



APPENDIX 3

3. GEOTECHNICAL REPORT

Prepared by: Galt Geotechnics

Reference: J1501235 001

Dated: 30 October 2015

Report on
GEOTECHNICAL STUDY
PROPOSED RESIDENTIAL SUBDIVISION
LOT 19 SIXTY EIGHT ROAD
BALDIVIS

Submitted to:
The Spatial Group
PO Box 1345
SOUTH PERTH WA 6951

www.galtgeo.com.au
2/39 Flynn St, WEMBLEY WA 6 014
T: +61 (8) 6272-0200
F: +61 (8) 9285-8444

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1. INTRODUCTION

This report presents the outcomes of Galt Geotechnics Pty Ltd's (Galt's) geotechnical study for the proposed residential subdivision at Lot 19 Sixty Eight Road, Baldivis ("the site"). The location of the site relative to the surrounding area is shown on Figure 1, Site and Location Plan.

The study was authorised by Tom Carroll of The Spatial Group in an email dated 19 October 2015.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The site is roughly rectangular, covering about 9.1 ha. The site is bounded by Sixty Eight Road to the south, a new residential subdivision to the west and bushland to the other sides. Publicly available surface contour data shows that the surface slopes from about RL 33 m AHD at the northeast corner to a low of RL 15 m AHD over the southern part of the site.

The southern half of the site is currently a market garden with an established irrigation system. A residence and various buildings are located in the southeast corner. The remainder of the site is bushland.

The provided plan shows that the site is to be subdivided into 92 lots ranging in size from 300 m² to over 500 m². The southeastern part will be a high school and public open space will be located in the middle of the northern half. Details of the proposed earthworks have not been provided but it is likely that between 3 m and 4 m of cut will be required over the northern half of the site in order to achieve final levels.

We assume that the buildings will be single and double storey residential buildings of masonry or steel frame construction.

Note: We understand that a separate geotechnical investigation will be carried out for the proposed school buildings. The recommendations provided herein do not apply to the school.

3. PROJECT OBJECTIVES

The objectives of the study were to:

- ✦ assess subsurface soil and groundwater conditions across the site;
- ✦ provide recommendations on suitable footing systems for the proposed development;
- ✦ provide a site classification(s) in accordance with AS 2870-2011 "Residential Slabs and Footings";
- ✦ provide recommendations and geotechnical design parameters for earth retaining structures;
- ✦ assess the appropriate site subsoil class for the site in accordance with AS 1170.4-2007;
- ✦ recommend appropriate site preparation procedures including compaction criteria;
- ✦ assess the permeability of the soils at the site for potential on-site disposal of stormwater by infiltration; and
- ✦ provide a subgrade California bearing ratio (CBR) value for pavement thickness design by others.

4. FIELDWORK

Fieldwork was completed by Galt on the 26 of October 2015 and comprised:

- ✦ walk-over survey and inspection of existing buildings for visual signs of ground related movement;
- ✦ excavation of machine auger boreholes at ten locations (BH01 – BH10), extending to depths of 3.0 m and 5.0 m;

- testing with a Perth sand penetrometer (PSP) adjacent to selected boreholes, extending to depths of between 1.05 m and 1.95 m; and
- infiltration testing using the 'inverse auger hole' technique at three locations (P01 – P03), at a depth of about 0.6 m below ground.

General

The test locations were selected and positioned by a geotechnical engineer from Galt using a handheld GPS accurate to about 5 m in the horizontal plane. Our engineer observed the drilling of the boreholes, conducted penetrometer testing and infiltration testing, logged the materials encountered in the boreholes.

Approximate test locations are shown on Figure 1, Site and Location Plan. Photographs of the site are presented in Appendix A, Site Photographs.

Boreholes

Boreholes were drilled with an Ezi-probe, utility-mounted drill rig with an auger diameter of 100 mm. The drill rig was supplied and operated by Galt. Borehole reports are presented in Appendix B, Summary Borehole Reports along with a method of soil description and a list of explanatory notes and abbreviations used in the reports.

Perth Sand Penetrometer Tests

PSP testing was conducted in accordance with AS1289.6.3.3 except to a greater depth than the 0.45 m specified in the standard. PSP blow counts were also recorded in 0.15 m intervals rather than per 0.3 m. The test results are presented in Appendix C, Perth Sand Penetrometer Test Results.

Infiltration Test Results

Infiltration testing was carried out using the inverse auger hole method described by Cocks¹. The results of the unsaturated permeability testing are presented in Appendix D, Infiltration Test Results and summarised in Table 1: Summary of Infiltration Test Results

Table 1: Summary of Infiltration Test Results

Test Name	Test Depth (m)	Soil Description	Minimum Unsaturated Permeability, k (m/day)		
			Test 1	Test 2	Test 3
P01	0.64	Sand	7.9	6.5	6.1
P02	0.69	Sand	>15	>15	>15
P03	0.67	Sand	>15	>15	>15

- Notes:
1. The minimum permeabilities shown are typically recorded towards the end of the test, with pressure head varying between about 0.06 m and 0.3 m.
 2. Permeability values higher than about 15 m/day are not reported due to the inaccuracy of the test method in highly permeable material.

¹ Cocks, G (2007), "Disposal of Stormwater Runoff by Soakage in Perth Western Australia", Journal and News of the Australian Geomechanics Society, Volume 42 No. 3, pp 101-114

5. SITE CONDITIONS

5.1 Geology

The Rockingham sheet of the 1:50,000 scale Environmental Geology series map indicates that the area is underlain by sand derived from the weathering of Tamala Limestone. This is described as *SAND – pale yellowish brown, medium to coarse grained, sub-angular to well rounded quartz, trace of feldspar, shell debris, variably lithified, surface kankar, or eolian origin.*

The findings of the investigation are generally in accordance with the published geology.

5.2 Subsurface Conditions

Subsurface conditions are generally consistent across the site. The typical soil profile may be summarised as:

- ✦ SAND (SP), fine to coarse grained, sub-angular to sub-rounded, grey becoming orange-brown at depth, trace rootlets in top 0.15 m, dry becoming moist at depth, typically loose to medium dense, present from surface extending to maximum depth of investigation (5.0 m).

5.3 Groundwater

The Perth Groundwater Atlas (1997) does not extend to this site. However, from our experience in this area, we would expect the groundwater table to be at about RL 6 m AHD (about 10 m below the lowest part of the site).

Groundwater was not encountered within any of the boreholes excavated during the fieldwork (to a maximum excavation depth of 5.0 m).

6. GEOTECHNICAL ASSESSMENT

6.1 Site Classification

We consider that the site is geotechnically capable of supporting the proposed development.

We have assessed the site classification for the site in accordance with AS2870 (2011) "Residential Slabs and Footings". Based on the ground conditions encountered during the investigation, we consider that a site classification of "Class A" will be appropriate for the site provided that conventional site preparation is undertaken prior to construction (refer to Section 6.4).

6.2 Site Subsoil Class

We have assessed the site subsoil class in accordance with AS1170.4-2007, "Earthquake Design Actions – Australia". We consider that a site subsoil class of 'Ce' is appropriate for the site. This is based on the presence of loose to dense sand and the expected depth to rock being less than 45 m.

6.3 Shallow Footings

Provided that the site preparation measures given in Section 6.4 are completed, we consider that proposed residential structures may be founded on shallow footings constructed in accordance with the requirements of AS 2870-2011 for the appropriate site classification as outlined in Section 6.1 (maximum bearing pressure of 100 kPa).

6.4 Site Preparation

The site preparation measures outlined below are aimed at improvement of the site in preparation for construction of the proposed development. This site preparation will not be required below landscaped areas provided that the measures carried out extend at least 2.0 m beyond the footprints of on-ground slabs, footings and pavements. Practically speaking, it will probably be necessary to undertake these measures across the entire site except in public open space areas.

The following site preparation measures must be followed for on-ground slabs, footings and pavements:

- ✦ Demolish/remove residences and associated outbuildings and pavements (including removal of all footings) and dispose of off-site.
- ✦ Remove stockpiled garden waste, construction rubble and household rubbish present across the site.
- ✦ Remove any deleterious material from site including buried services, soak wells, footings and slabs.
- ✦ Strip all vegetation and topsoil from the site (including grubbing out of tree roots). We recommend that a 100 mm strip is carried out across the site (probably deeper in the market garden areas), however all roots must be removed.
- ✦ Topsoil may be stockpiled for possible screening and blending to produce a suitable structural fill (refer to Section 6.6).
- ✦ Moisture condition and compact the exposed ground to achieve the level of compaction specified in Section 6.5 to a depth of 0.9 m.
- ✦ Where fill is required to build up levels, use approved fill (refer to Section 6.6), placed and compacted in layers no greater than 300 mm loose thickness.
- ✦ Excavate footing trenches and compact the exposed bases to achieve the level of compaction specified in Section 6.5 to a depth of at least 0.9 m below the footings.

6.5 Compaction

In situ sand and imported granular fill must be compacted using suitable compaction equipment to achieve a dry density ratio (DDR) of at least 95% of maximum modified dry density (MMDD) as determined in accordance with AS 1289.5.2.1 and within 2% of optimum moisture content (OMC).

Where sand is used as fill, a Perth sand penetrometer (PSP) may be used for compaction control. The following minimum PSP blow counts may be assumed to correlate to the required DDR:

- ✦ 150 mm-450 mm: 8
- ✦ 450 mm-750 mm: 10
- ✦ 750 mm-900 mm: 6 (or 750 mm-1050 mm: 12)

If difficulties are experienced in achieving the required blow count, an on-site PSP calibration should be undertaken to determine the site-specific blow count correlating to the required dry density ratio.

Over-excavation and replacement of loose materials must be performed where the minimum dry DDR cannot be achieved.

Fill must be placed in horizontal layers of not greater than 300 mm loose thickness. Each layer must be compacted by suitable compaction equipment, and carefully controlled to ensure even compaction over the full area and depth of each layer.

Care will need to be taken when compacting in the vicinity of existing services and structures. This is particularly important if vibratory compaction is being carried out. Tynan (1973)² provides assistance with the selection of compaction equipment for use adjacent to services.

After compaction, verify that the required level of compaction has been achieved by testing to a minimum depth of 0.9 m:

- ✦ on each lift of fill on a 40 m grid;
- ✦ at each spread footing location;
- ✦ at 10 m centres along gravity retaining wall footings and strip footings (where present); and
- ✦ on a grid of 15 m centres below on-ground slabs and pavements.

6.6 Approved Fill

Imported granular fill must comply with the material requirements as stated in AS 3798-2007, "Guidelines on Earthworks for Commercial and Residential Developments". Generally, the *in situ* sand present at the site is suitable for re-use as inert structural fill. Any organic-rich sand or sand containing significant proportions of fines (>5% of material less than 0.075 mm in size) must not be used as inert structural fill.

Re-Use of Topsoil

Topsoil may be considered for re-use as inert structural fill, provided the material is screened (40 mm screen) and blended with clean inert sand, such that the total organic content is less than 2%, and the permeability of the material meets the design requirements (to be determined by the project civil engineer or hydrologist). Due to the expected lower permeability of topsoil blends, this material may generally be used as structural fill provided that it is placed more than 1.2 m below finished surface level where soak wells are present, or at a higher level in other areas dependent on the permeability requirements set by the project civil engineer or hydrologist.

Field trials should be carried out at the start of earthworks to confirm the permeability of the topsoil blend and whether such a blend can be used as permeable structural fill. We would expect that a blend of 1 part screened topsoil : 1-2 parts clean sand would be suitable.

Where doubt exists, a geotechnical engineer must be engaged to inspect and approve the use of potential fill materials.

6.7 Excavation

Based on the soil profile encountered, we expect that excavations on site will be readily achievable to depths of 5 m below current surface level using conventional earthmoving equipment (i.e. with a 10 tonne or larger excavator with a toothed bucket). **Note:** Boreholes were limited to 3.0 m depth over the southern part of the site (proposed fill area). If deeper excavations are required over this area, additional investigation is required.

Excavations in sand are prone to instability particularly below the water table (this may be an issue for any deep excavations in the lower-lying southern part of the site).

Above the water table, we recommend batter angles no steeper than 1V:2H for temporary slopes and 1V:3H for permanent slopes where no external restraint is provided to the slope. Even at these slope angles, rilling and erosion of the slope may occur. Where steeper slopes are required, temporary or permanent slope retention must be employed.

² Tynan (1973) Ground Vibration and Damage Effects on Buildings, Australia Road Research Board, Special Report No. 11.

Temporary slopes up to 1V:1.5H can be considered where:

- ✦ No surcharge (machinery, stockpiles, etc) is present at the crest of the slope.
- ✦ The maximum slope height is 2 m.
- ✦ The water table is at least 1 m below the toe of the slope.

A geotechnical engineer must be consulted where there is any doubt regarding the stability or safety of unsupported excavations.

6.8 Retaining Structure

Retaining structures may be designed in accordance with AS 4678-2002 "Earth-Retaining Structures". For the design of retaining structures, the following parameters in Table 2 are appropriate.

Table 2: Retaining Structure Design Parameters

Soil Type	Bulk Density (t/m ³)	Angle of Internal Friction (deg.)	Wall Friction = 0°		Wall Friction = 0.5Φ	
			Coefficient of Active Earth Pressure, K _a	Coefficient of Passive Earth Pressure, K _p	Coefficient of Active Earth Pressure, K _a	Coefficient of Passive Earth Pressure, K _p
Medium dense sand	17	33	0.29	3.4	0.26	5.3
Dense to very dense sand and sand fill	18	36	0.26	3.9	0.22	6.5

- Notes:**
1. Earth pressure coefficients are provided in this table for conditions of zero friction between the wall and the soil and with wall friction of 0.5Φ'.
 2. The retaining wall designer should make an independent assessment of the parameters appropriate to the construction method to be used, including alternative values of wall friction.
 3. A horizontal ground surface behind the wall has been assumed.

Compaction plant can augment the lateral earth pressure acting on retaining walls. Hand operated compaction equipment is recommended within 2 m of any retaining walls to minimise compaction pressures.

It is important to note that some ground movement is to be expected behind any soil retaining system, including gravity retaining walls.

Note: Prepared footing excavations for all high retaining walls (>1.5 m) must be carefully assessed by a competent person to ensure that adequate preparation has been achieved for the proposed walls.

6.9 Pavement Subgrades

Where design of flexible pavements is undertaken, a subgrade California bearing ratio (CBR) of 12% may be assumed for pavement thickness design. This CBR value assumes that the site preparation requirements outlined in Section 6.4 have been carried out on the pavement subgrade.

6.10 Stormwater Disposal

The results of infiltration testing are presented in Appendix D and summarised in Table 1: Summary of Infiltration Test Results. The minimum measured permeabilities are as follows:

- ⚡ P01: 6.1 m/day
- ⚡ P02: >15 m/day
- ⚡ P03: >15 m/day

Note: The accuracy of the field permeability tests is uncertain in very high permeability materials ($k > 15$ m/day).

We consider that the sands at the site are suitable for on-site disposal of stormwater by infiltration using soak wells or similar. Notwithstanding the results of the permeability testing, we recommend a design value of permeability (k) not greater than 5 m/day for the *in situ* sand and sand fill to allow for the variability in materials and reduced permeability as a consequence of:

- ⚡ densification of sand during site preparation works;
- ⚡ natural variation in sands; and
- ⚡ clogging of the sand around soak wells and soakage basins over time with fines.

The permeability of compacted imported fill and any blends of sand and screened topsoil must be checked.

Soak wells should be placed outside a line of 1V:2H extending below the edge of the nearest footing (or at least 3 m of footings or on-ground slabs) subject to local council regulations. Discharge from soak wells has been known to promote densification of loose sandy soils, leading to settlements of footings and slabs. Soak wells should be carefully wrapped with geotextile to prevent migration of sand and fines into the soak well.

7. CLOSURE

We draw your attention to Appendix E of this report, "Understanding your Report". The information provided within is intended to inform you as to what your realistic expectations of this report should be. This information is provided not to reduce the level of responsibility accepted by Galt, but to ensure that all parties who rely on this report are aware of the responsibilities each assumes in so doing.

GALT GEOTECHNICS PTY LTD



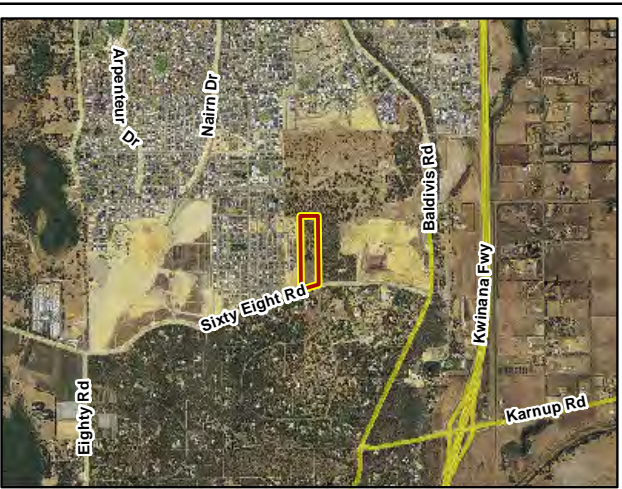
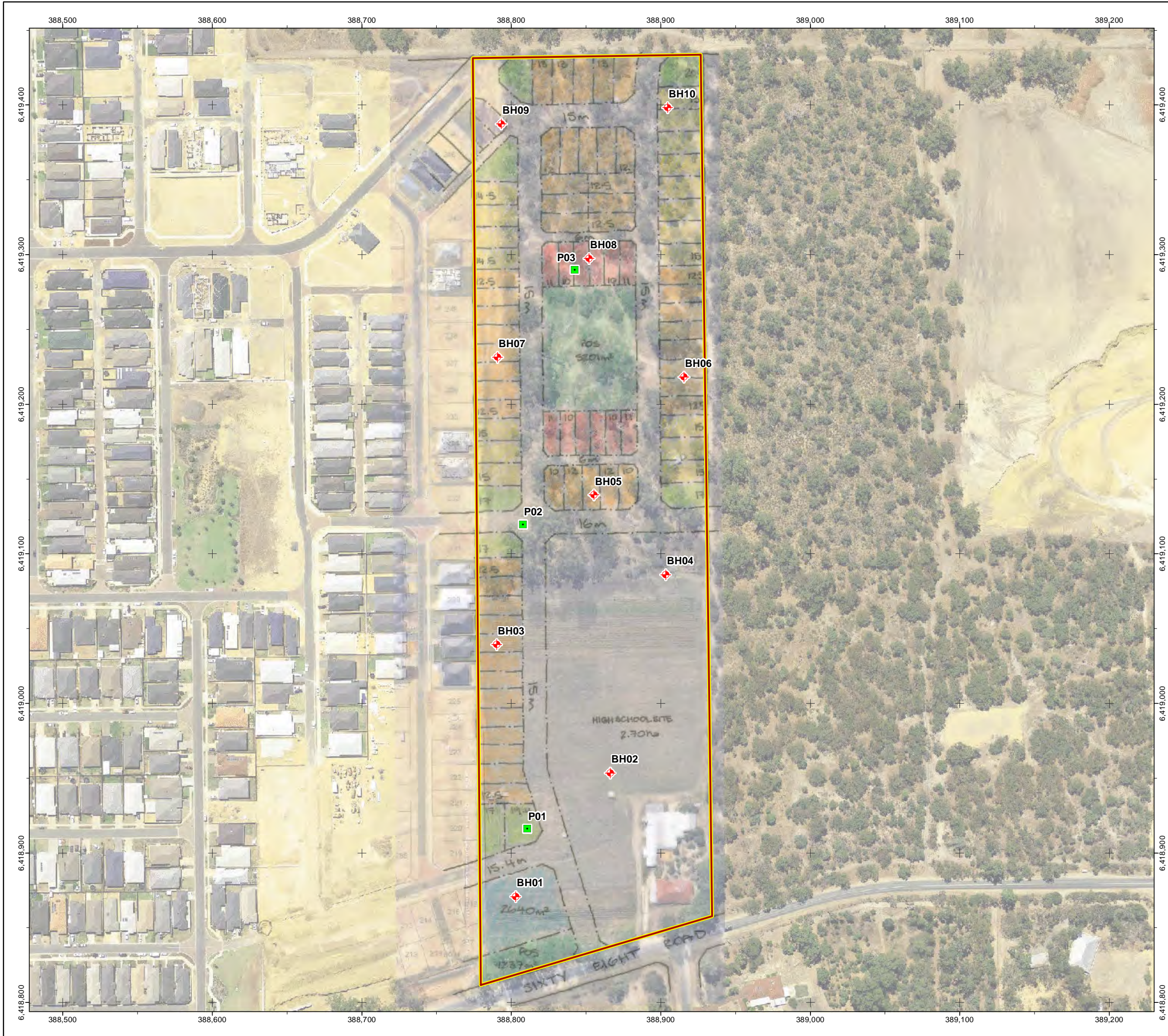
Rick Piovesan CPEng
Geotechnical Engineer



Brendon Blok
Graduate Geotechnical Engineer

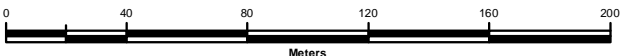
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Figures



Legend

- Site Boundary
- Borehole
- Permeability Test



	SCALE	1:2,500	(A3)
	DRAWN	DAC	
	DATE DRAWN	27/10/2015	
	CHECKED	RP	
	DATE CHECKED	30/10/2015	
	PROJECTION	GDA 1994 MGA Zone 50	

Galt Geotechnics Pty Ltd
ACN : 138 490 865
Tel : +61 (0)8 6272-0200
Fax : +61 (0)8 9285 8444
Address : U2, 39 Flynn Street,
Wembley, WA, 6014

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CLIENT	THE SPATIAL GROUP		
PROJECT	PROPOSED RESIDENTIAL SUBDIVISION		
LOCATION	LOT 19 SIXTY EIGHT ROAD BALDIVIS		
TITLE	SITE & LOCATION PLAN		
Job No	J1501235	Fig No	FIGURE 1
		Rev	A

Appendix A: Site Photographs



Photograph 1: View of BH01 looking west



Photograph 2: View from BH03 looking south



Photograph 3: View of BH04 looking south



Photograph 4: View of BH07 looking south



Photograph 5: View of BH08 looking north



Photograph 6: View of BH10 looking east

Appendix B: Borehole Reports

METHOD OF SOIL DESCRIPTION BOREHOLE AND TEST PIT REPORTS



GRAPHIC LOG & UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) SYMBOLS

Graphic	USCS	Soil Name	Graphic	USCS	Soil Name
		FILL (various types)		SM	Silty SAND
		COBBLES		ML	SILT (low liquid limit)
		BOULDERS		MH	SILT (high liquid limit)
	GP	GRAVEL (poorly graded)		CL	CLAY (low plasticity)
	GW	GRAVEL (well graded)		CI	CLAY (medium plasticity)
	GC	Clayey GRAVEL		CH	CLAY (high plasticity)
	SP	SAND (poorly graded)		OL	Organic SILT (low liquid limit)
	SW	SAND (well graded)		OH	Organic SILT (high liquid limit)
	SC	Clayey SAND		Pt	PEAT

RESISTANCE TO EXCAVATION

Symbol	Term	Description
VE	Very easy	All resistances are relative to the selected method of excavation
E	Easy	
F	Firm	
H	Hard	
VH	Very hard	

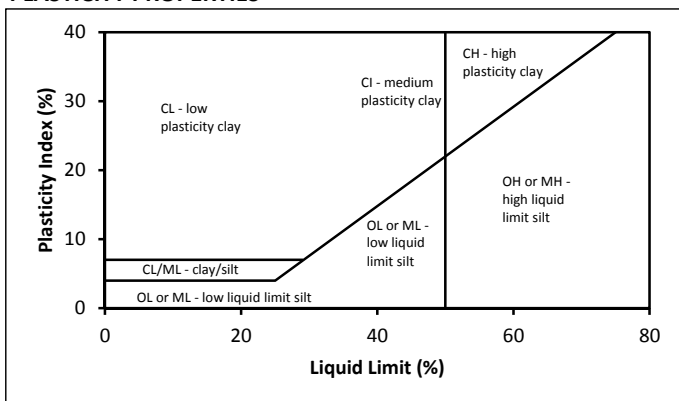
SOIL CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil descriptions are based on AS1726-1993, Appendix A. Material properties are assessed in the field by visual/tactile methods in combination with field testing techniques (where used).

PARTICLE SIZE

Soil Name	Particle Size (mm)
BOULDERS	>200
COBBLES	63 to 200
GRAVEL	Coarse 20 to 63
	Medium 6 to 20
	Fine 2 to 6
SAND	Coarse 0.6 to 2.0
	Medium 0.2 to 0.6
	Fine 0.075 to 0.2
FINES	SILT 0.002 to 0.075
	CLAY <0.002

PLASTICITY PROPERTIES



MOISTURE CONDITION

AS1726-1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726-1993 and HB160-2006

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N"	DCP blows per 100 mm	Symbol	Term	Density Index (%)	SPT "N"	DCP blows per 100 mm	PSP Blows per 300 mm
VS	Very Soft	0 to 12	0 to 2	<1	VL	Very Loose	<15	0 to 4	<1	0 to 2
S	Soft	12 to 25	2 to 4	<1	L	Loose	15 to 35	4 to 10	1 to 2	2 to 6
F	Firm	25 to 50	4 to 8	1 to 2	MD	Medium Dense	35 to 65	10 to 30	2 to 3	6 to 8
St	Stiff	50 to 100	8 to 15	3 to 4	D	Dense	65 to 85	30 to 50	4 to 8	8 to 15
VSt	Very Stiff	100 to 200	15 to 30	5 to 10	VD	Very Dense	>85	>50	>8	>15
H	Hard	>200	>30	>10						

Note: PSP correlations only valid to 450 mm depth

Consistency and density may also be inferred from excavation performance and material behaviour.

EXPLANATORY NOTES TO BE READ WITH BOREHOLE AND TEST PIT REPORTS



METHOD OF DRILLING OR EXCAVATION

AC	Air Core	E	Excavator	PQ3	PQ3 Core Barrel
AD/T	Auger Drilling with TC-Bit	EH	Excavator with Hammer	PT	Push Tube
AD/V	Auger Drilling with V-Bit	HA	Hand Auger	R	Ripper
AT	Air Track	HMLC	HMLC Core Barrel	RR	Rock Roller
B	Bulldozer Blade	HQ3	HQ3 Core Barrel	SON	Sonic Rig
BH	Backhoe Bucket	N	Natural Exposure	SPT	Driven SPT
CT	Cable Tool	NMLC	NMLC Core Barrel	WB	Washbore
DT	Diatube	PP	Push Probe	X	Existing Excavation

SUPPORT

T Timbering

PENETRATION EFFORT (RELATIVE TO THE EQUIPMENT USED)

VE	Very Easy	E	Easy	F	Firm
H	Hard	VH	Very Hard		

WATER

▶	Water Inflow	▼	Water Level
◀	Water Loss (complete)		
◁	Water Loss (partial)		

SAMPLING AND TESTING

B	Bulk Disturbed Sample	P	Piston Sample
BLK	Block Sample	PBT	Plate Bearing Test
C	Core Sample	U	Undisturbed Push-in Sample
CBR	CBR Mould Sample		U50: 50 mm diameter
D	Small Disturbed Sample	SPT	Standard Penetration Test
ES	Environmental Soil Sample		Example: 3, 4, 5 N=9
EW	Environmental Water Sample		3,4,5: Blows per 150 mm
G	Gas Sample		N=9: Blows per 300 mm after
HP	Hand Penetrometer		150 mm seating interval
LB	Large Bulk Disturbed Sample	VS	Vane Shear; P = Peak
M	Mazier Type Sample		R = Remoulded (kPa)
MC	Moisture Content Sample	W	Water Sample

ROCK CORE RECOVERY

$$\text{TCR} = \text{Total Core Recovery (\%)} = \frac{\text{CRL}}{\text{TCL}} \times 100$$

$$\text{SCR} = \text{Solid Core Recovery (\%)} = \frac{\text{CCR}}{\text{TCL}} \times 100$$

$$\text{RQD} = \text{Rock Quality Designation (\%)} = \frac{\text{ALC} > 100}{\text{TCL}} \times 100$$

TCL Length of Core Run

CRL Recovered Length of Core

CCR Total Length of Cylindrical Pieces of Core Recovered

ALC>100 Total Length of Axial Lengths of Core Greater than 100 mm Long

Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	E		0.0					.	SP	SAND: fine to medium grained, sub-angular to sub-rounded, dark grey, trace rootlets in top 0.15 m	D	D	
			0.5							Fine to coarse grained, grey-brown			
			1.0					.		Becoming orange-brown, trace fines			
			1.5					.			M		
			2.0					.					
			2.5					.					
			3.0					.					
			3.5					.		Hole terminated at 3.00 m Target depth Groundwater not encountered			
			4.0					.					
			4.5					.					
			5.0					.					
			5.5					.					

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling					Sampling			Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	E		0.0					.	.	SAND: fine to medium grained, sub-angular to sub-rounded, dark grey, trace rootlets in top 0.15 m	D		
			0.5										
			1.0					.	.	Fine to coarse grained, grey-brown			
			1.5					.	.	SP		D	
			2.0					.	.				
			2.5					.	.	Becoming orange-brown, trace fines	M		
			3.0					.	.				
			3.5					.	.	Hole terminated at 3.00 m Target depth Groundwater not encountered			
			4.0					.	.				
			4.5					.	.				
			5.0					.	.				
			5.5					.	.				

Sketch & Other Observations



Comments:

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Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling					Sampling			Field Material Description					
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MA	E		0.0					<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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Sketch & Other Observations



Comments:

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Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling					Sampling		Field Material Description							
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	E		0.0					* *						

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MA	E		0.0					.	.	SAND: fine to medium grained, sub-angular to sub-rounded, pale grey, trace rootlets in top 0.15 m	D	L	
			0.5							Fine to coarse grained, brown, trace fines			
			1.0					.	.				
			1.5					.	.	Becoming brown-orange			
			2.0					.	.		M	MD	
			2.5					.	.				
			3.0					.	.				
			3.5					.	.				
			4.0					.	.				
			4.5					.	.				
			5.0					.	.	Hole terminated at 5.00 m Target depth Groundwater not encountered			
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METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA			0.0					<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div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Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Job Number: J1501235	Contractor: Galt	Date: 26/10/2015
Client: The Spatial Group	Drill Rig: Eziprobe	Logged: BB
Project: Proposed Residential Subdivision	Inclination: -90°	Checked Date: 25/10/2015
Location: Lot 19 Sixty Eight Road, Baldivis		Checked By: RP

Drilling				Sampling			Field Material Description							
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	m		0.0							SAND: fine to medium grained, sub-angular to sub-rounded, mottled dark and pale grey, trace rootlets in top 0.15 m				
			0.5						Fine to coarse grained, pale brown		D			
			1.0											
			1.5											
			2.0											
			2.5						SP	Becoming brown, trace fines		D		
			3.0								M			
			3.5											
			4.0							Becoming orange-brown				
			4.5											
			5.0						Hole terminated at 5.00 m Target depth Groundwater not encountered					
			5.5											

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

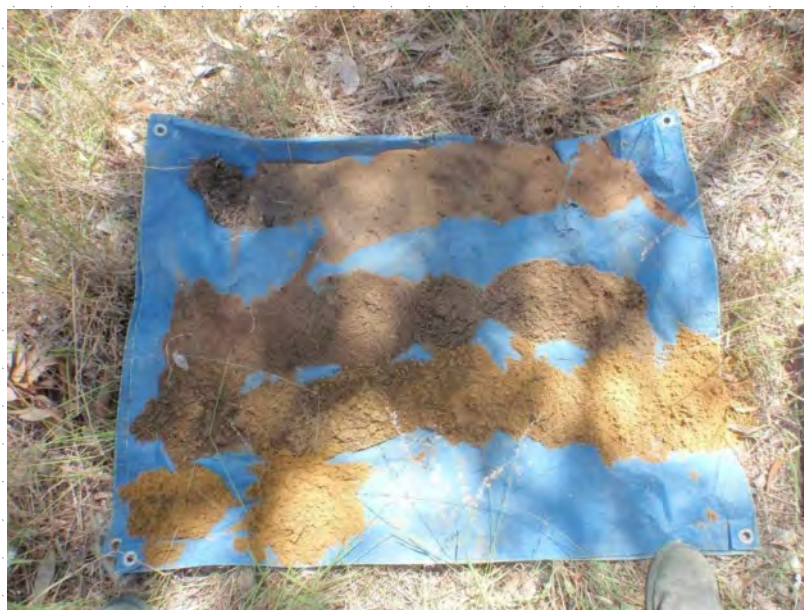
Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling				Sampling			Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	m		0.0							SAND: fine to coarse grained, sub-angular to sub-rounded, brown, trace rootlets in top 0.15 m		L	
			0.5										
			1.0								D		
			1.5										
			2.0										
			2.5				SP					MD	
			3.0										
			3.5								M		
			4.0										
			4.5										
			5.0						Hole terminated at 5.00 m Target depth Groundwater not encountered				
			5.5										

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling				Sampling			Field Material Description							
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	m		0.0							SP	SAND: fine to coarse grained, sub-angular to sub-rounded, pale brown		D	
			0.5									D		
			1.0											
			1.5											
			2.0											
			2.5											
			3.0											
			3.5											
			4.0											
			4.5											
			5.0							Hole terminated at 5.00 m Target depth Groundwater not encountered				
			5.5											

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Job Number: J1501235
Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Contractor: Galt
Drill Rig: Eziprobe
Inclination: -90°

Date: 26/10/2015
Logged: BB
Checked Date: 25/10/2015
Checked By: RP

Drilling					Sampling		Field Material Description							
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	ACID SULPHATE SAMPLE	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
MA	m		0.0							SAND: fine to coarse grained, sub-angular to sub-rounded, pale brown, trace rootlets in top 0.15 m	D			
			0.5											
			1.0											
			1.5											
			2.0											
			2.5						SP			MD		
			3.0							Becoming orange-brown, trace fines	M			
			3.5											
			4.0											
			4.5											
			5.0							Hole terminated at 5.00 m Target depth Groundwater not encountered				
			5.5											

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Appendix C: Perth Sand Penetrometer Test Results

**PERTH SAND PENETROMETER FIELD TEST DATA (Standard Depth 900mm)
(AS12896.3.3)**

Client: The Spatial Group
Project: Proposed Residential Subdivision
Location: Lot 19 Sixty Eight Road, Baldivis

Job No: J1501235
Date: 26-Oct-15
Engineer: BB



Test No:	1	2	3	4	5	6	7	8
Location:	BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08
Depth (mm)	N° of Penetrometer Blows per 150 mm Depth Interval							
0-150	Seat	Seat	Seat	Seat	Seat	Seat	Seat	Seat
150-300	4	5	4	2	2	2	2	2
300-450	6	6	7	3	3	3	5	2
450-600	7	7	6	2	4	2	6	1
600-750	6	6	6	3	2	2	8	2
750-900	6	6	6	2	2	5	7	1
900-1050	6	6	6	2	3	2	7	2
1050-1200				3	3	3		3
1200-1350				3	4	2		3
1350-1500				3	4	4		3
1500-1650				3	4	3		3
1650-1800				3	4	3		3
1800-1950				3	4	4		3
1950-2100								

Test No:	9	10						
Location:	BH09	BH10						
Depth (mm)	N° of Penetrometer Blows per 150 mm Depth Interval							
0-150	Seat	Seat						
150-300	5	2						
300-450	9	4						
450-600	9	4						
600-750	10	3						
750-900	12	3						
900-1050	14	3						
1050-1200		3						
1200-1350		4						
1350-1500		3						
1500-1650		3						
1650-1800		3						
1800-1950		3						
1950-2100								

Test No:								
Location:								
Depth (mm)	N° of Penetrometer Blows per 150 mm Depth Interval							
0-150								
150-300								
300-450								
450-600								
600-750								
750-900								
900-1050								
1050-1200								
1200-1350								
1350-1500								
1500-1650								
1650-1800								

Perth Sand Penetrometer tests done in accordance with AS 1289.6.3.3 (except blow counts are reported per 150 mm, rather than 300 mm)
HB: Hammer bounce (refusal)
0 = Penetration due to hammer weight only
R: Refusal

Appendix D: Infiltration Test Results

Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics

Spreadsheet author:

ORW

17-Oct-09

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Job No: J1501235

Client: The Spatial Group

Site: Lot 19 Sixty Eight Road

Location: Baldivis

Calc by: BB

BH Name: 1

Test Depth: 0.64 m

Spreadsheet Legend

Required input

Calculated field

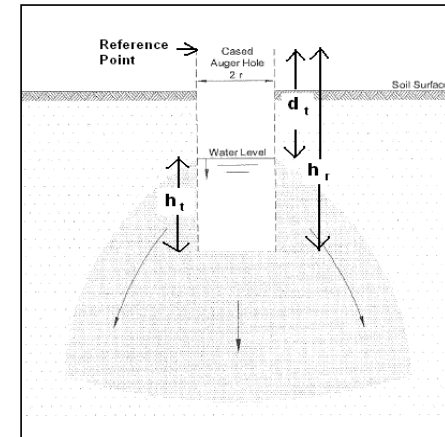
Comment field

Field not used

Fixed field

$$K = 1.15r \frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

Parameter	Description	Value	Units
K	Permeability		m/s
r	radius of test hole	0.045	m
t	time since start of measurement		s
h_r	reference point height above base	0.7	m
d_t	depth from reference point to water at time t		m
h_t	Water column height at time t		m
h_0	h_t at t=0		m



Test 1

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.5		
30	0.26	0.44	9.1E-05	7.9
60	0.32	0.38	9.8E-05	8.4
90	0.37	0.33	9.8E-05	8.5
120	0.41	0.29	9.6E-05	8.3
150	0.45	0.25	9.8E-05	8.4
180	0.48	0.22	9.6E-05	8.3
AVERAGE			9.6E-05	8.3

Test 2

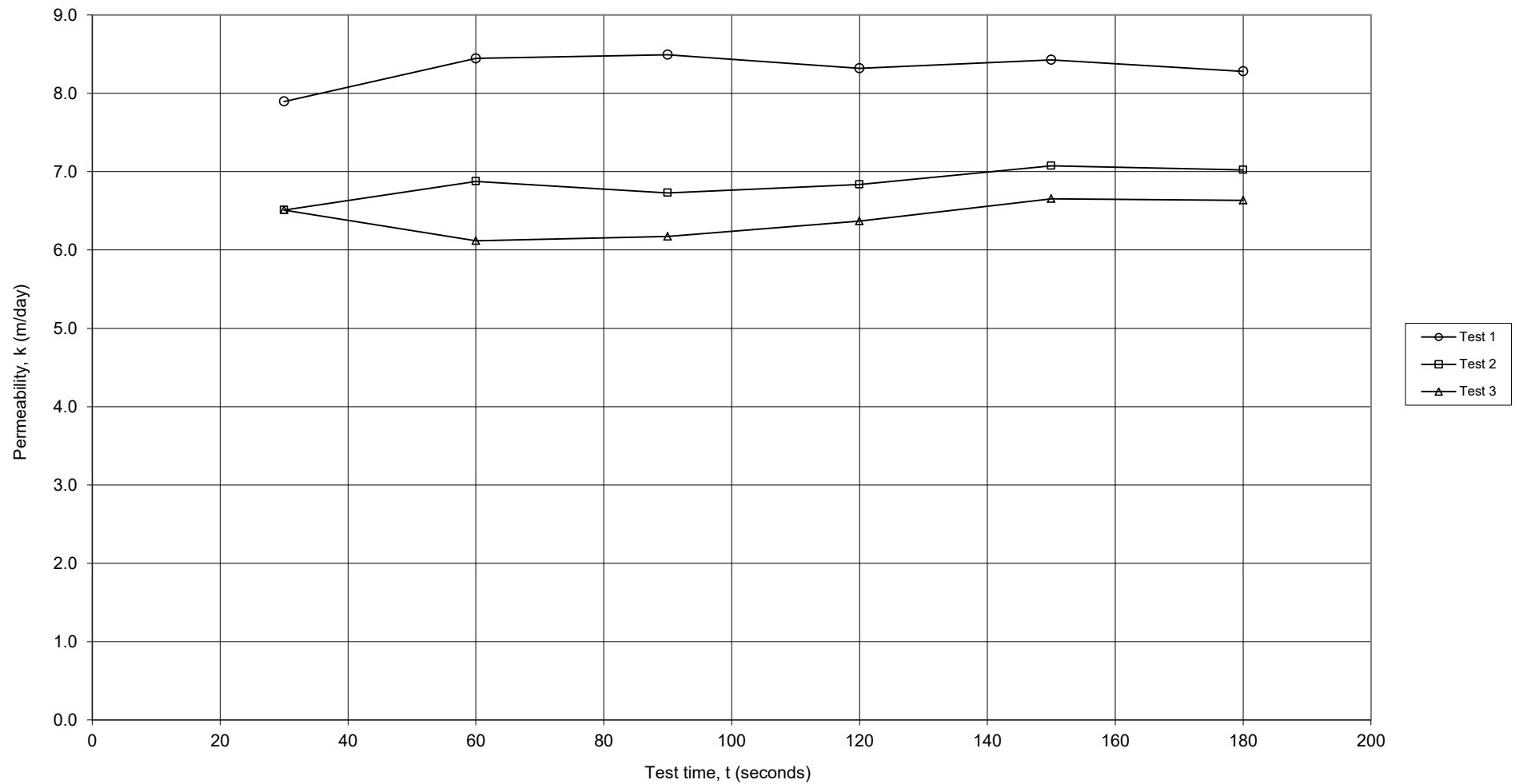
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.5		
30	0.25	0.45	7.5E-05	6.5
60	0.3	0.4	8.0E-05	6.9
90	0.34	0.36	7.8E-05	6.7
120	0.38	0.32	7.9E-05	6.8
150	0.42	0.28	8.2E-05	7.1
180	0.45	0.25	8.1E-05	7.0
AVERAGE			7.9E-05	6.8

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.5		
30	0.25	0.45	7.5E-05	6.5
60	0.29	0.41	7.1E-05	6.1
90	0.33	0.37	7.1E-05	6.2
120	0.37	0.33	7.4E-05	6.4
150	0.41	0.29	7.7E-05	6.7
180	0.44	0.26	7.7E-05	6.6
AVERAGE			7.4E-05	6.4

Permeability by Inverse Auger Hole Method

1



Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics

Spreadsheet author:

ORW

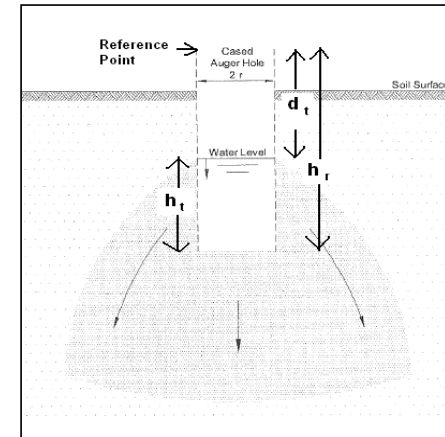
17-Oct-09

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Job No: J1501235
Client: The Spatial Group
Site: Lot 19 Sixty Eight Road
Location: Baldivis
Calc by: BB

$$K = 1.15r \frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

BH Name: 2	Parameter	Description	Value	Units
Test Depth: 0.69 m	K	Permeability		m/s
Spreadsheet Legend	r	radius of test hole	0.045	m
Required input	t	time since start of measurement		s
Calculated field	h_r	reference point height above base	0.73	m
Comment field	d_t	depth from reference point to water at time t		m
Field not used	h_t	Water column height at time t		m
Fixed field	h_0	h_t at t=0		m



Test 1

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.53		
30	0.46	0.27	4.8E-04	41.2
60	0.57	0.16	4.1E-04	35.8
90	0.64	0.09	4.0E-04	34.3
AVERAGE			4.3E-04	37.1

Test 2

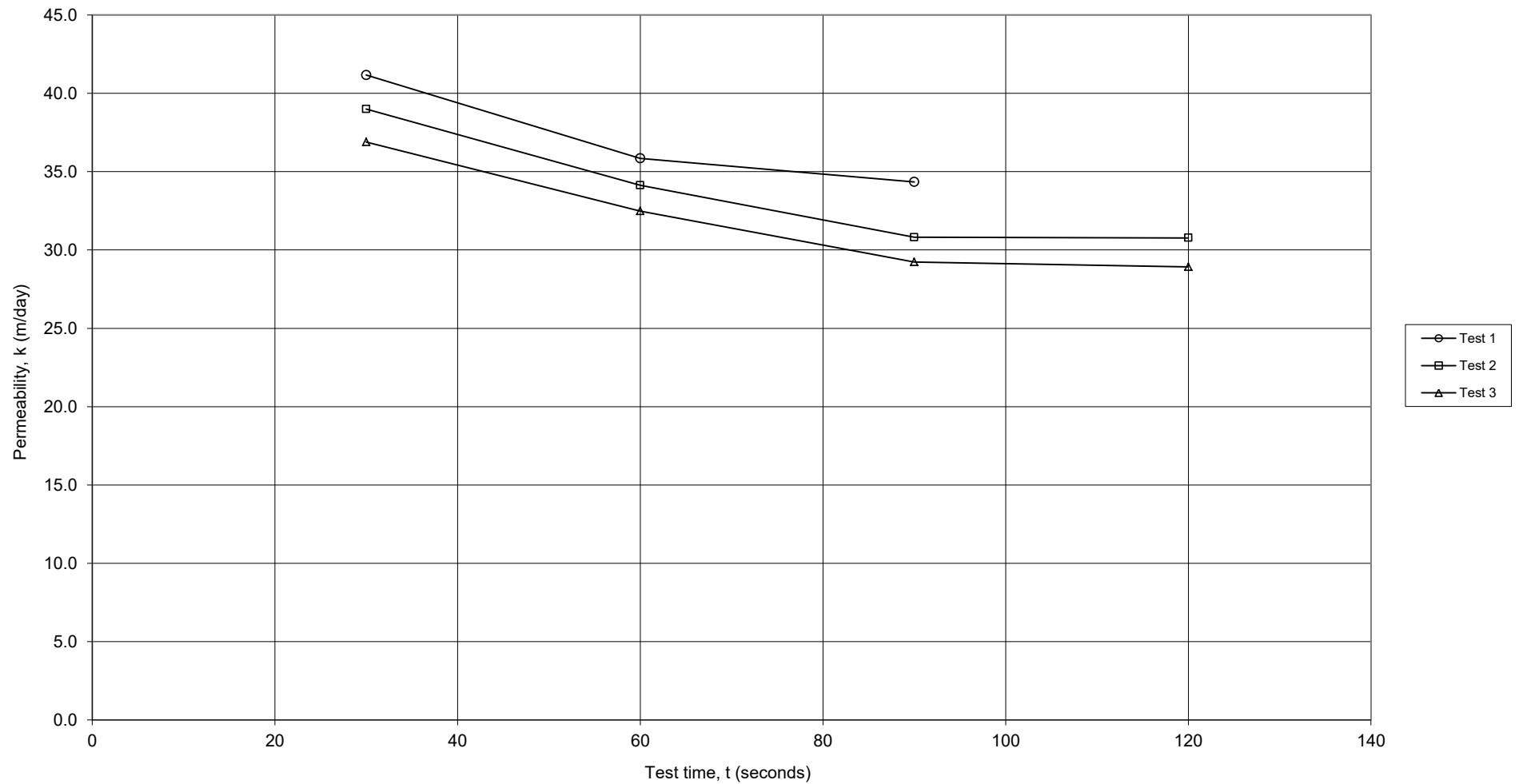
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.53		
30	0.45	0.28	4.5E-04	39.0
60	0.56	0.17	3.9E-04	34.1
90	0.62	0.11	3.6E-04	30.8
120	0.67	0.06	3.6E-04	30.8
AVERAGE			3.9E-04	33.7

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.53		
30	0.44	0.29	4.3E-04	36.9
60	0.55	0.18	3.8E-04	32.5
90	0.61	0.12	3.4E-04	29.2
120	0.66	0.07	3.3E-04	28.9
AVERAGE			3.7E-04	31.9

Permeability by Inverse Auger Hole Method

2



Permeability Calculation - Inverse Auger Hole Method

Galt Geotechnics

Spreadsheet author:

ORW

17-Oct-09

REFERENCE: Cocks, G. *Disposal of Stormwater Runoff by Soakage in Perth Western Australia*, Journal and News of the Australian Geomechanics Society, Volume 42 No 3 September 2007, pp101-114

Job No: J1501235

Client: The Spatial Group

Site: Lot 19 Sixty Eight Road

Location: Baldivis

Calc by: BB

BH Name: 3

Test Depth: 0.67 m

Spreadsheet Legend

Required input

Calculated field

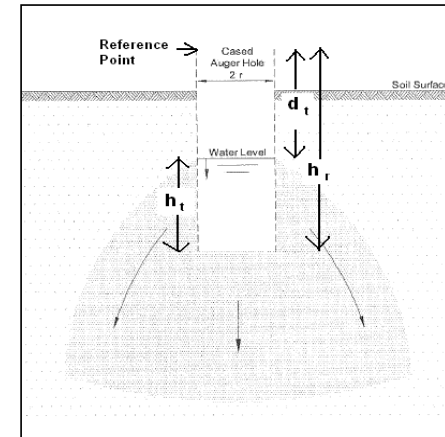
Comment field

Field not used

Fixed field

$$K = 1.15r \frac{\log_{10}(h_0 + \frac{1}{2}r) - \log_{10}(h_t + \frac{1}{2}r)}{t - t_0}$$

Parameter	Description	Value	Units
K	Permeability		m/s
r	radius of test hole	0.045	m
t	time since start of measurement		s
h_r	reference point height above base	0.72	m
d_t	depth from reference point to water at time t		m
h_t	Water column height at time t		m
h_0	h_t at t=0		m



Test 1

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.52		
30	0.49	0.23	5.7E-04	49.5
60	0.6	0.12	5.0E-04	43.3
90	0.67	0.05	5.0E-04	43.4
AVERAGE			5.3E-04	45.4

Test 2

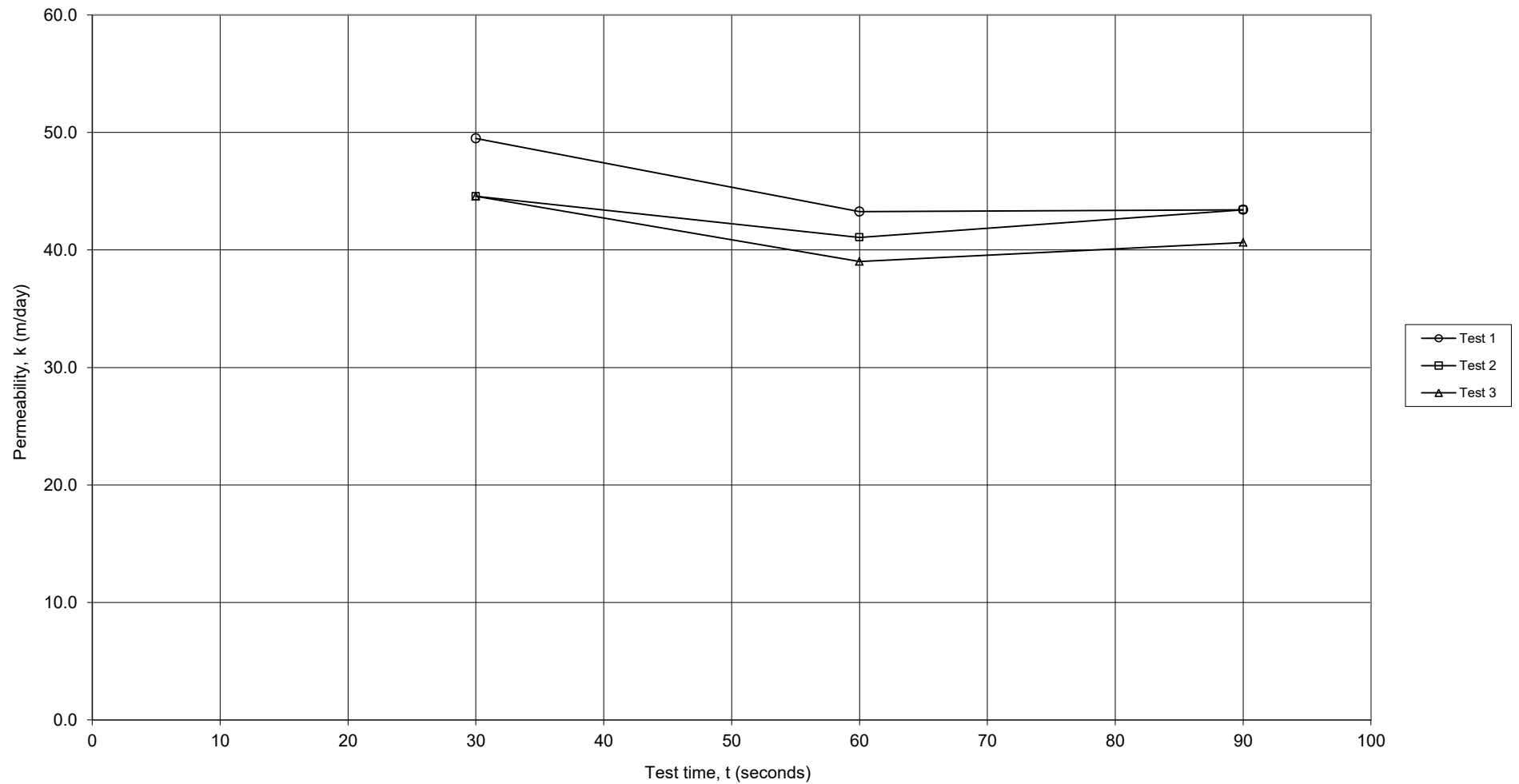
t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.52		
30	0.47	0.25	5.2E-04	44.6
60	0.59	0.13	4.8E-04	41.1
90	0.67	0.05	5.0E-04	43.4
AVERAGE			5.0E-04	43.0

Test 3

t (s)	d_w (m)	h_t (m)	K (m/s)	K (m/day)
0	0.2	0.52		
30	0.47	0.25	5.2E-04	44.6
60	0.58	0.14	4.5E-04	39.0
90	0.66	0.06	4.7E-04	40.6
AVERAGE			4.8E-04	41.4

Permeability by Inverse Auger Hole Method

3



Appendix E: Understanding Your Report

UNDERSTANDING YOUR REPORT

GALT FORM PMP11 Rev2

1. EXPECTATIONS OF THE REPORT

This document has been prepared to clarify what is and is not provided in your report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with the conditions on site.

Geotechnical engineering and environmental science are less exact than other engineering and scientific disciplines. We include this information to help you understand where our responsibilities begin and end. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of projects and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following:

- ✦ the project objectives as we understood them and as described in this report;
- ✦ the specific site mentioned in this report; and
- ✦ the current and proposed development at the site.

It should not be used for any purpose other than that indicated in the report. You should not rely on this report if any of the following conditions apply:

- ✦ the report was not written for you;
- ✦ the report was not written for the site specific to your development;
- ✦ the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- ✦ the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the design process by being engaged for consultation with other members of the project team. Furthermore, we recommend that we be able to review work produced by other members of the project team that relies on information provided in our report.

3. SOIL LOGS

Our reports often include logs of intrusive and non-intrusive investigation techniques. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

4. THIRD PARTY RELIANCE

We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party because of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

5. CHANGE IN SUBSURFACE CONDITIONS

The recommendations in this report are based on the ground conditions that existed at the time when the study was undertaken. Changes in ground conditions can occur in numerous ways including anthropogenic events (such as construction or contaminating activities on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where ground conditions have changed, additional sampling, testing or analysis may be required to fully assess the changed conditions.

6. SUBSURFACE CONDITIONS DURING CONSTRUCTION

Practical constraints mean that we cannot know every minute detail about the subsurface conditions at a particular site. We use professional judgement to form an opinion about the subsurface conditions at the site. Some variation to our evaluated conditions is likely and significant variation is possible. Accordingly, our report should not be considered as final as it is developed from professional judgement and opinion.

The most effective means of dealing with unanticipated ground conditions is to engage us for construction support. We can only finalise our recommendations by observing actual subsurface conditions encountered during construction. We cannot accept liability for a report's recommendations if we cannot observe construction.

7. ENVIRONMENTAL AND GEOTECHNICAL ISSUES

Unless specifically mentioned otherwise in our report, environmental considerations are not addressed in geotechnical reports. Similarly, geotechnical issues are not addressed in environmental reports. The investigation techniques used for geotechnical investigations can differ from those used for environmental investigations. It is the client's responsibility to satisfy themselves that geotechnical and environmental considerations have been taken into account for the site.

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