6.2 a Vegetation Survey Report 3D

Vegetation Survey Report

of the proposed

'Ella Bay Integrated Resort Project'

Prepared by

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for

Satori Resorts

on behalf of

Biodiversity Assessment and Management Pty Ltd

Final _May 2011

Executive Summary

The Ella Bay Integrated Resort site (EBIR) is located approximately nine kilometres to the north-east of Innisfail, adjoining the extensive swampland and rainforest of the Ella Bay National Park. Although nestled within the Wet Tropics World Heritage, the proposed development site is degraded with significant exotic weed infestation within paddocks dominated by introduced pasture grass and exotic shrubs.

A floristic survey of the project site, including assessment of a proposed road access corridor, was undertaken over three stages between August 2006 (six months after the advent of Cyclone Larry) and October 2008. Latter survey periods provided comparative information on the rate of forest recovery after significant disturbance. A total of 40 quaternary sites, 19 secondary (and tertiary) sites, four primary monitoring sites and four secondary monitoring sites were completed throughout various stages of the survey. Across all project components, the survey identified 18 regional ecosystems with one of these being listed under the VMA as 'endangered', 13 as 'of concern' and 4 as 'not of concern'. The EPBC threatened ecological community '*Littoral Rain Forest and Coastal Vine Thickets of Eastern Australia* (critically endangered)' was also identified in areas marginal to the development site and adjacent to the proposed access corridor.

Four plant species recorded during the study are considered significant under Queensland's NCA. *Macaranga polyadenia, Endiandra globosa, Icnanthus pallens var. majus* and *Rourea brachyandra* are all listed as 'Near-threatened' under the NCA. Populations of *Rourea brachyandra* and *Endiandra globosa* are particularly well developed in the southern portion of the proposed road access corridor, occurring in well developed mesophyll vine forest. No species scheduled as significant under the EPBC Act were identified during the survey although several species are identified as likely to occur within the project area. Habitat suitable for *Carronia pedicellata* (endangered), *Arenga australasica* (vulnerable), *Canarium acutifolium* var. *acutifolium* (vulnerable), *Hupzeria phlegmarioides* (vulnerable) and *Aponogeton proliferus* (endangered) is present within the study area and potential for their occurrence is moderate to high.

The initial floristic survey completed six months after the impact of Cyclone Larry (August 2006) indicated canopy foliage was largely stripped by extreme wind, and in lower structural layers, foliage was often wilted from increased solar exposure. This initial survey

method was not tailored to provide repeatable measurements although subsequent floristic survey completed in October (2008) established permanent vegetatation monitoring sites within the EBIR project area. These sites can be used to provide repeatable measurements of foliage projected cover (FPC) on an annual basis, useful to detect changes to foliage vigour in future monitoring cycles, whether these be attributed to local site disturbance or long term seasonal cycles. Whilst it is not possible to provide any quantifiable measurement of the recovery of forest communities on the site in the time lapsed since the original survey, photographic comparisons between survey site EB6 provide evidence for a rapid recovery of foliage cover and vigour within the community (RE7.3.3) in all structural layers. A similar recovery in canopy and foliage cover was noted in the majority of vegetation communities examined in the latter survey period.

Vegetation Survey Report
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List of Abbreviations

BAAM	-	Biodiversity Assessment and Management Pty Ltd
DEH	-	Department of Environment and Heritage (Commonwealth)
DPI	-	Department of Primary Industries (Queensland)
EPA	-	Environmental Protection Agency (Queensland)
EBIR	-	Ella Bay Integrated Resort Site
EPBC	-	*Environment Protection and Biodiversity Conservation Act 1999*
IPA	-	*Intergrated Planning Act 1997*
JSC	-	Johnstone Shire Council
LGA	-	Local Government Area
LPA	-	*Lands Protection (Pest and Stock Route Management) Act 2002*
NCA	-	*Nature Conservation Act 1992*
NRMW	-	Department of Natural Resources, Mines and Water (Queensland)
RE	-	Regional Ecosystem
REDD	-	Regional Ecosystem Description Database
SAC	-	Southern Access Corridor (Road Access)
VMA	-	*Vegetation Management Act 1999*
WONS		Weeds of National Significance
WTMA		Wet Tropics Management Agency

1.0 INTRODUCTION

This report has been compiled for Biodiversity Assessment and Management Pty Ltd for the purpose of providing an independent and comprehensive flora assessment for the proposed Ella Bay Integrated Resort development site (EBIR), including an assessment of associated infrastructure including an access road and pedestrian boardwalk. The EBIR is located nine kilometres to the north of Flying Fish Point with the southern-most portion of the access road beginning on freehold land to the immediate west of the Flying Fish Point Township.
The assessment includes:

- A comprehensive survey of the terrestrial vegetation present within the study area including Regional Ecosystem (RE) descriptions and flora species lists;
- Significance of flora, both observed and potential, under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC), Queensland *Nature Conservation Act 1992* (NCA), Queensland *Vegetation Management Act 1999* (VMA);
- An evaluation and comment on the presence or absence of any significant vegetation communities on the property, including those currently mapped under Queensland's RE mapping, EPBC significant communities and the location of any additional communities of conservation significance identified during the course of the study;
- Identification of significant land management issues that may impact the development and comment on the landowner obligations to address these issues under current legislation;

All following observations and recommendations are based on a thorough review of available literature and detailed site investigation undertaken over a number of stages in August 2006, March, 2007 and October 2008.

2.0 STUDY AREA DESCRIPTION

2.1 LOCATION

The EBIR study site concerns Lot 30 on Crown Plan N157629, located approximately nine kilometres to the north-east of Innisfail within the Wet Tropics Bioregion. The site adjoins the extensive swampland and rainforests of the Ella Bay National Park to the north, south and west with a small boundary section adjoining freehold land in the far south west corner

of the property. The Ella Bay National Park forms part of the Wet Tropics World Heritage area.

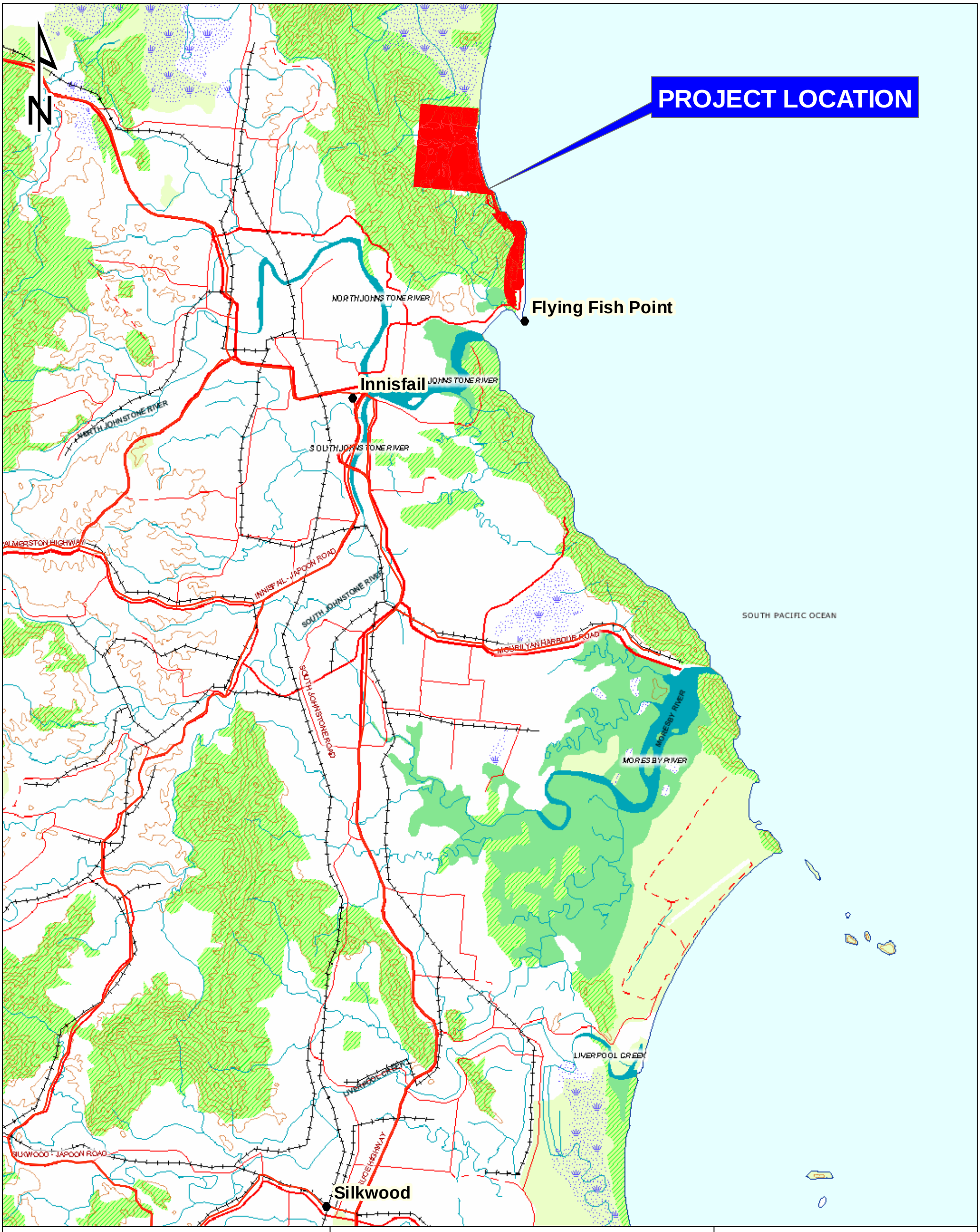
The proposed access road traverses unallocated State Land (Lot 8 USL35566, Lot 18 USL35566) in its southern section, National Park (NPW151) throughout much of its northern section, and fringes the boundary between National Park and freehold allotments (Lots 246 on NR3550 and 235 on NR7590) in its central and central / southern sections. The proposed road corridor is herein referred to as the "Southern Access Corridor (SAC)" for descriptive purposes. A proposed beachfront pedestrian walkway extending from immediately north of the Flying Fish Point township to the location of the council picnic ground, was assessed as an additional study component. The location of the study areas, including infrastructure components is provided in **Figure 1.**

2.2 LAND USE AND TERRESTRIAL FEATURES

The EBIR site was largely cleared in the late 1960's, and has been utilised mainly for pastoral purposes since that time. The utilised land is generally degraded with significant areas of exotic weed infestations within paddocks of introduced pasture grasses, namely Signal Grass (*Brachiaria decumbens*) and Humidicola (*Brachiaria humidicola*).

A vegetated buffer of approximately 300m is retained on the northern boundary adjacent to the National Park, and a fairly extensive and irregular natural buffer is retained along the national park boundary in the south. Two relatively large natural drainage features, with associated minor tributaries traverse the cleared area, both streams possessing continuous, although highly degraded, strips of riparian rainforest vegetation, which are continuous with the more extensive tracts of natural rainforest vegetation to the west.

Access to the property is obtained from an unsealed road cut into the steep rocky coastline to the south, linking the property with developed areas of Flying Fish Point. A permanent dwelling, with associated sheds and machinery is located on footslopes in the south-eastern corner of the property. Infrastructure is otherwise limited to property improvements such as a well-developed and maintained system of fence lines and cattle yards and concrete causeways have been erected on the major stream crossings.



NOTES:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

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Figure 1. Site locality

Client

Satori Resorts

0 2,000 4,000 6,000 8,000

Metres

Scale	1:107,549	Drawn By	DG	Checked	DS	File Path	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	Date	13/02/09	A3

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2.3 GEOLOGY, SOILS AND TOPOGRAPHY

The EBIR study area is located within a coastal enclave, bound to north, west and south by the broadly circular Seymour Range which pinches into the coastline at Cooper Point to the north, and Heath Point to the south. The stretch of coastline between these headlands is occupied by a pro-grading sandy shoreline, passing westward into a series of low and topographically degraded parallel beach ridges. The highest topographic feature on the property is a low domed hill rising to 68m in the south, on which the homestead is located. The majority of the utilised land (cleared) occupies a broad coastal alluvial plain which slopes gently toward the east, falling from an elevation of 20m on the western margin of the property, to approximately 2m on the coastal fringe over a distance of approximately 2km.
The geology is relatively simple, comprising of; highly deformed quartz-mylonites and green schists of the Barron River Metamorphic group (de Keyser et al. 1962) on the foothills in the south; an overlapping series of incised relict alluvial fans on the coastal plain, which are overlain by an irregular series of degraded parallel sand ridges and associated swales on the coastal fringes. Over large areas of cleared and highly degraded land, these relict sand ridges are no longer recognisable surface features with the sand being re-dispersed due to intensive cattle grazing. Soils range from yellow dermosols (silty clay loams) on the metamorphic footslopes, brown kandosols (deep silty loams) on the alluvial plains, and orthic tenosols (dune sands) on the parallel dunes. The alluvial plains are interspersed with aquic hydrosols (permanently wet clays soils) which form swamplands in dune swales and as scattered swampy depressions across the coastal alluvial plain (Mackenzie et al. 2004).

Although located on a narrow coastal corridor, the SAC study area demonstrates some geomorphic diversity with coastal outwash plains, metamorphic headlands and ridgelines, with minor sections located on stabilised dune sands. Heath Point forms the most easterly feature rising from the coastline westward as a poorly defined spur to join the north- south trending Seymour Range to the west. Heath Point divides the coastal alluvial plains formed behind Ella Bay to the north and Flying Fish Point to the south. Both coastal plains possess a narrow fringe of low dune ridges on their seaward margins, which have minor incursions into the SAC.

Table 1 provides a breakdown of the geological features recognised on the project site, brief descriptive notes and a land zone classification consistent with those of the EPA (2006).

Table 1. Landform and geological elements recognised on the study site

Geological Attribute	Geological Description	EPA Land Zone
A	Alluvial plains, riverine flood plains, drainage depression and swamps (excluding dune swales).	3
D	Relict parallel beach ridges and coastal foredunes.	2
DS	Swampland associated with dune swales.	2
M	Quartz mylonites, schists, and associated metamorphic rocks.	11

2.4 DRAINAGE FEATURES AND HYDROLOGY

The EBIR site drains the steep sided circular coastal enclave of the Seymour Range, although drainage features on the property are relatively mature, deeply incised into their own flood plain alluvium to depths of up to 4m. Streams are often characterised by well defined meander bends, cut away banks and narrow point bar deposits. The major streams were flowing at the time of survey with regular runs and pools, over a typically sandy bed load. The two largest streams are of third order and traverse the coastal plain within the project area. Surface hydrology is complex with broad, seasonally inundated drainage depressions, often in dune swales, and a number of isolated swamplands scattered across the alluvial landscape. These swamplands overflow during wet periods, nourishing local watercourses, helping to maintain stream flow and ground water levels well into the dry season. The swamplands also introduce a degree of ecological complexity into the landscape.

Several creeklines of various sizes are traversed by the SAC. The largest of these has permanent water and is located within NR5994 to the immediate north of the National Park boundary. This creekline has few riffle zones, replaced by pools of water with a sandy or sediment bedload, terminating seaward in a sandy swale which breaches the coastal foredune. Other smaller watercourses do not appear to contain permanent water, but are likely to run regularly with rainfall. These are typically steep, fast flowing streams with rock or boulder bedloads.

3.0 STUDY METHODS

The survey was undertaken over three stages with an initial 2 day survey conducted on the EBIR site in August 2006. A secondary phase of survey was conducted in July 2007 to confirm ecological information and provide a preliminary identification of floristic constraints on the SAC. A final phase of ecological survey was completed in October 2008. This assessment provided supplementary floristic survey of the EBIR site, allowing an assessment of floristic integrity and vegetation recovery 2.5 years after the advent of Cyclone Larry. Detailed floristic survey was also undertaken on the SAC, providing detailed mapping of EVR species locations. Vegetation on the proposed beachfront access corridor was also undertaken during this period.

3.1 DESK TOP

Prior to the field survey, relevant databases were searched in order to provide background information regarding flora species known from the region and local area. This included searches of the Commonwealth's EPBC Online Protected Matters Search Tool, the Queensland Herbarium's HerbRecs database and the EPA's WildNet database. Information gained from this phase of the study was used to ensure that survey methods were designed to detect flora species of significance known from the region. All other available and relevant information relating to the vegetation and flora of the study area was reviewed. This included previous comprehensive vegetation surveys of the study area or surrounds, aerial photography analysis, geology, land zones and topography, and relevant planning documentation administered by JSC and the Queensland Government.

3.2 FLORA SURVEY

3.2.1 Survey Effort and Transect/Site Selection

Survey sites on the EBIR site were chosen from a preliminary stereoscopic analysis of aerial photographs captured at a variety of scales and years, in conjunction with available mapping data from the Queensland Herbarium mapping database, and mapping data of Stanton and Stanton (in prep.). Beach Protection Authority Photographs at 1:12 000 scale (2001) partial coverage of the seaward portions of the EBIR, and coverage was supplemented with more recent 1:40 000 scale (2004) aerial photographs provided by the Department of Natural Resources, Mines and Water. Aerial photography post dating Cyclone Larry (March 2006)

was supplied in digital format for the 2008 survey effort, although the inability to view the photography stereoscopically meant that its use was largely limited to rectification of digitised vegetation line work. Throughout the course of the field survey, survey sites additional to those chosen during desktop assessment were added opportunistically. The initial 2006 phase of survey resulted in a total of 18 sites sampled to mainly Tertiary level. The supplementary survey completed in October 2008 resulted in an additional 11 sites, including 4 sites chosen as permanent points for vegetation monitoring. The locations of the vegetation survey sites are listed in **Table 2** [Vegetation Survey Site Locations] and shown on **Figure 2a** [Flora Survey Site Locations].

Table 2. Vegetation Survey Site Locations[1] of EBIR site.

Survey Site No.	Survey Effort	Survey Period	Latitude	Longitude
EB1	Quaternary	Aug. 06	0706412	8643174
EB2	Tertiary	Aug. 06	0400457	8068970
EB3	Tertiary	Aug. 06	0400398	8068967
EB4	Quaternary	Aug. 06	0400372	8068866
EB5	Tertiary	Aug. 06	0399540	8069164
EB6	Tertiary	Aug. 06	0399468	8070362
EB7	Tertiary	Aug. 06	0399487	8070306
EB8	Tertiary	Aug. 06	0399485	8070314
EB9	Quaternary	Aug. 06	0399782	8070293
EB10	Quaternary	Aug. 06	0399458	8070164
EB11	Quaternary	Aug. 06	0399157	8069517
EB12	Tertiary	Aug. 06	0400374	8069118
EB13	Quaternary	Aug. 06	0400318	8069213
EB14	Quaternary	Aug. 06	0400060	8068741
EB15	Quaternary	Aug. 06	0400120	8068786
EB16	Tertiary	Aug. 06	0400581	8068806
EB17	Tertiary	Aug. 06	0400611	8068438
EB18	Tertiary	Aug. 06	0400320	8068337
EB8c	Quaternary	October 08	0400090	8070356
EB8f	Quaternary	October 08	0400182	8070251
EB8g	Quaternary	October 08	0400010	8070196
EB20	Quaternary	October 08	0400123	8070279
EB21a	Quaternary	October 08	0399181	8069130
EBQ22a	Quaternary	October 08	0399770	8069130
EBQ23a	Quaternary	October 08	0400718	8068784
EBM3a	Permanent Monitoring	October 08	0399642	8069806
EBM6a	Permanent Monitoring	October 08	0399470	8070368
EBM8a	Permanent Monitoring	October 08	0399378	8070342
EBM20a	Permanent Monitoring	October 08	0400098	8070284

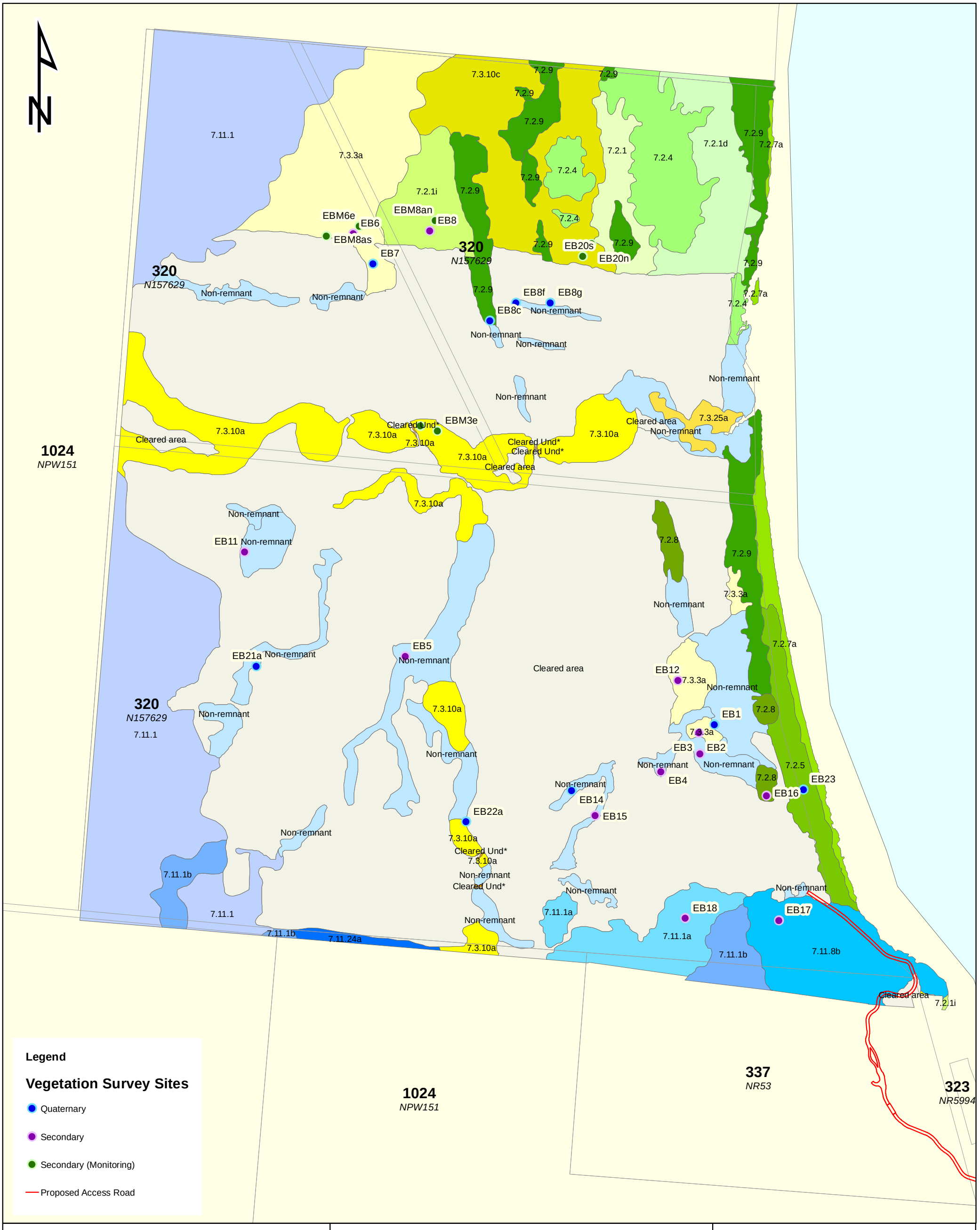
Sample sites on the the SAC were chosen from stereo photography prior to field survey with a total of 9 detailed sites recorded during the July 2007 survey effort and an additional 10 Quaternary sites recorded during the October 2008 survey. An additional four detailed

secondary sites were sampled in the latter survey in conjunction with establishment permanent monitoring sites. Thirteen opportunistic quaternary sites were also sampled on the beachfront north of Flying Fish Point to assess vegetation condition and remnant status in the vicinity of the proposed pedestrian board walk. The locations of these sites is shown in **Figure 2b** with GPS Co-ordinates and sample intensity recorded in **Table 3**.

Table 3. Site locations on the SAC and Flying Fish Point beachfront area.

Site No.	Site Intensity	Survey Period	E	N
	SAC			
ERL1	Secondary	July 2007	401955	8068552
ERL2	Secondary	July 2007	400457	8068970
ERL3	Secondary	July 2007	400398	8068967
ERL4	Secondary	July 2007	401606	8067429
ERL5	Secondary	July 2007	401526	8067336
ERL6	Secondary	July 2007	401415	8067651
ERL7	Secondary	July 2007	401125	8067970
ERL8	Secondary	July 2007	401187	8067841
ERL9	Secondary	July 2007	401649	8064925
EBM1(n)	Primary (permanent monitoring)	October 2008	401542	8065828
EBM1(s)	Primary (permanent monitoring)	October 2008	401544	8065781
EBM2(n)	Primary (permanent monitoring)	October 2008	401507	8065871
EBM2(s)	Primary (permanent monitoring)	October 2008	401514	8065812
EBM(NP)1 -S	Primary (permanent monitoring)	December08	401508	8066098
EBM(NP)1 -N	Primary (permanent monitoring)	December08	401514	8066156
EBM(NP)2 -S	Primary (permanent monitoring)	December08	401477	8067565
EBM(NP)2- N	Primary (permanent monitoring)	December08	401445	8067605
EBRQ12a	Quaternary	October 2008	401733	8067351
EBRQ12b	Quaternary	October 2008	401862	8067341
EBR1	Quaternary	October 2008	401545	8065762
EBR2	Quaternary	October 2008	401545	8065762
EBR3	Quaternary	October 2008	401545	8065762
EBR4	Quaternary	October 2008	401505	8065316
EBR6	Quaternary	October 2008	401525	8065290
EBR7	Quaternary	October 2008	401523	8065260
EBR8	Quaternary	October 2008	401532	8065149
EBR9	Quaternary	October 2008	401521	8065078
	Beachfront			
EB24	Quaternary	October 2008	401932	8066016
EB25	Quaternary	October 2008	401954	8066040
EB26	Quaternary	October 2008	401964	8066116
EB27	Quaternary	October 2008	401959	8066169
EB28	Quaternary	October 2008	401959	8066194
EB29	Quaternary	October 2008	401982	8066288
EB30	Quaternary	October 2008	401991	8066423
EB31	Quaternary	October 2008	401960	8066512
EB32	Quaternary	October 2008	402004	8066527
EB33	Quaternary	October 2008	402000	8066960
EB34	Quaternary	October 2008	402006	8066766
EB35	Quaternary	October 2008	402024	8066878
EB36	Quaternary	October 2008	402008	8066907

[1] Map Datum GDA94 and locations recorded on Garmin GPS.



Legend

Vegetation Survey Sites

- Quaternary
- Secondary
- Secondary (Monitoring)
- Proposed Access Road

N O T E S:

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Map 2a: Ella Bay Resort Site - Site Locations

Client

Satori Resorts

0 200 400 600 800

Metres

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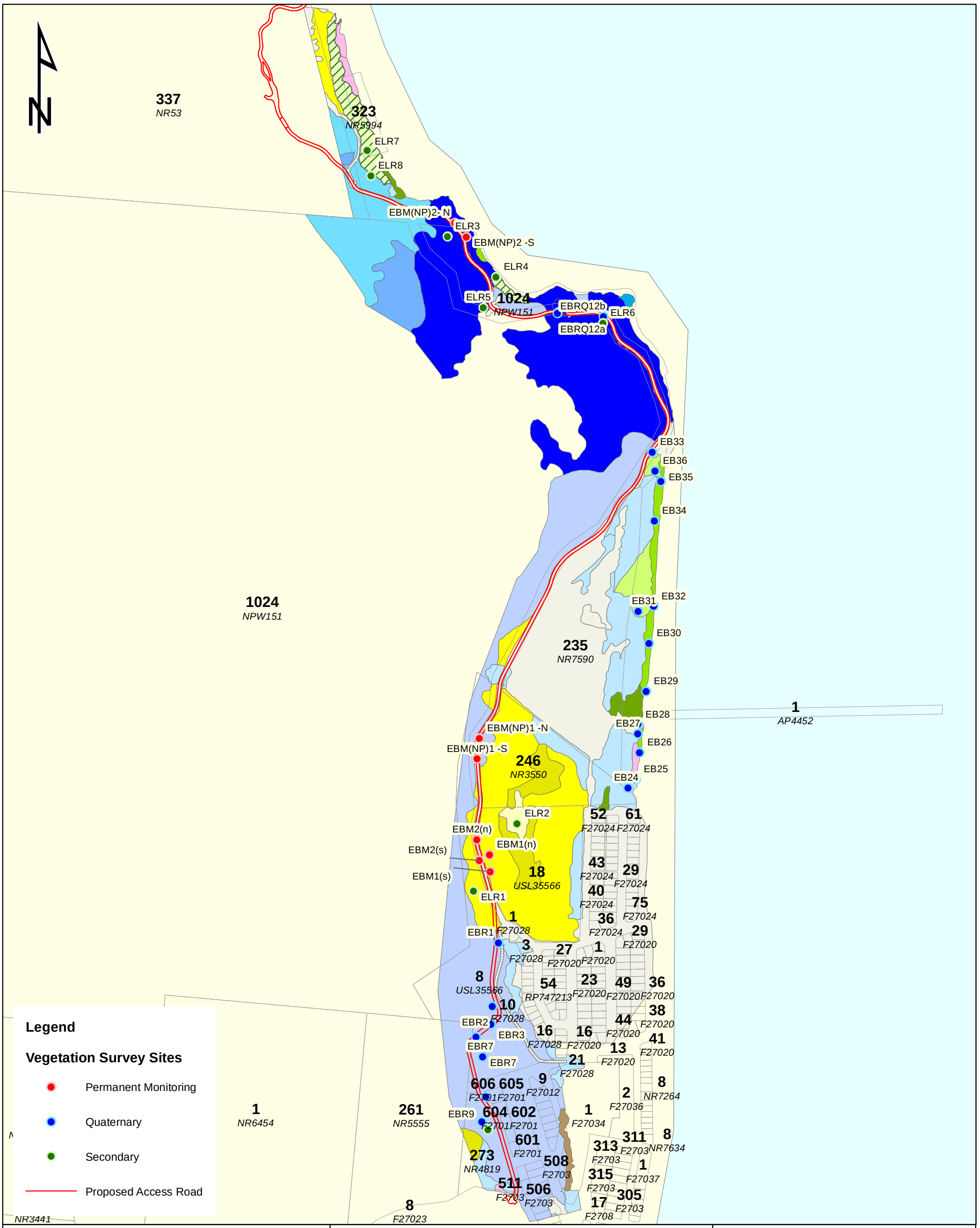

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Map 2: Road Area - Site Survey Locations

Client

Satori Resorts

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

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3.2.2 Survey Techniques

EBIR Site

Of the18 sites selected for vegetation survey during the August 2006 survey period within the EBIR, 11 sites were sampled to a tertiary level. Due to the extreme wind disturbance created by the incursion of Cyclone Larry into the study area in March 2006, standard 50m by 10m vegetation transect plots proved an unfeasible method of assessment for most rainforest communities, and the method was modified to allow an easier negotiation of windfall and dense thickets of *Calamus* (wait-a-while). Site data was collected using the Bitterlich method (Bitterlich 1974), with a radial sweep recording intercepts with canopy (T1), sub-canopy (T2) and shrubs (S1). A full record of species from all structural layers was then recorded from within the sweep area. This method allowed an assessment of the basal area of individual structural layers and defined an area over which detailed botanical investigation was made.

Transects for recording canopy cover was not a useful survey method as much of the canopy was stripped, canopy trees often being degraded to single upright stems devoid of branches, or in the case of some palm forests, destroyed through extreme windfall. Canopy cover counts registered using this method were extremely low (<40% in most cases) rendering much of the surveyed vegetation as non-remnant, if the definition as per the *Vegetation Management Act (1999)* is stringently applied. In order to make a comparative assessment of canopy cover, the Bitterlich method was applied to selected sites, to maintain a consistency of approach across the project area. This allowed direct comparisons of standing biomass between disturbed and undisturbed sites. Other detailed data collected during the field survey includes; Topographic features such as slope and aspect; Geomorphic and geological features including parent rock types, soils, landform elements, and drainage features; Vegetation structural type details including predominant leaf size and structural complexity; Species lists and abundance; and Photographic references.

To provide a robust means to assess changes in vegetation structure and floristic composition into the future, four permanently marked monitoring sites were established within the study area during the October 2008 study period. Each site consisted of a measured fifty metre transect marked by star pickets (both ends of transect) and labelled for future reference. Transects were measured with 50 x $1m^2$ quadrats accurately positioned

along a stretched tape measure. From the centre of each quadrat, a densitometer was used to measure foliage cover of the all species which comprised the canopy layer (T1), sub-canopy (T2) and shrub layer the latter based on a combination upper (S1) and lower (S2) structural layers. Quantified information on foliage projected cover (FPC) for each structural layer, collected in a manner which is repeatable, will enable changes in vegetation vigour, structure and floristic composition to be detected into future monitoring efforts. Percentage cover for ground layers (G) was also recorded. Basal area measurements were also taken at a central point on the site transect using a Bittterlich gauge.

The majority of the monitoring sites are located on the northern fringe of the study area in the buffer zone between the Ella Bay National Park to the north, and the resort development site. The placement of sites in these locations will enable processes with potential to affect ecological values in the adjacent national park area to be identified at an early stage.

The 2008 assessment was extended to several locations within in the study site which were not examined in detail during the original survey, where specific questions in regard to the structural integrity and floristic composition of the vegetation required clarification. Assessment of these areas was completed with quaternary observation.

SAC and Beachfront Survey

An initial phase of field survey was completed in July 2007 over a two day period. Due to the extreme wind disturbance created by the incursion of Cyclone Larry into the study area in March 2006, standard traverse searches for Near-threatened and threatened species proved ineffective. Site assessment therefore consisted of detailed floristic survey in identified communities in accessible locations with nine secondary sites completed. This was followed by general roadside traverse along formed sections of the road corridor. All tenures were assessed on foot for habitat suitability and floristic representation. The dense nature of the forest regrowth meant full traverse of the entire route was not feasible.

Detailed sites were surveyed using the Bitterlich method with a radial sweep recording intercepts with canopy (T1), sub-canopy (T2) and shrubs (S1). A full record of species from all structural layers was then recorded from within the sweep area. This method allowed an assessment of the basal area of individual structural layers and defined an area over which detailed botanical investigation was made. Standard 50m by 10m vegetation transect plots proved an unfeasible method of assessment for the rainforest communities, and the method

was modified to allow an easier negotiation of windfall and dense thickets of *Calamus* (wait-a-while). A total of nine detailed (secondary) survey sites were recorded in the study areas, not including floristic information recorded during general traverse.

The October 2008 survey focused on a detailed assessment of EVR species along both formed and unformed sections of the proposed access road. A meandering foot traverse of the unformed southern portion of the proposed road, which passes to the west of the Flying Fish Point township, was undertaken to identify EVR species in the vicinity of the proposed alignment. The lack of any formal ground surveyed alignment, difficulty in establishing GPS locations (even in relatively open canopies), and access difficulties imposed by severely wind damaged vine forest, constrained the ability to maintain strict adherence to a precise route location. Any EVR species located during the traverse were flagged and GPS locations determined wherever possible. For some locations, GPS precision factors of +/- 60m only could be achieved. Species which could not be identified readily in the field, particularly those with potential to be EVR species, were retained for identification (or species confirmation) by a Wet Tropics botanical expert (Robert Jago).

The existing corridor along Ella Bay Road was assessed for EVR species to a distance of 5m from the road edge on both sides of the road wherever potential habitat existed. Particular attention was paid to areas where roadside widening was to be most pronounced, particularly adjacent to and south of the fish farm where construction of a cassowary exclusion fence is proposed. Attention also focussed on tight road corners along the existing road (within the Ella Bay National Park) where further widening is proposed.

The locations of EVR species were flagged in the field (with pink tape) and positions recorded by GPS. Where population clusters were identified, a central tree (vine or shrub) was flagged and the population cluster recorded in summary notes. Quaternary descriptions of vegetation were recorded in some locations to assist vegetation community classification and target searches for EVR species.

The assessment of the beachfront area undertaken on foot between the northern end of the rock wall at Flying Fish Point and the council picnic ground approximately 1.2 km to the north. Quaternary site data description was utilised to describe the condition of vegetation communities identified within the area of potential impact. Quaternary description included information on geomorphic process where relevant, description of remnant status (under the

Vegetation Management Act 1999), dominant species, and a list of component exotic species.

3.2.3 Vegetation Mapping

Department of Natural Resources, Mines and Water (DNRM & W) Regional Ecosystem (RE) mapping for the study area, as established under the VMA, was utilised as a basis for vegetation mapping in all study sectors. This was supplemented by the Wet Tropics 1:50 000 scale vegetation community mapping database and spatial layers (Stanton and Stanton, in prep.). It must be emphasised that whilst the regional ecosystem mapping is based largely on the mapping of Stanton and Stanton (2006), the latter serves a purely scientific and land management purpose only and provides no legislative significance. The 1:50 000 scale mapping proved a usable scale for the survey area, however detailed traverses conducted during this exercise and further assessment of 1:12 000 scale aerial photography indicates vegetation complexities at a finer scale than represented on the current RE mapping. These complexities related largely to the structural and floristic variations corresponding to changes in topography, soil and landform. Wherever possible, these floristic variations were recorded in site data and described as variations within the broad structural groupings and regional ecosystems. An assessment of community condition, reflecting historic and recent cyclone disturbance to a large degree, as well as logging history, was also made during the field exercise. This was largely a subjective exercise and could not be represented in a spatial form due to temporal limitations in the available aerial photography. Where possible however, areas of intact vegetation were noted and recorded in the site data as having high local conservation significance.

4.0 RESULTS

4.1 DESK TOP

4.1.1 Previous Studies

The earliest descriptions and mapping of vegetation in the Humid Tropical Region of North Queensland was carried out by Tracey (1982), wherein vegetation of the study area was mapped as a number of vegetation units including:

- Mesophyll Vine Forest (Type 2a): This type represents the distribution of extensive areas of rainforest on foothills and lowlands occurring below 400m (Tracey 1982). More recent detailed mapping throughout the Wet Tropical

Bioregion has been carried out by Stanton and Stanton (2005). This work forms the basis for the EPA regional ecosystem classification within the bioregion;

- Sclerophyll Vine Forest (Type 12c): A dominant open forest type on the foothills and coastal ranges dominated by *Acacia mangium.* This type was mapped in the vicinity of the homestead;
- Open forest of *Melaleuca quinquenervia* (Type 15a): Open forest of *Melaleuca quinquenervia* was mapped over extensive areas to the north of the property with a few enclaves mapped in the presently cleared areas; and
- Coastal foredune complex/mosaic (type 17): This community, comprising of a mosaic of woodland and shrubland types of coastal dune systems including those dominated by *Corymbia tessellaris* and *Casuarina equisetifolia* were mapped in a broad linear strip along the coastal fringe, extending north from the homestead.

It is interesting to note that this mapping was completed on 1960 aerial photography which predated clearing of the EBIR site. This allows pre-clearing information regarding original canopy structure and floristic composition to be evaluated.

Stanton and Stanton (in prep.) completed 1:50 000 scale mapping over the area utilising 1998 colour aerial photography flown specifically for vegetation mapping purposes. The mapping provided a more detailed breakdown of vegetation types across the property, and a classification of geological and landform types. This mapping identified: extensive areas of feather palm swampland to the north of the cleared paddocks (type A3a); significant areas of mesophyll vine forest on sand dunes and sand sheets classified under the categories of D72 (mesophyll vine forest with feather palms on shallow sand sheets); and mesophyll vine forest on sand dunes (D2b). Further refinement to the boundaries of a number of shrubland and woodland types, including extensive areas of *Melaleuca quinquenervia* open forest (types D33 and A33), and *Lophostemon* and *Corymbia* dominated open forest on coastal dunes (type D91) was achieved together with recognition of extensive areas of regrowth vine and sclerophyll forest. It should also be noted that whilst mylonitic geologies were mapped under the geological classification of **BMy** (biotite and mylonite schists), they are separate from the more extensive areas of low grade metamorphic rocks mapped under the geological classification of **Scht** (undifferentiated metasediments, schists and metamorphics) to the west. It should be stressed that these mylonitic rocks are not amphibolites, as inferred by the current certified regional ecosystem mapping (see section 3.1.2), (D. Stanton pers. obs).

A number of planning studies relevant to the study area have been carried out by various agencies and authorities. These include but are not limited to the following:

- Johnstone Shire Council State of the Shire Report 2005. This documents includes relevant background information on biodiversity and land management;
- Johnstone River Catchment Revegetation Strategy 2003;
- Johnstone Shire Council Pest Management Plan 2004; and
- Strategy for the Conservation of Biodiversity in the Johnstone Shire 2003.

4.1.2 Existing RE Mapping

The existing 1:50 000 scale regional ecosystems mapping within the study area indicates a relatively diverse mix of vegetation communities with extensive areas of the 'Endangered' RE 7.2.1 (Mesophyll vine forest. on beach ridges and sand plains of beach origin) on the northern boundary of the project area. Smaller areas are also mapped behind the vegetated foredune to the north of the homestead. A strip of mesophyll vine forest on alluvium, currently mapped as RE 7.3.10 (of concern) dissects the EBIR property with an additional minor occurrence on the northern boundary of the cleared paddock. Regional ecosystem 7.3.3, a feather palm swampland listed as 'of concern' also occupies a relatively extensive portion of vegetation on the northern boundary of the EBIR site. Other significant regional ecosystems include RE 7.2.4, an 'of concern' open eucalypt forest on beach sands, and RE 7.11.24 (Closed vineland of wind-disturbed vine forest). Descriptions of regional ecosystems extracted from the REDD (2005) that are currently acknowledged within the study area are listed in **Table 4** below. The certified regional ecosystems mapping also indicates that the much of the vegetated area on the property is mapped as essential habitat for the cassowary as defined in Queensland's *Nature Conservation Act* (1992). Acceptable solutions to allow preservation of this essential habitat must be met, if consent to develop and is to be granted.

Table 4. Current RE's Mapped on the Subject Site with are of occurrence indicated

RE	Status	Description (REDD)	EBIR Site	SAC and Beachfront
7.1.1	*Not of Concern*	Mangrove low closed forest to open shrubland.	*	
7.2.1	*Endangered*	Mesophyll vine forest. Beach ridges and sand plains of beach origin, mainly in small patches in the lee of coastal beach ridges in very high rainfall areas.	*	*
7.2.4	*Of Concern*	Eucalyptus spp. (often *E. pellita* (red Stringybark) or *Corymbia intermedia* (pink bloodwood)) open	*	

RE	Status	Description (REDD)	EBIR Site	SAC and Beachfront
		forest and/or *Lophostemon suaveolens* (swamp mahogany) open forest on swampy sandplains of beach origin, and Pleistocene beach ridges.		
7.2.7	*Of Concern*	*Casuarina equisetifolia* (coast she oak) +/- *Corymbia tessellaris* (Moreton Bay ash) open forest +/- groved vine forest shrublands.	*	
7.2.8	*Of Concern*	*Melaleuca leucadendra* open forest to woodland. Sands of beach origin		*
7.2.9	*Of Concern*	*Melaleuca quinquenervia* (swamp paperbark) shrubland to closed forest, or *Lepironia articulata* (grey sedge) open to closed sedgeland. Dune swales and swampy sandplains of beach origin.	*	
7.3.3	*Of Concern*	Mesophyll vine forest with *Archontophoenix alexandrae* (feather palm).	*	
7.3.5	*Not of Concern*	*Melaleuca quinquenervia* (swamp paperbark) and/or *Melaleuca cajuputi* (cajuput) closed forest to shrubland on poorly drained alluvial plains.	*	
7.3.10	*Of Concern*	Simple-complex mesophyll to notophyll vine forest.	*	*
7.11.1	*Not of Concern*	Simple-complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.	*	*
7.11.24	*Of Concern*	Closed vineland of wind-disturbed vine forest.	*	
7.11.25	*Of Concern*	Simple-complex mesophyll to notophyll vine forest on amphibolites of the very wet lowlands and foothills.	*	*

4.1.3 Significant Flora Species

Database searches indicate that 36 plant species of special conservation significance occur within the locality of the subject site. An online search of the EPBC database indicates that 14 plant species, or habitats for these plants occur within the locality of the subject site[2]. Six of these species are Endangered and eight are Vulnerable. A search of the EPA Queensland Herbariums Herbrecs database and the Wildlife Online Database reveals 22 species listed on the Schedule of the NCA[3]. Four of these species are Endangered, four species are Vulnerable, and 12 species are Near-threatened. These species are listed in **Table 5.**

Table 5. Potential Significant Flora Species

Species Name	Common Name	EPBC	NCA
Aphyllorchis queenslandica			Near-threatened
Aponogeton bullosus		Endangered	
Aponogeton cuneatus			Near-

[2] Search area of 10 km radius from site.
[3] Herbrecs search area of 10 km radius from site (17 24' 0" – 17 34' 46.2" S 145 57' 00" – 146 06' 00' E).

Species Name	Common Name	EPBC	NCA
			threatened
Aponogeton proliferus		Endangered	Endangered
Arenga australasica	Australian Arenga Palm	Vulnerable	
Canarium acutifolium var. *acutifolium*		Vulnerable	
Carronia pedicellata		Endangered	
Dendrobium mirbelianum	Dendrobium orchid	Endangered	Endangered
Dendrobium superbiens	Dendrobium orchid	Vulnerable	
Dioclea hexandra			Vulnerable
Eleocharis retroflexa		Vulnerable	Vulnerable
Elaeocarpus stellaris			Near-threatened
Endiandra globosa	Ball-fruited Walnut		Near-threatened
Fimbristylis adjuncta		Endangered	Endangered
Garnotia stricta var. longiseta			Near-threatened
Hodgkinsonia frutescens		Vulnerable	Vulnerable
Hupzeria phlegmatioides	A Tassel Fern	Vulnerable	Vulnerable
Hupzeria prolifera	A Tassel Fern	Vulnerable	Vulnerable
Ilex sp. (Gadgarra B.P.Hyland RFK2011)			Near-threatened
Macaranga polyadenia			Near-threatened
Microsorum membranifolium			Near-threatened
Nepenthes mirabilis	Pitcher Plant		Endangered
Phaius tancarvilleae	Swamp Lily	Endangered	
Piper mestonii	Long Pepper		Near-threatened
Polyalthia sp. (Wyvuri B.P.Hyland RFK2632)			Near-threatened
Polyscias bellendenkerensis		Vulnerable	Vulnerable
Pseuduvaria villosa			Near-threatened
Rourea brachyandra			Near-threatened

4.2 FIELD SURVEY

4.2.1 Regional Ecosystems

Regional ecosystems (RE's) often comprise an amalgamated group of vegetation communities (VC's), representing the finer scale structural and floristic variation within a broader ecological group. Aerial photographic analysis completed in conjunction with a detailed field survey effort indicates a number of VC's with a range of geological associations within the broader study area. The classification of VC's follows the system devised by Tracey (1982) and Stanton and Stanton (in prep.) for ease of reference to available mapping information. A further descriptor is given with an appended x, indicating a severely disturbed community whose structural attributes are sufficient to allow retention of a remnant status. This disturbance can be introduced via a range of causes including

severe wind disturbance, mechanical disturbance, or weed invasion. The suite of VC's includes six secondary (non-remnant) vegetation community classifications, three of these being dominated by exotic species.

Vegetation communities, community descriptions, and associated landforms are indicated in **Appendix A** with the spatial distribution of vegetation communities with the study area provided in **Appendix A1 and Appendix A2.**

Vegetation communities are classified into regional ecosystems based on structural types, floristics assemblages and landform associations. With reference to **Table 6**, eleven regional ecosystems are identified on the site EBIR site, with an additional four regional ecosytems identified as occurring on the SAC and beach front study areas only. Spatial distribution of these regional ecosystems with their component vegetation communities is provided in **Figures 3a** and **3b** with **Figures 4a** and **4b** identifying the conservation status of RE's. Further discussion concerning the classification and derivation of these regional ecosystems is provided in **Section 4.2.2**.

Table 6. Regional Ecosystems in the Project Area.

Regional Ecosystem	Description[4]	Vegetation Management Status	Component Vegetation Communities	EBIR	SAC and Beach.
Land Zone 1 – Estuarine Muds					
7.1.1	Mangrove low closed forest to open shrubland	Not of Concern	E22a		*
Land Zone 2-Sand Dunes and Dune Swales					
7.2.1i 7.2.1d 7.2.1	Mesophyll vine forest. Beach ridges and sand plains of beach origin, mainly in small patches in the lee of coastal beach ridges in very high rainfall areas	Endangered	D2b	*	*
7.2.4	*Eucalyptus* spp. [often *E. pellita* (red Stringybark) or *Corymbia intermedia* (pink bloodwood)] open forest and/or *Lophostemon suaveolens* (swamp mahogany) open forest on swampy sandplains of beach origin, and Pleistocene beach ridges.	Of Concern	D91	*	
7.2.5	Mesophyll to notophyll vine forest of *Syzygium forte* subsp. *forte* (white apple) on sands of beach origin.	Of Concern	D75x	*	*
7.2.7a	Coastal foredune complex with *Casuarina equisetifolia*	Of Concern	D44	*	*
7.2.8	*Melaleuca leucadendra* (weeping tea tree) open forest to woodland. Sands of beach origin.	Of Concern	DS38	*	*

[4] Truncated description as per REDD.

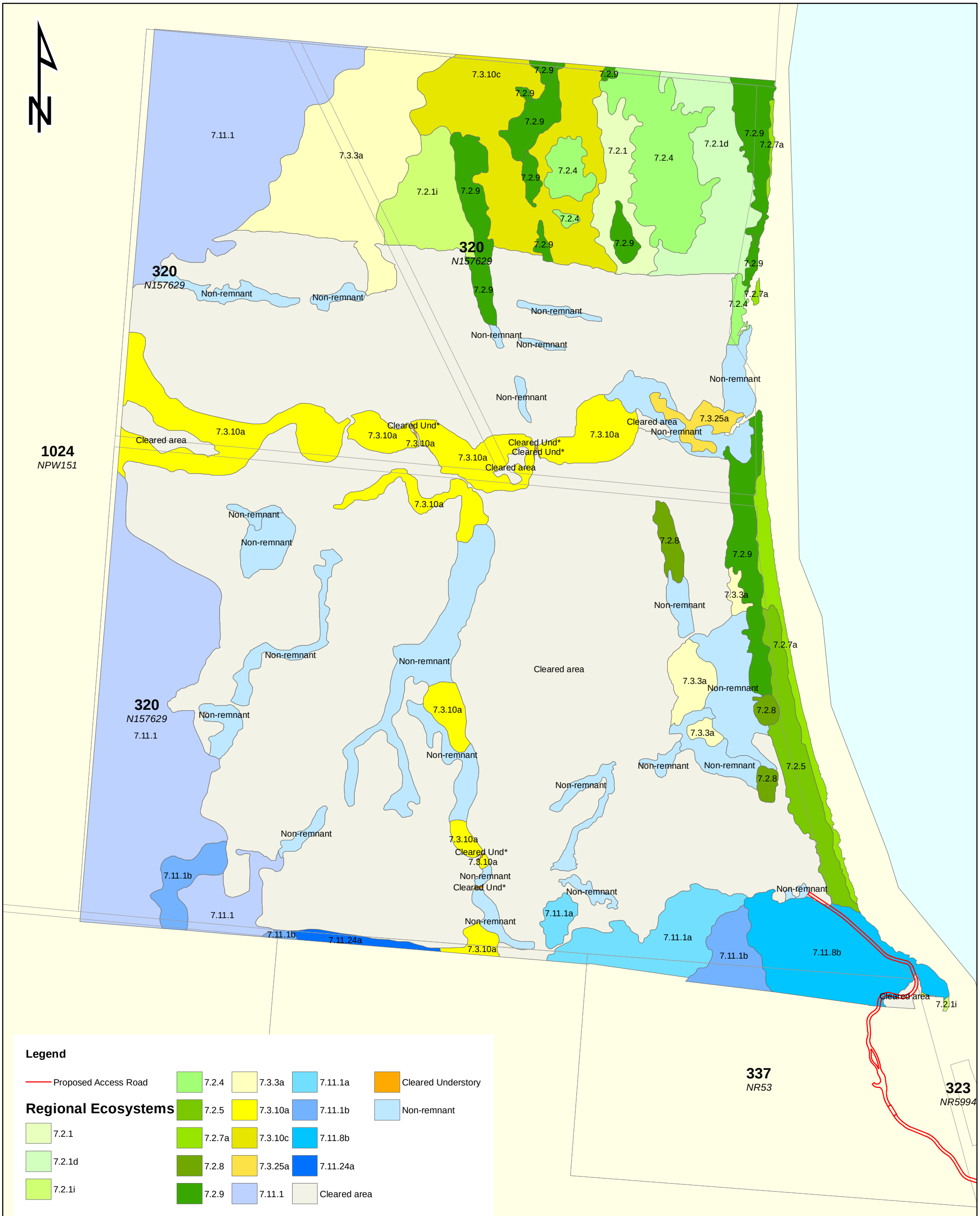
Regional Ecosystem	Description[4]	Vegetation Management Status	Component Vegetation Communities	EBIR	SAC and Beach.
7.2.9	*Melaleuca quinquenervia* (swamp paperbark) shrubland to closed forest, or *Lepironia articulata* (grey sedge) open to closed sedgeland. Dune swales and swampy sandplains of beach origin.	Of Concern	DS33	*	
Land Zone 3- Alluvial plains, riverine flood plains, drainage depression and swamps (excluding dune swales)					
7.3.3a	Mesophyll vine forest with *Archontophoenix alexandrae* (feather palm).	Of Concern	A3a	*	*
7.3.10a	Simple to complex mesophyll to notophyll vine forest on moderate to poorly drained alluvial plains of moderate fertility.	Of Concern	A2a	*	*
7.3.10c	Mesophyll vine forest with scattered *Archontophoenix alexandrae* (feather palm) in the sub-canopy. Seasonally inundated lowland alluvial plains.	Of Concern	A72x	*	
7.3.25a	*Melaleuca leucadendra* open forest and woodland. Stream levees and prior streams on well-drained sandy clay loam alluvial soils.	Of Concern	A38	*	*
Land Zone 11- Metamorphic Rocks					
7.11.1	Simple-complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.	Not of Concern	M2a	*	*
7.11.1a	Mesophyll vine forest. Very wet and wet lowlands and foothills.	Not of Concern	M2a(a)	*	*
7.11.1b	Mesophyll vine forest recovering from disturbance, with *Acacia* canopy or emergents. Very wet and wet lowlands and foothills.	Not of Concern	M12a	*	
7.11.8b	*Acacia mangium* and *A. celsa* open to closed forest. Very wet and wet lowlands and foothills	Of Concern	M12c	*	
7.11.24a	Closed vineland of wind disturbed vine forest.	Of Concern	M2ax(w)	*	
7.11.26	Rock pavement	Of Concern	M21		*
7.11.34a	Complex of shrubland, low heathy or shrubby woodlands or open forests dominated by *Corymbia tessellaris* and *Lophostemon suaveolens.*	Of Concern	M91v		*

4.2.2 Regional Ecosystems Description, Condition, and Rationale for Classification

The following provides:

- brief summary of regional ecosystems and their component vegetation communities;
- rationale for RE classification;

- summary floristic compositions; and
- additional information regarding their nature which requires further clarification.



NOTES:

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Figure 3a: Ella Bay Resort Site - Regional Ecosystems

Client

Satori Resorts

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
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337
NR53

323
NR5994

1024
NPW151

1024
NPW151

235
NR7590

1
AP4452

246
NR3550

52 61
F27024 F27024

18
USL35566

43 29
F27024 F27024

40 75
F27024 F27024

1 36 29
F27028 F27024 F27020

3 27 1
F27028 F27020 F27020

8 54 23 49 36
USL35566 RP747213 F27020 F27020 F27020

10 38
F27028

44
F27020

16 16 41
F27028 F27020 F27020

13
F27020

21 9 8
F27028 F27012

606 605 2
F2701 F2701 F27036

261
NR5555

604 602 1
F2701 F2701 F27034

601 311 8
F2701 F2703 NR7634

273 508 313 1
NR4819 F2703 F2703

315
F2703

F27037

511 506 305
F2703 F2703

17
F2703

8
F27023

F2708

NR3441

Legend

Proposed Access Road

7.11.1

Regional Ecosystems

7.1.1

7.2.1i

7.2.5

7.2.7a

7.2.8

7.3.3a

7.3.10a

7.3.25a

7.11.1a

7.11.1b

7.11.26

7.11.34a

Cleared areas

Non-remnant

Plantation

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Figure 3b: SAC - Regional Ecosystems

Client

Satori Resources

0 200 400 600 800

Metres

Scale 1:10,000 **Drawn By** DG **Checked** DS

File Path C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd

Date 12/05/11

A3

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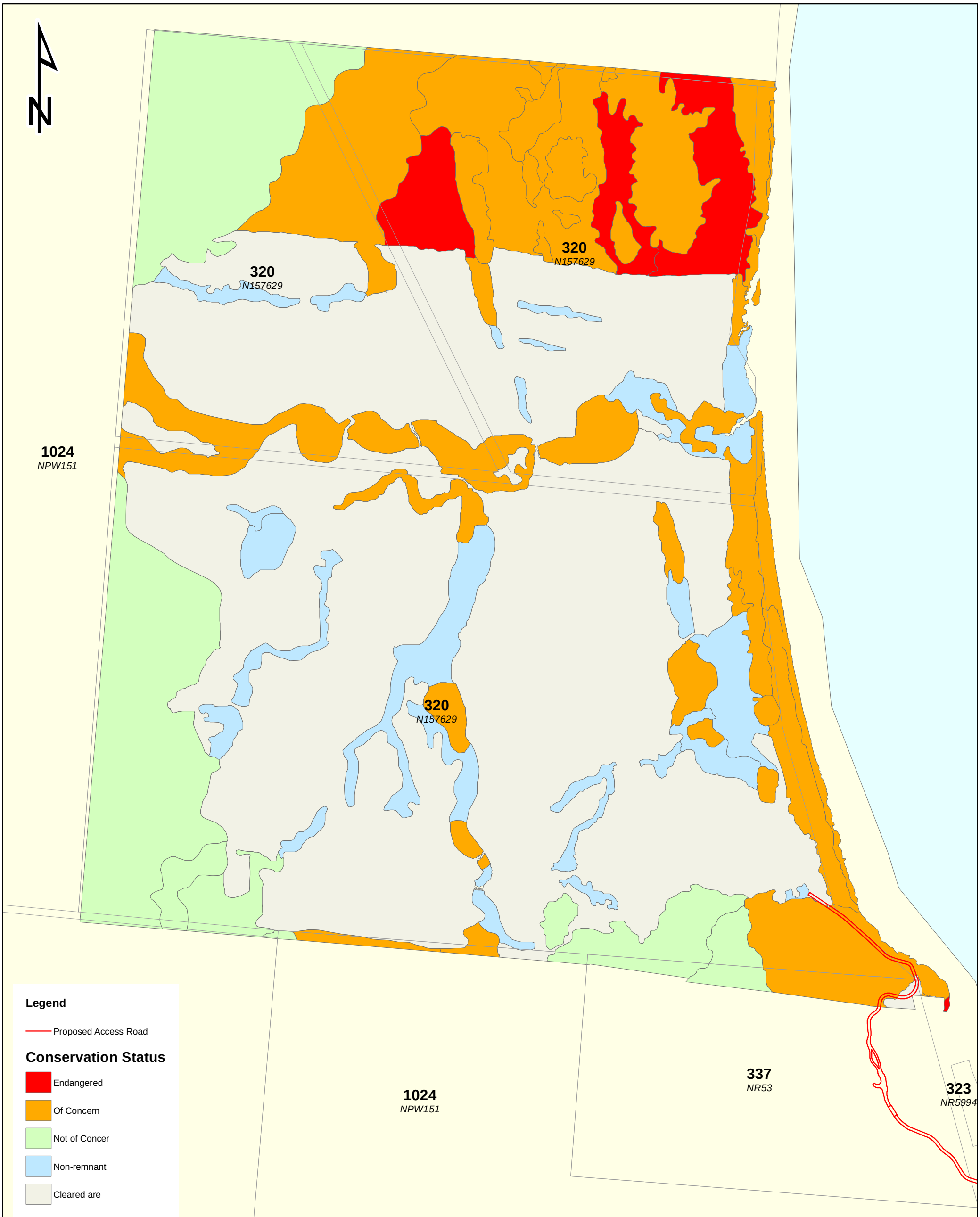

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Figure 4a: Ella Bay Resort Site - Conversation Status (VMA)

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Satori Resorts

0 200 400 600 800

Metres

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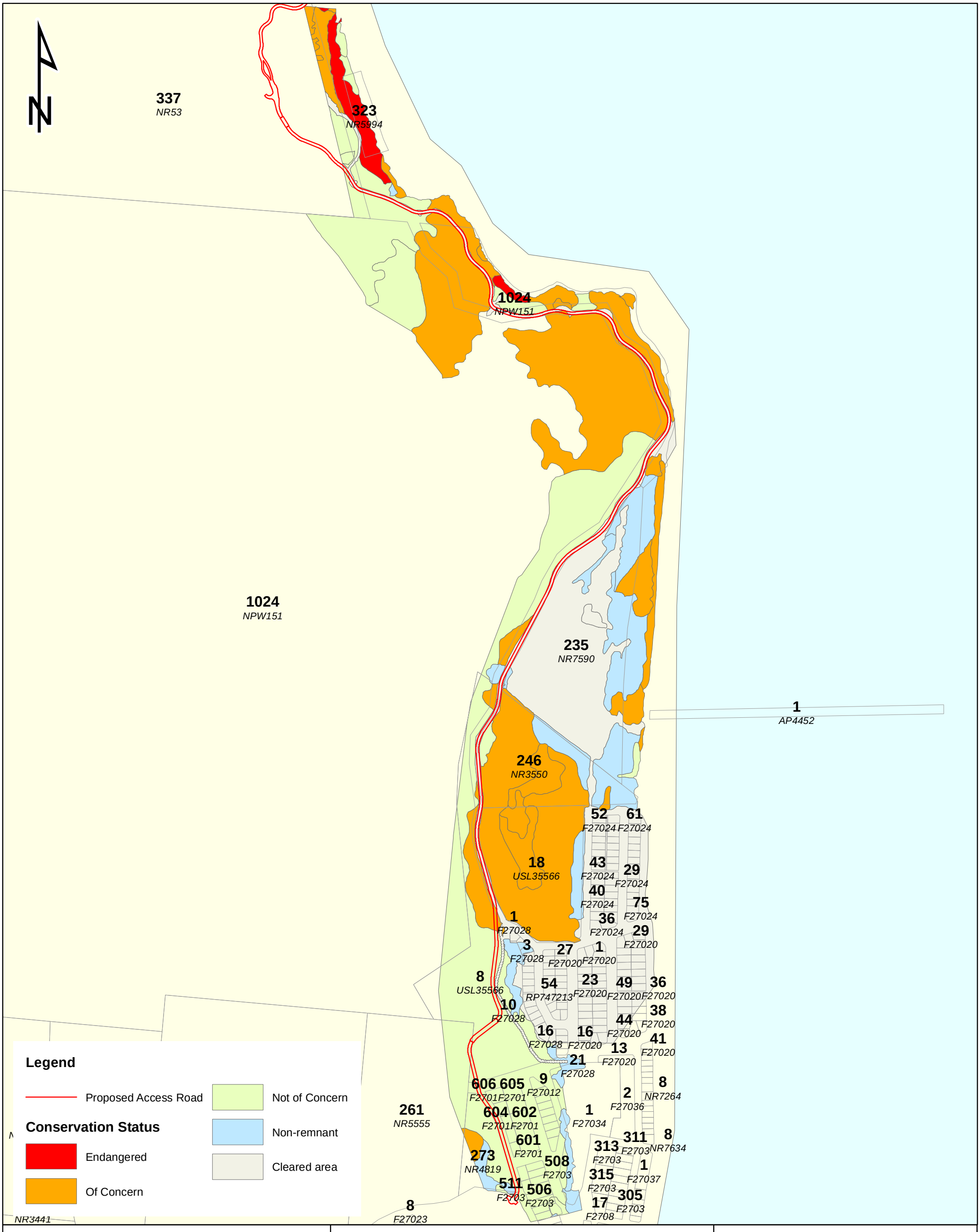

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Figure 4a: Ella Bay Resort Site - Conversation Status (VMA)

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Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

Regional Ecosystem 7.1.1 **Mangrove low closed forest to open shrubland**

Status - Not of Concern (VMA)

Representative Sites: EB25

Small areas of low mangrove forest, woodland and shrubland are located in the southern portion of the beach front study area. This community occupies a saline swampland formed from a breach of the frontal dune system and is composed predominantly of *Excoecaria agallocha* and *Aegiceras corniculatus.* Remnants of a former *Melaleuca leucadendra* open forest (freshwater wetland) represented by stark dead tree trunks are clearly visible emerging above the mangrove canopy. It is evident that this is a transitional community resulting from salinisation of a freshwater wetland. The causes of this salinisation are discussed more thoroughly in following sections although it is clear that it has been accelerated by beachfront erosion caused by the rocky retaining wall that forms a seaward buffer to the Flying Fish Point township. The salinisation of this system has likely resulted in the confusing aerial photographic signature of vegetation displayed in 2001 aerial photography.

Photograph 1. The stark white trunks of dead *Melaleuca leucadendra* (former freshwater swampland) emerging above a low mangrove woodland. Frontal dune breach.

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Regional Ecosystem 7.2.1 **Mesophyll vine forest. Beach ridges and sand plains of beach origin, mainly in small patches in the lee of coastal beach ridges in very high rainfall areas**.

Status - Endangered (VMA), Critically Endangered (EPBC).

Representative Sites: ELR 4 (SAC), ELR7 (SAC) , EBM8a (Permanent Monitoring – EBIR), EBM8 (EBIR)

The best development of RE7.2.1 occurs on the northern boundary of the EBIR site occupying the broad buffer between Ella Bay National Park and the cleared grazing lands

on the site. Well developed although heavily disturbed examples are also found in the vicinity of the SAC.

On the EBIR site, the ecosystem was sampled at location EB8 where it occupies a broad suppressed ridge of medium grained siliceous beach sand. The canopy features of this community are relatively intact, despite the recent passing of Cyclone Larry in March 2006. Typical canopy species recorded at the survey site included *Homalium circumpinnatum, Alstonia scholaris, Psuedoweinmania lachnocarpa, Cryptocarya hypospodia, Syzygium forte* subsp. *forte, Syzygium cormiflorum, Grevillea baileyana, Syzygium angophoriodes,* and *Euroschinus falcatus.* The secondary tree layer included *Rhodomyrtus macrocarpa, Acmenosperma claviflorum, Chionanthus ramiflora,* and *Podocarpus neriifolius.* The community at the subject site has been previously mapped on alluvium (land zone 3) in the mapping of Stanton and Stanton (in prep), and in the EPA's regional ecosystem mapping. Consequently the community is currently placed in the '*of concern*' regional ecosystem 7.3.10. Site inspecting clearly indicates that the community occupies a suppressed beach sand ridge (land zone 2) and should more correctly mapped as 7.2.1i *('Endangered'*). This discrepancy requires amendment in both databases to recognise this small area of unique and endangered vine forest. A permanent monitoring site has been established in this ecosystem at site EBM8a, establishing baseline floristic information for measurement and comparison on an annual basis.

In the north-eastern section of the EBIR site, an extensive area of RE sub-type 7.2.1d is represented, indicative of the sub-dominance of feather palms in the mesophyll vine forest canopy. No site data has been established in this community and its occurrence is based largely aerial photographic interpretation of landform. Small areas of feather palm forest in dune swales is also represented under the all-encompassing classification of RE7.2.1, with no RE sub-type for this community recognised in the current REDD (Version 5.2, 2007) .

On the SAC, the ecosystem is limited to two linear strips of vegetation, formed on coastal back dunes in the central and northern portions of alignment, although both occurrences occur to the north of the national park boundary. Dominant canopy species in these communities include *Intisia bijuga, Acacia mangium, Dysoxylum mollissimum, Syzigium forte subsp. forte, Calophyllum australianum* and *Beilshmedia obtusifolia.* The ground cover is heavily degraded in some sections with invasion of *Megathyrsus maximum* into disturbed areas, particularly in the vicinity of the council camping grounds. The current unsealed

access road skirts the western fringes of this community and direct impacts during road construction are not expected.

Photograph 2. Well developed mesophyll vine forest (VC2b) on a stabilised dune. Ella Bay Road (EBR4).

***Regional Ecosystem 7.2.4*: *Eucalyptus* spp. [often *E. pellita* (red stringybark) or *Corymbia intermedia* (pink bloodwood)] open forest and/or *Lophostemon suaveolens* (swamp mahogany) open forest on swampy sandplains of beach origin, and Pleistocene beach ridges.**

Status - Of Concern (VMA)

Representative Sites: No representative sites

This 'of concern' regional ecosystem occupies well-drained sand ridges in the northern section of the property where it is represented as vegetation community D91 in this mapping exercise. The canopy dominance of *Lophostemon suaveolens* in this community was determined during the Wet Tropics vegetation community mapping (Stanton and Stanton, in prep.) and no further field sampling was undertaken during this exercise.

***Regional Ecosystem 7.2.5:* Mesophyll to notophyll vine forest of *Syzygium forte* subsp. *forte* on sands of beach origin**

Status - Of Concern (VMA), Critically Endangered (EPBC)

Reference Sites: EB31, EB36, EB23(EBIR).

Small areas of this ecosystem are located in backdune situations in the beach front study area. The community forms an open to closed forest with dominant *Euroschinus falcatu*s, *Syzygium forte* subsp. *forte*, *Canarium australianum* and *Chionanthus ramiflorus* with canopy heights to 28m. The community is heavily fragmented with remnant patches interspersed with extensive areas of secondary (non-remnant) vegetation. Although

possessing remnant status, all mappable units of this vegetation type have suffered from past disturbance, evidenced by regular canopy gaps, coppicing of *Syzygium forte* and the dominance of *Euroschinus falcatus* in some locations. A representative photograph is provided as Photograph 3.

Although marginally outside the EBIR property boundary, a severely altered example comprising secondary growth dominated by *Euroschinus falcatus*, *Syzygium forte* subsp. *forte*, *Chionanthus ramiflorus* and *Hibiscus tiliaceus* is mapped at the location of EB23. Although severe disturbance is noted, the community possesses sufficient canopy height and canopy cover to be represented with remnant status.

Photograph 3. Remnant patch of RE7.2.5a with *Syzygium forte* subsp. *forte* at the location of Site EB36.

Regional Ecosystem 7.2.7a: **Coastal foredune complex with *Casuarina equisetifolia.* Sands of beach origin**

Status - Of Concern (VMA)

Representative Sites: EB29, EB30, EB32, EB33, EB35

Mapped occurrences of this ecosystem in the vicinity of the EBIR site were not sampled during the field study, mostly occurring outside the property boundary. Highly disturbed representations were however sampled on the Flying Fish Point beach front at the location of the proposed pedestrian boardwalk. In this location, the woodland / herbland complex (represented in Photographs 4 and 5) occupies frontal dune locations with the best development located in the northern section of the examined beachfront area. The ecosystem has been largely destroyed in the southern portion of the beachfront area due to foredune erosion. The vegetation complex comprises shrubland of *Guettarda speciosa*, *Terminalia arenicola*, *Hibiscus tiliaceus* and *Colubrina asiatica* mosaiced with low woodland dominated by *Casuarina equisetifolia.* Woodland and shrubland copses are

interspersed with herblands of *Cassytha filiformis*, *Ipomoea pes-caprae* and *Sphagneticola trilobata** (Singapore daisy). The latter species dominates ground cover components of this community in some locations. Other species include *Scaevola taccada*, *Wallastonia biflora* and *Ximenia americana*. Although remnant, a high degree of disturbance is noted in this community with partial clearing evident in some locations (access tracks) and regular dominance of exotic species in the ground cover.

Photograph 4. Foredune shrubland/herbland mosaic (RE7.2.7a) with dominant *Guettarda speciosa* represented by the light green crowns in the foreground.

Photograph 5. A dense cover of *Cassytha filiformis* on foredunes to the north of Flying Fish Point. The species (rusty orange) is mixed with Singapore Daisy, an exotic species.

***Regional Ecosystem 7.2.8*: *Melaleuca leucadendra* (weeping tea tree) open forest to woodland. Sands of beach origin and dune swales.**

Status - Of Concern (VMA).

Representative Sites: EB16

This 'of concern' regional ecosystem was once considerably more extensive in the project area, being heavily impacted by clearing and now surviving only as small isolated remnants in swampy dune swales behind the coastal foredune. The community was sampled at site EB16, where *Melaleuca leucadendra* attained a maximum height of over 40m over a sub

canopy of *Melicope elleryana, Dillenia alata, Nauclea orientalis, Hibiscus tiliaceus, Glochidion sumatranum* and the introduced *Annona glabra.* Typical species of the shrub layer are *Macaranga polyadenia, Polyscias australiana, Atractocarpus fitzalanii*, and *Ficus congesta* with a groundcover of *Stenocleana palustris, Scleria polycarpa*, and *Pandanus solmslaubachii.*

The community in this location is mapped as the Endangered vine forest community RE 7.2.1 in EPA's regional ecosystem mapping and as A29 (sclerophyll regrowth) in the Wet Tropics vegetation community mapping, due to the limited size of the polygon (<1ha). As per definition of the *VMA (1999),* isolated areas of intact vegetation of less than 1ha are classified as non-remnant. A map modification though the PMAV process will be required before any incursion into the community boundary is made. It should be noted that this community provides an important habitat for *Macaranga polyadenia* which was collected at site EB16. This species is listed as 'Near-threatened' under the NCA 1999. Invasion of Pond Apple which currently occurs in the secondary tree and shrub layers represents a significant threat to this ecosystem.

On the Flying Fish Point beachfront study area, tall open forests of *Melaleuca leucadendra* have been heavily fragmented in the beachfront study area through both severe mechanical disturbance and dieback as a result of salinisation. Scattered remnants exist in backdune locations, although many of these areas are represented as single trees which are too small to be mapped individually. Impacts to this ecosystem are likely to be minimal.

***Regional Ecosystem 7.2.9*: *Melaleuca quinquenervia* (swamp paperbark) shrubland to closed forest, or *Lepironia articulata* (grey sedge) open to closed sedgeland. Dune swales and swampy sandplains of beach origin**

Status - Of Concern (VMA)

Representative Sites: EB9

Similar to RE 7.2.8, this vegetation community was once considerably more extensive in the subject site, and its area has been significantly reduced through clearing. Intact stands are present in dune swales in the northern section of the mapping area, as well as a linear remnant immediately behind the coastal foredune. This community had suffered extreme windfall as the result of Cyclone Winifred in 1986 (P. Stanton, pers. comm. August 2006). As evident at site EB9, the community was stripped of much of its remaining canopy during Cyclone Larry early in 2006. As a result, the community consists of a jumble of fallen logs

with occasional emergent trees of *Melaleuca quinquenervia* and *Barringtonia racemosa, Elaeocarpus grandis,* and *Syzygium angophoriodes,* above a ground cover of swamp tolerant ferns and sedges. Additional species are *Glochidion sumatranum, Polyscias australiana, Canavalia rosea, Tetracera nordtiana, Flagellaria indica, Lygodium microphyllum, Ludwigia octovalvis, Platycerium superbum, Scleria polycarpa* and the exotic *Annona glabra*.

The classification of this community into an appropriate land zone was difficult due to the degradation of the sandy beach ridges in disturbed open paddocks with little evidence of a repetitive sand dune and swale landform. These communities do however occupy linear features that parallel the present coastline and were obviously formed under the influence of a prograding shoreline. A classification of these landform features into Land Zone 2 was thus considered the most appropriate. These *Melaleuca* communities are semi-permanent swamplands and present important wetland habitat.

Photograph 6. Severe wind damage in regional ecosystem 7.2.9 and Site EB9. This location was mapped as non-remnant under the EPA's regional ecosystem mapping, although has retained its classification as essential habitat for the cassowary and as such, is subject to the conditions of the VMA (1999)

Regional Ecosystem 7.3.3a - Mesophyll Vine Forest with *Archontophoenix alexandrae* (feather palms).

Status - Of Concern (VMA)

Representative Sites: EB6, EB7, EB12, EBM6a, ELR2.

Feather palm forest on alluvium is a dominant vegetation community on the northern boundary of the EBIR site where it occupies a swampy, seasonally inundated alluvial plain. In these areas, it forms a broad a mosaic with the associated vegetation communities A72 (RE 7.3.10c) and D2b (RE 7.2.1i). The community was sampled at sites EB6 and EB7

where it demonstrated a relatively intact canopy dominated by Archontophoenix alexandrae with associated species including *Nauclea orientalis, Beilschmedia obtusifolia, Melicope elleryana, Glochidion sumatranum* and *Syzygium sayeri*. A permanent monitoring site (EBM6a), established at the location of EB6 in October 2008 provides a comparative assessment of recovery in this community, with detailed discussion provided in **Section 4.3.3**. Although largely dry at the time of survey, these communities possess gilgai soil morphology typical of seasonally inundated alluvial soils with ponded surface water present in the more extensive drainage depressions. A small area of swampland sampled at EB7 which intrudes into the margins of the cleared paddock in the north, is continuous with larger areas of palm swampland to the north. Despite the representation of this forest patch as a non-remnant community on the EPA regional ecosystem mapping, and as a regrowth community in the Wet Tropics Vegetation Community Mapping (Stanton and Stanton, in prep.), the area should be regarded as a viable remnant of this regional ecosystem and subject to the conditions of the Vegetation Management Act (1999) on account of the integrity of the dominant palm forest canopy.

A highly disturbed remnant of this forest type was also recognised in the EBIR at the location of site EB12, where the community consisted of an extremely wind disturbed canopy with sparse feather palms over a shrubby rainforest sub canopy. Cover of the broken 15-20m canopy layer was reduced to 15% and dominated by *Archontophoenix alexandrae, Glochidion sumatranum, Melicope elleryana, Syzygium sayeri* and *Elaeocarpus grandis*. The cause of this disturbance is unclear although extreme and repetitive wind disturbance is likely to be a contributing factor considering Innisfail's cyclone history. The recognition of vegetation in this location as RE 7.3.3a again varies from the EPA regional ecosystem mapping which has this community classified as the endangered vine forest RE 12.2.1. Dependant on the activities proposed on the property, this area will require an amendment in the PMAV process prior to development. The recovery of this type from severe wind disturbance is threatened by the invasion of Pond Apple, which is a relatively prominent component of the disturbed canopy.

In the vicinity of the SAC, feather palm forest was recorded at Site ERL2 (on Unallocated State Land- USL 35566) with a small area approximately 500m east from the existing road. The canopy of this community is dominated by an even mix of feather and fan palms (*Archontophoenix alexandrae* and *Licuala ramsayi* respectively) with *Acmena hemilampra, Acacia mangium* and *Alstonia muellerii*. The type merges with tall *Melaleuca leucadendra*

open forest (RE 7.3.25a) with little change in the floristic nature of the sub-canopy and ground covers. As this community is a seasonal swamp, it should be avoided in the location of any associated infrastructure including bicycle paths and pedestrian access points.

Photograph 7. Tall mesophyll vine forest with dominant fan palms at the location of site ELR2.

Regional Ecosystem 7.3.10a/ 7.3.10c: **Simple to complex mesophyll to notophyll vine forest on moderate to poorly drained alluvial plains of moderate fertility.**

Status – Of Concern (VMA)

Representative Sites: EBM3w, EB22a, EBM1n, EBM2n, ERL1

Rainforest types on alluvium are rare vegetation types in the Wet Tropics Bioregion having been severely impacted by clearing on lowland coastal plains. A sinuous strip of this regional ecosystem is mapped along a major drainage line in the central portion of the EBIR site. Along this corridor, rainforest is often restricted to the steep alluvial banks and may be better developed within the terraces of meander bends. This community was sampled in October 2008 at site EBM3w where a permanent monitoring site was established. The community in this location was dominated by pioneer species, indicative of past disturbance although canopy height (20 -35m) and cover was sufficient for the community to be classified as remnant vegetation. Typical canopy species include *Elaeocarpus grandis, Myristica insipida, Cryptocarya hypospodia, Syzygium forte subsp. forte, Alstonia scholaris Melia azedarach* and *Harpullia hillii.*

A less extensive band of non-remnant vegetation splays from this strip towards the south. These communities were examined in some detail during the field inspection (Site EB5, EB14, EB15), both comprising discontinuous strips of vine forest, with scattered emergent trees above a severely wind disturbed sub-canopy which dropped to near ground level in some places. Typical canopy species include *Alstonia scholaris, Archontophoenix alexandrae, Beilschmiedia obtusifolia, Cananga odorata, Chionanthus ramiflora, Cryptocarya hypospodia, Cryptocarya pleurosperma, Diploglottis smithii, Dysoxylum gaudichaudianum, Elaeocarpus grandis, Endiandra longipedicellata, Endospermum myrmecodium, Myristica insipida, Nauclea orientalis, Syzygium cormiflorum, Syzygium forte subsp. forte, Synima macrocarpa* and *Trema orientalis.*

The distinction between remnant and non-remnant communities along these drainage lines becomes obscure due to repetitive cycles of wind disturbance combined with anthropogenic interference. Classification of remnant and non-remnant status was completed with the aid of historic aerial photographs during the Wet Tropics vegetation community mapping and as such, the classification provided by the EPA has been accepted, although little evidence of 'on ground' difference can be detected between the two communities. Small vestiges of remnant vegetation were identified along this otherwise non-remnant corridor at the location of site EB22a. These areas community were previously mapped as non-remnant vegetation based on observation of a severely wind impacted canopy during the August 2006 survey. In any case, non-remnant riparian communities are afforded some protection under the current Wet Tropics Tree Clearing Guidelines (EPA 2005) which requires a 25m buffer be retained along all second order streams. Adherence to these guidelines will also maintain an important wildlife corridor facilitating faunal movement between the coastal foredunes and extensive vine forest communities to the west. Restoration of these important riparian systems is achievable through the removal or management of stock access, and a long-term commitment to control of environmental weeds such as sicklepod, snake weed, and numerous exotic pasture grasses.

Significant areas on the northern boundary of the EBIR site are mapped under the classification of RE7.3.10c, represented by mesophyll vine forest with prominent *Archontophoenix alexandrae* (VC72x) These areas are identified on available EPA regional ecosystem mapping (Version 5.0, 2005) as the 'endangered' vine forest ecosystem 7.2.1d,

although site inspection clearly identifies the community as occurring on a heavy clay plain rather than a sand sheet or dune. Permanent vegetation monitoring site EBM20 was established in this ecosystem where the prominent canopy trees comprised *Pouteria xerocarpa, Endiandra montana, Gmelina dalrympleana, Archontophoenix alexandrae, Acmena hemilampra var. hemilampra, Acronychia vestita, Alstonia muelleriana, Xanthophyllum octandrum, Syzygium alilligneum, Syzygium cormiflorum, Calamus australis, Tetracera daemeliana, Cryptocarya hypospodia* and *Elaeocarpus bancrofti.* The community was heavily wind disturbed with numerous canopy openings and dense tangles of *Calamus australis* in the sub-canopy and shrub layers.

Photograph 8. Heavily disturbed Mesophyll vine forest (VCA72x) at the location of permanent monitoring site EBM20

On the SAC, well developed vine forest on alluvium is mapped in the area between the Flying Fish Point township and the fish farm where two detailed monitoring sites were established in conjunction with a study to establish baseline condition for edge effects on the existing unsealed access road. These sites are discussed in detail in 3d Environmental (2009a). The ecosystem in this location demonstrated a severely wind affected canopy with numerous wind throws and a canopy height that ranged from 15m to 40m. Dominant canopy species recorded are *Syzygium cormiflorum, Alstonia scholaris, Commersonia bartramia, Cananga odorata, Endiandra montana, Aleurites rockinghamensis* and *Endiandra globosa.* It should be noted that *Endiandra globosa*, listed as 'Near-threatened' under the NCA is a prominent canopy and shrub species where this community occurs adjacent to the Ella Bay access road. Similarly, *Rourea brachiandra* (Near-threatened, NCA) forms a prominent wiry liane in ground and shrub layers.

Photograph 9. An emergent *Alstonia scholaris* to 40m representing stature of the original undisturbed canopy (site EBM1).

Regional Ecosystem 7.3.25a: *Melaleuca leucadendra* open forest and woodland. Stream levees and prior streams on well-drained sandy clay loam alluvial soils.

Status – Of Concern (VMA)

Representative Sites: No Representative Sites

Only minor areas of this regional ecosystem (under classification of A38v) have been mapped in the vicinity of the SAC under the classification of A38v. This area is central to the large tract of vine forest on lot 18 USL35566. The RE is found in association with feather palm forest (RE7.3.3) and is similarly indicative of seasonal waterlogging (seasonal swampland). This community provides potential habitat to *Macaranga polyadenia* and may be subject to invasion by Pond Apple.

Regional Ecosystem 7.11.1: **Simple-complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.**

Status – Not of Concern (VMA)

Representative Sites: EB18 (EBIR), ELR5, ELR8, ELR9, EBR1, EBR2, EBR3, EBR4, EBR5, EBR6, EBR7, EBR9.

This regional ecosystem is subdivided into three variants based on disturbance history, floristic composition and vegetation community structure. Regional ecosystem 7.11.1 is represented on the coastal foothill along the western margins of the EBIR property boundary as well as on the southern portions of the SAC. Current regional ecosystems mapping identifies this community as the '*of concern*' RE 7.11.25 (Simple-complex mesophyll to notophyll vine forest on very wet lowlands and foothills on amphibolite). This classification requires revision on the basis that the dominant lithology on this hillslope is

quartz mylonite and schist, rather than the more mafic amphibolite compositions. This confusion in land zone interpretation stems from the Wet Tropics Vegetation Communities mapping of Stanton and Stanton (2006) which classified the higher metamorphic grade amphibolites and mylonites into one geological unit. A map amendment can be sought for the reclassification of this unit if required by the proposed development layout process. It should be noted that where sampled on the SAC, this community provides habitat for *Endiandra globosa*, listed as Near-threatened under the NCA (1992).

Photograph 10. Heavily disturbed mesophyll vine forest on the SAC (Site ELR9) with prominent windthrows evident.

RE 7.11.1a [vegetation community M2a(a)] comprises the better developed vine forest communities on colluvial footslopes and protected gully lines. This community was sampled at EB18 on the EBIR site where the canopy was dominated by *Alstonia scholaris* and *Castanospermum australe* with canopy emergents obtaining heights of over 40m. Additional canopy species include *Acmenosperma claviflorum, Cryptocarya grandis, Cryptocarya oblata, Dysoxylum arborescens, Myristica insipida,* and *Vitex acuminata*. The forest type verges on complex mesophyll vine forest in places with an abundance of structural features including epiphytes, hemi-epiphytes and palms (*Licuala ramsayi, Ptychosperma elegans, and Pandanus monticola*). In places this community has been subject to severe wind disturbance, which may manifest in canopy towers of *Calamus australis* and *Merremia peltata.* On the SAC, the ecosystem was sampled a ERL5 where it

comprised a tall mesophyll vine forest with dominant *Castanospermum australe, Litsea leafeana, Ficus destruens, Intsia bijuga* and *Melicope vitiflora.* The ' Near-threatened (NCA)' shrub species *Macaranga polyadenia* was recorded at this location.

Rainforest types dominated by *Acacia celsa* classified as RE 7.11.1b, are a prominent feature of most wind disturbed landscapes in the wet tropical lowlands. With the disturbance history in the Innisfail district, it is not surprising that these communities are present in the study area. The type is generally, although not exclusively associated with exposed ridgelines where historic wind disturbance has been most intense. Areas dominated by this regional ecosystem occupy minor areas on exposed ridgelines in the far south of the property in the vicinity of the Stage 1 development.

Regional Ecosystem 7.11.8b- *Acacia mangium and A. celsa* open to closed forest. Very wet and wet lowlands and foothills.

Status – Not of Concern (VMA)

Representative Sites: ET17

This 'of concern' regional ecosystem was recorded on the hillslope immediately behind the EBIR site homestead at site ET17, within the Stage 1 development area. The canopy is dominated by *Acacia mangium* and *Lophostemon suaveolens* in roughly equal proportions, with minor occurrences of *Acacia celsa, Euroschinus falcatus, Cupaniopsis foveolata,* and *Polyscias elegans.* The sparse secondary tree layer features *Lophostemon suaveolens, Litsea leefeana, Deplanchea tetraphylla, Alstonia meulleriana, Grevillea baileyana, Endiandra hypotephra* and *Cryptocarya vulgaris* with a relatively open understorey dominated by vine forest species.

Although recorded in the 1:100 000 scale mapping of Tracey (1982), this detail was not recorded in the mapping of Stanton and Stanton (in prep.) or the EPA regional ecosystems mapping, classifying the area as M2a and RE 7.11.25 respectively. The community suffered severe wind disturbance during Cyclone Larry in 2006 with a significant number of the canopy trees either severely damaged or on the ground. The subsequent survey undertaken in October 2008 did not re-examine this community

Regional Ecosystem 7.11.24a- Closed vineland of wind disturbed vine forest

Status – Of Concern (VMA)

Representative Sites – No representative sites.

This community was discussed previously in relation to its parent vegetation community (RE 7.11.1a). Although not sampled intensively during the field survey due to difficult access, the structure and floristic assemblage was ascertained readily from external vantage points. The dominant canopy emergent in this community is *Alstonia scholaris* with an impenetrable sub-canopy of sprawling vines, most prominently *Merremia peltata* and *Calamus australis*.

It is noteworthy that the EPA Vegetation Management Status of the wind impacted forest (RE 7.11.24c) is '*of concern*' (REDD 2005) whilst the intact communities are classified as '*not of concern*'. It is difficult to apply any logical reasoning to this classification discrepancy, particularly following the advent of Cyclone Larry which would have significantly increased the aerial extent of the wind disturbed communities. This ecosystem is mapped on the southern boundary of the EBIR site and is unlikely to be directly impacted by the proposal.

Regional Ecosystem 7.11.26: **Rock Pavement Communities**

Status – Of Concern (VMA)

Representative Sites: No –representative sites.

Small areas of this RE are mapped in the vicinity of Heath Point (SAC) where the community is comprised of a mosaic of shrubland and bare metamorphic rock face. The floristic composition of this community has not been determined due to access difficulties. All areas of this community fall outside the area of direct impact.

Regional Ecosystem 7.11.34 - Complex of shrubland, low heathy or shrubby woodlands or open forests dominated by *Corymbia tessellaris* and *Lophostemon suaveolens*

Status – Of Concern (VMA)

Representative Sites – ELR3, ELR6, EBM4

This community occupies steep coastal headlands in the vicinity of Heath Point in the central and central-northern portions of the SAC within NP151. The type occurs as an open forest dominated by *Lophostemon suaveolens* and *Acacia celsa* with a developing vine forest sub-canopy and shrub layer. Canopy heights range from 8 to 15m. Direct impacts will be incurred during construction of the SAC through road widening and associated cut into steeper portions of the coastal escarpment. The Near-threatened (NCA, 1992) listed grass *Icnanthus pallens* was recorded in this community (ELR6) although more fertile

material is required to confirm the identification and extent of this species. *Aphyllorchis queenslandica*, a Near-threatened (NCA, 1992) herb, has also previously been recorded in this community (Queensland Herbarium Herbrecs extract, 2006).

Detailed monitoring site EBM4 was established within this community during the October 2008 assessment, with the site utilised to establish baseline information on road edge effects within the world heritage area. Detailed sampling of ground covers during this exercise failed to locate either *Icnanthus pallens* or *Aphyllorchis queenslandica* within this community, indicating that the occurrence of these species is likely to be cryptic and unpredictable.

Photograph 11. *Lophostemon suaveolens* dominant open forest on Heath Point within NP151.

4.2.3 EPBC Significant Vegetation Communities

The survey of the EBIR site and SAC corridor identified the following EPBC community:

Littoral Rain Forest and Coastal Vine Thickets of Eastern Australia

Status: Critically Endangered (Listing October 10, 2008).

The location of the EPBC significant community in the EBIR and SAC areas is shown in Figures 5a and 5b respectively. The EPBC scheduled community comprises:

Regional Ecosystem 7.2.1 (VC2b): Mesophyll vine forest. Occurs on beach ridges and sand plains of beach origin, mainly in small patches in the lee of coastal beach ridges in very high rainfall areas.

Reference Sites: ELR 4 (SAC), ELR7 (SAC), EBM8a (Permanent Monitoring –EBIR), EBM8 (EBIR).

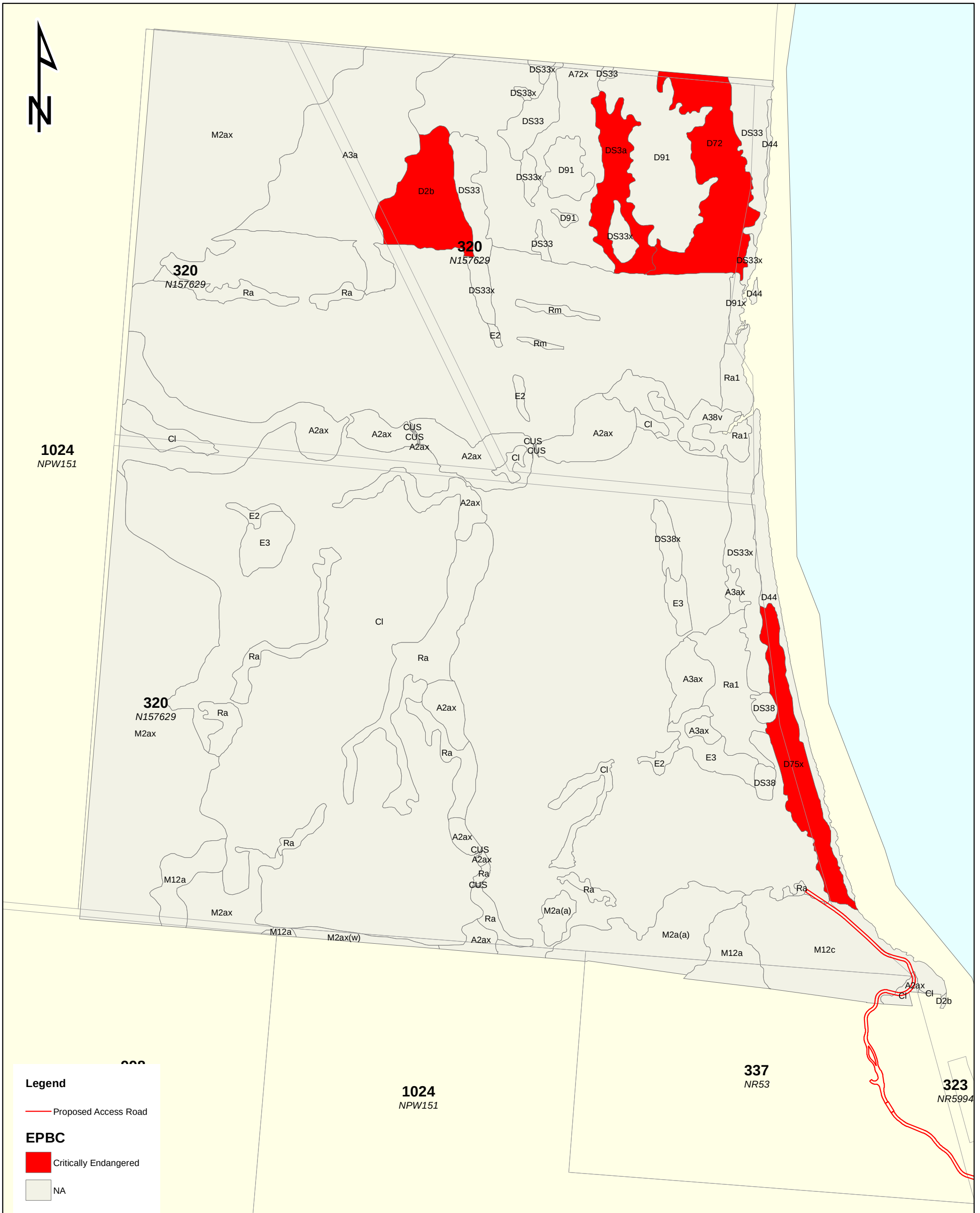
The best development of RE7.2.1 occurs on the northern boundary of the EBIR occupying the broad buffer between Ella Bay National Park and the cleared grazing lands on the site. Well developed although heavily disturbed examples are also found in the vicinity of the SAC.

Regional Ecosystem 7.2.5a (VC75): Mesophyll to notophyll vine forest of Syzygium forte subsp. forte on sands of beach origin,
Reference Sites: EB31, EB36, EB23 (EBIR).

Small areas of RE7.2.5a are located in backdune situations along the northern portion of the Flying Fish Point beachfront. The community is heavily fragmented with remnant patches interspersed with extensive areas of secondary (non-remnant) vegetation although all patches are greater than the minimum 0.1 ha threshold size required for EPBC classification.

4.2.4 Non Remnant Vegetation

Non remnant vegetation, including extensive cleared areas, are recognised in the current regional ecosystem mapping, although some discrepancies exist between this mapping, the Wet Tropics Vegetation Community Mapping, and reality on the ground. Perhaps the most pressing regards the nature of the vegetation sampled at sites EB1 and EB3. Vegetation at these sites are unmistakeably non-remnant with a canopy dominated by the exotic weed *Annona glabra* mixed with a scattering of native species including *Melaleuca leucadendra* and *Archontophoenix alexandrae*. Whilst these communities are recognised as regrowth in the Wet Tropics Vegetation Community Mapping (Stanton and Stanton, in prep.), the EPA regional ecosystems mapping describes these areas as remnants of the *Endangered* RE 7.2.1. This introduces an unusual paradox in that while the landowner is required by law to control *Annona glabra*, a class 2 declared weed (*Land and Stock Protection Act 2002),* doing so in this location risks potential breach of the *VMA (1999).* Advice from the EPA is required prior to any weed control in this location.



NOTES:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

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Figure 5a: Ella Bay Resort Site - EPBC Status

Client

Satori Resorts

0 200 400 600 800

Metres

3D Environmental
Vegetation Assessment & Mapping Specialists

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Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

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NR53

323
NR5994

1024
NPW151

1024
NPW151

235
NR7590

1
AP4452

246
NR3550

52 F27024
61 F27024
18 USL35566
43 F27024
29 F27024
40 F27024
75 F27024
1 F27028
36 F27024
29 F27020
3 F27028
27 F27020
1 F27020
8 USL35566
54 RP747213
23 F27020
49 F27020
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13 F27020
21 F27028
606 F2701
605 F2701
9 F27012
2 F27036
8 NR7264
604 F2701
602 F2701
1 F27034
601 F2701
311 F2703
313 F2703
8 NR7634
273 NR4819
508 F2703
1 F27037
315 F2703
511 F2703
506 F2703
305 F2703
17 F2708

1 NR6454

261 NR5555

8 F27023

NR3441

Legend

Proposed Access Road

EPBC

Critically Endangered

NA

N O T E S:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

Figure 5b: EPBC Significant VC's SAC

Client

Satori Resources

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

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There are a number of non-remnant types mapped across the property which have particular relevance to land management. These include areas of regrowth dominated by vine forest species, sclerophyll species, and a number of sub-classifications dominated by exotic species. Retention of these non-remnant communities dominated by native species is desirable if they provide a corridor for faunal movement, provide habitat for significant species, or offer a buffer zone along riparian margins. It should be noted that extensive infestations of sicklepod (*Senna obtusifolia)* noted in the August 2006 field survey effort were observed to be significantly reduced in the October 2008 survey, and no occurrences were of sufficient size to be represented in the vegetation community mapping. Eradication of *Hymenachne amplexicaule* (Hymenachne) and *Annona glabra* (Pond Apple) has not been undertaken to any significant degree, although at this stage, there is little point in eradicating these species until comprehensive rehabilitation plans have been developed for infested areas. Eradication of these exotic wetland species in the absence of rehabilitation planting and continued control measures will likely result in re-infestation, or replacement with another invasive exotic species.

Non-remnant sub-classifications are summarised in **Table 7** and spatially represented in the vegetation communities mapping shown in **Appendix A1** and **Appendix A2.**

Table 7. Sub-classifications of non-remnant vegetation communities.

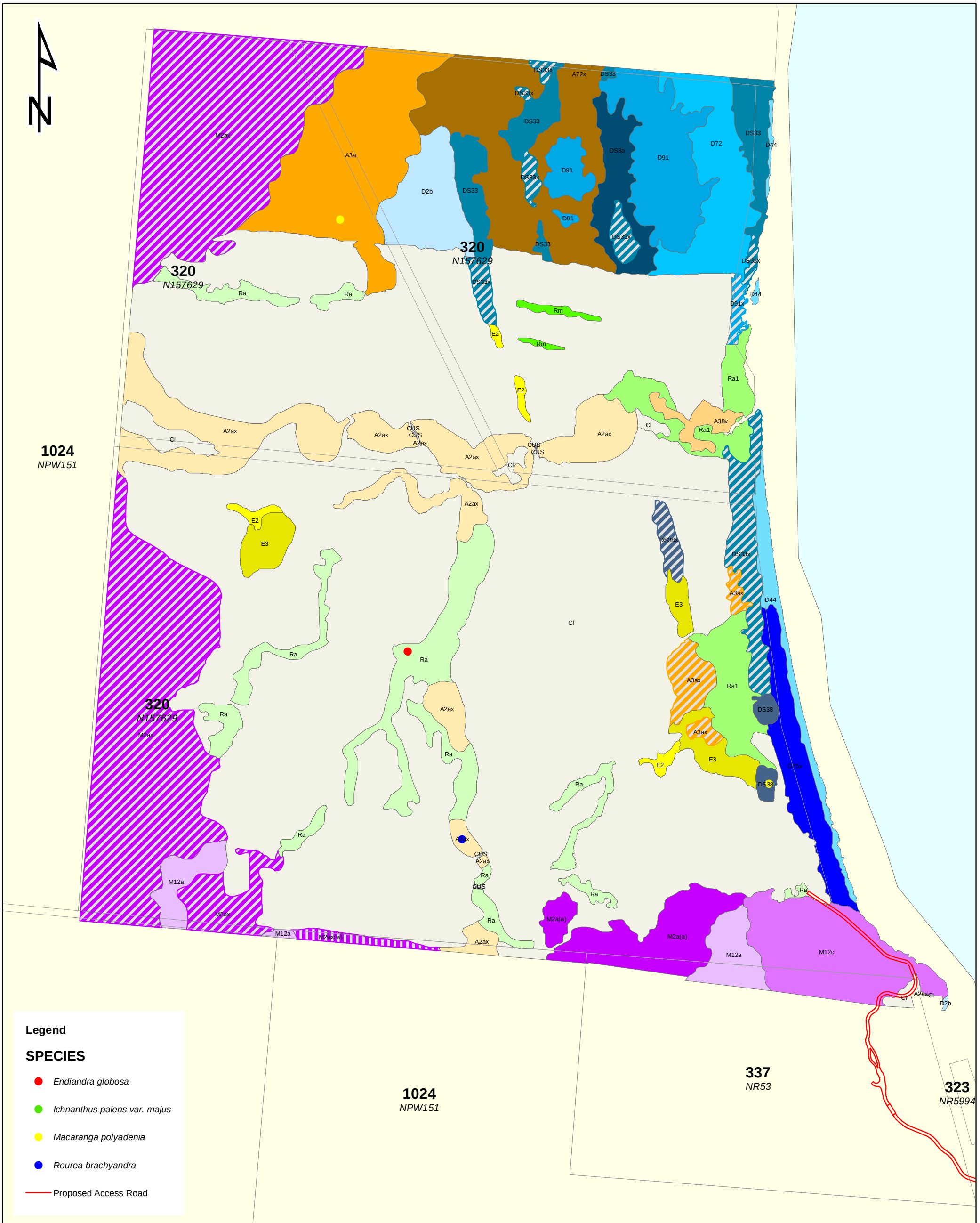
Non-remnant classification	Classification Description	Distribution on Site
RA	Non-remnant or secondary forest communities dominated by vine forest species typical of the parent vegetation type.	Mostly along disturbed drainage lines traversing cleared areas.
RA1	Non-remnant or secondary communities dominated by Hibiscus tiliaceus plus exotic species.	A relatively extensive area in dune swales and swampy flats behind the coastal foredune. Hibiscus tiliaceus generally indicates occasional tidal inundation or slightly saline surface water.
RM	Non-remnant or secondary communities dominated by Melaleuca spp.	Minor areas scattered across the cleared paddocks. Often associated with disturbed dune swales.
E2	Exotic grassland dominated by Hymenachne amplexicaulis.	Small areas are located on the swampy margins of cleared paddocks. .Generally seasonal wetlands.
E3	Exotic shrubland and closed shrubland dominated by Annona glabra.	Extensive areas of this invasive shrub are found on swampy sites, often in disturbed swampland communities and on drainage lines.

4.3 RECORDED SIGNIFICANT FLORA SPECIES

A list of identified species is provided for the EBIR site, the SAC and beachfront sites in Appendix C, Appendix D and Appendix E. Four species recorded are considered to be of conservation significance being

- *Macaranga polyadenia;*
- *Endiandra globosa;*
- *Icnanthus pallens,* and;
- *Rourea brachyandra*

Site records for these species are provided in **Figure 6a** and **Figure 6b**. Details regarding the ecology , location and population extent of these species is provided in the following sections. *Polyalthia patinata* (Near-threatened, NCA) and *Callerya pilipes* (Near-threatened, NCA) were recorded from the 50m transect of permanent monitoring site EBM(NP)1 in mesophyll vine forest. Although these records were at some distance from the immediate roadside fringe, the chance for occurrence of these species on the roadside corridor should be considered high.



N O T E S:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

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Figure 6a. EVR species locations in the EBIR site

Client

Satori Resorts

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

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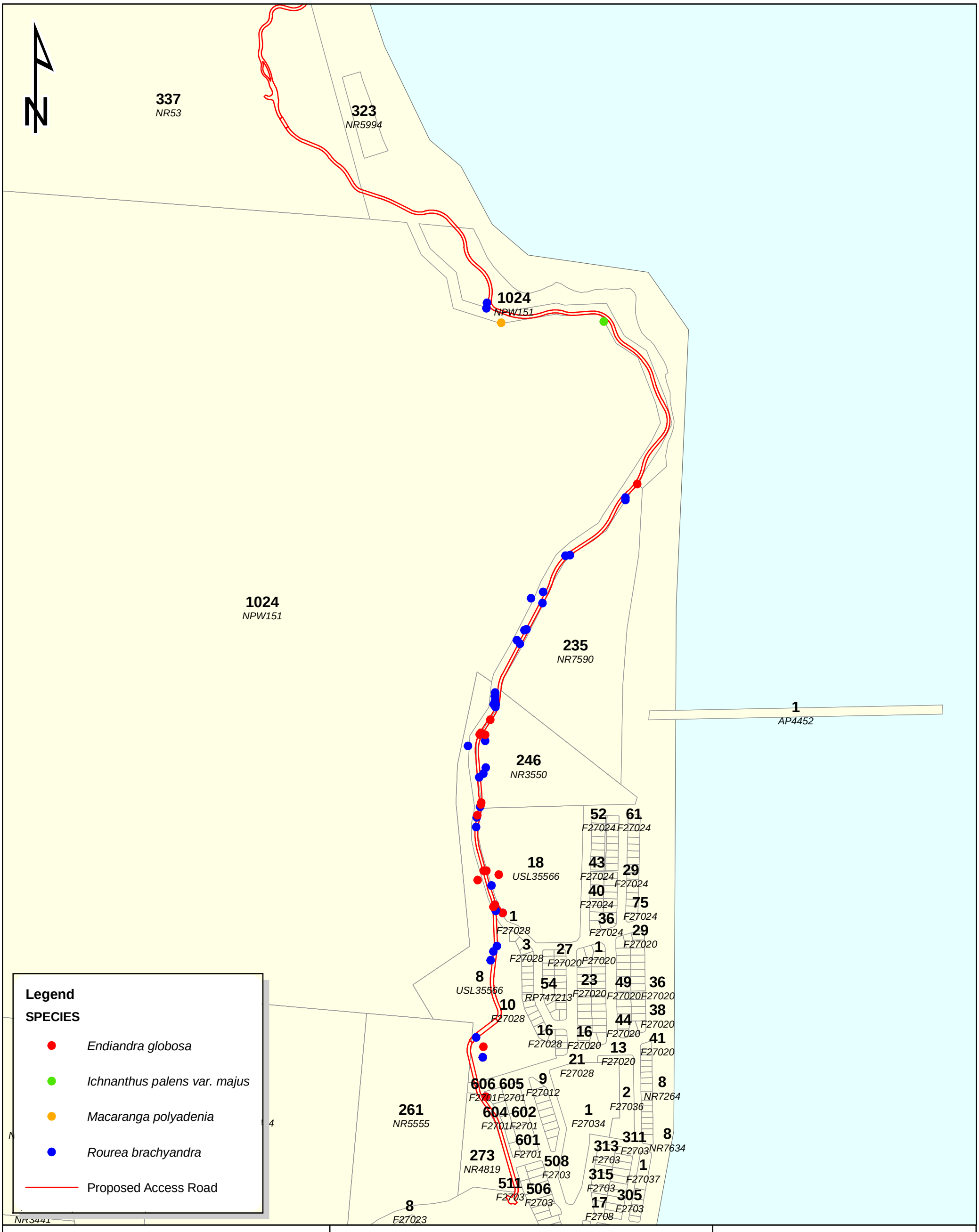

NOTES:

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Figure 6b. Road Area - EVR species locations

Client

Satori Resorts

0 200 400 600 800

Metres

Scale	1:10,000	Drawn By	DG	Checked	DS	File Path	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	Date	13/02/09	A3

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***Macaranga polyadenia* (No Common Name)**

Status: Near-threatened (NCA) and Not Listed (EPBC)

Description: Small tree.

Habitat Preferences: Occurs from near sea level to about 100m in well developed rainforest which is periodically flooded or in situations close to permanent water (Hyland et al. 1993).

Distribution: Occurs in north eastern Cape York Peninsula and north eastern Queensland. Three Herbarium records in the vicinity of the subject site as follows:

Garadunga in rainforest regrowth;

Johnstone River, habitat unspecified;

Warrina Conservation Reserve, Innisfail, in lowland swamp forest.

Distribution on Subject Site: The species was collected in mesophyll vine forest dominated by Feather Palms (RE 7.2.1 and 7.3.3a) (Sites EB3, EB6, EB12, EB16) on the EBIR. A single specimen was also collected in mesophyll vine forest adjacent to a fast flowing watercourse (site ERL5) on the SAC . It has a potential to occur in all swamp forest habitats including regrowth communities.

Threatening Processes: The habitat of *Macaranga polyadenia* has been severely impacted by wind disturbance although this is not a direct threat to the species (and may promote it recruitment). The accelerating invasion of Pond Apple in these seasonal wetland communities (RE7.3.3) has the potential to greatly impact the species through chocking and smothering, and gradual species displacement.

***Endiandra globosa* (Ball Fruited Walnut)**

Status: Near-threatened (NCA), Not Listed (EPBC)

Description: A tree to 30m x 40 cm dbh, usually small to medium sized (Hyland 1989).

Habitat Preferences: In north eastern Queensland it occurs in well developed lowland rainforests from sea level to 360m (Hyland 1989; Hyland et al. 1993).

Distribution: Occurs in north eastern Queensland and also occurs in north eastern New South Wales and southern Queensland (Hyland 1989; Hyland et al. 1993). The nine herbarium records are some distance from the subject site:

- Tropical Trials Unit, Pin Gin Hill (6 records);
- Australian Insect Farm, Seymour Range, tributary of Polly Creek, NNW of Daradgee. Complex mesophyll rainforest along creek on krasnozem soil with schist boulders;
- Erbacher property, tributary of Horans Creek, off Hernon road, NW of Innisfail. Complex mesophyll rainforest on a combination of krasnozem and spew clay soil.

Canopy of: *Backhousia bancroftiii, Acmena graveolens, Alstonia muelleriana, Cardwellia, Endiandra montana* and *Elaeocarpus grandis*;

- Gregory Falls near Innisfail in complex mesophyll vine forest on basaltic krasnozem.

Distribution on Subject Site: The species was observed in Site EB5 within the EBIR site within non-remnant disturbed riparian mesophyll vine forest where its abundance was noted as uncommon. The habitat fringes a creekline and was heavily impacted by wind disturbance. Large populations were recorded from within the southern sections of the SAC, generally south of the fish farm on the Ella Bay road where it occurred within well developed mesophyll vine forest (RE7.3.10, RE7.11.1).

Threatening Processes: Threatening process related largely to direct clearing of habitat. The species habitat on the EBIR is currently impacted by cattle and weed invasion including Pond Apple, whilst all habitats of the species, including those on the SAC are severely wind-disturbed. The species appears to recover quickly from direct disturbance and a large number of shrubs observed were coppicing at the base as a result of previous disturbance.

Photograph 12. Typical form of *Endiandra globosa* with coppice stems.

Photograph 13. *Endiandra globosa* leaf

Icnanthus pallens

Status: Near-threatened (NCA), Not Listed (EPBC)

Description: A low prostrate sprawling ground cover.

Habitat Preferences: In north eastern Queensland it occurs in ecotonal areas within sclerophyll vine forests and adjacent to vine forest margins.

Distribution: Occurs in the Cook (11 records) and North Kennedy (2 records) districts of northern and central Queensland (EPA, 2007) extending northward into Papua New Guinea. No herbarium records are recorded in the search area.

Distribution on Subject Site: The species was recorded observed in Site ELR6 within Lophostemon suaveolens open forest (RE7.11.34) during the July 2007 survey effort. Additional fertile material is required to confirm identification and species extent within this RE. Subsequent detailed habitat surveys undertaken in October 2008 indicate failed to provide any further species collections or material indicating that the species is cryptic and often difficult to detect. Impacts to the species may be directly incurred through road widening associated with construction of the SAC, particularly in the vicinity of Heath Point.

Threatening Processes: Major threats to habitat include displacement of the species through vine forest invasion in ground and shrub layers, and displacement of habitat through weed invasion on roadside edges.

***Rourea brachyandra* (Water Vine)**

Status: - Near-threatened NCA (1992)

Description: Rourea is a woody understorey vine with stem diameters to 8cm which occurs in north-east Queensland, Asia, Malesia and the Pacific Islands

Habitat Preference: Grows in well developed lowland and upland rainforest from sea level to 800m (Hyland *et al.* 2003). Herbrecs data indicates that the major known habitats are lowland vine forests on soils derived from basic igneous rocks.

Distribution on Subject Site: The survey results confirm that Rourea is a common species in the understorey with significant populations recorded within the roadside easement adjacent to and south of the fish farm on the SAC. Survey record points indicated in **Figure 5b** often represent the central stem of a broader species cluster. Data collected within permanent monitoring points indicates that Rourea occurs up to 50m in from the road edge within vine forests on alluvium and metamorphic footslopes. Representative photographs of the species are provided in Photographs 14 and 15.

Photograph 14. Compound leaf of *Rourea brachyandra*

Photo 15. Terminal leaflet of *Rourea brachyandra*

4.4 PREDICTED SPECIES OF CONSERVATION SIGNIFICANCE

In addition to those species discussed above, a number of flora species with special conservation significance have the potential to occur within the vegetation communities present at the site. These are discussed in further detail in **Table 8**. The table includes detail on those conservation significant species known from the search area but not considered to occur within the subject site.

Table 8. Potential Significant Flora Species

Species Name	EPBC	NCA	Habit	Likely	Possible	Unlikely	Comments
Aphyllorchis queenslandica	Not Listed	Near-threatened	A herb.	X			Known from a single specimen Herbrecs specimen (Wannan) on a metamorphic hillslope dominated by *Lophostemon suaveolens* at Ella Bay. Highly likely in RE 7.11.8b and RE7.11.34 on the SAC.
Aponogeton bullosus	E	Not Listed	Rooted, submerged, perennial aquatic.			X	Grows in cool rapidly flowing freshwater rivers and streams. Confined to northern Queensland in fast-flowing rivers on and running off the Atherton Tableland and in the Palmerston, South Johnstone and Mirriwinni districts (Hellquist and Jacobs 1998). Closest known record to subject site is to the north at Josephine Creek near Mt Bartle Frere (S. Jacobs 8249, B.Hellquist, J.Wiersema, 14 Aug 1997, BRI, NASC, NSW) (Hellquist and Jacobs 1998). No Herbrecs record from 10 km radius of subject site. The species was not observed during the survey.
Aponogeton cuneatus	Not Listed	Near-threatened	Perennial freshwater herb.		X		Two Herbrecs records at Victory Creek near its junction with the North Johnstone River growing in water from 1-2m in depth, and an imprecise record from Innisfail. Note that this species is not recognised in the Revision of the Aponogeton by Hellquist and Jacobs (1998). The species was not observed during the survey although possibility exists within streams within the EBIR site and to the immediate north of the National Park boundary on the SAC.
Aponogeton proliferus	E	E	Perennial freshwater herb.		X		An extremely rare species known only from the Innisfail region in narrow shallow and heavily shaded coastal streams, presumably now restricted because of extensive clearing and habitat loss (Hellquist and Jacobs 1998). One record in Herbrecs from Innisfail district in creek through rainforest (S. Jacobs 7148) (Hellquist and Jacobs 1998). Observations within potential habitat during the field survey did not locate this species. There remains a possibility however that the species occurs within streams on the EBIR subject site.
Arenga australasica	V	Not listed	A Palm	X			Known from Type 2b forests in the Mission Beach area and from MVF on basalt at Clump Point to the south of the study area. No Herbrecs records however areas mapped as 2b/RE 7.2.1 are considered high potential habitat for this species. Not recorded during survey of the EBIR or SAC project areas. The potential for this species to occur in the vicinity of the project area should be considered high, although extensive search efforts in habitats adjacent to the EBIR site and the SAC indicates that direct impact to the species is extremely unlikely.
Callerya pilipes	Not Listed	Near-threatened	A vine (legume)	X			A single specimen was collected from the 50m transect on permanent monitoring site EBM(NP)1. Known habitat is lowland mesophyll to complex mesophyll vine forest with potential to occur within RE7.3.1a and RE7.11.1 on both immediate roadside(SAC) and the EBIR site.

Species Name	EPBC	NCA	Habit	Likely	Possible	Unlikely	Comments
Canarium acutifolium var. *acutifolium*	V	Not listed	A tree.	X			Occurs in NEQ and restricted to mesophyll vine forest of coastal lowlands between Mossman and Tully between sea level and 100m. Commonly occupies creek and river banks (Hyland *et al*. 2002). The species was not observed during the survey however potential habitat exists in RE7.3.10, particularly adjacent to water-courses. Potential exists for this species to occur adjacent to major drainage features on the EBIR project site although severe habitat degradation principally from cyclones in these areas limits suitability of habitat.
Carronia pedicellata	E	Not listed	A vine.		X		Occurs in NEQ in well developed complex notophyll and mesophyll rainforest between sea level to 520m (Queensland Herbarium 2008). Recorded in targeted surveys of proposed Tully – Innisfail 274 kva powerline (http://biotropica.com.au/PROJECTS/targeted.html) with no Herbrecs records in the 10km radius search area. Not recorded in this survey however potential habitat occurs within the site in rainforest of metamorphic footslopes (RE7.11.1) and well developed vine forest on alluvium (RE7.3.10).
Dendrobium mirbelianum	E	Not listed	Epiphytic orchid.		X		Grows on trees or exposed rocks from sea level to 600m often in mangroves and on trees overhanging beaches and in coastal forests (Laverack et al. 2006). One imprecise Herbrecs record from Babinda area. Not recorded in this survey.
Dendrobium superbiens	V	Not listed	Epiphytic orchid.		X		No Herbrecs records in the 10km radius search area. Not recorded in this survey.
Dioclea hexandra	Not listed	V	A vine with deep purple red flowers.	X			Occurs in NEQ and PNG from sea level to 50m in lowland rainforest and swamp forest (Hyland et al. 2002). One Herbrecs record from Etty Bay in rainforest and swamps (C.T. White 11691). Potential habitat occurs within the subject site.
Eleocharis retroflexa	V	V	A small tufted and mat forming sedge.			X	Five Herbrecs records all from Eubanangee Swamp. No suitable habitat within the subject site.
Elaeocarpus stellaris	Not listed	Near-threatened	A small tree.		X		Endemic to NEQ, restricted to the Alexandra Ck-McDowall Range Area and just south of Mt Bartle Frere on the Nth and Sth Johnstone Rivers where it grows in a variety of well-developed rainforests between 50-500m (Hyland et al. 2002). Three Herbrecs records (2 from Gregory Falls on basalt, and one imprecise record from Innisfail). Not recorded in this survey.
Fimbristylis adjuncta	E	E	A tufted, oblique to erect sedge 4-6 in.		X		A single Herbarium record from Eubenangee Swamp N of Garradunga. Suitable habitat within the subject site.

Species Name	EPBC	NCA	Habit	Likely	Possible	Unlikely	Comments
Garnotia stricta var. *longiseta*	Not listed	Near-threatened	Erect grass with inconspicuous spikelets, rooting at nodes.		X		Two Herbrecs records both located in the Seymour Range, NNW of Daradgee. Habitat is simple notophyll-mesophyll rainforest on poorly drained clay spew derived from schist; and Notophyll-mesophyll rainforest along creek with schist rocks. Similar habitat exists in the subject site in rainforest of metamorphic footslopes.
Hodgkinsonia frutescens	V	V	A shrub.			X	No Herbrecs records from the vicinity of the site. Known from the understorey in upland and lowland rainforest in NEQ and CYP (Hyland et al. 2002). Unlikely to occur as this species generally prefers basalt soils typically in type 5b forests of the Atherton Tableland.
Hupzeria phlegmarioides	V	V	A pendulous epiphyte.	X			In Australia, restricted to north-eastern Qld; also from Indonesia to the Pacific. In Qld, it occurs as an epiphyte in rainforest. Potential suitable habitat in RE7.11.34 within NP151 (Heath Point) as well as potential habitat within RE 7.3.25 in the integrated resort site project area. General habitat also occurs within the road study.
Hupzeria prolifera	Not listed	Near-threatened	A pendulous epiphyte.			X	In Australia, restricted to north-eastern Qld; also from Indonesia to the Pacific. In Qld, it occurs as an epiphyte in rainforest. Records indicate unsuitable habitat within the subject site (*Flora of Australia* Volume 48 (1998).
Ilex sp. (Gadgarra B.P.Hyland RFK2011)	Not listed	Near-threatened	A tree.		X		Endemic to NEQ known only from a few collections from Mission Beach, Wyvuri and the Mulgrave River, to Gadgarra on the Atherton Tableland. Grows in well-developed rainforest between sea level and 700m. A single herbarium record from Seymour Range, NNW of Daradgee in SMNVF on clay spew derived from schist, poorly drained. (Herbrecs Data). Similar habitat occurs on the site however not recorded in the field survey.
Nepenthes mirabilis	Not listed	E	A Pitcher Plant.			X	No suitable habitat occurs within the subject site. A number of records well to north in Wyvuri Swamp.
Phaius tancarvilleae	E		Terrestrial Orchid.		X		There is some confusion surrounding the nomenclature of the *Phaius* genus. *P. tancarvilleae* is identified on the EPBC Act however is not recognised in Qld according to the latest Qld Census (Bostock and Holland 2007). The three species recognised in Qld are *P. australis, P. bernaysii* and *P. pictus*. While some reports consider *P. tancarvilleae* as not native to Australia, it retains validity as a native species in NSW where it is listed as endangered on the NSW Threatened Species Act. For the purpose of this report, the current nomenclature standard as determined by the Queensland Herbarium is used therefore excluding the occurrence of *P. tankervilleae* in the study area. *P. pictus* is a Vulnerable EPBC species which is only known from 3 locailties in the Wet Tropics with the type locality from the Bellenden Ker Range, Mossman and Sth Johnstone. No Phauis

Species Name	EPBC	NCA	Habit	Likely	Possible	Unlikely	Comments
							species were recorded during the field survey.
Piper mestonii	Not listed	Near-threatened	A vine.	X			Grows in well developed lowland rainforest between sea level and 350m (Hyland et al. 2002). Two Herbrecs records: 1) 17 km N of Innisfail and 1 km S of Rocky Point, Bramston Beach, in dense mixed swamp forest dominated by *Melaleuca* and *Pandanus*; 2) Eubenangee Swamp. Potential to occur in swamp rainforest of communities within the site. Further survey work required.
Polyalthia patinata	Not listed	Near-threatened	A shrub with glossy simple alternate leaves and fibrous twig bark.	X			Occurs near sea level to 200m in lowland rainforest (Hyland et al. 2002). North eastern Queensland and restricted to the area between Cairns and Innisfail. The plant is known from 16 collections within the Cook botanical district (Henderson 2002) with a single record from the Herbrecs search area at Berner Creek Innisfail (W.R. Petrie 39). Habitat not prescribed. Based on its occurrence in the locality in wind disturbed rainforest at permanent monitoring site EBM(NP)1 (50m transect) as well as a number of samples recorded in the Jubilee Grove area, this species has a high potential to occur in rainforest on metamorphic foothills.
Polyscias bellendenkerensis	V	V	A tall shrub.			X	Known only from mountain top areas of Bartle Frere, Bellenden Kerr, and Daintree (Hyland et al. 2002). Discounted on the basis of unsuitable habitat.
Pseuduvaria villosa	Not listed	Near-threatened	An understorey shrub.		X		Endemic to NEQ where it is restricted to between the Nth Johnstone R. and Liverpool Ck in well developed lowland and foothill rainforests frequently on soils derived from basalt. One Herbrecs record from Gregory Falls, Lower Palmerston via Innisfail on basalt and another from Bermer Creek, Innisfail. Not recorded in field survey. CMVF on basaltic krasnozem does not occur within the site.

4.5 HABITAT CONDITION

EBIR and SAC

With the timing of the initial EBIR vegetation survey six months after the impact of Cyclone Larry, it is unfortunate that survey methods were unable to be tailored to provide repeatable measurements of floristic health and vigour. The projected canopy cover (PCC) and stem count measurements collected during the initial survey period (3d Environmental, 2006) did not provide any repeatable measurement of the health of either canopy, sub-canopy or lower structural layers. Foliage was noted to have been largely stripped by extreme wind during this initial survey and in lower structural layers, foliage was often wilted from increased solar exposure.

The supplementary survey completed in October (2008) established permanent sites within the EBIR project area where repeatable measurements of foliage projected cover (FPC) can be repeated on an annual basis. These measurements presented in **Appendix D** will be useful to determine either continued foliage recovery in future monitoring cycles, or potential decreases in foliage vigour that may be attributed to site disturbance or long term seasonal cycles. Whilst it is not possible to provide any quantifiable measurement of the recovery of forest communities on the site in the time lapsed since the original survey, photographic comparisons between survey site EB6 (measured in August, 2006 as represented in Photograph 16) and survey site EBM6a (measured in October 2008 as represented in Photograph 17 at the same approximate location) provide indication of the rapid recovery of foliage cover and vigour within the community (RE7.3.3) in all structural layers. In comparison with the 50% percent crown cover measured at EB6 using a line intercept method of Neldner *et al.* (2005), FPC of the canopy was recorded at 32%. While cover measurement of the secondary tree layer remain at a constant 40%, the understorey and ground layers show a significant increase in cover between the 2006 and 2008 survey. The basal area measurement from both surveys shows an identical value of 25m2/ha.

A similar recovery in canopy and foliage cover was noted in the majority of vegetation communities examined in the supplementary survey, giving confidence to the designation of remnant status to some areas previously mapped as non-remnant vegetation. It should also be noted that the feather palm swampland community (RE7.3.3) at the location of EBM6a has suffered no apparent increase in sub-canopy densities of the noxious weed *Annona glabra* (Pond Apple) from densities recorded in the original survey. It was expected that

invasion of this species might be facilitated by an increase in light penetration associated with extreme wind damage. The other sites similarly did not show any marked invasion of exotic weeds post cyclone recovery.

In relation to habitat for EVR species, intensive survey in four permanent monitoring locations failed to identify significant species additional to those identified during the original survey effort with the exception of *Rourea brachyandra* identified at EBM22a. This gives confidence that the EVR species list compiled as a result of the original survey is a representative indication of the population densities and nature of significant flora on the site.

Some concern has been raised about the degree to which the current population of Agile Wallabies (*Macropus agilis*) is affecting the integrity of vine forest and riparian communities within the study area. Examination of a number of riparian forest communities indicates that the wallabies have a well established system of pads into the forest underbrush. These pads extend only a limited distance into the forest margins and wallabies appear to be using these forest margins as resting places. Degradation of the internal portions of these forest communities by the wallaby could not be substantiated.

Photograph 16. Site EB6 measured in August, 2006 demonstrating broad canopy gaps and wilted sub-canopy and shrub layers.

Photograph 17. Vegetation at the location as site EB6 in October 2007 (see site EBM6a). Dense foliage cover in all structural layers should be noted.

Whilst the effects of Cyclone Larry are similarly noted on the SAC, the most intensively affected areas are typically the foothills of the eastern escarpment, immediately above the break of slope with the alluvial plain. These areas are typically dominated by dense towers and sprawling mats of *Calamus radicans* and *Calamus australis* with scattered emerging shrubs and trees. The rainforest grass *Panicum incomtum* is particularly prominent in the most heavily wind affected areas. The heavily wind disturbed 'cyclone scrubs' provide relatively poor habitat for the majority of significant (EVR) species potentially occuring within the study area, and compared to undisturbed areas, present much lower biodiversity value. The edge effect of the current Ella Bay road on biodiversity values within adjacent forest communities is discussed in a separate baseline survey report (3d Environmental 2008b) which deals specifically with this issue.

Photograph 18. Dense shrub cover of *Calamus radicans* in the southern portion of the SAC area.

Beach Front Areas – Flying Fish Point

The construction of the boulder retaining wall on the Flying Fish Point beachfront has severely compromised the integrity of foredune vegetation to the immediate north of this structure. Accelerated erosion and destruction of foredune vegetation has occurred as sedimentary process has re-equilibrated in an attempt to reinstate normal crescent shaped beach morphology. This accelerated erosion appears to have been responsible for salinisation and dieback of back dune *Melaleuca leucadendra* swamplands as a rapidly regressing foredune has become susceptible to saltwater breach during storm surge and spring tides. The instability of the beachfront in this southern area should be considered as a major constraint during design and construction of the boardwalk. It should also be stressed that control of further beachfront erosion in this location will be extremely difficult.

The foredune communities have also been severely compromised through mechanical disturbance (access tracks) and other forms of partial clearing as well as extensive invasion of exotic species. Singapore Daisy (*Sphagneticola trilobata)*, a Class 3 declared plant (Land Protection Act, 2002), is perhaps the most pervasive of these species, dominating the ground cover in some locations to the total exclusion of native species. A species of Prickly Pear (*Opuntia* sp.*)* is scattered on the landward edge of the frontal dune with occasional infestation of *Lantana camara** (Class 3 LPA 2002). Dense groves of Mother-in-Law's Tongue (*Sansevieria* sp.*)* are notable together with *Praxelis clematidea*, Psidium guajava** (Guava) and occasional shrubs of *Annona glabra** (Pond Apple) in some locations. An extensive cover of Pond Apple seedlings is often apparent immediately above the high tide mark. A management plan considering control and management of exotic species will be required to fulfil requirements of the permit process prior to construction. A list of exotic

species recorded on the Flying Fish Point beachfront is presented in **Appendix G**, in conjunction with a full list of recorded species.

Photograph 19. A dense cover of Singapore Daisy on the beachfront to the north of Flying Fish Point. This area has been included with adjacent non-remnant vegetation.

Photograph 20. Heavy infestation of Mother in Law Tongue on the foredune.

4.6 DECLARED WEEDS

Several declared weeds (under the provisions of the *Land Protection Act 1999* (LPA) were recorded within the study area. Pond Apple (*Annona glabra*), Hymenachne (*Hymenachne amplexicaule),* and Sickle Pod (*Senna obtusifolia*) formed stands of sufficient density to allow separation into mappable units in some locations. Control of sickle pod post the 2006 September reduced the most intensive infestations of the species, which in October 2008, occurred as scattered copses throughout the EBIR site.

Pond Apple (*Annona glabra):* Pond Apple is Class 2 highly invasive tree weed of swamps in the wet tropical lowlands, and is listed as a Weed of National Significance (WONS) and subject to a Strategic Plan under the National Weeds Strategy Framework (ARMCANZ et al. 2000). This species presents the most serious threat to biodiversity of all exotic species

on the site. Of particular concern are the swampland communities of the adjacent Ella Bay National Park which due to the recent disturbance created by Cyclone Larry, are likely to present suitable edaphic conditions for this weed to penetrate otherwise undisturbed areas. With the tendency for this weed to be spread by animals, both exotic and native, it is likely that this species has already found a niche in several locations within the national park boundary. Within the project area, the most severe infestations occur on disturbed drainage lines or swamplands where near pure stands of the species often prevail. Control of feral pigs, should be considered a fundamental practice in any weed eradication program. By law, all landholders must take reasonable steps to keep their lands free of Class 2 pests.

QPWS (2004) report that: "the most effective control techniques are cut stump for smaller trees, stem injection for larger trees and the felling of trees over 25 centimeters diameter with immediate herbicide treatment of stumps. It is further recommended that treated trees should be left in situ to reduce further disturbance to an area. Follow-up work is considered crucial to the long-term success of any control work and should be an essential component of any control programs." The Queensland Parks and Wildlife Service utilised these methods to great effect in the Eubanangee National Park, a previously severely affected area which is now free of the weed (Peter Stanton. pers. comm. August 2006). Based on work carried out by QPWS in 2003, the average cost to undertake initial control of a pond apple infestation was $2,860 per hectare with costs reported to vary for different types of infestations and control technique used (QPWS 2004).

Hymenachne *(Hymenachne amplexicaulis)*: A swamp dwelling robust perennial exotic grass commonly 1-2.5 m in height that has established on wet drainage lines within the cleared areas on the property (refer **Figure 4**). In Queensland it is a declared Class 2 pest, and is a WONS and subject to a Strategic Plan under the National Weeds Strategy Framework (ARMCANZ et al. 2000). The grass has the potential to completely smother wetland communities effectively suffocating native species and destroying aquatic habitats (Stanton 1998). It is generally found as a monoculture able to grow and thrive in water up to 1.5 metres in depth and can form floating mats (Stanton 1998). When colonising rivers, drains, and wetlands infestations act as silt and nutrient traps and will exacerbate flooding problems through reduction in flood flows (Johnstone River Shire Pest Management Plan 2005). There is high potential for this species to spread into undisturbed wetland of National Significance within the adjacent Ella Bay National Park. This threat is

significantly increased in the advent of Cyclone Larry which increased light penetration into natural swampland communities. Infestations within the LGA are known from the South Maria Creek System, Mena Creek area, Liverpool Creek and small infestations in the North Johnstone River (Johnstone River Shire 2004; Csurhes et al. 1999).

Sicklepod (*Senna obtusifolia):* Sicklepod is an invasive legume that has established within extensive areas of exotic grassland. It is a declared plant that is common throughout LGA on pastures and poorly managed land (Johnstone River Shire 2004) and otherwise occurs between Bamaga to just south of Mackay on coastal areas and on alluvial margins (Mackey et al. 1997). This species favours better drained and more fertile soils, typically on alluvial soils. Infestations on the subject site are extensive yet patchy and generally constrained by the dense cover of the *Brachiaria* spp. dominated improved pastures. Large seed reserves that remain in the soil may germinate at any time of the year under favourable conditions (Johnstone River Shire 2004).

A number of additional exotic species were found on the site, most of these being pasture imports found in association with severely degraded habitats. Species include as Hyptis (*Hyptis capitata* and H. *suaveolens*), Blue Top (*Aegeratum conyzioides),* Broad-leaved Carpet Grass *(Axonopus compressus),* Indian Calapo (*Calopogonium mucunoides),* Devils Apple *(Solanum torvum),* Thick Head *(Crassocephalum crepidioidesare),* Tropical Chickweed *(Drymaria cordata),* Sensitive Weed *(Mimosa pudica*), Giant Panic *(Panicum maximum),* Snake Weed *(Stachytarpheta cayennensis),* and Lantern Burr *(Urena lobata)* are prevalent in degraded areas across the broader study area. Lantana (*Lantana* camara) (Declared Class 3) and Giant Rats Tail Grass *(Sporobolus pyramidalis),* (declared Class 2) were also recorded at several locations within the study area. A significant infestation of Yellow Allamanda (*Allamander cathartica*) was observed within the subject site along the access road between the entrance gate and the homestead. Yellow Allamander is a rampant climber known otherwise from isolated infestations in the Johnstone Shire area (Johnstone River Shire 2004). Infestations of Singapore Daisy were observed along the foredunes of Ella Bay.

It is worthy to note that the Johnstone Shire Council has included a specific code in the draft planning scheme to reduce the probability of new weed incursion occurring on newly developed land. This code requires that any development involving the movement of soil or plant material on the land to be carried out occurs in a manner that does not cause weed

spread within the land or to other surrounding lands. The performance criteria identify the following requirements:

a) Disturbance of soil and vegetation is limited to the footprint area of the buildings and/ or development;
b) Earthmoving and vegetation control machinery and vehicles leave the land only after being thoroughly washed down at a location whereby material will be contained within the land (i.e. not in drainage ways or near the boundaries of the land);
c) Any soil or vegetation removed from the area will be in covered loads to reduce the spread of any weeds along the transport corridor;
d) Any soil/sand/gravel, hydromulch or vegetation bought into the land will not contain any plant material of any weeds stated schedule 4 (State legislation, or Council's Local Laws and Pest Management Plans), (Johnstone River Shire Pest Management Plan 2005).

Table 9 summarises the declared plants found in the Johnstone Shire and identifies the priority and measures for control as determined by the Pest Management Plan for the LGA.

Table 9. Control Priority and Measures for Declared Plants[5]

Plant	**Control Priority[6]**	**Control Measure[7]**	**Declaration Status[8]**
Pond Apple *(Annona glabra)*	E	3	C2
Hymenachne *(Hymenachne amplexicaulis)*	B	2	C2
Lantana *(Lantana camara)*	D	4	C3
Sicklepod *(Senna obtusifolia)*	C	3	C2

[5] Source: Johnstone Shire Council – Pest Management Plan July 2002 – 2006 - Version 1 - 7 May, 2004
[6] B. Declared plants found generally in the Johnstone Shire and it is the intent to eradicate the plant over time, from the Shire.
C. Declared plants found in the Johnstone Shire which are to be destroyed by owners where found.
D. Declared Plants found generally in Johnstone Shire and are to be controlled by the owners.
E. Declared plants found generally in the Johnstone Shire and information on identification and treatment by owners is promoted.
[7] 2. Owner to control plants where they are found. It is the aim of Council that plants in this category are to be **eradicated** from the Shire over a period of time.
3. Owner to **destroy** declared plants within time stipulated on notice. Property Management Plan may be entered into providing the Declared Plants ability to multiply is reduced/eliminated.
4. Notice is not generally served, with owners **encouraged** and informed to be able to identify and treat these plants. Council may serve notice where an owner neglects this general duty, to the detriment of surrounding owners.
[8] **Class 2 or Class 3** – If it is established in the State; and is causing, or has the potential to cause, and adverse economic, environmental or social impact in the State another State or part of the State or another State. In deciding whether to declare an animal or plant to be a class 2 or class 3 pest, consideration is given to :
- The significance of the animal's or plant's impact or potential impact;
- The area affected, or likely to be affected, by the impact;
- The extent to which the animal or plant has spread or is likely to spread.

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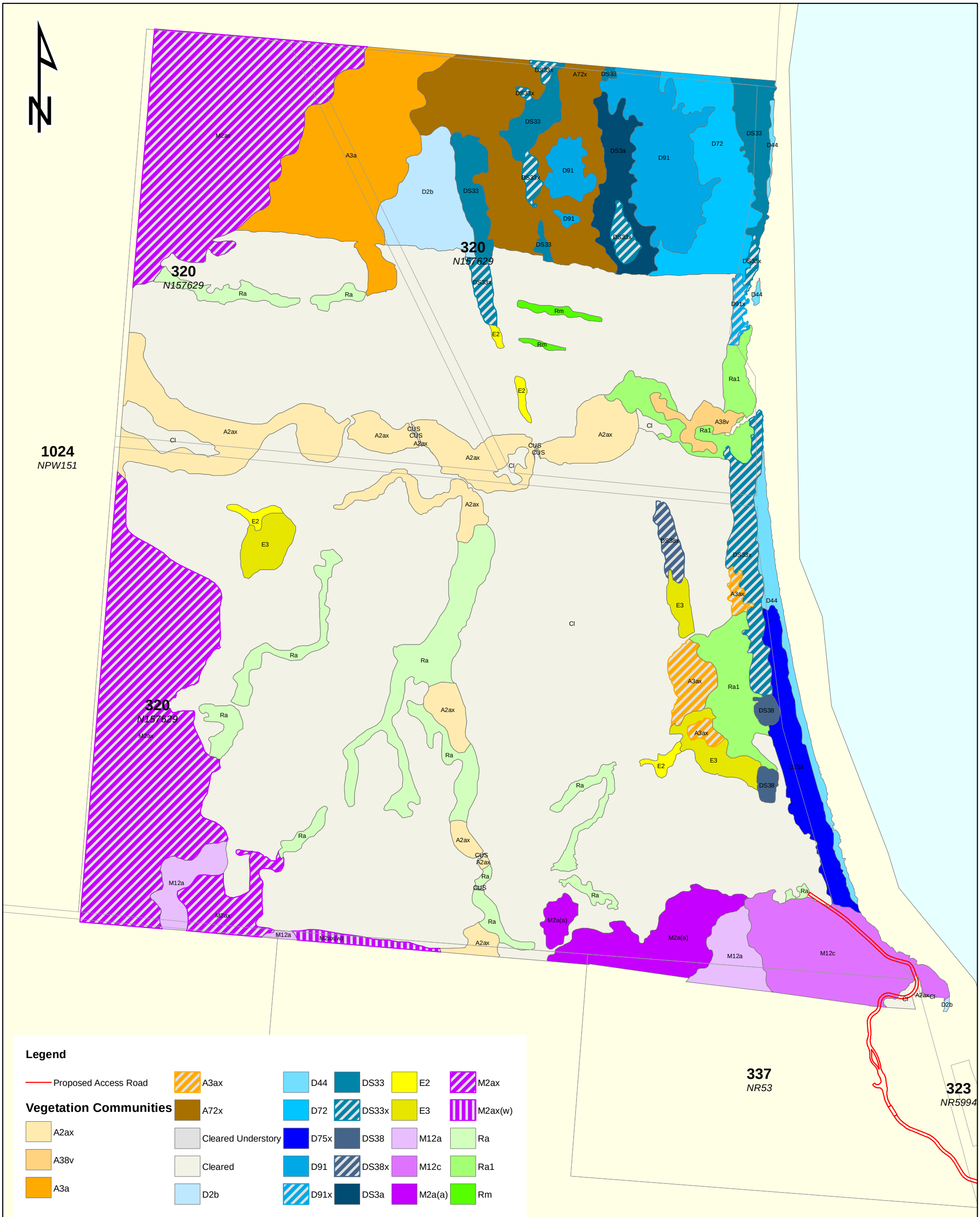
APPENDIX A: VEGETATION COMMUNITY – DESCRIPTIONS AND ASSOCIATIONS

Vegetation Communities located within study area with area of occurrence indicated.

Community No.	Description	Landform	EBIR	SAC and Beach.
Vine Forest Communities				
2a/2ax	Mesophyll vine forest.	Footslopes on metamorphic rocks (M) and alluvial outwash flood plains (A).	*	*
2ax(w)	Complex mesophyll to mesophyll vine forest with severe wind damage.	Footslopes on metamorphic rocks (M)	*	
2b	Mesophyll vine forest on beach ridges.	Relict parallel beach ridges (D).	*	*
3a/3ax	Mesophyll vine forest with dominant feather palms (*Archontophoenix alexandrae).*	Seasonally inundated lowland swamps/drainage depressions (A).	*	*
72	Mesophyll vine forest with *Archontophoenix alexandrae.*	Shallow sand sheets and interdune swales. Seasonally wet/saturated (D, DS).	*	
75	Mesophyll to notophyll vine forest of *Syzygium forte* subsp. *forte* (white apple).	Coastal backdunes (D)	*	*
66	Vineland	M	*	
Sclerophyll Vine Forests				
12a	Notophyll vine forest with dominant *Acacia celsa.*	Upper ridgelines and crests on metamorphic rocks (M).		*
12c	Sclerophyll vine forest with dominant *Acacia mangium* and *Lophostemon suaveolens*.	Metamorphic footslopes in north-east of property (M).	*	
91	Sclerophyll vine forest with *Lophostemon suaveolen.*	Confined to dune ridges (D) and coastal headlands (M).	*	*
Melaleuca Dominant Communities				
33/33x	Open forest dominated by *Melaleuca quinquenervia.*	Dune Swales (DS) and seasonally inundated alluvial depressions (A).	*	
38/38x	Tall open forest dominated by *Melaleuca leucadendra.*	Seasonally inundated dune swales (D) and alluvial drainage depressions (A).	*	*
Coastal Foredune Communities and Shrublands				
44	Foredune complex dominated by shrubland and low open forest of *Casuarina equisetifolia.*	Coastal foredune on beach sands (D).	*	*
Rock Pavement Communities				
21	Rock pavement.	Coastal headlands (M)		*
Mangrove Communities				
22a	Mangrove low closed forest to open shrubland	Estuarine/ intertidal areas	*	*



NOTES:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

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Appendix A1. Ella Bay Resort Site - Vegetation Communities

Client

Satori Resorts

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	12/05/11	A3

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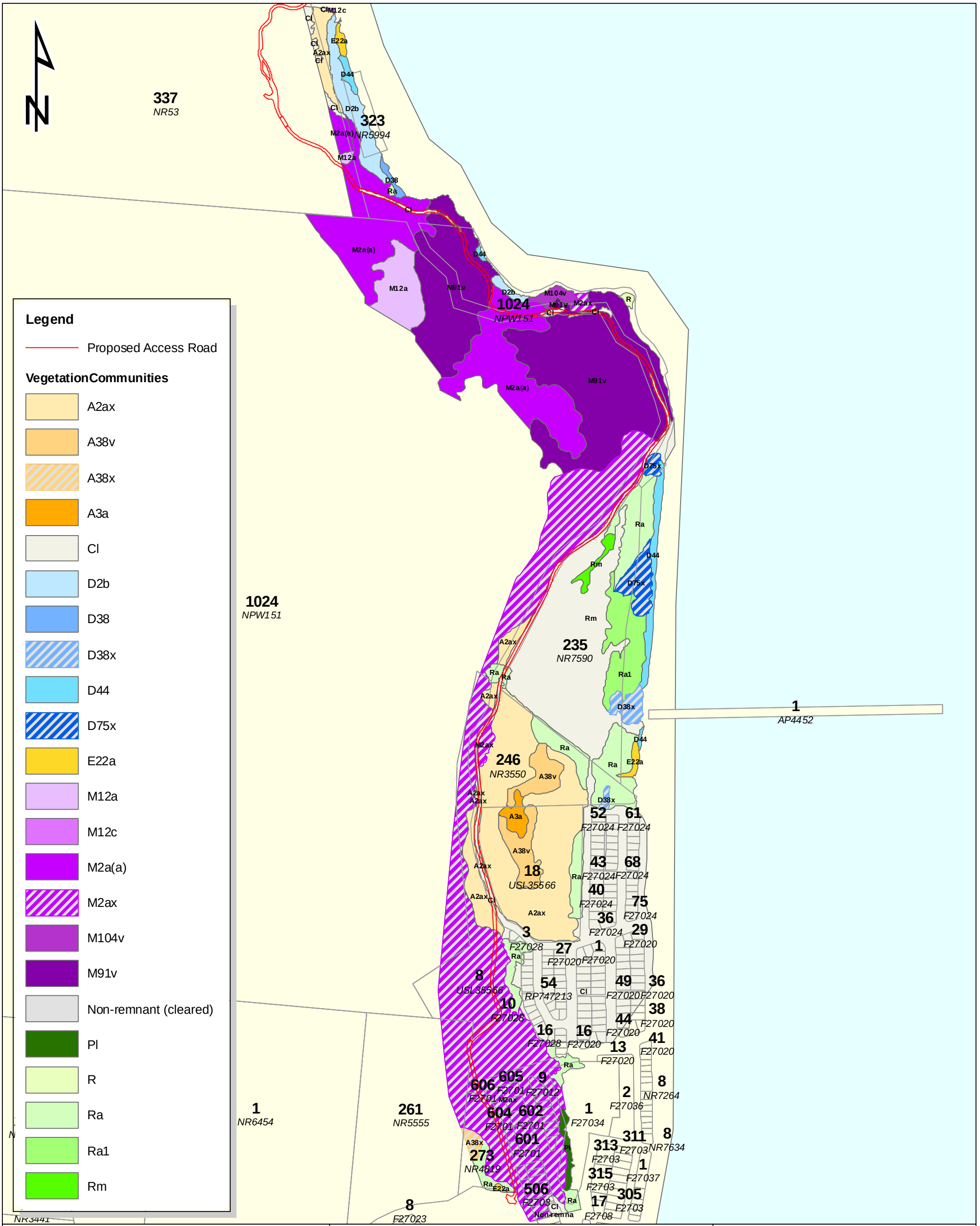

NOTES:

(i) This plan has been produced for exclusive use of the client and **3D Environmental**

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Appendix A2. Road Area - Vegetation Communities

Client

Satori Resources

0 200 400 600 800

Metres

Scale	Drawn By	Checked	File Path	Date	
1:10,000	DG	DS	C:\3D Environmental\Ella_Bay\Ellabay2\ella2_mapping_A3P.mxd	09/12/08	A3

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APPENDIX B: SUMMARY VEGETATION SITE DATA – AUGUST 2006 SURVEY

Site Number: EB1

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0706412 E, 8643174 N
Photo #: DS 46
Landform and Geology:
Slope: 0
Aspect: 0
Structure: Closed shrubland of *Hibiscus tiliaceus* with emergent *Archontophoenix alexandrae*
Regional Ecosystem: Non-remnant
Vegetation Community Code: Ra1

Structural Summary

Strata	Height Range	Cover	Dominants	Basal Area Sweep (1 cm)
E	20-35 m	<5%	*Archontophoenix alexandrae*	Not carried out.
S1	10-12m	30%	*Hibiscus tiliaceus* *Annona glabra** *Commersonia bartramia*	Not carried out.
S2	2-3m	80%	*Hibiscus tiliaceus* *Lantana camara** *Pandanus solmslaubachii*	Not carried out.
G	0-1m	60%	*Stenocleana palustris* *Scleria polycarpa* *Entada phaseoloides* *Merrimia peltata*	Not carried out.

Site Number: EB2

Survey Intensity: Tertiary
Date: 30/08/06
Location GPS: 0400457 E 8068970 N
Photo #: DS 48, 49
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Mesophyll vine forest with Feather palms (disturbed)
Regional Ecosystem: Non-remnant
Vegetation Community Code: A3ax

Structural Summary

Strata	Height Range	Cover	Dominants	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	20-25m	25-30%	*Melicope vitiflora* *Glochidion sumatranum* *Nauclea orientalis* *Commersonia bartramia*	10 1 1 1	13
T2	15-20m	10%	*Glochidion sumatranum* *Nauclea orientalis* *Hibiscus tiliaceus* *Macaranga tanarius*	5 3 1 1	10
S1	2-10m	40%	*Polyscias australiana* *Macaranga tanarius* *Annona glabra** *Merremia peltata* *Atractocarpus fitzalanii* *Ficus congesta*	-	-
G	0-1m	30%	*Axonopus compressus** *Scleria polycarpa* *Leptaspis banksii* *Archontophoenix alexandrae* *Entada phaseoloides* *Merremia peltata*	-	-
					23m2/ha

Site Number: EB3

Survey Intensity: Tertiary
Date: 30/08/06
Location GPS: 0400398 E, 8068967 N
Photo #: DS 50, 51
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Low closed swamp forest
Regional Ecosystem: non-remnant
Vegetation Community Code: e3

Structural Summary

Strata	Height Range	Cover	Dominants	Basal Area Sweep (1 cm)	Total BA m2/ha
E	35-40m	<5%	*Nauclea orientalis* *Melaleuca leucadendra*	1 0	1
T1	8-12m	100%	*Annona glabra** *Glochidion sumatranum* *Hibiscus tiliaceus* *Nauclea orientalis* *Archontophoenix alexandrae* *Barringtonia racemosa*	33 3 2 1 1 0	40
S1	2-4m	15%	*Atractocarpus fitzalanii* *Ficus congesta* *Barringtonia racemosa* *Myrsine porosa* *Macaranga polyadenia*		
G	0-1m	10%	*Stenocleana palustris* *Scleria polycarpa* *Calamus australis* *Dendrobium discolor* *Piper* sp.	-	-
					41m2/ha

Site Number: EB4

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0400372 E, 8068866 N
Photo #: DS 52
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Exotic grassland dominated by Hymenachne.
Regional Ecosystem: Non-remnant
Vegetation Community Code: e2

Descriptive Notes: Infestation of *Hymenachne amplexicaulis*, in low lying swampy depressions surrounded by *Annona glabra* with extensive fringing patches of *Senna obtusifolia*. Additional weeds that occur on the edges of the community *are Stachytarpheta jamaicensis, Aegeratum conyzioides, Solanum torvum, Urena lobata, Sida cordifolia, Mimosa pudica* and *Sporobolus* sp.

Site Number: EB5

Survey Intensity: Tertiary
Date: 30/08/06
Location GPS: 0399540 E 8069164 N
Photo #: DS 53, 54
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Low closed forest with occasional emergents
Regional Ecosystem: Non-remnant
Vegetation Community Code: rA
Descriptive Notes: Heavily wind disturbed fringing meandering creek line. High species diversity within the community. Weed impacts particularly on margins.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	20-40m	30%	*Chionanthus ramiflorus* *Alstonia scholaris* *Polyscias elegans* *Cryptocarya hypospodia* *Cryptocarya pleurosperma* *Endiandra longipedicellata*	6 1 1 1 1 0	10
T2	7-14m	20%	*Chionanthus ramiflorus* *Polyscias elegans* *Garcinia warrenii* *Barringtonia racemosa*	2 1 0 0	3
S1	2-4m	15%	*Rhodomyrtus trineura* *Chionanthus ramiflorus* *Myristica insipida* *Cryptocarya cunninghamiana*	5 1	6

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
			Ficus congesta *Macaranga involucrata* var. *mallotoides*		
G	0-1m	10%	*Calamus australis* *Calamus caryotoides*	-	-
					19m2/ha

Site Number: EB6

Survey Intensity: Tertiary
Date: 30/08/06
Location GPS: 0399468 E, 8070362 N
Photo #: DS 62, 63, 64
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Swamp forest dominated by Feather Palms with *Nauclea orientalis* and *Beilschmiedia obtusifolia*
Regional Ecosystem: 7.3.3
Vegetation Community Code: 3a
Significant Flora: *Macaranga polyadenia* (Near-threatened)
Descriptive Notes: Heavily wind disturbed.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	25-35m	50%	*Archontophoenix alexandrae* *Nauclea orientalis* *Beilschmeidia obtusifolia* *Syzygium papyraceum* *Glochidion sumatranum* *Melicope elleryana*	18 4 2 0 0 0	24
T2	15-20m	40%	*Barringtonia racemosa* *Syzygium cormiflorum* *Syzygium angophoroides* *Cerbera floribunda* *Cryptocarya hypospodia* *Melicope elleryana* *Pandanus solmslaubachii* *Glochidion sumatranum* *Diploglottis smithii*	2 1 0 0 0 0 0 0 0	3
S1	1-6m	30%	*Tetracera nordtiana* *Helicia nordtiana* *Rhodamnia sessiliflora*	-	

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
			Macaranga polyadenia *Ficus congesta* *Calamus australis*		
G	0-1m	<5%	*Thoracostachyum sumatranum*	-	-
					25m2/ha

Site Number: EB7

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0399487 E, 8070306
Photo #: DS 65
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Swamp forest dominated by *Nauclea orientalis* with Feather Palms.
Regional Ecosystem: 7.3.3
Vegetation Community Code: 3a
Significant Flora: None recoded. Habitat for *Macaranga polyadenia* (Near-threatened).
Descriptive Notes: Heavily wind disturbed.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	20-25m	50%	*Nauclea orientalis* *Archontophoenix alexandrae* *Barringtonia racemosa* *Syzygium sayeri*	14 5 1 1	21
T2	15-20m	40%	*Barringtonia racemosa* *Archontophoenix alexandrae* *Dillenia alata*	10 1 1	12
S1	1-6m	30%	*Rhodamnia sessiliflora* *Ficus congesta* *Tetracera nordtiana* *Helicia nordtiana* *Calamus australis*	-	-
G	0-1m	<5%	*Thoracostachyum sumatranum*	-	-
					33m2/ha

Site Number: EB8

Survey Intensity: Tertiary
Date: 30/08/06
Location GPS: 0399485 E, 8070314 N
Photo #: DS 66, 67, 68
Landform and Geology: Relict beach ridge/dune. Grey medium siliceous sands with organic A1.
Slope: 0
Aspect: 0
Structure: Evergreen notophyll vine forest.
Regional Ecosystem: 7.2.1 - Endangered
Vegetation Community Code: 2b
Significant Flora: None recoded. Potential habitat for *Arenga australasica*.
Descriptive Notes: Moderate wind disturbance.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	25-35m	60%	*Homalium circumpinnatum* *Alstonia scholaris* *Pseudoweinmannia lachnocarpa* *Cryptocarya hypospodia* *Grevillea baileyana* *Syzygium angophoroides* *Syzygium forte* subsp. *forte* Indet. *Euroschinus falcatus* *Calophyllum sil* *Semecarpus australiana*	5 3 2 1 1 1 1 1 1 0 0	16
T2	10-20m	50%	*Rhodomyrtus macrocarpa* *Acmenosperma claviflorum* *Chionanthus ramiflora*	1 1 1	3
S1	2-8m	40%	*Rhodamnia sessiliflora* *Syzygium forte* subsp. *forte* *Rhodomyrtus macrocarpa*	1 1 1	3
G	0-1m	5%	*Cissus repens* *Calamus caryotoides*	-	-
					22m2/ha

Site Number: EB9

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0399782 E, 8070293 N
Photo #: -
Landform and Geology: Swale. Aquic vertosols.
Slope: 0
Aspect: 0
Structure: *Melaleuca quinquinervia* open forest.
Regional Ecosystem: 7.2.9 – Of Concern
Vegetation Community Code: 33
Significant Flora: None recoded. Potential habitat for *Phauis tankervilleae, Piper mestonii*.
Descriptive Notes: Heavy wind disturbance.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	10- 25m	10%	*Melaleuca quinquinervia* *Glochidion sumatranum* *Barringtonia racemosa*	Not performed.	-
S1	2-8m	40%	*Syzygium angophoriodes* *Elaeocarpus grandis* *Annona glabra**	-	-
G	0-1.5m	65%	*Canavalia rosea* *Tetracera nordtiana* *Scleria polycarpa* *Flagellaria indica* *Ludwigia octovalvis* *Lygodium microphyllum* *Platycerium superbum*	-	-
					-

Site Number: EB10

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0399458 E, 8070164 N
Photo #: DF 15
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Swamp forest.
Regional Ecosystem: Non-remnant
Vegetation Community Code: ra
Significant Flora: None recoded. Low potential habitat for *Macaranga polyadenia*.
Descriptive Notes: Heavy wind disturbance.

Structural Summary (Species component similar to Site EB6).

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	15- 25m	50%	*Barringtonia racemosa* *Archontopheonix alexandrae* *Glochidion sumatranum* *Nauclea orientalis* *Carallia brachiate* *Elaeocarpus grandis* *Grevillea baileyana* *Pandanus solmslaubachii*	Not performed.	-
S1	2-8m	10%	Not recorded	-	-
G	0-1.5m	<5%	Not recorded	-	-
					-

Site Number: EB11

Survey Intensity: Quaternary
Date: 30/08/06
Location GPS: 0399157 E, 8069517 N
Photo #: DS 74, 75
Landform and Geology: Alluvial
Slope: 0
Aspect: 0
Structure: Swamp forest with a degraded canopy of *Melicope elleryana, Glochidion sumatranum*, and *Melaleuca leucadendra* with a dense secondary tree layer of *Annona glabra* extending to margins to form pure stands.
Regional Ecosystem: Non-remnant
Vegetation Community Code: E3
Significant Flora: None recoded. Low potential habitat for *Macaranga polyadenia*.
Descriptive Notes: Fringed by extensive areas of tall sedgeland/fernland (wetland) with Scleria polycarpa and Stenocleana palustris. Degraded by exotic weeds; *Calopogonium mucunoides, Hyptis capitata, Hymenachne amplexicaulis*, and *Persicaria* sp.

Site Number: EB12

Survey Intensity: Tertiary
Date: 31/08/06
Location GPS: 0400374 E, 8069118 N
Photo #: DS 79, 80
Landform and Geology: Alluvial on poorly drained aquic vertosols.
Slope: 0
Aspect: 0
Structure: Feather Palm forest.
Regional Ecosystem: 7.3.3
Vegetation Community Code: 3a
Significant Flora: *Macaranga polyadenia*
Descriptive Notes: Heavy wind disturbance.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	15- 25m	15%	*Glochidion sumatranum* *Archontopheonix alexandrae* *Melicope elleryana* *Elaeocarpus grandis* *Syzygium sayeri*	2 2 2 1 1	8
T2	12-18m	20%	*Glochidion sumatranum* *Annona glabra** *Macaranga inamoena* *Cerbera floribunda* *Nauclea orientalis* *Timonius timon* *Alstonia scholaris* *Trichosperma pleiostigma*	3 2 1 2 0 0 0 0	8
S1	2-8m	60%	*Dillenia alata* *Hibiscus tiliaceus* *Rhodomyrtus sessiliflora* *Polyscias australiana* *Macaranga polyadenia* *Ficus congesta* *Pandanus solmslaubachii* *Annona glabra**	1 1 0 0 0 0 0 0	2
G	0-1.5m	80%	*Ichnocarpus frutescens* *Entada phaseoloides* *Calamus motii* *Flagellaria indica* *Scleria polycarpa* *Stenocleana palustris* *Canavalia rosea* *Annona glabra**	-	-
					20m2/ha

Site Number: EB13

Survey Intensity: Quaternary
Date: 31/08/06
Location GPS: 0400318E, 8069213N
Photo #: DS 82, 83
Landform and Geology: Alluvial on poorly drained aquic vertosols.
Slope: 0
Aspect: 0
Structure: Low closed forest of Pond Apple.
Regional Ecosystem: Non-remnant
Vegetation Community Code: e3
Significant Flora: None recorded.
Descriptive Notes: Typical of major infestation of Pond Apple on forest edges.

Site Number: EB14

Survey Intensity: Quaternary
Date: 31/08/06
Location GPS: No GPS record.
Photo #: No photos.
Landform and Geology: Riverine alluvium on silty loam with poorly drained swampy depressions.
Slope: 0
Aspect: 0
Structure: Low closed forest (disturbed).
Regional Ecosystem: Non-remnant
Vegetation Community Code: ra
Significant Flora: None recorded.
Descriptive Notes: Weed infestations of *Annona glabra, Psidium guava, Hyptis capitata, Urena lobata,* and *Axonopus compressus* on forest edges.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	10- 20m	20%	*Nauclea orientalis* *Glochidion sumatranum* *Melicope elleryana* *Grevillea baileyana*	Not recorded	-
T2	12-18m	20%	*Glochidion sumatranum* *Annona glabra** *Macaranga inamoena* *Dillenia alata*	-	-
S1	2-8m	60%	*Annona glabra** *Dillenia alata* *Ficus congesta* *Hibiscus tiliaceus* *Polyscias australiana* *Rhodomyrtus sessiliflora*	-	-
G	0-1.5m	80%	*Stenocleana palustris* *Axonopus compressus** *Scleria polycarpa* *Ichnocarpus frutescens* *Annona glabra**	-	-

Site Number: EB15

Survey Intensity: Quaternary
Date: 31/08/06
Location GPS: 0400120 E 8068786 N
Photo #: DS 84, 85.
Landform and Geology: Riverine alluvium on silty loam.
Slope: 0
Aspect: 0
Structure: Low closed riparian forest (advanced regrowth), restricted to a narrow 10-15m band along a meandering creek line.
Regional Ecosystem: Non-remnant
Vegetation Community Code: ra
Significant Flora: None recorded.
Descriptive Notes: Weed infestations of *Annona glabra, Solanum torvum, Stachytarpheta* sp., *Hyptis capitata, Urena lobata, Senna obtusifolia, Sida retusa* and *Axonopus compressus* on forest edges.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	10- 25m	40%	*Grevillea baileyana* *Cryptocarya hypospodia* *Elaeocarpus grandis* *Semecarpus australiensis* *Alstonia scholaris* *Annona glabra** *Carallia brachiata* *Myristica insipida* *Magnifera indica** *Terminalis sericocarpa* *Syzygium forte* subsp. *forte*	Not recorded	-
T2	12-18m	20%	*Myristica insipida* *Helicia nordtiana* *Premna* sp. *Rhodomyrtus* sp. *Melodinus australis*	-	-
S1	2-8m	60%	*Elaeocarpus grahamii* *Myristica insipida* *Polyscias australiana* *Phaleria octandra* *Rhus taitensis* *Ficus congesta* *Claoxylon tenerifolium* *Chionanthus ramiflorus* *Morinda citrifolia* *Gardenia ovularis* *Elaeocarpus arnhemicus*	-	-
G	0-1.5m	80%	*Sida retusa** *Axonopus compressus** *Stachytarpheta jamaicensis**	-	-

Site Number: EB16

Survey Intensity: Tertiary
Date: 31/08/06
Location GPS: 0400581 E, 8068806 N
Photo #: DS 88, 89
Landform and Geology: Swampy swale.
Slope: 0
Aspect: 0
Structure: Open forest of *Melaleuca leucadendra*.
Regional Ecosystem: 7.2.9
Vegetation Community Code: ds38
Significant Flora: *Macaranga polyadenia*

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	30-40m	40%	*Melaleuca leucadendra* *Dillenia alata* *Macaranga polyadenia*	14 1 1	16
T2	10-20m	20%	*Nauclea orientalis* *Annona glabra** *Dillenia alata* *Melicope elleryana* *Glochidion sumatranum*	2 1 1 1 0	5
S1	3-8m	50%	*Macaranga polyadenia* *Pandanus solmslaubachii* *Atractocarpus fitzalanii* *Annona glabra** *Polyscias australiana* *Ficus congesta* *Glochidion sumatranum* *Mrysine* sp.	1 1 0 0 0 0 0 0	2
G	0-1.5m	40-50%	*Stenocleana palustris* *Scleria polycarpa* *Pandanus solmslaubachii* *Annona glabra**	-	-
					23m2/ha

Site Number: EB17

Survey Intensity: Tertiary
Date: 31/08/06
Location GPS: 0400611E 8068438N
Photo #: DS 90, 91; DF 28, 29
Landform and Geology: Steep metamorphic footslope.
Slope: 25 deg.
Aspect: 30 deg. NE
Structure: Open forest of *Acacia mangium and Lophostemon suaveolens* with *Acacia celsa* subdominant.
Regional Ecosystem: 7.11.8b
Vegetation Community Code: 12c
Significant Flora: None recorded. Potential habitat for *Aphyllorchia quenslandica, Rourea brachyandra* and *Endiandra globosa*.
Descriptive Notes: -Heavy wind disturbance.

Structural Summary

Strata	Height Range	Cover	Species	BA Sweep (1 cm)	Total BA m2/ha
T1	15-25m	30%	*Acacia mangium* *Lophostemon suaveolens* *Acacia celsa* *Euroschinus falcatus* *Cupaniopsis foveolata* *Polyscias elegans*	2 3 1 0 0 0	6
T2	8-12m	20%	*Lophostemon suaveolens* *Litsea leefeana* *Acacia celsa* *Alstonia meulleriana* *Deplanchea tetraphylla* *Cryptocarya vulgaris* *Darlingia ferruginea* *Euroschinus falcatus* *Grevillea baileyana* *Cupaniopsis foveolata* *Endiandra hypotephra* *Gmelina dalrympleana*	2 2 1 1 1 1 0 0 0 0 0 0	8
S1	1-6m	40%	*Flagellaria indica* *Entada phaseoloides* *Ichnocarpus frutescens* *Melodinus australis* *Melodorum leichhardtii* *Atractocarpus fitzalanii* *Polyscias australiana* *Melodorum uhrii* *Neolitsea dealbata* *Jasminum didymum* subsp. *didymum* *Mischocarpus exangulatus* *Timonius timon* *Adenanthera pavonina*	-	-
G	0-1m	5%	*Flagellaria indica* *Entada phaseoloides* *Aegeratum conyzioides**	-	-
					14m2/ha

Site Number: EB18

Survey Intensity: Tertiary
Date: 31/08/06
Location GPS: 0400320E 8068337N
Photo #: DS 96, 97
Landform and Geology: Metamorphic footslope.
Slope: 25 deg.
Aspect: 310 deg.
Structure: Mesophyll Vine Forest.
Regional Ecosystem: 7.11.1a
Vegetation Community Code: 2a (a)
Significant Flora: None recorded. Potential habitat for *Aphyllorchia queenslandica, Rourea brachyandra, Endiandra globosa, Dioclea hexandra, Ilex* sp. (Gadgarra), *Garnotia stricta* var. *longiseta.*
Descriptive Notes: -Minor wind disturbance.

Structural Summary

Strata	Height Range	Cover	Species	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	30-35m	75%	*Alstonia scholaris* *Myristica insipida* *Cryptocarya oblata* *Medicosma farenana* *Dysoxylum arborescens* *Vitex acuminata* *Cryptocarya grandis* *Castanospermum australe* *Synima macrocarpa* *Pouteria* sp. *Acmenosperma claviflorum* Sapindaceae Indet. Indet. Indet.	5 2 2 2 1 1 1 1 1 1 1 1 1 1	21
T2	18-25m	60%	*Myristica insipida* *Medicosma fareana* *Castanospermum australe* *Acronychia vestita* *Citronella moorei*	2 0 0 0 0	2
S1	2-10m	80%	*Brombya platynema* *Connarus conchocarpus* *Faradrya splendida* *Polyscias elegans* *Entada rheedii* *Tabernaemontana pandaqui* *Pothos longipes* *Calamus australis* *Licuala ramsayi* *Mucuna gigantea* *Pandanus monticola* *Cupaniopsis foveolata* *Symploccis cochichinensis* var. *pilioscula*	-	-
G	0-1m	<5%	*Bowenia spectabilis*	-	-
					23m2/ha

APPENDIX C: SUMMARY VEGETATION SITE DATA – JULY 2007 SURVEY

Site Number: ERL1

Survey Intensity: Secondary
Date: 19/07/07
Location GPS: 0401955 E, 806552 N
Landform and Geology: Sloping alluvial outwash plain
Slope: 5º
Aspect: W
Structure: Wind damaged mesophyll vine forest
Significant Flora: *Endiandra globosa* (Near-threatened)
Regional Ecosystem: 7.3.10
Vegetation Community Code: A2a

Site Number: ELR2

Survey Intensity: Secondary
Date: 19/07/07
Location GPS: 0400457 E 8068970 N
Landform and Geology: Alluvial outwash (swamp)
Slope: 0
Aspect: 0
Structure: Feather palm vine forest
Regional Ecosystem: 7.3.3a
Vegetation Community Code: A3a

Site Number: ELR3

Survey Intensity: Secondary
Date: 19/07/07
Location GPS: 0400398 E, 8068967 N
Photo #: DS 50, 51
Landform and Geology: Metamorphic slope (coastal headland)
Slope: 25^{oo}
Aspect: NW
Structure: Low *Lophostem suaveolens* dominant open forest
Regional Ecosystem: 7.11.34
Vegetation Community Code: M91v

Site Number: ELR4

Survey Intensity: Secondary
Date: 19/07/07

Location GPS: 0401606E, 8067429 N
Landform and Geology: Coastal foredune
Slope: 0
Aspect: 0
Structure: Mesophyll vine forest
Regional Ecosystem: 7.2.1
Vegetation Community Code: D2b
Descriptive Notes: Heavily degraded ground cover through pedestrian traffic

Site Number: ELR5

Survey Intensity: Secondary
Date: 19/07/07
Location GPS: 0401526 E 8067336 N
Landform and Geology: Steep metamorphic footslope (drainage line)
Slope: 30º
Aspect: WNW
Structure: Regional Ecosystem: 7.11.34
Vegetation Community Code: M91v
Significant Flora: *Macaranga polyadenia* (Near-threatened)
Descriptive Notes: Protected pocket in sheltered gully line

Site Number: ELR6

Survey Intensity: Secondary
Date: 20/07/07
Location GPS: 0401415 E, 8067651 N
Landform and Geology: Metamorphic slope (coastal headland)
Slope: 25º
Aspect: NW
Structure: Low *Lophostem suaveolens* dominant open forest
Regional Ecosystem: 7.11.34
Vegetation Community Code: 2a
Significant Flora: *Ichnanthus pallens* (Near-threatened)
Descriptive Notes: Heavily degraded on road margins by *Panicum maximum*

Site Number: ELR7

Survey Intensity: Secondary
Date: 20/07/07
Location GPS: 0401125 E, 8067970 N
Landform and Geology:
Structure: Mesophyll vine forest
Regional Ecosystem: 7.2.1
Vegetation Community Code: D2b
Significant Flora: None recorded
Descriptive Notes: Heavily wind disturbed

Site Number: ELR8

Survey Intensity: Secondary
Date: 20/07/07
Location GPS: 0401187 E, 8067841 N
Landform and Geology: Metamorphic footslope
Slope: 15º
Aspect: WNW
Structure: Mesophyll vine forest
Regional Ecosystem: 7.11.1
Vegetation Community Code: M2a
Significant Flora: None recoded.
Descriptive Notes: Moderate wind disturbance.

Site Number: ELR9

Survey Intensity: Secondary
Date: 20/07/07
Location GPS: 0401649 E, 8064925 N
Landform and Geology: Metamorphic footslope
Slope: 25º
Aspect: WSW
Structure: Mesophyll Vine Forest
Regional Ecosystem: 7.11.1
Vegetation Community Code: M2a
Significant Flora: None recoded.
Descriptive Notes: Extremely heavy wind disturbance..

APPENDIX D: QUATERNARY SITE DATA – OCTOBER 2008 SURVEY. EBIR SITES

Site Number: EBQ21a

Survey Intensity: Quaternary
Date: 26/10/08
Location GPS: 0399181 E, 8069130 N.
Landform and Geology: Alluvial terrace and banks
Slope: 0
Aspect: 0
Structure: Secondary Mesophyll vine forest.
Regional Ecosystem: Non Remnant
Vegetation Community Code: Ra1
Significant Flora: None recoded.
Descriptive Notes: Heavily disturbed non-remnant patch. Broken canopy dominated by *Grevillea baileyana, Nauclea orientalis, Aleurites rockinghamensis, Endospermum medullosum, Myristica insipida, Cryptocarya hypospodia, Alstonia scholaris, Chionanthus ramiflorus,* and *Cerbera floribunda,*

Site Number: EBQ22a

Survey Intensity: Quaternary
Date: 26/10/08
Location GPS: 0399770 E, 8069130 N.
Landform and Geology: Alluvial terrace and banks. Narrow riparian fringe.
Slope: 0
Aspect: 0
Structure: Advanced Secondary Mesophyll vine forest.
Regional Ecosystem: 7.3.10a
Vegetation Community Code: A2ax
Significant Flora: *Rourea brachyandra* (Near-threatened).
Descriptive Notes: Heavily disturbed remnant patch of advanced regrowth. Broken canopy dominated by *Cryptocarya hypospodia, Alstonia scholaris, Chionanthus ramiflorus, Grevillea baileyana.* Understorey species include: *Gomphandra australiana, Helicia nortoniana, Polyscias elegans, Chionanthus ramiflorus, Dysoxylum arborescens, Dysoxylum mollisimum* subsp. *molle, Toechima erythrocarpa, Tetracera daemeliana, Garcinia warrenii, Elaeocarpus michealii, Flagellaria indica, Breynia cernua, Rhodomyrtus sessilifolia, Melodorum leichhardtii, Endiandra longipediecllata, Pandora pandorana, Atractocarpus fitzalanii, Litsea bindoniana, Archontophoenix alexandrae, Cryptocarya vulgaris, Syzygium forte* subsp. *forte, Syzygium alliligneum, Symplocos cochichinensis var. pilosiuscula, Piper caninum, Melodinus australis, Polyscias australiana, Macaranga tanarius, Claoxylon hillii, Litsea leefeana, Elaeocarpus grandis, Pittosporum ferrugineum, Hedycarya loxocarya, Aglaia sapindina, Eupomatia laurina.*

Site Number: EBQ23a

Survey Intensity: Quaternary
Date: 26/10/08
Location GPS: 0400718 E, 8068784 N.
Landform and Geology: Backdune.
Slope: 0
Aspect: 0
Structure: Simple mesophyll/ notophyll vine forest (advanced secondary forest)
Regional Ecosystem: 7.2.5 -
Vegetation Community Code: D75x

Significant Flora: None observed.
Descriptive Notes: Even canopy of 25m dominated by S*yzygium forte* subsp. *forte*, *Euroschinus falcatus, Calophyllum inophyllum, Acacia crassicarpa, Alstonia scholaris,* and *Melia azedarach.* Significant alteration of original canopy structure. Lantana occasional in understorey. Note Singapore Daisy infestation in frontal dune woodland adjoining on seaward side.

APPENDIX E: PERMANENT MONITORING SITES – OCTOBER 2008 (EBIR).

Site Number: EBM3
Survey Intensity: Secondary (50x10m)
Date: 25/10/08
Location GPS: Start transect at 0399642 E / 8069806 N at 115 deg. SE to 399690 E / 8069792 N
Landform and Geology: Alluvial terrace
Slope: 0
Aspect: 0
Structure: Mesophyll vine forest
Regional Ecosystem: 7.3.10a
Vegetation Community Code: A2ax
Descriptive Notes: Wind disturbed mesophyll vine forest fringing meandering creek line. Weed impacts on margins. Canopy comprises a significant component of secondary growth.

Structural Summary:

Strata	Height Range	FPC (measured)	Species	Species FPC	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	20-35m	60%	*Elaeocarpus grandis* *Myristica insipida* *Mangifera indica** *Cryptocarya hypospodia* *Syzygium forte subsp. forte* *Alstonia scholaris* *Melia azedarach* *Harpullia hillii*	45% - - 5% - 5% - 5%	5 1 1 2 1 1 1 -	12
T2	7-14m	52%	*Synima cordierorum* *Chionanthus ramiflorus* *Alstonia scholaris* *Mischarytera lautereriana* *Commersonia bartramia* *Helicia nortoniana* *Diploglottis smithii* *Ganophyllum falcatum* *Castanospora alphandii* *Mangifera indica** *Polyscias australianum* *Myristica insipida* *Merrimia peltata*	8% 4% - - - - 2% 14% 6% 2% 2% 10% 2%	2 1 1 1 1 1 1 - - - - - -	9
S1	2-4m	62%	*Myristica insipida* *Cryptocarya hypospodia* *Phaleria clerodendron* *Polyscias australiana* *Acronychia vestita* *Trichosperma pleiostigma* *Macaranga tanarius* *Commersonia bartramia* *Gomphandra australiana* *Trophis scandens* *Entada phaselioides* *Clerodendron traceyanum*	36% - - - 2% 4% 6% 4% 4% 2% 2% 2%	1 1 1	2
G	0-1m	11%	*Calamus australis* *Calamus caryotoides*		-	-
						23m2/ha

Site EBM3w looking from end of transect to the NW.

Site Number: EB6a

Survey Intensity: Secondary (50x10m)
Date: 26/10/08
Location GPS: Start transect at 0399470 E / 8070368 N at 40 deg. NE to 0399507 E, 8070378 N
Landform and Geology: Seasonal swamp
Slope: 0
Aspect: 0
Structure: Swamp forest dominated by Feather Palms with *Nauclea orientalis*
Regional Ecosystem: 7.3.3
Vegetation Community Code: 3a
Significant Flora: *Macaranga polyadenia* (Near-threatened)
Descriptive Notes: Heavily wind disturbed in 2006.

Structural Summary:

Strata	Height Range	FPC (measured)	Crown Cover estimate (2006)	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	18-25m	32%	50%	*Archontophoenix alexandrae*	10	5	24
				Nauclea orientalis	-	3	
				Glochidion sumatranum	10	2	
				Melicope elleryana	8	2	
				Commersonia bartramia	2	1	
				Symplocos cochichinensis var. pilosiuscula	-	1	
				Davidsonia pruriens	2	-	
T2	10-16m	40%	40%	*Rhodomyrtus sessiliflora*	2	1	1
				Polyscias australiana	2	-	
				Aphananthe philippinensis	2	-	
				Faradraya splendida	4	-	
				Barringtonia racemosa	2	-	
				Myristica insipida	4	-	
				Commersonia bartramia	2	-	
				Lauraceae	4	-	
				Phaleria octandra	2	-	
				Nauclea orientalis	2	-	
				Synima cordierorum	6	-	
				Sarcopteryx marytana	4	-	
				Elaeocarpus grandis	1	-	
S1	1-6m	60%	30%	*Cryptocarya clarksoniana*	8	1	0

Strata	Height Range	FPC (measured)	Crown Cover estimate (2006)	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
				Macaranga polyadenia ®	2		
				Symploccos cochichinensis var. pilosiuscula	6		
				Alpinia caerulea	1		
				Macaranga involucrata var. mallotoides	4		
				Calamus australis	6		
				Calamus radicans	4		
				Sarcopteryx martyana	8		
				Tetracera deamelianum	2		
				Synima cordierorum	2		
				Rhodomyrtus sessiliflora	2		
				Tetracera nordtiana	2		
				Dysoxylum sp.	2		
				Tetrasynandra pubescens	2		
				Lygodium reticulata	2		
				Litsea leefeana	8		
				Pandanus monticola	-		
				*Annona glabra**	-		
				Polyscias murrayi	-		
				Helicia nortoniana	-		
				Melodorum leichhardtii	-		
				Cryptocarya murrayi	-		
				Maesa dependens	-		
				Hydriastele wendlandiana	-		
				Harpullia rhyticarpa	-		
				Pouteria chartacea	-		
				Mallotus paniculatus	-		
				Garcinia warrenii	-		
				Polyscias australiana	-		
				Bridelia insularis	-		
				Piper caninum			
G	0-1m	21%	<5%	*Alpinea caerulea*		-	-
				Archontophoenix alexandrae	-		
				Calamus australis	-		
				Cyperus sp.	-		
				Euroschinus falcata	-		
				Faradraya splendida	-		
				Flagellaria indica	-		
				Helicia nortoniana	-		
				Myristica insipida	-		
				Pandanus monticola	-		
				Rhodomyrtus sessilifolia	-		
				Tetracera nordtiana	-		
							25m2/ha

Site EBM6a looking NE from western end of transect.

Site EBM6a looking SW from eastern end of transect.

Typical canopy structure of EBM6a with canopy dominance of *Archontophoenix alexandrae.*.

Site Number: EB8a

Survey Intensity: Secondary
Date: 25/10/08
Location GPS: start transect 0399378 E, 8070342 N; at 00 deg. to 399384 E, 8070383 N
Landform and Geology: Relict beach ridge/dune. Grey medium siliceous sands with organic A1.
Slope: 0
Aspect: 0
Structure: Evergreen notophyll vine forest.
Regional Ecosystem: 7.2.1 - Endangered
Vegetation Community Code: 2b
Significant Flora: None recoded. Potential habitat for *Arenga australasica*.
Descriptive Notes: Moderate wind disturbance.

Structural Summary:

Strata	Height Range	FPC	Crown Cover (2006)	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	20-30m	48%	60%	*Alstonia scholaris*	-	4	15
				Grevillea baileyana	4	2	
				Pseudoweinmannia lachnocarpa	32	3	
				Cryptocarya hypospodia	-	1	
				Syzygium alliligneum	-	1	
				Chionanthus ramiflorus	-	1	
				Homalium circumpinnatum	12	1	
				Euroschinus falcatus	-	1	
				Carallia brachiata	-	1	
T2	10-20m	52%	50%	*Chionanthus ramiflora*	-	4	13
				Polyscias australianum	4	3	
				Rhodomyrtus sessiliflora	10	2	
				Rhodomyrtus macrocarpa	2	4	
				Pseudoweinmannia lachnocarpa	10	-	
				Mischocarpus lachnocarpus	6	-	
				Endiandra hypotephra	4	-	
				Melodorum leichhardtii	2	-	
				Syzygium leuhmanii	6	-	
				Xanthophyllum octandrum	8	-	
				Polyalthia nitidissima	-	-	
				Acmena hemilampra subsp. hemilampra	-	-	
				Platycerium bifurcata	-	-	
				Hypserpa decumbens	-	-	
				Podocarpus grayae	-	-	
S1	2-8m	58%	40%	*Mischocarpus lachnocarpus*	2	1	
				Hypserpa laurina	2	1	
				Rhodomyrtus sessiliflora	8	1	
				Rhodomyrtus macrocarpa	14	-	
				Cryptocarya hypospodia	2	-	
				Polyalthia nitidissima	14	-	
				Syzygium leuhmanii	8		
				Tetracera nordtiana	2		
				Cryptocarya exfoliata	2		
				Syzygium alilligneum	4		
				Terminalia sericocarpa	-		
				Cananga odorata	-		
				Macaranga involucrata var. mallotoides	-		
				Chionanthus ramiflorus	-		
				Tabernaemontana orientalis	-		
				Acmena hemilampra subsp. hemilampra	-		
				Helicia nortoniana	-		
				Cryptocarya vulgaris	-		
				Decaspermum humile	-		
				Calophyllum sil	-		
				Syzygium cormiflorum	-		
				Tetrasynandra pubescens	-		
				Symploccos cochichinensis var. pilosiuscula	-		
				Clerodendron floribundum	-		
				Pouteria xerocarpa	-		
				Diploglottis smithii	-		
				Mrinida sp.	-		

Strata	Height Range	FPC	Crown Cover (2006)	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
				Cryptocarya cunninghamii *Fagraea gracilipes* *Gmelina fasciculifera* *Ventilago ecorollata* *Beilschmiedia obtusifolia* *Grevillea baileyana* *Melodorum leichhardtii* *Flagellaria indica* *Hypserpa decumbens* *Guoia acutifolia* *Podocarpus grayae* *Macaranga tanarius* *Pouteria chartacea* *Salacia disepala*	- - - - - - - - - - - - - -		
G	0-1m	25%	5%	Leaf Litter Bare ground *Polyalthia nitidissima* *Cryptocarya exfoliata* *Uvaria concavum* *Cryptocarya hypospodia* *Chionanthus ramiflorus* *Diploglottis smithii* *Rhodomyrtus sesssiliolia* *Calamus caryotoides* *Dillenia alata* *Tetracera daemeliana*	50 25 4 10 0.5 0.5 0.5 3 6 1 - -	-	-
							28m2/ha

Photograph 17. Site EBM8as looking from start of transect south to north.

Photograph 18. Site EBM8an looking from end of transect to the south.

Site Number: EBS20a

Survey Intensity: Secondary
Date: 26/10/08
Location GPS: start transect 0400098 E, 8070284 N; at 030 deg. to 0400123 E, 8070318 N
Landform and Geology: Alluvial clay plain with minor sand
Slope: 0
Aspect: 0
Structure: Mesophyll vine forest.
Regional Ecosystem: 7.3.10c – Of Concern
Vegetation Community Code: A72x
Significant Flora: None recoded. Potential habitat for *Arenga australasica*.
Descriptive Notes: Moderate wind disturbance.

Structural Summary:

Strata	Height Range	FPC	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
T1	15-35m	58%	*Pouteria xerocarpa*	12	3	11
			Endiandra montana	14	2	
			Gmelina dalrympleana	8	1	
			Archontophoenix alexandrae	-	1	
			Acmena hemilampra var. hemilampra	4	1	
			Acronychia vestita	8	1	
			Alstonia muelleriana	-	1	
			Xanthophyllum octandrum	-	1	
			Syzygium alilligneum	4	-	
			Syzygium cormiflorum	8	-	
			Calamus australis	-	-	
			Tetracera daemeliana	-	-	
			Cryptocarya hypospodia	-	-	
			Elaeocarpus bancroftii	-	-	
T2	10-20m	6%	*Elaeocarpus micheali*	2	-	-
			Carallia brachiata	2	-	
			Syzygium cormiflorum	2	-	
			Calamus australis	-	-	
			Mischocarpus lachnocarpus	-	-	
			Cryptocarya hypospodia	-	-	
			Rhodomyrtus sessiliflora	-	-	
			Calamus caryotoides	-	-	
			Poteria xerocarpa	-	-	
			Syzygium alilligneum	-	-	
			Trophis scandens	-	-	
			Calophyllum sil	-	-	
			Flagellaria indica	-	-	
			Rhodomyrtus macrocarpa	-	-	
			Synima cordierorum	-	-	
S1	2-8m	58%	*Cryptocarya vulgaris*	2	-	-
			Rhodamnia sessiliflora	4	-	
			Atractocarpus fitzalanii	10	-	
			Kennedia sp.	6	-	
			Syzygium allilligneum	2	-	
			Calamus carypotoides	4	-	
			Helecia nortoniana	4	-	
			Polyscias australianum	4	-	
			Tetracaera daemeliana	4	-	
			Fagraea gracilipes	2	-	
			Syzygium cormiflorum	4	-	
			Cryptocarya hypospodia	2	-	
			Carallia brachiata	4	-	
			Diploglottis smithii	2	-	

Strata	Height Range	FPC	Species	Species FPC %	Basal Area Sweep (1 cm)	Total BA m2/ha
			Calamus australis	4	-	
G	0-1m	15%	Leaf litter Bare ground *Rhodomyrtus sessiliflora* *Alstonia muelleriana* *Archontophoenix alexandrae* *Tetracera nordtiana* *Embelia caudata* *Mischocarpus lachnocarpus* *Tetrasynandra pubescens* *Lygodium reticulata* *Glochidion sumatranum*	57 10 3 1 1 5 1 1 1 1 1		-
						11m2/ha

Photograph 19. Site EB20s looking from start of transect to the north.

Photograph 20. Site EB20n looking from end of transect to the south.

APPENDIX F: EBIR SITE - FLORA SPECIES LIST

Coll: No.	Species	Flw /Ft	Status
	Acacia celsa		
	Acacia mangium		
	Acronychia vestita		
	**Aegeratum conyzioides*		Exotic
	Aglaia sapindina		
	Allangium villosum subsp. *polyosmoides*		
	Alpinia caerulea		
	Alstonia meulleriana		
	Alstonia scholaris		
	**Annona glabra* (Class 2 Pest)		Exotic
	Aphananthe philippinensis		
	Archontophoenix alexandrae		
	Ardisia brevipedata		
	Aslpenium nidus		
	Atractocarpus fitzalanii		
	Austrosteenisia stipularis		
	**Axonopus compressus*		Exotic
	Barringtonia racemosa		
	Beilschmedia obtusifolia		
	Bowenia spectabilis		
	Breynia cernua		
	Bridelia insularis		
	Brombya platynema		
	Brombya sp.		
	Calamus australis		
	Calamus moti		
	Calamus caryotoides		
	**Calopogonium mucunoides*		Exotic
	Calophyllum australianum		
	Calophyllum inophyllum		
	Calophyllum sil		
	Carallia brachiata		
	Castanospora alphandii		
	Cerbera florbinda		
	Cissus repens		
	Citronella smythii		
	Claoxylon hillii		
	Clerodendron traceyanum		
	Commersonia bartramia		
	Connarus conchocarpus		
	Cordyline cannifolia		
	**Crassocephalum crepidioidesare*		Exotic
	Cryptocarya hypospodia		
	Cryptocarya murrayi		
	Cryptocarya pleurosperma		
	Cryptocarya vulgaris		
	Cyathea rebeccae		
	Darlingia darlingiana		
	Darlingia ferruginea		
	Davidsonia pruriens		
	Diploglottis smithii		
	**Drymaria cordata*		
	Dysoxylum arborescens	Flw	
	Dysoxylum mollisimum subsp. mollisimum		
	Dysoxylum oppositifolium		

Coll: No.	Species	Flw /Ft	Status
	Elaeocarpus bancroftii		
	Elaeocarpus grandis		
	Eleaocarpus michaelii		
	Embelia caudata		
	Endiandra globosa	Near-threatened	
	Endiandra hypotephra		
	Endiandra longipedicellata		
	Epipremum amplissimum		
	Epipremum pinnatum		
	Endiandra montana		
	Entada phaseoloides		
	Eupomatia laurina		
	Euroschinus falcatus		
	Fagraea cambagei		
	Fagraea gracilipes		
	Faradraya splendida		
	Ficus congesta		
	Ficus copiosa		
	Flagellaria indica		
	Freycinetia excelsa		
	Freycinetia scandens		
	Ganophyllum falcatum		
	Garcinia warrenii		
	Gardenia ovularis		
	Glochidion sumatranum		
	Gmelina dalrympleana		
	Gomphandra australiana		
	Grevillea baileyana		
	Guioa lasioneura		
	Guoia acutifolia		
	Harpulia hillii		
	Harpullia rhyticarpa		
	Hedicarya loxocarya		
	Helicia nortoniana		
	Hibbertia scandens		
	Homalium circumpinnatum		
	Hydriastele wendlandiana		
	Hypserpa decumbens		
	Hypserpa laurina		
	Ichnocarpus frutescens		
	**Lantana camara*		Exotic
	Leptaspis banksii		
	Licuala ramsayi		
	Litsea bindoniana		
	Litsea leefeana		
	Lycopodium reticulatum		
	Lygodium microphyllum		
	Macaranga imanoena		
	Macaranga involucrata var. *mallotoides*		
	Macaranga polyadenia		Near-threatened (NCA)
	Macaranga subdentata		
	Macaranga tanarius		
	Mackinlaya confusa		
	Maesa dependens		

Coll: No.	Species	Flw /Ft	Status
	Mallotus paniculatus		
	Mallotus polyadenos		
	Mangifera indica		Exotic
	Melastoma malabathricum subsp. *malabathricum*		
	Melia azaderach		
	Melicope bonwickii		
	Melicope vitiflora		
	Melicope xanthoxyloides		
	Melodinus australis		
	Melodorum leichardtii		
	Melodorum uhrii		
	Merremia peltata		
	**Mimosa pudica*		
	Mischocarpus exangulatus		
	Mischocarpus lachnocarpus		
	Mischarytera lautereriana		
	Myristica insipida		
	Myrsine porosa		
	Nauclea orientalis		
	Neimeyera prunifera		
	Neolitsea dealbata		
	Omolanthus nutans		
	Pachygone ovata		
	Pandanus monticola		
	Pandanus solmslaubachii		
	Pandora pandorana		
	Megathyrsys maximum var. maximum		Exotic
	Phaleria clerodendron		
	Phaleria octandra		
	Piper caninum		
	Piper novae-hollandiae		
	Pittosporum ferrugineum		
	Pittosporum revolutum		
	Platycerium superbum		
	Podocarpus grayae		
	Polyscias australianum		
	Polyscias elegans		
	Pothos longipes		
	Pouteria chartacea	Ft	
	Pouteria xerocarpa		
	Pseudoweinmannia lachnocarpa		
	Ptychosperma elegans		
	Pycnarrhena novoguineensis		
	Pyrosia longifolia		
	Rhaphiodophora australasica		
	Rhodamnia sessiliflora		
	Rhodomyrtus macrocarpa		
	Rourea brachyandra		Near-threatened (NCA)
	Rhodomyrtus sessilifolia		
	Sarcopteryx marytana		
	**Sida rhombifolia*		Exotic
	Smilax aculeatissima		
	Smilax glyciphylla		
	**Stachytarpheta cayennensis*		Exotic
	Symploccos cochinchinensis var. *pilosiuscula*		

Coll: No.	Species	Flw /Ft	Status
	Synima cordierorunm		
	Syzygium alliiligneum		
	Syzygium cormiflorum		
	Syzygium forte subsp. forte		
	Syzygium hemilampra subsp. hemilampra		
	Syzygium sayeri		
	Syzygium leuhmanii		
	Synima cordierorum		
	Tabernaemontana pandacqui	Flw Buds	
	Tetracera daemeliana		
	Tetracera nordtiana		
	Tetrastigma sp.		
	Tetrasynandra pubescens		
	Timonius timon		
	Toechima erythrocarpa		
	Trichosperma pleiostigma		
	Trophis scandens		
	Xanthophyllum octandrum		
	**Urena lobata*		Exotic

APPENDIX G: ELLA BAY ROAD (SAC) - RECORDED FLORA SPECIES LIST

Coll: No.	Species	Flw /Ft	Status
	Acacia celsa		
	Acacia flavescens		
	Acacia mangium		
	Acmena divaricata		
	Acmena hemilampra		
	Achronychia acronychioides		
	Achronychia acidula		
	Achronychia laevis		
	Acronychia vestita		
	Adenanthera pavonina		
	**Aegeratum conyzioides*		
	Aleurites rockinghamensis		
	Allangium villosum subsp. *polyosmoides*		
	Alphitonia incana		
	Alpinia caerulea		
	Alstonia meulleriana		
	Alyxia spicata		
	Alstonia scholaris		
	Aneilema acuminatum		
	Antidesma erostre		
	Archidendron grandiflorum		
	Archirhodomyrtus beckleri		
	Archontophoenix alexandrae		
	Ardisia brevipedata		
	Argusia argentea		
	Arytera divaricata		
	Aslpenium nidus		
	Atractocarpus fitzalanii		
	Atractocarpus hirtus		
	Austrosteenisia stipitata		
	Axonopus compressus		Exotic
	Axonopus ficifolius		
	Barringtonia racemosa		
	Beilschmedia obtusifolia		
	Blechnum cartilagineum		
	Bowenia spectabilis		
	Breynia cernua		
	Breynia oblongifolia		
	Brombya platynema		
	Calamus australis		
	Calamus caryotoides		
	Calamus radicans		
	Callerya sp. (Barrat Creek G. Sankowsky 428)		
	Callicarpa longifolia		
	Calophyllum australianum		
	Calophyllum sil		
	Calopogonium mucunoides		
	Cananga odorata		
	Canarium australianum		
	Canarium vitiense		
	Carallia brachiata		
	Carica papaya		Exotic
	Castanospermum australe		

Coll: No.	Species	Flw /Ft	Status
	Castanopora alphandii		
	Cayratia japonica		
	Cayratia odorata		
	Centella asiatica		
	Cerbera florbinda		
	Chionanthus ramiflorus		
	Cissus penninervis		
	Cissus repens		
	Citronella smythii		
	Claoxylon tenerifolium		
	*Cleome trifolia**		
	Clerodendron tomentosa#		
	Clerodendrum tracyanum		
	Cocos nucifera		
	Commelina ensiifolia		Exotic
	Commersonia bartramia		
	Connarus conchocarpus		
	Coveniella poecilophlebia		
	Cordyline manners-suttoniae		
	Crassocephalum crepidioidesare		Exotic
	Cryptocarya bidwillii		
	Cryptocarya cunninghamiana		
	Cryptocarya grandis		
	Cryptocarya hypospodia		
	Crytocarya leavigata		
	Cryptocarya murrayi		
	Cryptocarya mackinnoniana		
	Cryptocarya oblata		
	Cryptocarya pleurosperma		
	Cryptocarya triplinervis		
	Cryptocarya vulgaris		
	Cupaniopsis flagelliformis		
	Cupaniopsis foveolata		
	Cyathea rebeccae		
	Cycas media		
	Cyclophyllum multiflorum		
	Cyclosorus sp.		
	*Cyperus brevicaule**		
	Daphnandra repandula		
	Davidsonia pruriens		
	Decaspermum humile		
	Deplanchea tetraphylla		
	Dianella caerulea var. vannata		
	Dillenia allata		
	Diospyros cupulosa		
	Diplocyslos palmatus		
	Diploglottis bracteata		
	Diploglottis smithii		
	*Draceana fragrans**		
	**Drymaria cordata*		
	Drypetes deplanchei		
	Dysoxylum alliaceum		
	Dysoxylum arborescens		
	Dysoxylum gaudicaudiana		
	Dysoxylum latifolium		
	Dysoxylum mollissimum supsp. molle		
	Dysoxylum oppositifolium		

Coll: No.	Species	Flw /Ft	Status
	Dysoxylum pettigrewianum		
	Elaeocarpus grandis		
	Embelia caulialata		
	Endiandra compressa		
	Endiandra cowleyana		
	Endiandra globosa		Near-threatened
	Endiandra hypotephra		
	Endiandra impressicosta		
	Endiandra leptodendron		
	Endiandra longipedicellata		
	Endiandra monothyra		
	Endiandra montana		
	Endospermum myrmecophilum		
	Epipremnum pinnatum		
	Entada phaseoloides		
	Eupomatia bennettii		
	Euroschinus falcata var. falcata		
	Euroschinus falcata#		
	Eustrephus latifolius		
	Fagraea cambagei		
	Faradraya splendida		
	Ficus congesta		
	Ficus copiosa		
	Ficus destruens		
	Ficus drupacea		
	Ficus fraseri#		
	Ficus hispida#		
	Ficus leptoclada		
	Ficus variegata		
	Ficus virens var. virens		
	Flindersia bourjottiana		
	Flagellaria indica		
	Freycinetia excelsa		
	Freycinetia scandens		
	Garcinia warrenii		
	Ganophyllum falcatum		
	Glochidion harveyanum		
	Glochidion lobocarpum		
	Glochidion sumatranum		
	Gmelina fasciculiflora		
	Gomphandra australiana		
	Grevillea baileyana		
	Guioa lasioneura		
	Guoia acutifolia		
	Gynochtodes sessilis		
	Harpullia rhyticarpa		
	Hedicarya loxycarya		
	Hedrianthera sp.		
	Hedyotis radicans		
	Helicia nortoniana		
	Hibbertia scandens		
	Hibiscus tiiaceous		
	Hippocreatea barbarta		
	Homalium circumpinnatum		
	Hypserpa decumbens		
	Hypserpa laurina		

Coll: No.	Species	Flw /Ft	Status
	*Hyptis capitata**		
	Homolanthus novoguinensis		
	Hugonia jenkinsii		
	Hydriastele wendlandiana		
	Hypserpa decumbens		
	Hypserpa laurina		
	Icnanthus pallens var. majus		Near-threatened
	Ichnocarpus frutescens		
	Intsia bijuga		
	Ipomoea sp. 1		
	Irvingbaileya australis		
	Ixora timorense		
	Jasminum didymum subsp. didymium		
	Lantana camara (Class 3 Pest)		Exotic
	Lepidozamia hopeii		
	Leptaspis banksii		
	Licuala ramsayi		
	Linospadix minor		
	Litsea bindoniana		
	Litsea fawcettiana		
	Litsea leefeana		
	Lophostemon suaveolens		
	Ludwigia octovalvis		
	Lygodium reticulatum		
	Lygodium microphyllum		
	Macaranga inanaema		
	Macaranga involucrata var. *mallotoides*		
	Macaranga polyadenia		Near-threatened
	Macaranga subdentata		
	Macaranga tanarius		
	Mackinlaya confusa		
	Maesa dependens var. dependens		
	Mallotus discolor		
	Mallotus paniculatus		
	Mallotus polyadenos		
	Mangifera indica		Exotic
	Mapania macrocephala		
	Mecardonia procumbens		Exotic
	*Megathyrsus maximus var. maximus**		
	Melia azaderach		
	Melicope bonwickii		
	Melicope elleryana		
	Melicope vitiflora		
	Melicope xanthoxyloides		
	Melodinus australis		
	Melodorum leichhardtii		
	Melodorum uhrii		
	Merremia peltata		
	Millettia pinnata		
	Mimosa pudica		Exotic
	Mischocarpus exangulatus		
	Mischocarpus lachnocarpus		
	Morinda citrifolia		
	Mucuna gigantea		
	Musa banksii		

Coll: No.	Species	Flw /Ft	Status
	Myristica insipida		
	Myrsine porosa		
	Neimeyera prunifera		
	Neolitsea dealbata#		
	Neosepiciea jucunda		
	Neolitsea brassii		
	Neprolepis obliterata		
	Ochrosia elliptica		
	Omolanthus novoguinensis		
	Oplismenus aemulus		
	Pachygone longifolia		
	Pachygone ovata		
	Palaquium galactoxylon		
	Palmeria hypotephra		
	Pandanus monticola		
	Pandanus tectorius		
	Panicum incomtum		Exotic
	Parapachygone longifolia		
	Parsonsia velutina		
	*Paspalum scrobiculata**		Exotic
	Passiflora edulis		Exotic
	Passiflora foetida		Exotic
	Phaleria clerodendrum#		
	Pilidiostigma tetramerum		
	Pilidiostigma tropicum		
	Piper caninum		
	Piper novae-hollandiae		
	Pittosporum ferrugineum		
	Pittosporum revolutum		
	Platycerium superbum		
	Podocarpus greyae		
	Polyscias australianum		
	Polyscias elegans		
	Polyscias murrayi		
	Pothos longipes		
	Pouteria chartacea		
	Pouteria xerocarpa		
	Premna serratifolia		
	Pseuderanthemum variable		
	Ptychosperma elegans		
	Pycnarrhena novoguineensis		
	Pyrosia longifolia		
	Rapanea acrodiifolia		
	Rapanea porosai		
	Rhodamnia sessiliflora		
	Rhodamnia spongiosa		
	Rhodomyrtus macrocarpa		
	Rhysotoechia robertsoniana		
	Rhus taitensis		
	Ripogonum album		
	Rourea brachyandra		Near-threatened (NCA)
	Rubus moluccanas var. trilobus		
	Sarcopetalum harveyanum		
	Sarcopteryx martyana		
	Schefflera actinophylla		

Coll: No.	Species	Flw /Ft	Status
	Schizoea dichotoma		
	Scleria polycarpa		
	*Scoparia dulcis**		Exotic
	Semecarpus australiensis		
	Senna obtusifolia (Class 2 Pest)		Exotic
	Sida rhombifolia		Exotic
	Siphonodon membranaceum		
	Smilax australis		
	Solanum mauritianum		Exotic
	*Solanum torvum**		Exotiv
	Sphagneticola trilobata (Class 3 Pest)		Exotic
	Stachytarpheta cayennensis		Exotic
	Stephania japonica		
	Symplocos cochinchinensis subsp. thwaitesii var. pilosciuscula		
	*Synedrella nudiflora**		
	Syzygium alliiligneum		
	Syzygium cormiflorum		
	Syzygium forte subsp. forte		
	Syzygium kuranda		
	Syzigium luehmannii		
	Synima cordierorum		
	Synima macrophylla		
	Tabernaemontana orientalis#		
	Tabernaemontana pandacqui		
	Taenitis pinnata		
	Tarenna dallachiana		
	Terminalua arenicola		
	Terminalia sericocarpa		
	Tetracera nordtiana var. nordtiana		
	Tetracera daemelianum		
	Tetrastigma sp.		
	Tetrasynandra pubescens		
	Timonius timon		
	Toechima daemelianum		
	Toechima erythrocarpum		
	Trema cannabina		
	Trema orientalis		
	Trichospermum pleiostigma		
	Tristemma mauritianum		Exotic
	*Triumphetta rhomboidea**		Exotic
	Trophis scandens var. scandens		
	Urena lobata		Exotic
	Uvaria concavum		
	Vandasina retusa		
	Wrightia laevis subsp. millgar		
	Xanthophyllum octandrum		
	Zanthoxylum nitidum		

APPENDIX H: ELLA BAY BEACHFRONT - RECORDED FLORA SPECIES LIST

Species	Mangrove low closed forest to open shrubland RE7.1.1	Mesophyll to notophyll vine forest of *Syzygium forte* subsp. *forte* RE7.2.5	Coastal foredune complex with *Casuarina equisetifolia* RE7.2.7a	*Melaleuca leucadendra* open forest to woodland RE7.2.8
Acacia crassicarpa		X	X	X
*Aegeratum conyzioides**			X	
Aegiceras corniculatus	X			
Alyxia spicata		X	X	X
*Annona glabra**	X		X	
Asplenium nidus		X		
*Bryophyllum delagoense** *(Class 2)*			X	
Calophyllum inophyllum		X	X	
Canarium australasicum		X		X
Canavalia rosea			X	X
Carallia brachiata		X		
Cassytha pubescens		X	X	X
Casuarina equisetifolia			X	
*Cathareus roseus**		X	X	
Clerodendron floribundum		X		
Clerodendron inerme			X	X
*Cocos nucifera**			X	
Colubrina asiatica			X	X
*Crotalaria pallida**			X	
Cryptocarya hypospodia		X		
Cymbopogon refractus			X	
Dianella caerulea		X	X	X
Epipremum pinnatum		X		
Erythrina variegata			X	
Euroschinus falcatus		X		
Excoecaria agollocha	X			X
Ficus opposita		X		
Flagellaria indica		X		X
Guia acutifolia		X		
Hibiscus tiliaceus			X	X
Imperata cylindrica		X	X	
Jagera pseudorhus		X		
Jasminum didymum subsp. didymum		X		
*Lantana camara** *(Class 3)*		X	X	
Macaranga involucrata var. mallotoides		X		X
Melaleuca leucadendra		X		X
Melia azedarach		X		
Milletia pinnata		X		
*Opuntia sp.** *(Class 3)*			X	
Pandanus tectorius			X	
Panicum sp.			X	
Passiflora aurantia			X	
Pittosporum venulosum		X		
Platycerium bifurcata		X		
Polyalthia nitidissima		X		

Polyscias elegens		X		
*Praxelis clematidea**			X	
Premna serratifolia			X	X
*Psidium guajava**			X	
*Sansevieria trifasciata**			X	
Scaevola taccada			X	
Semecarpus australiensis		X		
*Sphagneticola trilobata** *(Class 1)*		X	X	
Smilax australis		X		X
Sporobolus virginicus	X		X	
*Stachytarpheta jamaicensis**		X	X	
Stephania japonica		X		X
Syzygium forte subsp. forte		X		
Tabernaemontana orientalis		X		
Terminalia catappa		X	X	
Terminalia muelleri		X		
Thespesia populneoides			X	
Vigna marina			X	
Vitex trifolia			X	
Wallostonia biflora			X	
Ximenia americana			X	
TOTAL	**3**	**37**	**38**	**16**

APPENDIX I: ELLA BAY ROAD (SAC) – SIGNIFICANT SPECIES RECORDS

Easting	Northing	Species	NCA (1992)	Population	Habitat notes
Option C – Behind Flying Fish Point township					
401505	8065316	*Rourea brachyandra*	Near-threatened	7 plants in 5x5m	Wind disturbed vine forest on metamorphic slopes with 26m canopy of Alstonia scholaris, Melicope vitiflora, M. bonwickii, Grevillea baileyana, Castanospermum australe and a dense understorey of Calamus radicans, C. australis
401505	8065316	*Rourea brachyandra*	Near-threatened	2 plants on margin of drain	Wind disturbed vine forest on metamorphic slopes with 26m canopy of Alstonia scholaris, Melicope vitiflora, M. bonwickii, Grevillea baileyana, Castanospermum australe and a dense understorey of Calamus radicans, C. australis
401505	8065316	*Rourea brachyandra*	Near-threatened	scattered vines on margin of drain	Wind disturbed vine forest on metamorphic slopes with 26m canopy of Alstonia scholaris, Melicope vitiflora, M. bonwickii, Grevillea baileyana, Castanospermum australe and a dense understorey of Calamus radicans, C. australis
401505	8065316	*Rourea brachyandra*	Near-threatened	Single vine in understorey	Wind disturbed vine forest on metamorphic slopes with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401505	8065316	*Rourea brachyandra*	Near-threatened	Single vine in understorey	Wind disturbed vine forest on metamorphic slopes with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401525	8065290	*Endiandra globosa*	Near-threatened	Tree 12m, Understorey saplings	Wind disturbed vine forest on metamorphic slopes (southern midlsope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401523	8065260	*Endiandra globosa*	Near-threatened	Canopy tree 20m suckering from base	Wind disturbed vine forest on metamorphic slopes (southern midlsope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401523	8065260	*Rourea brachyandra*	Near-threatened	Single vine in understorey	Wind disturbed vine forest on metamorphic slopes (southern midlsope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401532	8065149	*Rourea brachyandra*	Near-threatened	Single vine in understorey	Wind disturbed vine forest on metamorphic slopes (southern midlsope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401532	8065149	*Endiandra globosa*	Near-	Small tree 6m	Wind disturbed vine forest on metamorphic slopes (southern midlsope) with broken canopy of

Easting	Northing	Species	NCA (1992)	Population	Habitat notes
			threatened		Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401521	8065078	*Endiandra globosa*	Near-threatened	Canopy tree 20m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401924	8066826	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401924	8066833	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401768	8066671	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401755	8066669	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401530	8066149	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401482	8066135	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401532	8066074	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on alluvium
401525	8066057	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401505	8065907	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401516	8065964	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401513	8066047	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401506	8065934	*Rourea brachyandra*	Near-threatened	Base of vine cluster	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and

Easting	Northing	Species	NCA (1992)	Population	Habitat notes
					patches of Panicum incomtum
401508	8065940	*Endiandra globosa*	Near-threatened	tree 15m	Wind disturbed vine forest on alluvium
401519	8065976	*Endiandra globosa*	Near-threatened	Shrub- 5m	Wind disturbed vine forest on alluvium
401518	8065971	*Endiandra globosa*	Near-threatened	Shrub- 8m	Wind disturbed vine forest on alluvium
401957	8066871	*Endiandra globosa*	Near-threatened	Shrub- 8m	Wind disturbed vine forest on alluvium
401568	8065773	*Endiandra globosa*	Near-threatened	east side, tree 15m	Wind disturbed vine forest on alluvium
401548	8065743	*Rourea brachyandra*	Near-threatened	east side, patch if vines in understorey	Wind disturbed vine forest on alluvium
401560	8065673	*Endiandra globosa*	Near-threatened	east side, shrub 3m	Wind disturbed vine forest on alluvium
401560	8065679	*Rourea brachyandra*	Near-threatened	Group of robust vines to 4cm dbh	Wind disturbed vine forest on alluvium
401579	8065666	*Rourea brachyandra*	Near-threatened	east side, 3 vines	Wind disturbed vine forest on alluvium
401579	8065666	*Endiandra globosa*	Near-threatened	east side, sapling tree 7m	Wind disturbed vine forest on alluvium
401563	8065675	*Endiandra globosa*	Near-threatened	west side, tree 25m	Wind disturbed vine forest on alluvium
401560	8065672	*Rourea brachyandra*	Near-threatened	west side, group of 3 vines	Wind disturbed vine forest on alluvium
401557	8065689	*Rourea brachyandra*	Near-threatened	west side	Wind disturbed vine forest on alluvium
401557	8065689	*Endiandra globosa*	Near-threatened	west side, 4 shrubs	Wind disturbed vine forest on alluvium
401553	8065683	*Endiandra globosa*	Near-threatened	west side, sapling 5m suckering from damaged tree	Wind disturbed vine forest on alluvium
401509	8065758	*Endiandra globosa*	Near-threatened	west side	Wind disturbed vine forest on alluvium
401533	8065784	*Endiandra globosa*	Near-threatened	west side	Wind disturbed vine forest on alluvium
401526	8065784	*Endiandra globosa*	Near-threatened	west side	Wind disturbed vine forest on alluvium
401544	8066209	*Endiandra globosa*	Near-threatened	west side in NP, tree 15m	Wind disturbed vine forest on alluvium

Easting	Northing	Species	NCA (1992)	Population	Habitat notes
401530	8066166	*Endiandra globosa*	Near-threatened	east side in NP, sapling shrub 4m	Wind disturbed vine forest on alluvium
401415	8067651	*Icnanthus pallens*	Near-threatened	Singe plant	Prostrate grass within RE7.11.34a (L. suaveolens open forest)
401526	8067336	*Macaranga polyadenia*	Near-threatened	Single shrub	Well developed mesophyll vine forest on steep gully line
401558	8066285	*Rourea brachyandra*	Near-threatened	east side	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401557	8066275	*Rourea brachyandra*	Near-threatened	east side, cluster of vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401558	8066264	*Rourea brachyandra*	Near-threatened	east side	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401554	8066252	*Rourea brachyandra*	Near-threatened	east side in NP, sapling shrub 4m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401560	8066252	*Rourea brachyandra*	Near-threatened	east side	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401559	8066244	*Rourea brachyandra*	Near-threatened	east side	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401518	8066171	*Endiandra globosa*	Near-threatened	east side, sapling shrub 4m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401518	8066171	*Endiandra globosa*	Near-threatened	east side, sapling shrub 3m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401515	8066167	*Endiandra globosa*	Near-threatened	east side, sapling 3m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum

Easting	Northing	Species	NCA (1992)	Population	Habitat notes
					australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401515	8066167	*Endiandra globosa*	Near-threatened	east side, sapling 4m	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401619	8066432	*Rourea brachyandra*	Near-threatened	opposite fish farm	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401627	8066422	*Rourea brachyandra*	Near-threatened	opposite fish farm	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401640	8066460	*Rourea brachyandra*	Near-threatened	opposite fish farm, cluster of vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401646	8066463	*Rourea brachyandra*	Near-threatened	opposite fish farm, robust vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401691	8066536	*Rourea brachyandra*	Near-threatened	seedling vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401659	8066550	*Rourea brachyandra*	Near-threatened	seedling vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401693	8066568	*Rourea brachyandra*	Near-threatened	seedling vines	Wind disturbed vine forest on metamorphic slopes (base of southern slope) with broken canopy of Alstonia scholaris, Endospermum medullosum, Acacia celsa, Myristica insipida, Castanospermum australe, Grevillea baileyana, and a dense understorey of Calamus radicans, C. australis and patches of Panicum incomtum
401693	8066568	*Rourea brachyandra*	Near-threatened	Large cluster of vines near waterfall, west side in NP.	Mesophyll vine forest on metamorphic slope