Alten Construction Pty Ltd

Proposed Residential Development
882A Pittwater Road, Dee Why NSW

Preliminary Geotechnical Assessment

Our ref: 6325-G1
23 December 2020

Your trusted engineering professionals

Document Authorisation

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882A Pittwater Road, Dee Why NSW
Preliminary Geotechnical Assessment

Prepared for Alten Construction Pty Ltd

Our ref: 6325-G1
23 December 2020

For and on behalf of
AssetGeoEnviro

Mark Bartel

Mark Bartel
BE, MEngSc, GMQ, CPEng, RPEQ/NER(Civil), APEC IntPE(Aus)
Managing Director | Senior Principal Geotechnical Engineer

Document Control

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Suite 2.06 / 56 Delhi Road
North Ryde NSW 2113
02 9878 6005
assetgeoenviro.com.au

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Contents

1. Introduction

1.1 General

This report presents the results of a Preliminary Geotechnical Assessment (PGA) for the proposed residential development at 882A Pittwater Road, Dee Why. The assessment was commissioned on 18 November 2020 by Priscilla Touma of Alten Construction Pty Ltd. The work was carried out in accordance with the proposal by AssetGeoEnviro (Asset) dated 17 November 2020, reference 6325-P1.

1.2 Project Details

Documents supplied to us for this investigation are listed in Appendix A and comprised:

- Architectural plans (prepared by: Crawford Architects; ref: 20036; dwg nos: A001A, A002B, A100B, A101B, A102B, A103B, A104B, A105B, A106B, A300B, A301B, A350B, A351B; issued 20.11.17).

Based on the supplied drawings, we understand that the project involves the construction of a eight-storey residential development with some commercial units on the lower levels and no basement levels. The finished floor level of the ground floor is similar to the existing ground surface. Minimal excavation is anticipated for the development, generally less than 1m and up to about 1.5m to 2m locally for a lift pit over-run.

1.3 Scope of Work

The objective of the PGA is to provide information on the site conditions and anticipated subsurface conditions to support a Development Application.

The scope of work included:

- Walkover observations of site conditions.
- Review of supplied documents and previous geotechnical data for nearby developments, including the site at 874–876 Pittwater Road and 8 Oaks Avenue, Dee Why.
- Engineering assessment and reporting.

This report must be read in conjunction with the attached "Important Information about your Geotechnical Report" in Appendix A. Attention is drawn to the limitations inherent in site investigations and the importance of verifying the subsurface conditions inferred herein.

2. Site Description

The site is located at the eastern side of Pittwater Road in Dee Why, as shown in Figure 1. It has a long generally rectangular shape measuring about 6.4m width by about 34m to 40m length. The site is bounded to the west by Pittwater Road, to the north by an apartment building with commercial ground floor units, to the east by a plaza development, and to the south by a three and four storey residential and commercial development. The development to the north and east is understood to include two-level basement car parking with secant pile walls. Further south, on the corner of Pittwater Road and Oaks Avenue, is a multi-storey mixed-use development under construction including multiple basement levels.

Topographically, the site is located in very gently sloping to level terrain about 20m above AHD. The overall ground surface slope across the site is downwards to the east at less than about 1.5º. The ground continues to slope down to the east towards the Pacific Ocean which is located about 1km away. Dee Why Lagoon is located about 0.8km to the north east of the site.

At the time of investigation, the site was occupied by an existing one / two storey commercial property which appears to be in overall good condition. The site is adjacent to Pittwater Road, a six-lane TfNSW gazetted road. The external area comprised brick pavement and pedestrian walkways, which are known to be underlain by many buried services.

3. Geology

The 1:100,000 Sydney Geological Map indicates the site is underlain by Hawkesbury Sandstone.

A number of geotechnical investigations have previously been conducted by Asset and others within 250m of the site. These investigations suggest the site is underlain by alluvial and residual sand and clay, in turn underlain by sandstone bedrock. Two investigations conducted at sites opposite the subject site, on the north-western side of Pittwater Rd, encountered sandstone bedrock at varying depths of 0.8m to 6.5m below ground level. That site confirmed rockhead to be dipping significantly to the east. The data suggests the presence of deep buried alluvial channel that trends to the north-east.

4. Subsurface Conditions

A generalised geotechnical model for the site has been developed is shown in Table 1, developed primarily from investigations carried out for the site at 874–876 Pittwater Road and 8 Oaks Avenue, Dee Why. This model is for preliminary planning only, and site-specific invasive investigation will be required to assess the conditions at the subject site.

Table 1 - Generalised Site Geotechnical Model

Unit	Origin	Description	Depth to Top of Unit [1] (m)	Unit Thickness [1] (m)
1	Paving over Fill	CONCRETE floor slab over SAND / Silty SAND.	Ground surface	≤ 1
2	Alluvium	Layers of SAND, Silty SAND, Clayey SAND, Sandy CLAY. Variable density (loose to medium dense to dense with some areas comprising very loose sands) and consistency (firm to very stiff possibly some soft and very soft bands).	≤ 1	10 to 26
3	Residual	SAND, medium grained, brown, some gravelly bands, medium dense to dense (may not be present at some locations)	up to 13	0 to 2m
4a	Bedrock [2]	SANDSTONE, fine to medium grained, highly to moderately weathered, low strength, assessed Class 4.	15 to 27	1 to 2
4b	Bedrock [2]	SANDSTONE, fine to medium grained, moderately weathered, medium strength, assessed Class 3.	16 to 29	1 to 2
4c	Bedrock [2]	SANDSTONE, fine to medium grained, slightly weathered to fresh, high strength, assessed Class 2.	17 to	– –

Notes:

1. The depths and unit thicknesses are based on the information from a nearby site and do not necessarily represent the maximum and minimum values across that site, and do not necessarily represent the actual subsurface conditions at the subject site.
2. Rock classification to Pells, P.J.N., Mostyn, G. & Walker, B.F., Foundations on Sandstone and Shale in the Sydney Region, Australian Geomechanics Journal, December 1998.

5. Groundwater

Groundwater is anticipated at about 5m to 6m depth below ground level, with a gradient down to the east.

6. Discussions & Recommendations

6.1 Key Geotechnical Constraints

The key geotechnical constraints include variable and potentially poor subsurface conditions, and presence of adjoining basements.

Preliminary recommendations for design and construction of the development are provided in the following sections. These will require site-specific invasive investigation to confirm.

6.2 Earthworks

6.2.1 Excavation

The excavation for the proposed development is anticipated to be fully within soils, which would be achievable using conventional earthmoving equipment (i.e. hydraulic excavator bucket). Excavation of sandstone bedrock is not expected to be required.

6.2.2 Subgrade Preparation

The following general recommendations are provided for subgrade preparation for earthworks, pavements, slab-on-ground construction, and minor structures:

- Strip existing fill and topsoil. Remove unsuitable materials from the site (e.g. material containing deleterious matter). Stockpile remainder for re-use as landscaping material or remove from site.
- Excavate natural soils to design subgrade level, stockpiling suitable soils for re-use as engineered fill or remove to spoil.
- Compact the upper 150mm depth to a density index (AS1289.5.6.1–1998) not less than 80%. Areas which show visible heave under compaction equipment should be over-excavated a further 0.3m and replaced with approved fill compacted to a density index not less than 80%. It may be necessary to construct a working platform for construction equipment, depending on the actual site conditions.

Any waste soils being removed from the site must be classified in accordance with current regulatory authority requirements to enable appropriate disposal to an appropriately licensed landfill facility.

6.2.3 Filling

Where filing is required, place in horizontal layers over prepared subgrade and compact as per Table 2.

Table 2 – Compaction Specifications

Parameter	Cohesive Fill	Non Cohesive Fill
Fill layer thickness (loose measurement): • Within 1.5m of the rear of retaining walls • Elsewhere	 0.2m 0.3m	 0.2m 0.3m
Density: • Beneath Pavements • Beneath Structures • Upper 150mm of subgrade	 ≥ 95% Std ≥ 98% Std ≥ 100% Std	 ≥ 70% ID ≥ 80% ID ≥ 80% ID
Moisture content during compaction	± 2% of optimum	Moist but not wet

Filling within 1.5m of the rear of any retaining walls (e.g. adjacent basements) should be compacted using lightweight equipment (e.g. hand-operated plate compactor or ride-on compactor not more than 3 tonnes static weight) to limit compaction-induced lateral pressures.

Any soils to be imported onto the site for backfilling and reinstatement of excavated areas should be free of contamination and deleterious material and should include appropriate validation documentation in accordance with current regulatory authority requirements which confirms its suitability for the proposed land use. Asset can provide further advice on this matter if required.

6.2.4 Batter Slopes

Temporary and permanent batter slopes are not proposed for this development.

6.3 Footings

Footing selection and design will depend heavily on the actual subsurface conditions at the site. Possible options could include a stiffened raft slab, piles to suitable founding material, or a piled raft slab. The raft slab option would be appropriate if the subsurface conditions can accommodate high level loading without generating excessive settlement. The piled option would be appropriate where there are significant weak layers in the profile and deeper foundations are required to achieve load / settlement criteria.

If piles are considered, they would likely be rock-socketed, and the parameters in Table 3 may be used for preliminary design purposes.

Table 3 – Footing Design Parameters

Founding Stratum	Maximum Allowable (Serviceability) Values (kPa)			Ultimate Strength Limit State Values (kPa)			
	End Bearing	Shaft Friction Compression #	Shaft Friction Tension	End Bearing	Shaft Friction Compression #	Shaft Friction Tension*	Typical E_{field} MPa
Class 4 or better Sandstone	2,000	200	100	6,000	600	300	200
Class 3 Sandstone	3,500	350	175	10,500	1,000	500	400
Class 2 Sandstone	6,000	600	300	18,000	1,800	90	1,000

Note:

* Uplift capacity of piles in tension loading should also be checked for inverted cone pull out mechanism.

clean socket of roughness category R2 or better is assumed

BEL Bulk Excavation Level

In accordance with AS2159-2009 "Piling–Design and Installation", for limit state design, the ultimate geotechnical pile capacity shall be multiplied by a geotechnical reduction factor (Φg). This factor is derived from an Average Risk Rating (ARR) which considers geotechnical uncertainties, redundancy of the foundation system, construction supervision, and the quantity and type of pile testing (if any). Where testing is undertaken, or more comprehensive ground investigation is carried out, it may be possible to adopt a larger Φg value that results in a more economical pile design. Further geotechnical advice will be required in consultation with the pile designer and piling contractor, to develop an appropriate Φg value.

Settlements for footings on rock are anticipated to be about 1% of the minimum footing dimension, based on serviceability parameters as per Table 3.

Continuous Flight Auger (CFA) or Concrete Injected Screw (CIS) piles may be adopted for foundation piles. It will be necessary to construct a suitable working platform for safe operation.

An experienced Geotechnical Engineer should review footing designs to check that the recommendations of the geotechnical report have been included and should assess footing excavations to confirm the design assumptions.

6.4 Potential Impacts on Adjacent Developments

Potential geotechnical risks of construction on adjoining developments could include settlement/deflection of adjacent footings and basement retaining walls due to footing loading. Design development will need to address this potential impact after the ground conditions are investigated, to ensure that potential impacts on adjacent developments are acceptable.

7. Limitations

In addition to the limitations inherent in site investigations (refer to the attached Information Sheets), it must be pointed out that the recommendations in this report are based on assessed subsurface conditions from nearby investigations. To assess the subsurface profile at this site, invasive investigation is required. This should include, as a minimum, three Cone Penetrometer soundings down to bedrock and cored boreholes into the bedrock. Contamination investigations would also be required.

It is recommended that a qualified and experienced Geotechnical Engineer be engaged to provide further input and review during investigations and design development; including site visits during construction to verify the site conditions and provide advice where conditions vary from those assumed in this report. Development of an appropriate inspection and testing plan should be carried out in consultation with the Geotechnical Engineer.

This report and details for the proposed development should be submitted to relevant regulatory authorities that have an interest in the property (e.g. Council) or are responsible for services that may be within or adjacent to the site (e.g. Sydney Water, Transport for NSW), for their review.

Asset accepts no liability where our recommendations are not followed or are only partially followed. The document “Important Information about your Geotechnical Report” in Appendix A provides additional information about the uses and limitations of this report.

Figures

0 1:8000 A4 500m

Approximate only – subject to detail survey.
Source: SIX Maps
This drawing is used to illustrate site locality only and must not be used for any other purpose.
Copyright of source drawing remains with SIX Maps.

issue	date	description
A	23.12.20	INITIAL ISSUE

assetgeoenviro
2.06/56 Delhi Rd
North Ryde NSW 2113
t: 02 9878 6005
e: info@assetgeoenviro.com.au

Proposed Residential Development
882A Pittwater Road, Dee Why NSW
for
Alten Construction Pty Ltd

Site Locality

drawn: MAB
date: 23.12.20
checked: MAB
scale: 1:8000 A4

job no.: 6325
fig: 1
issue: A

Appendix A

Important Information about your Geotechnical Report
Soil & Rock Explanation Sheets

Important Information about your Geotechnical Report

Scope of Services

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client and Asset Geotechnical Engineering Pty Ltd ("Asset"), for the specific site investigated. The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

The report should not be used if there have been changes to the project, without first consulting with Asset to assess if the report's recommendations are still valid. Asset does not accept responsibility for problems that occur due to project changes if they are not consulted.

Reliance on Data

Asset has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. Asset has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, Asset will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Asset.

Geotechnical Engineering

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

Limitations of Site Investigation

The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behavior with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

Therefore, the recommendations in the report can only be regarded as preliminary. Asset should be retained during the project implementation to assess if the report's recommendations are valid and whether or not changes should be considered as the project proceeds.

Subsurface Conditions are Time Dependent

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. Asset should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

Verification of Site Conditions

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that Asset be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

Reproduction of Reports

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and no other party. Asset assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of Asset or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

Data Must Not Be Separated from The Report

The report as a whole presents the site assessment, and must not be copied in part or altered in any way.

Logs, figures, drawings, test results etc. included in our reports are developed by professionals based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These data should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Partial Use of Report

Where the recommendations of the report are only partially followed, there may be significant implications for the project and could lead to problems. Consult Asset if you are not intending to follow all of the report recommendations, to assess what the implications could be. Asset does not accept responsibility for problems that develop where the report recommendations have only been partially followed if they have not been consulted.

Other Limitations

Asset will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

Soil and Rock Explanation Sheets (1 of 2)

Log Abbreviations & Notes

METHOD

borehole logs

AS	auger screw *
AD	auger drill *
RR	roller / tricone
W	washbore
CT	cable tool
HA	hand auger
D	diatube
B	blade / blank bit
V	V-bit
T	TC-bit

* bit shown by suffix e.g. ADV

excavation logs

NE	natural excavation
HE	hand excavation
BH	backhoe bucket
EX	excavator bucket
DZ	dozer blade
R	ripper tooth

coring

NMLC, NQ, PQ, HQ

SUPPORT

borehole logs	
N	nil
M	mud
C	casing
NQ	NQ rods

excavation logs	
N	nil
S	shoring
B	benched

CORE—LIFT

casing installed

barrel withdrawn

NOTES, SAMPLES, TESTS

D	disturbed
B	bulk disturbed
U50	thin-walled sample, 50mm diameter
HP	hand penetrometer (kPa)
SV	shear vane test (kPa)
DCP	dynamic cone penetrometer (blows per 100mm penetration)
SPT	standard penetration test
N*	SPT value (blows per 300mm) * denotes sample taken
Nc	SPT with solid cone
R	refusal of DCP or SPT

USCS SYMBOLS

GW	Gravel and gravel-sand mixtures, little or no fines.
GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels
GM	Gravel-silt mixtures and gravel-sand-silt mixtures.
GC	Gravel-clay mixtures and gravel-sand-clay mixtures.
SW	Sand and gravel-sand mixtures, little or no fines.
SP	Sand and gravel sand mixtures, little or no fines.
SM	Sand-silt mixtures.
SC	Sand-clay mixtures.
ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity.
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays.
OL	Organic silts
MH	Inorganic silts
CH	Inorganic clays of high plasticity.
OH	Organic clays of medium to high plasticity, organic silt
PT	Peat, highly organic soils.

MOISTURE CONDITION

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

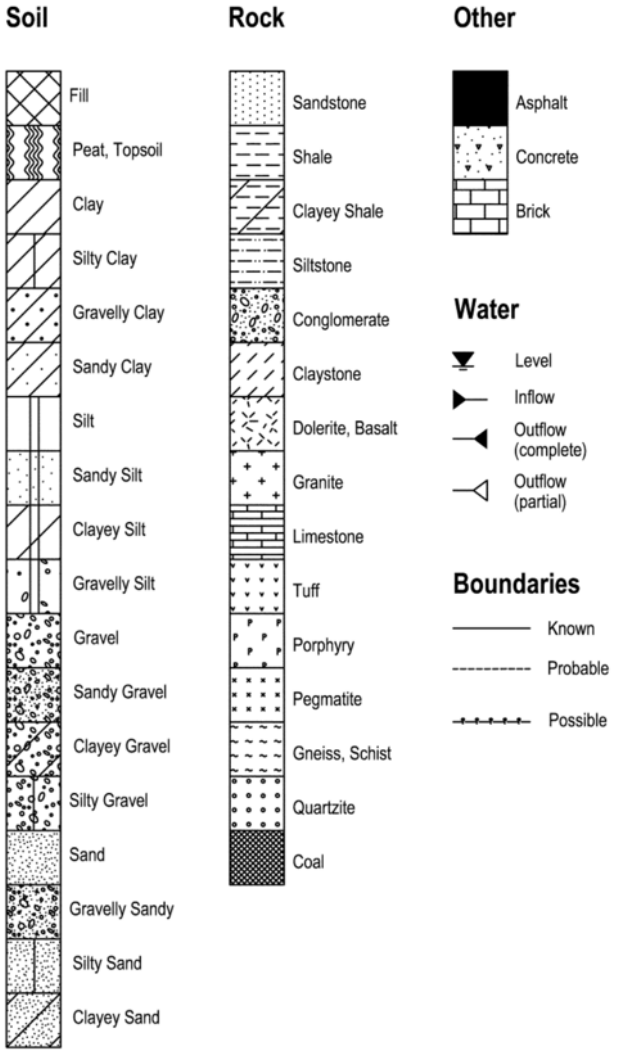
CONSISTENCY

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable

DENSITY INDEX

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Graphic Log



WEATHERING

XW	extremely weathered
HW	highly weathered
MW	moderately weathered
SW	slightly weathered
FR	fresh

STRENGTH

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

RQD (%)

= sum of intact core pieces > 2 x diameter x 100
total length of core run drilled

DEFECTS:

type	
JT	joint
PT	parting
SZ	shear zone
SM	seam

coating	
cl	clean
st	stained
ve	veneer
co	coating

shape	
pl	planar
cu	curved
un	undulating
st	stepped
ir	irregular

roughness	
po	polished
sl	slickensided
sm	smooth
ro	rough
vr	very rough

inclination

measured above axis and perpendicular to core

Soil and Rock Explanation Sheets (2 of 2)

AS1726-2017

Soils and rock are described in the following terms, which are broadly in accordance with AS1726-2017.

Soil

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Fine grained and cemented soils are hard, friable or powdery. Uncemented coarse grained soils run freely through hand.
Moist	Soil feels cool and darkened in colour. Fine grained soils can be moulded. Coarse soils tend to cohere.
Wet	As for moist, but with free water forming on hand.

Moisture content of cohesive soils may also be described in relation to plastic limit (W_P) or liquid limit (W_L) [>> much greater than, > greater than, < less than, << much less than].

CONSISTENCY OF FINE-GRAINED SOILS

Term	Su (kPa)	Term	Su (kPa)
Very soft	< 12	Very Stiff	>100 – ≤200
Soft	>12 – ≤25	Hard	> 200
Firm	>25 – ≤50	Friable	–
Stiff	>50 – ≤100		

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Term	Density Index (%)	Term	Density Index (%)
Very Loose	< 15	Dense	65 – 85
Loose	15 – 35	Very Dense	>85
Medium Dense	35 – 65		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		63 – 200
Gravel	coarse	19 – 63
	medium	6.7 – 19
	fine	2.36 – 6.7
Sand	coarse	0.6 – 2.36
	medium	0.21 – 0.6
	fine	0.075 – 0.21
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass:	
	coarse grained	*fine grained*
Trace	≤ 15%	≤ 5%
With	>15% – ≤30%	>5% – ≤12%

SOIL ZONING

Layers	Continuous across exposures or sample.
Lenses	Discontinuous, lenticular shaped zones.
Pockets	Irregular shape zones of different material.

SOIL CEMENTING

Weakly	Easily broken up by hand pressure in water or air.
Moderately	Effort is required to break up by hand in water or in air.

USCS SYMBOLS

Symbol	Description
GW	Gravel and gravel-sand mixtures, little or no fines.
GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels.
GM	Gravel-silt mixtures and gravel-sand-silt mixtures.
GC	Gravel-clay mixtures and gravel-sand-clay mixtures.
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CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays.
OL	Organic silts
MH	Inorganic silts
CH	Inorganic clays of high plasticity.
OH	Organic clays of medium to high plasticity, organic silt
PT	Peat, highly organic soils.

Rock

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of …..)
Conglomerate	... gravel sized (>2mm) fragments.
Sandstone	... sand sized (0.06 to 2mm) grains.
Siltstone	... silt sized (<0.06mm) particles, rock is not laminated.
Claystone	... clay, rock is not laminated.
Shale	... silt or clay sized particles, rock is laminated.

LAYERING

Term	Description
Massive	No layering apparent.
Poorly Developed	Layering just visible. Little effect on properties.
Well Developed	Layering distinct. Rock breaks more easily parallel to layering.

STRUCTURE

Term	Spacing (mm)	Term	Spacing
Thinly laminated	<6	Medium bedded	200 – 600
Laminated	6 – 20	Thickly bedded	600 – 2,000
Very thinly bedded	20 – 60	Very thickly bedded	> 2,000
Thinly bedded	60 – 200		

STRENGTH (NOTE: Is50 = Point Load Strength Index)

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	<0.03	High	1.0 – 3.0
Very low	0.03 – 0.1	Very High	3.0 – 10.0
Low	0.1 – 0.3	Extremely High	>10.0
Medium	0.3 – 1.0		

WEATHERING

Term	Description
Residual Soil	Material is weathered to an extent that it has soil properties. Rock structures are no longer visible, but the soil has not been significantly transported.
Extremely …..	Material is weathered to the extent that it has soil properties. Mass structures, material texture & fabric of original rock is still visible.
Highly …..	Rock strength is significantly changed by weathering; rock is discolored, usually by iron staining or bleaching. Some primary minerals have weathered to clay minerals.
Moderately …..	Rock strength shows little or no change of strength from fresh rock; rock may be discolored.
Slightly …..	Rock is partially discolored but shows little or no change of strength from fresh rock.
Fresh	Rock shows no signs of decomposition or staining.

DEFECT DESCRIPTION

Type	
Joint	A surface or crack across which the rock has little or no tensile strength. May be open or closed.
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering/bedding. May be open or closed.
Sheared Zone	Zone of rock substance with roughly parallel, near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects.
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed).
Shape	
Planar	Consistent orientation.
Curved	Gradual change in orientation.
Undulating	Wavy surface.
Stepped	One or more well defined steps.
Irregular	Many sharp changes in orientation.
Roughness	
Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.
Smooth	Smooth to touch. Few or no surface irregularities.
Rough	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper.
Very Rough	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper.
Coating	
Clean	No visible coating or discolouring.
Stained	No visible coating but surfaces are discolored.
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating =1mm thick. Thicker soil material described as seam.