



Bushfire Management Plan

Scotland Island

Adopted 8th October 2007

Prepared for

Natural Resources Unit

by

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CONTENTS

1.	EXECUTIVE SUMMARY	1
2.	PROJECT STATUS	1
3.	MAJOR LEGISLATIVE AND POLICY DOCUMENTATION RELATIVE TO SCOTLAND ISLAND	2
4.	DESCRIPTION OF THE ISLAND	3
4.1	Physical Description of the Island	3
4.1.1	Location	3
4.1.2	Terrain	3
4.1.3	Flora.....	3
4.1.4	Fauna	4
4.1.5	Heritage and Cultural Issues.....	5
4.2	Community Profile.....	5
4.2.1	The People.....	5
4.2.2	Community Values.....	5
5.	CONSULTATION	6
5.1	Community	6
5.1.1	Individual Views	6
5.1.2	Stakeholder meeting	6
5.1.3	Scotland Island Residents' Association.....	6
5.1.3	Scotland Island Rural Fire Brigade.....	6
5.1.4	Exhibition of the Draft Bushfire Management Plan for Scotland Island	7
5.2	Agency Consultation.....	7
6.	FIRE HISTORY.....	7
7.	FACTORS LIKELY TO INFLUENCE FIRE BEHAVIOUR.....	8
7.1	Aspect.....	8
7.2	Slope	9
7.3	Surface Characteristics.....	9
7.4	Fuel Characteristics	10
7.5	Fire Weather	10
7.6	Expected Fire Behaviour	11
8.	IDENTIFY ASSETS AT RISK.....	11

8.1	Preamble – The Risk Management Process	11
8.2	Methodology	12
8.3	Potential Ignition Sources	13
8.3.1	Ember Shower	13
8.3.2	Structural Fire	13
8.3.3	Motor Vehicles	15
8.3.4	Accidental Causes	15
8.3.5	Lightning	15
8.3.6	Arson or Deliberate Ignition	15
8.4	Residential Properties	15
8.5	Public Buildings	15
8.6	Electricity Supply and Assets	16
8.7	Water Supply – Domestic	16
8.7.1	Background.....	16
8.7.2	Fire Risk to the System.....	17
8.8	Environmental Assets	17
8.9	Fire Risk Analysis for Roads and Trails	18
8.10	Risk Analysis of Council Reserves	18
8.10.1	Catherine Park	18
8.10.2	Pathilda Reserve.....	18
8.10.3	Harold Reserve.....	18
8.10.4	Leahvera Reserve	18
9	FIRE MITIGATION CONSIDERATIONS	19
9.1	Mitigation Concepts	19
9.2	Burning	19
9.3	Mechanical/Manual Fuel Management	20
9.4	Other Fuel Management Options	20
9.5	Sensitive Areas	21
9.6	Biodiversity	21
9.7	Asset Protection Zones	22
9.8	Mitigation of Risks on Private Land	23
9.9	Standards of Building Construction	24
10	FIRE MANAGEMENT ZONES	25
10.1	General	25

10.2	Areas Suitable for Hazard Reduction by Burning	26
10.3	Areas Suitable for Alternative Hazard Reduction Methods	26
10.4	Initial Fire Regimes.....	26
10.5	Environmental Impact Assessment and Burn Plans.....	27
11	MONITORING FIRE REGIMES AND BIODIVERSITY	28
12	FIRE FIGHTING OPERATIONS	28
12.1	A Vulnerable Community	28
12.2	Water Supply – Fire fighting	29
12.3	The Serviceability of Roads and Trails	30
12.4	Access to the Island.....	31
12.5	Warning Systems	32
13.	COMMUNITY INVOLVEMENT	32
14.	REVIEW OF FIRE MANAGEMENT PLAN.....	33
15.	RECOMMENDATIONS	34
16.	ACTIONS AND PRIORITY	37
17.	CONCLUSION.....	45
18.	ACKNOWLEDGEMENTS	46
19.	ANNEXURES	47

1. Executive Summary

Despite the number of Recommendations and Action Points, there are but four major fire management issues:

- The roads and tracks are sub standard across much of the island for safe use during a serious bushfire incident.
- The ground fuel and shrub layer is excessive and in conjunction with the steepness of the terrain, control of a bushfire will most likely be extremely difficult if not impossible.
- The water service to the island is inadequate for domestic purposes for a number of reasons, despite the best intentions of the community. For other than a relatively minor fire event in a localised area, the water supply will not cope with the demand.
- The last major bushfire event on Scotland Island occurred in 1939. In 1994, ember shower from a fire in Ku-ring-gai Chase national Park occurred on the island but on that occasion, the local brigade and the community managed to extinguish the hot spots. On that occasion the community was very fortunate. Indications are that mainly through a change of attitude, perhaps complacency, the community is less prepared now than it was back in 1994.

Pittwater Council is in a difficult position in trying to deliver service to the Scotland Island community. To be able to provide the same level of service on the island that it does to other residents would be cost prohibitive but it would also totally destroy the unique island environment.

Fire protection for the residents is essential and within this plan, initiatives have been identified that, with co-operation from both upper levels of government, various agencies, the Rural Fire Service and the Scotland Island community, an acceptable level of bushfire protection is achievable. Failure by any of these groups of people places the entire program at risk.

Under the current circumstances, “a major bushfire incident is more of a probability than a possibility and it is really a matter of when”. Co-operative implementation by relevant stakeholders of the plans recommendations (Section 15) via the actions and priorities detailed in Section 16 can markedly reduce the intensity and impact of that fire when it happens.

2. Project Status

This Fire Management Plan has been prepared under contract to Pittwater Council. The Fire Management Plan (the Plan) applies to the whole of Scotland Island. The Plan encompasses the four bushland reserves: Elizabeth Park, Harold Reserve, Leahvera Reserve and Pathilda Reserve; the Catherine Park passive recreation reserve, the road reserves and private land holdings. The Plan contains suggested fire management activities which are aligned with the priorities of protecting life, property and the environment, as stipulated in the Rural Fires Act. These activities should commence in this year, 2006.

Insofar as is practicable, the Plan should be considered in conjunction with the “Urban Bushland Inventory and Action Plan – Central Ward Reserves”, “Parks and Playgrounds Plan of Management” and “Warringah/Pittwater Bushfire Risk Management Plan”.

3. Major Legislative and Policy Documentation Relative to Scotland Island

The following pieces of legislation and other documents as listed have been taken into consideration in the formulation of this Fire Management Plan:

- Brad Jones – Elizabeth Park – Bush Regeneration Report 1994
- Heritage Act 1977
- Local Government Act 1993
- Pittwater Council – Parks and Playgrounds Plan of Management 2000
- Pittwater Council – Urban Bushland Inventory and Action Plan 1997
- Planning for Bushfire Protection 2001
- Rural Fires Act 1997
- State Environmental Planning Policy No 19 – Bushland in Urban Areas
- Threatened Species Conservation Act 1995
- Warringah/Pittwater BFMC – Operations Plan for Major Bushfires on Scotland Island 1997
- Warringah/Pittwater Bushfire Risk Management Plan
- NSW National Parks and Wildlife Service – Draft Fire Management Strategy Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island nature reserve, Spectacle Island nature Reserve and Mt Ku-ring-gai Aboriginal Area.

The management objectives for the bushland reserves are detailed in Pittwater Council's Action Plan. The development of this fire plan is integral to the attainment of those objectives.

Within the Bushfire Risk Management Plan, Scotland Island is identified as follows:

- Bushfire Hazard Classification – **high**
- Environmental Risk Classification – **major**
- Community Risk Classification – **major**
- Bushfire Hazard Management Zone – Land Management Zone (**isolated community**).

Having regard to the proximity of the Bushland Road Reserves to urban development, together with the objectives in “Urban Bushland Inventory and Action Plans” relating to Elizabeth Park and Harold, Leahvera and Pathilda reserves, the following management objectives are deemed to be appropriate to this Fire Management Plan:

- Protect life, property and community assets from the adverse impact of fire;
- Manage fire regimes within the Reserves and Parks to restore, maintain and enhance biodiversity;
- Encourage co-operative and co-ordinated fire management strategies between the Rural Fire Service, Pittwater Council, the wider Scotland Islands community and in particular land owners with assets close to the parks and reserves;
- Minimise the risk of damage by fire to aboriginal sites, historic places and culturally significant features which may exist on the island.

4. Description of the Island

4.1 Physical Description of the Island

4.1.1 Location

Scotland Island is located in the southern end of Pittwater, approximately 450 metres north-east of Church Point and 500 metres from Ku-ring-gai Chase National Park to the west. The island covers an area of 52.5 hectares. It is surrounded by continuously navigable water, although generally, it is extremely shallow adjacent to the island. The only access to the island is by boat.

Location of the island is shown in Annexure 1 (Extract of UBD Map)

4.1.2 Terrain

Scotland Island rises to an east-west running ridge 100 metres above sea level. Parts of the island are very steep with slopes up to 30° being measured. A contour map, Map 2, illustrates the steep topography.

The higher levels of the island are composed of outcrops of Hawkesbury sandstone and soils which are derived from this rock. These parts of the island are classified as geotechnically stable.

The lower portions of the island are comprised of Newport Formation shales and sandstone and their derivative clay based soils. Due to this structure and the steepness of the slopes, these areas have been classified as geotechnically unstable.

There are a number of non-perennial creeks draining the island through Catherine Park, Pathilda Reserve, Harold Reserve, Leahvera reserve and in the gullies which run through private properties in the south and north-west.

There is a network of largely unsealed roads servicing the island: two discontinuous ring roads and a limited number of radial roads. The lower ring road is composed of Florence Terrace, Richard Road and Robertson Road. A private land holding separates Florence Terrace from Richard Road. The upper ring road consists of Thompson Street. The north-western section of this street only exists as an informal walking track due to the steep and rocky terrain. The radial roads are Hilda Avenue, Cecil Street and Harold Avenue in the south of the island and Kevin Avenue in the north. On the eastern side of the island a portion of Elsie Street which connects Thompson Street to Florence Terrace has been converted to a stepped pedestrian access. Aoma Street in the north runs south from Richard Road to service several houses before intersecting the walking track section of Thompson Street. In the west Fitzpatrick Street only exists as a stepped walking track between Thompson Street and Elizabeth Park.

Due to the lack of adequate road drainage, there is considerable erosion along sections of Thompson Street, along the fire trail which runs from Kevin Avenue up to and through Elizabeth Park and down Hilda and Elsie Streets.

4.1.3 Flora

Scotland Island is covered by well established trees on both public and private land. The resulting canopy obscures much of the residential development on the island. On many residential blocks, trees have only been removed to allow construction of the dwelling. There is a wide variation in treatment of the understorey around the houses, ranging from the complete

removal of endemic shrubs and the replacement with cultivated shrubs and lawns, to the almost complete retention of the natural understorey.

Spotted Gum (*Corymbia maculata*) Forest covers the bulk of the island. This forest is partially remnant but mainly regrowth following extensive harvesting of the original forest during the nineteenth century. This forest type is considered significant due to the limited amount of spotted Gum Forest conserved in National Parks and the very limited distribution within the Pittwater area. The only mature trees, in this forest community, are large specimens of Smooth Barked Apple (*angophora costata*) and just a very few spotted gums which were either not mature enough to harvest or had flaws in the trunks.

The Spotted Gum Forest can be described as open-canopy sclerophyll forest. This vegetation group is flammable in dry seasons with most component species being fire tolerant. According to the guidelines in "Planning for Bushfire Protection", it is classed as Group 1 vegetation.

Rainforest communities occur in the lower reaches of the gullies around the island. On the southern side of the island this vegetation extends up the gullies to the southern slopes of Elizabeth Park. Due to the lack of fire on the island, several species of understorey shrubs, Native Daphne (*Pittosporum undulatum*) and Blueberry Ash (*Elaeocarpus reticulatus*) are increasingly encroaching into the surrounding Spotted Gum Community. Rainforest is not tolerant of fire and due to its humid environment, less conducive to fire. However, during extremely dry spells rainforest will become flammable. It is desirable to prevent fire from hazard reductions penetrating deeply into these areas of rainforest.

The spread of Native Daphne and Blueberry Ash is indicative of the long absence of fire from the Spotted Gum Forest and a significant cause (through suppression) of the lack of seedlings of both the Spotted Gum and Smooth Barked Apple.

There is a significant weed problem on the island. The most widespread weeds observed are Lantana (*Lantana camara*) and Asparagus Fern (*Protasparagus aethiopicus*). A range of other weeds and garden escapees, which have the potential to become a significant problem, was also observed: Blackberry (*Rubus ulmifolius*), Black-eyed Susan (*Thunbergia alata*), Camphor Laurel (*Cinnamomum camphora*), Cassia (*Senna pendula*), Coral Tree (*Erythrina x sykesii*), Crucifix Orchid (*Epidendrum ibaguense*), Formosa Lily (*Lilium formosanum*), Honeysuckle (*Lonicera japonica*), Morning Glory (*Ipomoea indica*), Moth Vine (*Araujia sericifera*), Paddy's Lucerne (*Sida rhombifolia*), Polygonum or Bokhara (*Fallopia baldschuanica*), Privet – Broad-leaved (*Ligustrum lucidum*) and Small-leaved (*Ligustrum sinense*) and Wandering Jew (*Tradescantia fluminensis*).

4.1.4 Fauna

The vegetation on the island supports a small range of resident birds and animals and a larger range of visiting birds and bats. Amongst these are three threatened bird species: Glossy Black Cockatoo (*Calyptorhynchus lathami*), Powerful Owl (*Ninox strenua*) and Noisy Pitta (*Pitta versicolor*). Additionally there are two threatened bat species: Common Bent-wing Bat (*Miniopterus schreibersii*) and Greater Broad-nosed Bat (*Scoteanax ruepelli*).

Glossy Black Cockatoos would be the most adversely affected of these species, by bushfires on the island, as under extreme fire conditions, their major food source, *Alocasuarina torulosa*, would be severely damaged or killed.

Additionally, there are several mammals found on the Island including the: Common Brushtail Possum (*Trichosurus vulpecula*); Common Ringtail Possum (*Pseudocheirus peregrinus*); and the Short-beaked Echidna (*Tachyglossus aculeatus*).

4.1.5 Heritage and Cultural Issues

There are no registered sites of either Aboriginal or European heritage within the fire susceptible areas of the island. However, there is an aboriginal midden located to the south of Cargo Wharf. This site is currently at risk of damage from the existing movement of vehicles and heavy freight by barge which unloads onto the shore on the southern side of Cargo Wharf. In the event of a major fire on Scotland Island, the movement of additional resources to the island would increase the risk to this shell deposit site.

There are rock sculptures close to Bells Wharf. These were created by a Joseph Benn in the latter half of the nineteenth century. The sculptures are understood to be on the shoreline and not vulnerable to fire damage.

4.2 Community Profile

4.2.1 The People

Initial European settlement on Scotland Island took place in 1809 when the bulk of the island was granted to one Andrew Thompson. There was no significant population growth until a 1920s subdivision. The population then grew slowly, with the bulk of the residents being weekenders.

From the 1960s when electricity was brought to the island, the population steadily increased, accompanied with a change of use from predominantly weekenders to predominantly permanent residents. The 2001 Census indicated a total population of 730.

At present the population is closer to 1,000 people, rising to 1200 on weekends and holiday seasons. There is a small amount of tourist accommodation on the island attracting some tourist visitation.

4.2.2 Community Values

As the population has grown there has been a change in community values and expectations. There appears to have been three distinct stages of development on the island: firstly, the island would have been regarded as an affordable site for weekenders; secondly, an affordable site for permanent cottages and finally as a desirable and expensive site for urban living without being a part of suburbia.

During the first stage (1920 to 1960), residents would have accepted basic housing with a total reliance on rain water and a basic road system which serviced largely pedestrian movement.

There was a high level of community spirit. Towards the end of this period they were starting to look for community services which they themselves could provide: Progress Association and Bushfire Brigade.

During the second stage (1960 to 1990), residents began to seek improved services: a better road system and an emergency water supply system to supplement their reliance on rainwater. They were starting to expect similar services to those provided to mainland residents. As a result there is now mains electricity and telephone supplied to the island.

During the final stage (1990 to present), the island community is splitting into factions. There are still residents who are content to rely on the basic infrastructure that now exists, however there are others who want equal service parity with the mainland. There are many residents who rely exclusively on the de facto water supply to the island for almost all of their water needs, despite the fact that the service does not meet potable water standards. Most people have an expectation that all the roads should be upgraded, perhaps even sealed and that a normal suburban water supply should be provided by Sydney Water.

Some members of the community belong to either Scotland Island Residents Association or Scotland Island Rural Fire Brigade, but not both, some members belong to both while other people belong to neither. There are probably subtle divides between long term residents, newly arrived residents and weekenders.

5. Consultation

5.1 Community

The views of the Scotland Island Community have been canvassed in regard to the project. In the initial stages three consultative strategies have been used with further opportunity for input scheduled for later in the program. Various agencies were also contacted as part of the consultative process.

Community opinion was also canvassed at a stakeholders' meeting chaired by a Pittwater Council staff member.

5.1.1 Individual Views

Around the island there are a number of community notice boards. In an open letter to the residents, they were invited to directly email or mail their comments and concerns apropos the development of the plan.

The development of the plan also benefited from face to face discussions with individual residents during the field inspections upon the island.

5.1.2 Stakeholder meeting

A stakeholder meeting was held on the island at the Community Centre on the 6th May 2006. This meeting was well attended with several issues becoming apparent. Twenty six people attended with the meeting chaired by Pittwater Council. Brian Parry and Associates and NSW Rural Fire Service Staff were also in attendance.

5.1.3 Scotland Island Residents' Association

In the early stages of the project a meeting was convened with a group of people from the executive of the Scotland Island Residents' Association. At this meeting the project was explained in some detail to the attendees and an invitation extended for the Association to provide input on relevant issues for consideration within the project.

5.1.3 Scotland Island Rural Fire Brigade

A meeting with the brigade executive and other members was convened to outline to the brigade the objectives for the project and to invite input on issues, both negative and positive, that influence the level of fire prevention and protection upon the island.

5.1.4 Exhibition of the Draft Bushfire Management Plan for Scotland Island

The Draft Bushfire Management Plan for Scotland Island was placed on public exhibition between the 8th July and the 5th August 2006, with 10 submissions received. Generally, the issues raised in the submissions related to: the impacts on the environment; the level and condition of the islands infrastructure; and the need for community education.

5.2 Agency Consultation

The following agencies were contacted in regard to the development of a Bushfire Management Plan for Scotland Island. On being made aware of the project, each was invited to have input to the project by identifying relevant issues:

- Energy Australia
- NSW RFS (District Office)
- NSW FB (Regional Office)
- NSW National Parks & Wildlife Service (Sydney North Region)
- Pittwater Council
- Nature Conservation Council
- Metropolitan Aboriginal Land Council (via Pittwater Council staff)

Through the consultative process each agency representative has had the opportunity to express their views on the direction that needs to apply in developing the Scotland Island Bushfire Management Plan. The document has been prepared with due regard to the views expressed by individuals and through various group meetings.

In considering bushfire management issues it became evident that some of these concerns were also relevant to other emergency events on the island. In most cases involving consultation with resident groups and agency representatives, the consensus was that these similarities should be mentioned within the plan.

6. Fire History

The Warringah Pittwater area is affected by large scale and intense wildfires on about a 10 year cycle with major fire seasons occurring in 1943/44, 1957/58, 1968/69, 1979/80, 1990/91 and 1993/94. A number of small scale fires are experienced annually within the Warringah Pittwater Bushfire Management Committee's area. These fires however are rarely significant in nature and are usually contained to a small area and within a short time frame. (Warringah Pittwater Bushfire Management Committee – Bush Fire Risk Management Plan 2000).

The fire history of Scotland Island has been poorly document by local government and the Rural Fire Service, although a number of bush and house fires are known to have occurred since 1939.

The recorded incidents are:

- 1939 - A major bushfire in Ku-ring-gai National Park spotted onto the island resulting in a bushfire that burnt most of the island.
- 1967 - A campfire on the western foreshores burnt to the top of the hill before being contained.

- 1994 - Members of the community who were strategically placed around the island prevented any fires which started as spotting from the bushfire in Ku-ring-gai National Park, from developing into wildfire.

There have been a number of house fires which range from small kitchen fires to the total destruction of the residence. It is probable that there have been also been other small undocumented scrub fires on the island as well.

The Rural Fire Service has undertaken a number of small hazard reduction burns on both private land and within Council reserves:

- 1995 - Fitzpatrick Street and Kevin Avenue (2)
- 1996 - Thompson Street (between Hilda and Fitzpatrick Streets)
- 1998 - Elizabeth Park (2)
- 2001 - Aoma Street, Elizabeth Park and Thompson Street (between Fitzpatrick and Aoma Street)
- 2003 - Pathilda Reserve and Robertson Road (adjacent to Preschool and Community Hall) (2).

“Due to the combination of climate, topography and vegetation, the Sydney Region is characterised as one of the most bushfire prone areas in the world. Periodically, every 5-12 years, drought conditions combine with hot, dry, north-westerly to south-westerly air streams that produce the potential for high intensity uncontrollable bushfires. Although bushfires may occur at any time of the year, the highest probability of bushfires occurs in December and January.” (NSW National Parks and Wildlife Service – Draft Fire Management Strategy Ku-ring-gai Chase National Park)

NPWS records only extend back to 1943. However in that period they have recorded major bushfires within Ku-ring-gai Chase National Park in 1946, 1958, 1965, 1979, 1980, 1983, 1990, 1994 and 2004. In 1994 spot fires were extinguished in Newport. This indicates that a very high potential exists for spotting onto Scotland Island.

7. Factors Likely to Influence Fire Behaviour

There are a number of physical factors which influence fire behaviour. These include topography and fuel characteristics. Topography may be analysed by considering aspect, slope and surface characteristics.

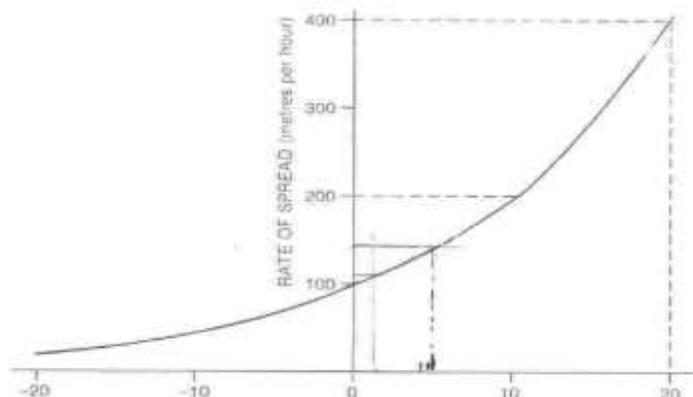
7.1 Aspect

The northern side of the island with its greater exposure to sunlight and north-westerly winds (during fire weather conditions) will dry out quickly. The distance from the seafront and the elevation of the Palm Beach Peninsula seem to shield Scotland Island from most of the humid north-easterly winds. As a result the eastern aspects of the island dry in a similar manner to the northern side.

Due to the elevation of the island and the steepness of the terrain there are areas on the southern side of the island which receive very little sunshine, These areas dry out very slowly and are only likely to sustain wildfire during drought conditions.

7.2 Slope

There are steep slopes throughout the island with some slopes approaching 30°. The slopes on the island will have a significant influence on fires under high to extreme fire conditions. As can be seen from the figure below, the rate of spread of fire increases rapidly after the slope exceeds 10°.



Fire travelling downslope Fire travelling upslope
(Courtesy NSW Rural Fire Service)

This increase is caused primarily by preheating of the fuels (through direct flame contact, radiation and convection). The rate of spread could be even greater under the influence of hot westerly winds.

7.3 Surface Characteristics

There are three significant surface features, on Scotland Island, which will affect fire behaviour: rock outcrops, drainage lines and residential development. The latter may either hinder fire spread or add fuel to the fire. The existing road network is considered to be a minor impediment only to the spread of fire due to the narrowness of the carriage way and the high fuel and vegetation levels in the remaining width of the road corridors.

Rocky outcrops may cause directional changes to the upward passage of fire, disperse the fire and create a broken fire front, somewhat different to that which would be expected from the influence of slope alone. Extremely large outcrops, such as those which occur along Thompson Street walking track, may actually offer a containment line potential under some fuel and weather conditions.

Most of the drainage lines on the island contain rainforest vegetation at the lower levels. On the southern side of the island the rainforest extends up to the boundary of Elizabeth Park which runs close to the 85 metre contour. Under benign conditions hazard reduction fire or low intensity bushfire will most likely self extinguish as it penetrates the rainforest vegetation. It must be noted however that under extreme fire weather and/or during periods of drought, rainforest will sustain wildfire.

Residential development on the island, above the lower ring road system (Florence Street, Robertson and Richard Roads) has the potential to affect upward fire spread. This development may be considered as one which can either inhibit fire spread or accelerate fire spread.

Inhibiting Development - has the potential to withstand bushfire attack and may even break up the fire front.

A residential development where:-

- there is managed garden which meets the criteria for landscaping within bushfire prone areas (6.2.1 Design Criteria – Planning for Bushfire Protection 2001),
- buildings meet Level 2 or 3 construction standards, and
- good housekeeping and maintenance standards have been maintained,

Fuelling Development - has the potential to succumb to and even fuel any approaching fire.

A residential development where:-

- the buildings are surrounded, overhung and touched by vegetation,
- buildings do not conform to Level 1, 2 or 3 Construction Standards,
- leaf litter and fallen twigs cover roofs and tops of water tanks, and
- layers of leaves cover the ground beside and under buildings and surrounding water tanks,

7.4 Fuel Characteristics

Due to the absence of widespread fire on the island, it can be assumed that ground fuel has accumulated to maximum levels, except where hazard reduction has taken place within the last 10 years. Maximum fuel level is the stable state in which the rate of accumulation of fuel is matched by the rate of decomposition of the lower layers of detritus.

Using the NSW Rural Fire Service's guides within their publication "Planning for Bushfire Protection", coupled with inspection of the island, it has been estimated that fuel loads within parts of the island covered by Spotted Gum Forest could be as high as 40t/hectare and within the rainforests could be as high as 10t/hectare.

7.5 Fire Weather

The Bureau of Meteorology has an automatic weather station at Terry Hills. The Rural Fire Service has been recording weather data at their Fire Control Centre at Terry Hills for over ten years. Unfortunately the data is totally irrelevant to Scotland Island, due to its distance from Terry Hills and its unusual and isolated geographic location.

Being surrounded by water, the island should experience lower temperatures and higher humidity. However, under the influence of extreme fire weather, the island has the potential to become very volatile.

The greatest threat to Scotland Island comes from spotting (ember shower) from bushfires in Ku-ring-gai Chase National Park under extreme fire weather. Depending on wind direction and fuel conditions, fires in an arc extending from south-west through to north-west of the island may be a source of spotting.

During the 1994 fires in the National Park, spotting occurred onto the island but due to the diligence of the local brigade and residents, no running fires ensued. Burnt material which originated from back burning operations that took place in the cooler part of the day was

recorded as landing in the Palm Beach area. The weather data which was recorded at the start of the 1994 fires typifies the conditions under which spotting may occur onto the island:

- 6th January 1994: Temperature 37°C, Relative Humidity: 21%, Wind gusting to 47 Kph.
- 7th January 1994: Temperature: 38°C, Relative Humidity: 20%

7.6 Expected Fire Behaviour

The most likely cause of bushfire on the island will be spotting from bushfires within Ku-ring-gai Chase National Park. This has happened in the past resulting in a major fire in 1939 and through community action, was prevented from happening in 1994. The sites in which fires may start from spotting will probably be on the western, northern and eastern aspects of the island as well as in Elizabeth Park which covers the summit of the island. There is a lesser chance of spot fires developing on the southern aspect, but it cannot be ruled out as spotting is most likely to happen under extreme fire weather conditions. Under these conditions all of the vegetation on the island may be dry enough to sustain fire.

Multiple spot ignitions will be possible under extreme fire weather conditions. Fires which start on the lower portions will rapidly spread upwards. It could be possible to have runs of fire approaching the summit from differing directions. Fires which start near the summit will spread rapidly under the influence of predominantly westerly winds in an easterly direction and will spread slowly in all other directions.

It is highly probable that many houses in their current state of unpreparedness for a bushfire will be lost. These burning homes will further exacerbate the situation by drawing resources away from the controlling of the bushfire and by increasing the intensity and rate of spread. There are a range of other possible ignition sources which are detailed in section 8 of this plan which could lead to a similar situation.

There is a lesser chance of accidental fire starting on the island. It is likely that such fires will occur under more benign conditions and will be readily contained by the local Fire Brigade assisted by community members.

8. Identify Assets at Risk

8.1 Preamble – The Risk Management Process

This particular project has been initiated to look at the bushfire management issues in regard to Scotland Island. It is difficult however to consider a bushfire in this setting in isolation of the other problems that could occur as a consequence of such an incident.

As a means of quantifying a bushfire event on the island to other natural disasters and emergencies, an assessment format has been used that is based upon the processes laid down by the NSW State Emergency Management Committee. While it must be accepted that through locally based resources some fires will be controlled in their early stages, from a “risk management” perspective, the plan must be based upon a major incident, indeed an emergency situation, beyond the capabilities of the “on island” resources.

Within the Emergency Management structure an “Emergency” can include any or all of the following

- loss of human life
- health consequences for humans
- property loss
- property damage
- a negative impact upon the environment
- the death of animals
- injury to animals

The damage or loss of property can be personal or it may relate to infrastructure. Infrastructure losses can cause enormous disruption to family life and community services.

8.2 Methodology

To assist in establishing the relativity of an incident on the island to the system adopted throughout NSW, a series of ratings have been calculated based upon the outcomes of the consultative processes. To present the assessment results, the following criteria were used:

Consequence Descriptors

- | | | | |
|----|---------------|---|--|
| 1. | Insignificant | - | without injury or loss |
| 2. | Minor Event | - | without fatalities – minimal asset damage |
| 3. | Moderate | - | perhaps injuries to humans – some damage to assets |
| 4. | Major | - | could be fatalities – significant asset damage |
| 5. | Catastrophic | - | numerous fatalities – extensive asset damage – community disruption. |

Consequence descriptors used by the State Emergency Management Committee (SEMC) extend further to take in the effects on human life and health, property, financial and the environment.

Likelihood Ratings

- | | | | |
|----|----------------|---|--|
| A. | Almost Certain | - | expected to occur |
| B. | Likely | - | will probably occur |
| C. | Possible | - | might occur |
| D. | Unlikely | - | not expected to occur |
| E. | Rare | - | may occur in exceptional circumstances |

By bringing together the “consequence descriptor” and the “likelihood rating” the “level of risk” can be calculated.

There is some inconsistency in the terminology used by the State Emergency Management Committee (SEMC) and the Warringah Pittwater Bush Fire Risk Management Plan. The Risk Management Plan lists 5 risk levels, extreme risk, major risk, moderate risk, minor risk and insignificant risk where the SEMC uses only four, extreme risk, high risk, moderate risk, and low risk.

As previously stated, to provide relativity to other emergency incidents, the SEMC methodology and terminology is being used in the preparation of this plan.

For a bush fire incident on Scotland Island, based upon information gained through the consultative process and supported by calculations of fire behaviour, the “likelihood” rating is “likely,” the “consequence descriptor” is “major” and the risk level is “extreme.”

The risk matrix shown in table 1 was used for this purpose.

8.3 Potential Ignition Sources

Six potential sources of ignition have been identified as likely sources for ignition of bushfires upon the island.

8.3.1 Ember Shower

Bushfires burning under severe weather conditions along the western side of Pittwater have the potential to deposit embers upon the island and cause an ignition. Such an event previously occurred in 1939 and the potential is further reinforced by the ember shower experienced during the 1994 fire. Fortunately residents of the island were alert and extinguished the embers as soon as they landed.

8.3.2 Structural Fire

Many of the residences upon the island are of lightweight construction with vegetation in close proximity to the building. Previous structural fires have been identified as having the potential to ignite the vegetation close to the building by flame impingement, radiated heat or by creating an ember shower. A structural fire and bushfire burning simultaneously during even normal summer weather conditions would be beyond the resorting level of the brigade.

Table 1. Risk Calculator Matrix

Hazard	Likelihood	Consequence				
		Insignificant	Minor	Moderate	MAJOR	Catastrophic
	Almost certain	High	High	Extreme	Extreme	Extreme
Bushfire	LIKELY	Moderate	High	High	EXTREME	Extreme
	Possible	Low	Moderate	High	Extreme	Extreme
	Unlikely	Low	Low	Moderate	High	Extreme
	Rare	Low	Low	Moderate	High	High

8.3.3 Motor Vehicles

Upon the island there are a variety of motor vehicles that are used by the residents. They include motor scooters, motor bikes, quad bikes, small all terrain vehicles, light trucks and 30-40 cars. Some of the vehicles are used in off-road situations where the grass and twigs form a continuous ground cover. Under some weather conditions when the grasses are cured, there is the potential for a vehicle to cause an ignition.

8.3.4 Accidental Causes

There are a range of activities that can lead to a fire situation. These can be as simple as the use of a lawn mower, a mishap when using the barbecue or an escape when fire is being used for hazard reduction purposes. These types of incidents tend to occur in close proximity to a building and the level of bushfire preparedness will be a critical factor in achieving control of the situation.

8.3.5 Lightning

Scotland Island is separated from the “mainland” and it rises to a height of about 100 metres above the surrounding water. Some medium to high trees extend above the height so there is scope for lightning to cause an ignition of the surrounding bushland during such an event or at a later stage.

8.3.6 Arson or Deliberate Ignition

Deliberate setting of fires has been suspected in the past although few in number. The potential cannot be ignored.

8.4 Residential Properties

There are about 344 residences on the island with the potential for another 32 to be constructed. Other than for the waterfront land that is used for the four perimeter reserves, almost the entire remaining perimeter is taken up by residential development. Most of these are waterfront parcels which also have access to a road.

There are three and occasionally four layers of houses around the island. Most of the land parcels used for residential purposes are heavily vegetated. The vast majority of residences are of lightweight construction, elevated above combustible vegetation that has the potential to ignite the premises by ember shower, radiant heat and in some locations, flame impingement.

The pattern of residential development is such that, as a consequence of a relatively minor fire in perhaps a kitchen, there is the potential for that fire to develop before the arrival of the brigade, fully involve the residence and have the fire extend up the slope to involve other structures.

8.5 Public Buildings

There are only three non-residential buildings upon the island, these being the fire station, kindergarten and the community hall. All three are located in close proximity to Catherine Park.

During a major bushfire incident, the kindergarten and community hall buildings would be utilised by the support services. Both buildings are considered to be bushfire prone because of the proximity to vegetative fuel and the building design features which make them vulnerable for bush and other fires.

8.6 Electricity Supply and Assets

The electricity reticulation upon the island is by overhead supply. Many of the poles are timber. Each pole is situated either within a road reserve or recreational reserve. Bundled cable has been used extensively. The same poles are carrying the telephone cables.

The electricity supply network is considered to be at risk because most of the poles are surrounded by vegetation at ground level. Additionally, during a major fire event it is anticipated that trees will be affected in such a way that they will fall across the power lines. Some concern is also held for the proximity of the vegetation to the ground level transformers.

The overhead cables, both electrical and telephone will probably be adversely affected by radiant heat and in some locations, perhaps flame impingement during a significant fire event. Fuel sampling and subsequent calculations within some exposed locations conservatively indicate that the heat output may exceed 26 kilowatts per metre of fire front with a length of flame of 15 to 28 metres, these readings being variable because of variations in the vegetation structure resulting from land use.

The overall extent of damage to the distribution system could be extensive and necessitate moving plant and equipment across to the island by barge.

Lack of supply of electricity for more than a few hours will severely impact upon the community. Loss of telephone line services will have less impact due to the availability of mobile telephone service in the area.

8.7 Water Supply – Domestic

8.7.1 Background

The provision of water to the 344 residences upon the island is inadequate for a bushfire prone area. There is confusion amongst residents and others about the effective diameter of the water supply line that extends from Church Point to the junction of Vivian Street and Richard Road. It is at this point that the supply is split through 3 meters to provide water to the residences.

The supply is metered by Sydney Water at Church Point on account to Pittwater Council. The service travels under Pittwater to the island and then the responsibility for distribution is designated to the Scotland Island Residents' Association who hold the licence. It seems that originally the water supply was established as an emergency line for fire fighting on the island. Residents were reliant on collecting rainwater for their domestic usage. Most residents are of the opinion that the usage restrictions were lifted by Council to allow domestic use in the early 1980's because of drought conditions. This was to be a supply to one tap but later in the 1980's, without authorisation from Council, a 25 mm PVC reticulation system was developed by the residents.

It is understood that in the intervening period since then, Council has sought to have Sydney Water accept responsibility for providing water to each of the island residences but this has not occurred.

Since 2002 Council has divested responsibility for the distribution of water from the system to the Scotland Island Residents' Association. That group has set about providing an upgrade of the system by replacing the 25 mm PVC line with an improved PVC system that permits better

control of water usage, provides better flow through an inside diameter of 38 mm and is less prone to physical damage due to its wall thickness of about 5 mm.

The upgrade of the service has been achieved on the “user pays” basis, funded from the sale of water by the Residents’ Association. The cost of the work through labour and material has exceeded \$100,000. The project has been well managed and generally is well supported by the community. There are however some detractors who resent being charged to access the scheme. Part of their stated concern relates to a perceived increase in fire risk to the householders who choose to not pay the fees. A point raised that it denies the brigade access to supply is not valid as brigade access to any water supply is legislated.

8.7.2 Fire Risk to the System

Similar to the old system the new water distribution piping system has been laid above the ground. For the most part it has been laid within the road reserves and upon the recreation reserves but it is a matter of concern that it is exposed to fire impact because of its proximity to bushfire fuel. Advice provided by the manufacturer is that the PVC material will break down at 110 - 130°C, a temperature that will occur during even very minor fire events.

It is anticipated that primarily, bushfire events that occur around the western, northern and eastern sides of the island will tend to climb toward the reserve at the top of the island. Since the majority of the water system follows the circular road system upon the island, the level of exposure of the pipe is considerable. Reinstatement of the service could be both costly and time consuming.

Unless a commitment is received for an upgrade to a proper reticulated water system to be constructed in the near future, then consideration should be given to having the majority of the pipes placed underground.

8.8 Environmental Assets

The greatest environmental impact will result from a major fire under severe fire weather conditions with ignition occurring on the north, north western, western or south western fringe portions of the island. Such a fire would be extremely difficult to stop and at the time, the priority will centre upon residents and structural assets. Spotting could also extend to the eastern section of the island under a westerly wind but then, under the influence of an eddying effect, burn back toward the top of the island impacting upon the structural assets on the eastern side of the island.

As explained elsewhere in the report, the vegetation is currently adversely affected by the absence of fire in some areas. In the fire scenario as described, faunal species could be almost decimated. This level of devastation may extend right across the island. Regeneration after such an event would be a slow process.

The problem will not stop there. There is an instability problem across the island with the exception of Elizabeth Park. After a severe fire event that totally removes the ground vegetation and shrub layer, heavy and/or prolonged rainfall will result in extensive erosion on the steeper areas and this will cause land slips.

The risk that fire presents to the island environment cannot be overstated. Even the marine fringe will be affected by erosion and sedimentation after a major fire.

8.9 Fire Risk Analysis for Roads and Trails

In New South Wales the publication “Planning for Bushfire Protection” has been accepted as prescribing for roads, trails, fire breaks and buildings in bushfire prone areas. Most of the development upon the island pre-dates the document including the construction of the roads.

At the time when the roads were being built there would have been very few motorised vehicles on the island. That situation is changing and this has the potential to create major problems. The roads are narrow to the point of not allowing for passing or overtaking even if one vehicle is stationary. In many locations, due to poor drainage the carriageway is carrying the surface water for in excess of 100 metres, causing severe scouring of the surface and road foundation material.

Hilda Avenue is damaged to the point of being unusable. It could be argued that this is a fire management issue as some people may be forced to use that or other roads by the actual location at which a fire occurs. The roads also are essential for pedestrian use, especially during a fire incident that may require evacuation or some other precautionary action.

8.10 Risk Analysis of Council Reserves

8.10.1 Catherine Park

In general terms, this reserve is well maintained and poses minimal threat to the surrounding properties. The reserve is quite accessible for fuel management activities with most of the perimeter enclosed within the roads. The community hall and kindergarten are within this reserve and since they would be the focal point for community and incident support in any emergency event on the island, it is imperative that all forms of hazard in close proximity to these buildings is well managed.

8.10.2 Pathilda Reserve

This reserve extends from the foreshore up to Thompson Street. Despite the fact that it carries within the reserve a drainage line, it can become quite dry due to its north easterly exposure. The vegetation within the reserve is quite volatile in nature, both below and above Florence Terrace. Adjacent properties are at some risk of fire burning upon the reserve.

8.10.3 Harold Reserve

Located on the south eastern extremity of the island this reserve is not considered to pose much of a fire threat to nearby properties.

8.10.4 Leahvera Reserve

This reserve is situated on the western side of the island below the Robertson Road/ Richard Road intersection. The northern and southern portions of the reserve are separated by the steep concrete road that is the service road for Cargo Wharf.

Above the Robertson/Richardson Roads intersection there is land identified as Fitzpatrick Avenue. This is an unmade road upon which the vegetation density is variable.

Since there is so much activity centred around Cargo Wharf on a daily basis, there is an elevated likelihood of ignition in this area. Fuel levels upon this reserve need to be maintained as a Strategic Fire Advantage Zone with the accent being upon discontinuity of fuel between the foreshore and the trafficable road above.

Any fire incident under adverse weather conditions in the vicinity of the Leahvera Reserve has the potential to seriously affect most of the island.

9 Fire Mitigation Considerations

9.1 Mitigation Concepts

As previously indicated the last major fire which affected the island happened in 1939. Few people remember that occasion and many would now consider that the threat has been reduced by the increase in population. That view is totally wrong. In this day and age there are many more people to protect, more structural assets at risk and a higher level of commitment to protecting the environment by retaining trees and other vegetation in closer proximity than was the practice in 1939.

We cannot eliminate the risk but there are means by which that level of exposure or potential loss can be mitigated or reduced.

Fire relies upon the availability of fuel, heat and oxygen to be present for it to be sustained. We can add to that the need for an ignition source. Through public education we try to eliminate exposure to an ignition source, through the imposition of total fire bans, fire restrictions, observation of people acting suspiciously and warning advice on the use of products capable of causing a fire.

Oxygen is in the air that we breathe so it is available to any bush fire. On a summer day the air can be hot and this heat transfers to the bush and other materials that are exposed to it.

The one thing that a bush fire relies upon that we can in some way influence is the amount of fuel that is available to the fire. By reducing the quantity of grasses, leaves, twigs and some standing fuel, we can reduce the severity of a future fire to a level that allows fire fighters to gain control of the fire.

Most of the activities in preparing for the onset of a bush fire relate to the management of the material that the fire would consume, but treating it in such a way that we minimise the adverse effects of these precautions upon the environment.

9.2 Burning

Fire has been a major shaping force of the Australian environment and continues to be a significant factor. As a consequence, and as previously stated virtually all fire management plans involve the management of ground fuels through the use of prescribed burning. Controlled, low to medium intensity fires can prevent the development of destructive, uncontrollable fires, through the removal of an appropriate amount of the ground fuel.

Fires which result in the removal of all litter, including the decayed or decomposing layer should be avoided. The intense heat released by such fires has a damaging effect on the surface material and is one of the major factors leading to soil erosion. However, many species are advantaged by the creation of "ash-bed". This may be the case for Pittwater Spotted Gums. To address this low to medium intensity will be used in association with a low fuel moisture content. A fuel moisture of between 8-18% is proposed for prescribed burning to advantage those species that require fire as part of their life cycle.

High intensity fires are difficult to manage effectively with large flame length leading to canopy scorch. High intensity fires can affect the physical and chemical characteristics of soil leading to changes in the composition and/or growth rate of the ground flora. They can also destroy mature and hollow bearing trees and hollow logs. These outcomes can adversely affect the ability of some native fauna to continue to live within the area.

Mosaic pattern hazard burning is most desirable as it creates a range of bushland age and density conditions including unburned vegetation that provides shelter for local fauna, while newly burned patches provide a food source by way of freshly sprouting leaves and shoots. Wildfires can effectively destroy this vital mosaic and subsequently the biodiversity of the area.

Frequent fires can also change the composition of flora leading to a reduction in the shrub understorey and an increase in grasses. This has been considered when setting prescribed burning intervals. The fire period chosen for the areas of Pittwater Spotted Gum on the Island will be in line with those used in the Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve, Spectacle Island Nature Reserve and Mt Ku-ring-gai Aboriginal Area Fire Strategy, produced by the Department of Environment and Climate Change. Finalisation of these fire periods will also be based on the results of an environmental assessment prior to the proposed burns being implemented.

It is important to note that hazard reduction burning at the proposed intervals (see section 10.2) will not prevent fire from occurring or reduce fire frequency. Hazard reduction burning cannot be relied on to reduce fire intensity and impacts on communities. It must be used in conjunction with other fire management measures.

9.3 Mechanical/Manual Fuel Management

There are areas where fire may not be the appropriate fuel reduction mechanism due to proximity of buildings or other flammable assets or the small size of areas to be managed. In these locations clearing of ground fuel will be carried out by use of hand or powered tools and plant.

Clearing will involve the thinning or removal of the shrub layer, under pruning trees and the removal of ground litter from beside structures. Pruning's may be mulched, spread on site and compacted to reduce flammability, providing the material is well removed from buildings and other flammable structures.

Vegetation that is properly mulched to a fine consistency can be effectively used as a low flammability ground cover that can inhibit weed growth and reduce the loss of soil through water and wind erosion. This form of treatment is ideal for fuel management around residential sections of the island.

9.4 Other Fuel Management Options

For the removal of bushfire fuel, numerous residents spoke favourably about a mulching option that would enable the residents and Council contractors to gather the material and have it mulched and used on the island. An earlier program involved a mulcher being supplied by Council. This worked well for many people but it is accepted that the machine failed due to misuse by some residents.

Residents have suggested that if a contractor could be arranged to visit the island for one Saturday per month to provide and operate a mulcher, this would provide a safe and

environmentally acceptable alternative to burning the material. Residents would use the mulched material on their own property.

A variation to that mulching proposal is to have the material centrally stockpiled and mulched with the material then being composted. This does have merit but any stockpile of material for mulching could prove difficult to manage with an expectation that it would become a dumping ground for rubbish and material unsuitable for mulching.

A similar concern is held for a suggestion that a central location be nominated for the depositing of the light vegetative material that constitutes a fire hazard and that the Scotland Island Rural Fire Service be tasked to burn the materials when needed. This seems to be flawed also. Firstly there is likely to be a problem of rubbish being dumped at the location or heavy logs and branches that would burn for an extended period of time. Heaped material for burning also would tend to generate a substantial amount of smoke, more so than may be acceptable to residents on the island, in the Pittwater Council area and perhaps even the Sydney Basin.

The final option that has been considered is that which is currently being used whereby the material is taken to the wharf and then transported from the island. Most residents that were interviewed consider the system to be impractical and wonder how the cost of this service would compare to that of having a contractor with the mulching equipment visit the island.

Overall the support for some form of mulching service is strong for the management of bushfire fuel on the privately owned land. Composting also has merit. The positives and negatives of each system need to be evaluated by Council. Such a decision is outside of the scope of this plan.

9.5 Sensitive Areas

Sensitive areas where hazard reduction activities could cause damage encompass heritage and cultural sites and rainforest. Although there are no registered heritage or cultural sites in the fire prone areas of the island, certain precautions need to be noted in the event such sites are identified in future years.

Inappropriately sited fire trails and control lines can damage heritage and cultural areas. Intense fire can cause exfoliation of rock, damaging rock shelters, Aboriginal art sites and engravings. Trees burnt in a wildfire can collapse onto a site causing damage.

Should any site be found, careful manual or mechanical clearing should reduce potential damage from either controlled burn or wildfire.

As previously noted, fire should be excluded from rainforest. This is best achieved by burning neighbouring fire management zones under conditions in which the fire will self extinguish as it approaches the rainforest. These activities must be monitored as the boundaries of rainforest are not fixed, but recede under the impact of fire and expand during its absence.

9.6 Biodiversity

To maintain biodiversity, suitable fire frequencies for vulnerable plant communities and/or vulnerable species need to be adhered to within their biodiversity thresholds. The minimum fire period for the areas of Pittwater Spotted Gum on the Island will be in line with the Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve, Spectacle Island Nature Reserve and Mt Ku-ring-gai Aboriginal Area Fire Strategy, prepared by the

Department of Environment and Climate Change, . This has a minimum fire period of 12 years, with a maximum of 30 years, In addition, as a general guide no more than 30% of the distribution of the community should have an age class less than the minimum fire interval. Over the life of this plan the fire period will remain current with any Department of Environment and Climate Change prescriptions.

Prescription burns should, where feasible, only cover a section of each vegetation community at a time so as to retain a diversity of fire frequency and associated age classes within these communities.

In order to preserve biodiversity and prevent species extinction, there are some general principles to follow regarding fire regimes. According to the nature of their life history, groups of plant and animal species may react similarly to fire. Thus, individual species specific fire regimes are not always stated. In general, the needs for most flora species can be summarised in broad groups. Where thresholds are unknown, a precautionary approach should be applied. The interaction between fauna and flora is an important consideration in fire management as the habitats of many fauna species are reliant on the presence of certain flora and their communities.

Initially, in order to maintain biodiversity, low intensity fire has been prescribed with one exception, to deal with a known problem as described in Section 10.1. Some experimentation with medium intensity fire on small sample areas should be considered as part of the research and monitoring work.

Where fire regimes of fairly rigid frequency, intensity and extent occur, extinction of some species may occur. Frequent fires of less than 5 years will dramatically simplify understorey vegetation and must be avoided. Such activity has not been included within this Fire Management Plan.

Whilst Pittwater Council is the major land holder on the Island it must be remembered that the vast majority of the Pittwater Spotted Gum Forest found on the Island is located on Private Property. The recommended fire period relates the management of public lands. It should also be implemented on private properties where hazard reduction burning is possible.

The effect of fire regimes and all fire management practices require evaluation and this may be achieved by mapping of the area and recording characteristics of all fire activity and the effect on flora and fauna species, both long and short term.

Delineation of all species within each zone is neither achievable, nor necessarily desirable. In selecting fire management zones within the Council reserves, wide scope has been provided to preserve and improve on the balance and retention of native species.

9.7 Asset Protection Zones

New development in bushfire prone areas must now comply with strict standards at both the subdivision stage and for the construction of individual residences. The subdivision design is expected to include an Outer Protection Area (OPA) and an Inner Protection (IPA). Together they form the Asset Protection Zone (APZ). The APZ is an identified fire break within which the bushfire fuel is managed for the protection of structural assets. A perimeter road or fire trail can be included as part of the APZ.

Asset Protection Zones have proven to be very effective as a means of protecting assets from flame impingement, radiant heat and ember shower pertaining to actual bushfire incidents. They have also benefited the fire services and land management agencies by clearly identifying the outer extremities of each property for day to day management of the area and more specifically as a control line for hazard reduction burning.

The highest level of fire hazard on Scotland Island involves the properties on the western, northern and eastern perimeter of Elizabeth Park. The level of protection afforded to those properties would be considerably enhanced if even a fire trail could be constructed immediately adjacent to their rear boundaries.

Currently some of these properties use a trail in Elizabeth Park to access their properties. That trail is well clear of the property boundaries and would be of limited value during a running fire. It is also the cause of considerable environmental degradation within the park.

Between Fitzpatrick Avenue and Elsie Street around the southern boundary of Elizabeth Park there are about eight allotments upon which construction has not commenced at this point in time. It would be appropriate for Council to require a minimum setback of 20 metres from the rear boundary within each allotment when a development application for each is received. This would be compliant with the provisions of "Planning for Bushfire Protection.

The provision of a perimeter fire trail immediately behind these properties would be beneficial but appears to be impractical because of the terrain. In this case a walking track should be constructed and maintained as close to the property boundaries as possible as an Asset Protection Zone that would be available immediately for the brigade to use to stop any movement south from a fire incident within Elizabeth Park.

Between Elizabeth Park and Thompson Street there is an unformed road identified as Bayview Street. Unless Council at some stage decides to construct a road on that land parcel it should be maintained as an Asset Protection Zone to restrict the build up of bush fire fuels that compromise the fire safety of other residents in the near vicinity.

There is a need for some review of the setback distances and prescription for clearing and management of fuel in this area to minimise the environmental impact that the standard prescription would cause.

9.8 Mitigation of Risks on Private Land

Amongst some residents there is evident a degree of apathy and/or lack of understanding for the need for fire preventative work to be carried out for their own protection and their responsibility toward other residents. There is evidence that intense bush fire activity on the western side of Pittwater can cause ignition on Scotland Island. Under severe fire weather conditions any ignition caused by embers within about 100 metres of the waterfront could cause severe property losses elsewhere on the island. An ignition caused by ember shower from Pittwater is considered to be a "probability more so than a possibility." The question is when. As stated earlier in the report there is also potential for localised ignitions through various causes.

It is extremely difficult to effectively advise landholders of what degree of grass shrubs and trees and the resulting rubbish looks like at a hazardous level. The local fire brigade can explain this or better still, residents could attend a FireWise Programme.

Under Section 66 of the Rural Fires Act 1997, Council may issue notices to private land owners or occupiers for the purpose of removing bush fire hazards from their land.

The Warringah Pittwater Bush Fire Risk Management Plan Section 5.2 “Responsibility for Implementing the Bush Fire Risk Management Plan” states:

“In the case of private property, the Rural Fires Act imposes an additional requirement on Local Government Councils to ensure that the owners or occupiers of private property have taken the required steps to reduce bushfire hazards on their properties.”

That responsibility has been formally delegated to the Rural Fire Service under a Service Level Agreement.

It is considered essential that a more proactive approach be adopted to reduce the fuel hazard levels on private land in the absence of this essential work being implemented by land owners or occupiers on a voluntary basis.

Council administers the tree preservation policy in the area. There is confusion within the area about how that policy relates to work required for fire prevention. This is a concern that Council could address through a newsletter to Scotland Island residents.

The community also need to be provided with information on what constitutes fuel and how it can be managed and disposed. Currently there is a minimal green waste collection on the island. This is unlikely to provide for the removal of the fuel loads on private property. Alternatives need to be investigated and developed to allow residents to dispose of the excess vegetation. These measures could include: composting, mulching and pile burning.

It is imperative that the community be provided with information on the preparation of their property to minimise risks from bushfire. The Council in association with the NSW Rural Fire Service will provide yearly circular reminding residents of their responsibilities and details on how to prepare their properties. The NSW Rural Fire Service through the FireWise program will also be available to provide specific advice and street meetings prior and during the fire season.

Finally, residents should be encouraged to remove noxious and environmental weeds from their properties. In many areas of the island much of the fuel load is made up of noxious and environmental weed. Noxious weeds are required to be removed through the *Noxious Weeds Act 1993*. Following informal requests to remove these weeds a formal process as detailed in the Act can be taken if no action occurs.

9.9 Standards of Building Construction

An Australian standard AS 3959 has been developed specifically for new development in bushfire prone areas. Future development, particularly in close proximity to Elizabeth Park, should be compliant to the appropriate standard of construction to match the calculated category of bushfire attack.

It would be very difficult to impose the requirements of the building standard AS 3959 on residences previously approved. As a minimum, Council should insist that on future alterations and additions to existing properties, the new work is to enhance the level of fire protection of the premises. This must include the availability of at least 10,000 litres of stored water dedicated

specifically for fire protection though this provision may be able to be lifted after a properly engineered reticulation system has been constructed.

All residents need to develop an awareness of how to prepare their home for bushfire protection. Excellent brochures are freely available from the Rural Fire Service.

10 Fire Management Zones

10.1 General

For the purpose of this Plan, a number of Fire Management Zones will be created within the parks, reserves and road corridors which are the direct responsibility of Pittwater Council. Other agencies that are using these land parcels have a vested interest in participating with Council in achieving effective fire fuel management for the improved protection of their respective assets. The designation of these zones should **not** preclude appropriate hazard reduction activities of private land.

All fire based hazard reductions should be planned and executed as co-ordinated activities by Pittwater Council and the Rural Fire Service. This is necessary to allow Council to treat fire zones for exotic weeds prior to burning and to follow up with post fire regeneration activities.

Pre fire weed control should be implemented to minimise the need for post fire regeneration. There may also be the need to replant some areas with native plants which are endemic to that location, particularly local saplings of Pittwater Spotted Gum which are not well represented in the reserves. This is more likely to be an issue in the lower reaches of the island where the geotechnically unstable soils have previously been covered and stabilised by weeds.

The location of all containment lines required to allow prescribed burning are to be identified in consultation with and approved by Councils Natural Resources staff to ensure appropriate locations.

As a general rule zones should be ignited on the higher containment lines, but not as a continuous line of fire. As the fire moves down the hill, particularly where rocky outcrops occur, a mosaic burn pattern is expected to develop. A minimum of 40% of the fuel should be removed to render the burn effective. Maximum available ground fuel removal should not exceed 80%. The retention of some ground fuel is necessary to provide a habitat for ground dwelling fauna and to minimise the possibility of erosion of the previously described unstable soils. Scorch height as distinct from flame height should not exceed an average height of 5 metres within any zone.

The exception to this rule will be the southern aspect of Elizabeth Park where a more intense fire regime is initially required to curtail the spread of *Pittosporum undulatum* and *Elaeocarpus reticulatus* into the Spotted Gum Forest and to encourage Spotted Gum (*Corymbia maculata*) regeneration within that plant community. It will be necessary to ignite at the southern (lower) zone boundary and allow a continuous line of fire to develop. A higher percentage removal of ground fuel and a higher scorch height are both acceptable on this initial hazard reduction.

It is extremely important that fire not be allowed to penetrate any hollow trees to prevent the collapse of those trees for two principal reasons:

1. There are comparatively few trees with hollows due the relatively young age of the trees on the island. It is necessary to preserve these trees as habitat for birds and arboreal mammals;
2. A large number of the trees with hollows either overhang homes or are close enough to fall onto homes in the event of collapse.

The preferred time for hazard reduction will be from late summer to early spring. The exact time will be determined by weather conditions and fuel conditions. A downloadable fire danger meter is available from the CSIRO web site. This should be used to calculate the weather conditions required for the lower intensity burns.

No two adjacent zones should be burnt within the same year or in consecutive years.

10.2 Areas Suitable for Hazard Reduction by Burning

Only areas supporting sclerophyll type vegetation should be considered for hazard reduction by fire. Therefore the following areas will be the fire compartments:

- Thompson Street (Road Reserve) Footpath between Fitzpatrick Avenue and Aoma Street;
- Thompson Street (Road Reserve) between Robertson Road and Kevin Avenue plus portion of Catherine Park which lies south of the road which connects Robertson Road to Kevin Avenue;
- Pathilda Reserve between Florence Terrace and Thompson Street;
- Pathilda Reserve below Florence Terrace to the 20 metre contour;
- Elizabeth Park. Elizabeth Park should be subdivided into 4 or 5 smaller compartments utilising existing and/or proposed vehicular and walking tracks.

10.3 Areas Suitable for Alternative Hazard Reduction Methods

The following areas should be hazard reduced by alternative means:

- Leahvera Reserve;
- Pathilda Reserve below the 20 metre contour, by removal of exotic vegetation;
- Powerline easements within trafficable Road Reserves.

Mechanical or manual hazard reduction is to be carried out at whatever intervals are necessary to protect the exposed assets. These methods rely on the modification of fuels such as tittering, slashing or the removal and collection of fuels. Appropriate methods will be chosen depending on the nature of the fuels and any environmental sensitivities.

10.4 Initial Fire Regimes

It is recommended that the fire regime for the Spotted Gum Open Forest Endangered Ecological Community be as advocated by the Ku-ring-gai Chase National Park, Lion Island Nature Reserve, Long Island Nature Reserve, Spectacle Island Nature Reserve and Mt Ku-ring-gai Aboriginal Area Fire Strategy, produced by the Department of Environment and Climate Change. The recommendation is for a minimum of 12 years or maximum of 30 years between fire cycles.

Due to the vulnerability of nearby assets it is recommended that initially two complete cycles of hazard reduction be conducted with a twelve year interval between each zone burn. Within Elizabeth Park one compartment is to be burnt every three years. The fire zones on the island are shown in Annexure 3.

During this period longitudinal studies of the parks and reserves should be conducted. On the basis of this monitoring, it will be possible to reassess, if necessary, the intervals at which the zones should be hazard reduced. Table 2 provides the suggested cycle of zone hazard reduction.

10.5 Environmental Impact Assessment and Burn Plans

Prior to the conducting of any hazard reduction burns within Elizabeth Park Pittwater Council will undertake a Review of Environmental Factors (REF) or analysis using the Environmental Assessment Code. This will be forwarded to the Warringah Pittwater Bushfire Management Committee and used in the preparation of the “Burn Plan” for the hazard reduction. The REF or Code Assessment will detail mitigation measures required to minimise environmental impacts. These assessments will also indicate any weed control required pre and post burn. Post burn monitoring will be undertaken as outlined in section 11.

Table 2. The suggested cycle of zone hazard reduction.

Fire Regime Schedule		
Fire Management Zone	Years in which to be burned	
Thompson Street (Road Reserve) Footpath between Fitzpatrick Avenue & Aoma Street. (Zone 1)	2013	2025
Thompson Street (Road Reserve) between Robertson Road and Kevin Avenue plus southern portion of Catherine Park.(Zone 2)	2008	2019
Pathilda Reserve between Florence Terrace and Thompson Street. (Zone 3)	2014	2025
Pathilda Reserve below Florence Terrace to 20 metre contour. (Zone 4)	2016	2028
Elizabeth Park – Compartment 1 (Zone 5)	2014	2026
Elizabeth Park – Compartment 2 (Zone 5)	2011	2024
Elizabeth Park – Compartment 3 (Zone 5)	2008	2021
Elizabeth Park – Compartment 4 (Zone 5)	2017	2029
Elizabeth Park – Compartment 5 (Zone 5)	2020	2032

Notes:

1. Due to the number of informal walking tracks within the Thompson Street Footpath Fire Management Zone, it may be possible to further compartmentalise this zone.
2. The compartments within Elizabeth Park (and Thompson Street Footpath) should be burnt following the same guidelines as apply to Fire Management Zones (refer to Subsection **10.1**).

11 Monitoring Fire Regimes and Biodiversity

There appears to be a significant lack of mature trees on the island. This is most likely a result of the early timber industry on the island. In the Spotted Gum Forest there is also a lack of juvenile trees and a reduced diversity of shrubs. This, along with the infiltration of weeds, both native and exotic, is a sign of the lack of fire, both bushfire and hazard reduction. These characteristics of the vegetation have flow on effects on the fauna - lack of nesting sites, lack of or altered quantities of food sources.

Reference has been made in the body of the report of the need to reintroduce fire into parts of the island in an attempt to restore the native vegetation to its natural parameters. Similarly, reference has already been made of the need to control exotic plants and weeds as part of the fire mitigation processes.

Monitoring the impact of fire on biodiversity is an essential part of the fire management process. Every opportunity should be seized to foster ecological research as a means of broadening knowledge of the variety, quantity and quality of flora and fauna on the island. The fire regimes proposed within this report are based on the precautionary principle, to suit the existing conditions, the flora and fauna that may be present, while offering increased protection to people and their assets. These proposals may need some modification following comprehensive faunal and floristic study of the island or, as a result of observations and research after the first and subsequent fire events within each fire management zone or compartment. The reaction of weeds to fire also needs to be monitored as part of measuring the effectiveness of fire management practices for both scheduled and unscheduled fire.

To assist in gathering the relevant information a draft checklist has been included in conjunction with the “Research and Monitoring Schedule” (Annexure 5).

12 Fire Fighting Operations

12.1 A Vulnerable Community

The Warringah Pittwater Bush Fire Risk Management Plan identifies the Bush Fire Hazard classification for Scotland Island as **HIGH**. The plan also identifies the Bush Fire Environmental Risk classification for the island as **MAJOR**.

Of more concern is the Community Risk Classification of **MAJOR RISK**. Despite this classification there are a number of inadequacies that need to be addressed to improve the fire safety level for the Scotland Island community.

Through the consultative process, well informed people spoke of the possible impact that a serious bush fire event could have on life and property in less than 10 minutes after ignition.

Some indicated that the fire would move so fast that helicopters would be the only means of exercising any control over the fire. Most people do agree that individuals within the community must accept more responsibility for their own level of fire protection. Despite this view, efforts by the brigade to enhance the level of awareness and education seem to have been ignored by most residents.

Some issues for resolve do clearly extend beyond the residents of the island and in some cases, may require a co-ordinated approach that involves up to 3 levels of government and various other agencies.

12.2 Water Supply – Fire fighting

The installation of the upgraded domestic water supply is a credit to the Scotland Island Resident's Association. It is not capable though of meeting the needs of the fire service during a major incident.

The domestic supply itself is extremely vulnerable to fire because it has not been placed underground. If the projection is that this system is to remain in service for an extended period then some funding assistance should be pursued to try to protect it from bush fire impact.

For about 344 residences upon the island a more adequate water service is warranted. The responsibility for providing the upgrade should rest with Sydney Water and the NSW Government as it is consistent with their responsibilities elsewhere throughout the metropolitan area and beyond.

Some of the Scotland Island community do not yet understand that the survival of their homes in a bush fire situation depends mainly on themselves and their neighbours. In regard to the water supply, during the fire season it is essential that private water tanks are kept full so that water is immediately available when a fire occurs. That will not be the time to think about topping up the tanks. With the water from the private tanks and a pump, groups of residents will achieve as much as the fire brigade during the initial onset and mop-up stages of the fire. Section 13 – Community Involvement provides further detail of how to prepare for self protection.

It is the view of Sydney Water that it is not required to engineer the water reticulation system to the requirements of the fire service though they do provide facilities for the brigade to access it when necessary. Until a larger diameter supply line is constructed from Church Point to the island and up to a header tank in Elizabeth Park, the fire brigade will have to rely upon the ability to access stored water supplied from designated tanks within Elizabeth Park or private tanks in proximity to where the brigade need to use it.

An interim concept has been suggested that from each of the fire service dedicated tanks in Elizabeth Park, a 65 mm steel line be constructed to a point where the brigade can access the supply without first travelling up to the park. This does have merit but it still falls well short of being an adequate supply for fire fighting.

- The Implementation of the proposal requires further investigation. It would provide for a permanently charged line from number 3 tank down Fitzpatrick Avenue to Robertson Road with access points at Thompson Street and Robertson Road.
- A line from number 2 tank down Bayview Street to Thompson Street where there would be an access point.

- A line from number 1 tank down Elsie Street with access points at Thompson Street and Florence Terrace.

There are other options being spoken of within the community. Most of them rely upon providing a steel main as a hydrant service, constructed in a similar manner to the system that has been mentioned but providing for additional access points by constructing the line across private property.

The common feature for all of the interim proposals is that in any major fire event, the demand on the water service and storage will exceed supply.

12.3 The Serviceability of Roads and Trails

Residents have commented about the increase in the number of vehicles now being used upon the island and as a consequence, the damage that is being caused to the roads and trails. The extent of damage actually extends beyond that with parking spaces being carved into hills and bushland being removed to facilitate private access to properties through reserves and parks.

The number of resident's vehicles are a cause for concern also from the safety perspective, heightened during a fire emergency on the island. The roads are narrow, corrugated and provide poor vision of the road ahead at many locations. Vehicles can have trouble passing or, even if one vehicle is stationary, overtaking. Florence Terrace and the trail from Kevin Street up to the water tanks in Elizabeth Park are dead end situations that can lead to entrapment and burn-over accidents for fire fighters.

The development of the roads and tracks upon Scotland Island has evolved over a period of about 70 to 80 years it seems. Although the road reserves are up to 20 metres in width it would be totally, impractical and environmentally disastrous to now try to upgrade to road construction standards that are used today for public roads. Some compromise is necessary though to achieve a level of safety for fire fighters and the community during emergency situations.

As a foundation for addressing fire fighter safety on the island the following criteria is suggested for incorporation where **practical** within Council's Roads Master Plan for Scotland Island and any associated future works program:

- The roads need to be accessible to the emergency services under all weather conditions.
- Every effort should be made to provide a through access for emergency service vehicles. Where this is not achievable dead end roads or trails should not exceed 200 metres in length and terminate with a suitable turnaround facility for use by emergency service vehicles.
- A trafficable width of four metres will apply with an additional one metre wide shoulder on each side of the carriageway maintained clear of bushes and long grass.
- The maximum unsealed gradient is not to exceed 10°.
- A passing bay is to be provided about every 200 metres, providing a minimum traffic width of seven metres.
- The road or trail will have appropriate drainage and erosion controls.

- Parking of vehicles upon the roadway or within passing bays is not permitted and enforcement procedures are to be applied.
- Vegetation within the road reserve is to be managed to prevent encroachment within the carriageway and to facilitate adequate road vision near bends, curves and crests.

The construction of additional fire trails within Elizabeth Park is not feasible due to topography, environmental constraints and cost. Specific projects required in supporting of fire fighter safety need to be included.

- Creation of 2 refuge areas of defensible space at either end of the fire trail in Elizabeth Park and provision of access from these areas to lower ring roads. These refuges are to include Council and private lands to be maintained as strategic fire advantage zones. These areas are shown in Annexure 4.
- Creation of a pathway across the southern boundary of Elizabeth Park;
- Investigate the feasibility of a gated fire trail to link vehicle access from the vicinity of water tank 3, down Fitzpatrick Avenue then south along Thompson Street to join with the formed road near Hilda Avenue.
- Develop a refuge area at Elsie Street (near water tank 1) and provide a designated egress from the area down to the intersection with Thompson Street. This is to double as a public walkway.
- Investigate the feasibility of a gated fire trail down Elsie Street between Thompson Street and Florence Terrace to overcome the current dead end situation and associated safety concerns. The road surface would need to be similar to that at Cargo wharf as the land is so steep.

12.4 Access to the Island

Concerns have been raised during the consultative process about the perceived difficulties that could occur in having additional resources moved onto the island to assist in a major fire incident. It is understood that tidal conditions can make beach landings very difficult at times and this could negatively impact upon the timely arrival of assistance.

Currently Emergency access to the Island is detailed in the “Operations Plan for Major Bush Fire on Scotland Island, 1996”. There needs to be a review of this Plan to confirm that the emergency access arrangements are adequate.

Since problems at the disembarkment point can have serious consequences during fire incidents, the possible construction of a ramp and other options should be investigated further.

The design features of Tankers deployed as assistance is critical. Small to medium tankers are suitable for use on the island. Large tankers with lug tyres are not suitable for safety reasons, particularly the effect that the tyres will have on the soft road shoulders during tight turns and bends.

An immediate improvement in relation to the current Operations Plan can be made to the emergency access situation by creating an appropriate “loading zone” at Cargo wharf. Ensuring

the removal of rubbish and debris from the area and maintaining the useability of the turning circles on both the Island and the main land. An equitable arrangement needs to be developed that recognises the needs of residents and contractors whilst ensuring that the wharf is accessible and serviceable for emergency services.

12.5 Warning Systems

The geographic form of the island presents some problems in alerting brigade members on the eastern side of the island of an incident occurring on the north or west. Currently the brigade members are dependent upon telephone communication to initiate a callout, a system which can cause a significant delay at times when few members are actually on the island.

The objective is to alert brigade members quickly and this could be achieved by a paging system.

The provision of an audible alarm is considered by a number of brigade personnel as a better method of overcoming the problem and the technology is available to activate the system remotely by use of a mobile telephone. This system also could alert residents of a major incident, not necessarily just bushfire related.

It would be appropriate that these concerns and possible solutions be referred to the District Manager of Warringah Pittwater Rural Fire Service for further investigation.

13. Community Involvement

As the last major bushfire to sweep through Scotland Island was in 1939 and as such, predates the fire experience of almost all current residents. The general attitude of many demonstrates disregard for the risk and their legal responsibilities for reducing the fire hazard on their own land and preventing the escape of fire from their property.

The island provides a wonderful bushland setting for the residents. There is an almost seamless flow of vegetation from private land to Council reserve to road reserve. With this in mind, the residents have a vested interest in protecting themselves and their environment from fire.

Due to the isolation of the island and consequently the time taken to bring additional fire fighting resources to the island, the residents cannot expect the Rural Fire Service to provide their total fire protection. It is imperative that the residents assist in their own fire protection, both individually and as a community.

There are a number of things residents can do to assist in their protection:

- They are well placed to detect and report unauthorised and unattended fires during the bushfire danger period;
- Consider co-operative arrangements with neighbouring properties, perhaps even formalising these arrangements through the Community Fire Wise Program run by the Rural Fire Service;
- They are well placed to watch for spotting from bushfires in Ku-ring-gai Chase National Park, particularly during periods of extreme fire weather;

- There are well publicised bushfire maintenance procedures for home owners to implement prior to the bushfire danger period. These include what action should be taken if there is a likelihood of a bushfire impacting on their property;
- There are other “self help” initiatives that are available to help protect homes during any fire event. These include maintaining a dedicated reserve or separate supply of water for fire fighting, having a petrol powered pump and suitable fire fighting hose, having a valve and a Storz fitting on each water tank to enable the Brigade to quickly access water and by having chemical additives available to enhance the effectiveness of the water that is available.

Lastly, Council and the Rural Fire Service personnel will be endeavouring to protect the community by carrying out hazard reduction burning within a number of parks, reserves and road reserves, in a prescribed manner, to reduce the intensity of any fire which occurs in those areas. The support of residents for these activities is essential as is a co-operative approach to ensure that the work is not negated due to inaction on nearby properties.

14. Review of Fire Management Plan

This Fire Management Plan has been developed as a blueprint for achieving a high level of bushfire preparedness. At some stage in the future it is anticipated that the island will be subjected to a bushfire that will be started by an ember shower or some other ignition source. The measures enunciated within this plan aim to provide a framework which can reduce the impact of such an event.

The measures that have been proposed include some change in management practices that are causing undue environmental impact upon the island. The most obvious environmental problem is the infestation of Lantana and other weeds and measures have been suggested for correcting this in conjunction with other bushfire fuel management initiatives. Fire management and weed management can be co-ordinated to meet the objectives of both programs.

The implementation of various projects identified within this plan will require co-ordination and co-operation from many people, organisations and agencies. As the largest landholder on the island, it would be appropriate for Council to adopt the lead role in the co-ordination process. All of the agencies with assets upon the island must accept a level of responsibility and involvement in the implementation of this plan.

Fine tuning of the detail will be essential and these adjustments will be identified through the monitoring process.

To ensure that the objectives of the plan continue to be achieved it is recommended that the document be reviewed by no later than 2012.

15. Recommendations

1. As a result of reducing fire damage to electricity supply assets, Energy Australia and Telstra be requested to participate in vegetation management practices in proximity to overhead lines, poles and transformers.
2. That Council draw to the attention of the New South Wales Government and Sydney Water the need for the reticulated water supply to be extended from Church Point to better serve the requirements of the Scotland Island community.
3. Council work with the Scotland Island Residents' Association to develop improvements for the existing "non-potable" water supply lines, to ensure continuity of service during fires and road maintenance.
5. That maintenance programs, which include bushfire preventative measures, be developed and promulgated for the kindergarten and community hall in Catherine Park.
6. Enclose the storage area underneath the community hall to avoid lodgement of sparks and embers beneath the hall.
7. That Council, as the major landholder on Scotland Island and the entity responsible for the removal of fire hazards from private land, fulfil the "co-ordinator" role for all bushfire hazard mitigation work upon Scotland island.
8. The full range of fire hazard mitigation concepts be considered when prescribing adequate fire protection but with due concern for maintaining biodiversity.
9. That the NSW Rural Fire Service, under delegation from Council, adopt a more proactive approach to the serving of notices on landholders to strategically reduce the availability of bushfire fuel on residential properties.
10. That through the development and distribution of a newsletter to residents, Council outline to the residents of Scotland Island the objectives and requirements of Council's Tree Preservation Policy, together with the actions residents need to take in regard to trees that are considered to be a fire or safety hazard and the importance of retaining trees with "hollows" should be highlighted where that does not compromise fire and safety needs.
11. That for all future development adjacent to Elizabeth Park, Council will require by way of an Asset Protection Zone, a setback from the park of at least 20 metres.
12. That the requirements of "Planning for Bushfire Protection" and Australian standard AS 3959 be applied as far as practicable by Council to any future development proposals including alterations and additions to existing residences.
13. Through the newsletter to residents information be provided on the requirements to manage fuel levels on private property and possible ways to manage and dispose of Bushfire fuels on the Island.
14. As a basis for species management and biodiversity, the adoption of the five zone

concept and initial fire regimes is supported.

15. That Elizabeth Park (Zone 5) be subdivided into five compartments for management and monitoring, the actual boundaries to be identified after the fire trail and pathway issues are resolved.
16. Council staff in conjunction with the Rural Fire Service and other agencies to ensure that all relevant material regarding fire activity and environmental issues are recorded within the "Research and Monitoring Schedule".
17. That in the absence of an adequate mains water reticulation system on the island, as an interim means of improving the level of fire protection and fire fighter safety, the provision of 3x 65mm steel pipes with valves as described below should be installed

A permanently charged line from tank 3 in Elizabeth Park down Fitzpatrick Avenue to Robertson Road with access points at Thompson Street and Robertson Road.

A permanently charged line from tank 2 in Elizabeth Park down Bayview Street to Thompson Street where there would need to be an access point.

A permanently charged line from tank 1 in Elizabeth Park down Elsie Street with access points at Thompson Street and Florence Terrace.

18. That funding for the upgrade of the water supply from the tanks in Elizabeth Park be sought from the relevant State and Federal grants schemes, for example the "Bushfire Mitigation Works Program".
19. Creation of 2 refuge areas of defensible space at either end of the fire trail in Elizabeth Park and provision of access from these areas to lower ring roads. These refuges are to include Council and private lands to be maintained as strategic fire advantage zones
20. Investigate the feasibility of a gated fire trail down Elsie Street between Thompson Street and Florence Terrace to overcome the current dead end situation and associated safety concerns.
21. Creation of a pathway across the southern boundary of Elizabeth Park to provide emergency access/egrees for fire fighters
22. Provide emergency access/egress, (investigate the feasibility of a gated fire trail to link vehicle) from the vicinity of water tank 3, down Fitzpatrick Avenue then south along Thompson Street to join with the formed road near Hilda Avenue.
23. Develop a refuge area at Elsie Street (near water tank 1) and provide a designated egress from the area down to the intersection with Thompson Street. This is to double as a public walkway.
24. That having regard to fire fighter and community safety, together with the geographic difficulties that the island presents, Council seek the concurrence of the New South Police and Rural Fire Service to the adoption of the following **standards where practical**, for road and trail construction on Scotland Island:

The roads need to be accessible to the emergency services under all weather conditions.

Every effort should be made to provide a through access for emergency service vehicles. Where unavoidable, dead end roads or trails should not exceed 200 metres in length and terminate with a suitable turn around facility for use by emergency service vehicles.

A minimum trafficable width of four metres will apply with an additional one metre wide shoulder on each side of the carriageway maintained clear of bushes and long grass.

The maximum gradient is not to exceed 15°.

A passing bay is to be provided about every 200 metres, providing a minimum traffic width of seven metres.

The road or trail will have appropriate drainage and erosion controls.

Parking of vehicles upon the roadway or within passing bays is not to be permitted and enforcement procedures are to be applied.

Vegetation within the road reserve is to be managed to prevent encroachment within the carriageway and to facilitate adequate road vision near bends, curves and crests.

25. Currently Emergency access to the Island is detailed in the "Operations Plan for Major Bush Fire on Scotland Island, 1996". The NSW Rural Fire Service needs to review of this Plan to confirm and determine what the emergency access arrangements to the island are during a Major bushfire Event.
26. As a means of alerting brigade members of a major incident, the NSW Rural Fire Service be requested to investigate and, if appropriate, provide pagers to each brigade member or else install a siren system which can be activated by use of a mobile telephone.
27. That the NSW Rural Fire Service, through the District Office, plans and implements a high impact Community Fire Wise Program on Scotland Island, to encourage co-operation with neighbours and other fire based "self help" initiatives for survival protection of their assets.
28. That the conditions of consent on all new dwellings on Scotland Island incorporate a condition for the reservation of 10 000L as emergency static water supply for all water tanks. An audit is required to determine which properties have this available to the NSW Rural Fire Service.
29. That this Fire Management Plan for Scotland Island be amended as necessary but be fully reviewed by no later than 2012.

16. ACTIONS AND PRIORITY

Action Number	Priority	Recommendation	Description	Associated Actions
1	2	As a result of reducing fire damage to electricity supply assets, Energy Australia and Telstra be requested to participate in vegetation management practices in proximity to overhead lines, poles and transformers.	Both Telstra and Energy Australia have assets within the road reserve and they have a vested interest in fuel management to protect them.	<ul style="list-style-type: none"> • That through the district Bush Fire Management Committee, Council seek assistance from Telstra and Energy Australia in reducing the fuel levels in proximity to the overhead lines.
3	1	That Council draw to the attention of the New South Wales Government and Sydney Water the need for the reticulated water supply to be extended from Church Point to better serve the requirements of the Scotland Island Community.	The water supply to Scotland Island is totally inadequate and fails to meet the Australian Standards. The State Government through Sydney Water is the responsible authority.	<ul style="list-style-type: none"> • Council to make the findings of this report available to the relevant State Government organisations. • That Pittwater Council in conjunction with Scotland Island Resident's Association (SIRA) lobby the State Government on the importance of a reticulated water supply for the island based upon Health and Safety.
4	2	Council work with the Scotland Island Resident's Association to investigate means of protecting the current existing "non-potable" water supply lines for continuity of service during fires and road maintenance.	The residents have recently funded the replacement of the water system on the island. Unless a reticulated water supply is to be constructed in the near future the existing system needs to be protected to prevent loss during bush fires and road maintenance.	<ul style="list-style-type: none"> • That subject to the projected time for the provision of a reticulated water supply, Council support the Scotland Island Resident's Association in seeking to secure a grant to carry out the work necessary to protect the existing system.
5 & 6	1	That maintenance programmes, which include bush fire preventative measures, be developed and promulgated for the Kindergarten and Community Hall in Catherine Park. Enclose the storage area underneath the Community Hall to avoid lodgement of sparks and embers beneath the hall.	These buildings fulfil an important role for the community and will be essential during and after natural disasters. Both require a Bush Fire Preparedness Strategy to be implemented.	<ul style="list-style-type: none"> • Enclose the storage area beneath the community hall as protection from sparks and embers. • Take steps to prevent or effectively manage the build up of bush fire fuel adjacent to the buildings. • Provide additional treatments to reduce susceptibility to Bushfire for example use of barricade treatments, etc. • Establish a routine for this removal of debris from the roof of the buildings.

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
7	1	That Council, as the major landholder on Scotland Island and the entity responsible for the removal of fire hazards from private land, fulfil the “co-ordinator” role for all bush fire hazard mitigation work upon Scotland Island.	In addition to being the major land holder on the island, Council has the legislative responsibility for ensuring that fire hazards are cleared from private land. Council is well placed to co-ordinate all Bush Fire Hazard Mitigation work on the island to ensure maximum fire safety with due regard for the environment.	<ul style="list-style-type: none"> • <i>Formalise through the Bush Fire Management Committee that Council will fulfil the co-ordination role for all Fire Hazard Management issues upon the island.</i>
8	2	The full range of fire hazard mitigation concepts be considered when prescribing adequate fire protection but with due concern for maintaining biodiversity.	The report identifies a number of fire mitigation concepts that could be applicable for use on the island. Use of various options will be essential if biodiversity is to be maintained.	<ul style="list-style-type: none"> • <i>That Council staff in fulfilling the co-ordinating role, promote a closer working relationship with the Rural Fire Service and the Community in striving for better fire protection but with due regard for the environment.</i>
9	1	That the NSW Rural Fire Service, under delegation from Council, adopt a more proactive approach to the serving of notices on landholders to strategically reduce the availability of bush fire fuel on residential properties.	Council has legislative responsibility to ensure that fire hazards are cleared from private land, even though this has been delegated to the Rural Fire Service. This work must compliment other fire mitigation works that occur on the island to maximise the overall level of community protection.	<ul style="list-style-type: none"> • <i>Council staff must maintain effective communication with all stakeholders on all matters associated with fire protection.</i> • <i>Ensure that community fire safety remains as the highest priority in actioning this plan.</i>
10	2	That though the development and distribution of a newsletter to residents, Council outline to the residents of Scotland Island the objectives and requirements of Council’s Tree Preservation Policy, together with the actions residents need to take in regard to trees that are considered to be a fire or safety hazard. Through the newsletter to residents on tree preservation and fire protection, the importance of retaining trees with “hollows” should be highlighted where that does not compromise fire and safety needs.	Residents are confused about how Council’s Tree Preservation Policy relates to fire and safety threats on their own land, neighbour’s land or Council land. This needs to be clarified. Residents have difficulties in the removal of fuel collected on there properties.	<ul style="list-style-type: none"> • <i>Council to produce a newsletter which clarifies this area of concern.</i> • <i>Special mention should be made in the newsletter of the value and need to retain “hollow” bearing trees as habitat for native fauna.</i>

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
11	1	That for all future development adjacent to Elizabeth Park Council will require by way of an Asset Protection Zone a setback from the park of at least 20 metres.	The southern portion of the island is not considered to be as bush fire prone as the other three aspects. The exception to this is the land adjacent to the southern boundary of Elizabeth Park.	<ul style="list-style-type: none"> • <i>Where possible with no environmental impediment Asset Protection Zone of at least 20 metres width should be applied by Council to any future development in this area.</i>
12	1	That the requirements of "Planning for Bushfire Protection" and Australian Standard AS 3959 be applied as far as practical by Council to any future development proposals including alterations and additions to existing residences.	Bush fire poses a major threat to the island residents. From a risk management perspective Council should insist on the provisions of "Planning for Bushfire Protection" and AS 3959 being applied for all alterations and additions to residences upon the island.	<ul style="list-style-type: none"> • <i>Council to ensure that the policies that have been adopted by the State Government are implemented fully in regard to any structural work upon the island.</i>
13	1	That through the development and distribution of a newsletter to Residents, Council and the NSW RFS provide the residents of Scotland Island with details on what constitutes fuel and how it can be controlled and disposed of.	That Pittwater Council in association with SIRA and the NSW Rural fire Service develop an annual newsletter on management of bushfire risk, particularly how to manage bushfire fuels.	<ul style="list-style-type: none"> • <i>Details on composting and pile burning to manage fuel loads on private and public property be developed as a matter of urgency.</i> • <i>Council in consultation with SIRA investigate other measures to provide for green waste removal on the Island.</i>
14	2	As a basis for species management and biodiversity, the adoption of the 5 zone concept and initial fire regimes is supported.	Five zones have been identified and described in the plan for Bush Fire Management. This concept is to be adopted and incorporated into the annual Hazard Reduction Programme.	<ul style="list-style-type: none"> • <i>That a mosaic burning pattern be utilized and supplemented with manual Hazard Reduction and other methods as considered applicable.</i> • <i>Adopt and implement the appropriate fire regime detailed within the Warringah Pittwater Bushfire Risk Management Plan as the interim standard.</i> • <i>Subject to funding availability implement post and pre-weeding in conjunction with hazard burning.</i>

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
15	2	That Elizabeth Park (Zone 5) be subdivided into 5 compartments for management and monitoring, the actual boundaries to be identified after the fire trail and pathway issues are resolved. Upgrade of the main access via Kevin Street is essential.	<p>Elizabeth Park is considered to be high of conservation value. For fire management within the spotted gum colony 5 compartments have been tentatively adopted pending decision on the re-routing of the fire trail and access/egress issues.</p> <p>Improved road access to Elizabeth Park via Kevin Street is essential due to it's poor condition.</p>	<ul style="list-style-type: none"> • After resolve of the fire trail and pathway issues within Elizabeth Park, identify 5 compartments to facilitate meeting the fire regime schedule for spotted gums. • That Council seek funding assistance from the "Bushfire Mitigation Works Programme" for the reconstruction of the fire trail from Kevin Street to Elizabeth Park.
16	1	Council staff in conjunction with the Rural Fire Service and other agencies ensure that all relevant material regarding fire activity and environmental issues are recorded within the "Research and Monitoring Schedule."	Council should adopt the co-ordinating role for fire mitigation on the island but the recording of information is reliant upon the co-operation of the Rural Fire Service since they will implement much of the work.	<ul style="list-style-type: none"> • That all stakeholder groups ensure that a report on all fire activity and relative environmental data is made available for the appropriate council officer to enter into the "Research and Monitoring Schedule."
17 & 18	1	That in the absence of an adequate mains water reticulation system on the island, as an interim means of improving the level of fire protection and fire fighter safety, the provision of 3 x 65 mm steel pipes with valves as described below should be installed.	On the assumption that a reticulated water system including fire hydrants will not be constructed within 12 months it is necessary for fire fighter safety and effectiveness that some interim system be provided. This would take the form of 63 mm steel pipes, permanently charged being constructed from each tank to the road system below.	<ul style="list-style-type: none"> • Council to seek funding for the upgrade of the water supply for fire fighting from the tanks in Elizabeth Park to the road system, the funds to be sought through the "Bush Mitigation Works Programme" which is part of the Natural Disaster Mitigation Programme.
19	2	That a fire trail be constructed with gates as a fire fighter safety issue to provide vehicular access/egress from the vicinity of tank 3 in Elizabeth Park down Fitzpatrick Avenue then south along Thompson Street to link with the formed road.	Fire vehicles which travel up to Elizabeth Park to fight a fire or access water are at risk of entrapment and overrun. It is also a laborious process moving from that location via Kevin Street to relocate close to the residences.	<ul style="list-style-type: none"> • That Council investigate the feasibility of constructing a gated fire trail from water tank 3 to Thompson Street (near Hilda) in conjunction with the NSW RFS. • That if a fire trail is not feasible a signposted pathway be constructed to ensure safe egress. • Construction of the fire trail should be funded through the NSW RFS sources", particularly the Bushfire Mitigation Works Programme".

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
20	2	That a fire trail be constructed down Elsie Street between Thompson and Florence Terrace to remove the current "dead end" situation in Florence Terrace.	Florence Terrace is the road access for numerous properties but it is a potential entrapment situation for fire vehicles, fire fighters and residents. Re-opening of the vehicle link between Thompson Street and Florence Terrace will partially overcome the problem.	<ul style="list-style-type: none"> • <i>That the feasibility of constructing a gated fire trail between Thompson St and Florence Terrace be investigated by Council in conjunction with the NSW RFS.</i> • <i>Council to prepare a design, cost the project and seek appropriate funding.</i>
21	2	Develop a refuge area at Elsie Street (near water tank 1) and provide a designated egress from the area down to the intersection with Thompson Street. This is to double as a public walkway	Situations will arise where fire fighters must access Elizabeth Park to fight fires. The construction of a gated fire trail from the water tank and down to Thompson Street will reduce the risk of entrapment.	<ul style="list-style-type: none"> • <i>Council to maintain appropriate fuel loads in refuge area and maintain the pathway down Elsie St</i> • <i>Construction costs for a fire trail should be sought through relevant grant funding NSW RFS.</i>
22 & 23	2	Creation of a pathway across the southern boundary of Elizabeth Park to provide emergency access/egrees for fire fighters.	A pathway across the southern boundary of the reserve will assist in emergency egress and access as well as acting as a containment line. The pathway will be constructed as a category 3 path in the relevant Australian Standard.	<ul style="list-style-type: none"> • <i>Council to investigate the location of the pathway in relation to providing minimal environmental disturbance and location of property boundaries...</i> • <i>That funding for the construction work be sought from the "Bushfire Mitigation Works Programme."</i>

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
24	1	That having regard to fire fighter and community safety, together with the geographic difficulties that the island present, Council seek the concurrence of the New South Wales Police and Rural Fire Service to the adoption of the following standards for road and trail construction on Scotland Island.	<p>Roads on the island are currently not adequate for bush fire fighting. Council should aim to meet as a minimum the fire trail standard. However, given the topography and geology of the island it is unlikely that all of these criteria can be met for all of the island roads.</p> <p>Within the draft stage of the Scotland Island Roads Master Plan, which Council is currently developing, the degree to which the suggested standard can be applied to the roads should be identified and the concurrence of both the Police and the New South Wales Rural Fire Service canvassed.</p>	<ul style="list-style-type: none"> • <i>Council is in the midst of preparing a Roads Master Plan for Scotland Island. Any improvements to the road system should be resolved and developed within this document. As a foundation for addressing fire fighter safety on the island the following criteria is suggested where practical.</i> <ul style="list-style-type: none"> ○ <i>The roads need to be accessible to the emergency services under all weather conditions.</i> ○ <i>Every effort should be made to provide a through access for emergency service vehicles.</i> ○ <i>Where unavoidable, dead end roads or trails should not exceed 200 metres in length and terminate with a suitable turn around facility for use by emergency service vehicles.</i> ○ <i>A trafficable width of 4 metres will apply with an additional 1 metre wide shoulder on each side of the carriageway maintained excessive fuels.</i> ○ <i>The maximum unsealed gradient is not to exceed 15°.</i>
25	3	Currently Emergency access to the Island is detailed in the "Operations Plan for Major Bush Fire on Scotland Island, 1996". The NSW Rural Fire Service needs to review of this Plan to confirm and determine what the emergency access arrangements to the island are during a Major bushfire Event.	During a serious bush fire it may be necessary for additional emergency services to be transported to the island. However, the NSW Rural Fire Service need to review the "Operations Plan for Major Bush Fire on Scotland Island, 1996" to determine what resources would be required and how these can be transported.	<ul style="list-style-type: none"> • <i>The NSW Rural Fire Service reviews the "Operations Plan for Major Bush Fire on Scotland Island, 1996". This review shall determine the types and scale of resources likely to be employed on the Island and how they will be deployed.</i>

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
26	2	As a means of alerting brigade members of a major incident, the NSW Rural Fire Service be requested to investigate and, if appropriate provide pagers to each brigade member or else install a siren system which can be activated by use of a mobile telephone.	Significant delays can occur in responding the Scotland Island Rural Fire Brigade to incidents by telephone, particularly members living on the east and south of the island. There is also concern for a means of providing early warning of residents of a serious fire incident.	<ul style="list-style-type: none"> • <i>That the NSW RFS via the district office investigate the problem raised by it's members and consider issuing pagers or installing a land based siren system that can be activated by a mobile telephone.</i>
27	1	That the NSW Rural Fire Service, through the District Office, plans and implements a high impact Community Fire Wise Programme on Scotland Island, to encourage co-operation with neighbours and other fire based "self help" initiatives for survival protection of their assets.	There is an element of complacency and individualism within the community about the risk that bush fire actually presents on the island. A change in community attitude is essential to achieving a safer environment on the island.	<ul style="list-style-type: none"> • <i>The NSW RFS via the District Office be requested to conduct a high impact "Community Fire Wise Programme" upon the island.</i> • <i>The key objectives for the programme should be encouraging groups of people to work together including:</i> <ul style="list-style-type: none"> ○ <i>The role and responsibility of landholders in fire prevention and preparation.</i> ○ <i>Provide an overview of the measures promulgated through this plan for the Scotland Island community.</i>

Scotland Island Bushfire Management Plan

Action Number	Priority	Recommendation	Description	Associated Actions
28	1	That the conditions of consent on all new dwellings on Scotland Island incorporate a condition for the reservation of 10 000L as emergency static water supply for all water tanks. An audit is required to determine which properties have this available to the NSW Rural Fire Service.	Given the lack of a reticulated water supply static water supplies become very important. Residences on the island should reserve 10 000L of water within there water tanks as an emergency supply. The NSW Rural Fire Service should be aware where this condition exists.	<ul style="list-style-type: none"> • A condition be placed on all future development consents that 10 000L of stored water be reserved as an emergency water supply. • An audit be undertaken to determine where this condition already exists.
29	2	That this Fire Management Plan for Scotland Island be amended as necessary but be fully reviewed by no later than 2012.	The Fire Management Plan for Scotland Island will need to be amended to maintain currency with fire related issues.	<ul style="list-style-type: none"> • Council staff audit the success for the plan implementation • Council staff amends the Plan as necessary and promulgate the changes to the community. • At 5 year intervals engage all stakeholders in conducting a review of the Fire Management Plan.

Note the following timeframes

- Priority 1 – within two years of the adoption of the plan.
- Priority 2 – within five years of the adoption of the plan.
- Priority 3 – as funding becomes available.

17. Conclusion

In summary, having regard to the current level of bush fire preparedness and the best intentions of the dedicated members of the Scotland Island Rural Fire Brigade, a major bush fire incident is more of a probability than a possibility and it is really a matter of time.

An attitudinal change toward better co-operation between the numerous stakeholders on all fire management issues could lead to some change in this prediction.

Working within the fire regimes for the various native species present on the island will cause some fuel build-up capable of carrying a bushfire. There will be a degree of hazard but if all component parts of this plan re implemented on schedule, the intensity of any wildfire occurrence will be minimised and subject to the timely availability of resources, manageable.

18. Acknowledgements

This Bushfire Management Plan has been prepared by Brian Parry and Associates Pty. Ltd. for Pittwater Council. The island is home to a very proud and enthusiastic community with divergent views on many issues. Through the consultative process the views of many residents have been collected, considered and broadly used in setting a future direction for mitigating the bush fire risk on the island.

Our sincere thanks to the members of the Scotland Island Rural Fire Brigade and the representative group from the Scotland Island Resident's Association for meeting with us both in their respective groups and for many, on an individual basis. Our thanks also to the District Manager of the New South Wales Rural Fire Service, Superintendent Craig Geddes and Inspector George Sheppard for their valuable input.

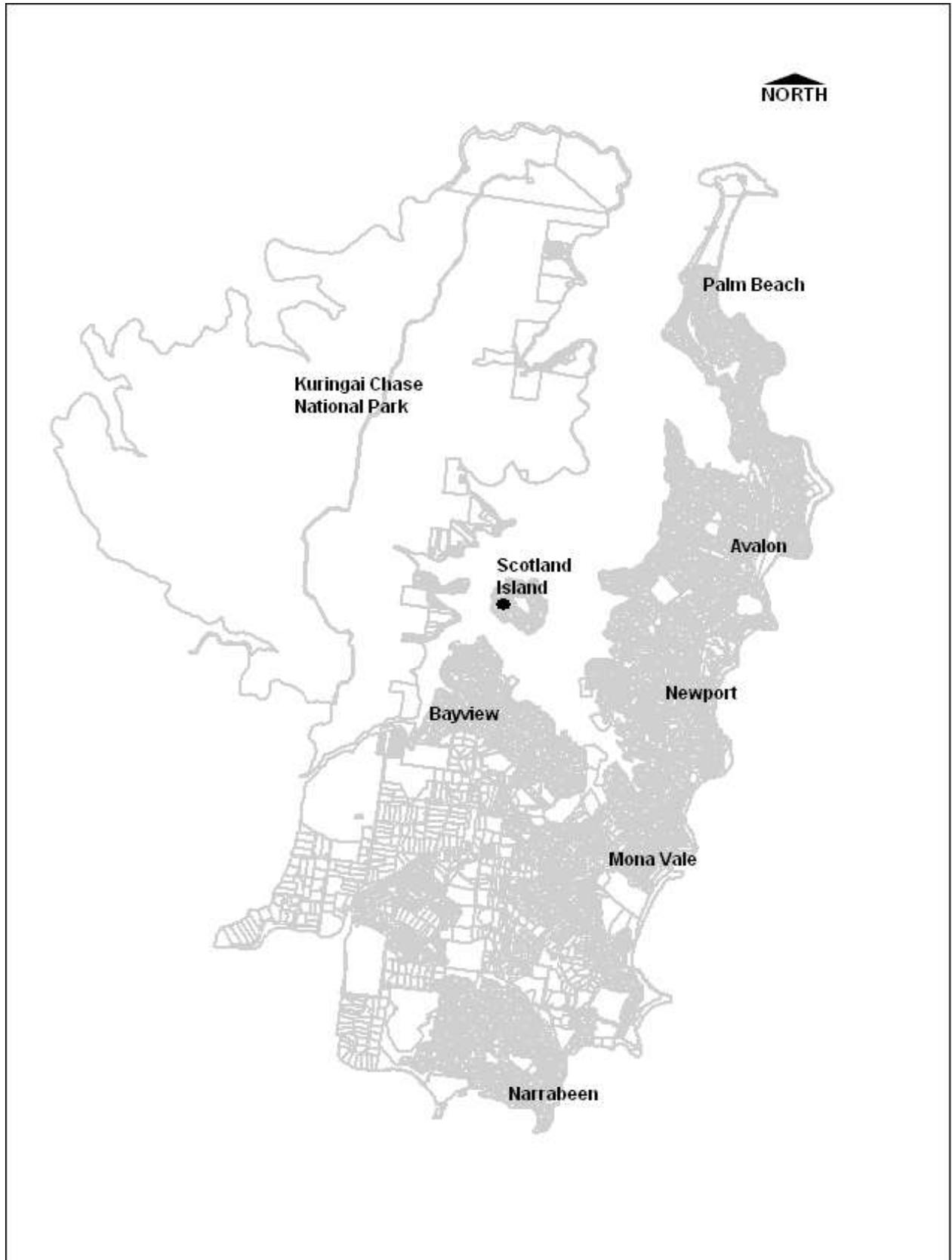
Oversight of the project on behalf of Pittwater Council was carried out by Mark Beharrell the Senior Environment Projects Officer. Mapping and G.I.S. work was provided by Chris Wright. Field work and preparation of the report involved Vic Walker, Margaret Preece and I.

To all involved in the project "Thank you."

19. Annexures

1. Scotland Island Location Map
2. Scotland Island Contour Map
3. Fire Management Zones
4. Elizabeth Park Refuge Areas
5. Scotland Island Fire Management Work Sheet
6. Annual Research & Monitoring Schedule

Annexure 1 – Scotland Island Location Map



Annexure 2 – Scotland Island Contour Map

Annexure 2. Scotland Island Contour Map (2 metre contours).



Annexure 3 – Fire Management Zones

Annexure 3. Fire Management Zones

Zone 1 

Thompson St (road reserve)
footpath between Fitzpatrick Ave
& Aoma St

Zone 2 

Thompson St (road reserve)
between Robertson Rd and Kevin Ave
plus southern portion of Catherine
Park

Zone 3 

Pathilda reserve between Florence
Terrace to 20m contour

Zone 4 

Pathilda Reserve between Florehe
Terrace and Thompson St

Zone 5

Elizabeth Park - There are five
compartments:

-  1. North-western sector
north of fire trail to 100m contour
-  2. Western sector from properties
to fire trail
-  3. South-eastern sector from
properties to the fire trail
-  4. Eastern sector north of the fire
trail to the 100m contour
-  5. Northern sector from the Kevin
Ave entrance to the 100m contour



Annexure 4 – Elizabeth Park Fire Refuge Areas

ANNEXURE 4. Refuge Areas and Escape Routes



Annexure 5 - Scotland Island Fire Management Work Sheet

SCOTLAND ISLAND FIRE MANAGEMENT WORK SHEET		Fire Management Zone No.
Area Treated / Burnt	Percentage Treated	Achievable against objectives?
Commencement Date/Time Group		
Completion Date / Time Group		
Agencies Involved:-		
Compliance to the Fire Management Plan Prescription: YES / NO		
Average scorch height Average flame height Ease of control		
Prevailing weather	RH:	TEMP: WIND SPEED
WIND DIRECTION		
Public attitude to the work:		
Attitude of Fire crews to the work:		
Was pre-burn weed control initiated? YES / NO		
What weed species were noticed?		
Was post-burn weed control initiated? YES / NO		
What were the dominant native species of flora in the area?		
Observations at 6 weeks post burn:		
Observations at 3 months post burn:		
Reporting Officer: Date:		

**Annexure 6
Annual Research Monitoring Schedule
Scotland Island**

Tasking	Agency Tasking	2007	2008	2009	2010	2011	Program to extend for at least 20 yrs for research purposes
1. Develop a GIS for Scotland Island with details of access tracks, fire management zones, cultural features and known locations of sensitive plant communities.	Council						
2. Make provision within the GIS Programme to record species, dates and numbers of faunal species on each Fire Management Zone.	N.C.C. Council						
3. Develop and implement pre-fire weed management Strategies for each zone.	Council RFS						
4. Identify native flora species suitable for revegetating areas on completion of weed eradication work.	Council						
5. Develop and implement post-fire weed management strategies for zones that have been hazard reduced or subjected to wildfire during the year	Council RFS			-		-	
6. Assess and record observations of the response of vegetation to fire exposure 3 years after each incident and periodically thereafter	Council						
7. Prescribe and record the desired weather conditions, fire behaviour and outcomes for hazard reduction in each fire management zone except for fire activity associated with weed management.	Council RFS NPWS						
8. Record the weather and fuel conditions, together with a description of fire behaviour for any unscheduled fire incident.	RFS						



9. Develop and maintain observation sites and databases to monitor the regenerative growth of specific trees and shrubs affected by fire.	Council N.C.C. NPWS						
10. Ensure that future development adjacent to Elizabeth Park is compliant with the set back requirements of 'Planning for Bushfire Protection.' Record non-compliant development.	Council RFS						
11. Monitor and rectify any negative environmental consequences arising from the construction of fire trails or walking tracks that are intended for use as fire management zone boundaries.	Council RFS N.C.C.						
12. Monitor, rectify and record any subsidence or erosion arising from fire management works, such events to be entered into the GIS.	Council RFS						
13. Identify within the CIS subsidence on any other land upon the island.	Council						
14. Ensure that adjoining and close neighbours to each Fire Management Zone understand the objectives and fire management strategies being used in the zone. Record all activity annually.	BFMC						