

6. Landscape Design and Implementation

As outlined in the previous sections of the report, the planting design responds to the site, the heritage qualities of the street trees, and Grafton being known for the Jacarandas, as well as responding to the need for a new approach to future streets that employs more sustainable, indigenous strategies. Planting, mulching and fertilizing will be done in accordance with RMS' R178 and R 179 specifications. The following information is provided to elaborate more on the planting design and landscape treatments.

6.1 Planting Design

The planting design responds to RMS guidelines as well as to Clarence Valley Council's policies, plans of management and guidelines for street trees and open space strategies. It also is designed to assist in mitigating the new works, and settling the infrastructure into the setting.

Planting design strategies are discussed within the Urban Design Concept Plan section 5, and in this section we elaborate further on species mixes, including graphic examples of plants chosen to portray the characters of key plant mixes and specific trees proposed.

6.1.1 Plant Mixes

Pound Street Streetscape Mixes

Shrubs

Callistemon "White Anzac"
Eriostemon myoporoides

Native tussocks and groundcovers

Anigozanthos flavidus
Lomandra longifolia "Tanika"
Lomandra hystrix "Katie Bells"

Greaves Street/ parkland and South Grafton embankments

High shrubs/low trees

Acacia elongata
Acmena smithii
Callistemon viminalis
Cupaniopsis anacardioides
Elaeocarpus reticulatus
Meleleuca styphelioides
Szygium luehmannii

Low shrubs

Baeckea virgata
Breynia oblongifolia
Dodonaea viscosa
Eriostemon myoporoides
Indigofera australis
Melaleuca thymifolia

Native Grasses

Austrodanthonia spp
Dianella caerulea
Imperata cylindrical
Lomandra longifolia
Microleana stipoides
Themeda australis

Median tussocks

Dianella caerulea "Little Jess"
Dianella caerulea "Lucia"
Lomandra longifolia "Tanika"

Pound Street - Planting Mixes



Fig. 6-1: Low Shrubs



Fig. 6-2: High Shrubs / Low Trees



Fig. 6-3: Low Shrubs



Fig. 6-4: Native grasses

Street trees

North Grafton

Pound St- north: *Flindersia australis*, Australian Teak
Pound St- south: *Jacaranda mimosifolia*
Clarence Street: reinstating existing *Stenocarpus sinatus*

Frangible small scale tree species- under/near power lines

Callistemon viminalis
Szygium leuhmannii

Greaves Street Park

Riparian trees predominant (*Eucalyptus grandis*,
Eucalyptus tereticornis, *Eucalyptus moluccana*) with
accent of:

Jacaranda mimosifolia
Ficus macrocarpa var. *hillii*
Brachychiton acerifolius (Illawarra Flame Tree)



Fig. 6-6: *Brachychiton acerifolius* (Illawarra Flame Tree)



Fig. 6-8: *Flindersia australis*



Fig. 6-10: *Szygium leuhmannii*



Fig. 6-5: *Jacaranda mimosifolia*



Fig. 6-7: *Ficus macrocarpa* var. *hillii*



Fig. 6-9: *Stenocarpus sinatus*



Fig. 6-11: *Callistemon viminalis*

South Grafton

Strong, evergreen framework proposed to complement the large commercial scale buildings and road infrastructure.

Tall trees

- Eucalyptus moluccana*
- Eucalyptus tereticornis*
- Angophora floribunda*
- Melaleuca quinquenervia*

Screening Shrubs- entrance roadway verges near industrial zones

- Acacia elongata*
- Banksia integrifolia*
- Callistemon viminalis*
- Cupaniopsis anacardioides*
- Elaeocarpus reticularis*
- Melaleuca linariifolia*
- Melaleuca styphelioides*
- Syzygium luehmannii*

Frangible street trees

- Syzygium luehmannii*



Fig. 6-12: *Eucalyptus moluccana*



Fig. 6-14: *Angophora floribunda*



Fig. 6-13: *Eucalyptus tereticornis*



Fig. 6-15: *Melaleuca quinquenervia*

Riparian planting

Riparian planting is proposed to each river bank transition space between river and the new bridge. This planting reinforces the indigenous species of the Sub-tropical coastal floodplain forest EEC association.

Riparian Shrubs

- Acmena smithii*
- Backhousia myrtifolia*
- Breynia oblongifolia*
- Banksia integrifolia*
- Elaeocarpus reticularis*
- Leptospermum polygalifolium*
- Melaleuca styphelioides*

Riparian tree planting

- Casuarina glauca*
- Casuarina cunninghamiana*
- Eucalyptus grandis*
- Eucalyptus moluccana*

Accent plant- roundabout Gwydir Street

This gateway needs strong definition. It balances the Jacarandas that lead to the old bridge/truss entry to Grafton, with the new indigenous Eucalypts street tree link to the new bridge.

Refer to the detail plan and artistic impression that illustrates the design. A dense, shrub framing with Bird of Paradise is proposed under the Jacarandas, and accented by swathes of native tussocks- Lomandras and Dianellas in the foreground. Views to the Truck Driver Memorial and to the service station will be maintained.

Under the Eucalypts, native tussocks predominate.

On the roundabout there is a subtle earth shaping to mound to the centre, and plant size transitions to 500mm high at the top, accented by grey/green groundcover - *Westringia "mundi"*.



Fig. 6-16: Riparian Planting - Shrubs



Fig. 6-17: Riparian tree planting

6.2 Planting Plans, Densities, and Sizes

Refer to the planting plans for detailed information which show the plant mixes and densities for all planting zones. The planting design responds to RMS guidelines as well as to Clarence Valley Council's policies, plans of management and guidelines for street trees and open space strategies.

Refer to the planting plans that indicate densities per hatch for various planting types and the sizes. A plant schedule, divided into North and South Grafton is provided for information. The densities comply with the brief, using denser spacings in key locations, and larger pot sizes. Larger tree stock (35L) is used at key intersections and streetscape areas, with smaller stock in open spaces.

Refer to the planting plans that indicate densities per hatch for various planting types and the sizes. A plant schedule, divided into North and South Grafton is provided for information. The densities comply with the brief, using denser spacings in key locations, and larger pot sizes. Larger tree stock (35L) is used at key intersections and streetscape areas, with smaller stock in open spaces.

GRAFTON BRIDGE PLANT SCHEDULE	
SPECIES	COMMON NAME
SPOT PLANTED TREES	
Angophora floribunda	Rough-barked Apple
Brachychiton acerifolius	
Callistemon viminalis	
Casuarina glauca	Swamp Oak
Casuarina cunninghamiana	River Oak
Eucalyptus grandis	Flooded Gum
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Ficus Macrocarpa var Hilli	
Flindersia Australis	Australian teak
Jacaranda mimosifolia	Jacaranda
Melaleuca quinquenervia	Broad-leaved Paperbark
Stenocarpus sinuatus	Fire Wheel Tree
Syzygium luehmannii	Leaved Lillypilly
TOTAL	
SHRUBS	
Acacia drummondii	Drummond's Wattle
Acacia elongata	Swamp Wattle
Acmena smithii	Creek Lilly Pilly
Backhousia myrtifolia	Grey myrtle
Baeckea virgata	Twiggy Baeckea
Banksia integrifolia	Coast Banksia
Breynia oblongifolia	Breynia
Callistemon viminalis	Weeping Red Bottlebrush
Callistemon "White Anzac"	Dwarf white Bottlebrush
Cupanopsis anacardioides	
Dodonaea viscosa	Hop Bush
Elaeocarpus obovatus	Hard Quandong
Elaeocarpus reticularis	
Eriostemon myoporoides	
Indigofera australis	Native indigo
Leptospermum polygalifolium subsp.cismontanum	Creek Tea Tree
Melaleuca linearifolia	Snow in Summer
Melaleuca stypheliodes	Prickly Paperbark
Melaleuca thymifolia	
Strelitzia reginae	
Syzygium luehmannii	Leaved Lillypilly
Westringia fruticosa	
TOTAL	

Table 6-1: Plant Schedule illustrating the plant species used. Numbers will be updated in detailed design.

NATIVE GRASSES & GROUNDCOVERS	
Anigozanthus flavidus	
Austrodanthonia sp.	Tall Wallaby Grass
Baumea articulata	
Carex appressa	Tussock Sedge
Dianella caerulea	Blue Flax Lily
Dianella variegated spp	
Dianella caerulea "Little Jess"	Blue Flax Lily-hybrid
Dianella caerulea "Lucia"	Blue Flax Lily- hybrid
Eleocharis sphacelata	
Juncus usitatus	Common rush
Imperata cylindrica	Blady Grass
Isoplepis nodosa	Knobby Club Rush
Lomandra hystrix "Katie belles"	
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra longifolia "Tanika"	Spiny-headed Mat-rush (hybrid)
Lythrum salicaria	
Microleana stipoides var stipiodes	Weeping Grass
Myriophyllum salsugenum	
Potamogetan crispus	
Potamogetan ochreatus / pectinatus	
Schoenoplectus validus	
Scirpus spp	
Themeda australis	
TOTAL	

6.3 Soil Conditioning, Fertilising

6.3.1 Site Improved Topsoil

The top layer of depth 50mm of high organic trash layer would be stockpiled separately from other topsoils on site. This material could be used for the embankment areas where dryland grassing or hydroseeding/hydromulching is shown.

All other site soil will be stripped and stockpiled according to specification. Soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine to medium texture classification to AS 4419 and is free from stones > 25 mm diameter, clay lumps > 75 mm diameter, weeds and tree roots, sticks and rubbish, and material toxic to plants will be tested and ameliorated prior for reuse on revegetated areas.

Site topsoil will not be incorporated into the works until soil testing certification has been approved. Site Improved topsoil will need to meet standard RMS/AS 4419 properties for reuse. Addition of compost, fertiliser, water crystals and additives will be as required by the results of soil testing. Testing of site improved topsoil would be carried out as per brief to confirm that it meets the above requirements.

It is the intent on this project to remediate the subsoils as well as the topsoils, to minimise the need for importing topsoil from external areas. The testing would comply as per topsoil tests, and this approach is more sustainable than normal practice. In the detail design stage we will outline the procedures for this.

Imported Topsoil

Imported organic topsoil would be a weed-free “organic type” soil mix that conforms with AS 4419 and suitable for the culture of plant material in landscape areas. It must:

- (a) be of a friable porous nature;
- (b) contain no refuse or materials toxic to plant growth;
- (c) contain no stumps, roots, clay lump or stones larger than 25 mm in size;
- (d) have an organic content of at least 15% to 20% by mass as determined by the method specified in AS 1289
- (e) have a pH in the range of 5 to 6.5;
- (f) have a soluble salt content not exceeding 0.06% by mass;
- (g) be suitable for phosphorus sensitive plants; and
- (h) be free of weed and weed refuse material.

6.3.2 Fertiliser

The amount and type will vary according to location and type of remediated soil undertaken. For example if compost and additives are added to the site soil for amelioration, then there will be no need for additional fertiliser around the individual plants.

The proposed vegetation types do not have a high nutrient requirement however, since the surface trash layer is removed and is likely to contain most of the organic matter and a high level of plant nutrients some replacement may be advisable. This can be done via the addition of fertiliser and a surface mulch. Fertiliser to be used, as required to the table below.

LANDSCAPE TYPE	DESCRIPTORS	FERTILISER & MULCH OPTION	PLANT SIZE
Mass Planting Bed Type 1	Mixed Canopy , Shrubs	Native Plant Food* 30g/m2 , plus 30-50mm mulch, plus Urea 10g/m2	'Tubestock'/ 100mm/ semi advanced
Mass Planting Bed Type 2	Native grasses and tussocks	Native Plant Food* 30g/m2 ,plus 30-50mm mulch, plus Urea 10g/m2	Tubestock or 100mm
Dryland grassing	Seed mix	Native Plant Food* 30g/m2, plus 30-50mm mulch, plus Urea 10g/m2 +	
Turfing	Streetscape areas	to RMS specification	

* eg Amgrow Native Plant Food NPK 9.2:2.3:5.7

+ If using the high organic trash layer soil on these areas use only 10g/m2 of urea and omit the compost and fertiliser.

Table. 6-2: Fertiliser and mulch option

6.3.3 Soil Additive for Plant Establishment

Where soil remediation works are not undertaken i.e. with imported topsoil, soil additives would be applied. They would be a dry granular mixture, comprising water absorbent polymers, organic and mineral fertiliser, trace elements, carrier material and growth stimulators and must be incorporated into the excavated planting hole during planting operations in accordance with the manufacturer's recommendations.

6.3.4 Mulching

Mulching is used on all mass planting beds, and for individual spot planting. Mulch layer will be 75mm thick.

Woodchip mulch used in landscape planting must, to the extent possible, be derived from trees and shrubs removed during the clearing and grubbing works on the site on this project, the mulch produced in this way will be insufficient, and the shortfall shall be made up by using imported hardwood chip. Hardwood chip mulch or remediated site mulch must comply with AS 4419 and AS4454 and the following requirements:

Mulch types will vary according to the following:

Individual planting of trees - a 75mm thick layer of woodchip mulch around the base of the plant. Mulch to form 1000mm diameter mulched saucers to each tree.

Mass planted beds-native grass/tussock - mulch will be 75mm depth.

Riparian Mass planted beds - mixed canopy and shrubs and grasses- either forest blend mulch or remediated, approved site mulch to be used to all mass planting bed areas as shown.

6.3.5 Staking

Tree guards are to be used for all 5L, 25L and 35L trees spot planted into mass planted beds or dryland grass areas, except where the slopes are steeper than 2.5:1. Standard tree guards would be green plastic type tree guards 350 mm dia. x 450 mm long, purpose manufactured, recycled plastic film with holes punched in it to avoid fungal growth (such as Tree Max or approved equivalent) and each tree guard must be secured with three bamboo stakes

6.3.6 Tree Guards

Bamboo stakes for "standard green" tree guards must be 750 mm long. Tree guards shall be provided to all tree tubestock plants planted. Bamboo stakes can be used for tubestock plants with tree guards only. Otherwise use hardwood stakes, 25 x 25mm x 750mm long. After 12 months or as plants emerge from the tops of tree guards all tree guards and stakes must be removed by the Contractor.

PLANT SIZE	TIMBER STAKE SIZE	NUMBER OF STAKES
'Tubestock' – Semi Advanced	25 mm x 25 mm x 750 mm long Or 15mm Dia x 750 mm long	1
'Advanced'- 25L	25 mm x 25 mm x 1 500 mm long	2 stakes required with use of tree guard
'Super Advanced'-35L	38 mm x 38 mm x 1 800 mm long	2

Table. 6-3: Timber stake size

For Tubestock - Bamboo stakes may be used in place of hardwood, and must be 15 mm in diameter and 750 mm long. Ties must be 50 mm wide hessian webbing.

6.4 Seed Mix Schedules

There are two different grass seed mixes proposed for hydroseeding and hydromulching. They include:

- pasture grassing applied to the earth embankments.
- dryland grassing areas: these are areas within the town's parkland, road verges on flat ground, where shown on the plans;

Refer to planting plans for locations.

From experience from other projects, the SWTC weights are insufficient for successful outcomes, especially for 2:1 batters.

Exact distribution of seed weights per species per mix, will be resolved (and approved by the Designer's Representative) after seed availability is confirmed. Note that the minimum seed weight proposed below for hydroseeding at 10kg/ha for native grass seed exceeds SWTC minimum weight of 10kg/ha (including cover crop).

HYDRO SEEDING & HYDROMULCHING SEED MIX - EMBANKMENT AREAS		
	Common Name	Seed
Cover Crop (exact weights to be confirmed at time)		kg/ha
Rye Corn @25kg/ha (cooler months); or Millet @20kg/ha (warmer months)		20
Red Clover		4
Total- cover crop		24
Permanent Grass seed		
<i>Cynadon dactylon</i>	Couch	17
<i>Dicantheum sericeum</i>	Queensland Blue Grass	5
<i>Themeda triandra</i>	Kangaroo Grass	5
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	1
<i>Microleana stipoides</i>	Weeping Grass	2
Total- permanent seed		30

HYDRO SEEDING & HYDROMULCHING SEED MIX - DRYLAND GRASS AREAS		
	Common Name	Seed
Cover Crop (exact weights to be confirmed at time)		kg/ha
Rye Corn @25kg/ha (cooler months); or Millet @20kg/ha (warmer months)		20
Red Clover		4
Total- cover crop		24
Permanent Grass seed		
<i>Cynadon dactylon</i>	Couch	20
<i>Zoysia "Macrantha"</i>	Nara	10
Total- permanent seed		30

Table. 6-4: Hydro seeding and hydromulching seed mix

HYDRO SEEDING & HYDROMULCHING SEED MIX - VEGETATED SWALES		
	Common Name	Seed
Cover Crop (exact weights to be confirmed at time)		kg/ha
Rye Corn @25kg/ha (cooler months); or Millet @20kg/ha (warmer months)		20
Red Clover		4
Total		24
native Grass seed		
<i>Austrostipa ramosisissima</i>	Spear Grass	1
<i>Bothriochloa macra</i>	Red Grass	2
<i>Capillipedium spicigerum</i>	Scented-top Grass	4
<i>Dianella caerulea</i>	Blue Flax Lily	1
<i>Dicanthium sericeum</i>		1
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	1
<i>Microleana stipoides</i>	Weeping Grass	2
sub total		14

Material	Rate per Hectare
(a) Hydromulching	
(i) Water	35,000 litres
(ii) Organic fertilizer: pelletised poultry manure	250 kg
(iii) Seed	See Annexure R178/A
(iv) Cellulose fibre mulch:	
- Sugar cane mulch, mixed with 20% (by weight) of shredded paper; or	3,500 kg
- Wood fibre mulch	2,500 kg
(v) Binder: granulated 'Guar gum'	60 kg
(vi) Biodegradable green dye	As recommended
(b) Hydroseeding	As per plant/seed schedules
(i) Water	20,000 litres
(ii) Organic fertilizer: pelletised poultry manure	250 kg
(iii) Seed	See Annexure R178/A
(iv) Biodegradable green dye	As recommended
(c) Straw mulching (only for ad hoc temporary stabilization)	
(i) Straw	5,000 kg
(ii) Binder:	
- Undiluted residual bitumen emulsion; or	2,500 litres
- Granulated 'Guar gum'	100 kg

Table. 6-5: Application rates for materials

6.5 Landscape Compliance Table

LANDSCAPE AREAS	SPECIES (Tenderer to list all species for each landscape area)	TOTAL NUMBERS (Tenderer to identify the total numbers of plants for each species)	SPACING (Tenderer to identify the spacing of the plants measured as plants/m2)	SIZES (Tenderer to identify the sizes of the plants either as tubestock, 150mm or advanced trees)	FERTILISER (Tenderer to identify the type and rate of fertiliser or tablets/ plant and weight of the tablets)	MULCHING (Tenderer to identify the types, depths and areas of mulching)	STAKING & GUARDS (Tenderer to identify the use of stakes and guards)
1. Low shrub planting in medians for screening headlight glare	Refer to accent shrub planting in medians; and Appendix B - Planting Plans	Refer to Planting Plans and Schedule in Table 6-1 and Appendix B.	Refer to Planting Plans, Appendix B	Refer to Table 6-1 Plant Schedule and Planting Plans in Appendix B	Refer to Section 6.2.1 Soil Conditioning, and Section 6.2.2 Fertilising.	Refer to Section 6.2.4 Mulching.	Refer to Section 6.2.5 Staking; Section 6.2.6 Tree Guards
2. Planting at noise walls	Appendix B - Planting Plans	Refer to Planting Plans and Schedule in Table 6-1 and Appendix B.	Refer to Planting Plans, Appendix B	Refer to Table 6-1 Plant Schedule and Planting Plans in Appendix B	Refer to Section 6.2.1 Soil Conditioning, and Section 6.2.2 Fertilising.	Refer to Section 6.2.4 Mulching.	Refer to Section 6.2.5 Staking; Section 6.2.6 Tree Guards
3. Low riparian plants	Used in infiltration areas and wetland filter edges to ponds. Refer to Appendix B - Planting Plans.	Refer to Planting Plans and Schedule in Table 6-1 and Appendix B.	Refer to Planting Plans, Appendix B	Refer to Table 6-1 Plant Schedule and Planting Plans in Appendix B	Refer to Section 6.2.1 Soil Conditioning, and Section 6.2.2 Fertilising.	Refer to Section 6.2.4 Mulching.	NA
4. Specific planting at underpasses	NA	NA	NA	NA	NA	NA	NA
5. Planting at intersections and interchanges	Appendix B - Planting Plans	Refer to Planting Plans and Schedule in Table 6-1 and Appendix B.	Refer to Planting Plans, Appendix B	Refer to Table 6-1 Plant Schedule and Planting Plans in Appendix B	Refer to Section 6.2.1 Soil Conditioning, and Section 6.2.2 Fertilising.	Refer to Section 6.2.4 Mulching.	Refer to Section 6.2.5 Staking; Section 6.2.6 Tree Guards
6. All other areas	Appendix B - Planting Plans	Refer to Planting Plans and Schedule in Table 6-1 and Appendix B.	Refer to Planting Plans, Appendix B	Refer to Table 6-1 Plant Schedule and Planting Plans in Appendix B	Refer to Section 6.2.1 Soil Conditioning, and Section 6.2.2 Fertilising.	Refer to Section 6.2.4 Mulching.	Refer to Section 6.2.5 Staking; Section 6.2.6 Tree Guards
TOTAL	Refer to Table 6-1 plant schedule	Refer to Table 6-1 and Appendix B, Planting Plans & plant schedule	NA				

Table. 6-6 Landscape compliance

6.6 Earthworks, Landform, Slope Stabilisation

6.6.1 Revegetation on Steep Batters

Range of Treatments

During detail design we will assess the varying conditions and site constraints imposed by asset legacy, constructability and safety. From this initial analysis, we have developed a few landscape treatments that could be used on steeper batters for batter stabilisation and revegetation success.

Where batters are 2:1, on the embankment to the new roadway, the majority of the batters will be hydroseeded and hydromulched with a dryland grass mix, suited to the climate and site conditions. The idea is for the batters to blend into the adjacent rural/pasture land.

Some areas, where visual mitigation is required are mass planting beds.

The following pages outline the main re vegetation scenarios for the varying conditions that will be applied according to location, accessibility, element of risk, and practicality in constructability. The methods will be further assessed in detail design. For the purposes of cost planning, we have costed these aspects of these treatments in our bid.

6.6.2 Hydroseeding, Hydromulching

50mm soil mix Jute mesh or other soil stabiliser used where and when required.

6.6.3 Planting into Organic Fibre Matting

If required, where batters steepen locally on site, the dryland grassing will be changed to planting into organic fibre matting. 150mm-200mm re mediated soil used for steep slopes, tight spaces where mulch not feasible or practical.

6.6.4 Mass Planting Beds

There are various treatments depending on the type of planting bed. Topsoil requirements are:

- mass planting beds with various sized plants as per schedules: 150mm topsoil;
- mass planting accent beds with large stock size plants: 200mm topsoil;
- riparian/ bushland planting areas- topsoil mixed into planting holes, or 150mm depth topsoil.

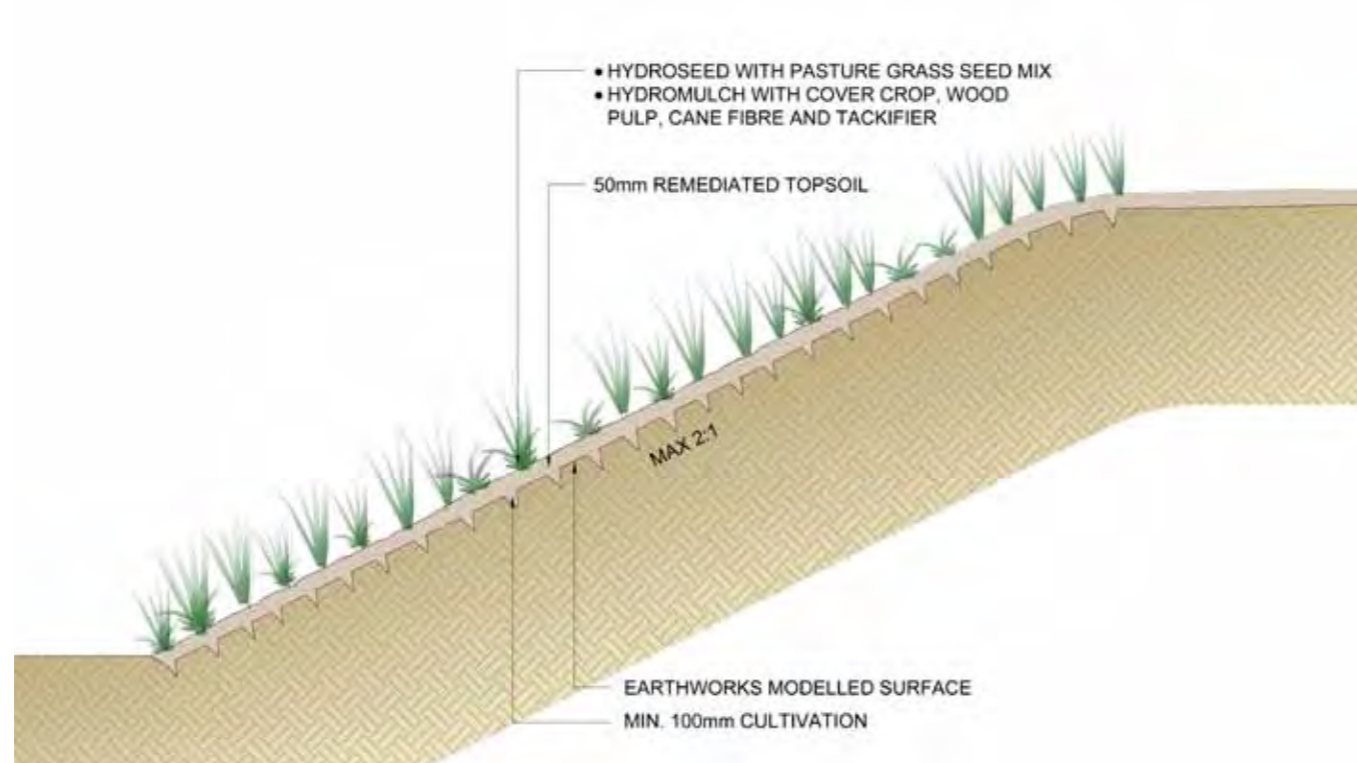


Fig. 6-18: Hydroseeding and hydromulching typical detail

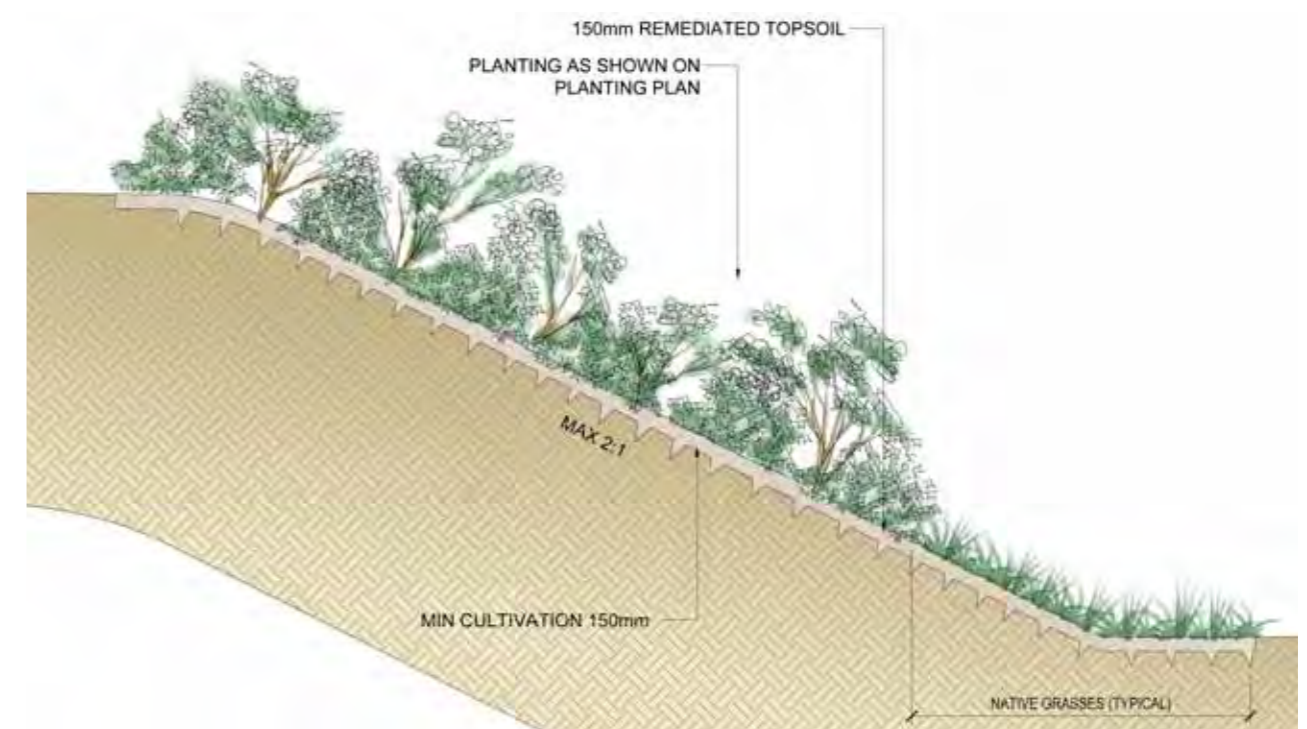


Fig. 6-19: Typical fill batter with mass planting bed treatment on 2:1 batter within topsoil layer of 150mm depth, and 75mm Forest Blend Mulch..

6.7 Planting Details

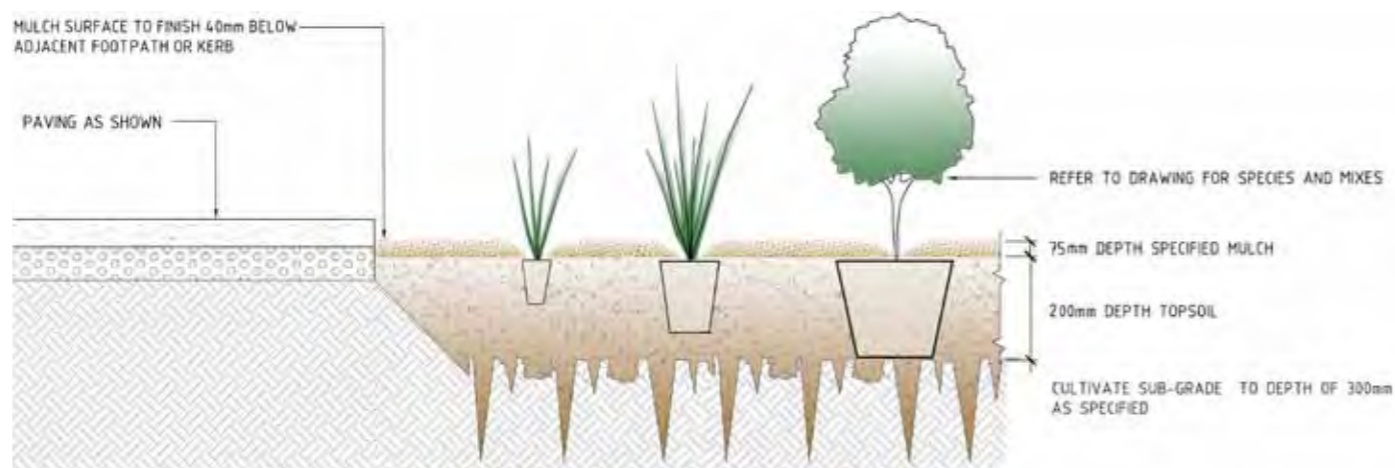


Fig. 6-20: Accent planting areas adjacent paving or kerb - various pot sizes

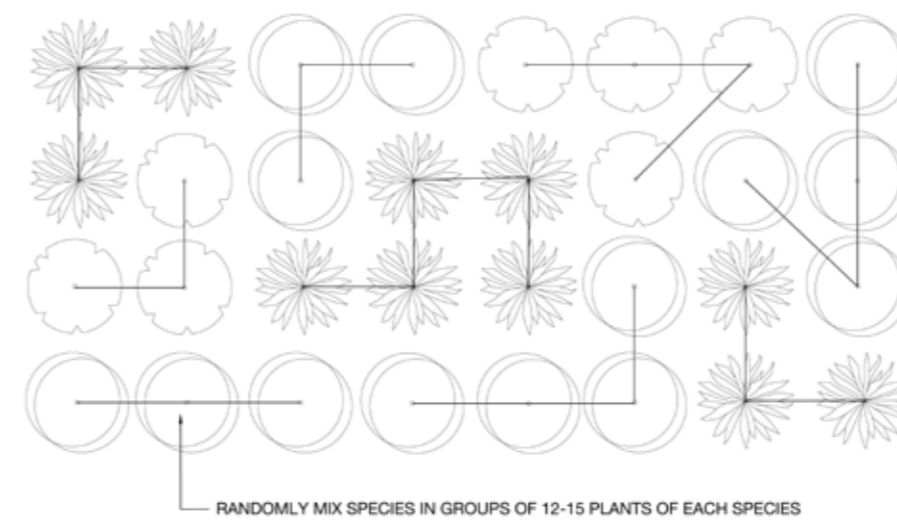


Fig. 6-22: Informal mix of native grasses

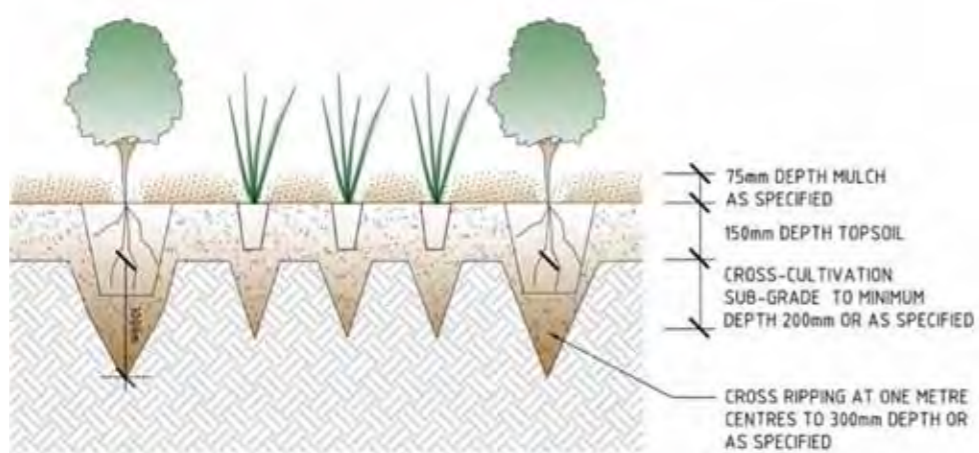


Fig. 6-21: Mass planting bed with trees and shrubs

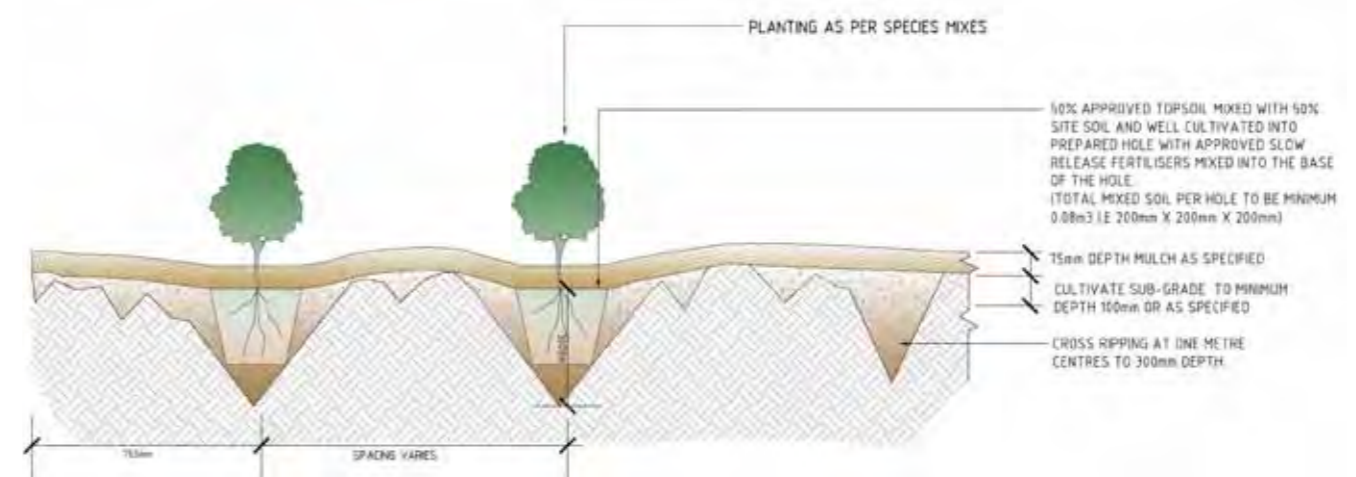


Fig. 6-23: Bushland/riparian planting areas

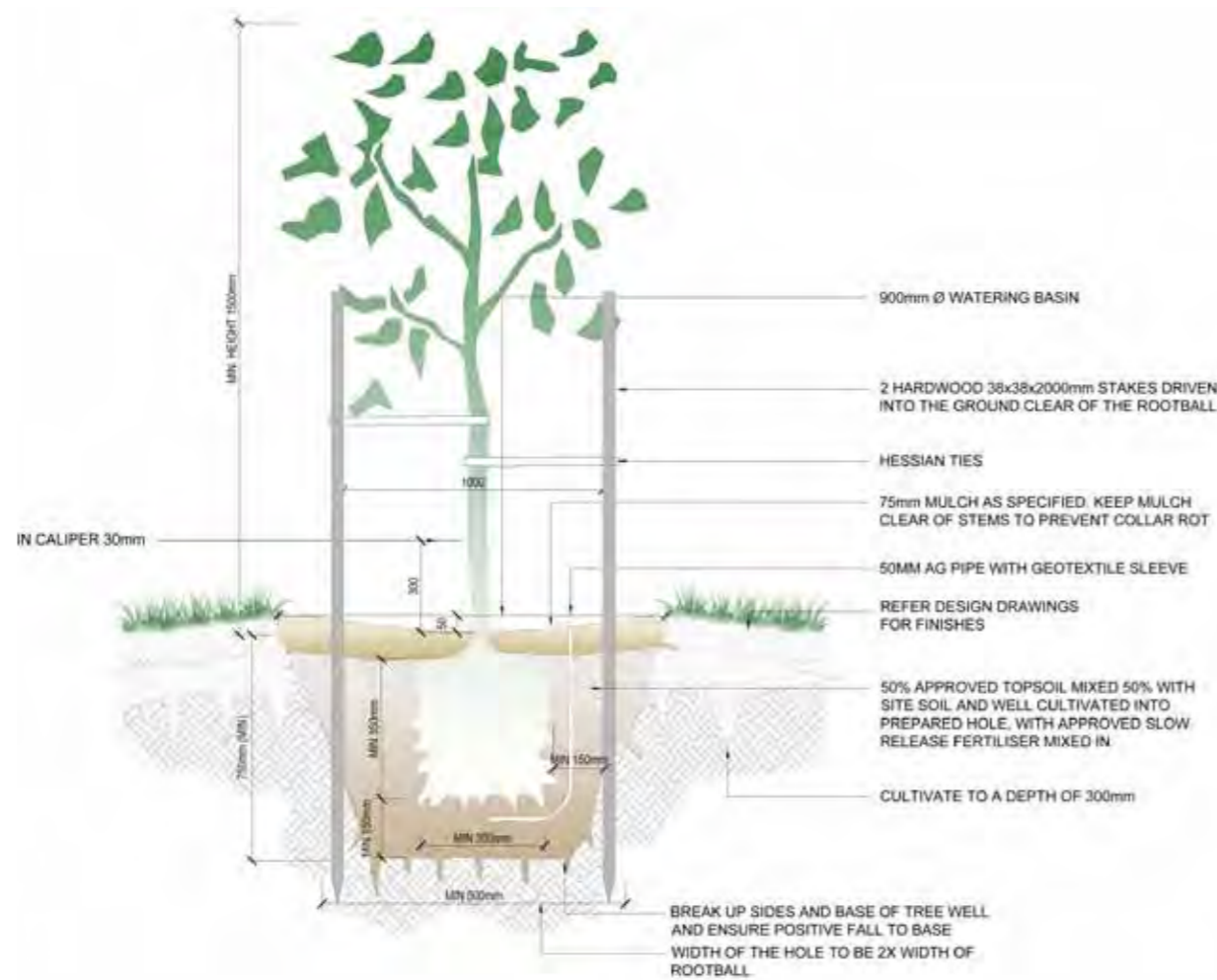


Fig. 6-24: 35L tree planting

6.8 Water Sensitive Design

6.8.1 Soft Engineered Approach

Integrated approaches to drainage, hydrology and landscape will be coordinated through the design process and applied where practicable. The demonstration of practical, sustainable water sensitive design measures will maximise on-site infiltration, reduce piping and kerbs and minimise water table/natural drainage impacts to existing vegetation.

The following approaches and key elements are integrated through the design plans:

- vegetated swales
- infiltration areas
- raingardens
- spill containment basins

Typical integrated landscape approaches to WSUD, along with key elements within the design, are illustrated on the following pages.

6.8.2 Vegetated Swales

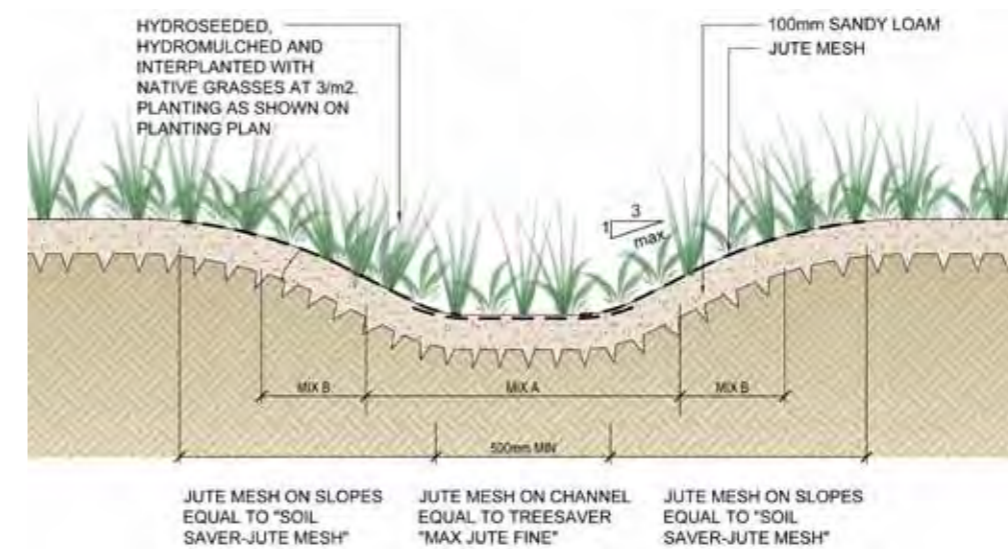


Fig. 6-25: Vegetated swales- hydroseeded, hydromulched, with native grasses interplanted.

6.8.3 Rain gardens in Pound Street

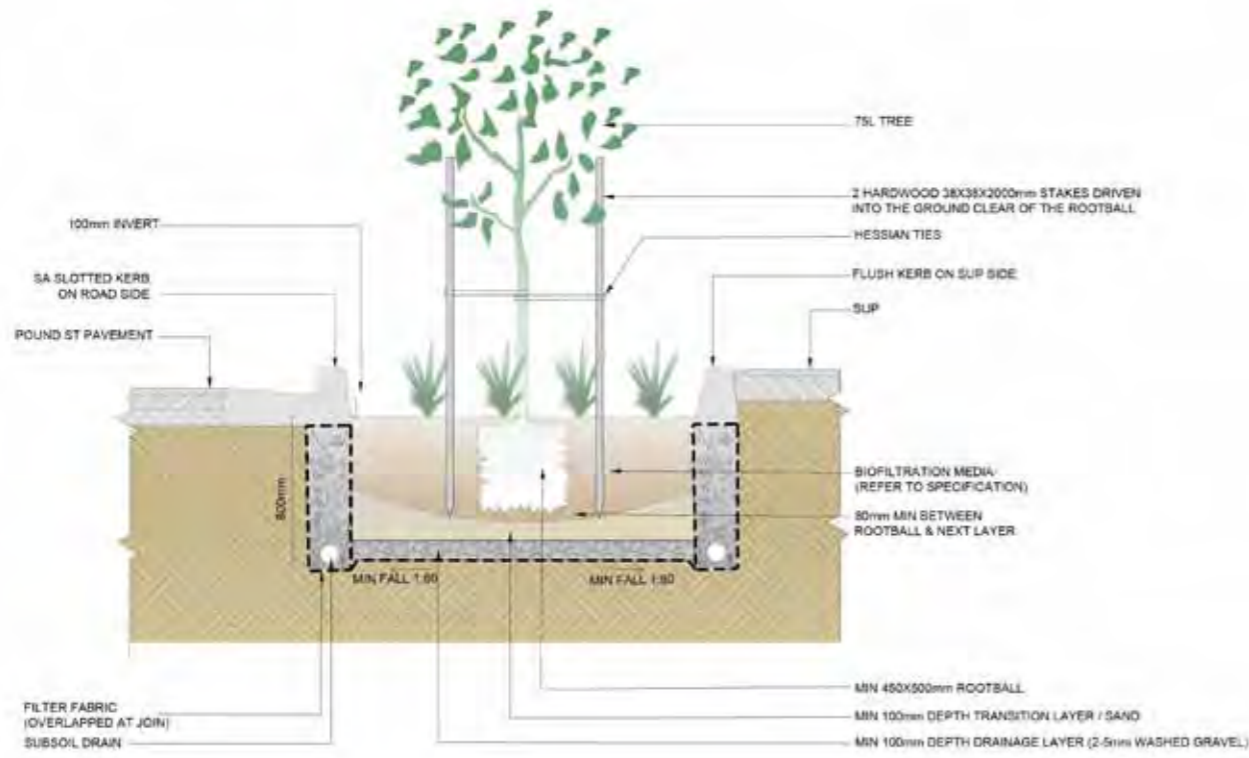


Fig. 6-26: Rain gardens, Pound Street

6.8.4 Multi-purpose infiltration area with native grass/ tussock edge



Fig. 6-28: Multi-purpose infiltration area - typical edge section



Fig. 6-27: Rain garden example- Leppington Station, Sydney (design by KI Studio)

6.8.5 Spill containment basin



Fig. 6-29: Spill containment basin

6.9 Plant Mixes

Rain Garden Mix (Pound Street)

(100mm tubes @4/m2)

- 25% *Carex appressa*
- 40% *Juncus usitatus*
- 15% *Lomandra longifolia* "fluvatilis"
- 10% *Lomandra longifolia* "Tropic Cascade"
- 5% *Schoenoplectus validus*
- 5% *Microleana stipoides* var *stipoides*

Infiltration areas

Where shown, 100mm tubes interplanted into "Nara (*Zoysia macrantha*)" turf or hydromulched areas at @3/m2)

- 50% *Carex appressa*/*Carex longibrachiata*
- 40% *Juncus usitatus*
- 10% *Microleana stipoides* var *stipoides*

The plant mixes for the rain gardens will be revised during detail design stage, as a particular landscape filter media (made predominantly from recycled products) is proposed and this media can accommodate a far greater range of plant materials.

Wetland Filter - "Dry" Edges (Slopes of Channels, & Infiltration areas



Wetland Filter - Infiltration Areas



Rain Gardens



6.10 Methodology to Protect Existing Vegetation

6.10.1 Mitigation Strategies

Protection of local bio-diversity

As illustrated in the Biosis Report/EIS there are remnant areas of native vegetation including threatened species along the river bank. These would be fenced-off during construction to prevent unauthorised access or accidental damage. The road corridor will be revegetated using species consistent with the vegetation communities that exist along the upgrade, increasing the level of bio-diversity along the corridor. The following general measures will be taken to protect and assist the recovery of local biodiversity.

'Best practice' management of erosion and sediment discharges during the construction phase would be implemented to ensure there is no significant discharge of sediment into watercourses or vegetation communities downslope and downstream of the roadworks. A range of measures is to be implemented during construction, including the use of silt fences, sediment ponds and hay bales, and the covering and protection of exposed soil surfaces as rapidly as possible.

The construction and use of water quality control ponds would incorporate macrophyte vegetation, to ensure that the water quality of adjacent watercourses and waterbodies does not deteriorate as a consequence of discharges from the construction and operational phases of the upgrade.

Threatened species conservation and Endangered Ecological Community (EEC) vegetation would be protected through the following measures:

Install protective fencing around nominated threatened species and EEC's

Eradicate existing weed growth and exotic plant species, through herbicide control of pasture grasses and physical removal of exotic trees and shrubs

For mature trees that may be impacted by earthworks or road corridor constraints, there would be typical guidelines for minimum setbacks to be assessed and agreed upon for this project in the detail design stage. They would include for example:

- Minimum 1.5 metres from edge of trunk to kerb (flat ground, minimal ground disturbance)
- Minimum 1.5 metres retention of natural ground around tree trunks in cut batter situations
- Minimum 2 metres retention of natural ground retention around tree in fill batters
- Retaining walls are preferred to batters around trees, to maximise soil volumes near retained trees. The use of boulder walls or similar is preferred because of the reduced footing excavation required and associated impact.
- Severing tree roots is not recommended on both sides of any tree. Any services adjacent to tree trunks should be investigated for boring under the trees- to Arborist's specification. Planning of common service trenches and proposed service alignments need to be carefully evaluated in the design stage to ensure minimal impacts on trees.

The use of structural soil in tree planting pits or vaults could be considered to maximise rooting volume. However before such treatment is proposed, an Arborist report on the tree's longevity would be prepared. Refer to typical details for tree wells/dry stone retaining walls that could be used if applicable in the detail design stage.



Fig. 6-30: Freshwater Wetlands on Coastal Floodplain areas- on river's edge, North Grafton - these areas will be fenced off during construction work



Fig. 6-31: Existing Jacarandas in areas of future park space will be protected and levels not disturbed within the crown of the tree

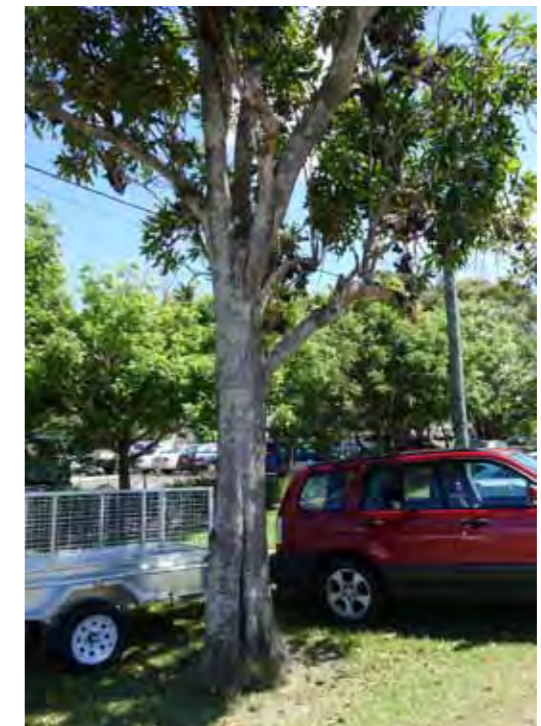


Fig. 6-32: Existing street tree in Clarence Street- levels will not be disturbed within the crown of the tree.

6.10.2 Tree Protection Methods

The integrated landscape and urban design plans indicate a few trees close to the proposed kerb lines where tree protection measures would be further investigated in detail design stage to minimise impacts upon root protection zones.

The following methods would be further evaluated in the detail design stage as options for use in particular circumstances, and will be undertaken in consultation with an arborist:

- informal drystone retaining edges, low concrete RW landscape retainers; and
- permeable fill areas.

The key principle is to minimise impacts to tree roots to retain significant corridor and streetscape trees that greatly contribute to the overall setting.

The following detail has been included to provide typical approaches that will be developed further in detail design.

The details will reflect the principles and guidelines set out in *AS 4870-2009, Protection of trees on development sites*

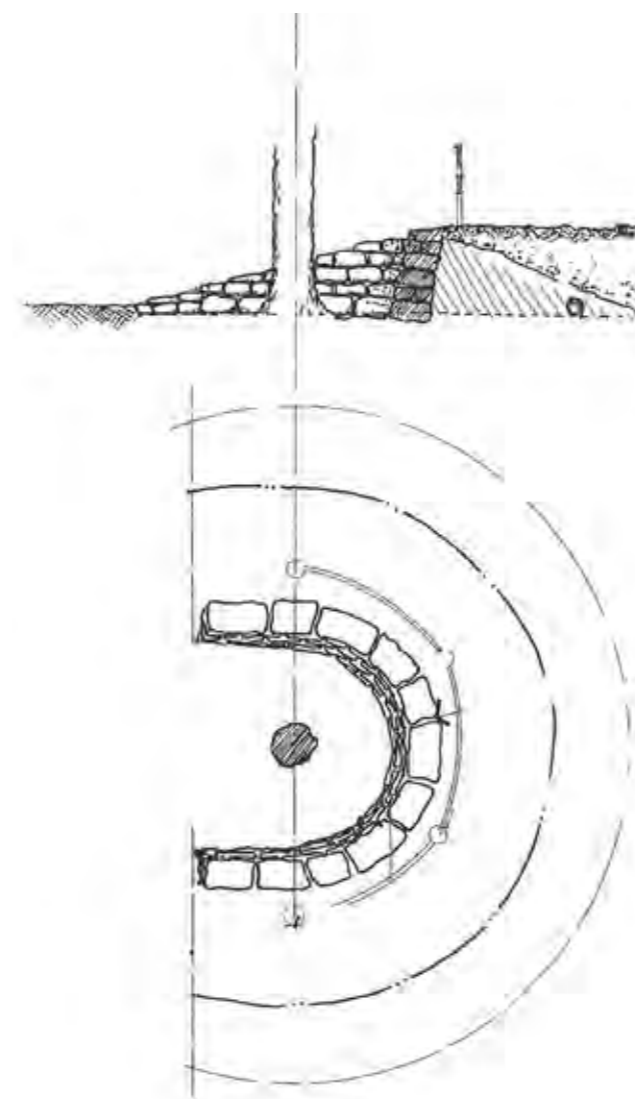


Fig. 6-33: Drystone retaining and pervious material

6.11 Restoration of Compound and Ancillary Facility Sites

Refer to section 2.4 “Compounds and ancillary facilities”, of the Construction Environmental Management Plan, July 2016, for more detailed information on what is proposed. A range of construction related facilities are required to build the Project including site compounds, stockpile areas, precast facilities and flood mitigation stockpile sites.

The EIS identified and assessed the following ancillary facilities:

- The main site compound (about 9 ha in size) in South Grafton, and
- The Pound Street site in Grafton (about 0.45 ha in size).

These ancillary facility sites are shaded yellow in Figure 6-35. They include site compounds with offices, workforce facilities (such as parking, lunchrooms and toilets), workshops and storage areas for plant and construction materials. The main site compound (about 9 ha in size) will be located in South Grafton and a smaller compound (about 0.45 ha in size) for the construction of the northern abutment, the Pound Street railway viaduct replacement and road upgrades will be located in Grafton. As identified in the EIS, a concrete pre-cast yard will be co-located within the main site compound. All site compounds will be fenced for security and safety purposes. The construction compounds will be used for the duration of the construction.

RMS has identified one additional ancillary facility site adjacent to the South Grafton site compound, to the east of Iolanthe Street. This ancillary facility site is shaded green in Figure 6-35.

Landscape revegetation will include:

- topsoiling and seeding of dryland grass species to reflect the existing situation;
- turf in tight urban areas;
- revegetation according to the Landscape Plans in Appendix B; and
- additional indigenous tree planting to replace any small scale vegetation previously if removed during construction, and beyond the permanent landscape works as shown, South Grafton (in flood plain area).

It is noted that the majority of these areas are within permanent landscape sites for the project in these areas. The species of these will be further developed in the detailed design stage.



Fig. 6-34: Restoration of compound and ancillary sites

7. Landscape Management

7.1 Maintenance

Maintenance is a critical consideration in terms of design treatment and the need for ongoing management of landscapes. Decisions made at the design and construction phases will have ongoing impacts in relation to maintenance and will affect the viability of the landscape scheme. The following strategies are outlined that will be used to address the ongoing management concerns.

Integrated Pest Management - the construction phase will document approved methods for preventing or controlling:

- Unacceptable levels of weed, pest, or disease damage.
- Weed Control for Trees, Shrubs, Vines, and Groundcovers
- Weed, Insect and Disease Control for Turf

The planting design aims to minimise pests through good, varied plant selection, and improving habitats. Should an outbreak be identified which could impact upon the establishment of landscape outcomes, an appropriate action plan will be determined. This is covered in the Flora and Fauna Management Plan.

Weed Control

Good mulch thickness will prevent weeds growing and regular spraying of herbicides, using non-pesticide treatments. A weed management plan will be prepared which covers issues such as management of weed outbreaks both during construction and maintenance phases of the project.

Weed control will be carried out in all areas of the corridor including revegetated and planted areas for a period of 36 months, commencing from the date of final construction completion.

The Landscape Specification will outline weed management further as per RMS practice. The focus of weed control will be on removing noxious weeds and controlling environmental weeds. The ongoing management plan will be implemented post

construction to minimise regeneration or infestation of weeds.

Proposer construction implementation and maintenance procedures will control the level of weed invasion including:

- Restriction on areas of disturbed vegetation.
- Restriction on stockpiling to areas already cleared of vegetation or in weedy areas.
- Use of weed-free topsoil in landscape works, and revegetating disturbed sites with locally sourced indigenous species (local provenance).
- Revegetation using treated, stockpiled topsoil(weed free), along with the use of local provenance plant species to stabilise the soil as well as managing weed control regularly.
- Implementation and enforcement of the landscape design during the construction phase at the correct timing and seasons- to ensure batter slopes are constructed as designed and revegetated at times of NO extreme weather.
- Ensuring adequate maintenance to landscaped areas and ensuring regular watering in dry period to encourage successful plant revegetation cover.
- Appropriate and compliant topsoil testing and subsoil/topsoil assessments and implementation to encourage plant establishment. Removal / treatment of topsoil with weed seed within it is critical as a procedure for plant establishment. To achieve this numerous waterings over topsoil placement are required to encourage weed seed to germinate, prior to planting and mulching so the weed cover can be first removed.
- Complying with the nominate densities for grasses, shrubs and trees, as well as minimum mulch depths specified to ensure maximum plant coverage and weed suppression.
- Maintenance plans will be consistent with the requirements of RMS Specification R179 and R178. Works will not only include weed removal but also the replacements of failed stock and re-hydromulching, and topping up of mass planting bed mulch layers, following regular on site checks.
- Monitoring of weed invasions, and presence by personnel well experienced in weed management.
- Incorporation of the Weed Management Plan into the Flora and Fauna Management Plan, detailing necessary weed control works.

Fencing

To ensure establishment of proposed planting, pests such as rabbits and hares will also be addressed, as necessary. This may involve temporary rabbit proof fencing or the use of guards. At this stage no fencing is proposed as the intensity of rabbit or other pests appears to be low.

Watering

Planting will be watered and maintained until plants have become established. The period is for 36 months. Normally the watering will be 20 litres of water per plant per week for the first 12 weeks, followed by 10 litres of water per plant per week until the 26th week. This obviously depends on the rainfall. Plant health will be determined, and watering needs assessed following this period. If extended periods without rain are experienced during the establishment period, then watering over and above the normal construction practice will be undertaken to supplement natural rainfall.

Fertilising

Fertilising post planting may be required where specific nutrient deficiencies are identified. The need for additional fertiliser will be minimised by the use of slow release fertiliser. Any additional fertiliser requirements will be reviewed as part of the maintenance plan for the project.

Pruning and Thinning

Pruning is expected to be a minor component of the maintenance. It may be required to ensure sightlines and signs are not obscured.

Plant Replacements

Dead, diseased or dying plants will be replaced to ensure 90% of planting is established after 12 months. The checks on planting will be undertaken every 6 -8 weeks during the maintenance period, and plants replaced within two months of inspection..

7.2 Monitoring and Evaluation

Ongoing surveillance of the road corridor and streetscapes for weed management and landscape establishment will be undertaken throughout the establishment period of three years. A detailed management plan will be prepared when the final design development is complete for the project.

7.3 Occupational Health and Safety

The design of the new roadways and streetscapes considers the safety of works during construction and the ongoing maintenance of the project areas. Risk Assessment and safety in design workshops will be held during the detail design stage of the project. Management of registers will ensure the development of the design, with safety as a key input.

There are 2:1 slopes that are not easily traversed by vehicle or by foot, resulting in construction and maintenance access issues. The Clarence River Council has a machine suited to cutting the grass on the 2:1 batters, hence the design incorporates pasture grass as is currently on the levee. Good plant establishment in mass planted beds as designed will reduce the need for maintenance access by foot.

Bridge abutment and culverts also pose safety risks and will be addressed during the detailed design phase.

Maintenance risks also include workers being close to trafficable areas. The implementation needs to consider issues such a sightlines, the need for road closures and other activities adjacent the road when workers are maintaining garden beds, grassland areas, mowing verges, and undertaking pest/weed management. Maintenance risks can be minimised by reducing the frequency of the occurrence, which can be addressed through appropriate plant density and selection.

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8. Heritage Interpretation Plan

8.1 Introduction

As a result of the Submissions report, requirements NH1 and AH3, a heritage interpretation plan has been prepared to provide opportunities to enhance the understanding and appreciation of the heritage items, values and themes associated with Grafton, in the vicinity of the project area.

In areas, such as along Pound Street where the Fig trees are, the interpretation plan also identifies strategies to compensate for the loss of the mature Fig street trees.

The heritage interpretation plan has been developed in consultation with Clarence Valley Council, the Grafton Ngerrie Local Aboriginal Land Council (LALC) Elders and relevant stakeholders.

The ideas presented in this plan will be refined further during detailed design development for the project.

The Aboriginal community will continue to be consulted as an identified group within the overall community consultation strategy for the project.

The plan highlights the salient sites and features within the landscape in a manner that respectfully enhances and protects these values.

(Source: ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON Submissions report October 2014)

8.2 Objectives and Methodology

Objectives

The following objectives have been developed to drive the heritage interpretation plan:

- ensure the heritage interpretation is integrated holistically within the overall urban and landscape design for the project.
- demonstrate interpretation of both Aboriginal heritage and non-Aboriginal heritage.
- ensure the design concepts are simple, easy to maintain, robust, and are designed as deterrents to graffiti.

Methodology

The summary methodology is as follows:

1.0 Project Initiation

- Team meeting to discuss priorities, consultation with Council and other groups, key tasks & program.
- Review Background studies:
 - EIS Heritage Reports on both Indigenous Heritage and Non Indigenous Heritage.
 - Clarence Valley Council's Heritage Strategy 2011

2.0 Site Visit & Community Heritage Interpretation Consultation

- Liaison (Fulton Hogan) with Clarence Valley Council, including Aboriginal representation and historic groups
- receive input and respond (Fulton Hogan)

3.0 Prepare Heritage Interpretation Plan Report

3.1 Executive summary

- Project Background
- Objectives & Methodology
- Acknowledgements

3.2 The Approach

Historical Elements within Study Area

- Themes identified in EIS

o Aboriginal Heritage

o Non Aboriginal Heritage

- Links to the Grafton Heritage Trail
- Summarise key audience, risks, safety in design issues etc

3.3 The Site & UDL Strategy

- Location
- The UD & L Strategy

3.4 Interpretative Themes, Storylines & Strategies

- Identify key art & heritage strategies and heritage interpretation themes – and chart location/theme/strategy.

Concentrate on those items already identified in the EIS for the interpretation plan consideration, as noted below:

- South Grafton- the Golden Eel, Alipou Creek, the old wharf remains, the rail turnstyle
- North Grafton- two heritage houses
- The Old Grafton Bridge

Outputs:

- Text to describe the proposed heritage interpretation elements
- Precedent images to convey the design intent;
- Plan to show where and how the elements would be integrated

8.3 Acknowledgements

This Heritage Interpretation Plan has been prepared by KI Studio based on information as described in the EIS for the project, for both Aboriginal and Non Aboriginal Heritage, prepared by Biosis, and archaeological/remote sensing by Comber Associates.

KI Studio is grateful also for images and plans/information prepared by Greg Nash, RMS Grafton Office.

8.4 The Approach

This interpretation plan has been prepared, using heritage analysis and information provided by others in the “*Additional Crossing of the Clarence River at Grafton*”, E.I.S, Non-aboriginal and Aboriginal Heritage Assessments (Biosis), 2014/2015, plus the “Indigenous Heritage Assessment for Route Selection, Proposed Additional Crossing of the Clarence River, Grafton, 2003. (BIOSIS).

Whilst the above mentioned heritage studies provide details on impacts, number of items and relevance to local and state heritage, this task is more about analysing the essence of the information presented, to create a legible story of what is important to the community, to the area, and how these elements would/could cohesively be integrated into a legible and physical interpretation plan.

It is intended to integrate the non-aboriginal and aboriginal heritage interpretation elements through signage and space.

8.5 Historical Elements within Study Area

8.5.1 Themes identified in the EIS

The EIS noted broad themes for the heritage of Grafton. We have reviewed these, and assessed their relevance to this project in particular, along with undertaking an assessment of which elements could be well integrated into the Urban Design/Landscape Plan.

The broad themes identified in the development of Grafton included:

- The Cedar Getters
- Squatters, Settlers and the Town Plan
- Grafton Boom-Grafton Bust, The Golden Years, Bridging the Gap, and

- United city of Two Towns; and
- Modernism

A few remaining heritage items, stories or elements relating to the above themes exist throughout the project area, or adjacent to it. For this interpretation strategy relating to the new bridge project, we have summarised the history of the main components within, or adjacent to the study area.

The following section illustrates how this information has been developed into four key themes for the project area that we believe would create an interesting, logical heritage link through the area for the community.

8.5.2 Non Aboriginal Heritage

The project area is associated with 76 heritage items, including one shipwreck (SS Induna- FMW29), and two conservation areas (Grafton Conservation Area -C3 and South Grafton Conservation Area -C7).

Three of the heritage items are of state significance; these are the Clarence Rail and Road Bridge (CZB36), South Grafton Railway Precinct (CZB37) and “Arcola” (FMW27). The remaining 73 heritage items are of local significance.

The most significant impacts will be to the Grafton Conservation Area (C3) which is traversed by the Construction works zone boundary and contains a total of 36 heritage items. Impacts within the Construction works zone boundary include:

- Direct total impacts to 10 heritage items where option for retention have been considered but are not feasible. These impacts (historical and aesthetic) can be partially mitigated by archival recording, the preparation of an interpretation plan for the whole site and relocation of one heritage item.

“Ravensford”, 36 Villiers Street, Grafton (Villiers Street Residential Group 1; CVLEP I841; NT R2623).

One of several large, two-storeyed and timber-clad residences built in Grafton between 1890 - to 1910.

The architecture borrows from several influences though is essentially a display of classic Colonial Georgian symmetry. In this regard it aspires to a degree of historic formal authority through the use of an imposing façade and balanced sidelight and transom windows around the central doors. This is softened by later Victorian stylistic elements including ironlace balustrading and 6-paned casement bay windows. The classic theme is also muted by the use of an ornamental ‘Federation style’ false gable at the apex of the roofline.

Although clearly a product of the boom era of Grafton, Ravensford was not influenced by the ‘Boom style’ of heavy ornamentation popular during the 1890s elsewhere in NSW. This reflects a distinctive subtlety common to Grafton architecture. Ravensford was originally constructed c. 1860 as a single storey residence for Captain George Greenaway, a riverboat captain. Greenaway served as a Pilot at Ballina and then Captain of river boats on the Clarence River from 1863 until he retired. He died in Grafton in 1928. At some stage it was acquired by the Henson family who added a second storey in 1890. This changed the face of the building from a simple cottage to a grand residence. The Henson family ran a cordial factory at 32 Villiers St (CZB10 & CZB12) on the same section from 1876.

The building is remarkably intact though in 2010 was listed as requiring painting and repairs to rotten sills, bargeboards and cladding. Two-storey timber residences from this period are now rare and are evidence of the contrast between the wealthy and poor in turn of the century Grafton. Ravensford is on an important corner site with mature trees and historical associations dating to Grafton’s earliest phase. Original construction of the ground floor c.1860 would make the foundations among the oldest surviving in Grafton. The close association of Ravensford and Dunvegan (CZB12) makes this a particularly significant section of both Pound and Villiers Streets.

Given its age, Ravenswood has high archaeological potential, particularly within the footprint of the building and at the rear of the property where earlier phases of construction may have been present. The dwelling lies within the Grafton Urban Conservation Area.



Fig. 8-1: Ravenswood, on the corner of Pound and Villiers Streets

Former residence “Dunvegan” 47 Pound Street, Grafton (CVLEP I115; NT R2657).

This imposing two storey timber-clad residence is unusually large in scale and it combines Victorian and Federation elements including iron lace balustrading and valances and carved barge boards with fretted work at the apex. Dunvegan is believed to be constructed of local hardwood¹¹¹ supplied by one of the local sawmills operating on the southern bank of the Clarence.

A photograph dated 1909 shows that the building when constructed had only one gable end facing the street. Today the house has two gabled bays, one at either end, the eastern one being 1926 additions. It repeats exactly the detailing to doors and windows of the original bay,

including timber window surrounds, paired small paned sash windows, and carved bargeboards with fretted work at the apex. The verandah between the two bays has elaborate iron lace balustrading and valances and timber posts. The combination of iron and timber detailing is indicative of the transition from Victorian to Federation styles which occurred in Grafton at the turn of the century.

(Source: ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON, Appendix G – Technical Paper: Non-Aboriginal heritage assessment)

The building is in largely original condition, and has recently required repairs and conservation assessment. Built for the Powell family in 1905 by George Wunderlich and sons, It is now in public ownership and forms part of the Grafton TAFE complex and is in close association with listed street trees. Former residences from 49- 59 Pound Street have been removed in the development of this TAFE complex. Buildings of the quality and size of Dunvegan are becoming increasingly rare in Grafton.112 Dunvegan was listed in schedule 3 of the REP as a regionally significant building and has been suggested to have possible State significance.113 Dunvegan makes a significant contribution to the historic fabric of Pound Street. The residence is testament to the use of locally-derived hardwood timber in homes for the wealthy. The dwelling lies within the Grafton Urban Conservation Area.

Due to its continual used, Dunvegan has potential to contain archaeological structures and deposits dating to the establishment of the house and early subdivision in 1850s Grafton The listing is large and encompasses adjacent former properties, which have since been removed. There may be archaeological remains associated with these properties.



Fig. 8-2: Dunvegan on Pound Street

Street trees: Jacaranda, Brachychiton & Ficus sp. over 3 metres (CVLEP I135).

Six figs Ficus sp. over 3 metres in height are found within this section of the project area. None of these

are associated with historically recorded plantings however the Ficus trees form an avenue along Pound Street between Villiers and Clarence Streets, an area subdivided and well developed by the 1870s. The trees are mature and may date to around this time as figs were among the species introduced to Grafton Street plantings from the Sydney Botanic Gardens and other sources from 1872. Two of the figs frame former residence Dunvegan.



Fig. 8-3: Pound Street was known as "Jacaranda Avenue."

King George V Plaque: Pound Street, Grafton (CVLEP I688).

A marble plaque attached to the base of the Pound street viaduct in conjunction with the planting of 39 Jacaranda trees along Pound Street from Clarence Street to the river to commemorate the 25th anniversary of the reign of King George V. By 1991, 25 of these original plantings remained.117 During the most recent survey Biosis confirmed that nine of these original plantings remain.

A wall hanging held by the Clarence River Historical Society lists the names of all those who planted trees and showed that almost every local business, church and charitable organisation was part of the project. Participants besides the Mayor Ald B.C. Eggans and local member of House of Representatives Dr Earle Page included such people as T.N. Page for the Historical Society, Majorie Hassel (Junior Red Cross), A.H. Lipman, Mr Stoner (Grafton Dairy Co), Mrs H. Sanders (Victoria Croquet Club). It bears the following inscription: Jubilee Avenue This Avenue of trees was

planted by the Grafton City Council on the 6 May 1935, the occasion of the official celebration of the Silver Jubilee of His Majesty King George. The plaque and associated trees demonstrated a continuing desire by Council to beautifying the town through street plantings, a commitment begun in 1874 when Council adopted a by-law for the planting of street trees. Further commitment to this movement can be seen in Queen Street in the 1973 plantings during the Jacaranda Festival to commemorate various local identities. In this regard it contributes, together with Coronation plaque in Clarence Street to the heritage fabric of the Pound Street area and greater Grafton.

Grafton Railway Viaducts (SRA827; CVLEP I687, I514).

A series of Art-Deco re-inforced concrete arch viaducts constructed by NSW Government Railways from 1927-1932 to provide a link between the northern end of the Clarence River underbridge to the original Grafton railway station. The viaduct sections are mostly of three spans with a large arch over each roadway with smaller flanking arches over the footpaths.

The railway viaducts are locally significant for being the final link in the North Coast railway between Brisbane and Sydney. The two viaducts lie within the Grafton Urban Conservation Area.



Fig. 8-4: Railway viaduct crossing at Greaves Street

Grafton Rail and Road Bridge (SHR1036; NCREP Schedule 2; SRA237; CVLEP I134).

The Grafton Rail and Road Bridge is a 6-truss steel bridge linking Grafton with South Grafton. As

early as 1910 the Chief Commissioner of the New South Wales Railways wrote to the Public Works Department pointing out the necessity of a bridge over the Clarence River at Grafton. Plans were begun by the Railway & Tramway Department early in 1921. However in 1922 the Minister for Works asked the Railways Commissioners to prepare new designs and estimates for a bridge to carry vehicular traffic as well.

Alternative schemes were considered but putting a roadway above the railway was found to be not only the cheapest arrangement but also allowed all the previous calculations to be used. The piers were sunk to bedrock by means of rectangular steel caissons; The final product was a double-deck road/rail structure with a lift span to allow the passing of river traffic in the form of a bascule. This was electrically operated by two 35 horsepower (26kW) motors powered by the Nymboida hydroelectric scheme but is no longer used. The bridge consists of five steel truss spans of from 212 ft 6 ins (74 m) to 245 ft (75 m) in length, with the bascule span of 76 ft (23.2 m) and two approach spans, being 66 ft (20 m) long for the railway and 100 ft (30.5 m) long for the roadway. The total length of the bridge is 1,500 ft (457 m) and it spans 1,300 (396 m) of water.

For many years the Clarence was the main obstacle in completing the rail link between Sydney and Grafton and the bridge presents a commanding visual



Fig. 8-5: The Old Grafton Bridge crossing the Clarence River

(Source: ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON, Appendix G – Technical Paper: Non-Aboriginal heritage assessment)

reminder of the 1932 completion of the North coast standard gauge line between Sydney and Brisbane. It marks an important epoch in the history of bridge construction. After the Hawkesbury bridges this was the next largest steel railway bridge project in NSW. It has features unique in the NSW railway system with double deck trusses with the road on top, and an American patented double deck bascule span to allow shipping to continue on the Clarence. The bridge is the only one of its type in NSW and is acknowledged as significant to the State. The heritage listing boundary for each structure includes the structure, the piers, abutments, embankments and track formation for a distance of 10 metres in all directions from those elements". The extent of the listing to the north and south is not clear, however it appears that the listing does not extend beyond the bridge itself, and therefore would not include parts of the rail viaduct north of Bridge Park. The bridge is the key engineering and historic landmark in Grafton and marks an important era in the history of the Clarence Valley area.

The construction area for the bridge was located on the Southern bank of the Clarence adjacent to the South Grafton Rail Precinct. This area formed a series of wharves, buildings and rail sidings. This area was used to receive and assemble bridge spans and then float them out onto the Clarence for construction.

None of these buildings or structures remains aside from four concrete and wood supports visible on the southern bank of the Clarence. The site contains potential archaeological remains associated with the construction of the Clarence River Bridge.

SS Induna (CV LEP I133; Shipwreck ID no. 890).

Located on the riverbank behind number 13 Riverside Drive South Grafton, to the west of the bridge are the partial remains of the former steamship SS Induna. Partial remains include the cast iron hull, propeller and rudder. The fabric is rusty but the ships hull is still visible. As part of this group is the Bow Memorial located in a small grassed area on Riverside Drive in front of the retirement village. It comprises a section of the riveted cast iron bow from the ship mounted on a small mound of stone. A small brass plaque gives the history of the ship and the origins of the Bow Memorial.

The Plaque was donated by Burns Philip & Co Sydney and the monument was erected by the Council of the City of Grafton in 1975.



Fig. 8-6: Stern of the SS Induna (FMW29)
(Source: Comber Consultants, cited in EIS - Appendix G)

Railway Precinct & Turntable

The towns of Grafton and South Grafton continued modest but erratic growth in the 1890s and early 1900s. Much of this was based on Grafton's position as a regional centre although the railway to the New England tableland threatened to capture much of the trade to New England through Grafton. (Lee 2003 p251-253, cited in EIS - Appendix G)

Connecting Grafton to the railway network presented some difficulties as the route along the North Coast from the Hunter Valley was through steep ranges and across large rivers which made this an expensive prospect and prompted ideas of connecting Grafton by rail to Glen Inness. This meant that the railway came to Grafton not from Sydney but from the Tweed Valley in the North.

The railway line was finally approved in 1903 from Casino to Grafton, and after the first ground being broken in Grafton in April 1901, the line was opened in November 1906 (Krass 2009 p164, cited in EIS - Appendix G).

The railway network simply linked wharves in the three river valleys (Tweed, Richmond River, and Hunter). The facilities at South Grafton (constructed in 1915) consisted of a Station and platform; goods siding and shed, engine and carriage facilities and a siding to a wharf. (Dunn 2002 p.95, cited in EIS - Appendix G)

The wharf provided transshipment facilities to the sea link to Sydney. These railway facilities are adjacent to, or within the project boundary, and include the through-type engine shed built in 1908, a roundhouse depot built in 1915 and 18.2 metres turntable built in 1925.

The railway into South Grafton was an isolated section to Glenreagh (and from there a branch line headed to Dorrigo) and was opened in October 1915. (Milne, 2005, cited in EIS - Appendix G). The terminus included a station; goods yards and shed; a six stall locomotive shed and engine facilities, and a carriage shed. A branch line ran to the west over Alipou Creek to a government wharf and later the North Coast Steam Navigation Company acquired land and established a jetty to the west of the wharf.

The line from Sydney was opened in 1923 with the opening of the section from Coffs Harbour but this occasion did not require South Grafton railway station to be altered. (Chief Traffic Manager 1922, cited in EIS - Appendix G) This more or less completed the North

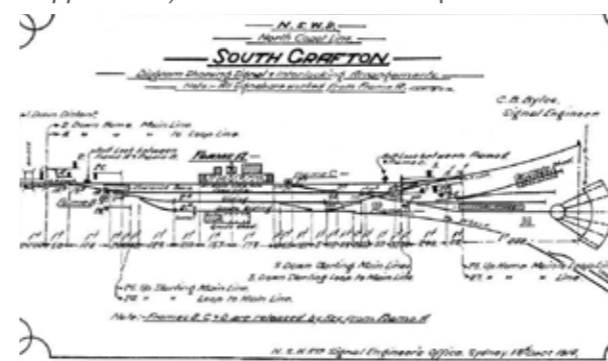


Fig. 8-7: Diagram showing signal and interlocking arrangement
(Source: EIS - Appendix G, p. 46)

Coast line between Murwillumbah on the Tweed and Sydney except for the bridge over the Clarence River. Construction of the main line to Brisbane via Kyogle was completed in 1930 putting Grafton on the main interstate line. The problem was the Clarence River crossing. **Train Ferries**

The NSW Government railway adopted a temporary solution by acquiring and concerting a barge – the Swallow and a small cargo ship the SS Induna and converting them into train ferries. This involved

constructing an upper deck on which the rolling stock ran for transportation across the Clarence. Initially, only one track was installed on the upper deck of the Swallow but soon after their entry into service this was enlarged to three tracks. The SS Induna being smaller had only Additional one track. The Swallow was first in service in 1925 followed by the SS Induna in 1926. (Dunn 2003 pp111-112; Lee 2003 p236-238, cited in EIS - Appendix G)

The ferry route was from the railway wharf at South Grafton upstream to the railway wharf at Grafton and not directly across like the current bridge alignment (Crossing of the Clarence River at Grafton).



Fig. 8-8: Historic photo of the Swallow.
(Source: EIS - Appendix G, p. 49)

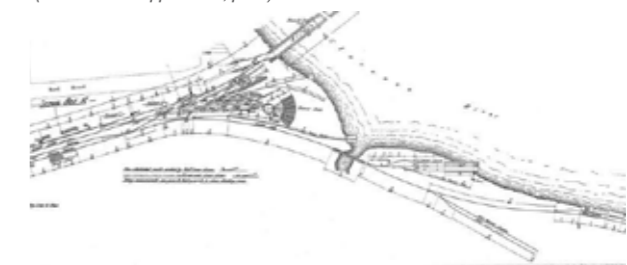


Fig. 8-9: South Grafton in 1932 showing ferry arrangements and the new bridge. Note this is plan is not to scale.
(Source: EIS - Appendix G, p. 47)

Wharf remains

Remnant sections of wharf exist between the old and new Grafton bridges.

(Source: EIS - ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON, Appendix G – Technical Paper: Non-Aboriginal heritage assessment)

8.5.3 Aboriginal Heritage

The Golden Eel and Alipou Creek.

The archaeological assessment identified one Aboriginal site within the project area: Golden Eel Site (12-6-0326).

In addition there is one Aboriginal sites recorded in close proximity to the project area: Alipou Creek AS 1

The Clarence River Golden Eel site is a culturally significant site, with a general restriction applying to access to the site.

Co-ordinates for this site have been provided by OEH, however the extent of the site has not been specified. On the basis of information provided in the field by Aboriginal representatives the entirety of the Clarence River and Alipou Creek has been identified as an Aboriginal site associated with the Golden Eel dreaming story. It is known that the Golden Eel site and the formation of the Clarence River are considered to be of high cultural significance to the local Aboriginal people. In her book, *Singing the Coast*, Somerville discusses with Tony Perkins the importance of the “Golden” dreaming stories to the Gumbaynggir Aboriginal people:

“Each of the different clan groups in Gumbaynggir country had different major storylines and associated miirlarl (sacred or special places) and where these storylines meet up are the most powerful places of all.”

“Tony explained: ‘The three main golden spirits that belong to Aboriginal people is that Golden Eel, that Golden Dog, and down at Nambucca way they got that Golden Kangaroo.’”

“We’ve got, you know, the Golden Kangaroo and if you go up, between here and Grafton and Grafton does have the Golden Dog Hotel there and they also have the Golden Eel up at the bridge at Grafton there, so they’re the three sites, the Waanyji Miirlarl in Coramba, Buurrga (Eel) Miirlarl at Grafton and Nunguu Miirlarl here, special places...” (Somerville, 2010, p. 215, cited in EIS - Appendix H).

While there are discrete Aboriginal archaeological sites located in proximity to the Clarence River and Alipou Creek, the Golden Eel site is related specifically to the topographical features of the waterways themselves. Aboriginal representatives have indicated that the integrity and setting of the Clarence River and Alipou Creek is important to the overall cultural values of the Golden Eel site.

Throughout consultation, representatives of the Grafton Ngerrie Local Aboriginal Land Council have emphasised the importance of the Golden Eel site as having important cultural values to the local Aboriginal community. Broadly, the Golden Eel site is a creation story associated with the Clarence River and Alipou Creek. The confluence of the Alipou Creek and the Clarence River has been identified as a specific landscape feature with important an important relationship to the Golden Eel story. This landscape feature is not located in the project area, however the Grafton Ngerrie Local Aboriginal Land Council have indicated that alteration of this landscape feature would be considered to impact the cultural values of the Golden Eel site.

Dreaming stories such as the Golden Eel story, gain their importance to Aboriginal people as informative and communicative devices utilised to communicate spiritual beliefs and cosmology; relationships between people, genders and country; living arrangements and practices; food and food collecting; and designs on implements, weapons and body adornment (Attenbrow, 2003, p. 127, cited in EIS - Appendix H).

The specific detail related to the Golden Eel story is culturally restricted information. Tony Perkins, a Gumbaynggir person, has described a deliberate cultural teaching practice among the Gumbaynggir Aboriginal people where some levels of information are restricted from certain members of the group. This restriction of information is used to encourage communication and sharing amongst individuals of a peer group as they aged to build a complete picture of each story from different fragments handed down to individuals by Elders (Somerville, 2010, p. 217, cited in EIS - Appendix H).

Although no Aboriginal cultural material was identified in the project area during this assessment, such material would be considered to have high cultural values to the local Aboriginal community as being tangible connections between Aboriginal past and present and evidence of past Aboriginal lifestyles.

(Source: EIS - ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON Appendix H – Technical Paper: Aboriginal heritage assessment)

The Big River

The Clarence River, also known as “the Big River”, Biirrinba or ngunitiji, is an important site for several Aboriginal groups including the Bundjalung people and features heavily in creation stories of the area.

Alipou Creek is the resting place of the Golden Eel, a mythical figure of great importance to neighbouring tribal groups. It is located on the south bank of the Clarence River to the east of the existing Grafton Bridge, in close proximity to several marriage trees. According to tradition, the trees were used to dissolve relationships rather that create them; arranged marriages were dissolved when the tallest limbs were removed. The Golden Eel resting place and ceremonial site are thus considered areas of high cultural significance (Biosis Research Pty Ltd 2004:11; 2011:24, cited in Clarence Valley Aboriginal Heritage Study).

The river is used as a teaching site to educate young Aboriginal people about their traditional heritage. In a well-known creation story, the old witch Dirrangun came to rest at the entrance of the Clarence River in Yamba. After a quarrel, Dirrangun’s son left his mother, taking his two sons with him. He constructed a canoe and, placing his sons at either end, sailed out from Iluka towards Ballina. Enraged that they had abandoned her, Dirrangun called for the sea to become violent and the wind to howl. As the father turned the canoe into Ballina the waves came up and sank the canoe with the two boys and their father still inside. Realising what she had done, Dirrangun drowned herself in the river and became a submerged rock at the head

of the Clarence River at Yamba. Reportedly, visitors to Ballina can still see the canoe with the father and his two sons in the form of rock; and when the sea roars it is said to be Dirrangun calling for her lost son and grandsons (Byrne 1986:19; Currawinya Pty Ltd 2010; McSwan and Switzer 2006:17, cited in Clarence Valley Aboriginal Heritage Study).






In a similar myth kept by members of the Bandjalang clan, an old woman was caring for a baby when it was stolen by two men. The two men cut bark from a nearby tree and made a canoe intending to sailing to Urunga. The woman ran to the water’s edge and hit the ocean with her yam stick, calling for the waters to divide. This action caused the first waves to form on the ocean and, for Bandjalang people, explains why waves are formed (Hoddinott 1978:62; Godwin and Creamer 1982:51; Therin Archaeological Consulting 2004, cited in Clarence Valley Aboriginal Heritage Study).






(Source: Clarence Valley Aboriginal Heritage Study, March 2015 Prepared by Australian Museum Consulting for Clarence Valley Council)



Fig. 8-10: Aerial photograph of the Clarence River and the Islands

(Source: EIS - Appendix H)

Item & Location	Significance		Constraints	Principles
<p>Ravensford 36 Villiers Street, North Grafton within the Grafton Conservation Area</p>	<p>This attractive two storey residence has remarkably intact external details and is set within a garden of mature trees on an important corner site. It is significant historically for its association with Captain Greenway (c 1860) and later the Henson family who owned a cordial factory next door. It is representative of the quality two storey residences built in the period 1890 -1910 and can be compared with Lormont (16 Victoria Street). The site is likely to have archaeological potential.</p>		<ul style="list-style-type: none"> close to footpath limited space 	<ul style="list-style-type: none"> signage located adjacent Fig tree framing Dunvegan
<p>"Dunvegan" 47 Pound Street, North Grafton, within the Grafton Conservation Area</p>	<p>The Clarence Valley is noted for its timber industry which initially harvested soft woods like cedar and later hardwoods for construction purposes. Dunvegan is an imposing two storey timber clad residence, unusually large in scale and in largely original condition, tells of the local use of this timber. Built for the Powell family in 1905 and extended in 1926 it presents a variety of Victorian and Federation elements including iron lace balustrading, valances, and carved barge boards with fretted work at the apex. It is now in public ownership and forms part of the Grafton TAFE complex. Buildings of this quality and size are becoming increasingly rare in Grafton. It is likely to be significant to the State.</p>		<ul style="list-style-type: none"> close to footpath limited space 	<ul style="list-style-type: none"> discrete signage in street verge, possibly attached to picket fence
<p>Street trees Two Brachychiton discolor (Lacebark), eight Ficus rubiginosa (Rusty Fig), two Ficus microcarpa var. hillii (Hills Fig) and 25 Jacarandas are present along the length of Pound Street within or in the vicinity of the construction works zone boundary</p>	<p>Included in the Grafton Conservation Area are significant Fig and Jacaranda trees that will be removed. The majority of the impact will be along Pound Street, where mature Fig trees will be removed.</p> <p>Tree planting was introduced in 1881 to beautify the town and also to provide much needed shade. Street tree plantings have also been undertaken to commemorate particular historic events, and have become synonymous with Grafton. They make a significant contribution in depicting the history and aesthetics of the town. As commemorative monuments they have a specific relationship to people and historical events in Grafton and are important to the Grafton community as a whole.</p>		<ul style="list-style-type: none"> road corridor sight lines 	<ul style="list-style-type: none"> creatively recycle Fig tree wood illustrate old street character constraints demonstrate new evergreen street trees & water sensitive design in rain gardens demonstrate significance of relationship between trees, historical events
<p>King George V Plaque (Item no. I688) On the existing pier to the railway bridge, over Pound Street</p>	<p>In between I687 & I514. This plaque, and the associated street plantings, are historically significant showing the warmth of feelings for the English particularly King George V in Grafton in 1935. It also demonstrates the continuing desire of Council to beautifying the town through street plantings, a commitment begun in 1874 when Council adopted a by-law for the planting of street trees.</p>		<ul style="list-style-type: none"> new bridge columns are round, hence not suited to the plaque space /road safety visibility 	<ul style="list-style-type: none"> attach to existing sandstone buttress wall to railway bridge, north verge ensure visibility and space for school groups to congregate around place where visibility to remaining Jacarandas along Pound Street (between Bridge & Kent Street) is clear
<p>Grafton Railway Viaducts (ARTC S.170 Register) The item includes the railway embankment and viaducts through Grafton from the north end of the Clarence River Bridge. Bridges are at the crossing of Clarence, Villiers, Duke, Prince, Queen, Mary and Pound Streets</p>	<p>The railway viaducts are architecturally significant for the first use of precast reinforced concrete beams and of concrete Art-Deco arches over seven roads in Grafton. They have historical significance as part of the final link in the North Coast railway linking Brisbane and Sydney and for their social and commercial benefit to passenger and freight transport by rail Heritage Act - s.170 In addition to listing on the CVLEP and containment within the Grafton Urban Conservation area, the viaducts are listed on the NSW State agency (SRA) heritage register.</p>		<ul style="list-style-type: none"> visibility from footpaths and local streets 	<ul style="list-style-type: none"> ensure visibility from interpretation signage show integrated with road bridge

Item & Location	Significance		Constraints	Principles
<p>The Old Grafton Bridge Clarence River</p>	<p>This bridge is a double-deck road/rail structure, the only one of its type in NSW. There is a lift span to allow passing of river traffic (no longer used). It presents a commanding visual reminder of rail and road to residents of Grafton. Opening of the bridge in 1932 completed the North coast standard gauge line between Sydney and Brisbane, avoiding the winding route via Tenterfield. The viaduct along with the wharf remains are important relics of the development of the north coast railway. The viaduct is representative of similar structures constructed at a range of locations, many of which have been replaced.</p>		<ul style="list-style-type: none"> not pedestrian friendly traffic noise 	<ul style="list-style-type: none"> signage location to have clear views of bridge European heritage theme rustic, bold, vandal proof
<p>Railway Precinct, Turntable & Train Ferries</p>	<p>The remnant historic 18.2 metre wide turntable was built in 1925, as part of the railway precinct on the south Grafton side of the Clarence River. From an urban design perspective the original design plan for this precinct as per the 1914 plan that illustrates the turntable, various railway connections to the river and wharfs provide inspiration for interpretation.</p> <p>The train ferries (SS Induna and the Swallow) are also unique in terms of their function as transportation across the river prior to the first Grafton bridge being constructed.</p>		<ul style="list-style-type: none"> just outside project site boundary new road crosses over heritage plan/radial lines to river cycle path adjacent-safety 	<ul style="list-style-type: none"> simple, creative interpretation of what will be remnant lines in the landscape rustic, bold, vandal proof illustrate the many components of the old railway precinct
<p>Wharf remains South Grafton</p>	<p>The wharf remains are remnant of the times when the Train Ferries were active, and locomotives were not permitted except as specially authorised movements. Generally the ferries carried non-passenger rolling stock so passengers transferred into new trains while the goods and mail vans were transported; most other transfers were of freight following stock. Passengers were transported in regular passenger ferries (78.) Jetties and track work were constructed at both locations. The tracks ran down steep embankments to jetties with "adjustable 100' long drawbridges" leading to floating pontoons 79 (Plate 10).</p>		<ul style="list-style-type: none"> accessibility down steep river bank remote 	<ul style="list-style-type: none"> incorporate location in signage relate to railway precinct river transport theme
<p>SS Induna and Bow Memorial (ItemNo: I133) South bank of the Clarence River west of the Clarence River Bridge. The bow memorial is located in a small grassed area on Riverside Drive in front of the retirement village.</p>	<p>The hull of the SS Induna and the Bow Memorial are visible remains of the significant early shipping history of the Clarence. They provide evidence of shipping's importance to the development of the North Coast and are linked to the development of the rail transport on the north coast. The remains have a commemorative value given that SS Induna is associated with the escape of Winston Churchill from the Boers in 1899. With the remains of rail ferry wharf on the northern bank of the Clarence River they are of State significance.</p>		<ul style="list-style-type: none"> accessibility along open space or through retirement village? partly covered in silt/grass 	<ul style="list-style-type: none"> locate on a map with clear visible line form, at location of signage illustrate old ship scale and purpose illustrate its part in river transport
<p>The Golden Eel & Alipou Creek The Big River Wilson's Hill South Grafton</p>	<p>The Clarence River, also known as the Big River, Biirrinba or Ngunitiji, is an important site for several Aboriginal groups including the Bundjalung people and features heavily in creation stories of the area.</p> <p>Alipou Creek is the resting place of the Golden Eel, a mythical figure of great importance to neighbouring tribal groups. Dreaming stories such as the Golden Eel story, gain their importance to Aboriginal people as informative and communicative devices utilised to communicate spiritual beliefs and cosmology; relationships between people, genders and country; living arrangements and practices; food and food collecting; and designs on implements, weapons and body adornment.</p> <p>Wilson's Hill is an important Aboriginal site that also requires consideration for interpretation, even though it is outside the project area.</p>		<ul style="list-style-type: none"> limited access overgrown with weeds consent required from Aboriginal group, elders 	<ul style="list-style-type: none"> landscape dominant integrate, consult with Aboriginal Lands Council, local Elders interpretative signage, trail tree planting, creek restoration

8.6 Implementation Strategy

The implementation strategy draws upon four overriding themes:

- **Old Grafton**, based on the historic houses of North Grafton, Ravensford and Dunvegan as well as the avenue of Fig trees along Pound Street.
- **Bridging the Gap**, inspired by the historic viaduct and the double deck truss bridge across the river.
- **Rail Link Across the River**, explaining the history of the railway crossing, using ferries, railway turntable and other elements.
- **Aboriginal Past and the Big River**, reflecting upon the Golden Eel and Alipou Creek, the Big River, marriage trees and Wilson's Hill.

There is scope for Council to develop a marketing heritage trail that traverses this area as well as areas beyond. The adjacent plans illustrate opportunities to highlight the heritage interpretation along a journey from Grafton (north) across the bridge to South Grafton, and vice versa.

It should be noted, that the presented heritage strategy includes elements that are beyond the scope of works of this project such as the railway turntable. Yet, these elements form an important role in the story telling of rail and river transport in Grafton.

The heritage elements link into Council's wider strategy for the town as referred to figures 8.11 and 8.14.



Fig. 8-11: Grafton heritage guide - Grafton

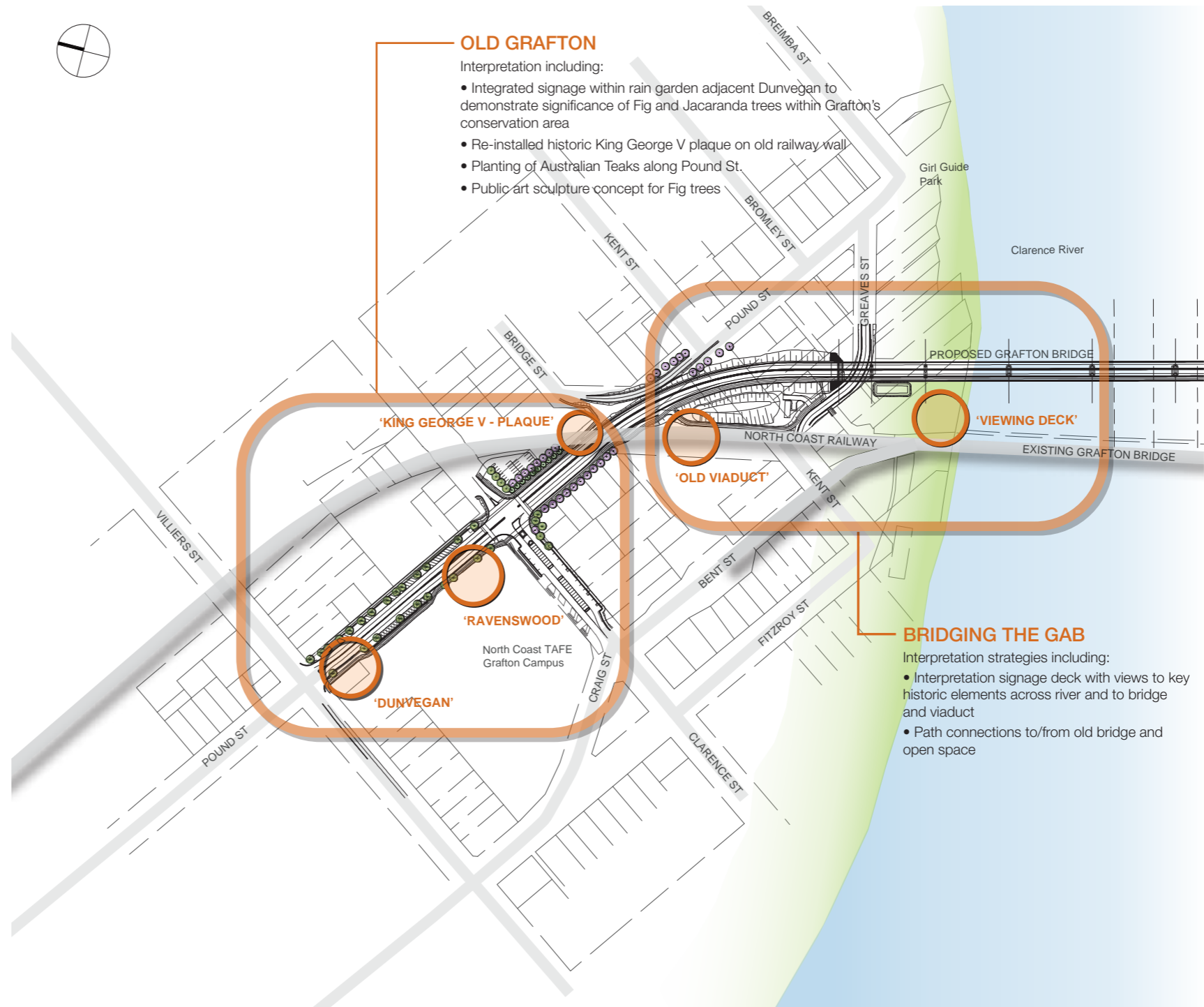


Fig. 8-12: Implementation Strategy Plan - North Grafton

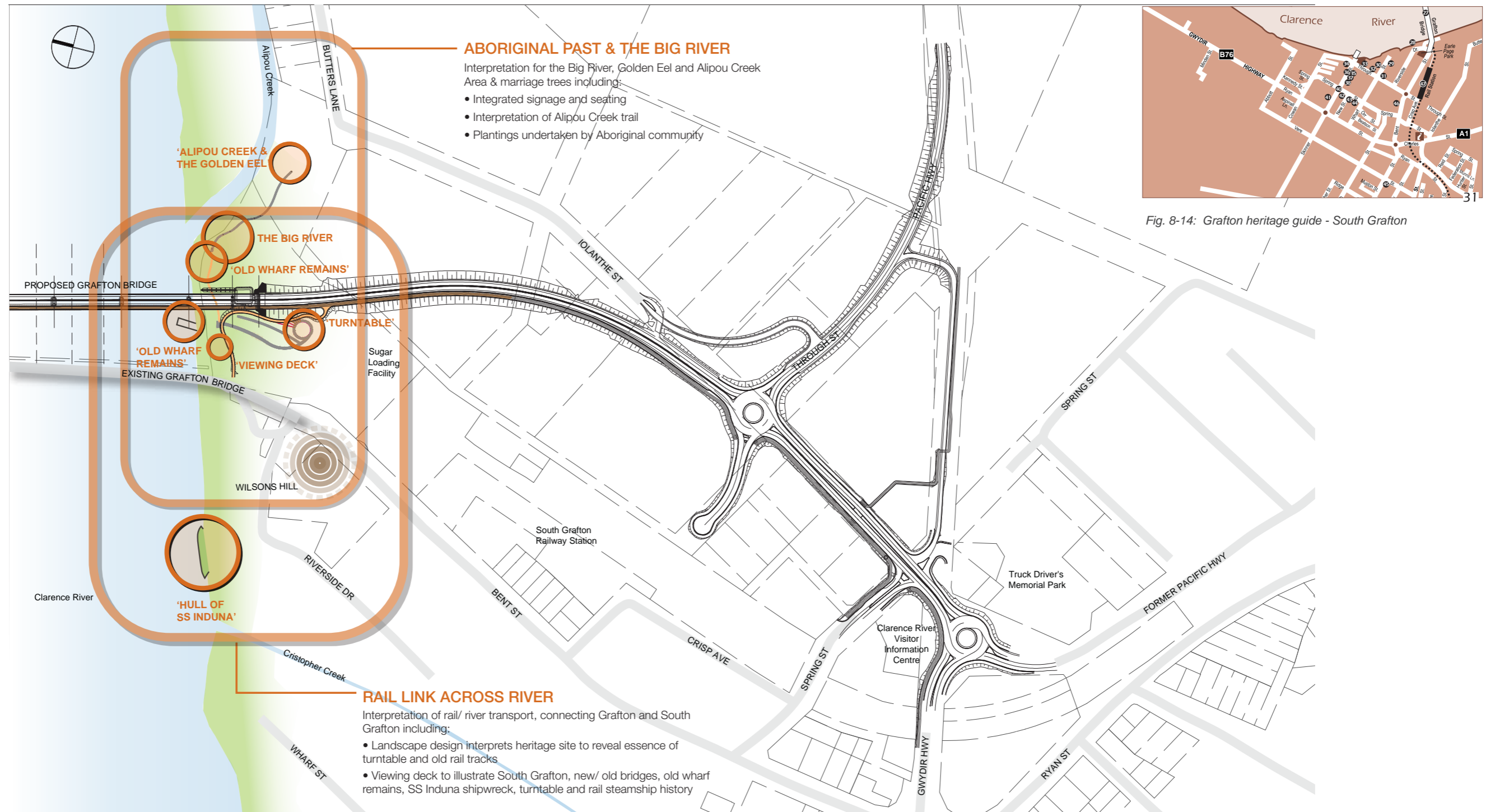


Fig. 8-14: Grafton heritage guide - South Grafton

Fig. 8-13: Implementation Strategy Plan - South Grafton

8.6.1 Old Grafton

"Grafton Conservation Area's" listing states that *"Grafton is a fine example of a subtropical mid nineteenth century river port, city and pastoral seat. It contains a fine group of civic and ecclesiastical buildings and many spacious timber houses which display both craftsmanship in detail and the ubiquitous verandah of northern Australia."*

The magnificent canopies of Ficus, Jacarandas and Camphor laurels provide shade and colour while serving to link the natural and man made features of the city". (Source: Register of National Estate-(Place ID 3437))

Location

Various locations- along Pound Street- outside Ravenswood, Dunvegan, King George V Plaque on railway bridge crossing, and Pound Street generally for Fig and Jacaranda trees. Fig sculptures could be scattered through Greaves St park.

Audience

General public, walking along streets and within parks.

All ages.



Fig. 8-15: View looking north along Pound Street, to the railway viaduct In the mid-distance. A King George V Plaque on the railway bridge will be relocated, as part of the existing structure will be removed.

Themes / Storyline

- Plantings of Fig and Jacaranda trees are an important part of Grafton's streetscape heritage. They are strong elements within the conservation areas of Grafton
- Ravenswood is one of several large, two-storeyed and timber-clad residences built in Grafton between 1890 - to 1910.
- Dunvegan, a two storey timber-clad residence is unusually large in scale and it combines Victorian and Federation elements including iron lace balustrading and valances and carved barge boards with fretted work at the apex. Dunvegan is believed to be constructed of local hardwood supplied by one of the local sawmills operating on the southern bank of the Clarence.
- The King George V Plaque, and the associated street plantings, are historically significant showing the warmth of feelings for the English particularly King George V in Grafton in 1935. It also demonstrates the continuing desire of Council to beautify the town through street plantings.

Interpretation Strategy

- Consider heritage interpretation signage where the two Fig trees used to frame the former residence- *"Dunvegan"*, beside the fence, and possibly integrate signage with the new rain garden, to demonstrate sustainable greening for Grafton CBD.
- Implement new evergreen native street tree plantings to create a strong avenue of trees to replicate the aesthetics of the Grafton Conservation Area as a whole.
- Strengthen Jacaranda tree plantings adjacent the old viaduct and on existing Jacaranda streets where possible.
- Consider interpretive signage adjacent the new rain gardens in Pound Street, close to *"Ravenswood"*, to provide environmental interpretation regarding trees and water and the value they both bring to our urban environments.
- Relocate the historic King George V Plaque onto one of the new piers of the railway viaduct on Pound Street, on the northern verge.

Key Historic Information

Fig Trees

Fig trees were among the species introduced to Grafton Street plantings from the Sydney Botanic Gardens and other sources from 1872. Two of the figs frame the former residence, Dunvegan. It is noted that these trees will be removed during construction of the road widening.

As Fig tree species are not supported by Council today for streetscapes in urban areas, the new proposed street tree plantings are a native Australian Teak species.

Social Events and commemorations

The unification of Grafton and South Grafton during this period coincided with the introduction of electricity and the mood of the times is symbolised by various social events and commemorations from the 1930s. The town celebrated the 25th anniversary of the reign of King George V in 1925, and in a proud tradition begun in the 1870s marked the occasion with various community street tree plantings. An avenue of Jacaranda trees, already prevalent in the town, had been planted on Pound Street north of Villiers Street in the 1880s and this was expanded on with the planting of 39 more along the project area section of Pound Street from Clarence Street to the river to mark the anniversary.

Jacaranda Avenue

Pound Street has long been known as 'Jacaranda Avenue' as a result of these plantings. Twenty-five of these Jacarandas remained in 1991, and further street trees would have been planted within or adjacent to the project area during this historic phase. Two plaques are present within the project area that commemorate the events surrounding certain plantings (see Coronation Plaque – CZB12 and King George V Plaque- CZB19)

INTERPRETATION DEVICE



Fig. 8-16: Tree sculpture, Tate Gallery, London



Fig. 8-17: Rounds of timber could create interesting texture on ground



Fig. 8-18: Example of a signage panel using weathered steel.
(Source: Drumminhands Design, www.drumminhands.com)



Fig. 8-19: Example of a creative reuse of timber for a railing

EXAMPLE OF CONTENT



Fig. 8-20: King Georges Plaque V, currently set on a railway bridge pier.



Fig. 8-22: View looking east along Pound Street; the plaque is on the right side bridge pier.



Fig. 8-21: North-west facing photograph of Pound Street streetscape between Villiers and Clarence Street.

View shows the street trees (now removed) which, together with prominent heritage items 'Ravensford' (out of view) and Dunvegan, (visible on the left), form a significant streetscape within the project area.

(Source: EIS - Appendix G, p. 13)

8.6.2 Bridging the Gap

Location

Greaves Street park space due to difficulties in congregating on or near the old bridge where good views are obtained. The park provides vistas across the river to other historic interpretation elements. This site focuses in particular on the historic viaduct and bridge structure, yet makes references to all the other sites to inspire curiosity for the viewer to follow the trail.

Audience

General public, walking along the Clarence River banks, pedestrians and cyclists along the cycle paths, pedestrian paths and within the parks. All ages, mainly young children to adult.

Themes / Storyline

Double –deck road/rail bridge, the only one in NSW. Viaduct is representative of similar structures constructed in 1930s.

Interpretation Strategy

Provide a viewing deck that invites the viewer to enjoy the riverside. The deck would be finished in concrete with a grey oxide and strips to steel inlays.

Introduce the viewer to an array of elements that could be explored via signage (showing the direction/ location of the Old Grafton Bridge, the Grafton Railway Viaducts, the Wharf remains and the SS Induna wreck on the other side of the river bank). Incorporate ground inlays that indicate the location of these items.

Integrate signage interpretation that demonstrates the significance of the double deck arrangement, and the view potential across the river, as well as the space created between the new and old bridge.

Link to other pathways to encourage exploration. Opportunities to reuse sections of removed bridge/ pier/tree timber materials will be investigated in the detailed design of the HIP.



Fig. 8-23: View looking south across the river from Greaves Street Park.



Fig. 8-24: View looking west towards the existing bridge.



Fig. 8-25: Detailed Implementation Strategy Plan - North Grafton

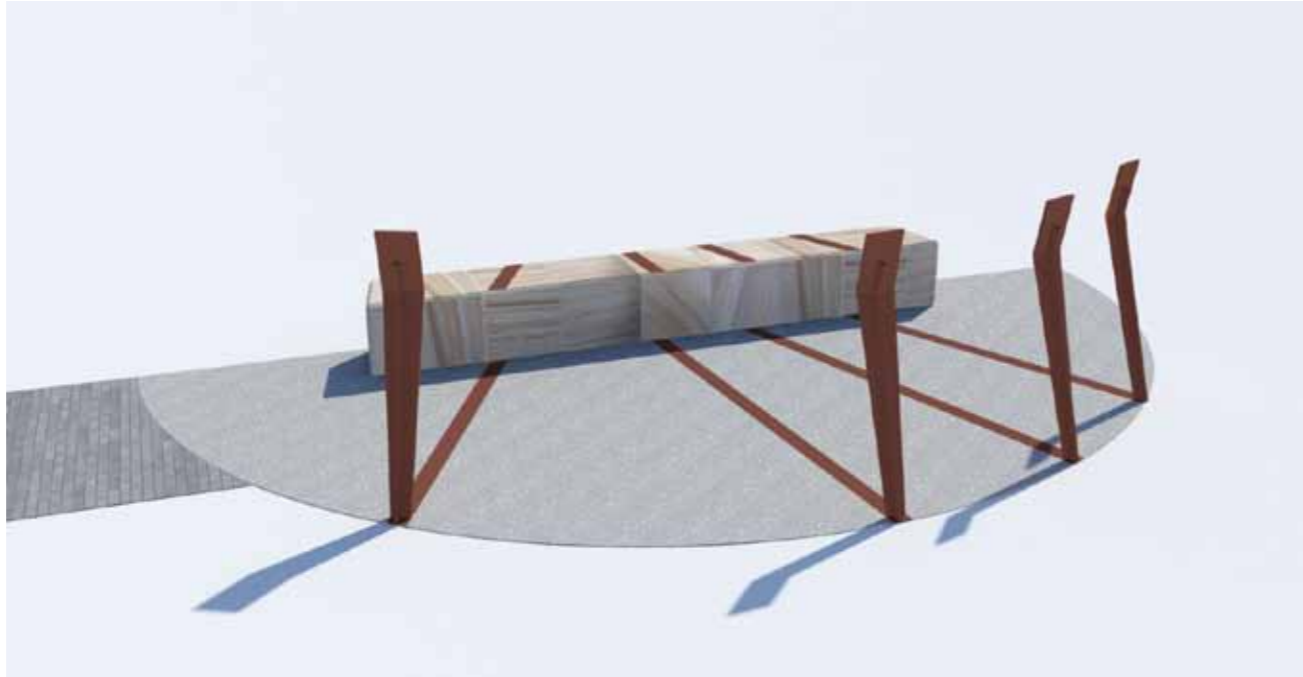


Fig. 8-26: The small lookout terrace would integrate ground inlays and signage panels. The inlays follow the axis to the different interpretation sites and the semi circular shape of the terrace echoes the turntable element.



Fig. 8-28: Indicative 3D model of the proposed signage.



Fig. 8-27: Indicative photomontage of the interpretation terrace.

INTERPRETATION DEVICE

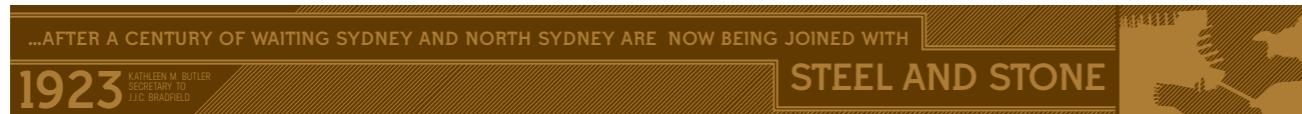


Fig. 8-29: Example of a ground inlay with historic references.
(Source: GML Heritage, www.gml.com.au)



Fig. 8-30: Example of a ground inlay that shows the original shoreline.
(Source: GML Heritage, www.gml.com.au)



Fig. 8-31: Example of a signage panel using weathered steel.
(Source: Drumminhands Design, www.drumminhands.com)

EXAMPLE OF CONTENT



Fig. 8-32: Old photo of the bridge and railway precinct, note turntable to far left.
(Source: EIS - Appendix G, p. 51)



Fig. 8-33: Floating the first pier into position at South Grafton on Monday 26 May, 1930 (CRHS).
Source: Fruits of Federation, The Grafton-Brisbane Uniform Gauge Railway and the Clarence River Bridge, Robert Lee, page 67.



Fig. 8-34: Underside of the Grafton Railway Viaduct: inspiration for materials to use for interpretation



8.6.3 Rail Transport across the River

Whilst this element is not part of the proposed project scope, it has been included in this strategy to demonstrate how the various sites and interpretation elements tie together into a unified strategy.

Location

River foreshore and grounds wedged between the existing and new bridge near the mill.

Audience

General public, walking along the Clarence River banks, pedestrians and cyclists along the cycle paths,

All ages, from young children to adult.

Themes / Storyline

Demonstrate the link between the rail line finishing at the turntable, how the trains got to the steamships across the rails, and the steam ships carrying trains across the Clarence River to South Grafton, till when the Grafton Bridge was constructed.

Illustrate the purpose, scale and character of the old rail ferries, double and single deck.



Fig. 8-35: 1912 Rail De-railment, south bank of the Clarence River, Grafton.
(Source:)

Interpretation Strategy

This strategy is dependent upon funding from TfNSW.

- Explain the story of the shippings importance to the development of the North Coast and how they are linked to the development of the rail transport on the north coast.
- Explain the significance of the link to Winston Churchill escape.(SS Induna)
- Clearly demonstrate the remaining archaeological remains of these wharfs and associated rail lines. (Show old plans, old photos of the steamships and recent remote sensing imagery for finding the steamship remains.)
- Illustrate the inter-relationships between the railway precinct elements- the railway turntable, tracks, buildings, wharfs.
- Demonstrate the steamships- their size, character and function.



Fig. 8-36: The turntable is a significant heritage element in the context of rail transport in Grafton.

Key elements:

Turntable

Consideration for a pathway around the turntable with balustrade and integrated signage, consistent with other interpretation elements.

Ground weathered steel inlays (no signage incorporated) would reflect the location of the radiating rails to the locomotive depot.

Interpretive signage would be incorporated into the railing that illustrates aspects of the historic facility.

Utilise old rail tracks as pathways where applicable, and connect the path to the adjacent shared path.

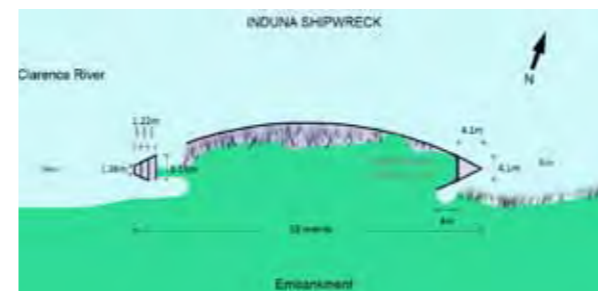


Fig. 8-37: Site Plan of the SS Induna (FMW29)

(Source: Comber Consultants, cited in EIS - Appendix G)

Viewing deck (opportunity for others)

Deck between the two bridges, with clear sight lines to the Grafton side of the River, Alipou Creek and to the wharf remains and SS. Induna wreck site.

SS Induna and Swallow- incorporate simple signage at the foreshore deck describing the significance of these unique ships in the history of Grafton.

Signage to illustrate the partial remains of the SS Induna -the cast iron hull, propeller and rudder. The fabric is rusty but the ship's hull is still visible. Illustrate by map the location of the Bow Memorial, in a small grassed area on Riverside Drive in front of the retirement village, on private property. It comprises a section of the riveted cast iron bow from the ship mounted on a small mound of stone. A small brass plaque outlines the history of the ship and the origins of the Bow Memorial.



Fig. 8-38: View of the SS Induna at the river foreshore.

(Source: Comber Consultants, cited in EIS - Appendix G)

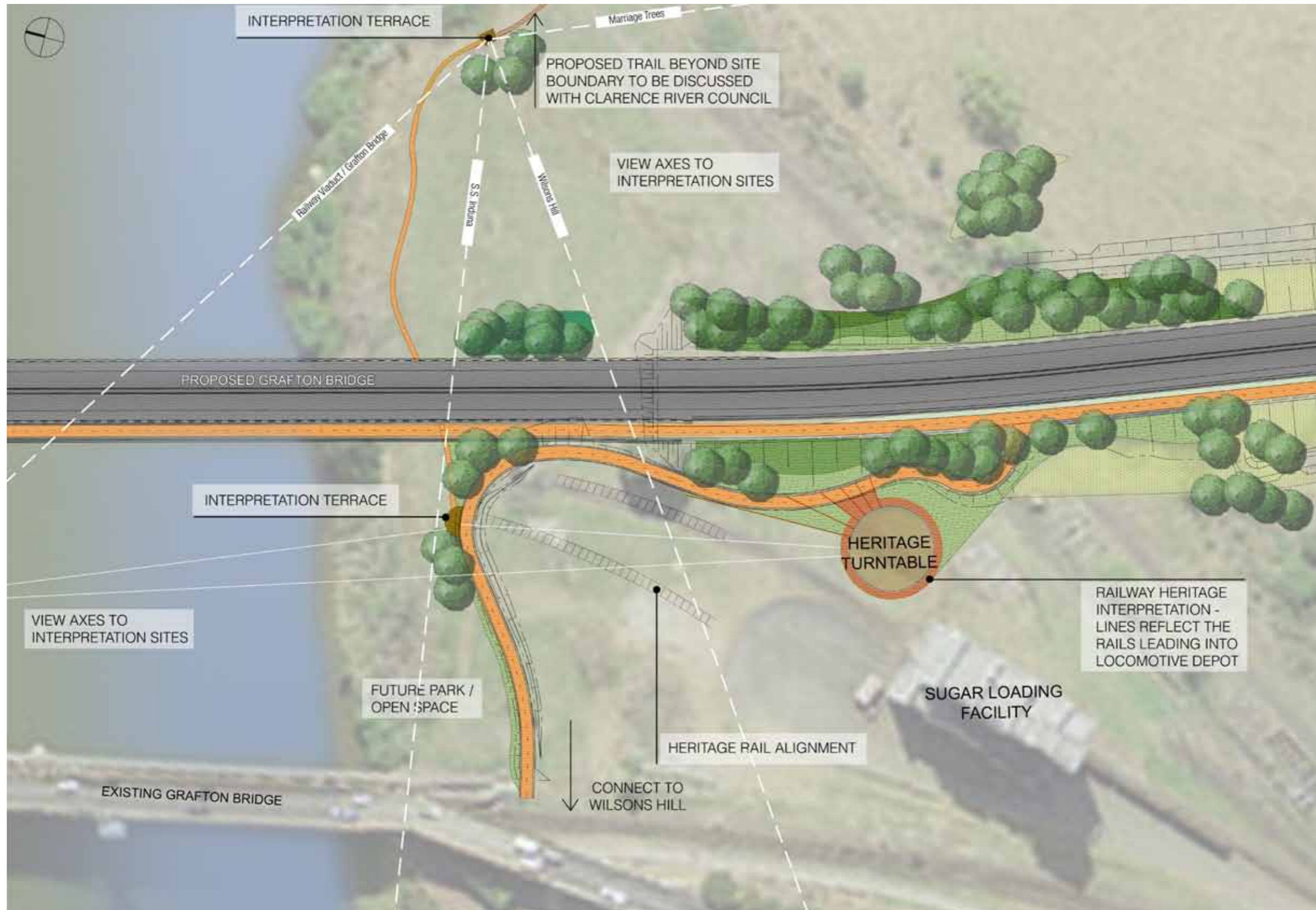


Fig. 8-39: Heritage Strategy Implementation - Detail Plan - North Grafton. Note that this strategy is dependent upon funding from TfNSW.

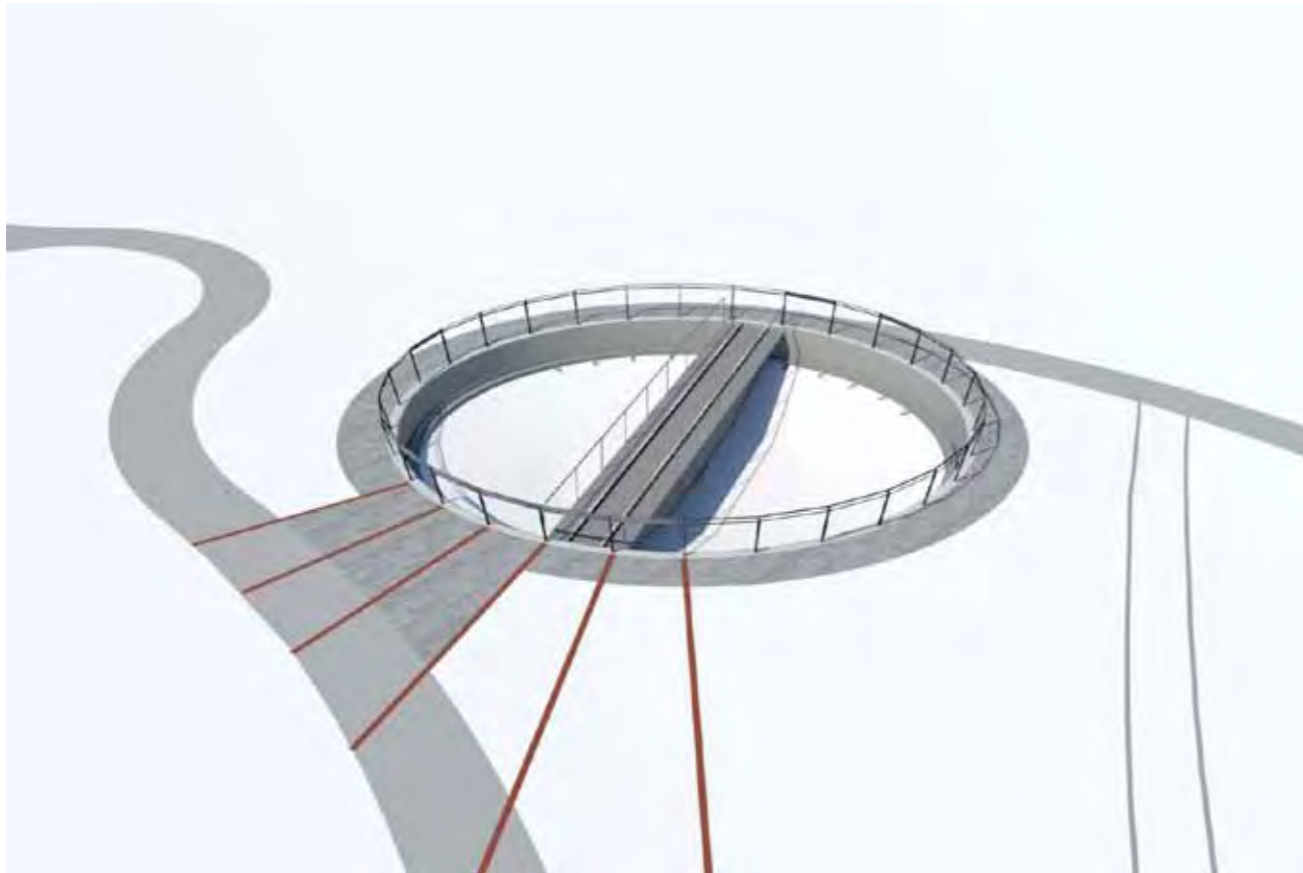


Fig. 8-40: Abstract view of the potential treatment for the turntable interpretation. The radiating steel ground inlets reflect the layout of the rails leading into the locomotive depot. Note that this strategy is dependent upon funding from TfNSW.

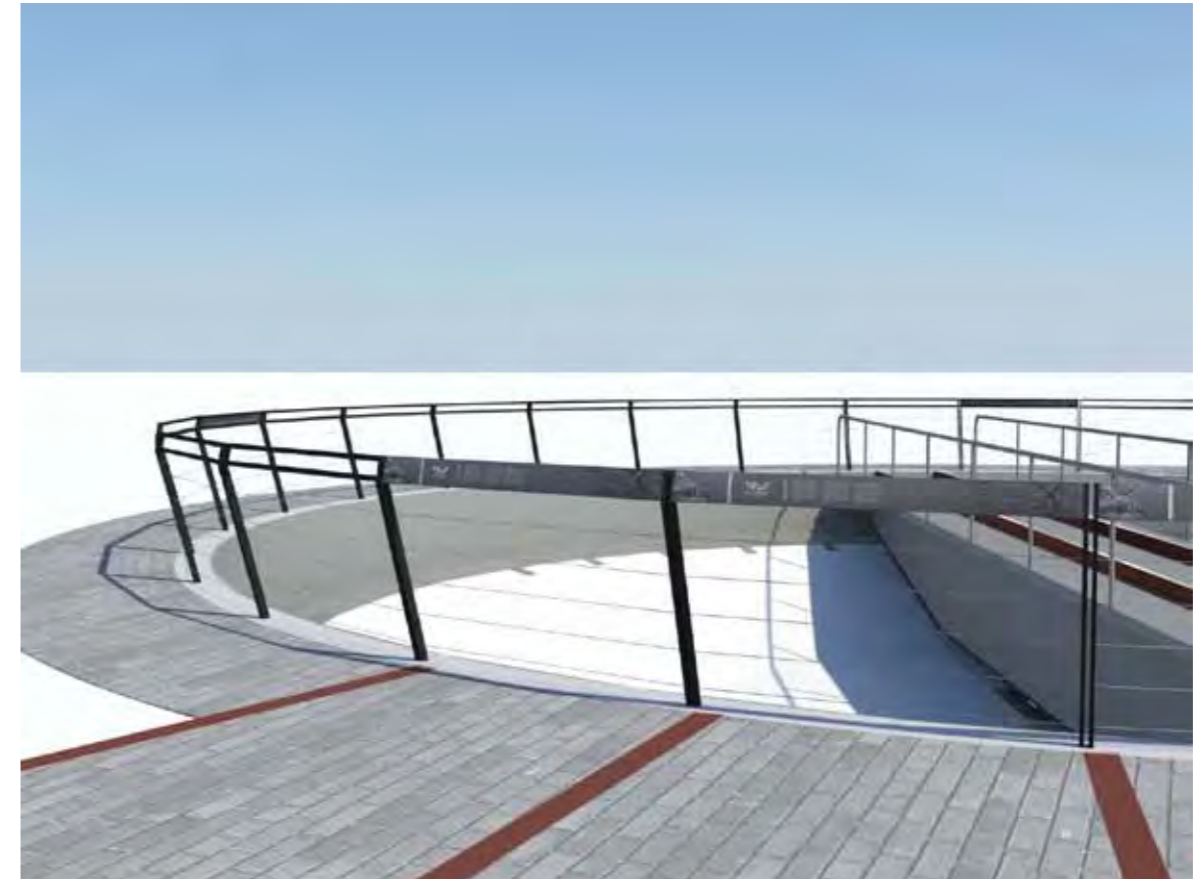


Fig. 8-41: Interpretation would be integrated into the railing of the turntable to be as unobtrusive as possible. Note that this strategy is dependent upon funding from TfNSW.

INTERPRETATION DEVICE



Fig. 8-42: Example of a weathered steel ground inlay without historic references.



Fig. 8-43: Example of a heritage signage integrated with a railing, Ballast Point Park.



Fig. 8-44: Example of a signage panel using weathered steel.
(Source: Drumminhands Design www.drumminhands.com)



Fig. 8-45: Bow of the SS Induna.
(Source: Comber Consultants, cited in EIS - Appendix G)

EXAMPLE OF CONTENT



Fig. 8-46: Rail Ferries Swallow (left) and SS Induna
(Source: Frozen in Time Gallery, www.frozentime.com.au, cited in EIS - Appendix G1, p. 48)



Fig. 8-47: Swallow
(Source: Frozen in Time Gallery, www.frozentime.com.au)



Fig. 8-48: Aerial Image showing the southern riverbank and Locomotive Depot
(Source: Comber Consultants, cited in EIS - Appendix G)



Fig. 8-49: Historic overlay of the facility over an aerial photograph.



Fig. 8-50: Aerial Image of the South Grafton Locomotive Depot
(Source: Comber Consultants, cited in EIS - Appendix G)



Fig. 8-51: Old Wharfs beside Alipou Creek.

(Source: EIS - Appendix G, p. 50)



Fig. 8-53: S.S. Induna wreck

(Clarence Valley, www.clarencevalley.com)



Fig. 8-52: South Grafton in 1932 showing ferry arrangements and the new bridge. Note this is plan is not to scale.

(Source: EIS - Appendix G, p. 47)



Fig. 8-54: Ferrous ring Photograph, Old Wharfs beside Alipou Creek.

(Source: EIS - Appendix G, p. 76)

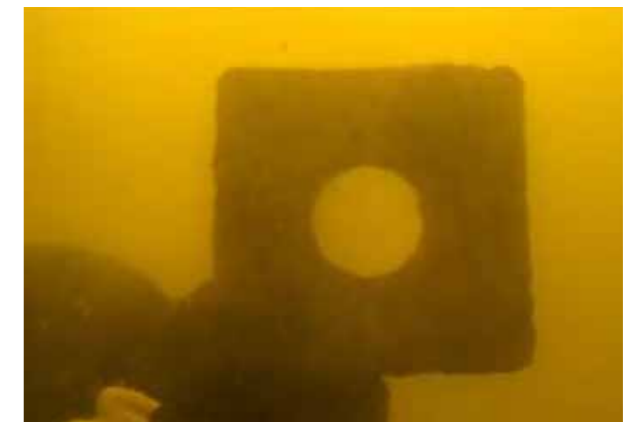


Fig. 8-55: Ferrous collar for bolt or spike

(Source: EIS - Appendix G, p. 76)

8.6.4 Aboriginal Part and the Big River

Location

Possible scope includes the south bank of the Clarence River, from Wilsons Hill (beyond project scope) to the Alipou Creek area, east of the new Grafton bridge.

Audience

General public, walking along the Clarence River banks, pedestrians and cyclists coming from the new bridge abutment on south Grafton.

All ages, from young children to adult.

Themes / Storyline

Illustrate with mapping how The Golden Eel site is related specifically to the topographical features of the waterways themselves.

Aboriginal representatives to provide information relative to the integrity and setting of the Clarence River and Alipou Creek and its importance to the overall cultural values of the Golden Eel site - e.g the creation story associated with the Clarence River and Alipou Creek..

The significance of the two islands and the bend in the river.

Aboriginal Elders/groups to provide information for dreaming stories such as the Golden Eel story, and to recommend the communicative devices to explain (if appropriate) their spiritual beliefs and cosmology; relationships between people, genders and country; living arrangements and practices; food and food collecting; and designs on implements, weapons and body adornment, relative to this local area.

Interpretation Strategy

The Aboriginal interpretive strategy will be formulated in conjunction with the local Aboriginal community.

This would ideally highlight salient sites and features within the landscape in a manner that respectfully enhances and protects these values. A few ideas are summarised below for further consideration:

The Golden Eel resting place and ceremonial site

Working with the Grafton Ngerrie LALC we will develop interpretation information to portray how Alipou Creek is the resting place of the Golden Eel, a mythical figure of great importance to neighbouring tribal groups. We understand that this place if is located on the south bank of the Clarence River to the east of the existing Grafton Bridge, in close proximity to several marriage trees.

Marriage Trees

According to tradition, the marriage trees were used to dissolve relationships rather than create them; arranged marriages were able to be dissolved only if the woman successfully removed a tallest tree limb. This practice continued into the 1970s. (LALC)

(Biosis Research Pty Ltd 2004:11; 2011:24, cited in EIS - Appendix G).

River as a Teaching site

Interpretive signage (if appropriate) to illustrate how the river is used as a teaching site to educate young Aboriginal people about their traditional heritage.

Key Elements recommended:

- Aboriginal river trail (some of which is beyond the project boundaries) whcih could include “bush tucker” and medicine plants of the area
- Interpretive signage, with seating
- Plantings undertaken by aboriginal community to enhance degraded river ecosystem
- Possible media link to aboriginal stories of the local area



Fig. 8-56: Looking across the Clarence River, to the southern banks near Alipou Creek, where part of the Golden Eel site story is linked
(Source: EIS - Appendix H1,p. 17)



Fig. 8-57: The Clarence River, identified as being created during The Dreamtime
(Source: EIS - Appendix H1,p. 17)

INTERPRETATION DEVICE



Fig. 8-58: Example of a signage panel using weathered steel.
 (Source: Drumminhands Design, www.drumminhands.com)

EXAMPLE OF CONTENT

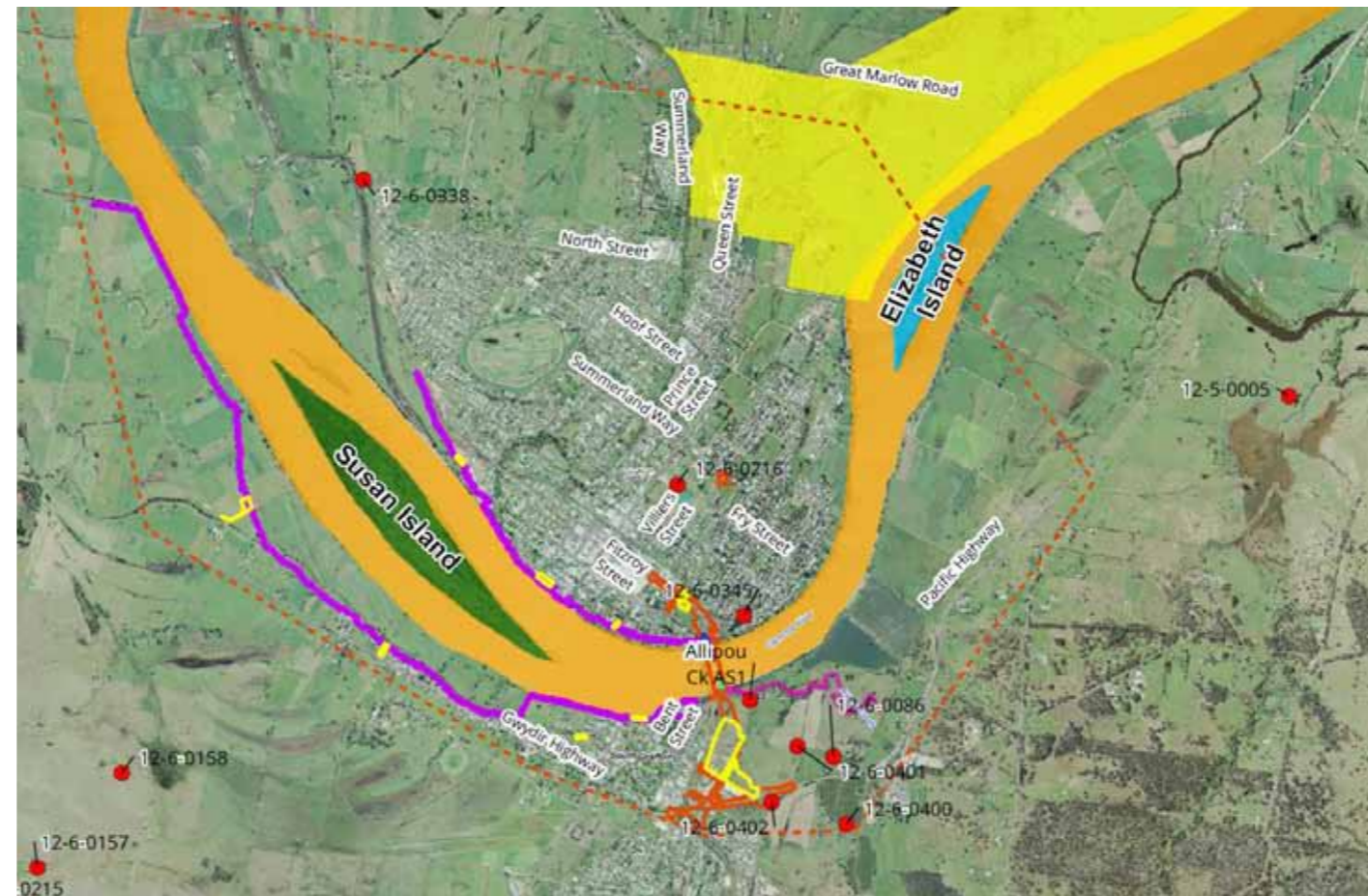


Fig. 8-59: Key Aboriginal Heritage.
 (Source: EIS - Appendix H1, p. 20)



Fig. 8-60: Australian Aborigines spearing (i.e. fishing) in river in Grafton", by George Washington Wilson and Co, taken in 1895 in the Grafton District, NSW

(Source: "Clarence Valley Aboriginal Heritage Study", AMBS, for Clarence Valley Council, 2015, p.15. Pictures Collection, State Library of Victoria. Image a13359, <http://www.slv.vic.gov/pictoria/gid/slv-pic.aab64124>)

It is noted that other aboriginal heritage images, photos and history are also contained in the "Clarence Valley Aboriginal Heritage Study", AMBS, for Clarence Valley Council, 2015.

Other images and stories depicted in the above mentioned report will be considered for inclusion in this heritage interpretation plan strategy, based on further consultation with the Aboriginal community.

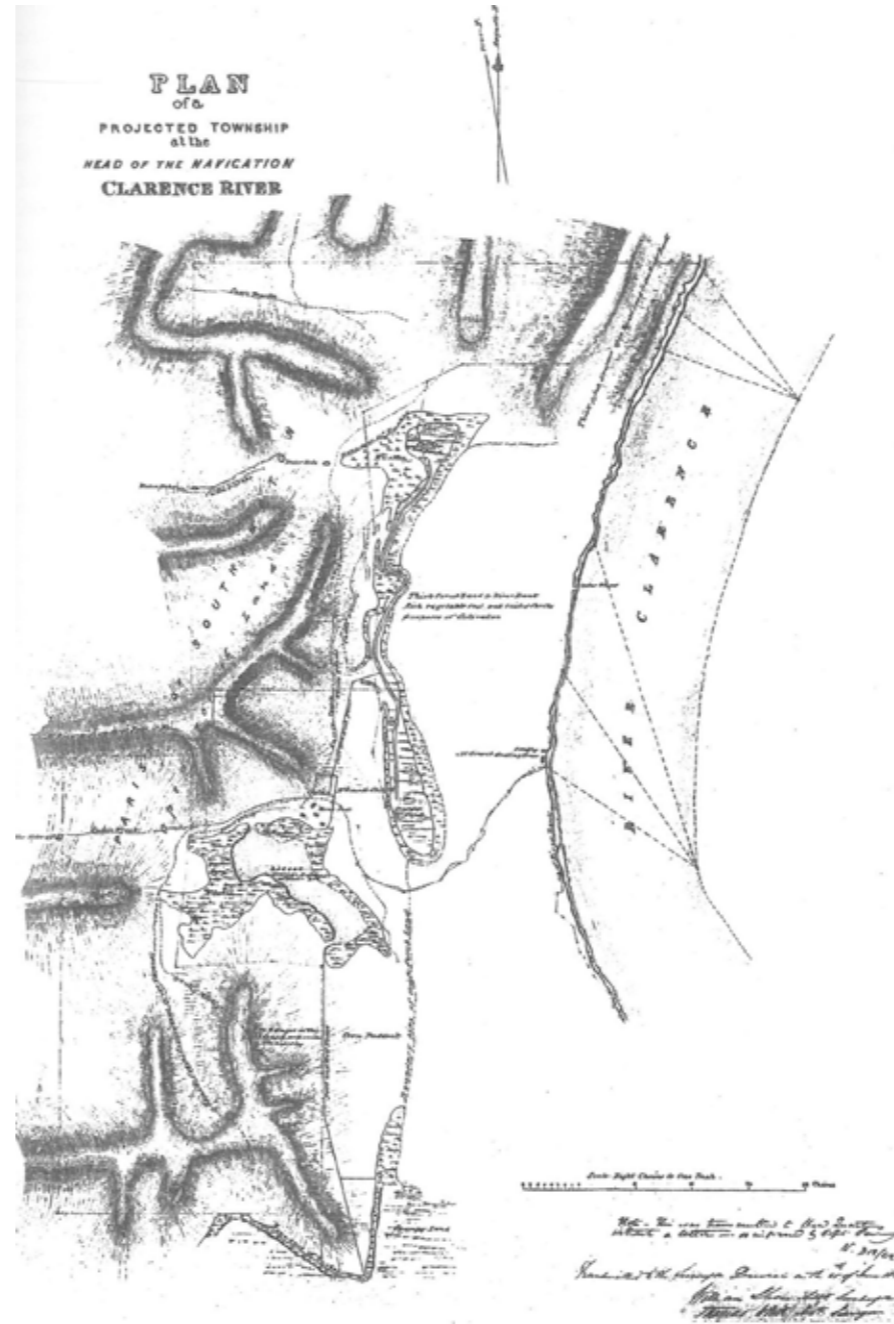


Fig. 8-61: Early Plan of the Projected township for Grafton- note the ridgelines and wetlands in South Grafton- it may be possible for the community to rejuvenate a wetland area.

(Source: Grafton- Jacaranda City on the Clarence- a History, Terry Kass, p 43)



BUSHLAND AT ULSTER LODGE AT THE RIVER BANK (BETWEEN NORTH AND POWELL STREETS)

Fig. 8-62: Original bushland (thick "brush") at the river bank, between North and Powell Streets- inspiration for new river bank plantings.

(Source: Grafton- Jacaranda City on the Clarence- a History, Terry Kass, p 93)

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