LOCAL GOVERNMENT SPECIFIC REQUIREMENTS

INTRODUCTION

This section contains variations and additions to FNQROC Regional Development Manual that apply specifically within the Cairns Regional Council Local Government Area.

CONTENTS

The following sections have varied or additional clauses:

CLAUSE **PAGE**

CONSTRUCTION PROCEDURES

CP1.17 APPLICATION FOR COUNCIL TO COMPLETE PRIVATE WORKS

1. CRC only undertakes private works for water infrastructure. CRC does not undertake any private works for sewerage infrastructure.

APPENDIX P –

4. DRAFTING REQUIREMENTS ("AS CONSTRUCTED")

ADDITIONAL CLAUSE

2. Area Prefix numbers are listed in the Table below: The "Sewer Main Number" and "Manhole Numbers" are to be as designated on the relevant design drawings.

SUBURB NAME	*ALPHA CODE*	*SUBURB NAME*	*ALPHA CODE*
AEROGLEN	AG	HOLLOWAYS BEACH	HB
ALOOMBA	AL	KAMERUNGA	KA
BABINDA	BA	KANIMBLA	KI
BARRON	BN	KEWARRA BEACH	KB
BARRON GORGE	BG	LAMB RANGE	LR
BARTLE FRERE	BF	LITTLE MULGRAVE	LM
BAYVIEW HEIGHTS	BH	MACALISTER RANGE	MC
BELLENDEN KER	BL	MACHANS BEACH	MB
BENTLEY PARK	BP	MANOORA	MR
BRAMSTON BEACH	BB	MANUNDA	MU
BRINSMEAD	BM	MIRRIWINNI	MW
BUNGALOW	BU	MOOROOBOOL	ML
CAIRNS CITY	CC	MOUNT PETER	MP
CAIRNS NORTH	CN	MOUNT SHERIDAN	MS
CARAVONICA	CV	NGATJAN	NN
CLIFTON BEACH	CB	PACKERS CAMP	PA
CORAL SEA	CS	PALM COVE	PC
DEERAL	DE	PARRAMATTA PARK	PP

EARLVILLE	EV	PORTSMITH	PS
EAST RUSSELL	ER	REDLYNCH	RL
EAST TRINITY	ET	SMITHFIELD	SM
EDGE HILL	EH	STRATFORD	ST
EDMONTON	ED	TRINITY BEACH	TB
ELLIS BEACH	EB	TRINITY PARK	TP
EUBENANGEE	EU	WAUGH POCKET	WP
FISHERY FALLS	FF	WESTCOURT	WC
FITZROY ISLAND	FI	WHITE ROCK	WR
FRESHWATER	FW	WHITFIELD	WF
GLEN BOUGHTON	GN	WOOPEN CREEK	WO
GOLDSBOROUGH	GB	WOOROONOORAN	WN
GORDONVALE	GV	WOREE	WE
GREEN HILL	GH	WRIGHTS CREEK	WI
GREEN ISLAND	GI	YORKEYS KNOB	YK

12. WATER RETICULATION

1. 'Linework' table to be replaced with:

Description	Layer	Colour (by layer)	Linetype (by layer)
Water Main > 50 dia	AC_WATER_WM	2 (Yellow)	Continuous Polyline (0.0 wide)
Water Main =< 50 dia	AC_WATER_WM	4 (Cyan)	Continuous Polyline (0.0 wide)
Trunk Main	AC_WATER_WM	2 (Yellow)	Dashed Polyline (0.0 wide)
Private Service	AC_WATER_WM	4 (Cyan)	Continuous Polyline (0.0 wide)
Reclaimed Water Main	AC_WATER_WM	200 (Purple)	Continuous Polyline (0.0 wide)
Service to Park or Landscaping	AC_WATER_WM	7 (White)	Continuous Polyline (0.0 wide)
Pipe Text Leader Line	AC_WATER_PIPELEADER	4 (Cyan)	Continuous Polyline (0.0 wide)
Existing Water Features	AC_WATER_EXIST	8 (Grey)	Dashed (0.0 wide)

7. 'Text' table to be replaced with:

Description	Layer	Colour	Text Style	Text Height
Pipe Size, Material and Notes	AC_WATER_PIPE	4 (Cyan)	RS	2.0
Reservoir Text	AC_WATER_TEXT	4 (Cyan)	RS	2

13. SEWERAGE RETICULATION

1. 'Linework' table to be replaced with:

Description	Layer	Colour (by layer)	Linetype (by layer)
Pressure (Rising) Mains	AC_SEWER_RPIPE	6 (Magenta)	Pmain (assign linetype to object)
Gravity Mains	AC_SEWER_GPIPE	6 (Magenta)	Continuous
Vacuum Mains	AC_SEWER_VPIPE	6 (Magenta)	Vmain (assign linetype to object)
Sewer Main Leader Line	AC_SEWER_PIPELEADER	4 (Cyan)	Continuous
Existing Features	AC_SEWER_EXIST	8	Dashed (0.0 wide)
*PCB's	AC_SEWER_PCB	Red	Continuous

Additional note: Pipe text boxes to be inserted at the centre point of the associated line. Text blocks are dynamic and can be moved after insertion.

15.STORMWATER DRAINAGE SYSTEM

1. 'Linework' table to be replaced with:

Description	Layer	Colour (by layer)	Linetype (by layer)
RC Pipes	AC_DRAINAGE_PIPE	1 (Red)	RCP (Polyline 0.5 wide)
PVC Pipes	AC_DRAINAGE_PIPE	1 (Red)	Continuous (Polyline 0.25 wide)
Box Culverts	AC_DRAINAGE_CULVERT	7 (White)	RCBC (Polyline 0.5 wide)
Catch Drain	AC_DRAINAGE_DRAIN	1 (Red)	CDP (Polyline 0.5 wide)
Drainage Pipe Leader Lines	AC_DRAINAGE_PIPELEADER	4 (Cyan)	Continuous
Drainage Culvert Leader Lines	AC_DRAINAGE_CULVERTLEADER	7 (White)	Continuous
Drainage Channel Leader Lines	AC_DRAINAGE_DRAINLEADER	4 (Cyan)	Continuous
Sub Surface Drains	AC_DRAINAGE_SSURF	3 (Green)	SSD (Polyline 0.0 wide)
Retaining Walls	AC_DRAINAGE_RETWALL	132	Continuous (Polyline 1.0 wide)
Existing Features	AC_DRAINAGE_EXIST	8 (Grey)	Dashed (0.0 wide)

Additional note: Each text box is to be inserted at the centre point of the associated line. Text blocks are dynamic and can be moved after insertion

Item 5 additional note: Each individual culvert is to have an associated Culvert Text box and leader line

DESIGN GUIDELINE – D1 ROAD GEOMETRY

D1.22 SIGNS AND ROAD MARKINGS

SUBSTITUTE CLAUSE

Street signs installed within Cairns Regional Council are to be in accordance with CRC specific standard drawing S1040 – CRC.

DESIGN GUIDELINE – D2 SITE REGRADING

D2.05 CLEARING

ADDITTIONAL CLAUSES

8. Appropriate design includes the involvement of an AQF Level 5 certified Arborist to advise on the Tree Protection Zones and condition of trees which may be selected for possible retention.

9. Where trees are selected for retention, the Surveyor should include the size of the canopy and trunk diameter of the tree on the plan to scale. This will assist the Designer to determine the TPZ and SRZ as per AS4970 to avoid design conflicts with the trees.

10. As part of the clearing process and before any grading or other earthworks take place, Tree Protection Zones as per AS4970 are to be delineated and installed for those tree selected for retention.

DESIGN GUIDELINE - D3 ROAD PAVEMENTS

D3.14 ASPHALTIC CONCRETE

SUBSTITUTE CLAUSE

4. For all asphalt surfacing within Cairns Regional Council Local Authority, up to 30mm thickness, the asphalt grading defined as “CRC 10” shall be used. Refer to Appendix C for details.

DESIGN GUIDELINE – D4 STORMWATER DRAINAGE

D4.05 DESIGN AVERAGE RECURRANCE INTERVAL

ADDITIONAL CLAUSES

3. Due to the nature of the topography within and around Cairns City, varying design criteria have been developed for different areas.

4. Figure D4.01 shows areas of the Cairns City where different design criteria apply. Area B generally relates to the historical developed area between the Whitfield Ranges and the Trinity Inlet where existing drainage systems are constrained by tidal influence. Area B is divided into the High Zone and Low Zone as indicated on Figure D4.02. Design criteria within the Area B (Low Zone) have been established to ensure that primary drainage systems are designed taking into account established tailwater levels as adopted by Cairns Regional

Council. Tailwater levels for design of primary drainage systems within the Area B (Low Zone) area shall be as advised by the Council.

5. The design Annual Recurrence Intervals for all forms of development are as follows (these requirements shall apply in lieu of the requirements specified in Table 7.3.1 of the QUDM):

6. Within all zones, Council will require a minimum of 300mm freeboard for Habitable Floor levels from the Defined Inundation Event as outlined within the Cairns Plan 2016 Flood and inundation hazards overlay code. This level should be confirmed by Council prior to proceeding with any planning work.

AREA A – (Relates to all areas within Cairns Regional Council's area of responsibility not included in Area B – Refer Figure D4.01).

In accordance with Table 7.3.1 of the QUDM

AREA B (High Zone) – Refer Figure D4.02)

Major System Design	–	ARI 100 years. (Downstream emergency relief paths in low zone to be checked).
Minor System Design	–	ARI 5 years (with the exception of "Greenfield Sites", that subject to Council approval may be ARI 2 year).
Cross Drainage	-	ARI 10 years for all roads.

AREA B (Low Zone – Refer Figure D4.02))

Major System Design	-	Surcharge paths for flows greater than ARI 5 years and overland flow paths shall be checked to ensure that flows do not enter private property, or cause local flooding and are conveyed to receiving water without causing damage to private property or municipal works.
Minor System Design	-	ARI 5 years
Cross Drainage	-	ARI 5 years for all roads.


CAIRNS REGIONAL COUNCIL
STORMWATER DRAINAGE
DESIGN CRITERIA AREAS
Legend
AREA A
AREA B
ELLIS BEACH
PALM COVE
CLIFTON BEACH
TRINITY BEACH
YORKEYS KNOB
CAIRNS CITY
EDMONTON
MOUNT PETER
GORDONVALE
ALOOMBA
GOLDSBOROUGH
DEERAL
BABINDA
BRAMSTON BEACH
MIRIWINNI
BARTLE FRERE

FIGURE D4.01


STORMWATER DRAINAGE
AREA B HIGH & LOW ZONES
Barron River
KAMERUNGA ROAD
STRATFORD PDE
CAPTAIN COOK HIGHWAY
AIRPORT AVE
AEROGLEN
STRATFORD
FRESHWATER
HIGH ZONE
RICHARDSON ST
RUSSELL ST
WHITFIELD
EDGE HILL
BRINSMEAD
WESTERN ARTERIAL RD
JENSEN ST
COLLINS AVE
CAIRNS NORTH
GREENSLOPES ST
POLENTZ ST
CALDER ST
Cairns Harbour
MANOORA
RESERVOIR ROAD
ENMORE ST
ANDERSON ST
MANUNDA
CAIRNS CITY
KANIMBLA
MURRAY ST
PEASE ST
LOW ZONE
PARRAMATTA PARK
MOODY ST
LAKE MORRIS RD
WESTCOURT
SWALLOW ST
CALLUM ST
MULGRAVE RD
MOOROOBOOL
BUNGALOW
RAY JONES DRIVE
EARLVILLE
Chinaman Creek
HIGH ZONE
PORTSMITH
TOOGOOD RD
JACKSON DR
BAYVIEW HEIGHTS
WOREE
ANDERSON RD
BRUCE HWY
WHITE ROCK
N
0 0.5 1 2
kilometres
FIGURE D4.02

DESIGN GUIDELINE - D6 WATER RETICULATION

D6.07 DESIGN CRITERIA

ADDITIONAL CLAUSE

D6.16 GENERAL

1. Refer to CRC Design Guideline for Water Pump Stations.

D6.17 PUMP STATIONS

2. Refer to CRC Design Guideline for Water Pump Stations.

D6.18 TELEMETRY

1. Refer to CRC Design Guideline for Switchboards.

DESIGN GUIDELINE – D7 SEWERAGE RETICULATION

D7.17 GENERAL

1. Refer to CRC Design Guideline for Sewerage Pump Stations.

D7.18 PUMP STATIONS

1. Refer to CRC Design Guideline for Sewage Pump Stations

D7.27 TELEMETRY

1. Refer to CRC Design Guideline for Switchboards.

DESIGN GUIDELINE – D9 LANDSCAPING

ON-STREET LANDSCAPING WORKS

D9.04 GENERAL

ADDITIONAL CLAUSES

7. Entry Statements mark and define the entry to a special precinct or residential estate and be must be located entirely within private property and maintained by the property owner.

D9.06 VERGES

AMENDED CLAUSES

5. Aside from grass establishment and tree planting, landscaping of the verge between the property boundary and kerb is not a Council requirement and may only be considered in extreme situations. Any proposed landscaping on the verge, other than street tree planting, must be discussed with Council, prior to the submission of any associated application. Landscape planting within the verge may require supporting irrigation plans designed to Councils Irrigation Standard to be included in the application for assessment.

ADDITIONAL CLAUSES

9. When presented with a tree planting area within the verge less than 1600mm in width such as within older areas of Cairns, Council must be contacted during the concept planning stages to discuss suitable species for street tree planting. Street trees are best suited for verges where there is greater than 1600mm width between infrastructure and the back of kerb. Council may require the installation of street trees within a Tree Island in accordance with the FNQROC Development Manual Standard Drawing S4100, where a verge area is limited or where this treatment for street tree installation is consistent on the street.

10. Where a standard footpath installation restricts verge tree planting, localised deviation of the footpath, either around existing trees or to allocate a suitable area for a verge tree installation shall be incorporated within the design for Councils consideration/assessment.

11. In local streets where there are constraints to tree canopy development such as in areas where overhead power lines or a reduced verge area is present and median planting is not an option, the civil designer shall design the sealed parking areas in way to include street trees within a tree island. Isolated street trees within unsealed shoulders in urban areas such as trees within hard surfacing without a tree island, surrounded by grass and/or crushed stone is not Council's preferred outcome for the road carriageway.

12. In the City Centre Local Plan area Council's preference is for the tree planting within the road carriage way design to incorporate tree root/soil cell systems beneath the hard surface and tree grills surrounding the trunk to optimise long term tree root establishment and protection and provide car parking areas in close vicinity of the tree.

13. Tree islands need to be of an adequate scale, to allow for large shade tree canopy and root development in consideration of the Australian Standard AS 4970 Protection of trees on development sites and allow for the infiltration of water to the root zone. Tree islands shall allow for the necessary storm water flow along the kerb and channel. In older streets of the Local Government Area, tree islands may be able to accommodate two or more trees within a linear tree island on the road carriage way.

14. Refer to the Cairns Regional Councils Tree Species for Public Landscaping (Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees), attached as Appendix D.

15. Where an existing tree is required to be protected with a new tree island, new installations of under planting is not a Council requirement and is subject to Council assessment

D9.07 STREET TREE PLANTING

AMENDED CLAUSE

10. The developer shall notify Council in writing on completion of the approved/endorsed on street landscaping in accordance with their Development Approval or Landscaping Endorsement to arrange for a Practical Landscaping Completion Endorsement/Final Landscaping Inspection. The developer shall maintain the on-street planting or public landscaping for a minimum of 13 weeks following receipt of Council's Landscaping Practical Completion Endorsement and maintain the landscaping until the developments Final Works Acceptance.

    Council at its discretion may accept a contribution at Works Acceptance/Plan Approval stage for the supply and planting of street trees after the completion of houses on the lots. A landscaping plan needs to be provided to prospective purchasers indicating locations for street trees.

11. In high profile areas such as the CBD, main arterial roads or as directed by Council, root directors/water wells are required opposed to root barriers.

ADDITIONAL CLAUSES:

12. Council supports the construction of an attractive streetscape with character and species diversity through the following design characteristics and requirements:

a. Street trees selected are to be as per Cairns Regional Councils approved species and siting list, listed in Appendix A..

b. An individual character may be obtained by using a specific tree species for each street or a specific species for each side of the street, such as a species suitable for planting within the verge, beneath overhead power lines or within a tree island. Refer to Cairns Regional Councils Tree Species for Public Landscaping, attached as Appendix D.

c. Species diversity shall be achieved by a change of species within a cul-de-sac, or at an intersection, or at a regular nominated interval. No more than 20 street trees of the same species can be planted consecutively in an avenue without a species change. Increasing diversity avoids high losses of street trees due to species-specific disease or insect transfer.

13. To ensure consistency in growth rate and form, all trees must be well established in their root and branch formation as per AS 2303 Tree Stock for Landscape Use, presenting a clear trunk and canopy at Councils final acceptance of the landscaping.

14. All plants shall be grown in containers and shall comply with the following minimum size requirements:

    a. Trees - 25 Litre/300mm container for street tree planting, minimum 1.5-2 metres in height;

    b. Trees - 45 Litre/400mm container for medians, tree guards, traffic islands, car park trees and roundabouts, minimum 1.5-2 metres in height;

    c. Single stemmed palms - 45 Litre/400mm container, minimum 1.5-2 metres in height;

    d. Clumping Palms - 45 Litre/400mm container, minimum 1.5-2 metres in height;

    e. Shrubs – 140mm/200mm container (dependant on species) and well formed; and

    f. Groundcovers – 140mm container.

15. Any proposed advanced container sizes greater than the prescribed standard for tree planting, such as 75 Litre or larger and ex-ground plants will require specific specifications for installation and anchoring to be submitted for Council approval.

16. Street trees shall not be supplied container bound, (greater than the plant to pot-ratio, 3:1 as prescribed within AS2303). If an advanced tree is desirable, the container size must be a minimum 45 Litre size to ensure strong, healthy root establishment.

17. A well composted forested and chip mulch, compliant with Australian Standard 4454, shall be installed within tree islands.

PUBLIC OPEN SPACE

D9.09 GENERAL

AMENDED CLAUSE

3. Landscaping plans shall be prepared by a person of professional standing in the field of landscape architecture or landscape design, at a standard acceptable to Council, taking into account the following design elements to achieve council‘s objectives for a public open space:

    a. Inclusion of large canopy shade trees throughout the site, set back from infrastructure, playground structures and neighbouring property boundaries. Setback distances mitigate the potential for impacts such as leaf drop, unwanted shading of neighbouring properties, root damage to private infrastructure whilst providing shade to central public gathering places.

    b. Only small trees shall be positioned adjacent to neighbouring private property boundaries and shall be setback a minimum of four (4) metres to avoid encroachment. Planting of shrubs and groundcovers are not supported adjacent to property boundary fences.

c. A mulched grouped island/corridor planting (trees positioned 1.5-2 metres apart) with a concentration of native tree species shall be located in areas to provide shading, screening and habitat connectivity. The grouped island or corridor planting shall be utilised to reduce unnecessary expansive grassed areas.

d. A tree line planting shall define edges such as informal kick-about areas or public open space boundaries reducing the requirements for bollards or post and rail installation. Where single shade trees are proposed they shall be provided with a mulched surround to 100 mm depth in a minimum 1.2 metre area, thus avoiding damage to trunks by mowers or whipper snippers.

e. Landscaped garden beds with shrubs, groundcovers, grasses and accent plants shall be kept to a minimum and not supported within Local Parks. The installation of landscaped garden beds will require irrigation to be designed and installed in accordance with Councils Irrigation Standard. Refer to the Cairns Regional Councils Tropical Plants for Use Within Irrigated Public Landscaping, attached as Appendix E.

f. Any shrubs, grasses and groundcovers must be located minimum 500mm from the edge of the garden bed.

g. A minimum 75% of the proposed tree planting shall be endemic, and species should be selected on their adaptability to site conditions, and their value to local fauna. Where the proposed park adjoins an area of established native vegetation, an extension of this habitat into the park should be implemented by using compatible species. Refer to the Cairns Regional Councils Tree Species for Public Landscaping (Park/Specimen), attached as Appendix D.

h. Informal native revegetation planting shall be utilised in linear parks, buffers and open space corridors with a focus on providing canopy trees. Landscaped garden beds are not supported in these areas. Refer to the Cairns Regional Councils Tree Species for Public Landscaping (Revegetation), attached as Appendix D.

i. Exotic flowering trees and non-native palms shall be limited and utilised to provide emphasis on a point of interest, such as a specimen tree, an entrance avenue or a grove planting within a park only.

j. All proposed palms must be entirely (trunk and canopy) contained within a mulched garden bed. Solitary palms within grassed areas are not supported.

k. All grassed areas must be covered with topsoil to a depth of not less than 40mm and shall be lightly compacted and grassed, weed free. Grass must be established within the proposed park as quickly as possible in order to avoid erosion and sedimentation to the local waterways, and prevent the establishment of weeds.

D9.16 FURNITURE

ADDITIONAL CLAUSE

5. Refuse bins may be supplied and where approved shall be installed in accordance with Councils Standard for refuse bins. Contact Council to obtain the design and specifications for refuse bins.

D9.17 SIGNAGE AND INTERPRETATION

ADDITIONAL CLAUSE:

3. In instances where the developer would like to name a park, they shall provide an application and written submission to Council in accordance Council's Park Naming Policy.

D9.19 PROVISION OF WATER

ADDITIONAL CLAUSE:

5. All drinking fountains on public land require a dedicated potable water supply that is not cross connected to any other fixtures, including irrigation systems.

D9.20 IRRIGATION

AMENDED CLAUSE:

2. Table 2 and Table 3 below, list the requirements for installation of irrigation in parks and on street landscaping respectively:

Table 2: Hierarchy of irrigation application for parks

Sub Type	**Irrigation Guideline**
Local Recreation Park/Node	Irrigation not required
District Recreation Park/Node	Permanent Irrigation where necessary
Destination Recreation Park/Node	Permanent Irrigation where necessary
District Sport Park	Permanent Irrigation
City Wide/Regional Recreational Park	Permanent Irrigation where necessary
City Wide Sports Park/Precinct	Permanent Irrigation where necessary
Linear Open Space, Buffers and Conservation Areas	Irrigation not required

Table 3: Hierarchy of irrigation application for on-street landscaping

Sub Type	**Irrigation Guideline**
Arterial Roads/ Sub arterial Roads	Minimum requirement: Temp systems for establishment purposes; Long term consideration dependent on scope of application
Major Collector Roads/ Industrial Roads	Irrigation not required; Temp systems for establishment purposes only
Minor Collector Roads/Major Rural Roads	Irrigation not required; Temp systems for establishment purposes only
Access Streets/Access Places	Irrigation not required
Minor Rural Roads	Irrigation not required
Traffic Islands, Medians and Roundabouts	Long term consideration dependent on scope of application; Where shrubs and groundcovers are a requirement, permanent irrigation is a Council requirement for all roundabouts islands and medians.

AMENDED CLAUSE:

3. An irrigation plan and maintenance schedule prepared by an irrigation consultant/designer, shall be submitted to Council for approval together with the landscaping plans in accordance with the requirements set out in Table 1.

Cartographic conventions	Title, date, project, project number, drawing number; scale; north point; legend; details of the author (name, qualifications/experience, contacts).

Contextual information	Easements and other encumbrances; adjoining land uses; Street names.
Extent of Works Electrical	Automated Controller location and type; Decoder or Multicore Cabling Plan; Solenoid valve location, type and size.
Extent of Works Hydraulic	Backflow location, type and size; Mainline location, type and size; Solenoid valve box location; Lateral line location, type and size; Sprinkler head location and type; Nozzle spray type and arc radius; quick coupling valve locations.
Conduit information	Location of all areas where conduit is installed under hard surfaces, i.e. roads, foot paths, etc.
Cross sectional installation information	Mainline trench arrangement; rotor sprinkler; fixed spray sprinkler; quick coupling valve arrangement; Valve, decoder/multicore layout with cabling colour to valve identified; msp layout.
Valve data chart	Valve number; size; flow (l/s); number of sprinklers; sprinkler type; precip. rate (mm/hr)
Shift schedule	Shift number; valve number; flow (l/s); type; peak runtime (hrs/pw)

D9.21 PLAYGROUNDS

ADDITIONAL CLAUSES:

10. Picnic Settings shall have sufficient paved area to facilitate wheel chair access and manoeuvring to at least two parts of a table setting.

11. All-access drinking fountain and tap combination with a dog bowl (where required) shall be supplied and installed in accordance with Council's Standard Drawing. An application for a metered water supply connection is required to be submitted to Council for the drinking fountain water connection.

12. In consultation with council, all abilities compliant footpath connections to playgrounds, seating, picnic areas, shelters, barbeques and drinking fountains are to be constructed where directed. Accessible toilets (if required) shall have paved connections to pathways or footpaths.

NATURAL AREA RESTORATION AND REVEGETATION

NEW CLAUSES:

D9.24 GENERAL

1. A Restoration/Revegetation Plan must be prepared by a suitably experienced person in the field of natural area revegetation and restoration and at a standard acceptable to Council. The designer shall have consulted with Council prior to commencement of project planning to ascertain whether there are any site specific limitations such as easements, special plant species, soil stabilisation, and timing for the

project.

2. The plan must outline all works that are to be carried out at the site such as:
    a. site preparation;
    b. Planting;
    c. temporary irrigation (if required); and
    d. Maintenance frequency and duration.

    Cairns Regional Councils Tree Species for Public Landscaping (Revegetation), attached as Appendix D provides a list of native species that may be suitable for revegetation projects dependant of the Regional Ecosystem vegetation classification and land zone for the site.
3. Restoration specifications must ensure both weed management and maintenance is carried out by the developer to an acceptable standard whist regeneration is establishing.

D9.25 PLANTING

1. All plantings shall be carried out at an appropriate time of year when the likelihood or rainfall is greatest and when the threat to planting success are at a minimum. This will be limiting to plantings outside of season which may leave the site exposed to erosion whilst waiting for in season. Any out of season plantings will need a watering strategy suitable to conditions. Details such as average rainfall and months with the most reliable amount of rainfall shall be identified for each individual site during the project planning.
2. Developers/contractors shall allow sufficient lead-in times when planning projects to ensure that suitable plant stock can be sourced (it generally takes 12-18 months to produce stock from seed given different fruiting periods) for stock integrity.
3. In some instances, natural areas will be capable of naturally regenerating without the requirement for additional planting. In these instances, specifications to ensure the ability for natural succession to occur must be provided with a restoration plan.
4. Grassed interface between natural areas and public open space shall be cut using a side arm slasher and weed regrowth blanket sprayed with a non-residual aquatic friendly specified glyphosate preparation. Such areas shall be subject to three herbicide treatments to limit weed competition post planting. All dead material must remain on site to provide a soil cover.
5. Plants shall be supplied in a minimum forestry tube or similar.
6. Species shall be local to the project area and stock shall be from seed sourced from an appropriate provenance wherever possible.
7. Plants shall be centred at a minimum 1.5 metre spacing’s and or to ensure rapid site capture at the Final Works Acceptance Inspection.
8. Fertiliser shall be incorporated at planting depth (e.g., 1 x agritab).
9. Trees shall be secured by staking as required.
10. Plants must be watered directly after planting prior to the spreading of mulch. A minimum of 10 Litres of water should be given to each tree immediately after planting. If planting coincides with natural rainfall, then the need for ongoing watering is alleviated.

D9.26 MULCHING

1. Mulching helps to reduce the growth of weeds, keeps soil temperatures more constant and helps to retain soil moisture levels. Mulching is beneficial if it covers the entire area rather than a ring around individual trees. Mulch shall be installed to a depth of 100mm and should be left just clear of the plant stem. Mulches are not being suitable for use in areas subject to concentrated water flow unless covered by netting or suitably sized gravel mulch is used.
2. Natural Forest mulch to be used in "natural" planting areas only, such as buffer planting or parkland planting. It should be installed to a minimum 100mm compacted depth, free from rocks, nut grass, and any other invasive weed. Where abundant biomass is present from sprayed grasses and weeds, the

sprayed vegetation may be considered a suitable mulch by Council, without the requirement for additional commercial mulch.

D9.27 MAINTENANCE

1. The contractor shall be responsible for replacing dead trees that are damaged/dead within the establishment period. A specified maintenance period of a minimum 1 year is required for revegetation planting and or until the canopy closes unless an alternative maintenance duration is approved by Council.

D9.28 WEED ERADICATION

1. Restricted weeds shall be adequately managed on site before planting in line with General Biosecurity Obligation. Any pest that would interfere with a planting shall be managed on site before a planting occurs.
2. The Cairns Biosecurity Plan has been developed as a requirement under the *Biosecurity Act 2014.* This plan prioritises actions to address invasive and pest species and identifies the roles and responsibilities of all stakeholders, including Council, state government and landowners. This Plan also sets out guidelines for monitoring and evaluating pest management activities across the region.
3. The Cairns Regional Council Extended Environmental Weed List, attached as Appendix F and included within the Cairns Region Biosecurity Plan specifies species that may not be approved for landscaping installation on Council land.

D9.29 RESTORATION REVEGETATION TYPES

1. Riparian Revegetation
   a. Riparian Revegetation is the restoration of healthy functioning waterways by providing shade to help prevent algal blooms and invasion of exotic species, providing bank stabilisation reducing sedimentation and damage to infrastructure and crops and by providing filtration by the reinstatement of the local riparian forest system.
   b. Suitable local plant species that are specially adapted to cope with flood periods and increased water flow rates shall be used in riparian revegetation plantings. Site preparation and planting of riparian revegetation projects in waterways which flood annually must be timed appropriately. Most on-ground works must be delayed till the likelihood of flood events has passed.

2. Beach Strand Revegetation
   a. Rehabilitation and revegetation of the beach strand area is to reinstate the natural strand vegetation in order to provide a natural buffer that will minimise the natural processes of wind and sand erosion, connect up fragmented remnant areas and prevent the loss of biodiversity.
   b. The beach strand vegetation communities in the wet tropics contain diverse species of flora and fauna many of which are unique to the area. The rehabilitation and revegetation of these communities is essential to prevent the loss of biodiversity.
3. Vegetation Retention Linkages or Buffers in newly enveloped areas
   a. Trees species for vegetation linkages shall be selected according to the local vegetation Regional Ecosystem vegetation communities and the primary target fauna species for which the linkage is provided. Where appropriate vegetation linkages shall connect up existing remnants and/or follow vegetated waterways. Where possible vegetation linkages shall avoid crossing over major roads or other infrastructure barriers such as built up areas.
4. Roadside Revegetation
   a. The ultimate aim of roadside revegetation is to reinstate appropriate native vegetation on roadsides to create linkages following major road works where the remnant vegetation in the immediate vicinity

has been fragmented. Adequate retention and reinstatement of vegetation in roadside areas and waterways adjacent to roads assists with maintaining wildlife corridors, stability of batters, providing vegetation linkages and aids with the protection of remnant vegetation and waterways by filtering roadside pollutant run-off and noise effects.

b. The planting shall be selected so as not to create a safety risk to road users.

5. Wetland Revegetation

a. Fully-functioning restored wetland systems assist with improving water quality reaching the Great Barrier Reef by capturing excess sediment and nutrients. Water quality is also improved by reinstating appropriate aquatic and terrestrial vegetation that assist in sediment filtration and provide a suitable habitat for aquatic and terrestrial fauna.

b. It is important that both the terrestrial and aquatic vegetation components of the wetland community must be thoroughly investigated in the project planning stage to determine the most appropriate species to plant and the most suitable method of plant establishment.

c. Where rehabilitation involves a large amount of weed eradication, determine the source of the weed. seed during project planning stage to ensure project success and supply a long-term management plan to address the weed issue on site.

d. Ensure that aquatic flora is planted in the most appropriate location and in the right depth of water. Emergent plants stabilise wetland banks and help with nutrient and sediment stripping from the water. Submerged plants trap suspended sediment and assist with stripping nutrients from the water. Investigate the wetland hydrology prior to planting to ensure that aquatic flora is planted in the most appropriate place (eg. Floating aquatic plants such as Nymphaea do not grow well in fast flowing water).

6. Rapid Site Capture

a. This type of revegetation project shall only be used on sites where the only objective of the project is to rapidly stabilise or provide cover to a site. A high percentage of pioneer and early successional species are used in these projects in order to obtain the quickest growth rates. Direct seeding is not a viable option in most Wet Tropics sites with high rainfall and fertile soils because of the difficult nature of weed maintenance.

b. Rapid site capture shall provide a quick environmental solution in an area in the shortest possible time with the least amount of input by using quick growing local species. By providing a canopy cover in the shortest possible time period shall reduce the site maintenance input and risk to the environmental values.

SPECIFICATION – S6 – SEWERAGE RETICULATION

S6.03 PIPES GENERAL

13. Alternative pipe material are permitted when registered on the Cairns Regional Councils Approved product list and installed to Manufacturers Requirements and by a suitably qualified installer so as not to compromise product warranty.

S6.21 MANHOLES

14. Precast manholes are not permitted without approval from council.

15. Alternative manhole configurations to Drawing **S3000** are permitted when registered on the Cairns Regional Councils Approved Product list and installed to Manufactures Requirement and by a suitably qualified installer so as not to compromise product warranty.

SPECIFICATION – S8 – LANDSCAPING

MATERIALS

S8.09 IRRIGATION PIPEWORK

REPLACE CLAUSES:

1. Poly Pipe fittings shall be a minimum Class 16, compression / screwed joints.
2. Rubber ring uPVC pipe fittings shall be a minimum Class 12, Tees, 900 bends, 450 Bends shall be cast iron.
3. Tapping Saddles shall be gunmetal or poly, tapping saddle nuts, bolts and washers will be stainless steel.
4. Fittings for screwed isolation valves shall be line sized and installed utilizing appropriate thread seal as recommended by the manufacturer.

IRRIGATION

S8.15 GENERAL

ADDITIONAL CLAUSES:

3. Irrigation controls to be compatible with Councils Rainbird IQ System.
4. Unless approved otherwise, the irrigation system shall be fully automatic and 240/24 VAC in operation
5. Sprinkler heads installed directly adjacent to hard services shall have a minimum clearance of 25mm from the hard surface.

S8.16 EXCAVATION

AMENDED CLAUSE:

3. Trenching is to be in continuous straight lines and uniform grades, with trench bottom level and free of rubbish and sharp projections. The trench width is to have a minimum of 25 (mm?) horizontal clearance around the pipework. Minimum cover over pipe work is to be 450mm and 300mm cover for laterals.

S8.17 LAYING OF PIPES

AMENDED CLAUSE:

1. All pipework to be bedded in clean fill sand with a minimum 50mm under and 100mm above.

ADDITIONAL CLAUSES:

4. Parallel or multiple pipes in a common trench requires a min of 50mm of clean fill sand between the pipes.
5. Threaded fittings to be taped unless otherwise recommended.
6. All solvent weld joints to be undertaken as per the manufacturer's recommendation.

S8.22 SPRINKLER UNITS

ADDITIONAL CLAUSES:

Spray Nozzles

1. All sprinklers shall feature arc and radius adjustment, fixed arcs between 0 and 360 degree operating at 250 kPa (nominally)

Dripline

2. If authorised by council, a Solenoid valve is to be fitted with 20mm 120 mesh Filter Assembly, Air Release Valve and Pressure Regulation Valve.

Rotator Nozzles

3. All sprinklers shall be interchangeable and feature arc and radius adjustment.

Gear Drive Sprinklers

4. All sprinklers shall be interchangeable and feature arc and radius adjustment through the top of the sprinkler

Articulated Risers

5. Pop-Ups are to be installed on a 3 elbow Schedule 80 PVC riser which is a minimum of 250mm long, and of a diameter to match the inlet size of the relevant sprinkler.
6. Shrub-Heads are to be installed on a Schedule 80 PVC riser of a suitable length to ensure clearance of landscape min 250mm long, and of a diameter to match the inlet size of the relevant sprinkler.

Double O-ring Riser

7. Articulated 'O' ring risers are to provide flexible connection between pressurised mainline and outlets.
8. They are to consist of a minimum of a 4 elbow, Schedule 80 PVC riser, and minimum of 250mm long and of a diameter to suit inlet of the designated Valve.
9. Installation is to be to Automatic Valves, Air Valves and Quick Coupling Valves.

S8.24 Valves

ADDITIONAL CLAUSES:

6. Valve box to have geo-fabric wrapping to prevent spoil entry to box. Fill base of valve box with min.50 deep drainage layer of 20 diameter washed river pebbles. All valve boxes shall be installed to comply with the relevant load rating if in an area of vehicular traffic.
7. Identification of the solenoid within the valve box shall be by tag attached to either the solenoid or the lower section of the valve box. Solenoid valve I.D. shall include the following Identification:
    a. Solenoid valve number
    b. Wiring run identification (if multiple runs utilised on project)

c. Controller identification (if multiple controllers utilised on project

S8.25 Backflow Prevention Devices

ADDITIONAL CLAUSE:

2. Council will nominate a Double Check Valve or a Council nominated RPZ to be implemented if there is a high risk of contaminants entering the potable water supply.

CAIRNS REGIONAL COUNCIL STANDARD DRAWINGS

1. The following additional Standard Drawings, shall be deemed to be applicable for those works that shall ultimately become Cairns Regional Council's responsibility for ongoing maintenance:

Roadwork's & Drainage

S1020A-CRC	**Segmental Paving Units**
S1040B-CRC	**Street Signage**
S1035A-CRC	**CBD Pathway Treatment**

Water

S9020A-CRC	**Above Ground Pressire Relief Valve (PRV) 300mm DIA**
S9021A-CRC	**Above Ground Pressire Relief Valve (PRV) 150mm DIA**
S9022A-CRC	**District Meter**
S9025A-CRC	**Scour Valve and Dissipation Manhole**

Sewerage

S3035B CRC	**Pump Station Overflow Pit Chamber and Outlet Details**
S3036B CRC	**Pump Station Overflow Pit Screen and Stopboard Details**
S3037B CRC	**Pump Station Overflow Pit Double Flap Valve**
S3038A CRC	**Pump Station Overflow Outlet Flap Valve**
S3039A CRC	**Pump Station Overflow Outlet Cage**
S9026A-CRC	**Scour Valve Arrangement for Sewerage Applications**

Landscaping

S4010B-CRC	**Typical Planting Plan & Plant Schedule**
S4020B-CRC	**Typical Hard Landscape Plan**
S4110A-CRC	**Landscaping Guidelines - Tree Grate Type 1**
S4120A-CRC	**Landscaping Guidelines - Footpath Planter Type A**
S4130A-CRC	**Landscaping Guidelines - Footpath Planter Type B**
S4140A-CRC	**Landscaping Guidelines - Footpath Planter Type C**
S4150A-CRC	**Landscaping Guidelines - Footpath Planter Type D**
S4160B-CRC	**Landscaping Guidelines - Footpath Planter Type E**

S4170A-CRC	**Treatment to boundaries - Treatment Type A & B**
S4171A-CRC	**Treatment to boundaries – Combination of Treatments**
S4200B-CRC	**Verge Landscaping Guidelines - Tree Planting: Setout**
S4210B-CRC	**Urban Street Tree Planting**
S4220A-CRC	**Car Park Tree Planting**
S4310C-CRC	**Landscaping Guidelines - Timber Bollard**
S4320A-CRC	**Post and Rail**
S9050A-CRC	**PWD Drinking Fountain**
S9060A-CRC	**Dogs Not Permitted in Playground Area Sign**
S9070A-CRC	**Rubbish Bin Enclosure**

APPENDIX A - DELETED

APPENDIX B

FIELD OUTSTATION RTU REQUIREMENTS

Field Outstations

Cairns Water require that all the following characteristics are fully supported in tendered field RTU's.

Time stamping. Time stamped logging of all events both for non-critical events and change of state.

***Background polling*.** Background polling requests data logged in the RTU since the last poll, and updates the HMI historical database. For efficient operation the background polls occur at suitably long intervals, ensuring that a suitable "window" exists for any report-by-exception communications from the field RTU to occur. This ensures that the site is still communicating and that any important trends are accumulated by the Supervisory system and are available for viewing on the SCADA system.

Report by exception. In the event of an alarm or other abnormal condition, the RTU is able to notify the SCADA system of the condition, and the Supervisory system is able to immediately request all logged data since the last poll. This allows any trend leading up to the alarm or abnormal condition to be analyzed by the system or operators.

Intelligent device. The RTU must be able to support both internal data logging and complex mathematical and control functionality. This ability allows raw data to be processed in the field. With considered implementation the data retrieval can be maximized while minimizing the use of the communications bandwidth.

Open Standards protocol. Support of Open Standards for both communications protocol and the RTU programming language. The RTU must be able to communicate with the SCADA using the DNP 3 protocol.

Remote programming. The RTU must be able to be configured, programmed and reset remotely via the telemetry radio network.

Field Outstation Inputs & Outputs

Analogue Inputs
All analogue inputs must be calibrated to provide loop fail detection. They are to be 4 to 20mA signals and must be calibrated from 3.5mA to 20.5mA for loop or device failure detection.

Analogue Outputs
All analogue outputs must be able to provide 4 to 20mA signals into an 850 ohm load and must be calibrated from 3.5mA to 20.5mA for loop or device failure detection.

DC power supply
A 24VDC supply must be included in the RTU for use with the inputs and outputs so that any devices providing / receiving the 4 to 20mA signals can be powered from the DC supply via these signals.

Digital Inputs
Input signals must be from voltage-free contacts. The RTU is to supply the switching voltage. The state (on/off) of each input must be displayed on a light emitting diode to allow for on site interrogation without the need for panel lights.

Digital Outputs
Outputs are to be voltage-free contacts rated at 0.5A at 24VDC or 32VAC. The state (on/off) of each outputmust be displayed on a light emitting diode to allow for on site interrogation without the need for panel lights.

Field Outstation Data
The Field Outstation equipment must be able to provide any combination of water and wastewater control functions and monitoring. The speed with which a new sewerage or water station can be added to the system by an end user will be important selection criteria. RTU's, that require specialized integration, will not be considered. In order to evaluate the likely time required for configuration of a new water or wastewater pumping station into the "SCADA System", details are given below of the minimum Station I/O, Derived Data, Control Function and Statistical Functions.

Wastewater Pump station RTU I/O Requirements

The following station I/O is required where the RTU will perform individual pump control based on well level (all inputs and outputs are active high unless specified otherwise):

Standard Inputs and Outputs for 2 pump Sewage Pumping Station Table 1

Standard Inputs and Outputs for 2 pump Sewage Pumping Station					
I/O	No	Kingfisher Slot/Card/Pin No	Description	System	Input Mechanism
Digital Input	1	15/IO3/T10	Pump 1 is Running	Pump 1	Run Relay
	2	15/IO3/T11	Pump 1 has a Fault	Pump 1	Fault Relay
	3	15/IO3/T12	Pump 1 is in Auto Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Auto position
	4	15/IO3/T13	Pump 1 is in Local Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Local position
	5	16/IO3/T10	Pump 2 is Running	Pump 2	Run Relay
	6	16/IO3/T11	Pump 2 has a Fault	Pump 2	Fault Relay
	7	16/IO3/T12	Pump 2 is in Auto Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Auto position
	8	16/IO3/T13	Pump 2 is in Local Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Local position
	9	14/DI5/T4	Wet Well level is Very High	Common	Float Switch (for alarm redundancy & control redundancy)
	10	14/DI5/T5	Wet well is Overflowing	Common	Float Switch (for EPA requirements)
	11	14/DI5/T2	Flow Pulse	Common	Flow Pulse Relay
	12	14/DI5/T3	Station has Phase Failure	Common	Phase Failure Relay
	13	14/DI5/T1	Rain Gauge	Ancillary	Tipper bucket , 0.2mm tip
	14	14/DI5/T6	Wet well exhaust fan is running	Common	Current Sensing Relay
	15	14/DI5/T14	"Generator Set is in Auto Mode"	Generator Set	Contacts in Gen Set cabinet
	16	14/DI5/T13	Generator Set has Fault	Generator Set	Contacts in Gen Set cabinet
	17	14/DI5/T12	Generator Set is "On Line"	Generator Set	Contacts in Gen Set cabinet
	18	14/DI5/T7	Sump Pump is Running	Dry Well Sump	Run Relay
	19	14/DI5/T8	Sump Pump has a Fault	Dry Well Sump	Fault Relay
	20	14/DI5/T11	Sump Liquid Level is High	Dry Well Sump	Float Switch
	21	14/DI5/T17	Spare		
	22	14/DI5/T18	Station is being Accessed	Common	Door switches
	23	14/DI5/T15	Spare		
	24	14/DI5/T16	Spare		
Digital Output	1	15/IO3/T15	Run Pump 1	Pump 1	Contacts to control relay
	2	15/IO3/T16	Reset Pump 1	Pump 1	Contacts to control relay
	3	16/IO3/T15	Run Pump 2	Pump 2	Contacts to control relay
	4	16/IO3/T16	Reset Pump 2	Pump 2	Contacts to control relay
	5	16/IO3/T17	Well Wash Spray	Wet Well	Contacts to control relay
Analogue Input	1	15/IO3/T1	Pump 1 Motor Current	Pump 1	AC currnet transducer
	2	16/IO3/T1	Pump 2 Motor Current	Pump 2	AC currnet transducer
	3	15/IO3/T2	Wet Well Level	Common	Pressure transducer
	4	15/IO3/T3	Sewage Flow Rate	Common	Flow Meter (if available)
	5	15/IO3/T4	Ground Water Level	Ancillary	Water Level transducer (if available)
	6	16/IO3/T2	Discharge/Mains Water Pressure	Ancillary	Water Pressure transducer (if available)
Analogue Output	1	15/IO3/T7	Pump 1 VSD Speed	Pump 1	4-20mA or 0-10 V (if present)
	2	16/IO3/T7	Pump 2 VSD Speed	Pump 2	4-20mA or 0-10 V (if present)

Note: All inputs are active high

.
A Diesel Pump shall be configured as a generator set, except that it shall run in case of both standard pumps being unavailable or in fault, and reservoir filling is required.

Note: All digital inputs and outputs are active high.
The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customised in standard configurations to suit individual station requirements.

Waste water pump station control is generally to be driven using a pressure transducer level signal from the station wetwell. The Generator Fault Input is a combination of Low Battery Voltage, Low Fuel Level, and critical Generator Faults (Low oil pressure, water temperature, no fuel etc)

The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customized in standard configurations to suit individual station requirements. The RTU should include some additional I/O and/or allow additional I/O cards to be added. The RTU at every pumping station must calculate an estimate of flow from pump operations, given the well parameters. The current transmitters are used for determining possible pump choke or ragging. If the station current usage is outside a pre-determined band for “XX” seconds then this may indicate a pump ragging. Excessive current may mean a faulty bearing or similar, while a decrease in current may mean impeller damage or ragging

of the impeller. Maximum & minimum allowed current set points are to be retained in the RTU for comparison and alarming. The value must be adjustable via the SCADA.

Wastewater Pump Station I/O between RTU and SCADA

The RTU is to perform calculations and station monitoring, based on set points and parameters adjustable via the SCADA. This allows standardization of the RTU programs, it allows flexibility of calculations, flexibility of alarming and of pump control duty and other functions. The modules within the RTU code for monitoring and calculating information based on optional devices such as a rain gauge and flow meter are to be enabled and disabled via the SCADA without the need to reprogram the RTU. Because the calculations are done in the RTU, accurate time stamped events are possible. All RTU data provided to the SCADA is to be time stamped in the RTU. Should the RTU lose connection with the SCADA, the RTU must store the events until they are later transferred to the SCADA database.

NOTES:
All daily totalisation uses a rollover time of Midnight.

A pump becomes unavailable when any of the following occur:

1. There is a AC phase failure
2. The station is inhibited (by SCADA)
3. The pump has a fault
4. The pump has failed to start, and this condition has not been reset by the SCADA
5. The RTU input pump auto is false

When a pump becomes unavailable, the other available pump(s) must take over the pumping duty automatically. The SCADA operator will use the Control points to override normal automatic operation of the station and individual pumps. The Analogue Set points are used to set station operating and alarm parameters. The RTU control program must be capable of the control functions and calculations indicated by the RTU I/O and RTU/SCADA I/O listed above. The adjustment of the setpoints is to be via SCADA. The adjustments must not require modification of the RTU's control program.

Water Supply Pump station I/O Requirements
The following station I/O is required for sites where the RTU will perform individual pump control based on a controlled reservoir level:

Standard Inputs and Outputs for 2 pump Water Pumping Station Table 2

Standard Inputs and Outputs for 2 pump Water Pumping Station					
I/O	No	Kingfisher Slot/Card/Pin No	Description	System	Input Mechanism
Digital Input	1	15/IO3/T10	Pump 1 is Running	Pump 1	Run Relay
	2	15/IO3/T11	Pump 1 has a Fault	Pump 1	Fault Relay
	3	15/IO3/T12	Pump 1 is in Auto Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Auto position
	4	15/IO3/T13	Pump 1 is in Local Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Local position
	5	16/IO3/T10	Pump 2 is Running	Pump 2	Run Relay
	6	16/IO3/T11	Pump 2 has a Fault	Pump 2	Fault Relay
	7	16/IO3/T12	Pump 2 is in Auto Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Auto position
	8	16/IO3/T13	Pump 2 is in Local Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Local position
	9	14/DI5/T18	Station is being Accessed	Common	Door switches
	10	14/DI5/T3	Station has Phase Failure	Common	Phase Failure Relay
	11	14/DI5/T1	Rain Gauge	Ancillary	Tipper bucket , 0.2mm tip
	12	14/DI5/T2	Flowmeter Pulse	Ancillary	Pulse per kilolitre
	13	14/DI5/T7	"Generator Set is in Auto Mode"	Generator Set	Contacts in Gen Set cabinet
	14	14/DI5/T6	Generator Set has Fault	Generator Set	Contacts in Gen Set cabinet
	15	14/DI5/T5	Generator Set is "On Line"	Generator Set	Contacts in Gen Set cabinet
	16	14/DI5/T8	Generator Set Low Fuel Level	Generator Set	Float Switch
	17	14/DI5/T9	Plant Fault	Ancillary	Fault Relay
Digital Output	1	15/IO3/T15	Run Pump 1	Pump 1	Contacts to control relay
	2	15/IO3/T16	Reset Pump 1	Pump 1	Contacts to control relay
	3	16/IO3/T15	Run Pump 2	Pump 2	Contacts to control relay
	4	16/IO3/T16	Reset Pump 2	Pump 2	Contacts to control relay
Analogue Input	1		Spare		
	2		Spare		
	3		Spare		
	4	16/IO3/T4	Flow Rate	Common	Flow Meter (if available)
	5		Spare		
	6		Spare		
	7		Spare		
	8		Spare		
Analogue Output	1				4-20mA or 0-10 V (if present)
	2				4-20mA or 0-10 V (if present)

A Diesel Pump shall be configured as a generator set, except that it shall run in case of both standard pumps being unavailable or in fault, and reservoir filling is required.

Note: All digital inputs and outputs are active high.
The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customised in standard configurations to suit individual station requirements.

The Pump Control is generally to be driven using a DNP3 level signal from a remote reservoir. The Generator Set Fault Input is a combination of Generator Low Battery Voltage, Generator Low Fuel Level, and critical Generator Faults (Low oil pressure, water temperature, no fuel etc)

Water Supply Pump Station I/O between RTU and SCADA

The RTU is to perform calculations and station monitoring, based on setpoints and parameters adjustable via the SCADA. This allows standardisation of the RTU programs, it allows flexibility of calculations, flexibility of alarming and of pump control duty and other functions. The modules within the RTU code for monitoring and calculating information based on optional devices such as a rain gauge and flow meter are to be enabled and disabled via the SCADA without the need to reprogram the RTU. Because the calculations are done in the RTU, accurate time stamped events are possible. All RTU data provided to the SCADA is to be time stamped in the RTU. Should the RTU lose connection with the SCADA, the RTU must store the events until they are later transferred to the SCADA database.

NOTES:
All daily totalisation uses a rollover time of midnight.

A pump becomes unavailable when any of the following occur:

- There is a AC phase failure
- The station is inhibited by SCADA
- The pump has a fault
- The pump has failed to start, and this condition has not been reset by the SCADA
- The RTU input pump auto is false

When a pump becomes unavailable, the other available pump(s) must take over the pumping duty automatically. The SCADA operator will use the control points to override normal automatic operation of the station and individual pumps. The analogue Set points are used to set station operating and alarm parameters. The RTU control program must be capable of the control functions and calculations indicated by the RTU I/O and RTU/SCADA I/O listed above. The adjustment of the set points is to be via SCADA. The adjustments must not require modification of the RTU's control program.

Standard RTU control functions for Wastewater and Water Supply pumping stations.

Well Level Control / Reservoir Level Control using SCADA adjustable set points for Duty Pump Start, Standby Pump Start & Pump Stop, and using the input from an analogue level transmitter or a reservoir level from a remote peer RTU at a reservoir. The RTU will activate a Pump Run Output when the well/reservoir level reaches the Duty Pump Start set point and deactivate the output when the level reaches the Pump Stop setpoint. The pump to be started will be determined by the duty control option selected. See below.

Pump Duty Control with user selectable options for:

CYCLE: where pump duty is swapped at the end of each pump cycle to ensure even run times of both pumps.

DUTY 1-2: where Pump 1 is the duty pump & Pump 2 is standby.

DUTY 2-1: where Pump 1 is the duty pump & Pump 2 is standby.

Duty Level Override must be provided for testing purposes to allow the operator to start the station if it is between normal Start & Stop Levels. The station would start and run until the Stop level is reached and then return to normal operation.

Maximum Permitted Pumps must be provided to allow the operator to specify how many pumps can run at one time. The Hydraulic Design of the station or the capacity of the electricity supply to the station will determine this. If the maximum permitted number of pumps is 1, it is assumed that one pump can cover all pumping requirements. If the duty pump is running and the well/reservoir level reaches the Standby Pump Start level, the Duty pump should stop and the Standby pump will start in its place as it is assumed that there may be a problem with the first pump. If the maximum permitted number of pumps is 2, it is assumed that in times of high flow that two (2) pumps will be required to run. The Standby Duty pump will start if the Standby Pump Start level is reached and both pumps will cut-out when the Pump Stop Level is reached.

Station & Pump Inhibit - this option must be provided to allow the operator to inhibit a pump from running or the entire station for maintenance purposes. This command will generate some form of feedback to notify the operator that the station is inhibited.

Setpoint checks must be performed by the RTU program to confirm the validity of setpoints entered. This is to ensure that there is no logic error in the values entered. Default setpoints must also be provided within the RTU program to ensure that the program will operate when loaded for the first time without the need to enter setpoints.

Pump Current Monitoring (SEWER SITES ONLY) must be implemented utilising a current transducers monitoring current of each pump. The program should compare the pump current against the *Normal Pump Current* setpoint and see whether it is above or below a tolerance setpoint. This must flag an alarm if the pump is running out of its rated range. It may also be an option to take some action within the program such as change pump duty.

Optional Control Functions

Reservoir Fill Control – reservoir should periodically send a refresh command to the pump station while it requests water, the pump station receiving the refresh command must start a watchdog timer that is reset by each refresh. If a refresh is not received within the watchdog period, the pump station RTU will stop pumping.

STANDARD STATISTICAL FUNCTIONS

All statistical functions are to work based on day running from midnight to midnight the next morning. This enables the various personnel to have the latest information available at the commencement of their work each day.

Pump Starts Totalisation must count the *Starts in the last hour* as this relates to the capacity of the motor starter, which generally has a starts/hour rating. This *Starts in the last hour* figure should be compared with a *Normal Starts* setpoint and flag an alarm if exceeded. Values for Pump Starts Today & Yesterday must also be calculated. The value for yesterday will be uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures.

Pump Hours Run Totalisation must count the hours run since the pump has started. This *Hours Run Since Start* figure should be compared with a *Normal Hours* setpoint and flag an alarm if exceeded. This would come into play if there was a problem with the pump impeller or a faulty level transmitter where the well level failed to reach the Pump Stop setpoint. Values for Pump Hours Run Today & Yesterday must also be calculated. The value for yesterday can uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures.

OPTIONAL STATISTICAL FUNCTIONS

Station Flow Totalisation should totalise the station inflow signal to provide total flow figures for Today &Yesterday. The value for yesterday can uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures. It is preferred that the RTU totalise the raw count and apply a scaling factor at the SCADA. This is done to keep program generic and suitable for any flow meter scaling.

Water Supply Reservoir I/O Requirements

The reservoir I/O required for sites will depend upon proposal, contact Cairns Regional Council, Water & Waste SCADA Co-ordinator for requirements.

Water Supply Multiple Booster Pressure Pump Station I/O Requirements

The Booster Pressure Pump Station I/O required for sites will depend upon proposal, contact Cairns Regional Council, Water & Waste SCADA Co-ordinator for requirements.

APPENDIX C

ASPHALT SPECIFICATION "CRC 10"

CAIRNS REGIONAL COUNCIL ASPHALT SPECIFICATION " CRC 10"

MODIFIED GRADING LIMITS
FOR COMBINED AGGREGATE/FILLER IN 10mm STANDARD ASPHALT

A.S. Sieve Size (mm)	Percent Passing By Mass (%)
13.20	100
9.50	95 - 100
4.75	66 - 80
2.36	38 - 52
0.600	23 - 29
0.300	16 - 22
0.150	7 - 13
0.075	3 - 7
Binder Content	**5.40 – 6.00 %**

APPENDIX D

TREE SPECIES FOR PUBLIC LANDSCAPING

Tree Species for Public Landscaping							
***Exotic Species**							
Botanical Name	**Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees**	**Verge**	**Under Powerlines**	**Park**	**Specimen**	**Buffer Mound**	**Revegetation**
Acacia celsa							**x**
Acacia crassicarpa							**x**
Acacia flavescens							**x**
Acacia mangium							**x**
Acacia oraria							**x**
Acacia polystachya							**x**
Acacia simsii							**x**
Acronychia acidula							**x**
Acronychia imperforata 'Vista'		**x**	**x**				
Agathis robusta					**x**		
Aglaia sapindina							**x**
Albizia procera				**x**	**x**		**x**
Aleurites rockinghamensis						**x**	**x**
Allocasuarina torulosa					**x**		**x**
Alstonia scholaris					**x**		**x**
Antidesma bunius				**x**		**x**	**x**
Araucaria cunninghamii					**x**		
Archidendron grandiflorum	**x**			**x**		**x**	**x**
Archontophoenix alexandrae	**x limited**						**x**
Argyrodendron polyandrum				**x**			**x**
Aryrodendron lucyi	**x**			**x**		**x**	**x**
Arytera divaricata	**x**	**x**		**x**		**x**	**x**
Atractocarpus fitzalanii			**x**			**x**	**x**
Atractocarpus sessillis			**x**			**x**	**x**
Backhousia anisata	**x**			**x**			

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Backhousia bancroftii	x			x		x	x
Backhousia citriodora	x						
Barringtonia acutangula	x	x	x	x		x	x
Barringtonia asiatica				x	x		
Barringtonia calyptrata					x		x
*Bauhinia x blakeana**	x				x		
Beilschmiedia bancroftii				x		x	x
Beilschmiedia obtusifolia							x
Beilschmiedia recurva							x
*Bolusanthus speciosa**					x		
Bombax ceiba					x		x
Brachychiton acerifolia	x				x		
Buchanania arborescens	x	x		x		x	x
Buckinghamia celsissima	x	x				x	
*Caeselpinia ferrea**	x				x		
Callitris intertropica					x		x
Calophyllum inophyllum	x			x	x		
Calophyllum sil	x	x		x	x		
Cananga odorata							x
Canarium australianum						x	x
Canarium muelleri						x	x
Carallia brachiata							x
Cardwellia sublimis				x	x		x
*Cassia bakeriana**	x				x		
*Cassia brewsterii**	x				x	x	
*Cassia fistula**	x				x		

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
*Cassia grandis**	x				x		
*Cassia javanica**	x				x		
*Cassia nodosa**	x				x		
Cassia 'Paluma Range'	x			x		x	
Cassia 'Queenslandica'	x			x		x	
Cassia 'Rainbow Shower'*	x				x		
*Cassia spectablis**					x		
Castanospermum australe				x	x	x	x
Castanospora aphlandii						x	x
Casuarina cunninghamiana					x		x
Casuarina equisetifolia					x		x
Cerbera floribunda							x
Cerbera manghas							x
Chionanthus ramiflora						x	x
Chisocheton longistipitatus							x
Cleistanthus apodus						x	x
Cleistanthus hylandii						x	x
Cochlospermum gillivraei							x
*Cocoloba uvifera**	x				x		
*Colvillea racemosa**	x				x		
Cordia dichotoma	x						x
Cordia sebsebania	x	x	x				x
Corymbia intermedia					x		x
Corymbia ptychocarpa					x		x
Corymbia tessellaris					x		x
Cryptocarya hypospodia						x	x
Cryptocarya mackinnoniana							x

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Cryptocarya triplinervis				x	x	x	x
Cupaniopsis anacardiodies	x	x				x	x
Cupaniopsis flagelliformis						x	x
Cynometra iripa	x			x	x	x	x
Darlingia darlingiana							x
Davidsonia pruiens				x			x
*Delonix regia**	x				x		
Deplanchea tetraphylla	x			x	x	x	x
Dillenia alata	x			x		x	x
Diploglottis cunninghamii				x	x		x
Diploglottis smithii							x
Dissiliaria surculosa			x			x	x
Dysoxylum alliaceum				x	x		x
Dysoxylum mollissimum				x	x		x
Dysoxylum oppositifolium				x	x		x
Elaeocarpus bancroftii				x		x	x
Elaeocarpus eumundi	x	x				x	
Elaeocarpus grandis				x	x		x
Elaeocarpus obovatus				x	x	x	x
Endiandra hypotephra							x
Endiandra sankeyana				x	x		x
Erythrina vespertilio	x				x		
Eucalyptus abergiana					x		x
Eucalyptus crebra					x		x
Eucalyptus grandis					x		x
Eucalyptus pellita					x		x

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Eucalyptus phoenicea					x		x
Eucalyptus platyphylla					x		x
Eucalyptus tereticornis subsp. Tereticornis					x		x
Ficus benjamina					x		
Ficus congesta							x
Ficus drupacea					x		x
Ficus microcarpa Hillii					x		x
Ficus pleurocarpa					x		x
Ficus racemosa							x
Ficus virens					x		x
Ficus virgata				x	x		
*Flacourtia s*p. Cape Plum			x			x	
Flindersia australis	x				x		
Flindersia bourjotiana	x	x		x	x	x	x
Flindersia brayleyana	x	x		x	x	x	x
Flindersia ifflaiana	x	x		x	x	x	x
Ganophyllum falcatum		x				x	x
Glochidion harveyanum						x	x
Gmelina dalrympleana	x			x		x	x
Grevillea baileyana	x	x		x		x	x
Guioa acutifolia						x	x
Guioa semiglauca	x	x		x		x	x
Gymnostoma australianum					x		
Harpullia arborea		x				x	x
Harpullia pendula						x	x
Harpullia ramiflora	x	x		x			x
Hernandia nymphaeifolia	x			x	x	x	x

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Hibiscus tiliaceus						x	x
Homolanthus novo-guineensis						x	x
Hydriastele wendlandiana							x
Intsia bijuga	x			x	x	x	x
*Jacaranda mimosifolia**					x		
Kailarsenia ochreata		x	x				x
Largerstroemia archeriana	x			x	x	x	x
*Largerstroemia floribunda**	x				x		
*Largerstroemia indica flos regine**	x				x		
*Largerstroemia speciosa**	x				x		
Leea indica						x	x
Leptospermum flavescens 'Cardwell'						x	x
Leptospermum madidum	x	x	x		x		
Leptospermum petersonii						x	
Litsea leefeana							x
*Lophanthera lactescens**	x				x		
Lophostemon confertus	x			x	x	x	x
Lophostemon suaveolens	x			x	x	x	x
Macaranga involucrata							x
Macaranga tanarius							x
Mallotus philippensis						x	x
Maniltoa lenticellata	x	x		x	x	x	x
Melaleuca bracteata 'Revolution Gold'			x			x	

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Melaleuca leucadendra				x	x	x	x
Melaleuca linariifolia	x		x	x		x	x
Melaleuca quinquinerva				x		x	x
Melaleuca 'Snow Storm'	x		x	x			
Melaleuca viminalis (formerly Callistemon)			x	x		x	x
Melaleuca viridiflora							x
Melia azedarach						x	x
Melicope ellerayana				x		x	x
Melicope rubra						x	x
*Meusa Ferrea**					x		
Micromelum minutum							x
Milletta Pinnata	x			x	x	x	x
Mimusops elengi	x	x		x		x	x
Morinda citrifolia							x
Myristica insipida							x
Nauclea orientalis				x	x		x
Neolitsea dealbata							x
Palaquium galactoxylum					x		x
Pandanus monticola							x
Pandanus solmslaubachii							x
Paraserianthes toona				x	x		x
Phaleria clerodendron						x	x
Phyllanthus cuscutiflorus			x			x	x
Pittosporum ferrugineum						x	x
Planchonia careya	x			x			x
Pleiogynium timorense				x	x		x

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Plumeria 'Bali Whirl'*			x		x		
*Plumeria obtusa**			x		x		
*Plumeria rubra**			x		x		
Podocarpus elatus	x				x		
Podocarpus grayae	x				x		x
Polyalthia longifolia 'Pendula'*	x						
Polyscias elegans							x
Premna serratifolia						x	x
*Pterocarpus indicus**					x		
Ptychosperma elegans							x
Rhus taitensis						x	x
*Saraca indica**	x				x		
*Saraca thaipingensis**	x				x		
Scaevola taccada							x
*Schotia brachypetala**			x				
Scolopia braunii	x			x	x	x	x
Sophora tomentosa							x
Stenocarpus sinuatus	x	x		x		x	x
Sterculia quadrifida	x					x	x
Sterculia shillinglawii	x	x		x	x	x	x
Storckiella australiensis	x						x
Syncarpia glomulifera				x	x	x	
Synima cordierorum							x
Syzygium 'Captian Cook'			x				
Syzygium alliligneum	x			x	x	x	x
Syzygium angophoroides	x	x		x	x	x	x
Syzygium 'Aussie Gem'			x				
Syzygium 'Aussie Southern'			x				

Botanical Name	Median, Tree Islands, Roundabouts, Shoulders, Car Park Trees	Verge	Under Powerlines	Park	Specimen	Buffer Mound	Revegetation
Syzygium australe		x	x			x	x
Syzygium bamagense	x			x	x	x	x
Syzygium 'Big Red'			x				
Syzygium branderhorstii	x			x		x	x
Syzygium claviflorum	x			x		x	x
Syzygium cormiflorum	x			x	x	x	x
Syzygium 'Elegance'			x				
Syzygium 'Elite'			x				
Syzygium fibrosum	x	x		x	x	x	x
Syzygium forte ssp. *Forte*	x			x	x	x	x
Syzygium forte ssp. *potamophilom*	x			x	x	x	x
Syzygium francisii	x			x	x	x	
Syzygium graveolens	x			x		x	x
Syzygium hemilampra	x	x		x		x	x
Syzygium 'Hinterland Gold'			x				
Syzygium luehmannii	x	x		x	x	x	x
*Syzygium mallacense**	x			x	x		
*Syzygium megacarpa**					x		
Syzygium oleosum	x	x		x		x	x
Syzygium papyraceum	x			x		x	x
Syzygium pseudofastigiatum	x			x		x	x
Syzygium 'Reslience'			x				
Syzygium tierneyanum				x	x	x	x
Syzygium unipunctata	x						
Syzygium wilsonii							x

*Tabebuia argentea**	x				x		
*Tabebuia chrysantha**	x				x		
*Tabebuia palmerii**	x				x		
Tabernaemontana orientalis							x
*Tamarindus indica**					x		
*Tectona grandis**					x		
Terminalia arenicola				x		x	x
Terminalia catappa				x	x		x
Terminalia muelleri	x	x		x		x	x
Terminalia sericocarpa				x	x		x
Thespesia populnea						x	x
Tibouchina 'Kathleen'*	x				x		
Toechima daemelianum				x		x	x
Toechima erythocarpum	x	x		x		x	x
Toechima pterocarpum	x	x		x		x	x
Toona ciliata				x	x		x
Tristaniopsis exiliflora							x
Waterhousia hedraiophyllum				x			
Xanthostemon chrysanthus	x	x		x		x	x
Xanthostemon 'Trail Balzer'			x		x		

APPENDIX E

TROPICAL PLANTS FOR USE WITHIN IRRIGATED PUBLIC LANDSCAPING

List of Suitable and Locally Available Tropical Plants for use within Irrigated Public Landscaping		
***Exotic Species**		
Botanical Name	**Park**	**Screening**
Alamanda cathartica 'Sunee'*	x	
*Baeckea s*p. Mount Tozer	x	
Brunsfelsia americana 'Lady of the Night'*	x	x
Brunsfelsia americana 'Sweet Temptation'*	x	x
*Brunsfelsia latifolia**	x	x
*Carphalea Kirondron**	x	x
Cordyline cannifolia	x	
Cordyline in Variety*	x	
Cordyline manners-suttonia	x	
Crinum pendunculatum	x	
Croton *Codiaeum in Variety**	x	x
*Dieties bicolor**	x	
*Dieties grandiflora**	x	
*Dillenia philippinensis**	x	x
Euphorbia hortensis	x	x
*Euphorbia '*Snowflake'	x	
*Excoecaria bicolor**	x	
*Ficus deltoidies 'Green Island'**	x	
Gardenia psidioides 'Glennie River'	x	
*Gardenia radicans**	x	
Gardenia scabrella	x	x
*Gardenia Sol' dor**	x	x
*Gardenia taitensis**	x	
Graptophyllum excelsum	x	
Graptophyllum illicifolium	x	x
*Graptophyllum in Variety**	x	x
Hibbertia scandens	x	
Hibiscus 'Cuban Orange'*	x	
*Hibiscus rosa-sinensis**	x	x
*Hibiscus schizopetalus**	x	x
Hibiscus tiliaceus rubra	x	x
*Hymenocallis littoralis variegata**	x	
*Hymenocallis littoralis**	x	
*Hymenocallis speciosa**	x	
Ixora Dwarf in Variety*	x	
Ixora in Variety*	x	x
*Jasminum nitidum**	x	x

Botanical Name	Park	Screening
*Juniperus conferta**	x	
*Kopsia fruticosa**	x	x
*Largerstroemia indica**	x	x
Liriope 'Evergreen Giant'*	x	
Lomandra hystrix	x	
Lomandra longifolia	x	
Melaleuca in variety (formerly *Callistemon)*	x	x
Melicope rubra	x	x
Murraya 'Min a min'*	x	x
Murraya paniculata cutting grown*	x	x
Mussaenda philippica in Variety*	x	x
*Ophiopogon japonicus Nana**	x	
*Ophiopogon japonicus**	x	
*Ophiopogon variegata**	x	
*Pachystachys lutea**	x	x
Pennisteum Advena Rubrum	x	
*Philodendron selloum**	x	x
*Philodendron williamsii**	x	
*Philodendron 'Xanadu'**	x	
Phyllanthus cuscutiflorus	x	x
Phyllanthus lamprophyllus	x	
*Phyllanthus multifolius**	x	
*Pleomele reflexa**	x	x
Plumbago capensis 'Royal Cape'*	x	
*Pseuderanthemum sp.**	x	x
*Radermachera 'Summer Scent'**	x	x
*Rhoeo spathacea**	x	
*Russelia equisetiformis**	x	
*Schefflera arboricola variegatum**	x	
Serissa in Variety*	x	
Syzygium in Variety	x	x
Tabernaemontana coronaria	x	x
Tabernaemontana 'Sweet Love'		x
Wrightia antidysenterica 'Artic Snow'*	x	
*Wrightia religiosa**	x	x
Xanthostemon 'Fairhill Gold'	x	x
Xanthostemon 'Little Goldie'	x	x
Xanthostemon verticulatus	x	x

APPENDIX F

EXTENDED ENVIRONMENTAL WEED LIST

Table F1 - Legend

Zone Description	Generalised management Principles
DELIMITATION	Target survey in these areas. Generally where a pest presence is expected, but the extent is not yet recorded or mapped. Liaise with stakeholders, share map data. Enlist landholders/community groups to report sightings.
PREVENTION	Areas that are presumed clean of particular pest. Maintain preventative measures including weed hygiene and general surveillance. Prevention areas may be largely unsurveyed and should be targeted during annual roadside surveys.
REMOVAL	Continued work following control of a pest. Maintain follow ups on seed recruitment at timely intervals, manage seed banks, exclusion fencing and signage for weed hygiene. Length of removal phase may be determined by known seed longevity.
INTENSIVE CONTROL	Intensive control or initial control works in these sub-catchments. Includes eradication programs, and species with achievable extent. Often utilised in large catchments initially in the upper extent of the infestation. Compliance considered to meet objectives.
IMPACT REDUCTION	Containment of major infestations. Buffers maintained, important natural assets protected, roadsides/paddocks slashed, grazing practices modified. Property pest management plans developed in private, State and Council controlled land. Down catchment approach utilised where possible.

Table F1 - Legend

Species	Common name	Declared	National Program	Score	Rating
Abelmoschus manihot	Sunset Hibiscus	ENV	No	<10	Low Level
Acalypha hispida	Red Cats tails	ENV	No	<10	Low Level
Acalypha wilkesiana	Acalypha	ENV	No	<10	Low Level
Aechynome americana	American Jointvetch	ENV	No	<10	Low Level
Aeschynome indica	Budda Pea	ENV	No	<10	Low Level
Aeschynome villosa	Villos joint vetch	ENV	No	<10	Low Level
Agave vivipara	Agave	ENV	No	<10	Low Level
Ageratum conyzoides	Blue Top Billygoat Weed	ENV	No	<10	Low Level
Aglaonema commutatum	Chinese evergreen	ENV	No	<10	Low Level
Allamanda cathartica	Allamanda	ENV	No	17	MEDIUM
Alocasia macrorrhizos	Elephant Ear	ENV	No	<10	Low Level
Alpinia zerumbet	Shell Ginger	ENV	No	<10	Low Level
Alpinia zerumbet var. variegata	Variegated Shell Ginger	ENV	No	<10	Low Level
Alternanthera brasiliana	Brasilian Joyweed	ENV	No	<10	Low Level
Alternanthera denticulata	Lesser Joyweed	ENV	No	<10	Low Level
Alternanthera ficoidea	Josephs coat	ENV	No	<10	Low Level
Alternanthera philoxeroides	Alligator Weed	C1	Wons	38	2-HIGH
Alternanthera pungens	Khaki Weed	ENV	No	<10	Low Level
Alternanthera sessilis	Sessile Joyweed	ENV	No	<10	Low Level
Alysicarpus ovalifolius	False moneywort	ENV	No	<10	Low Level
Alysicarpus vaginalis	Alyce clover	ENV	No	<10	Low Level
Annona glabra	Pond Apple	C2	Wons	32	8-HIGH
Antigonon leptopus	Coral Vine	ENV	No	<10	Low Level
Arachis pintoi	Pinto Peanut	ENV	No	<10	Low Level
Ardisia crenata	Coral Bush	ENV	No	<10	Low Level
Ardisia elliptica	Shoe-button Ardisia	ENV	No	<10	Low Level
Argemone ochroleuca var. ochroleuca	Mexican Poppy	ENV	No	<10	Low Level

Species	Common name	Declared	National Program	Score	Rating
Argyreia nervosa	Elephant ear vine	ENV	No	18	MEDIUM
Aristolochia spp.	Aristolochia	C3	No	<10	Low Level
Arundo donax	Giant Reed Grass	ENV	No	<10	Low Level
Asparagus plumosus	Asparagus Fern	ENV	No	<10	Low Level
Azadirachta indica	Neem tree	ENV	No	11	MEDIUM
Bambusa balcooa	Balcooa Bamboo	ENV	No	<10	Low Level
Bambusa spp	Bamboo Creeping and clumping	ENV	No	16	MEDIUM
Bambusa vulgaris	Yellow Bamboo	ENV	No	<10	Low Level
Bauhinia monandra	Orchid Tree	ENV	No	<10	Low Level
Begonia spp.	Begonia	ENV	No	<10	Low Level
Bixa orellana	Lipstick Plant	ENV	No	<10	Low Level
Bothriochloa bladhii	Forest Blue Grass	ENV	No	<10	Low Level
Brillantaisia lamium	Brillantaisia	*ENV	No	25	18-HIGH
Bryophyllum pinnatum	Resurrection Plant	ENV	No	<10	Low Level
Bryophyllum spp	Mother of millions	C2	No	19	MEDIUM
Cabomba caroliniana	Cabomba	C2	Wons	28	13-HIGH
Cajanus cajan	Pigeon Pea	ENV	No	<10	Low Level
Caladium bicolor	Caladium	ENV	No	<10	Low Level
Calopogonium mucunoides	Calopo	ENV	No	14	MEDIUM
Canna indica	Red Canna Lily	ENV	No	12	MEDIUM
Capsicum annuum var. glabriusculum	Bird's Eye Chilli	ENV	No	<10	Low Level
Cardiospermum grandiflorum	Balloon vine	C3	No	18	MEDIUM
Carpentaria acuminata	Carpentaria Palm	ENV	No	<10	Low Level
Caryota mitis	Clustered Fishtail Palm	ENV	No	<10	Low Level
Cassia fistula	Golden Shower Tree	ENV	No	<10	Low Level
Cassia javanica	Pink Cassia	ENV	No	<10	Low Level
Castilla elastica	Panama Rubber Tree	*ENV	No	25	19-HIGH
Cecropia spp.	Mexican bean tree	C1	No	25	20-HIGH
Cenchrus americanus	Pearl Millet	ENV	No	<10	Low Level
Cenchrus echinatus	Mossman River Grass	ENV	No	<10	Low Level
Cenchrus purpureum	Elephant Grass	ENV	No	21	MEDIUM
Cenchrus setaceum	African fountain grass	C3	No	18	MEDIUM
Centrosema molle	Centro	ENV	No	<10	Low Level
Centrosema pubescens	Centro pubescens	ENV	No	13	MEDIUM
Cestrum nocturnum	Lady of the night	ENV	No	<10	Low Level
Chamaesyce hirta	Asthma Weed	ENV	No	<10	Low Level
Chromolaena odorata	Siam weed	C1	Siam	33	6-HIGH
Cleome aculeata	Spider Flower	ENV	No	<10	Low Level
Clitoria ternatea	Butterfly Pea	ENV	No	<10	Low Level
Clitoria laurifolia	Clitoria	ENV	No	13	MEDIUM
Cocos nucifera	Coconut	ENV	No	<10	Low Level
Coffea arabica	Coffee arabica	ENV	No	12	MEDIUM
Coffea liberica	Liberian Coffee	ENV	No	<10	Low Level

Species	Common name	Declared	National Program	Score	Rating
Colocasia esculenta	Taro	ENV	No	<10	Low Level
Costus speciosa	Costus	ENV	No	<10	Low Level
Crotalaria goreensis	Gambia Pea	ENV	No	<10	Low Level
Crotalaria lanceolata	Rattlebox Lance leaf	ENV	No	<10	Low Level
Crotalaria pallida var. obovata	Rattle Pod Streaked	ENV	No	<10	Low Level
Crotalaria retusa	Rattlepod	ENV	No	<10	Low Level
Crotalaria spectabilis	Rattlepod Showy	ENV	No	<10	Low Level
Crotalaria zanzibarica	Rattlepod zanzibar	ENV	No	<10	Low Level
Cucumis anguria var. anguria	Spiny Cucumber	ENV	No	<10	Low Level
Curcuma longa	Turmeric	ENV	No	<10	Low Level
Cyperus aromaticus	Navua Sedge	ENV	No	16	MEDIUM
Cyperus esculentus	Yellow Nutgrass	ENV	No	<10	Low Level
Cyperus involucratus	Umbrella Sedge	ENV	No	<10	Low Level
Datura ferox	Fierce Thornapple	ENV	No	<10	Low Level
Delonix regia	Poinciana Tree	ENV	No	<10	Low Level
Desmodium heterophyllum	Hetero	ENV	No	<10	Low Level
Desmodium tortuosum	Beggar Weed	ENV	No	<10	Low Level
Dieffenbachia seguine	Dumb Cane	ENV	No	<10	Low Level
Duranta erecta	Golden Dewdrops Sky Flower	ENV	No	18	MEDIUM
Dypsis lutescens	Golden Cane Palm	ENV	No	<10	Low Level
Echinochloa polystachya	Aleman grass	ENV	No	<10	Low Level
Eichhornia crassipes	Water Hyacinth	C2	No	26	16-HIGH
Elaeis guineensis	African Oil Palm	ENV	No	<10	Low Level
Elephantopus mollis	Tobacco weed	C2	No	18	MEDIUM
Epipremnum aureum	Golden Pothos	ENV	No	22	MEDIUM
Epipremnum pinnatum cv. aureum	Golden Pothos	ENV	No	<10	Low Level
Eranthemum pulchellum	Blue Sage	ENV	No	<10	Low Level
Etlingera elatior	Torch Ginger	ENV	No	<10	Low Level
Eugenia uniflora	Brazilian Cherry	ENV	No	<10	Low Level
Eupatorium riparium	Mistflower	ENV	No	<10	Low Level
Euphorbia cyathophora	Dwarf Poinsettia	ENV	No	<10	Low Level
Euphorbia heterophylla	Milkweed	ENV	No	<10	Low Level
Euphorbia tirucalli	Pencil Bush	ENV	No	<10	Low Level
Gloriosa superba	Glory Lily	ENV	No	<10	Low Level
Harungana madagascariensis	Harungana	C3	No	21	MEDIUM
Hedychium coronarium	White ginger	C3	No	<10	Low Level
Heliconia bihai	Heliconia- crab claw	ENV	No	<10	Low Level
Heliconia psittacorum	Heliconia	ENV	No	<10	Low Level
Hibiscus rosa-sinensis	Hibiscus	ENV	No	<10	Low Level
Hiptage benghalensis	Hiptage	*ENV	No	<10	Low Level
Hygrophila costata	Hygrophila	C1	No	22	MEDIUM
Hygrophila polysperma	Dwarf Hygrophila	ENV	No	<10	Low Level
Hymenachne amplexicaulis	Hymenachne	C2	Wons	36	3-HIGH

Species	Common name	Declared	National Program	Score	Rating
Hymenocallis littoralis	Spider Lily	ENV	No	<10	Low Level
Hyptis capitata	Knobweed	ENV	No	<10	Low Level
Hyptis pectinata	Comb Bushmint	ENV	No	<10	Low Level
Hyptis suaveolens	Hyptis	ENV	No	<10	Low Level
Inga vera	Icecream Bean	ENV	No	<10	Low Level
Ipomoea cairica	Mile-a-minute	ENV	No	13	MEDIUM
Ipomoea hederifolia	Red Convolvulus	ENV	No	13	MEDIUM
Ipomoea indica	Blue Morning Glory	ENV	No	13	MEDIUM
Ipomoea obscura	Obscure morning glory	ENV	No	<10	Low Level
Ipomoea plebeia	Bell Vine	ENV	No	13	MEDIUM
Ipomoea polymorpha	Small mauve ipomea	ENV	No	<10	Low Level
Ipomoea purpureum	Common Morning Glory	ENV	No	13	MEDIUM
Ipomoea quamoclit	Star of Bethlehem	ENV	No	13	MEDIUM
Ipomoea triloba	Littlebell	ENV	No	<10	Low Level
Jatropha gossypiifolia	Bellyache bush	ENV	No	<10	Low Level
Kaempferia pulchra	Asian Crocus	ENV	No	<10	Low Level
Lantana camara	Lantana	C3	Wons	21	MEDIUM
Leucaena leucocephala	Leucaeana	ENV	No	22	MEDIUM
Leucaena leucocephala subsp. leucocephala	Leucaena	ENV	No	<10	Low Level
Leucas lavandulifolia	Leucas	ENV	No	<10	Low Level
Leucas zeylanica	Leucas Ceylon slitwort	ENV	No	<10	Low Level
Ligustrum sinense	Chinese Privet	ENV	No	<10	Low Level
Limnocharis flava	Yellow Sawah Lettuce	C1	4TW	39	1-HIGH
Lycopersicon esculentum	Tomato	ENV	No	<10	Low Level
Macroptilium atropurpureum	Siratro	ENV	No	13	MEDIUM
Macroptilium lathyroides	Phasey Bean	ENV	No	<10	Low Level
Malvastrum americanum	Spiked Malvastrum	ENV	No	<10	Low Level
Malvastrum coromandelianum	Prickly Malvastrum	ENV	No	<10	Low Level
Manihot esculenta	Cassava	ENV	No	<10	Low Level
Manihot glaziovii	Manihot rubber tree	*ENV	No	24	MEDIUM
Medicago sativa	Lucerne	ENV	No	<10	Low Level
Megathyrsus maximum	Guinea Grass	ENV	No	13	MEDIUM
Melinis minutiflora	Molasses Grass	ENV	No	<10	Low Level
Melinis repens	Red Natal Grass	ENV	No	<10	Low Level
Merremia dissecta	Snake vine	ENV	No	<10	Low Level
Merremia peltata	Native vine	ENV	No	13	MEDIUM
Merremia quinquefolia	Merremia	ENV	No	<10	Low Level
Merremia tuberosa	Yellow morning glory	ENV	No	<10	Low Level
Miconia spp.	Miconia	C1	4TW	32	9-HIGH
Mimosa diplotricha	Giant Sensitive Weed	ENV	No	<10	Low Level
Mimosa invisa	Giant Sensitive Plant	C2	No	27	15-HIGH
Mimosa pudica	Common Sensitive Plant	ENV	No	13	MEDIUM
Mimosa pudica var. unijuga	Sensitive Plant	ENV	No	<10	Low Level

Species	Common name	Declared	National Program	Score	Rating
Momordica charantia	Balsam Pear	ENV	No	21	MEDIUM
Mucuna pruriens	Velvet Bean	ENV	No	<10	Low Level
Murraya paniculata var. "Exotica"	Mock Orange	ENV	No	<10	Low Level
Neonotonia wightii	Glycine	ENV	No	13	MEDIUM
Neptunia oleracea and N. plena	Water mimosa	C1	No	26	17-HIGH
Ochna serrulata	Mickey Mouse Plant	ENV	No	<10	Low Level
Ocimum americanum	Basil	ENV	No	<10	Low Level
Odontonema stricta	Fire spike	ENV	No	21	MEDIUM
Odontonema tubaeforme	Firespike Plant	ENV	No	<10	Low Level
Opuntia stricta; syn. O. inermis	Prickly Pear	C2	No	<10	Low Level
Parmentiera aculeata	Cucumber Tree	ENV	No	20	MEDIUM
Parthenium hysterophorus	Parthenium	C2	Wons	36	4-HIGH
Paspalum paniculatum	Russell River Grass	ENV	No	<10	Low Level
Paspalum villei	Vasey Grass	ENV	No	<10	Low Level
Paspalum virgatum	Clyde Road Grass	ENV	No	17	MEDIUM
Passiflora coccinea	Scarlet Passion-flower	ENV	No	<10	Low Level
Passiflora edulis	Passion Fruit	ENV	No	<10	Low Level
Passiflora foetida	Stinking Passion Fruit	ENV	No	<10	Low Level
Passiflora spp.	Passionfruit/flower exotic	ENV	No	16	MEDIUM
Passiflora suberosa	Corky passion flower	ENV	No	<10	Low Level
Pedilanthus tithymaloides subsp. smallii	Slipper-flower	ENV	No	<10	Low Level
Peltophorum pterocarpum	Yellow Flame Tree	ENV	No	<10	Low Level
Philodendron lacerum	Philodendron	ENV	No	<10	Low Level
Philodendron scandens	Philodendron- velvet leaf	ENV	No	<10	Low Level
Phyllanthus amarus	Phyllanthus	ENV	No	<10	Low Level
Phyllanthus debilis	Niruri	ENV	No	<10	Low Level
Phyllanthus tenellus	Mascarene Island leaf flower	ENV	No	<10	Low Level
Phyllanthus urinaria	Chamber Bitter	ENV	No	<10	Low Level
Phyllostachys aurea	Fishpole Bamboo	ENV	No	<10	Low Level
Physalis angulata	Wild Gooseberry	ENV	No	<10	Low Level
Phytolacca octandra	Inkweed; Dyeberry	ENV	No	<10	Low Level
Phytolacca rivinoides	Venezualan pokeweed	ENV	No	<10	Low Level
Pilea cadierei	Aluminum Plant	ENV	No	<10	Low Level
Pistia stratiotes	Water Lettuce	C2	No	31	10-HIGH
Pithecellobium dulce	Madras Thorn	ENV	No	<10	Low Level
Pityrogramma calomelanos var. calomelanos	Silver Fern	ENV	No	<10	Low Level
Praxelis clematidea	Praxelis	ENV	No	<10	Low Level
Psidium cattleianum var. cattleianum	Cherry Guava	ENV	No	<10	Low Level
Psidium guajava	Guava	ENV	No	16	MEDIUM
Pueraria montana, P. lobata	Kudzu vine	C2	No	28	14-HIGH
Pueraria phaseoloides	Puero, tropical kudzu	ENV	No	13	MEDIUM
Ravenala madagascariensis	Travellers Palm	ENV	No	<10	Low Level

Species	Common name	Declared	National Program	Score	Rating
Ricinus communis	Castor oil bush	ENV	No	15	MEDIUM
Rivina humilis	Coral Berry	ENV	No	<10	Low Level
Rottboellia cochinchinensis	Itch Grass	ENV	No	24	MEDIUM
Rubus alceiifolius	Giant Bramble	ENV	No	15	MEDIUM
Salvia misella	Wild Sage	ENV	No	<10	Low Level
Salvinia molesta	Salvinia/Water Fern	C2	Wons	35	5-HIGH
Samanea saman	Raintree	ENV	No	15	MEDIUM
Sanchezia parvibracteata	Sanchezia	ENV	No	21	MEDIUM
Sansevieria trifasciata	Mother-in-laws tongue	ENV	No	21	MEDIUM
Sauropus androgynus	Sweet-leaf Sauropus	ENV	No	<10	Low Level
Selaginella willdenovii	Peacock Fern	C3	No	<10	Low Level
Senna alata	Candle bush	ENV	No	22	MEDIUM
Senna obtusifolia, S. hirsuta and S. tora	Sicklepod	C2	No	29	11-HIGH
Sida acuta	Spinyhead Sida	ENV	No	<10	Low Level
Sida cordifolia	Flannel Weed	ENV	No	<10	Low Level
Sida rhombifolia	Common Sida	ENV	No	<10	Low Level
Solanum americanum subsp nutans	Glossy Nightshade	ENV	No	<10	Low Level
Solanum mauritianum	Wild tobacco	ENV	No	15	MEDIUM
Solanum nigrum subsp. nigrum	Blackberry Nightshade	ENV	No	<10	Low Level
Solanum seaforthianum	Brazilian Nightshade	ENV	No	<10	Low Level
Solanum torvum	Devil's Fig	ENV	No	<10	Low Level
Spathodea campanulata	African Tulip Tree	C3	No	24	MEDIUM
Spermacoce latifolia	Square Weed	ENV	No	<10	Low Level
Sphagneticola trilobata	Singapore Daisy	C3	No	23	MEDIUM
Sporobolus africanus	Parramatta grass	C2	No	20	MEDIUM
Sporobolus fertilis	Giant Parramatta grass	C2	No	20	MEDIUM
Sporobolus jacquemontii	American rat's tail grass	ENV	No	<10	Low Level
Sporobolus jacquemontii	American rat's tail grass	C2	No	20	MEDIUM
Sporobolus pyramidalis and S. natalensis	Giant rat's tail grass	C2	No	20	MEDIUM
Stachytarpheta cayennensis	Snakeweed	ENV	No	<10	Low Level
Stachytarpheta jamaicensis	Blue Snakeweed	ENV	No	<10	Low Level
Stachytarpheta mutabilis	Pink Snakeweed	ENV	No	<10	Low Level
Stachytarpheta spp.	Snake Weed	ENV	No	<10	Low Level
Stephanophysum longifolium	Red Christmas pride	ENV	No	<10	Low Level
Strobilanthes dyeriana	Persian shield	ENV	No	<10	Low Level
Syngonium podophyllum	Goosefoot	ENV	No	<10	Low Level
Syngonium spp	Syngonium	ENV	No	16	MEDIUM
Syzygium jambos	Rose Apple	ENV	No	<10	Low Level
Tabebuia pallida	Pink Trumpet Tree	ENV	No	<10	Low Level
Tarenaya hassleriana	Prickly Spider Flower	ENV	No	<10	Low Level
Tecoma stans	Yellow Bells	ENV	No	<10	Low Level
Thalia geniculata	Alligator Flag Weed	ENV	No	<10	Low Level
Themeda quadrivalvis	Grader Grass	C2	No	22	MEDIUM

Species	Common name	Declared	National Program	Score	Rating
Thevetia peruviana	Yellow oleander	C3	No	18	MEDIUM
Thunbergia alata	Black-eyed Susan	ENV	No	13	MEDIUM
Thunbergia fragrans	Thunbergia fragrans	C1	No	<10	Low Level
Thunbergia grandiflora	Blue Thunbergia	C2	No	33	7-HIGH
Thunbergia laurifolia	Laurel Clock Vine	C1	No	29	12-HIGH
Thysanolaena maxima	Tiger Grass	ENV	No	<10	Low Level
Tithonia diversifolia	Japanese Sunflower	ENV	No	19	MEDIUM
Tradescantia spathacea	Moses-in-the-boat	ENV	No	<10	Low Level
Tradescantia zebrina	Wandering Jew	ENV	No	16	MEDIUM
Triplaris weigeltiana	Long Jack	ENV	No	<10	Low Level
Triumfetta pilosa	NA	ENV	No	<10	Low Level
Triumfetta rhomboidea	Chinese Burr	ENV	No	<10	Low Level
Turbina corymbosa	Turbina	ENV	No	<10	Low Level
Urena lobata	Urena Burr	ENV	No	<10	Low Level
Urochloa decumbens	Signal Grass	ENV	No	<10	Low Level
Urochloa (Brachiaria) humidicola	Humidicola	ENV	No	<10	Low Level
Urochloa mutica	Para grass	ENV	No	18	MEDIUM
Urochloa (Brachiaria) subquadripara	Green Summer Grass	ENV	No	<10	Low Level
Vernonia elaeagnifolia	Curtain Creeper	ENV	No	<10	Low Level
Xanthium pungens	Noogoora burr	ENV	No	18	MEDIUM
Zingiber officinale	Ginger	ENV	No	<10	Low Level
Zingiber spectabile	Beehive Ginger	ENV	No	<10	Low Level