

Bushland Management Plan for the Duffys Forest Endangered Ecological Community around Seaforth Oval Carpark

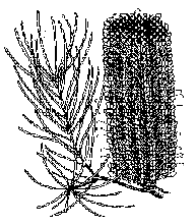


By

**Nicholas Skelton, B. Sc. (Hons), M. App. Sc. &
Caroline Metzler, B. Sc. (Comm), Hons.**

February 2007

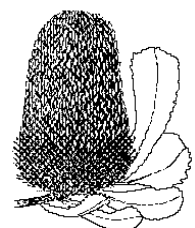
**Prepared for
Manly Council**



GIS Environmental Consultants

45 Austin Avenue, North Curl Curl 2099

Mobile Ph: 0419 438 672, Ph: (02) 9939 5129, Fax: 9401 0715, Email: ecology@ecology.net.au

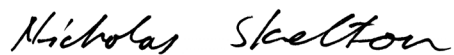


1. Table of Contents

1. Table of Contents.....	2
2. Introduction.....	4
2.2 Background	5
2.3 Site Description	5
2.4 Flora at the Site.....	6
2.5 Fauna at the Site	7
2.6 Aims	7
2.7 Quantifiable Goals	8
2.8 Management Strategies	8
2.9 Map 1. The Site	9
2.10 Data Sources.....	10
2.11 What Cannot Be Done in the Bushland Area	10
2.12 Who Must Read This Management Plan	10
2.13 Threats to the Duffys Forest on This Site.....	11
3. Required Management.....	16
3.2 Annual Monitoring.....	20
3.3 Ananalysis of Changes	21
3.4 Review and Updating.....	21
3.5 Where to find Clarification.....	21
4. References	21
5. Appendix A. Duffys Forest Local Definition.....	23
6. Appendix B. Land Ownership	24
7. Appendix C. Council Zoning	25
8. Appendix D. Weed List.....	26
9. Appendix E. Baseline Flora Survey.....	27
10. Appendix F. Duffys Forest Local Distribution	28
11. Appendix G. Fauna Survey Results	29
12. Appendix H. Phytophthora Fact Sheet (RBG)	30
13. Appendix I. Monitoring Record Sheet.....	31

We would like to acknowledge the assistance of Chris Kraus, Bushland Management Coordinator, Manly Council for his work on an earlier version of this BMP and his edits on this version. Nick Corkish, Regional Operations Officer, Environment Protection and Regulation Division, DEC.

Approved for Release by



Nicholas Skelton

Date: February 12th, 2007

Director

GIS Environmental Consultants

This document is supplied without alterations and may not be changed without approval of GIS Environmental Consultants.

Copyright GIS Environmental Consultants, All rights Reserved © 2007.

GIS Environmental Consultants (Publisher) is the owner of the copyright subsisting in this publication. Other than as permitted by the Copyright Act and as outlined in the Terms of Engagement, no part of this report may be reprinted or reproduced or used in any form, copied or transmitted, by any electronic or by other means (including photocopying, scanning, or otherwise), without the prior written permission of GIS Environmental Consultants. Legal action will be taken against any breach of Copyright. This report is only available in book form. No part of it is authorised to be sold, distributed or offered in any other form.

2. Introduction

This Bushland Management Plan (BMP) describes the works to maintain, improve and monitor the 0.44 ha of endangered Duffys Forest Ecological Community around the Seaforth Oval carpark. See Map 1. The long term management of this area as an endangered ecological community was part of the proposal for the redevelopment of the access road and carpark for Seaforth Oval that is planned to be built in March 2007. The 5a assessment that was part of the assessment and approval process for the development stated that Council would carry out the required management for at least 10 years. The 5a assessment adopts recommendations of the SIS and BMP.

Appropriate management is essential if this remnant is to remain viable. Ecological communities have a natural resilience, however, if an ecological community is disturbed beyond a point where it can naturally recover it will turn into a different community often dominated by weeds. The threats that could cause this community to be irreversibly disturbed are: clearing, inappropriate fire regimes, weed invasion, physical disturbance, edge effects (fragmentation) and changes to microclimate.

The condition of the vegetation, as of February 2007, varied from good to highly degraded. An area of 607m² of Duffys Forest topsoil was translocated from the construction site before the new access road was made.

The actions in this Plan will require a section 91 (TSC Act) or a section 132c (NP&W Act) licence to carry out the works. In the adjacent Warringah Council area tree trimming and bush regeneration have required licensing.

This Plan sets performance goals rather than allocating an amount of effort that is required to carry out the works. If the goals are not being met then the amount of effort is to be increased.

This Plan aims to identify and reduce the threats to the Duffys Forest Ecological Community, describe how this ecological community can be effectively conserved and improved to assist in the recovery of the ecological community in the locality. This Plan describes both the activities that need to be carried out and the activities that can not be allowed to happen. A mechanism for monitoring the success of the Plan is also included. The success of this Plan will be measured against the baseline ecological survey of the site, which was conducted as part of the impact assessment of the development. (See Section 2.4 below and Appendices D and E).

The management of other aspects and areas of the Seaforth Oval facility are described in a separate Plan of management entitled 'Seaforth Oval Plan of Management' (2004). The management of Duffys Forest and other types of bushland to the north, south and west of the site is managed by the Garigal National Park Plan of Management.

This Plan of management also fulfils the objectives of the working draft Recovery Plan for the DFEC, which requires a Plan of Management be developed for each remnant.

2.1.1 Implementation

This BMP will be effective for the site at the commencement of public use of the carpark or access road. The BMP will continue until replaced by an updated version, or until revoked by Manly Council. This plan will remain in place even if the zoning, ownership or tenure of the land changes.

2.1.2 Plan Review

It is recommended that this Plan be reviewed every 5 years, to allow updating and incorporation of new information.

2.2 Background

This part of Seaforth is known to have particularly high environmental value, providing habitat for several threatened species of animals and plants and an Endangered Ecological Community called Duffys Forest. The reason for the concentration of ecological values is the very rare type of soil that occurs on this ridgetop. This patch of Duffys Forest occurs on this site and a section further to the north, east and south and a nearby patch occurs adjacent to Wakehurst Golf Course further to the east.

The access road, carpark and sport facilities building have been recently redeveloped. During construction, environmental protection was controlled by a Works Environment Protection Plan (WEPP) (Skelton, Weiss and Metzler, 2007). The WEPP includes some on-site works such as the erection of fences and signs, weed control, collection of plant propagules, logs and boulders and bush regeneration. The method to be used for the recovery of topsoil is described in a report entitled "Plan for Soil Translocation Works in a Remnant of Duffys Forest Endangered Ecological Community" (Toolijooa 2006).

2.2.1 Environmental and Legislative Background

Duffys Forest Ecological Community is the name given to a suite of organisms living together and relying on each other and a particular combination of physical environmental conditions to form an ecosystem or ecological community. The Duffys Forest Ecological Community is defined in the schedules of the TSC Act, 1995. See Appendix A.

The following is an extract from the draft Duffys Forest Endangered Ecological Community Recovery Plan.

"The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a recovery plan for which it has agreed to be responsible. Public authorities and councils identified as responsible for the implementation of recovery plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the Act specifies that public authorities must not make decisions that are inconsistent with the provisions of a recovery plan. The Government agencies relevant to this plan areDEC, ...Manly Council, RTA...

Consequently, public authorities that manage land that has DFEC, must as the responsible land manager, manage the site in accordance with the recovery plan."

Out of the 14 responsible government agencies only Manly Council, Hornsby Council, DNR and the RFS have not yet carried out management actions. Manly Council has also not been included on the working group.

Threatened species and endangered ecological communities are described and protected by the NSW Threatened Species Conservation Act 1995 (TSC Act) and the Federal Environment Protection and Biodiversity Act 1995. The current maximum penalty (fine) for anyone harming threatened species or endangered ecological community without a licence is \$220,000 and/or 2 years imprisonment. This site contains the Endangered Ecological Community known as Duffys Forest.

The actions in this plan will require a section 91 (TSC Act) and a section 132c (NP&W Act) licence. In the adjacent Warringah Council area tree trimming and bush regeneration have required licensing.

2.3 Site Description

The size, shape and location of the site is shown in Map 1. To the north, west and south of this site is Garigal National Park. On the eastern side is the two lane arterial road, called Wakehurst Parkway on land owned by the Roads and Traffic Authority. Beyond the road is the urban suburb of Seaforth and another remnant of Duffys Forest. The site is currently under the care and control of the Department of Lands who do not actively management the site

other than removing rubbish. This plan will significantly improve the management of this land.

2.3.1 Zoning and Tenure (Ownership)

The land for this BMP is a combination of Crown Land under the care and control of Council, land where Council is applying for care and control and a small area of Vacant Crown Land being purchased by RTA. Appendix B shows the current tenure of the site. The Council zoning of the land is a combination of Open Space, "National Park Zone" and "RTA Road Widening". The map in Appendix C shows the distribution of the zonings.

2.3.2 Geology, Topography and Soils

The soils of the subject site are deeply weathered clay with ironstone inclusions and areas of laterite. The soils are derived from a Wianamatta Shale Cap overlying Hawkesbury Sandstone. Seaforth Oval is surrounded by a varied landform of steep slopes, ridges, and deep valleys with sandstone outcrops, cliffs, and wetlands. This soil type is only found on ridge tops and is an essential part of the Duffys Forest Ecological Community.

2.4 Flora at the Site

No threatened plant species have been found on the site, however several are known to occur within 200m. The vegetation community on the site is a remnant stand of open forest in which the dominant tree species are *Allocasuarina littoralis* (Black She Oak) and *Eucalyptus sieberi* (Silvertop Ash). The most common shrub species are *Kunzea ambigua*, *Acacia longifolia*, *Dodonea triquetra* and *Pittosporum undulatum*. The ground layer includes *Entolasia stricta*, *Dianella caerulea*, *Imperata cylindrica* and *Pteridium esculentum*. The predominant weed species found include: *Paspalum quadrifarium*, *Avena barbata*, *Protasparagus aethiopicus*, and *Nephrolepis cordifolia*. Appendix D shows the weed list as determined by Manly Council. Appendix E shows the results from a flora study conducted by GIS Environmental Consultants and a flora study conducted by Manly Council in December 2006.

One rare flora species, *Prostanthera* sp. 'Manly Dam' (Conn 4444) (not yet formally named), was located 90 m from the proposed construction site. *Prostanthera* sp. 'Manly Dam' (Conn 4444) is not currently listed as a Threatened Species or Endangered Population under the TSC Act 1995. The threatened species *Pimelea curviflora* var. *curviflora* occurs in 2 populations nearby one 40 m away and one 400m away.

A more detailed description of the vegetation at this site is given in the SIS (Skelton, 2007).

Particular care needs to be taken during management works so that potential habitat for these adjacent rare species is not harmed.

2.4.1 Duffys Forest Ecological Community

An ecological community is a particular combination of plants, animals, soil, fungi and other organisms that forms living ecosystem. Duffys Forest ecological community is characterised, and legally defined, by a distinct mixture of plants and a specific soil type. The distribution of Duffys Forest around this site is shown in Appendix F. Appendix A is the full legal definition of Duffys Forest Endangered Ecological Community.

The site has been botanically investigated several times and determined to be Duffys Forest. There has been two 20X20 m quadrats surveyed and the results analysed to determine how well the vegetation fits into the description of Duffys Forest. Particular care needs to be taken during management works so that this community is not harmed.

It is estimated that only 15% of the original area covered by the community now exists and it is distributed in a number of small remnants (Smith and Smith 2000). Threats to the survival of the community include; land clearing; habitat degradation by rubbish dumping; access by people, trail bikes, and other vehicles; weed invasion facilitated by urban run off; an inappropriate fire regime and unauthorised horse riding activities in the area. Only a small number of fragments of the community occur within Ku-ring-gai Chase and Garigal National Parks and all of these are on the boundary of the Parks and adjacent to roads. In view of the

substantial reduction in area occupied by the community, its fragmentation and the numerous threats to the community, the TSC Act Scientific Committee is of the opinion that the Duffys Forest Ecological Community is likely to become extinct in nature unless the factors threatening its survival cease to operate.

2.4.2 Resilience of the Ecosystem

At the time of writing, the vegetation on the site was senescent due to lack of fire, there has also been clearing, dumping and weed invasion. Adjacent construction has involved the translocation of 607m² of Duffys Forest top soil from the areas being developed to areas of suitable subsoil. It is recommended that the non translocation areas be burnt just after the time of the translocation to encourage seed fall into the adjacent translocation areas and promote germination in the translocation areas. By doing this later burning will not kill young plants in the adjacent translocation areas. The size of the soil seed bank is not known, there are extensive edge effects and human pressures therefore the resilience of the vegetation is likely to be low.

2.4.3 Fire History

It appears from the age and structure of the vegetation that the site has not been burnt in more than 30 years.

2.5 Fauna at the Site

No threatened fauna species have been found on the site and the site is currently not particularly good habitat for any threatened fauna species. Glider sap feed marks were found 20 m from the site, but these are most likely to be from Sugar Gliders, not Squirrel Gliders or Yellow-bellied Gliders. Grey-headed Flying-foxes were observed flying over the site and adjacent field during the nocturnal survey and the Anabat recordings revealed the presence of the Large Bent-wing Bat (*Miniopterus schreibersii*) in the existing carpark adjacent to the subject site. Fauna Survey results of this site appears in "Flora and Fauna of Manly Council's Bushland Reserves Part B: Reserve Profiles", a report prepared for Manly Council by GIS Environmental Consultants 2004. The survey was conducted over a period of 12 months, beginning in June 2001. Appendix G provides data from 2004 opportunistic diurnal surveys and nocturnal surveys conducted by GIS Environmental Consultants. Particular care needs to be taken during management works so that these rare species are not harmed.

2.6 Aims

The aims of this Bushland Management Plan are:

- ◆ To protect the integrity and ensure the long-term viability of the Duffys Forest Ecological Community that occurs on this site.
- ◆ To identify potential threats to the ecological community and provide measures to prevent or reduce these threats.
- ◆ To ensure management practices are appropriate and justifiable.
- ◆ To set quantifiable goals, triggers and remediative measures if goals are not being met.
- ◆ To inform and educate the land managers, maintenance workers about the importance of this ecosystem. With a better understanding of the environment on this site there will be increased appreciation of its value.
- ◆ To detect change in the vegetation over time and change management appropriately.
- ◆ To recommend a clear plan of environmental management actions for the next 10 years to achieve these aims
- ◆ To review and make appropriate changes to this management plan every 5 years.

2.7 Quantifiable Goals

All annual weeds will to be prevented from seeding.

All woody weeds will be prevented from reaching 50 cm high.

All weed material will to be removed off site.

Dumped rubbish is to remain on site for no longer than 1 week.

In the Assisted Natural Regeneration Zone and the Translocation Recipient Zone better than 5/95% projected foliage cover weed to native ratio will be met at all times. If this is not achieved than a 20% increase in weed control effort is required for the next 12 months.

The number of weed species must decrease by at least 20% each year or a 20% increase in effort is required.

The species of plant on the site must include more positive indicator species than negative indicator species. If not then the recovery team or an ecologist is to be called in to advise on changes to management.

2.8 Management Strategies

These aims will be achieved by the following management strategies:

- ◆ Implementing the program of: weed control, bushland management, fire frequency, access control, education and monitoring described in this Plan. The program details: the amount of effort needed, the required ecological qualifications and experience needed, appropriate planting (if required), appropriate weed control methods and habitat restoration goals.
- ◆ Maintain a leaf litter cover on the soil surface.
- ◆ Ensuring the mixture of plant species and their relative abundances are representative of the Duffys Forest endangered ecological community, by monitoring and adjusting the management practices appropriately.
- ◆ Collaboration with adjacent land holders to ensure a co-ordinated approach especially for mosaic burning, weed control, threatened species management, future translocation needs and rabbit control.
- ◆ To establish a monitoring program to determine changes in health of the ecological community when compared to the baseline data and control sites and to assess the success, or otherwise, of this management plan. Using the set data sheets and photo points in the back of this report for monitoring, reporting and assessing the work undertaken, changes taking place and a photographic record of the site.
- ◆ Providing information and educating the people working on the property about ecologically sustainable property maintenance. Ensuring the future land managers of the property know about the valuable natural assets that occur on the land. Informing Council staff so they can understand and better appreciate the plants and animals they share their work site with.
- ◆ Manly Council is acquiring care and control of the land and the current zoning as a national park is considered appropriate to ensure the long-term conservation of the land.

The action plan (Table 1) describes in detail issues that affect the site and the objectives and actions required to manage these issues.

2.10 Data Sources

Information about the species and ecological communities on the site was derived from a wide variety of sources. These sources include: field visits, the legal definition of Duffys Forest vegetation, vegetation surveys of the area and consultation with other experts. This information has been combined with local knowledge and experience to produce the practical recommendations in this plan. Consultation with NSW Department of Environment and Conservation (DEC) has also been undertaken. Documents that this Plan has been written in accordance with include;

- Bringing the bush back to Western Sydney, Best Practice Guidelines for Bush Regeneration on the Cumberland Plains authored by DIPNR
- Bush Regeneration: Recovering Australian Landscapes authored by Robin Buchanin.
- Distribution of the Duffys Forest Ecological Community at Seaforth Oval authored by P & J Smith Ecological Consultants.
- Draft guidelines for the management of Duffys Forest ecological community remnants: ecological restoration & reconstruction authored by NSW Department of Environment and Conservation
- Draft guidelines for the management of Duffys Forest ecological community remnants: buffers and adjoining vegetation authored by NSW Department of Environment and Conservation
- Draft guidelines for the management of Duffys Forest ecological community remnants: soil seed bank translocation authored by NSW Department of Environment and Conservation
- Draft guidelines for the management of Duffys Forest ecological community remnants: fire management practices authored by NSW Department of Environment and Conservation
- Endangered Ecological Community Information: Duffys Forest Ecological Community authored by NSW Department of Environment and Conservation
- Species Impact Statement for the proposed Seaforth Oval Access Improvements and Car Park at Seaforth Oval, Seaforth authored by GIS Environmental Consultants, 2007

2.11 What Cannot Be Done in the Bushland Area

The following activities cannot be allowed to happen in the Environmental Protection Area shown on Map 1:

- ◆ **Damaging any locally native tree or other plant dead or alive except for safety reasons or as part of a burn.**
- ◆ **Disturbing the soil surface including rocks.**
- ◆ **Polluting or changing water flows.**
- ◆ **Depositing sand, soil, gravel, pollutants, building materials, fertiliser, etc.**
- ◆ **People access must be restricted to when absolutely necessary, such as managing the vegetation in this area or monitoring the site. Tracks are not allowed to be formed. If paths are forming immediate action is to be taken to prevent the use.**
- ◆ **Smoking is strictly prohibited due to the fire risk.**

2.12 Who Must Read This Management Plan

All managers and contractors responsible for work in or around this site must read this Plan to familiarise themselves with their obligations and responsibilities.

It is the responsibility of all managers and contractors to ensure that work practices are compatible with this Plan and that employees and contractors are aware of the restrictions that are relevant to their work on this site.

2.13 Threats to the Duffys Forest on This Site

The specific threats to the Duffys Forest vegetation on this site after construction of the carpark and access way are;

- ◆ Inappropriate timing, patchiness or heat of burning.
- ◆ Absence of fire reducing the viability of the community in the long term and too frequent fire history, which will also be detrimental.
- ◆ Physical damage by people due to use of trails within or adjacent to the Environment Protection Area,
- ◆ Reduction in water quality eg. Pollution, added nutrients and silt. Reduction in water quality may happen as a result of fertilisers, imported soils, drainage works or chemical spills.
- ◆ Weed invasion will decrease the habitat value of the site due to competition with native plants, changing the habitat and nutrient balance of the site. The sight of weeds will decrease the perception of the value of the area as native bushland which is likely to lead to further degradation.
- ◆ Genetic contamination of the gene pool for each species on the site may occur if similar species (from the same genus) are planted that are not from the local gene pool. This is only likely to happen if inappropriate plant material is used in landscaping or weeds are allowed to occur in or near the site.
- ◆ Feral animals such as dogs, cats, rabbits, foxes and a wide variety of birds may occur on the site from time to time. The impact from these can be eating of seedlings, increases in the amounts of phosphorous and nitrogen, introduction and spread of weeds, as well as predation and competition with the native animals.
- ◆ Listed threats to Duffys Forest that are not considered to be important at this site are; nutrient and hydrological regimes, seed collection, erosion by horses, bicycles, motorcycles and excessive pedestrian use.

Table 1 – Bushland Management Action Plan

ISSUE	PRIORITY	OBJECTIVES & ACTIONS REQUIRED	TIMING	COMMENTS
Weed Control	HIGH	- Engage a bush regeneration contractor to undertake weed control works specified in this Plan within the restrictions of this Plan and in the whole of the area of this plan. - Weed control works in adjacent bushland areas to minimise spread of weeds into DFEC. - A specific s91 and a s132c licence will be required. - Implement Phytophthora hygiene protocols. - The DFRP requires minimising of the use of herbicide and restriction to only use as cut and paint or scrape and paint. - The DFRP requires that only bush regenerators with a high level of botanical knowledge and significant amount of experience be allowed to work in DF sites.	Start July 2007 at 3 months, 6 months, 12 months, 18 months and then at least yearly, as required by the DFRP. Due the poor condition of this site and the translocation it is recommended that the weed control be conducted every 3 months for 10 years Ongoing 6 monthly	Adhering to this Plan must be included in the contract for the Contractor. Council has committed to implement and manage this project over a 10 year period.
Remove Rubbish	HIGH	Remove any garden and building site waste illegally dumped on this site	Ongoing as needed.	
Ecological burning	MEDIUM	- Burn the translocation areas only if it is within 2 days of the translocation. - Burn the areas of retained bushland adjacent to the translocation areas within 2 weeks after the translocation. Do not burn before the translocation or more than 2 weeks after. This is to encourage seed fall and adjacent germination. - Careful explanation of the reasons to burn and the restrictions of the site will need to be explained to the fire personnel. - A temporary fence between the translocation and burn	April 2007	Advance planning will be needed to get assistance from the RFS or Metropolitan fire service NSW Fire Brigade for the burn.

		areas before and during the burn to prevent trampling. Fence can be removed immediately after. ▪ Logs and branches are not to be burnt. This is considered a threatening process for this ecological community. ▪ A medium to high intensity burn is required across the site. There is to be no piling of fuel. Burning evenly across the site is essential for the soil seed bank. All fire is to be extinguished in each section of the area within 15 minutes of being lit. Site should be reinspected at end of the day and any smouldering areas extinguished. ▪ Additional fuel brush may be needed. This should be the fine branches of the trees cut down during the clearing for the development, that have been left to dry for at least 1 week. ▪ This area is not to be burnt more frequently than every 12 years and no less than every 20 years. ▪ Do not pile fuel as the centres will be too hot and much of the site will not get enough heat.			
Soil Translocation areas for possible future needs	MEDIUM	▪ This type of sub soil is very rare and will be in great demand for translocations, if further translocations are needed nearby. ▪ Keep areas identified on Map 1 available for future translocations should they be required. ▪ Plant suitable overstorey species i.e. <i>Eucalyptus seiberi</i> (not Casuarinas), using native plants grown from seed collected from the local Duffys Forest remnants. ▪ Implement Phytophthora hygiene protocols.	Ongoing	Hopefully no more removal of Duffys Forest will ever occur, but the possibility can be prepared for, at this ideal site.	
Plant propagation	HIGH	▪ The DFRP is clear that "Planting is not to take place in DFEC remnants". ▪ Propagation for planting is only to be used if the	February 2008 if needed	The monitoring and analysis will determine if any planting is	

		translocation is unsuccessful and needs supplementing. This will not be apparent for at least 1 year. There are no plans for attempting to revegetate areas with Duffys Forest Ecological Community.	Eucalypt seed collection in February 2007	needed.
Site Protection	HIGH	The future translocation areas will need <i>Eucalyptus sieberi</i> trees planting to establish a shade canopy for translocations in future years if needed.	April 2007	
		- On completion of the development works, permanent fencing in the form of a curb (gutter) and 1m high post and rail fence with a black plastic mesh is required. This fence is not to be bandicoot proof - Signage is to be installed informing all that no access allowed, dumping of rubbish is prohibited and that the site is not to be burnt until at least 2019.	April 2007	
Monitoring	HIGH	- The Duffys Forest recovery plan required the following monitoring. Four 1X1 quadrats two 20X20m quadrates with five 20X20 controls quadrats. - Fill in data sheets and take set photos. Monitoring changes in the mixture of species, their relative abundances and the structure of the vegetation to determine if the vegetation is representative of the definition of Duffys Forest. This will need to be done in the 3 types of management areas ie. the translocation areas, the retained bushland and the areas for future translocation. - Test the results of the monitoring against the quantifiable goals, including the effectiveness of weed control. - Analyse the results of the monitoring and compare to previous monitoring, the baseline and control sites to determine if and what type of changes to management practices are required. - Summarise the effort and materials used in	Surveyed at 3 months, 6 months, 12 months, 18 months and then yearly, as required by the DFRRC Annually in September Annually in September Annually in September Annually in September	Must be carried out independently of bush regenerators. Ensure weed control performance targets are met.

Monitoring	HIGH	▪ The Duffys Forest recovery plan required the following monitoring. Four 1X1 quadrats two 20X20m quadrates with five 20X20 controls quadrats. ▪ Fill in data sheets and take set photos. Monitoring changes in the mixture of species, their relative abundances and the structure of the vegetation to determine if the vegetation is representative of the definition of Duffys Forest. This will need to be done in the 3 types of management areas ie. the translocation areas, the retained bushland and the areas for future translocation. ▪ Test the results of the monitoring against the quantifiable goals, including the effectiveness of weed control. ▪ Analyse the results of the monitoring and compare to	Surveyed at 3 months, 6 months, 12 months, 18 months and then yearly, as required by the DFRC Annually in September Annually in September	Must be carried out independently of bush regenerators. Ensure weed control performance targets are met.
------------	------	--	--	--

3. Required Management

Below is a description of the general management measures that are to be undertaken. Table 1 describes some specific management recommendations and the timeframe for them to occur. There are 3 management zones:

- Translocation recipient (target) areas
- Retained bushland to have assisted natural regeneration
- Areas prepared for future translocations if required.

Translocation recipient (target) areas

There are 607m² of area with laterite sub soil where Duffys Forest topsoil was translocated to during the development of the access road and car park works. See Map 1. Due to the depleted nature of the translocated topsoil these areas require very careful management if they are to become viable Duffys Forest.

Retained bushland to have assisted natural regeneration

These areas were degraded Duffys Forest at the time of writing. The plan is to burn these areas and control the weeds using bush regeneration techniques and carefully monitor them to determine if further management in the form of planting is required.

Areas prepared for future translocations if required.

These areas contain the very rare laterite topsoil that will be required if there is a need for future Duffys Forest translocations. It is hoped there will never be a need for future translocations nearby, but the reality is there may be a need for these areas in the near future. If these areas are not used in the next 5 years they should be considered for an attempt at revegetation although it is very unlikely that any resemblance to Duffys forest can be created. These areas need to be immediately planted with a tree canopy of *Eucalyptus seiberi* to prepare a more favourable microclimate. No Understorey plants are to be planted until it is certain that these areas will not be used for translocations. Noxious weeds are to be controlled but non-environmental pest exotics can be tolerated.

3.1.1 Restriction of Access

Physical damage to the vegetation and soil by the use of trails within or adjacent to the Environment Protection Area and other uses of the area are to be prevented by fencing and signage.

Access into bushland that is to be retained will be restricted by a permanent post and rail or similar fence (See Map 1). There will be permanent A5 sized signs every 15 m along the boundary describing that the area is an ecological conservation area and entry is not allowed. If it becomes apparent that paths are forming or people are using the area for access then paths must be effectively signposted and blocked.

3.1.2 Workers/Maintenance at the Site

Due to the sensitivity of this ecological community only qualified bush regenerators are to work on this site. A minimum requirement of at least level 2(pre2004) Certificate in Bush Regeneration (TAFE) or at least a Certificate 3 (post 2004) in conservation & Land management (Natural Area Restoration & Management (TAFE) and a minimum of two years supervised bush regeneration experience working in Sydney Dry Sclerophyll Forest. Regenerators should be familiar with the techniques in "Bringing the Bush Back to western Sydney: Best practise Guidelines for bush Regeneration on the Cumberland Plain, (DIPNR 2003).

3.1.3 Feral and Pest Animals

Rabbits must be continuously and effectively suppressed. If evidence of rabbits becomes present it must be immediately dealt with in co-ordination with the managers of Garigal

National Park. Rabbits will eat large amounts of seedlings and will drastically change the ecology of the site.

3.1.4 Public Education

The need to educate the public is a requirement of the draft Duffys Forest Recovery Plan. To educate the public on the importance of this area, it is recommended that 2 copies of this management plan be kept in the Manly Council Library (one in the local studies section) and one copy in the Manly Environment Centre.

3.1.5 Buffer Zones

The proposal will buffer the existing Duffys Forest vegetation to a variable width in accordance with the DEC on DFEC remnants: Buffers and adjoining vegetation draft guidelines. The old access road has Duffys Forest on both sides buffering will assist in closing his gap especially with *Eucalyptus sieberi* tree planting to establish a suitable microclimate.

3.1.6 Adjacent Landscape/Garden Maintenance

No invasive species or environmental weeds are to be planted in the adjacent gardens and the gardens are to be maintained weed free. There is to be no use of soluble or organic fertiliser during the landscaping or maintenance of the adjacent gardens. Only weed free mulch is to be used.

3.1.7 Other Management Practices

There is to be no use of soluble or organic fertiliser during bush regeneration works. There is to be no irrigation of the site after the first summer.

Phytophthora hygiene protocols are to be strictly adhered to.

3.1.8 Maintenance of the Environment Protection Area

All bush-regeneration work must be undertaken by workers with a minimum of TAFE Bush Regeneration Certificate II (pre 2004) qualification or Certificate III (post 2004) in Conservation & Land Management (Natural Area Restoration & Management) **and** a minimum of two years supervised bush regeneration experience working in DFEC. They are to be supervised by an individual with TAFE Bush Regeneration Certificate IV qualification or an Environmental Scientist B.Sc (Hons) with at least 5 years experience in the ecology of this area. The site bushland overseer must be on site at all times while work is being carried out. Staff should be familiar with "*Bringing the Bush Back to Western Sydney: Best Practice Guidelines for Bush Regeneration on the Cumberland Plain*" (Department of Infrastructure, Planning and Natural Resources, 2003). It is the responsibility of the Site Bushland Overseer to ensure staff have access to this plan and that work practices are consistent with this plan.

3.1.9 Weed Removal and Bush Regeneration

Bush regeneration work will start as soon as site works commence and will continue for the life of the construction.

Weed invasion will decrease the habitat value of the site due to competition with native plants and changing the habitat and nutrient balance of the site. The sight of weeds will decrease the perceived value of the area as native bushland, which is likely to lead to further degradation.

The method of removal must be the most appropriate for the species of weed concerned and should cause minimum disturbance to the leaf litter and soil surface. Best practise bush regeneration techniques must be used at all times. All exotic species within the Environmental Protection Area must be treated as weeds. Some propagation of plant material from the site and planting of tube stock may be required in the areas adjacent to the construction area and if any paths have been formed.

All staff are to comply with the following performance measures as a result of their works:

- All annual weeds will be prevented from seeding;

- Once primary weed control is completed, all woody weed regrowth will be prevented from exceeding 50cm in height;
- All mature vine weeds will be removed from the canopy and prevented from re-establishing;
- Native plants planted on the site will be maintained alive or any losses replaced; and
- All vegetation waste created from bush regeneration works will be removed from the site.

3.1.10 Plant Material for Bush Regeneration

The primary aim of bush regeneration on this site is to retain the existing ecosystem and allow it to naturally reproduce to be self-sustaining and naturally self seed. There should not be a need for intervention such as planting, however if there are proposals to plant within the Environment Protection Area, they should be approved by Council Bushland Management Coordinator or the Duffys Forest Recovery Team. Details regarding sources and quality of plant material used including the source of the propagation material should be recorded.

Due to the close proximity of the development, it may be necessary to supplement the natural reproduction of the plants. Any plants needed must be propagated from local native species. This may include disturbed areas, for example, where there are large patches occurring with low amounts of natural regeneration. The areas being kept for future translocations should be planted with a shade tree cover. Only plants propagated from local native species, within 5 km of this site, should be used. This type of material is available from nurseries that specialise in this type of stock.

3.1.11 Ecological Burning

The most important management strategy is fire. Fire and scarification (disturbing the soil as part of translocation) releases dormancy mechanisms on seeds and a burst of germination will occur. This periodic burst of germination is essential for the viability of the ecological community. The burn must happen at the same time as the scarification otherwise seedlings will be killed which will have a significant detrimental effect on the ecological community and deplete the soil seed bank. If the initial burn is carried out incorrectly then the soil seed bank will be depleted and the ecosystem of this patch is unlikely to be able to become a resemblance of the Duffys Forest. This vegetation has low resilience. When fuel hazard reduction (by manual or by controlled burn) is to be carried out, an Ecologist/Environmental scientist must develop the burn plan. The Ecologist/Environmental Scientist should have at least 5 years experience in the ecology of Duffys Forest Vegetation. The Ecologist/Environmental Scientist must personally approve all the work themselves in the field and not subcontract or delegate.

Burning must be co-ordinated with adjacent land management and fire plans to produce a mosaic of different aged vegetation. Fires in last summer or Autumn are preferable but the initial burn should not be delayed for this reason. Burning will require permission from the Manly-Mosman Bushfire Management Committee and the Department of Environment and Conservation. It is not likely the area will be burnt as part of hazard reduction as there are no residences adjacent to this area. Manly Council is on the local Bushfire Management Committee and can ensure no planned fires occur within 12 years. The signs will have in small writing that the site is not to be burnt before 2019.

The fire frequency should not exceed two fires in quick succession each five years or greater than 30 years. Due to the close proximity of buildings this may need to be achieved by pile burning. The next fire should not be before 2019. An application to burn will need to be lodged with the Mosman-Manly Bushfire Management Committee via the Rural Fire Service. The timing of this fire may need to be altered by a year or two depending on the fire history of the surrounding area and weather conditions. The time of the year the burn is carried out and the intensity should be planned after consultation with the National Parks and Wildlife Service and the Rural Fire Service.

It is likely the burn will kill the casuarinas which dominate the community at the moment. This is natural and not of concern.

3.1.12 Litter and Dumping

Any foreign material including litter and soil is to be removed from the Environment Protection Area and disposed of appropriately and immediately. If dumping is allowed to gather it will encourage more dumping.

3.1.13 *Phytophthora* Hygiene Protocols

The root rot fungus *Phytophthora cinnamomi* is listed as a threatening process to many threatened species and/or ecological communities. Proper hygiene protocols are to be followed, i.e. all tools, boots and machinery must be cleaned before entering the site. All contractors working within the Environment Protection Area must follow the Royal Botanic Gardens (RBG) protocols for control of *Phytophthora cinnamomi*. See Appendix H for Fact Sheet.

Phytophthora root rot is a disease of plant roots caused by a water mould that can cause widespread plant death. Death is often associated with other stresses to native trees such as insect attack, changes to drainage, drought, weed growth and possibly lack of fire. *Phytophthora* is spread in contaminated soil and so is easily spread in soil adhering to footwear, tools and machinery. Due to the ridge top location of this site, *Phytophthora* infection is unlikely, however given the site is an endangered ecological community precautions should be taken. The following guidelines aim to prevent the spread of this pathogen into areas where the disease does not occur in order to protect our native vegetation.

Protocols required include:

- Always assume that the area you are working in is free of *Phytophthora*. Conversely always assume that the activity you are about to undertake will have the potential to introduce the disease;
- Clean equipment, machinery and footwear before entering a site;
- Ensure that any adhering soil is removed as even the smallest amount of soil can contain spores of the pathogen. Spray or soak all soles of shoes and tools with one of the following disinfectants before entering and leaving a site:
 - Bleach (Sodium Hypochlorite) - 1% strength
 - Household Disinfectants – Use as per label
 - Methylated Spirits – 70% strength

Allow a few minutes for the solution to soak into any soil that may remain on the shoe / tool.

Follow these procedures when moving through a site if you expect you will be moving from a potential *Phytophthora* infected area to a non-*Phytophthora* infected area. Potential *Phytophthora* infected areas include, drainage lines or areas where there is evidence of canopy dieback.

- Never drive vehicles/trailers into bushland reserves, unless appropriate vehicle decontamination procedures are carried out;
- Where there is information regarding the distribution of the pathogen always work in areas known to be free of the pathogen before working in infected areas;
- Minimise soil disturbance on the sites. Any activity that involves soil disturbance has the greatest potential for movement of the pathogen. In these situations it is essential that the soil not be moved from the site adjacent to the activity. By this we mean that soil dug is placed next to the excavation site – not dispersed across a larger area;
- Bag all weeds and soils that have been disturbed for removal off-site. It is essential that plants are not dragged through the bush with exposed roots and adhering soil. The bags need to be robust enough to ensure that they are not damaged moving through the vegetation;
- Avoid working or minimise activities when the soil is very wet. The pathogen will be most active then, and the soil is more likely to adhere to foot wear and equipment; and
- Only plant local plant stock that has come from suppliers who are accredited by the Nursery Industry Association. Never plant susceptible plant species in areas where *Phytophthora* is present (more research is required).

Since spores are capable of surviving for extended periods of time, *P. cinnamomi* can survive in dead plant tissue for a number of years. This has implications for leaving infected dead timber

in reserves and sourcing suitable mulch. Mulch will need to be attained from accredited sources and should not be placed in bushland reserves but may be required along track edges.

Adapted from protocols developed by Brett Summerell, Royal Botanic Gardens, Sydney (November 2003).

3.2 Annual Monitoring

Monitoring is essential to determine if the appropriate management is being used. Monitoring needs to be carried out independently of the bush regeneration contractor and by someone able to analyse the data, interpret the findings and make appropriate changes to the management regime. The monitoring data must be collected in a standard way through time to allow temporal comparisons and should be standard with the way monitoring is carried out on other Duffys Forest Sites.

The monitoring needs to measure:

- If the quantifiable goals are being met;
- The management practises used over the last 12 months;
- The presence of pest fauna;
- Records of effort spent and materials used;
- Presence of other threatening processes; and
- Areas of degradation using established photo points.

3.2.1 Filling in the Data Sheet

The data sheet (Appendix I) must be photo copied and filled in every year in September after the bush regeneration work has been carried out. All boxes must be filled in with a response and the map must be marked with the relevant information. The data sheet requires information on:

- ◆ the date of the assessment and the assessor;
- ◆ the condition of the site (erosion, paths, disturbance fire litter etc.);
- ◆ the weeds removed;
- ◆ the bush regeneration effort;
- ◆ the work carried out;
- ◆ the materials used;
- ◆ the presence of feral animals; and
- ◆ other relating information.

3.2.2 Disturbance Recording

All disturbances to the Environment Protection Area must be recorded on the map in the monitoring data sheets. This includes fire, soil use, dumped material, public safety issues, tree lopping, erosion and siltation and tracks.

It is also recommended that a record be kept of the need for repairs to fences and signs, edging replacement and weed removal (species and amount).

3.2.3 Erosion and Siltation

Preventive measures to control erosion are likely to be required in areas with a slope of more than 5%. Surface water from hard surfaces should be prevented from entering the Duffys forest areas.

All evidence of erosion and siltation on the site must be shown on the map on the data sheet and measures to stop the erosion must be carried out.

3.2.4 Tree Death

All occurrences of tree death or substantial die back of a tree canopy must be recorded on the map in the data sheets.

3.2.5 Other Monitoring

Other monitoring includes works in the landscaped gardens, lawns and hard surfaced areas, whether there are any public safety issues and whether there is any evidence of tree lopping, insects or fungal infestation, etc.

3.2.6 Photos

Nine photo monitoring points are shown on Map 1. A total of 30 monitoring photos are to be taken from the nine points and included in the data sheet information annually. A comparison is to be made with the previous year and baseline photos taken on site.

Photos are to be taken in September every year from the permanent survey points shown on Map 1. The colour photos are to be taken using a digital camera in the directions shown on Map 1. The photos must be taken from a standing position. These photos are to be compared to previous photos and stored on a correctly labelled CD in Manly Council Library, with the dates and the text "Bushland Monitoring photographs for Seaforth Oval").

3.3 Analysis of Change

Annual quadrats will reveal if the mixture and relative abundance of species is representative of the Duffys Forest Community. The data is to be compared to other Duffys Forest sites (a substantial database of quadrat data has been collated) using multivariate analysis and the Smith and Smith Formula to determine if remediation actions are required. Comparison of the photos may provide supporting information about the structural and some of the floristic changes in the vegetation. If significant changes are found and the community does not represent Duffys Forest then an ecologist or the Duffys Forest Recovery Team is to recommend remedial actions.

3.4 Review and Updating

This management Plan should be reviewed and updated every 5 years by a qualified Environmental Scientist. This is next scheduled to occur in 2012. The process must take into account the results of relevant new research and legislation. The Bushland Management Plan (whether changed or not) should then be approved by the Duffys Forest Recovery Team.

3.5 Where to find Clarification

If any part of this plan is unclear or there are questions about what is, or is not allowed in the Environmental Protection Area, contact Council's Bushland Management Coordinator or the Duffys Forest Recovery team care of the Department of Environment and Conservation (DEC), Ph: 9585 6827.

4. References

NPWS, 2005, Duffys Forest Endangered Ecological Community Recovery Plan, Working Draft, Department of Environment and Conservation NSW

Smith P. and J. Smith 2000, Survey of the Duffys Forest Vegetation Community, NPWS and Warringah Council

DIPNR, 2003, Bringing the bush back to Western Sydney, Best Practice Guidelines for Bush Regeneration on the Cumberland Plains

Buchanan Robin, 1989, Bush Regeneration: Recovering Australian Landscapes authored by.

Distribution of the Duffys Forest Ecological Community at Seaforth Oval authored by P & J Smith Ecological Consultants.

Draft guidelines for the management of Duffys Forest ecological community remnants: ecological restoration & reconstruction authored by NSW Department of Environment and Conservation

Draft guidelines for the management of Duffys Forest ecological community remnants: buffers and adjoining vegetation authored by NSW Department of Environment and Conservation

Draft guidelines for the management of Duffys Forest ecological community remnants: soil seed bank translocation authored by NSW Department of Environment and Conservation

Draft guidelines for the management of Duffys Forest ecological community remnants: fire management practices authored by NSW Department of Environment and Conservation

Endangered Ecological Community Information: Duffys Forest Ecological Community authored by NSW Department of Environment and Conservation

Species Impact Statement for the proposed Seaforth Oval Access Improvements and Car Park at Seaforth Oval, Seaforth. Authored by GIS Environmental Consultants, 2007

Works and Environment Protection Plan for Changes to Access and Carpark at Seaforth Oval, Seaforth. Authored by GIS Environmental Consultants, 2007

Plan for Soil Translocation Works in a Remnant of Duffys Forest Endangered Ecological Community. Authored by Toolijooa 2006

Threatened Species and Conservation Act, 1995

Seaforth Oval Plan of Management' (2004)

5. Appendix A. Duffys Forest Local Definition

Duffys Forest Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Preliminary Determination to support a proposal to amend Part 3 of Schedule 1 of the Act (Endangered ecological communities) by listing Duffys Forest Ecological Community in the Sydney Basin Bioregion as an endangered ecological community and as a consequence to omit reference to the Duffys Forest vegetation community in Part 3 of Schedule 1 of the Act. Listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. A Notice of Final Determination to list the Duffys Forest vegetation community appeared in the NSW Government Gazette No. 112 on 24th July, 1998. The Scientific Committee considers that an amendment should be made to this listing following the receipt of additional information about the ecological community.
2. Duffys Forest Ecological Community is the accepted name for the ecological community that occurs on the ridgetops, plateaus, upper slopes and occasionally mid slopes on Hawkesbury sandstone geology, typically in association with laterite soils and soils derived from shale and laminite lenses. It has the structural form predominantly of open-forest to woodland. The Duffys Forest Ecological Community has been reported from the Warringah, Pittwater, Ku-ring-gai, Hornsby and Manly Local Government Areas, although it may occur elsewhere in the Sydney Basin Bioregion.
3. Duffys Forest Ecological Community is characterised by the following assemblage of vascular plant species:

Acacia linifolia

Acacia myrtifolia

Acacia suaveolens

Acacia ulicifolia
Actinotus minor
Allocasuarina littoralis
Angophora costata
Anisopogon avenaceus
Austrostipa pubescens
Banksia ericifolia
Banksia serrata
Banksia spinulosa
Billardiera scandens
Boronia ledifolia
Boronia pinnata
Bossiaea heterophylla
Bossiaea obcordata
Brunoniella pumilio
Cassythia pubescens
Ceratopetalum gummiferum
Conospermum longifolium
Comesperma ericinum
Cyathochaeta diandra
Dampiera stricta
Dianella caerulea
Dillwynia retorta
Dodonaea triquetra
Entolasia stricta
Epacris pulchella
Eucalyptus capitellata
Eucalyptus gummifera
Eucalyptus haemastoma
Eucalyptus sieberi
Gompholobium grandiflorum
Gonocarpus teucrioides
Grevillea buxifolia
Grevillea caleyi
Grevillea linearifolia
Hakea dactyloides
Hakea sericea

Hakea teretifolia
Hibbertia bracteata
Hovea linearis
Lambertia formosa
Lasiopetalum ferrugineum
Lepidosperma laterale
Leptospermum trinervium
Lindsaea linearis
Lindsaea microphylla
Lomandra glauca
Lomandra longifolia
Lomandra multiflora
Lomandra obliqua
Lomatia silaifolia
Micrantheum ericoides
Patersonia glabrata
Patersonia sericea
Persoonia levis
Persoonia pinifolia
Petrophile pulchella
Phyllanthus hirtellus
Phyllota phyllicoides
Pimelea linifolia
Platysace linearifolia
Pteridium esculentum
Pultenaea daphnoides
Pultenaea elliptica
Pultenaea linophylla
Telopea speciosissima
Tetrarrhena juncea
Xanthorrhoea media
Xanthosia tridentata
Xylomelum pyriforme

4. The total species list of the community is considerably larger than that given in 3 (above), with many species present in only one or two sites or in very small quantity. In any particular site not all of the

assemblage listed in 3 may be present. At any one time, seeds of some species may only be present in the soil seedbank with no above ground individuals present. The species composition of the site will be influenced by the size of the site and by its recent disturbance history. The number of species and the above ground composition of species will change with time since fire, and may also change in response to changes in fire frequency. The community is an important habitat for a diverse fauna (vertebrates and invertebrates), but detailed records are not available from most stands and the invertebrate fauna is poorly known.

5. Smith & Smith (2000) give a list of diagnostic plant species for Duffys Forest Ecological Community and describe how the community can be distinguished from surrounding ecological communities. Diagnostic species provide a guide to identification of the community, but care should be taken in the application and interpretation of diagnostic plant species because of sampling limitations; the reduction in species diversity in degraded sites; and the fact that some species may only be present at a site at some times as a part of the soil seedbank or as dormant buds/tubers.

6. The endangered shrub *Grevillea caleyi* is largely restricted to Duffys Forest Ecological Community though it is not present at all locations of the community. Other threatened plant species known from the community include *Persoonia hirsuta*, *Tetratheca glandulosa*, *Pimelea curviflora* var. *curviflora*, *Epacris purpurascens* var. *purpurascens*.

7. The Scientific Committee noted that general information on the Duffys Forest Ecological Community is contained in:

Benson, D. & Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3(4) 677-787.

NPWS (2001) *Grevillea caleyi* R.Br. (Proteaceae) Draft Recovery Plan for public comment. NSW National Parks and Wildlife Service, Hurstville.

Thomas, J. & Benson, D.H. (1985) Vegetation survey of Ku-ring-gai Chase National Park. National Herbarium of New South Wales, Royal Botanic Gardens, Sydney.

Sheringham, P.R. & Sanders, J.M. (1993) Vegetation survey of Garigal National Park and surrounding Crown Lands. A report for the NSW National Parks and Wildlife Service.

Scott, J., Marshall, A. & Auld, T.D. (1995) Conservation research statement and recovery plan for *Grevillea caleyi*. ANCA Endangered Species Project No. 456.

Smith, P. & Smith, J. (2000) Survey of the Duffys Forest Vegetation Community. Unpublished Report to NSW National Parks and Wildlife Service and Warringah Council.

These surveys and accompanying maps are by no means inclusive in their representation of Duffys Forest Ecological Community. The scale of the Sydney map is too coarse to map the smaller remnants of this community. The community is highly fragmented by urban developments and not all the small fragments appear on the maps. Duffys Forest Ecological Community is represented on the southern edge of the Ku-ring-gai Chase National Park vegetation map (Thomas & Benson 1985) and the northern edge of the Garigal National Park vegetation map (Sheringham & Sanders 1993). These two maps do not directly abut as there is a gap in the middle comprising cleared land within which small remnant patches of the Duffys Forest Ecological Community exist. Some disturbed or degraded remnants of Duffys Forest Ecological Community may not be mapped as the community in Smith and Smith (2000).

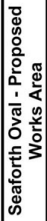
8. It is estimated that only 15% of the original area of the Duffys Forest Ecological Community currently exists in the form of a number of remnants.

9. Threats to the survival of the Duffys Forest Ecological Community include land clearing and associated fragmentation, habitat degradation by rubbish dumping; weed invasion facilitated by urban runoff, an inappropriate fire regime, unauthorised horse riding activities in the area and access by people, trail bikes, and other vehicles

10. Only a small number of fragments of the Duffys Forest Ecological Community occur within Ku-ring-gai Chase and Garigal National Parks, and all of these are on the boundary of the Parks and bounded by roads.

11. In view of the substantial reduction in the area occupied by the community, its fragmentation and the numerous threats to the community, the Scientific Committee is of the opinion that Duffys Forest Ecological Community is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate and that listing as an endangered ecological community is warranted.

6. Appendix B. Land Ownership

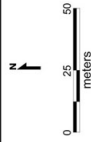


Land Acquisition Map

07/07/2006

Date of Aerial Photography 2005 © SKM AusImage

- | Area required for RTA Works | Area of Crown Land to be added to R89212 | Cadastre |
|--|---|---|
|  |  |  |



Projection: MAP GRID OF AUSTRALIA
DATUM: GDA 94

1. The data for this plan has been supplied by Land and Property Information, NSW and has subsequently been modified and updated by Manly Council. The information contained on this plan is provided by Manly Council in good faith, but Manly Council gives no warranties and accepts no responsibility as to the accuracy, correctness or completeness of the information contained on the plan and shall not be liable for any loss or damage occasioned directly or indirectly through the use of, or reliance on, the information contained on the map.

2. Persons rely on the information contained on this plan entirely at their own risk and should exercise their own skill and care (including where relevant by obtaining appropriate professional advice) in relation to its use, scope and other interests. Insofar as the location of the easement is concerned, the location of the easement is not a matter of public interest in land are concerned. Manly Council cannot give any guarantee to the accuracy of the information displayed on this plan. Please refer to appropriate deposited plans and otherwise make independent enquiries of the appropriate instrumentality or authority as regards location of easements.

3. Within regards to any information shown or depicted on Manly Council's plans and records, especially as regards stormwater, sewerage, and other infrastructure, Manly Council must give any guarantee as to the accuracy, completeness or completeness of such information, makes no representations, gives no warranties and accepts no responsibility as to the accuracy, correctness or completeness of any such information, and shall not be liable for any loss or damage occasioned directly or indirectly through the use of, or reliance on, the information contained on the plan. Persons excavating must exercise care and will be held responsible for any damage to Council's infrastructure.

GIS



7. Appendix C. Council Zoning



Seaford Oval Area

Manly Council Zoning

DATE OF ISSUE: 17/05/2006

LEGEND

- Residential Zone
- Business Zone
- Open Space Zone
- National Park Zone
- RTA Road Widening
- LGA Boundary



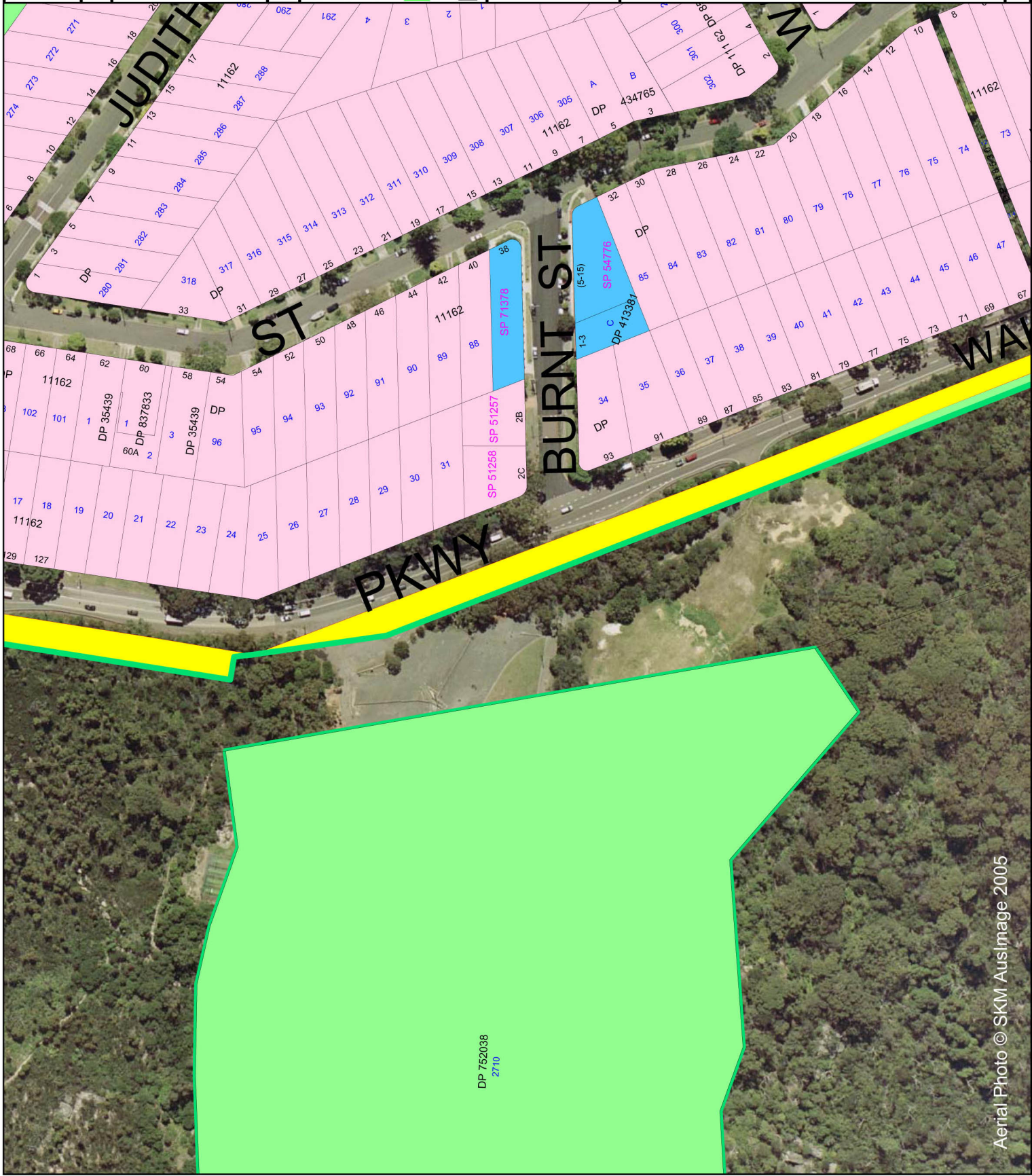
Scale 1:2000

Projection: MAP GRID OF AUSTRALIA
DATUM: GDA 94

NOTES

1. The data for this plan has been supplied by Land and Property Information, NSW and has subsequently been modified and updated by Manly Council. The information contained on this plan is provided by Manly Council in good faith, but Manly Council gives no warranties and accepts no responsibility as to the accuracy, completeness or reliability of the information contained on this plan. Manly Council shall not be liable for loss or damage occasioned directly or indirectly through the use of, or reliance on, the information contained on the map.
2. Persons rely on the information contained on this plan entirely at their own risk and should exercise their own skill and care (including where relevant by obtaining appropriate professional and technical advice) in relation to its use, acceptability and suitability, insofar as the location of easements and other interests in land are concerned. Manly Council cannot give any guarantee to the accuracy of the information displayed on this plan. Please refer to appropriate deposited plans and otherwise make independent enquiries of the appropriate instrumentality or authority as regards location of easements.
3. Within regards to any information shown or depicted on Manly Council's maps, plans, reports, maps, diagrams, or other documents, Manly Council cannot give any guarantee as to the accuracy, correctness or completeness of such information, makes no representations, gives no warranties and accepts no responsibility as to the accuracy, correctness or completeness of any such information, and shall not be liable for any loss or damage occasioned directly or indirectly through the use of, or reliance on, the information contained on the plan. Persons excavating must exercise care and will be held responsible for any damage to Council's infrastructure.

Map produced by: GIS



8. Appendix D. Weed List

By Manly Council

Appendix D: Weed species present and the appropriate weed control technique

Weed species	Manual control	Cut / paint	Scrape/ paint	Spray herbicide	Chisel/ drill	Skirt vines in canopy	Herbicide used
<i>Acetosa sagitata</i>	X		X			X	Glyphosate
<i>Ageratina adenophorum</i>	X	X					Glyphosate
<i>Anagallis arvensis</i>	X						
<i>Ambrosia sp</i>	X						
<i>Anthoxanthrum odoratum</i>	X			X			Glyphosate
<i>Avena barbata</i>	X			X			Glyphosate
<i>Bidens pilosa</i>	X			X			Glyphosate
<i>Brasica sp</i>	X			X			Glyphosate
<i>Briza maxima</i>	X			X			Glyphosate
<i>Briza minor</i>	X			X			Glyphosate
<i>Bryophyllum sp</i>	X						
Cellery top	X						
<i>Conyza sp.</i>	X			X			Glyphosate
<i>Cirsium vulgare</i>	X			X			Glyphosate
<i>Cynodon dactylon</i>	X			X			Glyphosate
<i>Ehrharta erecta</i>	X			X			Glyphosate
<i>Eleusine indica</i>	X		X				Glyphosate
<i>Eragrostis curvula</i>	X			X			Glyphosate
<i>Digitaria sanguinalis</i>	X			X			Glyphosate
<i>Dipogon tuberosus</i>	X	X				X	Glyphosate
<i>Gnaphalium spp</i>	X			X			Glyphosate
<i>Hypochoeris radicata</i>	X			X			Glyphosate
<i>Lantana camara</i>	X	X	X				Glyphosate
<i>Ligustrum lucidum</i>	X	X	X				Glyphosate
<i>Ligustrum sinense</i>	X	X	X				Glyphosate
<i>Lillium formosum</i>	X	X	X	X			Glyphosate
<i>Lonicera japonica</i>	X		X	X		X	Glyphosate

Weed species	Manual control	Cut / paint	Scrape/ paint	Spray herbicide	Chisel/ drill	Skirt vines in canopy	Herbicide used
<i>Ochna serrulata</i>	X		X				Glyphosate
<i>Oxalis sp.</i>	X			X			Glyphosate
<i>Paspalum quadrifarium</i>	X			X			Glyphosate
<i>Pennisetum clandestinum</i>	X			X			Glyphosate
<i>Phytolacca octandra</i>	X	X		X			Glyphosate
<i>Plantago lanceolata</i>	X			X			Glyphosate
<i>Protoasparagus aethiopicus</i>	X	X					Trounce
<i>Setaria sp.</i>	X			X			Glyphosate
<i>Sida rhombifolia</i>	X	X	X	X			Glyphosate
<i>Sonchus oleraceus</i>	X			X			Glyphosate
<i>Nothoscordum gracile</i>	X			X			Glyphosate
<i>Senecio madagascariensis</i>	X			X			Glyphosate
<i>Senna pendula</i>	X	X	X				Glyphosate
<i>Solanum nigrum</i>	X			X			Glyphosate
<i>Tropaeolum majus</i>	X						
<i>Verbena sp.</i>	X	X		X			Glyphosate
<i>Vulpia myuros</i>	X			X			Glyphosate

9. Appendix E. Baseline Flora Survey

- Compiled by GIS Environmental Consultants
- Manly Council study December 2006

Appendix E: Flora Survey Data Compiled by GIS Environmental Consultants

Genus and Species	Family	Habit	Order	Common Name	Status	Q1 Abundance This Study	Q2 Abundance This Study	Q3 Abundance This Study	Incidental This Study *	James (2003) Presence/ Absence	Smith & Smith (2000) Presence/ Absence
<i>Acacia longifolia</i>	FABACEAE	Shrub	DICOTYLEDON	Sydney Golden Wattle		1	2	0		+	+
<i>Acacia parramattensis</i>	MIMOSACEAE	Shrub	DICOTYLEDON	Parramatta Green Wattle		0	0	1		+	+
<i>Acacia terminalis</i>	MIMOSACEAE	Shrub	DICOTYLEDON	Sunshine Wattle					*	+	+
<i>Agapanthus orientalis</i>	AMARYLLIDACEAE	Herb	MONOCOTYLEDON	Agapanthus	Weed				*	-	-
<i>Ageratina adenophora</i>	ASTERACEAE	Herb	DICOTYLEDON	Crofton Weed	Weed				*	-	-
<i>Allocasuarina littoralis</i>	CASUARINACEAE	Tree	DICOTYLEDON	Black She-oak		5	5	6		+	+
<i>Anagallis arvensis</i>	PRIMULACEAE	Herb	DICOTYLEDON	Scarlet Pimpernel	Weed	1	0	0		-	-
<i>Aristida vagans</i>	POACEAE	Herb	MONOCOTYLEDON	Three-awned Spear Grass		0	1	0		+	+
<i>Bidens pilosa</i>	ASTERACEAE	Herb	DICOTYLEDON	Cobbler's Pegs, Pitchforks	Weed	1	2	1		+	-
<i>Billardiera scandens</i> var. <i>scandens</i>	PITTOSPORACEAE	Shrub	DICOTYLEDON	Apple Berry		0	3	0		+	+
<i>Briza maxima</i>	POACEAE	Grass	MONOCOTYLEDON	Quaking Grass	Weed	0	1	0		-	-
<i>Bromeliad</i>	BROMELIACEAE	Herb	MONOCOTYLEDON	Bromeliad					*	-	-
<i>Chlorophytum comosum</i>	LILLIACEAE	Herb	MONOCOTYLEDON	Spider Plant	Weed				*	-	-
<i>Clematis aristata</i>	RANUNCULACEAE	Herb	DICOTYLEDON	Old Man's Beard		1	0	0		-	-
<i>Commelina cyanea</i>	COMMELINACEAE	Herb	MONOCOTYLEDON	Creeping Christian		1	0	1		+	+
<i>Conyza sp.</i>	ASTERACEAE	Herb	DICOTYLEDON	Fleabane	Weed	1	0	1		+	-
<i>Cortaderia sp.</i>	POACEAE	Grass	MONOCOTYLEDON	Pampas Grass	Weed				*	-	-
<i>Cotoneaster pannosus</i>	ROSACEAE	Shrub	DICOTYLEDON	Cotoneaster	Weed				*	-	-
<i>Cryptostylis subulata</i>	ORCHIDACEAE	Herb	MONOCOTYLEDON	Duck Orchid		0	2	0		-	-
<i>Dianella caerulea</i> var. <i>caerulea/producta</i>	PHORMIACEAE	Herb	MONOCOTYLEDON	Blue Flax Lily		2	4	4		+	+
<i>Dichelachne crinita</i>	POACEAE	Grass	MONOCOTYLEDON	Long Haired Plume Grass		0	1	0		+	-
<i>Dodonaea triquetra</i>	SAPINDACEAE	Shrub	DICOTYLEDON	Hop Bush		1	3	2		+	+
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	POACEAE	Grass	MONOCOTYLEDON	Hedgehog Grass		1	0	0		+	+
<i>Ehrharta erecta</i>	POACEAE	Grass	MONOCOTYLEDON	Veldt Grass	Weed	2	3	4		?	?

<i>Elaeocarpus reticulatus</i>	ELAEOCARPACEAE	Tree	DICOTYLEDON	Blueberry Ash		1	2	0		+	+	+
<i>Entolasia marginata</i>	POACEAE	Herb	MONOCOTYLEDON						*	+	+	+
<i>Entolasia stricta</i>	POACEAE	Grass	MONOCOTYLEDON	Wiry Panic		2	3	4		+	+	+
<i>Eragrostis curvula</i>	POACEAE	Herb	MONOCOTYLEDON	African Lovegrass					*	+		-
<i>Eucaalyptus sieberi</i>	MYRTACEAE	Tree	DICOTYLEDON	Silver-top Ash		5	5	4		-	-	-
<i>Euphorbia peplus</i>	EUPHORBIACEAE	Herb	DICOTYLEDON	Petty Spurge					*	-		
<i>Foeniculum vulgare</i>	APIACEAE	Herb	DICOTYLEDON	Fennel	Weed	1	0	0		-	-	-
<i>Gahnia aspera</i>	CYPERACEAE	Sedge	MONOCOTYLEDON	Saw Sedge		0	2	0		+	+	-
<i>Gahnia erythrocarpa</i>	CYPERACEAE	Sedge	MONOCOTYLEDON	Sword Sedge					*	+	+	+
<i>Galium binifolium</i>	RUBIACEAE	Herb	DICOTYLEDON			0	1	0		-	-	-
<i>Geranium homeanum</i>	GERANIACEAE	Herb	DICOTYLEDON	Northern Cranesbill		1	3	0		+	+	+
<i>Glochidion ferdinandii</i> var. <i>ferdinandi</i>	EUPHORBIACEAE	Tree	DICOTYLEDON	Cheesetree		0	2	1		+	+	+
<i>Glycine tabacina</i>	FABACEAE	Herb	DICOTYLEDON			1	0	0		+	+	?
<i>Grevillea buxifolia</i> var. <i>buxifolia</i>	PROTEACEAE	Shrub	DICOTYLEDON	Grey spider flower					*	+	+	+
<i>Hakea dactyloides</i>	PROTEACEAE	Shrub	DICOTYLEDON	Finger Hakea		0	0	2		+	+	+
<i>Hypochoeris radicata</i>	ASTERACEAE	Herb	DICOTYLEDON	Cats Ear	Weed	1	1	2		+	+	?
<i>Imperata cylindrica</i> var. <i>major</i>	POACEAE	Grass	MONOCOTYLEDON	Blady Grass		2	0	3		+	+	+
<i>Juncus usitatus</i>	JUNCACEAE	Herb	MONOCOTYLEDON						*	+	+	+
<i>Kennedia rubicunda</i>	FABACEAE	Vine	DICOTYLEDON	Dusky Coral-pea		1	0	0		+	+	+
<i>Kunzea ambigua</i>	MYRTACEAE	Shrub	DICOTYLEDON	Tick Bush		0	0	3		+	+	+
<i>Lantana camara</i>	VERBENACEAE	Shrub	DICOTYLEDON	Lantana	Nox W2	1	0	2		+	+	-
<i>Lasiopetalum ferrugineum</i>	STERCULIACEAE	Shrub	DICOTYLEDON	Rusty Petals		1	0	0		+	+	+
<i>Lepidosperma filiforme</i>	CYPERACEAE	Sedge	MONOCOTYLEDON			0	2	0		-	-	-
<i>Lepidosperma gunnii</i>	CYPERACEAE	Sedge	MONOCOTYLEDON	Narrow Sword-sedge		0	1	0		+	+	-
<i>Lepidosperma laterale</i>	CYPERACEAE	Sedge	MONOCOTYLEDON			0	2	0		+	+	+
<i>Leptospermum trinervium</i>	MYRTACEAE	Tree	DICOTYLEDON	Slender Tea-tree					*	+	+	+
<i>Ligustrum lucidum</i>	OLEACEAE	Shrub	DICOTYLEDON	Privet - broad leaved	Nox W4b	1	0	1		?	-	-
<i>Ligustrum sinense</i>	OLEACEAE	Tree	DICOTYLEDON	Small-leaved privet		0	0	1		+	+	-
<i>Lilium formosum</i>	LILIACEAE	Herb	MONOCOTYLEDON	Roadside Lily	Weed				*	-	-	-

<i>Lomandra glauca</i>	LOMANDRACEAE	Herb	MONOCOTYLEDON	Pale Mat-rush		0	2	0		+		+
<i>Lomandra longifolia</i>	LOMANDRACEAE	Herb	MONOCOTYLEDON	Honey Reed		0	2	1		+		+
<i>Melaleuca ?armillaris</i>	MYRTACEAE	Tree	DICOTYLEDON			0	0	2		+		-
<i>Microlaena stipoides</i> var. <i>stipoides</i>	POACEAE	Grass	MONOCOTYLEDON	Weeping Grass		1	2	1		+		+
<i>Nephrolepis cordifolia</i>	DAVALLIACEAE	Fern	FERN	Fishbone Fern	Weed				*	+		-
<i>Nothoscordum gracile</i>	ALLIACEAE	Herb	MONOCOTYLEDON	Onion Weed	Weed	1	0	0		-		-
<i>Ochna serrulata</i>	OCHNACEAE	Shrub	DICOTYLEDON	Ochna, Mickey Mouse Plant	Weed				*	-		-
<i>Omalanthus populifolius</i>	EUPHORBIACEAE	Shrub	DICOTYLEDON	Bleeding Heart		2	0	2		+		+
<i>Opercularia aspera</i>	RUBIACEAE	Herb	DICOTYLEDON	Coarse Stinkweed		0	1	0		+		+
<i>Opismenus aemulus</i>	POACEAE	Grass	MONOCOTYLEDON	Basket Grass		1	2	1		+		+
<i>Oxalis rubens</i>	OXALIDACEAE	Herb	DICOTYLEDON			1	0	0		-		-
<i>Ozothamnus diosmifolium</i>	ASTERACEAE	Herb	DICOTYLEDON	Everlasting, Paper Daisy		1	0	0		+		+
<i>Paspalum dilatatum</i>	POACEAE	Grass	MONOCOTYLEDON	Water Grass		0	0	1		-		-
<i>Paspalum quadrifarium</i>	POACEAE	Grass	MONOCOTYLEDON	Tussock Paspalum		1	0	1		+		-
<i>Passiflora edulis</i>	PASSIFLORACEAE	Vine	DICOTYLEDON	Passionfruit	Weed	1	0	0		-		-
<i>Pennisetum clandestinum</i>	POACEAE	Grass	MONOCOTYLEDON	Kikuyu	Weed	0	0	1		-		-
<i>Persoonia pinifolia</i>	PROTEACEAE		DICOTYLEDON			1	0	0		-		-
<i>Phyllanthus hirtellus</i>	EUPHORBIACEAE	Shrub	DICOTYLEDON	Thyme Spurge		0	2	0		-		-
<i>Phytolacca octandra</i>	PHYTOLACCACEAE	Herb	MONOCOTYLEDON	Ink Weed	Weed				*	-		-
<i>Pittosporum undulatum</i>	PITTOSPORACEAE	Tree	DICOTYLEDON	Sweet Pittosporum		2	3	1		+		+
<i>Plantago lanceolata</i>	PLANTAGINACEAE	Herb	DICOTYLEDON	Lamb's Tongues, Plantain	Weed				*	-		-
<i>Platysace linearifolia</i>	APIACEAE	Herb	DICOTYLEDON	Carrot Tops					*	+		+
<i>Protoasparagus aethiopicus</i>	LILIACEAE	Herb	MONOCOTYLEDON	Asparagus fern	Weed	0	2	3		+		-
<i>Pteridium esculentum</i>	DENNSTAEDIACEAE	Fern	FERN	Bracken		0	0	4		+		+
<i>Senna pendula</i> var. <i>glabrata</i>	CAESALPINIOIDEAE	Shrub	DICOTYLEDON	Cassia	Weed	1	0	2		+		+
<i>Setaria gracilis</i>	POACEAE	Grass	MONOCOTYLEDON	Pigeon Grass	Weed				*	-		-
<i>Sida rhombifolia</i>	MALVACEAE	Shrub	DICOTYLEDON	Paddy's Lucerne	Weed	1	1	0		+		-
<i>Sisymbrium officinale</i>	CRUCIFERAE	Herb	DICOTYLEDON	Hedge Mustard	Weed	1	0	0		-		-
<i>Smilax glyciphylla</i>	SMILACACEAE	Scrambler	MONOCOTYLEDON	Native Sarsaparilla, Sweet Tea		0	2	0		+		+

<i>Solanum mauritianum</i>	SOLANACEAE	Shrub	DICOTYLEDON	Wild Tobacco Tree		0				*	-	-
<i>Solanum nigrum</i>	SOLANACEAE	Herb	DICOTYLEDON	Blackberry Nightshade	Weed	1	1	1			-	-
<i>Sonchus oleraceus</i>	ASTERACEAE	Herb	DICOTYLEDON	Sow Thistle	Weed	1	1	2			-	-
<i>Stenotaphrum secundatum</i>	POACEAE	Grass	MONOCOTYLEDON	Buffalo Grass		0	3	0			-	-
<i>Tetragonia tetragonioides</i>	AIZOACEAE	Herb	DICOTYLEDON	New Zealand Spinach	Weed	2	0	0			+	-
<i>Tradescantia fluminensis</i>	COMMELINACEAE	Herb	DICOTYLEDON	Wandering Creeper	Weed					*	-	-
<i>Vicia sativa</i>	FABACEAE	Herb	DICOTYLEDON	Common Vetch	Weed	1	0	0			-	-
<i>Xanthosia tridentata</i>	APIACEAE	Shrub	DICOTYLEDON	Rock Xanthosia		0	2	0			+	+

Abundance key: 0: not detected

- 1: rare very few, < 5%, < 3 individuals
- 2: scattered few, < 5%, < 12 individuals
- 3: widespread but sparse, > 12 individuals
- 4: frequent, 5 – 20%
- 5: common, 20 – 50%
- 6: dominant, 50 – 75%
- 7: very abundant, 75 – 100%.

Quadrat Physical Characteristics

Character	Quadrat 1	Quadrat 2	Quadrat 3
Topography	Ridgetop	Ridgetop	Ridgetop
Aspect	South	South	South
Slope	Average slope across site is 5 - 10°.		
Rocks	Loose rocks/ introduced construction waste	Loose rocks/ introduced construction waste	Loose rocks/ introduced construction waste
Soil Colour	Grey	Orange	Grey
Soil Texture	100% deeply weathered clay with Ironstone inclusions	100% deeply weathered clay with Ironstone inclusions	100% deeply weathered clay with Ironstone inclusions
Soil Depth	< 2 cm	< 2 cm	< 2 cm
Leaf Litter Depth	4 cm	5 cm	4 cm
Erosion	Not evident	Not evident	Not evident
Hollow bearing trees	0	0	0
Hollow bearing logs	0	0	0
Fallen logs (trunk diameter > 20 cm measured at chest height)	2	0	5
Disturbance History	Highly modified	Highly modified, dumping of garden clippings	Highly modified, dumping of household rubbish
Time since last fire	> 30 years	> 30 years	> 30 years

Species Lists of Vegetation Occurring in the Duffys Forest Remnants at Seaforth Oval

Weed Species		Native Species	
<i>Acetosa sagitata</i> <i>Ageratina adenophorum</i> <i>Anagallis arvensis</i> <i>Ambrosia</i> sp <i>Anthoxanthrum odoratum</i> <i>Avena barbata</i> <i>Bidens pilosa</i> <i>Brasica</i> sp <i>Briza maxima</i> <i>Briza minor</i> <i>Bryophyllum</i> sp <i>Cellery top</i> <i>Conyza</i> sp. <i>Cirsium vulgare</i> <i>Cynodon dactylon</i> <i>Ehrharta erecta</i> <i>Eleusine indica</i> <i>Eragrostis curvula</i> <i>Digitaria sanguinalis</i> <i>Dipogon tuberosus</i> <i>Gnaphalium spp</i> <i>Hypochoeris radicata</i> <i>Lantana camara</i> <i>Ligustrum lucidum</i> <i>Ligustrum sinense</i> <i>Lillium formosum</i> <i>Lonicera japonica</i>	<i>Ochna serrulata</i> <i>Oxalis</i> sp. <i>Paspalum quadrifarium</i> <i>Pennisetum clandestinum</i> <i>Phytolacca octandra</i> <i>Plantago lanceolata</i> <i>Protoasparagus aethiopicus</i> <i>Setaria</i> sp. <i>Sida rhombifolia</i> <i>Sonchus oleraceus</i> <i>Nothoscordum gracile</i> <i>Senecio madagascariensis</i> <i>Senna pendula</i> <i>Solanum nigrum</i> <i>Tropaeolum majus</i> <i>Verbena</i> sp. <i>Vulpia myuros</i>	<i>Acacia decurrens</i> <i>Acacia linifolia</i> <i>Acacia longifolia</i> <i>Acacia myrtifolia</i> <i>Acacia terminalis</i> <i>Allocasuarina littoralis</i> <i>Angophora hispida</i> <i>Anisopogon</i> sp. <i>Billadaria scandens</i> <i>Centella asiatica</i> <i>Corymbia gummifera</i> <i>Cryptostylus subulata</i> <i>Cyathochaeta</i> sp. <i>Dianella revolutum</i> <i>Echinopogon caespitosa</i> <i>Elaeocarpus reticulatus</i> <i>Entolasia stricta</i> <i>Eucalyptus haemastoma</i> <i>Eucalyptus seiberii</i> <i>Dodonea triquetra</i> <i>Dianella caerulea</i> <i>Glycine clandestina</i> <i>Glochidion ferdinandi</i> <i>Grevillea buxifolia</i> <i>Grevillea linearifolia</i> <i>Hakea dactyloides</i> <i>Hibbertia</i> sp.	<i>Imperata cylindrica</i> <i>Kennedia rubicunda</i> <i>Kunzea ambigua</i> <i>Lasiopetalum ferrugineum</i> <i>Lasiopetalum joycea</i> <i>Lomandra glauca</i> <i>Lomandra longifolia</i> <i>Lomatia silaifolia</i> <i>Micrantheum ericoides</i> <i>Microlaena stipoides</i> <i>Omalanthus nutans</i> <i>Opercularia diphylla</i> <i>Patersonia</i> sp. <i>Persoonia pinifolia</i> <i>Pimelea curviflora ssp curviflora</i> <i>Pittosporum undulatum</i> <i>Polyscias sambucifolia</i> <i>Pteridium esculentum</i> <i>Smilax glyciophylla</i> <i>Solanum</i> sp <i>Synoum glandulosum</i> <i>Tetragonia tetraganoides</i> <i>Woolisia pungens</i> <i>Xanthorrhoea media</i> <i>Xylomelum pyriforme</i>

(Surveyed 2/11/06 and 7/12/06 by Chris Kraus Bushland Management Coordinator and Dom Edmonds Senior Bush Regeneration Supervisor, Manly Council)

10. Appendix F. Duffys Forest Local Distribution



11. Appendix G. Fauna Survey Results

Conducted by GIS Environmental Consultants

Appendix G: Fauna Survey Data Compiled by GIS Environmental Consultants

Species	Status	Record	Detected in 2004 Survey
Avifauna			
<i>Anthochaera carulina</i> - Red Wattlebird	Native	o	
<i>Cacatua sanguinea</i> - Little Corella	Native	o	
<i>Elanus axillaris</i> - Black-shouldered Kite	Native	o	
<i>Gymnorhina tibicen</i> - Australian Magpie	Native	o	o, h
<i>Haliastur sphenurus</i> - Whistling Kite	Native	h	
<i>Malurus lamberti</i> - Variegated Fairy-wren	Native	o	
<i>Manorina melanocephala</i> - Noisy Miner	Native	o	
<i>Neochmia temporalis</i> - Red-browed Finch	Native	o	
<i>Platyercus elegans</i> - Crimson Rosella	Native	o	
<i>Rhipidura fuliginosa</i> - Grey Fantail	Native	o	
<i>Sericornis frontalis</i> - White-browed Scrubwren	Native	o	
<i>Strepera graculina</i> - Pied Currawong	Native	o	o, h
<i>Streptopelia chinensis</i> - Spotted Turtle-dove	Introduced	h	
<i>Vanellus miles</i> - Masked Lapwing	Native	o	
Mammals			
<i>Canis familiaris</i> - Dog	Introduced	o	o
<i>Miniopterus schreibersii</i> – Eastern Bent-wing Bat	Native, Vulnerable		ANABAT
<i>Oryctolagus cuniculus</i> - Rabbit	Introduced	t	
<i>Pseudocheirus peregrinus</i> - Common Ringtail Possum	Native	t	o
<i>Pteropus poliocephalus</i> - Grey-headed Flying-fox	Native Vulnerable		o, h
<i>Trichosurus vulpecula</i> - Common Brushtail Possum	Native	t	r
<i>Vespadelus darlingtoni</i> - Large Forest Bat	Native		ANABAT
Reptiles and Amphibians			

Species	Status	Record	Detected in 2004 Survey
<i>Lampropholis guichenoti</i> - Pale-flecked Garden Sunskink	Native	o	
<i>Lampropholis delicata</i> - Dark-flecked Garden Sunskink	Native	o	o
<i>Ctenotus robustus</i> - Robust Ctenotus	Native	o	
<i>Saproscincus mustelinus</i> - Weasel Skink	Native	o	

Record type: h = heard, o = observed, t = tracks, scats, hairs and traces, r = remains identified on site

12. Appendix H. Phytophthora Fact Sheet (RBG)

Phytophthora root rot — fact sheet

Phytophthora cinnamomi is a microscopic soilborne organism, invisible to the naked eye, which causes root rot of a wide variety of plant species including many native and introduced plants. Other species of *Phytophthora* may cause diseases on a wide range of plants but are generally less severe. The biology and control measures are very similar so this outline will concentrate only on *Phytophthora cinnamomi*.

Infection often results in the death of the plant, with earlier symptoms including wilting, yellowing and retention of dried foliage and darkening of young feeder roots and occasionally the larger roots. *Phytophthora cinnamomi* requires moist soil conditions and warm temperatures to be active, but damage caused by the disease most often occurs in summer when plants are drought stressed. The plant is unable to adequately absorb enough water from the soil because its roots are damaged and consequently may die. Small swimming zoospores are released which attach to and infect roots, normally behind the root tip. All spores and structures of *Phytophthora* are microscopic and cannot be seen with the naked eye. There is no way of visually telling if the pathogen is present in the soil.

After infection *Phytophthora* grows through the root destroying the tissue which is then unable to absorb water and nutrients. Further zoospores are produced in sporangia, particularly when the soil is moist and warm, and are released into the soil. Consequently zoospore numbers can build up quite rapidly. Zoospores move in water and may infect neighbouring plants especially those down slope from a site of infection. These spores are easily transported in storm water, drainage water, contaminated soil and on tools, footwear and vehicles. A further two spore types may be produced, a chlamydospore and an oospore, which are survival structures produced when conditions become unfavourable such as when a food source is exhausted or in periods of low temperature or drought. These spores are capable of surviving for extended periods of time, and when conditions become favourable they germinate and renew the life cycle. This allows *Phytophthora* to survive in dead plant tissue and in the soil for extended periods.

At present there is no one simple method for controlling *Phytophthora cinnamomi*. A combination of sanitation measures, good horticultural management, selective use of some fungicides and the addition of organic matter to soils can be used to retard the activity of *Phytophthora*.

Prevention Measures

Nursery: All plants should, wherever possible, be grown in soil mixes which have been correctly steam-air pasteurised (30 minutes at 60°C). If it is not possible to pasteurise mixes make sure that the mix components are disease free. Ensure that the potting mix is not subsequently contaminated. eg. by water draining into soil bins in heavy rain or by careless handling with implements. Plants brought into nurseries from outside sources should ideally be propagated by cuttings to prevent the importation of *Phytophthora* (and many other disease and insect pests), or quarantined. All previously used pots and containers should be free of soil prior to use and sterilised by soaking in a solution of a disinfectant/detergent compound. It is essential to remove soil by washing prior to soaking in order to



Plant Disease Diagnostic Unit
Botanic Gardens Trust
Mrs Macquaries Rd
Sydney NSW 2000
Telephone: (02) 9231 8186
Facsimile: (02) 9241 1135
Email: pddu@rbgsyd.nsw.gov.au

achieve maximum kill of the pathogen. It is also important to wash implements (cutting knives, secateurs etc) regularly to remove any possibility of transferring the fungus from one plant to another. Avoid bringing contaminated soil on boots and equipment into the nursery areas. *Phytophthora cinnamomi* can survive in very small quantities of soil for long periods of time so nursery sanitation is very important. All plants should preferably be grown on raised wire-mesh bench at least 30 cm off the ground; this minimises water splash, which may possibly contain the fungal spores, from the ground onto the plants. If this cannot be achieved plants should be grown on free draining blue metal. Keep the whole nursery area clean and free of dead plant material and refuse. Soil mixes should permit free drainage; a potting mix which allows air into 15% of air spaces after watering is recommended. If a plant becomes infected, or is suspected of being infected, if possible it should be carefully examined (without contaminating other plants) for symptoms such as darkening of young rootlets. Infected and dead plants should be removed and disposed of carefully. Burning the infected plant or disposal in garbage are the most satisfactory methods of disposal. Infested potting soil should be carefully disposed.

Garden plantings

Soil preparation: Regardless of whether the pathogen is present in a soil it is important to add quantities of organic matter such as mulches, manures and composted material to the area (if this is appropriate to the plant species). These components increase the level of soil micro-organisms, such as fungi (eg. *Trichoderma*), actinomycetes and bacteria, which suppress the activity of *Phytophthora* and retard disease development. Mulches also minimise the contact between soil and footwear so that there is less potential for the transport of soil. Maintain nutrient levels so that root growth is promoted, but however do not use inappropriate nutrient mixtures that may be deleterious to the plant (ie. take care with phosphate sensitive plants). If possible, plant in holes sufficiently large enough to promote rapid root growth, this combined with good nutrition will allow the plant to compensate for any root damage caused by pathogens. Never use techniques such as post-hole diggers to prepare planting holes as these techniques result in poor drainage, thus enhancing disease development, and may aid in the spread of the pathogen. Ensure that drainage is adequate to prevent water logging, which promotes disease incidence and severity. All run-off water from known infected sites should be contained and directed to the storm water channels. Remember that water can very easily transport the swimming zoospores of *Phytophthora cinnamomi*.

Prevention and caring of infected plants: Fungicides containing potassium phosphonate are registered for control of this disease in certain situations. Information on these fungicides can be obtained from your local nursery or on the websites of the manufacturers. It is however important to ensure that application occurs when the plant can be expected to be actively exporting from the leaves to the root system ie. in summer (once in early summer and then 4-5 weeks later), so that the chemical is transported to the roots where it is required. Plants should be sprayed for quite a wide area around the infected site. If you have to move or replant material never move a plant from an infected site to an uninfected site. If the species is required in these circumstances, repropagate by cuttings. As in the case of initial plantings, the preparation of the site, the addition of organic matter and the attention to drainage are all essential when replanting material. When removing plants it is essential to remove as much of the tissue, including roots, as possible. The pathogen may persist in dead tissue for many years. Dead roots and any pruned material should be disposed of carefully. Do not replant in the same plant hole; where possible plant away from the dead plant, preferably upslope as plants downslope from any site of infection will be at

greatest risk from the disease. Remember that unassisted movement of *Phytophthora* up a slope is very slow, while downward movement may be quite rapid.

Hygiene: Sanitation of tools, machinery and boots is probably the most effective means by which the spread of *Phytophthora cinnamomi* can be limited. Spades and other tools should always be washed free of soil before and between plantings. In addition, tools should be regularly drenched in a solution of detergent or disinfectant. A large drum containing this solution should be placed in a convenient place in the depot and tools should be regularly brought back, washed to remove soil and drenched. The more frequently this is done the better the control of any soilborne diseases, particularly *Phytophthora*, will be. In situations where you are planting a number of plants take a container of disinfectant with you and disinfect tools between replanting. Boots and tyres are also an important means by which *Phytophthora* may be transported, as soil containing the fungus may cling to the boot or tyre. Wherever possible remove soil from boots and tyres and limit the movement of soil and the fungus. Vehicles should move towards known infected areas and be washed down after working in these areas before use in clean areas. It may not always be feasible to remove all soil, however limiting the movement of large amounts of soil by washing off with water will suffice in most situations. Sanitation procedures may seem time consuming and annoying, but prevention and limitation of a disease such as *Phytophthora* is the most effective means of disease control.

13. Appendix I. Monitoring Record Sheet

Appendix I

Monitoring Sheet for Environmental Audit of Duffys Forest Management at Seaforth Oval

By Nicholas Skelton, GIS Environmental Consultants Ph: 041 943 8672

See text of Bushland Management Plan for details

Date of survey / / 20

Bushregenerators

Field Leader
Other field person (if any)
Business name
Contact Mobile Phone Number

Name	Qualifications & Experience	Signature

Environment Protection Area Fencing

Description of condition of fences & any maintenance required
Show location on map

Litter and Dumping

Show location on map

Type	Action taken

Erosion

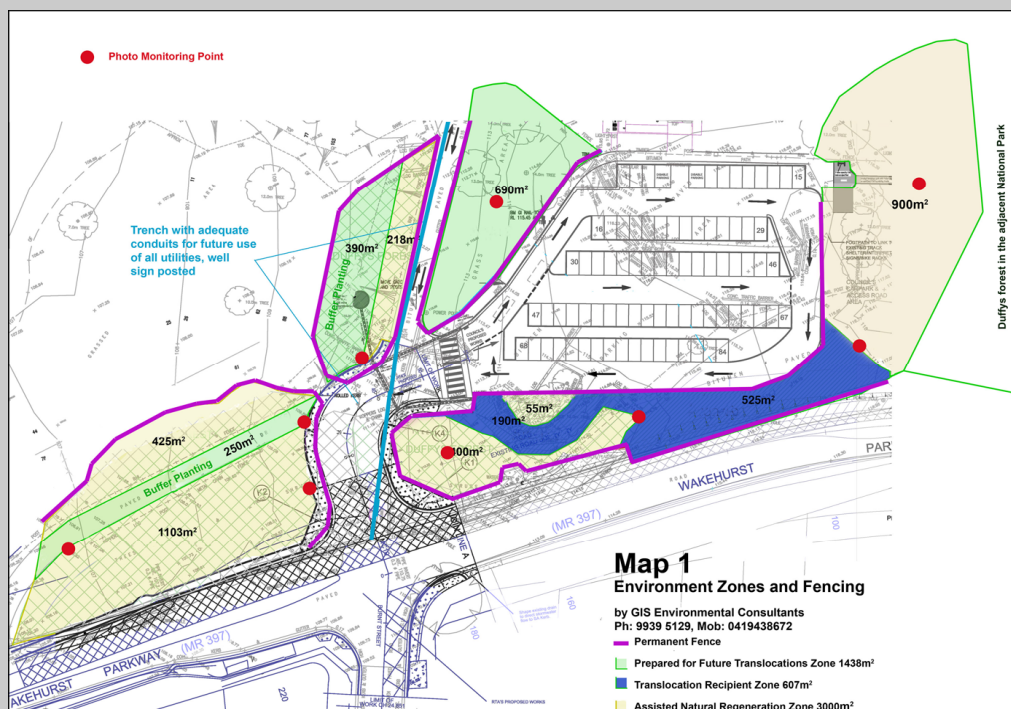
Any evidence of erosion with description, location, cause and any actions taken so far.

Show location on map

Weed Control and Access Maintenance

Include weed control methods used, and show on map where plants were planted and weeding occurred.

Site Map



Draw on Map weeds, plants planted, erosion, siltation, litter, dumpings, tree dieback, paths, disturbance etc.

Materials Used

Plants planted (if none write "None") Use back of sheet and say PTO if needed.	Species	Quantity	Pot Size/Virolcell etc.
Source of material (eg. nursery)	Ph:		
Other materials used			

Weeds and animals seen Weeds and Exotic Plants removed Use back of sheet and say PTO if needed.	Species	Quantity
Animals seen during field work		

Pest birds seen on site (Circle): Sparrows, Indian Mynas, other

Evidence (scats ect) of cats or dogs or foxes using the site in last 12 months

is there any evidence of rabbits yes/no details

Disturbance within Environment Protection Area

Fire	No / Yes Show on map	Silt/erosion	No / Yes map
Foot Paths	No / Yes Show on map	Tree Die back or death	No / Yes map
Removal or leaf litter	No / Yes Show on map	Insect or Fungal infestations	No / Yes map
Trenching	No / Yes Show on map	Public safety issues	
Is the adjacent landscaped area being maintained weed free	No / Yes	Tree lopping	No / Yes map

Other Signs of disturbance eg. Exotic plants planted, soil imported, herbicide or insecticide use, vegetation (including trees) damaged or dead, nutrient spill, changed drainage etc.

Monitoring/Photos

30 Photos taken at the 9 photo points (See map) (Circle answer)	Number of photos and direction
	PP1 Yes / No
	PP2 Yes / No
	PP3 Yes / No
	PP4 Yes / No
	PP5 Yes / No
	PP6 Yes / No
	PP7 Yes / No
	PP8 Yes / No
	PP9 Yes / No

Effort

Total Hours spent on site since last monitoring survey	
Hours spent checking fences, signs, edging	
Hours spent weeding	
Hours spent maintaining access restrictions	
Hours spent other activities (specify)	
Send completed form and photos with dates on back to Manly Councils Bushland co-ordinator;	