The Antarctic Treaty

Measures adopted at
the Thirty-eighth Consultative Meeting
held at Sofia 01 – 10 June 2015

Presented to Parliament
by the Secretary of State for Foreign and Commonwealth Affairs
by Command of Her Majesty
December 2016

Cm 9356

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MEASURES ADOPTED AT THE THIRTY-EIGTH ANTARCTIC TREATY CONSULTATIVE MEETING

Sofia, Bulgaria 01-10 June 2015

The Measures[1] adopted at the Thirty-sixth Antarctic Treaty Consultative Meeting are reproduced below from the Final Report of the Meeting.

In accordance with Article IX, paragraph 4, of the Antarctic Treaty, the Measures adopted at Consultative Meetings become effective upon approval by all Contracting Parties whose representatives were entitled to participate in the meeting at which they were adopted (i.e. all the Consultative Parties). The full text of the Final Report of the Meeting, including the Decisions and Resolutions adopted at that Meeting and colour copies of the maps found in this command paper, is available on the website of the Antarctic Treaty Secretariat at www.ats.aq/documents.

The approval procedures set out in Article 6 (1) of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty[2] apply to Measures 1 to 18 (2015).

The approval procedures set out in Article 8 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty applies to Measure 19 (2015).

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[1]As defined in Decision 1 (1995), published in Miscellaneous No. 28 (1996) Cm 3483
[2] Treaty Series No. 15 (2006) Cm 6855
The texts of the Antarctic Treaty together with the texts of the Recommendations of the first three Consultative Meetings (Canberra 1961, Buenos Aires 1962 and Brussels 1964) have been published in Treaty Series No. 97 (1961) Cmnd. 1535 and Miscellaneous No. 23 (1965) Cmnd. 2822. The text of the Environmental Protocol to the Antarctic Treaty has been published in Treaty Series No. 6 (1999) Cm 4256. The text of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty has been published in Treaty Series No. 15 (2006) Cm 6855.

The Recommendations of the Fourth to Eighteenth Consultative Meetings, the Reports of the First to Sixth Special Consultative Meetings and the Measures adopted at the Nineteenth and the Measures adopted at the Twenty-sixth, Twenty-seventh, Twenty-eighth, Twenty-ninth, Thirtieth, Thirty-first, Thirty-second, Thirty-third, Thirty-fourth, Thirty-fifth, Thirty-sixth and Thirty-seventh Consultative Meetings were also published as Command Papers. No Command Papers were published for the Twentieth to Twenty-fifth Consultative Meetings.

Measures Adopted at the XXXVIII Consultative Meeting held at Sofia, Bulgaria 01-10 June 2015

Measure 1 (2015)

Antarctic Specially Protected Area No 101 (Taylor Rookery, Mac.Robertson Land): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation IV-1(1966), which designated Taylor Rookery, Mac.Robertson Land as Specially Protected Area ("SPA") No 1;
- Recommendation XVII-2 (1992), which adopted a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 1 as ASPA 101;
- Measures 2 (2005) and 1 (2010), which adopted revised Management Plans for ASPA 101;

Recalling that Recommendation XVII-2 (1992) has not become effective and was withdrawn by Measure 1 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 101;

Desiring to replace the existing Management Plan for ASPA 101 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. The revised Management Plan for Antarctic Specially Protected Area No 101 (Taylor Rookery, Mac.Robertson Land), which is annexed to this Measure, be approved; and
2. The Management Plan for Antarctic Specially Protected Area No 101 annexed to Measure 1 ` (2010) be revoked.

Management Plan for Antarctic Specially Protected Area No. 101

TAYLOR ROOKERY, MAC.ROBERTSON LAND

Introduction

Taylor Rookery is an emperor penguin (*Aptenodytes forsteri*) colony located on the east side of Taylor Glacier, Mac.Robertson Land (67°27'S; 60°51'E, Map A). The site was originally designated as Specially Protected Area No. 1, through Recommendation IV-I (1966), after a proposal by Australia. A management plan for the Area was adopted under Recommendation XVII-2 (1992). In accordance with Decision 1 (2002) the site was redesignated and renumbered as Antarctic Specially Protected Area (ASPA) No. 101. Revised ASPA management plans were adopted under Measure 2 (2005) and Measure 1 (2010). Taylor Rookery is designated as an ASPA to protect the largest known colony of emperor penguins located entirely on land.

1. Description of values to be protected

Of the 48 currently known emperor penguin colonies around Antarctica, the first land-based colony was only discovered at Emperor Island, Dion Islands, Antarctic Peninsula (67°52'S, 68°43'W) in 1948. About 150 breeding pairs occupied the island, but since the 1970s the population decreased and comprised only 22 pairs in 1999. No emperor penguins have been sighted at the Dion Islands since 2009 and the colony is likely to have become extinct. The colony at Taylor Glacier was the second land-based colony to be discovered, in October 1954. This colony is entirely land-based throughout the breeding season. Because of this uncommon characteristic this colony was designated as a Specially Protected Area in 1966, as was Emperor Island. A third land-based colony with about 250 pairs was discovered in Amundsen Bay, East Antarctica, in 1999.

The emperor penguin colony at Taylor Glacier is the largest known land-based colony (Map B) and as such is of outstanding scientific importance. The Australian Antarctic program has monitored the population at the Taylor Glacier colony, intermittently from 1957 to 1987, and annually since 1988. Photographic censuses have resulted in counts with high levels of accuracy. The number of adults at the colony averaged about 3680 breeding pairs in the early years. In the 1988-2010 period, the population averaged 2930 pairs or 20.5% less than earlier years. From 2011-2014, a further drop of 12% occurred (unpublished data). The reasons for this decrease are unknown. Similar long term records are available only for two other emperor penguin colonies, near Dumont d'Urville (Pointe Géologie Archipelago, ASPA 120, 66º40'S, 140º01'E), and at Haswell Island (ASPA 127, 66º31'S, 93º00’E), where both colonies decreased by about 50% in the 1970s. Population data are also available for a number of colonies in the Ross Sea region. However, the records of the latter are not continuous and do not include counts of the colonies in winter.

Each year the Australian Antarctic program makes no more than three visits, at different times of year, to Taylor Glacier. The colony is ideal for census work as it is surrounded by small rocky hills which make it possible to observe the penguins without entering the breeding area. Thus, human disturbance to the colony, especially since 1988, has been very low and direct human interference can be excluded as a potential factor influencing the health of this population.

2. Aims and Objectives

Management of Taylor Rookery aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance;
- allow research on the ecosystem and physical environment, particularly on the avifauna, provided it is for compelling reasons which cannot be served elsewhere;
- minimise the possibility of introduction of pathogens which may cause disease in bird populations within the Area;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- allow for the gathering of data on the population status of the emperor penguin colony on a regular basis and in a sustainable manner; and
- allow visits for management purposes in support of the aims of the management plan.

3. Management Activities

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

- visits shall be made to the Area as necessary (preferably not less than once every five years) to assess whether the Area continues to serve the purposes for which it was designated and to ensure that management activities are adequate: and
- the Management Plan shall be reviewed at least every five years and updated as required.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map A: Antarctic Specially Protected Area No. 101, Taylor Rookery, Mawson Coast, Mac.Robertson Land, East Antarctica. The inset map indicates the location in relation to the Antarctic continent.
Map B: Antarctic Specially Protected Area No. 101, Taylor Rookery: Topography and Emperor Penguin Colony.
Map C: Antarctic Specially Protected Area No. 101, Taylor Rookery: Vehicle and Helicopter Approach and Landing Site.
Map D: Antarctic Specially Protected Area No. 101, Taylor Rookery: ASPA Boundary Points.

All map specifications: Horizontal Datum: WGS84; Vertical Datum: Mean Sea Level.

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

The Taylor Rookery ASPA consists of the whole of the northernmost rock exposure on the east side of Taylor Glacier, Mac.Robertson Land (67°27' 14”S, 60°53' 0”E, Map B). Boundary coordinates for the Area are provided at Appendix 1 and are shown on Map D. The Area boundary follows the coastline (at the low tide mark) from a point at the north-western corner of the Area at 67°27’4.9”S, 60°52’58.2”E (boundary point 1), in a roughly south-easterly direction to boundary point 6 (67°27’27.8”S, 60°53’7.7”E). The boundary then continues in a westerly and then northerly direction (roughly following the limit of the ice free area) to boundary point 22 (67°27’18”S, 60°52’50.2”E) then follows the ice cliff north to boundary point 23 (67°27’5.3”S, 60°52’57.1”E) and then joins back to boundary point 1. There are no boundary markers delimiting the site.

The emperor penguin colony is located on a low lying rock outcrop in the south-west corner of a bay formed by Taylor Glacier to the west, the polar ice cap to the south and the islands of the Colbeck Archipelago to the east. The Area is surrounded by fast ice to the north and east. The Area is some 90 kilometres west of Mawson station. There is ice-free terrain adjacent to the glacier on the western boundary and to the south the rock rises steeply to meet the ice of the plateau. The rock itself forms a horseshoe around a central flat area of exposed rock and moraine. This area is covered with snow in winter and is occupied by the emperor penguins. A couple of small melt lakes form in late spring and a small stream exits to the north-east. The sides of the horseshoe are rounded ridges of rock which are bare and smoothed by ice. Otherwise the terrain is rough and dissected with cracks and fissures. The average height of the ridges is about 30 metres.

The Area also has a raised beach which is typical of several found along the coast of Mac.Robertson Land. The beach is composed of locally derived pebbles, cobbles and boulders between 1 cm and 1 m across. It slopes upwards from the shoreline to a well defined platform several metres broad and 3 to 6 m above sea level. The Area is readily defined by its natural features.

Climate

Limited data exist for the meteorology of the Area. Conditions are probably similar to those of the Mawson station area, approximately 90 km to the east, where the mean monthly temperatures range from +0.1°C in January to -18.8°C in August, with extreme temperatures ranging from +10.6°C to -36.0°C. The mean annual wind speed is 10.9 m per second with frequent prolonged periods of strong south-easterly katabatic winds from the ice cap with mean wind speeds over 25 m per second and gusts often exceeding 50 m per second. Local sections of the coast vary in their exposure to strong winds and it is possible that slightly lower mean wind speed may exist at Taylor Rookery. Other characteristics of the weather are high cloudiness throughout the year, very low humidity, low precipitation and frequent periods of strong winds, drifting snow and low visibility associated with the passage of major low pressure systems.

Environmental Domains and Antarctic Conservation Biogeographic Regions

Based on the Environmental Domains Analysis for Antarctica (Resolution 3(2008)) Taylor Rookery is located within Environment D *East Antarctic coastal geologic*. Based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) Taylor Rookery is not assigned to a Biogeographic Region.

Geology and Soils

The rocks at Taylor Rookery are metamorphic and probably formed from ancient metamorphic sedimentary rocks. They are mapped as garnet-biotite-quartz-felspar gneiss, granite and migmatite. The metamorphic rocks are intruded by charnockite which has yielded an isotopic age of 100 million years, thus defining a minimum age for the metamorphic rocks. Numerous shear zones intersect the banded metamorphic rocks and there are recognised traces of an old erosion surface at about 60 m altitude.

Vegetation

The flora of Taylor Rookery consists of at least ten species of lichen (Table 1) and an unknown number of terrestrial and freshwater algae. No mosses have been recorded from the Area. Twenty six species of lichen and three species of moss can be found in the region, 20 of which are found on nearby Chapman Ridge and 16 from Cape Bruce on the western side of Taylor Glacier. The rock types are not conducive to colonization by lichens. Most of the lichens occurring at Taylor Rookery grow on the higher outcrops at the southern end where weathering is least.

LICHENS

Pseudephebe minuscula	*Lecidea phillipsiana*
Buellia frigida	*Physcia caesia*
Caloplaca citrina	*Xanthoria elegans*
Candelariella flava	*Xanthoria mawsonii*
Rhizoplaca melanophthalma	*Lecanora expectans*

Table 1. Plants recorded from Taylor Rookery.

Birds

Emperor penguins

The breeding site of the emperor penguins is a north-facing amphitheatre formed by the tongue of the Taylor Glacier to the west and rocky hills to the east. The penguins occupy the areas that are level, and are covered with snow for most of the breeding season.

First hatchlings were observed in mid July which suggests mid May as the onset of laying. Fledglings depart the colony from mid December to mid January, usually leaving during the day when the weather is the warmest and the katabatic wind has subsided. Adult birds and fledglings generally head in N–NE towards a polynya 60-70 km from the colony. The fast ice extent reduces to approximately 25 km by mid January. The polynya appears to be a permanent feature of the Mawson Coast.
Following the commencement of the ongoing monitoring program in 1988, up to about 2010 the penguins occupied the southern part of the Area. In recent years, they have moved to the northern part where they now spend the winter. In 2014 they were observed for the first time occupying the fast ice outside the Area (as early as October). The ongoing monitoring program will help determine whether this is a recurring behaviour; if so, changes to the Area management arrangements may be required.

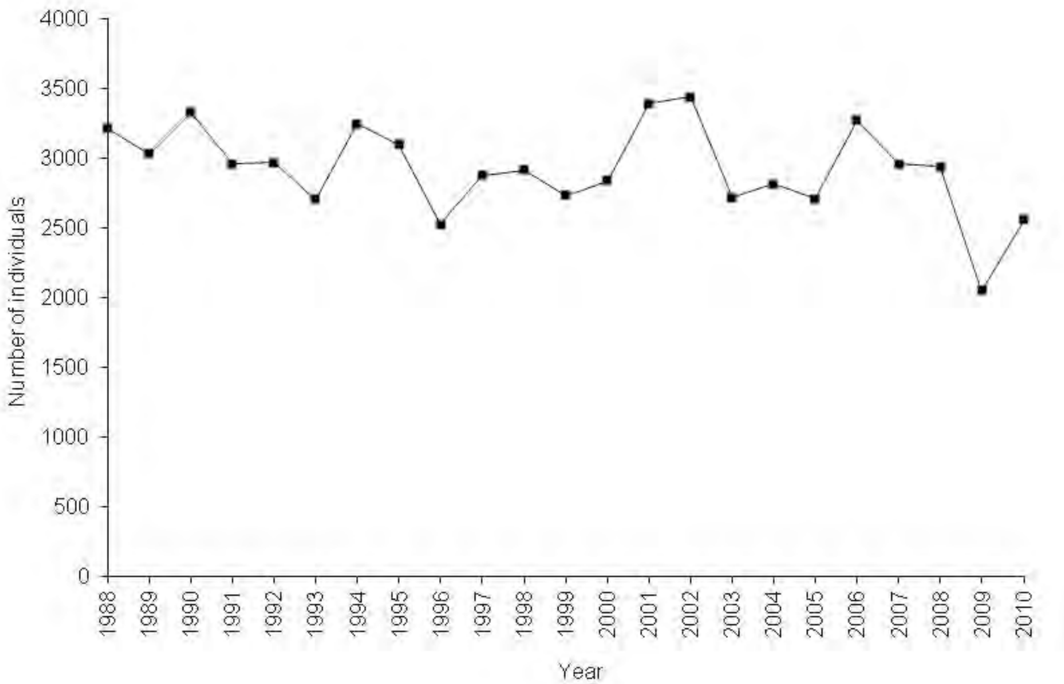

Figure 1. Numbers of adult emperor penguins present in the colony during winter at Taylor Glacier, 1988–2010. Source: Robertson et al. (2014)

Skuas

Skuas are often observed near the penguin colony. It is not known whether these birds breed in this location.

6(ii) Access to the Area

Travel to the Area may be by vehicle over sea ice, which is generally only possible during the period 1 May to 25 December, or by aircraft, in accordance with section 7(ii) of this plan.

6(iii) Location of structures within and adjacent to the Area

Two automated cameras were set up within the Area in 2013 on the rocky ridges surrounding the breeding area of the penguins (see Map B for camera locations – 67°27’10.8”S, 60°53’6”E and 67°27’18.0”S, 60°52’55.2”E . A four-berth refuge is located in the Colbeck Archipelago, approximately five kilometres to the north-east of the Area (see Map A – 67°26’17.9”S, 60°59’23.6”E). Mawson station (67°36’S, 62°53’E) is approximately 90 kilometres to the east.

6(iv) Location of other protected areas in the vicinity

ASPA No. 102 Rookery Islands, Mac.Robertson Land (67°36'36" S and 62°32'01" E) is located approximately 80 kilometres east of Taylor Rookery (see Map A).

6(v) Special zones within the Area

There are no special zones within the Area.

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a permit issued by an appropriate national authority. Conditions for issuing a permit to enter the Area are that:

- it is issued only for compelling scientific reasons that cannot be served elsewhere, in particular for scientific study of the avifauna and ecosystem of the Area, or for essential management purposes consistent with plan objectives, such as inspection, management or review;
- the actions permitted will not jeopardise the values of the Area;
- the actions permitted are in accordance with the management plan;
- the permit, or an authorised copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the permit;
- the permit shall be issued for a finite period; and
- the appropriate national authority shall be notified of any activities or measures undertaken that were not included in the authorised permit.

7(ii) Access to and Movement within or over the Area

Whenever possible, vehicle access to the Area should be from sea ice to the east of Colbeck Archipelago, to avoid crossing the penguin’s pathways from the rookery to the sea (see Map B). Vehicle entry to the Area is prohibited. Vehicles used for transport to the Area are to be left outside the Area, to the east, and entry to the Area must be by foot. The approach route for vehicles is marked on Map C.

The following conditions apply to the use of aircraft:

- disturbance of the colony by aircraft shall be avoided at all times;

- overflights of the colony are prohibited, except where essential for scientific or management purposes. Such overflights are to be at an altitude of no less than 930 m (3050 ft) for single-engine helicopters and fixed-wing aircraft, and no less than 1500 m (5000 ft) for twin-engine helicopters;
- fixed wing aircraft are not permitted to land inside the Area;
- fixed wing aircraft used to approach the Area shall not land or take off within 930 m (3050 ft) or fly within 750 m (2500 ft) of the colony;
- helicopters shall approach the Area from the east over the sea ice and preferably, where sea ice conditions permit, land outside the Area at the point marked “H” on Map C (60°53’32.5”E, 67°27’6.1”S), with access to the Area being by foot;
- when landing outside the Area, single-engine helicopters should not land or take off within 930 m (3050 ft) or fly within 750 m of the colony, and twin-engine helicopters should not land, take off or fly within 1500 m (5000 ft) of the colony;
- if landing inside the Area is essential due to unsuitable sea ice conditions, only singled-engine helicopters may land in the north-east of the Area at the point marked "H" on Map C (60°53’17.8”E, 67°27’6.8”S), where a headland to the south obscures the colony from view and noise;
- single-engine helicopters approaching to land in the Area should fly a the lowest safe height over the sea ice to avoid disturbing the colony; and
- refuelling of aircrafts is not permitted within the Area.

There are no marked pedestrian routes within the Area. Unless disturbance is authorised by permit, pedestrians should keep well away from the colony area (at least 50 m) and give way to departing and arriving penguins. Pedestrians moving in and around the Area should avoid crossing the access routes of the birds if possible, or cross quickly without obstructing penguin traffic.

7(iii) Activities which are or may be conducted within the Area, including restrictions on time and place

Penguins may be in the Area in most months, and are particularly sensitive to disturbance during the following periods:

- from mid-May to mid-July, when they are incubating eggs; and
- from mid-July to mid-September, when adults are brooding chicks.

The Area may be accessed to conduct censuses of the emperor penguin colony. The colony is ideal for census work because it can be done without any disturbance to the birds. The best vantage point for viewing and photographing the penguins in winter are the rocky headlands that run adjacent to Taylor Glacier, on the western side of the colony, and on the eastern side of the Area. The ideal time for a census

of adults is from 22 June to 5 July, since during this time most birds present are incubating males, each representing one breeding pair.
Other activities which may be conducted in the Area:

- compelling scientific research which cannot be undertaken elsewhere and which will not jeopardise the avifauna or the ecosystem of the Area;
- essential management activities, including monitoring; and
- sampling, which should be the minimum required for the approved research programs.

7(iv) Installation, modification or removal of structures

No new structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons and for a pre-established period, as specified in a permit. Scientific markers and equipment must be secured and maintained in good condition, clearly identifying the permitting country, name of principal investigator and year of installation. All such items should be made of materials that pose minimum risk of harm to fauna and flora or of contamination of the Area.

A condition of the permit shall be that equipment associated with the approved activity shall be removed on or before completion of the activity. Details of markers and equipment temporarily left in situ (GPS locations, description, tags, etc. and expected removal date) shall be reported to the permitting authority. Temporary field huts, if permitted, should be placed well away from the penguin colony at the point to the north-east of the Area, where a headland to the south obscures the colony from view.

7(v) Location of field camps
A four-berth refuge is located in the Colbeck Archipelago, approximately 5 kilometres to the north-east of the Area (60°59’23.6”E, 67°26’17.9”S).
Camping is permitted within the Area and should be well away from the penguin colony, preferably at the point to the north-east of the Area where a headland to the south obscures the colony from view (as indicated on Map B).

7(vi) Restrictions on materials and organisms which may be brought into the Area

- No poultry products, including dried food containing egg powder, are to be taken into the Area.
- No depots of food or other supplies are to be left within the Area beyond the season for which they are required.
- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. The highest level precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-

organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area) into the Area.

- To the maximum extent practicable, clothing, footwear and other equipment used or brought into the Area (including backpacks, carry-bags and other equipment) shall be thoroughly cleaned before entering and after leaving the Area.
- Boots and sampling/research equipment and markers that come into contact with the ground shall be disinfected or cleaned with hot water and bleach before entering and after visiting the Area to help prevent accidental introductions of animals, plant material, micro-organisms and non-sterile soil into the Area. Cleaning should be undertaken either at the refuge hut or on station.
- Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for terrestrial scientific field research in Antarctica (SCAR 2009).
- No herbicides or pesticides shall be brought into the Area. Any other chemicals, including radio- nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in a permit, shall be removed from the Area at or before the conclusion of the activity for which the permit was granted.
- Fuel is not to be stored in the Area unless required for essential purposes connected with the activity for which the permit has been granted. All such fuel shall be removed at the conclusion of the permitted activity. Permanent fuel depots are not permitted.
- All material introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so as to minimise the risk of environment impacts.

7(vii) Taking of, or harmful interference with, native flora and fauna

Taking of or harmful interference with native flora and fauna is prohibited, except in accordance with a permit. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

Ornithological research on the breeding birds present within the Area shall be limited to activities that are non-invasive and non-disruptive. If the capture of individuals is required, capture should occur outside the Area if at all possible to reduce disturbance to the colony.

7(viii) Collection and removal of anything not brought into the Area by the permit holder

Material may be collected or removed from the Area only in accordance with a permit and should be limited to the minimum necessary to meet scientific or management needs.
Material of human origin likely to compromise the values of the Area, and which was not brought into the Area by the permit holder or otherwise authorised, may be removed unless the impact of the removal is likely to be greater than leaving the material in situ. If such material is found the permit issuing authority shall be notified, if possible while the field party is still within the Area.

7(ix) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area. Wastes from field parties shall be stored in such a manner to prevent scavenging by wildlife (e.g. skuas) until such time as the wastes can be disposed or removed. Wastes are to be removed no later than the departure of the field party. Human wastes and grey water may be disposed into the sea well outside the Area.

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

- carry out biological monitoring and Area inspection activities, which may involve the collection of samples for analysis or review;
- erect or maintain scientific equipment and structures, and signposts; or
- carry out other protective measures.

Any specific sites of long-term monitoring shall be appropriately marked and a GPS position obtained for lodgement with the Antarctic Data Directory System through the appropriate national authority.

Visitors shall take special precautions against the introduction of alien organisms to the Area. Of particular concern are pathogenic, microbial or vegetation introductions sourced from soils, flora or fauna at other Antarctic sites, including research stations, or from regions outside Antarctica. To minimise the risk of introductions, before entering the Area visitors shall thoroughly clean footwear and any equipment to be used in the Area, particularly sampling equipment and markers.

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such visit reports should include, as applicable, the information identified in the visit report form contained in the *Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas*. If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.

A copy of the report should be forwarded to the Party responsible for development of the Management Plan (Australia) to assist in management of the Area, and the monitoring of bird populations.

8. Supporting Documentation

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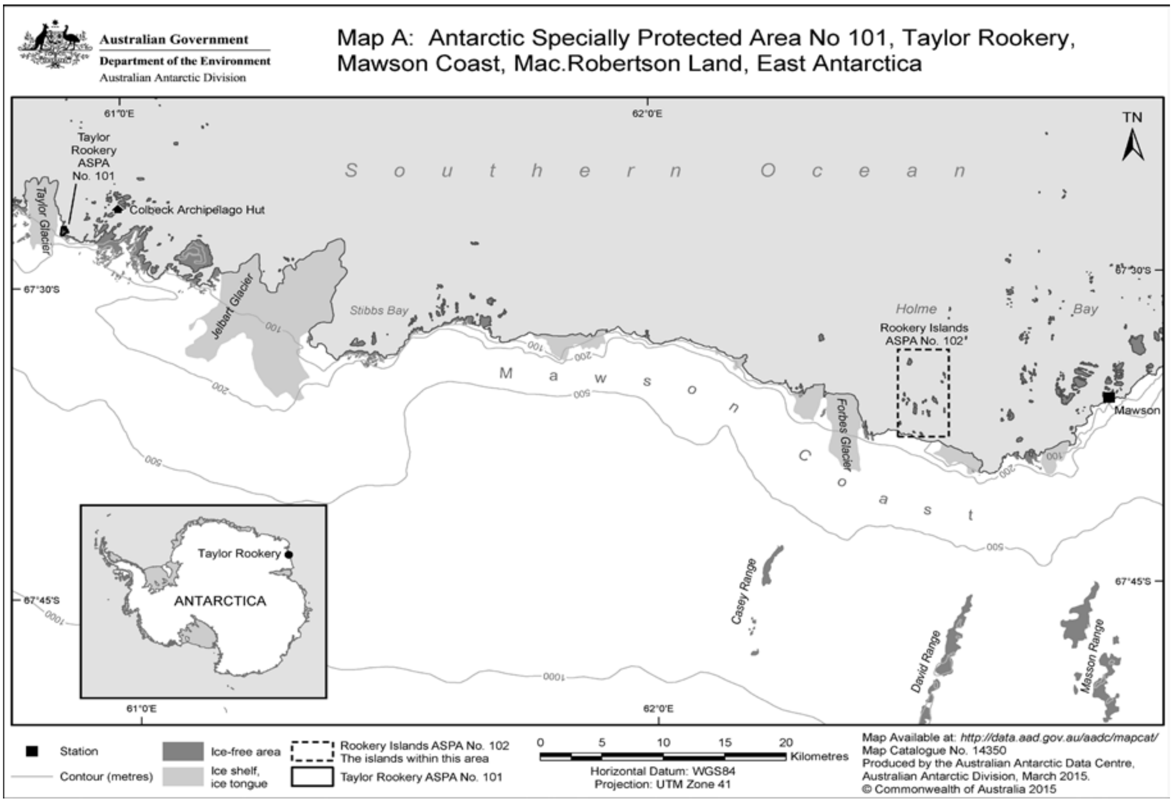
Appendix 1: Taylor Rookery, Antarctic Specially Protected Area No 101, boundary coordinates

Boundary Point	Latitude (S)	Longitude (E)	Boundary Point	Latitude (S)	Longitude (E)
1	67°27'4.9"	60°52’58.2"	14	67°27’27.9"	60°52’49.3"
2	67°27’17.1"	60°53’29.5"	15	67°27’28.7"	60°52’48.8"
3	67°27’17.7"	60°53’31.0"	16	67°27’28.9"	60°52’47.7"
4	67°27’21.6"	60°53’27.5"	17	67°27’28.9"	60°52’46.5"
5	67°27’22.4"	60°53’19.3"	18	67°27’28.3"	60°52’46.0"
6	67°27’27.8"	60°53’7.7"	19	67°27’24.9"	60°52’45.4"
7	67°27’29.1"	60°53’4.9"	20	67°27’20.7"	60°52’50.1"
8	67°27’29.8"	60°53’2.6"	21	67°27’19.3"	60°52’49.9"
9	67°27’30.1"	60°53’0.5"	22	67°27’18.0"	60°52’50.2"
10	67°27’29.8"	60°52’57.1"	Follows ice cliff north		
11	67°27’29.3"	60°52’55.5"	23	67°27’5.3"	60°52’57.1"
12	67°27’28.0"	60°52’54.6"			
13	67°27’27.4"	60°52’51.5"			



Australian Government
Department of the Environment
Australian Antarctic Division
Map A: Antarctic Specially Protected Area No 101, Taylor Rookery, Mawson Coast, Mac.Robertson Land, East Antarctica
Taylor Rookery ASPA No. 101
Colbeck Archipelago Hut
Southern Ocean
Taylor Glacier
Jelbart Glacier
Stibbs Bay
Holme Bay
Rookery Islands ASPA No. 102
Mawson
Mawson Coast
Forbes Glacier
Casey Range
David Range
Masson Range
Taylor Rookery
ANTARCTICA
TN
61°0'E
62°0'E
67°30'S
67°45'S
Station
Contour (metres)
Ice-free area
Ice shelf, ice tongue
Rookery Islands ASPA No. 102 The islands within this area
Taylor Rookery ASPA No. 101
0 5 10 15 20 Kilometres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14350
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, March 2015.
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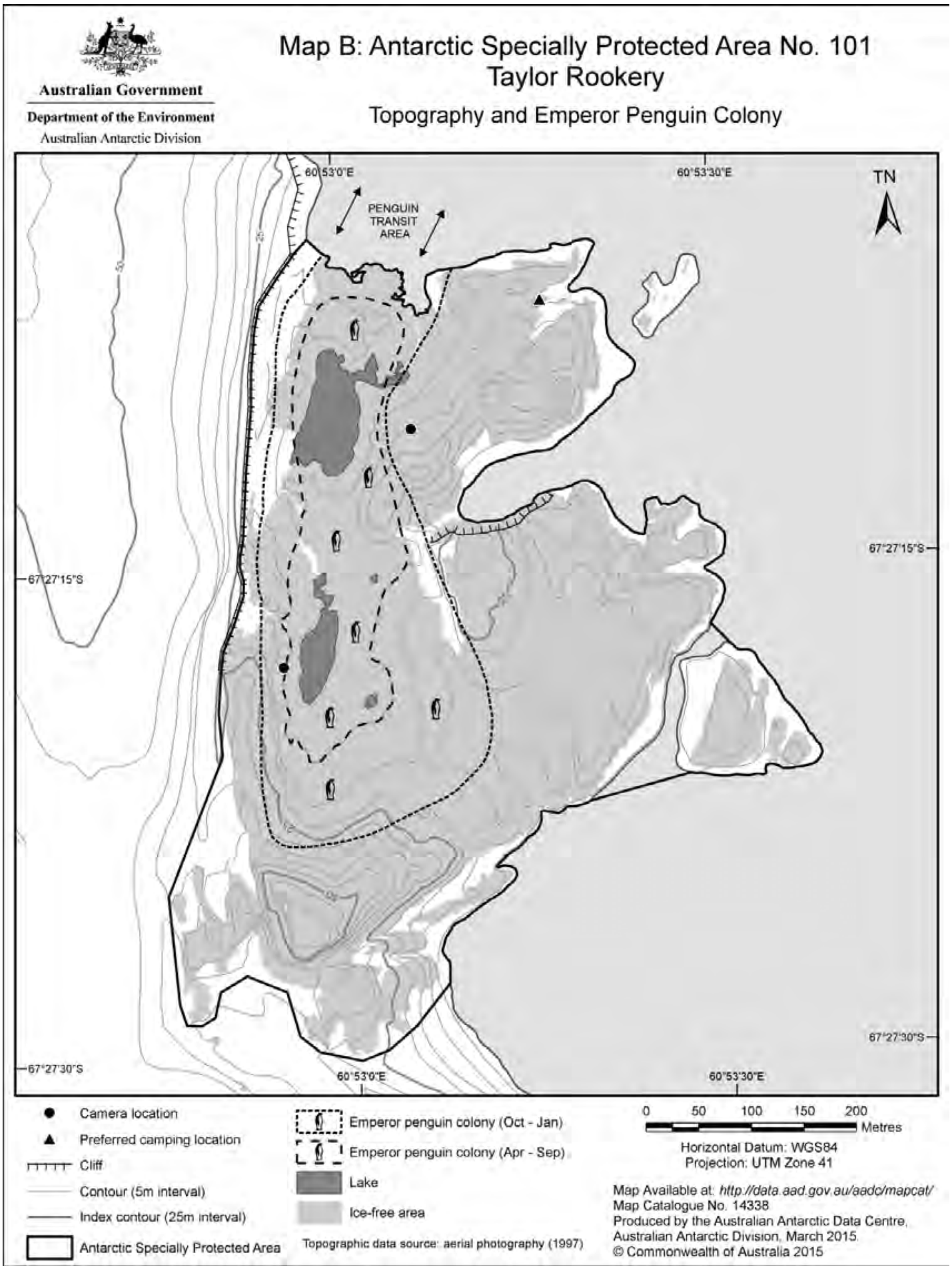
Australian Government
Department of the Environment
Australian Antarctic Division
Map B: Antarctic Specially Protected Area No. 101
Taylor Rookery
Topography and Emperor Penguin Colony
60°53'0"E
60°53'30"E
TN
PENGUIN TRANSIT AREA
67°27'15"S
67°27'30"S
Camera location
Preferred camping location
Cliff
Contour (5m interval)
Index contour (25m interval)
Antarctic Specially Protected Area
Emperor penguin colony (Oct - Jan)
Emperor penguin colony (Apr - Sep)
Lake
Ice-free area
Topographic data source: aerial photography (1997)
0 50 100 150 200 Metres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14338
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, March 2015
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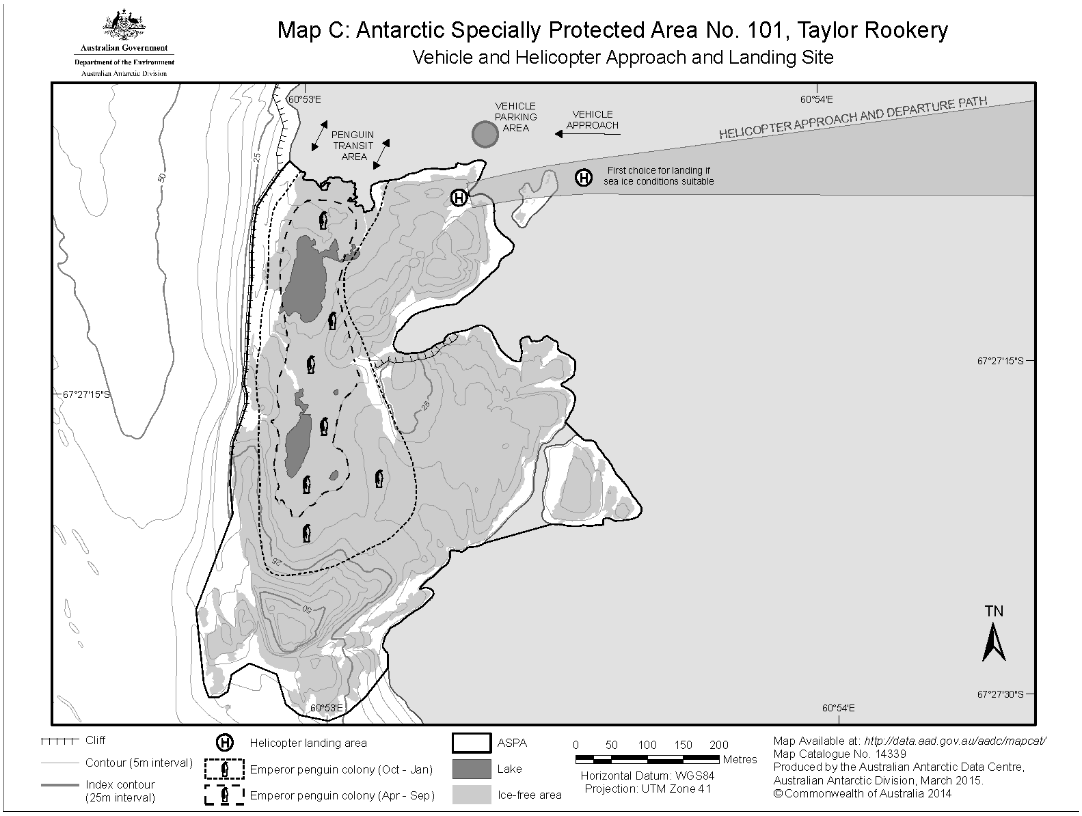
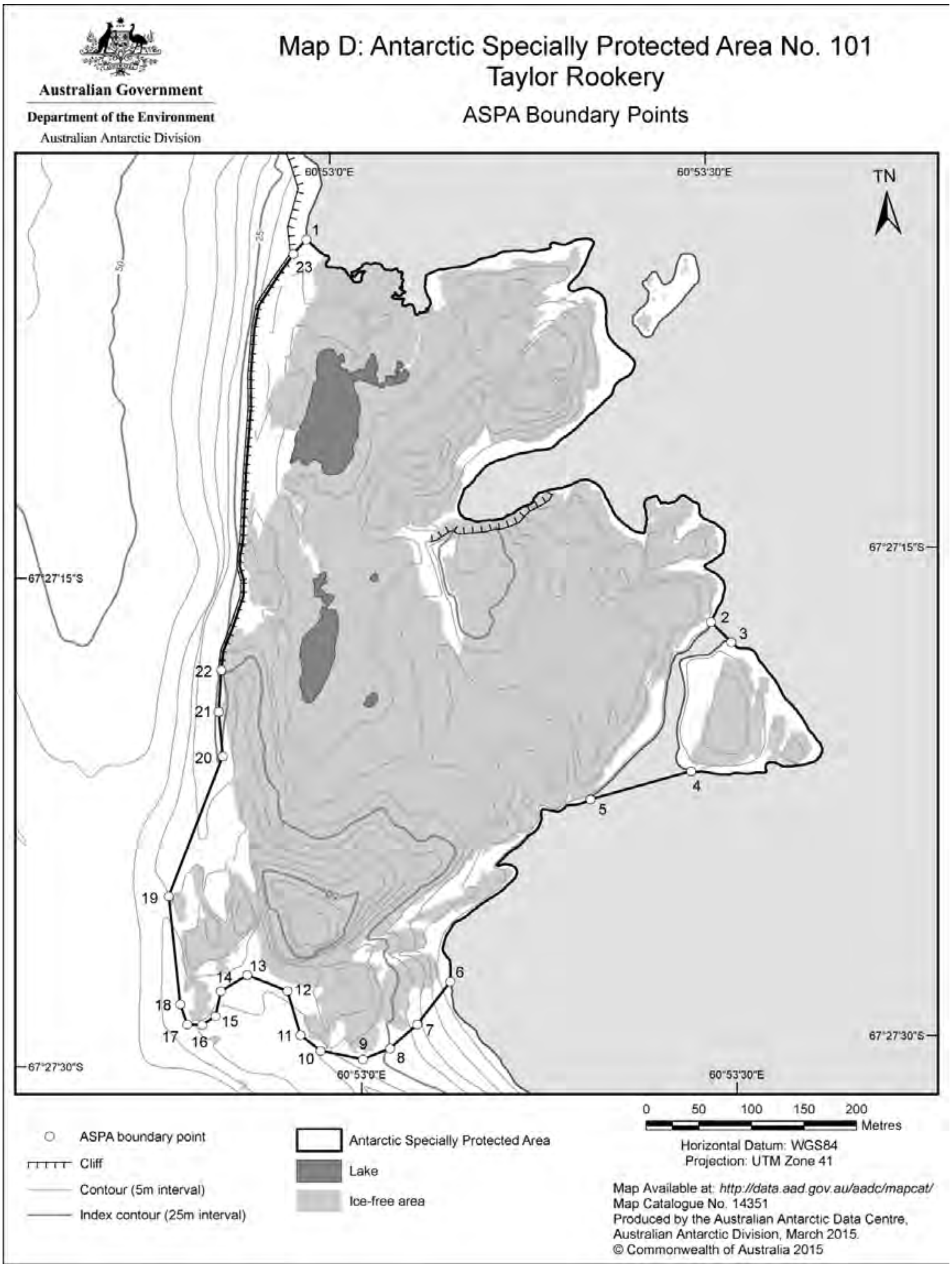
Map C: Antarctic Specially Protected Area No. 101, Taylor Rookery

Vehicle and Helicopter Approach and Landing Site




Australian Government
Department of the Environment
Australian Antarctic Division
Map D: Antarctic Specially Protected Area No. 101
Taylor Rookery
ASPA Boundary Points
TN
60°53'0"E
60°53'30"E
67°27'15"S
67°27'30"S
ASPA boundary point
Cliff
Contour (5m interval)
Index contour (25m interval)
Antarctic Specially Protected Area
Lake
Ice-free area
0 50 100 150 200 Metres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14351
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, March 2015.
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Measure 2 (2015)

Antarctic Specially Protected Area No 102 (Rookery Islands, Holme Bay, Mac.Robertson Land): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation IV-2 (1966), which designated Rookery Islands, Holme Bay as Specially Protected Area ("SPA") No 2;
- Recommendation XVII-2 (1992), which adopted a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 2 as ASPA 102;
- Measures 2 (2005) and 2 (2010), which adopted revised Management Plans for ASPA 102;

Recalling that Recommendation XVII-2 (1992) has not become effective and was withdrawn by Measure 1 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 102;

Desiring to replace the existing Management Plan for ASPA 102 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 102 (Rookery Islands, Holme Bay, Mac.Robertson Land), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 102 annexed to Measure 2 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area No. 102

ROOKERY ISLANDS, HOLME BAY, MAC.ROBERTSON LAND

Introduction

The Rookery Islands are a group of small islands and rocks in the western part of Holme Bay, lying to the north of the Masson and David Ranges in Mac.Robertson Land, East Antarctica (67°36'36" S, 62°32'01" E, Map A and Map B). The Rookery Islands were originally designated as Specially Protected Area No. 2 through Recommendation IV-II (1966), after a proposal by Australia. A management plan for the Area was adopted under Recommendation XVII-2 (1992). In accordance with Decision 1 (2002), the site was redesignated and renumbered as Antarctic Specially Protected Area (ASPA) No. 102. Revised ASPA management plans were adopted under Measure 2 (2005) and Measure 2 (2010). The Area is designated to protect breeding colonies of the five bird species known to breed in the region, including the southern giant petrel (*Macronectes giganteus*) and the Cape petrel (*Daption capensis*) which are not known to occur elsewhere in the region. The Area is one of only four known southern giant petrel breeding colonies in East Antarctica.

1. Description of values to be protected

The Rookery Islands contain breeding colonies of five bird species: Adélie penguin (*Pygoscelis adeliae*), Cape petrel, snow petrel (*Pagodroma nivea*), southern giant petrel, and Antarctic skua (*Catharacta maccormicki*). It is also highly likely that Wilson's storm petrels breed on the islands. The Area is primarily designated to safeguard this unusual assemblage of bird species. The Rookery Islands also provide a representative sample of the near-shore island habitats occurring along the coast of Mac.Robertson Land.
A small colony of about 4 pairs of southern giant petrels is located on Giganteus Island, the third largest island in the Rookery Islands group. However, up to 80 southern giant petrels have been occasionally observed feeding on seal carcasses in the Holme Bay region. The species is not known to breed elsewhere in the Holme Bay region. This colony is one of only four known breeding sites in East Antarctica. The other three East Antarctic colonies are located near the Australian stations of Casey (Frazier Islands, ASPA 160, 66°14'S 110°10'E, approximately 250 pairs), and Davis (Hawker Island, ASPA 167, 68º35'S, 77º50'E, approximately 35 pairs), and near the French station Dumont d'Urville (Pointe-Géologie Archipelago, ASPA 120, 66º40'S, 140º01'E, 12-15 pairs).These four breeding colonies represent less than one per cent of the global breeding population that comprises approximately 50,000 breeding pairs, approximately 11,000 of which are found south of 60°S, mostly in the Antarctic Peninsula region.

Currently there are relatively few published data available that allow robust analyses of southern giant petrel population trends. Some locations have experienced a decrease that appears to be stabilising or to have reversed in recent years. Small increases have occurred at other locations.

The seabird assemblage occupying the Area comprises breeding populations of probably five of the eight flying seabird species breeding in East Antarctica, and one penguin species. This offers a unique opportunity to study population dynamics of different species. In addition, it is important to protect southern giant petrels at the southern limit of their breeding range. The Antarctic Treaty parties have committed to minimise human disturbance to southern giant petrels, and to encourage regular population counts at all breeding sites in the Antarctic Treaty area.

2. Aims and Objectives

Management of the Rookery Islands aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the ecosystem, particularly on the avifauna, and physical environment, provided it is for compelling reasons which cannot be served elsewhere;
- minimise the possibility of introduction of pathogens which may cause disease in bird populations within the Area;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- minimise human disturbance to southern giant petrels on Giganteus Island;
- allow Giganteus Island to be used as a reference area for future comparative studies with other breeding populations of southern giant petrels;
- preserve Giganteus Island, henceforth, as a highly restricted area by limiting human visitation to the island during the southern giant petrel breeding season;
- allow for the gathering of data on the population status and related demography of the bird species on a regular basis; and
- allow visits for management purposes in support of the aims of the management plan.

3. Management Activities

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

- information on the location of the Area (stating special restrictions that apply), and a copy of this Management Plan shall be kept available at adjacent operational research/field stations and will be made available to ships visiting the vicinity;
- where practicable the Area shall be visited as necessary (preferably no less than once every five years), to assess whether it continues to serve the purposes for which it was designated and to ensure that management activities are adequate;
- where practicable, at least one research visit should be conducted to census the southern giant petrels at Giganteus Island and other seabird populations in each five year period, to enable assessment of breeding populations.
- the Management Plan shall be reviewed at least every five years.

4. Period of Designation

Designation is for an indefinite period.

5. Maps

Map A:Antarctic Specially Protected Area No 102, Rookery Islands, Mawson Coast, Mac.Robertson Land, East Antarctica. The inset map indicates the location in relation to the Antarctic continent.
Map B: Antarctic Specially Protected Area No 102, Rookery Islands. Bird distribution
Map C: Antarctic Specially Protected Area No 102, Giganteus Island (Restricted Zone). Topography and bird distribution.

Specifications for all Maps:
Horizontal Datum: WGS84 Projection: UTM Zone 49.

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

The Rookery Islands comprise a small group of approximately 75 small islands and rocks in the south-west part of Holme Bay, Mac.Robertson Land, about 10 km to the west of the Australian station Mawson. The Area comprises those rocks and islands lying within a rectangle enclosed by following coordinates: 62°28'01"E, 67°33'45"S; 62°34'37"E, 67°33'47"S; 62°28'02"E, 67°38'10"S; 62°34'39"E, 67°38'11"S (Map B).

There are no boundary markers delimiting the site.

The Rookery Islands range in size from small rocks which barely remain above water at high tide to the larger islands which include Giganteus Island (approximately 400 m long, 400 m wide and 30 m high) and Rookery Island, the highest of the group, with an altitude of 62 m, and of similar area, but slightly more elongate. Raised beaches are evident on Giganteus Island.

Climate

Limited data exist for the meteorology of the Area. Conditions are probably similar to those of the Mawson station area where the mean monthly temperature ranges from +0.1°C in January to -18.8°C in August, with extreme temperatures ranging from +10.6°C to -36.0°C. The mean annual wind speed is 10.9 m per second with frequent prolonged periods of strong south-easterly katabatic winds from the ice cap at mean speeds over 25 m per second and gusts often exceeding 50 m per second. Mean wind speed decreases seaward with distance from the icecap, but is unlikely to be much lower at the Rookery Islands which lie quite close to the coast. Other general characteristics of the coastal Antarctic climate to which these islands are likely to be subjected are high cloudiness throughout the year, very low absolute humidity, low precipitation and frequent periods of intensified winds, drifting snow and low visibility associated with the passage of major low pressure systems.

Environmental Domains and Antarctic Conservation Biogeographic Regions

Based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) the Rookery Islands are located within Environment D *East Antarctic coastal geologic*. Based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) the Rookery Islands are not assigned to a Biogeographic Region.

Geology and soils

The Rookery Islands are outcrops of the Mawson charnockite, a rock type which occurs over an area of at least 2000 square kilometres along the coast of Mac.Robertson Land. The charnockites of the Rookery Islands are the fine grained variant and are comparatively poor in the mineral hypersthene but rich in garnet and biotite. The charnockites enclose abundant bands and lenses of hornfels, garnetiferous quartz and felspar-rich gneisses. There are also a number of pegmatic dykes which cut across the charnockite rocks.

Vegetation

No mosses or lichens have been recorded from any of the Rookery Islands. There are some terrestrial algae but no taxonomic identifications have been made. Most of the smaller islands and rocks are covered with sea spray in summer and are sometimes scoured by rafted sea ice in winter and spring. It is considered unlikely that species of moss or lichen could become established.

Inland waters

There are no freshwater bodies on the Rookery Islands.

Birds

Five species of birds are known to breed on the Rookery Islands: Adélie penguin (*Pygoscelis adeliae*), Cape petrel (*Daption capensis*), snow petrel (*Pagodroma nivea*), southern giant petrel (*Macronectes giganteus*), and the south polar skua (*Catharacta maccormicki*). Wilson's storm petrels (*Oceanites oceanicus*) are likely to breed there as well but nest sites have not yet been found.

The southern giant petrels nest on Giganteus Island (Map C). The colony is currently very small but has been stable at 2-4 breeding pairs since the mid-1960s. A total of 16 incubating birds were recorded in 1958, and in 1967, 13 nests were occupied but only four contained eggs. Only two nests were present in 1972, four in 1973, two in 1977, one in 1981, two in 1982, and three in 2001. During the most recent count in 2007, four nests were counted on two separate occasions, with two pairs and two lone birds at first count (27th November) and three pairs and one lone bird on an egg (therefore assumed to have an absent partner) at second count (10th December). The nests are shallow mounds of stones and are built on broad gravel patches on the raised beaches. The area has many old nest sites and several may be rebuilt each year but there is no evidence that they are used.

Cape petrels breed on Rookery Island and a small island known as Pintado Island, located 300 m north-west of Rookery Island. In the most recent survey of Cape petrel populations in the Area on 24 December 2007, 123 occupied nests were observed on Pintado Island and 10 occupied nests on Rookery Island. The nearest known breeding colonies of Cape petrels to the Area occur at four rock outcrops near Forbes Glacier 8 km to the west, and on Scullin and Murray Monoliths (ASPA 164) approximately 200 km to the east. A remotely operating camera on the un-named island 250 m east of Rookery Island (Map B) is monitoring annual breeding success of approximately 30 Cape petrel nests.

Adélie penguins breed on 14 of the islands. The most recent population survey across the Area in December 2007 estimated the breeding population at all 14 islands was approximately 91,000 occupied nests. The largest populations occur on Rookery Island (31,000 occupied nests) and Giganteus Island (11,000 occupied nests). Although the Area-wide survey has not been repeated since 2007, surveys of individual islands are being undertaken each year and an up-dated Area-wide estimate will be possible during the life of this plan. A remotely operating camera on Rookery Island (Map B) is also monitoring the annual breeding success at approximately 30 Adelie penguin nests.

Snow petrels nest throughout the Rookery Islands and in greatest concentration on Rookery Island. Wilson's storm petrels are frequently seen flying around the islands and probably breed on a number of the larger islands in the group, although no nests have been recorded.

6(ii) Access to the Area

The Area can be accessed by oversnow vehicles or boats (depending on sea ice conditions) and aircraft. There are no designated landing sites (also see Section 7(ii)).

6(iii) Location of structures within and adjacent to the Area

Two remotely operating time lapse cameras are located at 67º37'55.5"S, 62º30'47.9"E and 67º36'12.6"S, 62º 29' 17.0"E. Deployed in 2010/11, the cameras support long term monitoring of Adélie penguin and Cape petrel breeding success and phenology, with minimal disturbance. While not permanent the cameras are expected to remain in place beyond the term of this plan.

There are no other structures within or adjacent to the Area.

6(iv) Location of other protected areas in the vicinity

ASPA 101 Taylor Rookery, Mac.Robertson Land (67°27'14"S; 60°53'0"E) is located approximately 80 kilometres to the west.

6(v) Special zones within the Area

Giganteus Island is designated as a Restricted Zone to afford a high level of protection to southern giant petrels (Map B, Map C). Entry is restricted and may only be permitted in accordance with the purposes and conditions detailed elsewhere in this management plan.

7. Terms and conditions for entry permits

7(i) General conditions

Entry into the Area is prohibited except in accordance with a permit issued by an appropriate national authority. Conditions for issuing a permit to enter the Area are that:

- it is issued only for compelling scientific reasons that cannot be served elsewhere, in particular for scientific study of the avifauna and ecosystem of the Area, or for essential management purposes consistent with plan objectives, such as inspection, maintenance or review;
- the actions permitted will not jeopardise the values of the Area;
- the actions permitted are in accordance with the management plan;
- the permit, or an authorised copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the permit;
- permits shall be issued for a stated period;
- the appropriate national authority shall be notified of any activities/measures undertaken that were not included in the authorised permit.

Entry to the Giganteus Island Restricted Zone is only permitted in accordance with conditions outlined below.

- Permits to enter the Giganteus Island Restricted Zone during the southern giant petrel breeding period (1 October to 30 April) may only be issued for the purpose of conducting censuses. Other research may be conducted outside the breeding period in accordance with a permit.
- Wherever practicable, censuses should be conducted from outside the southern giant petrel colony using vantage points from which the nesting birds may be counted.
- Access to the Restricted Zone should be limited to the minimum amount of time reasonably required to undertake the census.
- Visits to conduct censuses should be made by a team including someone from a national Antarctic program with relevant scientific skills and experience. Other personnel should remain at the shoreline.
- For permitted activities associated with obtaining census data or biological data, persons shall not approach closer than is necessary to any nesting southern giant petrels, and in no case closer than 20 m so long as no birds are disturbed (showing no change in behaviour).
- Overflights of Giganteus Island are prohibited.

7(ii) Access to, and movement within or over the Area

Travel to the Area may be by boat, by vehicle over sea ice, or by aircraft.
Vehicles are prohibited on the islands, and vehicles and boats must be left at the shoreline. Movement on the islands is by foot only. Vehicles used to access the islands over sea ice must be taken no closer than 250 m from concentrations of birds.

Access to Giganteus Island is prohibited except in accordance with the provisions elsewhere in this Plan.

If access to the islands is not possible by boat or by vehicle over sea ice, then fixed wing aircraft or helicopters may be used subject to the following conditions:

- disturbance of the colonies by aircraft shall be avoided at all times
- sea ice landings shall be encouraged (where practicable);
- aircraft landings on Giganteus Island during the breeding season are prohibited;
- as aircraft may provide the only viable access to the other islands when sea and sea ice access is not possible, single-engine helicopters may land on the islands during the breeding season where it is possible to maintain a distance of at least 500 m from bird colonies. Permission to land an aircraft may be granted for essential scientific or management purposes only if it can be demonstrated that disturbance will be minimal. Only personnel who are required to carry out work in the Area should leave the helicopter;
- when accessing Giganteus Island by aircraft outside the breeding season sea ice landings are preferred, following separation distances mentioned below;
- at all other times, single-engine helicopters and fixed wing aircraft must not land or take off within 930 m (3050 ft) or fly within 750 m of bird colonies, and twin-engine helicopters must not land, take off or fly within 1500 m of bird colonies;
- overflights of the islands during the breeding season is prohibited, except where essential for scientific or management purposes. Such overflights are to be at an altitude of no less than 930 m (3050 ft) for single-engine helicopters and fixed-wing aircraft, and no less than 1500 m (5000 ft) for twin-engine helicopters;
- refuelling of aircraft is prohibited within the Area.

There are no marked pedestrian routes within the Area. Unless disturbance is authorised by permit, pedestrians should keep at least 100 m from concentrations of birds, and give way to departing and arriving penguins. Pedestrians moving in or around the Area should avoid crossing the access routes of birds if possible, or cross quickly without disturbing penguin traffic.

7(iii) Activities which are or may be conducted within the Area, including restrictions on time and place

The following activities may be conducted within the Area as authorised in a permit;

- scientific research consistent with the Management Plan for the Area which cannot be undertaken elsewhere and which will not jeopardise the values for which the Area has been designated or the ecosystems of the Area;

- essential management activities, including monitoring; and
- sampling, which should be the minimum required for approved research programs.

7(iv) Installation, modification, or removal of structures

- Permanent structures or installations are prohibited.
- Other structures or installations shall not be erected within the Area except as specified in a permit.
- Small temporary refuges, hides, blinds or screens may be constructed for the purpose of scientific study of the avifauna.
- Installation (including site selection), removal, modification or maintenance of structures shall be undertaken in a manner that minimises disturbance to breeding birds.
- All scientific equipment or markers installed within the Area must be clearly identified by country, name of the principal investigator, year of installation and date of expected removal.
- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer required. All such items should be made of materials that pose minimal risk of harm to bird populations or of contamination of the Area. Permits will require the removal of specific structures, equipment or markers before the permit expiry date.

7(v) Location of field camps

- Camping is prohibited within the Area except in an emergency.

7(vi) Restrictions on materials and organisms that may be brought into the Area

- No poultry products, including dried food containing egg powder, are to be taken into the Area.
- No depots of food or other supplies are to be left within the Area beyond the season for which they are required.
- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. The highest level precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area) into the Area;
- To the maximum extent practicable, clothing, footwear and other equipment used or brought into the Area (including backpacks, carry-bags and other equipment) shall be thoroughly cleaned before entering and after leaving the Area.
- Boots and sampling/research equipment and markers that comes into contact with the ground shall be disinfected or cleaned with hot water and bleach before entering and after visiting the Area to help prevent accidental introductions of animals, plant material, micro-organisms and non-sterile soil into the Area. Cleaning should be undertaken at station.

- Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for terrestrial scientific field research in Antarctica (SCAR 2009);
- No herbicides or pesticides shall be brought into the Area. Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in a permit, shall be removed from the Area as far as possible at or before the conclusion of the activity for which the permit was granted.
- Fuel is not to be stored in the Area unless required for essential purposes connected with the activity for which the permit has been granted. Permanent fuel depots are not permitted.
- All material introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so as to minimise the risk of environmental impact.

7(vii) Taking of, or harmful interference with, native flora and fauna

- Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the *SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.*
- Ornithological research shall be limited to activities that are non-invasive and non-disruptive to the breeding seabirds present within the Area. Surveys, including aeria l photographs for the purposes of population census, shall have a high priority.
- Disturbance of southern giant petrels shall be avoided at all times.

7(viii) **C**ollection or removal of anything not brought into the Area by the permit holder

- Material may only be collected or removed from the Area as authorised in a permit and shall be limited to the minimum necessary to meet scientific or management needs.
- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorised, may be removed unless the impact of the removal is likely to be greater than leaving the material *in situ*. If such material is found the permit issuing authority shall be notified if possible while the field party is present within the Area.

7(ix) Disposal of waste

- All wastes, including human wastes, shall be removed from the Area. Wastes from field parties shall be stored in such a manner to prevent scavenging by wildlife (e.g. skuas) until such time as the wastes can be disposed or removed. Wastes are to be removed no later than the departure of the field party. Human wastes and grey water may be disposed into the sea outside the Area.

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan
Permits may be granted to enter the Area to:

- carry out biological monitoring and Area inspection activities, which may involve the collection of samples for analysis or review;
- erect or maintain scientific equipment and structures, and signposts; or
- carry out other protective measures.

Any specific sites of long-term monitoring shall be appropriately marked and a GPS position obtained for lodgement with the Antarctic Data Directory System through the appropriate national authority.

To help maintain the ecological and scientific values of the Area, visitors shall take special precautions against introductions of non-indigenous organisms. Of particular concern are pathogenic, microbial or vegetation introductions sourced from soils, flora and fauna at other Antarctic sites, including research stations, or from regions outside Antarctica. To minimise the risk of introductions, before entering the Area visitors shall thoroughly clean footwear and any equipment, particularly sampling equipment and markers to be used in the Area.

Where practical, a census of southern giant petrels on Giganteus Island shall be conducted at least once in every five year period. Censuses of other species may be undertaken during this visit provided no additional disturbance is caused to the southern giant petrels.
To reduce disturbance to wildlife, noise levels including verbal communication is to be kept to a minimum. The use of motor-driven tools and any other activity likely to generate noise and thereby cause disturbance to nesting birds is prohibited within the Area during the breeding period (1 October to 30 April).

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such visit reports should include, as applicable, the information identified in the visit report form contained in the *Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas*. If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.
A copy of the report should be forwarded to the Party responsible for development of the Management Plan (Australia) to assist in management of the Area, and the monitoring of bird populations. Visit reports shall provide detailed information on census data, locations of any new colonies or nests not previously recorded, a brief summary of research findings and copies of photographs taken of the Area.

8. Supporting Documentation

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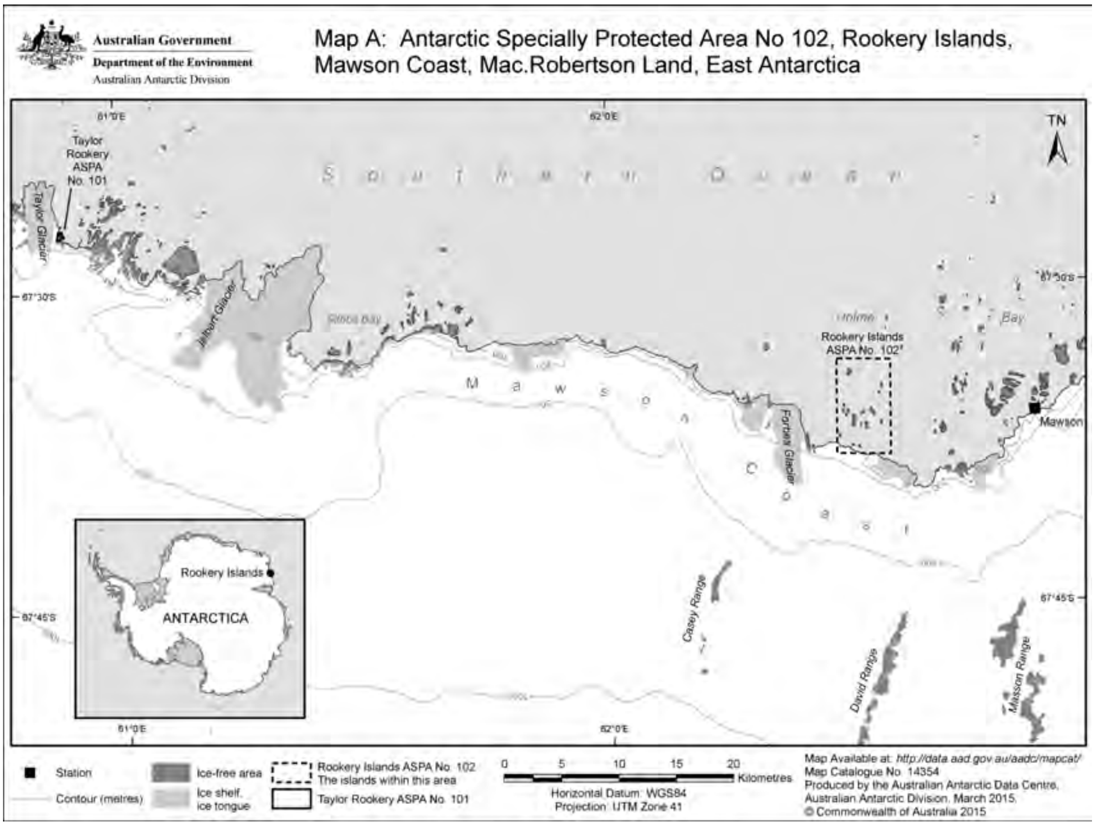
Australian Government
Department of the Environment
Australian Antarctic Division
Map A: Antarctic Specially Protected Area No 102, Rookery Islands, Mawson Coast, Mac.Robertson Land, East Antarctica
TN
Taylor Rookery ASPA No. 101
Taylor Glacier
Jelbart Glacier
Southern Ocean
Rookery Islands ASPA No. 102
Forbes Glacier
Mawson
Mawson Coast
Casey Range
David Range
Masson Range
Rookery Islands
ANTARCTICA
Station
Contour (metres)
Ice-free area
Ice shelf, ice tongue
Rookery Islands ASPA No. 102 The islands within this area
Taylor Rookery ASPA No. 101
0 5 10 15 20 Kilometres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14354
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, March 2015.
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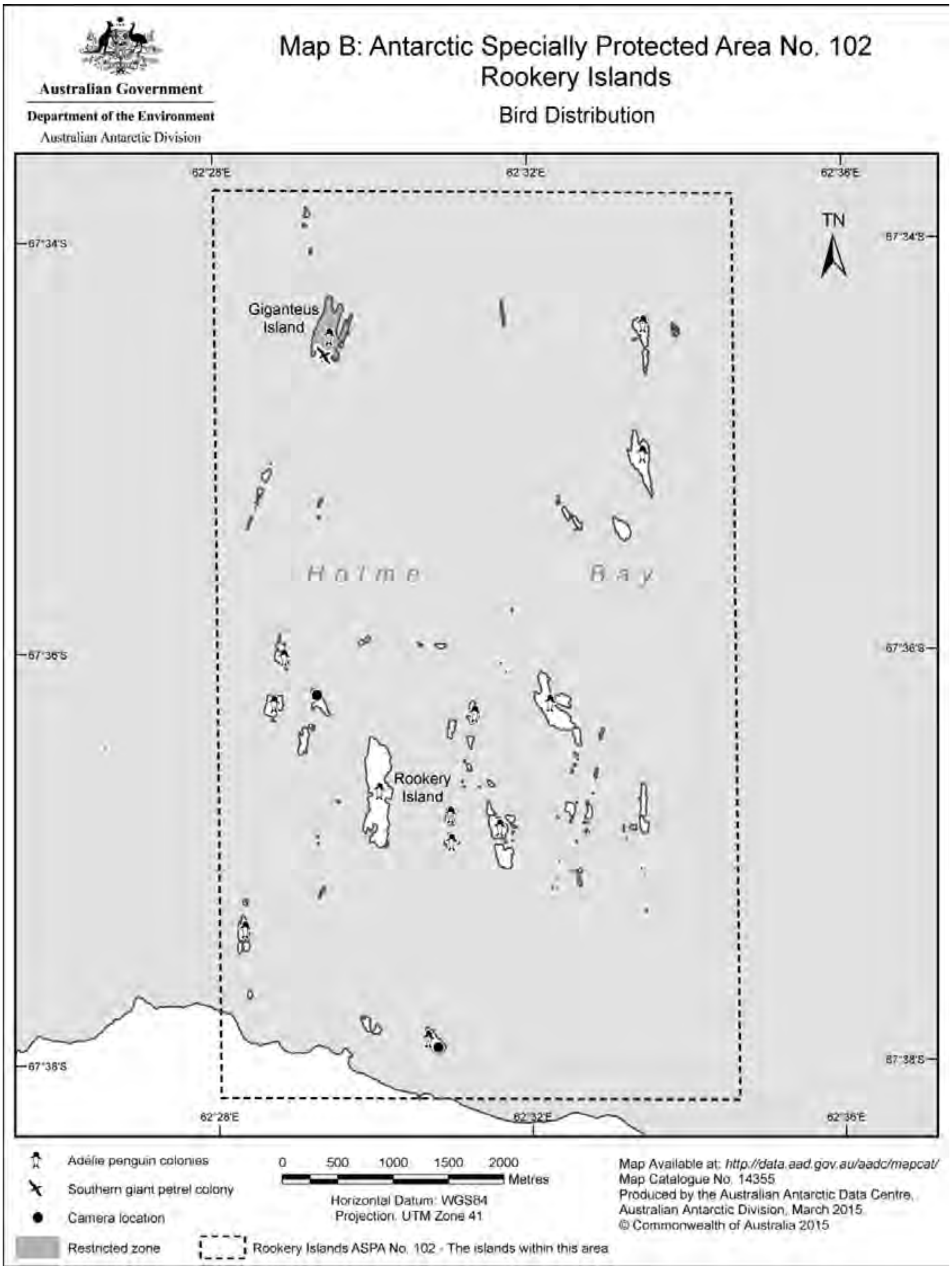
Australian Government
Department of the Environment
Australian Antarctic Division
Map B: Antarctic Specially Protected Area No. 102
Rookery Islands
Bird Distribution
TN
Giganteus Island
Holme Bay
Rookery Island
Adélie penguin colonies
Southern giant petrel colony
Camera location
Restricted zone
Rookery Islands ASPA No. 102 - The islands within this area
0 500 1000 1500 2000
Metres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14355
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, March 2015
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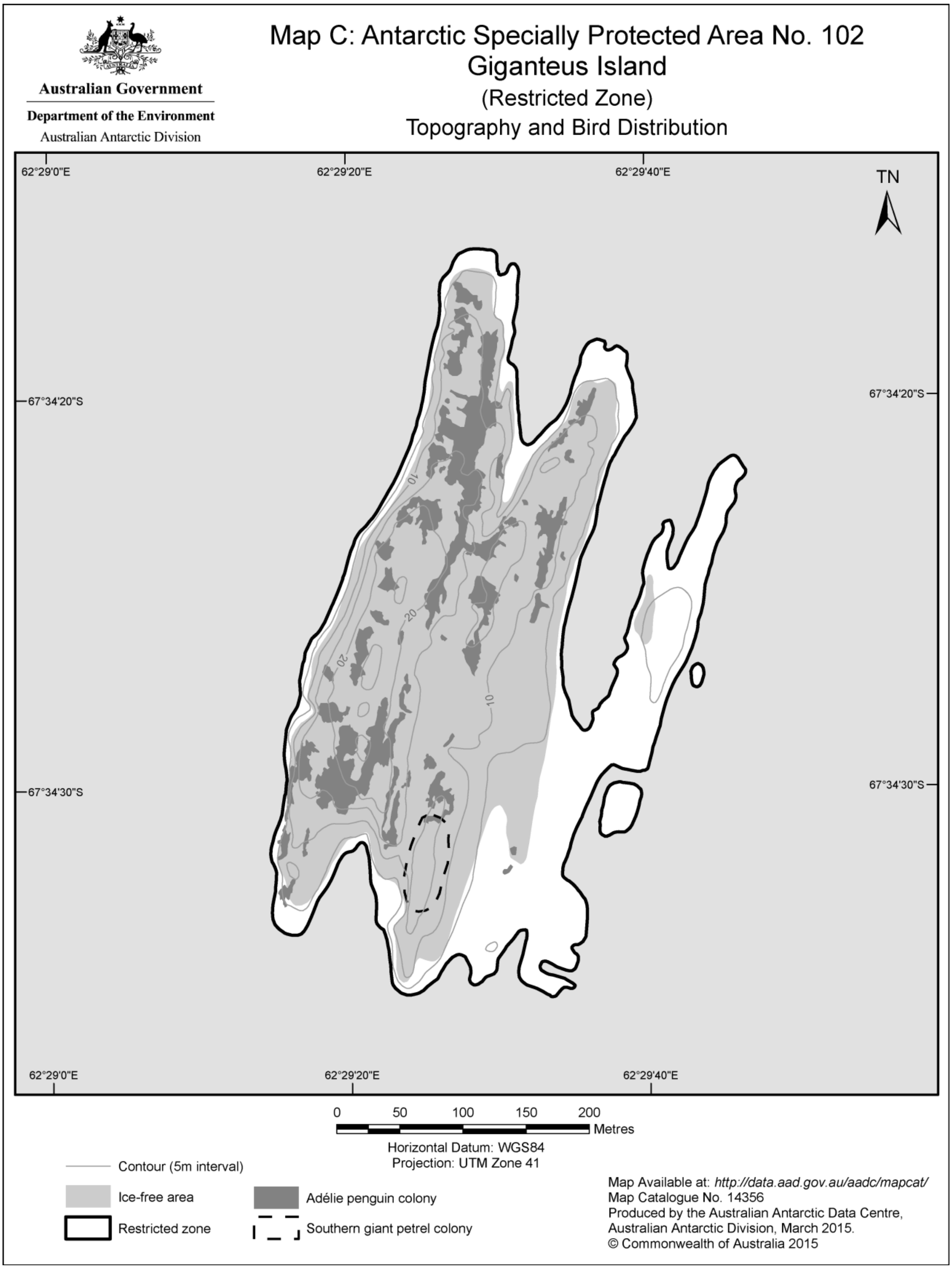

Australian Government
Department of the Environment
Australian Antarctic Division
Map C: Antarctic Specially Protected Area No. 102
Giganteus Island
(Restricted Zone)
Topography and Bird Distribution
62°29'0"E
62°29'20"E
62°29'40"E
TN
67°34'20"S
67°34'30"S
10
20
0 50 100 150 200 Metres
Horizontal Datum: WGS84
Projection: UTM Zone 41
Contour (5m interval)
Ice-free area
Adélie penguin colony
Restricted zone
Southern giant petrel colony
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14356
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, March 2015.
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Measure 3 (2015)

Antarctic Specially Protected Area No 103 (Ardery Island and Odbert Island, Budd Coast, Wilkes Land, East Antarctica): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation IV-3 (1966), which designated Ardery Island and Odbert Island, Budd Coast as Specially Protected Area ("SPA") No 3;
- Recommendation XVII-2 (1992), which adopted a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 3 as ASPA 103;
- Measures 2 (2005) and 3 (2010), which adopted revised Management Plans for ASPA 103;

Recalling that Recommendation XVII-2 (1992) has not become effective and was withdrawn by Measure 1 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 103;

Desiring to replace the existing Management Plan for ASPA 103 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. The revised Management Plan for Antarctic Specially Protected Area No 103 (Ardery Island and Odbert Island, Budd Coast, Wilkes Land, East Antarctica), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 103 annexed to Measure 3 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area No. 103

ARDERY ISLAND AND ODBERT ISLAND, BUDD COAST, WILKES LAND, EAST ANTARCTICA

Introduction

Ardery Island and Odbert Island (66°22’20”S; 110°29’10”E, Map A) were originally designated as Specially Protected Area No. 3, through Recommendation IV-III (1966), after a proposal by Australia. A management plan for the Area was adopted under Recommendation XVII-2 (1992). In accordance with Decision 1 (2002), the site was redesignated and renumbered as Antarctic Specially Protected Area (ASPA) No. 103. Revised management plans for the ASPA were adopted under Measure 2 (2005) and Measure 3 (2010). The Area is primarily designated to protect the unusual assemblage of breeding colonies of several species of petrel. The Antarctic petrel (*Thalassoica antarctic*a) and the southern fulmar (*Fulmarus glacialoides*) are of particular scientific interest.

1. Description of values to be protected

The Area is designated primarily to protect the assemblage of four fulmarine petrels at Ardery Island and Odbert Island (Map B and C). The four species of fulmarine petrels, all belonging to different genera, are Antarctic petrels, southern fulmars, Cape petrels (*Daption capense*), and snow petrels (*Pagodroma nivea*). All breed in the Area in sufficient numbers to allow comparative study. Study of these four genera at one location is of high ecological importance in understanding their responses to changes in the Southern Ocean ecosystem.

The Antarctic petrel is the only species in the genus *Thalassoica*; they occur most commonly in the Ross and Weddell seas and are much less abundant in East Antarctica. Similarly, the southern fulmar inhabits islands mainly near the Antarctic Peninsula and the islands of the Scotia Arc where about a quarter of its global population resides. Since southern fulmars require steeper slopes as breeding habitat (to allow falling away from the colony when becoming airborne) than Antarctic petrels, this species is more prone to suffer reductions in breeding success in poor weather conditions.
Both islands are also occupied by breeding populations of Wilson's storm petrels (*Oceanites oceanicus*) and Antarctic skuas (*Catharacta maccormicki*). Odbert Island also supports a breeding population of Adélie penguins (*Pygoscelis adeliae*).

2. Aims and Objectives

Management of Ardery Island and Odbert Island aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance;
- allow scientific research on the ecosystem and physical environment, particularly on the avifauna, provided it is for compelling reasons which cannot be served elsewhere;
- minimise the possibility of introduction of pathogens which may cause disease in bird populations within the Area;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- allow for the gathering of data on the population status of the bird species on a regular basis; and
- allow visits for management purposes in support of the aims of the management plan.

3. Management activities

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

- a copy of this Management Plan shall be made available at Casey station and to ships visiting the vicinity;
- the Area shall be visited as necessary, preferably no less than once every five years, to assess whether it continues to serve the purposes for which it was designated, and to ensure that management activities are adequate: and
- the Management Plan shall be reviewed at least every five years.

4. Period of designation

Designation is for an indefinite period.

5. Maps

- **Map A**: Antarctic Specially Protected Area No 103, Ardery Island and Odbert Island, Budd Coast, Wilkes Land, East Antarctica. The inset map indicates the location in relation to the Antarctic continent.
- **Map B**: Antarctic Specially Protected Area No 103, Ardery Island: Topography and Bird Distribution.
- **Map C**: Antarctic Specially Protected Area No 103, Odbert Island: Topography and Bird Distribution.
- **Map D**: Antarctic Specially Protected Area No 103: Ardery Island and Odbert Island: Helicopter approach and landing sites.

Specifications for all maps: Horizontal Datum: WGS84; Vertical Datum: Mean Sea Level

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

Ardery Island (66°22’15”S, 110°27’0”E) and Odbert Island (66°22’24”S, 110°32’28”E) are among the southernmost of the Windmill Islands in the south of Vincennes Bay, off the Budd Coast of Wilkes Land, Eastern Antarctica. The Area comprises both islands down to low water mark.

Topography

Ardery Island and Odbert Island are located 5 km and 0.6 km, respectively, to the west of Robinson Ridge, south of Casey station.

Odbert Island is approximately 2.7 km long and 0.8 km wide. It has a rocky coast which rises steeply from the sea to a plateau. The highest point is 90 m altitude. The plateau is dissected by a series of valleys which run to the south from the high flat rim on the northern side. These valleys are snow covered in winter. The hill tops remain essentially ice and snow free. In some years, the island remains joined to Robinson Ridge on the mainland by sea ice.

Ardery Island is a steep, ice free island approximately 1.2 km long and 0.8 km wide, with an east-west orientation. The highest point is 117 m above sea level.

The terrain on both islands is rugged and dissected by fissures. The cliffs are fractured and have narrow exposed ledges which in summer are occupied by nesting sea birds. On the hillsides and plateau region, the exposed rock is ice-smoothed and the valley floors are covered with moraine. The islands have undergone isostatic rebound. Moraine and solifluction debris is abundant at heights in excess of 30 metres above mean sea level but considerably less at lower altitudes.

Geology

The Windmill Islands region represents one of the eastern most outcrops of a Mesoproterozoic low-pressure granulite facies terrain that extends west to the Bunger Hills and further to the Archaean complexes in Princess Elizabeth Land, to minor exposures in the east in the Dumont d'Urville area and in Commonwealth Bay. The total outcrop areas do not exceed more than a few square kilometres. The Mesoproterozoic outcrop of the Windmill Islands and the Archaean complexes of Princess Elizabeth Land are two of the few major areas in East Antarctica that can be directly correlated with an Australian equivalent in a Gondwana reconstruction. The Mesoproterozoic facies terrain comprise a series of migmatitic metapelites and metapsammites interlayered with mafic to ultramafic and felsic sequences with rare calc-silicates, large partial melt bodies (Windmill Island supacrustals), undeformed granite, charnockite, gabbro, pegmatite, aplites and cut by easterly-trending late dolerite dykes.

Ardery Island and Odbert Island are part of the southern gradation of a metamorphic grade transition which separates the northern part of the Windmill Islands region from the southern part. The metamorphic grade ranges from amphibolite facies, sillimanite-biotite orthoclase in the north at Clark Peninsula, through biotite-cordierite-almandine granulite, to hornblende-orthopyroxene granulite at Browning Peninsula in the south.

Ardery Island and Odbert Island together with Robinson Ridge, Holl Island, Peterson Island and the Browning Peninsula are similar geologically and are composed of Ardery charnockite. Charnockites are of granitic composition but were formed under anhydrous conditions. The Ardery Charnockite of Ardery Island and Odbert Island intrudes the Windmill metamorphics and consists of a modal assemblage of quartz + plagioclase + microcline + orthopyroxene + biotite + clinopyroxene hornblende with opaques and minor zircon and apatite. An isotopic age of about 1,200 million years for the Ardery charnockite has been established. The charnockite is prone to deep weathering and crumbles readily because of its mineral assemblage, whereas the metamorphic sequences of the northerly parts of the region have a much more stable mineral assemblage and crystalline structure. This difference has a significant influence on the distribution of vegetation in the Windmill Islands region with the northern rock types providing a more suitable substrate for slow growing lichens.

Soils on the islands are poorly developed and consist of little more than rock flour, moraine and eroded material. Some soils contain small amounts of organic matter derived from excreta and feathers from the seabirds.

Glaciation

The Windmill Islands region was glaciated during the Late Pleistocene. The southern region of the Windmill Islands was deglaciated by 8,000 corr. yr B.P., and the northern region, including the Bailey Peninsula deglaciated by 5,500 corr. yr B.P. Isostatic uplift has occurred at a rate of 0.5 to 0.6 m/100 yr, with the upper mean marine limit, featured as ice-pushed ridges, being observed at nearby Robinson Ridge at approximately 28.5 metres.

Climate

The climate of the Windmill Islands region is frigid-Antarctic. Conditions at Ardery Island and Odbert Island are probably similar to those of the Casey station area approximately 12 km to the north. Meteorological data for the period 1957 to 1983 from Casey station (altitude 32 m) on the Bailey Peninsula show mean temperatures for the warmest and coldest months of 0.3 and -14.9°C, respectively, with extreme temperatures ranging from 9.2 to -41°C. Mean annual temperature for the period was –9.3°C.

The climate is dry with a mean annual snowfall of 195 mm year^{-1} (rainfall equivalent) precipitation as rain has been recorded in summer. However, within the last 10 to 15 years the mean annual temperature has decreased to –9.1°C and the mean annual snowfall has increased to 230 mm year^{-1} (rainfall equivalent).

On average the area experiences 96 days with gale-force winds, which are predominantly easterly in direction, off the polar ice cap. Blizzards are frequent, especially during winter. Snowfall is common during the winter, but the extremely strong winds scour the exposed areas. On most hill crests in the area snow gathers in the lee of rock outcrops and in depressions in the substratum. Further down the slopes snow forms deeper drifts.

Environmental Domains and Antarctic Conservation Biogeographic Regions

Based on the Environmental Domains Analysis for Antarctica (Resolution 3(2008)) Ardery Island and Odbert Island are located within Environment L *Continental coastal-zone ice sheet*. Based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) the Area is located within Biogeographic Region 7 *East Antarctica*.

Biological Features

Terrestrial

The flora of Odbert Island consists of three moss species, eleven lichen species (Table 1), and an unknown number of terrestrial and freshwater algae. The most extensive development of lichens is towards the highest elevations of the southern parts of the island in an area of ice-fractured bedrock. The algae occur in tarns, soil seepage areas and soil. Stands of *Prasiola* spp and other green algae and cyanobacteria occur below snow drifts down slope from penguin colonies towards the western part of the island.

The flora of Ardery Island comprises several species of lichen similar to those found on Odbert Island.

The only recorded invertebrates are ectoparasites of birds. Ardery Island is the type locality for the Antarctic flea *Glaciopsyllus antarcticus,* associated with southern fulmars.

MOSSES
Bryum pseudotriquetrum Hedw.) Gaertn., Meyer & Scherb.
Ceratodon purpureus (Hedw.) Brid.
Schistidium antarcticum (= Grimmia antarctici) (Card.) L.I.Savicz & Smirnova

LICHENS
Buellia frigida (Darb.)
Buellia soredians Filson
Buellia sp.
Caloplaca athallina Darb.
Caloplaca citrina (Hoffm.) Th. Fr.
Candelariella flava (C.W.Dodge & Baker) Castello & Nimis
Rhizoplaca melanophthalma (Ram.) Leuck. et Poelt
Rinodina olivaceobrunnea Dodge & Baker
Umbilicaria decussata (Vill.) Zahlbr.
Xanthoria mawsonii Dodge.
Usnea antarctica Du Rietz

ALGAE
Prasiola crispa (Lightfoot) Kützing
Prasiococcus sp.

Table 1. List of mosses, lichens and algae recorded from Odbert Island.

Lakes

Cold monomictic lakes and ponds occur throughout the Windmill Islands region in bedrock depressions, and are usually ice-free during January and February. Nutrient rich lakes are found near the coast in close proximity to extant or abandoned penguin colonies. Sterile lakes are located further inland and are fed by melt water and local precipitation. On Ardery Island and Odbert Island, there are a number of small tarns which are frozen in winter and filled with melt water in summer. Many of the tarns are ephemeral, drying out towards the end of summer. Other tarns located below snow banks are fed continuously by melt water.

Birds and seals

Odbert Island has breeding populations of Adélie penguins, Cape petrels, snow petrels, southern fulmars, Wilson's storm petrels, and south polar skuas. Ardery Island supports a similar species composition as well as Antarctic petrels, but does not have any breeding Adélie penguins. The southern giant petrel (*Macronectes giganteus*), which breeds on the Frazier Islands approximately 23 km to the north-west, is the only species breeding in the Windmill Islands that breeds neither at Ardery Island nor at Odbert Island.

No seals inhabit Ardery Island and Odbert Island although Weddell seals (*Leptonychotes weddellii*) are frequently observed on the sea ice around them. The main pupping area is about 3 km to the south-east between Herring Island and the Antarctic mainland. In this area, disturbance of the sea ice caused by movement of the Peterson Glacier ensures open water and easy access to food. About 100 pups are born annually in the region. Elephant seals (*Mirounga leonina*) haul out a little farther to the south on Petersen Island and on the Browning Peninsula. Up to 100 of these seals are seen annually; most are mature males and only a few females have also been observed.

Adélie penguin (Pygoscelis adeliae)

Adélie penguins breed on Odbert Island, and although they regularly come ashore on Ardery Island, none breed there. The most recent published estimate of the breeding population on Odbert Island is 11,000 pairs in 1989/90. Observations during a visit to the Area in 2012/13 indicated that the population had increased further, but no new estimate is yet available.

Egg laying usually commences before the middle of November, the first chicks hatch around mid-December, and juveniles start leaving the colony in early February. Southern fulmar (Fulmarus glacialoides)

The total population of southern fulmars in the Area is about 5,000 breeding pairs. There are approximately 3,000 occupied southern fulmar sites on Ardery Island; the largest colonies are located on the northern cliffs and around the eastern tip of the island. At Odbert Island, most of the 2,000 sites are concentrated in two large colonies on Haun Bluff and in the central north.

Southern fulmars breed colonially on or near the cliffs and ravines. Nests are situated on small cliff ledges but also on large nearly flat terraces, some birds nest in the open, others in deep crevices or between loose rocks. First eggs appear in early December and most are laid within 10 days. Hatching commences in the third week of January and chicks fledge by mid-March.

Antarctic petrel (Thalassoica antarctica)

The total population of Antarctic petrels in the Area has been estimated at just over 300 breeding pairs. The largest colony, on the Northern Plateau at Ardery Island, contains at least 150 sites in the main area and some 25 sites in smaller groups nearby. At Odbert Island, some 30 nests are located in a small area off the central northern cliffs.

Most nests of Antarctic petrels are situated on plateau-like areas or gently sloping sections of steep cliffs on the Northern Plateau, and smaller colonies around Soucek Ravine. Nests are very close together; isolated nesting on small ledges appears to be avoided. In late November, the first Antarctic petrels return from their pre-laying exodus and a week later most birds have returned to lay their eggs. First hatchlings appear in the second week of January, fledging commences in late February to early March, and all chicks have left before the middle of March.

Cape petrel (Daption capense)

Approximately 750 breeding pairs of Cape petrel utilise the Area, with most breeding at Ardery Island in small colonies on the northern cliffs. Scattered nests are present on both sides of Snowie Mountain. There are approximately 100 to 200 nesting sites on Odbert Island, mostly located around the fulmar colonies.

Cape petrels prefer nesting sites sheltered by slightly overhanging rocks and substantial cover from the back and if possible the sides. Most nests are in less steep parts of cliffs or along the top edges of cliffs both in colonies and small scattered groups. After returning from the pre-laying exodus, eggs are laid in late November, and hatching commences in the second week of January. Most chicks have fledged by the first week of March.

Snow petrel (Pagodroma nivea)

The number of snow petrels in the Area is estimated at over 1,100 breeding pairs. Approximately 1,000 snow petrel nesting sites were located on Ardery Island in 1990, mostly on the slopes of Snowie Mountain. Snow petrels appear to be less abundant on Odbert Island than on Ardery with 100 – 1000 nesting sites. In 2003, 752 active nests were found on Ardery Island and 824 on Odbert Island.

The snow petrels breed in crevices or in holes between loose rocks in loose, low density aggregations. Isolated nests are common, as are nests within colonies of other species. Suitable snow petrel habitat also harbours Wilson's storm petrels. The onset of egg laying varies between concentrations of nests, with laying occurring within the first three weeks of December, and chicks hatching from the middle of January onwards. All are fledged in the first two weeks of March.

Wilson's storm petrel (Oceanites oceanicus)

Wilson's storm petrels are widely distributed, and nest in all suitable rocky areas within the Area. Approximately 1,000 nesting sites have been documented for Ardery Island. Odbert Island has 1,000 – 2,000 nesting sites, at a lower density than that of Ardery Island because of the general spread of suitable rock areas. Wilson's storm petrels breed in deep, narrow holes. As the nests can be extremely difficult to detect the population estimates are likely to be considerable under-estimates.

South polar skua (Catharacta maccormicki)

In 1984/85, ten pairs of south polar skua bred on Ardery Island, and another three more pairs may have held territories. A similar number was present in 1986/87, although only seven pairs produced eggs. Odbert Island had 10 - 20 pairs. The distribution of south polar skua nests on Ardery Island reflects their dependence on petrels. Most pairs have observation points close to petrel nests, from which they can observe their food territory on the bird cliffs. At Odbert Island, most nests were near the penguin colonies.

Nests are shallow hollows in gravel, either fully in the open on flat ground or slightly protected by surrounding rocks. Territories and nest locations appear to be stable from year to year; near a nest there are usually several depressions of previous nests. Egg laying dates vary considerably, though most are concentrated around late November to early December. The first chicks are observed in the last days of December, and juveniles begin to fly by mid February.

Non-breeding bird species

Emperor penguins (*Aptenodytes forsteri*) do not breed in the immediate Casey area but individual birds have been observed near Casey station and even far inland. A chinstrap penguin (*Pygoscelis antarctica*) was observed in January 1987 in the Adélie penguin colony on Whitney Point, north of Casey. Southern giant petrels, both adults and immatures, are regular visitors to Ardery Island. In favourable winds they fly along the bird cliffs in search of food. An emaciated juvenile blue petrel (*Halobaena caerulea)* arrived at Casey in March 1987. In November 1984, an adult Dominican gull (*Larus dominicanus*) was sighted in the Casey area. Groups of terns, possibly Arctic tern (*Sterna paradisea)*, were observed in the Casey area in 1984/ 85 and in 1986/87, when a few groups of up to 100 birds were seen and heard high in the air in March.

6(ii) Access to the Area

Travel to the Area may be by vehicle over sea ice, by boat or by aircraft, in accordance with section 7(ii) of this plan.

6(iii) Location of structures within or adjacent to the Area

Four remotely operating time lapse cameras are located on Ardery Island and one on Odbert Island (locations 66°22’6.3”S, 110°26’42.9”E; 66°22’13.4”S, 110°27’46.2”E; 66°22’6.2”S, 110°26’56.3”E; 66°22’7.7”S, 110°26’57.7”E (Map B) and 66°22’37.8”S, 110°33’55.3”E (Map C)). Deployed in 2010/11, the cameras have been located for long term monitoring of southern Fulmar, Cape petrel and Adélie penguin breeding success and phenology with minimal disturbance. While the cameras are not permanent, they are expected to remain in place beyond the term of this plan.

6(iv) Location of other protected areas within close proximity

The following Protected Areas are located in the vicinity of Ardery Island and Odbert Island (see Map A):

- North-east Bailey Peninsula (66°17'S, 110°32'E) (ASPA No 135) approximately 12 km north of Ardery Island and Odbert Island;
- Clark Peninsula (66°15'S, 110°36'E) (ASPA No 136), approximately 16 km north of Ardery Island and Odbert Island;
- Frazier Islands (66°13’S 110°11’E) (ASPA No 160), approximately 23 km north-east of Ardery Island and Odbert Island.

6(v) Special zones within the Area

There are no special zones within the Area.

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a permit issued by an appropriate national authority. Conditions for issuing a permit to enter the Area are that:

- it is issued only for compelling scientific reasons that cannot be served elsewhere, in particular for scientific study of the avifauna and ecosystem of the Area, or for essential management purposes consistent with plan objectives such as inspection, maintenance or review;
- the actions permitted will not jeopardise the values of the Area;
- the actions permitted are in accordance with the management plan;
- the permit, or an authorised copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the permit;

- permits shall be issued for a stated period;
- the appropriate national authority shall be notified of any activities/measures undertaken that were not included in the authorised permit.

7(ii) Access to, and movement within or over the Area

Vehicles and boats used to visit the islands must be left at the shoreline. Movement within the Area is by foot only.

Defined landing sites for access by sea and helicopter to Ardery Island and Odbert Island are shown on Map D. At Ardery Island, the preferred boat landing site is at Robertson Landing where there are three rock anchors to tie down a boat or other equipment. The boat landing site marked for Ardery Island on Map D is within 200 metres of seabird colonies. However, it represents the preferred safe landing site on the island. All landings must be undertaken carefully to avoid disturbance to the birds. There are no defined pedestrian routes within the Area, however, pedestrians should keep their distance from and avoid disturbance of the birds at all times.

If access to the islands is not possible by boat or by vehicle over sea ice, then fixed wing aircraft or helicopters may be used subject to the following conditions:

- disturbance of the colonies by aircraft shall be avoided at all times;
- sea ice landings shall be encouraged (where practicable);
- overflight of the islands should be avoided at all times, except where it is considered essential for scientific or management purposes as authorised in a permit. In these instances, overflight must be at a vertical or horizontal distance of no less than 930 metres (3050 feet) for single-engine aircraft and 1500 metres (5000 feet) for twin-engine aircraft;
- during the breeding season of penguins and petrels, defined here as the period from 1 November to 1 April, helicopter movement to the islands should be kept to the minimum;
- the use of twin-engine helicopters to land on Ardery Island or Odbert Island is prohibited;
- the single-engine helicopter approach to Ardery Island should be at a high altitude and from a southern direction as the lowest densities of birds are on the southern cliffs (see Maps B and D);
- the single-engine helicopter approach to Odbert Island should preferably be from the south, avoiding cliff areas because of the nesting petrels (see Maps C and D);
- single-engine helicopter landing sites marked on Map D are approximate and pilots shall ensure that disturbance of breeding colonies is avoided.
- only personnel who are required to carry out work in the Area should leave the helicopter;
- refuelling of aircraft is prohibited within the Area.

7(iii) Activities which are, or may be conducted within the Area

The following activities may be conducted within the Area as authorised in a permit;

- compelling scientific research consistent with the Management Plan for the Area which cannot be undertaken elsewhere and will not jeopardise the values for which the Area has been designated or the ecosystems of the Area;
- essential management activities, including monitoring; and
- sampling, which should be the minimum required for approved research programs.

7(iv) Installation, modification, or removal of structures

- No permanent structures are to be erected in the Area.
- Any structures erected or installed within the Area are to be specified in a permit.
- Scientific markers and equipment must be secured and maintained in good condition, clearly identifying the permitting country, name of principal investigator and year of installation. All such items should be made of materials that pose minimum risk of contamination of the Area.
- A condition of the permit shall be the removal of equipment associated with scientific research before the permit for that research expires. Details of markers and equipment temporarily left in situ (GPS locations, description, tags, etc. and expected removal date) shall be reported to the permitting Authority.
- When permitted, the installation of a field hut on Ardery Island must take place before 1 November when the breeding season commences, and removal after 1 April when fledglings have departed. Installation and removal should be supported by vehicle over sea ice unless sea ice conditions prevent this.

7(v) Location of field camps

- Camping is prohibited on Odbert Island except in emergency.
- If required for field work, a hut may be erected on Ardery Island at the point specified on Map D. There are eight solid rock anchors available at this location. There is a refuge hut “Robinson Ridge Hut”, on the mainland, located on Robinson Ridge (66°22.4’S 110°35.2’E), approximately 800 m west of Odbert Island (see Map A).

7(vi) Restrictions on materials and organisms that may be brought into the Area

- No poultry products, including dried food containing egg powder, are to be taken into the Area.
- No depots of food or other supplies are to be left within the Area beyond the season for which they are required.
- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. The highest level precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area) into the Area;
- To the maximum extent practicable, clothing, footwear and other equipment used or brought into the Area (including backpacks, carry-bags and other equipment) shall be thoroughly cleaned before entering and after leaving the Area.
- Boots and sampling/research equipment and markers that comes into contact with the ground shall be disinfected or cleaned with hot water and bleach before entering and after visiting the Area to help prevent accidental introductions of animals, plant material, micro-organisms and non-sterile soil into the Area. Cleaning should be undertaken either at the refuge hut or at station.
- Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for terrestrial scientific field research in Antarctica (SCAR 2009);
- No herbicides or pesticides shall be brought into the Area. Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in a permit, shall be removed from the Area at or before the conclusion of the activity for which the permit was granted.
- Fuel is not to be stored in the Area unless required for essential purposes connected with the activity for which the permit has been granted. Permanent fuel depots are not permitted.

- All material introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so as to minimise the risk of environmental impact.

7(vii) Taking of or harmful interference with native flora and fauna

- Taking of or harmful interference with native flora and fauna is prohibited, except in accordance with a permit.
- Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the *SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.*
- Ornithological research on the breeding birds present within the Area shall be limited to activities that are non-invasive and non-disruptive. Surveys shall have a high priority. If the capture of individuals is required, capture should occur at nests on the periphery of the Area if at all possible to reduce disturbance.

7(viii) Collection or removal of anything not brought into the Area by the permit holder

- Material may only be collected or removed from the Area as authorised in a permit and should be limited to the minimum necessary to meet scientific or management needs.
- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorised, may be removed unless the impact of the removal is likely to be greater than leaving the material *in situ*. If such material is found, the appropriate Authority must be notified and approval obtained prior to removal.

7(ix) Disposal of waste

- All wastes, including human wastes, shall be removed from the Area. Wastes from field parties shall be stored in such a manner to prevent scavenging by wildlife (e.g. skuas) until such time as the wastes can be disposed or removed. Wastes are to be removed no later than the departure of the field party. Human wastes and grey water may be disposed into the sea outside the Area

7(x) Measures that may be necessary to continue to meet the aims of the management plan

Permits may be granted to enter the Area to:

- carry out biological monitoring and Area inspection activities, which may involve the collection of samples for analysis or review;
- erect or maintain scientific equipment, structures, and signposts; or
- carry out other protective measures.

Any specific sites of long-term monitoring shall be appropriately marked and a GPS position obtained for lodgement with the Antarctic Data Directory System through the appropriate National Authority.
To help maintain the ecological and scientific values of the Area, visitors shall take special precautions against introductions. Of particular concern are pathogenic, microbial or vegetation introductions sourced from soils, flora and fauna at other Antarctic sites, including research stations, or from regions outside Antarctica. To minimise the risk of introductions, before entering the Area, visitors shall thoroughly clean footwear and any equipment, particularly sampling equipment and markers to be used in the Area.

7(xi) Requirement for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such visit reports should include, as applicable, the information identified in the visit report form contained in the *Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas*. If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.

A copy of the report should be forwarded to the Party responsible for development of the Management Plan (Australia) to assist in management of the Area, and monitoring of bird populations. Additionally visit reports should provide detailed information on census data, locations of any new colonies or nests not previously recorded, a brief summary of research findings and copies of photographs taken of the Area.

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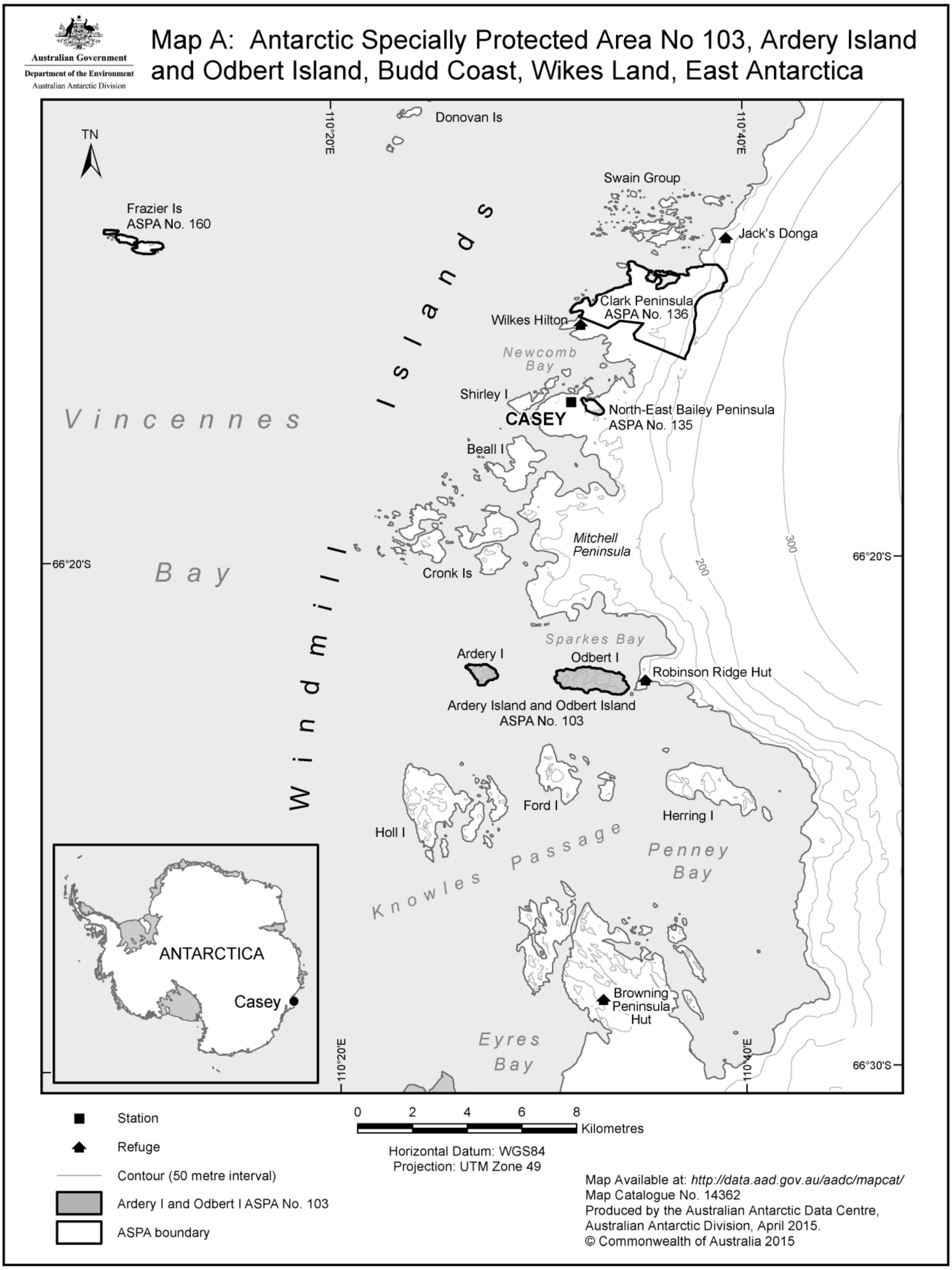
Australian Government
Department of the Environment
Australian Antarctic Division
Map A: Antarctic Specially Protected Area No 103, Ardery Island and Odbert Island, Budd Coast, Wikes Land, East Antarctica
Donovan Is
110°20'E
110°40'E
TN
Swain Group
Frazier Is
ASPA No. 160
Jack's Donga
Windmill Islands
Clark Peninsula
ASPA No. 136
Wilkes Hilton
Newcomb Bay
Shirley I
CASEY
North-East Bailey Peninsula
ASPA No. 135
Vincennes Bay
Beall I
Mitchell Peninsula
Cronk Is
66°20'S
300
200
Sparkes Bay
Ardery I
Odbert I
Robinson Ridge Hut
Ardery Island and Odbert Island
ASPA No. 103
Ford I
Herring I
Holl I
Knowles Passage
Penney Bay
ANTARCTICA
Casey
Browning Peninsula Hut
Eyres Bay
66°30'S
Station
Refuge
Contour (50 metre interval)
Ardery I and Odbert I ASPA No. 103
ASPA boundary
0 2 4 6 8
Kilometres
Horizontal Datum: WGS84
Projection: UTM Zone 49
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14362
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, April 2015.
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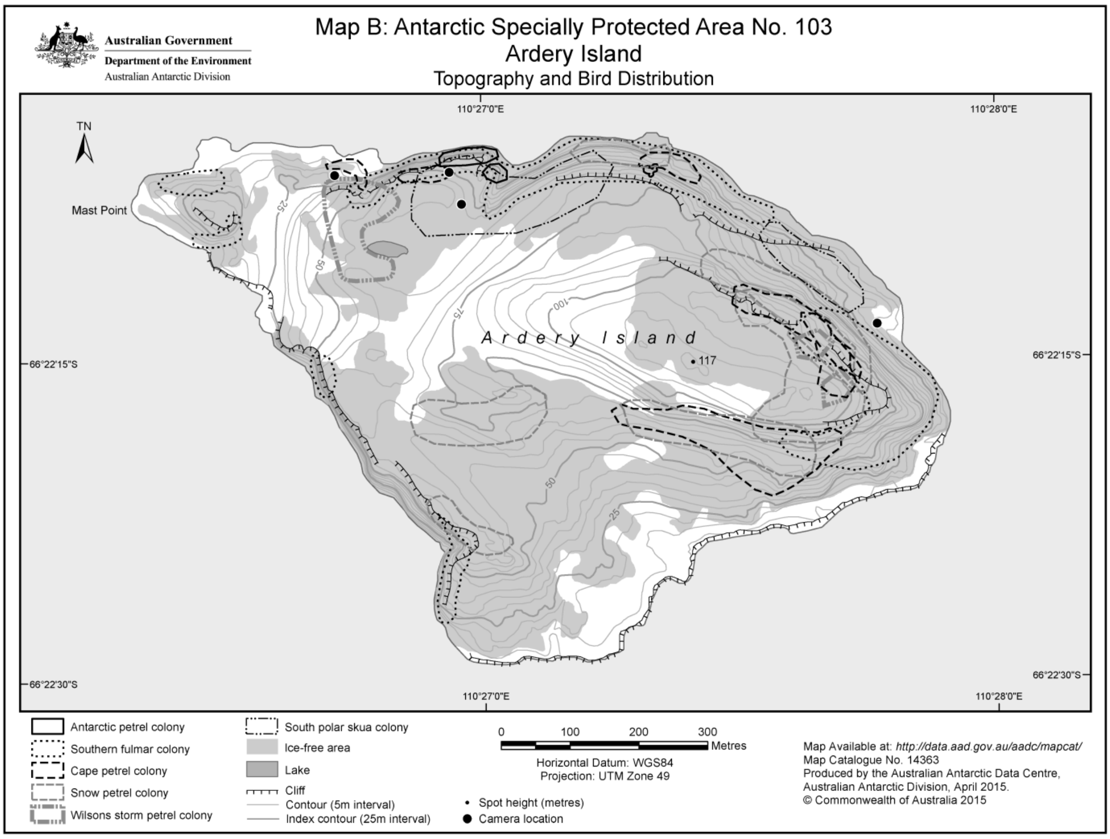
Map B: Antarctic Specially Protected Area No. 103
Ardery Island
Topography and Bird Distribution
Australian Government
Department of the Environment
Australian Antarctic Division
TN
Mast Point
Ardery Island
117
110°27'0"E
110°28'0"E
66°22'15"S
66°22'30"S
Antarctic petrel colony
Southern fulmar colony
Cape petrel colony
Snow petrel colony
Wilsons storm petrel colony
South polar skua colony
Ice-free area
Lake
Cliff
Contour (5m interval)
Index contour (25m interval)
0 100 200 300
Metres
Horizontal Datum: WGS84
Projection: UTM Zone 49
Spot height (metres)
Camera location
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14363
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, April 2015.
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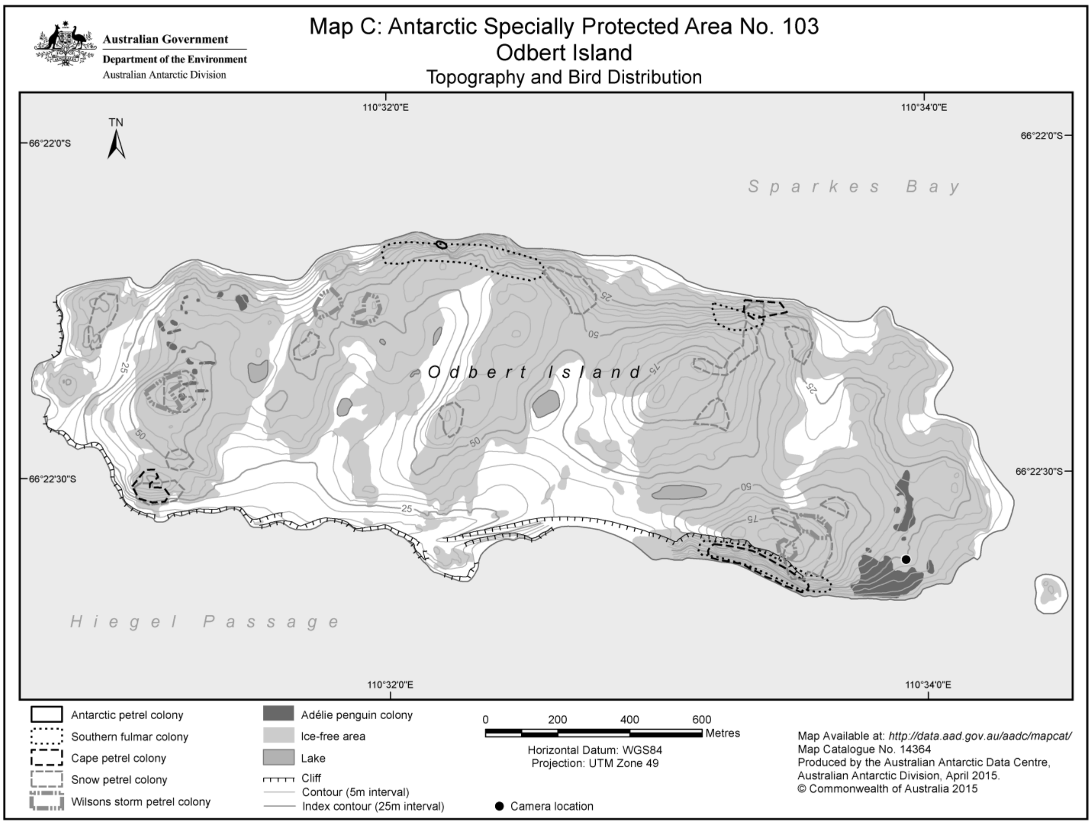

Australian Government
Department of the Environment
Australian Antarctic Division
Map C: Antarctic Specially Protected Area No. 103
Odbert Island
Topography and Bird Distribution
110°32'0"E
110°34'0"E
66°22'0"S
66°22'30"S
TN
Sparkes Bay
Odbert Island
Hiegel Passage
Antarctic petrel colony
Southern fulmar colony
Cape petrel colony
Snow petrel colony
Wilsons storm petrel colony
Adélie penguin colony
Ice-free area
Lake
Cliff
Contour (5m interval)
Index contour (25m interval)
Camera location
0 200 400 600 Metres
Horizontal Datum: WGS84
Projection: UTM Zone 49
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14364
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, April 2015.
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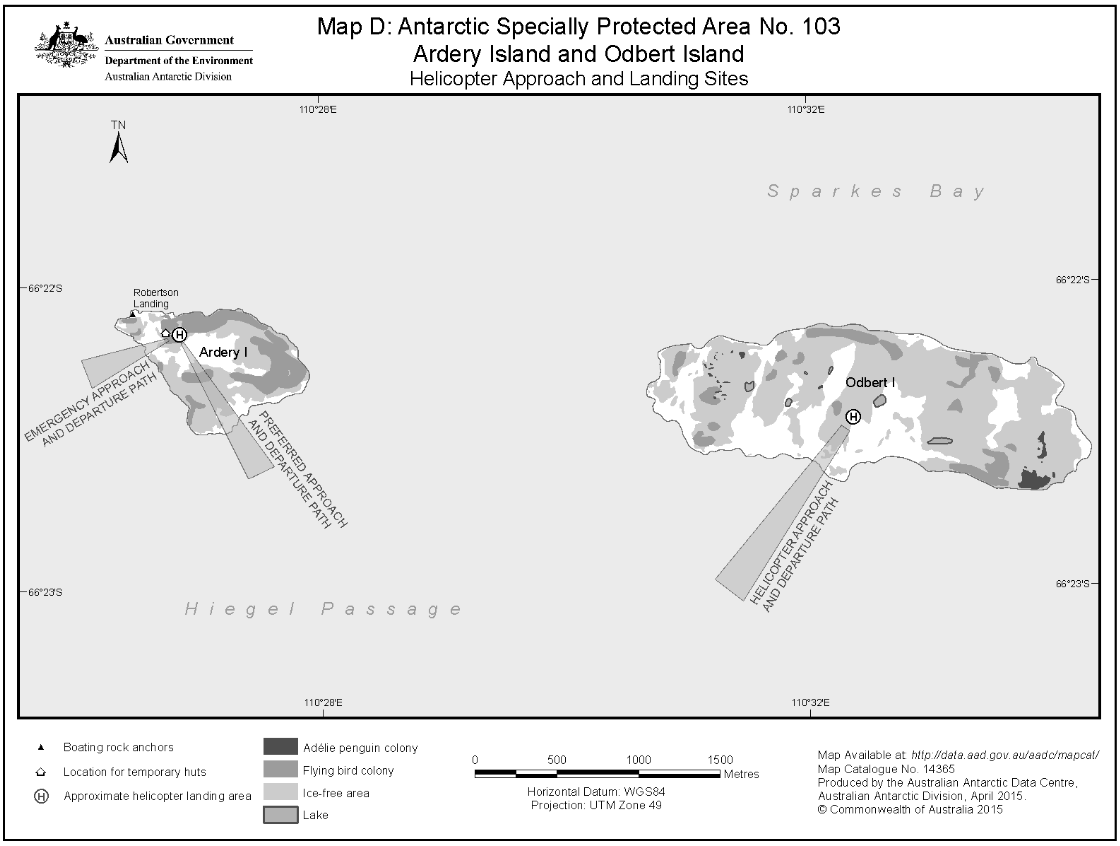

Australian Government
Department of the Environment
Australian Antarctic Division
Map D: Antarctic Specially Protected Area No. 103
Ardery Island and Odbert Island
Helicopter Approach and Landing Sites
110°28'E
110°32'E
TN
Sparkes Bay
66°22'S
Robertson Landing
Ardery I
EMERGENCY APPROACH AND DEPARTURE PATH
PREFERRED APPROACH AND DEPARTURE PATH
Odbert I
HELICOPTER APPROACH AND DEPARTURE PATH
66°23'S
Hiegel Passage
Boating rock anchors
Location for temporary huts
Approximate helicopter landing area
Adélie penguin colony
Flying bird colony
Ice-free area
Lake
0 500 1000 1500 Metres
Horizontal Datum: WGS84
Projection: UTM Zone 49
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14365
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, April 2015.
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Measure 4 (2015)

Antarctic Specially Protected Area No 104 (Sabrina Island, Balleny Islands): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty providing for the designation of Antarctic Specially Protected Areas ("ASPA") and approval of Management Plans for those Areas;

Recalling

- Recommendation IV-4 (1966), which designated Sabrina Island, Balleny Islands, as Specially Protected Area ("SPA") No 4 and annexed a map for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 4 as ASPA No 104;
- Measure 3 (2009), which adopted a revised Management Plan for ASPA 104;

Recalling that Recommendation IV-4 (1966) was designated as no longer effective by Measure 3 (2009);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 104;

Desiring to replace the existing Management Plan for ASPA 104 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:
1. The revised Management Plan for Antarctic Specially Protected Area No 104 (Sabrina Island, Balleny Islands), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 104 annexed to Measure 3 (2009) be revoked.

Management Plan For Antarctic Specially Protected Area No. 104

SABRINA ISLAND, BALLENY ISLANDS, ANTARCTICA

1. Description of values to be protected

Sabrina Island, in the Balleny Island archipelago, was originally designated as Specially Protected Area (SPA) No. 4 in Recommendation IV-4 (1966) on the grounds that "the Balleny Islands, as the most northerly Antarctic land in the Ross Sea region, supports a fauna and flora which reflects many circumpolar distributions at this latitude and that Sabrina Island in particular provides a representative sample of this fauna and flora." The site was re-designated Antarctic Specially Protected Area (ASPA) No. 104 in Decision 1 (2002). A Management Plan was prepared and adopted in Measure 3 (2009) which included Sabrina Island, 'Chinstrap Islet' and The Monolith.

The primary reason for the designation of Sabrina Island as an Antarctic Specially Protected Area is to protect the outstanding ecological values, specifically the biological diversity which is unique for the Ross Sea region.

The Balleny Islands, discovered in February 1839 by John Balleny who was a British sealer, are located approximately 325 km north of the Pennell and Oates Coasts. They are composed of three main islands, Young, Buckle and Sturge Islands, and several smaller islets that form a northwest-southeast island archipelago about 160 kilometres between 66° 15'S to 67° 10'S and 162° 15'E and 164° 45'E (Map 1). The Balleny Islands are the only truly oceanic islands (rather than continental islands) on the Ross Sea side of Antarctica with the exception of Scott Island, which is approximately 505 kilometres northeast of Cape Adare. The archipelago is located within the main Antarctic Circumpolar Current. As such, they provide an important resting and breeding habitat for seabird and seal species and are significant in circumpolar distribution for a variety of species (see Tables 1 and 2, Appendix 1).

Sabrina Island, 'Chinstrap Islet' and The Monolith are located approximately 3 kilometres south south-east of Buckle Island. These islands are the only known breeding site for Chinstrap penguins (*Pygoscelis antarctica*) between Bouvetoya and Peter I Islands (a span of 264° longitude), with the majority of breeding pairs found on Sabrina Island. In addition, this population co-exists with a much larger Adelie penguin (*P. adeliae*) colony where normally the two species breeding ranges are completely separate – except where some colonies overlap near the tip of the Antarctic Peninsula on the South Shetland Islands, and further north on the South Orkney Islands.

Sabrina Island's Adélie colony is of particular importance because it is the largest in the archipelago (and has the majority of the Chinstrap breeding pairs), and because the population is thought to be increasing. Being isolated and prone to difficult weather and ice conditions, the Balleny Islands have been subjected to very little human disturbance, with the exception of the Southern Ocean fisheries.

2. Aims and Objectives

Management of Sabrina Island aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- prevent or minimise the introduction to the Area of alien plants, animals and microbes;
- preserve the natural ecosystem as a reference area largely undisturbed by direct human activities;
- avoid disturbance to the Chinstrap penguin colony, which is anomalous in terms of species distribution, by preventing unnecessary sampling;
- allow scientific research in the Area provided it is for compelling reasons which cannot be served elsewhere and which will not jeopardize the natural ecological system in the Area;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management activities

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

- Copies of this Management Plan shall be made available to vessels operating in the vicinity of the Area.
- National programs shall ensure the boundaries of the Area and the restrictions that apply within are marked on relevant maps and marine charts for which they are responsible.
- The Area shall be visited as necessary to assess whether it continues to serve the purposes for which it was designated and to ensure that management activities are adequate.

4. Period of Designation

Designated for an indefinite period.

5. Maps and photographs

Map 1- ASPA 104: Sabrina Island, Balleny Islands, Antarctica. Regional Map.
Datum: WGS84; Projection: Antarctica Polar Stereographic; Data Source Main Map and Inset: SCAR Antarctic Digital Database, Version 6, 2012.

Map 2 – ASPA 104: Sabrina Island, Balleny Islands, Antarctica. Boundary, Access and Features. Datum: WGS84; Projection: UTM Zone 58 South; Data Source: Imagery from Digital Globe, WorldView – 1 Satellite, Acquired on 14 January, 2011, 50 cm resolution. Features captured by Land Information New Zealand.
Inset oblique photography obtained December 2014 by the Royal New Zealand Air Force (RNZAF).

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Location and general description:

The Balleny Islands are located around 325 km north of the Pennell and Oates Coasts (Map 1). The Islands are the exposed portion of a volcanic seamount chain. There are three main islands and a number of smaller islets and exposed rocks. Sabrina Island is located at 66°55 S, 163°19 E, three kilometres off the southern end of Buckle Island (the central of the main islands). It is less than 2 km across and reaches an estimated height of 180 m above sea level. A volcanic plug approximately 80 m high, named The Monolith, is attached to the southern end of Sabrina Island by a boulder spit. A small islet lies to the north east of Sabrina Island, commonly known as 'Chinstrap Islet'.

Boundaries:

The ASPA comprises all of Sabrina Island, The Monolith, and 'Chinstrap Islet' above sea level, at low tide (Map 2). The marine area is not included with the ASPA.

Natural Features:

Approximately a quarter of Sabrina Island is covered in permanent snow and ice, and an ice foot meets the sea at the northern end. A steep ridge runs across the island, with scoria slopes to the east and south. Sheer cliffs form the majority of the island's coast except for a cobble beach in the south west.

The scoria slopes to the east of the central ridge on Sabrina Island are occupied by Adélie and Chinstrap penguin nests. The birds access their nesting sites via the beach to the south west of the island. Sabrina Island has the largest penguin colony of the Balleny Island penguin colonies with approximately 3,770 Adélie breeding pairs recorded in 2000; and 202 Chinstrap adults and 109 chicks in 2006. 'Chinstrap Islet' had 2,298 penguin breeding pairs in 2000, with approximately 10 Chinstrap pairs recorded on the Islet in 1965 and 1984.

Cape petrels (*Daption capense*) were seen nesting on Sabrina Island in 2006 and also on the southern side of The Monolith in 1965 (although this has not been confirmed by more recent expeditions). Individual Macaroni penguins (*Eudyptes chrysolophus*) have been sighted on Sabrina Island (1964, possible sighting 1973).

Various species of algae (including Myxopycophyta, Xanthophyceae (*Tribonema spp.)* and Chlorophycophyta (*Prasiola spp.)*) have been recorded on Sabrina Island. Chromogenic (bright yellow) bacteria, yeasts, 14 species of filamentous fungi, two species of thermophilous fungi (*Aspergillus fumigatus* and *Chaetomium gracile*), mites (*Stereotydeus mollis, Nanorchestes antarcticus, Coccorhgidia* spp.) and nematodes have also been reported. Rock encrusting lichens, mainly *Caloplaca* or *Xanthoria* species occur on top of the main ridge.

6(ii) Access to the Area

- The Area is difficult to access due to the steep cliffs and terrain of each island and ice conditions at different times of the year. There is no identified access route to 'Chinstrap Islet' but Sabrina Island and The Monolith are accessible by helicopter or small boat from the cobble beach on the south west side of Sabrina Island (Map 2).
- Access restrictions apply within the Area, the specific conditions for which are set out in Section 7(ii) below.

6(iii) Location of structures within and adjacent to the Area

- There are no known existing structures on or adjacent to the Area.

6(iv) Location of other protected areas in the vicinity

- The nearest protected area to Sabrina Islands is ASPA 159: Cape Adare, Borchgrevink Coast located approximately 560 kilometres south east.

6(v) Special zones within the Area

- There are no special zones within the Area.

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a permit to enter the Area are that:

- it is issued for compelling scientific reasons which cannot be served elsewhere, or for reasons essential to the management of the Area;
- the actions permitted are in accordance with this Management Plan;
- the actions permitted will not jeopardize the natural ecological system or the environmental or scientific values of the Area;
- the Permit is issued for a finite period; and
- the Permit, or a copy, shall be carried within the Area.

7(ii) Access to, and movement within or over, the Area

- Access to Sabrina Island and The Monolith is by small boat or helicopter on the gravel beach below the scoria slopes of the south west side of Sabrina Island, 66° 55.166’S, 163° 18.599’E (Map 2).
- There is no identified preferred access route to 'Chinstrap Islet'.
- Helicopter overflight of the Area should be avoided, except for essential scientific or management purposes.
- The operation of aircraft over the Area should be carried out, as a minimum requirement, in compliance with the 'Guidelines for the operation of aircraft near concentrations of birds' contained in Resolution 2 (2004).
- All movement within the Area should be on foot. Pedestrian traffic should be kept to the minimum necessary to undertake permitted activities and every reasonable effort should be made to minimise trampling effects.

7(iii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- compelling scientific research which cannot be undertaken elsewhere and will not jeopardise the natural ecological system or the environmental or scientific values of the Area; and
- essential management activities, including monitoring and inspections.

7(iv) Installation, modification or removal of structures

- No new structures (i.e. signs or boundary markers) are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons and for pre-established periods, as specified in a Permit.
- All markers, structures or scientific equipment installed in the Area must be clearly identified by country, name of the principal investigator or agency, year of installation and date of expected removal.
- All such items should be free of organisms, propagules (e.g. seeds, eggs) and non-sterile soil, and be made of materials that can withstand the environmental conditions and pose minimal risk of contamination of the Area.
- Removal of specific structures or equipment for which the Permit has expired shall be the responsibility of the authority which granted the original Permit and shall be a condition of the Permit.

7(v) Location of field camps

Field camps may be established if necessary to support permitted scientific or management activity. The camp location should be selected to minimise disturbance to wildlife as much as possible and care should be taken to secure all equipment.

7(vi) Restrictions on materials and organisms which may be brought into the Area

- The deliberate introduction of animals, plant material, microorganisms and non-sterile soil into the Area shall not be permitted. Precautions shall be taken to prevent the accidental introduction of animals, plant material, microorganisms and non-sterile soil from other biologically distinct region (within or beyond the Antarctic Treaty area).
- All sampling equipment, footwear, outer clothing, backpacks and other equipment used or brought into the Area shall be thoroughly cleaned before entering the Area. Scrubbing footwear in a disinfectant footbath before each landing is recommended.
- No poultry products, including food products containing uncooked dried eggs, shall be taken into the Area.
- No pesticides shall be brought into the Area. Any other chemicals, which may be introduced for compelling scientific, management or safety purposes specified in the Permit, shall be removed from the Area at or before the conclusion of the activity for which the Permit was granted.
- Fuel, food and other materials are not to be deposited in the Area, unless required for essential purposes connected with the activity for which the Permit has been granted. All such materials introduced are to be removed when no longer required. Permanent depots are not permitted.

- Spill response materials appropriate to the volume of fuels or other hazardous liquids taken into the Area should be carried. Any spills should be immediately cleaned up, provided the response has less environmental impact than the spill itself.

7(vii) Taking of, or harmful interference with, native flora and fauna

- Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit issued in accordance with Annex II of the Protocol on Environmental Protection to the Antarctic Treaty. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) The collection or removal of materials not brought into the Area by the permit holder

- Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Permits shall not be granted if there is reasonable concern that the sampling proposed would take, remove or damage such quantities of soil, sediment, microbiota, flora or fauna, that their distribution or abundance within the Area would be significantly affected.
- Material of human origin likely to compromise the values of the Areas, which was not brought into the Area by the Permit Holder or otherwise authorised, may be removed from the Area, unless the impact of removal is likely to be greater than leaving the material *in situ*; if this is the case the appropriate authority should be notified.

7(ix) Disposal of waste

- All wastes, including all human wastes, shall be removed from the Area.

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

- carry out monitoring and Area inspection activities, which may involve the collection of a small number of samples or data for analysis or review;
- erect or maintain signposts, structures or scientific equipment;
- or for other management measures.

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such visit reports should include, as applicable, the information identified in the recommended visit report form, contained in Appendix 2 of the Revised Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas appended to Resolution 2 (2011) available from the website of the Secretariat of the Antarctic Treaty (www.ats.aq).

If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.

Data currently available for the Area is very limited. New Zealand, as the Party responsible for review of this Management Plan, would therefore appreciate copies of data and images which could assist future management of the Area.

8. Supporting documentation

Bradford-Grieve, Janet and Frenwick, Graham. November 2001. *A Review of the current knowledge describing the biodiversity of the Balleny Islands: Final Research Report for Ministry of Fisheries Research Projects ZBD2000/01 Objective 1 (in part).* NIWA, New Zealand.

de Lange W., Bell R. 1998. Tsunami risk from the southern flank: Balleny Islands earthquake. *Water and atmosphere*. 6(3), pp 13-15.

Macdonald, J.A., Barton, Kerry J., Metcalf, Peter. 2002. Chinstrap penguins (*Pygoscelis antarctica*) nesting on Sabrina Islet, Balleny Islands, Antarctica. *Polar Biology* 25:443-447

Robertson,CJR, Gilbert, JR, Erickson, AW. 1980. Birds and Seals of the Balleny Islands, Antarctica. *National Museum of New Zealand Reconds* 1(16).pp271-279

Sharp, Ben R. 2006. *Preliminary report from New Zealand research voyages to the Balleny Islands in the Ross Sea region, Antarctica, during January-March 2006.* Ministry of Fisheries, Wellington, New Zealand.

Smith, Franz. 2006. *Form 3: Format and Content of Voyage Reports: Balleny Islands Ecology Research Voyage.*

Varian, SJ. 2005. *A summary of the values of the Balleny Islands, Antarctica.* Ministry of Fisheries, Wellington, New Zealand.

Appendix 1

Table 1: Bird species recorded from the Balleny Islands

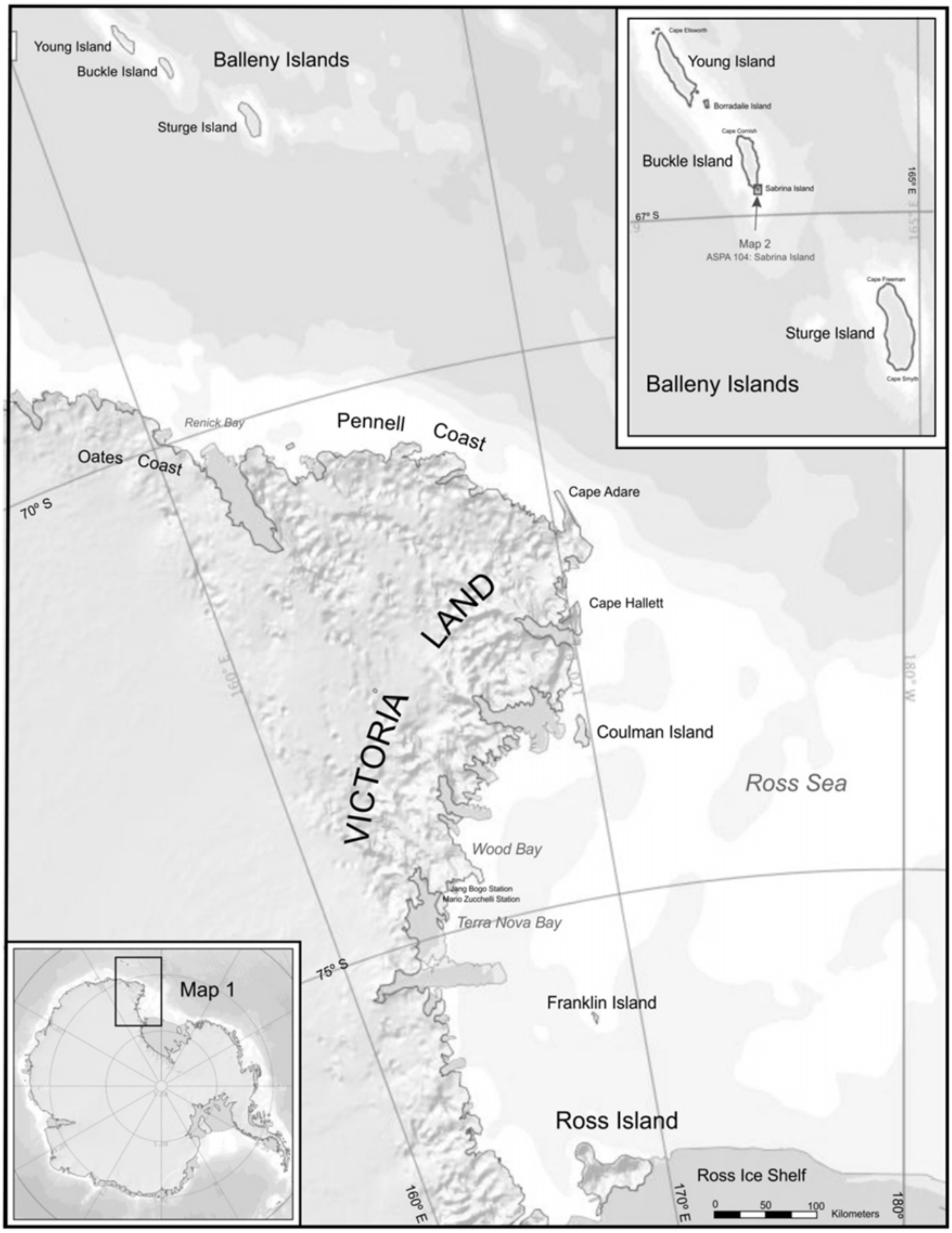
The table lists sightings recorded in expedition reports and scientific publications. Species indicated as breeding have been confirmed in recent expeditions (i.e. since 2000), those marked with S breed on Sabrina Island itself.

Common Name	**Species**	**Breeding**
Adélie penguin	*Pygoscelis adeliae*	✓ S
Antarctic fulmar	*Fulmarus glacialoides*	✓
Antarctic petrel	*Thalassoica antarctica*	✓
Antarctic prion	*Pachyptila desolata*	
Arctic tern	*Sterna paradisea*	
Black browed mollymawk	*Diomedea melanophrys*	
Cape pigeon	*Daption capense*	✓ S
Chinstrap penguin	*Pygoscelis antarctica*	✓ S
Grey-headed mollymawk	*Diomedea chrysostoma*	
Light-mantled sooty albatross	*Phoebetria palpebrata*	
Macaroni penguin	*Eudyptes chrysolphus*	
Snow petrel	*Pagodroma nivea*	✓
Sooty shearwater	*Puffinus griseus*	
Southern giant petrel	*Macronectes giganteus*	
South polar skua	***Catharacta maccormicki***	
Brown skua	*Catharacta antarctica subsp lonnbergi*	
Wandering albatross	*Diomedea exulans*	
White chinned petrel	*Procellaria aequinoctialis*	
Wilson's storm petrel	*Oceanites oceanicus*	

Table 2: Seal species recorded from the Balleny Islands

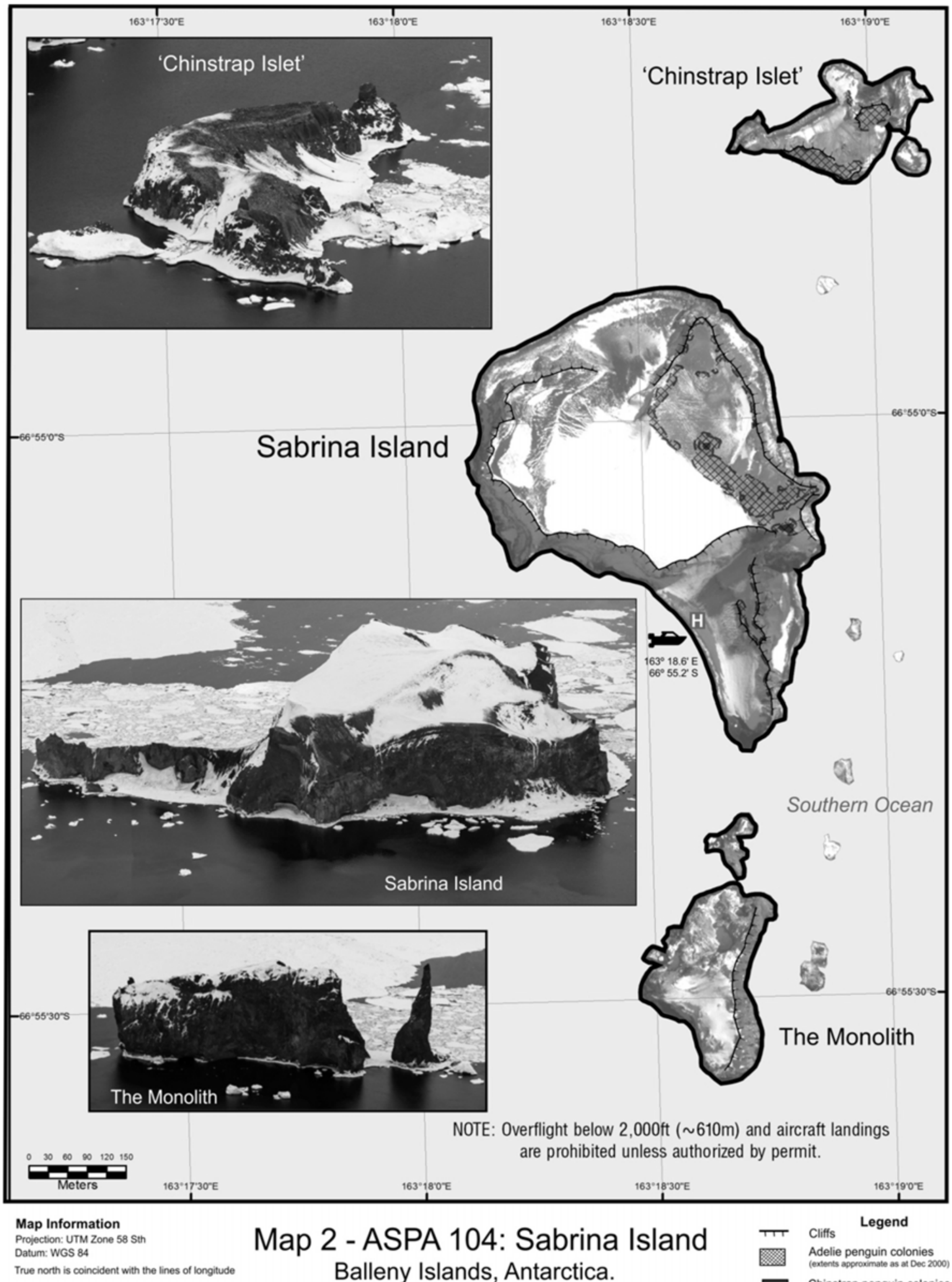
The table lists sightings recorded in expedition reports and scientific publications. Breeding has not been confirmed for any species.

Common Name	**Species**
Crabeater seal	*Lobodon carcinophagus*
Elephant seal	*Mirounga leonina*
Leopard seal	*Hydrurga leptonyx*
Weddell seal	*Leptyonychotes weddellii*



Map Information
Source: SCAR Antarctic Digital Database
Version 6.0 Year 2012
Projection: Antarctic Polar Stereographic
Datum: WGS84
True north is coincident with the lines of longitude

Map 1 - ASPA 104: Sabrina Island
Balleny Islands, Antarctica.
Regional Map



Map Information
Projection: UTM Zone 58 Sth
Datum: WGS 84
True north is coincident with the lines of longitude

Data Source
Imagery: Digital Globe, WorldView-1 Satellite
Acquired on 14 January 2011, 50cm res
Features: Captured by Land Information New Zealand
Oblique Photography: Taken in Dec 2014 by RNZAF

Map 2 - ASPA 104: Sabrina Island
Balleny Islands, Antarctica.

Boundary, Access and Features

Legend
- Cliffs
- Adelie penguin colonies (extents approximate as at Dec 2000)
- Chinstrap penguin colonies (extents approximate as at Dec 2000)
- ASPA Boundary
- H Preferred Landing Site (helicopter & small boat)

Measure 5 (2015)

Antarctic Specially Protected Area No 105 (Beaufort Island, McMurdo Sound, Ross Sea): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation IV-5 (1966), which designated Beaufort Island, Ross Sea as Specially Protected Area ("SPA") No 5;
- Measure 1 (1997), which annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 5 as ASPA 105;
- Measures 2 (2003) and 4 (2010), which adopted revised Management Plans for ASPA 105;

Recalling that Recommendation IV-5 (1966) was designated as no longer effective by Measure 4 (2010);

Recalling that Measure 1 (1997) has not become effective and was withdrawn by Measure 4 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 105;

Desiring to replace the existing Management Plan for ASPA 105 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. The revised Management Plan for Antarctic Specially Protected Area No 105 (Beaufort Island, McMurdo Sound, Ross Sea), which is annexed to this Measure, be approved; and

2. the Management Plan for Antarctic Specially Protected Area No 105 annexed to Measure 4 (2010) be revoked.

Management Plan For Antarctic Specially Protected Area No. 105

BEAUFORT ISLAND, McMURDO SOUND, ROSS SEA

1. Description of Values to be Protected

Beaufort Island was originally designated as Specially Protected Area No. 5 in Recommendation IV-5 (1966) on the grounds that it "contains substantial and varied avifauna, that it is one of the most important breeding grounds in the region, and that it should be protected to preserve the natural ecological system as a reference area." The Area was re-designated by Decision 1 (2002) as Antarctic Specially Protected Area (ASPA) No. 105 and a revised Management Plan was adopted through Measure 2 (2003) and Measure 4 (2010). The Area is an island relatively untouched by human activity, set aside primarily to protect the ecological values of the site from human interference.

Beaufort Island is the northern most feature of the Ross Archipelago, lying approximately 30 kilometres north of Cape Bird, Ross Island. It is a portion of the rim of a volcanic cone, the remainder of which was eroded away and is now submerged to the east of the island. The island, and the remains of the submerged caldera, block the predominantly westward drift of pack ice and ice bergs calving from the nearby Ross Ice Shelf. Icebergs ground on these peaks which in turn facilitate fast ice growth. Beaufort Island is predominantly rock but portions are ice and snow covered. On the south west side of the island there is a broad ice-free shelf with raised beaches behind which summer ponds form, fed by small meltwater streams draining to the coast. Sloping ice fields (about 12° to 15°) cover much of the west and north side of the island but the ice has been receding in recent years. An extensive flat area of less than 50 m elevation is at the north end of the island, where the ice cap of the island drains to a boulder beach, fringing that portion of the shore. Near vertical cliffs compose the eastern side of the island facing the centre of the caldera.

The avifauna is the most varied in the southern Ross Sea. There exists a large Adélie penguin (*Pygoscelis adeliae*) colony on the broad shelf of the southwest side of the island, and a smaller newly formed subcolony, established in 1995, on the beach along the northwest coast. The dating of Adélie penguin remains goes back 45,000 years. A breeding colony of Emperor penguins (*Aptenodytes forsteri*) exists in variable locations on the fast ice to the north and east of the island where grounded icebergs facilitate fast ice establishment. There is acolony of South polar skua (*Catharacta maccormicki*) on both the north and south coasts and Snow petrels (*Pagodroma nivea*) have been seen nesting in cavities on the cliffs at the south of the island. The boundaries of the Area, which previously excluded the Emperor colony, have been extended to include the fast-ice that could potentially be occupied by breeding birds. Weddell seals (*Leptonychotes weddellii*) haul out and pup on the fast ice adjacent to the various grounded icebergs and Leopard seals (*Hydruga leptonyx*) and Ross sea killer whales (Type C) but also the form known as Type B, occur in the vicinity. The Ross sea killer whales are attracted by fish, and the Leopard seals and Type B killer whales are attracted by the penguins and seals. Crabeater seals (*Lobodon carcinophagus)*, Minke whales (*Balaenoptera acutorostrata*) and Arnoux's beaked whales (*Berardius arnuxii*) have also been seen in the surrounding waters.

Beaufort Island is situated in Environment S – McMurdo South Victoria Land geologic based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and in Region 9 – South Victoria Land based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)). Other protected areas within Environment S includes

ASPA 116, 121, 122, 123, 124, 131, 137, 138, 154, 155, 156, 157, 158, 161, 172 and 175 and ASMA 2.

Open water and pack ice around the island early in the summer season makes access difficult somost of the Area is known to have been visited only infrequently. Other than the penguins, Beaufort Island has not been comprehensively studied and is largely undisturbed by direct human activity. However, recent observations indicate that the snow and ice fields are receding. The ecological, scientific and aesthetic values derived from the isolation and relatively low levels of human impact are important reasons for special protection at Beaufort Island.

2. Aims and Objectives

The aim of the Management Plan is to provide protection for the Area and its features so that its values can be preserved. The objectives of the Management Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- preserve the natural ecosystem as a reference area largely undisturbed by direct human activities;
- allow scientific research on the natural ecosystems, plant communities, avifauna, invertebrate communities and soils in the Area provided it is for compelling reasons which cannot be served elsewhere;
- minimise human disturbance to these communities by preventing unnecessary sampling;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management Activities

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

- Copies of this Management Plan (stating the special restrictions that apply), including maps of the Area, shall be made available at adjacent operational research/field stations.
- Markers, signs or structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition, and removed when no longer necessary.
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.
- National Antarctic Programmes operating in the region shall consult together with a view to ensuring these steps are carried out.

4. Period of Designation

Designated for an indefinite period.

5. Maps and Photographs

Map A: Beaufort Island topographic map. This map is derived from the orthophotograph used in Map B and C, using Map B and C specification. Inset: McMurdo Sound, showing Ross Island and the location of McMurdo Station (USA) and Scott Base (NZ).

Map B: Northern Beaufort Island orthophotograph. Orthophotograph specifications; Projection: Lambert Conformal Conic; Standard Parallel 1: 76.6°S; Standard Parallel 2: 79.3°S; Datum: WGS84; Includes material (c) METI and NASA 2006.

Map C: Southern Beaufort Island orthophotograph. Orthophotograph specifications as for Map B.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

The designated Area encompasses the whole of Beaufort Island (76° 56'S, 166° 56'E) above the mean high water mark, and includes adjacent fast-ice occupied by breeding Emperor penguins (Map A). The coordinates include:

- From the northern coast of Beaufort Island at 76 ° 55' 44" S, 166° 52' 42" E north to 76° 55' 30" S, 166° 52' 49" E;
- From 76° 55' 30" S, 166° 52' 49" E east to 76° 55' 30" S, 167° 00' E;
- From 76° 55' 30" S, 167° 00' E south along the 167° longitude parallel to where it intersects with the coastline of Beaufort Island at 76° 55' 30"S, 167° E (Map A).

The island is part of the late Tertiary volcanic vents that developed in a series along a line of weakness in the Ross Sea floor. The island is the remains of a basaltic cone of about the Last Interglacial age, and is one portion of the caldera. More than three quarters of the cone now comprises a circular series of submerged peaks to the east of Beaufort Island. These submerged peaks, along with the island, block the predominant westward drift of pack ice and cause icebergs to ground here which in turn allows fast ice to establish in this area. It is upon this fast ice that the Emperor penguins breed. The location of the breeding colony varies with the fast ice distribution and therefore the protected area boundary has been extended to account for the location of the colony in any given season.

The geology of the island is typical of an eroded, sub-aerially produced basaltic complex, with lava flows and explosion breccias and tuffs evident. Many of the volcanic rocks have been intruded by a series of late stage basaltic dikes, and there is evidence of layered ash-fall tuffs and welded spatter flows from local subsidiary cinder and spatter cones. The island is roughly 7 km long and 3.2 km wide rising to a highest point of 771 m at Paton Peak. The west and northwest side of the island is predominantly an ice field with ice cliffs along the northwest edge of about 20 m on the coast, while the east and south sides of the island are largely ice-free, with almost vertical, inaccessible cliffs rising straight from the sea. On the south west shore is Cadwalader Beach which comprises a beach foreland and cuspate spit, backed by steep basaltic cliffs and several talus cones. A series of beach ridges, which are generally occupied by the breeding Adélie penguins, have trapped meltwater ponds and mark the growth of the beach face away from the cliffs with time and isostatic uplift. A series of raised beaches is evident at the northern side of the island, some with evidence (quills and guano) of former and apparently substantial penguin occupation (to 45,000 years). Sub-tidal (abrasion) platforms and massive boulders are found below the highly weathered southern cliffs. The eastern cliffs descend directly into the sea. Beaufort Island is relatively inaccessible by sea, except on the south and north shores, due to the steep cliff nature of the island and owing to the submerged peaks and grounded icebergs. Shipping, therefore, gives the island a wide berth. In view of the isolation of Beaufort Island and the current low levels of shipping activity in the region, boundary markers and signs have not been installed to mark the Area. The need for marking should be re-evaluated at each Management Plan review.

There is one main Adélie penguin colony and one newly formed subcolony on Beaufort Island. The main colony of 70,468 breeding pairs (2013/14) occupies the flat area at Cadwalader Beach (Map A and C). Between 1981 and 2000 there was a general decreasing trend in the number of breeding pairs at the main colony, then an increasing trend from 2001-2012. The 2013/14 count is the highest number of breeding pairs recorded at this site since counts began in 1981 and is nearly twice the 30 years average (39,391 breeding pairs) for this site (Lyver et al., 2014). In 1995 a sub-colony established at the west end of the ice-free beach on the northern coast (76° 55' S, 166° 52'E) comprising 2 pairs with 3 chicks and approximately 10-15 non breeders. The sub-colony has continued to grow with 525 breeding pairs in the 2005-06 breeding season,677 breeding pairs in the 2008-09 season and 989 breeding pairs in the 2013/14 season. Since 1996, scientists from the USA and NZ programmes have been banding a sample of 400 near-to-fledging Adélie penguin chicks at the Cadwalader Beach area. A few hundred banded adults, survivors of their juvenile years, now reside in the colony. Penguins banded at Cape Royds, Cape Bird and Cape Crozier have been sighted especially at the sub-colony on the north beach. Beaufort Island not long ago provided many emigrants to Ross Island colonies, but with recession of the ice fields and increased availability of nesting space, this is no longer the case. Above the beach, a raised ice-cored moraine terrace (5–20 m elevation, ranging from 2-3 metres wide over most of its length but broadening to 50 metres at its eastern end) extends for 550 m before rising more steeply toward the unstable basaltic cliffs which persist around the entire eastern side of the island. At least three sub-fossil penguin colony deposits have been identified within the moraine terrace, each layer vertically separated by around 50–100 cm of gravels and sand, suggesting this part of the island had been occupied by a sizable breeding penguin colony.

South polar skuas nest (roughly 150 pairs, but not specifically known) on the steep talus accumulating below the cliffs that rise behind the Adélie penguin colony at Cadwalader beach. Another population of approximately 50 pairs of skuas (1995 count) breed on the terrace and ice-free slopes on the northern shore. The proportion of breeders to non-breeders in this population is not known, but approximately 25 and 50 chicks were counted in January 1995 and 1997 respectively. Several snow petrels have also been seen in the cliffs above the Adélie colony at Cadwalader Beach.

On the fast-ice extending out from the northern and eastern coasts of Beaufort Island, a small colony of Emperor penguins (live chick counts from 1962 to 2012 range from 131 to 2,038 individuals; aerial photo of adult abundance was 812 in 2012) is present annually between the months of approximately April to January. Chick counts minimally represent the number of breeding pairs. Chick counts at Beaufort Island declined between 2000 and 2004 when the giant iceberg B15A collided with the north-west tongue of the Ross Ice Shelf at Cape Crozier, Ross Island (Kooyman et al., 2007).

Between 2000 and 2012 chick and adult counts have been variable. The size of the colony is limited by the areal extent and condition of the fast-ice, which affects the availability of breeding sites in the lee of the northern slopes of Beaufort Island. The precise location of the colony varies from year to year and the colony moves within a breeding season, but the general area of occupation is on the fast ice at the foot of the cliffs off the north-eastern corner of the island, indicated on Map A and B. A higher coefficient of variation in chick abundance found at this small colony suggests that it occupies a marginal habitat and may be susceptible to environmental change.

The ice-cored moraine terrace above the beach on the north end of the island (Map A and B) supports the growth of vegetation. Little can grow in the thick guano covering the Cadwalader beach area and all other areas of the island are either cliffs or ice covered. An area of vegetation, 50 meters wide and 5-7 meters above the beach on the north of the island, was described from site visits in January 1995 and 1997, consisting of an extensive (approximately 2.5 ha), continuous area of a single moss species *Bryum argenteum*. A second species of moss, *Hennediella heimii*, is also found among the *B.argenteum*. The moss community is known to support significant populations of mites (Acari) and springtails (Collembola). Although a detailed survey of invertebrates has not been conducted, *Gomphiocephalus hodgsoni* (Collembola) and *Stereotydeus mollis* (Acari) were found to be very abundant in moss samples taken from Beaufort Island. Recent genetic analysis of these populations has found unique genetic mitochondrial DNA haplotypes at Beaufort Island not found in other invertebrate populations in the Ross Sea region.

A diverse community of algae, also prolific on the south-shore shelf, is found at this site and while a detailed algal survey has not yet been undertaken, several species of algae have been found including the red snow algae *Chlamydomonas sp*., *Chloromonas sp*., and *Chlamydomonas nivalis*, representing one of the most southerly locations where red snow algae have been observed and *Prasiola crispa* is particularly abundant at the north beach site. A number of unicellular chlorophytes and xanthophytes (including *Botrydiopsis* and *Pseudococcomyxa* species) and cyanobacteria (particularly scillatorians) were found mixed with *P. crispa*. Green snow algae, noticeable as a green band at the lower levels of snow banks above the beach and below the ice cliffs, contained a mixture of *Chloromonas* and *Klebsormidium* species.

6(ii) Restricted zones within the Area

None.

6(iii) Structures within and near the Area

The only structure known to exist on the island is a signpost on a prominent rock in the Adélie penguin colony at Cadwalader Beach (Map A and C). The sign, erected in 1959–60, bears the names and home towns of the seamen and the Captain of the HMNZS *Endeavour.* The sign is set in concrete and was in good condition in November 2008. The sign is of potential historic value and should remain *in situ* unless there are compelling reasons for its removal, which should be kept under review.

An astronomical survey station is recorded on a map of the island compiled in 1960, but it is unknown whether any associated permanent marker exists. The station is recorded as located at the south end of the main island ridge-line divide at an altitude of 549 m (Map C).

6(iv) Location of other protected areas within close proximity of the Area

The nearest protected area to Beaufort Island is New College Valley, Caughley Beach, Cape Bird (ASPA 116) located approximately 30 km to the south at Cape Bird, Ross Island. Cape Royds and Backdoor Bay (ASPAs 121 and 157) are a further 35 km to the south on Ross Island. Cape Crozier (ASPA 124) is about 40 km to the east. (Refer to the inset: Map A).

7. Terms and Conditions for Entry Permits

Entry into the Area is prohibited except in accordance with a Permit issued by appropriate national authorities. Conditions for issuing a Permit to enter the Area include:

- it is issued only for essential management purposes or compelling scientific reasons that cannot be served elsewhere;
- the actions permitted will not jeopardise the ecological or scientific values of the Area;
- any management activities are in support of the aims of the Management Plan;
- the actions permitted are in accordance with the Management Plan;
- the Permit, or an authorized copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the Permit;
- Permits shall be issued for a stated period.

7(i) Access to and movement within the Area

Land vehicles are prohibited within the Area and access shall be by small boat or by aircraft. Aircraft should land on the island only at the designated site (166° 52' 31" E, 76° 55' 49" S: Maps A and B) on the large flat toe of ice on the north end of the island. Should snow conditions at the designated landing site at the time of visit militate against a safe aircraft landing, a suitable mid- to late-season alternative to the designated landing site may be found at the nominated northern camp site at the western end of the northern beach on Beaufort Island. It is preferred that aircraft approach and depart from the designated landing site from the south or west (Map A). When it is found necessary to use the alternative site at the northern beach campsite, practical considerations may dictate a northern approach. When this is the case, aircraft shall avoid over flight of the area east of this site indicated on Maps Aand B. Use of smoke grenades when landing within the Area is prohibited unless absolutely necessary for safety and all grenades should be retrieved. There are no special restrictions on where access can be gained to the island by small boat. Pilots, air or boat crew, or other people on aircraft or boats, are prohibited from moving on foot beyond the immediate vicinity of the landing site unless specifically authorised by a Permit.

Over flight of bird breeding areas lower than 750 m (or 2500 ft) is normally prohibited. The areas where these special restrictions apply are shown on Maps A and B. When required for essential scientific or management purposes (e.g. aerial photography to assess colony size), transient over flights down to a minimum altitude of 300 m (1000 ft) may be allowed over these areas. Conduct of such over flights must be specifically authorised by a Permit.

Visitors should avoid unnecessary disturbance to birds, or walking on visible vegetation. Pedestrian traffic should be kept to the minimum consistent with the objectives of any permitted activities and every reasonable effort should be made to minimise effects.

7(ii) Activities that are or may be conducted in the Area, including restrictions on time or place

- Scientific research that will not jeopardise the ecosystem of the Area and which cannot be served elsewhere;
- Essential management activities, including monitoring.

7(iii) Installation, modification or removal of structures

No scientific equipment or structures are to be erected within the Area except as specified in a Permit. All markers, structures or scientific equipment installed in the Area must be approved by Permit and clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area. Removal of specific equipment for which the Permit has expired shall be a condition of the Permit.

7(iv) Location of field camps

Camping is permitted only at two designated sites (Maps A–C). The north camping site is located on the flat area north of the designated landing site, on a more sheltered location at the NW end of the beach, 200 m from where several pair of Adélie penguins and skuas nest (if present). The second site is located 100 m from the northern edge of the large Adélie penguin colony at Cadwalader Beach.

7(v) Restrictions on materials and organisms which can be brought into the Area

No living animals, plant material or microorganisms shall be deliberately introduced into the Area and the precautions listed in 7(ix) below shall be taken against accidental introductions. No herbicides or pesticides shall be brought into the Area. Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the Permit, shall be removed from the Area at or before the conclusion of the activity for which the Permit was granted. Fuel is not to be stored in the Area, unless required for essential purposes connected with the activity for which the Permit has been granted. All materials introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so that risk of their introduction into the environment is minimised.

7(vi) Taking or harmful interference with native flora or fauna

Taking or interfering with native flora or fauna is prohibited, except in accordance with a separate Permit issued under Article 3 of Annex II by the appropriate national authority specifically for that purpose. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the *SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica*.

7(vii) Collection or removal of anything not brought into the Area by the Permit holder

Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the Permit holder or otherwise authorised, may be removed unless the impact of removal is likely to be greater than leaving the material *in situ*. If this is the case the appropriate authority should be notified.

7(viii) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area.

7(ix) Measures that are necessary to ensure that the aims and objectives of the Management Plan can continue to be met

Permits may be granted to enter the Area to carry out biological monitoring and site inspection activities, which may involve the collection of small samples for analysis or review, or for protective measures.

Any specific sites of long-term monitoring shall be appropriately marked.

To help maintain the ecological and scientific values of the isolation and historically low level of human impact at Beaufort Island visitors shall take special precautions against introductions. Of particular concern are microbial or vegetation introductions sourced from soils at other Antarctic sites, including stations, or from regions outside Antarctica. Visitors shall take the following measures to minimise the risk of introductions:

a) Any sampling equipment or markers brought into the Area shall be sterilised and, to the maximum extent practicable, maintained in a sterile condition before being used within the Area. To the maximum extent practicable, footwear and other equipment used or brought into the Area (including backpacks, carry-bags, tent pegs, tarps and any other camping equipment) shall be thoroughly cleaned or sterilised and maintained in this condition before entering the Area;

b) Sterilisation should be by an acceptable method, such as by UV light, autoclave or by washing exposed surfaces in 70% ethanol solution in water.

7(x) Requirements for reports

Parties should ensure that the principal holder for each Permit issued, submit to the appropriate authority a report describing the activities undertaken. Such reports should include, as appropriate, the information identified in the Visit Report form suggested by SCAR. 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 the Management Plan. Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organising the scientific use of the Area.

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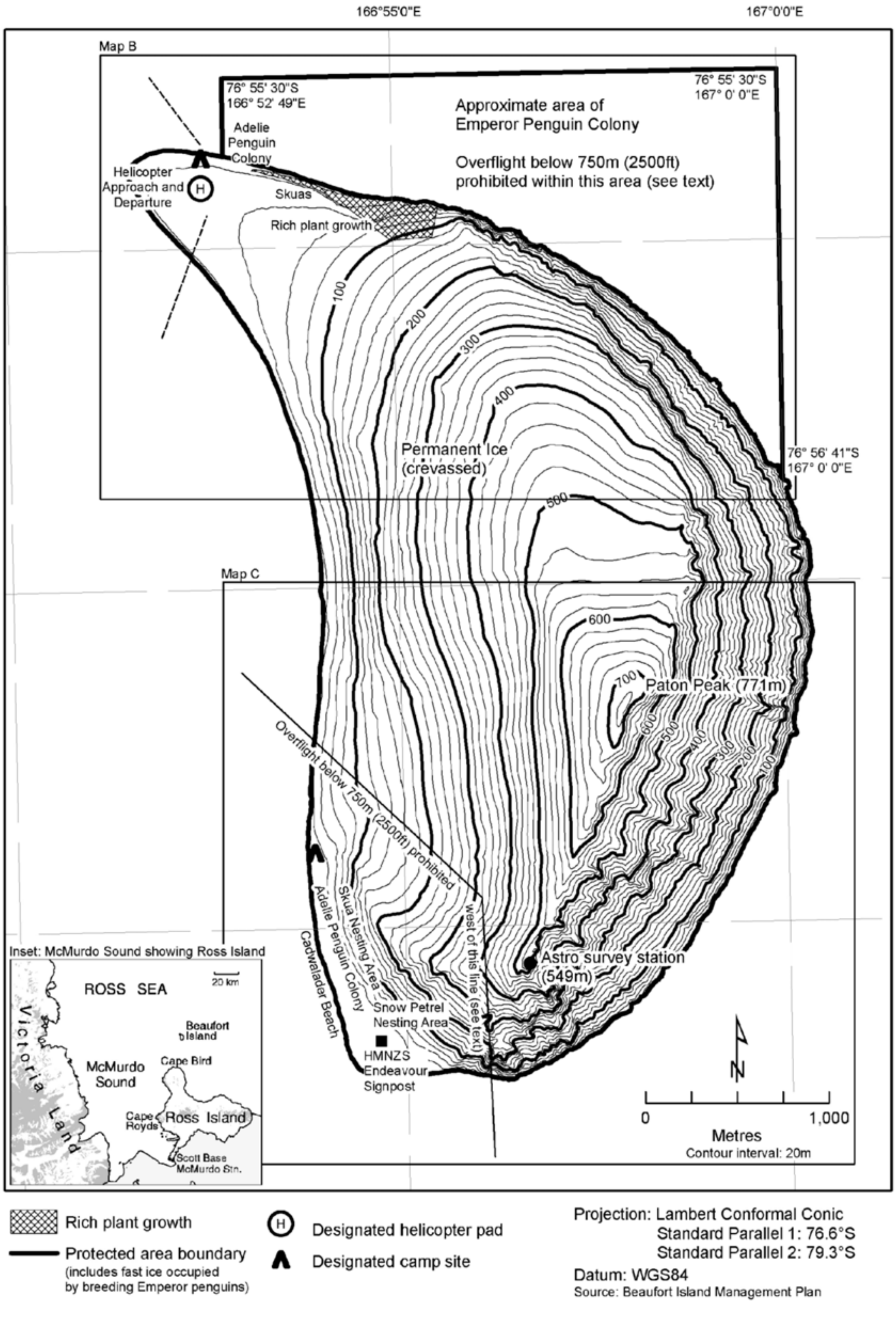
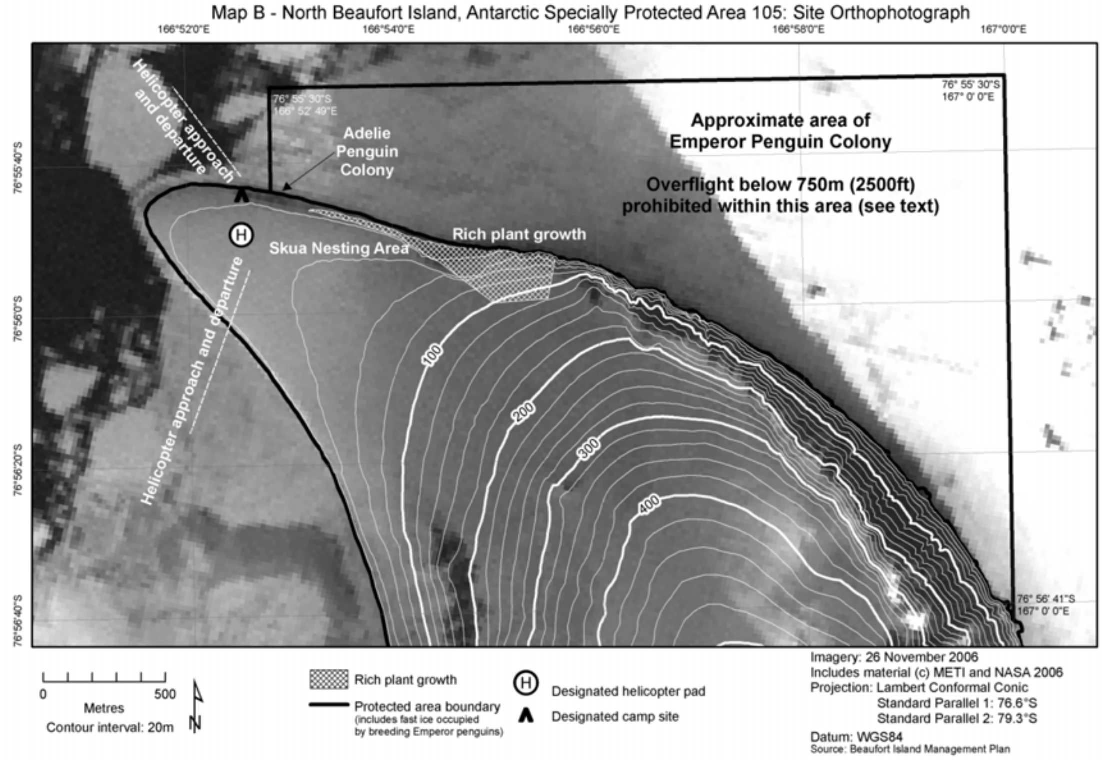
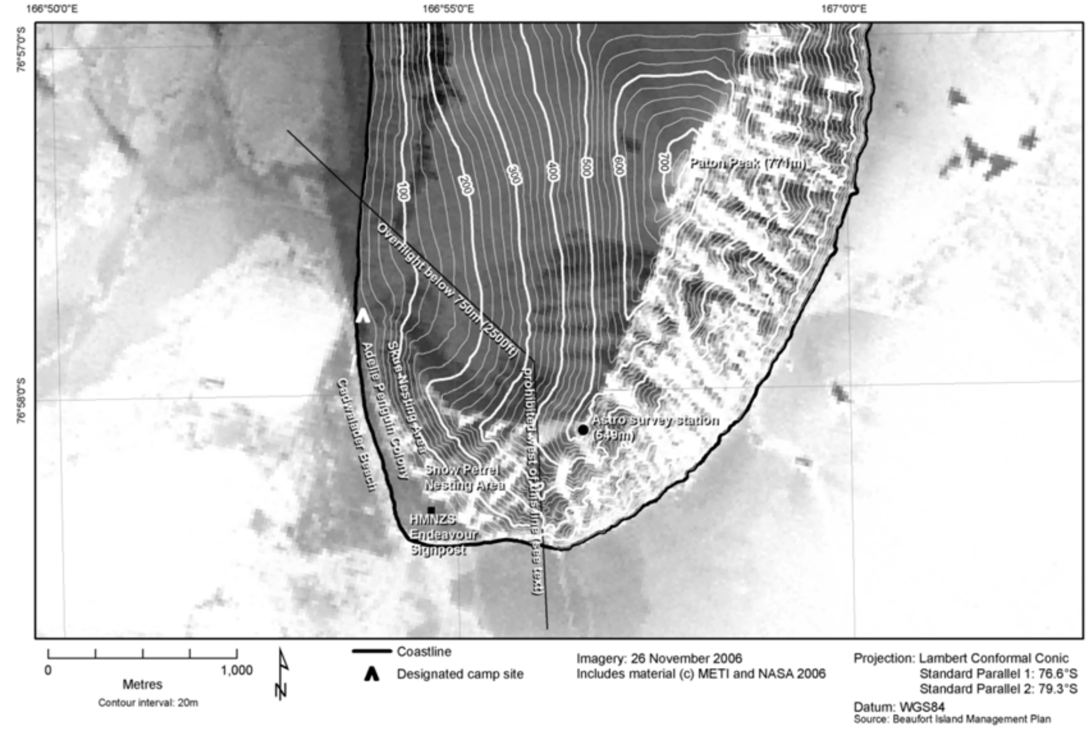
Map A - Beaufort Island, Antarctic Specially Protected Area 105: Topographic map



Map B - North Beaufort Island, Antarctic Specially Protected Area 105: Site Orthophotograph



Map C - South Beaufort Island, Antarctic Specially Protected Area 105: Site Orthophotograph



Measure 6 (2016)

Antarctic Specially Protected Area No 106 (Cape Hallett, Northern Victoria Land, Ross Sea): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation IV-7 (1966), which designated Cape Hallett, Victoria Land as Specially Protected `Area ("SPA") No 7;
- Recommendation XIII-13 (1985), which revised the description and boundaries of SPA 7;
- Decision 1 (2002), which renamed and renumbered SPA 7 as ASPA 106;
- Measures 1 (2002) and 5 (2010), which adopted Management Plans for the Area;

Recalling that Recommendations IV-7 (1966) and XIII-13 (1985) were designated as no longer effective by Measure 5 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 106;

Desiring to replace the existing Management Plan for ASPA 106 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. The revised Management Plan for Antarctic Specially Protected Area No 106 (Cape Hallett, Northern Victoria Land, Ross Sea), which is annexed to this Measure, be approved; and

2. the Management Plan for Antarctic Specially Protected Area No 106 annexed to Measure 5 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area (ASPA) No. 106

CAPE HALLETT, NORTHERN VICTORIA LAND, ROSS SEA (170° 14' E, 72° 19' S)

Introduction

The Cape Hallett Antarctic Specially Protected Area is situated at the northern extremity of the Hallett Peninsula, northern Victoria Land at 170°13'25" E, 72°19'11" S. Approximate area: 0.53 km^2. The primary reason for designation of the Area is that it provides an outstanding example of biological diversity, in particular a rich and diverse terrestrial ecosystem. It includes a small area of particularly rich vegetation that represents a valuable scientific resource for monitoring of vegetation change in Antarctica. The Area contains the most diverse arthropod community known in the Ross Sea region, which is of scientific interest. Furthermore, the Area contains a substantial Adélie penguin (*Pygoscelis adeliae*) breeding colony comprising around 64 000 pairs in 2009-10, which is recolonizing the site of the former Hallett Station (NZ / US) and is therefore of particular scientific interest. Cape Hallett is the only protected area in northern Victoria Land designated on the grounds of its terrestrial ecosystem or which includes a substantial bird colony, providing an important representation of the ecosystem in this region of Antarctica. The Area was proposed by the United States of America and adopted through Recommendation IV-7 [1966, Specially Protected Area (SPA) No. 7]; boundaries were extended by Recommendation XIII-13 (1985); the Area was renamed and renumbered through Decision 1 (2002), and the boundaries were further extended through Measure 1 (2002) to include the Adélie penguin colony, increasing the size of the Area to 75 ha. A further adjustment of the boundary was made through Measure 5 (2010) to delete the Managed Zone and replace this with two sites outside of the protected area, to be managed by Antarctic Treaty Site Guidelines for Visitors. One of the sites identified for visitor access is on the northern / NW coast of Seabee Hook and the second is on the SE coast. An additional revision was made to the eastern boundary, making the size of the Area 53 ha. The boundaries of the Area have not been changed in the current management plan.

ASPA No.106 was not classified under the Environmental Domains Analysis for Antarctica (EDA v.2.0) (Resolution 3 (2008)), although subsequent analysis has confirmed that the Area lies within 'Environment U – North Victoria Land Geologic'. Under the Antarctic Conservation Biogeographic Regions classification (Resolution 6 (2012)) the Area lies within ACBR8 – North Victoria Land.

1. Description of values to be protected

An area of approximately 12 ha at Cape Hallett was originally designated in Recommendation IV-7 (1966, SPA No. 7) after a proposal by the United States of America on the grounds that the Area provided an outstanding example of biological diversity, containing "a small patch of particularly rich and diverse vegetation which supports a variety of terrestrial fauna". The proposal gave special mention to the rich avifauna in the Area, which was noted as being of "outstanding scientific interest". The boundaries of the Area were enlarged in Recommendation XIII-13 (1985) to include extensive stands of vegetation to the south and north of the Area, increasing the Area to approximately 32 ha. The boundaries were further extended in Measure 1 (2002) to include scientific values related to the Adélie penguin (*Pygoscelis adeliae*) colony on Seabee Hook, increasing the size of the Area to 75 ha. Boundary and zoning revisions through Measure 5 (2010) reduced the size of the Area to 53 ha.

The eastern part of the Area contains a variety of habitats with plant communities that are considered important as they include most extensive, representative, and outstanding examples known near the northern extremity of the latitudinal gradient of Victoria Land and the Ross Sea. Vegetation surveys have recorded five species of moss in the Area, dominated by *Bryum subrotundifolium*, and 27 species of lichen. Although few algal species have been identified numerous species are expected to be present. The terrestrial habitats have been extensively studied, most recently as part of the international Latitudinal Gradient Project (LGP) (Italy, New Zealand, and United States). A vegetation plot in the eastern part of the Area is particularly valuable as a scientific resource for monitoring vegetation change in Antarctica, and this is designated a Restricted Zone. This site was first surveyed in detail in 1961-62 and provides a valuable baseline against which vegetation changes can be measured at a fine scale.

Detailed information on the distribution and abundance of arthropod species in the Area is available, which also represents a valuable scientific resource. In terms of species richness, Cape Hallett represents the most diverse arthropod community known in the Ross Sea region, with eight species of mites (Acari) and three of springtails (Collembola) identified within the Area. Of these, two (*Coccorhagidia gressitti* and *Eupodes wisei*) have their type localities at Cape Hallett.

A large number of markers were placed during early scientific studies conducted within the Area to mark sites of plant and bird studies. Many of these markers remain *in situ* and now represent a highly valuable resource for scientific studies that may wish to make repeat measurements.

Hallett Station was established by New Zealand and the United States on Seabee Hook in 1956 as part of the International Geophysical Year (IGY), and operated continuously until it closed in 1973. Although all structures have been removed, the site continues to possess enduring historic and heritage values relating to its former human use. In recognition of these values, many of the structures and artefacts from the former station are now held at the Canterbury Museum, Christchurch. In 2015, the only known remaining item of potential historical value and /or scientific value is the well-preserved body of a husky that died in 1964, which is contained in an enclosed wooden box located in the eastern part of the Area.

Adélie penguins have started to recolonize the site where the station was previously located. The history of human impact on the Adélie penguin colony and the subsequent station closure, together with the availability of reliable and repetitive historical data on Adélie population changes, make this site unique and ideal for scientific study of impacts on, and recovery of, the colony following substantial ecosystem disturbance. As such, the site has high scientific value, and in order to maintain this value it is desirable that any further human presence be carefully controlled and monitored.

In addition to the ecological and scientific values described, the Area possesses outstanding aesthetic values, with its combination of prolific biological resources and the impressive surrounding scenery of Edisto Inlet and Mt. Herschel (3335 m). Seabee Hook is one of only a few such sites that are relatively accessible in the northern Ross Sea. The site also has high educational value as an example of a station that was decommissioned and removed, with the site now showing evidence of recovery.

2. Aims and objectives

Management at Cape Hallett aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research, in particular on terrestrial and seabird ecology and on environmental recovery, while preventing unnecessary sampling and human disturbance in the Area;
- allow other scientific research provided it will not jeopardize the values of the Area;
- prevent the removal of, or disturbance to, markers used in previous scientific research that could be valuable for future comparative studies;
- allow environmental clean-up and remediation activities associated with the decommissioning and removal of the former Hallett Station as required and appropriate, provided the impacts of these activities are not greater than those arising from leaving material *in situ*;
- take into account the potential historic and heritage values of any artifacts before their removal and/or disposal, while allowing for appropriate clean-up and remediation;
- minimize the possibility of introduction of alien plants, animals and microbes into the Area; and
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management activities

- Markers should be installed to identify areas requiring specific management activities, such as scientific monitoring sites;
- Markers, signs or structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition, and removed when no longer necessary;
- National Antarctic programs operating in the Area should maintain a record of all new markers, signs and structures erected within the Area;
- National programs shall ensure the boundaries of the Area and the restrictions that apply within are marked on relevant maps and charts for which they are responsible;
- To the extent practicable, efforts shall be made to remove any small waste debris still present within the Area following the removal of Hallett Station, although this shall be undertaken in consultation with an appropriate authority to ensure that potentially important historic or heritage values of any artifacts are not lost;
- Visits shall be made as necessary (preferably at least once every five years) to assess whether the Area continues to serve the purposes for which it was designated and to ensure that management and maintenance measures are adequate;
- National Antarctic programs operating in the region shall consult together for the purpose of ensuring that the above provisions are implemented.

4. Period of designation

Designated for an indefinite period.

5. Maps

Map 1: Cape Hallett Antarctic Specially Protected Area No. 106: Regional map.
Map specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 72° 20' S; 2nd 72° 30' S; Central Meridian: 170° 00'E; Latitude of Origin: 72° 00'S; Spheroid and horizontal datum: WGS84; Contour interval 200 m.

Map 2: Cape Hallett Antarctic Specially Protected Area No. 106: Air access guidance. Map specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 72° 19' S; 2nd 72° 19' 30" S; Central Meridian: 170° 13' 30" E; Latitude of Origin: 72° 00' S; Spheroid: WGS84; Datum: USGS 'Fisher' geodetic station 1989-90: ITRF93 Coordinates 170° 12' 39.916" E, 72° 19' 06.7521" S;

Map 3: Cape Hallett Antarctic Specially Protected Area No. 106: Topographic map. Specifications for Map 3 are the same as for Map 2. Contour interval 5 m: contours derived from a digital elevation model used to generate an orthophotograph at 1:2500 with a positional accuracy of ±1 m (horizontal) and ±2 m (vertical) with an on-ground pixel resolution of 0.25 m.

Map 4: Cape Hallett Antarctic Specially Protected Area No. 106: Former Hallett Station area.

Specifications for Map 4 are the same as for Map 2.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Boundaries and coordinates

Cape Hallett is located at the southern end of Moubray Bay, Northern Victoria Land, in the western Ross Sea (Map 1). The protected area occupies most of the ice-free ground of a cuspate spit of low elevation known as Seabee Hook and includes the adjacent western slopes of the northern extremity of Hallett Peninsula, extending east of Willett Cove to the margin of the permanent glaciers (Maps 1 – 3).

The northern boundary of the Area extends along the northern coast of Seabee Hook from 170° 14' 25.5"E, 72° 19' 05.0"S to the eastern limit of the Adélie colony at 170° 14' 19.3" E, 72° 19' 04.9" S (Map 3). The boundary then follows the edge of the nesting area of the Adélie colony (as defined in 2009), maintaining a distance of at least 5 m from the colony, extending to the coordinate 170° 12' 25.3" E, 72° 19' 07.9" S (Map 4).

From 170° 12' 25.3" E, 72° 19' 07.9" S the boundary extends 33 m due west to the coast at 170° 12' 21.8" E, 72° 19' 07.9" S (Map 4). From this coastal position, the boundary of the Area continues southward to follow the western and southern coastline of Seabee Hook to the position 170° 12' 54.3" E, 72° 19' 19.1" S, which is near the southeastern extremity of the spit (Map 3). From this location the boundary extends northward, following around the edge of the nesting area, maintaining a distance of at least 5 m from the colony, in the southeastern part of Seabee Hook to the position 170° 12' 58.7" E, 72° 19' 15.3" S (Map 3). From this coastal position, the boundary of the Area continues northward to follow the low water shoreline along the eastern coast of Seabee Hook, and then follows the low water coastline around Willett Cove to the southern boundary at 170° 13' 24.9" E, 72° 19' 28.0" S (Map 3).

From 170° 13' 24.9" E, 72° 19' 28.0" S the boundary extends eastward to the Bornmann Glacier, following a seasonal stream which descends from the glacier. The eastern boundary of the Area then follows the glacier and permanent ice margin northward at elevations approximately between 120 – 150 m, crossing the steep western slopes of Hallett Peninsula and following the upper outcrops of a series of rocky ridges dissecting the slope. The boundary then descends to join the northern coastline of Seabee Hook at the base of a rock buttress at 170° 14' 25.5" E, 72° 19' 05.0" S (Map 3).

Climate

Seabee Hook is surrounded by sea ice for approximately eight months of the year. Sea ice usually breaks out annually, beginning in late December to early January, and re-forms in early March. Summer temperatures range from 4°C to -8°C, with a mean annual temperature of -15.3°C, and winds are predominantly from the south. Precipitation in the form of snow is common during the summer, with annual precipitation approximately 18.3 cm of water equivalent.

Geology, geomorphology, soils and freshwater environment

The topography of the Area comprises the large flat area of the spit and adjoining steep scree forming part of the western slopes of northern Hallett Peninsula. Seabee Hook is composed of coarse volcanic material deposited in a series of beach ridges, with gently undulating terrain of hummocks and depressions and a number of level areas. Many of the depressions contain melt water in the summer, and are colonized by dense mats of algae. In the northeastern part of the Area a small meltwater stream flows from the western slopes of the Hallett Peninsula down to Willett Cove. There is higher moisture availability in soils at Cape Hallett compared to sites in Southern Victoria Land. Sub-surface soils are typically saturated after snowfall, with groundwater at between 8 and 80 cm below the soil surface during summer. Permafrost underlies soils on Seabee Hook at a depth of ~1 m (Hofstee *et al*. 2006). Soils in areas occupied by, or affected by water runoff from, penguin colonies are ornithogenic in character and were classified as Typic Haplorthels over mounds and Typic Aquorthels between mounds by Hofstee *et al*. (2006). Beyond areas influenced by the presence of penguins, these authors classified soils as Typic Haplothels, with one example of Typic Haploturbels in an area of patterned ground.

Vegetation

In wetter parts of the Area, the algal component is comprised mainly of the sheet-like green alga *Prasiola crispa* and *Protococcus* sp., with associated filamentous and blue-green forms (*Ulothrix* sp.) and cyanobacteria (e.g. *Nostoc*). It is expected that a number of other algal species may be present, but few have been identified.
The vegetation within the Area, with the exception of algae such as *Prasiola*, is largely confined to the ice-free ground not occupied by breeding Adélie penguins, which is to the east of Willett Cove and south of 72° 19' 10" S. This area includes a 100-200 m strip of relatively level ground adjacent to Willett Cove and steeper slopes up to the crest of the Hallett Peninsula ridge. The strip of flat ground comprises a number of dry, gravel hummocks up to 1.5 m high, many of which are occupied by nesting skuas, and in the northern part old guano deposits indicate former occupation by Adélie penguins. Small patches of moss and algae may be found at the base of these hummocks but the upper parts are devoid of vegetation. Substantial beds of moss colonize stable gravel flats in the north part of the flat ground where there is a high water table, while scattered patches of moss, algae and lichen occur on coarser, more angular, loose rocks in the south. The moss becomes more sparse as the ground slopes upwards, with the notable exception of a particularly dense and extensive patch covering approximately 3900 m^2 with almost complete coverage of the substratum occupying a shallow valley on a scree slope in the south of the Area (Map 3). Only the most prolific areas are illustrated on Map 3.

Five moss species have been identified within the Area (Table 1). *Bryum subrotundifolium* is the dominant moss within the Area. The presence of *Bryum subrotundifolium* in such a bird enriched area makes the Area an excellent example of a bird affected vegetation site. Also, the presence of almost mono-specific stands of *Bryum pseudotriquetrum* at the site is unusual for the region.

The steep scree slope adjoining the largely flat area is dissected by shallow gullies and small ridges, with a number of prominent rock outcrops. These rock outcrops, particularly in the north of the Area, support large stands of lichens and scattered moss, with cover of 70 – 100% in many places. Twenty-seven lichen species have been recorded in the Area (Table 1). Nitrogen-tolerant lichen species such as *Xanthomendoza borealis* and species of *Caloplaca, Candelariella, Physcia* and *Xanthoria* may be observed in the immediate vicinity of the penguin breeding area (Crittenden *et al*. 2015).

Eight species of mites and three species of springtails have been recorded from within the Area (Table 1) (Sinclair *et al*. 2006). *F. grisea* occurs mainly on the scree slopes and adjacent level areas, *C. cisantarcticus* was reported to be associated with moss, occurring plentifully on level ground, while *D. klovstadi* was abundant under stones on the slopes. Four species of nematodes have been found in the Cape Hallett area (Table 1), the most abundant, and in general the most dominant, species of which is *Panagrolaimus davidi* Timm (Raymond *et al*. 2013).

Table 1: Moss, lichen and invertebrate species recorded within ASPA No. 106, Cape Hallett

Mosses a	**Lichens** a, b, c, d	**Invertebrates**
		Mites e
Bryum subrotundifolium	*Acarospora gwynnii*	*Coccorhagidia gressittii*
Bryum pseudotriquetrum	*Amandinea petermannii*	*Eupodes wisei*
Ceratodon purpureus	*Amandinea coniops*	*Maudheimia petronia*
Grimmia sp	*Buellia frigida*	*Nanorchestes* sp.,
Sarconeurum glaciale	*Caloplaca athallina*	*Stereotydeus belli*
	Caloplaca citrina	*S. puncatus*
	Caloplaca saxixola	*Tydeus setsukoae*
	Candelaria murrayi	*T. wadei*
	Candelariella flava	
	Lecanora chrysoleuca	**Springtails** e
	Lecanora expectans	*Cryptopygus cisantarcticus*
	Lecanora mons-nivis	*Friesea grisea*
	Lecanora physciella	*Desoria klovstadi*
	Lecidea cancriformis	
	Lecidella greenii	**Nematodes** f
	L. siplei	*Eudorylaimus antarcticus* (Steiner) Yeates
	Physcia caesia	*Panagrolaimus davidi* Timm
	Pleopsidium chlorophanum	*Plectus* sp.
	Rhizocarpon geographicum	*Scottnema lindsayae* Timm
	Rhizoplaca chrysoleuca	
	Rhizoplaca macleanii	
	Rhizoplaca melanophthalma	
	Umbilicaria decussata	
	Usnea sphacelata	
	Xanthomendoza borealis	
	Xanthoria elegans	
	Xanthoria mawsonii	

Sources:

a T.G.A. Green, University of Waikato, New Zealand and R. Seppelt, Australian Antarctic Division, 2002;b Smykla *et al*. 2011; c Ruprecht *et al*. 2012; d Crittenden *et al*. 2015; e Sinclair *et al*. 2006; f Raymond *et al*. 2013.

Birds

Seabee Hook is the site of one of the largest Adélie penguin colonies in the Ross Sea region, with a mean of 42 628 breeding pairs of Adélie penguins (*Pygoscelis adeliae*) reported over 14 seasons sampled between 1981 and 2012 (Lyver *et al*. 2014). Approximately 63 971 breeding pairs were present in 2009-10 (combined total of direct nest, oblique aerial and ground photo counts made 26 November – 3 December 2009; unpublished data ERA 2010). Seabee Hook is also the site of the former Hallett Station, a joint United States and New Zealand station that was open from 1956-73. During operation the station and associated infrastructure occupied an area of 4.6 ha on land that had formerly been occupied by breeding Adélie penguins. Establishment of Hallett Station in 1956 required eviction of 7580 penguins, including 3318 chicks, in order to clear the 0.83 ha required for bulldozing and erection of buildings. The colony was subjected to substantial impacts from the establishment and operation of Hallett Station, and declined from 62 900 pairs in 1959 to a low of 37 000 pairs in 1968, although increased again to 50 156 by 1972. Fluctuations in populations may have been exacerbated by changes in sea ice cover documented for the entire region. By 1987, after the closure of the station in 1973, the colony had increased to near its 1959 population; however, few areas modified by humans had by that time been fully recolonized. The area formerly occupied by the station has now been partly recolonized, although numbers were estimated at 39 014 breeding pairs in 1998-99, and an aerial census in 2006-07 (conducted as part of a long-term program) recorded only 19 744 breeding pairs (Lyver and Barton 2008, unpublished data). The count of 63 971 breeding pairs of Adélie penguins made in late 2009 (unpublished data ERA 2010) is comparable to numbers recorded on Seabee Hook around the time Hallett Station was built.

South Polar skuas (*Catharacta maccormicki*) breed within the Area. The population declined from 181 breeding pairs in 1960-61 to 98 breeding birds recorded in both 1968-69 and 1971-72. In January 1983 there was a population of 247 birds (84 breeding pairs and 79 non-breeding birds). A survey conducted between 27 November – 02 December 2009 recorded 14 breeding pairs and 66 individuals on Seabee Hook. An additional 23 breeding pairs and 92 individuals were counted in the area east of Willett Cove, giving a total of 37 breeding pairs and 158 individuals, and a grand total of 232 birds in 2009-10. Approximately 250 skua nest sites are marked and numbered within the Area; markers should not be disturbed or removed.

Emperor penguins (*Aptenodytes forsteri*) have been recorded in the vicinity in late December, and solitary Chinstrap penguins (*Pygoscelis antarctica*) have been recorded in late January and February. Wilson's Storm petrels (*Oceanites oceanicus*) and Snow petrels (*Pagodroma nivea*) breed close to Cape Hallett across Edisto Inlet; numerous Snow petrels were observed around the cliffs of Cape Hallett in December 2009, suggesting they may breed in this area. Southern Giant petrels (*Macronectes giganteus*) have been sighted frequently in the vicinity of the Area, although numbers have dropped in recent years, possibly due to declining populations further to the north. Weddell seals (*Leptonychotes weddellii*) are commonly seen; these seals breed in Edisto Inlet, and have been recorded ashore on Seabee Hook. Other mammals commonly seen offshore include Leopard seals (*Leptonyx hydrurga*) and Minke whales (*Balaenoptera acutorostrata*).

Human activities and impact

Hallett Station was established by New Zealand and the United States on Seabee Hook in December 1956 as part of the IGY. The base operated continuously until its closure in February 1973 and supported a range of activities including the 1967-68 Mt. Herschel expedition led by Sir Edmund Hilary. Station construction had significant impacts on the environment, with almost 8000 Adélie penguins removed from the site. Beginning in 1984, the station was progressively cleaned up, and a joint NZ / US multi-year remediation plan for the station and surrounding area was formulated in 2001. Remediation continued in 2003-04 and 2004-05, when most remaining structures were demolished and removed, and the last remaining substantial items were removed at the end of January 2010. Many of the buildings and artefacts from the former Hallett Station are now held at the Canterbury Museum, Christchurch.

Some material associated with the former station still remains dispersed throughout the Area, including small pieces of wood and metal, wire, and metal drums, much of which is firmly embedded in the ground. In addition, the well-preserved body of a husky that died in 1964 remains contained within an enclosed wooden box covered by rocks in the east of the Area (Map 3).

As part of the clean up operation, mounds were constructed within the old station footprint to encourage Adélie penguin recolonization, and substantial parts of these areas have now been occupied (Map 4). The history of human impact on the Adélie colony and its subsequent recovery make the site of high scientific value for research into the impacts on and recovery of the colony following significant ecosystem disturbance.

6(ii) Access to the Area

Access to the Area may be made by air, from the sea or by pedestrians over sea ice. Break out of sea ice at Cape Hallett usually begins between late December and early January and sea ice generally reforms in early March. Areas of sea ice that are potentially more stable and better suited to aircraft landing may be found at sites southwest of Seabee Hook in the enclosure of Edisto Inlet. However, sea ice within Edisto Inlet can break out rapidly, even early in the season, so care is needed.

The breeding season for Adélie penguins and skuas within the Area is between October and March. During this period and when suitable sea ice is present, fixed wing aircraft may land at any site outside of the 1/2 nautical mile (~930 m) guideline distance described in Section 7(i) and shown on Map 2. When landings beyond 1/2 nautical mile are unsafe or impractical, fixed wing landings may be made at any site beyond 1/4 nautical mile (~460m) of the Adélie colony on Seabee Hook. Access to the Area from fixed wing landing locations may be by helicopter or on foot over sea ice.

Helicopters may land at any site outside of the 1/2 nautical mile (~930m) guideline distance, except when such landings are unsafe or impractical, in which case the designated helicopter landing site within the Area in Willett Cove at 170° 13.579' E, 72° 19.228' S may be used. Helicopter access to the designated landing site should be from the south and follow the eastern coastline of Willett Cove (Map 2). Occasionally the designated helicopter landing site at Willett Cove may be susceptible to inundation by high tides.

When access to the Area is made from the sea, small boats may land anywhere within the Area, although small boat landings with the purpose of camping should be made to Willett Cove. Strong currents and eddies have been reported on the seaward margins of Seabee Hook, which may prove difficult for small boat landings. Ocean conditions are generally calmer in Willett Cove and in the lee of Seabee Hook.

Access to the Area on foot may be made over sea ice.

6(iii) Location of structures within and adjacent to the Area

Hallett Station was established on Seabee Hook in December 1956 and closed in February 1973. By 1960 the buildings of Hallett Station occupied 1.8 ha and the associated roads, refuse dumps, fuel caches and radio aerials a further 2.8 ha. The station was occupied year-round until 1964, from when summer-only operation continued until closure. The station was progressively dismantled after 1984 and in 1996 only six structures, including a large

378,500 liter (100,000 gallon) fuel tank remained. Liquid fuel remaining in the large fuel tank was removed in February 1996. Further clean-up work was undertaken in 2003-04 and 2004-05, to remove all remaining structures including the fuel tank, and to remove contaminated soil from the area. All remaining substantial items were removed from the Area on 30-31 January 2010.

Two Automatic Weather Stations (AWS) operated by the United States (McMurdo Dry Valleys Long Term Ecological Research) and New Zealand (National Institute of Water and Atmospheric Research) are located 10 m apart approximately 50 m north of the designated campsite (Map 3). New Zealand maintains a bunded fuel cache of several drums approximately 50 m south of the designated campsite. An enclosed box containing the remains of a husky dog that died in 1964 is located near a large rock in the eastern part of the Area, covered by loose rocks (Map 3).

The USGS geodetic station 'FISHER' (Maps 3 & 4) consists of a standard USGS Antarctic brass tablet stamped with "FISHER 1989-90" and is set flush on the top of a large concrete block (2x1x1 m) at an elevation of 2.15 m. The benchmark is located approximately 80 m south of the emergency cache and 140 m inland from the NW coast of Seabee Hook. Following recolonization of the old station area, the benchmark now lies within a small Adélie subcolony, and is therefore likely to be surrounded by breeding birds during the summer. An emergency cache, comprising a large box (~1.5 m square and 1 m in height) painted bright red on top with smaller box alongside, is located on the site of the former station (Map 4).
Markers from a number of scientific studies are present within the Area, including those delineating the vegetation monitoring plot within the Restricted Zone. It should be noted that not all historical markers have been documented.

6(iv) Location of other protected areas within close proximity of the Area

The nearest protected areas to Cape Hallett are Cape Adare (ASPA No.159) 115 km to the north, Mount Rittman (ASPA No.175) ~200 km to the south, and Mount Melbourne (ASPA No.175) and Edmonson Point (ASPA No.165) which are both approximately 290 km to the south.

6(v) Special zones within the Area

Restricted Zone

A small zone directly below the scree slopes in the northeast of the Area is designated a Restricted Zone in order to preserve part of the Area as a reference site for future comparative vegetation studies. Access to the Restricted Zone is allowed only for compelling reasons that cannot be served elsewhere in the Area. The remainder of the Area is more generally available for research programs and sample collection.

A vegetation study plot of approximately 28 m by 120 m was mapped in detail by Rudolph (1963), which was relocated and re-mapped by Brabyn *et al*. (2006) to provide a quantification of vegetation change at the site over a 42-year period. This site established by Rudolph represents an extremely valuable resource for monitoring vegetation change. Markers used in both studies remain *in situ* and define the extent of the vegetation monitoring plot. The NE corner of the monitoring plot is indicated by a large boulder with a cairn built on top, located at 170°14'2.55" E 72°19'11.37" S. Detailed descriptions of the plot are given in Rudolph (1963) and Brabyn *et al*. (2006). Rudolph also photographed stones colonized by lichens, which Brabyn *et al.* (2006) re-photographed to measure lichen growth rates. One of these sites (shown on Map 3) is within the Restricted Zone and should not be disturbed.

The Restricted Zone provides a buffer around the monitoring plot of 20 m on the NW side and 10 m on the other three sides, making a rectangle of 58 m in width and 140 m in length. The corner coordinates of the Restricted Zone are defined in Table 2. A series of cairns has been constructed (on existing rocks where possible) to indicate the extent of the Restricted Zone (Map 3).

Table 2. Restricted Zone corner coordinates

Corner	**Longitude (E)**	**Latitude (S)**
Northeast	170°14'4.012"	72°19'11.219"
Northwest	170°13'58.341"	72°19'10.43"
Southwest	170°13'51.901"	72°19'14.479"
Southeast	170°13'57.338"	72°19'15.299"

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a permit issued by an appropriate national authority. Conditions for issuing a permit to enter the Area are that:

- it is issued only for scientific purposes, or for educational purposes that cannot be served elsewhere, or for reasons essential to the management of the Area;
- the actions permitted are in accordance with the Management Plan;
- The activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the environmental, scientific, educational, historic, and aesthetic values of the Area;
- The Permit shall be issued for a finite period;
- the Permit, or a copy, shall be carried when in the Area.

7(ii) Access to and movement within the Area

- Access into the Area shall be by small boat, helicopter, or on foot.
- Vehicles are prohibited within the Area.
- Restrictions on aircraft operations apply during the period between 01 October and 31 March, when aircraft shall operate and land within the Area according to strict observance of the following conditions:
  - Overflight of the Area below 2000 feet (~610 m) is prohibited, unless authorized by permit for purposes allowed for by the Management Plan;
  - Overflight and landings within ½ nautical mile (~930 m) of the Adélie colony on Seabee Hook for tourism is strongly discouraged;
  - Landings within ½ nautical mile (~930 m) of the Adélie colony on Seabee Hook should be avoided wherever possible;

- Landings beyond ½ nautical mile (~930 m) of the Adélie colony may select landing sites according to visit needs and local conditions;
- The Primary Landing Site (170° 11.460' E, 72° 19.686' S) shown on Map 2 represents the location where access to the designated camping site is shortest by traverse over sea ice. Landings at this site may be made as local conditions allow; and
- When landings beyond ½ nautical mile (~930 m) of the Adélie colony are considered unsafe or impractical (e.g. because sea ice is absent or poor, if weather conditions are unfavorable, or because there is an important logistic need such as to move heavy equipment), the following conditions apply:

FIXED WING
- Fixed wing aircraft may land beyond ¼ nautical mile (~460 m) of the Adélie colony;
- Fixed wing aircraft landings should not be made in Willett Cove.

HELICOPTERS
- Helicopters shall land at the designated site at Willett Cove (170° 13.579' E, 72° 19.228' S) (Map 2), either on land or on sea ice adjacent to the campsite;
- On occasions the landing site is susceptible to inundation by high tides: if this occurs landings may made on nearby dry ground, avoiding vegetated sites and preferably remaining on beach gravels south of the designated landing site, keeping as close to the shore as possible. Landings closer to the Adélie penguin colony shall be avoided;
- Helicopters should follow the designated approach route to the maximum extent practicable. The preferred helicopter approach route is from the south and extends from the primary landing site to the designated landing site following a route along the southern and eastern coastline of Willett Cove (Map 2).

- There are no special restrictions on where access can be gained to the Area by small boat, although small boat landings with the purpose of camping should be made to Willett Cove in order to avoid the need to haul camp equipment through the Adélie colony.
- Access to the Restricted Zone is allowed only for compelling reasons that cannot be served elsewhere in the Area.
- It is important that all visitors are careful to restrict their movements around the campsite, keeping to the area along the shoreline to avoid trampling inland areas that are seasonally moist and richly colonized by a variety of plants and invertebrates, which are the subject of on-going research.
- Within the Adélie colony, visitors should not enter sub-groups of nesting penguins unless required for research or management purposes: visitors should walk around the coastal strip of Seabee Hook when possible, and/or around or between sub-groups. Traces of the old station road extend from the NW corner of Willett Cove through to the former station site, and remains a comparatively wide corridor where pedestrians can maintain a reasonable distance from nesting birds.
- Visitors should avoid walking on the scree slopes in the eastern part of the Area unless necessary for essential scientific or management purposes; screes are a sensitive and easily damaged habitat for a diverse community of flora and fauna.

- All pedestrian traffic should be kept to the minimum necessary consistent with the objectives of any permitted activities and every reasonable effort should be made to minimize effects. Visitors should avoid walking on visible vegetation. Care should be exercised when walking in areas of moist ground and on screes, where foot traffic can easily damage sensitive soils and plant communities.

7(iii) Activities that may be conducted within the Area

- Scientific research that will not jeopardize the values of the Area;
- Essential management activities, including assessment or remediation of impacts, and monitoring;
- Activities with educational aims (such as documentary reporting (photographic, audio or written), the production of educational resources or services, or educating program personnel about clean-up methods) that cannot be served elsewhere. Educational aims do not include tourism; and
- Activities with the aim of preserving or protecting historic resources within the Area.

7(iv) Installation, modification or removal of structures

- No structures are to be erected within the Area except as specified in a permit;
- All structures and scientific equipment installed in the Area must be authorized by permit and clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area;
- Installation (including site selection), maintenance, modification or removal of structures shall be undertaken in a manner that minimizes disturbance to flora and fauna;
- The emergency cache should only be used in genuine emergency, and any such use should be reported to an appropriate authority so the cache can be restocked; and
- Removal of specific equipment for which the permit has expired shall be the responsibility of the authority which granted the original Permit, and shall be a condition of the permit.

7(v) Location of field camps

Permanent field camps are prohibited within the Area. When conditions allow, temporary camping should preferably be located on sea ice in Willett Cove, which is outside of the Area. When this is not practical, temporary camping is permitted at a designated site on the eastern shore and 100 m south of the head of Willett Cove (72º 19' 13" S, 170º 13' 34" E). This site comprises unconsolidated beach gravels, is not colonized by birds or significant plant communities (although these are present nearby) and lies on the site of a former station road (Map 3). Stakes have been driven into the hard, stony ground at the campsite for tent guys; these should be used wherever possible.

The campsite is located immediately adjacent to areas rich in terrestrial fauna and flora and visitors should restrict their movements around the campsite to the area along the shoreline unless required for research purposes. On occasions the site is susceptible to inundation by high tides: if this occurs the camp may be moved to dry ground, avoiding vegetated sites to the maximum extent practicable and preferably remaining on beach gravels south of the designated campsite, keeping as close to the shore as possible.

7(vi) Restrictions on materials and organisms which may be brought into the Area

In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the Area are:

- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. Precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area);
- Visitors shall ensure that sampling equipment and markers brought into the Area are clean. To the maximum extent practicable, footwear and other equipment used or brought into the area (including backpacks, carry-bags and tents) shall be thoroughly cleaned before entering the Area. Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica (SCAR 2009);
- In view of the presence of breeding bird colonies at Cape Hallett, no poultry products, including products containing uncooked dried eggs, and wastes from such products, shall be released into the Area;
- No pesticides shall be brought into the Area;
- Fuel, food, chemicals and other materials shall not be stored in the Area, unless specifically authorized by permit, or are contained within an emergency cache authorized by an appropriate authority, and shall be stored and handled in a way that minimizes the risk of their accidental introduction into the environment;
- All materials introduced shall be for a stated period only, and shall be removed at or before the conclusion of that stated period; and
- If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*.

7(vii) Taking of, or harmful interference with, native flora or fauna

Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit issued under Article 3 of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) Collection or removal of materials not brought into the Area by the Permit holder

- Material may be collected or removed from the Area only in accordance with a permit and should be limited to the minimum necessary to meet scientific or management needs. Permits shall not be granted if there is a reasonable concern that the sampling proposed would take, remove or damage such quantities of soil, native flora or fauna that their distribution or abundance within the Area would be significantly affected.
- Removal of, or disturbance to, markers left by previous scientific work within the Area is prohibited unless specifically authorized by permit.
- Other than scientific markers as noted above, material of human origin likely to compromise the values of the Area, which was not brought into the Area by the Permit holder, and is clearly of no historic value or otherwise authorized, may be removed

from the Area unless the environmental impact of the removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority must be notified and approval obtained.
- Material found that is likely to possess important historic or heritage values should not be disturbed, damaged, removed or destroyed. Any such artifacts should be recorded and referred to the appropriate authority for a decision on conservation or removal. Relocation or removal of artifacts for the purposes of preservation, protection, or to re-establish historical accuracy is allowable by permit.
- The well-preserved body of a husky is contained in an enclosed wooden box located in the eastern part of the Area and should not be disturbed while options for its future management remain under consideration.

7(ix) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area.

7(x) Measures that may be necessary to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

- carry out monitoring and Area inspection activities, which may involve the collection of a small number of samples or data for analysis or review;
- erect or maintain signposts, structures or scientific equipment (specific sites of long-term monitoring should be appropriately marked);
- carry out protective measures.

7(xi) Requirements for reports

- The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and where possible should do so within six months after the visit has been completed.
- Such reports should include, as appropriate, the information identified in the Visit Report form contained in Appendix 2 of the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas (Resolution 2 (2011)). If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.
- Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organizing the scientific use of the Area.
- The appropriate authority should be notified of any activities / measures undertaken, anything removed, and / or of any materials released and not removed, that were not included in the authorized permit.

8. Supporting documentation

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(An extensive bibliography is available through the Latitudinal Gradient Project at http://www.lgp.aq)

Map 1: ASPA No. 106 - Cape Hallett - Regional Map

02 Mar 2015 (Map ID: 10068.0007.01)
United States Antarctic Program
Environmental Research & Assessment

Permanent ice
Ice shelf
Ice free ground
Coastline
Index contour (1000m)
Contour (200m)
Glacier flow line
Spot height (m)
Fuel cache & geology camp (IT)

0 5 10
Kilometers

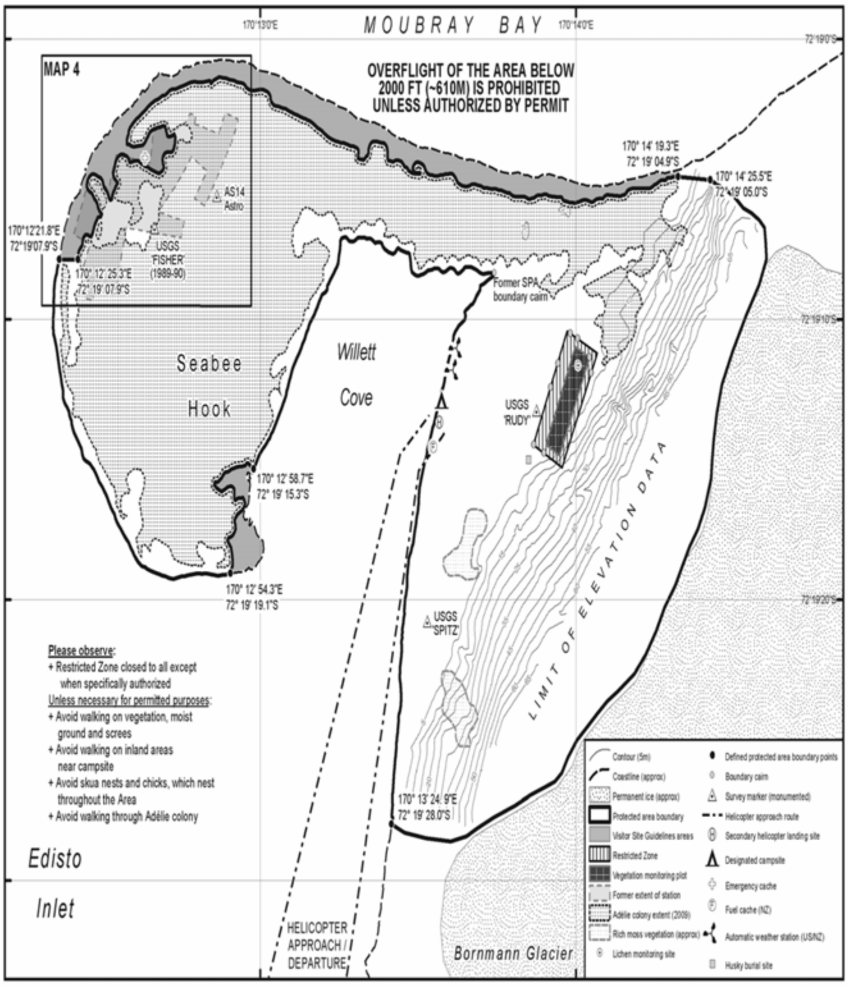
Projection: Lambert Conformal Conic
Spheroid and horizontal datum: WGS84;
Data: SCAR Antarctic Digital Database v5 (2007)
Contour interval: 200 m; Heights in meters.

Map 2: ASPA No.106 - Cape Hallett - Air access guidance

18 Mar 2015 (Map ID: 10068.0008.01)
United States Antarctic Program
Environmental Research & Assessment

Nautical Miles 0 0.5 1
0 0.5 1 Kilometers

Projection: Lambert Conformal Conic;
Spheroid: WGS84; Horizontal datum: USGS 'Fisher';
Data sources: ERA field survey (27 Nov - 03 Dec 09);
Base imagery: Quickbird 12 Oct 2009;
(Imagery © 2009 Digital Globe; NGA Commercial Imagery Program).

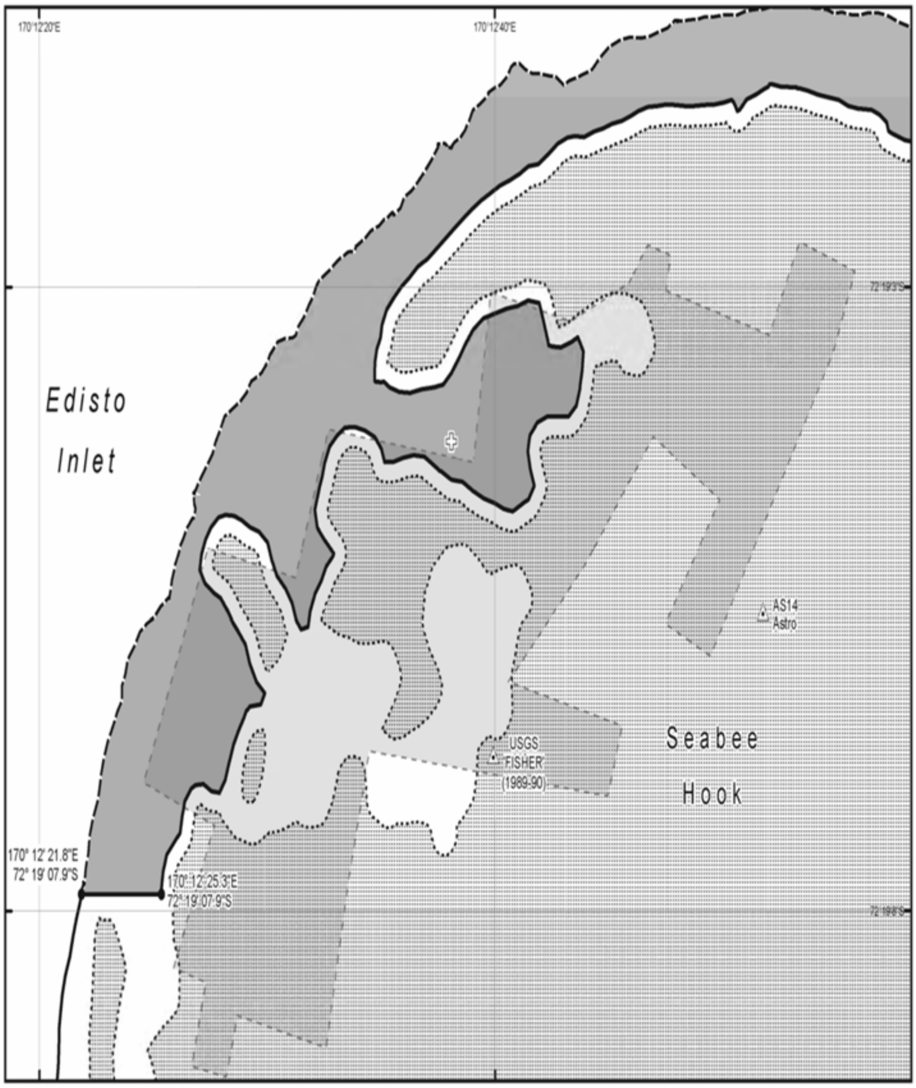


Map 3: ASPA No.106 - Cape Hallett - Topography, boundaries & features

0 100 200
Meters
N

18 Mar 2015 (Map ID: 10068.0009.01)
United States Antarctic Program
Environmental Research & Assessment

Projection: Lambert Conformal Conic;
Spheroid: WGS84; Horizontal datum: USGS 'Fisher'; Contour interval: 5 m;
Data sources: Coastline, Adélie colony, vegetation plot, husky burial site, survey markers,
AWS, fuel cache & emergency cache: ERA field survey (27 Nov - 03 Dec 09);
Contours: derived from aerial orthophotos; contour interval 5m.



Map 4: ASPA No.106 - Cape Hallett - Former Hallett Station area

Measure 7 (2015)

Antarctic Specially Protected Area No 119 (Davis Valley and Forlidas Pond, Dufek Massif, Pensacola Mountains): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation XVI-9 (1991), which designated Forlidas Pond and Davis Valley Ponds as Specially Protected Area ("SPA") No 23 and annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 23 as ASPA 119;
- Measures 2 (2005) and 6 (2010), which adopted revised Management Plans for ASPA 119;

Recalling that Recommendation XVI-9 (1991) has not become effective and was withdrawn by Measure 6 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 119;

Desiring to replace the existing Management Plan for ASPA 119 with the revised Management Plan;

Recommend to Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:

1. the revised Management Plan for Antarctic Specially Protected Area No 119 (Davis Valley and Forlidas Pond, Dufek Massif, Pensacola Mountains),which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 119 annexed to Measure 6 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area (ASPA) No. 119

DAVIS VALLEY AND FORLIDAS POND, DUFEK MASSIF, PENSACOLA MOUNTAINS (51° 05' W, 82° 29' S)

Introduction

Davis Valley and Forlidas Pond Antarctic Specially Protected Area (ASPA) is situated within the Dufek Massif, Pensacola Mountains at 51°4'53"W, 82°29'21"S. Approximate area: 55.8 km^2. The primary reason for the designation of the Area is that it contains some of the most southerly freshwater ponds with autotrophic microbial life known to exist in Antarctica, which represent unique examples of near-pristine freshwater ecosystems and their catchments. The geomorphology of the Area represents a unique scientific resource for the reconstruction of previous glacial and climatic events. As a consequence of its extreme remoteness and inaccessibility, the Area has experienced very little human activity and with the total number of visitors estimated to be less than 50 people. As a result, the Area has outstanding potential as a scientific reference site. Furthermore, the Area possesses outstanding wilderness and aesthetic values. The Area is one of the most southerly 'dry valley' systems in Antarctica and, as of April 2015, is the most southerly Antarctic Specially Protected Area (ASPA) in Antarctica. The Area was originally proposed by the United States of America and adopted through Recommendation XVI-9 (1991, SPA No. 23). It included Forlidas Pond (51°16'48"W, 82°27'28"S) and several ponds along the northern ice margin of the Davis Valley. The boundaries of the Area were extended to include the entire ice-free region centered on the Davis Valley through Measure 2 (2005). Newly available imagery in 2013 allowed the boundaries of the Area to be adjusted in the current management plan to follow the margins of ice-free ground.
The Area lies within 'Environment O – West Antarctic Ice Sheet' and 'Environment R – Transantarctic Mountains', as defined in the Environmental Domains Analysis for Antarctica (Resolution 3(2008)), and is the only protected area designated within Environment R. Under the Antarctic Conservation Biogeographic Regions classification (Resolution 6(2012)) the Area lies within ACBR10 – Transantarctic Mountains, and is also the only protected area designated within this bioregion.

1. Description of values to be protected

Forlidas Pond (51°16'48" W, 82°27'28" S) and several ponds along the northern ice margin of the Davis Valley (51°05' W, 82°27'30" S), in the Dufek Massif, Pensacola Mountains, were originally designated as a Specially Protected Area through Recommendation XVI-9 (1991, SPA No. 23) after a proposal by the United States of America. The Area was designated on the grounds that it "contains some of the most southerly freshwater ponds known in Antarctica containing plant life" which "should be protected as examples of unique near-pristine freshwater ecosystems and their catchments". The original Area comprised two sections approximately 500 metres apart with a combined total area of around 6 km^2. It included Forlidas Pond and the meltwater ponds along the ice margin at the northern limit of the Davis Valley. The site has been rarely visited and until recently there has been little information available on the ecosystems within the Area.

This Management Plan reaffirms the original reason for designation of the Area, recognizing the ponds and their associated plant life as pristine examples of a southerly freshwater habitat. The values identified for special protection and the boundaries of the Area were expanded as described below following a field visit made in December 2003 (Hodgson and Convey 2004).

The Davis Valley and the adjacent ice-free valleys is one of the most southerly 'dry valley' systems in Antarctica and, as of March 2015, is the most southerly Antarctic Specially Protected Area in Antarctica. While occupying an area of only 53 km^2, which is less than 1% of the area of the McMurdo Dry Valleys, the Area nevertheless contains the largest ice-free valley system found south of 80°S in the 90ºW-0º-90ºE half of Antarctica. Moreover, it is the only area known in this part of Antarctica where the geomorphology preserves such a detailed record of past glacial history. Some ice-free areas around the Weddell Sea region have scattered erratics and sometimes moraines, but the assemblage of drift limits, moraines, and abundant quartz-bearing erratics in the Davis Valley and associated valleys is very unusual. The location of the Dufek Massif close to the junction between the western and the eastern Antarctic ice sheets also makes this site particularly valuable for the collection of data that can be used to constrain parameters such as the past thickness and dynamics of this sector of the Antarctic ice sheet. Such data are potentially extremely valuable for understanding the response of the Antarctic ice sheet to climate change. The Area therefore has exceptional and unique scientific value for the interpretation of past glacial events and climate in this part of Antarctica and it is important that this value is maintained.

The terrestrial ecology of the Area is impoverished but is also highly unusual, with lake and meltwater stream environments and their associated biota being rare this far south in Antarctica. As such, they provide unique opportunities for the scientific study of biological communities near the extreme limit of the occurrence of these environments. Vegetation appears to be limited to cyanobacterial mats and a very sparse occurrence of small crustose lichens. The cyanobacterial mat growth in the terrestrial locations is surprisingly extensive, and represents the best examples of this community type known this far south. The cyanobacterial community appears to survive in at least three distinct environments:

- in the permanent water bodies;
- in exposed terrestrial locations, particularly at the boundaries of sorted polygons; and
- in a series of former or seasonally dry pond beds on ice-free ground in the Davis Valley.

No arthropods or nematodes have thus far been detected in samples taken from within the Area, and the invertebrate fauna in the Area is unusually sparse. This characteristic distinguishes the Area from more northerly ice-free valley systems such as those at the Ablation Valley – Ganymede Heights (ASPA No. 147), Alexander Island, or at the McMurdo Dry Valleys (ASMA No. 2), where such communities are present. Rotifers and tardigrades have been extracted from samples taken within the Area, with the greatest numbers occurring within the former pond beds in the Davis Valley, although their diversity and abundance is also extremely limited compared with more northerly Antarctic sites (Hodgson and Convey 2004). Further analyses of the samples obtained and identification of all taxa present are published (Hodgson *et al*. 2010; Fernandez-Carazo *et al*. 2011; Peeters *et al*. 2011, 2012)) and are an important contribution to the understanding of biogeographical relationships between the different regions of Antarctica.

The Area is extremely isolated and difficult to access, and as a result has been visited by only a small number of people. Reports indicate that small field parties visited the Area in December 1957, in the 1965-66 and 1973-74 austral summer seasons, in December 1978 and in December 2003. The total number of people having visited probably numbers less than 50, with visits generally limited to a period of a few weeks or days. No structures or installations have been built within the Area, and as far as is known all equipment brought into the Area has subsequently been removed. While Hodgson and Convey (2004) reported evidence of a very limited number of human footprints and several old soil pit excavations, the Area has been exposed to few opportunities for direct human impact. The Area is believed to be one of the most pristine ice-free valley systems in Antarctica, and is therefore considered to possess outstanding potential as a reference area for microbiological studies, and it is important that these values receive long-term protection.

The site possesses outstanding wilderness and aesthetic values. The dry and weathered brown valleys of the Area are surrounded by extensive ice-fields, the margins of which fringe the valleys with dry based glacial ice of a deep blue hue. This abrupt and dramatic blue-ice margin stands in stark contrast to the stony and barren ice-free landscape of the valleys, and aesthetically is extremely striking in appearance. One of the original explorers of this area in 1957 recalled "the excitement we felt at being the first people to view and enter this magnificently scenic, pristine area." (Behrendt 1998: 354). Further examples of descriptions of the Area by visitors are: "[the blue ice] was towering over us ~ 150 feet – a large wave of blue. It was like being in a tidal wave that was held in suspension as we walked under it…" (Reynolds, field notes, 1978), and "I still cannot find adequate superlatives to describe the features, whether large or small, biologic or physical… [Of the] many settings that stretch the imagination…in my experience none match the northern side of the Dufek Massif, with Davis Valley as its crown jewel." (Reynolds, pers. comm. 2000); "the most unusual [landscape] I have ever seen on any of the seven continents." (Boyer, pers. comm. 2000); "Probably the single most remarkable environment I've been, either in Antarctica or elsewhere" (Convey, pers. comm. 2004). Burt (2004) described the region simply as "inspiringly awesome".

The boundaries of the Area include the entire ice-free region centered on the Davis Valley, including the adjacent valleys and Forlidas Pond. In general, the margins of the surrounding ice sheets form the new boundary of the Area, providing special protection of the region as an integrated ice-free unit that closely approximates the valley catchments. The full catchments of the surrounding glaciers that flow into these valleys extend considerable distances from the ice-free area and do not possess many of the values related to the purpose of special protection, and are therefore excluded from the Area.

2. Aims and Objectives

Management at Davis Valley and Forlidas Pond aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance and sampling in the Area;
- preserve the ecosystem as an area largely undisturbed by human activities;
- preserve the almost pristine ecosystem for its potential as a biological reference area;
- allow scientific research on the natural ecosystem and physical environment within the Area provided it is for compelling reasons which cannot be served elsewhere;
- minimize the possibility of introduction of alien plants, animals and microbes to the Area; and
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management Activities

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

- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer necessary.
- National programs shall ensure the boundaries of the Area and the restrictions that apply within are marked on relevant maps and aeronautical charts;
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map 1: Davis Valley and Forlidas Pond, ASPA No. 119, Dufek Massif, Pensacola Mountains: Location Map.
Map Specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 82°S; 2nd 83°S; Central Meridian: 51°W; Latitude of Origin: 81°S; Spheroid: WGS84.
Inset: the location of the Pensacola Mountains and Map 1 in Antarctica.
Map 2: Davis Valley and Forlidas Pond, ASPA No. 119: Topographic map and protected area boundary.

Map Specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 82°S; 2nd 83°S; Central Meridian: 51°W; Latitude of Origin: 81°S; Spheroid: WGS84; Vertical datum: WGS84. EGM96 MSL height differential –21 m. Contour interval 25 m. Topographic data generated by digital orthophoto and photogrammetric techniques from USGS aerial photography (TMA400, TMA908, TMA909 (1958) and TMA1498 (1964)) by the Mapping and Geographic Information Centre, British Antarctic Survey (Cziferszky *et al*. 2004). Accuracy estimates: horizontal: ±1 m; vertical: ±2 m, declining towards the south away from available ground control points. The surrounding ice fields and ice-free area beyond orthophoto coverage are mapped from WorldView 1 satellite imagery (05 Nov 2013) (© Digital Globe, courtesy NGA Commercial Imagery Program) with elevation data generated from a DEM produced by the Polar Geospatial Center (PGC) in 2014..

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

General description

Davis Valley (51°05'W, 82°28'30"S) and Forlidas Pond (51°16'48"W, 82°27'28"S) are situated in the north-eastern Dufek Massif, Pensacola Mountains, part of the Transantarctic Mountain range (Map 1). The Dufek Massif is situated approximately mid-way between the Support Force Glacier and the Foundation Ice Stream, two of the major glaciers draining northwards from the Polar Plateau into the Ronne and Filchner Ice Shelves. Approximately 60 km to the southeast is the Forrestal Range (also part of the Pensacola Mountains), which is separated from the Dufek Massif by the Sallee Snowfield. The Ford

Ice Piedmont separates the Dufek Massif from the Ronne and Filchner Ice Shelves, about 50 km to the northwest and 70 km to the northeast respectively.

The Davis Valley is approximately five kilometers wide and seven kilometers long, with its northern extent defined by the blue ice lobes that form part of the southern margin of the Ford Ice Piedmont (Map 2). It is bounded in the northeast by Wujek Ridge and Mount Pavlovskogo (1074 m) and southeast by Mount Beljakova (1240 m), flanked on the outer side by a glacier draining north from the Sallee Snowfield to the Ford Ice Piedmont. The western extent of the Davis Valley is defined by Clemons Spur, Angels Peak (964 m) and Forlidas Ridge. The Edge Glacier extends approximately 4 km into the Davis Valley from the Sallee Snowfield. The southern Davis Valley is dominated by Mount Beljakova (1240 m), on the northwestern margin of the Sallee Snowfield. Several smaller valleys exist in the west of the Area, adjacent to the prominent Preslik Spur and Forlidas Ridge. Almost 75% of the region enclosed by the large surrounding ice fields is ice-free, comprising 39 km^2 of ice-free ground in total, with the remainder of the area covered by the Edge Glacier, other permanent bodies of snow / ice and several small ponds.

Forlidas Pond is landlocked and occupies a small unnamed dry valley separated from the Davis Valley by a tributary ridge extending north from Forlidas Ridge. Other pro-glacial lakes and ponds occur within the Area at various locations along the blue ice margin of the Ford Ice Piedmont, at the terminus of the Edge Glacier, and along the ice margin west of Forlidas Ridge and Clemons Spur.

Boundary

The Area comprises all of the Davis Valley and the immediately adjacent ice-free valleys, including several of the valley glaciers within these catchments (Map 2). The boundary predominantly follows the margins of the surrounding ice fields of the Ford Ice Piedmont and Sallee Snowfield, which enclose the ice-free area that is considered to be of outstanding value. The northern boundary extends parallel to and 500 metres north from the southern margin of the Ford Ice Piedmont in the Davis Valley and in the adjacent valley containing Forlidas Pond, extending from 51°24'02"W, 82°26'23.4"S in the northwest to 50°52'10"W, 82°26'45.5"S in the northeast. This provides a buffer of protection around the freshwater bodies of value along the northern glacier margin. The eastern boundary follows the ice margin along Wujek Ridge from the Ford Ice Piedmont to Mount Pavlovskogo. The southeastern boundary extends from Mount Pavlovskogo across the Sallee Snowfield and the upper slopes of the Edge Glacier, following areas of outcrop where they exist to Mount Beljakova. The southern and western boundaries of the Area follow the margins of the permanent ice, with the southernmost extent being at 51°17'00"W, 82°33'20"S. The boundary encompasses a total area of 55.8 km^2.

Boundary markers have not been installed in the Area because of its remoteness, the limited opportunities for visits and the practical difficulties of maintenance. Moreover, the margins of the permanent ice fields are generally sharply defined and form a visually obvious boundary around most of the Area.

Meteorology

Several estimates of mean annual surface air temperature have been made in the Dufek Massif region from measurements taken in ice bores or crevasses at around 10 metres depth. A measurement of –24.96°C was obtained 32 km due north of Forlidas Pond on the

Ford Ice Piedmont in December 1957 (Pit 12, Map 1) (Aughenbaugh *et al*. 1958). Another estimate of -9°C was made in December 1978 in the Enchanted Valley 26 km to the south (Map 1), measured in a crevasse at 8 metres depth (Boyer pers. comm. 2000).

Detailed meteorological data for the Area itself are limited to records collected over two weeks in 2003. Hodgson and Convey (2004) measured temperature and relative humidity over snow and rock surfaces at their sampling sites within the Area from 3-15 December 2003, with data recorded at 30-minute intervals, though sensors were not shielded with a Stevenson screen. Temperatures over snow ranged from a maximum of +12.8ºC to a minimum of –14.5ºC, with an average over the period of –0.56ºC. Temperatures over rock ranged from a maximum of +16.0ºC to a minimum of –8.6ºC, with an average over the period of +0.93ºC (data over rock were only recorded from 3-11 December 2003). Relative humidity recorded over snow ranged from a maximum of 80.4% to a minimum of 10.8%, with an average over the period of 42.6%. Over rock surfaces (from 3-11 December 2003), relative humidity ranged from a maximum of 80.9% to a minimum of 5.6%, with an average over the period of 38.7%.

Directly measured data on windspeeds and directions within the Area are not available, but models suggest near surface winds are predominantly from the west-north-west with mean winter velocities of c. 10 ms^{-1} (van Lipzig *et al.* 2004). While the older exposed ice-free areas above the glacial drift limit possess many features related to long-term wind erosion, there is some evidence to suggest that windspeeds within the locality are currently not especially high. For example, ice and snow surfaces were observed as largely free of wind-blown debris, and terrestrial cyanobacterial mats exist in-tact in exposed locations in the bottom of dry valleys (Hodgson and Convey 2004). No precipitation data are available, although the bare ice and rock surfaces and low average relative humidity recorded by Hodgson and Convey (2004) attest to a dry environment of low precipitation. This is consistent with a Type 2 dominated ablation area where sublimation-driven ablation occurs at the foot of the steep topographic barriers, with individual glacier valleys serving as gates for air drainage from the plateau to the Ronne-Filchner Ice Shelf. Strongest sublimation rates occur on these localized glaciers in the Transantarctic Mountains, where widespread blue ice areas are present (van den Broeke *et al.* 2006).

Geology, geomorphology and soils

The Dufek Massif is characterized by layered bands of cumulate rock belonging to the Dufek intrusion, thought to be one of the largest layered gabbro intrusions in the world (Behrendt *et al*. 1974; 1980; Ferris *et al.* 1998). This is exposed in the Davis Valley as the light- to medium-gray, medium-grained Aughenbaugh gabbro, which is the lowest exposed part of the Middle Jurassic Dufek intrusion (Ford *et al.* 1978).

The Davis Valley primarily consists of minimally weathered talus and glacial till of both local and exotic origin. In particular there appears to be an abundance of erratics of Dover Sandstone, one of several metasedimentary layers disrupted by the Dufek intrusion. An extensive glacial geomorphological record is evident. Features include overlapping valley-glacier moraines, ice sheet moraines, lake shoreline, lateral glacial channels, ice eroded surfaces, well-developed patterned ground and erratics. Boyer (1979) identified at least three major glacial and two major interglacial events, while Hodgson *et al.* (2012) maps geomorphological features derived from up to seven glacial stages. From oldest to youngest, these stages were: alpine glaciation of the escarpment edge; over-riding warm-based glaciation; glacier advance to an upper limit (760 m); two ice-sheet advances to closely parallel limits in the valleys; advance of the plateau outlet glacier (Edge Glacier) to merge with the ice sheet; and finally an advance and retreat of the main ice sheet margin.

Attempts to provide age constraints for some of these glacial events have been carried out using paired cosmogenic ^{10}Be-^{26}Al exposure ages on erratic boulders, composed of Dover Sandstone. These suggest that some parts of the valley have been exposed for >1.0-1.8 Ma and experienced only a minor ice sheet advance at the Last Glacial Maximum, consistent with an emerging dataset from around the Weddell Sea rim that implies only rather modest ice thickening at this time.

Soils are not well-developed in the Area and generally lack a significant organic component. Parker *et al*. (1982) collected a soil that was light brown in color, resulting from gravel weathering predominantly to muscovite. The soil comprised sand (81%) with silt (14%) and clay (5%), a composition different from other sites in the Pensacola Mountains where the clay proportions of six samples ranges from 0.4% to 1.6%. The soil sample from the Davis Valley had a pH of 6.4 (Parker *et al*. 1982).

Lakes, ponds and streams

Forlidas Pond is a perennially frozen, shallow, round landlocked pond that was ~100 metres in diameter in 1957 (Behrendt 1998). In December 2003 the lake was measured by Hodgson and Convey (2004) as 90.3 metres in diameter from shoreline to shoreline on a transect azimuth of 306º (magnetic). At this time it was frozen almost completely to its base, with a thin layer of hypersaline slush at the lake bottom, and a freshwater meltwater moat that was partly ice free and partly covered by 10-15 cm of ice (Hodgson and Convey 2004). Depth was measured at 1.83 m and the thickness of the ice between 1.63 and 1.83 metres. The conductivity and temperature in the brine layer was 142.02 mS cm^{-1} and -7.67ºC respectively, compared with 2.22 mS cm^{-1} and 0.7ºC in the freshwater moat (Hodgson *et al.* 2010). The salinity of the bottom-water in Forlidas Pond is thus around four times greater than seawater. This concentration of salts is the result of the pond being the remnant of a much larger lake, which evaporated from about 2200 years ago and can be identified by a series of lake terraces and a high shoreline 17.7 m above the present water level (Hodgson *et al*. 2012).

Hodgson and Convey (2004) also report a small remnant pro-glacial pond near the margin of the Ford Ice Piedmont, 900 metres north of Forlidas Pond. Two pro-glacial meltwater ponds also occur to the west of Forlidas Ridge and a series of similar pro-glacial meltwater ponds also occur along the blue-ice margin of the northern Davis Valley, located at 51º 05.5' W, 82º 27.5' S and 51º 07' W, 82º 27.55' S. The pro-glacial lake at the terminus of the Edge Glacier is the largest within the Area. This is permanently frozen to the bottom apart from at the eastern margins where seasonal meltwater has been observed.

Dry stream channels and water erosion features are evident within the ice-free area, although only the small glacial melt streams on the eastern margin of the Edge Glacier have thus far been reported as flowing in December (Hodgson and Convey 2004). The apparent lack of melt streams may be because all visits to date have been made in the month of December, possibly before streams become more active. The presence of lake moats, the positive temperatures recorded by Hodgson and Convey (2004), as well as the biological and the geomorphological evidence, as well observations of footprints into formerly moist ground (Convey pers. comm. 2015) suggest that it is probable that at least some streams become active later in the season from melting snow, although perhaps not on an annual basis.

Biology

Visible biota is dominated by cyanobacterial mats, found both in lakes and in patches on the surface of ice-free ground, and a very sparse occurrence of small crustose lichens. Neuburg *et al.* (1959) observed yellow and black lichens growing sparsely in sheltered places in the Davis Valley, while Hodgson and Convey (2004) observed several lichen forms growing deep within the crevices of boulders. These have been identified as *Lecidea cancrioformis* Dodge & Baker (Hodgson *et al.* 2010, and see Appendix 1: Table A1 for a list of taxa identified in the Area). The British Antarctic Survey Plant Database also reports *Blastenia succinea* Dodge & Baker and *Xanthoria elegans* (Link.) Th. Fr. in samples from elsewhere in the Dufek Massif, although these have not been independently verified. Previous anecdotal reports of the possible occurrence of mosses within the Area could not be substantiated by Hodgson and Convey (2004), and it is probable that the rich cyanobacterial mat growth was earlier mistaken for bryophytes by non-specialists. The cyanobacterial community is the most abundant biota and is present in at least three distinct environments:

(1) In the permanent water bodies; particularly in the moat of Forlidas Pond, at the bottom and littoral zones of the Davis Valley Ponds, and in the seasonally wetted perimeter of Edge Lake. These habitats are extensively covered by red-brown cyanobacterial mats. These are actively photosynthesizing, as evidenced by gas bubbles trapped against the lower ice surfaces, and bubbles incorporated into the ice. Because perennially ice covered lakes have elevated concentrations of dissolved O_2 gas, the microbial mats growing on the bottom can become buoyant and start to float off the bottom as 'lift-off' mats, or become incorporated into the base of the lake ice when it makes contact with the bed. In Forlidas Pond and the Davis Valley Ponds lift off mats frozen into the base of the lake ice eventually migrate up through the ice profile. In the Davis Valley, this appears to take place over several years with each summer marked by the development of a 2-3 cm melt-cavity formed by the upward progression of the clump thorough the lake ice due to preferential heating of its upper surface. These clumps eventually break out at the surface and are dispersed by wind onto the shoreline, or further afield. Cyanobacteria were also present in the hypersaline brine of Forlidas Pond as single cells and as small flakes. A strain corresponding to the morphology of *Leptolyngbya antarctica* was isolated from the saline slush of TM1 (Fernandez-Carazo *et al*. 2011).

(2) In exposed terrestrial locations, particularly at the edge of larger rocks and within the boundary crevices of frost sorted polygons. These are generally very foliose in form, mid brown in colour, and best developed at the edge of larger rocks with depths of at least 10-15 cm. Nearly all clumps were completely dry on discovery, although those near to melting snow were damp and some had lower thalli that were often deep green in colour. Particularly good examples of this growth form were found in the mid valley floor of Forlidas Valley and in Davis Valley (near a large snow gully where it meets the second major terrace above Edge Lake).

(3) In a series of dry pond beds in the Davis Valley, two of up to 50 m diameter, which have extensive areas of almost continuous cyanobacterial mat on the former pond floors. These pond beds and gullies occupy depressions and therefore may accumulate snow in winter, permitting the cyanobacteria to take advantage of the wet and protected environment within the snow patches.

The growth form also occurs in many of the adjacent small gullies between polygons or other cryoturbation features, which often have the appearance of temporary drainage features.

Analyses of the cyanobacterial molecular diversity from four samples collected in and around Forlidas Pond show a depleted diversity, with only 2 - 5 Operational Taxonomic Units (OTUs) per sample (Hodgson *et al*. 2010). This is likely a product of geographical isolation combined with multiple environmental stressors such as salinity and seasonal desiccation, and UV radiation. Some of the cyanobacteria, for example from the brine of Forlidas Pond, are related to sequences from other hypersaline Antarctic lakes, whilst others are found almost exclusively in glacial regions. The six cyanobacterial OTUs described from the Dufek Massif are all distributed in more than one location within the continent and are found outside Antarctica.

The invertebrate fauna within the area is equally impoverished, with both the diversity and abundance of organisms being extremely limited compared with lower latitude and coastal Antarctic sites. No nematodes or arthropods have been found, but there are three species of tardigrade present from two Classes: *Echiniscus* (cf) *pseudowendti* Dastych, 1984 (Heterotardigrada), *Acutuncus antarcticus* (Richters 1904) and *Diphascon sanae* Dastych, Ryan and Watkins, 1990 (Eutardigrada), and a few unidentified bdelloid rotifers (Hodgson *et al.* 2010). *Acutuncus antarcticus* is an Antarctic species that occurs in semi-permanent damp / wet habitats throughout the Antarctic continent and sub-Antarctic islands, but has not been reported from any of the close neighbour continents. *Echiniscus* (cf) *pseudowendti* and *Diphascon sanae* found in samples from Forlidas Pond are also endemic to the Antarctic, with restricted distributions.

The most productive sites for these organisms were not the aquatic environments of the permanent lakes, but the former pond beds in the Davis Valley, showing these areas to be biologically productive, which necessitates a source of liquid water. In December 2003 very little snow was evident on the valley floor, prompting Hodgson and Convey (2004) to reason that the source of moisture may be from a considerable increase in melt later in the season flowing off the local ice sheet in the upper valley, or from local ice-cored moraines. Although this process was not occurring during their visit, footprints and shallow soil survey pits remaining from one of the previous parties (i.e. 25-46 years old) indicated that some ground was moist or waterlogged at the time of the earlier visit. Seasonal inundation by liquid water would explain the extensiveness and integrity of this cyanobacterial community, and its apparent resilience to the potential ravages of polar winds, as well as the relative abundance of invertebrates extracted from samples taken from within these areas.

Viable yeast species have been recorded in the soil, along with the algae *Oscillatoria* sp., *Trebouxia* sp. and *Heterococcus* sp. (Parker *et al.* 1982). Chasmoendolithic microorganisms have been recorded in rocks in the Dufek Massif (Friedmann 1977), although Hodgson and Convey (2004) found no evidence of their presence within the Area and noted that rock types most favorable for the occurrence of endolithic organisms are not widespread.

Avifauna is sparse: in December 2003 a single snow petrel (*Pagadroma nivea*) was noted flying around one of the peaks above Davis Valley.

Human activities and impact

There have been few visits to the Area and human impacts are believed to be minimal (Table A2 Appendix 1). Because of its remoteness and the infrequency of visits, it is one

of the few ice-free areas of Antarctica where the compiled record of past human activity at the site is almost complete. The almost pristine condition of the environment contributes to the extremely high value of the Area and is an important reason for its special protection.
The key characteristics of visits recorded to the Area are summarized in Table A2 (Appendix 1), which should be updated as required (see Section 7(x)). Past camps have generally been on the ice sheet outside of the Area. Previous parties removed all wastes from the Area, with the possible exception of small quantities of human wastes. In 2003 all wastes including all human wastes were removed, both from within the Area and from the party's adjacent campsite on the Ford Ice Piedmont (Map 2). Hodgson and Convey (2004) noted that in December 2003 the evidence of previous visits was limited to a number of footprints and several shallow soil excavations in the Davis Valley.

6(ii) Access to the Area

Access to the Area may be made only on foot. Access to the icefields surrounding the Area may be made by aircraft or via overland routes. Access to the Area should be made as close as practicable to the intended study site, in order to minimize the amount of the Area that needs to be crossed. Due to the surrounding terrain and crevasse patterns, the most practical access routes into the Area are from the Ford Ice Piedmont to the north of the Area.

6(iii) Location of structures within and adjacent to the Area

No structures, installations or caches are known to exist within the Area.

6(iv) Location of other protected areas within close proximity of the Area

There are no other protected areas nearby, with the nearest being Ablation Valley – Ganymede Heights (ASPA No. 147), Alexander Island, which is approximately 1300 km to the north-west.

6(v) Special zones within the Area

None.

7. Permit conditions

7(i) General Permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

- it is issued only for compelling scientific or educational reasons that cannot be served elsewhere, or for reasons essential to the management of the Area ;
- the actions permitted are in accordance with this Management Plan;
- The activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the environmental, scientific and aesthetic and wilderness values of the Area, in particular its pristine value and its potential as a largely undisturbed biological reference site;
- The Permit shall be issued for a finite period.
- the Permit, or a copy, shall be carried when in the Area;

7(ii) Access to and movement within the Area

- Landing of aircraft is prohibited within the Area and overflight of the Area at less than 100 metres above ground level is prohibited.
- Vehicles are prohibited within the Area.
- Access into and movement within the Area shall be on foot.
- No special restrictions apply to the means of access, or air or land routes used, to move to and from the icefields surrounding the boundaries of the Area.
- Access into the Area should be at a practicable point close to sites of study in order to minimize the amount of the Area that needs to be traversed. The terrain and crevassing generally makes such access most practical from the Ford Ice Piedmont to the north of the Area.
- Pedestrian routes should avoid lakes, ponds, former pond beds, stream beds, areas of damp ground and areas of soft sediments or sedimentary features. Care should be exercised to avoid damage to any areas of cyanobacterial mat growth, in particular to the extensive areas found in relict pond beds in Davis Valley (see Map 2).
- Pedestrian traffic should be kept to the minimum necessary consistent with the objectives of any permitted activities and every reasonable effort should be made to minimize effects.

7(iii) Activities that may be conducted within the Area

- Scientific research that will not jeopardize the scientific, ecological or aesthetic and wilderness values of the Area, or its pristine value and potential as a reference site, and which cannot be served elsewhere;
- Essential management activities, including monitoring;
- Activities with educational aims that are undertaken for compelling reasons which cannot be served elsewhere. Activities may include documentary reporting (photographic, audio or written) or the production of educational resources or services. Educational activities shall not compromise the values for which the Area is protected, in particular its value as a near-pristine reference site. Educational aims do not include tourism.
- The appropriate authority should be notified of any activities / measures undertaken that were not included in the authorized Permit.

7(iv) Installation, modification or removal of structures

- No structures are to be erected within the Area except as specified in a Permit.
- Permanent structures are prohibited.
- All scientific equipment installed in the Area must be approved by Permit.
- Should equipment be intended to remain within the Area for a duration of more than one season it shall clearly be identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area.
- Installation (including site selection), maintenance, modification or removal of structures shall be undertaken in a manner that minimizes disturbance to the physical, ecological, scientific or aesthetic and wilderness values of the Area;
- Removal of structures, equipment or markers for which the Permit has expired shall be a condition of the Permit. It shall be the responsibility of the authority which granted the Permit to ensure that this condition is included in the Permit, and, in the event that

the Permit holder does not meet this obligation, it shall be that authority's responsibility to ensure removal.

7(v) Location of field camps

- Camping within the Area is prohibited.
- Suitable camp sites have been proven to the north and west of the Area on the Ford Ice Piedmont (Map 2), and also in the Enchanted Valley (Map 1).

7(vi) Restrictions on materials and organisms which may be brought into the A*rea*

In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the area are:

- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. Precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area)
- Visitors shall ensure that sampling equipment and markers brought into the Area are clean. To the maximum extent practicable, footwear and other equipment used or brought into the area (including backpacks, carry-bags and tents) shall be thoroughly cleaned before entering the Area. Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica (SCAR 2009);
- To reduce the risk of microbial contamination, the exposed surfaces of footwear, sampling equipment and markers should be sterilized before use within the Area. Sterilization should be by an acceptable method, such as by washing in 70% ethanol solution in water.
- No pesticides shall be brought into the Area;
- Fuel, food, chemicals, and other materials shall not be stored in the Area, unless specifically authorized by permit and shall be stored and handled in a way that minimizes the risk of their accidental introduction into the environment;
- All materials introduced shall be present only for a finite period stated in the Permit and shall be removed at or before the conclusion of that stated period; and
- If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*.

7(vii) Taking of, or harmful interference with, native flora or fa*una*

- Taking or harmful interference with native flora or fauna is prohibited, except in accordance with a permit issued under Article 3 of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) Collection or removal of materials not brought into the Area by the Permit holder

- Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Permits shall not be granted if there is a reasonable concern that the sampling proposed would take, remove or damage such quantities of soil, native flora or fauna that their distribution or abundance within the Area would be significantly affected.

- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the Permit Holder or otherwise authorized, may be removed from the Area unless the environmental impact of the removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority must be notified and approval obtained.

7(ix) Disposal of waste

All wastes, including water used for any human purpose and including all human wastes, shall be removed from the Area. Individuals or groups shall carry appropriate containers for human waste and gray water so that they may be safely transported and removed from the Area.

7(x) Measures that are necessary to ensure that the aims and objectives of the Management Plan can continue to be met

Permits may be granted to enter the Area to:

- carry out monitoring and Area inspection activities , which may involve the collection of a small number of samples or data for analysis or review;
- carry out protective measures;

7(xi) Requirements for reports

- The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed.
- Such reports should include, as appropriate, the information identified in the Visit Report form contained in Appendix 2 of the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas (Resolution 2 (2011)). If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.
- Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organizing the scientific use of the Area.
- The appropriate authority should be notified of any activities / measures undertaken, anything removed, and / or of any materials released and not removed, that were not included in the authorized permit.

8. Supporting documentation

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Appendix 1: Table A1. Biological sampling program in the Davis and Forlidas Valleys: groups of taxa identified and the methods used (Hodgson *et al.*, 2010).

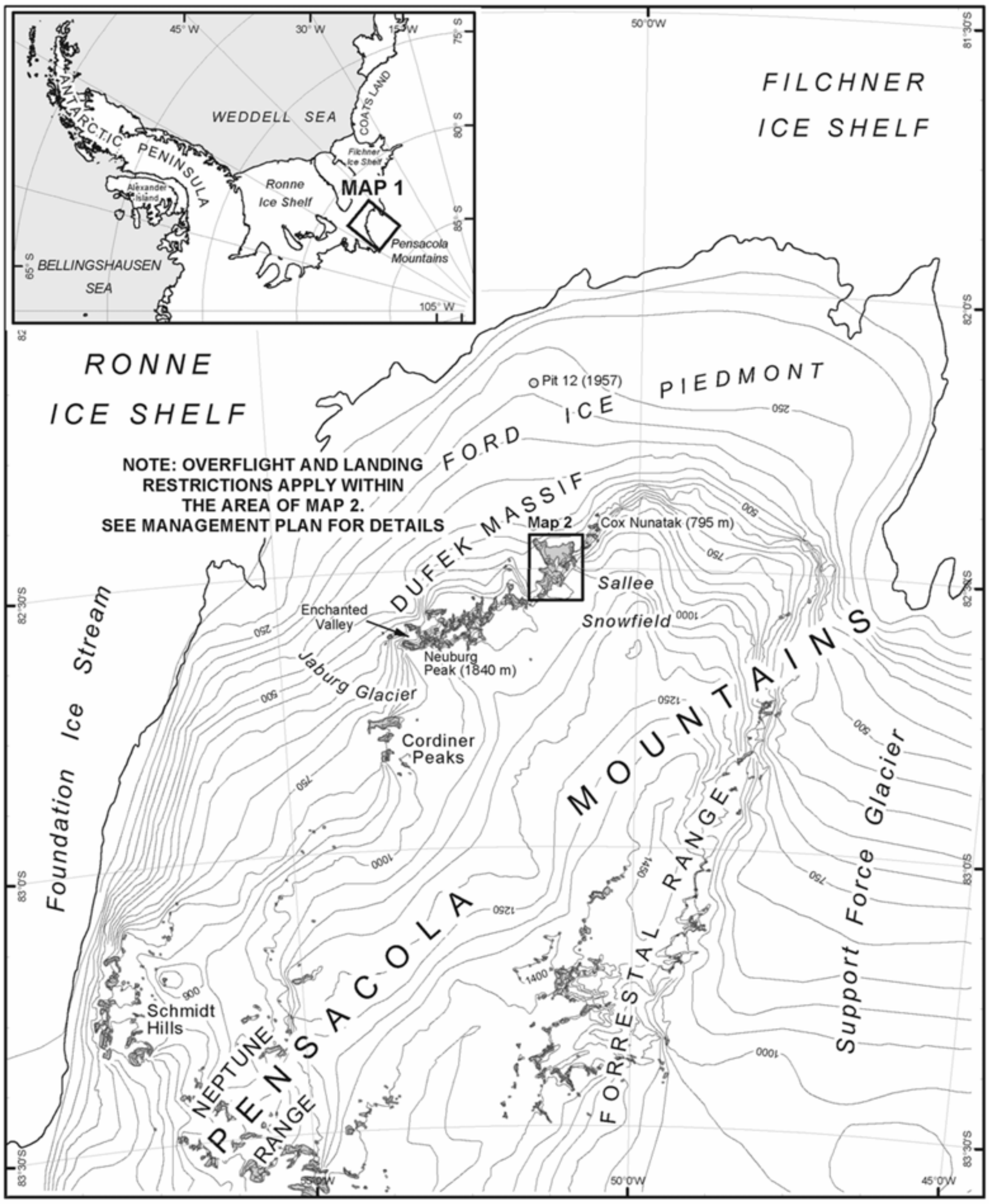
Description	**Method**	**No. samples**	**No. taxa**	**Taxa**
Bryophyta	Observational survey	0	0	n/a
Lichens	Observational survey	1	1	*Lecidea cancriformis* Dodge & Baker
Bacillariophyceae / Diatoms	Survey under light microscope	2	1	*Pinnularia microstauron* (Ehr.) Cl.††
Cyanobacteria	Clone library, DGGE + band sequencing, isolation of strains+ sequencing (microscopy)	3	6	Sample TM1: 16ST63, 16ST14 Sample TM2: 16ST63, 16ST14, 16ST44, 16ST49, 16ST80 Sample TM3: 16ST44, 16ST49, 16ST80, 16ST07
Chlorophyta /Green algae	DGGE + band sequencing	2	1	*Urospora* sp.
Rhizaria/ Cercozoa	DGGE + band sequencing	2	2	Heteromitidae, *Paulinella* sp.
Bacteria	DGGE + band sequencing	2	32	Cyanobacteria: Nostocales, Oscillatoriales, Chroococcales, Gloeobacteriales** Bacteroidetes: Sphingobacteriales, Flavobacteriales Firmicutes: Clostridiales Gammaproteobacteria: Pseudomonadales, Psychrobacter
Bacteria	Isolation of strains + sequencing	1	330 isolates	*Firmicutes* 33%, *Bacteroidetes* 23%, *Alphaproteobacteria* 25%, *Actinobacteria* 9%, *Betaproteobacteria*. 8%, *Gammaproteobacteria* 1.5%, Deinococci 0.3%
Arthropods	Tullenberg	50	0	n/a
Invertebrates	Baermann extractions	130	3	See Tardigrades (below)
Tardigrades	Light microscope (Molecular†)	14 20	3 1	*Echiniscus* (cf) *pseudowendti* Dastych, 1984 (Heterotardigrada), *Acutuncus antarcticus* (Richters, 1904) *Diphascon sanae* Dastych, Ryan and Watkins, 1990 (Eutardigrada)
Rotifers	Tullenberg and light microscope	130	present	Bdelloid rotifers
Soil bacteria and algae	Cultured (Parker *et al.*, 1982)*	1	3	Cyanobacteria: *Oscillatoria* sp. Algae: *Trebouxia* sp., *Heterocous* sp. (viable yeasts present)
Avifauna	Observation	n/a	1	Snow petrel (*Pagadroma nivea*)

*previously published, ** tentative identification based on about 100 bases, †analyses carried out on morphologically congruent samples from the Shackleton Range,††not considered as evidence of an extant community

Appendix 1: Table A2. Known visits to the Davis Valley and adjacent ice-free valleys within and near the Area.

Party	No. pers	Org	Purpose	Dates	Duration (days)	Locations visited	Camp	Transport
Aughenbaugh, Behrendt, Neuburg, Thiel, Walker	5	IGY (US)	Geology Geophysics	Dec 1957	?	FIP,DV,FP, FR	FIP west of FR	Sno-Cat traverse to FIP, then on foot
Ford, Schmidt, Nelson, Boyd, Rambo (?)	5	USGS	Geology	Dec 1965 – Jan 1966	?	?	Base camp in Neptune Range	Numerous helicopter landings in Dufek Massif
Ford & team	?	USGS	Geology	Summer 1973-74	?	?	?	?
Ford, Carlson, Czamanske, Nutt, England, Nelson	6	USGS	Geology	30 Nov – 30 Dec 1976 (expedition dates)	?	?	Base camp close to Walker Peak (southwest Dufek Massif)	Numerous helicopter landings in Dufek Massif. Motor toboggans and ski traverses used on ground.
Russian team led by Shuljatin, O. G. Accompanied by Ford (and Grue?) from the USA and Paech from Germany.	11	Soviet Antarctic Expedition (22)	Geology Geophysics	Summer 1976-77	49 (total expedition)	Dufek Massif and other locations in the Pensacola Mountains	Field camps on Provender Mountain, Read Mountain and Skidmor Mountain. Druznaja Station used as base camp.	Helicopter landings, snowmobile 'Buran', thence on foot
Russian team led by Kamenev, E. N.	6	Soviet Antarctic Expedition (23)	Geology Geophysics	06 Feb – 17 Feb 1978	11	Dufek Massif	Field camp in Schmidt Hills. Druznaja Station used as base camp.	Airplane, snowmobile 'Buran', thence on foot
Boyer, Reynolds	2	USGS	Geology	12 Dec 1978	2	FIP, DV	EV	Toboggan from EV to ice margin, thence on foot
Ford, Boyer, Reynolds Carl?	4	USGS	Geology	14 Dec 1978	4	FIP, DV, FR, AP	EV	Toboggan from EV to ice margin, thence on foot
Hodgson, Convey, Burt	3	BAS (UK)	Biology, Limnology, Glacial geo-morphology	3-15 Dec 2003	13	FIP, DV, FP, FR, AP	FIP 1.9km north of FP	Twin Otter to FIP, thence on foot.
TOTALS	~30				~40??	(numbers approximate owing to incomplete data)		

Key: FIP – Ford Ice Piedmont; DV – Davis Valley; FP – Forlidas Pond; FR– Forlidas Ridge; AP – Angels Peak; CS – Clemons Spur; PS – Preslik Spur; MB– Mt Beljakova; MP– Mt Pavlovskogo; EV–Enchanted Valley.



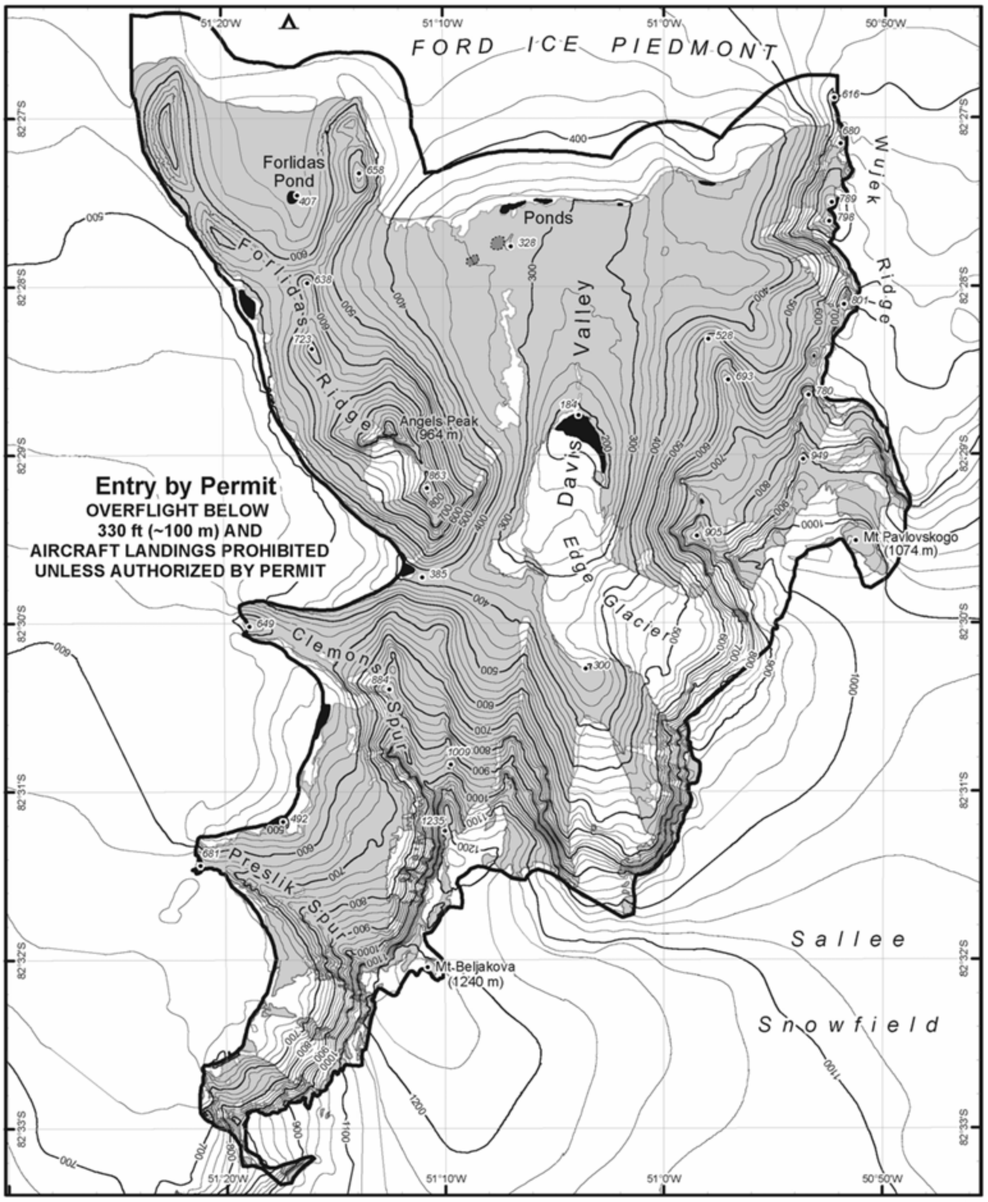
Map 1: ASPA No. 119 - Davis Valley and Forlidas Pond - Location Map

10 Feb 2015 (Map ID: 10068.0005.01)
United States Antarctic Program
Environmental Research & Assessment

0 10 20 Kilometers

Coastline
Contour (50 m)
Ice free ground
Permanent ice
Ice bore

Projection: Lambert Conformal Conic
Spheroid and horizontal datum: WGS84
Data sources: Coast & topography: SCAR ADD (v6, 2012).



Map 2: ASPA No. 119 - Davis Valley and Forlidas Pond - Topographic Map

13 Mar 2015 (Map ID: 10068.0006.01)
United States Antarctic Program
Environmental Research & Assessment

Spot elevation
Index contour (100 m)
Contour (25 m)
Ice free ground
Permanent ice
ASPA boundary
Lake
Relict pond bed
Proven campsite

0 1 2
Kilometers

Projection: Lambert Conformal Conic
Spheroid and horizontal datum: WGS84
Data sources: Topographic data supplied by the MAGIC, BAS. Derived from USGS aerial photography (1956, 1964), satellite imagery (2002) and field observations (Hodgson and Convey). Updated by ERA using WorldView imagery and DEM provided by PGC.

Measure 8 (2015)

Antarctic Specially Protected Area No 148 (Mount Flora, Hope Bay, Antarctic Peninsula): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Recommendation XV-6 (1989), which designated Mount Flora, Hope Bay, Antarctic Peninsula as Site of Special Scientific Interest ("SSSI") No 31 and annexed a Management Plan for the Site;
- Decision 1 (2002), which renamed and renumbered SSSI 31 as ASPA 148;
- Measure 1 (2002), which adopted a revised Management Plan for ASPA 148;

Recalling that Recommendation XV-6 (1989) was designated as no longer current by Decision 1 (2011);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 119;

Desiring to replace the existing Management Plan for ASPA 148 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:

1. the revised Management Plan for Antarctic Specially Protected Area No148 (Mount Flora, Hope Bay, Antarctic Peninsula), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 148 annexed to Measure 1 (2002) be revoked.

Management Plan for Antarctic Specially Protected Area No. 148

MOUNT FLORA, HOPE BAY, ANTARCTIC PENINSULA

Introduction

The primary reason for the designation of Mount Flora, Hope Bay, Antarctic Peninsula (Latitude 63°25’ S, Longitude 57°01’ W, 0.3 km^2) as an Antarctic Specially Protected Area (ASPA) is to protect scientific values associated with the rich fossil flora present within the Area.

Mount Flora was originally designated as a Site of Special Scientific Interest through Recommendation XV-6 (1989, SSSI No. 31) after a proposal by the United Kingdom. It was designated on the grounds that ‘the site is of exceptional scientific importance for its rich fossil flora’. It was one of the first fossil floras discovered in Antarctica and has played a significant role in deducing the geological history of the Antarctic Peninsula. Its long history as an easily accessible site and the large amount of fossiliferous debris occurring in scree has made it vulnerable to souvenir collectors, and the amount of material available for serious research has been considerably depleted.” The Management Plan underwent a major revision in 2002 (Measure 1) including changes to the boundary.

Geologist Johann Gunnar Andersson discovered Mount Flora during the Swedish South Polar Expedition (1901-04), whose original stone hut (Historic Site and Monument No. 39) remains nearby at Seal Point, Hope Bay. Otto Nordenskjöld, the leader of the expedition, named Mount Flora (as ‘Flora-Berg’) following the geological observations of Andersson, recognising it as the first significant fossil locality discovered in Antarctica. The Area subsequently became of great scientific importance for interpreting key geological relationships in the region.

The Area is approximately three kilometres southeast of Esperanza Station (Argentina) and Teniente de Navio Ruperto Elichiribehety Station (Uruguay).

The Area fits into the wider context of the Antarctic Protected Area system as one of the few ASPAs protecting primarily geological values. Resolution 3 (2008) recommended that the Environmental Domains Analysis for the Antarctic Continent, be used as a dynamic model for the identification of Antarctic Specially Protected Areas within the systematic environmental-geographical framework referred to in Article 3(2) of Annex V of the Protocol (see also Morgan et al., 2007). Using this model, ASPA 148 is contained within Environment Domain A: Antarctic Peninsula northern geologic (Morgan et al., 2007). ASPA 148 sits within Antarctic Conservation Biogeographic Region (ACBR) 1 Northeast Antarctic Peninsula.

1. Description of values to be protected

Following a visit to the ASPA by environmental managers from Argentina in January 2011 and January 2013 the values specified in the earlier designation were reviewed and re-confirmed. Values within the Area are set out as follows:

- Mount Flora has important scientific and historical values associated with this significant heritage of geological discovery in Antarctica.
- Mount Flora is characterised by three distinct geological formations: the Hope Bay Formation (Trinity Peninsula Group), which is separated by an unconformity from the overlying gently tilted plant beds of the Mount Flora Formation (Botany Bay Group), which in turn are overlaid by ignimbrites and welded tuffs of the Kenney Glacier Formation (Antarctic Peninsula Volcanic Group). The relationships between these formations have been fundamental for determining the age of the plant beds, which has been vital to the interpretation of the geology of the Antarctic Peninsula.
- Historically, the site has played an important role in comparisons with other Southern Hemisphere floras.
- The fossil flora has been important for providing Mesozoic palaeoclimate data from a region where such information is otherwise sparse.
- Mount Flora holds one of the few Jurassic floras known from Antarctica and it is the only site that has been relatively well studied and documented. The Mesozoic plant assemblages from Mount Flora include members of the sphenophytes, ferns, cycadophytes (cycads and bennetites), pteridosperms and conifers. Samples of the fossils have served as a major reference source for many studies of Jurassic and Cretaceous palaeobotany.

2. Aims and objectives

Management at Mount Flora aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance and sampling in the Area through uncontrolled access and inappropriate collections of geological material;
- allow scientific geological and palaeontological research, while ensuring protection from over-sampling;
- allow other scientific research within the Area provided it will not compromise the values for which the Area is protected;
- allow scientific research in the Area provided it is for compelling reasons which cannot be served elsewhere;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management activities

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

- A map showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently at Esperanza Station (Argentina) and Teniente de Navio Ruperto Elichiribehety Station (Uruguay), where copies of this Management Plan shall be made available.

- Persons wishing to make the ascent of Mount Flora shall be instructed not to enter the Area without a Permit issued by the appropriate authority.
- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition.
- Abandoned equipment or materials shall be removed to the maximum extent possible provided that doing so does not adversely impact on the values of the Area
- The area shall be visited by experts as necessary to assess whether it continues to serve the purposes for which it was designated and to ensure that management and maintenance activities are adequate. A desk assessment shall also be undertaken to consider the ASPA post-visits reports and available information on fossil collection within the Area.
- Increasing exposure of fossiliferous rocks on Mount Flora is expected if glacial ice in the vicinity continues to retreat, as has occurred in recent years. Periodic updating of the boundaries should be undertaken to ensure any newly-exposed fossiliferous rocks are included within the Area, which should be considered at the time of review of the Management Plan.
- A record of fossils collections from Mount Flora will be maintained based on post visit reports, in order to better assess the issuance of permits and to minimize over-sampling. (see sections *7(iii),(x)* and *(xi)*).

4. Period of designation

Designated for an indefinite period.

5. Maps

Map 1: Mount Flora ASPA No. 148 in relation to Hope Bay, Trinity Peninsula, and the South Shetland Islands, showing the location of the nearest protected areas. The location of Esperanza Station (Argentina) and Teniente de Navio Ruperto Elichiribehety Station (Uruguay) are also shown. Inset: the location of Mount Flora on the Antarctic Peninsula.

Map 2: Mount Flora ASPA No. 148, Hope Bay, topographic map. Map specifications: Projection: Lambert Conformal Conic: Standard parallels: 1st 76° 40’ S; 2nd 63° 20’ S Central Meridian: 57° 02’ W; Latitude of Origin: 70° 00’ S; Spheroid: WGS84. Vertical datum: mean sea level. Vertical contour interval 25 m. Horizontal and vertical accuracy unknown. Note: topography and positions are based on original 1950s survey data, and true positions are known to be in error by up to 500 m. Ice margins are provided based upon 1999 aerial photography.

Map 3: Mount Flora ASPA No. 148 geological map, adapted from the ‘Mapa Geológico de Bahía Esperanza Antártida’ published by the Intituto Geológico y Minero de España and Instituto Antártico Argentino (Scale 1:10,000).

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

GENERAL DESCRIPTION

Mount Flora (latitude 63°25’ S, longitude 57°01’ W, 0.3 km^2) is situated on the southeastern flank of Hope Bay, at the northern end of Trinity Peninsula, Antarctic

Peninsula (Map 1). The summit of Mount Flora (520 m) is approximately 1 km from the southern shore of Hope Bay. Four glaciers surround Mount Flora. The Flora Glacier extends from the cirque below the summit of Mount Flora in a northeasterly direction for one kilometre before it flows into a larger glacier that flanks the eastern and southern slopes of Mount Flora, extending northeast from The Pyramid (565 m) (Map 2). The western slopes of Mount Flora are bounded by the Kenney Glacier, which joins Depot Glacier before flowing into the head of Hope Bay. The Pyramid is a distinctive peak 1.5 km to the SSE of Mount Flora. To the north of the Area is the ice-free Five Lakes Valley and Scar Hills, and to the northeast is Lake Boeckella.

BOUNDARIES

The boundaries designated in the original Management Plan were amended during the 2002 Management Plan revision to include all of the known exposed fossiliferous strata on the northern slopes of Mount Flora. The summit ridge and highest peak of Mount Flora (520 m), which were formerly within the boundary, are comprised of non-fossiliferous volcanic rocks and have been excluded from the Area. The boundary runs from the north summit of Mount Flora (516 m) – the highest point of the boundary – westward down the ridge to the Kenney Glacier, the eastern margin of Kenney Glacier northward to the 150 m contour, eastward along the 150 m contour to the northwestern margin of the Flora Glacier, the northwestern margin of the Flora Glacier southwestward to the ridge leading westward to the north summit of Mount Flora. Where present, the glacier margins, lower outcrops, western ridge and northern summit of Mount Flora form visually obvious features that indicate the boundaries: the Area remains otherwise unmarked.

The boundary co-ordinates of the Area, starting with the north summit of Mt Flora and moving clockwise, are shown in Table 1.

Table 1. Boundary co-ordinates of ASPA No. 148 Mt Flora, Hope Bay, Antarctic Peninsula

Number	Latitude	Longitude
1	63°25’01.6’’ S	057°01’44.6’’ W
2	63°24’52.7’’ S	057°01’58.4’’ W
3	63°24’49.2’’ S	057°01’47.5’’ W
4	63°24’42.5’’ S	057°00’51.8’’ W
5	63°24’47.9’’ S	057°01’12.0’’ W
6	63°24’54.4’’ S	057°01’19.4’’ W
7	63°24’54.8’’ S	057°01’31.0’’ W

CLIMATE

No climate data are available for Mount Flora but local conditions are indicated by those at Esperanza Station. In summer (December, January and February), the average maximum temperature ranges between 2.6 ºC and 3.2 ºC, while the average minimum temperature ranges between -2.9 ºC and -1.8 ºC. During this season the temperature can reach as high as 14.8 ºC, as in 1978, or as low as -12.0 ºC, as in 1985. In winter, average maximum temperatures are around -6.0 ºC, while the minimum averages are about -15.0 ºC. Exceptionally, the temperature may rise to 13.0 ºC, or fall to -32.3 ºC, as in 1975. Temperatures at Mount Flora are likely to be lower owing to its greater elevation. The least windy months are December and January (mean wind speed 20-22 km h^{-1}), compared to May, July, August and September when winds are stronger (mean wind speed >30 km h^{-1}). During April and May gusts of more than 380 km h^{-1} have been recorded, resulting from katabatic winds from the local glacier. Strong winds (at or above 43 km h^{-1}) have been observed throughout the year, with an average frequency of c. 15 days per month. The average annual frequency of days with snow is 181 days per year. Throughout the year, snow fall occurs, on average, on 13-16 days each month, with a minimum average of 13 days in June. The average frequency of days with overcast skies is high in summer (23 days in January) but lower during the winter months (c. 13 days per month). The frequency of days with clear skies it is low throughout the year, ranging between 1 and 5 days per month. (Servicio Meteorológico Nacional, Argentina).

GEOLOGY, SOILS AND PALAEONTOLOGY

The geology of the Area comprises three main formations: the Hope Bay Formation, the Mount Flora Formation and the Kenney Glacier Formation. At the base, the Hope Bay Formation (Trinity Peninsula Group) is more than 1200 m thick and is characterised by marine siliciclastic turbidite and sandstone. It has an inferred Permo-Carboniferous age based on supposed Carboniferous spores (Grikurov and Dibner 1968) and Rb-Sr isotopic dating of 'grits' and mudstones (281 ±16 Ma; Pankhurst 1983) but the age evidence is sparse and open to ambiguous interpretation (Smellie and Millar 1995). The Hope Bay Formation is separated by an angular unconformity and a long stratigraphic gap from the overlying Mount Flora Formation. The Mount Flora Formation (Botany Bay Group) is composed mainly of sandstones, conglomerates and shale, and contains the most significant fossil strata. The overlying Kenney Glacier Formation (Antarctic Peninsula Volcanic Group), which is also separated from the Mount Flora Formation by an angular unconformity, is composed of ignimbrites and welded tuffs. There has been debate over the age of the Mount Flora Formation (Andersson 1906, Halle 1913, Bibby 1966, Thomson 1977, Farquharson 1984, Francis 1986, Gee 1989, Rees 1990); the most recent palaeobotanical and radiometric data available support an age of Early to Middle Jurassic (Rees 1993a, b, Rees and Cleal 1993, Riley and Leat 1999). Faults have been observed in the northern face of Mount Flora (Birkenmajer 1993a) and mapped separating the Trinity Peninsula Group and Mount Flora Formation (Smellie pers. comm. 2000).

The Mount Flora Formation is about 230-270 m thick and may be subdivided into an older Five Lakes Member and an upper Flora Glacier Member, which contains the most important fossil deposits. The Five Lakes Member is about 170 m thick and consists of plant-bearing coarse sedimentary breccias, conglomerates and sandstones. The dominant lithology, particularly in the lower part of the succession, is clast-supported cobble to boulder conglomerate (Farquharson 1984). It is well-exposed on the northern and northeastern slopes of Mount Flora between the Flora Glacier and Five Lakes Valley. The lower boundary of this member is an angular unconformity against the Hope Bay Formation. The contact between the Mount Flora Formation and the Hope Bay Formation is covered by scree. Some 50 m of basal beds of the Five Lakes Member are presumed unexposed. A higher section of the Five Lakes Member is well-exposed at a buttress which separates Flora Glacier from Five Lakes Valley (Martín Serrano et al. 2005, Montes et al. 2004).

The Flora Glacier Member comprises a sandstone-conglomerate complex 60-100 m thick, locally overlain by a shale complex up to 10 m thick, which is the main fossiliferous zone. It is best exposed at a buttress that divides the Flora Glacier cirque from Five Lakes Valley at approximately 350 m. A one metre-thick sill occurs in the upper section of the shale, close to the contact with the Kenney Glacier Formation. The sandstone association is dominated by fining upward cycles (characterised by decreasing grain size) that range in thickness from 2.5 to 11.5 m (Farquharson 1984). Although mostly inaccessible, good exposures of the Flora Glacier Member continue in the steep slopes of Mount Flora above Five Lakes Valley, extending westward to the margin of the Kenney Glacier. The thickness of the unit increases from 50-60 m at the buttress to about 100 m at the glacier margin. Volcanogenic deposits form a small but significant part of the Mount Flora Formation. A single ignimbrite 26 m thick forms a pale band across the north face of Mount Flora, approximately halfway up the sedimentary sequence (Farquharson 1984). The Kenney Glacier Formation volcanic rocks overlie the Mount Flora Formation, exposed in the highest part of Mount Flora. It also unconformably overlies the Hope Bay Formation on the eastern spur of the Pyramid (Smellie, pers. comm. 2000). The incomplete formation is a complex of predominantly evolved, rhyolite-dacite lavas, ignimbrites, agglomerates and tuffs (Birkenmajer 1993a & b). Farquharson (1984) identified the presence of tuffs, fine-grained agglomerates and welded tuffs. The most significant fossil exposures are found on the northern and northwestern faces of Mount Flora.

Most research has been conducted on samples from the relatively accessible northern face. The fossil flora was first comprehensively described by Halle (1913) and since then has been considered a standard for Mesozoic gondwanan floristic and biostratigraphic studies (Rees and Cleal 1993). Halle (1913) originally described 61 species from the fossils; this was revised to 43 species (Gee 1989), then to 38 species (Rees 1990) and, later still, to 32 species (Baldoni, 1986, Morel et al. 1994; Rees and Cleal 2004). More recently, 41 taxa have been described (Ociepa 2007; Birkenmajer and Ociepa 2008; Ociepa and Barbacka 2011). Fossil wood from the ASPA has also been studied (Torres et al. 2000).

The flora is represented typically by small scale-like leaves of Hepatophyta, stems and cone fragments of sphenophytes (Equisetaceae, *Equisetum*), as well as foliage of several ferns families (Dipteridaceae, Matoniaceae, Dicksoniaceae, Osmundaceae) and leaves and wood of gymnosperms (Caytoniales, Cycadales, Bennettitales, pteridosperms and conifers). Cycadophyte and conifer cone scales, seeds and other unidentifiable stems, leaves and foliage branches are also preserved (Taylor, no date; Rees pers. comm. 1999). Other floral fragments have been interpreted as fertile fern fronds or pollen organs of conifers but it remains uncertain how this species is related to other taxa because no spores or pollen have been obtained from the material to date (Ociepa and Barbacka, 2011). More generally, identifiable palynomorphs from the plant beds of Mount Flora Formation could not be recovered (Rees and Cleal 2004; Ociepa and Barbacka 2011). Four beetle (Order: Coleoptera) elytra (exoskeletons) have been identified from a small sample of shale, also containing plant fossils, from Mount Flora (Zeuner 1959). These were identified as *Grahamelytron crofti* and *Ademosynoides antarctica*. *G. crofti* is possibly a Carabidae, although it resembles a Chrysomelidae, while *A. antarctica* has been referred to as a Carabidae, Tenebrionidae, Elateridae or the fossil family Permosinidae (Zeuner, 1959). No other examples of fossil fauna have been recorded. There are no known marine fossil floral or faunal deposits in the Area.

TERRESTRIAL AND FRESHWATER BIOLOGY

The living flora within the Area is sparse and patchily distributed. Although a full floristic survey has not been made, a number of moss and lichen species have been identified as present. Moss species identified are: *Andreaea gainii, Bryum argenteum, Ceratodon purpureus, Hennediella heimii, Pohlia nutans, Sanionia uncinata, Schistidium antarctici* and *Syntrichia princeps*. Lichen species identified are: *Acarospora macrocyclos, Buellia anisomera, Buellia* spp., *Caloplaca* spp., *Candelariella vitellina, Cladonia pocillum, Haematomma erythromma, Physcia caesia, Pleopsidium chlorophanum, Pseudephebe* *minuscula, Rhizocarpon geographicum, Rhizoplaca aspidophora, Stereocaulon antarcticum, Tremolecia atrata, Umbilicaria antarctica, Umbilicaria decussata, Umbilicaria kappeni, Usnea antarctica, Xanthoria candelaria* and *Xanthoria elegans*. There are no permanent streams or lakes within the Area. No information is available on the invertebrate fauna or microbial communities present at Mount Flora.

BREEDING BIRDS

Little information is available on bird communities present at Mount Flora, although a report on the exact nesting sites of some species suggested that birds are unlikely to breed within the Area (Marshall 1945). However, the breeding birds of Hope Bay generally have been well-studied, for instance, Argentina has been monitoring the penguins colonies since the earlier 1990s. Part of one of the largest colonies of Adélie penguin (*Pygoscelis adeliae*) on the Antarctic Peninsula, numbering c. 102,000 pairs, is situated about 500 m northeast of the Area (Santos et al. 2013) (Map 2). Other birds breeding at Hope Bay include around 500 pairs of gentoo penguins (*Pygoscelis papua*) (Argentina Monitoring Program), brown skua (*Catharacta loennbergi*), south polar skua (*Catharacta maccormicki)*, Antarctic tern (*Sterna vittata*), Wilson's storm petrel (*Oceanites oceanicus*), kelp gull (*Larus dominicanus*), and sheathbill (*Chionis alba*). Further information on the number of breeding birds in the vicinity of Mount Flora can be found in Argentina (1997), Santos et al. (2013) and Coria and Montalti (1993).

HUMAN ACTIVITIES AND IMPACTS

Mount Flora was discovered in 1903 by Johann Gunnar Andersson, a member of the Swedish South Polar Expedition of 1901-04, which explored and mapped much of the northern Antarctic Peninsula. Andersson collected fossil and mineralogical specimens from Mount Flora while stranded and awaiting rescue at Hope Bay over the winter of 1903. Andersson and his companions over-wintered in a stone hut (Historic Site and Monument No. 39). The leader of the expedition was Otto Nordenskjöld, who named Mount Flora because of the geological findings of Andersson. The United Kingdom established Base 'D' at Hope Bay in 1945 as part of 'Operation Tabarin'. The station was operational until February 1964 with a winter complement of 7-19 personnel. Base 'D' was transferred from the United Kingdom to Uruguay in 1997 and renamed as Teniente de Navio Ruperto Elichiribehety Station. Argentina established Esperanza Station on 31 December 1951 and has operated the station continuously since, with approximately 50 winter and up to 70 summer personnel, devoted to the study of different scientific disciplines such as seismology, geology, geomorphology, and the monitoring of different parameters of the ecosystem and contamination.

Mount Flora was designated as a Site of Special Scientific Interest in 1989 as a result of concern that the best examples of fossils were being collected by casual visitors and might therefore be lost to science.

6(ii) Access to the Area

All access to the areas shall be on foot. The lower slopes of Mount Flora are easily accessible by foot from both the local research stations and from Hope Bay. However, reaching the boundary of the ASPA, and moving within it, requires a demanding hike, due to the steep nature of the local terrain. To access the area, follow the relatively flat ground south of Esperanza Station to Boeckella Lake. From there, follow a trail that heads southward towards the eastern end of the ASPA, which allows access via the least steep ground (see Map 2). Helicopter landings within the Area are prohibited, except under emergency conditions when the use of helicopters may be considered under the conditions set out in section 7 (ii) Access to and movement within or over the Area.

6(iii) Location of structures within and adjacent to the Area

There are no structures present within the Area. The nearest scientific research stations are Esperanza Station (Argentina) (latitude 63°24'S, longitude 56°59'W) and Teniente de Navio Ruperto Elichiribehety Station (Uruguay) (latitude 63°24'S, longitude 56°59'W), both approximately 1.5 kilometres northeast of the Area. The remains of a British Base, which burnt down in 1948, are situated 300 m to the northeast of the Uruguayan base. The graves of two British men who died in the above fire are located on a small promontory some 300 m to the north of the Uruguayan base. Two shelters, run by Argentina, are situated east of Mount Flora (latitude 63º25'10" S, longitude 56º59'50"W and latitude 63º27'36" S, longitude 57º11'14"W).

6(iv) Location of other Protected Areas in the vicinity

The nearest protected areas to Mount Flora are Potter Peninsula (ASPA No. 132), Western Shore of Admiralty Bay (ASPA No. 128), Lions Rump (ASPA No. 151), and Narębski Point, Barton Peninsula (ASPA No. 171), all of which are located on King George Island, South Shetland Islands, lying approximately 150 km to the west (Map 1). A stone hut (Historic Site and Monument No. 39) built by members of the Swedish South Polar Expedition and a bust of General San Martin, grotto with a statue of the Virgin of Lujan, and a flag mast erected by Argentina in 1955, together with a graveyard with stele in memory of members of Argentine expeditions who died in the area (Historic Site and Monument No. 40) are present within the vicinity of Esperanza Station (Map 2).

6(v) Special zones within the Area

None.

7. Terms and condition for entry Permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority as designated under Article 7 of Annex V of the Protocol on Environmental Protection to the Antarctic Treaty.
Conditions for issuing a Permit to enter the Area are that:

- it is issued for compelling scientific reasons which cannot be served elsewhere, or for reasons essential to the management of the Area;
- any management activities are in support of the objectives of the Management Plan;
- the actions permitted are in accordance with this Management Plan;
- the activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the scientific and historic values of the Area;
- should the applicant for a Permit propose to make rock collections, the applicant shall demonstrate to an appropriate national authority that the research proposed cannot be adequately served by samples already collected and held in the various collections worldwide, before a Permit is granted;

- the Permit, or an authorised copy, shall be carried when in the Area;
- a visit report shall be supplied to the authority named in the Permit;
- the Permits shall be issued for a finite period;
- the appropriate authority should be notified of any activities/measures undertaken that were not included in the authorised Permit.

7(ii) Access to and movement within or over the Area

- Access to and movement within the Area shall be on foot.
- Due to the steepness of the ground, which makes it technically difficult to land a helicopter within the Area, access to the Area by helicopter is not permitted, except in the event of an emergency. In an emergency, and if wind conditions allow, a helicopter can enter the ASPA, preferably without landing, to perform a rescue. If necessary or useful for the type of emergency in question, the helicopter may land on Flora Glacier. Should an emergency arise which necessitates the use of a helicopter, the helicopter flight paths shown in Map 2 are recommended. Furthermore, helicopter lands in the surrounding area are not recommended due to the high concentration of birds nesting in the vicinity of Mount Flora. The recommended helicopter landing site is the Esperanza Station helicopter pad (see Map 2). The 'Guidelines for the Operation of Aircraft near Concentrations of Birds' contained in Resolution 2 (2004) should also be consulted.
- Land vehicles are prohibited within the Area.
- Pedestrian traffic should be kept to the minimum necessary to undertake permitted activities and every reasonable effort should be made to minimise trampling effects, such as breakage of rocks, especially of rocks *in situ*.

7(iii) Activities which may be conducted in the Area

Activities which may be conducted within the Area include:

- Compelling scientific research which cannot be undertaken elsewhere;
- Scientific research that will not jeopardise the scientific values of the Area.
- Essential management activities, including monitoring.

Where geological sampling is involved this should, as a minimum standard, be in accordance with the following principles:

1. Sampling should be done with the minimum disturbance practical.
2. Sampling should be kept to the minimum necessary to achieve the research objectives.
3. Enough material/specimens should be left to allow future workers to understand the context of the material.
4. Sample sites should be left free of markings (paint, labels, etc.).
5. Specimens should be retained in a recognised repository after the project finishes.
6. Details of the GPS location of collection sites, volume/weight, sample orientation, type of material collected, and where the removed material will be housed, should be detailed in visit reports submitted to the appropriate national authority.
7. A copy of these details should also be provided to the Proponent Parties to facilitate the review of the Management Plan and to facilitate the provision of advice to other Parties regarding the existence of materials in geological repositories, with a view to minimising unnecessary new or additional sampling.

7(iv) Installation, modification, or removal of structures

No structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons and for a pre-established period, as specified in a permit. Permanent structures or installations are prohibited. All markers, structures or scientific equipment installed in the Area must be clearly identified by country, name of the principal investigator or agency, year of installation and date of expected removal. All such items should be free of organisms, propagules (e.g. seeds, eggs) and non-sterile soil, and be made of materials that can withstand the environmental conditions and pose minimal risk of contamination of the Area. Removal of specific equipment for which the Permit has expired shall be a condition of the Permit.

7(v) Location of field camps

Camping is prohibited within the Area.

7(vi) Restrictions on materials and organisms that may be brought into the Area

In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the area are:

- The deliberate introduction of animals, plant material, microorganisms and non-sterile soil into the Area shall not be permitted. Precautions shall be taken to prevent the accidental introduction of animals, plant material, microorganisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area). Furthermore, all tools (drills, picks, shovels, geological hammers, etc.) should be thoroughly cleaned before being taken to Antarctica, particularly those tools which have been used previously in high altitude and high latitude areas outside the Antarctic Treaty area.
- No herbicides or other pesticides shall be brought into the Area.
- Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the Permit, shall be removed from the Area at or before the conclusion of the activity for which the Permit was granted.
- Fuel or other chemicals shall not be stored in the Area unless specifically authorised by Permit condition. They shall be stored and handled in a way that minimises the risk of their accidental introduction into the environment.
- Materials introduced into the Area shall be for a stated period only and shall be removed by the end of that stated period. If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*.
- The appropriate authority shall be notified of any materials released and not removed that were not included in the authorised Permit.

7(vii) Taking of, or harmful interference with, native flora or fauna

Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit issued in accordance with Annex II of the Protocol on Environmental Protection to the Antarctic Treaty. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) Collection or removal of anything not brought into the Area by the Permit holder

Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs (see sections 7(iii) Activities which may be conducted in the Area and 7(x) Measures that may be necessary to continue to meet the aims of the management plan). Permits shall not be granted if there is a reasonable concern that the sampling proposed would take, remove or damage such quantities of fossiliferous rocks that their abundance on Mount Flora would be significantly affected. Other material of human origin likely to compromise the values of the Area, and which was not brought into the Area by the Permit Holder or otherwise authorised, may be removed from the Area unless the environmental impact of the removal is likely to be greater than leaving the material in situ; if this is the case the appropriate national authority must be notified and approval obtained.

7(ix) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area in accordance with Annex III (Waste disposal and waste management) to the Protocol on Environmental Protection to the Antarctic Treaty (1998).

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

In view of the fact that geological sampling is both permanent and results in cumulative impact the following measures shall be taken to safeguard the scientific values of the Area:

- Visitors removing geological samples from the Area shall complete a record describing the geological type, quantity and location of samples taken, which should, at a minimum, be deposited with their National Antarctic Data Centre and/or with the Antarctic Master Directory.
- Visitors planning to sample within the Area shall demonstrate that they have familiarised themselves with earlier collections to minimise duplication. Sample collections exist in repositories around the world including:

Repositories	***Information/repository website***
Museum of Natural Sciences, B. Rivadavia, Buenos Aires, Argentina	http://wander-argentina.com/natural-sciences-museum-buenos-aires/
Museum of Natural Sciences, La Plata, Argentina	http://www.welcomeargentina.com/laplata/museum-natural-sciences.html
Natural History Museum, London, UK	http://www.nhm.ac.uk/visit-us/galleries/green-zone/minerals/index.html
British Antarctic Survey, Cambridge, UK	http://www.antarctica.ac.uk/bas_research/data/collections/terrestrial_geology.php
Swedish Natural History Museum, Stockholm	http://www.nrm.se/english.16_en.html
Byrd Polar Research Center Polar Rock Repository, Ohio, USA	http://bprc.osu.edu/rr/

Institute of Geological Sciences, Polish Academy of Sciences, Krakow, Poland	http://www.ing.pan.pl/index_E.htm
Department of Geology, Institute of Geosciences, Federal University of Rio de Janeiro, Brazil	http://www.geologia.ufrj.br/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=50

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a visit report to the appropriate national authority as soon as practicable and no later than six months after the visit has been completed.

Such reports should include, as appropriate, the information identified in the *Antarctic Specially Protected Area visit report form* contained in the *Revised Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas* (Appendix 2). Amongst other details, the visit report should include the information requested in bullet point 6 of section *7(iii) Activities which may be conducted in the Area* of this Management Plan. Wherever possible, the national authority should also forward a copy of the visit report to the Proponent Parties, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organising the scientific use of the Area.

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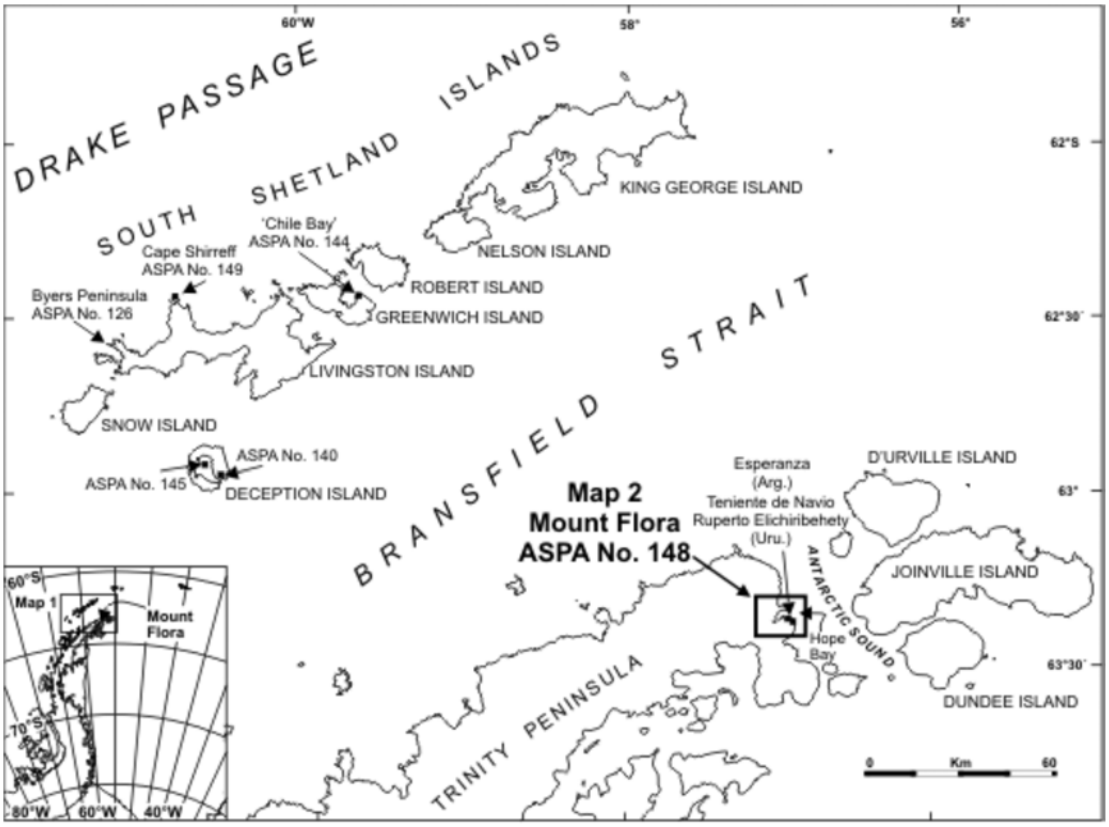
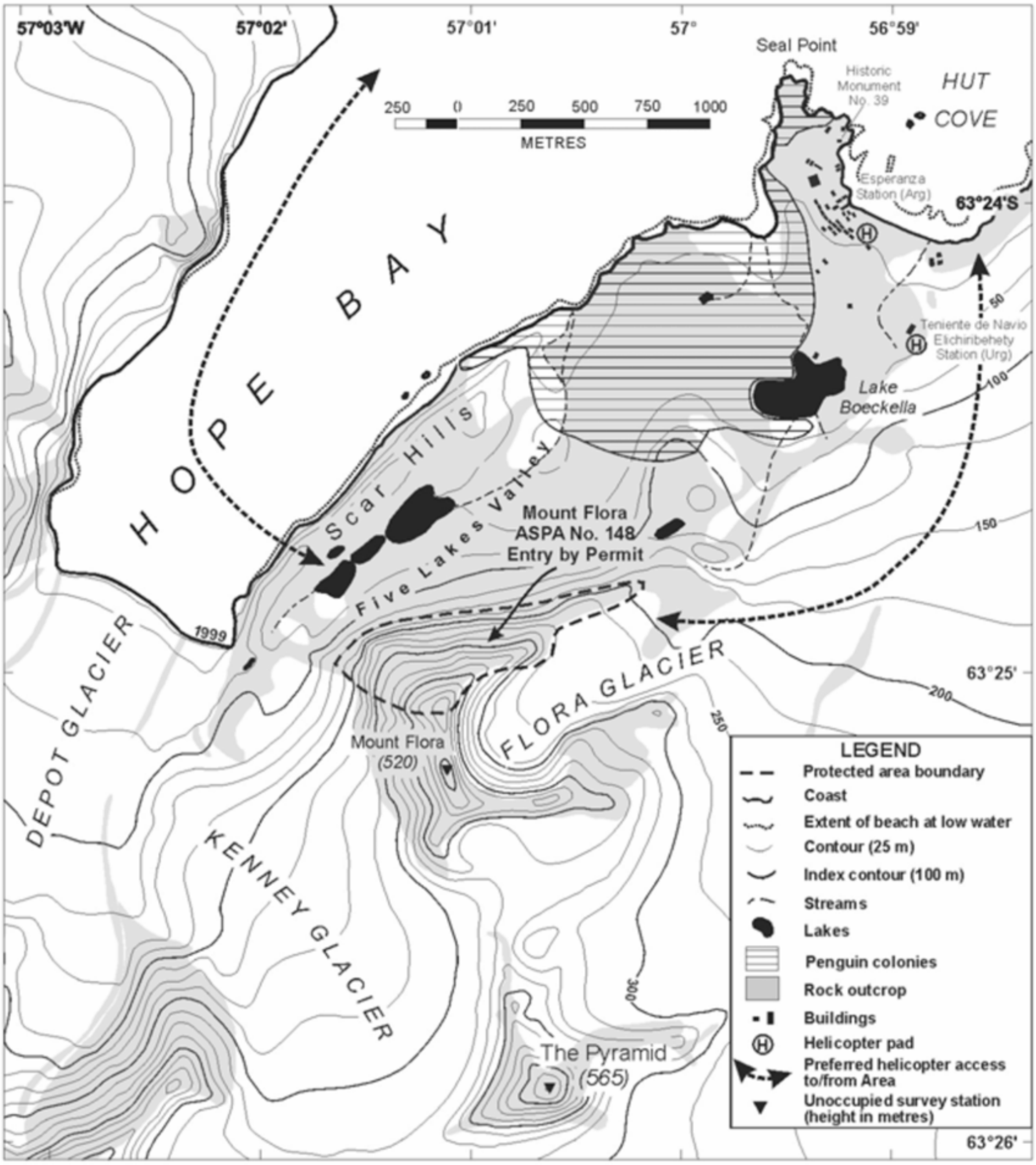
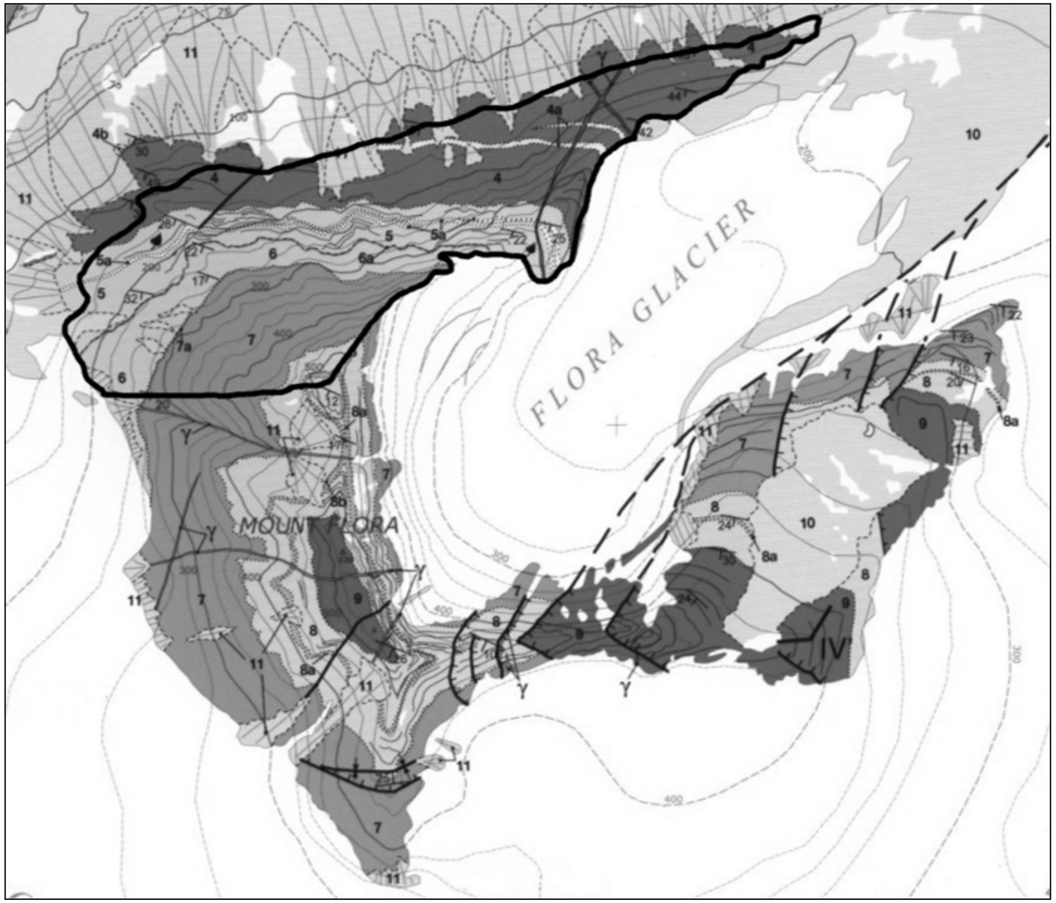


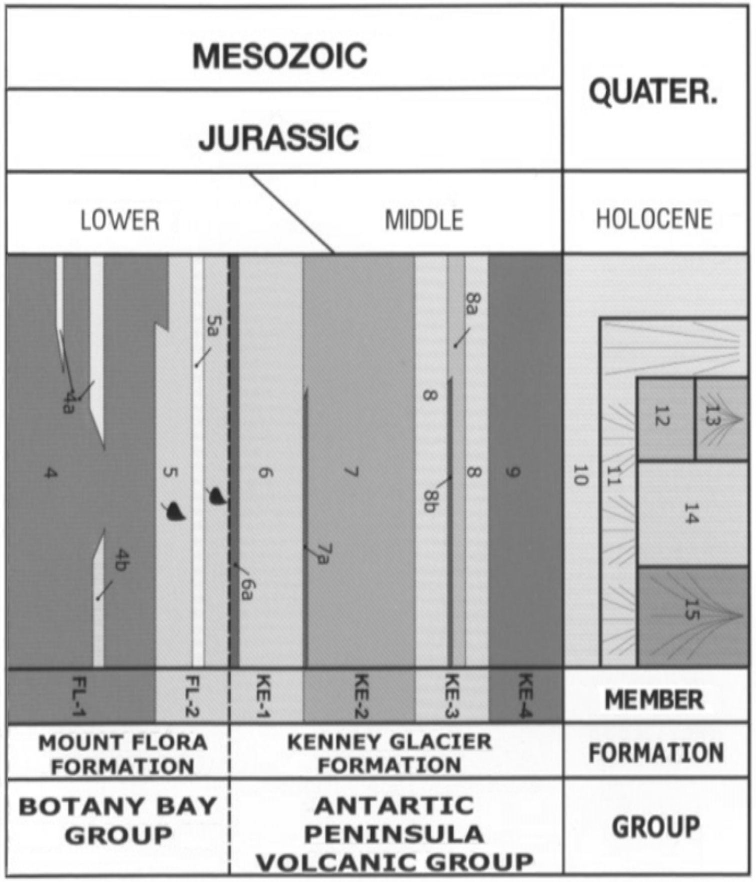
Map 1. Mount Flora (ASPA No. 148), Hope Bay, Antarctic Peninsula, location map.
Inset: location of Mount Flora on the Antarctic Peninsula.



Map 2. Mount Flora (ASPA No. 148), Hope Bay, topographic map.

Map 3: Mount Flora ASPA No. 148 geological map, adapted from the 'Mapa Geológico de Bahía Esperanza Antártida' published by the Instituto Geológico y Minero de España and Instituto Antártico Argentino (Scale 1:10,000). The sketch map is orientated with north to the top of the map. The area depicted is approximately 1.5 km across. Legend: 4. Massive conglomerates of different thicknesses. 5. Sandstones, conglomerates and black shales with plant remains. 5a. Fragmented volcanic rocks. 6. Welded tuffs with interbedded sandstones, volcanic breccias and welded ignimbrite beds. 6a. Reddish thermal contact. 7. Breccias, sandstones and siltstones with interbedded volcanic ignimbrites. 8. Welded tuffs, interbedded with welded ignimbrites and beds of breccia and sandstone. 8a. volcanic laminated siltstones, sandstones and volcanic basaltic lava layers. 8b. Reddish thermal contact. 9. Breccias and sandstones with interbedded volcanic ignimbrites. 10. Angular boulders with a sandy-silty matrix. Background till and moraines. 11. Angular boulders. Slopes and debris cones. γ: dyke : palaeobotanical remains.





Measure 9 (2015)

Antarctic Specially Protected Area No 152 (Western Bransfield Strait): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty providing for the designation of Antarctic Specially Protected Areas ("ASPA") and approval of Management Plans for those Areas;

Recalling

- Recommendation XVI-3 (1991), which designated Western Bransfield Strait, off Low Island, South Shetland Islands, as Site of Special Scientific Interest ("SSSI") No 35 and annexed a Management Plan for the Site;
- Measure 3 (2001), which extended the expiry date of SSSI 35 from 31 December 2001 to 31 December 2005;
- Decision 1 (2002), which renamed and renumbered SSSI 35 as Antarctic Specially Protected Area No 152;
- Measures 2 (2003) and 10 (2009), which adopted revised Management Plans for ASPA 152;

Recalling that Recommendation XVI-3 (1991) has not become effective and was withdrawn by Measure 10 (2009);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 152;

Desiring to replace the existing Management Plan for ASPA 152 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 152 (Western Bransfield Strait), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 152 annexed to Measure 10 (2009) be revoked.

Management Plan for Antarctic Specially Protected Area No. 152

WESTERN BRANSFIELD STRAIT

Introduction

The Area is located off the western and southern coasts of Low Island, South Shetland Islands, lying between 63°15'S and 63°30'S; 62°00'W and 62°45'W, and is fully marine. Approximate area: 916 km^2. Designation is on the grounds that the shallow shelf in this region near Low Island is one of only two known sites in the vicinity of Palmer Station (USA) that are suitable for bottom trawling for fish and other benthic organisms (see also ASPA No. 153 Eastern Dallmann Bay). The site offers unique opportunities to study the composition, structure and dynamics of several accessible marine communities. Proposed by the United States of America: adopted by Recommendation XVI-3 (Bonn, 1991: SSSI No. 35); date of expiry extended by Measure 3 (2001); renamed and renumbered by Decision 1 (2002); revised management plans adopted by Measure 2 (2003) and by Measure 10 (2009). The Area is approved under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) in accordance with Decision 9 (2005).
The Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) classifications are based on terrestrial criteria, and therefore have limited applicability in marine environments.

1. Description of values to be protected

Western Bransfield Strait (between latitudes 63°20'S and 63°35'S and longitudes 61°45'W and 62°30'W, approximately 916 km^2) was originally designated as a Site of Special Scientific Interest through Recommendation XVI-3 (1991, SSSI No. 35) after a proposal by the United States of America. It was designated on the grounds that "the shallow shelf south of Low Island is one of only two known sites in the vicinity of Palmer Station that are suitable for bottom trawling for fish and other benthic organisms. From an ecological standpoint, the Low Island site offers unique opportunities to study the composition, structure, and dynamics of several accessible marine communities. The Site, and in particular, its benthic fauna, is of exceptional scientific interest and requires long-term protection from potential harmful interference". Together with Eastern Dallmann Bay (ASPA No. 153), the Area is used in over 90 percent of specimen collections carried out by US researchers who are actively studying such fish communities within the region (Detrich pers. comms. 2009 and 2015).

The boundaries of the Area were revised by Measure 2 (2003) to include all of the shallow shelf down to 200 m depth to the west and south of Low Island, while the deeper water of Bransfield Strait to the east was excluded. The boundaries of the Area at Western Bransfield Strait are between latitudes 63°15'S and 63°30'S and longitudes 62°00'W and 62°45'W and are defined in the north-east by the shoreline of Low Island, encompassing an area of approximately 916 km^2 (Map 1).

The Area continues to be considered important for studies of the composition, structure and dynamics of the marine communities, and the original reasons for designation are reaffirmed in the current Management Plan. In addition, the Area is recognized as an important spawning ground for several fish species, including the rockcod *Notothenia coriiceps* and the icefish *Chaenocephalus aceratus*. Fish have been collected from the Area by scientists from Palmer Station since the early 1970s. The Area is within the research area of the Palmer Long Term Ecological Research (LTER) Program; fish collected from the Area are used in the study of biochemical and physiological adaptations to low temperatures. Some of the fish collected have been used for comparative studies with the more heavily impacted Arthur Harbor area. Scientific research is also being undertaken on the benthic faunal communities.

2. Aims and objectives

Management at Western Bransfield Strait aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the marine environment while ensuring protection from over-sampling;
- allow other scientific research within the Area provided it will not compromise the values for which the Area is protected;
- allow visits for management purposes in support of the aims of the management plan.

3. Management activities

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

- A map showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently and copies of this Management Plan shall be made available at Palmer Station (USA).
- National programs shall ensure the boundaries of the Area and the restrictions that apply within are marked on relevant maps and marine charts for which they are responsible.
- Copies of this Management Plan shall be made available to vessels travelling in the vicinity of the Area.
- Buoys, or other markers or structures installed within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer needed.
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.

4. Period of designation

Designated for an indefinite period.

5. Maps and photographs

Map 1: ASPA No. 152 Western Bransfield Strait bathymetric map. Coastline data are derived from the SCAR Antarctic Digital Database (ADD) Version 6.0 (2012). Bathymetry is derived from the International Bathymetric Chart of the Southern Ocean (IBCSO) v1.0 (2013). Bird data: ERA (2015). Important Bird Areas: BirdLife International / ERA (Harris *et al*. 2011).
Map specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 63° 15' S; 2nd 63° 30' S; Central Meridian: 62° 00' W; Latitude of Origin: 64° 00' S; Spheroid and horizontal datum: WGS84; Horizontal accuracy: maximum error of ±300 m. Isobath 200 m.

Inset: the location of Map 1, ASPA No. 152 Western Bransfield Strait, Antarctic Peninsula, showing the nearest protected area, ASPA No. 153, Eastern Dallmann Bay.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

General description

Bransfield Strait is a deep water passage approximately 220 km long and 120 km wide between the Antarctic Peninsula and the numerous islands that comprise the South Shetland Islands. The Drake Passage is to the north and to the west is the Bellingshausen Sea. The Area lies approximately 80 km west of the Antarctic Peninsula, mostly within the 200 m isobath directly south and west of Low Island (Map 1). Low Island is the southern-most of the South Shetland Islands, lying 60 km south-west of Deception Island and 25 km south-east of Smith Island. To the west and south of Low Island, and for approximately 20 km from the shore, the sea floor slopes gently from the intertidal zone to depths of approximately 200 m. The sea floor slopes steeply to the east of Low Island, reaching depths of up to 1200 m in this part of Bransfield Strait. Cores collected as part of the BENTART research programme during the austral summers of 2003 and 2006 indicate that the sea floor within the Area is generally composed of muddy sediments containing gravel or small stones, and of sessile epifaunal communities (Troncoso *et al.* 2008), which either remain firmly attached to substrates or move very slowly (Robinson *et al.* 1996).

Boundaries

The boundaries of the Area at Western Bransfield Strait are defined in the north as the line of latitude at 63°15'S and in the south at 63°30'S; in the east the boundary is defined as the line of longitude at 62°00'W and in the west 62°45'W (Map 1). The northeastern boundary is defined as the shoreline of Low Island, extending from 62°00'W, 63°20'S in the southeast (approximately two kilometers from Cape Hooker) to 62°13'30"W, 63°15'S in the northwest (Cape Wallace). The coastline boundary on the western and southern shores of Low Island is defined as the high tide level, and the intertidal zone is included within the Area. The Area extends a maximum of 27.6 km north-south and a maximum of 37.15 km east-west, encompassing an area of approximately 916 km^2. Boundary markers have not been installed because in the marine area this is impractical, while at Low Island the coast itself is a clearly defined and visually obvious boundary feature.

Oceanography, climate and marine geology

There is considerable year-to-year variation in sea ice within the Bransfield Strait region, although coverage appears to be less than 100 days per year (Parkinson 1998). Rates of sea ice advance and retreat along the northwestern Antarctic Peninsula are also variable. Sea ice advance is for approximately five months followed by approximately seven months of retreat. Ice growth is fastest in June and July and the fastest decay is in December and January (Stammerjohn and Smith 1996). Measurements made within the Bransfield Strait between 20th January and 9th February 2001 indicate that ocean temperatures in the Area averaged between 1.7 and 1.8 ºC at 5 m depth and 0.2 to 0.3ºC at the 150 m contour (Catalan *et al.* 2008). Water salinity within the Area ranged between 34.04 and 34.06 psu at 5 m, whilst at 150 m depth salinity reached 34.40 psu.

Wind is predominantly from the NNW direction, resulting in a southward flowing coastal current along the western Antarctic Peninsula (Hofman *et al.* 1996). Coupled with the northward flow of the Antarctic Circumpolar Current, this results in a predominantly clockwise circulation in Bransfield Strait (Dinniman and Klinck 2004; Ducklow *et al.* 2007), dominated by the Gerlache Strait Current and the Bransfield Strait Current (Zhou *et al.* 2002 and 2006). Drifters deployed as part of RACER (Research on Antarctic Coastal Ecosystems and Rates) between 1988 and 1990 indicate that eddie formation within the Area is minimal and that a strong north-easterly flow originates to the south of Low Island (Zhou *et al.* 2002). The current bifurcates to the west of Low Island, with water flowing to the north-east to merge with the Bransfield Strait Current and to the north-west, towards Smith Island. Local circulation is also influenced by tides, with tide records obtained at Low Island during a six-week period in December 1992 to January 1993 recording a maximum level variation of 1.70 m (López *et al.* 1994).

Seismic measurements from the Seismic Experiment in Patagonia and Antarctica (SEPA) monitoring station, located on the north-eastern coast of Low Island, have detected significant earthquake activity within the Area, which is thought to result from the intersection of the Hero Fracture Zone with the South Shetland Platform at Smith Island (Maurice *et al.* 2003). During the Spanish Antarctic campaign of 2006/07, an additional seismic monitoring station was installed on the southern coast of Low Island, in order to extend geodetic monitoring within the Bransfield Strait area (Berrocoso *et al*. 2007).

Marine biology

The predominantly soft sand / mud / cobbled-rock substrate of the Area supports a rich benthos with numerous fish species, invertebrates (sponges, anemones, annelids, molluscs, crustaceans, asteroids, ophiuroids, echinoids, holothurioids, brachiopods, tunicates), and marine plants, in several distinct communities.

Fish species commonly collected near Low Island at depths of 80 to 200m include *Chaenocephalus aceratus, Harpagifer bispinis, Notothenia coriiceps, Gobionotothen gibberifrons (formerly N. gibberifrons), Parachaenichthys charcoti* and *Trematomus newnesi* (Grove and Sidell 2004; Lau *et al.* 2001). Species rarely found at Low Island include *Champsocephalus gunnari, Chionodraco rastrospinosus* and *Pseudochaenichthys georgianus*. In addition, the Low Island shelf appears to be a spawning ground for several fish species, for example the ice fish *Chaenocephalus aceratus* and *N. coriiceps*, with the family Nototheniidae, representing the bulk of fish larvae and juveniles captured in the area (Catalan *et al.* 2008). Other juvenile fish species collected close to Low Island include *Trematomus lepidorhynus and Notothenia kempi*. The Area is a mating ground for yellowbelly rockcod (*Notothenia coriiceps*) (indicated by eggs) (Kellermann 1996). The fish spawn in May / June. The large eggs, around 4.5 mm in diameter, are pelagic after fertilization and ascend to the surface waters where they incubate during the winter. Larval species recorded in the Area include *Bathylagus antarcticus*, *Electrona antarctica*, *Gymnodraco acuticeps*, *Nototheniops larseni*, *Notothenia kempi* and *Pleuragramma antarcticum* (Sinque *et al.* 1986; Loeb *et al.* 1993; Morales-Nin *et al.* 1995).

Specimens collected during April-June 2008 and 2010 were used to investigate protein folding in *Gobionotothen gibberifrons* in relation to warming oceans (Cuellar *et al*. 2014).
The following benthic amphipod species have been recorded within the Area: *Ampelisca barnardi, A. bouvieri, Byblis subantarctica, Epimeria inermis, E. oxicarinata, E. walkeri, Eusirus antarcticus, E. perdentatus, Gitanopsis squamosa, Gnathiphimedia sexdentata, Jassa* spp., *Leucothoe spinicarpa, Liljeborgia georgiana, Melphidippa antarctica, Oediceroides calmani, O. lahillei, Orchomenella zschaui, Parharpinia obliqua, Parepimeria bidentata, Podocerus septemcarinatus*, *Prostebbingia longicornis,*

Shackeltonia robusta, Torometopa perlata, Uristes georgianus and *Waldeckia obesa* (Wakabara *et al.* 1995).

Molluscan assemblages have been analysed at four sample sites within the Area as part of an integrated study of the benthic ecosystem of Bransfield Strait, which was carried out between 24 January and 3 March 2003 (BENTART 03) and from 2 January to 17 February 2006 (BENTART 06) (Troncoso *et al*. 2008). The most abundant species in the Area was the bivalve *Lissarca notorcadensis*, distantly followed by *Pseudamauropsis aureolutea*, which was the most widely distributed. Other species collected included *Marseniopsis conica*, *Onoba gelida*, *Yoldiella profundorum*, *Anatoma euglypta*, *Chlanidota signeyana* and *Thyasira debilis*.

No information is available on the zooplankton or marine flora within the Area.

Marine mammals

Satellite tracking studies carried out between January 2004 and 2006 suggest that humpback whales (*Megaptera novaeangliae*) pass close to the Area and may enter it during foraging (Dalla Rosa *et al.* 2008). Southern elephant seals (*Mirounga leonina*) were tracked within the Area using satellite transmitters between December 1996 and February 1997 (Bornemann *et al.* 2000).

Birds

Approximately 325 000 pairs of chinstrap penguins (*Pygoscelis antarctica*) were breeding at ~13 locations on and near to the shore of Low Island in 1987 (Shuford & Spear 1988), most of which are in colonies located along or near the northeastern boundary of the Area. The largest colonies are immediately to the north of the Area at and near Cape Wallace (129 000 – 229 000 pairs) and at and near Cape Garry (approximately 104 375 pairs) and Jameson Point (20 000 – 35 000) (Map 1). These breeding sites, as well as nearby Cape Hooker, have been identified by BirdLife International as Important Bird Areas because of their large chinstrap penguin colonies (Harris *et al*. 2011). It is expected that the large colonies of chinstrap penguin influence the Area. Small colonies of Antarctic shags (*Phalacrocorax* [atriceps] *bransfieldensis*) have been observed at Cape Garry, on an island within the Area between Cape Garry and Jameson Point, and on an island several kilometers NE of Cape Wallace (Poncet and Poncet, unpublished data Feb 1987, in Harris 2006) (Map 1).

Human activities / impacts

Fish collected within the Area have been used for a variety of biochemical, genetic and physiological research, including: studies of the adaptations in fish that enable proteins to function at low temperatures (Detrich *et al.* 2000; Cheng and Detrich 2007); the adaptations of muscle and energy metabolism, including the processing of fatty acids to low temperatures (Hazel and Sidell 2003; Grove and Sidell 2004); efficient genome transcription in cold water (Lau *et al.* 2001; Magnoni *et al.* 1998); the influence of hydrostatic pressure on enzyme function within fish livers (Ciardiello *et al.* 1999); and the cardiovascular adaptations of icefishes, in compensation for their complete lack of haemoglobin (Sidell and O'Brien 2006).

Specimens collected during trawls in March and April 1991, 1992, and 1993 were used in comparative studies of Polynuclear Aromatic Hydrocarbon (PAH) contamination in fish with those collected from Arthur Harbor and the effects of Diesel Fuel Arctic (DFA) on

Notothenia gibberifrons (now *Gobionotothen gibberifrons*) (McDonald *et al.* 1995; Yu *et al.* 1995). The former study found levels of contamination in fish sampled from the Area were considerably lower than those sampled from the vicinity of the 1989 *Bahia Paraiso* wreck in Arthur Harbor and that fish captured near US scientific stations are exposed to PAH, albeit low levels (McDonald *et al.* 1992 and 1995). However, concentrations of PAH were higher than had been expected in fish collected from within the Area, with levels found to be similar to those in fish sampled from near Old Palmer Station.

6(ii) Access to the Area

Access into the Area is generally by ship from Bransfield Strait, or from the direction of Drake Passage, or Boyd Strait which lies to the north between Smith and Snow islands. Vessels may transit through the Area, although anchoring shall be avoided except in compelling circumstances. Access into the Area may be made by air or over sea ice when conditions allow. Access routes into or within the Area have not been defined.

6(iii) Location of structures within and adjacent to the Area

There are no structures known to be within or near the Area. The nearest scientific stations are Decepción (Argentina) and Gabriel de Castilla (Spain), both approximately 70 km to the northeast on Deception Island.

6(iv) Location of other protected areas in the vicinity

The nearest protected areas to Western Bransfield Strait are Eastern Dallmann Bay (ASPA No. 153), which lies about 45 km to the SSE, and Port Foster and other parts of Deception Island (ASPAs No. 140 and No. 145 respectively), which are approximately 70 km to the northeast (Map 1, Inset).

6(v) Special zones within the Area

None.

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

- it is issued only for scientific purposes, or for educational purposes that cannot be served elsewhere, or for reasons essential to the management of the Area;
- the actions permitted are in accordance with the Management Plan;
- the activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the environmental and scientific values of the Area;
- the Permit shall be issued for a finite period;
- the Permit, or a copy, shall be carried when in the Area.

7(ii) Access to, and movement within or over, the Area

Access into the Area shall be by sea, over sea ice or by air. There are no specific restrictions on routes of access to, or movement within, the Area, although movements should be kept to the minimum necessary consistent with the objectives of any permitted activity. Every reasonable effort should be made to minimize disturbance. Vessels may transit through the Area, although anchoring shall be avoided except in compelling circumstances. There are no special overflight restrictions within the Area, and aircraft may land by Permit when sea ice conditions allow, although pilots should take into account the large penguin colonies present near the northeastern boundary of the Area on the Low Island coast (Map 1).

7(iii) Activities that may be conducted in the Area

- Scientific research that will not jeopardize the values of the Area;
- Essential operational activities of vessels that will not jeopardize the values of the Area, such as transit through, or stationing within, the Area in order to facilitate science or other activities, including tourism, or for access to sites outside of the Area;
- Essential management activities, including monitoring.

7(iv) Installation, modification or removal of structures

- No structures are to be erected within the Area except as specified in a permit and permanent structures or installations are prohibited;
- All structures, scientific equipment or markers installed in the Area must be authorized by permit and clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area;
- Installation (including site selection), maintenance, modification or removal of structures shall be undertaken in a manner that minimizes disturbance to flora and fauna.
- Removal of specific equipment for which the permit has expired shall be the responsibility of the authority which granted the original Permit, and shall be a condition of the permit.

7(v) Location of field camps

None.

7(vi) Restrictions on materials and organisms which may be brought into the Area
In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the area are:

- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. Precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area);
- Visitors shall ensure that sampling equipment and markers brought into the Area are clean. To the maximum extent practicable, equipment to be used within the area shall be thoroughly cleaned before entering the Area. Visitors should also consult and

follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011);
- No pesticides shall be brought into the Area;
- Fuel, food, chemicals and other materials shall not be stored in the Area, unless specifically authorized by permit, and shall be stored and handled in a way that minimizes the risk of their accidental introduction into the environment;
- All materials introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period; and
- If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*.

7(vii) Taking of, or harmful interference with, native flora or fauna

- Taking of, or harmful interference with, native flora or fauna is prohibited, except in accordance with a permit issued under Article 3 of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) Collection or removal of materials not brought into the Area by the Permit holder

- Material may be collected or removed from the Area only in accordance with a permit and should be limited to the minimum necessary to meet scientific or management needs.
- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorized, may be removed from any part of the Area, unless the impact of removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority must be notified and approval obtained.

7(ix) Disposal of waste

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

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

- carry out monitoring and Area inspection activities, which may involve the collection of a small number of samples or data for analysis or review;
- Erect, install or maintain structures or scientific equipment;
- Carry out protective measures.

7(xi) Requirements for reports

- The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and where possible within six months after the visit has been completed.
- Such reports should include, as appropriate, the information identified in the Visit Report form contained in Appendix 2 of the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas (Resolution 2 (2011)). If appropriate, the

national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.

- Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organizing the scientific use of the Area.
- The appropriate authority should be notified of any activities/measures undertaken, anything removed and/or of any materials released and not removed, that were not included in the authorized permit.

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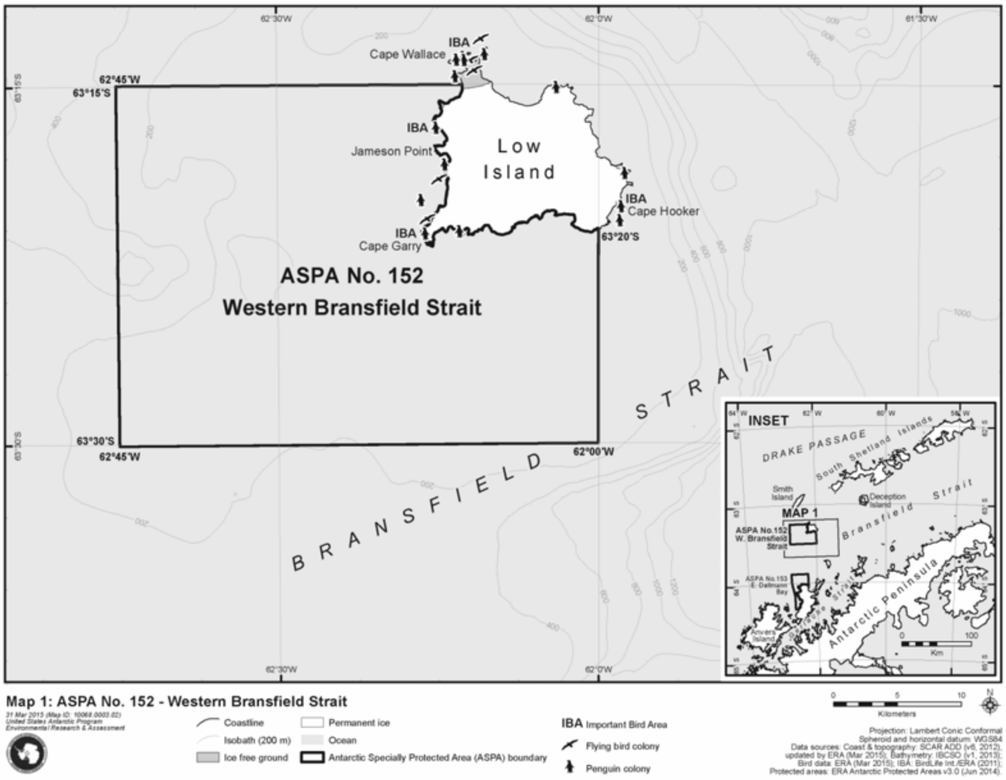

Map 1: ASPA No. 152 - Western Bransfield Strait

Measure 10 (2015)

Antarctic Specially Protected Area No 153 (Eastern Dallmann Bay): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty providing for the designation of Antarctic Specially Protected Areas ("ASPA") and approval of Management Plans for those Areas;

Recalling

- Recommendation XVI-3 (1991), which designated East Dallmann Bay, off Brabant Island as Site of Special Scientific Interest ("SSSI") No 36 and annexed a Management Plan for the Site;
- Measure 3 (2001), which extended the expiry date of SSSI 36 from 31 December 2001 to 31 December 2005;
- Decision 1 (2002), which renamed and renumbered SSSI 36 as ASPA No 153;
- Measures 2 (2003) and 11 (2009), which adopted revised Management Plans for ASPA 153;

Recalling that Recommendation XVI-3 (1991) has not become effective and was withdrawn by Measure 10 (2009);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 153;

Desiring to replace the existing Management Plan for ASPA 153 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 153 (Eastern Dallmann Bay), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 153 annexed to Measure 11 (2009) be revoked.

Management Plan for Antarctic Specially Protected Area No. 153

EASTERN DALLMANN BAY

Introduction

This Area is located off the western and northern coasts of Brabant Island, Palmer Archipelago, between 64°00'S and 64°20'S; 62°50'W and the western coast of Brabant Island, and is fully marine. Approximate area: 610 km^2. Designation on the grounds that the shallow shelf in this region near Brabant Island is one of only two known sites in the vicinity of Palmer Station (US) that are suitable for bottom trawling for fish and other benthic organisms (see also ASPA No. 152 Western Bransfield Strait). The benthic fauna of the site is of exceptional scientific interest and the area provides an important habitat for juvenile fish. Proposed by the United States of America: adopted by Recommendation XVI-3 (Bonn, 1991: SSSI No. 36); date of expiry extended by Measure 3 (2001); renamed and renumbered by Decision 1 (2002); revised management plan adopted by Measure 2 (2003) and Measure 11 (2009). The Area is approved under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) in accordance with Decision 9 (2005).

The Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) classifications are based on terrestrial criteria, and therefore have limited applicability in marine environments.

1. Description of values to be protected

Eastern Dallmann Bay (between latitudes 64°00'S and 64°20'S and from longitude 62°50'W eastward to the western shore of Brabant Island, approximately 610 km^2) was originally designated as a Site of Special Scientific Interest through Recommendation XVI-3 (1991, SSSI No. 36) after a proposal by the United States of America. It was designated on the grounds that “the shallow shelf west of East Dallmann Bay is one of only two known sites near Palmer Station that are suitable for bottom trawling for fish and other benthic organisms. The Site and, in particular, its benthic fauna, are of exceptional scientific interest and require long-term protection from harmful interference”. Together with Western Bransfield Strait (ASPA No. 152), the Area is used in over 90 percent of specimen collections carried out by US researchers who are actively studying such fish communities within the region (Detrich pers. comm. 2009 and 2015).

The boundaries of the Area were revised by Measure 2 (2003) to focus more specifically on the shallow shelf down to 200 m depth to the west and north of Brabant Island, while the deeper water of Dallmann Bay to the west has been excluded. The boundaries of the Area at Dallmann Bay are between latitudes 63°53'S and 64°20'S and longitudes 62°16'W and 62°45'W and are defined in the east by the shoreline of Brabant Island, encompassing an area of approximately 610 km^2 (Map 1).

The Area continues to be considered important for obtaining scientific samples of fish and other benthic organisms, and the original reasons for designation are reaffirmed in the current Management Plan. In addition, the Area is an important habitat for juvenile fish species, including the rockcod *Notothenia coriiceps* and the icefish *Chaenocephalus aceratus*. Fish have been collected from the Area by scientists from Palmer Station since the early 1970s. The Area is within the research area of the Palmer Long Term Ecological Research (LTER) Program. Fish collected from the Area are used in the study of biochemical and physiological adaptations to low temperatures. Some of the fish collected have been used for comparative studies with the more heavily impacted Arthur Harbour area scientific research is also being undertaken on the benthic faunal communities.

2. Aims and objectives

Management at Eastern Dallmann Bay aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance;
- allow scientific research on the marine environment while ensuring protection from over-sampling;
- allow other scientific research within the Area provided it will not compromise the values for which the Area is protected;
- allow visits for management purposes in support of the aims of the management plan.

3. Management activities

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

- A map showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently and copies of this Management Plan shall be made available at Palmer Station (US);
- National programs shall ensure the boundaries of the Area and the restrictions that apply within are marked on relevant maps and marine charts for which they are responsible;
- Copies of this Management Plan shall be made available to vessels traveling in the vicinity of the Area;
- Buoys, or other markers or structures installed within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer needed;
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.

4. Period of designation

Designated for an indefinite period.

5. Maps and photographs

Map 1: ASPA No. 153 Eastern Dallmann Bay bathymetric map. Coastline and terrestrial contour data are derived from the SCAR Antarctic Digital Database Version 6.0 (2012). Bathymetry is derived from the International Bathymetric Chart of the Southern Ocean (IBCSO) v1.0 (2013). Bird data: ERA (2015). Important Bird Areas: BirdLife International/ERA (Harris *et al.* 2011). Historic Sites and Monuments: ATS, updated by ERA (2014).
Map specifications: Projection: Lambert Conformal Conic; Standard parallels: 1st 64° 00' S; 2nd 64° 30' S; Central Meridian: 62° 30' W; Latitude of Origin: 65° 00' S; Spheroid and horizontal datum: WGS84; Horizontal accuracy: maximum error of ±300 m. Vertical contour interval 100 m, vertical accuracy to within ±50 m. Isobath 200 m.

Inset: the location of Map 1, ASPA No. 153 Eastern Dallmann Bay, Antarctic Peninsula, showing the nearest protected area, ASPA No. 152 Western Bransfield Strait.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

General description

Dallmann Bay (between latitudes 64°00'S and 64°20'S and from longitude 63°15'W eastward to the western shore of Brabant Island) is situated approximately 65 km west of the Antarctic Peninsula, between Brabant Island and Anvers Island, with Bransfield Strait to the north and Gerlache Strait to the south (Map 1). Brabant Island is predominantly ice-covered, with a high north-south mountain chain, which rises to 2520 m at Mount Parry and falls steeply to the sea on the western coast (Smellie *et al.* 2006). The western coastline is characterized by rock and ice cliffs and ice-free headlands, interspersed by steep boulder and narrow pebble beaches. Rock platforms are exposed at low tide in various locations north of Driencourt Point (Map 1), which field surveys carried out in January 2002 suggest are part of a much larger outcrop of volcanic rock, which extends approximately 10 km from Brabant Island and was formed by two phases of phreatomagmatic volcanism during the Late Quaternary (Smellie *et al.* 2006). Numerous rocky islets extend several kilometers offshore, including Astrolabe Needle (104 m) which stands one kilometer offshore, two kilometers south of Claude Point. West of Brabant Island the sea floor slopes moderately from the intertidal zone to depths of approximately 200 m before the slope eases to depths of 400-500 m beyond the western boundary of the Area. The gradient from the shore down to 200 m slopes more gently in the north of the Area. The Area lies mostly within the 200 m depth contour west and north of Brabant Island (Map 1). The sea floor in the Area is generally composed of a matrix of soft sand, mud and cobbled-rock.

Boundaries

The designated Area is defined in the south by latitude 64°20'S, extending from Fleming Point westward for two kilometers to 62°40'W. From this location, the western boundary extends due north on longitude 62°40'W for 18.5 km to 64°10'S, SSW of Astrolabe Needle. The western boundary then extends NNW almost 19 km to 62°45'W, 64°00'S. The western boundary then extends approximately 13 km due north on longitude 62°45'W to latitude 63°53'S, the northern boundary of the Area. The northern boundary extends along latitude 63°53'S from 62°45'W to 62°16'W, being a distance of approximately 23.4 km. The eastern boundary extends due south approximately 16 km from 62°16'W, 63°53'S to the eastern extremity of Pasteur Peninsula, Brabant Island, at 62°16'W, 64°02'S. From there, the eastern boundary is defined as the mean high water mark of the northern and western coastline of Brabant Island, which includes the intertidal zone within the Area. The Area is 50 km from north to south and extends up to a maximum of 23.4 km east-west. West of Brabant Island the width of the Area ranges between 10 km (at Guyou Bay) and 1.5 km (near Claude Point). The total area is approximately 610 km^2.

Oceanography, marine geology and climate

Regional winds are predominantly from the NNW, resulting in a southward flowing coastal current along the western Antarctic Peninsula (Hofmann *et al.* 1996). Coupled with the northward flow of the Antarctic Circumpolar Current, this results in a generally clockwise oceanic circulation along the western Antarctic Peninsula (Dinniman and Klinck

2004; Ducklow *et al.* 2007). Within Bransfield Strait, a cyclonic circulation predominates, with the two main currents (the Gerlache Strait Current and the Bransfield Strait Current) originating from the south of Brabant Island (Zhou *et al.* 2002, 2006). Drifters deployed as part of RACER (Research on Antarctic Coastal Ecosystems and Rates) between 1988 and 1990 suggest an east – west flow within the northern part of the Area and the formation of eddies between Metchnikoff Point and Astrolabe Needle (Zhou *et al*. 2002). Tidal variation on Brabant Island is almost two meters and observations made while fishing indicate strong near-shore currents (Furse 1986).

Measurements made between 20th January and 9th February 2001 indicated that ocean temperatures in the Area were 1.8 to 1.9 º C at a depth of 5 m and at 150 m depth, temperatures reached 0.3 to 0.45 ºC (Catalan *et al.* 2008). Measurements carried out between 11th June and 16th July 2001 suggested that water temperatures in the Area ranged between –0.8 to –1.1°C at depths of 100–200 m (Eastman and Lannoo 2004). Water salinity within the Area ranged between 33.84 and 34.04 psu at 5 m, whilst at 150 m depth salinity values were 34.42 -34.45 psu (Catalan *et al.* 2008). Sea ice coverage averages approximately 140 days per year within Eastern Dallmann Bay and persists for approximately 82% of the winter period (Stammerjohn *et al.* 2008). Sea ice concentrations show considerable interannual variability, which has been linked to phase changes in ENSO and the Southern Annular Mode (SAM) (Stammerjohn *et al.* 2008).

Seismic measurements from the Seismic Experiment in Patagonia and Antarctica (SEPA) geodetic monitoring network indicate a significant earthquake activity within the Area, particularly to the north of Brabant Island, which is thought to result from the intersection of the Hero Fracture Zone with the South Shetland Platform at Smith Island (Maurice *et al.* 2003).

Marine biology

The Area supports a rich benthic community including numerous fish species, invertebrates, and marine plants and the Area is an important habitat for juvenile fish species. Fish commonly collected within a depth range of 80 to 200m at Eastern Dallmann Bay include *Gobionotothen gibberifrons (formely Notothenia gibberifrons), Chaenocephalus aceratus, Champsocephalus gunnari*, *Pseudochaenichthys georgianus* and *Chionodraco rastrospinosus* (Eastman and Lannoo 2004; Dunlap *et al.* 2002). In addition to more common species, trawls carried out between 15th June and 4th July 2001 collected numerous specimens of *Lepidonotothen larseni, Lepidonotothen nudifrons Notothenia rossii* and *Notothenia coriiceps* and examples of *Parachaenichthys charcoti, Chaenodraco wilsoni, Dissostichus mawsoni, Trematomus eulepidotus* and *Lepidonotothen squamifrons* (Eastman and Sidell 2002; Grove and Sidell 2004). Specimens of *Trematomus newnesi* and *Gymnodraco acuticeps* have been collected occasionally within the Area (Hazel and Sidell 2003; Wujcik *et al*. 2007). Larval species recorded in the Area include *Artedidraco skottsberg, Gobionotothen gibberifrons, Lepidonotothen. nudifrons* and *Pleuragramma antarcticum* (Sinque *et al.* 1986; Loeb *et al.* 1993).

Invertebrates collected within the Area have included varieties of sponge, anemone, annelid, mollusc, crustacean, asteroid, ophiuroid, echinoid, holothurioid and tunicate. Acoustic echo-sounding was used to measure aggregations of Antarctic krill (*Euphausia superba*) within the Area during cruises between 1985 and 1988 (Ross *et al.* 1996). Aggregations were generally recorded in the upper 120 m of the water column. The lowest numbers of aggregations were observed in early spring, increasing to a maximum in late summer and early winter and spawning occurs from November to March (Zhou *et al.*

2002). The Area provides a food-rich nursery for krill, which may become entrained within the Area by eddy currents.

Birds

Two colonies of chinstrap penguins (*Pygoscelis antarctica*) have been recorded on the northwestern coast of Brabant Island immediately adjacent to the Area. Approximately 5000 breeding pairs were counted at Metchnikoff Point and approximately 250 pairs at Claude Point in 1985 (Woehler 1993). Colonies of Antarctic fulmars (*Fulmarus glacialoides*) have been observed at three locations along the coast of Brabant Island (Poncet and Poncet, unpublished data: in Harris 2006) and 1000 breeding pairs were estimated to be nesting along Cape Cockburn cliffs in 1987, at the northeastern boundary of the Area (Creuwels *et al*. 2007). Antarctic shags (*Phalacrocorax* [atriceps] *bransfieldensis)* have been observed to nest at four locations along the western coast of Brabant Island (Poncet and Poncet, unpublished data from Jan-Feb 1987, in Harris 2006). Other birds observed breeding on the western coast of Brabant Island and frequenting the Area are: Antarctic terns (*Sterna vittata*), black-bellied storm petrels (*Fregetta tropica*), brown skuas (*Catharacta antarctica*), cape petrels (*Daption capense*), greater sheathbills (*Chionis alba*), kelp gulls (*Larus dominicanus*), snow petrels (*Pagodroma nivea*), south polar skuas (*Catharacta maccormicki*) and Wilson's storm petrels (*Oceanites oceanicus*) (Parmelee and Rimmer 1985; Furse 1986). Antarctic petrel (*Thalassoica antarctica*), black-browed albatross (*Diomedea melanophris*), southern giant petrel (*Macronectes giganteus*) commonly forage in the Area (Furse 1986).

Marine mammals

Numerous marine mammals were observed in Dallmann Bay between January 1984 and March 1985 (Furse 1986). Humpback whales (*Megaptera novaeangliae*) were the most frequently sighted whale species, with possible sightings of killer whales (*Orcinus orca*) off Metchnikoff Point in May and June 1985. Satellite tracking of humpback whales between January 2004 and January 2006 indicated that numerous animals passed through the Area and foraged within it, with the broader Gerlache Strait region being identified as an important feeding ground for humpback whales (Dalla Rosa *et al.* 2008). Minke whales have been sighted within the Area, to the north of Brabant Island, during the austral summer (Dec – Feb) (Scheidat *et al.* 2008).

Crabeater seals (*Lobodon carcinophagus*), southern elephant seals (*Mirounga leonina*), numerous Antarctic fur seals (*Arctocephalus gazella*), leopard seals (*Hydrurga leptonyx*) and Weddell seals (*Leptonychotes weddellii*), were observed in the Area from Metchnikoff Point (Furse 1986).

Human activities / impacts

Numerous research cruises along the western Antarctic Peninsula have included sampling stations within the Area for oceanographic and/or biological research. Fish collected within the Area have been used for a variety of biochemical, genetic and physiological research. Studies of icefish biochemical processes have included: studies of the adaptations in fish that enable proteins to function at low temperatures (Dunlap *et al.* 2002; Cheng and Detrich 2007); the adaptations of muscle structure and energy metabolism, including the processing of fatty acids to low temperatures (Hazel and Sidell 2003; Grove and Sidell 2004; O'Brien *et al.* 2003); the influence of hydrostatic pressure on enzyme function within fish livers (Ciardiello *et al*. 1999) and efficient genome transcription at low water temperatures (Lau *et al*. 2001; Magnoni *et al*. 2002). Numerous studies have investigated icefish morphology, including; research into the cardiovascular adaptations of icefish, in compensation for their complete lack of haemoglobin (Wukcik *et al*. 2007; Sidell and O'Brien 2006); the histology and anatomy of the sense organs and brains of icefish (Eastman and Lannoo 2004); and neutral buoyancy of icefish in relation to their life histories and skeletal structure (Eastman and Sidell 2002).

Specimens collected during trawls in March and April 1991, 1992, and 1993 were used in comparative studies of polynuclear aromatic hydrocarbon (PAH) contamination in fish with those collected from Arthur Harbor and the effects of Diesel Fuel Arctic (DFA) on *Notothenia gibberifrons* (now *Gobionotothen gibberifrons*) (McDonald *et al.* 1995; Yu *et al*. 1995). The former study found levels of contamination in fish sampled from the Area were considerably lower than those sampled from the vicinity of the 1989 *Bahia Paraiso* wreck in Arthur Harbor and that fish captured near US scientific stations are exposed to PAH, albeit low levels (McDonald *et al*. 1992 and 1995). However concentrations of PAH were higher than had been expected in fish collected from within the Area, with levels found to be similar to those in fish sampled from near Old Palmer Station.

Specimens have been regularly collected in recent years (2008, 2009, 2010, 2011) for further research related to biochemical processes in icefish (Cuellar *et al*. 2014, Devor 2013, Mueller *et al*. 2011, Mueller *et al*. 2012, Teigen 2014).

A British Joint Services Expedition involving 35 team members spent one year on Brabant Island from January 1984 to March 1985 (Furse 1986). Several camps and numerous caches were established along the western coastline, including a main base camp at Metchnikoff Point. Some of the camp structures, equipment and supplies were abandoned following the expedition, although their status in 2015 is unknown. The level of impact of the expedition on the adjacent marine environment is also unknown.

The Brabant Island – Anvers Island region is a popular destination for tourism. Data on tourist visits compiled by the US National Science Foundation show that since the Area was first designated in 1991 a number of tour vessels have visited Dallmann Bay, and more specifically Metchnikoff Point. Tourist activity in the vicinity since original designation is summarised in Table 1. It is not clear where in Dallmann Bay the reported tourist visits took place, although it is thought that ship activity occurs predominantly within western Dallmann Bay, specifically along the coast of Anvers Island and close to the Melchior Islands (Crosbie pers. comm. 2008). In February 2010 a vessel collided with and injured a humpback whale during approach to Dallmann Bay (Liggett *et al*. 2010). It remains necessary, however, to move through the Area to gain access to Metchnikoff Point by sea.

Table 1. Tourism activity in the vicinity of ASPA No. 153, Eastern Dallmann Bay, 1991–92 to 2007–08. Numbers given in brackets indicate activity at Metchnikoff Point.

Year	No. of vessels	Total No. of Visitors	Small-boat cruise (pax)	Small-boat landing (pax)	Helicopter flight	Kayaking	Scuba diving
1991-92	(1)		(12)				
1992-93							
1993-94	1		84				
1994-95							
1995-96	2		104				
1996-97	1		70				
1997-98	(1)			(55)			
1998-99	(1)			(2)			

1999-00	2		102				
2000-01	0		0				
2001-02	(1)		0 (96)				
2002-03	0		0				
2003-04	0	0	0	0	0	0	0
2004-05	1	56	0	0	0	0	0
2005-06	7	1399	467	0	0	107	0
2006-07	8	1232	318	0	0	101	0
2007-08	8	10,068	61	0	0	0	0
2008-09	9	6545	170	0	0	0	0
2009-10	9	13,759	107	0	0	0	0
2010-11	9	2402	103	0	26	0	14
2011-12	4	2131	78	0	0	0	0
2012-13	8	3715	0	4	0	0	0
2013-14	9	3558	29	0	0	0	0

6(ii) Access to the Area

Access into the Area is generally by ship from Bransfield Strait, or from the direction of Gerlache Strait to the south, or from the Drake Passage in the west and through Dallmann Bay. Vessels may transit through the Area, although anchoring shall be avoided except in compelling circumstances. Access into the Area may be made by air or over sea ice when conditions allow. Access routes into or within the Area have not been defined.

6(iii) Location of structures within and adjacent to the Area

There are no structures known to be within the Area. Structures and other material from the UK Joint Services Expedition to Brabant Island (January 1984 to March 1985) may remain on the western shores of Brabant Island, particularly at Metchnikoff Point. The nearest stations are President González Videla (Chile), approximately 55 km south in Paradise Harbour; Port Lockroy (UK), approximately 75 km south-west on Goudier Island, Yelcho (Chile), approximately 80 km south-west on Doumar Island; and Palmer (US), approximately 90 km SW on Anvers Island.

6(iv) Location of other protected areas in the vicinity

The nearest protected area to Eastern Dallmann Bay is Western Bransfield Strait (ASPA No. 152), which lies about 45 km to the north. Antarctic Specially Managed Area No. 7 Southwest Anvers Island and Palmer Basin lies approximately 80 km to the southwest on the southern coast of Anvers Island (Map 1).

6(v) Special zones within the Area

None.

7. Terms and conditions for entry permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

- it is issued only for scientific purposes, or for educational purposes that cannot be served elsewhere, or for reasons essential to the management of the Area;
- the actions permitted are in accordance with the Management Plan;

- the activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the environmental and scientific values of the Area;
- the Permit shall be issued for a finite period;
- the Permit, or a copy, shall be carried when in the Area.

7(ii) Access to, and movement within or over, the Area

Access into the Area shall be by sea, over sea ice or by air. There are no specific restrictions on routes of access to or movement within the Area, although movements should be kept to the minimum necessary consistent with the objectives of any permitted activity. Every reasonable effort should be made to minimize disturbance. Vessels may transit through the Area, although anchoring shall be avoided except in compelling circumstances. There are no special overflight restrictions and aircraft may land by Permit when sea ice conditions allow, although pilots should take into account the bird breeding colonies present along the eastern boundary of the Area on the Brabant Island coast (Map 1).

7(iii) Activities that may be conducted in the Area

- Scientific research that will not jeopardize the values of the Area;
- Essential operational activities of vessels that will not jeopardize the values of the Area, such as transit through, or stationing within, the Area in order to facilitate science or other activities, including tourism, or for access to sites outside of the Area;
- Essential management activities, including monitoring.

7(iv) Installation, modification or removal of structures

- No structures are to be erected within the Area except as specified in a permit and permanent structures or installations are prohibited.
- All structures, scientific equipment or markers installed in the Area must be authorized by permit and clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area.
- Installation (including site selection), maintenance, modification or removal of structures shall be undertaken in a manner that minimizes disturbance to flora and fauna.
- Removal of specific equipment for which the permit has expired shall be the responsibility of the authority which granted the original Permit, and shall be a condition of the permit.

7(v) Location of field camps

None.

7(vi) Restrictions on materials and organisms which may be brought into the Area

In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the area are:

- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. Precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area);
- Visitors shall ensure that sampling equipment and markers brought into the Area are clean. To the maximum extent practicable, equipment to be used within the area shall be thoroughly cleaned before entering the Area. Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011);
- No pesticides shall be brought into the Area;
- Fuel, food, chemicals and other materials shall not be stored in the Area, unless specifically authorized by permit, and shall be stored and handled in a way that minimizes the risk of their accidental introduction into the environment;
- All materials introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period; and
- If release occurs which is likely to compromise the values of the Area, removal is encouraged only where the impact of removal is not likely to be greater than that of leaving the material *in situ*.

7(vii) Taking of, or harmful interference with, native flora or fauna

- Taking of, or harmful interference with, native flora or fauna is prohibited, except in accordance with a permit issued under Article 3 of Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) The collection or removal of materials not brought into the Area by the Permit holder

- Material may be collected or removed from the Area only in accordance with a permit and should be limited to the minimum necessary to meet scientific or management needs.
- Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorized, may be removed from any part of the Area, unless the impact of removal is likely to be greater than leaving the material *in situ*. If this is the case the appropriate authority must be notified and approval obtained.

7(ix) Disposal of waste

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

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

1. **Carry out monitoring and Area inspection activities, which may involve the collection of a small number of samples or data for analysis or review;**
2. **Erect, install or maintain structures or scientific equipment;**
3. **Carry out protective measures.**

7(xi) Requirements for reports

- The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and where possible within six months after the visit has been completed.
- Such reports should include, as appropriate, the information identified in the Visit Report form contained in Appendix 2 of the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas (Resolution 2 (2011)). If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.
- Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organizing the scientific use of the Area.
- The appropriate authority should be notified of any activities/measures undertaken, anything removed and / or of any materials released and not removed, that were not included in the authorized permit.

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Map 1: ASPA No. 153 - Eastern Dallmann Bay

31 Mar 2015 (Map ID:10068.0002.02)
United States Antarctic Program
Environmental Research & Assessment

Coastline
Contour (250 m)
Isobath (200 m)
Ice free ground
Permanent ice
Ocean
Protected area boundary
Historic Site & Monument
IBA Important Bird Area
Flying bird colony
Penguin colony

0 5 10
Kilometers

Projection: Lambert Conformal Conic
Spheroid and horizontal datum: WGS84
Data sources: Coast & topography: SCAR ADD (v4.1 2005, v6, 2012); Bathymetry: IBCSO (v1, 2013);
Bird data: ERA (Mar 2015); IBA: BirdLife Int./ERA (2011);
Protected areas: ERA Antarctic Protected Areas v3.0 (Jun 2014);
HSM: ATS, revised by ERA (Jun 2014).

Measure 11 (2015)

Antarctic Specially Protected Area No 155 (Cape Evans, Ross Island): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty providing for the designation of Antarctic Specially Protected Areas ("ASPA") and approval of Management Plans for those Areas;

Recalling

- Measure 2 (1997), which designated the Cape Evans Historic Site and its environs as a Specially Protected Area ("SPA") No 25 and annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 25 as ASPA 155;
- Measures 2 (2005), 12 (2008) and 8 (2010), which adopted revised Management Plans for ASPA 155;

Recalling that Measure 2 (1997) has not become effective and was withdrawn by Measure 8 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 155;

Desiring to replace the existing Management Plan for ASPA 155 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:
1. the revised Management Plan for Antarctic Specially Protected Area No 155 (Cape Evans, Ross Island), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 155 annexed to Measure 8 (2010) be revoked.

Management Plan For Antarctic Specially Protected Area No. 155

CAPE EVANS, ROSS ISLAND

(including Historic Site and Monument Nos. 16 and 17, the historic *Terra Nova* hut of Captain Robert Falcon Scott and its precincts and the Cross on Wind Vane Hill)

1. Description of Values to be protected

The significant historic value of this Area was formally recognised when it was listed as Historic Site and Monument Nos. 16 and 17 in Recommendation 9 (1972). An area containing both sites was designated as Specially Protected Area No. 25 in Measure 2 (1997) and redesignated as Antarctic Specially Protected Area 155 in Decision 1 (2002).

The *Terra Nova* hut (Historic Site and Monument No. 16) is the largest of the historic huts in the Ross Sea region. It was built in January 1911 by the British Antarctic *Terra Nova* Expedition of 1910-1913, led by Captain Robert Falcon Scott, RN. It was subsequently used as a base by the Ross Sea party of Sir Ernest Shackleton's Imperial Trans-Antarctic Expedition of 1914-1917.

Historic Site and Monument No. 17 consists of the Cross on Wind Vane Hill, erected in the memory of three members of Shackleton's Ross Sea party who died in 1916. In addition to this, two anchors from the ship *Aurora* of the Imperial Trans-Antarctic Expedition, two instrument shelters (one on Wind Vane Hill and the other near the *Terra Nova* hut), several supply dumps and numerous artefacts are distributed around the site.

Cape Evans is one of the principal sites of early human activity in Antarctica. It is an important symbol of the Heroic Age of Antarctic exploration and, as such, has considerable historical significance. Some of the earliest advances in the study of earth sciences, meteorology, flora and fauna in Antarctica are associated with the *Terra Nova* Expedition based at this site. The data collected can provide a bench mark against which to compare current measurements. The history of these activities and the contribution they have made to the understanding and awareness of Antarctica therefore contribute to both the historic and scientific value of the site.

A revised version of the Management Plan was adopted by means of Measure 2 (2005) and changes to the access and movement provisions were adopted by means of Measure 12 (2008) and Measure 8 (2010).

Cape Evans is situated in Environment S – McMurdo South Victoria Land geologic based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and in Region 9 – South Victoria Land based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)). Other protected areas within Environment S includes ASPA 105, 116, 121, 122, 123, 124, 131, 137, 138, 154, 156, 157, 158, 161, 172 and 175 and ASMA 2.

2. Aims and Objectives

The aim of the Management Plan is to provide protection for the Area and its features so that its values can be preserved. The objectives of the Management Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area;
- maintain the historic values of the area through planned conservation work which may include:

a. an annual ‘on-site’ maintenance programme,
b. a programme of monitoring the condition of artefacts and structures, and the factors which affect them, and
c. a programme of conservation of artefacts to be conducted on and off site;

- allow management activities which support the protection of the values and features of the Area including:

a. mapping and otherwise recording the disposition of historic items in the hut environs, and
b. recording other relevant historic data; and

- prevent unnecessary human disturbance to the Area, its features and artefacts through managed access to the *Terra Nova* hut.

3. Management Activities

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

- A regular programme of conservation work shall be undertaken on the *Terra Nova* hut and associated artefacts in the Area.
- Visits shall be made as necessary for management purposes.
- Systematic monitoring shall be put in place to assess the impacts of present visitor limits, and the results and any related management recommendations included in reviews of this Management Plan.
- National Antarctic Programmes operating in, or those with an interest in, the Area shall consult together with a view to ensuring the above management activities are implemented.
- Copies of this Management Plan, including maps of the Area, shall be made available at adjacent operational research/field stations.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map A: Cape Evans regional map. This map shows the boundaries of the Area with significant topographical features, field camp sites and helicopter landing sites. It also shows the approximate location of significant historical items within the area. Inset: Ross Island showing sites of nearby protected areas and stations.

Map B: Cape Evans site map. This map shows the approximate location of specific historic artefacts and sites within the Area.

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

Cape Evans is a small, triangular shaped, ice-free area at the south west of Ross Island, 10 kilometres to the south of Cape Royds and 22 kilometres to the north of Hut Point Peninsula on Ross Island. The ice-free area is composed of till-covered basalt bedrock. The designated Area is located on the north western coast of Cape Evans adjacent to Home Beach and centered on Scott's *Terra Nova* hut. The boundaries of the ASPA are:

- South: a line extending east from a point at 77º 38' 15.47" S, 166º 25' 9.48" E – 20 metres south of the cross on Wind Vane Hill;
- South-west: a line from the reference point above extended to follow the crest of the small ridge descending in a north westerly direction to the shoreline at 77º 38' 11.50" S, 166º 24' 49.47" E;
- North-west: by the shoreline of Home Beach;
- North-east: by the line of the outlet stream from Skua Lake to Home Beach at 77º 38' 4.89" S, 166º 25' 13.46" E;
- East: by the line extending south from the western edge of Skua Lake at 77º 38' 5.96" S, 166º 25' 35.74" E – to intersect with the southern boundary at 77º 38' 15.48" S, 166º 25' 35.68" E.

Skua (*Catharacta maccormicki*) nest at Cape Evans and Adelie penguins (*Pygoscelis adeliae*) from the colony at Cape Royds may occasionally transit the Area. Weddell seals (*Leptonychotes weddellii*) have also been seen hauled out on Home Beach.

6(ii) Access to the Area

When safe conditions exist, vehicle approach to the Area can be made across the sea ice. Vehicles are prohibited from entering the Area, unless approved to do so for management activities in accordance with 7(i) below. During open water, landings by boat may be made directly in front of the hut at Home Beach. Helicopter landings may be made at either of the existing designated landing sites marked on Maps A and B. One site is approximately 100 metres to the north of the hut, just outside the Area. The other is located adjacent to the New Zealand refuge hut approximately 250 metres beyond the south western boundary of the Area.

6(iii) Location of structures within and adjacent to the Area

All structures located within the Area are of historic origin, although a temporary, modern protective enclosure around the magnetic hut remains in place. A major feature of the Area is Scott's *Terra Nova* hut located on the north western coast of Cape Evans at Home Beach. The hut is surrounded by many historic relics including the two anchors from the *Aurora*, dog skeletons, an instrument shelter, two dog lines, meteorological screen, fuel dump, magnetic hut, coal stores, a flag pole and the experimental rock hut/rubbish dump which is an historic rock structure linked with the 'Worst Journey in the World' to Cape Crozier (1911) containing a small collection of artefacts. A memorial cross to three members of Shackleton's Ross Sea party of 1914-1917 stands on Wind Vane Hill. All these features are included within the boundaries of the Area.

A New Zealand refuge hut, camp site and helicopter landing site are situated approximately 250m to the south west of the Area.

The former Greenpeace year-round World Park Base was sited to the north east of Scott's *Terra Nova* hut from 1987 to 1992. No visible sign of the base remains.

6(iv) Location of other Protected Areas in the vicinity

- ASPA 121 (previously SSSI No. 1), Cape Royds, and
- ASPA 157 (SPA No. 27), Backdoor Bay, Cape Royds are 10 kilometres north of Cape Evans.
- ASPA 122 (SSSI No. 2), Arrival Heights and
- ASPA 158 (SPA No. 28), Hut Point are approximately 22 kilometres south of Cape Evans at Hut Point Peninsula.
- ASPA 130 (SSSI No. 11), Tramway Ridge is approximately 20 kilometres east of Cape Evans.

All sites are located on Ross Island.

6(v) Special Zones within the Area

There are no special zones within the Area.

7. Terms and Conditions for Entry Permits

Entry to the Area is prohibited except in accordance with a Permit. Permits shall be issued only by appropriate national authorities and may contain both general and specific conditions. A Permit may be issued by a national authority to cover a number of visits in a season. Parties operating in the Area shall consult together and with groups and organisations interested in visiting the Area to ensure that visitor numbers are not exceeded. Permits to enter the site may be issued for a stated period for:

- activities related to conservation, research and/or monitoring purposes;
- management activities in support of the objectives of this Plan;
- activities related to educational or recreational activities including tourism, providing they do not conflict with the objectives of this Plan; and
- any other activity specifically provided for in this Plan.

7(i) Access to and movement within or over the Area

- Control of movement within the Area is necessary to prevent damage caused by crowding around the many vulnerable features within the Area. The maximum number in the Area at any time (including guides and those within the hut) shall be: **40 people**.
- Control of numbers within the hut is necessary to prevent damage caused by crowding around the many vulnerable features within the hut. The maximum number within the hut at any time (including guides) shall be: **8 people**.
- Avoidance of cumulative impacts on the interior of the hut requires an annual limit on visitor numbers. The effects of the current visitor levels (average 1042 per year between 1998/99 and 2013/14) suggest that a significant increase could cause significant adverse impacts. The maximum annual number of visitors shall be: **2,000 people**.

- These limits have been set based on current visitor levels and on the best advice available from conservation advisory agencies (which include conservators, archaeologists, historians, museologists and other heritage protection professionals). The limits are based on the proposition that any significant increase in the current level of visitor numbers would be detrimental to the values to be protected. An ongoing monitoring programme to assess the effects of visitors is required to provide the basis for future reviews of the Management Plan, in particular whether the current limits on numbers of visitors are appropriate.
- Adequate supervision of visits to the Area is necessary to prevent damage caused by crowding and by actions inconsistent with the Code of Conduct set out in section 7(ii). All tourism, educational and recreational visits must be supervised by an experienced guide nominated by the operator (refer section 7(ix)).
- Helicopter landings are prohibited within the Area as they have the potential to damage the site by blowing scoria and ice particles and to accelerate the abrasion of the hut and surrounding artefacts. Refer to section 6(ii) for recommended approaches and landing sites.
- Vehicles are prohibited from entering the Area except where it is necessary to use vehicles for management activities. This may include, but is not limited to activities such as clearing snow and ice that is judged to be a threat to the historic hut or other artefacts. In all such cases consideration shall be given to:

i. using the minimum sized vehicle required for the job;

ii. ensuring the vehicle operator is fully trained and aware of the provisions of this Plan, and of the sensitivities at the site of operation of the vehicle;

iii. careful planning and monitoring of all vehicle movements within the site so as to avoid damage to either the hut or artefacts buried beneath accumulated snow and ice.

7(ii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- visits for conservation purposes;
- educational and/or recreational visits including tourism; and
- scientific activity which does not detract from the values of the Area.

Visitors should adhere to the following Code of Conduct, except where conservation, research, monitoring or management activities specified in the Permit require otherwise:

- Thoroughly clean grit and scoria, ice and snow from boots using the brushes provided before entering the hut to reduce floor abrasion and only use tripods or monopods with flat bottomed rubber bases as opposed to those with metal spikes which can damage the floor;
- Remove any clothing made wet by sea water, and any sea ice crystals from boots, as salt particles accelerate corrosion of metal objects;
- Do not touch, move or sit on any items or furniture in the huts - handling artefacts causes damage;
- As many areas are cramped and artefacts can be accidentally bumped, do not wear packs inside and when the maximum number of visitors (8) are in the hut at one time the use of tripods or monopods is prohibited;
- When moving around the sites, take great care not to tread on any items which may be obscured by snow and remain on established walking tracks;

- Use of combustion style lanterns, naked flames or smoking in or around the hut is strictly forbidden as fire is a major risk; and
- Visits should be recorded in the book provided. This allows times and levels of visitation to be correlated with temperature and humidity data automatically logged inside the hut.

7(iii) Installation, modification or removal of structures

- No new structures are to be erected in the Area, or scientific equipment installed, except for conservation activities as specified in section 1.
- No historic structure shall be removed from the Area, unless specified in a Permit issued in accordance with the provisions of section 7(vii).

7(iv) Location of field camps

- Use of the historic hut for living purposes is not permitted. Camping is prohibited in the Area under any circumstances.
- An existing field camp site is associated with the two New Zealand field shelters located 250m south west of the Area and should be used by all parties intending to camp in this area. A second alternative field camp site is located to the north of the Area near the helicopter pad on Home Beach (Map A and B).

7(v) Restrictions on materials and organisms which may be brought to the Area

- No living animals, plant material, micro-organisms or soil shall be introduced to the Area. No food products shall be taken into the Area.
- Chemicals may only be introduced for permitted scientific or conservation purposes. Chemicals (including fuel) or other materials are not to be left in the Area, unless required for essential purposes connected with the conservation of the historic structures or associated relics.
- All introduced materials are to be removed when no longer required and before a date to be specified in the relevant Permit.

7(vi) Taking or harmful interference with native flora and fauna

- This activity is prohibited except in accordance with a Permit issued by the appropriate national authority specifically for that purpose under Article 3, Annex II to the Protocol on Environmental Protection.
- Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(vii) Collection or removal of anything not imported by the Permit holder

- Material may be collected and removed from the Area for conservation reasons consistent with the objectives of this Management Plan only when specified in a Permit issued by the appropriate national authority.
- Materials which pose a threat to the environment or human health may be removed from the Area for disposal, in accordance with a Permit, where they meet one or more of the following criteria:

i. the artefact presents a threat to the environment, wildlife or human health and safety;

ii. it is in such poor condition that it is not reasonably possible to conserve it;
iii. it does not contribute in any significant way to our understanding of the hut, its occupants or the history of Antarctica;
iv. it does not contribute to, or it detracts from, the visual qualities of the site or the hut, and/or;
v. it is not a unique or rare item;

and where such action is:

i. undertaken by parties with appropriate heritage conservation expertise; and
ii. part of an overall plan for conservation work at the site.

- National authorities should ensure that any removal of artefacts and assessment against the above criteria is carried out by personnel with appropriate heritage conservation expertise.
- Artefacts judged to be of high historic value, which cannot be conserved on site with currently available techniques, may be removed in accordance with a Permit for storage in a controlled environment until such time as they can safely be returned to the Area.
- Except with respect to any part of, or the contents of, an historic site or monument, samples of soil and other natural materials may be removed for scientific purposes. Such removal must be in accordance with an appropriate Permit.

7(viii) Disposal of waste

All human waste, grey water and other waste generated by work parties or visitors shall be removed from the Area.

7(ix) Measures that may be necessary to ensure that the aims and objectives of the Management Plan continue to be met

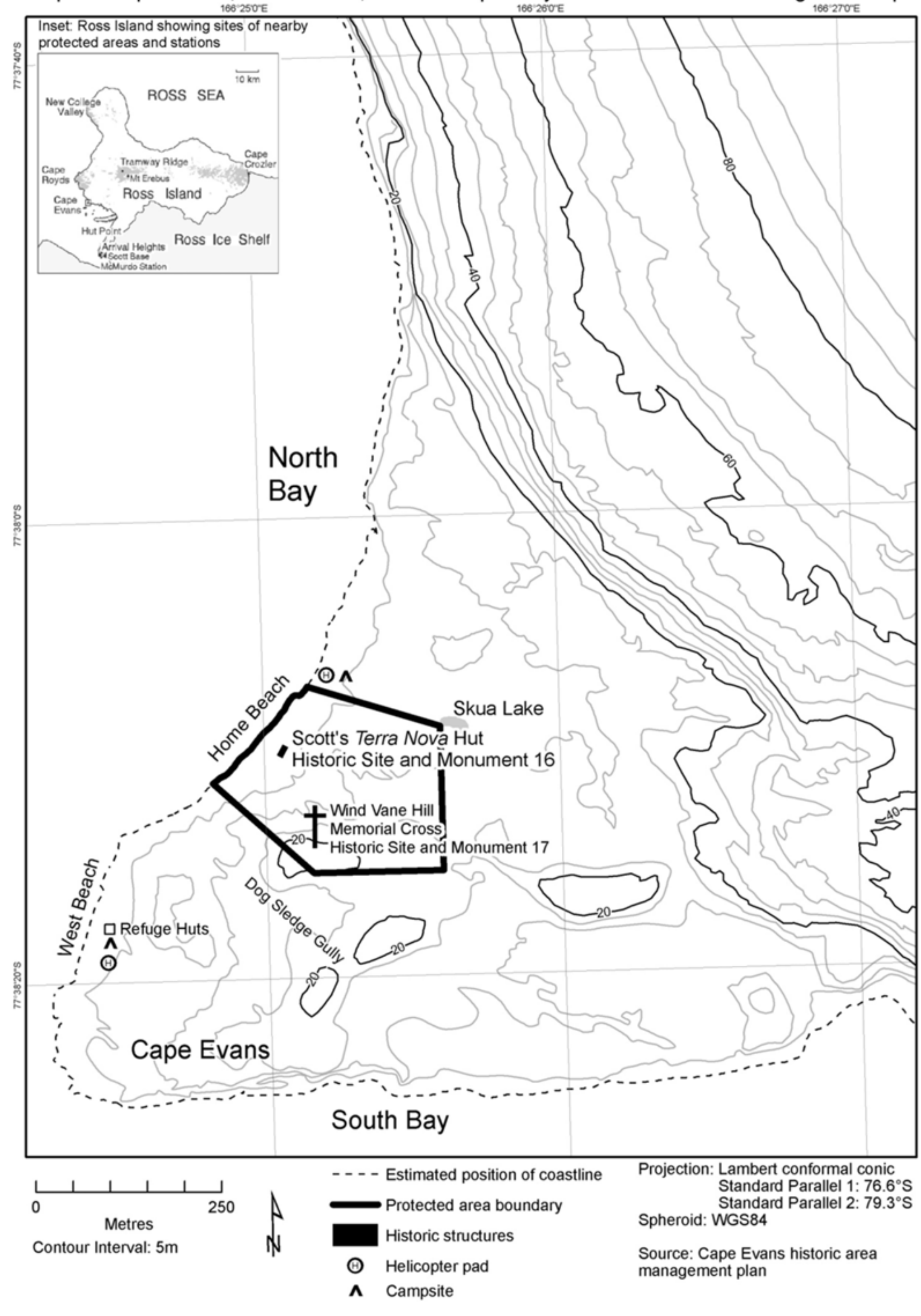
- The Permit, or an authorised copy, shall be carried within the Area.
- Information on the requirements of this Plan shall be provided to all visitors.
- The Code of Conduct set out in section 7(ii) shall be followed by all visitors, except where conservation, research, monitoring or management purposes require otherwise.
- Operators facilitating educational and recreational visits (including tourism) to the Area shall, prior to commencement of the summer season, nominate people with a working knowledge of both the site and this Management Plan to act as guides during visits.
- All educational and recreational visits (including tourism) shall be supervised by a nominated guide, who is responsible for briefing visitors on the Code of Conduct and the requirements of this Management Plan and ensuring they are complied with.
- Parties shall consult and coordinate to develop skills and resources, particularly those related to conservation techniques, to assist with the protection of the Area's values.

7(x) Requirements for reports

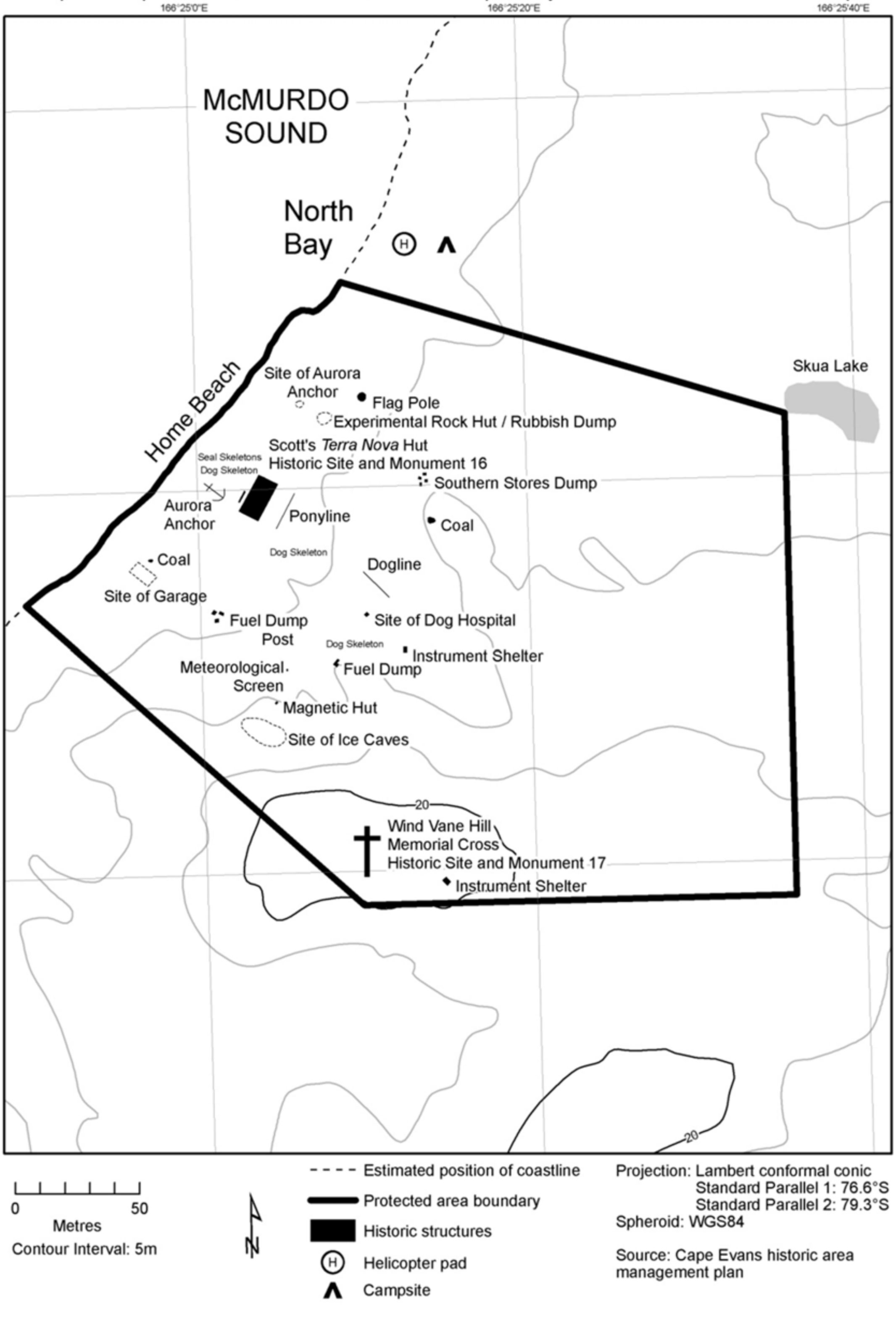
Parties shall ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports shall include, as appropriate, the information identified in the Visit Report provided in Appendix 4 of Resolution 2 (1998). In addition, any removal of materials in accordance with section 7(vii) shall be detailed, including the reason for removal and the current location of the items or the date of disposal. Any return of such items to the site shall also be reported.

Parties shall maintain a record of activities within the Area and, in the Annual Exchange of information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, in sufficient detail to allow an evaluation of the effectiveness of the Management Plan. Parties should wherever possible deposit originals or copies of such reports in a publicly accessible archive to maintain a record of visitation, to be used both for review of the Management Plan and in managing further visitation to the site.

Map A - Cape Evans, Ross Island, Antarctic Specially Protected Area 155: Regional Map



Map B - Cape Evans, Ross Island, Antarctic Specially Protected Area 155: Site Map



Measure 12 (2015)

Antarctic Specially Protected Area No 157 (Backdoor Bay, Cape Royds, Ross Island): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Measure 1 (1998), which designated the Cape Royds site as Specially Protected Area ("SPA") No 27 and annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 27 as ASPA 157;
- Measure 1 (2002), which adopted a revised Management Plan for ASPA 157;
- Measures 2 (2005) and 9 (2010), which adopted revised Management Plans for ASPA 157;

Recalling that Measure 1 (1998) had not become effective and was withdrawn by Measure 9 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 157;

Desiring to replace the existing Management Plan for ASPA 157 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No157 (Backdoor Bay, Cape Royds, Ross Island), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 157 annexed to Measure 9 (2010) be revoked.

Management Plan For Antarctic Specially Protected Area No. 157

BACKDOOR BAY, CAPE ROYDS, ROSS ISLAND

(including Historic Site and Monument No. 15, the historic hut of Sir Ernest Shackleton and its precincts)

1. Description of Values to be Protected

The significant historic value of this Area was formally recognised when it was listed as Historic Site and Monument No. 15 in Recommendation 9 (1972). It was designated as Specially Protected Area No. 27 in Measure 1 (1998) and redesignated as Antarctic Specially Protected Area 157 in Decision 1 (2002). The Management Plan was reviewed and a revised version with additional visitor management provisions was adopted by means of Measure 2 (2005) and Measure 9 (2010).

The hut (Historic Site and Monument No. 15) on which this Area is centered was built in February 1908 by the British Antarctic *Nimrod* Expedition of 1907-1909 which was led by Sir Ernest Shackleton. It was also periodically used by the Ross Sea party of Shackleton's Imperial Trans-Antarctic Expedition of 1914-1917.

Structures associated with the hut include stables, kennels, a latrine and a garage created for the first motor vehicle in Antarctica. Other significant relics in the Area include an instrument shelter, supply depots, and a rubbish site. Numerous additional artefacts are distributed around the Area.

Cape Royds is one of the principal areas of early human activity in Antarctica. It is an important symbol of the Heroic Age of Antarctic exploration and, as such, has considerable historical significance. Some of the earliest advances in the study of earth sciences, meteorology, flora and fauna in Antarctica are associated with the *Nimrod* Expedition which was based at this site. The history of these activities and the contribution they have made to the understanding and awareness of Antarctica give this Area significant scientific, aesthetic and historic value.

Cape Royds is situated in Environment S – McMurdo South Victoria Land geologic based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and in Region 9 – South Victoria Land based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)). Other protected areas within Environment S includes ASPA 105, 116, 121, 122, 123, 124, 131, 137, 138, 154, 155, 156, 158, 161, 172 and 175 and ASMA 2.

2. Aims and Objectives

The aim of the Management Plan is to provide protection for the Area and its features so that its values can be preserved. The objectives of the Management Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area;
- maintain the historic values of the Area through planned conservation work which may include:

a. an annual 'on-site' maintenance programme,

b. a programme of monitoring the condition of artefacts and structures, and the factors which affect them, and

c. a programme of conservation of artefacts conducted on and off site;

- allow management activities which support the protection of the values and features of the Area including:

a. mapping and otherwise recording the disposition of historic items in the hut environs, and

b. recording other relevant historic data;

- prevent unnecessary human disturbance to the Area, its features and artefacts through managed access to the *Nimrod* hut.

3. Management Activities

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

- A regular programme of conservation work shall be undertaken on the *Nimrod* hut and associated artefacts in the Area.
- Visits shall be made as necessary for management purposes.
- Systematic monitoring shall be put in place to assess the impacts of present visitor limits, and the results and any related management recommendations included in reviews of this Management Plan.
- National Antarctic Programmes operating in or those with an interest in, the Area shall consult together with a view to ensuring the above management activities are implemented.
- Copies of this Management Plan, including maps of the Area, shall be made available at adjacent operational research/field stations and will be provided to ships visiting the Area and vicinity.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map 1: ASPA No. 157 Backdoor Bay, Regional topographic map.
Projection: Lambert Conformal Conic; Standard parallels: 1st 77° 33' 30"S, 2nd 77° 33' 30"S: Central Meridian: 166° 10' 00"E; Latitude of origin: 78° 00' 00"S: Speheroid: WGS84.
Data sources:
The base map and contours are derived from an orthophotograph using aerial imagery acquired by USGS/DoSLI (SN7847) 16 November 1993 prepared at 1:2500 with a positional accuracy of ±1.25 m (horizontal) and ±2.5 m (vertical) and an on-ground pixel resolution of 0.4 m. Signposts: UNAVCO (Jan 2014). ASPA boundary: ERA (Jan 2014). Survey markers: LINZ (2011). Viewing areas and AWS (approx.): ERA (Jan 2014). Approximate penguin nesting area digitized from georeferenced aerial image acquired 19 Jan 2005 and supplied by P. Lyver, Landcare Research, Mar 2014. Contours (interval 10 m) and other infrastructure supplied by Gateway Antarctica (2009).

Inset 1: Ross Sea region, showing location of Inset 2.
Inset 2 Ross Island region, showing location of Map 1 and McMurdo Station (US) and Scott Base (NZ).

Map 2: ASPA No. 157 Backdoor Bay, Site topographic map. Map specifications as per Map 1, except the contour interval is 2 m.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Cape Royds is an ice free area at the western extremity of Ross Island, approximately 40 kilometers to the south of Cape Bird and 35 kilometers to the north of Hut Point Peninsula on Ross Island. The ice free area is composed of till covered basalt bedrock. The designated Area is located to the north east of Cape Royds adjacent to Backdoor Bay. It is immediately to the east of ASPA 121, an Adélie penguin colony. The Area is centered on Shackleton's *Nimrod* Expedition hut.

The eastern and southern boundary consists of the shoreline of the eastern coast of Cape Royds from an unmarked point in Backdoor Bay (77° 33' 07.5"S, 166° 10' 32.6"E) to an unmarked point in Arrival Bay (77° 33' 15.8"S, 166° 10' 06.6"E).

The western boundary follows the boundary of ASPA 121 from the coastline at Arrival Bay (77° 33' 15.8"S, 166° 10' 06.6"E) 18 metres north-west to a signpost at the southern end of the penguin viewing area (77°33´ 15.2" S, 166° 10´ 05.7" E), a further 74 metres to a signpost (77° 33' 12.9"S, 166° 10' 01.9"E) on the northern end of the penguin viewing area and a further 42 metres to a signpost (77° 33' 11.8"S, 166° 09' 59.0"E) east of Pony Lake.

The boundary then extends northwest from the signpost east of Pony Lake (77° 33' 11.8"S, 166° 09' 59.0"E) along a gully leading to an unmarked point (77° 33' 07.5" S, 166° 10' 12.9" E) adjacent to the New Zealand refuge hut.

The northern boundary extends due east from the New Zealand shelter (from the unmarked point at 77° 33' 07.5" S, 166° 10' 12.9" E) to the coastline of Backdoor Bay (77° 33' 07.5"S, 166° 10' 32.6"E).

Skua (*Catharacta maccormicki)* nest in the vicinity of the Area and Adelie penguins (*Pygoscelis adeliae)* from the adjacent colony at Cape Royds often transit the Area.

6(ii) Access to the Area

Access to the Area should be made on foot from Backdoor Bay or the helicopter landing sites using the routes shown in Map 2. Landings by boat (when there is open water), or vehicle (when safe sea ice conditions exist), may be made in Backdoor Bay. Care should be taken to avoid the marine extent of ASPA 121 (see Map 1 and 2).

Helicopters should land throughout the year at the Primary landing site (166°10.38'E, 77°33.06'S) north of the New Zealand refuge hut (Map 2). A Secondary landing site is located at 166°10.24'E, 77°33.11'S, ~100 m SW of the Primary landing site, which should be avoided when the penguin colony is occupied (01 November through 01 March).

6(iii) Location of structures within and adjacent to the Area

Apart from a Treaty plaque, all structures within the Area are of historic origin. A major feature of the Area is Shackleton's *Nimrod* Expedition hut located in a sheltered basin. The hut is surrounded by many other historic relics including an instrument shelter, supply depots, and a dump site. Numerous additional artefacts are distributed around the site.

A New Zealand refuge hut and camp site are located at the northwest corner of the ASPA.

6(iv) Location of other Protected Areas in the vicinity

- ASPA 121 (previously SSSI No. 1), Cape Royds is immediately adjacent to this Area.
- ASPA 122 (SSSI No. 2), Arrival Heights and
- ASPA 158 (SPA No. 28), Hut Point are approximately 35 kilometres south of Cape Royds at Hut Point Peninsula.
- ASPA 130 (SSSI No. 11), Tramway Ridge is 20 kilometres east of Cape Royds.
- ASPA 116 (SSSI No. 10, SPA No. 20), New College Valley is located 35 kilometres north in the vicinity of Cape Bird.
- ASPA 155 (SPA No. 25), Cape Evans is 12 kilometres south.
- ASPA 156 (SPA No. 26), Lewis Bay is 36 kilometres to the north east.

All sites are located on Ross Island.

6 (v) Special Zones within the Area

There are no special zones within the Area.

7. Terms and Conditions for Entry Permits

Entry to the Area is prohibited except in accordance with a Permit. Permits shall be issued only by appropriate national authorities and may contain both general and specific conditions. A Permit may be issued by a national authority to cover a number of visits in a season. Parties operating in the Area shall consult together and with groups and organisations interested in visiting the Area to ensure that visitor numbers are not exceeded.

Permits to enter the site may be issued for a stated period for:

- activities related to conservation, research and/or monitoring purposes;
- management activities in support of the objectives of this Management Plan; and
- activities related to educational or recreational activities including tourism, providing they do not conflict with the objectives of this Management Plan.

7(i) Access to and movement within or over the Area

- Control of movement within the Area is necessary to prevent damage caused by crowding around the many vulnerable features within the Area. The maximum number in the Area at any time (including guides and those within the hut) shall be: **40 people.**

- Control of numbers within the hut is necessary to prevent damage caused by crowding around the many vulnerable features within the hut. The maximum number within the hut at any time (including guides) shall be: **8 people.**
- Avoidance of cumulative impacts on the interior of the hut requires an annual limit on visitor numbers. The effects of current visitor levels (average 767 per year between 1998/99 and 2013/14) suggest that a significant increase could cause significant adverse impacts. The annual maximum number of visitors shall be: **2,000 people.**
- These limits have been set based on current visitor levels and on the best advice available from conservation advisory agencies (which include conservators, archaeologists, historians, museologists and other heritage protection professionals). The limits are based on the proposition that any significant increase in the current level of visitors would be detrimental to the values to be protected. An ongoing monitoring programme to assess the effect of visitors is required to provide the basis for future reviews of the Management Plan, in particular whether the current limits on numbers of visitors are appropriate.
- Adequate supervision of visits to the Area is necessary to prevent damage caused by crowding and by actions inconsistent with the Code of Conduct set out in section 7(ii). All tourism, educational and recreational visits must be supervised by an experienced guide nominated by the operator (refer section 7(ix)).
- Helicopter landings are prohibited within the Area as they have the potential to damage the site by blowing scoria and ice particles and to accelerate the abrasion of the hut and surrounding artefacts. Vehicles are prohibited within the Area. Refer to 6(ii) for recommended approaches and landing sites near the Area.

7(ii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- visits for conservation purposes;
- educational and/or recreational visits including tourism;
- scientific activity which does not detract from the values of the Area.

Visitors should adhere to the following Code of Conduct, except where conservation, research, monitoring or management activities specified in the Permit require otherwise:

- Thoroughly clean grit and scoria, ice and snow from boots using the brushes provided before entering the hut to reduce floor abrasion and only use tripods or monopods with flat bottomed rubber bases as opposed to those with metal spikes which can damage the floor;
- Remove any clothing made wet by sea water, and any sea ice crystals from boots, as salt particles accelerate corrosion of metal objects;
- Do not touch, move or sit on any items or furniture in the huts - handling artefacts causes damage;
- As many areas are cramped and artefacts can be accidentally bumped, do not wear packs inside and avoid the use of tripods or monopods when the maximum number of visitors (8) are in the hut at one time;
- When moving around the sites, take great care not to tread on any items which may be obscured by snow and remain on established walking tracks;
- Use of combustion style lanterns, naked flames or smoking in or around the hut is prohibited, as fire is a major risk; and

- Visits should be recorded in the book provided. This allows times and levels of visitation to be correlated with temperature and humidity data automatically logged inside the hut.

7(iii) Installation, modification or removal of structures

- No new structures are to be erected in the Area, or scientific equipment installed, except for conservation or scientific activities that do not detract from the values of the Area as specified in section 1.
- No historic item shall be removed from the Area, unless specified in a Permit issued in accordance with the provisions of section 7(vii).

7(iv) Location of field camps

- Use of the historic hut for living purposes is not permitted. Camping is prohibited within the Area under any circumstances.
- An existing field camp site and a New Zealand shelter are located at the north western boundary of the Area (see Map 2).

7(v) Restrictions on materials and organisms which may be brought into the Area

- No living animals, plant material, soil or micro-organisms shall be introduced to the Area. No food products shall be taken into the Area.
- Chemicals may only be introduced for permitted scientific or conservation purposes. Chemicals (including fuel) or other materials are not to be left in the Area, unless required for essential purposes connected with the conservation of the historic structures or the associated relics.
- All introduced materials are to be removed when no longer required and before a date to be specified in the relevant Permit.

7(vi) Taking or harmful interference with native flora and fauna

- This activity is prohibited except in accordance with a Permit issued by the appropriate national authority specifically for that purpose under Article 3, Annex II to the Protocol on Environmental Protection.
- Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(vii) Collection of anything not imported by the Permit Holder

- Material may be collected and removed from the Area for conservation or scientific reasons consistent with the objectives of this Management Plan only when specified in a Permit issued by the appropriate national authority.
- Materials which pose a threat to the environment or human health may be removed from the Area for disposal, in accordance with a Permit, where they meet one or more of the following criteria:

i. the artefact presents a threat to the environment, wildlife or human health and safety;
ii. it is in such poor condition that it is not reasonably possible to conserve it;
iii. it does not contribute in any significant way to our understanding of the hut, its occupants or the history of Antarctica;

iv. it does not contribute to, or it detracts from, the visual qualities of the site or the hut; and/or

v. it is not a unique or rare item;

and where such action is:

i. undertaken by parties with appropriate heritage conservation expertise; and

ii. part of an overall plan for conservation work at the site.

- National authorities should ensure that any removal of artefacts and assessment against the above criteria is carried out by personnel with appropriate heritage conservation expertise.
- Artefacts judged to be of high historic value, which cannot be conserved on site with currently available techniques, may be removed in accordance with a Permit for storage in a controlled environment until such time as they can safely be returned to the Area.
- Samples of soil and other natural materials may be removed for scientific purposes only in accordance with an appropriate Permit.

7(viii) Disposal of waste

All human waste, grey water and other waste generated by work parties or visitors shall be removed from the Area.

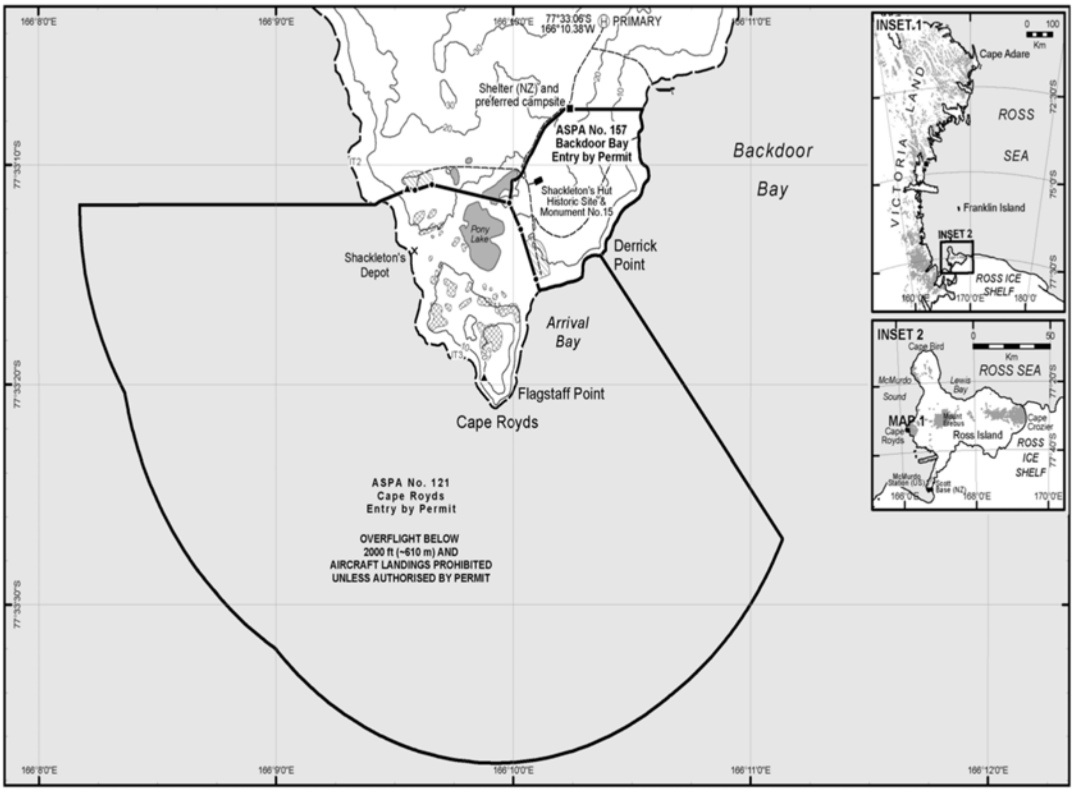
7(ix) Measures that may be necessary to ensure that the aims and objectives of the Management Plan continue to be met

- The Permit, or an authorised copy, shall be carried within the Area.
- Information on the requirements of this Management Plan shall be provided to all visitors.
- The Code of Conduct set out in section 7(ii) shall be followed by all visitors, except where conservation, research, monitoring or management purposes require otherwise.
- Operators facilitating educational and recreational visits (including tourism) to the Area should, prior to commencement of the summer season, nominate people with a working knowledge of both the site and this Management Plan to act as guides during visits.
- All educational and recreational visits (including tourism) shall be supervised by a nominated guide, who is responsible for briefing visitors on the Code of Conduct and the requirements of this Management Plan and ensuring they are complied with.
- Parties should consult and coordinate to develop skills and resources, particularly those related to conservation techniques, to assist with the protection of the Area's values.

7(x) Requirements for reports

Parties shall ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports shall include, as appropriate, the information identified in the Visit Report Form provided in Appendix 4 of Resolution 2 (1998). In addition, any removal of materials in accordance with section 7(vii) shall be detailed, including the reason for removal and the current location of the items or the date of disposal. Any return of such items to the site shall also be reported.

Parties shall maintain a record of activities within the Area and, in the Annual Exchange of Information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, in sufficient detail to allow evaluation of the effectiveness of the Management Plan. Parties should wherever possible deposit originals or copies of such reports in a publicly accessible archive to maintain a record of visitation, to be used both for review of the Management Plan and in managing further visitation to the site.



Map 1: ASPA No. 157 Backdoor Bay - Regional topographic map

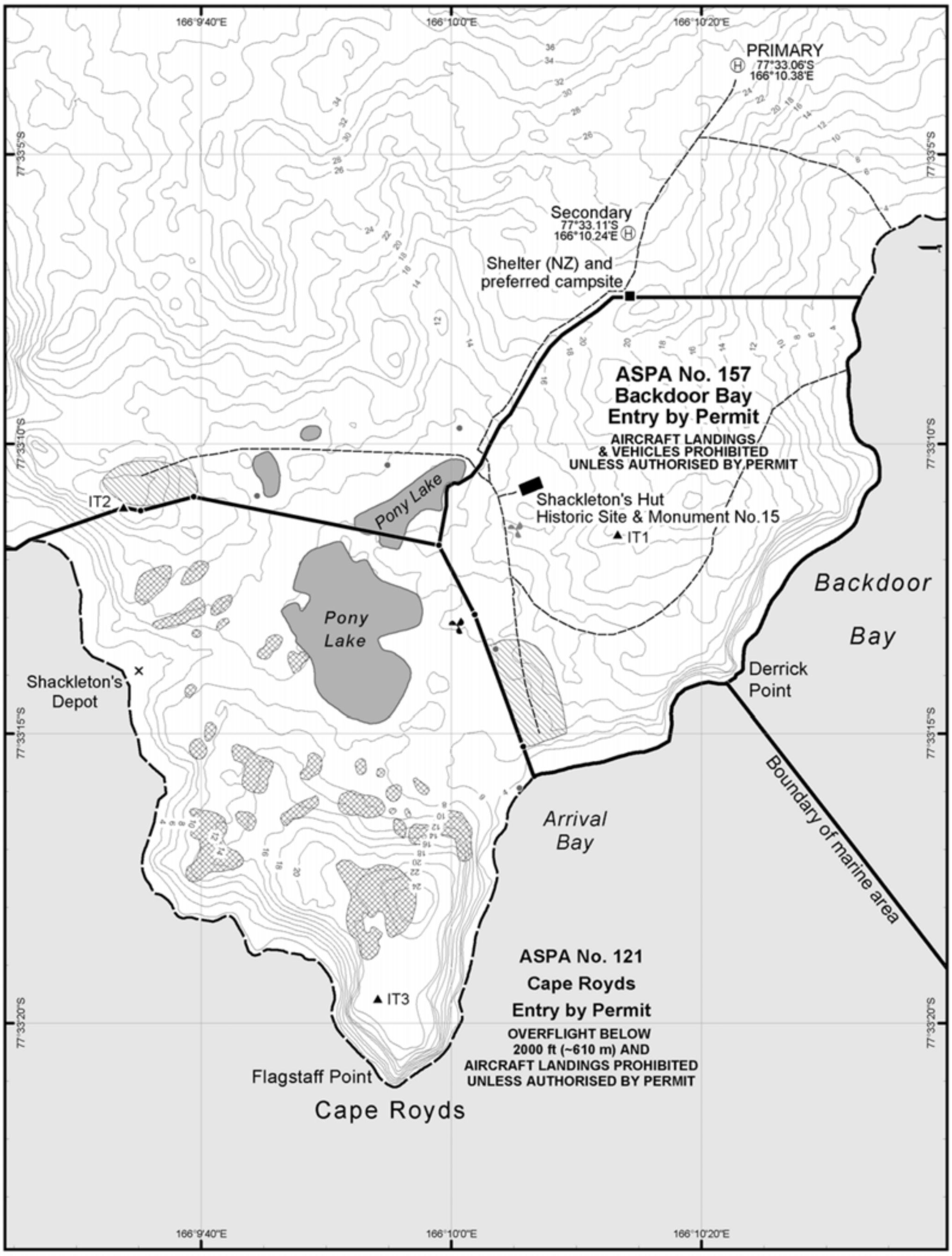
13 Apr 2015 (Map ID: 10093.001.03)
Antarctica New Zealand
Environmental Research & Assessment

Antarctica New Zealand

Coastline (approx)
Contour (10 m)
Ice free ground
Ocean
Lake / pond
Antarctic Specially Protected Area (ASPA) boundary
Penguin nesting area 2005 (approx.)
Penguin viewing area
Path
Building
Survey marker
Signpost / boundary point
Helicopter landing site
Preferred small boat landing site

0 50 100 150 200
Meters

Projection: Lambert Conic Conformal, Spheroid and horizontal datum: WGS 84. Data sources: ASPA boundary: ERA (Jan 2014); Signposts: UNAVCO (Jan 2014); Topography & infrastructure data supplied by Gateway Antarctica (2009); Penguins: digitised by ERA from georeferenced aerial image (2005) provided by Landcare Research.



Map 2: ASPA No. 157 Backdoor Bay - Site topographic map

29 Jan 2015 (Map ID: 10093.0002.02)
Antarctica New Zealand
Environmental Research & Assessment

Coastline (approx) · Contour (2 m) · Ice free ground · Ocean · Lake / pond · ASPA boundary · Penguin nesting area 2005 (approx.) · Penguin viewing area · Path · Building · Survey marker · Signpost / boundary point · Signpost · Helicopter landing site · Preferred small boat landing site · Automatic Weather Station · Historic weather station

0 50 100 Meters

Projection: Lambert Conic Conformal, Spheroid and horizontal datum: WGS 84.
Data sources: ASPA boundary: ERA (Jan 2014); Signposts: UNAVCO (Jan 2014); Topography & infrastructure data supplied by Gateway Antarctica (2009); Penguins: digitised by ERA from georeferenced aerial image (2005) provided by Landcare Research.

Antarctica New Zealand

Measure 13 (2015)

Antarctic Specially Protected Area No 158 (Hut Point, Ross Island): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Measure 1 (1998), which designated the Hut Point Historic Site as Specially Protected Area ("SPA") No 28 and annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 28 as ASPA 158;
- Measures 2 (2005) and 10 (2010), which adopted revised Management Plans for ASPA 158;

Recalling that Measure 1 (1998) has not become effective and was withdrawn by Measure 9 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 158;

Desiring to replace the existing Management Plan for ASPA 158 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:
1. the revised Management Plan for Antarctic Specially Protected Area No 158 (Hut Point, Ross Island), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 158 annexed to Measure 10 (2010) be revoked.

Management Plan For Antarctic Specially Protected Area No. 158

HUT POINT, ROSS ISLAND

(including Historic Site and Monument No. 18, the historic *Discovery* hut of Captain Robert Falcon Scott)

1. Description of Values to be Protected

The significant historic value of this Area was formally recognised when it was designated as Historic Site and Monument No. 18 in Recommendation 9 (1972). It was designated as Specially Protected Area No. 28 in Measure 1 (1998) and redesignated as Antarctic Specially Protected Area 158 in Decision 1 (2002). The Management Plan was reviewed and a revised version with additional visitor management provisions was adopted by means of Measure 2 (2005) and Measure 10 (2010).

The hut was built in February 1902 during the National Antarctic *Discovery* Expedition of 1901-1904, led by Captain Robert Falcon Scott who later found it a valuable advance staging point for journeys on the "Barrier" during his 1910-1913 expedition. It was also used by Sir Ernest Shackleton during the 1907-1909 British Antarctic *Nimrod* Expedition and later by his stranded Ross Sea party during the Imperial Trans-Antarctic Expedition of 1914-1917. This building was prefabricated in Australia to an 'outback' design with verandas on three sides.

The Hut Point site is one of the principal sites of early human activity in Antarctica. It is an important symbol of the Heroic Age of Antarctic exploration and, as such, has considerable historical significance. Some of the earliest advances in the study of earth sciences, meteorology, flora and fauna in Antarctica are associated with the *Discovery* Expedition based at this site. The history of these activities and the contribution they have made to the understanding and awareness of Antarctica give this Area significant scientific, aesthetic and historic value.

Hut Point is situated in Environment S – McMurdo South Victoria Land geologic based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and in Region 9 – South Victoria Land based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)). Other protected areas within Environment S includes ASPA 105, 116, 121, 122, 123, 124, 131, 137, 138, 154, 155, 156, 157, 161, 172 and 175 and ASMA 2.

2. Aims and Objectives

The aim of the Management Plan is to provide protection for the Area and its features so that its values can be preserved. The objectives of the Management Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area;
- maintain the historic values of the Area through planned conservation work which may include:

a. an annual 'on-site' maintenance programme,

b. a programme of monitoring the condition of artefacts and structures, and the factors which affect them, and
c. a programme of conservation of artefacts conducted on and off site;

- allow management activities which support the protection of the values and features of the Area including recording of any relevant historic data; and
- prevent unnecessary human disturbance to the Area, its features and artefacts through managed access to the *Discovery* hut.

3. Management Activities

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

- A regular programme of conservation work shall be undertaken on the *Discovery* hut and associated artefacts in the Area;
- Visits shall be made as necessary for management purposes;
- Systematic monitoring shall be put in place to assess the impacts of present visitor limits, and the results and any related management recommendations included in reviews of this Management Plan;
- National Antarctic Programmes operating in, or those with an interest in, the Area shall consult together with a view to ensuring the above management activities are implemented.
- Copies of this Management Plan, including maps of the Area, shall be made available at adjacent operational research/field stations and will be provided to ships visiting the Area and vicinity.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map A: Hut Point regional topographic map. This map shows the wider environs of the Area with significant topographic features and the adjacent US McMurdo Station. Inset: shows the position of the site in relation to other protected sites on Ross Island.

Map B: Hut Point site topographic map. This map shows the location of the historic hut, Vince's cross and other detail of the immediate environs.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Hut Point is a small ice free area protruding south west from Hut Point Peninsula and situated to the west of the United States McMurdo Station. The designated Area consists solely of the structure of the hut (77° 50’S, 166° 37’E) which is situated near the south western extremity of Hut Point.

6(ii) Access to the Area

There are no designated helicopter landings sites in the vicinity of the hut as helicopters have the potential to damage the hut by blowing scoria and ice particles and to accelerate the abrasion of the hut and surrounding artefacts. Vehicles may approach the hut along the road leading from the United States McMurdo Station, or from the sea ice when safe conditions exist. During open water, landings by boat may be made to the north of the hut.

6(iii) Location of structures within and adjacent to the Area

The designated Area consists solely of the structure of the historic *Discovery* hut (Historic Site and Monument No. 18). Historic Site and Monument No. 19, a cross to the memory of George T. Vince (a member of the *Discovery* Expedition who died in the vicinity), is situated approximately 75 metres west of the hut.

6(iv) Location of other Protected Areas in the vicinity

- ASPA 121 (previously SSSI No. 1) Cape Royds and
- ASPA 157 (SPA No. 28), Backdoor Bay, Cape Royds, are 32 kilometres north of Hut Point.
- ASPA 122 (SSSI No. 2), Arrival Heights, is 2 kilometres north of Hut Point on Hut Point Peninsula.
- ASPA 155 (SPA No. 25), Cape Evans, is 22 kilometres to the north of Hut Point.

All sites are located on Ross Island.

6(v) Special Zones within the Area

There are no special zones within the Area.

7. Terms and Conditions for Entry Permits

Entry to the Area is prohibited except in accordance with a Permit. Permits shall be issued only by appropriate national authorities and may contain both general and specific conditions. A Permit may be issued by a national authority to cover a number of visits in a season. Parties operating in the Area shall consult together and with groups and organisations interested in visiting the Area to ensure that visitor numbers are not exceeded.

Permits to enter the site may be issued for a stated period for:
- activities related to conservation, research and/or monitoring purposes;
- management activities in support of the objectives of this Management Plan; and
- activities related to educational or recreational activities including tourism, providing they do not conflict with the objectives of this Management Plan.

7(i) Access to and movement within or over the Area

- Control of numbers within the hut is necessary to prevent damage caused by crowding around the many vulnerable features within the hut. The maximum number within the hut at any time (including guides) shall be: **8 people**

- Avoidance of cumulative impacts on the interior of the hut requires an annual limit on visitor numbers. The effects of current visitor levels (average 1015 per year between 1998/99 and 2013/14) suggest that a significant increase could cause significant adverse impacts. The annual maximum number of visitors shall be: **2,000 people**
- These limits have been based on current visitor levels and on the best advice available from conservation advisory agencies (which include conservators, archaeologists, historians, museologists and other heritage protection professionals). The limits are based on the proposition that any significant increase in the current level of visitors would be detrimental to the values to be protected. An ongoing monitoring programme to assess the effect of visitors is required to provide the basis for future reviews of the Management Plan, in particular whether the current limits on numbers of visitors to the Area are appropriate.
- Adequate supervision of visits to the Area is necessary to prevent damage caused by crowding and by actions inconsistent with the Code of Conduct set out in section 7(ii). All tourism, educational and recreational visits must be supervised by an experienced guide nominated by the operator (refer section 7(ix)).
- Vehicles should avoid approaching the Area to within 50 meters from the building structure unless for management purposes.

7(ii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- visits for conservation purposes;
- educational and/or recreational visits including tourism;
- scientific activity which does not detract from the values of the Area.

Visitors should adhere to the following Code of Conduct, except where conservation, research, monitoring or management activities specified in the Permit require otherwise:

- Thoroughly clean grit and scoria, ice and snow from boots using the brushes provided before entering the hut to reduce floor abrasion and only use tripods or monopods with flat bottomed rubber bases as opposed to those with metal spikes which can damage the floor;
- Remove any clothing made wet by sea water, and any sea ice crystals from boots, as salt particles accelerate corrosion of metal objects;
- Do not touch, move or sit on any items or furniture in the huts - handling artefacts causes damage;
- As many areas are cramped and artefacts can be accidentally bumped, do not wear packs inside and avoid the use of tripods or monopods when the maximum number of visitors (8) are in the hut at one time;
- When moving around the sites, take great care not to tread on any items which may be obscured by snow;
- Use of combustion style lanterns, naked flames or smoking in or around the hut is prohibited, as fire is a major risk; and
- Visits should be recorded in the book provided. This allows times and levels of visitation to be correlated with temperature and humidity data automatically logged inside the hut.

7(iii) Installation, modification or removal of structures

- No alteration to the structure shall be made, except for conservation purposes or scientific activities that do not detract from the values of the Area as specified in section 1.
- No historic item shall be removed from the Area, unless specified in a Permit issues in accordance with the provisions of section 7(vii).

7(iv) Location of field camps

Use of the historic hut for living purposes is not permitted.

7(v) Restrictions on materials and organisms which may be brought into the Area

- No living animals, plant material, micro-organisms or soil shall be introduced to the Area. No food products shall be taken into the Area.
- Chemicals may only be introduced for permitted scientific or conservation purposes. Chemicals (including fuel) or other materials are not to be left in the Area, unless required for essential purposes connected with the conservation of the historic structure or the associated relics.
- All introduced materials are to be removed when no longer required and before a date to be specified in the relevant Permit.

7(vi) Taking or harmful interference with native flora and fauna

There are no native flora or fauna within the designated Area.

7(vii) Collection of anything not imported by the Permit Holder

- Material may be collected and removed from the Area for conservation or scientific reasons consistent with the objectives of this Management Plan only when specified in a Permit issued by the appropriate national authority.
- Materials which pose a threat to the environment or human health may be removed from the Area for disposal, in accordance with a Permit, where they meet one or more of the following criteria:

i. the artefact presents a threat to the environment, wildlife or human health and safety;
ii. it is in such poor condition that it is not reasonably possible to conserve it;
iii. it does not contribute in any significant way to our understanding of the hut, its occupants or the history of Antarctica;
iv. it does not contribute to, or it detracts from, the visual qualities of the site or the hut, and/or;
v. it is not a unique or rare item;

and where such action is:

i. undertaken by parties with appropriate heritage conservation expertise; and
ii. part of an overall plan for conservation work at the site.

- National authorities should ensure that any removal of artefacts and assessment against the above criteria is carried out by personnel with appropriate heritage conservation expertise.

- Artefacts judged to be of high historic value, which cannot be conserved on site with currently available techniques, may be removed in accordance with a Permit for storage in a controlled environment until such time as they can safely be returned to the Area.

7(viii) Disposal of waste

All human waste, grey water and other waste generated by work parties or visitors shall be removed from the Area.

7(ix) Measures that may be necessary to ensure that the aims and objectives of the plan continue to be met

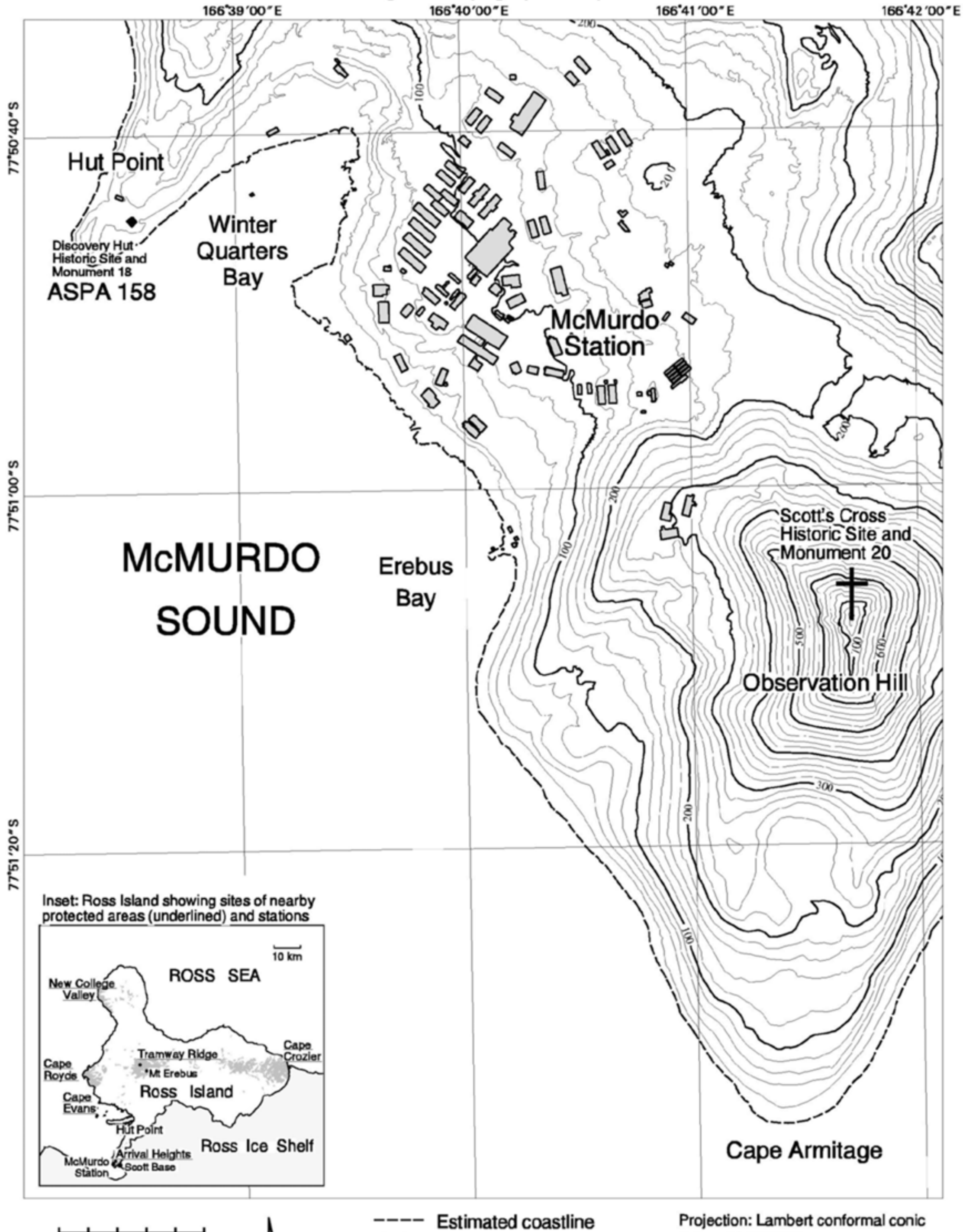
- The Permit, or an authorised copy, shall be carried within the Area.
- Information on the requirements of this Management Plan shall be provided to all visitors.
- The Code of Conduct set out in section 7(ii) shall be followed by all visitors, except where conservation, research, monitoring or management purposes require otherwise.
- Operators facilitating educational and recreational visits (including tourism) to the Area shall, prior to commencement of the summer season, nominate people with a working knowledge of both the site and this Management Plan to act as guides during visits.
- All educational and recreational visits (including tourism) shall be supervised by a nominated guide, who is responsible for briefing visitors on the Code of Conduct and the requirements of this Management Plan and ensuring it is complied with.
- Parties shall consult and coordinate to develop skills and resources, particularly those related to conservation techniques, to assist with the protection of the Area's values.

7(x) Requirements for reports

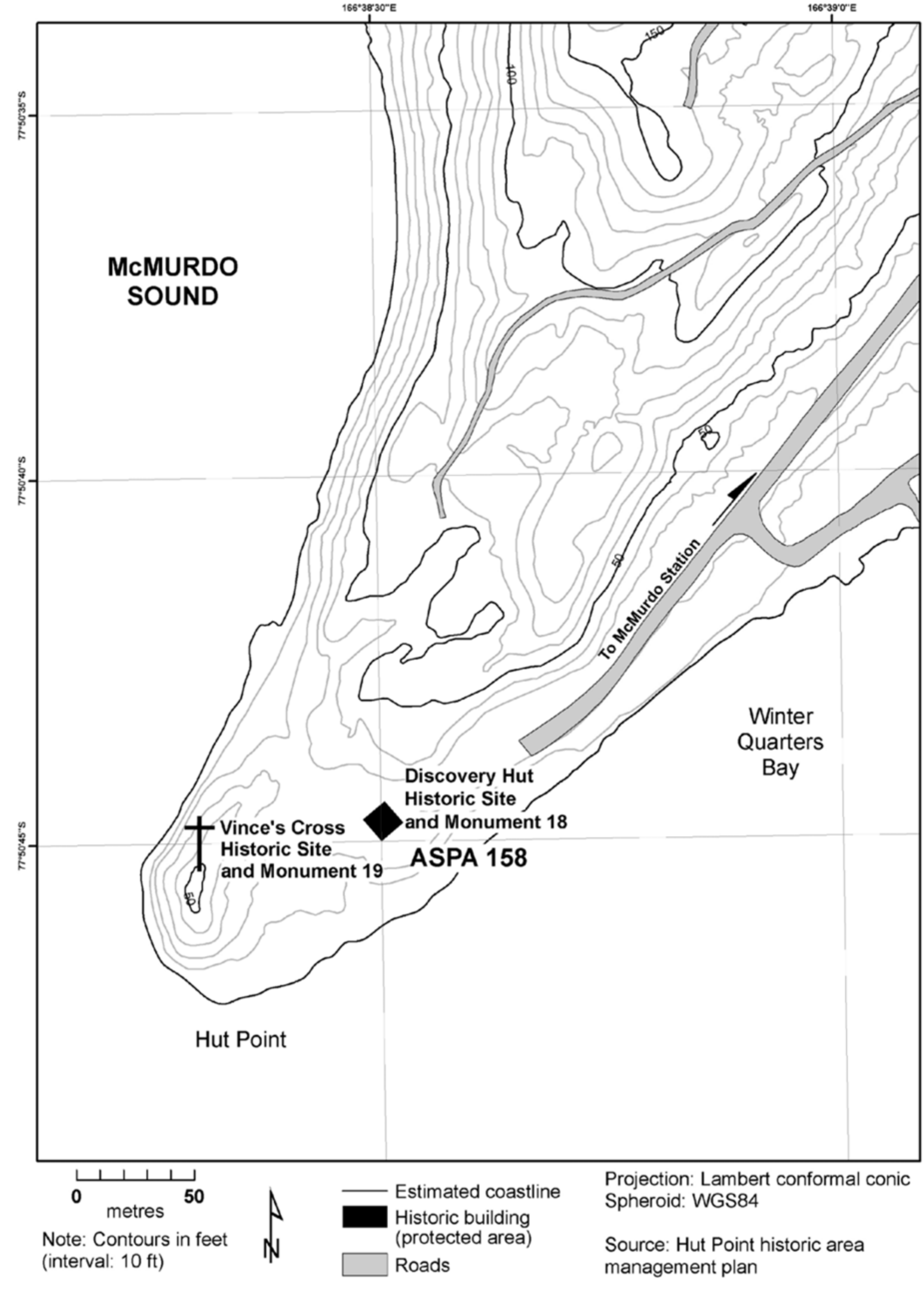
Parties shall ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports shall include, as appropriate, the information identified in the Visit Report Form provided in Appendix 4 of Resolution 2 (1998). In addition, any removal of materials in accordance with section 7 (vii) shall be detailed, including the reason for removal and the current location of the items or the date of disposal. Any return of such items to the site shall also be reported.

Parties shall maintain a record of activities within the Area and, in the Annual Exchange of Information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, in sufficient detail to allow evaluation of the effectiveness of the Management Plan. Parties should wherever possible deposit originals or copies of such reports in a publicly accessible archive to maintain a record of visitation, to be used both for review of the Management Plan and in managing further visitation to the site.

Map A - Historic Hut, Hut Point, Ross Island, Antarctic Specially Protected Area 158:
Regional Topographic Map



Map B - Historic Hut, Hut Point, Ross Island, Antarctic Specially Protected Area 158: Site Topographic Map



Measure 14 (2015)

Antarctic Specially Protected Area No 159 (Cape Adare, Borchgrevink Coast): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Measure 1 (1998), which designated the Cape Adare Historic Site and its environs as Specially Protected Area ("SPA") No 29 and annexed a Management Plan for the Area;
- Decision 1 (2002), which renamed and renumbered SPA 29 as ASPA 159;
- Measures 2 (2005) and 11 (2010), which adopted revised Management Plans for ASPA 159;

Recalling Measure 1 (1998) has not become effective and was withdrawn by Measure 9 (2010);

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 159;

Desiring to replace the existing Management Plan for ASPA 159 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 159 (Cape Adare, Borchgrevink Coast), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 159 annexed to Measure 11 (2010) be revoked.

Management Plan For Antarctic Specially Protected Area No. 159

CAPE ADARE, BORCHGREVINK COAST

(including Historic Site and Monument No. 22, the historic huts of Carsten Borchgrevink and Scott's Northern Party and their precincts)

1. Description of Values to be Protected

The historic value of this Area was formally recognized when it was listed as Historic Site and Monument No. 22 in Recommendation VII-9 (1972). It was designated as Specially Protected Area No. 29 in Measure 1 (1998) and redesignated as Antarctic Specially Protected Area 159 in Decision 1 (2002). The Management Plan was reviewed and a revised version was adopted by means of Measure 2 (2005) and Measure 11 (2011).

There are three main structures in the Area. Two huts were built in February 1899 during the British Antarctic *Southern Cross* Expedition led by Carston E. Borchgrevink (1898-1900). One hut served as a living hut and the other as a store. They were used for the first winter spent on the Antarctic continent. The collapsing remains of a third hut built in February 1911 for the Northern party led by Victor L.A. Campbell of Robert Falcon Scotts British Antarctic *Terra Nova* Expeditions (1910-1913), is situated 30 meters to the north of Borchgrevink's hut. The Northern party wintered in this hut in 1911.

In addition to these features there are numerous other historic relics located in the Area. These include stores depots, a latrine structure, two anchors from the ship *Southern Cross*, an ice anchor from the ship *Terra Nova*, and supplies of coal briquettes. Other historic items within the Area are buried in guano. Collectively, the three huts and associated historic relics are listed as Historic Site and Monument No. 22.

Cape Adare is one of the principal sites of early human activity in Antarctica as it includes the first building erected on the continent. It is an important symbol of the Heroic Age of Antarctic exploration and, as such, has considerable historical significance. Some of the earliest advances in the study of earth sciences, meteorology, flora and fauna in Antarctica are associated with the two earliest expeditions based at this site. The history of these activities and the contribution they have made to the understanding and awareness of Antarctica give this Area significant scientific, aesthetic and historic value.

Cape Adare is situated in Environment U – North Victoria Land geologic based on the Environmental Domains Analysis for Antarctica (Resolution 3 (2008)) and in Region 8 – North Victoria Land based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)). Other protected areas within Environment U include 106, 165, 173, and 175.

2. Aims and Objectives

The aim of the Management Plan is to provide protection for the Area and its features so that its values can be preserved. The objectives of the Plan are to:

- avoid degradation of, or substantial risk to, the values of the Area;
- maintain the historic values of the Area through planned conservation work which may include:

a. 'on-site' maintenance,
b. monitoring the condition of artefacts and structures, and the factors which affect them, and
c. conservation of artefacts to be conducted on and off site;

- allow management activities which support the protection of the values and features of the Area including:

a. mapping and otherwise recording the disposition of historic items in the hut environs, and
b. recording other relevant historic data;

- prevent unnecessary human disturbance to the Area, its features and artefacts through managed access to Borchgrevink's hut.

3. Management Activities

- A programme of conservation work shall be undertaken on the historic huts and associated structures and artefacts in the Area.
- Visits shall be made as necessary for management purposes.
- Systematic monitoring shall be put in place to assess the impacts of present visitor limits, and the results and any related management recommendations included in reviews of this Management Plan.
- National Antarctic Programmes operating in, or those with an interest in, the Area shall consult together with a view to ensuring the above management activities are implemented.
- Copies of this Management Plan, including maps of the Area, shall be made available at the nearest operational research/field stations and will be provided to ships visiting the Area and vicinity.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map A: Cape Adare regional map. This map shows the Cape Adare region along with the boundaries of the Area with significant topographic features. It also shows the approximate location of significant historical items within the Area.

Map B: Cape Adare site map. This map shows the approximate location of specific historic relics and structures within the Area.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Cape Adare is a generally ice free, prominent volcanic headland, at the northern extremity of Victoria Land, which marks the western approaches to the Ross Sea. The Area is located to the south west of the Cape on the southern shore of Ridley Beach, which encloses a large, flat, triangular area of shingle.

The whole of the flat area and the lower western slopes of the Adare Peninsula are occupied by one of the largest Adélie penguin (*Pygoscelis adeliae*) colonies in Antarctica. The penguins have almost completely occupied the Area and the need to avoid disturbance often restricts access to the huts.

The boundaries of the ASPA are:

- North, an east-west line drawn 50 metres north of the Northern Party Hut;
- East, a north-south line drawn 50 metres to the east of Borchgrevink's stores hut. The north east corner of the boundary is 71° 18.502'S, 170° 11.735'E and the south east corner of the boundary is 71° 18.633'S 170°11.735'E;
- West, a north-south line drawn 50 metres to the west of Borchgrevink's living hut. The north west corner of the boundary is 71° 18.502'S, 170° 11.547'E and the south west corner of the boundary is 71° 18.591'S, 170° 11.547'E; and
- South, the high tide mark of Ridley Beach.

Skuas (*Catharacta maccormicki*) nest in the vicinity and Weddell seals (*Leptonychotes weddellii*) also haul up along the beach.

6(ii) Access to the Area

There are no designated helicopter pads in the vicinity of the Area. Helicopter landings should be avoided as for most of the summer season it is difficult to operate helicopters without causing disturbance to penguins and skuas. Landings from the sea by boat, or vehicles travelling on the sea ice, may be made directly onto the beach as ice and surf conditions allow. From the beach, access to the Area is by foot. Care must be taken to avoid damage to artefacts in the Area and disturbance to birds nesting on and around the structures.

6(iii) Location of structures within and adjacent to the Area

Apart from a Treaty plaque all structures within the Area are of historic origin. Major features of the Area include Borchgrevink's *Southern Cross* Expedition living hut and the unroofed stores hut. Scott's Northern Party hut is situated 30 meters to the north of Borchgrevink's living hut and is in a state of collapse.

In addition to these structures there are many other historic relics distributed around the Area. These include stores depots, a latrine structure, two anchors from the ship *Southern Cross*, an ice anchor from the ship *Terra Nova*, and supplies of coal. Many of these items are either partly or completely covered in the guano of the Adélie penguins which also occupy the Area.

The grave (Historic Site and Monument No. 23) of Nicolai Hanson (biologist with the *Southern Cross* Expedition) is located approximately 1.5 km north east of historic huts. It is marked by a large boulder with an iron cross, a brass plaque and a white cross marked out in quartz pebbles.

6(iv) Location of other Protected Areas in the vicinity

The nearest protected area is ASPA 106 (previously SPA No. 7), approximately 115 km to the south, on the western side of Cape Hallett.

6(v) Special Zones within the Area

There are no special zones within the Area.

7. Terms and Conditions for Entry Permits

Entry to the Area is prohibited except in accordance with a Permit. Permits shall be issued only by appropriate national authorities and may contain both general and specific conditions. A Permit may be issued by a national authority to cover a number of visits in a season. Parties operating in the Area shall consult together and with groups and organisations interested in visiting the Area to ensure that visitor numbers are not exceeded.

Permits to enter the site may be issued for a stated period for:

- activities related to conservation, research and/or monitoring purposes;
- management activities in support of the objectives of this Management Plan; and
- activities related to educational or recreational activities including tourism, providing they do not conflict with the objectives of this Management Plan.

7(i) Access to and movement within the Area

- Control of movement within the Area is necessary to prevent disturbance to wildlife and damage caused by crowding around the many vulnerable historic features within the Area. The maximum number in the Area at any time (including guides and those within the hut) shall be: **40 people.**
- Control of numbers within Borchgrevink's hut is necessary to prevent damage caused by crowding around the many vulnerable features within the hut. The maximum number within the hut at any time (including guides) shall be: **4 people.**
- Avoidance of cumulative impacts on the interior of Borchgrevink's hut requires an annual limit on visitor numbers. The number of visitors to the hut varies considerably from year to year (average 181 per year between 1998/99 and 2013/14) but the effect of visitors to other historic huts in the Ross Sea region suggests that similar limits should apply. The annual maximum number of visitors shall be: **2,000 people.**
- These limits have been based on current visitor levels and on the best advice available from conservation advisory agencies (which include conservators, archaeologists, historians, museologists and other heritage protection professionals). The limits are based on the proposition that any significant increase in the current level of visitors would be detrimental to the values to be protected. An ongoing monitoring programme to assess the effect of visitors is required to provide the basis for future reviews of the Management Plan, in particular whether the limits on number of visitors are appropriate.
- Adequate supervision of visits to the Area is necessary to prevent damage caused by crowding and by actions inconsistent with the Code of Conduct set out in section 7(ii). All tourism, educational and recreational visits must be supervised by an experienced guide nominated by the operator (refer section 7(ix)).
- Helicopter landings are prohibited within the Area.
- The operation of aircraft over the Area or in the vicinity of the Area should be carried out, as a minimum requirement, in compliance with the ‘Guidelines for the Operation of Aircraft near Concentrations of Birds’ contained in Resolution 2 (2004).
- Vehicles are prohibited within the Area.

7(ii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- visits for conservation purposes;
- educational and/or recreational visits including tourism; and
- scientific activity which does not detract from the values of the Area.

Visitors should adhere to the following Code of Conduct, except where conservation, research, monitoring or management activities specified in the Permit require otherwise:

- Thoroughly clean grit and scoria, ice and snow from boots using the brushes provided before entering the hut to reduce floor abrasion and only use tripods or monopods with flat bottomed rubber bases as opposed to those with metal spikes which can damage the floor;
- Remove any clothing made wet by sea water, and any sea ice crystals from boots, as salt particles accelerate corrosion of metal objects;
- Do not touch, move or sit on any items or furniture in the huts - handling artefacts causes damage;
- As many areas are cramped and artefacts can be accidentally bumped, do not wear packs inside and avoid the use of tripods or monopods when the maximum number of visitors (4) are in the hut at one time;
- When moving around the sites, take great care not to tread on any items which may be obscured by snow and remain on established walking tracks;
- Use of combustion style lanterns, naked flames or smoking in or around the huts is prohibited, as fire is a major risk; and
- Visits should be recorded in the book provided. This allows times and levels of visitation to be correlated with temperature and humidity data automatically logged inside the hut.

7(iii) Installation, modification or removal of structures

- No new structures are to be erected in the Area, or scientific equipment installed, except for conservation or scientific activities that do not detract from the values of the Area as specified in section 1.
- No historic item shall be removed from the Area, unless specified in a Permit issued in accordance with the provisions of section 7(vii).

7(iv) Location of field camps

- Use of the historic hut, or other structures in the Area, for living purposes is not permitted.
- Camping is prohibited within the Area under any circumstances.

7(v) Restrictions on materials and organisms which may be brought into the Area

- No living animals, plant material, soil or micro-organisms shall be introduced to the Area.
- No food products shall be taken into the Area.
- Chemicals may only be introduced for permitted scientific or conservation purposes. Chemicals (including fuel) or other materials are not to be left in the Area, unless required for essential purposes connected with the conservation of the historic structures or the associated relics.

- All introduced materials are to be removed when no longer required and before a date to be specified in the Permit.

7(vi) Taking or harmful interference with native flora and fauna

- This activity is prohibited except in accordance with a Permit issued by the appropriate national authority specifically for that purpose under Article 3, Annex II to the Protocol on Environmental Protection.
- Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(vii) Collection of anything not imported by the Permit Holder

- Material may be collected and removed from the Area for conservation or scientific reasons consistent with the objectives of this Management Plan only when specified in a Permit issued by the appropriate national authority.
- Materials which pose a threat to the environment or human health may be removed from the Area for disposal, in accordance with a Permit, where they meet one or more of the following criteria:

i. the artefact presents a threat to the environment, wildlife or human health and safety;
ii. it is in such poor condition that it is not reasonably possible to conserve it;
iii. it does not contribute in any significant way to our understanding of the hut, its occupants or the history of Antarctica;
iv. it does not contribute to, or it detracts from, the visual qualities of the site or the hut, and/or;
v. it is not a unique or rare item;

and where such action is:

i. undertaken by parties with appropriate heritage conservation expertise; and
ii. part of an overall plan for conservation work at the site.

- National authorities should ensure that any removal of artefacts and assessment against the above criteria is carried out by personnel with appropriate heritage conservation expertise.
- Artefacts judged to be of high historic value, which cannot be conserved on site with currently available techniques, may be removed in accordance with a Permit for storage in a controlled environment until such time as they can safely be returned to the Area.

7(viii) Disposal of waste

All human waste, grey water and other waste generated by work parties or visitors shall be removed from the Area.

7(ix) Measures that may be necessary to ensure that the aims and objectives of the plan continue to be met

- The Permit, or an authorised copy, shall be carried within the Area.

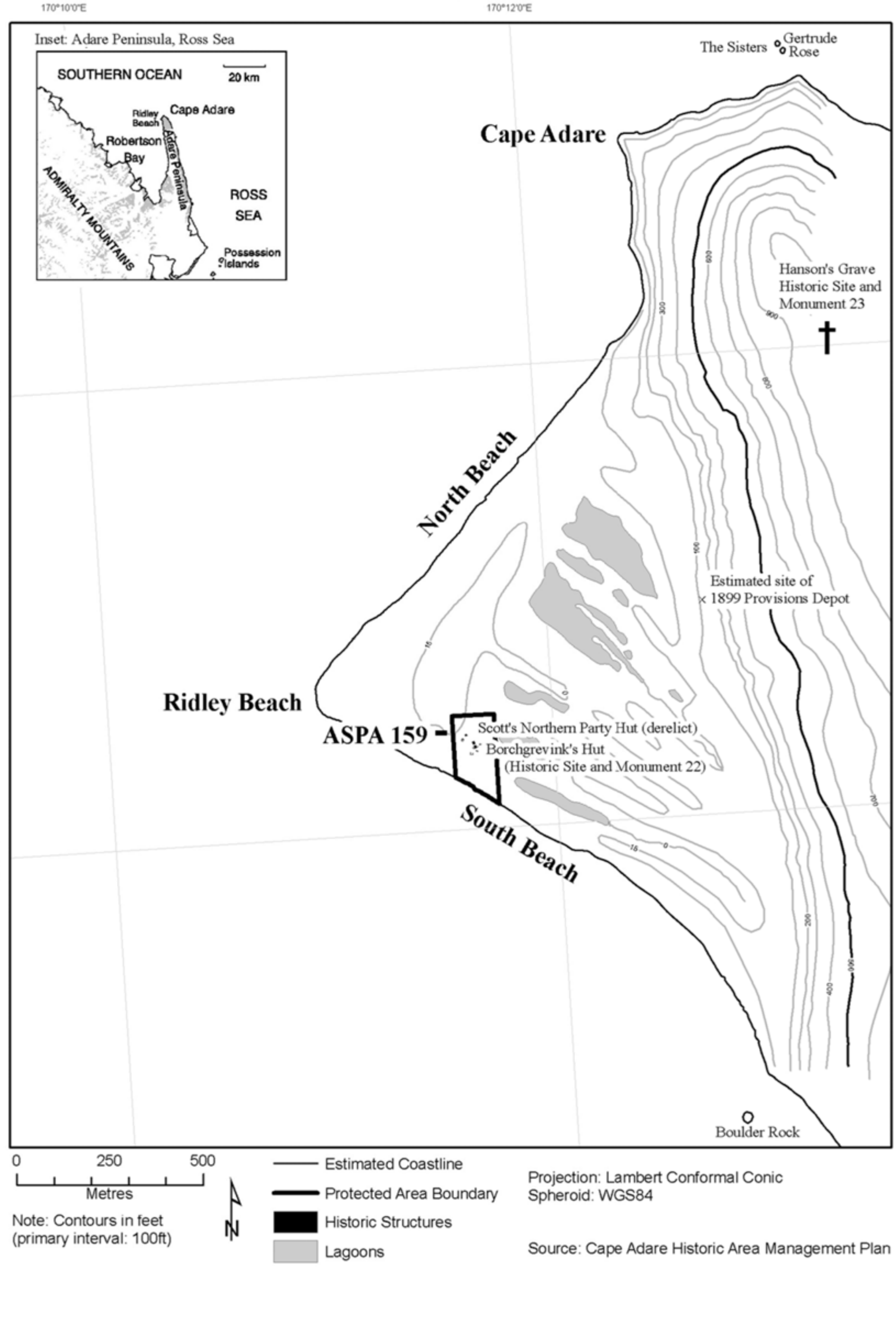
- Information on the requirements of this Management Plan shall be provided to all visitors.
- The Code of Conduct set out in section 7(ii) shall be followed by all visitors, except where conservation, research, monitoring or management purposes require otherwise.
- Operators facilitating educational and recreational visits (including tourism) to the Area shall, prior to commencement of the summer season, nominate people with a working knowledge of both the site and this Management Plan to act as guides during visits.
- All educational and recreational visits (including tourism) shall be supervised by a nominated guide, who is responsible for briefing visitors on the Code of Conduct and ensuring it is complied with.
- Parties shall consult and coordinate to develop skills and resources, particularly those related to conservation techniques, to assist with the protection of the Area's values.

7(x) Requirements for reports

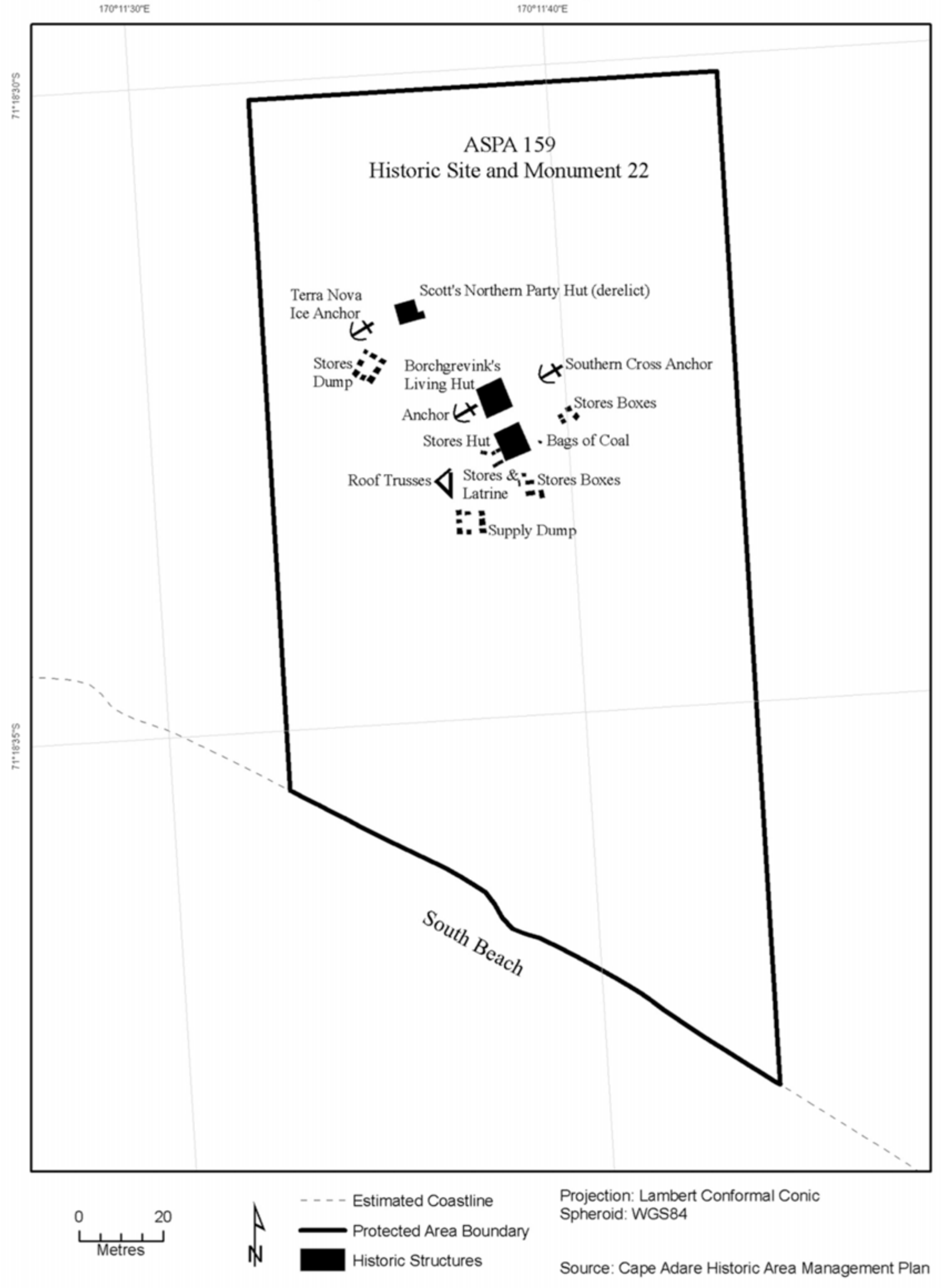
Parties shall ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports shall include, as appropriate, the information identified in the Visit Report Form provided in Appendix 4 of Resolution 2 (1998). In addition, any removal of materials in accordance with section 7 (vii) shall be detailed, including the reason for removal and the current location of the items or the date of disposal. Any return of such items to the site shall also be reported.

Parties shall maintain a record of such activities and, in the Annual Exchange of Information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, in sufficient detail to allow evaluation of the effectiveness of the Management Plan. Parties should wherever possible deposit originals or copies of such reports in a publicly accessible archive to maintain a record of visitation, to be used both for review of the Management Plan and in managing further visitation to the site.

Map A - Historic Hut, Cape Adare, Antarctic Specially Protected Area 159: Regional Map



Map B - Historic Hut, Cape Adare, Antarctic Specially Protected Area 159: Site Map



Measure 15 (2015)

Antarctic Specially Protected Area No 163 (Dakshin Gangotri Glacier, Dronning Maud Land): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Measure 2 (2005), which designated Dakshin Gangotri Glacier, Dronning Maud Land as ASPA 163 and annexed a Management Plan for the Area;
- Measure 12 (2010), which adopted a revised Management Plan for ASPA 163;

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 163;

Desiring to replace the existing Management Plan for ASPA 163 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 163 (Dakshin Gangotri Glacier, Dronning Maud Land), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 163 annexed to Measure 12 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area No 163

Dakshin Gangotri Glacier, Dronning Maud Land

Introduction

India introduced a Working Paper at XXV ATCM (WP47) on a draft management plan for a proposed site of Special Scientific Interest for Dakshin Gangotri Glacier Snout, Schirmacher Hills, Dronning Maud Land. The Committee noted that this should be termed an ASPA rather than SSSI. Accordingly, during XXVI ATCM India submitted a draft management plan for Antarctica Specially Protected Area (XXVI ATCM/WP-38) and thereafter submitted revised management plan during XXVII-ATCM (WP 33). The management plan was adopted by Measure 2 (2005) and designated ASPA 163 during XXVIII ATCM (WP 25). This Management Plan was further reviewed after five years with minor changes, while submitted to XXXIII-ATCM (WP055 rev1.) and adopted under Measure 12 (2010).

Dakshin Gangotri glacier has significant value in terms of glacier retreat monitoring. A snout is being monitored since 1983 to understand the effect of climate change on glacier. This area is also important for study of algae, moss, cynobacteria and lichen which are wide spread in Schirmacher Hills and especially within the ASPA site. Cynobacteria contribute significantly to the nitrogen fixation, and many species have been identified so far from this area. Many species of lichens are also indentified in this area according to study conducted since 2003.

1. Description of values to be protected

Historic Value

Dakshin Gangotri Glacier is a small tongue of polar continental ice sheet, overriding the Schirmacher Hills in central Dronning Maud Land (CDML). It was identified by the second Indian Antarctic Expedition in 1982-83 and since then its snout is being monitored regularly for fluctuation w.r.t. retreat/advance.

Scientific Value

With the availability of the vast amount of data for the past two decades, it has become a valuable site for observing the changes in the movement of the Antarctic ice sheet under the impact of global warming. The area has primary scientific importance for glaciologists and environmental scientists. Due to The scientific values of the Area and the nature of the research, the area is protected as an Antarctic Specially Protected Area consistent with Articles 2, 3, 5 and 6 of Annex V of the Protocol on Environmental Protection to the Antarctic Treaty; to prevent interference with ongoing planned scientific investigations.
Global positioning system (GPS) campaigns were conducted during the 2003 and 2004 austral summer seasons to obtain insight into the velocity and strain-rate distribution on the margin of the continental ice sheet overriding southern part of Schirmacher Hills in CDML. GPS data were collected for two years at 21 sites and analyzed to estimate the site coordinates baselines and velocities. Horizontal velocities of the glacier sites lie between 1.89±0.01 and 10.88±0.01 m a-1 to the north-northeast, with an average velocity of 6.21±0.01 m a-1. The principal strain rates provide a quantitative measurement of extension rates, which range from (0.11±0.01) &times 10-3 to (1.48±0.85) × 10-3 a-1, and

shortening rates, which range from (0.04±0.02) × 10-3 to (0.96±0.16) × 10-3 a-1 (Sunil et al., 2007).

Environmental Value

At the designated area, exploration showed abundant faunal diversity of the moss-inhabiting terrestrial invertebrate fauna. Schirmacher Hills is also an important area for the algae and cyanobacterial diversity. Terrestrial mosses are quite widespread in the Schirmacher Hills colonizing on a wide range of habitats. The mosses, because of their poikilohydric nature and alternative strategy of adaptation, are one of the plant groups which grow in Antarctica. Mosses play role in habitat modification, nutrient cycling and providing shelter and security to associated invertebrate animals. Studies on mosses in Schirmacher Hills revealed that distribution of mosses is significant at central part and at designated area as compare to eastern and western part.

Distribution of algae and cyanobacteria and flora of fresh water streams of the Hills at the designated area have been studied. The species reported are *G.magma, Chaemosiphon subglobosus, Oscillatoria limosa, O.limnetica,P. frigidum, P. autumnale, Nostoc commune, N.punctiforme, Calothrix gracilis, C.brevissima, Uronema sp.,and Cosmarium leave*. Among the cyanobacteria encountered in the stream of Schirmacher Hills, N_2 –fixing species might play a significant role in nitrogen economy of the ecosystem through N_2 –fixation. Studies on polar Skuas were also conducted at Schirmacher Hills and their nesting and breeding success have been reported around the designated place.

Further study on the Lichens carried out since 2003-04 within the protected area site, revealed occurance of species such as; *Acarospora geynnii* , C.W.Dodge & E.D.Rudolph, *Acarospora williamsii*, Filson, *Amandinea punctata*,(Hoffm.) Coppins & Scheid, *Buellia frigida*, Darb., *Buellia grimmiae*, Filson, *Candelaria murrayi*, Poelt, *Candelariella flava* , (C.W.Dodge & G.E. Baker), Castello & Nimis, *Carbonea vorticsa*, (Florke) Hertel, *Lecanora expectans* , Darb., *Lecanora fuscobrunnea* , C.W. Dodge & G.E. Baker, *Lecanora geophila* (Th. Fr.) Poelt, *Lecidea andersonii*, Filson, *Lecidea cancriformis* , C.W.Dodge & G.E. Baker, *Lecidella siplei* , (C.W. Dodge & G.E. baker) May., *Lepraria cacuminum* , (A. Massal.) Lohtander, *Physcia caesia* , (Hoffm.) Furnr., *Pseudephebe minuscule* , (Nyl. Ex Arnold) Brodo & D. Hawksw., and *Rhizoplaca melanophtalma*, (Ram.) Luckert & Poelt (Olech et al. 2010).

2. Aims and Objectives

Management of Dakshin Gangotri Glacier is aimed to:

- avoid degradation of values of the Area by preventing undue human interference
- allow glaciological and environmental scientific research, while ensuring protection of observational accuracy from any sort of man-made inputs
- ensure that peripheral points along the snout are not adversely affected by human activity in the Area
- maintain the Area as a reference marker for studying the movement patterns of this part of the Antarctic ice-sheet under the influence of global warming
- allow visits for management purposes in support of the aims of the Management Plan for the Area
- minimize the possibility of introduction of alien plants, animals and microbes into the Area

3. Management Activities

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

- A detailed map showing the location and boundaries of the Area and stating the special restrictions that apply would be displayed prominently at Maitri (India) and Novolazarevskaya (Russia) research stations; copies of this management plan will also be made available at both the stations.
- Two signs displaying the location and boundaries of the Area with clear statements of entry restrictions will be placed on prominent rocks near both the entrance points to the valley, the eastern end and the south-eastern end; to help avoid inadvertent entry.
- Copies of this management plan along with location and boundary maps of the Area will be provided to all the visiting ships/aircraft.
- Markers, signs, cairns and other structures erected within the Area for scientific and management purposes will be secured and maintained in good condition, and will be removed when no longer necessary.
- Visits shall be made as necessary (at least once every year) to assess whether the Area continues to serve the purposes for which it was designated and to ensure that maintenance and management are adequate.
- The management plan shall be reviewed no less than once every five years and updated as required.

4. Period of Designation

The ASPA is designated for an indefinite period.

5. Maps and Photographs

The following maps and photographs are enclosed for illustrating the Area and the proposed plan:

Map 1: Location of Schirmacher Hills in central Dronning Maud Land, East Antarctica.
Map2: Map of Schirmacher Hills, showing locations of Maitri Research Station (India) and Novolazarevskaya Research Station (Russia).
Map 3: Classification and Numbering of Lakes of Schirmacher Hills. (after Ravindra et al, 2001)
Map 4: Topographic map of the Area. (contour interval 10 m)
Map 5: Paths of Fossil Glaciers in Schirmacher Hills. (after Beg et al, 2000)
Map 6: Aerial view of the Dakshin Gangotri Glacier Snout.
Figure 1: Image showing the markers showing boundary location of ASPA

6. Description of the Area

i) Geographical coordinates, Boundary markers and Natural features

Schirmacher Hills is a rocky hill range, about 17 km long in E-W trend (bounded by Eastern longitudes 11° 22' 40" and 11° 54' 20") and about 0.7 km to 3.3 km wide (bounded by Southern latitudes 70° 43' 50" and 70° 46' 40"). Its elevation varies from 0 to 228 m above the msl. It is a part of central Dronning Maud Land in Eastern Antarctica. The proposed area is a fragment of the western part of Schirmacher Hills.

The Area proposed under ASPA is bounded by Eastern longitudes 11° 33' 30" and 11° 36' 30" and by the Southern latitudes 70° 44' 10" and 70° 45' 30". The Area is 4.53 sq. km in aerial extent. The northeastern and northwestern corners of the Area are on shelf-ice, while the southwestern extremity is on polar ice-sheet. The southeastern end lies on a rocky outcrop.

Topographically, the Area can be divided into four distinct units- the southern continental ice-sheet, rocky hill slopes, a vast central proglacial lake (Lake-B7, Sbrosovoye Lake) and northern undulatory shelf ice.

The southernmost ice-sheet is bare 'blue ice', descending from 180 m contour to 10 m contour at the snout of the Glacier. It is crevassed and crisscrossed by NE-SW to NNE-SSW trending fractures. Two small and ephemeral supraglacial streams flow over the snout in a NNE direction.

The rocky terrain is uneven and has the minimum width of the Schirmacher Hills at the snout point; less than 50 m only. The eastern and western sides of the hills slope towards the snout, making a wide valley. The contours descend from 150 m to msl at the northern margin of the rock outcrops.

The central part of the Area is occupied by Lake B7. It is a lake of glacial origin. The dimensions of the lake are about 500 m x 300 m.
The northernmost part of the Area comprises shelf ice with pressure ridges, fractures and crevasses. The contact between shelf ice and eastern rocky slopes is marked by a prominent 3-km long, NNE-SSW trending lineament. The fractures in the ice are also aligned parallel to this lineament.

Schirmacher Hills exposes a granulite to amphibolite facies metamorphic terrain. The rock types are represented by charnockites, enderbites, garnet-sillimanite, gneisses, garnet-biotite gneisses, quartzofeldspathic augen gneisses with some foliated lamprophyres, amphibolites, dolerite, metagabbro and metabasalt. The rock suites dominantly fall under Grenvillean (1000 Ma) and Pan-African (550 Ma) events. Three phases of deformation are distinct.

The Area comprises mostly charnockite-Khondalite type of rocks (quartz-garnet-sillimanite-perthite±graphite gneisses) with some interlayering of garnet-sillimanite quartzites, calc silicate gneisses and mafic granulites. Two sets of faults (N30E and N50E) are quite prominent. One such major fault runs from the north-eastern corner of the Area; cutting all the three geomorphological units- shelf ice, rocks and continental ice-sheet.

Meteorological data from the nearby Indian Research Station Maitri shows that the Area has a dry polar climate. The extreme temperatures for the warmest and the coldest months range between 7.4 to -34.8°C. The mean annual temperature is -10.2°C. December is the warmest month of the year and August is the coldest. The blizzards touch a gale speed of 90 to 95 knots; the mean annual wind speed is 18 knots. The dominant wind direction is E-SE. Snowfall is quite frequent during the winter months, but gale force winds scrub the rocky surfaces clean and snow deposition is widespread on the leeward side of the hillocks.
Glaciological observations from 1983 to 1996 were carried out by surveys from two fixed points (‘G’ and ‘H’) using EDM or theodolite. The results showed that the Glacier is steadily receding every year at an average recession rate of 70 cm per annum.

In 1996, to enhance the accuracy of the observations, 19 peripheral points were marked encircling the snout of the Glacier. The average annual recession in the years 1997 to 2002 was 48.7 cm, 74.9 cm, 69.5 cm, 65.8 cm and 62.7 cm, respectively. This translates into an overall average recession of 65.3 cm per annum for the period 1996-2002; which is in conformity with the observations for the previous period (1983 – 1996) of a recession rate of 7 meters per decade.

Further monitoring were carried out and data revealed that average yearly recession for 2003, 2004, 2005 and 2006, gradually increased to 68.0, 69.4, 71.3, 72.8 centimeter per annum. However during the year 2006-2007, the average retreat of the Dakshin Gangotri polar ice front was only 0.6 m, but the data collected from the western margin of Schirmacher Hills showed an average annual retreat of around 1.4 m during the year 2006-07. The average annual retreat of the Dakshin Gangotri Snout was recorded to be about 1m in 2008, whereas the average annual retreat for the western extension of polar ice front was recorded to be about 2m. The maximum recession was observed at observation-point-14, which recorded a cumulative recession of 17.21 meters in ten years (1996-2006).

Observations carried out after 2008-09 every year till date. Results shows that the annual recession of the snout is computed to be 1.1m, 0.26m, 0.59m, 0.33m, 0.92m, 0.29m and 1.31m, respectively. The recessional values computed from 1996-97 till date shows that the lowest recession has occurred in the year 2009-10 i.e 0.26 meter, whereas highest recession occurred during 2014-15 i.e 1.31 meter.

ii) Restricted and Managed Zones within the Area

Along the periphery of the Dakshin Gangotri Glacier, 19 observation points have been marked in February 1996. With reference to these points it was possible to record the movement of the Glacier with an accuracy of 1 cm. Precise monitoring on cm-scale is also available for the years 1996-2002. Access to this zone should be restricted. To protect the accuracy of scientific observations,it is proposed that a 100 m radius all along the periphery of the Glacier should have limited admittance.

iii) Structures within and near the Area

There are no structures present in the Area, apart from two cairns ('G' and 'H') marking the sites used for glaciological and topographical surveys.
In future, some signs and cairns will be erected notifying the protected status of the Area.

iv) Location of other Protected Areas within close proximity of the Area

In the entire Schirmacher Hills, there are no other protected areas.

7. Permit Conditions

i) Access to and movement within the Area

Entry into the Area would be prohibited except in accordance with a permit issued by an appropriate National Authority as designated under Annex V, Article 7 of the Protocol on Environmental Protection to the Antarctic Treaty.
A permit to enter the Area may only be issued for scientific research, or for essential management purposes consistent with the Management Plan's objectives and provisions; with the condition that the actions permitted will not jeopardize the scientific and environmental values of the Area and will not interfere with ongoing scientific studies. Access to the area is permitted only by foot, access to site using land vehicle or helicopter landing is prohibited within the area.

ii) Activities that are or may be conducted within the Area, including restrictions on time or place

The following activities may be conducted within the Area:

- Scientific research programmes consistent with the management Plan for the Area, including the values for which the Area has been designated; which can not be carried out elsewhere and which will not jeopardize the ecosystem of the Area.
- Essential management activities, including monitoring.

iii) Installation, modification or removal of structures

No structures are to be erected within the Area except as specified in a permit. Any equipment should not be installed if it is not essential for scientific research or for management activities, and it must be authorized in a permit. All scientific equipment installed in the Area must be clearly identified by country with name of principal investigator, year of installation and expected date of completion of the study. Details are to be included in the visit report. All such equipment should be made of materials that pose minimum risk of contamination and must be removed immediately after completion of the study. Removal of specific equipment for which the permit has expired shall be a condition of the permit.

iv) Location of field camps

Camping is not allowed in the Area. The field parties can camp either east of "Lake Kalika" at "VK-Ground" or beyond the western limit of the Area.

v) Restriction on materials and organisms, which can be brought into the Area

- No living animals, plant material or microorganism shall be deliberately introduced into the Area and precautions shall be taken against accidental introductions.
- No pesticides, herbicides, chemicals, radio-isotopes shall be brought into the Area, other than those permitted for scientific or management purposes. These authorized agents shall be removed from the Area at the conclusion of the activity.
- Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for terrestrial scientific field research in Antarctica (SCAR 2009).
- Fuel is not to be stored in the Area unless connected with authorized activity. Permanent depots are not to be built in the Area.
- All material taken into the Area shall be for a stated period only and shall be removed at or before the conclusion of that stated period.

vi) Taking or harmful interference with native flora and fauna
Any interference with the native flora and fauna of the Area shall be in accordance with the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, 1991, annex II, Article 3. Where taking or harmful interference with animals is involved, SCAR Code of Conduct for Use of Animals for Scientific Purposes in Antarctica shall be used as a minimum standard.

vii) Collection or removal of anything not brought into the Area by the Permit holder

Material may only be collected or removed from the Area as specified in the permit and shall be limited to the minimum necessary to meet scientific or management requirements.

Material of human origin, not brought into the Area by the permit holder, but which is likely to compromise the values of the Area may be removed from the Area unless the impact of removal is likely to be greater than leaving the material in situ. If this is the case the appropriate authority should be notified.

viii) Disposal of Waste

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

ix) Measures that are necessary to ensure that the aims and objectives of the management plan can continue to be met

- Permits may be granted to enter the Area to carry out biological monitoring and area inspection activities.
- Specific sites of long-term monitoring shall be appropriately marked and GPS positions will be obtained for records with the Antarctic Data Directory System through the appropriate National Authority.

x) Requirements for Reports

The principal permit holder would submit to the appropriate National Authority a visit report describing the activities undertaken by those issued permit. Reports are due and shall be submitted as soon as possible after the expiration of the permit, and include the types of information contained in SCAR visit report form or as required by national laws. The Authority will maintain a record of such activities and make this accessible to interested Parties.

8. Supporting Bibliography

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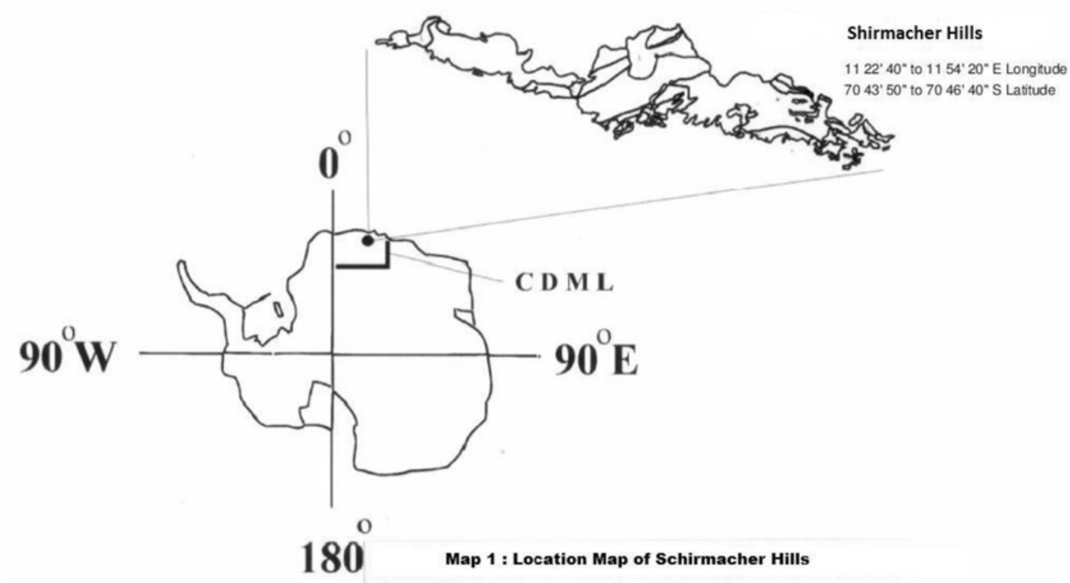
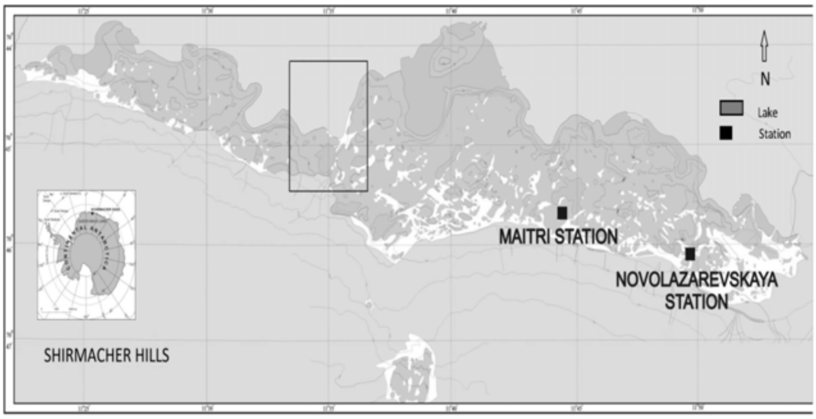
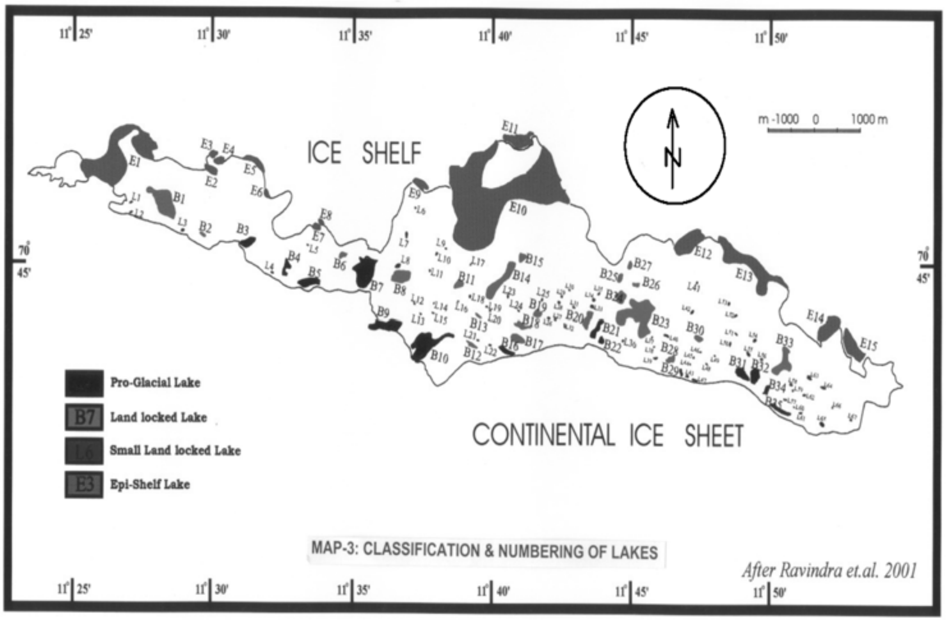
Figure 1: Images of Secured Markers at two Locations at the Boundary of ASPA-163



Map 1 : Location Map of Schirmacher Hills



MAP 2: MAP SHOWING LOCATION OF MAITRI AND NOVOLAZAREVSKAYA STATION



MAP-3: CLASSIFICATION & NUMBERING OF LAKES

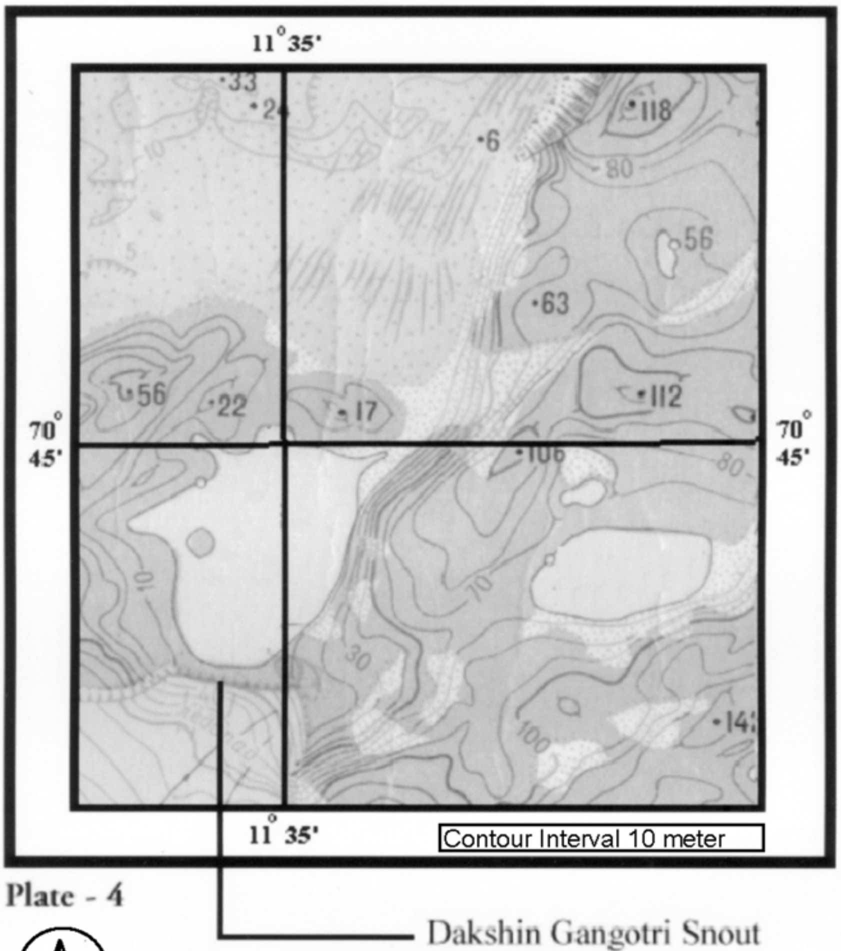


Plate - 4

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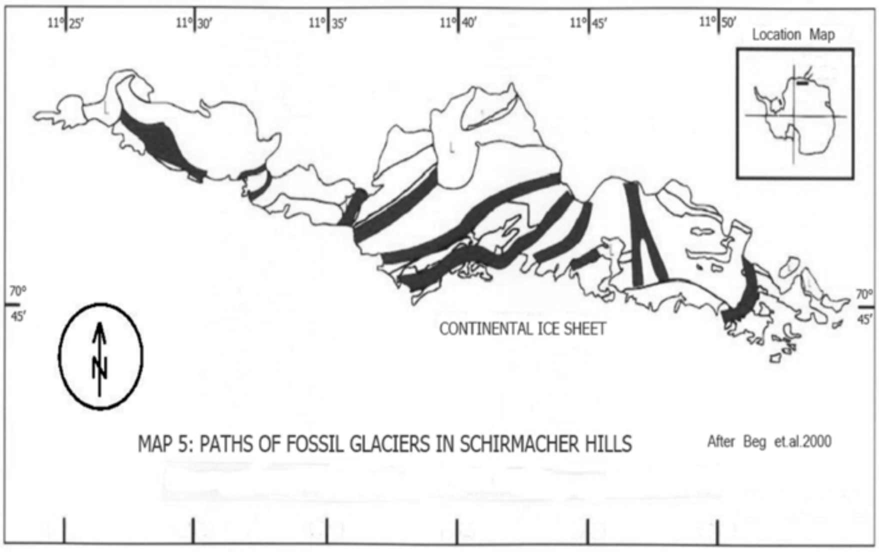
MAP-4: TOPOGRAPHIC MAP OF THE AREA



MAP 5: PATHS OF FOSSIL GLACIERS IN SCHIRMACHER HILLS


MAP-6: DAKSHIN GANGOTRI SNOUT (MARCH 2013)

Measure 16 (2015)

Antarctic Specially Protected Area No 164 (Scullin and Murray Monoliths, Mac.Robertson Land): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling

- Measure 2 (2005), which designated Scullin and Murray Monoliths, Mac. Robertson Land, East Antarctica as ASPA 164 and annexed a Management Plan for the Area;
- Measure 13 (2010), which adopted a revised Management Plan for ASPA 164;

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 164;

Desiring to replace the existing Management Plan for ASPA 164 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 164 (Scullin and Murray Monoliths, Mac.Robertson Land), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 164 annexed to Measure 13 (2010) be revoked.

Management Plan for Antarctic Specially Protected Area No. 164

SCULLIN AND MURRAY MONOLITHS, MAC.ROBERTSON LAND

Introduction

Scullin Monolith (67°47'37"S, 66°43'8"E) and Murray Monolith (67°47'3"S, 66°53'17"E) (Map A) were designated as Antarctic Specially Protected Area (ASPA) No 164 under Measure 2 (2005), following a proposal by Australia. A revised management plan for the Area was adopted under Measure 13 (2010). The Area is designated to protect the greatest concentration of breeding colonies of seabirds in East Antarctica. Seven species occupy territories in the Area: five species of petrel (Antarctic petrels *Thalassoica antarctica*, Cape petrels *Daption capense*, southern fulmars *Fulmarus glacialoides*, snow petrels *Pagodroma nivea*, Wilson's storm petrel *Oceanites oceanicus*), one penguin (Adélie penguin *Pygoscelis adeliae*) and one larid (south polar skua *Catharacta maccormicki*).

Compared to some other sites in East Antarctica, Scullin and Murray Monoliths are visited infrequently, and with the one known exception, all visits have been brief (less than a day). Scullin and Murray Monoliths were first visited during the second British, Australian and New Zealand Antarctic Research Expedition (BANZARE) voyage in 1930-31, on 13 February 1931. Sir Douglas Mawson named both monoliths during this visit. Murray Monolith was named after Sir George Murray, Chief Justice of South Australia, Chancellor of the University of Adelaide and a patron of the Expedition, while Scullin Monolith was named after James H. Scullin, Prime Minister of Australia from 1929-31.

A brief landing was made at Scullin Monolith on 26 February 1936 from the R.R.S. William Scoresby, when an ascent was made to a height of several hundred metres. The Norwegian Lars Christensen landed on 30 January 1937 and visited Scullin Monolith. Australian Antarctic program personnel occasionally make visits to the Area from Mawson station, approximately 160 km to the west. The only recorded stay within the Area was a six-day visit (1 to 6 February 1987), when comprehensive ornithological surveys were conducted. The first visit by a commercial tourist vessel to the area was made on 10 December 1992, and a small number of brief visits have been made in subsequent years.

1. Description of values to be protected

The Area is primarily designated to protect the outstanding ecological and scientific values associated with the important assemblage of seabirds found at Scullin Monolith and Murray Monolith.

With at least 160,000 pairs, the Antarctic petrel colony on Scullin Monolith is second in population size only to the colony at Svarthameren in the Mühlig Hofmannfjella, in Dronning Maud Land (ASPA 142). Thus, about a third of the estimated global population of approximately half a million pairs breeds at Scullin Monolith.

Adélie penguin colonies occupy the lower slopes of both monoliths, extending almost to the foreshore. The most recent survey in December 2010 found approximately 43,000 birds on Scullin Monolith and a further 80,000 pairs on Murray Monolith. (At this stage of the breeding season (mid incubation) the number of birds present will approximate the number of breeding pairs.) This represents approximately 5% of the Adélie penguin breeding population for East Antarctica and approximately 2% of the global population.

Many of the ocean-facing slopes of both monoliths are occupied by the other petrel species. Extensive breeding colonies occur on many of the steeper, higher-altitude slopes of both monoliths. South polar skuas nest throughout the Area, making use of the high density of breeding seabirds as prey during their breeding season.

Some large colonies of seabirds are known from elsewhere in East Antarctica (e.g. the Rauer Group). However, the combined breeding population conservatively estimated at 230,000 pairs and the rich species diversity within the two very small ice-free areas of Scullin and Murray Monoliths (about 1.9 and 0.9 km^2, respectively) mean that the monoliths support the greatest concentration of breeding seabirds, and one of the most diverse seabird breeding localities in East Antarctica (Appendix 1).

In addition to the outstanding ecological and scientific values, the Area possesses outstanding aesthetic values arising from the geomorphology of the two monoliths and the spectacular backdrop of glaciers that descend from the continental plateau and flow around the monoliths to end in calving glaciers.

The very large and diverse breeding assemblage of seabirds in a setting of high aesthetic and wilderness values warrants the highest level of protection.

2. Aims and Objectives

Management of Scullin and Murray Monoliths aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- maintain the undisturbed nature of the Area to permit its future use as a reference area;
- allow scientific research on the ecosystem and values of the Area, providing it is for compelling reasons which cannot be served elsewhere and will not impact on the values of the Area, particularly ornithological values;
- grant high priority to the collection of seabird census data from representative sample areas, reference breeding groups (RBGs) or of whole breeding populations. These census data will be major determinants in, and contributions to, future revisions of the management strategy for the Area;
- accord high priority to the collection of other biological survey data, in particular flora and invertebrate surveys. These survey data will be incorporated into future revisions of the management strategy for the Area;
- allow visits for management purposes in support of the aims of the management plan; and
- minimise the potential for introduction of non-native plants, animals and micro-organisms, particularly avian pathogens.

3. Management Activities

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

- where practical, the Area shall be visited as necessary, and preferably no less than once every five years, to conduct censuses of seabird breeding populations, including mapping of colonies and nest sites;
- information on the Scullin and Murray Monoliths ASPA, including copies of this management plan, will be made available at both Davis and Mawson stations and to all visitors;

- national Antarctic programs operating in the vicinity or intending to visit the Area shall consult with other national programs to ensure that research projects do not overlap or conflict; and
- where practical, management visits will be made to remove unnecessary materials currently located within the Area.

4. Period of Designation

The Area is designated for an indefinite period.

5. Maps and Photographs

- **Map A**: Antarctic Specially Protected Area No 164, Scullin and Murray Monoliths, Mac.Robertson Land, East Antarctica. The inset map indicates the location in relation to the Antarctic continent.
- **Map B**: Antarctic Specially Protected Area No. 164, Scullin Monolith: Topography and Bird Distribution.
- **Map C**: Antarctic Specially Protected Area No. 164, Murray Monolith: Topography and Bird Distribution.
- **Map D**: Antarctic Specially Protected Area No. 164: Scullin Monolith: Helicopter approach and landing site.

Specifications for all maps: Horizontal Datum: WGS84; Vertical Datum: Mean Sea Level.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Scullin Monolith (67°47’37”S, 66°43’8”E) and Murray Monolith (67°47’3”S, 66°53’17”E) are situated on the coast of Mac.Robertson Land some 160 km east of Mawson station (Map A). The monoliths are approximately seven kilometres apart and abut the sea at the edge of the continental ice sheet. The coastline to the west and east, and between the monoliths, consists of ice cliffs 30 – 40 m high; the Antarctic plateau rises steeply from there to the south. Scullin Monolith is a crescent-shaped massif whose highest point is 443 m above sea level. It encloses a broad north-facing cove with an entrance approximately one kilometre wide. All upper slopes of the monolith are precipitous, but in the lower 100 m the slope eases in many parts and these areas are strewn with boulders and large stones. Elsewhere in the lower parts the rock face falls sheer to the sea, and there are some scree slopes.

The walls of Murray Monolith rise from the sea to a dome-shaped summit at 340 m above sea level. On the western side of Murray Monolith, the lower slopes drop to a coastal platform. The Area extends over all ice-free areas associated with the two monoliths, and includes a portion of the adjacent continental ice and Torlyn Mountain to the south-west of Murray Monolith (which rises to about 400 m above sea level). There are no boundary markers delimiting the site.

The Scullin and Murray Monoliths ASPA comprises two sectors (see Map B and Map C):

- Scullin Monolith: the boundary commences at a coordinate on the coastline at 67°46’59”S, 66°40’30”E, then in a southerly direction to a coordinate at 67°48’03”S, 66°40’26”E, east to a coordinate at 67°48’06”S, 66° 44’33”E then north to a coordinate on the coast at 67°46’41”S, 66°44’37”E, then west following the coast line at the low tide mark to the coordinate 67°46’59”S,66° 40’30”E.

- Murray Monolith: the boundary commences on the coastline at 67°46’36”S, 66°51’01”E, then continuous in a southerly direction to 67°48’03”S, 66° 50’55”E, extends east to 67°48’05”S, 66°53’51”E, and north to 67°46’38”S, 66°54’00”E, then west following the coast line at the low tide mark to the coordinate 67°46’36”S, 66°51’01”E.

Birds

Seven species occupy territories in the Area: five species of petrel (Antarctic petrels *Thalassoica antarctica*, Cape petrels *Daption capense*, southern fulmars *Fulmarus glacialoides*, snow petrels *Pagodroma nivea*, Wilson’s storm petrel *Oceanites oceanicus*), one penguin (Adélie penguin *Pygoscelis adeliae*) and one larid (south polar skua *Catharacta maccormicki*). Scullin Monolith hosts the second largest colony of Antarctic petrels with a population of at least 160,000 pairs and significant Adélie penguin colonies. Less is known about the species diversity of Murray Monolith; however approximately 8,000 Adélie penguins were observed in 2010/11(Appendix 1).

There has been only one attempt (in 1986/87) to estimate the population of all species in the Area. A subsequent aerial survey in 2010/11 focussed on Adélie penguins only. Consequently, the Adélie penguin is the only species for which any data on population change is available. The Adélie population estimates for Scullin Monolith are similar at these two times (approximately 50,000 and 43,000 pairs) and the difference is likely to be within measurement error. The estimates for Murray Monolith differ substantially (approximately 20,000 and 8,000 pairs), but the basis for the early estimate is not clearly described and the value may not be reliable. It is likely that the 1986/87 census of petrels under-estimated the breeding population given the census occurred late in the breeding season.

Geology

The geology of the two monoliths is poorly understood, as they have been neither the subject of dedicated study nor specific geological mapping. The geology of the monoliths appears to be similar in general terms to that of the region around Mawson station. The rocks consist dominantly of high grade granulite facies gneisses of metasedimentary origin, including some sapphirine bearing rocks. The metamorphism occurred in anhydrous conditions probably at about 1000Ma. An age range of between 1254Ma and as young as 625Ma have been documented for the gneisses from Scullin Monolith. Metamorphism involved sedimentary rocks initially of Proterozoic age. These metamorphic basement rocks were intruded at about 920-985Ma by the Mawson Charnockite a form of granite characterised by presence of orthopyroxene, and common in this region. It forms the faces of the monoliths. The recorded an age of 433 and 450Ma which may reflect a later influence of the '500 Ma or Pan-African event' recorded widely throughout Gondwana. The margins of the monoliths contain some sediment carried by the icesheet and deposited by melting ice. The source cannot be specified but it may contain recycled material from farther inland and could perhaps provide evidence of some of the geology beneath the ice.

Environmental Domains and Antarctic Conservation Biogeographic Regions

Based on the Environmental Domains Analysis for Antarctica (Resolution 3(2008)) Scullin and Murray Monoliths are located within Environments D *East Antarctic coastal geologic* and L *Continental coastal-zone ice sheet*. Based on the Antarctic Conservation Biogeographic Regions (Resolution 6 (2012)) the Area is not assigned to a Biogeographic Region.

Vegetation

The flora reported from Scullin Monolith is given in Appendix 3, based on visits in 1972 and 1987. All species of lichens and moss found on Scullin Monolith occur elsewhere in Mac.Robertson Land (Appendix 2). Vegetation on Scullin Monolith is restricted mainly to the western plateau and associated nunataks. The coastal slopes are generally void of vegetation due to high levels of seabird guano. The distribution of vegetation on the western plateau is influenced by microtopography that controls the extent of exposure and moisture availability. Although not recorded, it is likely that vegetation at Murray Monolith is similar to that found at Scullin Monolith.

Other biota

There have been no comprehensive invertebrate studies at Scullin or Murray Monoliths. A leopard seal *Hydrurga leptonyx* was sighted during a visit in 1936 and several Weddell seals *Leptonychotes weddellii* were observed during visits in 1997 and 1998; no further observations of biota have been reported.

6(ii) Access to the Area

Travel to the Area is possible by small boat, by over-snow/ice vehicles or by aircraft, in accordance with section 7(ii) of this plan.

6(iii) Structures within and adjacent to the Area

At the time of writing (March 2015), a fibreglass 'Apple' refuge is situated on the south western summit ridge of Scullin Monolith (approximately 67°47’24”S, 66°41’38”E) (Map B and Map D). There are four 200-litre drums of helicopter fuel and one empty 200-litre drum as well as the (reported) remains of a food cache (1985/86 vintage). It is intended that all of this material be removed from the Area at the first suitable opportunity.

6(iv) Location of other protected areas within close proximity of the Area

There are two ASPAs located to the west of Scullin and Murray; ASPA No. 102, Rookery Islands (67°36’36” S, 62°32’01” E), is approximately 180 km to the west (c.20 km west of Mawson), and ASPA No. 101, Taylor Rookery (67°27’S; 60°53’E), is located approximately 70 km further west of the ASPA No. 102.

6(v) Special zones within the Area

There are no special zones within the Area.

7. Permit conditions

7(i) General permit conditions

Entry to the Area is prohibited except in accordance with a permit issued by an appropriate national authority. General conditions for issuing a permit to enter the Area are that:

- it is issued only for compelling scientific or management purposes that cannot be served elsewhere, in particular for scientific study of the avifauna and ecosystem of the Area, or for essential management purposes consistent with plan objectives, such as inspection, maintenance or review;
- the actions permitted are in accordance with this management plan and will not jeopardise the values of the Area;
- it is issued for a specified period;
- it will authorise the entry into the Area of no more than 10 people at any one time during the seabird breeding season, and no more than 15 people at any one time during the remainder of the year;
- the permit or an authorised copy shall be carried at all times when within the Area;
- a visit report shall be supplied to the appropriate national authority at the conclusion of the permitted activity; and
- the appropriate national authority shall be notified of any activities/measures undertaken that were not included in the authorised permit.

7(ii) Access to and movement within or over the Area

- Travel to the Area is possible by small boat, by over-snow/ice vehicles or by aircraft.
- Any movement within and around the Area shall observe the minimum specified wildlife approach distances (Appendix 3); closer approach may be allowed specifically under permit.
- Movement by visitors within the Area shall be by foot only.
- Small boats used to approach the Area must be operated at or below five knots within 500 m of the shore.
- It is recommended that visitors not permitted to enter the Area do not approach within 50 m of the shoreline.
- To reduce disturbance to wildlife, noise levels including verbal communication are to be kept to a minimum. The use of motor-driven tools and any other activity likely to generate loud noise and thereby cause disturbance to nesting birds shall not be allowed within the Area during the summer seabird breeding season (1 October to 31 March).

Aircraft may be used to enter the Area subject to the following conditions:

- disturbance of the colonies by aircraft shall be avoided at all times;
- during the breeding season (1 October to 31 March) there shall be no overflights of the Area below 1500 m (5000 ft) for twin-engine helicopters and below 930 m (3050 ft) for single-engine helicopters and fixed-wing aircraft;
- landings within the Area shall only occur at the designated landing site at Scullin monolith (Map D) and only by single-engine helicopters;
- single-engine helicopters shall approach the landing site from the south-west (as shown by the approved flight corridor in Map D);
- during the breeding season, twin-engine helicopters shall not land, take off or fly within 1500 m of the Area;
- during the breeding season, fixed wing aircraft shall not land or take off within 930 m or fly within 750 m (2500 ft) of the Area;
- under no circumstances are aircraft to fly within the Scullin Monolith amphitheatre during the breeding season;
- twin-engine helicopters may land at the designated landing site outside the breeding season (1 October - 31 March); and
- refuelling of aircraft is not to take place within the Area.

7(iii) Activities that are, or may be conducted within the Area, including restrictions on time and place

The following activities may be conducted within the Area as authorised by permit:

- compelling scientific research that cannot be undertaken elsewhere, including the initiation or continuance of ongoing monitoring programmes; and
- other scientific research and essential management activities consistent with this Management Plan that will not affect the values of the Area or its ecosystem integrity.

7(iv) Installation, modification or removal of structures

No new temporary structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons and for a pre-established period, as specified in a permit. Scientific markers and equipment must be secured and maintained in good condition, clearly identifying the permitting country, name of principal investigator and year of installation. All such items should be made of materials that pose minimum risk of harm to fauna and flora or of contamination of the Area.

A condition of the permit shall be that equipment associated with the approved activity shall be removed on or before completion of the activity. Details of markers and equipment temporarily left in situ (GPS locations, description, tags, etc. and expected removal date) shall be reported to the permitting authority.

7(v) Location of field camps

Temporary camps for field parties are permitted within the Area, but must be placed as far from seabird colonies and nesting sites as is practicable without compromising visitor safety. Camps shall be established for the minimum time necessary to undertake approved activities, and shall not be allowed to remain from one seabird breeding season to the next.

7(vi) Restrictions on materials and organisms that may be brought into the Area

- A small amount of fuel is permitted within the Area for cooking purposes while field parties are present. Otherwise, fuel is not to be stored within the Area.
- No poultry products, including dried foods containing egg powder, are to be taken into the Area.
- No herbicides or pesticides are to be taken into the Area.
- All chemicals required for research purposes must be approved by permit, and shall be removed at or before the conclusion of the permitted activity to which they relate. The importation and use of radio-nucleides and stable isotopes within the Area is prohibited.
- Deliberate introduction of animals, plant material, micro-organisms and non-sterile soil into the Area is prohibited. The highest level precautions shall be taken to prevent the accidental introduction of animals, plant material, micro-organisms and non-sterile soil from other biologically distinct regions (within or beyond the Antarctic Treaty area) into the Area;
- To the maximum extent practicable, clothing, footwear and other equipment used or brought into the Area (including backpacks, carry-bags and other equipment) shall be thoroughly cleaned before entering and after leaving the Area.
- Boots and sampling/research equipment and markers that comes into contact with the ground shall be disinfected or cleaned with hot water and bleach before entering and after visiting the Area to help prevent accidental introductions of animals, plant

material, micro-organisms and non-sterile soil into the Area. Cleaning should be undertaken at station.

- Visitors should also consult and follow as appropriate recommendations contained in the Committee for Environmental Protection Non-native Species Manual (CEP 2011), and in the Environmental Code of Conduct for terrestrial scientific field research in Antarctica (SCAR 2009);

7(vii) Taking of or harmful interference with native flora and fauna

Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a permit. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the *SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.* Disturbance to wildlife should be avoided at all times.

7(viii) Collection or removal of anything not brought into the Area by the permit holder

Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or was otherwise authorised, may be removed unless the impact of the removal is likely to be greater than leaving the material in situ. If such material is found, the permit issuing authority shall be notified if possible while the field party is present within the Area.
Specimens of natural materials may only be collected or removed from the Area as authorised in a permit and should be limited to the minimum necessary to meet scientific or management needs.

7(ix) Disposal of waste
All wastes, including human wastes, shall be removed from the Area. Wastes from field parties shall be stored in such a manner to prevent scavenging by wildlife (e.g. skuas) until such time as the wastes can be disposed or removed. Wastes are to be removed no later than the departure of the field party. Human wastes and grey water may be disposed into the sea well outside the Area.

7(x) Measures that may be necessary to ensure that the aims and objectives of the Management Plan continue to be met

- Permits may be granted to enter the Area to carry out biological monitoring and Area inspection activities, which may involve the collection of samples for analysis or review.
- Ornithological surveys, including aerial photographs for the purposes of population census, shall have a high priority.
- All GPS, survey and census data collected by field parties visiting the Area shall be made available to the permit issuing authority and the Party responsible for developing the management plan (if different).
- These data shall be lodged in the Antarctic Master Data Directory.
- Visitors shall take special precautions against the introduction of alien organisms to the Area. Of particular concern are pathogenic, microbial or vegetation introductions sourced from soils, flora or fauna at other Antarctic sites, including research stations, or from regions outside Antarctica. To minimise the risk of introductions, before entering the Area, visitors shall thoroughly clean footwear and any equipment to be used in the Area, particularly sampling equipment and markers.

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed. Such visit reports should include, as applicable, the information identified in the visit report form contained in the *Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas*. If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan. Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.
A copy of the report should be forwarded to the Party responsible for development of the Management Plan (Australia) to assist in management of the Area, and the monitoring of bird populations.

8. Supporting documentation

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Appendix 1: Estimates of breeding populations (pairs) of seabirds at Scullin and Murray Monoliths

Species	**Scullin Monolith**	**Murray Monolith**
Adélie penguin *Pygoscelis adeliae*	43,000	8,000
Southern fulmar *Fulmarus glacialoides*	1,350	150
Antarctic petrel *Thalassoica antarctica*	157,000	3,500
Cape petrel *Daption capense*	14	ND
Snow petrel *Pagodroma nivea*	1,200	ND
Wilson's storm petrel *Oceanites oceanicus*	ND	ND
South polar skua *Catharacta maccormicki*	30	ND

Note: ND indicates no census data are available

Appendix 2: Flora recorded at Scullin Monolith
The following taxa were collected at Scullin Monolith in 1972 (R Seppelt) and in 1987 (D Bergstrom), and were published in Bergstrom & Seppelt 1990).

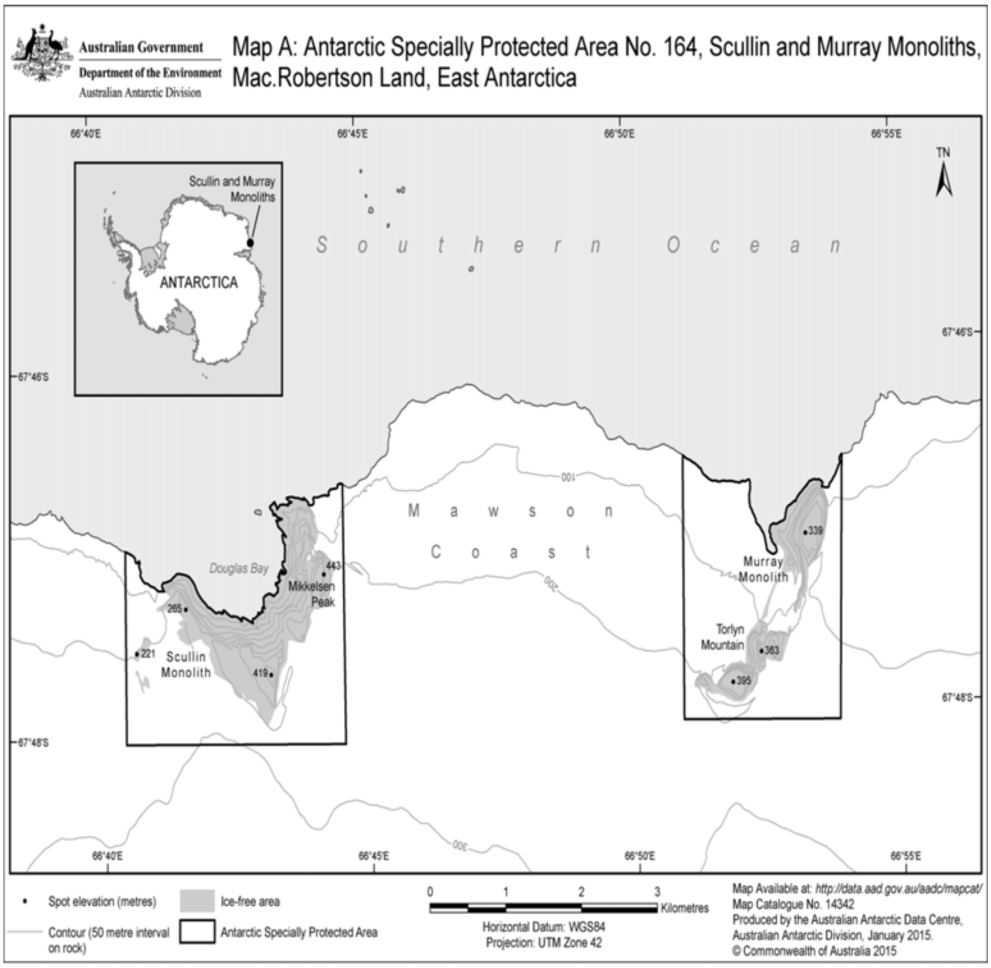
LICHENS **Acarosporaceae**	**Teloschistaceae**
Biatorella cerebriformis (Dodge) Filson	*Caloplaca citrina* (Hoffm.) Th. Fr.
*Acarosporagwynii*Dodge&Rudolph	*Xanthoriaelegans*(Link.)Th.Fr.

Lecanoraceae *Lecanora expectans* Darb *Rhizoplaca melanophthalma* (Ram.) Leuck.	*Xanthoria mawsonii* Dodge **Candelariaceae** *Candellariella hallettensis* Murray
Lecideaceae	**Umbilicariaceae**
Lecidea phillipsiana Filson	*Umbilicaria decussata* (Vill.) Zahlbr.
Lecidea woodberryi Filson **Physciaceae** *Physcia caesia* (Hoffm.) Hampe	**Usneaceae** *Usnea antarctica* Du Rietz *Pseudophebe miniscula* (Nyl. Ex Arnold) Brodo et Hawksw.
Buellia frigida Darb	
Buellia grimmiae Filson *Buellia lignoides* Filson	**BRYOPHYTES**
Rinodina olivaceobrunnea Dodge & Baker	**Grimmiaceae** *Grimmia lawiana* Willis **Pottiaceae** *Sarconeurum glaciale (C.* Muell.) Card. Et Bryhn

Appendix 3: Approach distances guide: minimum distances (m) to maintain when approaching wildlife without permit.

Species	People on foot/ski	Quad/skidoo	Hagglunds
Southern Giant Petrel	100	150	250
Emperor penguins in colonies	30		
Other penguins in colonies Moulting penguins Seals with pups Seal pups on their own Prions and petrels on nest South Polar Skua on nest	15		
Penguins on sea ice Non-breeding adult seals	5		

Notes:
1. These distances are a guide, and should you find that your activity is disturbing wildlife, a greater distance is to be maintained.
2. 'Prions and petrels' comprises Cape petrels, Antarctic petrels, Wilson's storm petrels, snow petrels and southern fulmars.



Australian Government
Department of the Environment
Australian Antarctic Division
Map A: Antarctic Specially Protected Area No. 164, Scullin and Murray Monoliths, Mac.Robertson Land, East Antarctica
66°40'E
66°45'E
66°50'E
66°55'E
TN
Scullin and Murray Monoliths
ANTARCTICA
S o u t h e r n   O c e a n
67°46'S
M a w s o n
C o a s t
Douglas Bay
443
Mikkelsen Peak
265
221
Scullin Monolith
419
339
Murray Monolith
Torlyn Mountain
363
395
67°48'S
100
200
300
Spot elevation (metres)
Ice-free area
Contour (50 metre interval on rock)
Antarctic Specially Protected Area
0 1 2 3 Kilometres
Horizontal Datum: WGS84
Projection: UTM Zone 42
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14342
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, January 2015.
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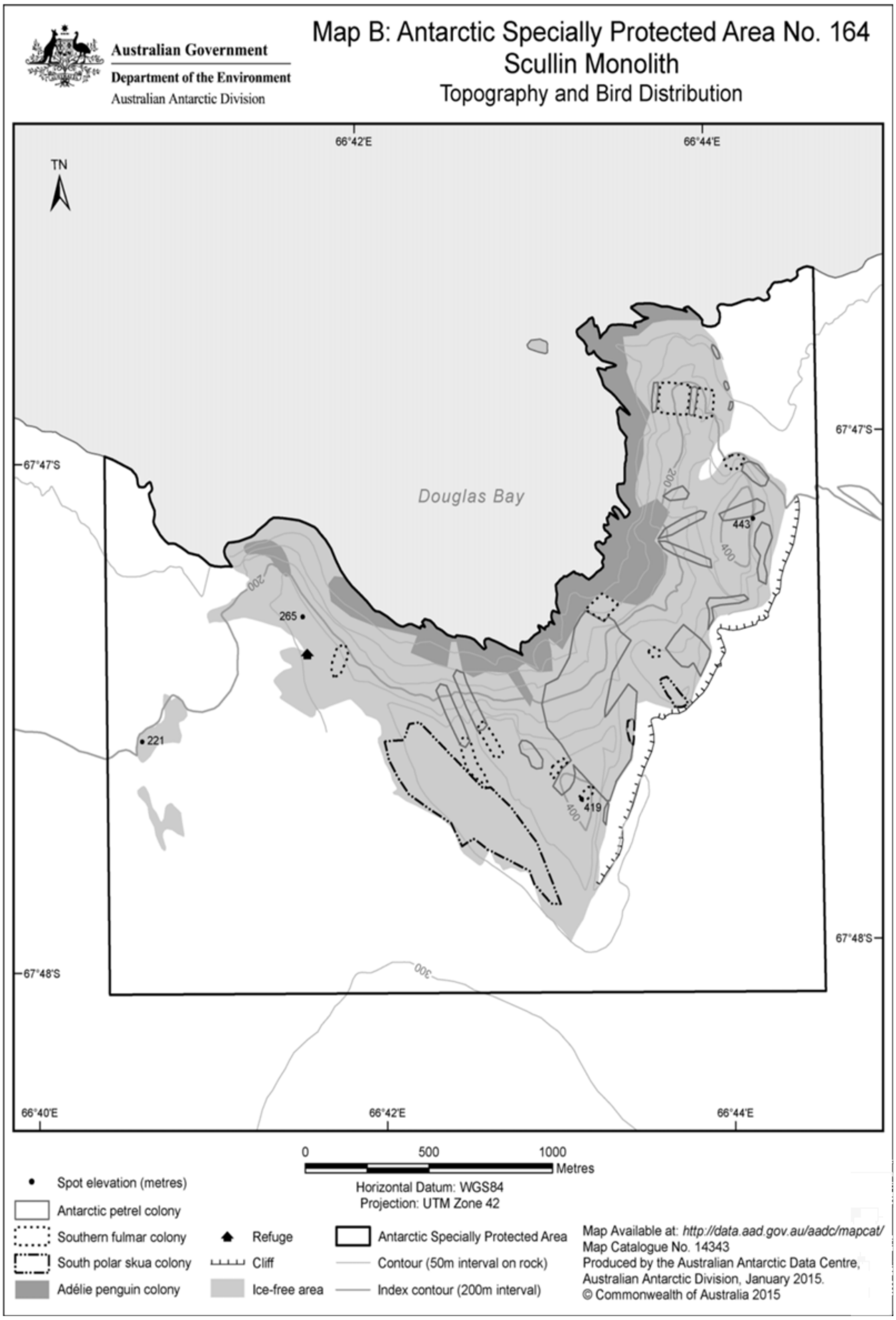
Australian Government
Department of the Environment
Australian Antarctic Division
Map B: Antarctic Specially Protected Area No. 164
Scullin Monolith
Topography and Bird Distribution
66°42'E
66°44'E
TN
67°47'S
Douglas Bay
443
400
200
265
221
419
67°48'S
300
66°40'E
0
500
1000
Metres
Horizontal Datum: WGS84
Projection: UTM Zone 42
Spot elevation (metres)
Antarctic petrel colony
Southern fulmar colony
South polar skua colony
Adélie penguin colony
Refuge
Cliff
Ice-free area
Antarctic Specially Protected Area
Contour (50m interval on rock)
Index contour (200m interval)
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14343
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, January 2015.
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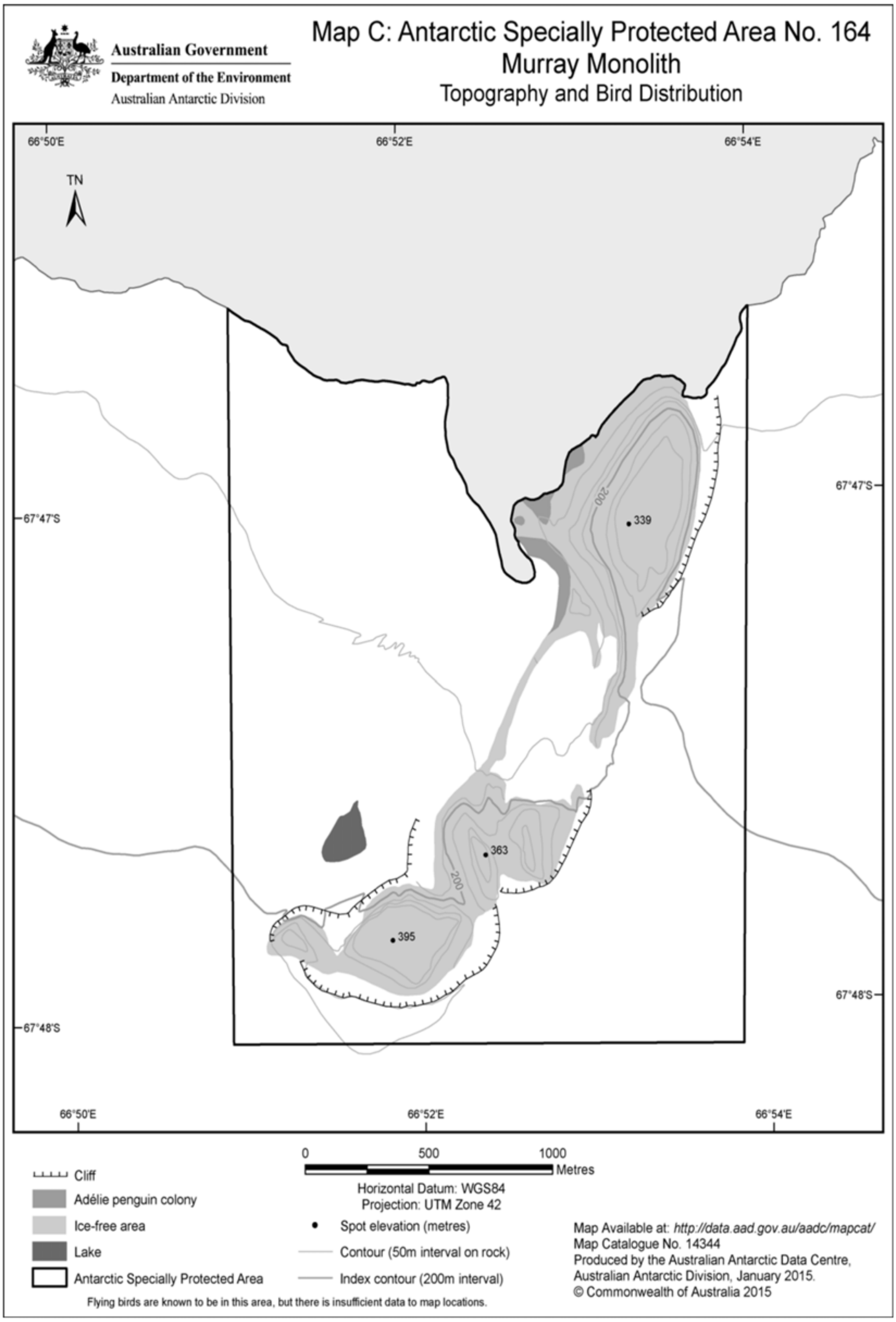

Australian Government
Department of the Environment
Australian Antarctic Division
Map C: Antarctic Specially Protected Area No. 164
Murray Monolith
Topography and Bird Distribution
66°50'E
66°52'E
66°54'E
TN
67°47'S
67°48'S
339
363
395
200
Cliff
Adélie penguin colony
Ice-free area
Lake
Antarctic Specially Protected Area
0
500
1000
Metres
Horizontal Datum: WGS84
Projection: UTM Zone 42
Spot elevation (metres)
Contour (50m interval on rock)
Index contour (200m interval)
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14344
Produced by the Australian Antarctic Data Centre,
Australian Antarctic Division, January 2015.
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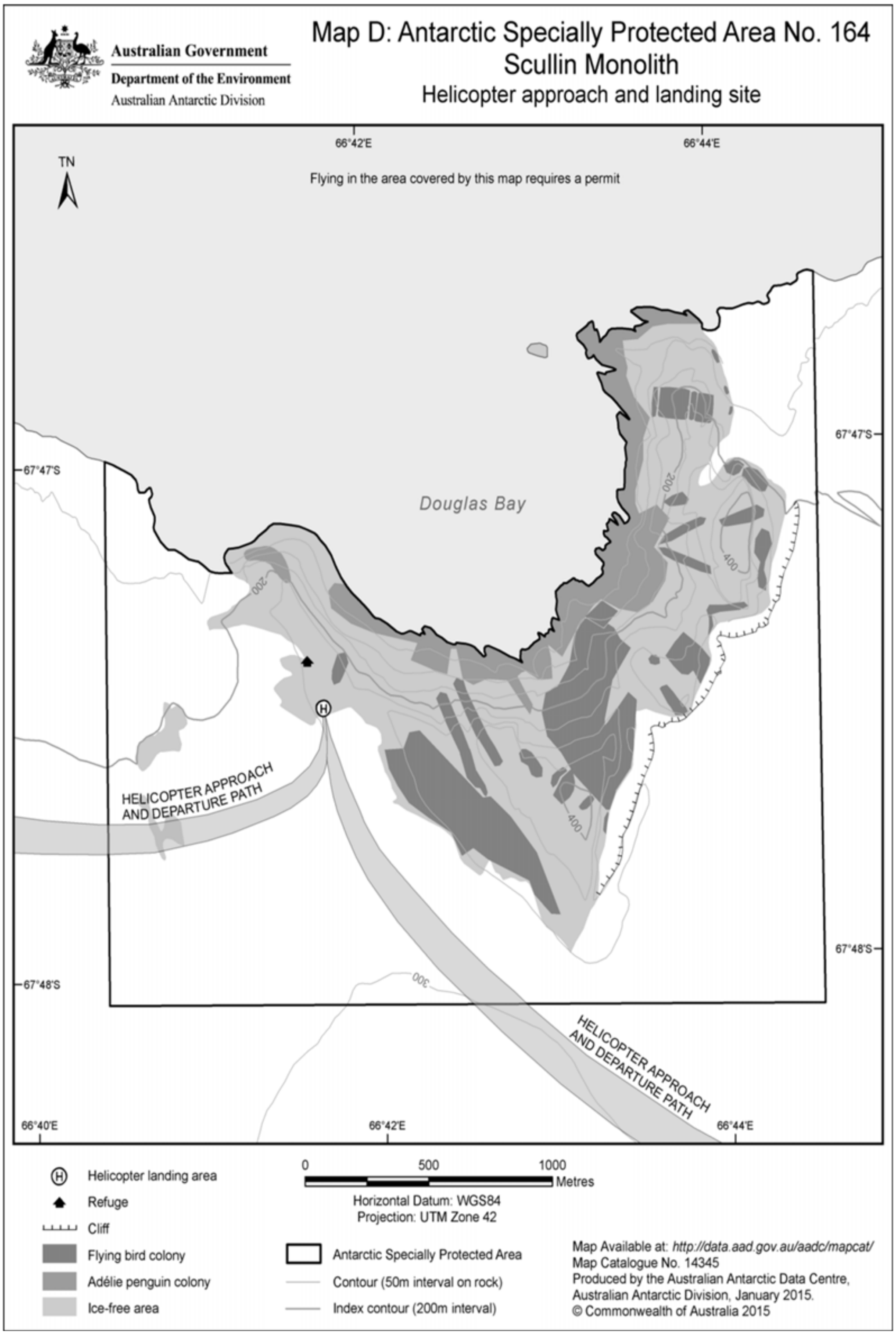
Flying birds are known to be in this area, but there is insufficient data to map locations.


Australian Government
Department of the Environment
Australian Antarctic Division
Map D: Antarctic Specially Protected Area No. 164
Scullin Monolith
Helicopter approach and landing site
66°42'E
66°44'E
TN
Flying in the area covered by this map requires a permit
67°47'S
Douglas Bay
200
400
HELICOPTER APPROACH AND DEPARTURE PATH
300
67°48'S
66°40'E
Helicopter landing area
Refuge
Cliff
Flying bird colony
Adélie penguin colony
Ice-free area
0
500
1000
Metres
Horizontal Datum: WGS84
Projection: UTM Zone 42
Antarctic Specially Protected Area
Contour (50m interval on rock)
Index contour (200m interval)
Map Available at: http://data.aad.gov.au/aadc/mapcat/
Map Catalogue No. 14345
Produced by the Australian Antarctic Data Centre, Australian Antarctic Division, January 2015.
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Measure 17 (2015)

Antarctic Specially Protected Area No 168 (Mount Harding, Grove Mountains, East Antarctica): Revised Management Plan

The Representatives,

Recalling Articles 3, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Protected Areas ("ASPA") and the approval of Management Plans for those Areas;

Recalling Measure 2 (2008), which designated Mount Harding, Grove Mountains, East Antarctica as ASPA 168 and annexed a Management Plan for the Area;

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASPA 168;

Desiring to replace the existing Management Plan for ASPA 168 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:

That:

1. the revised Management Plan for Antarctic Specially Protected Area No 168 (Mount Harding, Grove Mountains, East Antarctica), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Protected Area No 168 annexed to Measure 2 (2008) be revoked.

Management Plan for Antarctic Specially Protected Area No 168

MOUNT HARDING, GROVE MOUNTAINS, EAST ANTARCTICA

Introduction

The Grove Mountains (72°20’-73°10’S, 73°50’-75°40’E) are located approximately 400km inland (south) of the Larsemann Hills in Princess Elizabeth Land, East Antarctica, on the eastern bank of the Lambert Rift(Map A). Mount Harding (72°51’ -72°57’ S, 74°53’ -75°12’ E) is the largest mount around Grove Mountains region, and located in the core area of the Grove Mountains that presents a ridge-valley physiognomies consisting of nunataks, trending NNE-SSW and is 200m above the surface of blue ice (Map B).
The primary reason for designation of the Area as an Antarctic Specially Protected Area is to protect the unique geomorphological features of the area for scientific research on the evolutionary history of East Antarctic Ice Sheet (EAIS), while widening the category in the Antarctic protected areas system.

Research on the evolutionary history of EAIS plays an important role in reconstructing the paleoclimatic evolution in global scale. Up to now, a key constraint on the understanding of the EAIS behaviour remains the lack of direct evidence of ice sheet surface levels for constraining ice sheet models during known glacial maxima and minima in the post-14 Ma period.

The remains of the fluctuation of ice sheet surface preserved around Mount Harding, will most probably provide the precious direct evidences for reconstructing the EAIS behaviour. There are glacial erosion and wind-erosion physiognomies which are rare in nature and extremely vulnerable, such as the ice-core pyramid, the ventifact, etc. These glacial-geological features have not only important scientific values, but also rare wildness and aesthetic values and the disorderly human activities would cause perpetual, unrepairable damage to it.

The Chinese Antarctic Research Expedition (CHINARE) has visited the Grove Mountains for several times from1998 to 2014, and plans to visit the Area in the coming 2015/2016 season, focusing on research on geological tectonics, glacial geology and landscape, meteorology, ice-cap movement and mass balance, surveying and mapping, especially on fluctuation of Antarctic icecap surface since the Pliocene, and these research results in some new discoveries.

The Australian Antarctic Programme has visited the Grove Mountains to conduct a range of geoscience and glaciology research and support activities for several times. It currently maintains a continuous GPS station on Tianhe Range and expects to continue to access the region for research and operational purposes. Besides, Russian Antarctic Research Expedition has ever tripped there in 1958 and 1973 for a short stay, but whether they have arrived at the Area is unclear.

1. Description of values to be protected

The Mount Harding area designated as the site for the specially protected area (Map A) has the precious physiognomies of glacier erosion preserved in the ice sheet of inland Antarctic, which is of great scientific, aesthetic and wilderness values. The aim of this protected area is to preserve its scientific, aesthetic and wilderness values.

1(i) Scientific values

A lot of remains of ice sheet advance and retreat are preserved in Mount Harding, which are the direct evidence of the changes of cold and warm in the global environment since Pliocene. In this Area, the scientists have found the rare extreme cold desert soil, the sedimentary rocks formed in the Neogene Period that are not consolidated completely, as well as the valuable spore pollen assemblages in those paleo-soils and sedimentary rocks. All of these imply there was a warm climate event in this area probably resulting in a large-scale retreat of the EAIS, and its margin might be even beyond the Grove Mountains, 400km south from its present coast of the EAIS.

The unique geomorphological features in this Area includes the integral geologic-geomorphic remains and a series of special physiognomy, such as ice-core pyramid, ventifacts, ice-cored moraine (end moraine and lateral moraine), cold-desert soil, sedimentary erratics, pool of melted water, rochemoutonee, etc.

1(ii) Aesthetic and wilderness values

There is ice-eroded ice field geomorphology which is rare in nature in the Area, such as the pool of melted water, hanging moraine dyke, ice-core pyramid, ventifact, etc (photos 1-6). These geological and glacial landscapes contract finely with the vast blue ice, producing extremely significance and beauty to make high aesthetic and wilderness values.

2. Aims and objectives

Management of Mount Harding, Grove Mountains, East Antarctica aims to:

• Facilitate long-term scientific research while avoiding direct or cumulative damage to vulnerable geomorphological features;
• Allow scientific research in the Area provided it is for compelling reasons which cannot be served elsewhere and which will not jeopardize the values in that Area;
• Allow scientific research in the Area which is consistent with the management aims and objectives and which will not jeopardize the values in that Area;
• Allow visits for management purposes in support of the aims of the Management Plan;
• Minimize the introduction to the Area of alien plants, animals and microbes.

3. Management activities

• Copies of the Management Plan (attached with maps) shall be made available at the Zhongshan Station (China), Davis Station (Australia), Progress Station (Russia), and the map of the protected area should be put up at prominent positions in the stations mentioned above. Personnel in the vicinity of, accessing or flying over the Area shall be specifically instructed, by their national program as to the provisions and contents of the Management Plan.
• National Antarctic Programmes operating in the Area shall consult together with a view to ensuring the above management activities are implemented.
• The Area shall be visited as necessary, and no less than once every five years, to assess whether it continues to serve the purposes for which it was designated and to ensure that management activities are adequate.
• The Management Plan should be reviewed no less than once every five years and, if necessary, updated or revised.
• In case the Antarctic ice sheet continuously retreats so that the new remains of advance and retreat of EAIS are exposed in the vicinity of the protected area and the extent of remains of ice sheet advance and retreat expands, the boundary of the protected area

should be updated periodically so as to include the newly exposed remains of ice cap advance and retreat in the area. This should be taken into consideration in examining the Management Plan.

4. Period of designation

Designated for an indefinite period.

5. Maps and photos

• Map A, A1: Position of Grove Mountains. A2: Grove Mountains Area, Antarctica
• Map B, Protected Area around Mount Harding, Grove Mountains, Antarctica
• Map C, Location of Nunataks and Direction of Ice Flow around Mount Harding, Grove Mountains, Antarctica.
•Photo 1, Ventifact
•Photo 2, Ventifact
•Photo 3, Ice-core pyramid
•Photo 4, Hanging moraine dyke
•Photo 5, Pool of ice melted water
•Photo 6, Roches montannees

6. Description of the Area

6(i) Geographical co-ordinates, boundary markers and natural features

The Area is irregular, and approximately rectangular in shape, with a width of about 10km from east to west, a length of about 12km from south to north and an total area of about 120km^2 (Map A).

The proposed ASPA boundary was defined to ensure that the unique geomorphological features, formed in ice sheet advance and retreat in Mount Harding, can be specially protected as a whole.

Geographical Co-ordinates

The Specially protected Area of Mount Harding, Grove Mountains, includes the open blue-ice zone from the moraine on the west side of Mount Harding to the east side of the Zakharoff Ridge as well as a number of nunataks, detritus zone, and moraine etc. within it (Map B). Its geographical coordinates are: 72°51’ -72°57’ S, 74°53’ -75°12’ E.

Boundary marks

The western boundary of the Area is the moraine on the west side of Mount Harding, with its northern end turning eastward to the open blue-ice detritus zone on the east side of the Zakharoff Ridge via the north flank of the northern ridge of Mount Harding and the northern end of the Zakharoff Ridge, turning southwards to the northern end of Davey Nunataks, and then heading westwards to the southern end of the Xi Lake moraine to close the whole area. The geographical coordinates of the nine control points located at its boundary are counter clockwise: 1. 74°57’E, 72°51’ S, 2. 74°54’E, 72°53’ S, 3.74°53’E, 72°55’ S, 4. 74°54’E, 72°57’ S, 5. 75°00’E, 72°57’ S, 6.75°10’E, 72°57’ S, 7. 75°12’E, 72°55’ S, 8. 75°11’E, 72°52’ S, 9. 75°08’E, 72°51’ S.

No markers or signs are currently in place to mark the boundary.

General climate condition in summer

With an average altitude of more than 2000 meters in the Grove Mountains, the daily temperature range and strong wind frequency are greater than those at Zhongshan Station. When affected by the warm-moist current from the north, snowfall would appear constantly in this area, while under the control of the east current, the weather would mainly be sunny. The trend of daily wind speed change is greater than that at Zhongshan Station, where the maximum wind speed appears at around 05:00 am and minimum wind speed occurs at about 17:00 pm commonly. The daily mean wind speed is 7.5m/s from December 1998 to January 1999. Same as Zhongshan Station, the Grove Mountains area is influenced by the katabatic wind, but with a greater force than Zhongshan Station.

From December 1998 to January 1999, the average highest and lowest air temperature in the Grove Mountains area were -13.1°C and -22.6°C respectively, and the estimated average daily temperature range could be -9.5°C. In this area, in January in particular, the air temperature and snow temperature saw an obvious change during a day, where the average air temperature was -18.5°C, and the snow surface temperature was about -17.9°C, that is, the average snow temperature was higher than the average air temperature.

Physiognomy

Mount Harding in the central GMs is shaped as a crescent open to the north-west. Both the northern and southern ends are steep crests, protruding ~200m above the recent ice surface. The central segment of the ridge-line between two summits descends progressively until it reaches the ice surface in a central col, with a relic ice tongue hanging on the lee side. A stagnant field of blue ice, tens of km^2 wide, lies inside the crescent. All of this, shining each other with the vast blue ice, forms the magnificent, beautiful scene of ice-eroded ice field geomorphology.

The nunataks within the area may be divided into two groups. The one in the west is the tall nunataks represented by Mount Harding, and the other is a small part of the area including the low linear nunatak chain on the Zakharoff Ridge. The stoss slopes of rocky nunataks show smoothly abraded bedrock, with surfaces sparsely erratic till patches. The lee and lateral sides of the nunataks show generally sharp bluffs, resulting from both ice flow scraping and collapse along sub-vertical crevasses of rocks. The nunataks leave pair of “wake zone” of superglacial debris tens km in length on the ice surface, marking the path of present local ice flow.

The upper parts of the higher nunataks are usually jagged ridge populating with well-developed ventifacts on the summits, facing the dominant wind from the SE. The scarcity of glacial erosive imprints, also meters of depth inside the hard rock delved by wind- force blowing out indicate that these higher slopes are ice free since rather long time. But the lower parts of slopes beneath ~100m above ice surface have the features of recent glacial erosion such as fresh trimlines and erratics.
Some of small nunataks are typical “roches moutonnée” resulted from the past ice flow overriding. This regional borderline between wind and glacial erosions are considered to represent a former height of ice surface since certain phase, probably early Quaternary glaciations, and the later rises of ice surface did not exceed this limit.

Mount Harding is the largest nunatak in the Grove Mountains. On the west side of the crescent ridge there is a large stretch of lake shaped stagnant blue ice plain (Kunming

Lake, Xi Lake) and a dozen ice-cored pyramids (ice-cored cone) are visible at the juncture of the ice lake and the foot of the rocky nunataks.

The geological and glacial phenomena or landscapes that deserve special protection include (Map C) : Ventifact (photo 1, 2): As a result of long-term blow and erosion by fierce winds, there have developed a large number of ventifacts with peculiar shape around the southern summit of Mount Harding.

These ventifacts are the typical wind-erosion physiognomy rarely seen on the earth and are subject to the perpetual damage by disorderly human activities.

Ice-core pyramids (ice-cored cones, photo 3): Along the northern and southern banks of "Kunming Lake" is scattered a dozen ice-core pyramids. These ice-core pyramids are cone shaped with a height of 20-40m and a base diameter of 50-80m. These pyramids are the best marks for directly measuring the pneumatolysis of blue ice and of great importance to the research on the material balance and evolutionary history of the EAIS. They are extremely vulnerable and any human climbing behaviour will lead to their perpetual alteration and destruction.

Hanging moraine dyke (photo 4): On the north-west side of the stagnant blue ice pool lie some of linear floating moraine. These moraines are about 100m wide, 25-35m high and kilometres long. On the surface of the moraine there is a gravel bed with a thickness of 50-100 cm, below which is the blue ice. These exotic rock masses provide precious source material for studying the tectonics of the underlying base rocks of EAIS. The spore pollen assemblages contained in the sedimentary erratics are the key evidence of the large-scale retreat event of the EAIS during the Pliocene. Any walking or climbing activities will very probably cause the irreparable damage to these moraine dykes.

Cold-desert soil: Several cold-desert soil patches were found on the southern slope of Mount Harding above the regional erosion limit of 100m. The existence of such soils indicates also that the ice fluctuation has never been higher than this limit after the formation of soils because any higher rise of the ice would have scraped all of them away.
Microfossil assemblages in the sedimentary erratics: More than 25 species of Neogene microfossil of plant have been identified from such outwash sedimentary boulders. These spore and pollen assemblages provide useful information on the evolution of the EAIS since they are derived from a suite of glaciogenic strata hidden beneath the EAIS. Most of the pollen and spores are originated from local sources as in situ assemblages, representing a continental flora.

Pool of ice melted water (photo5): At the foot of the lee side of huge nunataks are often developed pools of ice melted water, large or small, each with an area from several dozen square meters up to a thousand square meters. The surface ice of these pools is extremely smooth and transparent, and the air bubbles are rich inside the ice from the bottom. The occurrence of the pool of ice melted water suggests the existence of a megathermal event.
Blue ice cliff: On the east side of the protected area are distributed blue ice cliffs or blue ice precipices, with the length of several thousand meters, usually 30-50m high, with a slope of 40-70°.

Roche moutonnees (photo 6): Typical roche moutonnees are distributed on the east and south sides of the protected area. They are peculiar in shape, have a large number of footprints of ice flow on their surfaces, and possess very high wilderness, aesthetic and scientific values.

Paleo-sedimentary basin (ice sheet leading edge): A paleo-ice erosion basin with the marginal sedimentary layer, at the front edge of ice sheet in the Pliocene is inferred to lie below the blue ice basin on the west side of Mount Harding. It is probably a brand-new type of subglacial lakes. Exploration of these paleo-sedimentary lake basins may yield the precious sedimentary records on the paleo-climatic and environmental changes during the Pliocene in this area.

Geological condition

These nunataks consist mainly of upper amphibolite to granulite facies metamorphic rocks, syn-orogenic to late orogenic granite, and post tectonic granodioritic aplite and pegmatite. The absence of active structures and earthquakes, and the lack of Cenozoic volcanism suggest that this region, along with Prydz Bay, have been geologically stable at least since the Late Mesozoic Epoch. New geological evidence obtained from this area shows that in the inland East Antarctica there exists a huge "Pan-African" stage orogenic zone from the Prydz Bay, Grove Mountains to the Prince Charles Mountains, which should be the last segmented suture zone of the Gondwana land.

6(ii) Access to the Area

Access to the area may be gained overland by vehicle or by aircraft landing on snow- and ice covered sites within or adjacent to the Area.

6(iii) Location of structures within and adjacent to the site

Australia maintains a continuous GPS station on Tianhe Ridge at 72°54’29.17479"S, 74°54’36.43606"E. The station consists of a GPS antenna mounted on a geodynamic survey pillar, three rugged cases containing batteries and GPS receivers, a solar panel frame holding four solar panels and a wind turbine. In addition there are three survey reference marks surrounding the GPS pillar, approximately 20m distant.
CHINARE maintains 1 geodetic control point in the Area using duel frequency GPS receivers (No: Z003) at 72º53’55.07437"S, 75º02’14.00782"E to meet the requirement of the satellite image mapping.

6(iv) Location of other protected areas in the vicinity

There are no other protected areas nearby.

6(v) Special Zones within the Area

There are no special zones within the Area.

7. Terms and conditions for entry Permits

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

• It is issued for compelling scientific reasons which cannot be served elsewhere, or for reasons essential to the management of the Area. Before the permit is issued, the applicant shall demonstrate to the appropriate competent authorities that the specimens or samples

already collected from other parts of the world so far cannot fully meet the needs of the researches proposed;
• The actions permitted are in accordance with this Management Plan;
• The activities permitted will give due consideration via the environmental impact assessment process to the continued protection of the scientific, aesthetic and wilderness values of the Area;
• The Permit or its valid copy shall be carried when in the Area;
• The Permit shall be issued for a finite period;
• Report on the activities must be submitted to the national authorities issuing the Permit and in charge of polar issues.

7(ii) Access to, and movement within or over, the Area

• Entry by land vehicles such as snowmobile and aircraft should avoid destroying the local equilibrium line separating the zone of net ablation from the inland zone of net accumulation, paleo-soil distribution zone, ventifacts, blue-ice cliff, ice-core pyramid, and other geological and natural physiognomy of important scientific research and environmental values;
• As there have many ice crevice in this area, it is recommend that entry by snowmobile would drive down the route along the two sides of which Chinese expedition has set colorful poles for the sake of safety;
• Aircraft operations within the Area should be mindful of the mountainous terrain;
• Climbing up the ice-core pyramids, walking on the floating moraine dyke and roches montannees is strictly prohibited.

7(iii) Activities which may be conducted within the Area

• Compelling scientific research which cannot be undertaken elsewhere and which must not damage the value of the Area;
• Major management activities, including monitoring, inspection, maintenance or review;
• Operational activities in support of scientific research or management within or beyond the Area, including visits to assess the effectiveness of the Management Plan and management activities.

7(iv) Installation, modification and removal of structures

• No structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons；
• All the facilities to be set up and installed within the Area shall be specified in the Permit issued by the competent authority of the particular country. Where possible, such installations should avoid sensitive geomorphological features；
• All the facilities installed in the Area must be clearly identified by country, name of the principal investigator or agency and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area. These facilities must be removed when they are no longer required, and so shall other abandoned equipment or materials as far as possible.

7(v) Location of field camps

For safety reasons, the camping sites must be selected in such a way as not to destroy or affect the special geological and natural physiognomy.

If not destroying the local and adjacent geological and natural physiognomy, Camping is allowed within the Area when necessary for purposes consistent with this Management Plan and where authorized in a Permit. In this area, the encampment near Mount Harding (No 9) and the encampment near Zakharoff Ridge (No 8) are the preferred camping site, shown in Map B. Camping should choose snow or ice surface or rock surface to avoid the remnants of ice sheet.

7(vi) Restrictions on materials and organisms which may be brought into the Area

• No depots of food or other supplies are to be left within the Area beyond the time period or activity
for which they are required;
• No living animals, plant material or micro-organisms shall be deliberately introduced into the Area. All necessary precautions shall be taken to prevent accidental introduction;
• All materials introduced shall be for a stated period, shall be removed at or before the conclusion ofthat stated period, and shall be stored and handled so as to minimize the risk of environment impacts.

7(vii) Taking of, or harmful interference with, native flora and fauna
No native flora and fauna are present.

7(viii) Collection or removal of materials not imported by the Permit holder

• Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs.
• Material of human origin likely to compromise the values of the Area, and which was not brought into the Area by the Permit holder or otherwise authorized, may be removed unless the impact of the removal is likely to be greater than leaving the material in situ. If this is the case, the appropriate national authority must be notified and approval obtained.

7(ix) Disposal of waste

At a minimum, all wastes, including all human wastes, shall be managed in accordance with Annex III and not disposed of into freshwater streams or lakes, onto ice-free areas, or onto areas of snow or ice which terminate in such areas of high ablation.

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan
None.

7(xi) Reporting requirements

• The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed.
• Such reports should include, as appropriate, the information identified in the visit report form contained in the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas. If necessary, the national authority should also make the visit report copy available to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.
• Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organizing the scientific use of the Area.

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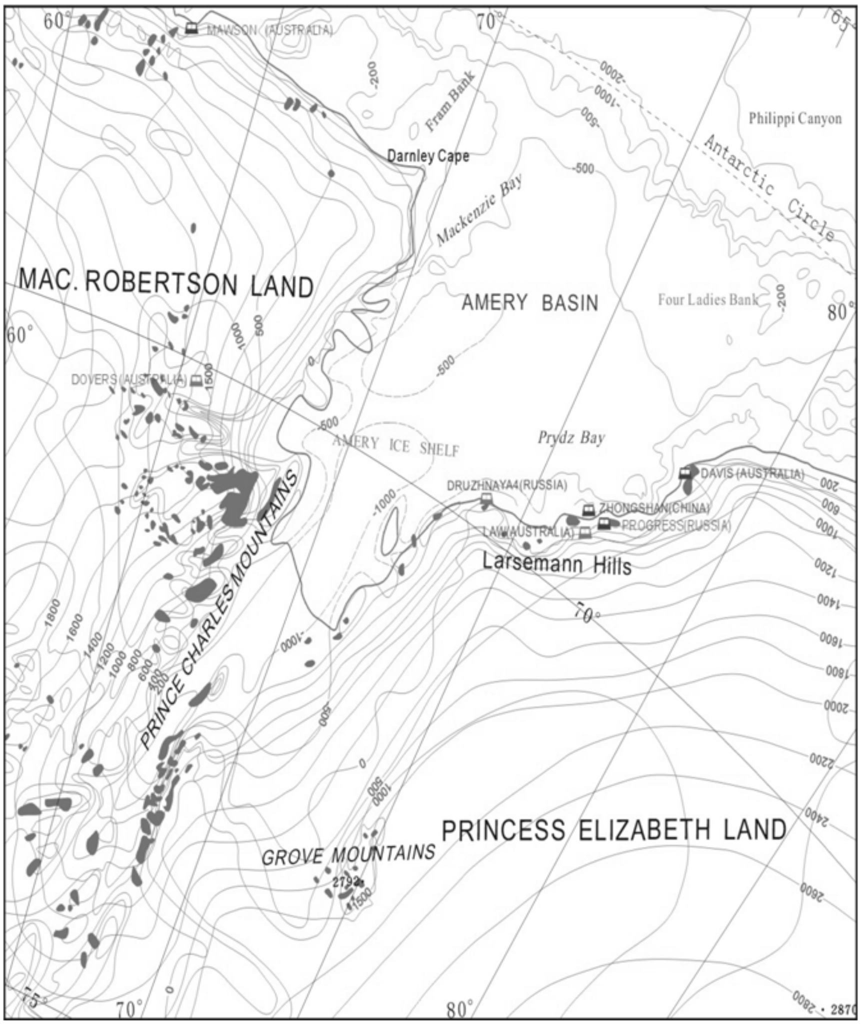
Map A1. Position of Grove Mountains

Mapping Standard: Projection: Normal Stereographic Horizontal datum:WGS-84

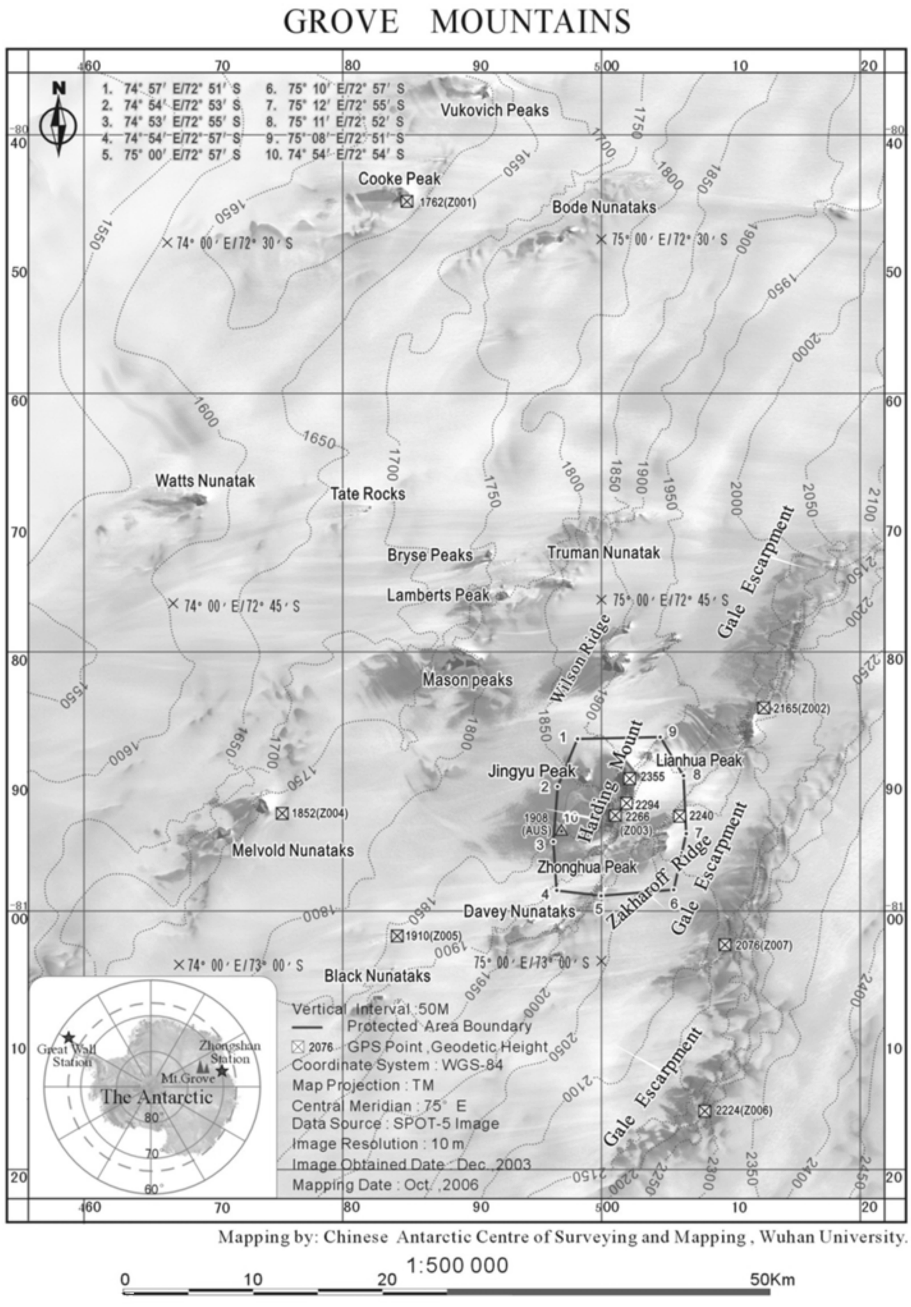
Manufacturer: Chinese Antarctic Centre of Surveying and Mapping, Wuhan University



Map A2. Grove Mountains Area, Antarctica

Mapping standards: Projection: TM, Horizontal datum: WGS-84

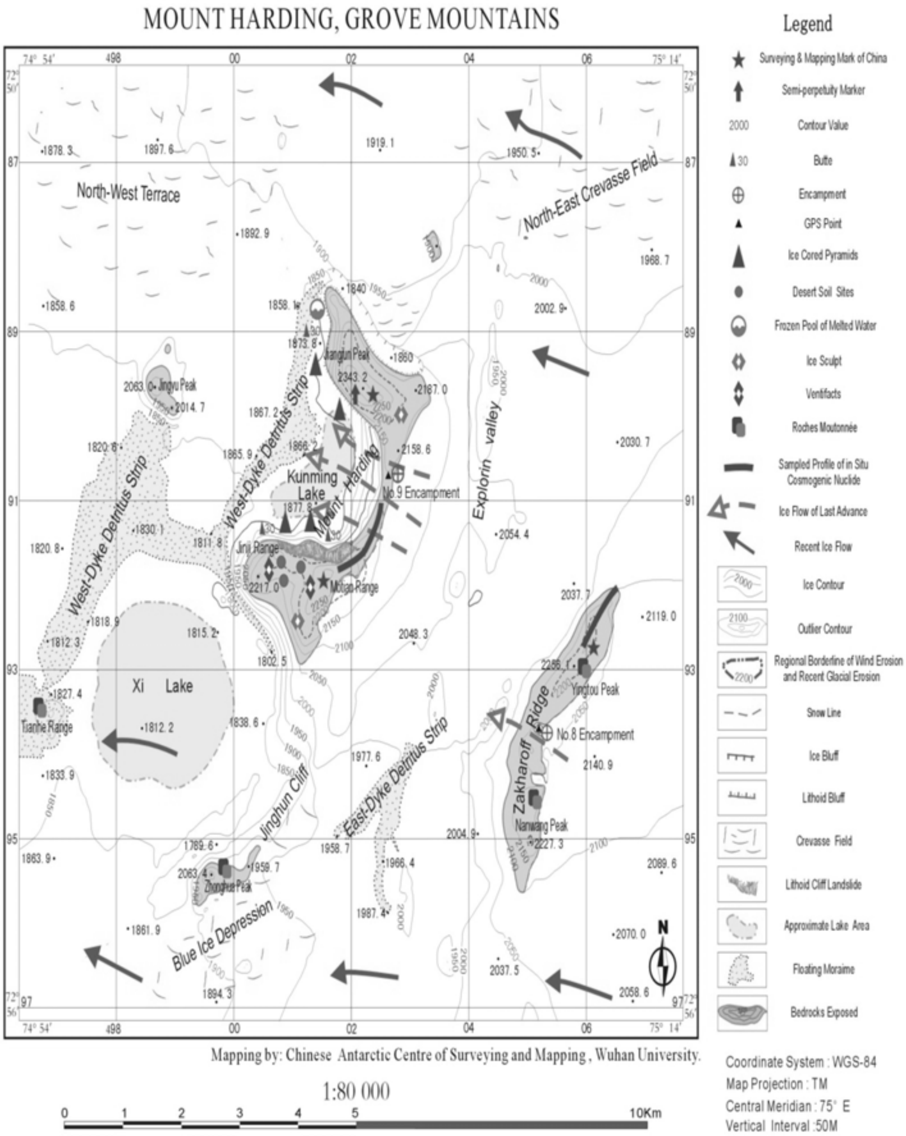
Manufacturer: Chinese Antarctic Centre of Surveying and Mapping, Wuhan University



Map B. Protected Area around Mount Harding, Grove Mountains, Antarctica

Mapping standards: Projection: TM Horizontal datum: WGS-84

Manufacturer: Chinese Antarctic Centre of Surveying and Mapping, Wuhan University



Map C. Location of Nunataks and Direction of Ice Flow around Mount Harding, Grove Mountains, Antarctica

Mapping standards: Projection: TM Horizontal datum: WGS-84

Manufacturer: Institute of Geology and Geophysics, Chinese Academy of Sciences

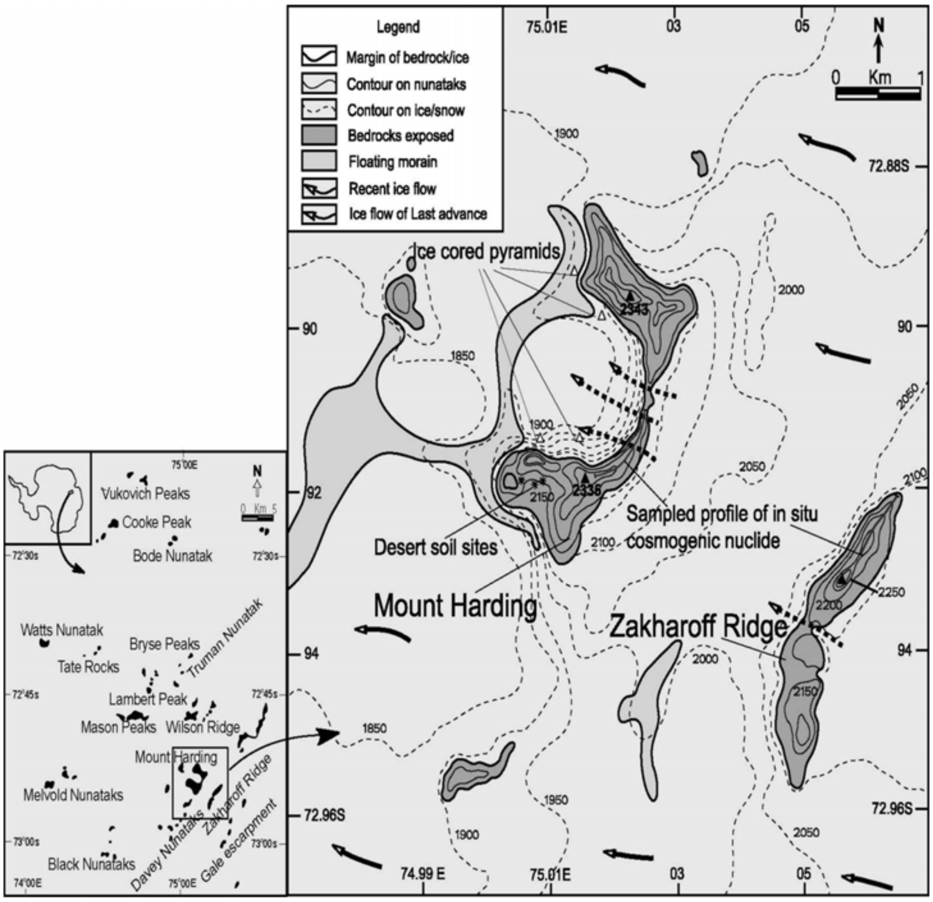


Photo 1: Ventifact, taken on January 13th, 2003

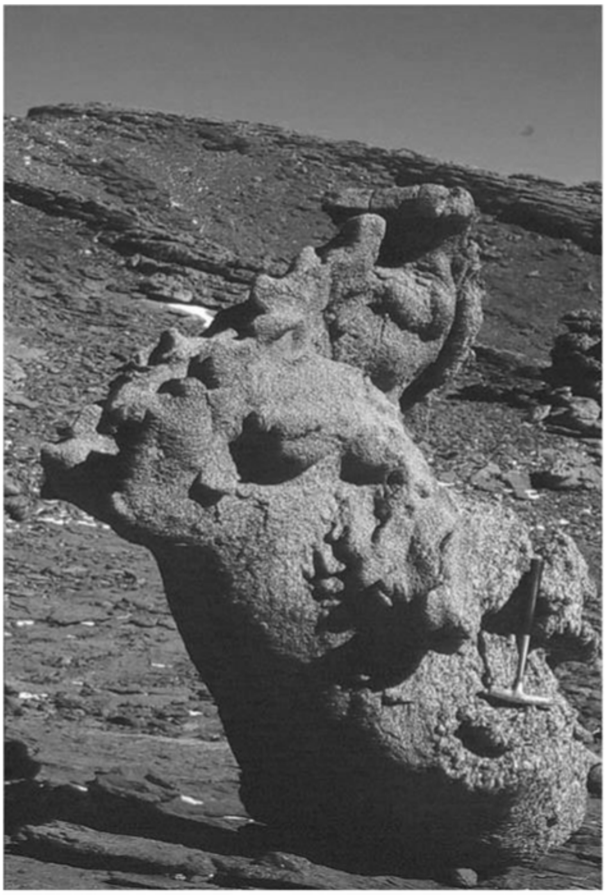


Photo 2: Ventifact, taken on January 13th, 2003

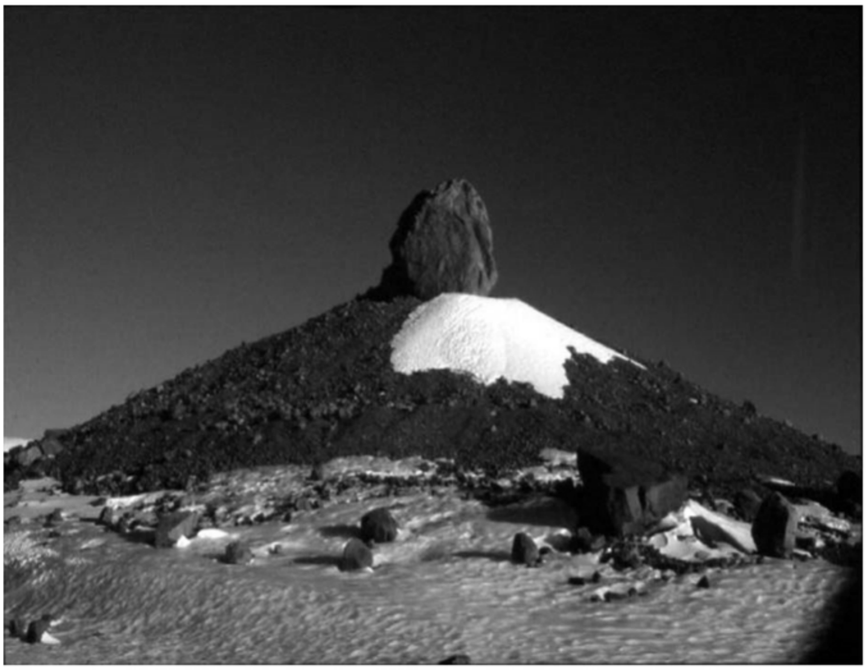


Photo3: Ice-core pyramid, taken on January 12th, 2003

Photo 4: Hanging moraine dyke, taken on January 14th, 2003

Photo 5: Pool of ice melted water, taken on January 14th, 2003

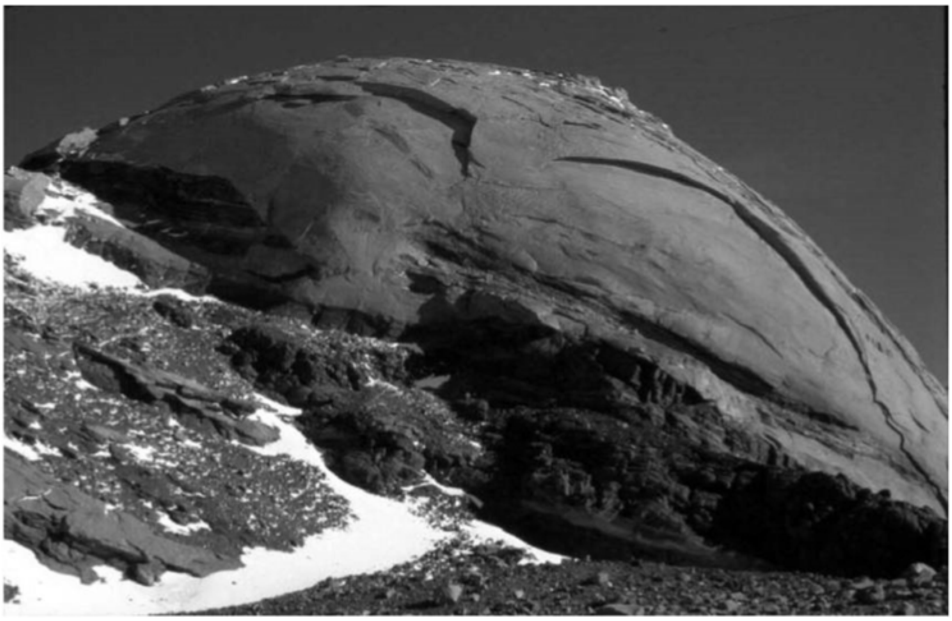


Photo 6: Roches montannees, taken on January 12th, 2003

Measure 18 (2015)

Antarctic Specially Managed Area No 2 (McMurdo Dry Valleys, Southern Victoria Land): Revised Management Plan

The Representatives,

Recalling Articles 4, 5 and 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, providing for the designation of Antarctic Specially Managed Areas ("ASMA") and the approval of Management Plans for those Areas;

Recalling
- Measure 1 (2004), which designated McMurdo Dry Valleys, Southern Victoria Land as ASMA 2 and annexed a Management Plan for the Area;
- Measure 10 (2011), which adopted a revised Management Plan for ASMA 2;

Noting that the Committee for Environmental Protection has endorsed a revised Management Plan for ASMA 2;

Desiring to replace the existing Management Plan for ASMA 2 with the revised Management Plan;

Recommend to their Governments the following Measure for approval in accordance with paragraph 1 of Article 6 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:
1. the revised Management Plan for Antarctic Specially Managed Area No 2 (McMurdo Dry Valleys, Southern Victoria Land), which is annexed to this Measure, be approved; and
2. the Management Plan for Antarctic Specially Managed Area No 2 annexed to Measure 10 (2011) be revoked.

Management Plan for Antarctic Specially Managed Area No. 2

MCMURDO DRY VALLEYS, SOUTHERN VICTORIA LAND

Introduction

The McMurdo Dry Valleys are the largest relatively ice-free region in Antarctica with approximately thirty percent of the ground surface largely free of snow and ice. The region encompasses a cold desert ecosystem, whose climate is not only cold and extremely arid (in the Wright Valley the mean annual temperature is –19.8°C and annual precipitation is less than 100 mm water equivalent), but also windy. The landscape of the Area contains mountain ranges, nunataks, glaciers, ice-free valleys, coastline, ice-covered lakes, ponds, meltwater streams, arid patterned soils and permafrost, sand dunes, and interconnected watershed systems. These watersheds have a regional influence on the McMurdo Sound marine ecosystem. The Area's location, where large-scale seasonal shifts in the water phase occur, is of great importance to the study of climate change. Through shifts in the ice-water balance over time, resulting in contraction and expansion of hydrological features and the accumulations of trace gases in ancient snow, the McMurdo Dry Valley terrain also contains records of past climate change. The extreme climate of the region serves as an important analogue for the conditions of ancient Earth and contemporary Mars, where such climate may have dominated the evolution of landscape and biota.

The Area was jointly proposed by the United States and New Zealand and adopted through Measure 1 (2004). This Management Plan aims to ensure the long-term protection of this unique environment, and to safeguard its values for the conduct of scientific research, education, and more general forms of appreciation. The Management Plan sets out the values, objectives and general rules for conduct within the region, and includes a number of maps and appendices that provide more specific guidelines for particular activities and designated zones within the Area, arranged according to the following structure:

Contents

1. Values to be protected and activities to be managed

The McMurdo Dry Valleys are characterized by unique ecosystems of generally low macrobiotic biodiversity and reduced food web complexity, although recent research has shown evidence of highly diverse microbial communities across relatively small areas, as well as between valleys. Moreover, as the largest ice-free region in Antarctica, the McMurdo Dry Valleys also contain relatively diverse habitats compared with other ice-free areas. The Area contains unusual microhabitats and biological communities (such as endolithic and cryoconite systems) as well as rare glaciological and geological features (for example, a brine-rich sub-glacial lake, hyper-saline surface lakes, unique marine deposits and undisturbed desert pavements). These glaciological and geological features are of value because they contain an extremely long record of natural events. The McMurdo Dry Valleys contain indicators of past and present regional climate change, as well as features that play a role in influencing local climate change. A Long Term Ecological Research (LTER) site was established in the Taylor Valley in 1993, and substantial research has been conducted by the program every season for almost twenty years, not only in the Taylor Valley but also more generally across the McMurdo Dry Valleys. The long-term environmental data sets that have been collected through this program, and through a range of other research initiatives in the McMurdo Dry Valleys, are some of the longest in Antarctica. These scientific values are of global and regional importance.

The Area is a valuable resource for understanding landscape processes and the stability of Antarctic ice sheets. The McMurdo Dry Valleys contain unique surface deposits including glacially deposited and modified sediments, sand dunes, desert pavement, glacio-lacustrine sediments, and marine fjord sediments containing valuable records of planetary change. The soil, rock, water, and ice environments and their associated biota are of scientific value as model ecosystems that allow deep insights into natural processes operating throughout the biosphere. Finally, the species that reside in the McMurdo Dry Valleys provide a biological resource for understanding adaptation to extreme environments, and are true end members of ecological continua.

The isolation of the McMurdo Dry Valleys and the extreme environment has generally protected it from human introductions of species from outside of Antarctica. Many parts of the Area are only rarely visited, and one (the Barwick and Balham Valleys protected area) has been set aside as a reference area where entry has been very strictly controlled for almost 40 years and overflight is prohibited. The relatively pristine condition of the McMurdo Dry Valleys, and the relative lack of introduced species established within the Area, are rarely observed elsewhere in the world and have both high scientific and ecological value, especially for comparative studies.

Sites of historic value originating from early exploration of the Area have also been noted, such as ‘Granite House’ at Botany Bay, Granite Harbor, which was constructed by members of the 1910-1913 British Antarctic Expedition and is designated as Historic Site No. 67.

The McMurdo Dry Valleys are also valued for their aesthetic and wilderness qualities. They represent a relatively pristine environment largely undisturbed and uncontaminated by humans. The dramatic landscape, composed of precipitous mountains, high ridges and sweeping valleys, imposing layered geological formations of dark dolerite set against pale sandstones, and contrasts of ice-free and glacier-covered terrain creates unique vistas with high aesthetic value.

Activities conducted in the area include a variety of scientific research, operations in support of science, media, arts, education and other official National Program visitors, and tourism.

The Area requires special management to ensure that its scientific, environmental, ecological, historic, aesthetic and wilderness values are protected, including that data sets collected over the last 100 years will continue to be of high value. Increasing human activity and potentially conflicting interests have made it necessary to manage and coordinate activities more effectively within the Area.

2. Aims and objectives

The aim of this Management Plan is to conserve and protect the unique and outstanding environment of the McMurdo Dry Valleys by managing and coordinating human activities in the Area such that the values of the McMurdo Dry Valleys are protected and sustained in the long term, especially the value of the extensive scientific datasets that have been collected.

The specific objectives of management in the Area are to:

- Facilitate scientific research while maintaining stewardship of the environment;
- Assist with the planning and coordination of human activities in the McMurdo Dry Valleys to manage actual or potential conflicts among different values (including those of different scientific disciplines), activities and operators;
- Ensure the long-term protection of scientific, ecological, aesthetic, wilderness and other values of the Area by minimizing disturbance to or degradation of these values, including disturbance to natural features and fauna and flora, and by minimizing the cumulative environmental impacts of human activities;
- Prevent the unintended introduction of species not native to the Area, and minimize as far as practicable the unintended transfer of native species within the Area;
- Minimize the footprint of all facilities and scientific experiments established in the Area, including the proliferation of field camps;
- Minimize any physical disturbance, contamination and wastes produced within the Area, and take all practical steps to contain, treat, remove or remediate these whether produced in the course of normal activities or by accident;
- Promote use of energy systems and modes of transport within the Area that have the least environmental impact, and minimize as far as practicable the use of fossil fuels for the conduct of activities within the Area;
- Improve the understanding of natural processes and human impacts in the Area, including through the conduct of monitoring programs; and
- Encourage communication and co-operation between users of the Area, in particular through dissemination of information on the Area and the provisions that apply.

3. Management activities

To achieve the aims and objectives of this Management Plan, the following management activities are to be undertaken:

- National Programs operating within the Area should convene as required, and at least annually, a McMurdo Dry Valleys Management Group (hereafter the Management Group) to oversee coordination of activities in the Area, including to:

- facilitate and ensure effective communication among those working in or visiting the Area;
- provide a forum to resolve any actual or potential conflicts in use;
- help minimize the duplication of activities;
- maintain a record of activities and, where practical, impacts in the Area;
- develop strategies to detect and address cumulative impacts;
- disseminate information on the Area, in particular on the activities occurring and the management measures that apply within the Area, including through maintaining this information electronically at http://www.mcmurdodryvalleys.aq/;
- review past, existing, and future activities and evaluate the effectiveness of management measures; and
- make recommendations on the implementation of this Management Plan.

- National Programs operating within the Area shall maintain copies of the current version of the management plan and supporting documentation in appropriate stations and research hut facilities and make these available to all persons in the Area, as well as electronically at http://www.mcmurdodryvalleys.aq/;
- National Programs operating within the Area and tour operators visiting should ensure that their personnel (including staff, crew, passengers, scientists and any other visitors) are briefed on, and are aware of, the requirements of this Management Plan, and in particular the *General Environmental Guidelines* (Appendix A) that applies within the Area;
- Tour operators and any other group or person responsible for planning and / or conducting non-governmental activities within the Area should coordinate their activities with National Programs operating in the Area in advance to ensure they do not pose risks to the values of the Area and that they comply with the requirements of the Management Plan;
- National Programs operating within the Area should seek to develop best practices with a view to achieving the objectives of the Management Plan, and to exchange freely such knowledge and information;
- Signs and / or markers should be erected where necessary and appropriate to show the location or boundaries of zones, research sites, landing sites or campsites within the Area. Signs and markers shall be secured and maintained in good condition, and removed when no longer necessary;
- Visits shall be made as necessary (no less than once every five years) to evaluate whether the Management Plan is effective and to ensure management measures are adequate. The Management Plan, Code of Conduct and Guidelines shall be revised and updated as necessary; and
- National Programs operating within the Area shall take such steps as are necessary and practical to ensure the requirements of the Management Plan are observed.

4. Period of designation

Designated for an indefinite period.

5. Maps and photographs

Table 1: List of maps included in the Management Plan

Map	Title	Source Scale	Estimated Error (+/- m)
Overviews			
Map 1	Overview-ASMA No.2 McMurdo Dry Valleys: boundary and zones	1:900,000	200
Map 2	Overview-Central Dry Valleys	1:400,000	200
Facilities Zones			
Map 3	Explorers Cove, New Harbor	1:25,000	2
Inset:	New Harbor Camp Facilities Zone	1:3000	2
Map 4	Lake Fryxell – Commonwealth Glacier	1:25,000	2
Inset:	F-6 Camp Facilities Zone	1:3000	2
Map 5	Lake Fryxell – Canada Glacier	1:25,000	2
Inset:	Lake Fryxell Camp Facilities Zone	1:3000	2
Map 6	Lake Hoare, Canada Glacier	1:25,000	2
Map 7	Lake Hoare Camp Facilities Zone	1:3000	2
Map 8	Lake Bonney, Taylor Valley	1:35,000	2
Inset 1:	ASPA No. 172 Blood Falls	1:10,000	2
Inset 2:	Lake Bonney Camp Facilities Zone	1:3000	2
Map 9	Mount Newall, Asgard Range	1:25,000	50
Inset:	Mount Newall Radio Repeater Facilities Zone	1:3000	2
Map 10	Marble Point, McMurdo Sound	1:35,000	5
Inset:	Marble Point Refueling Station Facilities Zone	1:5000	2
Map 11	Lower Wright Valley	1:25,000	50
Inset:	Lower Wright Hut Facilities Zone	1:3000	2

Map	Title	Source Scale	Estimated Error (+/- m)
Map 12	Lake Vanda, Wright Valley	1:25,000	50
Inset 1:	Lake Vanda Hut Facilities Zone	1:3000	2
Inset 2:	Bull Pass Hut Facilities Zone	1:3000	2
Map 13	Cape Roberts, Granite Harbor	1:10,000	10
Inset:	Cape Roberts Hut Facilities Zone	1:3000	10
Scientific Zones			
Map 14	Explorers Cove Scientific Zone	1:3000	2
Map 15	Boulder Pavement, Wright Valley	1:30,000	50
Inset:	Boulder Pavement Scientific Zone	1:10,000	50
Restricted Zones			
Map 16	Trough Lake Catchment Restricted Zone	1:70,000	10
Map 17	Mount Feather – Beacon Valley	1:130,000	50
Inset:	Mount Feather Sirius Deposit Restricted Zone	1:25,000	50
Map 18	Don Juan Pond, Wright Valley	1:50,000	50
Inset:	Don Juan Pond Restricted Zone	1:10,000	2
Map 19	Argo Gully, Wright Valley	1:30,000	50
Inset:	Argo Gully Restricted Zone	1:3000	15
Map 20	Prospect Mesa, Wright Valley	1:30,000	50
Inset:	Prospect Mesa Restricted Zone	1:5000	50
Map 21	Hart Glacier, Wright Valley	1:25,000	50
Inset:	Hart Ash Deposit Restricted Zone	1:3000	50
Map 22	Victoria Valley Sand Dunes Restricted Zone	1:50,000	50

Map	Title	Source Scale	Estimated Error (+/- m)
Map 23	Battleship Promontory Restricted Zone	1:50,000	50
Visitor Zones			
Map 24	Taylor Valley, Lake Fryxell	1:25,000	2
Inset:	Taylor Valley Visitor Zone	1:5000	2

6. Description of the Area

The McMurdo Dry Valleys are located in southern Victoria Land along the western coast of McMurdo Sound, southern Ross Sea, at approximately 77°30'S, 162°00'E. An area of approximately 17,500 km^2 is designated as an Antarctic Specially Managed Area (hereafter referred to as the 'Area') to manage human activities in the region for the protection of scientific, environmental, ecological, historic, aesthetic and wilderness values.

Based on the Environmental Domains Analysis for Antarctica (Resolution 3(2008)) the McMurdo Dry Valleys are located within Environment S – McMurdo – South Victoria Land geologic**.** Under the Antarctic Conservation Biogeographic Regions classification (Resolution 6 (2012)) the Area lies within ACBR9 – South Victoria Land.

6(i) Geographical coordinates, boundary markers, and natural features

All geographic coordinates in this Management Plan are given in degrees and decimal minutes (dd mm.mm) format.

The Area boundaries have been defined primarily on the basis of the hydrological catchments in the McMurdo Dry Valleys, including all of the ice-free ground and adjacent areas within these catchments, all of the Convoy Range in the north, and bounded by the Koettlitz Glacier in the south (Map 1). Offshore islands, except Tripp Island in the north and Heald Island in the south, are not included within the Area. Proceeding clockwise from the northeast, the boundary of the Area is defined as follows:

From the northeastern extremity of Tripp Island (76°38.09'S, 162°42.90'E) the boundary extends southward following the coastline at the mean low tide level to DeMaster Point (situated east of Marshall Valley at 78°04.20'S, 164°25.43'E), a distance of approximately 170 km. The boundary thence follows the northwestern margin of the Koettlitz Glacier in a southwesterly direction for approximately 25 km to Walcott Bay and Trough Lake, including within the Area all of the streams and lakes along the glacier margin (Map 16). The boundary thence follows the approximate southern grounding line of the Koettlitz Glacier margin in Walcott Bay, extending east towards The Bulwark and encompassing all of Trough Lake. The boundary thence continues east following Bulwark Stream for approximately 1.5 km to the northern extremity of The Bulwark. The boundary thence extends 3 km in a straight line northeast to the northwestern coastline of Heald Island, following around the northern coastline to the eastern extremity of the island at 78°15.00'S, 163°57.80'E.

The boundary extends from Heald Island approximately 14.8 km southwest to the summit of The Pyramid (854 m) (78°20.64’S, 163°29.95’E). The boundary thence continues southwest approximately 13.3 km to the foot of Highway Ridge (78°23.97’S, 162°58.57’E), from where it follows up the ridgeline in a northwesterly direction approximately 3.8 km to the summit of Shark Fin (2242 m) (78°22.11’S, 162°54.66’E). The boundary extends from Shark Fin northwest approximately 6.7 km to the summit of Mount Kempe (3004 m) (78°19.35’S, 162°43.18’E). The boundary continues northwest in a straight line from the summit of Mount Kempe approximately 83 km to the summit of Mount Wisneski (2320 m) (77°57.65’S, 159°33.73’E), which is the most southerly peak of the Lashley Mountains.

From Mount Wisneski, the boundary extends northwards for approximately 8.7 km to Mount Crean (2550 m) (77°53.00’S, 159°30.66’E), the highest peak in the Lashley Mountains. The boundary continues 5.6 km northward to the summit of Mount Koger (2450 m) (77°50.05’S, 159°33.09’E), the most northerly peak in the Lashley Mountains.

The boundary thence extends northeast approximately 15.3 km to Depot Nunatak (1980 m) (77°44.88’S, 160°03.19’E), and thence northwest approximately 19.6 km to the western extremity of the ice-free ground at Horseshoe Mountain (77°34.52’S, 159°53.72’E). The boundary continues north approximately 40 km to the summit of Mount DeWitt (2190 m) (77°13.05’S, 159°50.30’E), thence extends northwest approximately 38.4 km to the summit of Carapace Nunatak (2321 m) (76°53.31’S, 159°23.76’E), and continues a further 39 km north to the summit of Battlements Nunatak (2128 m) (76°32.27’S, 159°21.41’E).

The boundary extends east from Battlements Nunatak approximately 51 km to the summit of Mount Douglas (1750 m) (76°31.25’S, 161°18.64’E), and thence approximately 18 km in a southeasterly direction to the summit of Mount Endeavour (1870 m) (76°32.49’S, 161°59.97’E). The boundary extends southeast from Mount Endeavour approximately 21.3 km to the northeastern extremity of Tripp Island.

The principal basis for the coordinates given above is the USGS / LINZ 1:50,000 digital base map prepared for the McMurdo Dry Valleys, which has an estimated maximum error of +/- 50 m. Because this map does not extend to cover the western boundary, coordinates in these areas are from the USGS 1:250,000 map, with an estimated maximum error of +/- 200 m. Accurate mapping with a maximum error of +/- 2 m is available for a limited number of sites within the Area (see Table 1), mostly in the Taylor Valley, and accurate GPS coordinates are available to describe only parts of the boundaries. The 1:50,000 series was selected as the primary map base for boundary coordinates to ensure that these are given using a map datum that is defined to a consistent standard over most of the Area. For these reasons, GPS coordinates for the boundaries are likely to differ from the coordinates given above by up to 50 m, or in the west by up to ~200 m.

6(ii) Restricted and managed zones within the Area

This Management Plan establishes four types of zones within the Area: Facilities, Scientific, Restricted and Visitor. The management objectives of the different types of zones are set out in Table 2. Maps 1 and 2 show the location of the different types of zones, and Maps 3-24 (which appear in the relevant appendices) show each zone in its context of surrounding geography and the detailed features or infrastructure present at each site (usually shown within an inset). A new zone or zone type may be considered by the Management Group as the need arises, and those no longer needed may be delisted. Zoning updates should be given particular consideration at the time of Management Plan reviews.

Table 2: Management Zones designated within the Area and their specific objectives.

Management Zones	Specific Zone Objectives	Plan Appendix
Facilities Zone	To ensure that science support facilities and related human activities within the Area are contained and managed within designated areas.	C
Scientific Zone	To ensure those planning science or logistics within the Area, and all visitors to the Area, are aware of sites of current or long-term scientific investigation that may be sensitive to disturbance or have sensitive scientific equipment installed, so these may be taken into account during the planning and conduct of activities within the Area.	D
Restricted Zone	To restrict access into a particular part of the Area and/or activities within it for a range of reasons, e.g. owing to special scientific or ecological values, because of sensitivity, presence of hazards, or to restrict emissions or constructions at a particular site. Access into Restricted Zones should normally be for compelling reasons that cannot be served elsewhere within the Area.	E
Visitor Zone	To provide a means of managing the activities of visitors, including program personnel and/or tourists, so their impacts may be contained and, as appropriate, monitored and managed.	F

The overall policies applying within the zones are outlined in the sections below, while site-specific guidelines for the conduct of activities at each zone are found in Appendices D to F.

Facilities Zones

Facilities Zones have been established to contain temporary and semi-permanent facilities within pre-defined areas and thereby control their distribution and footprint. Facilities Zones may be areas where human presence is intended to be semi-permanent or for a defined period of time in which significant activity is occurring. They may also be areas where human presence is expected to have regular occupation and/or repetitive activity such as field camps. The establishment of new Facilities Zones should be designed to minimize the footprint of facilities and associated materials.
The following provisions should be observed for Facilities Zones:

- Substantial and repeatedly used facilities, camping sites, helicopter pads, and materials / supplies stores should be located within the boundaries of the Facilities Zones;
- Existing infrastructure, camping and storage sites within the Facilities Zones should be re-used where practicable;

- Provisions for fuel storage and handling within the Facilities Zones should take account of the requirements set out in the *General Environmental Guidelines for the McMurdo Dry Valleys* (Appendix A) by providing secondary containment, appropriate equipment for refilling, decanting or servicing operations, secure storage and appropriate spill response materials;
- Alternative energy sources and energy efficiency should be considered in the planning and maintenance of activities within the Facilities Zones;
- Waste minimization and management should be considered in the planning and maintenance of activities within the Facilities Zone and all waste should be stored securely and then be removed; and
- Contingency plans for emergencies should be developed as appropriate, to take into account the special needs of specific Facilities Zones.

Facilities Zones should not be located within Restricted Zones or Antarctic Specially Protected Areas (ASPAs), or at sites that could otherwise jeopardize the values of the Area.

Facilities Zones are listed in Appendix C with locations, boundary and infrastructure descriptions, designated landing sites, and maps.

Scientific Zones

The Scientific Zones listed in Appendix D have been designated to raise visitor awareness of specific sites of current and on-going scientific research in order to help ensure important scientific values or experiments are not disturbed. There are no general access restrictions that apply within Scientific Zones, although visitors should familiarize themselves with the provisions set out in Appendix D prior to visiting or planning work at these zones.

Restricted Zones

Restricted Zones have been designated at sites of high scientific value and which are particularly sensitive to human disturbance. Restricted Zones are outlined in Appendix E with a brief description of the boundaries, site features, impacts, and any specific guidelines for access and activities. Access to Restricted Zones should be for compelling reasons that cannot be served elsewhere within the Area, and any additional measures to ensure their protection as specified in Appendix E should be strictly observed when visits are made.

Visitor Zones

The Taylor Valley Visitor Zone is designated in order to manage visits by tourists or non-governmental expeditions to the Area within a defined area where the exceptional aesthetic and wilderness values of the McMurdo Dry Valleys can be appreciated at the same time as ensuring that potential impacts by tourist visits on other values present within the Area, particularly scientific and environmental values, are minimized.

The Taylor Valley Visitor Zone is located in the Taylor Valley near the Canada Glacier terminus (Map 24), at a site where safe and relatively easy access and movement can be reasonably assured with minimal impact to science activities or the environment. This site was selected following consultation among the National Programs operating in the Area, tour operators and International Association of Antarctic Tour Operators (IAATO).

Specific guidelines for the conduct of activities within the Visitor Zone are included in Appendix F as the Antarctic Treaty Visitor Site Guide: Taylor Valley, Southern Victoria Land, Ross Sea.

6(iii) Structures within and near the Area

The main structures within the Area are located in the Facilities Zones designated within the central McMurdo Dry Valleys (Maps 2 and 13). The Taylor Valley has five semi-permanent field camps (Maps 3-8), and three semi-permanent field camps are present in the Wright Valley (Maps 11 and 12). The most substantial structures are located at the Marble Point Refueling Facility (Map 10), and buildings are also located at Mount Newall (Map 9) and at Cape Roberts (Map 13).

There are a number of sites of scientific and operational instrumentation located throughout the Area outside of Facilities Zones, the most substantial of which are listed in Table 3. Other structures not listed include several Automatic Weather Stations (AWS), radio repeater sites (Mount Cerverus, Mount JJ Thompson), stream weirs and glacier mass balance devices.

Table 3: Structures within the Area outside of Facilities Zones.

Name	**RP**[1]	**Location**[2]	**Location Description**	**Structures**
Mount Coates Radio Repeater	US	77° 47.16'S 161° 58.23'E	Near summit of Mount Coates (1894 m), Kukri Hills. ~14 km from Lake Bonney Facilities Zone, Taylor Valley.	Radio repeater and associated equipment contained in two orange plastic cases. There is one antenna at the site.
Hjorth Hill Radio Repeater	US	77° 30.97'S 163° 37.22'E	Near summit of Hjorth Hill (790 m) ~ 6 km from Cape Bernacchi, northeast of Explorers Cove and the Taylor Valley.	Radio repeater and associated equipment at small hut (2.4m x 2.6m). The antenna is installed on the hut.

1. Party responsible for maintenance
2. Coordinates approximate

There are also several sites in the McMurdo Dry Valleys where semi-permanent camps have been decommissioned and removed (Table 4).

Table 4: Known sites of decommissioned semi-permanent camps in the Area.

Decommissioned site	**RP**[1]	**Geographic coordinates**[2]
Asgard Hut	NZ	77° 35′S, 161° 36′E
Brownworth Hut	NZ	77° 27′S, 162° 53′E
Bull Pass Hut (US structures at Bull Pass Hut Facilities Zone remain)	NZ	77° 31.01′S, 161° 51.08′E
Meserve Glacier Camp	US	77° 30.8′S, 162° 17′E
Miers Valley Hut	NZ	78° 08′S, 163° 50′E
Old Lake Bonney Hut	US	77° 42.2′S, 162° 30.6′E
Lake Fryxell Hut	NZ	77° 37′S, 163° 03′E
Vanda Station (some structures relocated to Lake Vanda Hut Facilities Zone)	NZ	77° 31.6′S, 161° 40.1′E
Commonwealth Glacier Camp	NZ	77° 34.94′S, 163° 35.81′E
Old New Harbor Camp	US	77° 34.5′S, 163° 29.9′E
Odell Glacier Camp	US	76° 40.86′S, 159° 54.8′E

1. Responsible Party
2. Coordinates approximate

Eight sites within the Area were drilled, several with multiple boreholes, as a part of the McMurdo Dry Valley Drilling Project (DVDP) carried out between 1971 and 1975. Drill sites for the project are located at Lake Vanda (DVDP 4) (drilled 85.8 m below ice surface), Don Juan Pond (DVDP 5, 3.4 m; DVDP 13, 75 m),Wright Valley North Fork basin (DVDP 14, 78 m), Lake Vida (DVDP 6, 305.8 m; permanently capped and closed by the US Program in 2006-07 and now several meters below the lake surface), Lake Fryxell (DVDP 7, 11.1 m), New Harbor (DVDP 8, 157.5 m; DVDP 9, 38.3 m; DVDP 10, 187 m), Commonwealth Glacier (DVDP 11, 328 m), and Lake Hoare (DVDP 12, 185 m).

6(iv) Location of other protected areas within the Area

Entry to an Antarctic Specially Protected Area (ASPA) is prohibited unless a permit for entry has been issued by a national authority. Four ASPAs are designated within the Area (Maps 1 and 2):

ASPA No. 123 Barwick and BalhamValleys, Southern Victoria Land (Maps 1, 2);

ASPA No. 131 Canada Glacier, Lake Fryxell, Taylor Valley, Victoria Land (Maps 2, 5, 24);

ASPA No. 138 Linnaeus Terrace, Asgard Range, Victoria Land (Maps 2, 18);

ASPA No. 154 Botany Bay, Cape Geology, Victoria Land (Map 1);

ASPA No. 172 Lower Taylor Glacier and Blood Falls, Taylor Valley, McMurdo Dry Valleys, Victoria Land (Maps 1, 2, 8, 17).

7. Code of Conduct

The Code of Conduct in this section is the main instrument for the management of activities in the Area. It outlines the overall management and operational principles for the Area.

In addition, further guidance is provided in the *General Environmental Guidelines for the McMurdo Dry Valleys* (Appendix A), *Environmental Guidelines for Scientific Research* (Appendix B), and in the List of Facilities Zone (Appendix C), Scientific Zones (Appendix D), Restricted Zones (Appendix E), and the Visitor Zone (Appendix F). All visitors to the McMurdo Dry Valleys should be aware of the *General Environmental Guidelines* in Appendix A, as a minimum, before entering the Area.

7(i) Access to and movement within the Area

The Area is large and has numerous potential access points. Access to the Area is normally made by helicopter from Ross Island, or over sea ice via New Harbor or Marble Point. Where practical, designated helicopter landing sites should be used: these are listed and shown on maps in Appendices C-F describing the management zones. Designated landing sites within ASPAs are defined and mapped in their relevant Management Plans. Where designated landing sites are unavailable, previously used landing sites should be selected when possible. Where it is expected that helicopters will be used for repetitive access to a particular location, consideration should be given to establishing a designated site for landing. Such suggestions should be referred to the Management Group. Overflight restrictions apply over ASPA No. 123 in the Barwick and Balham Valleys, ASPA No. 131 at Canada Glacier, ASPA No. 154 at Botany Bay, and over the Don Juan Pond and Victoria Valley Sand Dunes Restricted Zones.

All pedestrian access routes and movement within the Area should be undertaken so as to minimize disturbance to the soil and vegetated surfaces. There are a number of walking routes in the Area. In the Taylor Valley, these include routes between F-6 Camp and Lake Fryxell Camp, F-6 Camp and Lake Hoare Camp, Lake Hoare Camp and Lake Fryxell Camp, and Lake Hoare Camp and Lake Bonney Camp. There is a route from the edge of Lake Fryxell to the weir at Canada Stream. There are also routes outside the immediate vicinity of F-6, Lake Fryxell, Lake Bonney, and Lake Hoare camps. A route is defined to manage pedestrian movements within the Taylor Valley Visitor Zone (Appendix F). In the Wright Valley, there is a route between the Vanda Weir and the Vanda Huts. A loosely defined route exists along the Onyx River between Lake Vanda and Lake Brownworth, and tracks from overland vehicles moving along this route in the 1970's remain in evidence.

In some places where there has been sustained activity, foot tracks have developed in loose moraine soils, forming well-defined routes such as may be found near Facilities Zones and at field sites such as along the northern margin of the lower Taylor Glacier. In such cases, pedestrians should by preference use the existing tracks, unless it becomes evident that to do so would be either unsafe or result in greater impact than following an alternative route.

The use of vehicles within the Area should be restricted to lake ice or sea ice except where specifically authorized to operate on land at Marble Point (Map 11), New Harbor (Maps 3 and 14), and Cape Roberts (Map 13), where vehicles should use existing vehicle tracks.

Access into Restricted Zones should be avoided unless required for compelling reasons, and should be coordinated with National Programs operating within the Area.

Access by tourists and non-governmental expeditions should only be made to the Taylor Valley Visitor Zone in accordance with the guidelines adopted in Appendix F, and shall be coordinated in advance with National Programs operating within the Area.

7(ii) Activities that may be conducted in the Area

Activities which may be conducted in the area include scientific research; operations in support of science; media, arts, education or other official national program visitors; management activities including maintenance or removal of facilities; and tourism visits within the Visitor Zone, where these activities do not jeopardize the values of the Area.

All activities in the McMurdo Dry Valleys should be conducted in such a manner as to minimize impacts on the environment. Alternative energy sources (e.g. solar, wind, fuel cells) should be used wherever practicable in order to minimize fossil fuel usage. Specific guidelines for the conduct of activities in the Area are provided in Appendices A-E.

Tourism and non-governmental expeditions should additionally ensure their activities have minimal impact on the scientific activities being conducted within the Area, and are carried out in accordance with the Antarctic Treaty Visitor Site Guide: Taylor Valley (Appendix F).

7(iii) Installation, modification, or removal of structures

Care should be exercised when locating and establishing installations to minimize their impact on the environment. Consideration should be given to maximizing the use of existing facilities or sharing those of other programs before new facilities are constructed, and the footprint of all installations should be kept to the minimum practicable. Past installation sites should be re-used where possible and appropriate. In general, permanent or semi-permanent structures should not be installed outside of Facilities Zones, unless they are small in size and pose no significant threat to the values of the Area (e.g. an Automatic Weather Station (AWS) or a small solar- and battery-powered radio repeater with minimal associated infrastructure).

All installations should be maintained while operational and removed when no longer necessary. Installations should be identified by the National Program responsible, name of the principal investigator and year of installation. The types of installations and their coordinates should be recorded, with information provided to the responsible National Program and then shared by the Management Group.

National Programs should exchange information though the Management Group on proposals for new installations in advance of their construction, with the aim of coordinating activities and minimizing the need for new or potentially disruptive or duplicative installations.

7(iv) Field camps

In the McMurdo Dry Valleys, a field camp is considered to be a small temporary camp set up for research in a field season, and generally may comprise a number of tents and include temporary shelters for laboratory work or cooking. Field camps should generally only be established when the work they are intended to support cannot be accomplished practically by access from within one of the Facilities Zones.

Care should be exercised when locating and establishing field camps to minimize their impact on the environment. Consideration should be given to maximizing the use of past or existing field camp sites, or sharing those of other programs before new field camps are established, and the footprint of all field camps should be kept to the minimum practicable. All field camps should be maintained while operational and removed when no longer necessary. Special care should be taken to secure camp equipment from dispersal by wind. The coordinates of field camp sites should be recorded, with information provided to the responsible National Program and then shared by the Management Group.

Designated field camp sites outside of Facilities Zones or other zones within the Area are listed in Table 5.

Table 5: Designated field camp sites outside of Facilities Zones or other zones within the Area.

Name	**RP**[1]	**Location**	**Location Description**	**Field camp description**
Blood Falls field camp site	US	77°43.24' S 162°16.29' E 1 helicopter landing site at above location	Northwestern shore of Lake Bonney ~100 m from the terminus of Taylor Glacier and Blood Falls (see Map 8 Inset 1).	Slopes extending ~100 m upslope above the lake shoreline and for ~200 m northeast from Lawson Creek to a permanent survey benchmark (TP02) ~20 m from the lake shore. Tent sites are marked by stone circles. The designated helicopter landing site is located close to a cluster of tent sites in the southwest part of the field camp site.

1. Party responsible for maintenance

7(v) Taking or harmful interference with native flora or fauna

Taking or harmful interference with native flora or fauna is prohibited, except in accordance with a permit issued under Article 3 of Annex II to the Protocol by the appropriate national authority specifically for that purpose. Where animal taking or harmful interference is involved, this should, as a minimum standard, be in accordance with the Scientific Committee on Antarctic Research (SCAR) Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

To help maintain the ecological and scientific values of the Area visitors should take special precautions against the introduction of non-native species. Of particular concern are introductions from other Antarctic sites, including stations, or from regions outside Antarctica. Visitors should ensure that sampling equipment and markers brought into the Area are clean. Visitors should thoroughly clean all equipment (including backpacks, carry-bags and tents), clothing and footwear before entering the Area. Visitors should also be aware of the risk of transfer of species from one part of the Dry Valleys to another, which may also affect the values of the Area. In particular, visitors should aim to minimize the movement of soils from one site to another within the Dry Valleys by cleaning their equipment (e.g. camping and sampling equipment, vehicles, footwear) before transfer to another site.

7(vi) Collection or removal of material found in the Area

Material not covered by 7(v) above should only be collected or removed from the Area for scientific and associated educational purposes or essential management purposes and should be limited to the minimum necessary for those needs. Any meteorites taken are to be collected and curated according to accepted scientific standards, and made available for scientific purposes. Material of human origin likely to compromise the values of the Area should be removed unless the impact of removal is likely to be greater than leaving the material in place. If this is the case the appropriate authority should be notified.

7(vii) Waste management

All materials taken into the Area should, to the maximum extent practicable, be collected and removed from the Area when no longer required. Water used for any human purposes, including scientific purposes, should be removed and/or treated in a gray water evaporator (and residuals removed). All human wastes should be removed from the Area, including residues from incineration.

In accordance with Article 4 of Annex III to the Protocol, wastes shall not be disposed of onto ice-free areas, into freshwater systems or onto snow or in deep ice pits in ice which terminates in ice free areas or in areas of high ablation.

7(viii) Requirements for reports

Reports of activities in the Area should be maintained by the Management Group to the maximum extent practicable, and made available to all Parties.

In accordance with Article 10 of Annex V to the Protocol, arrangements shall be made for collection and exchange of reports of inspection visits and on any significant changes or damage within the Area.

Tour operators should record their visits to the Area, including the number of visitors, dates, and incidents in the Area, and submit these data in accordance with the procedures for reporting on expeditions adopted by the Antarctic Treaty Parties and IAATO.

8. Provisions for the exchange of information in advance of proposed activities

In addition to the normal exchange of information by means of the annual, national reports to the Parties of the Antarctic Treaty, and to SCAR and Council of Managers of National

Antarctic Programs (COMNAP), Parties operating in the Area should exchange information through the Management Group.

9. Supporting documentation

Electronic information

National Programs operating within the Area have established a website for the purpose of providing additional information and supporting documentation on the McMurdo Dry Valleys, including up-to-date management documents, protected area management plans, maps, descriptions and policies. This information may be accessed at http://www.mcmurdodryvalleys.aq

Management Plans

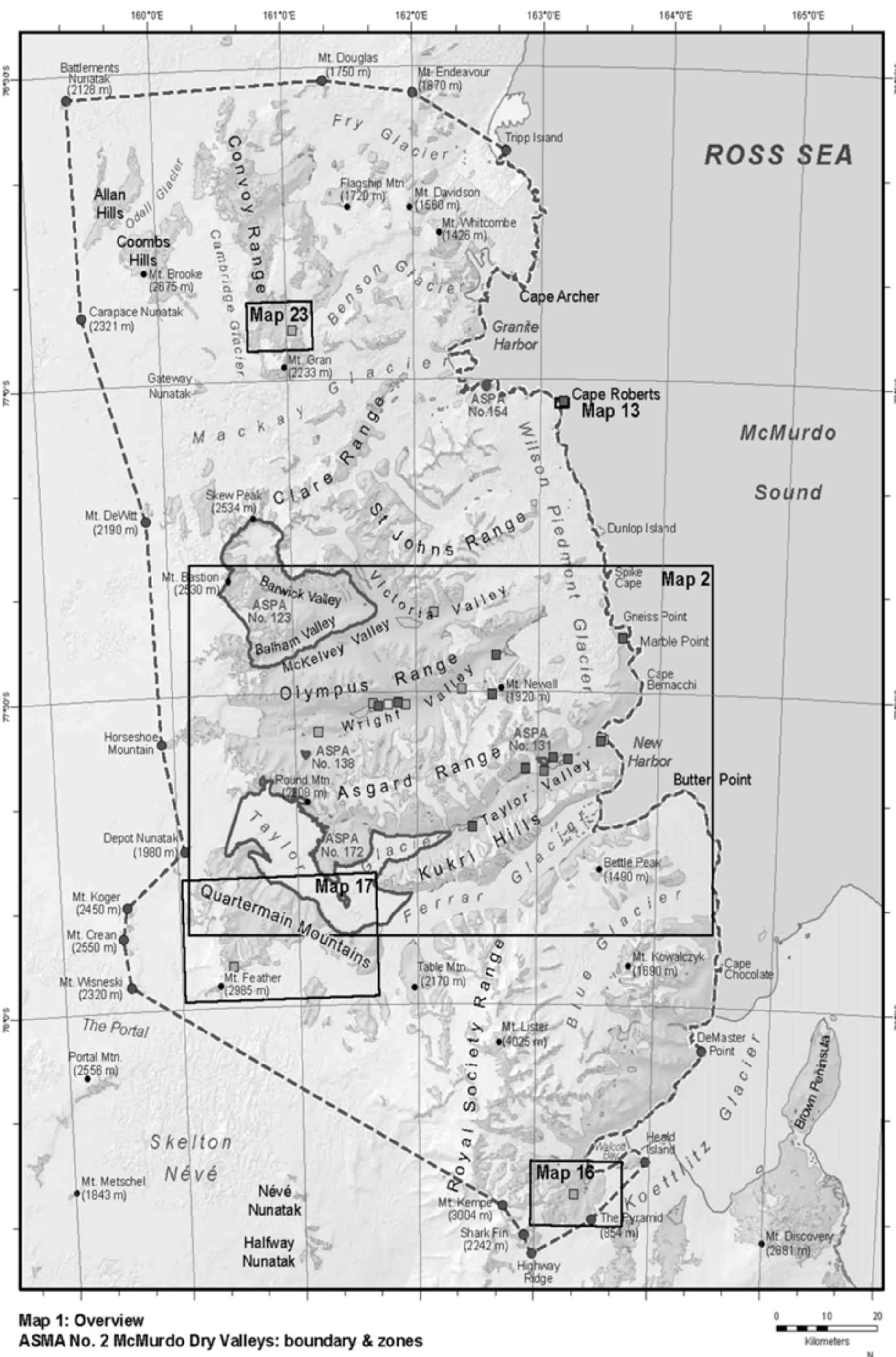
Management Plan for Antarctic Specially Protected Area No. 123 Barwick and Balham Valleys, South Victoria Land.

Management Plan for Antarctic Specially Protected Area No. 131 Canada Glacier, Taylor Valley, Victoria Land.

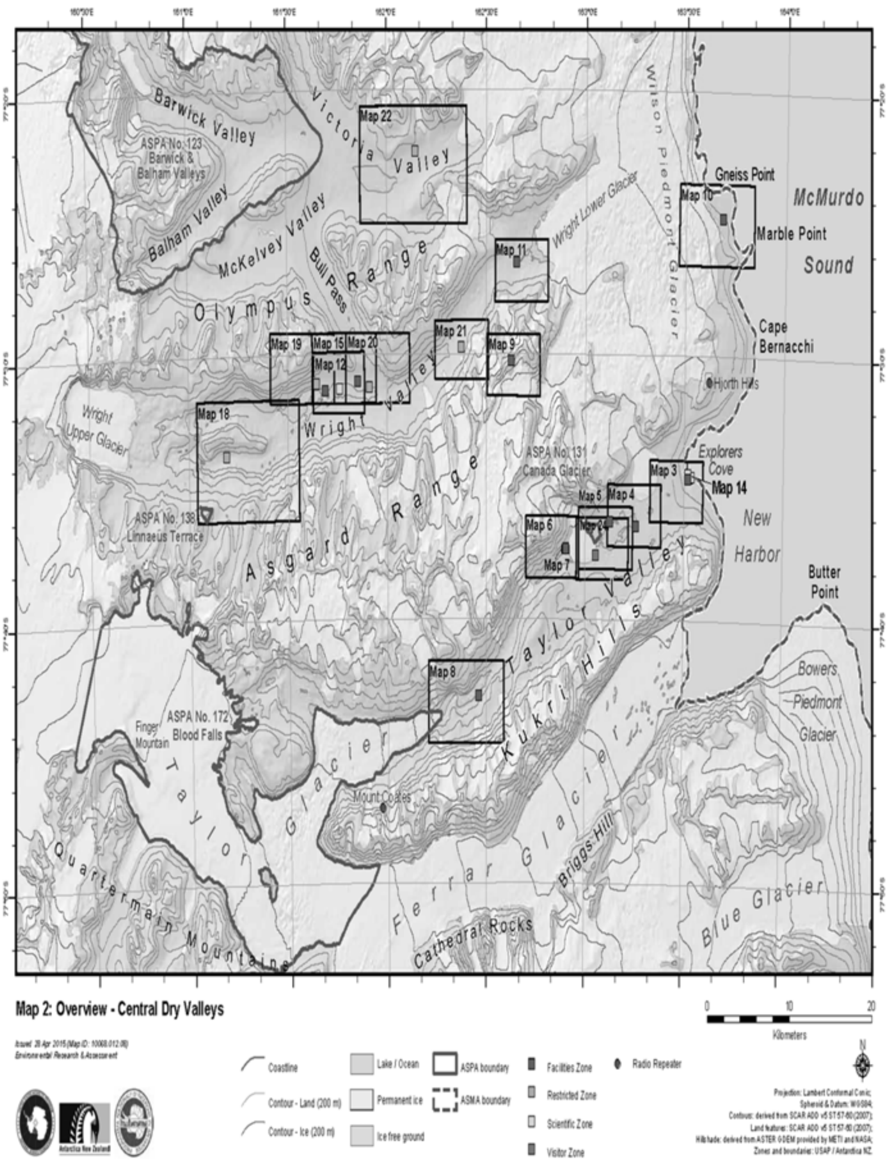
Management Plan for Antarctic Specially Protected Area No. 138 Linnaeus Terrace, Asgard Range, Victoria Land.

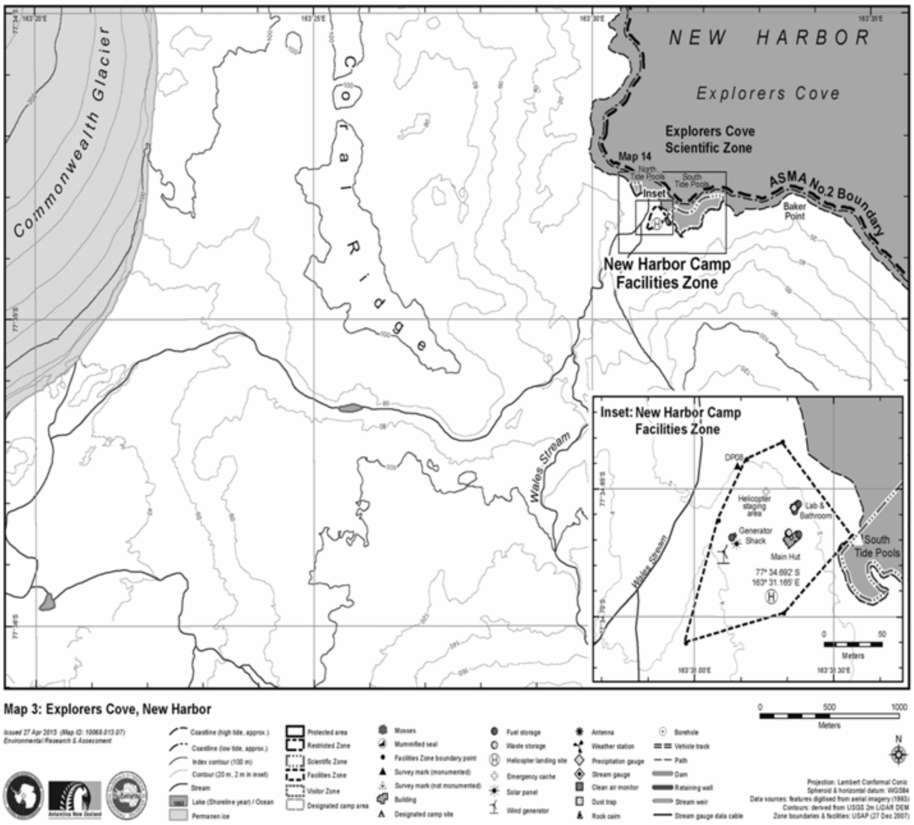
Management Plan for Antarctic Specially Protected Area No. 154 Botany Bay, Cape Geology, Victoria Land.

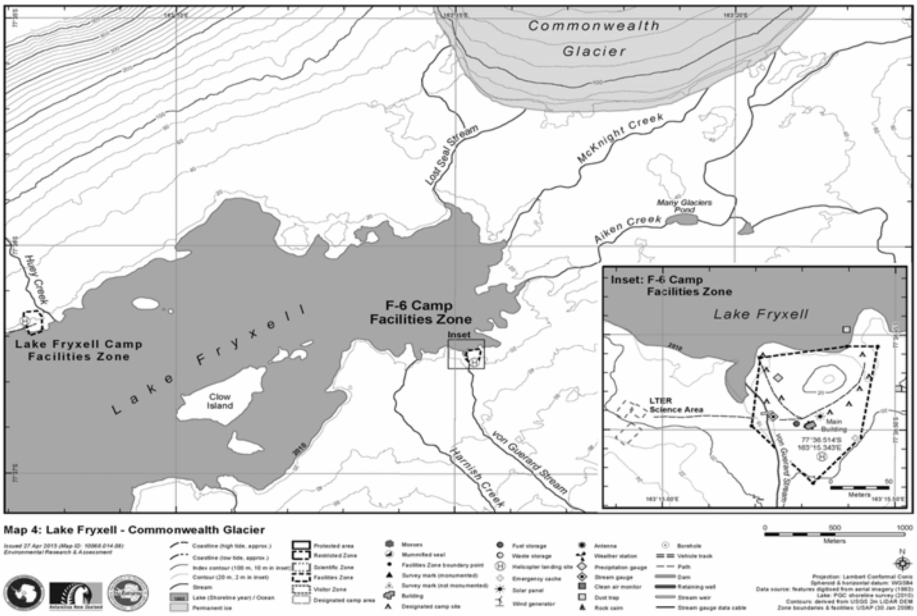
Management Plan for Antarctic Specially Protected Area No. 172 Lower Taylor Glacier and Blood Falls, Taylor Valley, McMurdo Dry Valleys, Victoria Land.

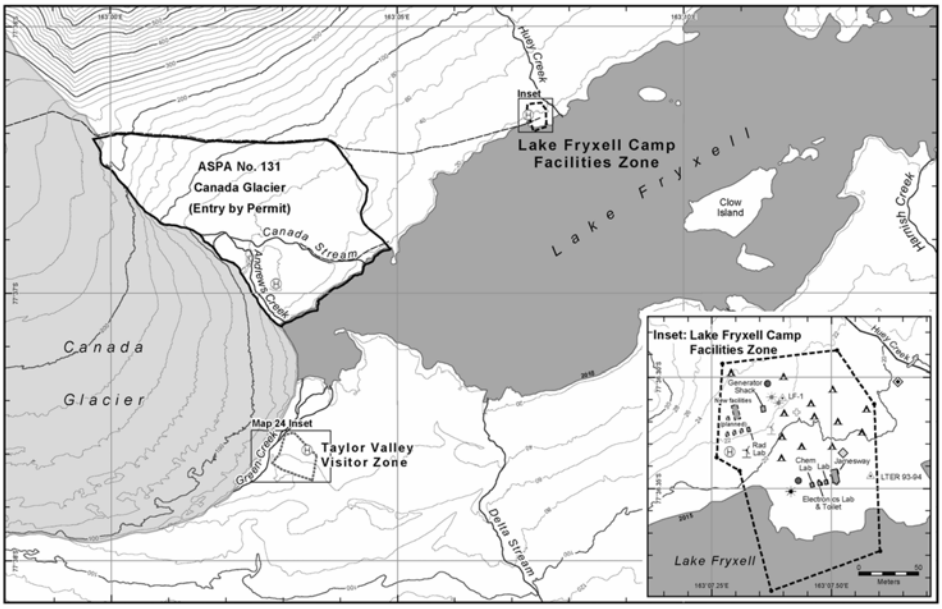


ROSS SEA
McMurdo Sound
Battlements Nunatak (2128 m)
Mt. Douglas (1750 m)
Mt. Endeavour (1870 m)
Tripp Island
Fry Glacier
Allan Hills
Odell Glacier
Coombs Hills
Convoy Range
Cambridge Glacier
Flagship Mtn (1720 m)
Mt. Davidson (1580 m)
Mt. Whitcombe (1426 m)
Mt. Brooke (2675 m)
Benson Glacier
Cape Archer
Granite Harbor
Carapace Nunatak (2321 m)
Map 23
Mt. Gran (2233 m)
Gateway Nunatak
Mackay Glacier
ASPA No.154
Cape Roberts
Map 13
Clare Range
Wilson Piedmont Glacier
Skew Peak (2534 m)
St Johns Range
Mt. DeWitt (2190 m)
Dunlop Island
Mt. Bastion (2530 m)
Barwick Valley
ASPA No. 123
Balham Valley
McKelvey Valley
Victoria Valley
Map 2
Spike Cape
Gneiss Point
Marble Point
Cape Bernacchi
Olympus Range
Wright Valley
Mt. Newall (1920 m)
Horseshoe Mountain
ASPA No. 138
ASPA No. 131
New Harbor
Butter Point
Asgard Range
Round Mtn. (2108 m)
Taylor Valley
Taylor Glacier
ASPA No. 172
Kukri Hills
Depot Nunatak (1980 m)
Bettle Peak (1490 m)
Map 17
Ferrar Glacier
Mt. Koger (2450 m)
Quartermain Mountains
Mt. Crean (2550 m)
Mt. Feather (2985 m)
Mt. Wisneski (2320 m)
Table Mtn. (2170 m)
Mt. Kowalczyk (1690 m)
Cape Chocolate
Blue Glacier
The Portal
Mt. Lister (4025 m)
DeMaster Point
Portal Mtn. (2556 m)
Royal Society Range
Brown Peninsula
Skelton Névé
Heald Island
Walcott Bay
Map 16
Koettlitz Glacier
Mt. Metschel (1843 m)
Névé Nunatak
Mt. Kempe (3004 m)
The Pyramid (854 m)
Shark Fin (2242 m)
Halfway Nunatak
Highway Ridge
Mt. Discovery (2681 m)
Map 1: Overview
ASMA No. 2 McMurdo Dry Valleys: boundary & zones
Issued 28 Apr 2015 (Map ID: 10068.011.11)
Environmental Research & Assessment
Coastline
Lake / Ocean
Permanent ice
Ice free ground
Mountain peak
ASMA boundary point
ASMA boundary
ASPA boundary
Facilities Zone
Restricted Zone
Scientific Zone
Visitor Zone
Kilometers
Projection: Lambert Conformal Conic
Spheroid & Datum: WGS84
Contours: derived from SCAR ADD v5 ST 57-60 (2007)
Land features: SCAR ADD v5 ST 57-60 (2007)
Hillshade: derived from ASTER GDEM provided by METI and NASA;
Boundaries & zones: USAP / Antarctica NZ

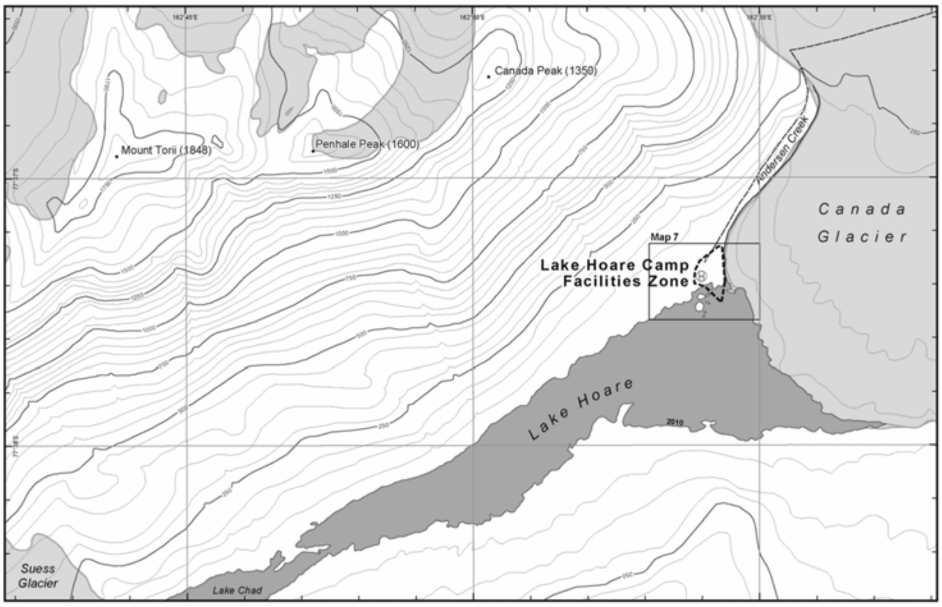

Barwick Valley
ASPA No. 123 Barwick & Balham Valleys
Balham Valley
McKelvey Valley
Victoria Valley
Map 22
Bull Pass
Olympus Range
Wright Lower Glacier
Wilson Piedmont Glacier
Gneiss Point
Map 10
McMurdo Sound
Marble Point
Map 11
Cape Bernacchi
Hjorth Hills
Map 19
Map 15
Map 20
Map 12
Map 21
Map 9
Wright Valley
Wright Upper Glacier
Map 18
ASPA No. 131 Canada Glacier
Explorers Cove
Map 3
Map 14
Map 5
Map 4
Map 6
Map 7
New Harbor
Butter Point
Asgard Range
ASPA No. 138 Linnaeus Terrace
Taylor Valley
Map 8
Bowers Piedmont Glacier
Kukri Hills
Finger Mountain
ASPA No. 172 Blood Falls
Taylor Glacier
Mount Coates
Ferrar Glacier
Briggs Hill
Blue Glacier
Quartermain Mountains
Cathedral Rocks
Map 2: Overview - Central Dry Valleys
Kilometers
Coastline
Contour - Land (200 m)
Contour - Ice (200 m)
Lake / Ocean
Permanent ice
Ice free ground
ASPA boundary
ASMA boundary
Facilities Zone
Restricted Zone
Scientific Zone
Visitor Zone
Radio Repeater


NEW HARBOR
Explorers Cove
Explorers Cove Scientific Zone
Map 14
North Tide Pools
South Tide Pools
Inset
ASMA No.2 Boundary
Baker Point
New Harbor Camp Facilities Zone
Commonwealth Glacier
Coral Ridge
Wales Stream
Inset: New Harbor Camp Facilities Zone
DP08
Helicopter staging area
Lab & Bathroom
Generator Shack
Main Hut
77° 34.692' S
163° 31.165' E
South Tide Pools
Meters
Map 3: Explorers Cove, New Harbor
Meters
Projection: Lambert Conformal Conic
Spheroid & horizontal datum: WGS84
Data sources: features digitised from aerial imagery (1993)
Contours: derived from USGS 2m LiDAR DEM
Zone boundaries & facilities: USAP (27 Dec 2007)

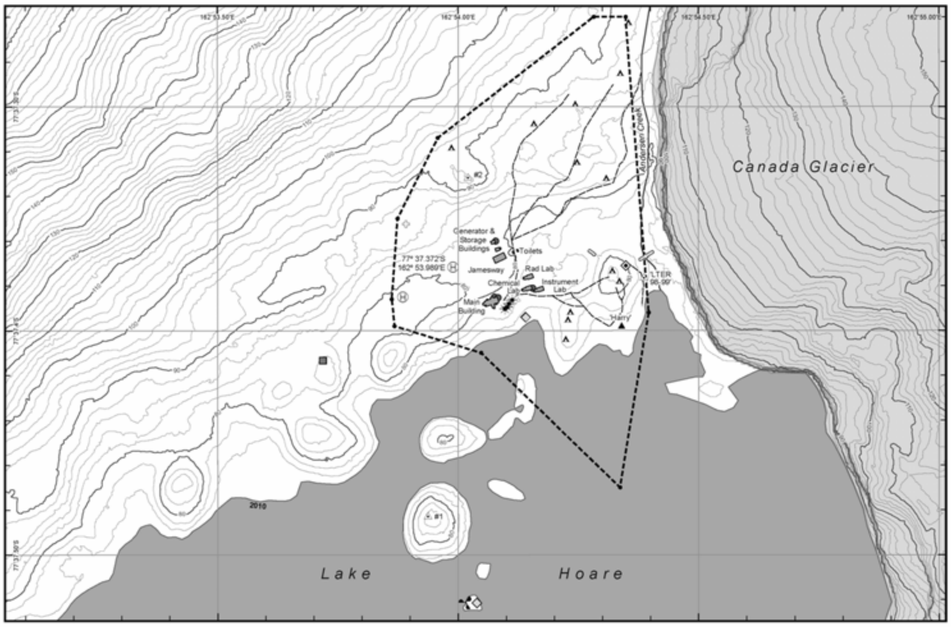

Commonwealth Glacier
Lost Seal Stream
McKnight Creek
Many Glaciers Pond
Aiken Creek
Huey Creek
Lake Fryxell Camp Facilities Zone
Lake Fryxell
F-6 Camp Facilities Zone
Inset
Clow Island
Harnish Creek
von Guerard Stream
Inset: F-6 Camp Facilities Zone
Lake Fryxell
LTER Science Area
Main Building
77°36.514'S
163°15.343'E
Meters
Map 4: Lake Fryxell - Commonwealth Glacier
Meters



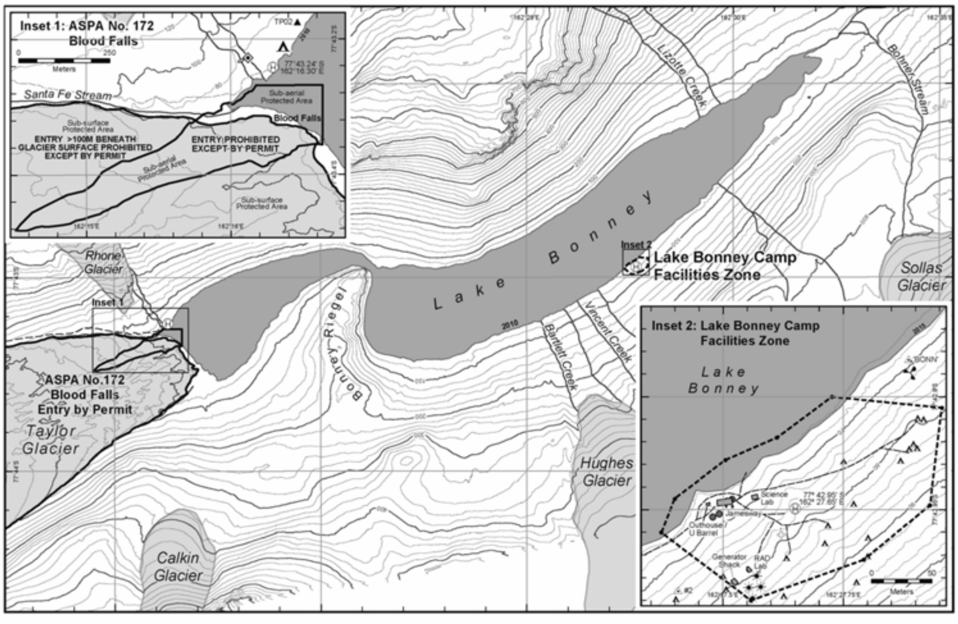
Map 5: Lake Fryxell - Canada Glacier



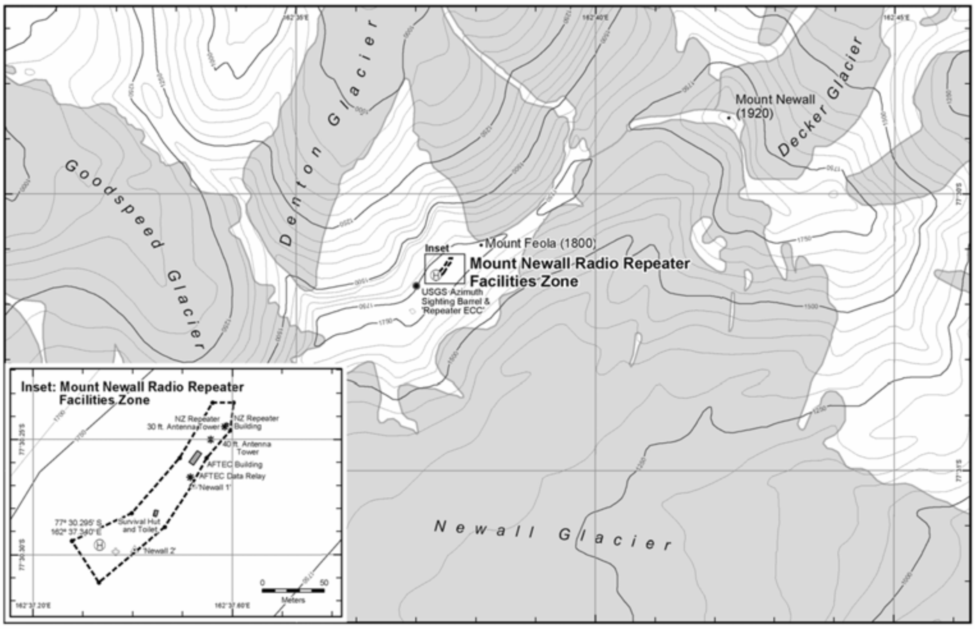
Map 6: Lake Hoare, Canada Glacier



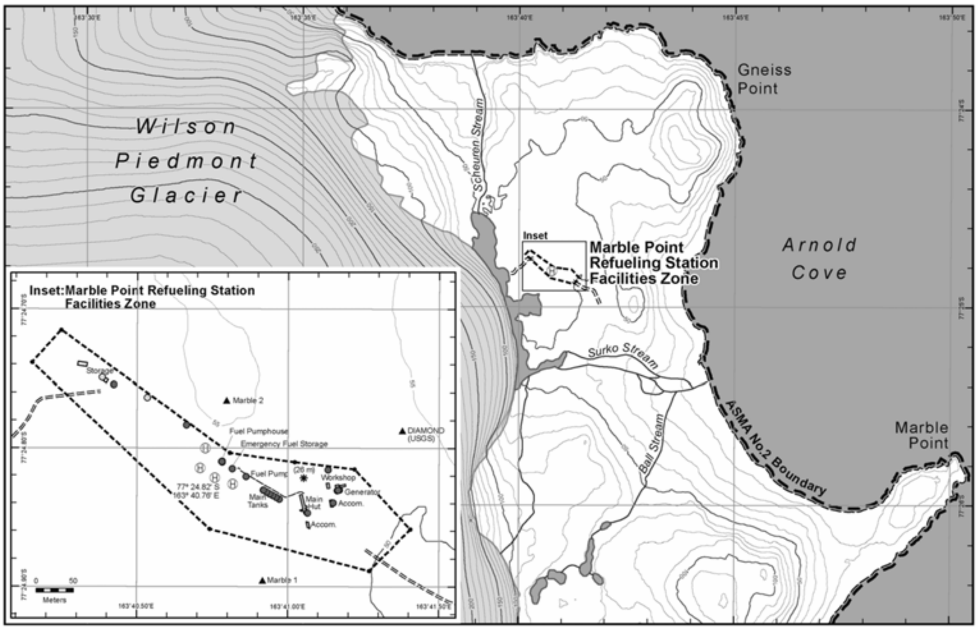
Map 7: Lake Hoare Camp Facilities Zone



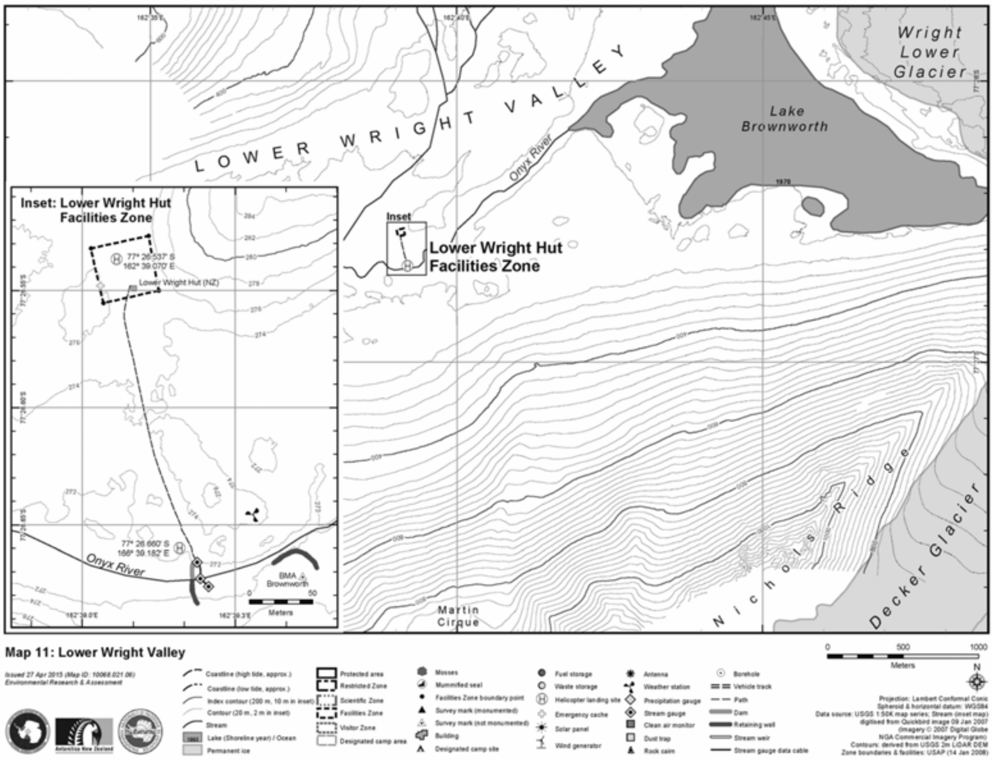
Map 8: Lake Bonney, Taylor Valley



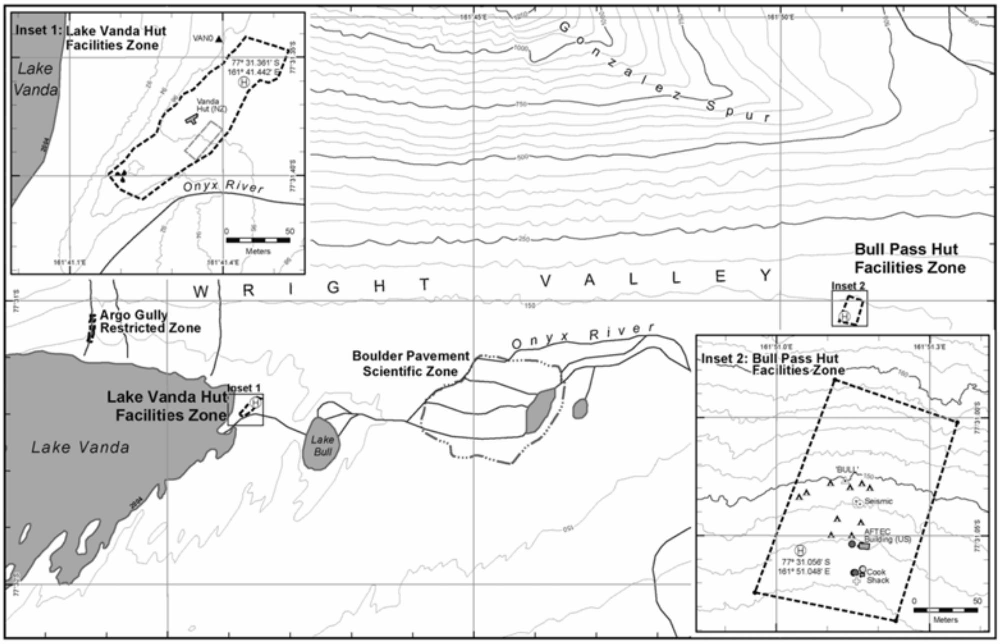
Map 9: Mount Newall, Asgard Range



Map 10: Marble Point, McMurdo Sound



Map 11: Lower Wright Valley



Map 12: Lake Vanda, Wright Valley

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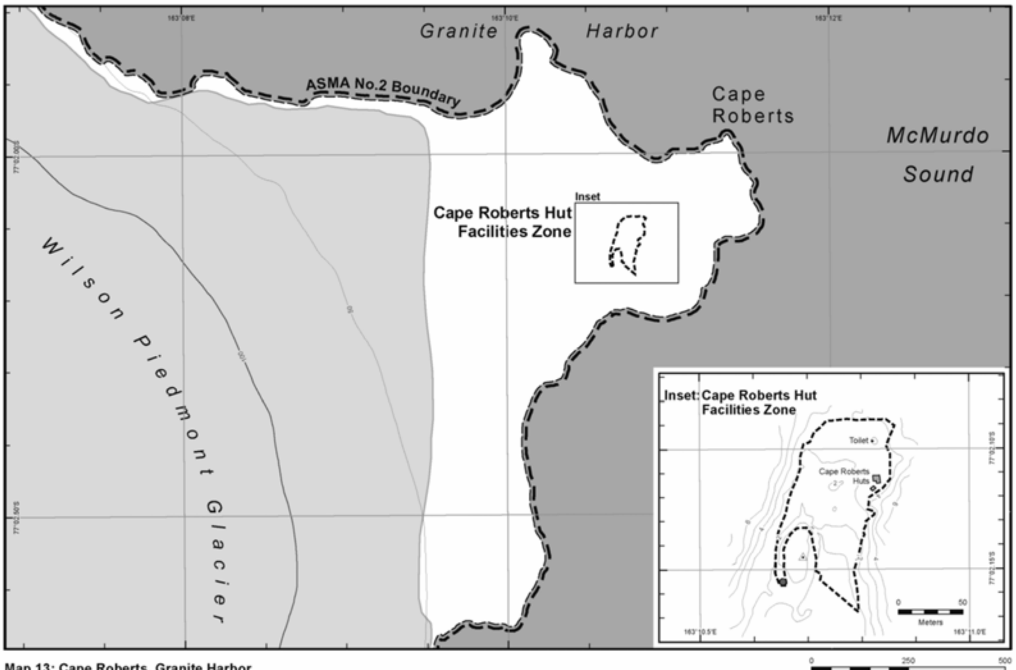
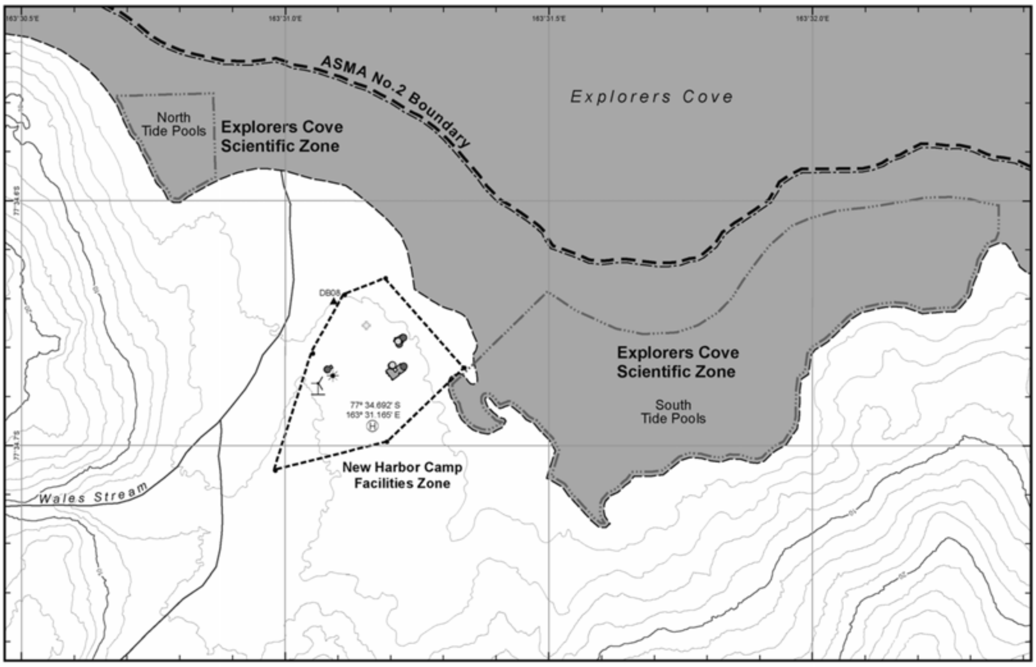
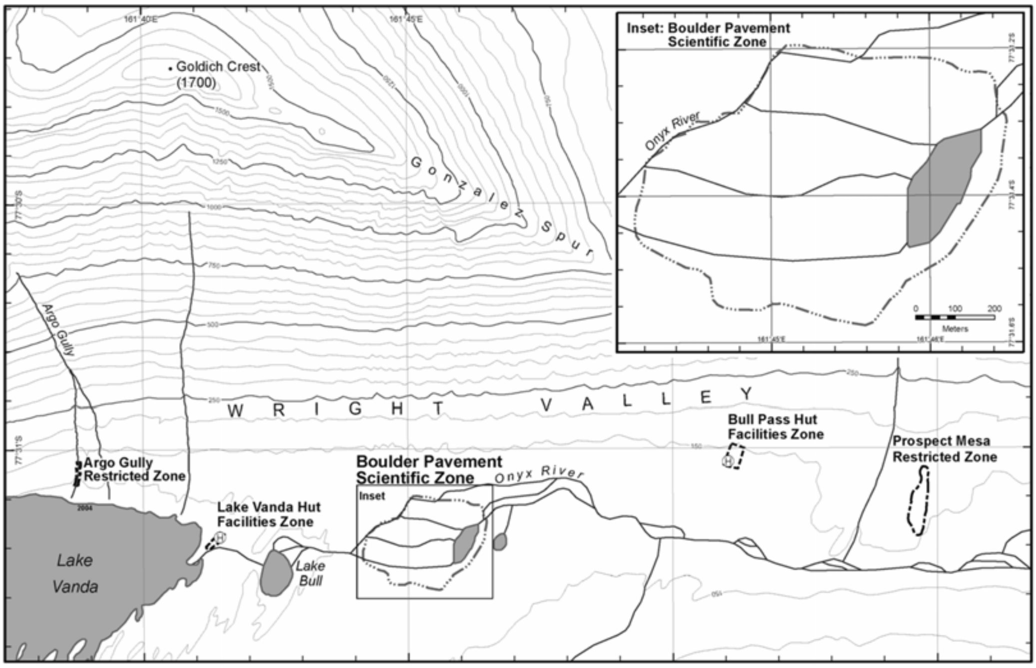


Map 13: Cape Roberts, Granite Harbor

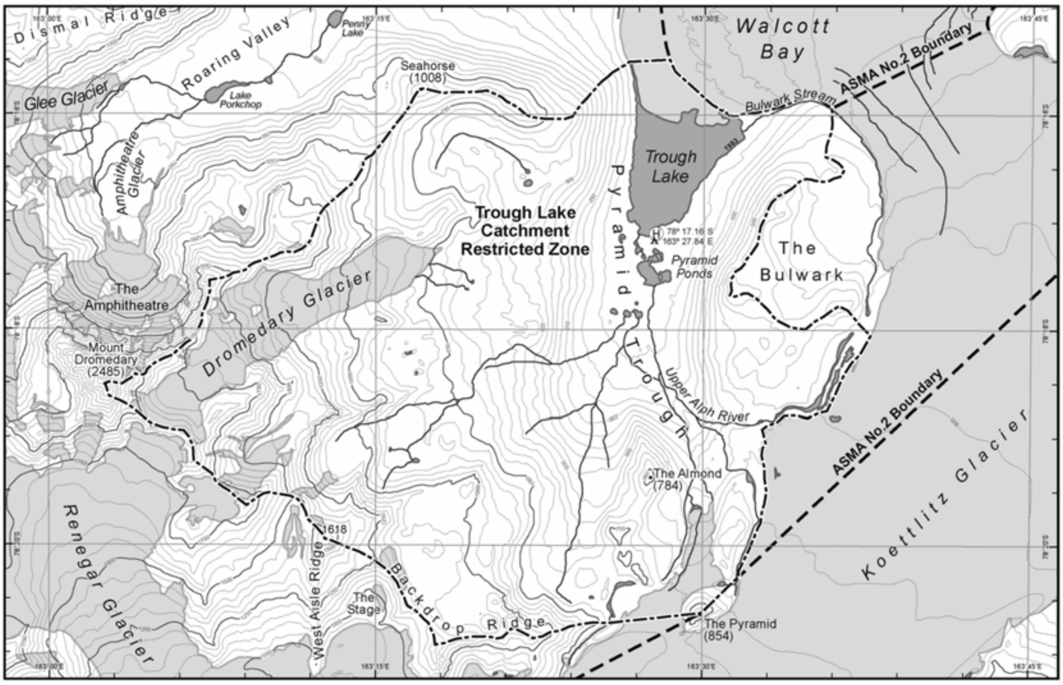
Issued 27 Apr 2015 (Map ID: 10068.023.05)
Environmental Research & Assessment



Map 14: Explorers Cove Scientific Zone

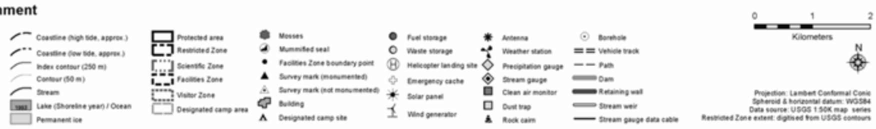


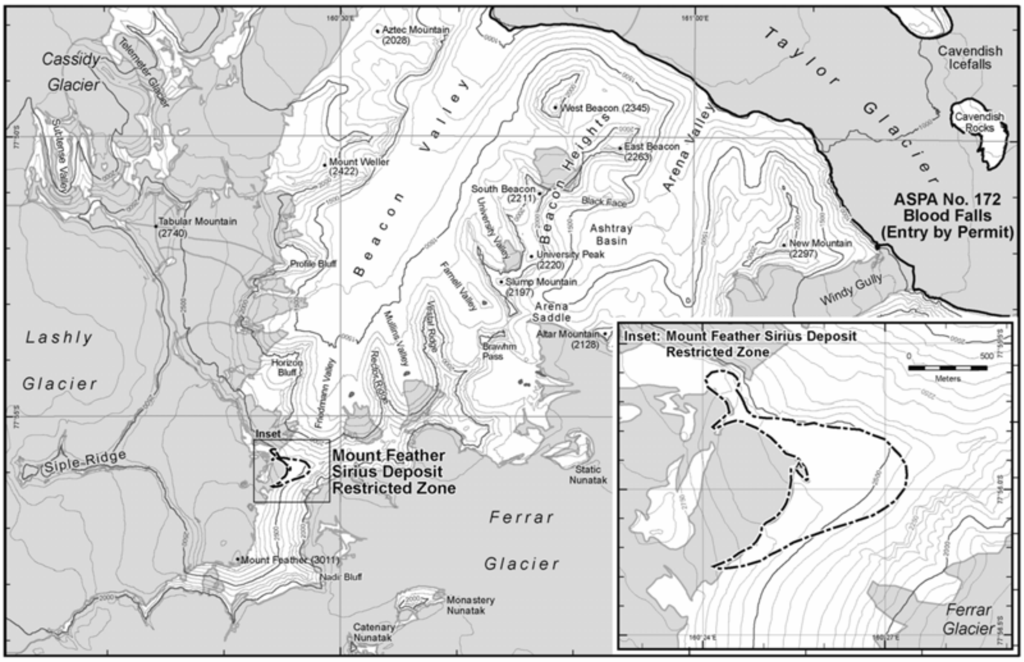
Map 15: Boulder Pavement, Wright Valley



Map 16: Trough Lake Catchment Restricted Zone

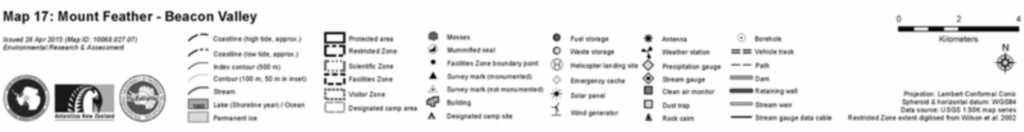
Issued 23 Apr 2015 (Map ID: 10068.026.07)
Environmental Research & Assessment

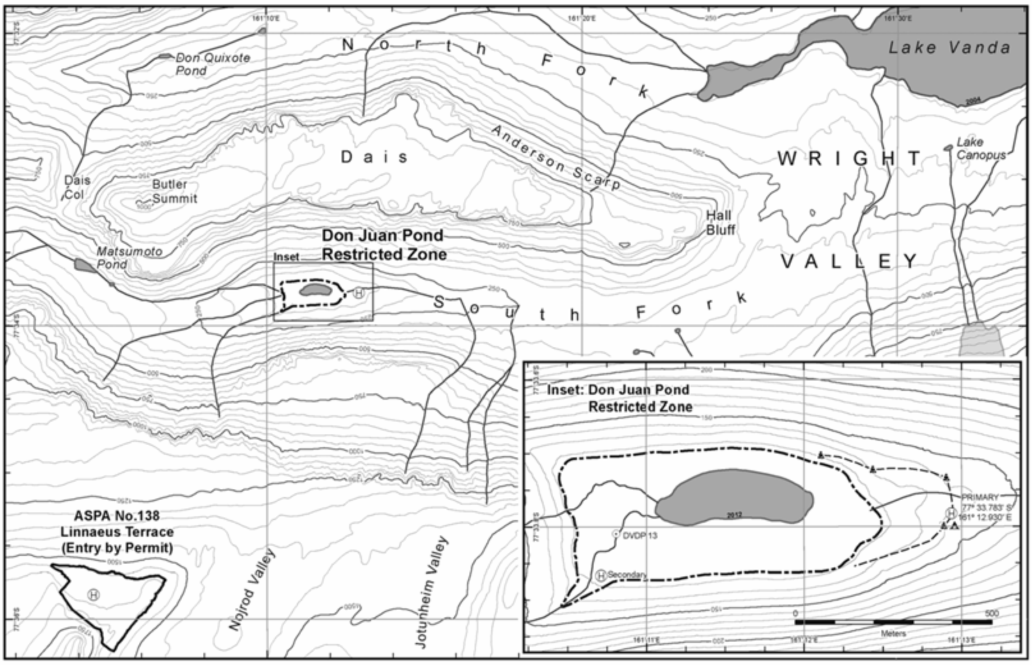




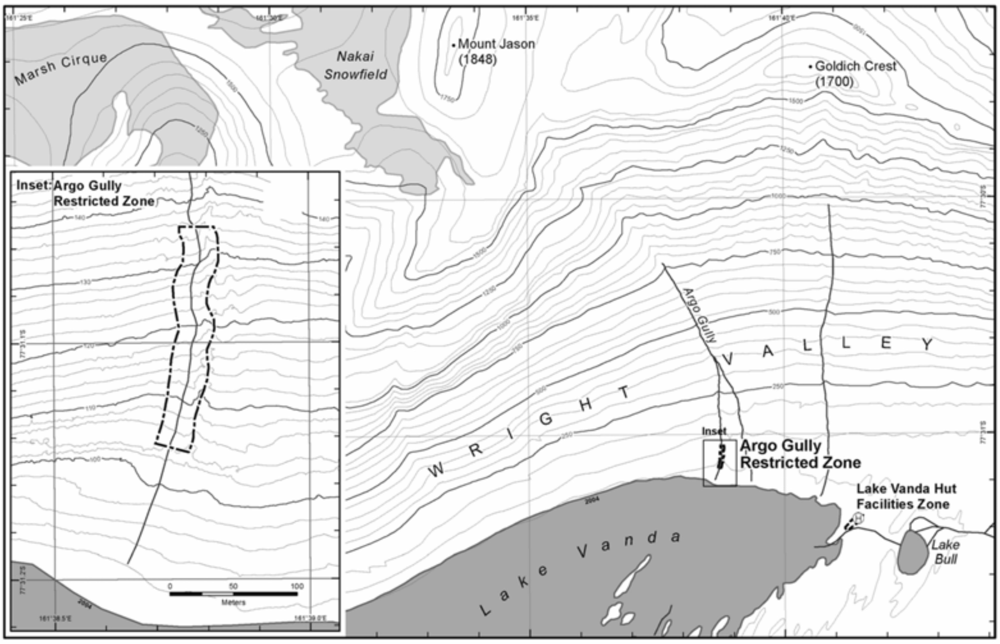
Map 17: Mount Feather - Beacon Valley

Issued 28 Apr 2015 (Map ID: 10068.027.07)
Environmental Research & Assessment

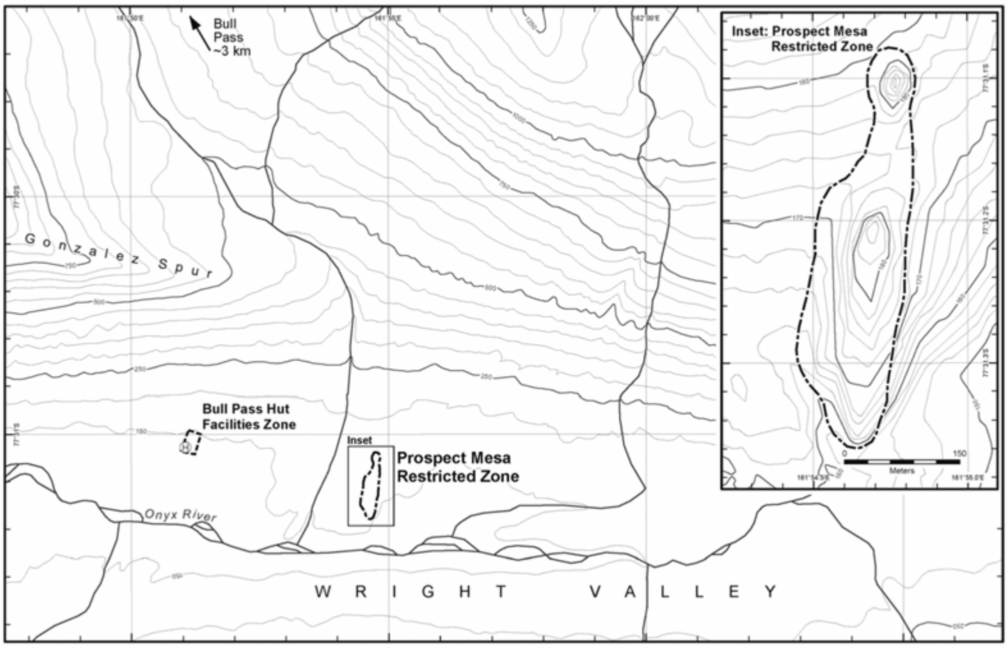




Map 18: Don Juan Pond, Wright Valley



Map 19: Argo Gully, Wright Valley



Map 20: Prospect Mesa, Wright Valley

Issued 28 Apr 2015 (Map ID: 10068.030.05)
Environmental Research & Assessment

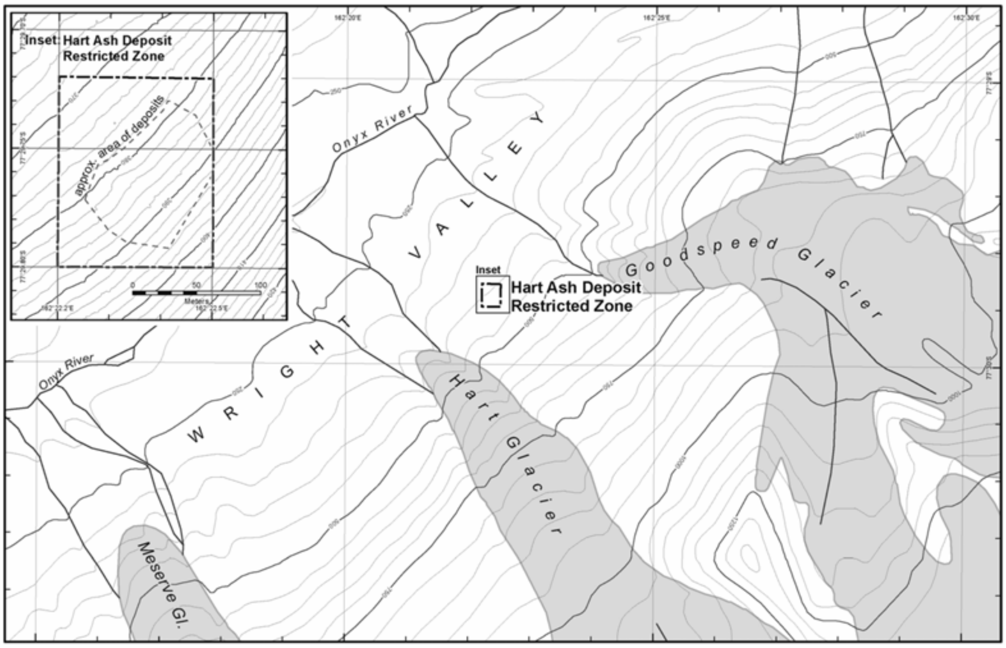
Antarctica New Zealand

Coastline (high tide, approx.) · Coastline (low tide, approx.) · Index contour (250 m, 10 m in inset) · Contour (50 m, 2m in inset) · Stream · Lake (Shoreline year) / Ocean · Permanent ice · Protected area · Restricted Zone · Scientific Zone · Facilities Zone · Visitor Zone · Designated camp area · Mosses · Mummified seal · Facilities Zone boundary point · Survey mark (monumented) · Survey mark (not monumented) · Building · Designated camp site · Fuel storage · Waste storage · Helicopter landing site · Emergency cache · Solar panel · Wind generator · Antenna · Weather station · Precipitation gauge · Stream gauge · Clean air monitor · Dust trap · Rock cairn · Borehole · Vehicle track · Path · Dam · Retaining wall · Stream weir · Stream gauge data cable

0 500 1000
Meters

N

Projection: Lambert Conformal Conic
Spheroid & horizontal datum: WGS84
Data source: USGS 1:50K map series
Inset contours: OSU / NASA / USGS 2m LiDAR DEM
Restricted Zone digitised from elevation data



Map 21: Hart Glacier, Wright Valley

Issued 28 Apr 2015 (Map ID: 10068.031.04)
Environmental Research & Assessment

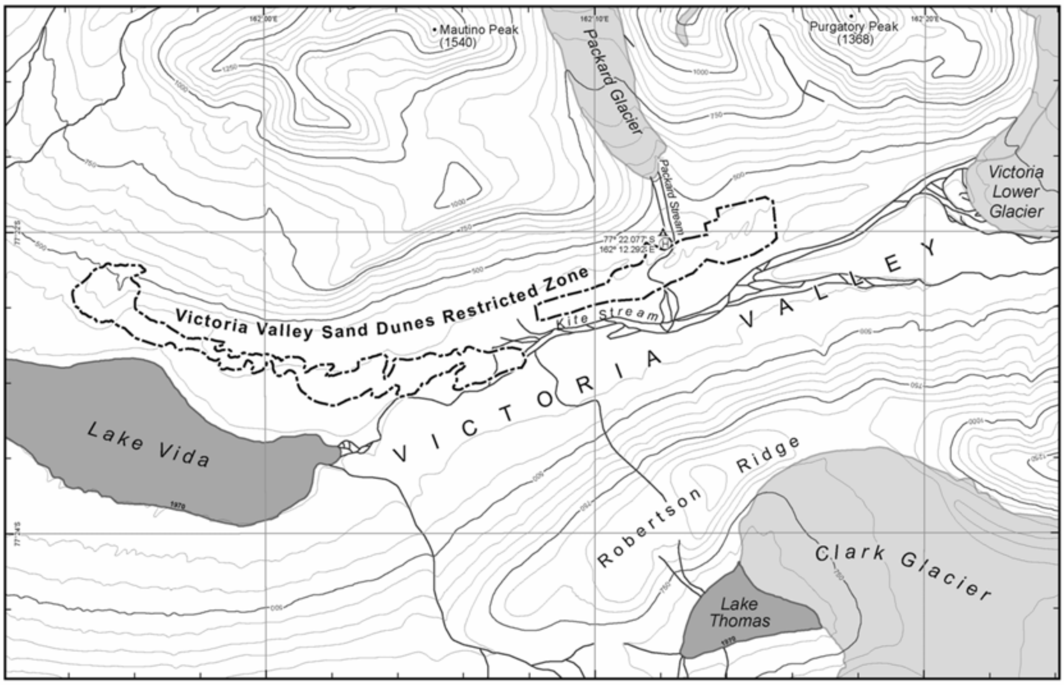
Antarctica New Zealand

Coastline (high tide, approx.) · Coastline (low tide, approx.) · Index contour (250 m, 10 m in inset) · Contour (50 m, 2m in inset) · Stream · Lake (Shoreline year) / Ocean · Permanent ice · Protected area · Restricted Zone · Scientific Zone · Facilities Zone · Visitor Zone · Designated camp area · Mosses · Mummified seal · Facilities Zone boundary point · Survey mark (monumented) · Survey mark (not monumented) · Building · Designated camp site · Fuel storage · Waste storage · Helicopter landing site · Emergency cache · Solar panel · Wind generator · Antenna · Weather station · Precipitation gauge · Stream gauge · Clean air monitor · Dust trap · Rock cairn · Borehole · Vehicle track · Path · Dam · Retaining wall · Stream weir · Stream gauge data cable

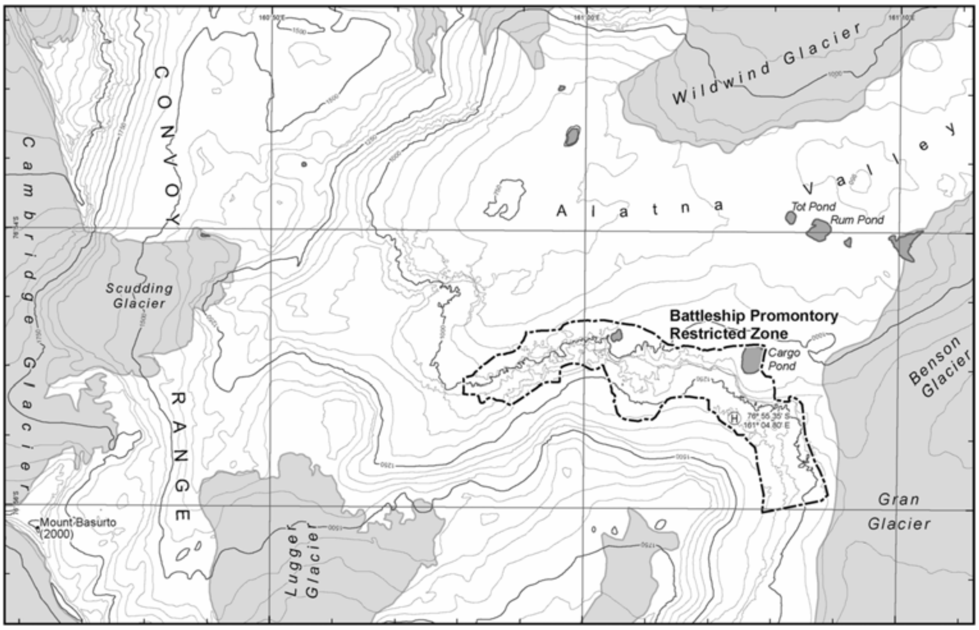
0 500 1000
Meters

N

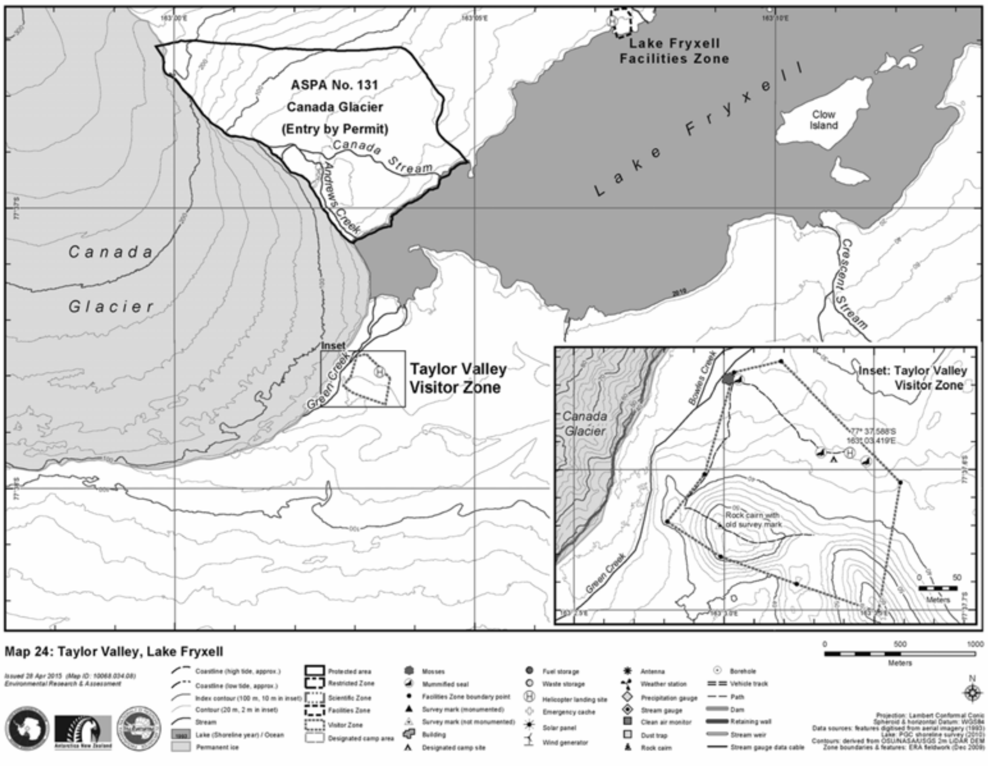
Projection: Lambert Conformal Conic
Spheroid & horizontal datum: WGS84
Data sources: USGS 1:50K map series
Inset contours: OSU / NASA / USGS 2m LiDAR DEM
Hart Ash deposit extent: M. Schiller pers.comm. 2011



Map 22: Victoria Valley Sand Dunes Restricted Zone
Issued 27 Apr 2015 (Map ID: 10068.032.08)
Environmental Research & Assessment



Map 23: Battleship Promontory, Restricted Zone
Issued 23 Apr 2015 (Map ID: 10068.033.06)
Environmental Research & Assessment



Map 24: Taylor Valley, Lake Fryxell

APPENDIX A:

General Environmental Guidelines for the McMurdo Dry Valleys

Why are the McMurdo Dry Valleys considered to be so important? The McMurdo Dry Valleys ecosystem contains geological and biological features that date back thousands to millions of years. Many of these ancient features could be easily and irreversibly damaged by human actions. Unusual communities of microscopic life forms, low biodiversity, simple food webs with limited trophic competition, severe temperature stress, aridity and nutrient limitations are other characteristics that make the McMurdo Dry Valleys unique. This ancient desert landscape and its biological communities have very little natural ability to recover from disturbance. Research in such systems must aim to minimize impacts to protect the environment for future generations.

Before you travel to the Area:

- Ensure that your planned activities follow the requirements of the Code of Conduct in the Management Plan, the Environmental Guidelines in Appendices A and B, and any specific guidelines that apply within management zones (Appendices C-F).
- Plan all activities such as travel, camp set up, fuel handling and secondary containment, and waste management (and minimisation), with the aim of minimizing environmental impacts. Individuals or groups should ensure sufficient equipment and survival gear is brought into the Area or available on-site for safety.
- To help prevent the unintended introduction of non-native species to the McMurdo Dry Valleys, thoroughly clean all equipment (including backpacks, carry-bags and tents), clothing and footwear before travel to the Area.

Travel and activities within the Area:

- To reduce the risk of transfer of species from one part of the Dry Valleys to another, clean equipment, vehicles, clothing and footwear before travel to another site.
- Be aware of the site-specific guidelines in Appendices C-F, and avoid Restricted Zones unless access is required for a compelling reason that cannot be served elsewhere within the Area.
- Stream crossings should be avoided; when it is necessary to cross streams, designated crossing points should be used whenever possible.
- Avoid swimming or diving in lakes, unless authorized by a National Program for scientific purposes.
- Avoid disturbing mummified seals or birds.
- Cairns should not be built in the Area unless authorized by a National Program.
- Do not leave any travel equipment behind (e.g. ice screws, pitons).

Pedestrian travel:

- Some biological communities and geological formations are especially fragile, even when concealed by snow; be alert and avoid such features when travelling within the Area. For example, avoid walking on vegetated areas, in streams or on stream bank sides, on dunes, through long-term soil experiments, on raised delta surfaces, on delicate rock formations, or over other sensitive features.
- Where practicable, keep to designated or established tracks. Please refer to site-specific guidelines for Zones (Appendices C-F) for further guidance.

Vehicle use:

- Vehicle use should be restricted to ice surfaces unless specifically authorized to do otherwise, or at Marble Point, Cape Roberts, and New Harbor.
- Vehicles should keep to established tracks wherever these are present.
- Vehicles should always be parked over a secondary containment unit or a drip tray.
- Vehicles should be used on lake ice only when essential, and they should be parked on permanent lake ice rather than moat ice during the period of summer melt.

Helicopter use:

- Designated helicopter pads should be used for helicopter landings where available. Otherwise, known previous landing sites should be used when possible. Designated helicopter pads are listed in Appendices C-F and are shown on Maps 3-24.

- Designated helicopter pads should be marked so they are clearly visible from the air and markers used should be well-secured and durable.
- Helicopter landings on lakes should be avoided as far as practicable.
- Helicopter operations should not use smoke bombs, except for essential safety purposes.
- Care should be taken to ensure that helicopter sling loads are properly secured. Trained personnel should supervise these operations.

Field camps: location and set up

- Use designated, former, or existing campsites, or share those of other programs to the maximum extent practicable before considering the establishment of new campsites.
- Minimize the footprint of all campsites.
- Campsites should be located as far as practical from lakeshores, streambeds, and long-term experiments to avoid damage or contamination. Do not camp in streambeds, even if they are dry.
- Rocks moved for new campsites or other activities in areas not previously disturbed should be replaced after the activity in their original footprint, if possible, and at a minimum should be placed with the salt-encrusted side faced-down. If the campsite is intended for multi-year activity additional guidance should be sought from the supporting National Program.
- The location of field camps should be recorded and submitted to the supporting National Program.
- Ensure that equipment and supplies are properly secured at all times to avoid dispersion by high winds.

Energy use:

- As much as practicable, use energy systems and modes of travel within the Area that have the least environmental impact and minimize the use of fossil fuels.

Use of Materials:

- Everything taken into the Area should be removed and returned to the appropriate National Program station for proper handling.
- Activities that could result in the dispersal of foreign materials should be avoided (e.g. do not use spray paint to mark rocks) or should be conducted inside a hut or tent (e.g. all cutting, sawing and unpacking).
- Explosives should not be used within the Area, unless approved by a National Program for use in support of essential scientific or management purposes.
- Where possible, ensure that nothing is left frozen into glaciers, snow or lake ice that may ablate out and cause later contamination.

Fuel and chemicals:

- Avoid all fuel and chemical spills as much as possible.
- Steps should be taken to prevent the accidental release of chemicals including laboratory reagents and isotopes (stable or radioactive). Chemicals of all kinds should be dispensed over drip trays or other forms of containment. When permitted to use radioisotopes, safety and handling instructions should be followed precisely.

- When using chemicals or fuels, ensure that spill kits and secondary containment units appropriate to the volume of the substance are available. Those working with chemicals and fuels should be familiar with their use and with appropriate spill response procedures.
- Chemical and fuel containers should be securely positioned and capped, particularly on lake ice.
- All fuel drums should be stored with secondary containment.
- Fuel cans with spouts should be used when refueling generators.
- Generators and vehicles should be refueled over drip trays with absorbent spill pads.
- Vehicle oil should not be changed except over a drip tray.

Waste and spills:

- Water used for ANY human purpose should be removed and/or treated in a gray water evaporator (and residuals should be removed from the Area).
- All human waste should be collected and removed.
- Individuals or groups should always carry proper containers for human waste and gray water so that they may be properly and safely transported for disposal.
- Clean up any spills and/or releases to the maximum extent possible and report the location(s) including coordinates, to the appropriate National Program.

APPENDIX B:

Environmental Guidelines for Scientific Research

Scientific activities in the McMurdo Dry Valleys include research on climate, glaciers, streams, lakes, soils, and local geology and geomorphology. The following environmental guidelines for scientific research seek to reduce the impact of research activities specific to key environments in the Area. These guidelines are based on the report McMurdo Dry Valley Lakes: Impacts of Research Activities (Wharton, R.A. and Doran, P.T., 1998), the product of an international workshop of scientists conducting research in the Area.

General requirements

- Do not displace or collect specimens of any kind, including fossils, except under permit for scientific and associated educational purposes.
- The location of sampling (including biological transects), drilling and soil excavation sites, and of any installations (e.g. stream control structures and instrumentation) should be recorded, and the coordinates submitted to the supporting National Program.
- Installations and equipment should pose minimal risk of harmful emissions to the environment (e.g. use gel cells or other non-spill batteries).
- Ensure all installations, materials and equipment are securely stored when not in use and are removed when no longer required.
- Any markers installed should be durable and fastened securely.
- Metadata records describing data collected should be submitted to the supporting National Program and included within the Antarctic Master Directory.

Sampling and experimental sites

- All scientific equipment, particularly equipment used for sampling and drilling, should be clean before being brought into the Area, and cleaned before being transferred to other sites for re-use within the Area.
- Securely tether all sampling equipment where there is a reasonable risk that it could be irretrievably lost.
- Sample sizes of all biomass and non-biological materials should be limited to the minimum required for effective completion of the planned analyses and archiving.
- Sampling sites (e.g. in lake ice, on glaciers or in soils) should be kept clean.
- Minimize, and where possible avoid, the use of drilling fluids.
- Experimental or monitoring sites intended to be used for more than one season should be clearly identified by country, name of the principal investigator and year of installation.

Scientific installations

For scientific installations, including meteorological stations, geographic monuments, communication repeaters, lake monitoring systems, and level recorders:

- Installations should be sited carefully, should be easily retrievable when required, and properly secured at all times to avoid dispersal by high winds.
- All installations in the Area should be clearly identified by country, name of the principal investigator and year of installation.

- Installations should be as energy-efficient as possible and use renewable energy sources wherever practicable.
- Installations should pose minimal risk of harmful emissions to the environment (e.g. use gel cells or other non-spill batteries).
- Installations should be periodically evaluated for deterioration, usefulness, and potential removal. The frequency of evaluation may depend on installation characteristics and the site, although in general this is likely to be needed at least once every 3-5 years.
- Installations should be designed and constructed so they can be decommissioned and removed at the end of their use.

Scientific equipment, fuels and materials

- Minimize the use of fossil-fuel-powered equipment; use solar-powered and hand devices when possible.
- Properly tune generators to minimize emissions and use only when necessary. Always place generators and fuel cans in drip pans.
- Carefully manage fuels, glycol, chemical waste, and all other liquids to avoid spills.
- Always refuel using drip pans.
- Ensure spill kits are always available on-site where liquid fuels or wastes (including chemicals and water extracted from lakes) are present.
- Materials liable to shatter at low temperatures, for example many polyethylene based plastics, should be avoided. Wooden and fabric components in semi-permanent structures should be avoided as these are subject to wind abrasion and occasional failure.

Streams

- Use flumes rather than weirs.
- To the extent practicable, use local materials to construct water measuring and control structures.
- Limit the number of tracer and manipulative experiments. Whenever possible, use modeling approaches to extend the application of experimental results to other streams and lake basins.
- Use only naturally occurring tracers and document tracer use.
- Design tracer experiments to limit the movement of tracers in lakes. The incremental flux from the experiment should be appropriately small in proportion to the average annual total flux for that solute from streams. Choose an experimental site with a long enough reach such that reactions will be completed by the end of the reach.
- Establish specific sites for biomass sampling and document geographic locations, sampling extent, and frequency.
- Develop and apply methods (e.g. spectral analysis) that do not rely on removal of samples for quantifying changes in biomass in streams.

Lakes

- Minimize the duration and extent to which structures are placed on the ice. When placing structures on the ice near shore, place them on the perennial ice rather than the moat (the moat is highly susceptible to rapid melting). Document the geographic location of the placement of structures on the ice.

- Use barriers (e.g. drip pans) between equipment (e.g. motors, tools) and ice to minimize the potential for hydrocarbon introduction into the ice as well as the physical melting of the ice surface.
- Document the area and the extent to which lake ice has been excavated, taking geographic coordinates. Areas that have been used for sampling or accessing the lake should be reused to the greatest extent possible.
- Minimize the use of motorized vehicles. All-terrain vehicles with four-stroke engines are preferable to snowmobiles with two-stroke engines (less efficient combustion in two-stroke engines causes an increase in the release of hydrocarbons and particulates).
- Use extreme caution when driving motorized vehicles to avoid rolling the vehicle or breaking through the ice cover.
- Remove materials brought up from beneath the ice. Do not dump or deposit water and sediment samples on the lake ice.
- Reduce helicopter overflights after the ice surfaces begin to melt and keep landings on lakes to a minimum.
- Avoid storage of materials on the lake ice surface.
- Use separate samplers (e.g. water collectors, plankton nets) and instruments, if feasible, for each lake to avoid cross contamination. Samplers or instruments used in more than one lake should be thoroughly cleaned (sterilize if possible) prior to reuse in a different lake.
- Carefully manage gray water extracted from lakes to avoid spills.
- Consider laboratory-based alternatives to *in situ* experiments involving any radioisotope, stable isotope, or other tracer in view of the future integrity of the biological and chemical properties of the lakes. Complete preliminary calculations to ascertain the potential impact of isotope experiments. Document and record any introductions.
- Incorporate metal-free haul lines and sampling containers such as “go-flow” bottles into sampling protocols to minimize metal contamination of the lakes.
- Promote use of an environmentally friendly substitute for glycol for use in melting access holes (e.g. a biodegradable antifreeze).
- Minimize the amount of gray water waste by collecting the least volume of water and sediment needed for research purposes.
- Train individuals working on the lake ice to take steps to reduce the loss of equipment through ice holes.
- Provide adequate training for research divers and support teams so that impacts to the lake environment are minimized.
- Prior to conducting diving or ROV operations in a particular lake, consider previous diving history at the proposed research site, the proximity of other areas of interest, and the vulnerability of the water column and benthos to disturbance. These considerations should also be applied to other sampling and measuring activities.
- Assemble and maintain records of diving and ROV activities, including timing, intensity, and duration.
- Use technological developments (e.g. rebreather apparatus, push-pull systems) that mitigate the environmental impacts of diving.

Soils

- Minimize surface and subsurface disturbance to the maximum extent practicable.
- Restore disturbed surfaces as close as possible to their natural state upon completion of the work. For larger-scale excavations (greater than 1 m^2), take photographs prior to breaking ground to provide a basis for restoration. Record the location of the remediated site.
- Place excavated soil on mats or groundsheets during soil sampling.
- Backfill all excavations to approximate original contour and replace desert pavement where possible. The desert pavement can be skimmed from the surface prior to digging and kept aside for replacement.
- Conduct thorough environmental assessment of proposed exogenous amendment experiments.
- Limit use of mechanical equipment (e.g. Cobra drills, soil augers).

Glaciers

- Minimize the use of liquid water (e.g. with hot water drills).
- Avoid the use of chemicals and chemical solutions on the ice.
- If stakes or other markers are placed on a glacier, use the minimum number of stakes required to meet research needs; where possible, label these with event number and project duration.
- Use electric chainsaws powered by a four-stroke generator whenever possible for large-scale sawing operations (less contamination than from two-stroke engines). Avoid the use of chainsaw blade lubricants when cutting cold ice.
- Upon completion of a research project, remove all materials – wood, metal, and sensors – embedded in the ice to minimize contamination.

APPENDIX C:

Guidelines for Facilities Zones

Facilities Zones include a designated area around the following facilities operated by National Programs in the Area:

- New Harbor Camp, Taylor Valley;
- F-6 Camp, Taylor Valley;
- Lake Fryxell Camp, Taylor Valley;
- Lake Hoare Camp, Taylor Valley;
- Lake Bonney Camp, Taylor Valley;
- Mount Newall Radio Repeater, Asgard Range;
- Marble Point Refueling Station, Marble Point;
- Lower Wright Camp, Wright Valley;
- Lake Vanda Hut, Wright Valley;
- Bull Pass Hut, Wright Valley;
- Cape Roberts Camp, Granite Harbor.

The locations, boundaries, helicopter landings sites, and infrastructure at Facilities Zones, together with an identification of the Maintaining Party are listed in Table C-1, which is followed by maps of the Facilities Zones and their local geographical context (Maps 3-13).

Facilities Zone	**Map No.**	**Boundary Description**	**Boundary Coordinates**	**Helicopter Landing Site Coordinates**	**RP**[1]	**Structures in Zone**
New Harbor Camp	3	The boundary goes from a point northwest of the generator shed (on the bank edge), southwest beyond the sling load area, east to a point south of the helicopter pad, northeast to a point east of the main Jamesways, northwest to a point north of the lab building, southwest to a point just north of the old bore hole, and southwest along the bank edge back to the point by the generator shed.	77° 34.66′S, 163° 31.05′E 77° 34.71′S, 163° 30.98′E 77° 34.70′S, 163° 31.19′E 77° 34.67′S, 163° 31.34′E 77° 34.63′S, 163° 31.19′E 77° 34.64′S, 163° 31.11′E	77° 34.692′S, 163° 31.165′E 1 helicopter landing pad plus sling load area.	US	Main building consists of two Jamesways connected by a wooden passageway, one 42 m^2 (448 sq. ft.) and the other 30 m^2 (320 sq. ft.). Adjacent to the main building are a 3 m^{2S} (32 sq. ft.) storage shed and a 1.5 m^2 (16 sq. ft.) outhouse. The camp also includes a 21 m^2 (224 sq. ft.) Jamesways that serve as a laboratory, an 8.9 m^2 (96 sq. ft.) generator shack, and a 1.5 m^2 (16 sq. ft.) diving equipment storage box. One survival cache box and one wind generator tower.
F-6 Camp	4	The boundary goes from a point southwest of the helicopter pad, northeast to a point just east of the emergency cache (survival box), north around the northern-easternmost tent site, west to a point northwest of the tent sites (by the lake), south around the stream weir, and southeast to the original point by the helicopter pad.	77° 36.53'S, 163° 15.32'E 77° 36.50'S, 163° 15.43'E 77° 36.46'S, 163° 15.46'E 77° 36.46'S, 163° 15.40'E 77° 36.46'S, 163° 15.21'E 77° 36.50'S, 163° 15.19'E	77° 6.514′S, 163° 15.343′E 1 helicopter landing pad.	US	A 42 m^2 (448 sq. ft.) main building with outhouse adjacent. Emergency cache.

Facilities Zone	Map No.	Boundary Description	Boundary Coordinates	Helicopter Landing Site Coordinates	RP[1]	Structures in Zone
Lake Fryxell Camp	5	The boundary follows the lake edge in the southeast corner to a point southwest of the helicopter pad, up to the small plateau below a hill, behind the farthest tent site in the northwest corner, east to the stream, southeast along the stream bank to the eastern most tent and south back to original point by the lake.	77° 36.38'S, 163° 07.60'E 77° 36.40'S, 163° 07.37'E 77° 36.34'S, 163° 07.31'E 77° 36.34'S, 163° 07.26'E 77° 36.29'S, 163° 07.27'E 77° 36.29'S, 163° 07.51'E 77° 36.31'S, 163° 07.59'E 77° 36.38'S, 163° 07.60'E	77° 36.33′S, 163° 07.428′E	US	A 62.7 m^2 (675 sq. ft.) Jamesway (main building), four 13.9 m^2 (150 sq. ft.) laboratories, and one 13.9 m^2 (150 sq. ft.) generator building. Wind generator tower, solar panel and one outhouse. Emergency cache. Proposed building sites, wind generator tower, & solar panels are shown.
Lake Hoare Camp	6 & 7	The boundary goes from the rocky area southeast of the helicopter pads, north around the emergency cache, northeast to a rock northwest of the westernmost tent site, northeast to a point north of another tent site, northeast again to the northeastern most tent site, south along the stream/glacier to a point east of the old Lake Hoare facilities (shower and dive storage buildings), southwest to the end of the spit, northwest to the beach below the main building, and northwest to	77° 37.40'S, 162° 53.87'E 77° 37.39'S, 162° 53.86'E 77° 37.35'S, 162° 53.87'E 77° 37.31'S, 162° 53.96'E 77° 37.26'S, 162° 54.28'E 77° 37.26'S, 162° 54.35'E 77° 37.39'S, 162° 54.40'E 77° 37.47'S, 162° 54.34'E 77° 37.41'S, 162° 54.05'E	77° 37.372′S, 162° 53.989′E 2 helicopter landing pads plus sling load area. Secondary pad is 46 m SW of the main pad.	US	A 55.7 m^2 (600 sq. ft.) main building, three 13.9 m^2 (150 sq. ft.) labs, a generator building (96 sq. ft.), a tool shed (96 sq. ft.), and three outhouses: two 2.2 m^2 (24 sq. ft.) and one 1.7 m^2 (18 sq. ft.), a 49.3 m^2 (530 sq. ft.) Jamesway. Solar panels and an emergency cache.

Facilities Zone	Map No.	Boundary Description	Boundary Coordinates	Helicopter Landing Site Coordinates	RP[1]	Structures in Zone
		the original point by the helicopter pads.				
Lake Bonney Camp	8	The boundary goes from a point west of the generator shed by the lake, southeast up to a boulder behind a tent site, northeast to a hill above a tent site, northeast to a point northeast of the easternmost tent site, west to the shoreline, southwest along the shoreline passing north of the helicopter landing pad, continuing southwest along the lake shore to a point northwest of the meteorological station and back to the original point below the generator shed.	77° 42.96'S, 162° 27.37'E 77° 42.99'S, 162° 27.56'E 77° 42.97'S, 162° 27.79'E 77° 42.95'S, 162° 27.93'E 77° 42.90'S, 162° 27.73'E 77° 42.92'S, 162° 27.61'E	77° 42.95′S, 162° 27.65′E 1 helicopter landing pad.	US	A 55.7 m^2 (600 sq. ft.) Jamesway, a 2.2 m^2 (24 sq. ft.) outhouse, an 8.9 m^2 (96 sq. ft.) generator building, a 11 m^2 (118 sq. ft.) science laboratory and a RAD lab. Solar panels and emergency cache.
Mount Newall Radio Repeater	9	The boundary goes from the northeastern most point northeast of the green equipment shelter, southwest along the southeastern side of the ridge around the green equipment shelter, the NZ Repeater, the wind turbine, the AFTEC Hut, the antenna, the survival camp hut,	77° 30.23'S, 162° 37.60'E 77° 30.25'S, 162° 37.60'E 77° 30.26'S, 162° 37.55'E 77° 30.27'S, 162° 37.52'E 77° 30.27'S, 162° 37.52'E 77° 30.29'S, 162° 37.46'E 77° 30.31'S, 162°	77° 30.295′S, 162° 37.340′E 1 helicopter landing pad.	US / NZ	The site includes both a US and a NZ radio repeater. There are three huts on Mt. Newall, including an 8.9 m^2 (96 sq. ft.) survival hut, a 22.3 m^2 (240 sq. ft.) shed encompassing a hybrid power system (both US), and a green equipment shelter 2.2 m^2 (24 sq. ft.) housing the NZ repeater. US repeater equipment contained in two orange plastic cases. There are two antennae (one US,

Facilities Zone	Map No.	Boundary Description	Boundary Coordinates	Helicopter Landing Site Coordinates	RP[1]	Structures in Zone
		the survival cache, around the helicopter landing pad, northeast along the north western side of the ridge around the camp hut, the antenna, the AFTEC Hut, the wind turbine, the NZ Repeater, and the green equipment shelter back to the original point.	37.33'E 77° 30.29'S, 162° 37.28'E 77° 30.28'S, 162° 37.40'E 77° 30.26'S, 162° 37.49'E 77° 30.23'S, 162° 37.56'E			one NZ) and a wind turbine (US) at the site.
Marble Point Refueling Station	10	The boundary goes from the easternmost point (east of soil pits), northwest around the main facilities area, northwest around the fuel storage tanks and pipe, northwest along the road, southwest around the end of the road and staging area, southeast along the road and around the helicopter pads, southeast around the pond, and northeast back to the point east of the soil pits.	77° 24.86'S, 163° 41.41'E 77° 24.82'S, 163° 41.22'E 77° 24.81'S, 163° 41.02'E 77° 24.80'S, 163° 40.81'E 77° 24.71'S, 163° 40.25'E 77° 24.74'S, 163° 40.15'E 77° 24.86'S, 163° 40.74'E 77° 24.89'S, 163° 41.27'E	77° 24.82′S, 163° 40.76′E 4 helicopter landing pads. The four pads are in close proximity (~25 m – 30 m apart). Coordinates are given for the central pad (second from main fuel tanks).	US	A 69.7 m^2 (750 sq. ft.) main building, a 41.8 m^2 (450 sq. ft.) bunkhouse, a 55.7 m^2 (600 sq. ft.) bunkhouse, a 7.4 m^2 (80 sq. ft.) fuel shack, 6 fuel storage tanks (25,000 gallons each), a 2.2 m^2 (24 sq. ft.) outhouse and incinerator for solid waste, a 1.9 m^2 (20 sq. ft.) storage shed, a 21 m^2 (224 sq. ft.) generator shed, a 27 m^2 (288 sq. ft.) workshop and storage building, and a 7 m^2 (76 sq. ft.) ASOS weather station. Fuel shed and outhouse at refuelling station.
Lower Wright Hut	11	The boundary encompasses the hut, a marked helicopter landing site, and an emergency box and is bounded by rising slopes on the western and	77° 26.56'S, 162° 39.04'E 77° 26.53'S, 162° 39.02'E 77° 26.53'S, 162° 39.13'E 77° 26.55'S, 162° 39.15'E	77° 26.537′S, 161° 39.070′E 1 helicopter landing pad.	NZ	One small hut with accommodation for 2 people with a floor area of 6 m^2 (65 sq. ft.). Emergency cache.

Facilities Zone	Map No.	Boundary Description	Boundary Coordinates	Helicopter Landing Site Coordinates	RP[1]	Structures in Zone
		eastern sides, a large pavement crack at the southern end and rocky areas at the northern end. A met screen and weir are outside the zone within walking distance of the site.				
Lake Vanda Hut	12 Inset 1	The boundary follows the edge of the flat area on which the huts, AWS, marked helicopter landing site and tent sites are located.	77° 31.42'S, 161° 41.15'E 77° 31.40'S, 161° 41.17'E 77° 31.34'S, 161° 41.45'E 77° 31.34'S, 161° 41.51'E 77° 31.36'S, 161° 41.51'E 77° 31.41'S, 161° 41.25'E	77° 31.361′S, 161° 41.442′E 1 helicopter landing pad.	NZ	Three interconnected huts with a total floor area of 30 m^2 (323 sq. ft.). Automatic Weather Station (AWS).
Bull Pass Hut	12 Inset 2	The boundary encompasses the pebbly flat ground on which the huts and tent sites are situated, and is bounded by a large boulder to the north, small rocky ridges to the east and west, and a line between ridge ends to the south. An AWS is established well to the west of the zone boundary.	77° 31.09'S, 161° 51.23'E 77° 31.07'S, 161° 50.96'E 77° 30.98'S, 161° 51.11'E 77° 31.00'S, 161° 51.35'E	77° 31.056′S, 161° 51.048′E 1 helicopter landing pad.	US	Two shelters located at this site, an equipment shelter and an environmental shelter approximately 28.7 m^2 (290 sq. ft.) which houses a hybrid power system. Emergency cache.
Cape Roberts Camp	13	The boundary encompasses all of the flat area between north and	77° 2.08'S, 163° 10.73'E 77° 2.08'S, 163°	No helicopter landing pads.	NZ	Two huts on the ice-free area of Cape Roberts with accommodation for four people

Facilities Zone	Map No.	Boundary Description	Boundary Coordinates	Helicopter Landing Site Coordinates	RP[1]	Structures in Zone
		south beaches on Cape Roberts, including the two huts and fuel rack. The southeast corner of the zone is at the fuel rack, and the boundary continues north along the edge of a bouldery slope, west along the edge of a rocky area, and south behind the huts along the edge another rocky slope. The zone is bounded to the south by the shoreline of a small bay.	10.79'E 77° 2.09'S, 163° 10.84'E 77° 2.16'S, 163° 10.79'E			(approximately 10 m^2.) as well a living hut 19 m^2 (205 sq. ft.). A storage rack for drummed fuel is also at the site.

APPENDIX D:

Guidelines for Scientific Zones

The following sites within the Area are designated Scientific Zones:

- Explorers Cove, New Harbor, Taylor Valley;
- Boulder Pavement, Wright Valley.

Brief site descriptions, guidelines for activities within each Scientific Zone, and Maps 14 and 15 showing the zone boundaries are attached.

Scientific Zone

Explorers Cove

Location: New Harbor, Taylor Valley

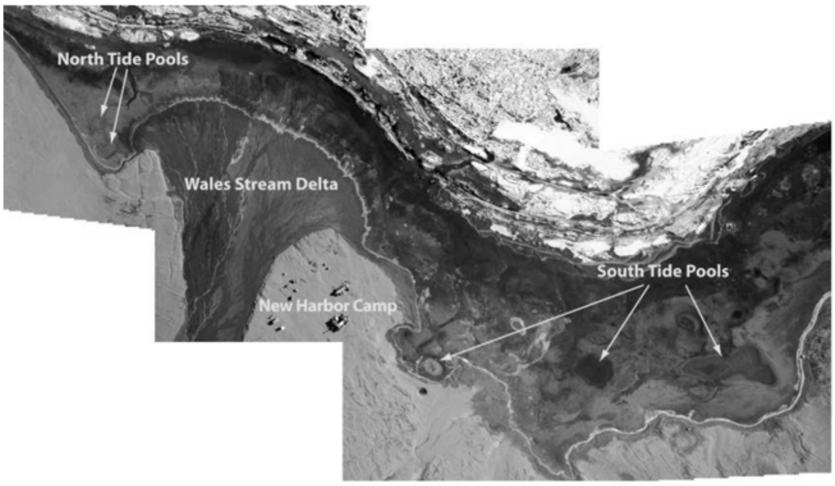
Two components centered on:

North tide pools (490 m^2):

77° 34.57' S, 163° 30.79' E; and

South tide pools (4360 m^2):

77° 34.66' S, 163° 31.82' E.



Zone area: 4850 m^2 *Photo montage: S. Bowser, USAP (28 Jan 2005)*

Purpose
To avoid disturbance to local marine environment and ecology which are the subject of long-term scientific studies.

Description
The Scientific Zone comprises two tide pool systems on the coast of Explorers Cove, both located close to the New Harbor Camp Facilities Zone and extending ~ 75 – 100 m offshore (Map 14). The southern component lies immediately east of New Harbor Camp, extending along the coast for ~ 500 m. The smaller northern component lies ~ 200 m northwest of New Harbor Camp, immediately west of the Wales Stream delta, and extends along the coast for ~ 100 m. These tidally inundated sand flats are characterized by tide pools containing benthic mats of diatoms and cyanobacteria, a significant source of nutrients for the Explorers Cove near-shore marine ecosystem.

Boundaries
The coastline boundary of both tide pools follows the mean high water mark, while the seaward boundary extends parallel to the coast following the approximate grounding line of sea ice pressure ridges (when present), which occur ~ 75 – 100 m offshore (see Map 14).

South Tide Pools: The western boundary extends 100 m NE from the coast at the NE corner of the New Harbor Camp Facilities Zone. The eastern extent of the Scientific Zone is marked on the shore of a small coastal promontory ~ 500 m east of the Facilities Zone by a small rock cairn, from which the eastern boundary extends due north ~ 30 m offshore.

North Tide Pools: The western boundary extends 100 m along the coast from a small embayment west of the Wales Stream delta. The northern boundary thence extends ~ 80 m due east from the coast, while the eastern boundary extends 70 m due north from the coast at the edge of the Wales Stream delta.

Impacts

KNOWN IMPACTS	None.
POTENTIAL IMPACTS	Shoreline sediments are soft and easily disturbed when not frozen.

Access requirements

HELICOPTER ACCESS	Use designated helicopter landing site at New Harbor Facilities Zone: 77° 34.692' S, 163° 31.165' E
SURFACE ACCESS	Access to the New Harbor Facilities Zone over sea ice may pass through the southern component of the Scientific Zone.

Special site guidance

- Avoid walking in the zone unless conducting scientific research, especially when the ice has thawed.
- Sterilize all sampling equipment before sampling at the site to avoid introducing non-native species.

Key references

Gooday, A.J., Bowser, S.S. & Bernhard, J.M. 1996. Benthic foraminiferal assemblages in Explorers Cove, Antarctica: A shallow-water site with deep-sea characteristics. *Progress in Oceanography* **37**: 117-66.

Site Map – Map 14.

Scientific Zone

Boulder Pavement

Location: Onyx River, central Wright Valley, 4 km east and upstream from Lake Vanda:

77° 31.33' S; 161° 54.58' E

Boulder Pavement: N. Biletnikoff, USAP (29 Jan 2009)

Purpose
To avoid disturbance to extensive microbial mats and ecology which are the subject of long-term scientific studies.

Description **Zone area:** 0.47 km^2

The Scientific Zone comprises a part of the Onyx River which fans out and flows slowly through an extensive and relatively flat area of boulders, where conditions are favorable for the growth of algae and cyanobacteria, forming the most extensive microbial mats in the Wright Valley and a biofilter for Lake Vanda.

Boundaries
The Scientific Zone extends to the perimeter of the extensive flat boulder pavement that is typically inundated by the Onyx River, which comprises an area ~ 0.8 km wide and 1.5 km long (Map 15).

Impacts

KNOWN IMPACTS	None.
POTENTIAL IMPACTS	Trampling may damage the microbial mats. The mats may be difficult to identify when the site is frozen. Activities within the zone increase the risk of the introduction of non-native species.

Access requirements

HELICOPTER ACCESS	Helicopter landings within the Scientific Zone should be avoided. Where practicable, visitors should use the designated helicopter landing sites at Lake Vanda Hut Facilities Zone (77° 31.361' S; 161° 41.442' E) or Bull Pass Hut Facilities Zone (77° 31.056' S161° 51.048' E) (Maps 12 & 15).
SURFACE ACCESS	The zone should be accessed on foot. Avoid walking in this area unless necessary for scientific or management purposes.

Special site guidance
- Avoid crossing the Scientific Zone unless necessary for scientific purposes, such as sampling.
- Walk only on the rocks and avoid trampling the microbial mats.
- Avoid the introduction of non-native species by sterilizing all sampling equipment before use at this site.

Key references

Howard-Williams, C., Vincent, C.L., Broady, P.A. & Vincent, W.F. 1986. Antarctic stream ecosystems: variability in environmental properties and algal community structure. *International Revue der gesamten Hydrobiologie und Hydrographie* **71**(4): 511-44.

Howard-Williams, C., Hawes, I., Schwarz, A.M. & Hall, J.A. 1997. Sources and sinks of nutrients in a polar desert stream, the Onyx River, Antarctica. In: Lyons, W.B., Howard-Williams, C. & Hawes, I. (Eds) *Ecosystem processes in Antarctic ice-free landscapes*. Proceedings of an International Workshop on Polar Desert Ecosystems, Christchurch, New Zealand: 155-70.

Green, W.J., Stage, B.R., Preston, A., Wagers, S., Shacat, J. & Newell, S. 2005. Geochemical processes in the Onyx River, Wright Valley, Antarctica: major ions, nutrients, trace metals. *Geochimica et Cosmochimica Acta* **69**(4): 839-50.

Site Map - Map 15.

APPENDIX E:

Guidelines for Restricted Zones

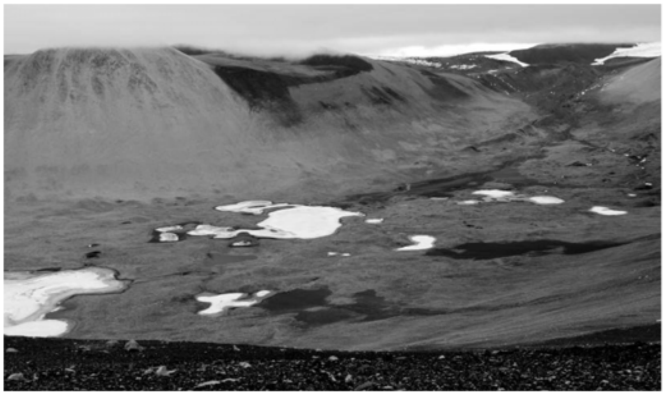
The following sites within the Area are designated Restricted Zones:

- Trough Lake catchment, Pyramid Trough, Royal Society Range;
- Mount Feather Sirius Deposit, Mount Feather;
- Don Juan Pond, South Fork, Wright Valley
- Argo Gully, Lake Vanda, Wright Valley;
- Prospect Mesa, Wright Valley;
- Hart Ash Deposit, Wright Valley;
- Victoria Valley sand dunes, Victoria Valley;
- Battleship Promontory, Alatna Valley, Convoy Range.
-

Brief site descriptions, guidelines for activities within each Restricted Zone, and maps showing the zone boundaries (Maps 16 – 23) are attached.

Restricted Zone

Trough Lake Catchment



Pyramid Trough: C. Harris, ERA / USAP (09 Dec 2009)

Location

Trough Lake catchment, Royal Society Range, several km northwest of the Koettlitz Glacier and southwest of Walcott Bay: 78° 18.17' S, 163° 20.57' E

Purpose

To avoid disturbance to a pristine hydrological catchment and its ecology, and to ensure the aesthetic and wilderness values of the zone are maintained.

Description **Zone area:** 79.8 km²

The Trough Lake catchment is enclosed by Mount Dromedary (2485 m), The Pyramid (854 m), The Bulwark (~ 600 m) and Seahorse (1008 m), and comprises a network of four main drainage systems feeding into Trough Lake (Map 16). The valley floor of Pyramid Trough contains a significant wetland system comprising a variety of pond and stream habitats in a confined area that support a range of rich biological communities that are representative of the region. Sparse communities of bryophytes and lichens are present. The catchment also contains some unique features, most notable of which are the presence of groups of cyanobacteria that are rare in other wetland systems in the region. Specifically, in addition to the common oscillatorian cyanobacteria, microbial mats in ponds and streams contain *Dichothrix* and *Schizothrix*, and a range of coccoid taxa. Trough Lake catchment has been visited infrequently compared to the other Dry Valleys, and the ecosystem is considered to be almost pristine.

Boundaries

The Restricted Zone boundary is defined by the Trough Lake catchment. Clockwise from The Pyramid, the boundary crosses a small tongue of the Koettlitz Glacier extending into the catchment, thence follows Backdrop Ridge to an unnamed peak (1618 m) at the top of West Aisle Ridge, thence northwest following the ridge to Mount Dromedary, from where it follows a ridge northeast to Seahorse. The boundary thence follows a ridge eastward and descends to Walcott Bay. The boundary proceeds due east ~800 m from the shoreline of Walcott Bay to the approximate grounding line of the Koettlitz Glacier, and thence follows the ASMA boundary to Bulwark Stream to the foot of the northeast ridge of The Bulwark. The boundary proceeds southward following The Bulwark ridge crest, crosses the head of the Upper Alph River, and follows the Koettlitz Glacier margin to ascend the northeastern ridge of The Pyramid.

Impacts

KNOWN IMPACTS	Rocks have been moved at the campsite, where an iron survey marker is installed on a small knoll at: 78° 17.17' S, 163° 27.83' E (18 m). Sampling has been undertaken at a number of lakes in the catchment.
POTENTIAL IMPACTS	Disturbance to water bodies, terrestrial ecology and sensitive soils by sampling or trampling. Introduction of non-native species.

Access requirements

HELICOPTER ACCESS	Helicopters should land at the designated site at: 78° 17.16' S, 163° 27.84' E (11 m).
SURFACE ACCESS	Movement within the zone should generally be on foot. Helicopters may be used for essential travel to sites that would be impracticable to access on foot from the campsite.

Special site guidance

- Visits to this catchment should be minimized and semi-permanent structures should not be installed within the zone.
- Avoid the introduction of non-native species by sterilizing all sampling equipment before visiting this site.
- Camping within the Restricted Zone should be at the site previously used (adjacent to the designated helicopter landing site) at: 78° 17.15' S, 163° 27.79' E (11 m).

Key references

Chinn, T.J.H. 1993. Physical hydrology of Dry Valleys lakes. *Antarctic Research Series* **59**: 1 –51.

Hendy, C.H. & Hall, B.L. 2006. The radiocarbon reservoir effect in proglacial lakes: examples from Antarctica. *Earth and Planetary Science Letters* **241**: 413-21.

Hawes, I., Webster-Brown, J., Wood, S. & Jungblut, A. 2010. A brief survey of aquatic habitats in the Pyramid Trough region, Antarctica. Unpublished report prepared for USAP on the aquatic ecology of the Trough Lake catchment.

Site Map Map 16

Restricted Zone

Mount Feather Sirius Deposit

Location

Northeast flank of Mount Feather (3011 m) between Lashley Glacier and the upper Ferrar Glacier:
77° 56.05' S, 160° 26.30' E

Mount Feather: C. Harris, ERA / USAP (11 Dec 2009)

Purpose

To avoid disturbance or damage to an area of Sirius Deposits, which are of high scientific value.

Description **Zone area:** 0.57 km²

The Mount Feather Diamicton is an area of semi-lithified glacigenic deposits that have been included within the Sirius Group at the upper Ferrar Glacier, ~3 km NE of Mount Feather (3011 m) (Map 17). The deposits lie at an elevation of between ~2400-2650 m, extending over ground of relatively gentle slope near the ridge crest and also outcropping on the steep eastern cliffs of the Mount Feather massif above Friedmann Valley and the Ferrar Glacier. The diamicton surface has distinct melt-water runnels near its perimeter and on steeper slopes. The deposits, which extend over an area of ~1.5 km x 1 km, contain microfossils and other evidence of high scientific importance for interpretation of the Neogene glacial history of the Dry Valleys and of the East Antarctic ice sheet as a whole.

Boundaries

The boundary of the Restricted Zone (Map 17) is defined based on the extent of the Mount Feather Diamicton as mapped by Wilson *et al.* (2002: Fig.1). Owing to limitations in the accuracy of available mapping in the region, the boundary is considered approximate, with an estimated accuracy of at least +/- 100 m.

Impacts

KNOWN IMPACTS	Rock samples have been collected. At least four shallow drill cores (of 3.2 m in depth or less) have been recovered from the site, although drilling fluids were not employed.
POTENTIAL IMPACTS	Drilling operations, especially those employing drilling fluids. Sampling and disturbance to sedimentary sequences.

Access requirements

HELICOPTER ACCESS	Helicopter operations in this location can be difficult owing to altitude and winds, and no specific landing site has yet been designated.
SURFACE ACCESS	Movement within the Restricted Zone should be on foot.

Special site guidance

- Do not move sediments, rocks and boulders, unless necessary for scientific purposes, and avoid disturbance to or alteration of the sedimentary sequences and melt-water runnels.
- Camping should be at the site previously used on adjacent snow surfaces at: 77 ° 55.93' S, 160 ° 25.66' E.

Key references

Wilson, G.S., Barron, J.A., Ashworth, A.C., Askin, R.A., Carter, J.A., Curren, M.G., Dalhuisen, D.H., Friedmann, E.I., Fyodorov-Davidov, D.G., Gilichinsky, D.A., Harper, M.A., Harwood, D.M., Hiemstra, J.F., Janecek, T.R, Licht, K.J., Ostroumov, V.E., Powell, R.D., Rivkina, E.M., Rose, S.A., Stroeven, A.P., Stroeven, P., van der Meer, J.J.M., and Wizevich M.C. 2002. The Mount Feather Diamicton of the Sirius Group: an accumulation of indicators of Neogene Antarctic glacial and climatic history. *Palaeogeography, Palaeoclimatology, Palaeoecology* **182**: 117-31.

Site Map – Map 17

Restricted Zone

Don Juan Pond

Location

At the foot of a rock glacier in South Fork, Wright Valley, in a closed basin at 118 m elevation below the Dais, ~ 7.5 km from Lake Vanda:
77° 33.77' S, 161° 11.32' E

Purpose

To protect a rare and sensitive hypersaline ecosystem of high scientific value from disturbance and damage.

Don Juan Pond: C. Harris, ERA / USAP (14 Dec 2009)

Description

Zone area: 23 ha

Don Juan Pond is a small hypersaline lake currently of ~400 x 150 m containing a calcium-chloride-rich brine with a salinity level of ~40%, making it the most saline natural water body known on Earth. Water levels have fluctuated over time, although recently the pond has been ~10 cm in depth. While water levels vary, the Restricted Zone extends to the perimeter of the pond floor salt deposits (Map 18). Microbial life, including numerous heterotrophic bacteria and a yeast, are found in the pond. A mat of mineral material and detritus cemented together by organic matter, referred to as the Don Juan Pond Salt Deposits, is found at the edge of the pond where the calcium chloride concentrations are reduced. Don Juan Pond is also the site where Antarcticite ($CaCl_2$ 6H20), a hygroscopic colorless mineral, was first identified forming naturally.

Boundaries

The Restricted Zone boundary is defined by the outer extent of the Don Juan Pond Salt Deposits, which extend to the edge of the basin pond floor, occupying an area of ~750 x 315 m (Map 18).

Impacts

KNOWN IMPACTS	The Dry Valleys Drilling Project drilled two boreholes at Don Juan Pond: DVDP 5 (3.5 m depth) and DVDP 13 (75 m depth), situated within the salt deposit area ~60 m and ~110 m respectively east of the rock glacier. DVDP 13 remains in evidence as an iron tube (capped) protruding ~ 1 m above the dry pond floor (Map 18). Small quantities of waste (e.g. rusted cans) were observed in soils ~50-100 m south and east of the Restricted Zone in Dec 2009, most likely originating from early camps established near the site.
POTENTIAL IMPACTS	Disturbance to water body, salt deposits and sensitive soils by sampling or trampling.

Access requirements

HELICOPTER ACCESS	Helicopters should land at the **Primary** Helicopter Landing Site (HLS), marked by a circle of rocks, ~180 m east of the Don Juan Pond salt deposits at 77° 33.783' S, 161° 12.930' E. Landings may be made at the Secondary HLS (Map 18) only to support essential scientific or management purposes that cannot practically be met from the Primary HLS. Helicopters should avoid overflight below 50 m above ground level within the Restricted Zone.
SURFACE ACCESS	Access to and movement within the Restricted Zone should be on foot.

Special site guidance

- Avoid walking through the pond and adjacent salt deposits unless necessary for scientific or management purposes.
- Walk carefully to minimize disturbance to the salt deposits and surrounding soft soils and sensitive slopes.
- Do not move any boulders.
- Camping is not permitted within the Restricted Zone. Camping should be at the designated site ~40 m south of the Primary HLS, marked by circles of rocks: 77° 33.795' S, 161° 12.950' E.

Key references

Harris, H.J.H. & Cartwright, K. 1981. Hydrology of the Don Juan Basin, Wright Valley, Antarctica. *Antarctic Research Series* **33:** 161-84.
Chinn, T.J. 1993. Physical hydrology of the Dry Valley lakes. *Antarctic Research Series* **59:** 1-51.
Samarkin, V.A., Madigan, M.T., Bowles, M.W., Casciotti, K.L., Priscu, J.C., McKay, C.P. & Joye, S.B. 2010. Abiotic nitrous oxide emission from the hypersaline Don Juan Pond in Antarctica. *Nature Geoscience* Online: 25 April 2010. DOI: 10.1038/NGEO847.

Site Map – Map 18

Restricted Zone

Argo Gully

Location

Northeastern shore of Lake Vanda, Wright Valley, below Mount Jason, at an elevation between 104 m and 235 m:
77° 31.09' S, 161° 38.77' E

Purpose

To avoid damage to exposed stratified marine fossiliferous deposits within the gully, which are of high scientific value.

Argo Gully: K. Pettway, USAP (31 Jan 2011)

Description **Zone area:** 4800 m^2

Part of the lower reach of a prominent stream channel in Argo Gully, below Mount Jason (1920 m), Olympus Range (Map 19), contains exposed beds (up to 2.8 meters thick) of massive glacial silts containing abundant marine diatom and silicoflagellate material overlying sediment. Pecten shell fragments have reportedly been found in the upper few centimeters of the deposit. The beds are horizontally stratified, which is in contrast to the underlying sediments. The deposits are overlain by deltaic sands, silts and gravels, deposited by the stream in Argo Gully. The deposits are indicative that the Wright Valley was formerly a shallow marine fjord, and have been dated as Middle Miocene. The full extent of the deposits below the overlying sediment is unknown, and the intermittent exposures along the channel change over time as a result of natural erosion.

Boundaries

The Restricted Zone extends from the first prominent raised beach (elevation 104 m) above, and ~140 meters from, the shore of Lake Vanda, for 175 meters up the stream channel to an elevation of ~135 m. The zone extends 25 meters either side of the stream channel (Map 19).

Impacts

KNOWN IMPACTS	None.
POTENTIAL IMPACTS	The deposit is within the permafrost but the surface continually slumps when the permafrost melts. The surface of the deposit if friable when touched.

Access requirements

HELICOPTER ACCESS	Helicopters should land at the designated site at Lake Vanda Hut Facilities Zone ~1.2 km to the east at: 77° 31.361' S, 161° 41.442' E.
SURFACE ACCESS	Access to and movement within the Restricted Zone should be on foot.

Special site guidance

- Avoid walking on the edges of the gully or above the exposed outcrops.
- Minimize disturbance to the sediments surrounding the deposits.
- Avoid touching the exposed outcrops unless conducting scientific research.

Key references

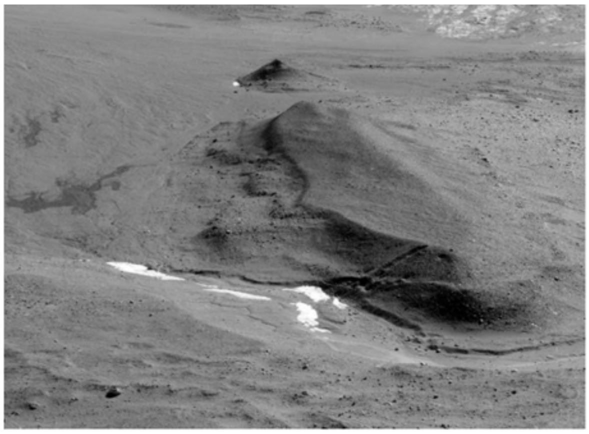
Brady, H.T. 1980. Palaeoenvironmental and biostratigraphic studies in the McMurdo and Ross Sea regions, Antarctica. Unpublished PhD thesis, Macquarie University, Australia.

Brady, H.T. 1979. A diatom report on DVDP cores 3, 4a, 12, 14, 15 and other related surface sections. In: Nagatta, T. (Ed) *Proceedings of the Seminar III on Dry Valley Drilling Project, 1978.* Memoirs of National Institute of Polar Research, Special Issue 13: 165-75.

Site Map – Map 19.

Restricted Zone

Prospect Mesa



Location

Below Bull Pass ~250 m north of the Onyx River, Wright Valley:
77° 31.33' S; 161° 54.58' E

Purpose

To avoid damage to a fragile deposit of fossilized extinct marine pecten (scallop) shells of a single species.

Prospect Mesa: C. Harris, ERA / USAP (15 Dec 2009)

Description **Zone area:** 4.76 ha

Prospect Mesa is a deposit of fossiliferous gravels overlying till containing a high density of well-preserved extinct marine pecten (scallop) shells of a single species, *Chlamys (Zygochlamys) tuftsensi*, of the Family Pectinidae. This is the only known site where this species is found. A stratified layer of sand and gravel overlying till is exposed in a gully cut by a stream flowing from Bull Pass a few hundred meters from its junction with the Onyx River (Map 20). The precise age of the deposit is unknown, although the presence of articulated shells, the abundance of complete shells, the lack of abrasion, the similarity of internal and external matrix, the lack of good size segregation and a generally very poor sorting of the clasts suggest that the fossils were deposited *in situ* in a marine fjord. Sponge spicules, radiolarian and a few ostracod fragments are also present but foraminifera are the most abundant and diverse microfossil group present.

Boundaries

The Restricted Zone boundary is defined around two adjacent mesa features, the smaller of the two being ~100 m north of the main feature. The boundary follows the well-defined NE bank of the stream descending from Bull Pass in the SW of the zone, and then follows around the base of the slopes that define the two features (Map 20).

Impacts

KNOWN IMPACTS	An excavation from early research exists on the southwest slope of the mesa (see photo), which is marked by a pole at the base.
POTENTIAL IMPACTS	Isolation of unbroken pecten fragments is extremely difficult. Disturbance or damage to the sediments may cause damage to the fossils.

Access requirements

HELICOPTER ACCESS	Helicopters should not land within the Restricted Zone. Use the designated helicopter landing site at Bull Pass Hut Facility Zone: 77° 31.056′S, 161° 51.048′E
SURFACE ACCESS	Access to and movement within the Restricted Zone should be on foot.

Special site guidance

- Avoid walking on top of the mesa.
- Pedestrians should walk carefully to minimize disturbance to fragile sedimentary structures, deposits and slopes.
- Camping is not permitted within the Restricted Zone.

Key references

Turner, R.D. 1967. A new species of fossil Chlamys from Wright Valley, McMurdo Sound, Antarctica. *New Zealand Journal of Geology and Geophysics* **10**: 446-55.

Vucetich, C.G. & Topping, W.W. 1972. A fjord origin for the pecten deposits, Wright Valley, Antarctica. *New Zealand Journal of Geology and Geophysics* **15**(4): 660-73.

Webb, P.N. 1972. Wright fjord, Pliocene marine invasion of an Antarctic Dry Valley. *Antarctic Journal of the United States* **7**: 227-34.

Prentice, M.L., Bockheim, J.G., Wilson, S.C., Burckle, L.H., Jodell, D.A., Schluchter, C. & Kellogg, D.E. 1993. Late Neogene Antarctic glacial history: evidence from central Wright Valley. *Antarctic Research Series* **60**: 207-50.

Site Map – Map 20

Restricted Zone

Hart Ash Deposit

Location

On a relatively featureless slope between the Goodspeed and Hart Glaciers, Wright Valley, at an elevation of ~400 m:
77° 29.76' S, 162° 22.35' E

Purpose

To avoid damage to an *in situ* deposit of volcanic ash airfall tephra that is of high scientific value.

Hart Ash deposit: J. Aislabie

Antarctica NZ Pictorial Collection (2005)

Description

Zone area: 1.8 ha

The Hart Ash deposit is an *in situ* preserved deposit of volcanic ash airfall tephra protected by a surface layer of gravel. The surface gravel protecting the ash layer has a wide spatial extent and the Hart Ash is not immediately visible unless the surface gravel is removed, making field identification difficult. The full extent of the Hart Ash deposit is thus unknown, although its maximum extent has been estimated as ~100 x 100 m (Map 21). The Hart Ash deposit, dated 3.9 ± 0.3 million years old, is of high scientific importance for interpreting the paleoclimate of the McMurdo Dry Valleys.

Boundaries

Owing to a lack of prominent surface landmarks, the boundary of the Restricted Zone is defined as an area of 150 m x 120 m following lines of latitude and longitude (Map 21) extending from the coordinates:
Upper Left: 77°29.72' S, 162°22.2' E
Lower Right: 77 29.8' S, 162 22.5' E

Impacts

KNOWN IMPACTS	None.
POTENTIAL IMPACTS	The deposit is covered by a thin gravel desert pavement which is easily disturbed by walking. Wind erosion of the ash deposits would be rapid if the desert pavement is disturbed.

Access requirements

HELICOPTER ACCESS	Helicopters should avoid landings and overflight below 50 m above ground level within the Restricted Zone. Helicopter landings should be made at least 100 m from the boundary.
SURFACE ACCESS	Access to and movement within the Restricted Zone should be on foot.

Special site guidance

- Avoid walking on the desert pavement overlying the ash deposits unless necessary for essential scientific or management purposes, and then walk carefully to minimize disturbance.
- Should the desert pavement be removed for essential scientific purposes, ensure the material is replaced to protect the feature.
- Camping is not permitted within the Restricted Zone.

Key references

Hall, B.L., Denton, G.H., Lux, D.R. & Bockheim, J. 1993. Late tertiary Antarctic paleoclimate and ice-sheet dynamics inferred from surficial deposits in Wright Valley. *Geografiska Annaler* **75A**(4): 239-67.

Morgan, D.J., Putkonen, J., Balco, G. & Stone, J. 2008. Colluvium erosion rates in the McMurdo Dry Valleys, Antarctica. Proceedings of the American Geophysical Union, Fall Meeting, 2008.

Schiller, M., Dickinson, W., Ditchburn, R.G., Graham, I.J. & Zondervan, A. 2009. Atmospheric 10Be in an Antarctic soil: implications for climate change. *Journal of Geophysical Research* **114**, FO1033.

Site Map – Map 21

Restricted Zone

Victoria Valley Sand Dunes

Location

In two main groups between Lake Vida and Victoria Lower Glacier, ~ 1 km south from the Packard Glacier terminus, Victoria Valley:
77° 22.19' S, 162° 12.45' E

Victoria Valley sand dunes (eastern group below Packard Glacier)
H. McGowan, Antarctica NZ Pictorial Collection (Dec 2004).

Purpose

To avoid damage to the sand dune system, which is fragile and of high scientific value.

Description

Zone area: 3.16 km²

The extensive Victoria Valley sand dune system is comprised of two distinctive areas made up of crescent-, transverse- and whaleback-shaped dunes and numerous sand mounds (Map 22). The largest group of dunes in the west extends over ~6 km and ranges between 200 to 800 m wide, with a total area of ~1.9 km^2. The smaller group of dunes in the east, which is bisected by Packard Stream and bounded to the south by Kite Stream, extends over ~3 km and ranges between 300 to 600 m wide with a total area of ~1.3 km^2. The source of sediment is from the surface and margins of the Victoria Lower Glacier and from ground moraine, which are transported west toward Lake Vida by the dominant easterly wind and meltwater streams. It is the only area where major eolian sand depositional forms occur in Antarctica. The dunes differ from the usual desert and coastal formations because the sand in the dunes is interbedded with compacted snow and contains permafrost.

Boundaries

The Restricted Zone boundary is defined by the outer extent of the main sand dune system in Victoria Valley, which extends in two groups for a distance of ~9 km with a width from varying from 200 to 800 m (Map 22).

Impacts

KNOWN IMPACTS	None
POTENTIAL IMPACTS	A thin surface layer of the sand dunes is mobile and dynamic. Damage or disruption to the internal permafrost of the dunes, can affect the integrity of the sand dune structure.

Access requirements

HELICOPTER ACCESS	Helicopters should avoid landing within the Restricted Zone and avoid overflight below 50 m above ground level. A designated helicopter landing site is located at the Packard Stream camp site at 77° 22.077' S, 162° 12.292' E.
SURFACE ACCESS	Access to and movement within the Restricted Zone should be on foot.

Special site guidance

- Avoid walking through the dunes unless necessary for scientific or management purposes.
- Walk carefully to minimize disturbance to the sensitive dune surfaces and slopes. Avoid disturbing the internal permafrost and structure of the sand dunes.
- Camping is not permitted within the Restricted Zone. Camping should be at the designated site at Packard Stream north of the eastern sand dunes group, marked by circles of rocks: 77°22.077' S, 162°12.292'E.

Key references

Lindsay, J.F. 1973. Reversing barchans dunes in Lower Victoria Valley, Antarctica. *Geological Society of America Bulletin* **84**: 1799-1806.

Calkin, P.E. & Rutford, R.H. 1974. The sand dunes of Victoria Valley, Antarctica. *The Geographical Review* **64**(2): 189-216.

Selby, M.J., Rains, R.B. & Palmer, R.W.P. 1974. Eolian deposits of the ice-free Victoria Valley, Southern Victoria Land, Antarctica. *New Zealand Journal of Geology and Geophysics* **17**(3): 543-62.

Speirs, H.C., McGowan, J.A. & Neil, D.T. 2008. Meteorological controls on sand transport and dune morphology in a polar-desert: Victoria Valley, Antarctica. *Earth Surface Processes and Landforms* **33**: 1875-91.

Site Map – Map 22

Restricted Zone

Battleship Promontory

Location

Southwest Alatna Valley, Convoy Range, ~1 km west of Benson Glacier: 76° 55.17' S, 161° 02.77' E

Purpose

To avoid damage to the fragile sandstone rock formations that host microbial communities, and to ensure aesthetic and wilderness values of the site are maintained.

a) Aerial from Alatna Valley. b) from Cargo Pond. C. Harris, ERA / USAP (16 Dec 2009)

Description **Zone area:** 4.31 km²

Battleship Promontory is an area of dramatic Beacon Sandstone outcrops rising from the southwestern floor of Alatna Valley, near Cargo Pond (Map 23). The cliff formation is ~5 km in length, and extends over an area of between 0.4 – 1.2 km in width. The promontory stands ~300 m in height at an elevation of between ~900-1200 m in the west and ~1050-1350 m in the east. The russet and white sandstone outcrops are deeply weathered into striking spires, ledges and eroded gully formations, into which dark boulders and sediments have accumulated from the overlying dolerite as it weathers from above. The environment hosts rich microbial communities, including lichens, cyanobacteria, non-photosynthetic bacteria, and fungi, with the highest microbial biodiversity yet recorded in the Dry Valleys. Cryptoendolithic microbial communities live in pore spaces within the sandstone rock, and comprise lichens and cyanobacteria growing to depths of up to 10 mm beneath the surface. These communities are extremely slow-growing, and the rocks in which they live are susceptible to breakage.

Boundaries

The Restricted Zone boundaries encompass the main area of sandstone outcrops at Battleship Promontory, extending from and including several small lakes present the foot of the formation, to its maximum upper extent (Map 23).

Impacts

KNOWN IMPACTS	Small instruments have previously been installed in rocks for *in situ* measurements, and a small quantity of rock samples collected. The designated helicopter landing site is marked by cloth flags weighed down by rocks, some of which were selected to ensure they were not used by subsequent scientists because they were modified by an early experiment (E. Friedmann, pers. comm. 1994). Air safety smoke canisters have been released at the site, causing localized contamination, a practice discontinued in the 1990s.
POTENTIAL IMPACTS	Breakage of fragile rock formations, over-sampling, introduction of non-native species.

Access requirements

HELICOPTER ACCESS	Helicopters should land at the designated site at: 76° 55.35' S, 161° 04.80' E (1296 m). If access is required to the base of the cliffs, or parts of the zone that are impractical to reach on foot, helicopters should avoid landing on sandstone surfaces or on lakes / ponds.
SURFACE ACCESS	Movement within the Restricted Zone should be on foot.

Special site guidance

- Walk carefully to minimize disturbance, avoid moving rocks and boulders, and do not break the fragile sandstone rock formations.
- Camping within the Restricted Zone should be at the site previously used, which is adjacent to the designated helicopter landing site at 76° 55.31' S, 161° 04.80' E (1294 m).

Key references

Friedmann, E.I., Hua, M.S., Ocampo-Friedmann, R. 1988. Cryptoendolithic lichen and cyanobacterial communities of the Ross Desert, Antarctica. *Polarforschung* **58**: 251-59.
Johnston, C.G. & Vestal, J.R. 1991. Photosynthetic carbon incorporation and turnover in Antarctic cryptoendolithic microbial communities: are they the slowest-growing communities on Earth? *Applied & Environmental Microbiology* **57**(8): 2308-11.

Site Map – Map 23

APPENDIX F:

Guidelines for Visitor Zones

The following site within the Area is designated a Visitor Zone:

- Taylor Valley

The Visitor Zone is located in the lower Taylor Valley near Canada Glacier. The location, boundaries, helicopter landing site, and features at the Visitor Zone are shown in Map 24.

The boundary of the Visitor Zone is defined as follows: proceeding in a clockwise direction from the northern limit of the zone on a low hill at 77° 37.523' S, 163° 03.189' E, the boundary extends 225 m southeast, past the designated helicopter landing site, to a point in moraine soils at 77° 37.609' S, 163° 03.585' E, thence extends 175 m southward ascending the summit of a small hill (elevation 60 m) at 77° 37.702' S, 163° 03.512' E. From this small hill, the boundary extends northwest 305 m towards and beyond a second small hill (summit elevation 56 m, marked nearby with a rock cairn and old survey marker), following a line ~30 m south of the main ridge joining the two hills, directly to a point on the western ridge of this second small hill at 77° 37.637' S, 163° 02.808' E. From this ridge, the boundary extends northeast 80 m directly to the western face of a prominent boulder located at 77° 37.603' S, 163° 02.933' E, which is ~70 m northwest from the cairn on the hill. The boundary thence extends northeast 130 m, descending parallel with the designated walking track (which follows a low moraine ridge) to a point near Bowles Creek at 77° 37.531' S, 163° 03.031' E. A mummified (dessicated) seal is located here, adjacent to a small area of mosses. The boundary thence extends eastward 65 m to return to the northern limit of the zone at 77° 37.523' S, 163° 03.189' E.

Special guidelines for activities within the Visitor Zone include that:

- Tour operators should ensure that all visitors to the Visitor Zone for which they are responsible have clean boots and equipment before visiting the site;
- Tour expedition helicopter landings should be made at the designated landing site at 77° 37.588' S, 163° 03.419' E (elevation 34 m);
- Tour operators should ensure that foot tracks within the Visitor Zone are clearly marked and that visitors stay on those routes. Markers used to mark tourist routes and sites of interest should be installed securely and removed at the end of each visit;
- Tents should only be erected at the designated tent site for health and safety reasons, and tour groups should not camp in the Visitor Zone except for reasons of safety;
- Tourist movement within the Visitor Zone should be conducted in small, guided groups;
- Stream and pond beds should be avoided; and
- Activities planned for and conducted within the Visitor Zone should be in accordance with ATCM Recommendation XVIII-1.

Further site-specific guidelines for the conduct of activities within the Visitor Zone are attached as the Antarctic Treaty Visitor Site Guide: Taylor Valley, Southern Victoria Land, Ross Sea (available from the Antarctic Treaty Secretariat at http://www.ats.aq/siteguidelines/documents/Taylor_e.pdf and from http://www.mcmurdodryvalleys.aq).

Measure 19 (2015)

Revised List of Antarctic Historic Sites and Monuments: Lame Dog Hut at the Bulgarian base St. Kliment Ohridski, Livingston Island and Oversnow heavy tractor "Kharkovchanka" that was used in Antarctica from 1959 to 2010

The Representatives,

Recalling the requirements of Article 8 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty to maintain a list of current Historic Sites and Monuments, and that such Sites and Monuments shall not be damaged, removed or destroyed;

Recalling Measure 3 (2003), which revised and updated the List of Historic Sites and Monuments, as subsequently amended;

Desiring to add two further Historic Sites and Monuments to the List of Historic Sites and Monuments;

Recommend to their Governments the following Measure for approval in accordance with paragraph 2 of Article 8 of Annex V to the Protocol on Environmental Protection to the Antarctic Treaty:
That:
1. the following be added to the List of Historic Sites and Monuments: "No 91: Lame Dog Hut at the Bulgarian base St. Kliment Ohridski, Livingston Island. The Lame Dog Hut was erected in April 1988, and had been the main building of St. Kliment Ohridski base until 1998. It is presently the oldest preserved building on Livingston Island, used as radio shack and post office, and hosting a museum exhibition of associated artefacts from the early Bulgarian science and logistic operations in Antarctica."
Location: 62° 38' 29" S, 60 ° 21' 53" W
Original proposing Party: Bulgaria
Party undertaking management: Bulgaria
"No 92: Oversnow heavy tractor "Kharkovchanka" that was used in Antarctica from 1959 to 2010.
The oversnow heavy tractor "Kharkovchanka" was designed and produced at the Malyshev Transport Machine-Building Plant in Kharkov specially for organizing inland sledge-tractor traverses in Antarctica. This was the first non-serial transport vehicle of the Soviet machine-building produced exclusively for operations in Antarctica. This tractor was not used outside Antarctica. Thus, the STT "Kharkovchanka" is a unique historical sample of engineering-technical developments made for exploration of Antarctica."
Location: 69°22′41,0″ S, 76°22′59,1″ E
Original proposing Party: the Russian Federation
Party undertaking management: the Russian Federation
2. the revised and updated List of Historic Sites and Monuments be annexed to this Measure.

Measure 19 (2015) Annex

Revised List of Historic Sites and Monuments

No.	Description	Location	Designation/ Amendment
1.	Flag mast erected in December 1965 at the South Geographical Pole by the First Argentine Overland Polar Expedition. Original proposing Party: Argentina Party undertaking management: Argentina	90° S	Rec. VII-9
2.	Rock cairn and plaques at Syowa Station in memory of Shin Fukushima, a member of the 4th Japanese Antarctic Research Expedition, who died in October 1960 while performing offcial duties. The cairn was erected on 11 January 1961, by his colleagues. Some of his ashes repose in the cairn. Original proposing Party: Japan Party undertaking management: Japan	69°00'S, 39°35'E	Rec. VII-9
3.	Rock cairn and plaque on Proclamation Island, Enderby Land, erected in January 1930 by Sir Douglas Mawson. The cairn and plaque commemorate the landing on Proclamation Island of Sir Douglas Mawson with a party from the British, Australian and New Zealand Antarctic Research Expedition of 1929-31. Original proposing Party: Australia Party undertaking management: Australia	65°51'S, 53°41'E	Rec.VII-9
4.	Pole of Inaccessibility Station building. Station building to which a bust of V.I. Lenin is fixed, together with a plaque in memory of the conquest of the Pole of Inaccessibility by Soviet Antarctic explorers in 1958. As of 2007 the station building was covered by snow. The bust of Lenin is erected on the wooden stand mounted on the building roof at about 1.5 m high above the snow surface. Original proposing Party: Russia Party undertaking management: Russia	82°06'42"S, 55°01'57"E	Rec. VII-9 Measure 11(2012)
5.	Rock cairn and plaque at Cape Bruce, Mac. Robertson Land, erected in February 1931 by Sir Douglas Mawson. The cairn and plaque commemorate the landing on Cape Bruce of Sir Douglas Mawson with a party from the British, Australian and New Zealand Antarctic Research Expedition of 1929-31. Original proposing Party: Australia Party undertaking management: Australia	67°25'S, 60°47'E	Rec. VII-9

No.	Description	Location	Designation/ Amendment
6.	Rock cairn at Walkabout Rocks, Vestfold Hills, Princess Elizabeth Land, erected in 1939 by Sir Hubert Wilkins. The cairn houses a canister containing a record of his visit. Original proposing Party: Australia 1 Party undertaking management: Australia	68°22'S, 78°33'E	Rec. VII-9
7.	Ivan Khmara's Stone. Stone with inscribed plaque erected at Buromsky island in memory of Ivan Khmara, driver- mechanic, the member of the 1st Complex Antarctic Expedition of the USSR (1st Soviet Antarctic Expedition) who perished on fast ice in the performance of duties on 21.01.1956. Initially the stone was erected at Mabus Point, Mirny observatory. In 1974, 19th SAE, the stone was moved to Buromsky Island because of construction activity Original proposing Party: Russia Party undertaking management: Russia	66°32'04"S, 92°59'57"E	Rec. VII-9 Measure 11(2012)
8.	Anatoly Shcheglov's Monument. Metal stele with plaque in memory of Anatoly Shcheglov, driver-mechanic who perished in the performance of duties, erected on sledge on the Mirny – Vostok route, at 2 km from Mirny station. Original proposing Party: Russia Party undertaking management: Russia	66º34'43"S, 92º58'23"E	Rec. VII-9 Measure 11(2012)
9.	Buromsky Island Cemetery. Cemetery on Buromsky Island, near Mirny Observatory in which are buried citizens of the USSR (Russian Federation), Czechoslovakia, GDR and Switzerland (members of the Soviet and Russian Antarctic Expeditions) who perished in the performance of their duties. Original proposing Party: Russia Party undertaking management: Russia	66°32'04"S, 93°00'E	Rec. VII-9 Measure 11(2012)
10.	Soviet Oasis Station Observatory. Magnetic observatory building at Dobrowolsky station (a part of the former Soviet station Oasis transferred to Poland) at Bunger Hills with a plaque in memory of the opening of Oasis station in 1956. Original proposing Party: Russia Party undertaking management: Russia	66°16'30"S, 100°45'03"E	Rec. VII-9 Measure 11(2012)
11.	Vostok Station Tractor. Heavy tractor ATT 11 at Vostok station which participated in the first traverse to the Earth Geomagnetic Pole, with plaque in memory of the opening of the Station in 1957. Original proposing Party: Russia Party undertaking management: Russia	78°27'48"S, 106°50'06"E	Rec. VII-9 Measure 11(2012)
12.	Cross and plaque at Cape Denison, George V Land. (Removed from the Antarctic Treaty list of Historic Sites and Monuments subsumed with HSM 13 into HSM 77)		
13.	Hut at Cape Denison, George V Land, (Removed from the Antarctic Treaty list of Historic Sites and Monuments subsumed with HSM 12 into HSM 77)		

No.	Description	Location	Designation/ Amendment
14.	Site of ice cave at Inexpressible Island, Terra Nova Bay, constructed in March 1912 by Victor Campbell's Northern Party, British Antarctic Expedition, 1910-13. The party spent the winter of 1912 in this ice cave. A wooden sign, plaque and seal bones remain at the site. Original proposing Party: New Zealand Parties undertaking management: New Zealand/Italy/UK	74°54'S, 163°43'E	Rec. VII-9 Measure 5(1995)
15.	Hut at Cape Royds, Ross Island, built in February 1908 by the British Antarctic Expedition of 1907-09, led by Sir Ernest Shackleton. Restored in January 1961 by the Antarctic Division of New Zealand Department of Scientific and Industrial Research. Site incorporated within ASPA 157 Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	77°33'S, 166°10'E	Rec. VII-9
16.	Hut at Cape Evans, Ross Island, built in January 1911 by the British Antarctic Expedition of 1910-1913, led by Captain Robert F. Scott. Restored in January 1961 by the Antarctic Division of New Zealand Department of Scientific and Industrial Research. Site incorporated within ASPA 155 Original proposing Parties: New Zealand /UK Parties undertaking management: New Zealand/UK	77°38'S, 166°24'E	Rec. VII-9
17.	Cross on Wind Vane Hill, Cape Evans, Ross Island, erected by the Ross Sea Party, led by Captain Aeneas Mackintosh, of Sir Ernest Shackleton's Imperial Trans-Antarctic Expedition of 1914-1916, in memory of three members of the party who died in the vicinity in 1916. Site incorporated within ASPA 155 Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	77°38'S, 166°24'E	Rec. VII-9
18.	Hut at Hut Point, Ross Island, built in February 1902 by the British Antarctic Expedition of 1901-04, led by Captain Robert F. Scott. Partially restored in January 1964 by the New Zealand Antarctic Society, with assistance from the United States Government. Site incorporated within ASPA 158 Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	77°50'S, 166°37'E	Rec. VII-9
19.	Cross at Hut Point, Ross Island, erected in February 1904 by the British Antarctic Expedition of 1901-04, in memory of George Vince, a member of the expedition, who died in the vicinity. Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	77°50'S, 166°37'E	Rec. VII-9

No.	Description	Location	Designation/ Amendment
20.	Cross on Observation Hill, Ross Island, erected in January 1913 by the British Antarctic Expedition of 1910-13, in memory of Captain Robert F. Scott's party which perished on the return journey from the South Pole in March 1912. Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	77°51'S, 166°41'E	Rec. VII-9
21.	Remains of stone hut at Cape Crozier, Ross Island, constructed in July 1911 by Edward Wilson's party of the British Antarctic Expedition (1910-13) during the winter journey to collect Emperor penguin eggs. Original proposing Party: New Zealand Parties undertaking management: New Zealand/UK	77°31'S, 169°22'E	Rec. VII-9
22.	Three huts and associated historic relics at Cape Adare. Two were built in February 1899 during the British Antarctic (Southern Cross) Expedition, 1898-1900, led by Carsten E. Borchgrevink. The third was built in February 1911 by Robert F. Scott's Northern Party, led by Victor L.A.Campbell. Scott's Northern Party hut has largely collapsed with only the porch standing in 2002. Site incorporated within ASPA 159. Original proposing Parties: New Zealand/UK Parties undertaking management: New Zealand/UK	71°18'S, 170°12'E	Rec. VII-9
23.	Grave at Cape Adare of Norwegian biologist Nicolai Hanson, a member of the British Antarctic (Southern Cross) Expedition, 1898-1900, led by Carsten E. Borchgrevink. A large boulder marks the head of the grave with the grave itself outlined in white quartz stones. A cross and plaque are attached to the boulder. Original proposing Parties: New Zealand/ UK Parties undertaking management: New Zealand/Norway	71°17'S, 170°13'E	Rec. VII-9
24.	Rock cairn, known as 'Amundsen's cairn', on Mount Betty, Queen Maud Range erected by Roald Amundsen on 6 January 1912, on his way back to Framheim from the South Pole. Original proposing Party: Norway Party undertaking management: Norway	85°11'S, 163°45'W	Rec. VII-9
25.	De-listed		
26.	Abandoned installations of Argentine Station 'General San Martin' on Barry Island, Debenham Islands, Marguerite Bay, with cross, flag mast, and monolith built in 1951. Original proposing Party: Argentina Party undertaking management: Argentina	68°08'S, 67°08'W	Rec. VII-9

No.	Description	Location	Designation/ Amendment
27.	Cairn with a replica of a lead plaque erected on Megalestris Hill, Petermann Island, in 1909 by the second French expedition led by Jean-Baptiste E.A.Charcot. The original plaque is in the reserves of the Museum National d'Histoire Naturelle (Paris). Original proposing Parties: Argentina/France/UK Parties undertaking management: France /UK	65°10'S, 64°09'W	Rec. VII-9
28.	Rock cairn at Port Charcot, Booth Island, with wooden pillar and plaque inscribed with the names of the first French expedition led by Jean-Baptiste E.A.Charcot which wintered here in 1904 aboard Le Français. Original proposing Party: Argentina Parties undertaking management: Argentina/France	65°03'S, 64°01'W	Rec. VII-9
29.	Lighthouse named 'Primero de Mayo' erected on Lambda Island, Melchior Islands, by Argentina in 1942. This was the first Argentine lighthouse in the Antarctic. Original proposing Party: Argentina Party undertaking management: Argentina	64°18'S, 62°59'W	Rec. VII-9
30.	Shelter at Paradise Harbour erected in 1950 near the Chilean Base 'Gabriel Gonzalez Videla' to honour Gabriel Gonzalez Videla, the first Head of State to visit the Antarctic. The shelter is a representative example of pre-IGY activity and constitutes an important national commemoration. Original proposing Party: Chile Party undertaking management: Chile	64°49'S, 62°51'W	Rec. VII-9
31.	De-listed		
32.	Concrete monolith erected in 1947, near Capitán Arturo Prat Base on Greenwich Island, South Shetland Islands. Point of reference for Chilean Antarctic hydrographic surveys. The monolith is representative of an important pre-IGY activity and is currently preserved and maintained by personnel from Prat Base. Original proposing Party: Chile Party undertaking management: Chile	62°28'S, 59°40'W	Rec. VII-9
33.	Shelter and cross with plaque near Capitán Arturo Prat Base (Chile), Greenwich Island, South Shetland Islands. Named in memory of Lieutenant-Commander González Pacheco, who died in 1960 while in charge of the station. The monument commemorates events related to a person whose role and the circumstances of his death have a symbolic value and the potential to educate people about significant human activities in Antarctica. Original proposing Party: Chile Party undertaking management: Chile	62°29'S, 59°40'W	Rec. VII-9

No.	Description	Location	Designation/ Amendment
34.	Bust at Capitán Arturo Prat Base (Chile), Greenwich Island, South Shetland Islands, of the Chilean naval hero Arturo Prat, erected in 1947. The monument is representative of pre-IGY activities and has symbolic value in the context of Chilean presence in Antarctica. Original proposing Party: Chile Party undertaking management: Chile	62°50'S, 59°41'W	Rec. VII-9
35.	Wooden cross and statue of the Virgin of Carmen erected in 1947 near Capitán Arturo Prat Base (Chile), Greenwich Island, South Shetland Islands. The monument is representative of pre-IGY activities and has a particularly symbolic and architectural value. Original proposing Party: Chile Party undertaking management: Chile	62°29'S, 59°40'W	Rec. VII-9
36.	Replica of a metal plaque erected by Eduard Dallmann at Potter Cove, King George Island, to commemorate the visit of his German expedition on 1 March, 1874 on board Grönland. Original proposing Parties: Argentina/UK Parties undertaking management: Argentina/Germany	62°14'S, 58°39'W	Rec. VII-9
37.	O'Higgins Historic Site located on Cape Legoupil, Antarctic Peninsula and comprising the following structures of historical value: • "Capitán General Bernardo O´Higgins Riquelme" Bust, erected in 1948 opposite the Base known under the same name. General O´Higgins was the first ruler of Chile to recognise the importance of Antarctica. It has a symbolic meaning in the history of Antarctic exploration since it was during his government that the vessel Dragon landed on the coast of the Antarctic Peninsula in 1820. This monument is also representative of pre-IGY activities in Antarctica. (63°19'14.3" S / 57°53'53.9"W) • Former "Capitán General Bernardo O'Higgins Riquelme" Antarctic Base, unveiled on 18th February, 1948 by the President of the Republic of Chile, Gabriel González Videla, the first President in the world to visit Antarctica. It is considered as a model pioneering base in the modern period of Antarctic exploration. (63°19' S, 57°54'W) • Plaque in memory of Lieutenants Oscar Inostroza Contreras and Sergio Ponce Torrealba, who perished in the Antarctic Continent for the sake of peace and science, on 12th August, 1957. (63°19'15.4" S / 57°53'52.9"W) Virgen del Carmen Grotto, located in the surroundings of the base, built approximately forty years ago. It has served as a place of spiritual withdrawal for the staff of the different Antarctic stations and expeditions. (63°19'15.9" S / 57°54'03.2"W). Original proposing Party: Chile Party undertaking management: Chile	63°19'S, 57°54'W	Rec. VII-9 Measure 11(2012)

No.	Description	Location	Designation/ Amendment
38.	Wooden hut on Snow Hill Island built in February 1902 by the main party of the Swedish South Polar Expedition led by Otto Nordenskjöld. Original proposing Parties: Argentina/ UK Parties undertaking management: Argentina/Sweden	64°22'S, 56°59'W	Rec. VII-9
39.	Stone hut at Hope Bay, Trinity Peninsula, built in January 1903 by a party of the Swedish South Polar Expedition. Original proposing Parties: Argentina/UK Parties undertaking management: Argentina/Sweden	63°24'S, 56°59' W	Rec. VII-9
40.	Bust of General San Martin, grotto with a statue of the Virgin of Lujan, and a flag mast at Base 'Esperanza', Hope Bay, erected by Argentina in 1955; together with a graveyard with stele in memory of members of Argentine expeditions who died in the area. Original proposing Party: Argentina Party undertaking management: Argentina	63°24'S, 56°59'W	Rec. VII-9
41.	Stone hut on Paulet Island built in February 1903 by survivors of the wrecked vessel Antarctic under Captain Carl A. Larsen, members of the Swedish South Polar Expedition led by Otto Nordenskjöld, together with a grave of a member of the expedition and the rock cairn built by the survivors of the wreck at the highest point of the island to draw the attention of rescue expeditions. Original proposing Parties: Argentina/UK Parties undertaking management: Argentina/Sweden/ Norway	63°34'S, 55°45'W	Rec. VII-9 Measure 5 (1997)
42.	Area of Scotia Bay, Laurie Island, South Orkney Island, in which are found: stone hut built in 1903 by the Scottish Antarctic Expedition led by William S. Bruce; the Argentine meteorological hut and magnetic observatory, built in 1905 and known as Moneta House; and a graveyard with twelve graves, the earliest of which dates from 1903. Original proposing Party: Argentina Parties undertaking management: Argentina/UK	60°46'S, 44°40'W	Rec. VII-9
43.	Cross erected in 1955, at a distance of 1,300 metres north-east of the Argentine General Belgrano I Station (Argentina) and subsequently moved to Belgrano II Station (Argentina), Nunatak Bertrab, Confin Coast, Coats Land in 1979. Original proposing Party: Argentina Party undertaking management: Argentina	77°52'S, 34°37'W	Rec. VII-9
44.	Plaque erected at the temporary Indian station 'Dakshin Gangotri', Princess Astrid Kyst, Dronning Maud Land, listing the names of the First Indian Antarctic Expedition which landed nearby on 9 January 1982. Original proposing Party: India Party undertaking management: India	70°45'S, 11°38'E	Rec. XII-7

No.	Description	Location	Designation/ Amendment
45.	Plaque on Brabant Island, on Metchnikoff Point, mounted at a height of 70 m on the crest of the moraine separating this point from the glacier and bearing the following inscription: This monument was built by François de Gerlache and other members of the Joint Services Expedition 1983-85 to commemorate the first landing on Brabant Island by the Belgian Antarctic Expedition, 1897-99: Adrien de Gerlache (Belgium) leader, Roald Amundsen (Norway), Henryk Arctowski (Poland), Frederick Cook (USA) and Emile Danco (Belgium) camped nearby from 30 January to 6 February 1898. Original proposing Party: Belgium Party undertaking management: Belgium	64°02'S, 62°34'W	Rec. XIII-16
46.	All the buildings and installations of Port-Martin base, Terre Adélie constructed in 1950 by the 3rd French expedition in Terre Adélie and partly destroyed by fire during the night of 23 to 24 January 1952. Original proposing Party: France Party undertaking management: France	66°49'S, 141°24'E	Rec. XIII-16
47.	Wooden building called 'Base Marret' on the Ile des Pétrels, Terre Adélie, where seven men under the command of Mario Marret overwintered in 1952 following the fire at Port Martin Base. Original proposing Party: France Party undertaking management: France	66°40'S, 140°01'E	Rec. XIII-16
48.	Iron cross on the North-East headland of the Ile des Pétrels, Terre Adélie, dedicated as a memorial to André Prudhomme, head meteorologist in the 3rd International Geophysical Year expedition who disappeared during a blizzard on 7 January 1959. Original proposing Party: France Party undertaking management: France	66°40'S, 140°01'E	Rec. XIII-16
49.	The concrete pillar erected by the First Polish Antarctic Expedition at Dobrolowski Station on the Bunger Hill to measure acceleration due to gravity g = 982,439.4 mgal ±0.4 mgal in relation to Warsaw, according to the Potsdam system, in January 1959. Original proposing Party: Poland Party undertaking management: Poland	66°16'S, 100°45'E	Rec. XIII-16

No.	Description	Location	Designation/ Amendment
50.	A brass plaque bearing the Polish Eagle, the national emblem of Poland, the dates 1975 and 1976, and the following text in Polish, English and Russian: In memory of the landing of members of the first Polish Antarctic marine research expedition on the vessels 'Profesor Siedlecki' and 'Tazar' in February 1976. This plaque, south-west of the Chilean and Soviet stations, is mounted on a cliff facing Maxwell Bay, Fildes Peninsula, King George Island. Original proposing Party: Poland Party undertaking management: Poland	62°12'S, 59°01'W	Rec. XIII-16
51.	The grave of Wlodzimierz Puchalski, surmounted by an iron cross, on a hill to the south of Arctowski station on King George Island. W. Puchalski was an artist and a producer of documentary nature films, who died on 19 January 1979 whilst working at the station. Original proposing Party: Poland Party undertaking management: Poland	62°13'S, 58°28'W	Rec. XIII-16
52.	Monolith erected to commemorate the establishment on 20 February 1985 by the Peoples Republic of China of the 'Great Wall Station' on Fildes Peninsula, King George Island, in the South Shetland Islands. Engraved on the monolith is the following inscription in Chinese: 'Great Wall Station, First Chinese Antarctic Research Expedition, 20 February 1985'. Original proposing Party: China Party undertaking management: China	62°13'S, 58°58'W	Rec. XIII-16
53.	Bust of Captain Luis Alberto Pardo, monolith and plaques on Point Wild, Elephant Island, south Shetland Islands, celebrating the rescue of the survivors of the British ship Endurance by the Chilean Navy cutter Yelcho displaying the following words: " Here on August 30 th, 1916, the Chilean Navy cutter Yelcho commanded by Pilot Luis Pardo Villalón rescued the 22 men from the Shackleton Expedition who survived the wreck of the 'Endurance' living for four and one half months in this Island". The Monolith and the plaques have been placed on Elephant Island and their replicas on the Chilean bases Capitan Arturo Prat (62o30'S, 59 o49'W) and President Eduardo Frei (62o12'S, 62 o12'W). Bronze busts of the pilot Luis Pardo Villalon were placed on the three above-mentioned monoliths during the XXIVth Chilean Antarctic Scientific Expedition in 1987-88. Original proposing Party: Chile Party undertaking management: Chile	61°03'S, 54°50'W	Rec. XIV-8 Rec. XV-13

No.	Description	Location	Designation/ Amendment
54.	Richard E. Byrd Historic Monument, McMurdo Station, Antarctica. Bronze bust on black marble, 5ft high x 2ft square, on wood platform, bearing inscriptions describing the polar achievements of Richard Evelyn Byrd. Erected at McMurdo Station in 1965. Original proposing Party: USA	77°51'S, 166°40'E	Rec. XV-12
55.	East Base, Antarctica, Stonington Island. Buildings and artefacts at East Base, Stonington Island and their immediate environs. These structures were erected and used during two U.S. wintering expeditions: the Antarctic Service Expedition (1939-1941) and the Ronne Antarctic Research Expedition (1947-1948). The size of the historic area is approximately 1,000 metres in the north-south direction (from the beach to Northeast Glacier adjacent to Back Bay) and approximately 500 metres in the east- west direction. Original proposing Party: USA	68°11'S, 67°00'W	Rec. XIV-8
56.	Waterboat Point, Danco Coast, Antarctic Peninsula. The remains and immediate environs of the Waterboat Point hut. It was occupied by the UK two-man expedition of Thomas W. Bagshawe and Maxime C. Lester in 1921-22. Only the base of the boat, foundations of doorposts and an outline of the hut and extension still exist. It is situated close to the Chilean station 'President Gabriel Gonzáles Videla'. Original proposing Party: Chile/UK Parties undertaking management: Chile/UK	64°49'S, 62°51'W	Rec. XVI-11
57.	Commemorative plaque at 'Yankee Bay' (Yankee Harbour), MacFarlane Strait, Greenwich Island, South Shetland Islands. Near a Chilean refuge. Erected to the memory of Captain Andrew MacFarlane, who in 1820 explored the Antarctic Peninsula area in the brigantine Dragon. Original proposing Parties: Chile/UK Parties undertaking management: Chile/UK	62°32'S, 59°45'W	Rec. XV-11
58.	De-listed		
59.	A cairn on Half Moon Beach, Cape Shirreif, Livingston Island, South Shetland Islands and a plaque on 'Cerro Gaviota' opposite San Telmo Islets commemorating the officers, soldiers and seamen aboard the Spanish vessel San Telmo, which sank in September 1819; possibly the first people to live and die in Antarctica. Site incorporated within ASPA 149. Original proposing Parties: Chile/Spain/Peru Parties undertaking management: Chile/Spain/Peru	62°28'S, 60°46'W	Rec. XV-11

No.	Description	Location	Designation/ Amendment
60.	Wooden plaque and cairn located at Penguins Bay, southern coast of Seymour Island (Marambio), James Ross Archipelago. This plaque was placed on 10 November 1903 by the crew of a rescue mission of the Argentinian Corvette Uruguay in the site where they met the members of the Swedish expedition led by Dr Otto Nordenskjöld. The text of the wooden plaque reads as follows: "10.XI.1903 Uruguay (Argentine Navy) in its journey to give assistance to the Swedish Antarctic expedition." In January 1990, a rock cairn was erected by Argentina in memory of this event in the place where the plaque is located. Original proposing Party: Argentina Parties undertaking management: Argentina/Sweden	64°16'S, 56°39'W	Rec. XVII-3
61.	'Base A' at Port Lockroy, Goudier Island, off Wiencke Island, Antarctic Peninsula. Of historic importance as an Operation Tabarin base from 1944 and for scientific research, including the first measurements of the ionosphere, and the first recording of an atmospheric whistler, from Antarctica. Port Lockroy was a key monitoring site during the International Geophysical Year of 1957/58. Original Proposing Party: UK Party undertaking management: UK	64°49'S, 63°29'W	Measure 4 (1995)
62.	'Base F (Wordie House)' on Winter Island, Argentine Islands. Of historic importance as an example of an early British scientific base. Original proposing Party: UK Parties undertaking management: UK/Ukraine	65°15'S, 64°16'W	Measure 4 (1995)
63.	'Base Y' on Horseshoe Island, Marguerite Bay, western Graham Land. Noteworthy as a relatively unaltered and completely equipped British scientific base of the late 1950s. 'Blaiklock', the refuge hut nearby, is considered an integral part of the base. Original proposing Party: UK Party undertaking management: UK	67°48'S, 67°18'W	Measure 4 (1995)
64.	'Base E' on Stonington Island, Marguerite Bay, western Graham Land. Of historical importance in the early period of exploration and later British Antarctic Survey (BAS) history of the 1960s and 1970s. Original proposing Party: UK Party undertaking management: UK	68°11'S, 67°00'W	Measure 4 (1995)

No.	Description	Location	Designation/ Amendment
65.	Message post, Svend Foyn Island, Possession Islands. A pole with a box attached was placed on the island on 16 January 1895 during the whaling expedition of Henryk Bull and Captain Leonard Kristensen of the ship Antarctic. It was examined and found intact by the British Antarctic Expedition of 1898-1900 and then sighted from the beach by the USS Edisto in 1956 and USCGS Glacier in 1965. Original proposing Parties: New Zealand/Norway/UK Parties undertaking management: New Zealand/ Norway	71°56'S, 171°05'W	Measure 4 (1995)
66.	Prestrud's Cairn, Scott Nunataks, Alexandra Mountains, Edward VII Peninsula. The small rock cairn was erected at the foot of the main bluff on the north side of the nunataks by Lieutenant K. Prestrud on 3 December 1911 during the Norwegian Antarctic Expedition of 1910- 1912. Original proposing Parties: New Zealand/ Norway/ UK Parties undertaking management: New Zealand/Norway	77°11'S, 154°32'W	Measure 4 (1995)
67.	Rock shelter, 'Granite House', Cape Geology, Granite Harbour. This shelter was constructed in 1911 for use as field kitchen by Griffith Taylor's second geological excursion during the British Antarctic Expedition of 1910-1913. It was enclosed on three sides with granite boulder walls and used a sledge to support a seal-skin roof. The stone walls of the shelter have partially collapsed. The shelter contains corroded remnants of tins, a seal skin and some cord. The sledge is now located 50 m seaward of the shelter and consists of a few scattered pieces of wood, straps and buckles. Site incorporated within ASPA 154. Original proposing Parties: New Zealand/Norway/UK Parties undertaking management: New Zealand/UK	77°00'S, 162°32'E	Measure 4 (1995)
68.	Site of depot at Hells Gate Moraine, Inexpressible Island, Terra Nova Bay.This emergency depot consisted of a sledge loaded with supplies and equipment which was placed on 25 January 1913 by the British Antarctic Expedition, 1910-1913. The sledge and supplies were removed in 1994 in order to stabilize their deteriorating condition. Original proposing Parties: New Zealand/Norway/UK Parties undertaking management: New Zealand/UK	74°52'S, 163°50'E	Measure 4 (1995)
69.	Message post at Cape Crozier, Ross Island, erected on 22 January 1902 by Captain Robert F. Scott's Discovery Expedition of 1901-04. It was to provide information for the expedition's relief ships, and held a metal message cylinder, which has since been removed. Site incorporated within ASPA 124 Original proposing Parties: New Zealand/Norway/UK Parties undertaking management: New Zealand/UK	77°27'S, 169°16'E	Measure 4 (1995)

No.	Description	Location	Designation/ Amendment
70.	Message post at Cape Wadworth, Coulman Island. A metal cylinder nailed to a red pole 8 m above sea level placed by Captain Robert F. Scott on 15 January 1902. He painted the rocks behind the post red and white to make it more conspicuous. Original proposing Parties: New Zealand/Norway/UK Parties undertaking management: New Zealand/UK	73°19'S, 169°47'E	Measure 4 (1995)
71.	Whalers Bay, Deception Island, South Shetland Islands. The site comprises all pre-1970 remains on the shore of Whalers Bay, including those from the early whaling period (1906-12) initiated by Captain Adolfus Andresen of the Sociedad Ballenera de Magallanes, Chile; the remains of the Norwegian Hektor Whaling Station established in 1912 and all artefacts associated with its operation until 1931; the site of a cemetery with 35 burials and a memorial to ten men lost at sea; and the remains from the period of British scientific and mapping activity (1944-1969). The site also acknowledges and commemorates the historic value of other events that occurred there, from which nothing remains. Original proposing Parties: Chile/ Norway Parties undertaking management: Chile/Norway/UK	62°59'S, 60°34'W	Measure 4 (1995)
72.	Mikkelsen Cairn, Tryne Islands, Vestfold Hills. A rock cairn and a wooden mast erected by the landing party led by Captain Klarius Mikkelsen of the Norwegian whaling ship Thorshavn and including Caroline Mikkelsen, Captain Mikkelsen's wife, the first woman to set foot on East Antarctica. The cairn was discovered by Australian National Antarctic Research Expedition field parties in 1957 and again in 1995. Original proposing Parties: Australia/Norway Parties undertaking management: Australia/Norway	68°22'S 78°24'E	Measure 2 (1996)
73.	Memorial Cross for the 1979 Mount Erebus crash victims, Lewis Bay, Ross Island. A cross of stainless steel which was erected in January 1987 on a rocky promontory three kilometers from the Mount Erebus crash site in memory of the 257 people of different nationalities who lost their lives when the aircraft in which they were travelling crashed into the lower slopes of Mount Erebus, Ross Island. The cross was erected as a mark of respect and in remembrance of those who died in the tragedy. Original proposing Party: New Zealand Party undertaking management: New Zealand	77°25'S, 167°27'E	Measure 4 (1997)
74.	The un-named cove on the south-west coast of Elephant Island, including the foreshore and the intertidal area, in which the wreckage of a large wooden sailing vessel is located. Original proposing Party: UK Party undertaking management: UK	61°14'S, 55°22'W	Measure 2 (1998)

No.	Description	Location	Designation/ Amendment
75.	The A Hut of Scott Base, being the only existing Trans Antarctic Expedition 1956/1957 building in Antarctica sited at Pram Point, Ross Island, Ross Sea Region, Antarctica. Original proposing Party: New Zealand Party undertaking management: New Zealand	77°51'S, 166°46'E	Measure 1 (2001)
76.	The ruins of the Base Pedro Aguirre Cerda Station, being a Chilean meteorological and volcanological center situated at Pendulum Cove, Deception Island, Antarctica, that was destroyed by volcanic eruptions in 1967 and 1969. Original proposing Party: Chile Party undertaking management: Chile	62o59'S, 60o40'W	Measure 2 (2001)
77	Cape Denison, Commonwealth Bay, George V Land, including Boat Harbour and the historic artefacts contained within its waters. This Site is contained within ASMA No. 3, designated by Measure 1 (2004). Part of this site is also contained within ASPA No. 162, designated by Measure 2 (2004). Original proposing Party: Australia Party undertaking management: Australia	67°00'30"S, 142°39'40"	Measure 3 (2004)
78	Memorial plaque at India Point, Humboldt Mountains, Wohlthat Massif, central Dronning Maud Land erected in memory of three scientists of the Geological Survey of India (GSI) and a communication technician from the Indian Navy - all members of the ninth Indian Expedition to Antarctica, who sacrificed their lives in this mountain camp in an accident on 8th January 1990. Original proposing Party: India Party undertaking management: India.	71°45'08"S, 11°12'30"E	Measure 3 (2004)
79	Lillie Marleen Hut, Mt. Dockery, Everett Range, Northern Victoria Land. The hut was erected to support the work of the German Antarctic Northern Victoria Land Expedition (GANOVEX I) of 1979/1980. The hut, a bivouac container made of prefabricated fiberglass units insulated with polyurethane foam, was named after the Lillie Glacier and the song "Lillie Marleen". The hut is closely associated with the dramatic sinking of the expedition ship "Gotland II" during GANOVEX II in December 1981. Original proposing Party: Germany Party undertaking management: Germany	71°12'S, 164°31'E	Measure 5 (2005)
80	Amundsen's Tent. The tent was erected at 90° by the Norwegian group of explorers led by Roald Amundsen on their arrival at the South Pole on 14 December 1911. The tent is currently buried underneath the snow and ice in the vicinity of the South Pole. Original proposing Party: Norway Party undertaking management: Norway	90°S	Measure 5 (2005)

No.	Description	Location	Designation/ Amendment
81	Rocher du Débarquement (Landing Rock), being a small island where Admiral Dumont D'Urville and his crew landed on 21 January 1840 when he discovered Terre Adélie. Original proposing Party: France Party undertaking management: France	66° 36.30'S, 140° 03.85'E	Measure 3 (2006)
82	Monument to the Antarctic Treaty and Plaque. This Monument is located near the Frei, Bellingshausen and Escudero bases, Fildes Peninsula, King George Island. The plaque at the foot of the monument commemorates the signatories of the Antarctic Treaty. This Monument has 4 plaques in fficial languages of the Antarctic Treaty. The plaques were installed in February 2011 and read as follows: "This historic monument, dedicated to the memory of the signatories of the Antarctic Treaty, Washington D.C., 1959, is also a reminder of the legacy of the First and Second International Polar Years (1882-1883 and 1932-1933) and of the International Geophysical Year (1957-1958) that preceded the Antarctic Treaty, and recalls the heritage of International Cooperation that led to the International Polar Year 2007-2008." This monument was designed and built by the American Joseph W. Pearson, who offered it to Chile. It was unveiled in 1999, on the occasion of the 40th anniversary of the signature of the Antarctic Treaty."22 Original proposing Party: Chile Party undertaking management: Chile	62º 12' 01" S; 58º 57' 41" W	Measure 3 (2007) Measure 11 (2011)
83	Base "W", Detaille Island, Lallemande Fjord, Loubert Coast. Base "W" is situated on a narrow isthmus at the northern end of Detaille Island, Lallemand Fjord, Loubet Coast. The site consists of a hut and a range of associated structures and outbuildings including a small emergency storage building, bitch and pup pens, anemometer tower and two standard tubular steel radio masts (one to the south west of the main hut and the other to the east). Base "W" was established in 1956 as a British science base primarily for survey, geology and meteorology and to contribute to the IGY in 1957. As a relatively unaltered base from the late 1950s, Base "W" provides an important reminder of the science and living conditions that existed when the Antarctic Treaty was signed 50 years ago. Original proposing Party: United Kingdom Party undertaking management: United Kingdom	66°52'S; 66°48'W	Measure 14 (2009)
84	Hut at Damoy Point, Dorian Bay, Wiencke Island, Palmer Archipelago. The site consists of a well-preserved hut and the scientific equipment and other artefacts inside it. It is located at Damoy Point on Dorian Bay, Wiencke Island, Palmer Archipelago. The hut was erected in 1973 and used for a number of years as a British summer air facility and transit station for scientific personnel. It was last occupied in 1993. Original proposing Party: United Kingdom Party undertaking management: United Kingdom	64° 49'S; 63°31'W	Measure 14 (2009)

No.	Description	Location	Designation/ Amendment
85	Plaque Commemorating the PM-3A Nuclear Power Plant at McMurdo Station. The plaque is approximately 18 x 24 inches, made of bronze and secured to a large vertical rock at McMurdo Station, the former site of the PM-3A nuclear power reactor. It is approximately halfway up the west side of Observation Hill. The plaque text details achievements of PM-3A, Antarctica's first nuclear power plant. Original proposing Party: United States Party Undertaking Management: United States	77° 51' S, 166° 41' E	Measure 15 (2010)
86	No.1 Building at Great Wall Station. The No.1 Building, built in 1985 with a total floor space of 175 square meters, is located at the centre of the Chinese Antarctic Great Wall Station which is situated in Fildes Peninsula, King George Island, South Shetlands, West Antarctica. The Building marked the commencement of China devoting to Antarctic research in the 1980s, and thus it is of great significance in commemorating China's Antarctic expedition. Original proposing Party: China Party undertaking management: China	62°13′4″ S, 58°57′44″ W	Measure 12 (2011)
87	Location of the first permanently occupied German Antarctic research station "Georg Forster" at the Schirmacher Oasis, Dronning Maud Land. The original site is situated by the Schirmacher Oasis and marked by a commemorative bronze plaque with the label in German language: Antarktisstation Georg Forster 70° 46' 39'' S 11° 51' 03'' E von 1976 bis 1996 The plaque is well preserved and affixed to a rock wall at the southern edge of the location. This Antarctic research station was opened on 21 April 1976 and closed down in 1993. The entire site has been completely cleaned up after the dismantling of the station was successfully terminated on 12 February 1996. The site is located about 1.5 km east of the current Russian Antarctic research station Novolazarevskaya. Original proposing Party: Germany Party undertaking management: Germany	70°46'39'' S, 11°51'03'' E Elevation: 141 meters above sea level	Measure 18 (2013)
88	Professor Kudryashov's Drilling Complex Building. The drilling complex building was constructed in the summer season of 1983-84. Under the leadership of Professor Boris Kudryashov, ancient mainland ice samples were obtained. Original proposing Party: Russian Federation Party undertaking management: Russian Federation	78º28' S, 106º 48' E Height above sea level 3488 m.	Measure 19 (2013)

No.	Description	Location	Designation/ Amendment
89	Terra Nova Expedition 1910-12, Upper "Summit Camp" used during survey of Mount Erebus in December 1912. Camp Site location includes part of a circle of rocks, which were likely used to weight the tent valences. The camp site was used by a science party on Captain Scott's Terra Nova Expedition, who undertook mapping and collected geological specimens on Mount Erebus in December 1912. Original proposing Parties: United Kingdom, New Zealand and United States Parties undertaking management: United Kingdom, New Zealand and United States	7730.348' S, 16710.223'E Circa 3,410m above sea level	Measure 20 (2013)
90	Terra Nova Expedition 1910-12, Lower "Camp E" Site used during survey of Mount Erebus in December 1912. Camp Site location consists of a slightly elevated area of gravel and includes some aligned rocks, which may have been used to weight the tent valences. The camp site was used by a science party on Captain Scott's Terra Nova Expedition, who undertook mapping and collected geological specimens on Mount Erebus in December 1912. Original proposing Parties: United Kingdom, New Zealand and United States Parties undertaking management: United Kingdom, New Zealand and United States	77° 30.348' S, 167° 9.246'E Circa 3,410 m above sea level	Measure 21 (2013)
91	Lame Dog Hut at the Bulgarian base St. Kliment Ohridski, Livingston Island The Lame Dog Hut was erected in April 1988, and had been the main building of St. Kliment Ohridski base until 1998. It is presently the oldest preserved building on Livingston Island, used as radio shack and post office, and hosting a museum exhibition of associated artefacts from the early Bulgarian science and logistic operations in Antarctica Original proposing Party: Bulgaria Party undertaking management: Bulgaria	62° 38' 29" S, 60° 21' 53" W	Measure 19 (2015)
92	Oversnow heavy tractor "Kharkovchanka" that was used in Antarctica from 1959 to 2010. The oversnow heavy tractor "Kharkovchanka" was designed and produced at the Malyshev Transport Machine-Building Plant in Kharkov specially for organizing inland sledge-tractor traverses in Antarctica. This was the first non-serial transport vehicle of the Soviet machine-building produced exclusively for operations in Antarctica. This tractor was not used outside Antarctica. Thus, the STT "Kharkovchanka" is a unique historical sample of engineering-technical developments made for exploration of Antarctica. Original proposing Party: the Russian Federation Party undertaking management: the Russian Federation	69°22′41,0″ S, 76°22′59,1″ E.	Measure 19 (2015)

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