HOME

CANTILEVER SOLDIER PILE WALL DESIGN
ROAD 'A' CUL DE SAC

Project:

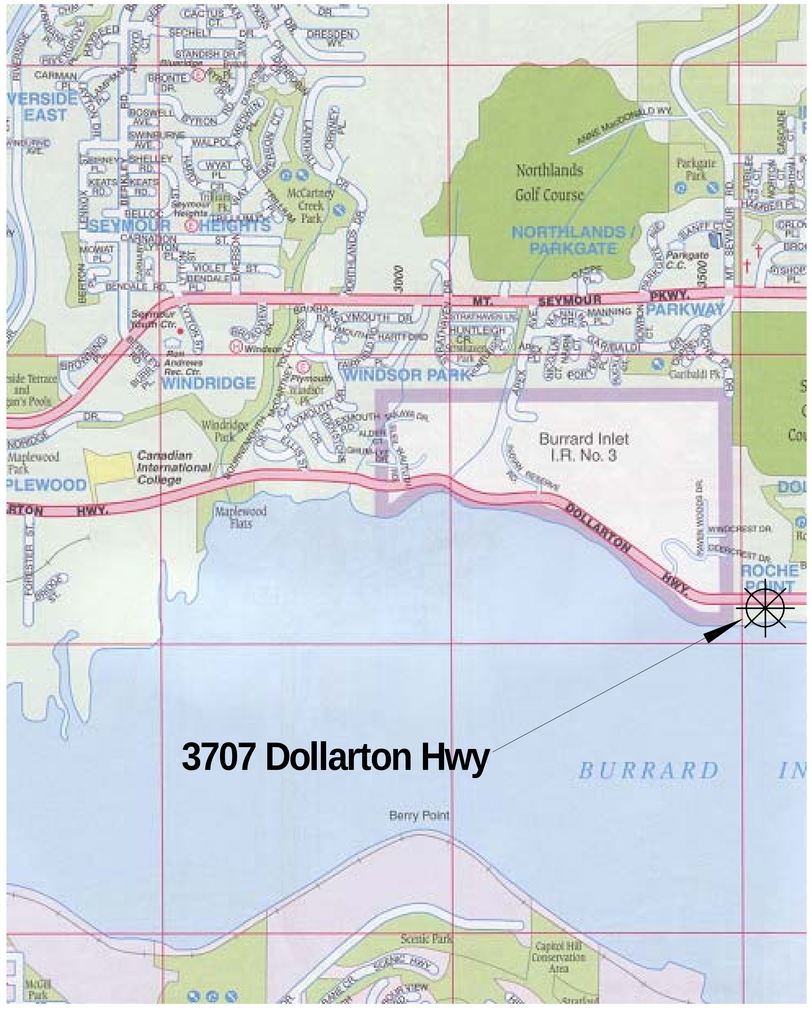
PROPOSED SUBDIVISION
3707 DOLLARTON HWY - N.VANCOUVER, BC

Client:

NICK EBRAHIM

Drawing List:

Figure SH-1 - Cantilever Soldier Pile Wall Design and Construction Recommendations
Figure SH-2 - Cantilever Soldier Pile Wall Plan
Figure SH-3 - Section A - Soldier Pile Wall
Figure SH-4 - Section B - Soldier Pile Wall
Figure SH-5 - Section C - Soldier Pile Wall



PUAR ENGINEERING CONSULTANTS INC

Puar Engineering CONSULTANTS

1.0 GENERAL

1.1 Project Team, Reference Documents, and Proposed Development
- Puar Engineering Consultants Inc's (herein referred to as "PECI") is the geotechnical design consultant.
- PECI's Geotechnical Investigation Report (dated 11Sept04)
- Civil design drawings by Creus Engineering Ltd ("Creus") (drawings via email 11Sept21)
- Landscape design drawings by Forma Design (drawings via email 12Feb07)

- The proposed Cantilevered Pipe Pile retaining walls will provide stabilization for the the grade difference adjacent the north and west edge of the Road 'A' cul de sac.
- PECI's design geometries are based on Forma Design's Landscape Plan Layout (Dwg. # L1) and Creus Engineering's site section geometries (Dwg.#DF 8741).

1.2 Estimated Subsurface Conditions
- Based on PECI's field investigation, our local experience, and information from the Geological Survey of Canada (GSC), the native materials in the general vicinity are expected to consist of up to 3 m of overburden (including compact sand) overlying the dense, till-like sand to silty sand deposit.
- Limited Interflow/ groundwater flow may perch on glaciated deposits.

1.3 Design Parameters
a.) Bearing Capacity of i.) till-like sand Subgrade - factored bearing resistance/ capacity of 300 kPa (6270 psf) at Ultimate Limit State (ULS); ii.) compact sand subgrade - factored bearing resistance/ capacity of 240 kPa (5000 psf) at Ultimate Limit State (ULS)
b.) LIVE LOAD: None; DEAD LOAD: None.

1.4 Site Drainage
- It is imperative that site grading and drainage systems (storm sewers, roof downspouts, curb gutters, etc.) be suitably designed and constructed, such that all flow collection points and outlets are outside the retaining wall area.
- Site grading shall be designed to route surface water around and away from the walls.

2.0 PRE-CONSTRUCTION REVIEW & OTHER CONSIDERATIONS
It is recommended that no construction take place until the following items have been addressed by the General Contractor and/or Client.

2.1 Utilities & Other Subsurface Elements
Prior to construction, the General Contractor shall determine the locations of all structures and underground services that may be affected by the proposed works; this includes proposed and existing building offsets and depths. The General Contractor shall verify utility information by independently collecting relevant reference drawings and obtaining field verification as required. All work shall be carried out without disturbance to existing utilities. The General Contractor shall notify PECI and the utility companies a minimum of 72 hours before commencing excavation.

2.2 Hoarding
For public safety, the General Contractor shall install hoarding that is adequately braced along all perimeter slopes. Hoarding should meet the minimum of requirements of the District of West Vancouver.

3.0 MATERIALS

3.1 Grout
Non-shrink Cementitious grout shall be "Microsil" grout, or approved equivalent. Grout shall be batched in accordance with the manufacturer's specifications and shall have a minimum compressive strength of 21 MPa (3.0 ksi) after 24 hours and 35 MPa (5.0 ksi) after 28 days.

3.2 Pipe Piles & Internal Reinforcement
Pipe Pile
Piles shall be embedded a minimum of 5.2 m below the proposed finished grade (ie. at El.19.5 m approx.). Schedule 80 steel pipe piles with the following characteristics shall be utilized:
- Length = 7 m to 9 m,
- Size = 100 mm (113 mm Outside Diameter, 96 mm Inside Diameter),
- Alignment = 6V:1H to vertical
- Embedment into Till-like sand 1.5 m (min.) and compact native sand 1.5 m (min.)

Internal Reinforcement
Steel Flatbar reinforcement shall have minimum cross-section dimensions as follows:
- Thickness: 10 mm (3/8") minimum,
- Height: 75 mm (min.); ideally, near-equivalent to internal diameter of pipe pile (ie. 96 mm)

Prior to and during grouting of pipe pile, flat bar orientation shall be confirmed to be as shown on Figure SH-2 (ie. perpendicular to wall alignment).

3.3 Reinforcement
Welded Wire Mesh
Welded Wire Mesh shall be installed in front and behind piping. Welded Wire Mesh CSA-G 30.5M 1983 grade 400 shall be continuous across all shotcrete joints, unless noted otherwise. Minimum mesh lap shall be 2 squares. Shoring shall be two layers of 4 x 4 x 8/8 WWM

Reinforcing Steel
- Horizontal reinforcement shall consist of 20 M rebar spaced at 0.6 m vertically in front and behind pipe piles.
- Reinforcing steel shall be CSA-G 30.12M, grade 400. Minimum bar lap shall be 0.5 m.

3.4 Shotcrete
The shotcrete support membrane shall conform to the material specification of ACI 506.2-95, "Specifications for Materials, Proportioning and Application of Shotcrete", published by the American Concrete Institute. Minimum compressive strength shall be 30 MPa (4.4 ksi) at 28 days, 14 MPa (2.0 ksi) at 3 days and 7 MPa (1.0 ksi) at 24 hours. Admixtures shall only be used if specifically approved by PECI.
Shotcrete Shoring shall be a minimum of 250 mm thick and shall completely contain the specified reinforcing with cover, as noted. A minimum cover of 75 mm shall contain the outer (south) edge of the pipe pile and lateral reinforcement.

3.5 Backfill
Backfill material shall consist of 12 to 19 mm clear crushed gravel.

4.0 INSTALLATION RECOMMENDATIONS

4.1 General
The General Contractor shall carry out regular site reconnaissance around the excavation and perimeter for the express purpose of observing any signs of movement of the soil around the excavation. The General Contractor shall report any observed movement or deterioration to PECI immediately.

4.2 Shoring Extents Confirmation
The total length to be shored should be based on the most recent Civil and Landcape Architectural Design drawings. Based on the above reference drawings, the total length to be shored is currently estimated to be 25 m (82'). This length includes the tail ends of the segment consists of 8.5 m shored at the full height (ie. 2.4 m) across the alignment of the basement; 45-degree tapers would be implemented at the north and south extremities (ie. over lengths of 2.7 m at both ends).

4.3 Shoring Sequencing
The central segment of the wall requires attention to the GVRD sanitary main, which is embedded a minimum distance of 2 m from the central segment of the proposed wall. Based on our observations during initial berm placement, the temporary berm is envisioned to have limited cohesion (from the temporary support standpoint), and it is envisioned that groundwater may not be encountered. As a result, construction scheduling should tentatively be based on cutting and spraying of the full length of one to three rows that are each approximately 1.2 m high/ deep. Conventional splicing and overlaps (for horizontal reinforcing, mesh, membrane, etc) should be assumed.
The following row height parameters apply to the critical section (Section C, refer to Figure SH-5):
- upper row to be cut at 1.2 m depth/ height (max.), and
- remaining rows to be cut at 1.2 m (max.) height.

4.4 Shotcrete
Shotcrete shall be applied in a horizontal or downward vector in such a way that voids behind the reinforcing steel do not develop. Panel edges shall be cleaned prior to shotcreting adjacent panels.

4.5 Site Drainage
General
- Surface water from upslope neighbouring areas may require mitigative measures, as discussed below. Based on our site observations to-date, it is not envisioned that groundwater would be encountered.
- The General Contractor or Shoring Sub-contractor -- depending on contractual obligations -- is responsible for construction and maintenance of works, such as berms and swales, to collect and divert any site water via pumping or gravity flow. At the end of each day and prior to rainfall events, the site shall be graded to direct run-off away from excavation slopes and shotcrete shoring.

Control of Surface Water
Any surface flows shall be directed to a suitable sediment removal system prior to discharge to the municipally approved outlet. The interior water level shall be maintained below the level of fresh shotcrete.

Control of Groundwater
Suitable measures shall be taken, where necessary, to control groundwater flow at the excavation face during excavation and shotcrete installation. These shall include the installation of materials such as burlap and filter cloth and pea or bird eye gravel to permit drainage without loss of soil. If any erosion or loss of soil occurs, PECI shall be contacted immediately.

4.6 Soil Drainage
Drainage Membrane
Drainage membrane shall be Nudrain WD15 or approved equivalent with 300 mm (min.) lap. Laps shall be sealed with continuous taping.

Horizontal Drains
- A Multi-Flow Drain System should be installed across the base of the wall; drains should 'daylight' at the drainage bio-swale (in front of the wall).
- Horizontal drains shall be utilized to lessen any potential hydrostatic pressure behind the shotcrete, such that 1 row of 1.2 m long, 50 mm perforated PVC weep-holes are set at 2 m (o/c) at a point 1 m above the proposed excavation base. The drains should be routed to the base of the wall, for discharge, as noted above.
- Drainage pipe shall be set in drilled holes at 5° up from horizontal. The gap between horizontal drains and the installation hole at shotcrete face shall be packed with filter cloth or dry packed. Opening size, length and location of drains shall be as indicated on the drawing.

5.0 QUALITY CONTROL & TESTING

5.1 Pipe Piles
A supplier's mill certificate should be provided for pipe piles.

5.2 Shotcrete
The Sub-contractor should provide a minimum of one test shotcrete panel, or as directed by PECI. Shotcrete test panels should be 750 x 750 x 89 mm gunned in the same position as the work. Four cores should be taken from each panel and tested for compressive strength by an approved, qualified testing agency at 24 hours, 3 days and 28 days (two cores). Depending upon our observations during construction, less or more testing may be recommended by PECI.

5.3 Field Review
During construction, PECI shall be contacted by the Contractor to attend the site to observe the following aspects of construction:
a.) installation of pipe piles (length and soil recovery during drilling),
b.) prior to each excavation stage (ie. prior to Stage 1, etc),
c.) lateral reinforcement installation,
d.) shotcrete application,
e.) drainage installation,
f.) backfilling

6.0 REFERENCE DRAWINGS - PRIORITY
The Geometries and Site Data shown on Civil and Landscape Architectural Design Drawings Take Precedence Over the InformationShown in Puar Engineering's Drawings. If any Conflict/ Discrepancy is Observed Between PECI's Design Drawings and those ofCreus Engineering and/or Forma Design and Puar, it Shall be Reported Immediately to PECI.

Revisions

CLIENT: EBRAHIM
3707 Dollarton Hwy, North Vancouver, BC
Proposed Subdivision

Reference Drawings

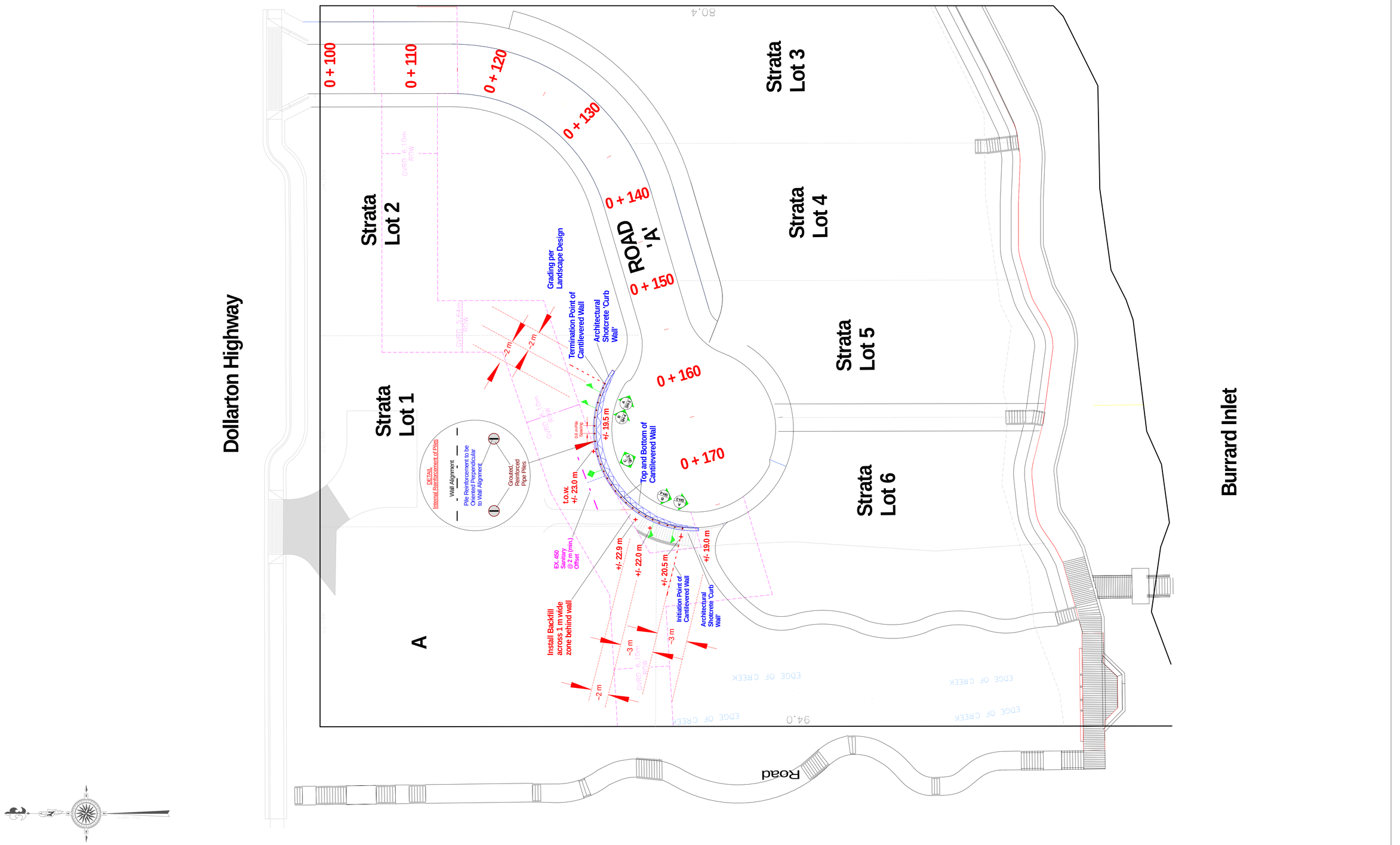
Road 'A' Cantilever Soldier Pile Wall DESIGN & CONSTRUCTION RECOMMENDATIONS

Scale:

Puar Engineering CONSULTANTS

Job No:	Date:	FIGURE:
07-2-256	12Feb	SH-1

Rev:	Dwn:	Chk:
	wsl	sp



Revisions

CLIENT: EBRAHIM
3707 Dollarton Hwy, North Vancouver, BC
Proposed Subdivision

Reference Drawings

Webster Engineering
Civil Site Plan
Dwg. DF 8728 (emailed 11Sept21)

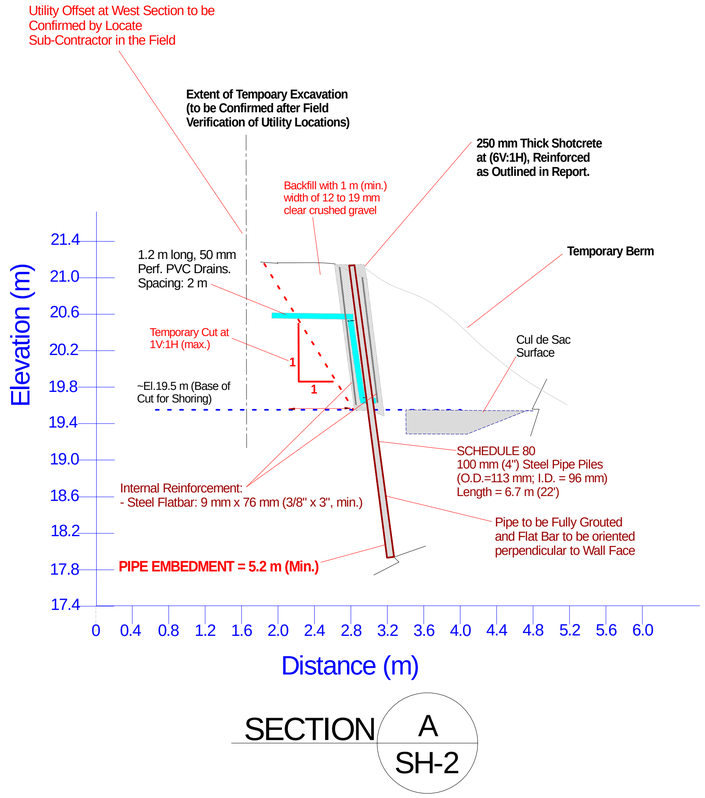
PLAN: Cantilevered Wall Road 'A' Cul de Sac

Scale: 1:200

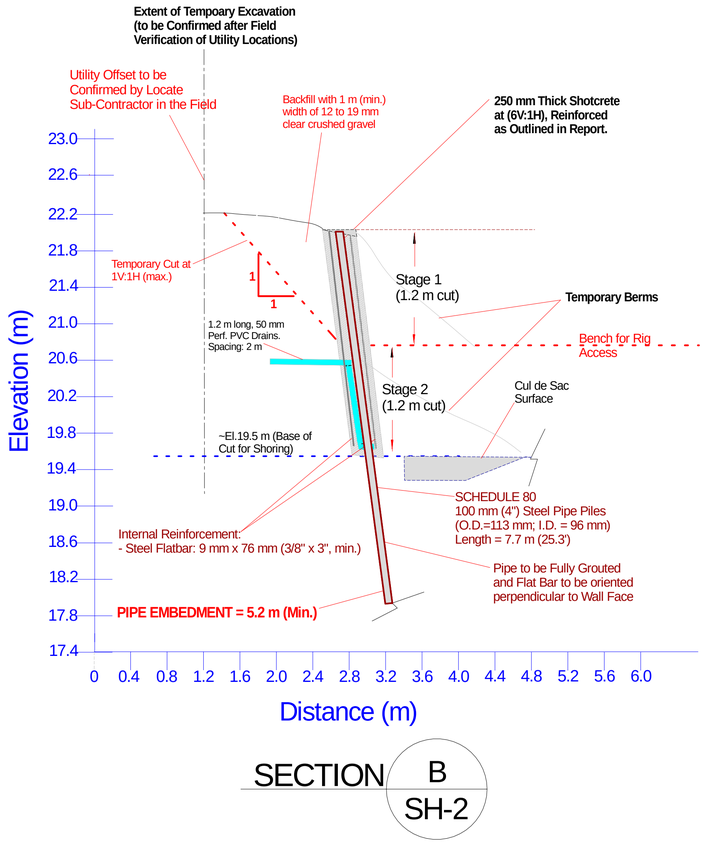
Puar Engineering CONSULTANTS

Job No:	Date:	FIGURE:
07-2-256	12Feb	SH-2

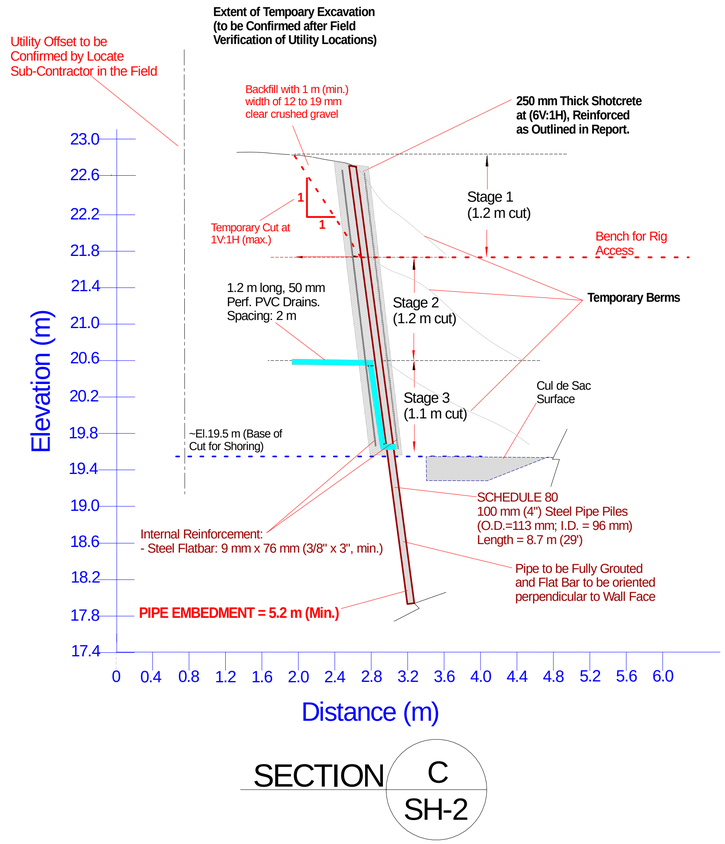
Rev:	Dwn:	Chk:
	wsl	sp



SECTION A
SH-2



SECTION B
SH-2



SECTION C
SH-2

NOTES:

Refer to Figure SH-1 for construction recommendations:
- staging of rows (panelling, etc),
- lateral reinforcement scheme (in front and behind piles)

Revisions

CLIENT: EBRAHIM
3707 Dollarton Hwy, North Vancouver, BC
Proposed Subdivision

Reference Drawings

SECTIONS A to C
Cantilevered Soldier Pile Wall

Scale: 1:50

Puar Engineering CONSULTANTS

Job No:	Date:	FIGURE:
07-2-256	12Feb	SH-3 SH-4 SH-5

Rev:	Dwn:	Chk:
	wsl	sp

HOME