Technical Specification

Transport and Main Roads Specifications MRTS16 Landscape and Revegetation Works

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Queensland Government

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Contents

1 Introduction

This Technical Specification applies to the construction of landscape and revegetation treatments in road 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 Technical Specification forms part of the Transport and Main Roads Specifications Manual.

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Additional terms used in this Technical Specification are defined in Table 2.

Table 2 – Definition of terms

Term	Definition
> 1 on 4 Slopes	Slopes steeper than 1V on 4H.
≤ 1 on 4 Slopes	Slopes equal to or flatter than 1V on 4H.
Biosecurity Instrument Permit	An authority issued by Biosecurity Queensland under the *Biosecurity Act* 2014 for movement of a carrier of a regulation biosecurity matter under a biosecurity zone regulation to a place outside the zone or into an area subject of a movement control.
Biosecurity Matter	Biosecurity matter as defined in the *Biosecurity Act* 2014 including but not limited to invasive plants (weeds) and animals.
Broadacre	The areas beyond the toe of a fill embankment or top of a cut batter that are generally flat to gently sloping.
Clear zone	The area that commences at the edge of the trafficable lane and is available for emergency use by errant vehicles. The distance that the clear zone extends from the carriageway edge is dependent on the traffic volume, road geometry and design speed of the road. This area may consist of a shoulder, parking bays, a recoverable slope or a clear run-out area. Refer to the Department's *Road Landscape Manual – Safety* chapter.
Contained areas	Medians, separators; and planting beds bordered by hard constructed garden edging.
DEHP	Department of Environment and Heritage Protection
Dolomite	Agricultural dolomite (calcium magnesium carbonate $CaMg(CO_3)_2$).
Gypsum	Agricultural gypsum (calcium sulfate $CaSO_4 2H_2O$).
High profile areas	Off road areas, highly visible to the public including: a) pedestrian areas and shared paths b) transport stations c) areas fronting residential property, and d) key entries, gateways and intersections.
Lime	Agricultural lime (calcium carbonate $CaCO_3$).

Term	Definition
Pesticide	A pesticide is the collective term for herbicides, insecticides and fungicides.
Potable water	Water of a quality suitable for drinking.
Propagules	The reproductive parts of plants including seeds, stolons, roots, corms, bulbs and stems.
Recycled water	Appropriately treated effluent or storm water meeting standards in this Technical Specification.
Representative soil sample	A representative soil sample is a sample that is representative of a single soil type and a single soil layer.
Seed germination / viability tests	Tests that indicate the live / viable seed percentages in a sample of seeds.
Seed purity test	A test that shows the percentages of pure seed, inert matter and other seed species in a sample of seeds.
Sight visibility zone	An area calculated to provide the driver with adequate time to observe the road layout and react and stop if necessary, before entering a potential conflict zone. Refer to the Department's *Road Landscape Manual* – Safety chapter.
Soil	For the purposes of this Technical Specification, soil is considered to be in two distinct layers: a) topsoil, and b) subsoil.
Stripped site topsoil	Non-ameliorated Site topsoil stripped and stockpiled after the clearing and grubbing process.
Subsoil	For the purposes of this Technical Specification, subsoil is considered: a) the soil below the topsoil layer b) the outer face / surface of a cut or fill embankment (subgrade), or c) the exposed soil in areas that have been stripped of topsoil in broadacre areas.
Topsoil	For the purposes of this Technical Specification, topsoil refers to: a) surface soil that contain organic material b) screened and ameliorated site topsoil that complies with Form D of Appendix MRTS16, or c) imported topsoil that complies with Form C of Appendix MRTS16.
Vegetation Treatment	Turfing, Seeding or Planting.
Weeds	Plants which include declared plants, environmental weeds and the wrong plant in the wrong place or non-specified species. Plants that are known to impact negatively on the vigour and sustainability of the specified species.

3 Referenced documents

3.1 Material and practices

Table 3.1 lists documents referenced in this Technical Specification.

Table 3.1 – Referenced documents

Reference	Title
	Biosecurity Act (2014) and Biosecurity Regulation (2016)
	*Chemical Usage (Agricultural and Veterinary) Control Ac*t (1988)
	*Agricultural Chemicals Distribution Control A*ct (1966)
	Land Protection (Pest and Stock Route Management) Act 2002
	Land Protection (Pest and Stock Route Management) Regulation 2003
	Queensland Water Recycling Guidelines (EPA 2005)
	Recycled Water Management Plan and Validation Guidelines (DEWS 2008)
	Guide to Workplace use of Non-potable Water Including Recycled Waters (DIER 2007)
-	Transport and Main Roads *Materials Testing Manual*
-	*Soil Chemical Methods : Australasia* – Rayment & Lyons, CSIRO 2011
AS 1289.3.8.1	*Methods of testing soils for engineering purposes - Soil classification tests - Dispersion - Determination of Emerson class number of a soil*
AS 2303	*Tree Stock for Landscape Use*
AS 2439.1	*Perforated plastics drainage and effluent pipe and fittings Perforated drainage pipe and associated fittings*
AS 3896	*Waters - Examination for Legionella spp. including Legionella pneumophia*
AS 4276.7	*Water microbiology - Escherichia coli and thermotolerant coliforms - Membrane filtration method*
AS 4373	Pruning of Amenity Trees
AS 4419	Soils for landscaping and garden use
AS 4454	*Compost, soil conditioners and mulches*
AS 4964	*Method for the qualitative identification of asbestos in bulk samples*
AS 5013.24.2	*Microbiology of food and animal feeding stuffs – Horizontal method for the detection and enumeration of Listeria monocytogenes - Enumeration method*
AS/NZ 1319:1994	*Safety Signs for the Occupational Environment*
MRTS01	*Introduction to Technical Specifications*
MRTS04	*General Earthworks*
MRTS21	*Bituminous Emulsion*
MRTS27	*Geotextiles (Separation and Filtration)*
MRTS50	*Specific Quality System Requirements*
MRTS51	*Environmental Management*
MRTS70	*Concrete*

Reference	Title
MRTS228	*Electrical Switchboards*
MRTS256	*Power Cables*
RLM	*Road Landscape Manual* (Transport and Main Roads)

3.2 Standard drawings

Table 3.2 lists standard drawings referenced in this Technical Specification.

Table 3.2 – Standard drawings

Standard Drawing Number	Title
1643	*Vegetation Ground Works - Planting Container Stock Kerbed Medians and Separators*
1644	*Vegetation Ground Works - Hardstand Abutments to Vegetation Works*
1647	*Vegetation Works - Matting*
1650	*Vegetation Works - Turfing*
1651	*Vegetation Works - Seeding*
1653	*Vegetation Works - Planting Container Stock < 25 L Container*
1654	*Vegetation Works - Planting Container Stock > 25 L Container*

4 Standard test methods

4.1 Test methods

Testing of all work shall be undertaken in accordance with Clause 4 of MRTS01 *Introduction to Technical Specifications*.

The standard test methods listed in Table 4.1 shall be used in this Technical Specification.

Table 4.1 – Test methods

Material	Test Method
Site Topsoil	*Form C of Appendix MRTS16*
Imported Topsoil	*Form C of Appendix MRTS16*
Manufactured Site Topsoil	*Form D of Appendix MRTS16*
Subsoil	*Form E of Appendix MRTS16*
Drainage Basin Soil	*Form F of Appendix MRTS16*
Organic Soil Conditioner	AS 4454 and *Form G of Appendix MRTS16*
Non-potable Water	*Form I of Appendix MRTS16*
Imported Mulch	AS 4454

Soil test methods have been developed by the department specifically for Queensland soils to ensure:

- topsoil is capable of supporting pasture grasses and native vegetation, and
- subsoil is capable of supporting plant growth and to identify and manage dispersive / sodic / saline soil risks.

The test forms are based primarily on components of AS 4419 *Soils for landscaping and garden use*, and *Soil Chemical Methods: Australasia*. The number of test parameters and parameter requirements have been reduced relevant to naturally occurring soils and their use in road building projects.

The Topsoil Testing form is relevant to naturally occurring topsoils and their reuse in road building projects.

The Manufactured Site Topsoil Compliance Testing form is relevant to stripped site topsoils which have undergone amelioration processes, and is based on testing those parameters affected by the amelioration process (including agricultural lime, dolomite, gypsum and / or organic soil conditioner).

The Subsoil Testing form is relevant to subsoils and their use in road building projects where present as either as insitu materials or reconstructed in bulk earthworks. It has been developed to identify and manage erosion / dispersion / sodicity risks and other critical chemical properties to ensure the outer layer of subsoil is capable of supporting plant growth.

The Drainage Basin Soil Testing form has been developed to ensure basin material is a suitable construction material and capable of supporting plant growth.

The Organic Soil Conditioner Testing form has been developed to ensure material will not cause health issues to workers or the general public. The Nitrogen Drawdown Index (NDI) parameter is tested to ensure material has reached maturity levels and is not detrimental to soil or vegetation establishment. Electrical conductivity is limited to ensure material does not inhibit seed germination and plant development.

The Non-potable Water Testing and Assessment Report form has been developed to ensure material will not cause health issues to workers or the general public. The requirements also ensure the chemical properties do not have a detrimental effect on soil or vegetation establishment.

4.2 Testing laboratory standards

Laboratory testing required as part of this technical specification shall be carried out by a laboratory accredited by the National Association of Testing Authorities (NATA).

Laboratories that typically test for the engineering or geotechnical characteristics of soils are often not equipped or experienced in carrying out the soil test methods required for testing topsoil and subsoil. It is recommended Australasian Soil and Plant Analysis Council (ASPAC) certified laboratories be used to ensure correct test methods are undertaken.

5 Quality system requirements

5.1 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* and Clause 8.3 of MRTS50 *Specific Quality System Requirements*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 5.1.

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2.1	1. Submission of a Soil Management Plan – Construction and assessment of suitability		Submission of a Soil Management Plan – Construction
5.2.2	2. Submission of Non-Potable Water Plan and applicable permits, and assessment of suitability		
5.3.1	3. Submission of a Seed Supply Proposal and assessment of suitability		
5.3.2	4. Submission of a Seed Harvesting Proposal and assessment of suitability		
5.3.3	5. Submission of a Plant Supply Proposal and assessment of suitability		
5.3.3.1		1. Nursery inspection of container stock	
5.3.4	6. Submission of a Plant Harvesting Proposal and assessment of suitability		
8.2.1	7. Manufactured site topsoil is in accordance with Form D of MRTS16 Appendix		
8.3		2. Weed treatment prior to other ground preparation operations	
8.4.1.1	8. Spreading of amelioration agents on subsoil		
8.4.1.2		3. Ripping of subsoil	
8.4.1.3		4. Cultivation of subsoil	
8.4.1.4		5. Roughening of subsoil	
8.4.2.1		6. Installation of topsoil	
8.5.3.1		7. Plant delivery	
8.5.3.2		8. Plant delivery	

Clause	Hold Point	Witness Point	Milestone
8.5.1	9. Sample installation of hydraulically applied seeding operations		
8.5.1	10. Inspection and verification of seeding materials and quantities		
8.5.3.3	11. Inspection of plant setting-out prior to planting.		
8.6.2.1	12. Submission of an irrigation system design.		
8.6.2.2	13. Commissioning and testing of the irrigation system.		
9.1			Issue of the Certificate of Commencement of the Establishment Period
9.1.1.7	14. Interim evaluation of treatments to determine if it is on track to meet the completion criteria		
9.1.2			Issue of the Certificate of Completion of the Establishment Period
9.2			Issue of the Certificate of Commencement of the Monitoring Period
9.2.2			Issue of the Certificate of Completion of the Monitoring Period

5.2 Plans to be included in the Contract Plan

5.2.1 Soil Management Plan – Construction

The Soil Management Plan – Construction shall be:

a) prepared in accordance with Form A of Appendix MRTS16

b) submitted as part of the Environmental Management Plan – Construction and prior to clearing and grubbing, and stripping of topsoil operations. **Milestone**

c) regularly updated and re-submitted when subsoil and topsoil testing occurs, and

d) assessed for suitability by the Administrator, prior to carrying out the implementation of the above operations and activities. **Hold Point 1**

The initial submission prior to clearing and grubbing, and stripping of topsoil requires at a minimum *Section 1 – Topsoil volumes assessment* and *Section 2 – Integrated soil management activities* to be completed to identify topsoil material requirements and demonstrate soil related activities are considered and addressed at the commencement of the project.

Where a soil management plan from the planning and design phases of the project is provided by the Principal, it shall be specified in Clause 1.1 of the Annexure MRTS16.1. Where a soil management plan is provided by the Principal, the Contractor shall prepare a Soil Management Plan – Construction and validate soil material requirements.

The intent of the Soil Management Plan – Construction is to:

- provide an understanding of project soil volumetric issues including total topsoil required for revegetation works, available stripped site soil, site soil shortfalls and requirements for imported topsoils, consideration of revegetation treatment type options
- identify and understand soil characteristics, deficiencies and associated risks
- determine amelioration types and rates
- ensure the appropriate management of soil throughout construction
- reduce the short and long term risk of erosion, vegetation failure and associated rework, and
- provide a Quality System to document soil material and construction related activities.

5.2.2 Non-Potable Water Management Plan (dam, creek, river and bore water)

Where a Contractor proposes to water vegetation works with non-potable water (dam, creek, river and bore water), they shall:

a) obtain the necessary permits and approvals for the use of water from proposed water source, and

b) submit a Non-Potable Water Management Plan in accordance with *Form H of Appendix MRTS16*.

The Non-Potable Water Management Plan shall be assessed for suitability by the Administrator, prior to use. **Hold Point 2**

This Clause excludes recycled water; recycled water shall be in accordance with Clause 7.7.1

5.3 Proposals

5.3.1 Seed Supply Proposal

The Contractor shall initially submit a Seed Supply Proposal for a determination as to its suitability by the Administrator, within 30 days of the date of Possession of Site or as specified in the Contract. **Hold Point 3** For projects with a long duration, updates shall be provided as seed availability and quality may vary over time.

The Seed Supply Proposal shall include:

a) seed supplier(s) details

b) Clause 3.2.2 or 3.2.3 of the Annexure MRTS16.1 with:

   i. seed species, application rates

   ii. adjusted application rates, where seed purity and germination / viability percentages are less than 95% purity and 80% germination / viability, and

iii. total required seed for each species / seed mix.

c) seed pre-treatment requirements for hard cased native seeds in accordance with Clause 7.4.9.2, and seed pre-treatments such as inoculation, coating or anticide in accordance with Clause 3.2.1 of the Annexure MRTS16.1, or as shown on the drawings

d) seed test certificates, in accordance with Clause 8.1.4

e) the timing and management of seed procurement in particular large volumes of species and or species diversity, and

f) proposed substitute species where seed species are unavailable.

Where seed supply is proposed to be supplied or supplemented by harvesting seed from site, a Seed Harvesting Proposal shall be prepared in accordance with Clause 5.3.2.

The Seed Supply Proposal is a management tool to:

- promote the timely supply of seed species and quantities, reducing the need for substitutes
- where substitute species are unavoidable, allow the Administrator to review and assess for suitability substitute and additional species
- allow the Administrator to confirm the species to be supplied and application rates meet the requirements of the Contract, and
- allow the Administrator to confirm seed pre-treatment requirements for hard cased native seeds are nominated.

5.3.2 Seed Harvesting Proposal

Where seed harvesting is to occur, the Contractor shall submit a Seed Harvesting Proposal for a determination as to its suitability by the Administrator, prior to harvesting seeds. **Hold Point 4**

The Seed Harvesting Proposal shall:

a) be prepared by a seed collector / merchant / specialist, and

b) be included as an annexure to the Seed Supply Proposal.

The Contractor shall obtain all relevant permits prior to harvesting, in accordance with DEHP requirements and MRTS51.

The Contractor shall collect, manage and store seed in accordance with the *Flora Bank Model Code of Practice and associated Guidelines*.

Collected seed shall be tested in accordance with Clause 8.1.4.

The Seed Harvesting Proposal shall include:

a) species to be harvested and their location

b) timing / season of harvesting for each species

c) seed harvester details / licences / permits

d) method of harvesting

e) method of storage and care

f) location for storage, and

g) seed test certificates.

5.3.3 Plant Supply Proposal

The Contractor shall submit a Plant Supply Proposal for a determination as to its suitability within 30 days of the date of Possession of Site or as specified in the Contract. **Hold Point 5**

The Plant Supply Proposal shall include:

a) plant nursery(s) details

b) the plant species, planting densities and quantities in accordance with Clause 3.4.1 of the Annexure MRTS16.1, or as shown on the drawings

c) the timing and management of plant procurement, in particular large volumes of species, container stock ≥ 25 L and specified stock required for critical and specialised functional roles (median headlight screening, noise wall screening, rehabilitation of environmental areas)

d) proposed substitute species where specified plant species are unavailable

e) inspection report forms and documentation in accordance with AS2303 *Tree Stock for Landscape Use*, for all tree stock in containers ≥ 25 L and ex-ground stock

f) proposed plant delivery program, including method of transport

g) installation methodology and work method statements for container stock > 100 L, and

h) dates for joint inspections at the nursery in accordance with Clause 5.3.3.1.

Where plant supply is proposed to be supplied or supplemented by harvesting plant material from Site, a Plant Harvesting Proposal shall be prepared in accordance with Clause 5.3.4

The Plant Supply Proposal is a management tool to:

- promote the timely procurement and supply of the specified container stock, reducing project delays or the need for substitutes. Large volumes of plants are typically contract grown and sufficient lead time is required to allow this process.
- allow the Administrator to confirm the species and quantities to be supplied meet the requirements of the Contract, and
- where substitute species are unavoidable, allow the Administrator to review and assess for suitability substitute species to determine their suitability.

5.3.3.1 Nursery inspections

Joint nursery inspections are required:

a) prior to the delivery of plants to Site

b) within sixty days of the Administrator deeming the Plant Supply Proposal suitable, and

c) every sixty days where the growing period is greater than sixty days.

The Contractor shall give a minimum 5 days' notice of joint inspections at nurseries. **Witness Point 1**

Plant root inspection shall:

a) not exceed 2% of the total of each species, or

b) not exceed two containers if less than 100.

If samples inspected are found to be defective, the entire species represented by the defective samples may be rejected. All plants rendered unsuitable as a result of an inspection will be rejected and considered as samples on which payment cannot be claimed.

5.3.4 Plant Harvesting Proposal

Where plant harvesting is to occur, the Contractor shall submit a Plant Harvesting Proposal for a determination as to its suitability prior to harvesting plants. **Hold Point 6**

The Plant Harvesting Proposal shall be:

a) prepared by a revegetation or horticultural specialist, and

b) included as an annexure to the Plant Supply Proposal.

The Contractor shall obtain all relevant permits prior to harvesting, in accordance with DEHP requirements and MRTS51.

The Plant Harvesting Proposal shall include:

a) species to be harvested and their location

b) harvester details / licences / permits

c) method of harvesting and transport to storage facility

d) method of storage and care

e) location (on-site or nursery) for storage

f) any specific installation requirements, and

g) any specific maintenance and monitoring requirements under the permit.

5.4 Quality system supplementary requirements

Quality system supplementary requirements of MRTS16 *Landscape and Revegetation Works* shall be specified in Clause 1.1 of the Annexure MRTS16.1.

6 General requirements

6.1 Landscape Representative

Where required in the General Conditions of Contract Appendix A, the Contractor shall employ a suitably qualified and experienced personnel as Landscape Representative(s).

Except where modified by the General Conditions of Contract Appendix A, the Landscape Representative(s) shall:

a) have a minimum five years of experience in supervising or carrying out large scale landscape and rehabilitation / revegetation projects, with demonstrated experience in:

   i. managing a program of landscape and revegetation works

ii. soil management as it relates to revegetation and erosion control, and

iii. design, implementation and establishment of works.

b) be engaged prior to clearing and grubbing, to have an active role in:

i. clearing and grubbing

ii. identification of topsoil suitable for stripping / stockpiling

iii. manufacture and storage of topsoil

iv. manufacture and storage of mulch

v. seed and plant procurement / harvesting

c) be available on Site when landscape and revegetation activities are being carried out, the Landscape Representative(s) does not necessarily need to be on Site full time, but shall be on Site when landscape and revegetation activities are being carried out

d) be available during the establishment and monitoring periods, until the end of the Date of Final Completion

e) assist in the development of the Contractor's Plans in accordance with Clause 5.2, and Proposals in accordance with Clause 5.3

f) ensure that the landscape and revegetation treatments are implemented in accordance with the design and this Technical Specification

g) prepare electronic (daily or as required by installation program) diaries including photographic evidence of the activities involved in each lot for uploading into the QA database. Supplementary evidentiary support documents such as supplier certifications of materials maybe uploaded separately into the QA database or associated management plans, and

h) ensure that the landscape and revegetation treatments established and monitored to meet the completion criteria of Clause 9.1.2 and Clause 9.2.2.

Nominating a Landscape Representative(s) on large and / or complex projects can save project funds by reducing failures and associated rework, providing a more robust landscape for the Department at handover. Landscape and revegetation activities are unique to other road building activities as they involve the use of living materials (plant material) that require establishment so as to successfully reach their intended function.

Landscape Representative(s) should be engaged early in the project life to ensure adequate planning and co-ordination with civil works programme and to undertake material procurement in accordance with the project Proposals of Clause 5.3

The Landscape Representative should not be confused with the Environmental Representative as they have distinctly separate qualifications, skills and experience.

6.2 Soil Assessor accreditation

The Contractor shall have sampling, assessment and interpretation of soil test results carried out by a:

a) Certified Professional Soil Scientist (CPSS), or

b) soil scientist or agronomist with:

   i. educational qualifications relating to soil science, and

   ii. at least ten years relevant experience in soil assessment and management.

It is important soil sampling, assessment, interpretation and recommendations are provided by appropriately qualified and experienced specialists. Incorrect interpretation and recommendations can lead to additional costs, project delays and / or rework.

6.3 General requirements supplementary requirements

General requirements supplementary requirements of MRTS16 *Landscape and Revegetation Works* shall be specified in Clause 2.1 of the Annexure MRTS16.1.

7 Materials

The material requirements used throughout this Technical Specification are given below.

Materials imported to Site shall be free of prohibited or restricted biosecurity matter.

The Contractor shall store materials to ensure no deterioration or contamination occurs, including the potential for environmental harm.

7.1 Soil

For the purposes of this Technical Specification, soil is considered to have two distinct layers:

a) Subsoil:

   i. the soil below the topsoil layer

   ii. the outer face / surface of a cut or fill embankment (subgrade), and

   iii. the exposed soil in broadacre areas that have been stripped of topsoil.

b) Topsoil:

   i. manufactured from site topsoil, and

   ii. imported topsoil.

Soil shall be free of contaminants harmful to plant growth.

7.1.1 Subsoil

Subsoil shall:

a) be sampled and tested, in accordance with Clause 8.1.1, and

b) be ameliorated, in accordance with the recommendations of the *Soil Management Plan – Construction*.

7.1.2 Topsoil

Topsoil shall be:

a) Site topsoil in accordance with Clause 7.1.2.1, or

b) imported topsoil in accordance with Clause 7.1.2.2.

Where practicable, Site topsoil shall be prioritised over imported topsoil.

7.1.2.1 Site topsoil

Site topsoil shall be:

a) topsoil stripped during clearing and grubbing operations, in accordance with MRTS04 *General Earthworks*, or topsoil in areas that have not been stripped

b) sampled and tested in accordance with Clause 8.1.2, and

c) manufactured in accordance with Clause 8.2.1.

When it is intended to use site topsoil, ensure the relevant clauses of Annexure MRTS04.1 *General Earthworks* is completed to promote the provision of adequate quantities of suitable material. Where insufficient quantities are available, additional imported materials may be required.

7.1.2.2 Imported topsoil

Imported topsoil shall:

a) be sampled and tested:

   i. in accordance with Clause 8.1.2, and

   ii. no later than six months before delivery to Site

b) be certified free prohibited or restricted biosecurity matter.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate the imported topsoil is in accordance with the requirements of this Clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the Soil Management Plan – Construction.

7.1.2.3 Backfill soil material

Backfill soil material, used in planting holes deeper than 300 mm, shall be ameliorated subsoil excavated from the planting hole.

7.2 Soil amelioration agents

Soil amelioration agents may include:

a) agricultural lime

b) agricultural gypsum

c) agricultural dolomite

d) fertiliser

e) organic soil conditioner

f) microbial inoculants

g) soil wetting agents, and

h) water holding agents.

7.2.1 Agricultural lime, agricultural dolomite and agricultural gypsum

Agricultural lime, agricultural dolomite and agricultural gypsum shall not be in a liquid form.

Agricultural lime shall be naturally occurring limestone (calcium carbonate $CaCO_3$).

Agricultural dolomite shall be naturally occurring dolomite (calcium magnesium carbonate $CaMg(CO_3)_2$).

Agricultural lime and agricultural dolomite shall meet the following parameter requirements:

a) have a neutralising value (NV) of 90 or above, determined using the Test Method 19A1 from the *Soil Chemical Methods: Australasia* (2011) by Rayment and Lyons

b) have a pH value of 8.5 +/- 0.5, determined using the test method in accordance with Clause 5.5 of AS 4419, and

c) have a particle size distribution of:

   i. 100% by weight to pass a 5 mm sieve

   ii. 95% by weight to pass a 3.5 mm sieve, and

   iii. 40% by weight to pass a 0.15 mm sieve.

Agricultural gypsum shall be naturally occurring grade 1 gypsum (calcium sulfate $CaSO_4 2H_2O$). Crushed plaster board is not permitted.

Agricultural gypsum shall meet the following parameter requirements:

a) a minimum 80% of gypsum

b) a moisture content of < 20%

c) have sodium content < 0.8%

d) have a total content (x-ray fluorescence test) of:

   i. 20% calcium (Ca)

   ii. 15% sulphur (S), and

   iii. < 2% sodium chloride (NaCl).

e) if manufactured – have a total content of heavy metals:

   i. < 0.001% cadmium (Cd), and

   ii. < 0.01% lead (Pb).

f) have a particle size distribution of:

   i. 100% by weight to pass a 6 mm sieve

   ii. 80% by weight to pass a 4 mm sieve, and

   iii. 50% by weight to pass a 2 mm sieve.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this Clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the *Soil Management Plan – Construction*.

7.2.2 Fertiliser

Fertiliser shall be delivered to the project in bags or containers, each labelled in accordance the Queensland Agricultural Standards Regulation 1997.

Planting treatments shall be fertilised with controlled / slow release fertilisers.

Seeding and turf treatments shall be fertilised with a combination of soluble and controlled / slow release fertilisers.

Controlled / slow release fertilisers:

- provide nutrients to plants over a longer period of time compared to uncontrolled release fertilisers
- are cost effective by reducing the requirement for additional fertilising, and
- have a reduced risk of nutrient deficient related failures in planting treatments.

Soluble fertilisers:

- provide immediate but relatively short supply of nutrients
- are water soluble and highly leachable, with potential for translocating into water bodies or adjacent vegetation treatments and potentially causing potential harm, and
- have a higher risk of nutrient deficient related vegetation failures if not reapplied during vegetation development.

The N:P:K:S rates are intended to:

- address nutrient requirements for each vegetation treatment type, and
- allow flexibility to address soil nutrient deficiencies identified in the *Soil Management Plan – Construction*.

7.2.3 Organic soil conditioner

Organic soil conditioner shall comply with:

a) AS 4454 Clause 3.1.1.1 (d) mature compost

b) AS 4454 Clause 3.1.1.2 (a) soil conditioner, and

c) Form G of Appendix MRTS16.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this Clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the *Soil Management Plan – Construction*.

7.2.4 Microbial inoculants

Biological growth stimulants shall:

a) not be toxic to plant growth

b) improve soil structure

c) stimulate seed germination

d) improve overall plant health and development, and

e) increase root mass and nutrient uptake.

Microbial inoculants shall comprise of one or more of the following:

a) beneficial bacteria / microbes, and / or

b) beneficial fungi / mycorrhizal fungi.

Where humic acid / humates are proposed for use, they must be combined with beneficial bacteria.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this Clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the *Soil Management Plan – Construction*.

7.2.5 Soil wetting and water holding agents

7.2.5.1 Soil wetting agents

Soil wetting agents (surfactants) shall:

a) have a life of at least three months from the time of application

b) reduce soil water repellence / hydrophobicity

c) reduce surface tension of soil particles

d) increase water penetration to soil, and

e) be free from matter toxic to plant growth.

7.2.5.2 Water holding agents

Water holding agents shall:

a) have a life of at least six months from the time of installation

b) hold water equal to at least 200 times their own mass

c) be hydrated / activated prior to installation, and

d) be free from matter toxic to plant growth.

Water holding agents shall be incorporated into the topsoil or installed in individual planting holes.

7.3 Pesticides

Pesticides shall:

a) be registered for use on roadsides and rights of way under the *Chemical Usage* (Agricultural and Veterinary) *Control Act* 1988, and

b) be registered for treatment of weeds by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

7.3.1 Knock-down herbicides

Knock-down herbicides shall be a broad spectrum, non-residual, glyphosate based herbicide that has been specifically manufactured for low aquatic toxicity.

7.3.2 Target herbicides

Target herbicides shall be used exclusively for the eradication of the target plant species. The type of herbicide and target vegetation to be controlled shall be specified in Clause 3.1.1 of the Annexure MRTS16.1.

7.3.3 Insecticides

Insecticides shall treat target insect species infesting vegetation works.

7.3.4 Fungicides

Fungicides shall treat target diseases infesting vegetation works.

7.4 Seeding

7.4.1 Drill seeding

Drill seeding treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) fertiliser (Clause 7.4.10), and

g) water (Clause 7.7).

7.4.2 Broadcast Seeding

Broadcast seeding treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) dry coarse sand or sawdust

g) fertiliser (Clause 7.4.10), and

h) water (Clause 7.7).

7.4.3 Hydromulch - Standard

Standard hydromulch treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the Soil Management Plan – Construction (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) fibre (Clause 7.4.3.1)

g) binder (Clause 7.4.3.2)

h) fertiliser (Clause 7.4.10), and

i) water (Clause 7.7).

7.4.3.1 Fibre

Fibres shall be free from matter toxic to plant growth, prohibited or restricted biosecurity matter, plant propagules, soil, rubbish, seed germination inhibitors and other deleterious materials. Fibre shall be in accordance with AS4454 Test Method I and Test Method M.

Fibre shall disperse into a uniform slurry when mixed with water.

Fibres shall have a mixture of fine material and longer fibres to promote interlocking and erosion control and provide a suitable environment for seed germination.

Fibre shall be supplied in bales covered with UV stabilised and weather resistant plastic, with a maximum moisture content of 15%. Fibre rates specified within respective construction clauses of this Specification are dry weight, with moisture content no greater than 15%.

Fibres shall be combined with a marker / tracer dye. Dye may be either pre-packaged with the fibre or included with the binder.

Fibres may be any of the following or combination of these fibres.

a) Sugar cane

Sugar cane fibre shall:

i. be predominantly sugar cane tops, and

ii. mechanically processed

b) Wood

Wood fibre shall:

i. be defibrated or other suitable fiberising process, and

ii. mechanically and thermally processed.

c) Straw

Straw fibre shall:

i. be crop residue

ii. be predominantly stalk material, and

iii. mechanically and thermally processed.

d) Paper

Paper fibre shall:

i. be manufactured from hammer-milling or other suitable fiberising process, and

ii. be combined with other fibres, and be no greater than 25% of the total fibre weight used.

e) Coir

Coir fibre shall:

i. be a fine / peat grade product, suitable for use in seed raising, and

ii. be combined with other fibres, and be no greater than 25% of the total fibre weight used.

7.4.3.2 Binder

Standard hydromulch binder shall:

a) have a minimum two month functional longevity

b) be free from:

i. matter toxic to plant growth / seed germination

ii. plant propagules

iii. soil

iv. rubbish, and

v. other deleterious materials.

c) be manufactured for use in hydromulch or similar seeding applications

d) be readily dispersible

e) be highly soluble / hydro-colloidal

f) display a delayed development of viscosity before setting, and

g) be applied in accordance with manufacturer's specification.

Binders may be pre-packaged with fibre.

7.4.4 Hydromulch - Bonded Fibre Matrix

Bonded fibre matrix is a hydraulically applied mix of fibres and binder. Bonded fibre matrix products shall be proprietary products that have been tested to meet Table 7.4.4, or other suitable independent testing method deemed suitable. The Contractor shall provide quality assurance documentation from

the supplier to demonstrate material is in accordance with Table 7.4.4, prior to delivery to Site. Bonded fibre matrix treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) fibre (Clause 7.4.4.1)

g) binder(Clause 7.4.4.2)

h) fertiliser (Clause 7.4.10), and

i) water (Clause 7.7).

Table 7.4.4 – Bonded Fibre Matrix Performance Standards

Property	Test Method	Tested Value
Functional longevity [1]	Observation	6 months
Minimum application rate	Observation	5000 kg/ha (500g/m^2)
Minimum application wet thickness	Observation	5 mm
Typical maximum slope gradient	Observation	≤ 1:2
Maximum uninterrupted slope length	Observation	20
Maximum C-Factor [2] (1:3 test)	ASTM 6459, or other suitable independent testing deemed suitable	0.05
Minimum vegetation establishment [3]	ASTM D7322, or other suitable independent testing deemed suitable	≥ 300%
Cure time	Observation	4 – 24 hour

[1] A manufacturer's estimated time period, based on field observations, that a product can be anticipated to provide effective erosion control.

[2] "C" Factor calculated as ratio of soil loss from a slope with the applied product, to a ratio of soil loss from an unprotected control slope.

[3] Calculated, as outlined in ASTM D7322, as a percentage by dividing the plant mass per area of the applied product plot by the plant mass per area of the untreated control plot.

7.4.4.1 Fibre

Fibres shall be free from matter toxic to plant growth, prohibited or restricted biosecurity matter, plant propagules, soil, rubbish, seed germination inhibitors and other deleterious materials. Fibre shall be in accordance with AS4454 Test Method I and Test Method M.

Fibre shall disperse into a uniform slurry when mixed with water.

Fibres shall have a mixture of fine material and longer fibres to promote interlocking and erosion control and provide a suitable environment for seed germination.

Fibre shall be supplied in bales covered with UV stabilised and weather resistant plastic, with a maximum moisture content of 15%. Fibre rates specified within respective construction clauses of this Specification are dry weight, with moisture content no greater than 15%.

Fibres shall be combined with a marker / tracer dye. Dye may be either pre-packaged with the fibre or included with the binder.

Fibres may be any of the following or combination of these fibres.

a) Sugar cane

Sugar cane fibre shall:

i. be predominantly sugar cane tops, and

ii. mechanically processed

b) Wood

Wood fibre shall:

i. be defibrated or other suitable fiberising process, and

ii. mechanically and thermally processed.

c) Straw

Straw fibre shall:

i. be crop residue

ii. be predominantly stalk material, and

iii. mechanically and thermally processed.

d) Paper

Paper fibre shall:

i. be manufactured from hammer-milling or other suitable fiberising process, and

ii. be combined with other fibres and be no greater than 25% of the total fibre weight used.

e) Coir

Coir fibre shall:

i. be a fine / peat grade product, suitable for use in seed raising, and

ii. be combined with other fibres and be no greater than 25% of the total fibre weight used.

7.4.4.2 Binder

Bonded fibre matrix binder shall:

a) have a minimum six months functional longevity

b) be non-re-wettable

c) be crosslinked hydro-colloidal

d) be free from:
   i. matter toxic to plant growth / seed germination
   ii. plant propagules
   iii. soil
   iv. rubbish, and
   v. other deleterious materials.

e) be readily dispersible

f) be highly soluble

g) display a delayed development of viscosity before setting, and

h) be applied in accordance with manufacturer's specification.

Binders may be pre-packaged with fibre.

Where binder is supplied / packaged separately from fibre, the manufacturer of the proprietary product(s), must provide certification the supplied materials and quantity / ratio is in accordance with the tested product, to meet the requirements of Table 7.4.4.

7.4.5 Hydro-compost

Hydro-compost is a hydraulically applied mix of compost, fibres and binder. The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the following compost, fibres and binder requirements, prior to delivery to Site.

Hydro-compost treatment:

a) topsoil (Clause 7.1.2) Note - Where a site topsoil is tested in accordance with Form C of Appendix MRTS16 and has less than 3% organic matter, Hydro-compost may be used to address organic matter requirements of the topsoil in lieu of ameliorating the stockpiled topsoil with organic soil conditioner.

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) topsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

d) compost be a minimum 60% of the total product and shall comply with, or an approved equivalent of, the following:
   i. AS 4454 Clause 3.1.1.1 (d) mature compost
   ii. AS 4454 Clause 3.1.1.2 (a) soil conditioner, and
   iii. Form G of Appendix MRTS16.

e) soil microbial inoculants (Clause 7.2.4)

f) soil wetting agent (Clause 7.2.5.1)

g) seed (Clause 7.4.9)

h) fibre (Clause 7.4.4.1)

i) binder (Clause 7.4.4.2)

j) fertiliser (Clause 7.4.10), and

k) water (Clause 7.7).

7.4.6 Straw Mulching

Straw mulching treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) dry coarse sand or sawdust, if broadcast seeding

g) straw mulching fibre (Clause 7.4.6.1)

h) bituminous emulsion binder (Clause 7.4.6.2)

i) fertiliser (Clause 7.4.10), and

j) water (Clause 7.7).

7.4.6.1 Fibre

Straw mulch shall:

a) be crop residue

b) be predominantly stalk material, and

c) be free from matter toxic to plant growth, plant propagules, soil, rubbish, and other deleterious materials.

Fibre rates specified within respective construction clauses of this Specification are dry weight, with moisture content no greater than 15%.

7.4.6.2 Binder

Bituminous binder shall:

a) be slow setting anionic bituminous emulsion (ASS) in accordance with the requirements of MRTS21 *Bituminous Emulsion*

b) be free from petroleum solvent or other components toxic to plant growth

c) be readily dispersible, and

d) display a delayed development of viscosity before setting.

Bituminous binder shall be further diluted 50 / 50 with water.

Application rates specified in Clause 8.5.1.6 is a diluted 50 / 50 rate.

7.4.7 Organic Blanket

Organics blanket treatment:

a) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

b) soil microbial inoculants (Clause 7.2.4)

c) soil wetting agent (Clause 7.2.5.1)

d) seed (Clause 7.4.9)

e) binder (Clause 7.4.7.1)

f) fertiliser (Clause 7.4.10)

g) water (Clause 7.7), and

h) mulch and soil conditioner materials compliant with

   i. AS 4454 Clause 3.1.1.1 (d) mature compost

   ii. Form G of Appendix MRTS16, and

   iii. mulch particle size distribution of

< 75 mm	100%
> 16 mm	10-20%
5 - 16 mm	30 – 50%, and
< 5 mm	30 – 50%.

7.4.7.1 Binder

Standard hydromulch binder shall:

a) have a minimum two month functional longevity

b) be free from:

   i. matter toxic to plant growth

   ii. plant propagules

   iii. soil

   iv. rubbish, and

   v. other deleterious materials.

c) be manufactured for use in hydromulch or similar seeding applications

d) be readily dispersible

e) be highly soluble / hydro-colloidal

f) display a delayed development of viscosity before setting, and

g) be applied in accordance with manufacturer's specification.

7.4.8 Seeded mesh lined drain

Seeded mesh lined drain treatment:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) seed (Clause 7.4.9)

f) organic mesh (Clause 7.4.8.1)

g) bituminous emulsion binder (Clause 7.4.8.2)

h) fertiliser (Clause 7.4.10), and

i) water (Clause 7.7)

7.4.8.1 Organic Mesh

Mesh used with seeding operations shall:

a) be an open jute or coir mesh material suitable for seeding operations

b) protect topsoil and seeding from water and wind erosion

c) be made from 100% biodegradable fabric

d) allow the exchange of air and water, and

e) not contain matter toxic to plant growth.

Fixing pins used to secure mesh shall be a minimum 30 x 200 mm steel U-pins.

The type of organic mesh shall be as specified in Clause 3.2.4 of the Annexure MRTS16.1.

Jute mesh has an approximate life of 3 - 6 months in a drainage structure.

Coir mesh has an approximate life of 6 – 18 months in a drainage structure.

7.4.8.2 Binder

Bituminous binder shall:

a) be slow setting anionic bituminous emulsion in accordance with the requirements of MRTS21 *Bituminous Emulsion*

b) be free from petroleum solvent or other components toxic to plant growth

c) be readily dispersible

d) be highly soluble, and

e) display a delayed development of viscosity before setting.

Bituminous binder shall be further diluted 50 / 50 with water.

Application rates specified in Clause 8.5.1.8 is a diluted 50 / 50 rate.

7.4.9 Seeds

Grass seed shall be in accordance with Clause 7.4.9.1.

Woodland / forest seed shall be in accordance with Clause 7.4.9.2.

Seeds shall be tested in accordance with Clause 8.1.4.

Minimum seed application rates are based on a seed purity of 95% and germination / viability of 80%. Where purity and germination / viability test certificates indicate seed lots are outside these parameters, the contractor shall adjust the application rate of the species to meet the minimum requirements. Where purity and germination / viability is low, consideration should be given to seeking an alternate supply or using a substitute species with higher purity and germination / viability.

Seed pre-treatments such as inoculation, coating or anticide in accordance with Clause 3.2.1 of the Annexure MRTS16.1, or as shown on the drawings.

Seed shall be supplied in containers or bags at a size suitable for use per load by the seeding contractor (will vary depending on type of seeding and equipment used), or by area (for example, per 500 m^2).

Seed shall be supplied in sealed containers or bags labelled with:

a) Project identification

b) Lot / bag number

c) mix name

d) species and quantities of each species

e) total bag weight, and

f) date.

The seed supplier shall provide certification of the supplied seed per lot / bag number, including the individual species and weight per bag to demonstrate material is in accordance with the requirements of this Clause and the Seed Supply Proposal, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the *Seed Supply Proposal*.

Where seed species are unavailable the Contractor shall submit a proposal to substitute species, in accordance with the Seed Supply Proposal. Substitute species shall be suitable to the site conditions and be suitable for use in areas with applicable design constraints (clear zone, sight visibility and other vegetation setbacks and clearances)

Where seed species and application rates are specified in Clause 3.2.2 or Clause 3.2.3 of the Annexure MRTS16.1 or shown on the drawings, the Contractor:

a) shall regard the seed mix and application rates as the required minimum, and

b) may increase the seed species and / or application rates to ensure Clause 9.1.2 and / or Clause 9.2.2 completion criteria is achieved.

It is recommended experienced agronomists, revegetation specialist and seed suppliers are consulted to develop seed mixes that are well suited to Site specific conditions, particular geographic regions and climatic zones of Queensland.

In developing seed mixes, consideration should be given to the adjoining landholder requirements (for example environmentally sensitive areas such State Forests / National Parks or pastoral / agricultural land) and minimising potential impacts.

A mixture of perennial grasses is required to reduce the risk of not achieving a suitable outcome. Perennial grass species selection should prioritise species:

- commonly found in the area, particularly turf or pasture areas
- suitable for the soil type and annual rainfall of the site / treatment area, and
- that are commercially available and cost effective.

It is important to note that some native grass species may not be suitable for seeding due to:

- lower germination and establishment rates
- shape / morphology relative to mechanical applicators
- an inability to compete with exotic grass species (included in the seed mix or in sites adjoining the Site), and
- availability.

7.4.9.1 Grass seed

Grass seed mix application rates shall be:

a) in accordance with Table 7.4.9.1

b) specified in Clause 3.2.2 of the Annexure MRTS16.1and / or shown on the drawings

c) included in the Seed Supply Proposal, and

d) based on a minimum 95% purity and 80% germination / viability.

Perennial grass species shall:

a) be perennial species

b) not exceed a mature height of 700 mm, and

c) be commonly found in the region.

Seeds shall be tested in accordance with Clause 8.1.4. The Contractor shall use the purity and germination / viability test certificates to adjust the application rates to achieve the minimum purity and germination / viability requirements.

Table 7.4.9.1 – Grass seed mix application rate

Time of Year	Description	Total Application Rate kg / ha
Perennial Species		
All	Cynodon dactylon (Green Couch) – Hulled	10
	Cynodon dactylon (Green Couch) – Un-Hulled	10
	Mix of three additional perennial grass species*	15
Cover Crop Species		
Apr - Aug	50% Annual Rye and 50% Annual Millet	10
Sep - Mar	100% Annual Millet	

Perennial grass species, shall contain a minimum 50% by weight of species existing within or adjoining the Site.

* Urban Areas (High profile areas, as per Table 2 – Definition of Terms) – a default mix of Cynodon dactylon 20 kg / ha hulled, 20 kg / ha unhulled and 10 kg / ha cover crop shall be used.

A mixture of perennial grasses is required to reduce the risk of not achieving a suitable outcome. Perennial grass species selection should prioritise species:

- commonly found in the area, particularly turf or pasture areas
- suitable for the soil type and annual rainfall of the site / treatment area,
- that are commercially available and cost effective, and
- are suitable to exposed, full sun conditions.

It is important to note that some native grass species may not be suitable for seeding due to:

- lower germination and establishment rates
- shape / morphology relative to mechanical applicators
- an inability to compete with exotic grass species (included in the seed mix or in sites adjoining the Site), and
- availability.

7.4.9.2 Woodland / forest seed

Woodland / forest seed mix application rates shall be:

a) in accordance with Table 7.4.9.2

b) specified in Clause 3.2.3 of the Annexure MRTS16.1 and / or shown on the drawings

c) included in the Seed Supply Proposal, and

d) based on a minimum 95% purity and 80% germination / viability.

Woodland / forest species shall:

a) be endemic to the region

b) be species with a mature height and width greater than 1.2 m

c) not include groundcover species, and

d) not include vine or climbing species.

Grass species shall be in accordance with Clause 7.4.9.1

Hard cased woodland / forest species seed shall be pre-treated by the supplier, by scarification of the seed case, unless otherwise specified in Seed Supply Proposal, and

Seeds shall be tested in accordance with Clause 8.1.4. The Contractor shall use the purity and germination / viability test certificates to adjust the application rates to achieve the minimum purity and germination / viability requirements.

Table 7.4.9.2 – Woodland / forest seed mix application rate

Time of Year	Description	Total Application Rate kg / ha
Native Woodland / Forest Species		
All	Mix of a minimum of three Acacia species*	5
	Mix of a minimum of three tree species*	2
	Mix of a minimum of three shrub species	1
Perennial Grass Species		
All	Cynodon dactylon (Green Couch) - Hulled	10
	Cynodon dactylon (Green Couch) – Un-Hulled	10
	Mix of three perennial species	15
Cover Crop Species		
Sep - Mar	100% Annual Millet	10
Apr - Aug	50% Annual Rye and 50% Annual Millet	

Woodland / Forest Species and Perennial grass species shall contain a minimum 50% by weight of species existing within or adjoining the Site.

* Where woodland / forest seed mix is proposed within road design constraint areas (clear zone and other vegetation setbacks and clearances), shrub species shall be used.

The intent of the woodland / forest species mix is to establish pioneer plant species to stabilise the site and provide a framework for natural successional processes to occur. The grass species provide the initial stabilisation of the Site, reducing runoff, increasing water absorption and improving soil biological systems. The acacia species are pioneer species which, over several years, assist in further stabilising the Site and developing soil conditions conducive to allowing subsequent succession with climax species.

7.4.10 Seeding fertilisers

Fertiliser shall:

a) be in accordance with Clause 7.2.2

b) be in accordance with Table 7.4.10, and

c) be in accordance with the *Soil Management Plan – Construction*.

Fertiliser shall be applied in the N:P:K:S rates in Table 7.4.10, unless specified otherwise in the *Soil Management Plan – Construction*.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this Clause, prior to delivery to site. The documentation shall be incorporated as an Appendix to the *Soil Management Plan – Construction*.

Table 7.4.10 – Seeding Fertiliser N:P:K:S Rates

	Soluble	**Controlled / Slow Release**
N	20 – 40 kg / ha	10 – 15 kg / ha
P	10 - 40 kg / ha	
K	20 - 80 kg / ha	
S	5 – 30 kg / ha	
Trace elements	As required	

An example fertiliser NPKS analysis of 10:10:20:6 applied at 100 kg / ha delivers approximately the following quantities of NPKS.

N – 10 kg/ha

P – 10 kg/ha

K – 20 kg/ha

S – 6 kg/ha

Accordingly, a minimum 200 kg / ha of the example fertiliser would need to be applied to meet the minimum NPKS rates.

7.5 Turfing

7.5.1 Turfing treatment material

Turfing treatment materials:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) turf (Clause 7.5.2)

f) fertiliser (Clause 7.5.3), and

g) water (Clause 7.7).

7.5.2 Turf

Turf shall:

a) have a minimum 30 mm depth of sod

b) be in a healthy condition

c) be free from prohibited or restricted biosecurity matter, pests, diseases and matter toxic to plant growth

d) show signs of active growth, and

e) be true to the form of the specified species.

A-grade turf shall consist of a minimum 95% of the specified turf species.

B-grade turf shall consist of a minimum 80% of the specified turf species.

Turf species, turf grade and roll width shall be specified in Clause 3.3.1 of the Annexure MRTS16.1.

The Contractor must provide Turf Certification of the species.

A-grade turf must be used in high profile urban areas such as:

- pedestrian areas and shared paths
- transport stations, and
- areas fronting residential property.

B-grade turf is suitable for all other areas other than high profile urban areas as noted above.

7.5.3 Turf fertiliser

Fertiliser shall:

a) be in accordance with Clause 7.2.2

b) be in accordance with Table 7.5.3, and

c) be in accordance with the *Soil Management Plan – Construction.*

Fertiliser shall be applied in the N:P:K:S rates in Table 7.5.3, unless specified otherwise in the *Soil Management Plan – Construction.*

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this Clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the. *Soil Management Plan – Construction.*

Table 7.5.3 – Turf Fertiliser N:P:K:S Rates

	Soluble	**Controlled / Slow Release**
N	20 – 40 kg / ha	10 – 15 kg / ha
P	10 – 40 kg / ha	
K	20 – 80 kg / ha	
S	5 – 30 kg / ha	
Trace elements	As required	

An example fertiliser NPKS analysis of 10:10:20:6 applied at 100 kg / ha delivers approximately the following quantities of NPKS.

N – 10 kg/ha

P – 10 kg/ha

K – 20 kg/ha

S – 6 kg/ha

Accordingly, a minimum 200 kg / ha of the example fertiliser would need to be applied to meet the minimum NPKS rates.

7.6 Planting

7.6.1 Planting treatment materials

Planting treatment materials:

a) topsoil (Clause 7.1.2)

b) subsoil ameliorants (gypsum, lime, dolomite) where required by the *Soil Management Plan – Construction* (Clause 7.2.1)

c) soil microbial inoculants, where specified in Clause 3.6 of the Annexure MRTS16.1(Clause 7.2.4)

d) soil wetting agent (Clause 7.2.5.1)

e) water holding agents, where specified in Clause 3.6 of the Annexure MRTS16.1 (Clause 7.2.5.2)

f) containerised plants and ex-ground stock (Clause 7.6.2)

g) mulch (Clause 7.6.3)

h) organic matting, where specified (Clause 7.6.4)

i) stakes and guys (Clause 7.6.5)

j) subsoil drain, where required, (Clause 7.6.6)

k) fertiliser (Clause 7.6.7), and

l) water (Clause 7.7).

7.6.2 Containerised plants and ex-ground stock

Plants may be obtained from:

a) nurseries, and / or

b) harvested plant material from Site.

Nurseries shall be members of *Nursery and Garden Industry Australia / Queensland*.

Plant container sizes include:

a) < 25 L container stock:
   i. Viro tube (macrophytes only)
   ii. Full native tube (50 x 50 x 130)
   iii. 140 mm
   iv. 200 mm, and
   v. 300 mm.

b) ≥ 25 L container stock:
   i. 25 L
   ii. 45 L
   iii. 100 L
   iv. 200 L
   v. 400 L, and
   vi. ex-ground stock.

Plant material shall:

a) be acclimatised to the conditions of the Site – by sun hardening and reducing watering

b) be of a size appropriate to the container size

c) be in a healthy condition free from weeds, pests and diseases

d) be free of prohibited or restricted biosecurity matter

e) not be showing signs of nutrient or water deficiency, heat stress, notable pest damage or other physical damages

f) be showing signs of active growth relative to season and true to form of the species

g) have a healthy root system and not be pot bound

h) be clearly and correctly labelled according to botanical name

i) have water resistant labels and tied securely to a minimum one species per tray, and

j) be delivered to site in fully enclosed trucks (container stock < 200 L).

Trees shall have a single, healthy, undamaged leading stem unless otherwise specified.

Trees shall be in accordance with AS2303 *Tree Stock for Landscape Use*.

Plant species, quantities, container sizes, mature heights and widths; and planting densities shall be specified in Clause 3.4.1 of the Annexure MRTS16.1 and shown on the drawings.

7.6.3 Mulch

Mulch shall be:

a) Site manufactured mulch, or

b) imported mulch.

7.6.3.1 Site manufactured mulch

Site manufactured mulch shall:

a) be manufactured from vegetation material set aside during clearing and grubbing operations in accordance with MRTS04 *General Earthworks*

b) be free from contaminants, rubbish and deleterious material

c) be free from weeds, including prohibited or restricted biosecurity matter, and

d) be manufactured in accordance with Clause 8.2.2.

Where vegetation exists on site and it is intended to use it to produce site manufactured mulch for use in permanent landscape works or temporary erosion and sediment control works, ensure the retention of adequate quantities of suitable material is nominated in the Annexure MRTS04.1 *General Earthworks*.

7.6.3.2 Imported mulch

Imported mulch shall:

a) comply with the requirements of AS 4454, Clause 3.1.1.1 (c) composted product

b) be free from contaminants, rubbish and deleterious material, and

c) be certified free from weeds, including prohibited or restricted biosecurity matter.

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this clause, prior to delivery to Site.

Mulch type and size shall be as specified in Clause 3.4.2 of the Annexure MRTS16.1.

7.6.4 Organic matting

Organic matting used with container planting operations shall:

a) be a high density material suitable for container planting operations

b) be made from 100% biodegradable fabric

c) minimise weed growth

d) reduce soil moisture loss

e) protect topsoil from water and wind erosion

f) allow the exchange of air and water, and

g) not contain matter toxic to plant growth.

Organic matting used with container planting operations in drainage structures shall be capable of withstanding design water velocities until vegetation is established.

Jute or coir mesh may be used to secure mulch on 1:2 scopes.

Fixing pins used to secure matting shall be a minimum 30 x 200 mm steel U-pins.

The type of organic matting shall be as specified in Clause 3.4.3 of the Annexure MRTS16.1

7.6.5 Stakes and guys

Stakes and guying shall be in accordance with Table 7.6.5.

Table 7.6.5 – Stakes and guys

Description	Container	Ties	Number of Stakes
600 x 10 mm diameter bamboo	Tube – 200 mm stock (marker for supplementary planting in seeded areas only)	-	1
1500 x 25 x 25 mm hardwood	25 – 45 L (tree species only)	✓	2
1800 x 50 x 50 mm hardwood	100 L stock (tree species only)	✓	
Guys*	≥ 200 L and ex-ground	-	4

*Guys shall be a proprietary underground tree guying system, installed in accordance with a manufacturer's recommendations.

7.6.6 Subsoil drain

Subsoil drains shall:

a) have a 100 mm perforated drainage pipe with textile sleeve compliant with AS 2439.1

b) have backfill material consisting of a single-sized aggregate of 20 mm or 10 mm particle size, with a maximum of 5% passing the AS 0.15 mm sieve, and

c) have a geotextile surround compliant with Clause 6 of MRTS27 *Geotextiles (Separation and Filtration)*.

7.6.7 Planting fertilisers

Fertilisers shall:

a) be in accordance with Clause 7.2.2

b) be controlled / slow release, minimum 6 months

c) applied in accordance with the manufacturer's application rate, and

d) have an N:P:K analysis within the following ranges, unless specified otherwise in the *Soil Management Plan – Construction*:

   i. N: 7 – 22

   ii. P: 1 – 6

   iii. K: 2 – 10

The Contractor shall provide quality assurance documentation from the supplier to demonstrate material is in accordance with the requirements of this clause, prior to delivery to Site. The documentation shall be incorporated as an Appendix to the *Soil Management Plan – Construction*.

7.7 Water

Water used for vegetation works shall be:

a) potable water, or

b) recycled water, in accordance with Clause 7.7.1, or

c) non-potable water (dam, creek, river and bore water) in accordance with Clause 7.7.2.

7.7.1 Recycled water

Recycled water used for vegetation works shall:

a) contain no substances toxic to plant growth

b) have a pH between 6 and 8.5 (inclusive)

c) have a total soluble salts concentration less than 1000 mg / L, and

d) be Class A or A+ only, in accordance with the *Queensland Water Recycling Guidelines (EPA 2005)*

e) be sourced from a supplier with a Recycled Water Management Plan prepared in accordance with the *Recycled Water Management Plan and Validation Guidelines (DEWS 2008)*

f) be managed and handled in accordance with the *Guide to Workplace use of Non-potable Water Including Recycled Waters (DIER 2007)*, and

g) have relevant signage erected in accordance with the AS/NZ 1319:1994 – *Safety Signs for the Occupational Environment*.

7.7.2 Non-potable water (dam, creek, river and bore water)

Non-potable water (excluding recycled water) used for vegetation works shall:

a) contain no substances toxic to plant growth

b) have a pH between 6 and 8.5 (inclusive)

c) have a total soluble salts concentration less than 1000 mg / L, and

d) be sampled and tested in accordance with Clause 8.1.3

e) be managed and applied, in accordance with the *Form H of MRTS16 Appendix*, and

f) have relevant signage erected in accordance with the AS/NZ 1319:1994 – *Safety Signs for the Occupational Environment*.

Water from sediment basins shall not be used for irrigating landscape and revegetation treatments.

Sediment basins are typically required to be flocculated and discharged within 5 days of a rain event. This timeframe does not allow for adequate testing. There is a high risk of water being toxic to vegetation where over flocculation occurs with salt and metal based flocculants.

7.8 Planting bed edging

7.8.1 Concrete planting bed edging

Concrete planting bed edging shall:

a) be 150 x 150 mm

b) be Class N25/10 concrete, in accordance with MRTS70 *Concrete*

c) have expansion joints installed at regular intervals not exceeding 20 m

d) have contraction joints between expansion joints at regular intervals not exceeding 5 m and / or at changes of curvature, and

e) be installed on subgrade compacted in accordance with the requirements of Clause 15 of MRTS04 *General Earthworks*.

Concrete testing not required.

7.9 Irrigation system

Irrigation system materials shall:

a) comply with relevant Australian Standards, and

b) meet the requirements of the applicable Local Government.

Materials used for electrical cabling and fittings shall comply with the requirements of MRTS228 *Electrical Switchboards* and MRTS256 *Power Cables*.

Specific irrigation design type and requirements shall be specified in Clause 3.5 of the Annexure MRTS16.1.

7.10 Material supplementary requirements

Material supplementary requirements of MRTS16 *Landscape and Revegetation Works* shall be specified in Clause 3.6 of the Annexure MRTS16.1.

8 Construction

The extent and types of vegetation treatments shall be installed as shown on the drawings, or as specified elsewhere in the Contract.

8.1 Sampling and testing

8.1.1 Subsoil sampling and testing

8.1.1.1 Subsoil sampling

Sampling shall be conducted by a soil scientist with qualifications in accordance with Clause 6.2. Where an accredited soil scientist is unavailable in a remote location, soil sampling will be carried out under the direction of the Administrator.

Sampling for each test shall comply with the following requirements:

a) be representative of the subsoil type and not include different subsoil types or topsoil layers

b) be in accordance with Table 8.1.1.1

c) be composed of a composite of 10 sub-samples representative of the subsoil lot (top 200 mm final trimmed cut batter face or bench, final trim fill batter face, final trimmed broadacre areas beyond the batter)

d) be approximately 1 kg

e) be placed in clean, sealable, durable plastic bags clearly labelled with:

   i. Project name

   ii. Job / Contract number

   iii. Sample date

   iv. Sample Location, including GPS or chainage reference

   v. Sample material layer / type, and

   vi. Lot / sub-lot identification.

f) be submitted to a laboratory for testing with a copy of the relevant testing Form, in accordance with Clause 8.1.1.2.

Table 8.1.1.1 – Subsoil sampling requirements

Subsoil	Sampling Frequency
Subsoil	One test per subsoil type
Drainage Basin	One test per subsoil type / 1 test per drainage basin

Consider undertaking field testing (for example, pH, EC and dispersion/slaking) to validate representative sampling.

Consideration should be given to increasing sampling and frequencies, as benefits include:

- reduced risk of anomalies or errors made during the sampling process
- greater certainty of results and recommendations, minimising the risk of poor outcomes
- reduced risk of inadequate amelioration recommendations for stockpiled topsoil, resulting in non-compliant results during compliance testing, required rework and further testing, and
- a relatively small increase in sampling / testing costs compared with the high costs and program delay of rework operations.

8.1.1.2 Subsoil testing

Testing shall be in accordance with Table 8.1.1.2.

Table 8.1.1.2 – Subsoil testing requirements

Soil Testing	Set of Tests Required
Subsoil	*Form E of MRTS16 Appendix*
Drainage Basin	*Form F of MRTS16 Appendix*

A Soil Assessment Report shall be:

a) prepared for each sample

b) prepared by a soil scientist with accreditations in accordance with Clause 6.2

c) in accordance with *Form B of MRTS16 Appendix*

d) used to develop the *Soil Management Plan – Construction*, and

e) incorporated as an Appendix to the *Soil Management Plan – Construction*.

Guidance on amelioration strategies, rates and targets are provided in *Form B of MRTS16 Appendix*.

8.1.2 Topsoil sampling and testing

8.1.2.1 Topsoil sampling

Sampling shall be conducted by a soil scientist with qualifications in accordance with Clause 6.2. Where an accredited soil scientist is unavailable in a remote location, soil sampling will be carried out under the direction of the Administrator.

Sampling for each test shall comply with the following requirements:

a) be representative of the topsoil type and not include different soil types or layers

b) be in accordance with Table 8.1.2.1

c) where sampling stockpiles, sub-samples shall be sampled from various locations, 0.5 m within the stockpile

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

e) be approximately 3.0 kg

f) be placed in clean, sealable, durable plastic bags clearly labelled with:

   i. Project name

   ii. Job / Contract number

   iii. Sample date

   iv. Sample Location, including GPS or chainage reference

   v. Sample material layer / type, and

   vi. Lot / sub-lot identification.

g) be submitted to a laboratory for testing with a copy of the relevant testing Form, in accordance with Clause 8.1.2.2.

Compliance sampling of manufactured site soil should ideally be tested between one and four weeks after manufacture.

Table 8.1.2.1 – Topsoil sampling requirements

Topsoil	Sampling Frequency
Insitu Topsoil	1 per 2500 m² with a minimum of 1 test per topsoil type
Site Stockpiled Topsoil	2 per 500 m³ with a minimum of 1 test per topsoil type
Manufactured Site Topsoil Compliance Testing	2 per 500 m³ with a minimum of 1 test per topsoil type
Imported Topsoil	1 per 500 m³ with a minimum of 1 test per manufactured batch

Allow sufficient time for soil sampling, testing assessment reporting to minimise delays in the construction program.

Consider sampling and testing site topsoil prior to stripping, for efficient and effective incorporation of ameliorants during the stripping process.

A soil sample should not contain any large particles whereas the sampled stockpile may; the soil sample would comply relevant to this requirement but not the stockpiled soil in general, therefore observation of the stockpiled soil is necessary.

Consideration should be given to increasing sampling and frequencies, as benefits include:

- reduced risk of anomalies or errors made during the sampling process
- greater certainty of results and recommendations, minimising the risk of poor outcomes
- reduced risk of inadequate amelioration recommendations for stockpiled topsoil, resulting in non-compliant results during compliance testing, required rework and further testing, and
- a relatively small increase in sampling / testing costs compared with the high costs and program delay of rework operations.

8.1.2.2 Topsoil testing

Testing shall be in accordance with Table 8.1.2.2.

Table 8.1.2.2 – Topsoil testing requirements

Topsoil	Set of Tests Required
Site Topsoil	*Form C of MRTS16 Appendix*
Manufactured Site Topsoil Compliance Testing	*Form D of MRTS16 Appendix*
Imported Topsoil	*Form C of MRTS16 Appendix*

A Soil Assessment Report shall be:

a) prepared for each sample

b) prepared by a soil scientist with accreditations in accordance with Clause 6.2

c) in accordance with *Form B of MRTS16 Appendix*

d) used to develop the *Soil Management Plan – Construction*, and

e) incorporated as an Appendix to the *Soil Management Plan – Construction*.

Guidance on amelioration strategies, rates and targets are provided in *Form B of MRTS16 Appendix*.

8.1.3 Non-potable water (dam, creek, river and bore water) sampling and testing

8.1.3.1 Non-potable water sampling

Sampling location and frequency shall be in accordance with Table 8.1.3.1.

Table 8.1.3.1 – Non-potable water sampling

Type	Sample Location	Sampling Frequency
Dams	Away from the edge 500 mm below the surface. If it is not possible, sample close to where the pump draws water, or at the first outlet along the supply line.	When water levels fluctuate, or when water quality visually changes
Creeks or Rivers	From the main flow where water movement is constant. Do not sample where there is little or no flow.	When water levels / flow rates fluctuate, or when water quality visually changes
Bores	Before sampling, allow the water to flow for sufficient time to remove standing water in pipes.	When water quality visually changes, or when an odour occurs

Sampling for each test shall comply with the following requirements:

a) be approximately 1 L

b) contain no air spaces in the bottle

c) be placed in a clean, sealable, durable plastic bottle clearly labelled with

   i. Project name

   ii. Job / Contract number

   iii. Sample date

   iv. Sample Location, including GPS or chainage reference

   v. Sample material layer / type, and

   vi. Lot / sub-lot identification.

d) be submitted to a laboratory for testing with a copy of the *Form I of MRTS16 Appendix*, in accordance with Clause 8.1.3.2.

8.1.3.2 Non-potable water testing

A Non-Potable Water Testing and Assessment Report shall be:

a) prepared for each sample tested

b) in accordance with *Form I of MRTS16 Appendix*

c) used to develop the *Non-potable Water Management Plan*, and

d) incorporated as an Appendix to the *Non-potable Water Management Plan*.

8.1.4 Seed Testing

Seeds shall be tested to determine:

a) purity percentage, and

b) germination / viability percentage.

A certificate for each species shall be included in the Appendix of the Seed Supply Proposal, and include the following:

a) species of the seed

b) purity percentage

c) germination / viability percentage, and

d) pre-treatments or coatings that have been applied to the seed.

Grass seed purity and germination / viability certificates shall be no older than 6 months old.

Tree and shrub seed purity and germination / viability certificates shall be no older than 1 year old.

Projects with a long duration require seed testing to be conducted regularly to ensure the minimum certificate ages are within the required timeframes.

8.2 Site manufactured materials

8.2.1 Manufacture of site topsoil

Site topsoil shall be manufactured in accordance with the *Soil Management Plan – Construction* by:

a) ameliorating topsoil with amelioration agents, and

b) screening, or similar operation, to achieve particle size requirements and / or to incorporate amelioration agents.

Note - fertilisers and wetting agents shall be applied during the installation of the vegetation works treatments.

Where not in accordance with *Form D of MRTS16 Appendix*, manufactured site topsoil shall have additional amelioration and testing until compliance is achieved. Manufactured site topsoil shall be in accordance with *Form D of MRTS16 Appendix* prior to being used. **Hold Point 7**

Where manufactured topsoil is to be stockpiled greater than two weeks, it shall be suitably stabilised by either seeding with a cover crop or applying a polymer based soil binder.

Consideration should be given to testing topsoils prior to stripping to identify the most suitable topsoils and stripping depths. This may also allow for application of ameliorants to the topsoil surface prior to stripping. This is an efficient method to incorporate the ameliorants during the stripping process.

Where site constraints do not allow for stockpiling of stripped site topsoil, it may be more cost effective to use a topsoil free vegetation treatment such as organics blanket seeding in lieu of importing and spreading topsoil.

8.2.2 Manufacture of site mulch

Site mulch shall be produced from material set aside during clearing and grubbing operations as specified in Annexure MRTS04.1 *General Earthworks*. Material must not contain prohibited or restricted biosecurity species.

Mulch shall be manufactured by:

a) double tub grinding vegetation to produce a fine material, with a maximum dimension of 75 mm

b) stockpiling material to a maximum height of 2 m, and

c) initially watering the stockpile so the entire stockpile is moist.

Mulch stockpiles shall:

a) not be located near water bodies or concentrate drainage flows or timber structures

b) not be located within the drip line of retained trees, and

c) be maintained weed free; weeds which appear shall be treated immediately.

8.2.3 Harvesting of site vegetation material

8.2.3.1 Harvesting of site seed material

Seeds shall be harvested and stored for in accordance with the *Seed Harvesting Proposal*.

8.2.3.2 Harvesting of site plant material

Plant material shall be harvested, stored and cared for in accordance with the *Plant Harvesting Proposal*.

8.3 Weed control

Prior to the commencement of ground preparation operations, the area shall be in a weed free condition. **Witness Point 2**

All prohibited and restricted Biosecurity Matters shall be addressed as per MRTS51 *Environmental Management* and the EMP-C.

Weed control methods include:

a) mechanical application of herbicide using boom spray or high volume power applicator

b) manual application of herbicide from knapsack or similar applicator, or

c) manual methods, including removal and disposal of weeds.

Application devices shall be calibrated to deliver prescribed rates of product in accordance with the manufacturer's instructions.

Where a herbicide is required to be applied to hazardous areas, as defined by the *Agricultural Chemicals Distribution Control Act (1966)*, the Contractor shall obtain and submit a distribution permit to the Administrator.

Handling and application of herbicides shall:

a) only be carried by a licensed contractor who possess qualifications and licences relevant to the products being applied

b) be in accordance with the *Agricultural Chemicals Distribution Control Act (1966)*

c) be in accordance with permit instructions under the *Chemical Usage (Agricultural and Veterinary) Control Act (1988)*

d) be in accordance with the manufacturer's instructions, and

e) be applied with biodegradable, non-toxic tracer dye to highlight areas sprayed.

The Contractor shall maintain records of spray activities.

Where herbicides are prohibited from use, weeds shall be removed by hand and disposed off site in accordance with Clause 11 of MRTS04 *General Earthworks* and relevant bio-security requirements.

Manual methods of weed control, weed removal and target vegetation shall be specified in Clause 3.1.2 of the Annexure MRTS16.1.

8.4 Ground preparation works

Ground preparation work operations include:

a) subsoil operations, and

b) topsoil operations.

8.4.1 Subsoil operations

Subsoil operations include:

a) sampling and testing, in accordance with Clause 8.1.1

b) spreading amelioration agents on subsoil, in accordance with Clause 8.4.1.1

c) ripping, in accordance with Clause 8.4.1.2

d) cultivation, in accordance with Clause 8.4.1.3, and

e) roughening, in accordance with Clause 8.4.1.4.

8.4.1.1 Spreading of amelioration agents on subsoil

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Ground preparation operations shall occur immediately after the application of amelioration agents.

The actual type and quantity of amelioration agent to be applied is determined through testing the subsoil and completing the relevant sections in the Soil Assessment Report and Soil Management Plan – Construction.

8.4.1.2 Ripping

Ripping shall be used in areas to be vegetated with slopes ≤ 1 on 4 where soil has been compacted. For example, decommissioned site compounds and building pads, parking areas, stockpile areas, roads and haul routes, and general areas compacted by construction works.

Ripping shall:

a) be a minimum 300 mm depth, with rip lines at 500 mm maximum spacing

b) be to just below the depth of the compacted layer

c) incorporate amelioration agents into the subsoil

d) occur when soils are dry enough to shatter compacted subsoil sufficiently to allow subsequent cultivation operation

e) be parallel to the contour

f) not invert soil layers, and

g) be followed with the spreading of amelioration agents **Witness Point 3**

h) be followed with the cultivation operation, in accordance with Clause 8.4.1.3, to produce a finely tilled planting bed.

Ripping shall not occur within the drip line of vegetation to be retained, or within 300 mm of paths, kerbs, road furniture or structures.

8.4.1.3 Cultivation

Cultivation shall be used in areas to be vegetated with slope ≤ 1 on 4.

Cultivation shall occur immediately after the application of amelioration agents. **Witness Point 4**

Cultivation shall:

a) be a minimum 150 mm depth

b) incorporate amelioration agents into the subsoil

c) occur when soils are dry enough to break up the surface of the subsoil to produce a finely tilled planting bed, and

d) be parallel to the contour.

All stone, rubble and other deleterious material greater than 40 mm that is brought to the surface in areas to be mown / slashed in the future shall be removed.

Cultivation shall not occur within the drip line of vegetation to be retained, or within 300 mm of paths, kerbs, road furniture or structures. Hand cultivation is required in these locations.

8.4.1.4 Roughening

Roughening shall be used in areas to be vegetated with slope > 1 on 4.

Roughening shall occur immediately after the application of amelioration agents. **Witness Point 5**

Roughening shall:

a) be approximately 50 mm depth

b) incorporate amelioration agents into the subsoil

c) occur when soils are dry enough to roughen / break up / crumb the surface, and

d) be parallel to the contour and form keys in the subsoil to prevent subsequent material slipping down the face of the slope

8.4.2 Topsoil operations

Topsoil work operations include:

a) sampling and testing, in accordance with Clause 8.1.2

b) manufacture of topsoil, in accordance with Clause 8.2.1

c) importation of topsoil, and

d) installation of topsoil, in accordance with Clause 8.4.2.1.

Allow sufficient time for soil sampling, testing assessment reporting; and amelioration and screening operations to minimise delays in the construction program.

Where topsoil is scheduled in the plans and allowance should be made for manufacturing site topsoil and / or for the importation of topsoil. Generally, the department prioritises the use of site won materials; however when there is a shortfall, or when it is not feasible to ameliorate or where site storage constraints apply, importation of topsoil may be required. Alternatively the use of an alternate treatment such as organic blanket which does not require topsoil, may be considered.

8.4.2.1 Installation of topsoil

Topsoil shall be installed within three days of the subsoil operations.

Topsoil shall be spread to the depths described in the relevant vegetation works operation, and allow for settlement after installation.

The Contractor shall give at least three days notice before installation of topsoil. **Witness Point 6**

8.5 Vegetation works

Vegetation work operations include:

a) seeding

b) turfing, and

c) planting.

8.5.1 Seeding

Seeding operations include:

a) drill seeding

b) broadcast seeding

c) hydromulch - standard

d) hydromulch - bonded fibre matrix

e) hydro-compost

f) straw mulching, and

g) organics blanket.

Do not apply seeding during rain or where the soil is too wet for machinery.

The Contractor shall prepare a sample installation to provide an agreed quality control for further installations **Hold Point 9**

All seeds, wetting agents, binders, fibre and fertilisers are to be bought to site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Sample installation shall form part of the final project. A sample area shall be prepared for each distinct area / and or seed mix. A sample area shall remain valid as a sample area for a maximum fourteen days (growth of cover crop / grass will change the appearance of a sample area).

The Contractor and Administrator shall:

a) determine the volume of fibre the tank can apply (volume varies with tank / pump and fibre / binder used) to determine a suitably sized sample area (minimum 100 m²)

b) clearly mark out the extent of the sample area

c) verify quanitites to be loaded into the tank / machinery

d) apply the seeding to the sample area in accordance with the relevant seeding clause. Ensure the minimum fibre depth is achieved (depth achieved will vary with fibre type / product and the roughness of the surface; the rougher the surface, the more fibre required to achieve the minimum depths).

e) where required, increase the fibre rate in order to achieve the minimum depth coverage based on the typical roughness / finish of the surface.

8.5.1.1 Drill seeding

Drill seeding shall be in accordance with Table 8.5.1.1.

Table 8.5.1.1 - Drill seeding

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering
≤ 1 on 4	1651	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	10 L /m²
> 1 on 4	Not suitable for drill seeding machinery				

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Drill seeding shall be installed within two days from the completion of the topsoil operation.

All seed, wetting agents and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Drill seeding shall be installed:

a) parallel to the contour

b) by drilling seed and fertiliser into the topsoil, ensuring the seed is covered by topsoil, and

c) by watering, on the day of installation, with a solution of water and wetting agent, until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

8.5.1.2 Broadcast seeding

Broadcast seeding shall be in accordance with Table 8.5.1.2.

Table 8.5.1.2 – Broadcast seeding

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering
≤ 1 on 4	1651	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	10 L /m²
> 1 on 4	1651	2	Roughening 50 mm		

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Broadcast seeding shall be installed within two days from the completion of the topsoil operation.

All seed, wetting agents and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Broadcast seeding shall be installed:

a) by blending a broadcast mixture of seed, fertiliser and a bulking agent such as dry, sharp sand or sawdust

b) by broadcasting the blended mixture on the topsoil

c) by lightly working the topsoil surface parallel to the contour by harrowing, raking, tracking or chain dragging, to ensure seeds are covered with topsoil, and

d) by watering, on the day of installation, with a solution of water and wetting agent until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

8.5.1.3 Hydromulch – Standard

Standard hydromulch shall be in accordance with Table 8.5.1.3.

Table 8.5.1.3 – Standard Hydromulch

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering	Minimum Fibre	Minimum Finished Fibre Depth
≤ 1 on 4	1651	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	NA	4000 kg/ha	4 mm
> 1 on 4	1651	2	Roughening 50 mm				

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Sample areas shall be installed in accordance with Clause 8.5.1 **Hold Point 9**

All seeds, wetting agents, binders, fibre and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10** Note, some proprietary products are packaged with pre-blended fibre, binder and wetting agents, which is suitable.

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Standard hydromulch shall be installed within two days from the completion of the topsoil operation.

Standard hydromulch shall be installed:

a) by moistening the topsoil layer with a solution of water and wetting agent

b) by applying the hydromulch slurry in an indirect, dispersed spray pattern, from opposing directions during each pass, to achieve a complete coverage and a uniform finish. Best results are obtained when applied at a range of angles from the toe of the slope and the top of the slope. In scenarios where this in not practicable because access is restricted, apply in a forward and then backward manner as the area is traversed

c) by applying the hydromulch slurry in a minimum two pass process as follows:

   i. the first pass shall consist of a slurry of water, 1000 kg/ha of fibre, binder, fertiliser and 90% of the seed mix. The first pass shall become tacky (not dry) before subsequent passes are applied, and

   ii. the subsequent passes shall consist of a slurry of water, balance of the fibre required, binder and 10% of the seed mix.

d) with no soil visible after installation and a minimum finished fibre depth of 4 mm to be achieved at any location, and

e) with no initial watering on the day of installation to allow the binder to set.

A minimum two pass process is required to ensure seed is in contact with the topsoil and is covered by mulch, reducing its exposure to the elements and predation by insects and birds.

8.5.1.4 Hydromulch - Bonded Fibre Matrix

Bonded fibre matrix shall be in accordance with Table 8.5.1.4.

Table 8.5.1.4 – Bonded Fibre Matrix

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering	Minimum Fibre	Minimum Finished Fibre Depth
≤ 1 on 4	1651	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	NA	5000 kg/ha	5 mm
> 1 on 4	1651	2	Roughening 50 mm				

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Regular sample areas shall be installed in accordance with Clause 8.5.1. **Hold Point 9**

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Bonded fibre matrix shall be installed within two days from the completion of the topsoil operation.

All seeds, wetting agents, binders, fibre and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10** Note, some proprietary products are packaged with pre-blended fibre, binder and wetting agents, which is suitable.

Bonded fibre matrix shall be installed:

a) by moistening the topsoil layer with a solution of water and wetting agent

b) by applying the bonded fibre matrix slurry in an indirect, dispersed spray pattern, from opposing directions during each pass, to achieve a complete coverage and a uniform finish. Best results are obtained when applied at a range of angles from the toe of the slope and the top of the slope. In scenarios where this in not practicable because access is restricted, apply in a forward and then backward manner as the area is traversed

c) by applying the bonded fibre matrix slurry in a minimum two pass process as follows:

   i. the first pass shall consist of a slurry of water, 1000 kg/ha of fibre, binder, fertiliser and 90% of the seed mix. The first pass shall become tacky (not dry) before subsequent passes are applied, and

   ii. the subsequent passes shall consist of a slurry of water, balance of the fibre required, binder and balance of the seed mix.

d) with no soil visible after installation and a minimum finished fibre depth of 5mm to be achieved at any location, and

e) with no initial watering on the day of installation to allow the binder to set.

A minimum two pass process is required to ensure seed is in contact with the topsoil and is covered by mulch, reducing its exposure to the elements and predation by insects and birds.

8.5.1.5 Hydro-compost

Hydro-compost shall be in accordance with Table 8.5.1.5.

Table 8.5.1.5 – Hydro-compost

Slope	Standard Drawing	Detail	Subsoil Operation		Topsoil Depth	Initial Watering	Minimum Finished Fibre Depth
≤ 1 on 4	1651	3*	Ripping* Cultivation	300 mm 150 mm	75 mm**	NA	10 mm
> 1 on 4	1651	4	Roughening	50 mm			

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Regular sample areas shall be installed in accordance with Clause 8.5.1. **Hold Point 9**

Where a site topsoil is tested in accordance with *Form C of Appendix MRTS16* and has less than 3% organic matter, Hydro-compost may be used to address organic matter requirements of the topsoil in lieu of ameliorating the stockpiled topsoil with organic soil conditioner.

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Hydro-compost shall be installed within two days from the completion of the topsoil operation.

All seeds, wetting agents, binders, fibre and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10** Note, some proprietary products are packaged with pre-blended compost, fibre, binder and wetting agents, which is suitable.

Hydro-compost shall be installed:

a) by moistening the topsoil layer with a solution of water and wetting agent

b) by hydraulically applying the hydro-compost slurry in an indirect, dispersed spray pattern, from opposing directions during each pass, to achieve a complete coverage and a uniform finish. Best results are obtained when applied at a range of angles from the toe of the slope and the top of the slope. In scenarios where this in not practicable because access is restricted, apply in a forward and then backward manner as the area is traversed

c) by applying the hydro-compost slurry in a minimum two pass process as follows:

   i. the first pass shall consist of a slurry of water, compost / fibre, binder, seed and fertiliser. The first pass shall become tacky (not dry) before subsequent passes are applied, and

   ii. the subsequent passes shall consist of a slurry of water, balance of the compost / fibre required, seed, binder, and fertiliser.

d) with no soil visible after installation and a minimum finished fibre depth of 10mm to be achieved at any location, and

e) with no initial watering on the day of installation to allow the binder to set.

8.5.1.6 Straw mulching

Straw mulching shall be in accordance with Table 8.5.1.6.

Table 8.5.1.6 – Straw mulching

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering	Fibre	Bitumen Emulsion	Minimum Finished Fibre Depth
≤ 1 on 4	1651	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	10 L/m²	5000 kg/ha	20000 L / ha	25 mm
> 1 on 4	1651	2	Roughening 50 mm					

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Regular sample areas shall be installed in accordance with Clause 8.5.1. **Hold Point 9**

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Seeding shall be installed within two days from the completion of the topsoil operations. All seeds, wetting agents, binders, fibre and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Straw mulch seeding shall be installed:

a) by installing seed as per drill seeding Clause 8.5.1.1, or broadcast seeding Clause 8.5.1.2, including the initial watering

b) by covering the finished drill / broadcast seeding with a mixture of straw and bituminous emulsion. Straw shall be spread with a purpose made blower. The emulsion may be incorporated into the airstream of the blower, or sprayed over the straw as a separate operation immediately after the application of straw

c) with no soil visible after installation and a minimum finished fibre depth of 25 mm to be achieved at any location, and

d) with no initial watering after the application of the straw mulch to allow the bituminous emulsion to set.

8.5.1.7 Organics blanket

Organic blanket shall be in accordance with Table 8.5.1.7.

Table 8.5.1.7 – Organics blanket

Slope	Standard Drawing	Detail	Subsoil Operation	Initial Watering	Organics Blanket Depth
≤ 1 on 4	1651	5*	Ripping* 300 mm Cultivation 150 mm	5 L/m²	40 mm
> 1 on 4	1651	6	Roughening 50 mm		

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Regular sample areas shall be installed in accordance with Clause 8.5.1. **Hold Point 9**

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Organics blanket shall be installed within two days from the completion of the subsoil operations. All seeds, wetting agents, binders and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Organics blanket shall be installed:

a) by spreading the organic blanket with a pneumatic blower, with binder and seed mixed into the blanket as it is being installed

b) with no soil visible after installation and a minimum finished fibre depth of 40 mm to be achieved at any location, and

c) by watering, on the day of installation, with a solution of water and wetting agent, until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

8.5.1.8 Mesh lined drain

Mesh lined drain shall be in accordance with Table 8.5.1.8.

Table 8.5.1.8 – Mesh lined drain

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering	Bitumen Emulsion
All	1647	3	Roughening 50 mm	75 mm	10 L/m²	20000 L/ha

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Regular sample areas shall be installed in accordance with Clause 8.5.1. **Hold Point 9**

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Seeding shall be installed within two days from the completion of the topsoil operations. All seeds, wetting agents, binders, fibre and fertilisers shall be brought on site in separately labelled containers and mixed on-site to allow verification of materials and quantities. **Hold Point 10**

Mesh lined drains shall be installed:

a) by installing seeding as per Clause 8.5.1.1 – Clause 8.5.1.7

b) by covering the finished seeding treatment with jute or coir mesh. Mesh shall be pulled taut and secured with pins in accordance with the manufacturers requirements, with the following exclusion – mesh to be secured with pinning only; securing ends of mesh using trenches is not permitted

c) by spraying mesh with a bituminous emulsion, and

d) with no watering after the application of the mesh to allow the bituminous emulsion to set.

8.5.2 Turfing

Turfing shall be in accordance with Table 8.5.2.

Table 8.5.2 – Turfing

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Initial Watering
≤ 1 on 4	1650	1*	Ripping* 300 mm Cultivation 150 mm	75 mm	25 L /m²
> 1 on 4	1650	2	Roughening 50 mm		

*Ripping only required where soils are compacted. For example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

Amelioration agents, where specified in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the specified rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents.
Witness Point 3, 4 or 5

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth. **Witness Point 6**

Turf shall be installed within two days from the completion of the topsoil operations.

Turf shall be delivered within one day of cutting, and installed within two days of cutting.

Turf shall be installed:

a) by spreading fertiliser over the topsoil and raking the surface smooth

b) to the prepared surface that has been moistened with a solution of water and wetting agent

c) on the day turf is delivered to site

d) by laying rolls parallel to the contour, in a staggered brick pattern, and

e) by watering, within 2 hours of installation, with a solution of water and wetting agent until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

Turf in high profile areas shall be top-dressed to ensure there are no gaps between rolls and to correct any uneven areas. Top-dressing shall be washed and graded sand specifically produced for the horticultural industry.

8.5.3 Planting

8.5.3.1 Planting Containers < 25 L

Planting of containers < 25 L shall be in accordance with Table 8.5.3.1

Table 8.5.3.1 –Planting < 25 L Containers

Slope	Standard Drawing	Detail	Subsoil Operation	Topsoil Depth	Mulch Depth	Alternate Surface Treatment	Initial Watering
Planting Contained Areas							
≤ 1 on 4	1653	1*	Ripping* 300 mm Cultivation 150 mm	300 mm	100 mm	-	10 L / m²
Planting Contained Areas – Median and Separators**							
≤ 1 on 4	1643	1	Ripping 300 mm Cultivation 150 mm	300 mm	100 mm	-	10 L / m²
Planting Broadacre Areas							
≤ 1 on 4	1653	2*	Ripping* 300 mm Cultivation 150 mm	150 mm	100 mm	-	10 L / m²
Planting Slopes > 1 on 4							
> 1 on 4	1653	3	Roughening 50 mm	75 mm	100 mm	-	10 L / m²
> 1 on 4	1653	4		Per hole			
Planting in Seeding Areas							
≤ 1 on 4	1653	5*	Ripping* 300 mm Cultivation 150 mm	75 mm	-	Seeding	10 L / m²
> 1 on 4	1653	6	Roughening 50 mm				
Planting in Matting							
Drains	1647	1	Roughening 50 mm	75 mm	-	Matting	10 L / m²
> 1 on 4	1647	2	Roughening 50 mm	75 mm	100 mm	Mesh	10 L / m²

*Ripping only required where soils are compacted, for example, decommissioned site compounds, building pads, parking areas, stockpile areas, roads and haul routes.

**In medians, separators or contained areas within pavements, subsoil drainage shall be installed in accordance with Standard Drawing 1643.

Amelioration agents, where required in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface at the required rates prior to subsoil operations. **Hold Point 8**

Subsoil operations shall occur immediately after the application of amelioration agents. **Witness Point 3, 4 or 5**

Topsoil shall be installed within three days from the completion of the subsoil operations. Topsoil shall be spread to the required depth over the prepared surface. Topsoil shall be moistened with a solution of water and wetting agent. **Witness Point 6**

Mulch shall be installed within one day from the completion of the topsoil operations. Mulch shall be spread to the required depth over the prepared surface.

Plants shall be installed within five days from the completion of the mulch operations.

Plants shall be installed within two days of delivery to site. The Contractor shall give two days notice prior to delivery of plants to allow inspection of the plants. **Witness Point 7**

Prior to installing plants, plants shall be set out in accordance with Clause 8.5.3.3. **Hold Point 11**

Plants shall be:

a) thoroughly watered 1-2 hours prior to planting

b) installed with controlled / slow release fertiliser, placed in each planting hole

c) installed with water holding agents, where specified

d) staked, where required, and

e) watered, on the day of installation, with a solution of water and wetting agent until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

Topsoil per planting hole – should only be used in small areas given the high labour costs associated with incorporating topsoil to individual planting holes.

Jute or coir mesh may be used to secure mulch on steep batters.

8.5.3.2 Planting Containers ≥ 25 L

Plants ≥ 25 L shall be installed in accordance with Table 8.5.3.2

Table 8.5.3.2 – Planting ≥ 25 L Containers

Slope	Standard Drawing	Detail	Subsoil Operation	Backfill Soil Per Hole	Topsoil Depth	Mulch Depth	Initial Watering
Planting Mulch Areas**							
≤ 1 on 4	1654	1	Ripping base of hole 200 mm and Roughening side of hole	Varies with container size - Remaining depth of hole	300 mm	150 mm	20 L per plant
Planting Grass Areas**							
≤ 1 on 4	1654	2	Ripping base of hole 200 mm and Roughening side of hole	Varies with container size - Remaining depth of hole	300 mm	150 mm	20 L / per plant

Slope	Standard Drawing	Detail	Subsoil Operation	Backfill Soil Per Hole	Topsoil Depth	Mulch Depth	Initial Watering
Planting Slopes > 1 on 4 – Free Draining Soils							
> 1 on 4	1654	3	Ripping base of hole 200 mm and Roughening side of hole	Varies with container size - Remaining depth of hole	300 mm	150 mm	20 L / per plant
Planting Slopes > 1 on 4 – Poor Draining Soils							
> 1 on 4	1654	4	Ripping base of hole 200 mm and Roughening side of hole	Varies with container size - Remaining depth of hole	300 mm	150 mm	20 L / per plant
Planting in Contained Areas							
-	1643	2	Ripping base of hole 200 mm and Roughening side of hole	Varies with container size - Remaining depth of hole	300 mm	100 mm	20 L / per plant

**In medians, separators or contained areas within pavements, subsoil drainage shall be installed in accordance with Standard Drawing 1643.

Prior to installing plants, plants shall be set out in accordance with Clause 8.5.3.3. **Hold Point 11**

The planting hole shall be excavated and the base of the hole ripped and the sides of the hole roughened in accordance with Table 8.5.3.2. **Witness Point 3 or 5**

Amelioration agents, where required in the *Soil Management Plan – Construction*, shall be spread over the subsoil surface and sides of holes at the required rates prior to subsoil operations. **Hold Point 8**

Plants shall be installed within two days of delivery to site. The Contractor shall give two days notice prior to delivery of plants to allow inspection of the plants. **Witness Point 7**

The plant, backfill material, topsoil shall be installed within one day from the completion of the planting hole. **Witness Point 6**

Planting shall be:

a) thoroughly watered 1-2 hours prior to planting

b) installed with controlled / slow release fertiliser, placed in each planting hole

c) installed with water holding agents, where specified

d) staked or guyed

e) installed with mulch, and

f) watered, on the day of installation, with a solution of water and wetting agent until the topsoil layer is moist. Watering shall be applied in multiple applications to ensure surface erosion does not occur.

8.5.3.3 Setting-out of plants

Prior to setting-out plants the Contractor shall determine locations and extent of the following elements:

a) services

b) services easements

c) road furniture

d) lighting

e) road signs

f) structures

g) clear zones, and

h) sight visibility zones.

The Contractor shall:

a) set out plants in the locations as shown on the drawings

b) adjust locations, as required, in accordance with vegetation setback and clearance table and notes:

c) as shown on the Drawings, or

d) in accordance with the *Road Landscape Manual – Appendix 4*, where not shown on the Drawings.

e) allow the inspection of plant set out in accordance with Clause 8 of MRTS01 *Introduction to Technical Specifications*. **Hold Point 11**

8.6 Hardscape works

Hardscape work operations include:

a) planting bed edging, and

b) irrigation.

8.6.1 Concrete planting bed edging

Concrete planting bed edging shall:

a) be 150 x 150 mm

b) have expansion joints installed at regular intervals not exceeding 20 m

c) have contraction joints between expansion joints at regular intervals not exceeding 5 m and / or at changes of curvature, and

d) be installed on subgrade compacted in accordance with the requirements of Clause 15 of MRTS04 *General Earthworks*.

8.6.2 Irrigation system

Permanent irrigation systems shall:

a) only be provided where specified in the Contract

b) provide a functioning sprinkler and / or drip irrigation system that delivers a quantity of water sufficient to maintain plant health and growth that is suitable to the Region, and

c) meet the requirements of the applicable Local Government.

8.6.2.1 Irrigation System Design

Prior to installation, the proposed design shall be submitted for a determination as to its suitability. **Hold Point 12**

Design of the irrigation system shall:

a) be in accordance with Clause 8.6.2

b) be carried out by a suitably qualified, certified landscape and turf irrigation designer

c) have 240V electrical components designed by an electrical engineer, and

d) be certified by the consultant organisation which carried out the design.

Documents produced shall include:

a) schematic drawings of the irrigation system showing:

   i. the number and sequence of watering stations

   ii. the locations of:

      - water filters
      - water isolation valves
      - irrigation controller, and
      - electrical isolation equipment

b) detailed drawings of the irrigation system showing:

   i. all pipe installations

   ii. conduits

   iii. sprinkler or dripper emitters

   iv. manual or automatic valve details

   v. backflow prevention devices

   vi. water filters

   vii. rain gauge / weather station / rain sensor

   viii. controllers

   ix. protection boxes and cabinets

   x. electrical connections, and

   xi. water supply connections.

c) a schedule showing the rates of application of all water outlet devices

d) installation specifications

e) a commissioning schedule and checklist

f) a statement of the design warranty, and

g) a comprehensive operating manual, including a parts list which sets out the description and suppliers of all components.

8.6.2.2 Supply, installation and commissioning

The irrigation system shall be installed:

a) in accordance with the approved design

b) in accordance with relevant Australian Standard listed in, but not limited to, Table 3.1, and

c) by a suitably qualified, certified irrigation contractor.

All electrical installations shall be installed by a registered electrical contractor as defined under the *Electricity Act 1994*.

The Contractor shall commission and test the irrigation system, at current local government supply pressure or design operating pressure respectively for a minimum period of 30 minutes, prior to covering. **Hold Point 13**

The Contractor shall provide training to the Principal's nominated representatives in the set up and operation of the irrigation system.

8.6.2.3 Warranties, Manuals and As Constructed Drawings

The Contractor shall provide:

a) construction and installation warranties

b) three hard copies of a comprehensive operating manual, including a parts list which sets out the description and suppliers of all components

c) three hard copies (A3 format) of the As-Constructed Drawings and specifications, and

d) three copies of an editable, electronic format copy of the As-Constructed Drawings and specification.

8.7 Construction supplementary requirements

Construction supplementary requirements of MRTS16 *Landscape and Revegetation Works* shall be specified in Clause 3.6 of the MRTS16.1 Annexure.

9 Establishment and monitoring

Vegetation works maintenance consists of two distinct periods:

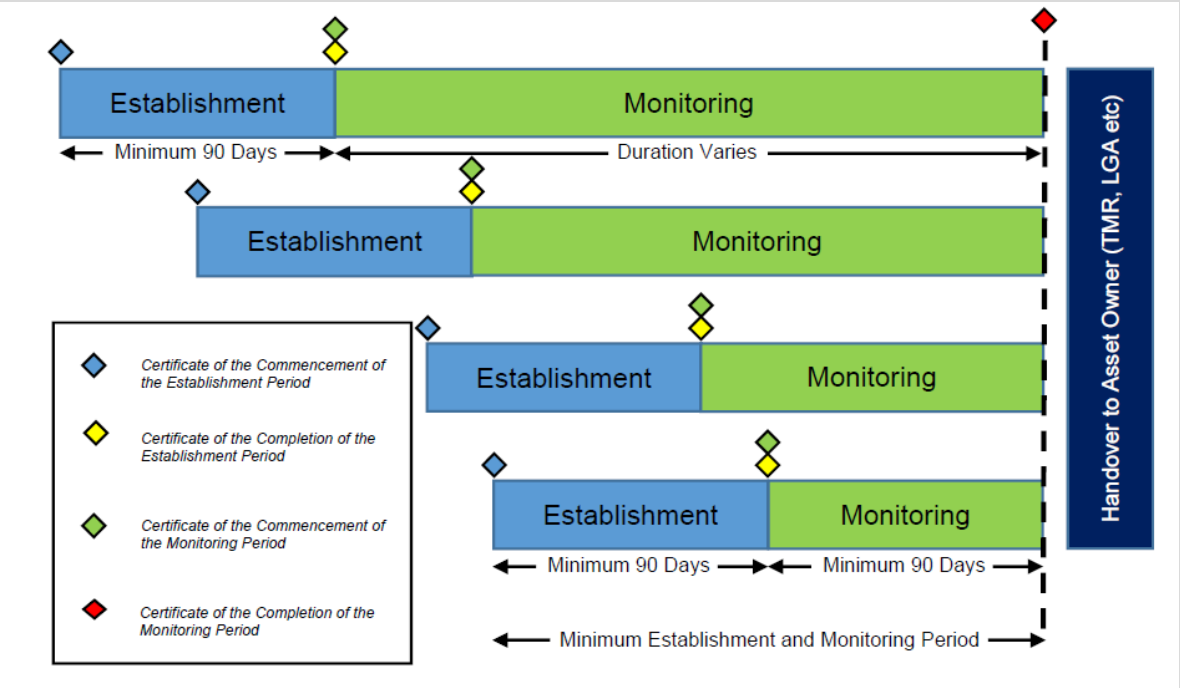
a) the Establishment Period, and

b) the Monitoring Period.

Contracts with native seeding and / or container stock treatments shall undertake an Establishment Period and Monitoring Period.

Contracts consisting of only grass seeding and / or turfing treatments may omit the Monitoring Period. Omission of the Monitoring Period shall be specified as per Clause 9.2.

Vegetation works maintenance is required for a lot or series of lots within a Contract. All vegetation work Monitoring Periods are required to be completed and to satisfy the completion criteria before the specified end date of the Defects Liability Period.



Where a lot's Monitoring Period finishes outside the Defects Liability Period, the creation of a Separable Portion may be required to be negotiated with the Contractor.

9.1 Establishment Period

The Establishment Period shall commence when the installation of treatments is deemed compliant and a *Certificate of Commencement of the Establishment Period* has been issued by the Administrator. **Milestone**

Where the Contractor has installed works in a series of lots, the Administrator shall issue a *Certificate of Commencement of the Establishment Period* for each lot. The Establishment Period shall:

a) be evaluated at four weeks (interim evaluation), in accordance with Clause 9.1.1.6 to determine if it is on track for meeting the completion criteria

b) be a minimum duration of ninety days from the date of *Certificate of Commencement of the Establishment Works*, and

c) where completion criteria has not been achieved, continue beyond the minimum ninety day until vegetation treatments meet the completion criteria of Clause 9.1.2.

9.1.1 Establishment Period operations

The Contractor shall care for the installed vegetation treatments to ensure their long term sustainability and to meet the completion criteria of Clause 9.1.2.

Establishment Period operations include:

a) watering

b) fertilising

c) weed control

d) pest and disease control

e) protection of vegetation works

f) interim evaluation

g) repair or re-installation of treatments

h) mowing, slashing and brush cutting

i) pruning

j) selective removal of non-complying plants

k) topping up of mulch, and

l) monthly program and inspection reporting.

9.1.1.1 Watering

During the Establishment Period watering shall:

a) be 'misted' or conducted in a manner that does not cause damage, run-off or subsequent erosion or displacement of treated areas

b) not spray onto, flow across or pond on paved areas including roadways, bikeways and footpaths, and

c) be in accordance with the minimum watering schedule and watering rates of Table 9.1.1.1(a) and Table 9.1.1.1(b), unless otherwise specified in Clause 4.1 of the Annexure MRTS16.1.

Watering must be applied in sufficient quantities and regularity to ensure:

a) soil moisture is maintained

b) germination of seedling occurs

c) emergence and establishment of seedlings, and

d) maintain and encourage deep rooting, and

e) the completion criteria of Clause 9.1.2 is achieved.

Table 9.1.1.1(a) – Minimum watering schedule – Establishment Period

Vegetation Treatment	% of watering rate in Table 9.1.1.1(b)	Frequency of watering days		
		Week 1, 2 and 3	Week 4 and 5	Remainder of Establishment Period
Seeding				
Drill Seeding*	100%	Daily	Every second day	As required to meet the completion criteria.
Broadcast Seeding*	100%	Daily	Every second day	
Hydromulch – Standard*	75%	Daily	Every second day	
Hydromulch – BFM*	75%	Daily	Every second day	
Hydro – compost*	75%	Daily	Every second day	
Straw mulching*	50%	Daily	Every second day	
Organic Blanket*	50%	Daily	Every second day	
Seed mesh lined drain*	75%	Daily	Every second day	
Turfing				
Turf	75%	Daily	Every second day	As required to meet the completion criteria.
Planting				
Mass Plantings – of container stock	100%	Every second day		As required to meet the completion criteria.
25 L – 45 L	200%	Every second day		
100 L – 200 L	300%	Every second day		
≥ 400 L	400%	Every second day		
The minimum relevant watering L/m² rate, as per Table 9.1.1.1(b) shall be applied. *Prior to the development of cover crop in seeding areas, apply the required minimum L/m² rate in two separate passes to minimise the risk of erosion. It is recommended, where practicable, watering occur in the morning or evening to increase infiltration and minimise evaporation.				

Table 9.1.1.1(b) – Watering rate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG Oct - Mar	AVG Apr - Sep
SEQ Districts	11	11	11	9	8	8	8	9	10	11	13	13	**12**	**10**
Mackay Whitsunday, Fitzroy and Wide Bay Districts	13	12	11	10	9	9	9	10	11	13	15	13	**13**	**10**
Far North and Northern Districts	13	12	12	11	10	10	10	11	12	15	16	14	**14**	**11**
Central Queensland and South West Districts	14	14	11	11	9	9	9	9	11	13	15	14	**14**	**10**
North West Districts	16	16	15	13	11	11	11	13	15	16	18	16	**16**	**12**

The rates in Table 9.1.1.1(b) are based on average daily pan evaporation rates + 5L to ensure water moisture is maintained consistent in the soil. The additional daily 5L/m² accounts for inefficiencies in the watering process.

Prior to the development of cover crop in seeding areas, apply the required minimum L/m² rate in two separate passes to minimise the risk of erosion.

Watering rates or frequency should be increased during periods of wind, drought and / or where soils have low moisture retaining characteristics.

Regular checks of soil moisture shall be undertaken to determine if watering rates require adjustment due to site, soil or seasonal conditions.

Table 9.1.1.1(b) is based on historic data from the Bureau of Meteorology and shall be used to adjust application rates and quantity allowances.

Prioritise early morning or night watering to lessen evaporation.

Temporary irrigation systems can be highly effective and efficient in delivering watering requirements, compared to watering with water trucks with cannons.

Below is a worked example for calculating water quantity requirements for a hydromulch seeding (75%) operation in summer in SEQ (avg 12L/m²), based on an area of 1 hectare.

Week 1 – 3	12 L x 75% x 21 days x 10,000 m² =	1,890,000 L =	1890 kilolitres / ha
Week 4 – 5	12 L x 75% x 7 days x 10,000 m² =	630,000 L =	630 kilolitres / ha
Week 6 – 12	As required to meet completion criteria – varies with treatment and conditions		

The above worked example is based on no rain events occurring within the 90 day Establishment Period. Depending on the location and season, natural rainfall events may reduce the required watering frequency. Where soil moisture is naturally maintained, watering frequency may be reduced.

Temporary irrigation system

Where the Contractor proposes to use a temporary irrigation system for Establishment Period watering purposes, the temporary irrigation system shall:

a) be designed and installed as such to deliver the quantities of water and frequency of watering in accordance with Clause 9.1.1.1

b) be conducted in a manner that does not cause damage or subsequent erosion or displacement of treated areas

c) not spray onto, flow across or pond on paved areas including roadways, bikeways and footpaths or active construction areas, and

d) be removed at the end of the maintenance period.

Depending on the scale of the project, temporary irrigation can significantly reduce the costs associated with watering, particularly where traffic control is required to apply water. Temporary irrigation is also highly effective at delivering required water levels and can be readily adjusted to cater for drier and wetter conditions.

Temporary irrigation should be set up outside of exclusion zones such that it can be accessed during daylight hours for repairs.

9.1.1.2 Establishment Period Fertilising

Seeding, turfing and planting treatments shall be fertilised at 6 weeks in accordance with Table 9.1.1.2, then as required, to ensure plant health and to achieve the completion criteria.

Table 9.1.1.2 – Establishment Period Fertilising Rates

	N	P	K	S	Trace Elements
Seeding	10 - 30 kg/ha	1 - 10 kg/ha	10 - 40 kg/ha	5 -15 kg/ha	As required
Turf	10 - 20 kg/ha	1 - 10 kg/ha	10 - 40 kg/ha	5 -15 kg/ha	As required
Planting	As required				

9.1.1.3 Weed control

Vegetation treatments shall be maintained in a weed free condition.

Handling and application of herbicides shall be in accordance with Clause 8.3.

Where vegetation treatments are poisoned due to overspray, the Contractor shall replace the vegetation treatment with the originally specified treatment.

Restricted, prohibited and invasive species shall be managed in accordance with MRTS51 and associated *Biosecurity Act 2014*.

9.1.1.4 Pest and disease control

Vegetation treatments shall be maintained in a pest and disease free condition.

Handling and application of pesticides shall be in accordance with Clause 8.3.

Restricted, prohibited and invasive species shall be managed in accordance with MRTS51 and associated *Biosecurity Act 2014*.

9.1.1.5 Protection of vegetation works

During the Establishment Period the Contractor shall install appropriate temporary measures, relative to the context and season, to protect installed works from surface water flows caused by watering and typical seasonal rainfall events. These measures must cater for the catchment area and not cause ponding on the pavement nor contribute to hydroplaning. These measures must be removed at the completion of the end of the Establishment Period.

9.1.1.6 Interim evaluation

After four weeks from installation, treatments shall be evaluated against the following criteria to determine if it is on track to meet the completion criteria. **Hold Point 14**

Repair or reinstate the area within seven days of issues being identified.

Seeding treatments

Seeding treatments shall have an even strike of cover crop.

Turfing treatments

Turfing treatments shall have a healthy grass cover and show signs of growth.

Container and ex-ground stock treatments

Throughout the Establishment Period container stock that dies shall be replaced, within seven days of being identified, with the same species and container size as originally specified.

9.1.1.7 Repair or re-installation of treatments

The Contractor shall repair / re-install failed or damaged treatments.

Where subsoil or topsoil is eroded, the Contractor shall repair and re-ameliorate the subsoil, re-apply topsoil to the affected area and reinstall the vegetation treatment.

Prior to re-installation, the Contractor shall investigate the failed treatment to determine the cause of poor performance or failure.

> The most common cause of vegetation failure, presuming the subsoil and topsoil have been adequately ameliorated, is through a lack of water and / or a lack of nutrients.
>
> If treatments are performing poorly, increased / modified watering rates and additional fertilising should be considered before complete re-installation of treatments.
>
> Where watering rates are adjusted and re-fertilising does not rectify the situation, the Quality Systems should be checked by the Administrator, prior to re-installing works.

9.1.1.8 Mowing, slashing and brush cutting

Slashing and brush cutting shall:

a) be in accordance with Table 9.1.1.8

b) be evenly windrowed or dispersed over the area, and

c) shall not disperse clippings into mulched planting beds.

Table 9.1.1.8 – Mowing, slashing and brush cutting schedule – Establishment Period

Vegetation Treatment (as shown in the Drawings)	**Mow**	**Intervention Level**	**Average Finished Height**
High Profile Areas			
Turfed Areas	1st and consecutive	50 mm	30 mm
Grass Seeded Areas (Couch or other turf species)	1st	200 mm	50 mm
	2nd	75 mm	40 mm
	3rd and consecutive	50 mm	30 mm
All Other Areas			
Turfed and Grass Seeded Areas	1st	200 mm	100 mm
	2nd and consecutive	300 mm	100 mm
Woodland / forest seeded areas	NA		

9.1.1.9 Pruning

Pruning shall:

a) be used to remove damaged, diseased or pest infested parts of plants

b) be used to formatively prune trees to clean lower sections of trunks, to allow the tree to develop appropriate form relative to pedestrian and sight visibility requirements, and

c) be in accordance with AS 4373 *Pruning of Amenity Trees*.

Care shall be taken to avoid placement of prunings in a manner that may be hazardous to public safety. Placement of prunings in clear zones, sight visibility zones and pedestrian areas is prohibited.

Pest or disease infested prunings shall be disposed off site in accordance with Clause 11 of MRTS04 *General Earthworks*.

9.1.1.10 Selective removal of non-complying vegetation

Potentially non-complying tree and shrub vegetation shall be removed in areas including:

a) sight visibility zones

b) clear zones

c) CCTV sight visibility zones

d) vegetation setbacks

e) below overhead services or structures

f) above underground services, and

g) service easements.

9.1.1.11 Topping up of mulch

Thirty days before the completion of the Establishment Period, mulched treatments shall be topped up with mulch to achieve the originally specified depths.

9.1.1.12 Monthly program and inspection report

A report shall be submitted to the Administrator every month, within seven days of the inspection.

The report shall include:

a) monthly program of maintenance works

b) dates of maintenance visits and inspections

c) maintenance works undertaken

d) maintenance works in progress

e) watering application dates and volumes

f) failed or failing vegetation treatments, their general locations on marked up plans, and suspected cause of failure

g) repair or re-installation of failed treatments

h) weeds identified and method of treatment

i) issues identified during inspections and actions required to remedy these, and

j) damage to vegetation caused by vandalism or theft of vegetation.

All vandalism and theft claims shall be supported by photographic evidence and / or police report.

9.1.2 Establishment Period completion criteria

The Establishment Period shall be completed when the lot has met the following completion criteria:

a) the area is weed free in accordance with Clause 9.1.1.3

b) seeding treatments meet the completion criteria of Clause 9.1.2.1

c) turfing treatments meet the completion criteria of Clause 9.1.2.2,

d) planting treatments meet the completion criteria of Clause 9.1.2.3, and

e) the lot has been established for a minimum 90 day duration.

At the completion of the Establishment Period a *Certificate of Completion of the Establishment Period* shall be issued by the Administrator. **Milestone**

9.1.2.1 Seeding treatments

Seeding treatments:

a) have a uniform cover of perennial and cover crop grasses over a minimum 90% of the area

b) have a minimum perennial cover of 30%

c) show no signs of nutrient deficiency

d) show no signs of water deficiency

e) have no rills or sheet erosion

f) have no bare areas > 1 m^2, and

g) grass seeded areas shall be mowed / slashed at a height in accordance with Clause 9.1.1.8.

9.1.2.2 Turfing treatments

Turfing treatments:

a) show no signs of nutrient deficiency

b) show no signs of water deficiency

c) shall be top dressed and contain no uneven jointing in pedestrian areas

d) have a healthy root system that has penetrated into the ground so that the turf cannot be easily lifted, and

e) are mowed / slashed at a height in accordance with Clause 9.1.1.8.

9.1.2.3 Planting treatments

Planting treatments:

a) show no signs of nutrient deficiency

b) show no signs of water deficiency

c) show no signs of pests or disease

d) are established and well formed, showing evidence of growth

e) have a healthy root system that has penetrated into the ground so that the plant cannot be easily lifted out of the ground

f) tree trunks shall be vertical

g) tree rootball cannot be tilted

h) where required ties shall be repaired, and

i) have a mulch depth in accordance with Clause 9.1.1.11.

9.2 Monitoring Period

The Monitoring Period shall commence with the issuing of the *Certificate of Commencement of the Monitoring Period* by the Administrator, following the completion of the Establishment Period.

Milestone

Where the Contractor has installed works in a series of lots, the Administer shall issue a *Certificate of Commencement of the Monitoring Period* for each lot.

All Monitoring Period lots must be handed over to the Authority in a single package at the completion of the Monitoring Period.

The Monitoring Period for each Lot shall:

a) be a minimum duration of 90 days, unless otherwise specified in Clause 4.2 of the Annexure MRTS16.1, from the date of *Certificate of the Commencement of the Monitoring Period*, and

b) continue until all vegetation treatments / Lots meet the completion criteria of Clause 9.2.2.

Where a lot's Monitoring Period finishes outside the Defects Liability Period, the creation of a Separable Portion may be required to be negotiated with the Contractor.

Where native seed mixes are installed in Autumn and Winter consideration should be given to increasing the minimum Monitoring Period until the end of Summer to ensure seeding has been successful. It is suggested to increase the Monitoring Period to the end of the wet season in this instance.

Where container stock has been installed, consideration should be given to increasing the Monitoring Period to ensure plants are mature enough to out-compete weeds beyond handover. It is suggested to increase the Monitoring Period to 180 days or greater.

For projects with Defects Liability Periods greater than 180 days it is suggested the Monitoring Period finish in line with the Defects Liability Period.

9.2.1 Monitoring Period operations

The Contractor shall care for the installed vegetation treatments to ensure their long term sustainability and to meet the completion criteria of Clause 9.2.2.

Monitoring Period operations include:

a) watering

b) fertilising

c) weed control

d) pest and disease control

e) repair or re-installation of failed treatments

f) mowing, slashing and brush cutting

g) pruning

h) selective removal of non-complying plants

i) topping up of mulch, and

j) monthly program and inspection reporting.

9.2.1.1 Watering

During the Monitoring Period watering shall:

a) be undertaken as required to achieve the completion criteria

b) be conducted in a manner that does not cause damage, run-off or subsequent erosion or displacement of treated areas, and

c) not spray onto, flow across or pond on paved areas including roadways, bikeways and footpaths or active construction areas.

Specific watering requirements may be nominated in Clause 4.1 of the Annexure MRTS16.1.

Watering should be undertaken to ensure soil moisture is maintained to promote plant health and to achieve the completion criteria. During periods of wind, drought and / or where soils have low moisture retaining characteristics, watering may be required. During periods of high rainfall, watering is not required.

Consideration should be given to potential costs, particularly on large projects, where multiple lots are installed and are monitored for durations longer than the minimum monitoring period nominated in the Contract.

9.2.1.2 Fertilising

Seeding, turfing and planting treatments shall be fertilised, as required, to ensure plant health and to achieve the completion criteria.

One month before the completion of the Monitoring Period, all container stock treatments shall be fertilised with an all-purpose controlled / slow release fertiliser, in accordance with manufacturers' specifications.

9.2.1.3 Weed control

Vegetation treatments shall be maintained in a weed free condition.

Handling and application of herbicides shall be in accordance with Clause 8.3.

Where vegetation treatments are poisoned due to overspray, the Contractor shall replace the vegetation treatment with the originally specified treatment.

Restricted, prohibited and invasive species shall be managed in accordance with MRTS51 and associated *Biosecurity Act 2014*.

9.2.1.4 Pest and disease control

Vegetation treatments shall be maintained in a pest and disease free condition.

Handling and application of pesticides shall be in accordance with Clause 8.3.

Restricted, prohibited and invasive species shall be managed in accordance with MRTS51 and associated *Biosecurity Act 2014*.

9.2.1.5 Protection of vegetation works

During the Monitoring Period the Contractor shall install appropriate temporary measures, relative to the context and season, to protect installed works from surface water flows caused by typical seasonal rainfall events.

These measures must cater for the catchment area and not cause ponding on the pavement nor contribute to hydroplaning.

These measures must be removed thirty days prior to the completion of the end of the Monitoring Period.

9.2.1.6 Not Used

9.2.1.7 Repair or re-installation of treatments

The Contractor shall repair / re-install failed or damaged treatments.

Where subsoil or topsoil is eroded, the Contractor shall repair and re-ameliorate the subsoil, re-apply topsoil to the affected area and reinstall the vegetation treatment.

Prior to re-installation, the Contractor shall investigate the failed treatment to determine the cause of poor performance or failure.

Throughout the Monitoring Period container stock that dies shall be replaced, within seven days of being identified, with the same species and container size as originally specified.

> The most common cause of vegetation treatment failure, presuming the subsoil and topsoil have been adequately ameliorated, is through a lack of water and / or a lack of nutrients.
>
> If treatments are performing poorly, increased /modified watering rates and additional fertilising should be considered before complete re-installation of treatments.

9.2.1.8 Mowing, slashing and brush cutting

Mowing, slashing and brush cutting shall:

a) be in accordance with Table 9.2.1.8

b) be evenly windrowed or dispersed over the area, and

c) shall not disperse clippings into mulched planting beds.

Do not mow or slash in native woodland / forest seeded areas.

Table 9.2.1.8 – Mowing, slashing and brush cutting schedule – Monitoring Period

Location	Intervention Level	Average Finished Height
Turf / High Profile Areas / Pedestrian Areas	50 mm	30 mm
Roadside grass verge areas, grass drains, and grass sight visibility areas	300 mm	100 mm

9.2.1.9 Pruning

Pruning shall:

a) be used to remove damaged, diseased or pest infested parts of plants

b) be used to formatively prune trees to clean lower sections of trunks, to allow the tree to develop appropriate form relative to pedestrian and sight visibility requirements, and

c) be in accordance with AS 4373 *Pruning of Amenity Trees*.

Care shall be taken to avoid placement of prunings in a manner that may be hazardous to public safety. Placement of prunings in clear zones, sight visibility zones and pedestrian areas is prohibited.

Pest or disease infested prunings shall be disposed off site in accordance with Clause 11 of MRTS04 *General Earthworks*.

9.2.1.10 Selective removal of non-complying vegetation

Potentially non-complying tree and shrub vegetation shall be removed in areas including:

a) sight visibility zones

b) clear zones

c) CCTV sight visibility zones

d) vegetation setbacks

e) below overhead services or structures

f) above underground services, and

g) service easements.

9.2.1.11 Topping up of mulch

Thirty days before the completion of the Monitoring Period, mulched treatments shall be topped up with mulch to achieve the originally specified depths.

9.2.1.12 Monthly program and inspection report

A report shall be submitted to the Administrator every month, within seven days of the inspection.

The report shall include:

a) monthly program of maintenance works

b) dates of maintenance visits and inspections

c) maintenance works undertaken

d) maintenance works in progress

e) watering application dates and volumes

f) failed or failing vegetation treatments, their general locations on marked up on plans, and suspected cause of failure

g) repair or re-installation of failed treatments

h) weeds identified and method of treatment

i) issues identified during inspections and actions required to remedy these, and

j) damage to vegetation caused by vandalism or theft of vegetation.

All vandalism and theft claims shall be supported by photographic evidence and / or police report.

9.2.2 Monitoring Period completion criteria

The Monitoring Period shall be completed when the lot has met the following completion criteria:

a) the area is weed free in accordance with Clause 9.2.1.3

b) seeding treatments meet the criteria of Clause 9.2.2.1

c) turfing treatments meet the criteria of Clause 9.2.2.2

d) planting treatments meet the criteria of Clause 9.2.2.3, and

e) the lot has been monitored for a minimum 90 day duration, or as otherwise specified in Clause 4.1 of the Annexure MRTS16.1 or the Contract.

Upon successful completion of the Monitoring Period the *Certificate of Completion of the Monitoring Period* shall be issued by the Administrator. **Milestone**

9.2.2.1 Seeding treatments

Seeding treatments shall:

a) have evidence of healthy growth

b) show no signs of nutrient deficiency

c) contain no bare areas > 1 m², and

d) contain no rills or sheet erosion.

Grassing treatments shall:

a) have 90% perennial grass coverage, and

b) roadside grass verge areas, grass drains, and grass sight visibility areas are mowed / slashed at a height in accordance with Table 9.2.1.8.

Woodland / forest treatments:

a) have 90% perennial grass coverage, and

b) contain native seed strike throughout the treatment area, or

c) where the Monitoring Period has been extended to 365 days or greater, have tree or shrub strike of nominally one plant per 16 m² (nominally 4 m centres).

Where high concentrations of shrubs and trees seedlings stricke and shade out grass species, lower percentage of perennial grass coverage is suitable. The intent of the coverage is to provide slope / surface stability.

9.2.2.2 Turfing treatments

Turfing treatments shall:

a) show no signs of nutrient deficiency

b) contain no uneven surfaces or jointing in pedestrian areas

c) have a healthy root system that has penetrated into the ground so that the turf cannot be easily lifted, and

d) are mowed / slashed at a height in accordance with Table 9.2.1.8.

9.2.2.3 Planting treatments

Planting treatments shall:

a) show no signs of nutrient deficiency

b) show no signs of water deficiency

c) show no signs of pests or disease

d) are established and well formed, showing evidence of growth typical of the species

e) tree rootball cannot be tilted

f) be formatively pruned in pedestrian areas, high profile areas or where directed, in accordance with Clause 9.2.1.9

g) have all stakes and ties removed, and

h) have a mulch depth in accordance with Clause 9.2.1.11.

9.3 Establishment and monitoring supplementary requirements

Establishment and monitoring supplementary requirements of MRTS16 *Landscape and Revegetation Works* shall be specified in Clause 4.4 of the Annexure MRTS16.1.