Conservation Area Management Plan

for Sydney's Desalination Plant

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Section 1 Introduction

1.1 Purpose

The purpose of this Conservation Area Management Plan (CAMP) is to describe how Veolia Water Australia (Pty)Ltd (VEOLIA) manages the designated Conservation Area (CA) at Sydney's Desalination Plant during its operation and maintenance phase to protect and enhance its conservation value. This plan provides for overall management of risks relating to the conservation significance and environmental sensitivities of the CA in accordance with Ministers Conditions of Approval (MCoA) 4.6b.

Four endangered ecological communities of plants and the presence of suitable habitat for a number of threatened species of animals has been identified in the CA. The combination of endangered native vegetation and ecosystems means this small area has conservation significance much greater than its limited size.

The CAMP has been developed in accordance with applicable legislative responsibilities and specific Project Approvals and contractual requirements for the operation and maintenance of Sydney's Desalination Plant as defined in the Operate and Maintain (O&M) Contract and relevant MCoA and Statement of Commitments (SoC) as detailed in Table 3 Compliance Obligations.

1.2 Scope

The CA requires ongoing management, as such, the objective of this CAMP is to ensure that all environmental risks associated with the CA management are identified and managed through the application of appropriate safeguards.

This CAMP is applicable to all VEOLIA activities during the operation and maintenance phase of the Sydney Desalination Plant.

This document includes details on management and quantitative monitoring of:

- Intact vegetation communities
- Grey-headed Flying Fox colonies
- Habitat within the CA for Green and Golden Bell Frog, the Wallum Froglet and the Large-footed Myotis
- The condition of the CA

This plan was updated in 2017 to address the requirement to revise the Vegetation Management Plan after five years of implementation (see Section 1.1 of the Vegetation Management Plan (Appendix 1). In addition, this updated plan and prescribed monitoring reflects feedback from the past five years of ecological monitoring undertaken during the operations and maintenance phase. The latest version of this plan was completed as part of a review to ensure that the plan remains consistent with relevant endangered listings, legislation and site conditions.

It should be noted that the CAMP does not address the impacts and management of surface water and groundwater from the Sydney Desalination Plant. These issues are addressed in the Surface Water and Groundwater Management Plan (MAN-9491).

1.3 References

Table 1 - References

Document reference	Operational Environmental Management Documentation	Document Number
TIER 1		
Operational EMS	Integrated Business Management System (IBMS) Manual	MAN-9490
TIER 2		
EMP	Environmental Management Plan	MAN-9490 Section 14
TIER 3		
MWQEMP	Marine Water Quality and Ecosystem Management Plan	MAN-9674
NEMP	Noise Environmental Management Plan	MAN-9675
SWGWMP	Surface Water and Groundwater Management Plan	MAN-9491
WEMP	Waste Environmental Management Plan	MAN-9676
CAMP	Conservation Area Management Plan (this document)	MAN-9918
TIER 4		
CTP	Environmental Compliance Tracking Program	
EMPr	Environmental Monitoring Program	

1.4 Definitions

Table 2 - Definitions

Abbreviation	Definition
APZ	Asset Protection Zone
ASS	Acid Sulphate Soils
CA	Conservation Area (the section of the site set aside for conservation purposes)
CAMP	Conservation Area Management Plan (this document)
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
DPS	Desalination Plant Site (the section of site set aside for the plant)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EA	Environmental Assessment
EMP	Environmental Management Plan (Section 14 of IBMS)
EMS	Environmental Management System (See IBMS)
EMSR	Environmental Management System Representative
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPA	NSW Environment Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Cth)
EPL	Environment Protection License
GGBF	Green and Golden Bell Frog (*Litoria aurea*)
GHFF	Grey-Headed Flying Fox (*Pteropus poliocephalus*)
IBMS	Veolia's Integrated Business Management System
KDP	Kurnell Desalination Plant
KDF	Kurnell Dune Forest
LEP	Local Environmental Plan
MCoA	Ministers Conditions of Approval
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NPWS	NSW National Parks and Wildlife Service (refer to OEH)
NSW	The State of New South Wales
O&M	Operate and Maintain
OEH	NSW Office of Environment and Heritage
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
PPR	Preferred Project Report
REF	Review of Environmental Factors

RP	Recovery Plan
Schedule 5	Planning Approval Responsibilities Operate and Maintain Contract
SEPP	State Environmental Planning Policy
SFW	Sydney Freshwater Wetlands
SoC	Statement of Commitments
SOFF	Swamp Oak Floodplain Forest
SSC	Sutherland Shire Council
SSFCF	Swamp Sclerophyll Forest on Coastal Floodplains
SDP	Sydney Desalination Plant
SWC	Sydney Water Corporation
SWGMP	Surface Water and Groundwater Management Plan
TAP	Threat Abatement Plan
TS-09	Technical Schedule-09 Environmental Requirements – Operate and Maintain Contract
TSC Act	Threatened Species Conservation (TSC) Act 1995 (NSW)
VMP	Vegetation Management Program
VEOLIA	Veolia

Section 2 Operational Environmental Management Documentation

The Environmental Management System (EMS) for the operation and maintenance phase of the Sydney Desalination Plant is described in the Integrated Business Management System (IBMS) Manual MAN-9490 (Tier 1). The Environmental Management Plan (EMP) MAN-9490 Section 14 (Tier 2) describes the centralised mechanism and environmental requirements that apply during operation and maintenance of the Sydney Desalination Plant. This document, the Conservation Area Management Plan (CAMP) MAN-9918 (Tier 3) is part of the VEOLIA environmental management suite of documents required for the Sydney Desalination Plant as illustrated below (Figure 1).

This CAMP describes management measures and quantitative monitoring techniques that will be adopted to mitigate and measure potential impacts on the conservation area or the site during operation and maintenance activities.

Specific environmental management measures will be incorporated into the relevant procedures and work instructions developed to guide activities on site.

2.1 Document control

Control of all environmental management documents will be managed in accordance with section 14 of the IBMS Manual.

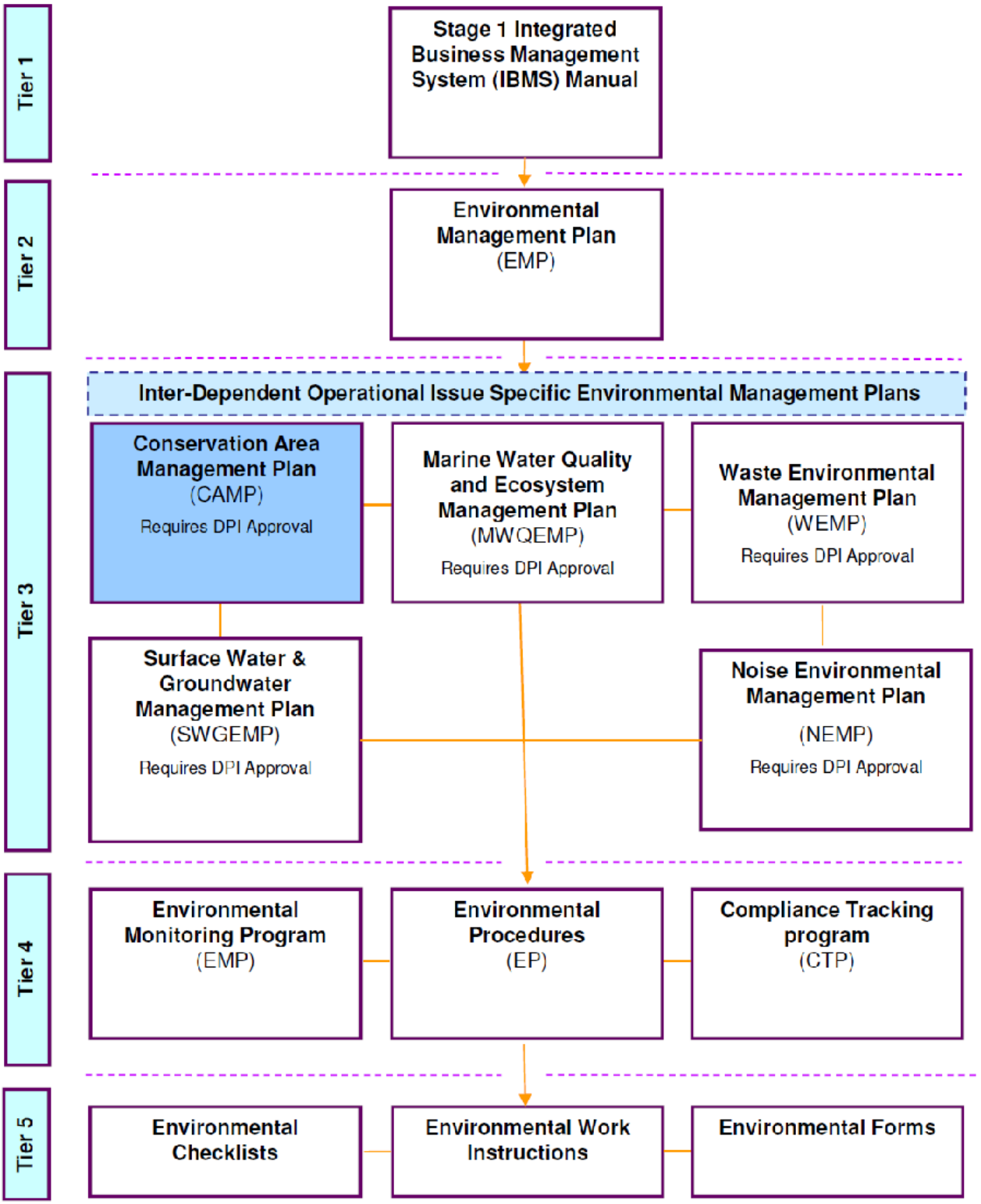

Figure 1 - Environmental Documentation Flow Chart

Section 3 Background

The total area of the site acquired by Sydney Water Corporation (SWC) for the Sydney Desalination Plant (SDP) is approximately 44.5 hectares. Areas of ecological or potential indigenous significance are limited to the conservation area that was identified as part of an earlier development application previously approved by Sutherland Shire Council. The designated conservation area of approximately 15 hectares is to be retained as a conservation area consistent with previous development consents. The conservation area includes endangered ecological communities and habitat for threatened fauna species.

The Environmental Assessment (EA) (SWC, November 2005) for the proposed Sydney Desalination Plant identified that the potential exists for adverse environmental impacts, if left unmitigated, from operations of the plant. Further to the EA a Preferred Project Report (PPR) (SWC August, 2006) was prepared with subsequent amendments to the Statement of Commitments (SoC). A complete list of the SoC can be found in the PPR. O&M commitments relevant to the management of the CA have been collated and reproduced in Table 3 of this plan.

3.1 Plan approval process and stakeholder consultation

The CAMP was prepared by SWC prior to construction to allow it to protect the value of the CA. VEOLIA has further developed the CAMP and will manage and implement this CAMP accordingly during the operation and maintenance stage of the Sydney Desalination Plant. The CAMP was submitted to SDP and OEH for consultation prior to submission to the Department of Planning, Industry and Environment (DPIE) who later approved the VEOLIA CAMP on 6th April 2011. Future versions of the CAMP will be forwarded to:

Greater Sydney Branch of Environment, Energy and Sustainability Group of DPIE.

Email address: rog.gsrplanning@environment.nsw.gov.au

An update of the CAMP occurred in 2012 to include the updated Vegetation Management Plan and to gain approval for modifications to the fauna monitoring procedure. This version was approved by the Department of Planning and Infrastructure on 10th October 2012 (refer to the Environmental Compliance Tracking Program for details).

The CAMP was further updated in 2017 to include a third updated Vegetation Management Plan (January, 2017). The plan was provided to the Department of Planning for information in early 2017.

Any key modifications to this Plan will again be undertaken in consultation with OEH in accordance with relevant Project Approvals. Thereafter the Plan will be reviewed annually in order that it remains consistent with relevant endangered listings, legislation and site conditions.

Section 4 Legislative And Other Requirements

4.1 Relevant legislation

Project Approval for Sydney's Desalination Plant has been obtained under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The EA for the Desalination Plant proposal was prepared under Part 3A of EP&A Act, within which SWC made a Statement of Commitments.

It should be noted that the Sydney Desalination Project is exempt from certain provisions under the Native Vegetation Act 2003 and the Coastal Protection Act 1979, as it falls under Part 3A approval under the EP&A Act.

VEOLIA has developed this CAMP in accordance with the requirements of the Project Approvals with consideration for the following relevant NSW and federal legislation. Staff and contractors undertaking work onsite must adhere to obligations under the approval, including this Plan when carrying out work associated with the management of the CA.

4.1.1 Acts

Environmental Protection and Biodiversity Conservation Act 1999: The EPBC Act enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Australian Government interests on the protection of matters of national environmental significance, with the states and territories having responsibility for matters of state and local significance. The Australian Government Department of Sustainability, Environment, Water, Population and Communities administers the EPBC Act.

VEOLIA must not have any significant impact on any matters of National Environmental Significance (NES). Under the EPBC Act, the Minister of Environment and Heritage has determined that the Sydney Desalination Project is not a Controlled Action[1], on the understanding that suitable arrangements will be made to manage stormwater and groundwater infiltration (associated with hardstand areas of the desalination plant) to avoid impacts on the nearby Quibray Bay portion of the Towra Point Ramsar Wetlands site. With regard to the property management of the CA, there is no risk of significant impact to any matters protected under the EPBC Act, if the environmental management safeguards and strategies identified in this CAMP and SWGMP are diligently implemented.

Threatened Species Conservation Act 1995: The TSC Act identifies and protects native plants and animals in danger of becoming extinct. The Act also provides for species recovery and threat abatement programs.

Veeolia is required to protect listed ecological communities and species onsite. The TSC Act, Schedule 1, Part 3 lists endangered ecological communities. The TSC Act lists the Green and Golden Bell Frog (Litoria aurea) as an Endangered species under Schedule 1, Part 1 and the Grey-Headed Flying Fox (Pteropus poliocephalus) and Wallum Froglet (Crinia tinnula) as Vulnerable species under Schedule 2, Part 1.

[1] EPBC Act Referral Letter from Minister for the Environment and Heritage, 8 November 2005 (refer to copy in EA).

Biosecurity Act 2015 (replaced the Noxious Weeds Act 1993 which was repealed in 2017): the act provides for the prevention, elimination, minimisation and management of biosecurity risks. Weeds are a major threat to our unique natural environment, threatening the survival of hundreds of native plants and animals in NSW alone. The Conservation Area is currently being rehabilitated by bush regenerators who are removing weeds from the area. Many of these weeds are Weeds of National Significance (WoNS) , environmental weeds and Priority weeds in the Sutherland Shire. The Conservation Area contains some WoNS such as bitou bush and lantana, and Veolia is working towards eliminating these and other weeds from the CA. Noxious weeds no longer exist but it is the responsibility of the landholder to deal with weeds as described by the Department of Primary Industries Weedwise website. For site specific information refer to section 3.5 in the VMP.

Protection of the Environment Operations Act 1997: The POEO Act enables the Government to set out explicit protection of the environment policies (PEPs) and adopt more innovative approaches to reducing pollution. PEPs are instruments for setting environmental standards, goals, protocols and guidelines. They provide both the framework for Government decisions that affect the environment, and are the means of adopting Australia-wide environment protection measures set by the National Environment Protection Council.

Operation and maintenance activities at Sydney's Desalination Plant are required to be effectively managed to ensure VEOLIA complies with the water quality goals and criteria outlined in Section 120 of the POEO Act 1997.

4.2 Compliance obligations

Sydney Water developed a *Statement of Commitments (SoC)* which can be found in the PPR - section 12.1 . These commitments mainly outline safeguards and mitigation measures to avoid adverse impact on the environment and ensure legislative compliance. They also outline monitoring and reporting requirements. Commitments relevant to the management of the Conservation Area (CA) are listed in *Table 3 - Compliance Obligations.*

The Minister for Planning issued the *Minister's Conditions of Approval (MCoA)* for the Desalination Plant project in November 2006 that imposes requirements for management of the CA (Minister for Planning, 2006). This CAMP has been prepared as required under MCoA Plant 4.6b. Relevant DPIE Ministers Conditions of Approval (MCoA) and Statement of Commitments (SoC) are listed in Table 3 below with a cross reference to where the condition is addressed in this Plan and/or other project management documents.

Overall environmental compliance will be managed in accordance with section 16 of the IBMS Manual. Records of environmental compliance will be submitted as required in the Environmental Compliance Tracking Program.

Table 3 Compliance Obligations

	No:	Requirement	Doc Ref:
MCoA Plant	2.3	For the purpose of this project approval, the land within the "conservation zone boundary" delineated in yellow in Figure 1 of Appendix A4 to Environmental Assessment of the Concept Plan for Sydney's Desalination Project, dated November 2005, and prepared by Sydney Water Corporation shall be a "conservation area" on the project site and shall not be subject to any development works.	Figure 2
	2.5	The Proponent shall revegetate and rehabilitate the conservation area referred to under condition 2.3 of this approval utilising local native species of local provenance which naturally occur in the adjoining vegetation communities. Particular focus shall be placed on revegetation and rehabilitation with the following vegetation communities: Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF), Kurnell Dune Forest (KDF), Sydney Freshwater Wetlands (SFW) and Swamp Oak Floodplain Forest (SOFF). Revegetation and rehabilitation shall be undertaken in accordance with an approved Conservation Area Management Plan (refer to condition 4.6b)	Section 6.4
	4.6(b)	a Conservation Area Management Plan to detail measures for the on-going management of the conservation area on the site. The Plan shall be developed in consultation with the DEC, and shall include, but not necessarily limited to:	This Plan
		i) a vegetation management program based on maintenance and rehabilitation of intact vegetation communities;	Section 6.4.1
		ii) methods in line with standard bush regeneration techniques, such as the Bradley method where appropriate;	Section 6.4.1
		iii) measures to minimise impacts on Grey-headed Flying Fox colonies, such as directing light away from the colonies and reducing short, sharp noises (for example, sirens or the use of compressed air);	Section 6.5.1
		iv) measures to protect the habitat within the conservation area for the Green and Golden Bell Frog, the Wallum Froglet and the Large-footed Myotis;	Section 6.4 and6.5
		v) provisions for monitoring the condition of the conservation area over time;	Section 7.1
SoC	3	A configuration of the design and layout of the desalination plant will be developed, incorporating future expansion, to protect endangered ecological communities and threatened species within the conservation area. This will include:	
		(a) Retaining the identified conservation area, that contains the largest and most currently intact area of significant vegetation communities on the site, to avoid biodiversity loss;	Section 4

	6	Conservation area within the desalination plant site maintained and rehabilitated to protect endangered ecological communities and habitat for threatened species.	
		(a) Developing a vegetation management program based on maintenance and rehabilitation of intact vegetation communities;	Section 6.4
		(b) Methods in line with standard bush regeneration techniques such as the Bradley method where appropriate;	Section 6.4
		(c) Measures to minimise impacts on the seasonal roosting colony of the Grey-headed Flying Fox, such as directing light away from the colony and reducing short, sharp noises such as those associated with sirens or the use of compressed air, to mitigate impacts associated with noise and light;	Section 6.5.1
		(d) Measures to protect the habitat within the conservation area for the endangered Green and Golden Bell Frog, Wallum Froglet and the Large-footed Myosis;	Section 6.5.1
		(e) Monitoring the condition of the conservation area for a sufficient period to take into account seasonal variability.	Section 7.1
		(f) Submission of the Plan to the Department of Planning.	Section 2.1

Section 5 Description Of The Environment

The site is divided for management purposes into two sections: the Conservation Area (CA), of approximately 15 hectares; and the Desalination Plant Site (DPS), of approximately 30 hectares. The CA has been set aside due to its value as a small protected area of remnant native vegetation and potential habitat for protected threatened species. The CA is completely fenced from the DPS and access is by approval only.

A part of Towra Point wetland lies directly to the west of the CA on the opposite side of the adjoining properties and Captain Cook Drive. This wetland is listed as a wetland of international importance in the Ramsar international treaty.

5.1 Vegetation

The Conservation Area is entirely vegetated and made up of a mosaic of four endangered ecological communities listed under the Threatened Species Conservation Act, 1995:

- Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF);
- Sydney Freshwater Wetlands (SFW);
- Kurnell Dune Forest (KDF); and
- Swamp Oak Floodplain Forest (SOFF).

Figure 2 shows the four endangered ecological communities, as mapped in the EA. Vegetation in the CA unshaded in Figure 2 was assessed as disturbed, with varying degrees of weed invasion. Figure 3 presents an updated summary of the vegetation communities with updated nomenclature for each vegetation community. Comparison of the figures shows that the vegetation has matured and the abundance and boundaries of the communities have changed over time.

The Vegetation Management Plan (VMP) (Appendix 1) classifies the CA into 7 management units (Zones 1 to 7), see Figure 2. These were defined by a combination of factors, including vegetation type, location and condition.

There are substantial numbers of weeds on some adjoining properties. These pose a potential problem for weed control in the CA, as they can be sources of weed propagules, such as seeds, for ongoing reinfestation.

The presence of infestations of noxious and environmental weeds represents a deterioration of the habitats for native species and particularly for threatened species and endangered ecological communities. Table 7 of the VMP provides an inventory of all noxious weeds recorded within the CA and their class within the Sutherland LGA.

Figure 2 - Conservation Area Vegetation Communities and Management Zones

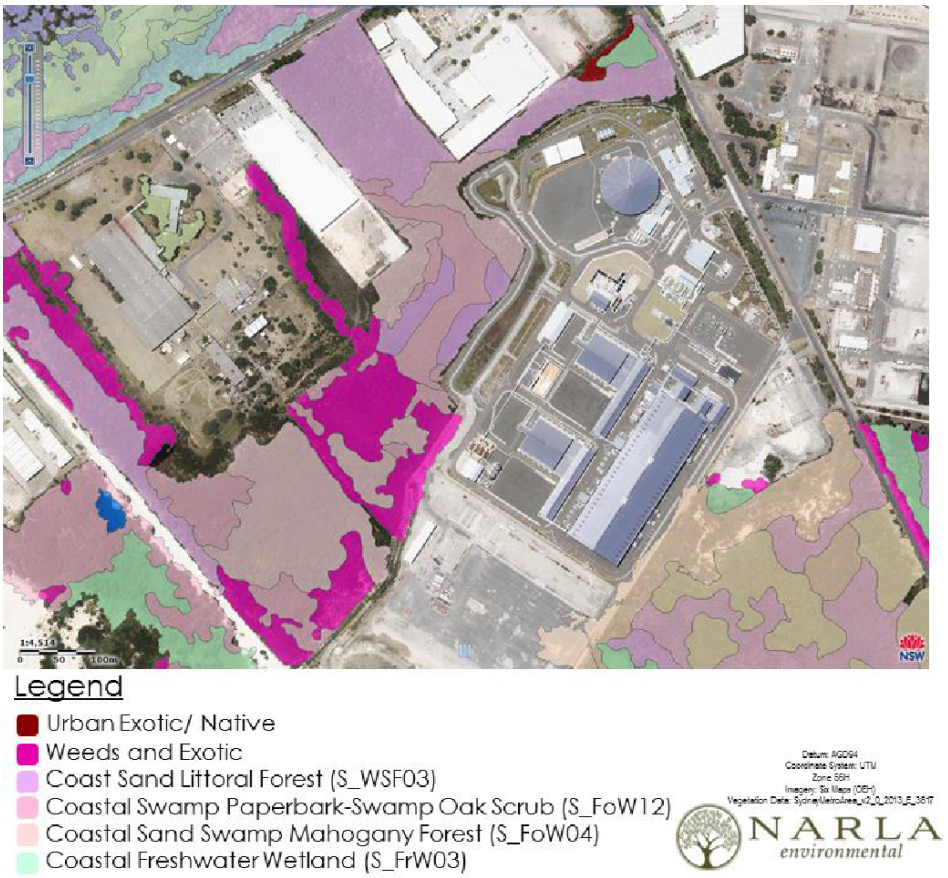

Figure 3 - Sydney Metropolitan Vegetation Mapping showing the CA (OEH 2013)

5.2 Fauna

There are two relevant endangered species statutes, the TSC Act (NSW) and the EPBC Act (Cth). The Grey-Headed Flying-Fox (GHFF) (*Pteropus poliocephalus*) (listed as a Vulnerable Species under both the EPBC Act and TSC Act) and the Wallum Froglet (*Crinia tinnula*) (listed as Endangered under the EPBC Act and Vulnerable under the TSC Act) were identified as being on the site or having inhabited the site in the last ten years.

Additional fauna species listed in the EPBC Act and the TSC Act have been identified as having potential or actual habitat on the desalination plant site. Table 4 provides a summary of all the species with potential habitat on site. There may also be other species present that have not been detected during the previous surveys.

Table 4 - EPBC Act and TSC Act Listed Flora and Fauna Species with potential habitat on the site

Scientific Name	Common Name	Status		Recorded in previous surveys?
		TSC Act	EPBC Act	
FLORA				
Acacia terminalis subsp. terminalis	Sunshine Wattle	Endangered	Endangered	No
Pterostylis sp. Botany Bay	Botany Bay Bearded Orchid	Endangered	Endangered	No
Thelymitra atronitida	Black-hooded Sun Orchid	N/A	Critically Endangered	No
FAUNA				
Birds				
Botaurus poiciloptilus	Australasian Bittern	Vulnerable	N/A	No
Calidris alba	Sanderling	Vulnerable	N/A	No
Charadrius mongolus	Lesser Sand-plover	Vulnerable	N/A	No
Diomedea exulans	Wandering Albatross	Endangered	Endangered	No
Lathamus discolor	Swift Parrot	Endangered	Endangered	No
Pterodroma leucoptera leucoptera	Gould's Petrel	Vulnerable	Endangered	No
Sterna albifrons	Little Tern	Endangered	N/A	No
Sterna fuscata	Sooty Tern	Vulnerable	N/A	No
Mammals				
Miniopterus schreibersii oceanensis	Eastern Bent-Wing Bat	Vulnerable	Endangered	No
Miniopterus australis	Little Bent-Wing Bat	Vulnerable	N/A	No
Myotis macropus	Southern Myotis	Vulnerable	N/A	No
Pteropus poliocephalus	Grey-Headed Flying Fox	Vulnerable	Vulnerable	Yes – camp site
Amphibians				
Crinia tinnula	Wallum Froglet	Vulnerable	Endangered	Yes – call heard during February 2012 targeted survey
Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	Yes – tadpoles in 1993 and 1996. Not found during targeted surveys in 2002, 2004 and 2006-2021.

5.2.1 Grey-headed flying fox

The GHFF (*Pteropus poliocephalus*) had for many years occupied part of the CA from spring to autumn (see Figure 3). This schedule of occupation encompasses significant phases in the annual reproductive cycle of GHFFs. Births occur from late September to November, lactation lasts approximately six months with the majority of young weaned during March and April; and conception occurs from March to May.

The GHFF altered their historic patterns of use of the camp in the CA during the 2008/09 and 2009/10 seasons. The area was not used as a stable, communal day roost from May 2008 to February 2010. However, a small number of animals used the camp intermittently during that time either as a short-term day roost or as a foraging roost at night. GHFF used the site as a day roost during autumn/winter 2010 and again in autumn 2011. The numbers of animals present in these two years were lower than pre-2008. However, mating groups were present in each year, highlighting the ongoing significance of the site to the species.

The monitoring program continued in the 2011/12 season to determine whether the flying foxes continue their affiliation with the CA by inspecting the site for the return to use as a day roost and by gathering evidence of use as a night roost. There was no evidence of the GHFF recorded which was unexpected. However, it was consistent with patterns found elsewhere in Sydney and may be explained by the presence of significant food resources within easy migration distance (250 km) of the Kurnell camp.

In July, 2016 GHFF again began using the CA as a day roost and continued to intermittently use the camp until March 2017. The GHFF camp size varied from zero to 300 during this time, and nursing females were observed from December 2016 to April 2017, peaking at 500 individuals in JUly of that year. A significant food shortage around the Sydney metropolitan region was being experienced at this time and the ecological consultants conducting the surveys were unable to identify what the GHFF camp were using as their primary food source. Long periods of hot weather events were also intermittently experienced at the time.

In May 2018 and April 2019, 300 and 200 individuals and dependent young were observed respectively, however since the end of the 2019 season the population has not exceeded 80 individuals but sub-adults and dependent young have been observed throughout that period (refer to the monthly monitoring reports filed in NSW| KDP |Environment | Int > Monitoring data > K2.3 - Flora and Fauna > K2.3.2 - GHFF > Monthly Monitoring for details .

5.2.2 Bentwing bats

The Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) is a small bat that hunts in forested areas, catching moths and other flying insects above the tree tops. The Little Bentwing Bat (*Miniopterus australis*) is a small insectivorous bat that forages beneath the canopy of densely vegetated habitats and are distinguished from the Eastern Bentwing-bat by its smaller size.

Caves are the primary roosting habitat for both species, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. The Eastern Bentwing Bat forms discrete populations centered on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Breeding or roosting colonies can number from 100 to 150,000 individuals. At other times of the year, populations disperse within about 300 km range of maternity caves. The two species often share roosting sites and the two species may form mixed clusters.

The conservation area has suitable foraging and roosting habitat for individuals. Application of pesticides in or adjacent to foraging areas and predation by feral cats and foxes are applicable identified threats to *Miniopterus species* (DECC, 2005).

5.2.3 Southern myotis

Southern Myotis (*Myotis macropus*) is a small insectivorous bat that forages over water. The Southern Myotis has not been recorded on this site during recent surveys though it has been recorded nearby on the Kurnell Peninsula (NPWS, 2006). Generally these animals roost in groups of 10 to 15 close to water in caves, mines, tree hollows, aqueduct tunnels and under bridges and in dense vegetation in the vicinity of bodies of slow-flowing or still water. They forage over streams and pools catching insects and small fish in the air and from the surface of the water.

Favourable roosting sites might be found within the CA in the form of large trees with roosting hollows or other dense vegetation. There are small bodies of water within the CA and the constructed wetland within the DPS that could be suitable foraging sites for this species. Roost disturbance, such as damage to hollow bearing trees and caves that the animals use, has been identified as a possible impact for Myotis macropus in the "Action Plan for Australian Bats" (DSEWPC, 1999).

5.2.4 Green and golden bell frog

Historically, the Kurnell Peninsula has had records of the Green and Golden Bell Frog (GGBF) (*Litoria aurea*) since the 1800's (Australian Museum records). Since 1980, GGBF's had been found within the wetlands on the DPS footprint, although numbers in the general area have severely declined since 1993 (White and Pyke, 1993).

The most recent sighting of Green and Golden Bell Frogs in the general area was of two frogs in the nearby Rocla site in 2004 (White, 2005). Prior to this, tadpoles were found on site in 1996, though the last recorded adult individual on site was in 1992.

The conservation area wetlands and vegetation on the DPS provides habitat for frogs, including the Green and Golden Bell Frog, however recent targeted surveys (2006 -2021) have not found any frogs or tadpoles of this species using any part of the site (refer to the biannual monitoring reports filed in NSW| KDP |Environment | Int > Monitoring data > K2.3 - Flora and Fauna > K2.3.1 - GGBF > Biannual Reports for details .

Predation by feral animals such as foxes, use of herbicides and other weed-control measures, as well as predation by exotic fish such as Plague Minnow are identified threats to the population (DECC, 2005) that are applicable to management at the site.

5.2.5 Wallum froglet

Wallum Froglet (*Crinia tinnula*) was recorded within the CA in a targeted survey conducted in February 2012 but had not been recorded in previous surveys or surveys between 2012 and 2021. Wallum Froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country.

Recent targeted surveys (2006 -2021) have not found any frogs or tadpoles of this species using any part of the site (refer to the biannual monitoring reports filed in NSW| KDP |Environment | Int > Monitoring data > K2.3 - Flora and Fauna > K2.3.1 - GGBF > Biannual Reports for details .

5.2.6 Introduced species

Red Fox (Vulpes vulpes) have been sighted at the Kurnell site and baiting programs are carried out on the site, as part of the Sutherland Shire Council Fox Baiting program, as well as in other areas of the peninsula. Other introduced species with potential to inhabit the site include rabbits, hares and cats.

Plague Minnow (Gambusia holbrooki) is known to prevent, or at least reduce the breeding success of GGBF on sites. The species was detected in both 2011 and 2012 targeted survey seasons, despite efforts to eradicate. They were not identified in the 2013-2017 targeted survey seasons within the conservation area, however they were found within the waterway running along Sir Joseph Banks Drive which is in close proximity to the conservation area.

5.3 Acid sulphate soils

The CA is mapped (NSW Natural Resource Atlas, 2010) as having potential risk for Acid Sulphate Soils (ASS) (Figure 4). The area is identified as having a high probability of encountering ASS in areas that have not been previously disturbed.

Figure 5 - Acid Sulphate Soil Map
(created with NSW Natural Resource Atlas-http://nratlas.nsw.gov.au Wednesday, August 18, 2010)

Section 6 Potential Conservation Area Impacts

6.1 Operational activities

Some of the activities related to the operation and maintenance of the desalination plant that were earlier envisaged to pose some potential risk to the CA included:

- lighting 24 hours per day for security purposes;
- noise; and
- truck movements.

Based on the plant design and 2 years of monitoring while the plant was operating (2010-2012), these activities are no longer considered potential CA risks. The lighting for the Plant is confined to localised buildings and is not directed towards the CA. All potential noise is controlled as equipment is housed within buildings and speciality casing, where required, to meet both occupational health and safety requirements as well noise compliance at sensitive receivers. Truck movements, namely chemical deliveries are limited to daytime and do not constitute a significant increase to traffic in the area. There have been no impacts as a consequence of operating and maintaining the Plant to flora or fauna associated with the CA detected during targeted monitoring.

While the plant was being re-built after the December 2015 tornado, consultation with the ecological consultants concluded that the location and extent of the re-build works would not pose any potential risk to the GHFF community. The conservation area was delineated from the re-build construction site and there had been no other impacts on the conservation area.

The plant commenced full operation (250 MLD in July 2019 due to low dam levels and continued to operate in that mode until early 2020 when Sydney's dams were filled following heavy rainfall. Since that time the plant has operated in low flow mode (50 MLD).

6.2 Mismanagement of activities

There may be risks from activities aimed at protecting the CA conservation values. These will cause impact if there is a degree of mismanagement.

A potential risk will be from the vegetation management activities. Excessive clearing, with the aim of removing or controlling weeds could result in modification of vegetation structure or species composition. This could alter the CA and impact on the endangered ecological communities and, as a result, the fauna. The use of herbicides and incorrect application of pesticides may also have a direct negative impact on local flora and fauna. In general, the aim is to ensure that no habitat loss or significant disturbance results from any of the work in the CA. In fact there will be an increase in fauna habitat dominated by native species in the long term.

It should be noted that no construction or similar work will occur in the CA.

Potential impacts on the GHFF camp could arise if work activities and access in the CA are not managed effectively. Inappropriate or excessive access to the area beneath the GHFF camp could cause major

disturbance to the animals when in occupancy. During certain times of the year when these animals are particularly sensitive, such as September to February, this could result in serious impacts. Work involving very loud noises, such as use of explosives could result in females aborting late in pregnancy. Females have also been known to abandon flightless young when stressed.

6.3 Illegal site access

Prior to the construction of the Plant, illegal access, in particular by motorcyclists , caused damage to the vegetation in the CA. One of the risks related to this is that new growth from the soil seed bank doesn't have a chance to grow to maturity and maintain genetic variety in the native vegetation. This will degrade the health of the vegetation in the CA and potentially reduce its ability to adapt to change. It should be noted that there have not been any recent reported cases of motorcycle access in the CA. The access which was previously used to access the CA from the non-Plant side has been restricted due to the neighbouring site being developed.

6.4 Invasion by exotic species

The presence of introduced fauna species at the site, including feral cats, rabbits, red fox (Vulpes vulpes) and Plague Minnow (Gambusia holbrooki) have the potential to reduce the success of both native flora and fauna at the site. These species can result in damage to vegetation as well as the abundance and success of native fauna through competition and predation.

Section 7 Management Activities

Sydney Water originally set aside the land in the CA to protect the endangered ecological communities of vegetation and threatened species. Operational activities on the Plant are managed to protect endangered ecological communities and threatened species within the CA, primarily by avoiding the area completely, except for approved vegetation management activities. Ongoing maintenance activities at the DPS (including weeding) will not affect the CA directly.

A summary of the management activities for each aspect is detailed in this section. It should be noted that all potential impacts associated with surface water and groundwater have been identified and addressed in the Surface Water and Groundwater Management Plan (MAN-9491) and all waste management considerations are included in the Waste Management Plan (MAN-9676).

This Plan will be reviewed annually to ensure continued effectiveness and priorities are to be updated where required. Any management recommendations from consultant reports will be included in the issue management system for actioning using Sphera (Rivo).

7.1 Site access

Site fencing is installed and maintained to prevent unauthorised access in addition to 24 hour onsite security for perimeter checks and monitoring of the surveillance system, however there is a section bordering Zone 3 which is not fenced, but access is limited by factory development in Clerke Place and limited access from Captain Cook Drive. In the event of trespassers being observed on the site, the Duty Operator should be contacted immediately and police notified if appropriate.

Due to the known risk of damage to the environment from illegal access, the strategy adopted is to prevent such access as much as possible. If access cannot be stopped, attempts will be made to direct motorcycles away from environmentally sensitive sections of the site by placing obstructions, such as large sandstone boulders, in the way.

Access by subcontractors into the CA from the DPS must be approved and is managed through the issue of a work permit and key to the padlocked gates. To be issued with a key for access into the CA an approved work method statement/JSEA outlining environmental and safety safeguards must first be approved by Veolia.

7.2 Site induction and environmental awareness

All personnel, including subcontractors and site visitors, are required to undertake a site induction including identification of safety and environmental issues. All staff and project personnel are made familiar with the CAMP and the relevant safeguards for their work.

Making staff and others accessing any part of the site aware of environmental sensitivities and issues on the site is the most effective way to avoid environmental impact to the CA. Combined with good induction procedures, the risk of impacting the CA is expected to be reduced substantially by the fact that the CA has been clearly delineated from the DPS with security fencing and padlocked access gates.

No hot works are to be undertaken onsite during Total Fire Bans (TOBANs). Staff working in or near the CA are to watch for indications of fire at all times. Fire fighting equipment will be kept on site in appropriate accessible locations and training given to all staff in its proper use.

7.3 Acid sulphate soils (ASS)

There is no significant risk of disturbing ASS for activities in the CA, as no excavation is required beyond digging out weeds or planting native seedlings, neither of which should cause any disturbance to soil layers deeper than 30 centimetres. ASS risks and appropriate safeguards will be identified for specific works requiring deep (> 1m) excavation of more than 1 m3 in any one location.

Groundwater monitoring is undertaken on the site in accordance with the Surface Water and Groundwater Management Plan MAN-9491 and if any change that could be attributed to the influence of acid sulphate soils is detected it would be notified to OEH and remediation options explored in consultation with the relevant authorities and specialists.

7.4 Vegetation management

The original Vegetation Management Plan (VMP) (2006) was prepared by EcoLogical and had a life span of five years. A revised VMP (see Appendix 1) was later written in 2011 by Keystone Ecological in light of the condition of the vegetation and lessons learnt from the management actions and rehabilitation results since 2006.

A third review of the VMP was undertaken in December 2016 and an updated plan was prepared by Narla Ecological . This plan will be used to manage the CA for the five years before formal review that is scheduled to occur in December 2021.

The implementation of this VMP is intended to minimise the potential for negative impacts, control Key Threatening Processes associated with weed infestations, satisfy noxious weed control requirements and ultimately provide a benefit to the endangered ecological communities and threatened species on the site and in the local area.

All vegetation management actions specified in the VMP shall be carried out by suitably qualified and experienced bush regenerators, as specified in the VMP. The use of trained personnel will ensure correct plant identification, work methods and compliance with required Work Health and Safety standards.

The VMP includes a monitoring program (detailed in Section 6.1 of Appendix 1). If, after monitoring, it is deemed that the weed eradication techniques are ineffective, then bush regeneration efforts would be increased to reduce the weed biomass. Likewise, if natural regeneration is failing then corrective measures will be implemented, including planting of tube stock from local provenance material.

7.4.1 Species recovery

The OEH have identified recovery strategies for the listed Endangered Ecological Communities (EEC) that occur on site. These are detailed in Table 5.

Table 5. Recovery Strategies

Endangered Ecological Community (EEC)	OEH Recommended Recovery Activity	Actions required within Sydney Desalination Plant CA
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale EEC	Support and provide information to land managers and maintenance crews regarding appropriate management.	This VMP provides detailed information for land managers including Veolia and bush regeneration contractors to best manage the EEC within the CA
	Determine and apply appropriate fire management practices.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Implement measures to control inappropriate water flows.	Historical changes to natural water flows have occurred throughout the area. These changes have facilitated the creation of infrastructure in the area. Water flows in and around the CA have been altered historically, however it is considered unlikely that these will be changed any further.
	Install gates, fencing, formal tracks and signs to manage access and prevent rubbish dumping.	The entire CA is either fenced or has restricted access to unauthorised persons. Unauthorised access may still occur from the north-west of the CA where there is no fencing. One formal track dissects the centre of the CA. It is considered that this track is sufficient for the management of the CA. Additional tracks constructed through the CA will require impact assessment (e.g. REF) prior to construction.
	Protect remnants from clearing and further fragmentation.	The establishment of the CA provides ongoing protection of the vegetation from clearing and fragmentation. This VMP guides best practice methods for further enhancing native habitat.

	Restore degraded habitat using bush regeneration techniques.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Prepare and implement site specific plans of management.	This VMP is a site-specific plan of management that provides recommendations for best practice management actions and monitoring of CA management performance.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Install stormwater control mechanisms to prevent off-site impacts from adjacent development.	This recovery strategy was addressed as part of the Sydney Desalination Plant approval and development process. However, the CA may still be vulnerable to spills from uncontrolled accidents in nearby sites.
	Control access to remnants by installing fencing and signage and rationalising informal tracks through the community.	The entire CA is either fenced or has restricted access to unauthorised persons. Unauthorised access may still occur from the north-west of the CA where there is no fencing. One formal track dissects the centre of the CA. It is considered that this track is sufficient for the management of the CA. Additional tracks constructed through the CA will require impact assessment (e.g. REF) prior to construction.
	Undertake weed control as required using removal methods that will not damage the community.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Protect and actively manage SFW remnants through conservation mechanisms such as covenanting and the preparation/implementation of site-specific vegetation management plans.	This VMP is a site-specific plan of management that provides recommendations for best practice management actions and monitoring of CA management performance.

	Improve vegetative connectivity within and between remnants through revegetation/regeneration programs and provide vegetative buffers around these remnants.	Maintenance of vegetation within the CA as outlined in this VMP assists in preserving and enhancing habitat connectivity with other remnant bushland areas of the Kurnell Peninsula e.g. Kamay Botany Bay National Park.
	Restore natural drainage conditions.	Historical changes to natural water flows have occurred throughout the area. These changes have facilitated the creation of infrastructure in the area. Water flows in and around the CA have been altered historically, however it is considered unlikely that these will be changed any further.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Promote public involvement in restoration activities.	Not applicable. The subject site has restricted access. Restoration activities are to be undertaken only by Qualified Bush Regeneration Contractors
	Instigate pig control programs	Not applicable. This pest species is not present within the subject site.
	Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezoning and regional planning.	The establishment of the CA protects relevant native vegetation habitat. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Promote regeneration by avoiding prolonged or heavy grazing.	Not applicable. Grazing no longer occurs locally.
	Weed control.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.

	Undertake restoration including bush regeneration and revegetation.	This VMP provides detailed information on recommended bush regeneration methods to be delivered by Qualified Bush Regeneration Contractors.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Instigate pig, deer and goat control programs.	Not Applicable. None of these species have been recorded in the subject site
	Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process.	The establishment of the CA provides ongoing protection of the vegetation from clearing and fragmentation. This VMP guides best practice methods for further enhancing native habitat.
	Promote regeneration by avoiding prolonged or heavy grazing.	Not applicable. Grazing no longer occurs locally.
	Undertake restoration including bush regeneration, revegetation and weed control, and promote public involvement in this restoration.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.

7.4.2 Bushfire

The CA is classed as “Vegetation category 1” on the Bushfire Prone land layer. Bushfire management measures were considered in the design layout of the site including examination of the site’s characteristics; such as slope, surrounding vegetation and the assets on site that require protection. These aim to reduce the risks to people and property in relation to the desalination plant generally in line with the NSW Rural Fire Service (2006) Planning for Bushfire Protection. The Bushfire Management Measures are aimed at protection of assets rather than vegetation management.

Reducing the risk of bushfire within the CA will mean that any grass or bushfires that have spread onto the desalination plant site must be controlled to avoid fire spreading to the CA. Fires from adjacent properties still pose a risk to the CA vegetation and fauna.

7.5 Fauna management

Existing and potential fauna at the Plant would be managed through the implementation of the VMP (Appendix 1). The VMP outlines measures to protect the habitat within the conservation area for the Green and Golden Bell Frog, the Wallum Froglet and the Large-footed Myotis as required by MCoA Plant 4.6b.

Narla Environmental, who has also undertaken GHFF monitoring surveys at the Plant since 2016, were the consultant that prepared the updated VMP and therefore were in the best position to ensure relevant safeguards to protect the GHFF camp at the Kurnell desalination plant site were incorporated.

Quantitative monitoring to measure the effectiveness of the safeguards and presence of threatened species will be undertaken as detailed in Section 8.1.2. If species are detected during scheduled surveys then a follow-up survey would be undertaken within a month to confirm the presence of the species. If they are detected at the second survey OEH would be notified (matthew.mo@environment.nsw.gov.au) the current controls of this Plan assessed to ensure the protection of the species continues.

7.5.1 Species recovery and threat abatement

At the time of preparation of this plan, there are no finalised Threat Abatement Plans (TAPs) that apply to the CA fauna. To guide recovery and threat abatement actions the TSC Act provides for the preparation of a Threatened Species Priorities Action Statement (the PAS) which outlines actions to recover species and manage threats.

The Office of Environment and Heritage have identified recovery strategies for the listed threatened species that occur or have the potential to occur on site. These are detailed in Table 6 including the actions to be implemented on the site as a part of this CAMP.

Table 6 Recovery Strategies

Threatened Species	OEH Recommended Recovery Activity	Actions required within Sydney Desalination Plant CA
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Protect roost sites, particularly avoid disturbance September through November.	Establishment of the CA provides general protection. Observe recommendations provided in sections 5.1 of the VMP (App 1) and 7.5.2 of this document.
	Identify and protect key foraging areas.	Key foraging resources have been previously identified within the CA including preferred feed tree species. This VMP guides further habitat enhancement. Observe recommendations provided in section 5.1 of the VMP (App 1) and 7.5.2 of this document.
	Manage and enforce licensed shooting.	Not Applicable

	Investigate and promote alternative non-lethal crop protection mechanisms.	Not Applicable
	Identify powerline blackspots and implement measures to reduce deaths; implement measures to reduce deaths from entanglement in netting and on barbed-wire.	To date powerlines and wire fencing have not been identified as an issue for the Grey-headed Flying Fox using the Sydney Desalination Plant CA. It is still recommended that local powerlines and any barbed wire fencing should be inspected for Grey-headed Flying Fox during times a Grey-headed Flying Fox colony is present, roosting within the CA.
	Increase public awareness/understanding about flying-foxes, and their involvement in flying-fox conservation.	Not Applicable
	Monitor the national population's status and distribution.	Outside of the VMP (app 1) scope however local population monitoring is addressed in supplementary documentation (Veolia 2015). DLIE contact is: Matthew.mo@environment.nsw.gov.au Information is available on the DPIE website: https://www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/management-flying-foxes There is the possibility of introducing orphaned GHFF to the colony provided the colony is > 100 individuals - contact details Charmian Gradwell - Sydney Metropolitan Wildlife Rescue Services - Charmian2@me.com
	Improve knowledge on demographics and population structure to better understand ecological requirements of the species.	Outside of the VMP (App1) scope however local population monitoring is addressed in supplementary documentation (Veolia 2015). Also see above.

Green and Golden Bell Frog (*Litoria aurea*)	Maintain captive bred populations for future possible re-introduction programs.	The possibility of introducing the GGBF to the stormwater basin is being investigated. Contact is Arthur White - 9599 1161 Email:arfawhite@gmail.com
	Initiate community awareness programs that highlight the presence of populations and catchment management approaches to improving stormwater quality, habitat retention and management.	Stormwater management is included in the Sydney Desalination Plant Surface and Groundwater Management Plan and its implementation will ensure habitat retention and management
	Develop measures to control or eradicate the introduced Plague Minnow.	Measures have been previously established (refer to Veolia CAMP 2015). Observe recommendations provided in section 3.6.1 of the VMP (App 1).
	Establish protocols for handling of frogs and educational strategies to minimise the inadvertent spread of fungal pathogens from site to site.	Handling of any fauna is to be avoided. Hygiene protocols are discussed in section 5.4 of the VMP (App 1).
	Develop strategies to provide for the development or enhancement of frog habitat to improve reproductive success and recruitment at known sites.	All management strategies within the VMP (app 1) intend to result in improved native habitat.
	Develop site specific plans of management to improve conservation outcomes for targeted populations.	All management strategies within the VMP (App 1) intend to result in improved native habitat.
	Develop strategies to provide disease-free and fish-free breeding habitat.	Measures have been previously established and listed within the CAMP (Veolia 2015). Refer to section 4.1 in the VMP (App 1) for further advice.
Wallum Froglet (*Crinia tinnula*)	Retain wetland protection buffers in new coastal developments.	The establishment of the CA and management as outlined in the VMP (App 1)
	Fence off swamps to prevent stock from grazing in these areas.	Grazing no longer occurs locally.
	Protect coastal wetland areas.	The establishment of the CA and management as outlined in the VMP (App 1)

	Manage and control pest species (Plague Minnow) in accordance with approved Threat Abatement Plans.	Recommendations in the VMP (App1) are to monitor for pest fish species during scheduled annual frog surveys and manage them appropriately in accordance to Threat Abatement Plans
	Apply fire regime appropriate for vegetation type (frequency varying between 6-35 year intervals) and ensure standing water is present if undertaking prescribed burns.	Not relevant as the site is too close to hazardous industry for the use of fire as a management tool.
	Control incursion of weeds into coastal wetland habitat	This VMP outlines updated best practice recommendation for vegetation management to be carried out by Qualified Bush Regenerators
	Rehabilitate or recreate former and existing habitat degraded or destroyed by grazing, sandmining and other activities	The VMP (App 1) guides best practice native habitat restoration and enhancement, designed to assist this and other locally indigenous species.
Southern Myotis (*Myotis macropus*)	Retain native vegetation along streams and rivers and around other waterbodies.	The establishment of the CA protects relevant native vegetation habitat. This VMP guides best practice methods for maintaining the native vegetation habitat within the CA.
	Minimise the use of pesticides adjacent to foraging areas.	Only targeted herbicide and terrestrial, predatory vertebrate pesticide (1080) is specified for use within the CA. This is outlined in this VMP and should be minimised. No pesticides are used to target invertebrates such that prey of the southern myotis may decline.
	Protect roosts from damage or disturbance.	No relevant roost habitat has been identified within the CA. If located in the future an Ecologist should be contacted for guidance.

7.5.2 Grey-headed flying fox

The overarching management consideration is to maintain the critical components of the habitat for the Grey-headed Flying-foxes. This includes a vigorous canopy structure, the wall of Lantana along the Zone's edge with Boat Harbour Road that acts as a buffer to the hottest westerly winds and the vine arbours

(including Morning Glory) that provide access to the coolest part of the vegetation during dangerously hot summer days. The following management strategies apply to works within Zone 7.

- The majority of works near the Grey-headed Flying-fox camp must occur when the animals are not in residence, generally from June to August but May to September may also be available.
- When the animals are in residence, low impact works near the camp site are allowed during March and April only, but a distance of at least 25 to 30 metres is to be maintained. This is due to the risk of causing pregnant females to abort or flightless young to be abandoned if they are disturbed during the breeding months from October to February. Such works must be undertaken quietly (e.g. no chain saws or shouting) and workers should not wear bright clothing. Appropriate low impact works include ground cover weed control (e.g. Trad rolling), manual removal of seedlings or scraping and painting of soft shrubs.
- Works must not radically alter the structure of the vegetation of the area occupied by the animals and so weed control must occur at a very slow pace.
- Morning Glory and other exotic vines should only be removed from the camp area in consultation with an expert on the Grey-headed Flying-fox. The removal of the exotic vine arbours will only occur slowly and progressively where native vines are in place as a structural substitute.
- Remove Ludwigia when animals are not using the camp.
- The bank of Lantana along the western boundary must not be removed. However, the growth of native plants is to be encouraged to replace the structural component of the vegetation now provided by Lantana.

GHFF feed primarily on blossom and fruit in canopy vegetation and supplement this diet with leaves. In accordance with the adopted Bradley method of vegetation management attempts to regenerate with diet species by direct seeding will be undertaken before planting within the CA, if required. The DPS landscaping plan incorporated the planting of various plants used as nectar sources by GHFF including Eucalyptus robusta, Banksia serrata, Callistemon citrinus and Melaleuca quinquenervia. In addition to these DPS planted species, existing suitable species previously present in the CA have had natural regeneration (Waratah Eco Works, Feb 2010).

7.5.3 Microbats

Strategies to protect the microbats and similar arboreal species on the site will involve the retention and protection of their habitat and possible roosting sites. No specific plans have been developed for each species, however measures that should ensure the habitat value and therefore species protection is maintained include retaining native vegetation along and around the few water bodies on site, and not allowing any modification of bodies of standing water in the CA. As the Large-Footed Myotis and other native animals are insectivorous, pesticide and herbicide use will be restricted.

7.5.4 Green and golden bell frog & wallum froglet

The large stormwater detention basin just outside of the Conservation Area was designed to provide additional frog habitat and was constructed and planted in 2009. Other areas of the site also provide potential frog habitat. The following considerations are adopted to minimise the impact of vegetation management works on the green and golden bell frog and other species.

- Herbicide use near waterways or wetlands including ephemeral areas is to be minimised and only herbicides and other additives formulated for use near waterways (e.g. Round-Up Biactive ™) are to be used.
- Pampas grass is a prominent weed through the site and is known to provide suitable habitat for frogs and other small animals. Each pampas grass tussock will be closely examined for the presence of frogs and other animals by searching the inner parts for sheltering animals before removal. Where animals are found the tussock will not be treated or removed but any seed heads will be removed. These plants can be treated at a later date when no animals are observed using the habitat.
- Dead branches or tree pruning available should be stored on site, not discarded. Large branches and logs are ideal shelter items for small terrestrial animals (e.g. small lizards, frogs and invertebrates). If the branches are small, they should be stacked in an area that receives some direct sunlight.

Protection of habitat for frogs by maintaining and improving the condition of the native vegetation and the groundwater and surface water will also benefit frog species

7.5.5 Other species

Although neither microbat species, the Eastern Bent-Wing Bat (*Miniopterus schreibersii oceanensis*) nor the Little Bent-Wing Bat (*Miniopterus australis*) have been sighted or recorded during previous surveys, they have potential foraging habitat within the CA. Safeguards to protect the GHFF and frogs should benefit these species as well. Baiting of foxes will avoid the risk of these animals being harmed by feral foxes. No additional specific safeguards or management recommendations are needed.

Eastern Banjo Frogs (*Limnodynastes dumerilii*) occur on the site (White, 2006). These squat frogs are burrowing animals and frequently dig burrows under thick bushes where the ground is cool and relatively moist. In addition to relocating any unearthed frogs no other specific safeguards or management recommendations are being applied.

The “Predation by Red Fox (*Vulpes vulpes*) TAP” is relevant to the Kurnell site. Management of the Red Fox will involve baiting programs initiated by National Parks and Wildlife Services and the Sutherland Shire Council.

7.5.6 Exotic species

NSW National Parks & Wildlife Service and Sutherland Shire Council Sutherland Shire Council (SSC) have implemented Integrated Fox and Rabbit Abatement Program on the Kurnell Peninsula. The program is undertaken to protect endangered migratory shore birds, endangered vegetation communities and Green and Golden Bell frog populations found on the Kurnell Peninsula and is an excellent example of integrated, co-operative wildlife conservation in urban areas.

The program implements integrated control operations on public and private property throughout the Kurnell Peninsula where numerous techniques of Fox and Rabbit control are undertaken including: major 1080 fox baiting program, shooting, Den/Warren detection using detection Dogs, Den/Warren fumigation, rabbit harbour control and trapping programs. The shooting and trapping program is completed to target bait shy Foxes, terrestrial rabbits and cats/rats that were disturbing/destroying the bait stations. Veolia participates in such integrated feral species control programs on the Peninsula where they are offered. A recent program (2020) has removed two cats. No foxes were found on site but rabbits have been sighted.

Site specific actions for the eradication of Gambusia holbrooki will be undertaken following the breeding season (September – April) if the species was identified in targeted surveys. Such actions may include controlled draining of the sites basin and investigation of potential to dose chemicals into closed systems should they be impacted and draining proves unsuccessful.

Section 8 Monitoring, Reporting And Auditing

Monitoring and reporting of the condition of the CA overtime will occur in accordance with the site specific Vegetation Management Program (see Appendix 1). Significant issues are to be raised immediately with the EMSR, OEH and the Department of Planning, Industry and Environment (DPIE), if required. Records are maintained on the local server.

8.1 Monitoring

Quantitative monitoring for relevant threatened species and vegetation will be undertaken according to the following program (see Table 7) as detailed further in the following subsections.

Table 7 - Monitoring program

Monitoring task	Timing (month)											
	J	F	M	A	M	J	J	A	S	O	N	D
Regular sweeps	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quantitative vegetation monitoring		✓										
GHFF Survey*#	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Frog Survey*	✓										✓	

* If a threatened species is detected a survey will be scheduled within a month to determine the species ongoing affiliation with the site.

Checks will be carried out during May, June, July and August by bush renergation staff. If GHFF are sighted the environmental consultant will be contacted to arrange surveys to be carried out.

8.1.1 Vegetation

Monitoring of the vegetation by the bush regeneration contractor will be undertaken throughout the 5 year VMP implementation period.

Informal monitoring will be undertaken using regular sweeps.

- The entire Conservation Area is to be regularly checked via random and targeted meander in order to detect new or previously undetected weed outbreaks. These weed sweeps are to occur more frequently in the growing season and when target weeds are more detectable.
- This information is to be incorporated into the vegetation mapping and Annual Vegetation Report and used to direct the treatment program.

Formal monitoring will consist of three components;

- Quadrants

  A monitoring quadrant of 10 x 10 metres in each Zone is to be sampled annually in February. The data to be collected from each quadrat comprises:

  - description of each vegetation layer-an estimate of height, percentage cover and a list of up to three major species in that layer;
  - species list for each quadrant with a cover abundance rating, using a modified Braun-Blanquet rating system; and
  - photograph of each quadrant taken with the picket visible in the foreground.

- Photographs

  15 photographic reference points are to be photographed annually in February. All of these photographs and their grid references as determined by GPS are to be incorporated into the Annual Vegetation Report that also includes the data collected from the monitoring quadrats.

- Mapping

  A map of the Conservation Area showing the densities of weeds and the areas of occurrence of different species is to be provided annually as part of the Annual Vegetation Report. These maps are to show:

  - Changes to weed and native percentage cover with an estimate in square metres of the approximate area rehabilitated during the previous 12 months;
  - Changes to species distributions;
  - Areas of Bitou Bush infestations with an estimate in square metres of the approximate area covered by this species (to facilitate reporting in accordance with the Draft Bitou Bush Threat Abatement Plan);
  - Any new incursions of weeds treated during the previous 12 months or any other management issues throughout the Conservation Area;

8.1.2 Fauna

A monitoring program for the GHFF and threatened frogs was initiated pre-construction and has been implemented continuously, including 2 years of operations. In that time there has not been a detectable influence from activities occurring on the Plant including construction which had the greatest perceived potential to impact the species given the increased activity on the site and associated noise. In recent years, however, the numbers have declined somewhat.

Specific targeted monitoring of the GHFF is carried out monthly and threatened frog species are conducted bi-annually during the previous period of occupancy and peak breeding period, respectively. The current safeguards in place as part of this plan will be assessed including benefits from the controls implemented for noise, illegal access, lighting and vegetation enhancement through the implementation of the VMP.

- Frog Surveys
  - Carried out over one night and undertaken after heavy rain/storm event where possible.

- Survey around wetland areas within and outside CA to establish if individuals are present and to provide advice on how best to preserve and maintain frog habitat during operation and maintenance of the Plant.
- Consider issues raised in the "Predation by Plague Minnow (*Gambusia holbrookii*) TAP".

- GHFF Survey
  - Determine pattern of occupation
  - Consider external factors influencing the potential for the species to inhabit the previous camp site

8.2 Reporting

To support compliance with the requirements of various contracts, legislative and Minister's Conditions of Approval, a legislative compliance register, TEM-5274 Compliance Register - NSW Water is maintained. This is complemented by the Environmental Compliance Tracking Program which is used to record relevant details. Any changes are reported monthly to SDP via the monthly report and collaboratively reported to the Department of Planning, Industry and Environment annually.

The MAN-9673 Incident and Emergency Manual includes an incident notification process where the Director-General will be notified by the Operations Manager (or delegate) of any incident with actual or potential significant off-site impacts on the biophysical environment as soon as practicable, as well as notifications in accordance with Part 5.7 of the POEO Act. Supplementary written details of the incident shall be provided within seven days of the date on which the incident occurred.

Monitoring and reporting requirements of the EPA, Environmental Protection License (EPL) would be carried out to the satisfaction of the conditions therein and otherwise reported via EPA Pollution Line. All other surface water and groundwater monitoring has been addressed in the Surface Water and Groundwater Management Plan (MAN-9491).

8.2.1 Vegetation

Three reports prepared by the bush regeneration contractors and provided to Veolia Water each year:

1. An Annual Review regarding compliance with the VMP's management strategies and fulfilment of the objectives. This is to include any recommendations for alterations to the management strategies in response to the condition of the vegetation; and
2. An Annual Vegetation Report of the specific results from the monitoring quadrats, photo points and weed mapping. This should include a time series of data and photographs to illustrate the changes over the entire management period. The grid references of the locations of each photo point should also be collected via GPS and reported in this document.

8.2.2 Fauna

A written report will be provided to Veolia following each survey. These reports will briefly describe the survey findings and any recommendations. Recommendations from surveys are promptly entered into the

sites issue management system RIVO and actions assigned to relevant staff for investigation/implementation.

8.3 Auditing

Auditing is managed by VEOLIA's corporate document PRO-161 Internal Audit Management Procedure which guides scheduling and conducting audits, auditor qualifications and audit reporting. At Kurnell, there are four levels of auditing taking place:

1. corporate level audit schedule which covers management system audits to identified standards for every Veolia site over the course of 12 months,
2. site specific audit schedule based on auditing specific areas of operations, or specific contract requirements,
3. schedule of client/Veolia "collaborative" audits which are focussed on evaluating management systems and compliance with Ministers Conditions of Approval, and
4. third party certification audits

Veolia maintains certification to the relevant management system standards specifically, ISO14000 Environmental Management Systems, ISO 9001 Quality Management Systems and AS4801 Safety Management Systems.

Section 9 Project Responsibilities And Training

9.1 Roles and responsibilities

In summary, the key responsibilities for the conservation area management are detailed in Table 8 below.

Table 8 Roles and Responsibilities

Role	Responsibility
Operations Manager:	Responsible for ensuring that conservation area management measures are implemented and maintained and, in the event of identified potential or actual breaches, to implement appropriate corrective or preventative actions to fulfill the requirements of this Plan. Responsible for advising applicable members of Sydney's Desalination Plant Team of complaints received pertaining to Conservation Area management or misuse and facilitating the resolution of complaints.
Environmental Management Systems Representative/s (EMSR):	Responsible for ensuring this Plan is implemented by Sydney Desalination Plant personnel. Undertake and assess data from inspections, monitoring and reporting and provide project-wide advice to ensure consistent approach and outcomes are achieved. Responsible for providing necessary training for Sydney Desalination Plant personnel to cover conservation area management issues.
Process Manager:	Responsible for providing assistance to the EMSR to fulfill the requirements of this Plan and for ensuring that appropriate conservation area management measures are implemented and maintained, and for reviewing performance of these measures.
Operations & Maintenance Supervisor:	Responsible for providing assistance to the EMSR to fulfill the requirements of this Plan and for ensuring that appropriate conservation area management measures are implemented and maintained.

Report Certification

Works for this report were undertaken by:

Name	Company / Position	Role
Kurtis Lindsay BSc (Hons)	Narla Environmental –Principal Ecologist	Reporting, Field Work, Project Management
Emily Strautins BSc (Hons)	Narla Environmental – Ecologist	Co-author, Desktop Analysis, Field Work
Gavin Thomas BSc	Narla Environmental-Ecologist	Co-author, Fieldwork
Elissa McFarlane BSc (Hons)	Narla Environmental-Ecologist	Co-author, Desktop Analysis

As Principal Ecologist and Manager of Narla Environmental, I Kurtis Lindsay certify that:

this Vegetation Management Plan has been prepared in accordance with the brief provided by Veolia.
the information presented in this report is a true and accurate record of the study findings in the opinion of the authors.

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Appendix 1- Vegetation Management Plan

NARLA
environmental

1. Vegetation Management Plan

Sydney Desalination Plant-Conservation Area

2016 – 2021

Report prepared for Veolia Water

Prepared for:	Veolia Water
Prepared by:	Narla Environmental Pty Ltd
Project no:	VEOL1
Date:	January 2017
Version:	Final v3

Narla Environmental Pty Ltd

www.narla.com.au

1. Introduction

1.1 Background

Narla Environmental Pty Ltd was engaged by Veolia Water Operations ('Veolia') to prepare the 2016 revised Vegetation Management Plan (VMP) for the Sydney Desalination Plant 'Conservation Area' (CA) located on the Kurnell Peninsula (the 'subject site'; Figure 1).

As part of the approval process for the Sydney Desalination Plant, a protected CA was established. This contained remnant vegetation found in the northern portions of each lot. The CA covers an area of approximately 15 ha. Veolia have been implementing conservation efforts across the CA since the Sydney Desalination Plant was established.

In order to guide the management of vegetation and threatened fauna within the CA, a Vegetation Management Plan (VMP) was established. The VMP has been reviewed and revised every five years, the most recent of which is due to be reviewed in December 2016 (Ashby, 2011). The current VMP will supersede previous versions, providing up to date information on the current state of vegetation within the CA and guide ongoing vegetation and habitat management for the next five years.

The main objectives of this VMP are to deliver a working document that achieves the following:

1. enhances the habitat for endangered ecological communities that occur on site;
2. enhances the habitat for threatened species known to occur on site;
3. enhances the habitat for threatened species with the potential to occur on site; and
4. improves the local flora with weed control.

1.2 Relevant Legislation

The following legislation has been assessed in the preparation of this VMP (Table 1).

Table 1. Legislation assessed in the preparation of this VMP

Legislation	Relevant Ecological Feature On Site	Triggered	Action Required
Coastal Protection Act 1979 NSW (CP Act)	Not applicable under Part 3A of the EP &A Act	No	None
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	A number of EPBC listed Endangered Ecological Communities (EEC) and threatened species are known or considered likely to be present within the CA.	Yes	Follow recommended controls to protect these species and EECs as outlined in this VMP
Fisheries Management Act 1994	No stream, lacustrine or marine environments occur within the subject site therefore this legislation does not apply to the subject site.	No	A standard search for species listed under the FM Act was conducted and no potential threatened species were found to occur in the

			catchment of the proposed works.
Native Vegetation Act 1993 (NV Act)	Not applicable under Part 3A of the EP &A Act	No	None
Noxious Weeds Act 1993 (NW Act)	Fifteen noxious weed species were identified within the CA.	Yes	These plants have been specifically addressed within this report. Follow management recommendations.
Protection of the Environment Operations Act 1997	All features	Yes	The development and application of this VMP.
State Environmental Planning Policy No. 14-Coastal Wetlands (SEPP 14)	No SEPP 14 Coastal Wetlands on site or in the vicinity or storm water discharge areas.	No	None
Threatened Species Conservation Act 1995 (TSC Act)	A number of TSC listed Endangered Ecological Communities (EEC) and threatened species are known or considered likely to be present within the CA.	Yes	Follow recommended controls to protect these species and EECs as outlined in this VMP

2. Site Description

2.1 Location and Zoning

The subject site lies within the suburb of Kurnell, under the jurisdiction of the Sutherland Shire Council. It is located at the southern limit of a large industrial area occupying the centre of the Kurnell Peninsula (Figure 1). To the north-west of the subject site is Towra Point Nature Reserve which is separated from the subject site by Captain Cook Drive. South of the subject site is Cronulla State Park, which joins Kamay Botany Bay National Park approximately 1.2 km away. To the west is Boat Harbour Park.

The Sydney Desalination Plant occupies two property lots:

Lot 2/ DP1077972 and

Lot 1/ DP1088703

Both lots are zoned 'IN1- General Industrial' under the Sutherland Shire Local Environment Plan (LEP 2015).

2.2 Geology, Soils and Topography

The Kurnell Peninsula is a coastal sand barrier complex within Botany Bay. It is predominantly made up of Quaternary estuarine sediments and marine quartz sand atop Hawkesbury Sandstone bedrock (aeolian

sands). Areas of exposed Hawkesbury Sandstone occur on the coastal headlands. (Hazelton & Tille 1990, Albani & Rickwood 1998).

The surface soils of the CA are dominated by Quaternary deposited aeolian sands at or below sea level. Much of the subject site is low lying, with numerous localised depressions, ideal for holding water (Babister, Barbour and Noble 2009). This has contributed to the creation of some permanent and ephemeral wetlands and waterways present within the CA. In these wetlands, the soil A horizon is heavily influenced by decaying organic matter.

The CA is linked to the wetlands of Towra Point via a drainage line that runs under Captain Cook Drive.

Figure 6. Location of the subject site (Sydney Desalination Plant and Conservation Area) within the landscape context of Kurnell Peninsula

3. Management Issues And Considerations

This section of the VMP discusses the issues and considerations relevant to the CA and its on-going management.

3.1 Vegetation Communities

The original vegetation mapping produced for the subject site is presented **(Figure 2)**. This mapping was produced for the Environmental Assessment that preceded development of the Sydney Desalination Plant (GHD 2005).

Two years after the last Sydney Desalination Plant CA VMP was published, the NSW Office of Environment and Heritage (OEH) produced a vegetation mapping layer that utilises fine scale vegetation community classifications specific to the Sydney Metropolitan Region (including the subject site). This vegetation mapping has been presented in this VMP **(Figure 3).**

A summary of the vegetation communities that have been mapped within the CA is presented **(Table 2).** Each of the communities is listed along with early nomenclature (GHD 2005) and current nomenclature (OEH 2013) for each vegetation community. A brief description of each community taken from OEH (2013) is also provided.

It is evident from the two maps that vegetation layer boundaries differ. This is not unexpected. The mapping undertaken by OEH (2013) is largely based on aerial imagery interpretation with limited ground truthing and therefore is likely to contain inaccuracies.

In the 11 years since the original vegetation mapping of the CA was produced (GHD 2005), the vegetation has matured due to an absence of ecological disturbance (e.g. wild fire) and the assisted management from bushland restoration professionals. It is considered likely that the ratios and boundaries of the definable communities originally mapped within the CA have changed overtime. This is particularly evident in the areas previously mapped as 'Freshwater Wetland' which at the time of survey (spring 2016) were dominated by Swamp Oak (Casuarina glauca) and Swamp Paperbark (Melaleuca ericifolia).

The vegetation communities mapped **(Figure 1; Figure 2)** all share diagnostic flora species however it is the abundance and cover of each species that are the main determinants of community identification. All of the vegetation communities in the CA intergrade to varying degrees. For example, all of the community types mapped are known to contain Swamp Oak (OEH 2013). This is the most abundant tree species within the CA and is continuing to regenerate and proliferate. Because of this it is difficult to determine clear boundaries between vegetation communities. It is also apparent the vegetation community boundaries have shifted over time and will continue to do so. This is typical of any living system.

3.1.1 Endangered Ecological Communities

All of the remnant vegetation communities within the CA are classified as Endangered Ecological Communities (EEC) under the New South Wales Threatened Species Conservation Act 1995 (TSC Act). A total of four EEC have been previously mapped as occurring within the CA, these are:

Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions Rockdale-endangered ecological community

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin

and South East Corner bioregions Rockdale-endangered ecological community

Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions Rockdale-endangered ecological community

Kurnell Dune Forest in the Sutherland Shire and the City of Rockdale

Current and historical land management activities have influenced the communities, their structure and extent within the CA. This VMP will guide the on-going management of these communities.

Figure 7. Original Vegetation Mapping of the CA (GHD 2005)

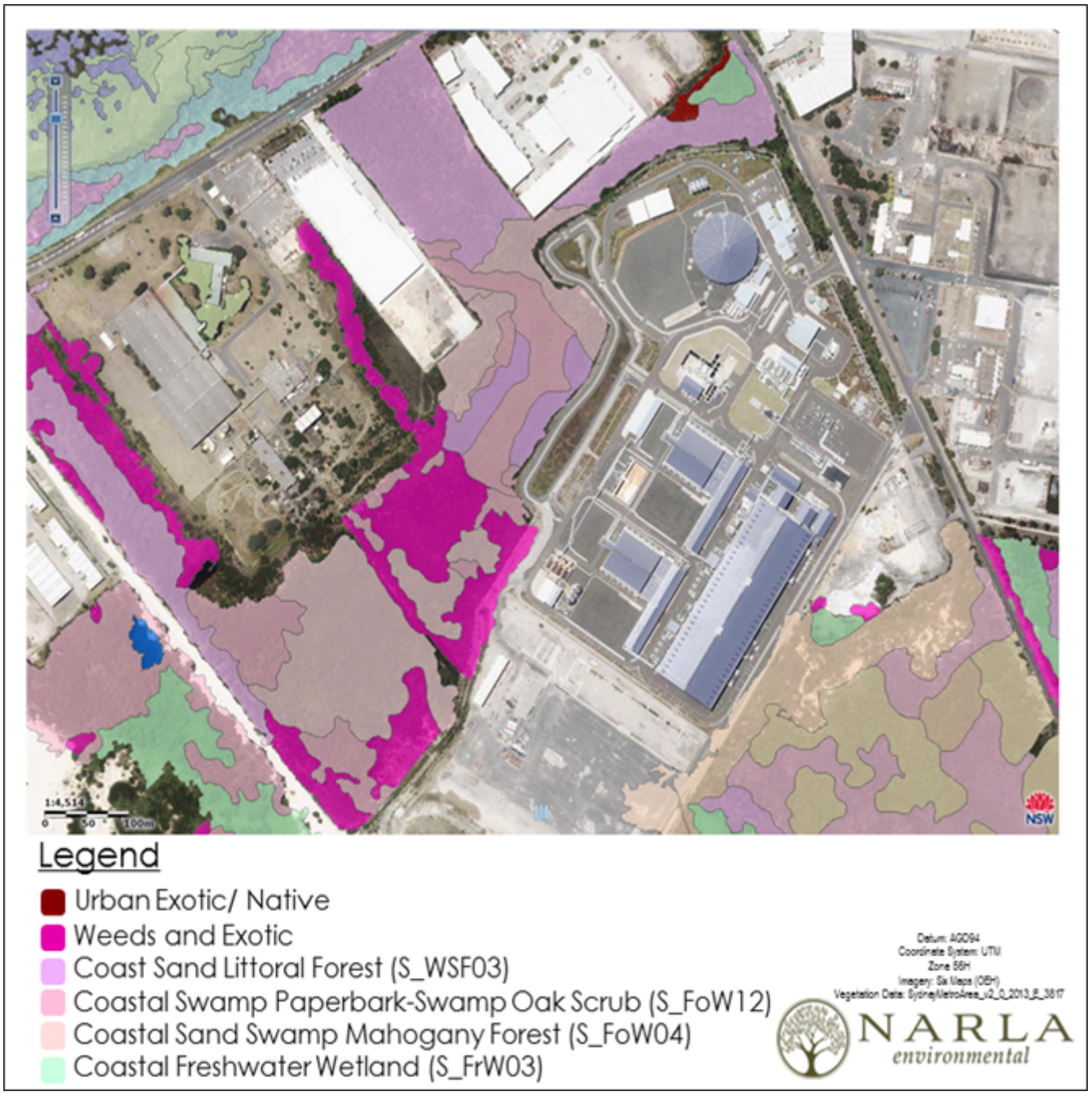

Figure 8. Sydney Metropolitan Vegetation Mapping showing the CA (OEH 2013)

Table 2. Vegetation communities identified within the CA

OEH 2013 Map Unit	GHD 2005 Map Unit	Area (ha) (GHD 2005)	Status (TSC Act 1995)	Description	State Class	NSW Plant Community Type (PCT)
Urban Exotic/ Native	Disturbed Land	n/a	n/a	Land that contains a mixed assemblage of native and exotic plant species. Native assemblage has experience disturbance to the level that no native vegetation community can be accurately identified.	n/a	n/a
Weeds and Exotic	Disturbed Land	n/a	n/a	Vegetated land which is occupied predominantly by non-indigenous plants.	n/a	n/a
Coastal Sand Littoral Forest (S_WSF03)	Kurnell Dune Forest	1.2	Kurnell dune forest in the Sutherland Shire and the City of Rockdale EEC	Coastal Sand Littoral Forest comprises a forest and woodland community with a prominent component of littoral rainforest species amongst the shrub and small tree layer. An open cover of tuckeroo (Cupaniopsis anacardioides) and other waxy leaved species occur below a canopy of banksia, casuarina and/or eucalypt trees. A high diversity of vines is found across multiple layers of the vegetation. The woody vine cockspur thorn (Maclura cochinchinensis), identifiable by its long spikes, is a useful diagnostic species for the community. Habitat and disturbance are both very influential in the structure and composition of the community at any given location. It is restricted to coastal sand deposits receiving greater than 1050 millimeters of mean annual rainfall. The most extensive areas remain on the older low-lying (c. 1.5-10 metres above sea level) transgressive barrier dunes along the northern side of the Kurnell Peninsula. On the drier siliceous sands the forest forms a eucalypt-dominated forest comprising bangalay (Eucalyptus botryoides) and/or swamp mahogany (Eucalyptus robusta) with a grassy and ferny ground cover. On the humic podsols associated with poorly drained areas eucalypts are less prominent and instead tall coast banksia (Banksia integrifolia) and swamp oak (Casuarina glauca) dominate above a ground cover of sedges thriving amongst the waterlogged soils. Above 10 metres above sea level this community is increasingly restricted to sheltered situations. Eucalypts may once have consistently dominated however today lower-growing banksia scrubs are more common. Similar forests occur on the sand deposits on the New South Wales Central Coast.	North Coast Wet Sclerophyll Forests	1536: Bangalay-Smooth-barked Apple-Swamp Mahogany Low Open Forest of Southern Sydney, Sydney Basin Bioregion

Coastal Swamp Paperbark-Swamp Oak Scrub (S_FoW12)	Swamp Oak Floodplain Forest	0.9	Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC	Dense stands of swamp paperbark (Melaleuca ericifolia) form a low open to closed wet scrub on coastal estuarine flats and on the margins of lagoons. Swamp oak (Casuarina glauca) may form a component of the scrub layer, or appear as an emergent layer as isolated individuals or as clumps of trees. These low-lying sites are periodically flooded by brackish and/or freshwater. The ground layer has a very diverse and abundant cover of sedges, rushes and taller reeds. Most common are twig-rushes (Baumea spp.) and common reed (Phragmites australis). These are species that can tolerate water with saline influence. In the Sydney area the community is concentrated in proximity to the estuarine systems of the Georges River and the margins of Narrabeen Lakes. All sample sites are situated at elevations less than five metres above sea level. Small areas are found near brackish lagoons such as Martons Swamp in Kurnell. It occurs elsewhere along the central and south coasts of New South Wales.	Coastal Floodplain Wetlands	1236: Swamp Paperbark-Swamp Oak Tall Shrubland on Estuarine Flats, Sydney Basin and South East Corner
Coastal Sand Swamp Mahogany Forest (S_FoW04)	Swamp Sclerophyll forest on Coastal Floodplains	6.9	Not Listed	Coastal Sand Swamp Mahogany Forest occurs on low-lying coastal sandy substrates found in or adjoining dune swales, lagoons and other alluvial infill. It is a low open eucalypt forest with a sparse dry shrub layer and a very distinctive ground cover of sedges, rushes and ferns. Swamp mahogany (Eucalyptus robusta) dominates the canopy above a low cover of paperbarks, tea-trees, banksias and wattles. These sites are underlain by an elevated water table that saturates the peaty sand year round. This encourages a diverse and abundant layer of sedges and rushes. These include bare twig-rush (Baumea juncea) jointed twig-rush (Baumea articulata), tall saw-sedge (Gahnia clarkei) and zig-zag bog-rush (Schoenus brevifolius). Few examples of this forest remain in the Sydney area, with Dee Why Lagoon and the Kurnell Peninsula retaining the largest areas. These landscapes are coastal barrier dunes that do not exceed 10 metres in elevation. In Sydney such swamps have been replaced by urban and industrial development. More extensive areas occur on the Central Coast (NPWS 2000c) and the NSW south coast to Jervis Bay (Tozer et al. 2010), although these too are now subject to development pressures.	Coastal Swamp Forests	1231: Swamp Mahogany Swamp Sclerophyll Forest on Coastal Lowlands of the Sydney Basin and South East Corner

Coastal Freshwater Wetland (S_FrW03)	Sydney Freshwater Wetlands	3.3	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC	Coastal Freshwater Wetland is associated with freshwater lagoons and swamps on alluvial flats and sand depressions across the New South Wales east coast. Lagoons have fluctuating levels of standing water that gives rise to a varied assemblage of species. They include a range of sedges, rushes and aquatic herbs with woody shrubs and small trees found only on the margins of the wetlands in low abundance. Tall reedlands (reaching over three metres in height) may dominate individual wetlands. Cumbungi (Typha orientalis) is typically dominant in urban wetlands and may be joined by common reed (Phragmites australis). Other tall reeds include Eleocharis sphacelata and tall sedges such as twig-rushes (Baumea spp.). The margins of open water carry a range of aquatic herbs such as Isachne gibbosa and Persicaria decipiens. Less frequently inundated wetlands support only a few species of sedges or rushes such as Carex appressa and or Baumea spp. which do not reach the height of the taller reedlands found elsewhere. In the Sydney metropolitan area Coastal Freshwater Wetland is most commonly found at low elevations less than five metres above sea level on coastal plains and flats. Several swamps occur on highly disturbed floodplains of the Cumberland Plain where elevations reach 20 metres above sea level. Many of the remaining swamps are situated amongst intensely developed urban landuses. In these environments drainage patterns have been altered and weeds may be prolific.	Coastal Freshwater Lagoons	781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner

3.1.2 Review of Vegetation Community Recovery Activities

A review of OEH recommended recovery strategies and activities were conducted as specified for each Vegetation Community / EEC found within the CA. Any proposed activities or strategies were evaluated and required management actions relevant to the VMP were summarised in Table 3.

Table 3. Review of OEH Recovery Actions relevant to EEC within the CA

Endangered Ecological Community	OEH Recommended Recovery Activity	Actions required within Sydney Desalination Plant CA
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale EEC	Support and provide information to land managers and maintenance crews regarding appropriate management.	This VMP provides detailed information for land managers including Veolia and bush regeneration contractors to best manage the EEC within the CA
	Determine and apply appropriate fire management practices.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Implement measures to control inappropriate water flows.	Historical changes to natural water flows have occurred throughout the area. These changes have facilitated the creation of infrastructure in the area. Water flows in and around the CA have been altered historically, however it is considered unlikely that these will be changed any further.
	Install gates, fencing, formal tracks and signs to manage access and prevent rubbish dumping.	The entire CA is either fenced or has restricted access to unauthorised persons. Unauthorised access may still occur from the north-west of the CA where there is no fencing. One formal track dissects the centre of the CA. It is considered that this track is sufficient for the management of the CA. Additional tracks constructed through the CA will require impact assessment (e.g. REF) prior to construction.
	Protect remnants from clearing and further fragmentation.	The establishment of the CA provides ongoing protection of the vegetation from clearing and fragmentation. This VMP guides best practice methods for further enhancing native habitat.

	Restore degraded habitat using bush regeneration techniques.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Prepare and implement site specific plans of management.	This VMP is a site-specific plan of management that provides recommendations for best practice management actions and monitoring of CA management performance.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Install stormwater control mechanisms to prevent off-site impacts from adjacent development.	This recovery strategy was addressed as part of the Sydney Desalination Plant approval and development process. However, the CA may still be vulnerable to spills from uncontrolled accidents in nearby sites.
	Control access to remnants by installing fencing and signage and rationalising informal tracks through the community.	The entire CA is either fenced or has restricted access to unauthorised persons. Unauthorised access may still occur from the north-west of the CA where there is no fencing. One formal track dissects the centre of the CA. It is considered that this track is sufficient for the management of the CA. Additional tracks constructed through the CA will require impact assessment (e.g. REF) prior to construction.
	Undertake weed control as required using removal methods that will not damage the community.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Protect and actively manage SFW remnants through conservation mechanisms such as covenanting and the preparation/implementation of site-specific vegetation management plans.	This VMP is a site-specific plan of management that provides recommendations for best practice management actions and monitoring of CA management performance.

	Improve vegetative connectivity within and between remnants through revegetation/regeneration programs and provide vegetative buffers around these remnants.	Maintenance of vegetation within the CA as outlined in this VMP assists in preserving and enhancing habitat connectivity with other remnant bushland areas of the Kurnell Peninsula e.g. Kamay Botany Bay National Park.
	Restore natural drainage conditions.	Historical changes to natural water flows have occurred throughout the area. These changes have facilitated the creation of infrastructure in the area. Water flows in and around the CA have been altered historically, however it is considered unlikely that these will be changed any further.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Promote public involvement in restoration activities.	Not applicable. The subject site has restricted access. Restoration activities are to be undertaken only by Qualified Bush Regeneration Contractors
	Instigate pig control programs	Not applicable. This pest species is not present within the subject site.
	Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezoning and regional planning.	The establishment of the CA protects relevant native vegetation habitat. This VMP directs ongoing works sensitive to the requirements of this EEC.
	Promote regeneration by avoiding prolonged or heavy grazing.	Not applicable. Grazing no longer occurs locally.
	Weed control.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.

	Undertake restoration including bush regeneration and revegetation.	This VMP provides detailed information on recommended bush regeneration methods to be delivered by Qualified Bush Regeneration Contractors.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Instigate pig, deer and goat control programs.	Not Applicable. None of these species have been recorded in the subject site
	Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.	Not applicable. The CA is located close to significant infrastructure and the risk of impact to assets is too high to warrant the use of fire as a management tool.
	Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process.	The establishment of the CA provides ongoing protection of the vegetation from clearing and fragmentation. This VMP guides best practice methods for further enhancing native habitat.
	Promote regeneration by avoiding prolonged or heavy grazing.	Not applicable. Grazing no longer occurs locally.
	Undertake restoration including bush regeneration, revegetation and weed control, and promote public involvement in this restoration.	Best practice weed control methods have been implemented and are further recommended. This VMP directs ongoing works sensitive to the requirements of this EEC.

3.2 Threatened Fauna Habitat

The CA is highly significant as it provides habitat for a diverse suite of threatened fauna species listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and / or the Threatened Species Conservation Act 1995 (TSC Act). The two most significant species are the Green and Golden Bell Frog and the Grey-headed Flying Fox. Maintaining and enhancing this habitat for threatened fauna is a key objective of vegetation management within the CA.

Significant areas of Green and Golden Bell Frog habitat exist within the CA along the ephemeral drainage lines, Freshwater Wetlands and in the sedges and rushes in the Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest. The sclerophyll forest vegetation of the CA has provided intermittent roosting habitat for colonies of Grey-headed Flying Fox for over a decade (Eby 2006).

The Environmental Assessment for the Sydney Desalination Plant (GHD 2005) states the following:

"All areas that currently support potential habitat for the Grey-headed Flying Fox and Green and Golden Bell Frog will be conserved at the site and the project will not isolate any current movement pathways for either of these species. Furthermore, all potential foraging habitat will be retained in the conservation areas and management measures will be implemented to prevent indirect impacts on habitat for these species. Consequently, it is unlikely that the project will have a significant impact on the lifecycle of either of these threatened species

or the populations at the site. Instead, proper and continued management may improve overall ecological conditions, improving the chance that these two species will continue to use resources on the site."

It is essential that active habitat restoration and management within the CA is undertaken in a manner that continues to preserve and enhance the habitat for the Green and Golden Bell Frog and Grey-headed Flying Fox as well as the other potentially occurring threatened species listed in Table 4. Habitat restoration efforts should not favour vegetation community restoration over threatened fauna habitat restoration.

Table 4. Threatened fauna species known to occur within the CA

Species	Conservation Status	Present on Site	Habitat/ Location
Grey-headed Flying Foxes (Pteropus poliocephalus)	Vulnerable – TSC Act Vulnerable – EPBC Act	Known	Existing seasonal breeding camp within the west of the CA (Veolia, 2015).
Green and Golden Bell Frog (Litoria aurea)	Endangered – TSC Act Vulnerable– EPBC Act	Known	Known breeding location in drainage gully adjacent to the Subject Site. Historical records collected within the CA and surrounding area (Bionet, 2016).
Wallum Frog (Crinia tinnula)	Vulnerable –TSC Act	Recorded within the CA during targeted survey (2012)	Numerous recent records from surrounding area. Highly specialised to acid paperbark swamps and sedge swamps of the coastal 'wallum' country (Meyer et al. 2008).
Southern Myotis (Myotis macropus)	Vulnerable –TSC Act	Recorded within the CA in 2009 (Bionet, 2016)	Proximal records found on the Kurnell Peninsula (Veolia, 2015). The CA likely provides habitat suitable for foraging. Limited roosting habitat has been identified. The nearest suitable roosting habitat occurs in the form of large man-made structures including sheds and buildings.

3.2.1 Review of Threatened Fauna Recovery Activities

A review of OEH recommended recovery strategies and activities were conducted as specified for each Threatened Species recorded within the CA. Any proposed activities or strategies were evaluated and required management actions relevant to the VMP were summarised in Table 5. Further detailed recommendations for habitat management through management of vegetation communities are provided in section 3.1.

Table 5. Review of targeted recovery activities and strategies for threatened species recorded within the CA.

Threatened Species	OEH Recommended Recovery Activity	Actions required within Sydney Desalination Plant CA
Grey-headed Flying-fox (Pteropus poliocephalus)	Protect roost sites, particularly avoid disturbance September through November.	Establishment of the CA provides general protection. Observe recommendations provided in section 5.1
	Identify and protect key foraging areas.	Key foraging resources have been previously identified within the CA including preferred feed tree species. This VMP guides further habitat enhancement. Observe recommendations provided in section 5.1
	Manage and enforce licensed shooting.	Not Applicable
	Investigate and promote alternative non-lethal crop protection mechanisms.	Not Applicable
	Identify powerline blackspots and implement measures to reduce deaths; implement measures to reduce deaths from entanglement in netting and on barbed-wire.	To date powerlines and wire fencing have not been identified as an issue for the Grey-headed Flying Fox using the Sydney Desalination Plant CA. It is still recommended that local powerlines and any barbed wire fencing should be inspected for Grey-headed Flying Fox during times a Grey-headed Flying Fox colony is present, roosting within the CA.
	Increase public awareness/understanding about flying-foxes, and their involvement in flying-fox conservation.	Not Applicable

	Monitor the national population's status and distribution.	Outside of this VMP scope however local population monitoring is addressed in supplementary documentation (Veolia 2015)
	Improve knowledge on demographics and population structure to better understand ecological requirements of the species.	Outside of this VMP scope however local population monitoring is addressed in supplementary documentation (Veolia 2015)
Green and Golden Bell Frog (Litoria aurea)	Maintain captive bred populations for future possible re-introduction programs.	Not applicable
	Initiate community awareness programs that highlight the presence of populations and catchment management approaches to improving stormwater quality, habitat retention and management.	Stormwater management is included in the Sydney Desalination Plant Surface and Groundwater Management Plan and its implementation will ensure habitat retention and management
	Develop measures to control or eradicate the introduced Plague Minnow.	Measures have been previously established (refer to Veolia CAMP 2015). Observe recommendations provided in section 3.6.1 of this VMP.
	Establish protocols for handling of frogs and educational strategies to minimise the inadvertent spread of fungal pathogens from site to site.	Handling of any fauna is to be avoided. Hygiene protocols are discussed in section 5.4 of this VMP.
	Develop strategies to provide for the development or enhancement of frog habitat to improve reproductive success and recruitment at known sites.	All management strategies within this VMP intend to result in improved native habitat.
	Develop site specific plans of management to improve conservation outcomes for targeted populations.	All management strategies within this VMP intend to result in improved native habitat.
	Develop strategies to provide disease-free and fish-free breeding habitat.	Measures have been previously established and listed within the CAMP (Veolia 2015). Refer to section 4.1 in this VMP for further advice.

Wallum Froglet (Crinia tinnula)	Retain wetland protection buffers in new coastal developments.	The establishment of the CA and management as outlined in this VMP
	Fence off swamps to prevent stock from grazing in these areas.	Grazing no longer occurs locally.
	Protect coastal wetland areas.	The establishment of the CA and management as outlined in this VMP
	Manage and control pest species (Plague Minnow) in accordance with approved Threat Abatement Plans.	Recommendations in this VMP are to monitor for pest fish species during scheduled annual frog surveys and manage them appropriately in accordance to Threat Abatement Plans
	Apply fire regime appropriate for vegetation type (frequency varying between 6-35 year intervals) and ensure standing water is present if undertaking prescribed burns.	Not relevant as the site is too close to hazardous industry for the use of fire as a management tool.
	Control incursion of weeds into coastal wetland habitat	This VMP outlines updated best practice recommendation for vegetation management to be carried out by Qualified Bush Regenerators
	Rehabilitate or recreate former and existing habitat degraded or destroyed by grazing, sandmining and other activities	This VMP guides best practice native habitat restoration and enhancement, designed to assist this and other locally indigenous species.
Southern Myotis (Myotis macropus)	Retain native vegetation along streams and rivers and around other waterbodies.	The establishment of the CA protects relevant native vegetation habitat. This VMP guides best practice methods for maintaining the native vegetation habitat within the CA.
	Minimise the use of pesticides adjacent to foraging areas.	Only targeted herbicide and terrestrial, predatory vertebrate pesticide (1080) is specified for use within the CA. This is outlined in this VMP and should be minimised. No pesticides are used to target invertebrates such that prey of the southern myotis may decline.

	Protect roosts from damage or disturbance.	No relevant roost habitat has been identified within the CA. If located in the future an Ecologist should be contacted for guidance.

3.3 Threatened Flora

No threatened flora has been recorded in the CA to date although it is important to note that there are abundant local records of the Endangered Magenta Lilly Pilly (Szygium paniculatum) (listed under the TSC Act and EPBC Act) from the Kurnell Peninsula including Towra Point Nature Reserve. This wet sclerophyll tree species is known to grow within four of the vegetation community types that dominate the CA. The species readily self-sows from seed dropped by birds (e.g. Pied Currawong Strepera graculina) and Flying Foxes (e.g. Grey-headed Flying Fox). It is possible that Magenta Lillypilly and/or other threatened flora may be found within the CA in the future especially as active weed removal efforts reduce the competition for resources that would otherwise hinder germination of such native tree species.

3.4 Key Threatening Processes

The following list of ten Key Threatening Processes (KTP) listed under the TSC Act have been considered to be in occurrence or have potential to occur within the CA and influence the EECs or threatened species that occur there:

i. Invasion of native plant communities by bitou bush and boneseed
ii. Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)
iii. Invasion and establishment of exotic vines and scramblers
iv. Invasion of native plant communities by African Olive Olea europaea L. subsp. cuspidata
v. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
vi. Invasion of native plant communities by exotic perennial grasses
vii. Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)
viii. Predation by the European red fox (Vulpes vulpes)
ix. Predation by Gambusia holbrooki Girard, 1859 (plague minnow or mosquito fish)
x. Predation by the feral cat (Felis catus)

Recommendations made within this report have addressed each of the listed KTPs with the aim of reducing the impact of each in the most efficient, effective manner.

3.5 Weeds and Exotic Vegetation

A large suite of Noxious and environmental weeds were identified within the CA during the preparation of this VMP. Dense infestations of weeds were most commonly recorded in patches along the boundaries of the CA. These areas contained a combination of environmental and noxious weeds. A number of less dense infestations were also identified within interior areas of bushland. These patches tended to be dominated by a few exotic species, including Turkey Rhubarb (Acetosa sagittata), Senna (Senna pendula), Crofton Weed (Ageratina adenophora), Blackberry (Rubus fruticosus var. aggregate), Madeira Vine (Anredera cordifolia), Pampas Grass (Cortaderia selloana) and isolated woody weeds.

The most densely infested areas identified during the survey have been highlighted in Figure 4. Other areas which contained only a few weeds at low densities were not included within this map, however all areas across the CA require on-going auxiliary action to prevent spread or reinfestation.

3.5.1 Noxious Weeds

During the site visit undertaken in development of this VMP, 15 Noxious Weed Species were identified within the CA. This included a combination of three Classes of Noxious Weeds listed for the Sutherland LGA and Weeds of National Significance (WONS) (DPI 2016). Definitions for the different Noxious Weed Categories are provided in Table 6.

The species identified, the noxious weed class and the zones where they were found to occur are provided within Table 7. These weed types require priority management action.

Table 6. Definitions of the noxious weeds classes relevant to the weeds identified within the CA

Noxious Weed Classes		
1	State Prohibited Weed	The plant must be eradicated from the land and the land must be kept free of the plant
3	Regionally Controlled Weed	The plant must be fully and continuously suppressed and destroyed
4	Locally Controlled Weed	The plant must not be sold, propagated or knowingly distributed
WONS	Weed of National Significance	These weeds are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.

Table 7. Inventory of all noxious weeds recorded within the CA and their class within the Sutherland LGA

Common Names	Scientific Name	Noxious Weed Category	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Ground Asparagus	*Asparagus aethiopicus*	WONS; 4	*	*	*		*	*	*
Bridal Creeper	*Asparagus asparagoides*	WONS; 4							*
Climbing Asparagus Fern	*Asparagus plumosus*	WONS; 4						*	
Green Cestrum	*Cestrum parqui*	3						*	
Boneseed	*Chrysanthemoides monilifera subsp. monilifera*	WONS; 1	*	*			*	*	*
Pampas Grass	*Cortaderia selloana*	3		*	*	*			*
Flax-leaf Broom	*Genista linifolia*	WONS; 4							*
Lantana	*Lantana camara*	WONS; 4	*					*	*
Large Leaf Privet	*Ligustrum lucidium*	4							*
Small Leaf Privet	*Ligustrum sinense*	4							*
Ludwigia	*Ludwigia peruviana*	3							*
African Olive	*Olea europaea subsp. cuspidata*	4	*	*		*	*		*
Castor Oil Plant	*Ricinus communis*	4	*						*
Blackberry	*Rubus fruticosus species aggregate*	WONS; 4	*	*	*			*	*
Fireweed	*Senecio madagascariensis*	WONS; 4	*						

Two Noxious Weed species were widely dispersed throughout the CA and as a result considered a particular threat to the on-going health of native vegetation communities. These were Lantana (Lantana camara) and Boneseed (Chrysanthemoides monilifera subsp. monilifera). Both of these species are listed KTPs for the region and each is listed as a WONS. Boneseed specifically, is listed as a Class 1 Noxious Weed for the Sutherland LGA, representing the highest priority class. The targeting of Noxious Weeds within the CA is considered the highest priority to be addressed by Bushland Restoration personnel working within the CA.

The control of noxious weeds within the site should be prioritised as follows:

Priority 1. Of particular concern are the weeds with the highest noxious rankings or those considered most likely to present a threat to EEC and threatened fauna habitat. This includes:

- Boneseed
- Lantana
- African Olive
- Ludwigia (Ludwigia peruviana)

Priority 2. Control and removal of exotic vines such as Madeira Vine, Bridal Creeper, Balloon Vine and Morning Glory is recommended as the second priority for Bushland Restoration efforts. This weed group presents a high risk to native vegetation and is likely to smother areas of EEC if left unmanaged.

Priority 3. Additional priority noxious weeds species identified which will require priority action include Pampas Grass and Green Cestrum (Cestrum parqui) all listed as Class 3 Noxious Weeds within the Sutherland Local Government Area. Sharp Rush (Juncus acutus) is an aggressive wetland weed that is not listed as noxious but poses a severe threat to freshwater wetlands and should be controlled as a matter of priority.

On-going efforts should be made to reduce the infiltration of weeds into the CA. Of particular concern is the impact of edge effects.

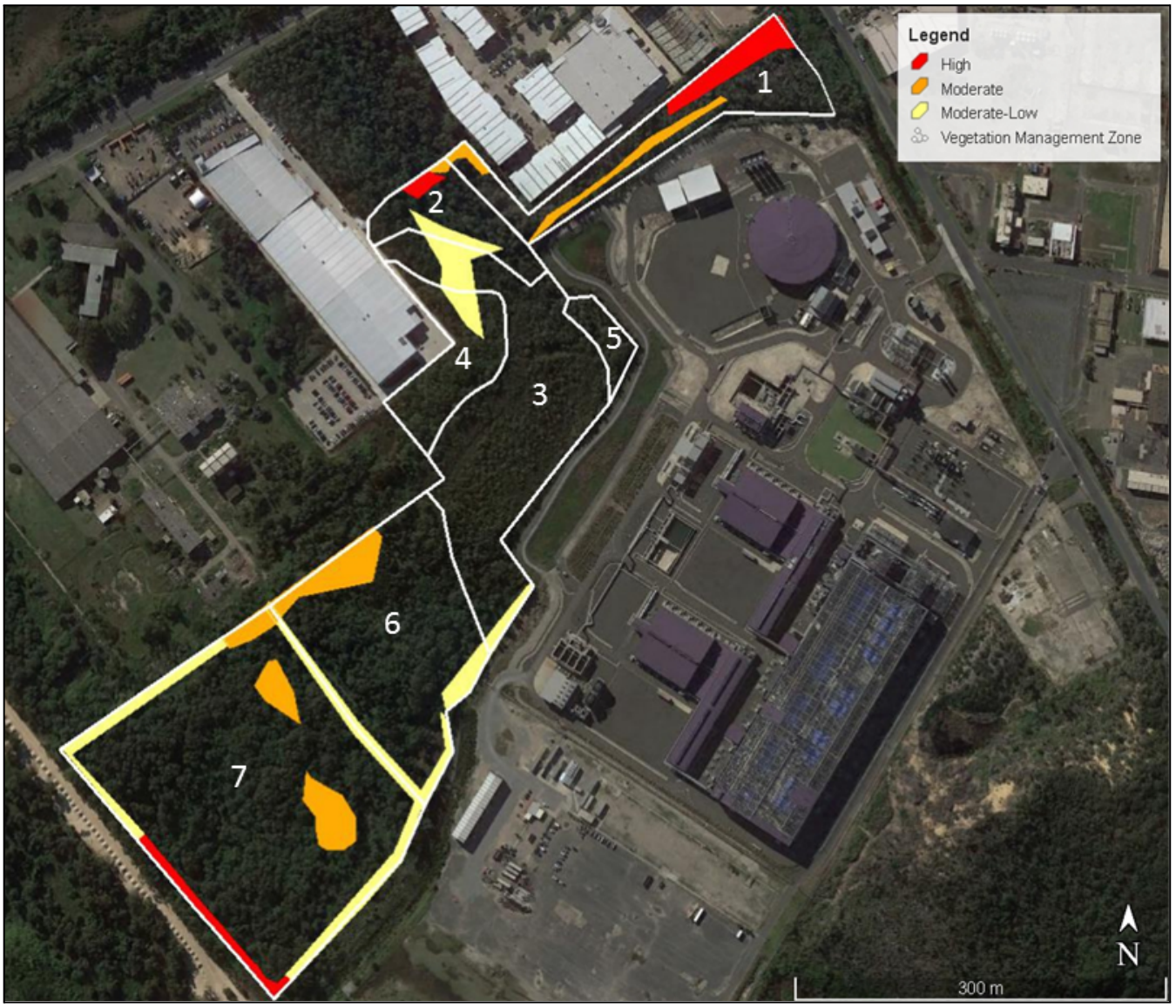

Figure 9. Management zones assigned to the CA and weed infestation severity mapped across the site during October 2016

3.6 Pest Fauna Species

3.6.1 Gambusia

The pest fish, Gambusia holbrooki commonly referred to as Plague Minnow, Mosquito Fish or Gambusia poses a significant threat to Green and Golden Bell Frog and Wallum Froglet within the CA. This pest fish species is listed as a KTP as it actively predates frog eggs and tadpoles preventing them from reaching maturity. It is known to occur within freshwater streams and drains within and immediately surrounding the CA.

3.6.2 Rabbit

Rabbits (Oryctolagus cuniculus) were observed foraging on the edges of the CA. Rabbits pose a threat to sensitive vegetation which makes up the EECs present and is a listed KTP. The most significant impacts from rabbits are likely to take place in the edges or in the south of the CA where seedling propagation is occurring.

Narla recommend that any existing rabbit control programs continue, and that these be applied collaboratively with similar programs occurring in adjacent National Park and private or Council owned Lands. The use of Pindone to control rabbits must be done with caution. All areas where Pindone is to be applied should be monitored with a remote camera prior to application. The remote camera must be inspected for evidence of native herbivorous fauna (e.g. native rats, wallabies or bandicoots) that may consume the bait.

3.6.3 Feral Predators

It is considered highly likely that Fox (Vulpes vulpes) and Feral Cat (Felis catus) inhabit the CA. These species pose significant threats to native fauna within the CA, including the Grey-headed Flying Fox and Green and Golden Bell Frog which both pose easy prey. Both species are listed as KTPs and the Fox is a declared Pest under the Local Land Services Pest Control Order (European Red Fox) 2014. It is the responsibility of all land managers to manage Fox on their lands. Ongoing management, including 1080 baiting, strategic trapping and shooting of Fox and trapping of Feral Cats are carried out collaboratively by NSW National Parks and Wildlife Service and Sutherland Council (OEH 2011).

4. Management of the Conservation Area

This section of the VMP details on-going management of the CA. The recommendations put forward will ensure threatened species habitat and EEC are maintained and enhanced in a time and cost effective manner.

4.1 Management Actions

All management actions have been assigned to distinct management zones. We have retained the same zones that were established in previous VMP (Figure 4, Ashby 2011). The seven existing management zones were considered suitable units for the on-going management of the CA. Retaining these zones provides

consistency for all site managers and allows effective comparative motioning and assessment of restoration efforts.

Detailed, zone-specific management actions have been provided in Table 8. Many of the areas discussed have been highlighted in Figure 3.

Table 8. Break down of target management actions required in each Management Zone.

Zone	Issue	Action required	Management Comments	Priority
Zone 1	Woody weed infestations in far north section, incl. Lantana and Boneseed as priorities.	Removal of whole plants and suppression of re-sprouting propagules.	▪ Cut and paint mature shrubs ▪ Hand remove or spot spray seedlings	1
	Heavy herbaceous weed infestations	Suppression and control	▪ Hand remove or spot spray resprouting propagules ▪ Only use targeted, riparian-friendly herbicides (e.g. Roundup Biactive). ▪ Edge effects allow for strong potential source of reinfestation, look at plausible methods to reduce this potential (e.g. weed fencing/brush cut buffer zones surrounding the CA). ▪ Supporting native riparian vegetation to provide better frog habitat. ▪ Regular weed treatment activities to occur along the banks of the channel, particularly in the planted areas.	2
Zone 2	Limited woody and herbaceous weeds in patches (particularly where canopy is open and along excavated	Removal and suppression	▪ Cut and paint mature plants ▪ Hand remove or spot spray seedlings	3

	drains). Woody weeds include African Olive and Lantana			
Zone 3	Weed invasion along southern edge. Priorities include Fireweed, Sharp Rush	Reduce weedy influx.	▪ Establish buffer zone. May require some management of weeds incurring from the Desalination Plant side of the fence. ▪ Spraying weeds along fence line from Desalination Plant with Glyphosate	2
	Scattered weeds throughout the centre region. Primarily: small, isolated Pampas Grass, newly sprouting blackberry and Broom Milkwort	Ongoing removal	▪ Hand pulling/ crowning-out ▪ Larger Pampas Grass should be carefully inspected for frogs, before cutting and painting	3
Zone 4	Scattered re-sprouting or new Boneseed and Olive plants	Require follow up treatments	▪ Hand Pull or Cut and Paint	2
	Scattered herbaceous (particularly Broom Milkwort)	Ongoing removal and suppression	▪ Hand pull	5
Zone 5	Gambusia	Ongoing monitoring via scheduled frog surveys	▪ If this species is present onsite this is a threat to native frogs including Green and Golden Bell Frog and Wallum Frogs ▪ A Management Plan will guide the survey, management and monitoring of Gambusia in the CA	5

	Scattered re-sprouting or new Boneseed and Olive plants	Require follow up treatments	▪ Hand Pull or Cut and Paint	1
	Herbaceous weed infiltration from edges and where canopy has provide new gaps	Monitor and suppress new infestations as they arise	▪ Hand pull/ spot spray ▪ Maintain buffer zone to prevent weed invasions	5
Zone 6	Weed invasion from off-site bushland to the north of the CA. Presence of exotic vines, Asparagus Ferns Boneseed and Lantana	Removal and suppression	▪ Recommend cut and painting/ manual removal, to limit damage to surrounding native vegetation. ▪ May require limited herbicide treatment ▪ Edge effects allow for strong potential source of reinfestation, look at plausible methods to reduce this potential e.g. weed fencing/ buffer zones. ▪ Collaborative weed management with northern neighbours is recommended for long term solutions	2
	Herbaceous weeds along southern edge and boundary path between Zones 6 and 7.	Ongoing removal and suppression. Prevent build up in seed bank	▪ Limit potential for spread into internal bushland areas.	4
Zone 7	Weed invasion from off-site bushland to the north of the CA. Presence of exotic vines, Asparagus Ferns Boneseed,	Removal and suppression	▪ Cut and painting/ manual removal, to limit damage to surrounding native vegetation. ▪ May require limited herbicide treatment ▪ Edge effects allow for strong potential source of reinfestation, look at plausible methods to reduce this potential e.g.	1

	Lantana and herbaceous weeds. This is allowing spread into interior of zone.		weed fencing/ buffer zones. ▪ Collaborative weed management with northern neighbours is recommended for long term solutions	
	Heavily weed infestation in the southernmost corner, incl. well established exotic vines, herbaceous and patchy woody weeds	Removal and suppression- Ongoing management	▪ Directly adjacent to waterways which are near bats, therefore minimize use of herbicides. If required, do not use surfactants near waterway edges. Only use targeted poisons (e.g. Roundup Biactive).	2
	Large Crofton infestations in the interior of patch	Removal	▪ Hand pull. ▪ This should be quickly addressed to prevent further spread. ▪ Once removed these areas should only require limited follow-up ▪ Some patches are associated with swampy areas. Minimize pesticide use	4
	Weed infestations along the southern boundary, incl. exotic vines, noxious woody weeds and herbaceous weeds.	Removal and suppression. Replacement with native vegetation –through encouraging natural regeneration	▪ Low risk of re-invasion with no weeds present directly to the south. ▪ Works should be conducted whilst bats are not present or with an Ecologist present to monitor bats. ▪ Much of the areas requiring work is unlikely to impact upon bats due to the distance from the camp (separated by a creek)	2

4.2 Quality Assurance of Persons Undertaking Restoration and Monitoring

In order to ensure the best quality work is maintained within the CA, It is recommended that any Bushland Restoration Practitioner selected to work within the CA must:

provide a statutory declaration stating their compliance with provisions of the National Gardening & Landscape Services Award 2010;

provide completed and signed Subcontractor Statement regarding payment of worker's compensation, payroll tax and remuneration;

provide established Workplace Health & Safety and Environmental Management Systems;

demonstrate implementation of safe workplace and appropriate environmental management practices and procedures (e.g. appropriate transport and management of herbicides);

provide Public Liability (min. $10M) and Workers Compensation Insurance;

have previous experience undertaking bushland restoration works within the Sutherland Shire, preferably Kurnell Peninsula.

provide relevant client references;

provide bush regeneration contractors with minimum qualification of a TAFE Certificate 2 in Bushland Regeneration. This applies to all bush regeneration contractors working in the CA.

provide a bush regeneration site supervisor with minimum qualifications and experience including Certificate III Conservation & Land Management and two years full-time equivalent experience as a trained bush regenerator;

schedule appropriately resourced regular site visits for the duration of contract period;

all herbicide usage, including storage and transport, to be in accordance with WorkCover NSW (2006) and all relevant legislation;

all bush regeneration crew members undertaking herbicide spray applications must hold a current chemicals application training certification to AQF Level III.

Bushland restoration works must be monitored by an experienced party in order to ensure resources are used adequately to achieve goals in restoring and maintaining the vegetation and habitat within the CA.

5. Additional Recommendations

5.1 Threatened Fauna Habitat Management

5.1.1 Grey-headed Flying Fox Camp Site

In order to reduce the chance of any potential disturbance or impacts to Grey-headed Flying Fox, bush regeneration activities should not take place within immediate area of the GHFF camp in Zone 7 while Grey-headed Flying Fox are roosting in the CA. Works can recommence once it is confirmed that the Grey-headed Flying Fox are not present.

To the west and south of the Grey-headed Flying Fox camp site in Zone 7 is a high concentration of environmental and noxious weeds. These weeds have been retained as a vegetative buffer to the Grey-headed Flying Fox colony which intermittently roosts in this part of the CA. The concentration of noxious weeds in this area was not found elsewhere in the CA. It is considered that this area should be addressed by Bush Regenerators to actively control these weeds as they form a significant source of infestation into the rest of the CA. Weed removal works must not be conducted in a manner that significantly alters the structure of the vegetation of the area occupied by the Grey-headed Flying Fox such that the colony is exposed to westerly winds or sun exposure. Instead, all weed removal in this area should be conducted in a gradual and progressive manner to allow the re-establishment of native trees, shrubs and vines. The 'Bradley Method' should be utilised where possible.

Removal of vine and woody weeds should take place in winter and autumn as this is when the Grey-headed Flying Fox are least likely to be present in the CA and minimal impact on the species most likely. No broad scale (primary) removal of vine or woody weeds should take place in the spring or summer months as this is when westerly winds are their hottest. Maintaining a vegetative screen in the western end of zone 7 is most important during the late spring and summer months. Removal of vines should be gradual and progressive. Vines should be skirted, and/ or scrapped and painted, but left in-situ. Vines should not be pulled from the canopy as this may distress flying foxes.

Table 9. Timeline for weed removal on the western perimeters of zone 7

Year	Task			
Season	**Summer**	**Autumn**	**Winter**	**Spring**
2017	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.	Noxious weed cover reduced across zone Encourage natural recruitment of native vegetation	Noxious weed cover reduced across zone Encourage natural recruitment of native vegetation	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.
2018	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.	Noxious and environmental weed cover reduced across zone Encourage natural recruitment of native vegetation	Noxious and environmental weed cover reduced across zone Encourage natural recruitment of native vegetation	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.fox Heat Stress Policy'.
2019	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.	Noxious and environmental weed cover reduced across zone Encourage natural recruitment of native vegetation	Noxious and environmental weed cover reduced across zone Encourage natural recruitment of native vegetation	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.
2020	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present.	Noxious weed cover eliminated across zone Encourage natural recruitment of native vegetation	Noxious weed cover prevented from re-establishing across zone Encourage natural recruitment of native vegetation	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present.

	No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.			No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.
2021	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.	Noxious weed cover prevented from re-establishing across zone Encourage natural recruitment of native vegetation	Noxious weed cover prevented from re-establishing across zone Encourage natural recruitment of native vegetation	No weed removal works to take place in the immediate vicinity of the GHFF colony if GHFF are present. No works to take place in zone 7 if temperatures exceed safe temperatures for GHFF (refer to Flying-fox Heat Stress Policy'.

5.1.2 Frog Habitat

Aquatic weeds occur within the CA. The most significant is Ludwigia (Ludwigia peruviana). This plant presents a major threat to the maintenance of frog habitat. Ludwigia can choke waterways and dominate all aquatic vegetation within a short timeframe. Dense stands can interfere with the natural flow of the waterway. The thick canopy reduces the amount of light entering the water and decreases water temperature. This ultimately affects the native aquatic flora and fauna communities.

Green and Golden Bell Frog do not distinguish between weeds and native plants. If a plant provides suitable habitat values for a frog to shelter in, a frog is likely to use it. The removal of aquatic weeds and Pampas Grass should only be undertaken after the subject plants have been thoroughly searched for the presence of any sheltering frogs, particularly Green and Golden Bell Frog which are readily recorded sheltering in such weeds. If a sheltering frog is found, it should be identified to species level and its location should be recorded. It should then be carefully relocated to the closest area of wet sedge / rush dominated habitat.

All pesticides, including Round-up Biactive have the potential to adversely impact biota, particularly sensitive species such as frogs. Across the CA all herbicide use should be minimised, and where required confined to spot spraying or direct application. Particular care must be taken when spraying in the vicinity of waterways. No spraying is to be conducted before rain is forecast.

Works should proceed progressively, in a manner that supports the regrowth of existing native vegetation already present or within the seed bank.

5.2 Non-threatened Fauna Habitat

Contractors working within the CA should take care to prevent inadvertently removing habitat used by fauna. The most common type of habitat accidentally removed by Bushland Regenerators is the nesting habitat of small birds. Many small, native birds nest in dense weed thickets and rely on them for shelter when indigenous vegetation cover is lacking. All dense weed thickets should be searched for bird nests prior to treatment or removal. If nests are observed, the host weeds should be left undisturbed until the conclusion of bird breeding season (autumn).

One species of rare and regionally restricted native land snail known as the Maroubra Woodland Snail (Meridolum maryae) occurs within the CA. This snail is about the size of a ten cent piece and has a pale coloured shell. People working within the CA are encouraged to avoid potentially impacting this species through the removal of shelter habitat such as debris or dumped metal, car parts etc. If such habitat features are to be removed, they should be inspected for sheltering snails and other species of fauna including frogs and reptiles. If sheltering fauna is found, it should be carefully relocated to the base of a dense sedge or shrub or under dense, moist leaf litter.

5.3 Threatened Flora Habitat Management

Bush regeneration contractors should be encouraged to become familiar with locally occurring threatened flora species (ie. Magenta Lillypilly) so they know to look for such species when working on site. If a contractor records a possible threatened flora species on site, the GPS coordinates of the location should be recorded and the plant marked with flagging tape to help others find it / avoid it. A voucher specimen should be collected from the plant and lodged with the New South Wales Herbarium for identification confirmation.

5.4 Pathogen and Propagule Control

Phytophthora, Myrtle rust and Chytrid fungus are three pathogens which can be spread through infected soil. These pathogens are listed as KTPs under the TSC Act. Precautions should be taken to reduce the spread of these pathogens that may be present in the CA.

Bush regeneration staff can consult the document Arrive Clean, Leave Clean (Commonwealth of Australia 2015) that provides detailed information on best practice methods to reduce spread of these pathogens between work sites.

5.5 Storm Damage and Debris

Sheets of metal debris were identified within the CA during the site visit in spring 2016. It is understood this debris came from the Sydney Desalination Plant during a major storm event which occurred in December 2015. Some of the debris is suspended in trees or partially imbedded in the ground and could present a safety issue for people working within the CA.

Debris may be removed by Sydney Desalination Plant maintenance staff or contractors. Care must be taken to wear PPE and apply appropriate manual handling techniques. Large pieces that cannot be removed by hand should either be cut up into smaller pieces to remove by hand, or be left in situ to continue providing

fauna habitat. Any removal works must be performed in a way that results in minimal further damage to existing native vegetation.

Some of the debris present in the CA is likely to be utilised as shelter habitat by fauna including Green and Golden Bell Frog and venomous snakes, therefore care must be taken to ensure both fauna and staff safety when working around or removing such debris.

5.6 Cleared Areas Surrounding the Conservation Area

The matrix surrounding the CA contains dense weed infestations. It is strongly recommended that such areas are maintained as a buffer zone to prevent re-establishment of weeds. Such maintenance may include brush cutting and spot spraying of weed infestations.

Where possible, weed infestations within buffer areas should be replaced with fast growing, locally indigenous native flora which may suppress the weeds from re-establishing within the buffer. If revegetation is not possible (i.e. within the Desalination Plant area) effort should be focused on permanently removing noxious and aggressive environmental weeds that infiltrate into the CA.

The area of historically cleared vegetation on the western boundary of the CA, specifically zones 6 and 7 is a source of weed infestation to the remainder of the CA. Effort should be made to restore this area into native vegetation. Translocation of material from elsewhere on the CA may help achieve this aim, otherwise active revegetation will be required. It is recommended that easily obtainable, fast growing, locally indigenous plants are sourced for revegetation purposes. Examples are listed in section 5.1.1.

5.7 Access Tracks

At the time of survey (spring 2016), it was deemed that accessibility across the CA was sufficient for the purpose of access and egress by authorised, specialist personnel such as bushland restoration professionals.

The clearing of access tracks within the CA has been put forward as a suggestion in order to improve access and egress across the CA by persons on foot. Clearing of any tracks within the CA, including foot tracks, can only be undertaken if the impacts of such works are assessed for impact significance upon protected matters listed under the TSC Act and/or EPBC Act. Such matters include all of the vegetation communities present within the CA (all are EEC listed under the TSC Act), and all threatened fauna and flora that are known, or considered likely to occur within the CA, such as Grey-headed Flying-fox and Green and Golden Bell Frog.

The impact assessment must be undertaken by a qualified Ecologist and will need to be submitted to the relevant regulatory authorities, in this case Sutherland Shire Council and/or the NSW Department of Planning.

Once the proposal to clear new access tracks has been approved, Sydney Desalination Plant will be permitted to clear access tracks within the CA subject to a series of consent conditions that will mitigate the exacerbation of any potential impacts.

Maintenance of the existing central access track (between zone 6 and zone 7) should be held as a high priority as this track is the primary access and egress point for all personnel working within the CA. Maintenance can take place in the form of slashing to prevent shrubs and trees from recolonising the access track and reducing accessibility. If any artificial or woody debris blocking the track should also be shifted off the track as quickly as possible. Maintenance of the track should take place as regularly as required to ensure the track does not become overgrown or impassable by people on foot.

5.8 Conservation Area Site Safety

An evacuation plan and Safety Work Method Statement should be prepared by all users of the CA in order to provide detail of the triggers for site evacuation (e.g. bushfire or electrical thunderstorm). These plans will detail the most suitable access routes and locations for evacuation and assembly in the event of danger. The locations for evacuation will depend on where in the CA the persons are working.

6. Monitoring and Performance Evaluation

6.1 Performance Criteria

Performance criteria for which to assess works progress across the CA. The following are to be achieved within the next five years.

Table 10. Performance Criteria

Management Objective	Current Status*	Performance Criteria
Removal and continual suppression of Noxious and Environmental Weeds.	Approximate percentage weed cover (combined noxious and environmental weeds) for each Zone is as follows:- Zone 1- 25% Zone 2 -20% Zone 3-7% Zone 4 -10% Zone 5 – 5% Zone 6 – 15% Zone 7 – 20%	Noxious weeds comprise less than 5% cover across each of the seven management zones and the entire CA. This excludes the weed ‘Kurnell Curse’ in Zone 7 where the performance criteria will be “ongoing containment and control”.
Removal of all aquatic Noxious Weeds from the CA.	Ludwigia occurs in Zone 7. In some parts of the drainage line along the perimeter of zone 7 this weed occupies over 10% of the waterbody.	No noxious weeds present within any of the waterbodies within the CA.

Restoration of the historically cleared area along the southern boundary of the CA to Swamp Sclerophyll Forest or Kurnell Dune Forest (zone 6 and 7).	An area of historically cleared land which is currently dominated by Kikuyu, Paspalum and herbaceous weeds with scattered native shrubs as few as one native plant per 20m².	Percentage cover of exotic vegetation should be reduced (with the objective to get total weed cover below 40%). Increased extent of native vegetation with evidence of natural propagation occurring through identification of seedlings or direct sowing.
Enhancement of Grey-headed Flying Fox habitat.	Roost and foraging resources provided by native vegetation are impacted by smoothing vines and competition with exotic flora.	Roost habitat should be clearly protected and enhanced for long term viability through the eradication of exotic vines. Natural recruitment of native vegetation which supplies fruit or nectar should be evident and encouraged through prioritised management of exotic weeds.
Enhancement of Green and Golden Bell Frog Habitat.	Moderate to good habitat available, however scattered weeds present	Removal of all Pampas Grass allowing natural recruitment of native sedges and rushes around water bodies.

* Refer to Appendix for methodology used in assessing the current status

6.2 Monitoring

It is recommended that the VMP is implemented for a minimum period of 5 years before formal review of the VMP is required. The rehabilitation actions identified in this VMP are to be monitored by the engaged bushland restoration contractor. The Bushland Restoration Contractor will continue to produce progress reports that summarise the bush regeneration efforts undertaken within the CA over the course of the previous year. Monitoring should occur throughout the entire implementation period.

The main objectives of the monitoring program are to:

- evaluate the effectiveness of the weed management program;
- detect new outbreaks of weeds;
- determine if adequate natural regeneration is occurring;
- ensure that the structure of the vegetation within the Grey-headed Flying-fox camp is maintained.

Monitoring includes both informal and formal collection of data:

- regular surveys across the entire site in order to assess known weed infestations and check for new weed outbreaks;
- a quadrat in each Zone is to be measured annually;
- a photograph is to be taken annually at predetermined reference points and at each quadrat; and
- mapping of weed outbreaks, with measurement of the area occupied by Bitou Bush.

If, after monitoring, it is deemed that the weed eradication techniques are ineffective, then alternative methodologies should be adopted. Likewise, if natural regeneration is failing then corrective measures will need to be implemented.

6.2.1 Regular Assessments of Weed Infestation Across Conservation Area

The entire Conservation Area is to be regularly checked via random and targeted meander in order to detect new or previously undetected weed outbreaks. These weed sweeps are to occur more frequently in the growing season and when target weeds are more detectable.

This information is to be incorporated into the vegetation mapping and Annual Vegetation Report (see below) and used to direct the treatment program.

6.2.2 Quadrats

A monitoring quadrat of 10 x 10 metres in each Zone is to be sampled annually in February.

A report on these quadrat results is to be prepared and submitted to Veolia Water soon after each data collection phase.

The locations of these quadrats are shown in yellow in Figure 12 and detailed in the following table:

Zone	Picket location in 10x10 metre quadrat	Grid reference (MGA) of star picket	
		Easting	Northing
1	NW corner	334336	6234077
2	NW corner	334012	6234001
3	SE corner	334120	6233729
4	Middle of quadrat	334061	6233849
5	NW corner	334169	6233884
6	Middle of quadrat	334013	6233616
7	Northern end	333873	6233541

The data to be collected from each quadrat comprises:

- description of each vegetation layer-an estimate of height, percentage cover and a list of up to three major species in that layer;
- species list for each quadrat with a cover abundance rating, using a modified Braun-Blanquet rating system (see Appendix as a guide); and
- photograph of each quadrat taken from the north west corner, facing south east with the picket visible in the foreground, with the exception being Quadrat 3 which is to be photographed from the south east corner facing north west.

6.2.3 Photographs

In addition to the reference photographs at the 7 monitoring quadrats, a further 15 photographic reference points are to be photographed annually in February.

The locations of these 15 photographic reference points and their directions are shown in blue in Figure 12 and summarised in the following table:

Photo point	Zone	Direction of photo
1	1	South west
2	1	South east
3	1	South east
4	2	South east
5	4	South east
6	3	South east
7	3	South west
8	4	North east
9	3	South east
10	6	South east
11	6	South east
12	7	South west
13	7	South west
14	7	South west
15	7	South west

It is recommended that an extra photographic reference point may be added for each Zone, at the discretion of the bush regeneration contractor, and chosen deliberately to show the changes in the vegetation. As the original locations of the monitoring plots and photo points were chosen randomly, they may not in all cases capture the best visual representation of the changes in the vegetation condition.

All of these photographs and their grid references as determined by GPS are to be incorporated into the Annual Vegetation Report that also includes the data collected from the monitoring quadrats.

6.2.4 Mapping

A map of the Conservation Area showing the densities of weeds and the areas of occurrence of different species is to be provided annually as part of the Annual Vegetation Report.

These maps are to show:

- Changes to weed and native percentage cover with an estimate in square metres of the approximate area rehabilitated during the previous 12 months;
- Changes to species distributions;
- Areas of Bitou Bush infestations with an estimate in square metres of the approximate area covered by this species (to facilitate reporting in accordance with the Draft Bitou Bush Threat Abatement Plan);
- Any new incursions of weeds treated during the previous 12 months or any other management issues throughout the Conservation Area;

6.2.5 Reporting

Two reports shall be prepared and provided to Veolia Water each year.

An ‘Annual Progress Review’ report that details the progress of CA management, compliance with the VMP’s management strategies and fulfilment of the objectives. This is to include any recommendations for alterations to the management strategies in response to the condition of the vegetation

An ‘Annual Vegetation Condition Report’ that details the of the specific results from the monitoring quadrats, photo points and weed mapping. This should include a time series of data and photographs to illustrate the changes over the entire management period. The grid references of the locations of each photo point should also be collected via GPS and reported in this document.

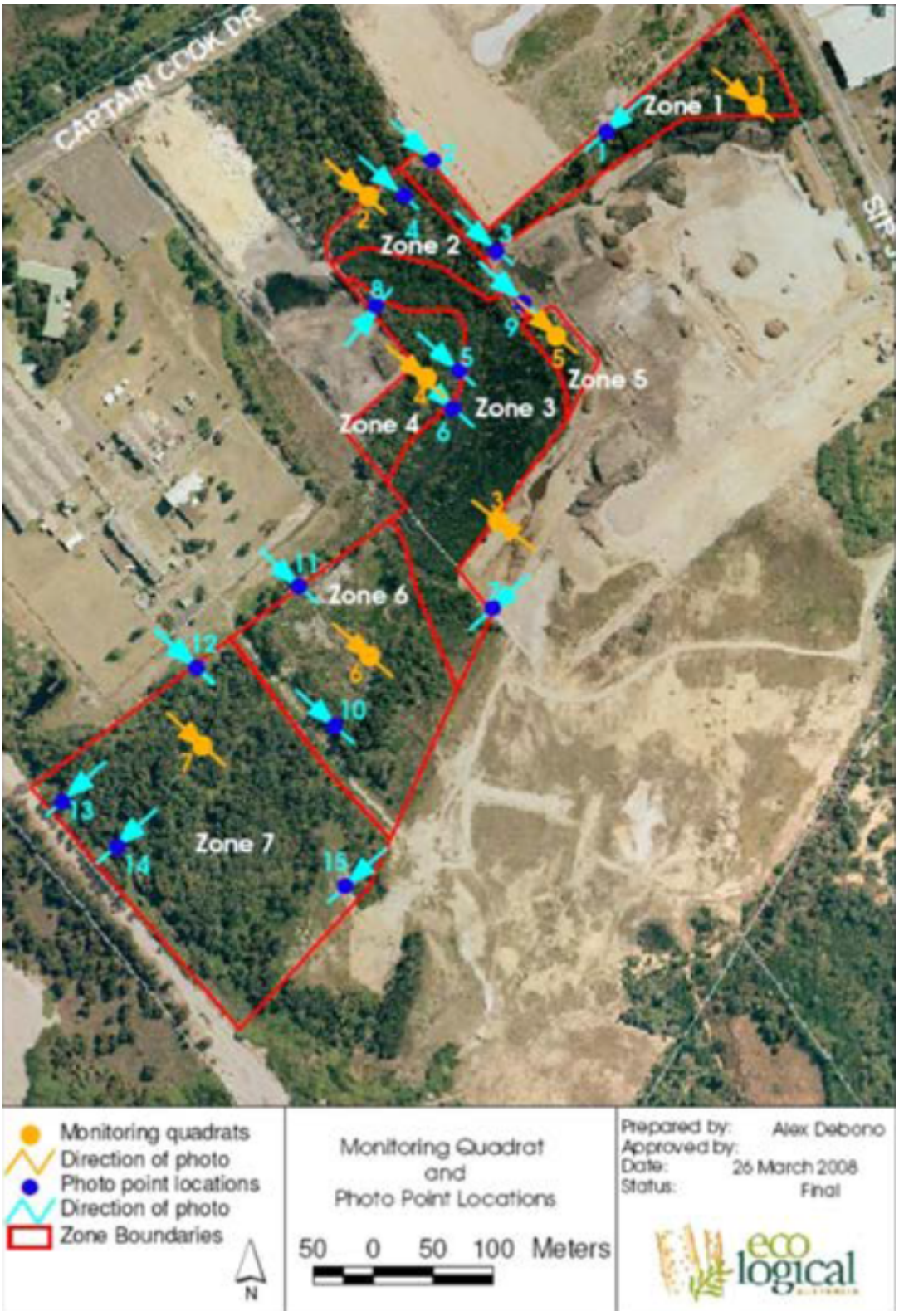

Figure 10. Locations of monitoring quadrats and photo points (Veolia 2015)

7. References

Albani, AD & Rickwood, PC (1998) 'The Botany Basin: its bedrock morphology and recent geological history', pp190-196. In McNally, GH & Jancowski, J (Eds), Collected Case Studies in Engineering Geology, Hydrogeology and Environmental Geology, Geological Society of Australia.

Ashby, E. (2011) Vegetation Management Plan, Conservation Area, Sydney Desalination Plant, Kurnell, Sutherland LGA. Unpublished report, Keystone Ecological

DECC (2008) Best practice guidelines: Green and Golden Bell Frog habitat, Sydney Metropolitan Catchment Management Authority, November 2008

Department of Environment (2015) Arrive Clean, Leave Clean- Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems, Commonwealth of Australia

Department of Environment and Climate Change NSW (DECC) (2007) Management Plan: The Green and Golden Bell Frog Key Population at Kurnell, Sydney Metropolitan Catchment Management Authority, July 2007

Department of Primary Industries (2016) Weeds Wise Resources http://weeds.dpi.nsw.gov.au/ [October 2016]

Eby, P. (2006) Site Management for the Grey-headed Flying Fox Camp at the Sydney Desalination Plant Site, A report to: Sydney Water Corporation, August 2006

GHD (2005) Sydney Water Corporation Desalination Plant Terrestrial Ecology Assessment Report. Report to Sydney Water Corporation

Hazelton PA & Tille PJ (1990) Soil Landscapes of the Wollongong-Port Hacking 1:100 000 Sheet, Soil Conservation Service, Sydney.

Meyer, E., Hero, J-M., Shoo, L. and Lewis, B. (2006) National recovery plan for the wallum sedge frog and other wallum-dependent frog species . Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane.

National Parks and Wildlife Services (NPWS) (2003) Approved NSW Threat Abatement Plan: Predation by Gambusia holbrooki -The Plague Minnow, Biodiversity Management Unit, August 2003

New South Wales Department of Primary Industries (2016) Weedwise http://weeds.dpi.nsw.gov.au/ [October 2016]

Office of Environment and Heritage (OEH) (2012) Threatened Species Profile: Sydney Freshwater Wetlands in the Sydney Basin Bioregion http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10788 [October 2016]

OEH (2013) the Vertebrate Fauna of Towra Point Nature Reserve –Final Report, NSW National Parks and Wildlife Services, October 2013

OEH (2014a) Threatened Species Profile: Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10945 [October 2016]

OEH (2014b) Threatened Species Profile: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10786 [October 2016]

OEH (2014c) Threatened Species Profile: Wallum Froglet (Crinia tinnula)
http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10183 [October 2016]

OEH (2014d) BioBanking Assessment Methodology 2014

OEH (2015a) Threatened Species Profile: Green and Golden Bell Frog (Litoria aurea)
http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10483 [October 2016]

OEH (2015b) Threatened Species Profile: Kurnell Dune Forest in the Sutherland Shire and City of Rockdale
http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10448 [October 2016]

OEH (2016a) Threatened Species Profile: Grey-headed Flying-fox (Pteropus poliocephalus)
http://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=785 [October 2016]

OEH (2016b) Threatened Species Profile: Southern Myotis (Myotis macropus)
http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10549 [October 2016]

Appendix 2 -Vegetation Condition Assessment Methodology

Site Assessment

Two experienced restoration Ecologists traversed the entirety of the CA. Each ecologist assessed three individual management zones for weeds and other management issues. Both ecologist assessed zone 7 together as it was the largest and most complex.

Each Ecologist was equipped with a Global Positioning System (GPS) with accuracy between 3 metres and 5 meters.

All Noxious Weeds and other significant environmental weeds observed on within each zone were recorded in a GPS. Each GPS point accounted for a weed infestation present across an area of approximately 5m².

The weed species name was recorded along with a cover rating as derived from a Modified Braun-Blanquet cover score system.

Modified Braun-Blanquet cover readings			**Severity Mapping Unit**
Rating	**Cover**	**Explanation**	
1	<5%	rare or few individuals, 3 or fewer individuals	Low
2	<5%	uncommon, more than 3 but sparsely scattered or localised	Low
3	<5%	common, consistent throughout plot	Moderate
4	5-25%	abundant, many individuals throughout	Moderate
5	26-50%	very abundant, many individuals throughout	High
6	51-75%	very abundant, many individuals throughout	High
7	76-100 %	very abundant, many individuals throughout	High

After each zone was completely traversed by an Ecologist and all notable weed infestations were marked, the data was uploaded into a GIS.

The data was mapped in the GIS according to Braun-Blanquet cover rating and weed infestation severity map produced.

It is important to note that weed cover varies according to season. In the summer months weedy grasses and annuals are more prolific. Therefore, it is important to ensure that on-going assessment of weed cover across the CA is conducted in the same season each year.

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