REVISED MANAGEMENT PLAN FOR TAYLOR ROOKERY, ANTARCTIC SPECIALLY PROTECTED AREA NO. 101

MAC. ROBERTSON LAND, EAST ANTARCTICA

Introduction

Taylor Rookery (Map A) was originally designated as Specially Protected Area No. 1, in accordance with the Agreed Measures for the Conservation of Antarctic Fauna and Flora, through Recommendation IV-I (1966), after a proposal by Australia. The Area was originally designated on the grounds that Taylor Rookery contains a colony of Emperor Penguins (*Aptenodytes forsteri*), which is the largest of two known colonies of this species located entirely on land. A revised description and management plan for the Area was adopted by Recommendation XVII-2 (1992) to accord with the revised format for Area Descriptions and Management Plans of Article 5 of Annex V of the Protocol on Environmental Protection to the Antarctic Treaty, adopted under Recommendation XVI-10 (1991). In accordance with Resolution XX -5 (1996) the site was redesignated and renumbered as Antarctic Specially Protected Area (ASPA) No. 101.

This revised Management Plan reaffirms the scientific values of the original designation.

1. Description of Values to be Protected

Taylor Rookery contains the largest Emperor penguin colony (Map B) known on land; almost all other emperor penguins colonies are located on sea ice. The number of breeding pairs at the colony has ranged from 2462 in 1989 to 3307 in 1990 and has averaged approximately 3000 over 15 years from 1988 to 2002. The rookery is important because of long-term monitoring of the population of the penguins (since 1954). The colony is ideal for counting since it is surrounded by small rocky hills which make it possible to observe every bird without entering the breeding area. A photographic census programhas been carried out annually since 1988, and it is believed that this method has resulted in almost complete accuracy of counting.

2. Aims and Objectives

Management at 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;
- gather data on the population status of the emperor penguin colony on a regular basis;

- 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:

- signs illustrating the location and boundaries, with clear statements of entry restrictions, shall be placed at appropriate locations on the boundary of the Area to help avoid inadvertent entry;
- information on the location of the Area (stating special restrictions that apply) shall be displayed prominently, and a copy of this Management Plan shall be kept available, at adjacent operational research/field stations and will be provided to ships visiting the vicinity;
- 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 required;
- abandoned equipment or materials shall be removed to the maximum extent possible provided doing so does not adversely impact on the values of the Area;
- visit the Area as necessary (no 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
- review the Management Plan at least every five years and update as required.

4. Period of Designation

Designated for an indefinite period.

5. Maps

Map A: East Antarctica, Mac. Robertson Land, Location of Antarctic Specially Protected Area No. 101, Taylor Rookery. The inset map indicates the location in relation to the Antarctic continent.
Map Specifications:
Projection: Lambert Conical Conformal
Horizontal Datum: WGS84
Vertical Datum: Mean Sea Level

Map B: Antarctic Specially Protected Area No. 101, Taylor Rookery. Showing Emperor Penguin Colony.
Map Specifications:
Horizontal Datum: WGS84
Vertical Datum: Mean Sea Level

Map C: Antarctic Specially Protected Area No. 101, Taylor Rookery. Showing Area in greater detail with landing and camping sites.

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

Taylor Rookery Antarctic Specially Protected Area consists of the whole of the northernmost rock exposure on the east side of Taylor Glacier, Mac. Robertson Land (67°26'S; 60°50'E). The rookery 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 sea 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. The compressed snow melts in summer to form a shallow lake and stream which 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 exists for the meteorology of the Area. Conditions are probably similar to those of the Mawson station area 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 windspeed 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.

Geology and Soils

The rocks at Taylor Rookey 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 the 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. The flora is comparable with the twenty six species of lichen and three species of moss, 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

The breeding site is a north-facing amphitheatre formed by the tongue of the Taylor Glacier to the west and rocky hills to the east. The penguins breed mainly on a saucer shaped depression of rock and gravel to the south of the headland, and to a lesser extent on the surface of a frozen melt lake at the northern side. Both areas are level and for most of the breeding season are covered with compressed snow on which the birds huddle to incubate during winter.

First hatchlings have been observed from mid July which suggests mid May as the onset of laying. Fledglings depart the colony from mid December to mid January and leave during the day when the weather is the warmest and the katabatic wind has subsided. Adult birds and fledglings head in a N-NE direction towards a polynya about 62 km from the colony. This ice edge reduces to approximately 25 km by mid January. The polynya appears to be a permanent feature of the Mawson Coast.

The size of the adult population appears to have remained relatively stable during the counting period. Numbers of adults ranged from 2462 in 1989 to 3307 in 1990 and averaged 3019 ± 267 over the 15 years from 1988 to 2000, with a very slight downward trend. During 2001 and 2002 the number of incubating birds appears to have recovered (Figure 1).

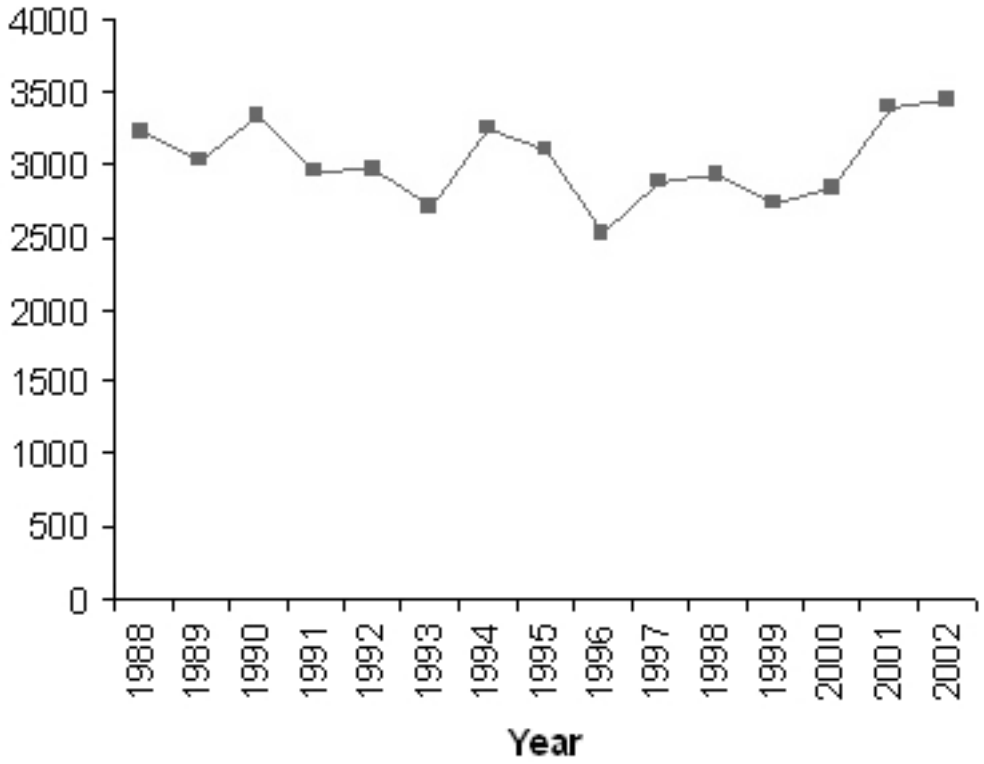

Figure 1. Numbers of breeding pairs of Emperor penguins at Taylor Glacier, 1988-2002. Vertical axis shows number of breeding pairs of birds. Horizontal axis shows bird count year.

6(ii) Special Zones within the Area

There are no special zones within the Area.

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

There are no know structures within the Area. A four-berth refuge is located in the Colbeck Archipelago, approximately 5 kilometres to the north-east of the Area (see Map B). Mawson station (67°36' S and 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, East Antarctica, (67°36'36.7" S and 62°32'06.7" E) is located approximately 80 kilometres east of Taylor Rookery and 10 kilometres west of Mawson station.

7. 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;

- 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 finite period;
- the appropriate authority should be notified of any activities or measures undertaken that were not included in the authorised Permit.

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

Whenever possible, access should be from sea ice to the east of Colbeck Archipelago, to avoid disturbance to the birds by crossing their pathways from the rookery to the sea (see Map B). Persons in the vicinity of the Area should also be aware of the penguins' pathways and take care to minimise disturbance.

Travel to the Area may be by oversnow vehicle, which is generally only possible during the period 1 May to 25 December, or by helicopter. Vehicle entry to the Area is prohibited. Oversnow vehicles used for transport to the Area are to be left outside the Area, to the east, and entry must be by foot. The approach route for vehicles is marked on Map B.

The following conditions apply to the use of helicopters:

- Helicopters are to approach the Area from the east over the sea ice and, where sea ice conditions permit, land outside the Area, with access being by foot (see Map B);
- Overflight of the rookery is prohibited;
- When landing outside the Area, helicopters should not land, take off or fly within 500 metres of the rookery;
- If landing inside the Area is essential due to sea ice conditions, helicopters should land in the north-east of the Area at the point marked "H", where a headland to the south obscures the colony from view (see Map B);
- Helicopters approaching to land in the Area must fly as low as possible over the sea ice to avoid disturbing the colony; and
- Helicopters are not to be refuelled 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 penguins. Movement in and around the Area should avoid crossing the access routes used by the birds.

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

The penguins are particularly sensitive to disturbance during the following periods:

- when they are incubating eggs, from mid-May to mid-July; and
- from mid-July to mid-December, when adults are feeding chicks, and the chicks fledge.

Penguins are known to be present at the rookery during every month except February, when no recorded human visits to the rookery have been made. Restrictions therefore apply year-round.

The emperor penguin colony is ideal for counting. Normally the best vantage point for viewing and photographing the penguins is a rocky headland which runs adjacent to Taylor Glacier, on the western side of the rookery. The ideal time for a census is from 22 June to 5 July, since during this time only incubating males are present, each representing one breeding pair. An ongoing photographic census programhas been carried out by the Australian Antarctic program since 1988.

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.
- Sampling, which should be the minimum required for the approved research programs.

7(iii) Installation, modification or removal of structures

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 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 left in situ (GPS locations, description, tags, etc. and expected “use by date”) should 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 (Map C)

7(iv) Location of field camps

A four-berth refuge is located in the Colbeck Archipelago, approximately 5 kilometres to the north-east of the Area (see Map B).

Camping is permitted within the Area and should be 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 (Map C).

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7(v) 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.
- No living animals, plant material or microorganisms shall be deliberately introduced into the Area and precautions 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 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(vi) 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.*

7(vii) 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 this is the case the appropriate Authority must be notified and approval obtained.

7(viii) Disposal of waste

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

7(ix) Measures that may be 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, which may involve the collection of samples for analysis or review; the erection or maintenance of scientific equipment and structures, and signposts; or for 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.
- ornithological research shall be limited to activities that are non-invasive and non-disruptive to the breeding birds present within the Area. Surveys, including aerial photographs for the purposes of population census, shall have a high priority.
- 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(x) Requirements for reports

Visit reports shall provide detailed information on all census data; locations of any new colonies or nests not previously recorded, as texts and maps; a brief summary of research findings; copies of all photographs taken of the ASPA; and comments indicating measures taken to ensure compliance with permit conditions.

The report may make recommendations relevant to the management of the Area, in particular as to whether the values for which the ASPA was designated are being adequately protected and whether management measures are effective.

The report should be submitted as soon as practicable after the visit to the ASPA has been completed, but no later than six months after the visit has occurred. A copy of the report should be made available to the permit issuing authority and the Australian Antarctic Division (if different) for the purposes of reviewing the management plan in accordance with the Antarctic Treaty system requirements. Reports should include a completed SCAR Visit Report, or such information as required by national laws. The permitting authority should maintain a record of the report for an indefinite period and shall make this available to SCAR, CCAMLR, COMNAP, and to interested parties upon request.

7(xi) Emergency provision

Exceptions to restrictions outlined in the management plan are in an emergency as specified in Article 11 of Annex V of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol).

8. Supporting Documentation

Budd, G.M. 1961 the biotopes of emperor penguin rookeries. Emu, 61, 171-189.

Budd, G.M., (1962) Population studies in rookeries of the Emperor Penguin Aptenodytes forsteri. Proceedings of the Zoological Society, London 139, 365-388.

Crohn, P.W. 1959 A contribution to the geology and glaciology of the western part of the Australian Antarctic Territory. Bull. Bur. Miner. Resour. Geol. Geophys., Aust., No. 32.

Filson, R.B. 1966 The lichens and mosses of Mac. Robertson Land. Melbourne: Dep. Ext. Affairs, Australia (Antarc. Div.).

Horne, R.S.C. 1983 The distribution of penguin breeding colonies on the Australian Antarctic Territory, Heard Island, the McDonald Islands and Macquarie Island. ANARE Res. Notes No. 9.

Kirkwood, R. and Robertson, G. (1997) Seasonal change in the foraging ecology of Emperor penguins on the Mawson Coast, Antarctica. Marine Ecology Progress Series 156: 205-223

Kirkwood, R. and Robertson, G. (1997) The energy assimilation efficiency of emperor penguins, Aptenodytes forsteri, fed a diet of Antarctic krill, Euphausia superba. Physiological Zoology 70: 27-32

Kirkwood, R. and Robertson, G. (1997) The foraging ecology of female emperor penguins in winter. Ecological Monographs 67: 155-176

Kirkwood, R. and Robertson, G. (1999) The occurrence and purpose of huddling by Emperor penguins during foraging trips. Emu 99: 40-45

Longton, R. E., 1988. Biology of polar bryophytes and lichens, Cambridge University Press, Cambridge. 307-309.

Melick, D. R., Hovenden, M. J., & Seppelt, R. D., 1994. Phytogeography of

Øvstedal, D. O., and Lewis Smith, R. I., 2001. Lichens of Antarctica and South Georgia: A Guide to their Identification and Ecology, Cambridge University Press, Cambridge.

Robertson, G. (1990). Huddles. Australian Geographic. 20: 76-94.

Robertson, G. (1992). Population Size and Breeding Success of Emperor Penguins Aptenodytes forsteri at the Auster and Taylor Glacier Colonies, Mawson Coast, Antarctica. Emu. 92: 62-71.

Robertson, G. and Newgrain, K. (1992). Efficacy of the tritiated water and 22Na turnover methods in estimating food and energy intake by Emperor penguins Aptenodytes forsteri. Physiological Zoology. 65: 933-951.

Robertson, Graham G., (1994). The Foraging Ecology of Emperor Penguins (Aptenodytes Forsteri) at two Mawson Coast Colonies, Antarctica. PhD Thesis, University of Tasmania.

Robertson, G., Williams, R. Green, K. and Robertson, L. (1994). Diet composition of Emperor penguin chicks Aptenodytes forsteri at two Mawson Coast colonies, Antarctica. Ibis. 136: 19-31

Robertson, G. (1995). The foraging ecology of Emperor penguins Aptenodytes forsteri at two Mawson Coast colonies, Antarctica. ANARE Reports 138, 139 pp.

Schwerdtfeger, W. 1970 The climate of the Antarctic. In: Climates of the Polar Regions (ed. S. Orvig), pp. 253-355. Amsterdam: Elsevier.

Schwerdtfeger, W. 1984 Weather and climate of the Antarctic, 261 pp. Amsterdam: Elsevier.

Streten, N.A., (1990) A review of the climate of Mawson – a representative strong wind site in East Antarctica. Antarctic Science 2, 79-89.

Trail, D.S. 1970 ANARE 1961 Geological traverses on the Mac. Robertson Land and Kemp Land Coast. Rept. Bur. Miner. Resour. Geol. Geophys. Aust. No. 135.

Trail, D.S., McLeod, I.R., Cook, P.J., and Wallis, G.R. 1967 Geological investigations by the Australian National Antarctic Research Expeditions 1965. Rept. Bur. Miner. Resour. Geol. Geophys. Aust. No. 118.

Wienecke, B., Kirkwood, R., Robertson, G. (2004) Pre-moult foraging trips and moult locations of Emperor penguins at the Mawson Coast. *Polar Biology* 27. 83-91;

Wienecke, B.C., Robertson, G. (1997) Foraging space of emperor penguins *Aptenodytes forsteri* in Antarctic shelf waters in winter. O. Kinne, (ed.) *Marine Ecology Progress Series* 159. 249-263.

Wienecke, B. C. and Robertson, G. (1997) Foraging space of Emperor penguins Aptenodytes forsteri in Antarctic shelf waters in winter. Marine Ecology Progress Series 159: 249-263

Willing, R.L. 1958 Australian discoveries of Emperor penguin rookeries in Antarctica during 1954-57. Nature, Lond., 182, 1393-1394

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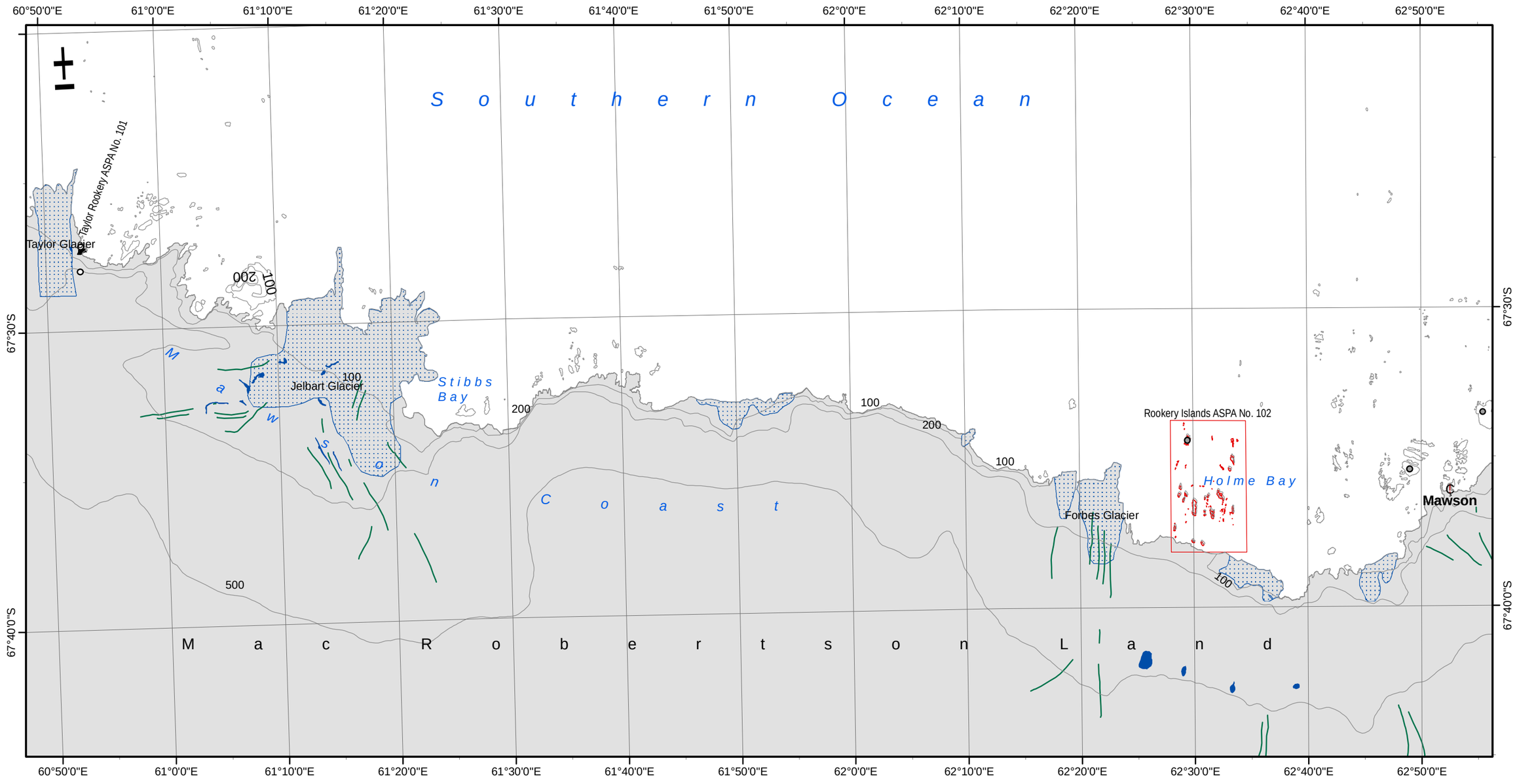
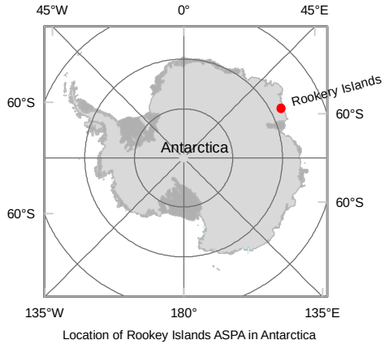
Department of the Environment and Heritage
Australian Antarctic Division

Map A: Antarctic Specially Protected Area No 101, Taylor Rookery, Mawson Coast, Mac.Robertson Land, East Antarctica.





Location of Rookey Islands ASPA in Antarctica

Scale 1:250,000

5 0 5 10 15 Kilometres

Horizontal Datum: WGS 84
Projection: UTM Zone 41

Produced by:
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Department of the Environment and Heritage. May 2005.

Legend

Stations
- Mawson station

Protected Areas
- Rookery Islands ASPA No 102
- Taylor Rookery ASPA No 101

Birds
- Adelie penguin
- Emperor penguin
- Southern giant petrel

Features
- Contour line 100 metre interval
- Lakes and Ponds
- Glacier Flow Line
- Glacier
- Continent

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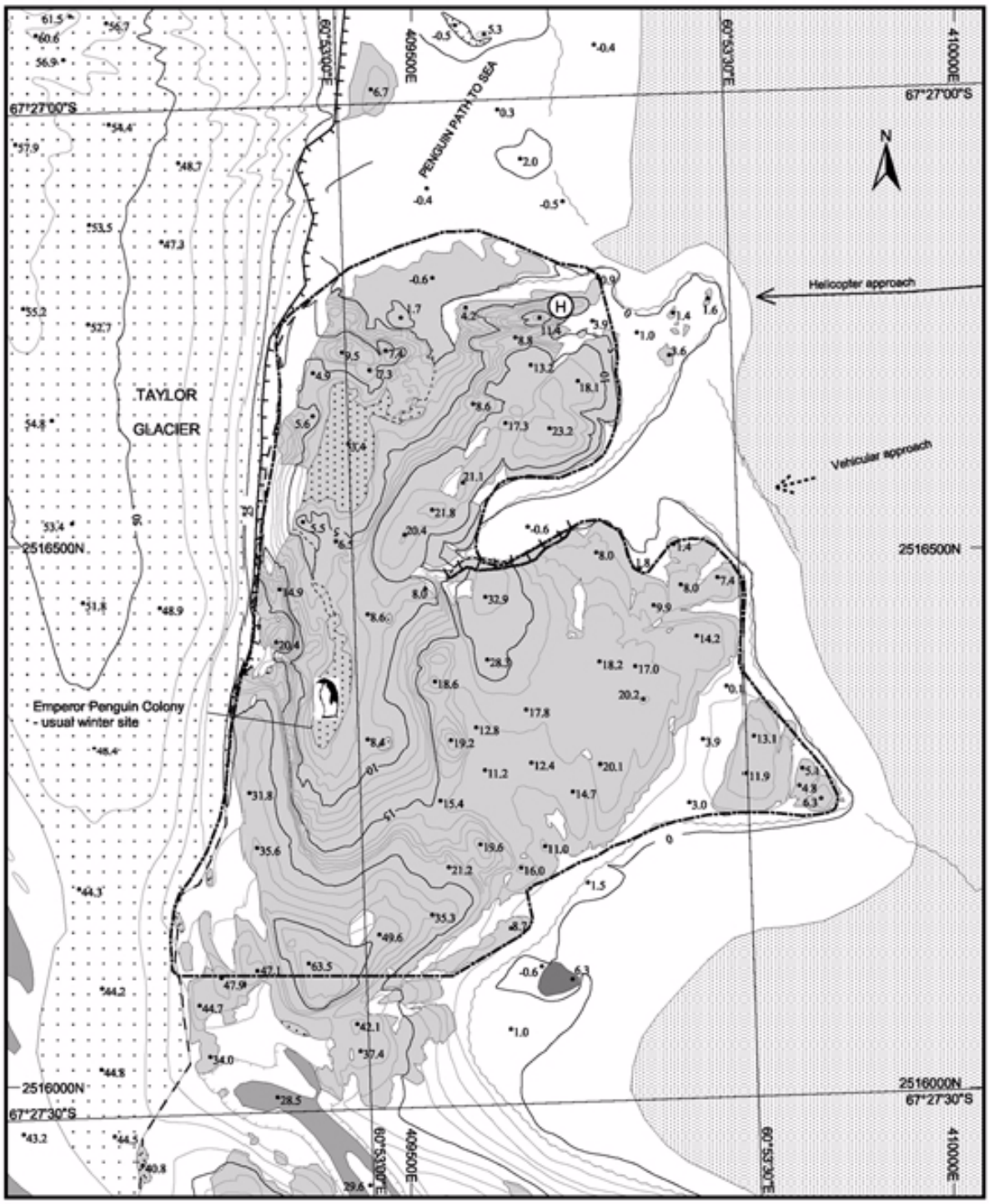
Map B: Antarctic Specially Protected Area No. 101: Taylor Rookery, Mawson Coast, Mac.Robertson Land, East Antarctica

Detail Taylor Rookery: Topography and Emperor Penguin Colony



Horizontal Datum: WGS 84
Projection: UTM Zone 42

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May 2005.

SCALE 1:5000

0 100 200 metres

LEGEND

- Continental ice
- Blue ice
- Iceberg
- Lake
- Exposed rock
- Sea
- Crevasse field
- Glacier edge
- Cliff - rock
- Cliff - ice
- Cliff base
- Tide crack
- Stream
- Spot height elevation
- Helipad
- Depression contour
- Index contour
- Intermediate contour
- Specially Protected Area boundary
- Emperor Penguin Colony - usual winter site

Note: Contour interval is 1.0 m up to R.L. 20 and 5.0 m above R.L.25 in the rookery area.
Contour interval is 10.0 m outside the rookery area.

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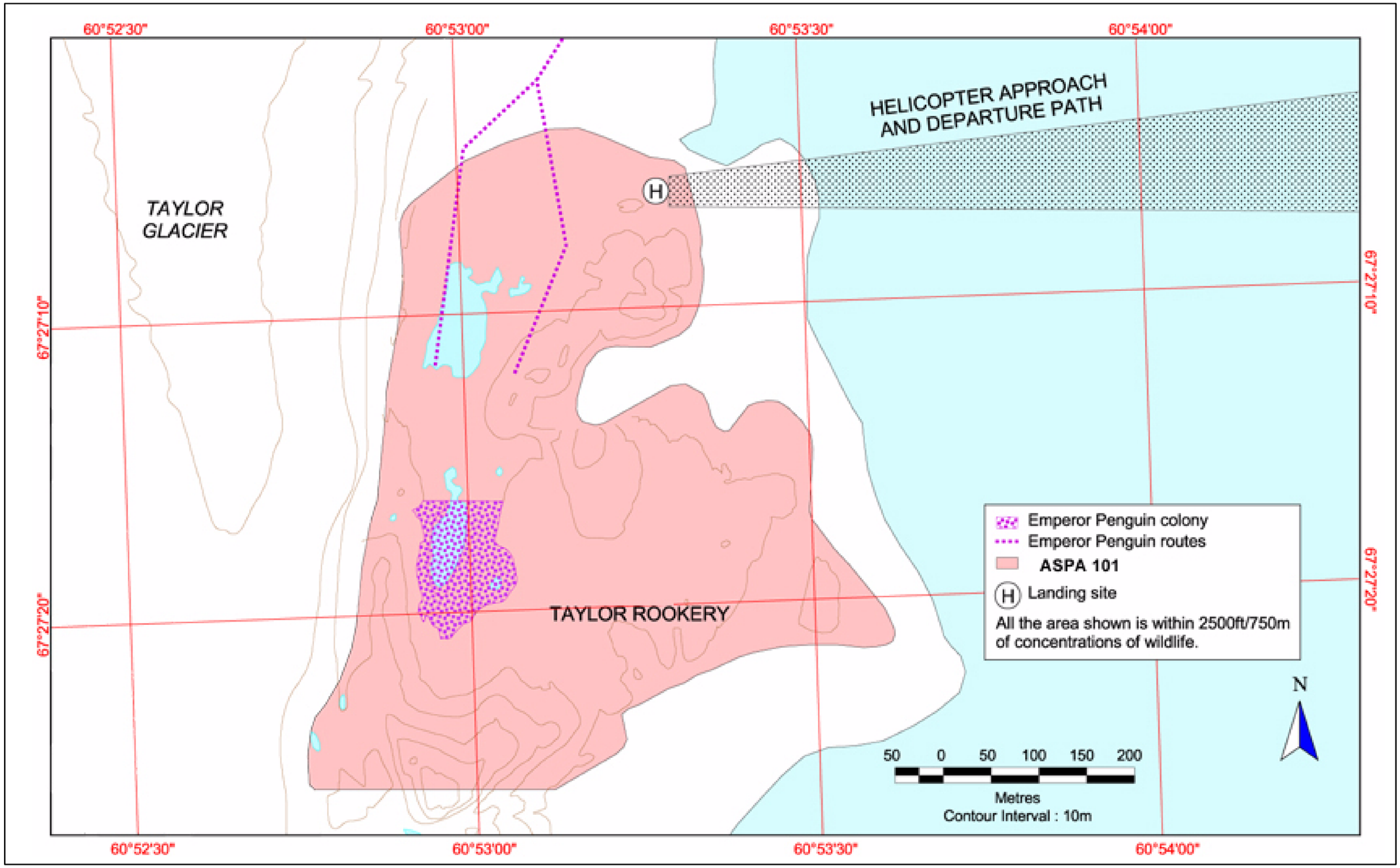
Map C: Antarctic Specially Protected Area No 101, Taylor Rookery, Mawson Coast, Mac.Robertson Land, East Antarctica

Helicopter Approach and Landing Site



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Projection: UTM Zone 41

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