The strongest winds of the year come at the time of least rainfall. Consequently, establishing new planting on the site will need to be carefully managed and species carefully considered for their hardiness under these conditions.

TOPOGRAPHY

The topography of the site undulates gently from the north to the south due to the three natural drainage lines that cross the site from east to west and the resultant ridge lines between them. The land falls 23m from a point on the western boundary to the shallow wetland on the south-eastern boundary. The east and west facing slopes are typically 3 to 6 degrees (Network Geotechnics, November 2003).

The predominantly shallow topography site allows versatility of use of recreational open space and allows ease of movement particularly for older people. It will also allow good infiltration and keep erosion to a minimum on the site. The hard surfaces where paved with porous materials, will also be able to reduce overland flow and allow soil purification of water travelling to the wetland.

SOILS & GEOTECHNICAL

The soils that dominate the site are finely grained clay soils overlying siltstone and sandstone. Along the southern-most drainage line there are also finely grained swamp sediments and granular and finely grained estuarine soils (Source: Network Geotechnics, June 2004). Despite the clay content and poor infiltration of the soils, there appears to be very little erosion on the site.

The variety of soils will allow for a broader variety of species, however the shallow depth of the soil and its potential for inundation may have a considerable impact on growth of vegetation. Beyond simple survival this will also affect the potential height of the vegetation and consequently its visual qualities. These factors will need to be taken into account in the design of architecture across the site.

HYDROLOGY

The surface hydrology of the site is generated by the three sub-catchments that cross the site from west to east (refer Figure 4). The dominating feature of the two southern most of these sub-catchments is the wetland at their base, the western periphery of which has the potential to impact on the site in times of high water flow.

Low ground water flows have been discovered below the surface in the vicinity of the drainage lines and wetland between 1.6m and 2.5m from the surface. The frequency and length of this subterranean water presence will have potential impacts on built form and its materials and method of construction.

Remnant Spotted Gums at the intersection of Naval College Road and Wool Road

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LEGEND

NATURAL DRAINAGE LINES

COOL MOIST SOUTHERLY WINDS

HOT DRY NORTH-WESTERLY WINDS

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4. NATURAL SYSTEMS

FLORA

Numerous studies of the flora of the site have been undertaken over a number of years and by several consultants. The most recent of these studies, undertaken by E.R.M. (January 2006) is also the most comprehensive as it covers both the proposed commercial and residential sites.

The results of these surveys reveal several related but different Eucalypt and Corymbia based communities with heathland, sedgeland and grassland in the low lying areas (refer Figure 5).

Also growing within the site is the Jervis Bay Leek Orchid (Prasophyllum affine), an endangered orchid. Prasophyllum grows in only a few locations within the site in the areas of poor drainage in heathland and sedgeland. The listing of these species on the Threatened Species List require protection from the impacts of future development.

The existing flora of the site appears to be thriving despite being seriously affected by bushfire, dry summers, wet winters, and often shallow damp soils. This suggests that indigenous vegetation would be the most suitable choice for both private and public open space planting. Where possible, indigenous stock would be even more appropriate as genetic adaptation for the site's micro-climate already exists.

Moisture loving Melaleucas along the eastern most drainage line

FAUNA

As with the flora, numerous studies have been done of the fauna in this area, most recently the ERM Species Impact Statement (2006). The report states the site has significant habitat value for local fauna, primarily because the site is regenerating bushland and adjacent to a substantial area of National Park. Also of significance is the site's exclusivity as habitat, the remaining amount of similar habitat in adjacent areas and the site's importance as part of a movement corridor for fauna.

Of particular note amongst the variety of fauna are the Eastern Bristlebird (endangered), the Glossy Black Cockatoo, the Yellow–bellied Glider and the Ground Parrot (all vulnerable). The significance of these species is recognised through an existing signage program along a pedestrian pathway that connects Wool Road opposite the High school to the Bay and Basin Recreation Centre.

The site has a particular value as a corridor for these species between the sections of Jervis Bay National Park east and west of Wool Road, maintenance of this corridor is of crucial importance. East-west connections across the site are also desirable to allow fauna full access to potential habitat sites.

Prasophyllum affine - the endangered Jervis Bay Leek Orchid

Stockland

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NATIONAL PARK COASTAL WETLAND - DRAINAGE SINK OF LOWER SITE

WOOLYBUTT WOODLAND

TURPENTINE FOREST

VARIOUS SCRIBBLY GUM COMMUNITIES

JERVIS BAY NATIONAL PARK (STATE GOV.)

SWAMP MAHOGANY/ TURPENTINE WOODLAND

SPOTTED GUM / BLACKBUTT FOREST

CLEARED / DISTURBED

WOOLYBUTT WOODLAND

HEATHLAND

SEDGELAND & GRASSLAND

HEATHLAND

SCRIBBLY GUM WOODLAND

VISUALLY SIGNIFICANT INDIVIDUAL TREES

0 10 20 50 100m

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5. EXISTING VEGETATION

EXISTING DEVELOPMENT ON SITE

There are no buildings currently on the site. There are however, two unsealed roads which receive frequent use. The northern-most road traverses the site from Naval College Road in the west of the site to Jervis Bay National Park in the east and on to Vincentia. This road runs roughly parallel to the southern drainage line and located approximately 200m from the drainage line on the northern side.

RECREATION & OPEN SPACE

The Bay & Basin Recreation Centre is located to the north of the site and includes a regional level indoor sports facility and playing fields currently accommodating rugby, AFL and cricket. The centre is also the main facility for organised sport for the local primary and high schools.

A regional level cycle way extends from Sanctuary Point through Erowal Bay, adjacent to the site along the Wool Road and on to Vincentia. This cycle way then continues on to Huskisson.

An opportunity exists for an internal cycle/pedestrian path network to effectively link local facilities and to the broader district cycle path network.

Existing educational signage near the Bay and Basin Recreation Centre

3.0 THE PROPOSAL

Stockland is seeking project approval for a residential subdivision and concept approval for a district centre in the south east corner of the site and an adaptable housing area adjacent to the Bay and Basin Leisure centre. A description of the proposal is summarised below.

The residential subdivision includes:

- a total of 604 lots;
- approximately 60 hectares (47 percent of the site) of open space area, which would be comprised of environmental conservation areas, asset protection zones and urban parks;
- an internal road network with three access points to Naval College Road;
- construction works related to providing physical infrastructure and services including some vegetation clearing.

The concept plan for the district centre includes:

- building footprints;
- an indicative total floor area of 32,000 square metres with approximately 20,000 square metres proposed in Stage 1 and 12,000 square metres proposed in Stage 2;
- a range of uses including a discount department store, supermarket, library, medical centre, child care centre, restaurants, bulky goods, potential housing and specialty retail;
- a site (Stage 3) for future bulky goods development;
- a road network that includes a main street, access to the Wool Road and access to a proposed road in the subdivision;
- an indicative total of 1,399 car parking spaces to be provided in two car parking areas and at the upper level of future buildings;
- a water feature and open space areas.

More specifically in relation to landscape design and public domain the proposal will involve the following components:

- Retention of the significant areas of existing trees and understorey on the site to retain the dominant bushland landscape character.
- Areas of private open space for residential allotments, which would integrate retention of existing trees where feasible, and allow for private recreation by residents.
- A large area of centrally located heathland open space to protect the Jervis Bay Leek Orchid
- Creation of an entry threshold to the District Centre and

Retention of existing vegetation is a key element of the proposal

residential precincts using planting and constructed water bodies

- A network of simple and legible footpaths and cycle paths, encouraging reduced car use.

The landscape design of public domain areas will integrate as much of the existing vegetation as possible and where necessary be rehabilitated with local provenance tree, shrub and ground cover species.

The use of the appropriate indigenous vegetation for the existing site conditions, including soil, aspect and wildlife corridor potential, is central to the landscape approach. Banksia ericifolia/Hakea teretifolia and other similar heathland species would be used in and around the immediate area of the heath, not only for botanical and visual consistency but also for freedom of movement and habitat for rare fauna such as the Ground Parrot and Eastern Bristlebird.

Locally occurring sedgeland species such as Xanthorrhea resinifera and Baumea articulata will be used in appropriate damp areas of the site. Corymbia maculata/Eucalyptus globoidea open-forest species will be used on the upper hillsides between riparian corridors and Eucalyptus sclerophylla woodland species will be used throughout the site on the intermediate levels between the damper lowlands and the drier upland forest.

Corymbia maculata/Eucalypltus globoidea open forest will be used along the north-west border of the site. This plant community contains Allocasuarina littoralis which is a food source for the threatened Glossy Black Cockatoo.

The private open space areas will also be embellished by way of controlled areas of turf and use of local provenance tree, shrub and ground cover species. Permeable paving to paths and driveways will be promoted.

4.0 MANAGEMENT ISSUES

The assessment of the site through physical examination and research has revealed issues and opportunities that will form the basis of landscape design principles for the site. These issues and opportunities are summarised below:

FLORA AND FAUNA MANAGEMENT & PROTECTION

There is a need to provide for fauna and flora corridors as there are several endangered and vulnerable flora and fauna species that exist on site or use the site as a corridor. The existing vegetation communities also provide habitat to many more non-threatened fauna species.

Flora protection will have regard to susceptibility to bushfire

The management of vegetation must have regard to the susceptibility and impacts of the site to fire. The NSW Rural Fire Service requirements including the Planning for Bush fire Protection Guidelines are an important framework for the management of vegetation, to reduce potential bushfire impacts.

Optimum retention of existing vegetation and careful site planning will ensure that these issues are appropriately addressed.

BIODIVERSITY

Partly due to its proximity to adjacent areas of National Park and the largely native cover of existing vegetation, the site displays a high degree of species diversity. The site is home to some 272 species of flora and 39 vertebrate faunal species (Gunninah 2000). Further details of species can be found in the ERM Species Impact Statement (2006).

The species range, age and number of trees and shrubs are important factors in the provision of food and habitat for terrestrial and avifauna. Enclosed heathlands provide valuable edge habitats. The total fauna population also contributes to nutrient recycling on site and thereby generates levels of bio-dependency.

Asset Protection Zones (APZs) are important in certain areas for safety and amenity. Though where possible, inclusion of under storey species in native planting schemes assists in maintaining a healthy biodiversity.

DRAINAGE LINES

There are three main drainage lines that feed into two wetlands situated in Jervis Bay National Park. The drainage lines are ephemeral and may vary between extremes of no water and flood conditions. In addition, water runs underground to varying degrees – especially in the lower areas.

There is an opportunity to incorporate these drainage corridors into the open space system for the development. Specific engineering and ecological design is required for managing and ameliorating all sources of on-site water pollution, as noted below.

STORMWATER MANAGEMENT – WATER QUALITY, NUTRIENT MANAGEMENT

Hard surfaces from increased development may generate higher levels of runoff and flow along the drainage lines. Generally, residential development will also increase levels of phosphates and nitrates in stormwater from garden fertilizer and animal pets. Nutrients in low lying lands may have detrimental effects on flora (native species have evolved in phosphorus deficient habitats) and by extension fauna.

Water Sensitive Urban Design (WSUD) principles will be instigated to mitigate the impacts of the development, these principles are shown in the Water Sensitive Urban Design Study (2006) undertaken by Forbes Rigby. Models suggest that residential area filtration would be ideally located in the Asset Protection Zones (APZ), areas at the periphery of the riparian zones and commercial district filtration would function most efficiently at the perimeter of the heathland.

IMPACT OF FIRE MANAGEMENT – CONTROL BURNING ACCESS TRAILS

The site is currently covered to a high degree by native vegetation and the design will retain as much of this as possible. However, the risk of fire is an important factor in any future management of vegetation. Particularly given the evidence of bushfire apparent on this site.

There are statutory requirements regarding the management of land in regard to bushfire risk which will have to be considered in any structural development concept. These requirements are detailed in the NSW Rural Fire Service's Planning for Bushfire Protection Guidelines (PBP 2001) which documents the management and setbacks for residential protection (Fuel reduction and Asset Protection Zone dimensions).

The APZ consists of an Inner and Outer Protection Area. There are a series of rules governing these two zones, based on slope, vegetation type, development type and other factors, as outlined in the Bushfire Assessment Report (Bushfire and Environmental Services 2006). The report prescribes APZ widths of some 20-40m around the perimeter of residential village zones, as detailed in the plan attached to that report.

Managing for bush fire protection will also require selective reduction in tree canopies, particularly in the Inner Protection Area. Clearly the need for clearances between trees will have scenic implications, requiring careful selection of trees to be retained that will optimise scenic values

Limited understorey planting and non-contiguous canopies in the APZ areas immediately adjacent to the riparian zones will create an open landscape with maximum visibility. This will allow funneled views into and out of the site and is in keeping with defensible space principles.

BUFFERS – VISUAL & ENVIRONMENTAL

The visual experience of continuous existing native vegetation along the Naval College Road is an important part of the perception of the area as a whole. For maintaining scenic quality it is important that this be retained.

These visual buffers can reduce the visual impact of development but also act as wildlife corridors and will assist in the survival of endangered species by mitigating habitat isolation.

Existing buffers adjacent to the Residential Precinct will be augmented with indigenous planting (local provenance where possible) to enhance both scenic and ecological quality.

In the area immediately surrounding the crossroads roundabout, it is suggested that these buffers be reduced to enhance visibility and increase safety at the intersection.