

ANTARCTIC SPECIALLY PROTECTED AREA (ASPA) NO. 105
BEAUFORT ISLAND, McMURDO SOUND, ROSS SEA

1. Description of values to be protected

Beaufort Island was originally designated in Recommendation IV-5 (1966, as Specially Protected Area No. 5) after a proposal by New Zealand 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 has been set aside primarily to protect the site’s ecological values and these reasons for long-term special protection still apply.

The island comprises a variety of terrain and habitats: gently sloping ice-free ground with summer ponds and small meltwater streams draining to the coast; moderately sloping ice fields covering much of the west side of the island; and steep, rugged cliffs on the eastern slopes. Recent investigations indicate the avifauna is not as varied as first thought, but there exists a large Adélie penguin (*Pygoscelis adeliae*) colony, a small breeding colony of Emperor penguins (*Aptenodytes forsteri*), and several breeding colonies of South polar skua (*Catharacta maccormicki*). The boundaries of the Area, which previously excluded the Emperor colony, have been extended to include fast-ice occupied by breeding birds.

Site visits in January 1995 and 1997 discovered and described a significant area of vegetation previously unrecorded on an ice-cored moraine bench of up to 50 m wide and 5–7 metres above the beach on the north of the island. The vegetation is exceptional both in its quantity and quality, and is the most extensive, continuous area of mosses yet known for the McMurdo Sound region. Although the area is extensive (approximately 2.5 ha), the moss community is dominated by a single species, *Bryum argenteum*: the essentially monospecific character of the site is also unique. The site enjoys warm summer temperatures because of its northerly aspect and shelter from southerly winds by high ice cliffs. The local microclimate, stability of the substrate and supply of water from the nearby ice-cliffs and snow banks are favourable for vegetation growth. As a result there is also a diverse community of algae, and while a detailed algal survey has not yet been undertaken, *Prasiola crispa* is particularly abundant throughout the site, together with a number of unicellular chlorophytes and xanthophytes (including *Botrydiopsis* and *Pseudococcomyxa*), and cyanobacteria (particularly scillatorians) mixed with the *Prasiola*. Green snow algae, a mixture of *Chloromonas* and *Klebsormidium*, are present as well as the red snow algae *Chlamydomonas* sp., *Chloromonas* sp., and

Chlamydomonas nivalis. This represents one of the most southerly locations where red snow algae have been observed. The exceptional plant communities at this site are fragile and vulnerable to disturbance and destruction by trampling, sampling and/or through foreign introductions. Conservation of the ecological and scientific values of this community are important reasons for special protection at Beaufort Island.

As an isolated island difficult of access, the site is known to have been visited only infrequently. Beaufort Island has not been comprehensively studied or documented but is largely undisturbed by direct human activity. In particular, Beaufort Island has been exposed to fewer opportunities for direct exotic biological introductions than many other sites in the Ross Sea. The ecological, scientific and aesthetic values derived from the isolation and relatively low level of human impact are important reasons for special protection at Beaufort Island.

2. Aims and objectives

Management at Beaufort Island aims 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 and soils in the Area provided it is for compelling reasons which cannot be served elsewhere;
- minimise human disturbance to plant 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 are to 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 the Management Plan shall be made available at Scott Base (NZ).

- 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

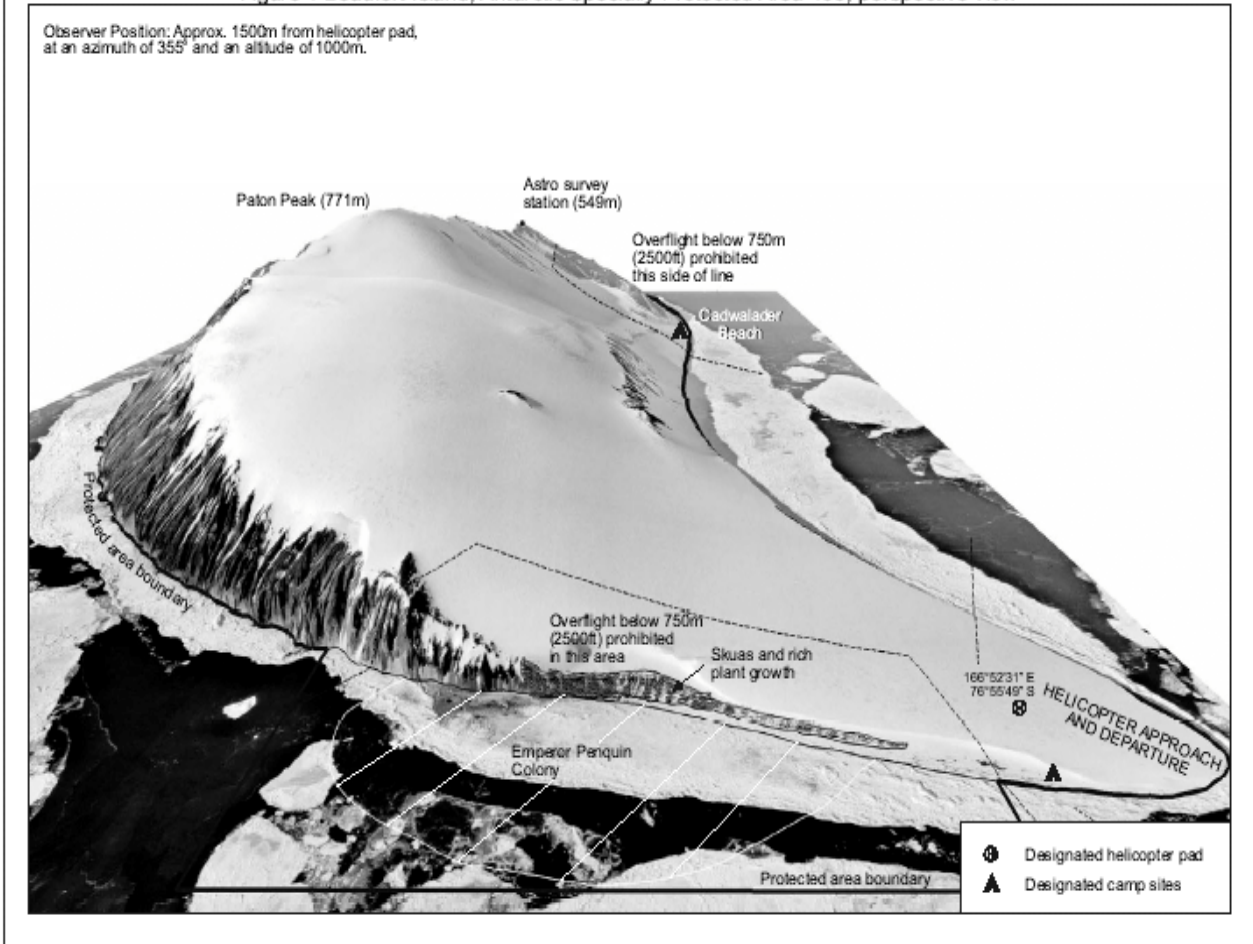
Map A: Beaufort Island regional topographic map. The map is derived from the orthophotograph in Map B, using Map B specifications. Inset: McMurdo Sound, showing Ross Island and the location of McMurdo Station (US) and Scott Base (NZ).

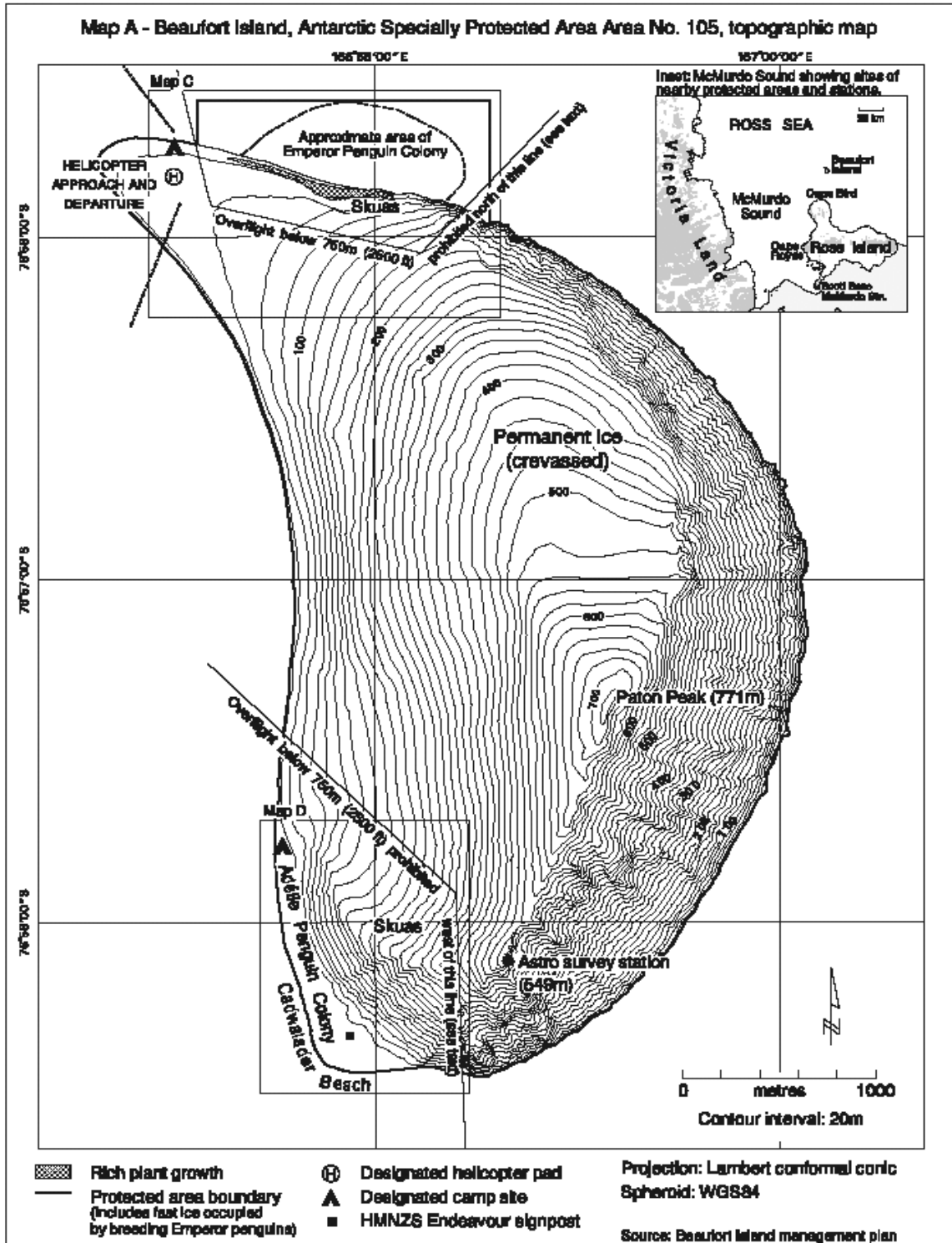
Map B: Beaufort Island regional orthophotograph. Orthophotograph specifications:
 Projection: Lambert conformal conic; Standard parallels: 1st 76° 40' 00" S; 2nd 79° 20' 00"S; Central Meridian: 167° 00' 00" E; Latitude of Origin: 78° 01' 16.211" S.
 Spheroid: WGS84. The original orthophotograph was prepared at 1:5000 with a positional accuracy of ±2.5 m (horizontal and vertical) with an on-ground pixel resolution of 1 m. Photography: USGS/DoSLI (SN7850) 22 November 1993.

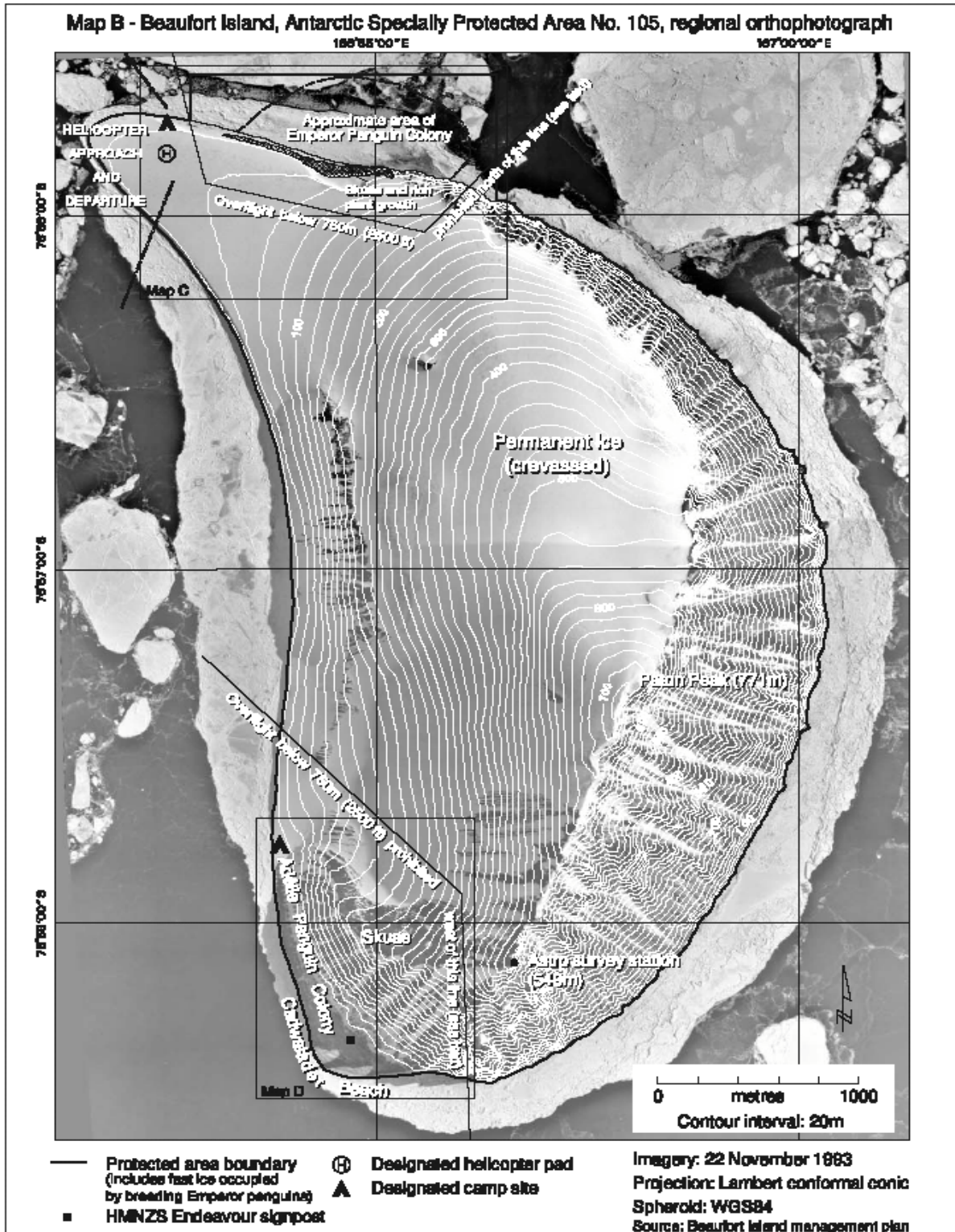
Map C: North Beaufort Island site orthophotograph. Specifications are the same as in Map B. The site of rich vegetation is indicated by hachures. The precise area of fast-ice occupied by breeding Emperor penguins is subject to variation both seasonally and inter-annually.

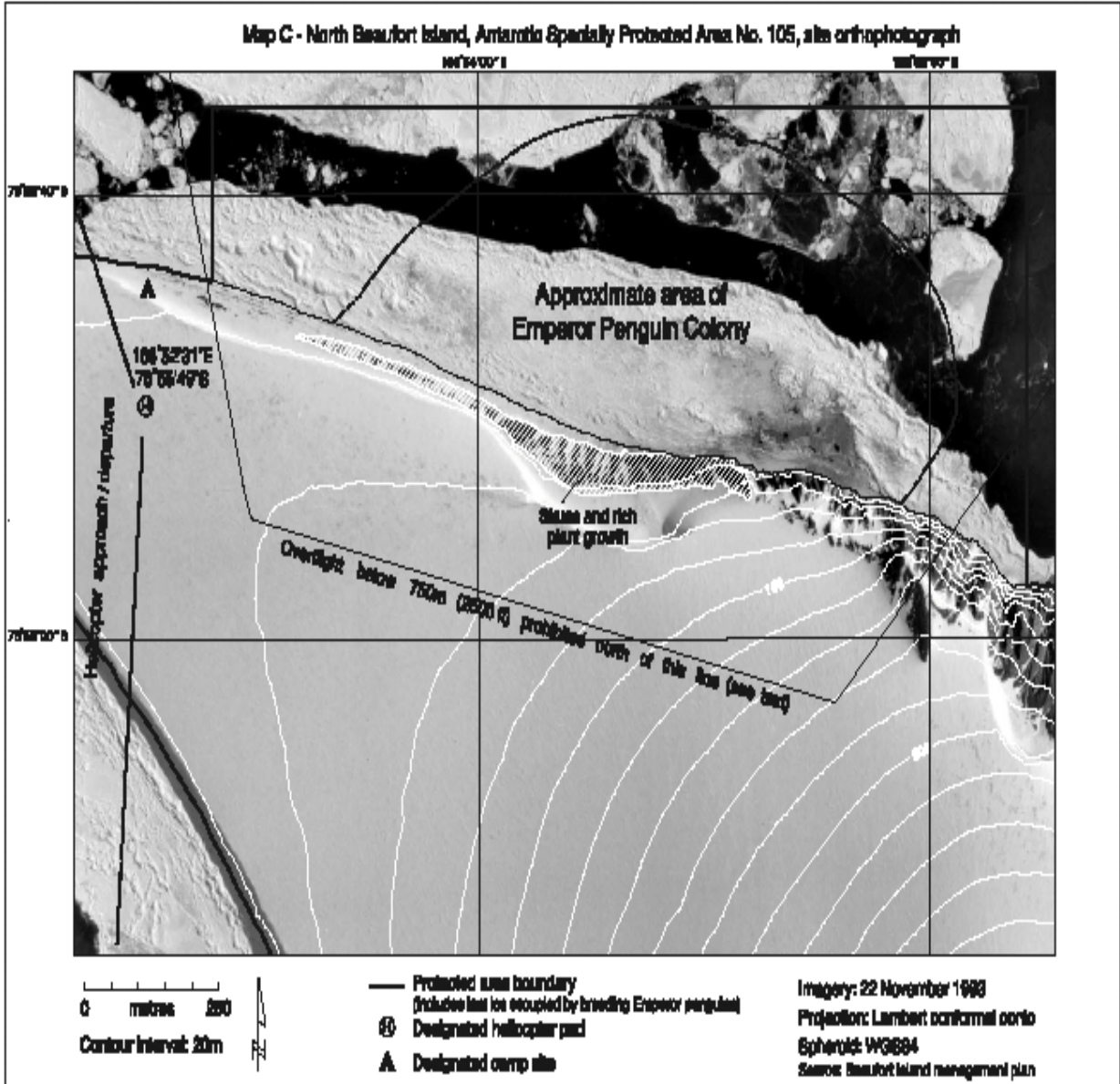
Map D: South Beaufort Island site orthophotograph. Specifications are the same as in Map B.

Figure 1 Beaufort Island, Antarctic Specially Protected Area 105, perspective view









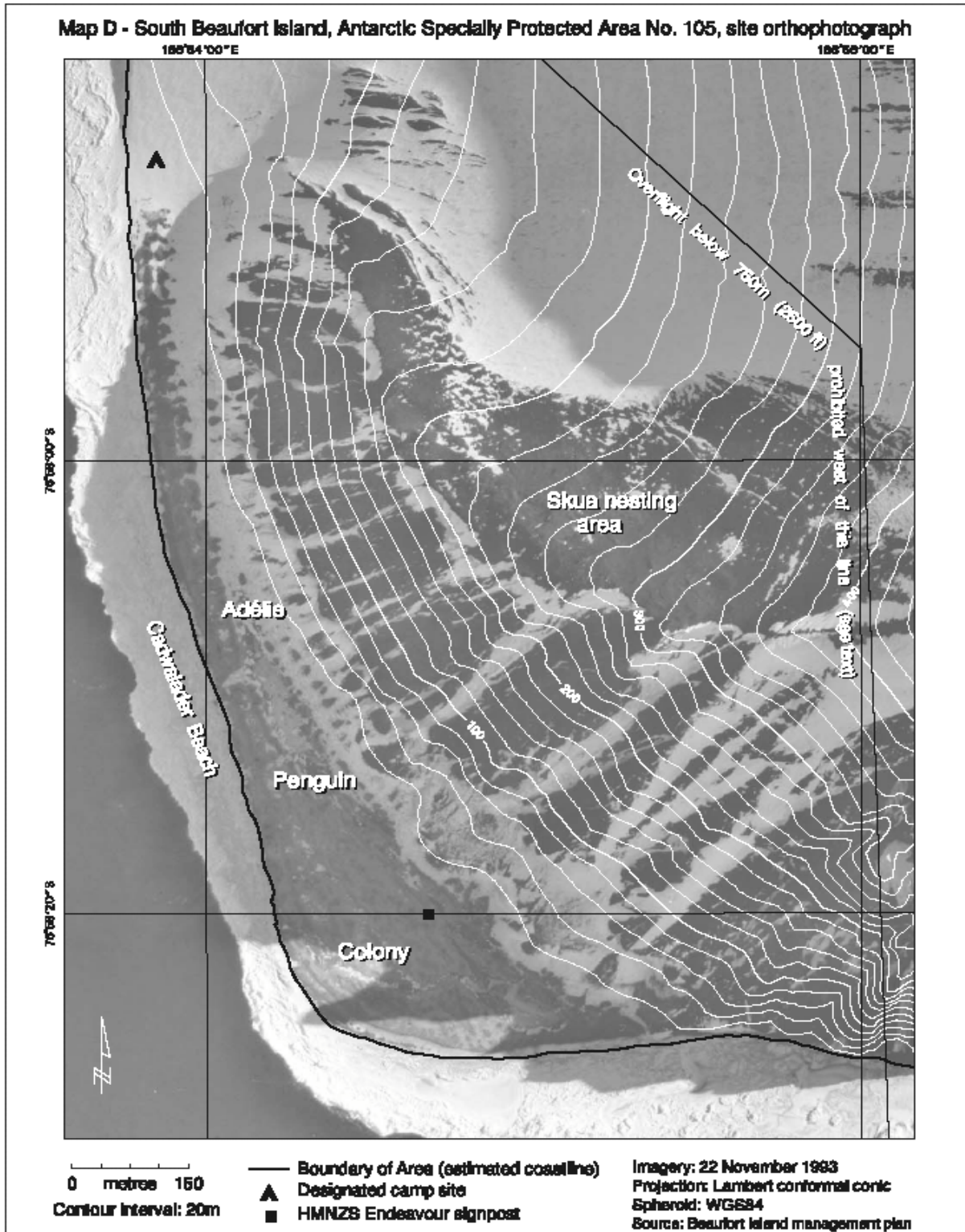


Figure 1: Perspective view of Beaufort Island from an elevation of 225 m, 900 m out from the preferred Helicopter Pad at an azimuth of 300° W.

6. Description of the Area

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

The designated Area encompasses the whole of Beaufort Island (76°59'S, 167°00'E Map A) above the mean high water mark, and includes adjacent fast-ice occupied by breeding Emperor penguins. The 7 km by 3.2 km island rises to 771 m at Paton Peak. The west side of the island is predominantly an ice field with ice cliffs of about 20 m on the coast, while the east and south sides of the island are largely ice-free, with steep and inaccessible cliffs rising straight from the sea. 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.

Beaufort Island is one of a series of late Tertiary volcanic vents that developed along a line of weakness in the Ross Sea floor. The geology 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. Cadwalader Beach comprises a beach foreland and cusped spit, backed by steep basaltic cliffs and several talus cones. A series of beach ridges, which are generally occupied by the breeding penguins, have trapped meltwater ponds and mark the growth of the beach face away from the cliffs with time. A series of raised beaches is evident at the northeastern end of the island, some with evidence (quills and guano) of former and apparently substantial penguin colonies. Sub-tidal (abrasion) platforms and massive boulders are found below the highly weathered eastern and southern cliffs.

An Adélie colony occupies the flat area at Cadwalader Beach (Map D). The number of Adélie penguins breeding on Beaufort Island peaked at 53,733 pairs in 1986. Since then the population has ranged from 23,512 breeding pairs (in 1998) to 45,768 (in 1987). Above the steep cliffs that rise behind the colony, a population of skuas (numbers unknown) nest on more gentle ice-free slopes at the edge of the permanent ice field on the west flank of the island. This ice field is punctuated mid-way by a 2 km line of rocky outcrops at an elevation of approximately 200 m. In the north the ice field broadens into

an extensive flat area of less than 50 m elevation, NE of which extends an ice-free beach about 1000 m in length and 50 m wide (Map C). In January 1995 a newly-established, possibly transitory, colony of Adélie penguins (comprising 2 pairs with 3 chicks and a approximately 10-15 non-breeders) occupied the west end of this beach. 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 20-50 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 in the recent past. The deposits may be useful for determining the age of former penguin colonies in the region.

A population of approximately 100 skuas (1995 count) breeds on the terrace and ice-free slopes leading toward the cliffs. 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.

On the fast-ice adjacent to the northern coastal reaches, a small colony of breeding Emperor penguins (1787 pairs at 1976 count; 179 pairs at 1983 count, 1355 adults at October 1994 count) is present annually between the months of approximately April to January. 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 indicated on Map C.

The ice-free moraine terrace on the north end of the island (Map C) also supports the richest growth of vegetation recorded on Beaufort Island. This vegetation is exceptional both in quantity and quality, and is the most extensive, continuous area of mosses yet known for the McMurdo Sound region. The site enjoys warm summer temperatures (an air temperature +13°C was recorded on 18 January 1997) because of its northerly aspect and shelter from southerly winds by a 20 m high semi-circular ice cliff. The local microclimate, stability of the ground surface and supply of water from the nearby ice-cliffs and snow banks are favourable for vegetation growth. Initially the water forms a diffuse flush but becomes progressively entrained into rivulets that have eroded narrow

valleys in the edge of the terrace. The moss community is extensive (approximately 2.5 ha), with much of the site showing 100% ground cover, dominated by a single species, *Bryum argenteum*. One specimen of another species, *Pottia heimii*, was found after an extensive search: the essentially monospecific character of the site is also unique. The *Bryum* occurs in scattered patches at the upper (southern) margin of the bench, adjacent to the annual drift snow at the base of the ice cliff, and more continuous mats (hummocks) occur in the middle of the bench and in areas where spreading water drainage occurs, especially at the eastern end. In the upper (southern) part of the area the *Bryum* is intermixed with *Nostoc* colonies (cyanobacterium). At lower and more northerly sites in areas of high water flow the moss may be overgrown with a brown coloured mixed cyanobacterial community, particularly in areas prone to flooding, cryoturbic disturbance and, possibly, skua activity. *Bryum argenteum* produces dehiscent shoot tips which disperse the plants down stream. Evidence of this dispersal was commonly seen with *B. argenteum* sometimes occurring as small, and probably ephemeral, communities on the beach below the terrace. The moss community is known to support significant populations of mites, but a detailed survey of invertebrates on Beaufort Island has yet to be undertaken.

The vegetation at Beaufort Island is comparable to the upper, wetter parts of the flush at Canada Glacier (ASPA 131), Taylor Valley, Victoria Land. The Canada Glacier flush has a common, second species, *Pottia heimii*, that grows in drier areas but this was almost completely absent at Beaufort Island. The reason for this is unknown, but could be due to substrate differences, the presence of numerous skuas occupying the drier areas at Beaufort Island, high nutrient levels in the melt water at Beaufort Island, or limited dispersal and colonisation opportunities. At Botany Bay (ASPA 154), Granite Harbour, Victoria Land — a warmer site than at Canada Glacier but at a similar latitude to Beaufort Island — the wetter areas are occupied by the moss *Ceratodon purpureus* or *Bryum argenteum*, so that there may be a sequence from wet to dry of *C. purpureus* - *B. argenteum* - *P. heimii*. While there is no understanding as to why *C. purpureus* is absent at Beaufort Island it is likely that limited dispersal and colonisation opportunities, as well as water nutrient status, may be important.

There is also a diverse community of algae, and while a detailed algal survey has not yet been undertaken, *Prasiola crispa* is particularly abundant throughout the site, reflecting the high nutrient status and abundance of melt water. A number of unicellular chlorophytes and xanthophytes (including *Botrydiopsis* and *Pseudococcomyxa*) and

cyanobacteria (particularly scillatorians) were found mixed with the Prasiola. 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*. The snow and ice cliffs forming the upper edge of the beach also contain a pinkish-brown deposit, consisting largely of fine silty material as well as the red snow algae *Chlamydomonas* sp., *Chloromonas* sp., and *Chlamydomonas nivalis*. This represents one of the most southerly locations where red snow algae have been observed.

During a NZ/US visit in January 1995 abandoned equipment was removed from among the Adélie colony at Cadwalader Beach. No other human impact was visually evident in 1995.

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 colony at Cadwalader Beach (Map D). The sign, erected in 1959–60, bears the names and home-towns of seamen and the Captain of the HMNZS *Endeavour*: the sign is set in concrete and was in good condition in January 1995. 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 A).

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

The nearest protected area to Beaufort Island is New College Valley ASPA 20 located 35 km to the south at Cape Bird, Ross Island. Cape Royds ASPAs 121 and 157 are a further 35 km to the south. (Refer to the inset: Map A).

7. Permit conditions

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 are that:

- it is issued only for 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-C and Figure 1) 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 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, Figure 1). 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 overflight of the area east of this site indicated on Maps A–C and Figure 1. 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.

Overflight 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–D and Figure 1. When required for essential scientific or management purposes, transient overflight down to a minimum altitude of 300 m (1000 ft) may be allowed over these areas: conduct of such overflights must be specifically authorised by 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–D). 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 on the snow 100 m from the northern edge of the large Adélie 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 flora or fauna is prohibited, except in accordance with a 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

1. 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.
2. Any specific sites of long-term monitoring shall be appropriately marked.
3. 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 or carry-bags) 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.

Bibliography

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