

Our Ref: C6453.B23220.FB.docx

17th August 2012
Mike Horne
Turf Design Studio
95 The Kingsway
Cronulla NSW 2230

Dear Mike

Re: Discovery Point Neighbourhood Park

I refer to your correspondence of July 25th 2012 and the sections of Discovery Point Neighbourhood Park sent subsequently on the 27th July 2012. It is my understanding you request a soil strategy together with specifications for construction of the park which is an entirely “on-slab” construction comprising areas of turf and of trees in turf.

There are three components to a successful installation of the type proposed:

1. Installation of a systematic drainage system over the entire slab prior to soil installation
2. Correct choice of soil depths.
3. Correct specification of the soil materials using a two-layered soil profile for the tree areas and a uniform soil profile of minimum 300 mm topsoil depth over the entire area.

The purpose of this report is to provide an opinion on soil depth requirements and to discuss and specify the soil specifications.

Drainage

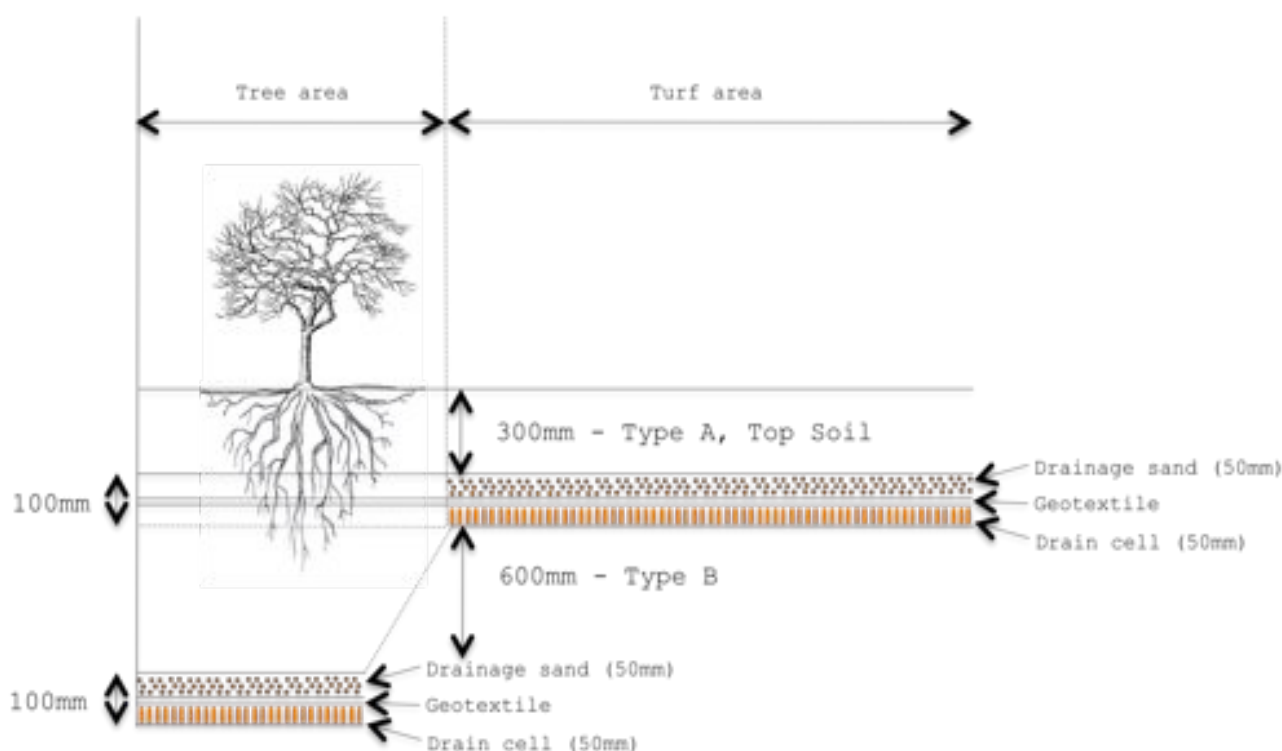
Drainage should consist of the following elements:

- “Atlantis” or other drain cell layer over waterproofed concrete.
- Alternatively use 10 mm aggregate but this needs to be thicker than the drain cell, ideally 100 mm thickness.
- Geotextile fabric over the drain cell or aggregate layer.
- Minimum 50 mm of clean drainage sand protecting the geotextile.

Soil Depths

Allowing for the drainage system being about 100 mm deep (50 mm drainage cell plus 50 mm filter sand on top) the depth should be a minimum 1000 mm for trees in turf areas and 400 mm for the turf areas. This will allow a functional soil profile of 900 mm for trees in turf and 300 mm turf rootzone. Further, in the tree root zone areas the soil should be two layered with a 300 mm "Type A" or topsoil layer over a 600 mm "Type B" or subsoil layer. The turf areas can comprise just the 300 mm of "Type A" topsoil

Figure 1 shows the relationships between the soil and drainage elements.



Soil Specifications

Generally a two-layered planting method is required utilising a low organic matter free draining soil below 300 mm and a high organic matter and high fertility topsoil in the surface 300 mm. Topsoil must be compaction resistant for use in a heavily used urban park.

Drainage sand is specified to ensure correct permeability rates and to protect geotextile fabric from clogging with silt.

See Appendix 1 for the three specifications:

- Soil Type A – topsoil to 300 mm
- Soil Type B – subsoil below 300 mm
- Drainage sand – protective layer 50 mm thick over geotextile fabric.



Simon Leake

Principal Soil Consultant

E:simon@sesl.com.au

APPENDIX 1

Soil specifications

Appendix 1

Soil Type A. Topsoil to 300 mm

General: Generally an organically enriched well drained sandy loam topsoil of “Type A” mix designed to provide aeration and nutrition as well as water holding benefits for trees root-zones is used in the surface 300 mm. Below 300 mm, increased risk of developing anaerobic conditions is offset by employing a two-layered soil where the lower layer or “Type B” subsoil is of low organic matter and high porosity.

Calcareous sands and soils will not be accepted for this specification.

Type A Topsoil Mix (Semi and Advanced Tree Topsoil Mix)

Suggested Components (Informative)

Suggested Components (Informative) <i>Components likely to meet the physical requirements of this specification</i>	
Medium grade clean sand	60-80 % as by % volume
Sandy loam soil or site soil characterised as in Specification 1.	10-20 % as by % volume
Composted organic matter conforming with AS 4454 SC	10-20 % as by % volume
Base Level Requirements for Fertilisers (to be verified by lab testing and per Agronomists Report)	
Magrilime (or 50/50 lime dolomite mixture)	0.5 -1 kg/ m ³
Compound NPK general purpose fertiliser	1 kg/ m ³
Controlled release general purpose 9-12 month fertiliser	2-3kg/ m ³

Alternatively a sandy loam to which 25% well composted garden waste is applied could achieve the same particle size properties as a sand/soil mix.

Performance Specification (Compulsory)

Generally the mix must meet all the requirements of AS 4419 – Landscape Soils for Soil Blends. Where the two requirements conflict those specified here shall take precedence. When using site won soils it is recommended to test for nutrients and trace elements prior to attempting to meet the requirements of Table 1 and 2 and the recommendations of a qualified soil agronomist shall be sought as to suitability of the levels.

Physical Properties	Units	Acceptable Range
Permeability fully compacted	mm/hr	50-100
Wettability	mm/hr	>5
Large Particles (method ref. BS7755 5.4) in the largest dimension		
<2 mm	% w/w	<5
1-2 mm	% w/w	<10
0.5-1.0 mm	% w/w	20-40
0.25 – 0.5	% w/w	25-40
0.1 – 0.25	% w/w	10 - 20
<0.1 mm	% w/w	<15
Organic Matter Content (AS4419)	% w/w	3-8

Chemical Properties	Units	Acceptable Range
pH in water (1:5)	pH units	5.8 – 6.8
pH in CaCl ₂ (1:5)	pH units	5.4 – 6.3
Electrical Conductivity 1:5 in water	dS/m	0.8
Mehlich 3 extractable Phosphorus (P)	Mehlich 3	50-100 mg/kg
Organic Matter	% dwb	3-15
Cation Exchange Properties	Units	Acceptable Range
Exchangeable Sodium (Na)	% of CEC	<7
Exchangeable Potassium (K)	% of CEC	3-10
Exchangeable Calcium (Ca)	% of CEC	60-80
Exchangeable Magnesium (Mg)	% of CEC	15-25
Exchangeable Aluminium (Al)	% of CEC	<5
Exchangeable Ca/Mg ratio	w/w	3 – 9
Mehlich 3 extractable Iron (Fe)	mg/kg	100-400
Mehlich 3 extractable Manganese (Mn)	mg/kg	25-150
Mehlich 3 extractable Zinc (Zn)	mg/kg	5-30
Mehlich 3 extractable Copper (Cu)	mg/kg	1-15
Mehlich 3 extractable Boron (B)	mg/kg	0.5-5
Available N (Ammonium-N + Nitrate-N)	Mg/kg	>25

Method References: Rayment & Lyons (1992) *Soil Chemical Test Methods*-Australasia CSIRO Publishing. Methods 4A1, 4B3, 3A1, 17B2, 15A1 & 18F1.

Type B Subsoil (Advanced Tree Subsoil Mix)

Designed to provide maximum drainage rate and compaction resistance. Water and nutrient holding capacity is enhanced by the addition of some soil but the matrix is very sandy. A very small amount of particulate organic matter (e.g. pine bark) is acceptable to provide better water holding without impeding drainage. If the sand contains some fine material lesser amounts of soil than those suggested may be required. Installed at any depth below 300 mm to backfill around new rootballs. A small amount of fertiliser is added to promote rapid initial root growth.

Calcareous sands and soils will not be accepted for this specification.

Suggested Components (Informative)

Suggested Components (Informative) <i>Components likely to meet the physical requirements of this specification</i>	
Medium grade clean sand	70-80 % as by % volume
Sandy loam soil or site-won topsoil	10-20 % as by % volume
Composted organic matter conforming with AS 4454 SC	<10 % as by % volume
Suggested soil conditioners (to be verified by lab testing and per Agronomists Report)	
Magrilime (or 50/50 lime dolomite mixture)	200g/tonne (or m ³)
Compound NPK turf fertiliser	0.5-1.0 kg/m ³

Performance Specification (Compulsory)

Generally the soil should meet all the requirements of AS 4419 – Landscape Soils, Soil Blend. Where the two requirements conflict those specified here shall take precedence. It is recommended to test for other nutrients and trace elements and the opinion of a qualified soil agronomist sought as to suitability of the levels.

Physical Properties	Units	Acceptable Range
Permeability fully compacted	mm/hr	200-400
Wettability	Mm/hr	>5
Large Particles (method ref. BS7755 5.4) in the largest dimension		
<2mm	% w/w	<5
1-2mm	% w/w	<10
0.5-1.0mm	% w/w	20-40
0.25 – 0.5	% w/w	30-50
0.1 – 0.25	% w/w	20-30
<0.1mm	% w/w	<15
Organic Matter Content (AS4419)	% w/w	<3

Chemical Properties	Units	Acceptable Range
pH in water (1:5)	pH units	5.5 – 6.8
Electrical Conductivity 1:5 in water	dS/m	0.5
Cation Exchange Properties	Units	Acceptable Range
Exchangeable Ca/Mg ratio	w/w	3 – 9
Available P (Mehlich 3)	mg/kg	20-50
Ammonium-N N	mg/kg	<50
Nitrate-N	mg/kg	20-50

Note: tests denoted as AS 4419 refer to the methodology used in AS 4419 – Landscape Soils.

Method References: Rayment & Lyons (1992) Soil Chemical Test Methods-Australasia CSIRO Publishing. Methods 4A1, 4B3, 3A1, 17B2, 15A1 & 18F1.

Drainage Sand – protective layer 50 mm thick over geotextile fabric.

Specified as a silt free non calcareous sand silica type sand of medium grain size, free of silt, clay and organic matter. The sand is used as a drainage layer and to protect geotextile against clogging by trapping silt and clay.

Calcareous sands and soils will not be accepted for this specification.

Performance Specification (Compulsory)

Property	Units	Requirement
Particle Size Range		
>2 mm	% w/w	<5
1-2 mm	% w/w	<10
0.5-1.0 mm	% w/w	20-40
0.25-0.5 mm	% w/w	30-50
0.1-0.25 mm	% w/w	20-30
<0.1 mm	% w/w	<5
Organic Matter Content (AS 4419)	%w/w	<1
pH 1:5	pH units	<6.5

Apply on top of the geotextile fabric a 50mm layer of sand where soil depth is greater than 500 mm. Use 30 mm sand layer in soil installations with a total depth of < 300 mm. Use as a drainage layer below soil profiles. Not for use in backfilling drainage pipes, use 10 mm drainage gravel.