

Aragon (Cordova Bay) Properties Ltd.  
201 – 1628 West 1st Avenue  
Vancouver, B.C.  
V6J 1G1

May 30, 2025  
File: 15783  
R0

Attention: Peter Censorio

**Re: Geotechnical Conditions Summary: Proposed Mixed-Use Development  
773 Cordova Bay Road, Saanich, B.C.**

## 1.0 INTRODUCTION

We understand that a new mixed-use development is proposed for the site noted above in Saanich, B.C. Based on the preliminary design information provided, the development is expected to include 13 development areas across a total of four phases. Proposed structures range from 3-storey townhomes to 11 storey concrete mid-rise structures. Various underground parking configurations are also being contemplated. In addition, the proposed development would include new roadways, parking areas, civil services and landscaped areas. In order to achieve proposed design grades, grade reinstatement fills, on the order of 10 m locally, will be required.

For the purposes of this summary report, we define the following types of construction:

- **‘Light’**, defined as wood frame construction up to 3 stories (i.e townhouse or single-family homes).
- **‘Moderate’**, defined as wood frame construction, with column loads in the range of 5000 kN.
- **‘Heavy’**, defined as concrete construction above and below grade.

GeoPacific has been asked to provide recommendations for design and construction of the proposed development based on the historic testing and records from the site, as well as the findings of our recent drill-based site investigation program. Our recommendations are based on the development plan articulated on the May 30, 2025 architectural plans prepared by DAU studio, attached to this summary for reference.

This summary report presents a summary of the results of our geotechnical investigation(s) of the soil and groundwater conditions at the proposed development site and comments on the feasibility of construction and the suitability of the site for the proposed development. The report has been prepared exclusively for Aragon Properties Ltd, for their use and the use of others on their design and construction team, and for the District of Saanich, for use in the development permitting process.

## 2.0 SITE DESCRIPTION

The site is located just west of the Cordova Bay Road - Fowler Road intersection in Saanich, B.C. The site is bounded by Cordova Bay Road to the south, Fowler Road to the east and single-family homes to the north and west. The site is irregular in shape with a net site area of approximately 20.6 acres. In general, the site slopes from west to east with a grade differential of approximately 30 m over approximately 300 m horizontal, based on the District of Saanich GIS “Saanich Web Map” and “Google Earth Pro”. The site is currently improved with light auxiliary structures.

For approximately 80 years, the site was an active aggregate mining operation. Upon exhausting suitable aggregate deposits, the excavations from the mining operation were filled with variable material from the surrounding region. We understand the portions of the site were later developed into a mobile home community.

### **3.0 FIELD INVESTIGATION**

GeoPacific completed an investigation of the soil and groundwater conditions at the site spanning 4 investigations between April 15<sup>th</sup> – 16<sup>th</sup>, April 29<sup>th</sup>, 30<sup>th</sup> to July 1<sup>st</sup>, May 22<sup>nd</sup> – 23<sup>rd</sup> & June 3<sup>rd</sup> – 4<sup>th</sup>, 2024, using the subcontracted services of Blue Max Drilling of Courtenay, B.C. A total of twenty-two (22) solid stem auger holes and seven (7) sonic boreholes supplemented with eleven (11) Cone Penetration Test (CPT) soundings, twenty-three (23) Dynamic Cone Penetration Test (DCPT) soundings and three (3) shear vane tests were completed over the period of investigation. Furthermore, GeoPacific completed a Multi-channel Analysis of Surface Waves (MASW) survey across the site from the dates of May 31<sup>st</sup> and June 12<sup>th</sup> to 14<sup>th</sup>, 2024. Eight (8) MASW acquisition lines were completed to assess the density gradients of the soils below existing grade and to provide seismic site classification for the proposed building site in accordance with the 2024 British Columbia Building Code (BCBC).

The sonic bore holes were completed to depths of up to 30.5 m below existing grade to assess depths of encountered variable fills. The CPT soundings were advanced to depths in the range of 1.5 to 20.2 m below grade, and the auger test holes were drilled to depths in the range of 1.5 to 9.1 m below grade. The investigation was supervised by a geologist from our office who logged and sampled the soils encountered.

Prior to our investigation, a BC One Call was placed, and a member of our staff was on site to clear the test locations of buried services. All test holes were backfilled and sealed in accordance with provincial abandonment requirements following classification, sampling and logging.

The CPT is an in-situ testing device which is pushed into the ground employing a hydraulic ram on the drill rig. The cone penetrometer records measurements of tip resistance, sleeve resistance, dynamic pore water pressure, temperature, and inclination in 50 mm increments. The data obtained may be correlated to estimate engineering parameters such as shear strength, relative density, soil behaviour type, and consolidation coefficients.

The test hole logs, CPT sounding data, interpreted soil parameters, results from our shear vanes tests, and results from our Multi-channel Analysis of Surface Waves (MASW) shear wave velocity models are presented in reports under a separate cover. The approximate locations of the CPT/SCPT soundings and MASW acquisition lines completed by GeoPacific Consultants Ltd. are shown on our Drawing No. 15783-01 - 03, following the text of this letter.

### **4.0 SUBSURFACE CONDITIONS**

#### **4.1 Soil Conditions**

According to “Quaternary Geological Map of Greater Victoria” (Map 2000-2), published by British Columbia Ministry of Energy and Mines, the site is understood to be located within an area of thick older Pleistocene deposits that were excavated for a historic gravel pit. The surficial deposits in the region are generally Vashon till or Quadra Sands and Gravels.

The subsurface conditions at our test hole locations were divided into three soil type areas across the four quadrants of the site. The northern and western quadrants of the site consisted of variable fills atop dense to very dense sand to silty sand and gravel. The northern quadrant was noted to be surfaced with a blast rock capping layer, overlying the above noted variable fills, whereas the western quadrant was noted to be surfaced with trace

amounts of topsoil and vegetation above the variable fills. The southern quadrant consisted of compact to very dense sand overlying dense to very dense silty sand and gravel. The eastern quadrant of the site consisted of sand and gravel fills overlying soft to stiff silty clay followed by native very dense gravelly sand.

A general description of the soils encountered is as follows:

**Eastern extent of the site (red hatch on drilling site plan, blue on MASW site plan):** Subsurface conditions consist of soft to stiff lightly to normally consolidated silty clays to depths of up to approximately 7.5 metres below current grade, atop dense to very dense silty sand and gravel at depth.

**Centre of the Southern extent of the site (pink hatch on site plan):** Subsurface conditions consist of compact to dense sand to depths of up to approximately 7 metres below current grade, overlying dense to very dense silty sand and gravel.

**Western and Northern extent of the site (yellow hatch on site plan):** Subsurface conditions generally consist of waste fills of variable composition and density up to approximately 27.5 metres below current grade, overlying dense to very dense silty sand and gravel.

- The “waste fills”, located at the **western extent of the site**, generally consist of variable loose to compact silty sand with some gravel, loose to compact silt and sand to soft to stiff clayey silt. The fills were noted to contain intermixed cobbles, boulders and concrete rubble throughout the quadrant. The waste fills were noted to contain other miscellaneous construction debris, were moist and black in colour. Auger / CPT refusal was encountered at depths ranging from approximately 13 m to 15 m below existing grade in this area. Subsequently, we advanced boreholes using a sonic drill rig in this area, which confirmed that the depth of fills encountered extended to depths ranging approximately from 22 m to 27.5 m below existing grade. Deep CPT investigations were completed within the sonic boreholes below the 15 m density gradient. The underlying layers encountered were interpreted to consist of generally compact to dense silt and sand to stiff to very stiff clayey silt. The completed MASW survey results indicate increases in density at approximately 15 m below grade, which correlates with the results of our CPT investigation. Relative densities of the soils were noted to increase between 22 and 30 m below grade.
- At the **Northern extent of the site**, a similar profile of variable waste fills to those located at the western extent of the site was encountered. In this area, the variable waste fills are capped with approximately 0.6 m of blast rock. The variable waste fills encountered in this region were noted to consist of interbedded layers of very dense blast rock fills, reinforced concrete rubble between variable loose layers ranging generally noted to be stiff to very stiff clayey silt to compact to dense silt and sand ranging between approximately 1.0 m to 7.0 m thick. The completed MASW results indicate increases in density at approximately 15 m below grade with a higher variability in density in the upper 15 m below existing grade. Relative densities of the soils were noted to increase between 22 and 30 m below grade.

### 4.3 Groundwater Conditions

Based on our site investigations, test hole logs by others, and our experience in the area, the groundwater in the area is deep. Therefore, we do not expect to encounter free groundwater at depths contemplated for development. However, we expect that some perched groundwater may be encountered as seepage from the surficial variable fills, sandier zones within the fine-grained variable fills and at the silty clay interfaces. The position of the groundwater level and the extent of seepage can be expected to vary seasonally, with generally higher water levels and heavier flows expected in the wetter winter and spring months.

## 5.0 DISCUSSION

### 5.1 General Comments

Based on the preliminary design information provided, the development is expected to include 13 development areas across a total of four phases. Proposed structures range from 3-storey townhomes to 11 storey concrete mid-rise structures. Various underground parking configurations are also being contemplated. In addition, the proposed development would include new roadways, parking areas, civil services and landscaped areas. In order to achieve proposed design grades, grade reinstatement fills, on the order of 10 m locally, will be required.

As noted previously, for the purposes of this summary report, we define the following types of construction:

- **‘Light’**, defined as wood frame construction up to 3 stories (i.e townhouse or single-family homes).
- **‘Moderate’**, defined as wood frame construction, with column loads in the range of 5000 kN.
- **‘Heavy’**, defined as concrete construction above and below grade.

The variability in compaction and composition of the fills placed in the former aggregate mine pits will control development of the site. All improvements, including roads and services which we assume would be constructed to local municipal standards, as well as buildings and other structures, would need to be designed in a way that either accommodates these varied ground conditions or the ground conditions would require improvement to achieve acceptable long-term performance. In general, good long-term performance means ground settlements that meet typical design and construction standards of 25 mm total and 1:500 for buildings and possibly higher settlements for paved surfaces where critical infrastructure is not located. For example, gravity sewers would need to maintain grades for at least a 20 to 50 year design life. Buildings could be allowed to settle in excess of 25 mm provided that differential settlements are maintained at about 1:500 or less.

Since the majority of the fills are relatively old, they have likely completed the majority of any consolidation settlement. Nevertheless, it is anticipated that the existing fills in typical municipal roadways would need to be compacted to depths of 3 to 5 m in order to provide adequate performance of road ways and below grade gravity services. The most practical method of achieving this is by surface compaction using the Rapid Impact Compactor (RIC) method. Some areas of the site may already be adequate to support roads and services, and the extent to which RIC would be undertaken would be confirmed by further testing in the roadways once detailed plans have been confirmed. The RIC method has been proven effective to treat variable fills to depths of up to 8 m below ground surface.

For buildings, the extent of ground treatment or special foundations would be building specific and would depend upon the weight of the structure, the extent of any below grade development and the specific settlement tolerances of the buildings.

From a geotechnical perspective, the **eastern extent of the site** is underlain by soft to firm normally to lightly over consolidated clays/silts/pond sediments (fills). As such, building construction of all types, with the exception of **‘light’** would require ground reinforcement elements/ground improvement measures, such as cemented stone columns or non-reinforced displacement piles, beneath a raft slab. Alternatively, it may be feasible to over-excavate the clays from this area in order to accommodate 2 levels of underground parking, such that conventional foundations could be utilized for “heavy” building construction bearing on the dense to very dense silty sand and gravel at depth.

The **center of the southern extent of the site**, was noted to be underlain by compact to dense sands overlying dense to very dense silty sand and gravel at approximately 7 m below grade. It is our opinion that this area could accommodate **'light'**, **'moderate'** and **'heavy'** construction types, either at grade (using ground improvement methods such as rapid impact compaction (RIC), to densify the surficial sands and gravels), or via over excavation of the compact sands and gravels to accommodate underground parking, which could be constructed using conventional foundations, without ground improvement. In addition, due to the granular nature of the soils in this area, any soil excavated to accommodate underground parking could be re-used as structural fill elsewhere on site.

The **western extent of the site** was noted to be underlain by waste fills of variable composition and density to depths ranging approximately from 22 m to 27.5 m below existing grade. During drilling, auger refusal was encountered frequently on large debris at depth, such as concrete chunks. Therefore, ground improvement measures such as stone columns may not be feasible. As such, construction of all types, with the exception of **'light'** would require ground reinforcement elements/ground improvement measures, such as non-reinforced displacement piles, beneath a raft slab. We note that the drilling was conducted from the toe of the westmost slope of the site- it may be feasible to locate heavier buildings on the native sand and gravel located within the westmost slope, if the buildings are set into the westmost slope, placed tight to the west property line.

The **northern extent of the site** was noted to contain similar soils to the western extent, however with generally higher densities encountered within the fills. This area would be suitable for **'light'** to **'moderate'** construction types without special ground improvement measures locally. **'Heavy'** construction would require ground reinforcement elements/ground improvement measures similar to the western extent, such as non-reinforced displacement piles, beneath a raft slab.

Moderately loaded buildings may be defined as having column loads in the range of up to 5000 kN. We anticipate that Light Wood Framed (LWF) buildings would be feasible from a geotechnical perspective pending review of structural requirements.

Depth of deep foundation elements, such as non-reinforced displacement piles, are anticipated to vary locally, depending on region and structural loading requirements. At this time, pile depths are anticipated to be in the range of 15 m to 25 m in depth. Final pile designs will be dependent on structural loading requirements to be reviewed by GeoPacific. It should be appreciated that piled foundations depths may be refined upon review of structural requirements.

The subsurface soils are not expected to be prone to liquefaction or other forms of ground softening under the design earthquake defined under the 2024 British Columbia Building Code (BCBC).

We confirm, from a geotechnical standpoint, that the proposed massing and grading for the above referenced site is feasible and acceptable considering the subsurface conditions encountered during our investigations. The site can be considered safe for the intended use, provided the recommendations in our geotechnical reports are followed. It is anticipated that once plans become finalized, further geotechnical studies would be undertaken and detailed geotechnical design recommendations will be provided for specific portions of the development.

## 6.0 CLOSURE

This report has been prepared exclusively for our client for the purpose of providing a preliminary geotechnical summary of results from our site investigation activities completed to date, and commentary for the preliminary design and construction of the proposed development during the rezoning phase. It is anticipated that it would be used by the District of Saanich in their permitting process. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of this letter is prohibited.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

For:  
**GeoPacific Consultants Ltd.**

Raymond Dickof, B.Sc.  
Project Manager

Reviewed by:



James Carson, B.A.Sc., P.Eng.  
Senior Project Engineer

Matt Kokan, M.A.Sc., P.Eng.  
Principal

# Comprehensive Development Plan

- ① Multi-Family Residential (Strata) (11 storeys)
- ② Multi-Family Residential (Strata) (11 storeys)
- ③ Multi-Family Residential (Strata) (11 storeys)
- ④ Multi-Family Residential (Strata) (5 storeys)
- ⑤ Multi-Family Residential (Strata) (5 storeys)
- ⑥ Multi-Family Residential (Strata) (10 storeys)
- ⑦ Multi-Family Residential (Strata) (10 storeys)
- ⑧ Multi-Family Residential (Strata) (8 storeys)
- ⑨ Multi-Family Residential (Strata) (6 storeys)
- ⑩ Rowhouses / Townhouse (Strata) (3 storeys)
- ⑪ Not Used
- ⑫ Multi-Family Residential (Strata) (6 storeys)
- ⑬ Mixed-Use (Market Rental + Daycare / Child) (6 storeys)
- ⑭ Multi-Family Residential (Non-Market / Below Market Rental) (6 storeys)
- ⑮ Mixed-Use (Non-Market / Below Market Rental + Commercial) (3 storeys)
- ⑯ Mixed-Use (Market Rental + Commercial) (4 - 6 storeys)
- ⑰ Rowhouse / Townhouse (Strata) (3 storeys)
- ⑱ Multi-Family Residential (Strata) (5 storeys)
- ⑲ Multi-Family Residential (Strata) (5 storeys)
- ⑳ Multi-Family Residential (Strata) (5 storeys)
- ㉑ Rowhouses / Townhomes (Strata) (3 storeys)

NOTES  
 The owner of the site shall be responsible for the provision of all utility services and shall be responsible for the provision of all utility services and shall be responsible for the provision of all utility services.





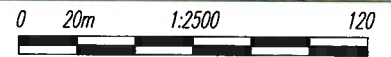
**LEGEND:**

- ⊕ TH24-XX - TEST HOLE (TH) LOCATION
- ⊕ CPT24-XX - CONE PENETRATION TEST (CPT) LOCATION

- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**  
1:2500

\*TEST LOCATIONS ARE APPROXIMATE



REVISIONS:

- A.
- B.
- C.

FILE NO.:

**15783**

DWG. NO.:

**15783-01**

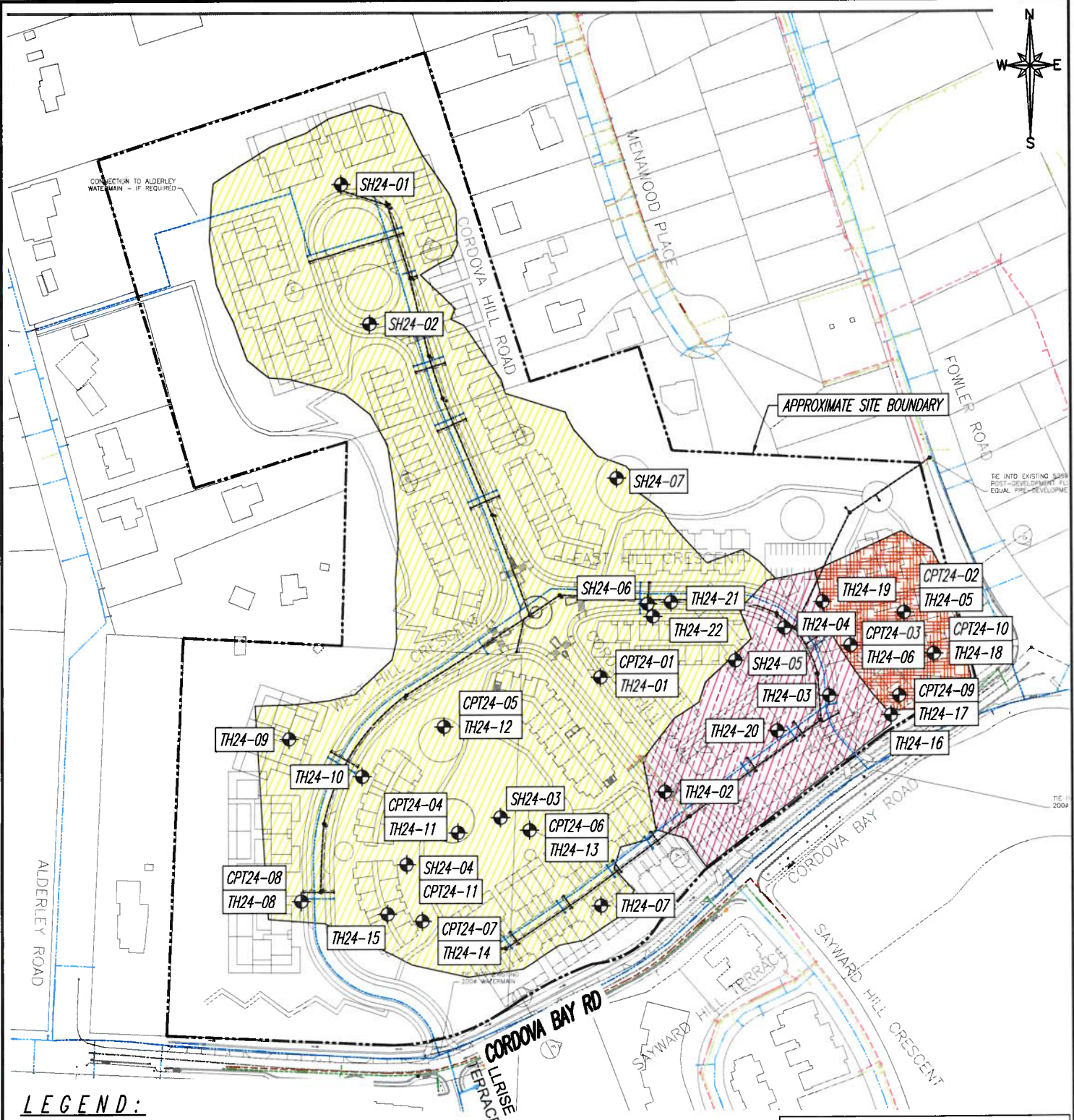


DATE: MAY 15, 2024

DRAWN BY: F.N.    APPROVED BY: M.J.K.    REVIEWED BY: R.D.

SCALE: AS SHOWN

**PROPOSED DEVELOPMENT**  
773 CORDOVA BAY ROAD, VICTORIA, B.C.  
**SITE PLAN**



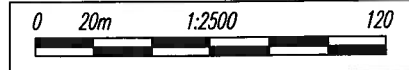
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- ◆ CPT24-XX - CONE PENETRATION TEST (CPT) LOCATION
- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**

1:2500

\*TEST LOCATIONS ARE APPROXIMATE



REVISIONS:

- A.
- B.
- C.

FILE NO.:

**15783**

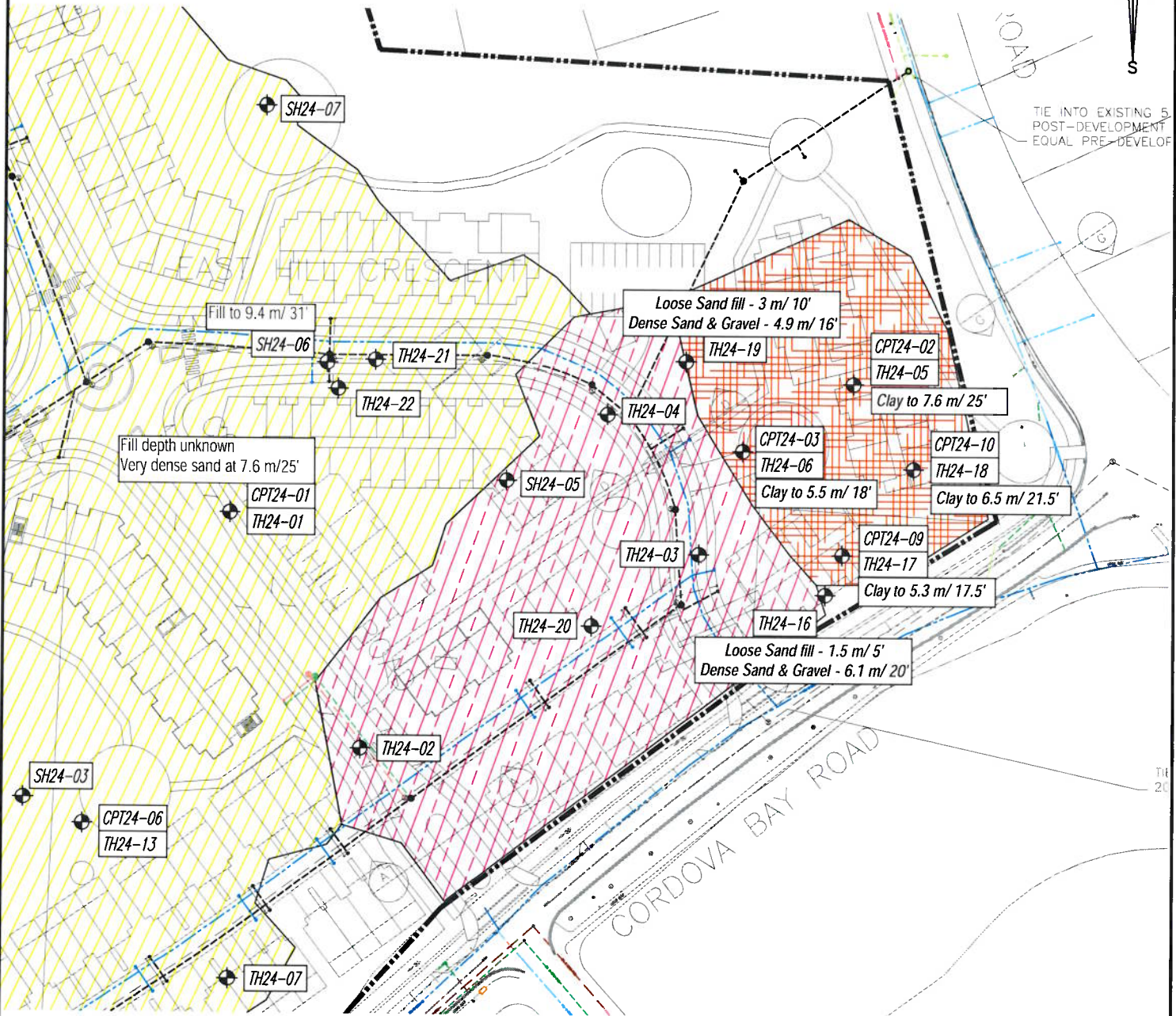
DWG. NO.:

**15783-02**



DATE:	MAY 15, 2024		
DRAWN BY:	F.N.	APPROVED BY:	M.J.K.
SCALE:	AS SHOWN		

**PROPOSED DEVELOPMENT**  
 773 CORDOVA BAY ROAD, VICTORIA, B.C.  
 SITE PLAN - CIVIL OVERLAY



**LEGEND:**

- ⊕ TH24-XX - TEST HOLE (TH) LOCATION
- ⊙ CPT24-XX - CONE PENETRATION TEST (CPT) LOCATION
- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**  
1:1500

\*TEST LOCATIONS ARE APPROXIMATE



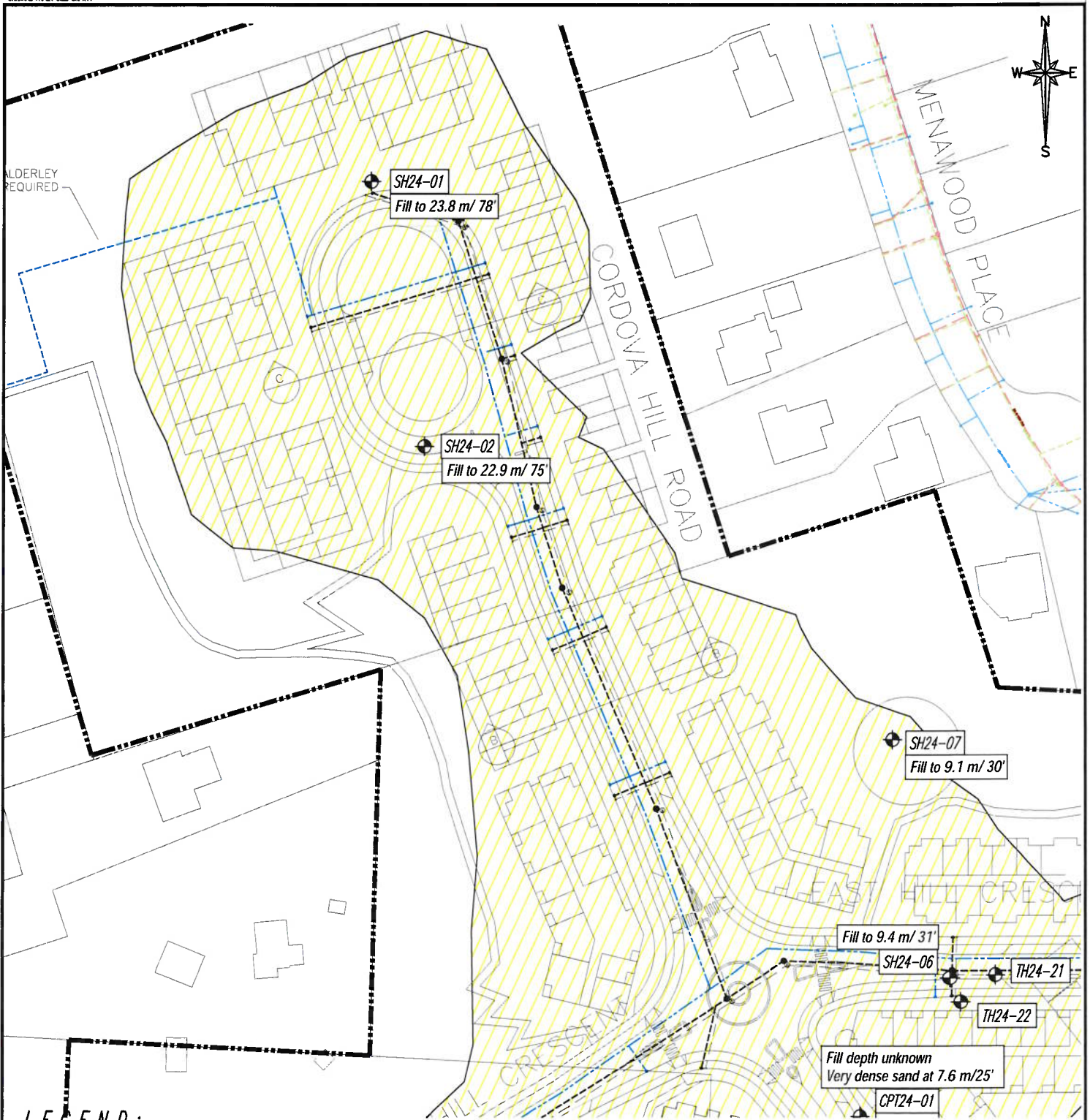
REVISIONS:
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FILE NO.:	<b>15783</b>
DWG. NO.:	<b>15783-02</b>



DATE:	MAY 15, 2024		
DRAWN BY:	APPROVED BY:	REVIEWED BY:	
F.N.	M.J.K.	R.D.	
SCALE:	AS SHOWN		

**PROPOSED DEVELOPMENT**  
773 CORDOVA BAY ROAD, VICTORIA, B.C.  
CIVIL OVERLAY - Area 1



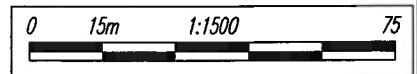
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- ⊕ TH24-XX - TEST HOLE (TH) LOCATION
- ⊕ CPT24-XX - CONE PENETRATION TEST (CPT) LOCATION
- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**

1:1500

\*TEST LOCATIONS ARE APPROXIMATE



REVISIONS:

- A.
- B.
- C.

FILE NO.:

**15783**

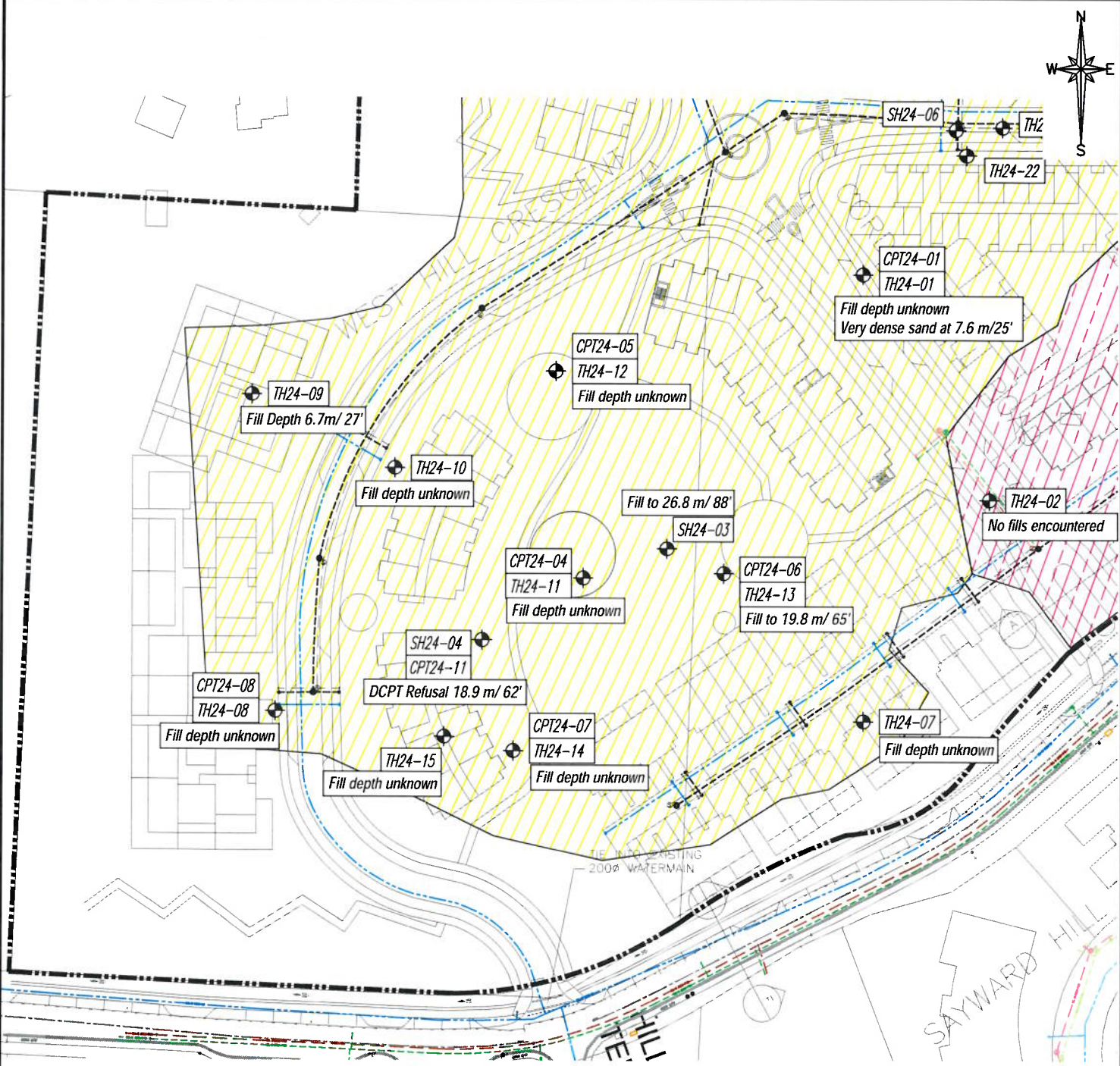
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**15783-02**



DATE:	MAY 15, 2024		
DRAWN BY:	APPROVED BY:	REVIEWED BY:	
F.N.	M.J.K.	R.D.	
SCALE:	AS SHOWN		

**PROPOSED DEVELOPMENT**  
 773 CORDOVA BAY ROAD, VICTORIA, B.C.  
 CIVL OVERLAY - Area 2



**LEGEND:**

- ⊕ TH24-XX - TEST HOLE (TH) LOCATION
- ⊕ CPT24-XX - CONE PENETRATION TEST (CPT) LOCATION
- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**  
1:1500

\*TEST LOCATIONS ARE APPROXIMATE

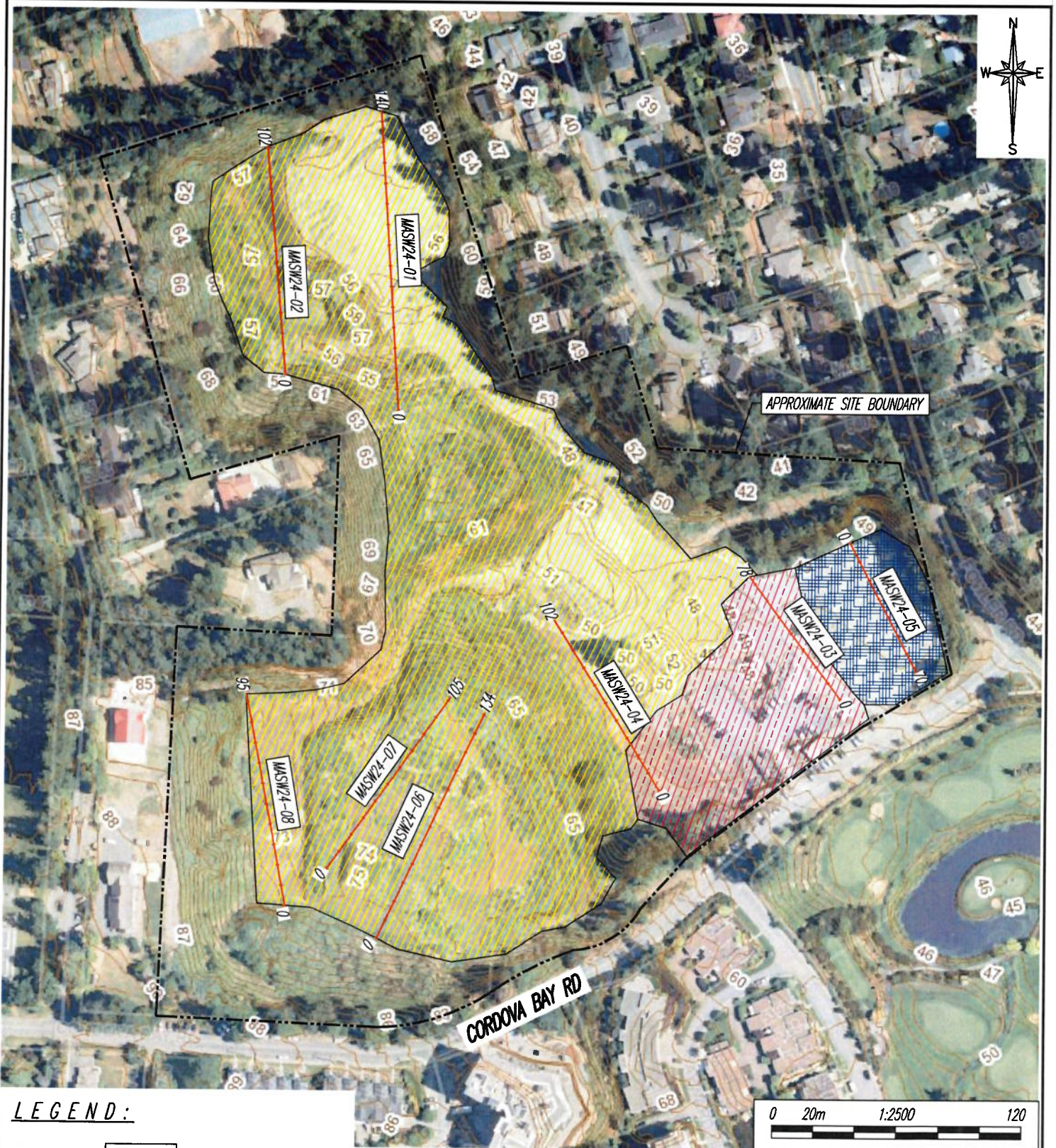


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A.	15783
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C.	15783-02



DATE:	MAY 15, 2024	
DRAWN BY:	APPROVED BY:	REVIEWED BY:
F.N.	M.J.K.	R.D.
SCALE:	AS SHOWN	

**PROPOSED DEVELOPMENT**  
773 CORDOVA BAY ROAD, VICTORIA, B.C.  
CIVIL OVERLAY - Area 3



**LEGEND:**

- MASW24-XX - MASW PROFILE
- WASTE FILLS
- SAND OVER GLACIAL TILL
- NORMALLY TO LIGHTLY CONSOLIDATED SILTY CLAY

**SITE PLAN**

1:2500

\*TEST LOCATIONS ARE APPROXIMATE

REVISIONS:

- A.
- B.
- C.

FILE NO.:

15783

DWG. NO.:

15783-01



**GEOPACIFIC**  
CONSULTANTS

DATE: JUNE 19, 2024

DRAWN BY: F.N.	APPROVED BY: M.J.K.	REVIEWED BY: R.D.
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SCALE: AS SHOWN

**PROPOSED DEVELOPMENT**  
773 CORDOVA BAY ROAD, VICTORIA, B.C.  
**MASW PROFILE**

