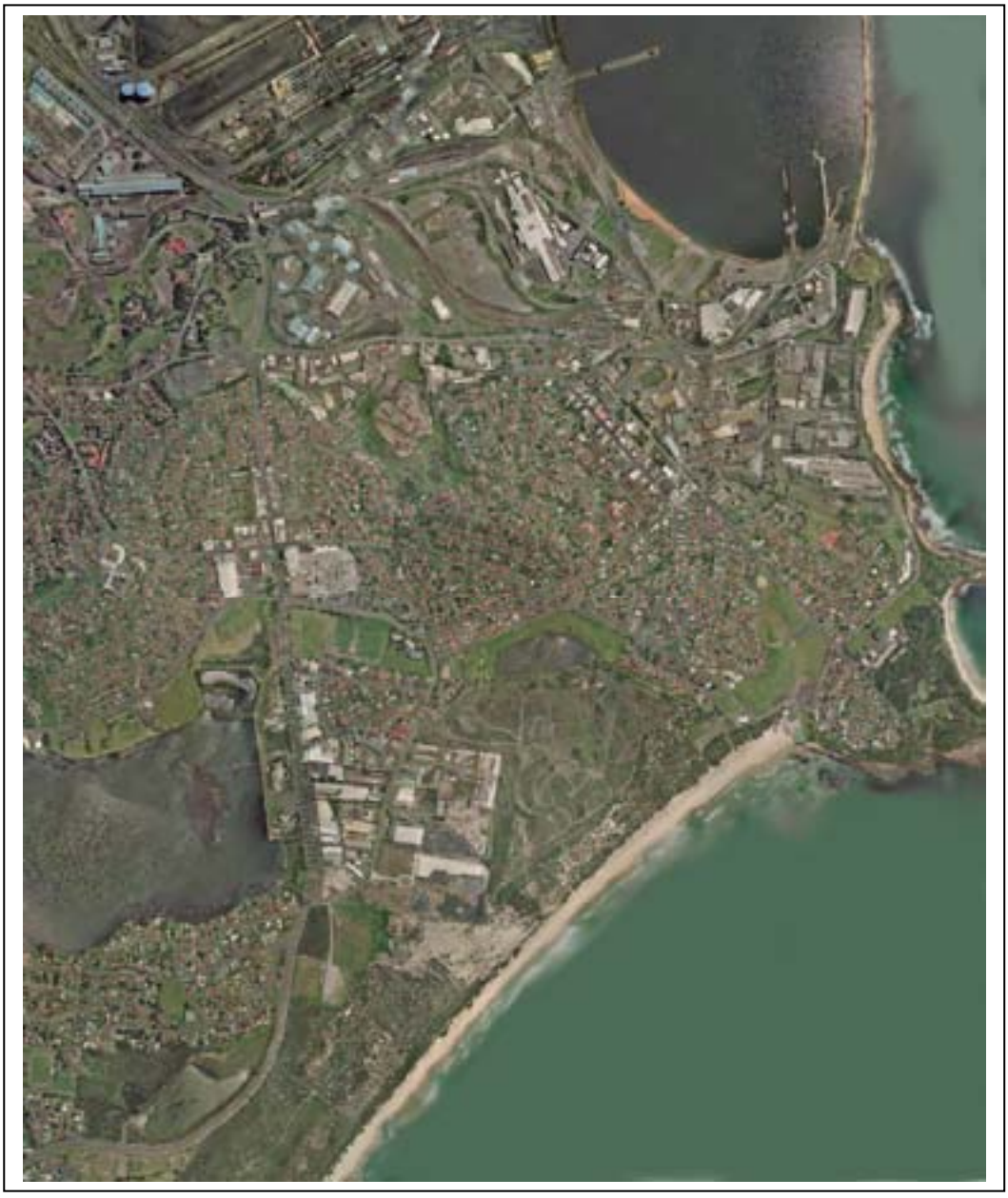
Management Plan

The Green and Golden Bell Frog Key Population at Port Kembla



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Cover photograph: Aerial Photo of Port Kembla, courtesy Wollongong City Council

This management plan should be cited as:

Department of Environment and Conservation (NSW) 2007, *Management Plan for the Green and Golden Bell Frog Key Population at Port Kembla.* Department of Environment and Conservation (NSW), Sydney.

This project was funded by the National Heritage Trust (NHT) and sponsored by the Southern Rivers Catchment Management Authority (CMA) on behalf of the other partner CMAs and supported by Wollongong City Council.

This plan was prepared on behalf of the NSW Department of Environment and Conservation and the above organisations by Molino Stewart Pty Ltd.

ISBN 978 1 74122 399 6
February 2007
DEC Publication Number 2007/106

INTRODUCTION

The Green and Golden Bell Frog

The Green and Golden Bell Frog (GGBF) *Litoria aurea* is a relatively large, muscular frog species with robust form. Adult sizes range from approximately 45mm to 100mm with most individuals being in the 60-80mm size class.

The colouration of the back is quite variable, being a vivid pea green splotched with almost metallic brass brown or gold (Figure 1). The backs of some individuals may be almost entirely green whilst in others the golden brown markings may almost cover the whole back.

The Green and Golden Bell Frog was formerly distributed from the NSW north coast near Brunswick Heads southwards along the NSW coast to Victoria, where it extends into East Gippsland, and west to Bathurst, Tumut and the ACT. In the 1960s, the species was considered widespread, abundant and commonly encountered. Today, the species exists as a series of isolated populations within its former known range.

The Green and Golden Bell Frog is listed as an Endangered Species under Schedule 1 of the NSW *Threatened Species Conservation Act 1995*. At the national level, the species is listed as Vulnerable under Schedule 1 Part 2 of the *Environment Protection and Biodiversity Conservation Act 1999*.

The consequences of being listed as a threatened species under both state and national legislation has been that a recovery plan will be prepared and considerations given to the species when assessing the impacts of developments and activities on populations of the species and its habitats. Whilst preparation of recovery plans has been made optional under the most recent legislation changes, a NSW recovery plan has been drafted for this species and for further technical background should be read in conjunction with this Management Plan.

The draft Green and Golden Bell Frog Recovery Plan defines Key Populations as conservation management units and identifies 43 such populations across the former extent of the species almost state-wide distribution.

The Southern Rivers Catchment Management Authority (CMA) has developed a Catchment Action Plan (CAP) that identifies a number of targets for better natural resource management. Biodiversity Catchment Target 2 and other targets within the CAP are supported by the implementation of actions within this Management Plan.

Figure 1. Green and Golden Bell Frog. ©Garry Daly.

The Port Kembla Management Plan

This Management Plan relates to the Port Kembla Key Population located in the Illawarra Green and Golden Bell Frog Management Region as identified in the draft NSW GGBF Recovery Plan.

This plan has been prepared to satisfy Action 11.3.4 of the draft GGBF Recovery Plan that was developed in accordance with the *Threatened Species Conservation Act 1995.* Action 11.3.4 calls for the NSW Department of Environment and Conservation (DEC) to prepare and implement a GGBF Management Plan for each key population on its own land and liaise with other landowners as necessary (e.g. local councils, industry, residents) to prepare and implement site specific Management Plans across the extent of the species distribution in NSW.

There is also a requirement under the Local Government Act for local councils to develop and implement management plans, where GGBFs occur on public land under their care, control and management. It is therefore envisaged that this Management Plan will satisfy this requirement of Wollongong City Council (with respect to the Port Kembla key population components occurring on public land). This Management Plan is also intended to provide guidance, direction and coordination for other stakeholders, land owner/managers at Port Kembla where the frog and/or its habitat occurs.

Purpose

The Port Kembla GGBF Management Plan has been prepared to ensure that the Port Kembla population is successfully managed and monitored such that the species continues to persist at the location and measures of the population's viability are maintained or improved over time.

There are two aims of the Management Plan.

1. To identify and, where possible, address the threats and other issues/factors affecting or likely to affect the conservation of the species at Port Kembla.
2. To manage the species in accordance with the strategies outlined within the draft GGBF Recovery Plan.

THE PORT KEMBLA POPULATION

Location

The Port Kembla Key Population is located between three and eight kilometres south of the Wollongong CBD (34° 26' S 150° 54' E) in the Illawarra Region of NSW (Figure 2). It consists of four main sub-populations at or around the following sites (see map below):

1. North Port Kembla
2. Boiler's Point
3. Coomaditchy Lagoon
4. Korrongulla Wetland

Figure 2 *Map of Port Kembla showing the location of recorded sightings of Green and Golden Bell Frogs*

The sites are a mix of publicly and privately owned lands. Wollongong City Council manages publicly owned land at Coomaditchy Lagoon and Korrongulla Wetland. GGBFs have also been found on industrial lands owned by companies including:

- Bluescope Steel
- Orica
- Metal Manufactures (MM)
- Commonwealth Rolling Mills (CRM)
- Port Kembla Copper (PKC)
- Garnock Engineering
- Cleary Bros
- Kembla Properties

Other owners of lands in the vicinity where GGBFs or their habitat have been found include:

- Port Kembla Port Corporation
- Coomaditchie United Aboriginal Corporation
- Rail Corp/State Rail
- Port Kembla Golf Club
- Wollongong Golf Club

GGBFs have also been detected and bred on the properties of local residents.

Habitat

The coastal plain at Port Kembla is generally cleared of native vegetation with urban and industrial development covering most of the area. Nevertheless, GGBFs have survived by using such local features as:

- Breeding habitat e.g. in permanent water bodies such as Coomaditchy Lagoon, South Pond and possibly Korrongulla Wetland. More ephemeral breeding habitat that includes domestic swimming pools, ponds, drainage depressions, culverts and possibly grassy swale areas. Some of these habitat areas may currently go unrecognised. Many of these features are human constructions made for other purposes and it can be at the whim of a decision as to whether they contain water or are allowed to continue to function as GGBF breeding habitat.
- Foraging habitat, including areas of native or introduced grasses, tussock vegetation and emergent sedges and reeds bordering water features. These areas are vital for the GGBF to feed in relative safety from predators and to bask in the sun by day.
- Shelter habitat, including similar vegetation to that used for foraging and, most particularly, rock piles, ground timber, tussock forming vegetation and other features that are difficult to categorise (crevices in the ground, around root systems of plants and ground debris).
- Movement habitat, generally typified by wet areas such as creek lines, drains, periodically damp areas, connecting or partially connecting vegetation, easements, laneways and even open areas that do not restrict movement.
- Over wintering habitat. Some of this habitat is probably in common with shelter habitat such as rock piles, ground timbers and logs and dense tussock vegetation. However, the sexes quite often differ in their selection of over wintering habitat and may seek to shelter in different areas and in less obvious locations such as amongst overgrown or dense and moist vegetation in residential gardens.

Species status

GGBFs were commonly encountered at Port Kembla during the 1960s and 1970s when they were also well distributed elsewhere throughout the Illawarra. During this period, coastal pockets of distribution in the Illawarra included from Thirroul to Fairy Meadow north of Wollongong and also on the elevated plateau areas south of Royal National Park, including around Maddens Plains and Helensburgh.

To the south of Wollongong, the frogs were distributed in hind dune and wetland areas from Port Kembla to Windang, and areas to the west of Lake Illawarra including Dapto, Albion Park and Jamberoo. On the coast, a GGBF population was associated with coastal lagoons including Little Lake (between Shellharbour and Warilla), the lagoon at Bass Point and the hind dune lagoon at Killalea Beach south of Bass Point. Frogs were also found at Bombo Head and floodplain areas of the Minamurra River at Kiama Downs and also at Springs Creek near Bombo.

This former distribution of GGBFs has contracted to only four known locations identified in the draft GGBF Recovery Plan as key populations in the Illawarra Region.

These populations are at:

1. Woonona, north of Wollongong
2. Dunmore/Killelea, south of Wollongong
3. Minamurra Headland/Springs Creek, near Kiama
4. Port Kembla (the focus of this plan)

Research undertaken by Ross Goldingay and his colleagues at Wollongong University (and now Southern Cross University) provides most of the little quantitative information available about the present status of the GGBF population at Port Kembla (see references). GGBFs have been seen at Coomaditchy Lagoon since before the early 1980s but were never quantified at the time. Estimates for the whole Port Kembla population, based on quantitative survey efforts, carried out in

the mid to late 1990s using maximum number estimates put numbers at around 100-150 adults. These estimates have since been revised from mark and recapture studies (2000) to be almost 350 adults at Coomaditchy and South Pond alone. Local residents to the north of the Lagoon have also regularly observed the frogs in the urban areas and crossing roads during wet weather.

Surveys of the Korrongulla sub-population, also during the mid to late 1990s, revealed relatively few GGBFs. The full extent of the North Port Kembla sub-population is unclear with significant numbers of adult GGBFs recorded at sites including the Orica, Kembla Properties and BlueScope Steel complexes. Preliminary estimates at the former Orica site may be as high as 100 and significant numbers of the frog have also been regularly recorded from the Cleary Bros site, down slope of Harry Morton Reserve, and are still known to occur there. A relatively small but significant population appears to be present at Boiler's Point with records at several sites including on MM and Port Kembla Copper lands and along the 'fringe' of the headland. Occasional sightings have been reported of a probable isolate at the extreme north of the management area near Springhill Road and the Tom Thumbs Lagoon wetlands near Coniston but the status of this population element is unknown.

THREAT ASSESSMENT

The identified threats to the Port Kembla Key Population of the Green and Golden Bell Frog that are known to be operating include:

1. Loss of habitat. The GGBFs occupy and utilise a wide variety of habitat types at Port Kembla, as identified above. There is continuing pressure to further develop and modify urban and industrial areas that provide much of these habitats and its connectivity.
2. Introduced predators that include:
   - Plague Minnow – *Gambusia holbrooki* (listed as a Key Threatening Process) present in Coomaditchy Lagoon and in many other water bodies and stream systems in Wollongong/Illawarra
   - Carp - *Cyprinus carpio* present in Coomaditchy Lagoon
   - Feral and Domestic Cats - *Felis catus*
   - The Red Fox *Vulpes vulpes* (listed as a Key Threatening Process for a number of threatened species).
3. Water quality. Stormwater and leakages, spillages, fall out in suspension or solution from industrial stacks from urban and industrial areas may pollute GGBF habitat such as wetlands and drainage areas.
4. Disease. Frog Chytrid is listed as a Key Threatening Process at state and national levels. This disease is emerging as possibly the single biggest threat to the species (as well as to many other species of frogs), after habitat loss. There is also the potential that some factors are operating at Port Kembla that are keeping the disease 'at bay' in some way. Consequently, there is a possibility that a better understanding of Port Kembla GGBF may provide clues to how the disease operates and therefore have wider conservation implications for GGBF and other frogs generally.
5. Management options. This includes a variety of possible impacts on GGBF such as:
   - Mowing and other vegetation management of public and other lands
   - Use of pesticides
   - Opening and closing or emptying of water bodies and its timing – both large and small
   - Fire
   - Large numbers of the Australian White Ibis (*Threskiornis molucca*) and the Silver Gull *Larus novaehollandiae* that may now congregate to excess and impact on the GGBF and/or its habitat.
6. Direct human impact such as road mortality through collisions with vehicles and collection and use of the frogs for bait or other purposes.

MANAGEMENT ACTIONS

Strategic considerations

Coupled with the need to minimise the direct threats to the elements of the Port Kembla population is the challenge to increase the mosaic of habitat available for each sub-population and to increase connectivity within and between the four sub-populations.

North Port Kembla - The North Port Kembla sub-population extends, most likely, across much of the industrial lands in and around the Port Kembla Steelworks. The GGBFs are believed to utilise drainage features, rail easements, roads, culverts and other low lying features, with their associated vegetation, as habitat. The use of these habitat features may be transient, intermittent and dependent on suitable weather conditions. A mosaic of additional small ponds, scrapes and suitable plantings could be relatively easily installed and could also take strategic advantage of positions in the vicinity of existing corridors and drainage easements. Efforts should be directed to improving habitat and its security at the Cleary Bros site and facilitating frog movements between that site and the Orica/Kembla Properties site and from both these sites to areas of habitat (both existing and strategically created) to the immediate north (RailCorp/SRA, BlueScope Steel, Brick & Block and CRM and possibly others).

The extent and value of existing frog habitat components and its interconnectivity is poorly understood for this area. A mapping exercise to more accurately validate potential habitat across all tenures is therefore desirable. This action will not only improve understanding of potential movement corridors but also increase understanding of the importance of certain lands so that landowners and consent authorities can consider this when planning future developments and changes to land use. It will also provide some insight and recommendations for strategically locating additional habitat components.

Connectivity between the North Port Kembla population and the sub-populations to the south is likely to be tenuous. Two possible corridors exist, the first around the coastal headland, and the second, via the Cleary Bros site and over the ridgeline through Harry Morton Park and residences. Actions could be implemented to further enhance these possible corridors along with other habitat components along the way. This initiative will require considerable coordination and cooperation between stakeholders.

The Tom Thumb Lagoon element needs a current status assessment and habitat creation initiatives considered accordingly. Connections between this population are exceedingly tenuous and would only be possible along rail easements, creek and drainage lines extending to the west (including Allen's Creek) in the vicinity of the Lysaughts component of the BlueScope steelworks complex.

Boiler's Point - The Boiler's Point sub-population is likely to occur in several discrete areas and connectivity between them will be mainly via roadside culverts along Gloucester Boulevard and the headland fringe. The lane ways between properties, property boundaries and parts of the properties of MM, PKC and the Illawarra Senior College (DET) could be landscaped to provide breeding habitat and movement paths for this sub-population. Previous efforts to create breeding habitat in this area should also be renovated or enhanced. Installation of further scrapes with suitable plantings along Gloucester Boulevard could also improve linkages to the existing GGBF habitat ponds at the Orica/Kembla Industries sites.

The Boiler's Point sub-population could also be better provided for with an enhanced connectivity route to the Coomaditchy sub-population via King George V Reserve, drainage lines and laneways through residential areas. Management actions could be implemented to better establish these links through appropriate plantings and other relatively minor landscaping.

Coomaditchy - The Coomaditchy sub-population needs to have efforts made to consolidate what is a priority 'hub' for the species at Port Kembla. Efforts need to be made to enhance or provide additional ephemeral habitat along its southern boundary at least. Stormwater outlets from the north should be modified further to provide for and protect the frogs. It has been further proposed that the natural eastern extension of the Lagoon, in-filled many years ago, should be reinstated and provided as an area of habitat for the frog and other species. A contingency should also be in

place to eradicate *Gambusia* and other exotic fish from Coomaditchy Lagoon should circumstance or new techniques make it possible to remove these exotic fish. Strategically, the lagoon forms a connective central link to other areas of habitat to the south and east via areas of vegetated land and a series of ponds. There is also further connection with adjacent low lying areas during wetter periods. Drainage features running east/west to Old Shellharbour Road may also provide a tenuous connection to the Korrongulla Wetland sub-population as could connections to the south via the perimeter of the Garnock site and adjacent soccer fields. These areas should be investigated for possible habitat works. Unfortunately, the road will always be a barrier to these movements. Linkages with the golf course could also be promoted through enhancement of golf course water hazard features through consultation with the Port Kembla Golf Club. Assessment is required to determine the value of this corridor through these potential linkages.

Korrongulla - The Korrongulla Wetland sub-population has largely been isolated from the other sub-populations by the Primbee Bypass. There is a significant area of potential habitat near the wetland that should be further assessed along with the current status of this subpopulation of the population at Korrongulla and the adjoining sand extraction/landfill site. Ephemeral breeding habitat should be targeted for careful integration into appropriate parts of the Korrongulla wetland and strategic opportunities taken with land use planning decisions with respect to future possible uses of the neighbouring landfill site.

Planning process

This Management Plan builds upon an existing local GGBF management plan and a range of past and current actions to manage the species. The 'Management Plan for The Green and Golden Bell Frog at Coomaditchy Lagoon' was prepared by the Green and Golden Bell Frog Group in 1998 (see details in references). This original plan gave an overview of the local status of the species and provided options for its future management. Several actions were carried out as a result of the plan including construction of a potential breeding site at Boiler's Point, a community education campaign to raise awareness of the GGBFs and a research program by staff and students at Wollongong University.

Other local actions to manage the species include:

- Residents created frog-friendly properties including breeding ponds and other habitat features e.g. dense tussock vegetation
- Wollongong City Council installed stormwater pits on the northern side of Coomaditchy Lagoon to provide habitat and reduce impacts of stormwater on the Lagoon. Council also initiated a more appropriate slashing and mowing regime at the Lagoon
- Orica/Incitec (now, in part, Kembla Properties) developed a site management plan for GGBF at its complex that included construction of breeding habitat, plant operational considerations and, under licence, a monitoring/reporting regime;
- Habitat improvements were carried out by local Bushcare and environment groups and Conservation Volunteers Australia
- Ancillary ponds were created on the southern side of Coomaditchy Lagoon through funds received by the Coomaditchie Aboriginal Corporation;
- Attempts were made at carp eradication in Coomaditchy Lagoon
- University of Wollongong researchers undertook investigations into the local GGBFs. This research has included tadpole rearing, micro chipping for population demographic study and UV radiation studies (see references).

A stakeholder workshop was facilitated by consultants Molino Stewart Pty Ltd to identify existing and other possible management actions as a basis for this plan and linked to the actions in the draft GGBF Recovery Plan. The workshop was held on 5 December 2006 with representation from:

- Local residents
- Industries (Bluescope Steel, MM)
- Environment groups (Conservation Volunteers Australia, Friends of Tom Thumb Lagoon)

- Researchers (Gaia Research P/L)
- Wollongong City Council
- DEC
- Port Kembla Port Corporation

This plan was then distributed in draft form for comment to these and other stakeholders including the Coomaditchie Aboriginal Corporation, University of Wollongong, other industries and State Rail.

Further comments by any interested parties are encouraged as the plan is implemented. These comments should be sent to DEC (see details in Contacts).

Objectives

There are three objectives of the Port Kembla GGBF Management Plan as follows:

1. To maintain the four existing GGBF sub-populations
2. To increase the population of GGBFs at Port Kembla
3. To further connect the four GGBF sub-populations.

Strategies

The following five strategies will be used to achieve these objectives:

1. Further development of GGBF breeding and other habitat components on public and private lands
2. Improvement of habitat within and between the GGBF sub-populations
3. Education and communications to build awareness of the GGBFs and encourage further participation
4. Reduction of external threats to GGBFs
5. Monitoring and research to better understand the extent and dynamics of the Port Kembla GGBF population.

Duration

The duration of this plan will be three years i.e. start 2007 and to end 2009

Implementation plan

The following implementation plan provides a framework for management actions related to the above strategies and the draft GGBF Recovery Plan. It describes the actions for each strategy, links to the draft Recovery Plan, responsibilities for the management actions, a cost estimate for the actions and possible sources of funding. A time frame for undertaking the various tasks is also provided. This plan should be read and actioned with appropriate reference to the draft GGBF Recovery plan.

It should be noted that some management actions are relevant to more than one strategy in this plan.

IMPLEMENTATION PLAN

Strategy 1: Further development of GGBF breeding habitat on public and private lands

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
1.1 Through appropriate regulatory mechanisms , on a case-by-case basis, develop and implement measures to retain, create and improve breeding habitat on various industry sites (link with 2.1 and 2.2)	Actions 10.3.1, 11.3.3	Wollongong City Council, DEC, Industries	As required	Industries	2007 - 2009
1.2 Liaise with industries to promote development and implementation of site specific GGBF management plans	Actions 10.3.1, 14.3.2	DEC Industries within Port Kembla population area	In-kind to industries		2007 – 2009
1.3 Install plastic breeding troughs and/or other equivalent habitat at appropriate locations (e.g. Harry Morton Park) with approvals	Action 11.3.3	DEC Wollongong City Council	$10,000	NHT/NSW Environmental Trust Grants/CMA devolved grants	2007
1.4 Create supplementary breeding habitat at Coomaditchy Lagoon, South Pond and along linkages.	Action 11.3.3	Wollongong City Council, Bushcare, Commaditchie Aboriginal Corporation	>$20,000	NHT/NSW Environmental Trust Grants/Council/ Threatened Species Network Community Grants	2007-2008
1.5 Create ephemeral breeding habitat at Korrongulla Wetland	Action 11.3.3	Wollongong City Council Bushcare	< $10,000	NHT/NSW Environmental Trust Grants/ Council/ Threatened Species Network Community Grants	2008-2009
1.6 Investigate possible installation of ephemeral breeding habitat in hind dune areas south of Coomaditchy Reserve	Action 11.3.3	DEC	$5,000	DEC/CMA devolved grants	2008

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 1: Further development of GGBF breeding habitat on public and private lands.

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
1.7 Explore opportunities where possible to improve the management of Threatened Species during any review of local planning instruments.	Action 10.3.1, 11.3.1	Wollongong City Council	As required	Wollongong City Council	2007 - 2009
1.8 DEC and WCC will liaise with Port Kembla Golf Club with respect to exploring opportunities for partnership in GGBF habitat enhancement activities at suitable sites on their site.	Actions 10.3.1, 11.3.3	DEC, Wollongong City Council, Port Kembla Golf Club	$5000	CMA devolved grants	2008

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 2: Improvement of habitat within and between the GGBF sub-populations

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
2.1 Through appropriate regulatory mechanisms, on a case-by-case basis, develop and implement measures to retain, create and improve connectivity within and between industry sites. (link with 2.2)	Actions 10.3.1, 11.3.3	Wollongong City Council, DEC, Industries	As required	Industries	2007 - 2009
2.2 Liaise with relevant licensed industries to undertake assessment of potential GGBF habitat elements across their property and endeavour to retain habitat and linkages within properties and with neighbouring properties.	Actions 10.3.1, 11.3.3	DEC, licensed industries			2007-2009
2.3 Investigate opportunities for improving sub-population connectivity between : • Boiler's Point & Coomaditchy Lagoon • Boiler's Point & North Port Kembla • Coomaditchy Lagoon & Korrongulla Wetland • North Port Kembla & Tom Thumb Lagoon • North Port Kembla industrial sites (link with Action 5.1)	Actions 10.3.1, 11.3.3	DEC	$20,000 (same budget as for Action 5.1)	CMA devolved funding/NSW Environmental Trusts/local sponsors	2007
2.4 Improve habitat connectivity (e.g. create swales, wet areas, appropriate landscape plantings) based on findings from Action 2.3	Action 11.3.3	DEC Wollongong City Council Industries Bushcare, CVA (only at TTL)	>$50,000	NHT/NSW Environmental Trust Grants/CMA devolved grants/ Threatened Species Network Community Grants	2008-09
2.5 DEC will liaise with RailCorp/SRA regarding possible use of areas of rail corridor for creating or enhancing existing connectivity/swale habitat along these easements and resolve access issues etc	Actions 10.3.1, 11.3.3	DEC, RailCorp/SRA	<$10,000	NHT/NSW Environmental Trust Grants/CMA devolved grants/ Threatened Species Network Community Grants, RailCorp/SRA	2008-2009

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 3: Education and communications to build awareness of the GGBFs and encourage further community participation

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
3.1 Prepare, distribute and report on a community survey seeking GGBF observations and interest in participation	Actions 12.3.1, 14.3.2	Wollongong City Council Environment groups, Coomaditchie Aboriginal Corporation	$2,000 (advertising, printing). Environment groups distribute/collect and collate	DEC/Council	2007
3.2 Liaise with Illawarra EEC to develop and implement GGBF education programs in local schools	Action 14.3.2	DEC Illawarra EEC (DET)	In-kind DET; educational consultants $1,500 to develop curriculum support materials.	Environmental Trust	2007-08
3.3 Develop and host a website including information about local GGBF populations and frog-friendly activities and promoting participation by community in implementing this plan	Action 14.3.1	DEC Other stakeholders	DEC Threatened Species website		2008
3.4 Liaise on a regular basis with local media (print, radio, TV) to encourage them to regularly report on GGBFs and the roll out of management actions in this plan	Action 14.3.1	DEC Other stakeholders	In-kind by DEC (e.g. media releases)		2007-09
3.5 Use or stage local community events to highlight GGBFs and encourage frog-friendly actions	Action 14.3.2	Wollongong City Council DEC, community stakeholder groups, Coomaditchie Aboriginal Corporation	$3,000 (production of static display for events)	Local sponsors	2008-09
3.6 Develop and maintain a network of stakeholders (GGBF 'Friends'/interest group) and partners including through a stakeholder list	Action 14.3.1	DEC	In-kind by DEC/CMA		2007 - 2009

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 4: Reduction of external threats to GGBFs

ACTION	RECOVERY PLAN LINK	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
4.1 Promote responsible cat ownership in relation to GGBFs through education (link with Actions 3.4, 3.5, 3.6)	Actions 11.3.2, 14.3.2	See Actions in Strategy 3	See Actions in Strategy 3	NHT/NSW Environmental Trust Grants/CMA devolved grants	2007-09
4.2 Control feral predators (e.g. trapping, fox baiting) at Coomaditchy Reserve and on industrial lands	Actions 11.3.2, 11.3.6	Wollongong City Council DEC Industries	As required	Council and industry works budgets in liaison with DEC	2007-09
4.3 Minimise stormwater impacts on GGBFs and their habitats through stormwater plans and actions	Action 11.3.1	Wollongong City Council DEC	As required	Stormwater plan budgets	2007-09
4.4 Investigate and implement Carp control measures at Coomaditchy Lagoon in consultation with DPI Fisheries	Action 11.3.2	DPI DEC Coomaditchie Aboriginal Corporation	>$20,000	NHT/NSW Environmental Trust Grants/CMA devolved grants	2007-08
4.5 Investigate opportunities to remove *Gambusia* at Coomaditchy Lagoon in consultation with DPI Fisheries and DEC (link with Action 4.4)	Actions 11.3.2, 11.3.6	DPI DEC	Link with investigation in Action 4.4	DEC through TAP implementation, NHT/NSW Environmental Trust Grants/CMA devolved grants	2007

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 4 (cont'd): Reduction of external threats to GGBFs

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
4.6 Liaise with landowners (Council, industries, residents, other groups) to encourage best practices (e.g. mowing, landscaping, creating and maintaining wet areas) related to GGBF habitat (link with Actions 3.1, 3.4, 3.6, 3.7)	Actions 11.3.1, 14.3.2	DEC, Wollongong City Council, CMA	See other Actions		2007-2009
4.7 Investigate likely impacts from pest numbers of the White Ibis at GGBF sites and seek DEC support for implementation of control measures as necessary	Action 11.3.2	DEC, Wollongong City Council, Wollongong University	Dependent on findings		2007-2008

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 5: Monitoring and research to better understand the extent and dynamics of the Port Kembla GGBF population

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST*	FUNDING SOURCES	TIMEFRAME
5.1 Map and identify existing and potential habitat across the Port Kembla population and identify tenure of affected lands (link with Action 2.3)	Action 11.3.4, 12.3.2	DEC Other stakeholders	$20,000 (same budget as Action 3.1)	CMA devolved funding/NSW Environmental Trusts/local sponsors	2007
5.2 Conduct a coordinated and systematic survey to determine baseline population numbers and location. Reconcile with historic records	Action 12.3.1	DEC, Wollongong University, other researchers	$30,000	CMA devolved funding/NSW Environmental Trusts/local sponsors	2007
5.3 Monitor effectiveness of management actions against baseline data from Action 5.2. report findings to DEC, stakeholders and community (link with Action 3.5)	Action 12.3.1	DEC, Wollongong University, Illawarra Senior College, Community Groups	$20,000	CMA devolved funding/NSW Environmental Trusts/local sponsors	2008-09
5.4 Liaise with University of Wollongong and Illawarra Senior College to encourage research and monitoring projects	Action 12.3.2	DEC	In-kind DEC		2007-09

***Note: Costs are indicative only and subject to available funding**

IMPLEMENTATION PLAN (continued)

Strategy 5 (cont'd): Monitoring and research to better understand the extent and dynamics of the Port Kembla GGBF population

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
5.5 Undertake sampling of frogs at different locations to see if frog chytrid is present.	Actions 11.3.5, 12.3.2	DEC	$5,000	CMA devolved funding/NSW Environmental Trusts/local sponsors/TAP funds, DEC, James Cook & Newcastle University Research	2007-08
5.6 Take water samples from various GGBF locations as part of the national Threat Abatement Plan (TAP) for chytrid. (link with Action 5.5)	Actions 11.3.6, 12.3.2	DEC	$5,000	CMA devolved funding/NSW Environmental Trusts/local sponsors/TAP funds, James Cook University	2007-08

***Note: Costs are indicative only and subject to available funding**

REVIEW

A meeting of stakeholders will be organised to occur following the activity period each season where results and trends will be discussed and recommendations for adding to and modifying management actions in the plan made.

A review of the plan is required after 2.5 years as a basis for its next iteration after three years.

Informal review of the plan is also encouraged both within organisations and through networks and partnerships. All recommendations to improve the plan should be directed to the DEC contact below.

THE FROG HYGIENE PROTOCOL

Individuals studying or surveying frogs often travel and collect samples of frogs from multiple sites. Green and Golden Bell Frogs can be particularly sensitive to the introduction of infectious pathogens, such as the frog chytrid fungus. Therefore, it is important that frog workers recognise the boundaries between sites and undertake measures which reduce the likelihood of spreading infection. The detailed procedures and measures are provided in the "Hygiene protocol for the control of disease in frogs", which can be obtained from the Department of Environment and Conservation, or downloaded from:
http://www.nationalparks.nsw.gov.au/pdfs/hyprfrog.pdf

ACKNOWLEDGEMENTS

The following individuals and organisations participated in the workshop, made constructive comment on the Management Plan or provided some important comments, advice or actions for or about the Green and Golden Bell Frog at Port Kembla. This assistance is gratefully acknowledged.
Tania Duratovic, Alison Foster, Ann Goeth, Paul Wearne and Helen Jessup – NSW DEC;
Paul Formosa, Jedda Lemmon, Aimee Beardsmore and Sue McGregor - Wollongong City Council;
Robynne Murphy – Bluescope Steel; Kate Williams - Metal Manufactures; Trevor Brown - Port Kembla Ports Authority; Chris Wade – formerly Orica; Pat Costa - Kembla Properties;
Daniel Deighton, Loui Gaudiosi, David & Ruby Jackson, Laura Rampin, Coral Clay and Michael Fox – Local Residents and/or frog conservationists who have done much for the frog in the local area;
Garry Daly – Herpetologist, consultant and untiring conservationist for the GGBF at Port Kembla;
Dr Ross Goldingay – frog researcher previously Wollongong University now Southern Cross University
A special thanks also goes to Werner Ziesche, long term resident of the Illawarra, for his insights into the Port Kembla area, its changes over time, and for accompanying the author during field investigations of the Port Kembla area during his formulation of the state-wide Recovery Plan for the GGBF.

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Appendices

Appendix 1 - Photos of some of the locations referred to in this Management Plan

Cleary Bros detention pond (photo J. Lemmon)

Coomaditchy Lagoon view to SE (photo G. Daly)v

Constructed habitat pond now non functional adjacent to Boilers Point (photo G. Daly)

Frog Friendly Garden at Port Kembla occupied by GGBF (photo G. Daly)

Boilers Point Dam requires management actions (photo G. Daly)

Green and Golden Bell Frog 'metamorphling' at Port Kembla – 2007 (photo H. Jessup)v

MM habitat area Boilers Point (photo G. Daly

Orica/Kembla Properties Pond created for the GGBF at North Port Kembla (photo C. Wade)

Frog Friendly Garden at Port Kembla occupied by GGBF (Photo G. Daly)

Disused swimming pool at Port Kembla regularly used by GGBF for breeding after rain (photo G. Daly)

Appendix 2 – Strategic Maps depicting ***possible*** movement corridors (red) and sites for ***possible*** habitat creation and enhancement works (green).