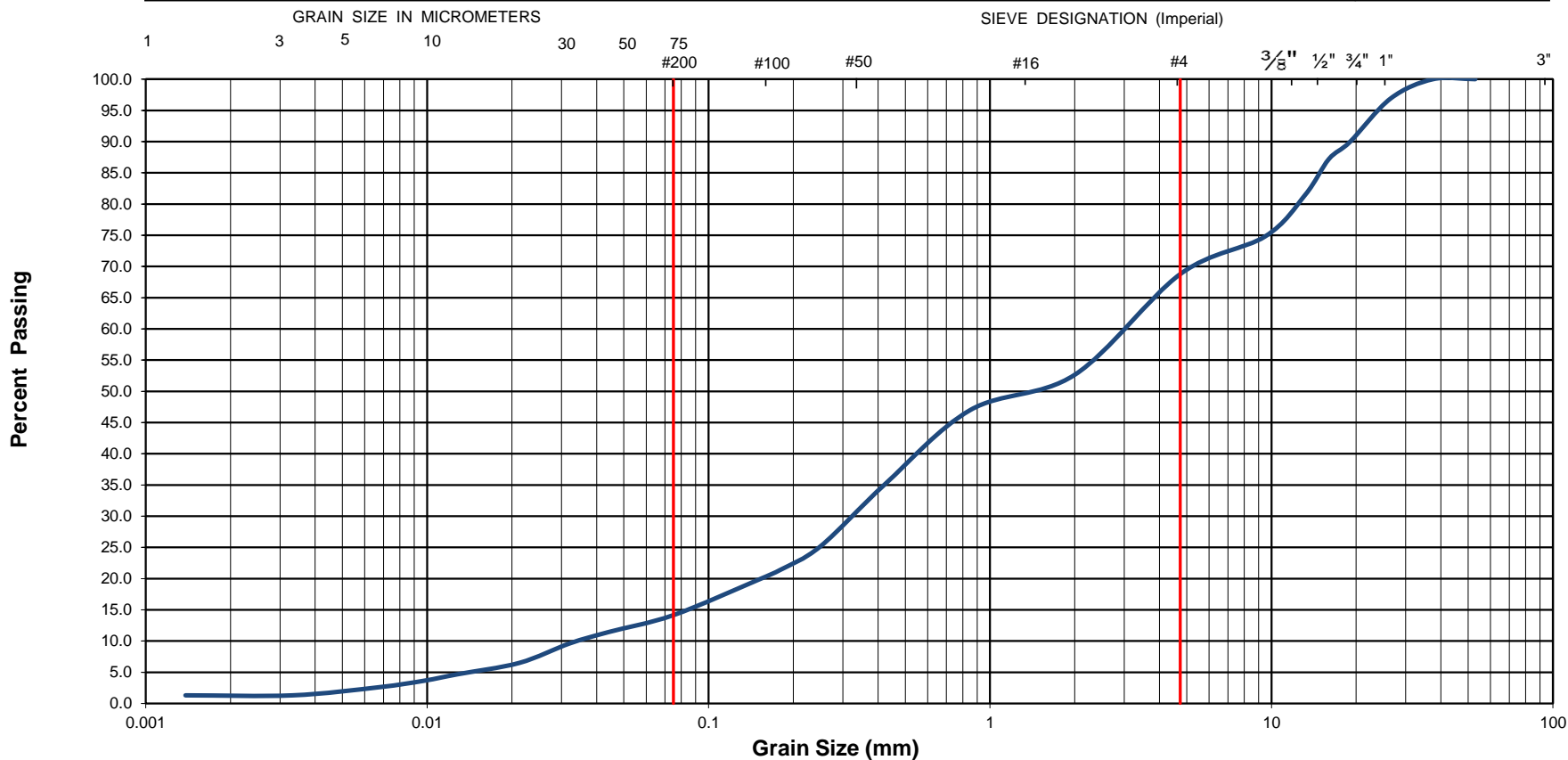


| | | | | | | |
|----------------------|-----------------------------|--------------------|--|-------------|----------|---------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak, Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 6 | Sample No.: | 6-3 | Depth (m) : 0 - 0.6 |
| Sample Description : | % Silt and Clay | 20 | % Sand | 52 | % Gravel | 28 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | Figure : 29 |



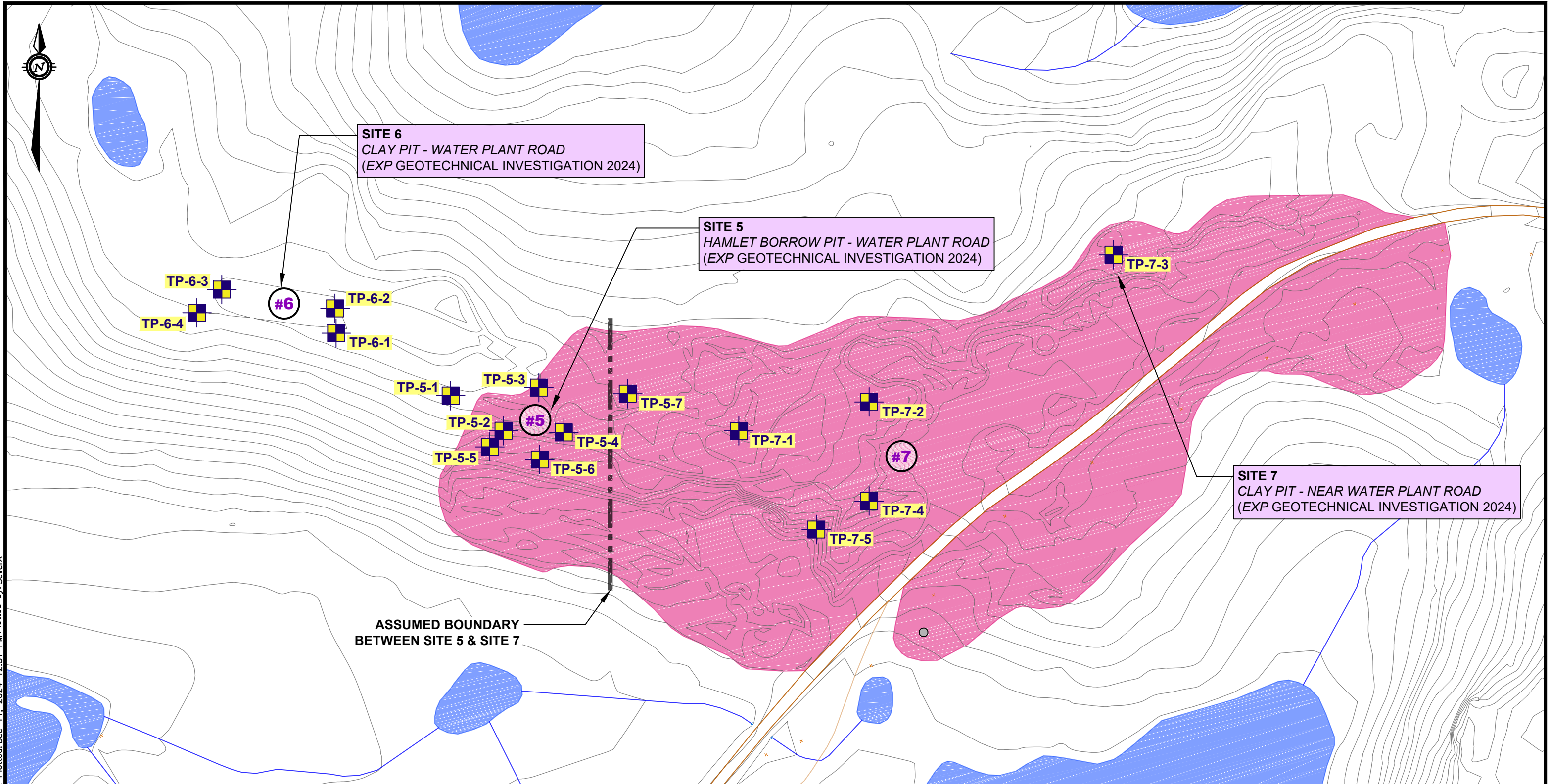
EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |

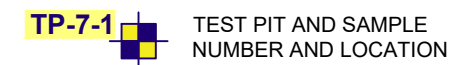
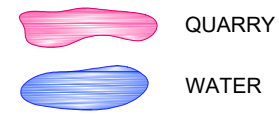


| | | | | | | | | | | | |
|----------------------|-----------------------------|--------------------|----|--|----|-------------|----|----------|--|-------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | | Granular Search, Hamlet of Taloyoak, Nunavut | | | | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | | Hamlet of Taloyoak, Nunavut | | | | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | | Site 6 | | Sample No.: | | 6-4 | | Depth (m) : | 0 - 0.6 |
| Sample Description : | | % Silt and Clay | 14 | % Sand | 55 | % Gravel | 31 | Figure : | | 30 | |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | | | | | | |

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LEGEND



#7 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

ORIGINAL SHEET SIZE: 17" X 11"
0 20m 40m 80m
HORIZONTAL 1:2000

BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

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DATE DECEMBER 2024
FILE NO OTT-24008122-A0

GRANULAR MATERIALS RESOURCES STUDY
TALOYOAK, NUNAVUT, CANADA
AGGREGATE RESOURCE LOCATIONS
SITE #7

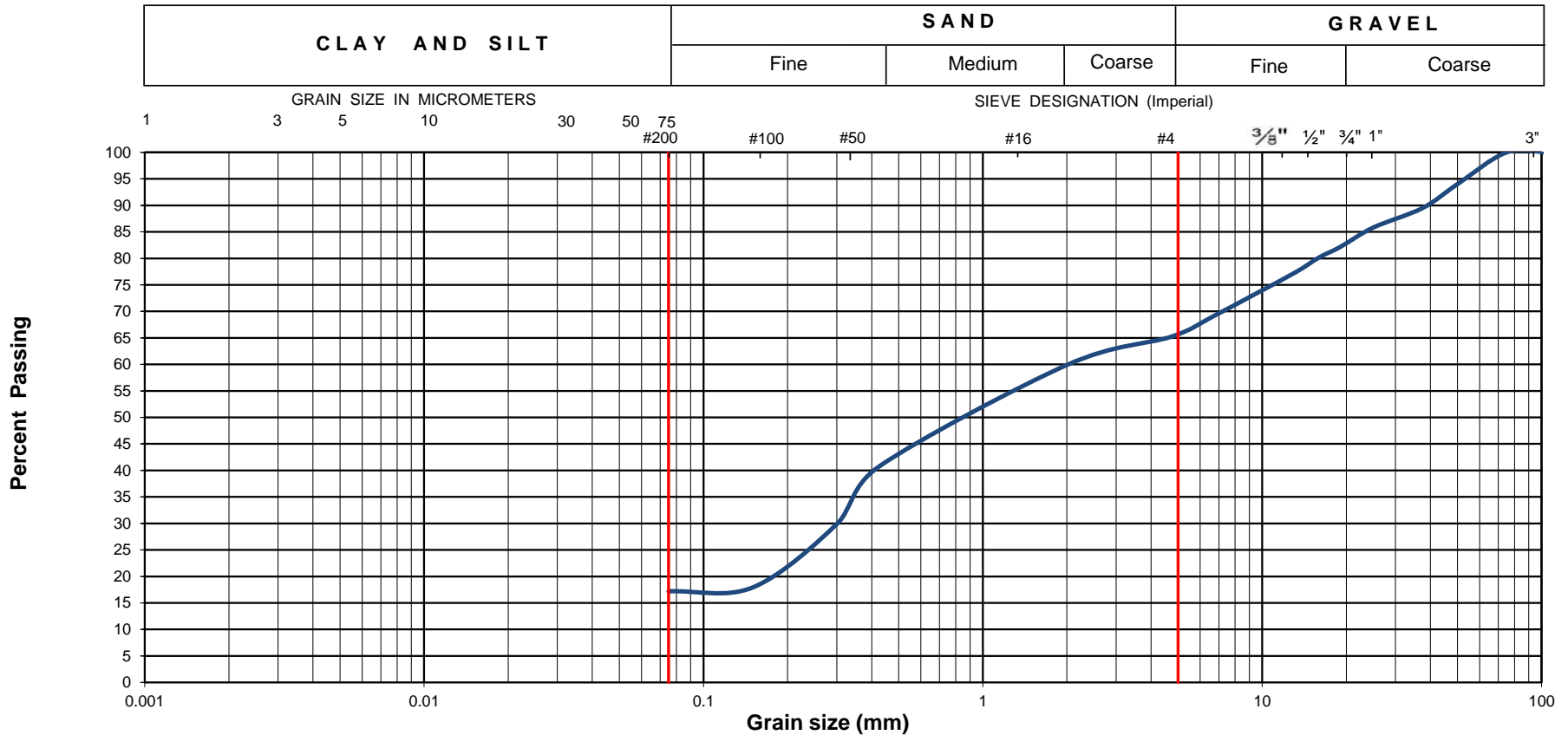
SCALE
1:2,000
SKETCH NO
FIG 31



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System



| | | | | | | | |
|----------------------|-----------------------------|--------------------|---|----------|-----|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 7 | Sample: | 7-1 | Depth (m) : | 0 - 1.5 |
| Sample Composition : | | Gravel (%) | 35 | Sand (%) | 47 | Silt & Clay (%) | 18 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | Figure : | 32 |

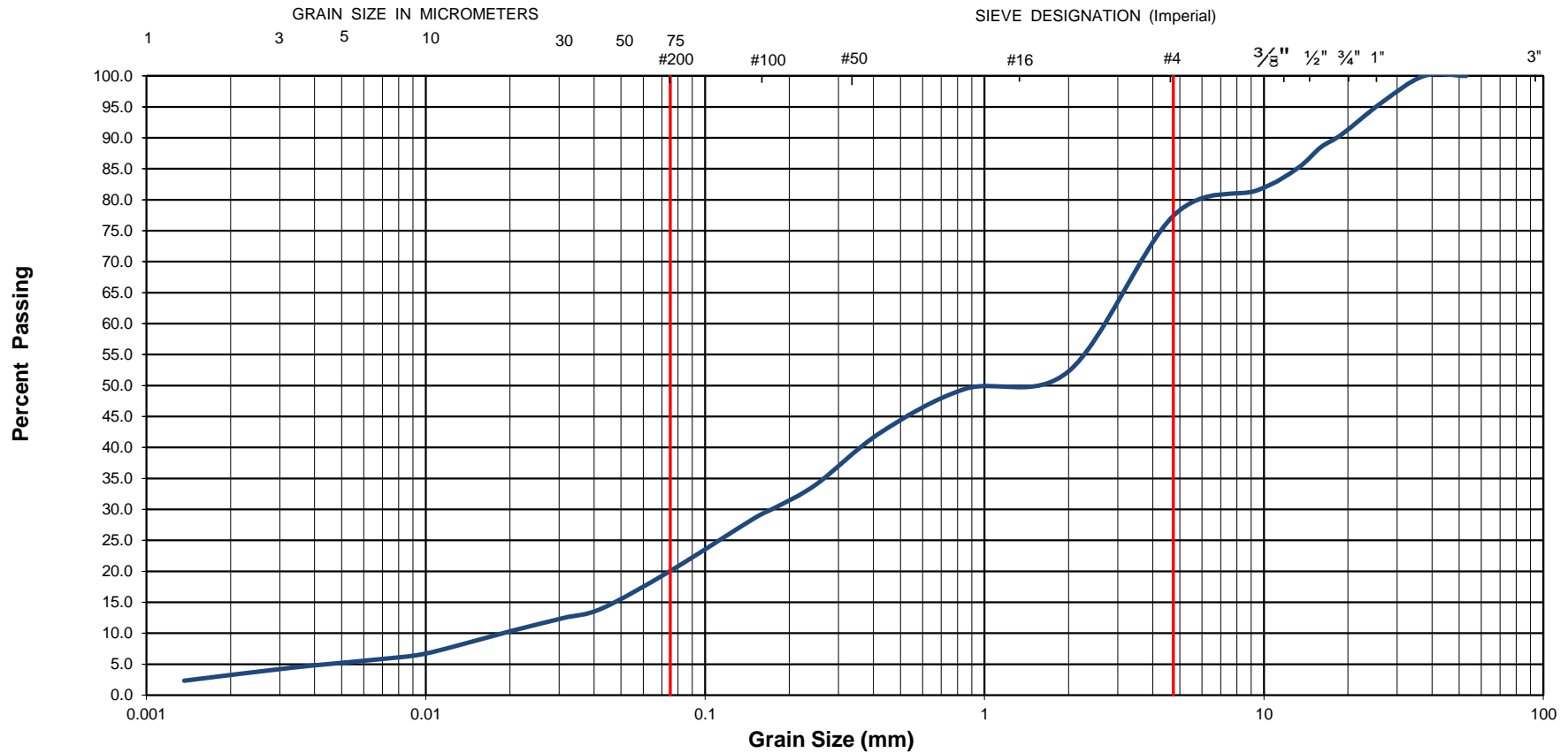


Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



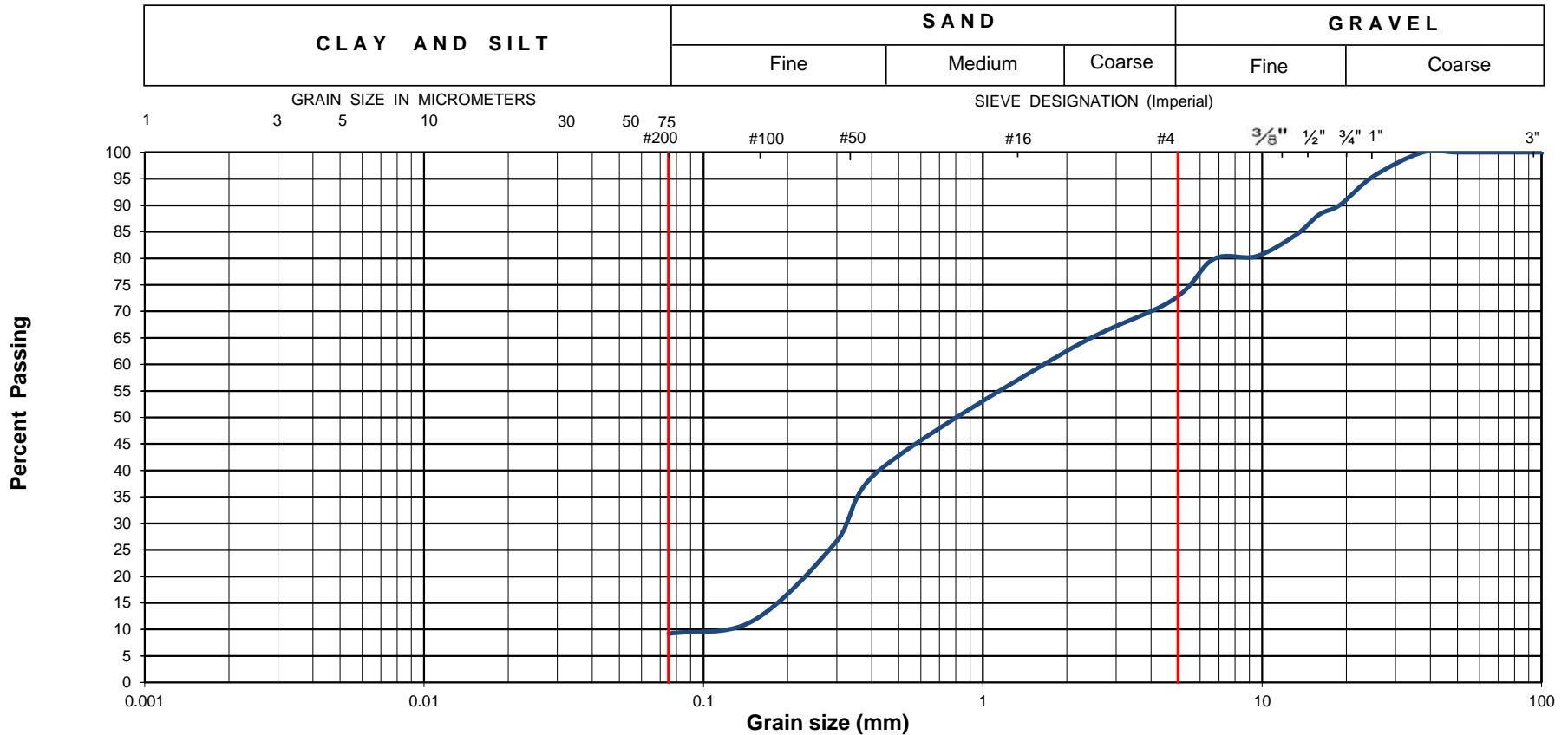
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|----------------------|-----------------------------|--------------------|--|-------------|----------|---------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak, Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 7 | Sample No.: | 7-3 | Depth (m) : 0 - 1.5 |
| Sample Description : | % Silt and Clay | 20 | % Sand | 57 | % Gravel | 23 |
| Sample Description : | Silty Sand with Gravel (SM) | | | | | Figure : 33 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

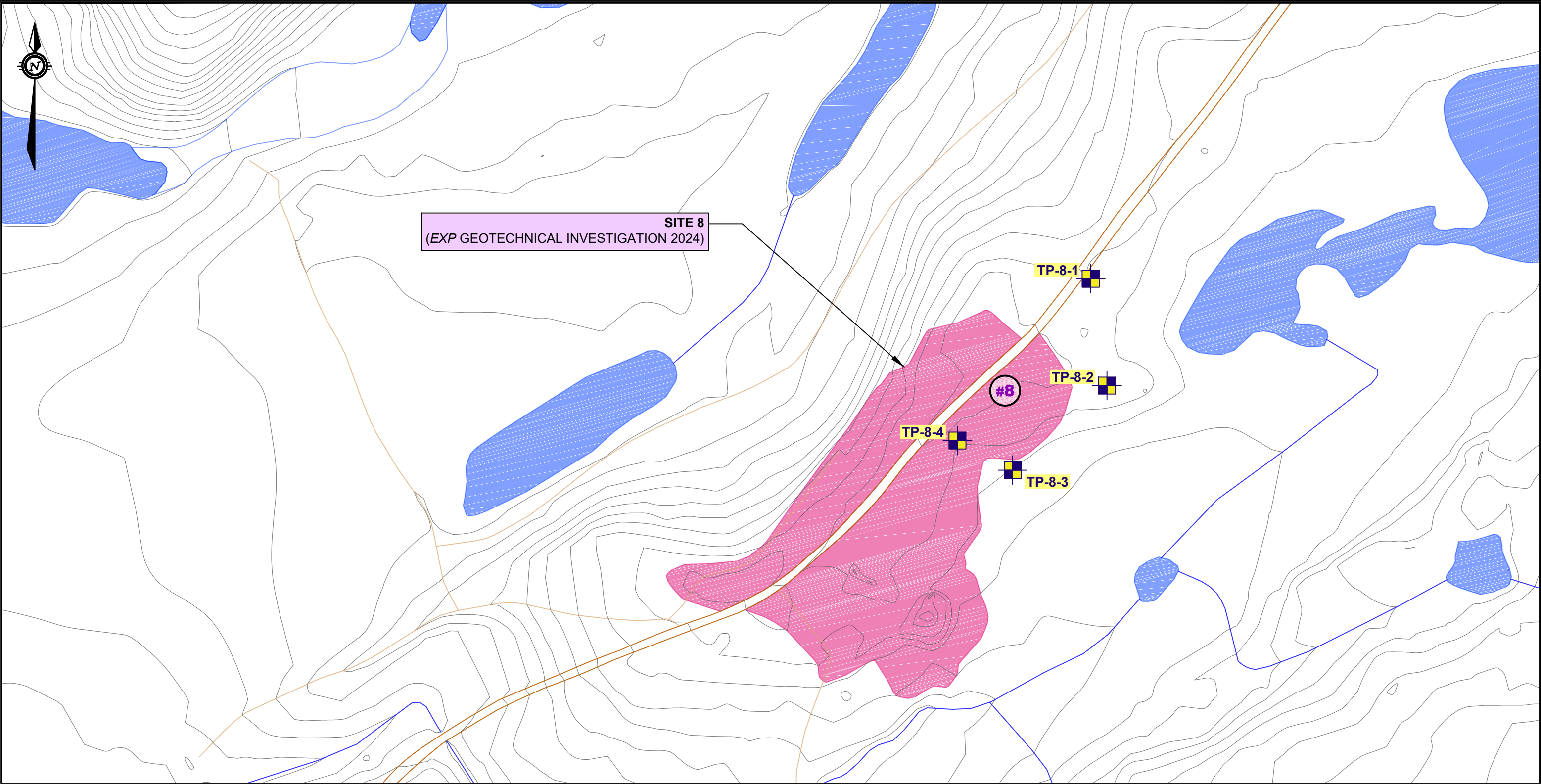
EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System


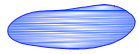


| | | | | | | | |
|----------------------|---|--------------------|---|----------|-----|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 7 | Sample: | 7-4 | Depth (m) : | 0 - 0.6 |
| Sample Composition : | | Gravel (%) | 28 | Sand (%) | 63 | Silt & Clay (%) | 9 |
| Sample Description : | Poorly Graded Sand with Silt and Gravel (SP-SM) | | | | | Figure : | 34 |

Filename: E:\OTT-24008122-A0\60_Execution\65 Drawings\OTT-24008122-A0_Geo.dwg
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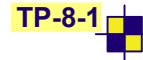
LEGEND


 QUARRY
 WATER

 GRAVEL ROAD

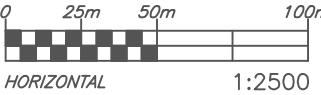
 TRAIL

 BUILDINGS FOOTPRINTS

 **TP-8-1** TEST PIT AND SAMPLE NUMBER AND LOCATION

 **#8** STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020)
(EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

ORIGINAL SHEET SIZE: 17" X 11"



BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
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| | |
|---------|-----------------|
| DESIGN | IT/SA/SB |
| DRAWN | AS |
| DATE | NOVEMBER 2024 |
| FILE NO | OTT-24008122-A0 |

| |
|------------------------------------|
| GRANULAR MATERIALS RESOURCES STUDY |
| TALOYOAK, NUNAVUT, CANADA |
| AGGREGATE RESOURCE LOCATIONS |
| SITE #8 |

| |
|-----------|
| SCALE |
| 1:2,500 |
| SKETCH NO |
| FIG 35 |

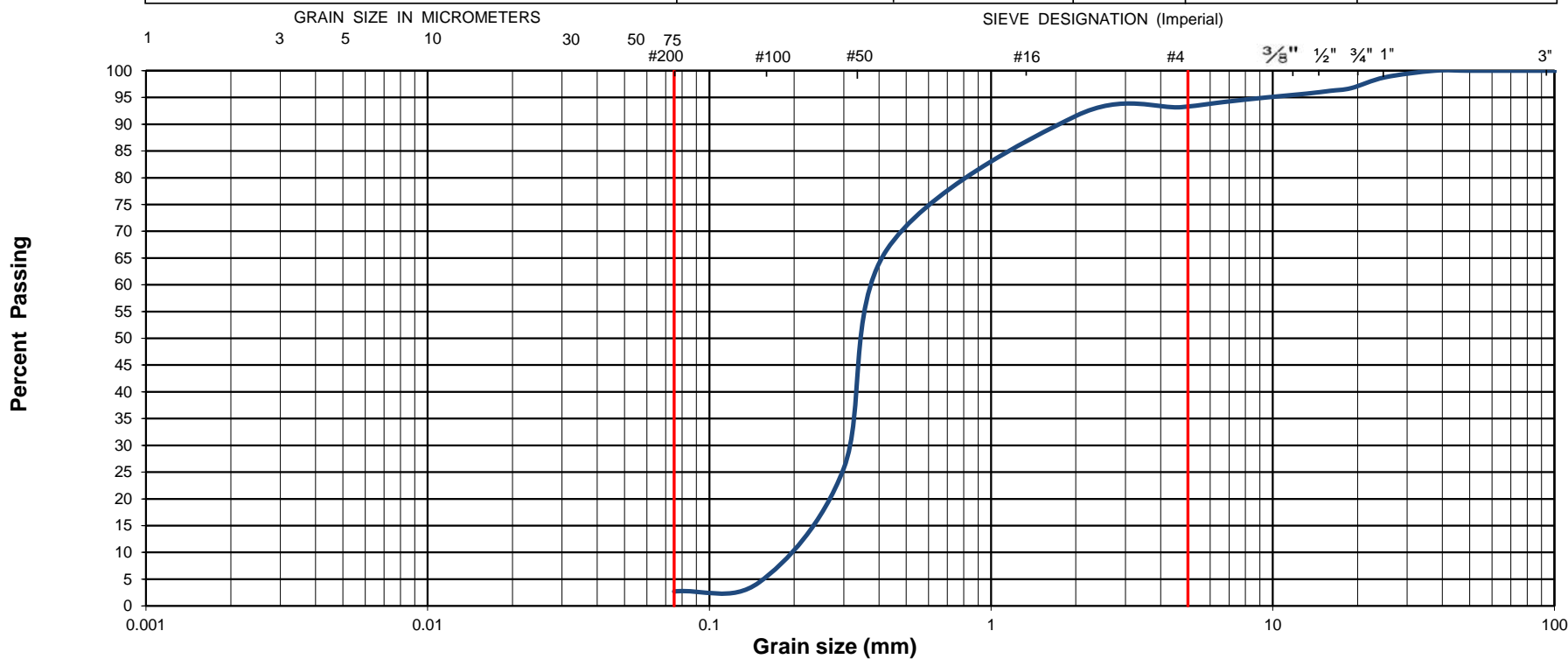


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



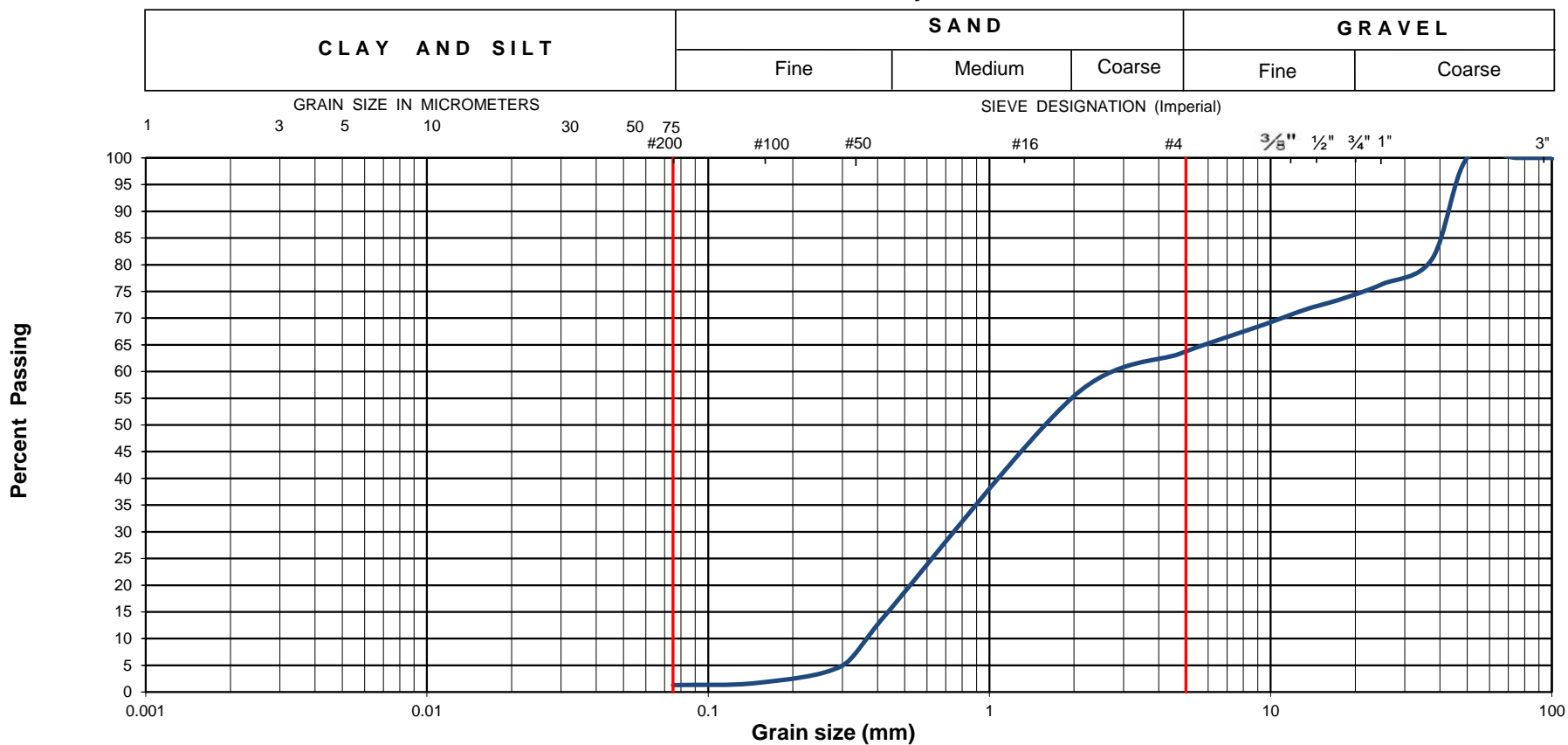
| | | | | | | |
|----------------------|--------------------------|--------------------|---|----------|-------|---------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 8 | Sample: | 8-1-1 | Depth (m) : 0 - 1.0 |
| Sample Composition : | | Gravel (%) | 7 | Sand (%) | 90 | Silt & Clay (%) 3 |
| Sample Description : | Poorly Graded Sand (SP) | | | | | Figure : 36 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

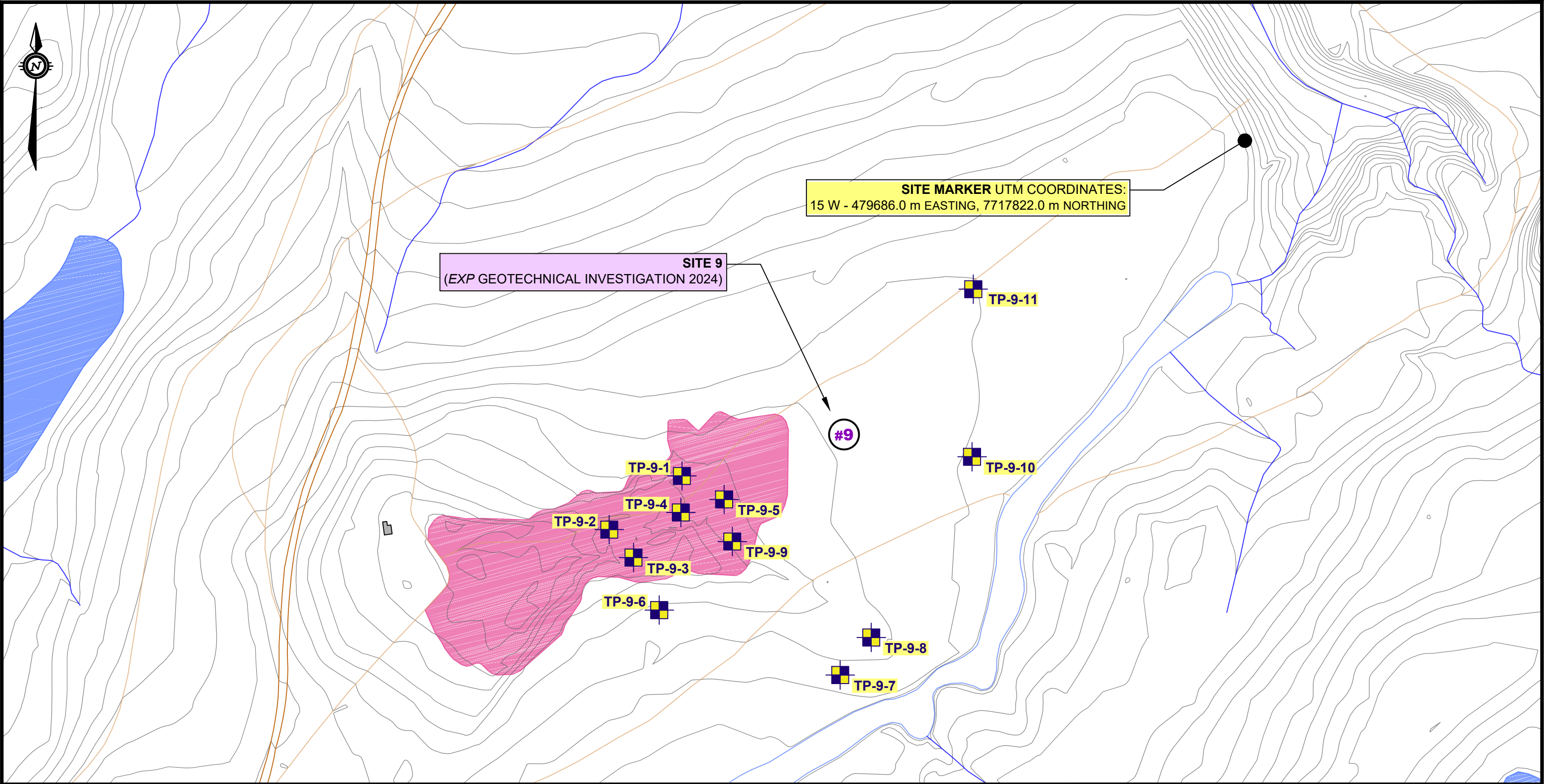
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100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System





| | | | | | | |
|----------------------|---------------------------------|--------------------|---|----------|-------|----------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 8 | Sample: | 8-4-1 | Depth (m) : 0 - 0.45 |
| Sample Composition : | | Gravel (%) | 37 | Sand (%) | 62 | Silt & Clay (%) 1 |
| Sample Description : | Poorly Graded Gravely Sand (SP) | | | | | Figure : 37 |

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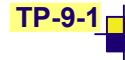



LEGEND

 QUARRY
 WATER

 GRAVEL ROAD
 TRAIL

 BUILDINGS FOOTPRINTS

 TEST PIT AND SAMPLE NUMBER AND LOCATION

 STUDY SITE NUMBER & LOCATION
(EXP REPORT #: OTT-00254843, DATED: DECEMBER 3, 2020
EXP REPORT #: OTT-24008122-A0, DATED: OCTOBER, 2024)

BASE DRAWINGS SOURCE:
GOVERNMENT OF NUNAVUT
COMMUNITY & GOVERNMENT
SERVICES PLANNING & LANDS DIVISION

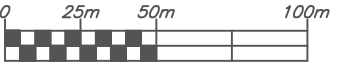
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| | |
|---------|-----------------|
| DESIGN | IT/SA/SB |
| DRAWN | AS |
| DATE | DECEMBER 2024 |
| FILE NO | OTT-24008122-A0 |

| |
|------------------------------------|
| GRANULAR MATERIALS RESOURCES STUDY |
| TALOYOAK, NUNAVUT, CANADA |
| AGGREGATE RESOURCE LOCATIONS |
| SITE #9 |

| |
|-----------|
| SCALE |
| 1:2,500 |
| SKETCH NO |
| FIG 38 |

ORIGINAL SHEET SIZE: 17" X 11"

HORIZONTAL 1:2500

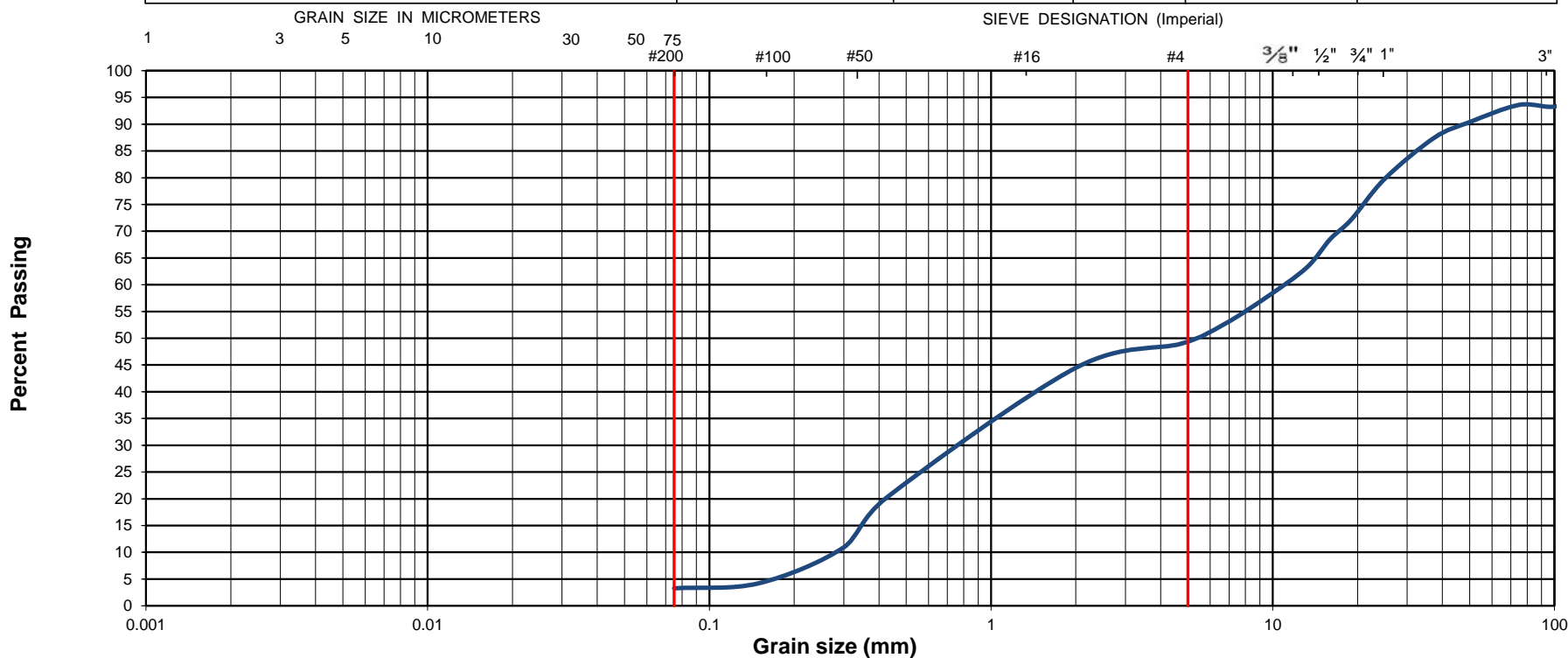


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-------|---------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 9 | Sample: | 9-2-1 | Depth (m) : 0 - 0.6 |
| Sample Composition : | | Gravel (%) | 51 | Sand (%) | 46 | Silt & Clay (%) 3 |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | Figure : 39 |

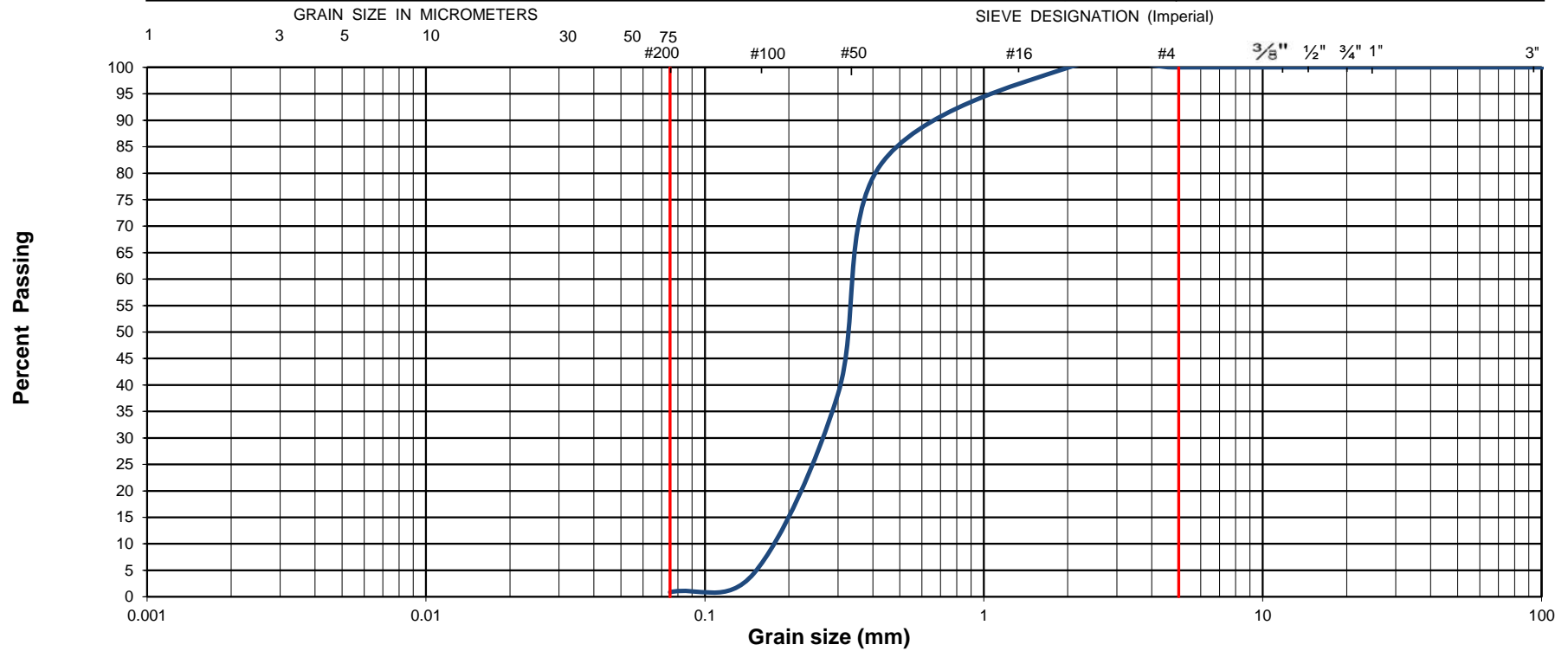


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | |
|----------------------|--------------------------|--------------------|---|----------|-------|------------------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 9 | Sample: | 9-2-2 | Depth (m) : 0.6 - 1.67 |
| Sample Composition : | | Gravel (%) | 0 | Sand (%) | 99 | Silt & Clay (%) 1 |
| Sample Description : | Poorly Graded Sand (SP) | | | | | Figure : 40 |

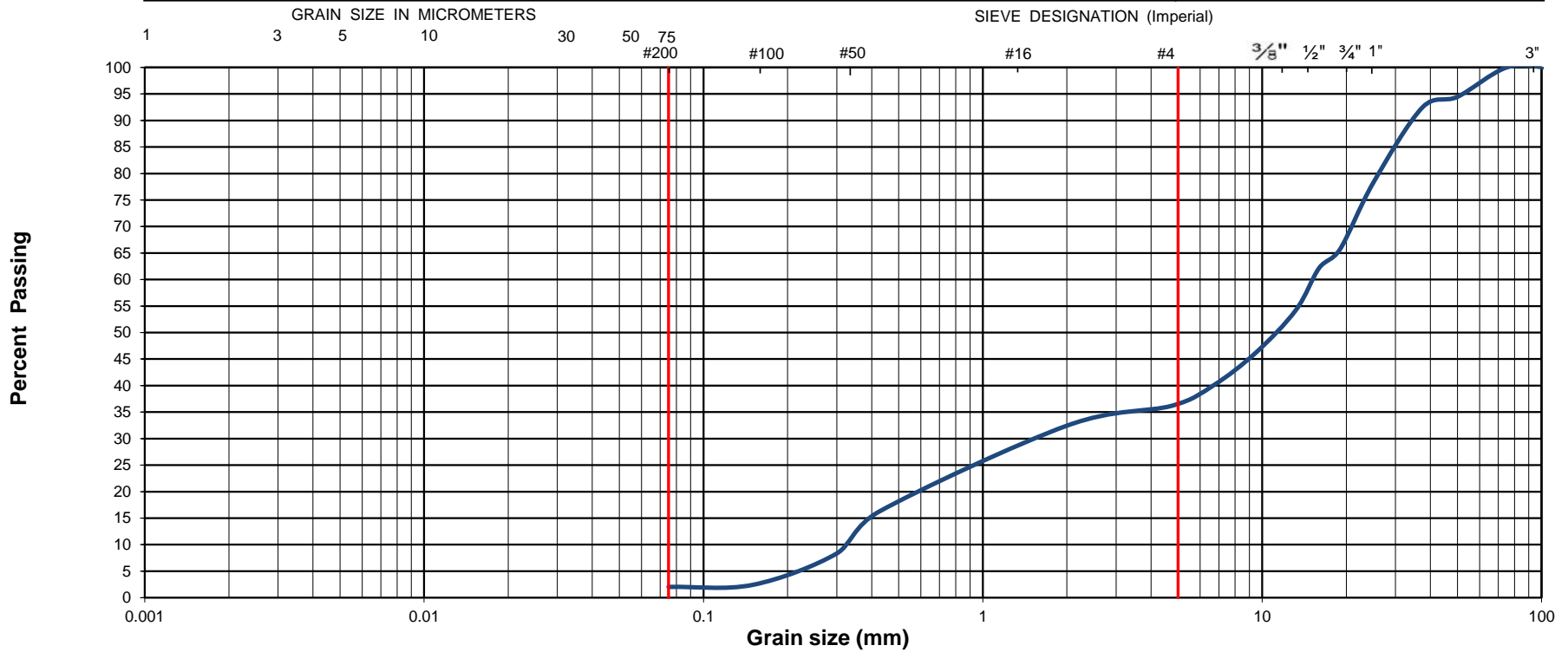


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

EXP Services Inc.
100-2650 Queensview Drive
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Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



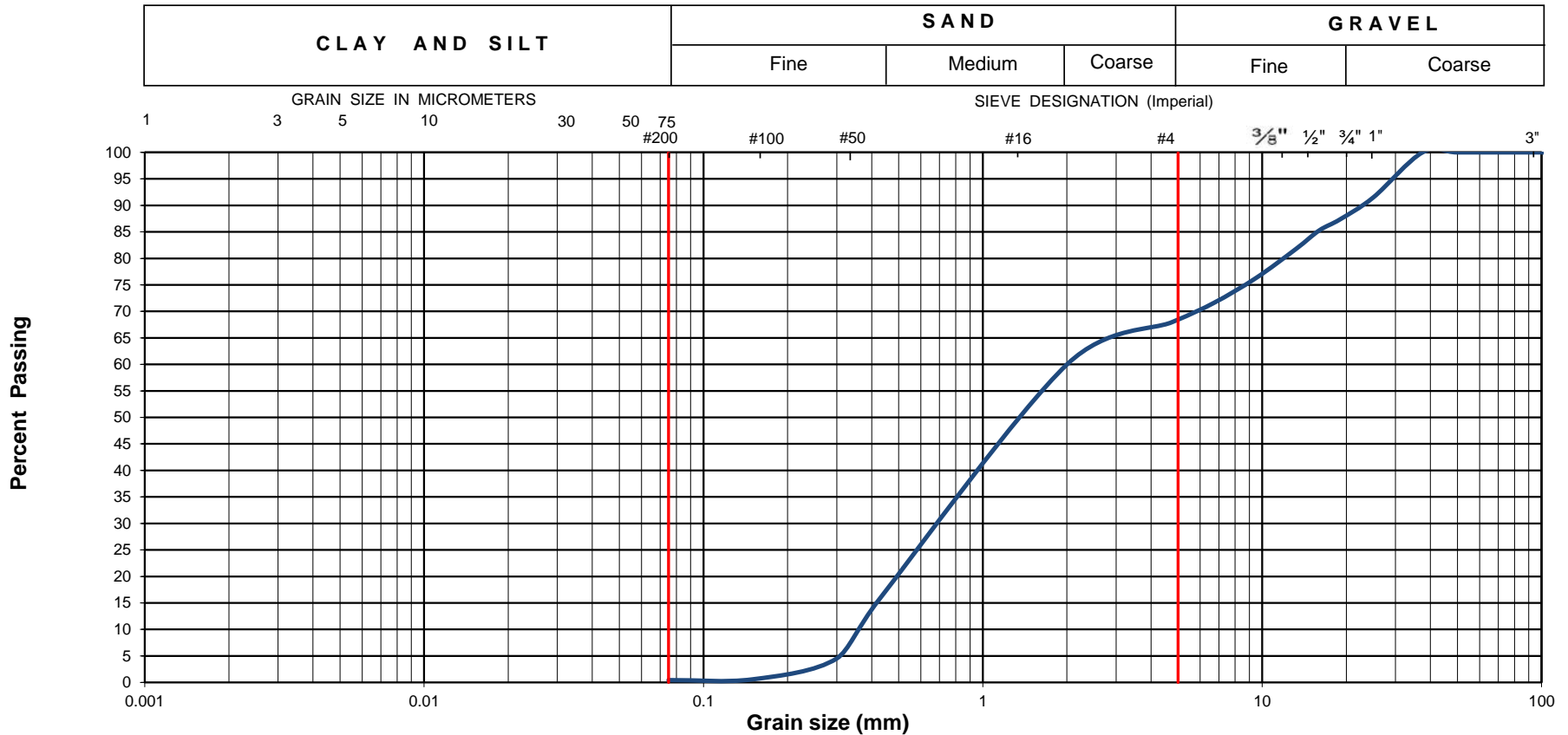
| | | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-----|-----------------|-------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 9 | Sample: | 9-3 | Depth (m) : | 0 - 2.1 |
| Sample Composition : | | Gravel (%) | 64 | Sand (%) | 34 | Silt & Clay (%) | 2 |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | | Figure : 41 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

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Unified Soil Classification System



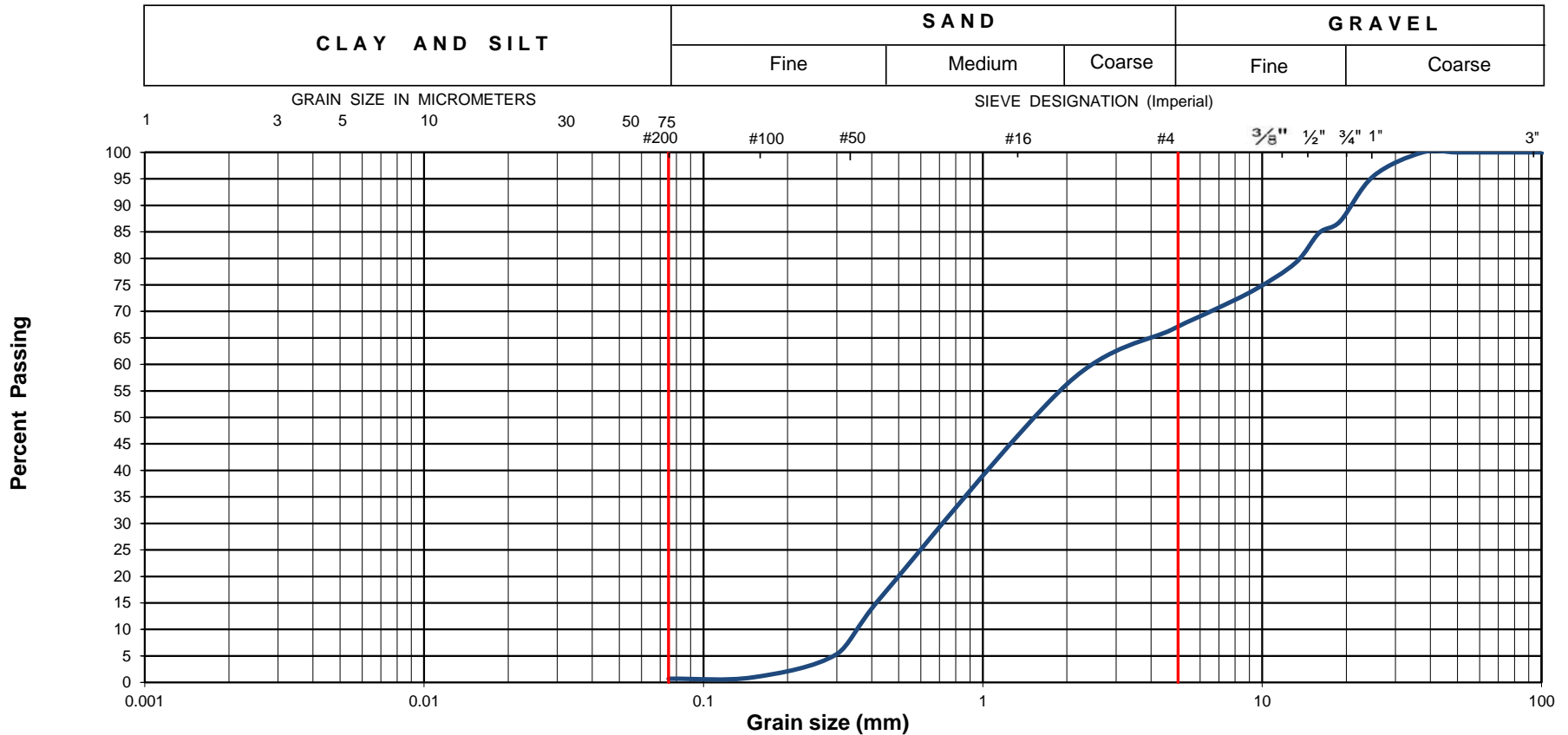
| | | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-------|-----------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 9 | Sample: | 9-6-1 | Depth (m) : | 0 - 0.3 |
| Sample Composition : | | Gravel (%) | 32 | Sand (%) | 68 | Silt & Clay (%) | 0 |
| Sample Description : | Poorly Graded Sand with Gravel (SP) | | | | | Figure : | 42 |



Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

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Unified Soil Classification System



| | | | | | | | |
|----------------------|-------------------------------------|--------------------|---|----------|-------|-----------------|-------------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : | Granular Search, Hamlet of Taloyoak Nunavut | | | | |
| Client : | Hamlet of Taloyoak | Project Location : | Hamlet of Taloyoak, Nunavut | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | Site 9 | Sample: | 9-6-2 | Depth (m) : | 0.3 - 0.6 |
| Sample Composition : | | Gravel (%) | 33 | Sand (%) | 66 | Silt & Clay (%) | 1 |
| Sample Description : | Poorly Graded Gravel with Sand (GP) | | | | | | Figure : 43 |

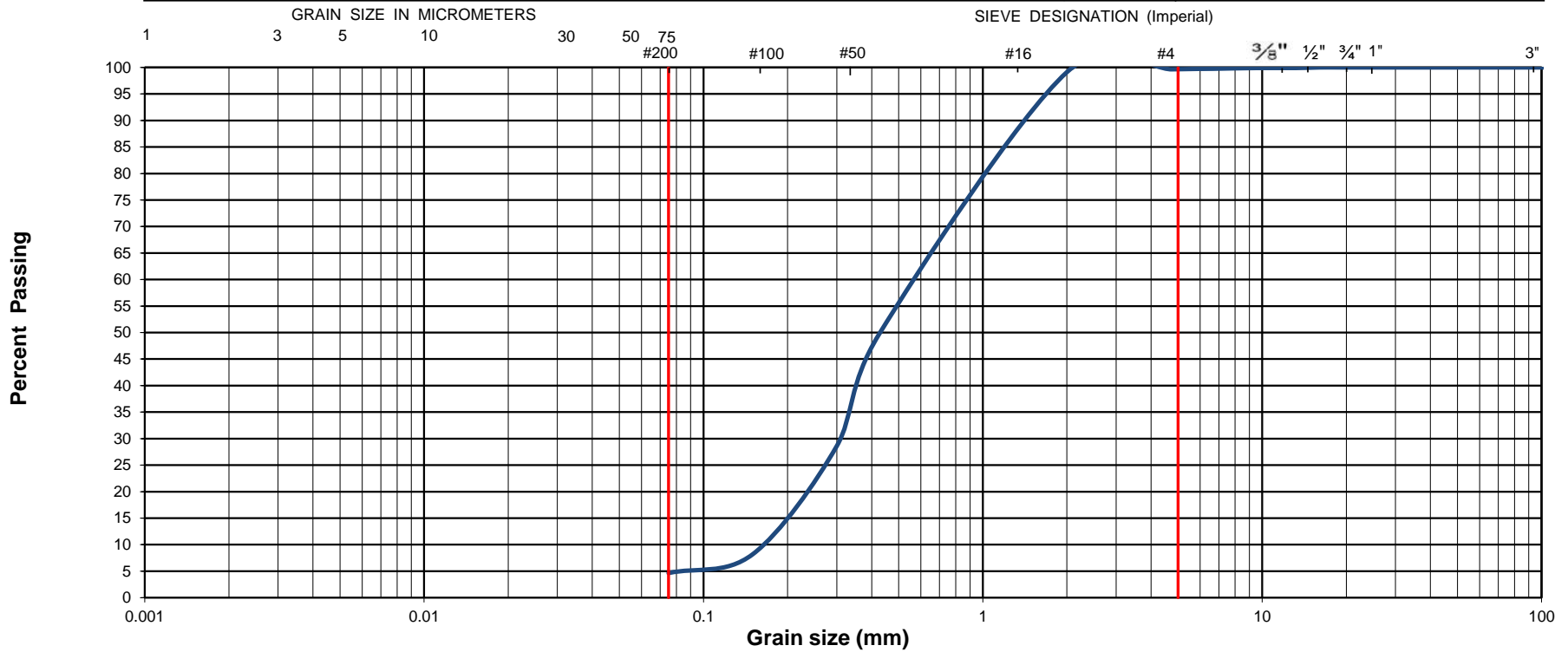


Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
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EXP Services Inc.
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Unified Soil Classification System

| CLAY AND SILT | SAND | | | GRAVEL | |
|---------------|------|--------|--------|--------|--------|
| | Fine | Medium | Coarse | Fine | Coarse |



| | | | | | | | | | | | |
|----------------------|--------------------------|--|---|----------|----|-----------------|---|-------------|--|-------------|---------|
| EXP Project No.: | OTT-24008122-A0 | Project Name : Granular Search, Hamlet of Taloyoak Nunavut | | | | | | | | | |
| Client : | Hamlet of Taloyoak | Project Location : Hamlet of Taloyoak, Nunavut | | | | | | | | | |
| Date Sampled : | September 12 to 14, 2024 | Borehole No: | | Site 9 | | Sample: | | 9-10 | | Depth (m) : | 0 - 1.0 |
| Sample Composition : | | Gravel (%) | 0 | Sand (%) | 95 | Silt & Clay (%) | 5 | Figure : 44 | | | |
| Sample Description : | Poorly Graded Sand (SP) | | | | | | | | | | |

EXP Services Inc.

Hamlet of Taloyoak
Granular Materials Resource Study, Hamlet of Taloyoak, Nunavut
Government of Nunavut SOA 2022-41
OTT-24008122-A0
December 12, 2024

Appendix A: Site Photographs

Site No. 1



Photograph 1: Oversized boulder stockpile at southwest corner of quarry



Photograph 2: South edge of quarry looking west



Photograph 3: North edge of quarry looking west



Photograph 4: Massive, oversized boulders, not crushable, stockpiled at quarry

Site No. 3



Photograph 5: Test Pit 2, Site 3, sand and gravel with cobbles and boulders



Photograph 6: Test Pit 2, Site 3, close up view of material in Test Pit 3-2



Photograph 7: Test Pit 3, Site 3, sand and gravel with cobbles



Photograph 8: Test Pit 3, Site 3, close up view of material



Photograph 9: Test Pit 7, Site 3, view of test pit wall



Photograph 10: Test Pit 7, Site 3 close up view of material in test pit



Photograph 11: Test Pit 10, Site 3, close up view of material in test pit



Photograph 12: Test Pit 10, Site 3, view of test pit wall



Photograph 13: Test Pit 13, Site 3, excavation in progress



Photograph 14: Test Pit 13, Site 3, close up view of material in test pit

Site No. 4



Photograph 15: Test Pit 1, Site 4, view of test pit wall



Photograph 16: Test Pit 1, Site 4, close up view of material in test pit



Photograph 17: Test Pit 2, Site 4, test pit excavation in progress. Note high groundwater table.



Photograph 18: Test Pit 2, Site 4, close up view of material in test pit



Photograph 19: Test Pit 6, Site 4, water puddle in vicinity of test pit



Photograph 20: Test Pit 6, Site 4, view of test pit wall

Site No. 5



Photograph 21: Test Pit 1, Site 5, view of test pit wall



Photograph 22: Test Pit 1, Site 5, close up view of material in test pit



Photograph 23: Test Pit 2, Site 5, partial view of test pit wall



Photograph 24: Test Pit 2, Site 5, sand and gravel with cobbles and boulders



Photograph 25: Test Pit 5, Site 5, lower plateau. Note water in test pit.



Photograph 26: Test Pit 6, Site 5, lower plateau. View of test pit wall.

Site No. 6



Photograph 27: Test Pit 6-2. Northeast corner of old clay pit



Photograph 28: Test Pit 6-4. Southwest corner of old clay pit. Note water in pit.



Photograph 29: Test Pit 6-1. Southeast corner of old clay pit. Note water in pit

Site No. 7



Photograph 30: Test Pit 2, Site 7, upper plateau, northwest corner. View of test pit wall.



Photograph 31: Test Pit 7-1. Top of berm ridge, upper plateau, sand and gravel



Photograph 32: Southeast Test Pit 5, Site 7. View of test pit wall.



Photograph 33: Test Pit 3, Site 7, view of exposed clay pit.



Photograph 34: Test Pit 3, Site 7. View of backfill in clay pit

Site No. 8



Photograph No. 35: Test Pit 1, Site 8, view of test pit wall



Photograph No. 36: Test Pit 1, Site 8, fine sand sample from test pit



Photograph No. 37: Test Pit 3, Site 8, view of test pit wall



Photograph No. 38: Test Pit 3, Site 8, close up view of material from in test pit

Site No. 9



Photograph No. 39: Test Pit 1, Site 9, close up view of sample from test pit



Photograph No. 40: Test Pit 3, Site 9, view of test pit wall



Photograph No. 41: Test Pit 3, Site 9, close up view of sample from test pit



Photograph No. 42: Test Pit 9, Site 9, view of test pit wall



Photograph No. 43: View of Test Pit 10, Site 9 (manually excavated)



Photograph No. 44: View of Test Pit 11, Site 9 (manually excavated)

EXP Services Inc.

Hamlet of Taloyoak
Granular Materials Resource Study, Hamlet of Taloyoak, Nunavut
Government of Nunavut SOA 2022-41
OTT-24008122-A0
December 12, 2024

Appendix B: Hamlet's Response to EXP's Questionnaire

2.3 - Existing Aggregate Resources:

A: Has there been any studies conducted on your available or potential aggregate sources in your community? YES ☒ NO ☐

If yes, please indicate the author, dates of reports and forward a copy to us.

On file with exp.

B: How many granular sources (pits and/or quarries) are currently active in your community?

Pits: 7 Quarries: 1 (Drilled & Blasted 2012)

C: To the best of your ability, please summarize and describe each source location as identified on the topographic map sheet of your community according to the following criteria: (utilize additional data forms for any additional aggregate sources)

2.3.1 Source Number (as identified by yourself): 1 (Area 1)

- Pit or quarry source? quarry
- Estimated quantity of aggregate remaining? 35,000 m³ +
- What processing is involved? (blasting, screening, stripping) Blast & crush
- Describe the terrain. (Flat, rolling, steep etc.) Rock Ridge
- Material type (sand, sand & gravel, boulders, bedrock etc.): Bedrock
- Deposit or geological formation? (if known): _____
- Typical uses in the community? (Roads, fill etc.) Rdwy / Housing Bldg (Airport) (runway)
- Annual resource consumption? (tones per year) 2000 m³
- Estimated life of pit or quarry? (final operating year) 10+ years

* Area 2 noted as Airport
- Stockpile *

Client: Government of Nunavut
Project Number: 24008122
Aggregate Resource Questionnaire
Date: August 2024

2.3.2 - Source Number (as identified by yourself): Area 3

- Pit or quarry source? Pit (below grade)
- Estimated quantity of aggregate remaining? (171,000 m³) + 5,000 above grade
- What processing is involved?(blasting, screening, stripping) Stripped & screen
- Describe the terrain. (Flat, rolling, steep etc.) Flat Plateau / water E & W
- Material type (sand, sand & gravel, boulders, bedrock etc.): Sa & Gr w boulders.
- Deposit or geological formation? (if known): _____
- Typical uses in the community? (Roads, fill etc.) In fill & up fill for rdway
- Annual resource consumption? (tones per year) Not used in 20 years.
- Estimated life of pit or quarry? (final operating year) 60+ years.

2.3.3 - Source Number (as identified by yourself): Area 4

- Pit or quarry source? Pit
- Estimated quantity of aggregate remaining? 33,750 m³
- What processing is involved?(blasting, screening, stripping) Strip & screen
- Describe the terrain. (Flat, rolling, steep etc.) Flat Plateau
- Material type (sand, sand & gravel, boulders, bedrock etc.): Sa & Gr w boulders
- Deposit or geological formation? (if known): _____
- Typical uses in the community? (Roads, fill etc.) Rdways & culverts
- Annual resource consumption? (tones per year) _____
- Estimated life of pit or quarry? (final operating year) 10 yrs +

2.3.2 - Source Number (as identified by yourself): Area 5/7

- Pit or quarry source? Pit
- Estimated quantity of aggregate remaining? 40,000 m³ +
- What processing is involved?(blasting, screening, stripping) Ripping & screening
- Describe the terrain. (Flat, rolling, steep etc.) Sand & Gravel with boulder ridge
- Material type (sand, sand & gravel, boulders, bedrock etc.): Sloping gentle on N. side
Excavated on south side
- Deposit or geological formation? (if known): Glacial
- Typical uses in the community? (Roads, fill etc.) Up fill for rds & Housing
- Annual resource consumption? (tones per year) 2000 m³ by Hamlet.
- Estimated life of pit or quarry? (final operating year) 50 year

2.3.3 - Source Number (as identified by yourself): Area 9

- Pit or quarry source? Pit
- Estimated quantity of aggregate remaining? 50,000⁺
- What processing is involved?(blasting, screening, stripping) stripping & screening
- Describe the terrain. (Flat, rolling, steep etc.) Flat
- Material type (sand, sand & gravel, boulders, bedrock etc.): SatGr.
- Deposit or geological formation? (if known): Glacial
- Typical uses in the community? (Roads, fill etc.) New Lagoon, culverts.
- Annual resource consumption? (tones per year) 1000 m³ by Hamlet.
- Estimated life of pit or quarry? (final operating year) 50 years.

Area 8 Fine Sand / Not a good
source of sand & gravel. but
SatGr. below water level noted



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**Aggregate Resource Management Study
Hamlet of Taloyak-
OTT-24008112**

1.0 Overview:

Attached please find a questionnaire comprising of 4 pages along with a geological Map of the community . We would appreciate that all relevant questions be answered to the best possible . Please indicate "N/A" where the question is not applicable to your community, or if there is no information available to your knowledge to provide an answer to the question.

Your co-operation in completing this questionnaire is greatly appreciated. We look forward to receiving back your questionnaire.

Ismail Taki, M.Eng, P.Eng
Manager, Geotechnical Services
Earth and Environment

2.0 Questionnaire:

Completed by: (Name) Hamlet office - 1-867-561-2302
Hamlet - SoA Janice (1-204-280-1280)
Position, Title: - Transportation Manager.
Ashoona 1867-345-0129.
Mailing Address: _____

Phone: (867) _____ Fax: (867) _____

2.1 Hamlet General Information:

A: Population Confirmation: (934) 2021 = 1000 people today
B: Industries: Artwork, Tourism, traditional living
C: Water Supply and Location: N-E of Town / Fresh Lake.
Canso Lake → 1.5 km N-E

2.2 Topographic Map Sheet Data:

Please refer to the enclosed topographic map of your community and sample topographic map sheet for the following questions.

- A: Please highlight the extent of your developed hamlet area on the topographic map of your community. Draw developed hamlet borders as close as possible to actual limits of your community as per example.
- B: Considering topographic, and physical restraints (terrain, water bodies, road access) among others: please plot, a rough estimate representing the furthest extent for the practical consideration of any future aggregate (sand and /or gravel) resource areas as per sample map sheet.
- C: Please identify the location and approximate extent of any existing pits or quarries (active or decommissioned) in your community as per enclosed sample sheet. Identify each source for future reference with a number or letter.
- D: Now identify if there are any potential aggregate resource site(s) (if any) on the same map sheet; however, utilizing a different symbolization and numbering system as per sample sheet.

EXP Services Inc.

*Hamlet of Taloyoak
Granular Materials Resource Study, Hamlet of Taloyoak, Nunavut
Government of Nunavut SOA 2022-41
OTT-24008122-A0
December 12, 2024*

Distribution List

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