EAST ARM ROAD QUARRY

GREEN AND GOLD FROG (*Litoria raniformis*)

HABITAT RESTORATION AND MANAGEMENT PLAN

Version 2.0

May 2023

DOCUMENT CONTROL

Version	Description	Prepared By	Date
1	Draft 1	EAR with assistance from Van Diemen Consulting Pty Ltd	30-4-2023
1		EPA comments	18-5-2023
2	Final	EAR with assistance from Van Diemen Consulting Pty Ltd	20-5-2023
2			

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ACRONYMS	
GGF	Green and gold frog (*Litoria raniformis*)
HRA – East	Habitat Restoration Area (east)
HRA – West	Habitat Restoration Area (west)
HRMP	Habitat Restoration and Management Plan
WPMP	EAST ARM ROAD QUARRY, HILLWOOD, WEED AND PATHOGEN MANAGEMENT PLAN, MARCH 2023

TERMS	
Habitat Protection Area	That area at the southern end of the farm dam which is to be protected through the implementation of this HRMP.
Habitat Restoration Area (east)	That area of land on the eastern side of the farm dam that is to be restored to predominantly over-wintering habitat.
Habitat Restoration Area (west)	That area of land on the eastern side of the farm dam that is to be restored to predominantly over-wintering habitat and managed to minimise the erosion of sediment into the farm dam from the adjacent aggregate stockpile area, and truck loading and carting activities.

PREFACE

This Habitat Restoration and Management Plan (HRMP) has been developed to specifically address the presence and appropriate management of Green and Gold Frog habitat at the East Arm Road Quarry, Hillwood.

Green and Gold Frog has been recorded in the farm dam located south-east of the Quarry. The most recent acoustic recordings of the dam indicate the species is present, and in moderate numbers based on the regularity of calls.

The **vision** of this HRMP and its implementation is:

> 'To maintain a Green and Gold Frog population in the farm dam at East Arm Road Quarry.'

The HRMP contains the following components –

Part A	*Introduction* to the project and the basis of the Habitat Restoration and Management Plan for the Green and Gold Frog at the East Arm Road Quarry.
Part B	*Legislative and relevant management plan* information for the Green and Gold Frog including the statutory conservation/threatened listing status under the
Part C	*Information about the Green and Gold Frog* including a description of the species, its habitat, and threats. Information about the species' presence, habitat types within the East Arm Road Quarry and potential local threats or impacts are provided.
Part D	*Plan implementation* which describes the need to have the HRMP accessible at the Quarry, staff induction and training requirements, plantings to facilitate habitat improvement and restoration, weed and pathogen management and emergency response measures in the event of fire or hydrocarbon spillage.
Part E	*Ongoing management practices* for each of the areas identified in the HRMP including the Habitat Protection Area and habitat Restoration Areas.
Part F	*Monitoring and adaptive management* procedures including monitoring methods and frequency, potential remedial works, and the process of adaptively managing the HRMP to reflect changed conditions and monitoring data results.
Part G	*Reporting* requirements to document the results of implementing the HRMP.
Part H	*References* cited in the HRMP.
Part I	*Attachments* referenced in the HRMP.

PART A - INTRODUCTION

A.1 PROJECT BACKGROUND AND VISION

The Habitat Restoration and Management Plan has been developed as part of the expansion of the East Arm Road Quarry (the 'Quarry') located at Hillwood on the East Tamar.

Green and Gold Frog has been recorded in the farm dam located south-east of the Quarry. The most recent acoustic recordings of the dam indicate the species is still present, and in moderate numbers based on the regularity and frequency of calls.

The Green and Gold Frog is listed as **vulnerable** on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the Tasmanian *Threatened Species Protection Act 1995.*

In Tasmania, *Litoria raniformis* is often known as Green and Gold Frog, which is the name applied in this HRMP and occasionally called Green and Golden Frog. On mainland Australia it is often referred to as the Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog and Southern Bell Frog.

This Habitat Restoration and Management Plan applies to the farm dam that is partly within the Mining Lease 1914P/M held by East Arm Resources Pty Ltd – see **Figure 1**. The farm dam is used to supply water to the Quarry to suppress dust on roads (water tank applied) and during crushing/screening activities.

The **vision** of this HRMP and its implementation is:

> 'To maintain a Green and Gold Frog population in the farm dam at East Arm Road Quarry.'

A.2 OBJECTIVES

The objectives of this HRMP are to:

- Implement a management plan that describes the location, habitat, and importance of the Green and Gold Frog in the farm dam at and adjacent to the East Arm Road Quarry;
- To protect the existing Green and Gold Frog habitat at the southern end of the farm dam;
- To restore and enhance Green and Gold Frog habitat within the identified Habitat Restoration Areas on the east and west of the farm dam;
- To mitigate and manage potential direct and indirect impacts to Green and Gold Frog from the development and operation of the East Arm Road Quarry; and
- To establish a long-term monitoring site to record the presence/absence of the species as the Quarry expands and revegetation works at the farm dam mature.

A.3 PLAN MANAGEMENT TEAM

The HRMP is to be implemented by a team comprised of management, staff and consultants.

A.4.1 EAST ARM RESOURCES PTY LTD

The East Arm Road Quarry is owned and operated by East Arm Resources Pty Ltd which is a company in the VSA Roads Group which includes Inroads, Centre State Asphalting, Western Quarries, Topcoat Asphalt and Primal Surfacing.

The Quarry employs a team of machinery/equipment operators, HSEQ officers, and administration staff.

Mr John Bell-Andrews (General Manager) leads the East Arm Quarry team, who since growing up in the George Town district, has followed a 30-year career path in the construction materials and road surfacing industries. The first 8 years of John's career was spent with CSR Ready-mix - Construction Materials, employed in a number of roles spanning quarrying, concrete and pre-cast concrete products. Since 1999, John has held Senior General Management roles in Alex Fraser Asphalt, Bilfinger Berger Services, and Centre State Asphalting with responsibilities across numerous States of Australia including Tasmania.

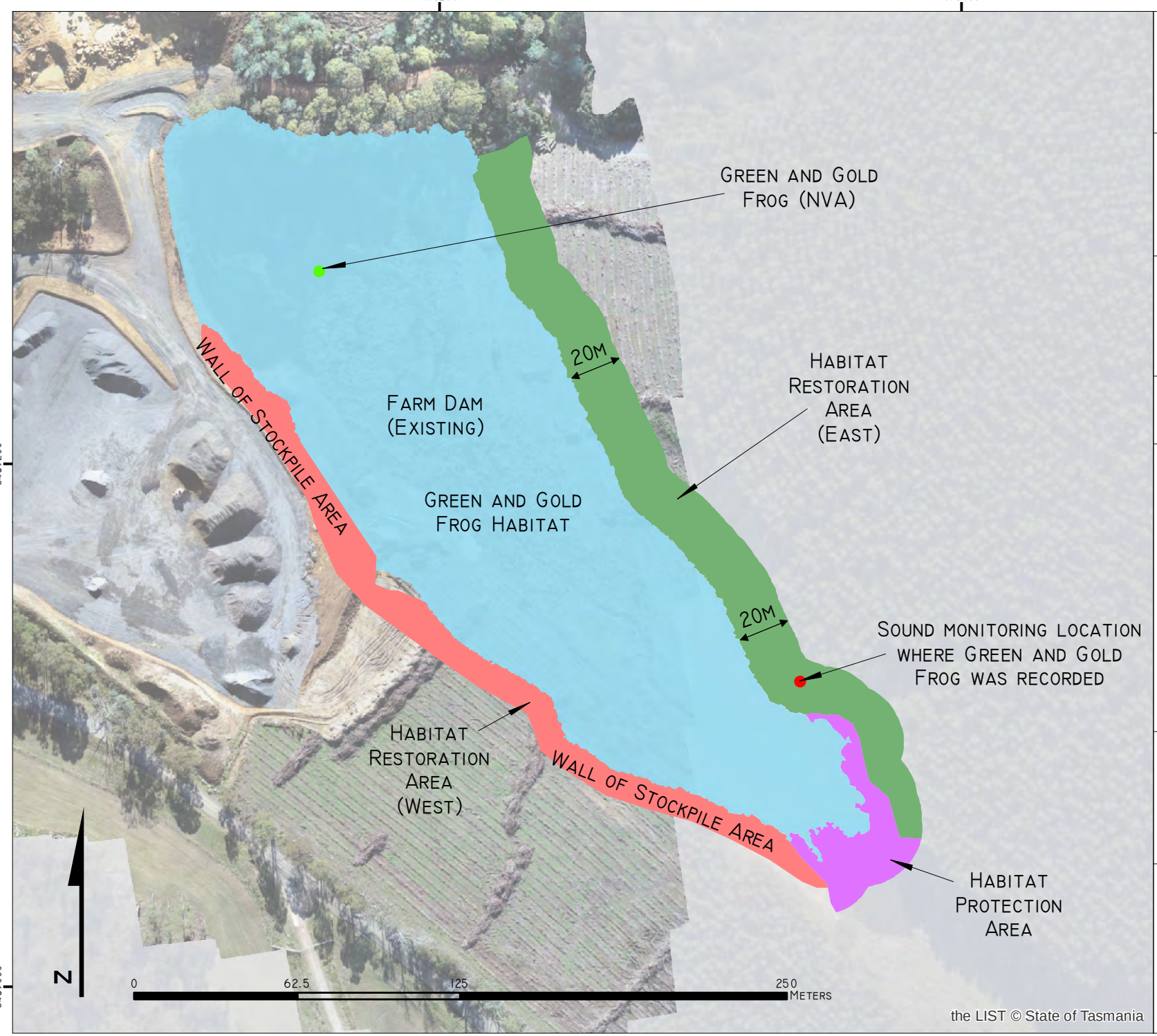
East Arm Resources Pty Ltd holds an adjacent Mining Lease (2077P/M) and is well advanced in the process of having Mining Lease 1914P/M transferred to it from the current Lessee (Landfall Nominees Pty Ltd). Work is underway to expand activities of extraction into Mining Lease 2077P/M by DA2020/060, with future development of transport related infrastructure to further export options.

A.4.2 ENVIRONMENTAL ASSISTANCE AND ADVICE

Van Diemen Consulting Pty Ltd has been engaged to provide on-site assistance and advice with the implementation of the HRMP.

A.4.3 CONTRACTORS

Additional contractors or specific service providers may be engaged to to provide on-site assistance with the implementation of the HRMP. For example, a native plant nursery may be engaged to contract grow and deliver additional plants for in-fill planting in the Habitat Restoration Areas.

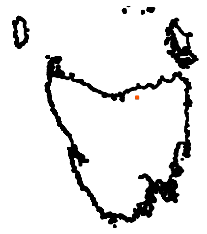


East Arm Road Quarry

Green and golf frog habitat restoration and management plan

Figure 1: Green and gold frog habitat restoration and management areas

TASMAP:	LGA:
BELL BAY BEACONSFIELD	GEORGE TOWN



DATUM: GDA94
GRID: MGA ZONE 55
SCALE: @A4 - NA

CLIENT: EAST ARM RESOURCES

DATE: 3 MAR 2023

PART B – LEGISLATIVE AND RELEVANT MANAGEMENT PLAN CONTEXT

B.1 LEGISLATIVE CONTEXT OF THE SPECIES

The legislative status of the green and gold frog is listed below.

Commonwealth

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The green and gold frog is listed as **vulnerable** under the EPBC Act. The EPBC Act protects Matters of National Environment Significance (MNES), including threatened species. The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. The habitat restoration and management works are unlikely to result in a significant impact on the species.

State

Threatened Species Protection Act 1995 (TSP Act)	The green and gold frog is listed as **vulnerable** on Schedule 4 of the TSP Act.
Nature Conservation (Wildlife) Regulations 2021	The green and gold frog is listed as **specially protected** wildlife in part 1 of Schedule 5 - Specially protected wildlife.

B.2 PERMIT REQUIREMENTS

The permit requirements (DA 2022/7 including PERMIT PART B, PERMIT CONDITIONS - ENVIRONMENTAL No. 11114) that are relevant to the Green and Gold Frog are below.

Permit Conditions

FF1 Protection of the green and gold frog (*Litoria raniformis*) habitat Unless otherwise approved in writing by the Director, no works other than water extraction for dust suppression are to be undertaken at the dam to the southeast of the quarry, as identified in the Environmental Effects Report as having a record of the green and gold frog.	The Condition requires that only water extraction for dust suppression is to be undertaken at the farm dam to the southeast of the quarry.
OP1 Machinery washdown Prior to entering The Land, machinery must be washed in accordance with the Weed and Disease Guidelines, or any subsequent revisions of that document.	The Condition requires that machinery is washed in accordance with the Weed

	and Disease Guidelines[1]. The Condition is implemented through the *Weed and Pathogen Management Plan* ().

B.3 OTHER RELEVANT PLANS

The following relevant plans and documents have been considered in the development of the HRMP.

Planning Instruments, and Other Relevant Plans

Listing Statement 'Threatened Species Unit 2001. Listing Statement: Green and Golden Frog *Litoria raniformis*. Department of Primary Industries, Water and Environment, Tasmania.'	State listing statement which provides information about the green and gold frog in Tasmania including threats and management actions to assist the recovery of the species.
Recovery Plan 'National Recovery Plan for the Southern Bell Frog *Litoria raniformis'* Published by the Victorian Government Department of Sustainability and Environment (DSE) Melbourne, January 2012.	A Recovery Plan for the green and gold frog under the Tasmanian *Threatened Species Protection Act 1995* and/or approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
EPBC Act Policy Statement 3.14 - Significant Impact Guidelines for the vulnerable growling grass frog (*Litoria raniformis*). Department of the Environment, Water, Heritage and the Arts – 2008.	This policy statement is designed to assist you to determine whether a proposed action is likely to have a significant impact on the growling grass frog (that is, whether or not the action is likely to be a 'controlled action' under the EPBC Act).
Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act, 2010. Department of the Environment, Water, Heritage and the Arts.	These survey guidelines are intended to provide a guide for stakeholders on the effort and methods considered appropriate when conducting a presence/absence survey for frogs listed as threatened under the EPBC Act.
The Threatened Species Action Plan 2022-2032	The green and gold frog, *Litoria raniformis,* is listed in Appendix 1: Priority species. The Threatened Species Action Plan maps a pathway to recovery for our nation's threatened wildlife, spanning terrestrial, marine and freshwater environments. It presents a vision to drive practical on-ground efforts and identifies critical action for the recovery of threatened species and ecological communities guided by experts and the Australian Public.

[1] means the document titled Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania, by the Department of Primary Industries, Parks, Water and Environment, dated March 2015, and any amendment to or substitution of this document.

PART C – GREEN AND GOLD FROG

This section provides details of the green and gold frog including a description of the species, its habitat, and threats.

C.1 DESCRIPTION

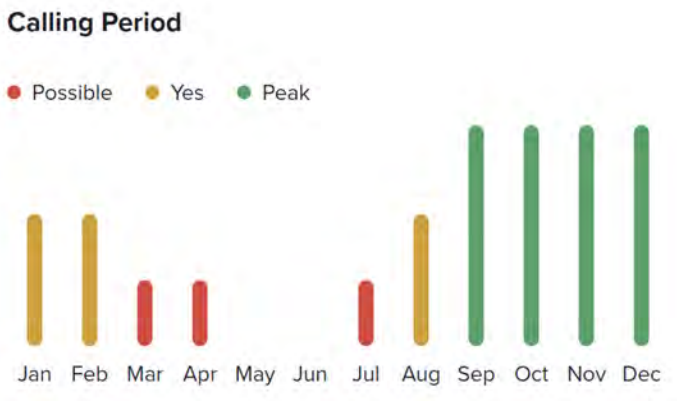
The green and gold frog is a large species that can reach up to 10 cm in body length. It has a green- brown back, with brown or bronze patches, and sometimes a pale longitudinal stripe along the middle. There is also a cream-coloured stripe from behind the eye that widens along the sides, and often a dark brown stripe from the nostril to the eye.

The belly is white. The pupil is horizontal, and the iris is gold. The groin and backs of the thighs are bright blue, and sometimes have small, bright yellow patches. Fingers are unwebbed and toes are fully webbed, both with small discs.

The species generally calls from September to December (peak breeding season) with calling also extending into other months including August, January, and February. Acoustic recordings of the species have been made at the East Arm Quarry in March and April.

The mating call is a very distinctive and complex series of grunts and growls. Calling activity can be erratic, often being restricted to warm calm days and evenings. Choruses (many males calling) can reach peaks mid-morning and early evening. In breeding condition, the male frog exhibits a mottled black throat and develops black nuptial pads (hard calluses) on the back of each thumb with which he grasps the female when mating (Threatened Species Unit 2001).

Eggs are laid as clusters at, or under, the surface of the water in permanent ponds, dams, swamps, and creek pools. Tadpoles can reach a total length of up to 9.5 cm and are clear yellow in colour, becoming green as they grow. They often hide in vegetation at the shallow edges of water bodies and take 12 to 15 months to develop into frogs. In Tasmania, the species breeds from September to January.



C.2 DISTRIBUTION

The green and gold frog occurs across a large area of south-east Australia (Pyke 2002), including New South Wales, the Australian Capital Territory, Victoria, South Australia, and Tasmania; the species has undergone significant declines in some areas.

In Tasmania, the known range of the green and gold frog includes coastal areas of south-eastern and northern Tasmania including King Island and Flinders Island, and inland around the Deloraine-Longford-Launceston region (Threatened Species Unit 2001).

C.3 HABITAT REQUIREMENTS

The Green and Gold Frog inhabits a wide range of still waterbodies across its range, including lagoons, swamps, lakes, ponds, farm dams, irrigation channels and quarries (DEC 2005). It also occupies slow-flowing sections of streams and rivers.

In the more mesic areas of Tasmania, frogs are typically found among vegetation within or at the edges of permanent water such as slow-flowing streams, swamps, lagoons, and lakes (Clemann and Gillespie 2004). In disturbed areas it commonly occurs in artificial waterbodies such as farm dams, irrigation channels and disused quarry holes, particularly where natural habitat is no longer available (Clemann and Gillespie 2004).

Note that the Green and Gold Frog can tolerate a degree of poor water quality, and the species has been known to breed in swimming pools, pools in cropland, disused quarry holes, and in farm dams.

There are three key aspects to the habitat of the Green and Gold Frog which are further described below.

C.3.1 BASKING HABITAT

Green and gold frogs are active during both day and night throughout the warmer months and can be seen basking out of water amongst vegetation or on rocks and logs. In Tasmania, it is the only frog to exhibit this behaviour (Threatened Species Unit 2001). The species is known to bask in filtered sunlight, that is, under partly cloudy conditions or in deep vegetation (Ehmann and White 1997) and is frequently found basking on grassy banks near water (Courtice and Grigg 1975). Its behaviour during winter is not well known, although it is speculated that it hibernates in warm, moist areas such as the mud at the bottom of ponds, under logs, rocks and debris or beneath thick vegetation (Ayers *et al.* 1996).

C.3.2 BREEDING HABITAT

The Green and gold frog is dependent upon permanent freshwater lagoons for breeding. The ideal breeding habitat is the shallow part of lagoons (up to approximately 1.5 m) where there is generally a complex vegetation structure.

Breeding habitat for the green and gold frog includes the following elements: still or slow-moving water bodies (lagoons, lakes, farm dams, ponds, irrigation channels, swamps, and slow-moving sections of rivers and streams); the species prefers the shallow part of lagoons (to approx. 1.5m) with a complex vegetation structure, often containing vegetation communities dominated by emergent plants such as water ribbons (*Triglochin*) and spikerush (*Eleocharis*), and submerged plants such as watermilfoil (*Myriophyllum*), marsh-flower (*Villarsia*), and pondweed (*Potamogeton*); however, other plant communities can also form suitable breeding habitat (Threatened Species Unit 2001).

C.3.3 REFUGE HABITAT

In addition to breeding habitat, woodlands, and forest habitat (including logs, rocks and other ground features) adjacent to the breeding site can be important for feeding and hibernation, and as habitat corridors allowing movement between

breeding sites. The variety of habitats this species utilises for refuge includes soil cracks, fallen timber, debris, and dense vegetation on low, frequently inundated floodplains (Cogger 2000).

C.4 EAST ARM ROAD QUARRY GREEN AND GOLD FROG HABITAT

The Green and Gold Frog inhabits a farm dam which is now used by the Quarry as its principal water supply to manage and suppress dust generated by the activities at the Quarry.

The key aspects of the Green and Gold Frog habitat at the Quarry are further described below.

C.4.1 BASKING HABITAT

Since the hardwood plantation was harvested a sparse ground coverage of exotic and native herbs has established around the edge of the farm dam. The eastern side of the farm dam is very open, and relatively flat. Other than a lack of cover for protection from predation, the area is basking habitat for Green and Gold Frog.

C.4.2 BREEDING HABITAT

The farm dam is a slow-moving water body with a shallow part (to approx. 1.5m) at the southern end and north-eastern corner. Emergent plants include water ribbons (*Triglochin*), cumbungi (*Typha latifolia*) and spikerush (*Eleocharis*), and submerged plants such as watermilfoil (*Myriophyllum*), marsh-flower (*Villarsia*), and pondweed (*Potamogeton*). Recruitment of the emergent species should continue without any intervention or promotion through planting.

C.4.3 REFUGE HABITAT

A small stand of *Melaleuca ericifolia* (swamp paperbark) at the southern end of the farm dam (where the acoustic recorder has been located) and upstream dense vegetation dominated by native and exotic grasses provides refuge and over-wintering habitat.

C.5 RELEVANT KEY THREATS

C.5.1 GENERAL THREATENING PROCESSES

The Green and Golden Frog can tolerate a degree of poor water quality; the species has been known to breed in swimming pools, pools in rice fields and other cropland, disused quarry holes, and in farm dams. However, extreme degradation of water quality through trampling by stock, input of chemicals (including fertilisers, herbicides, and domestic and industrial chemicals), and increased sedimentation from erosion and runoff, may destroy breeding habitat.

Chytrid is a fungal disease which can decimate frog populations. Chytrid can be spread in soil and mud on dirty vehicles and earthmoving equipment. To avoid the spread of chytrid into uninfected areas - wash and dry vehicles and earthmoving equipment before use in areas which have previously been largely free of human disturbance.

The major landscape threats to Green and Gold Frogs and their habitat can be broadly summarised below:

- drainage of wetlands and conversion to agriculture, housing, and other purposes;
- degradation of wetlands and water quality through stock damage, water abstraction, changed hydrology;
- modification of river systems;
- application of agricultural chemicals, including fertilisers;
- fragmentation of habitat;
- Chytrid fungus, a water-borne pathogen responsible for the Chytridiomycosis (an infectious disease which affects amphibians worldwide); and
- prolonged drought.

C.5.2 POTENTIAL THREATS – EAST ARM ROAD QUARRY

QUARRY OPERATIONAL THREATS

Only a few threats or potential impacts that may cause harm or negative impact to the species are present or may be present at the Quarry. These are summarised below.

Direct threats include:

- degradation of the aquatic and semi-aquatic vegetation in the farm dam through excessive and/or prolonged water abstraction; and
- direct impact to frogs from truck injury/mortality and/or occlusion in pipes used to abstract water from the dam.

Indirect threats include:

- Increase in dust from heavy machinery movements;
- Increase in noise by heavy machinery movements;
- Increase in vibration from heavy machinery movements;
- Increase in artificial light from operations occurring outside daylight hours;
- Accidental introduction of amphibian chytrid fungus by construction personnel, equipment, or machinery;
- Reduction of water quality through sediment-laden flow and/or contaminants originating from construction areas; and
- Spillage of hydrocarbons into the farm dam or areas which then drain to the farm dam via drains or ponds.

These threats and potential impacts can be managed to acceptable levels by the adoption and implementation of standard quarry management practices and those that are already regulated/conditioned by existing permits (e.g., dust control measures).

The water pipelines used to abstract water from the dam are fitted with a screen to exclude tadpoles and frogs, and other organic material.

Noise and vibration at the existing Quarry has not seemingly impacted the species because it is still present despite drilling and blasting and crushing and screening activities in the active pit and the movement of trucks and front end loaders nearby.

EXTERNAL THREATS

There are several threats to the management of the farm dam and its water quality and quantity which are outside the jurisdiction of East Arm Resources Pty Ltd and this HRMP.

As much as EAR can actively manage its operations to prevent or minimise the risk of potential impacts to water quality and quantity, the upper catchment of the farm dam is generally outside the area under EAR's direct management and operation of the Quarry. The catchment above the Quarry drains from land that is pasture, pine plantation, housing (very low density), native forest, and a potential compost facility. The quality of the water is currently unknown and may vary over time. Equally, water quantity may unnaturally vary over time through the possible impoundment of the creek or its tributaries to capture and store additional water on lands in the upper catchment.

The management of the plantation to be established on the eastern side of the farm dam is outside the scope of the HRMP and sits outside the jurisdiction of East Arm Resources Pty Ltd. The landowner has agreed to the establishment of the following:

- a 40m buffer measured from the edge of the full water supply level of the farm dam where there will be no spraying of herbicides (including residual herbicides); and
- a 20m buffer has also been established within which no plantation will be re-established.

These measures exceed the requirements of the forest practices plan to manage the presence of Green and Gold Frog in the farm dam.

PART D – PLAN IMPLEMENTATION

This section describes how the HRMP will be implemented including the training of Quarry staff and Contractors, installation of environmental controls for habitat restoration and protection areas and the enhancement of Green and Gold Frog habitat.

D.1 ACCESS TO DOCUMENTS AND PLAN

Hard copies of the Permit and the HRMP are to be held at the site (office).

An electronic copy of the Permit and the HRMP are to be held at the site (office) on USB.

D.2 TRAINING AND INDUCTIONS

EAR, or their representative, is responsible for implementing the environmental control measures described in the HRMP, and any relevant permit conditions and requirements imposed by permits.

D.2.1 INDUCTIONS AND AWARENESS

All full-time staff and contractors are required to attend an induction session prior to commencing work at the Quarry. The inductions are recorded. Staff induction documentation will include potential environmental impacts related to the HRMP and their respective control measures will be discussed, explained, and communicated to attendees.

An electronic sign-on system is in place at the Quarry which records the attendance at the Quarry by staff, contractors (excluding truck drivers collecting aggregate for delivery) and other people working in the Quarry. The online sign-in system will include information about the Green and Gold Frog that inhabits the farm dam and specifically the management requirements for the farm dam, Habitat Restoration Area, and the Habitat Protection Area.

D.2.2 TRAINING

Staff and contractors who are implementing the HRMP or are responsible for its implementation will receive specific training from a suitably qualified ecologist as to the habitat and management requirements for the Green and Gold Frog at the Quarry.

D.3 MARKING OUT MANAGEMENT BOUNDARIES

All marking out of the areas described in the HRMP must be completed before any activities commence at these areas.

D.3.1 HABITAT RESTORATION AND PROTECTION AREAS

A suitably qualified person is to mark with flagging tape or survey marker paint the boundary of the Habitat Protection and Restoration Areas.

Temporary fencing or other suitable markers (e.g., star pickets and signage) will be installed to identify machinery/disturbance exclusion zones.

D.3.2 OTHER AREAS

Other HRMP relevant areas to be appropriately marked out include the following –

- ✓ Location of the sediment pond at the south-eastern corner of the stockpile area including the access to it for maintenance and cleaning,
- ✓ Location of the buffer boundary around the farm dam within which herbicides may not be used.
- ✓ Location of the water pump used to access water from the farm dam for dust suppression purposes.

D.4 QUARRY HYGIENE MEASURES

The Quarry has in place a Weed and Pathogen Management Plan.

To minimise the risk of introducing pathogens and other soil-borne diseases to the site all plants used for the project will be accessed from a reputable supplier who has strict soil hygiene measures in place.

For works conducted in the Habitat Restoration Areas, the tools used must first be thoroughly washed in a solution of F10 disinfectant.

D.5 WEED AND PATHOGEN MANAGEMENT

D.5.1 WEEDS

The Quarry has in force a management plan to identify and manage weeds: EAST ARM ROAD QUARRY, HILLWOOD; WEED AND PATHOGEN MANAGEMENT PLAN MARCH 2023.

The *'Rivercare – Guideline for the safe and effective herbicide use near water'* and 'The 'Keeping It Clean – A Tasmanian Field Hygiene Manual to prevent the spread of freshwater pests and pathogens' will be applied in and adjacent to the area covered by this HRMP.

Key EAR staff will be trained in weed identification and management measures.

D.5.2 PATHOGENS - CHYTRID FUNGUS

Chytridiomycosis is an infectious disease that affects amphibians worldwide. It is caused by the chytrid fungus (*Batrachochytrium dendrobatidis*), a fungus capable of causing sporadic deaths in some amphibian populations and 100 per cent mortality in others. The disease has been implicated in the mass die-offs and species extinctions of frogs since the 1990s.

To minimise the risk of introducing chytrid fungus the Quarry implements a CLEAN MACHINERY AND EQUIPMENT POLICY. The policy requires that machinery is brought into the Quarry in a clean condition; free of weed propagules, clods of dirt and vegetative matter.

A Machinery Hygiene Inspection Sheet is to be used to record the machine/equipment brought into the Quarry, and from where it has been floated. The form is to be completed by a suitably qualified person prior to the Machinery or Equipment entering the Quarry. If the Machinery or Equipment fails to pass an inspection, it will be refused entry to the Quarry and sent away for further cleaning.

Works within the dam buffer area should apply the NRE Tas guidelines *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens* for machinery and equipment washdown procedures.

D.6 EMERGENCY RESPONSE PROCEDURES

The following measures are to be adopted in the event of an emergency in addition to the standard operating procedures in place at the Quarry.

D.6.1 FIRE

In the event of a fire (e.g., machinery, bushfire) always the contact emergency services on 000 (triple zero) without delay.

D.6.2 MINOR SPILL/LEAK CONTROL MEASURES

In the event of a hydrocarbon spillage or leak greater than 1 L volume but less than 10 L the spill kit (or kits) will be deployed as the means of clean-up. The spill kit (or kits) will be replenished as soon as possible, and the contaminated spill kit (or kits) will be disposed of at an authorised location to receive such waste material.

A **hydrocarbon spill boom** will be held on site in case an oil spill extends to or occurs in the farm dam.

An **Incident Report** must be completed within 48 hrs of the incident occurring and provided to the EAR General Manager by email or fax.

PART E – ONGOING MANAGEMENT PRACTICES

EAR will manage the area covered by the HRMP with assistance of suitably qualified persons or organisations. Expert assistance and advice will be sought on an ongoing basis.

E.1 HABITAT RESTORATION AREAS

E.1.1 LOCATION

The areas to have habitat restored and enhanced are shown in **Figure 1.** Two areas have been identified:

1. **East** – the eastern side of the farm dam where it adjoins plantation (to be replanted). The focus of habitat restoration is to establish high-quality basking and over-wintering habitat to compliment the breeding habitat offered by the farm dam.
2. **West** – the western side of the farm dam where it abuts the stockpile area used by the Quarry. The focus of habitat restoration is to establish shading and sediment erosion control vegetation to minimise the risk of dust entering the farm dam from surface erosion or dust. Over-wintering habitat is also to be established between emergent trees and shrubs.

E.1.2 PLANTINGS

SPECIES SELECTION AND SOURCING TUBESTOCK

Recommended plant species for each part of the Habitat Restoration Area are provided in **Table 1.**

The species used will depend on the availability of tubestock and the weather/soil conditions at the time the plantings are done. There may need to be several plantings staged over 12 months to gradually enhance the created habitat.

To minimise the risk of introducing pathogens and other soil-borne diseases to the site all plants used for the project will be accessed from a reputable supplier who has strict soil hygiene measures in place.

Table 1. Species to be planted in each of the Habitat Restoration Areas

Common name	Species name	Life Form	Approximate planting densities	Planting Area	
				HRA – East	HRA - West
Woolly tea-tree	*Leptospermum lanigerum*	Large shrub to small tree	1 per 5-10m^2		
Blackwood	*Acacia melanoxylon*	Large shrub to tree	1 per 30m^2		Sparse
Manuka	*Leptospermum scoparium*	Large shrub to small tree	1 per 10m^2		

Swamp paperbark	*Melaleuca ericifolia*	Large shrub to small tree	1 per 10-20m^2		Sparse
Slender honey-myrtle	*Melaleuca gibbosa*	Small shrub	1 per 20m^2		
Coast banksia	*Banksia marginata*	Large shrub to small tree	1 per 10-20m^2		
Cutting sedge	*Carex appressa*	Sedge	1 per 5-10m^2		
Drooping sedge	*Carex fascicularis*	Sedge	1 per 0.5-1m^2		
Club rush	*Ficinia nodosa*	Rush	1 per 0.5-1m^2		
Pale rush	*Juncus pallidus*	Rush	1 per 0.5-1m^2		
Silver tussock grass	*Poa labillardierei*	Grass	1 per 0.5m^2		

PLANTING AND WATERING TUBESTOCK

Tubestock should be planted at a suitable time of the year (e.g., autumn to winter, and possibly early to mid-spring depending upon medium to long term rainfall forecasts) to enhance the likelihood of survival of the plants without the need for additional watering. Fertiliser (tablets or in liquid form) is not to be used.

It is important that plantings are not over-watered as the plants can become reliant on the additional water being provided. Water should only be provided to tubestock to enable their survival, rather than growth, through a dry period. It is unlikely that tubestock will need any supplementary water once they have survived one summer period. If a dry period occurs, then watering should be conducted once per 14 days or when a soil probe when inserted into the soil around the tubestock indicates the soil profile is dry. Observations of plants for drought impacts should be made weekly in the spring and summer months for the first year after planting.

PROTECTING TUBESTOCK

Herbivory can be prevalent in areas of pasture, plantation (especially young plantation trees), and young vegetation rehabilitation works areas.

Plant species with a tree or shrub life form should be protected as far as practicable using a stake and tree guard. Fertiliser tablets should not be used as they promote lush new growth that is highly palatable to herbivores which may damage the growing plants.

It is important to be aware that on occasion, tree guards can attract wildlife to the tubestock which inevitably causes higher losses than if tree guards were not used. If there are high numbers of wallabies in the area, then some plants should be planted without a tree guard – instead they can be marked with a bamboo stick with a red/orange painted tip to enable identification of the planted tubestock.

If herbivory levels are very high and the tubestock are being heavily impacted, then advice and management recommendations will need to be sought on a case-by-case basis from a suitably qualified person.

E.1.3 COARSE WOODY DEBRIS AND ROCKS

Each HRA will have as part of the habitat restoration process coarse woody debris and rocks placed in areas to provide refuge habitat adjacent to the farm dam. The HRA – East area will be the primary location where CWD will be used as it is the more likely area to be used by Green and Gold Frog because it is the most distant from the activities associated with the Quarry (i.e., truck movements). CWD can be sourced from the Quarry as areas of vegetation are cleared to enable rock extraction.

E.2 HABITAT PROTECTION AREA

The Habitat Protection Area is comprised of existing swamp paperbark scrub/forest and associated low-lying grassland/ sedgeland that occurs along the drainage line/creek that drains northwards into the farm dam.

The primary focus of management is to mark off the area and avoid any disturbance.

E.3 MANAGEMENT ACTIONS

Management measures relating to the ongoing operation and maintenance associated with the Habitat Restoration and Habitat Protection Areas are outlined in **Table 2.**

Table 2. Management plan actions and timing for the Habitat Restoration and Management Plan at the East Arm Road Quarry

Measure	Action	Outcome	Timing
Enhance habitat within Habitat Restoration Area	Habitat enhancement should consist of the following: • Improved areas of foraging habitat consisting of tussocky grassland with occasional emergent trees and shrubs (active plantings) • Ensure connectivity throughout the Habitat Restoration Areas and Habitat Protection Areas made up of structured vegetation, boulders and/or logs, suitable for sheltering (active plantings and placement of CWD and rocks)	Habitat extent enhanced. Habitat quality enhanced. Habitat connectivity and function maintained.	Habitat enhancement commences within 6 months of the plan being approved. Habitat maintained throughout the life of the Quarry.
Inductions and Training	Inclusion of Green and Gold Frog specific information and management requirements in the induction and training program at the Quarry.	Raised awareness of Green and Golden Bell Frog presence in the farm dam and surrounds	Commenced within 3 months of the plan being approved. Throughout the life of the Quarry
Informative signage	Installation and maintenance of signage detailing the significance of the farm dam to the Green and Golden Bell Frog.	Raised awareness of Green and Golden Bell Frog presence in the farm dam and surrounds	Signage installed within 3 months of the plan being approved. Maintained throughout the life of the Quarry
Control threats within Habitat Restoration Areas and Habitat Protection Areas	Develop measures to reduce predation by feral cats. Apply the Weed and Pathogen Management Plan to manage threats of Chytrid, and noxious weed incursions.	Mortality/injury of individuals avoided. Secondary impacts of habitat degradation avoided or minimised.	Feral cat management commenced within 3 months of the plan being approved. Maintained throughout the life of the Quarry
Light spill management	Directional lighting should be used to minimise light spill outside daylight hours. Lights are to be switched off or dimmed outside of operational hours to reduce potential impacts to frogs.	Reduction of light spill to the farm dam and immediate Green and Gold Frog habitat around the farm dam	Maintained throughout the life of the Quarry

Sediment and erosion controls	Installation of sediment control ponds associated with the stockpile area. Installing erosion and sediment controls around remediation works area to prevent mobilisation of sediment into adjacent aquatic habitats. Checking and cleaning sediment ponds and drains to maintain their efficiency in sediment removal	Input of sediment-laden flow and/or contaminants avoided	Sediment ponds and drains installed within 3 months of the plan being approved. Maintained throughout the life of the Quarry

PART F – MONITORING AND ADAPTIVE MANAGEMENT

EAR is responsible for all monitoring, data collection and handling, associated with the implementation of the HRMP but may engage suitably qualified persons or organisations to assist with this process.

F.1 OBJECTIVES

The monitoring program is designed to: -

- Inform and report 'early-control', i.e., to demonstrate that management actions are effective in achieving interim performance targets, and therefore in time completion criteria; and
- Support an 'early warning' function, i.e., to inform timely decisions on corrective actions.

The objective of the monitoring program is to evaluate the progress of Offset Site management activities and inform successful and timely interventions. To achieve this goal, relevant data and information need to be gathered, collated, and interpreted as described below.

F.2 SUITABLY QUALIFIED PERSONS

All ecological – biodiversity related monitoring actions will be carried out by a suitably qualified ecologist who will have a relevant degree and enough experience that makes them competent to undertake field-based activities.

Some tasks, such as erosion monitoring, can be conducted by a suitably qualified/trained person.

F.3 DATA COLLECTION AND HANDLING

A data handling program will be implemented to ensure proper data storage and protection, data extraction, quality control, analysis, interpretation, reporting and presentation.

Key features of the data handling program will include:

- A standard template and structure for reports;
- Standardised data collection methods by qualified personnel; and
- Consistent filing within the EAR filing/database storage network.

Data can be provided to the relevant authorities on request, including the EPA and NRE Tas.

F.4 MONITORING PROGRESS TOWARDS OBJECTIVES

Table 3 provides the parameters and frequency of monitoring at the farm dam and surrounds which is inhabited by the Green and Gold Frog.

Data for each of the attributes monitored will be collected to quantify habitat improvement from baseline conditions. This will enable any change in attributes measured to be identified, thus enabling a comparison to previous years' data and progress towards attainment of the desired habitat improvements and/or maintenance.

Prior to the commencement of works, photopoint locations will be established by a suitably qualified person to ensure accurate photographic records of the works and improvements at the site are made. Guidelines are provided in **Attachment 2** to describe how to setup and record photopoint locations.

F.4.1 PLANTINGS

A visual assessment will be made of the number of plant losses for each species that has been planted. Records of losses will be kept including the species and the likely reason for loss (e.g., drought, insect attack).

F.4.2 EROSION AND SEDIMENTATION

Prior to the commencement of works, photopoint locations will be established by a suitably qualified person to ensure

F.4.3 ACOUSTIC RECORDINGS AND SURVEYS

A suitably qualified ecologist will conduct the acoustic surveys using specialist equipment. An acoustic recorder has been used at the site since October 2022 (**Plate 1**) with a brief period (3 weeks in late March to early April 2023) where recordings were not collected. No attempt is proposed to quantify the number of GGF present at the dam either at the start of the revegetation program or through its implementation.

Plate 1. Acoustic recorder at the southern end of the farm dam

F.4.4 ABUNDANCE SURVEYS

Visual encounter surveys will be designed and conducted by a suitably qualified ecologist to try and quantify the number of GGF that may be present in the dam and buffer area. Visual encounter surveys involve actively searching for frogs within a designated area which in this case is the dam and its buffer area shown in **Figure 1**. These surveys are best carried out between 20:30 and 03:00 hours. Sites should be systematically searched for frogs following general procedures

outlined by Crump and Scott (1994)[2], including using spotlights to scan all surfaces of the water body while traversing its length, focusing on inspection of aquatic vegetation (Heard *et al*. 2006)[3].

Estimates of GGF number may be made from these visual encounter surveys per area searched and time spent searching, in addition to the interpretation of acoustic recordings. The direct handling or trapping of GGF is not proposed, nor does it seem to be warranted to determine if the plan is achieving its goals of maintaining the species in the dam.

F.4.5 PHYSICAL SITE - MANAGEMENT MEASURES

In addition to ecological characteristics, the incidence and extent of significant weed incursions/occurrences, presence of pest animals and other deleterious impacts (e.g., unauthorised clearing, installation of tracks and drains) will be recorded through visual inspections.

Other impacts from land management activities (e.g., unlawful access to an area by off-road vehicle users) will be recorded by EAR or their representative conducting the monitoring. The observations made may initiate a monitoring event to determine if there has been an impact and its magnitude. Remedial works may be required.

Table 3. Monitoring parameter and frequency to assess the success of HRMP implementation

Parameter	Tasks	Frequency	Qualification to conduct task
Presence of Green and Gold Frog	Acoustic Survey	At least 28 consecutive days of recording within the following seasons: • Spring (September to November); • Summer (December to February); • Autumn (March to May). Opportunistic acoustic recordings or surveys (non-recording) may be conducted during winter (June to August) or during any other period of the year.	Suitably qualified ecologist
Abundance and presence of Green and Gold Frog	Direct surveys	Once per annum optimised for timing of the year by the acoustic recordings. GGF would not be handled or trapped, rather a spotlight survey would be developed and implemented	Suitably qualified ecologist

[2] Crump, M.L. & N.J. Scott (1994). Visual encounter surveys. Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster, eds. Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Page(s) 84-92. Smithsonian Institution Press, Washington, D.C.

[3] Heard, G.W., Robertson, P. & Scroggie, M.P. (2006). Assessing detection probabilities for the endangered green and golden frog (Litoria raniformis) in southern Victoria. Wildlife Research 33, 557–564.

		to try and quantify the number of GGF adults (not tadpoles) present.	
Erosion	Photopoints	Quarterly for a minimum of 4 years.	Suitably qualified/trained person
	Inspections	Weekly. Notes and observations are to be recorded.	
Plantings	Count losses	Every 3 months from planting for 18 months (6 monitoring events).	Suitably qualified/trained person
	Observations of recruitment	Every 3 months from planting for 18 months (6 monitoring events).	
	Photopoints	Every 3 months from planting for at least 4 years (minimum of 12 monitoring events).	

F.5 REMEDIAL WORKS

A suitably qualified ecologist will provide advice on the remedial works that may be required (e.g., improved sediment control measures, further movement of soil to improve water soakage into or through the site).

F.5.1 ADDITIONAL EROSION CONTROL MEASURES

Remedial works may be needed in the short-term to ensure that an sediment and erosion control measures in the HRA areas are working effectively.

Remedial actions may include for example:

- Additional and/or replacement of erosion control matting, mesh or sediment netting and fences;
- Enhancement of sediment pond rock pitching/drain size, and/or the addition of more sediment ponds;
- Use of rocks, coarse gravel, or coarse sands to protect drains from scouring; and
- Additional or more localised dense plantings of ground covers and herbs to assist with more rapid ground coverage of erodible soils.

F.5.2 ADDITIONAL PLANTINGS

A visual assessment will be made of the number of plant losses for each species planted and of the natural regeneration (seed, rootstock) that occurs over time. Additional plantings can compensate for the losses identified during inspections.

The species planted should be those listed in **Table 1** selected for either the HRA – East or HRA – West.

F.6 ADAPTIVE MANAGEMENT AND REVIEW OF HRMP

The HRMP is to apply an adaptive management approach; corrective actions may be triggered by events occurring within the area covered by the plan, or the results of monitoring activities.

Adaptively implementing the HRMP is critical to achieving its objectives.

EAR will adaptively implement this HRMP by considering and evaluating the learnings from plan implementation, mitigating any uncertainty associated with HRMP implementation, and to change management arrangements if the applied measures are not delivering the desired/expected improvements to Green and Gold Frog habitat condition.

The adaptive management cycle is based on core adaptive management principles, outlined in the diagram below.

To maintain an adaptive approach, EAR will: -

- Collect and incorporate new data/information gathered from plan implementation, data collected during monitoring activities and/or from new information derived from external sources;
- Effectively schedule monitoring activities;
- Commit to periodically reviewing risks, including those in response to the changing risk level, new information, changing circumstances or the results from implementing corrective actions;
- Identify and address the causes and/or consequences of significant environmental incidents; and
- Review the HRMP as soon as possible when there are indications of implementation failure/s.

A review of the HRMP will be necessary in the event of a major incident that causes a significant change to the character or condition of the area, or monitoring (acoustic) indicates that Green and Gold Frog is in potentially in decline or has become absent from the farm dam. Information included in the review will include monitoring results, details of any corrective actions and details of any action or activity carried out to increase the viability of the East Arm Road Quarry population of Green and Gold Frogs.

The HRMP review may involve changes to any part of the plan to adequately respond to the trigger and re-direct management actions towards achieving the desired outcomes. This could for example involve changes to the specific details of site management methods, monitoring methodology, or the schedules of monitoring, and reporting.

If a review is triggered, it will be conducted by EAR in consultation with the EPA.

Revisions of the HRMP will not be implemented until approval of the revised plan has been given by the EPA.

PART G – REPORTING

EAR is responsible for all reporting, monitoring and reviews of the HRMP but may engage suitably qualified persons or organisations to assist with this process.

G.1 IMPLEMENTATION RECORDS

G.1.1 INDUCTIONS, AWARENESS AND TRAINING

Records will be kept of the induction and training material developed to educate, enhance awareness and train staff. See section D.2 TRAINING AND INDUCTIONS for further details and information.

G.1.2 PLANTINGS

The number and type of plants purchased to restore the Habitat Restoration Areas will be kept for future reference and to calculate costs for project implementation, and to better select plant species for future rehabilitation/remedial works.

G.1.3 MONITORING DATA

See section F.3 DATA COLLECTION AND HANDLING for further details and information.

G.2 MONITORING REPORT

Unless otherwise advised by the EPA or imposed by any permit conditions, EAR will submit a Monitoring Report annually to the EPA for the life of the Quarry. The Monitoring Report will be submitted within 60 days after each anniversary of the approval of the HRMP.

The Monitoring Report will document progress and will include:

- Details of management actions, including on ground and remediation works, undertaken within the period.
- Results of monitoring activities, including weeds, habitat quality, vegetation quality and frog monitoring data (including frog presence and abundance if recorded).
- Site photographs including those from photo point locations.
- Details of any incidents or new and emerging management issues, with recommendations for corrective action and plan review.

EAR will publish the Monitoring Report on the EAR website within 3 months of submitting the document to the EPA.

PART H – REFERENCES

Ayers, D., S. Nash and K. Baggett (Eds) (1996). *Threatened Species of Western New South Wales*. Hurstville: NSW NPWS.

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PART I - ATTACHMENTS

ATTACHMENT 1. GREEN AND GOLD FROG LISTING STATEMENT – DNRET

THREATENED SPECIES LISTING STATEMENT

Green and Golden Frog, *Litoria raniformis*

.....Keferstein 1867

Status

Tasmanian *Threatened Species Protection Act 1995* .....Vulnerable

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* .....Vulnerable

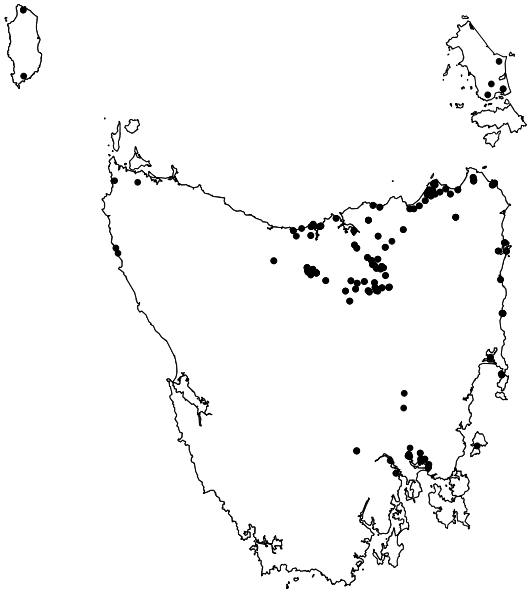
John Ashworth

Description

The Green and Golden Frog *Litoria raniformis* is a large aquatic frog commonly reaching a maximum length of up to 80mm and weighing up to 40g. Despite its name, its dorsal (back) colouration can vary considerably from almost totally green, through green and gold mottling, to very dark brown and black patterning. However, all colour types have a pale green stripe down the middle of the back and turquoise thigh colouration in adults.

Green and Golden Frogs are active during both day and night throughout the warmer months and can sometimes be seen 'basking' out of water amongst vegetation or on rocks and logs, the only Tasmanian frog to exhibit this behaviour. They have keen eyesight in daylight and as they are approached they will jump into the water with a distinctive 'plop'. This is often the only way to know they are there. At night, however, under torchlight, they can be approached with relative ease.

The breeding season in Tasmania spans September to January when males can be heard calling. The mating call of the Green and Golden Frog is a very distinctive and complex series of grunts and growls.



Calling activity can be erratic, often being restricted to warm calm days and evenings. Choruses (many males calling) can reach peaks mid morning and early evening. In breeding condition, the male frog exhibits a mottled black throat and develops black nuptial pads (hard calluses) on the back of each thumb with which he grasps the female when mating.

Green and Golden Frogs hunt and take refuge in dense patches of vegetation, rarely venturing into open water. They have a varied diet, which includes insects, lizards, and other frogs.

Distribution and Habitat

The Green and Golden Frog is dependent upon permanent freshwater lagoons for breeding. Ideal breeding habitat is the shallow part of lagoons (to approx 1.5m) where there is generally a complex vegetation structure. Breeding sites often contain vegetation communities dominated by emergent plants such as water ribbons (*Triglochin*) and spike-rush (*Eleocharis*), and submerged plants such as watermilfoil (*Myriophyllum*), marsh-flower (*Villarsia*), and pondweed (*Potamogeton*). However, other plant communities can form equally suitable habitat.

The range of the Green and Golden Frog is restricted to lowland areas, mainly in coastal zones with the exception of the Deloraine-Longford-Launceston region, and historically it was common in the Midlands region. The Green and Golden Frog was once common on King Island and Flinders Island but is now rare on these islands.

Important Locations

Table 1 Important locations for the Green and Golden Frog in Tasmania

Breeding Site	Locality	Reservation Status
Narawantapu National Park	North Coast	National Park
Mt William National Park	NE Tasmania	National Park
Hazards Lagoon	Freycinet Peninsula	National Park
Moriarty Lagoon	St Helens	Conservation Area
Blackmans Lagoon	Waterhouse	Conservation Area
Tamar Conservation Area	Launceston	Conservation Area
Seymour Swamp	Seymour	Conservation Area
Bowlers Lagoon	Boobyalla	Private / Conservation Area
Woodstock Lagoon	Longford	Private Sanctuary
Bowthorpe	Longford	Private
Woolnorth	Woolnorth	Private
Townsends Lagoon	Lewisham	Private
Launceston Airport	Evandale	Private
Falmouth	Falmouth	Private
Weegena	Weegena	Private
Winnaleah	Winnaleah	Private
Mosquito Creek	St Helens	Private
Prospect House	Richmond	Private
Orielton Creek	Sorell	Private

Threats, Limiting Factors and Management Issues

The major threats so far identified are:

- drainage of wetlands and conversion to agriculture, housing, and other purposes
- degradation of wetlands and water quality through stock damage
- modification of river systems
- application of agricultural chemicals, including fertilisers
- fragmentation of habitat
- drought

Drainage and clearance of wetlands is the major threat to the Green and Golden Frog. Greater protection for wetlands through legislation and voluntary agreements including covenants and management agreements will assist in preventing the loss of natural lagoons, which form the bulk of suitable breeding sites.

Stocking of sheep and cattle in and around wetlands is a serious threat to the integrity of habitat as well as posing a direct threat to the species by trampling. Fencing off natural wetlands to exclude stock is important and alternative stock watering should be provided.

Increased ultraviolet light because of ozone layer thinning may pose a threat to basking frogs such as the Green and Golden Frog.

The introduction of chytrid fungus into Tasmania, which has had a serious impact on mainland frog populations, could present a major threat to the species.

Conservation Assessment

In Tasmania declines have been reported from all areas in the last 15 years. Populations have been lost from areas in the Midlands, Derwent Valley and the north-west coast.

The Green and Golden Frog has declined significantly in population and range on the mainland. It was formerly widespread in south-eastern South Australia and the Murray Valley, most of Victoria and the Australian Capital Territory, and south-western New South Wales. The current distribution is unclear but it has disappeared from the Australian Capital Territory and the southern tablelands of New South Wales and has only patchy distribution in Victoria and South Australia.

Population Estimate

Table 1 presents the best known locations for the Green and Golden Frog in Tasmania. The largest populations are at Blackmans Lagoon in the Waterhouse area, and Bowlers Lagoon at the mouth of the Ringarooma River where many hundreds of frogs are estimated to breed. Smaller populations at other lagoons and wet areas in the vicinity of these lagoons indicate that healthy populations occupy those areas. However, population estimates at the other sites are relatively small, the sites being generally isolated from other colonies. For example, the populations at Orielton Creek, Mosquito Creek, and Bowthorpe number in the tens at best. These sites are more peripheral habitat than core habitat.

An estimate of population numbers is problematic if all breeding sites are not known. A further complicating factor is that frog populations vary considerably in abundance from year to year. This is compounded by the fact that, during recent years, much of Tasmania has been in drought, which has led to the drying out of breeding habitat, and therefore frog activity has declined significantly.

The population of the Green and Golden Frog in Tasmania is estimated to be in the region of 5,000 - 10,000 adults.

Reservation Status

The Green and Golden Frog has populations in nine formal reserves:

- Maria Island National Park
- Freycinet National Park
- Mount William National Park
- Narawantapu National Park
- Waterhouse Conservation Area
- Musselroe Bay Conservation Area
- Tamar Conservation Area
- Seymour Conservation Area
- St Helens Conservation Area

Assessment Criteria

The Green and Golden Frog meets the criteria for listing as Vulnerable in the Tasmanian *Threatened Species Protection Act 1995*, according to the guidelines applied by the Scientific Advisory Committee, because:

- (A1) there has been an observed reduction of the population in the form of a decline in area of occupancy of at least 20% over the last ten years and a decline in the quality of habitat
- (C1, C2) the population is estimated to number less than 10,000 mature individuals and is expected to continue to decline by at least 10% within ten years, and no population is estimated to be larger than 1,000 mature individuals

Recovery Program

Objectives

The recovery of threatened species relies on the preservation of viable populations throughout the species' geographic range in order to:

i) preserve genetically differentiated populations, and
ii) guard against catastrophic events eliminating the entire population

This can be achieved by:

- preventing the loss or degradation of known populations
- increasing the number of known populations through survey

Existing Management

No statewide management practices have been established for the species to date. A Natural Heritage Trust project 'Leap Frog' has been funded to rehabilitate some selected wetlands that have, or formerly had, populations of the Green and Golden Frog.

A Natural Heritage Trust project at Seymour Lagoon on the east coast was funded specifically to secure this habitat for the Green and Golden Frog. Fencing was erected to exclude stock and native vegetation regeneration. Rubbish and weeds were removed, and interpretive signs erected.

Actions Needed

- prevent further loss of natural wetlands
- prevent continuing degradation of habitat
- survey for unrecorded populations, particularly on the Bass Strait Islands
- develop a community-based frog conservation network
- establish a database of records which includes population and habitat data
- provide advice to land managers for wetland conservation
- ensure that appropriate quarantine measures are in place to prevent the introduction of chytrid fungus

Information Needed

- area of occupancy and population numbers
- threats to specific populations
- data on population structure and dynamics
- data on fecundity and recruitment

Management Advice

Management on Crown Land

Protect all known habitat on Crown Land. Any newly discovered populations and their habitat should be protected. The dynamics of populations in reserves is unknown and requires survey.

For the land owner/ land manager

The following actions are recommended for management of the Green and Golden Frog:

- fence around suitable habitats to exclude all livestock
- provide alternative feed and watering troughs for livestock
- leave a buffer zone of native vegetation around wetlands
- leave riparian zones in a natural state
- avoid 'tidying up' (clearing rocks and fallen logs) around wetlands
- prevent chemicals/fertilisers etc. entering wetlands
- rehabilitate degraded wetlands
- connect isolated breeding sites with permanent vegetation cover

For everyone

- learn what a Green and Golden Frog mating call sounds like - a recording of frog calls is available from the Deloraine Field Naturalist Group (see source materials)
- search for Green and Golden Frogs from September to January when the males are calling
- obtain the Frogs of Tasmania poster, showing all of Tasmania's frog species, from Service Tasmania
- help us to monitor populations by recording your observations e.g. date, map location, how many frogs, and send in your records to the Nature Conservation Branch

Further Information

Contact details: Threatened Species Unit, Department of Primary Industries, Water and Environment, GPO Box 44, Hobart, Tasmania 7001. Ph (03) 6233 6556, fax (03) 6233 3477.

Specialist Advice: Peter Brown, Threatened Species Unit, Department of Primary Industries, Water and Environment.

Source Material

References

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Review and Other Material

Statement Prepared: March 2001

Prepared by: John Ashworth

Review Date: 2006 or as new information is received.

Cite As: Threatened Species Unit 2001. Listing Statement: Green and Golden Frog *Litoria raniformis*. Department of Primary Industries, Water and Environment, Tasmania.

Further Information: Threatened Species Unit, Department of Primary Industries, Water and Environment, GPO Box 44, Hobart, Tasmania 7001.

http://www.parks.tas.gov.au/esl/listing_statements

Permit: It is an offence to collect, possess or disturb this species unless under permit.

ATTACHMENT 2. PHOTOPOINT GUIDELINES

Using photographs to visually record change in your bush

It is important to take photographs of your bush as part of the health assessment process as they give a faithful visual record of change in your bush. They are cheap, effective and require no specialist equipment. A simple and consistent way to take photographs of your bush is to establish a 'photo point site'. A 'photo point site' is a site from where a series of photographs are regularly taken. You can establish several photo point sites in your bush, or elsewhere on your property where you want to use photographs to visually record change in the landscape. For example, if you want to visually examine the impact of different land uses on each side of a fence that runs through native bush (ie one side is stock grazed and the other is not) take photographs looking down the fence line.

Photo point site location

When you select a photo point site make sure that it is typical of the bush you are assessing. Additional photo point sites can be established across your site/zone if you wish. When establishing a photo point site there are a few guiding principles to be aware of:

- Avoid steep slopes as they will make the photographs difficult to interpret.
- Try to locate the photo point site so it faces southwards to minimise sun glare. If this is not possible (ie you are taking photos of a south facing slope) reduce the glare by taking your photographs at a suitable time of day. If light conditions are not very good to take the photograph then come back when they are suitable.

Aim to take a photograph at each photo point site at least once a year and each time you conduct a bush health assessment of the site/zone. Take a photograph after every significant event at the site, such as after stock have been removed from an area, following a fire, or after major on-ground works have taken place (eg weed removal). Remember that a photograph showing no change may be just as important as one showing considerable change.

Equipment needed per photo point site

For each photo point site you will need:

- two star droppers or other marker posts, at least 1.6 m tall
- one labeling tag and numbering tool (or number the droppers before you go to the site)
- fine metal wire or a metal tie
- a pair of pliers
- a SLR camera with a standard 50 mm lens and colour film (a 50 mm lens is recommended as it closely approximates how the human eye perceives objects)
- a sledge hammer
- a 10 m tape measure
- a supply of 'Photo point information cards'
- a pen or pencil, sticky tape and a white board marker pen.

Setting up the photo point site

The layout of posts for each photo point site is shown in Figure 2.

- At the point from which you will take your photographs, hammer a dropper post into the ground so the top is close to eye level (1.4–1.6 m). This is the 'camera post'. The camera will be placed on top of this post when taking the photographs to ensure they are all taken from the same height. Record the height of the post on a 'Photo point information card' when you first take your photo in case it falls over and you need to hammer it back into the ground on your next visit.
- Hammer in another dropper post 10 m from the camera post along the direct line of sight to the vegetation, landscape or feature being monitored. This is the 'sighter post'.
- Both posts should be secure and difficult to remove. If vandalism could be a problem at your site hammer small marker pegs or decking nails into the ground at the base of each post to make

relocation possible should the post be removed. Recording the grid co-ordinates of each post with a geographic positioning system (GPS) and drawing a site map that accurately marks the location of both posts will also make relocation of the posts easier.

- Wire a metal labeling tag with the relevant photo point site identification code (see below) to the camera post above where it may be grazed by stock or native animals.

Taking the photograph

Attach an A4-sized data board (eg small whiteboard or an A4 piece of paper) to the 'sighter post' about half way up its height (Figure 2). Write the date and photo point identification code on the data board. The writing should be large enough to be readable on the developed photograph. When taking your photograph:

- Always use the same camera type (eg a 35 mm SLR with a standard 50 mm lens), or preferably the actual same camera
- Hold the camera on the 'camera post' and face the 'sighter post'. Focus the camera on the top of the 'sighter post'.
- Use a shutter speed of between 1/250 sec and 1/60 sec as this will provide good exposure and minimises the risk of the photograph being blurry. Come back another day if the lighting is poor.
- Avoid getting any bright glare in the lens.
- Always take more than one shot to make sure you get at least one good photograph.
- Number and file the photographs after developing and keep the negatives in a safe place such as a photo album. If required you could get the photographs scanned and stored on a CD when you get the film processed.

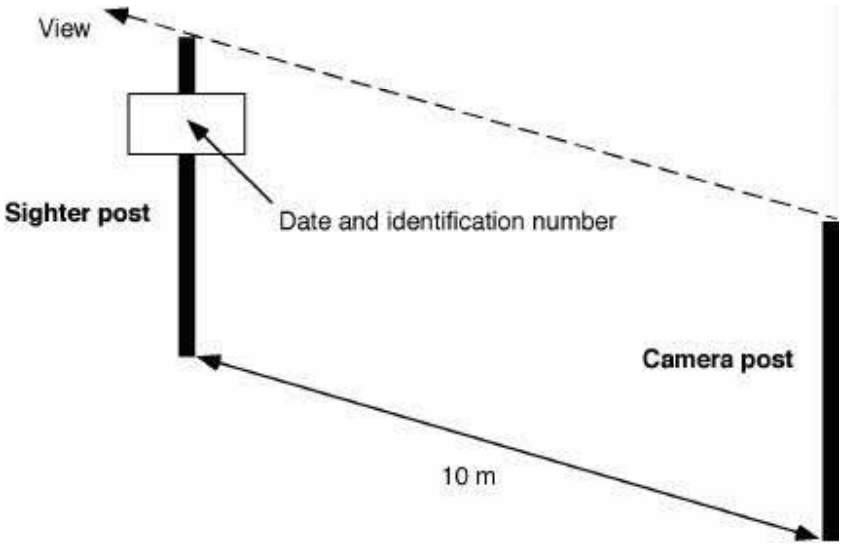

Figure 2. Layout of posts at a photo point site.

Recording photo point site information

Each photo point site must be given a unique identification code so it can be clearly distinguished from all the other photo point sites you establish. The code should be meaningful. For example, it could be JB12, which means it is photo point site 12 on John Brown's property.

For each photo point site record the following information on a 'Photo point information card': date; location, direction (compass bearing) and purpose; the number of the photographic negative; and any observations about the site. Complete a new photo point information card each time you revisit the photo point to take a photograph.

Photo Point Site Information Card

Photo point site identification code.	Date.
Location.	Photographer.
Grid coordinates of camera post.	Grid coordinates of sighter post.
Height of camera post.	Direction of photo.
Purpose of photo.	
Site observations and notes.	
Photo.	