

Appendix A

Buffers



PROPOSED DEVELOPMENT, FRASER DRIVE - SOUTH TWEED

Ecological Buffer Analysis

Cardno (Qld) Pty Ltd

ABN 57 051 074 992

Commercial Centre

Isle of Capri, Gold Coast

Queensland 4217 Australia

Telephone: 07 5539 9333

Facsimile: 07 5538 4647

International: +61 7 5539 9333

gco@cardno.com.au

www.cardno.com.au

Document Control					
Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
1	January 2008	Jeff Short		John Delaney	x-j.

"© 2006 Cardno (Qld) Pty Ltd All Rights Reserved. Copyright in the whole and every part of this document belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Cardno (Qld) Pty Ltd."

PROPOSED DEVELOPMENT, FRASER DRIVE - SOUTH TWEED ECOLOGICAL BUFFER ANALYSIS

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	ECOLOGICAL AND HYDROLOGICAL CONDITIONS	3
2.1	Ecological Conditions	3
2.2	Hydrological Conditions	5
3.	PROPOSED PLAN OF DEVELOPMENT	6
3.1	Land Use Patterns and Management	6
3.2	Stormwater Management Strategy	8
4.	BUFFER ANALYSIS.....	10
4.1	Functional Requirements	10
4.2	Statutory Requirements	14
4.2.1	State Environment Planning Policy No 14 – Coastal Wetlands	14
4.2.2	Threatened Species Conservation Act 1996.....	15
5.	SUMMARY	17

LIST OF TABLES

Table 1: Ecological communities associated with SEPP 14 Wetland complex.	4
Table 2: Summary of Wetland Zones and Functions.....	9
Table 3: Development Impact Overview.....	11
Table 4: Minimum Buffer Distances.....	17

LIST OF FIGURES

Figure 1	Locality Plan
Figure 2	Plan of Development over Aerial Photograph
Figure 3	Vegetation Communities
Figure 4	Buffers to Ecologically Sensitive Areas

APPENDICES

APPENDIX A	Extracts from Stormwater Management Plan (Cardno 2006)
------------	--

1. INTRODUCTION

Villa World Ltd propose urban development of Lot 2 on DP1000385 and Lot 9 on DP1039569, Fraser Drive, South Tweed Heads (the site). The location of the site is illustrated in Figure 1. The plan of urban development proposed for the site is illustrated in Figure 2 and includes the establishment of:

- 168 residential allotments ranging in size from approximately 450 m² to 1.33 hectares;
- an integrated housing precinct encompassing an area of approximately 2.7 hectares;
- public open space dedications of approximately 2.1 hectares; and
- associated infrastructure and roadways.

An Environmental Assessment, detailing the nature of the proposed plan of urban development, was lodged with the Department of Planning in June 2007 for assessment. As part of this assessment process the proposal was referred to various government agencies and authorities for consideration and comment. Various issues concerning the proposed plan of development have been raised by the Department of Planning and other relevant agencies including the potential impact of the development upon:

- a wetland area formally gazetted under the provisions of State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14); and
- areas of native vegetation that are analogous to Endangered Ecological Communities listed under the provisions of the *Threatened Species Conservation Act 1995* ("TSC Act").

The fundamental basis upon which issues concerning the potential for the proposed plan of development to have an unacceptable impact on SEPP 14 Wetlands and associated Endangered Ecological Communities ("EECs"), relates to the adequacy or otherwise of the buffers that have been provided in the plan of development to these environmentally sensitive areas. In this respect it is noted that:

- the proposed plan of development made provision for a minimum buffer of 30metres between urban development and adjacent environmentally sensitive areas; whilst
- state government agencies have promoted a buffer width of 50 metres as being the minimum required to appropriately protect the SEPP 14 Wetland and associated EECs.

The positions of the SEPP 14 Wetland and associated EECs, relative to the proposed layout of development in the north of the site, are illustrated in Figure 3.

To facilitate a resolution of this difference in position, a site inspection was carried out on the 25th of October 2007 and attended by:

- Ms Sally Laing of the Department of Planning;
- Mr Geoff Sainty, a wetland expert engaged by the Department of Planning to provide advice concerning these issues;
- Ms Sandy Pimm and Mr Clive Easton of Tweed Shire Council; and
- Mr John Delaney from Cardno (Qld) Pty Ltd.

At this site inspection it was agreed that:

- (a) the buffer(s) required between development and the adjacent SEPP Wetlands and associated ECC need not be a minimum of 50 metres in width provided that any proposed alternative arrangements would appropriately protect the values of the environmentally significant areas; and
- (b) the ultimate dimensions and characteristics of the buffer(s) required should take into account a number of factors including:
 - the existing ecological character and condition of the environmentally significant areas, including consideration of internal and external catchment influences;
 - the existing ecological character and condition of land adjoining the environmentally significant areas;
 - the nature of existing and proposed stormwater drainage arrangements, including consideration of internal and external catchment influences;
 - the nature of land uses, including tenure, proposed for land adjacent to the environmentally significant areas;
 - the critical functions and essential physical characteristics of the buffer (e.g. minimum setback requirements for bush fire protection purposes);
 - the nature of environmental enhancement and management works that would be carried out as part of the development within the environmentally significant areas and/or associated buffers (e.g. weed control); and
 - the nature of land use controls that would be imposed as part of the development within the buffer zones and adjoining urban development (e.g. landscaping controls, access controls etc).

This report provides an analysis of the scale and characteristics of spatial buffers that are considered to be reasonably required to protect environmentally significant areas from unacceptable impacts and thereby achieve compliance with the purpose and intent of SEPP 14 and the *Threatened Species Conservation Act 1995*. More specifically this report provides:

- in Section 2, an overview of the existing ecological and hydrological conditions of the environmentally significant areas and adjacent land which will either be developed for urban purposes or managed as a buffer between urban development and environmentally significant areas;
- in Section 3, an overview of the plan of urban development proposed for the site including consideration of proposed land uses, the location and extent of required earthworks, stormwater run-off quality and quantity controls, and proposed environmental management strategies;
- in Section 4, an overview of the functional requirements of any on-site buffers to environmentally significant areas including consideration of the requirements of SEPP 14 and the *Threatened Species Conservation Act 1995* as they relate to the protection of designated wetland areas and EECs; and
- in Section 5, a summary of the results and conclusions of this analysis.

2. ECOLOGICAL AND HYDROLOGICAL CONDITIONS

2.1 Ecological Conditions

The majority of the vegetation within the site has been previously cleared for agricultural purposes. The site currently supports large expanses of cleared grassland with scattered relic trees and an area of wetland vegetation in the north-western sector of the site. A large area in the north-eastern sector of the site, adjacent to the wetland, is currently devoid of native vegetation due to recent approved earthworks to fill the low-lying portions of the site. These works have created an open grassland with an unnaturally elevated position within the landscape.

The northern sector of the site, which is the focus of this report, supports a number of different ecological communities which may be broadly classified based on the structure and species composition of their vegetation communities. Details concerning the type and condition of five (5) ecological communities that have been identified in the northern sector of the site are provided in Table 1 and their distributions are illustrated in Figure 3. Additional details concerning these ecological communities have been provided previously in the Ecological Assessment Report submitted as a supporting document to the development application.

The diversity of ecological communities present within the northern sector of the site is a function of a number of factors including the effects of past land clearance episodes, alterations that have been made to the landform and drainage patterns of the site and adjacent land, the position of the site on the edge of the Terranora Broadwater, and natural biodiversity factors. The current condition of the ecological communities is also degraded by the prevalence of invasive weed species including Broad-leaved pepper tree, Crofton weed, Mistflower, Groundsel bush, Camphor laurel, Lantana, Castor oil plant, Asparagus fern, Umbrella tree, Easter cassia, Singapore daisy, Mile-a-minute and Cockspur coral.

A diversity of terrestrial and aquatic, vertebrate and invertebrate, fauna species form part of the ecological communities that exist within the north of the site. The constructed drainage system which contains both fresh and saline waters provides habitat for a variety of fish and aquatic invertebrates, which in turn provide a foraging resource for predatory birdlife such as the Pacific Heron (*Ardea pacifica*) and Forest Kingfisher (*Todiramphus macleayii*). Fish passage between the site's wetlands and the Terranora Broadwater is constrained by tidal gates that have been placed on culverts beneath James Road, with passage provided by a small aperture that has been established within the tidal gates to enable regulation of tidal influx. The site's constructed drainage systems, and the saltmarsh, mangrove and swamp oak forest they support, also provide breeding habitat for saltmarsh mosquitoes and biting midge.

The vegetation communities also provide habitat resources for a range of native bird and a limited diversity of mammalian, reptile and frog species. The main factor limiting the areas capacity to sustain, in isolation, native fauna is its limited extent. However the on-site habitat is contiguous with a similar sized habitat patch located on adjoining land to the north, and does maintain tentative linkages with external areas of terrestrial habitat.

The fauna habitat values of the site are also conditioned by the influence of past and existing land use practices that have, and in some instances continue to occur, on the site and adjoining land. In this respect the majority of the site has been cleared in the past and has been used for the grazing of livestock, which until quite recently had unrestricted access into the wetland sectors of the site. Urban development has also occurred on adjoining land to the north, west and south of the site. The effect of these influences is likely to have been the exclusion of fauna species that are particularly sensitive to the environmental perturbations associated with agricultural land uses and urban development.

Table 1: Ecological communities associated with SEPP 14 Wetland complex.

Ecological Community	Photograph
<i>Broad-leaved paperbark closed forest.</i> Condition: Good. Invasive weed species require management. Increased tidal influx may detrimentally impact on this community. This community is considered analogous to EEC described as "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" in the TSC Act.	
<i>Swamp she-oak forest to woodland.</i> Condition: Fair. Invasive weed species such as Groundsel bush require management. Increased tidal influx may detrimentally impact on this community. This community is considered analogous to EEC described as "Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions" in the TSC Act.	
<i>Mangrove forest.</i> Condition: Good. Increased tidal influx appears to be promoting the expansion of this community. This community is not analogous to any ECC listed under the provisions of the TSC Act.	
<i>Saltmarsh.</i> Condition: Good. Removal of livestock from the site has resulted in a notable improvement in the health and vigour of saltmarsh vegetation. This community is considered analogous to EEC described as "Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions" in the TSC Act.	
<i>Cleared/slashed grassland.</i> Ecological Condition: Poor. A constructed vegetation type that requires active management to prevent establishment of significant weed infestations. This community is not analogous to any ECC listed under the provisions of the TSC Act.	

2.2 Hydrological Conditions

The site is located within the catchment of the Terranora Broadwater. The site may be divided into four main site catchment areas which are briefly described as follows.

- Catchment Area A, which is approximately 2.4 hectares (ha) in extent and which discharges south towards existing residential lots on Shiraz Place and Merlot Drive. Surface run-off from this site catchment flows through urbanised land to the south before discharging into the Terranora Broadwater.
- Catchment Areas B and C, which are approximately 1.8ha and 5.3ha in extent and which discharge east across Fraser Drive. After crossing Fraser Drive stormwater run-off from these catchments is conveyed within a series of open drains that eventually flow across Fraser Drive and re-enter the northern sector of the site. Within the site these surface flows are conveyed within a constructed drainage system that traverses the mapped SEPP 14 Wetland area in the north-west of the site before flowing beneath James Road and then discharging into the Terranora Broadwater.
- Catchment Area D is the largest site catchment encompassing 15.7ha of the site. Surface flows from the majority of this catchment enter open drains that convey surface run-off through the SEPP 14 Wetland area.

A number of external catchment areas also contribute stormwater run-off flows through the site and into the adjacent broad-water. These external areas include:

- approximately 8.4ha of urban development along Seaview Street, Ocean Avenue and Hillcrest Avenue, which forms part of the overall catchment as on-site Catchment Area D;
- approximately 14.8ha of land to the east of Fraser Drive, which forms part of the same overall catchment as on-site Catchment Areas B and C; and
- land to the north of the site, which includes parts of the mapped SEPP 14 Wetland area that are external to the site. Surface flows from the majority of this northern catchment are also collected within and conveyed by a series of constructed drains that extend along the northern boundary of the site and within the mapped SEPP 14 Wetland area. surface flows are

Cardno Figure No DA19 in Appendix A shows the existing internal catchments for the site and the external catchments contributing stormwater run-off flows through the site.

The majority of stormwater run-off from the “on-site” and “external” SEPP 14 Wetland catchments is conveyed through the wetland via a series of excavated drainage channels. The excavated drainage channels that traverse the SEPP 14 Wetland area are generally located within defined drainage easements. It is noted that the western sector of the main drainage channel is not a free draining structure and is subject to tidal influences. When the capacities of the drainage channels within the wetland area are exceeded following substantial rainfall events and/or high spring tide events, water flows out into the adjacent wetland system. Tidal gates have been placed on culverts beneath James Road, with apertures in one of these tidal gates allowing some tidal influx from the Terranora Broadwater to occur.

The majority of the catchment of the wetland area that occurs within the northern sector of the site and on adjacent land to the north, has been developed for urban and pastoral purposes. As a consequence the qualities of waters flowing into the wetland from external catchments are different from those of the pre-development case.

3. PROPOSED PLAN OF DEVELOPMENT

Villa World Ltd proposes development of the site for the purposes of creating a residential subdivision and associated areas of public open space as depicted in Figure 2. Aspects of the proposed plan of development that are of particular relevance to this analysis include:

- the patterns of land use and management that are proposed within and adjacent to the northern sector of the site which encompasses the SEPP 14 Wetland area and associated EECs; and
- the manner in which the quantities and qualities of stormwater run-off which enter the wetland area will be managed.

3.1 Land Use Patterns and Management

The general pattern of land use that is proposed within and adjacent to the northern sector of the site is illustrated in Figure 2 and Figure 4. The subject part of the site is intended to be used for a number of purposes that are described below.

- Open Space (SEPP 14 Wetland Conservation), the boundaries of which coincide with the mapped and formally defined boundaries of the SEPP 14 Wetland. This area will be set aside for the purpose of conserving the SEPP14 Wetland and associated EECs that form part of the SEPP14 Wetland. The proposed development of the site will not require any earthworks, drainage, vegetation clearance or construction works within this Open Space dedication. The only activities that would potentially be carried out in this area as part of the development would be weed management and vegetation enhancement works. It is anticipated that there will be no active use of this area once it is formally transferred to Council.
- Open Space (SEPP 14 50m Buffer), the boundaries of which are defined by a 50 metre wide setback from the formally defined boundaries of the SEPP 14 Wetland. This open space buffer encompasses the majority of the EECs that are located outside of the SEPP14 Wetland area. The proposed development of the site will not require any earthworks, drainage or vegetation clearance works within this Open Space dedication. However it is recognised that this open space dedication does encompass some cleared areas that could be rehabilitated in a manner that complements the ecological values of the wetland area and associated EECs whilst providing an appropriate interface with adjacent urban land uses. The potential for the establishment of a public access track within disturbed parts of this Open Space dedication, along which appropriate interpretive information concerning the ecological values and functioning of the adjacent wetlands and EECs is also recognised. It is anticipated that there will be no active use of this area once it is formally transferred to Council.
- Open Space (Water Quality), which will accommodate a constructed wetland system that is designed to control the qualities and quantities of stormwater run-off from developed sectors of the site that enter into the downstream drainage system that traverses the SEPP 14 Wetland. The constructed wetland will be designed, landscaped and managed in a manner whereby it will also provide supplementary habitat for wildlife species that are native to the site locality and complement the ecological values and functions of the SEPP 14 Wetland and associated EECs.

This Open Space dedication will also encompass a new open drain that will convey surface flows originating from the external catchment to the east of Fraser Drive, which will be released into the existing drainage system that traverses the SEPP 14 Wetland area. The design and operation of the constructed wetland and perimeter drain is intended to ensure that there will be limited alteration to the existing hydrology and water quality of the down stream wetlands and associated EECs.

(note: as part of this assessment it became evident that the original design for the Constructed Wetland may have required disturbance to a mapped area of ECC. It was recommended that necessary modifications to the Constructed Wetland design be made to ensure that such disturbance did not occur. This recommendation was adopted and this analysis considers the revised design for the Constructed Wetland)

- Integrated Housing, which will be retained as a single land parcel that will be developed for a managed urban land use under the control of a "body corporate" or similar management structure. Whilst the precise form of urban development that will occur within this Integrated Housing site has not been determined, it is recognised that the capacity of such forms of development to control land use practices that have the potential for adverse environmental impacts (i.e. inappropriate landscaping, keeping and/or mismanagement of pets etc) is superior to that of standard residential subdivisions. This Integrated Housing lot does not encompass any ECCs and a cleared band of land ranging from 10m to 30 m in width extends between the edge of adjacent ECCs and the western boundary of the Integrated Housing lot.

The Integrated Housing lot will also contain an internal Open Space (Integrated Housing) dedication. This Open Space dedication would be managed for a number of purposes including asset protection, stormwater management, active and passive recreation. Whilst the precise location, form and mixture of uses that will occur in this Open Space dedication will be defined at a latter stage in the site development process, the internal Open Space dedication will most likely be situated along the western edge of the Integrated Housing lot. Uses of the internal Open Space dedication will also be complementary to, and cognisant of, the environmental values of adjoining land to the west that contains the SEPP 14 Wetland and associated ECCs.

- Large Lot Residential, encompassing proposed Lots 166-168, with each having an area in excess of 0.5 ha and a defined building location envelope (BLE). The position of the building location envelope on each lot is designed to restrict construction on steeply sloping land and to enable the establishment and maintenance of an Asset Protection Zone between the dwelling and potentially hazardous vegetation to be retained on site and within the proposed Open Space dedications. The current configuration of Lot 168 encompasses part of an ECC that occurs up-slope of the current alignment of the existing open drainage channel that traverses the wetland area.

(Recommendation 1, the long-term appropriate management of the area of ECC that extends into Lot 168 would be facilitated by a reconfiguration of the boundaries of Lot 168 to exclude this ECC area from Lot 168 and include it within the boundaries of the adjoining Open Space dedication. The realigned boundary of Lot 168 should be positioned so that it provides a 10m off-set to the edge of the mapped ECCs.)

- Standard Residential development which is separated from the SEPP 14 Wetland area and associated ECCs by the proposed Open Space dedications and the Integrated Housing lot. A minimum separation distance of 110 m is provided between standard residential lots and the adjacent ECCs, with a minimum buffer of 150m being provided between standard residential lots and the mapped SEPP 14 Wetland.
- Asset Protection Zones, which are required to provide for the mitigation of bushfire hazards associated with the establishment of residential land uses adjacent to areas of hazardous vegetation. In this respect it has been recognised that 20m wide Asset Protection Zones (APZs) are required within the Integrated Housing lot to the east of the SEPP 14 Wetland and associated ECCs and the Large Lot Residential lots to the south of the SEPP 14 Wetland and associated ECCs. The purpose of these APZs is to provide an area of land within the individual freehold allotments where management practices, that do not involve any disturbance to the ECCs, can be implemented. The location of the APZs, that have been recommended in the Bushfire Assessment Report (December 2007) prepared for the development by BOSKAE Environmental Planning,

are illustrated in Figure 4. The required APZ's are entirely located outside of the proposed Open Space dedications. This will enable the vegetation within the Open Space dedications to be managed for ecological purposes, with no bushfire hazard mitigation requirements. This will create an opportunity for a net increase in the extent of the EEC's contained within the Open Space dedications via the implementation of a rehabilitation program for cleared sectors of the Open Space dedication.

In summary, the proposed pattern of land use and management for the northern sector of the site, which encompasses and adjoins the SEPP 14 Wetland area and associated EECs, is responsive to the environmental values of these areas.

3.2 Stormwater Management Strategy

A Stormwater Management Plan (SWMP) has been developed for the site, outlining principles and strategies for the protection of stormwater quality during both the construction and operational phases of the development. The measures proposed include Water Sensitive Urban Design techniques to management water quality and quantity on site. The proposed stormwater layout has been designed in accordance with the 'deemed to comply' requirements outlined in Tweed Shire Council Development Design Specification D7 Stormwater Quality Version 3.1 and the Tweed Urban Stormwater Management Plan.

The post development stormwater network and catchment boundaries are illustrated a copy of Figure No.DA20 of the Stormwater Management Plan (Cardno Pty Ltd 2006) that is presented in Appendix A. A comparison of the pre-development conditions (Figure No. DA19) with the post-development conditions (Figure No. DA20) demonstrates that the proposed development will have little impact on the hydrology of the site. The major drainage networks present within the site will not be altered significantly. The status quo within the drainage easement that runs through the SEPP 14 Wetland area will be maintained with no increase in peak flows. Inflows into the SEPP 14 Wetland area from external catchments areas will be maintained.

A key aspect of the SWMP is the proposed Constructed Wetland system that has been designed and would be constructed in such a manner that ensures there will be no increase in runoff for all storm events up to and including the local catchment 100 year ARI event, without compromising the water quality of the site. A controlled discharge point will be used in the Constructed Wetland system to ensure that flows discharging from the overall development site into the SEPP 14 Wetland area are equivalent to the pre-development flows. Run-off from the external catchment to the east of the site will be piped through the site, without treatment within the Constructed Wetland, and will be released into the existing open drainage system that traverses the SEPP 14 Wetland area.

The proposed Constructed Wetland will be an on-stream urban stormwater wetland that will receive and treat run-off from the site. The general layout of the Constructed Wetland is illustrated in Figure 4, with additional detailed being provided in Figure No. DA25A presented in Appendix A. It is relevant to note that the design of the Constructed Wetland has been modified from that proposed in the original development application to ensure that there would be no direct physical disturbance to any ECCs during the construction phase of development. The Constructed Wetland will consist of several zones each performing a function in stormwater retention and treatment to polish runoff such that water quality at the discharge point meets those performance indicators required. The zones involved in a functioning on-stream wetland include:

1. Inlet & Deep Water Zone;
2. Littoral Zone;
3. Macrophyte Zone; and
4. Outlet & Deepwater Zone.

The functions of the zones for the wetland are outlined in Table 2 below.

Table 2: Summary of Wetland Zones and Functions

Zone	Location & Brief Description	Function
Inlet & Deepwater Zone	There are two inlet zones within this constructed wetland located in the north-east and south-east corners of the proposed wetland. These inlet zones are a combined inlet and deepwater zone which have a combined detention and treatment function.	- Conveys flows from the site into the wetland. - Diverts flows from draining directly into the SEPP 14 Wetland without prior treatment. - Prevents bed erosion through reducing the velocity of the flow. - Reduction in velocity captures larger sediments. - Protects the wetland from higher velocity flows. - Includes submerged plants (eg. Algae, Phytoplankton) which provide bed protection and improve water quality.
Macrophyte Zone	This zone provides includes open water and reed beds. It may include Spike and Club Rushes (e.g.. <i>Schoenoplectus validus</i> , <i>Bolboschoenus medianus</i> <i>Juncus usitatus</i> <i>Eleocharis acuta</i>).	- Water quality treatment. - Improve aesthetics. - Habitat creation. - Treatment of solids through sedimentation and filtration. - Nutrient uptake and transformation from microbial, epiphyte and microphyte growth.
Outlet & Deepwater Zone	The purpose of the outlet zone is to control the water level and rate of discharge from the wetland. The outlet zone is located in the north-west of the proposed wetland and discharges into the existing drainage easement.	- Manipulate water levels. - Protect wetland during high flows. - Includes submerged plants (eg. Algae, Phytoplankton) which provide bed protection and improve water quality. - Further reduction in velocity and larger sediments.
Littoral Zone	This zone surrounds the entire wetland encompassing the Inlet, Deepwater, Macrophyte and Outlet zones. It consists of a strip of vegetation and bank stabilisation treatments.	- Protection of banks. - Habitat function. - Water quality treatment for overland flows. - Aesthetic design.

The proposed Constructed Wetland will not capture and treat run-off from the Integrated Housing site. As such alternative arrangements will be required to ensure that run-off from the Integrated Housing site is treated to an appropriate standard and released in a controlled manner into the downstream wetland areas.

(Recommendation 2, provision should be made in the detailed design of development for the Integrated Housing site for the bio-retention swales, or appropriate alternative measures, that will provide for the treatment and non-point discharge of run-off into downstream wetland areas.)

4. BUFFER ANALYSIS

The ultimate dimensions and characteristics of any buffer(s) that may be required between urban land uses and environmentally significant areas must reasonably take into account the following factors:

- the requirements of applicable regulations and planning controls that confer statutory significance upon the subject area;
- the existing ecological character and condition of the environmentally significant areas, including consideration of internal and external catchment influences;
- the existing ecological character and condition of land adjoining the environmentally significant areas;
- the nature of existing and proposed stormwater drainage arrangements, including consideration of internal and external catchment influences;
- the nature of land uses, including tenure, proposed for land adjacent to the environmentally significant areas;
- the critical functions and essential physical characteristics of the buffer (e.g. minimum setback requirements for bushfire protection purposes);
- the nature of environmental enhancement and management works that would be carried out as part of the development within the environmentally significant areas and/or associated buffers (e.g. weed control); and
- the nature of land use controls that would be imposed as part of the development within the buffer zones and adjoining urban development (e.g. landscaping controls, access controls etc).

This section provides an analysis of the scale and characteristics of spatial buffers that are considered to be reasonably required to protect environmentally significant areas from unacceptable impacts and thereby achieve compliance with the purpose and intent of *SEPP 14* and the *Threatened Species Conservation Act 1995*.

4.1 Functional Requirements

The role of buffers in the management of environmentally significant/sensitive areas (i.e. wetlands and EECs) is well recognised and accepted. A “buffer” may be defined as an area of land separating adjacent land uses from an environmentally significant area which is managed for the purpose of mitigating impacts from adjacent land uses on the environmentally significant area. Buffers are usually comprised of a spatial component (i.e. a separation distance or buffer width) and one or more other “buffer elements” that may contribute to the functional effectiveness of the buffer. Examples of “buffer elements” include fencing, environmental awareness signage, revegetation works, appropriately designed/constructed access infrastructure, stormwater quality/quantity controls etc.

To effectively protect the SEPP 14 Wetland area and associated EECs, the on-site buffers that are required as part of the proposed plan of development need to encompass:

1. the SEPP 14 Wetland area and the associated EECs that extend outside of the SEPP14 Wetland area; and

2. sufficient adjacent land and/or buffer elements to allow for the mitigation of potential impacts to wetlands and ECCs that may occur as a consequence of the proposed adjoining land use, including:

- alterations to hydrology and water qualities, leading to changes in ecosystem structure and function;
- clearance of vegetation resulting in direct reductions in ecosystem extent and the potential for edge effects associated with the clearance of adjoining forest vegetation;
- altered fire regimes, including the potential need to manage environmentally significant vegetation for bushfire hazard mitigation purposes;
- the introduction and establishment of exotic flora species; and
- inappropriate forms of access to environmentally sensitive areas during both the construction and occupational phases of development.

The types of impacts associated with urban development adjacent to SEPP 14 Wetland areas and ECCs that typically require mitigation and their relevance to this particular development are described in Table 3.

Table 3: Development Impact Overview

Impact Types	Site Specific Implications
Alterations to the natural hydrology and/or water qualities of downstream wetlands.	As detailed in Section 2 herein, the hydrology of the site's wetland areas and associated ECCs has been substantially modified and the current ecological character and functioning of the SEPP 14 Wetland and associated ECCs has evolved under these modified conditions. As detailed in Section 3 herein, the plan of development's stormwater management system has been specifically designed to minimise any alterations to the existing hydrology and water qualities of the wetland areas located downstream of areas to be developed for urban purposes. All stormwater drainage and water quality treatment works will occur external to the SEPP 14 Wetland area and associated ECCs.
Clearing of native vegetation and associated direct (reduction in extent) and indirect (edge effects) impacts.	Subject to implementation of the design modifications made in <i>Recommendation 1</i> and <i>Recommendation 2</i>, the proposed plan of development will not require nor create a future need for the clearance of any native vegetation that makes a contribution towards the ecological character and functioning of the SEPP 14 Wetland and associated ECCs. In these respects it is noted that: 1. there will be no need to clear any native vegetation within the mapped SEPP 14 Wetland or ECC areas to construct the proposed development, including necessary stormwater management infrastructure; 2. there are no areas of forest or woodland vegetation located adjacent to mapped SEPP 14 Wetland or ECC areas, and as such the proposal will not result in edge effects that can typically be associated with the clearance of vegetation adjacent to environmentally significant areas (e.g. altered light regimes, desiccation etc); and 3. the potential for unauthorised clearance of vegetation to occur during the occupational phase of the development is limited due to the fact that there are only two freehold lots proposed that would share a common boundary with the Open Space reserve that encompasses the SEPP 14 Wetland or ECC areas. The proposed plan of development also provides opportunities for a

Impact Types	Site Specific Implications
	net increase in the extent of the EECs that are encompassed by the proposed Open Space dedications via the implementation of appropriately designed rehabilitation programs for cleared areas. The rehabilitation of cleared areas would also help to reduce some of the pre-existing edge effects that are evident within the site's EECs (e.g. weed establishment). In these respects the proposed development will not involve the clearance of vegetation that is likely to have direct or indirect adverse impacts upon the extent, ecological character and functioning of the SEPP 14 Wetland or EECs.
Altered fire regimes	The land use history of the site and adjacent land dictates the SEPP14 Wetland area and associated EECs have long been exposed to a fire regime that is substantially different from that which would have occurred in the region prior to the land's development for pastoral and urban purposes. From the perspective of allowing for the implementation of a regulated bushfire management regime that accommodates the ecological requirements of the SEPP 14 Wetland and ECCs, whilst catering for the presence of urban land uses that already exist in the immediate locality, the following aspects of the proposed plan of development are noted. 1. All parts of the SEPP 14 Wetland and ECCs are, subject to implementation of Recommendation 1, contained within the proposed Public Open Space dedications which will be managed by Council. The transfer of management of land that contains the SEPP 14 Wetland and ECCs to Council provides an opportunity for the implementation of a bushfire management regime that takes into account the ecological requirements of the different ecosystem types that are contained within this reserve and on adjacent land to the north. 2. The proposed plan of development makes provision for appropriate bushfire hazard mitigation measures in accordance with the NSW Rural Fire Service's Guidelines for Planning for Bushfire Protection (2006), including the provision of Asset Protection Zones (APZs). The proposed combination of bushfire hazard mitigation measure will afford the proposed urban land uses with an appropriate level of bushfire protection without relying on a particular form of bushfire management within the proposed Open Space dedications. In summary, the proposed plan of development will not require implementation of a bushfire management regime within the Open Space dedications that would adversely affect the ecological values or functioning of the site's SEPP 14 Wetland or EECs.
Invasion and establishment of exotic flora.	As detailed in Section 2 herein, invasive non-native plant species form a substantial component of the vegetation that forms the site's SEPP 14 Wetland and EECs. Such species include: Broad-leaved pepper tree, Crofton weed, Mistflower, Groundsel bush, Camphor laurel, Lantana, Castor oil plant, Asparagus fern, Umbrella tree, Easter cassia, Singapore daisy, Mile-a-minute and Cockspur coral. The further development of the site for urban purposes of the form proposed does create opportunities for the introduction of additional weed species into the site locality. Infestations of weeds have the capacity to fundamentally alter the species composition, structure and function of ecosystems over time. The capacity to manage existing and any future infestations of weed species that establish within the site's SEPP 14 Wetland area and

Impact Types	Site Specific Implications
	EEC's, is not strongly correlated to the buffer distances that are provided in the plan of development. This is due to the strong dispersal capacity of most weed species. The long-term management of weed species within the SEPP 14 Wetland area and EECs will only be achieved through a combination of measures including the following. 1. The development and implementation of a Weed Management Program to deal with existing and future infestations of invasive weeds. The transfer of formal management responsibility for the SEPP 14 Wetland area and EECs from private parties to Council is a critical step to achieving an appropriate long-term management regime for these areas. 2. The implementation of landscaping controls within Public Open Space areas and on private land holdings that directly adjoin the SEPP 14 Wetland area and EECs. Such controls would restrict the use of non-native plants in the landscaping of such land. In this respect, the majority of land that adjoins the SEPP 14 Wetland area and EECs will be either a Public Open Space (Water Quality) reserve or an Integrated Housing lot managed under a "body corporate" scheme. In both instances a substantial degree of control can be imposed over the types of plantings that will be established and maintained. 3. The provision of access restrictions to prevent the dumping of garden waste and refuse, particularly "over the back fence" garden waste management practices. This practice enables many garden plants that otherwise have a limited weed potential, due to their low dispersal abilities, to become weeds within natural areas. The proposed plan of development minimises the potential for the dumping of garden waste by limiting the number of freehold lots that would share a common boundary with the Open Space reserve that encompasses the SEPP 14 Wetland or EEC areas. There will also be no public road frontage to this Open Space reserve, further limiting the potential for garden waste deposition to occur as a consequence of this development.
Inappropriate forms of access to environmentally sensitive areas	Access to the SEPP 14 Wetland area and the EECs needs to be managed to ensure that the ecological character and functioning of these systems is not adversely affected. In this respect it is relevant to note that in the past access to these areas has resulted in the construction of a network of open drains that have fundamentally altered the natural hydrology of the subject area. Until quite recently livestock had unrestricted access to these areas and the signs of their usage of the area (e.g. track systems) is still evident, although the substantial recovery of saltmarsh communities that has occurred since livestock were removed from the site is an indicator of the resilience of these ecosystems. The transfer of land containing the SEPP 14 Wetland and EECs to public ownership, managed by Council, will create a need to regulate access. In this respect the layout of development facilitates regulated public access to these environmentally significant areas by: • limiting the number and types of freehold lots that would share a common boundary with the Open Space reserve that encompasses the SEPP 14 Wetland or EEC areas; and • avoiding the creation of any public road frontage to this Open Space reserve. As part of the development, appropriate forms of access to the

Impact Types	Site Specific Implications
	Open Space reserves would also be established in consultation with Council. This may include provision for: • access pathways and seating, enabling future residents and visitors opportunities to access the Public Open Space reserves in a manner that does not compromise their ecological values and functions; • fencing, to physically restrict public access into areas of particular environmental sensitivity or where a public hazard may exist (e.g. water filled drainage channels); and • signage, to provide residents and visitors with information concerning the environmental values and functions of the SEPP 14 Wetland and EEC areas and the measures that are required to protect these areas. During the construction phase of development it will also be necessary to ensure that appropriate controls are implemented to prevent unauthorised access into the SEPP 14 Wetland or EEC areas. There is no basis to believe that such controls can not be implemented, particularly given the fact that there is a buffer of cleared land at least 10 m in width between the outer limit of all mapped SEPP 14 Wetland and EEC areas and the areas where physical development works would be required.

In summary, the proposed plan of development provides for buffers that contain the necessary spatial components and buffer elements that will adequately mitigate potential construction and occupational phase impacts that can be reasonably expected to occur with the particular pattern of land use that is proposed for the site.

4.2 Statutory Requirements

The site's SEPP 14 Wetland and associated EECs are provided with formal significance by the effect of *State Environmental Planning Policy No. 14 – Coastal Wetlands* and the *Threatened Species Conservation Act 1995*.

4.2.1 State Environment Planning Policy No 14 – Coastal Wetlands

The *State Environmental Planning Policy No. 14 – Coastal Wetlands* (SEPP 14) aims to ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State. The Coastal Wetlands pursuant to SEPP 14 are identified on a series of maps produced by the Department of Environment and Planning, NSW. It is also relevant to note that there are no provisions within SEPP 14 that allow for the remapping of the boundaries of designated wetland areas.

The primary requirement of SEPP 14 as it relates to the management of designated wetland areas is that:

- (1) *In respect of land to which this policy applies, a person shall not:*
- (a) *clear that land,*
 - (b) *construct a levee on that land,*
 - (c) *drain that land, or*
 - (d) *fill that land,*

except with the consent of the council and the concurrence of the Director.

SEPP 14 does not provide for any mandatory, or recommended, setbacks between development and designated wetland areas to which the policy applies. As such the primary statutory requirement of SEPP 14 is that development not require any of the actions listed in 1(a) – (d) above unless approval is first obtained.

Given the above, it is concluded that the proposed plan of development is compliant with the requirements of SEPP 14.

4.2.2 Threatened Species Conservation Act 1996

The *Threatened Species Conservation Act 1995* ("TSC Act") provides for the protection of threatened species, communities and critical habitat in New South Wales. It provides for the identification, conservation and recovery of threatened species and their populations and communities. For the purposes of this response the key issue that will be addressed is the conservation of Endangered Ecological Communities (EECs).

The intent of TSC Act in regards to EECs is:

- a. to conserve biological diversity and promote ecologically sustainable development,
- b. to prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- c. to protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- d. to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- e. to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- f. to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The TSC Act specifies seven criteria (7 part test) that are to be used to determine whether a development is considered likely to have a significant impact on threatened species and ecological communities. Part C of the 7 part test is directly relevant to the protection of EECs and reads as follows:

- (c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

In applying the above criteria for determining whether the proposed development is likely to have a significant adverse impact upon any of the EECs located within the northern sector of the site, the following definitions of key (underlined) terms are important:

- Local occurrence: the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
- Composition: both the plant and animal species present, and the physical structure of the ecological community.

- Risk of extinction: this is the likelihood that the local occurrence of the ecological community will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the ecological community, and includes changes to ecological function.

The potential for the proposed development to have an adverse effect on the localised occurrence or composition of the EECs that occur on the site to the extent that any of the EECs would be placed at risk of extinction is negligible. As detailed in Section 4.1, the potential types of impacts on EECs that one could reasonably expect with the proposed pattern of land use have been considered and it is this assessment that appropriate impact mitigation measures:

- have been provided within the development layout, in terms of the spatial configuration of land uses proposed; and
- would be provided in due course as more detailed plans of development for the site are developed in consultation with Council (e.g. Open Space Management Plans).

In summary, the proposed plan of development:

1. makes provision for:
 - the preservation of the existing extent of the localised occurrence of EECs that occur on the site;
 - opportunities for a net increase in the localised occurrence of EECs on the site through the implementation of appropriately designed rehabilitation programs within proposed Public Open Space reserves;
 - the preservation and restoration of the species composition of the EECs via the development and implementation of an Open Space Management Plan that makes provision for weed management, bushfire management and rehabilitation works; and
 - improved community awareness of wetland and EEC management and conservation issues via the provision of infrastructure to enable sustainable access to and enjoyment of the proposed Public Open Space reserves, including the provision of educational signage.
2. will not have a significant adverse impact on any EECs and thereby achieves the intent of the *TSC Act*.

5. SUMMARY

The objective of the buffer analysis presented herein is to determine whether the proposed plan of development would be likely to have an unacceptable impact on SEPP 14 Wetlands and associated Endangered Ecological Communities ("EECs") due to some fundamental inadequacies in the buffers that have been provided between these environmentally significant areas and adjacent land to be developed for urban purposes.

As it relates to the issue of ecological buffers the concept that "more is better" is nearly always true. However it is also necessary to provide appropriate weighting to the legitimate interests of competing land uses and not unnecessarily constrain patterns of land use by requiring ecological buffers that consume more land than is reasonably required to achieve the desired level of environmental protection and functionality.

As part of this analysis several design recommendations have been made, the intent of these recommendations being to further reduce the potential for both short-term and long-term adverse impacts upon the site's SEPP 14 Wetland area and EECs. The conclusions of this analysis are based on the assumption that relevant modifications will be made to the design of the development in accordance with these recommendations (refer page 7 and page 9).

In summary, the minimum buffer distances that are proposed between mapped areas of SEPP 14 Wetland and EECs and different forms of urban development are summarised in Table 4.

Table 4: Minimum Buffer Distances

	Integrated Housing*	Large Lot Residential	Standard Residential
SEPP 14 Wetland	70	120	150
EEC	30	30	110

*: A minimum 20 m wide APZ required along the western boundary.

In addition to the spatial component of the buffer, this analysis has considered a number of other relevant factors including:

- the existing ecological character and condition of the environmentally significant areas, including consideration of internal and external catchment influences;
- the nature of land uses, including tenure, proposed for land adjacent to the environmentally significant areas and the nature of land use controls that would be imposed as part of the development within the buffer zones and adjoining urban development (e.g. landscaping controls, access controls etc); and
- the nature of the buffer itself, including the potential effectiveness of "buffer elements" such as fencing, environmental awareness signage, revegetation works, appropriately designed/constructed access infrastructure, stormwater quality/quantity controls etc.

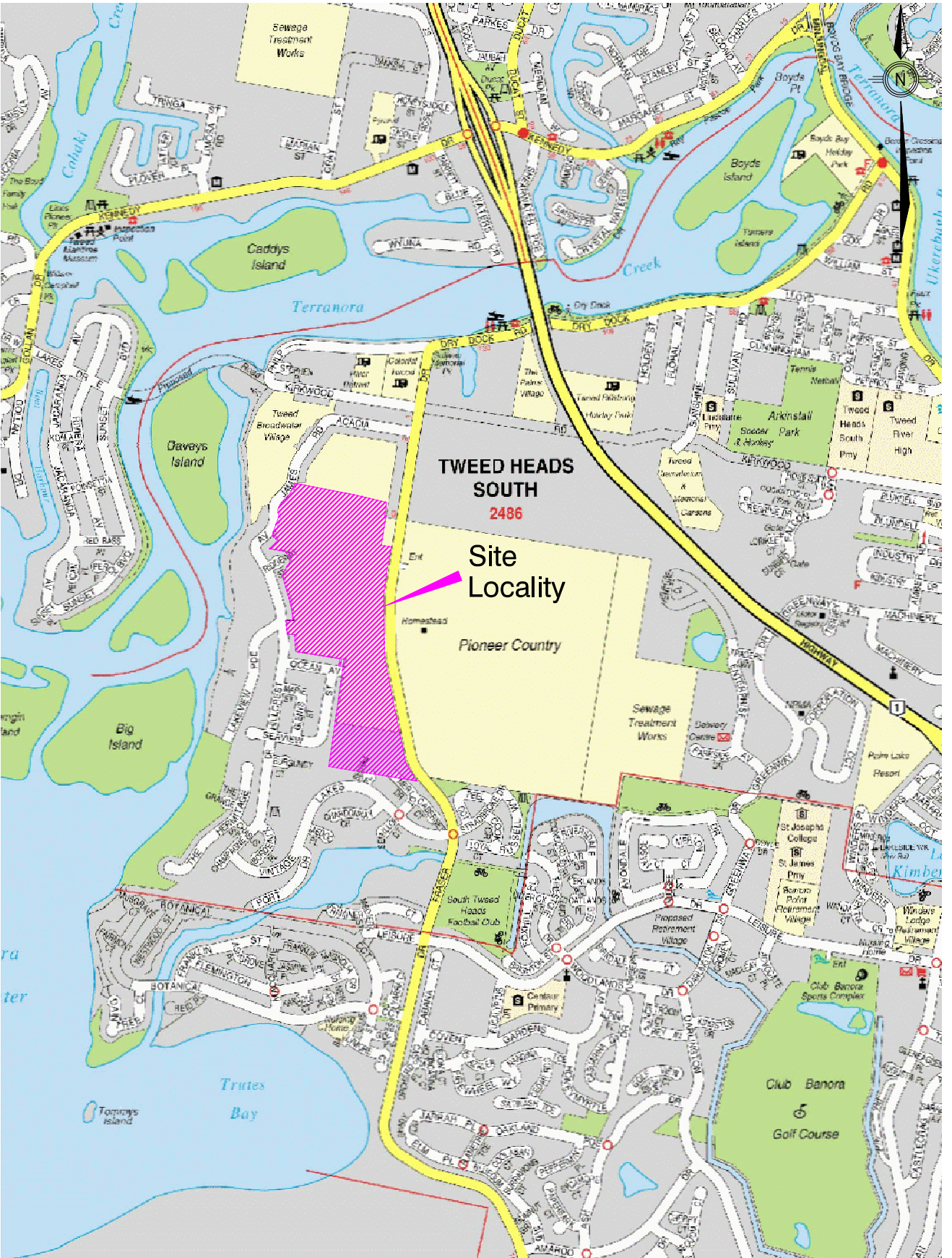
The conclusions of this analysis are as follows.

1. The proposed pattern of land use makes provision for sufficient adjacent land and/or buffer elements to allow for the mitigation of potential development impacts to wetlands and EECs, including:
 - alterations to hydrology and water qualities, leading to changes in ecosystem structure and function;

-
- clearance of vegetation resulting in direct reductions in ecosystem extent and the potential for edge effects associated with the clearance of adjoining forest vegetation;
 - altered fire regimes, including the potential need to manage environmentally significant vegetation for bushfire hazard mitigation purposes;
 - the introduction and establishment of exotic flora species; and
 - inappropriate forms of access to the environmentally sensitive areas during both the construction and occupational phases of development.
2. The proposed plan of development is compliant with the relevant requirements of SEPP 14 and the *TSC Act*.
 3. The application of a generic 50 metre minimum buffer width between SEPP 14 Wetland areas and EECs and land to be developed for urban purposes would, in this particular instance, unreasonably constrain patterns of land use and development at the site.

FIGURES

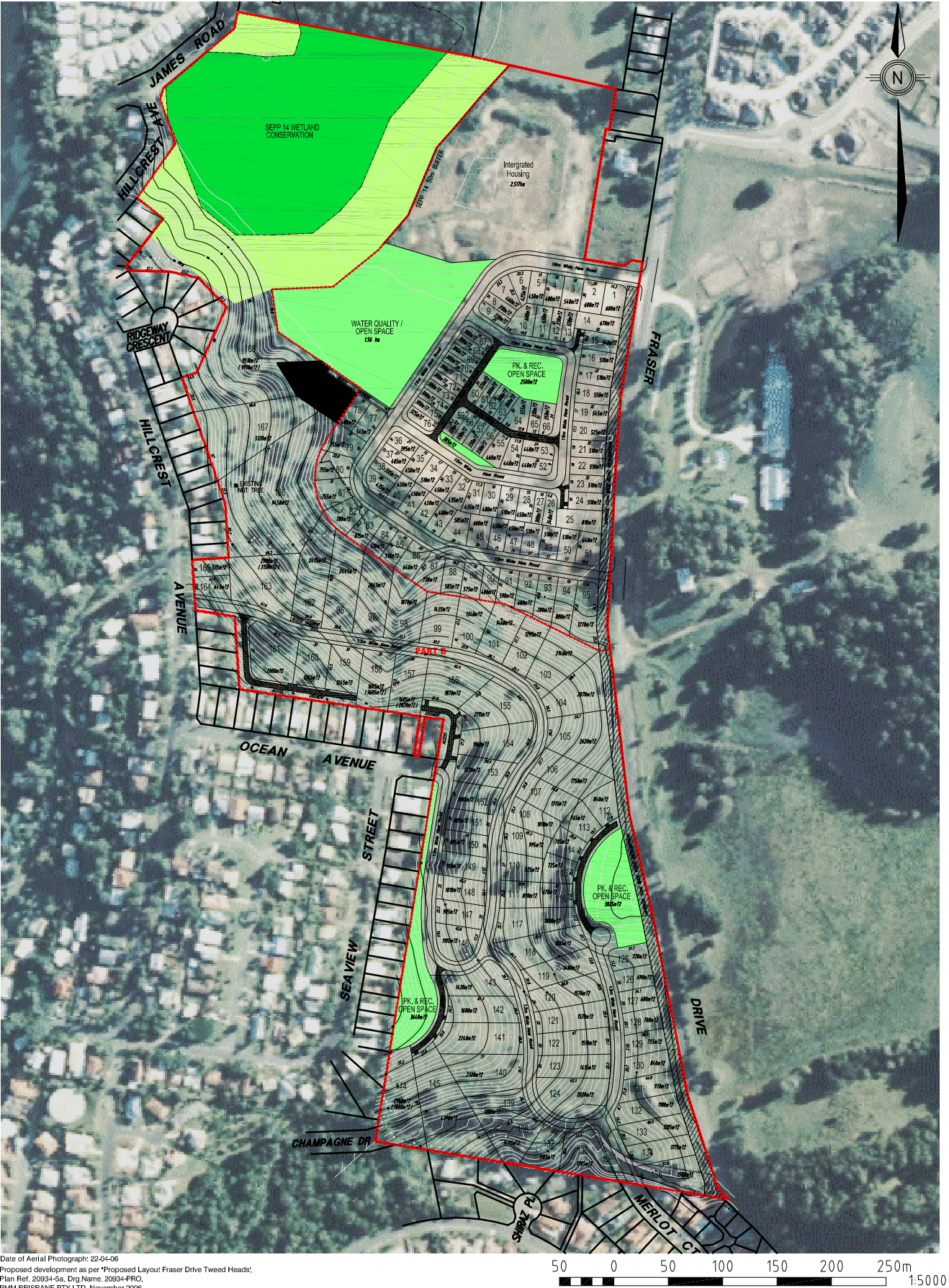
- Figure 1 Locality Plan**
- Figure 2 Plan of Development over Aerial Photograph**
- Figure 3 Vegetation Communities**
- Figure 4 Buffers to Ecologically Sensitive Areas**



Map reproduced with permission of UBD.
Copyright Universal Publishers Pty Ltd DG 01/06

© Cardno (Qld) Pty Ltd All Rights Reserved 2006.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.
This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Scale 1:20,000 (A4)
FIGURE 1
LOCALITY PLAN



© Cardno (Qld) Pty Ltd All Rights Reserved 2006.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.

This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

LEGEND

 Site Boundary

PROPOSED DEVELOPMENT

Scale 1:5000 (A4)
FIGURE 2



Proposed development as per "Proposed Layout Fraser Drive Tweed Heads",
Plan Ref. 20934-5a, Drg.Name. 20934-PRO,
PMM BRISBANE PTY LTD, November 2006

© Cardno (Qld) Pty Ltd All Rights Reserved 2006.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and
may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or
form or on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.

This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by
the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not
and shall not assume any responsibility or liability whatsoever to any third party arising out of
any use or reliance by third party on the content of this document.

Rev: Orig. Date: 30 January 2008

Villa World Ltd

CAD FILE: I:\7214-29\Acad\Buffer\Figure 3 - Vegetation Communities.dwg

XREFs:

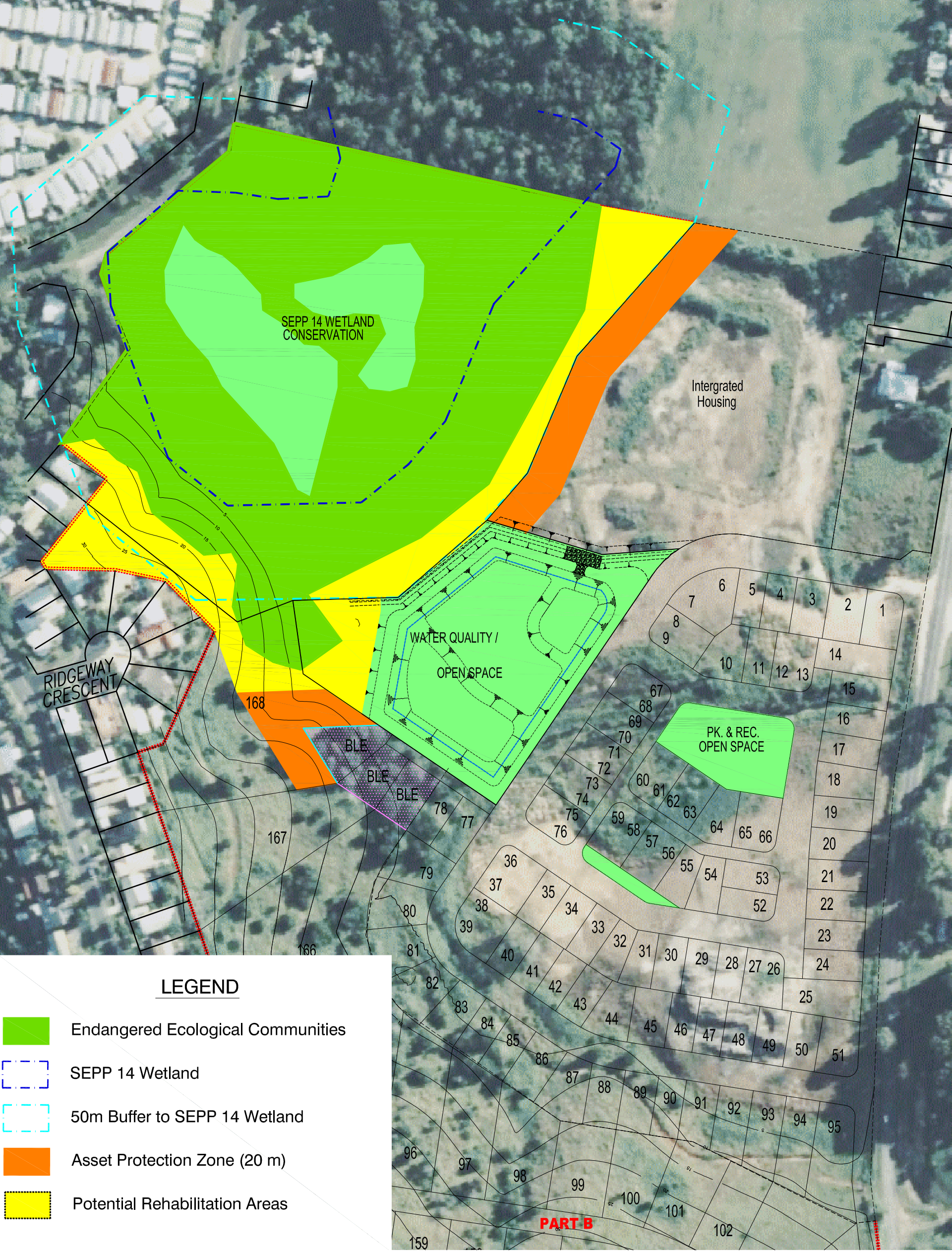
20 0 20 40 60 80 100m 1:2000

Scale 1:2000 (A3)

FIGURE 3 VEGETATION COMMUNITIES

Project No.: 7214/29

PRINT DATE: 30 January, 2008 - 4:37pm



Proposed development as per "Proposed Layout Fraser Drive Tweed Heads",
Plan Ref. 20934-5a, Drg.Name. 20934-PRO,
PMM BRISBANE PTY LTD, November 2006

© Cardno (Old) Pty Ltd All Rights Reserved 2006.
Copyright in the whole and every part of this drawing belongs to Cardno (Old) Pty Ltd and
may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or
form or on any media, to any person other than by agreement with Cardno (Old) Pty Ltd.
This document is produced by Cardno (Old) Pty Ltd solely for the benefit of and use by
the client in accordance with the terms of the retainer. Cardno (Old) Pty Ltd does not
and shall not assume any responsibility or liability whatsoever to any third party arising out of
any use or reliance by third party on the content of this document.

Rev: Orig. Date: 30 January 2008

Villa World Ltd

CAD FILE: I:\7214-29\Acad\Buffer\Figure 4 - Buffers to Ecologically Significant Areas.dwg

XREFs:

Scale 1:2000 (A3)

FIGURE 4

BUFFERS TO ECOLOGICALLY SIGNIFICANT AREAS

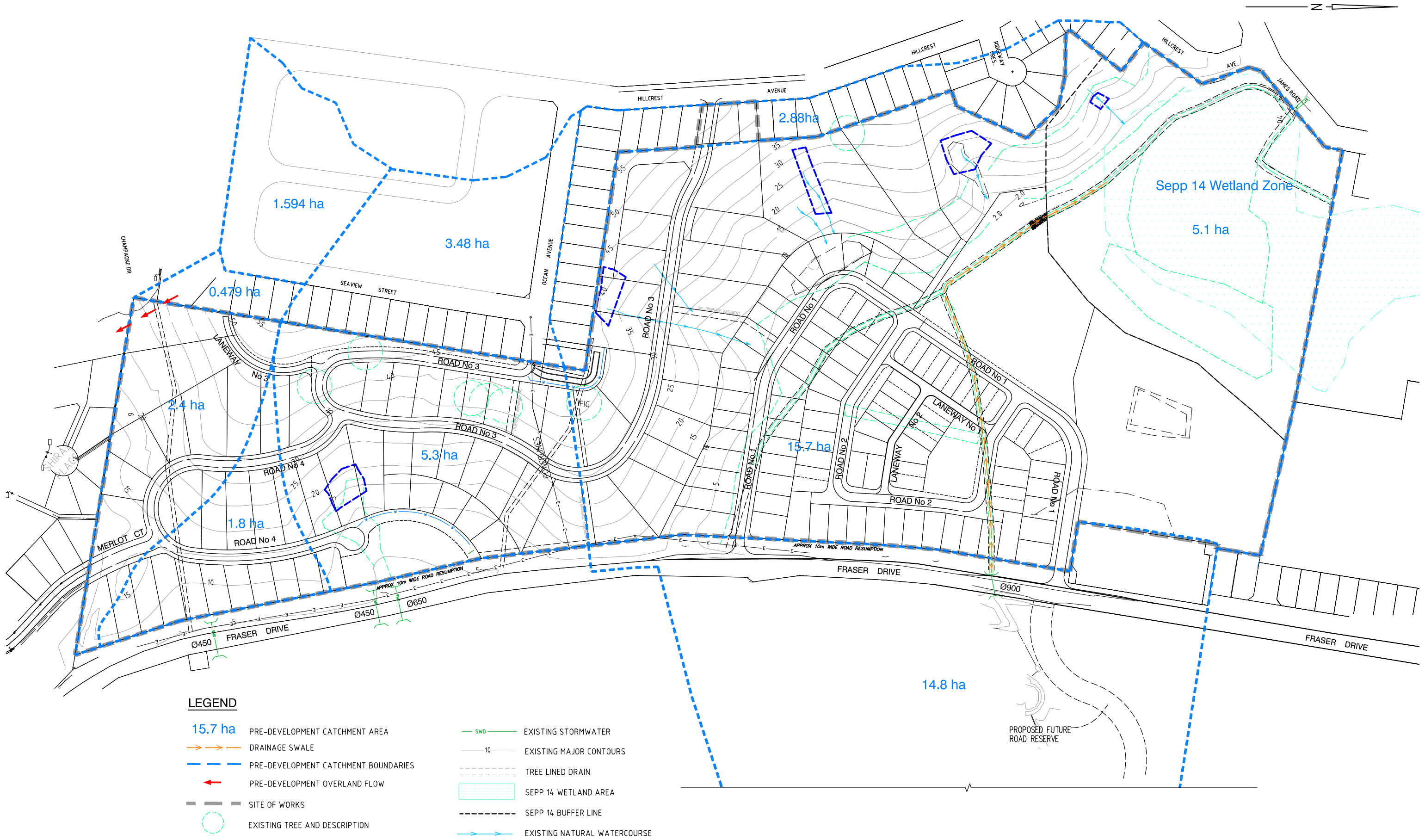
Project No.: 7214/29

PRINT DATE: 30 January, 2008 - 4:38pm

APPENDIX A

Extracts from Stormwater Management Plan (Cardno 2006)

Figure No DA19
Figure No DA 20
Figure No DA 25A



LEGEND

- | | | | |
|---------|--------------------------------------|--------------------|------------------------------|
| 15.7 ha | PRE-DEVELOPMENT CATCHMENT AREA | — SWD — | EXISTING STORMWATER |
| → → → | DRAINAGE SWALE | — 10 — | EXISTING MAJOR CONTOURS |
| — — — | PRE-DEVELOPMENT CATCHMENT BOUNDARIES | - - - - - | TREE LINED DRAIN |
| ← | PRE-DEVELOPMENT OVERLAND FLOW | [Green Dotted Box] | SEPP 14 WETLAND AREA |
| — — — | SITE OF WORKS | - - - - - | SEPP 14 BUFFER LINE |
| ○ | EXISTING TREE AND DESCRIPTION | → → → | EXISTING NATURAL WATERCOURSE |

0 50 100 150m
SCALE BEFORE REDUCTION 1: 1500

© Cardno (Qld) Pty Ltd All Rights Reserved 2005.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.

This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



Cardno (Qld) Pty Ltd ACN: 051 074 992
Commercial Centre, Isle of Capri
Gold Coast City, Queensland 4217
Email: gco@cardno.com.au

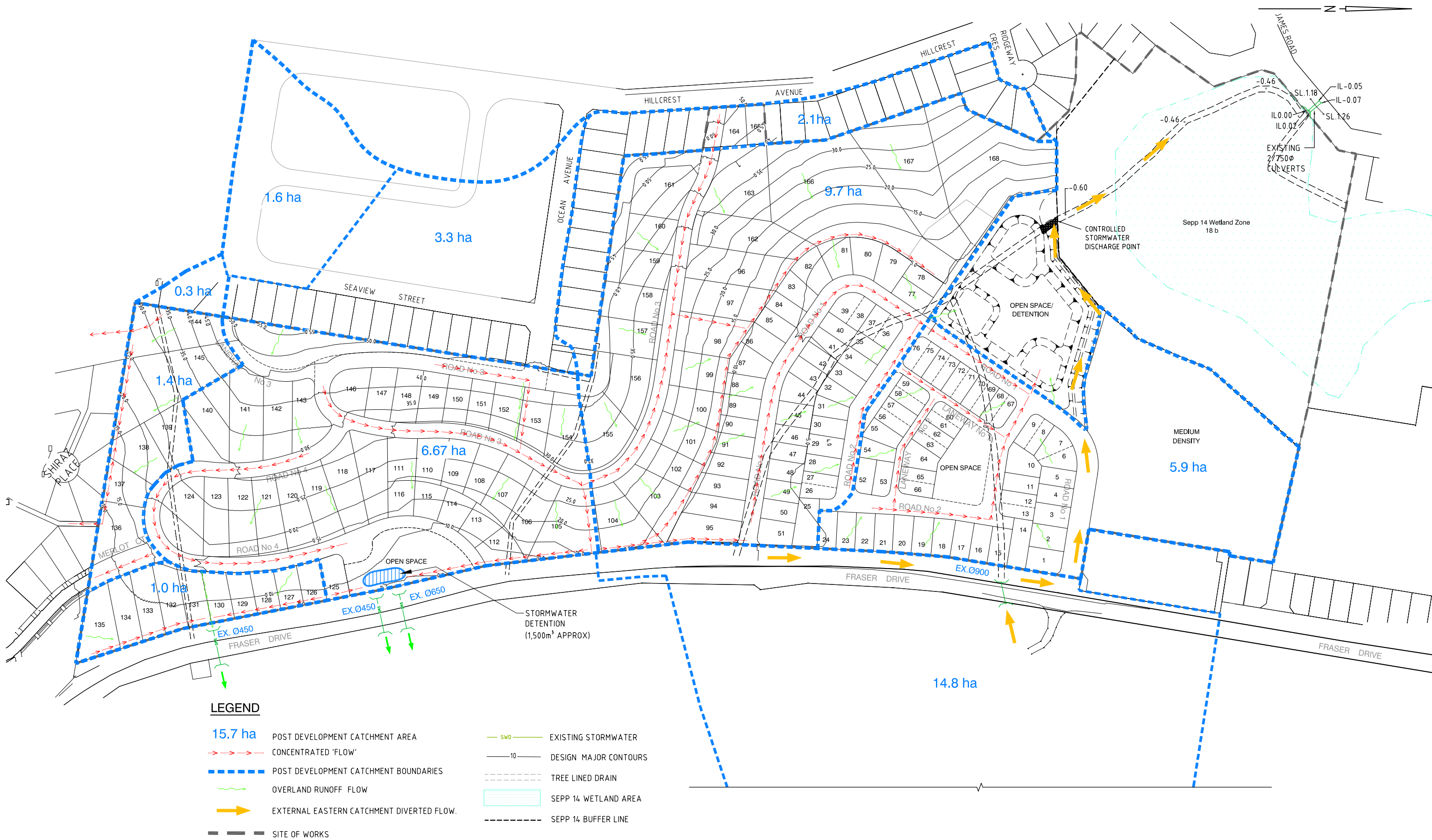
VILLA WORLD LIMITED

LOT 9 DP 1039569 & Part LOT 2 DP 1000385
FRASER DRIVE, SOUTH TWEED HEADS
FRASER DRIVE, SOUTH TWEED HEADS
ENGINEERING REPORT

SCALE :- 1 : 1500	A1
DATE :- 8 DECEMBER 2006	Rev.
DRAWING No.	
7214/29/01-DA19	

FIGURE No.DA 19

**PRE DEVELOPMENT
STORMWATER NETWORK**



0 50 100 150m
SCALE BEFORE REDUCTION 1: 1500

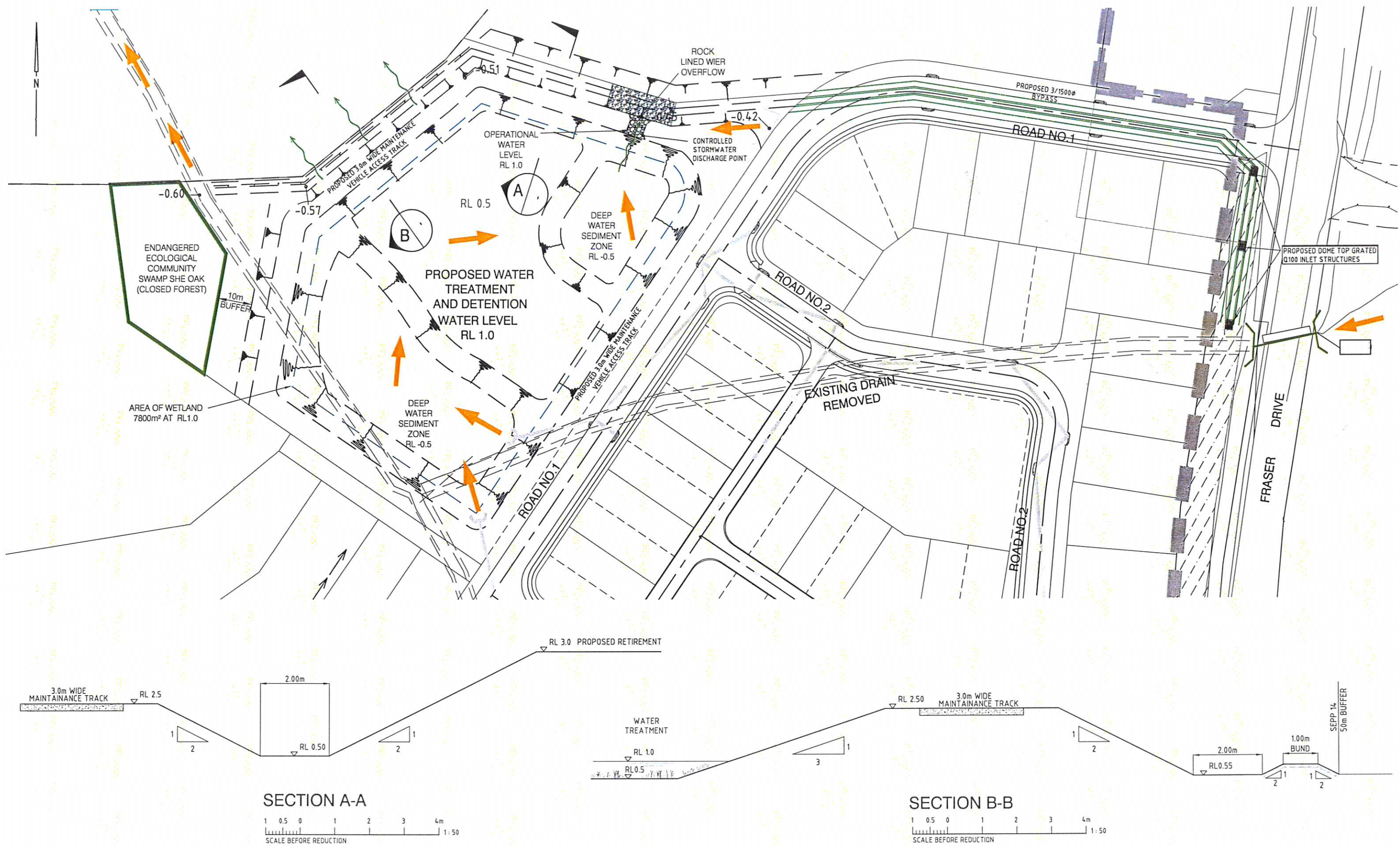
CAD FILE NAME: G:\7214\29\01\DA_Figures\72142901_DA20.dwg

© Cardno (Qld) Pty Ltd All Rights Reserved 2005.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.
This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



VILLA WORLD LIMITED	
LOT 9 DP 1039569 & Part LOT 2 DP 1000385	
FRASER DRIVE, SOUTH TWEED HEADS	
FRASER DRIVE, SOUTH TWEED HEADS	
ENGINEERING REPORT	
SCALE :- 1 : 1500	A1
DATE :- 8 DECEMBER 2006	Rev.
DRAWING No.	
7214/29/01-DA20	

FIGURE No.DA 20
POST DEVELOPMENT
STORMWATER NETWORK



10 5 0 10 20 30 40m
SCALE BEFORE REDUCTION 1:500

© Cardno (Qld) Pty Ltd All Rights Reserved 2005.
Copyright in the whole and every part of this drawing belongs to Cardno (Qld) Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or on any media, to any person other than by agreement with Cardno (Qld) Pty Ltd.

This document is produced by Cardno (Qld) Pty Ltd solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno (Qld) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



Cardno (Qld) Pty Ltd ACN: 051 074 992
Commercial Centre, Isle of Capri
Gold Coast City, Queensland 4217
Email: gco@cardno.com.au

VILLA WORLD LIMITED

LOT 9 DP 1039569 & Part LOT 2 DP 1000385
FRASER DRIVE, SOUTH TWEED HEADS
FRASER DRIVE, SOUTH TWEED HEADS
ENGINEERING REPORT

SCALE: 1:500 A1
DATE: 8 DECEMBER 2006 Rev. A
DRAWING No.
7214/29/01-DA25

FIGURE No.DA25A (19.12.07)

WATER TREATMENT AND
DETENTION BASIN DETAILS



NSW GOVERNMENT
Department of Planning

Mr Pradesh Ramiah
Senior Planner
CONICS
GPO Box 4401
SYDNEY NSW 2001

Contact: Sally Munk
Phone: 02 9228 6498
Fax: 02 9228 6540
Email: sally.munk@planning.nsw.gov.au
Our ref: MP06_0243
File: S06/00720

Dear Pradesh

Subject: Residential Subdivision at Fraser Drive, South Tweed (MP06_0243) – Ecological Buffer Analysis

I refer to the *Ecological Buffer Analysis* prepared by Cardno (Qld) Pty Ltd (dated January 2008) for the proposed development at Fraser Drive, South Tweed (MP06_0243).

The Department has reviewed the analysis and has consulted with those state government agencies that raised concern with the proposed reduced buffer width between the development and the endangered ecological communities (EECs) in the north-western corner of the site. Comments on the *Ecological Buffer Analysis* have been received from the Department of Environment and Climate Change, the Department of Primary Industries and the Northern Rivers Catchment Management Authority. Copies of all agency submissions are attached for your information and review (**Attachment 1**). The Department has also made some comments on the report (refer **Attachment 2**).

The *Ecological Buffer Analysis* does not provide adequate justification for a reduced buffer between the EECs and the integrated housing allotment. The report fails to adequately address the key question of why a reduced vegetated buffer width (as small as 10 metres) should be considered acceptable in this instance. Key pieces of policy and legislation relevant to the issue have not been addressed and incorrect buffer distances have been quoted in the report. Furthermore, a proposed buffer structure has not been provided.

The SEPP14 / EEC Swamp Sclerophyll Forest/Paperbark Forest is of extremely high quality and is an unusually tall stand of vegetation (approximately 30 metres). The forest is exceptional with an abundant and diverse mid- and under-storey, despite the loss of light from the high forest canopy. The proposed buffer will not provide adequate protection to this area of ecologically significant vegetation. The Preferred Project Report needs to give further consideration to providing an increased buffer in this part of the development.

The Department is willing to accept a reduced buffer adjacent to the stormwater quality treatment pond and residential Lot 168 as detailed in the Preliminary Draft Drawing No. 209345G, on the basis of the following mitigation and management commitments:

- the ecological buffer between the development and the EECs will be revegetated and rehabilitated and that there be ongoing weed management of the EEC wetland and the ecological buffer for a set period of time (Council to advise);
- revegetation along the western boundary of Lots 166, 167 and 168 to link up the single specimen of the Rough-shelled Bush Nut (*Macadamia tetraphylla*) with the wetland vegetation allowing future ecological interactions to occur. This is in accordance with the recovery actions specified for this threatened species by the Commonwealth Department of Environment, Water, Heritage and the Arts; and,

- upgrade the tidal floodgates under James Drive to Council-approved floodgates to improve fish passage, enhance water quality and reduce mosquito and midge outbreaks. The floodgates should use a calibrated tidal mechanism, similar to that used in a number of sites throughout the Tweed, which would permit some fish passage, flushing of waters behind the gate and by shutting down at a pre-determined tide height would continue to sustain both saltmarsh and freshwater wetland plant species

The Department supports provision of the Asset Protection Zone outside of the ecological buffer.

Sally Munk, Senior Environmental Planner, will be in contact with you to arrange a meeting to discuss this matter. Should you wish to discuss any of the above prior to the meeting, Mrs Munk may be contacted on 02 9228 6498 or by email at sally.munk@planning.nsw.gov.au.

Yours sincerely



Heather Warton
Director - Coastal Assessments

5.3.08

Your reference : File S06/00720
Our reference : FIL06/2036
Contact : Krister Waern, 02 66402503

Ms Heather Warton
Director, Coastal Assessments
NSW Department of Planning
GPO Box 39
SYDNEY, NSW 2001

Dear Ms Warton

**RE: SUBMISSION ON 157 LOT RESIDENTIAL SUBDIVISION AT FRASER DRIVE, SOUTH
TWEED (LOT 9 DP1039569), MP 06_0243.**

I refer to the above development proposal and the supplementary report prepared by the applicant and received via email by the Department of Environment and Climate Change (DECC) on 18 February 2008.

The DECC has reviewed all of the information to date including the applicant's justification for a reduced buffer area. The width of a buffer can vary greatly in relation to the purpose of the buffer and it also needs to be considered on a site by site basis. The issues discussed in the Ecological Buffer Analysis report prepared by Cardno have been considered by DECC in the context of the proposed development. The DECC recommends that the buffers be applied from the edge of the Endangered Ecological Communities which is marked as the approximate edge of the vegetation on the Proposed Layout map prepared by PMM.

The DECC provides the following recommendations in relation to the Cardno report:

- A reduction of the 50m buffer would be acceptable where the buffer adjoins the water quality/open space area. The current buffer provided in this area is acceptable.
- There may also be an opportunity to reduce the 50m buffer where it adjoins the large lot residential area, however, any reduction in buffer should be appropriately compensated for via rehabilitation or management commitments elsewhere.
- The 50m buffer should not be reduced where it adjoins the integrated housing area.
- The buffer area should consist of native vegetation and should not incorporate other infrastructure.

If you have any inquiries please contact Krister Waern on 66402503.

Yours sincerely

JON KEATS
Head Industry and Waste Unit North Coast
Environment Protection and Regulation

PO Box 498, Grafton NSW 2460
NSW Government Offices,
49 Victoria Street, Grafton NSW
Tel: (02) 6640 2500 Fax: (02) 6642 7743
ABN 30 841 387 271
www.environment.nsw.gov.au



Ms Heather Warton
Director, Coastal Assessments
Planning NSW
GPO Box 39
SYDNEY NSW 2001

29 February 2008

Attention: Ms Sally Munk

Dear Ms Munk

Re: Residential subdivision at Fraser Drive in South Tweed (MP06_0243)

Thank you for the opportunity to provide comment on the supplementary report prepared on behalf of the proponent for the abovementioned development.

Saltmarsh, an endangered ecological community, is a key fish habitat. Although it is acknowledged that the fish habitat value at this site is constrained by the floodgate. Complete dismissal of opening the gate through the use of a calibrated tidal mechanism, similar to that used in a number of sites throughout the Tweed would permit some fish passage, flushing of waters behind the gate and by shutting down at a predetermined tide height would continue to sustain both saltmarsh and freshwater wetland plant species. Cognisant of this opportunity DPI remains interest is in ensuring that the facility is designed, constructed and managed in a manner that minimise impacts on aquatic habitats.

Accepting that the Fisheries policy proscribed 50 metre habitat buffer can not be achieved on the constrained site DPI is not yet satisfied with the proposed buffer. This position is centred on incorporating a 10 metre wide track next to 10 metre wide couch grass appearing excessive. By way of context, minor roads are 6 metres wide and foreshore access tracks are in almost all instances no more than 2 metres wide. Reducing the track to a more standard width, affords some opportunity to increase the vegetative buffer with core role to protect the remnant.

Subsequent to DPI's initial comments there have been modifications to SEPP62 require consideration of impacts on priority oyster growing areas such as those within Terranora Broadwater to the north of the proposed development.

FISHERIES MANAGEMENT DIVISION
AQUATIC HABITAT PROTECTION BRANCH

1243 Bruxner Highway
WOLLONGBAR NSW 2477

ABN 51 734 124 190
www.dpi.nsw.gov.au
Tel: 02 6626 1269
Fax: 02 6626 1377

The original copy of this letter has been printed on both sides of the page to reduce waste of valuable natural resources



The SEPP requires appropriate and effective measures be undertaken to ameliorate impacts of the proposal on water quality and priority oyster growing areas. Incorporation of the effective aquatic habitat buffers into the layout of the subdivision contribute to achieving water quality objectives of SEPP 62.

For these reasons DPI believes a slightly increased habitat protection buffer comprising outcome can be achieved at this site.

For further enquiries please contact me on (02) 6626 1397.

Yours sincerely

Patrick Dwyer
Fisheries Conservation Manager (North)

FISHERIES MANAGEMENT DIVISION
AQUATIC HABITAT PROTECTION BRANCH

1243 Bruxner Highway
WOLLONGBAR NSW 2477

ABN 51 734 124 190
www.dpi.nsw.gov.au
Tel: 02 6626 1269
Fax: 02 6626 1377

The original copy of this letter has been printed on both sides of the page to reduce waste of valuable natural resources

Heather Warton
Director Coastal Assessments
NSW Department of Planning
GPO Box 39
Sydney NSW 2001

Contact: Peter Boyd
Phone: 02 66767 393
Fax: 02 66767 388
Email: peter.boyd@cma.nsw.gov.au

Our Ref: IN07/1080

Attention: Sally Munk

Dear Sally

**Re: Response to report by Cardno — Proposed Development, Fraser Drive, South Tweed—
Ecological Buffer Analysis, January 2008**

The Northern Rivers Catchment Management Authority (NRCMA) has considered Cardno's report and makes the following response at your request.

The NRCMA wants to ensure that the unique values of the wetland are protected. Our officers within the NRCMA are familiar with SEPP 14 wetlands where inappropriate buffers have lead to the degradation of the biodiversity values of the wetlands. The NRCMA is not satisfied that the wetland will be adequately protected by the Cardno proposal and recommends that a full 50m buffer be extended around the wetland and associated EECs. NRCMA is therefore of the view that the recommended variable width buffer is insufficient.

The NRCMA is of the view that the *North Coast guide for avoiding and reducing rural land use conflict and interface issues* (Centre for Coastal Agricultural Landscapes – Southern Cross University, June 2007) reflects the considered opinions and expertise of key local stakeholders in the area. The NRCMA therefore retains the view that the guideline's recommended buffer between wetlands and urban development of 100m is appropriate. The guide acknowledges that in certain circumstances there may be justification for variation of the standard buffer distances.

The 100m buffer is also consistent with the buffer policy used for land assessed as "high risk" in the DoP's *constraint layer* developed with the *Settlement Planning Guidelines August 2007 - Mid and Far North Coast Regional Strategies*.

However, the NRCMA is of the view that establishing a vegetated buffer structure is an improvement over the existing perimeter of the wetland and EEC and therefore a suitable justification for variation of the 100m buffer. We would be satisfied to see a minimum 50m vegetated buffer incorporating a number of zones of reducing vegetation height, consisting of appropriate tall native species (closest to the HCV vegetation), graduating to native hedge and then to native grasses. We would also consider the water quality control pond as an appropriate feature of the buffer zone and the vegetation buffer could therefore be reduced (from 100m total) around this feature.

As the development is not the only pressure on the wetland, further justification for variation of the standard 100m buffer in this instance may include (in addition to planting a vegetated buffer of at least 50m) a commitment to the following; weed management of the EEC wetland and buffer, maintenance and or modification of the floodgates to ensure appropriate tidal flows and compensatory habitat or rehabilitation offsite.

Yours sincerely



Michael Pitt
General Manager
29 February 2008

PROPOSED RESIDENTIAL SUBDIVISION AT FRASER DRIVE, SOUTH TWEED – MP06_0243

Comments on ‘Ecological Buffer Analysis’ dated January 2008 prepared by Cardno

- The report states that *“it was agreed at the site inspection that the buffer required between development and the adjacent SEPP 14 wetlands and associated EEC need not be a minimum of 50 metres in width provided that any proposed alternative arrangements would appropriately protect the values of the environmentally significant areas.”* This is incorrect. It was agreed that 50 metres was the accepted minimum standard, and detailed justification would be required for any variation to this standard.
- The report fails to respond adequately to the question being asked – that is – why is a 30 metre buffering to the EECs an acceptable buffer in this instance.
- The report fails to adequately explain the structure of the buffer – the 30metres appears to incorporate only 10-15m of vegetation outside the integrated housing allotment and 15-20m of APZ within the integrated housing allotment, however this is not clear.
- It is proposed that the stormwater detention basin be sited within the proposed ecological buffer. The *NSW Coastal Design Guidelines* specify that stormwater detention areas should not be located within setbacks to sensitive ecologies, as this reduces the level of environmental protection.
- It is proposed that the ecological buffer be included within the large residential lots, Lots 166 – 168. The *NSW Coastal Design Guidelines* specify that setbacks should be retained in public ownership as private ownership reduces the level of environmental protection.
- The buffer between the western boundary of the proposed integrated housing lot and the EECs and between the large residential lots and the EECs is as small as 10 metres in width at some points. No justification has been provided for a buffer width of 10 metres.
- The summary table (Table 4) on page 17 of the report is incorrect. The minimum buffer distances, based on Plan Reference 20934-5G dated 21 January 2008, are outlined below:

Table 1 – Minimum Buffer Distances

	Integrated Housing (m)	Large Lot Residential (m)	Standard Residential (m)
Mapped SEPP 14 Wetland	50	60	150
EECs	10	4	110

- Section 4.1 states that *“on-site buffers that are required as part of the proposed plan of development need to encompass the SEPP14 wetland area and the proposed EECs that extend outside of the SEPP14 wetland area”*. The ecological buffer should be sited adjacent to the wetland and EECs to protect these ecologically sensitive lands and should not include these areas.
- The report states that *“The transfer of management of land that contains the SEPP 14 wetland and EECs to Council provides an opportunity for the implementation of a bushfire management regime that takes into account the ecological requirements of the different ecosystem types that are contained within this reserve and on adjacent land to the north.”* The bushfire management regime is dictated by fuel loads specified in *Planning for Bushfire Protection (2006)* for an Asset Protection Zone, not by the ecological requirements of the ecosystem types. This is why it is critical for the APZ to be outside the ecological buffer.
- The transfer of formal management responsibility for the SEPP 14 wetland and EECs from private ownership to Council does not completely address the issue of invasion and establishment of exotic flora (page 13). Ecological buffers should also be retained within public ownership to ensure weed management and control in the buffer area is undertaken to reduce edge effects on the EECs and SEPP14 wetland area and ensure an appropriate long-term management regime of these areas.

- *State Environmental Planning Policy No.14 – Coastal Wetlands and the Threatened Species Conservation Act 1995* are not the only policy and legislation relevant to the issue. The following policy and legislation should also be considered in determining an appropriate buffer to the SEPP14 wetland and EECs:
 - State Environmental Planning Policy No.71 – Coastal Protection;
 - NSW Coastal Design Guidelines;
 - Policy and Guidelines Aquatic Habitat Management and Fish Conservation 1999;
 - North Coast Regional Environmental Plan 1988; and,
 - Priority actions for species protected under the *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Consideration

The report fails to adequately address the key question of why a reduced vegetated buffer (as small as 10 metres) should be considered acceptable in this instance. Key pieces of policy and legislation relevant to the issue have not been addressed and incorrect buffer distances have been quoted in the report. Furthermore, no consideration has been given to the requirement of buffers for threatened species of fauna (under the *Threatened Species Conservation Act 1995* or the *Environment Protection Biodiversity Act 1999*) within the wetland and EEC area.

The buffer width recommended for a particular wetland or ecological community will be dependent upon the conservation significance of the wetland, the quality and type of vegetation, the fauna within the wetland and the purposes of the buffer. The buffer is there to absorb impacts and bear the brunt of adverse impacts associated with proximity to urban development. The buffer can be expected to degrade over time and will need regular maintenance to ensure its effectiveness. Its effectiveness in minimising impacts on sensitive vegetation depends on its width (Smith & Smith, 1997).

As a general guideline to protect wetland's environmental values, the Water and Rivers Commission of Western Australia recommends that a minimum buffer of 50 metres is established from the boundary of wetland dependent vegetation. Buffers are designed to protect wetlands from potential deleterious impacts while helping safeguard and maintain ecological processes and functions within the wetland and, wherever possible, in the buffer. Buffers also act to protect the community from potential impacts such as mosquitos and midges (Water and Rivers Commission of WA).

The DECC advises that the distance of at least 50 metres has been a benchmark for over a decade and is deemed a suitable and viable buffer distance for this proposed development. A 50 metre buffer will serve several key recovery functions to address the identified threats to the endangered ecological communities as outlined in their Final Determinations, including:

- Further clearing for urban and rural development, and the subsequent impacts from fragmentation;
- Flood mitigation and drainage works;
- Land filling and earthworks associated with urban and industrial development;
- Changes in water quality, particularly increased nutrients and sedimentation;
- Weed invasion;
- Climate change;
- Rubbish dumping; and,
- Frequent burning which reduces the diversity of woody plant species.

DECC also advises that a review of the *Coffs Harbour Local Environmental Plan* in 1996 by State Agency representatives developed common standards and approaches to natural resource management issues. For environmentally sensitive areas a 50m buffer distance was derived by the Agencies. It was considered that environmentally sensitive areas would be expected to include:

- Native vegetation, fauna habitat and/or refuges of local, regional or state conservation value;
- SEPP 14 Wetlands;
- SEPP 26 Littoral Rainforest (100m buffer);
- Significant habitat for threatened fauna;
- National Parks and Nature Reserves.

DPI's policy with regard to aquatic habitat buffers outlined in *Policy and Guidelines Aquatic Habitat Management and Fish Conservation 1999* requires a buffer of at least 50 metres wide, increasing to 100 metres or more where they are adjacent to ecologically sensitive areas. This policy has not been achieved.

The *NSW Coastal Design Guidelines* specify the following in relation to buffers to ecologically sensitive areas:

- setbacks are designed to protect ecosystems and reserves covered under SEPP 14, SEPP 26, SEPP 44 as well as saltmarsh and mangrove communities and riparian vegetation;
- for new developments, setbacks should be at least 50 metres wide as a precautionary measure where possible, increasing to 100 metres or more where they are adjacent to ecologically sensitive areas;
- setbacks should be retained in public ownership;
- stormwater detention areas should not be located within setbacks to sensitive ecologies, as this reduces the level of environmental protection;
- existing and remnant native vegetation should be protected through generous setbacks and defined points of access;
- areas adjoining freshwater estuarine, coastal habitats and the coastal edge should be managed to reduce land use impacts through setbacks that also support the protection of sensitive ecologies, provision of public access along the foreshores and to natural areas, protection of properties from the effects of sea-level rise and improvement of water quality;
- setbacks should address coastal erosion hazards such as river flooding, sea-level rise, and changes in tidal current position; and,
- setbacks for redevelopment should consider a 100 year planning timeframe to address shore line retreat and sea-level rise.

The “*North Coast handbook for avoiding and reducing rural land use conflict and interface issues*” (Final Draft) 8 October 2007 prepared by Rob Learmonth, Rik Whitehead, Bill Boyd, Stephen Fletcher, in consultation with the North Coast Land Use Conflict Project Working Group, sets a minimum buffer distance of 100 metres between residential areas and wetlands and 50 metres between residential areas and native vegetation / habitat. The Working Group consists of representatives of all north coast local councils, DPI, DECC, Northern Rivers CMA, Southern Cross University and the Department of Planning.

The wetland buffer may be degraded or lost as a consequence of weed invasion, recreational users, urban development and road construction. Management is needed to prevent the loss of the buffer in the longer term. In rehabilitating and revegetating the wetland buffer a selection of native species analogous to those species already in the wetland should be used.

The Rough-shelled Bush Nut (*Macadamia tetraphylla*) is listed as vulnerable under both the NSW TSC Act and the Commonwealth EPBC Act. Recovery actions for this species include protecting areas of habitat from clearing or development and expanding and connecting remnant patches of habitat.

The single plant discovered on site is growing on a steep slope and is not within a building envelope or within an APZ. There is a chance that there is viable soil-stored seed within the vicinity of the plant. Further consideration should be given to undertaking weed control and revegetation to link up this isolated plant with the wetland vegetation allowing future ecological interactions to occur. At present

the vegetation on the steep slope at Fraser Drive is fairly poor habitat and without active management in the form of a connecting corridor the surviving plant will eventually die causing a localised extinction.

Recommendations

- The vegetated buffer should be increased to incorporate part of the integrated housing allotment.
- A vegetated linkage should extend across Lots 166 – 168 to protect the Rough-shelled Bush Nut.
- Provide a 20m APZ outside of the ecological buffer between the EECs and the proposed integrated housing allotment – the APZ may include perimeter roads and cleared road verges, or otherwise should be contained in private ownership (e.g. community title body corporate) to ensure ongoing appropriate maintenance;
- Upgrade the tidal floodgates under James Drive to Council-approved floodgates to improve fish passage and improve mosquito and midge management. The floodgates should use a calibrated tidal mechanism, similar to that used in a number of sites throughout the Tweed, that would permit some fish passage, flushing of waters behind the gate and by shutting down at a predetermined tide height would continue to sustain both saltmarsh and freshwater wetland plant species
- Details regarding the proposed stormwater treatment train using water sensitive urban design techniques for the integrated housing lot should be provided as part of the revised stormwater management plan.

Our Ref 721429 :kjd
Contact John Delaney

27 September 2007

Mr Pradesh Ramiah
Senior Planner
PMM Group
GPO Box 4401
SYDNEY NSW 2001

By facsimile: 02 8270 8399

Dear Sir

PROPOSED RESIDENTIAL SUBDIVISION - FRASER DRIVE, SOUTH TWEED HEADS

In response to your request for a response to the SEPP 14 Wetland submissions and issues raised by the Department of Planning, in correspondence dated 15-08-07, we are please to provide the following.

SEPP 14 Buffer

The following issue was raised concerning the proposed buffers to the SEPP 14 Wetland area that occurs on the site:

The proposed buffer to the SEPP 14 Wetland is insufficient. The Broadleaved Closed Forest to Woodland community and Swamp She-Oak Closed forest to Woodland Community as mapped, extend across the 50 metre buffer to the SEPP 14 Wetland. These communities are considered to be broadly analogous to three Endangered Ecological Communities listed under the Threatened Species Conservation Act 1995 and are associated with the SEPP 14 Wetland.

Although the actual extent of the SEPP 14 wetland appears to have been groundtruthed, the 50 metre buffer has been taken from the previously mapped boundary, and not the groundtruthed boundary.

The SEPP 14 maps are by no means accurate and should only be used as an indication of the extent of the wetland area. The boundaries were initially identified from stereo interpretation of 1:25000 aerial photographs dated 1984 and 1986 and are subject to regular amendments. The plans should be amended to include a 50 metre buffer from the groundtruthed SEPP 14 wetland boundary.

The aim of the State Environmental Planning Policy (SEPP) 14 is to ensure that the coastal wetlands are preserved and protected in the environmental and economic interest of the State. SEPP 14 specifically states that " *this policy applies to the land outlined by the outer edge of the heavy black line on the map.* " And in this respect the policy does not allow for the amendment of SEPP 14 Wetland boundaries based on field surveys.

Whilst SEPP 14 does not prescribe a specific setback or buffer between development and a SEPP 14 Wetland, it is acknowledged that State Agency Staff have generally accepted that 50 metres is an appropriate buffer width to environmentally sensitive areas including SEPP 14 Wetlands. Given that the location of the SEPP14 Wetland on the site is set by the SEPP 14 maps, the location of the 50 metre buffer to the SEPP 14 Wetland has been accurately mapped.

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

5 Gardner Close Milton Q
4064
PO Box 388 Toowong
Queensland 4066
Australia
Telephone: 07 3369 9822
Facsimile: 07 3369 9722
International: +61 7 3369
9822
cardno@cardno.com.au
www.cardno.com.au

Cardno Offices

Brisbane
Sydney
Canberra
Melbourne
Perth
Darwin

Cairns
Townsville
Mackay
Rockhampton
Hervey Bay
Sunshine Coast
Toowoomba
Gold Coast
Gosford
Baulkham Hills
Wollongong
Busselton

Papua New Guinea
Indonesia
Vietnam
China
Kenya
United Arab Emirates
United Kingdom
United States



The real issue is whether sufficient buffering has been provided between proposed residential land uses and areas of vegetation analogous to Endangered Ecological Communities (EECs), listed under the *TSC Act 1995*, that are located outside of the SEPP 14 Wetlands. In making such an assessment it is relevant to consider the nature of the buffers provided, the existing characteristics of the land located within the buffer, and the nature of proposed land uses within and adjacent to the buffer. In these respects the following points are noted.

- a. The proposed plan of development makes provision for the establishment of a Public Open Space reserve containing the SEPP 14 Wetland and a minimum 50m wide buffer to the SEPP 14 Wetland. The proposed Public Open Space Reserve also contains the majority of areas of ECCs located outside of the SEPP 14 Wetland, with the balance of the ECCs being located on proposed Lot 168.
- b. The proposed plan of development also makes provision for a 30 metre wide setback between the outer edge of the ECCs and adjacent building location envelopes defined for Lot 168 and the Integrated Housing site.
- c. The land encompassed by the 30 metre buffer to ECCs is mainly cleared land that has been affected by bulk earthworks and drainage works which have been carried out in accordance with existing development approvals.
- d. Our preliminary assessment of Asset Protection Zone width requirements for Lot 168 and the Integrated Housing site, using the NSW Rural Fire Service's 2006 Guidelines, are approximately 20m and as such there would be no need for vegetation clearance works within the SEPP Wetland or ECC to mitigate against the hazards of bushfire.
- e. The proposed buffers will function to mitigate against potential adverse impacts to the SEPP 14 Wetland and associated ECCs by:
 - preventing further clearing that may be required for the protection of urban development from hazards such as bushfire;
 - prevention of adverse impacts associated with flood mitigation/drainage works, land filling and earthworks associated with urban development;
 - mitigation of the potential for adverse changes in water quality, particularly increased nutrients and sedimentation associated with adjacent development;
 - mitigation of adverse impacts associated with altered micro-climate conditions (i.e. clearance of adjacent vegetation promoting invasion of weed species); and
 - mitigation of the potential for unauthorised physical disturbance or dumping of refuse.

In summary, it is our assessment that:

- to provide a consistent approach to the long-term management of ECCs that occur on the site it is recommended that the layout of development be amended such that the small area of ECCs that occurs in proposed Lot 168 is encompassed by the proposed Public Open Space reserve;
- the proposed development layout includes appropriate provisions for buffers that will facilitate the retention and protection of the SEPP 14 Wetlands and associated ECCs; and
- as part of the site development process a Management Plan should be prepared for the SEPP 14 Wetlands, associated ECCs and defined buffers to ensure that there is an integrated and consistent approach to the management of these areas during the detailed design, construction and occupational phases of urban development. Such a Management Plan would consider a range of issues including: stormwater management, bushfire management, landscaping, rehabilitation, roles and responsibilities.

Stormwater Management

The following issue was raised concerning stormwater management and the SEPP 14 Wetland area that occurs on the site:

It is proposed to drain part of the site to the SEPP 14 wetland in the southwest of the site. Clause 7(e) of SEPP 14 states that the consent authority should give consideration to establishment of whether any feasible alternatives exist to the draining to the wetland (either on other land or by other methods) and if so, the reasons give for choosing to drain to this location. Alternative methods for draining this land have not been considered.

If the only method for managing stormwater in the north-west of the site is to drain to the SEPP 14 wetland, further certainty regarding the effectiveness of the proposed management techniques to provide an acceptable level of protection to the wetland ecology is required. A conceptual MUSIC modelling exercise should be undertaken to demonstrate that the proposed stormwater management techniques will provide adequate protection to the wetland in terms of stormwater quantity (environmental flows) and quality.

Currently overland flow on the site drains to the wetland in the north west of the site, contributing suitable hydrological conditions for the continued existence of the SEPP 14 wetland and associated EECs. The proposal aims to maintain the existing conditions and flow regime on the site through the provision of water sensitive urban design concepts in a treatment train configuration. The proposed treatment train will maintain the existing flow regime whilst ensuring stormwater pollutants are treated to the required standard.

Diverting stormwater run-off to an alternate location would limit the stormwater recharge into the SEPP 14 wetland, thereby disrupting the flow regimes required to maintain the wetland and associated EECs. As such there are no viable stormwater run-off management alternatives warranting consideration.

In respect of water quality issues, it is noted that the proposal will involve the use of a constructed wetland to provide for the treatment of urban run-off prior to it being released into the downstream SEPP 14 Wetland. In this respect the Tweed Shire Council has developed a series of guidelines to inform the design, construction and maintenance of constructed wetlands and the development will adopt the "deemed to comply" provisions within these guidelines. It is also noted that the effectiveness of the constructed wetlands cannot be determined through MUSIC modelling.

As noted previously, it is our assessment that a consolidated Management Plan should be prepared for the SEPP 14 Wetlands and associated ECCs to guide the detailed design, construction and occupational phases of urban development. This Management Plan should provide an integrated strategy addressing a range of issues including: stormwater management, bushfire management, landscaping, rehabilitation, roles and responsibilities.

Should you have any queries concerning the information provided herein please do not hesitate to contact the undersigned.

Yours faithfully

John Delaney
Principal Ecologist
for **Cardno**