Application for a

Department of
Environment and Conservation (NSW)

Section 91 Licence

to harm or pick a threatened species, population or ecological community*, or damage habitat under the *Threatened Species Conservation Act 1995.*

1. Applicant's Name: *(if additional persons require authorisation by this licence, please attach details of names and addresses)*	Darren Jones Superintendent St Michaels Golf Club. Ryan Christie Bush regenerator St Michaels Golf Club	
2. Organisation name and position of Applicant: *(if applicable)*	St Michaels Golf Club Ltd Course Superintendent	
3. Postal address:	PO Box 375 Maroubra NSW 2036	4. Telephone: B.H.93113907 A.H.
5. Location of the action *(including grid reference and local government area and delineated on a map).*	St Michaels Golf Club Jennifer St La Perouse Randwick LGA Refer to locality map (Figure 1) in St Michael's Golf Course Remnant Vegetation Management Plan (Kate Low & Associates 2004)	
6. Full description of the action and its purpose *(eg. scientific research, environmental assessment, regeneration activities, development etc.).*	1. Ecological restoration activities to improve the condition of the endangered Eastern Suburbs Banksia Scrub and Littoral Rainforest ecological communities including: • ongoing bush regeneration works in the remnant native vegetation across the golf course in accordance with the recommendations in section 4.0 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004). • ecological burns within ESBS remnants consistent with	

* A threatened species, population or ecological community means a species, population or ecological community identified in Schedule 1, 1A or Schedule 2 of the *Threatened Species Conservation Act 1995*.

	sections 3.8, 3.15 and 4.0 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) and the 2009 – 2011 Fire Management Plan for St Michaels (see Attachment 1). All ecological burns will be carried out by golf course staff with bush regeneration qualifications in consultation with DECC. 2. Trimming of ESBS to maintain sight lines which involves • trimming of tree branches to restrict vertical encroachment on lines of sight to holes 4, 5, 6, 11 and 16 as per section 3.4 and 4 (4.4) of St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) (see Attachment 2). All trimming is to be carried out by golf course staff with bush regeneration qualifications.
7. Details of the area to be affected by the action *(in hectares)*.	Refer to areas marked on the site map (Attachment 3) • ecological burns (5 sites) – 0.619 ha line of sight trimming (10 sites) – 0.708 ha •
8. Duration and timing of the action *(including staging, if any).*	1. Ecological restoration activities will be carried out over the next 5 years on a regular basis as per the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) 2. Trimming of ESBS remnants will be carried out on an annual basis as part of ongoing course maintenance as per St Michaels Golf Course Remnant Vegetation Management Plan (Low 2004)
9. Is the action to occur on land declared as critical habitat*? *(please tick appropriate box)*	Yes: ☐ No: ☑

10. Threatened species, populations or ecological communities to be harmed or picked.	Scientific Name Eastern Suburbs Banksia Scrub (ESBS)	Common Name *(if known)*	Conservation Status *(i.e. endangered or vulnerable)* Endangered Ecological Community	Details of no. of individual animals, or proportion and type of plant material *(eg. fertile branchlets for herbarium specimens or whole plants or plant parts)* Area to be affected is shown in Attachment 3.

* Critical habitat means habitat declared as critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*.

11. Species impact: *(please tick appropriate box)* a) For action proposed on land declared as critical habtat; or b) For action proposed on land <u>not</u> declared as critical habitat.	An SIS is attached Items 12 to 25 have been addressed ☑

N.B: Provision of a species impact statement is a statutory requirement of a licence application, if the action is proposed on critical habitat.
The provision of information addressing items 12 to 17 is a statutory requirement of a licence application if the action proposed is <u>not</u> on land that is critical habitat. Information addressing any of the questions below must be attached to the application.

12. Describe the type and condition of habitats in and adjacent to the land to be affected by the action.	The site is a golf course which supports remnants of ESBS, Coastal Heath, Littoral Rainforest and Dune Forest of variable size and condition. The type and condition of the bushland on the golf course is covered in more detail in sections 2.7 , 3.22, 3.3, 3.8 and 3.11 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004). Section 4 of the Remnant Vegetation Management Plan outlines the condition of each remnant in more detail and provides recommendations for management actions.
13. Provide details of any known records of a threatened species in the same or similar known habitats in the locality *(include reference sources).*	Both ESBS and Littoral Rainforest are present in the locality. There are 6 patches of ESBS in Botany Bay NP, La Perouse and Little Bay as well as other patches at Jennifer St, Prince Henry Hospital and the NSW Golf Course. For more detail see Table 1 in the ESBS Recovery Plan. The Sydney Freshwater Wetlands EEC is present on adjacent land in the NSW golf course. There are records for other threatened species in the locality including Green and Golden Bell Frog, Eastern Bentwing Bat, *Acacia terminalis subsp. terminalis*, Wallum Froglet and Powerful Owl. However, it is unlikely that ESBS remnants at St Michael's provides habitat for these threatened species.
14. Provide details of any known or potential habitat for a threatened species on the land to be affected by the action *(include reference sources).*	The bushland at St Michael's golf course provides habitat for the ESBS and Littoral Rainforest EECs.
	1.327 ha of ESBS will be affected out of a distribution of 149ha and

15. Provide details of the amount of such habitat to be affected by the action proposed in relation to the known distribution of the species and its habitat in the locality.	36.48ha in the locality.
16. Provide an assessment of the likely nature and intensity of the effect of the action on the lifecycle and habitat of the species.	1. Ecological restoration including ecological burns and weed removal is expected to improve the condition of ESBS at St Michael's golf course by removing Bitou Bush, which is a Key Threatening Process for ESBS and stimulating germination of seed in the soil seed bank in areas where the vegetation is fragmented and senescent. 2. Line of sight trimming will not reduce the extent of ESBS at St Michael's golf course but it will alter the structure of the vegetation consequently it needs to be undertaken to the minimum extent necessary for the functioning of the golf course by staff with bush regeneration qualifications.
17. Provide details of possible measures to avoid or ameliorate the effect of the action.	All works will be undertaken by golf course staff with bush regeneration qualifications and will be carried out in line with the recommendations in section 4 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) in particular sections 4. 2, 4.3, 4.4, 4.8, 4.11 and 4.15. The ecological burns will be carried out in sequence as described in the 2009-2011 Fire Management Plan for St Michael's and they will be followed up with weed removal as required in the areas burnt. The results of any ecological burns will be monitored as per section 4.14 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) and the results will be provided to DECC as part of the reporting requirements for this licence. Line of sight trimming will be managed to minimise impacts on ESBS by following the recommendations in section 4.4 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) and using a trained bush regenerator to undertake the works.

N.B: The Director-General must determine whether the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats. To enable this assessment the Applicant is required to address items 18 to 25. Information addressing any of the questions below must be attached to the application.

18. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to	Not applicable because no threatened species will be impacted by the works.

be placed at risk of extinction.	
19. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not applicable because no endangered populations will be impacted by the works.
20. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (I) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(i) Ecological restoration activities including ecological burns should have a beneficial effect by increasing the quality and condition of the ESBS remnants on St Michael's golf course over time. Line of sight trimming will not affect the extent of the ESBS at St Michaels but it has the potential to alter the composition and reduce the viability of the community consequently it must be undertaken as recommended in Section 4 of the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) (ii) Ecological restoration activities should increase the species diversity within the ESBS remnants at St Michael's golf course which will have a beneficial effect on the composition of the ESBS. Line of sight trimming will alter the structure of the ESBS being trimmed and over time this may result in a reduction in the number of species present
21. In relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action	(i) Ecological burns may modify the ESBS habitat in the short term due to a reduction in the above ground vegetation. However, it will improve the habitat in the longer term by increasing species diversity within the burnt remnants. Weed control following the burns will also

proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	improve the condition of these habitats. Line of sight trimming will not remove the ESBS but it will modify the structure of the trimmed areas. (ii) There are several tracks through the ESBS remnants which will be allowed to regenerate. This will increase the extent of these remnants. No further clearing of tracks will occur within remnant vegetation at the golf course. (iii) All ESBS habitat is important given the restricted nature of this endangered ecological community and the degree of clearing that it has experienced in the past. Restoration works, including ecological burns and weed removal may modify the ESBS habitat in the short term but in the longer term, once the vegetation has recovered from burning and the disturbance associated with weed removal, habitat for this endangered community will improve. Line of sight trimming will modify the structure and, in the longer term, the composition of the habitat for ESBS but this will be restricted to a fairly small area (see question 7).
22. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	A draft report recommending the identification of Critical Habitat for ESBS has been prepared and will be exhibited in the second half of 2008. Ecological burns and restoration activities, if undertaken in line with the recommendations in the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004), are unlikely to have an adverse impact on Critical Habitat once it has been declared for the reasons outlined below in question 24. Line of sight trimming will not reduce the extent of Critical Habitat for ESBS, but as outlined above, it will modify the structure and composition of the trimmed vegetation.
23. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	The ecological burns and associated restoration activities are consistent wit the following objectives and actions in the Recovery Plan for ESBS: *9.3 Threat management and ecological restoration* *To restore and where practical connect and enlarge remnants of ESBS through appropriate management.* Line of sight trimming is not consistent with any objectives and actions in the Recovery Plan.
24. 6Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Ecological burns and associated restoration activities address the following Key Threatening Processes for ESBS: 1. High frequency fire - both high frequency fire and fire exclusion reduce species diversity, therefore reinstatement of an appropriate fire regime as per the recommendations in the St Michael's Golf Course Remnant Vegetation Management Plan (Low 2004) will reduce the impact of this KTP. 2. Invasion of native plant communities by Bitou Bush and exotic perennial grasses – ecological restoration activities before and after the ecological burns will reduce this threat to ESBS at St Michaels golf course.

	Line of sight trimming will result in modifications to the structure and composition of the trimmed vegetation and could therefore be considered to be part of the vegetation clearing KTP.

Important information for the Applicant

Processing times and fees

The *Threatened Species Conservation Act 1995* provides that the Director-General must make a decision on the licence application within 120 days where a species impact statement (SIS) has been received. No timeframes have been set for those applications which do not require a SIS. The Director-General will assess your application as soon as possible. You can assist this process by providing clear and concise information in your application.

Applicants may be charged a processing fee. The Director-General is required to advise prospective applicants of the maximum fee payable before the licence application is lodged. Therefore, prospective applicants should contact the DEC prior to submitting a licence application .

A $30 licence application fee must accompany a licence application.

Protected fauna and protected native plants*

Licensing provisions for protected fauna and protected native plants are contained within the *National Parks and Wildlife Act 1974.* However, a Section 91 Licence may be extended to include protected fauna and protected native plants when these will be affected by the action.

If you are applying for a licence to cover both threatened and protected species please provide the information requested in Item 10 and a list of protected species and details of the number of individuals animals or proportion and type of plant material which are likely to be harmed or picked.

Request for additional information

The Director-General may, after receiving the application, request additional information necessary for the determination of the licence application.

Species impact statement

Where the application is not accompanied by a SIS, the Director-General may decide, following an initial assessment of your application, that the action proposed is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. In such cases, the *Threatened Species Conservation Act 1995* requires that the applicant submit a SIS. Following initial review of the application, the Director-General will advise the applicant of the need to prepare a SIS.

Director-General's requirements for a SIS

Prior to the preparation of a SIS, a request for Director-General's requirements must be forwarded to the relevant DEC Office. The SIS must be prepared in accordance with section 109 and 110 of

* Protected fauna means fauna of a species not named in Schedule 11 of the *National Parks and Wildlife Act 1974.*
Protected native plant means a native plant of a species named in Schedule 13 of the *National Parks and Wildlife Service 1974.*

the TSC Act and must comply with any requirements notified by the Director-General of the Department of Environment and Conservation (NSW).

Certificates

If the Director-General decides, following an assessment of your application, that the proposed action is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Section 91 Licence is not required and the Director-General must, as soon as practicable after making the determination, issue the applicant with a certificate to that effect.

N.B: An action that is not required to be licensed under the Threatened Species Conservation Act 1995, may require licensing under the National Parks and Wildlife Act 1974, if it is likely to affect protected fauna or protected native plants.

I confirm that the information contained in this application is correct. I hereby apply for a licence under the provisions of Section 91 of the *Threatened Species Conservation Act 1995.*

Applicant's name, organisation and position *(Please print)*	Applicant's signature	Date
Darren Jones St Michael's Golf Course Superintendent		23/09/2008

For more information or to lodge this form, contact the Environment Protection and Regulation Division in your nearest office:

Sydney Metro Branch	Southern Branch	Northern Branch	Western Branch
P: 02 9995 5000	P: 02 6122 3100	P: 02 6640 2500	P: 02 6841 9800
F: 02 9995 6900	F: 02 6299 3525	F: 02 6642 7743	F: 02 6882 9217
PO Box 668	PO Box 622	PO Box 498	PO Box 1020
Parramatta	Queanbeyan	Grafton	Dubbo
NSW 2124	NSW 2620	NSW 2460	NSW 2830

Department of Environment and Conservation
Head Office, PO Box A290, Sydney South NSW 1232
Phone: 2 9995 5000 (switch) Fax: 9995 5999 Email: info@environment.nsw.gov.au

Eastern Suburbs Banksia Scrub

Critical Habitat

St Michael's GC ESBS Treatment

Burn

Burn and trim

Trim

St Michael's Golf Club
Eastern Suburbs Banksia Scrub Treatment

N

50 25 0 50 100

Metres

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Department of Environment & Climate Change NSW

ST. MICHAEL'S GOLF CLUB

REMNANT VEGETATION MANAGEMENT PLAN

Prepared by
KATE LOW AND ASSOCIATES

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SUMMARY

St. Michael's is a grade one golf course on the La Perouse peninsular to the south east of the Sydney CBD. The course is laid out amongst rolling sand dunes which fall away toward the Pacific Ocean. Most of the vegetation on the course is remnant bushland which reflects the rugged beauty and windswept nature of its coastal location. The Clubs' website describes it as "a wonderful course carved from a wilderness that will forever be a part of its charm and testing qualities".

Heath communities are the dominant feature of the bushland at St Michael's and occupy the most exposed areas. Eastern Suburbs Banksia Scrub occurs throughout the course on the open dunes. Nearer to the ocean as the sand shallows and rock outcrops appear, Coastal Sandstone Heath occurs. In the relatively sheltered area around the 2nd and 3rd two more communities are present. Coastal Dune Forest occurs on the deep high dunes towards the New South Wales Golf Club and a small pocket of Littoral Rainforest occurs adjacent to the 3rd tee.

Two of these vegetation communities are listed as Endangered Ecological Communities under the NSW Threatened Species Conservation Act (1995). Eastern Suburbs Banksia Scrub was listed in June 1997 and Littoral Rainforest has been listed in the last month. Eastern Suburbs Banksia Scrub is also listed as a nationally significant community under the commonwealth Environment Protection and Biodiversity Conservation Act (1999). These communities are protected as only a small proportion of their original distributions have escaped destruction. Whilst these communities are particularly fragile, all bushland at St. Michaels has important scenic, social, economic, conservation and historic value.

Golf courses are complex by nature and have high impacts on vegetation. At present, the major issues at St. Michaels relate to

legislation, clearing/ trimming and fragmentation of remnants. Weed management, ageing vegetation and fire are also important issues.

In late 2003, the Club approached Kate Low and Associates to produce a Remnant Vegetation Management Plan (the Plan). The purpose of the Plan is to assist the club in meeting business aims whilst addressing corporate responsibilities in relation to conservation and legislation.

The Plan is a technical document and is meant to be used at an operational level. Section 1 describes the physical characteristics of the course. Section 2 identifies the remnant vegetation issues. Section 3 gives general recommendations for actions across the course. Section 4 gives site-specific recommendations.

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1.0 BACKGROUND

1.1 INTRODUCTION

St. Michael's Golf Club (St. Michael's, The Club, the course) is a Grade 1 course in a spectacular location. The course sits on Little Bay headland overlooking the Pacific Ocean and is surrounded by Botany Bay National Park and two other golf courses (The NSW and The Coast).

In 2003, the club approached Kate Low and Associates to prepare a Remnant Vegetation Management Plan (RVMP, The Plan) for the bushland on the course. The major impetus for this report relates to the protection and conservation of Eastern Suburbs Banksia Scrub which occurs throughout the course. This ecological community is protected by state and federal legislation. A small stand of Littoral Rainforest is also protected at state level. Whilst protection of these communities is legislated, it is important to consider that the remnant bushland on St. Michael's is a major contributing factor to the beauty and challenging nature of the course.

1.2 LAND OWNERSHIP

The St. Michael's land is leased to The Club by the NSW Department of Lands (now part of the Department of Infrastructure Planning and Natural Resources (DIPNR). Under Schedule 1 of the Lease, item 42 states that 'all trees and vegetation except noxious weeds are to be retained.'

1.3 SCOPE AND PURPOSE OF THIS PLAN

This RVMP makes recommendations for all aspects of environmental management which impact on the native vegetation throughout the course. The Plan refers to planting practices only when they impact on bushland remnants. The Plan is intended to be a strategic document to assist in management decisions over the next 10 years.

1.4 AIMS AND OBJECTIVES

This plan is intended to facilitate the achievement of the following aims:

1. Protect and restore the native vegetation on the course with priority given to the endangered ecological communities Eastern Suburbs Banksia Scrub (ESBS) and Littoral Rainforest.

2. Facilitate the core business of the Club (golf) whilst achieving the first aim.

3. Assist in fulfilling St. Michael's corporate responsibilities in relation to compliance with environmental legislation.

1.4.1 OBJECTIVES

The following objectives will help the club achieve these aims:

Identify remnant bushland clearly, particularly Endangered Ecological Communities

Foster education and interest of staff, members and the public in relation to the significance of remnant vegetation, particularly Endangered Ecological Communities

Reduce golfing impacts on the natural environment

Control access through bushland remnants

Consolidate areas of fragmentation

Engage suitably qualified environmental practitioners

Adhere to all environmental legislation

Protect and restore habitat

Control feral animals

Control Noxious and environmental weeds

Conserve soil

Modify maintenance and planting practices

Initiate a monitoring program

1.5 METHOD

This plan is based on an extensive site survey, consultation and research. The site has been surveyed over a 6 month period. A number of environmental considerations were mapped including: native vegetation communities, bushland condition and major management issues.

This report has been developed in association with the St. Michaels Superintendent Darren Jones and the Greens Committee and Board of St. Michaels. Various other stakeholders have had input and/or are referenced. These include The NSW Department of Environment and Conservation (NSW DEC now incorporates the former NPWS) and Randwick City Council.

2.0 SITE DESCRIPTION

2.1 LOCATION

St. Michael's Golf Club is approximately 15 kms. south of the Sydney CBD in the suburbs of Little Bay and La Perouse. The Club lies towards the end of the La Perouse peninsular which is opposite Kurnell at the entrance to Botany Bay.

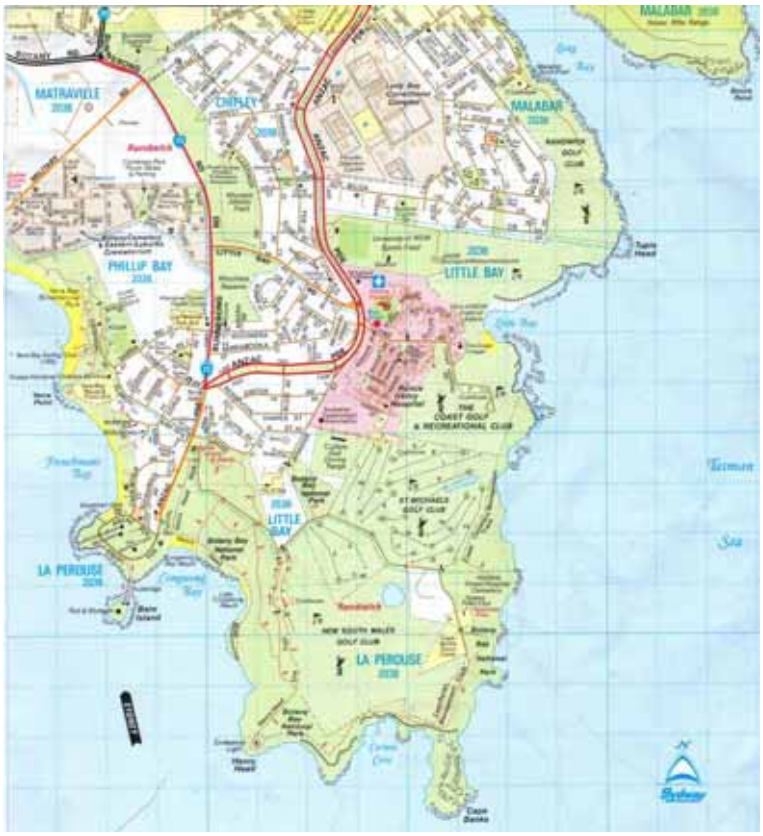

Figure 1
Location of St. Michael's Golf Club

The course is bounded on the north by The Coast Golf Club and to the south by the NSW Golf Club. To the east lies a small strip of Botany Bay National Park (North) which drops off in sheer rocky cliffs to the Pacific Ocean. To the west is the residential area of Little Bay. The Club lies within the LGA of Randwick and can be located on Figure 1.

2.2 REGIONAL CONTEXT

The course lies within a region of diverse land use. Uses include: imposing industrial transport complexes (notably Port Botany) which are entirely altered landscapes, extensive residential areas with little remnant vegetation, altered natural landscapes (golf courses and developed parts of Botany Bay National Park) and largely preserved natural landscapes (Botany Bay National Park and Pistol Range).

Five golf courses run along the coastline from Long Bay to Cape Banks. These are (north to south) Randwick, UNSW, The Coast, St. Michael's and The NSW. Botany Bay National Park runs along the coastal strip of the La Perouse peninsular. These golf courses (particularly St. Michael's and The NSW) form an important wildlife corridor linking the eastern and western areas of the National Park.

The natural areas in and adjacent to St. Michael's contain some of the best preserved examples of the nationally threatened ecological community- Eastern Suburbs Banksia Scrub. Extensive development of Sydney's Eastern Suburbs has meant that less than 3% of this original vegetation remains (NSW DEC 2004). In this context, the bushland on St. Michael's course has local, regional and national significance.

2.3 GEOLOGY, TOPOGRAPHY AND SOILS

The Club lies within the physiographic region described as the Botany Lowlands which comprise an extensive area of unconsolidated Aeolian sand dunes (Chapman and Murphy 1989). These dunes were formed in the Quaternary period and are laid over formations of Hawkesbury Sandstone (Benson and Howell 1990).

In the southern section of the course, steep dunes (46m and over) run down from the boundary with the NSW Golf Club to the road. Dunes on the northern side of the road have lower relief and

incorporate a series of depressions and broad drainage lines. Relief softens to gentle undulations which slope off to the northeast corner towards the ocean. Outcrops of Hawkesbury Sandstone begin to appear in these areas. (see Figure 4). Localised alterations to topography have been made in the process of developing the course.

The soils are almost pure sand and vary in depth across the course from very deep to absent (on rock outcrops) towards the coastline. These sands are generally fine grained and subject to extreme wind erosion and high water erosion. Topsoils tend to be water repellent; all other soil materials are free draining and have low to very low nutrient status. Poorly drained swales collect dark brown or black organic rich topsoil (Chapman and Murphy 1989)..

Figure 2 Typical soils on dry parts of the course.

Figure 3 Typical soils on wet areas of the course. Note dark organic rich topsoil.

2.3 CATCHMENTS AND DRAINAGE

The course lies within a sub-catchment which flows from (approximately) Anzac Parade to the Pacific Ocean. The sub-catchment is bounded by Malabar Headland to the north and Henry Head to the south.

Figure 4 Main sub-catchment areas and drainage lines within the course

There are 3 main sub-catchments within the course (see Figure 2). The majority of flow travels to the lake in the north east of the course via two main drainage lines.

In 2001, many attempts were made to alter drainage on the course by the construction of channels (D. Jones pers. com.). These modifications have a minimal impact on overall drainage patterns due to the free draining nature of soils on the course. In xxxx the NSWGC constructed Lake Perrie on their course as an irrigation reservoir. The lake has consistently leaked into the southern area of St. Michael's.

2.5 CLIMATE

The St. Michael's course occupies a highly exposed site. The course is subject to salt laden winds, storms and lightning strikes. Most rain falls in downpours. These harsh and volatile conditions define the vegetation and management of the course.

Average annual rainfall at La Perouse is around 1150mm, falling on 105 days per year. Most rain (approximately 70%) falls in major storms, which come from the SE_SW in January-July (Leeson, 1987, p26). Average summer maximum temperatures are 26 Celsius, with the maximum temperature recorded being 45C. Average winter minimum temperatures are 8C, with the lowest temperature recorded being 0C (Benson and Howell 1990; Bureau of Meteorology 2000).

There are a number of microclimates present within the course. Closer to the coast and on dune tops, conditions are very harsh and exposed. Further from the coast and in swales, wind and salt exposure are less pronounced. These variations in conditions are strongly reflected in the vegetation structures within the course.

2.6 LAND USE HISTORY

At the time of the first encounters with Europeans Aboriginal people of the Dharawal nation occupied the areas surrounding Botany Bay. The expedition of Comte de Laperouse arrived in the Bay in 1788. The party remained for six weeks and did not return.

Aboriginal occupation of the Botany Bay area was severely disrupted by the early1800s as a result of disease, attacks by colonists and a policy of removal of Aboriginal people. Documentary material on the language, traditions and everyday life of the Aboriginal people who occupied the area is largely confined to early historic accounts such as the journals of Cook and Banks.

On the La Perouse peninsula there are engravings of a whale and its' calf, a shark and several unidentified motifs. The engravings

are extremely feint. There are also two shell middens. Middens have been found around Congwong and Little Congwong Bays, (although these are much damaged by sand mining) and at Cape Banks.

The DEC (Parks and Wildlife Division) has been made aware by members of the local Aboriginal communities that the area has a rich oral tradition. Many members of the Dharawal nation currently live at La Perouse. Others live throughout Sydney, the Illawarra and elsewhere in NSW (NSW NPWS 2002).

2.6.1 COURSE DEVELOPMENT

The St. Michael's lease was secured in 1937 for the sum of $2 000. Clearing commenced in July 1937 and 9 holes were open on Sunday June 5th 1938. A year later, the remaining 9 holes were open (St. Michael's).

In 1942 when Japan came into World War II the Army took over the properties occupied by the NSWGC and St. Michael's. The two courses were an obvious choice for their strategic positioning for surveillance of watercraft into Botany Bay. The army occupation lasted from March 16th 1942 till January 31st 1946 (St. Michael's). Extensive fortifications, plotting rooms, barracks and a hospital were constructed just north of Cape Banks on land resumed by the military. The brick cottages and administration building still standing were probably built around 1938 to house staff responsible for the upkeep of the guns and related equipment (NSW NPWS 2002). St. Michael's members kept the club alive by holding fortnightly games at Eastlake.

In 1963 a new clubhouse was built (St. Michael's).

2.7 VEGETATION

Most of the vegetation on St. Michael's is remnant bushland. No widespread planting has taken place on the course.

Figure 5, Figure 6 and Figure 7 St Michael's has a distinctive beauty which sets it apart from more developed courses.

There are 4 vegetation communities present on the St. Michael's course. These communities may intergrade at the margins and boundaries and are not always clear.

Figure 8 shows the present extent and location of vegetation types throughout the course.

Coastal Dune Forest occurs on the deep high dunes towards the NSWGC. Eastern Suburbs Banksia Scrub occurs throughout the course and gives way to Coastal Sandstone Heath towards the ocean. A small pocket of Littoral Rainforest occurs adjacent to the 3rd tee (the boundary with the NSWGC is unclear).

Figure 8 Vegetation Communities Map

2.7.1 EASTERN SUBURBS BANKSIA SCRUB

Eastern Suburbs Banksia Scrub (ESBS) is an ecological community found only in the eastern suburbs of Sydney on nutrient poor sand deposits. The community is generally heath or scrub but includes occasional areas of woodland or low forest and occasional wet areas which are referred to as Wet ESBS (NSW Scientific Committee, 1997).

Figure 9 ESBS showing distinctive *Xanthorrhoea resinifera* in the foreground

Figure 10 Regenerating ESBS. Open sandy areas are a feature of this community

This vegetation community once covered approximately 5 300 hectares, but the extensive development of Sydney's Eastern Suburbs has meant that less than 3% of the original vegetation remains (NSW DEC 2004). Reflecting its conservation status, in 1997 Eastern Suburbs Banksia Scrub was listed as an endangered ecological community under Schedule 1 of the NSW Threatened Species Conservation Act (1995). ESBS is also listed as a Threatened Ecological Community under the (Commonwealth) Environment Protection and Biodiversity Conservation Act 1999.

Typical species of ESBS include *Banksia ericifolia, Eriostemon australasius, Lepidosperma laterale, Hypolaena fastigata, Leptospermum laevigatum, Monotoca elliptica, Rinocarpus pinifolius and Xanthorrhoea resinifera. Banksia aemula* is also a typical species of the community and occurs at its southern limit in La Perouse (Benson and Howell 1990a & b in NSW DEC 2004).

A fine example of this community is in Botany Bay National Park in the Jennifer Street Bushland adjacent to St. Michael's on the western side. Over 100 species occur on the Jennifer Street site which displays the richly diverse character possible within ESBS (Benson and Howell 1990).

2.7.2 COASTAL SANDSTONE HEATH

Coastal Sandstone Heath (CSH) occurs where the deep sand sheet which covers much of the Eastern Suburbs of Sydney gives way to expose extensive sandstone rock platforms and outcrops. The heath is strongly influenced by exposure to ocean winds and salt spray and by the degree of shelter and depths of soil available.

On the rocky exposed headlands are low wind-pruned heathlands with *Westringia fruticosa, Baeckea imbricata* and *Lomandra longifolia*. Taller heath and scrub also occurs with predominant shrub species being *Allocasuarina distyla, Banksia ericifolia, Leptospermum laevigatum* and *Melaleuca nodosa*. Smaller shrubs

include *Woollsia pungens, Darwinia fascicularis, Epacris microphylla and Hakea dactyloides*

.

Figure 11 *Melaleuca nodosa* flowering in CSH.

Although CSH shares many species with ESBS, it is typically much lower and characteristically contains maritime elements such as *Baeckea imbricata, Correa alba and Westringia fruticosa* (NSW Scientific Committee 2002).

2.7.3 COASTAL DUNE FOREST

Coastal Dune Forest (CDF) occurs on deep sands in areas which have some wind and salt-spray protection. The canopy is dominated by *Angophora costata*. .

Figure 12 CDF towards the NSWGC.

Figure 13 *Angophora costata* is a feature of CDF.

CDF is present at St. Michael's on the upper slope of the long dune which forms the boundary to the NSWGC.

2.7.4 LITTORAL RAINFOREST

Littoral rainforest (in the NSW North Coast, Sydney Basin and South East Corner bioregions) is an Endangered Ecological

Community which occurs on both sand dunes and on soils derived from underlying rocks (McKinley et al. 1999 in NSW DEC 2004). Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence (NSW DEC 2004).

Figure 14 Dense area of LRF bordering the NSWGC.

The community is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. While the canopy is dominated by rainforest species, scattered emergent individuals of schlerophyll species, such as *Angophora costata, Banksia integrifolia,* and *Eucalyptus botryoides* occur in many stands.

A small stand of this community occurs at St. Michael's behind the 3rd tee, bordering the NSWGC. *Acmena smithii, Backhousia myrtifolia* and *Eucalyptus botryoides* are the dominant species present.

2.7.4 WEEDS

Golf courses are by nature highly susceptible to weed invasion. Major contributing factors to this susceptibility are high light levels and maintenance processes (addition of water and nutrients). Most invasions occur in roughs and out of play areas whilst playing areas are generally carefully managed.

At St. Michael's, all bushland areas are affected to some degree by weeds which have been established on surrounding properties for many years. The most significant of these is Bitou Bush (*Chrysanthemoides monilifera* subsp. *rotundata*). Other major weeds include Turkey Rhubarb *(Acetosa sagittata)*, Lantana *(Lantana camara)*, Pampas Grass *(Cortaderia selloana)*, and African Love Grass *(Eragrostis curvula)*. *Ludwigia peruviana* is a problem along drainage lines. A comprehensive list of weeds is available in the Appendix.

Figure 15 Bitou Bush is widespread along coastal areas adjacent to the course

Figure 16 *Ludwigia peruviana* is an intractable problem along drainage lines.

2.8 FAUNA

2.8.1 NATIVE

No site specific fauna surveys have been carried out at St. Michael's. The course bounds Botany Bay (North) National Park, where surveys have been carried out. Fauna identified within the National Park includes:

Five frog species
11 lizard species
Four snake species
84 bird species (76 native, eight introduced)
10 mammals (four native, six introduced)
(Adapted from Low 2001 and NPWS 2002).

Many of these species are likely to be present at St. Michael's. The list of fauna found within Botany Bay National Park (North) is included in Appendix.

2.8.2 FERAL

Species recorded in Botany Bay National Park and/or on the course include the following:

Mammals:
House Mouse, Black Rat, Fox, Cat, Rabbit and Dog.

Birds:
Ring-necked Pheasant, European Starling, Common Mynah, House Sparrow, Blackbird, Red-whiskered Bulbul, Spotted Dove and Feral Pigeon.

3.0 GENERAL MANAGEMENT ISSUES

INTRODUCTION

This section identifies and discusses issues which have relevance across the course. The Management Issues Map which follows (Figure 17) locates discussion topics where possible.

Recommendations for responses to these issues are given in section 4.

3.1 ENVIRONMENTAL LEGISLATION

Environmental management is regulated by various pieces of legislation. The following is a summary of the main Acts affecting the management of St. Michael's at the time of writing this report.

Legislation is changing all the time and it is the responsibility of land managers to keep up to date with these changes.

NSW THREATENED SPECIES CONSERVATION ACT 1995

The TSC Act (1995) aims to prevent the extinction of and promote the recovery of threatened species, populations and ecological communities. Threatened species, populations and ecological communities are listed in schedules under this Act.

More detail on the *NSW Threatened Species Conservation Act* 1995 is included in the Appendix.

Implications

Eastern Suburbs Banksia Scrub (ESBS) and Littoral Rainforest are listed as endangered ecological communities under part 3 of schedule 1 of the TSC Act.

The Club are required to protect ESBS and Littoral Rainforest.

Figure 17 Management Issues map.

To carry out any construction work or any ecological burns within Endangered Ecological Communities, a section 91 licence is required. This licence is applied for through the NSW DEC.

NATIONAL PARKS & WILDLIFE Act (1974)

The NP & W Act (1974) aims to prevent the extinction of and promote the recovery of threatened species, populations and ecological communities.

Implications

To carry out any bush regeneration or seed collection work within Endangered Ecological Communities, a section 132c licence is required. This licence is applied for through the NSW DEC.

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT (1999) (Commonwealth)

Eastern Suburbs Banksia Scrub is listed as an endangered ecological community under the EPBC Act (1999).

If the Club propose any development that may impact on ESBS, they will need to comply with this Act. Under

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT (1979)

This is the principal Act controlling development in NSW. Any proposed development needs to be approved under this Act.

The consent authority for the Club is Randwick City Council.

PROTECTION OF THE ENVIRONMENT OPERATIONS ACT (1997)

The Protection of the Environment Operations Act (1997) (POEO) is the principal legislation governing pollution in NSW.

Section 120 of the Act states that a person must not pollute any waters, cause any waters to be polluted, or permit any waters to be polluted. Severe penalties exist under the POEO Act and the

legislation places liability on anyone who participated or contributed to the pollution of waters.

Under the POEO Act *Control of Burning Regulation (2000)* regulates pollution from fires. The Club must get permission from the NSW DEC (EPA division and Parks and Wildlife Division), the Federal Airports Commission (FAC) and Randwick Council to carry out any ecological burns.

PESTICIDES ACT (1999)

Under this act, it is an offence to use a pesticide in a way that causes injury or likely injury to another person; damage or likely damage to another person's property or harm to a non-target plant or animal.

Pesticide users must follow the label (or permit). Reasonable actions must be taken to ensure that non-target impacts are avoided. The Environment Protection Authority is the government agency that enforces safe use of pesticides in NSW.

New regulations in regard to record keeping came into force in August last year. New standards for user training came in to force this year. These regulations require stricter competency standards and must be complied with by September 2005.

NOXIOUS WEEDS ACT (1983)

This Act aims to control all declared noxious weeds. A copy of the declared weeds in the City of Randwick is available in the Appendix.

3.2 ENDANGERED ECOLOGICAL COMMUNITY MANAGEMENT

3.2.1 ESBS and LITTORAL RAINFOREST

Two Endangered Ecological Communities are present on the St. Michael's course. Approximately 7.17 hectares (NSW DEC 2004) of

Eastern Suburbs Banksia Scrub have been identified, spread throughout the course in a series of fragments. A small pocket of Littoral Rainforest occurs behind the 3rd tee.

The EPBC Act (1999), the TSC Act (1995) and the NP&W Act (1974) regulate activities which may impact on threatened species & communities. Activities which fall into this category include bush regeneration, weeding, seed collection, planting and track work. Most of these activities have been carried out at St. Michael's over the past few years.

Under the TSC Act (1995), any track construction, clearing, trimming or planting requires the land manager to obtain a Section 91 licence from the NSW DEC. Bush regeneration and seed collection work will require the contractor to hold a section 132c licence which is granted under the NP&W Act (1974).

These activities are regulated by legislation within endangered ecological communities because of their ability to destroy/degrade. The rationales behind these regulations are given in the following sections and apply to all remnant bushland on St. Michael's.

Restoration work within these communities requires a thorough understanding of the ecological processes involved. Greenkeeping and horticultural qualifications do not have the scope to address these requirements.

3.2.2 RECOVERY PLANS

The NSW Department of Environment and Conservation have prepared a recovery plan for ESBS. This plan was finalised in February 2004. The plan sets out best practice guidelines which may also be legally binding. Within the Recovery Plan, it is recommended that ESBS be declared as 'critical habitat'.

As Littoral Rainforest has only been declared as an Endangered Ecological Community recently, no Recovery Plan has been prepared.

3.2.3 CRITICAL HABITAT RECOMMENDATION for ESBS

Declaration of critical habitat provides clear legal recognition of the significance of an area of land for the ongoing survival of a species, population or community. Once declared, it becomes an offence to damage critical habitat. A species impact statement is mandatory for all developments and activities proposed within critical habitat (NSW DEC 2004). Critical habitat has been proposed for ESBS at a state level (under the TSC Act 1995) and at a federal level (under the EPBC Act 1999).

3.2.4 KEY THREATENING PROCESSES for ESBS

The following key threatening processes, as listed on Schedule 3 of the TSC Act, are potentially relevant to ESBS (NSW DEC 2004):

Clearing of native vegetation

Invasion of native plant communities by *Chrysanthemoides monilifera*

High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition

Infection of native plants by the pathogen *Phytophthora cinnamomi* (Phytophthora).

Competition and grazing by the feral European Rabbit

Invasion of native plant communities by exotic perennial grasses

Anthropogenic climate change

Apart from legal requirements, the restoration of bushland remnants on St. Michael's presents the club with a significant opportunity. The inherent visual quality of the course relates to its sweeping topography and rugged native vegetation. As part of the golfing experience, it is important that the club protects and preserves the natural environment of the course.

3.3 FRAGMENTATION of REMNANTS

St. Michael's retains a number of small bushland remnants scattered across the course. The size and shape of remnants plays a significant role in their ability to withstand impacts.

Most of the remnants on the course have a high edge ratio which makes them highly susceptible to 'edge effects'. Following is a brief summary of the meaning of the term 'edge effect' when applied to a discussion of bushland management.

The term 'edge effect' refers to the situation whereby exposed bushland edges are more affected by impacts than areas of core bushland. Edges are formed where any 'development' takes place within a piece of bushland. By their nature, golf courses fragment bushland as part of the initial construction process. Further incremental fragmentation occurs as a calculated process of clearing for paths and golf structures or as a gradual informal process of deterioration (shortcuts, mowing, weed invasion).

Impacts usually include a number of the following factors;
Increased light levels
competition from turf grasses/annuals
heated soils
overthrow of irrigation
seepage of nutrients (fertilisers/mulch)
encroachment of mowing equipment
transport of weed propagules
physical damage by pedestrians/buggies/machinery
Results include;
weed invasion at edges (particularly from grasses and annuals) and into remnant for at least ten metres
lack of regeneration at edges
weed invasion into remnants via tracks and golf features
reduction in size of remnant
loss of habitat and fauna interactions

Figure 18 Highly fragmented areas such as this have little resilience.

Figure 19 Edges are particularly vulnerable to fragmentation.

Figure 20 Areas which become fragmented quickly degrade. Consolidation of these areas would stop their decline.

The overall result of fragmentation can be seen on a structural level. The effect is most pronounced after large-scale weed removal (particularly Bitou spraying). Remnants become increasingly sparse in native vegetation cover and take on a 'scrappy' and disjointed look.

3.4 CLEARING AND TRIMMING

Clearing and trimming of bushland remnants to reduce playing difficulty and improve sight lines is an accepted practice at St. Michael's.

Figure 21 Trimmed ESBS towards the 4th.

Figure 22 Trimmed ESBS towards the 16th.

Clearing and trimming reduces the viability of bushland in the following ways:

Clearing/trimming of any ESBS remnant is regarded as a key threatening process under the TSC Act 1995 and is only legal with an appropriate licence.

Clearing/trimming of any Littoral Rainforest remnant is only legal with an appropriate licence.

Clearing/trimming of any remnant reduces the viability of all remnants in the community.

Trimming canopy trees causes structural changes which leads to degradation of remaining vegetation layers- these changes include increased light levels, heated soils, weed invasion and loss of seed bank.

Clearing part of any remnant reduces its viability by reducing size and increasing edge ratio.

3.5 ACCESS / PATHS

A combination of formal and informal paths are presently in use on the course. Many of these paths dissect or are adjacent to bushland remnants.

Clearing for new paths is an important issue. When carried out within an Endangered Ecological Community, any clearing has implications under the TSC Act (1995). Problems associated with clearing have been discussed in 3.4.

Within remnants, the construction of paths results in fragmentation. Problems associated with fragmentation have been discussed in 3.3.

Figure 23 This path between the 11th and 15th has no practical use. Closure and rehabilitation would greatly improve the viability of this remnant.

For some path construction, soils from other areas are being introduced into or adjacent to remnants. There are a number of problems associated with this practice. The introduction of *Phytophthora cinnamomi* (Phytophthora) can result. Phytophthora is a problem for all bushland areas and is listed as a key threatening process for ESBS. Transport of soils into remnants also has the potential to raise PH and/or introduce weed propagules.

3.6 EDGE TREATMENT

The junction of bushland and the golf course (fairways, rough, tees and greens) is a difficult place to manage. Edges have high levels of light, are often affected by irrigation water and have exotic grasses and annuals competing with native species. Exotic turf grasses invade remnant edges and can form dense, high mats. Stoloniferous grasses such as Couch, Buffalo and Kikuyu are a particular problem and are widespread at St. Michael's.

Management of these edges is a significant issue for two reasons. The first relates to ball retrieval and the second relates to conservation and the TSC Act.

To address the problem of ball retrieval, St. Michael's have developed a strategy for use throughout the course. Most edges are being managed by the spray application of the contact herbicide 'Roundup'. In relation to ball retrieval, results of this management practice are highly successful.

Figure 24 Present practice on the course involves the maintenance of large areas of bare soil.

Figure 25 A bush regeneration approach to areas such as this would strengthen resilience of the remnant.

Whilst the edge treatment addresses the golfing aims of the club, it does not reflect its conservation and legislative aims. When carried out within Endangered Ecological Communities the present edge treatment may constitute harming or picking under the TSC Act (1995).

Aside from legislative constraints, the following adverse conditions are created:

- o increases exposure to light, heat, wind
- o bares the soil (erosion, weed invasion, changes biotic processes)
- o destroys regeneration
- o encroaches
- o requires constant intervention, will never be self maintaining
- o uses large amounts of herbicide (of particular concern on sandy soils)

Where it is not imperative to have a bare edge (in out of play areas), an opportunity exists to explore other management methods. A bush regeneration approach to edges would considerably strengthen the conservation value of remnants.

At present, the Club is spending approximately $60 000 on weed control at edges (D. Jones pers. com.). An opportunity exists for a funding approach which addresses the golfing, legislative and conservation aims of this plan. Redirection of some of these funds towards a bush regeneration approach would satisfy all key aims.

3.7 DUMPING OF CLIPPINGS

At present, grass clippings are being spread within some remnants. The practice is taking place predominantly along edges bared by herbicide use. The clippings have the potential for dispersal further into remnants by wind, water and the movement of humans and fauna

There are a number of problems associated with this practice. The clippings act as a mulch and are causing/contributing to the death of existing seedlings and the suppression of potential regeneration. Whilst this is desirable in landscaped areas, it is not appropriate within a bushland area. Within the boundaries of Endangered

Ecological Communities, the practice constitutes 'harm or picking' under the TSC Act.

Grass clippings introduce weed propagules which may include seeds and vegetative matter. Weeds introduced would be predominately turf grasses and weeds of turf. The introduction of concentrated vegetative matter also modifies and increases nutrient loads. This is not desirable as it leads to disadvantage and sometimes death of native regeneration. As an interrelated factor, weeds become more invasive as nutrient levels become elevated.

The practice of spreading clippings communicates (to staff/public) an inappropriate concept of the conservation value and delicate ecological

of gardening and landscaping may be re-enforced by this practice. It important that delineations (physical and perceptual) are made at the boundaries between remnants and landscaped areas.

Figure 26 Clippings are being spread within remnant areas throughout the course.

Figure 27
Regeneration occurs along bare sandy edges.

3.8 SENESCENT AREAS

When applied to an area of bush, the term senescent means that most of the vegetation in the community (particularly dominants) is close to the end of its life or is dead. In healthy bushland areas individual trees regularly die as part of a natural process of renewal. In senescent areas, germination does not occur to replace the losses.

St. Michael's contains a number of these areas spread across the course. Factors contributing to senescence on the course include:
Fragmentation
Exclusion of fire
Weed invasion
Lack of interactions/disturbance/pollination by fauna

Stimulation of native germination is required in these areas. Various methods can be employed to achieve results. The main methods appropriate on the course are fire, mechanical soil disturbance and weed removal.

The use of fire is a well respected and common response to the treatment of senescent bushland areas. Its' use involves complex

interactions and results can be highly variable. 3.15 discusses these interactions in detail. On the course at St. Michael's, the use of fire needs to be carefully considered.

Figure 28 Dying *Leptospermum laevigatum*. Stimulation of new growth is needed in these areas.

Figure 29 The native vine *Parsonsia stramina* has become a problem in some remnants due to lack of fire.

Some vegetation communities respond well to soil disturbance. The communities on the course appear to be well suited to this method. Good results have been achieved within ESBS at York Road, Centennial Park (D. Hirschfeld pers. com 26.5.04). The mobile nature of the sands on the course indicates that seed distribution is likely to occur well below (up to 15cm) the present surface.

When choosing an approach, the crucial considerations relate to the makeup of the seedbank, vegetation structure and post treatment vulnerability.

SEEDBANK MAKEUP

When considering germination stimulation, it is important to acknowledge that the contents of the seedbank are not always predictable. Factors which vary include type (exotic/native), germination requirements, amount, viability, position in soil profile and species variation.

Given the dynamic and often unpredictable nature of disturbance, it is important that various approaches are trialed and well documented. Responses need to be accordingly varied and tailored to specific areas.

POST-TREATMENT VULNERABILITY

It is important to recognise that work on the course which involves disturbance will also require considerable follow-up. This is due in general to the nature of golf courses in terms of structure and impacts. Resources for follow-up work should be identified before initial treatments are carried out. Factors which may determine approaches include:

Fragmentation
Weed invasion (from adjacent areas or seedbank).
Erosion (by elements, traffic)
Vegetation structure
Trampling
Weather/season
Habitat

Given this variation, broad treatment options have been given in the Recommendations. These are guidelines for initial approaches and should be varied according to results.

3.9 PLANTING

Planting is a well established and respected horticultural and rehabilitation practice. If an area is cleared or weeded, it is traditional to plant it. In areas where there is a threatened ecological community such as ESBS, or where there is potential for natural regeneration, planting is not an acceptable practice.

Figure 30 Planting near the second tee.

Figure 31 Planting near ESBS which contains non-indigenous species including *Grevillea* 'Robin Gordon' and *Dichelachne* sp.

The reasons for not planting into remnants, and particularly into Endangered Ecological Communities are:

Planting into Endangered Ecological communities constitutes 'picking' under the TSC Act, and is illegal.

Can introduce disease, a particular issue being Phytophthora which is a key threatening process within ESBS.

Introducing plants from nurseries may alter the genetic makeup of the community. It is important to maintain the genetic integrity of vegetation communities, particularly Endangered Ecological Communities.

Affects the potential for the soil seed bank to germinate. There is often seed stored in the soil which, given the right conditions will germinate.

Alters the floristic composition of the vegetation community. Even if only species from the community are planted, it is impossible to recreate the complexity of the community. For instance, some species may be difficult to propagate. Planting tends to over-represent some species and ignore others. Over time this alters the floristic composition of the vegetation community.

Can be expensive, have high failure rates and be high maintenance.

3.10 CONSTRUCTION AND MAINTENANCE

The construction and maintenance of golf courses involves many processes and materials which have potential to damage bushland areas.

Movement of soils and machinery into and between ESBS remnants is an issue of particular importance. These practices could facilitate the introduction or spread of the pathogen Phytopthora (*Phytophthora cinnamomi).* Phytophthora has the potential to quickly degrade and lead to the death of entire plant communities. Reflecting its significance, infection by Phytophthora is listed as a Key Threatening Process under the TSC Act (1997).

Figure 32 Dumping of materials within remnants can quickly degrade an area.

Figure 33 Construction of practice area within a remnant near the clubhouse.

Other impacts which are evident at St. Michael's are outlined below:

physical damage to vegetation by machinery and groundstaff

transportation of weed propagules by movement of soils and machinery

suppression of existing vegetation and regeneration by mulching material

surface/subsurface irrigation and/or fertiliser damaging natives and encouraging weed plumes

change to drainage patterns -causes changes to floristic makeup/degradation

leachate from bitumen and cement paths -raises PH and encourages weeds

soils moved from remnants -depletes native seed bank and destroys soil structure

changes in soil levels around natives causing sickness/death of existing plants and covers native soil seed bank

3.11 WEED MANAGEMENT

The most problematic weeds on the course are described in the following section. A comprehensive list of weeds present can be found in the Appendix.

3.11.1 BITOU BUSH

The major weed affecting St. Michael's is Bitou Bush (*Chrysanthemoides monilifera* subsp. *rotundata*). In March 1999, Bitou Bush was listed as a key threatening process under the TSC Act. It has potential to severely degrade ESBS (NSW DEC 2004).

Bitou bush was first introduced to the La Perouse area around 1968 by the army on the recommendation of the NSW Soil Conservation Service. The area planted was to the south east of the course. Gradual spread occurred until the late 1970s and 1980s when severe infestations began (NPWS pers. com. 1999 in Low 2001).

Bitou Bush is a significant problem in neighbouring properties which include Botany Bay National Park and the Pistol Club. Because birds

and foxes spread Bitou Bush, while there are infestations nearby, it will always be an issue for St. Michael's.

Figure 34 Bitou Bush

Bitou is scattered throughout the course in degraded areas and in areas of good bush. Following any disturbance on the course, Bitou is likely to germinate prolifically. Disturbance factors may include
Fire
removal of vegetation-weeds and native
soil baring and shifting
mechanical

At the NSWGC, Bitou was a particular problem after the fires of the late '90s. Regeneration of Bitou tends to be fairly immediate after disturbance whilst native regeneration takes place over a longer time scale (Low 2001). The control of Bitou at this crucial stage is an important factor when considering restoration work.

Presently, the club is collaborating with the NSWGC and Botany Bay National Park in a Bitou control program. The program involves helicopter spraying of the herbicide 'Brushoff' at 30g/hectare (D. Jones pers.com 2003).

At the time of writing, the club was in receipt of a grant awarded under the Commonwealth Natural Heritage Trust. Monies were granted to St. Michael's GC, the NSWGC, Randwick G.C. Randwick Council and the Coast GC for bush regeneration. The grant was made in recognition of the conservation value of bushland on these properties. Sydney Bush Regeneration Company is presently carrying out works at St. Michael's.

3.11.2 VINES

Vines pose a particular threat to bushland areas as their growth habit enables access into canopy trees. Once the canopy becomes smothered in vines, it has little chance of survival. Without protective canopy, vegetation communities quickly degenerate.

Figure 35 *Acetosa sagittata* is the main vine weed throughout the course.

The vine Acetosa (*Acetosa sagittata)* has recently become a problem at St. Michael's and on surrounding properties. It is a prolific seeder and has highly mobile wind borne seeds.

Ipomoea cairica (Coastal Morning Glory) and *Anredera cordifolia* (Madeira Vine) are present in small amounts.

3.11.3 PERENNIAL GRASSES

The junction of the course and bushland remnants is affected by grasses which include Common Couch *(Cynodon dactylon),* African Love Grass *(Eragrostis curvula),* Paspalum *(Paspalum dilatatum),* Kikuyu *(Pennisetum clandestinum),* Ehrharta *(Ehrharta erecta*) and Buffalo Grass *(Stenotaphrum secundatum).*

Figure 36 Ehrharta (*Ehrharta erecta).*

Figure 37 African Love Grass (*Eragrostis curvula).*

Grasses have the ability to rapidly spread and form dense mats which smother native regeneration. Stoloniferous grasses (Couch, Kikuyu and Buffalo) are a particular problem. Ehrharta is a vigourous and frequent seeder and rapidly spreads through open

areas. Invasion of ESBS by perennial grasses is listed as a key threatening process.

Specific weed problems are identified on each zone map and accompanying recommendations in section 4.

3.12 FAUNA MANAGEMENT

3.12.1 NATIVE

Golf courses have varying potential as habitat as a result of dramatic divisions between types of vegetation cover. Generally, the highly developed areas of the course offer low habitat value whilst the larger areas of bush tend to provide a variety of habitats.

When managing for fauna, it is important that all parties have a commitment to preservation and protection. This involves knowledge of (or access to) information of species identification, habitat locations, breeding cycles, feeding and resting requirements and faunal interactions.

3.12.2 FERAL

Feral animals of significance at St. Michael's (at the time of writing) include Foxes and Rabbits.

Figure 38 Rabbits are a problem on the course, particularly in areas of bare soil.

Rabbits are listed as a Key Threatening Process within ESBS. For this reason it is imperative that St. Michael's carries out rabbit control throughout the course. Assistance and funding may be available through the Rural Lands Protection Board for this purpose.

3.13 EDUCATION/INFORMATION

3.13.1 GENERAL/INFORMAL

The natural beauty of St. Michael's is its greatest asset. As custodians of this asset, all stakeholders have a moral and financial interest in the responsible management of bushland on and around the course. Education is one of the most effective tools in encouraging collective responsibility and participation. An inclusive and enquiring approach is more likely to engender co-operation and enthusiasm than a 'policing' approach.

Figure 39 Interpretive signage at the entrace to the club.sm than a 'policing' approach.

Figure 40 Interpretive signage at the entrace to the club.

Making information available to interested parties is one of the simplest and most effective means of educating.

3.13.2 STAFF TRAINING

St. Michael's are presently assisting a staff member to complete the Natural Area Restoration Certificate at TAFE. Another staff member may be trained in the future. It is envisaged that in the future, some environmental restoration work will be carried out on an in-house basis (D. Jones pers. com.).

3.14 MONITORING

Monitoring is vital to any environmental management project. Many environmental processes are dynamic and interrelated. Alterations to these processes through management practices need to be observed over the long term. Clear records will enable these practices to be evaluated.

Changes to contractors and personnel are likely to occur to a significant extent during the life of this Plan. It is important that work is documented and information recorded so skills and knowledge are not lost.

3.15 FIRE

Throughout south-eastern Australia, most vegetation types require periodic fires to stimulate the continuation of various ecological processes. The relationship between fire and healthy bushland is complex and not fully understood (Low 2001). When planning for fire, the following are recognised as being key factors: season, intensity and frequency. The combination of these three elements is generally referred to as the 'fire regime'. Different vegetation communities have different ideal fire regimes (Bradstock and Auld 1995).

The following applications are required before carrying out ecological burns on the course:

NSW DEC (Parks and Wildlife Division) for ESBS and Littoral Rainforest

NSW DEC (EPA division) for all

NSW Fire Brigade

Burns can only be carried out between 1st April and 30th September

3.14.1 EASTERN SUBURBS BANKSIA SCRUB

Any planned fires within ESBS are regulated by the NSW TSC Act.

The ecology of fire within ESBS has not been thoroughly researched. Until more information is available, the Recovery Plan for ESBS states that the following parameters should be followed:

successive fires at intervals of less than 8 years should be avoided;

successive fires at intervals of more than 15 years should be avoided

fire exclusion for a period of more than 30 years should be avoided.

The regular burning of ESBS at frequencies near the lower end of these parameters (i.e. every 8 to 10 years) should also be avoided, as this may impact upon the seedling recruitment of component species with a long primary juvenile period (e.g. *Banksia serrata*) (NSW DEC 2004).

Areas of Wet ESBS on the course have particular needs in relation to fire. No information in regard to fire intervals within this structure was available at the time of writing. The precautionary principal should be applied till particular information is available (M. Bremner pers. com.)

3.14.2 LITTORAL RAINFOREST

All fire should be excluded from this community due to the long term adverse effect on species diversity. (NPWS 2002)

3.14.3 OTHER COMMUNITIES

Research into fire has been undertaken in Royal National Park, which has areas with similar vegetation, climate and geomorphological conditions to St. Michael's. This research has established the following parameters:

Open Forest or Woodland communities

loss of woody plants may occur where the frequency of fire exceeds 2 fires in quick succession within a period of 5 years, or is less than 1 fire every 30 years

Wet and Dry heath /Swamp and Sedgeland communities

loss of woody plants will occur if the frequency of fires exceeds 2 fires in quick succession within a period of 8 years; 3 fires in quick succession within a period of 15-30 years; or if there are no fires within 30 years.

*(Adapted from NPWS 2002)

4.0 RECOMMENDATIONS

PRIORITIES

Priorities are divided into the following categories within section 4:
Immediate and ongoing (imm./on.)
Immediate (imm.)
High – within the first 2 years
Medium – within the first 2 to 5 years
Low – within 5 to 10 years

NOTES ON GENERAL RECOMMENDATIONS

General Recommendations refer to processes which relate to works/practices across the course. Particular issues relate to Endangered Ecological Communities and thus they are given particular Recommendations. All general recommendations also refer to Endangered Ecological Communities.

Table 4.1 Environmental Legislation

Issues	Priority	Actions	Comments/check
Compliance/ licences	Imm./ on	Comply with all environmental legislation. Obtain all necessary licences	
Key threatening processes	Imm/ on.	Address all Key threatening processes as first priority. Specific recommendations are given for clearing (table 4.4), frequent fire (Table 4.15), *Phytophthora Cinnamomum* (Table 4.10), Rabbits (Table 4.12), Bitou and Invasion by perennial grasses (Table 4.11).	
Awareness of changes to legislation	Imm./ on.	Ensure current membership of the Australian Golf course Superintendents Association Subscribe to main industry publications Subscribe to main Government Authority web pages. These should include: NSW DEC (EPA division and Parks and Wildlife Division), Department of Infrastructure, Department of Planning and Natural Resources (DIPNR) Environmental Defenders Office (EDO).	
Dissemination of information	Imm./ on.	Ensure Board members/ staff and members are aware of the implications of environmental legislation. Call a meeting initially and then follow up with notes.	
Training	Imm./ on.	Train staff where necessary, particularly in regard to the Threatened Species Conservation Act and the Pesticides Act.	
Task scheduling	Imm./ on.	Adjust schedules to allow for adherence to legislative requirements	

Table 4.2 Endangered Ecological Community Management

Issues	Priority	Actions	Comments/check
Priority	Imm./ on.	Allocate resources to Endangered Ecological Communities as a first priority.	
Recovery Plan	Imm./ on.	Conduct meeting to familiarise Board and Superintendent with contents of ESBS Recovery Plan. Manage Endangered ESBS in accordance with the Recovery Plan	
Identification of E.E.C.	Imm.	Clearly define all identified ESBS and Littoral Rainforest remnants. Markers should be placed during a site meeting with a recognised expert. Positioning of markers should allow for extension of remnants where possible in areas of high resilience. Map position of markers accurately.	
	High	Regularly check that markers are correctly and clearly positioned (Superintendent) in accordance with map.	
Licences	Imm./ on.	Apply for all licences before carrying out any work which may impact on Endangered Ecological Communities.	
Training	Imm./ on.	Ensure that any work carried out in these communities is done by appropriately qualified and experienced bush regeneration contractors. Ensure all trainee regenerators work under the guidance of a fully trained supervisor. Trained supervisors should not be in charge of more than 2 untrained staff at any time.	
Funding	Imm./ on.	Investigate further funding options which may become available for conservation work within Endangered Ecological Communities.	
Approach	Imm./ on.	Apply integrated approaches by collaboration with neighbours on issues such as feral animals, weed control and funding.	

Table 4.3 Fragmentation of Remnants

Issues	Priority	Actions	Comments/check
Course development	Imm./ on.	Cease course development within remnants. Be aware of the destructive nature of incremental development.	
	High	Develop a long term course plan in association with the recommendations from this RVMP.	
Bush Regeneration	Med.	Engage Bush Regeneration contractors to carry out the following works: Widen and/or consolidate remnants using bush regeneration techniques where appropriate. Work small patches in areas of resilience. In areas where turf is encroaching, use a monocot specific herbicide such as 'Fusilade' to kill weed grasses. Follow up using appropriate methods. Use germination stimulation techniques (as described in Table 4.8) where appropriate. If regeneration does not occur within 2 years, return to a maintenance approach.	
Definition/monitoring of E.E.C.	High	Move markers to reflect the expanding boundaries of regenerating Endangered Ecological Communities. Document these changes by photographing and mapping.	

Table 4.5 Access and Paths

Issues	Priority	Actions	Comments/check
Legislation	Imm./ on.	Allow no new paths through any Endangered Ecological Communities.	
Fragmentation	Imm./ on.	Allow no new paths through any remnants.	
	High	Close all informal paths. Erect barriers (posts and ropes) where necessary. Discourage pedestrian access into remnants by means of signage and education.	
Local Rules	High	Adjust Local Rules to discourage entrance to remnants, especially Endangered Ecological Communities.	
Bush Regeneration	High	Use bush regeneration to rehabilitate and consolidate in areas of resilience where old paths have been closed.	

Table 4.4 Clearing and Trimming

Issues	Priority	Actions	Comments/check
Degradation	Imm./ on.	Cease clearing any remnant vegetation.	
Legislation	Imm./ on.	Cease clearing within any Endangered Ecological Community. Apply for a Section 91 licence from the DEC (Parks and Wildlife Division) for any trimming in Endangered Ecological Communities. Confer with DEC (Parks and Wildlife Division) in relation to committing funds to restoration of other areas for concessions given.	
Managing sight lines	Imm./ on.	Modify trimming practices within ESBS. Allow areas to regrow/narrow where possible. Peg out areas which are seen as essential for trimming. Markers should be permanent and placement accurately recorded on the clubs 1:1000 AWT map.	
	High	Engage bush regenerators to carry out vegetation trimming, Trimming should be a minimum height of xxxxxxx. Care should be taken to trim to an absolute minimum. Utilise fire to reduce vegetation height where appropriate (see General Fire Recommendations and site specific Recommendations.	

Table 4.6 Edge Treatment

Issues	Priority	Actions	Comments/check
Funding	High	Divert a portion of funds from spraying budget to bush regeneration works.	
Assessment of treatment options	High	Differentiate between treatment areas. In areas of high ball retrieval, the current treatment may be appropriate. In areas where it is not an issue, follow the bush regeneration approach. ESBS should be given priority.	
Bush Regeneration	High	Spray grasses at the edge of remnants with a monocot specific herbicide such as 'Fusilade'. Spray outside the remnant edge up to 1 metre wide. When treating an ESBS remnant, spray to the outside of markers. (The width of this treatment will depend on the remnant, the invasive quality of grass species and the spray intervals. Confer with bush regeneration contractor.) Engage bush regeneration contractors to hand weed grasses (from the sprayed edge into the remnant) and all other weeds (in the sprayed strip).	

Table 4.7 Spreading Grass Clippings on Remnant edges

Issues	Priority	Actions	Comments/check
Regeneration	Imm./ on.	Cease this practice as it affects actual and potential regeneration adversely.	
Weed dispersal	Imm./ on.	Cease this practice as it disperses weed seed into remnants.	
Nutrients	Imm./ on.	Cease this practice as it adversely affects nutrient loads which favour weed growth.	
Aesthetics and perceptions	Imm./ on.	Cease this practice as it creates a 'patchy look' and an undesirable impression in relation to ecological balance and conservation values. Spread clippings throughout the roughs	

Table 4.8. Senescent Areas

Issues	Priority	Actions	Comments/check
Funding	High	Identify funds for follow up work before attempting any large scale stimulation of germination.	
Approaches	Med.	Experiment with different methods. Open up small areas only, particularly in the experimental phase. Vary parameters and record results. Use results to guide further work.	
Stimulation of germination	Med	Utilise fire in areas which display resilience. Select areas which do not suffer significantly from fragmentation or weed invasion (or are adjacent to areas of significant weed invasion). Utilise mechanical methods of soil disturbance in areas where fire is not appropriate. Use a rotary hoe to a depth of approximately 15cm.	
Mesic species	Med	Hand remove *Elaeocarpus reticulatus* (Blueberry Ash) and *Parsonsia stramina* (Silkpod) in areas which are not suitable for burning.	

Table 4.9 Planting

Issues	Priority	Actions	Comments/check
TSC Act	Imm./ on.	Do not plant into or within 5 metres of Endangered Ecological communities.	
Genetic integrity	Imm./ on.	Follow planting guidelines in Appendix if planting is needed in an area adjacent to Endangered Ecological Communities.	
Records	Imm./ on.	Keep good records of all plantings. These should consist of maps and corresponding species lists.	
Weed species	Imm./ on.	Do not plant any species which appear on the weed species list (see Appendix)	

Table 4.10 Construction and Maintenance

Issues	Priority	Actions	Comments/check
ESBS	Imm./ on.	• Do not bring any soil into or within 5 metres of ESBS remnants. This can introduce Phytophthora which is a Key Threatening Process. • Do not allow any soil to blow or wash into any ESBS remnants.	
Inputs	Imm./ on.	• Keep foreign plant matter out of remnants. This includes mulch and grass clippings. • Keep irrigation water and/or fertilisers out of remnants (be aware of subsurface movement) • Do not transport any soils into any remnant. • Reduce the travel of weed propagules by cleaning machinery	
Physical damage	Imm./ on.	Use the smallest machinery possible when working around golf features adjacent to/in remnants. Allow only experienced operators in areas in/around remnants.	
Future development	High	Plan new shed to incorporate a wash down bay with traps to clean machinery. Engage qualified consultant to supplement this RVMP in relation to impacts	
Personnel	Imm./ on.	Make clear delineations between the work of groundstaff and bush regenerators	
Soils	Imm./ on.	Do not move any soil from remnants Do not change soil levels around remnants Use best practice erosion measures	

Table 4.11 Weed Management

Issues	Priority	Actions	Comments/check
Approach	High	Consider the impact of seed dispersal by feral animals (particularly Bitou by foxes). Involve neighbours in broad scale feral animal control. Continue to apply for joint funding grants with near neighbours. Make ground staff aware of major weed species. All staff should be able to recognise Bitou, Acetosa and other vines (at least).	
Bitou Bush	High	St. Michael's Continue joint control program with neighbours. Control outside remnants once/year. Bush regeneration contractors Control heavily infested areas gradually to allow for adequate follow up target seedlings in all remnants once/year	
Vines	High	Give priority to control of all vines across the course. Skirt vines from native plants and bag all propagules if immediate full control is not possible. Allocate sufficient time to carry out long term control of vines (ie removal of Acetosa tubers). Dispose of all weeded material in covered composting area on site. St Michael's Approach neighbours with view to entering into a co-operative control program for Acetosa. Control outside remnants twice/year. Bush regeneration contractors Target throughout remnants twice/year.	

Table 4.11 Weed Management continued.

Issues	Priority	Actions	Comments/check

Perennial grasses	High	Contain the spread of grasses before carrying out work which opens canopy. Do not overclear in areas adjacent to seeding or stoloniferous grasses. Allow adequate follow up time on grasses after any changes in conditions i.e. extra light, heated soils, disturbance to soils.	
Dispersal from Outside remnants (all other weeds)	Imm/ on	Remove/control to prevent seeding into remnant areas. (slashing/mulching/planting etc).	
Ludwigia	Low	Leave in situ till time and money allows control.	

Table 4.12 Fauna

Issues	Priority	Actions	Comments/check
Monitoring	Med.	Engage a consultant to conduct a fauna survey. The survey should take place over at least 2 seasons and preferably over 4. Results of the survey should be made available to staff and members.	
	High	Keep lists of all fauna located. Correlate lists compiled by Bush Regeneration contractors (ask for inclusion in monthly reports), staff members (keep record sheet in lunch room/office) and by club members (keep record sheets in clubhouse). These lists should document native and feral animals.	
Education/inclusion	High	Buy 2 copies of an accessible bird field guide. Keep one copy in the staff lunch room and one copy in the clubhouse. A guide which would be suitable is Simpson and Day *Field Guide to the Birds of Australia* Invite a specialist from Birds Australia or the Cumberland Bird Observers Club to run a guided walk around the course each year.	
Native Habitat	Imm./on.	When planning any clearing (including weeds), check for habitat first. If located, either do not clear or minimise disturbance. Clear in mosaics and move through areas quickly to minimise disturbance. Do not clear in peak breeding season (particularly Spring) unless absolutely necessary.	
Chemical Use	Imm/on	Check for the presence of fauna before spraying, particularly in wet areas. Always follow best practice guidelines. Drift/rain/minimal chemical particularly with Glyphosate on sand.	

Table 4.12 Fauna continued.

Issues	Priority	Actions	Comments/check
Feral Animals	High	Continue to work with surrounding land managers to carry out co-ordinated control of foxes and rabbits.	

Table 4.13 Education

Issues	Priority	Actions	Comments/check
Approach	High	Encourage the participation of all stakeholders in the recognition of the environmental values of the course.	
Dissemination of information	High	Invite specialist speakers to do an annual walk and talk about flora and fauna on the course. Extend invitation to staff, club members, visitors and local residents. Speakers may be sourced from the NSW DEC and/or Randwick Council and birding organisations. Display information around clubhouse, pro shop and staff lunch room. Include take away information- (eg copies of profiles from NSW DEC /Parks and Wildlife division website) Incorporate flora and fauna information into St. Michael's website Include some interpretative signs around course with species information etc. Put vegetation and fauna information in Newsletter	
Staff training	Imm.	Ensure that all trainee bush regenerators on staff work with a fully qualified supervisor till trained.	
	Med	Encourage/facilitate more staff members to undertake the Natural Area Restoration Certificate at TAFE.	

Table 4.14 Monitoring

Issues	Priority	Actions	Comments/check
Baselines	High	Map location of all Endangered Ecological Communities and record placement of markers. Establish photo points either on maps or on the ground with markers. Consistency is important here as contractors are likely to change.	
Bush Regeneration Monthly/Annual reports	Imm./ on.	Fauna sightings, feral and native Changes in weed populations/densities Photographs	
Independent review	Med - High	Engage expert to produce Condition of bushland maps every 2 years. Engage expert to identify major weeds and record changes in weed populations every 2 years.	

Table 4.15 Fire

Issues	Priority	Actions	Comments/check
Funding	High	Identify funding for follow-up work before planning a burn	
Legislation	Imm./ on.	Follow all legislative procedures, particularly in regard to Endangered Ecological Communities.	
Neighbours	High	Inform neighbours (NSW DEC, NSWGC, CGC, Cullens Driving Range) at least one month prior to planned burn.	
Approach	Imm.	Vary the season of fire as much as possible within the acceptable 'safe' period. Only burn one or two pockets each year.	
Post burn care	Imm.	After burning standing timber will need to be left for a one year period. All traffic (excluding official tracks) should be excluded from burn areas for at least 3 months (including bush regenerators).	
Record keeping	Imm./ on.	Keep clear records of all fires on the course. This is vital if appropriate fire intervals are to be maintained. Records should include maps showing extent of fire.	

SITE SPECIFIC RECOMMENDATIONS

Whilst broad scale actions are appropriate across the course, each remnant requires individual recommendations.

NOTES on ZONE MAPS
For ease of identification, the course has been broken up into 5 geographic zones. These divisions are shown on Figure xx.

NOTES on REMNANT NUMBERING
In the 1990s Dannie Ondinea and Daniel Hirschfeld surveyed remnant vegetation for Randwick City Council. St. Michael's was surveyed during that time and remnants were assigned numbers. Randwick Council has continued to use the numbering system for administration of restoration works. To create continuity, it was agreed (author and Darren Jones) that this report should continue to use the numbering system.

Adjacent areas do not necessarily have consecutive numbers. In the following recommendations, remnant numbers have been grouped according to proximity.

PRIORITIES
Site Specific Recommendations have been given three levels of priority. Each remnant has been given a rating of 1, 11 or 111. Priority has been given using the following attributes:

1: High resilience, ESBS or LRF
11: Moderate resilience ESBS, CSH
111: Low resilience, various

The break-up of priorities is shown on figure xx. In practice, the following order should be observed:
Commence work in all **1** remnants
Once these are stabilised, move to **11**
Once 11 are stabilised, move to **111**

***NOTE**

There are cases where general recommendations will require specific tasks to be undertaken in remnants regardless of their priority. Cases of this include control of highly dispersive weeds and identification of endangered ecological communities.

Within each remnant, separate issues have been given a priority. These have been graded High, Medium and Low with the occasional Immediate. Timing is the same as for General Recommendations and is to be worked into the overall priorities.

DEGRADED AREAS

The DEC Recovery Plan for ESBS locates the position of remnants across the course. Some degraded remnants may be ESBS without enough diversity to be classified as such. These remnants are noted in the Zone tables with an***.**

Figure 41 Zone boundaries and remnant priorities

Figure 42 Zone a Management issues

Table 4.16 ZONE A - *to be read in conjunction with map A and General Recommendations*

Medium sized ESBS remnant incorporating S9 & S26

Area	Description / Issues	Priority	Actions	Comments/check
S9	**Dry and Moist ESBS –generally diverse and healthy**	1		
	Bush regeneration	High	Perennial grasses Treat throughout 6 times/year Spray in open areas Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant. Follow General Recommendations for perennial grasses. Other weeds Carry out bush regeneration through entire remnant 4 times/year. Consolidate good areas.	
	Senescence	High	Control *Parsonsia straminea* (Silkpod) by hand in weedy areas.	
		Low	Trial mechanical disturbance in three 2m x 2m quadrats adjacent to tee. Consider fire in area above if mechanical disturbance shows good results.	

Table 4.16 ZONE A - *to be read in conjunction with map A and General Recommendations*

Medium sized ESBS remnant incorporating S9 & S26

Area	Description / Issues	Priority	Actions	Comments/check
S9 cont	Maintenance of landscape character in open sandy area	Med	Permit localised regeneration without compromising open sandy quality. Remove regenerating large dicots (eg. *Leptospermum laevigatum* (Coastal Teatree), *Eucalyptus* sp.) Allow monocots/groundcovers to remain.	
S26	**ESBS in good condition** vulnerable due to fragmentation	1		
	Fragmentation	High	Close eastern track. Use bush regeneration techniques to rehabilitate.	
		Med	Use bush regeneration techniques to extend remnant	
	Bush regeneration	High	<u>Perennial Grasses</u> Treat throughout 6 times/year. Spray in open areas. Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant Follow General Recommendations for perennial grasses. <u>Other weeds</u> Control and remove over 4 sessions /year.	

	Fire	Med	Consider the use of fire after reaching maintenance level for weeds. Drop large *Leptospermum laevegatum* (Coastal Teatree) to increase ground level fuel load before burning.	

Table 4.16 ZONE A - *to be read in conjunction with map a and General Recommendations*				
Area	Description / Issues	Priority	Actions	Comments/check
S10	**Diverse and fragmented Moist Heath**	11		
	Bush Regeneration	High	Remove *Andropogon virginicus* (Whisky Grass) and *Paspalum* sp.	
		Med	Consolidate better areas. Remove *Lantana camara* (Lantana) gradually as part of the consolidation process.	
	Fragmentation	Med	Close small track on western side of middle tee.	
		Low	Use bush regeneration techniques to consolidate.	
	Edge treatment	High	Modify practice. Follow General Recommendations for edge treatment.	
	Habitat	High	Be aware of the presence of at least 2 species of frogs (heard calling).	

Table 4.16 ZONE A - *to be read in conjunction with map a and General Recommendations*				
Area	Description / Issues	Priority	Actions	Comments/check
S11	**Highly fragmented and degraded Moist Heath**	111		
	Bush regeneration	High	Remove *Erythrina X sykesii* (Coral Tree).	
		Med	Control spread of *Lonicera japonica* (Honeysuckle). Control spread of *Eragrostis curvula* (African Love Grass).	
		Low	Control spread of all other weeds.	
	Habitat	High	Modify spraying practice immediately adjacent to drainage line to protect frogs.	
		Low	Establish reinforcement plantings (grasses/ sedges / rushes) on eastern side of drainage line	
S12	**Small fragment of degraded heath**. *	111		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa).	
		Med	Contain *Hydrocotyle bonariensis* (Hydrocotyle). Do not open up adjacent areas. Gradually remove *Eragrostis curvula* (African Love Grass) and P*aspalum urvillei.*	
		Low	Control the spread of all weeds to downstream remnants.	

Table 4.16 ZONE A - *to be read in conjunction with map a and General Recommendations*				
Area	Description / Issues	Priority	Actions	Comments/check
	Fire		Exclude	

Table 4.16 ZONE A - *to be read in conjunction with map a and General Recommendations*

Area	Description / Issues	Priority	Actions	Comments/check
S33 Sth.	**Degraded ESBS**	111		
	Bush regeneration	High	Follow all General Recommendations for *Acetosa sagittata* (Acetosa).	
		Med	Systematically remove other weeds.	
	Fragmentation	High	Close informal tracks	
		Med	Use bush regeneration techniques to consolidate track areas.	
		Low	Join fragments	
	Edge	High	Modify present treatment. Follow General Recommendations for edge.	
	Fire	Low	Consider after bush regeneration has been carried out for 5 years. Use mechanical disturbance to assess regeneration potential before attempting.	
S33 Nth.	**Planted out degraded Heath remnant**	111		
	Weed control	High	Follow all General Recommendations for *Acetosa sagittata* (Acetosa).	
		Med	Control the spread of weeds to other remnants.	
	Fire		Exclude.	

Figure 43 Zone B Management issues

Table 4.17 ZONE B - *to be read in conjunction with map B and General Recommendations*

Medium sized ESBS remnant incorporating S1 & S3

Area	Description/Issues	Priority	Actions	Comments/check
S1	**ESBS in variable condition**	1		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Control perennial grasses initially and systematically remove from better areas.	
		Med	<u>Perennial grasses</u> Continue to push out from better areas. Spray grasses in open areas Use combination of hand weeding and target spraying (Fusilade/low concentrations of Glyphosate) within remnant Follow all General Recommendations for perennial grasses. <u>Other weeds</u> Control and gradually remove. Work from better areas outwards.	
	Senescence	Med	Exclude fire in the medium term. Attempt mechanical disturbance.	

Table 4.17 ZONE B - *to be read in conjunction with map B and General Recommendations*

Medium sized ESBS remnant incorporating S1 & S3

Area	Description/Issues	Priority	Actions	Comments/check
S3	**ESBS in generally good condition**	1		
	Bush regeneration	High	Perennial grasses Treat throughout 6 times/year Spray in open areas Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant. Follow all General Recommendations for perennial grasses. Other weeds Work through core area treating all weeds twice a year.	
	(a) Localised weed plumes along paths and tee (grasses and annuals)	High	Stop spread into remnant. Control 4 times /year Use combination of hand removal and spray application	

Table 4.17 ZONE B - *to be read in conjunction with map B and General Recommendations*

Area	Description/Issues	Priority	Actions	Comments/check
S6 & S7	**Degraded moist and dry heath**	111		
	Weed control	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Target *Cortaderia selloana* (Pampas Grass).	
		Med	Control spread of weeds to other areas.	
S8	**Degraded but diverse CSH remnant**	111		
	Weed control	High	Target *Cortaderia selloana* (Pampas Grass).	
		Med	Stop spread of weeds to other areas.	
	Bush regeneration	Low	Consolidate better areas.	
S17	**ESBS in poor condition**	11		
	Bush regeneration	High	Control spread of *Hydrocotyle bonariensis* (Hydrocotyle). Control spread of *Stenotaphrum secundatum* (Buffalo Grass).	
		Med	Remove *Stenotaphrum secundatum* (Buffalo Grass) gradually. Do not remove in areas where it forms a barrier to *Hydrocotyle bonariensis* (Hydrocotyle) .	
			Remove *Olea europaea* ssp. *africana* (African Olive). Control spread of all weeds to better areas.	
		Low	Consolidate better areas.	

Table 4.17 ZONE B - *to be read in conjunction with map B and General Recommendations*

Area	Description/Issues	Priority	Actions	Comments/check
S17 cont.	Fragmentation	Low	Widen and join using bush regeneration techniques after consolidation has been achieved.	
	Fire	Low	Exclude Trial mechanical disturbance.	
S18	**Sedgeland around lake**			
	Weed control (St. Michaels to carry out).		Control spread of *Paspalum* sp. Water weeds Prevent further spread of *Ludwigia peruviana* (Ludwigia). Monitor extent and target any new infestations. Hand weed seedlings and use cut and paint techniques to minimise chemical use around lake. Monitor spread of *Nymphaea* sp. (Water Lily).	
S19	**Sedgeland around lake**			
	Weed control (St. Michaels to carry out).		Follow recommendations as for S18	

Figure 44 Zone C management issues

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S4	**Sedgeland around drainage lines within ESBS**	1		
	Approach (water borne propagules)	Imm/on	Carry out all weed control from the top of the drainage line (within St. Michael's property originates in S25). Where complete removal is not possible, control spread.	
	Weed control	High	Remove/stop spread of *Cortaderia selloana* (Pampas Grass) along drainage line.	
		Med	Control spread of other weeds to other areas where possible.	
		Low	Leave *Ludwigia peruviana* (Ludwigia) in place unless specific long term funding and viable treatment options become available.	
S15	**ESBS in moderate condition with highly altered areas**	1		
	Trimming	Med	Follow General Recommendations for trimming.	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S15 cont.	Around 16th tees	High	<u>Perennial grasses</u> Work around tees first. Stop movement into remnant using a combination of techniques including severing stolons and spray treatment. Maintain edge 4 times/year Work from inside remnant up to tees. Treat throughout 4 times/year Spray in open areas Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant Follow General Recommendations for perennial grasses.	
	Senescence	Med/ High	Carry out burns after significant bush regeneration gains have been made.	
	Drainage line	High	Remove *Erythrina* x *Sykesii* (Coral Tree).	
		Med	Gradually remove *Pennisetum clandestinum* (Kikuyu) and *Ehrharta erecta* (Ehrharta) from the top of the slope down.	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S15 cont.	Cleared dumping area (work to be carried out by Golf Course Staff)	Imm/on	Peg extent of area and do not allow to expand.	
		High	Control all weeds to prevent movement into remnant. by slashing/mowing to prevent seeding. Install silt fence around edge of cleared area to prevent movement of weed propagules.	
S16	**Degraded ESBS**	1		
	Soils	Imm/on	Ensure care is taken to protect soils on slope towards drainage line (eroded). These areas are unstable and may have little native seed bank.	
	Senescence	Imm	Exclude fire initially .	
		Med	Trial mechanical disturbance in 2m x 2m quadrat around dead *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush). If native regeneration occurs at higher rates than for undisturbed areas, carry out treatment in mosaics across slope.	
		Low	Consider fire if good regeneration occurs within 5 years.	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S16 cont.	Bush Regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa).	
		Med	Carry out control of all weeds in mosaics over small areas. Allow for follow up 4 times/year within the first year. If little or no regeneration occurs over 2 years, concentrate on control of weed spread to better areas.	
	Track	High	Close to all traffic excluding bush regenerators.	
		Low	Rehabilitate using bush regeneration techniques	
S23	**ESBS and wet heath* in generally good condition** with degraded drainage line	1		
	Tracks	Imm	Close western track.	
		High	Close eastern track immediately after completion of new bridge.	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S23 cont.		Med	Rehabilitate using bush regeneration techniques. Spray grasses with 'Fusilade' over 3-4 sessions. Work out from remnant edge and follow up. Continue to extend as regeneration occurs.	
	Irrigation overthrow	Imm/ on	Modify irrigation system around championship tee. Additional water is facilitating weed plume.	
	Trimming	Imm/ on	Modify current practices. Follow General Recommendations for trimming.	
		Med	Consider the use of fire to maintain sight lines. Burn only if good regeneration occurs in adjacent areas .	
	Fragmentation along edges	Med	Consolidate areas along southern edge Rehabilitate using bush regeneration methods as above (tracks).	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Large ESBS remnant incorporating S4, S15, S16 & S23

Area	Description/Issues	Priority	Actions	Comments/check
S23 cont.	Senescence	High	Treat *Elaeocarpus reticulatus* (Blueberry Ash) throughout after controlling grasses. Drill large individuals and leave in-situ. Hand remove/cut and paint small individuals.	
		Med	Use burn to stimulate soil seed bank. Follow General Recommendations for fire.	
	Bush regeneration	High	Follow General Recommendations for *Delairea odorata* (Cape Ivy) and *Acetosa sagittata* (Acetosa). Consolidate by treating all weeds in better areas	
		Med	Treat grasses throughout 4 times/year. Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate) within remnant. Follow General Recommendations for perennial grasses Continue to consolidate by treating all weeds, working out from better areas.	
	Drainage line	Low	Treat as for S4 Exclude fire	

Table 4.18 ZONE C - *to be read in conjunction with map C and General Recommendations*

Area	Description/Issues	Priority	Actions	Comments/check
S22	**Degraded, fragmented ESBS with planted out area**	11		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Contain spread of all other weed propagules to other remnants.	
		Med	Contain the spread of *Pennisetum clandestinum* (Kikuyu). Consolidate better areas	
	Senescence	Low	Trial mechanical disturbance.	
	Fire		Exclude.	
S28 & S29	**Long narrow strip of CDH)** (generally good quality with high edge impacts)	11		
	Informal tracks	High	Close to prevent buggy access into remnant.	
	Bush regeneration	High	Consolidate areas of good bush by pushing out from better areas 4 times/year.	
		Med	Control the spread of weeds from degraded edge.	
	Fire	Low	Exclude whilst edge is in degraded condition. Consider after significant improvements in weed density.	

Figure 45 Zone D management issues

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS remnant incorporating S5, S24 & S25

Area	Description/Issues	Priority	Actions	Comments/check
S5	**Diverse and healthy ESBS**	1		
	Bush Regeneration	High	Control and remove *Eragrostis curvula* (African Love Grass) and *Cynodon dactylon* (Common Couch) in the first year. Spray in open areas Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant Follow General Recommendations for perennial grasses. Work through treating all weeds 4 times /year	
		Med	Continue to work from better areas out.	
	Path to west of drainage line	Imm	Close to all traffic (except bush regenerators)	
		High	Spray grasses with 'Fusilade' over 3-4 sessions. Work out from remnant edge and follow up. Continue to extend as regeneration occurs.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS remnant incorporating S5, S24 & S25

Area	Description/Issues	Priority	Actions	Comments/check
S5 cont.	Fragmentation	Med	Consolidate isolated patches to north of main remnant area. Spray grasses with 'Fusilade' over 3-4 sessions. Work out from remnant edge and follow up. Continue to extend as regeneration occurs. Use mechanical disturbance to stimulate germination of soil seedbank.	
	Habitat		Pay particular attention to the presence of frogs in the drainage line.	
	Fire	Low	Exclude until area around drainage line shows significant improvement.	
S24	**Diverse and healthy ESBS**	1		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Contain *Hydrocotyle bonariensis* (Hydrocotyle) to prevent spread	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS remnant incorporating S5, S24 & S25

Area	Description/Issues	Priority	Actions	Comments/check
S24 cont.	Bush regeneration cont.	High	<u>Perennial Grasses</u> Control and remove grasses including *Paspalum* sp. and *Cortaderia selloana* (Pampas Grass) within the first year. Treat throughout 6 times in the first year. Spray in open areas. Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant Follow General Recommendations for perennial grasses. <u>Other weeds</u> Work through treating all other weeds 6 times /year	
		Med	Continue consolidation by working throughout better areas treating all weeds.	
	Consolidation/extension of remnant along southern edge.	Med	Spray grasses with 'Fusilade' over 3-4 sessions. Work out from remnant edge and follow up. Continue to extend as regeneration occurs.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS remnant incorporating S5, S24 & S25

Area	Description/Issues	Priority	Actions	Comments/check
S24 cont.	(a) Cleared planted edge within ESBS	High	Control all weeds 6 times/year (bush regenerators). Follow all General Recommendations for maintenance.	
		Med	Peg or tag plantings to identify. Remove mulch. Mechanically disturb soil to stimulate soil seed bank. Remove plantings gradually if good regeneration occurs.	
	Fire	Low	Consider after area around drainage line shows significant improvement. Follow General Fire Recommendations for moist heath.	
S25	**Wet ESBS** with channelled drainage line	1		
	Bush regeneration	High	Work out from remnant towards drainage line treating all weeds 6 times/year.	
	Drainage line	Low	Control/contain weeds to prevent spread down drainage line. Start from the top of drainage line. Work from the top of the slope downwards.	
	Fire	Low	Follow General Fire Recommendations for moist heath.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*				
Long narrow remnant incorporating S13 & S35				
Area	Description/Issues	Priority	Actions	Comments/check
S13	**Highly degraded heath** with channelled drainage line adjacent to road.	111		
	Fragmentation and weed invasion	Med	Prepare area to carry out reinforcement plantings. Spray grasses (where possible) before planting out. Follow General Recommendations for planting.	
	Weed dispersal	Med	Control spread to better areas, particularly via drainage line.	
	Fire		Exclude	
S14	**Degraded planted out heath**	111		
	Weed dispersal			
	Fire			
S35	**Narrow strip of degraded wet heath***	111		
	Bush regeneration	High	Control the spread of grasses to better areas.	
		Med	Control spread of all weeds to better areas.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS and CSH remnant incorporating S20 & S21

Area	Description/Issues	Priority	Actions	Comments/check
S20	**Fragmented ESBS and moist CSH in moderate condition**	11		
	Edge	Imm/on	Modify edge treatment. Follow General Recommendations for edges.	
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). <u>Perennial Grasses</u> Treat throughout 6 times in the first 2 years. Consolidate better areas first. Spray in open areas Use combination of hand weeding and spraying (Fusilade/low concentrations of Glyphosate)within remnant. Follow General Recommendations for perennial grasses. <u>Other weeds</u> Treat all weeds in better areas 4 times / year.	
		Med	Continue to consolidate better areas.	
S20 cont	(b)Fragmentation	Med	Reduce access between 13th and 14th fairways to one path. Close off completely if possible. Use regeneration techniques described in S5. Trial mechanical disturbance. If effective after 1 year, continue to use.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*

Medium sized ESBS and CSH remnant incorporating S20 & S21				
Area	Description/Issues	Priority	Actions	Comments/check
	Fire	Low	Exclude fire till bush regeneration and consolidation are well advanced.	
S21	**Diverse and healthy ESBS**	11		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Treat all other weeds 4 times / year. Consolidate better areas first.	
	Fire	Med	Consider fire when *Acetosa sagittata* (Acetosa) and grasses are controlled.	

Table 4.19 ZONE D - *to be read in conjunction with map D and General Recommendations*				
Small ESBS and wet heath remnant incorporating S27 & S36				
Area	Description/Issues	Priority	Actions	Comments/check
S27	**ESBS in good condition** with degraded edge	11		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Target *Cortaderia selloana* (Pampas Grass). Work to expand area of good bush. Treat all weeds 4 times/year.	
	Fire	Low	Follow General Recommendations for fire.	
S36	**Wet heath* in variable condition**	11		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Control spread of all weeds to S27.	
		Med	Consolidate by working from good areas following drainage flow.	
	Planted edge	High	Maintain regularly to stop dispersal of weeds.	
	Habitat	Imm/on	Consider the presence of frogs	

Figure 46 Zone E management issues

Table 4.20 ZONE E - *to be read in conjunction with map E and General Recommendations*

Large ESBS, CDF and LRF remnant adjoining the NSWGC incorporating S2, S40 & S41

Area	Description/Issues	Priority	Actions	Comments/check
S2 & S40	**Extensive area of Coastal dune forest and ESBS in variable condition**.	1		
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Control spread of *Stenotaphrum secundatum* (Buffalo Grass) and other grasses. Consistently treat all weeds working from the good core outwards.	
	Fire	Med	Prepare for burn after secondary weed work has been undertaken. Co-ordinate with NSWGC for combined burn.	
	High habitat values	Imm/ on	Show particular attention to habitat recommendations.	
	(a) Mined area within ESBS	High	Control spread of weeds to areas of good bush Control *Cynodon dactylon* (Common Couch) with 'Fusilade'. Avoid opening *Lantana camara* (Lantana) canopy where grasses are likely to invade Exclude fire if possible	
	(b) Degraded edge to road	High	Follow General Recommendations for vines. Control the spread of grasses into better part of remnant.	

Table 4.20 ZONE E - *to be read in conjunction with map E and General Recommendations*

Large ESBS, CDF and LRF remnant adjoining the NSWGC incorporating S2, S40 & S41

Area	Description/Issues	Priority	Actions	Comments/check
S2 & S40 cont	Senescence	Med	Prepare for fire in good areas after significant bush regeneration work has been completed. Keep fire out of disturbed edges towards road.	
	Bush regeneration	Med/High	Work from good areas out and consistently control all weeds.	
S41	**Littoral Rainforest in fair condition**	1		
	Approach	High	Liase with NSWGC to have co-ordinated approach.	
	Bush regeneration	High	Control *Ehrharta erecta* (Ehrharta) before continuing primary removal of *Lantana camara* (Lantana).	
		Med	Gradually continue primary work as native regeneration occurs.	
	Fire		Exclude	

Table 4.20 ZONE E - *to be read in conjunction with map E and General Recommendations*

Large ESBS, CDF and LRF remnant adjoining the NSWGC incorporating S30, S31 & S32

Area	Description/Issues	Priority	Actions	Comments/check
S30	**ESBS and heath/forest in moderately good condition with localised degradation**	11		
	Trimming	High	Follow General Recommendations for trimming.	
	Road edge	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Control I*pomoea cairica* (Coastal Morning Glory) around canopy.	
		Med	Control all other weeds to avoid spread. Treat and remove vine weeds.	
	(c) Highly degraded area Contains some pockets of good regeneration	High	Control *Ipomoea cairica* (Coastal Morning Glory). Keep out of better areas	
		Med	Control all other weeds. Keep out of better areas.	
		Low	Consolidate better areas.	
	(**d)** Exposed jute-meshed bank	High	Stabilise soil with plantings. Follow General Recommendations for planting.	
		Med	Control weeds so they do not spread to better areas. Pay particular attention to grasses.	

Table 4.20 ZONE E - *to be read in conjunction with map E and General Recommendations*

Large ESBS, CDF and LRF remnant adjoining the NSWGC incorporating S30, S31 & S32

Area	Description/Issues	Priority	Actions	Comments/check
S31 cont.	**ESBS in generally moderate to poor condition**	11		
	Trimming	High	Follow General Recommendations for trimming.	
	Bush regeneration	High	Follow General Recommendations for *Acetosa sagittata* (Acetosa). Consolidate good areas consistently controlling all weeds 6 times / year.	
	Edge	High	Modify current practices. Follow General Recommendations for edge.	
	Senescence	Med	Prepare for fire after significant bush regeneration work has been completed.	
S32	**ESBS with localised degradation**	1		
	Bush Regeneration	High	Treat grasses throughout. Follow General Recommendations for perennial grasses.	
			Carry out primary work. Cut and paint *Lantana camara* (Lantana) to lift fuel load	
	Senescence	High	Prepare for burn after removal of grasses and Lantana treatment. Follow General Recommendations for fire.	

Table 4.20 ZONE E - *to be read in conjunction with map E and General Recommendations*

Large ESBS, CDF and LRF remnant adjoining the NSWGC incorporating S30, S31 & S32

Area	Description/Issues	Priority	Actions	Comments/check
S32 cont.	**(e)** Previously mined area in ESBS	High	Control spread of grasses. Deseed grasses/annuals before carrying out burn throughout remnant.	
		Med	Control spread of all weeds to other areas.	
S34	**Mixed Remnant and planting in poor condition**	111		
	Weed control	Med	Control spread of weeds to other areas.	
	Fire		Exclude.	

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APPENDIX

LEGISLATION

Pesticides Amendment (User Training) Regulation 2003
(gazetted 29.8.03) requires users of pesticides for commercial or occupational purposes, or in connection with agricultural or forestry operations, to be trained to particular levels of competency in pesticide use by 1 September 2005. From that date, it will be an offence for a person to use a pesticide without the required qualifications, or to engage such a person to use a pesticide, in those circumstances. It will also be an offence for a person to falsely represent that the person has the required qualifications. There are some limited exceptions to the training requirement, including where small quantities of pesticides available to the general public which are commonly used for domestic purposes are applied by hand or hand-held equipment, or where an unqualified person is being directly supervised by a qualified person in certain circumstances. For more information on the new training requirements, see Pesticides Training.

APPENDIX

LEGISLATION

Threatened Species Conservation Act (TSC Act 1995)
The TSC Act includes the following objectives:
Prevent extinction and promote the recovery of threatened species, populations, and ecological communities
Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed
Encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving cooperative management.

Threatened species, populations and ecological communities are listed in schedules under the Act. The NSW Scientific Committee makes a final determination regarding threatened ecological communities, and the community is then gazetted. The Final Determination is understood to be the legal definition of the ecological community.
A list of characteristic species is included in the Final Determination. The species present in endangered communities are not limited to this list, nor do all species need to be present.

Under the TSC Act it is an offence to harm or pick threatened species, populations and ecological communities (plants), or to damage their habitat. Picking includes to gather, pluck, cut, pull up, destroy, poison, take, dig up, remove or injure the plant or any part of the plant.

Some of the activities currently undertaken at St. Michael's including clearing for paths, lopping to improve sight lines, planting, fertilising, watering, mulching and even weeding, constitute picking under the Act.

LICENCES

Any work which may impact on threatened ecological communities requires a licence. Two licences currently cover all activities and must be applied for *before the commencement of any work:*

Section 91 (under the TSC Act)
When construction/ maintenance work and ecological burns are planned, a licence must be applied for under Section 91. If these activities are not likely to have an adverse affect on threatened ecological communities, the licence is granted.

Submissions must be made to the NPWS officer within the local council area. At present, contact details are:
Martin Bremner
Threatened Species Unit, Department of Environment and Conservation

Penalties for harming or picking Eastern Suburbs Banksia Scrub without a Section 91 Licence, when one is required, include: fines up to $220,000, imprisonment for up to two years and the costs of damage mitigation and habitat restoration.

The Threatened Species Conservation Act 1995 also has other provisions, including: declaration of critical habitat, threat abatement plans, stop work orders and joint management agreements.

Section 132c (under the NP&W Act)
When ecological restoration work is planned (bush regeneration, seed collection etc.), a licence must be applied for under section 132c. This licence takes into account accumulative effects across the ecological community's range.

Application forms can be accessed on the web at scientific_licence_application.pdf

Submissions must be made to the NPWS Threatened Species Unit. At present, contact details are:
Brendan Nielly
NPWS Head Office
9585 6444

Recovery Plans

A Final Recovery Plan for ESBS was completed in February 2004.

The plan can be viewed on the NPWS website at recovery_final_esbs.pdf

No Recovery Plan has been made for Littoral Rainforest to date.

ENDANGERED ECOLOGICAL COMMUNITIES

EASTERN SUBURBS BANKSIA SCRUB (ESBS)
A profile of this community can be found on the NPWS website at
eecinfo_eastern_suburbs_banksia_scrub.pdf

LITTORAL RAINFOREST (LR)
A copy of the final determination to list this community is available on the NPWS website at
Littoral rainforest

WEEDS

Major weed species present at St. Michael's

Summer 2004

Vines and scramblers
Acetosa sagittata (Turkey Rhubarb)
Anredera cordifolia (Madeira vine)
Ipomoea cairica (Coastal Morning Glory)
Delairea odorata (Cape Ivy)
Lonicera japonica (Honeysuckle)
Protasparagus plumosus (Climbing asparagus)
Protasparagus aethiopicus(Asparagus fern)

Water
Ludwigia peruviana (Water Primrose)
Nymphaea sp (Giant Water Lily)

Woody
Erythrina x sykesii (Coral Tree)
Chrysanthemoides monilifera subsp. *rotundata* (Bitou Bush)
Lantana camara (Lantana)
Pittosporum undulatum (Sweet Pittosporum)
Ageratina adenophora (Crofton Weed).
Senna pendula var. *glabrata* (Senna, Cassia)
Coprosma repens (Mirror Bush)
Olea europaea subsp. *africana* (African Olive)
Phoenix canariensis (Phoenix palm)

Herbaceous
Bidens pilosa (Cobblers Pegs)
Conyza sp. (Fleabane)
Hydrocotyle bonariensis (Kurnell curse)
Hypochaeris radicata (Flatweed)
Solanum nigrum (Blackberry Nightshade)
Senecio madagascariensis (Fireweed)
Nephrolepis cordifolia (Fishbone Fern)

Grasses
Andropogon virginicus (Whisky Grass)
Briza maxima (Quaking Grass)
Cynodon dactylon (Common Couch)

Stenotaphrum secundatum (Buffalo Grass)
Pennisetum clandestinum (Kikuyu)
Ehrharta erecta (Panic Veldt Grass)
Eragrostis curvula (African Love Grass)
Cortaderia selloana (Pampas Grass)
Paspalum dilatatum (Paspalum)
Paspalum urvilli

Noxious within the Randwick LGA

A number of noxious weeds are present on the course. A list of declared noxious weeds within Randwick City Council can be found at Randwick City Council noxious weeds

FAUNA

A fauna survey was not within the scope of this plan. Information adapted from the *NPWS Plan of Management for Botany Bay National Park* follows. These records give a good guide to what species are likely to be utilising St. Michael's. Uses may be permanent or seasonal and include feeding, nesting and breeding.

Botany Bay National Park has not been subject to a systematic fauna survey. Consequently, there is potential for a greater range of fauna species than currently known. This applies particularly to herpetofauna (amphibians and reptiles) and microceropteran (insectivorous) bats, two groups that require relatively specialised survey techniques for detection.

Notwithstanding the above, native animals which are known to be present in the La Perouse section of the park include:

MAMMALS

Brush-tailed possums (*Trichosurus vulpecula*),
Ringtail possums, (*Pseudocheirus peregrinus*),
Grey-headed flying foxes (*Pteropus poliocephalus*),
Bent-wing bats (*Miniopterus schreibersii*)
Echidnas (*Tachyglossus aculeatus*)

SNAKES

Eastern brown snakes (*Pseudonaja textilis*) and
Red-bellied black snakes (*Pseudechisporphyriacus*).

BIRDS

Over 70 native bird species have been recorded in the La Perouse section of thepark and 96 species have been recorded in the Kurnell section. They include several species listed under the Japan-Australia Migratory Birds Agreement (JAMBA).

Species of state, regional or local significance include:
Japanese snipe(*Gallinago hardwickii*),
Whimbrel (*Numenius phaeopus*),
Arctic jaeger (*Stercorarius parasiticus*),
Red-necked stint (*Calidris ruficollis*),
Common eastern tern (*Sterna hirumdo*),
Peregrine falcon (*Falco peregrinus*),
Powerful owl (*Ninox strenua*) (threatened species)
Australian pipit (*Anthus novaeseelandiae*),
Superb fairy wren (*Malurus cyaneus*), silvereye
(*Zosterops lateralis*),
Red-browed finch (*Neochmia temporalis*)
New Holland honeyeater (*Phylidonyris novaehollandiae*).

Unusual species for the area are the Variegated fairy-wren (*Malurus lamberti*) and Golden-headed cisticola (*Cisticola exilis*).

PLANTING