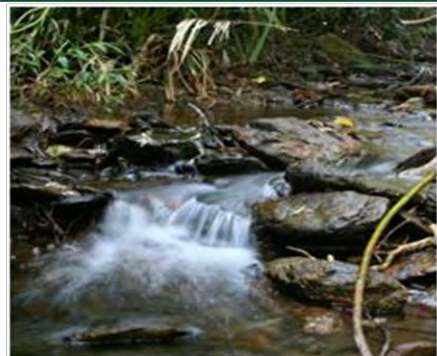


Ella Bay Integrated Resort Proposal

SEIS Submission Response

Volume Three

Environmental Management Plans





Executive Summary

This volume contains the initial Environmental Management Plan (EMP) and Sub-plans for the Ella Bay Integrated Resort Community. A draft EMP (Volume 5) was provided in the EIS as required under the EIS terms of reference. The EMP contained in this volume has been specifically written for Ella Bay Developments. The EMP and Sub-plans have been based on information presented in the EIS, SEIS and subsequent studies contained in this submission.

The EMP is an overarching document for the sub-plans. The sub-plans in this report have been written for issues that are related to Matters of National Environmental Significance as defined by the EPBC act. Specifically the Sub-plans completed and contained herein are:

- Southern Cassowary Management Sub-Plan
- Stream Dwelling Rainforest Frog Species Management Sub-Plan
- Spectacled Flying Fox Management Sub-Plan
- Marine Turtle Species Management Sub-Plan
- Flora Management Sub-Plan
- Weed Management Sub-Plan
- Cultural Heritage Management Sub-Plan

The Ella Bay Development will be a staged development over a period of 15 years and planning, construction and operations will overlap for that period. The sub-plans have been written to cover all three stages where appropriate, to ensure that a consistent environmental management is followed.

The plans have been completed to a preapproval status and will require updating after approval commitments have been defined. Some of the sub-plans rely on information from other sub-plans which have not been completed for example the Cassowary Road Management Strategy will require input from the Ella Bay Road Management Sub-Plan.



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3.1 Environmental Management Plan

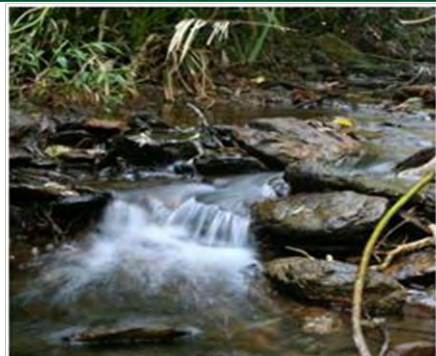


Environmental Management Plan

For the

Ella Bay Development

October 2009 Revision 1





Environmental Management Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the EBD Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
0	May 09	PJ/RL	KR	RL
1	Oct 09	KR	RL	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

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ENVIRONMENTAL MANAGEMENT PLAN EXECUTIVE SUMMARY

Ella Bay Developments proposes to construct a staged, master planned tourism and residential community, implementing best practice sustainable development, located at Ella Bay, 10km northeast of Innisfail. EBD is to consist of: eco-friendly residences; resort units and villas; a village precinct; golf course; educational precinct; and 84 hectares of revegetation and rehabilitation.

EBD will undertake both on and offsite impact mitigation through a range of best-practice flora & fauna management measures, including cassowary fencing, bridges and fauna underpasses, habitat and water quality improvements, weed and pest management, dog and cat exclusion and ongoing community environmental awareness, participation and educational programs.

To reach EBD, a 4.8 km long sealed access road from Flying Fish Point to Ella Bay is required. This road enhances / rebuilds the existing unsealed council road and private access road to Ella Bay. The road is to incorporate fauna mitigation measures, based on environmentally sensitive road engineering and design, and will utilise a directional fencing strategy to direct cassowaries and other fauna to specific fauna underpasses. Other fauna mitigation measures include frog fencing and 4 small fauna underpasses. Traffic calming devices will also be incorporated.

Ella Bay Development's Environmental Management Plan (EBD EMP) is designed to be a user friendly document, which ensures that the environmental commitments, management and mitigation measures identified in the EIS approvals process are implemented, monitored, audited and improved and that no breaches of environmental legislative or regulatory requirements, permits or licences occur.

The Environmental Management Plan consists of a main document which outlines the overall environmental management system and a series of separate Environmental Management Sub-Plans. The Sub-Plans are not designed as stand alone documents but rather as specific documents addressing a specific environmental management issue which is to be addressed with a management plan eg *Weed Management*, *Southern Cassowary Management*, *Stream Dwelling Rainforest Frog Management*, etc which must be read along with the overall EMP document.

The EMP and Sub-Plans were developed from mitigation measures detailed in part 4 of the Ella Bay EIS and the SEIS as well as public and multi-agency comments and submissions in response to the SEIS and addressed subsequently in the submission response to the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project which are:

- to employ best environmental management practices and controls to protect and enhance the environmental values of the area;
- .minimise, mitigate and manage potential impacts of the development on the environment throughout construction and operation;
- provide a platform for consistent approach which assures that the required standards of environmental protection are achieved;

The Ella Bay Development will be a staged development over a period of 15 years with planning, construction and operations overlapping during that period. The EMP and sub-plans have been written to include and cover all phases of the development where appropriate, to ensure that a consistent environmental approach is maintained.

Ella Bay Development's Environmental Management Team will consist of all employees, construction workers, operations staff, specialist Environmental Managers and project and facility managers. All these personnel along with residents and visitors are to be accountable for the overall environmental management and performance of the EBD project. EBD's Overall Environmental Management Philosophy, and every individual's role and contribution to it, will be the focal point of the site induction process.



A range of specific actions, procedures and tasks are identified and detailed throughout the EMP and Management Sub-Plans. They are assigned to a responsibility/function/category and corresponding action team: Environmental Audit, Environmental Implementation or Environmental Control. As the environmental management team grows with the EBD project, specific tasks will be assigned / reassigned to relevant personnel according to the hierarchy of responsibility.

The EMP further details:

- the mechanism for implementation of the environmental management in association with the various phases of the development (planning, construction and operations) and development staging to completion;
- commitment to high levels of environmental performance, including environmental objectives, ie levels of risk, performance standards and associated measureable indicators, performance monitoring and reporting;
- impact prevention or mitigation actions to implement commitments and corrective responses to deviation from performance standards or incidents;;
- The use and roles of environmental experts and consultants to be known as advisors;
- Work method statements (work plan environmental assessments);
- Induction and Environmental Awareness Training;
- Community engagement, communication, reporting and Complaint Management; and
- Sub-Plan Structure.



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1. Introduction

This Environmental Management Plan (EMP) provides the management systems and procedures to ensure the Ella Bay Developments (EBD) exceeds best practice environmental controls in managing potential environmental impacts throughout the planning, construction and operation of the project. This document will be the environmental blueprint for preparation of sub-plans specific to the project.

Ella Bay will be a staged development where planning, construction and operation will coexist on the site for up to 15 years. Ella Bay Developments will consist of:

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay, including a suitable access route from Flying Fish Point to Ella Bay, Queensland.

Ella Bay Development will be a master-planned, tourism and residential lifestyle community, implementing leading systems and technology that will set the benchmark in ecologically sustainable development. Ella Bay will undertake both on and offsite impact mitigation through a range of best-practice flora & fauna management measures, including cassowary fencing, bridge and fauna underpasses, habitat and water quality improvements, revegetation and rehabilitation, weed and pest management, dog and cat exclusion and ongoing community environmental awareness and education programs.

This EMP provides an integrated management system to facilitate the incorporation of environmentally sustainable development practices throughout construction and operation.

This EMP will ensure compliance with:

- Commonwealth Department of Environment Water Heritage and Arts (DSEWPC) conditions of approval;
- Queensland Department of Infrastructure and Planning conditions of approval;
- Cassowary Coast Regional Council Development approval;
- any approvals, permits and licences related to the project; and
- relevant legislation, agreements, policies and guidelines;

Project Location

The Ella Bay Development is located in the Cassowary Coast Regional Council area, 88 km south of Cairns and 10 km north of Innisfail in North Queensland.

Figure 1.1 shows the regional location of the Ella Bay Development area.

Figure 1.2 shows the location of the access road, designed in two stages with stage 1 to be along the alignment of the existing Ella Bay Road between Flying Fish Point and Ella Bay, a portion of which intersects the Wet Tropics World Heritage Area (WTWHA) and Ella Bay National Park. Stage 2 will have a new alignment to bypass the township of Flying Fish Point.



Fig .1.1 Location map of Ella Bay Development



Fig 1.2 Location of Ella Bay Road Stage 1 and Stage 2

Project Description



Fig 1.3 Ella Bay Development.

The Ella Bay Development (Figure 1.3) is proposed to be completed within 15 years from the commencement of construction works.

The Ella Bay Development will consist of:

- 540 eco-friendly residences set around a range of community facilities;
- Four resort precincts; comprising 860 resort units and villas;
- A village precinct incorporating retail spaces, professional services, offices, and restaurants and dining;
- An 18 hole golf course;
- An educational precinct incorporating a welcome centre, a collaborative research institute, an international school and sports centre;
- Innovative sustainable systems and technology to meet the communities resource and infrastructure needs; and
- 84 hectares of revegetation and rehabilitation.

The Ella Bay Development will also include a 4.8km long access road that incorporates fauna impact mitigation measures based on environmentally sensitive road engineering and design. The access road (Figure 1.2) will consist of 2 stages.

Stage 1 will be a 4.0km upgrade of the existing Ella Bay Road from Flying Fish Point;

- 980m upgrade to the existing Ella Bay Road alignment. This is a flat section of unsurveyed road on Council controlled land and will include a road bridge as a fauna



underpass (suitable for Cassowaries). The road runs immediately adjacent to Ella Bay National Park World Heritage Area

- 1560m upgrade to the existing Ella Bay Road alignment as it runs through Ella Bay National Park World Heritage Area. This is a winding section of the Ella Bay Road around the Heath Point headland inside the WHA Zone C;
- 350m upgrade to the existing Ella Bay Road alignment as it exits Heath Point. This is an undulating section along Council controlled Esplanade.
- 1090m of new alignment along an existing road easement in private land at Little Cove. This is a relatively flat section of road which crosses two creeks and will incorporate two bridges with fauna underpass design.

Stage 2 will be a new 0.8km road that bypasses Flying Fish Point to the west

- A new intersection along Bay Road where it changes to Alice street. This is an existing tar sealed road along the road to Flying Fish Point.
- 350m of new road on an existing old planned subdivision road easement of Alice Street. This is a rising section of road towards the Seymour Range.
- 440m of new road on State land. This section of road passes through a saddle of the Seymour Range above Flying Fish Point via a tunnel through the lowest point of the ridge. The tunnel will provide a fauna overpass for all fauna.

The road will utilise a directional fencing strategy to direct cassowaries and other fauna to specific fauna underpasses. The road will be fenced on both sides in areas considered accessible by cassowaries, except where the terrain at the side of the road is too steep or the embankments are greater than 2m in height. Three road bridges will provide safe fauna habitat connectivity under the road; one of the bridges will be a purpose built fauna underpass, where as the other two bridges will incorporate fauna underpass design together with the creek crossing. Other fauna mitigation measures including frog fencing, four small fauna underpasses, and traffic calming devices will be included.

History

The site is a former agricultural property which has been cleared and subsequently heavily degraded with introduced weeds. The site will require substantive rehabilitation of weed infested areas and revegetation of cleared areas.

Pre first contact, the Ella Bay area was inhabited by the Bagirgabara clan one of the Mamu-speaking clan groups of the Innisfail region (Pentecost 2007). The richness and diversity of the Wet Tropics lowland rainforest environment, would have allowed for a population density of approximately 2 km² per person and a 'band' of approximately 50 individuals.

First contact came with the survivors of the wreck of the brig "Maria" when it landed at Ella Bay, and their subsequent rescue in 1872. Then followed the "cedar getters" and the first purchase of the land in 1880. The Ella Bay site was first surveyed in 1882 and large areas of the site were cleared for banana production and small crop farming. There are numerous newspaper reports from the early 1900's of Ella Bay being one the major banana growing areas in Queensland. (Brisbane Courier 1903, Sydney Morning Herald 1906, Rockhampton Morning Bulletin 1903) The newspaper articles report that the land was leased to Chinese farmers and there were over 100 men working the site, that 500 acres had been cleared for bananas and there was a 340ft long jetty built in 1902 to load steamers with bananas to Brisbane. There was a note of Ella Bay Road (tender for bridge, Cairns Post 1917).

In recent history, most of the Ella Bay site was shown as clear in Army mapping dated 1943 and the small amount of remaining areas were cleared and levelled in the mid 1960's. Since that time the site has been used mainly for pastoral purposes. Introduced tropical pasture grass (*Brachiaria decumbens* and *Brachiaria humidicola*) covers almost all of the cleared area. Introduced weed infestation (Pond apple, Hymenachne, Sicklepod etc) have further degraded much of these pasture areas and the margins of remnant vegetated areas.



Background

The impact assessment process for this State Significant project has been carried out under the requirements of the Queensland State Development and Public Works Organisation Act 1971 and is also the subject of a bilateral agreement between the Queensland and the Commonwealth Governments in relation to environmental assessment under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The Commonwealth Minister decided, on 4 July 2005, that the Proposal constitutes a controlled action under Section 75 of the EPBC Act, with the controlling provisions being World Heritage (sections 12 and 15A) and Listed threatened species and communities (sections 18 and 18A).

EMP Purpose

The purpose of the Ella Bay Developments EMP is:

- To detail the methods and procedures which will be used to meet the environmental objectives and targets of the Project;
- To record the hazard and risk identification and management process during construction and operation;
- To record the process of implementing controls to minimise the impacts of the Project on the environment; and
- To develop a user-friendly document that ensures that the environmental commitments, management and mitigation measures identified in the EIS approvals process are being implemented, monitored, audited and improved;

EMP Objectives

The objectives of the Ella Bay Developments EMP are to:

- Employ the best environmental management practices in all aspects of the project to enhance the environment and heritage, and to minimise the impact of the development;
- Provide a platform for a consistent and uniform approach which assures that the required standards of environmental protection are achieved;
- Provide evidence of the environmentally responsible management; and
- Provide local, state and commonwealth authorities, stakeholders and the proponent with a common focus for approvals, conditions and compliance with policies and conditions.

EMP Performance Targets

The following key performance targets will be adopted:

- No breach of environmental legislative or regulatory requirements;
- Environmental incident rate of zero;
- Improve local environmental habitat value;
- Minimise greenhouse gas emissions; and
- Minimise energy, water and other resource consumption.



Ella Bay Environmental Policy

Ella Bay Developments is committed to an ecologically sustainable development with the natural environment as the primary responsibility. Ella Bay Developments is committed to:

Education and Awareness

Communicate our Environmental Policy, standards and relevant Management plans to all employees, contractors, residents and visitors ensuring they understand their responsibility to protect our natural environment and promote ecologically sustainable development.

Provide opportunities that lead to greater understanding, appreciation and enjoyment of both the natural and social environment as a result of education, provision of an interpretive and educational service and research initiatives and involvement

Continuous Improvement

Strive to improve our environmental performance and make best practise and innovation of environmental protection an integral part of the activities. Search for continual areas of improvement through regular reviews of all our operations and setting measurable targets to achieve improvement.

Natural Environment Protection

The heritage, biodiversity and ecology of Ella Bay's natural environment are restored using a combination of habitat and wildlife rehabilitation, protection measures, and conservation activities.

Environmental Stewardship

A responsible and protective attitude to the natural environment is embraced in keeping with the right to use the environment for tourism purposes and preserve it in its natural state for future generations

Built Environment

The built environment will be designed and constructed to include all elements of environmental planning in the execution of the development and to perform in an environmentally sound manner.

Sustainable Resource Use

Create an environmentally self-sufficient community that manages its own energy, water, and sewerage treatment using Energy (electricity and fuel), water and materials sourced and consumed in a sustainable manner with the goal of net zero carbon emissions.

Local and Indigenous Communities

Include local and indigenous communities in business planning and operations, with the aim being to provide support, and encourage involvement.

Traditional Owners

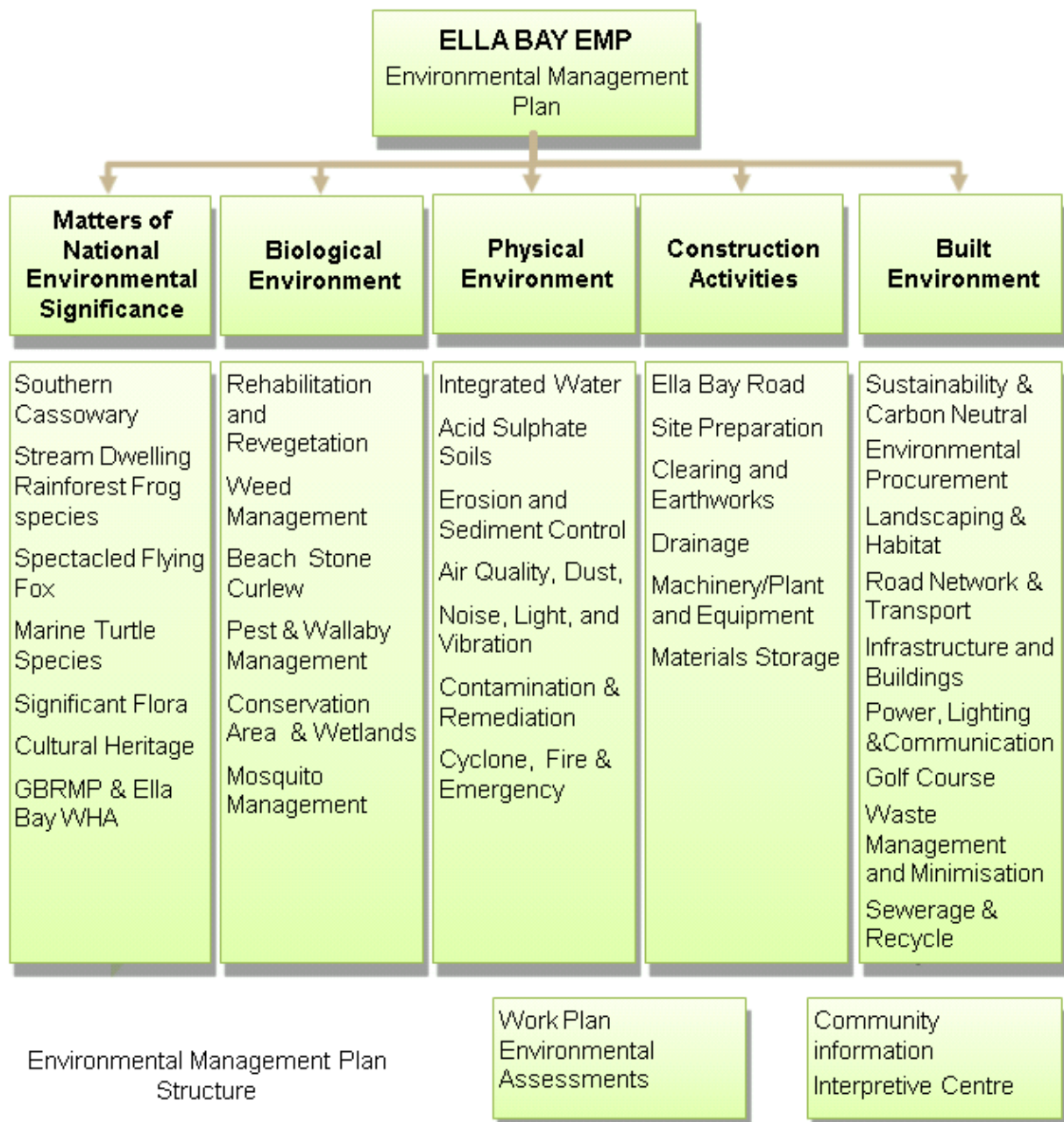
Recognise the Bagirbarra people as the Traditional Owners of the Ella Bay land and acknowledge and respect the contribution that the Bagirbarra people and their culture have made and continue to make to Ella Bay and its identity.

Environmental Management Plan and Sub-Plans

The Environmental Management Plan consists of this main document that outlines the overall environmental management system plus a series of management sub-plans. The sub-plans outline the aspects, impacts, management measures and monitoring requirements for each key environmental element, and phase of construction/operation. The sub-plans also nominate who is responsible for implementing those controls and the frequency/timing of implementation. For each key environmental element the sub-plan will identify the:

- Objective;
- Performance criteria;
- Risk assessment
- Control measures;
- Monitoring/reporting;
- Corrective action; and,
- Emergency incident procedure.

The overall environmental document framework of the EMP and sub-plans is shown below.



Approval Process of EMP

This EMP and completed sub-plans will form part of the approval of Ella Bay. The sub-plans completed for approval are:

- Southern Cassowary Management Sub-plan;
- Stream Dwelling Rainforest Frog Species Management Sub-plan;
- Marine Turtle Species Management Sub-plan;
- Spectacled Flying-Fox Management Sub-plan;
- Significant Flora Species Management Sub-plan;
- Weed Species Management Sub-plan; and
- Cultural Heritage Management Sub-plan.

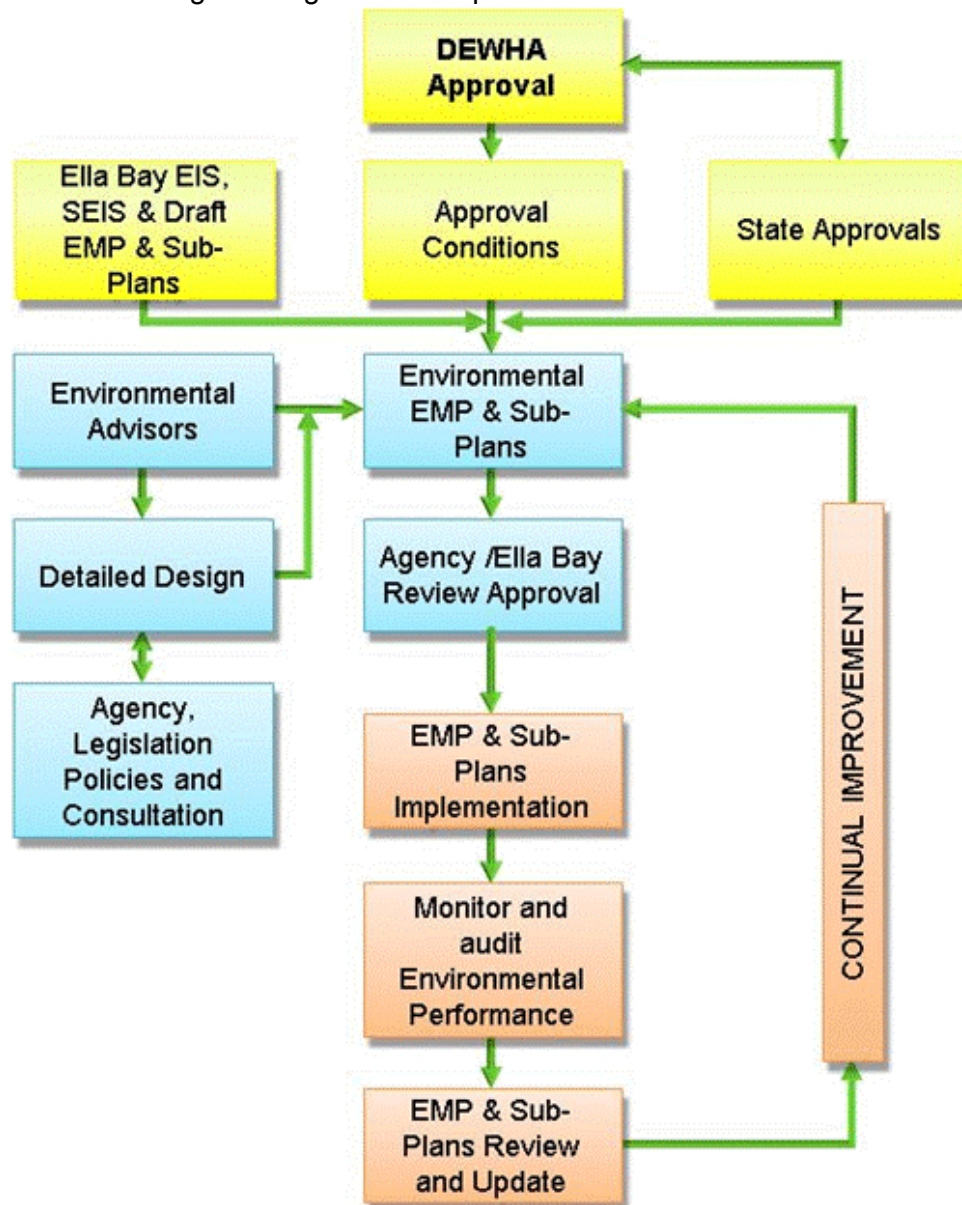


Fig 1.5 EMP Preparation

The preparation of further sub-plans which sit under the overarching EMP will be conducted in the post-approval period and throughout construction and operation. A schedule of these sub-plans to be prepared and incorporated is identified in Section 6, Environmental Management Sub-plans.



Relevant Legislation, Agreements, Policies and Guidelines

Element	Legislation/Policy/Guideline	Authority
EIS Framework	<i>State Development and Public Works Organisation Act 1971</i>	Co-ordinator General
	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	DSEWPC
	Bilateral Agreement between the Australian Government and Queensland – Relating to Environmental Assessment (2004)	DSEWPC/ Queensland Government
Biodiversity Conservation	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	DSEWPC
Nature Conservation	<i>Nature Conservation Act 1992</i>	EPA
	<i>Nature Conservation (Wildlife) Regulation 2007</i>	EPA
Wet Tropics	<i>Wet Tropics World Heritage Protection and Management Act 1998</i>	WTMA
	Wet Tropics Management Plan 1998	WTMA
Great Barrier Reef	<i>Great Barrier Reef Marine Park Act 1975</i>	GBRMPA
	Environmental Impact Management Policy (2004)	GBRMPA
	Reef Water Quality Protection Plan (2003)	Queensland Government
	<i>Fisheries Act 1994</i>	DERM
Coastal Management	<i>Coastal Protection and Management Act 1995</i>	EPA
	State Coastal Management Plan (2002)	EPA
	<i>Beach Protection Act (1968)</i>	
Wetlands	Strategy for the Conservation and Management of Queensland's Wetlands (1999)	EPA
Environment Protection	<i>Environmental Protection Act 1994</i>	EPA
Water Quality	<i>Environmental Protection (Water Policy) 1997</i>	EPA
	<i>Environmental Protection (Water) Amendment Policy (No.1) 2007</i>	EPA
	Operational Policy – Licensing: Approval of Sewage Treatment Plants including options for use of reclaimed water (2008)	EPA
Air Quality	<i>Environmental Protection (Air) Policy 1997</i>	EPA



Element	Legislation/Policy/Guideline	Authority
Noise	<i>Environmental Protection (Noise) Policy 1997</i>	EPA
Waste Management	<i>Environmental Protection (Waste Management) Policy 2000</i>	EPA
	<i>Environmental Protection (Waste Management) Regulation 2000</i>	EPA
Vegetation Protection	<i>Vegetation Management Act 1999</i>	DERM
	State Policy for Vegetation Management 2006	DERM
	Regional Vegetation Management Code for Coastal Bioregions 2006	DERM
Pest Species	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	DERM
Acid Sulphate Soils	Instruction for the Treatment and Management of Acid Sulphate Soils (2001)	DERM
	National Strategy for the Management of Coastal Acid Sulphate Soils (2000)	DSEWPC
Cultural Heritage	<i>Aboriginal Cultural Heritage Act 2003</i>	DERM
	Duty of Care Guidelines 2004	DERM

Conditions of Approval

The conditions of approval and statement of commitments will be listed in table 2.1 with a cross reference to where the condition is addressed in this EMP or other subplans.

Table 2.1 Ministers Conditions of Approval

Condition No.	Condition or Commitment requirement	EMP/Sub-plan Reference

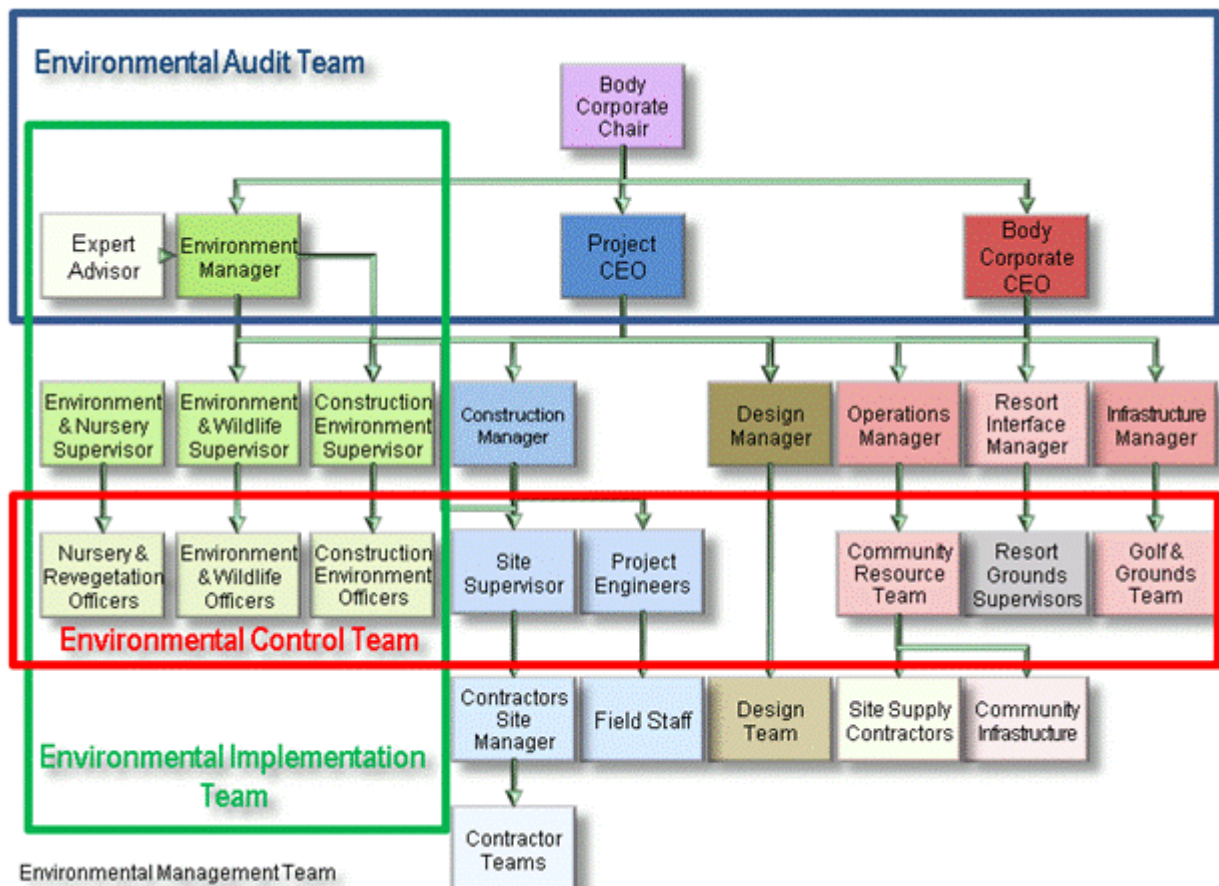
2. Environmental Management Implementation and Operation

Environmental Management Team

Ella Bay's Environmental Management Team will consist of all employees including construction workers, operations staff, specialist environmental managers and project and facility managers. The entire team will be responsible for the overall environmental performance of the project.

A range of specific actions, procedures and tasks are detailed throughout this EMP document and sub-plans. Who is responsible for these tasks will vary depending on the requirements of the task. For example, day-to-day hazard identification will be the responsibility of all levels of staff, while sophisticated environmental audits will be the responsibility of higher environmental management positions. The diagram below provides an outline of these levels of environmental responsibility. The relevant responsibility levels will be highlighted to employees as part of the site induction.

Tasks identified throughout the EMP document will be given a category level and as the environmental management team grows, specific tasks will be assigned to relevant personnel according to the hierarchy of responsibility.





Environmental Experts and Consultants

Environmental experts and consultants will be contracted as required to provide specialist advice on particular environmental matters, undertake surveys and inspections, implement monitoring programs or prepare environmental reports. These specialists may include the following:

- Specialist ecologists as expert advisors;
- Environmental engineers;
- Water scientists;
- Cassowary specialists;
- Frog specialists; and
- Flora, revegetation, weed specialists.

The Expert Advisors (EA) will oversee all elements of the conservation and management programs on site. The Expert Advisors will provide advice to the Ella Bay Environmental Staff and provide an external audit function of the management and compliance to the Environmental Sub-plans. The Expert Advisors will be recognised experts in the field. Their role will be to:

- Monitor and audit the Ella Bay Development and associated access road during the construction and operational phases;
- Monitor efficacy of all mitigation at the construction and operational phases. The monitoring program must seek to identify negative (or positive) trends and likely causal factors;
- Provide expert advice to the EBD Environmental Manager and EBD management on any required modification or changes to mitigation strategies, and sign off on the implementation;
- Participate in all reviews and updates of the EM sub-plans; and
- Prepare an annual report on the effectiveness of the mitigation strategies.

Environmental Management Team Responsibilities

The primary responsibilities and functions of EBD Environmental Audit Team – EAT include:

- Conduct, supervise and/or review environmental audits including the appointment of auditors (internal and external). Following the completion of audits, examine the results and reports. Coordinate responses and required corrective actions, response measures and actions as documented are required to be filed with audit reports;
- Following audits evaluate if EMP/Sub-Plans and other EBD Management Systems have been properly implemented and maintained. If not commission review;
- Investigate non-compliances and environmental incidences and report to environmental agencies where necessary;
- Ensure sufficient resources are available for the EMP and EM Sub-Plans to be implemented and understood;
- Develop and initiate auditing schedules for EMPs and EM Sub-Plans. On completion evaluate if properly implemented and maintained. Commission review(s) if necessary;
- Continually monitor/audit environmental performance to ensure compatibility with policy and objectives in EMP and EM Sub-Plans. Where appropriate initiate reviews/changes;
- Conduct EMP and EM Sub-Plan reviews and where changes occur/are necessary approve and communicate changes and where appropriate forward to Environmental Approval Agencies / Regulators; and
- Report to environmental agencies (including non-compliances and environmental incidences) and an annual environmental report.

Responsibilities and Functions of EBD Environmental Implementation Team – EIT include:

- Develop, deliver and assess the effectiveness of the Induction and Environmental Awareness Training Program (IEATP);



- Ensure that environmental protection requirements/procedures and audit results are communicated to all personnel including construction subcontractors and members of the community;
- Development the Communications Management System and maintain its register;
- Undertake EMP annual reviews and EM Sub-Plans reviews when required. Report upon findings, making recommendations for change or updating and commenting upon whether they are being properly implemented;
- Assist with updating of the EMP and EM Sub-Plans and communicate changes to staff, contractors and sub-contractors through the environmental training process and the respective Environmental Teams to which they belong;
- Register and investigate environmental complaints /non compliance and ensure that remedial solutions are effectively developed, reported and implemented;
- Conduct or initiate regular monitoring (Schedules for each of the individual monitoring programs are available in the EBD Environmental Monitoring Checklist which is a component of the Communications Management System Register) to assess the effectiveness of current environmental controls in achieving relevant performance criteria, environmental targets and objectives, and meeting conditions in environmental approvals and licences;
- Review environmental monitoring and inspection reports undertaken by the EBD Environmental Controls Team and others. Liaise with these personnel and ensure any actions required are initiated;
- Following completion of audits, evaluate if EMP/Sub-Plans have been properly implemented and maintained. Commission reviews and corrective actions and coordinate responses and reporting;
- Routinely review and report on environmental activities in Inspection and Test Plans, Project Forms/Checklists; and
- Liaise with staff, community and technical specialists (advisors) in the monitoring of environmental controls.

Responsibilities and Functions of EBD Environmental Controls Team – ECT include:

- Ensure environmental controls are established prior to commencement of construction or maintenance activities and other procedures;
- Ensure subcontractors fulfil their environmental obligations;
- Inspect, document and report on environmental management system practices and controls. Identify non conforming work, non compliances and other environmental management system issues, occurring and potential, and report to the appropriate EBD Environmental Team (Audit or Implementation);
- Undertake monitoring and other activities in Inspection and Test Plans, Project Forms/Checklists and the EBD Environmental Monitoring Checklist. Perform environmental monitoring and inspections and prepare reports as requested;
- Ensure and verify that corrective action(s) have/has been taken for non-conforming work and non compliance(s) and recorded;
- Assist in the routine completion of the Communications Management Register and System and the EBD Site Diary; and
- Assist in the review of the Induction and Environmental Awareness Training Program (IEATP).

General Environmental Responsibilities of all EBD Staff, and residents.

- Day-to-day environmental hazard identification;
- Day to day environmental surveillance and monitoring;
- Ensure all work is conducted in accordance with EMP and minimal environmental impact;
- Identify and notify Audit Team of non-compliances;
- Carry out agreed rectification works for non-compliances; and
- Be involved in regular 'toolbox' training and keep up-to -date with environmental issues.



Guests and visitors will be encouraged to report on any environmental issues.

The Environmental Management Team will be populated after project approval. Many EBD personnel may belong to more than one team or grouping. The names and contact details will be included as an addendum to this EMP. The interim environmental management will be performed by the study and site rehabilitation staff.

EBD Position/Function	Environmental Controls Team	Environmental Implementation Team	Environmental Audit Team	General Environmental Responsibilities
Body Corporate Chair			x	x
Body Corporate CEO			x	x
Project CEO			x	x
Expert Advisors (Cassowary, Frogs, Weeds, Flora and , Turtles)		x	x	x
Environmental Manager		x	x	x
Construction Manager				x
Design Manager				x
Resort Interface Manger				x
Operations Manager				x
Environmental Nursery Supervisor		x		x
Environmental Wildlife Supervisor		x		x
Construction Environmental Superintendent		x		x
Site Supervisor	x			x
Surveyors & Project Engineers	x			x
Nursery & Revegetation Officers	x	x		x
Environment and Wildlife Officers	x	x		x
Construction Environmental Officers	x	x		x
Community Resource Team	x			x
Resort Ground Supervisors	x			x
Resort and Grounds Team	x			x
Golf and Grounds Team	x			x
Contractors Site Manager				x
Field Staff				x
Supply Supervisor				x
Community Infrastructure				x
Contractor Teams				x
Site Supply Contractors				x

Table 2.2 Allocation of Ella Bay Developments Staff and Contractors to Environmental Teams (also see Figure 2.1)



Environmental Management Procedure

Ella Bay Development will facilitate a continuous management process during construction and operation to ensure best practice environmental management and compliance with all approvals, permits, licences and standards. This EMP document describes the guiding environmental management systems to ensure this occurs.

Throughout the EIS assessment process a range of processes and commitments were identified to ensure the protection and enhancement of the natural environment at Ella Bay. For each key environmental element a sub-plan ensures these specific environmental control measures are incorporated and monitored for effectiveness. Compliance with objectives, targets and performance criteria will be assessed through routine monitoring and maintenance of environmental controls.

Daily inspections of work areas by the Environmental Inspection Team, and weekly inspections by the Environmental Manager will provide a means for identifying environmental and maintenance requirements before they reach a critical stage. Specific corrective actions and incident emergency response mechanisms are outlined in sub-plans.

EMP or EM Sub-Plan changes are to be communicated to the all staff, contractors and sub-contractors through the environmental training process and the respective Environmental Teams to which they belong

Each EM Sub-Plan described within the EMP will define specific actions for dealing with non-compliance with environmental management controls, and environmental incidents and emergencies. The procedures will outline the EBD Environmental Team with authority and responsibility for handling and investigating non-compliance, taking action and completing corrective and preventative action (Audit, Implementation, or Controls).

Review and Amendment Provisions: Reviewed plans will be distributed to appropriate environmental authorities clearly indicating the reviewed/changed elements.

Audits include:

- Initial and 6 monthly constructional phase audits;
- Annual operational phase audits;
- Completion of construction of a project stage audits (within 28 days of the completion of construction of a project stage, an environmental compliance audit, including site inspection and full review of environmental records is required);
- Monitoring programs audits;
- Audit of the Induction and Environmental Awareness Training Program (IEATP);
- Audit of the Communications Management Register and System including environmental complaints.

Communications Management System Register

The Communications Management System Register will include:

- Details of environmental incidents and actions taken;
- Details of environmental complaints made by the community and others and actions taken;
- Emergency contact response details for Environmental Experts and Consultants including injured wildlife and Environmental Regulators;
- Locations of MSDS sheets; and
- Schedules for each of the individual monitoring programs as a part of the EBD Environmental Monitoring Checklist.

Responsibility for monitoring will lie with the Environmental Implementation Team, led by the EBD Environment Manager. The Environmental Audit Team will audit the monitoring process and in many cases, day to day routine monitoring will be undertaken by members of the Environmental Controls Team.



Regular reports will be compiled including:

- Status of environmental activities such as monitoring and surveillance of controls, inspections and testing during the preceding month;
- Complaints, infringements and penalties incurred;
- Status of any non-compliances or corrective actions; and
- Outcomes of any environmental audits undertaken during the preceding month.

Monitoring reports will be used to facilitate the preparation of the Annual Environmental Monitoring Report that will be formally submitted to appropriate environmental authorities.

The monitoring and most other reports will be summarised, formatted and posted to the projects 'live' environmental reporting website that will provide continuous public access to the projects environmental performance. This website, public meetings newsletters and information leaflets will be the community core of EBD's Community Consultation Program.

Ecological Risk Assessment

The result of unplanned adverse environmental effects can be catastrophic to the environment and ultimately to Ella Bay. EBD will require a risk analysis performed for all Environmental Management Sub-plans and for work Method Statements (WMS – see next section)

The process of performing a risk assessment involves

- Evaluating possible risks compared to an ecological measurement; and
- Then mitigating the risk until the risk is minimised to a manageable risk.

The common method of risk evaluation is to assess both the severity and the likelihood of occurrence and place a rating against the potential hazard of a risk factor.

To simplify the complexity and difficulty of performing ecological risk assessments, an Ella Bay specific risk table has been prepared based on a similar framework to safety risk assessments (AS4360). The likelihood of the occurrence has been adjusted to an Ella Bay relevant timeframe and the consequence of the potential hazard adjusted to a project relevant ecological impact.

Development of the guiding parameters; consequence and likelihood will be performed as part of the individual Environmental Management Sub-plans and then applied in the Work Method Statements which will be prepared on an ongoing basis by the individual construction and operations teams performing the work. The advantage of this approach is that the overarching ecological values are established in the EMS and the individual risks are then evaluated for the situation.

The ecological measurement is;

Does the potential hazard impact on the Ella Bay ecological goal to improve biodiversity and abundance?

The type of hazard must be a creditable scenario ie spillage of herbicide contributing to EPBC listed frog deaths, cyclone fence damage leading to road death of a cassowary. The risk should be extended to include cyclone, fire and flood scenarios during the construction period where appropriate.

The EBD definition of consequence of the event is listed below

Negligible

- Incidental environmental nuisance. Sufficient to require reporting as an environmental incident. Eg overspray, minor spill;
- Possible incidental impacts to flora and fauna in a locally affected environmental setting. No ecological consequences.

Minor

- Minor environmental nuisance to the affected community. Reportable as an incident in annual report or referral to DERM;

- Reduction of the abundance/biomass of flora and fauna in the affected environmental setting. No changes to biodiversity or the exposed ecological system.

Major

- Major environmental nuisance to the affected community;
- Reduction of abundance/biomass in the affected environmental setting. Limited impact to local biodiversity without a significant loss of pre-impact ecological functioning.

Severe

- Substantial reduction of abundance/biomass in the affected environmental setting. Significant impact to biodiversity and ecological functioning. Eventual recovery of ecological systems possible, but not necessarily to the same pre-impact conditions.

Disastrous

- Irreversible/irrecoverable changes to abundance/ biomass in the affected environmental setting. Loss of biodiversity on a regional scale. Loss of ecological functioning with little prospect of recovery to pre-impact conditions.

Likelihood	CONSEQUENCE SEVERITY				
	Negligible monthly report / no noticeable impact	Minor reportable / impact	Major EPBC impact / regulatory fine	Severe Fine / Reputation damaged	Disastrous Approval Suspended
Months common					
Year likely					
Years < 15 construction period					
Years < 100 design min life					
Years >100 rare, highly unlikely					

Negligible Risk

Moderate Risk

Significant Risk

Intolerable Risk

Incorporate cost effective measures for risk reduction strategies within scope of long term planning

Implement cost effective measures for risk reduction - formalise routine procedures for reducing risk

Implement cost effective measures for risk reduction - senior management responsibility

Cannot be justified under any circumstance, reduce risk



Work Method Statements

Work Method Statements (WMS) will be prepared for specific higher-risk activities to ensure sound environmental practices are implemented and to minimise the risk of environmental incidents. Plan-based WMSs will be prepared for the more complex environmental control processes which do not follow common practice or where the absence of such instructions could be potentially detrimental to the environment. The incorporation of cost effective measures for risk reduction will be included in the WMS. Where there is a significant or intolerable risk category the risk must be elevated to an Environmental Audit Team member.

WMS will be prepared for a range of activities including:

- Works in waterways including culvert installation and temporary waterway crossings, this will also require DERM approval for ordered streams;
- Concrete works;
- Batch plant operation;
- Excavation, drilling and/or treatment of contaminated soil; and
- Chemical and herbicide storage and use.

Environment in Procurement

One of the major ecologically sustainable goals of Ella Bay Development will be maximising environmental procurement for goods and services. The Environmental Procurement Management Sub-plan will detail guidelines for assessment through;

- Procurement of goods and services that seek to minimise environmental impact;
- Working with suppliers and service providers to encourage continuous reduction in the adverse environmental impact of goods and services; and
- Assessing the environmental impact of goods and services.

The assessment will incorporate environmental criteria into procurement of products and services, along with price and performance criteria. Procurement will be assessed against the following guidelines:

- comply with occupational health and safety requirements;
- meet environmental best practice in energy efficiency and/or consumption;
- environmentally sound whole of life footprint in manufacture, use and disposal;
- be designed and made for reliability, long life and ease of upgrading or updating;
- Packaging wastes are reusable or recyclable, designed for ease of recycling, re-manufacture or otherwise minimise waste; and through
- Purchase of recycled goods.

In many cases the suppliers will not have adequate environmental knowledge, systems or procedures and Ella Bay staff will work with the suppliers to provide information, training, tools and technical assistance for environmental systems management.



Training and Awareness

Welcome Centre

The Ella Bay Welcome Centre will play a key role in raising environmental awareness among employees, contractors, subcontractors, residents and visitors. The Welcome Centre's main purposes will be to:

- Induct residents and visitors to Ella Bay, highlighting significant environmental issues and ecologically sustainable practices and procedures;
- Facilitate ongoing environmental education and awareness programs for resident, tourists, visitors and workers;
- Provide an onsite base for environmental monitoring and surveillance;
- Centralise important management and administration functions in the one location; and
- Central 'point of reference' for all induction and environmental awareness training.

Induction and Environmental Awareness Training

All employees, contractors and subcontractors must undergo an environmental induction which will outline their responsibilities under the EMP. The training will ensure that all employees, contractors and sub-contractors understand their obligation to exercise due diligence for environmental matters. A key focus will be to change the mindset of the construction workforce to be aware of their environment and develop a greater understanding, appreciation and enjoyment of the environment. The importance of environmental compliance will be enforced with a photo swipe card registration valid for 12 months which will require annual renewal by induction. The environmental card will be suspended for certain specific nominated offences with the result the employee will not be able to work.

The environmental induction will include:

- A general site induction including significant environmental issues and areas;
- Awareness of the specific environmental features of Ella Bay;
- Familiarisation with the requirements of the EMP;
- Environmental emergency response training;
- Familiarisation with site environmental controls;
- Reporting process for environmental harm/incidents;
- Targeted environmental training for specific personnel; and
- Offences that will lead to environmental card suspension.

Records of induction and further training will be kept on a database including the topic of the training carried out, dates, names and trainer details. Inductees will be required to sign-off that they have been informed of the environmental issues and that they understand their responsibilities. The Environmental Manager will review the program and monitor its implementation

Regular Onsite 'Toolbox' Training

One of the major communication means for the Construction team will be regular "Toolbox" training which will help to ensure that relevant information is communicated to the workforce and that feedback can be provided on issues of interest or concern. "Toolbox" training will generally be prepared and delivered by an Environmental Controls Team member. Regular "Toolbox" training topics may include:

- Flora and fauna features;
- Flora and fauna protection;
- Working around cassowaries
- Protecting waterways and riparian zones;
- Wastewater control;
- Vegetation clearing techniques;
- Weed and pest management;



- The efficient use of plant and materials;
- Waste management, minimisation and recycling;
- Noise and vibration minimisation;
- Dust control;
- Work methods; and
- General site issues.

Environmental Communication and Consultation

Community Engagement and Consultation

The local community and relevant stakeholders will be consulted regularly during construction and operation of the Project. Specific actions that will be implemented to ensure continuous engagement with the wider community include:

- Welcome Centre environmental education and awareness programs;
- Advertising of environmental awareness activity timetables;
- A 'live' environmental reporting website. The site will allow a facility for community comments, complaints and suggestions. The site will host the results of monitoring, monthly reports, notification of environmental incidents, and corrective measures implemented, ensuring that the projects environmental performance is made publicly available;
- Regular publication of an Environmental Newsletter;
- The EMP and sub-plans will be publicly available;
- Publicising a general project 'info' number prior to construction; and
- Establishing a publicised contractor's hotline during construction, with associated procedures ensuring that responses to all enquiries and complaints are prompt and that complaints are properly addressed.

Community Reporting and Complaint Management

A Communications Management System and register will be established and maintained by the Environmental Implementation Team who will receive, log, track and respond to reports, and complaints within specified timeframes. The following details will be recorded in the register:

- Date;
- Time;
- Type of communication (telephone, letter, meeting etc);
- Name, address, contact number of reporter, complainant;
- Nature of report or complaint;
- Details;
- Action taken in response including who the report, complaint was referred to (if not resolved immediately); and
- Details of any monitoring undertaken to confirm that the report, complaint has been satisfactorily resolved.

A 24 hour communications contact number will be established, publicised and listed with a telephone company. This would enable any member of the general public to reach a person who can arrange appropriate response action to a report or complaint.

Other Stakeholders

Consultation with a range of non-community, external stakeholders will be undertaken throughout the project. A list of relevant contact details for project stakeholders and environmental agencies will be maintained by the Environmental Officer.

Emergency Preparedness and Response

Activities that are associated with potential or major environmental incidents are identified in the respective sub-plans, with specific incident management procedures outlined. The



environmental consequences of cyclones, hazards and emergency preparedness will be included in the Cyclone, Fire & Emergency Management Sub-plan which will be finalised prior to commencement of substantial construction.

The key to effective prevention of incidents is monitoring, surveillance and training. During construction activities, inspections and preventative action to be performed will include:

- Daily inspections of active work sites;
- Completion of routine environmental checklists;
- Regular environmental training;
- Employee hazard identification procedures; and
- On-going environmental monitoring.

Environmental and safety information on hazardous substances (e.g. MSDS) will be available at the Welcome Centre, main site offices and where such substances are to be stored.

Testing of environmental response procedures may be conducted in areas where a pollution risk is present. Personnel involved in emergency response activities will be provided with specific training.

A current list of emergency response contacts will be maintained at the main site office and Welcome Centre.

Incident Reporting and Notification

In the case of an environmental incident, specific response measures are identified in the relevant sub-plans. The following procedures should also be implemented where necessary:

- Notify the Environmental Manager or Environmental Implementation Team member of the incident;
- Monitor the effectiveness of emergency response measures and environmental controls;
- Seek advice from a specialist if required;
- Notify relevant environmental agencies if required;
- Identify strategies to prevent reoccurrence; and
- Document the incident on the project database.

3. Monitoring and Compliance

Environmental Monitoring

Regular monitoring will be conducted to assess the effectiveness of current environmental controls in achieving relevant performance criteria, and environmental targets and objectives.

Each sub-plan will incorporate specific monitoring procedures and schedules. This will outline the overall:

- Timing.
- Frequency.
- Methodology.
- Locations.
- Responsibilities.

Schedules for each of the individual monitoring programs will be added to the Ella Bay Environmental Monitoring Checklist. This will assist the Environmental Manager in ensuring that all monitoring activities are appropriately scheduled and duly completed.

Monitoring outlined in sub-plans will assess aspects including:

- Water quality;
- Flora and fauna monitoring;
- Vegetation management;
- Weed and pest management
- Erosion and sedimentation;
- Flood control;
- Air quality;
- Noise and vibration; and
- Archaeology and heritage.

Issues that would be considered in the development of monitoring programs for these elements include:

- Background data;
- Sampling procedures;
- Site access;
- Reporting and data interpretation;
- Recommendations;
- Laboratory procedures; and
- Statutory limits.

Compliance with Performance Criteria

Each sub-plan will have a set of measurable performance criteria that the results from ongoing monitoring must achieve. Where non-compliance is detected, or monitoring results are outside of the expected or acceptable range:

- The results will be analysed by the Environmental Manager in more detail with the view of determining possible causes for the non-conformance;
- A site inspection will be undertaken by the Environmental Manager;
- Relevant personnel will be contacted and advised of the problem;
- Relevant corrective action outlined in sub-plans will be identified;
- An agreed action will be identified; and
- Action will be implemented to rectify the problem.



Environmental Auditing

Internal

Planned and documented audits aimed at evaluating the EMP's implementation and effectiveness will be carried out as detailed in the auditing schedule. Internal audits will be conducted by the Environmental Manager.

The initial audit is scheduled within 12 weeks of project commencement, followed by 6 monthly audits during the construction phase, and annual audits for the operational phase.

The audit will determine whether or not the EMP was properly implemented and maintained and provide information for the EMP Review.

Elements that may be audited include:

- Compliance with the conditions of approval;
- Compliance with the EMP;
- Compliance with other approvals, permits and licences;
- Complaint response;
- Sub-contractor activities;
- Training records;
- Non-compliances;
- Preventative actions;
- Incident reports;
- Monitoring results; and
- System documentation such as checklist completion.

An environmental audit schedule will be prepared prior to commencement of substantial construction.

External

External audits will be conducted from time-to-time by an independent Project Verifier and if required Environmental Agencies. The outcomes of any external audit will be documented and forwarded to the Project Director and the Environmental Audit Team.

Response to any issues or required actions identified in the external audit will be the responsibility of the Project Director in coordination with the Environmental Manager. Any response measures or actions taken will be documented and filed with the audit report.

Stage Completion Audit.

Within 28 days after the completion of construction of a project stage, an environmental compliance audit, including site inspection and full review of environmental records will be carried out. The purpose of the audit is to:

- Identify any environmental protection measures which have not been finalised for the stage;
- Record the condition of existing environmental protection controls;
- Itemise environmental protection controls which need ongoing management; and
- Facilitate a process of continuous improvement of environmental control measures that will be included in further stages.



Corrective Action

Each Sub-Plan described within the EMP will define specific actions for dealing with non-compliance with environmental management controls, and environmental incidents and emergencies. The procedures will define who is responsible and has the authority for handling and investigating non-compliance, taking action and completing corrective and preventative action.

The standard procedures in a non-compliance event may involve:

- The nature of the event investigated by the Environmental Manager;
- Advice sought from a specialist;
- Monitoring be undertaken;
- The effectiveness or need for new/additional controls reviewed;
- An appropriate preventative and corrective action implemented;
- Strategies identified to prevent reoccurrence;
- Environmental documentation be reviewed and revised; and,
- The environmental non-compliance documented on the project database.



4. EMP Review

Review of the EMP will be carried out annually from commencement of substantial construction. The Environmental Manager will be responsible for the review which will assess the EMPs overall operation and implementation. The review will determine if the environmental management system is operating effectively and if not to amend the EMP to address any identified short falls.

A report will be provided to the Project CEO with any recommendations for change to the EMP. The Project CEO and the Environmental Audit Team will review and approve changes to the system.

Any changes to the EMPs will be communicated to all staff, contractors and sub-contractors through the environmental training and “tool box talks”. The reviewed EMPs will also be submitted where appropriate to the relevant agencies, clearly indicating the reviewed elements.

The annual review is to consider:

- Audits;
- Site personnel comments;
- Agency comments;
- Community comments and complaints;
- Details of corrective or preventative actions taken;
- Monitoring records;
- Non-compliances;
- Incident reports;
- Inspection programs;
- The extent of compliance with objectives and targets; and
- The effect of changes in standards and legislation.



5. Reporting

A written report will be compiled each month by the Environmental Manager and Project Environmental Officer. The monthly report will include:

- status of environmental activities such as monitoring and surveillance of controls, inspections and testing during the preceding month;
- complaints, infringements and penalties incurred;
- status of any non-compliances or corrective actions; and
- outcomes of any environmental audits undertaken during the preceding month.

The monthly environment report will be uploaded to the projects 'live' environmental reporting website which will provide continuous public access to the projects environmental performance. The monthly reports will be used to facilitate the preparation of the annual Environmental Monitoring Report that will be formally submitted to the relevant agencies DSEWPC, DERM, WTMA and the Cassowary Coast Regional Council.



6. Environmental Management Sub-plans

Along with this guiding EMP document a number of sub-plans have been completed pre-approval and are to be incorporated as part of the approval of the Ella Bay Development. These sub-plans are the:

- Southern Cassowary Management Sub-plan;
- Stream Dwelling Rainforest Frog Species Management Sub-plan;
- Spectacled Flying-Fox Management Sub-plan;
- Marine Turtle Species Management Sub-plan;
- Significant Flora Species Management Sub-plan; and
- Weed Species Management Sub-plan;

The preparation and amendment of further sub-plans which sit under the overarching EMP will be conducted in the post-approval period and throughout the construction and operation of the Ella Bay Development. The schedule of sub-plans will include (but not limited to):

Matters of National Environmental Significance

- | | |
|---|----------|
| ▪ Southern Cassowary Management Sub-Plan | complete |
| ▪ Stream Dwelling Rainforest Frog Environmental Management Sub-Plan | complete |
| ▪ Spectacled Flying-fox Environmental Management Sub-Plan | complete |
| ▪ Marine Turtle Species Sub-Plan | complete |
| ▪ Significant Flora Management Sub-plan | complete |
| ▪ Cultural Heritage Management Sub-plan | complete |
| ▪ GBRMP & Ella Bay WHA Values Sub-plan | |

Biological Environment

- | | |
|--|----------|
| ▪ Revegetation and Rehabilitation Management Sub-plan. | |
| ▪ Weed Management Sub-plan | complete |
| ▪ Beach Stone Curlew Management Sub-plan | |
| ▪ Pest & Wallaby Management Sub-plan | |
| ▪ Conservation Area and Wetlands Management Sub-plan | |
| ▪ Mosquito Management Sub-plan | |

Physical Environment

- Integrated Water Management Sub-Plan
- Acid Sulphate Soils Management Sub-plan
- Erosion and Sediment Control Sub-Plan.
- Air Quality, Dust, Noise, Light and Vibration Management Sub-plan
- Contamination & Remediation Management Sub-plan
- Cyclone, Fire & Emergency Management Sub-plan

Construction

- Ella Bay Road Construction Management Sub-Plan
- Site Preparation Management Sub-Plan
- Clearing and Earthworks Management Sub-Plan
- Drainage Management Sub-Plan
- Machinery Plant and Equipment Management Sub-Plan
- Materials Storage Management Sub-Plan

Built Environment

- Sustainability and Carbon Neutral
- Environmental Procurement
- Road Network & Transport Management Sub-plan
- Infrastructure & Buildings Management Sub-plan
- Power, Lighting and Communication Management Sub-plan



- Golf Course Management Sub-plan
- Waste Management & Minimisation Sub-plan
- Sewerage & Recycle Management Sub-plan



7. Standard Systems

Environmental Management Plan Systems

The standard systems for audit and compliance will be contained in the appendix of the Environmental Management Plan. The systems will be completed after approval and will comply with the approval conditions and commitments. Draft copies have been included which will require modification after system design and for ease of website upload.

The following typical EMP system forms and procedures have been prepared in draft:

- Environmental Audit Schedule;
- Environmental Audit Report;
- Environmental Non-conformance Report;
- Environmental Risk Assessment;
- Environmental Training Tool Box Attendance Record; and
- Environmental Incident and Corrective Action Report.

The appendix will also contain:

- A list of commitments which form part of the approval process;
- A table of consents, licences and approvals;
- A list of the members of the Environmental Audit, Compliance and Implementation teams and their contact details.
- Emergency contact details for incidents from all sub-plans;

Sub-plan systems

Systems, procedures and strategies will be contained in the appendix of each of the relevant sub-plans. For example the following procedures are contained in the Appendix of the Stream Dwelling Rainforest Frog Environmental Management Sub-Plan:

- Amphibian Hygiene Protocol
- Frog Relocation Procedure
- Chytrid Fungus Hygiene Program
- Stream Dwelling Rainforest Frog species Monitoring Program



ENVIRONMENTAL AUDIT REPORT

Project Area:		Sub-plan ref	
Audit Date:			

INTRODUCTION

1.1 Purpose	
1.2 Scope	
1.3 Ella Bay Location	
1.4 Persons conducting Audit:	
1.5 Attendees Opening meeting:	
1.6 Attendees Closing meeting:	

OVERALL RESULTS

2.1 SUMMARY:	
2.2 NON COMPLIANCES:	

AUDIT DETAILS



ENVIRONMENTAL AUDIT REPORT (cont.)

RECOMMENDATIONS FOR IMPROVEMENT

ATTACHMENTS

The following audit records are attached for Reference

MANAGEMENT REVIEW & COMMENT

ENVIRONMENTAL AUDIT TEAM REVIEW & COMMENT

Signature:	
Name:	
Role:	ENVIRONMENTAL MANAGER
Date:	



ENVIRONMENTAL NON-CONFORMANCE REPORT

Date of audit	No:	
DETAILS (HOW & WHY THE SYSTEM OR PRODUCT DOES NOT CONFORM?)		
To be completed by member of Environmental Team.		
Company:		
Work Area/Location:		
Description	<input type="checkbox"/> Design/planning	<input type="checkbox"/> Mitigation
	<input type="checkbox"/> Procurement	<input type="checkbox"/> System/program
	<input type="checkbox"/> Construction	<input type="checkbox"/> Workplace Practice
	<input type="checkbox"/> Operation	<input type="checkbox"/> Commitment condition
	<input type="checkbox"/> Safety	<input type="checkbox"/> Legislation
	<input type="checkbox"/> Other	<input type="checkbox"/> Other

Issued By

Name:	Signature:
Position/Role:	Date:

Proposed Actions to Fix

Details :	SYSTEM	ACTION/ PRODUCT
	<input type="checkbox"/> Implement as Doc.	<input type="checkbox"/> Use as is
	<input type="checkbox"/> Revise Procedure	<input type="checkbox"/> Regrade/reuse
	<input type="checkbox"/> New Procedure	<input type="checkbox"/> Workplace Practice
	<input type="checkbox"/> Other	<input type="checkbox"/> Reject/ replace
		<input type="checkbox"/> Rework/ Repair
		<input type="checkbox"/> Other

Proposed Corrective Actions

Details :	SYSTEM	ACTION/ PRODUCT
	<input type="checkbox"/> Documentation	<input type="checkbox"/> Planning Design
	<input type="checkbox"/> Roles responsibil.	<input type="checkbox"/> Materials
	<input type="checkbox"/> Training Education	<input type="checkbox"/> Equipment
	<input type="checkbox"/> Atitude	<input type="checkbox"/> Other



ENVIRONMENTAL NON-CONFORMANCE REPORT (Cont.)

EAT REVIEW OF ACTIONS AND CORRECTIONS

EAT review	REVIEW COMMENTS	
	Name:	Role:
	Signature:	Date:



ENVIRONMENTAL RISK ASSESSMENT

Does the potential hazard impact on the Ella Bay ecological goal to improve biodiversity and abundance?

Job Description:				
Work method statement			Work Area:	
DETAILS OF ACTIVITY How will the work be done? (List steps in sequence)	POTENTIAL HAZARDS What can cause harm? Evaluate the impact of the question	RISK Apply the risk matrix Likelihood vs Severity	HAZARD CONTROLS How can the risk be minimised? Eliminate, substitute, engineer, document or protect	WHO Who will ensure this is completed?
Prepared By: Name: Role: Date;			Reviewed By: Approved By:	

ENVIRONMENTAL RISK ASSESSMENT (Cont.)

Likelihood	CONSEQUENCE SEVERITY				
	Negligible monthly report / no noticeable impact	Minor reportable / impact	Major EPBC impact / regulatory fine	Severe Fine / Reputation damaged	Disastrous Approval Suspended
Months common					
Year likely					
Years < 15 construction period					
Years < 100 design min life					
Years >100 rare, highly unlikely					

	Negligible Risk	Incorporate cost effective measures for risk reduction strategies within scope of long term planning
	Moderate Risk	Implement cost effective measures for risk reduction - formalise routine procedures for reducing risk
	Significant Risk	Implement cost effective measures for risk reduction - senior management responsibility
	Intolerable Risk	Cannot be justified under any circumstance, reduce risk

Negligible

- Incidental environmental nuisance. Sufficient to require reporting as an environmental incident. Eg overspray, minor spill;
- Possible incidental impacts to flora and fauna in a locally affected environmental setting. No ecological consequences.

Minor

- Minor environmental nuisance to the affected community. Reportable as an incident in annual report or referral to DERM;
- Reduction of the abundance/biomass of flora and fauna in the affected environmental setting. No changes to biodiversity or the exposed ecological system.

Major

- Major environmental nuisance to the affected community;
- Reduction of abundance/biomass in the affected environmental setting. Limited impact to local biodiversity without a significant loss of pre-impact ecological functioning.

Severe

- Substantial reduction of abundance/biomass in the affected environmental setting. Significant impact to biodiversity and ecological functioning. Eventual recovery of ecological systems possible, but not necessarily to the same pre-impact conditions.

Disastrous

- Irreversible/irrecoverable changes to abundance/ biomass in the affected environmental setting. Loss of biodiversity on a regional scale. Loss of ecological functioning with little prospect of recovery to pre-impact conditions.



ENVIRONMENTAL INCIDENT REPORT AND INVESTIGATION

THIS FORM MUST BE RETURNED WITHIN 24 HOURS OF THE INCIDENT TO THE ENVIRONMENTAL MANAGER

To be completed by member of Environmental Implementation Team.

Date of INCIDENT:

WHAT HAPPENED?

(Summarise the facts)

Work Area/Location:

Type of Incident:

Details of Incident

Where (attach sketch or map)

At what Time?

What were the weather conditions?

Flora Impact:

Fauna Impact:

Environmental Emergency Procedure

Environmental Sub-plan requirement?

Was the emergency procedure followed?

DERM

Was DERM (EPA) notified?

☐ Yes

☐ No

Position/Role:

Date:

VET or Specialist Advisor

Was a specialist required?

☐ Yes

☐ No

Position/Role:

Date:

SEVERITY (refer to Risk Scale)

What was the Risk Scale?

☐ Negligible

☐ Minor

☐ Major

☐ Severe

☐ Disaster

Work Method Statement No:

Work Method Statement Description:



ENVIRONMENTAL INCIDENT REPORT AND INVESTIGATION (Cont.)

Who was Involved:

Details :	Name	Role	Company
Who was at Scene?			
Who were Witnesses			
Who reported the incident?		To Whom?	

HOW DID IT HAPPEN

Explain clearly how the incident occurred: describe the events, Conditions, activities, BEFORE, DURING AND AFTER including details of Environmental and work conditions, the extent of damage or injury etc, include sketched, photographs, witness statements)

WHY DID IT HAPPEN

Provide an analysis of the CAUSE of the incident including what acts, failures to act and conditions contributed most directly to it?



ENVIRONMENTAL INCIDENT REPORT AND INVESTIGATION (Cont.)

HOW WILL A REPEAT OF THIS EVENT BE AVOIDED?

Detail WHAT PREVENTATIVE ACTIONS must be taken by whom to eliminate the possibility of a similar incident occurring again?

Environmental Documentation?

Was the Environmental Sub-plan used?
Was the Environmental Sub-plan correct?
Did the Induction or Tool Box talks cover this type of incident?
Did the Work Method Statement cover this type of incident?
Was this type of incident foreseeable?

ENVIRONMENTAL AUDIT TEAM REVIEW

	Name	Role	Signature
Environmental Audit Team Review?			
Corrective Actions Required.			



3.2 Southern Cassowary Management Sub-Plan



Environmental Management Sub-Plan

For the

Southern Cassowary

October 2010 Revision 1





Southern Cassowary Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the Ella Bay Developments Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 0	Oct 2009	L Moore	KR	RL
Rev 1	Oct 2010	KR	RL	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

Distribution List of Registered Copies and Key Contacts

Position	Name	Copy Number	Contact Details
Project CEO		1	
Environmental Manager		2	
Construction Manager		3	
Design Manager		4	
DSEWPC		5	
Qld DERM		6	

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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

Refer to the *Ella Bay Environmental Management Plan* for further details.

The Southern Cassowary (*Casuarius casuarius johnsonii*) is an iconic species of the area and the survival and recovery of the local population is of the highest importance to the Ella Bay Development.

Document Structure

This document is a sub-plan of the Ella Bay Development Environmental Management Plan (EMP). This sub-plan outlines the specific management procedures that relate to the Southern Cassowary conservation and mitigation measures in areas at Ella Bay and along the Ella Bay road.

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans. The EMP sets out the project details, management process and authority and training procedures.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Cassowary Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans eg Pest and Wallaby Management Sub-Plan which covers feral pigs, Weed Management Sub-Plan which covers the introduced pond apple weed species, the Ella Bay Road Management Sub-Plan and the Significant Flora Species Management Sub-Plan.

This Sub-Plan outlines the specific management procedures that relate to Southern Cassowaries that may frequent areas of Ella Bay and along the Ella Bay road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure that objectives listed in this Sub-Plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.

Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and any corrective action necessary will be prepared and logged. This document and process will be subject to regular auditing and review.



2. Background

The Southern Cassowary (*Casuarius casuarius johnsonii*) population at Ella Bay is part of an isolated subpopulation of the Graham-Seymour Range (Moore 2006). The Ella Bay Development is located at the southern end of the Graham-Seymour Range Cassowary subpopulation. The Southern Cassowary subpopulation has been isolated due to anthropogenic change; predominantly degraded habitat on the western range, clearing for cane farms, and the Bruce Highway.

The size of the subpopulation of adult and independent cassowaries in the Graham Range and Seymour Range, based on the approximate area of available habitat and using the population density measurements estimated for the nearby Mission Beach population (Moore, 2003, 2007), was tentatively estimated to be 51-73 independent birds. The Graham and Seymour Range Cassowary populations could potentially comprise 23-33 and 28-40 independent birds respectively. It is emphasised that these population figures are desktop estimates only and, apart from the forested areas surrounding the EBD and Flying Fish Point, field surveys have not been undertaken.

The Cassowary Population Viability Analysis (PVA) (Moore 2007) indicated that the population was threatened by loss of connectivity between the Graham and Seymour Range, and the expansion of the coastal development and associated activities. The recurring cyclone damage to rainforest along both ranges has also contributed to this habitat degradation.

The Cassowary PVA concluded that the potential anthropogenic impacts associated with the Ella Bay Development were additional cumulative impacts on what is likely to be an already declining cassowary population. This finding does not reduce the significance of such anthropogenic impacts, however, but instead highlights the critical importance of ensuring that any mitigation related to the development is effective and monitored for the life of the project. It also identifies that adaptive management must be practised if mitigation is not achieving its performance criteria.

The success of the cassowary impact mitigation and this EMP will be through a range of best-practice flora & fauna management measures and continued population monitoring both on and offsite. The range of mitigation including cassowary movement corridors, cassowary directional fencing; bridges and fauna underpasses; habitat and water quality improvements; weed and pest management, dog and cat exclusion and ongoing community environmental awareness, participation and educational programs will require rigorous management.



3. Objectives of the Cassowary Management Sub-plan

This Cassowary Management Sub-Plan is aligned with the objectives of: the Queensland Government EPA “Recovery Plan for the Southern Cassowary *Casuarius casuarius johnsonii*”. (2007); DEWHA 2009, Significant Impact Guidelines for the endangered southern cassowary (*Casuarius casuarius johnsonii*) Wet Tropics Population - EPBC Act policy statement 3.15 (2007); and Action plan for Australian birds (2000).

The Recovery Plan for the Southern Cassowary *Casuarius casuarius johnsonii* aims

“To secure the long term protection of cassowary populations through improved planning mechanisms supported by robust monitoring, threat abatement and community engagement programmes” (2007, page16).

This Sub-Plan seeks to assist in achieving these ends by outlining a program of actions for implementation over the life of the EBD development.

The Cassowary Environmental Management Sub-Plan considers all foreseeable aspects of the environmental issues relating to the Ella Bay Project during its lifetime to ensure that there are no avoidable impacts on the surrounding population of the endangered Southern Cassowary (*Casuarius casuarius johnsonii*). This is achieved by providing life-of-proposal control actions and associated performance criteria, assignments of responsibility, programs of monitoring against performance criteria, reporting obligations, and contingency plans in case the performance criteria are not met. The Sub-Plan provides Commonwealth, State and local authorities, the community, and significant stakeholders with a common focus for monitoring compliance with both the environmental legislation and project-specific approval conditions as they relate to the Southern Cassowary.

Objectives

The primary aim of this Cassowary Environmental Management Sub-Plan is to ensure that the level of environmental protection is consistent with relevant Commonwealth and State legislation, and that best practices in habitat conservation are applied over the life of the project. The envisaged outcomes of the Sub-Plan includes the retention and enhancement of all cassowary habitat within the EBD, the preservation and persistence of the surrounding cassowary population, and a significant reduction in the current risk level of cassowary deaths from roads, dogs and feral pig egg predation.

The secondary objective is to foster community and visitor education of all issues with regards to cassowary conservation and to further cassowary conservation research at the EBD site and within similar areas of habitat in the coastal Wet Tropics.

The ultimate measurement of the conservation and management of the local cassowary population surrounding the EBD and the Ella Bay road is a scientifically designed and conducted cassowary population monitoring program. This monitoring program must seek to identify negative (or positive) cassowary population trends and likely causal factors.

Ecological information on cassowaries, including the results of monitoring and mitigation during all phases of the development, will be analysed by the Cassowary Advisor (CA) and appropriate findings published in scientific and conservation management journals to assist in the conservation of the cassowary.

This Cassowary Management Sub-Plan outlines the procedures and processes required to be followed for the effective management of the Southern Cassowary throughout the life of the Ella Bay Development (EBD) project. It is a flexible document that authorises users to modify it through adaptive management as, and when, new and better procedures are identified. As such, it is not meant to be definitive at this point in time and is instead an indication of the Proponent’s intention to meet, and where possible, exceed best practice for the conservation management and enhancement of the Southern Cassowary.



- Provides feedback on the annual report of the state of the local cassowary population and the effectiveness of mitigation strategies.

The Cassowary Advisor will also provide an external audit function of Cassowary management and compliance to this Sub-Plan, along with the Environmental Manager and is to be a member of both the Ella Bay Developments Environmental Audit Team (EAT) and the Environmental Implementation Team (EIT).



5. Reporting and Sub-plan Reviews

Reporting

Systematic reporting underpins all phases of planning, construction and operation. Reporting includes three main types:

Regular and Event Based - Based on the elements of the following environmental management schedules (sections 6,7&8) for the respective phase of the project: planning, construction and operation.

Monthly - Prepared by the Environmental Implementation Team to inform of the progress of the cassowary management strategies. The report will be collated from the communications register (CR) contingencies, procedural non-compliance and if necessary recommendations for changes or improvements.

Annual report - Prepared by the Environmental Implementation Team and based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (six monthly) will be undertaken by the Environmental Audit Team (including the CA) to examine the reports and to review changes or improvements to the Southern Cassowary SP, including any additional mitigation measures found to be necessary.

6. Planning Phase

Potential Impacts on Cassowaries during the Planning Phase

- Staging of road construction may impact on cassowary connectivity.
- Surveying for road alignment may impact on cassowary habitat.
- Location of areas to house construction infrastructure (machinery compounds, staff rest facilities, stockpile areas etc) may impact on cassowary habitat, movements, foraging, and behaviour.
- Dog attack;
- Feral pigs.

Objectives

- No cassowary deaths as a result of EBD activities
- No damage to vegetation outside footprint of road alignment and ancillary work areas.
- No disruption to east west cassowary connectivity.

Performance Criteria

- Planning for the road alignment avoids all areas of protected and roadside vegetation.
- Staging of road construction allows for continued functional connectivity throughout construction phase prior to completion of fauna underpasses.

Mitigation Measures, Monitoring and Compliance

The following table outlines the initial environmental planning activities relating to the Southern Cassowary that are to be completed prior to the commencement of construction.

Responsibilities for various actions will be assigned to either of 3 Environmental teams composed of various personnel and shown on the figure above:

The environmental team will be measured by the performance criteria (**PC**) with monitoring events being recorded in a compliance register (**CR**) in the tables below.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
Planning for road construction staging	Compliance - Ensure connectivity for cassowaries is planned and maintained.	When Required - Staging of road construction to be signed off by ET and the Cassowary Advisor prior to commencement of construction activities.	EAT	<i>Road Staging Program</i> demonstrating maintenance of East-West connectivity.	Amend staging if needed.
On-ground Surveying and Planning for road alignment	Implement - Important trees and vegetation to be barrier meshed and flagged to prevent machinery damage to above ground structure or roots within the drip line	When Required - Site inspection prior to commencement of clearing activities to tag and flag the trees.	EIT	Event Based - Number of retained trees damaged in pre-construction clearing operation. To be reported in CR	Monitor recovery and supplement planting with trees of same species and provenance. Maintain for at least 12 months or until road construction is completed, whichever is longer.
Planning for the location of vehicle parking, fuels store and bunding, stockpile areas, and workers facilities etc	Construction related activities and disturbance areas to be located: Within cleared areas of previously disturbed vegetation. Proximal to construction areas. Away from fauna movement corridors and water sources. To avoid vehicles moving across vegetated corridors.	Detailed plans to be drawn showing location of construction related infrastructure to be signed off prior to commencement of construction activities. Staging plan of barrier mesh exclusion fences to be prepared and signed off prior to commencement of each new construction phase beginning.	EAT EAT	Detailed plans showing location of construction activities, infrastructure and its proximity to known cassowary activity areas.	Amend locations if needed.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	<p>Implement - Location of cassowary water supplies and other essential habitat to be clearly marked and protected from construction activities and associated disturbance.</p> <p>Implement – Undertake appropriate removal and rehabilitation of areas disturbed during construction.</p>				
Cassowary habitat rehabilitation	Develop and Implement - Prepare rehabilitation plan including locations, species, numbers, site preparations, and timing of activities	Plans to be signed off by EAT	EIT	When required - Detailed plans showing rehabilitation locations, plant species, numbers, site works and preparations, and timing of activities.	
Dog control	<p>Compliance No dogs under any circumstances to enter the EBD construction site or in the company of any construction staff or (sub) contractors.</p> <p>Compliance Removal of any unrestrained dogs from the road and site.</p>	Daily monitoring for dogs to be undertaken on all construction sites.	<p>ECT</p> <p>EAT</p>	<p>Dog restrictions to be included in Tendering documentation and repeated in induction training.</p> <p>Compliance reporting and recorded in EBD CR.</p>	<p>Dismissal from project for workers bringing dogs on site.</p> <p>Dogs to be removed.</p>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	Wild dog control is addressed in the Pest and Wallaby Management Sub-Plan.				
Feral pigs	<p>Implement Ongoing pig control program using cassowary-proof pig-traps to be implemented for the EBD site and road.</p> <p>Implement Feral pig control strategies as addressed in the Pest and Wallaby Management Plan, (based upon the management guidelines outlined by QDPI&F and the WTMA.)</p>	EIT to supervise all aspects of the pig control program.	EIT	<p>Monthly Pig capture numbers to be documented and included in the monthly report and EBD CR.</p> <p>The monthly capture number, age, sex, and approximate size (length) of each captured pig to be documented and used to assist in the cassowary management program.</p>	Reassessment of pig control strategies if sightings, damage or captured pig numbers remain unchanged or increase.

7. Construction Phase

Potential impacts on cassowaries during construction phase

- Increased road traffic and risk of road death.
- Cassowaries accessing the road corridor.
- Cassowaries being isolated within the road corridor.
- Increased human activity.
- Dust and noise.
- Loss of connectivity.
- Human-cassowary interactions.
- Disturbance and degradation to adjoining cassowary habitat.
- Wire & plastic waste.
- Food scraps.
- Contaminating or isolation of water supplies from cassowaries.
- Effective exclusion of birds from work areas.
- Dog attack.
- Feral pigs.

Objectives

- To avoid injury to cassowaries or damage to cassowary habitat as a result of EBD activities.
- To maintain the normal foraging and breeding behaviour of the cassowary during the construction of the Ella Bay Development (EBD) and Ella Bay road.

Performance Criteria (as a result of EBD activities)

- No cassowary 'incidents' i.e. deaths, traffic collisions/near collisions, interactions with EBD workers, or dog attacks.
- No change in pre-construction cassowary behaviour.
- No cassowaries being isolated on the road corridor.
- No avoidable disturbance to cassowary movement corridors.
- No damage or disturbance to cassowary habitat outside road alignment and ancillary work area footprints.

Mitigation Measures, Monitoring and Compliance

The following table outlines the initial environmental planning activities relating to the Southern Cassowary that are to be completed during the construction phase of the EBD.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Increased road traffic and increased risk of road death	<p>Compliance - All vehicles to stay within designated road alignment.</p> <p>Develop and Implement - <i>Road Traffic Management Strategy</i> for the EBD and Ella Bay road in place during construction phase.</p> <p>Compliance - All vehicles to stay within designated road alignment.</p> <p>Compliance - Where unfenced a maximum 20km speed limit is enacted for all construction and non-construction vehicles in known cassowary habitat including at road crossing points.</p> <p>Develop and Implement - Where unfenced, implement a <i>Traffic Control Program</i> to comprise specific road-based mitigation at known cassowary crossing points.</p> <p>Implement - Daily inspection of status of cassowary crossing points for evidence of crossings and fence</p>	<p>Before each stage, communicate to all staff and sub contractors:</p> <ul style="list-style-type: none"> Cassowary incident reporting system (to be developed) <i>Road Traffic Management Strategy for the stage; and</i> <i>Site Traffic Control Program</i> <p>Undertake Cassowary <i>Road Monitoring Program</i>.</p> <p>Refer to <i>Ella Bay Road Management Sub-Plan</i> and/or <i>Road Network & Transport Management Sub-plan</i></p>	<p>EIT</p> <p>ECT</p>	<p>Monthly - Compliance with Road Management Strategy (and audited regularly).</p> <p>Regular - EIT and EAT to conduct audits of effectiveness of road crossing strategies.</p> <p>Monthly - Cassowary incident log to be maintained in EBD CR and reported.</p> <p>Immediate - All incidents recorded in EBD CR reported to EAT</p> <p>Daily - Crossing point inspection log to be maintained and reported in EBD CR.</p>	<p>Ongoing evaluation of road strategies and plans to ensure best practice in cassowary road management.</p> <p>Instigate a 'one warning then removal' system for staff or sub-contractors that fail to adhere to road management controls.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	integrity.				
Cassowaries trapped within the road corridor	<p>Install - escape gates and fencing (at key points).</p> <p>Install and Record - escape gate is to be fitted with a monitoring device for usage (cassowary and large fauna).</p> <p>Develop and Communicate - reporting system for cassowary road 'incidents' (communicate to all contractors, visitors and staff).</p>	<p>Weekly and Event Based - All escape gates to be checked. Maintenance on an 'as needed' basis to ensure gate integrity.</p> <p>Weekly - inspect and log monitors into EBD CR.</p> <p>As Required - Reporting system included in induction for all contractors and visitors.</p>	<p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>Event Based - Report to EIT and EAT of any cassowary incidents on road. Report usage counts to EIT.</p> <p>Monthly - Report to be recorded in EBD CR. Include results of one-way gate inspections and maintenance.</p>	<p>Escape gates to be immediately repaired if found faulty.</p> <p>Intensive monitoring of specific gates that show high usage history to determine cause, and options for corrective action.</p>
Increased human activity	<p>Compliance - No workforce access to adjoining vegetated areas.</p> <p>Avoid - Extended activities in or adjacent to known cassowary road crossing points and highly frequented habitat to be avoided.</p> <p>Maintenance - Portable toilets and waste bins provided for construction staff (regularly emptied).</p>	<p>Weekly - checks to ensure compliance with forest access restriction.</p> <p>When Required - Construction sub-plans to include strategies to limit duration of work adjacent to cassowary habitat.</p> <p>As Required - communicate sub-plans to all staff and subcontractors before each stage of construction commences.</p>	<p>ECT</p> <p>EIT</p>	<p>Event Based - Non-compliance and corrective actions reported in EBD CR.</p>	<p>Re-brief staff or (sub) contractors as necessary EIT.</p> <p>Removal from project for repeat offences.</p>
Dust and noise	Implement - dust	Event Based - Dust control	EIT	Monthly - Reports to	Increase frequency of



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>suppression measures. Refer to <i>Air Quality, Dust, Noise, Light and Vibration Management Sub-plan</i></p> <p>Compliance - Machinery to comply with construction noise limits specified under the Environmental Protection Act.</p>	<p>measures to be undertaken in response to weather and construction conditions.</p> <p>Activity Based - Checks to ensure compliance with noise control measures.</p>	ECT	include updates on dust and noise control measures to be recorded in EBD CR and audited by EAT.	<p>dust suppression measures.</p> <p>Machinery that does not comply with noise regulations are to be removed from site.</p>
Loss of connectivity	<p>Avoid - Construction infrastructure and access tracks located to avoid creating barriers to cassowary movement along or between habitat corridors.</p> <p>Compliance - No temporary or permanent access tracks/roads in excess of 4 metres wide to bisect known cassowary corridors on the Ella Bay property.</p> <p>Avoid - extended activities in or adjacent to known cassowary habitat, watering points or movement corridors.</p>	<p>Daily - Monitor construction activities to ensure compliance with cassowary EMP.</p> <p>Daily - monitor of construction activities to ensure continued daily access for cassowaries to water supplies and foraging areas.</p>	<p>EAT</p> <p>EAT</p>	<p>Event Based - Immediate recording in EBD CR and reporting of non-compliance to EAT.</p> <p>Event Based - Incident reporting and recording in EBD CR.</p>	EAT to assess any non-compliance, devise and sign off on remedial actions and strategies.
Human-	Develop - Induction course	Before each Construction	EIT	Event Based - All	Re-brief staff or (sub)

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
cassowary interactions	<p>to be prepared on appropriate behaviour around cassowaries</p> <p>Implement - All staff and (sub)contractors to attend an induction course on behaviour around cassowaries.</p> <p>Implement - Temporary cassowary exclusion fencing (barrier mesh & shade cloth) to be erected prior to start of each construction phase as per approved plan to dissuade birds accessing construction sites</p> <p>Develop - Protocol on appropriate methods for removing cassowaries from construction areas.</p> <p>Any necessary removal materials to be kept in a central location nominated by EIT.</p> <p>Nominated 'vet-on-call' to be contacted immediately to facilitate response.</p>	<p>Stage – Develop reporting system for cassowary 'incidents' and communicate to all staff and (sub) contractors.</p> <p>Daily - Monitor and maintain any barrier mesh exclusion fencing around active construction sites.</p>	<p>EIT with assistance from ECT</p> <p>ECT</p> <p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>cassowary related incidents on site to be recorded EBD CR and audited regularly by EAT.</p> <p>Event Based - Monitoring to be recorded EBD CR</p>	<p>contractors as necessary.</p> <p>Immediate removal from project for persons hand feeding or providing food to birds.</p> <p>Review and amendment of exclusion strategies.</p>
Disturbance and	Design - Locate vehicle parking, fuel and materials	Before each Construction Stage - Define vehicle and	EIT	Event Based - Compliance reporting	Re-brief staff or (sub)

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
degradation to adjoining cassowary habitat	stores, stockpile areas, workers facilities etc only in designated areas as per approved plan. Compliance - No access by staff, (sub) contractors, or machinery to adjoining forest areas.	foot-access routes, mark and communicated to all staff and (sub) contractors. Daily - Checks to ensure compliance with access restrictions.	ECT	and recording in EBD CR.	contractors. All disturbed sites to be rehabilitated ECT.
Rehabilitation of cassowary movement corridors	Plan And Implement - Revegetation & Rehabilitation areas identified and fenced with barrier mesh or similar material to prevent damage. Implement - Site preparation, planting, and maintenance, to be implemented in stages as per <i>EBD Revegetation & Rehabilitation Management Plan</i> . Implement - Revegetation & Rehabilitation to commence immediately on completion of construction activity completion and to be staged to avoid lengthy disruption to cassowary movement along corridor(s).	As per Plan - Adhere to the performance criteria of <i>EBD Revegetation & Rehabilitation Management Plan</i> as regards plant success and area revegetated.	EIT	Event Based - Incident reporting and recording in EBD CR.	Dead plantings (>5%) to be replaced with equivalent species and maintained until established.
Dog control	Compliance - No dogs and	Daily - Monitor for dogs and	ECT	As Required – Dog and	Removal from project

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>cats under any circumstances to enter the site.</p> <p>Compliance – Immediate removal of any unrestrained dogs or cats from the road construction site.</p> <p>Implement - Wild dog and cat control is addressed in the <i>Pest and Wallaby Management Plan</i>.</p>	cats to be undertaken on all construction sites.	EAT	<p>cat restrictions to be included in Tendering documentation and repeated in induction training EIT.</p> <p>Event Based - Compliance reporting and recording in EBD CR.</p>	<p>for workers bringing dogs or cats on site.</p> <p>Dogs or cats to be removed to the Council controlled facilities.</p>
Refuse issues e.g., wire and plastic, food scraps and other 'attractive' items	<p>When Required - <i>Waste Management & Minimisation Sub-plan</i> to ensure as a key objective, the correct disposal of construction material such as wires, plastics or other 'attractive' items that may be ingested by cassowaries.</p> <p>Compliance and Implementation - Food to be eaten only in designated areas and provision of covered bins at all designated areas for disposal of food scraps.</p>	<p>Ongoing - Cleanup of all construction sites to remove potentially hazardous items. Includes a general daily, end of construction cleanup.</p> <p>Daily - Empty secure covered food scrap bins and remove to council transfer depot.</p>	<p>ECT</p> <p>ECT</p>	Event Based - Compliance reporting and recording in EBD CR. Auditing by EAT.	EIT review staff training and/or waste mgmt strategy as necessary.
Water quality	Implement - <i>Integrated Water Management Sub-</i>	Weekly and Event Based - Checks of all erosion and	EAT	Event Based - EIT reports on any problems	Review <i>Integrated Water Management</i>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p><i>Plan</i> and the <i>Erosion and Sediment Control Sub-Plan</i> (or similar). Plans to include the key outcomes:</p> <ul style="list-style-type: none"> No access to watercourses by construction workers and vehicles No use of water sources for construction activities. All refuelling and maintenance to be undertaken in designated bunded areas away from overland flow paths and low-lying areas Relevant staff/ (sub) contractors trained in erosion and sediment control techniques and infrastructure maintenance.(and verified / repeated at Induction) 	sediment control infrastructure and specific checks after each significant rainfall events.	EAT	<p>that may have arisen. in EBD CR. Regular auditing EAT.</p> <p>Event Based - Reports to be included in EBD CR.</p>	<i>Sub-Plan and/or the Erosion and Sediment Control Sub-Plan</i> and maintenance schedule.
Feral pigs	<p>Implement Ongoing pig control program using cassowary-proof pig-traps to be implemented for the EBD site and road.</p> <p>Implement Feral pig control</p>	EIT to supervise all aspects of the pig control program.	EIT	<p>Monthly Pig capture numbers to be documented and included in the monthly report and EBD CR.</p> <p>The monthly capture</p>	Reassessment of pig control strategies if sightings, damage or captured pig numbers remain unchanged or increase.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	strategies as addressed in the Pest and Wallaby Management Plan, (based upon the management guidelines outlined by QDPI&F and the WTMA.)			number, age, sex, and approximate size (length) of each captured pig to be documented and used to assist in the cassowary management program.	

8. Operation Phase

Potential Impacts on Cassowaries during Operational Phase

- Cassowaries accessing the road corridor;
- Cassowaries being trapped within the road corridor;
- Increased traffic volumes on Ella Bay road and increased risk of road death;
- Cassowaries unable or unwilling to use designated road crossing mitigation to access the FFP Reserve;
- Impact of traffic movement within the EBD on cassowaries;
- Increased human activity in EBD;
- Cassowaries entering residential and resort areas;
- Residents, staff and visitors entering cassowary habitat and movement corridors and negatively impacting on birds or being threatened by birds;
- Changes in cassowary habitat usage due to Ella Bay road, residential, or resort operations;
- Human-cassowary interactions on proposed golf course;
- Degradation of habitat values due to garden plant escapees;
- Dog attack;
- Feral pigs;
- Disease

Objectives

- Preservation and enhancement of cassowary values while ensuring safe operation of the EBD and Ella Bay road.

Performance Criteria

- No cassowary's on roadway corridor;
- No cassowary 'incidents' i.e., collisions or near-misses with vehicles;
- Monitoring program indicates regular movement of cassowaries safely across the Ella Bay road;
- No dog attacks from dogs associated with EBD residents/activities;
- No harmful interactions between birds and residents, staff, or visitors;
- No change in pre-construction cassowary behaviour;
- No disturbance to cassowary movement corridors;
- Monitoring program indicates regular usage by cassowaries of EBD cassowary corridors;
- Proposed new northern cassowary movement corridor, planted, and monitored for cassowary usage;
- No damage or disturbance to cassowary habitat outside road alignment and ancillary work area footprints;
- No introduction of weeds, pathogens and pests;
- Reduced pig presence on and around EBD.

Mitigation Measures, Monitoring and Compliance

The following table outlines the initial environmental planning activities relating to the Southern Cassowary that are to be completed during the operation of the EBD.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
Increased road traffic volumes on Ella Bay road	<p>Create Awareness – Promote ‘regulated’ speed limits (Note – Aims to reinforce psychological speed limit suggested by design of roadway).</p> <p>Implement - Cassowary fencing along the road corridor to prevent cassowaries accessing the road</p> <p>Implement - Safe cassowary road crossings at the Flying Fish Point Reserve facilitated by a purpose built underpass.</p> <p>Implement - All cassowary road incidents to be logged in the EBD CR</p>	<p>Event Based - Monitoring of actual vehicle speeds.</p> <p>Ongoing - Evaluate of effectiveness of <i>Cassowary Road Management Strategy</i>. Include effectiveness of fencing and usage by cassowaries of underpass and raised bridges.</p> <p>Weekly and Event - Cassowary fence to be monitored weekly, after any significant storm or wind events and after any cassowary incidents.</p> <p>As Required – Maintenance fence on an ‘as needed’.</p>	<p>ECT</p> <p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>Monthly - All elements of <i>Cassowary Road Management Strategy</i> to be included in the in a report which is to be examined by EAT.</p> <p>Event Based - Immediate reporting of cassowary incidents to EIT.</p>	<p>Review of the <i>Cassowary Road Management Strategy</i> to include road-based* traffic-calming and other additional measures to slow vehicle speed EIT.</p>
Cassowaries trapped within the road corridor	<p>Implement - Cassowary escape gates are installed at regular intervals in the cassowary fencing to allow the birds to exit the road</p>	<p>Weekly and Event Based - Escape gates to be checked at least weekly and after any cassowary incidents.</p> <p>As Required - Maintenance</p>	EIT	<p>Event Based - Immediate reporting to EIT of any cassowary incidents on Ella Bay road. Regular reporting</p>	<p>Escape gates to be immediately repaired if found faulty.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	<p>corridor.</p> <p>Implement and Monitor - Each escape gate is to be fitted with a monitoring device to record usage by cassowaries and other large fauna e.g. wallabies.</p> <p>Develop and Implement - Reporting system for cassowary road 'incidents' and communicated to all residents, visitors and staff.</p>	<p>on an 'as needed' basis to ensure gate integrity.</p> <p>Weekly - Inspection and logging of monitors, recorded in EBD CR.</p> <p>As Required - Reporting system included in induction for all visitors and new residents.</p>	<p>EIT</p> <p>EIT</p>	<p>of this data to EBD.</p> <p>Report usage counts to EIT and after any cassowary road incident for follow-up.</p> <p>Monthly - Report to include results of one-way gate inspections and maintenance.</p>	<p>Intensive monitoring of specific gates that show high usage history to determine cause, and options for corrective action.</p>
Impact of traffic movement within the EBD on cassowaries	<p>Compliance - Regulated speed limits for all vehicles within EBD.</p> <p>Record - All cassowary 'incidents' within EBD to be logged in EBD CR.</p> <p>Awareness Raising - Reporting system for cassowary 'incidents' to be included in site induction for all new residents, visitors and staff.</p> <p>Develop and Implement - Guidelines prepared on appropriate methods for cassowaries that enter internal road(s).</p>	<p>Event Based - Following each reported sighting or incident.</p>	<p>EIT with assistance from ECT.</p> <p>EIT</p> <p>EIT</p> <p>ECT</p>	<p>Event Based - Immediate reporting to EIT and EAT of any cassowary incidents on the EBD internal road system.</p> <p>Monthly - Included in monthly report.</p>	<p>Review guidelines for EBD cassowary management.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
Cassowaries unable or unwilling to use designated road crossing mitigation to utilise the Flying Fish Point FFP Reserve	Implement – Cassowary <i>Monitoring Program</i> to establish cassowary usage of the fauna underpass.	Weekly and Monthly - Monitor road crossing mitigation measures. Include mapping and quantifying cassowary tracks and scats at (and within close proximity of) overpass/raised bridge. (Note - Results to be included in EBD CR.)	EIT EIT	For the first two years following construction, a monthly report is to include results of monitoring at the fauna underpass during the previous month. Quarterly reports subsequently. EIT to produce annual report of the fauna underpass monitoring program.	Management of crossing points to increase potential usage by cassowaries e.g., plantings or screening. Fall back to road-based* traffic calming at crossings points with reduced speed limits, warning signs, speed humps, and warning lights. Fauna underpass to remain operational to increase cassowary crossing options. Road-based traffic calming to be gradually decommissioned if cassowaries increase usage of underpass. (but with monitoring and re-introduction if any problems noted)
Increased human activity in EBD	Develop and Implement - Guidelines on appropriate methods for removing cassowaries from residential or resort areas. Develop and Implement -	Ongoing - All new residents, visitors and staff to attend site induction.	EIT	Monthly - Report any incidents in EBD CR. EAT to inspect these reports.	Ongoing evaluation and 3yrlly Re-evaluation of internal and external fencing strategies.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	<p>Induction course on appropriate behaviour around cassowaries. Includes:</p> <ul style="list-style-type: none"> • Appropriate behaviour in cassowary habitat. • Specific responses and behaviour for golfers. • Strictly 'no feeding' policy (regulated and enforced). <p>Develop and Implement - Cassowary incident reporting.</p> <p>Develop and Implement - <i>Internal Fencing Strategy</i> to prevent access by cassowaries to EBD and people accessing cassowary habitat.</p>	<p>Daily - Monitor to ensure no cassowaries have gained access to the residential or resort areas.</p> <p>Daily - Monitor to ensure no unauthorised pathways have been established in restricted access areas.</p>	<p>EIT</p> <p>EIT</p>		
Rehabilitation of cassowary movement corridors	Implement - Corridor rehabilitation areas to be fenced.	Quarterly and Annually - Inspect and record results in the EBD CR.	EIT	<p>Six monthly – Report status of the cassowary corridor rehabilitation. (Note - For the first two years of the Operational Phase).</p> <p>Annual – Reports Annually fter 2 years</p>	Dead plantings (>5%) to be replaced with equivalent species and maintained until established.
Changes in	Implement and Record -	Quarterly - Survey of	EIT	Monthly - Report on:	Ongoing evaluation of



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
cassowary habitat usage due to Ella Bay road, residential, or resort operations	Monitoring of cassowary usage of EBD and surrounding habitat, and Ella Bay road. Results to be recorded in the EBD CR.	cassowary usage of habitat immediately adjoining the EBD and Ella Bay road. Results to be recorded in the EBD CR.		<ul style="list-style-type: none"> Location and Status (adult, juvenile, chicks) of sightings <p>Event Based - Update residents, visitors and regulators (i.e. website, newsletters).</p> <p>Annually: Report by EIT to EAT documenting cassowary habitat usage. Include the results of overpass-raised bridge crossing point.</p>	habitat protection strategies.
Degradation of habitat values due to garden plant escapees	<p>Implement - <i>Weed Management Sub-Plan</i> for the site. Include potential invasion of garden plant species into surrounding cassowary habitat.</p> <p>Implement - <i>Maintenance Program</i> for public areas to focus works invasive plants (Priority to those listed in Weeds of the Wet Tropics (WTMA) or similar).</p> <p>Compliance - Landscaping of public areas/community land does not include known</p>	Ongoing - Facility materials and equipment to be kept free of weed propagule material.	EIT	Monthly - Report to include results of weed control program.	Increase control measures and/or target specific areas in the event of a weed outbreak.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	<p>invasive species. Provision of appropriate landscaping plants from site nursery to residents will be considered.</p> <p>Education and Awareness - A list of prohibited invasive plants to be provided to all residents for use when gardens are being established or renovated.</p> <p>Education and Awareness - Site induction for all new residents to address environmentally acceptable gardening for sensitive natural areas.</p> <p>Implement - Regular collection of green waste from public and private gardens for appropriate disposal at council transfer station.</p>				
Dog control	<p>Compliance - No dogs or cats to be allowed within EBD.</p> <p>Removal - Any dogs and cats from the EBD.</p> <p>Implement - Wild dog and</p>	Ongoing - EIT to supervise all aspects of monitoring and control program.	ECT	<p>Event Based - Incidences to be recorded in the EBD CR and occurrences.</p> <p>(Note - Included in monthly report).</p>	<p>Removal of any dogs or cats from within the EBD.</p> <p>Re-brief residents, visitors and staff that fail to adhere to dog control</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	cat control is addressed in the Pest and Wallaby Management Sub-Plan.				requirements.
Feral pigs	Ongoing pig control program using cassowary-proof pig-traps to be implemented for the EBD site throughout the operational phase. Feral pig control strategies are addressed in the Pest and Wallaby Management Sub-Plan, which is based upon the management guidelines outlined by QDPI&F and the WTMA.	EIT to supervise all aspects of the pig control program.	EIT	Pig capture numbers and statistics to be documented and included in the monthly report to be included in the EBD CR. The monthly capture number, age, sex, and approximate size (length) of each captured pig to be documented and used to assist in the cassowary management program.	Reassessment of pig control strategies if captured pig numbers remain unchanged or increase.
Disease	Develop and Implement Guidelines – For the appropriate care of poultry and aviary birds to avoid any possible spread of disease to cassowaries. Issues to be addressed include: <ul style="list-style-type: none"> Location of pens/cages away from cassowary areas (i.e. identified movement corridors 	Ongoing - poultry control program to consider inspection of holding pens and animal hygiene in high risk area.	ECT EIT	As Required - Report on location of poultry pens, health of and number of birds being kept in the EBD CR.	Re-brief residents that fail to adhere to guidelines for keeping poultry and aviaries. If required for repeated offences, permission to keep poultry or aviaries on the EBD is to be withdrawn and the birds in question removed from the site.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBT Team	Reporting	Corrective actions if deviation from performance criteria
	<p>and general habitat)</p> <ul style="list-style-type: none"> • Disposal of pen/cage debris and dead birds • Animal hygiene and health <p>Permit and Compliance - Permission to keep live poultry or aviaries within the EBD must be obtained from the body corporate who will take advice from the EAT.</p>				
Impact of Cyclones on Cassowaries	<p>Implement - On cyclone warning and approach Cassowary fence along Ella Bay Road - shade cloth to be temporarily protected by dropping to ground and securing. Install cassowary warning signs and restrict road speed to 40km/hr.</p> <p>Develop and Implement - Guidelines to be developed for post cyclone damage procedures including clearing of downed trees, and cassowary feeding stations with DERM</p>	Event Based - On cyclone warning and post cyclone	<p>EIT</p> <p>EAT</p>	As Required - Prepare cyclone procedure and report of management procedures post cyclone.	Post cyclone analysis with DERM QPWS

*road based traffic calming includes physical treatments within the road corridor such as speed bumps, rumble strips, chicanes etc



9. Auditing and Reporting

An independent audit will be commissioned by the Ella Bay Development Environmental Audit Team, to determine whether the performance indicators have been met and maintained and provide information for the Cassowary Environmental Management Sub-Plan Review. Auditing will occur annually during the construction phase and continue into the operational phase. A copy of the audit will be provided to the relevant Environmental authorities.

The Ella Bay Development Environmental Implementation Team will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include tabulated (Cassowary) data from all monitoring events to allow assessment of trends.

Logs are to be kept of all sample results and subsequent corrective action (s) (if any). They are an integral part of the EBD Communications Register, details of which are detailed in the EBD EMP.

10. References and Information Sources

DEHW, 2009, *Recovery Plan For the Southern Cassowary*, Department of the Environment, Water, Heritage and the Arts (DEWHA), 2009

QPWS, 2001. *Recovery plan for the Southern Cassowary Casuarius casuarius johnsonii* 2001-05. Queensland National Parks and Wildlife Service, Brisbane 2001

Websites

[Recovery plan for the southern cassowary](#) - *Casuarius casuarius* ... The southern cassowary is not listed under any international agreements. This recovery plan is consistent with Australia's international responsibilities. ...

www.environment.gov.au/.../recovery/southern-cassowary/.../sth-cassowary.pdf -

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009v). *Significant Impact Guidelines for the endangered southern cassowary (Casuarius casuarius johnsonii) Wet Tropics Population. EPBC Act policy statement 3.15*. [Online]. Canberra: DEWHA. Available from: <http://www.environment.gov.au/epbc/publications/casuarius-casuarius-johnsonii.html>.

Garnett, S.T. & G.M. Crowley (2000). *The Action Plan for Australian Birds 2000*. [Online]. Canberra, ACT: Environment Australia and Birds Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>

Department of the Environment and Water Resources (DEW) (2007e). *Southern cassowary, Casuarius casuarius johnsonii Threatened Species Day fact sheet*. [Online].

Legislation

Environment Protection and Biodiversity Conservation Act (the EPBC ...

The Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act) is the Australian Government's central piece of environmental legislation. ... www.environment.gov.au/epbc/index.html

Land Protection (Pest and Stock Route Management) Act 2002 Queensland. Land Protection (Pest and Stock Route Management) Act. 2002. Reprinted as in force on 1 July 2009. Reprint No. 3B. This reprint is prepared by ... www.legislation.qld.gov.au/LEGISLTN/.../L/LandPrPSRMA02.pdf

Land Protection (Pest and Stock Route Management) Regulation 2003 Queensland. Land Protection (Pest and Stock Route Management) Act 2002. Land Protection (Pest and Stock Route Management). Regulation 2003 ... www.legislation.qld.gov.au/LEGISLTN/.../L/LandPRPSRMR03.pdf

References

Moore, LA. (2007b). Cassowary habitat assessment and preferred alignment impact assessment of the Ella Bay access road. Consultancy report for Satori Resorts Ella Bay Pty Ltd.

Moore, LA. (2006a). Cassowary assessment of the 'Ella Bay Integrated Resort Project' North Queensland: (A report for Ella Bay Developments)

Volume I – Cassowary field survey

Volume II – Impacts and mitigation

Volume III – Population viability analysis



Moore, LA. (2009). Wet Season Cassowary Survey 'Ella Bay Integrated Resort Project' North Queensland (A report for Ella Bay Developments)

Buosi P (2009) Supplementary Survey (Nov 2009) for the Southern Cassowary at the Proposed Ella Bay Integrated Resort (A report for Ella Bay Developments)

Hogg A, Roper K (2009) Cassowary escape gate trials at the Johnstone River Crocodile Park (unpublished Ella Bay Developments)



Appendix A: : Cassowary Specialist Contacts

Contact Details

Natural Resource Assessment Consultants

Peter Bousi
Phone: (07) 4771 6380
Email: peter@natres.com.au

Queensland Parks and Wildlife Services

Innisfail QPWS office - 4048 3719 (office hours)
Local Ranger (Dan Mead) - 0427 126 602 (24/7)
State-wide (if no response locally) - 1300 130 372 and follow the prompts

Department of Environment and Resource Management (DERM)

Phone: 1300 130 372

Cassowary Aware Vet

Graham.M. Lauridsen
Phone: 07 40612900
Innisfail Vet Surgery – 84 Mourilyan Rd, East Innisfail



Appendix B: Cassowary Emergency Management Procedure

Ella Bay Development

If a Cassowary is seen on site alive (within the EB road corridor, or EB development), injured or dead you are to notify the Environmental Implementation Team immediately.

BE AWARE - Cassowaries are an endangered species and it is illegal to touch, harm, or move them unless the Cassowary is in imminent danger of serious injury. Injured Cassowaries may be dangerous and are able to inflict life threatening injuries

If the Cassowary is alive and well:-

- Notify Ella Bay Environmental Implementation Team ASAP;
- Environmental Implementation Team Staff to inspect on site and record details and GPS coordinates;
- Environmental Implementation Team Staff to undertake a risk assessment of the Cassowary; and
- If the cassowary is at risk to injury from motor vehicles or construction infrastructure, or to staff, visitors or residents then contact Environment And Wildlife Supervisor who will liaise with DERM regarding procedure.

If the Cassowary is injured:-

Cassowaries have a poor survival rate from injury with motor vehicles, urgency is important

- Notify Ella Bay Environmental Implementation Team Staff immediately;
- Environmental Implementation Team Staff to immediately notify DERM and local/expert vet;
- Environmental Implementation Team Staff to inspect on site and record details and GPS coordinates; and
- Environmental Implementation Team Staff to undertake a risk assessment of the Cassowary.

If the Cassowary is dead:-

- Notify Ella Bay Environmental Implementation Team Staff ASAP;
- Environmental Implementation Team Staff to inspect on site and record details and GPS coordinates and exact time of incident;
- Environmental Implementation Team Staff to notify the Cassowary Advisor, DERM and secure body for DERM inspection; and
- Environmental Implementation Team Staff to prepare investigative incident report, mitigation measures must be reviewed and recommendations applied.

Site Risk Assessment

This assessment will include:-

- Determine the location of the Cassowary;
- Review the environment around the Cassowary, including any construction works;
- Visually assess the Cassowary to see if the animal is distressed in any way, Stress indicators may include grunting calls and enriched neck colouration;
- Cease work if the Cassowary is within 50m or showing signs of distress. Consider modification of the works, slowing down vehicles, modifying routes;
- Advise staff, residents and guests in the area that the Cassowary is present; and
- If the Cassowary is considered at risk remain in the area.



3.3 Stream Dwelling Rainforest Frog Species Management Sub-Plan

Environmental Management Sub-Plan

For the

Stream Dwelling Rainforest Frog Species

December 2009 Revision 1





Stream Dwelling Rainforest Frog Species Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the EBD Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 1	Dec 2009	PJ/ZP/KR	KR	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

Distribution List of Registered Copies and Key Contacts

Position	Name	Copy Number	Contact Details
Project Director		1	
Environmental Manager		2	
Construction Manager		3	
Design Manager		4	
DSEWPC		5	
Qld DERM		6	

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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

Refer to the *Ella Bay Environmental Management Plan* for further details.

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park and the Great Barrier Reef Marine Park.

Amphibian surveys identified the Environmental Protection and Biodiversity Conservation (EPBC) Act listed an endangered frog species the Common Mist Frog (*Litoria rheocola*) in upstream habitat of the Ella Bay development site. Other EPBC listed frog species considered likely or possible to occur included the Torrent Treefrog (*Litoria nannotis*) and Australian Lacelid (*Nyctimystes dayi*).

Document Structure

This document is a sub-plan of the Ella Bay Development Environmental Management Plan (EMP). This sub-plan outlines the specific management procedures that relate to Stream Dwelling Rainforest Frog species that may be located in areas at Ella Bay and along the Ella Bay road.

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans. The EBD EMP sets out the project details, management process and authority and training procedures.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Stream Rainforest Frog Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans eg Pest Management Sub-Plan which covers feral pigs, Weed Species Management Sub-Plan which covers the introduced weed species, the Ella Bay Road Management Sub-Plan and the Significant Flora Species Management Sub-Plan.

This Sub-Plan outlines the specific management procedures that relate to Stream Rainforest Frog that may frequent areas of Ella Bay and along the Ella Bay road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure that objectives listed in this Sub-Plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.

Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and any corrective action necessary will be prepared and logged. This document and process will be subject to regular auditing and review.

2. Background

Amphibian surveys identified the Environmental Protection and Biodiversity Conservation (EPBC) Act listed an endangered frog species the Common Mist Frog (*Litoria rheocola*) in upstream habitat of the Ella Bay development site.

Other EPBC listed frog species considered likely or possible to occur included the Torrent Treefrog (*Litoria nannotis*) and Australian Lacelid (*Nyctimystes dayi*). While these species were not observed in fauna surveys of the site and surrounding area, precautionary management measures outlined in this sub-plan will be implemented to protect any potential occurrences of these species.

These stream dwelling rainforest frog species were acknowledged in the Recovery Plan – “Stream Dwelling Rainforest Frogs of the Wet Tropics Biogeographic Region of the North-east Queensland Recovery Plan 2000-2004”. This sub-plan has been developed with significant consideration given to the six key actions identified in the Recovery Plan:

- Action 1: Assess and Monitor Populations
- Action 2: Investigate the role of disease as a threatening factor
- Action 3: Translocate and reintroduce species on an adaptive management basis
- Action 4: Clarify needs of species
- Action 5: Inform and involve the public
- Action 6: Frogs needs are considered in land management

Subsequent to the publication of the *Recovery Plan*, a *Threat Abatement Plan* was developed in response to the threat posed to native frog populations by the amphibian pathogen, chytrid fungus (“Threat abatement plan for Infection of amphibians with chytrid fungus resulting in chytridiomycosis”).

The amphibian chytrid fungus has been linked with dramatic frog population declines and extinctions, particularly in high-altitude rainforest areas, and is listed as a key threatening process under the EPBC Act. It appears to have been introduced into south-eastern Queensland in the 1970s. It rapidly dispersed up the east coast, and must have done so by natural means, since it reached a great many remote sites in the Wet Tropics more or less simultaneously. It caused declines and disappearances of populations of eight species in the Wet Tropics at all sites above 400m elevation. However intensive monitoring has never been shown to cause declines or disappearances at sites below 400m, despite being endemic at all such sites in the Wet Tropics that have been adequately sampled.

A survey by JCU for Ella Bay confirmed the presence of Chytrid Fungus on the Ella Bay site (Alford 2009). It also occurs at multiple sites within 20 km of the Ella Bay site, and evidence indicates that all of the chytrid fungus in Queensland belongs to a very recently dispersed clone, there is no reason to institute measures to quarantine the site (Alford, 2009). As a precautionary measure an amphibian hygiene protocol for the manual handling of frogs is to be adhered to, ensuring that activities associated with the Ella Bay Development do not contribute to the spread of the pathogen.



3. Objectives of the Stream Dwelling Rainforest Frog Environmental Management Sub-Plan

The primary aim of the Environmental Management Sub-Plan is to ensure that the level of environmental protection is consistent with relevant Commonwealth and State legislation, and that best practices in habitat conservation are applied over the life of the project.

This Environmental Management Sub-Plan is aligned with the objectives of the Queensland Government EPA Recovery Plan for the Stream Dwelling Rainforest Frogs of the Wet Tropics

“To significantly improve the conservation status and long term survival of each species through protection of existing populations or expansion of existing populations into previously inhabited areas.”

The envisaged outcomes of the Environmental Management Sub-Plan include:

- the retention, enhancement and expansion of all stream dwelling frog habitat within the EBD;
- the preservation and development of the surrounding stream dwelling frog population;
- ensuring that individuals of these frog species are not harmed during the clearing and construction process; and
- to ensure the long-term future of Stream Dwelling Rainforest Frogs within the local area by protecting their habitat from any detrimental processes that may result from the construction and operation of the Ella Bay Development.

This Environmental Management Sub-Plan seeks to achieve these outcomes by outlining a program of actions for implementation over the life of the EBD development. It is likely that actions initiated under this Sub-Plan along with revegetation and rehabilitation activities resulting from the EBD will ultimately result in increases in frog populations with the EBD. It follows the principles and guidelines of North Queensland Threatened Frogs Recovery Team recovery plan for the stream-dwelling rainforest frogs of the Wet Tropics Biogeographic region of north-east Queensland 2000-2004.

4. Stream Dwelling Rainforest Frog Profile

Site Distribution

The Common Mist Frog is a stream-dwelling frog species found only in fast-flowing, rocky streams in rainforest and wet sclerophyll habitats. Fauna surveys located the species in the south-western portion of the subject site in association with riffle zone habitat and in an upstream location from the Ella Bay Road. It is also likely to be present in riffle zones associated with the creekline running from the central western boundary. Tadpoles were located within these locations indicating that the local population is breeding. Despite searches, the species was not observed in riffle zone habitats that traverse cleared grazing land. The diagram at Appendix A identifies the locations the species has been identified in past surveys.

Although not reported in the surveys, the habitat at EBD is favourable to two other endangered rainforest frogs. The Australian Lacelid (*Nyctimystes dayi*) is likely to occur in similar habitats to the common mist frog. The Torrent Tree Frog (*Litorinia nannotis*) occurs may occur within the EBD however it is normally located at higher elevations.

Common Mist Frog (*Litoria rheocola*)



A moderate sized frog (27-41mm) with a dorsal surface of dull grey or brown, with irregular darker markings. There is a distinct inverted triangle marking on the top of the head, stretching between the eyes down to the coccygeal region. An obscure darker band runs along the side of the snout, through the eye and ear to the shoulder. The skin is smooth above, with scattered small tubercles. The ventral surface is granular, white in colour. The finger and toe discs are large. The fingers are moderately webbed, and the toes nearly fully webbed. The tympanum is small and covered by skin, though the rim may be distinct. The male nuptial pads are small, with fine dark spicules. The tip of the snout is bluntly pointed. No population declines have been observed in lowland rainforests below 400 m, but *L. rheocola* has disappeared from most sites above this altitude (NQFRT, 2001)

Australian Lacelid (*Nyctimystes dayi*)



A moderately sized frog (35-55mm), readily distinguished from other Australian hylids by the presence of large and prominent eyes with a vertical pupil and reticulated venation of the lower eyelid. The dorsal surfaces may be shagreened, finely granular or smooth. It is highly variable in colour, and may be dark or light brown, grey or creamish, with or without irregular light markings. White or creamish spots reminiscent of lichen are often present, but vary in size and shape. The ventral surfaces are coarsely granular, cream in colour. The snout ranges from acuminate to rounded. The tympanum is indistinct. The hands are moderately webbed, and the feet are extensively webbed. (NQTFRT, 2001)

Torrent Treefrog (*Litoria nannotis*)

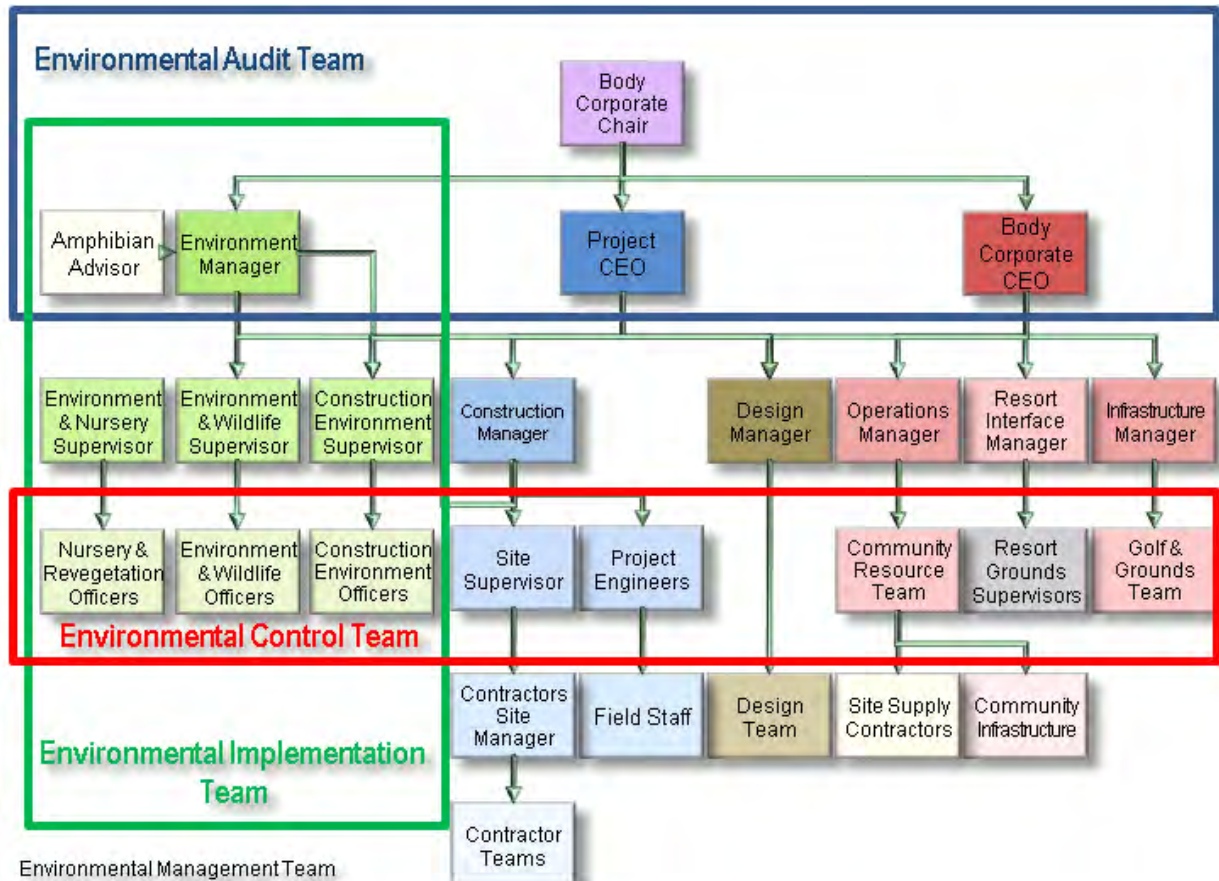


A moderately large (32-59mm), robust species its dorsal surface is slate, olive or dull brown in colour, with irregular dark mottling. The ventral surface is white or cream in colour, often with brown on the throat. The axilla and groin are flesh coloured. The skin is shagreened, finely granular, or with numerous small scattered warts above, granular below. The fingers have basal webbing, and the toes are fully webbed. The finger and toe discs are well developed. Males have a large prepollex, with black spiny nuptial pads and accessory spines on the chest, head, forearm and thighs. There is no vocal sac. The snout is bluntly rounded, and the tympanum is indistinct (NQTFRT, 2001).

5. Responsibilities and Authorities

The organisational structure of the project, in terms of environmental responsibilities, is outlined in detail in the Ella Bay Development Environmental Management Plan (EBD EMP). Ella Bay Developments and Sub-Contractors during the Construction Stage are to be allocated to one or more teams (usually one). The key to the teams used below and in subsequent are:

- **EAT** - Environmental Audit Team
- **ECT** - Environmental Controls Team
- **EIT** - Environmental Implementation Team



Amphibian Advisor (AA)

An important part of the structure is the overseer role of an expert ecologist, recognised in the field of herpetology. The Amphibian Advisor will oversee all elements of frog conservation and management programs. The AA will provide expert advice to the EBD Environmental Staff regarding:

- Conducting frog monitoring of the EBD and Ella Bay road during the construction and operational phases
- Monitoring the efficacy of all frog mitigation strategies at the construction and operational phases. This monitoring program must seek to identify negative (or positive) frog population trends and likely causal factors.
- Participation in reviews of the environmental management plan and provides expert advice on any required modification or changes to mitigation strategies, and signs off on their implementation.
- Providing feedback on the annual report of the state of the local frog population(s) and the effectiveness of mitigation strategies.



The Advisor will also provide an external audit function of the stream dwelling frog management and compliance to this environmental management plan

The Amphibian Advisor is to be a member of both the Ella Bay Developments Environmental Audit Team (EAT) and the Ella Bay Developments Environmental Implementation Team (EIT).



6. Reporting and Sub-plan Reviews

Reporting

Systematic reporting underpins all phases of planning, construction and operation. Reporting includes three main types:

Regular and Event Based - Based on the elements of the following environmental management schedules (sections 7,8&9) for the respective phase of the project: planning, construction and operation.

Monthly - Prepared by the Environmental Implementation Team to inform of the progress of the Stream dwelling rainforest frog species management strategies. The report will be collated from the communications register (CR) contingencies, procedural non-compliance and if necessary recommendations for changes or improvements.

Annual report - Prepared by the Environmental Implementation Team and based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (six monthly) will be undertaken by the Environmental Audit Team (including the AA) to examine the reports and to review changes or improvements to the Sub-plan, including any additional mitigation measures found to be necessary.



7. Planning Phase

Potential Impacts during the Planning Phase

- Staging of road construction may impact on frog creek connectivity.
- Surveying for road alignment may impact on frog habitat.
- Location of areas to house construction infrastructure (machinery compounds, staff rest facilities, stockpile areas etc) may impact on frog habitat, movements, and breeding.
- Spread of chytrid fungus through handling of frogs.

Objectives

- No damage to vegetation outside footprint of road alignment and ancillary work areas.
- No disruption to east west creek connectivity.
- To prevent the spread of chytrid fungus into areas where it may impact on threatened amphibian species.

Performance Criteria

- Planning for road alignment avoids all areas of protected and roadside vegetation.
- Staging of road construction allows for continued functional connectivity throughout construction phase prior to completion of formal fauna underpasses.
- No frog mortality through survey or information gathering activities.
- No evidence of the increased spread of pathogens (associated with planning phase).

Mitigation Measures, Monitoring and Compliance

Preferentially all chemicals used will be frog and aquatic friendly, and where this is not possible extensive usage restrictions will apply with proximity to riparian areas or alternative methods used.

The following table outlines the initial environmental planning activities relating to Stream Dwelling Rainforest Frog species that are to be completed prior to the commencement of construction. Responsibilities for various actions will be assigned to either of 3 Environmental teams composed of various personnel and shown on the figure above:

The environmental team will be measured by the performance criteria (**PC**) with monitoring events being recorded in a communications register (**CR**) in the tables below.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting
Baseline frog population monitoring.	<p>Implement: Baseline frog monitoring will be conducted prior to construction to provide data on the abundance and distribution of the local frog populations, in accordance with the <i>Stream Dwelling Rainforest Frog Monitoring Plan</i> (Appendix C).</p> <p><i>Note: The baseline monitoring will also include recording the existing frog mortality along the roadway.</i></p>	<p>Event Based (During Breeding Season): The baseline monitoring should be conducted during peak breeding times (i.e. during the wet season following a significant (>25 mm) rainfall event).</p> <p>Ongoing: Subsequent to the baseline frog monitoring ongoing monitoring for Stream Dwelling Rainforest Frog species will be conducted in accordance with the <i>Stream Dwelling Rainforest Frog Monitoring Plan</i> (Appendix C).</p>	EIT	<p>Results of baseline frog monitoring will be reported to establish baseline data which will form the performance criteria for ongoing frog monitoring to be assessed against.</p> <p>EAT to sign off on PC</p>
Identify frog habitat that will require pre-clearing survey	<p>Research: Identify potential frog habitat that will require a pre-clearing survey for Stream Dwelling Rainforest Frog species due to construction or clearing.</p>	<p>Event Based: Survey for frogs at identified sites to be conducted immediately prior to clearing/construction activities. Frogs found in areas of potential disturbance will be relocated to safe locations in accordance with the <i>Relocation Procedure (as outlined on page 23)</i></p>	EIT	<p>Plan/identify locations where pre-clearing survey is likely to be required. EAT to approve.</p> <p>Report results of survey(s) and any subsequent action(s) to EAT.</p>
Creek crossing design	<p>Implement: Existing creek culverts will be replaced with frog and fauna friendly designs.</p> <p>Note: Design intention includes –</p> <ul style="list-style-type: none"> ▪ Replace the existing pipe culverts with larger flat bottom box culverts or bridge structures; ▪ Incorporate dry ledges and energy dissipation devices on the downstream side of the road to reduce stream velocity; ▪ Allow frogs and other fauna the 	<p>Event Based (Prior to construction): Detailed plans showing creek crossing design and frog fence design are to be signed off by ecologist prior to commencement of construction activities.</p>	EIT	<p>Detailed plans showing creek crossings, culvert design, location of fences and construction methodology. EAT to approve.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting
	<p>opportunity to negotiate and/or inhabit the creek waters to the east of the road; and</p> <ul style="list-style-type: none"> Reduce the erosivity of stream flow at specific locations. <p><i>The road will also be fenced with specially designed frog-proof fencing for 25 m either side of the creek crossings. Design intention is to reduce opportunities for frogs to access the road surface.</i></p>			
Location of bridges and other creek crossings on-site	Assessment: Detailed assess specific vegetation and frog habitat on-site to determine the most appropriate location for internal creek crossings.	Event Based (Prior to construction): Detailed plans showing location of creek crossings, significant vegetation/habitat and construction methodology to be signed off by EAT prior to commencement of construction activities.	EIT	Detailed plans showing location of creek crossings, significant vegetation/habitat and construction methodology.
Location of wetland and bio-retention filters (BRF) on-site	Assessment: Detailed assess specific vegetation and frog habitat on-site to determine the most appropriate location for of storm water sensitive urban designed (WSUD) structures (i.e. internal creek).	Event Based (Prior to construction): Detailed plans showing location of wetland and BRF discharge structures, significant vegetation & habitat and construction methodology to be signed off by EIT.	EIT	Detailed plans showing location of WSUD discharge into creeks, significant vegetation/habitat and construction methodology.
Potential spread of chytrid fungus	<p><i>Note: A JCU survey has established that Chytrid Fungus is present on site and likely to be present throughout the area.</i></p> <p>Implement: Frog handling to be conducted in accordance with the hygiene protocols specified in Append B</p>	Ongoing	EIT	Incident Reporting



8. Construction Phase

Potential Impacts during the Construction Phase

Potential impacts to Stream Dwelling Rainforest Frog species during construction of the Ella Bay Development include:

- increased road traffic and risk of road mortality;
- increased human activity;
- hindering of movement and loss of habitat connectivity;
- disturbance and degradation to frog habitat;
- erosion and sediment issues;
- deterioration of water quality;
- general litter and pollutants;
- dust and noise; and
- spread of chytrid fungus through handling of frogs.

Objectives

- No damage to vegetation outside footprint of road alignment and work areas.
- No disruption to east west creek connectivity.
- To prevent the spread of chytrid fungus into areas where it may impact on threatened amphibian species.

Performance Criteria

- Total Frog mortalities on road-ways are within predetermined range, No Stream Dwelling Frog mortalities on road-ways.
- monitoring program shows no decrease in diversity and/or abundance of local frog populations;
- monitoring program does not indicate hindering of movement of Stream Dwelling Rainforest Frog species under the roads;
- no damage or disturbance to Stream Dwelling Rainforest Frog species habitat outside road alignment and ancillary work area footprints;
- erosion and sediment control performance is within the acceptable range;
- monitored water quality parameters are within the acceptable range; and
- no evidence of increased spread of pathogens.

Mitigation Measures, Monitoring and Compliance

Preferentially all chemicals used will be frog and aquatic friendly, and where this is not possible extensive usage restrictions will apply with proximity to riparian areas or alternative methods used.

The following table outlines the environmental control measures developed to ensure protection of Stream Dwelling Rainforest Frog species and their habitat during the construction of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this sub-plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Increased road traffic and risk of road mortality	Implement: <i>Road Traffic Management Strategy</i> for the EBD and Ella Bay road in place during construction.	Ongoing: Regular evaluation of effectiveness of <i>Road Traffic Management Strategy</i> .	EAT	Ongoing: Compliance with road management strategy reported.	<p><i>Note: Action to be taken if results of road mortality indicate an increase in the number of Stream Dwelling Rainforest Frogs being killed or injured.</i></p> <p>Re-evaluate the effectiveness of the frog-proof fencing, install temporary protection measures, undertake tool box talks and redesign fence (if necessary).</p>
	Compliance: All vehicles to stay on designated road alignment.	Ongoing: <i>Road Traffic Management Strategy</i> to be communicated to all staff and (sub) contractors.	EIT		
	Installation: Frog fencing installed in locations as per approved designs established during Planning phase.	Ongoing and Event Based: Frog-fences to be monitored regularly, after any significant storm or major wind event. Maintenance on an 'as needed' basis to ensure integrity.	EIT	Event Based: Monitoring data recorded EBD CR.	
	Installation: Safe road crossings provided at watercourses. Installed as per approved designs established during Planning phase.	Ongoing and Event Based: Crossings of watercourses will be inspected regularly and after any significant storm events to ensure safe passage of frog species is available under the road-way. Maintenance and cleaning of culverts will be conducted on an 'as needed' basis to ensure integrity.	EIT	Ongoing: Inspection data recorded EBD CR.	



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Increased human activity;	Develop and Implement: Induction course to raise awareness and appropriate behaviour around Stream Dwelling Rainforest Frog species.	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Ongoing: Inspection data recorded EBD CR.	Review management measures to restrict staff, visitors and residents from access to watercourses i.e. signs, fencing, designated pathways etc. <i>Note: Additional measures may be necessary during peak breeding</i> Re-brief staff or subcontractors as necessary EIT
	Implement Education & Awareness: Induction for visitors and residents at the Welcome Centre	Ongoing: All staff and (sub) contractors to attend the site induction	EIT		
	Compliance & Regulate: Restrict staff and contractor access to watercourses within adjoining forest areas.	Ongoing (Event Based): Regular checks/inspections to ensure compliance with forest access restriction	ECT		
	Manage: Avoid extended activities in or adjacent to watercourses and identified frog habitat.	Before Construction Commences: <i>Construction Sub-Plans</i> to include strategies to limit any work in or adjacent to watercourses and identified frog habitat. Sub-Plans to be communicated to all staff and subcontractors before work commences.	EIT		
Hindering of movement and loss of habitat connectivity;	Implement: Large culverts or bridging structures to allow frogs to safely negotiate creek waters under the Ella Bay road and within the EBD.	Ongoing: Regularly monitor road mortality of Stream Dwelling Rainforest Frogs along Ella Bay road. Event Based (between September and December during wet conditions): Specific	EIT	Ongoing: Monitoring data recorded EBD CR	<i>Note: Action to be taken if results of road mortality indicate an increase in the number of Stream Dwelling Rainforest Frogs being killed or injured.</i>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
	Implement: Frog-proof fencing provided 25 m either side of creek crossings along the Ella Bay road to reduce opportunities for frogs to access the road surface.	monitoring program during their peak breeding times.			Re-evaluate the effectiveness of the frog-proof fencing, install temporary protection measures, undertake tool box talks and redesign fence (if necessary).
Disturbance and degradation to frog habitat.	Compliance: Construction works at creek crossings are to be undertaken during the driest months of the year.	Daily: Monitor construction activities around creek crossings to ensure compliance with sub-plan.	EIT	Ongoing: Monitoring data recorded EBD CR.	<i>Note: Action to be undertaken if terrestrial habitats show signs of disturbance.</i> Assess damage and causes. Further rectification through information and training, review of construction techniques, re-evaluation of Vegetation Management Plan. If necessary undertake rehabilitation / revegetation of disturbed area.
	Implement: Prior to clearing, survey for frogs habitat within 20m of creeklines (and any other identified priority areas) for frogs.	Ongoing: Monitor the presence of Stream Dwelling Rainforest Frog species within the creeklines on a regular basis under the guidelines of the <i>Stream Dwelling Rainforest Frog Monitoring Program</i> . <i>Note: Monitoring of terrestrial habitats will be undertaken at the same location and time as the Stream Dwelling Rainforest Frog monitoring events.</i>	EIT		Immediately cease vegetation clearing and/or construction if Stream Dwelling Rainforest Frog species are located within the area of disturbance. Notify suitably qualified personnel to remove frogs from area of disturbance. Ensure <i>Amphibian Hygiene Protocols</i> are adhered to (see Appendix B). Vegetation clearing and/or construction cannot proceed until all Stream Dwelling Rainforest Frogs have

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
	<p>Relocate: Any individuals present are to be relocated to suitable and safe habitat along the same creekline.</p> <p><i>Note: Frog handling should be conducted in accordance with the hygiene protocols specified in Appendix B.</i></p> <p>Identify: Clearly define the area for clearing. No unauthorised disturbance to areas outside of the 'designated clearing zone' is permitted.</p> <p>Management Practices: During clearing and earthworks, creek banks are to be retained in their current form where possible. Where not possible and absolutely necessary, removal of creek-bank vegetation will be best environmental practice. Additionally, level of removal will be kept to an absolute minimum.</p> <p>Implement: Restore/rehabilitate native vegetation on completion of creek crossing as per the <i>Rehabilitation Sub-Plan</i>.</p>		<p>EIT</p> <p>EIT</p> <p>EIT</p> <p>EIT</p>		<p>been removed from the area of disturbance.</p>
Rehabilitation	Compliance: Site preparation and	Event Based: Adhere to the performance	EAT	Ongoing:	Review <i>Revegetation</i>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
of riparian strips	planting of riparian strips to be conducted as per <i>Revegetation Management Sub-plan</i> . Compliance: Rehabilitation works to be conducted with minimal disturbance to riparian strips.	criteria of <i>Revegetation Management Sub-plan</i> .		Compliance reporting. Data recorded EBD CR.	<i>Management Sub-plan</i> if monitoring indicates works are not producing desired outcomes.
Erosion and sediment issues	Implement: Approved erosion and sediment control plan in place for all construction sites. Training: Relevant staff/ (sub) contractors trained in erosion and sediment control techniques and infrastructure maintenance.	Weekly: Inspect all erosion and sediment control measures. Event Based: Specific inspection after each significant rainfall events. Ongoing: Verify contractors have recognised sediment and erosion training.	ECT ECT	Ongoing: Reports on performance, and any problems.	Identify cause and rectify immediately. Ongoing and regular review <i>Erosion and Sediment Control Sub-Plan</i> .
Deterioration of water quality	Implement: <i>Integrated Water Management sub-plan</i> in place for construction phase.	Ongoing: Monitoring of water quality of streams will be conducted in accordance with the <i>Integrated Water Management sub-plan</i> .	EAT	Monthly: Compliance reporting.	An immediate response if water quality monitoring reveals unexpected values (as per the <i>Integrated Water Management sub-plan</i>) Identify cause and rectify. Relocate frogs if considered to be at risk from poor water quality only after DERM approval.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
		<i>Note: In addition water quality at frog monitoring, sites will be monitored in accordance with the Stream Dwelling Rainforest Frog Monitoring Program (Appendix C).</i>	EAT		Review <i>Integrated Water Management sub-plan</i> .
Herbicide overspray	<p>Compliance: Weed control to be conducted in accordance with the <i>Weed Management Sub-plan</i>.</p> <p>Includes techniques that do not threaten Stream Dwelling Rainforest Frog species or their habitat.</p>	Ongoing: Regular inspection of post sprayed areas for evidence of impacts to frogs.	ECT	Monthly: Compliance reporting with weed control.	Review weed control strategies.
General litter and pollutants	<p>Compliance: <i>Waste Management and Minimisation Sub-plan</i> to ensure the correct disposal of construction material and general waste</p> <p>Implement: Storm water control measures to be installed as per the <i>Integrated Water Management Sub-plan</i>.</p> <p>Compliance: Maintenance of bridging structures will be conducted in a manner that prevents contaminants (e.g. drips and spills from paint or timber protection, chemicals, oil or grease etc.) from entering creeks.</p>	Ongoing: Regular inspections of watercourses and other habitat of Stream Dwelling Rainforest Frogs.	EAT	Monthly: Compliance reporting.	<p>If immediate response is required identify source and rectify.</p> <p>Review storm water control measures and Waste Management Strategies.</p> <p>Re-brief staff or subcontractors as required.</p>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Dust and noise	<p>Implement: Dust suppression measures in place for works as per <i>Air Quality, Dust, Noise, Light and Vibration Management Sub-plan</i>.</p> <p>Compliance: Machinery to comply with construction noise limits specified under the Environmental Protection Act.</p>	Ongoing: Adhere to dust and noise control performance criteria as per Construction Sub-plan.	EAT	Monthly: Reports to include dust and noise control measures.	<p>Increase frequency of dust suppression measures.</p> <p>Machinery that does not comply with noise regulations are to be removed from site.</p>
Increased spread of pathogens;	<p>Implement: A chytrid fungus hygiene program to be conducted in accordance with the Amphibian Hygiene Protocol (Appendix B).</p> <p>Education & Compliance: Ensure personnel that may require accessing the creeklines, are aware of and adhere to the <i>Amphibian Hygiene Protocol</i> (Appendix B)</p>	Ongoing: Any deceased amphibians should be collected, preserved and submitted for disease diagnosis as per the Sick, Injured and Deceased Frog Procedure.	<p>EAT</p> <p>EAT</p>		Review Amphibian Hygiene Protocol as required.



9. Operation Phase

Potential Impacts during the Operation Phase

Potential impacts to Stream Dwelling Rainforest Frog species during operation of the Ella Bay Development include:

- increased road traffic and risk of road mortality;
- increased human activity;
- hindering of movement and loss of habitat connectivity;
- disturbance and degradation to frog habitat;
- erosion and sediment issues;
- deterioration of water quality
- general litter and pollutants;
- increased spread of pathogens

Objectives

- No damage to vegetation outside resort footprint.
- No disruption to east west creek connectivity.
- To prevent the spread of chytrid fungus into areas where it may impact on threatened amphibian species or may lead to amphibian species becoming threatened.

Performance Criteria

- Frog mortalities on road-ways are within predetermined range, No Stream Dwelling Frog mortalities on road-ways.
- monitoring program shows no decrease in diversity and/or abundance of local frog populations;
- monitoring program does not indicate hindering of movement of Stream Dwelling Rainforest Frog species under the Ella Bay road;
- no damage or disturbance to Stream Dwelling Rainforest Frog species habitat
- erosion and sediment control performance is within the acceptable range;
- monitored water quality parameters are within the acceptable range; and
- no evidence of the increased spread of pathogens

Mitigation Measures, Monitoring and Compliance

Preferentially all chemicals used will be frog and aquatic friendly, and where this is not possible extensive usage restrictions will apply with proximity to riparian areas or alternative methods used.

The following table outlines the environmental control measures developed to ensure protection of Stream Dwelling Rainforest Frog species and their habitat during the operation of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this sub-plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Increased road traffic and risk of road mortality	Implement: <i>Road Traffic Management Strategy</i> in place during operation.	Ongoing: Evaluate the effectiveness of <i>Road Traffic Management Strategy</i> in protecting Stream Dwelling Rainforest Frog species. Refer to <i>Road Network & Transport Management Sub-plan</i>	EAT	Monthly: Compliance reporting against Road Management Strategy.	If results of road mortality indicate an increase in the number of Stream Dwelling Rainforest Frogs being killed or injured whilst trying to cross the Ella Bay road, immediately respond. This may involve re-evaluating the effectiveness of the frog-proof fencing, installing temporary protection measures and fence redesign if necessary.
	Compliance: All vehicles to stay on designated roads.	Event Based: <i>Road Traffic Management Strategy</i> to be communicated to all staff and (sub) contractors.	EIT		
	Implement: Frog fencing.	Ongoing: Frog-fences to be monitored regularly. Event Based: Inspect after any significant storm or wind events. <i>Note - Maintenance on an 'as needed' basis to ensure integrity.</i>	EIT		
	Implement: Safe road crossings provided at watercourses.	Ongoing and Event Based: Crossings of watercourses will be inspected regularly and after any significant storm events. Purpose is so safe passage of frog species is continually available under the road-way. <i>Note - Maintenance and cleaning of culverts will be conducted on an 'as needed' basis to ensure integrity.</i>	EIT		



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Increased human activity.	Develop and Implement: Induction course for the purpose of raising awareness and appropriate behaviour around Stream Dwelling Rainforest Frog species.	Ongoing: All staff to attend the site induction.	EIT	Monthly: Non-compliance and corrective actions reporting.	Review management measures to restrict staff, visitors and residents from access to watercourses i.e. signs, fencing, designated pathways etc. Additional measures may be necessary during peak breeding periods. Re-brief staff, visitors or resident as necessary.
	Implement: Induction for visitors and residents at the Welcome Centre.	Ongoing: All visitors and residents to attend the induction	EIT		
	Education and Compliance: Restrict staff, visitor and resident access to watercourses within adjoining forest areas	Ongoing: Regular compliance checks/inspections for forest access activity.	ECT		
	Management: Avoid extended activities in or adjacent to watercourses and identified frog habitat.	Before Work Commences: Operational sub-plans to include strategies to limit any work in or adjacent to watercourses and identified frog habitat. Sub-plans to be communicated to all staff and subcontractors.	EIT		



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Hindering of movement and loss of habitat connectivity;	<p>Implement: Large culverts or bridging structures to allow frogs to safely negotiate creek waters under the Ella Bay road and within the EBD.</p> <p>Implement: Frog-proof fencing provided 25 m either side of creek crossings along the Ella Bay road.</p> <p><i>Note: Reduce opportunities for frogs to access the road surface.</i></p>	<p>Ongoing: Regularly monitor road for impacts on Stream Dwelling Rainforest Frogs.</p> <p>Event Based (September and December during wet Conditions): Inspect for particularly during peak breeding times.</p>	EIT	Monthly: Compliance Reporting	If results of road mortality indicate an increase in the number of Stream Dwelling Rainforest Frogs being killed or injured whilst trying to cross the Ella Bay road, immediately respond. This may involve re-evaluating the effectiveness of the frog-proof fencing, installing temporary protection measures and fence redesign if necessary
Disturbance and degradation to frog habitat;	<p>Compliance: Maintenance work required at creek crossings is to be undertaken during dry conditions.</p>	<p>Daily: Monitor maintenance activities to ensure compliance.</p> <p>Ongoing: Monitor the presence of Stream Dwelling Rainforest Frog species within the creeklines on a regular basis under the guidelines of the <i>Stream Dwelling Rainforest Frog Monitoring Program</i>.</p> <p><i>Note - Monitoring of terrestrial habitats will be undertaken at the same location and time as the Stream Dwelling Rainforest Frog monitoring events.</i></p>	<p>EIT</p> <p>EIT</p>	Monthly: Compliance reporting.	<p>Immediately respond, identify cause and rectify if health of terrestrial habitats shows signs of disturbance.</p> <p>Assess damage and causes.</p> <p>Further rectification through information and training, review of maintenance techniques, re-evaluation of <i>Vegetation Management Plan</i>.</p> <p>If required undertake rehabilitation / revegetation of disturbed area.</p>
Rehabilitation of riparian strips	<p>Compliance: Maintenance of riparian strips to be conducted as per <i>Rehabilitation Sub-plan</i>.</p> <p>Compliance: Rehabilitation works</p>	Ongoing: Adhere to the performance criteria of <i>Rehabilitation Sub-plan</i> .	EAT	Monthly: Compliance reporting.	Review <i>Vegetation Management Plan</i> if monitoring indicates rehabilitation/restoration works are not producing desired outcomes.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
	to be conducted with minimal disturbance to riparian strips.				
Erosion and sediment issues	Implement: <i>Erosion and Sediment Control Sub-Plan</i> Implement Training: Relevant staff/ (sub) contractors trained in erosion and sediment control techniques and infrastructure maintenance.	Weekly: Inspect erosion and sediment control measures. Event: Based: Specific checks after each significant rainfall events. Event Based: Verify contractors have recognised sediment and erosion training	ECT ECT	Monthly: Report on performance and any issues.	If immediate response is required identify cause and rectify. <i>Review Erosion and Sediment Control Sub-plan.</i>
Deterioration of water quality	Implement: <i>Integrated Water Management Sub-plan.</i>	Ongoing: Monitoring of water quality of streams will be conducted in accordance with the <i>Integrated Water Management Sub-plan.</i> Ongoing: Additional water quality analysis at frog monitoring sites in accordance with the <i>Stream Dwelling Rainforest Frog Monitoring Program</i> (Appendix C).	ECT ECT	Monthly: Compliance reporting.	Immediate response if water quality monitoring reveals a departure from expected values (as per the <i>Integrated Water Management Sub-plan</i>). Identify cause and rectify. Frogs considered to be at risk from poor water quality, may necessitate relocation. <i>Review Integrated Water Management Sub-plan.</i>
Herbicide overspray	Compliance: Weed control should be conducted in accordance with the <i>Weed Management Sub-plan</i> . Techniques are not to threaten Stream Dwelling Rainforest Frog species or their habitat.	Ongoing: Inspect post sprayed areas.	ECT	Monthly: Compliance reporting with weed control	<i>Review of Weed Control Strategies.</i>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
General litter and pollutants	<p>Compliance: <i>Waste Management and Minimisation Sub-plan</i> to ensure the correct disposal of general waste</p> <p>Compliance: Storm water control measures to be installed as per the <i>Integrated Water Management Sub-plan</i>.</p> <p>Compliance: Maintenance of bridging structures will be conducted in a manner that prevents contaminants (e.g. drips and spills from paint or timber protection, chemicals, oil or grease etc.) from entering creeks.</p>	Ongoing: Regular inspections of watercourses and Stream Dwelling Rainforest Frog habitat.	EAT	Monthly: Compliance reporting.	<p>Immediate response will identify source and rectify.</p> <p>Review storm water control measures and <i>Waste Management and Minimisation Sub-plan</i></p> <p>Re-brief staff or subcontractors as necessary.</p>
Increased spread of pathogens.	<p>Implement : A <i>Chytrid Fungus Hygiene Program</i> will operate In conjunction with the <i>Weed management Sub-plan</i>. All work is to be conducted in accordance with the <i>Amphibian Hygiene Protocol</i> (Appendix B).</p> <p>Education and Compliance: Ensure personnel involved with monitoring, vegetation management and other aspects that may require accessing the creeklines, are aware of and adhere to the <i>Amphibian Hygiene Protocol</i> (Appendix B)</p>	Event Based: Any deceased amphibians should be collected, preserved and submitted for disease diagnosis as per the <i>Sick, Injured and Deceased Frog Procedure</i> .	EIT		Review <i>Amphibian Hygiene Protocol</i> as necessary.



10. Auditing and Reporting

An independent audit will be commissioned by the Ella Bay Development Audit team, which includes the Amphibian Advisor and the Environmental Manager, to determine whether the performance indicators have been met and maintained and provide information for the *Rainforest Stream Dwelling Frog Environmental Management Sub-Plan* Review. Auditing will occur within six months of project commencement followed by six monthly audits during the construction and operational phases. A copy of the audit will be provided to DSEWPC and DERM.

The Environmental Staff will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include tabulated data (frog census and water quality) from all monitoring events to allow assessment of trends.

Logs are to be kept of all sample results and subsequent corrective action (if any).



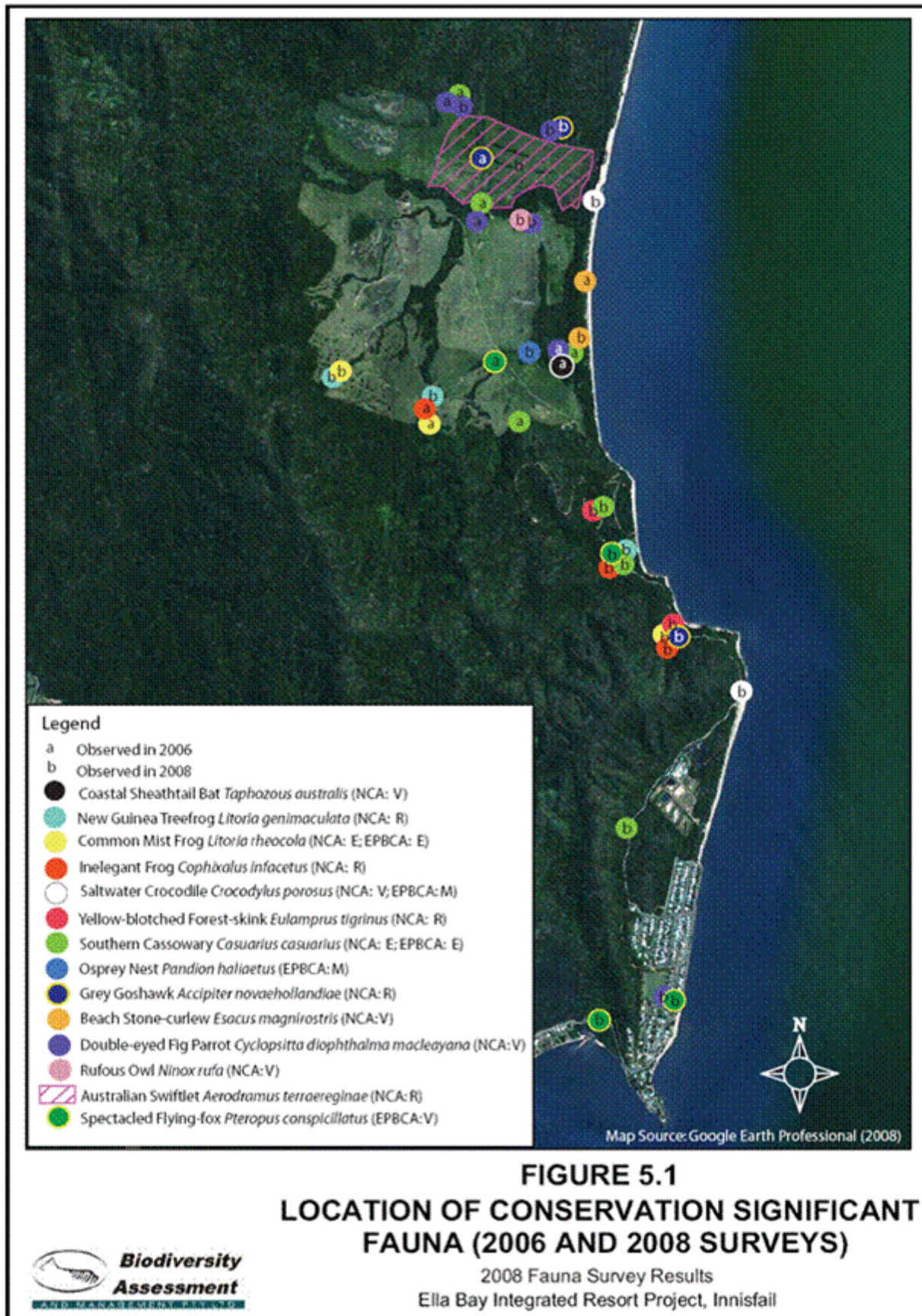
11. References and Information Sources

Alford, 2010, The host-pathogen biology of the amphibian chytrid skin fungus, *Batrachochytrium dendrobatidis* , and its implications for work proposed to be carried out at Ella Bay, Queensland. A report to Ella Bay Developments.

NQTFRT, 2001. North Queensland Threatened Frogs Recovery Team recovery plan for the stream-dwelling rainforest frogs of the Wet Tropics Biogeographic region of north-east Queensland 2000-2004. Report to Environment Australia, Canberra. Queensland Parks and Wildlife Service, Brisbane. 2001.

Richards, S.J., Mc Donald. K.R. & Alford, R.A. 1993 . Declines in populations of Australia's endemic tropic frogs. Pacific Conservation Biology 1: 66-77.

Appendix A: Site Distribution





Appendix B: Emergency Incident Procedures

Relocation Procedure:

Frogs identified as requiring relocation in a pre-construction survey or regular inspection in an area that may be disturbed (or due to an emergency incident) shall be relocated using the process outlined below.

- Procedures and techniques outlined in the *Amphibian Hygiene Protocol* (Appendix B) should be followed where practical.
- Ecologist or suitably trained personnel shall identify and capture the frog.
- Frogs should be relocated to suitable and safe habitat within the same creekline where possible as determined by the ecologist or suitably trained personnel.
- Time between capture and release should be kept to a minimum to limit the stress of Stream Dwelling Rainforest Frogs during relocation.

Chemical Spill or other Habitat Contamination:

Refer to the *Weed Management Sub-EMP* for immediate response and remediation measures for chemical spills or other habitat contamination. If Stream Dwelling Rainforest Frog species are considered to be at risk as a result of the incident, frogs should be captured and relocated as per the relocation procedure outlined above. If frogs can not be released in the same creekline they should be relocated to safe habitat as close to the capture location as possible and based on, the recommendation of an ecologist or other suitably trained personnel. Handling of frogs should be conducted in accordance with the *Amphibian Hygiene Protocol* (Appendix B).

Sick, Injured and Deceased Frog Procedure:

Dead amphibians or amphibians that are obviously ill should be regarded as a higher infection risk than clinically normal amphibians and should be handled with gloves or plastic bags. Sick or injured frogs should be protected and a frog rehabilitation centre contacted for specialist advice. If a terminally ill or freshly dead wild amphibian is found, it should be collected, preserved and submitted for disease diagnosis. The handling and transportation of sick, injured or deceased frogs should be conducted in accordance with the *Amphibian Hygiene Protocol* (Appendix B). Contacts for submitting frogs for rehabilitation and disease diagnosis are provided in Appendix D.

Appendix C: Hygiene Protocol

HYGIENE PROTOCOL FOR HANDLING AMPHIBIANS IN FIELD STUDIES

Speare R¹, Berger L¹, Skerratt LF², Alford R³, Mendez D¹, Cashins S³, Kenyon N³, Hauselberger K³, Rowley J³

Amphibian Diseases Group, James Cook University, Townsville 4811, Australia. 8 October 2004

¹ School of Public Health and Tropical Medicine

² School of Biomedical Sciences

³ School of Tropical Biology

General principles and background

1. Effective wildlife management is based on sound scientific evidence and collection of this evidence sometimes requires handling, measurement and manipulation of wild amphibians.
2. Hygiene protocols should be guided by the best available scientific evidence.
3. Hygiene protocols must be practical to carry out under field conditions.
4. Wild amphibians are naturally at risk of exposure to infectious disease via contact with the environment such as water and moist substrates and other amphibians. The number and level of pathogens encountered through these pathways represent the background risk of transmission of pathogens to amphibians.
5. The most severe diseases of wild amphibians are chytridiomycosis, caused by the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), and to a lesser extent, ranaviral disease caused by Ranaviruses. Outbreaks of chytridiomycosis have been documented in wild amphibians in eastern Australia, environs of Adelaide and southwest Western Australia. No outbreaks of ranaviral disease in wild amphibians have been detected in Australia although one ranavirus, the Bohle iridiovirus, occurs in the wild in Australia.
6. Once the amphibian chytrid fungus is present in a water body it appears to naturally spread throughout that water body.
7. Handling of amphibians should be done in a manner that does not significantly increase their risks of exposure to infectious disease above those normally experienced in the absence of handling. People handling amphibians should not be expected to reduce risks below the natural level for those amphibians.
8. Current data do not indicate that scientific activities have played a significant role in the transmission of chytridiomycosis or other pathogens of amphibians in the wild in Australia or any other country.
9. There is no evidence that the amphibian chytrid fungus or other pathogens of amphibians have been transmitted between water catchments by vehicles, footwear or clothing.
10. As the amphibian chytrid fungus is extremely sensitive to temperatures above 29°C and will die at 32°C, *B. dendrobatidis* will not grow on human skin. Ranaviruses, the other major pathogen of amphibians, also shows a sensitivity to temperature, being unable to grow above 33°C.
11. Complete drying will kill the amphibian chytrid fungus, but will not kill ranaviruses.
12. The greatest risk of transmission of infectious agents is when amphibians are placed together in contact or in the same container or in containers reused for holding amphibians without disinfection between amphibians.



13. Effective disinfection strategies (See Table 1), based on scientific evidence, are available for a range of purposes to reduce risks associated with the amphibian chytrid fungus and with ranaviruses.
14. Amphibians have a range of powerful natural anti-microbial agents in their skin which may be responsible for the low incidence of infection after toe tip clipping.
15. Amphibians do not appear to show signs of stress after handling; however, unnecessary handling should be avoided.
16. The duration of handling should be as short as possible as handling procedures that are quick, even if they are potentially painful, may have less affect on stress levels than longer procedures.

Specific actions

1. Amphibians can be handled using bare hands as long as the handler washes their hands between amphibians in water to which the animals would normally be exposed; this will ensure that the risks to frogs of exposure are not increased above environmental levels.
2. If no water is available for washing hands between amphibians, the handler should wear unused disposable gloves, or wear an unused plastic bag, or wipe their hands with a sterilising alcohol-based hand disinfectant between amphibians.
3. If amphibians are held in a container prior to return to the wild, the container should not have previously have been used for holding other amphibians, or if previously used, the container should be disinfected prior to use using methods given in Table 1.
4. Surgical instruments, such as scissors used for toe tip clipping, should be sterilised between amphibians by chemical disinfection using 70% ethanol or other chemicals listed in Table 1.
5. When toe tip clipping is used, no more than 50% of the free length of the digit should be removed.
6. Amphibians should be handled and released as quickly as possible.
7. Amphibians should be released at the site from which they were captured.
8. No more than one terrestrial individual should ever be held in the same container simultaneously.
9. Tadpoles normally share water and placing them in a common container does not increase their rates of physical contact. They can therefore be held in groups in containers, as long as all members of the group are from the same site.
10. Tadpoles for release should not be held with batches of tadpoles collected from other sites in the same or different water bodies.
11. Non-surgical equipment used in a stream or water body should be disinfected using one of the methods listed in Table 1 prior to use in any other water bodies.
12. Footwear should be washed to remove any mud and disinfected using one of the methods listed in Table 1 prior to being used in a separate water catchment or water body isolated from the initial water body.
13. As there is no evidence that vehicles play a role in dissemination of the amphibian chytrid fungus, no action is required at this time.
14. Dead amphibians or amphibians that are obviously ill should be regarded as a higher infection risk than clinically normal amphibians and should be handled with gloves or plastic bags. If a sick or freshly dead wild amphibian is found, it should be collected, preserved and submitted for disease diagnosis.

Table 1: Disinfection strategies suitable for killing *Batrachochytrium dendrobatidis* and ranaviruses in field studies. Where concentrations and time are given, these are minimum shown to be effective. For *B. dendrobatidis* based on Berger (2001) and Johnson et al (2003) and for ranaviruses on Langdon (1989) and Miocevic et al (1993).

Purpose	Disinfectant	Concentration	Time	Pathogen killed
Disinfecting surgical equip. & instruments	Ethanol	70%	1 min	<i>B. dendrobatidis</i> Ranaviruses
	Vircon	1 mg/ml	1 min	<i>B. dendrobatidis</i> Ranaviruses
	Benzalkonium chloride	1 mg/ml	1 min	<i>B. dendrobatidis</i>
Disinfecting collection equipment and containers	Sodium hypochlorite (bleach)	1%	1 min	<i>B. dendrobatidis</i>
	Sodium hypochlorite (bleach)	4%	15 min	Ranaviruses
	Didecyl dimethyl ammonium chloride	1 in 1000 dilution	0.5 min	<i>B. dendrobatidis</i>
	Complete drying		3 hrs or greater	<i>B. dendrobatidis</i>
	Heat	60°C	5 min	<i>B. dendrobatidis</i>
			15 min	Ranaviruses
	Heat	37°C	4 hrs	<i>B. dendrobatidis</i>
	Sterilising UV light		1 min	Ranaviruses only
Disinfecting footwear	Sodium hypochlorite	1%	1 min	<i>B. dendrobatidis</i>
	Sodium hypochlorite (bleach)	4%	15 min	Ranaviruses
	Didecyl dimethyl ammonium chloride	1 in 1000 dilution	1 min	<i>B. dendrobatidis</i>
	Complete drying		3 hrs or greater	<i>B. dendrobatidis</i>
Disinfecting cloth (eg, bags, clothes)	Hot wash	60°C or greater	5 min	<i>B. dendrobatidis</i>
			15 min	Ranaviruses



Literature Cited

- Berger L. Diseases in Australian Frogs [PhD thesis]. Townsville, Australia. James Cook University: Townsville. 2001.
- Johnson M, Berger L, Philips L, Speare R. Fungicidal effects of chemical disinfectants, UV light, dessication and heat on the amphibian chytrid, *Batrachochytrium dendrobatidis*. *Diseases of Aquatic Organisms* 2003;57:255-260.
- Langdon JS. Experimental transmission and pathogenicity of epizootic haematopoietic necrosis virus (EHNV) in red fin perch, *Perca fluviatilis* L., and 11 other teleosts. *Journal of Fish Diseases* 1989;12:295-310.
- Miocevic I, Smith J, Owens L, Speare R. Ultraviolet sterilisation of model viruses important to finfish aquaculture in Australia. *Australian Veterinary Journal* 1993;70:25-27.



Appendix D: Stream Dwelling Rainforest Frog Species Monitoring Program

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
Line Transects	<p>Prior to monitoring, identify the aquatic and terrestrial habitat parameters associated with the presence of all Stream Dwelling Rainforest Frog species (Baseline Data). This will be achieved by sampling at least five known frog sites within the local area and recording water quality and terrestrial habitat data as per the attached Stream Dwelling Rainforest Frog Monitoring Data Sheet.</p> <p>Establish 2 x 50 m monitoring transects spaced a minimum of 50 m apart within appropriate sections (i.e. near riffle zones or areas of fast flow where Stream Dwelling Rainforest Frogs are present) at all Ella Bay road creek crossing points. Establish 2 x 50 m control transects within each creek system. Control sites must be located well outside of the potential disturbance zone created by construction of the Ella Bay road. Locations for transects will be established prior to the first monitoring event. Clearly and permanently mark the start and end point of transects. Record the GPS location of start and end point.</p> <p>Employ personnel familiar with the habitat requirements of the Stream Dwelling Rainforest Frog species who are able to identify their distinctive call, as well as calls of other frogs, to establish transects and conduct monitoring (observer).</p>	<p>Transect needs to be established prior to commencement of monitoring program.</p> <p>Monitoring is to occur over three consecutive nights (this may be reduced to two nights depending on weather conditions and presence of frogs), every six months for the first two years of monitoring. Frequency of monitoring events will be reviewed after two years in compliance with the EMP.</p> <p>Monitoring should preferably take place during or immediately following a reasonable rainfall event. Suitable conditions include monitoring during, or within three days of a significant rainfall event (enough rain to allow flowing of water) and when minimum night time temperatures are >18Co.</p>	<p>Transect is clearly visible to the observer and GPS locations of start and end points have been recorded.</p> <p>Observer/s is experienced in frog monitoring.</p> <p>Stream Dwelling Rainforest Frogs are heard/sighted along transects within retained habitats.</p> <p>Undue trampling of vegetation is not evident.</p> <p>Footwear and other equipment that comes into contact with waterbodies should either be equipment dedicated for use at Ella Bay or disinfected prior to arrival for each monitoring event. Footwear, hands and any equipment that has had contact with water, is cleaned in bleach before moving between monitoring and control sites and between control sites within different catchments.</p>

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
	<p>Observer to measure pH, conductivity, water depth and temperature, dissolved oxygen, and turbidity of water at transect and comment on the physical condition of the waterbody if present, as per attached Stream Dwelling Rainforest Frog Monitoring Data Sheet.</p> <p>Observer to perform rapid assessment of vegetation cover (e.g. percent canopy cover and height, presence of logs and rocks etc.) at five points along transects as per attached Stream Dwelling Rainforest Frog Monitoring Data Sheet.</p> <p>Observer to walk transect once during dusk, stopping every 10m to listen for calling Stream Dwelling Rainforest Frogs and other frog species. Record GPS location of any observed frogs.</p> <p>Observer to walk transect each night, whilst searching and listening for Stream Dwelling Rainforest Frogs and other frog species. Record GPS location of any observed frogs.</p> <p>Take opportunistic photographs of frogs, tadpoles etc. during transect monitoring.</p> <p>Avoid making noise whilst monitoring as unnatural noise will silence the frogs.</p> <p>Avoid excessive trampling of vegetation whilst traversing transects.</p> <p>Observer must wear fresh disposable gloves if</p>		

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
	<p>handling frogs. Gloves should be disposed of after handling each frog to avoid the risk of disease transmission.</p> <p>Observer must clean footwear and any equipment that comes in contact with water, with a diluted bleach solution before moving on to monitoring sites within different catchments to avoid the risk of spreading Chytrid disease.</p>		
Dip Netting	<p>To confirm that Stream Dwelling Rainforest Frogs are successfully breeding within the monitoring sites, dip netting of the water should occur within the transect.</p> <p>Any tadpoles should be identified and immediately released.</p> <p>Observer must clean footwear and any equipment that comes in contact with water, with a diluted bleach solution before moving on to monitoring sites within different catchments to avoid the risk of spreading Chytrid disease.</p>	Once during dusk transect search as specified above.	Stream Dwelling Rainforest Frogs tadpoles are observed.
Reporting	<p>Estimate the density of all frog species for monitoring and control sites.</p> <p>Accurately map the distribution of all frog species throughout the monitoring and control sites.</p> <p>Record the physical and chemical condition (pH, conductivity, temperature, depth) of waterbody.</p>	<p>At the completion of each transect.</p> <p>Compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to</p>	<p>Data are accurately recorded and processed.</p> <p>Reports have been read and filed on system.</p> <p>Yearly summary report sent to DSEWPC and DERM in line the EMP.</p>

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
	Record the condition of the riparian vegetation. Identify management issues for Stream Dwelling Rainforest Frogs movement throughout the site.	include tabulated data (frog census and water quality) from all monitoring events to allow assessment of trends.	
Corrective Actions (Linked to Reporting)	<p>Immediately notify Environmental Manager if significant change in species diversity or abundance is observed that could be attributed to construction and/or operational works. Threatening processes are to cease until issue is addressed.</p> <p>Immediately notify Environmental Manager if significant change in measured water variables is recorded. Threatening processes are to cease until issue is addressed.</p> <p>Immediately notify Environmental Manager if changes in abundance, composition or health of riparian vegetation observed, that could be attributed to operational works. Works to cease until threatening cause is rectified.</p> <p>Immediately notify Environmental Manager of any management issues observed during monitoring. Threatening processes are to cease until issue is addressed.</p>		



STREAM DWELLING RAINFOREST FROG MONITORING DATA SHEET							
Recorders							
Date			Time				
Site Name							
Site Location Details							
Transect Location		Start	E	N	End	E	N
Frog Census							
Species		Observed	Calling	Comments			
Climatic Details							
Air Temperature (°C)				Humidity (%)			
Cloud Cover %				Moon Phase			
Rainfall during previous night (mm)				Rainfall during previous week (mm)			
Water Quality							
Water Temperature (°C)				Water depth (cm)			
Conductivity (uS/cm)				pH			
Dissolved Oxygen (mg/L)				Water Flow (m/s)			
Turbidity (NTU)							
Colour & Appearance of Water				Water Surface Condition (e.g. presence of floating debris, oil film, algae, etc.)			



STREAM DWELLING RAINFOREST FROG MONITORING DATA SHEET

Terrestrial Habitat Assessment

% Canopy Cover

% Ground Cover (logs, rocks)

% Weed Cover

Additional Comments/notes



Appendix E: Frog Specialist Contacts

Contact one of the following specialists to arrange receipt and analyse sick and dead frogs.
Make contact prior to dispatching package:

Professor Ross Alford

School of Marine and Tropical Biology
James Cook University
Smithfield QLD 4878
Fax: +61 7 4725 1570
Mobile: +61 4 2712 2937
Email: Ross.Alford@jcu.edu.au

Assoc. Professor Rick Speare

School of Public Health and Tropical Medicine
JCU House — Suite 13
57 Mitchell Street
North Ward
TOWNSVILLE QLD 4810
Phone: 07 4722 5777
Fax: 07 4722 5788
Richard.Speare@jcu.edu.au

Diana Mendez

School of Public Health and Tropical Medicine
JCU House — Suite 11
57 Mitchell Street
North Ward
TOWNSVILLE QLD 4810
Phone: 07 4722 5771 or 07 4781 4181
Fax: 07 4722 5788
Diana.Mendez@jcu.edu.au

Cairns Frog Hospital

Balaclava Vet Surgery
Corner of Mulgrave Road and Dalton Street
CAIRNS, QLD 4870
Phone: (07) 4045-0373
curator@fdrproject.org.au

Tropical Froggery Innisfail Inc

Anthony Kahler
TBA when operational
Phone:
toads@znet.com.au



3.4 Spectacled Flying Fox Management Sub-Plan

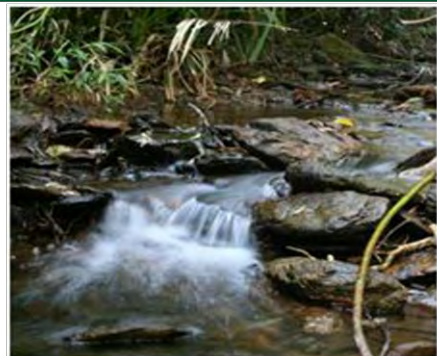


Environmental Management Sub-Plan

For the

Spectacled Flying-fox

October 2009 Revision 1





Spectacled Flying-fox Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the EBD Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 1	Oct 2009	PJ/ZP/KR	KR	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

Distribution List of Registered Copies and Key Contacts

Position	Name	Copy Number	Contact Details
Project Director		1	
Environmental Manager		2	
Construction Manager		3	
Design Manager		4	
DSEWPC		5	
Qld DERM		6	

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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

Refer to the *Ella Bay Environmental Management Plan* for further details.

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park.

The Spectacled Flying-fox Ella Bay is not known to roost in the area surrounding Ella Bay however the Spectacled Flying-fox has been reported flying over and feeding at Ella Bay.

During two surveys in 2006 & 2008 of the site and Ella Bay road, several Spectacled Flying-fox individuals were observed feeding in a large fruiting *Szygium* along the access road, and one individual was seen in the SE corner of the site. Individuals were also observed feeding in trees at Flying Fish Point.

Document Structure

This document is a Sub-Plan of the Ella Bay Development Environmental Management Plan (EMP). This sub-plan outlines the specific management procedures that relate to the Spectacled Flying-fox (*Pteropus conspicillatus*) that may be located in areas at Ella Bay and along Ella Bay road.

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans. The EMP sets out the project details, management process and authority and training procedures.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Spectacled Flying-fox Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans.

This Sub-Plan outlines the specific management procedures that relate to Spectacled Flying-fox that may frequent areas of Ella Bay and along the Ella Bay road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure that objectives listed in this Sub Plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.

Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and any corrective action necessary will be prepared and logged. This document and process will be subject to regular auditing and review.

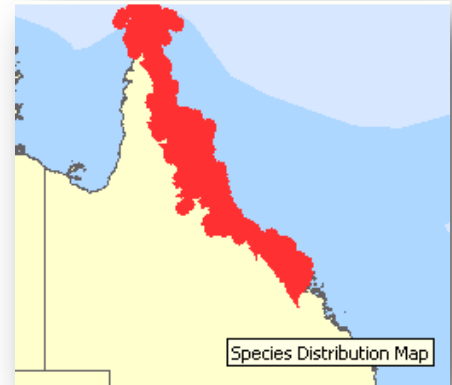
2. Background

The largest population of Spectacled Flying-fox in Australia is from the Wet Tropics of Queensland World Heritage Area between Townsville and Cooktown.

The Spectacled Flying-fox is a rainforest specialist known to move over large distances in search of fruit and dispersing seeds over considerable distances. It is regarded as an integral part of the World Heritage values of the Wet Tropics of Queensland World Heritage Area.

The Spectacled Flying-fox was included in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) list of threatened species as Vulnerable in 2002. The Spectacled Flying Fox was also acknowledged in *The Action Plan for Australian Bats* (Duncan et al. 1999).

This Sub-Plan has been prepared to assist in the implementation of appropriate environmental management measures to protect any Spectacled Flying-foxes during planning, construction and operation of the Ella Bay Integrated Resort. Significant consideration was given to ensure that their habitat is not detrimentally altered as a result of this process.





3. Objectives of the Spectacled Flying-fox Environmental Management Sub-Plan

The primary aim of the Environmental Management Sub-Plan is to ensure that the level of environmental protection is consistent with relevant Commonwealth and State legislation, and that best practices in habitat conservation are applied over the life of the project.

The envisaged outcomes of this Environmental Management Sub-Plan includes the retention and enhancement of all Spectacled Flying-fox habitat within the EBD, the preservation and persistence of the surrounding populations, ensuring that individuals of this bat species are not harmed during the clearing and construction process; and to ensure the long-term future of Spectacled Flying-fox within the local area by protecting their habitat from any detrimental processes as a result of the construction and operation of the Ella Bay Integrated Resort.

This Environmental Management Sub-Plan seeks to achieve these ends by outlining a program of actions for implementation throughout the duration of the EBD development.

4. Spectacled Flying-fox (*Pteropus conspicillatus*) Profile

Site Distribution

During the two BAAM surveys (2006 & 2008) of the site and Ella Bay road, several Spectacled Fly-fox individuals were observed feeding in a large fruiting *Syzygium* along the access road and one individual was seen in the SE corner of the site. Individuals were also observed feeding in trees at Flying Fish Point. A large permanent camp of Spectacled Flying-foxes was observed in a melaleuca wetland in Innisfail, approximately 7 km from the study site. No other species were observed roosting at the camp.

The map in [Appendix A](#) identifies the locations the species have been identified in the BAAM surveys.

Spectacled Flying-fox

The Spectacled Flying-fox is the only Australian mainland flying-fox species that is specialised to rainforest. They feed on more than 35 species of rainforest trees and are rarely observed far from this habitat. The species favours the nectar and pollen of eucalypt blossoms, as well as native and introduced fruits. Large groups of hundreds to tens of thousands may roost at a single location, called a camp. Camps are usually located in rainforest and gallery forest trees, but they have also been recorded roosting in mangroves, paperbark, eucalypt forest and tall acacia trees. The animals can move a great distance from camps in search of fruit and they disperse seeds up to 20 km from the source tree. Consequently, they are considered to be a major dispersal agent of rainforest seeds across the landscape and between rainforest patches (BAAM 2009 and references cited within).

The Spectacled Flying-fox is recognisable by pale yellow fur around its eyes (the 'spectacles'), and on its shoulders and the back of its neck.



The main threats to the Spectacled Flying-fox are habitat clearing (including fragmentation and modification) to facilitate agriculture and silviculture. While this has slowed, it still poses a threat. In addition, large numbers have been lost through crop protection activities such as shooting,



electrocution and roost harassment around orchards; pathogens including diseases and tick infestation; and collision with human infrastructure such as fences and powerlines.

Paralysis ticks (*Ixodes holocyclus*) kill hundreds of Spectacled Flying-foxes (*Pteropus conspicillatus*) on the Atherton Tablelands each year. Spectacled Flying-foxes occur throughout the Wet Tropics of far north Queensland but it is only on the high altitude Atherton Tablelands, above 700 metres, where ticks become a problem.

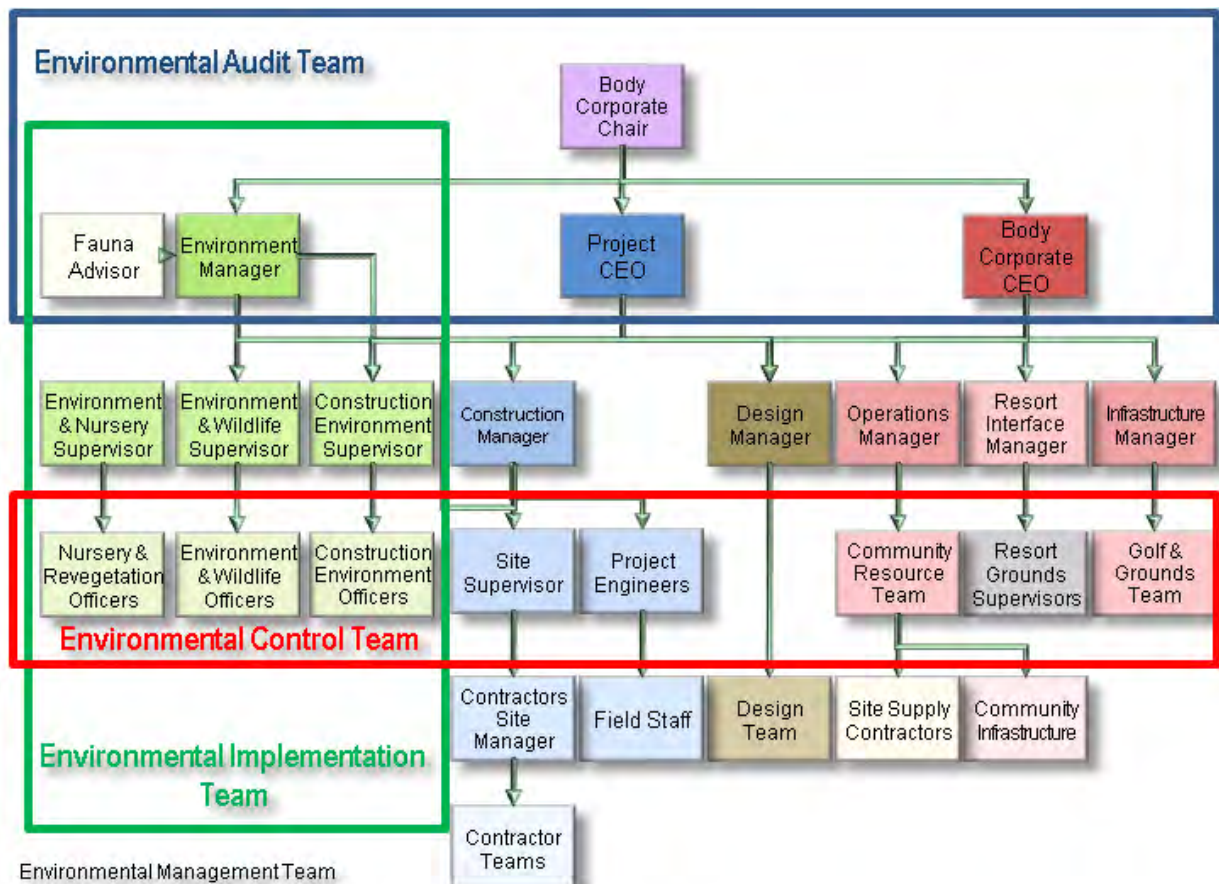
The Australian bat *Lyssavirus*, a new virus was discovered in Australian bats in 1996. It has been detected from four species of fruit bat including the Spectacled flying-fox *Pteropus conspicillatus*) and 1 species of insectivorous bat. This zoonotic virus is closely related to the rabies virus.

Rabies virus and other *Lyssaviruses* are usually transmitted to humans via bites or scratches which provide direct access of the virus in saliva to exposed tissue and nerve endings. This means most people would not be exposed to *Lyssavirus* through casual contact with bats. As the bat *Lyssavirus* is closely related to classic rabies virus, infection may be prevented by rabies vaccine and rabies immunoglobulin.

5. Responsibilities and Authorities

The organisational structure of the project, in terms of environmental responsibilities, is outlined in detail in the Ella Bay Development Environmental Management Plan (EBD EMP). Ella Bay Developments and Sub-Contractors during the Construction Stage are to be allocated to one or more teams (usually one) to be known as:

- **EAT** - Environmental Audit Team
- **ECT** - Environmental Controls Team
- **EIT** - Environmental Implementation Team



Fauna Advisor (FA)

An important part of the Ella Bay Development Environmental Management Structure and organisation is the overseer role of an expert fauna ecologist, recognised in this field, to be known as the Fauna Advisor (FA).

The Fauna Advisor will advise on all elements of Flying Fox conservation and management programs. The FA will provide expert advice to the EBD Environmental Staff regarding:

- Conducting assessments for bat monitoring of the EBD and Ella Bay road during the planning, construction and operational phases;
- Monitoring the efficacy of all bat mitigation at the planning, construction and operational phases. This monitoring program must seek to identify any negative (or positive) bat population trends and likely causal factors;
- Providing advice to the EBD Environmental Manager and EBD management on any review or required modification/ changes to mitigation strategies, and signs off on their implementation;
- Providing feedback on the annual report of the state of the local Spectacled Flying-fox population(s) and the effectiveness of mitigation strategies.



The FA will also participate in the external audit function of the Spectacled Flying-fox management and compliance to this Environmental Management Sub-Plan. The FA is to be a member of both the Ella Bay Developments Environmental Audit Team (EBD EAT) and the Ella Bay Developments Environmental Implementation Team (EBD EIT).



6. Reporting and Sub-plan Reviews

Reporting

Systematic reporting underpins all phases of planning, construction and operation. Reporting includes three main types:

Regular and Event Based - Based on the elements of the following environmental management schedules (sections 7,8&9) for the respective phase of the project: planning, construction and operation.

Monthly -Reports will be prepared by the Environmental Implementation Team to inform of the progress of the Spectacled Flying Fox management strategies. The report will be collated from the communications register (CR) contingencies, procedural non-compliance and if necessary recommendations for changes or improvements.

Annual report - Prepared by the Environmental Implementation Team and based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (six monthly) will be undertaken by the Environmental Audit Team (including the FA) to examine the reports and to review changes or improvements to the sub-plan, including any additional mitigation measures found to be necessary.

7. Planning Phase

Potential Impacts during the Planning Phase

- Vegetation clearing may result in the loss of habitat including food resources.
- Positioning of power lines.
- Positioning and design of fencing.
- Increased human activity.
- Disturbance of camps.
- Spread of pathogens (e.g. *Australian bat lyssavirus (ABLV)*- see [Appendix B](#)).

Objectives

- No damage to vegetation outside footprint of road alignment and ancillary work areas.
- No unnecessary clearing of food resource fruiting trees.
- Power lines and fencing to be sensitively designed.
- To prevent disturbance to camps.
- To minimise the spread of pathogens.

Performance Criteria

- Planning for road alignment avoids all areas of protected and roadside vegetation.
- Road alignment designed to minimise the clearing of native vegetation, particularly food resources (i.e. fruiting trees).
- Underground power to be used and fencing design agreed upon by the Fauna Advisor.
- No disturbance to any identified camps.
- No incidents of pathogen spread to humans

Reporting

Reports will be prepared by the Environmental Implementation Team to inform of the progress of Spectacled Flying-fox management strategies. The Environmental Implementation Team will have an inclusive role on the design team during the design and planning information gathering process. The report will include logs of unanticipated contingencies, and instances of procedural non-compliance and if necessary recommendations for changes or improvements made to this document, including any additional mitigation measures found to be necessary. The report and designs will be signed off by the Environmental Audit Team. The Fauna Advisor (FA) is a member of both the Environmental Audit Team and the Environmental Implementation Team.

Mitigation Measures, Monitoring and Compliance

The following table outlines the initial environmental planning activities relating to Spectacled Flying-fox that are to be completed prior to the commencement of construction.

The environmental team will be measured by the performance criteria (**PC**) with monitoring events being recorded in a compliance register (**CR**) in the tables below.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions
Baseline Spectacled Flying-fox population monitoring.	Implement: Baseline Spectacled Flying-fox monitoring will be conducted prior to construction to provide data on the abundance and distribution of the local populations and camps, in accordance with the Spectacled <i>Flying-fox Monitoring Plan</i> (Appendix C).	Prior to Works Commencing: Baseline monitoring to be undertaken.	EIT	Ongoing: Results of monitoring will be reported. This will establish baseline data. The data will form the performance criteria (PC) for ongoing monitoring to be assessed against. EAT to sign off on PC.	Implement: Baseline Spectacled Flying-fox monitoring will be conducted prior to construction to provide data on the abundance and distribution of the local populations and camps, in accordance with the Spectacled <i>Flying-fox Monitoring Plan</i> (Appendix C).
Camp Disturbance	Implement: Fauna spotting for camps to be undertaken: <ul style="list-style-type: none"> In and adjacent to the development area; Along the road alignment; and Within F50 m either side of the alignment. 	Prior to Works Commencing: Undertake spotting activities.	EIT		If a camp is observed within 250m of the road/development area, these areas to be avoided, with a 100m buffer established between the road and the camp.
Loss of habitat	Research and Planning: Identify potential habitat that will require a pre-clearing survey for Spectacled Flying-fox due to construction or clearing activities. Implement: Survey vegetation along road alignment with focus on: <ul style="list-style-type: none"> Native vegetation; Extent of weeds; 	Prior to any clearing/construction activities. Refer to 3D reports <i>Vegetation Survey of the proposed 'Ella Bay Integrated Resort Project'</i> . and <i>Ella Bay Road Edge Effect Monitoring Baseline Data</i>	EIT EIT	Event Based: Detailed plan identifying locations where pre-clearing survey is likely to be required. Ongoing: Detailed survey reviewed by FA	

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions
	<ul style="list-style-type: none"> Trees with a diameter >30cm; and Food resources for the Spectacled Flying-fox. <p>Implement: Design buildings and road alignments to minimise the clearing of native vegetation. <i>Note - Focus on avoiding food resources for Spectacled Flying-fox (i.e. fruiting trees).</i></p>		EAT		
Increased human activity	Develop: Induction course to raise awareness and appropriate behaviour around Spectacled Flying-fox.	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Monthly: Non-compliance and corrective actions reported monthly.	Re-brief staff or (sub) contractors as necessary.
Location of powerlines	Implement: Powerlines and cabling to be installed underground.	Before Construction Activity: Methodology to be signed off.	EIT	Ongoing: Report produced for EAT as part of CR.	
Location and design of fencing	Implement: Bat sensitive designed fencing with increase 'visibility as the major criteria.	Before Construction Activity Methodology to be signed off.	EIT	Ongoing: Report produced for EAT as part of CR	
Potential spread of pathogens (e.g. <i>Lyssavirus</i>)	Compliance: Avoid handling live bats unless deemed unavoidable and absolutely necessary. <i>Note – If handling is necessary, implement risk mitigation actions. This is to include responses such as thick gloves.</i>	Ongoing: Maintain log of any incidences in CR.	EIT	Event Based: Compliance reporting to be included in CR.	Monitor log to ensure compliance EAT.

8. Construction Phase

Potential Impacts during the Construction Phase

Potential impacts to Spectacled Flying-fox during construction of the Ella Bay Development include:

- loss of habitat including food resources;
- disturbance of camps; (if identified on-site);
- increased human activity;
- spread of pathogens (e.g. *Lyssavirus*);
- spread of weeds;
- dust and noise; and
- mortality due to fencing or power lines.

Objectives

- No damage to vegetation outside footprint of road alignment and development work areas.
- Revegetate/rehabilitate native vegetation including food resources on completion of construction in accordance with Vegetation Management Sub-Plan.
- To prevent disturbance to any identified camps (on-site)
- To prevent the spread of pathogens.

Performance Criteria

- Monitoring program shows no decrease in diversity and/or abundance of Spectacled Flying-fox populations;
- The clearing of vegetation has been conducted in a manner that minimises removal/disturbance of native vegetation and food resources.
- No damage or disturbance to Spectacled Flying-fox habitat outside road alignment and development work area footprints.
- No damage or disturbance to Spectacled Flying-fox camps, (if identified on-site).
- No above-ground powerlines or cabling installed along roadways.
- No Spectacled Flying-fox mortalities on site from fencing or powerlines.
- No evidence of the spread of pathogens to humans.

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental control measures developed to ensure protection of Spectacled Flying-fox and their habitat during the construction of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Management Sub-Plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Increased human activity	Education: Induction course to raise awareness and appropriate behaviour around Spectacled Flying-fox. Communication: Sub-Plans to be communicated to all staff and (sub) contractors before each stage of construction commences	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Monthly: Non-compliance and corrective actions reported in EBD CR.	Re-brief staff or subcontractors as necessary.
Potential spread of pathogens (e.g. <i>Lyssavirus</i>)	Compliance: Restrict handling live bats (as the virus can be contracted through contact with their saliva from bites or scratches). Mitigate by using thick gloves.	Ongoing: Maintain log of any incidences. Event Based: Any deceased bats should be collected, preserved and submitted for disease diagnosis to the FA. <i>Note – personnel must wear gloves.</i>	EIT	Event Based: Compliance reporting to be included in EBD CR.	Monitor log to ensure compliance
Dust and noise	Implement: Dust suppression measures in place for works as per <i>Construction Sub-Plan</i> .	Ongoing: Adhere to dust and noise control performance criteria as per <i>Construction Sub-Plan</i> .	ECT	Ongoing: Reports include updates on dust and noise control measures included in EBD CR.	Increase frequency of dust suppression measures.
	Comply: Machinery to comply with construction noise limits specified under the <i>Environmental Protection Act</i>	Ongoing	ET	Ongoing	Machinery that does not comply with noise regulations are to be removed from site.
Mortality due to fencing	Implement: 'Visibility' sensitive design of fencing.	Monthly: Monitor fencing	ECT	Event Based: Incident and associated reporting to be	Review fencing design EIT.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
				included in EBD CR.	
Mortality due to powerlines	Implement: Powerlines and cables will all be installed underground to prevent deaths of Flying-fox through electrocution.	Ongoing	EAT	<i>Not applicable</i>	<i>Not applicable</i>



9. Operation Phase

Potential Impacts during the Operation Phase

Potential impacts to the Spectacled Flying-fox during operation of the Ella Bay Development include:

- loss of habitat including food resources;
- disturbance of camps;
- increased human activity;
- spread of pathogens (e.g. *Lyssavirus*);
- spread of weeds;
- mortality due to fencing or power lines.

Objectives

- No damage to vegetation outside footprint of Ella Bay road and resort areas.
- Accomplish revegetation/rehabilitation goals for native vegetation including food resources in accordance with Vegetation Management Plan.
- To prevent disturbance to any identified camps.
- To prevent the spread of pathogens.
- To prevent the spread of weeds.

Performance Criteria

- Monitoring program shows no decrease in diversity and/or abundance of Spectacled Flying-fox populations.
- No damage or disturbance to Spectacled Flying-fox habitat outside road alignment and resort area footprints.
- No damage or disturbance to Spectacled Flying-fox camps.
- No Spectacled Flying-fox mortalities on site from fencing or powerlines.
- No evidence of weed incursion into areas outside of designated 'no-go zones'.
- No evidence of the spread of pathogens.

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental control measures developed to ensure protection of the Spectacled Flying-fox and their habitat during the operation of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Management Sub-Plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Loss of habitat	Implement: Define area for clearing. Compliance: No unauthorised disturbance to areas outside of the designated clearing zone.	Ongoing	ECT	Event Based: Incident and compliance reporting to be included in EBD CR.	Immediately cease vegetation clearing if located outside of the permitted area. Notify EAT.
	Implement: Significant revegetation and rehabilitation of native vegetation is ongoing in specific priority areas. Certain areas will be completed post construction.	Ongoing: Adhere to the performance criteria of <i>Revegetation & Rehabilitation Management Plan</i> .	EAT	Ongoing: Compliance reporting to be included in EBD CR.	Review <i>Vegetation Management Plan</i> if monitoring indicates rehabilitation/restoration works are not producing desired outcomes EIT.
Camp Disturbance	Compliance: Should a camp be observed within 250 m of the road/development area, these areas should be avoided. A 100m buffer to be established between the road/development area and the camp.	Ongoing: All staff and (sub) contractors to be made aware of buffer area.	ECT	Event Based: Incident reporting to be included in EBD CR.	Re-brief staff or (sub) contractors as necessary
	Compliance: Should a camp be discovered, no disturbance to occur within the 100m buffer during the birthing period.	September to December: No disturbance activities.	EAT	Event Based: Incident reporting to be included in EBD CR.	Re-brief staff or (sub) contractors as necessary

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Increased human activity	Implement: Induction course to raise awareness and appropriate behaviour around Spectacled Flying-fox. Communicate: Sub-plans to be communicated to all staff and (sub) contractors before any maintenance work commences	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Event Based: Non-compliance and corrective actions to be reported and included in EBD CR.	
	Implement: Induction for visitors and residents at the Welcome Centre	Ongoing: Visitors and residents to receive induction.	EIT		Re-brief staff, visitors or residents as necessary.
Potential spread of pathogens (e.g. <i>Lyssavirus</i>)	Compliance: Restrict handling live bats (as the virus can be contracted through contact with their saliva from bites or scratches). Mitigate by using thick gloves.	Ongoing: Maintain log of any incidences. Event Based: Any deceased bats should be collected, preserved and submitted for disease diagnosis to the FA. <i>Note – personnel must wear gloves.</i>	EIT	Event Based: Compliance reporting included in EBD CR.	Monitor log to ensure compliance
Mortality due to fencing	Implement: 'Visibility' sensitive design of fencing.	Monthly: Monitor fencing.	ECT	Event Based: Incident and other reporting to be included in EBD CR.	Review fencing design in consultation with FA.



10. Auditing and Reporting

An independent audit will be commissioned by the Ella Bay Development Audit Team, which includes the Fauna Advisor and the Environmental Manager, to determine whether the performance indicators have been met and maintained and provide information for the Spectacled Flying-fox Environmental Management Sub-Plan Review. Auditing will occur annually during the construction phase and continue into the operational phase. A copy of the audit will be provided to DSEWPC and DERM.

The Ella Bay Development Environmental Implementation Team will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include tabulated (Spectacled Flying-fox) data from all monitoring events to allow assessment of trends.

Logs are to be kept of all sample results and subsequent corrective action (s) (if any). They are an integral part of the EBD Communications Register, details of which are detailed in the EBD EMP.

11. Emergency Incident Procedure

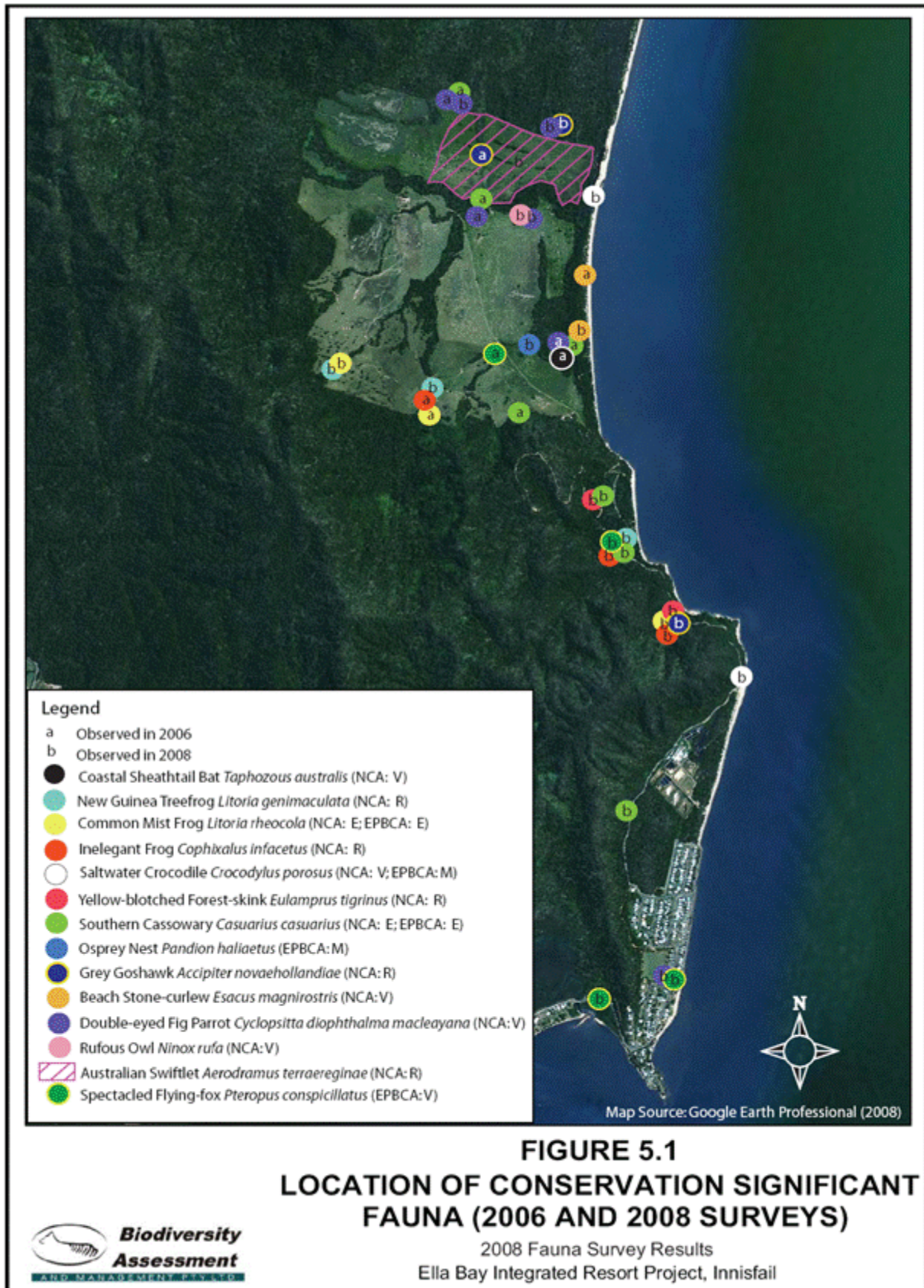
Chemical spill or other habitat contamination: Refer to the Hazard and Emergency Management Sub-Plan for immediate response and remediation measures for chemical spills or other habitat contamination. If the Spectacled Flying-fox are considered to be at risk as a result of the incident, the Fauna Advisor should be consulted regarding a capture and relocation procedure. If Flying-foxes can not be released in the same habitat they should be relocated in a safe habitat as close to the capture location as possible, at the recommendation of an ecologist or other suitably trained personnel. Handling of flying-foxes should only be conducted by personnel that have been vaccinated against the Australian *bat* *Lyssavirus*. (Appendix B). Gloves are highly recommended when handling a flying-fox as they may bite or scratch.

Sick, injured and deceased flying-fox procedure: Dead or obviously ill flying-foxes should be regarded as a higher infection risk than clinically normal flying-foxes thus should be handled with gloves or plastic bags. Sick or injured flying-foxes should be protected and a flying-fox rehabilitation centre contacted for specialist advice. If a terminally ill or freshly dead flying-fox is found, it should be collected, preserved and submitted for disease diagnosis. Contacts for submitting flying-foxes for rehabilitation and disease diagnosis are provided in Appendix D.

References

- EPBC Act 1999. <http://www.environment.gov.au/epbc/publications/pubs/spectacled-flying-fox.pdf> Last updated 10 April 2008. Accessed 17 April 2009.
- Duncan, A., G.B. Baker & N. Montgomery (1999). *The Action Plan for Australian Bats*. [Online]. Environment Australia. Canberra: Environment Australia, 1999 *The Action Plan for Australian Bats* <http://www.environment.gov.au/biodiversity/threatened/publications/action/bats/17.html> Last updated 3 March 2009. Accessed 17 April 2009
- Biodiversity Assessment & Management Pty Ltd (BAAM) 2009. *Ella Bay Development November 2008 Fauna Survey Results*.
- 3D Environmental 2009 *Baseline Vegetation Monitoring of Edge Effect for Ella Bay Road Flying Fish Point*
- 3D Environmental 2009 *Vegetation Survey of the proposed 'Ella Bay Integrated Resort Project'*.

Appendix A: Site Distribution



Appendix B: The Australian Bat *Lyssavirus* Health Warning

The Australian bat *Lyssavirus* has been detected from four species of fruit bat (the Black flying-fox *Pteropus alecto*, the Little Red flying-fox *Pteropus scapulatus*, the Grey-headed flying-fox *Pteropus poliocephalus* and the Spectacled flying-fox *Pteropus conspicillatus*) and one species of insectivorous bat (the Yellow-bellied sheath-tail bat *Saccolaimus flaviventris*). (AUSVETPLAN 1999)

The demonstration of pathogenicity in humans through the deaths of two Queensland women in November 1996 and December 1998 as a result of the new *lyssavirus* infection has led to recommendations for use of rabies vaccine to protect people occupationally exposed to the virus, and as a post exposure treatment for humans bitten or scratched by one of these species (Lyssavirus Expert Group, 1996 – cited within AUSVETPLAN 1999).

Rabies virus and other *Lyssaviruses* are usually transmitted to humans via bites or scratches which provide direct access of the virus in saliva to exposed tissue and nerve endings. This means most people would not be exposed to *Lyssavirus* through casual contact with bats. As the bat *Lyssavirus* is closely related to classic rabies virus, infection may be prevented by rabies vaccine and rabies immunoglobulin. Recommendations for administering these are provided below. Recent evidence suggests that the side effects of this vaccine are not acceptable. Consequently applicable EBD staff will not be required to undertake this treatment. Instead all contact with bats should be avoided.

Recommendations

Pre-exposure vaccination

Pre-exposure vaccination should be recommended to those occupationally or recreationally exposed to bats, where there is a risk of being bitten or scratched, for example:

- bat carers;
- wildlife officers (including local government officers);
- and power-line workers who frequently remove bats from power lines.

Pre-exposure vaccination consists of three intramuscular doses of 1ml rabies vaccine given on days 0, 7 and 28.

Handling Flying-foxes

Gloves are highly recommended when handling injured bats as they bite and scratch vigorously.

Grab them behind the head but do not restrict breathing. Wrap the animal loosely in a cloth, allowing the head and hind legs to stick out. Place the animal in a cage or box with a mesh or sticks on top, so the animal can hang around comfortably during transport.

People bitten or scratched by bats

The wound should be scrubbed thoroughly as soon as possible with soap and water. Proper cleansing of the wound is the single most effective measure for reducing the transmission. Where possible, the bat should be kept for further investigation by the State veterinary laboratory. Guidelines have been developed to aid the decision on whether to administer vaccine alone or combined with rabies immunoglobulin. Factors include the type of wound, how recent the exposure was and the behaviour of the bat. Please contact your Public Health Unit, which will provide advice on the appropriate course of action. Contact such as patting bats or exposure to urine and faeces does not constitute an at-risk exposure. Pre-exposure vaccination should be offered if the person has ongoing contact with bats. (New South Wales Public Health Bulletin 1996; Queensland Health, 2008))



References

- Bat Lyssavirus information for medical practitioners. (1996) New South Wales Public Health Bulletin 7, 128–129
http://www.publish.csiro.au/?act=view_file&file_id=NB96043.pdf Accessed 23.04.09
- Australian Veterinary Emergency Plan (AUSVETPLAN) 1999. *Disease Strategy for Australian Bat Lyssavirus in Domestic Animals and Captive Bat Colonies*.
<http://www.animalhealthaustralia.com.au/fms/Animal%20Health%20Australia/AUSVETPLAN/lyssafinal.pdf> Accessed 23.04.09
- Queensland Health (2008) Australian Bat Lyssavirus
www.access.health.qld.gov.au/nid/.../australianBatLyssavirus_fs.asp
Accessed 22.10. 09

Appendix C: Spectacled Flying-fox Monitoring Program

Survey Guidelines

A review of survey guidelines is being undertaken by the Commonwealth Department of the Environment, Water, Heritage and the Arts in 2009.

The Australian Museum Business Services (2004a) recommends the following survey techniques for the Spectacled Flying-fox:

Survey techniques

The primary method for surveying is to conduct visual searches for day roosts and night feeding sites. The locations of over 100 camps have been recorded and location information is available through the Queensland Environment Protection Agency (EPA). Population counts have been conducted and there is a network of people with knowledge about camp location and seasonal movements, including local people, orchardists, Queensland DERM (EPA) officers, flying-fox carer networks and traditional land owners.

Flying-foxes are easily seen at a distance as they roost or while they are flying. Flying-foxes have distinctive audible calls as well as distinctive odour and droppings.

In addition, a vegetation survey of the project area should be conducted to establish if significant stands of Spectacled Flying-fox food plants are present. Food plants are listed in Hall and Richards (2000).

Surveys should be conducted as follows:

Day surveys: searching for day roosts or presence of feeding activity:

Presence of feeding activity in fruit trees can be identified by looking for large compressed pieces of fruit skin and flesh on the ground under a tree. These fragments are known as "spats" and are made by flying-foxes when they compress fruit between their tongue and hard palate to extract the juice, then spit out the remains. Spats are about the size of a ten cent piece and are a clear sign of flying-fox feeding activity. Other signs of feeding activity include: broken leaders (new season's shoots) at the top of a tree, tooth marks on fruit under a tree, and stones from fruit under a tree (DNRE 2002).

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
Day Survey	<p>Searching for day roosts or presence of feeding activity:</p> <p>Conduct walking transects (100 m apart) looking, listening and smelling for the presence of roosting bats.</p> <p>Employ personnel familiar with the habitat requirements of the Spectacled Flying-fox who are able to identify their species, establish transects and conduct monitoring (observer).</p> <p>Examine ground and foliage for flying-fox scats and spats – see notes.</p> <p>Note that this species rarely vocalises during rain or during some periods of the day</p> <p>Take opportunistic photographs of bats, scats, spats etc. during transect monitoring.</p> <p>Avoid excessive trampling of vegetation whilst traversing transects.</p> <p>A food plant survey should be conducted by qualified personnel.</p> <p>Observer must clean footwear and any equipment that comes in contact with water, with a diluted bleach solution before moving on to monitoring sites within different</p>	<p>Transect needs to be established prior to commencement of monitoring program.</p> <p>Frequency of monitoring events will be reviewed after two years in compliance with the EMP.</p>	<p>Transect is clearly visible to the observer and GPS locations of start and end points have been recorded.</p> <p>Observer/s is experienced in bat monitoring.</p> <p>Undue trampling of vegetation is not evident.</p> <p>Report provided to Environmental Implementation Team.</p> <p>Footwear and other equipment that comes into contact with waterbodies should either be equipment dedicated for use at Ella Bay or</p>

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
	catchments to avoid the risk of spreading chytrid disease.		disinfected prior to arrival for each monitoring event.
Night Survey	<p>Looking for feeding and flying bats:</p> <p>Conduct walking transects (100 m apart) looking, listening and smelling for the presence of feeding or flying bats.</p> <p>Alternative methods may include night-time audio recording at selected sites or fruiting food plants within the project area.</p> <p>Observer must clean footwear and any equipment that comes in contact with water, with a diluted bleach solution before moving on to monitoring sites within different catchments to avoid the risk of spreading chytrid disease.</p>	Survey conducted once during the night.	Spectacled Flying-fox were observed.
Reporting	<p>Estimate the density of Spectacled Flying-fox for monitoring and control sites.</p> <p>Accurately map the distribution of all flying-fox species throughout the monitoring and control sites.</p> <p>Identify any management issues for the Spectacled Flying-fox with relation to the site.</p>	<p>At the completion of each transect.</p> <p>Compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the</p>	<p>Data are accurately recorded and processed.</p> <p>Reports have been read and filed on EBD Communications Register.</p> <p>Yearly summary report sent to DSEWPC and DERM in line the EBD EMP.</p>



Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
		DSEWPC reporting requirements. The report is to include tabulated data (bat census) from all monitoring events to allow assessment of trends.	
Corrective Actions (Linked to Reporting)	<p>Immediately notify Environmental Implementation Team if significant change in species diversity or abundance is observed that could be attributed to construction and/or operational works. Threatening processes are to cease until issue is addressed.</p> <p>Immediately notify Environmental Implementation Team if changes in abundance, composition or health of the food resources are observed, that could be attributed to operational works. Works to cease until threatening cause is rectified.</p> <p>Immediately notify Environmental Implementation Team of any management issues observed during monitoring. Threatening processes are to cease until issue is addressed.</p>		<p>Correct and timely action taken</p> <p>Correct and timely action taken</p> <p>Correct and timely action taken</p>



SPECTACLED FLYING-FOX MONITORING DATA SHEET			
Recorders			
Date		Time	
Day/Night Survey			
Site Location Details			
Transect Location	Start	E N	End E N
Bat Census			
Species	Observed	Other	Comments
Terrestrial Habitat Assessment			
% Canopy Cover		% Food Resources	
% Weed Cover			
Additional Comments/Notes			



Survey Effort Guide

The project survey should take approximately 10 hours per day and night survey. If activity is high and a camp is located in the project area, several repeat surveys throughout the year should be conducted.

Seasonal Considerations

Occupation of camps is highly seasonal. Camp movements are dependant upon seasonal fruiting and flowering of food plants.

Dusk Fly-Out Counts

A census for Spectacled Flying-foxes was conducted in 1998 at all known camps in the wet tropics between Daintree in the north, the Russell River in the south and the Atherton Tableland to the west. The census was undertaken by counting the number of bats leaving camps at dusk using hand counters. Counters assembled at camps before evening fly-out and stopped counting when animals were no longer seen leaving the colony or it became too dark to observe them. Bats were tallied in groups of up to 50 as they crossed a fixed point, usually a road verge or a powerline (Garnett et al. 1999).

References:

- Department of the Environment, Water, Heritage and the Arts (2009). *Pteropus conspicillatus* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra.
http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=185
Accessed 24.04.2009
- Hall, L. & G. Richards (2000). *Flying foxes: Fruit and Blossom Bats of Australia*. Sydney, NSW: University of NSW
- Australian Museum Business Services (AMBS) (2004a). *The Provision of Data for Draft National Fauna Survey Standards: Bats* Draft Report to the Commonwealth Department of Environment and Heritage. DNRE 2002
- Garnett, S.T., O.A. Whybird & H.G. Spencer (1999). *Conservation status of the Spectacled Flying-fox Pteropus conspicillatus*. Australian Zoologist. 31:38-54.

Appendix D: Spectacled Flying-fox Specialist Contacts

Contact one of the following specialists for:

- further information
- assistance with found/orphaned flying-foxes
- analyse for sick or dead flying-foxes. Make contact phone and email prior to arranging receipt and dispatching of the package.

Tolga Bat Rescue & Research Inc

PO Box 685 Atherton
QLD 4883
Tel/fax 07 4091 2683
Email: jenny@tolgabathospital.org

Val Bolton

Innisfail Bat Carer
Mobile: 0416 000 948

Heather Macgregor

Far North Queensland Wildlife Rescue (FNQWR) - Cairns
Tel: (07) 40534467
Mobile: 0407 962 075

Dr Hugh Spencer (Director)

Cape Tribulation Tropical Research Station – The BatHouse
PMB 5 Cape Tribulation
QLD 4873
Tel: (07) 40980063
Email: hugh@austrop.org.au



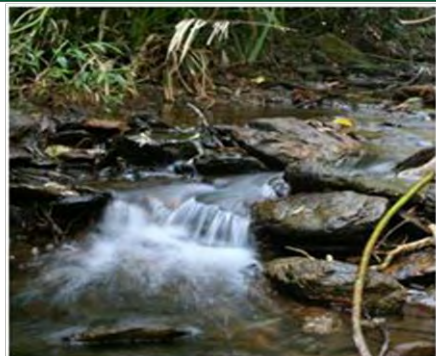
3.5 Marine Turtle Species Management Sub-Plan

Environmental Management Sub-Plan

For the

Marine Turtle Species

April 2009 Revision 1





Marine Turtle Species Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the EBD Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 1	April 2009	JT/KR	KR	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

Distribution List of Registered Copies and Key Contacts

Position	Name	Copy Number	Contact Details
Project Director		1	
Environmental Manager		2	
Construction Manager		3	
Design Manager		4	
DSEWPC		5	
Qld DERM		6	

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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

Refer to the *Ella Bay Environmental Management Plan* for further details.

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park and the Great Barrier Reef Marine Park.

Ella Bay is not a recognised significant marine turtle natal, mating or feeding area however marine turtle species have been reported as nesting along Ella Bay.

Document Structure

This document is a Sub-Plan of the Ella Bay Development Environmental Management Plan (EMP). This Sub-Plan outlines the specific management procedures that relate to Marine Turtle species that may be located in areas at Ella Bay.

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans. The EMP sets out the project details, management process and authority and training procedures.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Marine Turtle Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans.

This Sub-Plan outlines the specific management procedures that relate to Marine Turtles that may frequent coastal areas of Ella Bay and along the Ella Bay road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure that objectives listed in this Sub Plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.

Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and any corrective action necessary will be prepared and logged. This document and process will be subject to regular auditing and review.

2. Background

Ella Bay is not a recognised significant marine turtle natal, mating or feeding area. Listed marine turtle species considered likely or possible to occur include the:

- Loggerhead Turtle (*Caretta caretta*);
- Green Turtle (*Chelonia mydas*);
- Hawksbill Turtle (*Eretmochelys imbricate*);
- Olive Ridley Turtle (*Lepidochelys olivacea*);
- Flatback Turtle (*Natator depressus*); and
- Leatherback Turtle (*Dermochelys coriacea*).

Only the Green Turtle and the Flatback Turtle, have potential to nest along mainland beaches around Ella Bay.

While no turtle species were observed in targeted fauna surveys of the site and surrounding area, conducted in October 2006 and November 2008, incidental records of nests and sightings exist with one or two nestings per year in the area (Ella Bay Turtle Reports 2011).

This Environmental Management Sub-Plan for marine turtles has been developed as part of this commitment along with precautionary management measures outlined in this plan to protect any potential occurrences of these turtle species.

The Recovery Plan for Marine Turtles in Australia (Environment Australia 2003) adopts a threat-based approach, where the premise is to reduce the likelihood that current threats will cause mortalities, or to modify activities to reduce the potential for future mortalities at all stages of a marine turtle's life. While recovery actions are primarily in the hands of regulators a number a number of the identified threats and possible actions are relevant to the Ella Bay Development and are incorporated here as part of this Marine Turtle Environmental Sub Management Plan which with other Sub Management Plans are important components of the Ella Bay Development Environmental Management Plan.

The resort development is well set back (approx. 200m) from the beach with a naturally vegetated Esplanade forming a buffer zone providing a physical barrier between the resort and the beach.



3. Objectives of the Marine Turtle Environmental Management Plan

The primary aim of this Environmental Management Sub-Plan is to ensure commitment to mitigating and managing all potential impacts on marine turtles within the EBD area, ensure that this level of environmental protection is consistent with relevant Commonwealth and State legislation, and that best practices in marine turtle habitat conservation are applied over the life of the EBD project.

This Environmental Management Sub-Plan is aligned with the objectives of the Environment Australia *Recovery Plan for the Marine Turtles in Australia* (Environment Australia 2003) ie

“To significantly improve the conservation status and long term survival of each species through protection of existing populations or expansion of existing populations into previously inhabited areas”

The Recovery Plan for Marine Turtles in Australia identifies the following threats to marine turtle nesting success: marine debris that may tangle or choke turtles; light pollution from coastal developments, street lights and industrial complexes (that can disorientate hatchlings, as well as nesting females, leading to stranding and/or increased predation); tourism and recreation activities (e.g. nesting females may refuse to land on a beach subject to high levels of uncontrolled human access for fishing, camping, etc); vehicle damage (that can crush nests and/or damage nesting habitat by compacting sand and creating wheel ruts that trap hatchlings); and faunal predation of eggs (including introduced predators such as feral Pigs, Foxes *Vulpes vulpes* and feral Dogs) (Ecological, 2009)

The envisaged outcomes of the Environmental Management Sub-Plan includes the retention and enhancement of all marine turtle habitat within the EBD, the preservation and persistence of the surrounding marine turtle population, ensuring that individuals of these turtle species are not harmed during the clearing and construction process; and to ensure the long-term future of Marine Turtles within the local area by protecting their habitat from any detrimental processes as a result of the construction and operation of the Ella Bay Development.

This Environmental Management Sub-Plan seeks to achieve these ends by outlining a program of actions for implementation over the life of the EBD development.

4. Marine Turtle Profile

Site Distribution

Marine turtles are generally highly migratory, moving between feeding grounds and rookeries (mating and nesting areas), with both males and females undertaking migrations of up to 3,000 km (Environment Australia 2003). Turtles typically nest along the Queensland coast from October to February, and they predominantly nest at night around the high tide (GBRMPA 2009). Nesting sites are situated above the high tide mark, and nesting females prefer moist sand to dry sand (GBRMPA 2009). Loggerhead, green and flatback hatchlings emerge from December to May (GBRMPA 2009), usually at night (although they do emerge during the day on occasion, Thorogood 2009).

All marine turtle species are experiencing serious threats to their survival. The main threats are:

- habitat degradation and destruction, particularly seagrass beds, mangrove forests;
- nesting beaches and coral reefs;
- entanglement and drowning in fishing gear and shark nets and drum lines;
- boat strike;
- ingestion of plastic bags;
- pollution and declining water quality;
- indigenous over-harvesting of both turtles and eggs;
- predation of eggs by native and introduced animals; and
- light horizon disorientation (e.g. street and house lights).

(Environment Australia 2003; Kirkwood & Hooper 2004; GBRMPA 2009)

The majority of strandings and mortality reports in Queensland are related to boat strike and entanglement in fishing gear, with the majority of the reports concentrated in southern Queensland (Thorogood 2009 and references cited within).

Green Turtle (*Chelonia mydas*)

The green turtle is listed as 'vulnerable', 'marine' and 'migratory' under the EPBC Act and 'vulnerable' under the NCWR. Globally, it is also listed as 'endangered' by the IUCN.

Breeding is seasonal but cyclic over 4-6 years (mean 5.4yrs) and driven primarily by the El Nino cycle in northern GBR waters (Limpus 2008 and references cited within). Nesting primarily takes place in a limited number of large rookeries with some smaller rookeries, however random females nest along North Queensland coast. Data from rookeries shows that;

- mating commences from September reaching a peak in October/November and ceases by mid November/December;
- nesting occurs from October to March with a peak in late December to early January,
- nesting cycles over a two to three week (mean 12 days) time period during this period with up to 6 nestings in the same area;
- the nesting female stays locally around what is described as the internesting habitat during the full nesting season;
- hatchlings emerge early December to May
- nesting is repeated every two to three weeks with up to five to six nestings in one season;

Green Turtles are the most likely species to nest on the Ella Bay beach, the nestings at Ella Bay are from a small number of females (Thorogood 2009).

Adult females display high fidelity to nesting beaches. Most females return to the same beach for successive clutches (within a nesting season) and successive nesting seasons (Limpus et al. 2001).



There is little or no feeding by the breeding females while in the internesting habitat (Limpus 2008). While Green turtles feed extensively on seagrass, particularly *Halophila ovalis*, *Halophila spinulosa* and *Halodule uninervis* as a primary food source, this causes them to be indirectly affected by seagrass health, which can be negatively impacted upon by sediment, nutrient and pesticide levels (e.g. McKenzie & Campbell 2003). *Halophila*, a preferred food item, appears to be particularly sensitive to the duration and frequency of light-deprivation events such as the high-sediment loads of floodwater. This is particularly true for environments subject to temporarily variable light conditions (Longstaff et al. 1999), such as inshore waters of Innisfail.

The northern GBR stock is the largest remaining green turtle breeding population in the world (Limpus 2008). Although the population has shown a general increase in numbers the current generation of northern GBR green turtles are very seriously threatened by (Limpus 2008):

- excessive harvest of adult and near-adult turtles across foraging grounds, and
- climate and habitat related loss of hatchling success

Flatback Turtle (*Natator depressus*)

The flatback turtle is listed as 'vulnerable', 'migratory' and 'marine' under the EPBC Act and 'vulnerable' under the NCWR.



Breeding is seasonal in eastern Queensland waters (Limpus 2007 and references cited within):

- mating occurs mid October
- nesting peaks in late November to early December and typically ceases by late January, and
- hatchlings emerge from early December to (typically) late March, with peak hatching in February

Flatback turtles may nest on Ella Bay beaches (Thorogood 2009)

Adult females display high fidelity to nesting beaches (Limpus 2007). Most females return to the same beach for successive clutches (within a nesting season) and successive nesting seasons.

Within waters of the GBR, flatbacks appear to prefer soft-bottomed waters, between 6 and 35 m deep, and are rarely found over intertidal seagrass meadows or coral reefs (Robins & Mayer 1998 in Limpus 2007).

Adult turtles are carnivorous and commonly forage for soft-bodied benthic invertebrates. Juvenile and adult flatbacks seem to occupy similar habitats and forage on benthic organisms (DE&WR 2006).

Loggerhead Turtle (*Caretta caretta*)

The loggerhead turtle is listed as 'endangered', 'marine' and 'migratory' under the EPBC Act and 'endangered' under the NCWR. Globally, it is also listed as 'endangered' by the IUCN.

Loggerhead turtles feed on benthic invertebrates, such as crustaceans and molluscs, in shallow, turbid waters. And as is the case with the green turtle, they tend to maintain small some ranges within their foraging grounds (Thorogood 2009). Loggerhead turtles commonly



forage in shallow, turbid waters (GBRMPA 2009).

Loggerhead turtles are unlikely to nest on the beach adjacent to the proposed development although they may use adjacent waters for foraging (Thorogood 2009 and references cited within).

During the period 1999 to 2004, no loggerheads have been reported stranded in the Innisfail region (Thorogood 2009).

Hawksbill Turtle (*Eretmochelys imbricata*)

The hawksbill turtle is listed as 'vulnerable', 'migratory' and 'marine' under the EPBC Act and 'vulnerable' by the NCWR. It is also listed as 'critically endangered' by the IUCN. Globally, the hawksbill and leatherback are considered the most threatened marine turtles (IUCN 2007).

Hawksbill turtles are unlikely to nest on the beach adjacent to the proposed development



(Thorogood 2009) although they may use adjacent waters for foraging (DEWHA 2009).

Hawksbills appear to forage within rocky and coral reef habitats (Witzell 1983 in DE&WR 2006b) for sponges and algae together with seagrass and a range of benthic invertebrates (Whiting 2000a in DE&WR 2006b). They commonly forage in shallow, turbid waters (GBRMPA 2009).

During the period 1999 to 2004, two hawksbills have been reported stranded in the Innisfail region (Thorogood 2009).

Olive Ridley Turtle (*Lepidochelys olivacea*)

The olive ridley is listed as 'endangered', 'migratory' and 'marine' under the EPBC Act and 'endangered' under the NCWR. It is also listed as 'endangered' by the IUCN.

Olive ridley turtles are unlikely to nest on the beach adjacent to the proposed development although they may use adjacent waters for foraging (Thorogood 2009 and references cited within).

The olive ridley primarily breeds in the Gulf of Carpentaria and Northern Territory. Nesting has not been recorded in the GBR (GBRMPA 2009).



The olive ridley appears to forage in benthic and pelagic habitats, for mostly gastropods and bivalves. It is most commonly found in waters with a depth of 11 to 40 m (Robins 1995 in DE&WR 2006b) but has also been reported in water more than 100 m deep (Hughes 1974a in DE&WR 2006b).

During the period 1999 to 2004, no olive ridleys have been reported stranded in the Innisfail region (Thorogood 2009 and references cited within).

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback turtle is listed as 'endangered', 'migratory' and 'marine' under the EPBC Act and 'endangered' under the NCWR. It is also listed as 'critically endangered' by the IUCN. Globally, the leatherback and hawksbill are considered the most threatened marine turtles (IUCN 2007).



Leatherback turtles are unlikely to nest on the beach adjacent to the proposed development (Thorogood 2009), although they may use adjacent waters for foraging (DEWHA 2009).

Leatherbacks are pelagic species, uniquely adapted to survive in cold waters (Thorogood 2009). They feed on gelatinous organisms such as jellyfish and salps from the surface layer of the water column to depths of over 200 m, and their distribution is influenced by prey abundance (DE&WR 2006b).

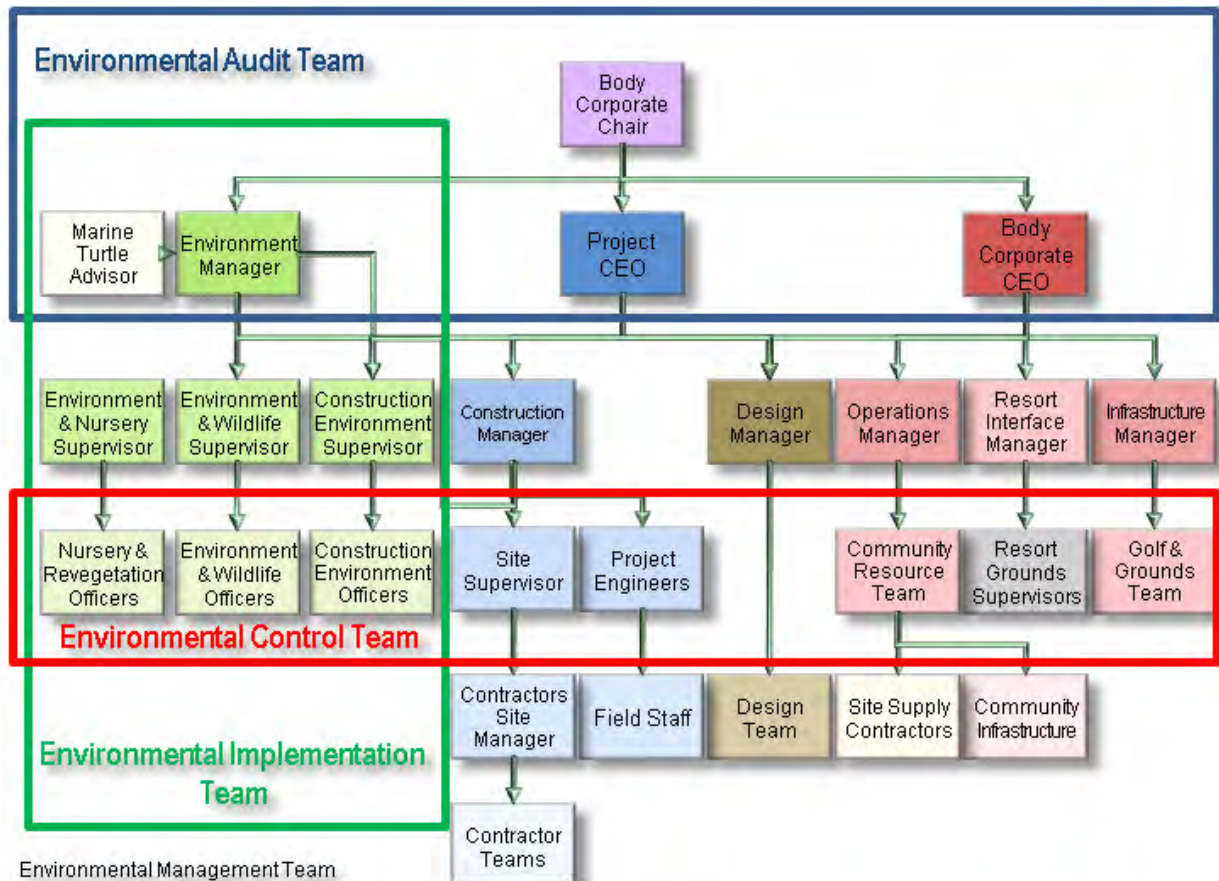


During the period 1999 to 2004, no leatherbacks have been reported stranded in the Innisfail region (Thorogood 2009 and references cited within).

5. Responsibilities and Authorities

The organisational structure of the project, in terms of environmental responsibilities, is outlined in detail in the Ella Bay Development Environmental Management Plan (EBD EMP). Ella Bay Developments and Sub-Contractors during the Construction Stage are to be allocated to one or more teams (usually one) to be known as:

- **EAT** - Environmental Audit Team
- **ECT** - Environmental Controls Team
- **EIT** - Environmental Implementation Team



Marine Turtle Advisor (MTA)

The Marine Turtle Advisor will advise on all elements of marine turtle conservation and management programs. The MTA will provide expert advice to the EBD Environmental Staff regarding:

- Conducting turtle monitoring of the EBD during the construction and operational phases;
- Monitoring the efficacy of all turtle mitigation at the construction and operational phases. This monitoring program must seek to identify if there is a regular annual turtle population, any negative (or positive) turtle population trends and likely causal factors;
- Providing advice to the EBD Environmental Manager and EBD management on any review or required modification/ changes to mitigation strategies, and signs off on their implementation;
- Providing feedback on the annual report of the state of the marine turtle population(s) and the effectiveness of mitigation strategies.

The MTA will also participate in the external audit function for the marine turtle management and compliance to this environmental management sub-plan.



The MTA is to be a member of both the Ella Bay Developments Environmental Audit Team (EAT) and the Ella Bay Developments Environmental Implementation Team (EIT).



6. Reporting and Sub-plan Reviews

Reporting

Systematic reporting underpins all phases of planning, construction and operation. Reporting includes three main types:

- Regular and Event Based** - Based on the elements of the following environmental management schedules (sections 7,8&9) for the respective phase of the project: planning, construction and operation.
- Monthly** - During the months of November to April monthly reports will be prepared by the Environmental Implementation Team to inform of the progress of the marine turtle environmental management strategies. The report will be collated from the communications register (CR) contingencies, procedural non-compliance and if necessary recommendations for changes or improvements.
- Annual report** - Prepared by the Environmental Implementation Team and based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (annual) will be undertaken by the Environmental Audit Team (including the MTA) to examine the reports and to review changes or improvements to the subplan, including any additional mitigation measures found to be necessary.



7. Planning Phase

Potential Impacts during the Planning Phase

- Marine debris and general litter (particularly plastic).
- Predation of eggs by feral animals, including dogs and pigs.
- Increased human activity.
- Disturbance of the breeding, nesting and hatching beach area between the months of November to April.

Objectives

- No disturbance to, or deterioration of, the beach habitat.
- No disturbance or interference of marine turtles.

Performance Criteria

- Ella Bay vehicles are prohibited to drive on the beach during nesting season.
- Monitoring of marine turtle species has been conducted in accordance with the Marine Turtle Monitoring Program and its established protocols.
- Any human derived marine debris or rubbish especially plastic to be collected and removed from the beach.

Mitigation Measures, Monitoring and Compliance

The following table outlines the initial environmental planning activities relating to Marine Turtles that are to be completed prior to the commencement of construction. Responsibilities for various actions will be assigned to either of 3 Environmental teams composed of various personnel and shown on the figure above:

The environmental team will be measured by the performance criteria (**PC**) with monitoring events being recorded in a compliance register (**CR**) in the tables below.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Human-Turtle Interactions	<p>Inform and Educate :</p> <p>An induction course to be prepared on appropriate behaviour and protocols around turtles</p> <p>All staff and (sub)contractors to attend an induction course on behaviour and protocols around turtles</p>	<p>Before Planning Commences : Reporting system for turtle 'incidents' to be developed and communicated to all staff and (sub)contractors.</p> <p>Weekly - Monitor the beach during the peak turtle nesting and hatching periods (within the period November to April)</p>	<p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>Event Based: maintain log of any turtle related incidents on site</p>	<p>Re-brief staff or (sub) contractors as necessary.</p> <p>Immediate dismissal from project for persons disturbing nesting area.</p> <p>Review and amendment of educational strategies.</p>
Habitat Disturbance	<p>Compliance: Access to vehicles on the beach is restricted all year around. Exceptions will only be made for emergencies, or with permit for human derived rubbish collection (threat to marine turtles).</p> <p><i>When access is permitted, restrictions will further apply including driving on the wet compacted sand by the water's edge.</i></p>	<p>November to April - Access to vehicles on the beach prohibited during the turtle breeding, nesting and hatching periods.</p>	<p>ECT</p>	<p>Event Based: Incident reporting</p>	<p>Non compliance is a dismissal offence.</p>
Marine Debris	<p>Implement: Collection (and disposal) of human derived</p>	<p>Ongoing: Mitigation undertaken regularly throughout the year.</p>	<p>EIT</p> <p>EAT</p>	<p>Event Based: Incident reporting</p>	



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>marine debris or rubbish encountered on the beach. Priority given to plastic material.</p> <p><i>If necessary, access will be permitted after Environmental Manager approval.</i></p> <p><i>Vehicles restricted to low tyre pressure (Quad), driving on the wet compacted sand by the water's edge.</i></p>	Priority implementation during the turtle breeding, nesting and hatching periods (November to April).		Beach Access permit issued by EAT on single use basis.	
Feral Pests Including pigs and dogs	Implement: <i>Pest and Wallaby Management Sub-Plan</i>	Ongoing	EAT	Event Based: Incident reporting	



8. Construction Phase

Potential Impacts during the Construction Phase

Potential impacts to Marine Turtle species during construction of the Ella Bay Development include:

- Increased human activity;
- Disturbance and degradation to turtle habitat;
- Deterioration of water quality;
- Marine debris, general litter and pollutants especially plastic material;
- Light and noise; and
- Predation of eggs by feral animals, including dogs and pigs.

Objectives

- No disturbance to, or deterioration of, the beach habitat.
- No disturbance or interference of marine turtles.

Performance Criteria

- No unnecessary interaction between humans and turtles.
- Monitoring program shows no decrease in diversity and/or abundance of local turtle populations.;
- Monitoring program does not indicate disorientation of Marine Turtle species on the beach.
- No damage or disturbance to Marine Turtle species habitat.;
- Monitored water quality parameters are within the acceptable range; and
- No evidence of the egg predation by feral animals.

Mitigation Measures, Monitoring and Compliance

If the construction activities are deemed to have an adverse effect on sea turtle numbers, then immediate steps will be taken to mitigate impacts and implement required corrective actions.

All incidents will be reported and managed through to resolution via EBD's incident reporting procedures. Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and the cause should be prepared and is to be included as part of the EBD Communications Register. Control measures are to be implemented, rectified and/or replaced in the event of non-conformance.

Incidents relating to marine turtles will also be documented as part of the turtle monitoring program. The Environmental Implementation Team will investigate reasons why performance indicators have not been met and will ensure that all relevant staff and contractors are re-briefed and advised of their responsibilities. Where management methods are not achieving the desired outcomes, the Marine Turtle Environmental Management Sub-Plan will be reviewed in collaboration with the Marine Turtle Advisor.

The following table outlines the environmental control measures developed to ensure protection of Marine Turtle species and their habitat during the construction of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Sub-Plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Human-Turtle Interactions	<p>Inform and Educate :</p> <p>An induction course to be prepared on appropriate behaviour around turtles.</p> <p>All staff and (sub)contractors to attend an induction course on behaviour around turtles.</p>	<p>Before Construction: Reporting system for turtle 'incidents' to be developed and communicated to all staff and (sub)contractors</p> <p>Weekly (November to April): Monitor beach during the peak turtle nesting and hatching periods.</p>	<p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>Event Based: EIT to maintain log of any turtle related incidents on site, to be included in EBD CR.</p> <p>Event Based: EIT to maintain log of any turtle related incidents on site, to be included in EBD CR.</p>	<p>Re-brief staff or (sub) contractors as necessary.</p> <p>Immediate dismissal from project for persons disturbing nesting area.</p> <p>Review and amendment of educational strategies.</p>
Habitat Disturbance	<p>Compliance: Vehicle access to the beach is restricted all year around. <i>(Note: Exceptions for emergencies. This will be restricted driving on the wet compacted sand by the water's edge.)</i></p>	<p>November to April: Vehicle access prohibited during turtle breeding, nesting and hatching periods.</p>	ECT and EAT	<p>Event Based: Incident reporting to be included in EBD CR.</p>	<p>Non compliance is a dismissal offence.</p>
Light Disturbance	<p>Compliance: Vehicle access to the beach is restricted all year around. <i>(Note: Exceptions for emergencies. This will be restricted driving on the wet compacted sand by the water's edge.)</i></p> <p><i>Note: The potential for artificial light from the EBD affecting the beach environment is considered minor due to the buffer of Esplanade vegetation of at least 100m wide.</i></p>	<p>November to April: Vehicle access prohibited during turtle breeding, nesting and hatching periods.</p>	ECT and EAT	<p>Event Based: Incident reporting to be included in EBD CR.</p>	<p>Non compliance is a dismissal offence.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>Implement: November to April, outside daylight hours operations will be minimised. Operational light levels will be minimised. Monitoring program to inform operational process.</p> <p>Implement: Outdoor light level shall be reduced by the application of a range of strategies. Refer to <i>Operations Mitigation/Control Measures</i> for light reduction methodologies.</p> <p>Compliance: Areas of construction shall be lit only when personnel are present or equipment is operating.</p> <p>Implement: Where safety of personnel is not compromised, reflective tape may be used. The purpose is to reduce the amount of ambient light required.</p>	<p>November to April: A <i>Light Audit Program</i> shall be conducted when lighting is used for construction during turtle:</p> <ul style="list-style-type: none"> • Breeding; • Nesting; and • Hatching periods. <p>Asses and measure illumination levels at the beach as well as light spill into marine areas.</p>	ECT	Monthly: Light Audit results to be reported and included in EBD CR. EAT to audit this data regularly during turtle nesting season.	Non conforming light breaches to have further controls and compliance measures implemented.
Water Quality	<p>Compliance: Lights shall be directed away from large plant and equipment.</p> <p>Strict application guidelines for pesticides and herbicides are in place.</p>				
Marine Debris	<p>Implement: Collect (and dispose) of human derived marine debris or rubbish encountered on the beach. Priority given to plastic material.</p> <p><i>If necessary, access will be permitted after Environmental Manager approval.</i></p> <p><i>Vehicles restricted to low tyre pressure (Quad), driving on the wet compacted sand by the water's edge.</i></p>	Ongoing: Mitigation undertaken regularly all year.	ECT and EIT	<p>Event Based: Incident reporting to be included in EBD CR.</p> <p><i>(Note: Potential data resource for use by appropriate agencies)</i></p>	

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Feral Pests	Implement: Undertake <i>Pest and Wallaby Management Sub-Plan</i> and <i>Feral Pig Control Program</i> . Compliance: Enforce strict adherence to no dogs on site (zero tolerance).	Ongoing: Implement throughout the year. <i>Note: Priority activity during nesting period.</i>	EIT	Event Based: Incident reporting to be included in EBD CR.	
Noise Disturbance	Compliance: Noise restrictions, particularly for low frequency, will be in force at night during the turtle season. Develop and Implement: Guidelines on allowable on night activities. Determined by low frequency emissions.	Prior to Nesting Season: Complete overnight audit. During Nesting/Hatching Season: Spot audit based on site activity and identified turtle activity <i>Note: Form part of monitoring program.</i>	ECT	Annual: Report audit results to EAT.	Non conforming noise breaches to have controls implemented.
Natural Occurrences: i.e. King Tides	Awareness Raising: Notify DERM of occurrences.	During Nesting/Hatching Season (after King Tides): Inspect nesting sites.	EIT	Event Based: Incident reporting to be included in EBD CR.	Refer to DERM, appropriate actions regarding egg and nests.



9. Operation Phase

Potential Impacts during the Operation Phase

Potential impacts to Marine Turtle species during the operation of the Ella Bay Development include:

- Increased human activity;
- Disturbance and degradation to turtle habitat;
- Deterioration of water quality;
- Marine debris, general litter and pollutants;
- Light and noise; and
- Predation of eggs by feral animals and dogs.

Objectives

- No disturbance to, or deterioration of, the beach habitat.
- No disturbance or interference of marine turtles.

Performance Criteria

- No interaction between humans and turtles.
- Monitoring program shows no decrease in diversity and/or abundance of local turtle populations.
- Monitoring program does not indicate disorientation of Marine Turtle species on the beach.
- No damage or disturbance to Marine Turtle species habitat.
- Monitored water quality parameters are within the acceptable range; and
- No evidence of the predation by feral animals.

Mitigation Measures, Monitoring and Compliance

If the operational activities are deemed to have an adverse effect on sea turtle numbers, then immediate steps will be taken to mitigate impacts and implement required corrective actions.

All incidents will be reported and managed through to resolution via EBD's incident reporting procedures. Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and the cause should be prepared and kept in the EBD CR; control measures are to be implemented, rectified and/or replaced in the event of non-conformance.

Incidents relating to sea turtles will also be documented as part of the turtle monitoring program. The EBD EAT will investigate reasons why performance indicators have not been met and will ensure that all relevant staff and contractors are de-briefed and advised of their responsibilities. Where management methods are not achieving the desired outcomes, the Marine Turtle Management Sub-Plan will be reviewed.

The following table outlines the environmental control measures developed to ensure protection of Marine Turtle species and their habitat during the operation of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Sub-Plan.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Human-Turtle Interactions	Inform and Educate : Develop induction course for appropriate behaviour around turtles.	Before Operations Commence: Reporting system for turtle 'incidents' to be developed and communicated to all staff and (sub)contractors. Weekly (during November to April): Monitoring beach area for nesting and hatching. Ongoing: Observational monitoring	EIT	Event Based: EIT to maintain log of any turtle related incidents on site, to be included in EBD CR. Event Based: EIT to maintain log of any turtle sighting incidents on site, to be included in EBD CR.	Re-brief staff or (sub) contractors as necessary.
	Implement: All staff and (sub)contractors to attend an induction course on behaviour around turtles.		EIT		Immediate dismissal from project for persons disturbing nesting area (zero tolerance)
	Educate and Implement: All resort guests will receive an induction through the Welcome Centre		EIT		Review and amendment of educational strategies.
	Display boards and information signage will be erected along the beach. Compliance Monitoring: Tourism and recreational activities to be monitored.		EIT		
Habitat Disturbance	Compliance: Vehicle access to the beach is restricted all year around. <i>(Note: Exceptions only for emergencies. This will be restricted driving on the wet compacted sand by the water's edge.)</i>	November to April: Vehicle access prohibited during turtle breeding, nesting and hatching periods.	ECT and EAT	Event Based: Incident reporting to be included in EBD CR.	Non compliance is a dismissal offence.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Light Disturbance	<p><i>Note: The potential for artificial light from the EBD affecting the beach environment is considered minor due to the buffer of Esplanade vegetation of at least 100m wide.</i></p> <p>Implement (precaution): Outdoor light level shall be reduced by the application of a range of strategies. These include:</p> <ul style="list-style-type: none"> • Maximise use of yellow, orange and red lights within F 50m of beach (except where safety requires other coloured lights); • Reduce lux levels in specific identified 'sensitive' areas; • Using focused down lighting; • Shielding light sources; • Using artificial or natural screens; • Recessing sources; • Lowering mountings; • Using timers; and • Using motion sensors. <p>Implement: Specifically where white and other coloured lights including fluorescent lights are unavoidable, reduce light spill by either shading or orientation.</p> <p>Implement: Ensure minimal light visible from the beach. No lights will face seawards. Shades will be constructed over lights to prevent sky glow.</p>	<p>November to April: Audit illumination at the beach and light spill into marine areas prior to the turtle breeding, nesting and hatching periods (November to April) to.</p>	ECT	<p>Annually: Light Audit results to be reported to and included in EBD CR.</p> <p>Ongoing/Spot: EAT to audit this data regularly during turtle nesting season.</p>	Non conforming light breaches to have further controls implemented

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>Implement: Lights will be low to the ground wherever possible. Pathway lights will be less than one metre in height and shaded to prevent upward illumination.</p> <p>Implement: Where colour definition or safety is not critical, light types shall be selected that are least disruptive to sea turtles (such as shielded or recessed lighting with long wavelengths).</p>				
Water Quality	<p>Compliance: Only pre-approved pesticides and herbicides will be used on site</p> <p>Compliance: Strict application guidelines for pesticides and herbicides are in place</p>	Ongoing: A <i>Water Quality Monitoring Plan</i> implemented	EAT	Event Based: As required	Investigate pollutant source and promptly rectify.
Marine Debris	Implement: Collection and disposal of any marine debris or rubbish encountered on the beach	Ongoing: Mitigation undertaken regularly all year.	ECT and EIT	Event Based: Incident reporting to be included in EBD CR.	Non conforming noise breaches to have further controls implemented.
Feral Pests	<p>Implement: <i>Pest Management Plan</i> and active <i>Feral Pig Control Program</i>.</p> <p>Compliance: No dogs allowed on site..</p>	Ongoing: Implement throughout the year.	EIT	Event Based: Incident reporting to be included in EBD CR.	
Natural Occurrences: i.e. King Tides	Awareness Raising: Notify DERM of occurrences.	During Nesting/Hatching Season (after King Tides): Inspect nesting sites.	EIT	Event Based: Incident reporting to be included in EBD CR.	Refer to DERM, appropriate actions regarding eggs/nests be undertaken.



10. Auditing and Reporting

Key aspects of the auditing and reporting framework is:

- **Accountable** - An independent audit by the Marine Turtle Advisor and the Environmental Manager will determine whether the performance indicators have been met and maintained and provide information for the Environmental Management Sub-Plan Review.
- **Measurable** - Audit within six months of project commencement followed by annual audits during the construction and operational phases.
- **Peer Reviewed** - A copy of the audit will be provided to DSEWPC and DERM.
- **Adaptive** - The Site Environmental Staff will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include tabulated data (turtle census and water quality) from all monitoring events to allow assessment of trends.
- **Assessable** - Logs are to be kept of all sample results and subsequent corrective action (s) (if any). They are an integral part of the EBD Communications Register, details of which are detailed in the EBD EMP.

11. References

Literature Cited

- DE&WR 2006b, *Marine Species Conservation – Marine Turtles* [online], <http://www.environment.gov.au/coasts/species/turtles/index.html> updated 27 August 2007, accessed 9 April 2009.
- DEWHA 2009, EPBC *Protected Matters Search Tool*, [online database] <http://www.environment.gov.au/erin/ert/epbc/index.html> , accessed 7 April 2009
- Environment Australia 2003, ***Recovery Plan for Marine Turtles in Australia*** ISBN 0 6422 1436 0. PDF file. *Recovery Plan for Marine Turtles in Australia* (PDF - 567 KB) www.environment.gov.au/coasts/publications/turtle-recovery/ -
- GBRMPA 2009, Marine Turtles [online], http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/natural_values/marine_turtles accessed 8 April 2009.
- IUCN 2007, *The IUCN Red List of Threatened Species* [online], <http://www.iucnredlist.org>, accessed 8 April 2009.
- Kirkwood, J. M. & Hooper, J. N. A. 2004, *Burnett Mary Regional Assessment Coastal & Marine Biodiversity*, submitted to Burnett Mary Regional Group for Natural Resources Management, Queensland Department of Primary Industries & Fisheries, Brisbane.
- Lee Long, W.J., Coles, R.G. & McKenzie, L.J. 1997, 'Issues for seagrass conservation management in Queensland', *Pacific Conservation Biology*, 5: 321 – 328.
- Limpus, C. J. 2008, *A Biological Review of Australian Marine Turtles. 2. Green Turtle Chelonia mydas (Linnaeus)*, Environmental Protection Agency, Brisbane.
- Limpus, C. J. 2007, *A Biological Review of Australian Marine Turtles. 5. Flatback Turtle Natator depressus (Garman)*, Environmental Protection Agency, Brisbane.
- Limpus, C. J., Carter, D. and Hamann, M. 2001, The green turtle, *Chelonia mydas*, in Queensland: the Bramble Cay rookery in the 1979–1980 breeding season, *Chelonian Conservation and Biology*, 4(1): 34–46.
- Longstaff, B. J., Loneragan, N. R., O'Donohue, M. J. & Dennison, W. C. 1999, 'Effects of light deprivation on the survival and recovery of the seagrass *Halophila ovalis* (R. Br.) Hook', *Journal of Experimental Marine Biology and Ecology*, 234:1-27.
- McKenzie, L.J. & Campbell, S.J. 2003, *Seagrass Resources of the Booral Wetlands and the Great Sandy Strait*, Department of Primary Industries and Queensland Parks and Wildlife Service, Cairns
- Thorogood, J. 2009. 'Ella Bay Development - Marine Turtle Review' frc environmental, frc Ref: 090307



Legislation

Environment Protection and Biodiversity Conservation Act (the EPBC ...

The Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act) is the Australian Government's central piece of environmental legislation. ...
www.environment.gov.au/epbc/index.html

Land Protection (Pest and Stock Route Management) Act 2002
Queensland. Land Protection (Pest and Stock Route Management) Act. 2002. Reprinted as in force on 1 July 2009. Reprint No. 3B. This reprint is prepared by ...
www.legislation.qld.gov.au/LEGISLTN/.../L/LandPrPSRMA02.pdf

Land Protection (Pest and Stock Route Management) Regulation 2003
Queensland. Land Protection (Pest and Stock Route Management) Act 2002. Land Protection (Pest and Stock Route Management). Regulation 2003 ...
www.legislation.qld.gov.au/LEGISLTN/.../L/LandPRPSRMR03.pdf



Appendix A: Emergency Incident Procedure

Relocation procedure: Turtles identified as requiring relocation in a regular inspection in an area that may be disturbed (or due to an emergency incident) shall be relocated using the process outlined below.

Notify DERM immediately via phone and email, do not allow the turtle to be touched or moved until a DERM representative arrives onsite.

Sick, injured and deceased turtle procedure: Notify DERM immediately, via phone and email, do not allow the turtle to be touched or moved until a DERM representative arrives onsite.

DERM contact details for a sick or dead turtle is **1300 130 372**, with details of:

- **Location**
- **What animal it is (if known) and**
- **Whether it is dead or alive.**

The local DERM Wildlife specialist is **Dan Mead** on **0427 126 602**

Chemical spill or other habitat contamination: Refer to the *Cyclone, Fire & Emergency Management Sub-plan* for immediate response and remediation measures for chemical spills or other habitat contamination. If marine turtle species are considered to be at risk as a result of the incident, notify DERM via phone and email.

The Pollution Hotline for DERM is **1300 130 372**

Appendix B: Marine Turtle Species Monitoring Program

Monitoring Methodology

During the nesting and hatching periods (November to April), weekly monitoring of the beach will take place on foot during the early hours of the morning. Any marine turtle tracks will be recorded. Fresh tracks that are not marred by footprints, crab tracks, etc and older tracks that are found exclusively above the high water mark and are generally overlaid by animal tracks (e.g., crabs, sea birds, domestic or feral animals). Older tracks are comparatively faint and appear the colour of the surrounding beach.

Any nests discovered will be recorded by GPS coordinates. Nests discovered prior to operation will not identified by any demarcation to reduce the risk of vandalism. Nests discovered once operational will be demarcated by using numbered poles. Whenever possible, the species will be identified based on the track-marks left on the beach, and confirmed after hatching.

Nest information is registered, such as nest location and distance from the sea, number of eggs, date, time and name of observer. If tags are found, the date and locality where the turtle was found, together with the names and institutions participating, should be sent to the return address engraved on the tag or to a central tagging database depending on the procedure operating in the region.

Nesting times will be recorded and hatching dates estimated. Continuous follow-up of the nests will be carried out, in the 10 days prior to the expected hatching date. .

After hatching, any nests will be excavated in order to estimate the total number of eggs laid, fertile eggs, hatched eggs, hatchling deaths inside the nest, hatchlings leaving the nest, depth of nest, amongst other important information.

A datasheet (see below) allows for data collection and recording. It will be used for recording nesting activities and shall contain information on the species, nesting date, location (including coordinates), beach characteristics, moon phase, type of tide, and if known: number of eggs laid, fertile eggs, eggs hatched, hatchling deaths inside the nest, hatchlings leaving the nest, amongst other important data.

Management Methodology

The approach to be adopted for newborn turtles, given the complexity as well as possible behavioural changes and disorientation, will be to only intervene where and when necessary, attempting to ensure that natural processes occur as normal. Records shall also be kept of sea turtles found (alive or dead) along the Ella Bay coastline, as well as of other species appearing along the coast during this period (e.g., fish and marine mammals).

If results of marine turtle monitoring indicate a change in abundance or composition of turtle assemblage has occurred, an action plan to assess causes will be developed. Immediately respond, identify cause and rectify if feasible. Rectify cause through information and training.

If causes are determined to have resulted from the development (e.g. direct impacts to nesting sites, hatchling disorientation) implement measures to rectify, increase monitoring, re-evaluate the Marine Turtle Management Plan and if required consult further with marine turtle experts.

Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
Beach Inspection	<p>Prior to monitoring, observer to be familiar and able to identify all marine turtle species.</p> <p>Observer to describe any vegetation cover, presence of logs, rocks and condition of the sand.</p> <p>Observer to walk the beach and record the GPS location of any observed turtles and/or tracks.</p> <p>Take opportunistic photographs of any turtles, tracks, etc during monitoring.</p> <p>Avoid using high wattage lighting whilst monitoring as it may disorientate any turtles present.</p> <p>Avoid making excessive noise whilst monitoring.</p>	<p>Over the nesting and hatching periods (November to April), monitoring is to occur weekly during the daytime (depending on weather conditions and presence of turtles).</p> <p>Frequency of monitoring events will be reviewed after the first turtle 'season' in compliance with the EMP.</p> <p>Monitoring should immediately follow a king tide to identify if any nests have been affected.</p>	<p>Observer/s is experienced in turtle monitoring.</p> <p>Any signs of turtles have been recorded and GPS location points noted.</p> <p>Condition of the beach habitat has been recorded.</p> <p>Relevant action taken if king tide affects a nest.</p>
Reporting	<p>Accurately map the distribution of any turtle species along sites.</p> <p>Record the condition of the beach habitat.</p> <p>Identify any management issues for marine turtles along the adjacent beach.</p>	<p>At the completion of each monitoring event.</p> <p>Compile an overall report at the end of each month, noting any significant changes in trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include tabulated data (turtle census) from all monitoring events to allow assessment of trends.</p>	<p>Data are accurately recorded and processed.</p> <p>Reports have been read and filed on system.</p> <p>Yearly summary report sent to DSEWPC and DERM.</p>
Corrective Actions (Linked to Reporting)	<p>Immediately notify Environmental Manager if a significant change is observed that may be attributed to construction or operational works that could have a negative impact on the marine turtle. Threatening processes are to cease until issue is addressed.</p> <p>Immediately notify Environmental Manager if significant change in measured water variables is recorded. Threatening processes are to cease until issue is addressed.</p> <p>Immediately notify Environmental Manager if changes in marine turtle habitat are observed, that could be attributed to operational works. Works to cease until threatening cause is rectified.</p>		



Monitoring Technique	Methodology	Timing/Frequency	Performance Indicators
	Immediately notify Environmental Manager of any management issues observed during monitoring. Threatening processes are to cease until issue is addressed.		



Table 1 and 2 – Data Sheets

Marine Turtle Habitat Study		Weekly: Nov to Apr	
Date: / /200_		Time: am/pm	
Surveyor Name			
Survey from Little Cove to Ella Bay NP	Start E N	End E N	
Lighting Disturbances: Yes/No		Noise Disturbances: Yes/No	
Assessment of Threats (Predation/ Habitat Destruction/Marine Debris/Other)			
Remarks/Comments/Photos Taken			

Nest Data Sheet			
Date		Time	
Observer Name			
Nesting Date (if known)			
Nest Coordinates	E N		
Species (if known)			
Distance from High Tide Line			
Type of Tide		Moon Phase	
Dimensions of the Nest			
Remarks/Comments/Photos Taken			



Appendix C: Marine Turtle Specialist Contacts

Contact one of the following specialists to arrange receipt and analyse sick and dead turtles.
Make contact prior to dispatching package:

John Thorogood M.Sc., Ph.D., FAIBiol., FEIANZ

Managing Principal
frc environmental
(07) 3820 4900
Email:

Other Contacts

Department of Environment Resource Management (DERM)

1300 130 372
Option 3 relates to marine turtle (and marine mammal) strandings
Email:

Queensland Parks & Wildlife

5443 8944 during business hours (Monday to Friday)
If people find an injured, stranded or dead turtle - 24 hour hotline on **1300 360 898**.



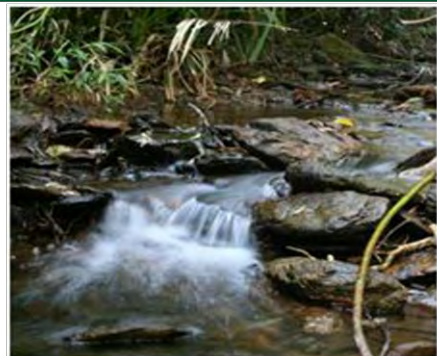
3.6 Significant Flora Management Sub-Plan

Environmental Management Sub-Plan

For

Significant Flora

October 2009 Revision 1





Significant Flora Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the Ella Bay Development (EBD) Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 1	Oct 2009	KR	MW	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark

Distribution List of Registered Copies and Key Contacts

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Construction Manager		3	
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Qld DERM		6	

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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

Refer to the *Ella Bay Environmental Management Plan* for further details.

Document Structure

This document is a sub-plan of the Ella Bay Development Environmental Management Plan (EMP). This sub-plan outlines the specific management procedures that relate to any conservation significant flora that may be located in areas at Ella Bay and along the Ella Bay road.

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans. The EMP sets out the project details, management process and authority and training procedures.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Flora Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans eg Weed Species Management Sub-Plan which covers introduced weed species, the Ella Bay Road Management Sub-Plan and other Sub-Plans.

This Sub-Plan outlines the specific management procedures that relate to flora that may be present within Ella Bay and along the Ella Bay road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure the objectives of this sub-plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.



2. Background

The Ella Bay Development site (EBD) is adjoining the extensive swampland and rainforest of the Ella Bay National Park. Although bordering the Wet Tropics World Heritage Area, the proposed development site is degraded with significant exotic weed infestation within paddocks dominated by introduced pasture grass and exotic shrubs.

3D Environmental consultants compiled the *Vegetation Survey of the proposed 'Ella Bay Integrated Resort Project' (2009)* which included an assessment of the proposed Ella Bay road corridor. It identified eighteen (18) regional ecosystems (RE) with one of these being listed as 'endangered' under the *Vegetation Management Act 1999* (Queensland) (VMA); thirteen (13) as 'of concern' and four (4) as 'not of concern'. See Appendix 1.

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) a 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 Ella Bay road corridor. See Appendix 2

The survey of the project site indicated that thirty six (36) plant species of special conservation significance occur within the locality of the subject site – see Appendix 3.

Permanent vegetation monitoring sites (see Appendix 4) have been established within the EBD 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.



3. Objectives of the Flora Management Plan

The primary aim of the Flora Management Sub-Plan is to ensure that the level of environmental protection is consistent with relevant Commonwealth and State legislation, and that best practices in habitat conservation are applied over the life of the project.

The envisaged outcomes of this Environmental Management Sub-Plan includes the retention and enhancement of all conservation significant flora habitat within the EBD, ensuring that individuals of these species are not harmed during the clearing and construction process; and to ensure the long-term future of conservation significant flora within the local area by protecting its habitat from any detrimental processes as a result of the construction and operation of the Ella Bay Development.

This Flora Management Sub-Plan seeks to achieve these ends by outlining a program of actions for implementation throughout the duration of the Ella Bay Development.

The Commonwealth Conservation Advice on conserving significant flora provides the following regional priority recovery and threat abatement actions that can be implemented to support the sustainability of important species:

Habitat Loss, Disturbance and Modification

- Develop and implement a management plan to restrict illegal collection of species;
- Monitor known populations to identify key threats;
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary;
- Identify populations of high conservation priority;
- Ensure road widening and maintenance activities (or other infrastructure or development activities) involving substrate or vegetation disturbance in areas where conservation significant flora occurs does not adversely impact on known populations;
- Manage any changes to hydrology that may result in changes to water table levels, run-off or pollution; and
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate inclusion in reserve tenure if possible.

Fire

- Develop and implement a suitable fire management strategy for conservation significant flora. Refer to the Ella Bay Development Cyclone, Fire & Emergency Management Sub-plan (to be completed); and
- As appropriate, provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operation maps.



4. Local Priority Actions

The following local priority recovery and threat abatement actions can be done to support the sustainability of conservation significant flora.

Habitat Loss, Disturbance and Modification

- Suitably control and manage routes to suitably constrain public access on private land.
- Minimise adverse impacts from land use at known sites.

Invasive Weeds

- Identify and remove weeds in the local area, which could become a threat to conservation significant flora, using appropriate methods. Refer to Ella Bay Development Weed Management Sub-plan;
- Manage sites to prevent introduction of invasive weeds, which could become a threat to the species, using appropriate methods; and
- Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on conservation significant flora.

Trampling, Browsing or Grazing

- Implement a management plan for the control and eradication of feral pigs. Refer to Ella Bay Development Pest & Wallaby Management Sub-plan (this document is not complete in the interim refer to Ella Bay Feral Pig Guideline);

Fire

- Design and implement an appropriate fire management regime for local flora populations.



5. Site Distribution

No species classified as conservation significant under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) were identified on site 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), *Hupezia phlegmarioides* (vulnerable) and *Aponogeton proliferus* (endangered) is present within the study area and potential for their occurrence is moderate to high (Stanton 2009).

Four plant species recorded during the study are considered significant under Queensland's *Nature Conservation Act 1992* (NCA) – See Appendix D. *Macaranga polyadenia*, *Endiandra globosa*, *Iconanthus pallens* var. *majus* and *Rourea brachyandra* are all listed as 'rare' under the NCA. Populations of *Rourea brachyandra* and *Endiandra globosa* are particularly well developed in the southern portion of the proposed Ella Bay road corridor, occurring in well developed mesophyll vine forest.

6. Conservation Significant Flora under the Environment Protection and Biodiversity Conservation Act 1999

Carronia pedicellata.

Status: Endangered (EPBC) Not Listed (NCA)

Description: *Carronia pedicellata*, (Flower image) Family Menispermaceae, is a large woody climber. The hairy stems often bear prominent discoid scars. The petioles are 1.3–3.5 cm long and sometimes swollen at the apex. The leaf blades are lance-shaped to elliptic in outline, 8.5–16 cm long by 3.5–6 cm wide. The upper surface of the leaf is hairless or sparsely hairy. The lower leaf surface is hairy especially along the main nerves. The inflorescences are open and much branched, 5–17 cm long and borne in leaf axils and the small flowers are unisexual and stalked. Male and female flowers are borne on separate plants. The fruit are egg-shaped, 12–14 mm long, pink to red in colour and covered with yellowish-brown hairs. This species is distinguished from *C. protensa* by the stalked flowers.



Photo: B Jago

Distribution and Habitat: *Carronia pedicellata* is endemic to north-east Queensland. The species is known to be widespread from Bellenden Ker to Mission Beach with disjunct populations in the Noah and Cooper Creek catchments near Cape Tribulation (Queensland Herbarium, 2008). It is recorded in the Wooroonooran and Clump Mountain National Parks and several conservation reserves. The known populations on freehold land at Noah Creek (near Cape Tribulation) and near Babinda are in areas of remnant vegetation, as defined under the *Vegetation Management Act 1999* (Queensland), and are therefore currently protected from broad-scale clearing. This species occurs within the Wet Tropics (Queensland) Natural Resource Management Region.

Carronia pedicellata grows in complex mesophyll or notophyll vine forest of deep soils derived from basalt, granite or metamorphic substrates at altitudes from near sea level to 520 m. There is no quantitative information on population sizes.

Threatening Processes: The main potential threats to *C. pedicellata* are disturbance and clearing of habitat not currently protected.

(Source: Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Carronia pedicellata*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within)

Australian Arenga Palm (*Arenga australasica*)

Status: Vulnerable (EPBC) Not Listed (NCA)

Description: *Arenga australasica*, Family Arecaceae, also known as Australian Arenga Palm, is a clump-forming palm usually with 1–3 dominant trunks, growing to 20 m tall and 30 cm in diameter, and numerous immature suckers emerging from the base (Jones, 1984). Clumps are often dense and wide-spreading (Jones, 1996). The leaflets are glossy dark green on the upper surface and greyish beneath and are broadly oval-shaped in outline, 2–3.5 m long and supported by a stout, cylindrical, rough textured leaf stalk to 1.6 m long (Cronin, 1989). The leaves are subdivided into pinnately divided, close-spaced linear leaflets, growing to 1 m long and 7 cm wide. Flowers are yellow and about 1 cm across. The ripe fruits are red, purple or brown, globular, approximately 2 cm across and contain one to three seeds. Stems die after bearing fruit from their lower-most inflorescence.

Distribution and Habitat: Australian Arenga Palm occurs in the far north of the Northern Territory and north-eastern Queensland. In Queensland, it occurs from the Torres Strait to south of Innisfail.

The species occurs as a minor component in littoral and near-coastal monsoon rainforests in stony creek beds on sandy or red basalt soils. Habitat usually has a good water supply and some fire protection. Cultivation of the species is uncommon but there are specimens held in Brisbane parks and Cooktown Botanic Gardens. Populations in conservation reserves include Clump Mountains National Park (NP), Edmund Kennedy NP, and Tam O'Shanter NP (Queensland). This species occurs within the Cape York and Wet Tropics (Queensland) and the Northern Territory Natural Resource Management Regions.

Threatening Processes: The main identified threats to Australian Arenga Palm are destruction of habitat, inappropriate fire regimes and physiological constraints.

The main potential threats to Australian Arenga Palm are changes to the water table, habitat destruction and feral animals.



(Source: Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Arenga australasica*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within)

Aponogeton proliferus.

Status: Endangered (EPBC) Endangered (NCA)

Description: *Aponogeton prolifer*, Family Aponogetonaceae, formerly known as *Aponogeton proliferus*, is a rooted, submerged, perennial aquatic. Tubers are small, less than 1 cm long. Leaves are submersed, 18–31 cm long, and usually 1.3–1.6 cm wide. The yellow flower head is emergent, up to 5.5 cm long on stalks that grow to 32 cm long. The spathe (leaf like structure that protects the inflorescence) grows to 1.5 cm long. New plants are commonly produced at the tip of inflorescence-like structures and these proliferous shoots distinguish the species



Photo: S.L. Winterton

Distribution and Habitat: *Aponogeton prolifer* is an aquatic herb known only from creeks running through rainforest margins in the Innisfail region, northern Queensland, where 12 plants were seen in 1994. It occurs in narrow, shallow and heavily shaded coastal streams

Threatening Processes: The main identified threats to *A. prolifer* include illegal collecting for the aquarium trade; extensive clearing; and loss of habitat.

The main potential threats to *A. prolifer* include changes to water flow and degradation of water quality, and the encroachment of exotic weeds, especially aquatic grasses.

(Source: Threatened Species Scientific Committee (2008mf). Commonwealth Conservation Advice on *Aponogeton proliferus*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within)

Canarium acutifolium var. acutifolium.

Status: Vulnerable (EPBC) Not Listed (NCA)

Description: *Canarium acutifolium* var. *acutifolium*, Family Burseraceae, is a tree to 40 m tall. Leaves are pinnate (divided into leaflets which are borne in opposite pairs on the leaf axis) with 2–7 pairs of leaflets, terminated by a single leaflet. Leaflets are oval in outline, widest in the middle or the sides parallel, about 25 cm long and 8 cm wide, margin entire, apex gradually tapering to a point and midrib and lateral veins raised on the upper surface. Inflorescences are borne in the angles between leaves and stems, branched, 30–50 cm long and many flowered. This species has separate male and female flowers, which are about 4 mm long, shortly stalked, the flower parts in whorls of three. The calyx is 2–2.5 mm high and white, cream, green or yellow. Petals are about 3 mm long and white, cream, green or yellow. Fruits are blue, fleshy, egg-shaped and 12–15 mm long. *Canarium acutifolium* var. *acutifolium* is distinguished from other varieties of *C. acutifolium* by having three stamens rather than six



Source:
http://www.pngplants.org/PNGtrees/TreeDescriptions/Canarium_acutifolium_DC_Merr.html

Distribution and Habitat: *Canarium acutifolium* var. *acutifolium* occurs in north-east Australia and Malaysia. In Australia, it occurs between Mossman and Tully in Queensland. Herbarium specimens have been collected in the Mossman River, Russell River, Mulgrave River, South Johnstone River, Liverpool Creek and Tully River catchments, with a disjunct record from the Gilbert River. Collections have been made in mesophyll vine forest along rivers and creeks at altitudes of 5 to 200 m. This species occurs within the Wet Tropics and Northern Gulf (Queensland) Natural Resource Management Regions.

The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community.

Threatening Processes: Threats to *C. acutifolium* var. *acutifolium* are unknown.

(Source: Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice* on *Canarium acutifolium* var. *acutifolium*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within)

Layered Tassel-fern (*Huperzia phlegmarioides*)

Status: Vulnerable (EPBC) Vulnerable (NCA)

Description: *Huperzia phlegmarioides*, Family Lycopodiaceae, also known as the Layered Tassel-fern, is a fern ally with attractive hanging 'tassels'. Branches are tufted, at first erect, becoming arched to pendulous, branched several times, 40–80 cm long. The transition from sterile to fertile zone is abrupt, the fertile zone is 2–20 cm long, one to several times forked. Leaves are arranged in four rows, leathery and stiff, angled at 40° to the axis, entire, 8–15 mm long bright green and shiny. Spore-bearing leaves are 2–3.5 mm long, the spore bodies occupying a third to nearly the entire length.



Source: <http://asgap.org.au/APOL21/mar01-4k.html>

Distribution and Habitat: The Layered Tassel-fern is an epiphyte occurring in lowland to mid-altitude rainforests or lowland swamps in north-eastern Queensland, from the Iron Range to Townsville. Population sizes are not known. Known populations mostly occur within protected areas, although a few populations are known to exist outside of National Parks, particularly in the McIlwraith Ranges. Populations occurring in areas of remnant vegetation, as defined under the *Vegetation Management Act 1999* (Queensland), are currently protected from broad scale clearing. This species occurs over an extent of >30,000 km², and in at least 10 locations. This species occurs within the Wet Tropics and Cape York (Queensland) Natural Resource Management regions.

The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities:

- Mabi Forest (Complex Notophyll Vine Forest 5b), and
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin.

Threatening Processes: The main identified threats to Layered Tassel-fern are collecting pressure for the horticultural trade, and habitat damage from cyclones and land-clearing.

(Source: Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Huperzia phlegmarioides*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within)

Swamp Orchid (*Phaius tancarvilleae*)

Status: Endangered (EPBC)

Description: *Phaius tancarvilleae*, Family Orchidaceae, also known as Swamp Lily or Greater Swamp-orchid, is a terrestrial orchid which forms 1–2 inflorescences from axils of the lower leaves that are 60–210 cm long, 8–14 flowered and stiffly erect. Sepals and lateral petals are white on the outside, red-brown with yellow veins on the inside, about 6 cm long, 1–1.5 cm wide and oblong-acuminate. Lateral petals are about 3–5.5 cm long, 0.8–1.2 cm wide. Labellum lamina is 3–5 cm long, 2–4.5 mm wide, white suffused with mauve or red with a yellow keel inside; spur 0.5–1.5 mm long.

Swamp Orchid tends to occur in sunny positions in swamp forest ecotones. Associated vegetation includes swamp sclerophyll forest (*Melaleuca quinquinervi-Eucalyptus robusta-Lophostemon suaveolens*), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as *Archontophoenix cunninghamiana* or *Livistona australis* (3D Environmental 2009, and references cited within).

BAAM identified the regional ecosystem (RE) 7.11.25 as appropriate habitat for the Swamp Orchid. This habitat consists of simple-complex mesophyll to notophyll vine forest on amphibolites of the very wet lowlands and foothills

Distribution and Habitat: There is conflicting information as to the extent of the Swamp Orchid's distribution. The Council of Head of Australian Herbaria (CHAH) 2008 states, 'In north-east Queensland, Swamp Orchid is restricted to the Atherton Tableland with an unknown population size and area of occurrence. Whereas DEWHA reports a more widespread distribution. *The Swamp Orchid contributes to, and constitutes a part of the World Heritage values of the Wet Tropics of Queensland World Heritage Area. The EPBC Act protects the World Heritage values of a declared World Heritage property.*

Threatening Processes: The main identified threats to the Swamp Orchid are collection for horticulture; habitat clearing and fragmentation, agriculture, and roadwork; drainage and nutrient run-off pollution of swamps; frequent fire; grazing and trampling by domestic stock and feral pigs (*Sus scrofa*); and weed invasion.

Distribution and identification confusion may lead to the application of inappropriate actions. Threatening invasive weeds include *Lantana camara*, *Schefflera actinophylla*, *Baccharis* sp. and *Eugenia uniflora*

(Source: Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Phaius tancarvilleae*. [Online]. Department of the Environment, Water, Heritage and the Arts, and references cited within) Department of the Environment, Water, Heritage and the Arts (2009). *Phaius tancarvilleae* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 2009-05-22



Source: Australian Plant Image Index

7. Conservation Significant Vegetation Communities under the Environment Protection and Biodiversity Conservation Act 1999

Littoral rainforest and coastal vine thicket

Status: Endangered (RE 7.2.1, VMA) to 'of concern' (RE 7.2.5, VMA) and Critically Endangered (EPBC).

Description: The community listed as littoral rainforest and coastal vine thicket (hereafter littoral rainforest) under the EPBC contains several Regional Ecosystems (RE) under the VMA. The descriptions are based on the RE classification. On the eastern boundary of the EBD and Ella Bay Road corridor areas, littoral rainforest (mainly 7.2.5 with some 7.2.1) is located in back dune situations and forms an open to closed forest with canopy heights up to 28m. The dominant canopy species are *Euroschinus falcatus*, *Syzygium forte* subsp. *forte*, *Canarium australianum* and *Chionanthus ramiflorus*. The area mapped as littoral rainforest actually contains extensive areas of dense pond apple interspersed with fragmented, remnant patches of littoral rainforest. The vegetation in this area has suffered from past disturbance as is evident by regular canopy gaps, coppicing of *Syzygium forte* subsp. *forte* and the dominance of *Euroschinus falcatus*. The littoral rainforest classified as RE 7.2.1 in the Ella Bay Road corridor area consists of the following dominant canopy species; *Intisia bijuga*, *Acacia mangium*, *Dysoxylum mollissimum*, *Syzygium forte* subsp. *forte*, *Calophyllum australianum* and *Beilshmedia obtusifolia*. The understorey of this area of littoral rainforest is also highly degraded.

The area classified as littoral rainforest in the northern-western part of the EBD area (RE 7.2.1) occupies a broad suppressed ridge of medium grained siliceous beach sand. The canopy is reasonably intact with sporadic individual and dense patches of pond apple trees. In the swamp boundary zone there is also significant feral pig damage. The typical canopy species recorded at this site include *Homalium circumpinnatum*, *Alstonia scholaris*, *Psuedoweinmania lachnocarpa*, *Cryptocarya hypospodia*, *Syzygium forte* subsp. *forte*, *Syzygium cormiflorum*, *Grevillea baileyana*, *Syzygium angophoriodes* and *Euroschinus falcatus*. Secondary tree layer species include *Rhodomyrtus macrocarpa*, *Acmenosperma claviflorum*, *Chionanthus ramiflora* and *Podocarpus neriifolius*.

Littoral rainforest (RE 7.2.1d) in the north-eastern section of the EBD area has sustained some heavy wind damage in places, suffers from high levels of feral pig damage and pond apple invasion. This littoral rainforest has a mesophyll vine forest canopy with a sub-dominance of feather palms. There are also some small areas of feather palm forest in dune swales.



Distribution and Habitat: This ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia. Typically, the ecological community occurs within two kilometres of the coast or adjacent to a large salt water body, such as an estuary and, thus, is influenced by the sea. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes that can include dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands. As a result, the ecological community is not associated with a particular soil type and can occur on a variety of geological substrata.

The ecological community occurs from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria as well as on offshore islands on the east coast. The REs are restricted to coastal dune systems within the Wet Tropics Bioregion of North Queensland.

Threatening Processes: On the EBD and Ella Bay Road corridor areas the littoral rainforest is threatened by feral pig damage, herbivory and trampling of seedlings/understorey vegetation by the unnaturally high density of Agile wallabies on site and weed invasion by transformer weeds (mainly pond apple). Damage from extreme wind events such as cyclone Larry is prevalent and has caused many tree falls and canopy gaps. The threatening processes caused by pigs, wallabies and weeds greatly reduce this vegetation type's ability to repair itself and leads to a synergistic impact when all threatening processes are combined.

Sources:

Advice to the Minister for the Environment, Water, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (2008).

3D Environmental. (2009). Vegetation survey report of the proposed 'Ella Bay Integrated Resort Project'.

8. Conservation Significant Flora under Queensland's *Nature Conservation Act 1992*

Macaranga polyadenia.

Status: Rare (NCA) and Not Listed (EPBC)

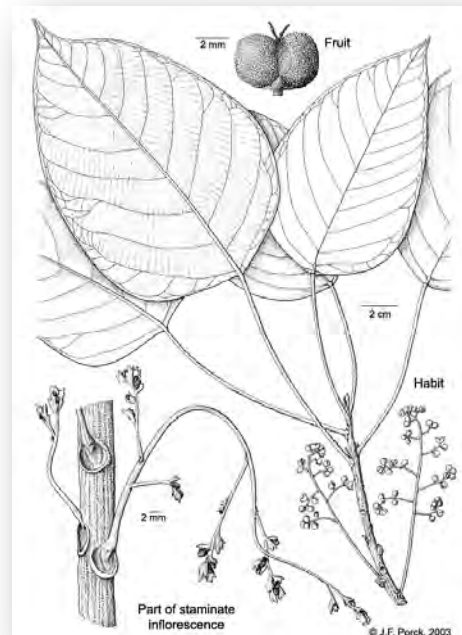
Description: Small tree

Distribution and Habitat: Occurs from near sea level to about 100m in well developed rainforest which is periodically flooded or in situations close to permanent water

Occurs in north-eastern Cape York Peninsula and north eastern Queensland.

Distribution on EBD Site: The species was collected in mesophyll vine forest dominated by Feather Palms (RE 7.2.1 and 7.3.3a) on the EBD. A single specimen was also collected in mesophyll vine forest adjacent to a fast flowing watercourse in the Ella Bay Road corridor area. It has a potential to occur in all swamp forest habitats including regrowth communities. (See Appendix D)

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 choking and smothering, and gradual species displacement.



Source: [National Herbarium Nederland](#)

Ball Fruited Walnut (*Endiandra globosa*)

Status: Rare (NCA), Not Listed (EPBC)

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

Distribution and Habitat: In north eastern Queensland it occurs in well developed lowland rainforests from sea level to 360m.

Distribution on EBD Site: The species was observed 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 Ella Bay Road corridor area, generally south of the fish farm on the Ella Bay road where it occurred within well developed mesophyll vine forest. (See Appendix 4)

Threatening Processes: Threatening process related largely to direct clearing of habitat. The species habitat on the EBD is currently impacted by cattle and weed invasion including Pond Apple, whilst all habitats of the species, including those on the Ella



Source: 3D (2009)

Bay Road corridor area 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.

Ichnanthus pallens. var majus

Status: Rare (NCA), Not Listed (EPBC)

Description: A low prostrate sprawling ground cover. (no image available)

Distribution and Habitat: Occurs in the Cook and North Kennedy districts of northern and central Queensland extending northward into Papua New Guinea.

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

Distribution on EBD Site: The species were recorded observed within *Lophostemon suaveolens* open forest (RE7.11.34) during the first survey effort. Additional fertile material is required to confirm identification and species extent within this RE. Subsequent detailed habitat surveys undertaken failed to provide any further species collections or material indicating that the species is cryptic and often difficult to detect. (See Appendix D)

Threatening Processes: Impacts to the species may be directly incurred through road widening associated with construction of the Ella Bay Road corridor area, particularly in the vicinity of Heath Point.

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.

Water Vine (Rourea brachyandra)

Status: Rare (NCA)

Description: Rourea is a woody understorey vine with stem diameters to 8cm.

Distribution and Habitat: Occurs in north-east Queensland, Asia, Malaysia and the Pacific Islands

Grows in well developed lowland and upland rainforest from sea level to 800m. Herbrecks data indicates that the major known habitats are lowland vine forests on soils derived from basic igneous rocks.

Distribution on EBD 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 Ella Bay Road corridor area. 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. (See Appendix D)

Threatening Processes - Threatening process related largely to direct clearing of habitat.

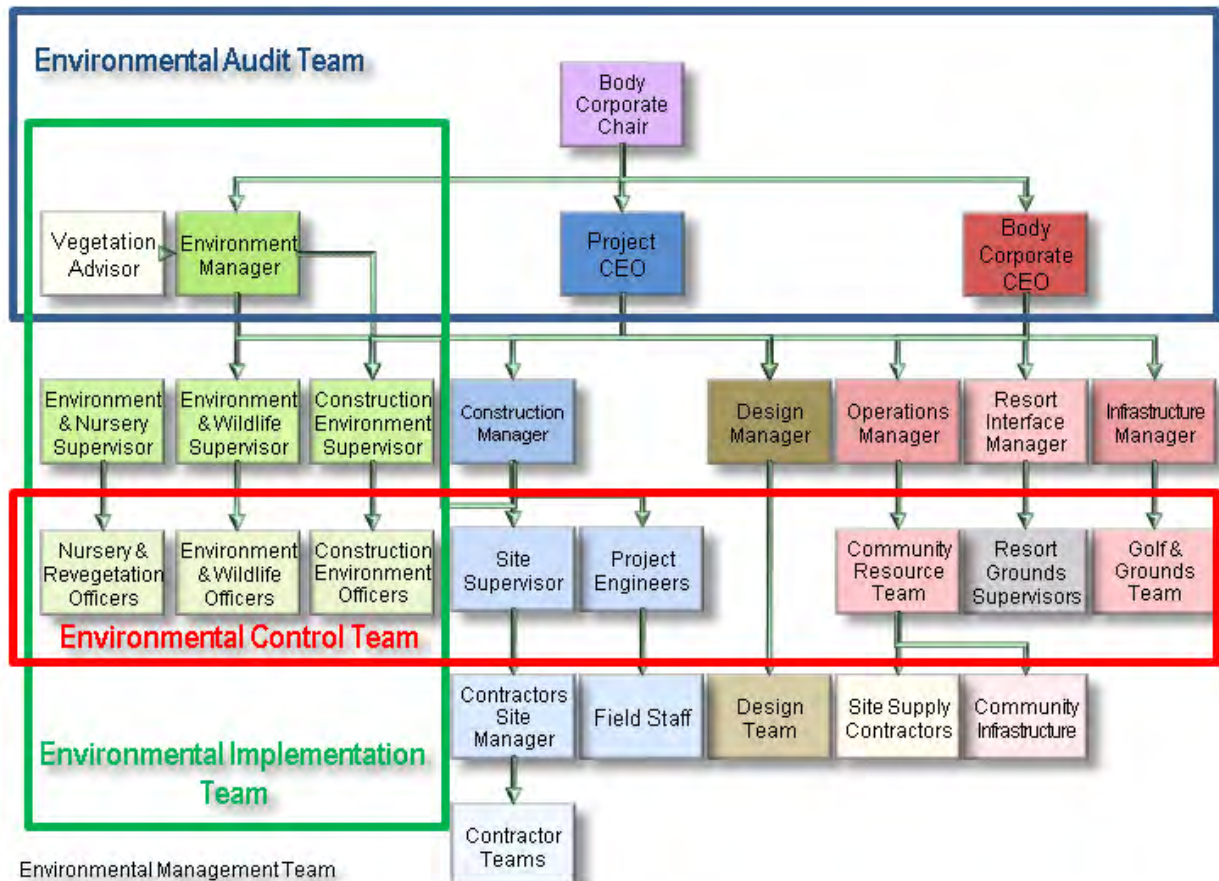


Source : Water Vine (3D)

9. Responsibilities and Authorities

The organisational structure of the project, in terms of environmental responsibilities, is outlined in detail in the Ella Bay Development Environmental Management Plan (EBD EMP). Ella Bay Developments and Sub-Contractors during the Construction Stage are to be allocated to one or more teams (usually one) to be known as:

- **EAT** - Environmental Audit Team
- **ECT** - Environmental Controls Team
- **EIT** - Environmental Implementation Team



Vegetation Advisor (VA)

The Vegetation Advisor will oversee all elements of flora conservation and management programs. The VA will also provide expert advice to the Environmental Staff regarding:

- Conducting flora monitoring of the EBD and associated Ella Bay road during the construction and operational phases
- Monitoring the efficacy of all flora mitigation at the planning, construction and operational phases. This monitoring program must seek to identify any negative (or positive) conservation significant flora population trends and likely causal factors.
- Provides advice to the EBD Environmental Manager and EBD management on any review or required modification/ changes to mitigation strategies, and signs off on their implementation.
- Provides feedback on the annual report on the state of the local conservation significant flora populations (if any) and the effectiveness of mitigation strategies.

The Advisor will also provide an external audit function of the flora management and compliance to this environmental management sub-plan along with the Environmental Manager



and is to be a member of both the Ella Bay Developments Environmental Audit Team (EAT) and the Environmental Implementation Team (EIT).



10. Reporting and Sub-plan Reviews

Reporting

Systematic reporting underpins all phases of planning, construction and operation. Reporting includes three main types:

- **Regular and Event Based** - Based on the elements of the following environmental management schedules (sections 11,12&13) for the respective phase of the project: planning, construction and operation.
- **Monthly** - Prepared by the Environmental Implementation Team to inform of the progress of the cassowary management strategies. The report will be collated from the communications register (CR) contingencies, procedural non-compliance and if necessary recommendations for changes or improvements.
- **Annual report** - Prepared by the Environmental Implementation Team and based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (six monthly) will be undertaken by the Environmental Audit Team (including the VA) to examine the reports and to review changes or improvements to the Significant Flora Management Sub-Plan, including any additional mitigation measures found to be necessary.

11. Planning Phase

Potential Impacts during the Planning Phase

- Clearance may result in conservation significant flora mortality and/or reduced foliage cover
- Decline in water quality
- Spread of weeds;
- Conservation significant flora mortality resulting from weed control measures
- Increased human activity impacting on conservation significant flora habitat
- Unauthorised collection of species
- Trampling by feral pigs

Objectives

- To minimise the impact on conservation significant flora during the planning process.
- No damage to vegetation outside footprint of road alignment and ancillary work areas.
- No deterioration of water quality
- To prevent the spread of weeds

Performance Criteria

- Planning for road alignment avoids areas of protected and roadside vegetation.
- Road alignment designed to minimise the clearing of native vegetation.
- Water quality within acceptable range
- No increase in spread of weeds
- Enforced restrictions on the removal of species from site
- Minimal mortality of conservation significant flora

Mitigation Measures, Monitoring and Compliance

A Fire Management Plan will be implemented throughout the development process. The following table outlines the initial environmental planning activities relating to conservation significant flora that are to be completed prior to the commencement of construction.

The environmental team will be measured by the performance criteria (**PC**) with monitoring events being recorded in a compliance register (**CR**) in the tables below.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person	Reporting	Corrective actions
Baseline conservation of significant flora, population identification & monitoring.	<p>Implement: Baseline conservation significant flora identification and monitoring.</p> <p><i>Note - Conducted prior to construction to provide data on the abundance (if any) and distribution of the local populations, as outlined in 3D Environmental (2009) Vegetation Survey Report of the Proposed 'Ella Bay Integrated Resort Project'. (See Appendix E)</i></p> <p>Implement: Undertake seed collection and storage.</p> <p>Compliance: Pond apple control operations are supervised by environmental officer. Sensitive pond apple tree removal to avoid significant epiphytic and terrestrial flora.</p>	<p>Prior to Commencing Work: The baseline monitoring to be conducted.</p> <p>Monthly and Event Based</p> <p>Event Based: Monitoring and reporting on weed control activities</p>	<p>FA/EO</p> <p>EO</p> <p>EO</p>	<p>Event Based: Results of monitoring will be reported to establish baseline data. <i>Note - This data will form the performance criteria for ongoing monitoring to be assessed against.</i></p> <p>Ongoing: Keep a log of actions</p> <p>Ongoing: Keep log of control activities and presence of any significant flora species</p>	
Foliage projected cover (FPC) monitoring	<p>Implement: Monitor foliage projected cover (FPC) from established permanent monitoring points identified in the <i>Vegetation Survey Report of the Proposed 'Ella Bay Integrated Resort Project'</i>. 3D Environmental (2009) (See Appendix E)</p>	Event Based: Establish baseline	FA/EO	Event Based: Informs baseline report.	
Loss of habitat	<p>Implement: Identify potential habitat that will require a pre-clearing survey for conservation significant flora due to construction or clearing activities.</p>	Event Based: Prior to any clearing/construction activities.	EIT	Event Based: Detailed plan for Site Manager identifying locations where pre-clearing survey is likely to	



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person	Reporting	Corrective actions
	<p>Plan: Design buildings and road alignments to avoid the clearing of conservation significant flora habitat.</p> <p>Implement: Significant species that are located within 20m of disturbance areas will be translocated (where practical).</p> <p><i>Note: This is only to ensure significant species are not adversely affected by the proposed works.</i></p> <p>Implement: Significant species located in areas scheduled for pond apple control will be translocated to another suitable site – (when deemed to be at risk).</p>	<p>Event Based: Prior to any clearing/construction activities.</p> <p>Ongoing: Prior and during control operations</p>	<p>Design Engineers/ EIT</p> <p>EIT</p> <p>EIT</p>	<p>be required.</p> <p>Event Based: Report on completion of translocations</p> <p>Event Based: Report on completion of translocations</p>	
Increased human activity	<p>Develop and Implement: Induction course to raise awareness of the:</p> <ul style="list-style-type: none"> Potential conservation significant flora onsite and along the Ella Bay road alignment; and Removal of conservation significant flora is prohibited. 	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Monthly: Report non-compliance and corrective actions.	Re-brief staff or (sub) contractors as necessary. Individuals removing significant flora will be immediately dismissed.
Potential spread of weeds	<p>Compliance: All machinery to use washdown facilities at site entrance.</p> <p>Implement: <i>Weed Management Control Sub-Plan.</i></p>	<p>Ongoing: All machinery to be washed down prior to entry and exit of site.</p> <p>Ongoing: Train staff to recognise weed species of the local area.</p>	<p>ECT</p> <p>EIT</p>	Event Based: Incident Reporting	Re-brief staff or (sub) contractors as necessary.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person	Reporting	Corrective actions
Water Quality	<p>Compliance: Only pre-approved pesticides and herbicides to be used on site. Implement: Strict application guidelines for pesticides and herbicides are in place. Planning & Design: Tracks/roads crossing areas are to be designed to reduce incidences of sedimentation and/or detrimental effects associated with increases in nutrient and decline in water quality within adjacent areas. Planning & Design: Drainage will be designed to channel away road runoff (where possible).</p> <p><i>Note: Purpose is to preserve the pre-disturbance nutrient levels and reduce the incidence of sedimentation.</i> Planning & Design: Water entering from roads or development areas is to be designed to be treated to remove sediments and nutrients prior to its release.</p>	Ongoing: Implementation of the <i>Integrated Water Management Sub-Plan</i>	EIT after Consulting ECTs	Weekly & Monthly	Investigate pollutant source and promptly rectify
	<p>Implement: <i>Erosion and Sediment Control Management Sub-Plan</i>.</p> <p>Compliance: Areas sprayed for revegetation purposes in steep areas, will be left bare for as short a time as possible to reduce erosion (utilise natural mulch from dead grass).</p> <p><i>Note - Revegetation & Rehabilitation Management and Weed Management Sub-Plans set out methodologies.</i></p>	<p>Ongoing</p> <p>Ongoing</p>	<p>EAT</p> <p>EIT</p>		
Feral Pigs	Implement: Pest and Wallaby Management Plan	Ongoing	EIT	Event Based: Incident reporting	

12. Construction Phase

Potential Impacts during the Construction Phase

Potential impacts to conservation significant flora during construction of the Ella Bay Development include:

- Clearance may result in conservation significant flora mortality and/or reduced foliage cover
- Decline in water quality
- Spread of weeds;
- Flora mortality resulting from weed control measures
- Increased human activity impacting on conservation significant flora habitat
- Unauthorised collection of species
- Trampling by feral pigs
- Dust

Objectives

- To minimise the impact on significant flora species during the construction process.
- No damage to vegetation outside footprint of road alignment and ancillary work areas.
- No deterioration of water quality
- To prevent the spread of weeds

Performance Criteria

- Monitoring program shows no decrease in diversity and/or abundance of conservation significant flora populations;
- The clearing of vegetation has been conducted in a manner that minimises removal/disturbance of conservation significant flora habitat.
- Water quality within acceptable range
- No increase in spread of weeds
- Enforced restrictions on the removal of species from site
- Minimal mortality of conservation significant flora

Mitigation Measures, Monitoring and Compliance

A Fire Management Plan will be implemented throughout the development process. The following table outlines the environmental control measures developed to ensure protection of conservation significant flora and its habitat during the construction of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this sub-plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Loss of habitat	<p>Implement: Clearly define the area for clearing. <i>Note - No unauthorised disturbance to areas outside of the designated clearing zone will be permitted.</i></p> <p>Implement: Significant revegetation and rehabilitation of native vegetation is ongoing in specific areas. Further activity will occur post construction works in others.</p> <p>Implement: Significant species that are located within 20m of disturbance areas will be translocated (where practical). <i>Note: This is only to ensure significant species are not adversely affected by the proposed works.</i></p> <p>Observe: Monitor translocated species</p> <p>Implement: Significant species located in an area scheduled for pond apple control will be translocated to another suitable site – (when deemed to be at risk).</p>	<p>Ongoing: Adhere to the performance criteria of <i>Revegetation & Rehabilitation Sub-Plan</i>.</p> <p>Ongoing</p> <p>Prior and during control operations.</p>	<p>EIT</p> <p>EIT</p> <p>EIT</p> <p>EIT</p>	<p>Ongoing: Incident reporting and recording CR.</p> <p>Monthly: Compliance reporting and recording CR.</p> <p>Event Based: Report on completion of translocation (s) to EAT.</p> <p>Event Based: Report on completion of translocation (s) to EAT.</p>	<p>Immediately cease vegetation clearing if located outside of the permitted area. Notify EAT.</p> <p>Review <i>Revegetation & Rehabilitation Sub-Plan</i> if monitoring indicates rehabilitation/restoration works are not producing desired outcomes.</p>
Significant flora population monitoring	Implement: Any species identified in baseline survey to be monitored and any threats highlighted (See Appendix E)	Monthly	EIT	Event Based: Report to EAT.	Investigate and mitigate threat or action translocation of species.
	Implement: Appropriate seed collection and storage.	Monthly or Event Based	EIT	Event Based: Record activities in EBD CR.	
Foliage	Implement: Monitor foliage projected cover	Annual basis	EIT	Annually:	



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
projected cover (FPC) monitoring	(FPC) from established permanent monitoring points identified in the <i>Vegetation Survey Report of the Proposed 'Ella Bay Integrated Resort Project'</i> . 3D Environmental (2009) (See Appendix E)			Record in EBD CR and report to EAT.	
Increased human activity	<p>Implement: Induction course to raise awareness of:</p> <ul style="list-style-type: none"> Potential conservation significant flora onsite and along the Ella Bay road alignment; & Removal of conservation significant flora is prohibited. <p>Education and Awareness: EMP sub-plans to be communicated to all staff and (sub) contractors before each stage of construction commences</p>	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Event Based: Non-compliance and corrective actions recorded and reported to EAT.	Re-brief staff or (sub) contractors as necessary EIT. Individuals removing conservation significant flora will be immediately dismissed.
Water Quality	<p>Implement: <i>Integrated Water Management Sub-Plan</i>.</p> <p>Compliance: Pre-approved pesticides and herbicides will only be used on site</p> <p>Implement: Strict application guidelines for pesticides and herbicides are in place</p> <p>Planning & Design: Tracks/roads crossing areas are to be designed to reduce incidences of sedimentation and/or detrimental effects associated with increases in nutrient and decline in water quality within adjacent areas.</p> <p>Implement: Where possible drainage will channel away road runoff to preserve the pre-disturbance nutrient levels and reduce</p>		EIT with assistance from ECT. EAT	As required	Investigate pollutant source and promptly rectify .

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
	the incidence of sedimentation. Compliance: Any water entering from roads or development areas is to be designed to be treated to remove sediments and nutrients prior to its release.				
Potential spread of weeds	Implement: <i>Weed control sub-plan</i> for EBD. Compliance: All machinery to use washdown facilities at site entrance.	Ongoing: The presence of weeds within retained vegetation will be monitored as per the <i>Weed Management Control Sub-plan</i> . Ongoing: Maintain a record of vehicle usage of washdown facility.	EIT assisted by the ECT ECT	Ongoing: Record in EBD CR and report to EAT. Ongoing	Review staff training and weed control plan as necessary EIT. Re-brief staff or (sub) contractors as necessary EIT.
	Compliance: Weed control to be conducted in accordance with the <i>Weed Management Control Sub-plan</i> . This includes using techniques that do not threaten conservation significant flora.	Ongoing: Train staff to recognise weed species on site	EIT	Event Based	
Feral Pigs	Implement: <i>Pest and Wallaby Management Plan</i>	Ongoing	EIT	Event Based: Incident reporting and recording EBD CR.	
Dust	Implement & Comply: Dust suppression measures in place for works as per <i>Air Quality, Dust, Noise, Light and Vibration Management Sub-plan</i> .	Ongoing: Adhere to dust control performance criteria as per <i>Air Quality, Dust, Noise, Light and Vibration Management Sub-plan</i> .	EIT	Monthly: Reports to include updates on dust control	Increase frequency of dust suppression measures.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
				measures.	



13. Operation Phase

Potential Impacts during the Operation Phase

Potential impacts to conservation significant flora during operation of the Ella Bay Development include:

- Decline in water quality
- Spread of weeds;
- Significant flora mortality resulting from weed control measures
- Reduced foliage cover
- Increased human activity impacting on conservation significant flora habitat
- Unauthorised collection of species
- Trampling by feral pigs

Objectives

- To minimise the impact on significant flora species operation process.
- No damage to vegetation outside footprint of road alignment and resort areas.
- No deterioration of water quality
- To prevent the spread of weeds

Performance Criteria

- Monitoring program shows no decrease in diversity and/or abundance of conservation significant flora populations;
- No damage or disturbance to conservation significant flora habitat outside road alignment and resort area footprints.
- Water quality within acceptable range
- No increase in spread of weeds
- Enforced restrictions on the removal of species from site
- Minimal mortality of conservation significant flora

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental control measures developed to ensure protection of the conservation significant flora and their habitat during the operation of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this sub-plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Loss of habitat	Implement: Clearly define the area for clearing. <i>Note - No unauthorised disturbance to areas outside of the designated clearing zone will be permitted.</i>		EIT	Event Based: Incident reporting and recording EBD CR.	Immediately cease vegetation clearing if located outside of the permitted area. Notify EAT.
	Implement: Significant revegetation and rehabilitation of native vegetation is ongoing in specific areas. Further activity will occur post construction works in others.	Ongoing: Adhere to the performance criteria of <i>Rehabilitation Sub-Plan</i> .	EIT	Monthly: Compliance reporting and recording EBD CR.	Review <i>Vegetation Management Plan</i> if monitoring indicates rehabilitation/restoration works are not producing desired outcomes.
	Implement: Significant species that are located within 20m of disturbance areas will be translocated (where practical). <i>Note: This is only to ensure significant species are not adversely affected by the proposed works.</i>	Prior and during control operations	EIT		
	Observe: Monitor translocated species	Ongoing	EIT	Event Based: Record in EBD CR and report to EAT.	Investigate and mitigate threat or action translocation of species.
Significant flora population monitoring	Implement: Significant species located in an area scheduled for pond apple control will be translocated to another suitable site – (when deemed to be at risk).	Monthly	EIT	Ongoing: Retain a record of actions in EBD CR.	
	Implement: Seed collection and storage.	Monthly or when opportune	EIT	Ongoing: Report to EM.	
Foliage projected cover (FPC) monitoring	Implement: Monitor foliage projected cover (FPC) from established permanent monitoring points identified in the <i>Vegetation Survey Report of the Proposed 'Ella Bay Development Project'</i> . 3D Environmental (2009) (See Appendix E)	Annually	EIT	Event Based: Incident reporting and recording EBD CR.	Immediately cease vegetation clearing if located outside of the permitted area. Notify EAT.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
Increased human activity;	Implement: Induction course to raise awareness of: <ul style="list-style-type: none"> Potential conservation significant flora onsite and along the Ella Bay road alignment; & Removal of conservation significant flora is prohibited. 	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Event Based: Non-compliance and corrective actions recorded and reported to EAT.	
	Education & Awareness: <i>EMP sub-plans</i> to be communicated to all staff and (sub) contractors before operation commences.	Ongoing: All staff and (sub) contractors to attend the site induction.	EIT	Event Based: Non-compliance and corrective actions recorded and reported to EAT.	Re-brief staff or (sub) contractors as necessary. Individuals removing conservation significant flora will be immediately dismissed.
	Implement: Induction for visitors and residents at the Welcome Centre	Ongoing: All visitors and residents to attend the induction	EIT		Re-brief staff, visitors or residents as necessary.
Water Quality	Compliance: Pre-approved pesticides and herbicides will be used on site. Compliance: Strict application guidelines for pesticides and herbicides are in place	Ongoing: <i>Integrated Water Management Plan</i> .	EIT with assistance from ECT.	As required.	Investigate pollutant source and promptly rectify.
	Implement: Environmentally effective stormwater management systems.		EIT	As required	
	Implement: Effective sediment and erosion control measures in-place.	Ongoing: <i>Sediment and Erosion Control Plan</i>	EIT		
Potential spread of weeds	Implement: <i>Weed control sub-plan</i> for EBD to be implemented for the resort operation.	Ongoing: Presence of weeds within retained vegetation will be monitored as per the <i>Weed Management Control Sub-plan</i> .	EIT assisted by the ECT.	On-going: Record in EBD CR and report to EAT.	Review staff training and weed control plan as necessary EIT.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible Person(s)	Reporting	Corrective actions if deviation from performance criteria
	<p>Compliance: All 'at risk' machinery must be spray-cleaned in the washdown bay each time they enter and exit the EBD area to control the spread of weeds.</p> <p>Compliance: Weed control should be conducted in accordance with the <i>Weed Management Control Sub-plan</i> using techniques that do not threaten conservation significant flora.</p>	<p>Ongoing: Maintain log of all vehicles using washdown facility</p> <p>Ongoing: Train staff to recognise weed species on site</p>	<p>ECT</p> <p>EIT</p>		Re-brief staff or (sub) contractors as necessary EIT.
Feral Pigs	Implement: <i>Pest and Wallaby Management Plan</i>	Ongoing	EIT	Event Based: Incident reporting and recording EBD CR.	



14. Auditing and Reporting

An independent audit by the Flora Advisor will determine whether the performance indicators have been met and maintained and provide information for the Environmental Management Plan Review. Auditing will occur within six months of project commencement followed by six month audits during the construction phase. A copy of the audit will be provided to DSEWPC and DERM.

The Environmental Staff will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include flora census tabulated data from all monitoring events to allow assessment of trends.

Logs are to be kept of all sample results and subsequent corrective action (if any).



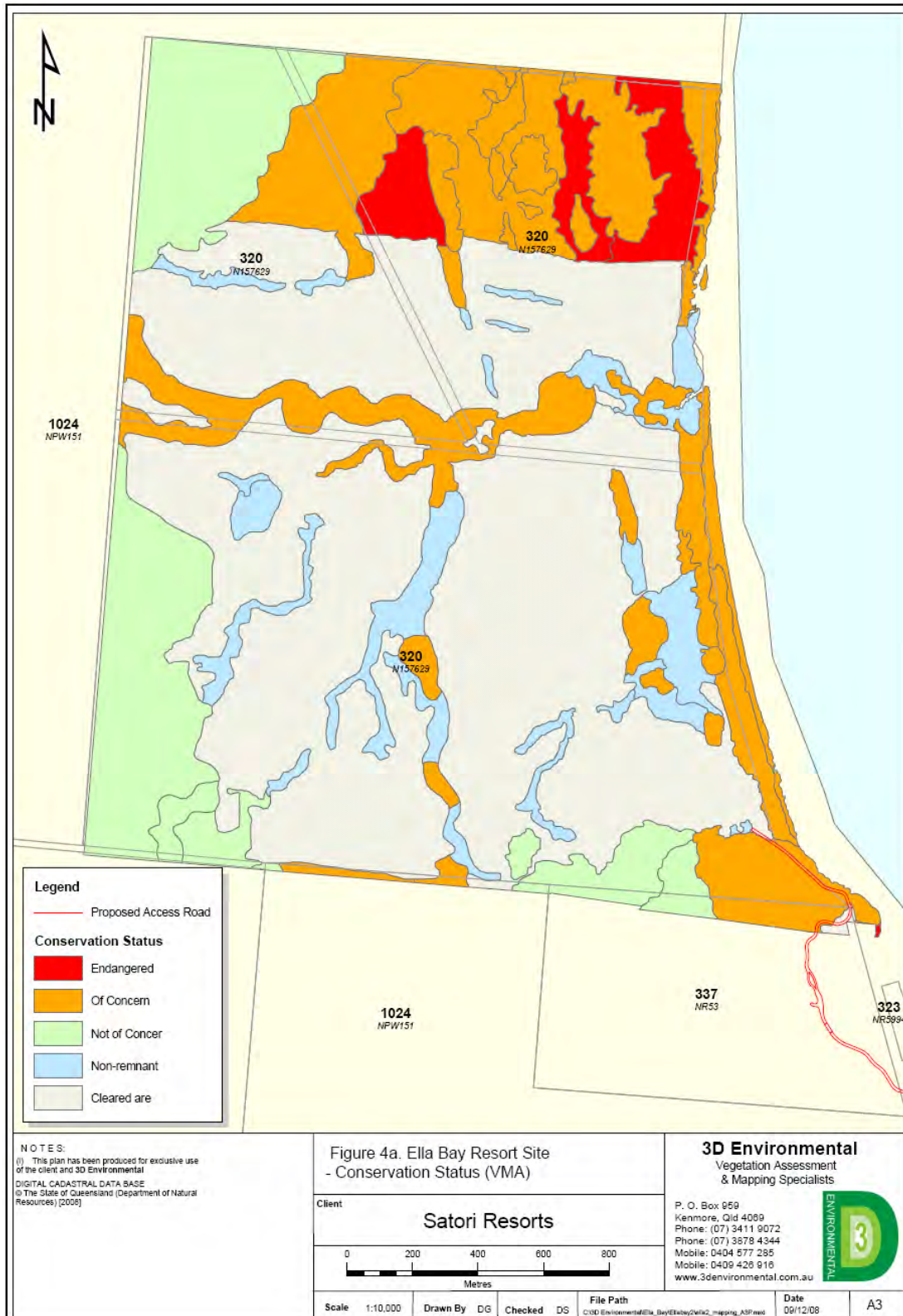
15. Emergency Incident Procedure

Chemical spill or other habitat contamination: Refer to the *Cyclone, Fire & Emergency Management Sub-plan* for immediate response and remediation measures for chemical spills or other habitat contamination. If conservation significant flora are considered to be at risk as a result of the incident, the Flora Advisor should be consulted regarding an emergency translocation procedure.

16. References:

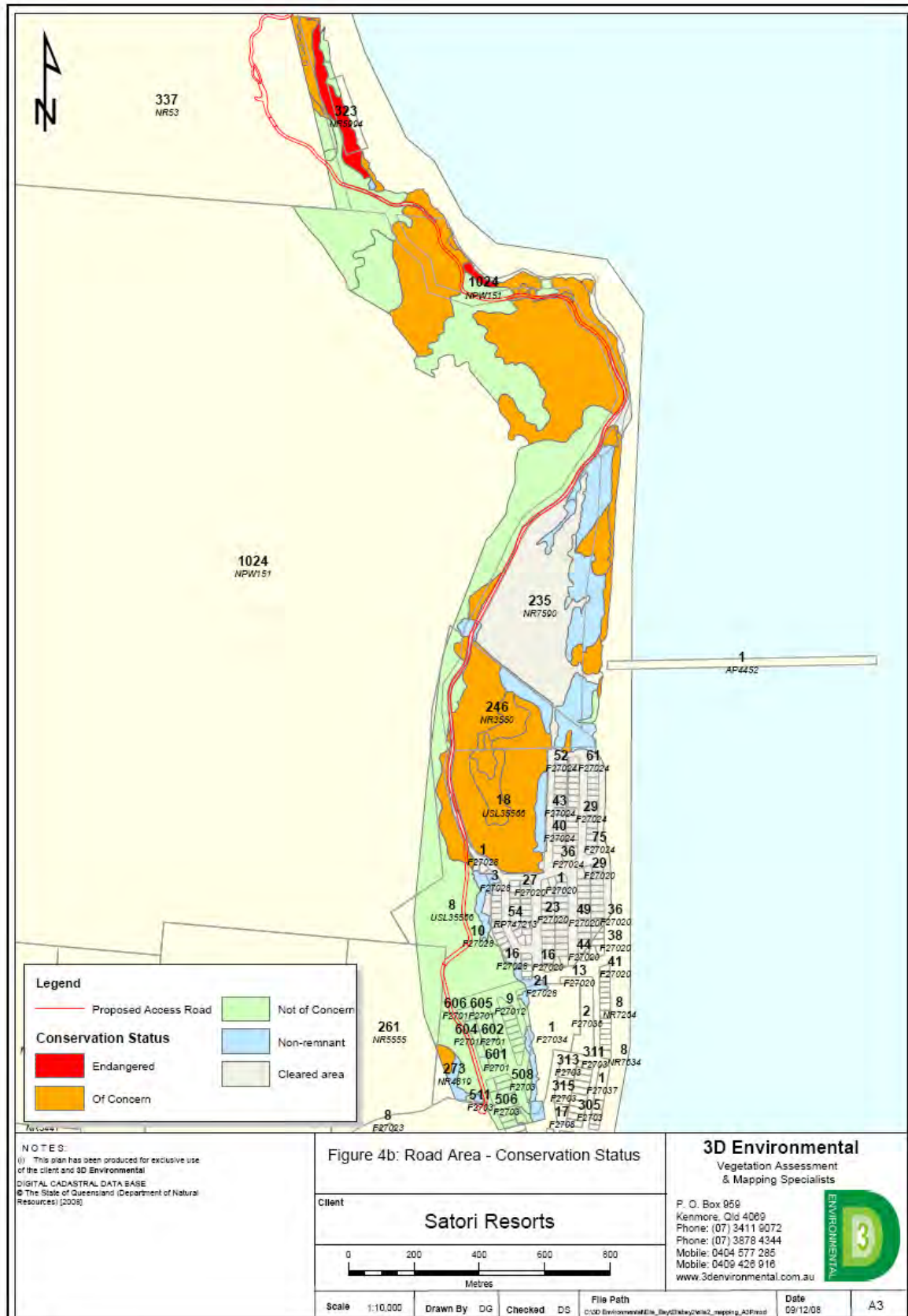
- Stanton D (2009) *Vegetation Survey Report of the Proposed 'Ella Bay Integrated Resort Project'*. 3D Environmental 2009 Report to Ella Bay Developments.
- Department of the Environment, Water, Heritage and the Arts (2009). *Carronia pedicellata* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 22.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Carronia pedicellata*. [Online]. Department of the Environment, Water, Heritage and the Arts
- Department of the Environment, Water, Heritage and the Arts (2009). *Arenga australasica* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 23.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Arenga australasica*. [Online]. Department of the Environment, Water, Heritage and the Arts
- Department of the Environment, Water, Heritage and the Arts (2009). *Aponogeton proliferus* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 22.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Aponogeton proliferus*. [Online]. Department of the Environment, Water, Heritage and the Arts
- Department of the Environment, Water, Heritage and the Arts (2009). *Canarium acutifolium var. acutifolium* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 22.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Canarium acutifolium var. acutifolium*. [Online]. Department of the Environment, Water, Heritage and the Arts
- Department of the Environment, Water, Heritage and the Arts (2009). *Huperzia phlegmarioides* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 22.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Huperzia phlegmarioides*. [Online]. Department of the Environment, Water, Heritage and the Arts
- Department of the Environment, Water, Heritage and the Arts (2009). *Phaius tancarvilleae* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed 23.05.09
- Threatened Species Scientific Committee (2008mf). *Commonwealth Conservation Advice on Phaius tancarvilleae*. [Online]. Department of the Environment, Water, Heritage and the Arts

Appendix A: Vegetation Management Act 1999 Conservation Status of Regional Ecosystems



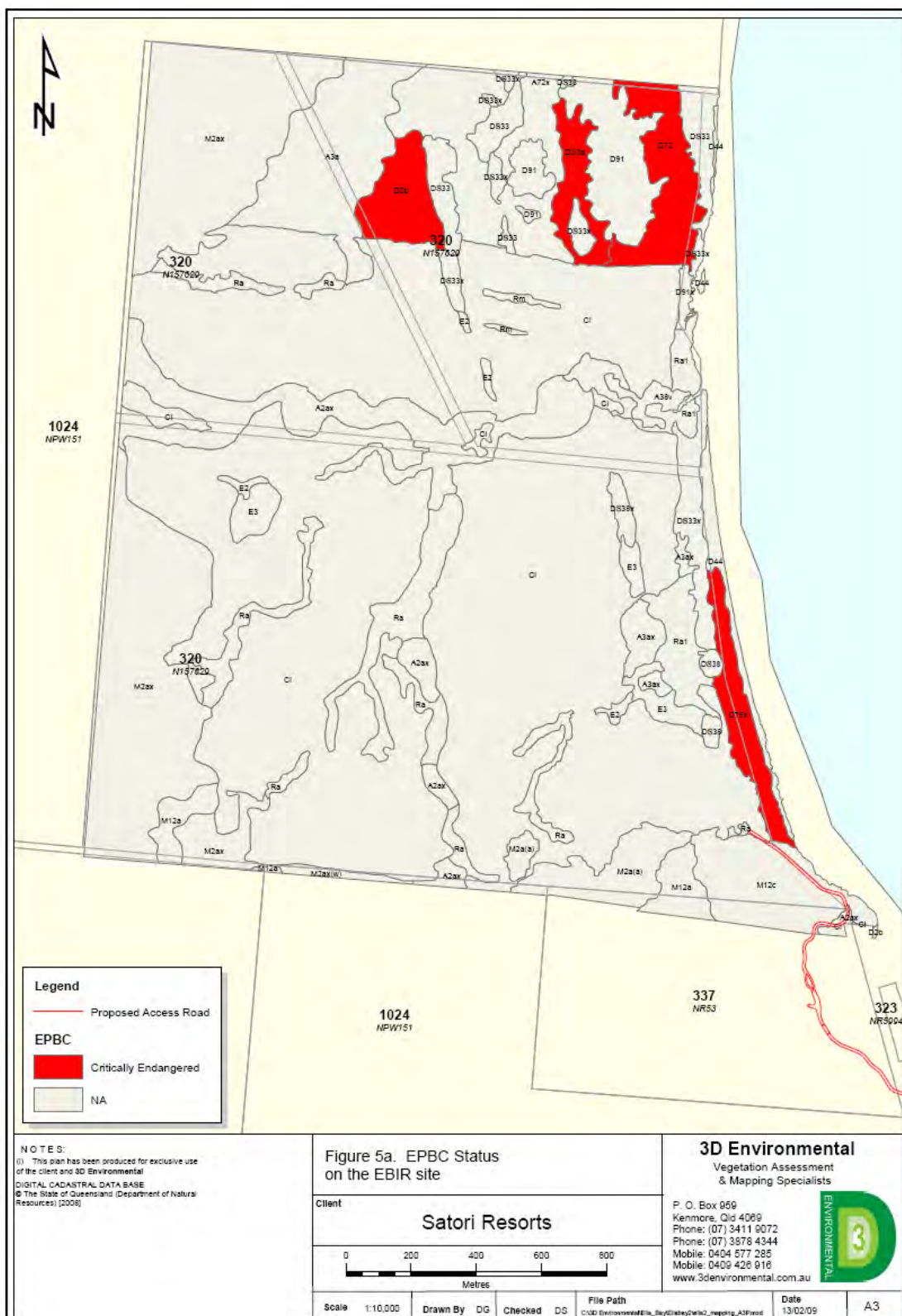
Management Act 1999 - On Site Conservation Status

Vegetation

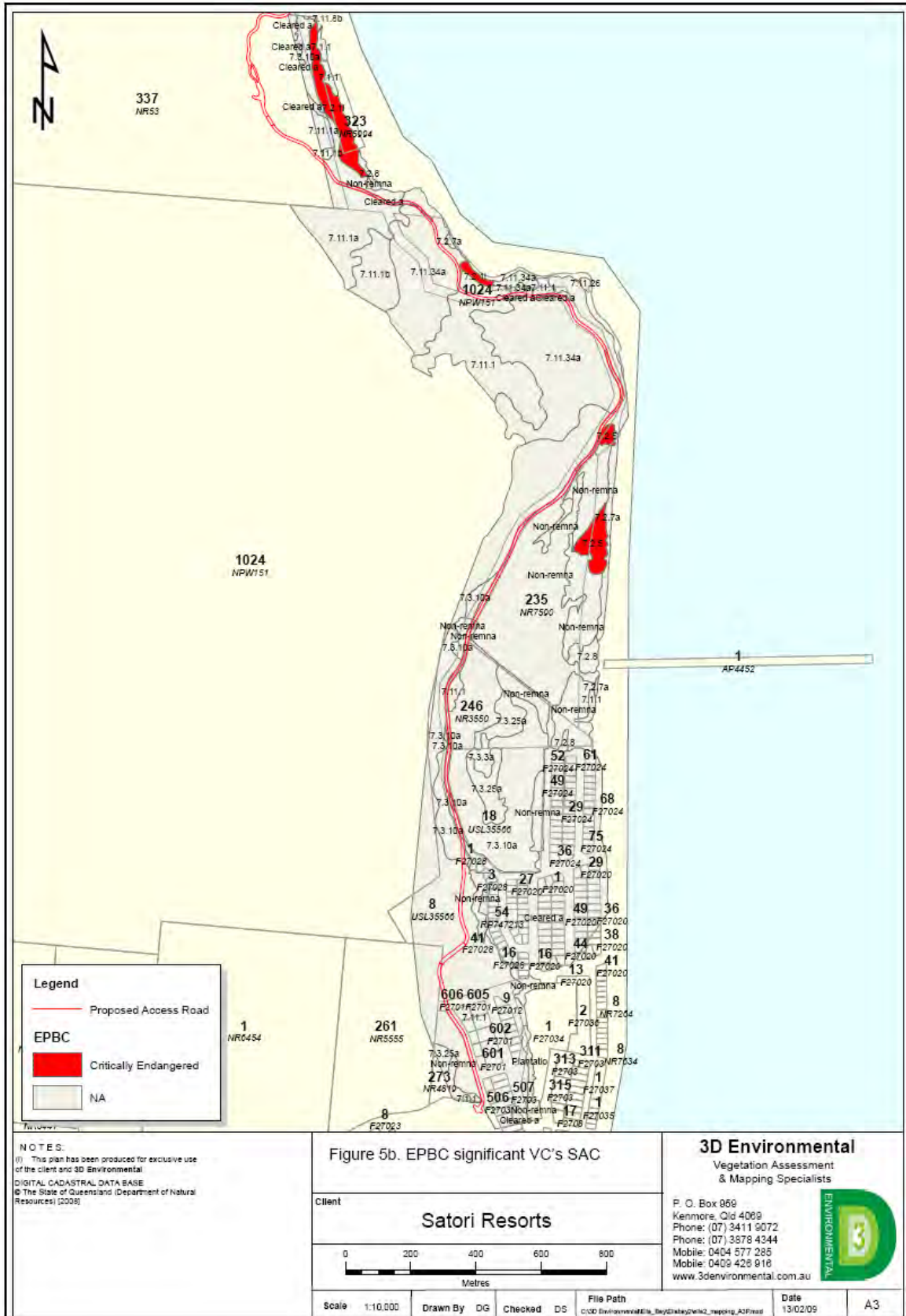


Vegetation Management Act 1999 – Ella Bay Road Conservation Status

Appendix B: Environment Protection and Biodiversity Conservation Act 1999 Conservation Status



EPBC Status – On Site

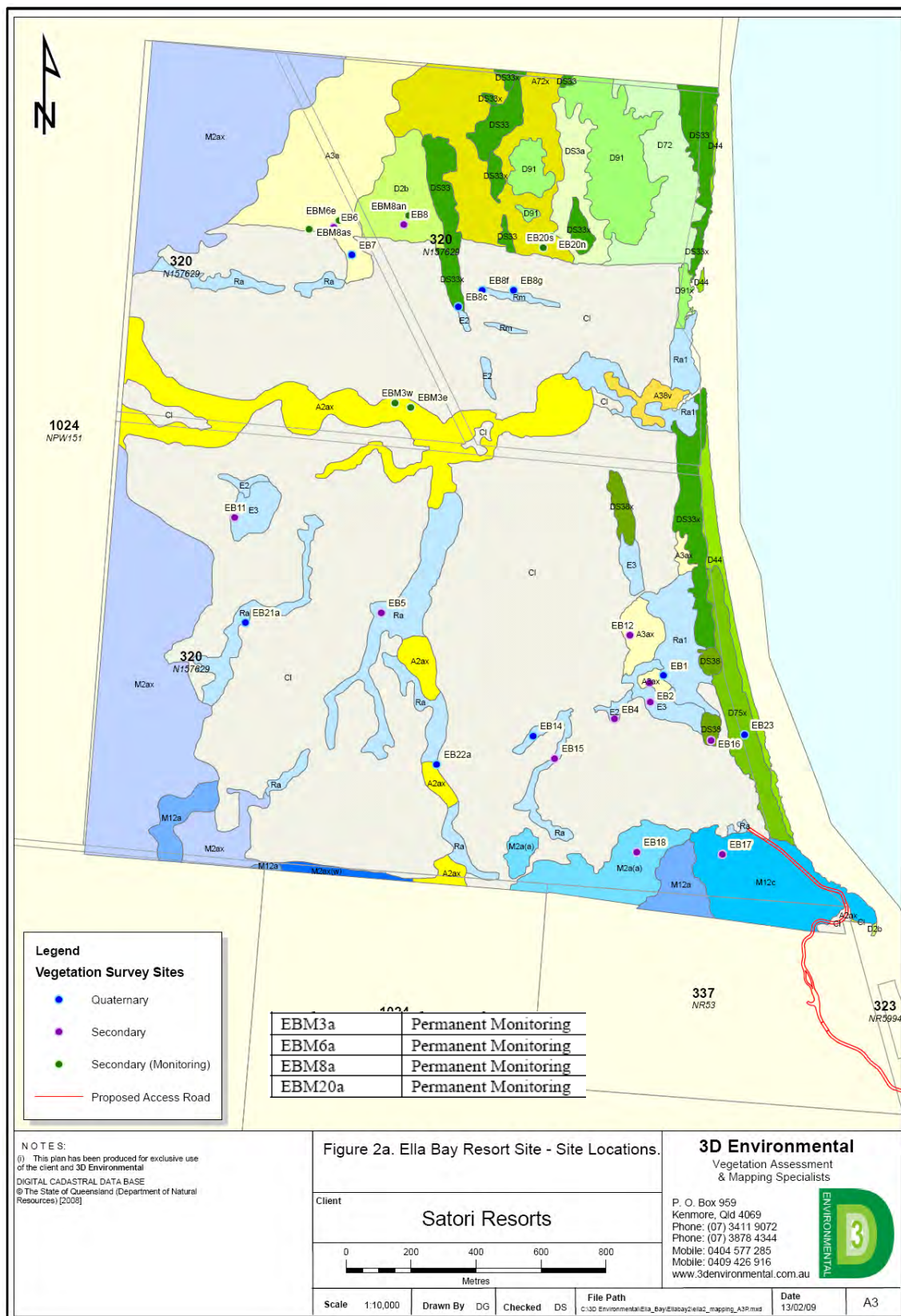


EPBC Status – Ella Bay Road

Appendix C: Potential Conservation Significant Flora Species

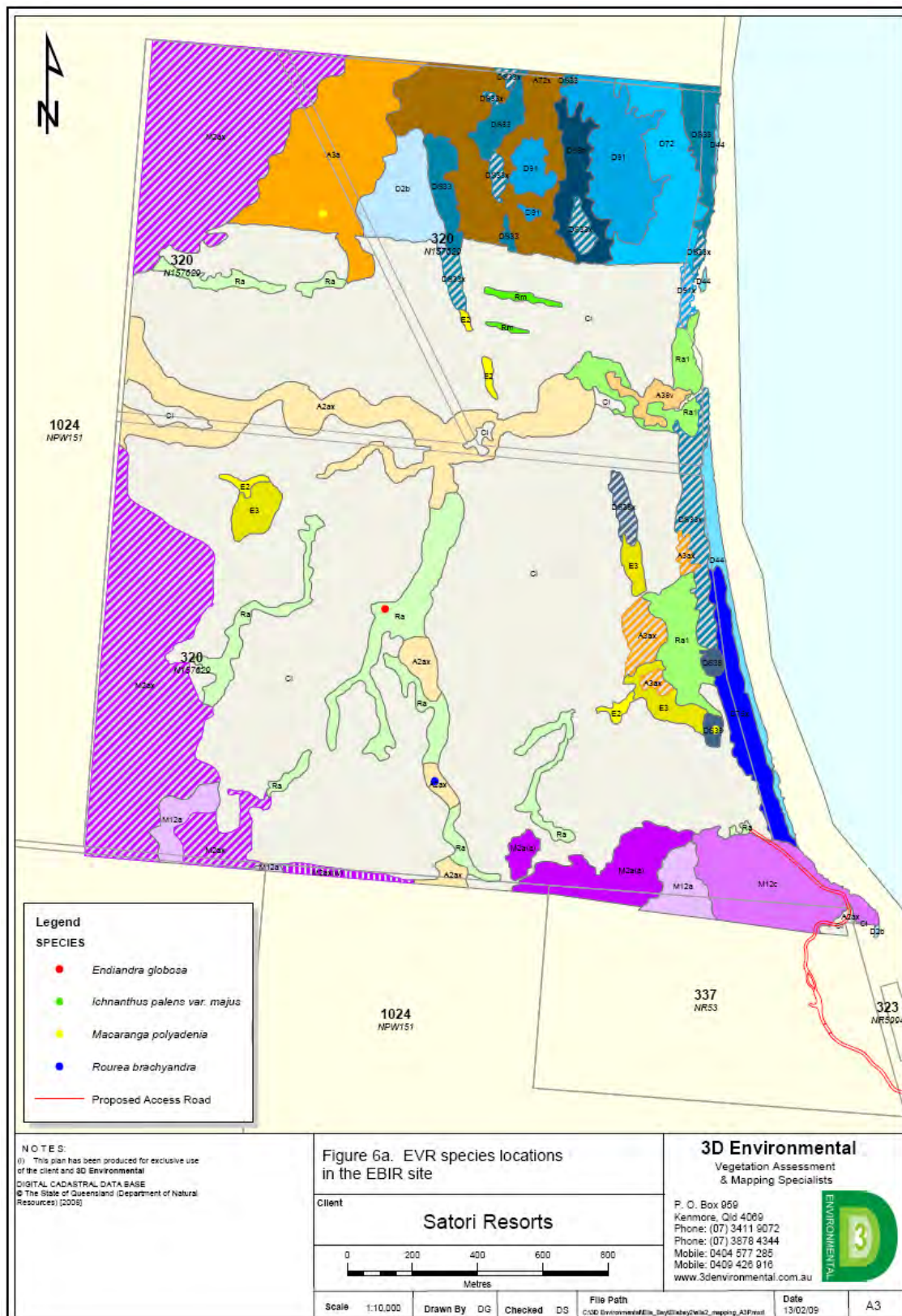
Species Name	Common Name	EPBC	NCA
<i>Aphyllorchis queenslandica</i>			Rare
<i>Aponogeton bullosus</i>		Endangered	
<i>Aponogeton cuneatus</i>			Rare
<i>Aponogeton proliferus</i>		Endangered	Endangered
<i>Arenga australasica</i>	Australian Arenga Palm	Vulnerable	
<i>Canarium acutifolium</i> var. <i>acutifolium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

Appendix D: Locations of the Permanent Monitoring Points



Location of Permanent Flora Monitoring Locations

Appendix E: Endangered, Vulnerable and/or Rare (EVR) species under Queensland's *Nature Conservation Act 1992*



Endangered, Vulnerable and/or Rare (EVR) species locations on Site

Endangered, Vulnerable and/or Rare (EVR) species locations along the proposed Ella Bay Road Alignment.

Appendix F: Conservation Significant Flora Monitoring Program

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

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

Bitterlich Technique

Bitterlich realized that one technique could combine tree size and tree density, the two components of stand basal area. The technique works by using angles of sight to determine contributions to stand basal area. Trees whose breast height diameters appear larger than the fixed angle subtended by the angle gauge are included in the sample as "hits;" trees that are narrower than the angle are "misses." The process is to scan the stand by rotating around the sample location point, counting hits (and ignoring misses). Notice that a tree can be a hit by being very large or, if small, very close to the measurement point.

The angle gauge is the simplest tool for creating the fixed angle. The line of sight from your eye to the left edge of one of the openings establishes one line. The line of sight from your eye to the right edge of the same opening establishes the second line. The two lines define the fixed angle. (The other openings can also be used, but have different conversion factors; see below.) Of course, the angle is fixed only if the angle gauge is a set distance from your eyes. That is what the chain from head to gauge is for. Keep your eye over the sampling point because your eye is where the angle starts



(Photograph courtesy of Ben Meadows Company)

Source: <http://oregonstate.edu/instruct/bot440/wilsomar/Content/HTM-trees.htm> accessed 03.06.09



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 1m² 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 Bitterlich gauge.

Extract from 3D Environmental (2009) *Vegetation Survey Report of the Proposed 'Ella Bay Development Project'*.

Frequent monitoring will be undertaken by the EBD environmental staff to collate data for reporting and to identify any (unforeseen?) threats to conservation significant flora. An example of the data sheet is provided in Table 1

Table 1 - Proposed Flora Monitoring Data Sheet

FLORA MONITORING DATA SHEET				
Recorders				
Date		Time		
Transect Location		Start	E N	End E N
Flora Census				
Species	Observed	Distribution	Observed Threats	Comments
Terrestrial Habitat Assessment				
% Canopy Cover				
% Weed Cover				
Additional Comments/Notes				

Appendix G: Conservation Significant Flora Specialist Contacts

Contact one of the following specialists for:

- further information
- assistance with translocation of conservation significant flora species

David Stanton

3D Environmental
Tel/fax (07) 3411 9072
Mobile: 0447 822 119
Email: davidstanton@3denvironmental.com.au

Dr. Ing Toh

Natural Resource Assessment (NRA)
1st Floor 320 Sheridan Street,
Cairns QLD 4870
Tel (07) 4031 5122
Fax: (61) 7 4051 67403
Email: nra@natres.com.au

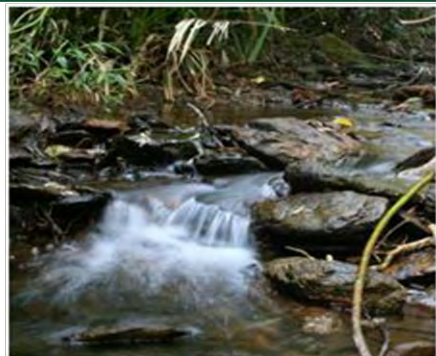
3.7 Cultural Heritage Management Sub-Plan

Cultural Heritage

THIS CULTURAL HERITAGE MANAGEMENT
PLAN HAS BEEN REMOVED FROM THE
PUBLIC DOCUMENTATION

Management Plan

April 2010 Revision 1





3.8 Weed Management Sub-Plan



Environmental Management Sub-Plan

For

Weed Management

August 2010 Revision 1





Weed Management Sub-Plan

Plan Review

This plan will be regularly reviewed and updated in accordance with the Ella Bay Development (EBD) Environmental Management Plan. The review will incorporate changes identified by the continuous improvement process and any changes to legislation or the environment. The current status is listed in the Revision Table below.

Revision Table

Rev	Date	Prepared	Reviewed	Approved
Rev 0	April 2009	SG/AH	KF	RL
Rev 1	Aug 2010	KR	DP	RL

Plan Control

This document is a controlled document and the holders of registered copies will receive revisions to this document should they occur. The superseded document should be destroyed upon receipt of the revised version. The currency of this document may be ascertained by reference to the Master List of Documents displayed on the Ella Bay web site. Revised sections will be referenced with a Revision document watermark.

Distribution List of Registered Copies and Key Contacts

Position	Name	Copy Number	Contact Details
Project Director		1	
Environmental Manager		2	
Construction Manager		3	
Design Manager		4	
DSEWPC		5	
Qld DERM		6	



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1. Introduction

The Ella Bay Development (EBD) is located adjacent to World Heritage listed Ella Bay National Park and the Great Barrier Reef Marine Park. The EBD site itself is not within the World Heritage area, however contains both unique yet degraded environment. The project will consist of;

The development and operation of a residential and tourism integrated community and associated infrastructure at Ella Bay including a suitable access route from Flying Fish Point to Ella Bay Queensland.

The Ella Bay site has been farmed for over a century and during this time extensive areas of land have been cleared and in some cases reclaimed by the rainforest. The main sources of degradation are:

- Historic logging practices;
- Clearance for bananas, market gardening, cropping, pasture;
- Systemic weed invasion;
- Cyclonic wind damage;
- Damage caused by activity by high numbers of native (agile wallabies); and
- Degradation caused introduced (pigs) animal activity.

Document Structure

This document is a Sub-Plan of the Ella Bay Development Environmental Management Plan (EMP).

The EBD Environmental Management Plan (EMP) System consists of a main document which outlines the overall environmental management system and a series of separate environmental management Sub-Plans.

The EMP and Sub-Plans were developed from mitigation measures detailed in the Ella Bay EIS and after consideration of public and agency comments and submissions in response to the EIS and addressed subsequently in the SEIS.

The EMP details the methods and procedures which will be used to meet the environmental objectives and targets of the EBD Project and sets out the project details, management process and authority and training procedures.

This Weed Management Sub-Plan is designed to be read in conjunction with the overarching EMP document and appropriate other Sub-Plans.

This Sub-Plan outlines the specific management procedures that relate to weeds that may be present within Ella Bay and along Ella Bay Road.

Document Management

This document outlines the planning and environmental control measures that are to be implemented at the EBD to ensure that objectives listed in this Sub Plan are achieved.

This document is a controlled document and the holders of registered copies, listed previously, will receive revisions to this document when they occur. The superseded document should be destroyed upon receipt of the revised version.

Where non-compliance to the performance indicators occurs, e.g., where an incident has occurred, a detailed report of the incident and any corrective action necessary will be prepared and logged. This document and process will be subject to regular auditing and review.



2. Background

Prior to clearing for pastoral activity, the EBD site consisted of predominately lowland rainforest and swamp communities. The EBD site was first visited by cedar getters in the late 1800's and gazetted as a property in 1882 and developed as a market garden and extensively cleared and farmed for bananas. More recently in the mid 1960's the EBD site was further cleared and intensively farmed as a grazing property.

Further impacts include disturbance from cyclonic winds, feral pig activity and disturbance caused by unnaturally high densities of agile wallabies eating and trampling groundcover vegetation. This has led to:

- Extensive weed infestations in forest and wetland areas; and
- Displacement of pasture grasses with broadleaved weeds in the cleared areas.



3. Objectives of the Weed Management Sub-Plan

Objective 1: Ensure that obligations under the *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)* for declared weed control are met.

Objective 2: Ensure that species listed under Environment Protection and Biodiversity Conservation Act (EPBC Act) and Nature Conservation Act 1992 (NCA) are protected.

Objective 3: Ensure habitat improvement through the control of environmental weeds found in the EBD and EBR areas.

Objective 4: Compliment applicable plans and strategies relating to the site including:

- Cassowary Coast Regional Council's Pest Management Plan (2006);
- The Australian Weeds Management Strategy (2007);
- Queensland Weeds Strategy (2007); and
- Weeds of National Significance (WONS).

Objective 5: Minimise and quickly respond to any new weed invasions that occur within the EBD or EBR areas.

The expected outcomes through the implementation of the *Weed Management Sub-Plan* include:

- **Plant Species Prioritisation** - The effective control of declared and environmental weeds within the EBD and EBR areas;
- **Location and Species Focus** - Reducing and controlling weeds as a threatening process towards endangered, vulnerable and rare animals, plants and ecological communities on the EBD and EBR sites;
- **Early Intervention** - Ensuring weeds do not adversely impact on revegetation activities;
- **Hygienic Practices** - Minimising the likelihood of additional weed species being introduced to the site during planning, construction and operation phases of the project;
- **Proactive Response Management** - Rapidly responding to any new weed incursions.

This Environmental Management Sub-Plan seeks to achieve these outcomes by outlining a program of actions for implementation throughout the duration of the EBD.

4. Weeds present in EBD and EBR areas

Due to the productive tropical climate found at Ella Bay there are many introduced plant species which have become invasive. These species can be broken down into those that pose a threat to forested or wetland areas (environmental weeds) (Appendix 1) and those which pose a threat to open areas such as paddocks and unestablished revegetation areas (disturbance weeds) (Appendix 2). The priority species are briefly discussed below with some additional information presented in Appendix 1 and 3. Descriptions and information on the ecology of most of the weed species listed in this Sub-Plan can be found at the following website http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_10234_ENA_HTML.htm. Several weed species found within the EBD and EBR areas are declared weeds under the Land Protection (Pest and Stock Route Management) Act 2002 Qld. A more comprehensive weed species list containing declaration status and control methods is given in Appendices 1 and 2.

Serious Threat: Based on distribution and impact, the most serious environmental weeds at the EBD/EBR site are:

- Pond Apple (*Annona glabra*);
- Singapore Daisy (*Sphagneticola trilobata*); and
- Hymenachne (*Hymenachne amplexicaulis*).

Pond Apple and Hymenachne are currently on the top 20 Weeds of National Significance List.

High Threat: Based on distribution and impact, the most serious disturbance weeds on site are:

- Sickie Pod (*Senna obtusifolia* and other members of the *Senna* genus);
- Snake Weed (*Stachytarpheta* species);
- Rat's Tail grasses (*Sporobolus* species) - largely restricted to track and trails; and
- Tall grasses (in particular Guinea Grass *Panicum maximum*).

Concern Threat: Other weeds of concern include:

- Introduced ponded pasture grasses;
- Giant Bramble (*Rubus alceifolius*);
- Guava (*Psidium guajava*);
- Lantana (*Lantana Camera*) - ;
- Allamanda (*Allamanda cathartica*) - limited distributions on site;
- Pink Periwinkle (*Catharanthus roseus*) – limited distributions on site; and
- *Mimosa* (sensitive plants) which occur throughout the site at low densities.
- A number of vines from the Pea (*Fabaceae*) and Passionfruit (*Passifloraceae*) families.

Note - That species in the category 'Concern Threat' should be targeted for control before further spread becomes a problem. They have the potential to become serious weeds, and have potential to become problems on forest edges and at revegetation sites.



5. Weed Control Methods

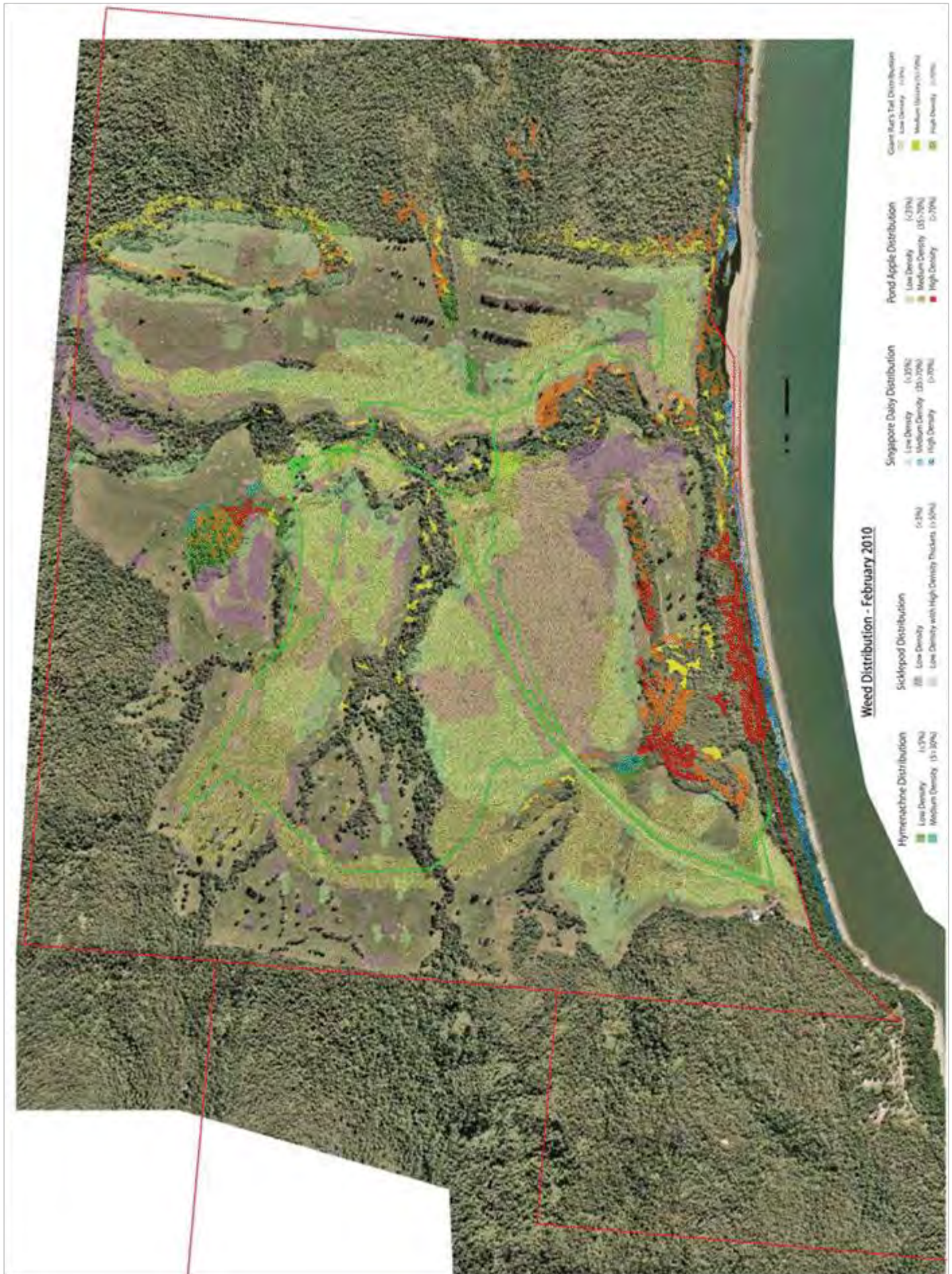
In order to achieve the outlined desired outcomes, a combination of physical and chemical weed control methods will be used. The use of chemicals on the site will be controlled to comply with the Great Barrier Reef Marine Park Authority (GBRMPA) restrictions on the use of certain herbicides within catchments draining into the Great Barrier Reef. Ella Bay Developments is committed to these restrictions, not allowing these herbicides to be used (see Appendix 7). Specific information on chemicals; herbicides and surfactants is detailed in Appendices 1 and 2.

Preferentially all chemicals used will be frog and aquatic friendly, and where this is not possible extensive usage restrictions will apply with proximity to riparian areas or alternative methods used.

The long-term control of weeds over large sections of the EBD and EBR areas will be achieved through revegetation, mowing, and spot control using non chemical methods.

In some instances clearing will be required to access weed infestations. Clearing of vegetation for weed or pest management is controlled under the Regional Vegetation Management Code for Coastal Bioregions part W. Clearing is restricted within wetlands, watercourses, remnant vegetation, erosion prone areas and acid sulphate soils.

Approval is required from DERM in areas of assessable vegetation where native woody vegetation will be destroyed in the process of managing weeds or pests.



6. Risk Assessment Associated with Weed Control

Weed control will include the use of herbicides which have a high risk to humans and the environment associated with storage, use, unintended overspray and runoff. The following risk assessment is based on outcomes that could impact on human or environmental health during weed control operations.

The risk level was determined by:

- How often an undesirable outcome could occur; relative to
- How often that action actually occurs.

For example:

- Large areas of the site will be subjected to controlled herbicide spraying;
- Due to the scale of the activity the risk of off-target damage could be considered moderate; and
- Should an undesirable outcome of an action occur the responses outlined in the right hand side of the table will be used to rectify the situation.

Note - The primary focus of this exercise is to anticipate the potential problems and modify operational behaviour. A job specific risk analysis will be required for work method statements prior to the start of work.

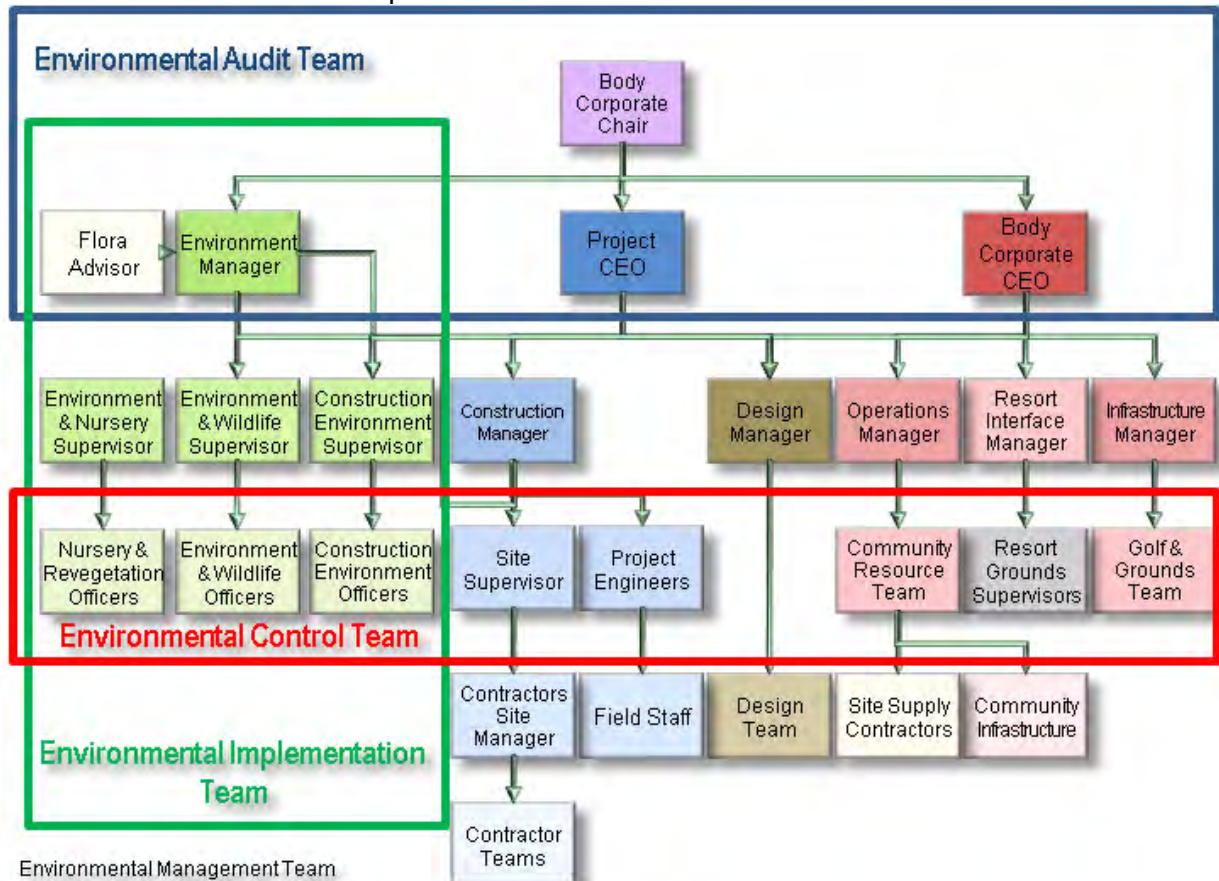
Risk	Risk level				Response
	Very Low	Low	Mod	High	
Herbicide spills low volume concentrate and mixed solution	×				-Instigate hazardous material response if a spill occurs; -Contact WHSO and Environmental Manager; -Ensure anyone coming into contact with herbicide knows correct handling methods; -Review herbicide handling storage and containment guidelines if necessary; -Note and report incident to site supervisor.
Herbicide spills Large volume 20L Concentrate in or near aquatic areas		×			-Instigate hazardous material response; -Contact WHSO, Environmental Manager and CEO; -Contact DERM; -Instigate emergency wildlife management response with DERM; -Investigate incident and audit herbicide handling storage and containment guidelines; -Use spotters if crossing creeks with boom spray tanks containing herbicide
Fire in herbicide storage area	×				-Instigate hazardous material response and notify fire brigade; -Contact WHSO and Environmental Manager; -Review herbicide storage guidelines; -Note and report incident to site supervisor.
Close encounter, injury or death caused by crocodile attack during weed control	×				-Instigate emergency response and notify ambulance service (and police); -Contact WHSO and Environmental Manager; -Review wetland weed control approaches;

Risk	Risk level				Response
					-Note and report location and incident to site supervisor.
Weed control equipment causing injury or death weed control operations	x				<ul style="list-style-type: none"> -Instigate emergency response and notify ambulance service (and police); -Contact WHSO and Environmental Manager; -Review safety measures; -Note and report incident to site supervisor.
Death of EPBC act listed frog species following weed control operations	x				<ul style="list-style-type: none"> -Investigate incident and submit report to relevant authority; -Increase level of supervision; -Review weed control procedures including time of day and year for herbicide application.
Introduction of amphibian diseases during weed control operations	x				<ul style="list-style-type: none"> -Quarantine infected area; -Notify officer in charge of frog conservation; - Review and audit vehicle wash down and weed control equipment hygiene procedures; -Take note of incident and report.
Off-target damage to habitat of EPBC listed frog species		x			<ul style="list-style-type: none"> -Investigate incident and submit report to relevant authority; -Increase level of supervision; -Revegetate as soon as possible if necessary; -Use more selective control methods if possible.
Off-target damage to the EPBC listed littoral rainforest vegetation community		x			<ul style="list-style-type: none"> -Investigate incident and submit report to relevant authority; -Increase level of supervision; -Revegetate as soon as possible if necessary; -Use more selective control methods if possible.
Off-target herbicide damage			x		<ul style="list-style-type: none"> -Increase level of supervision; -Ensure weed control contractors can identify native plant species; -Revegetate if necessary; -Ensure contractors know how to use weed control equipment and are ChemCert qualified; -Reduce cut-off wind speed -Repeat offenses may result in contract termination; -Take note of incident.
Unintentional weed reproductive material dispersal and introduction of new weed species				x	<ul style="list-style-type: none"> -Control any new weed outbreaks; -Review and audit vehicle wash down procedures; -Take note of incident and report in next weed management report.

7. Responsibilities and Authorities

The organisational structure of the project, in terms of environmental responsibilities, is outlined in detail in the Ella Bay Development Environmental Management Plan (EBD EMP). Ella Bay Developments and Sub-Contractors during the Construction Stage are to be allocated to one or more teams (usually one) to be known as:

- **EAT** - Environmental Audit Team
- **ECT** - Environmental Controls Team
- **EIT** - Environmental Implementation Team



Vegetation Advisor (VA)

An important part of the above structure is the advisory role of a flora expert, (to be known as the Vegetation Advisor (VA), who is also recognised in the field of Weed Control.

The Vegetation Advisor will advise on all elements of weed control strategies and maintenance programs on the EBD and EBR. The VA will provide expert advice to the EBD Environmental Staff regarding:

- Conducting assessments of weed control strategies of the EBD and associated Ella Bay Road during the planning, construction and operational phases.
- Ella Bay Road Monitoring for the efficacy of all weed mitigation at the planning, construction and operational phases. This monitoring program must seek to identify negative (or positive) weed trends and likely causal factors.
- Provides feedback on the annual report of the state of the weed population(s) and the effectiveness of mitigation strategies.

The Vegetation Advisor will also provide an external audit function of weed management and compliance to this Sub-Plan, along with the Environmental Manager and is to be a member of both the Ella Bay Developments Environmental Audit Team (EAT) and the Ella Bay Developments Environmental Implementation Team (EIT).



8. Reporting and Sub-plan Reviews

Reporting

Regular reporting will be based on the elements of the following environmental management schedules (sections 9,10&11) for the respective phase of the project: planning, construction and operation.

Monthly reports will be prepared by the Environmental Implementation Team to inform of the progress of the Weed Control management strategies. The report will be collated from the communications register (CR), and will include logs of unanticipated contingencies, any instances of procedural non-compliance and if necessary recommendations for changes or improvements made to this document, including any additional mitigation measures found to be necessary

An Annual report will be prepared by the Environmental Implementation Team based on the monthly reports, environmental management schedules and evaluation of the mitigation measures. This report once approved by the EAT will be included in the Proponent's Annual Compliance Report for the Ella Bay Development and other external reports.

Sub-plan Reviews

An environmental review (six monthly) will be undertaken by the Environmental Audit Team (including the VA) to examine the reports and to review changes or improvements to this Sub-Plan, including any additional mitigation measures found to be necessary.

9. Planning Phase

Potential Impacts during the Planning Phase

- Staging of road construction may impact on weed control efforts in that area.
- Contractors (e.g. surveyors) may spread weed seed and/or plant material.
- Contractors assigned to weed control may damage desirable vegetation and/or pollute surface or ground water.
- Locations of construction infrastructure (machinery compounds, staff rest facilities, stockpile areas, etc) may impact on weed control efforts in that area.
- Weed removal contributing to erosion, sedimentation and water quality problems.
- Weed control operations may cause the death of EPBC listed frog species and/or damage their habitat.
- Weed control operations may cause off-target damage to the EPBC listed, littoral rainforest vegetation community.

Objectives

- To minimise the impact weeds have on EVR¹ animals, plants and ecological communities.
- To minimise and where possible eliminate off-target damage during weed control operations.
- To minimise and where possible eliminate water pollution caused by herbicides.
- To minimise and where possible eliminate weed spread and the introduction of new weed species.
- To minimise erosion, sedimentation and water quality problems associated with weed control.
- To minimise and where possible eliminate deaths of EPBC² listed frog species, and damage to their habitat caused by weed control operations.
- To minimise and where possible eliminate off-target damage to the EPBC listed littoral rainforest vegetation community.

Performance Criteria

- No increase in the distribution of major weed species currently found within the EBD and EBR areas.
- No new weed species introduced into the EBD and EBR areas.
- Minimal off-target damage during weed control operations.
- No water pollution caused by herbicides.
- Minimal erosion, sedimentation and water quality problems caused by weed removal.
- No EPBC listed frog species' deaths and no damage to their habitat caused by weed control operations.
- No off-target damage to the EPBC listed littoral rainforest vegetation community.

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental planning activities relating to Weed Management that are to be completed prior to the commencement of construction. Responsibilities for various actions will be assigned to either of 3 Environmental teams composed of various personnel and shown on the figure 7.1.

The environmental teams will be measured by the performance criteria (**PC**) with monitoring events being recorded in a compliance register (**CR**) in the tables below.

¹ Endangered, vulnerable and rare – Classified under the Nature Conservation Act 1992 (NCA)

² Listed under Environment Protection and Biodiversity Conservation Act (EPBC Act)



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions
Staging of road construction may impact on weed control efforts in that area.	<p>Implement: Baseline weed monitoring prior to construction.</p> <p>Planning: Baseline data to refine abundance and distribution maps.</p> <p><i>Note - This work will also include recording the effectiveness of prior control or mitigation activities.</i></p> <p>Implement: Weed control operations conducted prior to road construction.</p>	Before and After Construction: Monitor road areas. Purpose is to determine effectiveness weed containment.	EIT	Event Based: Results of weed monitoring and mapping will be utilised to assess the performance of weed management strategies and impact of construction works.	
Road construction will require WTMA permit with weed control conditions	<p>Research: Alternative weed control measures to aid WTMA conditions.</p> <p>Planning: Identify weed infested areas where construction clearing activities will occur. Highlight where relocation of activity is unworkable.</p> <p>Education and Awareness: Induct all staff on recognition of weeds. Focus on dispersal means.</p> <p>Implement and Compliance: Specific hygiene measures for weed spread throughout the year.</p>	<p>Ongoing:</p> <ul style="list-style-type: none"> Relevant weeds and extent identified. The high risk periods of seed transfer detailed. Strategies to mitigate the spread of the weed(s) implemented. 	EIT	<p>Event Based: Identify weed locations on plan where activities are likely.</p> <p>Event Based: Detail information in inductions. Advise how staff responsibilities will be applied.</p>	
Contractors Surveyors may spread weed seed and/or	<p>Maintenance: Washdown facility.</p> <p>Education and Awareness: As part of the induction, provide diagram showing locations commonly missed</p>	<p>Random & Frequent: 2-5 inspections per week.</p> <p>Ongoing: Washdown log to be maintained in conjunction with</p>	ECT	Event Based: Reports to include results of vehicle inspections and the weeds intercepted by the	Re-induct and warn of penalty for re-offence



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions
plant material	in vehicle/machinery washdown.	the site sign-in book. Random & Frequent: Washdown facility and its use will be inspected to ensure compliance.		washdown facility. Reports to be included in EBD CR. Event Based: Incident reporting in EBD CR of breaches to washdown requirement.	
Weed control operators may damage desirable vegetation &/or pollute surface &/or ground water(s).	Implement: Induction of all operators detailing their zone of operations. <i>Note – Zones will be defined by a buffer of 25m or more from surface waters and 10m or more from existing vegetation.</i> Education and Awareness: Operators will be trained in weed identification and equipment use. <i>Note - refer to Integrated Water Management Sub-Plan For more details.</i>	Ongoing: Throughout weed control operations.	EIT	Event Based: Include summary of spray sheets Event Based: Breaches to be reported immediately and recorded in EBD CR.	Provision of printed material at tool box talks / re-induction Stop work in the event of breach. Revegetate if needed.
Erosion, sediment and water quality issues associated with weed removal.	Training: Relevant staff, (sub) contractors trained in erosion and sediment control techniques. Implement: Where practical, revegetate area as soon as possible after weed removal. Compliance: Preference to conduct	Weekly: Inspect all erosion and sediment control measures Event Based: Specific checks after each significant rainfall events.	ECT	Monthly: Reports on performance and any problems that may have arisen recorded in EBD CR.	If immediate response is required identify cause and rectify. Review <i>Erosion and Sediment Control Sub-</i>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions
	high risk weed control in the dry season.				<i>Plan.</i>
Mortality of EPBC listed frog species and/or damage to their habitat caused by weed control operations.	<p>Compliance: Preference to mechanical/manual control. Selective targeted spot weed control to occur in these areas.</p> <p>Training: Only weed control operators with specialised training to operate within riparian and frog designated areas.</p> <p>Training: Operators to be trained in frog ID, weed ID and equipment use.</p> <p>Compliance: Highest level of supervision in these areas.</p>	Before and after weed control and one week follow-up.	ECT	Event Based: Immediate reporting of any incident in EBD CR.	Audit and Review weed control procedures.
Off-target damage to EPBC littoral rainforest vegetation community	<p>Compliance: Preference to mechanical/manual control. Selective targeted spot weed control to occur in these areas.</p> <p>Training: Only weed control operators with specialised training to operate within EPBC designated areas.</p> <p>Training: Operators to be trained in frog ID, weed ID and equipment use.</p> <p>Compliance: Highest level of supervision in these areas.</p>	Before and after weed control and one week follow-up.	ECT	Event Based: Immediate reporting of any incident in EBD CR.	Revegetate area if required Review <i>weed control procedures.</i>

10. Construction Phase

Potential Impacts during the Construction Phase

Potential impacts on weed prevalence and dispersal during construction of the Ella Bay Development:

- Increased road traffic and human activity increasing risk of weed dispersal and introduction;
- Disturbance to pastures and natural environments creating opportunities for weed colonisation;
- Off-target damage during weed control operations;
- Water contamination caused by herbicides;
- Weed removal contributing to erosion, sedimentation and water quality problems;
- Weed control operations may cause the death of EPBC listed frog species and/or damage their habitat; and
- Weed control operations may cause off-target damage to the EPBC listed, littoral rainforest vegetation community.

Objectives

- Minimise disturbance to desirable vegetation (both natural and/or pasture grasses) outside footprint of road alignment and ancillary work areas.
- To minimise and where possible eliminate off-target damage during weed control operations.
- To minimise and where possible eliminate water pollution caused by herbicides.
- To minimise and where possible eliminate weed spread and the introduction of new weed species.
- To minimise erosion, sedimentation and water quality problems associated with weed control.
- To minimise and where possible eliminate deaths of EPBC listed frog species, and damage to their habitat caused by weed control operations.
- To minimise and where possible eliminate off-target damage to the EPBC listed littoral rainforest vegetation community.

Performance Criteria

- No breaches of washdown requirements.
- Monitoring shows no increase in abundance or spread of weed populations.
- Minimal damage to natural vegetation and pastures.
- Erosion and sediment control performance is within the acceptable range.
- Monitored water quality parameters are within the acceptable range.
- No EPBC listed frog species' deaths and no damage to their habitat caused by weed control operations.
- No off-target damage to the EPBC listed littoral rainforest vegetation community.

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental control measures to manage weeds during the construction of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Sub-Plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Increased construction, road and human traffic increasing the risk of weed dispersal.	<p>Implement: <i>Construction Traffic Management Strategy</i> for the EBD and associated Ella Bay Road in place during construction and operation.</p> <p>Compliance: All vehicles to stay within designated road alignment or isolated to construction areas.</p> <p>Implement: Washdown facilities installed in locations as per approved designs.</p> <p>Education & Awareness: Induct visitors and contractors on washdown procedures.</p>	<p>Ongoing: Evaluate effectiveness of <i>Construction Traffic Management Strategy</i> in preventing dispersal of weed seed and plant parts.</p> <p>Before Each Stage of Construction: <i>Construction Traffic Management Strategy</i> to be communicated to all staff and (sub) contractors.</p> <p>Ongoing: Monitor roads, creek crossings & access points for germination of weeds (especially GRT).</p> <p>Ongoing and Event Based: Washdown facilities to be regularly monitored (and after any significant weather events).</p> <p>As Required: Maintenance to ensure integrity.</p> <p>Ongoing: Maintain washdown log.</p>	<p>EAT</p> <p>EIT</p> <p>ECT</p> <p>ECT</p> <p>ECT</p>	<p>Event Based: Compliance with <i>Construction Traffic Management Strategy</i> reported.</p> <p>Event Based: Immediate reporting of any incident in EBD CR.</p> <p>Event Based: Immediate reporting of any incident in EBD CR.</p> <p>Event Based: Record EBD</p>	<p>Immediately respond if an increase in the area under weeds and/or new weeds found on-site.</p> <p>This may involve re-evaluating the effectiveness of the washdown facility, installing temporary control measures and redesign and/or refresher of induction process if necessary.</p> <p>Re-instruct contractors & staff on washdown procedures.</p>

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
				CR.	
Off-target damage to EPBC littoral rainforest vegetation community.	<p>Compliance: Preference to mechanical/manual control. Selective targeted spot weed control to occur in these areas.</p> <p>Training: Only weed control operators with specialised training to operate within EPBC designated areas.</p> <p>Training: Operators to be trained in frog ID, weed ID and equipment use.</p> <p>Compliance: Highest level of supervision in these areas.</p>	Before and after weed control and one week follow-up.	EIT	Event Based: Immediate reporting of any incident in EBD CR and to EAT.	<p>Revegetate area if required.</p> <p>Review the weed control procedures.</p>
Disturbance to pastures & natural environments creating opportunities for weed colonisation.	<p>Implement: Decommission existing access track & gate network surplus to requirement.</p> <p>Compliance: Construction work to occur according to schedules developed in planning phase.</p> <p>Implement: Specific disturbed areas will be revegetated.</p> <p>Implement: Weed control operations in areas of additional weed colonisation.</p> <p>Compliance: Works at creek</p>	<p>During Construction: Frequent inspections of construction and surrounding areas for signs of unnecessary disturbance and potential weed colonisation.</p> <p>Ongoing: Monitor work areas for extent of clearing activities.</p> <p>Daily: Monitor construction activities around creek crossings to ensure compliance with sub-plan.</p>	<p>EAT</p> <p>EAT</p> <p>EAT</p>	Event Based: Compliance reporting in EBD CR.	<p>Immediately respond if results indicate an increase in non-work related access. This may involve re-evaluating the effectiveness of the temporary exclusion structure(s) and information communicated in the induction process.</p> <p>Immediately respond, identify cause and rectify if health of terrestrial</p>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>crossings are to be undertaken during the drier periods of the year.</p> <p>Implement: Undertake investigations for signs of weed introduction and reasons why, where habitat within 25m of creek-lines has been disturbed by construction.</p> <p><i>Note - Any weeds found are to be removed.</i></p> <p>Compliance: Define on-ground the area for clearing with flagging tape. No unauthorised disturbance to areas outside of the designated clearing zone is permitted.</p>	<p>Ongoing: Monitor terrestrial habitats for weed invasion to be undertaken at the same location and time.</p> <p>Before Construction: Communicate to contractors in the induction about minimizing disturbance.</p>	<p>EAT</p> <p>EAT</p> <p>EIT</p>		<p>habitats shows signs of disturbance.</p> <p>Assess damage and causes. Further rectification through information and training, review of construction techniques, re-evaluation of <i>Vegetation Management Plan</i>. If necessary undertake rehabilitation / revegetation of disturbed area.</p> <p>Immediately cease vegetation clearing and/or construction if the import of weeds is identified and/or the levels of disturbance are excessive. Vegetation clearing and/or construction proceeds only after all risk of weed introduction has been reduced and/or the area of disturbance minimised.</p>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	Compliance: Creek banks are to be retained in their current form other than for essential works - (removal of creek-bank vegetation kept to an absolute minimum).		EAT		
	Implement: Restore/rehabilitate native vegetation on completion of works as per the <i>Rehabilitation Sub-plan</i> .		EAT		
Erosion, sediment and water quality issues associated with weed removal.	<p>Education and Awareness: Relevant staff/ (sub) contractors trained in erosion and sediment control techniques.</p> <p>Implement: Revegetate area as soon as practical after weed removal.</p> <p>Compliance: Focus on high risk weed control operations during the dry season.</p>	Weekly & Event Based: Inspect erosion and sediment control measures and specific checks after each significant rainfall events.	<p>ECT</p> <p>EIT</p>	Event Based: Reporting on performance and any problems that may have arisen in EBD CR.	<p>If immediate response is required identify cause and rectify.</p> <p>Review <i>Erosion and Sediment Control Sub-Plan</i>.</p>
Deterioration of water quality.	Implement: <i>Water Management Sub-Plan</i> in place for construction.	Ongoing: Monitor water quality of streams in accordance with the <i>Water Management Sub-Plan</i> .	EIT	Ongoing: Regular compliance reporting in EBD CR and auditing of reports EAT.	If water quality monitoring reveals a departure from expected values as per the water quality management plan immediately respond; identify cause and rectify.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
					It may have resulted from earlier weed control works. Review <i>Water Management Sub-Plan</i> .
Spread of weeds, introduction of new weed species.	Implement & Compliance: All work is to be conducted in accordance with the <i>Weed Hygiene Protocol</i> (Appendix 9). Compliance: All construction machinery to be cleaned in the washdown bay each time they enter and exit the EBD construction area. Machinery that is carrying soil must be cleaned in the washdown facility.	Random and frequent (2-5 per week): Inspections priority areas. Ongoing: Washdown log to be kept in conjunction with sign-in book Ongoing: Washdown facility and its use will be inspected at intervals to ensure compliance.	ECT ECT ECT ECT	Ongoing: Reports EBD CR results of vehicle inspections and weeds intercepted Event Based: Incident reporting of breaches to washdown procedure in EBD CR.	Review staff training and weed control plan as necessary. EIT. Review <i>Weed Hygiene Protocol</i> as necessary. EIT.
Death of EPBC listed frog species and/or damage to their habitat caused by weed control operations.	Compliance: Preference to mechanical/manual control. Selective targeted spot weed control to occur in these areas. Training: Only weed control operators with specialised training are to operate within riparian and	Before and after weed control and one week follow-up.	ECT	Event Based: Immediate reporting of any incident in EBD CR and to EAT.	Immediately cease work and/or monitoring if an impact on amphibians is identified. <i>Note: Work proceeds only after all risk to amphibians has been reduced and protocols</i>



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	<p>frog designated areas.</p> <p>Training: Operators to be trained in frog ID, weed ID and equipment use.</p> <p>Compliance: Highest level of supervision in these areas.</p> <p>Education and Awareness: Personnel undertaking weed monitoring and vegetation management within riparian zones to be aware of (and adhere to) the <i>Amphibian Hygiene Protocol</i>.</p>				<p><i>reviewed with personnel.</i></p> <p>EAT to audit weed control operations program and initiate a review of weed control procedures if necessary.</p>

11. Operations Phase

Potential Impacts during the Operations Phase

- Increased road traffic and human activity leading to higher risks of weed introduction and dispersal.
- Garden escapees from private gardens establishing as new weed species.
- Herbicide pollution of waterways.
- Off-target damage during weed control operations.
- Disturbance to desirable vegetation increasing the risk of weed invasion;
- Weed control operations may cause the death of EPBC listed frog species and/or damage their habitat.
- Weed control operations may cause off-target damage to the EPBC listed littoral rainforest vegetation community.

Objectives

- To minimise disturbance of desirable vegetation (both natural and/or pasture grasses).
- To minimise and where possible eliminate off-target damage during weed control operations.
- To minimise and where possible eliminate water pollution caused by herbicides.
- To minimise and where possible eliminate weed spread and the introduction of new weed species.
- Reduce risk of garden escapees becoming problematic weeds.
- To minimise and where possible eliminate deaths of EPBC listed frog species, and damage to their habitat caused by weed control operations.
- To minimise and where possible eliminate off-target damage to the EPBC listed littoral rainforest vegetation community.

Performance Criteria

- Residents using mostly native plants in private gardens and not growing any plants with environmental weed classification.
- No increase in weed species distribution on site.
- No new weed species detected.
- Minimal disturbance to desirable vegetation.
- Herbicide levels in waterways within acceptable range.
- No EPBC listed frog species' deaths and no damage to their habitat caused by weed control operations.
- No off-target damage to the EPBC listed littoral rainforest vegetation communities.

Mitigation Measures, Monitoring and Compliance

The following table outlines the environmental control measures to manage weeds during the operation phase of the Ella Bay Development. Particular monitoring, reporting and corrective actions are also identified to ensure the long-term effectiveness of this Sub-Plan.



Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
Increased road traffic and human activity leading to higher risks of weed introduction and dispersal.	Implement: Apply <i>Road Traffic Management Strategy</i> for the EBD and associated Ella Bay Road.	Annually: Evaluate the effectiveness of the <i>Road Traffic Management Strategy</i> in preventing dispersal of weed seeds and plant parts.	EAT	Monthly: Compliance, non-compliance and corrective actions reported to EIT and ECT in EBD CR.	Immediately respond if new weeds found on-site. Conduct a more intensive weed dispersal public awareness campaign.
	Compliance: Vehicles to operate within designated road alignment.	Ongoing: <i>Road Traffic Management Strategy</i> to be communicated to all staff and (sub) contractors.	EIT		Re-brief staff or subcontractors as necessary EIT.
	Implement: Washdown facilities installed. <i>Note – Specific facilities for grounds maintenance vehicles, at access points for 'off road' movement.</i>	Ongoing & Event Based: Washdown facilities to be monitored regularly and after any significant weather events. As Required: Maintain facilities to ensure integrity.	ECT		
	Education and Awareness: Residents and visitors educated regarding the risks of vehicle based weed spread.	Ongoing: Washdown log maintained and checked regularly. Ongoing: Regular	EIT		

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Freq uency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
	Implement: Monitor staff, visitor and resident access to watercourses within adjoining forest areas.	compliance inspections of forest areas for access activity.	EAT		
Establishment of private gardens and resort landscaping with little/no risk of introduction of exotics into natural environments.	Education & Awareness: Undertake weed awareness program(s) for resident contractors & staff. Encourage residents to grow endemic plant species in garden. On-site nursery to stock native plants popular/ desirable in tropical gardens for residents .		ECT	Ongoing: EBD Communications Register in EBD CR.	Plants regarded as environmental weeds that are found in gardens to be controlled.
Deterioration of water quality caused by herbicide pollution.	Implement: <i>Water Quality Management Sub-Plan</i> .	Ongoing: Monitoring of water quality of streams will be conducted in accordance with the <i>Water Management Sub-Plan</i> .	EIT	Ongoing: Compliance reporting in EBD CR.	Immediately respond to any departure from expected values, identify cause and rectify. Review Water Management Sub-Plan.
Death of EPBC listed frog species and/or damage to their habitat caused by	Compliance: Selective targeted weed control to occur in these areas. Training: Only weed control operators with specialised training to operate within frog	Ongoing: Regular inspections.	EIT and ECT	Immediate: Report any incident in EBD CR.	Revegetate area if required Review the weed control procedures.

Issue	Mitigation/Control measure(s)	Monitoring/Timing/Frequency	Responsible EBD Team	Reporting	Corrective actions if deviation from performance criteria
weed control operations.	<p>designated areas.</p> <p>Training: Operators to be trained in weed ID and equipment use.</p> <p>Compliance: Highest specialist supervision in these areas.</p>				
Off-target damage to EPBC littoral rainforest vegetation community	<p>Compliance: Selective targeted weed control to occur in these areas.</p> <p>Training: Only weed control operators with specialised training to operate within frog designated areas.</p> <p>Training: Operators to be trained in weed ID and equipment use.</p> <p>Compliance: Highest specialist supervision in these areas.</p>	<p>Ongoing: Regular inspections.</p>	EIT	<p>Immediate: Report any incident.</p>	<p>Revegetate area if required</p> <p>Review the <i>Weed Control Procedures</i>.</p>



12. Auditing and Reporting

An independent audit by the Vegetation Advisor and the Environmental Audit Team Manager will determine whether the performance indicators have been met and maintained and provide information for the Environmental Management Plan Review. Auditing by the EBD Environmental Auditing Team will occur within six months of project commencement followed by six month audits during the construction phase. A copy of the audit will be provided to DSEWPC and DERM.

The Environmental Implementation Team will compile an overall report at the end of each monitoring event, noting any significant changes in measured variables, trends and conditions to ensure alignment with the DSEWPC reporting requirements. The report is to include weed census tabulated data from all monitoring events to allow assessment of trends.

Logs are to be kept of all sample results and subsequent corrective action (if any) and maintained in the EBD Communications Register.



13. Emergency Incident Procedure

Chemical spill or other habitat contamination: Refer to the *Hazard and Emergency Management Sub-Plan* for immediate response and remediation measures for chemical spills or other habitat contamination. If conservation of significant flora are considered to be at risk as a result of the incident, the EBD Environmental Implementation Team including the Vegetation Advisor and should be consulted regarding an emergency translocation procedure and their involvement.

14. References and Information Sources

Chemical Storage

Storage of chemicals must be according to Australian Standard AS2507-1998 The Storage And Handling Of Agricultural And Veterinary Chemicals. Reference to minor agricultural goods storage

Weed Management in Queensland

The main contact for advice on legislation, policies, programmes and coordination of control activities in Queensland is the Department of Primary Industries and Fisheries , Department of Natural Resources and Water and the Environmental Protection Agency.

The links below provide a summary of the weed management information for Queensland.

- Overview/summary of Queensland legislation (Weeds Australia)
- Queensland Government
- Biosecurity Queensland
- Queensland Department of Natural Resources and Water
- Queensland Environmental Protection Agency
- Queensland Parks and Wildlife Service
- Pest plant and animal management on public land managed by Queensland Parks and Wildlife Service
- Management plans for public land managed by Queensland Parks and Wildlife Service
- Queensland Land Protection (Pest and Stock Route Management) Act 2002
- Queensland Local Government Act 1993
- Queensland Land Act 1994
- Queensland Nature Conservation Act 1992
- Queensland Forestry Act 1959
- Local governments in Queensland
- Weed Society of Queensland
- Queensland Department of Main Roads Pest Management Strategy
- Regional Natural Resource Management in Queensland
- Agvet chemicals and residues - Queensland Department of Primary Industries and Fisheries

Legislation

- Environment Protection and Biodiversity Conservation Act (the EPBC) - The Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance. www.environment.gov.au/epbc/index.html
- Land Protection (Pest and Stock Route Management) Regulation 2003 Queensland and Land Protection (Pest and Stock Route Management) Act 2002. - The Regulation and Act declares the pest plants and pest animals for control and management in the state, establishes the purposes for keeping declared species and which species can be kept under permit, . www.legislation.qld.gov.au
- Regional Vegetation Management Code for Coastal Bioregions November 2009. The code places restrictions on clearing of vegetation for weed control. <http://www.derm.qld.gov.au/>.

Weed Identification

- Descriptions and information on the ecology of most of the weed species listed in this Sub-Plan can be found at;
http://www.dpi.qld.gov.au/cps/rde/dpi/hs.xsl/4790_10234_ENA_HTML.htm

- Identification material is available (e.g. Weed Pocket Guide: Agricultural and Environmental Weeds – Far North Queensland (DNR Sept 2001) available for download at www.wettropics.gov.au/mwha/mwha_pdf/FNQWEED2.PDF),

Weed Plans/Strategies

- Weeds of National Significance (WONS) 2009
- www.weeds.gov.au/weeds/lists/wons.html
- Australian Weeds Strategy 2009 - www.weeds.gov.au/publications/strategies/weed-strategy.html
- Queensland Weeds Strategy - www.dpi.qld.gov.au
- Cassowary Coast Regional Council's Pest Management Plan 2006 - www.cassowarycoast.qld.gov.au
- Cassowary Coast Regional Council Pest Management Plan 2002-2006 - www.CCRC.qld.gov.au
- Cairns City Council Pest Management Plan 2005 - www.cityofcairns.qld.gov.au

Water Quality

- Coastal Catchment Initiative (CCI) - www.creektocoral.org.au
- The National Water Quality Management Strategy (NWQMS) - www.environment.gov.au/water/policy-programs/nwqms/
- Great Barrier Reef Marine Park Authority (2008) - Draft Water Quality Guidelines - www.gbrmpa.gov.au/___.../WaterQualityGuidelinefortheGBR.pdf
- ANZECC water quality guidelines 2000 - www.mincos.gov.au
- Queensland Water Quality Guidelines - www.epa.qld.gov.au

Appendix A: Declared weeds on the Ella Bay Development

Note - Summary of controls (in order of status under the Land Protection Act).

Species	Common Name	Status	Control method	Growth Habit
<i>Annona glabra</i>	Pond Apple	Class 2 (Weed of National Significance)	Ringbark, Stem injection or cut and paint with concentrated glyphosate (e.g. Roundup Biactive®). Can foliar spray seedlings.	Perennial Tree
<i>Senna obtusifolia</i>	Sicklepod	Class 2	Slashing, cut and paint, hand removal or foliar spray with triclopyr + picloram (e.g. Grazon DS™) before it seeds	Annual or short-lived perennial shrub
<i>Sporobolus</i> grasses	Rat's Tail Grass	Class 2	Spot or boom spray with sodium flupropanate (e.g. Taskforce ®).	Tussocky perennial grass
<i>Hymenachne amplexicaulis</i>	Hymenachne	Class 2 (Weed of National Significance)	Foliar spray with glyphosate.	Perennial Grass
<i>Lantana camara</i>	Lantana	Class 3 (Weed of National Significance)	Cut and paint with glyphosate, foliar spray with metsulfuron-methyl or triclopyr + picloram or mechanical removal.	Perennial shrub
<i>Sphagneticola trilobata</i>	Singapore Daisy	Class 3	Foliar spray with metsulfuron-methyl.	Perennial herb

Appendix B: Environmental Weeds (not declared) on the Ella Bay Development

Note: Summary of controls (in alphabetical order)

Species	Common Name	Control method	Growth Habit
<i>Allamanda cathartica</i>	Allamanda	Cut and paint with glyphosate.	Perennial vine
<i>Calopogonium mucunoides</i>	Calopo	Spot spray with glyphosate, fluroxypyr or metsulfuron-methyl.	Perennial vine
<i>Cyperus aromaticus</i>	Navua Sedge	Physical removal, spotspray with glyphosate.	Perennial Sedge
<i>Datura stramonium</i>	Common Thornapple	Cut and paint, with glyphosate, foliar spray with metsulfuron-methyl.	Annual herb
<i>Hyptis capitata</i>	Knobweed	Spot spray with glyphosate, fluroxypyr or metsulfuron-methyl.	Annual herb
<i>Ipomoea indica</i>	Blue Morning Glory	Cut and paint, foliar spray with glyphosate or metsulfuron-methyl before it seeds	Perennial vine
<i>Mimosa pudica</i>	Common Sensitive Plant	Foliar spray with fluroxypyr (e.g. Starane 200®) or metsulfuron-methyl.	Perennial herb
<i>Momordica charantia</i>	Balsam Pear	Foliar spray with fluroxypyr or metsulfuron-methyl.	Annual vine
<i>Panicum maximum</i>	Guinea Grass	Foliar spray with glyphosate, slash /mow before seeding.	Perennial grass
<i>Psidium guajava</i>	Yellow Guava	Cut and paint with concentrate glyphosate.	Perennial shrub
<i>Rubus alceifolius</i>	Giant Bramble	Cut and paint with glyphosate, foliar spray with metsulfuron-methyl or mechanical removal followed by spray before it fruits	Perennial shrub
<i>Stachytarpheta spp.</i>	Snakeweeds	Foliar spray with glyphosate, fluroxypyr, triclopyr + picloram or metsulfuron-methyl.	Perennial herb
<i>Solanum torvum</i>	Devil's Fig	Cut and paint with glyphosate before it seeds.	Perennial shrub



Appendix C: Weed Species Recorded during the 3D Vegetation Survey for Ella Bay not listed as an Environmental Weed.

Signal Grass	<i>Brachiaria decumbens</i>				
Humidicola	<i>Brachiaria humidicola</i>	Associated	with	introduced	pasture.
Blue Top	<i>Aegeratum conyzoides</i>				
Broad-leafed Carpet-Grass	<i>Axonopus compressus</i>				
Thick Head	<i>Crassocephalum crepidiodes</i>				
Tropical Chickweed	<i>Drymaria cordata</i>				
Snake Weed	<i>Stachytarpheta cayennensis</i>				
Lantern Burr habitats.	<i>Urena lobata</i>	Associated	with	severely	degraded



Appendix D: Noxious Plants with Potential to Infest Ella Bay

(refer to Johnstone Shire Council Pest Management Plan 2002-2006 and Cairns City Council Pest Management Plan 2005)

Class 1

ALLIGATOR WEED	<i>Altemanthera philoxeroides</i>
ANCHORED WATER HYACINTH	<i>Eichhornia azurea</i>
BRIDAL CREEPER	<i>Asparagus asparagoides</i>
FLOATING WATER CHESTNUTS	<i>Trapa</i> spp.
LIMNOCHARIS	<i>Limnocharis flava</i>
MIKANIA VINE	all <i>Mikania</i> species
SALVINIA	<i>Salvinia</i> spp. other than <i>S. molesta</i>
SERRATED TUSsock	<i>Nassella trichotoma</i>
THUNBERGIA	<i>Thunbergia annua</i> , <i>T. fragrans</i> or <i>T. laurifolia</i>

Class 2

AMERICAN RATS TAIL GRASS	<i>Sporobolus jacquemontii</i>
ANNUAL RAGWEED	<i>Ambrosia artemisiifolia</i>
CABOMBA	all Cabomba species
GIANT PARRAMATTA GRASS	<i>Sporobolus fertilis</i> .
GIANT SENSITIVE PLANT	<i>Mimosa invisa</i>
MOTHER OF MILLIONS	<i>Bryophyllum tubiflorum</i> & <i>B. daigremontianum</i> x
<i>tubiflorum</i>	
PARRAMATTA GRASS	<i>Sporobolus africanus</i>
PRICKLY PEAR	<i>Opuntia</i> spp. other than <i>O. ficus-indica</i>)
SALVINIA	<i>Salvinia molesta</i>
THUNBERGIA	<i>Thunbergia grandiflora</i>
TOBACCO WEED	<i>Elephantopus mollis</i>
WATER HYACINTH	<i>Eichhornia crassipes</i>
WATER LETTUCE	<i>Pistia stratiotes</i>

Class 3

AFRICAN TULIP TREE	<i>Spathodea camanulata</i>
ASPARAGUS FERN.	<i>Asparagus africanus</i>
BALLON VINE	<i>Cardiospermum grandiflorum</i>
BLACKBERRY	<i>Rubus fruticosus</i>
CAT'S CLAW CREEPER	<i>Macfadyena unguis-cati</i>
HARUNGANA.	<i>Harungana madagascariensis</i>
PRIVETS	<i>Ligustrum lucidum</i> (broad) and <i>L. sinense</i> (small)

Appendix E: Serious Environmental Weeds – Identification and Treatment Calendars

Pond Apple (*Annona glabra*)



Site distribution:

Current infestations extend principally along and behind the beach dune swales and along the primary and secondary watercourses with an approx area of 30ha under dispersed pond apple individuals / clumps with a further 17ha under more established stands / thickets.

Control strategy and management objectives:

- Focus Areas - Start work at the top of a catchment and proceed downstream along watercourses and drainage lines.
- Timing - Control effort is to be accelerated in the dry season (August to November) so all plants that have germinated from the previous fruiting cycle are removed.
- Objective - Effectively control and contain it with long term control over large areas achieved through revegetation.

	Treatment Calendar for Pond Apple (<i>Annona glabra</i>)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	✓	✓									✓	✓
Fruiting	✓	✓	✓	✓								
Seed Drop		✓	✓	✓								
Germination			✓	✓	✓	✓	✓	✓	✓	✓		
Chemical Treatment	✓	✓	✓	✓				✓	✓	✓	✓	✓
Non Chemical Treatment		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Pond apple habitat control matrix

Area ** condition	Forested areas	Wetlands	Open wet areas	Open dry areas
Good	Seedling – Hand Pull Sap/Tree – Cut Stump	Seedling – Hand Pull Sap/Tree – Cut Stump	NA	NA
Medium	Seedling – Hand Pull Sap/Tree – Cut Stump Wallaby exclusion Strata planting	Seedling – Hand Pull Sap/Tree – Cut Stump Wallaby exclusion Strata planting	NA	NA
Poor	Seedling – Hand Pull – Cut Stump Drop tree Wallaby exclusion Total Strata planting	Seedling – Hand Pull Sap/Tree – Cut Stump Drop tree Wallaby exclusion Total strata planting	Seedling – Hand Pull /Foliar Spray Sap/Tree – Cut Stump Drop tree Wallaby exclusion Total Strata planting	Seedling - Foliar Spray Sap/Tree – Cut Stump /Mechanical/Drop tree Wallaby exclusion Total Strata planting

Notes

Seedling to 50cm tall, saplings 50cm to 2m tall and trees greater than 2m

** Area condition:

- Good** Natural vegetation largely intact with limited wallaby damage to groundcover vegetation and only scattered pond apple trees/saplings and seedlings, high degree of selectivity required due to high concentrations of native species and/or legislative requirements
- Medium** Visible damage to vegetation structure (such as treefalls), obvious wallaby damage to groundcover and/or 5 to 25% of stems pond apple, Selectivity required due to the presence of native species and/or legislative requirements
- Poor** Significant vegetation structural and wallaby damage with greater than 25% of stems of pond apple. Wallaby exc. refers to wallaby exclusion mainly through fencing. Broad acre and/or non-selective weed control measures could be used
- Strata planting** Refers to revegetation activities concentrating on the most damaged vegetation strata (i.e. ground cover, mid-storey and/or canopy cover). Some revegetation areas may have only one stratum (i.e. sedge lands).

Sicklepod (*Senna obtusifolia*)



Site distribution:

Current infestations occur throughout the central cleared areas and are associated with poorer pastures or disturbance. Infestation size ranges from dense swards to isolated modest-sized clumps and individuals. Do not spray when the plant is fruiting. Spaying not preferred during wet season.

Management objective:

Objective: To greatly reduce the extent of this weed over the EBD site and deplete the soil seed bank.

	Treatment Calendar for Sicklepod (<i>Senna obtusifolia</i>)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	✓			✓	✓	✓	✓			✓	✓	✓
Fruiting	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Seed Drop	✓	✓	✓	✓		✓	✓	✓	✓			✓
Germination	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemical Treatment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non Chemical Treat.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Rat's Tail Grasses (*Sporobolus* species)



Site distribution:

Current infestations extend principally along property access roads and holding areas (e.g. old cattle yards). From there the weed has spread into areas of poorer pasture or disturbance.

Management objective:

Objective: To reduce the extent of this weed over the EBD site and deplete the soil seed bank.

	Treatment Calendar for Rat's Tail Grasses (<i>Sporobolus</i> species)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	✓✓	✓✓	✓✓	✓✓	✓✓	✓			✓	✓✓	✓✓	✓✓
Fruiting	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓			✓✓	✓✓	✓✓
Seed Drop	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Germination	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemical Treatment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non Chemical Treat.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Hymenachne (*Hymenachne amplexicaulis*)



Site distribution:

Hymenachne occurs in scattered infestations around the EBD site with a total area of less than 2ha. It occurs in damp pasture areas, moving water and wetlands.

Management objective:

Objective: The effective control and containment of this species within the EBD site.

	Treatment Calendar for Hymenachne (<i>Hymenachne amplexicaulis</i>)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
Fruiting	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Seed Drop		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Germination	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemical Treatment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non Chemical Treat.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Shaded cells indicate general pattern of growth in average seasons Unshaded cells indicate exceptional growth pattern in very wet years

Appendix F: Herbicides Prohibited from use on Ella Bay

The following herbicides are prohibited from use at Ella Bay Development (ref Draft Water Quality Guideline for the Great Barrier Reef Marine Park (2008));

- Diuron
- Atrazine
- Ametryn
- Simazine
- Hexazinone
- 2,4-D,
- Tebuthiuron

(Note - 2,4-D may be present as a mix in chemicals such as Tordon.)

Background.

The use of herbicides in the Great Barrier Reef catchments has increased progressively in areas under crop cultivation. Seven main herbicides (above) are in widespread use throughout the Great Barrier Reef catchment and are being widely detected in fresh and marine waters of the Great Barrier Reef region.

The herbicides diuron, simazine and atrazine are commonly found in flood plumes, coastal waters and sediments in the Great Barrier Reef lagoon. It is held that high concentrations of (or long periods of exposure to) these herbicides under extreme conditions will result in expulsion of the symbiont algae (bleaching) from adult coral.

The use of herbicide at EBD will support environmentally sensitive initiatives contained within:

- Coastal Catchments Initiative (CCI);
- National Water Quality Management Strategy (NWQMS);
- Draft Water Quality Guideline for the Great Barrier Reef Marine Park (2008) compiled by the Great Barrier Reef Marine Park Authority (GBRMPA); and
- ANZECC 2000 and EPA 2006 water quality guidelines.



Herbicide Reference List for Ella Bay Development as at 17 August 2010.

Always refer to the label for the active ingredient.

PROHIBITED FROM USE:

Actives	Brand/Product/Trade Names Examples	Comment
Diuron	ChemAg Diuron 900 WG Herbicide; Sipcam Diuron 500 SC Herbicide; OzCrop Diuron 900 WG Herbicide; 4Farmers Diuron 500 SC Liquid Herbicide.	Most likely to contaminate the aquatic environment. Refer <i>Material Safety Data Sheet</i> .
Atrazine	Dicamba + Atrazine; Dicambazine; Simazat™ 4L; Simazat™ 90DF; 4Farmers Atrazine 900 WG.	Most likely to contaminate the aquatic environment. Refer <i>Material Safety Data Sheet</i> .
Ametryn	Farmoz Ametrex 800 WG; Flowable Primatolò Z Liquid Herbicide; Krismat® WG Herbicide.	Most likely to contaminate the aquatic environment. Refer <i>Material Safety Data Sheet</i> .
Simazine	Simanex 500 SC HERBICIDE; ChemAg Simazine 500 Flowable Herbicide; Farmoz Simazine 900 WDG Herbicide, Sipcam Simazine 900 WDG Herbicide; 4Farmers Simazine 900 WG.	Soil persistent herbicide that may have effects up to 2 years after application, depending on rate. Varying toxicity to aquatic organisms, fauna, soil organisms and bees. Refer <i>Material Safety Data Sheet</i> .
Hexazinone	4Farmers Diuron/Hexazinone WG Herbicide; Farmoz Bobcat Combi WG Herbicide, Dupont Velpar K4 XDF Herbicide, Nufarm Grunt 750 WDG Herbicide.	Varying toxicity to fish and freshwater organisms. Moderate to high persistence in the soil environment. Potential to contaminate ground and surface water. Refer <i>Material Safety Data Sheet</i> .
Tebuthiuron	Graslan Aerial Herbicide, Ospray Scrubmaster 200 Herbicide, Tubulan 200GR Herbicide.	Varying toxicity to fish, aquatic species, birds and bees. Mobile in soil. Refer <i>Material Safety Data Sheet</i> .
2,4-D	Amicide 625; Nufarm; 2,4-D Amine 625; Farmoz 2,4-D Lv Ester 600.	Harmful to aquatic organisms, may cause long-term effects to the aquatic environment. Varying effects to birds, bees and other organisms. Refer <i>Material Safety Data Sheet</i> .



RESTRICTED APPLICATION USE:

Actives	Brand/Product/Trade Names Examples	Comment
Triclopyr + Picloram	Grazon DS Herbicide; Titan Triclopyr + Picloram 400	No 'broad boom spray' application within 10 meters from remnant vegetation, vegetated areas, 25 meters from a stream/waterbody or root zone/drip line of isolated native trees. May kill native trees if sprayed around drip line eg <i>Ficus</i> sp.. Refer <i>Material Safety Data Sheet</i> .
Flupropanate	Taskforce; Tussock.	Harmless to aquatic organisms. Avoid contaminating waterways. Relies on pre-emergent effect residual in soil, activated by rainfall wash into soil. Refer <i>Material Safety Data Sheet</i> .
Paraquat dichloride trihydrate	Shirquat (contains 250g/litre Paraquat); Genfarm Paraquat 250 Herbicide; 4Farmers PARAQUAT 250 Herbicide.	This product is toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment. Little data on mammals, but is likely to be highly toxic to all. Restricted use to Zone 1. Refer <i>Material Safety Data Sheet</i> .
Metsulfuron-methyl	Associate Herbicide.	Do not contaminate dams, waterways. Refer <i>Material Safety Data Sheet</i> .
Glyphosate 875, 510, 450, 360	4Farmers Glyphosate 875 Herbicide; Turf Culture Oskar 510 Glyphosate Herbicide, Gladiator 450; Defender Home Garden Glyphosate 360 Weed Control.	Non-selective. Harmful to fish and other aquatic organisms (mainly due to the surfactant). Do not contaminate dams and waterways. Refer <i>Material Safety Data Sheet</i> .

ECO-CONSIDERATE APPLICATION USE:

Actives	Brand/Product/Trade Names Examples	Comment
Glyphosate	Roundup Biactive Weedkiller Concentrate; Bayer Sickle 540 ; Sipcam Raze	Non-selective."Frog Friendly" Glyphosates have been formulated to reduce the toxicity of the product to certain aquatic organisms including frogs and is the preferred formulation for use around dams, waterways and other aquatic situations. When controlling weeds in aquatic situations refer to label directions to minimise the entry of spray into the water. Tests in a variety of mammalian, avian and /aquatic species have shown that glyphosate does not bioaccumulate. Refer <i>Material Safety Data Sheet</i> .



Appendix G: Operational Procedures for Weed Control on the Ella Bay Development and Ella Bay Road

This *Operational Weed Management Procedure* has been developed for use on site. It guides the day to day operational regime to be implemented on the site for both herbicide application and mechanical/manual methods. Reference should also be made to Appendix 10 Safety Work Method Statement for Herbicide Use.

The primary method of weed control will be by mechanical or manual slashing, mowing and removal. Herbicide application is limited to control where mechanical and/or manual methods are not economical or are impractical

Preference will be to glyphosate-based mixtures for spot and spray applications in aquatic environments that are AgVet approved (i.e. contain 'frog-friendly' surfactants eg. Roundup® Biactive);

Prerequisites

The following are prerequisites for weed control crews using herbicides.

All weed control crews are required to:

- Be ChemCert trained;
- Complete a site induction process;
- Be provided with weed identification material (e.g. Weed Pocket Guide: Agricultural and Environmental Weeds – Far North Queensland (DNR Sept 2001) available for download at www.wettropics.gov.au/mwha/mwha_pdf/FNQWEED2.PDF
- Each crew will require a designated supervisor that has been ChemCert trained to the level of "Accreditation"; and
- Be certified to these procedures.

Weather

The weather plays an important part of herbicide control in the Wet Tropics. The weather forecast for the day should be reviewed and analysed before undertaking activities, and the weather conditions should be monitored during application. Guidelines are taken from advice provided by the Bureau of Meteorology <http://www.bom.gov.au/info/leaflets/Pesticide-Spraying.pdf>. If in doubt reference either the site or a handheld weather station.

- The wind speed is appropriate
 - Spray when the wind is steady and ideally 3-15 km/h
- Rain is not forecast within the recommended period
 - For Glyphosate within less than 4 hours;
 - For most other herbicides within less than 8 hours;
 - There is no dew on the ground.
- The temperature is preferably less than 30°C.
- Humidity is preferably above 50% and less than 90%:
 - Optimal temperature and humidity conditions frequently occur in the early morning and into mid morning when conditions are not too hot nor too dry.
- Do not spray when there is risk of an atmospheric inversion:
 - Inversions frequently form in the late evening and strengthen overnight.

Record keeping

For each day of weed control operations, a *Record of Ground Distribution (Application) of Herbicides* must be completed by the operator. This record sheet will be provided to the EBD Environmental Supervisor on completion of the day's work.

The EBD Environmental Supervisor will compile the information and calculate how much of each herbicide was used in the previous month (monthly usage data) including the number of drums returned during the month.



Discrepancies will require an investigation. The monthly usage data and any investigations will be included in the monthly report.

In Queensland, the Department of Primary Industries and Fisheries (DPI&F) administers the *Agricultural Chemicals Distribution Control Act 1966* (ACDC Act). Section 26 of the ACDC Act requires that records are kept for all ground distribution of herbicides carried out using ground equipment.

All records made under section 26 of the ACDC Act are required to be kept for a minimum period of 2 years. It is recommended that health records be kept for 30 years.

Storage and transport of herbicides on the EBD site

Herbicides must only be stored in an approved storage facility that complies to Australian Standard AS2507-1998 for minor agricultural goods storage. All herbicides entering or leaving the storage facility are required to be noted on the *Storage Sheet* which is to be outside the storage facility.

Herbicides are to be transported in the tray of a utility or within a trailer and secured within a leak proof containment tray. In order to minimise the distance mixed herbicides are transported and subsequent risk of spills, herbicide concentrate can be taken from the main herbicide storage facility (this must be noted on the Storage Sheet) and stored in day storage facilities for easier access. The day storage facilities are to be covered and bunded. On completion of the day's weed control operations, any remaining concentrate must be returned to the secure storage facility with the details noted on the storage sheet (including amount of herbicide used and returned).

The potential highest environmental damage for Ella Bay is the transport of concentrates and premixed herbicide across creek crossings. Concentrated herbicide must be secured within a containment tray and in the case of premixed herbicide in boom spray tanks a spotter must be used to ensure that hoses or containers are not damaged.

Mixing of herbicides and storage of mixed herbicides

The following guidelines for mixing of herbicides and adjuvants should be observed:

- Combine only the amount of herbicide that is expected to be used for that day;
- Transfer of concentrate must only be made in a bunded area. Preference is for evacuation by inductor or by positive displacement pump directly from the container;
- For small quantities of herbicide for backpack sprayers a graduated plastic syringe is preferred. All herbicides are to be measured using an appropriate graduated meter;
- In the event of excess herbicide mix being made for the day's weed control operations, the mixture may be kept for later use as per manufactures label advice (i.e. is it effective for three days after mixing). The mixture is to be kept within the mixing container (i.e. knapsack) and stored within a secured, bunded area out of direct sunlight where it is unlikely to fall over. This action must be noted on the original mixing days spray sheet and on any subsequent days of use spray sheet.
- A clear information tag is to be attached to the equipment containing the old herbicide mixture. This tag label must clearly state:
 - herbicide and concentration;
 - date of mixing;
 - expiry date of mixture;
 - name of mixer and the names of subsequent users; and
 - If the expiry date on the mixture has passed or there is no reasonable probability that it will be used by the expiry date, the mixture should be disposed of as per the instructions below.



Disposal of surplus herbicide, rinsate and containers

Herbicide

Dispose of herbicide concentrate or unused mixed herbicide by dilution and neutralisation by the addition of lime.

- Transfer the concentrate or mix to the rinsate storage tank;
- Dilute by the addition of water such that the mix strength is less than 1:1000, approx ten fold dilution of mix strength. Note rinsate volume in daily spray sheet;
- Add sufficient lime to increase pH – dose at 20kg/1000L of diluted rinsate;
- Leave to neutralise and denature for one week;
- Dispose of water by irrigation over grassed areas at least 50m from riparian areas: Not when wet; and Not to saturation or runoff.

Rinsate

Dispose of rinsate used for hygiene of spray equipment and/or change of herbicide by dilution and irrigation.

- Dilute by the addition of water such that the mix strength is less than 1:10,000, approx one hundred fold dilution of mix strength. Note rinsate volume in daily spray sheet;
- Dispose of 'run through' by irrigation over grassed areas at least 50m from riparian areas. Not when wet and Not to saturation or runoff;
- Dispose of any remaining rinsate into the rinsate storage tank and dispose of as for herbicide when suitable;
- Note rinsate volume in daily spray sheet.

Disposal of herbicide storage containers

- Rinse containers by continuous rinse on a post spray while making up the batch of herbicide;
- Puncture all herbicide containers immediately to prevent re-use and take to a disposal site that accepts used chemical containers; and
- Note details on storage sheet.



Herbicide and Chemical Safety

When mixing and using herbicides, operators may come in contact with concentrate and prepared mix.

The operator is required to wear appropriate Personnel Protective Equipment (PPE) that includes:

- protective glasses;
- washable hat;
- chemical resistant gloves (neoprene or nitrile);
- long sleeved shirts and trousers – disposable coveralls are available, buttoned at the neck and wrists; and
- chemical resistant safety boots.

The operator should:

- Avoid contact with skin and eyes;
- Wash hands, arms and face thoroughly with soap and water (after use and before eating, drinking or smoking); and
- Wash gloves and contaminated clothing (after each day's use).

The operator should be familiar with the Safe Work Method Statement.



Safe Work Method Statement (WMS) for Tractor and Quad Spray Herbicide Application

The operator must possess a Chemcert certificate and must be trained to operate the tractor or quad and spray outfit.

Process Steps	Potential Hazards	Control Methods
1. Task Identification and Preparation	Spray drift, water contamination and off- target damage	Identify target species. Consider alternatives to chemicals. Check the weather conditions. Consider the application method. Consider the environmental impact.
2. Chemical selection	Long term health effects Disposal of excess chemical Disposal of empty containers	Consider 'frog friendly' Glyphosate. Check MSDS for chemical choices Choose the LEAST TOXIC chemical for the target species. Calculate the application rate - use the lowest rate to achieve the desired results. Can one chemical be used for several different target species? Use only herbicides that comply to Herbicide Reference List for Ella Bay Development . Select returnable/recyclable drums.
3. Method of Chemical Application	Chemical exposure Machinery/plant hazards	Consider the alternatives. Open Quad boom spray. ensure use of PPE, use fan forced helmet. Cab tractor with charcoal filters mounted unit. Preference for shrouded spray to contain the spray within the target area
4. Personal Protective Equipment required	Chemical exposure during transport, storage, mixing, use and disposal	Consult MSDS. PPE may include: Waterproof Nitrile gloves. Protective clothing (whole of body Chemical suit). Goggles, (chemical goggles fitted with moisture traps for eye protection). Face shield, Respirator. PVC/ rubber boots. Washable hat. All as per Australian Standard 2507 4.6 - "The Storage and Handling of Pesticides"
5. Check Spray Equipment	Chemical exposure from leaking equipment	Check the pump and motor. With PTO-driven pump ensure PTO covers are correctly fitted Check low hanging hoses before filling, before and after use and after trafficking rough ground or stubble/sticks.

Process Steps	Potential Hazards	Control Methods
		Check the tank, hoses, connections, filters and nozzles for leaks. If any faults are detected do not proceed until they have been repaired.
6. Collect Chemical	Concentrate chemical exposure Manual handling of drums	Always read the material safety data sheets and manufacturer's instructions before handling any chemicals. Check the Emergency response / First Aid requirements including spill containment and cleanup and the personal protective equipment that is required and ensure its availability. If either MSDS or label is missing - do not use. Use trolleys for moving drums over 20 litres. If having to transport chemicals secure in back of utility within containment and not in boot of car or station wagon.
7. Mix Chemical	Chemical exposure to self and others including eye and skin exposure, ingestion and inhalation Spills and site contamination	Check the application rate from the label. Ensure no unprotected bystanders are present. Decant/Mix in the open or in well ventilated area with spill containment (this may be concrete slab) Use chemical pump or decanting cradle. Fill the tank to 60-70% of quantity required with water, and then add the chemical using an approved filling device (eg chemical pump or closed chemical transfer systems). Use an agitator or pump recirculation for mixing. Top up the quantity required with water. Fix appropriate signage to the vehicle identifying contents of the spray vat.
	Lifting Drums	Use trolleys and chemical pumps.
8. Spraying Chemical	Chemical exposure to self and others including eye and skin exposure, and inhalation Spray Drift Heat exposure Open channels (visibility at end of rows) Other traffic	Ensure no one is present or likely to enter spray area. With Quad select fit and maintain PPE according to MSDS. Avoid application in weather greater than 30 C. Carry water on sprayer/tractor identified for cleaning hands and washing nozzles. Ensure cabin charcoal filter is operating/check life of filters. Carry PPE for cleaning nozzles and on job maintenance Check the wind – if it is too strong don't spray. Where possible spray down wind. Avoid walking through the sprayed area. Ensure the correct coverage is sprayed on the target.



Process Steps	Potential Hazards	Control Methods
		Do not smoke or eat while spraying. Avoid over-spraying. Try and calculate spray requirements to avoid unused chemical in tank.
9. Clean up and Decontamination	Chemical exposure Site contamination	Fit PPE. Rinse the spray tank and hoses twice with clean water or cleaning agent (see MSDS for mixing and wash down requirements) Use rinsate procedure. Do not get into spray tank Return unused chemical to chemical store Continuous rinse empty drums, spike and return to Drummuster. Remove charcoal filter from cab, inspect for colour change and damage to seals. If OK seal in plastic bag and return to storage away from chemicals Wash gloves, respirator and face shield after each use. Hat and protective clothing must be washed on a regular basis separate from normal clothing.
10. Personal Hygiene	Exposure to chemical and chemical residues	Always have available 20 litres of fresh clean water, soap and clean towelling with the spray unit. Wash hands immediately after using chemicals and before eating, smoking or drinking.
11. Record Keeping		Record details of the chemical use: Operator, chemical used, application rate, application method, time (mixing + application + clean up), temperature, location, wind speed and direction.



Emergency procedure - Herbicide spills

The MSDS for each chemical is located in the herbicide mixing area. A copy is available in the office and beside the herbicide storage: (*File name and number*).

The MSDS has information including:

- Identification;
- Health hazard information;
- Precautions for use;
- Safe handling information; and
- LD50 figures (used to describe the toxicity of the herbicide).

Poisons Information Centre Contact is 13 11 26.

Spill Definition: A spill is any quantity of spray mixture greater than 2 litres; or 100mL of concentrate, spilled onto the ground (outside the bunded impermeable area) or in/near a waterway. Within the bunded area any spills greater than 10L of spray mixture; or 500mL of concentrate are to be reported.

All handling, mixing and responding to herbicide spills is to be done using full PPE.

Major Spills: Contact the EBD Environmental Supervisor and any required emergency services.

Minor Spills: (less than 500mL of concentrate or 50L of spray mixture): notify the EBD Environmental Supervisor after spill has been contained (see procedure below) unless the spill has caused injury in which case follow major spill procedure.

In the event of a spill or incident:

1. Take immediate action to prevent harm to people – i.e. (but not limited too) dilute with water, wash eyes, exposed skin and hands, remove saturated clothing and manage bystanders;
2. Immediate action to reduce the loss and prevent harm to the environment -stand up container, limit spread by use of bund (sand, boom or pad), collect spilled material and apply clean-up materials where possible for appropriate disposal;
3. Once extent of additional damage is contained - a site incident/accident form is to be filled in as soon as practicable and submitted to the site EM before leaving site; and
4. A follow up review will be delivered to staff at a toolbox meeting to ensure no repeat or additional damage.

The form is available in hard copy at the site office (yellow form) and available electronically.

Containment Procedure:

1. Dilute the mixture by a factor of four (e.g. 1L to 4L) with water;
2. Dig a hole that is 60cm deep and that is at least 25m from surface water and desirable vegetation;
3. Coat the bottom of the hole with lime and add diluted mixture; and
4. Add one cup of lime on top of mixture and cover with at least 50cm of soil and compress so it can't be accessed by people or animals.

Measures for increased protection and recovery, include the use of PPE, minimal delay in rinsing eyes (eye wash) and skin (emergency shower), and removal of herbicide-saturated clothing.

Ingestion of any herbicide will require immediate medical treatment - Innisfail Hospital ph: (07) 4061 5411.



Note: Make sure that all responses to herbicide spills, storage, application and disposal of herbicides meet local, state and federal government requirements and always follow instructions on herbicide product labels.

Safety Directions:

- Avoid contact with skin and eyes.
- When preparing and using the spray, wear cotton overalls buttoned to the neck and wrist, a washable hat and rubber gloves.
- After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water.
- After each day's use, wash gloves and contaminated clothing.

Weed Control - Procedures by Zones

Principles:

- Implementation of zones at the EBD site is based on the presence of sensitive areas that will be protected from inappropriate weed control - including (inadvertent) herbicide application.
- All operators are required to operate only within the zone they are inducted and trained for.
- Recognition of the zones is based on a buffer defined as (whichever is the greater to apply):
 - 10m from remnant vegetation; or
 - 25m from streams/water bodies

Zone 1 – Less sensitive

This zone covers all the open areas up to but no closer than the buffer distances. As such it compromises the great majority of the property.

Non-chemical weed controls are:

- Strategic slashing/mowing to both prevent seed set, & favour the pasture grasses in competing with the broadleaf weeds (not practical for the control of Giant Rat's Tail Grass).

Herbicide controls are:

- Predominantly broad acre boom-spraying (for the following weeds & at the label rates); and
- Supplemented by spot spraying as the weeds become fewer (more a maintenance task).

Weed(s)	Herbicide	Product	Boom spray rate# (per ha)	Spotspray rate# (per 100L water)
Sickle pod, Snakeweed	triclopyr and picloram (300 and 100 g/L) mix Adjuvant	Grazon® DS	3L	200mL
		Uptake	1-2L	
		Li 700		
Rat's Tail Grass	sodium flupropanate and Paraquat	TASKFORCE® Shirquat	2L 0.4L	200mL

#Note: Reduced rates apply where the weed is targeted at seedling stage.

Zone 2 – Second most sensitive

This zone is that **within** the buffer distances and includes:

- Lagoons;
- Riparian systems; and
- Individual (or small clumps of) trees in the cleared areas.

These are the second most sensitive areas. The objective is towards favouring the natural regeneration processes.

This zone is where extra training and supervision is delivered before and during works by an EBD Environmental Supervisor.

Non-chemical weed controls are to be used where possible and include:

- Mowing and/or whipper-snipping;

- Mulching (preference to use materials sourced on-site where possible);
- Concentrated solarisation with black plastic;
- Manual removal &/or chipping of weeds; and
- Encouragement actions to shade ground level through canopy closure.

Herbicide controls are:

- Selective spraying with backpack units (using nozzle shields when amongst native seedlings);
- Cut stump weed stems above the ground with secateurs, cane knives, chainsaw or brush hooks. Immediately apply a 50% Glyphosate mix to the cut surface; and
- Drilling 10mm holes around the trunk / stem. Immediately fill with a 70% Glyphosate mix.

Weed(s)	Herbicide	Product	Paint / Fill mix (%)	Backpack rate# (per 15L water)
Sickle Pod, Snakeweed, Pond Apple seedlings, Lantana, Giant Bramble	Triclopyr and Picloram (300 + 100 g/L) mix and Paraquat Adjuvant	Grazon® DS Shurquat Uptake or Li 700	NA	30mL
Rat's Tail Grass	Sodium Flupropanate	TASKFORCE®	NA	30mL
Singapore Daisy / Balsam Pear	Metsulfuron Methyl Adjuvant	Associate X SEED	NA	4g 7mls
Guinea Grass	Glyphosate	Roundup Biactive	NA	185mL
Hymenachne	Glyphosate	Roundup Biactive	NA	140mL
Pond Apple, Yellow Guava, Devil's Fig, Thornapple, Allamanda	Glyphosate	Roundup Biactive, Sickle or Weedmaster Duo	70	NA
Sensitive Plant (Giant & Common)	Fluroxypr (or plus Aminopyralid)	Starane (or Hotshot)	NA	70mL

Zone 3 – Areas under revegetation

This zone covers those areas under a revegetation program. They are most likely within areas previously under pasture. May be fenced to exclude wallabies and feral pig activity.

- Preference is for non-chemical weed control. Where possible, it will be as for Zone 2; and
- Herbicide controls will include shielding of the spray nozzle and management of drift. Will include spraying with backpack units (rates as per Zone 2). Where the revegetation is in a large area, a planting pattern will be adopted that facilitates the movement of a small All Terrain Vehicle (ATV) with powered sprayer.



Zone 4 – Listed species habitat and ecological communities.

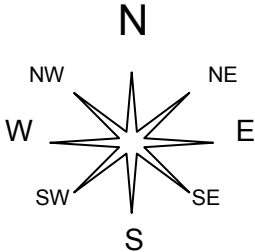
This zone covers EPBC listed species habitat and listed ecological communities. These areas are to be considered the most sensitive for weed control purposes.

- Weed control operations in this area will be conducted by only highly skilled weed control practitioners under close supervision by an EBD Environmental Supervisor; and
- The weed control methods used will be highly selective and will use the same herbicide application rates as Zone 2.

RECORD OF GROUND DISTRIBUTION (APPLICATION) OF HERBICIDES

Ella Bay and Ella Bay Road

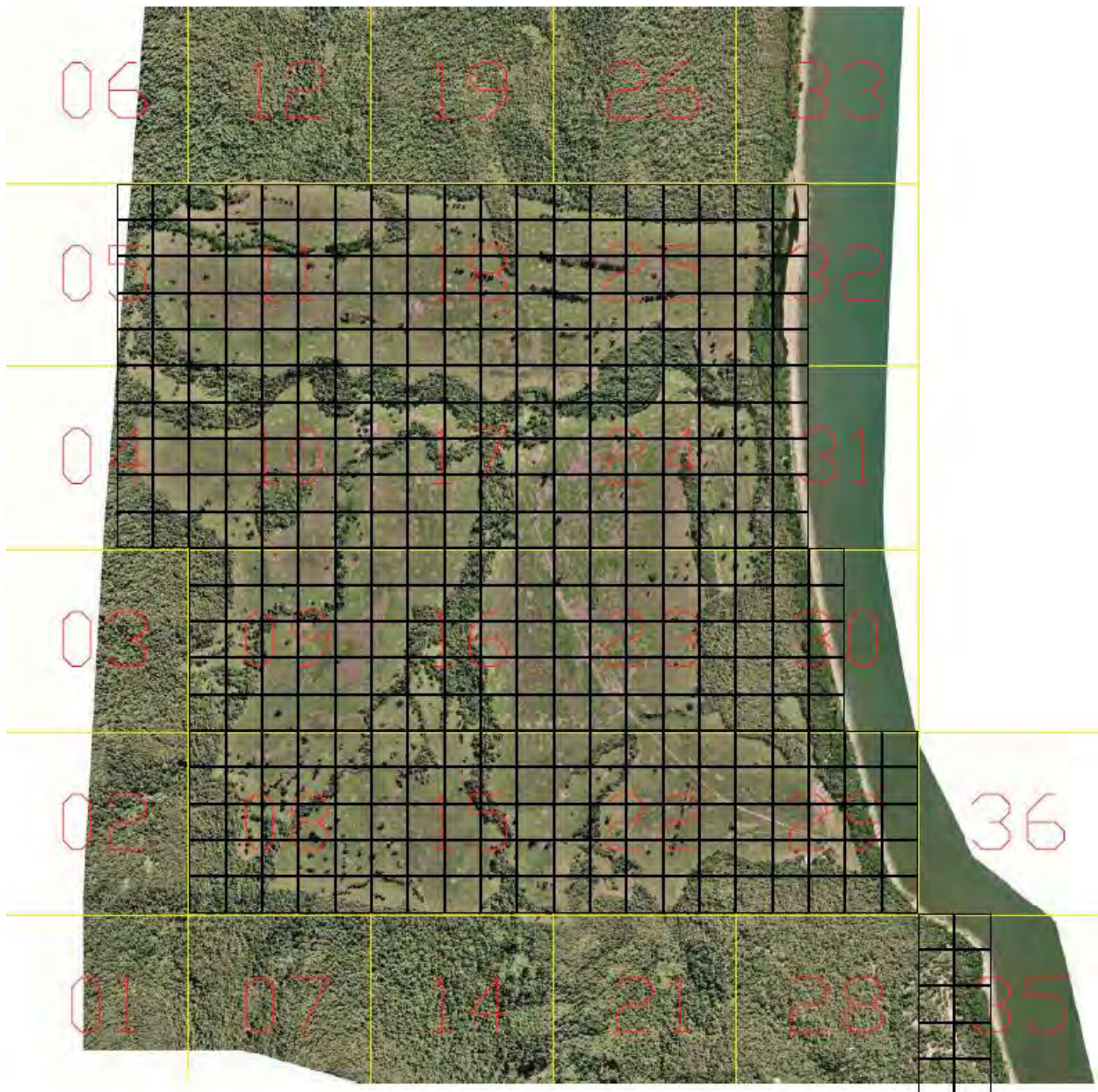
This record must be kept for 2 years after the application.

1. Date 2. Operator 3. Start 4. Finish 5. Target weed species (lantana, etc) 6. Area Ha / GPS file (if used)	7. Zone <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> 1 Open</div> <div><input type="checkbox"/> 2 Riparian</div> <div><input type="checkbox"/> 3 Reveg.</div> <div><input type="checkbox"/> 4 EPBC.</div> </div> 8. Type of Equipment <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> 12m Boom</div> <div><input type="checkbox"/> 6m Boom</div> <div><input type="checkbox"/> Tractor Hand gun</div> <div><input type="checkbox"/> Quad Hand Gun</div> </div>
9. Weather conditions – refer to weather station data NOTE: If rainfall is forecast for today do not proceed with spraying activities. If wind speed is greater than 20km/hr do not use boom spray If weather conditions change indicate with arrow to new condition <div style="text-align: center;">  </div> <p>Wind Direction</p>	Wind Speed <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> Calm <3km/h</div> <div><input type="checkbox"/> Light 3-10km/h</div> <div><input type="checkbox"/> Slight 10-15km/h</div> <div><input type="checkbox"/> Gentle >15km/h</div> </div> Temperature <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> Cool <20°C</div> <div><input type="checkbox"/> Light 20-25°C</div> <div><input type="checkbox"/> Slight 25-30°C</div> <div><input type="checkbox"/> Hot >30°C</div> </div> Humidity <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> <20%</div> <div><input type="checkbox"/> 20-50%</div> <div><input type="checkbox"/> 50-90%</div> <div><input type="checkbox"/> >90%</div> </div> Rainfall in past 24 hours <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> Dry 0mm</div> <div><input type="checkbox"/> Light <2mm</div> <div><input type="checkbox"/> Slight 2-10mm</div> <div><input type="checkbox"/> Heavy >10mm</div> </div>

10. Herbicide Mixture

Spray mix	Batch Number where listed	Application rate e.g. per ha or per 100 L	Total volume mm or L
Herbicide Trade name			
Active constituent			
Herbicide Trade name			
Active constituent			
Water			
Wetting Agent/emulsifier			

Signature.....



Each Square equals 1 ha. mark area sprayed



Appendix H: Weed Hygiene Protocol

Aim: Prevent importation of weed seed, vegetative material and amphibious diseases.

General principles and background:

17. Effective weed management is based on scientific understanding and data and the desire to protect the wider environment.
18. Hygiene protocols should be guided by the best available scientific evidence and OHS issues.
19. Hygiene protocols must be practical to carry out under field conditions.
20. Weeds extensively colonise and invade natural and cleared areas by a range of seed dispersal mechanisms. This includes:
 - a. Wind and water;
 - b. Passing undigested through animals (mainly birds); and
 - c. Attached to animal fur, human clothing, vehicles and machinery and contaminated soil.
21. Many weeds disperse through vegetative propagation (e.g. Singapore daisy). This includes:
 - a. Stem and root fragments.
 - b. Leaves.
 - c. Tubers, bulbs, rhizomes, corms and stolons.

Dispersal is mainly through contaminated soil and other bulk materials (e.g. mulch, fill and sand) but can be also in floodwaters, tides, and on machinery/vehicles.

Specific actions

1. Vehicle inspections will be undertaken when entering and leaving. Washdown bay to be utilised to remove all visible soil and vegetable material.
2. Stock piles of bulk material are to be located a minimum of 25m from any water body or stream, and monitored for any weed germinations while stored.
3. Washdown bays will be routinely inspected, maintained and any germinated seedlings eliminated.