

ENVIRONMENTAL SOIL SOLUTIONS AUSTRALIA

Soil Report, WE BLOW SOIL MIX Soil Project

22 January 2016

Soil and Soil Chemical Property Assessment of 'Base Mix 7mm Media Soil Mix'

Job No. 164488

D Baker BSc

SOIL MIX Project (WE BLOW)

Assessment and discussion of Soil (Base Mix 7mm Jan 2016) Media Sample Properties

Introduction

The intent of this report is to provide a presentation of the key characteristics of the soil mix found in the BASE SOIL MIX (7mm) project and confirm the properties limitations of the sampled soils' data and to assess and compare soil properties existing and report on their suitability. The aim is to assist in the Project (SOIL Base Mix Jan, 2016 blended Media Mix) in interpretation of the existing soil media conditions and in deciding on any limitations of the existing soil properties and indicate their application.

Background

WE BLOW contracted Environmental Soil Solutions Australia Pty/Ltd (ESSA) to assess the soil samples from the SOIL BASE MIX site (7mm media mix) sampled by WE BLOW & sent to ESSA on 16 January 2016.

The soil assessment brief was to compare & comment on the soil suitability, (blended media) suitability, nutrition, texture, permeability and any dispersive characteristics and any other soil factors, which may affect its use as suitable planting media and/or use as subsoil for revegetation.

ESSA conducted the sub sampling of the samples (provided by WE Blow) and the soil testing on behalf of WE BLOW commission. A total of (1) bulk sample Labelled "Base Mix 7mm Oct 2013" was tested by ESSA & selected by WE BLOW and was examined in the laboratory via representative subsample selected by ESSA for assessment. The total of (1 bulk) laboratory sample was selected from the bulk soil sample supplied and tested for the required appropriate analytical suites.

Phosyn Analytical was sent the sub sampled soils from the ESSA & WE BLOW by ESSA for testing on 16 Jan 2016. Phosyn Analytical received the soil sample from the stockpile sampling for testing on 18 Jan, 2016. Phosyn Soil Report for 1 (total) sample is identified by batch number B085023 New Base Mix – Jan 2016 with corresponding laboratory number SBI1580 inclusive and dated 22 January 2016.

The laboratory number corresponds to the test sample mix and is listed in the following Tables in the report.

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Soil Chemical and Physical Property Assessment

The soil properties (soil test parameters) assessed for the 1 soil sample mix from 'The SOIL Base Mix' Dec 2015 project are:

- Soil pH and salt;
- Soil Cations (calcium, magnesium, sodium, potassium & Aluminium);
- ESP ratio (% sodium of total cations);
- Calcium to Magnesium ratio;
- Phosphorus;
- Fertility (N, P, K);
- Organic Matter;
- Trace Elements (Cu, Zn, Mn & Fe);
- Sulfate;
- Texture;
- Permeability (AS4419(2003) Appendix G
- Boron.

For locations of sample sites refer to Table 1 Sample description Soil Description.

Table 1 below lists the soil properties relating to each site and profile depth.

Table 1 – Soil Test Parameters, SOIL Base Mix Site (WE BLOW)
Sampled by WE BLOW

| #Sample Desc. | Sample Lab No. | Soil pH | EC dS/m | +ESP Ratio | Ca *meq% | Mg meq% | CEC meq% | Ca/Mg Ratio | **K meq% |
|-----------------------------|--|---------|---------|------------|----------|---------|----------|-------------|----------|
| B Base Mix 7mm Jan 20165 | SBI1180 | 7.2 | 1.18 | 7 | 12 | 4.9 | 22 | 2.5 | 3.5 |
| Comment | Organic Coarse sandy loam soil, neutral pH , Mod cations (Ca & Mg) mod. salts(non saline) (chloride <500mg/kg, Ca/Mg ratio satisfactory - non.Sodic , low dispersive | | | | | | | | |

Soil pH

The level of pH strongly influences the ability of plants to take up nutrients from a soil and the ability of the vegetation to be sustainable. For the neutral soil pH (Table 1) of the sampled soil pH is ideal for plant growth. The general range pH for plant growth for most plants is 6.5 – 7.5. The pH is 7.2 (neutral) and ideal.

No agricultural limestone (/dolomite) incorporation into these soils is recommended. For any amelioration recommendations see Table of Recommendations Table 3.

Soil Texture and Dispersion Characteristics

Soil texture gives an indication of the sand, silt and clay content of a soil. This soil is:

- **Base Mix**– Organic Coarse Sandy Loam – not hard setting

The Base Mix 7mm mix is preferable for required use as applied irrigation will enter rather than “runoff” and is ideal.

Table 2 lists the more important soil macro nutrients required for plant growth in these projects. Available Phosphorus (P) and Potassium (K) as tabulated for the analysed samples for the Base Mix soil study and discussed in following sections of the report.

Soil Permeability

Permeability testing on the Base Mix 2016 mixes was undertaken and results are:

- **Base Mix**– Organic Coarse Sandy Loam Soil – Permeability is IDEAL at 17 cm/hr

Comment _ the above result shows that Base Mix is satisfactory for soil drainage and low water logging and good growth will result.

Soil Soluble Salts (EC)

For 2 mixes sampled, for the project they have Very low to low concentrations of soluble. The result s indicate that no problems exist in either media with reference to detrimental Soluble salts.

**Table 2 - Soil Fertility Summary Assessment –
SOIL BASE MIX Drain Project- WE BLOW**

| #Sample Desc. | Sample Lab No. | P mg/kg | K meq/100g | S mg/kg | B mg/kg | Cu mg/kg | Zn mg/kg |
|----------------------------|---|---------|------------|---------|---------|----------|----------|
| B Base Mix 7mm Jan 2016 | SBI1180 | 57 | 3.5 | 326 | 0.6 | 1.6 | 18.4 |
| Comment | High P , High K , High S, Moderate B, Moderate Cu , high Zinc | | | | | | |

Soil Exchangeable Cations (Ca, Mg, K, ESP and Ca/Mg Ratio)

A soil's ability to supply nutrients to plants is determined by its CEC. Soil exchangeable cations assessed in this project were Ca, Mg, Na, K and Al.

Soil data collected from the mix in this study has moderate exchangeable Calcium (Ca) in the mix. Recommendations for the mix are given in Table 1 comments & amelioration in Table 3.

The relative proportions (Ca/Mg ratio) are also important. Where Ca/Mg ratio is <2 this property has a negative effect on soil stability & increases soil dispersion this mix is satisfactory for Ca/Mg ratio.

For Potassium Base Mix is very high and satisfactory especially for grasses.

Soil Exchangeable Aluminium (Al)

A deleterious soil characteristic of some very acid soil horizons is the presence of high exchangeable Al. NO high proportions of Al, were found in the soil mix.

Soil exchangeable Al is no problem in this soil.

Dispersion Assessment

The Dispersion Assessment is assessed as low in Base Mix.

Phosphorus

Phosphorus Assessment overall is assessed as high in new Base Mix 58mg/kg. For this soil mix would not benefit from P fertiliser additions except for very high P requirement plants. Low P requirement plants may not be suited

Other Nutrients & Organic Matter

For K specific comments are made in cation section.

For Trace elements especially for Zinc the concentration is very high and other micro nutrients are adequate but may need some boosting via fertiliser (B, Cu). For Boron is moderate but for some plants may be required in higher concentrations- any fertiliser should contain trace element boost. Iron & Manganese are considered adequate. Organic Matter satisfactory & is moderate at 8.3%.

Comments Re soil Base Mix See Table 3

Table 3 –SOIL MIX soil mix comparisons recommendations (WE BLOW)*

| Sample Desc. | Permeability | Texture & drainage | pH, EC & Cations | Trace Elements |
|--------------|-------------------------|--|--------------------------------|---|
| New Base Mix | Moderate & satisfactory | Organic Coarse sandy Loam, well drained – no water logging- possible nutrient loss if non coated CRF** fertilisers used. | Satisfactory most applications | Zinc satisfactory – Moderate and may require boosting for Cu, B |

**Controlled Release Fertiliser = CRF * = Recommend Scotts HydrofloL wetting Agent

Additional comments

New Base Mix is satisfactory for proposed use (See comments above) & AS44199 (2003) below in Appendix.

Laboratory Methods

Laboratory Methods used for the assessment are those recommended and re Methods used for the assessment of soil properties by following the Australian Laboratory Handbook of Soil and Water Chemical Methods (1992) by Rayment & Higginson now Rayment & Lyons (2011). The methods used are recognized Australia wide as consistent methods and procedures that are used for diagnostic and research purposes.

If you have any queries about this report or require any further details please contact me.

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ASSSI (Qld)**

Appendix A

Soil Analysis Certificates

- Phosyn Report No. B085023, 22 January 2016
AS4419 (2003) Report WB220116

Environmental Soil Solutions Australia Pty Ltd

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TEST RESULTS

Certificate #0116-WB16B

Client: WE Blow
Project: Soil Mix
Sample ID: We Blow Base Mix 7mm
No. Of Samples: 1 of 1
SOIL TEST RESULTS – NATURAL SOILS OR BLENDS

Job No: 154488
Date Sampled: 140116
Date Received: 160116
Lab No: SBI1180

| Property | Test Result | Test Requirement / Procedure AS4419 (2003) |
|--|----------------------------|--|
| Bulk Density (kg/L) | 0.91 | Appendix B – Clause 5.2 >0.6 Kg/L. |
| Organic Matter (C%) | 7.3 | Appendix C AS12894.1.1 – Clause 5.3 - >3%. |
| Wettability (mm/min) | 8.5 | Appendix C – Clause 5.5 – >5mm/min. |
| pH | 7.2 | Appendix D – Clause 5.6 – pH 5.5 - 7.5. |
| EC (dS/m) | 1.18 | Appendix D – Clause 5.7 - <1.2 dS/m. |
| Phosphorus (P) mg/kg | 57 | Appendix D – Clause 5.9 - <5mg/kg Sensitive Plants <20mg/kg mod Sensitive >20mg/kg other plants. |
| Dispersibility | 1 | Appendix E – Clause 5.10 1= Flocculated 4 = Min Flocculated. |
| Toxicity Index | Pass | Appendix F – Clause 5.11 – Index. |
| NDI | ND | Appendix G – Clause 5.12 – if Org Matter >10%. |
| Permeability (cm/hr) | 17cm/hr | Appendix H – Clause 5.13 Range 2 –100cm /hr. |
| Soil Texture | Organic (Coarse)Sandy Loam | Clause 5.14 |
| Large Particles | 0,0 | Clause 5.15 - <8%, <20m, >10mm, <2%, >20mm. |
| Remarks: Analysis Report B085023. ND = Not Done WE Blow Base Mix 2013 Passes AS 4419- 2003 all tested items Permeability Satisfactory. P may not suit P sensitive plants | | |
| Test Procedures: AS 4419(2003) | | Checked by: D Baker |

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MASSI

Authorised Signatory