Technical Specification

Transport and Main Roads Specifications MRTS16B Vegetation Ground Works

April 2012

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Contents

1 Introduction

This technical specification applies to the general requirements of vegetation ground works for road construction and associated works.

This technical specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other technical specifications as appropriate.

This specification forms part of the Transport and Main Roads Specifications Manual.

2 Definition of terms

The terms used in this specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*.

Landscape and revegetation related terms and abbreviations used in this specification are defined in Table 2 of MRTS16 *General Requirements – Landscape and Revegetation Works*. Guidance on generic landscape and revegetation terms is contained in the department's Landscape and Revegetation Works User Guideline.

3 Standards

3.1 Test methods

Testing shall be in accordance with, but not limited to the tests listed in Table 3.1.

Table 3.1 – Standard test methods

Property to be Tested	Test	Standard Tests
Bulk density, organic matter, wettability, pH (H_2O, 1:5), electrical conductivity, extractable phosphorous content, permeability, texture and large particles	-	AS 4419* Soils for landscaping and garden use
Dispersion – Emerson class number and Atterberg limits – liquid limit % and plastic index % Soil clay % and soil silt and clay %	-	AS 1289 Methods of testing soils for engineering purposes
Construction moisture content	Q110A	
Exchangeable – calcium, magnesium, sodium, potassium and aluminium	-	Australian Laboratory Handbook of Soil and Water Methods (ALHS)
Imported mulch	-	AS 4454 Composts, soil conditioners and mulches

*Table Note: Amended in accordance with Clause 7.

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this specification are summarised in Table 4.1.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
4.2.1	1 Submission of a Planting Media Management Plan (PMMP-C)		
5.1			Submission of samples
6.2.2		Inspection of unopened bags, containers or stockpiles of amelioration agents – ground preparation	
7.2.2		Inspection of unopened bags, containers or stockpiles of amelioration agents – planting media	
7.3.1.3		Application of amelioration agents to in situ material – subsoil	
7.3.2.7		Application of amelioration agents to in situ material –planting media insitu	

4.2 Plans to be included in the Contract Plan

The plan applicable to this specification is the PMMP-C which shall address the requirements of the MRTS16 *Landscape and Revegetation Works Specification Suite*, and be included as part of the EMP-C.

4.2.1 Planting Media Management Plan – Construction (PMMP-C)

The Contractor shall prepare and submit an initial PMMP-C for determination by the Administrator as to its suitability as part of the EMP-C. **Hold Point 1** The PMMP-C is an evolving document and updates shall be provided to the Administrator at regular intervals as topsoil, stripping, stockpiling and batter formation works occur.

The PMMP-C shall be prepared in accordance with proforma A of the Appendix. Additional items may be required to be included in the PMMP-C. In such instances, additional requirements shall be given in Item 4.1 of the Annexure.

4.2.1.1 Soil Assessment Report

The Contractor shall provide a Soil Assessment Report prepared by a soil scientist with accreditations specified in Clause 4.2.1.2 and in accordance with proforma B of the Appendix. The Soil Assessment Report/s shall be used to develop the PMMP-C. The Contractor shall incorporate the Soil Assessment Report/s as an Appendix to the PMMP-C.

The Contractor shall use and include in the Appendix of the Soil Assessment Report the following documents:

a) proforma C for the testing of site soil for use as planting media and the certification of imported planting media

b) proforma D for the testing of subsoils

c) proforma E for the testing of soils for use in construction of drainage devices, and

d) imported planting media suppliers certificates.

Where additional soil test parameters are required to those listed in proforma C, D and / or E, they shall be specified in Item 4.2 of the Annexure.

4.2.1.2 Soil assessor accreditation

Assessment and interpretation of soil tests shall only be carried out by a soil scientist with accreditation under the Certified Professional Soil Scientist (CPSS) scheme and / or a soil scientist eligible for accreditation and membership of the Australian Society of Soil Science Incorporated (ASSSI).

5 General requirements

5.1 Samples

The Contractor shall submit to the Administrator, samples of materials in accordance with Clause 5.5 of MRTS16 *General Requirements – Landscape and Revegetation Work*. **Milestone**

6 Ground preparation

6.1 General

Ground preparation operations shall be carried out where shown on the Drawings, or as specified elsewhere in the Contract.

6.2 Material requirements

6.2.1 Pesticides

Refer to MRTS16 *General Requirements* for material requirements of pesticides including herbicides, insecticides and fungicide.

6.2.2 Amelioration agents

Refer to Clause 5.4 of MRTS16 *General Requirements* for material requirements of amelioration agents.

The Contractor shall advise the Administrator at least three days before applying the amelioration agents to allow the Administrator the opportunity to inspect unopened bags, containers or stockpiled materials. **Witness Point**

6.3 Construction

6.3.1 Prior to ground preparation works – weed control

Prior to the commencement of ground preparation activities, the site shall be in a weed free condition.

Refer to Clause 6.3.1 of MRTS16E *Establishment and Monitoring Works* for weed control requirements.

6.3.2 Prior to ground preparation works – amelioration of in situ material

Where required in the PMMP-C, the Contractor shall spread amelioration agents at the specified rates to the insitu surface.

The proceeding ground preparation operations shall fully incorporate the agent to the depth specified for the relevant ground preparation operation.

Amelioration agents shall be incorporated within 24 hours of being applied.

6.3.3 Ground preparation general

Ground preparation shall be carried out in the areas shown on the Drawings and to the depths as specified.

The area shall be weed free and where required, soil amelioration agents shall be spread prior to the commencement of ground preparation operations.

Ground preparation operations shall be carried out parallel to the surface contours.

Ground preparation by mechanical means shall not be carried out within the dripline of vegetation to be retained or within 300 mm of paths, kerbs or structures in accordance with Standard Drawing 1645. Surface preparation in these areas shall be done manually.

Non-conforming stone, rubble and other deleterious material that is brought to the surface during ground preparation operations, shall be removed.

Work areas shall be protected from over land flow and construction activities.

Where erosion causes damage to prepared surfaces, the Contractor shall carry out remedial works to reinstate the area.

6.3.3.1 Roughening

Roughening of fill embankments or cut batters, 1:3 or steeper, shall be to a minimum 50 mm depth and form keys for planting media.

6.3.3.2 Ripping

Ripping shall be to a minimum 300 mm depth and shall shatter compacted soil layers sufficiently to allow subsequent ground preparation operations.

6.3.3.3 Ploughing

Ploughing shall be to a minimum 50 mm depth and shall break up large clods sufficiently to allow subsequent landscape and revegetation operations.

6.3.3.4 Cultivation

Cultivation shall be to a minimum 150 mm depth and shall break up the surface of the compacted subgrade to produce a finely tilled planting bed. Cultivation shall be used as the ground preparation in areas less than 1:3 slope.

7 Planting media

7.1 General

Planting media operations shall be carried out where shown on the Drawings, or as specified elsewhere in the Contract.

Planting media may be sourced from stripped site soil or imported material. Where practicable, stripped site soil shall be utilised for planting media.

Where soil has been tested by the Principal, the soil test data and / or soil assessment report may be provided. In such instances, the data and / or reports are provided on an information only basis. The Contractor may refer to such soil information when preparing the PMMP-C.

The Contractor shall allow sufficient time for soil sampling, testing and soil assessment reporting to minimise delays in the construction program.

7.2 Material requirements

7.2.1 General

Site or imported planting media and soil amelioration agents shall be free of any chemical contaminant.

Fertiliser, soil wetting agents and / or water holding agents shall be delivered to the site in unopened bags or containers bearing the manufacturer's description, analysis of constituents and quantity.

7.2.2 Amelioration agents

Refer to MRTS16 *General Requirements* for material requirements of amelioration agents.

The Contractor shall advise the Administrator at least three days before applying the amelioration agents to allow for the inspection of unopened bags, containers or stockpiled materials.

Witness Point

7.2.3 Site soil

Following the Contractor's assessment, the stripped topsoils, broadacre topsoils and subsoils shall be assessed as either a moderate to high risk soil or a low risk soil.

7.2.3.1 Low risk soils

Low risk soils display non-dispersive characteristics and naturally support plant growth.

Low risk soils require no or minor amelioration to achieve compliance with proforma C for use as planting media.

Low risk subsoils require no or minor amelioration to achieve compliance with proforma D.

7.2.3.2 Moderate to high risk soils

Moderate to high risk soils display dispersive characteristics and/or do not naturally support plant growth.

Moderate to high risk soils require major amelioration to achieve compliance with proforma C for use as planting media. Where this is not practicable, replacement with imported planting media is required.

Moderate to high risk subsoils require major amelioration to achieve compliance with proforma D.

7.2.4 Imported planting media

The Contractor shall ensure imported planting media meets the requirements of proforma C and Clause 7.3.2.8.

7.2.5 Subsoil

Subsoil, in relation to landscape and revegetation works is defined as:

a) the soil beneath the topsoil layer

b) the outer face of cut and fill embankments, and

c) the exposed soil in areas that have been stripped of topsoil beyond embankments (broadacre areas).

7.3 Construction

7.3.1.1 Testing of subsoil

The Contractor shall carry out testing of subsoil in areas that are to be treated with landscape and revegetation works as shown on the Drawings, or elsewhere in the contract. The Contractor shall carry out testing of subsoil using proforma D and in accordance with Clause 7.3.1.2.

Soil samples shall be submitted to the laboratory for testing with proforma D.

A proforma D schedule shall be completed for each sample by adding the test results.

Each completed proforma will be included within the Appendix of the Soil Assessment Report.

7.3.1.2 Lot size and sampling of subsoil

Unless specified otherwise in Item 3 of the Annexure, subsoil shall be tested with a minimum of 1 test per cut or fill batter or broadacre area. Where multiple types of subsoils are present 1 test per soil type, which ever is greater.

Each soil test shall be representative of the batter or subsoil type and is to be sampled and tested separately. To ensure the testing is representative, sampling for each test shall comply with the following requirements:

a) be composed of a composite of 10 sub-samples representative of the batter or subsoil type

b) be approximately 1 kg, and

c) be placed in clean, durable plastic bags.

Soil samples shall be clearly labelled in accordance with proforma F.

7.3.1.3 Amelioration of subsoils

Amelioration agents and application rates shall be as per the PMMP-C.

The Contractor shall advise the Administrator at least three days before applying the amelioration agents for the inspection of applied amelioration agents prior to incorporation. **Witness Point**

Amelioration agents shall be applied directly to the subsoil.

Amelioration agents shall be incorporated during the ground preparation operations as specified on the Drawings within 24 hours of being applied, or as per Clause 6.3.3 where not specified on the Drawings.

7.3.2 Planting media

7.3.2.1 Testing of stockpiled topsoil for use as planting media

The Contractor shall carry out testing of stockpiled topsoil using proforma C and in accordance with Clause 7.3.2.2.

Soil samples shall be submitted to a laboratory for testing with a copy of proforma C.

A proforma C schedule shall be completed for each sample by adding the test results.

Each completed proforma will be included within the Appendix of the Soil Assessment Report.

7.3.2.2 Lot size and sampling of stockpiled topsoil for use as planting media

Unless specified otherwise in Item 3 of the Annexure, the maximum test lot size for stockpiled site topsoil for use as planting media shall be 500 m^3 with a minimum of one test per soil type, whichever is the greater.

Each soil test shall be representative of the soil type. To ensure the testing is representative, sampling for each test shall comply with the following requirements:

a) be composed of a composite of 10 sub-samples representative of the stockpile

b) be representative of the full depth recorded including the taking of a sample from the centre (core) of the stockpile

c) be approximately 3.0 kg per bagged sample for testing, and

d) be placed in clean, durable plastic bags.

A composite soil sample shall not include different soils or soil layers.

Soil samples shall be clearly labelled in accordance with proforma F of the Appendix.

7.3.2.3 Amelioration of stockpiled topsoil for use as planting media

Amelioration agents and application rates shall be as per the PMMP-C.

Amelioration agents shall be thoroughly incorporated into stockpiled topsoil as per the PMMP-C.

Planting media amelioration, other than the use of fertilisers and wetting agents, shall not occur after placement of planting media.

Ameliorated stockpiled topsoil shall be re-tested against proforma C while stockpiled, in accordance with Clause 7.3.2.2.

Where ameliorated topsoils do not meet the requirements of proforma C, additional amelioration and re-testing shall be undertaken until compliance is achieved.

7.3.2.4 Screening of stockpiled topsoil for use as planting media

The Contractor shall screen stockpiled topsoil to achieve particle size requirements as per proforma C.

7.3.2.5 Testing of broadacre topsoil for use as planting media

The Contractor shall carry out testing of broadacre topsoil using proforma C and in accordance with Clause 7.3.2.6.

Soil samples shall be submitted to a laboratory for testing with a copy of proforma C.

A proforma C schedule shall be completed for each sample by adding the test results.

Each completed proforma will be included within the Appendix of the Soil Assessment Report.

7.3.2.6 Lot size and sampling of broadacre topsoil for use as planting media insitu

Unless specified otherwise in Item 3 of the Annexure, the maximum lot size for broadacre topsoil for use as planting media shall be 2500 m^2 with a minimum of one test per soil type, whichever is the greater.

Each soil test shall be representative of the soil type. To ensure the testing is representative, sampling for each test shall comply with the following requirements:

a) be composed of a composite of 10 sub-samples representative of the test area

b) be approximately 3.0 kg per bagged sample for testing, and

c) be placed in clean, durable plastic bags.

A composite soil sample shall not include different soils or soil layers.

Soil samples shall be clearly labelled in accordance with proforma F of the Appendix.

7.3.2.7 Amelioration of broadacre soils for use as planting media insitu

Topsoils for use as planting media in broadacre areas shall be ameliorated insitu.

Amelioration agents and application rates shall be as per the PMMP-C.

The Contractor shall advise the Administrator at least three days before applying the amelioration agents for the inspection of applied amelioration agents prior to incorporation. **Witness Point**

Amelioration agents shall be applied directly to the topsoil.

Amelioration agents shall be incorporated during the ground preparation operations as specified on the Drawings within 24 hours of being applied, or as per Clause 6.3.3 where not specified on the Drawings.

7.3.2.8 Testing of imported planting media

The Contractor shall carry out testing of imported planting media using proforma C and in accordance with the following, prior to it being imported:

a) soil samples shall be submitted to a laboratory for testing with proforma C

b) a proforma C schedule shall be completed for each sample by adding the test results

c) each completed proforma will be included within the Appendix of the Soil Assessment Report, and

d) test results shall be no older than three months and be representative of the manufactured batch delivered to site.

7.3.2.9 Lot size and sampling of imported planting media

Written certification is to be provided by the supplier per 250 m^3 lot thereafter, to certify the supplied material is the same manufactured batch as originally tested.

A completed test proforma C shall be provided per manufactured batch of imported topsoil.

Each imported planting media soil test shall be representative of the imported planting media soil type. To ensure the testing is representative, sampling for each test shall comply with the following requirements:

a) be composed of a composite of 10 sub-samples representative of the stockpile

b) be representative of the full depth recorded including the taking of a sample from the centre (core) of the stockpile

c) be approximately 3.0 kg per bagged sample for testing, and

d) be placed in clean, durable plastic bags.

A composite soil sample shall not include different soils or soil layers.

Imported planting media soil samples shall be clearly labelled in accordance with proforma F of the Appendix.

Only compliant material shall be imported.

Where non-compliant material is imported it shall be removed from site and disposed of at the Contractors expense.

7.3.3 Placement of planting media

Planting media shall be placed in the areas and to the depths shown on the Drawings or where not shown, as specified in the Standard Drawings.

Planting media shall be placed within five days of completion of ground preparation works.

Planting media shall be spread evenly over the surface of the prepared subsoil. The depths as specified are minimum depths after settlement has occurred. Allowance shall be made for settlement during placement.

After finishing, no compaction of the prepared surface is to occur apart from compaction resulting from mulching or other planting operations.

Placement of planting media adjacent to hardstand areas shall be installed in accordance with Standard Drawing 1644.

No work which would result in degradation of the planting media structure shall take place after placement of planting media.

Turfing, hydromulching, seeding and / or mulching shall take place within two days of the planting media being placed. Where the Contractor's operations have caused a delay, and / or where the planting media has become hydrophobic, the Contractor shall apply a wetting agent, in conjunction with watering to ensure the planting media is moist prior to and at the time of turfing, hydromulching, seeding and / or mulching taking place.

8 Mulching

8.1 General

Mulching operations shall be carried out where shown on the Drawings, or as specified elsewhere in the Contract.

Where container stock plantings have been specified in mulched areas, pre-emergent herbicide shall be applied in accordance with Clause 8.3.1 prior to placement of organic mulch and rock mulch geofabric.

Where seeding, of any type, has been specified, pre-emergent is not to be used under any circumstances.

8.2 Material requirements

8.2.1 General

Mulch shall be free from soil, plant propagules, rubbish, pests, diseases, other contaminants, other deleterious material and matter toxic to plant growth.

8.2.2 Pre-emergent herbicide

Refer to MRTS16 *General Requirements* for material requirements of pre-emergent herbicide.

8.2.3 Organic Mulches

Organic mulches shall contain only vegetative material and may comprise one or more of the following:

a) imported organic mulch; or

b) site organic mulch which may be:

   i. tub ground site mulch produced by tub grinding vegetation removed during clearing and grubbing

   ii. chipped site mulch produced by the chipping of vegetation removed during clearing and grubbing, or

   iii. other material, where specified in Item 5.1 of the Annexure.

Site organic mulch shall be produced with an average approximate size of 30 mm x 20 mm x 5 mm and a maximum dimension of 50 mm.

Imported organic mulch shall comply with AS 4454 Clause 3.1.1.1 (b) pasteurized product and Clause 3.1.1.2 (b) coarse mulch.

The Contractor shall provide certification from the supplier that the imported organic mulch complies with AS 4454.

Where non-compliant material is imported it shall be removed from site and disposed of at the Contractors expense.

8.2.4 Rock mulches

The various types of rock mulches are specified as follows:

a) site rock mulch

b) imported quarried rock mulch, and

c) other material, where specified in Item 5.2 of the Annexure.

8.3 Construction

8.3.1 General

Mulch shall be placed within two days of the planting media being placed, as per Clause 7.3.3.

Where container stock plantings have been specified in mulched areas, pre-emergent herbicide shall be applied prior to placement of organic mulch and rock mulch geofabric.

Mulch shall be placed before planting of container stock in mass mulched areas. Where planting is proposed that requires plants to be individually mulched, mulch shall be placed as soon as practicable after the completion of the planting operations.

Mulch shall be spread evenly in the locations and to the depths shown on the Drawings or as otherwise specified. The depths specified or shown on the Drawings are minimum depths after settlement. Allowance shall be made for settlement in the amount of mulch placed. Mulch shall be raked to achieve a smooth, even surface.

The finished level of mulch shall be within 25 mm of the surface levels of abutting structures and hardstand areas, or as shown on the Drawings.

Where container stock plantings have been specified in organic mulched areas only, a second application of pre-emergent herbicide shall be applied to the organic mulch layer and activated as per the manufacturer's specification. The timing of activation may be carried out during the first watering of the container stock.

Where seeding, of any type, has been specified, pre-emergent is not to be used under any circumstances.

8.3.2 Manufacture of site organic mulch

Vegetative material, set aside during clearing and grubbing operations, may be processed and stockpiled to produce organic mulch.

Vegetative material to be processed may include trees, bark, shrubs, branches and any other vegetative material that is considered suitable by the Administrator for use as organic mulch. Weed species shall not be included.

Processing of vegetative material may be achieved by using either a tub grinder or chipper.

Where leachate, resulting from decomposing mulch, may affect the surrounding environment, lime shall be spread across flow path of the leachate at a rate of 1 kg/m^2.

Stockpiles shall not be located on overland flow paths, near water bodies or within the dripline of retained trees.

Stockpiles shall be maintained weed free. Any weeds which appear shall be treated immediately.

Stockpiles shall be limited to a height of 3 m and a width of 8 m. Prior to use, mulch produced on the site shall be aged and leached in an open stockpile for at least one month after milling. Mulch stockpiles shall be turned and watered at least once per week. Allowance shall be made in the works program for this ageing process.

8.3.3 Placement of organic mulch

Mulch shall not be placed closer than 25 mm and shall be placed in accordance with the Standard Drawings.

Organic mulch shall be placed to the depths shown in the Drawings, or where not shown, to a minimum depth of 100 mm and in accordance with the Standard Drawings.

Trees in grassed areas shall be mulched to a minimum of 150 mm depth and 1000 mm diameter.

Pre-emergent is to be applied and activated in accordance with Clause 8.3.1.

8.3.4 Placement of rock mulch

Rock mulch shall be placed to the depths shown in the Drawings, or where not shown, to a minimum depth of 150 mm. Geofabric shall be placed on the prepared surface prior to spreading of rock mulch and shall comply with Clause 6 of MRTS27 *Geotextiles (Separation and Filtration)*.

Pre-emergent is to be applied and activated in accordance with Clause 8.3.1.

9 Environmental matting and plant mats

9.1 General

Environmental matting operations shall be carried out where shown on the Drawings, or as specified elsewhere in the Contract.

9.2 Material requirements

9.2.1 Environmental matting

The type and size of environmental matting shall be as specified on the Drawings or as per Item 6.1 of the Annexure.

Environmental matting is a biodegradable material, used in lieu of or in conjunction with organic mulch, which shall comply with the following properties:

a) made from 100% biodegradable fabric

b) allows vegetation penetration

c) minimises soil moisture loss

d) allows the exchange of air and water, and

e) does not contain any matter toxic to plant growth.

9.2.2 Plant mats

The type and size of plant mats shall be as specified on the Drawings or as per Item 6.2 of the Annexure.

Plant mats shall consist of 100% biodegradable pre-cut fabric which shall comply with the following properties:

a) made from 100% biodegradable fabric

b) minimises vegetation penetration

c) minimises soil moisture loss

d) allows the exchange of air and water, and

e) does not contain any matter toxic to plant growth.

9.2.3 Fixing pins

Fixing pins used to secure environmental matting and plant mats shall be 'U' shaped mild steel and of a size and strength to ensure matting maintains direct contact with the ground.

9.3 Construction

9.3.1 General

Any material which protrudes more than 50 mm above the surface to be treated with environmental matting shall be removed prior to placement of the environmental matting and plant mats.

9.3.2 Installation of environmental matting

Environmental matting shall be installed as soon as practicable after the completion of planting media or mulch operations, and prior to planting.

Environmental matting shall be placed with a minimum lap between sheets as per manufacturer's specifications, or where not specified as per Standard Drawing 1647.

Where matting is to be installed on batters, the upper, outer edge of the matting area shall extend over the hinge point and be buried and pinned in a trench to a depth of at least 300 mm in accordance with Standard Drawing 1647.

Where a catch bank has been installed, the matting shall extend over the bank and be secured with pins.

9.3.3 Installation of plant mats

Plant mats to individual container stock shall be installed after the completion of planting operations.

The placement of plant mats shall allow the temporary concentration and percolation of water into the plant's root system and be installed in accordance with Standard Drawing 1648.

10 Supplementary requirements

The requirements of MRTS16B *Vegetation Ground Works* are varied by the supplementary requirements given in Item 7 of the Annexure.

Appendix – Proformas and Test Method

Proforma A – PMMP-C

The Contractor shall prepare a PMMP-C that includes:

1. General project and site description.
2. Identify:
    - if stockpiled stripped topsoil is to be used or disposed
    - the estimated volumes of suitable stockpiled stripped topsoil
    - if required, the estimated volumes of imported planting media
        - a justification for the use of imported planting media and intended supplier.
    - management processes and activities that demonstrate how the imported planting media is to be managed relevant to:
        - the Soil Assessment Report/s
        - the Erosion and Sediment Control Plan
        - the road construction program; and in particular
        - the landscape and revegetation operations.
3. Management strategies and programs for the amelioration of:
    - stripped topsoil stockpiles
    - insitu stripped topsoil
    - subsoil (outer embankment of cut batters), and
    - subsoil (outer embankment of fill batters).
4. Plans showing and detailing the:
    - location and numbering of each stockpile
    - amelioration agents and rates for each stockpile
    - stockpiles to be disposed
    - location and numbering of stockpiles that have been ameliorated and met compliance
    - location and numbering of batters (subsoil) including the amelioration agents and rates for each
    - location and numbering of batters that have been ameliorated and met compliance
    - location of each test sites, and
    - areas that require further testing and reporting.
5. An appendix that includes the:
    - Soil Assessment Report/s, and
    - See proforma B for documents to be included in the Soil Assessment Report annexure.

Proforma B – Soil Assessment Report

The Contractor shall prepare a Soil Assessment Report that includes:

1. General project and site description.
2. Plans showing and detailing:
   - location and numbering of each stockpile
   - location and numbering of each batter, and
   - location of each test site.
3. Tables detailing, per sample the:
   - test results compared to the proforma soil test parameter requirement for each test in the proforma
   - clearly defined non-conforming soil properties, and
   - interpretation of the non-conforming soil properties as a low or moderate to high risk.
4. Written assessment and interpretation of test result relevant to the intended use of planting media, including:
   - suitability of the stripped topsoil for use as planting media
   - clearly defined non-conforming soil properties
   - erodibility and dispersion risk assessment
   - estimated volumes of available suitable stockpiled stripped topsoil
   - recommendations for the best use of a particular soil type, where applicable
   - unsuitable stockpiled stripped topsoil to be disposed of, and
   - where required, provide an assessment on the material to be used for the construction of drainage devices.
5. Recommended amelioration programs for stripped topsoil addressing:
   - hydrophobicity
   - wettability and / or moisture retention
   - acidity and / or alkalinity
   - exchangeable sodium percentage (ESP)
   - calcium magnesium ratio (Ca:Mg), and
   - organic matter content.
6. Amelioration programs for subsoil (outer 200 mm of batters) addressing:
   - acidity and / or alkalinity
   - exchangeable sodium percentage (ESP)
   - calcium magnesium ratios (Ca:Mg), and
   - aluminium toxicity (if present).

   Amelioration rates shall be expressed as follows:

   Dry weight material (agricultural lime, dolomite, gypsum etc)

   - Topsoil stockpiles kg/m^3
   - Topsoil insitu kg/m^2; and
   - Subsoil insitu kg/m^2.

Soil conditioner

- Topsoil stockpiles m^3/m^3, and
- Topsoil insitu m^3/m^2

Wetting agents

- Varies - as per manufacturers' specifications

7. Compliance test results for ameliorated stockpiled planting media reported as per points 3-6 of this proforma.
8. A completed test suite proforma per sample shall be included in the appendix of the Soil Assessment Report relevant to the intended use of the soil as follows:
   - proforma C for the testing of site soil for use as planting media and the certification of imported planting media
   - proforma D for the testing of subsoils
   - proforma E for the testing of soils for use in construction of drainage devices, and
   - imported planting media suppliers certificates.

Proforma C – Full-Suite Analysis Schedule

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	**Test Method**	**Soil Test Parameter Requirements**	**Soil Test Results**
Refer AS 4419 – Soils for landscaping and garden use NOTE MODIFIED REQUIREMENTS			
Bulk density (BD)	Clause 5.2	> 0.7 kg/L	
Organic matter (OM) (relevant to the organic carbon concentration)	Clause 5.3	3 to 10%	
Wettability	Clause 5.4	> 5 mm/min.	
pH (H_2O, 1:5) – a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity (EC)	Clause 5.6	< 1.2 dS/m	
Extractable phosphorous content (Extr. P) Very P sensitive plants Moderately P sensitive plants	Clause 5.8	 < 5 mg/kg < 20 mg/kg	
Permeability	Clause 5.12	2 – 100 cm/hr	
Texture	Clause 5.13	Refer to Table AS 4419, Table I1 Soil texture Classification	
Large particles – planting media to – a) Turfed or grass seeded areas to be mown or slashed b) Batters to be mulched or hydraulic seeded and hydraulically mulched c) Broad acre areas to be seeded with native species	Clause 5.14	 100% by weight to pass a 20 mm sieve 100% by weight to pass a 50 mm sieve 100% by weight to pass a 75 mm sieve	
Refer Appendix Table 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)			
Water Repellence Rating (for sands to clay loams)	Appendix Table 1	Class 0 or 1	
Refer AS 1289.3.8.1 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	Method 3.8.1	Class 3 to 8	

Soil Test Parameter	Test Method	Soil Test Parameter Requirements	Soil Test Results
Refer ALHS (Australian Laboratory Handbook of Soil and Water Chemical Methods)			
Exchangeable calcium (Ca) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	 ≥ 2 meq/100 g ≥ 5 meq/100 g	
Exchangeable magnesium (Mg) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	 > 0.6 meq/100 g > 1.0 meq/100 g	
Calcium magnesium ratio (Ca:Mg) Exchangeable form for sands and loamy sands and sandy loams to clay loams	Clause 15B3	2 – 10	
Exchangeable sodium percentage (ESP) (Na base saturation % = % Na of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	 < 6 < 15	
Exchangeable potassium (K) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	 > 0.2 meq/100 g > 0.4 meq/100 g	
Exchangeable aluminium percentage (Al base saturation % = % Al of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15G1	 < 25 < 40	
Effective cation exchange capacity (ECEC) (ECEC = sum of exchangeable cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15J1	 > 5 meq/100 g > 10 meq/100 g	

Proforma D – Sub-Suite Analysis Schedule

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	**Test Method**	**Soil Test Parameter Requirements**	**Soil Test Results**
Refer AS 4419 – Soils for landscaping and garden use NOTE MODIFIED REQUIREMENTS			
Organic matter (OM) (relevant to the organic carbon concentration)	Clause 5.3	3 to 10%	
pH (H_2O, 1:5): a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity (EC)	Clause 5.6	< 1.2 dS/m	
Texture	Clause 5.13	Refer to Table AS 4419, Table I1 Soil texture Classification	
Refer Appendix Table 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)			
Water Repellence Rating (for sands to clay loams)	Appendix Table 1	Class 0 or 1	
Refer AS 1289.3.8.1 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	Method 3.8.1	Class 3 to 8	
Refer ALHS (Australian Laboratory Handbook of Soil and Water Chemical Methods)			
Exchangeable calcium (Ca) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	≥ 2 meq/100 g ≥ 5 meq/100 g	
Exchangeable magnesium (Mg) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.6 meq/100 g > 1.0 meq/100 g	
Calcium magnesium ratio (Ca:Mg) Exchangeable form for sands and loamy sands and sandy loams to clay loams	Clause 15B3	2 – 10	
Exchangeable sodium percentage (ESP)	Clause 15B3	< 6 < 15	

Soil Test Parameter	Test Method	Soil Test Parameter Requirements	Soil Test Results
(Na base saturation % = % Na of total cations) a) Sands and loamy sands b) Sandy loams to clay loams			
Exchangeable potassium (K) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.2 meq/100 g > 0.4 meq/100 g	
Exchangeable aluminium percentage (Al base saturation % = % Al of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15G1	< 25 < 40	
Effective cation exchange capacity (ECEC) (ECEC = sum of exchangeable cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15J1	> 5 meq/100 g > 10 meq/100 g	

Proforma E – Test Suite Analysis Schedule for Construction of Drainage Devices

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	**Test Method**	**Soil Test Parameter Requirements**	**Soil Test Results**
Refer MRTS04 – General Earthworks			
General fill material Class A	Table 9A	Requirements as per Table 9A – embankment Material Properties	
Refer AS 1289 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	AS 1289 3.8.1	Class 3 or greater	
Material Testing Manual			
Construction moisture content	Q110A	± 2% (OMC)	
Refer AS 4419 – Soils for landscaping and garden use – NOTE MODIFIED REQUIREMENTS			
pH (H_2O, 1:5): a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity – EC	Clause 5.6	< 1.2 dS / m	
Refer ALHS (Australian Laboratory Handbook of Soil and Water Chemical Methods)			
Exchangeable sodium % of total cations	Clause 15B3	< 6 (< 15 where clay is > 35%)	

Proforma F – Soil Sample Label

The Contractor shall complete and securely attach a label to each bagged soil sample using the following label format:

MRTS16B– Appendix – Proforma F

Project Name: ……

Job/Contract Number: ……

Sample Date: ……

Sample Location/Site No: ……

Sample Depth and Layer: ……

Test Method 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)

Scope

Test method 1 sets out the method for determining water repellency by using the water droplet penetration time (WDPT) test [1].

Principle

A measured amount of water in droplets is applied to a dried, smoothed, level, uncompacted soil surface and the time that lapses before the droplets are absorbed is determined.

Reagent

Deionized or distilled water.

Apparatus

The following apparatus is required:

a) an oven capable of heating a sample of soil to 40 ± 2ºC and validated for time to constant mass

   NOTE: constant mass is achieved when, after the initial drying period, successive drying over 1 h periods gives rise to a weight loss of not more than 1% of the initial weight loss;

b) standard medicine dropper, and

c) stopwatch.

Procedure

The procedure shall be as follows:

a) in the oven (1.4(a)), dry a minimum 300 ml volume of soil – that has a smoothed, levelled but uncompacted surface – on a flat tray to constant 40ºC

b) to the sample that has been allowed to cool to room temperature, apply 3 water droplets from the standard medicine dropper (1.4(b))

c) using a stopwatch (1.4(c)), record the time it takes for the water to infiltrate (disappear) into the soil, and

d) determine the classification of water repellency after 1 minute by referring to Table 1.

Table 1 – Classification of the Persistence of Soil Water Repellency

Class	WDPT (seconds)	Water Repellence Rating
0	< 5	wettable; non-water repellent
1	5 – 60	slightly water repellent
2	> 60	strongly water repellent

Test Report

The test report shall contain the following:

a) sample identification, including sufficient details to show the time period between the sampling and testing of the product

b) classification of persistence of soil water repellency of the sample, and

c) reference to this test method, that is Test Method 1 – Appendix of MRTS16B *Vegetation Ground Works*.

[1]. The WDPT test was originally developed by Van't Woudt, 1959.

[2]. The classification of a soil's wettability was developed by Louis W, Dekker, 1988.