Brewster Hjorth Pty Ltd

Australian Institute of Police Management Preferred Project Report

Ecological Assessment

December 2008

Alison Hunt and Associates Pty Ltd

TERRESTRIAL | MARINE | AQUATIC

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1 INTRODUCTION

1.1 Purpose

Alison Hunt & Associates Pty Ltd was commissioned by Brewster Hjorth Pty Ltd to prepare an Ecological Assessment Report to accompany the Preferred Project Report for the Australian Institute of Police Management (AIPM) Redevelopment of their site located at Collins Road, Manly NSW (Figure 1). The site is listed as State Significant Site under Schedule 3 of the NSW *State Environmental Planning Policy (Major Projects) 2005*.

A Project Application and Environmental Assessment (EA) were provided to the Department of Planning under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in November 2007. Comments received have been incorporated into a redesigned proposal for inclusion in the Preferred Project Report (Figure 2).

As a part of this reassessment, consideration of the off-site and on-site impacts on the adjacent marine environment as a consequence of the redevelopment is required especially in relation to those species listed under the Schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This report is submitted with the Preferred Project Report.

1.2 Background

A number of designs have been considered for this project. Each version has resulted in the scheme being altered and revised until the final plan (20816-10.DD03-06 10 November 2008) (Figure 2), on which this Preferred Project Scheme is based, was reached. This Preferred Project Scheme has been attained through consultation with government departments and other stakeholders to achieve the current design values aimed at protecting biodiversity across the site and within the Sydney Harbour National Park (SHNP) and in particular the endangered populations of the Long-nosed Bandicoot and the Little Penguin.

Consequently, a number of ecological reports have been prepared for the redevelopment including:

- GHD Pty Ltd 2006 Australian Institute of Police Management Facilities Upgrade – Ecological Assessment. Prepared for United KFPW on behalf of the Australian Federal Police.
- AHA Ecology 2007 Australian Institute of Police Management Facilities Upgrade. Ecological Assessment Addendum. Prepared for Brewster Hjorth Pty Ltd.

This assessment has largely been based on the detailed field studies undertaken by GHD Pty Ltd (2006). This report should be read in conjunction with the GHD Pty Ltd's document and other documents produced during project development.

1.3 Stakeholder Considerations

Following the exhibition of the Part 3A Major Project Application, public submissions and comments by agencies and stakeholders were submitted to the NSW Department of Planning (DoP). Table 1 summarises the main stakeholder considerations relevant to this proposal.

Table 1 Response to Submissions

Respondent	Summary of Ecological Concerns	Location in Report
Department of Environment, Water, Heritage and the Arts	Little Penguin: footprint, monitoring, construction times and noise and light barriers.	4.5.4, Section 5, Appendix A
	Long-nosed Bandicoot: significant loss of foraging habitat.	4.5.3, Section 5, Appendix A
	Sydney Harbour National Park and Asset Protection Zone.	1.2.2, 4.2
	Phytophthora cinnamomi	4.3.6, Section 5
	Construction Environment Management Plan and Operation Environment Management Plan.	Section 5, Appendix A
Department of Environment and Climate Change	Little Penguins concerns and requirements.	4.5.4, Section 5, Appendix A
	Long-nosed Bandicoot concerns and requirements.	4.5.3, Section 5, Appendix A
	Sydney Harbour National Park and Asset Protection Zone.	1.2.2, 4.2
	Phytophthora cinnamomi	4.3.6, Section 5, Appendix A
	Construction Environment Management Plan and Operation Environment Management Plan.	Section 5, Appendix A
Individual submission	Impacts on Little Penguin, Long-nosed Bandicoot and Red-crowned Toadlet	4.5.3, 4.5.4, 4.5.2
	Proposed building overlooks the main nesting habitat of the Little Penguin colony.	4.5.4
	Redevelopment would cause issues with traffic, noise and habitat disturbance	Section 5, Appendix A
Sydney Harbour & Foreshores Committee	Impact on wildlife in particular the bandicoots due to a reduction of foraging areas and increased vehicle and personal activity.	4.3.3, Section 5, Appendix A

Respondent	Summary of Ecological Concerns	Location in Report
Individual submission	Impacts on Little Penguin and Long-nosed Bandicoot from siting of buildings, potential noise and lighting, construction activities, loss of foraging area & increased hard paved surfaces.	4.5.3, 4.5.4, Section 5, Appendix A
	No plans to restore natural creek for habitat of the Red-crowned Toadlet.	4.5.2
Individual submission	Impacts on Little Penguin and Long-nosed Bandicoot	4.5.3, 4.5.4, Section 5, Appendix A
North Head Sanctuary Foundation Inc.	Bushfire protection measures should not entail further clearing of vegetation with Sydney Harbour National Park.	1.2.2, 3.1.1, 3.1.2, 4.2, 4.3.1
	Construction workers be briefed on flora and fauna.	Section 5, Appendix A
	Impacts on Little Penguin and Long-nosed Bandicoot from siting of buildings, potential noise and lighting, construction activities, loss of foraging area & increased hard paved surfaces.	4.5.3, 4.5.4, Section 5, Appendix A
	Ensure any changes to water flows do not impact on the Red-crowned Toadlet	4.5.2
Individual submission	Environment impacts and management issues relating to noise, traffic, waste, sewerage, on Little Penguin, Long-nosed Bandicoot, Red-crowned Toadlet, loss of bushland on SHNP for bushfire protection.	1.2.2, 4.2, 4.5.2, 4.5.3, 4.5.4, Section 5, Appendix A
Individual submission	The proposed redevelop will endanger the Little Penguin and Long-nosed Bandicoot populations on the site.	4.5.3, 4.5.4 Section 5, Appendix A
Individual submission	The Senior Common Room is too big and is located in an area right above the highest concentration of the Little Penguin population. The penguins are highly sensitive to noise and light at night.	4.5.4 Section 5, Appendix A
Manly Council	There is no habitat enhancement proposed for the Long-nosed Bandicoot. A decrease in the total area of foraging habitat.	4.5.3

Respondent	Summary of Ecological Concerns	Location in Report
	For the proposal to be sustainable it should restore the watercourse with the required buffer zone.	4.5.2
	Referral does not adequately describe the large caves which are part of the cliff line and are used by penguins for nesting.	4.5.4
Individual submission	The deck of the Senior Common Room is close to the highest concentration of Little Penguins.	4.5.4
	Bandicoots and penguins are sensitive to light, noise and disturbance and will be affected by construction and increased activities on the site.	4.5.3, 4.5.4, Section 5, Appendix A
	The clearing of bushland accommodate the Asset Protection Zone will put the penguin and bandicoot populations at danger.	1.2.2, 4.5.3, 4.5.4, Section 5, Appendix A
Individual submission	Penguin colony needs to be protected from human activity.	4.5.4, Section 5, Appendix A
	There would be more noise, traffic, pollution and loss of both penguin and bandicoot habitats as a result of demolition, building activity, open air entertainment and increase in visitors.	Section 5, Appendix A
	The above impacts would have a detrimental effect on the flora and fauna of the areas.	4.5.2

1.4 Proposal

1.4.1 Structural

The AIPM is proposing to redevelop their site at Collins Beach, North Head (Figure 1). Redevelopment will result in an altered layout of the site, involve the demolition of a number of existing structures and the construction of new buildings including additional overnight accommodation. The Preferred Project Plan is a design scheme prepared as a result of comments received on the Project Application and Environmental Assessment. The revised plan (20816-10.DD03-06 10 November 2008 (Figure 2) involves removal of the proposed cottages and common room along the northern section of the site but retains light construction techniques as well as other light and noise considerations so as to minimise nocturnal disturbance.

The Preferred Project scheme accordingly seeks approval for:

- Demolition of the dormitory style visitor accommodation blocks, administrative office accommodation, senior common room facilities and ancillary buildings;
- New visitor accommodation within 2 building forms of two storeys, comprising a total of 45 beds and one teaching room;
- Refurbishment and a single storey western extension of the existing library and construction of a new two storey administration building east of the existing library;
- Refurbishment of the Axial Hospital Group building to accommodate teaching rooms, dining areas, the Senior Common Room, and meeting areas;
- Landscape improvement works including the reinstatement of lawn areas north of the Axial Hospital Building following the removal of the existing dormitory buildings and interpretation of the jetty road. Development of a "natural creek" to the north of the site and opportunity for filtration of stormwater;
- Increase in residential visitor accommodation facilities from 30 beds to 54 beds and a total staff level from 35 to 40 employees (inclusive of training, administrative and maintenance staff);
- New car park area at the western end of the southern boundary; widening of aisle width of the existing car park area east of the Axial Hospital Building and additional 4 parking spaces to the north of eastern car park area;
- The selection of materials and colours to integrate with heritage items and the surrounding natural bushland setting. Selected materials require low maintenance and durability;
- Retention of the existing stonewall along the site's eastern boundary; and
- Incorporation of resource efficiency measures in design and operation.

1.4.2 Fire Management

Bushfire Protection Planning and Assessment Services has prepared a Bushfire Risk Assessment report that assess the potential hazards and risks as well as the mitigation measures required to minimise risk. An area proposed as an Asset Protection Zone (APZ) would be maintained between the AIPM and the SHNP with the aim of protecting life and property at the AIPM from bushfires within the SHNP, and to prevent the spread of fires from the AIPM into the SHNP.

1.4.3 Landscaping

Taylor Brammer Landscape Architects have prepared a Landscape Design which would focus on reinstating native vegetation and improving habitat resources for native fauna. The proposed landscaping is outlined below.

- Turf would be laid across the northern section of the site where the current residential building is to be removed to provide additional Long-nosed Bandicoot foraging habitat;

- The provision of low dense plantings along the northern boundary of the Heritage Track to provide refuge areas for the Long-nosed Bandicoot;
- New landscaping between the proposed residential buildings and in the orientation space between the library and the main heritage building;
- Screen plantings using native species in front of and between the new buildings;
- Wherever possible locally endemic species would be used; and
- Reinstatement of some of the natural features of the stream which intermittently flows north across the site from the SHNP.

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0 250 500

Metres

Figure 1 Site Location

AHA Ecology

NOVEMBER 2008
20816-10.DD03-06
PRINT DATE: 10.11.08

brewster hjorth ARCHITECTS

A04

AUSTRALIAN INSTITUTE OF POLICE MANAGEMENT

for The Australian Federal Police

SITE GROUND FLOOR PLAN

SCALE 1:200 @ B1

0 2m 5m 10m

1.5 Site Description

The AIPM covers an area of approximately 1.7 hectares (ha) and is situated at the end of Collins Beach Road, Manly NSW (Figure 1). Sydney Harbour National Park (SHNP) bounds the site on the south, east and west and the northern boundary is formed by the sandstone cliffs of Spring Cove. The site is predominantly maintained lawns with scattered native trees as well as a native garden in the south east of the site which incorporates mature Smooth-barked Apple (*Angophora costata*) trees. A drainage line flows south from the adjacent SHNP across the site in a northerly direction.

The site is operated by the AIPM and is a classroom based training facility for various police jurisdictions, other government agencies and private entities. It provides accommodation for trainees as well as associated administrative, living and studying facilities. The site is generally restricted and has limited public access.

1.6 Soils and Topography

GHD Pty Ltd (2006) describes the site as a relatively flat area that slopes down a small sandstone cliff to Spring Cove. The soils are sandy and have been mapped in the Gymea soil landscape group (Chapman and Murphy 1989). The geology of North Head comprises Triassic units of the Sydney Basin sequence (GIS Environmental Consultants 2003a).

1.7 Existing Ecological Factors

There are a number of threatened species known to inhabit the SHNP and the North Head area. Of particular importance to this proposal are the endangered populations listed under the TSC Act:

- *Little Penguin population in the Manly point area*; and

  The Little Penguin (*Eudyptula minor*) population at Manly is the only known breeding population on mainland NSW. This species breeds along the foreshore that bounds the AIPM within Spring Cove and some of this area forms part of the Critical Habitat which has been declared for this population.

- *Long-nosed Bandicoot population at North Head*.

  An Endangered Population of the Long-nosed Bandicoot (*Perameles nasuta*) is also known to occur throughout North Head. This species uses the open grassy areas of the AIPM for foraging but there is no known breeding habitat for this species within the AIPM site.

The redevelopment has been designed so as to minimise direct and indirect impacts on these Endangered Populations. These impacts are outlined and assessed in Section 4.5.

1.8 Legislative Framework

A number of legislative requirements in relation to the biodiversity of the site are relevant. These include but are not necessarily limited to those listed below.

- The site has been listed as State Significant Site under Schedule 3 of the *State Environmental Planning Policy (Major Projects) 2005* and consequently will be assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Flora and fauna issues listed under the TSC Act would be considered using the Draft *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) as required under Part 3A of the EP&A Act; and
- A Bilateral Agreement between the Commonwealth of Australia and the state of NSW has allowed this proposal to be subject to a one-off accredited assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Consequently, this proposal does not require assessment under the EPBC Act as it would be undertaken in the manner specified in Schedule 1 of the Bilateral Agreement. However, consideration has been given to those species and populations which are listed under this Act and with the potential to occur within the locality (i.e. 10 km radius).

2 METHOD OF REASSESSMENT

This assessment relies solely on the field assessment undertaken by GHD Pty Ltd in 2005 and 2006 and the results presented in *Australian Institute of Police Management Facilities Upgrade Ecological Assessment* (GHD Pty Ltd 2006). The findings of the GHD Pty Ltd (2006) study have been used to reassess this proposal with due consideration under:

- Part 3A of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act);
- Architectural drawings by Brewster Hjorth Architects (20816-10.DD03-06 10 November 2008);
- Construction and Environmental Management Plans prepared by Gondwana Consulting Pty Ltd; and
- Comments on the Environment Assessment received from stakeholders.

This document should be read in conjunction with GHD Pty Ltd (2006) in which details of the site assessment and findings are presented in full.

3 FINDINGS

3.1 Vegetation

3.1.1 AIPM

The ecological assessment undertaken by GHD Pty Ltd (2006) reports the AIPM site to be highly modified with scattered native trees remaining throughout the area with patches of native vegetation and varying levels of weed invasion at the site boundaries. A summary of the vegetation survey reported by GHD Pty Ltd (2006) is provided below.

A number of exotic species have been planted at various locations throughout the site, notably around buildings and the car park. A native landscaped garden is established in the south east of the site and consists of a native shrub understorey with large native trees (Smooth-barked Apple) including one hollow-bearing tree that appears to contain a beehive.

An area of native vegetation extends through the centre of the southern portion of the site. The vegetation here is reportedly similar to the vegetation to the east of the site and is considered likely to be remnant bushland or regeneration from the existing seedbed. This area also supports a number of large native trees (Smooth-barked Apple) and includes Coastal Banksia (*Banksia integrifolia*).

A number of native trees (Smooth-barked Apple, Broad-leaved Paperbark (*Melaleuca quinquenervia*) and a Stringybark (*Eucalyptus* sp.)) are present in the north of the site, scattered over maintained lawns. The foreshore / cliff edge supports a mixture of native and exotic vegetation with a dense understorey of the exotic African Lovegrass (*Eragrostis curvula*) and patches of Lantana (*Lantana camara*).

3.2 Fauna Habitat

3.2.1 AIPM

The ecological assessment undertaken by GHD Pty Ltd (2006) reports the AIPM site to be highly modified with limited remaining fauna habitat and resources. A summary of the fauna habitat assessment reported by GHD Pty Ltd (2006) is provided below.

The large scattered native trees would provide habitat for some woodland birds while areas of denser shrub understoreys may provide nesting and shelter habitat for smaller bird species. The open grass areas of the site provide foraging for common bird species such as the Australian Magpie (*Gymnorhina tibicen*).

The Manly Point endangered population of the Little Penguin is known to nest in the rocky crevices of the foreshore and cliff face of the site's northern boundary.

Habitat for arboreal mammals is limited on the site. Only one tree hollow was observed during the site inspection and this appeared to contain a beehive which would preclude the use of the hollow by other hollow-dependent fauna (e.g. birds, marsupials or bats).

Habitat for ground dwelling mammals is also limited on the site. The presence of the European Rabbit (*Oryctolagus cunicilus*), a competitor of native species for foraging resources, was noted through scats. Numerous diggings by the Long-nosed Bandicoot from the North Head endangered population known to forage across the site were also observed.

A drainage line passing through the centre of the site may provide amphibian habitat, with limited potential habitat for the threatened Red-crowned Toadlet (*Pseudophryne australis*) at the southern end.

Habitat for small reptiles is present at various locations throughout the site where groundcover provides suitable cover. The sandstone areas in the south of the site and along the cliff face would provide suitable refuge sites for a variety of reptiles. The Eastern Water Dragon (*Physignathus lesuerii*) is known from the area and appears to be abundant at the site.

3.3 Threatened Flora

Database searches (DEC 2005) carried out by GHD Pty Ltd (2006) found a number of threatened flora species recorded within the locality (i.e. 10 km radius). The highly modified nature of the AIPM site limits the potential for the majority of threatened flora to occur. Those species previously recorded in the locality and an assessment of the likelihood of their occurrence on the site are listed in Table 2.

After an assessment of the available habitat within the AIPM, a number of species were considered to have the potential to occur in nearby habitat and these species are listed below:

- Bynoe's Wattle (*Acacia bynoeana*);
- Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*);
- *Allocasuarina portuensis*;
- *Callistemon linearifolius*;
- Bauer's Midge Orchid (*Genoplesium baueri*); and
- *Chamaesyce psammogeton*.

However, only limited suitable habitat for *Chamaesyce psammogeton* occurs along the rocky cliff top of Spring Cove. This area is heavily infested with African Lovegrass and therefore this species is unlikely to occur and therefore further assessment of potential impacts on this species is not undertaken.

3.4 Threatened Fauna

Database searches (DEC 2005) carried out by GHD Pty Ltd (2006) found a number of threatened fauna species recorded within the locality (i.e. 10 km radius) (refer to Figure 3; GHD Pty Ltd 2006). Again, the modified nature of the AIPM site limits suitable habitat for threatened species. Those

species previously recorded and known to occur in the locality and an assessment of the likelihood of their occurrence on the site are listed in Table 2.

After an assessment of the available habitat within the AIPM, a number of species were considered to have the potential to occur in nearby habitat and these species are listed below. The highly modified nature of the AIPM site means that there are no endangered ecological communities potentially occurring within the site or directly adjacent to the AIPM compound.

- Eastern Pygmy-possum (*Cercartetus nanus*)
- Spotted-tailed Quoll (*Dasyurus maculatus*);
- Southern Brown Bandicoot (*Isoodon obesulus obesulus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Long-nosed Bandicoot (Population) (*Perameles nasuta*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Giant Burrowing Frog (*Heleioporus australiacus*);
- Red-crowned Toadlet (*Pseudophryne australis*);
- Rosenberg's Goanna (*Varanus rosenbergi*);
- Little Penguin (Population) (*Eudyptula minor*);
- Barking Owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*); and
- Masked Owl (*Tyto novaehollandiae*).

Two endangered populations are known from the locality; the Long-nosed Bandicoot and Little Penguin. The Long-nosed Bandicoot forages across the AIPM site and the Little Penguin nests along the sandstone cliff and foreshore of the northern boundary. Design and management measures are to be implemented to minimise impacts on these populations during construction as well as in the ongoing management of the site.

The adjacent SHNP provides suitable habitat for a range of threatened species. There is therefore the potential for some of these species, such as owls and bats, to forage across the AIPM site. However roosting habitat is not present within the AIPM site.

The drainage line running through the AIPM site and adjacent SHNP may provide habitat for the Red-crowned Toadlet. Although the watercourse is ephemeral and has adjacent areas of rock, leaf litter and moist soil, this area has been modified and therefore habitat is limited.

3.5 Connectivity

The AIPM site is a cleared area and is bounded by the SHNP. Some clearing of ground layer plants within the southern boundary of the site would be required to comply with requirements for asset protection zones and several trees would also be removed for a new car park in this section. This area is currently largely cleared and it is considered that this minor additional clearing would not result in further fragmentation of the National Park.

3.6 Other Ecological Factors

Three weed species from the GHD Pty Ltd (2006) flora list are listed under the *Noxious Weeds Act 1993* (NW Act) for the Manly control area. Lantana and Asparagus Fern (*Asparagus aethiopicus*) are listed as Control Class 4 weeds and Pampas Grass (*Cortaferia* spp.) as a Control Class 3 weed for the Manly area. Class 4 weeds are "Locally Controlled Weeds" and the control action for this class states that "the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local authority". Management Plans for Lantana and Asparagus Fern (Manly Council 2006a and 2006b) detail the control requirements and methods for these weeds in the Manly area. Class 3 weeds are "Regionally Controlled Weeds" and the control action states that "the plant must be fully and continuously suppressed and destroyed". A species of Cotoneaster was also recorded and is listed as a weed in the Manly Local Government Area (LGA).

Phytophthora cinnamomi (Pc) is known to commonly cause disease and death in trees in the local area. A number of trees were noted as dead or dying during the site investigation (GHD Pty Ltd 2006). It is possible that Pc may be present but this could only be confirmed through soil analysis. Pc is spread through water and drainage and therefore management measures to prevent possible spread of this fungus are recommended by GHD Pty Ltd (2006) and best practice guidelines for the management of Pc is included in the Construction Environmental Management Plan prepared by Gondwana Consulting Pty Ltd (2008).

Table 2 Threatened Species Recorded within the Locality or with the Potential to Occur

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Flora					
Acacia bynoeana	Bynoe's Wattle	E	V	Mainly in heath and dry sclerophyll forest, seeming to prefer open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches.	Unlikely to occur on AIPM site due to modified and landscaped nature of site. Potential habitat present within adjacent Sydney Harbour National Park.
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	E	E	Generally occurs in coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated as well as being highly modified or disturbed due to surrounding urban development.	Unlikely to occur on AIPM site due to modified and landscaped nature of site. Potential habitat present within adjacent Sydney Harbour National Park.
Allocasuarina portuensis	Nielson's Park She-oak	E	E	Occurs within tall closed woodland.	Unlikely to occur on AIPM site due to modified and landscaped nature of site. Potential habitat present within adjacent Sydney Harbour National Park.
Caladenia tessellata	Tessellated Spider Orchid	E	V	Generally found in grassy sclerophyll woodland on clay loam or sandy soils.	Unlikely. No suitable habitat.
Callistemon linearifolius	Netted Bottle Brush	V		Grows in dry sclerophyll forest on the coast and adjacent ranges.	Unlikely to occur on AIPM site due to modified and landscaped nature of

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
					site. Potential habitat present within adjacent Sydney Harbour National Park.
Chamaesyce psammogeton		E		Grows on fore-dunes and exposed headlands, often with Spinifex (*Spinifex sericeus).*	Limited potential habitat along rocky cliff in the north but unlikely to occur due to heavy infestation of African Lovegrass.
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone within coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Unlikely to occur on AIPM site due to modified and landscaped nature of site. Potential habitat present within adjacent Sydney Harbour National Park.
Genoplesium baueri	Bauer's Midge Orchid	V		Sparse sclerophyll forest and moss gardens over sandstone.	Limited potential habitat in south of site and adjacent Sydney Harbour National Park.
Pimelea spicata		E	E	Occurs on undulating topography of substrates derived from Wianamatta Shale, within Cumberland Plain Woodland.	Unlikely. No suitable habitat.
Syzygium paniculatum	Brush Cherry	V	V	Gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Unlikely. No suitable habitat.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Tetratheca glandulosa		V	V	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest.	Unlikely. No suitable habitat.
Thesium australe	Austral Toad Flax	V	V	Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass (*Themeda australis).*	Unlikely. No suitable habitat.
Mammals					
Aepyprymnus rufescens	Rufous Bettong	V		Inhabits tall, moist eucalypt forests and open woodlands, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	Unlikely. Historical record. No suitable habitat.
Cercartetus nanus	Eastern Pygmy-possum	V		Rainforest, sclerophyll forest and woodland to heath – but heath and woodland are preferred. Forages on banksias, eucalypts and bottlebrushes.	Unlikely. No suitable habitat.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely to occur on AIPM site due to modified and landscaped nature of site. Potential habitat present within adjacent Sydney Harbour National Park.
Dasyurus viverrinus	Eastern Quoll	E		Occurs in dry sclerophyll forest, scrub, heathland and cultivated land. There have been no recent sightings of this species in NSW.	Unlikely. Historical record.
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E	Inhabits scrubby vegetation, including heath, shrubland, and heathy forest and woodland. It is often associated with well-drained soils and dry heathland communities.	Potential foraging habitat present.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Is essentially a cave bat, but also utilises man-made habitats such as road culverts, storm-water tunnels and other man-made structures. It is known from a variety of habitats along the east coast including rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grasslands (Churchill 1998)	Has been recorded at North Head and may forage across the site.
Mormopterus norfolkensis	Eastern Freetail-bat	V		Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range and roosts primarily in tree hollows but also in man-made structures or under bark.	Potential foraging and roosting habitat present within adjacent Sydney Harbour National Park.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Perameles nasuta	Long-nosed Bandicoot (Population)	E		This population occupies a variety of habitats on North Head. It forages mainly at or after dusk, digging characteristic small conical holes.	Resident population on North Head. Known to forage across the site.
Phascolarctos cinereus	Koala	V		Eucalypt woodlands & forests. It is limited to areas of preferred feed trees in eucalypt woodlands and forests.	Unlikely. No suitable habitat.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, melaleucas and banksias.	Known to forage within the National Park. Limited habitat present within study area.
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	Found in heath, woodland and open forest with sandy soils. Generally lives in heath or forest and will travel several hundred metres to creeks to breed. Burrows into deep litter or loose soil, emerging to feed or breed after rain.	Habitat present within adjacent Sydney Harbour National Park.
Litoria aurea	Green and Golden Bell Frog	V	E	Marshes, dams & stream-sides particularly those containing Typha or Eleocharis. Need unshaded waterbodies, free of predatory fish with a grassy area nearby.	Unlikely. No suitable habitat.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Pseudophryne australis	Red-crowned Toadlet	V		Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Potential habitat present within the drainage line and adjacent leaf litter and bush rock.
Reptiles					
Varanus rosenbergi	Rosenberg's Goanna	V		Found in heath, open forest, and woodland, and is associated with termites, the mounds of which this species nests in. Termite mounds are a critical habitat component for this species.	Potential habitat present within adjacent Sydney Harbour National Park.
Avifauna					
Erythrotriorchis radiatus	Red Goshawk	E	V	Occurs mainly in watercourses, in swamp forest and woodland on the coastal plain. It favours dense forest interspersed with open woodland or cleared land and often frequents forest edges.	Unlikely. No suitable habitat.
Esacus neglectus	Beach Stone-curlew	E		Occurs on open, undisturbed beaches, islands, reefs, and estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred; may also frequent river mouths, offshore sandbars and rock platforms.	Unlikely. No suitable habitat.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Ixobrychus flavicollis	Black Bittern	V		Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation.	Unlikely. No suitable habitat.
Lathamus discolor	Swift Parrot	E	E, M	Migrates to the Australian south-east mainland between March and October. Areas where eucalypts are flowering profusely or where there are abundant lerp infestations.	Unlikely. No suitable habitat.
Ninox connivens	Barking Owl	V		Eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting.	May forage across the site due to proximity to potential habitat within the National Park.
Ninox strenua	Powerful Owl	V		Range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well.	May forage across the site due to proximity to potential habitat within the National Park.
Pandion haliaetus	Osprey	V		This species is a large, water-dependent bird of prey. It favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. Nests are built high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Unlikely. Suitable nesting habitat not present within the AIPM. Limited potential nesting habitat present within adjacent National Park.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
Ptilinopus magnificus	Wompoo Fruit-Dove	V		Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests, feeding on a diverse range of tree and vine fruits. Most often seen in mature forests, but also found in remnant and regenerating rainforest.	Unlikely. No suitable habitat.
Ptilinopus superbus	Superb Fruit-Dove	V		Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely. No suitable habitat.
Stagonopleura guttata	Diamond Firetail	V		Grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands.	Unlikely. No suitable habitat.
Tyto novaehollandiae	Masked Owl	V		Dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides.	May forage across the site due to proximity to potential habitat within the National Park.
Xanthomyza phrygia	Regent Honeyeater	E	E, M	Dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly	Unlikely. No suitable habitat.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurring at Site
				large numbers of mature trees, high canopy cover and abundance of mistletoes.	
Marine Species					
Eudyptula minor	Little Penguin (Population)	E		Only known breeding population on the mainland in NSW. A range of nest sites are utilised by the penguins at Manly including under rocks on the foreshore, under seaside houses and structures, such as stairs, in wood piles and under overhanging vegetation including lantana and under coral tree roots.	Known breeding population on cliffs at the site.
Note: TSC Act = NSW *Threatened Species Conservation Act 1995*; EPBC Act = Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*; E = Endangered, V = Vulnerable, M = Migratory. APZ = Asset Protection Zone. Source: DEC 2005; Habitat profiles obtained from online DECC threatened species profiles, PlantNet 2008.					

4 IMPACT ASSESSMENT

4.1 General Impacts

A number of direct and indirect impacts have the potential to occur as a consequence of this proposal and these are listed below:

4.1.1 Direct

- Construction of a new administration building in the south-east of the site and for the car park extension would result in the removal of a small section of lawn;
- Removal of some planted native vegetation for the extension of the administration building in the south of the site although all trees would be retained;
- Removal of small areas of lawn in the centre of the site for Classroom 1;
- Small reduction in the amount of habitat for some common native species;
- Noise and disturbance of foraging areas for the Long-nosed Bandicoot during construction;
- Potential increase in road-kill of the Long-nosed Bandicoot due to increased vehicular movements during construction and operation;
- An increase in foraging resources for the Long-nosed Bandicoot by reinstatement of grassed areas after removal of the current accommodation buildings; and
- An increase in distance between the buildings on the site and the Little Penguin nesting area.

4.1.2 Indirect

- Potential for pollutants and seeds of exotic species to be transported from the site through wind or into the drainage line and into the adjacent Little Penguin nesting area;
- Runoff and sedimentation into breeding areas of the Little Penguin;
- Spread of pesticides and herbicides used for gardening and landscaping to lawn areas through runoff. This has the potential to change the macroinvertebrate composition or abundance and kill fungi that provide feeding resources for the Long-nosed Bandicoot;
- Potential spread of *Phytophthora cinnamomi* (Pc) if present in the soil;
- Potential disturbance of the Little Penguin population due to human activities at the site during construction and operation;
- Sedimentation of the drainage line which may occur during heavy rainfall events after removal of vegetation; and
- Potential for edge effects to penetrate further into the Sydney Harbour National Park due to additional cleared space.

Potential effects of these direct and indirect impacts are discussed in detail in relation to threatened species and populations in Section 4.

A Construction Environment Management Plan (CEMP) and Operation Environment Management Plan (OEMP) have been prepared by Gondwana Consulting Pty Ltd (2008). Management measures are included in these documents to mitigate against these impacts and are discussed in Section 5.

4.2 Impacts on Adjoining National Park

The NSW National Parks and Wildlife Service has prepared *Guidelines for Development Adjoining National Parks* (1998). These guidelines outline the key issues that should be considered when assessing proposal adjoining National Parks and these include:

- Corridor Values;
- Erosion and Sedimentation;
- Stormwater Runoff to NPWS Land;
- Management Implications and Impacts;
- Fire;
- Boundary Encroachments, and
- Visual Impact.

Potential impacts of the proposal on the SHNP with regards to each of these matters are provided below:

4.2.1 Corridor Values

Disruption to movement corridors can isolate and fragment landscapes as some fauna and the propagules of some plants are unable to move across areas which are cleared and / or have barriers that physically hinder movement. However, the AIPM site is a cleared area and is bounded by the SHNP and redevelopment of this area would not result in further fragmentation of the National Park or fragment any current vegetated corridors.

4.2.2 Erosion and Sedimentation

Measures to prevent stormwater runoff and sedimentation from entering the adjacent SHNP are outlined in the CEMP and an Erosion and Sedimentation Plan would be prepared prior to the beginning of construction.

4.2.3 Stormwater Runoff to NPWS Land

Measures to prevent stormwater runoff and sedimentation from entering the adjacent SHNP are outlined in the CEMP and an Erosion and Sedimentation Plan would be prepared prior to construction beginning. It is noted in the guidelines (NPWS 1998) that any stormwater runoff that may enter the

National Park would need to be managed in accordance with 'best practice' stormwater treatment measures to maximise:

- On-site pollutant retention and removal, and
- Infiltration and sub-surface discharge of stormwater.

However as a general rule, stormwater runoff should not be allowed to enter the adjacent SHNP where possible. The AIPM site is generally downslope of the SHNP and it is unlikely that stormwater would flow into the National Park from the site.

4.2.4 Management Implications and Impacts

The proposal involves the redevelopment of the APIM site which is currently used for police training. An increase in accommodation would be approximately 50% over current accommodation available on site. However, such an increase in the numbers of people on site is unlikely to have substantial management implications for the running of the adjacent SHNP as all training activities are confined to within the boundaries of the AIPM site. Furthermore, measures as outlined in the CEMP and OEMP would be implemented to prevent indirect impacts on the SHNP such as the spread of weeds into the park that may otherwise result in the need for additional management activities by DECC.

4.2.5 Fire

Consultation with DECC has been undertaken regarding fire management measures and these are included in the Bushfire Risk Assessment (2008) that has been prepared by Bushfire Protection Planning and Assessment Services.

4.2.6 Boundary Encroachment

The proposed redevelopment would be wholly contained within the current AIPM site boundaries.

4.2.7 Visual Impact

The site currently supports building and infrastructure for the AIPM. The site is completely fenced and generally obscured from vision from within the SHNP. The proposal involves the redevelopment of the site and it is therefore unlikely that the redevelopment would negatively alter the visual amenity of the site or impact on the recreational amenity of users of the SHNP.

4.3 Key Threatening Processes

A number of Key Threatening Processes (KTP) listed under the TSC Act and EPBC Act were considered relevant to the redevelopment by GHD Pty Ltd (2006) and these are listed below.

4.3.1 Clearing of native vegetation (TSC Act) / Land Clearance (EPBC Act);

The clearing of native vegetation may result in:

- Destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes;
- Fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species;
- Riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities;
- Disturbed habitat which may permit the establishment and spread of exotic species which may displace native species; and
- Loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates.

The AIPM site is currently largely cleared although some minor removal of native species would be required and these are largely landscape plants. These areas of minor clearing are unlikely to provide the important habitat for a species or to impede gene flow through this area even for small isolated populations.

4.3.2 Competition and grazing by the feral European Rabbit (TSC Act) / Competition and land degradation by feral Rabbits (EPBC Act);

The European Rabbit currently grazes across the site. An increase in grassed areas to provide additional foraging resources for the Long-nosed Bandicoot would also increase resources for the European Rabbit.

4.3.3 Competition from feral honeybees (TSC Act);

Honeybees impact on biodiversity by competing for tree hollows and via competition for floral resources, such as pollen and nectar. A honeybee colony was reported to occur within a tree hollow on the AIPM site.

4.3.4 Predation by the European Red Fox (TSC Act and EPBC Act);

It is possible that this proposal may result in increased predation by the European Red Fox should the species become re-established within the Park especially during construction. However, the CEMP listed management measures to assist with control of foraging across the site by the European Red Fox (e.g. covering of all putrescible waste).

4.3.5 Invasion, establishment and spread of *Lantana camara* (TSC Act);

Lantana (*Lantana camara*) is already established along the Little Penguin nesting area along the northern boundary of the AIPM. This proposal would not exacerbate the invasion, establishment and spread of Lantana across the site or within the SHNP as weed control and landscape management would be undertaken on the AIPM site on an ongoing basis.

4.3.6 Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*) (TSC Act and EPBC Act).

It is possible that this proposal could introduce /spread *Phytophthora cinnamomi* (Pc) across the AIPM site and within the SHNP. Management measures have been developed and these have been based on the National Best Practice Guidelines documented in Management of *Phytophthora cinnamomi* for Biodiversity Conservation in Australia Part 2 – National Best Practice Guidelines (refer to Section 0).

4.3.7 Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands

The ephemeral stream which flows from the SHNP northward across the site and discharges at the northern boundary of the site is already largely altered through channelization and piping underneath existing buildings. This proposal would assist with the re-establishment of some natural elements to this stream by reinstating more natural stream features along the southern and northern extremities of the AIPM site.

KTPs relevant to specific threatened species and populations are discussed within the impact assessment.

4.4 Cumulative Impacts

The redevelopment of the AIPM site is not likely to not substantially increase cumulative impacts at North Head. All development would be undertaken within the current site boundaries. It is considered that the scale of the impact of the proposed construction and operation are predicted to be relatively minor and manageable and would not substantially increase cumulative impacts within the locality.

4.5 NSW *Environmental Planning and Assessment Act 1979*

4.5.1 Background

An assessment of the impacts of this proposal on species, populations and ecological communities listed under Schedules 1, 1A and 2 of the TSC Act has been undertaken. This impact assessment was undertaken in accordance with the *Draft Part 3A Guidelines for Threatened Species Assessment* (DEC & DPI 2005). Species considered include those species considered as potentially occurring on or adjacent to the site. Table 2 details the habitat requirements and threats for each of these species.

- Bynoe's Wattle (*Acacia bynoeana*);
- Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*);
- Nielson's Park She-oak (*Allocasuarina portuensis*);
- Netted Bottle Brush (*Callistemon linearifolius*);
- Heart-leaved Stringybark (*Eucalyptus camfieldii*); and
- Bauer's Midge Orchid (*Genoplesium baueri*).
- Eastern Pygmy-possum (*Cercartetus nanus*)
- Spotted-tailed Quoll (*Dasyurus maculatus*);
- Southern Brown Bandicoot (*Isoodon obesulus obesulus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Long-nosed Bandicoot (Population) (*Perameles nasuta*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Giant Burrowing Frog (*Heleioporus australiacus*);
- Red-crowned Toadlet (*Pseudophryne australis*);
- Rosenberg's Goanna (*Varanus rosenbergi*);
- Little Penguin (Population) (*Eudyptula minor*);
- Barking Owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*); and
- Masked Owl (*Tyto novaehollandiae*).

Assessments have been undertaken for guilds of species where species are considered to have similar habitat requirements. Potential impacts on threatened species are assessed below. A separate assessment of the potential impacts on the Long-nosed Bandicoot and Little Penguin endangered populations has been undertaken in 4.5.3 and 4.5.4, respectively.

4.5.2 Threatened Species Assessment

Assessment of the likely impacts on the Long-nosed Bandicoot and Little Penguin have been undertaken separate to the assessment provided below. Assessments for these species are located in Section 4.5.3 and Section 4.5.4, respectively.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Flora

No threatened flora species were identified during the site inspection by GHD Pty Ltd (2006) although targeted searches were not undertaken. However, many of these species are large and conspicuous and would have been recorded if present. Potential habitat for these species is considered to be present only within the fringing areas of the SHNP.

Bynoe's Wattle is associated with more open areas and is often found on trail margins and vegetation edges, including recently burnt patches where competition is reduced (DECC 2005).

Recruitment of some flora species, for example, the Sunshine Wattle, occurs after fires. T Natural pollinators of this species are birds and bees which would not be impacted by this proposal (DECC 2005).

Nielson's Park She-oak is assumed to be wind pollinated. As this species has been planted at known locations in the area, and these populations are self-sustaining, it is unlikely that the proposed redevelopment of the AIPM site would jeopardise the lifecycle of this species.

The Netted Bottle Brush is known from only five or six populations within the Sydney area and, like other *Callistemon* species, is pollinated by birds and bees (DECC 2005). It is unlikely that the proposed redevelopment of the AIPM site would jeopardise the lifecycle of this species.

Heart-leaved Stringybark is known from North Head but was not identified on the AIPM site (GHD Pty Ltd 2006). This species is believed to have a poor response to too frequent fires and generally occurs in scattered stands (DECC 2005). It is unlikely that the proposed redevelopment of the AIPM site would jeopardise the lifecycle of this species.

Bauer's Midge Orchid belongs to a subfamily of terrestrial orchids existing in fire-prone areas that die back annually to dormant underground root tubers and all orchids rely on infection by mycorrhizal fungi to develop into plants. Species in the genus *Genoplesium* are pollinated by Chloropid and Milichiid flies (Weston *et al* 2005). Pollinating invertebrates are unlikely to be affected by the redevelopment of the AIPM site.

Avifauna

The Barking Owl roosts in tall understorey trees with dense foliage along creek lines and breeds in nests constructed within large hollows. This species preys predominantly on invertebrates throughout the year and on birds and small mammals, including rabbits, during breeding (DECC 2005).

The Powerful Owl roosts during the day in dense, tall vegetation and nests in large hollows of large eucalypts. The main prey items are medium-sized arboreal mammals and therefore generally hunts within forests and woodlands although is known to occasionally hunt in open areas (DECC 2005).

The Masked Owl roosts and breeds in moist eucalypt gullies using tree hollows, and sometimes caves, to nest. The main prey items include both arboreal and ground-dwelling mammals and it often hunts along forest edges (DECC 2005).

There is no roosting or nesting habitat within the AIPM site. Nesting of these species is likely to occur within the adjacent SHNP. As such, the proposed redevelopment is unlikely to affect the roosting or breeding behaviour of these species.

These birds may forage in the vicinity of the AIPM, within the National Park as well as across the AIPM site. The redevelopment on the AIPM site is unlikely to negatively affect the foraging of this species, as it will not alter the current open nature of the site. Extensive foraging habitat is available for these species in the adjacent SHNP.

Ground-dwelling and Arboreal Mammals

The Eastern Pygmy-possum generally builds nests in tree hollows but nests have also been found under decorticating bark. This species predominantly feeds on nectar and pollen from eucalypts, banksias and bottlebrushes but also eats invertebrates throughout the year (DECC 2005). Suitable habitat for this species is absent from the AIPM site but is likely to be present in the adjacent SHNP.

The Spotted-tailed Quoll uses a variety of resources for den sites, including hollow-bearing trees, fallen logs, rocky cliff faces, boulder fields, rock crevices and small caves. This species consumes a range of prey, such as arboreal and ground-dwelling mammals, invertebrates and carrion (DECC 2005). Suitable den habitat for this species is not available within the AIPM site. Current foraging opportunities for this species within the AIPM would not be altered by the redevelopment and therefore it is unlikely that this proposal would affect the lifecycle of this species.

The Southern Brown Bandicoot nests on the ground in small depressions that are covered by leaf litter or plant matter. They may nest under bushes such as blackberry or in rabbit burrows. They forage by digging in soft soils and feed on a variety of invertebrates and the fruit-bodies of underground fruiting fungi (DECC 2005). Suitably sheltered nesting habitat for this species is not available within the AIPM site.

Extensive suitable foraging and denning / nesting habitat are available for these species in the adjacent SHNP. Redevelopment of the AIPM site is unlikely to adversely affect the lifecycle of these species.

Microchiropteran and Megachiropteran Bats

The Eastern Bentwing-bat primarily roosts in caves, but also uses man-made structures such as stormwater tunnels and old mines. This species generally hunts in forested areas, flying over tree tops to catch moths and other insects (DECC 2005). Roosting habitat is unlikely to be available within the AIPM site.

The Eastern Freetail-bat roosts mainly in tree hollows but will also roost under bark and in man-made structures. This species is assumed to be insectivorous (DECC 2005). Two hollow-bearing stag trees were noted as present within the adjacent SHNP. Habitat within the SHNP would not be altered as a consequence of this proposal.

The Grey-headed Flying-fox generally forms large camps which roost in gullies, close to water and in vegetation with dense canopies. This species forages on the nectar and pollen of a variety of native eucalypts, banksias and melaleucas and the fruits of rainforest trees and vines (DECC 2005). There are no known roosting camps of this species in the area, and therefore the proposal is unlikely to affect the lifecycle of this species.

Amphibians

The Giant Burrowing Frog can travel several hundred metres to breed in rocky creeks by laying eggs under in-stream vegetation. This species feeds on ground-dwelling invertebrates amongst leaf litter (DECC 2005). Suitable breeding habitat is not provided by the drainage line present within the AIPM site.

The Red-crowned Toadlet congregates to breed in dense vegetation beside ephemeral creeks and drainage lines. This species disperses outside the breeding season and can be found under rocks and logs on sandstone ledges and forages amongst leaf litter (DECC 2005). The drainage line present within the SHNP and continuing into the southern section of the AIPM site provides marginal potential breeding habitat for this species. The most southern section of the drainage line within the AIPM site would be restored as a part of this proposal. However, more extensive and suitable habitat is available within the adjacent SHNP. The lifecycle of this species is therefore unlikely to be substantially affected by the proposal.

Reptiles

Rosenberg's Goanna nests in termite mounds and as such termite mounds are a critical habitat component for this species. This species feeds on carrion, birds, eggs, reptiles and mammals (DECC 2005). Suitable nesting habitat does not exist on the site and therefore this proposal is unlikely to affect the lifecycle of this species.

How is the proposal likely to affect the habitat of a threatened species, populations or ecological community?

Flora

Potential habitat for threatened flora occurs predominantly within the adjacent SHNP and these areas would not be altered and would be protected during construction. Suitable habitat for Bauer's Midge Orchid in the south of the AIPM site would not be disturbed by the redevelopment.

Weed species may spread through an area after clearing due to ease of access and reduced competition. However the AIPM is currently a modified area with the majority of the site already cleared. A number of weed species already exist on the AIPM site and the spread of these species would be avoided through the implementation of weed control and construction management. Only small areas of a landscaped garden would be cleared for the redevelopment. This clearance is unlikely to contribute to the introduction or spread of feral species. Edge effects such as weed invasion are unlikely to increase and the spread of weeds into the adjacent SHNP should be minimised through the implementation of weed management measures.

Avifauna

Habitat for these species is unlikely to be affected by the proposal. The AIPM site provides limited open area for foraging habitat and this habitat would not be altered by the proposed redevelopment as redevelopment on the AIPM site would not remove any key habitat features. Extensive habitat for these species is available in the adjacent SHNP and therefore it is considered that the proposal is unlikely to adversely affect the habitat of these species.

Ground-dwelling and Arboreal Mammals

The removal of large or significant trees from the AIPM site has been minimised through design of the plan to incorporate as much extant vegetation into the final design as possible. Current foraging habitat for these species within the AIPM site is unlikely to be negatively affected.

Predation on native animals by feral species is a common threat to many threatened species. Feral animals may spread through an area after clearing due to ease of access, less competition and improved hunting. However the AIPM is currently a modified area with most of the site already cleared. Only small areas of a landscaped garden would be further cleared for the redevelopment. This clearance is unlikely to contribute to the introduction or spread of feral species. The Construction Environmental Management Plan (CEMP) also specifies strict measures to ensure that putrescible waste is not left unprotected on site which could otherwise attract feral and domestic animals.

Microchiropteran and Megachiropteran Bats

Two hollow-bearing stags are present directly adjacent to the AIPM site within the SHNP and these may provide potential habitat for microchiropteran bats such as the Eastern Freetail-bat. No vegetation or stage trees within the SHNP would be altered or removed during redevelopment of the AIPM site. Furthermore, foraging habitat for bat species is unlikely to be affected by the proposal. Lighting associated with the AIPM may attract insectivorous bats to forage over this site

due to increased insect activity although lighting levels are not expected to exceed current levels and consequently insect activity on site should not substantially increase.

Bats are highly mobile and forage widely and as suitable habitat is available for these bat species in the adjacent SHNP it is unlikely that that the proposal would negatively affect the habitat for these species.

Amphibians

As discussed, the aquatic habitat available for these species in the drainage line may be improved as a consequence of re-establishment of this drainage line. Additionally, extensive similar habitat is available along the same drainage line as well as along other water bodies within the SHNP.

Suitable habitat for the Red-crowned Toadlet within the AIPM site along the sandstone ledges will not be affected by the proposed development. Indirect impacts on the habitat such as runoff will be mitigated against.

Reptiles

Limited foraging habitat for Rosenberg's Goanna exists within the site. Foraging habitat within the AIPM would not be altered by the redevelopment. Extensive foraging habitat is available in the adjacent SHNP. Potential key habitat features such as fallen logs may be used for shelter by this species. There was limited fallen wood on the site and none likely to provide substantial shelter for this species. Consequently, key habitat features would not be removed as a result of the proposal.

During construction, vehicle movement will increase through the site. Vehicle movement is unlikely to affect threatened species as the majority of threatened species habitat is limited foraging habitat which will not be affected by vehicle movement. The drainage line will also not be affected by increased vehicular movement as the drainage line is not crossed by access roads as it is piped through the site.

Does the proposal affect any threatened species or populations at the limit of its known distribution?

Flora

Bynoe's Wattle; *Callistemon linearifolius*, *Genoplesium baueri* and Heart-leaved Stringybark would not be at the limits of their known distribution if they were to occur within the site.

Sunshine Wattle has a very limited distribution between Botany Bay to the northern foreshore of Port Jackson. There have been a number of recent collections from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays (DECC 2005). It is likely that this species would be close to the limits of its known distribution if it was to occur within the study area.

The original known habitat of *Allocasuarina portuensis* is at Nielsen Park (within SHNP). However, no plants remain at the original discovery site. Successful propagation has been undertaken within Nielson Park and within the local area (DECC 2005). This species would therefore be at the limit of its distribution if it occurred at the site.

Fauna

None of the threatened fauna species known, or with the potential, to occur would be at the limits of their known distribution if they occurred on site.

How is the proposal likely to affect current disturbance regimes?

Construction activities would alter current disturbance regimes. Increased disturbance is likely to occur through increases in traffic, noise and an overall increase in human activities on site. These disturbances would be temporary. Mitigation measures within the CEMP specifically address measures to minimise impacts associated with construction (see Section 0).

Operational disturbance patterns pertaining to the AIPM site would not be substantially altered over current levels as all redevelopment would be undertaken within the boundaries of the AIPM site and activities within the site would not be markedly altered from current patterns.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity would not be altered as a consequence of this proposal as the site is currently cleared and no further clearing outside the site boundaries would be required.

How is the proposal likely to affect critical habitat?

Critical habitats crucial to survival have not been declared for any of these threatened species.

4.5.3 Long-nosed Bandicoot Endangered Population

Environmental Impact Assessment Guidelines (EIAGs) (NSW NPWS 2004b) have been prepared for this endangered population of the Long-nosed Bandicoot. A Recovery Plan is partially prepared. The EIAGs provide information on suitable survey methods for this species, lifecycle information as well as key threats to this species.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Long-nosed Bandicoot shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris and sometimes hidden with soil and with the entrance closed for greater concealment (DECC 2005, NSW NPWS 2004b). The Long-nosed Bandicoot is not known to nest on the AIPM site although will shelter on the site if disturbed

whilst foraging. This foraging habitat would not be removed by the redevelopment but instead would be enhanced by increased areas of lawn in the north of the site and landscaping features specifically designed for this species (e.g. low, dense plantings which would provide refuge islands).

How is the proposal likely to affect the habitat of a threatened species, populations or ecological community?

The Long-nosed bandicoot forages across the grassed areas of the AIPM site at or after dusk by digging conical shaped holes in search of invertebrates, fungi and tubers (DECC 2005, NSW NPWS 2004b). Although the majority of grassed areas of the AIPM site are used from time to time the Long-nosed bandicoot focuses their feeding activity on the northern lawn in front of the current accommodation building. This foraging area is considered an important resource for this species as there is limited open area foraging habitat in the surrounding SHNP. This proposal would expand this area through removal of the current accommodation block, with the exception of Spring and Kookaburra Cottages. Although there would be an overall reduction in grassed area across the site, approximately 450 m^2 of lawn would be reinstated along northern section of the site thereby expanding foraging habitat within their preferred foraging area. Additionally, low dense indigenous vegetation would be planted along the northern boundary of the Heritage Track to provide refuge areas for the Long-nosed Bandicoot. These considerations are in accordance with requirements set out within the EIAGs for this species that state that *all habitat for this species is considered significant and habitat should not be fragmented or movement should not be restricted by development* (NSW NPWS 2004b).

Predation by feral animals is considered a key threatening process for this population (NSW NPWS 2004b). Predation by native animals is also a consideration for this species. Substantial shelter is available in the adjacent SHNP. However, landscaping undertaken on the AIPM site will provide additional refuge and shelter sites for this species that will reduce the risk of predation.

During construction and operations, vehicle movements will increase along the access road and through the site. The majority of vehicular movements would be during daylight hours although some movements would take place at dusk, during the night and at dawn. The CEMP and OEMP sets out measures to reduce the risk of bandicoots being injured or killed, including a reduction in the current speed levels along the access road and education of the construction personnel as to the importance of this population.

Monitoring of the North Head Bandicoot population is currently being undertaken (NSW NPWS 2004b) and would continue to ensure the population is not adversely affected by the prescribed burning and construction activities. In addition to this, a number of management measures would be implemented to minimise disturbance to this species during and post construction. These measures are included in the CEMP and OEMP (Gondwana Consulting Pty Ltd 2008) and are outlined in Section 0.

Does the proposal affect any threatened species or populations at the limit of its known distribution?

The Long-nosed Bandicoot endangered population is currently isolated on the headland of North Head (DECC 2005). This population is at the limit of its known distribution at North Head.

How is the proposal likely to affect current disturbance regimes?

Construction activities would alter current disturbance regimes. Increased disturbance is likely to occur through increases in traffic, noise and an overall increase in human activities on site. These disturbances would be temporary. Mitigation measures within the CEMP specifically address measures to minimise impacts associated with construction (see Section 0).

Operational disturbance patterns pertaining to the AIPM site would not be substantially altered over current levels as all redevelopment would be undertaken within the boundaries of the AIPM site and activities within the site would not be markedly altered from current patterns.

How is the proposal likely to affect habitat connectivity?

This population is currently isolated and further fragmentation of habitat is considered detrimental (NSW NPWS 2004b). The AIPM site is already a cleared area and as such, the proposal would not result in additional isolation of habitat. The increased foraging resources and landscaping between buildings and along the Heritage Track would also provide refuges which will facilitate more extensive movement throughout the area. These considerations are in accord with the EIAGs that state that further fragmentation of habitat should be avoided as it would be detrimental to the persistence of this population.

How is the proposal likely to affect critical habitat?

There is no declared critical habitat for this endangered population.

4.5.4 Little Penguin Endangered Population

Environmental Impact Assessment Guidelines (NSW NPWS 2003) and a Recovery Plan (NSW NPWS 2000) have been prepared for this population. The Recovery Plan aims to maintain and enhance the current population of Little Penguins through research and implementing recovery criteria.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Little Penguin nests in a variety of situations, including under rocks on the foreshore, under seaside houses and stairs, in wood piles, under overhanging vegetation (including Lantana) and under the roots of Coral Trees (*Erythrina sykesii*) (DECC 2005) and under Many Wharf. The Recovery Plan for this population refers to habitat disturbance and destruction as a key threat to this population.

This species is known to breed along the ridgetop of northern boundary of the AIPM site. Breeding habitat would not be removed as part of the proposal and construction associated with the redevelopment would not occur in the area known to support breeding habitat. Additionally, the current scheme provides additional setback from the northern breeding areas to the redevelopment. Measures to prevent stormwater runoff and sedimentation from entering the

breeding area are outlined in the CEMP and an Erosion and Sedimentation Plan would be prepared prior to construction beginning.

However, indirect construction impacts could occur especially during breeding and moulting when the Little Penguin is particularly sensitive to disturbance. Disturbance to breeding behaviour as well as protection of critical habitat of this species would be avoided through the stringent implementation of a number of management measures included in the CEMP and OEMP (Gondwana Consulting Pty Ltd 2008) (see Section 5), including staged construction to allow the current accommodation blocks remain in place as a visual and noise barriers until substantial completion of the remaining redevelopment has been completed. Removal of the current accommodation block should be undertaken outside of the moulting period from approximately February through April.

Monitoring of the population is currently undertaken by DECC. The DECC monitoring program provides a considerable database for pre-construction benchmarks. The CEMP (Gondwana Consulting Pty Ltd 2008) also sets out additional monitoring to be undertaken during construction including:

- The Contractor, under DECC (NPWS) direction or supervision, will monitor ambient night lighting levels below the cliffline in the central area of the site (using a hand held light meter) between 9pm and 10pm of a weekday evening and at the same times on Sunday night for three consecutive weeks before the start of works. This will provide a baseline against which to assess any increased light levels at this location, due to security lighting, during the demolition/construction works. Monitoring of night light levels - at the same position and times - will be undertaken, by the Contractor, quarterly during the works if requested by the DECC (NPWS) (and preferably undertaken in conjunction with other Little Penguin monitoring efforts to avoid additional disturbance).
- Weekly monitoring of Little Penguins will be undertaken at the start of demolition/construction works, and will take place weekly for the first 3 months of activity. After this time monitoring frequencies will revert to fortnightly, including during the breeding and moulting season, or as consistent with the DECC (NPWS) established monitoring programme.
- Monitoring frequencies will also be increased whenever possible impacts are suspected, as evidenced by Little Penguin numbers dropping (or increasing) to outside the range of previously observed population and breeding variability, the DECC (NPWS) direction, or on the Contractor's and/or THINC Project's own accord.
- Little Penguin breeding burrows will be determined by visual inspection, in a manner similar to the established DECC (NPWS) monitoring program, and recorded. Non-breeding burrows will also be recorded.
- The Contractor will engage suitably qualified personnel or induct and train nominated staff, as approved by the DECC (NPWS), to undertake the above monitoring tasks and to be available (if required) for the identification, handling and release of Little Penguins from pits/holes/trenches, stockpiles, machinery or other work sites. The DECC (NPWS) will be offered the opportunity to undertake the monitoring program before other personnel are engaged to undertake this role. Local "Penguin Wardens" may also be considered for these roles, if appropriate.

- The Contractor will regularly - at least weekly during the nesting/breeding season and least fortnightly at other times - monitor that area of the work site north of the northernmost silt fence to the top of the cliffline and Little Penguin nesting/breeding area for new Little Penguin breeding burrows and other nesting or Penguin activity. All Contractor staff (including sub-contractors) will be vigilant for Little Penguins, or sightings of activity, across other "higher" parts of the site. Any sign of new Little Penguin activity will be immediately notified to THINC Project's Project Manager and the DECC (NPWS), and measures for the protection of possible outlying burrows agreed for implementation by the Contractor. The Contractor will maintain a record of all Little Penguin incursion, evidence or activity above the cliffline and foreshore nesting/breeding area.
- The Contractor will maintain a record of all Little Penguins, and other fauna, removed from pits/holes/trenches, stockpiles, machinery or other work sites - including the timing, species, condition, location and other relevant information.
- The Contractor will conduct regular inspections - at least twice weekly - to assess the integrity and effectiveness of fencing, barriers, stormwater and erosion and sedimentation control measures, in particular after rain events.
- Stormwater quality will be assessed, at least fortnightly or immediately after major rainfall events, by the Contractor over the duration of the demolition/construction, and the results recorded - refer EP09 for stormwater assessment parameters.
- The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if erosion and sedimentation controls are breached, stormwater management measures fail, or contaminated stormwater discharges are detected to the extent that sediment or other material is deposited within the nesting area through erosion and water movement or excess/contaminated stormwater passes over the cliff edge and into the nesting area.
- The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if the Little Penguin colony is disturbed in any way.
- The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if dead or sick Penguins are noted. Any injured animals will be dealt with immediately according to a protocol to be developed with the DECC (NPWS). The Contractor will maintain a record of all Little Penguins, and other fauna, injured or killed on-site.
- The Contractor will undertake "before and after" light and noise monitoring, using hand held light and noise meters, at a minimum of two locations in the Little Penguin foreshore nesting/breeding area (one above and one below the cliffline) to assess the effectiveness of any temporary noise and light barrier installed above the Little Penguin foreshore nesting/breeding area.

As the proposal will not alter current breeding habitat and strict management measures will be implemented to avoid indirect impacts on this population it is considered unlikely that the redevelopment will affect the lifecycle of this species if management measures are strictly followed.

How is the proposal likely to affect the habitat of a threatened species, populations or ecological community?

The Little Penguin nests in the sandstone cliffs of Spring Cove (Area A, NSW NPWS 2003). This is the only breeding population on the mainland of NSW (DECC 2005). The area is declared critical habitat for this species (NSW NPWS 2002). Impacts on this habitat are addressed at a later stage of this assessment where critical habitat is concerned.

Does the proposal affect any threatened species or populations at the limit of its known distribution?

The Little Penguin endangered population inhabiting the Manly Harbour foreshore is the only known mainland breeding population in NSW (DECC 2005). This population is therefore at the limit of its known distribution.

How is the proposal likely to affect current disturbance regimes?

Disturbance regimes would be altered during construction through changes in noise, vibration and an increase in human activity on the site. Current disturbance regimes are relatively minimal. The greatest disturbance threats are through feral and domestic animals and through human-induced impacts. Further weed invasion along the western boundary may also increase current disturbance regimes. The CEMP and OEMP (Gondwana Consulting Pty Ltd 2008) addresses ways in which these would be minimised including control of feral animals on site, fencing of the area to prevent inappropriate access to the site, education of all site personnel and weed management and landscaping plan (refer to Section 5).

How is the proposal likely to affect habitat connectivity?

The proposed works would not isolate any Little Penguin habitat as nest sites are located on the cliffs along the northern boundary of the AIPM site.

How is the proposal likely to affect critical habitat?

The site includes a section of the foreshore declared as Critical Habitat for this population of Little Penguins (NSW NPWS 2002). The foreshore, cliffs and associated cliff top of Spring Cove bounds the north of the AIPM site. This area falls into Area A of the declared Critical Habitat (NSW NPWS 2002). No works or other activities would be undertaken within declared Critical Habitat.

The key threats to this population listed in the Recovery Plan (NSW NPWS 2000) are predation, loss of habitat and disturbance of nest sites.

Predation by foxes, dogs and cats is a threat to this population. Dogs have killed a number of Little Penguins in residential areas and in Spring Cove a dog from a moored boat came ashore and killed a number of individuals (NSW NPWS 2000). Foxes and cats also pose a threat to the nesting birds. There are no domestic dogs present on the AIPM site and guard dogs would not be used for security purposes during construction. Feral animals would be controlled through strict management of putrescible waste on the site during construction and operation.

Minimising the disturbance to the species through indirect impacts has been considered in the proposed redevelopment. Noise and light will be minimised through a number of measures. Construction will be undertaken 24 m from the northern boundary wall and behind existing buildings that will act as a noise barrier. Demolition of the current accommodation block would be undertaken after substantial completion of the major construction activities on site and this area is within 12 m of the Little Penguin nesting habitat. The current plan has been redesigned to relocate the Senior Common Room from the north-western end of the redevelopment to the current building footprint. This significant change will aid in ensuring that the Little Penguin's activities are not disturbed through noise and light.

Pollution is also considered a threatening process for this species (NSW NPWS 2003). Stormwater runoff may expose the population to pollutants causing mortality or reduction in breeding (NSW NPWS 2000). During construction the potential for sediment runoff and grey water runoff from development activities will be mitigated against through the preparation and implementation of an Erosion and Sedimentation Plan prior to construction. These mitigation measures are included in the CEMP and OEMP (Gondwana Consulting Pty Ltd 2008) and would include such features as monitoring of stormwater runoff, installation of siltation fences and redirecting water flows.

During construction vehicle movement will increase through the site. The access roads do not enter critical habitat and movement of vehicles across the site to construction areas will not enter Little Penguin habitat. The CEMP (Gondwana Consulting Pty Ltd 2008) incorporates mitigation measures that consider the sensitive breeding time of the Little Penguin and avoid high activity and noise levels (including vibrations) during this time (refer Section 5).

4.6 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

A one off Bilateral Agreement applies to the redevelopment of the AIPM site as it is deemed a 'controlled action' under the EPBC Act and is subject to assessment under Part 3A of the EP&A Act. Species and populations listed under the EPBC Act that are relevant are listed below:

- Bynoe's Wattle (*Acacia bynoeana*);
- Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*);
- Nielson's Park She-oak (*Allocasuarina portuensis*)*;*
- Heart-leaved Stringybark (*Eucalyptus camfieldii*);
- Spotted-tailed Quoll (*Dasyurus maculatus*);
- Southern Brown Bandicoot (*Isoodon obesulus obesulus*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*); and
- Giant Burrowing Frog (*Heleioporus australiacus*).

An assessment of potential impacts of the redevelopment on habitat for these species as required was carried out by GHD accordance with the EPBC Act *Administrative Guidelines for Significance*. GHD

(2006) concluded that the redevelopment would not significantly impact these species. A further assessment of the Preferred Project Scheme is provided below.

An action is likely to have a significant impact if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

None of the listed flora or fauna occurs on the AIPM site although there is suitable habitat for these species within the adjacent SHNP. The redevelopment of the site would be undertaken within the current boundaries of the AIPM and consequently it is unlikely that an important population of these would be impacted to such an extent that it would lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

The redevelopment of the site would be undertaken within the current boundaries of the AIPM and consequently it is unlikely that an area of occupancy of an important population would be reduced.

Fragment an existing important population into two or more populations

The redevelopment of the site would be undertaken within the current boundaries of the AIPM and consequently it is unlikely that fragmentation to any population would occur.

Adversely affect habitat critical to the survival of a species

There is no known habitat critical to the survival of the species present at the site.

Disrupt the breeding cycle of an important population

Disruption of the breeding cycle of an important population is not anticipated as minor potential impacts to the adjacent SHNP would be managed through stringent implementation of the CEMP and OEMP, which includes measures to manage erosion and sedimentation.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The AIPM site is currently modified and would not provide quality habitat for any of the relevant species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

There would be ongoing weed management across the site and therefore it is unlikely that invasive species would spread across the site and into the adjacent SHNP as a consequence of this proposal.

Introduce disease that may cause the species to decline

This proposal is not of the type that would increase the risk of the introduction and / or spread of disease that would affect the relevant species. However, there is the potential that *Phytophthora cinnamomi* (Pc) could be spread into and across the site through movement of vehicles and machinery during construction. The CEMP details the measures that would be undertaken during construction to control the introduction / spread of this pathogen across the site and into the adjacent SHNP.

Interfere substantially with the recovery of the species

It is unlikely that this proposal would interfere substantially with the recovery of species as the proposed development would be contained within the current site boundaries and a range of mitigation measures are proposed to protect adjacent habitats.

Conclusion

It is considered that impacts on any species are unlikely to be significant as all proposed development would be undertaken with the current site boundaries and any anticipated impacts could be managed through the implementation of a number of measures to protect these habitats including measures detailed in the CEMP and OEMP.

5 AVOIDANCE AND MITIGATION RECOMMENDATIONS

A number of measures are proposed for implementation at the site to assist with the prevention of impacts on the endangered populations of the Little Penguin and Long-nosed Bandicoot and native flora and fauna within the SHNP and these are discussed below.

5.1 Consultation

This project has been ongoing for a number of years and consultation with DECC (formerly NPWS and DEC) has been ongoing over this time. It is understood that consultation has assisted the AFP in steering some aspects of this proposed redevelopment. Some of the outcomes of these consultations have included the following measures to protect the endangered populations on the site:

- Removal of existing residential buildings to keep the area to the north of the Heritage Track clear with the aim of extending the Long-nosed Bandicoot habitat and setting development back from Little Penguin habitat;
- Provision of low and dense native vegetation along the northern side of the Heritage Track in order to provide the Long-nosed Bandicoot with refuge habitat;
- Ensuring all construction activities occur during daylight hours;
- Retention of the current row of northern accommodation rooms until after construction is largely completed elsewhere on the site to provide a visual and noise barrier from the proposed construction activities; and
- Construction activities may occur on the site from 1 June to 28 February (Little Penguin breeding period) as all construction activities will occur behind current building lines. Construction should be undertaken in strict accordance with the Construction Environmental Management Plan.

5.2 Avoidance

A number of measures have been incorporated into the revised amended design scheme for this redevelopment so as to minimise impacts on the Long-nosed Bandicoot and Little Penguin. Such design features include:

- Removal of the new Senior Common Room and deck from near to the northern breeding habitat of the Little Penguin and foraging habitat of the bandicoot. These would be incorporated into the Heritage Quarantine buildings currently on site;
- Fencing off sensitive areas during construction to avoid inappropriate access; and
- Implementation of CEMP to minimise construction disturbance to these species by considering breeding periods and noise and vibration sensitivity.

5.3 Mitigation and Management

A number of mitigation and management measures have been developed and incorporated into the CEMP and OEMP prepared by Gondwana Consulting Pty Ltd (2008). The CEMP sections for the Little Penguin and the Long-nosed Bandicoot are included in full in Appendix A as impacts have the greatest potential to occur during construction.

The CEMP and OEMP also include comprehensive management actions for:

- Vegetation, weeds and pest control;
- *Phytophthora cinnamomi* (Pc) control; and
- Erosion and Sedimentation Control

It is considered that with stringent implementation of the measures detailed in the CEMP and OEMP that any potential impacts could be mitigated against thereby protecting the biodiversity values on-site and off-site at North Head.

6 CONCLUSIONS

The AIPM site is located in an environmentally sensitive area which has been listed as a National Heritage Place. Although the majority of the site has previously been cleared its location at North Head, siting adjacent to Sydney Harbour National Park and the presence of two endangered populations on the AIPM facility makes stringent ecological management of the site a high priority. The Little Penguin population is known to breed along the ridgetop of the northern boundary of the site. This area has also been declared Critical Habitat for this species. The Long-nosed Bandicoot forages across the site with concentrated activity along the northern grassed area in front of the existing residential accommodation. It is not known to breed on the AIPM site but would find nesting habitat within the Sydney Harbour National Park.

Key threshold statements relevant to this proposal are detailed below:

Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

- It is considered that overall biodiversity values on and adjacent to the site would not be compromised;
- Strict implementation of the CEMP would protect the Long-nosed Bandicoot during construction;
- The overall outcome for the Long-nosed Bandicoot on site would be improved by adoption of the Preferred Project Scheme (20816-10.DD03-06 10 November 2008) which includes expansion of the Long-nosed Bandicoot's foraging habitat;
- Stringent and diligent implementation of the CEMP would protect the Little Penguin during construction; and
- The overall outcome for the Little Penguin on site would be maintained through the adoption of the Preferred Project Scheme (20816-10.DD03-06 10 November 2008) which sets development back from the Little Penguin breeding habitat.

Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.

- It is considered that the long-term viability of overall biodiversity values on the site and adjacent to the site would not be compromised;
- Strict implementation of the CEMP would protect the Long-nosed Bandicoot during construction;
- The overall outcome for the Long-nosed Bandicoot on site would include long-term viability by implementation of sensitive landscaping and building design and increasing foraging habitat for this species;
- Stringent and diligent implementation of the CEMP would assist with maintaining this Little Penguin population on site during construction by ensuring successful breeding; and
- The long-term viability of the Little Penguin on site would be maintained through the inclusion of the Preferred Project Scheme which was designed to protect the nest sites of this species but removing further development along the northern section of the site.

Whether or not the proposal is likely accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

- It is considered that overall biodiversity on and adjacent to the site would not be placed at risk;
- Revision of the Preferred Project Scheme and stringent and diligent adherence to the CEMP would reduce the risk that either the Long-nosed Bandicoot or Little Penguin would abandon the site. If either population was to abandon the site it is:
  - Unlikely that the Little Penguin population would thrive long-term due to available limited safe nesting area within the Manly LGA; and
  - It is expected that the long-term viability of the Long-nosed Bandicoot would decrease due to limited foraging resources across North Head.

Whether or not the proposal will adversely affect critical habitat.

- The ridgetop along the northern boundary of the AIPM site supports Critical Habitat for the Little Penguin.
- Stringent and diligent implementation of the CEMP would protect the Critical Habitat from adverse impacts.

The strict implementation of the CEMP (Gondwana Consulting Pty Ltd 2008) is critical to the maintenance of the Little Penguin and Long-nosed Bandicoot populations on site and in the protection of the adjoining SHNP as the majority of the potential risks to biodiversity are associated with the construction phase. The management measures outlined in that document would prevent major impacts on either of these endangered populations. It is considered that operational aspects of the redevelopment of the AIPM site would not be substantially different to current levels and could be managed successfully to avoid long-term impacts on these species.

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APPENDIX A

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN LITTLE PENGUIN AND LONG-NOSED BANDICOOT

Gondwana Consulting Pty Ltd 2008

Little Penguin (*Eudyptula minor)*	
Performance Objective	▪ To minimise any impacts of the works on the Little Penguin colony. ▪ To protect the Little Penguin foreshore nesting/breeding area and any other parts of the site important to the species. ▪ To ensure continued use of the area by Little Penguins during construction, at levels comparable to existing levels.
Goals	▪ No disruption to the Little Penguin population, particularly during breeding and moulting periods. ▪ No reduction in the numbers of Little Penguins using the site, outside the range of previously observed population and breeding variability.
Mitigation Measures	▪ Site induction of all personnel, including contractors, will include information on the Little Penguin, the extent of the foreshore nesting/breeding area and its importance, and the measures in place or to be followed to protect both. ▪ Advisory and regulatory signs will be installed at the entrance to the construction site (AIPM complex) and along the upper (southern) margin of the site's northern cliffline/foreshore (approximately along the line of the existing low wall, and extending west past the known active Penguin breeding burrow near the sewage pumping station) indicating "sensitive habitat/restricted access" and advising access restrictions associated with the Little Penguin foreshore nesting/breeding area. The signs will identify the area as environmentally sensitive, specify access/use protocols and/or restrictions, and include contact details for the Contractor's Health Safety and Environment Officer or other appropriate Contractor representatives. ▪ No part of the foreshore nesting/breeding area, and no vegetation in the vicinity (within 10-12 metres) of the known active breeding burrow above the cliffline (near the sewage pumping station), will be cleared during the project. Any unforeseen activity/works that may be essential in this area will require discussion with, and prior approval by, the DECC (NPWS). ▪ The Contractor will endeavour to schedule the works, notably demolition and external/building envelope construction, in recognition of the location of individual works activities on the site (and especially proximity to the Little Penguin foreshore nesting/breeding area) and periods of Little Penguin vulnerability (especially moulting and breeding times) so as to minimise potential impacts wherever practical. ▪ The two existing northern accommodation blocks (adjacent to Spring Cove Cottage) will be retained while demolition

works and construction of the external building envelopes takes place across the southern/south-western parts of the site. These buildings will provide a barrier - physical, visual and acoustic - between much of the works site and most of the Little Penguin foreshore nesting/breeding area. This should negate the need for a special noise and light barrier in this area during these works. However the need for such a barrier will be regularly reviewed in consideration of the monitoring of Little Penguin numbers/activity during construction and discussions with the DECC (NPWS).

- The two existing northern accommodation blocks (adjacent to Spring Cove Cottage) will be demolished following, or at substantial completion of, construction works across the remainder of the site. This will only occur, subject to project staging, at a time outside the Little Penguin breeding season (July to February) and the moulting period (from approximately February to the end of April) - but may occur inside these times with DECC (NPWS) approval if breeding is not occurring and dependent on monitoring results. A construction fence and silt fencing will be installed along the downslope side of these structures - no more than 3 metres north of the existing building line - during demolition and construction works to limit access/movement and impacts on the Little Penguin foreshore nesting/breeding area (and grassed Bandicoot foraging areas, as below). No heavy machinery will be permitted in the area above the nesting/breeding colony below the line of the construction/silt fence, with all machinery to work east-west "along contour" or from upslope of the site. This area will be rehabilitated to match the existing ground surface and turfed.
- THINC Project's Project Manager and the Contractor will liaise with the DECC (NPWS) regarding the need for a temporary noise and light barrier downslope of the two existing northern accommodation blocks (adjacent to Spring Cove Cottage) during the demolition of these structures and reinstatement of this site – especially if works are approved by the DECC (NPWS) during the breeding/moulting seasons. Such a temporary structure may be warranted in order to retain noise levels as close as possible to ambient levels and minimise disruption to the Little Penguin colony, and/or in response to the findings of the monitoring of Little Penguin numbers/activity. This barrier, if required, will be designed and installed so as not to impede fauna movement (and the passage of stormwater) and could be installed as part of the hay bales silt barrier. However its final position and structure will (if it is warranted) would require further detailed design, to be undertaken by the Contractor and approved by the THINC Projects Project Manager and the DECC (NPWS) prior to construction.
- Temporary fencing will be erected to protect the known active Little Penguin breeding burrow downslope of the sewage pumping station (but above the cliffline) north-west of Kookaburra Cottage. Temporary plastic mesh fencing, or similar, will be supported by signage - with all

fencing/barriers not extending to within 200 millimetres above the ground surface, to allow for the passage of Little Penguins underneath (and Long-nosed Bandicoots that transit this area, as below).

- Any night or security lighting of the construction area will be directed away from the Little Penguin nesting areas, wherever possible. Any lighting essential in this area will be provided with suitable hoods or glare-foils to reduce light spill across the Penguin nesting areas.
- The Contractor will ensure that all security personnel, including contractors, are suitably inducted prior to commencing work on site - with particular reference to the Little Penguin nesting area and the requirements/behaviour of this species. Security personnel's patrol routes and operating procedures may be modified to minimise disturbance to Little Penguins. Dogs will not be permitted on-site as part of security operations.
- In conjunction with management measures for the Long-nosed Bandicoot - refer below for further details - all pits/holes/trenches within 25 metres of the upper edge of the Little Penguin nesting/breeding area, and other known active breeding burrows, will be fitted with "escape ramps" (planks with cross slats/baffles) or if necessary, due to repeated incidents of trapped wildlife, covered each night (or when not "in use" for any multiple days) to prevent entrapment, injuries or death of Little Penguins.
- All pits/holes/trenches (including covered excavations and the proposed vehicle wash-down facility - see EPO7) will be checked by the Contractor for Little Penguins within 2 hours of sunrise in winter and 1 hour of sunrise in summer (in conjunction with the similar checks required for the Long-nosed Bandicoot, as below). This will be done every day, including all non-work days, while ever there are open pits/holes/trenches on-site. Any Little Penguins found are to be released immediately by encouraging their movement out of the excavation by carefully placing one or more planks (with cross slats/baffles if required) into the hole which would allow the Penguin to escape by their own volition. If this method fails to enable safe movement of a Penguin from an excavation they will be carefully relocated to immediately adjacent nesting areas by suitably qualified personnel engaged by the Contractor or inducted/trained Contractor staff, as approved by the DECC (NPWS).
- Before the use of machinery or stockpiled materials (building materials, soil, vegetation) these will be inspected by hand, within 2 hours of sunrise in winter and 1 hour of sunrise in summer (in conjunction with the similar checks required for the Long-nosed Bandicoot, as below), for Little Penguins that may have ventured into them. Any Penguins found are to be allowed to escape by their own volition or if they do not move of their own accord they will be relocated to immediately adjacent nesting areas by suitably qualified personnel engaged by the Contractor or inducted/trained Contractor staff, as approved by the DECC (NPWS).

Little Penguin (*Eudyptula minor)*	
	▪ Little Penguins will only be handled by persons trained in the handling of the Penguins, as approved by the DECC (NPWS). Local "Penguin Wardens" may also be considered for these roles, if appropriate. ▪ The Contractor will identify up to 4 personnel, one of whom will be the Site Health Safety and Environment Officer, who will receive additional training and be approved by the DECC (NPWS) to be able to enter the Little Penguin foreshore nesting/breeding area to carry out monitoring, assessment and other tasks as specified in this CEMP and as may be essential during the project's demolition/construction phase. Except in emergencies, access for other staff and activities - on a one-off or specific tasks basis - will first be discussed with the DECC (NPWS) and appropriate precautionary/protective measures identified. ▪ Silt fencing, and other erosion and sedimentation control measures, will be implemented according to the Erosion and Sediment Control Plan (Appendix D) to limit the movement and deposition of sediment, building wastes and other materials downslope into the Little Penguin nesting area. ▪ During the initial construction phase, and prior to harvesting and re-use, stormwater and surface water flows across the site will continue to be directed into the existing stormwater discharge system - comprising inlet drains, piping, holding/settling pits, and established discharge points at three locations in the cliffline (towards the western portion of the site, via the existing/piped central drainage line and via an existing outlet near the eastern sandstone wall). This drainage system and stormwater discharge points have co-existed with the Little Penguin colony for many years. However additional stormwater and erosion and sediment control measures will be implemented - as set out in the Erosion and Sediment Control Masterplan (Appendix D), refer EP09 - to prevent over-loading or contamination of the stormwater system during the demolition/construction phase and any possible impacts on the Little Penguin nesting area. ▪ The central drainage line will be channelised/lined with rock surfacing and clumped plantings, during construction and a rock anti-scour/energy-diffusing bed installed at its discharge point above the cliffline and Little Penguin nesting area - as shown in the Site Landscape Plan (Appendix C). Two additional stormwater discharge points will be installed upslope of the cliffline at the extreme western and eastern ends of the site, also discharging via rock anti-scour/energy-diffusing beds onto the grassed area above the Penguin colony. ▪ The grassed area above (south) of the Little Penguin nesting area will be retained, and enhanced, to assist in filtering surface water flows from the site before they reach the nesting area (as well as being an important Long-nosed Bandicoot foraging area, as below). Small pockets of

Little Penguin (*Eudyptula minor)*	
	clumped plantings of low native species will also be established along the downslope edge of the lower (northern) roadway - as shown on the Site Landscape Plan (Appendix C) - to intercept minor surface runoff before spilling this out to filter across this grassed area as overland flow. ▪ An 8 kph speed limit will apply, and be enforced, for all vehicle movements within the site to minimise the risks posed to any Little Penguins that may venture beyond the nesting area (as well as for safety and logistical reasons, given the confined site area).
Performance Measures	▪ Penguins continue to follow normal nesting, breeding and moulting activities throughout demolition and construction activity (as benchmarked from existing DECC (NPWS) population monitoring data). ▪ No reduction in the numbers of Penguins nesting during demolition and construction, outside the range of previously observed population and breeding variability as compared to past years (from existing DECC (NPWS) population monitoring data) and in reference to local habitat in use elsewhere. ▪ No abandoned Little Penguin nests, beyond those that could be expected under normal breeding behaviours (as advised by DECC (NPWS) and previously observed breeding behaviours/variability). ▪ No death of adults or chicks on-site due to demolition/construction activities. ▪ No intrusions or disturbance of the Little Penguin nesting area, or known active breeding burrows above the cliffline.
Monitoring / Auditing / Reporting	▪ The established DECC (NPWS) Little Penguin monitoring program provides considerable background/pre-works data. This will be employed as a pre-construction benchmark against which to assess any effects of the works on the Little Penguin colony. ▪ The Contractor, under DECC (NPWS) direction or supervision, will monitor ambient night lighting levels below the cliffline in the central area of the site (using a hand held light meter) between 9pm and 10pm of a weekday evening and at the same times on Sunday night for three consecutive weeks before the start of works. This will provide a baseline against which to assess any increased light levels at this location, due to security lighting, during the demolition/construction works. Monitoring of night light levels - at the same position and times - will be undertaken, by the Contractor, quarterly during the works if requested by the DECC (NPWS) (and preferably undertaken in conjunction with other Little Penguin monitoring efforts to avoid additional disturbance). ▪ Weekly monitoring of Little Penguins will be undertaken at the start of demolition/construction works, and will take place weekly for the first 3 months of activity. After this time monitoring frequencies will revert to fortnightly, including

during the breeding and moulting season, or as consistent with the DECC (NPWS) established monitoring programme.

- Monitoring frequencies will also be increased whenever possible impacts are suspected, as evidenced by Little Penguin numbers dropping (or increasing) to outside the range of previously observed population and breeding variability, the DECC (NPWS) direction, or on the Contractor's and/or THINC Project's own accord.
- Little Penguin breeding burrows will be determined by visual inspection, in a manner similar to the established DECC (NPWS) monitoring program, and recorded. Non-breeding burrows will also be recorded.
- The Contractor will engage suitably qualified personnel or induct and train nominated staff, as approved by the DECC (NPWS), to undertake the above monitoring tasks and to be available (if required) for the identification, handling and release of Little Penguins from pits/holes/trenches, stockpiles, machinery or other work sites. The DECC (NPWS) will be offered the opportunity to undertake the monitoring program before other personnel are engaged to undertake this role. Local "Penguin Wardens" may also be considered for these roles, if appropriate.
- The Contractor will regularly - at least weekly during the nesting/breeding season and least fortnightly at other times - monitor that area of the work site north of the northernmost silt fence to the top of the cliffline and Little Penguin nesting/breeding area for new Little Penguin breeding burrows and other nesting or Penguin activity. All Contractor staff (including sub-contractors) will be vigilant for Little Penguins, or sightings of activity, across other "higher" parts of the site. Any sign of new Little Penguin activity will be immediately notified to THINC Project's Project Manager and the DECC (NPWS), and measures for the protection of possible outlying burrows agreed for implementation by the Contractor. The Contractor will maintain a record of all Little Penguin incursion, evidence or activity above the cliffline and foreshore nesting/breeding area.
- The Contractor will maintain a record of all Little Penguins, and other fauna, removed from pits/holes/trenches, stockpiles, machinery or other work sites - including the timing, species, condition, location and other relevant information.
- The Contractor will conduct regular inspections - at least twice weekly - to assess the integrity and effectiveness of fencing, barriers, stormwater and erosion and sedimentation control measures, in particular after rain events.
- Stormwater quality will be assessed, at least fortnightly or immediately after major rainfall events, by the Contractor over the duration of the demolition/construction, and the results recorded - refer EP09 for stormwater assessment parameters.

Little Penguin (*Eudyptula minor)*	
	▪ The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if erosion and sedimentation controls are breached, stormwater management measures fail, or contaminated stormwater discharges are detected to the extent that sediment or other material is deposited within the nesting area through erosion and water movement or excess/contaminated stormwater passes over the cliff edge and into the nesting area. ▪ The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if the Little Penguin colony is disturbed in any way. ▪ The Contractor will notify THINC Project's Project Manager and DECC (NPWS) immediately if dead or sick Penguins are noted. Any injured animals will be dealt with immediately according to a protocol to be developed with the DECC (NPWS). The Contractor will maintain a record of all Little Penguins, and other fauna, injured or killed on-site. ▪ The Contractor will undertake "before and after" light and noise monitoring, using hand held light and noise meters, at a minimum of two locations in the Little Penguin foreshore nesting/breeding area (one above and one below the cliffline) to assess the effectiveness of any temporary noise and light barrier installed above the Little Penguin foreshore nesting/breeding area.
Corrective Action	▪ In the case of the abandonment of nest sites and/or chicks or death of Little Penguins all works on the site will cease and, as soon as is practical, the DECC (NPWS) will inspect the Little Penguin colony and remedial/corrective actions identified in liaison with THINC Projects. The Contractor will be responsible for implementing corrective actions as per DECC (NPWS) advice. ▪ If monitoring indicates a marked reduction in Little Penguin numbers or activity generally within the colony - outside the range of previously observed population and breeding variability to a level to be agreed with the DECC (NPWS) - and this can be reasonably attributed to the demolition/construction works (rather than off-site or other influences), then the following strategies may be implemented after prior discussion with the DECC (NPWS): o additional or upgraded fencing of the nesting area - including installing or upgrading noise and light barriers if appropriate - to further reduce the impacts of demolition/construction activities; o modification of night lighting to reduce light spill across the nesting area; o modification of evening and night security patrols/activity; o reviewing daily operations and limiting the most disruptive or intrusive operations to the middle of the work day, or other periods when Little Penguins are

least active or susceptible;

- reviewing and limiting work hours in the 2 to 3 hours immediately before dusk and after sunrise; and
- rescheduling highly disruptive works to outside the Little Penguin breeding and moulting periods.

- The above reduction in Little Penguin numbers/activity will also trigger an inspection of the site, as soon as is practical and within a maximum of 3 working days, by the DECC (NPWS) and the identification of corrective actions as per DECC (NPWS) advice for discussion with the Contractor and THINC Project's Project Manager. These actions may include the above, or alternative, corrective measures.
- Penguin monitoring measures will be increased, if this is supported by the DECC (NPWS) and will not further disrupt/stress the population, to assess the efficacy of the above remedial measures.
- The Contractor will liaise with the THINC Project's Project Manager and DECC (NPWS) prior to undertaking any works to remediate any inadvertent damage/impacts to the Little Penguin nesting area or individual burrows. As soon as is practical the DECC (NPWS) will inspect any damage/impact to the nesting area and provide advice as to preferred corrective actions.
- If monitoring indicates that Little Penguins are observed to stray into the main works area on more than 1 occasion in any 2 week period, then the following strategies may be implemented (after prior discussion with the DECC (NPWS) where relevant):
  - additional warning signage will be installed at high risk locations or sites with a record of near-misses or incidents;
  - speed humps and other traffic slowing devices may be installed at high risk locations or sites with a record of near-misses or incidents; and
  - perimeter fencing on the main works area will be upgraded/reinforced (where this does not adversely affect other species, notably the Long-nosed Bandicoot, as below).
- If monitoring shows pits/holes/trenches to be a serious hazard for Little Penguins, with Penguins being found on more than 1 occasion in any 2 week period, low level fencing (anchored to, or below, the ground surface) or similar more substantial measures will be installed at problem sites where Little Penguins have been repeatedly located in pits/holes/trenches or for all such features within 25 metres of the top of the cliffline and nesting area.
- The need for a temporary noise and light barrier downslope of the two existing northern accommodation blocks (adjacent to Spring Cove Cottage) during the subsequent demolition of these structures and reinstatement of this site, will be reviewed in discussions with the DECC (NPWS) in

Little Penguin (*Eudyptula minor)*	
	consideration of the findings of the monitoring of Little Penguin numbers/activity. This barrier, if required, will be designed and installed so as not to impede fauna movement (and the passage of stormwater) and could be installed as part of the hay bales silt barrier. However its final position and structure will (if it is warranted) would require further detailed design, to be undertaken by the Contractor and approved by the THINC Projects Project Manager and the DECC (NPWS) prior to construction. ▪ Damaged fencing, barriers, signage, stormwater and erosion/sedimentation control measures threat could pose a threat to the Little Penguin nesting area will be repaired/reinstated as soon as practicable after damage or failure - within 5 days maximum, or within 3 days if further significant rainfall events are predicted. ▪ Where monitoring shows that the nature/quality of stormwater passing through the nesting area poses a potential threat to Little Penguins measures such as on-site detention, treatment, diversion or capture and removal from site will be identified in discussions with the DECC (NPWS) and implemented by the Contractor as/where/when required. ▪ Investigations and/or corrective actions undertaken as a result of a complaint, audit, inspection or incident will be documented and compiled within the Environmental Complaints, Non-conformances and Corrective Actions Register as maintained by the Contractor and THINC Projects. ▪ The Contractor according to an agreed responsibility and timescale will assign or close out all corrective actions undertaken by them, or undertaken as directed by THINC Projects or the DECC (NPWS).
Responsibility	THINC Projects (where specified). Contractor. All site personnel.

Long-nosed Bandicoot (*Perameles nasuta*)	
Performance Objective	▪ To minimise any impacts of the works on the Long-nosed Bandicoot. ▪ To ensure continued use of the area by the Long-nosed Bandicoot during construction at comparable to existing levels.
Goals	▪ No reduction in the numbers of Long-nosed Bandicoot using the site in comparison to pre-construction monitoring and on-site observations from past years as well as observed activity levels across other known locally

Long-nosed Bandicoot (*Perameles nasuta*)	
	comparable habitat. ▪ No death or injury to the Long-nosed Bandicoot on-site or in surrounding areas, including Collins Beach Road, due to construction activities.
Mitigation Measures	▪ Site induction of all personnel, including contractors, will include information on the Long-nosed Bandicoot as well as the measures in place to protect them, their foraging areas and habitat. ▪ Advisory and regulatory signs will be installed at the entrance to the construction site (AIPM complex), in association with all habitat/foraging area protective fencing, and along the upper (southern) margin of the extended northern grassed foraging zone (this "sensitive habitat/restricted access" sign could also address access restrictions associated with the Little Penguin foreshore nesting/breeding area, as above). The signs will identify these areas as environmentally sensitive, specify access/use protocols and/or restrictions, and include contact details for the Contractor's Health Safety and Environment Officer or other appropriate Contractor representatives. ▪ A Bandicoot injuries and deaths "running tally" sign (similar to the "safety record" signage typically employed on large work sites) will be prominently displayed at the entry to the AIPM site - to reinforce the presence of Bandicoots and the risks posed to them - for all workers, contractors, delivery drivers and visitors entering the site. ▪ Any areas of native vegetation or potential Long-nosed Bandicoot habitat/refuge to be cleared will be thoroughly inspected - on foot - prior to clearing. Any Bandicoots encountered, that do not move to suitable nearby bushland/refuges of their own volition, will be relocated to adjacent areas of suitable habitat/refuge by suitably qualified personnel engaged by the Contractor or inducted/trained Contractor staff, as approved by the DECC (NPWS). ▪ The two existing northern accommodation blocks (adjacent to Spring Cove Cottage) will be retained while demolition and construction works take place across the southern/south-western parts of the site. These buildings will provide a barrier - physical, visual and acoustic - between much of the works site and the extended northern grassed Bandicoot foraging zone. This should negate the need for a special noise and light barrier in this area. However the need for such a barrier will be regularly reviewed in consideration of the monitoring of Bandicoot numbers/activity during construction and discussions with the DECC (NPWS). ▪ The two existing northern accommodation blocks (adjacent to Spring Cove Cottage) will be demolished following, or at substantial completion of, construction works across the remainder of the site - subject to project staging and the need to minimise possible impacts on the Little Penguin

colony (as above). This area will be rehabilitated to match the existing ground surface and turfed - increasing the extent of Long-nosed Bandicoot foraging area. These works will be timed to minimise impacts on the Bandicoots (and Little Penguins, as above). A construction fence and silt fencing will be installed along the downslope margin of these structures during demolition, to limit impacts on the grassed foraging area (and Little Penguin foreshore nesting/breeding area).

- Clumped plantings of low-growing native species will be established as occasional vegetation islands across the expanded grassed foraging area as shown on the Site Landscape Plan (Appendix C), and will serve as additional refuge areas for Bandicoots.
- Temporary barrier fencing will be erected to protect the Bandicoot foraging and movement zone (to/from SHNP) in the area north of Harbour Cottage and west of Kookaburra Cottage. This fencing will stop access by site personnel or vehicles/machinery as well as preventing stockpiling and other uses/activities (but is not intended to control noise and light). Temporary plastic mesh fencing, or similar, will be used - with all fencing/barriers not extending to within 200 millimetres above the ground surface to allow for the passage of Long-nosed Bandicoots underneath.
- Temporary fencing will be used to delineate other parts of the site where no works, storage, access/parking or other activity are proposed/planned – such as possibly along the bushland/vegetated areas of the site's southern margin. This fencing will be plastic mesh or other construction/safety style fencing. Where such temporary barriers are used they will not extend to below 200 millimetres above the ground surface, to allow for the passage of Long-nosed Bandicoots.
- Any night or security lighting of the construction area will be directed away from the main northern grassed foraging area used by Bandicoots, or provided with suitable hoods or glare-foils to reduce light spill across grassed areas.
- The contractor will ensure that all security personnel, including contractors, are suitably inducted prior to commencing work on site – with particular reference to the nocturnal and crepuscular activity of Long-nosed Bandicoots, feeding behaviour, and the location and extent of preferred foraging areas. Security personnel's patrol routes and operating procedures may be modified to minimise night disturbance to Bandicoots. Dogs will not be permitted on-site as part of security operations.
- All pits/holes/trenches that are too deep or steep sided to allow any Bandicoots falling into them to escape of their own volition - considered to be any pit deeper than 300 millimetres and with vertical sides all round - will be fitted with one or more "escape ramps" (planks at least 150 millimetres wide with cross slats/baffles for grip) each night, or when not "in use" for any multiple days, to prevent entrapment, injuries or death of Bandicoots. Multiple

"escape ramps" will be provided in those excavations obstructed by steel reinforcing or other obstacles that may limit the movement of Long-nosed Bandicoots or other wildlife (notably Little Penguins).

- All pits/holes/trenches (including covered excavations and the proposed vehicle wash-down facility - see EPO7) will be checked by the Contractor for Long-nosed Bandicoots as close to sunrise as possible, with all excavations to be checked within 2 hours of sunrise in winter and 1 hour of sunrise in summer. This will be done every day, including all non-work days, while ever there are open pits/holes/trenches on-site. Any Bandicoots found are to be released immediately by encouraging their movement out of the excavation by carefully placing a plank into the hole which would allow the Bandicoot to escape by their own volition to suitable nearby bushland/refuges. If this method fails to enable safe movement of a Bandicoot from an excavation they will be carefully removed by suitably qualified personnel engaged by the Contractor or inducted/trained Contractor staff, as approved by the DECC (NPWS), to adjacent areas of suitable habitat/refuge.
- Before the use of machinery or stockpiled materials (building materials, soil, vegetation) these will be inspected by hand and as close to sunrise as possible, with all excavations to be checked within 2 hours of sunrise in winter and 1 hour of sunrise in summer, for Bandicoots that may have taken refuge in them overnight. Any Bandicoots found are to be allowed to escape by their own volition to suitable nearby bushland/refuges. If Bandicoots do not move of their own accord they will be relocated to adjacent areas of suitable habitat/refuge by suitably qualified personnel engaged by the Contractor or inducted/trained Contractor staff, as approved by the DECC (NPWS).
- Bandicoots should only be handled by persons trained in the handling of the Long-nosed Bandicoots, as approved by the DECC (NPWS).
- Silt fencing, and other erosion and sedimentation control measures, will be implemented according to the Erosion and Sediment Control Plan (Appendix D) to limit the deposition of sediment and building wastes across downslope Bandicoot foraging areas.
- Clumped plantings of low native species will be established along the downslope edge of the lower (northern) roadway - as shown on the Site Landscape Plan (Appendix C) - to intercept minor surface runoff before spilling this out to filter across the grassed foraging area, and to provide Bandicoot refuges.
- An 8 kph speed limit will apply, and be enforced, for all vehicle movements within the site to minimise the risks posed to Bandicoots from construction vehicles (as well as for safety and logistical reasons, given the confined site area).
- All construction staff, including contractors and (as far as

Long-nosed Bandicoot (*Perameles nasuta*)	
	practical) regular suppliers/delivery drivers, will be alerted to be vigilant for Bandicoots on or beside Collins Beach Road - and especially during the period 1 to 2 hours after sunrise and 1 hour each side of dusk. All drivers will be altered to the 40 kph speed limit on Collins Beach Road.
Performance Measures	▪ Bandicoots continue to be regularly seen foraging on-site at levels comparable to before the start of demolition/construction works. ▪ Maintenance of viable Bandicoot foraging habitat outside of the demolition/construction area and any temporary fencing. ▪ No injuries to Bandicoots on-site. ▪ No Bandicoots deaths on-site. ▪ Road mortality rates for Bandicoots along Collins Beach Road are comparable to those already observed prior to the start of demolition/construction works.
Monitoring / Auditing / Reporting	▪ In addition to the established DECC (NPWS) program, monitoring of Long-nosed Bandicoots across the site will be increased prior to the start of works and within the first months of demolition and construction to establish a pre-construction benchmark and ensure Bandicoot numbers are not significantly impacted by the works. Monitoring of the presence of Long-nosed Bandicoots, involving trapping and/or spotlight transects of foraging areas and/or surveys of Bandicoot diggings, will occur for at least three nights/occasions each month for three months prior to construction. Monitoring, of the same survey intensity and using the same set of techniques, will continue during the first three months of demolition and construction. Pre-construction monitoring will be the responsibility of THINC Projects, while the Contractor will be responsible for monitoring following the commencement of demolition and construction. ▪ The Contractor will monitor ambient night lighting levels (using a hand held light meter) in the western, central and southern areas of the main northern Bandicoot foraging area above the cliffline between 9pm and 10pm on three occasions when a residential course in occupation at the site. This will provide a baseline against which to assess any increased light levels at these locations, due to security lighting, during the demolition/construction works. Monitoring of night light levels - at the same three positions and times - will be undertaken, by the Contractor, monthly for the duration of the works. ▪ These monitoring frequencies will be reviewed, in collaboration with the DECC (NPWS), after the first three months of demolition and construction and may be varied if warranted, however monitoring will continue to be undertaken at least quarterly during the entire demolition/construction period. ▪ In addition to the above monitoring measures, the Contractor will establish up to two “duration monitoring

Long-nosed Bandicoot (*Perameles nasuta*)	
	sites" where the digging activity of Long-nosed Bandicoots will be recorded one morning each month for the entire duration of demolition and construction. The site(s) will be selected in collaboration with the DECC (NPWS), and will be locations unaffected by construction activity during the entire course of the project, and each should cover an area of at least 4 metres by 4 metres. ▪ THINC Projects (for pre-works monitoring) and the Contractor will engage suitably qualified personnel or induct and train nominated staff, as approved by the DECC (NPWS), to undertake the above monitoring tasks and to be available (if required) for the identification, handling and release of Bandicoots from pits/holes/trenches, stockpiles, machinery or other work sites. The DECC (NPWS) will be offered the opportunity to undertake these roles before other personnel are engaged. ▪ DECC (NPWS) thereafter continue to monitor Bandicoot numbers at site as per their established monitoring program. ▪ The Contractor will maintain a record of all Long-nosed Bandicoots, and other fauna, removed from pits/holes/trenches, stockpiles, machinery or other work sites – including the timing, species, condition, location and other relevant information. ▪ The Contractor will arrange for the inspection of Collins Beach Road and margins, from the AIPM gate to the junction with North Head Scenic Drive, each evening within 1 hour of the end of work and departure from site of the majority of vehicles and again in the morning within 1 hour following the arrival of most on-site/worker traffic - to locate and record any injured or dead Bandicoots. ▪ The Contractor will notify the THINC Project's Project Manager and DECC (NPWS) immediately if dead or injured Bandicoots are noted on-site or along Collins Beach Road. Any injured animals will be dealt with immediately according to a protocol to be developed with the DECC (NPWS). The Contractor will maintain a record of all Bandicoots, and other fauna, injured or killed on-site or along Collins Beach Road. ▪ The Contractor will conduct regular audits - at least quarterly - of fencing, barriers and erosion and sedimentation control measures, in particular after rain events. ▪ The Contractor will notify the THINC Project's Project Manager and DECC (NPWS) immediately if erosion and sedimentation controls are breached to the extent that sediment is deposited across Bandicoot foraging areas.
Corrective Action	▪ In the case of a death or injury of a Bandicoot, the DECC (NPWS) will inspect the site as soon as is practical and the Contractor implements corrective actions as per DECC (NPWS) advice. ▪ If Long-nosed Bandicoots, or other wildlife (notably Little

Penguins), are repeatedly trapped in pits/holes/trenches despite the use of "escape ramps" then each night, or when not "in use" for any multiple days, to prevent entrapment, injuries or death of Bandicoots and other wildlife these holes will:

- have their margins delineated by scattering timber along the drop's edges; or;
- be covered with plyboard sheeting or similar); or ;
- be fenced, by fencing pegged to ground level and at least 500 millimetres high.

- If monitoring indicates a marked reduction in Bandicoot foraging activity generally across the site - to a level to be agreed with the DECC (NPWS) - then the following strategies may be implemented after prior discussion with the DECC (NPWS):
  - artificially enhancing Bandicoot foraging areas, such as by irrigation and/or aeration and/or light tilling;
  - additional or upgraded fencing of foraging areas - including noise and light barrier fencing if appropriate – to further reduce the impacts of demolition/construction activities;
  - modification of night lighting to reduce light spill across foraging areas;
  - modification of evening and night security patrols/activity;
  - reviewing daily operations and limiting the most disruptive or intrusive operations to the middle of the work day, or other periods when Bandicoots are least active or susceptible;
  - adjusting the staging works to minimise the extent of foraging areas that are subject to impacts or disturbance at any one time; and
  - reviewing and limiting work hours in the 2 to 3 hours following sunrise and before and immediately after dusk.
- The above reduction in Bandicoot foraging across the site will also trigger an inspection of the site, as soon as is practical, by the DECC (NPWS) and the identification of corrective actions as per DECC (NPWS) advice for discussion with the Contractor and THINC Project's Project Manager. These actions may include the above, or alternative, corrective measures.
- Damage to protected grassed foraging areas will be remediated, and the area reinstated to a condition equal to or above its former state, within a maximum of 3 days. This may include removal of sediment, fill or other contaminants, returfing, irrigation, and aeration/tilling. As soon as is practical the DECC (NPWS) will inspect any damaged foraging areas and provide advice as to preferred corrective actions.

- If Bandicoot injuries or fatalities due to construction traffic within the site exceeds 1 incident in any 6 month period the following strategies may be implemented where relevant (after prior discussion with the DECC (NPWS)):
  - additional warning signage will be installed at high risk locations or sites with a record of near-misses or incidents;
  - the on-site vehicle speed limit will be reduced to 5 kph;
  - speed humps and other traffic slowing devices may be installed at high risk locations or sites with a record of near-misses or incidents;
  - sub-contractors and suppliers will be required to report any incidents or repeated problems involving Long-nosed Bandicoots; and
  - reviewing daily operations in an effort to limit the majority of vehicle movements to the middle of the work day, or other periods when Bandicoots are least active or susceptible.
- If Bandicoot injuries or fatalities along Collins Beach Road, from the AIPM gate to the junction with North Head Scenic Drive, exceed 1 incident in any 6 month period - and this can be reasonably attributed to construction traffic - the following strategies may be implemented (after prior discussion with the DECC (NPWS), as owners of this road, where relevant):
  - additional warning signage will be installed at high risk locations or sites with a record of near-misses or incidents (with approval from the DECC (NPWS));
  - additional temporary speed humps and traffic slowing devices may be installed (with approval from the DECC (NPWS));
  - a special construction traffic speed limit of 20 kph will be notified and enforced, by the Contractor (with signposting as appropriate, with approval from the DECC (NPWS));
  - the construction traffic speed limit may be progressively reduced by 5 kph for every vehicle related Bandicoot injury/fatality (to a lower limit of 8 kph);
  - fencing of key sections of the roadside, possibly in conjunction with existing or additional speed humps/traffic calming, to funnel Bandicoots to managed low-speed road sections;
  - aggressive slashing of the narrow grass road verges, to temporarily reduce their foraging appeal to Bandicoots;
  - reviewing work hours and daily operations in an attempt to limit access traffic during periods of high Bandicoot activity - especially during dusk in the winter months when Bandicoot activity and departing traffic

Long-nosed Bandicoot (*Perameles nasuta*)	
	may clash most heavily; and o actively managing arriving departing worker traffic to travel Collins Beach Road in “pulses” or groups of vehicles to reduce the duration/frequency of vehicle movement along this road. ▪ If delineating the margins of pits/holes/trenches by placing timber or logs around the edge proves inadequate in deterring Bandicoot entry, low level fencing (anchored to or below the ground surface) or similar more substantial measures to guide foraging activities away from these openings will be installed at problem sites where Bandicoots have been repeatedly located in pits/holes/trenches. ▪ The need for a temporary noise and light barrier downslope of the two existing northern accommodation blocks (adjacent to Spring Cove Cottage) during demolition and construction works across other parts of the site, and during the subsequent demolition of these structures and reinstatement of this site, will be reviewed in discussions with the DECC (NPWS) in consideration of the findings of the monitoring of Bandicoot numbers/activity. If required this barrier will be designed and installed so as not to impede fauna movement. ▪ Investigations and/or corrective actions undertaken as a result of a complaint, audit, inspection or incident will be documented and compiled within the Environmental Complaints, Non-conformances and Corrective Actions Register as maintained by the Contractor and THINC Projects ▪ The Contractor according to an agreed responsibility and timescale will assign or close out all corrective actions undertaken by them, or undertaken as directed by THINC Projects or the DECC (NPWS).
Responsibility	THINC Projects (for pre-works Bandicoot monitoring). The Contractor. All site personnel.

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