natural contours and where possible, avoiding re-grading of the existing levels of street verges. This will avoid damaging the roots of existing site trees to be retained.

The site will be largely screened from Naval College Road and the Wool Road by remnant vegetation augmented by indigenous planting. Through this buffer are three major access roads running approximately north-south into the commercial zone and the two residential village areas.

Many local streets have the potential to split carriageways closest to the bush edge, creating wedges (Refer Figure 8) that contain generous medians of existing vegetation which will provide visual interest and street runoff absorption. The 'ridge' roads contain medians that will enable significant existing tree retention and also provide visual interest and function as street runoff absorption.

The emphasis on the retention of existing trees within the streetscape (where feasible and safe), will be sympathetic and responsive to the existing bushland character. The APZ's tree understorey will be thinned, significant trees retained and canopies reduced to ensure they do not meet.

Selected local indigenous species will be used for supplementary infill planting along streets. This will occur where existing retained trees do not provide sufficient density for streetscape character.

Village parks are designed for a variety of active and passive recreation

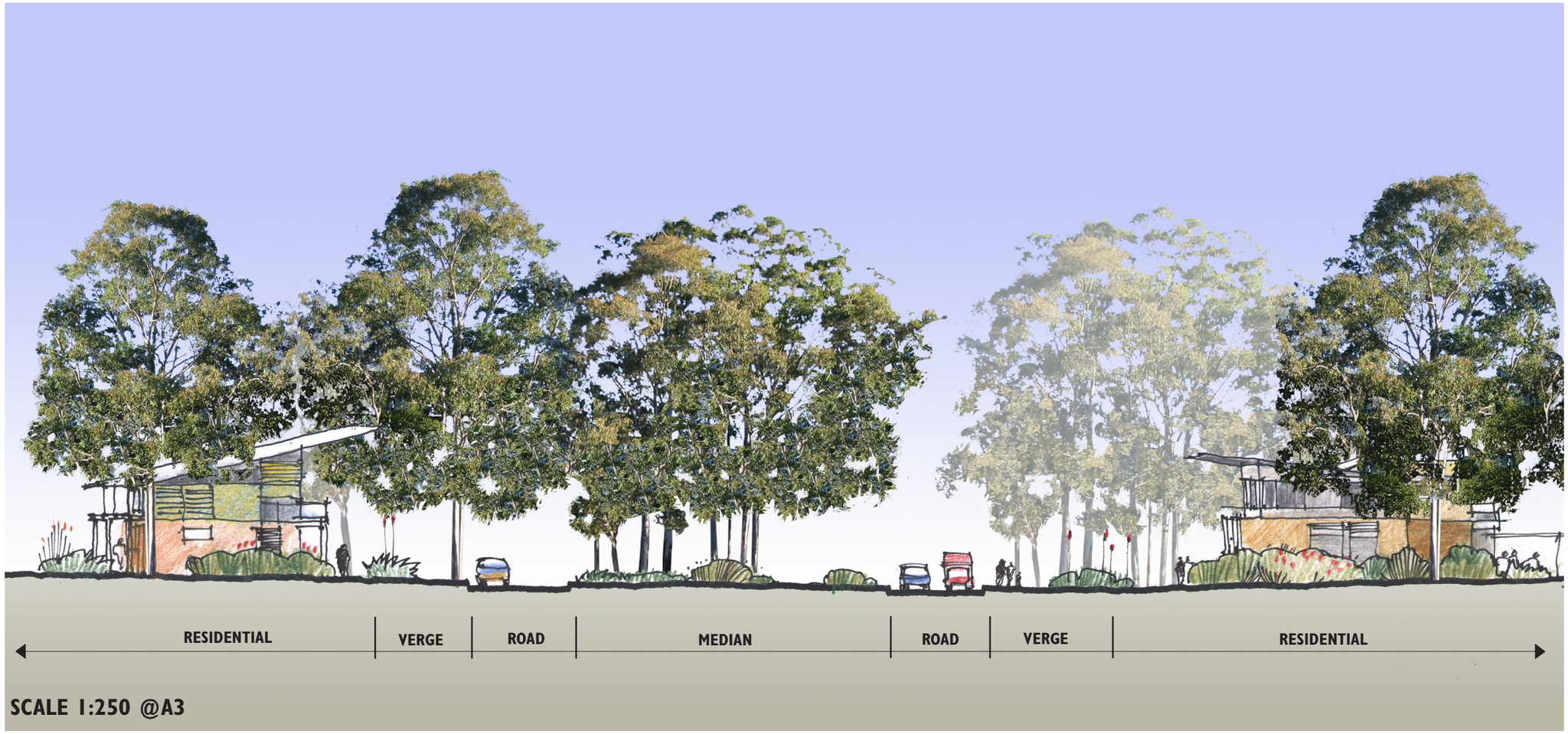
RIPARIAN ZONES/TRUNK DRAINAGE

The riparian zones and trunk drainage area will be kept in a natural condition and no substantial urban development will be permitted within them. The main access roads will cross on a bridge with only minor fill on the approach abutments. Two large settling ponds will be constructed in the central and eastern (District Centre) riparian ways to help settle the increased loading of sediments and nutrients that will result from the urbanisation of the catchments. In addition there will be some 15-20 smaller ephemeral wetlands in the central and western catchments with macrophyte planting to help control water quality.

The riparian corridor separating the commercial and residential areas on the eastern and northern boundary has also been designed to provide a flight path for the threatened Eastern Bristle bird and Ground

Stockland

CLOUSTON associates



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8. LOCAL STREET (WEDGE TYPE) SECTION

Parrot to provide access to areas beyond this site. Other threatened flora species have been protected by incorporating them into parkland or the riparian corridors.

Informal planting augmenting existing vegetation and soft kerbing will form the basis of the streetscape character

PATHWAYS AND CYCLEWAYS

A hierarchy of pathways will be constructed throughout the site to provide pedestrian and bicycle paths to most areas. Where possible these pathways minimise contact with the roadways to maximise pedestrian safety.

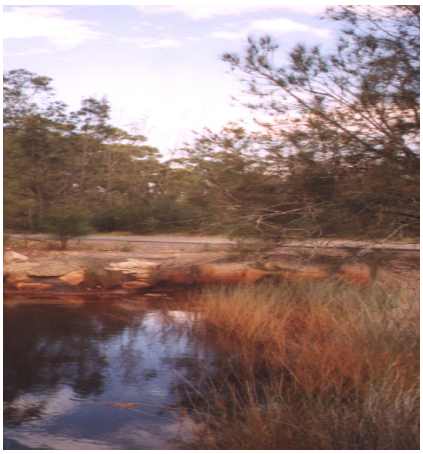
The three path types proposed are:

- Foot and Cycle Path (2.4m),
- Footpath (1.2m)
- Bushland Edge Path.

All path types will link together and create a major circulation route that traverses the whole site and effectively creates a loop around and through the residential villages, through the heathland and back through the District Centre.

Foot and Cycle Paths are concrete paths to 2.4m wide which are marked for both pedestrian and cyclist use. This network extends through the site primarily from north to south along larger roads. The function of this network is to create freedom of movement between the residential and commercial areas, Vincentia Village, Vincentia High School, Vincentia Primary School and the Leisure Centre. The pathways connect with the existing cycle route between Huskisson and Sanctuary Point.

The 1.2 metre wide footpaths will connect with the Foot and Cycle path network and form the basis of pedestrian movement through the site. These will occur at the edges of the suburban blocks which make up the Village subdivisions. The reserve for these paths has a generous vegetated verge which is typically 4-5 metres. They are smaller and less assuming than the foot and cycle paths and will mostly be on one side of the road only.



Protection of riparian zones and their ephemeral ponds are an integral part of the landscape design

In keeping with the overall concept, the footpaths in the District Centre will be more formal, with road edging and guttering and a more formal layout of street trees.

Bushland Edge Paths will also be provided and will be located in bushland and heathland areas, the APZs of the riparian zones and the bushland site boundary. These paths are 1.2m wide and have a gravel surface to allow free water movement while also having an acceptable landscape character. They are designed for passive recreational purposes and allow movement through the bushland with minimal environmental impact.

Shareways will allow comfortable co-use of cyclists and pedestrians

ENTRANCE THRESHOLDS

The main vehicle entrances are located along Wool and Naval College Roads. Existing vegetation along these entrances will be retained where possible and as necessary supplemented with clusters of larger scale species such as local provenance Spotted Gums. This planting will clearly identify entrance points and contribute to the overall landscape character of the site.

The primary residential entrance from Naval College Road occurs east of the Central Riparian Zone and is designed as a large public open space with emphasis on passive recreation. This parkland will contain a naturally-shaped ornamental water body with wetland planting that will be part of the filtration system that runs the length of the Central Riparian Zone. The park will also be characterised by:

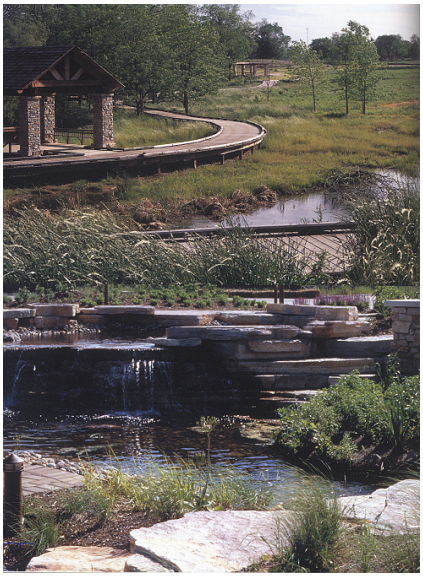
- Permeable pathways,
- Interpretive signage for environmental education,
- Shrub beds for visual diversity and screening, and
- Turf areas for picnics and active recreation.

Walking trails will be designed to maximise the bushland experience

LOCAL NATIVE PLANTING SCHEMES

The plant material schemes recommended for the site will be based on local provenance plant species. Limited areas of non-invasive, non-local plant species will supplement the overall existing bushland landscape treatments. This will help mitigate the degradation of the existing bush and heathland character over the long term and maintain a unified and coherent landscape throughout the development. In addition, these palettes of plant species are considered the most environmentally sustainable selection as they are best adapted for the soil type and climate of the site. More details on the species will be provided at the detailed design stage.

The recent NSW and ACT Nursery & Garden Industry Association DAGE (Discovering Alternatives to Garden Escapes) initiative to educate the wider community to plant more environmentally and 'bush friendly' plant species is recommended for application to this development through a coordinated strategy including:



The residential entrance threshold will contain an ornamental water feature that also acts as part of a greater filtration system

- Providing new residents with free native plants, and
- Undertaking education campaigns aimed at residents and local school children about the environmental impacts of noxious or environmental weeds species.

A viewing platform in the residential entrance threshold will allow interaction with the water feature

Local provenance will ensure climatic adaptabilty of indigenous planting

7.0 THE MANAGEMENT PLAN

TREE AND HABITAT PRESERVATION

In general there will be a strong emphasis on retaining the existing native trees where these are healthy and in good condition and do not require significant ongoing maintenance. To enable successful retention of trees and shrubs a range of management measures and techniques will be documented in the site Construction Environmental Management Plan (EMP). The **Construction EMP will be binding on the various civil** construction contractors who will be engaged on site.

Where safe, habitat trees will be retained to ensure effectiveness of corridors

Design emphasis has been placed on construction of pathways at grade thus minimising the amount of cut and potential damage to tree root systems. Other protocols will include the use of bunting and brightly coloured tape to be placed around individual trees and clumps of trees during the construction period. Contractor "No-Go" areas will be clearly marked, as will be all approved construction access tracks, material handling and storage areas. These construction access and storage areas will be kept away from significant trees, groups of trees and areas of important habitat.

Consideration will be given to penalty clauses in all construction contracts should any violation of the restricted areas occur.

Parklands have been located to retain established trees for habitat, visual interst and amenity

TREE PLANTING

In general native species of local provenance will be used on the site which have been propagated and grown-on in a nursery prior to construction.

Tree planting will follow the planting plans to be developed at a later stage of the project along with other building and infrastructure contract documentation. The tree planting and soft landscape elements are likely to be let as one contract.

Some areas that will not be disturbed during construction can be planted early on in the development, particularly areas like the street buffers which just require thickening or assisted regeneration. Other areas like the Commercial zone may have to wait until the building contractors have finished their works.

MULCHING

All street trees and special landscape zones (i.e. around the District Centre, carparks) will be mulched to control weeds and help preserve ground moisture. Where trees need to be removed they will be mulched for reuse as on site landscaping.

MOWING/SLASHING

APZs will be slashed two to three times a year depending on growth conditions and fuel loadings. There are a few small lawn areas that will

require hand and or machine mowing as a part of the maintenance program.

IRRIGATION

In general there will be no broad scale irrigation programs on this site. The emphasis is to retain or to use plant species that are endemic to the area and therefore can tolerate the local climatic extremes.

Some minor irrigation will be used in a few selected areas to quicken the establishment of specialised landscapes. These will principally be small lawn areas around the District Centre and other high use parts of the site.

Irrigation will primarily be bayonet connections with overhead impact sprinklers or for hand held applications. There are no proposals for wide spread use of dripper systems or similar. This will place a stronger control on the use of water over the site.

POND MAINTENANCE

The recycling and polishing ponds will need occasional maintenance. Apart from litter that may collect in them, the sediment trap section will need periodic emptying, and the macrophytes themselves may require thinning after a certain period. Water quality monitoring will document any nutrient build up that could lead to algal growth.

MAINTENANCE

In general most areas will have low maintenance requirements due to the significant retention of established existing viable trees and shrubs. Using local provenance grown plant species will generally reduce maintenance costs compared to other types of planting as they are adapted to local weather and soil conditions, and may be considered essentially as self maintaining.

Like all major suburban areas, the open spaces, parklands and other landscaped areas of the site will be subject to a maintenance contract. This will cover issues such as tree replacement for plantings that have failed, mowing and slashing, the removal of fallen timbers/trees, and the removal of any invading tree/shrub species into areas required to be kept clear (APZ etc). As noted above, minor irrigation may be required in some areas.

OTHER MANAGEMENT ISSUES

Site Nutrient Management

The development has the potential to disturb the current low yield nutrient cycle, with impacts on the riparian areas and ultimately the National Park wetlands unless appropriately managed. WSUD principles are designed to minimise potential nutrient impacts by bio-filtration swales and pond systems.

Roof water should not be discharged directly into storm water but collected in rainwater tanks for household use. Street design and bio-filtration swales will allow the maximum amount of nutrient to soak into the soil and be taken up in-situ. Trunk drains that may carry storm surge will terminate in settling ponds. Pervious surfaces will be investigated in the construction of pathways.

The carparks will have their own system of collector swales which ultimately drain into the previously mentioned treatment ponds where sediments and any attached nutrients are collected and absorbed in the lower pond macrophyte beds.

Public education will be important to inform residents to the new community of their potential impacts on the local environment, particularly aimed at discouraging damaging activities such as fertilizing lawns and car washing in streets, etc.

Weed management

Weed seed can reach the bush in a variety of ways including by wind or birds and other animals which eat the fruit and later drop the seed. By encouraging the use of indigenous plant species in residential gardens the problem of weed invasion into the bushland will be reduced.

Weed management will form part of the resident education program and prospective owners will be given pamphlets on the problems associated with this issue. Another weed management initiative is to provide for regular collection of garden waste so it can be re-cycled into compost at the local waste recycling centre.

8.0 PROJECT IMPLEMENTATION PHASING

PHASE 1 URBAN DESIGN/STRUCTURE PLANNING

- Structure planning to be responsive to habitat corridors and vegetation patterns
- Maintain isolated unique stands of vegetation types
- Create clear linked series of open spaces/corridors for the movement of wildlife through the site, particularly east to west connecting Jervis Bay and other National Parks.
- Maximise natural visual resources
- Road and WSUD design responsive to landform and vegetation patterns
- Align major roads along ridge lines and minor roads at 90 degrees to natural contours to minimise cut and fill and maximise natural surface and sub-soil water flows.
- Built form densities and height controls responsive to vegetation patterns
- Open space structure to integrate significant trees/tree groups

PHASE 2 CIVIL/INFRASTRUCTURE ROLL OUT

- Prepare a Construction EMP for each stage to cover all construction activities
- Appoint an onsite environmental manager to implement and monitor Construction EMP outcomes Induct all contractors on EMP objectives and environmental controls/penalties
- Adopt low impact vegetation clearing methods for roads and service corridors
- Recycle all trees to be removed for re-use as site mulch. Habitat trees with hollows can be placed back into bushland
- Provide temporary protective fencing to all habitat and riparian areas as appropriate
- Consider boring rather than trenching services to reduce impacts on trees

PHASE 3 BUILDING/LANDSCAPE CONSTRUCTION

- Instigate specific Tree Protection Order (TPO) controls and penalties and consider building envelope controls for each lot
- Promote 'habitat' and 'water wise' private gardens
- Set up a local provenance seed bank for ongoing plant propagation for rehabilitation of residential and commercial sites

- Provide a bonus plant scheme to assist new residents to plant locally native species
- Limit lawn areas and fertilizer use to prevent nutrient imbalance and weed invasion

PHASE 4 PUBLIC DOMAIN/OPEN SPACE MANAGEMENT

- Prepare an Vegetation Management Plan for all public areas including roads, parks and reserves integrated with urban stormwater and fire management plans
- Involve local schools and bushcare groups in monitoring environmental performance indicators i.e. fauna populations, weed invasion levels and stormwater quality
- Encourage active involvement of environmental committees to assist Council and National Parks to maintain public domain areas, habitat corridors etc
- Provide support to the recovery program for threatened species on site

PHASE 5 RESIDENT EDUCATION AND INDUCTION PROGRAM

- Provide environmental induction for new residents prior to land purchase and pre-construction approvals
- Implement an ongoing education program on appropriate household and private garden maintenance practices with Council and NPWS endorsement
- Enforce an appropriate pet policy (exclude cats) and educate community on the environmental benefits

9.0 BIBLIOGRAPHY

Annand Alcock Urban Design Masterplan Report

Buchanan, Robin A., 1996, Bush Regeneration - Recovering Australian Landscapes, McPhersons Printing Group, Australia (Produced by Open Training and Education Network, TAFE, NSW)

Bushfire and Environmental Services, 2006, Bushfire Assessment.

Cundall Johnston & Partners Pty Ltd, ESD Study

ERM, January 2006, Species Impact Statement

ERM, 2006, Vincentia Hydrogeological Study.

Forbes Rigby Pty Ltd, 2006, Vincentia Coastal Village & District Centre Utility Services & Infrastructure Report.

Forbes Rigby Pty Ltd, 2006, Vincentia Coastal Village & District Centre Water Sensitive Urban Design Study.

Leishman, Michelle R., 1986, Distribution of Soil Phosphorus Within Urban Bushland in the Area of Ku-rin-gai, Sydney, Hons. Thesis, School of Biological Sciences, Macquarie University, NSW

McLoughlin, Lynne & Rawling, Judith, 1993, Making Your Garden Bush Friendly

Network Geotechnics Pty Ltd, 2004, Masterplanning study – Geotechnical.

Network Geotechnics Pty Ltd, June 2004, Proposed Residential and Commercial Development, The Wool Road and Naval College, Vincentia, Masterplanning Study (Geotechnical), Report G23085/1- D

NSW North Coast Weeds Advisory Committee, 2003, Bushland Friendly Nursery Scheme, BFNS Environmental weeds and native alternatives.

Recher et al, 1986, Ecology in Australia