



Management Plan

for Historic Site and Monument 77 and Antarctic Specially Managed Area No. 3 CAPE DENISON, COMMONWEALTH BAY, GEORGE V LAND, EAST ANTARCTICA

Latitude 67° 00' 13" S — 67° 00' 50" S
Longitude 142° 40' 00.1" E — 142° 41' 27" E

Introduction

Cape Denison, Commonwealth Bay is one of the principal sites of early human activity in Antarctica. It is the location of the base of the Australasian Antarctic Expedition of 1911-14 organised and led by Dr (later Sir) Douglas Mawson. An important symbol of the 'heroic age' of Antarctic exploration (1895-1917), it is one of only six hut sites remaining from this period. Cape Denison hosted some of the earliest comprehensive studies of Antarctic geology, geography, terrestrial magnetism, astronomy, meteorology, glaciology, oceanography, biology, zoology and botany. It was also the base of numerous explorations inland and features artefacts associated with these sledging parties, including food caches and equipment. Due to the considerable historical, cultural and scientific significance of Cape Denison,

the entire area is designated as an Antarctic Specially Managed Area (ASMA) consistent with Articles 2, 4, 5 and 6 of Annex V of the Protocol on Environmental Protection to the Antarctic Treaty. It is also listed as a Historic Site and Monument in accordance with Article IX(1) of the Antarctic Treaty and Article 8(2) of Annex V of the Protocol.

Cape Denison is characterised by four valleys aligned northwest/southeast. The majority of Australasian Antarctic Expedition artefacts, including buildings ('Mawson's Huts') and other structures, are concentrated in the westernmost valley and on the ridges on either side of the valley. The historic huts and their immediate surrounds constitute Antarctic Specially Protected Area (ASP) No. XXX.

1. Description of Values to be Protected

1.1 Primary values

This ASMA is proposed on the grounds that Cape Denison is a site of historic, archaeological, social and aesthetic values.

Historic value

Antarctica's 'heroic age' was a period of great human adventure and discovery. Cape Denison, Commonwealth Bay provides the setting for the buildings, structures and relics of the Main Base of the Australasian Antarctic Expedition (AAE) of 1911–14, led by Dr Douglas Mawson.

The prime focus of Mawson's was scientific research. Nevertheless, the expedition also had an exploratory agenda, with the aim of charting the entire Antarctic coastline immediately south of Australia. For this purpose at least five sledging expeditions were undertaken from Cape Denison from spring 1912, including the infamous Far-Eastern Sledging Party during which expeditioners Belgrave Ninnis and Xavier Mertz perished and Mawson himself barely survived. Overall, more than 6,500 km of coastline and hinterland was explored by sledging parties of the Expedition.

Cape Denison contains numerous relics relating to the work of Mawson's expedition, including Mawson's Huts and other significant and relatively untouched artefacts from the 'heroic age'. While the majority is concentrated in the westernmost valley and its immediate surrounds, the historical boundaries of the Main Base extend further. Artefacts and other evidence of occupation, such as food caches, extend across the entire Cape, forming a rich resource of material available for research and interpretation, and potentially yielding scientific data and information about aspects of expeditioner life not included in official written accounts.

Aesthetic values

This ASMA is designated to preserve not only the artefacts remaining *in situ* but also the cultural landscape of Cape Denison in which Mawson and his men lived and worked. Cape Denison is characterised by its almost incessant blizzard conditions, which severely limit access to the region and activities at the site. System and katabatic winds pour down the plateau and funnel through the Cape's valleys; blasting the hut with gusts that in May 1912 reached 322 km/h. (The average wind speed for the month was 98 km/h). Cape Denison is not only the windiest place in Antarctica, but



also the windiest place on Earth at sea level. The site thus provides the physical and symbolic context of the extreme isolation and harsh conditions endured by the expedition members and, by association, all other 'heroic age' researchers and explorers. In designating the entire area as an ASMA, Cape Denison's unique 'sense of place' is protected, with Mawson's Huts and Boat Harbour as the focus of the visual catchment. Mawson's Huts themselves are provided with additional protection in ASPA 162.

Educational values

Cape Denison's wildlife and undisturbed artefacts, framed against the dramatic backdrop of the Antarctic Plateau, represent significant educational values. The Area's isolation and extreme weather provide visitors with a unique insight into the conditions endured by 'heroic age' researchers and explorers, and a chance to form a deeper appreciation of their achievements.

Environmental values

The paucity of relatively ice-free areas in the immediate region means that Cape Denison represents an important assemblage of life forms (Appendices A and C). The closest ice-free areas of equal or greater size to Cape Denison are approximately 20 km to the east of Cape Denison (from the centroid of the ASMA), and approximately 60 km to the west respectively. A haul-out site for Weddell, leopard and elephant seals, the Cape is also an important breeding area for Adélie penguins, Wilson's storm-petrels, snow petrels and south polar skuas.

Flora at Cape Denison is represented by 13 lichen species distributed on boulders and other moraines throughout the peninsula. These species are listed at Appendix C. No bryophytes are evident. The lichens' distribution on rocks, which are subject to different patterns of snow ablation, makes them vulnerable to trampling and other interference by visitors, however infrequent visitation may be.

Cape Denison has 13 small lakes. These are associated with glacial action, are a permanent feature, and are frozen over for most of the year. Since such lakes are also susceptible to physical, chemical and biological modification within their catchment boundaries, a catchment-based approach to the management of human activities is required.

Scientific values

Mawson, a geologist, planned his expedition in order to examine the theories about continental connection and the processes of glaciation and climate. He also sought to study the South Magnetic Pole and magnetic charting for navigational purposes; to conduct biological studies, including the identification of new species; and to establish a weather station.

Cape Denison provides opportunities to repeat Mawson's experiments and conduct further research into magnetism, meteorology, biology, and other sciences. For example, although Antarctic lakes are generally recognised as valuable due to their relatively simple natural ecosystems, the lakes at Cape Denison have neither been sampled nor their biota studied. There are also numerous non-marine algae present; however, no surveys have been undertaken. The records from Mawson's expedition provide a dataset against which the results of modern research may be compared, and the site's isolation lends it considerable value for future use as a reference site for other areas that experience a greater level of human activities.

2. Aims and Objectives

Management of the Area aims to assist in planning and co-ordinating current and future activities in the Area, to avoid possible conflicts, and to improve co-operation between Parties in order to avoid degradation of, or substantial risk to, the values of the Area. Management objectives are:

- to prevent degradation of the Area, its features, artefacts, and values;
- to maintain the heritage values of the Area through planned conservation¹ and archaeological work programs; and
- to provide for management activities which support the protection of the values and features of the Area.

3. Management Activities

The following management activities may be undertaken to protect the values of the Area:

- research and other activities essential or desirable for understanding, protecting and maintaining the values of the Area;
- the removal of objects not related to the AAE of 1911–14 and/or the British Australian New Zealand Antarctic Research Expeditions (BANZARE) of 1929–31 and that compromise the historic and aesthetic values of the Area, provided that removal does not adversely impact on the values of the Area, and that the objects are appropriately documented prior to removal. Priority should be given to the removal of field infrastructure from the Visual Protection Zone, giving consideration to the needs (including those of safety) of conservation workers and the program of conservation works;
- essential maintenance of other objects and infrastructure, including the Automatic Weather Station;
- installation of signage to indicate the boundaries of the HSM and ASMA;
- visitation of the Area as necessary to assess whether it continues to serve the purposes for which it was designated and to ensure that management activities are adequate; and
- consultation with other national Antarctic programs operating in the region, or those with an interest or experience in Antarctic historic site management, with a view to ensuring the above provisions are implemented effectively.

¹ In the context of this Management Plan the term conservation "means all the processes of looking after a place so as to retain its cultural significance", as defined in Article 1.4, of The Burra Charter: The Australian ICOMOS Burra Charter, 1999.



4. Period of designation

This ASMA is designated for an indefinite period.

5. Description of the Area

5.1 Geographical coordinates, boundary markers and natural features

Cape Denison (67° 00' 13" S—67° 00' 050" S; 142° 39' 02" E—142° 41' 28" E) is located in the centre of Commonwealth Bay, a 60 km-wide stretch of coast in George V Land some 3,000 km south of Hobart, Australia. The Cape itself is a rugged, 1.5 km-wide tongue of ice, snow, rock and moraine projecting into Commonwealth Bay from the steeply rising wall of the ice cap of continental Antarctica. On the western side of the Cape is Boat Harbour, a 400m-long indentation in the coast.

The designated ASMA (Map A) extends from Land's End (67° 00' 46" S, 142° 39' 24" E) in the west, along the coastline to the northern tip of the western shore of Boat Harbour (67° 00' 24" S, 142° 39' 28" E), across the mouth of Boat Harbour (in a straight north-easterly diagonal) to the northern tip of Penguin Knob (67° 00' 17" S, 142° 39' 31" E) on the eastern shore of Boat Harbour, and then along the coastline in a south-easterly direction down to John O'Groats (67° 00' 47" S, 142° 41' 27" E). The southern boundary extends in a straight line from Land's End to John O'Groats along latitude 67° 00' 47" S. With the exception of the boundary across the mouth of Boat Harbour, the northern coastal boundary extends to that land above the lowest tide.

The shoreline and the ice cliffs at both ends of the Cape (Land's End and John O'Groats) form a clearly defined boundary; as such, no boundary markers have been installed because the coast is a clearly defined boundary. Signs will be installed at the eastern (John O'Groats) and western (Land's End) limits of the southern boundary.

Natural features: Topography and geomorphology

The topography of Cape Denison is defined by a series of four rocky ridges, running south- southeast to north-northwest, and three valleys. The largest, most westerly of these valleys contains the AAE buildings, which are protected within ASPA 162. The basement of the Cape Denison area consists of partially migmatized, massive felsic orthogneiss intruded about 2350 million years ago (Ma) into an older metamorphosed sequence. Above the basement the area features a lower zone of relatively polished rock and a higher zone of relatively unpolished rock; the former being especially prominent below 12 metres above sea level and indicative of more recent uplift and exposure than the upper zone. An upper and lower moraine are apparent, with the upper moraine, closer to the edge of plateau, containing a diversity of angular boulders. The lower moraine is dominated by local rocks sorted into bands, perhaps the result of an 'ice push' from the sea rather than being genuine glacial moraine.

Water bodies

Cape Denison contains 13 small glacial lakes, which are generally oriented parallel to the foliation of the basement rocks. At the height of summer Cape Denison also features numerous melt streams which flow into Commonwealth Bay. It is not known whether the streams flow down established courses, or whether the streams are a feature of the regular freeze/thaw cycle.

Biological features

Cape Denison is the summer habitat for breeding Adélie penguins, Wilson's storm-petrels, snow petrels and the south polar skua (Map C). Other species sighted in the area include the Cape petrel, Antarctic petrel, southern giant petrel and emperor penguin. A full list of species and number of breeding pairs (where available) is attached as Appendix A. Weddell seals, southern elephant seals and leopard seals have been recorded as hauling out and, in the case of elephant seals, moulting at Cape Denison. However, the sporadic nature of visits to the Area means that monitoring has been inconsistent and the exact extent of the seal population uncertain. Some data is presented in Appendix Bii.

The only flora evident at Cape Denison is lichens, for which a list of species is included at Appendix C, and non-marine algae, which have yet to be studied.

5.2 Access to the Area

Sea, land and air access to Cape Denison is difficult due to the rugged topography and climate of the area. Sea ice extent and uncharted bathymetry may constrain ship access to approximately 3nm from the coastline. Access is then gained either by small watercraft or by helicopter, although attempts to land are frequently hampered by heavy seas and prevailing north-westerly or katabatic winds. Boat landings may be made at Boat Harbour and due north of Sørensen Hut. The helicopter landing site and approach and departure flight paths are indicated on Map C.

There are no roads or other transport infrastructure on shore. Land vehicles should only be used in accordance with the Code of Conduct (see Section 8.0).

Pedestrian access within the Area is unrestricted except in places where AAE buildings, artefacts, or bird or lichen colonies are present, and should be conducted in accordance with the Code of Conduct (see Section 8.0).

5.3 Location of structures and other anthropogenic objects within and near to the Area

Cape Denison is notable for being the location of four historic buildings and a Memorial Cross constructed by the AAE of 1911-1914. The buildings and their immediate environs are protected by ASPA 162.

Within the ASMA there are several AAE structures, including survey markers and the mast on top of Anemometer Hill, about 150 m east of Mawson's Main Hut. On 5 January 1931 members of the BANZARE party (including Douglas Mawson) visited Cape Denison to claim formal possession of George V Land on behalf of Great Britain, and used the mast to support the proclamation flag and canister containing the proclamation itself. A small timber plaque and proclamation, still attached to the mast, are the only 'formal' artefacts of that visit remaining *in situ* today.

Cape Denison additionally features six other structures: an automatic weather station (AWS); a field shelter known as Sørensen Hut; a red fibreglass 'Apple' hut; a wooden platform on which tents may be pitched; a field shelter known as Granholm Hut, and a plaque near Mawson's Main Hut indicating that the hut is a Historic Monument.



The AWS is located at 67° 00' 33" S; 142° 39' 51" E on a rise near Round Lake and approximately 150 m southeast of Mawson's Main Hut. It has been operating since 1990 as part of the Antarctic Automatic Weather Project of the University of Wisconsin—Madison, and is the property of that institution.

Sørensen Hut is located about 400m east of Mawson's Main Hut at 67° 00' 29" S; 142° 40' 12" E. It was constructed by the Australian national program in 1986 to provide temporary shelter for parties conducting conservation works on Mawson's Huts and contains some provisions and field equipment. Numerous items are also stored underneath and immediately adjacent to Sørensen Hut, and in the adjacent Apple hut.

Granholt Hut is situated at 67° 00' 29" S; 142° 39' 26" E, some 160 m northwest of Mawson's Main Hut. It was constructed in 1978 to provide a temporary shelter and workshop for parties working on Mawson's Huts. It contains numerous building materials, some field equipment and limited provisions. Additional building materials are stored beneath the hut.

To the east of Granholt Hut is a stack of Oregon and Baltic pine timbers for use in conservation work on the Main Hut. This stack is secured with galvanised cables attached to rock bolts. A similar timber stack is located on rocks some 100 m southeast of the Main Hut and 10 m east of the designated helicopter landing site.

The HSM marker currently situated adjacent to the Main Hut will be replaced by appropriate signage to indicate that the whole of Cape Denison has been designated as a Historic Site. The signage will be in the English, French, Spanish and Russian languages, and will indicate the protection status of the site and its contents under the Antarctic Treaty.

Objects left by Mawson's expedition are scattered throughout the Area, and appear from year to year depending on snow cover. These include cairns; cached seal and penguin carcasses; timbers; and a large collection of disassembled penguin skeletons. It is believed that a significant number of artefacts exist under the snow and have yet to be uncovered. It is additionally possible that artefacts from the ice cave known as 'Aladdin's Cave', a sledging depot excavated by Mawson's expedition in 1912, may also be present in the vicinity of the ASMA, if not within the ASMA itself. The cave was originally located on the plateau at 67° 05' S, 142° 38' E, some 8 km south of Mawson's Main Hut, but it may have been relocated (via the movement of ice) up to 4.5 km down-slope from the original 1912 location. Its exact location has yet to be determined.

5.4 Location of other protected areas in or near to the Area

ASPA 162, encompassing the four AAE huts, is located within the Cape Denison ASMA, and exists to protect their historic and social values.

The Cape Denison ASMA is to be simultaneously listed as Historic Site No. **70** under the Antarctic Treaty.

There are no other ASPAs or ASMAs within 50 km of Cape Denison.

6. Zones within the Area

All activities within the Area are to comply with the provisions of the Madrid Protocol and the Code of Conduct contained in this management plan (see Section 8.0). In addition to these general guidelines, three zones are defined in which restrictions on certain activities are deemed necessary in order to meet the management objectives for the Area.

6.1 ASPA 162

ASPA 162 (Mawson's Huts) is located within the ASMA. This ASPA encompasses the four Australasian Antarctic Expedition huts in order to protect their historic and social values. Entry to the ASPA and activities within it require a permit and must be carried out in accordance with the ASPA Management Plan.

6.2 Visual Protection Zone

The visual catchment of Mawson's Huts and the Memorial Cross is of particular importance within the Cape Denison cultural landscape. In order to protect the landscape setting and 'sense of place' of Mawson's Huts, a Visual Protection Zone is defined within the proposed ASMA. To preserve these values, no new structures should be built within the Visual Protection Zone. The Visual Protection Zone is illustrated on Maps A and B and is generally defined as the area enclosed by the western and eastern ridge lines of the valley containing the historic structures. The boundary extends from the coastline (67° 00' 24.9" S, 142° 39' 14.3" E) and runs southeast along the western side of the westernmost ridge to the ice plateau (67° 00' 46.8" S, 142° 39' 37.2" E); northeast along the edge of the ice plateau to 67° 00' 43.9" S, 142° 40' 5.6" E; north-northwest between Round Lake and Long Lake to 67° 00' 33.7" S, 142° 39' 59.8" E; then as far as Magnetograph House (67° 00' 20.3" S, 142° 39' 46.6" E); and then northwest along the eastern side of the eastern ridge line to the sea (67° 00' 15.7" S, 142° 39' 28.2" E).

6.3 Helicopter Zone

Helicopter operations have the potential to disturb breeding and moulting wildlife. To minimise disturbance to seals and nesting birds at Cape Denison during the summer months, helicopters should only land at the site indicated on Map C and approach and depart in accordance with the flight paths indicated on the map. Departure paths have been selected to avoid wildlife concentrations as much as possible. Use of a single-engined helicopter is preferable; however twin-engined helicopters may be used with due regard for the potentially greater disturbance to wildlife. The presence of seals and the breeding cycle of birds nesting in the Area are charted at Appendices Bi and Bii; twin-engine helicopter operations should be avoided during weeks that birds are hatching eggs or raising chicks (late October to early March).



7.0 Maps of the Area

Map A: Cape Denison Management Zones. This map shows the boundaries of the ASMA, the Historic Site, the Visual Protection Zone, ASPA No. 162, and significant topographic features of the Area. The inset map indicates the location in relation to the Antarctic continent.

Map Specifications:

Projection: UTM Zone 54 Horizontal Datum: WGS84

Map B: Cape Denison Visual Protection Zone. This map shows the boundaries of the Visual Protection Zone and indicates the position of significant historic artefacts, including the four Australasian Antarctic Expedition huts, the Memorial Cross, and Anemometer Hill, the site of the BANZARE Proclamation Pole.

Map Specifications:

Projection: UTM Zone 54 Horizontal Datum: WGS84

Map C: Cape Denison Flight Paths and Bird Colonies. This map indicates the approaches, departures and landing site for helicopters, as well as the location of bird colonies in the vicinity.

Map Specifications:

Projection: UTM Zone 54 Horizontal Datum: WGS84

8.0 Code of Conduct

The actions of individuals contribute significantly to protecting the Antarctic environment. This Code of Conduct is intended to provide general guidelines to help minimise environmental impacts at Cape Denison, but it cannot be expected to cover every situation. All visitors, including national program personnel and tourists, should consider their responsibilities and seek to minimise their impact on all aspects of the environment and most particularly the values described.

8.1 Access to and movement within or over the Area

All land vehicles are prohibited within the Area, with the exception of small all-terrain vehicles which, due to the colonisation of rocky areas by lichens and seabirds, should be used on snow and ice surfaces only and with due consideration of the location of historic artefacts. Pedestrian access within the Area is unrestricted but artefact-rich areas (such as the scatter immediately to the north of the Main Hut), bird or lichen colonies, and penguin 'highways' (the established route of birds moving between their nest and the sea) should be avoided.

8.2 Activities which are or may be conducted within the Area

- Historic conservation and archaeological work.
- Research, including scientific research.
- Visitation for the purposes of education or recreation, including tourism in line with Recommendation XVIII-1.
- Essential maintenance of non-historic infrastructure, including the Automatic Weather Station, and removal of non-historic objects that compromise the historic and aesthetic values of the Area. These activities should be conducted by authorised personnel only.

8.3 The installation, modification, or removal of structures

To preserve the historic, archaeological, social, aesthetic and environmental values of the ASMA, no new structures should be constructed, nor additional scientific equipment installed in the Area, except for the conservation, research or maintenance activities specified in Section 3.0 above.

All equipment and infrastructure left in the Area should be periodically reviewed for maintenance and potential removal.

8.4 The location of field camps

Existing non-historic infrastructure should be used by Parties undertaking activities in accordance with this management plan, in preference to establishing new infrastructure.

Tents should be pitched on the wooden platform adjacent to Sørensen Hut. Use of the huts and any supplies should be reported to the Australian national program as soon as practicable to ensure the safety of other people who may be reliant upon known stores.

8.5 The taking of or harmful interference with native flora and fauna

Approach distances to wildlife should be consistent with those agreed within the Committee for Environmental Protection. Until guidelines are adopted by the Committee, Table 1 below provides guidance.

Visitors should not wash, swim or dive in the lakes. These activities could contaminate the water body and disturb the water column, microbial communities, and sediments.

Table 1: Minimum distances to maintain when approaching wildlife on foot

Species	Phase of life	On foot (m)
Snow petrels	Nesting	15
Wilson's storm-petrels	Nesting	15
South polar skuas	Nesting	15
Adélie penguins	Summer: on ice or away from colony	5
	Summer: breeding birds in colonies	15
Breeding Weddell seals and pups (includes weaners)	All times	15
Mature seals on their own (all species)	All times	5



8.6 The collection or removal of anything not brought into the Area by the visitor

Cape Denison is listed as a Historic Site under the Antarctic Treaty. In accordance with Annex V, Article 8 (4) of the Protocol, no historic structure or other artefact at Cape Denison should be damaged, destroyed or removed, unless removal of an artefact is essential for conservation purposes. Any artefacts may only be removed by authorised and appropriately trained personnel. The repatriation of the artefact to the location at Cape Denison from which it was removed is generally preferable unless further damage or deterioration may result from repatriation.

If an artefact is to be removed, the Australian national program should be informed so that documentation regarding that program's archaeological research at Cape Denison may be amended accordingly.

8.7 The disposal of waste

All wastes, including human wastes, should be removed from the Area.

Refuelling of vehicles, generators and other essential equipment should be conducted with due care for the surrounding environment. Refuelling activities should not be conducted in the catchment areas of lakes or melt streams, at the ice edge, or in other sensitive areas.

8.8 Reports to be made to the appropriate authority regarding visits to the Area

To enhance cooperation and the coordination of activities in the Area, to allow for effective site monitoring and management, to facilitate the consideration of cumulative impacts, and to fulfill the aims and objectives of this Management Plan:

National program personnel, tourists and other non-government personnel proposing to visit, land, and/or conduct activities in the Area should inform the Australian national program of their intentions as soon as is practicable.

The details of all field activities should be accurately recorded for transfer to the management database of the Australian national program. See Section 9.0 below.

9.0 Information exchange

Parties with active programs in the Area and non-government operators should exchange information obtained during visits to the Area that may have a bearing on the operation of this Management Plan. For example, the expedition or tour leader should submit to the appropriate authority a report describing the activities undertaken in the Area. Such reports should include, as appropriate, the information identified in the Visit Report form contained in Appendix 4 of Resolution 2 (1998)(CEP 1). Parties should maintain a record of such activities and, in the Annual Exchange of Information, should provide summary descriptions of activities conducted by persons subject to their jurisdiction, which should be in sufficient detail to allow evaluation of the effectiveness of this Management Plan.

Parties should, wherever possible, deposit originals or copies in a publicly accessible archive (such as the dedicated Mawson's Huts website at http://www.aad.gov.au/mawsons_huts) to maintain a record of visitation or usage of the site, to be used both in any review of this Management Plan and to assist in organising the use of the Area.

10.0 Supporting Documentation

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Dr Eric J. Woehler, ornithologist, Australian Antarctic Division, pers. comm. September 2002; 31 March 2003.



Appendix A

Fauna recorded at Cape Denison, Commonwealth Bay Breeding populations (pairs) of seabirds at Cape Denison

Species	No. pairs, December 2002
Adélie penguin <i>Pygoscelis adeliae</i>	18,737
Wilson's storm-petrel <i>Oceanites oceanicus</i>	38
Snow petrel <i>Pagodroma nivea</i>	30
South polar skua <i>Catharacta maccormicki</i>	8
Antarctic prion <i>Pachyptila desolata</i> (indeterminate breeding status) Cape petrel <i>Daption capense</i> (indeterminate breeding status)	
Other seabirds sighted at Cape Denison	
Species	
Antarctic petrel <i>Thalassoica antarctica</i> Southern giant petrel <i>Macronectes giganteus</i> Sing penguin <i>Aptenodytes patagonica</i> Royal penguin (carcase) <i>Eudyptes schlegeli</i> Chinstrap penguin <i>Pygoscelis Antarctica</i> Emperor penguin <i>Aptenodytes forsteri</i>	
Seals recorded at Cape Denison	
Species	
Weddell seal <i>Leptonychotes weddellii</i> Leopard seal <i>Hydrurga leptonyx</i> Southern elephant seal <i>Mirounga leonina</i>	

Appendix B: Helicopter operations

Breeding cycles of nesting seabirds at Cape Denison, Commonwealth Bay

Species breeding at Cape Denison	Number	Summer breeding cycle
Wilson's storm-petrel (<i>Oceanites oceanicus</i>)	Approximately 38 pairs; three small colonies	Before mid-December: adults; after mid- December: adults, eggs and chicks
Snow petrel (<i>Pagodroma nivea</i>)	Approximately 30; one small colony	Before late November: adults; after late November: adults, eggs and chicks
Adélie penguin (<i>Pygoscelis adeliae</i>)	Approximately 18,800 pairs, numerous colonies	Before November: adults; after November: adults, eggs and chicks
South polar skua (<i>Catharacta maccormicki</i>)	Approximately 8 pairs, scattered nests on fringes of penguin colonies	Before mid-December: adults; after mid- December: adults and eggs; after late December: adults and chicks

Appendix Bii: Helicopter operations

Seals at Cape Denison, Commonwealth Bay

Species	Number	Summer breeding cycle
Weddell seal (<i>Leptonychotes weddellii</i>)	Exact number not known, no established colonies	Before November: no seals; between mid-November to end December, approx. 24 adults per day
Southern elephant seal (<i>Mirounga leonina</i>)	Exact number not known, no established colonies	Approx. 2 or adults per day in December



Appendix C

Flora recorded at Cape Denison, Commonwealth Bay

The following taxa were recorded at Cape Denison by the Australasian Antarctic Expedition (AAE) of 1911–14 and the British Australian New Zealand Antarctic Research Expedition (BANZARE) in 1929–31 and published by Carroll W. Dodge in *BANZARE Reports, Series B, Vol. VII, July 1948*.

LICHENS

Lecideaceae

Lecidea cancriformis **Dodge & Baker**
Toninia johnstoni **Dodge**

Umbilicaiaceae

Umbilicaria decussata (Vill.) Zahlbr.

Lecanoraceae

Rhizoplaca melanophthalma (Ram.) Leuck. & Poelt
Lecanora expectans Darb.
Pleopsidium chlorophanum (Wahlenb.) Zopf

Parmeliaceae

Physcia caesia (Hoffm.) Th. Fr.

Usneaceae

Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D.
Hawksw.
Usnea antarctica Du Rietz

Blasteniaceae

Candelariella flava (C.W. Dodge & Baker) Castello & Nimis
Xanthoria elegans (Link) Th. Fr.
Xanthoria Mawsonii Dodge

Buelliaceae

Buellia frigida Darb.

BRYOPHYTES

No bryophytes evident at Cape Denison.

There are numerous non-marine algae; however, no surveys have been undertaken.





