APPENDIX A:
DESIGN REPORT FOR LANDSCAPE FINAL DETAILED DESIGN (100%)
TABLE OF CONTENTS

1 INTRODUCTION .......................................................................................................................................... 1
  1.1 Project Background ........................................................................................................................ 1
  1.2 Scope of Report .............................................................................................................................. 1
  1.3 Deliverables .................................................................................................................................... 2
  1.4 Design Submissions ........................................................................................................................ 2
    1.4.1 Urban and Landscape Design Sub Plan and 15% Noise Wall Drawing Package .................... 2
    1.4.2 Preliminary Detailed Design Report (85%) ............................................................................ 2
    1.4.3 Final Design Report (100%) ................................................................................................... 2

2 DESIGN INPUTS .......................................................................................................................................... 3
  2.1 Design Requirements and Performance Criteria ........................................................................... 3
    2.1.1 Standards .............................................................................................................................. 3
    2.1.2 Order of Precedence ............................................................................................................. 3
  2.2 Related Design Lots ........................................................................................................................ 3

3 DESIGN DEVELOPMENT ..................................................................................................................... 5
  3.1 Design Description ......................................................................................................................... 6
    3.1.1 Landscape Character Zones .................................................................................................. 7

4 LANDSCAPE REHABILITATION AREAS ................................................................................................. 9
  4.1 Landscape Rehabilitation Areas Disturbed by Construction Activities .......................................... 9
  4.2 Bushland Regeneration Areas ...................................................................................................... 10
  4.3 Bushland Reconstruction Areas ................................................................................................... 10

5 TOPSOIL MANAGEMENT .......................................................................................................................... 12
  5.1 Landscape Topsoils .................................................................................................................... 12
  5.2 Bushland Topsoils ........................................................................................................................ 12
  5.3 Topsoil Management Zones ......................................................................................................... 15
  5.4 Topsoil Management in Landscape Rehabilitation Areas ............................................................ 15
    5.4.1 Stripping .............................................................................................................................. 15
    5.4.2 Direct Return ....................................................................................................................... 16
    5.4.3 Stockpiling .......................................................................................................................... 16
    5.4.4 Preparation for bushland topsoil application ..................................................................... 16
    5.4.5 Application of bushland topsoil .......................................................................................... 17
  5.5 Topsoil Application ....................................................................................................................... 18
  5.6 Cover Crop ...................................................................................................................................... 20

6 AREAS OF SPECIAL CONSIDERATION ................................................................................................. 21
  6.1 Fauna Crossings ............................................................................................................................ 21
  6.2 Water Quality Basins and Vegetated Drainage Channels ............................................................... 21
  6.3 Scour Protection ........................................................................................................................... 23
  6.4 Landscape Medians ....................................................................................................................... 23
6.5 Slopes Exceeding 2H:1V ................................................................. 23
6.6 Advanced tree planting ................................................................. 23
6.7 Maintenance and Monitoring ...................................................... 23
6.8 Long Batteries ............................................................................ 23
7 DESIGN INTEGRATION ................................................................... 25

7.1 Key Interfaces: ............................................................................ 25
7.1.1 Road Alignments and Earthworks ........................................... 25
7.1.2 Drainage ................................................................................. 25
7.1.3 Pavements ............................................................................. 25
7.1.4 Geotechnical ........................................................................ 25
7.1.5 Utilities ................................................................................ 25
7.1.6 Property Access and Adjustments ........................................... 25
7.1.7 Environment ......................................................................... 26
7.1.8 Signage and Roadside Furniture .............................................. 26
7.1.9 Urban Design ......................................................................... 26
7.2 Changes from Preliminary Detailed Design Submission .......... 26
7.3 Changes from Final Design Submission ..................................... 26
7.4 Ongoing and/or Outstanding Issues .......................................... 27

8 CONSTRUCTION CONSIDERATIONS ............................................... 28

8.1 Key Constructability Issues ......................................................... 28
8.2 Constructability and Staging ...................................................... 28

9 SAFETY IN DESIGN ....................................................................... 29

9.1 Key Safety Issues ....................................................................... 29
9.2 Safety in Design ....................................................................... 29

10 DURABILITY ................................................................................ 30

11 DESIGN COMPLIANCE ................................................................. 31

LIST OF APPENDICES

Appendix A LIST OF DRAWINGS
Appendix B RESPONSES TO PROJECT VERIFIER COMMENTS
Appendix C RESPONSES TO RTA COMMENTS
Appendix D ENVIRONMENTAL COMPLIANCE REGISTER

LIST OF FIGURES

FIGURE 4.1 EXTENT OF LANDSCAPE REHABILITATION AREAS ......................... 9
FIGURE 5.1 LANDSCAPE TOPSOIL PROCEDURES .............................................. 13
FIGURE 5.2 BUSHLAND TOPSOIL PROCEDURES ................................................ 14
FIGURE 5.3 TOPSOIL EXTENTS ................................................................ 15
FIGURE 5.4 SUGGESTIONS FOR WINDROWING TOPSOILS AND MULCH FOR LATER SPREADING ON BATTERS ...... 18
FIGURE 6.1 WATER QUALITY BASIN LANDSCAPE SECTION ......................... 22
1 INTRODUCTION

1.1 Project Background

The northern section of the Hunter Expressway Project will provide a high standard 27km length of dual carriageway between Kurri Kurri and Branxton that will improve safety, reduce highway congestion, and provide a safer local road network. The Kurri Kurri to Branxton section of the Hunter Expressway connects the Alliance section of the Hunter Expressway at Station 12900 to Branxton at Station 39500. The scope of the project includes four interchanges connecting the local road network at Kurri Kurri, Loxford, Allandale and Branxton. It also includes grade separated road and rail crossings, local road adjustments, and the provision of heavy vehicle stops and rest areas.

The RTA has awarded a design and construct (D&C) contract to AbiGroup Contractors Pty Ltd to build the western section of the Hunter Expressway.

The following acronyms are used in this report:

- DECCW – Department of Environment, Climate Change and Water
- DII – Department of Industry and Investment
- DJV—Design Joint Venture
- HEX – Hunter Expressway
- PV – Project Verifier
- RC – Reinforced concrete
- RCBC – Reinforced concrete box culvert
- RDG – Road Design Guide
- RS – Reinforced soil
- RTA – Roads and Traffic Authority of NSW
- SWTC – Scope of Works and Technical Criteria
- LHCCREMS- Lower Hunter and Central Coast Regional Environmental Mapping Project
- KSSW—Kurri Sand Swamp Woodland
- LHSIGF—Lower Hunter Spotted Gum-Ironbark Forest
- HLRF—Hunter Lowlands Redgum Forest
- CHISGGGBF—Central Hunter Ironbark-Spotted Gum-Grey Box Forest
- CHRF—Central Hunter Riparian Forest

This report should be read in conjunction with the drawings listed in Appendix A.

1.2 Scope of Report

This report describes the Final (100%) Detailed Design of the Landscape required between Kurri Kurri and Branxton. This design lot includes all of the planting and seeding and other design requirements of the scope of works Urban Design including noise walls, bridge treatments retaining walls and rest areas. It is not documented in this report – refer Lot U3 and U5 drawing packages.

The 85% detail landscape design reinforces and incorporates the output of related disciplines such as road geometry, drainage, geotechnical, environment and urban design and requirements of the SWTC including additional requirements described in Appendix 4, 5 and 15 and 17 of the SWTC. As described in this report, the landscape design covers all the landscape requirements for:

- General landscaping of the entire alignment including planting and seeding;
- Landscaping at interchanges;
2. Design Inputs

2.1 Design Requirements and Performance Criteria

The design of the landscape has been undertaken to comply with the design requirements and criteria listed within Appendices 4, 5, 15 and 17 of the SWTC. And the relevant design standards.

2.1.1 Standards

The requirements of the following relevant standards have been incorporated into the landscape design:

- Reference Documents
  - Hunter Expressway: Kurri Kurri to Branston, Appendix 15, Urban Design Scope of Works and Technical Criteria
  - Shortcrete Design Guidelines. RTA guidelines to avoid, minimise and improve the appearance of shortcrete – RTA.
  - Noise Wall Design Guidelines, RTA 2007
  - Designing to Minimise Vandalism – An investigation into planning and design measures to avoid or mitigate vandalism. – Draft - RTA November 2008.
  - RTA Landscape Guideline April 2008.
  - Modified RTA specifications R176, R178 and R179

2.1.2 Order of Precedence

Unless otherwise stated, the following order of precedence has been applied in the design:

- Project Deed
- SWTC
- Appendix 15
- Australian Standards;
- Other reference documents and standards.

2.2 Related Design Lots

- The following design lots are integrated into the Design Lot U6: Landscape Package – Zone 1, 2 and 3,
- Design Lot R1A, R1B and R1C: Alignment and Earthworks – Zone 1, 2 and 3
- Design Lot D1A, D1B and D1C: Drainage – Zone 1, 2 and 3
- Design Lot U3: Noise Walls Zone 1, 2 and 3
- Design Lot U5: Rest Areas
- Design Lot R4: Pavements & Subsoil Drainage – Zone 1, 2 and 3
- Design Lot R5: Street Lighting – Zones 1, 2 and 3
- Design Lot R7: Utilities – Zone 1, 2 and 3
- Design Lot R3: Signs and Line markings – Zone 1, 2 and 3
3 DESIGN DEVELOPMENT

The Kurri Kurri to Branxton section of the Hunter Expressway will pass through an area of high floristic diversity. This contributes to the character of the various landscape zones identified in the landscape concept design. It also provides all of the trees, shrubs, groundcovers and sedges required for specific uses (such as screening, filtering and erosion control, batter stabilisation and ornamental plantings) throughout the alignment.

For these reasons we have not found it necessary to include non-endemic native plantings in the project and only one exotic tree species (Olives) which is used as a cultural planting reference to the vineyard/Orchard/agricultural landscape and gateway to the Hunter Wine Region. Therefore the planting and re-vegetation strategy can be regarded as displaying a high level of endemism throughout its 27 kilometres.

The landscape planting plans are based upon the principles outlined in the Urban and Landscape Concept Design Report (Kiah Infranet 2007) and additional requirements outlined in Appendix 4, 5 and 15 of the Scope of Works and Technical Criteria (SWTC) which included LHCREMS Vegetation Community Profiles mapping April 2000 and subsequent site observations.

Notable aspects of the design are:

1. The planting has been selected from and is designed to conform to the five identified vegetation communities encountered throughout the Kurri Kurri to Branxton section of the proposed alignment.
2. The planting design conforms to, reinforces and maintains the landscape character of the character zones identified in the RTA Concept Design Report.
3. The planting design conforms to context. For example where open pasture is encountered, the planting is generally exotic pasture grasses or native grasses. Where the context is of bushland, the expressway landscape is revegetated with the corresponding bushland species.
4. Planting is carefully placed in relation to identified views from the expressway and importantly, connecting roads (many of which are tourist routes).
5. Planting at the Branxton Rest Areas utilises species from the Central Hunter Ironbark-Spotted Gum-Grey Box Forest and integrates with noise walls and mounding to create character plantings that announce the entry into Branxton township from the west.
6. Throughout only indigenous species from the encountered plant communities have been utilised. Suitable species from each plant community have been used to revegetate the alignment in key areas, while in non-critical areas, all useful plants listed from the plant community have been used (where they are able to be propagated or where seed can be utilised in hydromulch mixes).
8. Planting at noise walls and retaining walls has been maximised to take advantage of the ability to plant non-frangible species between barriers and walls at these locations where space has allowed.
9. Endemic macrophyte and margin zone planting at water quality ponds is designed to allow migration to individual species preferred depth.
10. Where there is a low possibility of scour in swales and drains (between 0.5% and 5% slope), they are vegetated with non-invasive native grasses and sedges in conjunction with Jute Mesh and bitumen emulsion.
11. Feature trees are selected from the vegetation communities occurring within the character zones in which they occur.
12. A hierarchy of intersections has been identified through unique planting.
13. There is a direct relationship between the vegetation communities and soil landscapes, such that soil management as proposed will see areas replanted with species suited to a particular soil landscape.
In particular, the commitment to apply direct return of topsoils (given the integrity of bushland within the corridor) immediately or soon after stripping, in order to take advantage of soil-stored seed, may well obviate the requirement for much of the hydromulching which has been documented and produce a far superior biodiversity outcome.

3.1.1 Landscape Character Zones

The landscape character zones are derived from the Urban and Landscape Design Report prepared by Kiah Infranet. Character Zones 5 to 11 apply to the works from Kurri Kurri to Branxton. The following is a summary of the landscape treatment for each character zone.

3.1.1.1 Character Zone 5 - Urban Environs at Kurri Kurri

This character zone connects to the Alliance stage of the upgrade and as such must display continuity in design with that section. The vegetation community encountered is the Kurri Sand Swamp Woodland, a unique vegetation community over a deep sand soil profile with a unique complement of plant species (many of which are excellent species for highway revegetation purposes). The dominant structure is the Kurri Kurri Interchange connecting to the township of Kurri Kurri in the south and Heddon Greta in the north. However the urban environs are not dominant visually from the new expressway. In this zone the expressway runs parallel to high voltage overhead power lines requiring extensive clearing distances which have influenced planting decisions. To emphasise the presence of the town centre, feature trees selected from the Kurri Sand Swamp Woodland such as Parramatta Red Gum and Narrow-leaved Apple are planted in semi-formal treatments with mass planted KSSW shrubs and Native Sarsaparilla providing colour below.

3.1.1.2 Character Zone 6 – McLeod Road to Old Maitland Road – Industry and Pastureland

The key features of this character zone are the Loxford Interchange and the proximity to the Kurri Kurri Aluminium Refinery to the North which is glimpsed obliquely (sightline via the electricity easement) by road users travelling east. The landscape design responds to its presence with a striped geometric planting pattern in the median (Banksia spinulosa, Hakea dactyloides, Melaleuca nodosa and Lambertia Formosa) contrasting the natural setting of the surrounding vegetation.

3.1.1.3 Character Zone 7 – Old Maitland Road to East Allandale Road – Quarry and Bushland

This character zone traverses extensive areas of bushland and is typified by taller vegetation from the Lower Hunter Central Hunter Riparian Forest vegetation which also provide the surroundings for the fauna underpasses and arboreal crossings.

3.1.1.4 Character Zone 8 – East Allandale Road to Mount Molly Morgan – Undulating Rural Land

From this character zone the views into the hinterland and to the Barrington Tops travelling west and views to Kurri Kurri, the Aluminium Refinery and Mount Sugarloaf to the east become more apparent, and where views occur from existing pasturage, they are retained. Elsewhere, extensive areas of Bushland Reconstruction will infill gaps and reconnect patches of existing bushland. The dominant trees are Forest Red Gum, Spotted Gum and Ironbarks.

3.1.1.5 Character Zone 9 – Mount Molly Morgan to Greta – Rugged Terrain

Beginning at the Camp Road Underpass, this character zone enters more rugged terrain at the foothills of Mount Molly Morgan. The Camp Road Underpass is a key feature of this zone and is installed to allow views from both Camp Road, the expressway, and to Mount Molly Morgan. As shown in the aerial perspective, the underpass nestles comfortably in the foothill setting. The obsolete section of Camp Road is reconstructed to match the existing context.
Extensive bushland reconstruction around the interchange will further reduce the impact of the road, and further integrate it with the woodland character. Forest Red Gum is the dominant feature tree, with woodland planting composed of a broad range of up to thirteen other species of Eucalypts.

3.1.1.6 Character Zone 10 – Greta to Branxton Interchange – Spotted Gum Dominant
Extensive areas of bushland occur in this zone and it is likely that there will be considerable scope for bushland regeneration to improve the biodiversity of the vegetation communities present. A long section of median planting is required in this zone to reduce headlight glare comprising Banksia spinulosa, Hakea dactyloides Melaleuca nodosa and Lambertia formosa. Taller shrubs for screening noise walls include Callistemon salignus, Melaleuca linariifolia and M. stypheloides. A large cutting at Station 32800 is revegetated with plants from the Lower Hunter Spotted Gum – Ironbark community in order to visually ameliorate the impact of the cutting which occurs within a forest setting. The Tuckers Lane overpass is planted with an advance of Forest Red Gum (Eucalyptus tereticornis).

3.1.1.7 Character Zone 11 – Branxton – Wine Region and Urban Environments
This zone must create an effective visual connection to the town of Branxton at the Branxton Interchange. The Vineyard pattern (derived from the concept design) has been developed in detail design and is now represented by rows of Olives planted in deep furrows to represent agricultural patterns on the landscape. The Olive chosen is a selection called “Swan Hill” which is known to not produce pollen or fruit and does therefore not represent a weed hazard. The Olive species best able to replicate the pattern in a low maintenance environment. The rows will appear pronounced. Strip plantings of native grasses and shrubs complete the effect. A native grass planted median allows clear views of the interchange and the cultural plantings. Avenue planting of Spotted Gum with native grasses in the verge below line the entry road into Branxton.

South of the interchange, bush regeneration will reinforce the existing woodland forest. At Wine Country Drive the formal landscape treatment is repeated with Avenue plantings lining Wine Country Drive and formal plantings announcing the approaches to the overpass.

The Central Hunter Ironbark Spotted Gum Grey Box Forest which is encountered for the majority of this zone introduces new species which are available for use for various purposes. Screening for noise walls in this zone include Allocasuarina luehmannii, Melaleuca linariifolia with Lomandra multiflora subsp. multiflora as an understory. To Corymbia maculata (Spotted Gum) are added the feature trees Eucalyptus crebra (Narrow-leaved Ironbark) and E. moluccana (Grey Box). Each of these species is represented in the Branxton Rest Areas. Scoblly Gums have been co-opted from the KSSW community to specifically cast a shadow effect on noise walls in this zone.

3.1.1.8 Branxton Rest Areas
The rest areas at Branxton are described in the rest area design report. They are an important feature of the highway landscape and the formal planting grid, landforming and gabion walls of the rest areas announce entry to the wine county region for eastbound travelers.

4 LANDSCAPE REHABILITATION AREAS
In addition to the above general aspects of the landscape, the landscape design also includes requirements as set out in Appendix 15 for Landscape Rehabilitation Areas. See Table 4.1 below for the extent of landscape rehabilitation areas. Landscape Rehabilitation Areas are designed to protect and improve the biodiversity of the dominant vegetation communities (especially those listed as EEC’s which include; Central Hunter Riparian Forest, Hunter Lowland Redgum Forest, Kurri Sand Swamp Woodland, Lower Hunter Spotted Gum-Ironbark Forest and post the original mapping now also includes Central Hunter Ironbark-Spotted Gum-Grey Box Forest) within the project area.

<table>
<thead>
<tr>
<th>Chainage</th>
<th>Description</th>
<th>Dominant vegetation communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>12900 - 20000</td>
<td>Chaining 12900 to waterway at Chainage 20000</td>
<td>Kurri Sand Swamp Woodland Lower Hunter Spotted Gum Ironbark Forest</td>
</tr>
<tr>
<td>20700 - 26600</td>
<td>Waterway at Chaining 20700 to 800m south of Allandale interchange</td>
<td>Lower Hunter Spotted Gum Ironbark Forest Hunter Lowland Redgum Forest</td>
</tr>
<tr>
<td>28250 - 35300</td>
<td>750m north of Allandale interchange to Branxton interchange</td>
<td>Lower Hunter Spotted Gum Ironbark Forest Hunter Lowland Redgum Forest</td>
</tr>
</tbody>
</table>

Figure 4.1 Extent of Landscape Rehabilitation Areas
Landscape Rehabilitation Areas include the following sub types:

4.1 Landscape Rehabilitation Areas Disturbed by Construction Activities
These are areas which include de-commissioned side roads and tracks, batching plants, site offices and compounds, construction parking areas, and all other areas with slopes 3:1 or less which require rehabilitation following construction. These areas are indicated on the planting and seeding plans and topsoil plans and will be rehabilitated according to Appendix 15.6 and RTA Specification D & C R178 Vegetation which specifies measures such as:

- The method of striping of A1 and A2 horizons topsoil for re-use in landscape rehabilitation areas;
- Direct return of topsoil where practical;
- Stockpiling of bushland topsoil in order to preserve the stored soil seedbank and soil micro-flora;
- Preparation of receiving sites for bushland topsoil;
- Composting and amelioration of components (site topsoil and woodchip) of bushland topsoil;
- Application of bushland topsoil, and;
- Application of the appropriate hydromulch seed mix and planting (according to character zone and vegetation community).

Within Landscape Rehabilitation Areas disturbed by construction activities, the Contractor must implement careful management of topsoil stripping, storage and return for the purpose of preserving the native species soil seedbank. In summary, the soil seedbank from nominated areas is to be salvaged during clearing operations, stored according to vegetation community type, and then spread on batters and road verges to revegetate the site as construction is progressively completed. In optimal circumstances, programming will facilitate the direct return of topsoil.
Apart from the obvious ecological benefits such as the return of the endemic species composition (the soil seedbank will be composed entirely of native seed in the areas proposed for this treatment), prevention of weeds and improved management of Endangered Ecological Communities (avoiding the introduction of non-local genetic material into EEC’s), the project cost savings could prove to be substantial by reducing the requirement for seed collection, hydromulching, and landscape planting.

Plant propagules other than seed can also be present in the salvaged soil. These can include the roots and tubers of herbaceous native irises, lilies and other plant types which can propagate from below ground plant parts. In the majority of native plant communities, species with soil-stored seed can comprise 20-50% of the total flora. Soil seedbanks are composed mainly of fast growing pioneer species, particularly ground layer species and shrubs. Many of these species are not reliably propagated from seed (eg; Persoonia spp.)

The extent of potential Landscape Rehabilitation Areas Disturbed by Construction are indicated on the Planting and Seeding Plans.

4.2 Bushland Regeneration Areas

These comprise well forested areas within the project boundary where within 12 months of commencement of the work they can be anticipated to have less than 15% weed cover. Regenerating the bushland within the project boundary will improve biodiversity and improve the expressway backdrop of native Australian landscape and pastoral views.

The Bush regeneration approach will utilise 5 strategies in order to remove weeds:

- Selective spraying with herbicides;
- Cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brushcutters and painting out stumps with herbicide;
- Target drilling and injecting large exotic trees with herbicide;
- Hand removal, and;
- Burning areas dominated by naturalised grasses.

The D and C will make all efforts to exclude access to these areas other than the designated bush regenerators, to prevent disturbance and the introduction of weeds. Access should be strictly policed because the savings in later remedial action are likely to be significant.

This is particularly pertinent because since the LHCREMS native vegetation mapping by Biosis Research in 2005 upon which the landscape rehabilitation areas and clearing limits are based, ground –truthing has shown that there has been significant increases in the regrowth vegetation cover of bushland.

The extent of potential bushland regeneration areas are indicated on the Planting and Seeding Plans.

4.3 Bushland Reconstruction Areas

These are areas within the project boundary where existing bushland or bushland remnants surround or are in proximity to clearings, and where the new expressway would cause these areas to become “island” clearings.

These areas will be subject to landscape rehabilitation through active revegetation (called “Bushland Reconstruction”) to “fill” the “gaps” in the existing bushland. This increases the area of each vegetation community, compensates for some of the loss due to clearing for the expressway and improves habitat connectivity for fauna. The majority of bushland reconstruction will be comprised of the five vegetation communities listed as Endangered Ecological Communities.

It is anticipated that many of these areas will have topsoil horizons intact and will not require additional topsoil. In addition there may be remnant trees, shrubs or native grasses present which precludes extensive cultivation. Soil preparation will include the addition of ameliorants and cultivation as recommended by the project soil scientist.

Direct seeding of natives with the appropriate hydromulch seed mix (according to character zone and vegetation community), and/or mass planting and follow up weed control will contribute to a well vegetated corridor with improved biodiversity.

Areas of bushland reconstruction were identified from aerial mapping. In the intervening period since mapping, ground –truthing has shown that bushland has increased in some areas through regrowth with the introduction of very few weeds. Therefore many of the areas indicated as bushland reconstruction may be best managed as bushland regeneration areas with no planting seeding or mulching required. Such areas will be identified on site by the Landscape Restoration Manager.

As for bushland regeneration areas, it is in the contractors interest to restrict access to these areas wherever possible in order to allow the natural regrowth to continue for the duration of the construction period.

The extent of potential bushland reconstruction areas are indicated on the Planting and Seeding Plans.
5 TOPSOIL MANAGEMENT

Topsoil management, as detailed in Appendix 15, Version 6.0, of the SWTC and topsoil drawings HEA-GEN-DRG-LA001-301 to 326, has been carefully considered in respect of opportunities for:

- direct return of topsoil;
- soil amendments;
- the utilization of organic materials and other soil ameliorants as additives to improve soil quality, and;
- the stockpiling of topsoil to preserve the soil seed bank and to ensure soils from plant communities remain intact and are returned to areas where those plant communities occur.

The application of these requirements for the Kurri Kurri to Branxton section are described below.

Landscape Topsoil and Bushland Topsoil.

Two terms are used to describe the topsoils used for this project. Landscape Topsoils and Bushland Topsoils.

5.1 Landscape Topsoils

All topsoils which are not required for landscape rehabilitation areas are hereafter referred to as “Landscape Topsoils”. Landscape topsoils are generally from areas of the alignment where existing (mainly exotic) pasture is the main vegetation cover but may also include patches of bushland or remnant trees. Generally there is no intact existing vegetation community present.

Unlike Bushland topsoils, there is no requirement to strip, store or apply landscape topsoils according to vegetation community. Therefore landscape topsoils are to be stripped and stored according to RTA specification R44.

The method for treating landscape topsoils is summarised in Figure 5.1.

5.2 Bushland Topsoils

App. 15 of the SWTC uses the term “Bushland Topsoil” to describe topsoil to be stripped and re-used in the nominated Landscape Rehabilitation Areas. These are the topsoils where the native soil seedbank is to be preserved. Site visits by the project team have verified the notable absence of weeds in the nominated landscape rehabilitation areas.

The method for treating landscape topsoils is summarised in the figure 5.2.
5.3 Topsoil Management Zones
The nominated chainages where each type occurs, and the vegetation communities that occur within them, are shown in Figure 5.3 below:

![Figure 5.3 Topsoil Extents](image)

5.4 Topsoil Management in Landscape Rehabilitation Areas
The following extract from the SWTC Appendix 15 describes the requirements for stripping, storing and applying bushland topsoils. Any recommendations, proposed changes or comments are shown in red.

5.4.1 Stripping
- The Contractor must undertake soil pedology survey and analysis within each soil landscape and vegetation community type. Each soil landscape and vegetation community type must be tested in three locations, each with three sampling depths of A1, A2 and B1 horizon. Soil testing must be undertaken by a National Association of Testing Authorities (NATA) registered laboratory and include pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon/nitrogen.
- Soil testing and any recommendations must be made by an appropriately qualified soil scientist with expertise in revegetation.
- The Contractor must strip at least 50,000m³ of A1 Horizon topsoil from Landscape Rehabilitation Areas, or sufficient topsoil to implement the landscape rehabilitation requirements, whichever is greater, in the manner outlined below. The quantities of topsoil from each vegetation community type stripped must be directly proportional to the areas of each vegetation community subject to landscape rehabilitation activities.
- Stripping undertaken for the purpose of generating bushland topsoil must be undertaken by the following process:
5.4.2 Direct Return

The construction process must facilitate the immediate re-laying (hereafter referred to as direct return) of stripped topsoil in Landscape Rehabilitation Areas. Where it is not practical to direct return bushland topsoil to batters and embankments of the road formation due to earthworks programming, the Contractor is to direct return an amount of bushland topsoil to Landscape Rehabilitation Areas within the road corridor where bushland restoration is required.

Where it is not possible to undertake direct return of bushland topsoil, bushland topsoil must be stockpiled in areas separate from all other stockpiled material to minimise the potential for weed contamination. Topsoil handling and stockpile contamination are critical factors with regard to the success of the landscape rehabilitation process.

5.4.3 Stockpiling

Bushland topsoil must be stockpiled separately by vegetation community type. For each vegetation community type, topsoil is to be stockpiled as follows:

(i) A2 Horizon in windrows up to one (1) metre high by a maximum of three (3) metres wide at the base; and
(ii) A2 Horizon in windrows of any stable configuration. (According to R44)

(j) A2 Horizon Only) must not be stockpiled for periods greater than:

(i) Bushland topsoil from Endangered Ecological Communities - 6 months;
(ii) Bushland topsoil from the Grotta to Branston section - 12 months, with the exception of cut batters below the first bench and fill batters above the first bench; and
(iii) All other bushland topsoil – 18 months.

(k) Topsoil stockpile areas must be managed continuously so that weed densities are no greater than 5% over the entire stockpile area. All weeds must be eradicated before setting seed.

(l) Large, clearly legible signs must be placed and maintained on each windrow, nominating vegetation community type, soil horizon, collection area (e.g. by chainage) and date of stockpiling.

5.4.4 Preparation for bushland topsoil application

(m) All bushland topsoil re-used within landscape rehabilitation areas must be prepared in the following manner:

(i) Soil testing must be carried out to finished sub-grades to address any severe soil deficiencies. Should the test results indicate that subsols contain contaminants or have chemical properties likely to inhibit the success of the landscape restoration process, additives must be added during ripping, as required by the Soil Scientist;

(ii) Prior to the placement of topsoil, continuously eradicate weeds to treatment and adjoining areas, until weed growth four (4) weeks after the last spray comprises less than 5% cover, and then eradicate remaining weeds, and;

(iii) Rip the subsoil to a depth ranging from 50-100mm using the tynes on a swivelling head excavator bucket, or by some other means to form a loosened or roughened surface suitable for the application of topsoil and/or seed. Since this procedure is for slopes of 3:1 or less, we recommend ripping to 300mm. During ripping, mix in any materials required by the soil testing into the upper 100 mm layer to the rates specified within the soil testing recommendations. Rip parallel to the final contours where possible. Do not rip within the drip line of trees to be retained. Do not disturb services or tree roots, cultivating these areas by hand if necessary. Remove any weeds, rubbish or other deleterious material brought to the surface by the ripping process.
Figure 5.4  Suggestions for Windrowing topsoils and mulch for later spreading on batters

Final topsoil treatments will be made in consultation with the project soil scientist. The topsoil treatments may include amelioration with compost, lime, gypsum and fertilizer and other parameters as identified in R178.

5.5 Topsoil Application

The following topsoil applications are required for the various landscape types encountered.

Topsoil Treatment 1: For Areas Flatter than 3H:1V (For planting, hydromulching, turfing and grass seeding all areas other than batters).

- Rip the subsoil to a depth of 300mm (except within water quality basins and creek edges which should be ripped to 100mm only, and for medians which should be ripped to 200mm). Rip parallel to contours on slopes.
- Do not smooth orcompact the roughened subsoil surface prior to the application of topsoil.

Topsoil Treatment 2: For Areas Steeper than 3H:1V (For hydromulching batters)

- Prepare batter sub-base by ripping to a depth of 100mm using the tynes on a swivelling head excavator bucket, or by some other means to form a loosened or roughened surface suitable for the application of topsoil and/or seed. During ripping, mix in any materials required by the soil testing into the upper 100mm layer to the rates specified within the soil testing recommendations and/or as advised by the Project soil scientist or geotechnical advisor. This may include the mixing of gypsum or any other suitable agent to prevent erosion of subsoil. If dispersivity is identified as an issue for the materials on the cut batter faces to be vegetated.
- Apply A1 horizon topsoil to a minimum depth of 50mm, but not more than 100mm.
- Spread out the topsoil to an even surface but do not otherwise smooth or compact the surface. (topsoil should have been previously ameliorated and any additional materials required by soil testing mixed at the stockpile.)
- Provide ‘cleatmarks’, ‘dimples’ or horizontal scores so the sub-base surface. This is best achieved by track rolling with an excavator or bulldozer.
- Apply appropriate hydromulch seed mix.
- For slopes steeper than 2H:1V and up to 1.5H:1V install Jute Mesh as per the specification over final topsoil preparation and prior to hydromulching.

Topsoil Treatment 3: (Bushland Reconstruction and Landscape Rehabilitation Areas Disturbed by Construction Activities)

- Where existing topsoil is absent;
- Rip the subsoil/subgrade to a depth of 300mm. Where existing road surface occurs, it is to be removed. Avoid ripping within the dripline of established trees. Where A2 horizon is absent, apply A2 Horizon to a depth of 200mm. Apply A1 horizon bushland topsoil to a depth of 100mm. Apply appropriate hydromulch seed mix or planting in accordance with the landscape plans.
- Where existing topsoil is present;
- Assess whether there may be seedling regeneration in the area. In such cases, the landscape restoration officer may take no immediate action. If no germination can be observed, Rip the topsoil to a depth of 300mm. Avoid ripping within the dripline of established trees. Apply composted site mulch to the amount as directed by the Alliance soil scientist to augment the organic matter of the site soil. Apply appropriate hydromulch seed mix or planting in accordance with the landscape plans.
- Where existing topsoil and grass or other vegetative cover is also present;
5.6 Cover Crop

A cover crop of fast growing annual grasses is to be applied to all disturbed areas of the site. The purpose of the cover crop is to stabilise the surface material, particularly baffles, and to provide an effective barrier to erosion. Depending upon programming and construction staging, the cover crop may be applied separately or in conjunction with the final native seed mix.

For pasture grass only mixes, the seed of couch and cover crop are best applied simultaneously. Should the seeding fail at any time it can be reapplied until it establishes. Cover crop seeding will also be used to minimise erosion and weed establishment on topsoil stockpiles. The generally accepted rate used by the RTA for cover crops is 65kg/ha. However given the greater emphasis on stockpile procedures and the corresponding likelihood of soil-stored seed, we have reduced this rate to 30kg/ha in order to improve conditions for germination of soil stored seed and native seed applied with cover crop.

Cover crop seeding will also be used to stabilise the surface material, particularly baffles, and to provide an effective barrier to erosion. The generally accepted rate used by the RTA for cover crops is 65kg/ha. However given the greater emphasis on stockpile procedures and the corresponding likelihood of soil-stored seed, we have reduced this rate to 30kg/ha in order to improve conditions for germination of soil stored seed and native seed applied with cover crop.

The area of special consideration includes the planting of individual provenance trees mulched and staked to provide a quick landscape effect, and facilitate the reintroduction of specific desirable species. 75mm mulch is to be applied to all planted areas whether group planting or individual tree planting. Individually planted trees will receive 1mx1mx75mm of mulch per tree. Do not apply mulch to areas below water lines. All tubestock shrubs and trees are to be staked with a marker stake as per the planting schedules.

### 6.1 Fauna Crossings

Other than the Allandale Quarry property access which doubles as a fauna crossing, all fauna crossings (not including arboreal crossings) follow creeklines in crossing the expressway and utilise reinforced concrete box culvert drainage structures. Therefore the landscaping for these areas requires careful consideration to prevent damage from flooding as well as to assist fauna in using the crossings. The fauna underpasses comply with the requirements of Appendix 4. These requirements include plantings to attract fauna, allowing unobstructed views to, and through the underpass, and strategic tree plantings for fauna refuge. The creeks crossed by the expressway are generally intermittent and respond to seasonal rains.

Measures to assist the landscape establishment include:

- Organic fibre mesh pinned to 2H:1V max embankments over 50-100mm depth of additional topsoil through which long stem tubestock or regular tubestock macrophytes and tussocks are planted. The mesh is to cover the embankment to the top of the channel or to the extent of disturbed ground.
- Site rocks of various size from 500-1000mm in natural formation to assist holding down mesh and for scour protection where the new work interfaces with the existing creek channel (This treatment is for zones beyond scour protection as described in the drainage package).
- Beyond the zone of normal high water begins the typical landscape zone of trees shrubs and groundcovers with 50-100mm additional topsoil if required and 75mm mulch if planted.
- Sugar Cane mulch is used in place of site-won tub-ground mulch in the proximity of riparian zones to prevent tannins from leaching into the waterways.
- Central Hunter Riparian Forest vegetation community species occur in all riparian zones and will typically include plantings of CHRF trees, CHRF shrubs and planting of macrophytes and tussocks at the interface between the existing creek and culvert with species including: Allocasuarina littoralis, Casuarina glauca, Angophora floribunda, Eucalyptus tereticornis, and Melaleuca decora, shrubs such as Callistemon lineariis, Melaleuca nodosa and Leptospernum polygalifolium and, macrophytes and tussocks such as Danella, Lomandra, Fimbrystilis, Gahnia, Lepidosperma, Schoenus and Themeda.

- Fauna escape poles are located on the embankment out of the main channel and approx. 2 metres from the end of the headwall. A second pole is to be provided where existing trees are more than 10 metres from the first pole.

### 6.2 Water Quality Basins and Vegetated Drainage Channels

During the 85% design phase, the landscape design for water quality basins accommodated their transferall from "for construction temporary" basins to permanent basins. Water quality basins were designed to be permanently full, therefore the inundated zone of the basin was not to be planted as they may have held water at the time of planting and in most cases would have been too deep for planting (typically 2 metres). However in extended dry periods they may have become dry through leakage and evaporation. Therefore by planting only a percentage of the perimeter of the inundated zone where the highest fluctuations in water level would have occurred, the design anticipated opportunistic migration of sedges into the deeper levels as suits individual species.

However since that time it has been recognised that in order to achieve water quality targets in the initial stages following construction, that topsoiling and planting will be required throughout the basin. It is also recognised that basins must be pumped clean following construction and therefore the planting may proceed following this procedure. The 100% landscape plans document this additional planting.
All basin plantings are endemic sedges, macrophytes and grasses. Water Quality basins are to be prepared and planted as follows:

- Topsoiling will occur on the basin embankments from the maximum water level to the permanent water level.
- Ripping internal batters and floor to 100mm depth.
- Applying 50-100mm topsoil on inner embankments, and 50mm on basin floor.
- Laying and pinning organic fibre mesh over the embankment topsoil.
- Cover cropping of entire topsoiled area.
- Planting of tubestock macrophytes, sedges and tussocks throughout.
- 75mm mulch over organic fibre mesh to the extent of the maximum water only. No mulch within inundated zone.
- The 1-3m wide access grassed crest and outer embankments of basins will be seeded with native or pasture grasses. In some instances outer embankments are seeded with native shrubs.

For Maintenance of WQB refer to the HEX Landscape Maintenance Plan (Currently in Draft form only).

### 6.3 Scour Protection

The requirement for at least 75% vegetative cover beneath bridges over creeks (excluding the width of the creek bed) may necessitate either planting directly into the spaces between scour protection rocks or covering scour protection with 300mm depth of topsoil to enable planting. Planting is with appropriate locally endemic species to encourage fauna use. Details have been provided in the 100% landscape drawings (refer drawing details, HEX-LS-20-D805, D811 & D812).

### 6.4 Landscape Medians

Medians throughout the western section of the Hunter Expressway are 12m wide. This leaves 8300mm of landscaped zone. The design takes into consideration the road profile and drainage, surrounding landscape context, ease of maintenance, sightlines and headlight glare.

Where the alignment passes through sensitive vegetation communities, grasses used in the median are native, and where the alignment passes through paddock landscape the median grasses are exotic pasture grasses. Frangible shrubs where they occur are confined to a 4.3m wide strip with a 2 or 4m wide native or exotic mowing strip each side. Where driver sightlines conflict with the median shrub planting and shrub hydromulching, the landscape plans have been modified to ensure no shrub planting occurs within the sightlines.

Shrub planting in medians are selected from the vegetation community through which the alignment passes. The Native grass mix contains sedges which in median swales are anticipated to predominate.

### 6.5 Slopes Exceeding 2H:1V

Slopes exceeding 2H:1V (generally where retaining walls or rock cuts transition to slopes) will be prepared as for topsoil treatment 2 and with 50mm depth topsoil under pinned organic fibre mesh before seeding with the appropriate hydromulch mix. Where pinning is not possible due to rock beneath, the mesh should be extended to natural ground and "trenched as per the detail shown in the landscape plans.

### 6.6 Advanced tree planting

The 100% design incorporates 1516 advanced tree plantings of 35 litre stock and 130 Olive “Swan Hill” as 50 litre stock at the Kurri Kurri and Branxton interchanges and the rest area for feature/marker planting.

### 6.7 Maintenance and Monitoring

All HEX landscaping works will be monitored and maintained by a suitably qualified landscape specialist for a period as specified in R178 and R179.

Any required remediation measure(s) will be implemented to maintain landscaping works as required by Appendix 15 of the SWTC.

A Landscaping Maintenance Plan (LMP), detailing all landscape maintenance actions for the Landscaping Maintenance, will be prepared as a part of the Detailed Design Documentation with the final document available with the IFC documentation.

The landscaping will be cost effective; minimise ongoing maintenance requirements and utilise native species, dense planting, bold simple planting designs and rapid planting establishment.

### 6.8 Long Batteries

In agreement with the RTA, short benches have been removed where the second batter slope was considered too short to warrant the inclusion of benching. It is not anticipated that special landscape treatments are required other.
than the inclusion of Jute Mesh to the extra length of batter to counter possible increased erosive potential. This will be documented in the IFC design.

7 DESIGN INTEGRATION

7.1 Key Interfaces
In the preparation of the landscape design and topsoil strategy the following interfaces have taken place:

- Regular interface with the RTA urban, landscape and environment advisors and peer review.
- Discussion with DECC and Lands Department via RTA interface officers.
- Regular design meetings with DJV disciplines especially drainage and highway design and the DJV Environmental Representatives.
- Regular discussion and feedback sessions with construction team.
- Interface with cost estimators.
- Community Consultation (Focus Group Presentation 110504 Kurri Kurri TAFE)
- Utilities for Clearances to underground and overhead easements including utility furniture.

7.1.1 Road Alignments and Earthworks
The landscape has been designed to 100% using the 100% road design model. Weekly co-ordination meeting have ensured that the landscape interfaces satisfactorily with this version of the design. This interface includes the impact of vegetation on driver sightlines, road furniture, and the treatment for long batters.

7.1.2 Drainage
There are several drainage culvert structures and fauna underpasses crossing the main alignment under noise walls. Special noise wall foundation details have been provided to avoid clashes with underground drainage and culvert structures. Refer to the Structural Design Report.

Surface water drainage where required in front of the noise walls is collected by pits and piped to the back of the noise walls in order to maintain noise attenuation.

7.1.3 Pavements
The landscape design has taken into consideration the depth of topsoil and ripping depths in proximity to pavements, particularly in medians. Setbacks from pavement edges have been observed.

7.1.4 Geotechnical
Geotechnical interfaces will be ongoing and focus on the presence of rock batters, coal seams and acid sulphate rock and their impact upon landscape treatments.

7.1.5 Utilities
The detailed landscape plan will be provided to TransGrid, Energy Australia and Jemena and any other relevant service providers for approval before work commences. A 100% co-ordination lot will be used to check vegetation against utilities in respect of power, water, gas, Telstra and private services.

7.1.6 Property Access and Adjustments
The landscape design includes setbacks and clearances from the various fencing used throughout the project. Design packages are being reviewed by the urban and landscape team prior to release and the interface elements relevant to landscape are checked off as part of the QA system.
7.1.7 Environment
Interfaces with environmental consent conditions have been checked at all phases of the landscape design especially in respect of Appendices 4, 5, 15 and other requirements of the SWTC. Further interfaces with the respective environmental authorities are anticipated prior to IFC design.

7.1.8 Signage and Roadside Furniture
The landscape has been set back to allow for the required deflection from the wire rope safety barriers. The noise walls act and replace the requirements for fauna fences where required as detailed in the Property Works and Fencing Design Lot 86. Trees will not obstruct visibility to road signage.

7.1.9 Urban Design
The design of the landscape have been developed with regular input from our Urban designers and the RTA and maintains compliance with Appendix 15 of the SWTC. Noise walls have been integrated with the landscape design in all instances.

7.2 Changes from Preliminary Detailed Design Submission
Planting of groundcovers at intersection has been reduced considerably since the 15% design to improve maintenance requirements of these areas.

The Design for Branxton interchange has changed considerably to improve maintenance but also to produce a stronger more legible design for the long term.

The western extents of the expressway have been extended and are now regarded as zone 4. This zone has not been included in this issue.

There has been some rationalisation of the extents of vegetation communities to ensure that species are returned to environments on the new formation that are suited to the subject species. For instance in order to prevent riparian species being placed back on batter.

Hydromulching quantities for native plants per hectare have been reduced to 8kg/ha and cover crops have been reduced to 30kg/ha.

7.3 Changes from Final Design Submission

Seed Collection. Since issue of the 85% design, the RTA have engaged a seed consultant (Geoff Williams, Diversity Seeds) to advise on the seed procurement process, criteria for seed collection zones and quality assurance for seed sourcing. The hydromulching schedules (and hence used collection schedules) have been adjusted in consultation with the seed consultant to adjust the list according to recommended species, preferred supplementary species and non-preferred supplementary species. Species composition remains largely intact and total quantity of seed remains the same, however quantities of some individual species have changed according to current availability.

Shrub and Tree Planting. Shrub numbers have been reduced in some areas (notably at the Kurri Kurri & Branxton interchange ellipses) to allow for a greater quantity of tubestock tree planting. It was considered that tree planting quantities in some locations was too few, so smaller groups have been aggregated and each group doubled in number. Tubestock tree planting has therefore approximately doubled, while shrub numbers have been reduced by approx. 12,300.

7.4 Ongoing and/or Outstanding Issues
Ongoing and outstanding issues include:

The final extent of clearing limits

Cut 28 on the western side of the Northbound Rest Area

The location of areas to be disturbed by construction needs to be provided in order for a landscape rehabilitation seed schedule to be developed.
8 CONSTRUCTION CONSIDERATIONS

8.1 Key Constructability Issues

As part of the design development process, the designers have been liaising with the construction team to ensure that the design solution is practical and has been optimised for construction. A key constructability issue for the landscape design is the implementation of direct return of topsoil.

The design submission process includes reviews by Abigroup. This allows the construction team to review and provide input into the documented design process. This review and input will occur as part of the design development process through formal and informal meetings. Abigroup will conduct a final detailed constructability review at the Substantial Detailed Design submission. Following this review, detailed construction safety plans and procedures will be developed and documented in the Contractor’s Construction Plan. The landscape has been designed for ease of construction. In terms of safety during construction, normal Occupational Health and Safety (OH&S) considerations will apply at the site.

8.2 Constructability and Staging

Landscaping works will be staged in co-ordination with construction and will be, where practicable, implemented as each construction section is completed. Landscaping of the road reserve will precede construction where practicable.

9 SAFETY IN DESIGN

9.1 Key Safety Issues

The key safety issues that were investigated during the design process included:

- Safety of road maintenance workers
- Safety of workers installing the landscape design
- Pedestrian and cyclist safety
- Public use when near completion
- Passive surveillance
- Vandalism and violence

9.2 Safety in Design

A Safety in Design workshop was held on the 10 December 2010 following the 15% concept design issue to assess the design elements and maintenance of the rest areas. The outcome of this workshop was a schedule of risk assessments and mitigation strategies for the rest area. A final SIDs workshop was held on 20 May 2011. The results of this workshop will be included in the IFC Design report.
10 DURABILITY

The landscape design has incorporated the ‘Design life’ as defined in the SWTC Section 5.5 as the period over which an asset must perform its intended function, without replacement, refurbishment or significant maintenance.

11 DESIGN COMPLIANCE

The Landscape design has been designed in accordance with the requirements of Appendix 15 of the SWTC. Refer to Environmental Compliance checklist.
### Appendix A  LIST OF DRAWINGS

<table>
<thead>
<tr>
<th>Hex LS 20-0001</th>
<th>Curve Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex LS 20-0002</td>
<td>Sheet layout</td>
</tr>
<tr>
<td>Hex LS 20-0003</td>
<td>Drawing Index &amp; Notes</td>
</tr>
<tr>
<td>Hex LS 21-0101</td>
<td>Zone 1 - planting plan sheet 1</td>
</tr>
<tr>
<td>Hex LS 21-0102</td>
<td>Zone 1 - planting plan sheet 2</td>
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<tr>
<td>Hex LS 21-0103</td>
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<td>Zone 3 - planting plan sheet 66</td>
</tr>
<tr>
<td>Hex LS 23-0167</td>
<td>Typical Sections - Landscape treatment for medians</td>
</tr>
<tr>
<td>Hex LS 23-0168</td>
<td>Typical Sections - Landscape treatment for verge</td>
</tr>
<tr>
<td>Hex LS 23-0169</td>
<td>Typical Landscape Details</td>
</tr>
<tr>
<td>Hex LS 23-0170</td>
<td>Typical Fauna Underpass Detail</td>
</tr>
<tr>
<td>Hex LS 23-0171</td>
<td>Typical Furrow Detail</td>
</tr>
<tr>
<td>Hex LS 23-0172</td>
<td>Typical Landscape Treatment at Noise Wall</td>
</tr>
<tr>
<td>Hex LS 23-0173</td>
<td>Typical Basin - Sheet 1</td>
</tr>
<tr>
<td>Hex LS 23-0174</td>
<td>Typical Basin - Sheet 2</td>
</tr>
<tr>
<td>Hex LS 23-0175</td>
<td>Typical Landscape Detail - Creek Realignment</td>
</tr>
<tr>
<td>Hex LS 23-0176</td>
<td>Detail Planting Plan - Bridge Over Swamp Creek</td>
</tr>
<tr>
<td>Hex LS 23-0177</td>
<td>Detail Planting Plan - Bridge Over Anvil Creek</td>
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<tr>
<td>Hex LS 23-0178</td>
<td>Landscape Planting Schedule - Sheet 1</td>
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<td>Landscape Planting Schedule - Sheet 3</td>
</tr>
<tr>
<td>Hex LS 23-0181</td>
<td>Landscape Planting Schedule - Sheet 4</td>
</tr>
<tr>
<td>Hex LS 23-0182</td>
<td>Landscape Planting Schedule - Sheet 5</td>
</tr>
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<td>Hex LS 23-0183</td>
<td>Landscape Planting Schedule - Sheet 6</td>
</tr>
<tr>
<td>Hex LS 23-0184</td>
<td>Landscape Planting Schedule - Sheet 7</td>
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<td>Hex LS 23-0185</td>
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</tr>
<tr>
<td>Hex LS 23-0186</td>
<td>Landscape Planting Schedule - Sheet 9</td>
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<td>Hex LS 23-0187</td>
<td>Landscape Planting Schedule - Sheet 10</td>
</tr>
<tr>
<td>Hex LS 23-0188</td>
<td>Landscape Planting Schedule - Sheet 11</td>
</tr>
<tr>
<td>Hex LS 23-0189</td>
<td>Landscape Planting Schedule - Sheet 12</td>
</tr>
<tr>
<td>Hex LS 23-0190</td>
<td>Landscape Planting Schedule - Sheet 13</td>
</tr>
</tbody>
</table>

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

HBO+EMTB  SEPTEMBER 2011  SYU-002251  HUNTER EXPRESSWAY: KURRI KURRI TO BRANXTON - FINAL URBAN + LANDSCAPE DESIGN SUB PLAN REPORT (100%)
Appendix B  RESPONSES TO PROJECT VERIFIER COMMENTS

By Noel Corkery

1. Introduction
The section of Hunter Expressway between interchanges at Kurri Kurri and Branxton will cover a distance of 27km. Abigroup Contractors Pty Ltd is to develop this section under a Design and Construct (D&C) contract with the Roads and Traffic Authority of New South Wales (RTA).

Davis Langdon (DL) has been engaged by the RTA and Abigroup as Project Verifier for design and construction of the Expressway. Corkery Consulting has been engaged by DL to carry out verification of the urban and landscape design components of the project, with Noel Corkery as the Nominated Landscape Architect responsible for the verification.

This Report presents the outcomes of the verification process for the 15% documentation, which assesses compliance of the urban and landscape design documentation with the relevant performance criteria.

2. Design Responsibility
HBO+EMTB are engaged by Abigroup to carry out design and documentation of the landscape and urban components of the project. The initial landscape and urban design concept design was prepared for RTA by Kiah Infranet in May 2007 and presented in an Urban and Landscape Design Report.

3. Verification Process & Criteria
Relevant documents have been reviewed to identify issues to be addressed and criteria to be applied through the verification process. Documents reviewed included:

- Hunter Expressway Scope of Works and Technical Criteria issued by RTA:
  - Appendix 4, Additional Environmental Requirements
  - Appendix 15, Urban Design Performance and Design Requirements
  - Appendix 17, Rest Area Criteria
  - Appendix 31, Contractor's Urban & Landscape Design
    - General Urban & Landscape Design Part 1
    - General Urban & Landscape Design Part 2
    - Earthworks, Landform & Slope Stabilisation
    - Bridges
    - Landscape Design
    - Noise Barriers & Headlight Screens
- Documents prepared by HBO+EMTB in March 2010, which include:
  - Planting and Seeding Plans (20 drawings).
  - Topsoil Plans (20 drawings).
  - Planting and Seeding Schedules (7).
  - Landscape Management Report and Maintenance Requirements.
- 'Beyond the Pavement - RTA Urban Design Policy, Procedures and Design Principles’ (2009)
- Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW, RTA, July 2003.
- Shotcrete Design Guidelines: Design guidelines to avoid, minimise and improve the appearance of shotcrete, RTA, June 2005.
- Noise wall design guideline: Design guidelines to improve the appearance of noise walls in NSW, RTA, February 2007

4. Summary
Results of the verification confirm that the urban and landscape design documentation generally complies with the relevant criteria as set out in the Hunter Expressway Scope of Works and Technical Criteria issued by RTA and other documents listed in Section 3 above.

However, a number of issues have been identified where the design is inconsistent with the relevant requirements. In some situations the variation has resulted from the more detailed design process that responds to other requirement of the road design in respect of engineering performance and safety requirements. Also, a number of minor noncompliance issues relate to inadequate detail produced for the 15% issue. In these cases it is noted that although the level of information is what would reasonably be expected for 15% issue, further clarification will be required at 85% issue to confirm compliance.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
Appendix A

A key issue identified is the heavy reliance on hydro-mulching to establish vegetation on the 1:2 slopes and along substantial section of the medians. This will require substantial soil management and subsequent maintenance until vegetation is established. A comprehensive specification and contractual arrangements will be required at the 85% issue to ensure the application of the required level of expertise successfully implement the works. Contractual arrangements also need to be in place to ensure repair works are carried out should there be failures with the proposed hydro-mulching process. The non-compliances are listed in the table below together with comments on their significance and recommended measures to address them in the 85% issue.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

<table>
<thead>
<tr>
<th>Item</th>
<th>Document</th>
<th>Reference</th>
<th>Compliance*</th>
<th>PV Comments / Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cross section dimensions (including separation and clearances) - Where provided in Appendix A of the Scope of Works and Technical Criteria, they must be used in the design of the Project Works.</td>
<td>85% Preliminary Design Design Report Appendix A Drawings Hex-LS-20-D801, Hex-LS-20-D802 &amp; Appendix 9</td>
<td>Y</td>
<td>Complies. Cross section dimensions provided in Appendix A are used in the landscape treatment cross sections.</td>
</tr>
<tr>
<td>2</td>
<td>Culverts and Underpasses - dimensions of required for fauna or fish passage identified in the other Environmental Documents are minimum dimensions and must not be reduced.</td>
<td>85% Preliminary Design Report 6.1 &amp; Typical Fauna Underpass Hex-LS-20-D805</td>
<td>Y</td>
<td>Complies. Dimensions meet minimum requirements.</td>
</tr>
</tbody>
</table>
### Bridges
- Lengths, locations and positioning of bridge crossings of waterways must:
  - minimise intrusion into and impacts on the creeks or rivers being crossed;
  - minimise intrusion into and impacts on the creek banks and river banks, sensitive environments and riparian zones;
  - maximise available space for fauna movement and ensure a minimum provide an effective dry passage width for fauna movement of 3 metres;
  - avoid pits within waterways and minimise impacts on waterways, and
  - maximise natural light under bridges.

#### Minimum Overall Lengths
- **B.7.1 BR04 Twin Bridges over Swamp Creek**
  - Minimum Overall Length (between front faces of abutments): 60m
- **B.7.2 BR21 Bridge over Anvil Creek on Connection to New England Hwy**
  - Minimum Overall Length (between front faces of abutments): 35m
- **B.7.3 BR25 Twin Bridges over Black Creek**
  - Minimum Overall Length (between front faces of abutments): 105m

### Boundary Fencing
- **B.7.1 BR04 Twin Bridges over Swamp Creek**
  - Boundary fences have recently been installed by the RTA in EEC areas. (Boundary fencing is not part of the Property Works Package which states that “Fencing Requirements are in accordance with the SWTC Appendix 28”)
- **B.7.2 BR21 Bridge over Anvil Creek on Connection to New England Hwy**
  - Boundary fences have recently been installed by the RTA in EEC areas. (Boundary fencing is not part of the Property Works Package which states that “Fencing Requirements are in accordance with the SWTC Appendix 28”)
- **B.7.3 BR25 Twin Bridges over Black Creek**
  - Boundary fences have recently been installed by the RTA in EEC areas. (Boundary fencing is not part of the Property Works Package which states that “Fencing Requirements are in accordance with the SWTC Appendix 28”)

### Native Vegetation Clearing
- **B.7.1 BR04 Twin Bridges over Swamp Creek**
  - Minimum Overall Length (between front faces of abutments): 60m
- **B.7.2 BR21 Bridge over Anvil Creek on Connection to New England Hwy**
  - Minimum Overall Length (between front faces of abutments): 35m
- **B.7.3 BR25 Twin Bridges over Black Creek**
  - Minimum Overall Length (between front faces of abutments): 105m

### Endangered Ecological Communities
- **B.7.1 BR04 Twin Bridges over Swamp Creek**
  - Minimum Overall Length (between front faces of abutments): 60m
- **B.7.2 BR21 Bridge over Anvil Creek on Connection to New England Hwy**
  - Minimum Overall Length (between front faces of abutments): 35m
- **B.7.3 BR25 Twin Bridges over Black Creek**
  - Minimum Overall Length (between front faces of abutments): 105m
10. Fauna Underpasses: (a) Notwithstanding the requirements of other Environmental Documents, where fauna access is required through or under structures, the access provided must not include permanent wetway or spill through unevented baffles deeper than 1.0 H:V in cross section. (b) Notwithstanding the requirements of other Environmental Documents, fauna underpass structures must be provided, as a minimum, at the locations and in accordance with the requirements detailed in Table 4.2. (c) Fauna underpasses must comply with the fauna underpass requirements in Appendix 5 and the Contractor must consult with the Department of Environment, Climate Change and Water (DECCW) and comply with its requirements in relation to the location, design, installation and landscaping of fauna underpasses.

<table>
<thead>
<tr>
<th>Location</th>
<th>Chainage</th>
<th>Purpose of structure</th>
<th>Type of Structure</th>
<th>Dimensions</th>
<th>Tributary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Waterholes Creek</td>
<td>17100</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 3 cells, Height - 2.4m</td>
<td>Black Waterholes Creek</td>
</tr>
<tr>
<td>Sawyers Gully Creek</td>
<td>22300</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 4 cells, Height - 2.4m</td>
<td>Sawyers Gully Creek</td>
</tr>
<tr>
<td>Tributary of Sawyers Gully Creek</td>
<td>23540</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 3 cells, Height - 2.4m</td>
<td>Sawyers Gully Creek</td>
</tr>
<tr>
<td>Tributary of Sawyers Gully Creek</td>
<td>23550</td>
<td>Property access and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 3.6m, Height - 3.6m</td>
<td>Bishops Creek</td>
</tr>
<tr>
<td>Allandale Quarry property access track</td>
<td>24980</td>
<td>Property access</td>
<td>Bridge</td>
<td>Horizontal clearance – 11.0m, Vertical Clearance – 4.6m</td>
<td>Watercourse</td>
</tr>
<tr>
<td>Tributary of Anvil Creek near Greta Camp</td>
<td>28400</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 2 cells, Height - 2.4m</td>
<td>Tributary of Anvil Creek near Greta Camp</td>
</tr>
<tr>
<td>West of Camp Road</td>
<td>30200</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 3 cells, Height - 2.4m</td>
<td>West of Camp Road</td>
</tr>
<tr>
<td>Watercourse West of Camp Road</td>
<td>30700</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 2 cells, Height - 2.4m</td>
<td>West of Tuckers Lane</td>
</tr>
<tr>
<td>Watercourse West of Tuckers Lane</td>
<td>33000</td>
<td>Drainage and fauna underpass</td>
<td>Reinforced concrete box culvert</td>
<td>Width - 2 cells, Height - 2.4m</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: The minimum cell width is 2.4m. Note 2: The horizontal clearance of the Allandale Quarry property access track is the minimum clear horizontal opening of the Allandale Quarry access twin bridges. Note 3: The vertical clearance of the Allandale Quarry property access track is the minimum clear vertical opening from the existing access track level to the underside of the Allandale Quarry access twin bridges.

11. Fauna Fencing - must be provided, as a minimum, at the locations and for the lengths adjacent to the Main Carriageways as detailed in Table 4.3.

<table>
<thead>
<tr>
<th>Location</th>
<th>Chainage</th>
<th>Purpose of structure</th>
<th>Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gully Creek</td>
<td>22000 - 22600</td>
<td>Drainage and fauna fencing</td>
<td>D1.1 to D1.66</td>
</tr>
<tr>
<td>Bishop Creek</td>
<td>24000 - 24600</td>
<td>Drainage and fauna fencing</td>
<td></td>
</tr>
<tr>
<td>Tributary of Anvil Creek near Greta Camp</td>
<td>28400 - 28600</td>
<td>Drainage and fauna fencing</td>
<td></td>
</tr>
<tr>
<td>West of Camp Road</td>
<td>30200 - 30500</td>
<td>Drainage and fauna fencing</td>
<td></td>
</tr>
<tr>
<td>Watercourse West of Camp Road</td>
<td>30700 - 31000</td>
<td>Drainage and fauna fencing</td>
<td></td>
</tr>
<tr>
<td>West of Tuckers Lane</td>
<td>33000 - 33500</td>
<td>Drainage and fauna fencing</td>
<td></td>
</tr>
</tbody>
</table>

12. Nest Boxes - must comply with the requirements of Appendix 14 for the provision, installation, monitoring and maintenance.

13. Weed Management - the Contractor must comply with the requirements of Appendix 14 for the development of a strategy for weed management and the implementation of procedures to control and manage weeds during the performance of the Contractor’s Work and the Landscaping Maintenance.

Note: The Weed Management Plan must be provided in the 100% documentation which includes weed management.
### Appendix 15

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Rehabilitation - the Contractor must comply the requirements of Appendix 15.</td>
<td>M</td>
<td>NA</td>
</tr>
<tr>
<td>Compensatory Habitat - the Contractor must not make changes to the Project Works, the Temporary Works or the Landscaping Maintenance that increases the requirements for the provision of compensatory habitat required by condition 46.</td>
<td>NA</td>
<td>C</td>
</tr>
</tbody>
</table>

#### 1. Urban Design - The Project Works must:
- (i) be sensitive and responsive to the landform and character of the landscape context of the Project Works and the surrounding area;
- (ii) provide a visually attractive aesthetic to the landscape;
- (iii) provide a road corridor that is well vegetated, with planting which matches the character of the local vegetation and adjoining vegetation communities as closely as possible, and retains good views to the surrounding landscape.

**Details:**

- Urban & Landscape Design Sub Plan (15%) & 85% Preliminary Detail Design Report

**Score:** Y (Complied at 15%)

**Notes:**
- Design Report at 85% provides detailed methods for soil preparation and treatment to optimise hydromulching and revegetation success. LMP needs to be provided to check monitoring for achieving outcomes (i), (ii) & (iii)
- The LMP is available for review with the 100% landscape package

#### 2. Quality of the urban and landscape design - the requirements must be consistent throughout the Project Works. It must also conform to the requirements for safety, cost effectiveness and sustainability as set down in section 1.4 of "Beyond the Pavement - RTA Urban Design Policy Procedures and Design Principles - 2009".

**Details:**

- Urban & Landscape Design Sub Plan (15%)

**Score:** Y (Complied at 15%)

**Notes:**
- The designers HBO+EMTB are listed on the RTA's Register of Prequalified Contractors under Category U2 (Urban Design Services)

#### 3. Urban and landscape designers - The Contractor must include qualified and experienced urban and landscape designers in the design team for the Project Works. The urban and landscape designers must:
- (i) be registered on RTA's Urban Services Category U2 Register of Prequalified Contractors;
- (ii) be integrated into the design organisation and with all the various design disciplines;
- (iii) be involved in the ongoing development, detailing and finalisation of the urban and landscape design and all its elements;
- (iv) attend the Construction Site during the construction activities to monitor the implementation and effectiveness of the urban and landscape design and;
- (v) review and advise on all design issues and modifications affecting the urban and landscape design during the construction period, in consultation with RTA's Representatives.

**Details:**

- Urban & Landscape Design Sub Plan (15%)

**Score:** Y (Complied at 15%)

**Notes:**
- The designers HBO+EMTB are listed on the RTA's Register of Prequalified Contractors under Category U2 (Urban Design Services)

#### 4. Urban and landscape design - must be "best urban design practice", as this requirement is detailed and required by relevant RTA Reference Documents, which promote simple, elegant, cost effective design solutions. They also promote durability, sustainability and safety as key characteristics of good design.

**Details:**

- Urban & Landscape Design Sub Plan (15%)

**Score:** Y (Complied at 15%)

**Notes:**
- Complied at 15% C

#### 5. Character Zone requirements - The Contractor’s urban and landscape design must be consistent with and comply with the urban and landscape designs of the character zone requirements contained in sections 15.5 of this Appendix 15.

**Details:**

- Urban & Landscape Design Sub Plan (15%)

**Score:** Y (Complied at 15%)

**Notes:**
- Complied at 15% C

#### 6. Detailed urban and landscape design - must comply with:
- (i) traffic calming requirements;
- (ii) drainage requirements for both construction and maintenance; and
- (iii) environmental requirements relating to flora and fauna, noise and water quality.

**Details:**

- Preliminary Detail Design Report, Design Development 3.14 & Appendix B, Cross Sections

**Score:** Y (Complied at 15%)

**Notes:**
- Complied C

#### 7. Artwork - must not be included in the Contractor’s urban and landscape design.

**Details:**

- Urban & Landscape Design Sub Plan (15%)

**Score:** Y (Complied at 15%)

**Notes:**
- Complied C
<table>
<thead>
<tr>
<th>Section</th>
<th>Interpretation</th>
<th>Requirement Details</th>
<th>Compliance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Appendix A</td>
<td>Design Lot U6 Design Report for Landscape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>15.2 Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05, BR10 to BR11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(b) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(c) Bridge</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(d) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(e) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(f) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(g) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>(h) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>(i) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>(j) Bridges</td>
<td>Bridges to George's Valley Elevations &amp; Sections; BR01 to BR05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Y: Complied at 10%
- C: Complied at 15%
- N: Noted as complying at 15% & requiring further review. Compliance verified at 88%.
- C: Complied at 15%
- C: Complied at 15%
- C: Complied at 15%
- C: Complied at 15%
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- C: Complied at 15%
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- C: Complied at 15%
- C: Complied at 15%
### B.4 Abutments

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirement</th>
<th>Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.5.1</td>
<td>Where retaining abutment structures are utilised, they must return back to the alignment to form substructures. Retaining abutment structures must be finished in concrete panels and must be designed so that the horizontal joints are accentuated to provide strong horizontal banding and the vertical joints are minimised and less accentuated. Abutments must visually relate to other retaining structures.</td>
<td>Y</td>
<td>Completed at 15%</td>
</tr>
<tr>
<td>B.5.2</td>
<td>For bridges that span over the main carriageways of the Hunter Expressway, retaining abutment structures perpendicular to the centrelines of bridges must be offset to towards the base of the wall at an angle of no less than 5 degrees from the vertical. Visible parallel to the centrelines of bridges must be assessed a minimum of 0.00m by cantilevering the parapet.</td>
<td>Y</td>
<td>Completed at 15%</td>
</tr>
<tr>
<td>B.5.3</td>
<td>Abutment design must address and accommodate:</td>
<td>N</td>
<td>80% documents do not provide sufficient information to allow verification. Additional information needs to be provided in 100% documents</td>
</tr>
<tr>
<td>B.5.4</td>
<td>Exposed shotcrete must not be used around the curtilage of the bridges, unless the location is not C85% documents do not provide sufficient information to allow verification.</td>
<td>Y</td>
<td>Complete</td>
</tr>
<tr>
<td>B.5.5</td>
<td>Abutment hard surfacing areas must be edged to reduce future crumbling and to form a neat interface.</td>
<td>N</td>
<td>No relevant documents at 85%</td>
</tr>
<tr>
<td>B.5.6</td>
<td>Batters 2:1 or flatter are vegetated. Batters steeper than 1:2 are finished with Gabion Mattresses for scour protection.</td>
<td>Y</td>
<td>The 100% landscape design includes scour protection details and Fauna corridor access requirements.</td>
</tr>
<tr>
<td>B.5.7</td>
<td>Abutment hard surfacing areas must be edged to reduce future crumbling and to form a neat interface. Other than hard-surfaced abutments, embankments must be vegetated to reduce erosion. Where fauna access is not required under bridges, hard erosion resistant treatments must be applied to the areas which are shaded or are sheltered from rainfall.</td>
<td>N</td>
<td>80% documents do not provide sufficient information to allow verification. Additional information needs to be provided in 100% documents</td>
</tr>
<tr>
<td>B.5.8</td>
<td>Subject: Only creeks and fauna underpasses have rock protection at 1:1.5. The adjacent earthwork is transitioned into the rock protection on all sides. Vegetative cover abuts this edge on all sides. No hard erosion treatments for shaded areas under bridges; landscape is also required to cover 70% of the area below bridges which in some cases covers scour (hard surfacing) treatment.</td>
<td>Y</td>
<td>Complete</td>
</tr>
<tr>
<td>B.5.9</td>
<td>Exposed shotcrete must not be used around the curtilage of the bridges, unless the location is not shaded and/or surrounding land users.</td>
<td>N</td>
<td>No relevant documents at 85%</td>
</tr>
<tr>
<td>B.5.10</td>
<td>Vegetation must be utilised to achieve the aesthetic of the structure's natural setting.</td>
<td>Y</td>
<td>Complete</td>
</tr>
<tr>
<td>B.5.11</td>
<td>80% documents do not provide sufficient information to allow verification. Additional information needs to be provided in 100% documents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.5.12</td>
<td>Exposed shotcrete must not be used around the curtilage of the bridges, unless the location is not shaded and/or surrounding land users.</td>
<td>Y</td>
<td>Complete</td>
</tr>
</tbody>
</table>

Detail Design for Hunter Expressway – Kurri Kurri to Branxton
27. (b) Where safety screens are required, they must extend the full length of the bridge from abutment to abutment with a generous tapered overlap of the abutments to match the extent of the bridge parapets. Bridge safety screens must be designed as a folding element when seen in section to visually articulate the screen and reinforce a horizontal character. The screens must be terminated by tapering ends towards the parapet and their fixing points must be in line with the double rail barrier to minimise visual clutter. Safety screens, including posts, must not obscure the outer faces of the parapets and must be integral with the shape and form of the parapets, including the traffic barrier railing system and any safety barriers to hide services or drainage pipes.

28. (a) Bridges must be single-span with no intermediate piers between abutments.

29. (b) Bridges must be constructed using retaining wall-type abutments rather than spill through abutments.

30. (a) Corrugated aggregate finish must be applied to the abutment walls to assist in integrating the structure within its setting.

31. (b) Where bridges where access ramps are to be provided to both carriageways, roads over the Main Carriageway must be configured as a roundabout, elliptical in plan with the long axis of the ellipse parallel to the centreline of the Local road passing over the main Carriageway.

32. (g) Structural methods which involve a shadowing of the superstructure, elegant leading edges and parapets, refined supporting structures and integrated open rail safety barriers and safety screens must be used to increase the apparent slenderness of the bridges.

33. (h) On bridges where the centreline of the superstructure is curved in either vertical or horizontal alignments, use only structural methods which guides can be seen to the same radius as the superstructure above.

34. (i) Where bridge abutments are not technically feasible at a particular location and a spill through abutment is to be used, surfaces under the end spans of the bridges must be paved in a paving slab finish or stone bedding.

35. (j) Where abutments are not technically feasible at a particular location and a spill through abutment is to be used, to ensure the vertical clearance between embankment hinge point and soffit on each carriageway is equal.

36. (k) If retaining type abutments are not technically feasible at a particular location and a spill through abutment is to be used, surfaces under the end spans of the bridges must be paved in a paving slab finish or stone bedding.

37. (l) If it is technically not feasible to provide piers, they must be of a column or wall type with headstocks.

38. (m) If headstocks or wall type abutments are not technically feasible at a particular location and a spill through abutment is to be used, surfaces under the end spans of the bridges must be paved in a paving slab finish or stone bedding.

39. (n) Use of grading and landscape design includes scour protection details and Fauna corridor access requirements.

40. (o) Where main rock mattresses or rip-rap rock must be used for scour protection at bridge abutments to improve visual amenity.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
16.3 Requirements for Earthworks, Landform and Slope Stabilisation

The earthworks and stabilisation treatments must be integrated with the local landform and must, as a minimum, include the following features:

(a) The vertical and horizontal alignment of the Works must be flowing and responsive to the landform and landscape. Independently grading the crossovers is an acceptable method to achieve the outcome.

(b) Exposed rock finish to cut batters is acceptable, provided that shotcrete does not comprise more than 10% of the surface area of the exposed batter. Exposed rock batters must be constructed as vertical as the material will allow. Where shotcrete coverage of any exposed batter exceeds 10%, the batter must be covered with concrete panels, or laid back sufficiently to allow it to be planted. Should areas of weak rock be experienced during construction, stone pitching using locally won rock should be used to infill the week areas.

(c) Where shotcrete is used and is visible from the road, or surrounding land, it must comply with the Complied at 15%

(d) The vertical and horizontal alignment of the Works must be flowing and responsive to the landform and landscape. Independently grading the crossovers is an acceptable method to achieve this outcome. 

(e) The slopes of batter must vary in response to the existing landform. The slopes of batters must be Complies. Noted as a design principle at 15%. Noted and shown on cross

(f) The tops and bottoms of batters must be rounded and feathered into the adjacent landform. The ends of batters into existing landform

16.4 Requirements for Drainage

85% Design report explains slope angles of 1:2 adopted to minimise footprint

(a) A system of water sensitive drainage devices must be used, where practical, to drain and cleanse runoff. Such devices must include swales, ponds, or basins to control the intensity of, and remove pollutants from, stormwater runoff. The forms are retained in the current design at 85% therefore do not meet requirements. Report needs to explain the reason for shapes not being natural and informal. Planting is used to integrate drainage elements with the landscape.

(b) Water quality pond shape in most instances, is driven by the requirement to reduce vegetation has left little scope for transitioning batters into existing landform

(c) There is no indication on 85% drawings that shotcrete is to be used.

(d) There is no indication on 85% drawings that shotcrete is to be used.

(e) C4 Shotcrete Minimisation Strategy & 85% Preliminary Design Report

(f) The earthworks and stabilisation treatments must be integrated with the local landform and must, as a minimum, include the following features:

(i) Shotcrete must not be used around the base of light columns or other roadside fittings or furniture;

(ii) The edges of the shotcrete must be masked off to avoid overspray;

(iii) The colour and texture of the shotcrete must match the colour and texture of the surrounding rock face, except where lay backs and curves are required by Appendix 11 of the Scope of Works and Technical Criteria.

(j) The slopes of batter must vary in response to the existing landform. The slopes of batters must be Complies. Noted as a design principle at 15%. Noted and shown on cross

(k) Where shotcrete is used and is visible from the road, or surrounding land, it must comply with the Complied at 15%

(l) The earthworks and stabilisation treatments must be integrated with the local landform and must, as a minimum, include the following features:

(m) The vertical and horizontal alignment of the Works must be flowing and responsive to the landform and landscape. Independently grading the crossovers is an acceptable method to achieve this outcome. 

(n) The slopes of batter must vary in response to the existing landform. The slopes of batters must be Complies. Noted as a design principle at 15%. Noted and shown on cross

(o) The tops and bottoms of batters must be rounded and feathered into the adjacent landform. The ends of batters into existing landform

Detected Design for Hunter Expressway – Kurri Kurri to Branxton
**Informal shape, given the linear nature of the clearing.**

**Concrete or shotcrete must not be used in drainage channels that are visible to road users and residences where practical alternative means of scour protection are available.** The use of natural materials as drainage channel stabilisation materials, including stone in wire mattresses, must be maximised in these situations.

85% Preliminary Design Report & Appendix A: Drawings Hex-LS-20-D001 - Hex-LS-20-D908

**6.3.6.1 General**

- The landscape and planting design must:
  1. provide an attractive approach to and departure from the developed areas along the route;

85% Preliminary Design Report & Appendix A: Drawings Hex-LS-20-D001 - Hex-LS-20-D908

- The extent of concrete channels is noted in the 85% documents to allow verification.

- The landscape and planting design provides for wayfinding with more than 900 feature trees in unique plantings in key locations.

- The extent of concrete, rock and vegetated channels. See Urban Design Report. Trials of colour to best minimise visual impact of channels have been trialled. See Urban Design Report.

- Concrete or shotcrete must not be used in drainage channels that are visible to road users and residences where practical alternative means of scour protection are available. The use of natural materials as drainage channel stabilisation materials, including stone in wire mattresses, must be maximised in these situations.

85% Preliminary Design Report & Appendix A: Drawings Hex-LS-20-D001 - Hex-LS-20-D908

- The extent of concrete channels is noted in the 85% documents to allow verification.

- The landscape and planting design provides for wayfinding with more than 900 feature trees in unique plantings in key locations.

- Concrete or shotcrete must not be used in drainage channels that are visible to road users and residences where practical alternative means of scour protection are available. The use of natural materials as drainage channel stabilisation materials, including stone in wire mattresses, must be maximised in these situations.

85% Preliminary Design Report & Appendix A: Drawings Hex-LS-20-D001 - Hex-LS-20-D908

- The extent of concrete channels is noted in the 85% documents to allow verification.

- The landscape and planting design provides for wayfinding with more than 900 feature trees in unique plantings in key locations.
Non-frangible planting and seeding must conform to clear zone requirements or be protected by a safety barrier with the required allowance for barrier reflection.

Design Report & draft specification. See R176 included in the 100% package for this project.

100% Design Report & draft specification. See R176 included in the 100% package for this project.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton.
15.5.4 Planting

The landscaping must be used where tree, shrub and ground cover planting is required for early landscape and visual effect (particularly at intersections), for a neat attractive finish on opening (particularly in urban areas) and at town approaches, for visual screening for properties, and for fauna refuge. Planting for visual screening has been instigated following completion of community consultation and residents feedback.

15.5.5 Landscaping Maintenance

Appendix 15 also has a requirement for planting medians with 27,500 plant numbers.

There is more than double the required plant numbers. Location plant nos. vary due to the requirements of the final design. Eg. there is no location plant no. allowance for planting at bridges or creek crossing scour protection.

Design report includes detail of topsoil treatments designed to improve the results from hydromulching. However, draft LMP needs to be provided to allow verification. LMP needs to detail all maintenance and remediation actions required for vegetation establishment particularly on 1:2 slopes and along medians.
15.6 Rehabilitation for Biodiversity Protection and Recovery

Landscape Rehabilitation

(a) Notwithstanding the requirements of DECCW Condition of Concurrence 15 and the Minister's Condition of Approval 59, 62 to 67, the Contractor must comply with the landscape rehabilitation requirements outlined in this Appendix 15 as a minimum. Implementation of these requirements shall be supported by the preparation of a Landscape Rehabilitation Plan in consultation with DECCW and generally consistent with the Hunter Expressway Brief for Landscape Rehabilitation.

(b) The Landscape Rehabilitation Plan must be prepared by persons with demonstrable experience in the ecological rehabilitation of large and degraded landscapes and must include:

(i) Employment of rehabilitation specialists including a Landscape Restoration Manager and a Soil Scientist.

A. The Landscape Restoration Manager must have, as a minimum, the following qualifications and experience:

- have a minimum of ten years experience in bushland regeneration and restoration;
- complete training in bushland regeneration/horticultural studies to a minimum level of Certificate IV in Horticulture or equivalent; and
- be a member or eligible for professional membership into the Australia Association of Bush Regenerators (AABR).

The Soil Scientist must be accredited under the Certified Professional Soil Scientist Scheme (CPSS) and/or be eligible for accreditation and membership of the Australian Society of Soil Science Incorporated.

(ii) Identification of areas within the road corridor to be subject to landscape rehabilitation consistent with this Appendix.

(iii) Desired landscape rehabilitation outcomes for each rehabilitation area consistent with the performance requirements outlined in this Appendix.

(iv) Landscape rehabilitation techniques to be adopted for each rehabilitation area consistent with this Appendix.

(v) Identification of propagation and nursery materials required to carry out landscape rehabilitation in accordance with this Appendix.

(vi) Quality control procedures to ensure execution of works in accordance with the requirements of the Project Deed. This must include preparation and implementation of a stepwise inspection and test plan to confirm that the required rehabilitation standards outcomes have been achieved.

(vii) Training of all construction personnel involved in clearing, stripping, stockpiling and topsoiling activities in relation to rehabilitation requirements. The training must describe clearing, topsoil stripping, stockpiling, and application techniques to be employed on the project.

(viii) Maintenance requirements of each rehabilitation area until the completion of works under the Project Deed. Rehabilitation activities must be designed and implemented to minimise maintenance after the Date of Construction Completion.

(ix) Monitoring of rehabilitation areas at 3-monthly intervals to measure performance against the performance requirements outlined in this Appendix and provide recommendations for improvement. Monitoring must exist for the duration of the landscaping maintenance period. Monitoring reports must be provided to the RTA.

No reference in 85% documents

Information is not provided for requirements (ii) to (ix). Information should be provided in 100% documents including LRP & prepared with input from the Landscape Restoration Manager and Soil Scientist. Qualifications and experience requirements of both needs to be described in the Final Design Report. Draft LRP needs to be provided to allow verification.

LRP to be provided at Pre IFC. To be prepared by project environment officer in consultation with Landscape Architect.
15.6.1 Landscape Rehabilitation Areas:
(a) The Contractor shall undertake landscape rehabilitation activities in accordance with this Appendix in the areas within the road corridor outlined in the Table Chainage Description Dominant vegetation communities.
(b) This does not preclude revegetation/landscaping works in other locations in accordance with other requirements of the Project Deed.
(c) All areas described in the table above are hereafter referred to as Landscape Rehabilitation Areas.

15.6.2 Performance Requirements for Landscape Rehabilitation Areas:

(a) Species representative of each of the structural strata (tree, shrub and herb layer), as listed within the tables in Annexure 15.1/A; and
(b) All of the species identified with positive or unique fidelity, as listed within the tables in Annexure 15.1/A; and
(c) At least 50% of the vascular plant species, as listed within the tables in Annexure 15.1/A, with a community frequency of 25% or greater; and
(d) Sufficient cover of native herbs established at a density which is sufficient to ensure continuous plant coverage by completion of the landscaping maintenance period; and
(e) Weed species comprise no greater than 5% of all plant species per restored area with exception of 15% in riparian vegetation communities.

Y 85% Preliminary Detail Design Report, 5.3.2 Topsoil Management Plans Fig 5.3 & Appendix A

Y Complex

Y 85% Preliminary Detail Design Report, 5.3.2 Topsoil Management Plans Fig 5.3 & Appendix A

Y

Y Verified as generally complying at 15%. Further verified by intensive checking of Hydromulch Schedules at 85%.

Y Landscape rehabilitation areas are showing all the signs of natural regeneration since access has been excluded. Tree seed is in hand and available for inclusion in hydromulch mixes in rehabilitation areas if required. However the preferred treatment is to manage any naturally regenerating areas as Bushland Regeneration Areas.

Y Landscaping Design and Hydromulch Schedules HEX-LS-20-D906

Y Landscaping Design and Hydromulch Schedules HEX-LS-20-D906

Y

Y

See LMP for re-vegetation strategy

Y

Information can only be provided post-construct following rehab

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

HBO + EMTB SEPTEMBER 2011 SYU-002251 HUNTER EXPRESSWAY: KURRI KURRI TO BRANXTON - FINAL URBAN + LANDSCAPE DESIGN SUB PLAN REPORT (100%)
82 Weed cover is less than 5% per restored area. 85% Preliminary Design Report, S.4.4 Preparation for bushland topsoil application N Information is not provided in 85% Design Report or staff spec. Relevant information needs to be provided in 100% documents including LMP & specification. Information can only be provided post construction following rehab.

83 0.2% Topsoil Management in Landscape Rehabilitation Areas
(a) Within Landscape Rehabilitation Areas disturbed by construction activities and all other landscape areas on Site, the Contractor must implement the following standards and procedures in carrying out works under the Project Deed.

84 Soil Testing
(b) The Contractor must undertake soil pedology surveys and analysis within each soil landscape and vegetation community type. Each soil landscape and vegetation community type must be tested at three locations, each with thee sampling depths of A1, A2 and B1 horizon. Soil testing must be undertaken by a National Association of Testing Authorities (NATA) registered laboratory and include pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon/dioxide.
(c) Soil testing and any recommendations to soil management recommendations must be made by an appropriately qualified soil scientist with expertise in revegetation.

85 Stripping of topsoil required for revegetation in Landscape Rehabilitation Areas
(a) Topsoil to be used for revegetation in landscape rehabilitation areas is hereafter referred to as bushland topsoil.
(b) The structure of much of the site topsoil is fragile, and needs to be handled with a carefully integrated clearing and stripping process.
(c) The Contractor must strip at least 50,000m3 of A1 Horizon topsoil from Landscape Rehabilitation Areas, or sufficient topsoil to implement the landscape rehabilitation requirements, whichever is greater, in the manner outlined below. The quantities of topsoil from each vegetation community type stripped must be directly proportional to the areas of each vegetation community subject to landscape rehabilitation activities.
(d) Stripping undertaken for the purpose of generating bushland topsoil must be undertaken by the following processes:
(i) Limit the use of heavy or tracked vehicles and equipment so as not to disturb the A1 horizon surface soil to the extent that it is contaminated with lower layers.
(ii) Where tree density does not allow effective slashing or the stripping of topsoil as described below, reverse trees and stumps in a manner that does not mix B Horizon soil with bushland topsoil. Acceptable methods include felling trees and grinding stumps.
(iii) Slash the understorey to within 50mm of ground level, leaving the slashed trash in situ.
(iv) Pause for a period of one (1) week prior to undertaking bushland topsoil stripping.
(v) Strip A1 Horizon bushland topsoil to a depth of 100mm plus the slashed trash.
(vi) Relocate bushland topsoil as either direct return or to stockpile.
(vii) Strip remaining topsoil to extent required. Avoid mixing of B Horizon material.
(viii) Clear any remaining trees (including stumps) and any other remaining vegetation.

86 Direct return of topsoil
The construction process must facilitate the immediate re-laying (hereafter referred to as direct return) of stripped topsoil to Landscape Rehabilitation Areas. Where it is not practicable to direct return bushland topsoil to batters and embankments of the road formation due to earthworks programming, the Contractor is to direct return an amount of bushland topsoil to Landscape Rehabilitation Areas within the road corridor where bushland restoration is required.

85% Preliminary Design Report, S.4.1 Stripping A1 Horizon topsoil
85% Preliminary Design Report, S.4.1 Stripping N Design Report, S.4.1 Stripping A1 Horizon topsoil specification M Design Report describes the intent however draft specification does not provide sufficient information. 100% documents need to provide detailed information to allow verification. Specifications provided with 100% design.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Appendix A

#### Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

<table>
<thead>
<tr>
<th>Stockpiling of bushland topsoil</th>
<th>Y</th>
<th>Complex</th>
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</thead>
<tbody>
<tr>
<td>Where it is not possible to undertake direct return of bushland topsoil, bushland topsoil must be stockpiled in areas separate from all other stockpiled material to minimise the potential for weed contamination. Topsoil handling and stockpile contamination are critical factors with regard to the success of the landscape rehabilitation process.</td>
<td>M</td>
<td>(6) Complex</td>
</tr>
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<td>This information is contained in Specifications provided with 100% design</td>
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<tr>
<th>Stockpiling of bushland topsoil</th>
<th>Y</th>
<th>Complex</th>
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<tbody>
<tr>
<td>For each vegetation community type, topsoil is to be stockpiled as follows:</td>
<td>M</td>
<td>(6) Complex</td>
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<tr>
<td>This information is contained in Specifications provided with 100% design</td>
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<tr>
<th>Stockpiling of bushland topsoil</th>
<th>Y</th>
<th>Complex</th>
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<tbody>
<tr>
<td>All bushland topsoil re-used within landscape rehabilitation areas must be prepared in the following manner:</td>
<td>Y</td>
<td>Complex</td>
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<td>This information is contained in Specifications provided with 100% design</td>
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<table>
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<tr>
<th>Application of bushland topsoil</th>
<th>Y</th>
<th>Complex</th>
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</thead>
<tbody>
<tr>
<td>Application of bushland topsoil in Landscape Rehabilitation Areas must be applied in accordance with the requirements of Specification RTA D&amp;C R178 Vegetation and the Appendix 15.</td>
<td>Y</td>
<td>Complex</td>
</tr>
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**HBO+EMTB September 2011:** SYU-002251 Hunter Expressway: Kurri Kurri to Branxton - Final Urban + Landscape Design Sub Plan Report (100%)
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Description</th>
<th>Compliance</th>
<th>Notes</th>
</tr>
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</table>
| 84   | 5.4.4   | Preparation for bushland Topsoil Application | Y Complex | 85% Preliminary Design Report, S.4.4 Application of bushland topsoil in Landscape Restoration Areas with 3:1 slopes or less must be undertaken in the opposite order to stripping, as follows: 
(i) A2 Horizon to a depth of 200mm; and 
(ii) A1 Horizon to a depth of 100mm. 

85%  Preliminary Design Report, S.4.4 Preparation for bushland Topsoil Application | Y Complex | 85% Preliminary Design Report, S.4.4 Application of bushland topsoil in Landscape Restoration Areas with 3:1 slopes or less must be undertaken in the opposite order to stripping, as follows: 
(i) A2 Horizon to a depth of 200mm; and 
(ii) A1 Horizon to a depth of 100mm. 

| 86   | 5.4.5   | Application of Bushland Topsoil | Y Complex | 86% Preliminary Design Report, S.4.5 Application of Bushland Topsoil | Y Complex | 86% Preliminary Design Report, S.4.5 Application of bushland topsoil in Landscape Restoration Areas with 3:1 slopes or less must be undertaken in the opposite order to stripping, as follows: 
(i) A2 Horizon to a depth of 200mm; and 
(ii) A1 Horizon to a depth of 100mm. 

| 87   | 5.4.6   | Augmentation of Landscape Rehabilitation Areas | M Design Report describes the intent however draft specification does not provide sufficient information. 100% documents need to provide detailed information to allow verification | 87% Preliminary Design Report, Chap.4D: Chp.4D: Specifications & Design Report, S.4.6 Augmentation of Landscape Rehabilitation Areas | M Design Report describes the intent however draft specification does not provide sufficient information. 100% documents need to provide detailed information to allow verification | 87% Preliminary Design Report, Chap.4D: Chp.4D: Specifications & Design Report, S.4.6 Augmentation of Landscape Rehabilitation Areas | M Design Report describes the intent however draft specification does not provide sufficient information. 100% documents need to provide detailed information to allow verification | 87% Preliminary Design Report, Chap.4D: Chp.4D: Specifications & Design Report, S.4.6 Augmentation of Landscape Rehabilitation Areas | M Design Report describes the intent however draft specification does not provide sufficient information. 100% documents need to provide detailed information to allow verification |

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Bushland Rehabilitation

Areas not disturbed by construction activities and where weed cover can be anticipated to be less than 15% of plant cover within 12 months of commencing the work must be subject to bushland regeneration to meet the landscape rehabilitation performance criteria.

#### (d) Landscape Rehabilitation

- Primary weeding, including techniques such as:
  - A. selective spraying of weeds with herbicides;
  - B. cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters and painting cut stumps with herbicide;
  - C. target drilling and injecting certain large exotic trees such as African Olive, Willow, Large and Small-leaf Poplar between December and April, whilst sap flow is at optimum levels for herbicide translocation, with herbicides such as Alphosate and a glyphosate/diesel mix;
  - D. selective hand removal of weeds, and
  - E. burning areas dominated by naturalised grasses.

- Follow-up weeding must be undertaken in areas that have received a primary weeding treatment, including selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds are to be targeted during the follow-up weeding phase. Follow-up bush regeneration work is to commence no longer than 3 months after the first exposure to primary weeding.

#### (e) The bush regeneration program must be approached using three (3) strategies, as follows:

1. 
   - **Primary weeding**, including techniques such as:
     - A. selective spraying of weeds with herbicides;
     - B. cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters and painting cut stumps with herbicide;
     - C. target drilling and injecting certain large exotic trees such as African Olive, Willow, Large and Small-leaf Poplar between December and April, whilst sap flow is at optimum levels for herbicide translocation, with herbicides such as Alphosate and a glyphosate/diesel mix;
     - D. selective hand removal of weeds, and
     - E. burning areas dominated by naturalised grasses.

2. **Avoid disturbance to remnant native plants and to soil stored seed banks, which may contain dormant native plant propagules. All weeds are to be targeted during the primary weeding phase.**

3. **Follow-up weeding must be undertaken in areas that have received a primary weeding treatment, including selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds are to be targeted during the follow-up weeding phase. Follow-up bush regeneration work is to commence no later than 3 months after the first exposure to primary weeding.**

### Bushland Reconstruction

Areas not disturbed by construction activities or subject to bushland regeneration must be subject to bushland reconstruction to meet the landscape rehabilitation performance criteria. Bushland reconstruction must be undertaken as follows:

1. **Soil preparation**, including addition of amendments and cultivation as recommended within the soil testing results.

2. **Planting using any of the following alternative methods**:
   - A. Mass Planting: Mulch to 100mm depth, followed by planting using Hiko or similar cell size at a density of 10 plants sq.m, with the number of trees, shrubs and groundcovers broadly informed by the structure of the community being reconstructed, e.g. tree species and shrub strata layer for a woodland community than for a forest community. A substantial ground layer, with a predominance of grasses, will be required for all communities to provide an initial, quick, self-regenerating, and dense weed suppressing ground layer. Planting must be consistent with section 15.5 of this Appendix,
   - B. Direct Seeding of Native Grasses: Direct seeding of a select suite of native grasses.

3. **Bushland reconstruction must be undertaken by a Bushland Regenerator where a substantial relevant body of this work has been undertaken, or by a Landscape Contractor who is a member of the Landscape Contractors’ Association, and has demonstrated strong record of experience in undertaking projects of this nature.**

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### Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

| Appendix | Design Lot U6 | Design Report for Landscape | Final Detailed Design (100%) Report | 85% Preliminary Design Report | M | (i) Complex | (i) 85% Design Report explains that follow-up of previously identified areas for vegetation reconstruction have substantially regenerated therefore the report notes many areas nominat for Bushland Reconstruction may be best managed as remnant native areas with no planting, seeding or mulching required. Where mass planting is to occur, a range of plant densities are nominated at less than 10 plants sq.m

This information is contained in Specifications provided with 100% design

Landscape rehabilitation areas are showing all the signs of natural regeneration since access has been excluded. Tree seed is in hand and available for inclusion in hydromulch mixes in rehabilitation areas if required. However the preferred treatment is to manage any naturally regenerating areas as Bushland Regeneration Areas. If additional rehab is required, it will be accomplished by a combination of seeding and planting.

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HBO+EMTB SEPTEMBER 2011 SYU-002251 HUNTER EXPRESSWAY: KURRI KURRI TO BRANXTON - FINAL URBAN + LANDSCAPE DESIGN SUB PLAN REPORT (100%)
15.7 Requirements for Road Furniture

(a) Fauna fencing must be placed behind plantings to obscure it from the Main Carriageways and Local Road Works. Views of fencing on the skyline must be minimised. All fencing mesh must be dark coloured or black in appearance where it is visible from the Main Carriageways or Local Road Works.

(i) Where not required for noise attenuation purposes, safety barrier types must be selected to minimise the obstruction of views. Wire rope systems must be used in preference to solid barrier types to provide good views. The upstands/posts of wire rope type barriers must be white.

(ii) Signposting must be located to prevent the visual obstruction of good views of the landscape and views against the skyline must be minimised.

(iii) The design and placement of lighting must minimise visual intrusion and must include the use of slender, simple and refined lighting columns that eliminate unnecessary light spillage.

15.8 Requirements for Road Structures Generally

(a) Road structures, including culverts, underpasses and walls, must be unobtrusive. Visible road structures must be simple, refined and without any unnecessary embellishments.

(b) The appearance of concrete retaining structures associated with:

(i) Bridges must have a strong horizontal emphasis; and

(iv) Retaining walls and noise walls must have a strong vertical emphasis.

(c) The design of rock filled gabions visible from the road or surrounding properties must demonstrate consideration of the three-dimensional form of the better face. The gabions must be constructed using techniques which control appearance of the better faces, including the use of formwork and hand-packing individual stones. Structures must be neutral in colour and have non-reflective finishes.

(d) Road structures must be designed and placed to minimise visual intrusion and be screened by existing or proposed vegetation to minimise their visibility to road users.

(e) The design of retaining structures must be undertaken in consideration of all other elements such as bridges, noise walls and landscaping and provide a cohesive and unified design outcome.

(f) Gabions must be used as a retaining wall material for feature landscape treatments at the Branxton interchange and rest areas.

(g) Wall plan layouts must be simple and be straight or have large radius curved alignments sympathetic to the alignment and interfaces with adjoining infrastructure, including roads, pathways and bridges, and environmental features, including creeks and stands of trees. Kinks and bends must not be used in walls in either horizontal or vertical alignments.

(h) Walls must be designed with capping that neatly finish the wall with smooth flow lines. Drainage must be diverted and aligned away from wall faces. Cappings, drainage channels, barriers, noise walls and headlight screens must be integrated.

(i) Road structures must be provided with safe access for maintenance purposes.

(j) Structures and piers must be designed and detailed to accommodate movement and settlement over time.

(k) Joints for retaining structures must preferably be concealed or expressed as part of the structure's design in an unobtrusive manner (flying buttresses are not considered to be obtrusive).

(l) Except where specifically elsewhere in this Appendix 15, retaining walls must generally be flush with the parapet face.

(m) Structures must be designed to minimise graffiti. Whitewash costs must be considered in the design of structures and the design should minimise the need for ongoing repair works due to vandalism or graffiti.

(n) Adjacent and remote landscaping and planting beds must be used to reduce the visual impact of structures.

(o) Protector systems, fencing, safety barriers, noise barriers and headlight screens must be integrated with structures to reduce visual clutter. All joints must align to reinforce the vertical emphasis.

Design Report 85% does not include information on road structures. 100% documents need to provide information to allow verification.
15.8.1 Requirements for Noise Barriers

(a) Selection of the type of noise barrier must be based on the following decreasing order of precedence, except where otherwise required by the Environmental Documents:

(i) landscaped mound or ‘false’ cutting; and
(ii) noise mound and wall combination; and
(iii) noise walls.

(b) Noise walls must respond appropriately to the context in which they are located.

Noise walls must be easily maintainable, durable and aesthetically pleasing.

Noise walls must enhance the Project Works and surrounding neighbourhood environment.

All noise walls must be designed and detailed, including their texture, materials, finishes and colour, to be consistent, contextual and have interesting forms.

(c) Noise walls must comply, as a minimum, with the following requirements:

(i) the appearance of both sides of noise walls must be a vertical concrete panel Exposed 'Z' clips must not be used in the noise walls;
(ii) timber, glass or other fragile or easily damaged materials must not be used for noise walls;
(iii) fixing systems and footings must be concealed;
(iv) a planted zone, with a minimum width of 2 metres, must be provided between noise walls and the road and between noise receptors and noise walls;
(v) the tops of noise walls must not be stepped and must form a continuous flowing line;
(vi) the horizontal alignment of the noise walls must be parallel to the outside edge of the carriageways and roads;
(vii) where noise walls are constructed of lapped panels, the lapping must be in the direction of traffic on the immediately adjacent carriageway lane. Noise wall support posts must not be visible from the adjacent travel lanes;
(viii) noise walls must not start or terminate abruptly with vertical faces. Noise walls must emerge from the ground with smooth flowing lines and must have a vertical emphasis;
(ix) both sides of the noise walls must be equivalent in design quality;
(x) noise walls must respond to the locality in which they are located. Noise walls in feature areas must be sculptural, dynamic and interesting;
(xi) noise walls must be integrated with other structures, including headlight screens, retaining walls, bridges and landscaping;
(xii) noise walls on top of retaining walls must consolidate into one wall;
(xiii) where noise walls are located close to property boundaries and near neighbourhoods, they must be recessive and simple; and
(xiv) noise wall designs must address and accommodate drainage under the noise wall.

(d) Noise walls must respond appropriately to the context in which they are located.

(e) Noise walls must comply, as a minimum, with the following requirements:

(i) the appearance of both sides of noise walls must be a vertical concrete panel Exposed 'Z' clips must not be used in the noise walls;
(ii) timber, glass or other fragile or easily damaged materials must not be used for noise walls;
(iii) fixing systems and footings must be concealed;
(iv) a planted zone, with a minimum width of 2 metres, must be provided between noise walls and the road and between noise receptors and noise walls;
(v) the tops of noise walls must not be stepped and must form a continuous flowing line;
(vi) the horizontal alignment of the noise walls must be parallel to the outside edge of the carriageways and roads;
(vii) where noise walls are constructed of lapped panels, the lapping must be in the direction of traffic on the immediately adjacent carriageway lane. Noise wall support posts must not be visible from the adjacent travel lanes;
(viii) noise walls must not start or terminate abruptly with vertical faces. Noise walls must emerge from the ground with smooth flowing lines and must have a vertical emphasis;
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(xii) noise walls on top of retaining walls must consolidate into one wall;
(xiii) where noise walls are located close to property boundaries and near neighbourhoods, they must be recessive and simple; and
(xiv) noise wall designs must address and accommodate drainage under the noise wall.

(f) Noise walls must start or terminate abruptly with vertical faces. Noise walls must emerge from the ground with smooth flowing lines and must have a vertical emphasis.

(g) Noise walls must comply, as a minimum, with the following requirements:

(i) the appearance of both sides of noise walls must be a vertical concrete panel Exposed 'Z' clips must not be used in the noise walls;
(ii) timber, glass or other fragile or easily damaged materials must not be used for noise walls;
(iii) fixing systems and footings must be concealed;
(iv) a planted zone, with a minimum width of 2 metres, must be provided between noise walls and the road and between noise receptors and noise walls;
(v) the tops of noise walls must not be stepped and must form a continuous flowing line;
(vi) the horizontal alignment of the noise walls must be parallel to the outside edge of the carriageways and roads;
(vii) where noise walls are constructed of lapped panels, the lapping must be in the direction of traffic on the immediately adjacent carriageway lane. Noise wall support posts must not be visible from the adjacent travel lanes;
(viii) noise walls must not start or terminate abruptly with vertical faces. Noise walls must emerge from the ground with smooth flowing lines and must have a vertical emphasis;
(ix) both sides of the noise walls must be equivalent in design quality;
(x) noise walls must respond to the locality in which they are located. Noise walls in feature areas must be sculptural, dynamic and interesting;
(xi) noise walls must be integrated with other structures, including headlight screens, retaining walls, bridges and landscaping;
(xii) noise walls on top of retaining walls must consolidate into one wall;
(xiii) where noise walls are located close to property boundaries and near neighbourhoods, they must be recessive and simple; and
(xiv) noise wall designs must address and accommodate drainage under the noise wall.

15.9 Requirements for Footpaths, Shared Paths and Cycle Paths

(a) Footpaths, shared paths and cycle paths must be constructed from a brushed finished concrete with an integral oxide pigmentation, grey in colour equal to Colour Concrete Systems “Onyx” to reduce glare.

(b) Where paths are provided on overbridges, they must continue beyond the extent of any adjacent bridge barriers to permit pedestrians to access the road surface or adjacent paths without having to cross any area of turf, lawns or planting.

(c) Noise Barriers. NA. Refer to separate validation of 85% noise walls.

(d) Transparent noise walls must be used for residences where views of high quality scenery would otherwise be blocked by opaque noise walls.

(e) The design of the noise walls must include an anti-graffiti strategy, for both sides of the noise walls. Details of this anti-graffiti strategy, including maintenance and remedial measures, must be included in the Environmental Impact Statement to be submitted in terms of section 21.6 of Appendix 21 of the SWTC.

See Urban Design Package.
### 15.10 Requirements for Interpretation of Cultural Heritage

(a) The Contractor must develop techniques for interpretation of cultural heritage in consultation with the community to ensure the needs of the various community groups are incorporated.

(b) Notwithstanding any urban and landscape design themes illustrated in section 15.12 of this Appendix, interpretive elements must not be constructed using location-specific materials or finishes.

(c) Interpretation must be achieved through one or more of the following methods:

- Selection and particular arrangement of plant species; and
- Passive methods such as retaining a significant view.

(d) Where the design for interpretation using one or more of the methods described in section 15.10(c) is not possible, no interpretation in the design should be provided. Where design for interpretation is not possible, the area must be designed to be consistent with the urban and landscape themes of the immediately adjacent areas.

### 15.11 Requirements for Rest Areas

15.11.1 General

Rest areas must be designed in accordance with Appendix 17 of the SWTC. The landscape design for the rest areas must provide scattered tree planting of Corymbia maculata, Eucalyptus crebra, Eucalyptus moluccana and native mown grasses to create a different landscaped character from Main Carriageways.

### 15.12.1 General

(a) RTA has commissioned KIAH Infranet to prepare an urban and landscape design, which is documented in a report titled “Urban and Landscape Design Report – F3 to Branxton Link” (Report). The Report is Information Document ID275.

(i) The Report identifies eleven character zones for the whole F3 to Branxton project. Character zones 5 to 11, which are shown in the drawings on pages 94 to 97 of the Report (“Character Zones”) apply to the Works under the Project Deed.

### Landscape Character Precincts

#### A.7.1 Character Precincts

- Hex-LS-22-D101 to HEX-LS-22-D106

#### 3.1.1 Landscape Character Zone 5

Noted as generally complying at 35%

- Extent of both WRB and F barrier apparent
- Theme of character of Kurri Sand Swamp Woodland is enforced through indienenous plant species
- Understorey of Hardenbergia is indicated with shrub species of KSSW but not nominated for the top of batters.
- Reason for not including Acacia spp. in understorey needs to be explained

### Landscape Planting Plans

HD4-D5-G5-D151 to HD4-D5-D152

- Noted as generally complying at 20%
  - Extent of both WRB and F barrier apparent
  - Theme of character of Kurri Sand Swamp Woodland is enforced through indienenous plant species
  - Understorey of Hardenbergia is indicated with shrub species of KSSW but not nominated for the top of batters.
  - Reason for not including Acacia spp. in understorey needs to be explained

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
Appendix A

DESIGN LOT UE
DESIGN REPORT FOR LANDSCAPE
FINAL DETAILED DESIGN (100%) REPORT

108 Structures
(a) Kurri Kurri Interchange:
The height of the structures at the Kurri Kurri interchange must be minimised to reduce the visual impacts of earthworks.
Where noise walls are required, the noise walls must be designed as an integral part of the road components rather than as isolated barriers such as gabion baskets, rock walls or mounding.
The urban design of the interchange must be consistent with the urban design themes detailed in the drawings 'Kurri Kurri 3D animation, Birdview', and 'Kurri Kurri 3D study - screen detail' on page 152 of the Report and the drawing 'Artistic impression of the Kurri Kurri Interchange with the twin overpasses' on page 153 of the Report, but excluding the artwork shown on these drawings.

109 Structures
(b) McLeod Road Transverse Bridge:
The McLeod Road transverse bridge must be designed to integrate with the surrounding landform and minimise potential batters. The bridge must be designed in sympathy with the suite of bridges for the Project Works.
The urban design of the McLeod Road transverse bridge must be consistent with the urban design themes detailed in the drawings 'McLeods Road Overpass', 'McLeods Road Cross Section' and 'McLeods Road Abutment' on pages 155 to 157 inclusive of the Report.

110 (b) Character Zone 6:
Landscaping:
The Contractor must prepare the landscape design for Character Zone 6 consistent with the landscape themes detailed in the drawings 'Landscape Plan Zone 6a', 'Landscape Plan Zone 6b', 'Landscape Plan Zone 6c' and 'Landscape Plan Zone 6d' on pages 160 to 163 inclusive of the Report and the drawings associated legend on page 162 of the Report.

Landscape revegetation must reflect the Kurri Sand Swamp Woodland associations in the areas to the east, to reinforce creek crossings and to ameliorate cuts and fills created by the proposed roadworks. Planting must be extended at the minor ridgeline to further accentuate the ridge line and to mitigate visual impacts of the cutting. Wire rope barriers must be used, as far as is compatible with the engineering design requirements, to minimise vegetation clearance and maximise the visual presence of the Kurri Sand Swamp Woodland.

Landscape revegetation must reflect the Lower Hunter Spotted Gum-Ironbark Forest associations in the areas to the west, to reinforce creek crossings and to ameliorate cuts and fills created by the proposed roadworks. Open plantings of Eucalypts with native grass understorey must be provided to allow views through to pastoral lands.

The planting areas in the median adjacent to the area of above ground power lines must be provided in abstract geometric lines to reflect the influence of man in the landscape. A 'rigid' landscape planting scheme that complements the stacks of the aluminium smelter plant and the power lines must provide a contrasting composition to the natural setting of the Kurri Sand Swamp Woodland along the route.

Low landscape treatment, through native grassing to the lower sections of the bridge abutments must be provided at the Old Maitland Road Overpass, so as to create an open vista of the bridge structure.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.7.1 BR06, B.5.8 BR06, B.5.8 BR08 and Kiah Infranet Report pp. 167-169</td>
<td>Structures</td>
<td>Y</td>
<td>Completed at 15%</td>
</tr>
</tbody>
</table>

- **South Maitland Railway Bridge:**
  - The bridge structure and foundations of the South Maitland Railway Bridge will be constructed by others under a separate contract. The Contractor must construct the bridge abutments to meet the requirements of Appendix II of the Scope of Works and Technical Criteria.
- **Swamp Creek pedestrian bridge:**
  - The Swamp Creek pedestrian bridge must have clean and simple lines with spilled batters to minimise visual depth.
- **Lюxford interchange (Hart Road) transverse bridge:**
  - The Luxford interchange (Hart Road) transverse bridge must be a portal type structure to express and reinforce its setting along a ridgeline and must maintain visual continuity with other structures on the Project.
- **Old Maitland Road transverse bridge:**
  - The Old Maitland Road transverse bridge must be designed in sympathy with the suite of bridges for the Project Works.

**Landscaping**

- **Character Zone 7:**
  - The Contractor must prepare the landscape design for Character Zone 7 consistent with the landscape themes detailed in the drawings 'Landscape Plan Zone 7a', 'Landscape Plan Zone 7b' and 'Landscape Plan Zone 7c' on pages 167 to 169 inclusive of the Report and the drawings’ associated legend on page 168 of the Report.
  - Re-vegetation in this character zone must reflect the existing dominant bushland setting by reinforcing the Central Hunter Riparian Forest along the Sawyer’s Gully area, and the lower Hunter Spotted Gum Ironbark Forest on the higher areas of land. In the open pastoral areas around Sawyers Gully, a more open landscape character must be provided to complement the rural setting.
  - Creek crossings must be reinforced with appropriate plantings in sympathy with the theme at creek crossings elsewhere on the Project Works. Plantings must be extended beyond large cuts and fills to assist in visual amelioration.

**Landscape Planting Plans**

- **HEX-LS-22-D120 to HEX-LS-22-D127**

**Structures**

- **Quarry access twin bridges (underpass):**
  - To maintain existing access within the quarry site must be designed in sympathy with the suite of bridges for the Project Works. However, walls must be vertical rather than stepped for simplicity of form.

---

**Notes:**

- Further information on urban design elements of the bridges needs to be provided in the 100% documents to allow verification.
- Bridges are as described.

---

**Details:**

- **Design Lot U6**
- **Design Report for Landscape**
- **Final Detailed Design (100%) Report**

---

**Sources:**

- HBO-EMTB SEPTEMBER 2011
- SYU-002251 HUNTER EXPRESSWAY: KURRI KURRI TO BRANXTON - FINAL URBAN + LANDSCAPE DESIGN SUB PLAN REPORT (100%)

| M | The following compliance for Character Zone 8 applies: Landscape design is consistent with themes detailed for zones 8a, 8b & associated legend. - planning design on forces nominated existing vegetation communities. - nominated view potentials are retained with hydromulching mix of pasture grass.

| 1. | Spotted gums as accent trees.

| 2. | Lower canopy utilising the existing species of Acacias, Dillwynias, Leucopogons and Danthonias as low accent shrubs and grasses around the interchange.

| 3. | Existing timber rural fences are retained. These are shown on the Property Works and Fencing Drawings. The symbol has been added to the 100% landscape drawings so the extent of retained timber rural fencing can be seen. Spotted Gums are used as the dominant tree species whenever mass tree planting occurs in this zone. Acacias are well represented in the existing species of the area. Kurri Kurri and Mount Sugarloaf must also be exploited by similar open planting.

| 4. | At the Allendale Road Interchange a Red Gum upper canopy must be used along Allandale Road, to reinforce the existing character of mature vegetation. The visual screening at the interchange must be minimised to allow views of the entrance from the approach road. The Red Gum upper canopy retains the existing species of Acacias, Dillwynias, Leucopogons and Danthonias as low accent shrubs and grasses around the interchange.

| 5. | The view potential to the south east and to the west of the Main Carriageway must be exploited by more open planting, so as to allow filtered views through team hedges. Views to distant ranges, Barrington Tops, Kurri Kurri and Mount Sugarloof must be retained by similar open planting.

| 6. | Existing timber rural fencing along the Main Carriageway must, as far as is practicable, be retained. The Contractor must prepare the landscape design for Character Zone 8 consistent with the themes detailed for zones 8a, 8b & associated legend. - planning design on forces nominated existing vegetation communities. - nominated view potentials are retained with hydromulching mix of pasture grass.

| 7. | Existing timber rural fences are retained. These are shown on the Property Works and Fencing Drawings. The symbol has been added to the 100% landscape drawings so the extent of retained timber rural fencing can be seen. Spotted Gums are used as the dominant tree species whenever mass tree planting occurs in this zone. Acacias are well represented in the existing species of the area. Kurri Kurri and Mount Sugarloof must also be exploited by similar open planting.

| 8. | Existing timber rural fences are retained. These are shown on the Property Works and Fencing Drawings. The symbol has been added to the 100% landscape drawings so the extent of retained timber rural fencing can be seen. Spotted Gums are used as the dominant tree species whenever mass tree planting occurs in this zone. Acacias are well represented in the existing species of the area. Kurri Kurri and Mount Sugarloof must also be exploited by similar open planting.

| 9. | Mycorrhizas possibly assist breakdown of woody seed coat and establishment of seedling. It is assumed that Leucopogon will be returned via direct return of topsoil and by correct topsoil management procedures given it is a coloniser of disturbed sites. Mycorrhizas possibly assist breakdown of woody seed coat and establishment of seeding.

**Section treatments must be consistent with the landscape themes detailed in the drawings of the sections at Chainages 26500 and 27300 on page 174 of the Report.** Batters must be densely planted with the indigenous species of the area to assist in visual amelioration of the road works. Trees must not be planted on the high areas of artificial fill as to detrimentally affect the scale of the natural landscape. Low native grasses must be planted on the lower slopes of the batters adjacent to the structures to retain open views to the abutments and bridge structure. Low native grasses must be planted on the lower slopes of the batters adjacent to the structures to retain open views to the abutments and bridge structure.

### Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

| 80% Design BRIDGE CASSILLY ROAD INTERCHANGE INSIDE VIEW AT ALLANDALE ROAD | V | Urban Design of Allandale Interchange (Lovedale Road) transverse bridge appears to comply.

### Appendix A

**DESIGN LOT UI**

**DESIGN REPORT FOR LANDSCAPE**

**FINAL DETAILED DESIGN (100%) REPORT**
116 US 12 Character Zone 9
Landscaping
The Contractor must prepare the landscape design for Character Zone 9 consistent with the landscape themes detailed in the drawings: Landscape Plan Zone 9 and Camp Road Underpass on pages 181 and 182 respectively of the Report and the drawings’ associated legend on page 180 of the Report. 

Bidders must, as far as is compatible with the engineering design requirements, be designed to reduce impact on the surrounding landscape and encourage plant revegetation. 

The Contractor must prepare the landscape design for Character Zone 9 consistent with the landscape themes detailed in the drawings: Landscape Plan Zone 9 and Camp Road Underpass on pages 181 and 182 respectively of the Report and the drawings’ associated legend on page 180 of the Report. 

Earthworks in the vicinity of the Camp Road twin bridges and Sawyers Creek twin bridges must be designed to minimise impact on the surrounding undulating landform. Section treatments must be designed to reinforce landscape themes detailed in the drawings in the section at Chainage 201000 on page 185 of the Report. 

The indigenous vegetation of Lower Hunter Spotted Gum Ironbark Forest must be reinforced through revegetation measures to cuts and fills. 

Earthworks in the vicinity of the Camp Road twin bridges and Sawyers Creek twin bridges must be designed to minimise impact on the surrounding undulating landform. Section treatments must be designed to reinforce landscape themes detailed in the drawings in the section at Chainage 201000 on page 185 of the Report. 

Whether or not is apparent.

As far as is compatible with the engineering design requirements, type F barriers and wire rope barriers must be used at the interchange would allow closer tree planting to the road pavement, so as to reflect the woodland character of the adjacent landscape.

The landscape theme for the Camp Road Underpass must reinforce the Red Gum as the main tree canopy species, within the indigenous association of Hunter Lowlands Redgum Forest, with an understory of Hardenbergias, Acacias, Danielleas and Dillwynias.

Landscape Planting Plans
- HEX-LS-22-D136 to HEX-LS-22-D138 &
- 3.1.1.5 Landscape Character Zone 9

Generally complete.

Extension use of WRB and extent of F Barrier at the interchange is apparent. 

Red Gum features with other Eucalyptus spp. for reinforcing the landscape theme for the Camp Road Underpass.

Understorey of Hardenbergias is provided, however Design Report need to explain why there are no plantings of Acacias, Danielleas and Dillwynias as required.

As above, Dillwynias are better representatives of KSSW. Acacias and Danielleas are well represented in the HLRF and LHSGIF seed mixes respectively.

117 Structures
(a) Camp Road North bridge
The Camp Road north and south bridges must be designed in sympathy with the suite of bridges for the Project. 

(a) Camp Road North bridge
The Camp Road north and south bridges must be designed in sympathy with the suite of bridges for the Project.

Safety Coordinating Agent
The Contractor must prepare the landscape design for Character Zone 10 consists of Character Zone 10 consistent with the landscape themes detailed in the drawings: Landscape Plan Zone 10a and Landscape Plan Zone 10b on pages 186 and 187 of the Report and the drawings’ associated legend on page 185 of the Report. 

The landscape design within this character zone must create a strong bushland character that reinforces the enclosed, high visual quality of the surrounding landscape.

The creek including Sawyers Creek and Anvil Creek must be revegetated with the Hunter Lowland Redgum Forest species to express the creek crossings.

The landscape design must reinforce the existing indigenous associations of Lower Hunter Spotted Gum Woodland and, in the wetter drainage lines, creeks and low lying areas, Hunter Lowland Redgum Forest. 

The Creek including Sawyers Creek and Anvil Creek must be revegetated with the Hunter Lowland Redgum Forest species to express the creek crossings.

Vegetation barriers must be used, as far as is compatible with the engineering design requirements, to minimise vegetation clearance and environmental fragmentation. 

At the cutting at approximate chainage 32800, bushland revegetation on the batters must be densely planted to assist in visually ameliorating the works, as shown on the drawing of the typical section shown.

The contractor must prepare the landscape design for Character Zone 10 consistent with the landscape themes detailed in the drawings: Landscape Plan Zone 10a and Landscape Plan Zone 10b on pages 186 and 187 of the Report and the drawings’ associated legend on page 185 of the Report. 

The landscape design within this character zone must create a strong bushland character that reinforces the enclosed, high visual quality of the surrounding landscape.

The creek including Sawyers Creek and Anvil Creek must be revegetated with the Hunter Lowland Redgum Forest species to express the creek crossings.

Vegetation barriers must be used, as far as is compatible with the engineering design requirements, to minimise vegetation clearance and environmental fragmentation. 

At the cutting at approximate chainage 32800, bushland revegetation on the batters must be densely planted to assist in visually ameliorating the works, as shown on the drawing of the typical section shown.

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
119. Tuckers Lane transverse bridge
The Tuckers Lane transverse bridge must be designed in sympathy with the suite of bridges for the Project Works.
The urban design of the Tuckers Lane transverse bridge must be consistent with the urban design themes depicted in the drawings ‘Tuckers Lane Bridge’ and ‘Tuckers lane Bridge cross section’ on pages 169 and 168 of the Report.
Noted as generally complying at 15%. Further relevant information on the urban design elements of the bridge are not provided in the 85% documents. See urban design report.

120. Character Zone 11 Structures
Noted as generally complying at 15%. Additional information required in Appendix A.

121. Branxton Interchange twin bridges
The Branxton Interchange twin bridges must be designed in sympathy with the suite of bridges for the Project Works.
(a) Branxton Interchange twin bridges:
The Branxton Interchange twin bridges must be designed in sympathy with the suite of bridges for the Project Works. The urban design of the Branxton Interchange twin bridges must be consistent with the urban design themes detailed in the drawing ‘Artistic rendering of a view within the proposed Branxton Interchange’ on page 190 of the Report. The Branxton Interchange bridge over the Main Northern Railway must be designed in sympathy with the suite of bridges for the Project Works, but in this instance, the abutment walls must be kept vertical for simplicity.
(b) Branxton Interchange bridge over Aed Creek:
The Branxton Interchange bridge over Aed Creek must be designed in sympathy with the suite of bridges for the Project Works, and the overall depth of the bridge must be kept to a minimum.
(c) Kheer County Olive transverse bridge:
The Vine County Olive transverse bridge must be designed in sympathy with the suite of bridges for the Project Works.
(d) Main Northern Railway twin bridges:
The Main Northern Railway twin bridges must be designed in sympathy with the suite of bridges for the Project Works, with a walled abutment between the bridges to minimise the extent of the bridge spans.

Appendix C  RESPONSES TO RTA COMMENTS

Not available at this time
Appendix D  ENVIRONMENTAL COMPLIANCE REGISTER
APPENDIX B:
LANDSCAPE MAINTENANCE PLAN (100%) INCORPORATING THE LANDSCAPE REHABILITATION PLAN
TABLE OF CONTENTS

1 BACKGROUND ............................................................................................................................................. 1
  1.1 Project Background ...................................................................................................................... 1
  1.2 Purpose of this Report .................................................................................................................... 1
  1.3 Where this Plan Applies ...................................................................................................................... 2
  1.4 Landscape Maintenance Responsibility ............................................................................................. 2
  1.5 Landscape Types to be Maintained ..................................................................................................... 3

2 SUMMARY TABLE OF MAINTENANCE REQUIRED ...................................................................................... 6

3 MAINTENANCE ACTIONS ................................................................................................................................... 11
  A. All Areas ................................................................................................................................................ 11
  A. Specific Landscape Types ....................................................................................................................... 15
     Grassed (Mown) Areas .............................................................................................................................. 15
     Vegetation Areas (Hydromulch) .............................................................................................................. 16
     Planting Areas (Tube stock) .................................................................................................................... 18
     Landscape Bed plantings ....................................................................................................................... 20

3 Areas of Special Consideration .................................................................................................................... 31

4 LANDSCAPE REHABILITATION PLAN ........................................................................................................... 36
  4.1 Landscape Rehabilitation Areas Disturbed by Construction Activities .............................................. 36
  4.2 Bushland Regeneration Areas .............................................................................................................. 37
  4.3 Bushland Reconstruction Areas .......................................................................................................... 38
  4.4 Clearing Limits ...................................................................................................................................... 39
  4.5 Maintenance in Landscape Rehabilitation Areas .................................................................................. 39
  4.6 Monitoring of Landscape Rehabilitation Works .................................................................................. 39

5 TOPSOIL MANAGEMENT ................................................................................................................................ 40
  5.1 Landscape Topsoils ............................................................................................................................... 40
  5.2 Bushland Topsoils .................................................................................................................................. 40
  5.3 Topsoil Management Zones .................................................................................................................. 43
  5.4 Topsoil Management in Landscape Rehabilitation Areas .................................................................... 43
     5.4.1 Stripping ....................................................................................................................................... 43
     5.4.2 Direct Return ................................................................................................................................. 44
     5.4.3 Stockpiling ................................................................................................................................... 44
     5.4.4 Preparation for bushland topsoil application .............................................................................. 45
     5.4.5 Application of bushland topsoil ................................................................................................. 45
  5.5 Topsoil Application .................................................................................................................................. 47
  5.6 Cover Crop ............................................................................................................................................ 49

LIST OF APPENDICES

Appendix A LIST OF DRAWINGS
Appendix B NOXIOUS WEED SPECIES: CESSNICK, MAITLAND & PORT MACQUARIE
Appendix C THREE MONTHLY MAINTENANCE AUDIT

LIST OF FIGURES

FIGURE 4.1 EXTENT OF LANDSCAPE REHABILITATION AREAS ........................................................................ 36
FIGURE 5.1 LANDSCAPE TOPSOIL PROCEDURES ......................................................................................... 41
FIGURE 5.2 BUSHLAND TOPSOIL PROCEDURES .......................................................................................... 42
FIGURE 5.3 TOPOSOIL EXTENTS ................................................................................................................... 43
FIGURE 5.4 SUGGESTIONS FOR WINDROWING TOPSOILS AND Mulch FOR LATER SPREADING ON BATTERS.... 47
1 BACKGROUND

1.1 Project Background
The Landscape Maintenance Plan (LMP) is designed to provide a methodology for both the short term landscape maintenance undertakings required of the contractor and the longer term maintenance scope of the authorities responsible for the maintenance following handover. It differs in content to the standard Landscape Maintenance Plan in that it contains additional information on the management and maintenance requirements for Landscape Rehabilitation Areas (LRA).

Landscape Rehabilitation Plan
A Landscape Rehabilitation Plan is incorporated into the LMP prepared by HBO+EMTB in consultation with the Project Landscape Restoration Manager and Soil Scientist and with input from the Office of Environment and Heritage.

The Landscape Restoration Manager engaged by Abigroup will oversee and monitor both the landscape rehabilitation areas and also the general landscape works for a period of not less than three years. If the landscape restoration manager is also not suitably qualified as a landscape specialist for the general landscape works then such a person will be engaged.

The LRP is generally consistent with the Hunter Expressway Brief for Landscape Rehabilitation and includes:

- Identification of areas within the road corridor to be subject to landscape rehabilitation consistent with this Appendix.
- Desired landscape rehabilitation outcomes for each rehabilitation area consistent with the performance requirements outlined in Appendix 15 of the SWTC.
- Landscape rehabilitation techniques to be adopted for each rehabilitation area consistent with Appendix 15.
- Identification of propagation and nursery materials required to carry out landscape rehabilitation in accordance with this Appendix 15.
- Quality control procedures to ensure execution of works in accordance with the requirements of the Project Deed. This includes preparation and implementation of a stepwise inspection and test plan to confirm that the required rehabilitation standards outcomes have been achieved.
- Training of all construction personnel involved in clearing, stripping, stockpiling and topsoiling activities in relation to rehabilitation requirements. The training must describe clearing, topsoil stripping, stockpiling, and application techniques to be employed on the project.
- Maintenance requirements of each rehabilitation area until the completion of works under the Project Deed. Rehabilitation activities must be designed and implemented to avoid minimal maintenance at the completion of works under the Project Deed.
- Monitoring of rehabilitation areas at 3-monthly intervals to measure performance against the performance requirements outlined in Appendix 15 and provide recommendations for improvement. Monitoring must extend for the duration of the landscaping maintenance period. Monitoring reports must be provided to the RTA.

1.2 Purpose of this Report
This Landscape Maintenance Plan (LMP) has been requested by the RTA to promote the cost effective and consistent management of roadside landscape vegetation established for the Hunter Expressway F3 to Kurri Kurri. This LMP promotes a standard approach to the maintenance of landscape plantings, both in technique and frequency. To avoid duplication and to highlight the specific maintenance requirements of some landscape types, the LMP details the required maintenance actions into two categories:

1. All Areas
   Those maintenance actions that apply to every section of the landscape.


2. Specific Landscape Types
   Those maintenance actions specific to the different landscape types present (This includes Landscape Rehabilitation Areas).

1.3 Where this Plan Applies
   This LMP applies to Hunter Expressway Kurri Kurri to Branxton.

The scope of works and associated drawings are divided into three landscape management sections:

- Eastern Section (Kurri Kurri to Old Maitland Road):
  Station 12900 to Station 21700
- Middle Section, (Old Maitland Road to Camp Road Underpass)
  Station 21700 to Station 30100
- Western Section, (Camp Road to Black Creek)
  Station 30100 to Station 39500

The approximate locations of these sections are illustrated Figure 1.

1.4 Landscape Maintenance Responsibility
   Three agencies are responsible for the maintenance of roadside landscapes within this LMP:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Extent of responsibility on Hunter Expressway Kurri Kurri to Branxton.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council</td>
<td>Local service roads, roundabouts and intersections and public areas immediately outside of highway corridor</td>
</tr>
<tr>
<td>RTA</td>
<td>Hunter Expressway corridor – for the lifetime of the expressway</td>
</tr>
<tr>
<td>Abigroup</td>
<td>All from the commencement of construction until the date of construction completion and for 12 months post completion.</td>
</tr>
<tr>
<td>Abigroup - Landscape Rehabilitation Areas</td>
<td>Bushland Restoration Areas. Abigroup have engaged a landscape restoration manager who will carry out, monitor and maintain landscape rehabilitation areas for a period of 3 years</td>
</tr>
</tbody>
</table>

Grass Areas (Mown)
- Road edge mowing strips
- Medians
- Branxton Truck Rest Area
- Fauna fence maintenance
- Track and clear zones.

(Abigroup is required to mow grass during construction, establishment and maintenance period. Thereafter mowing is by others)

Landscape Planting Beds
Landscape planted beds. These vary in appearance from mass plantings of single species (e.g. Lomandra sp; Dianella sp) to more complex beds containing advanced trees, low and tall shrubs and ground covers. Planting size includes tubestock and 35 litre.

Vegetation (Hydromulch)
Shrubs and groundcovers are seeded using the hydromulching method. Species mix varies according to location and plant community.

The design intent is to allow an easy, quick and repeatable method of establishing vegetation cover with particular concern for soil stability. Where a vegetated area fails (i.e., scouring, land slippage) the soil profile is reconstructed and re-hydromulched to re-establish vegetation cover.

At specific locations the hydromulch vegetation is over planted with tubestock tree species.

Hydromulch areas show the following variations, based on the plant species used in specific areas:
- Pasture grasses (non-native species)
- Native grasses
- Groundcovers
- Frangible shrubs
- Mixes including all of the above

Planting (Tubestock)
Mass planting using tubestock of tree/tall shrub, frangible shrubs and groundcover species.

Planting of tubestock show the following variations, based on location, function and plant species used in individual areas:
- Massed tubestock planted in hydromulched areas
- Massed tubestock in ponds, wetlands and creek corridors and fauna underpasses
- Massed tubestock feature planting in roundabouts, medians, at bridges and sightline zones.
Grass Areas (Mown)
- Road edge mowing strips
- Medians
- Branxton Truck Rest Area
- Fauna fence maintenance
- Track and clear zones.
(abiGroup is required to mow grass during construction, establishment and maintenance period. Thereafter mowing is by others)

Landscape Planting Beds
Landscape planted beds. These vary in appearance from mass plantings of single species (e.g., Lomandra sp; Dianella sp) to more complex beds containing advanced trees, low and tall shrubs and ground covers.
Planting size includes tubestock and 35 litre.

Vegetation (Hydromulch)
Shrubs and groundcovers are seeded using the hydromulching method. Species mix varies according to location and plant community.
The design intent is to allow an easy, quick and repeatable method of establishing vegetation cover with particular concern for soil stability. Where a vegetated area fails (i.e., scouling, land slippage) the soil profile is reconstructed and re-hydromulched to re-establish vegetation cover.
At specific locations the hydromulch vegetation is over planted with tubestock tree species.
Hydromulch areas show the following variations, based on the plant species used in specific areas:
- Pasture grasses (non-native species)
- Native grasses
- Groundcovers
- Frangible shrubs
- Mixes including all of the above

Planting (Tubestock)
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Planting of tubestock show the following variations, based on location, function and plant species used in individual areas:
- Massed tubestock planted in hydromulched areas;
- Massed tubestock in ponds, wetlands and creek corridors and fauna underpasses
- Massed tubestock feature planting in roundabouts, medians, at bridges and sightline zones.

Areas of Special Consideration
These areas may vary in appearance and function and have specific maintenance requirements in addition to other landscape types listed.
- Batter Re-Vegetation Management Strategy
- Fauna Underpasses
- Fauna Fence
- Buchanan Rest Area
- Water Quality ponds
- Riparian Zones
- Bushland regeneration area (see LRP)
- Bushland reconstruction area (see LRP)
- Bushland rehabilitation Areas disturbed by construction activities (side tracks) (See LRP)
The exact extent of these landscape types is illustrated on the landscape planting and seeding plans.
## 2. SUMMARY TABLE OF MAINTENANCE REQUIRED

<table>
<thead>
<tr>
<th>Maintenance Actions</th>
<th>Tasks</th>
<th>Timeframes / Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weekly (Su)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Su</td>
</tr>
<tr>
<td>All Areas</td>
<td>Summarised from Section 3 of this LMP</td>
<td></td>
</tr>
<tr>
<td>1. Pruning of Vegetation for Safety</td>
<td>Maintaining driver and pedestrian sightlines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetation in intersection traffic islands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pruning trees over carriageways, roads, paths and cycle ways.</td>
<td></td>
</tr>
<tr>
<td>2. Management of Non Frangible Vegetation</td>
<td>Remove woody “non-frangible” vegetation in setbacks</td>
<td></td>
</tr>
<tr>
<td>3. Noxious Weed Control</td>
<td>Treat noxious weeds according to control category</td>
<td></td>
</tr>
<tr>
<td>4. Rubbish Removal</td>
<td>Remove all roadside litter and debris.</td>
<td></td>
</tr>
<tr>
<td>5. Auditing and Reporting</td>
<td>Audit and report on maintenance and additional works</td>
<td></td>
</tr>
<tr>
<td>Grassed Areas (Mown) Only</td>
<td>Summarised from Section 3 of this LMP</td>
<td></td>
</tr>
<tr>
<td>1. Mowing</td>
<td>Mow grass to a minimum maximum height of 5cm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Every 6 weeks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Every 8 weeks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Every 12 weeks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Every 8 weeks</td>
<td></td>
</tr>
<tr>
<td>2. Replacement of Damaged Grass</td>
<td>Re-establish damaged turf.</td>
<td></td>
</tr>
<tr>
<td>3. Weed Control in Grass</td>
<td>Control weeds in turf areas using selective biodegradable herbicides.</td>
<td></td>
</tr>
</tbody>
</table>

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
<table>
<thead>
<tr>
<th>Maintenance Actions</th>
<th>Tasks</th>
<th>Timeframes / Frequency</th>
<th>As Required</th>
<th>As Specified Below</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weekly</td>
<td>Monthly</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Replace landscape plants damaged or killed by herbicide.</td>
<td>Should this happen it suggests improper use. Review manufactures instructions and application method</td>
<td>As Specified Below</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mulching</td>
<td>Reapply mulch to individual tubestock and maintain to a depth of 75 mm min. Do not apply mulch in areas within water zones, ponds and creek lines</td>
<td>Every two years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Removal of Dead / Dying Plant Material</td>
<td>Remove dead or dying planting material and replace.</td>
<td>As Specified Below</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Replacement Plantings</td>
<td>Replace failed plantings with specified species and densities.</td>
<td>As Specified Below</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water replacement plantings for 12 weeks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Tree Guards and Stakes</td>
<td>Check and repair damaged tree guards and stakes during establishment.</td>
<td>As Specified Below</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replace damaged tree guards and stakes during establishment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remove tree guards and stakes.</td>
<td>12 months after planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fertilising and Pruning</td>
<td>Fertilise all plantings at specified rates.</td>
<td>At time of planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prune all plantings in specified manner:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Detailed Design for Hunter Expressway – Kurri Kurri to Branxton**
### Maintenance Actions

**Tasks**
- Tall / Medium / Low Shrubs
- Climbers
- Groundcover / Tussocks

<table>
<thead>
<tr>
<th>Maintenance Actions</th>
<th>Tasks</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Seasonal</th>
<th>As Required</th>
<th>As Specified Below</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Su</td>
<td>Au</td>
<td>Wi</td>
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<td>Su</td>
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<td>Au</td>
<td>Wi</td>
<td></td>
<td>As Specified Below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Su</td>
<td>Wi</td>
<td></td>
<td>As Specified Below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Au</td>
<td>Wi</td>
<td></td>
<td>As Specified Below</td>
</tr>
</tbody>
</table>

#### Areas of Special Consideration

( Summarised from Section 3 of this LMP)

1. Refer Section 3

---

### 3 MAINTENANCE ACTIONS

**“The RTA Pesticide Use Notification Plan must be followed prior to herbicide application”**

The Plan is available on the RTA Website at:


Maintenance actions to be undertaken under this LMP are divided into two categories based on which landscape type is being maintained:

5. Actions for All Areas;

6. Specific Actions for Different Landscape Types.

In addition to actions that apply to all landscape types / areas, these actions are applied to a specific landscape type.

**A. All Areas**

The following maintenance actions are to be implemented by all maintenance authorities (with reference to the Table of Responsibilities S1.3) across all areas of this LMP:

a) **Pruning of Vegetation for Safety**

- Pruning to maintain driver sight lines; pruning to remove dead wood from overhanging paths, cycle-ways and roads.
- Prune to an extent where this will not re-occur as a problem in the period to next routine maintenance without compromising overall form and growth potential of plant.

**Actions Required**

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining driver sight lines</td>
<td></td>
</tr>
<tr>
<td>Within the sightline zone, prune all roadside vegetation, to a height of 300mm, when:</td>
<td></td>
</tr>
<tr>
<td>Vegetation obscures any part of horizontal railing of safety barriers, when viewed from approaching traffic, within 300 m of all intersections and access roads. Any vegetation other than grasses and tussocks closer than 1.7m from the back of barrier</td>
<td>Monthly</td>
</tr>
<tr>
<td>Pruning trees over carriageways, roads, paths and cycle ways</td>
<td></td>
</tr>
<tr>
<td>Prune all roadside vegetation over carriageways, roads, paths and cycle ways when it is:</td>
<td></td>
</tr>
<tr>
<td>Carriageways / Roads: Lower than 5.5 m above carriageway:</td>
<td></td>
</tr>
<tr>
<td>Paths and Cycle ways: Lower than 3.3 m above path or cycleway</td>
<td></td>
</tr>
</tbody>
</table>

---

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Actions Required | Frequency
--- | ---
All areas: Overhanging dead / diseased / badly damaged trees or limbs |  

#### b) Management of Non Frangible Vegetation

To ensure that non frangible vegetation is removed in dangerous areas in accordance with RTA safety standards.

| Actions Required | Frequency |
--- | --- |
Remove woody regeneration / woody weeds (ie. where trunk diameter exceeds 150 mm measured at 300 mm from the ground) in set back area by manual removal if present in the following areas: | Annual |
Set backs from edge of travel lane:  
With safety rail present: 1.7m.  
With no safety rail present, setback varies as follows:  
<70 km/h speed zones: 5 m  
70-90 km/h speed zones: 9 m  
>90 km/h speed zones: 11 m |  

#### c) Noxious Weed Control

Noxious weeds continuously controlled as per legal requirements.

| Actions Required | Frequency |
--- | --- |
Continuously suppress and destroy, in accordance with their control category, the growth of all declared noxious weeds where present or where they establish. Of particular concern are:  
The areas planted with Pasture Grass. These areas must remain free of noxious weeds, in particular Giant Parramatta Grass;  
All areas where site topsoil has been respread. Site topsoil has been noted to contain Lantana seed. | Monthly |

Declared noxious weed species within the area are listed in Appendix 2 – Noxious Weed Species and Control Categories (pg. 26) of this LMP.

#### d) Rubbish Removal

Litter and roadside debris removal.
**e) Auditing and Reporting**

Regular auditing and reporting on maintenance works undertaken and additional works required.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of entire site to report on LMP maintenance compliance, report and enact remedial works.</td>
<td>Every 3 months</td>
</tr>
</tbody>
</table>

*An auditing and reporting form is provided in Appendix 3 – Three Monthly Maintenance Audit of this LMP.*

---

**A. Specific Landscape Types**

**Grassed (Mown) Areas**

The following maintenance actions are to be implemented by all maintenance authorities in grassed (mown) areas.

The extent of grassed (mown) areas are illustrated on the Landscape Plans (Appendix 1) pg. 23.

**a) Mowing**

Maintenance of grasses areas for neat appearance and to maintain groundcover.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove litter prior to mowing.</td>
<td></td>
</tr>
<tr>
<td>Mow grass at road side to a min height of 50 mm and max height of 150 mm.</td>
<td></td>
</tr>
<tr>
<td>Mow grass at rest area picnic and transpiration areas to a min height of 50 mm and max height of 100 mm.</td>
<td></td>
</tr>
<tr>
<td>Do not scalp grass.</td>
<td></td>
</tr>
<tr>
<td>Clippings to remain where they fall except that: road surfaces, drains, footpaths, picnic areas and cycle paths shall be swept or raked clear of clippings and these clippings shall be removed from site.</td>
<td></td>
</tr>
</tbody>
</table>

- Spring – Every 8 weeks
- Summer – Every 6 weeks
- Autumn – Every 8 weeks
- Winter – Every 12 weeks

**b) Replacement of Damaged Grass**

Replacement of grass damaged by vehicles or other disturbances.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish grass cover immediately after damage / death / removal. Use originally specified species.</td>
<td>As Required</td>
</tr>
</tbody>
</table>

**c) Weed control in Grass**

Ensure that grass remains weed free.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control, through the use of selective herbicides, the establishment and growth of weed species in turf.</td>
<td>Monthly</td>
</tr>
<tr>
<td>Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Dye (colour: red) is to be added to herbicides to show extent of treated area.</td>
<td></td>
</tr>
</tbody>
</table>
**Vegetation Areas (Hydromulch)**

The following maintenance issues and actions are to be implemented by all maintenance authorities in vegetation (hydromulch) areas.

The extent of vegetation (hydromulch) areas is illustrated on the Landscape Plans (Appendix 1) pg. 23.

**a) Weeding**

To ensure that environmental weeds do not reproduce within vegetation (hydromulch) areas and compete with vegetation.

Weeding and weed control is considered to be a critical maintenance action.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m² area.</td>
<td>Monthly</td>
</tr>
<tr>
<td>Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.</td>
<td></td>
</tr>
<tr>
<td>Herbicide use to be in accordance with regulation rates and manufacturers recommendations.</td>
<td></td>
</tr>
<tr>
<td>Dye is to be added to herbicides to show extent of treated area.</td>
<td></td>
</tr>
<tr>
<td>Use of bio-degradable herbicide is encouraged</td>
<td></td>
</tr>
</tbody>
</table>

**b) Mulching**

Maintain an adequate level of mulch in planted beds where these are located within otherwise hydromulch areas, to maximise soil binding, water conservation and weed suppression.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulch is applied as part of the hydromulch application process. Maintain mulch in planted beds in otherwise hydromulched areas to a depth of minimum 75mm. through periodic applications</td>
<td>Pre-required</td>
</tr>
</tbody>
</table>

**c) Removal of Dead / Dying Plant Material**

To remove dead or dying plant material from landscapes. This action may be required as plantings mature, after damage or adverse environmental conditions.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove dead or dying plant material only if contact between re-applied hydromulch and ground will not occur. Preference is to slash and leave existing dead or dying plant material to act as additional mulch material.</td>
<td>As required.</td>
</tr>
</tbody>
</table>

Replacement of plantings in accordance with actions listed in 4. Replacement Plantings (below)

**d) Replacement Plantings**

To ensure that the density and species of established plant material is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace failed, senescent or damaged plantings. Densities and species used are to be in accordance with those specified in the original landscape plans.</td>
<td>As Required</td>
</tr>
<tr>
<td>Water replacement plantings for a minimum of 12 weeks after planting.</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

The species density and species selections specified for each area of landscape covered by this LMP are provided in Appendix 1 – Landscape Plans (pg. 23).
Planting Areas (Tubestock)

The following maintenance issues and actions are to be implemented by all maintenance authorities in plantings (Tubestock). The extent of plantings (Tubestock) are illustrated on the Landscape Planting and Seeding Plans.

a) Weeding

To ensure that environmental weeds do not reproduce within planted beds and compete with plantings.

Weeding and weed control is considered to be a critical maintenance action.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m² area.</td>
<td>Monthly</td>
</tr>
<tr>
<td>Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.</td>
<td></td>
</tr>
<tr>
<td>Herbicide use to be in accordance with regulation rates and manufacturers recommendations.</td>
<td></td>
</tr>
<tr>
<td>Dye is to be added to herbicides to show extent of treated area.</td>
<td></td>
</tr>
<tr>
<td>Use of bio-degradable herbicide is encouraged</td>
<td></td>
</tr>
</tbody>
</table>

b) Mulching

Maintain an adequate level of mulch in planted beds to maximise water conservation and weed suppression.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain mulch depth to min 75 mm, though periodic applications. Use same mulch as originally specified in each planting.</td>
<td>As required.</td>
</tr>
<tr>
<td>Mulch is to be applied to all existing and new planting (Tubestock).</td>
<td></td>
</tr>
<tr>
<td>Do not apply mulch to those areas of planting with the water line at creek lines, ponds and wetlands</td>
<td></td>
</tr>
</tbody>
</table>

c) Removal of Dead / Dying Plant Material

To remove dead or dying plant material from landscapes. This action may be required as plantings mature, after damage or adverse environmental conditions.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove dead or dying plant material.</td>
<td>As required.</td>
</tr>
<tr>
<td>Replace plantings in accordance with actions listed in 4. Replacement Plantings (below)</td>
<td></td>
</tr>
</tbody>
</table>

d) Replacement Plantings

To ensure that the density and species of established plant material is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace failed, senescent or damaged plantings. Densities, sizes and species used are to be in accordance with those specified in the original landscape plans.</td>
<td>As Required</td>
</tr>
<tr>
<td>Water replacement plantings for a minimum of 12 weeks after planting.</td>
<td>Weekly</td>
</tr>
<tr>
<td>The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans</td>
<td></td>
</tr>
</tbody>
</table>

e) Tree Guards and Stakes

To replace tree guards / stakes when damaged and to remove when no longer required.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace timber tree guards or stakes (for trees and shrubs) if damaged or removed prior to plant establishment. Replace with same or equivalent guard / stake.</td>
<td>As required.</td>
</tr>
<tr>
<td>Remove tree guards and stakes.</td>
<td>12 months after planting.</td>
</tr>
</tbody>
</table>
Appendix B

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton

**Landscape Bed Plantings**

The following maintenance issues and actions are to be implemented by all maintenance authorities in landscape bed plantings.

The extent of landscape bed plantings are illustrated on the Landscape Planting and Seeding Plans.

a) **Weeding**

To ensure that environmental weeds do not reproduce within planted beds and compete with plantings.

Weeding and weed control is considered to be a critical maintenance action.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Weeds to not exceed 10% cover in any 50m² area.</td>
<td>Monthly</td>
</tr>
<tr>
<td>Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.</td>
<td></td>
</tr>
<tr>
<td>Herbicide use to be in accordance with regulation rates and manufacturers recommendations.</td>
<td></td>
</tr>
<tr>
<td>Dye (colour: red) is to be added to herbicides to show extent of treated area.</td>
<td></td>
</tr>
</tbody>
</table>

b) **Mulching**

Maintain an adequate level of mulch in planted beds to maximise water conservation and weed suppression.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain mulch depth to min 75 mm through periodic applications. Use same mulch as originally specified in each planting.</td>
<td>As required.</td>
</tr>
<tr>
<td>Mulch is to be applied to beds at edges of roads, paths and verges.</td>
<td></td>
</tr>
</tbody>
</table>

c) **Removal of Dead / Dying Plant Material**

To remove dead or dying plant material from landscapes. This action may be required as plantings mature, after damage or adverse environmental conditions.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove dead or dying plant material.</td>
<td>As required.</td>
</tr>
<tr>
<td>Replacement of plantings in accordance with actions listed in 4. Replacement Plantings (below)</td>
<td></td>
</tr>
</tbody>
</table>

d) **Replacement Plantings**

To ensure that the density and species of established plant material is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace failed, senescent or damaged plantings. Densities, sizes and species used are to be in accordance with those specified in the original landscape plans.</td>
<td>As Required</td>
</tr>
<tr>
<td>Water replacement plantings for a minimum of 12 weeks after planting.</td>
<td>Weekly</td>
</tr>
<tr>
<td>The species density and species selections specified for each area of landscape covered by this LMP are provided in Appendix 1 – Landscape Plans</td>
<td></td>
</tr>
</tbody>
</table>

e) **Tree Guards and Stakes**

To replace tree guards / stakes when damaged, and to remove when no longer required.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace timber tree guards or stakes (for trees and shrubs) if damaged or removed prior to plant establishment. Replace with same or equivalent guard / stake.</td>
<td>As required.</td>
</tr>
<tr>
<td>Remove tree guards and stakes.</td>
<td>12 months after planting.</td>
</tr>
</tbody>
</table>
f) Horticultural Maintenance of Plantings

Horticultural maintenance of advanced plantings to ensure the long life and maintenance of form.

The following tables outline the standards required for pruning and fertilising all Landscape Planter Bed or Feature Plantings.

**Trees - Feature Planting**

<table>
<thead>
<tr>
<th>Botanic Name</th>
<th>Common Name</th>
<th>Pruning Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acmena smithii</td>
<td>Lilly Pilly</td>
<td>B</td>
</tr>
<tr>
<td>Allocasuarina littoralis</td>
<td>Black She-Oak</td>
<td>B</td>
</tr>
<tr>
<td>Allocasuarina torulosa</td>
<td>Forest She-Oak</td>
<td>B</td>
</tr>
<tr>
<td>Angophora bakeri</td>
<td>Narrow-leaved Apple</td>
<td>A</td>
</tr>
<tr>
<td>Angophora costata</td>
<td>Sydney Red Gum</td>
<td>B</td>
</tr>
<tr>
<td>Angophora fluminens</td>
<td>Rough-barked Apple</td>
<td>A</td>
</tr>
<tr>
<td>Callistemon salignus</td>
<td>Willow Bottlebrush</td>
<td>B</td>
</tr>
<tr>
<td>Casuarina glauca</td>
<td>Swamp Oak</td>
<td>B</td>
</tr>
<tr>
<td>Corymbia gummiflora</td>
<td>Red Bloodwood</td>
<td>A</td>
</tr>
<tr>
<td>Corymbia maculata</td>
<td>Spotted Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus agglomerata</td>
<td>Blue-leaved Stringybark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus ampilodora</td>
<td>Cabbage Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus capitellata</td>
<td>Brown Stringybark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus crebra</td>
<td>Narrow-leaved Ironbark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus fibrosa</td>
<td>Broad-leaved Red Ironbark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus grandis</td>
<td>Flooded Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus moluccana</td>
<td>Grey Box</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus microcorys</td>
<td>Tallowood</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus parramattensis subsp. Deaardiens</td>
<td>Parramatta Red Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus pilularis</td>
<td>Blackbutt</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus piperita</td>
<td>Sydney Peppermint</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus punctata</td>
<td>Grey Gum</td>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Botanic Name</th>
<th>Common Name</th>
<th>Pruning Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus racemosus</td>
<td>Narrow-leaved Scribbly Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus robusta</td>
<td>Swamp Mahogany</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus siderophloia</td>
<td>Northern Grey Ironbark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus signata</td>
<td>Scribbly Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus spanicola</td>
<td>Narrow-leaved Ironbark</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus tereticornis</td>
<td>Forest Red Gum</td>
<td>A</td>
</tr>
<tr>
<td>Eucalyptus umbra</td>
<td>Broad-leaved White Mahogany</td>
<td>A</td>
</tr>
<tr>
<td>Ficus coronata</td>
<td>Sandpaper Fig</td>
<td>B</td>
</tr>
<tr>
<td>Glochidion ferrinianum</td>
<td>Cheese Tree</td>
<td>B</td>
</tr>
<tr>
<td>Syncarpia glomulifera</td>
<td>Turpentine</td>
<td>A</td>
</tr>
<tr>
<td>Melaleuca linariifolia</td>
<td>Flax-leaved Paperbark</td>
<td>B</td>
</tr>
<tr>
<td>Melaleuca stypheloides</td>
<td>Prickly-leaved Paperbark</td>
<td>B</td>
</tr>
<tr>
<td>Olea Europea “Swain-H8”</td>
<td>European Olive (Non-fruiting variety)</td>
<td>B (prune lower limbs to 2m above ground)</td>
</tr>
</tbody>
</table>

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
<table>
<thead>
<tr>
<th>Species</th>
<th>Subspecies</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callistemon salignus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casuarina glauca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corymbia gumiflora</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corymbia maculata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus ampilifila</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus crebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus agglomerata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus cappelata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus ferox</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus grandis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus microcorys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus moroeorys</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
For all tree species, the following fertilising and pruning is required:

### Apply the following fertiliser to all species:

<table>
<thead>
<tr>
<th>Fertilising</th>
<th>Frequency</th>
</tr>
</thead>
</table>

### Pruning

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Prune to remove split leaders, remove dead limbs, and remove heavily damaged limbs. As maturity permits prune lower branches to collar to 5.5 m above ground level where these overhang carriageways and roads. In other areas, prune lower branches to 3.3m above ground level.</td>
<td>As required.</td>
</tr>
<tr>
<td>B Prune to remove split leaders, remove dead limbs, and remove heavily damaged limbs. As maturity permits prune lower branches to 1 m above ground level</td>
<td>As required.</td>
</tr>
<tr>
<td>C Prune to remove dead fronds. Remove fronds to base of crown of fronds, do not leave fronds hanging from trunk.</td>
<td>As required.</td>
</tr>
</tbody>
</table>

For all shrub species, the following fertilising and pruning is required:

### Apply the following fertiliser to all species:

<table>
<thead>
<tr>
<th>Fertilising</th>
<th>Frequency</th>
</tr>
</thead>
</table>

### Pruning

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Prune evenly to promote compact shape (to specified max. height). Remove 200 to 300mm (depending on vigour of previous plant growth) length of branches all around the plant.</td>
<td>Annually. Late Spring</td>
</tr>
<tr>
<td>C Tip prune to encourage density.</td>
<td>Annually after flowering.</td>
</tr>
</tbody>
</table>

---

**Feature Planting-Shrubs**

<table>
<thead>
<tr>
<th>Botanic Name</th>
<th>Common Name</th>
<th>Pruning Type</th>
<th>Max. Height (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banksia spinulosa</td>
<td>Hair-pin Banksia</td>
<td>B</td>
<td>2.5</td>
</tr>
<tr>
<td>Callistemon salignus</td>
<td>Willow Bottlebrush</td>
<td>B</td>
<td>2.5</td>
</tr>
<tr>
<td>Flannel dactyloides</td>
<td>Broad-leaved Flannel</td>
<td>B</td>
<td>2</td>
</tr>
<tr>
<td>Lumberia Armosa</td>
<td>Mountain Devil</td>
<td>B</td>
<td>1.2</td>
</tr>
<tr>
<td>Leptospermum polyanthum</td>
<td>Lemon-scented Tea-tree</td>
<td>B</td>
<td>2.5</td>
</tr>
<tr>
<td>Melaleuca decora</td>
<td>White Feather Honeymyrtle</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>Melaleuca farinosa</td>
<td>Flax-leaved Paperbark</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>Melaleuca nodosa</td>
<td>Ball Honeymyrtle</td>
<td>B</td>
<td>2</td>
</tr>
</tbody>
</table>

Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Feature Planting - Ground Covers / Low Tussocks

<table>
<thead>
<tr>
<th>Botanic Name</th>
<th>Common Name</th>
<th>Pruning Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clematis aristata</td>
<td>Old Man's Beard G</td>
<td>G</td>
</tr>
<tr>
<td>Dianella revoluta var. revoluta</td>
<td>Spreading Flax Lily</td>
<td>H</td>
</tr>
<tr>
<td>Hardenbergia violacea</td>
<td>False Sarsaparilla</td>
<td>G</td>
</tr>
<tr>
<td>Lepidosperma laterale</td>
<td>Variable Sword Sedge</td>
<td>H</td>
</tr>
<tr>
<td>Lomandra longifolia</td>
<td>Spiny-headed Mat-Rush</td>
<td>H</td>
</tr>
<tr>
<td>Lomandra multiflora subsp. multiflora</td>
<td>Many flowered Mat Rush</td>
<td>H</td>
</tr>
<tr>
<td>Oxylobium ellipticum</td>
<td>Pea</td>
<td>G</td>
</tr>
<tr>
<td>Phyllanthus hirtellus</td>
<td>Thyme Spurge</td>
<td>G</td>
</tr>
</tbody>
</table>

For all groundcover and low tussock species, the following fertilising and pruning is required:

<table>
<thead>
<tr>
<th>Fertilising</th>
<th>Frequency</th>
<th>Pruning</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 grams slow release</td>
<td>Annually.</td>
<td>G Prune evenly to a height of 300mm above ground</td>
<td>Every 2 years in April.</td>
</tr>
<tr>
<td>fertiliser per plant.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N:P:K ratio - 18:3:10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H Remove spent flower heads</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>J Mowing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Prune species as per appropriate type: |

<table>
<thead>
<tr>
<th></th>
<th>Pruning</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G</td>
<td>Every 2 years in April.</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Detailed Design for Hunter Expressway – Kurri Kurri to Branxton**
Areas of Special Consideration

The following maintenance issues and actions are to be implemented by all maintenance authorities in areas of special consideration.

The extent of special are illustrated generally on the LMP Landscape Plans

1. Batter Re-Vegetation Management Strategy

To ensure batter stability through the successful establishment of vegetation.

A batter management strategy is recommended as part of the long-term management of the road edge. The strategy will be audited and revised as experiences demands.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intervention</th>
<th>Repair Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Topsoil and hydromulch</td>
<td>Where areas larger than rilling occur After previous option fails</td>
<td>Reapply topsoil as specified in Landscape Plans and ensure an even finish and matches existing ground levels. Vegetation is established and binds soil within first growing season.</td>
</tr>
<tr>
<td>2. Topsoil and hydroseed</td>
<td>At areas where rilling only occurs After initial growing season or next failure. Vegetation is established and binds soil within first growing season, halting rilling.</td>
<td></td>
</tr>
<tr>
<td>3. Engineered solutions may include anchor mat, or meshes</td>
<td>At slopes of 2:1 or steeper After previous options fail</td>
<td>Apply topsoil type to ensure successful vegetation growth. Topsoil depth as per the anchor mat manufacturers recommendations. Vegetation is established and binds soil within first growing season.</td>
</tr>
<tr>
<td>4. One of the previous treatments plus Tubestock planting</td>
<td>After previous options fail and only in those areas where tree planting is permitted is not interfering with sight lines or within a setback zone</td>
<td>Vegetation is established and binds soil within first growing season.</td>
</tr>
<tr>
<td>5. Lastly shotcrete (although shotcrete is not preferred and would require urban design treatments to be visually acceptable)</td>
<td>After previous options fail</td>
<td></td>
</tr>
</tbody>
</table>
The cause of rilling should be identified and rectified before reapplication of topsoil etc.

All plant species, hydromulch and tubestock to be as per Landscape Planting and Seeding Plans.

Geo-technical advice is recommended for each situation to identify potential variations in the physical properties of the underlying geology which may impact on the practicality of planting vegetation community type on a single cut batter. Final plant selection was varied to match the final exposed geological properties without variation to the design intent as best as possible.

Final plant selection for use at these locations should be as per the Landscape Planting and Seeding Plan to match those species in the existing adjacent vegetation community and that tolerate drier conditions due to potentially lower or non-existent water table.

2. Fauna Underpasses

To ensure that the integrity of the fauna underpasses is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove all plant growth from fence ie; vine growth</td>
<td>As required</td>
</tr>
<tr>
<td>Remove all fallen branches and tree limbs that are leaning or resting on or against the fence or fauna crossing paths</td>
<td>As required</td>
</tr>
<tr>
<td>Maintain the grassed access path across the underpass to maintain height to 300mm max.</td>
<td>As required</td>
</tr>
<tr>
<td>Provide surveillance for evidence of predators such as foxes, cats and wild dogs and report to DEC if suspected.</td>
<td>monthly</td>
</tr>
<tr>
<td>Maintain fauna refuge poles and frog pipes in good condition and repair where necessary</td>
<td>As required</td>
</tr>
</tbody>
</table>

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans.

3. Fauna Fence

To ensure that the integrity of the fauna fence is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove all plant growth from fence ie; vine growth</td>
<td>As required</td>
</tr>
<tr>
<td>Remove all fallen branches and tree limbs that are leaning or resting on or against the fence</td>
<td>As required</td>
</tr>
<tr>
<td>Maintain height of planting to maximum 300mm in height within 2 metres and remove all naturally occurring tree species within 3 metres of the non-road side of the fence.</td>
<td>As required</td>
</tr>
<tr>
<td>Maintain height of planting to maximum 300mm in height within 1m and remove all naturally occurring tree species within 2 metres on the road side of the fence except where shown on plan.</td>
<td>As required</td>
</tr>
</tbody>
</table>

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans.

4. Water Quality Ponds and Detention Basins

To ensure that the integrity of the transpiration area is maintained.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain grass species as per Grassed (Mown) Areas Refer Grassed (Mown) Areas</td>
<td>Weeds Macrophyte zones and embankments As required but only during dry periods when no water present</td>
</tr>
<tr>
<td>Weed macrophyte zones and embankments</td>
<td>As required</td>
</tr>
<tr>
<td>Macrophyte Zones should require no special attention except through periods of prolonged drought when local tree species may colonise the basins. These are to be removed.</td>
<td>As required</td>
</tr>
<tr>
<td>If spills occur or when silt build-up requires removal, macrophytes may require total replacement as per the landscape plans</td>
<td>As required</td>
</tr>
</tbody>
</table>

The species density and species selections specified for macrophyte (margin zone planting) zones covered by this LMP will be provided in the Landscape Plans.

5. Threatened Species

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
</table>

The species density and species selections specified for macrophyte (margin zone planting) zones covered by this LMP will be provided in the Landscape Plans.
### Actions Required

**Frequency**

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care is to be taken not to harm threatened flora within the road corridor. The location of all the threatened species is to be documented along with a monitoring report as per Appendix 14 of the SWTC to be issued for all individual threatened species covered in the EMP.</td>
<td>Annually</td>
</tr>
</tbody>
</table>

### 6. Site Works

There are a number of areas on the landscape plans that state “Extent of Works to be confirmed on site”. This work is documented below.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Batch Plants</td>
<td></td>
</tr>
<tr>
<td>2. Compounds</td>
<td></td>
</tr>
<tr>
<td>3. Stockpiles</td>
<td></td>
</tr>
<tr>
<td>4. Other areas</td>
<td></td>
</tr>
<tr>
<td>Adjust extent of landscape works on site to suit. The yards will be in place during the maintenance period, after which the yard will be the subject of further landscape remediation as per Landscape Rehabilitation – Areas Disturbed by Construction.</td>
<td>Completion of works</td>
</tr>
</tbody>
</table>

### 7. Buchanan Rest Areas – Northbound and Southbound

To ensure that the integrity and standard of the rest area is maintained for public amenity.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove all rubbish to prevent the blocking of permeable kerb. Remove rubbish from vegetated swales.</td>
<td>As required</td>
</tr>
<tr>
<td>Remove all fallen branches and tree limbs that are leaning or resting on or against water quality pond fences</td>
<td>As required</td>
</tr>
<tr>
<td>Maintain grassed areas as per “mowing”</td>
<td>As per “mowing”</td>
</tr>
<tr>
<td>Maintain grassed septic absorption area as per mowing to maintain grass and removing clippings</td>
<td>As per “mowing”</td>
</tr>
<tr>
<td>Visually inspect amenities and alert RTA to any actions (such as vandalism or inoperable equipment) required outside the scope of the landscape maintenance</td>
<td>As required</td>
</tr>
</tbody>
</table>

### 8. Riparian Zones

To ensure that the integrity of riparian zones is maintained for resilience to flooding.

<table>
<thead>
<tr>
<th>Actions Required</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove all rubbish and fallen branches to prevent the blocking of underbridges or culverts. Remove rubbish from vegetated zones.</td>
<td>As required</td>
</tr>
<tr>
<td>Inspection following abnormal rainfall events to assess any damage caused by increased flows. Take remedial action as for All Areas, replacement plantings and horticultural maintenance of plantings.</td>
<td>As required</td>
</tr>
<tr>
<td>Repair Jute Mesh where damage or lifting has occurred.</td>
<td>As required</td>
</tr>
</tbody>
</table>

The species density and species selections specified for each area of landscape covered by this LMP will be provided in the Landscape Plans.

### 9. Bushland Regeneration Area

See Section 4. Landscape Rehabilitation Plan.

### 10. Bushland Reconstruction Area

See Section 4. Landscape Rehabilitation Plan.

### 11. Bushland Rehabilitation Areas disturbed by construction activities (construction access tracks and other landscape types within bushland areas and used for construction purposes)

See Section 4. Landscape Rehabilitation Plan.
4 LANDSCAPE REHABILITATION PLAN

In addition to the above general aspects of the landscape, the landscape design also includes requirements as set out in Appendix 15 for Landscape Rehabilitation Areas. See Table 4.1 below for the extent of landscape rehabilitation areas. Landscape Rehabilitation Areas are designed to protect and improve the biodiversity of the dominant vegetation communities (especially those listed as EEC’s which include; Central Hunter Riparian Forest, Hunter Lowland Redgum Forest, Kurri Sand Swamp Woodland, Lower Hunter Spotted Gum-Ironbark Forest and post the original mapping now also includes Central Hunter Ironbark-Spotted Gum-Grey Box Forest) within the project area.

### Table 4.1 Extent of Landscape Rehabilitation Areas

<table>
<thead>
<tr>
<th>Chainage</th>
<th>Description</th>
<th>Dominant vegetation communities</th>
</tr>
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<tbody>
<tr>
<td>12900 - 20000</td>
<td>Waterway at Ch 12900 to waterway at Ch 20000</td>
<td>Kurri Sand Swamp Woodland Lower Hunter Spotted Gum Ironbark Forest</td>
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<tr>
<td>20700 - 26600</td>
<td>Waterway at Ch 20700 to 800m south of Alandale interchange</td>
<td>Lower Hunter Spotted Gum Ironbark Forest Hunter Lowland Redgum Forest</td>
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<tr>
<td>28250 - 35500</td>
<td>750m north of Alandale interchange to Branxton interchange</td>
<td>Lower Hunter Spotted Gum Ironbark Forest Hunter Lowland Redgum Forest</td>
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</tbody>
</table>

These comprise well forested areas within the project boundary where within 12 months of commencement of the work they can be anticipated to have less than 15% weed cover. Regenerating the bushland within the project boundary will improve biodiversity and improve the expressway backdrop of native Australian landscape and pastoral views.

### 4.2 Bushland Regeneration Areas

Bushland regeneration will be undertaken in areas that have received a primary weeding treatment, including selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds are to be targeted during the follow up weeding phase.

Follow-up weeding will be undertaken in areas that have received a primary weeding treatment, including selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds are to be targeted during the follow up weeding phase.

Follow-up bush regeneration work is to commence no longer than 3 months after the first exposure to primary weeding, and continue to a point where native plants occur at 95% or higher cover levels. Maintenance weeding is to be undertaken in areas where native plant regeneration has significantly progressed to the stage where native plants occur at high percentage cover levels (95% or greater).

Bushland regeneration is to be undertaken by appropriately qualified bush regenerators. All bush regenerators will have attained or be in the process of completing the TAFE certificate ii course in natural area restoration, or an equivalent qualification which has strong practical application of the principles of natural regeneration.

**Figure 4.1 Extent of Landscape Rehabilitation Areas**

Landscape Rehabilitation Areas include the following sub types:

- **4.1 Landscape Rehabilitation Areas Disturbed by Construction Activities**

These are areas which include de-commisioned side roads and tracks, batching plants, site offices and compounds, construction parking areas, and all other areas with slopes 3:1 or less which require rehabilitation following construction. These areas are indicated on the planting and seeding plans and topsoil plans and will be rehabilitated according to Appendix 15.6 and RTA Specification D & C R378 Vegetation which specify measures such as:

- The method of stripping of A1 and A2 horizons topsoil for re-use in landscape rehabilitation areas;
- Direct return of topsoil where practical;
- Stockpiling of bushland topsoil in order to preserve the stored soil seedbank and soil micro-flora;
- Preparation of receiving sites for bushland topsoil;
- Composting and amelioration of components (site topsoil and woodchip) of bushland topsoil;
- Application of bushland topsoil, and;
- Application of the appropriate hydromulch seed mix and planting (according to character zone and vegetation community).

See section 5 for details of topsoil management and treatments for Landscape Rehabilitation Areas Disturbed by Construction Activities or HEX-LS-20-0003.

Within Landscape Rehabilitation Areas disturbed by construction activities, the Contractor must implement careful management of topsoil stripping, storage and return for the purpose of preserving the native species soil seedbank.

**Detailed Design for Hunter Expressway – Kurri Kurri to Branxton**

In summary, the soil seedbank from nominated areas is to be salvaged during clearing operations, stored according to vegetation community type, and then spread on batters and road verges to revegetate the site as construction is progressively completed. In optimal circumstances, programming will facilitate the direct return of topsoil.

Apart from the obvious ecological benefits such as the return of the endemic species composition (the soil seedbank will be composed entirely of native seed in the areas proposed for this treatment), prevention of weeds and improved management of Endangered Ecological Communities (avoiding the introduction of non-local genetic material into EEC’s), the project cost savings could prove to be substantial by reducing the requirement for seed collection, hydromulching, and landscape planting.

Plant propagules other than seed can also be present in the salvaged soil. These can include the roots and tubers of herbaceous native irises, lilies and other plant types which can propagate from below ground plant parts. In the majority of native plant communities, species with soil-stored seed can comprise 20-50% of the total flora. Soil seedbanks are composed mainly of fast growing pioneer species, particularly ground layer species and shrubs. Many of these species are not reliably propagated from seed (eg; Persoonia spp.)

The method of stripping of A1 and A2 horizons topsoil for re-use in landscape rehabilitation areas;
The D and C will make all efforts to exclude access to these areas other than the designated bush regenerators, to prevent disturbance and the introduction of weeds. Access should be strictly policed because the savings in later remedial action are likely to be significant.

This is particularly pertinent because since the LACCREMS native vegetation mapping by Biosis Research in 2005 upon which the landscape rehabilitation areas and clearing limits are based, ground-truthing has shown that there has been significant increases in the regrowth vegetation cover of bushland.

The extent of potential bushland regeneration areas are indicated on the Planting and Seeding Plans.

4.3 Bushland Reconstruction Areas

These are areas within the project boundary where existing bushland or bushland remnants surround or are in proximity to clearings, and where the new expressway would cause these areas to become “island” clearings. These areas will be subject to landscape rehabilitation through active revegetation (called “Bushland Reconstruction”) to “infill” the “gaps” in the existing bushland. This increases the area of each vegetation community, compensates for some of the loss due to clearing for the expressway and improves habitat connectivity for fauna. The majority of bushland reconstruction will be comprised of the five vegetation communities found to be occurring along the western section of the highway, four of which are listed as Endangered Ecological Communities.

It is anticipated that many of these areas will have topsoil horizons intact and will not require additional topsoil. In addition there are often remnant trees, shrubs or native grasses present which precludes extensive cultivation. Soil preparation will include the addition of ameliorants and cultivation as recommended by the project soil scientist. Direct seeding of natives with the appropriate hydromulch seed mix (according to character zone and vegetation community), and/or mass planting. Follow up weed control will contribute to a well vegetated corridor with improved biodiversity.

Where no remnant or regrowth bushland is found, Bushland Reconstruction Areas provide an ideal case for direct return of bushland topsoil. Prepare these area ahead of topsoil stripping of the alignment construction footprint by spraying with glyphosate at the recommended rate to remove pasture grasses and weeds, stripped A1 horizon topsoil can be placed directly over the area. This soil should contain sufficient seed for rapid germination. Ensure that the stripped soil originates from the adjacent vegetation communities. See Section 5.5 of this report for topsoil treatments for Bushland Reconstruction Areas or HEX-LS-20-0003.

In addition to direct return and in order to control erosion, hydromulch the entire area where shown on the landscape plans with the appropriate hydromulch mix. Note that Hydromulch mixes in the landscape schedules do not contain tree seed. Tree seed from the appropriate vegetation community can be added to the hydromulch mixes for Bushland Reconstruction Areas because all are beyond the required clearance distances.

Areas of bushland reconstruction were identified from aerial mapping. In the intervening period since mapping, ground-truthing has shown that bushland has increased in some areas through regrowth with the introduction of very few weeds. Therefore many of the areas indicated as bushland reconstruction may be best managed as bushland regeneration areas with no planting seeding or mulching required. Such areas will be identified on site by the Landscape Restoration Manager.

As for bushland regeneration areas, it is in the contractors interest to restrict access to these areas wherever possible in order to allow the natural regrowth to continue for the duration of the construction period.

The extent of potential bushland reconstruction areas are indicated on the Planting and Seeding Plans.

4.4 Clearing Limits

Beyond the clearing limits shown on the landscape plans are extensive Landscape Rehabilitation Areas. The single most important task of the Landscape Restoration Manager is to restrict access to these areas. Failure to do so will result in the degradation of intact or naturally regenerating vegetation communities which must be then rehabilitated at greater cost. Restricting access is also the single most effective method of preventing the introduction of weeds to these areas.

4.5 Maintenance in Landscape Rehabilitation Areas

Following establishment, the maintenance required for landscape rehabilitation areas follows that described for Landscape maintenance in other areas (see landscape maintenance plan). Those that can be described as bushland regeneration areas will utilize the weed removal strategies described in that approach.

Maintenance of Landscape rehabilitation areas will continue throughout the project works from the commencement of construction until the date of construction completion and for 12 months post completion.

4.6 Monitoring of Landscape Rehabilitation Works

Any augmentation of Landscape Rehabilitation Areas through weed control, planting, seeding or translocation of topsoil will be monitored. Monitoring will take place within each vegetation community and within each landscape rehabilitation type. Each location would be marked with a stake, which is used as the centre of a 20m radius sample plot. Data on a range of environmental and biological variables should be collected prior to the translocation, and photographs taken of the sites. Photographs should be taken from the same position during each monitoring session.

Examples of variables that would be monitored include:

- Habitat condition;
- Floristics and structure;
- The environmental parameters controlled, such as weeds, irrigation and grazing animals;
- The intensity of management required;
- Growth and survival of planted seeds;
- The survival of the target species established; and,
- Reproduction of translocated and self-recruited plants.

In addition, the presence of any threatened species identified within the Bushland Rehabilitation Areas should be monitored and data collected as above.

Monitoring of rehabilitation works is to be performed at 3 monthly intervals throughout the contract period in order to measure performance against the requirements of Appendix 15 and to provide recommendations for improvement. Monitoring reports must be provided to the RTA representative. See Appendix C for 3-monthly maintenance form.
5 TOPSOIL MANAGEMENT

Topsoil management, as detailed in Appendix 15, Version 6.0, of the SWTC and topsoil drawings HEA-GEN-DRG-LA001-301 to 326, has been carefully considered in respect of opportunities for:

- direct return of topsoil;
- soil amendments;
- the utilization of organic materials and other soil ameliorants as additives to improve soil quality, and;
- the stockpiling of topsoil to preserve the soil seed bank and to ensure soils from plant communities remain intact and are returned to areas where those plant communities occur.

The application of these requirements for the Kurri Kurri to Branxton section are described below.

Landscape Topsoil and Bushland Topsoil.
Two terms are used to describe the topsoils used for this project. Landscape Topsoils and Bushland Topsoils

5.1 Landscape Topsoils
All topsoils which are not required for landscape rehabilitation areas are hereafter referred to as “Landscape Topsoils”. Landscape topsoils are generally from areas of the alignment where existing (mainly exotic) pasture is the main vegetation cover but may also include patches of bushland or remnant trees. Generally there is no intact existing vegetation community present.

Unlike Bushland topsoils, there is no requirement to strip, store or apply landscape topsoils according to vegetation community. Therefore landscape topsoils are to be stripped and stored according to RTA specification R44. The method for treating landscape topsoils is summarised in figure 5.1;

5.2 Bushland Topsoils
App. 15 of the SWTC uses the term “Bushland Topsoil” to describe topsoil to be stripped and re-used in the nominated Landscape Rehabilitation Areas. These are the topsoils where the native soil seedbank is to be preserved. Site visits by the project team have verified the notable absence of weeds in the nominated landscape rehabilitation areas.

The method for treating landscape topsoils is summarised in the figure 5.2;
5.3 Topsoil Management Zones

The nominated chainages where each type occurs, and the vegetation communities that occur within them, are shown in Figure 5.3 below:

5.4 Topsoil Management in Landscape Rehabilitation Areas

The following extract from the SWTC Appendix 15 describes the requirements for stripping, storing and applying bushland topsoils. Any recommendations, proposed changes or comments are shown in red.

5.4.1 Stripping

- The Contractor must undertake soil pedology survey and analysis within each soil landscape and vegetation community type. Each soil landscape and vegetation community type must be tested in three locations, each with three sampling depths of A1, A2 and B1 horizons. Soil testing must be undertaken by a National Association of Testing Authorities (NATA) registered laboratory and include pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon/nitrogen.
- Soil testing and any recommendations must be made by an appropriately qualified soil scientist with expertise in revegetation.
- The Contractor must strip at least 50,000m³ of A1 Horizon topsoil from Landscape Rehabilitation Areas, or sufficient topsoil to implement the landscape rehabilitation requirements, whichever is greater, in the manner outlined below. The quantities of topsoil from each vegetation community type stripped must be directly proportional to the areas of each vegetation community subject to landscape rehabilitation activities.
- Stripping undertaken for the purpose of generating bushland topsoil must be undertaken by the following process:

   1. Soil testing prior to stripping each soil community type in three locations at three depths.
   2. Stripping A1 horizon with slashed trash to a depth of 100mm. Remaining topsoil to the depth required.
   3. Stockpile according to vegetation community and cover crop (to 1.5m high x 3m wide. A1 to 1m high, A2 to 1.5m high, A1 to 1.5m high).
   4. Direct return mix with loose compost.

5.4.2 Soil Testing

- Soil testing must verify existing organic matter content and include additional testing for pH, salinity, cation exchange capacity, plant available phosphorous, total organic matter, total nitrogen and carbon/nitrogen.

5.4.3 Topsoiling

- All other areas:
  - Direct return. Mix with 15% composted mulch.
5.4.4 Preparation for bushland topsoil application

(m) All bushland topsoil re-used within landscape rehabilitation areas must be prepared in the following manner:

(i) Liming and mixing of any A1 Horizon to a depth of 200mm; and
(ii) A3 Horizon to a depth of 100mm. The soil depths noted here are fine for Landscape Rehabilitation Areas outside the formation. However on formations such as fill and cut batters, and in special situations such as at interchanges, medians and adjacent to noise walls, this may be varied. Refer to the landscape plans. The general depth for roadworks batter slopes of 2:1 is 50-100mm, however in cases when composted mulch is added at the maximum quantities described here, it would have a greater ability to withstand slippage and erosive forces and could therefore be applied to a full 100mm

5.4.5 Application of bus hland topsoil

(b) Bushland topsoil must be stockpiled separately by vegetation community type. For each vegetation community type, topsoil is to be stockpiled as follows:

(i) A1 Horizon in windrows up to one (1) metre high by a maximum of three (3) metres wide at the base; and
(ii) A2 Horizon in windrows of any stable configuration. (According to RA4)

5.4.3 Stockpiling

(i) Bushland topsoil from Endangered Ecological Communities - 6 months;
(ii) Bushland topsoil from the Greta to Branxton section - 12 months, with the exception of cut batters below the first bench and fill batters above the first bench; and
(iii) All other bushland topsoil – 18 months.

5.4.4 Preparation for bushland topsoil application

(m) All bushland topsoil re-used within landscape rehabilitation areas must be prepared in the following manner:

(i) Limit the use of heavy or tracked vehicles and equipment so as not to disturb the A1 horizon surface soil to the extent that it is contaminated with lower layers.
(ii) Where tree density does not allow effective slashing or the stripping of topsoil as described below, remove trees and stumps in a manner that does not mix B Horizon soil with bushland topsoil. Acceptable methods include felling trees and grinding stumps.
(iii) Slash the understory to within 50mm of ground level, leaving the slashed trash insitu.
(iv) Pause for a period of one (1) week prior to undertaking bushland topsoil stripping.
(v) Strip remaining topsoil to extent required. Avoid mixing of B Horizon material.
(vi) Clear any remaining trees [including stumps] and any other remaining vegetation.

5.4.2 Direct Return

The construction process must facilitate the immediate re-laying (hereafter referred to as direct return) of stripped topsoil in Landscape Rehabilitation Areas. Where it is not practical to direct return bushland topsoil to batters and embankments of the road formation due to earthworks programming, the Contractor is to direct return an amount of bushland topsoil to Landscape Rehabilitation Areas within the road corridor where bushland restoration is required. Where it is not possible to undertake direct return of bushland topsoil, bushland topsoil must be stockpiled in areas separate from all other stockpiled material to minimise the potential for weed contamination. Topsoil handling and stockpile contamination are critical factors with regard to the success of the landscape rehabilitation process.

In addition to direct return of topsoil, the direct return of mulches containing known seed bearing material, the salvage of tree trunks and large branches to provide coarse woody debris, and the salvage of cut branches and any other seed bearing plant material to spread at the receptor site as a brush matting, are all practical methods of returning seed to rehabilitation sites within the project works.

5.4.3 Stockpiling

Bushland topsoil must be stockpiled separately by vegetation community type. For each vegetation community type, topsoil is to be stockpiled as follows:

(i) A1 Horizon in windrows up to one (1) metre high by a maximum of three (3) metres wide at the base; and
(ii) A2 Horizon in windrows of any stable configuration. (According to RA4)
(j) Bushland topsoil (A1 Horizon Only) must not be stockpiled for periods greater than:

(i) Bushland topsoil from Endangered Ecological Communities - 6 months;
(ii) Bushland topsoil from the Greta to Branxton section - 12 months, with the exception of cut batters below the first bench and fill batters above the first bench; and
(iii) All other bushland topsoil – 18 months.

Large, clearly legible signs must be placed and maintained on each windrow, nominating vegetation community type, soil horizon, collection area (e.g. by chaining) and date of stockpiling.

These additives may be best added in liquid form especially since they must be added early to assist the composting process and if windrowed in remote locations which make chemical mixing and turning of dry ingredients impractical.
Given these parameters and also limited areas available for separate stockpiling and composting of mulches due to clearing limits required for Endangered Ecological Communities, one solution may be to stockpile in windrows at the bottom and/or tops of cut and fill batters as in figure 5.4 below to facilitate the composting process, mixing and spreading of bushland topsoils.

**Figure 5.4 Suggestions for Windrowing topsoils and mulch for later spreading on batters**

Final topsoil treatments will be made in consultation with the project soil scientist. The topsoil treatments may include amelioration with compost, lime, gypsum and fertilizer and other parameters as identified in R178.

### 5.5 Topsoil Application

The following topsoil applications are required for the various landscape types encountered.

**Topsoil Treatment 1: For Areas Flatter than 3H:1V (For planting, hydromulching, turfing and grass seeding all areas other than batters).**

- Rip the subsoil to a depth of 300mm (except within water quality basins and creek edges which should be ripped to 100mm only, and for medians which should be ripped to 200mm). Rip parallel to contours on slopes.
- Do not smooth or compact the roughened subsoil surface prior to the application of topsoil.
Topsoil Treatment 1: For Areas Steeper than 3H:1V (for hydromulching batters)

- Prepare batter base/sub by ripping to a depth of 100mm using the tynes on a swivelling head excavator bucket, or by some other means to form a loosened or roughened surface suitable for the application of topsoil and/or seed. During ripping, mix in any materials required by soil testing into the upper 100mm layer to the rates specified within the soil testing recommendations and/or as advised by the Project soil scientist or geotechnical advisor. This may include the mixing of gypsum or any other suitable agent to prevent erosion of subsoil, if dispersivity is identified as an issue for the materials on the cut batter faces to be vegetated.
- Apply A1 horizon topsoil to a minimum depth of 50mm, but not more than 100mm.
- Spread out the topsoil to an even surface but do not otherwise smooth or compact the surface. (topsoil should have been previously ameliorated and any additional materials required by soil testing mixed at the stockpile).
- Provide ‘cleatmarks’, ‘dimples’ or horizontal scores so the base surface. This is best achieved by track rolling with an excavator or bulldozer.
- Apply appropriate hydromulch seed mix.
- For slopes steeper than 2H:1V and up to 1.5H:1V install Jute Mesh as per the specification over final topsoil preparation and prior to hydromulching.

Topsoil Treatment 2: For Areas Steeper than 3H:1V (For hydromulching batters)

- Apply A1 horizon topsoil to a minimum depth of 100mm generally; 100mm for medians; 150mm where feature trees, shrubs and mass plantings occur at intersections, and; 300mm where between the noise wall and pavement.
- Spread the topsoil but do not otherwise smooth or compact the surface. Trim the surface flush with adjacent surfaces.
- Apply appropriate hydromulch seed mix or plant. Where pasture grass or native/pasture seeding is to be applied, level, trim and roll to lightly compact.
- For tubestock: prepare 150x150x200mm deep hole.
- For advanced tree: prepare 400x400x350mm deep hole.
- Apply fertiliser at the recommended rates (refer to relevant version of modified specifications R178 and R179).
- Install advanced trees/ tubestock and backfill with topsoil to finish flush with ground level.
- Apply 75mm mulch to planted areas.
- Spread the topsoil but do not otherwise smooth or compact the surface. Trim the surface flush with adjacent surfaces.
- Topsoil Treatment 3: (Bushland Reconstruction and Landscape Rehabilitation Areas Disturbed by Construction Activities)

- Where existing topsoil is absent;
- Rip the subsoil/subgrade to a depth of 300mm. Where existing road surface occurs, it is to be removed. Avoid ripping within the dripline of established trees. Where A2 horizon is absent, apply A2 Horizon to a depth of 200mm. Apply A1 horizon bushland topsoil to a depth of 100mm. Apply appropriate hydromulch seed mix or planting in accordance with the landscape plans.
- Where existing topsoil is present;
- Assess whether there may be seedling regeneration in the area. In such cases, the landscape restoration officer may take no immediate action. If no germination can be observed, Rip the topsoil to a depth of 300mm. Avoid ripping within the dripline of established trees. Apply composted site mulch to the amount as directed by the Alliance soil scientist to augment the organic matter of the site soil. Apply appropriate hydromulch seed mix or planting in accordance with the landscape plans.
- Where existing topsoil and grass or other vegetative cover is also present;
**Appendix A**  
**LIST OF DRAWINGS**

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**Detailed Design for Hunter Expressway – Kurri Kurri to Branxton**
Appendix B  NOXIOUS WEED SPECIES: CESSnock, MAITLAND & PORT MACQUARIE

The following table contains a list of the Noxious Weed species that have been declared for the land covered by this LMP which includes the Local Government Areas of Cessnock, Maitland and Lake Macquarie City Council.

Maintenance staff should be familiarised with the identification of these species as their control (in accordance with the control category) is a legal requirement under the NSW Noxious Weeds Act.

Control techniques for these species are to be consistent the standards / practices outlined in the Noxious and Environmental Weed Control Handbook 2004-2005. Copies of this handbook can be downloaded for free from:


Where control standards have not been clearly defined for a species, control is to utilise chemicals (where required) that are registered for use on the species or control techniques that minimise environmental impacts.

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<tr>
<th>Common name</th>
<th>Botanical Name</th>
<th>Control Class</th>
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<td>Grass Trees</td>
<td>Celmisua repens</td>
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<td>Dactylis glomerata</td>
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Detailed Design for Hunter Expressway – Kurri Kurri to Branxton
### Appendix C  THREE MONTHLY MAINTENANCE AUDIT

This form is to be completed by the landscape supervisor / landscape officer in each agency responsible for overseeing their section of the site. Two copies of this completed form are required. One is to be issued to maintenance staff for action. The second is to be maintained for records.

Date of Inspection: ____________________________

Inspected by: _______________________________

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<th>Location</th>
<th>Landscape Type / Area</th>
<th>Issue</th>
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<th>Variation?</th>
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Signed: ____________________________ Date: ____________________________

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*Detailed Design for Hunter Expressway – Kurri Kurri to Branxton*