

Caddens Hill Project Stages 1 to 7 Soil Investigation

Prepared for:

Place Design

October 2016

Report C5063.Q6142.B40910



Introduction

SESL Australia has been engaged by Place Design Group Pty Ltd (the Client) to undertake an on-site soil resource assessment at Caddens Hill – Stages 1 to 7 (the Site). The majority of the development works have not begun hence the soil has not been stripped and is still in-situ.

SESL understands that the topsoil will be used in the development site for multiple landscapes as listed:

- 1. Hill Top Park with turf grass and native plantings;
- 2. Street verges;
- 3. Wetland detention basins;
- 4. Entry statement areas and;
- 5. Sportsfields.

The objective of this assessment is to characterise the physical and chemical properties of the soil for the purpose of determining what soil amelioration is required for the different landscaping options. The soil from this landscape area is prone to waterlogging due to its high fines content therefore amelioration advise on the street verge plantings, wetlands and turf areas will be included to ensure compaction resulting in waterlogging doesn't become an issue.

The natural soil landscape is a combination of "South Creek" and "Luddenham" (Hazelton and Bannerman, 1990). This Luddenham soil landscape comprises of dark brown silty loam podsolics soils formed on Wianamatta Shales often associated with Minchinbury Sandstone. South Creek soils are formed on fine textured fluvial deposits associated with drainage lines and mostly show a deep profile of structured fine sandy clay loams overlying silty clay subsoils. They are associated with the floodplains of drainage networks of the Cumberland Plain. Both soil types are prone to waterlogging, flood hazards, permanently high water tables, erosion from water and surface movement. Luddenham soils are highly erodible and have hardsetting surfaces. South creek are often highly sodic in the subsoil and hence prone to undercutting and tunnel erosion.

This report provides advice on what soil amelioration is required for plant growth and the different landscapes options.

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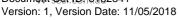
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Methodology

The field assessment was carried out by Chantal Milner and Deanne Norris of SESL on Wednesday 5th October 2016.

Based on a discussion with Steven Holmes and Lingling Qiu from Place Design Pty Ltd it was decided that 13 locations would be selected for sampling from throughout the site. Exact locations were defined after a site walkover and assessing the differences in slope and topography. Samples were collected by hand auger to an average depth of 400mm so that the subsoil could also be assessed.

The collected samples were analysed for a range of soil chemistry properties. Soils were tested for pH, EC, exchangeable cations and plant available nutrients, organic matter and texture.

The pH, EC, exchangeable cations and plant available nutrients were all analysed utilising the Mehlich 3 extract. Mehlich 3 (M3) estimates plant availability of most macro- and micronutrients on soils acid to neutral pH using a dilute acid-fluoride-EDTA solution of pH 2.5. The method has shown to be well correlated to crop response to fertilizer phosphorus and applicable for the determination of extractable potassium, calcium, magnesium, sodium and micronutrients, such as manganese, iron, copper and zinc (Mehlich, 1984). Organic matter was assessed using dumus combustion to the ASTM D7573-09 method. Texture was determined using SESLs own procedure (SESL PM0003) which is based on Northcote (1992).

Field & Laboratory Results

Topsoil Physical and Chemical Properties

The soil showed evidence of a clay based material exposed to frequent waterlogging seen as mottling of bright oranges and reds. Mottling is the result of oxidation and reduction reactions due to waterlogging. The waterlogging is a result of the texture (sandy clay loam to light clay) of the material which is fine and has a high clay content which increases with depth. Mottling due to seasonal wetting and drying is typical of the low-lying soil of the Luddenham soil landscape.

Chemically he soil has slight to strong acidity with low salinity. The cation exchange is variable with some samples dominated by hydrogen or are highly magnesic and sodic, others are just magnesic or have a balanced cation exchange. Overall nutrients are low aside from manganese and magnesium. High manganese is indicative of waterlogging. Magnesium is generally prevalent in subsoils only and its presence in topsoil is consistent with a low-lying and intermittently waterlogged condition. Iron/manganese concretions ("shotgun pellets") are common at the A/B boundary indicating intense wetting and drying cycles typical of the Eastern Australian climate. This is a result not only of extreme variations in rainfall but poor internal drainage of the soils.

The chemical and physical test results are presented in Appendix A. Table 1 summarises the topsoil chemical and physical test results.

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Table 1. Topsoil (A-Horizon) chemical and physical analysis results.

Sample Number	1	2	3	4	5	6	7	8	9	10	11	12	13
	BH1 0-	BH2	BH3 0-	BH4 0-	BH5 0-	BH6 0-	BH7 0-	BH8 0-	BH9 0-	BH10 0-	BH11 0-	BH12 0-	BH13 0-
Sample Name	300		300	200	200	200	200	200	280	200	350	200	170
pH in H₂O	6.2	7.3	6.2	6.0	6.6	6.6	6.4	6.6	6.5	6.4	7.1	6.6	6.4
pH in CaCl₂	5.5	6.4	5.5	5.5	5.7	6.0	5.8	5.8	5.7	5.4	6.4	6.0	5.4
EC dSm	0.1	0.2	0.1	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Na mg/kg	23.5	377.	32.5	203	62.5	57.8	40	22.7	17.8	62.2	3	13.7	82.8
CI mg/kg	30.7	223	26.8	207	25	40.8	77.4	36.6	40.1	45.6	43.4	46.1	46
Na % CEC	0.8	13.6	1.8	9.3	4.5	1.7	0.8	0.8	0.6	1.4	1.0	0.6	2.4
K % CEC	3.1	1.8	5.3	2.7	4.3	3.6	6.5	5.7	6.7	3.8	1.5	4.9	2.5
Ca % CEC	38.0	35.7	52.9	35.8	3	51.6	63.1	73.6	64.5	41.9	71.4	71.6	32.8
Mg % CEC	29.3	48.9	40.4	52.6	53.3	42.9	29.6	19.9	27.8	29.2	25.9	22.7	32.6
H % CEC	29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.2	0.0	0.0	29.5
AI % CEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
eCEC meq/100g	12.9	12.1	7.6	9.5	6.0	14.6	20.9	13.2	13.2	18.8	16.8	10.9	14.8
NO₃ mg/kg	6.4	2.8	9.2	1.0	1.3	6.4	11	1.2	4.4	3.4	5.8	5.4	3.9
PO₄ mg/kg	6.0	7.9	21.6	3.0	2.8	5.3	42.7	6.5	4.8	4.1	54.	10.4	2.7
K mg/kg	158	85.5	158	103	103	203	529	294	344	283	97.8	208	143
SO4 mg/kg	11	8.7	12	10	7.9	8.9	12	8.5	7.7	8.5	5.7	7.8	11
Ca mg/kg	982	866	805	681	456	151	2643	1948	1707	1580	2403	1562	972
Mg mg/kg	460	718	373	607	389	761	752	320	446	666	529	301	586
Fe mg/kg	224	179	270	195	160	205	230	179	149	211	156	155	167

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Mn mg/kg	182	268	156	84	267	100	54	290	99	137	219	270	60
Cu mg/kg	4.8	2.2	2.5	2.6	2.3	2.5	3.7	14	3.3	3.5	15	25	2.7
B mg/kg	0.4	0.3	0.3	0.3	0.3	0.6	0.5	0.6	0.6	0.5	0.6	0.5	0.3
Zn mg/kg	4.1	3.2	4.6	2.2	2.7	4.8	5.1	4.5	6.8	4.0	4.0	3.4	1.6
Organic matter	5.2	1.0	5.3	4.6	4.4	5.1	5.4	5.7	5.7	5.7	2.5	3.9	3.2
	Clay	Sandy	Sandy	Sandy	Sandy	Clay	Light	Clay	Clay	Clay	Sandy	Sandy	Clay
Texture	Loam	Clay	Clay	Clay	Clay	Loam	Clay	Loam	Loam	Loam	Clay	Clay	Loam
			Loam	Loam	Loam						Loam		
Infiltration Rate	Moderate	Slow	Moderate	Moderate	Moderate	Moderate	Slow	Moderate	Moderate	Moderate	Moderate	Slow	Moderate

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Table 2. Subsoil (B-Horizon) chemical and physical analysis results.

Sample Number	14	15	16	17
Sample Name	BH3 300-400	BH4 250-400	BH12 200+	BH13 170+
pH in H₂O	6.6	6.5	6.8	7.1
pH in CaCl₂	5.1	6.1	5.9	6.0
EC dSm	0.1	0.7	0.0	0.1
Na mg/kg	268	731	23	195
CI mg/kg	0.0	0.0	0.0	0.0
Na % CEC	7.5	18.9	0.7	5.0
K % CEC	0.6	0.9	2.3	1.4

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Ca % CEC	19.4	23.9	74.3	45.0
Mg % CEC	44.2	56.0	22.5	48.7
H % CEC	28.3	0.0	0.0	0.0
AI % CEC	0.1	0.0	0.0	0.0
eCEC meq/100g	15.4	16.8	14.8	16.9
K mg/kg	36	58	134	94
Ca mg/kg	598	806	2202	1525
Mg mg/kg	828	1143	404	1001
Texture	Medium Clay	Light Medium Clay	Sandy Clay	Light Clay
Structure	Polyhedral	Polyhedral	Polyhedral	Polyhedral
Aggregate Strength	Pedal - Strong	Pedal - Moderate	Pedal - Moderate	Pedal - Strong
Permeability	Slow	Slow	Slow	Slow



As areas are to be developed sequentially in stages it is useful to classify each development stage by soil type into seven (7) discrete areas defined by the stage of work-

Stage 1 (Boreholes 11 and 12)

This sandy clay to sandy clay loam soil is slightly acidic in $CaCl_2$ with desirably low salinity, sodium and chloride levels. The cation exchange is balanced. The eCEC is moderate indicating that this soil holds onto nutrients well. Nutrients are low deficient aside from magnesium and manganese. This is indicative of soils that waterlog. Organic matter = 2.5% (moderate) to 3.9% (high).

This soil type contain20-30% to 35-45% clay therefore have a slow permeability and a greater tendency for waterlogging.

Subsoil BH12

Subsoill is a sandy clay with a moderate polyhedral structure and slow permeability. It is moderately acidic with desirably low salinity and sodium. The cation exchange is close to being balanced. The eCEC is moderate.

Stage 2 (Borehole 5)

Soil is a sandy clay loam with moderate permeability. It is moderately acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic and slightly sodic. The eCEC is low. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is high at 4.4%

Stage 3 (Borehole 8)

Soil is a clay loam with moderate permeability. It is moderaely acidic with desirably low salinity, sodium and chloride. The cation exchange is balanced. The eCEC is moderate.

NPS are low and need boosting. Manganese is high as the result of waterlogging. Potassium is also high. Organic matter is very high at 5.7%

Stage 4 (Boreholes 6 and 7)

BH6

Soil is a clay loam with moderate permeability. It is slightly acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic. The eCEC is moderate.

NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is high at 5.1%

BH7

Soil is a light clay with slow permeability. It is moderaely acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic. The eCEC is moderate.

N & P are marginal, sulphate is low. Manganese is high as the result of waterlogging. Potassium is also high. Organic matter is very high at 5.4%

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Stages 5 & 6 (Boreholes 9, 10 and 13)

Soil is a clay loam with moderate permeability. It is moderately to strongly acidic with desirably low salinity, sodium and chloride. The cation exchange is balanced in BH9 however BH10 and BH13 are dominated by hydrogen which explains the strong acidity. The eCEC is moderate indicating that the soils retain nutrients well. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is moderate (3.2%) to very high at 5.7%

BH13 Subsoill is a light clay with a strong polyhedral structure and slow permeability. It is slightly acidic with desirably low salinity and moderate sodium. The cation exchange is highly magnesic and sodic. The eCEC is moderate.

Stage 7 (Borehole 1 to Borehole 4)

Soil is a clay loam to sandy clay loam with moderate permeability. It is moderately to strongly acidic with desirably low salinity, sodium and chloride aside from BH2 and BH4 which have high sodium and chloride levels. The cation exchange is primarily magnesic and sodic aside from BH1 which is dominated by hydrogen which explains the strong acidity. BH1 and BH2 have a moderate eCEC indicating that the soils retain nutrients well however BH3 and BH4 have a low eCEC indicating poor nutrient holding capacity.

NPK, S and Ca are low and need boosting. Manganese is high as the result of waterlogging.

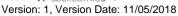
Organic matter is low (1%) to very high at 5.3%

BH3 Subsoil is a medium clay with a strong polyhedral structure and slow permeability. It is strongly acidic with desirably low salinity and high sodium. The cation exchange is dominated by hydrogen which explains the acidity. It is also sodic and magnesic. The eCEC is moderate.

BH4 Subsoil is a light medium clay with a moderate polyhedral structure and slow permeability. It is slightly acidic with high salinity and very high sodium. The cation exchange is highly magnesic and sodic. The eCEC is moderate.

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Discussion

The purpose of this investigation is to assess the soil conditions for reuse in the following areas of the development that are outlined in Table 3.

Table 3. Landscape types and the correlated development stage.

Development Stage	Landscape Type	Soil type required
1	Street verges and residential properties with general planting	Local soil
2	Street verges and residential properties with general planting	Local soil
3	Street verges and residential properties with general planting	Local soil
4	Hill Top Park, street verges and residential properties with general planting	Local soil
5&6	Detention basin x 2 and Street verges and residential properties with general planting	Local soil Imported loamy sand for detention basins.
7	Sportsfield and detention basin	Imported loamy sand for detention basins. Local soil or imported loamy sand for the sportsfield.

The performance of the soil is judged on its chemical and physical properties. Ideally a good performing soil for landscaping would have a neutral pH, low salinity, balanced cation exchange and moderate nutrients. Physically the permeability would be moderate for landscaping areas and rapid for sportsfields.

The best soils from this site, based on texture are fine sandy clay loams. Significant areas comprise sandy clay loam with 20-30% clay with low to moderate permeability. The next best soils are the clay loams. The least preferred soils are the light clays with 35-40% clay and slow permeability. Fortunately, the majority of the samples are sandy clay loams to clay loams.

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Summary of issues to be addressed

In summary here are several issues that need to be addressed in order to improve and restore the soil for landscaping use:

- <u>Dispersion due to sodic and magnesic chemistry</u> The magnesium and sodium salts can cause the soil surface to loose structure, harden, crust and as a result become dispersive. An application of gypsum will help correct the cation balance and flush out these salts.
- <u>Acidic pH</u>. As vegetation develops it acidifies its soil by depleting it of calcium. To counteract the soils becoming even more severely acidic we recommend lime additions to allow vegetation to develop properly.
- <u>High manganese levels</u>. Manganese levels range up to 290mg/kg. High manganese levels are indicative of waterlogging, which is further supported by the mottling which is apparent in most profiles.
- <u>Deficient nutrients</u> The nutrient levels are extremely deficient in particular the macronutrients. The soil will need fertilization prior to planting to ensure the vegetation isn't hungry.
- <u>Potential compaction issues</u> in passive amenity turf and sportsfield areas. Import a loamy sand soil for the sportsfield areas. Refer to Appendix C Active Turf Specification.

<u>Ensure adequate rooting volume for street trees</u> – Due to the heavy nature of the subsoil tree root systems will be very dependant on lateral spread to provide adequate rooting volume. This is often limiting where infrastructure such as paths and kerbs limit lateral spread.

The main limitations for the restoration will be to improve the nutrition of the soil, reducing the acidity and improving the soil structure to prevent dispersion and hardsetting characteristics. The high clay content of the soil will cause compaction and waterlogging issues in the sportsfield areas unless a suitable soil is imported or drainage solutions are employed. Generally the soils can be expected to drain slowly hence choice of plantings should be adapted to periods of waterlogging.

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Recommendations (for contractor use).

The following section is divided into 4 areas for contractor use:

- 1. Soil stripping process.
- 2. Stockpiling process.
- 3. Site subgrade preparation and treatment.
- 4. Topsoil Treatment Process.
- 5. Topsoil re-spreading for use in landscape.

Soil Stripping and Amelioration Process

Stripping and stockpiling of topsoil should occur immediately before bulk earthworks and be done in such a manner as to minimise erosion and sediment loss from site. Preparation is necessary to ensure that rubbish and foreign matter is minimised in the stripped soil. Stockpiles must be located in a convenient place away from any risk of running water and subject to suitable erosion control measures. They must be protected from contamination during the construction process and records kept of their location and type of soil, if any, they contain.

Table 4. Stripping process

Preparation:	 Clear all debris including demolition waste, timber, rubbish wire fences, rock, gravelled driveways etc. Clear trees and shrub growth and slash if necessary. Clear pasture and weed growth if heavy or otherwise a problem spray with a broad spectrum herbicide at manufacturers rates and allow 1–2 weeks to obtain kill before stripping.
Stripping:	 Avoid the inclusion of subsoil in topsoil stripping, adjust depth accordingly. Stop stripping if the more brightly coloured clay subsoil starts showing. In areas of very heavy pasture growth remove the top 50mm of thatch and weed-seed bank and stockpile separately. Strip topsoil to 200mm or to just above the clay subsoil.

1. Stockpiling Process

Stockpiling of topsoil should occur immediately before bulk earthworks and be done in such a manner as to minimise erosion and sediment loss from site. Preparation is necessary to ensure that rubbish and foreign matter is minimised in the stripped soil.

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Stockpiles must be located in a convenient place away from any risk of running water and subject to suitable erosion control measures. They must be protected from contamination during the construction process and records kept of their location and type of soil.

- Locate stockpiles 5 m or more from concentrated water flows (including drainage lines, roadways).
- Locations should have less than 10% slope.
- Locate greater than 8 m from any retained trees.
- Protect upslope using diversion drains.
- Protect downslope sediment loss using sediment control structures (silt fencing or other approved method).
- Stockpiles must be no higher than 2 m but may be flat topped.
- Label stockpiles with origin and date.
- Protect stockpiles from waste and rubbish dumping and encroachment of works.
- If stockpiles are to be in place longer than 3 months, sow with a seasonally appropriate annual cover crop

2. Site subgrade preparation and treatment

Before laying topsoil, the following **subgrade treatment** must be applied to all finished subgrade areas:

- 1. Fair and trim to relative level to accommodate the required overall soil depths
- 2. Remove rocks > 50 mm diameter.
- 3. Remove rubbish such as construction generated waste, plastics, metals and glass.
- 4. Apply ameliorants according to the following schedule in Table 5 to ameliorate the subgrade.

Table 5. Subsoil treatments.

Landscape treatment	Gypsum g/m ²
All exposed subgrade (landscaping areas only)	. 400

5. Chisel, disc plough or use an excavator with a type attachment to loosen the subgrade and mix the ameliorants to 200 mm depth to incorporate.

Note: Use an excavator with a tyne or ripping blade for operations on the steeper batters or where access is difficult. Its imperative during the stripping that the process is carefully supervised to ensure that both weeds and subsoil are not included with the topsoil.

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3. Topsoil Treatment Process

These soils are magnesic and sodic which are prone to dispersion therefore gypsum is needed to improve the structure of the soil. The majority of the nutrients require boosting therefore a NPK+TE compound fertiliser or straights are required for most soil areas. Soils are not overly acidic for general landscaping purposes.

Table 6. Schedule of amelioration requirements.

Landscape Type	Stage	Bore Hole	Fertiliser	Gypsum	Lime	Green Waste Compost	
	1	11 & 12		-	-		
	2	5		-	-		
	3	8		-	-		
General planting	4	6 & 7	50g/m ² or 0.5kg/m ³ of Pasture Boosta or similar. Natives	250g/m ² or 2.5kg/m ³ of gypsum	-	20L/m2 or 200L/m3	
	5&6	9, 10 & 13	100g/m ² or 1kg/m ³ of Bush Tucker or native fertiliser.	200g/m ² or 2.0kg/m ³ of gypsum	200g/m ² or 2.0kg/m ³ of lime		
	1	11 & 12		-	-		
	2	5		-	-		
	3	8		-	-		
Street Verges	4	6 & 7	50g/m ² or 0.5kg/m ³ of Nutricote Black or similar.	250g/m ² or 2.5kg/m ³ of gypsum	-	-	
	5 & 6	9, 10 & 13		200g/m ² or 2.0kg/m ³ of gypsum	200g/m ² or 2.0kg/m ³ of lime		
Hill Top Park	4	6&7	<i>Exotics</i> 50g/m ² or 0.5kg/m ³ of Pasture Boosta or similar. <i>Natives</i> 100g/m ² or 1kg/m ³ of Bush Tucker or native fertiliser.	250g/m ² or 2.5kg/m ³ of gypsum	-	20L/m2 or 200L/m3	
Sportsfield	7	1, 2, 3 & 4	50g/m ² or 0.5kg/m ³ of Pasture Starter or similar. NB: May not be required for imported soil.	300g/m ² or 3kg/m ³ of gypsum for site soil only.	-	-	

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				NB: May not be required for imported soil.	
Detention	5&6	9, 10 &	No fertiliser requirements	250g/m ² or	
Basin		13	in the imported filtration	2.5kg/m ³ of	
	7	1, 2, 3 &	layer	gypsum	
		4		for subsoil only	

(a) Exotics = Use a general purpose NPK+TE fertiliser such as Pasture Boosta for turf areas or Nutricote Black for tree plantings.

(b) Natives = Use a low P formulation such as Neutrog Bush Tucker, Patons Native Mix or Osmocote Low P slow release

4. Topsoil re-spreading for use in landscape.

The method of application that proves most economical is usually:

- 1. Spray weed growth on the soil stockpiles with a 1:50 dilution (or the manufacturers specification) of Roundup or other brand of Glyphosate concentrate and wait 2 weeks;
- 2. Remove excess rank weed growth;
- 3. Apply the ameliorants as specified in Table 6 either in bulk by the cubic metre as stockpiles are exploited or on a square meter basis to re-spread topsoils in-situ.;
- 4. If applying to re-spread topsoils incorporate ameliorants into the surface 150mm using chisel ploughs;
- 5. Leave in loose condition for planting, do not consolidate and ;
- 6. Alternatively, the soils fertilisers can be blended into the stockpiles using the m³ application rate followed by thorough mixing.

Table 7. Recommended soil depths of topsoil (A-Horizon) and subsoil (B-Horizon).

Landscape Class	Topsoil Depth	Subsoil Depth
Turf areas	.> 150mm	.150mm
Shrubs/mass planting	250mm	200mm
Garden areas	250-300mm	200mm

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Special Planting Situations

Street Trees

When discussing street trees there are a few main points that need to be addressed to ensure success of the plantings and to avoid any heaving due to the growth of tree roots.

- 1. Effective rooting volume of soil.
- 2. Tree species selection
- 3. Soil type and drainage systems
- 4. Use of structural soils or strata/silva cells.

1. Total effective rooting volume & tree species selection

The total soil volume is dependent on the tree size and as a rough guide should follow the below rooting volumes. Small trees = $11.3m^3$

Medium trees = $22.6m^3$

Large trees = $34m^3$

Depending on the interspacing between the trees the root system should be able to exploit the soil in a linear pattern therefore gaining further soil void space.

3. Soil type and drainage system

The site soil is primarily clay loam to a sandy clay loam therefore making this soil suitable for use as a filler media in structural soils (see below). Due to the heaviness of the soil a drainage system or at least a "u-pipe" aeration pipe at planting is advised to allow adequate ventilation.

4. Structural Soils or Strata/Silva Cells.

There are two main choices for the street trees which are to be planted in the street verges.

- 1. Structural soils
- 2. Strata cells

Both of these choices are designed for accommodating root systems underneath paved or sealed surface such as concrete or pavers. They could be used to improve rooting soil volumes for the trees by installing under the concrete or paved areas.

Structural support soils (SSS)

Structural soils are designed to form a basement for engineered structure such as roads, pavements and kerbing whilst also providing rooting volume for tree roots. Due to the high void space, they will permit root growth through the medium and also help distribute root pressures over a wider section of pavement, reducing or delaying pavement heaving by roots. The size of the aggregates or stone fraction determines how large the roots can grow before heaving occurs.

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SSS is a two-part system comprised of a stone lattice for strength and structural support (load bearing) and filler soil to service the horticultural needs. The stone lattice provides structural stability through stone-to-stone contact, while also providing interconnected voids for root penetration, air and water movement. The system is engineered to maintain a high degree of porosity after installation and compaction. The intention is to 'suspend' the horticultural soil component of the blend between stones, which come together during compaction, producing a load-bearing, compacted stone lattice with uncompacted soil in the voids.

The ratio of filler soil to aggregate is the major consideration for achieving the engineering and horticultural objective. Thus the 'aggregate', 'filler soil' and blending ratio of the two need to be specified and carefully validated. Generally, it will be an amount of filler soil equal to half the void space of the compacted aggregate. Assuming the aggregate has a void space of 40%, it will be 10 parts aggregate by volume to 2 parts filler soil.

Important note: The total volume of SSS soil is determined by the volume of aggregate as adding filler soil does not increase the overall volume. Tree soil volume estimations must factor this into calculations for recommending soil volume.

Also note that SSS is only around 30% effective rooting volume so to gain one m³ of rooting volume requires 3m³ of SSS.

Transport and placement of structural soils

Structural Soil must be a uniformly blended mixture of aggregate and filler soil and are prone to segregation during handling at the source and during transport. Particular care must be taken to ensure that all structural soil is thoroughly homogenised before placement and compaction. To assist this, and to prevent segregation, ensure that the mixture remains moist at all times during mixing transport, storage and placement.

Strata Cells or Silva Cells

Strata or Silva cells are likely to be a more expensive options however are the preferred choice when void space and soil volume is limited. The soil availability increases to 90% which means less space overall is required. However, a loam soil is best for use with these cells and the current site soil might have to be modified to meet this texture requirement.

Wetland Soils

It is essential that a highly permeable loamy sand medium is imported for use as the growing and filtration layer in biofiltration bed installations. It is recommended that a sand transition layer is installed below the filtration layer followed by a drainage layer i.e. 10mm aggregate installed below the transition layer.

Sportsfield Soils

The sandy clay loam soil is not recommended for use in the sportsfield areas. The heavy texture of the soil will lead to compaction and waterlogging issues. This can be overcome with the use of subsoil drainage combined with sand slit drainage to allow excess water to drain. Alternatively, and preferably, an imported soil that is suited to active high traffic areas is recommended. An 'Active high-traffic turf' specification has been included in Appendix C.

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The soil texture is predominantly a clay loam to sandy clay loam with 20% being a light clay. This is acceptable for passive amenity turf areas however not recommended for sportsfield activities. Importing 100mm of sand combined with sand slitting and sand grooving may need to be considered if local soil is to be used. Clay loams like this can be used but budgets must allow for retrofitting of sand slit drainage and sand grooving within 2 years of construction. This can be a way of defraying cost into the future but sand slit drainage needs to be renewed every 5-10 years and in the long term using a sandy sportsfield soil in the first place is lower cost.

Sand Slit Drainage

Sand slitting is the method of cutting narrow trenches that are backfilled with drainage pipes and sand using specialist equipment by a contractor. This is an effective method to improve drainage in compacted sportsfield soil and is usually combined with the installation of trunk drains and sand grooves to interconnect the subsoil drainage with the surface.

Sand Grooving

The technique involves cutting slots to 10mm wide to around 75-100mm depth at 300mm centres and backfilling these with sand thereby connecting the surface with the sand slit drains. It is installed by specialist contractors and can improve the drainage of otherwise unsuitable soils for 5-10 years depending on maintenance.

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Summary

The soils are typical of the South Creek and Luddenham landscape, which are acidic, sodic and magnesic. This chemistry is hostile which is acceptable for Australian natives however for general landscaping the chemistry requires improvement to prevent the plants from hunger. The chemistry of the soil requires ameliorating with gypsum, lime and the relevant compound or straight fertiliser. Due to relatively high organic matter levels the use of imported compost is not considered necessary except for the higher quality landscape areas.

Due to the physical nature of the site soil, it is suitable for the following landscaping areas:

- 1. Hill Top Park with turf grass and native plantings;
- 2. Street verges and;
- 3. Entry statement areas.

The wetland detention basins and the sportsfield will require imported soil to meet the correct texture requirements for these landscapes. A specification has been provided for sportsfield soils.

In our opinion if our instructions are followed this soil will be acceptable for reuse at the Caddens Hill development project.

Please feel free to contact our office with any questions you may have. Sincerely,

SESL Australia.

Chantal Milner Soil Scientist

limiteral

Simon Leake Principal Soil Scientist

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References

Bannerman, S.M. and Hazelton, P.A. (1990), *Soil Landscapes of the Penrith 1:100 000 Sheet*. Soil Conservation Service of NSW, Sydney.

Mehlich, A. (1984) *Mehlich-3 soil test extractant: a modification of Mehlich-2 extractant.* Commun. Soil Sci. Plant Anal. 15(12):1409-1416.

Appendices

Appendix A: Laboratory Analysis Appendix B: Site Map Appendix C: Specification Appendix D: Site Photos

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Appendix A Laboratory Analysis

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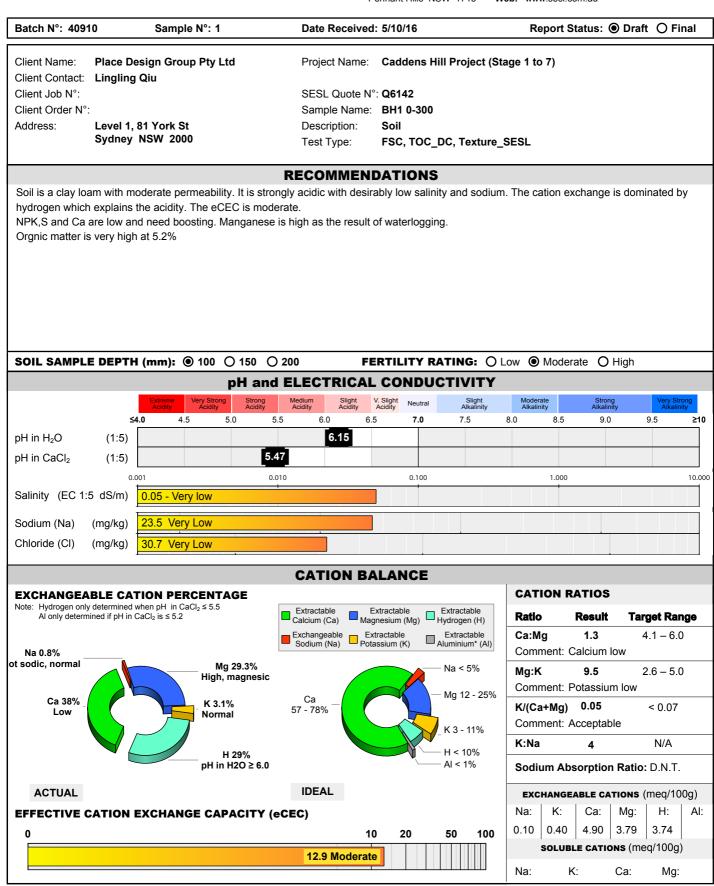


Mehlich 3 - Multi-nutrient Extractant

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
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Batch N°: 40910

Sample N°: 1

Date Received: 5/10/16

Report Status:
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		PLAN	T A	VAILABLE	NU	TRIENT	S			
Major Nutrients	Result (mg/kg)	Very Low	Low	Marginal	Z	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	6.4							0.9	4	3.1
Phosphate-P (PO ₄)	6							0.8	8.4	7.6
Potassium (K) [†]	158							21	34.8	13.8
Sulphate-S (SO ₄)	11							1.5	9	7.5
Calcium (Ca) [†]	982							130.6	248	117.4
Magnesium (Mg) [†]	460							61.2	25.8	Drawdowr
Iron (Fe)	224							29.8	73.4	43.6
Manganese (Mn) [†]	182							24.2	5.9	Drawdowi
Zinc (Zn) [†]	4.1							0.5	0.7	0.2
Copper (Cu)	4.8				-			0.6	0.8	0.2
Boron (B) [†]	0.4							0.1	0.4	0.3
Explanation of graph Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutri is barely adequate the plant, and build-up is still recommended. Potential response nutrient addition is to 60%.	for i to i 30	Adequate Supply of this nutrien adequate for the plan and and only maintenance applicat rates are recommence Potential response to nutrient addition is 5 30%.	t, ion led.	High The level is ex may be detrim growth (i.e. ph may contribute ground and su Drawdown is r Potential respo addition is <2%	ental to plant ytotoxic) and to pollution of rface waters. ecommended. onse to nutrient	elemental applic the Adequate ba economic efficien environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ment recommendatio ation to shift the soil It and, which maximises ncy, and minimises in objective nutrient m bil nutrients. There is fertiliser when soil tes ements are based on nd selected soil depth	est level to within growth/yield, and spact on the unagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangea	ble A	cidity			Physical	Descriptio	on	
0.15 0.11 High		Eff. Cation Ex	Cation ch. Ca	is (meq/100g ⁻¹): apacity (eCEC):	12	<u>?</u> .9		clay content:		Clay Loam 25 - 35%
0.06 Ex Adequate	≥0.4	Base Saturati Exchangeable Exchangeable	e Acidi e Acidi	ty (meq/100g ⁻¹): ty (%):		.32	Size: Gravel con Aggregate Structural u	strength: init:		Not gravelly Did not tes
0.01		- to achieve p	oH 6.0	(g/sqm):	0		Potential in Permeabilit	filtration rate		Moderate Did not test
Low. Plant response to a	applied P is likely.	 to neutralise 	e Al (g	/sqm):	-			EC _{SE} (dS/m)		0.4
		Gypsum App – to achieve 6 The CGAR is depth of 100n addition to ac	67.5% correc nm an	exch. Ca (g/sqn cted for a soil d any Lime	n):	436	are mos Organic Ca	atly negligib arbon (OC%) atter (OM%):	[†] : 3 – Very hi	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Batch N°: 40910 Sample N°: 2	Date Received	: 5/10/16	Report Status: 🖲 Draft 🔿 Final
Client Name: Place Design Group Pty L Client Contact: Lingling Qiu	.td Project Name:	Caddens Hill Project	(Stage 1 to 7)
Client Job N°:	SESL Quote N°	: Q6142	
Client Order N°:	Sample Name:	BH2	
Address: Level 1, 81 York St	Description:	Soil	
Sydney NSW 2000	Test Type:	FSC, TOC_DC, Textu	ire_SESL
	RECOMMENI	DATIONS	
Soil is a sandy clay with slow permeability. It sodic. The eCEC is moderate. NPK,S and Ca are low and need boosting. N Orgnic matter is very low at 1%			hloride. The cation exchange is magnesic and
SOIL SAMPLE DEPTH (mm): 100 			O Low Moderate O High
	pH and ELECTRICAL		
Extreme Very Strong Acidity Acidity	g Strong Medium Slight Acidity Acidity	V. Slight Neutral Slight Alkalinit	y Alkalinity Alkalinity Very Strong Alkalinity
≤4.0 4.5	5.0 5.5 6.0 6.5		8.0 8.5 9.0 9.5 ≥10
pH in H ₂ O (1:5)		7.34	
pH in CaCl ₂ (1:5)	6.37		
0.001	0.010	0.100	1.000 10.00
Salinity (EC 1:5 dS/m)			
Sodium (Na) (mg/kg) 377 High			
Chloride (Cl) (mg/kg) 222.8 High			
	CATION BA	LANCE	
EXCHANGEABLE CATION PERCENT Note: Hydrogen only determined when pH in CaCl ₂ ≤ 5.5		xtractable Extractable	CATION RATIOS
Al only determined if pH in $CaCl_2$ is ≤ 5.2	Calcium (Ca) Mag	nesium (Mg) 💾 Hydrogen (H)	
Na 13.6%		tractable Extractable assium (K) Aluminium* (A	$(A) = \begin{bmatrix} Ca:Mg & 0.7 & 4.1 - 6.0 \\ Comment: Potential Calcium deficiency \end{bmatrix}$
derate sodicity		─── Na < 5%	Mg:K 26.9 2.6 – 5.0
			Comment: Potential Potassium deficiend
Ca 35.7%	Ca _	— Mg 12 - 28	5%
Low	57 - 78%		K/(Ca+Mg) 0.02 < 0.07 Comment: Acceptable
	g 48.9% magnesic	K 3 - 11%	· ·
		H < 10%	K:Na 0.1 N/A
K 1.8%		Al < 1%	Sodium Absorption Ratio: D.N.T.
ACTUAL	IDEAL		EXCHANGEABLE CATIONS (meq/100g)
EFFECTIVE CATION EXCHANGE CAI	PACITY (eCEC)		Na: K: Ca: Mg: H: Al:
0	10) 20 50 10	1.64 0.22 4.32 5.91
	12.1 Moderate		SOLUBLE CATIONS (meq/100g)
			Na: K: Ca: Mg:

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Batch N°: 40910

Sample N°: 2

Date Received: 5/10/16

Report Status:
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		PLANT A	VAILABLE	NU	TRIENT	S			
Major Nutrients	Result (mg/kg)	Very Low 📃 Low	/ Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	2.8						0.4	4	3.6
Phosphate-P (PO ₄)	7.9						1.1	8.4	7.3
Potassium (K) [†]	85.5						11.4	34.8	23.4
Sulphate-S (SO ₄)	8.7						1.2	9	7.8
Calcium (Ca) [†]	866						115.2	248	132.8
Magnesium (Mg) [†]	718						95.5	25.8	Drawdowr
Iron (Fe)	179						23.8	73.4	49.6
Manganese (Mn) [†]	268						35.6	5.9	Drawdowr
Zinc (Zn) [†]	3.2						0.4	0.7	0.3
Copper (Cu)	2.2						0.3	0.8	0.5
Boron (B) [†]	0.3						0	0.4	0.4
Explanation of graph	ranges:							ment recommendatio	calculates the
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Adequate Supply of this nutrien adequate for the plan and and only maintenance applicat rates are recommend Potential response to nutrient addition is 5 to 30%.	it, tion led.	High The level is ext may be detrime growth (i.e. phy may contribute ground and sun Drawdown is re Potential respo addition is <2%	ental to plant vtotoxic) and to pollution of face waters. ecommended. nse to nutrient	the Adequate ba economic efficient environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ation to shift the soil i and, which maximises noy, and minimises in objective nutrients may oil nutrients. There is fertiliser when soil tes ements are based on ad selected soil depth	s growth/yield, and npact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity			Physical	Descriptio	on	
0.15 0.11 0.06 High	ccessive	Adams-Evans Buf Sum of Base Catio Eff. Cation Exch. (Base Saturation (9	ons (meq/100g ⁻¹): Capacity (eCEC):		.1	Texture: Colour: Estimated of Size:	clay content:		Sandy Clay - 35 - 45% -
0 Adequate	≥0.4	Exchangeable Aci	dity (meq/100g ⁻¹):		-	Gravel con Aggregate	strength:		Not gravelly - Did not test
0.02 Low. Plant response to a	-	Lime Application – to achieve pH 6. – to neutralise Al (.0 (g/sqm):	0 -		Potential infiltration rate:		Did not test Slow Did not test 1.4	
		Gypsum Applicat – to achieve 67.59 The CGAR is corred depth of 100mm a addition to achieve	% exch. Ca (g/sqn ected for a soil ind any Lime	n):	440	are mos Organic Ca	stly negligib arbon (OC%) atter (OM%):	[†] : 0.6 – Very	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Batch N°: 40910 Sample N°: 3 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Sample Name: BH3 0-300 Client Order N°: Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a sandy clay loam with moderate permeability. It is moderately acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic. The eCEC is low. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Orgnic matter is very high at 5.3% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Slight Moderate Alkalinity Medium Acidity Neutra 4.5 7.5 9.0 ≤4.0 5.5 6.0 8.0 8.5 9.5 ≥10 5.0 6.5 7.0 pH in H₂O (1:5) 6.23 5.51 pH in CaCl₂ (1:5)0.001 0.010 0 1 0 0 1.000 10.000 Salinity (EC 1:5 dS/m) 0.06 - Very low Sodium (Na) (mg/kg) 32.5 Very Low Chloride (Cl) (mg/kg) 26.8 Very Low **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in $CaCl_2 \le 5.5$ Al only determined if pH in $CaCl_2$ is ≤ 5.2 Extractable Extractable Extractable Hydrogen (H) Ratio **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Extractable Aluminium* (Al) Exchangeable Sodium (Na) 4.1 – 6.0 Ca:Mg 1.3 Potassium (K) Comment: Calcium low Na 1.8% Not sodic, normal Na < 5% Mg:K 7.7 2.6 - 5.0Comment: Potassium low Mg 12 - 25% Mg 40.4% Са Ca 52.9% 0.06 K/(Ca+Mq) < 0.07 High, magnesic 57 - 78% Low Comment: Acceptable K 3 - 11% K:Na N/A 2.9 H < 10% K 5.3% AI < 1% Sodium Absorption Ratio: D.N.T. Normal IDEAL ACTUAL **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca: Mg: H: AI **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** 0.40 4.02 3.07 0.14 0 10 20 50 100 SOLUBLE CATIONS (meq/100g) 7.6 Low Na: K٠ Ca:

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Disci Tests are performed under a quality system complying with ISO 9001: 2008. Results are based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for a lack of performance based on its interpretation and recommendations. This document must not be reproduced except in full

Ma:



Mehlich 3 - Multi-nutrient Extractant

Mailing Address:

Sample Drop Off: 16 Chilvers Road Thornleigh NSW 2120 PO Box 357 Pennant Hills NSW 1715

1300 30 40 80 Tel: 1300 64 46 89 Fax: info@sesl.com.au Em: Web: www.sesl.com.au

Batch N°: 40910

Sample N°: 3

Date Received: 5/10/16

Report Status:
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		PLANT A	VAILABLE	NU.	FRIENT	S			
Major Nutrients	Result (mg/kg)	Very Low	Marginal	Ø	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	9.2						1.2	4	2.8
Phosphate-P (PO ₄)	21.6						2.9	8.4	5.5
Potassium (K) [†]	158						21	29.3	8.3
Sulphate-S (SO ₄)	12						1.6	9	7.4
Calcium (Ca) [†]	805						107.1	208.3	101.2
Magnesium (Mg) [†]	373						49.6	21.7	Drawdown
Iron (Fe)	270						35.9	73.4	37.5
Manganese (Mn) [†]	156						20.7	5.9	Drawdown
Zinc (Zn) [†]	4.6						0.6	0.7	0.1
Copper (Cu)	2.5						0.3	0.8	0.5
Boron (B) [†]	0.3						0	0.4	0.4
Explanation of graph	ranges:							ment recommendation	
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Adequate Supply of this nutrient adequate for the plan and and only maintenance applicat rates are recommend Potential response to nutrient addition is 5 t 30%.	t, r ion r led. g io l	pround and sur Drawdown is re	ental to plant (totoxic) and to pollution of face waters. ecommended. nse to nutrient	the Adequate ba economic efficient environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ation to shift the soil it and, which maximises not and minimises in objective nutrient ma oil nutrients. There is fertiliser when soil tes ements are based on ad selected soil depth	s growth/yield, and npact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity			Physical	Descriptio	on	
0.15		Adams-Evans Buf Sum of Base Catio	ons (meq/100g ⁻¹):			Texture: Colour:	_	Sandy	r Clay Loam -
High		Eff. Cation Exch. (Base Saturation (%		7.6 100		Estimated Size:	clay content:		20 - 30%
Adequate	cessive	Exchangeable Aci				Gravel con	tent [.]		Not gravelly
	≥0.4	Exchangeable Aci	• • • • •	-		Aggregate		•	
mmol/kg		Lime Application	Pato			Structural u	unit:		Did not test
		- to achieve pH 6.		0		Potential in	filtration rate	:	Moderate
0.03		– to neutralise AI (-		Permeabilit	,		Did not test
0.03	applied P is likely	Gypsum Application Rate				Calculated EC _{SE} (dS/m): – Non-saline. Salinity eff are mostly negligible.		,	0.6
0.03	applied P is likely.			n): 1	27				plants
	applied P is likely.	Gypsum Applicat – to achieve 67.5% The CGAR is corre	% exch. Ca (g/sqn	n): 1	27	are mos	stly negligib		
	applied P is likely.	- to achieve 67.5%	% exch. Ca (g/sqn ected for a soil nd any Lime	n): 1	27	are mos Organic Ca	stly negligib arbon (OC%) atter (OM%):	le. [†] : 3.1 – Very	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

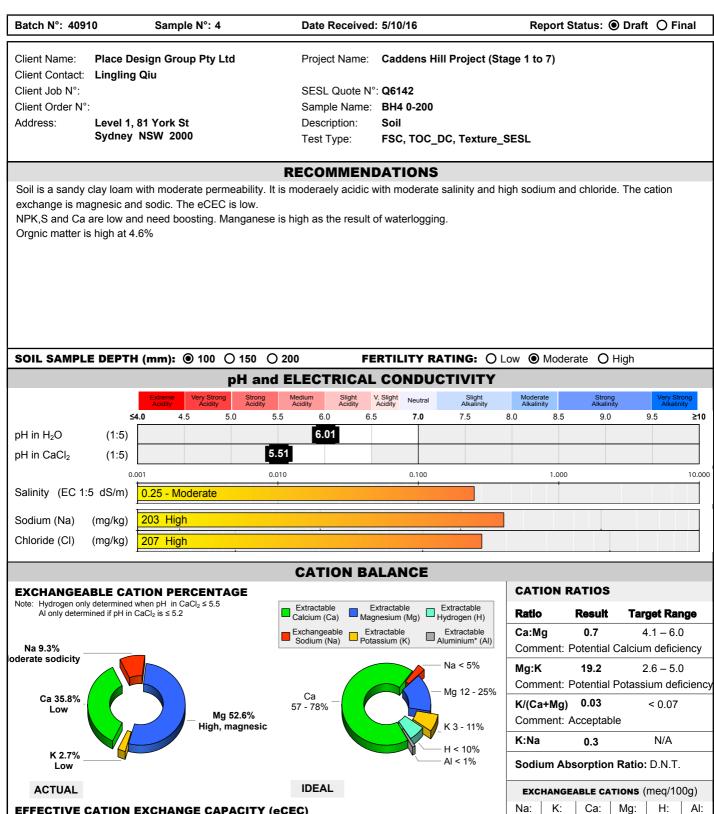
METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Mehlich 3 - Multi-nutrient Extractant

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10

9.5 Low

Disci

20

50

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100

0.88

Na:

0.26

K:

5.00

Ca.

Ma:

SOLUBLE CATIONS (meq/100g)

3.40

0

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Batch N°: 40910

Sample N°: 4

Date Received: 5/10/16

Report Status:
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		PL/	ANT A	VAILABLE	NU	JTRIENT	S			
Major Nutrients	Result (mg/kg)	Very Low	Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	0.97							0.1	4	3.9
Phosphate-P (PO ₄)	3 🗖				-			0.4	8.4	8
Potassium (K) [†]	103							13.7	29.3	15.6
Sulphate-S (SO ₄)	10							1.3	9	7.7
Calcium (Ca) [†]	681							90.6	208.3	117.7
Magnesium (Mg) [†]	607							80.7	21.7	Drawdowr
Iron (Fe)	195							25.9	73.4	47.5
Manganese (Mn) [†]	84							11.2	5.9	Drawdowr
Zinc (Zn) [†]	2.2							0.3	0.7	0.4
Copper (Cu)	2.6							0.3	0.8	0.5
Boron (B) [†]	0.3							0	0.4	0.4
Explanation of graph	ranges:							NOTES: Adjust	ment recommendatio	n calculates the
severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	is barely adec the plant, and build-up is stil recommended Potential resp nutrient additi to 60%.	l d. ionse to	adequate for the pla and and only maintenance applic rates are recommer Potential response t nutrient addition is 5 30%.	ation ded. o	may be detrime growth (i.e. phy may contribute ground and su Drawdown is re Potential respo addition is <2%	totoxic) and to pollution of face waters. ecommended. nse to nutrient	utilise residual se reason to apply the Adequate. • g/sqm measure	 objective nutrient ma oil nutrients. There is fertiliser when soil tes ements are based on id selected soil depth 	no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchang	geable /	Acidity			Physical	Descriptio	on	
		Adams-Ev	ans Buff	er pH (BpH):	-		Texture:		Sandy	Clay Loam
0.15		Sum of Ba	ase Catio	ns (meq/100g ⁻¹)	: 9.	5	Colour:			-
High				apacity (eCEC)				clay content:		20 - 30%
	cessive	Base Satu	`	₀): dity (meq/100g ⁻¹	10 \.	00	Size: Gravel con	tont:		-
Adequate		Exchange) -		Aggregate			Not gravelly
0 mmol/kg	≥0.4	•		• • •			Structural u	-		Did not test
		Lime App			•		Potential in	filtration rate		Moderate
0		- to achie			0		Permeabili	ty (mm/hr):		Did not test
Low. Plant response to a	applied P is likely.	– to neutra	alise Al (g	g/sqm):	-		Calculated	EC _{SE} (dS/m)):	2.4
		Gypsum /							rowth on ser	sitive
				exch. Ca (g/sq	m):	345		becies is aff		
				ected for a soil			-	, ,	[†] : 2.7 – High	
		depth of 1 addition to		,			Additional	atter (OM%):	4.0	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

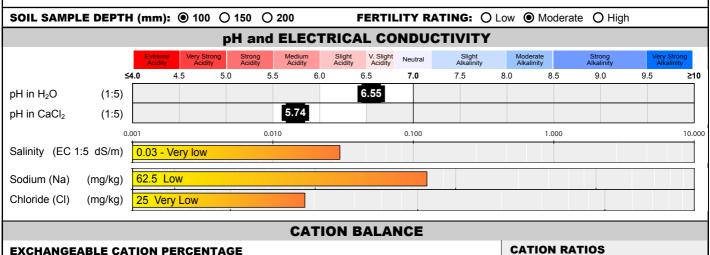
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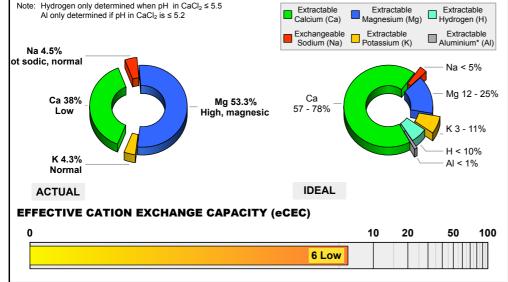


Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road Tel: 1300 30 40 80 Thornleigh NSW 2120 1300 64 46 89 Fax: PO Box 357 Mailing Address: Em: info@sesl.com.au Pennant Hills NSW 1715 Web: www.sesl.com.au

Batch N°: 40910 Sample N°: 5 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Sample Name: BH5 0-200 Client Order N°: Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a sandy clay loam with moderate permeability. It is moderaely acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic and slightly sodic. The eCEC is low. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is high at 4.4%





CATION RATIOS

Ratio	•	Result	Tar	get Rar	nge					
Ca:M	g	0.7	2	4.1 – 6.0)					
Comr	ment: P	otential	Calciur	n deficie	ency					
Mg:K	<u> </u>	12.3	2	2.6 – 5.0)					
Comment: Potential Potassium deficiency										
K/(Ca+Mg) 0.05 < 0.07										
Comr	ment: A	cceptat	ole							
K:Na		1		N/A						
Sodi	um Abs	orptio	n Ratio	D.N.T.						
EXC	HANGE	ABLE CA	TIONS (meq/10	0g)					
Na:	K:	Ca:	Mg:	H:	AI:					
0.27	0.26	2.28	3.20							
	SOLUBL	E CATIO	ons (me	q/100g))					
Na: K: Ca: Mg:										

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Batch N°: 40910

Sample N°: 5

Date Received: 5/10/16

Report Status:
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Major NutrientsNitrate-N (NO3)Phosphate-P (PO4)Potassium (K) †Sulphate-S (SO4)Calcium (Ca) †Magnesium (Mg) †	Result (mg/kg) Image: Constraint of the second second second	/ery Low 📃 Low	Marginal	Z	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Phosphate-P (PO ₄) Potassium (K) [†] Sulphate-S (SO ₄) Calcium (Ca) [†]	2.8							(9,0411)	(g/sqiii)
Potassium (K) [†] Sulphate-S (SO ₄) Calcium (Ca) [†]							0.2	4	3.8
Sulphate-S (SO ₄) Calcium (Ca) [†]	103						0.4	8.4	8
Calcium (Ca) [†]							13.7	29.3	15.6
, ,	7.9						1.1	9	7.9
Magnesium (Mg) [†]	456						60.6	208.3	147.7
	389						51.7	21.7	Drawdown
Iron (Fe)	160						21.3	73.4	52.1
Manganese (Mn) [†]	267						35.5	5.9	Drawdown
Zinc (Zn) [†]	2.7						0.4	0.7	0.3
Copper (Cu)	2.3						0.3	0.8	0.5
Boron (B) [†]	0.3						0	0.4	0.4
Explanation of graph ra	anges:	Marginal	💋 Adequate		High		elemental applica the Adequate ba	I nent recommendation ation to shift the soil to and, which maximises acy, and minimises in	est level to within growth/yield, and
deficiency symptoms present. Large applications r	hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	adequate for the plan and and only maintenance applicat rates are recommend Potential response to nutrient addition is 5 f 30%.	tion ded.	may be detrime growth (i.e. phy may contribute ground and sur Drawdown is re Potential respon addition is <2%	totoxic) and to pollution of face waters. ecommended. nse to nutrient	utilise residual so reason to apply fo Adequate . • g/sqm measure	objective nutrient ma oil nutrients. There is ertiliser when soil tes ements are based on id selected soil depth	no agronomic t levels exceed soil bulk density of
Phosphorus Saturat	tion Index	Exchangeable	Acidity			Physical	Descriptio	on	
		Adams-Evans Buff	fer pH (BpH):	-		Texture:		Sandy	Clay Loam
0.15	_	Sum of Base Catio	ons (meq/100g ⁻¹):	6		Colour:			-
0.11 High		Eff. Cation Exch. C					clay content:		20 - 30%
	essive	Base Saturation (%	,	10	0	Size:	- t	_	-
Low		Exchangeable Acid	• • • • •	: -		Gravel cont Aggregate		ſ	Not gravelly
0 mmol/kg	≥0.4	-	• • •	-		Structural L	•		- Did not test
		Lime Application					filtration rate		Moderate
0		- to achieve pH 6.0		0		Permeabilit	y (mm/hr):		Did not test
Low. Plant response to app	plied P is likely.	– to neutralise AI (g/sqm):	-			EC _{SE} (dS/m)		0.3
		Gypsum Applicat		n).	203		aline. Salini tly negligib	ty effects on le.	plants
		The CGAR is corre		,.	200	Organic Ca	rbon (OC%)	[†] : 2.6 – High	
		depth of 100mm a					atter (OM%):		
		addition to achieve	-			Additional of			

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Batch N°: 40910 Sample N°: 6 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Sample Name: BH6 0-200 Client Order N°: Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a clay loam with moderate permeability. It is slightly acidic with desirably low salinity, sodium and chloride. The cation exchange is magnesic. The eCEC is moderate. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is high at 5.1% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Neutra Slight Moderate Alkalinity Medium 4.5 9.0 ≤4.0 6.0 6.5 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 7.5 pH in H₂O (1:5) 6.6 5.99 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.06 - Very low Sodium (Na) (mg/kg) 57.8 Low Chloride (Cl) (mg/kg) 40.8 Very Low **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in $CaCl_2 \le 5.5$ Al only determined if pH in $CaCl_2$ is ≤ 5.2 Extractable Extractable Extractable Hydrogen (H) Ratio **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Extractable Aluminium* (Al) Exchangeable Sodium (Na) 1.2 4.1 – 6.0 Ca:Mg Potassium (K) Na 1.7% Comment: Calcium low Not sodic, normal Na < 5% Mg:K 12 2.6 - 5.0Mg 12 - 25% Mg 42.9% Са Ca 51.6% 0.04 K/(Ca+Mq) < 0.07 High, magnesic 57 - 78% Low Comment: Acceptable K 3 - 11% K:Na N/A 2.1 H < 10% K 3.6%

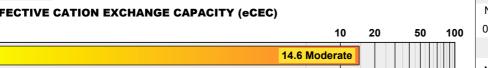
EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)

Normal

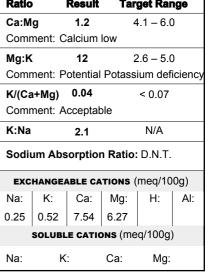
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IDEAL



ACTUAL

0

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AI < 1%



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Batch N°: 40910

Sample N°: 6

Date Received: 5/10/16

Report Status:
 Draft O Final

		PLANT A	VAILABLE	NUTI	RIENT	S			
Major Nutrients	Result (mg/kg)	Very Low	Marginal	💋 Ac	lequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Nitrate-N (NO ₃)	6.4						0.9	4	3.1
Phosphate-P (PO ₄)	5.3						0.7	8.4	7.7
Potassium (K) [†]	203						27	34.8	7.8
Sulphate-S (SO ₄)	8.9						1.2	9	7.8
Calcium (Ca) [†]	1510						200.8	248	47.2
Magnesium (Mg) [†]	761						101.2	25.8	Drawdowi
Iron (Fe)	205						27.3	73.4	46.1
Manganese (Mn) [†]	100						13.3	5.9	Drawdowr
Zinc (Zn) [†]	4.8						0.6	0.7	0.1
Copper (Cu)	2.5						0.3	0.8	0.5
Boron (B) [†]	0.6						0.1	0.4	0.3
Explanation of graph	ranges:						NOTES: Adjustr	ment recommendation	n calculates the
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Adequate Supply of this nutrien adequate for the plar and and only maintenance applicar rates are recommeno. Potential response to nutrient addition is 5 30%.	it, ma gro tion ma led. gro Dra to Pot	y be detrime wth (i.e. phy y contribute und and sur wdown is re	cessive and ental to plant (totoxic) and to pollution of fface waters. ecommended. inse to nutrient b.	economic efficien environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	and, which maximises ncy, and minimises in objective nutrient ma oil nutrients. There is fertiliser when soil tes ements are based on id selected soil depth	nagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity			Physical	Descriptio	on	
0.15	_	Adams-Evans Buff Sum of Base Catic		- 14.6		Texture: Colour:			Clay Loam
0.11 High 0.06 Ex	cessive	Eff. Cation Exch. C Base Saturation (%		14.6 100		Estimated of Size:	clay content:		25 - 35%
Adequate		Exchangeable Acid	dity (meq/100g⁻¹)	-		Gravel con	tent:		Gravelly
0 mmol/kg	≥0.4	Exchangeable Acie	dity (%):	-		Aggregate	•		
minorkų	9	Lime Application	Rate			Structural u			Did not test
0.01		 to achieve pH 6.0 	0 (g/sqm):	0		Permeabilit	filtration rate		Moderate Did not test
Low. Plant response to a	applied P is likely.	 to neutralise AI (g/sqm):	-			EC _{SE} (dS/m)		0.5
		Gypsum Applicat – to achieve 67.5%		n): 26 !	5	– Non-s	,	ity effects on	
		The CGAR is corrected for a soil depth of 100mm and any Lime addition to achieve pH 6.0.				-	atter (OM%):	[†] : 3 – Very hi 5.1	gh

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Mehlich 3 - Multi-nutrient Extractant

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 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

Batch N°: 40910	Sample N°: 7	Date Receive	d: 5/10/16		Repo	ort Status: 🔘 I	Draft O Fin	al
Client Name: Place D Client Contact: Lingling	esign Group Pty Ltd g Qiu	Project Name:	Caddens Hill	Project (St	tage 1 to 7)			
Client Job N°:	•	SESL Quote N	J°: Q6142					
Client Order N°:		Sample Name	BH7 0-200					
Address: Level 1	, 81 York St	Description:	Soil					
Sydney	NSW 2000	Test Type:	FSC, TOC_DO	C, Texture_	SESL			
		RECOMMEN						
	ow permeability. It is moderae	ely acidic with desirab	ly low salinity, so	dium and c	hloride. The	e cation exchar	ge is magnes	iC.
The eCEC is moderate.	hate is low. Manganese is hig	the result of wa	terlogging Potas	sium is also	hiah			
Organic matter is very hi		in as the result of wat	enogging. rotas	510111 15 6150	, nign.			
SOIL SAMPLE DEPT	H (mm):) 200 F	ERTILITY RAT		Low 🔘 Mo	oderate O Hig	gh	
	nH an	d ELECTRICA	L CONDUC	ΤΙVΙΤΥ				
					Moderate	Strong	Very Stror	a
	Acidity Acidity Acidity	Acidity Acidity	V. Slight Acidity Neutral	Slight Alkalinity	Alkalinity	Strong Alkalinity	Very Stron Alkalinity	
	≤4.0 4.5 5.0		5.5 7.0	7.5	8.0 8	3.5 9.0	9.5	≥10
pH in H_2O (1:5)		6.35						
pH in CaCl ₂ (1:5)		5.78						
C	.001	0.010	0.100		1.	000		10.000
Salinity (EC 1:5 dS/m)	0.08 - Very low	+						
·····, (· ··· ···,								
Sodium (Na) (mg/kg)	39.9 Very Low							
Chloride (Cl) (mg/kg)	77.4 Very Low							
		CATION B	ALANCE					
EXCHANGEABLE CA	TION PERCENTAGE				CATIO	N RATIOS		
Note: Hydrogen only determined	when pH in $CaCl_2 \le 5.5$	Extractable	Extractable _ Ex	xtractable	D -44	D 14	T	
Al only determined if pH in	$CaCl_2$ is ≤ 5.2	Calcium (Ca) Ma	• • • • •	drogen (H)	Ratio	Result	Target Rang	je
		Exchangeable Sodium (Na)	Extractable Extractable Alu	Extractable uminium* (AI)	Ca:Mg	2.1	4.1 – 6.0	
	Na 0.8%	-1			Commer	nt: Calcium low		
	Not sodic, norm			Na < 5%	Mg:K	4.6	2.6 – 5.0	
	Mg 29.6%			Mg 12 - 25%	Commer	nt: Balanced		
Ca 63.1% Normal	High, magnesic	Ca 57 - 78% [—]		5	K/(Ca+N	lg) 0.07	< 0.07	
Norman				K 3 - 11%	Commer	nt: High		
				()-11/0	K:Na	7.9	N/A	-
	K 6.5% Normal			H < 10% Al < 1%				
			F	AI < 170	Sodium	Absorption R	atio: D.N.I.	
ACTUAL		IDEAL			EXCHA	NGEABLE CATIO	NS (meq/100	g)
	EXCHANGE CAPACITY	(eCEC)			Na: ł	K: Ca: M	1g: H:	AI:
EFFECTIVE CATION					- I	1 1		
			10 20 7	50 400	0.17 1.	35 13.19 6.	19	
effective cation			10 20 5	50 100		I I	I I	
			<u> </u>	50 100		35 13.19 6. LUBLE CATIONS K: Ca	(meq/100g)	

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Batch N°: 40910

Sample N°: 7

Date Received: 5/10/16

Report Status:
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		PLAN	ТА	VAILABLE	N	JTRIENT	S			
Major Nutrients	Result (mg/kg)	Very Low	Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	11							1.5	4	2.5
Phosphate-P (PO ₄)	42.7				_			5.7	8.4	2.7
Potassium (K) [†]	529							70.4	46	Drawdown
Sulphate-S (SO ₄)	12							1.6	9	7.4
Calcium (Ca) [†]	2643							351.5	327.7	Drawdowr
Magnesium (Mg) [†]	752							100	34.2	Drawdowr
Iron (Fe)	230							30.6	73.4	42.8
Manganese (Mn) [†]	54							7.2	5.9	Drawdowr
Zinc (Zn) [†]	5.1							0.7	0.7	0
Copper (Cu)	3.7							0.5	0.8	0.3
Boron (B) [†]	0.5							0.1	0.4	0.3
Explanation of graph	ranges:							NOTES: Adjustr	ment recommendatio	n calculates the
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrie is barely adequate the plant, and build-up is still recommended. Potential response nutrient addition is to 60%.	for	Supply of this nutrie adequate for the pla and and only maintenance applic rates are recommer Potential response t nutrient addition is 5 30%.	int, ation ided. io	ground and su Drawdown is r	ental to plant ytotoxic) and to pollution of rface waters. ecommended. onse to nutrient	economic efficient environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	and, which maximises ncy, and minimises in objective nutrient m oil nutrients. There is fertiliser when soil tes aments are based on nd selected soil depth	npact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ration Index	Exchangea	ble A	Acidity			Physical	Descriptio	on	
0.15 0.11 0.06	ccessive		Catio ch. C	ns (meq/100g ⁻¹) apacity (eCEC)	: 20).9).9)0	Texture: Colour: Estimated Size:	clay content:		Light Clay 35 - 40%
0	≥0.4	Exchangeable Exchangeable		lity (meq/100g⁻¹ lity (%):): - -		Gravel con Aggregate		I	Not gravelly
0.05 0.05 Low. Plant response to applied P is likely.		 to achieve p to neutralise Gypsum App to achieve 6 The CGAR is 	Lime Application Rate – to achieve pH 6.0 (g/sqm): – to neutralise Al (g/sqm): Gypsum Application Rate – to achieve 67.5% exch. Ca (g/sqm): The CGAR is corrected for a soil		0 - m):	105	Permeabilit Calculated – Non-s are mos	filtration rate ty (mm/hr): EC _{SE} (dS/m) a line. Salini stly negligib	e:): ity effects or ile. [†] : 3.2 – Very	•
		depth of 100m addition to ach		-			Additional of		. 	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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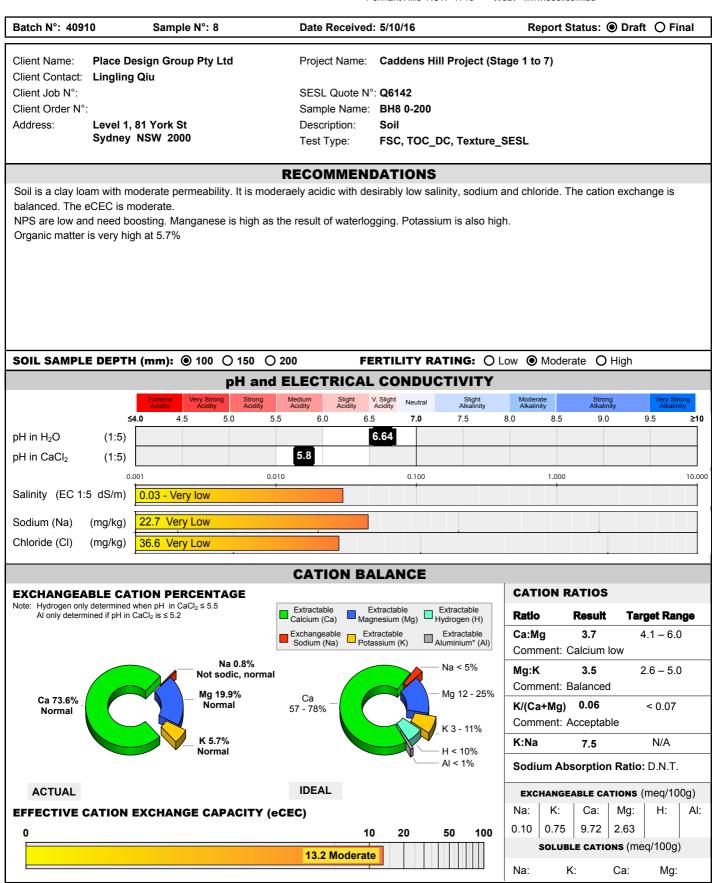


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Batch N°: 40910

Sample N°: 8

Date Received: 5/10/16

Report Status:
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		PLANT A	VAILABLE	NUTRIE	ENTS			
Major Nutrients	Result (mg/kg)	Very Low	Marginal	💋 Adequ	uate 📕 High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	1.2					0.2	4	3.8
Phosphate-P (PO ₄)	6.5					0.9	8.4	7.5
Potassium (K) [†]	294					39.1	34.8	Drawdowr
Sulphate-S (SO ₄)	8.5					1.1	9	7.9
Calcium (Ca) [†]	1948					259.1	248	Drawdowi
Magnesium (Mg) [†]	320					42.6	25.8	Drawdowi
Iron (Fe)	179					23.8	73.4	49.6
Manganese (Mn) [†]	290					38.6	5.9	Drawdow
Zinc (Zn) [†]	4.5					0.6	0.7	0.1
Copper (Cu)	14					1.9	0.8	Drawdowr
Boron (B) [†]	0.6					0.1	0.4	0.3
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Supply of this nutrient adequate for the plant and and only maintenance applicative rates are recommende Potential response to nutrient addition is 5 to 30%.	is The level , may be growth (on may cor ed. ground a Drawdow	ligh el is excessive and detrimental to plant i.e. phytotoxic) and thribute to pollution of and surface waters. wn is recommended. Il response to nutrient is <2%.	Adequate. • g/sqm measurements are based on soil bulk densit		
Phosphorus Satur	ration Index	Exchangeable /	Acidity		Physical	Descriptio	on	
					-	-		
0.15 0.11 0.06 High Ex	xcessive	Adams-Evans Buff Sum of Base Catio Eff. Cation Exch. C Base Saturation (%	ons (meq/100g ⁻¹): Capacity (eCEC):	- 13.2 13.2 100	Texture: Colour: Estimated Size:	clay content:		Clay Loam 25 - 35%
0.11 High	xcessive	Sum of Base Catio Eff. Cation Exch. C	ons (meq/100g ⁻¹): Capacity (eCEC): %):	13.2 100	Colour: Estimated	clay content:		25 - 35%
0.11 0.06 Adequate	≥0.4	Sum of Base Catio Eff. Cation Exch. C Base Saturation (%	ons (meq/100g ⁻¹): Capacity (eCEC): %): dity (meq/100g ⁻¹):	13.2 100	Colour: Estimated Size: Gravel con Aggregate	clay content: tent: strength:		25 - 35% Gravelly
0.11 High Adequate	≥0.4	Sum of Base Catio Eff. Cation Exch. C Base Saturation (% Exchangeable Acio	ons (meq/100g ⁻¹): Capacity (eCEC): %): dity (meq/100g ⁻¹): dity (%):	13.2 100	Colour: Estimated Size: Gravel con Aggregate Structural	clay content: itent: strength: unit:		25 - 35% Gravelly Did not tes
0.11 0.06 Adequate	≥0.4	Sum of Base Catio Eff. Cation Exch. C Base Saturation (% Exchangeable Acio Exchangeable Acio	ons (meq/100g ⁻¹): Capacity (eCEC): 6): dity (meq/100g ⁻¹): dity (%): Rate	13.2 100	Colour: Estimated Size: Gravel con Aggregate Structural Potential ir	clay content: ttent: strength: unit: ifiltration rate):	25 - 35% Gravelly Did not test Moderate
0.11 High Adequate 0 mmol/k	≥0.4	Sum of Base Catio Eff. Cation Exch. C Base Saturation (% Exchangeable Acio Exchangeable Acio Lime Application	ons (meq/100g ⁻¹): Capacity (eCEC): 6): dity (meq/100g ⁻¹): dity (%): Rate 0 (g/sqm):	13.2 100 - -	Colour: Estimated Size: Gravel con Aggregate Structural i Potential ir Permeabili	clay content: ttent: strength: unit: nfiltration rate ty (mm/hr):	2:	25 - 35% Gravelly Did not test Moderate Did not test
0.11 High Adequate mmol/k 0.01	≥0.4	Sum of Base Catio Eff. Cation Exch. C Base Saturation (% Exchangeable Acid Exchangeable Acid Lime Application – to achieve pH 6.0	ons (meq/100g ⁻¹): Capacity (eCEC): 6): dity (meq/100g ⁻¹): dity (%): Rate 0 (g/sqm): g/sqm): ion Rate	13.2 100 - - 0 -	Colour: Estimated Size: Gravel con Aggregate Structural Potential in Permeabili Calculated – Non-s are mos	clay content: strength: unit: nfiltration rate ty (mm/hr): EC _{SE} (dS/m) saline. Salini stly negligib	e:): ity effects on	25 - 35% Gravelly Did not tes Moderate Did not tes 0.3 plants

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Batch N°: 40910 Sample N°: 9 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Sample Name: BH9 0-280 Client Order N°: Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a clay loam with moderate permeability. It is moderaely acidic with desirably low salinity, sodium and chloride. The cation exchange is balanced. The eCEC is moderate. NPS are low and need boosting. Manganese is high as the result of waterlogging. Potassium is also high. Organic matter is very high at 5.7% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Slight Moderate Alkalinity Medium Neutral 9.0 ≤4.0 4.5 6.0 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 6.5 7.5 6.46 pH in H₂O (1:5) 5.74 pH in CaCl₂ (1:5)0.001 0.010 0 1 0 0 1.000 10.000 Salinity (EC 1:5 dS/m) 0.04 - Very low Sodium (Na) (mg/kg) 17.8 Very Low Chloride (Cl) (mg/kg) 40.1 Very Low **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in CaCl₂ ≤ 5.5 Extractable Extractable Extractable Ratio Al only determined if pH in CaCl₂ is \leq 5.2 Hydrogen (H) **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Exchangeable Sodium (Na) Extractable Aluminium* (AI) 4.1 – 6.0 Ca:Mg 2.3 Potassium (K) Comment: Calcium low Na 0.6% Not sodic, normal Na < 5% Mg:K 4.2 2.6 - 5.0Comment: Balanced Mg 27.8% Mg 12 - 25% Са Ca 64.5% High, magnesic 0.07 K/(Ca+Mq) < 0.07 57 - 78% Normal Comment: High K 3 - 11% K:Na N/A 11 K 6.7% H < 10% Normal AI < 1% Sodium Absorption Ratio: D.N.T. IDEAL ACTUAL **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca: H: AI **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ma: 3.67 0.08 0.88 8.52 0 10 20 50 100 SOLUBLE CATIONS (meq/100g) 13.2 Moderate K: Na: Ca: Ma:



Version: 1, Version Date: 11/05/2018

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		PLANT A	VAILABLE	NUTI	RIENT	S			
Major Nutrients	Result (mg/kg)	Very Low 📃 Low	Marginal	💋 Ac	lequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	4.4						0.6	4	3.4
Phosphate-P (PO ₄)	4.8						0.6	8.4	7.8
Potassium (K) [†]	344						45.8	34.8	Drawdowr
Sulphate-S (SO ₄)	7.7						1	9	8
Calcium (Ca) [†]	1707						227	248	21
Magnesium (Mg) [†]	446						59.3	25.8	Drawdowr
Iron (Fe)	149						19.8	73.4	53.6
Manganese (Mn) [†]	99						13.2	5.9	Drawdowr
Zinc (Zn) [†]	6.8						0.9	0.7	Drawdowr
Copper (Cu)	3.3						0.4	0.8	0.4
Boron (B) [†]	0.6						0.1	0.4	0.3
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Adequate Supply of this nutrien adequate for the plar and and only maintenance applicar rates are recommenc Potential response to nutrient addition is 5 30%.	it, may grov tion may led. grov Dra to Pot	y be detrime wth (i.e. phy y contribute und and sur wdown is re	cessive and ental to plant (totoxic) and to pollution of frace waters. ecommended. onse to nutrient	the Adequate ba economic efficient environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ation to shift the soil it and, which maximises not and minimises in objective nutrient ma oil nutrients. There is ertiliser when soil tes ements are based on id selected soil depth	a growth/yield, and apact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity			Physical	Descriptio	on	
0.15 0.06 Adequate 0 mmol/kg 0.01 Low. Plant response to a	-	Adams-Evans Buff Sum of Base Catio Eff. Cation Exch. C Base Saturation (% Exchangeable Acid Exchangeable Acid Exchangeab	ons (meq/100g ⁻¹): Capacity (eCEC): %): dity (meq/100g ⁻¹) dity (%): Rate 0 (g/sqm): g/sqm): tion Rate	13.2 100 - - 0 -		Size: Gravel com Aggregate Structural u Potential in Permeabilit Calculated – Non-s are mos	strength: unit: filtration rate ty (mm/hr): EC _{SE} (dS/m)	:): (ty effects on le.	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

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Sample Drop Off: 16 Chilvers Road Tel: 1300 30 40 80 Thornleigh NSW 2120 1300 64 46 89 Fax: PO Box 357 Mailing Address: Em: info@sesl.com.au Pennant Hills NSW 1715 Web: www.sesl.com.au

Batch N°: 40910 Sample N°: 10 Date Received: 5/10/16 Report Status:
 Draft O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Client Order N°: Sample Name: BH10 0-200 Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a clay loam with moderate permeability. It is strongly acidic with desirably low salinity and sodium. The cation exchange is dominated by hydrogen which explains the acidity. It is also slightly magnesic. The eCEC is moderate. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Orgnic matter is very high at 5.7% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Neutral Slight Moderate Alkalinity Medium 4.5 9.0 ≤4.0 6.0 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 6.5 7.5 6.44 pH in H₂O (1:5) 5.37 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.04 - Very low Sodium (Na) (mg/kg) 62.2 Low Chloride (Cl) 45.6 Very Low (mg/kg) **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in $CaCl_2 \le 5.5$ Al only determined if pH in $CaCl_2$ is ≤ 5.2 Extractable Extractable Extractable Hydrogen (H) Ratio **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Extractable Aluminium* (AI) 4.1 – 6.0 Exchangeable Ca:Mg 1.4 Potassium (K) Sodium (Na) Comment: Calcium low Na 1.4% ot sodic, normal Na < 5% Mg 29.2% Mg:K 7.6 2.6 - 5.0High, magnesic Comment: Potassium low Mg 12 - 25% Са Ca 41.9% 0.05 K/(Ca+Mq) < 0.07 57 - 78% Low K 3.8% Comment: Acceptable K 3 - 11% Normal K:Na N/A 2.7 H < 10% H 23.2% AI < 1% pH in H2O ≥ 6.0





IDEAL

Sodium Absorption Ratio: D.N.T. **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca. H: AI Ma: 5.48 0.72 7.88 4.37 SOLUBLE CATIONS (meq/100g) K٠ Ca. Ma:

Version: 1, Version Date: 11/05/2018

Document Set ID: 8182541

ACTUAL

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Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road

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Batch N°: 40910

Sample N°: 10

Date Received: 5/10/16

Report Status:
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		PLANT /	AVAILABLE	NUTRIE	INTS			
Major Nutrients	Result (mg/kg)	Very Low 📃 Low	v Marginal	💋 Adequ	iate 🗾 High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Nitrate-N (NO ₃)	3.4					0.5	4	3.5
Phosphate-P (PO ₄)	4.1					0.5	8.4	7.9
Potassium (K) [†]	283					37.6	40.4	2.8
Sulphate-S (SO ₄)	8.5					1.1	9	7.9
Calcium (Ca) [†]	1580					210.1	287.8	77.7
Magnesium (Mg) [†]	666					88.6	29.9	Drawdowi
Iron (Fe)	211					28.1	73.4	45.3
Manganese (Mn) [†]	137					18.2	5.9	Drawdowi
Zinc (Zn) [†]	4					0.5	0.7	0.2
Copper (Cu)	3.5					0.5	0.8	0.3
Boron (B) [†]	0.5					0.1	0.4	0.3
Explanation of graph	ranges:					NOTES: Adjustr	ment recommendatio	n calculates the
Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Supply of this nutrier adequate for the plar and and only maintenance applica rates are recommenn Potential response to nutrient addition is 5 30%.	nt, may be o growth (i tion may com ded. ground a o Drawdow	It is excessive and detrimental to plant i.e. phytotoxic) and tribute to pollution of and surface waters. vn is recommended. I response to nutrient is <2%.	environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ncy, and minimises in objective nutrient ma oil nutrients. There is fertiliser when soil tes ements are based on nd selected soil depth	anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity		Physical	Descriptio	on	
		Adams-Evans But	ffer pH (BpH):	7.3	Texture:			Clay Loam
0.15 0.11 High Adequate	ccessive	Sum of Base Cation Eff. Cation Exch. (Base Saturation (Exchangeable Action	Capacity (eCEC): %):	18.8 76.6	Colour: Estimated Size: Gravel con	clay content: tent:		25 - 35% Not gravelly
Low	≥0.4	Exchangeable Ac	•••••	-	Aggregate	strength:		
0.01	-	Lime Application – to achieve pH 6 – to neutralise Al 6 Gypsum Applica – to achieve 67.59	.0 (g/sqm): (g/sqm): tion Rate	0 - n): 551	Permeabili Calculated – Non-s	nfiltration rate ty (mm/hr): EC _{SE} (dS/m)	::): i ty effects o r	Did not tes Moderate Did not tes 0.3 plants
		The CGAR is corr depth of 100mm a addition to achieve	ected for a soil and any Lime	,	-	atter (OM%):	[†] : 3.4 – Very 5.7	high

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

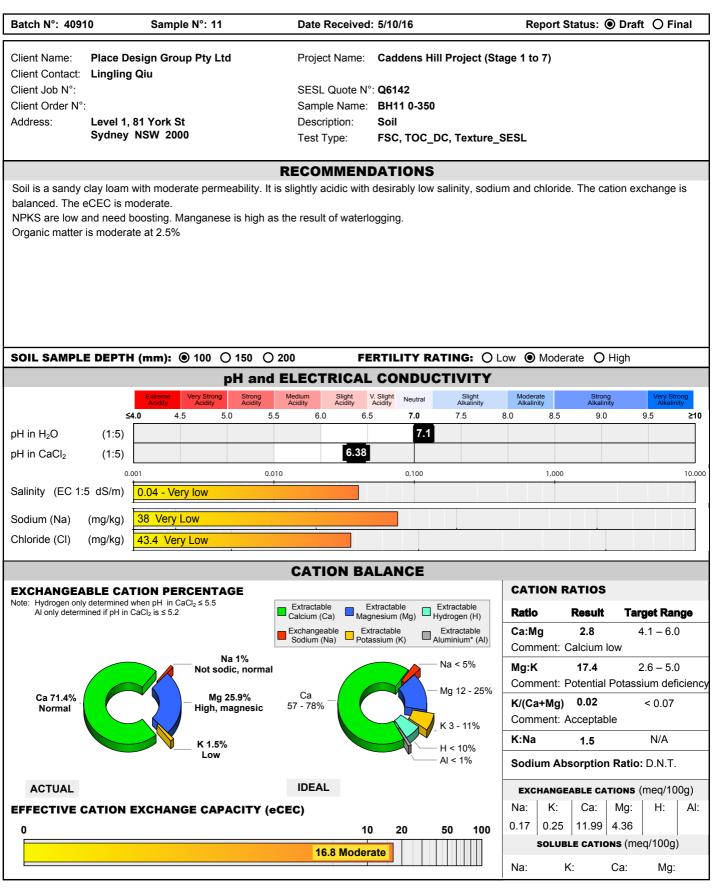
METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Mehlich 3 - Multi-nutrient Extractant

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Mehlich 3 - Multi-nutrient Extractant

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Batch N°: 40910

Sample N°: 11

Date Received: 5/10/16

Report Status:
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		PLANT A	VAILABLE	NUTR	RIENT	S			
Major Nutrients	Result (mg/kg)	Very Low 📃 Low	Marginal	💋 Ade	equate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Nitrate-N (NO ₃)	5.8						0.8	4	3.2
Phosphate-P (PO ₄)	54						7.2	8.4	1.2
Potassium (K) [†]	97.8						13	40.4	27.4
Sulphate-S (SO ₄)	5.7						0.8	9	8.2
Calcium (Ca) [†]	2403						319.6	287.8	Drawdowr
Magnesium (Mg) [†]	529						70.4	29.9	Drawdowr
Iron (Fe)	156						20.7	73.4	52.7
Manganese (Mn) [†]	219						29.1	5.9	Drawdowr
Zinc (Zn) [†]	4						0.5	0.7	0.2
Copper (Cu)	15						2	0.8	Drawdowr
Boron (B) [†]	0.6						0.1	0.4	0.3
Explanation of graph	ranges:						NOTES: Adjustr	nent recommendation	n calculates the
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Supply of this nutrient adequate for the plan and and only maintenance applicat rates are recommend Potential response to nutrient addition is 5 t 30%.	t, may grow on may ed. grou Drav o Pote	be detrime th (i.e. phy contribute nd and su vdown is re-	cessive and ental to plant ytotoxic) and to pollution of rface waters. ecommended. onse to nutrient 6.	the Adequate ba economic efficier environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ation to shift the soil it and, which maximises roy, and minimises in objective nutrient ma oil nutrients. There is ertiliser when soil tes ertents are based on id selected soil depth	s growth/yield, and apact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satura	ation Index	Exchangeable	Acidity			Physical	Descriptio	on	
		Adams-Evans Buf	fer pH (BpH):	-		Texture:		Sandy	Clay Loam
0.15 0.06 Adequete 0 0.09 Adequete, Economic		Sum of Base Catic Eff. Cation Exch. C Base Saturation (% Exchangeable Acid Exchangeable Acid Exchangeable Acid Lime Application – to achieve pH 6. – to neutralise AI (%	Capacity (eCEC): %): dity (meq/100g ⁻¹): dity (%): Rate 0 (g/sqm):	16.8 16.8 100 - - -		Size: Gravel com Aggregate Structural u Potential in Permeabilit Calculated	strength: unit: filtration rate ty (mm/hr): EC _{SE} (dS/m)	ן י:):	20 - 30% - - - - - - - - - - - - - - - - - - -

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Mehlich 3 - Multi-nutrient Extractant

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
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 1300 30 40 80

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 Web:
 www.sesl.com.au

Batch N°: 40910 Sample N°: 12 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Client Order N°: Sample Name: BH12 0-200 Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a sandy clay with slow permeability. It is slightly acidic with desirably low salinity, sodium and chloride. The cation exchange is balanced. The eCEC is low. NPK S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Organic matter is high at 3.9% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Neutra Slight Moderate Alkalinity Medium 9.0 ≤4.0 4.5 6.0 6.5 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 7.5 pH in H₂O (1:5) 6.63 6.01 pH in CaCl₂ (1:5)0.100 0.001 0.010 1.000 10.000 Salinity (EC 1:5 dS/m) 0.03 - Very low Sodium (Na) (mg/kg) 13.7 Very Low Chloride (Cl) (mg/kg) 46.1 Very Low **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in $CaCl_2 \le 5.5$ Extractable Extractable Extractable Ratio Al only determined if pH in CaCl₂ is \leq 5.2 Hydrogen (H) **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Exchangeable Sodium (Na) Extractable Aluminium* (AI) 4.1 – 6.0 Ca:Mg 3.1 Potassium (K) Comment: Calcium low Na 0.6% Na < 5% Mg:K 4.7 2.6 - 5.0Not sodic, normal Comment: Balanced Mg 12 - 25% Mg 22.7% Са Ca 71.6% 0.05 K/(Ca+Mɑ) < 0.07 Normal 57 - 78% Normal Comment: Acceptable K 3 - 11% K:Na N/A K 4.9% 8.8 H < 10% Norma AI < 1%





IDEAL

Sodium Absorption Ratio: D.N.T. **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca: H: AI Ma: 2.48 0.06 0.53 7.80 SOLUBLE CATIONS (meq/100g) K: Ca: Ma:

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Batch N°: 40910

Sample N°: 12

Date Received: 5/10/16

Report Status:
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		PLAN	T AVAILABL	E NU	TRIENT	'S			
Major Nutrients	Result (mg/kg)	Very Low	Low Margin	al 💋	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Nitrate-N (NO ₃)	5.4						0.7	4	3.3
Phosphate-P (PO ₄)	10.4						1.4	8.4	7
Potassium (K) [†]	208						27.7	34.8	7.1
Sulphate-S (SO ₄)	7.8	1					1	9	8
Calcium (Ca) [†]	1562						207.7	248	40.3
Magnesium (Mg) [†]	301						40	25.8	Drawdow
Iron (Fe)	155						20.6	73.4	52.8
Manganese (Mn) [†]	270						35.9	5.9	Drawdow
Zinc (Zn) [†]	3.4						0.5	0.7	0.2
Copper (Cu)	25						3.3	0.8	Drawdow
Boron (B) [†]	0.5						0.1	0.4	0.3
Explanation of graph	ranges:						NOTES: Adjust	ment recommendatio	n calculates the
Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Supply of this nutrie is barely adequate fi the plant, and build-up is still recommended. Potential response t nutrient addition is 3 to 60%.	or adequate for the and and only maintenance app rates are recomm Potential response	plant, lication nended. se to	ground and su Drawdown is r	ental to plant ytotoxic) and to pollution of rface waters. ecommended. onse to nutrient	environment. Drawdown: The utilise residual s reason to apply Adequate. • g/sqm measure	ncy, and minimises in e objective nutrient ma oil nutrients. There is fertiliser when soil tes ements are based on nd selected soil depth	anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeab	ole Acidity			Physical	Description	on	
0.15 0.11 0.06 High Ex	cessive	Sum of Base C	Buffer pH (BpH): Cations (meq/100g ch. Capacity (eCE		9	Texture: Colour: Estimated Size:	clay content:		Sandy Clay 35 - 45%
Adequate			Acidity (meq/100		-	Gravel con		I	Not gravelly
mmol/kg 0.01 Low. Plant response to a		The CGAR is c	H 6.0 (g/sqm): Al (g/sqm): ication Rate 7.5% exch. Ca (g/ corrected for a soi m and any Lime	• •	0	Permeabili Calculated – Non-s are mos	filtration rate ty (mm/hr): EC _{SE} (dS/m ealine. Salin stly negligib arbon (OC%) atter (OM%):	e:): ity effects or le. [†] : 2.3 – High	Did not tes Slov Did not tes 0.: plants

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

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Batch N°: 40910 Sample N°: 13 Date Received: 5/10/16 Report Status:
 Draft
 O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Client Order N°: Sample Name: BH13 0-170 Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: FSC, TOC_DC, Texture_SESL RECOMMENDATIONS Soil is a clay loam with moderate permeability. It is strongly acidic with desirably low salinity and sodium. The cation exchange is dominated by hydrogen which explains the acidity. It is also slightly magnesic. The eCEC is moderate. NPK,S and Ca are low and need boosting. Manganese is high as the result of waterlogging. Orgnic matter is moderate at 3.2% O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Neutral Slight Moderate Alkalinity Medium 4.5 9.0 ≤4.0 6.0 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 6.5 7.5 6.43 pH in H₂O (1:5) 5.41 pH in CaCl₂ (1:5)0.100 0.001 0.010 1.000 10.000 Salinity (EC 1:5 dS/m) 0.04 - Very low Sodium (Na) (mg/kg) 82.8 Low Chloride (Cl) (mg/kg) 46 Very Low **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in $CaCl_2 \le 5.5$ Al only determined if pH in $CaCl_2$ is ≤ 5.2 Extractable Extractable Extractable Hydrogen (H) Ratio **Target Range** Magnesium (Mg) Result Calcium (Ca) Extractable Exchangeable Sodium (Na) Extractable Aluminium* (AI) 4.1 – 6.0 Ca:Mg 1 Potassium (K) Comment: Calcium low Na 2.4% Mg 32.6% ot sodic, normal Na < 5% Mg:K 13 2.6 - 5.0High, magnesic Comment: Potential Potassium deficiency Mg 12 - 25% Са Ca 32.8% 0.04 K/(Ca+Mq) < 0.07 57 - 78% Low K 2.5% Comment: Acceptable K 3 - 11% Low K:Na N/A 1 H < 10% H 29.5% AI < 1% Sodium Absorption Ratio: D.N.T. pH in H2O ≥ 6.0 IDEAL ACTUAL **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca: H: AI **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ma: 4.82 0.36 0.37 4.85 4.37 0 10 20 50 100 SOLUBLE CATIONS (meq/100g) 14.8 Moderate Na: K٠ Ca. Ma:

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Batch N°: 40910

Sample N°: 13

Date Received: 5/10/16

Report Status:
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		PLANT /	AVAILABLE	NUTRIEN	TS			
Major Nutrients	Result (mg/kg)	Very Low 📃 Lov	v Marginal	💋 Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	3.9					0.5	4	3.5
Phosphate-P (PO ₄)	2.7					0.4	8.4	8
Potassium (K) [†]	143					19	34.8	15.8
Sulphate-S (SO ₄)	11					1.5	9	7.5
Calcium (Ca) [†]	972					129.3	248	118.7
Magnesium (Mg) [†]	586		_			77.9	25.8	Drawdown
Iron (Fe)	167					22.2	73.4	51.2
Manganese (Mn) [†]	60					8	5.9	Drawdown
Zinc (Zn) [†]	1.6					0.2	0.7	0.5
Copper (Cu)	2.7					0.4	0.8	0.4
Boron (B) [†]	0.3					0	0.4	0.4
Explanation of graph						NOTED	ment recommendation	
Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidden hunger", or sub-clinical deficiency. Potential response to nutrient addition is 60 to 90%.	Marginal Supply of this nutrient is barely adequate for the plant, and build-up is still recommended. Potential response to nutrient addition is 30 to 60%.	Adequate Supply of this nutrien adequate for the plan and and only maintenance applicat rates are recommend Potential response to nutrient addition is 5 to 30%.	t, may be detrii growth (i.e. p ion may contribu ed. ground and s Drawdown is	excessive and mental to plant hytotoxic) and te to pollution of uriface waters. recommended. ponse to nutrient 2%.	the Adequate ba economic efficie environment. Drawdown: The utilise residual so reason to apply in Adequate. • g/sqm measure	ation to shift the soil it and, which maximises ncy, and minimises in objective nutrient ma bil nutrients. There is fertiliser when soil tes ements are based on id selected soil depth	s growth/yield, and npact on the anagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	Exchangeable	Acidity		Physical	Descriptio	on	
0.15 0.11		Adams-Evans Bur Sum of Base Cati Eff. Cation Exch.	ons (meq/100g ⁻¹): Capacity (eCEC):	7.3 10.4 14.8 70.27		clay content:		Clay Loam - 25 - 35%
0.06 Ex	cessive	Base Saturation (Exchangeable Ac	,		Size: Gravel con	itent:		- Gravelly
Low	≥0.4	Exchangeable Ac	• • • • •	-	Aggregate			-
mmol/kg	9	Lime Application	Pato		Structural	unit:		Did not test
				0		nfiltration rate	:	Moderate
0		 to achieve pH 6 						Did not test
0 Low. Plant response to a	applied P is likely.	 to achieve pH 6 to neutralise Al 		-	Permeabili			
0 Low. Plant response to a	applied P is likely.	•	(g/sqm): tion Rate	- 1): 588	Calculated – Non-s are mos	EC _{SE} (dS/m saline. Salini stly negligib): ity effects on le.	0.3 plants
	applied P is likely.	– to neutralise Al Gypsum Applica	(g/sqm): tion Rate % exch. Ca (g/sqn ected for a soil	- 1): 588	Calculated – Non-s are mos Organic Ca	EC _{SE} (dS/m saline. Salini stly negligib): ity effects on le. [†] : 1.9 – Mode	0.3 plants

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

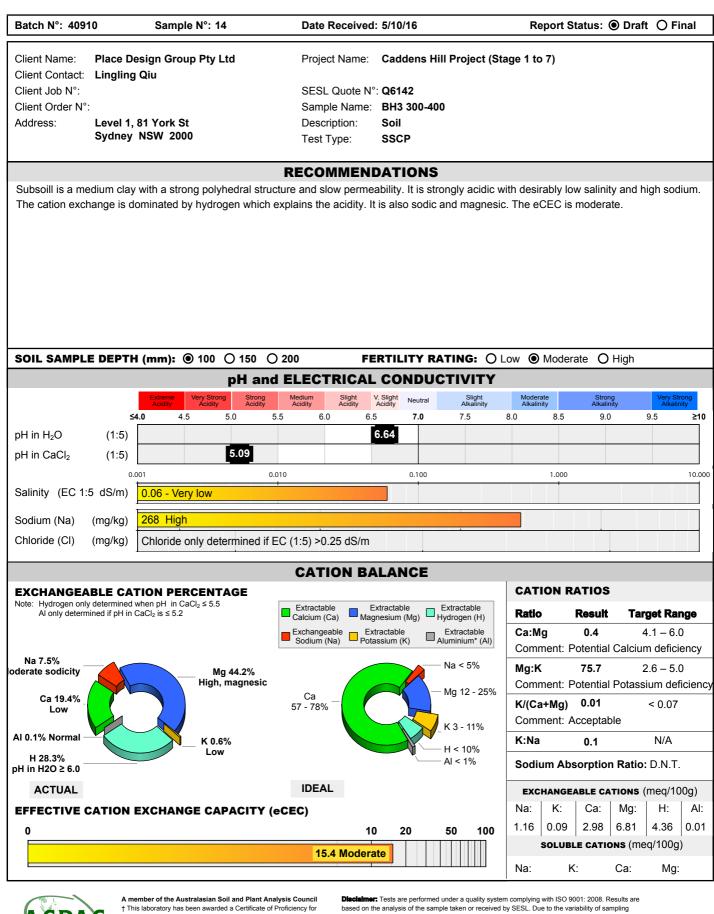
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Mehlich 3 - Multi-nutrient Extractant

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Batch N°: 40910

Sample N°: 14

Date Received: 5/10/16

Report Status:
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			Ρ		AVAILABLE	NU	JTRIEN	ſS			
Major Nutrients	Result (mg/kg)		Very Low	/ Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	-								-	4	Did not tes
Phosphate-P (PO ₄)	-					_			-	8.4	Did not tes
Potassium (K) [†]	36.2								4.8	40.4	35.6
Sulphate-S (SO ₄)	-								-	9	9
Calcium (Ca) [†]	598								79.5	287.8	208.3
Magnesium (Mg) [†]	828								110.1	29.9	Drawdowi
Iron (Fe)	-								-	73.4	Did not tes
Manganese (Mn) [†]	-								-	5.9	Did not tes
Zinc (Zn) [†]	-								-	0.7	Did not tes
Copper (Cu)	-								-	0.8	Did not tes
Boron (B) [†]	-								-	0.4	Did not tes
Explanation of graph	ranges:								NOTES: Adjust	nent recommendation	calculates the
severely depressed and deficiency symptoms	hunger", or sub deficiency. Pote			idequate for	adequate for the pla	int,	may be detrim	ental to plant	Drawdown: The	objective nutrient ma	inagement is to
present. Large applications for soil building purposes are usually recommended. Potential response to	response to nui addition is 60 to	trient		still	and and only maintenance applic rates are recommen Potential response nutrient addition is 30%.	ation ided. to	ground and su Drawdown is i	ytotoxic) and e to pollution of irface waters. recommended. onse to nutrient	utilise residual so reason to apply f Adequate. • g/sqm measure	bil nutrients. There is ertiliser when soil tes ements are based on ad selected soil depth	no agronomic t levels exceed soil bulk density of
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	response to nui addition is 60 to	trient 5 90%.	build-up is recommer Potential r nutrient ac to 60%.	s still nded. response to	maintenance applic rates are recommen Potential response nutrient addition is 8 30%.	ation ided. to	may contribute ground and su Drawdown is i Potential resp	ytotoxic) and e to pollution of irface waters. recommended. onse to nutrient %.	utilise residual so reason to apply f Adequate. • g/sqm measure	bil nutrients. There is ertiliser when soil tes ements are based on ad selected soil depth	no agronomic t levels exceed soil bulk density of
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	response to nui addition is 60 to	trient 5 90%.	build-up is recommer Potential r nutrient ac to 60%.	e still nded. response to ddition is 30	maintenance applic rates are recommen Potential response nutrient addition is 8 30%.	ation ided. to	may contribut ground and su Drawdown is Potential resp addition is <20	ytotoxic) and e to pollution of irface waters. recommended. onse to nutrient %.	utilise residual so reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar	bil nutrients. There is ertiliser when soil tes ements are based on id selected soil depth	no agronomic t levels exceed soil bulk density of
oresent. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15	response to nui addition is 60 to	trient 5 90%.	build-up is recommen Potential in nutrient ac to 60%. Excha Adams Sum of	s still nded. response to ddition is 30 Ingeable -Evans Buf Base Catio	maintenance applic rates are recommen Potential response nutrient addition is 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹	ation nded. to 5 to 7.3): 11	may contribute ground and su Drawdown is Potential resp addition is <29	ytotoxic) and to pollution of irface waters. recommended. onse to nutrient %. Physical Texture: Colour:	utilise residual s reason to apply f Adequate. • g/sqm measure 1.33 tonne/m ³ ar	oil nutrients. There is iertiliser when soil tes ements are based on a d selected soil depth	no agronomic t levels exceed soil bulk density of
oresent. Large applications for soil building purposes are usually recommended. Octential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.11 High	ation Inde	trient 5 90%.	build-up is recommen Potential in nutrient act to 60%. Excha Adams Sum of Eff. Cat	a still Inded. response to didition is 30 Ingeable -Evans Buf Base Cation tion Exch. (maintenance applic rates are recommen Potential response nutrient addition is 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC)	ation aded. to 5 to 7.3): 11 : 15	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and to pollution of irrace waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated	utilise residual so reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar	oil nutrients. There is iertiliser when soil tes ements are based on id selected soil depth	no agronomic t levels exceed soil bulk density of edium Clay 40 - 55%
oresent. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.11 High Ex	response to nui addition is 60 to	trient 5 90%.	build-up is recommen Potential n nutrient ac to 60%. Excha Adams Sum of Eff. Cat Base S	a still ided. response to iddition is 30 Ingeable -Evans Buf Base Cation Exch. (aturation (Acidity fer pH (BpH): cnapacity (eCEC) %):	ation nded. to 5 to 7.3): 11 : 15 71	may contribute ground and su Drawdown is Potential resp addition is <2 ⁴	ytotoxic) and to pollution of inface waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size:	utilise residual sc reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic	oil nutrients. There is iertiliser when soil tes ements are based on id selected soil depth	no agronomic levels exceed soil bulk density of edium Clay 40 - 55% (11 - 25mm)
oresent. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.11 High	ation Inde	trient 5 90%.	build-up is recommer Potential r nutrient at to 60%. Excha Adams Sum of Eff. Cat Base S Exchar	a still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation Exch. (aturation (ugeable Aci	maintenance applic rates are recommen Potential response nutrient addition is ! 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): idity (meq/100g ⁻¹	ation nded. to 5 to 7.3): 11 : 15 71	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and to pollution of inface waters. eccommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con	utilise residual sr reason to apply f Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent:	oli nutrients. There is iertiliser when soil tes ements are based on ad selected soil depth on Medium	edium Clay 40 - 55% (11 - 25mm) Gravelly
oresent. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Lin High Ex	addition is 60 to	trient 5 90%.	build-up is recommer Potential r nutrient at to 60%. Excha Adams Sum of Eff. Cat Base S Exchar	a still ided. response to iddition is 30 Ingeable -Evans Buf Base Cation Exch. (aturation (maintenance applic rates are recommen Potential response nutrient addition is ! 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): idity (meq/100g ⁻¹	ation nded. to 5 to 7.3): 11 : 15 71	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and to pollution of inface waters. ecommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate	utilise residual is reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength:	oli nutrients. There is iertiliser when soil tes ements are based on ad selected soil depth on Medium	edium Clay 40 - 55% (11 - 25mm) Gravelly dal - Strong
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Adequate	addition is 60 to	trient 5 90%.	build-up is recommen- Potential in nutrient art to 60%. Excha Adams Sum of Eff. Cai Base S Exchar Exchar	a still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation Exch. (aturation (ugeable Aci	maintenance applic rates are recommen Potential response nutrient addition is 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): idity (meq/100g ⁻¹ idity (%):	ation nded. to 5 to 7.3): 11 : 15 71	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and to pollution of inface waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural	utilise residual sc reason to apply the Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit:	oli nutrients. There is iertiliser when soil tes ements are based on a dd selected soil depth on Medium (Per	edium Clay 40 - 55% (11 - 25mm) Gravelly Polyhedra
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Adequate	addition is 60 to	trient 5 90%.	build-up is recommen- Potential in to 60%. Excha Adams Sum of Eff. Cat Base S Exchar Exchar Exchar Lime A – to acl	s still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation tion Exch. (aturation (' ugeable Acion ugeable Acion uge	maintenance applic rates are recommen Potential response nutrient addition is 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): didity (meq/100g ⁻¹ idity (%): Rate .0 (g/sqm):	ation nded. to 5 to 7.3): 11 : 15 71	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and a to pollution of irface waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural u Potential ir	utilise residual sc reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit: ifiltration rate	oli nutrients. There is iertiliser when soil tes ements are based on a dd selected soil depth on Medium (Per	no agronomic t levels exceed soil bulk density of dedium Clay 40 - 55% (11 - 25mm) Gravelly dal - Strong Polyhedral Slow
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.01 0.15 0.06 Adequate 0 mmol/kg	response to nul addition is 60 to ation Inde: cessive	trient 5 90%. X 0.4	build-up is recommen- Potential in to 60%. Excha Adams Sum of Eff. Cat Base S Exchar Exchar Exchar Lime A – to acl	a still ded. response to ddition is 30 Angeable -Evans Buf Base Cation Exch. (aturation (ugeable Aciangeable Acia	maintenance applic rates are recommen Potential response nutrient addition is 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): didity (meq/100g ⁻¹ idity (%): Rate .0 (g/sqm):	ation nded. to 5 to 7.: 11 : 15 71): - -	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and to pollution of irrace waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural to Potential ir Permeabili	utilise residual sc reason to apply the Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit: unit: ufiltration rate ty (mm/hr):	oil nutrients. There is iertiliser when soil tes ements are based on a id selected soil depth on Medium (Per ::	no agronomic t levels exceed soil bulk density of dedium Clay 40 - 55% (11 - 25mm) Gravelly dal - Strong Polyhedra Slow 2.5 - 5
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Adequate 0 mmol/kg	response to nul addition is 60 to ation Inde: cessive	trient 5 90%. X 0.4	build-up is recommen- Potential n to 60%. Excha Adams Sum of Eff. Cat Base S Exchar Exchar Exchar Lime A – to act – to neu Gypsu	a still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation Exch. (1) aturation (1) ageable Acion ageable Acion ageab	maintenance applic rates are recommen Potential response nutrient addition is s 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): didity (meq/100g ⁻¹ didity (%): Rate 0 (g/sqm): (g/sqm): tion Rate	ation Ided. Io 5 to 7.1 11 : 15 71 : 15 71 0 1	may contribut ground and su Drawdown is Potential resp addition is <2° 3 1. 5.4 1.43	ytotoxic) and a to pollution of irrace waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural u Potential ir Permeabili Calculated – Non-s	utilise residual sc reason to apply the Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit: unit: unit: unit: filltration rate ty (mm/hr): EC _{SE} (dS/m) caline. Salini	Dil nutrients. There is iertiliser when soil tes ments are based on id selected soil depth Dn Medium (Per ::): ty effects on	no agronomic t levels exceed soil bulk density of dedium Clay 40 - 55% (11 - 25mm) Gravelly dal - Strong Polyhedral Slow 2.5 - 5 0.5
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Adequate 0 mmol/kg	response to nul addition is 60 to ation Inde: cessive	trient 5 90%. X 0.4	build-up is recommen- Potential r nutrient at to 60%. Exchar Base S Exchar Exchar Exchar Lime A – to acl – to neu Gypsu – to acl	a still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation tion Exch. (aturation (' ageable Aci ageable Aci a	maintenance applic rates are recommen Potential response nutrient addition is ! 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): idity (meq/100g ⁻¹ idity (%): a Rate .0 (g/sqm):	ation Ided. Io 5 to 7.1 11 : 15 71 : 15 71 0 1	may contribut ground and st Drawdown is i Potential resp addition is <2º 3 5.4	ytotoxic) and a to pollution of irrace waters. recommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural of Potential irr Permeabili Calculated – Non-s are mos	utilise residual sc reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit: tiglitration rate ty (mm/hr): EC _{SE} (dS/m) saline. Salini stly negligib	Dil nutrients. There is iertiliser when soil tes ments are based on id selected soil depth Dn Medium (Per ::): ty effects on	no agronomic t levels exceed soil bulk density of edium Clay 40 - 55% (11 - 25mm) Gravelly dal - Strong Polyhedra Slow 2.5 - 5 0.5 plants
present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%. Phosphorus Satur 0.15 0.06 Adequate 0 mmol/kg	response to nul addition is 60 to ation Inde: cessive	trient 5 90%. X 0.4	build-up is recommen- Potential r nutrient act to 60%. Exchar Base S Exchar Exchar Exchar Lime A – to acl – to neu Gypsu – to acl The CC	a still ded. response to ddition is 30 Ingeable -Evans Buf Base Cation tion Exch. (aturation (' aturation (' aturation Aci aturation Aci atur	maintenance applic rates are recommen Potential response nutrient addition is s 30%. Acidity ffer pH (BpH): ons (meq/100g ⁻¹ Capacity (eCEC) %): didity (meq/100g ⁻¹ idity (%): n Rate .0 (g/sqm): (g/sqm): tion Rate % exch. Ca (g/sc	ation Ided. Io 5 to 7.1 11 : 15 71 : 15 71 0 1	may contribut ground and su Drawdown is Potential resp addition is <2° 3 1. 5.4 1.43	ytotoxic) and to pollution of inface waters. ecommended. onse to nutrient %. Physical Texture: Colour: Estimated Size: Gravel con Aggregate Structural of Potential ir Permeabili Calculated – Non-s are mos Organic Ca	utilise residual sc reason to apply 1 Adequate. • g/sqm measure 1.33 tonne/m ³ ar Descriptic clay content: tent: strength: unit: tiglitration rate ty (mm/hr): EC _{SE} (dS/m) saline. Salini stly negligib	Di nutrients. There is iertiliser when soil tes erreitiser when soil tes erreitiser when soil tes erreitiser when soil tes on Medium (Per erreitiser) ity effects on le. [†] : Did not tes	no agronomic t levels exceed soil bulk density of (10 - 55% (11 - 25mm) Gravelly dal - Strong Polyhedral Slow 2.5 - 5 0.5 plants

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

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Batch N°: 40910

Client Name:

Client Contact:

Client Order N°:

Client Job N°:

Address:

Soil Chemistry Profile

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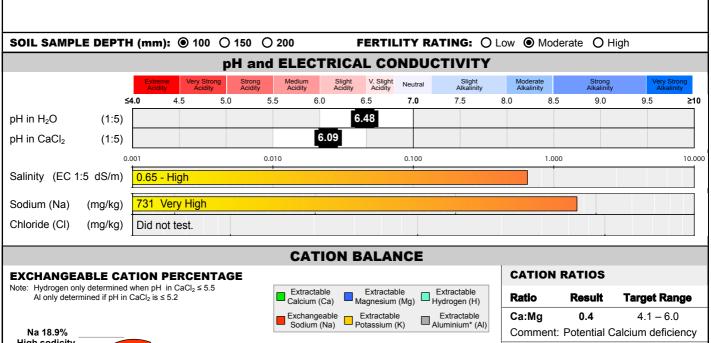
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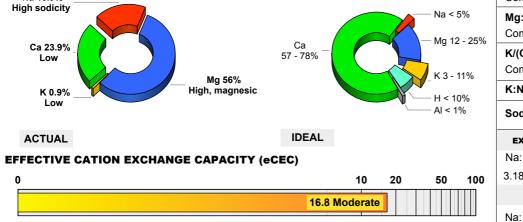
 0
 Sample N°: 15
 Date Received: 5/10/16
 Report Status:

 Project Name:
 Caddens Hill Project (Stage 1 to 7)
 Lingling Qiu
 SESL Quote N°: Q6142
 Sample Name:
 BH4 250-400
 Level 1, 81 York St
 Description:
 Soil
 Sydney NSW 2000
 Test Type:
 SSCP

RECOMMENDATIONS

Subsoill is a light medium clay with a moderate polyhedral structure and slow permeability. It is slightly acidic with high salinity and very high sodium. The cation exchange is highly magnesic and sodic. The eCEC is moderate.





Mg:K 62.7 2.6 - 5.0Comment: Potential Potassium deficiency 0.01 K/(Ca+Mq) < 0.07 Comment: Acceptable K:Na N/A 0 Sodium Absorption Ratio: D.N.T. **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ Ca: H: AI Ma: 4.02 9.41 3.18 0.15 SOLUBLE CATIONS (meq/100g)

Ca:

Ma:

K:

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Report Status:
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			F	PLANT	AV	AILABLE	I NU	JTRIENT	rs 🛛			
Major Nutrients	Result (mg/kg)	V	ery Lov	w 📃 Lo	sw	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	-									-	4	Did not tes
Phosphate-P (PO ₄)	-									-	8.4	Did not tes
Potassium (K) [†]	58.1									7.7	40.4	32.7
Sulphate-S (SO ₄)	-									-	9	9
Calcium (Ca) [†]	806									107.2	287.8	180.6
Magnesium (Mg) [†]	1143									152	29.9	Drawdowr
Iron (Fe)	-									-	73.4	Did not tes
Manganese (Mn) [†]	-									-	5.9	Did not tes
Zinc (Zn) [†]	-									-	0.7	Did not tes
Copper (Cu)	-									-	0.8	Did not tes
Boron (B) [†]	-									-	0.4	Did not tes
Explanation of graph Very Low Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Low Potential "hidde hunger", or sub deficiency. Pote response to nut addition is 60 to	-clinical ential trient	Supply or is barely the plant build-up recomme Potential	is still	a a rr ra P	Adequate upply of this nutrie dequate for the pla nd and only naintenance applica taes are recommen otential response utrient addition is 9 0%.	ant, ation nded. to	ground and su Drawdown is r	ental to plant ytotoxic) and to pollution of irface waters. recommended. onse to nutrient	elemental applica the Adequate ba economic efficier environment. Drawdown: The utilise residual so reason to apply f Adequate. • g/sqm measure	ment recommendation ation to shift the soil the and, which maximises ncy, and minimises in objective nutrient ma oil nutrients. There is eritiliser when soil tes ments are based on id selected soil depth	est level to within growth/yield, and spact on the unagement is to no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	ĸ	Exch	angeabl	e Ac	cidity			Physical	Descriptio	on	
0.15			Sum o	of Base Ca	ations	⁻ pH (BpH): s (meq/100g ⁻¹		5.8	Texture: Colour:		-	edium Clay
0.06 High				ation Exch Saturation		pacity (eCEC)): 16 10	5.8 NO	Estimated Size:	clay content:		40 - 45%
Adequate	cessive				• •	y (meq/100g⁻¹		0	Gravel con	tent [.]		e (1 - 10mm) Not gravelly
Low		0.4		ngeable A			·· -		Aggregate			- Moderate
mmol/kg)	0.4		Applicatio					Structural u	unit:		Polyhedral
0				chieve pH			0			filtration rate	:	Slow
Low. Plant response to a	applied P is like	lv		eutralise A			-		Permeabilit	,		2.5 - 5
		, y.	– to ac The C depth	GAR is co	5% e orrect and	exch. Ca (g/so ted for a soil any Lime	ım):	838	– Moder plant sp Organic Ca	arbon (OC%) atter (OM%):	Growth on m ected. [†] : Did not tes	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

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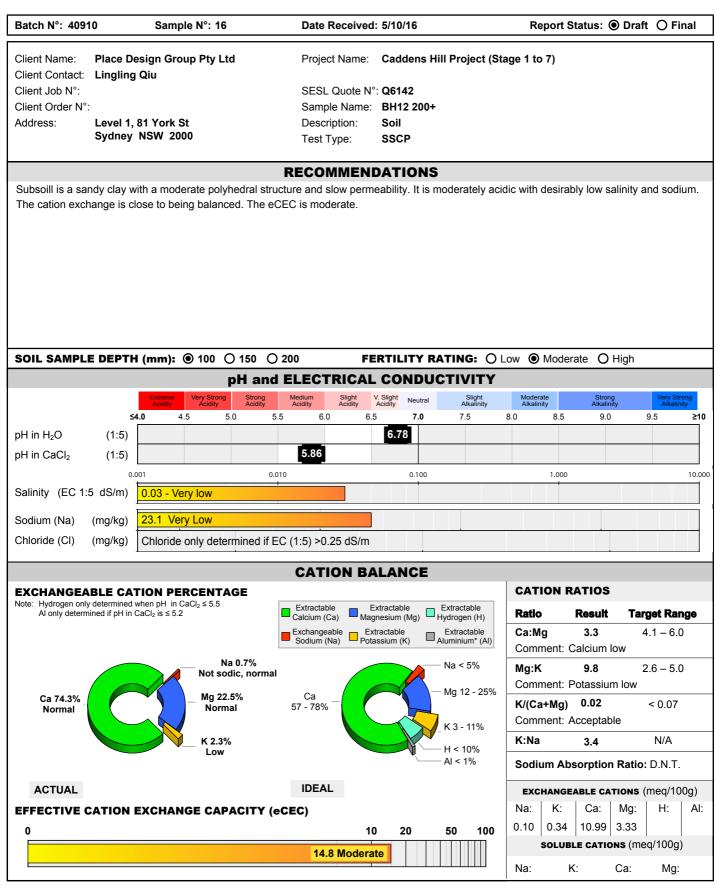


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			Р	LANT A	VAILABLE	NU	TRIEN	TS			
Major Nutrients	Result (mg/kg)	<u> </u>	/ery Low	Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	-								-	4	Did not tes
Phosphate-P (PO ₄)	-								-	8.4	Did not tes
Potassium (K) [†]	134								17.8	34.8	17
Sulphate-S (SO ₄)	-								-	9	9
Calcium (Ca) [†]	2202								292.9	248	Drawdowr
Magnesium (Mg) [†]	404								53.7	25.8	Drawdowr
Iron (Fe)	-								-	73.4	Did not tes
Manganese (Mn) [†]	-								-	5.9	Did not tes
Zinc (Zn) [†]	-								-	0.7	Did not tes
Copper (Cu)	-								-	0.8	Did not tes
Boron (B) [†]	_								-	0.4	Did not tes
Explanation of graph	ranges.									nent recommendatior	
Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	Potential "hidde hunger", or sub- deficiency. Pote response to nut addition is 60 to	clinical ntial rient	is barely a the plant, a build-up is recommen Potential r	still	Supply of this nutrie adequate for the pla and and only maintenance applic rates are recommer Potential response t nutrient addition is 5 30%.	ant, ation nded. to	growth (i.e. p may contribu ground and s Drawdown is	nental to plant hytotoxic) and te to pollution of urface waters. recommended. ponse to nutrient	utilise residual so reason to apply f Adequate. • g/sqm measure	objective nutrient ma bil nutrients. There is fertiliser when soil test ements are based on a nd selected soil depth	no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Inde	C	Excha	ngeable /	Acidity			Physical	Descriptio	on	
Phosphorus Satur	ation Index	C		-	Acidity fer pH (BpH):	-		Physical Texture:	Descriptio		Sandy Clay
0.15	ation Inde	C	Adams- Sum of	-Evans Buff Base Catio	fer pH (BpH): ons (meq/100g⁻¹)			Texture: Colour:	_		Sandy Clay
0.15 0.11 High		C	Adams- Sum of Eff. Cat	-Evans Buff Base Catio tion Exch. C	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC)	: 14	.8	Texture: Colour: Estimated	Descriptio		35 - 45%
0.15 0.06 High Ex	cation Index	C	Adams- Sum of Eff. Cat Base S	-Evans Buff Base Catio tion Exch. C aturation (%	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) %):	: 14 10	.8	Texture: Colour: Estimated Size:	clay content:	Fine	35 - 45% (1 - 10mm)
0.15 0.11 High Adequate	ccessive		Adams- Sum of Eff. Cat Base S Exchan	-Evans Buff Base Catio tion Exch. C aturation (% geable Acio	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹	: 14 10	.8	Texture: Colour: Estimated Size: Gravel con	clay content: tent:	Fine	35 - 45% (1 - 10mm) Not gravelly
0.15 0.11 High Ex Adequate	accessive	C).4	Adams- Sum of Eff. Cat Base S Exchan	-Evans Buff Base Catio tion Exch. C aturation (%	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹	: 14 10	.8	Texture: Colour: Estimated Size: Gravel con Aggregate	clay content: tent: strength:	Fine	35 - 45% (1 - 10mm) Not gravelly - Moderate
0.15 0.06 Adequate	accessive		Adams- Sum of Eff. Cat Base S Exchan Exchan	-Evans Buff Base Catio tion Exch. C aturation (% geable Acio	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) %): dity (meq/100g ⁻¹ dity (%):	: 14 10	.8	Texture: Colour: Estimated Size: Gravel con Aggregate Structural u	clay content: tent: strength: unit:	Fine N Pedal	35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral
0.15 0.06 Adequate	accessive		Adams- Sum of Eff. Cat Base S Exchan Exchan Lime A – to ach	Evans Buff Base Catio tion Exch. C aturation (% geable Acio geable Acio geable Acio pplication hieve pH 6.0	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹ dity (%): Rate 0 (g/sqm):	: 14 10	.8	Texture: Colour: Estimated of Size: Gravel con Aggregate Structural of Potential in	clay content: tent: strength: unit: filtration rate	Fine N Pedal	35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral Slow
0.15 0.11 High Low mmol/kg	ccessive g).4	Adams- Sum of Eff. Cat Base S Exchan Exchan Lime A – to ach	Evans Buff Base Catio tion Exch. C aturation (% geable Acio geable Acio geable Acio	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹ dity (%): Rate 0 (g/sqm):	: 14 10): - -	.8	Texture: Colour: Estimated of Size: Gravel con Aggregate Structural of Potential in Permeabilit	clay content: tent: strength: unit: filtration rate	Fine N Pedal	35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral Slow 2.5 - 5
0.15 0.11 High Low mmol/kg	ccessive g).4	Adams- Sum of Eff. Cat Base S Exchan Exchan Lime A – to act – to neu Gypsun	Evans Buff Base Catio tion Exch. C aturation (% geable Acio geable Acio geable Acio ngeable Acio ngeable Acio nieve pH 6.0 utralise Al (g	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹ dity (%): Rate 0 (g/sqm): g/sqm): tion Rate	: 14 10): - - 0 -	.8 0	Texture: Colour: Estimated of Size: Gravel con Aggregate Structural of Potential in Permeabilit Calculated – Non-s	clay content: tent: strength: unit: filtration rate ty (mm/hr): EC _{SE} (dS/m) aline. Salini	Fine Pedal ::): ty effects on	Sandy Clay 35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral Slow 2.5 - 5 0.3 plants
0.15 0.11 High Low mmol/kg	ccessive g).4	Adams- Sum of Eff. Cat Base S. Exchan Exchan Lime A – to act – to neu Gypsun – to act	Evans Buff Base Catio tion Exch. C aturation (% geable Acio geable Acio pplication nieve pH 6.1 utralise Al (§ m Applicat nieve 67.5%	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹ dity (%): Rate 0 (g/sqm): g/sqm): :ion Rate 6 exch. Ca (g/sq	: 14 10): - - 0 -	.8 0	Texture: Colour: Estimated of Size: Gravel con Aggregate Structural of Potential in Permeabilit Calculated – Non-s are mos	clay content: tent: strength: unit: filtration rate ty (mm/hr): EC _{SE} (dS/m) aline. Salini stly negligib	Fine Pedal :: :: ty effects on le.	35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral Slow 2.5 - 5 0.3 plants
0.11 High Adequate mmol/kg	ccessive g).4	Adams- Sum of Eff. Cat Base S. Exchan Exchan Lime A – to act – to neu Gypsun – to act The CG	Evans Buff Base Catio ition Exch. C aturation (% geable Acio geable Acio pplication nieve pH 6.0 utralise Al (g m Applicat nieve 67.5% GAR is corre	fer pH (BpH): ons (meq/100g ⁻¹) Capacity (eCEC) 6): dity (meq/100g ⁻¹ dity (%): Rate 0 (g/sqm): g/sqm): tion Rate	: 14 10): - - 0 -	.8 0	Texture: Colour: Estimated of Size: Gravel con Aggregate Structural of Potential in Permeabilit Calculated – Non-s are mos Organic Ca	clay content: tent: strength: unit: filtration rate ty (mm/hr): EC _{SE} (dS/m) aline. Salini stly negligib	Fine Pedal :: :: ty effects on le. [†] : Did not tes	35 - 45% (1 - 10mm) Not gravelly - Moderate Polyhedral Slow 2.5 - 5 0.3 plants

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

A member of the Australasian Soil and Plant Analysis Council † This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has been demonstrated are highlighted in this report.



Mehlich 3 - Multi-nutrient Extractant

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 40910 Sample Nº: 17 Date Received: 5/10/16 Report Status:
 Draft O Final Client Name: Place Design Group Pty Ltd Project Name: Caddens Hill Project (Stage 1 to 7) Client Contact: Lingling Qiu Client Job N°: SESL Quote N°: Q6142 Client Order N°: Sample Name: BH13 170+ Address: Level 1, 81 York St Description: Soil Sydney NSW 2000 Test Type: SSCP RECOMMENDATIONS Subsoill is a light clay with a strong polyhedral structure and slow permeability. It is slightly acidic with desirably low salinity and moderate sodium. The cation exchange is highly magnesic and sodic. The eCEC is moderate. O High **SOIL SAMPLE DEPTH (mm): ()** 100 () 150 () 200 FERTILITY RATING: O Low O Moderate pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Slight Moderate Alkalinity Mediun Neutra 7.5 9.0 ≤4.0 4.5 7.0 8.0 8.5 9.5 ≥10 5.0 5.5 6.0 6.5 pH in H₂O (1:5) 7.12 6 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.05 - Very low Sodium (Na) (mg/kg) 195 Medium Chloride (CI) Chloride only determined if EC (1:5) >0.25 dS/m (mg/kg) **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in CaCl₂ ≤ 5.5 Extractable Extractable Extractable Ratio Al only determined if pH in CaCl₂ is \leq 5.2 **Target Range** Magnesium (Mg) Hydrogen (H) Result Calcium (Ca) Extractable Exchangeable Sodium (Na) Extractable Aluminium* (AI) 0.9 4.1 – 6.0 Ca:Mg Potassium (K) Na 5% Comment: Potential Calcium deficiency Moderate sodicity Na < 5% Mg:K 34.3 2.6 - 5.0Comment: Potential Potassium deficiency Mg 12 - 25% Са Ca 45% 0.02 K/(Ca+Mq) < 0.07 57 - 78% Low Mg 48.7% Comment: Acceptable High, magnesic K 3 - 11% K:Na N/A 0.3 H < 10% K 1.4% AI < 1% Sodium Absorption Ratio: D.N.T. Low IDEAL ACTUAL **EXCHANGEABLE CATIONS** (meq/100g) Na: K٠ H: AI **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ca: Ma: 7.61 8.24 0.85 0.24 0 10 20 50 100 SOLUBLE CATIONS (meq/100g) 16.9 Moderate Na: K: Ca: Ma:

ASPAC



Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road

Mailing Address:

Thornleigh NSW 2120 PO Box 357 Pennant Hills NSW 1715

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Batch N°: 40910

Sample N°: 17

Date Received: 5/10/16

Report Status:
 Draft O Final

			PL	ANT A	VAILABLE	N	JTRIENT	'S			
Major Nutrients	Result (mg/kg)	<u> </u>	/ery Low	Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Nitrate-N (NO ₃)	-								-	4	Did not tes
Phosphate-P (PO ₄)	-					-			-	8.4	Did not tes
Potassium (K) [†]	94.3			_ _					12.5	40.4	27.9
Sulphate-S (SO ₄)	-								-	9	9
Calcium (Ca) [†]	1525								202.8	287.8	85
Magnesium (Mg) [†]	1001								133.1	29.9	Drawdow
Iron (Fe)	-								-	73.4	Did not tes
Manganese (Mn) [†]	-								-	5.9	Did not tes
Zinc (Zn) [†]	-								-	0.7	Did not tes
Copper (Cu)	-								-	0.8	Did not tes
Boron (B) [†]	-			_					-	0.4	Did not tes
Explanation of graph	ranges:									nent recommendatio	calculates the
severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >90%.	hunger", or sub deficiency. Pote response to nut addition is 60 to	ential trient	is barely ad the plant, ar build-up is s recommend Potential re- nutrient add to 60%.	nd still ed. sponse to	adequate for the pla and and only maintenance applic rates are recommen Potential response nutrient addition is 30%.	ation ided. to	may be detrim growth (i.e. ph may contribute ground and su Drawdown is r Potential respo addition is <2%	ytotoxic) and to pollution of rface waters. ecommended. onse to nutrient	utilise residual so reason to apply f Adequate. • g/sqm measure	objective nutrient ma bil nutrients. There is ertiliser when soil tes ements are based on id selected soil depth	no agronomic t levels exceed soil bulk density of
Phosphorus Satur	ation Index	ĸ	Exchar	ngeable	Acidity			Physical	Descriptio	on	
0.15 0.11 High Adequate	ccessive		Sum of E Eff. Catio Base Sa Exchang	Base Catio on Exch. C turation (%	dity (meq/100g ⁻¹	: 16 10	5.9 5.9 00	Texture: Colour: Estimated of Size: Gravel con Aggregate		Medium I	Light Clay 35 - 40% (11 - 25mm) Not gravelly dal - Strong
0 mmol/kg	g	0.4	-		,			Structural u	•	16	Polyhedra
			-	plication		•			filtration rate	:	Slow
0				eve pH 6. tralise Al (0 (g/sqm): a/sam):	0		Permeabili	y (mm/hr):		5 - 20
Low. Plant response to a	applied P is like	ely.		· ·		-			EC _{SE} (dS/m)		0.4
			 to achi The CGA depth of 	AR is corre	6 exch. Ca (g/sc ected for a soil nd any Lime	m):	435	are mos Organic Ca	stly negligib arbon (OC%) atter (OM%):	†: Did not tes	

Consultant: Chantal Milner

Authorised Signatory: Simon Leake

Date Report Generated 19/10/2016

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4A1, C1 (1:5) - Rayment & Higginson (1992) 5A1, Chioride - Rayment & Higginson (1992) 7B1 Alumnitum - SESL in-house, POL K, SQ, Ca, Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) TextureSitructerColour - PM0003 (Texture-"Northcole" (1992), Structure- "Murphy" (1991), Colour- "Munseil" (2000))

A member of the Australasian Soil and Plant Analysis Council † This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has been demonstrated are highlighted in this report.



Appendix B Site Map & Sample Locations

WATER MINING SPORTS & RECREATION HORTICULTURE & AGRICULTURE ENVIRONMENTAL ENGINEERING & GEOTECH URBAN HORTICULTURE & LANDSCAPING

 ABN 70 106 810 708
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 NSW 1

 Document, Set JD: 8182541
 Version: 1, Version Date: 11/05/2018

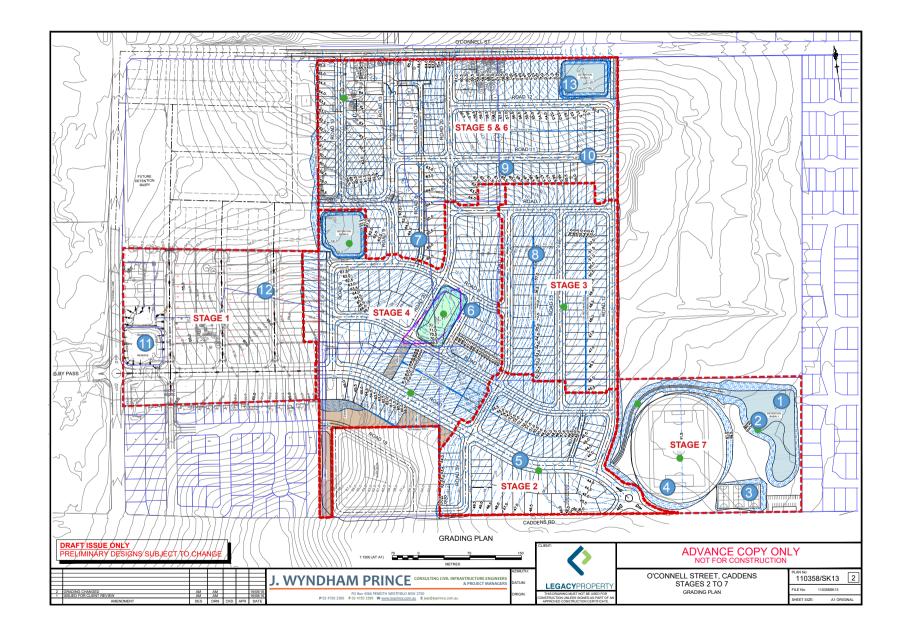
POSTLABPO Box 35716 Chilvers IPennant HillsThornleighNSW 1715NSW 2120

LAB ACT 16 Chilvers Rd Level 5 Thornleigh 7 London Cct NSW 2120 Canberra ACT 2601

VIC Level 1 tt 88 Mt Alexander Rd Flemington VIC 3031

QLD Level 10 15 Green Square Cl Fortitude Valley QLD 4006







Appendix C **Active Turf Specification**

WATER MINING SPORTS & RECREATION HORTICULTURE & AGRICULTURE ENVIRONMENTAL ENGINEERING & GEOTECH URBAN HORTICULTURE & LANDSCAPING

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VIC Level 1 Flemington VIC 3031

QLD Level 10 7 London Cct 88 Mt Alexander Rd 15 Green Square Cl Fortitude Valley QLD 4006





Specification: Active high-traffic turf

Part A. 'Fit-for-purpose' performance description

Generally, a sandy, well-drained 'turf underlay' topsoil mix designed to provide resistance to compaction, rapid drainage but with adequate water-holding capacity to sustain turf growth. The specification is not as rigorous as a full USGA premium grade playing field specification and is intended for moderate to high levels of use in competitive sports. The narrow fines specifications is considered important in meeting the shear strength Target range without risking undue compaction, but precedence will be given to meeting the shear strength and permeability test Target ranges.

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the Target ranges of Tables 1.0 and 2.0.

Property	Units	Target range			
2.0 mm (fine gravel)	% retained by mass	< 3			
1.0 mm (very coarse sand)		< 10			
0.5 mm (coarse sand)		10–30			
0.25 mm (medium sand)		20–40	40–70		
0.1 mm (fine sand)		20–30			
0.05 (very fine sand)		< 15 (max 2	0% combined vfs, Si +Cl)		
0.002 mm (silt)		< 8 (Si + Cla	ay combined 5–8%)		
< 0.002 mm (clay)		2–6			
Large particles		2–10 mm <	2% > 10 mm 0%		
Organic matter content	% w/w	2 to 5			
Permeability	mm/hour	50–200 (@	16 drops by McIntyre Jakobsen)		
Wettability (AS 4419)	mm/hour	> 5			
Dispersibility in water		1 or 2	(AS4419) Category		

Table 1.0. Physical properties particle size analysis

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Table 2.0. Chemical properties		
Property	Units	Target range
pH in water (1:5)	pH units	5.4-8.0
pH in CaCl ₂ (1:5)	pH units	5.2–7.5
Electrical conductivity (1:5)	dS/m	< 0.5
Exchangeable Na percentage	% of ECEC	< 7
Exchangeable Ca/Mg ratio	Ratio	3–9
Available phosphorus Mehlich 3	mg/kg	50–150
Olsen		20–50
Available nitrogen (nitrate N + ammonium N)	mg/kg	30–100

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical Target ranges of this specification. This is not part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical Target ranges of this specification							
	60–80% by	e.g 7 parts washed					
Medium grade clean sand	volume	sand/2 part sandy					
	10–30% by	loam/1 part AS4454					
Sandy loam soil or site soil	volume	compost.					
Composted soil conditioner conforming with	10% by						
Australian Standard AS 4454	volume						
Base level Target ranges for fertilisers (to be ve	erified by laborate	ory testing and per					
agronomist's report)							
Lime and/or dolomite	2 kg/m ³ at mix	ing					
Balanced compound NPK turf starter fertiliser	2.9 kg/100m ² a	after placement					
Minor and trace elements 300 g/m ³ at mixing							

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist recommendations.

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Specification: Raingardens and stormwater filtration soils

Part A. 'Fit-for-purpose' performance description

A high permeability loamy sand medium for use as the growing and filtration layer in biofiltration bed installations. The specification is based on a modified version of 'Guidelines for filtration media in biofiltration systems' (FAWB 2009). The permeability Target ranges are quite strict and usually mean that naturally occurring materials will not meet the specifications and mixtures of sand with some soil are required. The FAWB recommendation is that only the surface 100 mm of filtration media must be fertilised to aid plant establishment.

The required properties of the drainage layer and transition layer (if needed) are also specified. When considering variation more emphasis must be placed on compacted permeability than on strict adherence to particle distribution. In practice, hydrologists may define the permeability rate more closely than is specified here following hydraulic loading calculations.

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the Target ranges of Tables 3.0 and 4.0. Where engineers have otherwise specified permeability that specification will over-ride permeability from Table 3.0.

Property	Units	Target range
Texture, preferred range	n/a	Loamy Sand
Permeability	mm/h	100–300
Particle size distribution	_	
2.0–3.35 mm fine gravel	%	< 3
	w/w	
1.0–2.0 mm coarse sand	%	4–10
	w/w	
0.25–1.0 mm medium & coarse	%	40–60
sand	w/w	
0.15–0.25 mm fine sand	%	10–30
	w/w	
0.05–0.15 mm very fine sand	%	5–30
	w/w	
< 0.05 mm silt plus clay	%	< 3
	w/w	

Table 3.0. Physical properties

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WATER MINING SPORTS & RECREATION HORTICULTURE & AGRICULTURE ENVIRONMENTAL ROGINEERING & GEOTECH URBAN HORTICULTURE & LANDSCAPING

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LAB Pennant Hills Thornleigh 1.0.1.0400

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Table 4.0. Chemical properties		
Property	Units	Target range
pH (1:5 in water)	pH units	5.5–7.5
Electrical conductivity (1:5)	dS/m	< 1.2
Phosphorus (Olsen)	mg/kg	< 80
Total nitrogen	mg/kg	< 1000
Organic matter	% w/w	2–5

Chemical properties of the surface layer are not subject to performance specifications by FAWB.

A transition layer is only needed where the following criteria are not met:

- D15 (drainage layer) 5 × D85 (filtration media)
- D15 (drainage layer) = $5-20 \times D15$ (filtration media)
- D50 (drainage layer) < 25 × D50 (filtration media)
- D60 (drainage layer) < 10 × D10 (filtration media)

When a transition layer is needed ensure:

• D15 (transition layer) 5 × D85 (filtration media)

Do not use geotextile fabrics over drainage layer.

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical Target ranges of this specification. This is not part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example suggested components for the surface layer

Loamy sand or sandy loam soil	< 20% v/v
Medium sand	70–80% v/v
Composted soil conditioner conforming with	
AS4454	10–20% v/v

Example base level Target ranges for fertilisers for the surface layer (to be verified by laboratory testing and per agronomist's report)

Organic fertiliser (e.g. poultry manure)	5 kg/m ³ or 500 g/m ²
Compound fertiliser NPK 16:4:14)	0.4 kg/m ³ or 40 g/m ²
Trace element mix	0.1 g/m ³ or 10 g/m ²
Superphosphate	0.2 g/m ³ or 20 g/m ²
Magnesium sulphate	0.3 g/m ³ or 30 g/m ²
Potassium sulphate	0.2 g/m ³ or 20 g/m ²

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WATER MINING SPORTS & RECREATION HORTICULTURE & AGRICULTURE ENVIRONMENTAL ROGINEERING & GEOTECH URBAN HORTICULTURE & LANDSCAPING

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LAB 1.0.1.0400

ACT

VIC 7 London Cct 88 Mt Alexander Rd

OLD Level 10 15 Green Square Cl





Example suggested components for the filtration layer

	r			
Loamy sand or sandy loam soil	< 20% v/v			
Medium sand	70–80% v/v			
Composted soil conditioner conforming with				
AS4454	10–20% v/v			
Example suggested components for the transition layer				
Medium sand	100% v/v			
Example suggested components for the drainage layer				
2–5 mm drainage gravel	100% v/v			

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist recommendations.

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Specification: Passive amenity turf (optional)

Part A. 'Fit-for-purpose' performance description

Generally, this requires a sandy loam 'turf underlay' topsoil mix designed to provide moderate resistance to compaction in public and other amenity turf areas subject moderate levels of pedestrian traffic. The specification is not suitable for active recreational areas and is not generally considered suitable for construction of playing fields, even with specific turf management practices to prevent compaction.

Part B. Product specification (technical parameters)

Generally the soil must be free of 'unwanted material' and must meet all the Target ranges of Tables 5.0 and 6.0.

Property	Units	Target range		
2.0 mm (fine gravel)	% retained by mass	< 10		
1.0 mm (very coarse sand)		< 10		
0.5 mm (coarse sand)		10–30		
0.25 mm (medium sand)		20–40	30–50	
0.1 mm (fine sand)		10–30		
0.05 (very fine sand)		5–15 (max 25% combined vfs, Si +Cl)		
0.002 mm (silt)		< 12 (Si + Clay combined) 5–10		
< 0.002 mm (clay)		3–8		
Large particles		2–20 mm = < 10% > 20 mm = 0%		
Organic matter content	% w/w	2 to 8		
Permeability	mm/hour	> 30 (@ 16 drops by McIntyre Jakobsen)		
Wettability (AS 4419)	mm/hour	> 5		
Dispersibility in water		1 or 2	(AS4419) Category	

Table 5.0. Physical properties particle size analysis

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Table 6.0. Chemical properties		
Property	Units	Target range
pH in water (1:5)	pH units	5.4-8.0
pH in CaCl ₂ (1:5)	pH units	5.2–7.5
Electrical conductivity (1:5)	dS/m	< 0.5
Exchangeable Na percentage	% of ECEC	< 7
Exchangeable Ca/Mg ratio	Ratio	3–9
Available phosphorus Mehlich 3	mg/kg	50–150
Olsen		20–50
Available nitrogen (nitrate N + ammonium N)	mg/kg	30–100

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical Target ranges of this specification. This is not part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical Target ranges of this specification			
Medium-coarse grade washed sand	30–50% by volume	e.g. 5 parts washed	
Sandy loam soil or site soil	40–60% by volume	sand/4 parts site soil	
Composted soil conditioner conforming with		loam/1 part AS4454	
AS4454	10% by volume	compost.	
Base level Target ranges for fertilisers (to be verified by laboratory testing and per			
agronomist's report)			
Lime and/or dolomite	2 kg/m ³ at mixing		
Balanced compound NPK turf starter fertiliser	0.5 kg/m ³ or 50 g/m ² after placement		
Minor and trace elements	300 g/m ³ at mixing		

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required m

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Appendix D Site Photos

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VIC Level 1 Flemington VIC 3031

QLD Level 10 7 London Cct 88 Mt Alexander Rd 15 Green Square Cl Fortitude Valley QLD 4006





Caddens Hill Development Place Design Photos October 2016



Photo 1. BH 1 - Medium brown sandy clay loam. Site of proposed detention basin.



Photo 2. BH 5 - Medium brown sandy clay loam with orange-brown light clay subsoil. Mid-slope.

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Caddens Hill Development Place Design Photos October 2016



Photo 3. Well structured medium brown clay loam. Bright red medium clay subsoil. Top of hill.



Photo 4. BH 8 – Sandy clay loam. Sample taken from top of hill near fence line.

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Photo 5. BH13 - medium brown sandy clay loam.

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