Management Plan for
Antarctic Specially Protected Area No. 108
GREEN ISLAND, BERTHELOT ISLANDS, ANTARCTIC PENINSULA

1. Description of values to be protected

Green Island (Latitude 65°19' S, Longitude 64°09' W, approximately 0.2 km^2), Berthelot Islands, Grandidier Channel, Antarctic Peninsula, was originally designated as a Specially Protected Area through Recommendation IV-9 (1966, SPA No. 9) after a proposal by the United Kingdom. It was designated on the grounds that the vegetation "is exceptionally rich, [and] is probably the most luxuriant anywhere on the west side of the Antarctic Peninsula". The Recommendation noted: "in some places the humus is 2 metres thick and that this area, being of outstanding scientific interest, should be protected because it is probably one of the most diverse Antarctic ecosystems". A Management Plan for the site was prepared by the United Kingdom and adopted through Recommendation XVI-6 (1991). The original reasons for designation were extended and elaborated, although following comparisons to other sites in the vicinity, Green Island was no longer considered to be particularly diverse. The vegetation on the island was described as extensive on the north-facing slopes, with well-developed continuous banks of moss turf formed by *Chorisodontium aciphyllum* and *Polytrichum strictum* that, over much of their extent, overlie peat of more than one metre in depth. Antarctic hair grass (*Deschampsia antarctica*), one of only two native vascular plants that grow south of 56°S, was noted as frequent in small patches near a blue-eyed cormorant (*Phalacrocorax atriceps*) colony. The colony of blue-eyed cormorants, located on the steep, rocky northwestern corner of the island, was noted as being possibly one of the largest along the Antarctic Peninsula.

The present management plan reaffirms the values of the rich *Chorisodontium-Polytrichum* moss turf as being the primary reason for special protection of Green Island. The *Polytrichum strictum* moss banks, with associated *Chorisodontium aciphyllum*, are considered to be the most extensive examples of this vegetation feature in the west Antarctic Peninsula region, occupying an area of over 0.5 ha. Moreover, in recent years many comparable moss banks on more northerly islands have suffered damage as a result of an increase in Antarctic fur seals (*Arctocephalus gazella*). The vegetation at Green Island has thus far escaped any significant damage. In addition, *Chorisodontium aciphyllum* is close to the southern-most limit of its range at the Berthelot Islands. The blue-eyed cormorant colony was one of the largest along the Antarctic Peninsula in 1981, when 500-600 individuals were present, and, until more recent data confirm otherwise, the value of this colony as one of the largest known, is included as an additional value and thus a further reason for special protection of Green Island.

Green Island has been afforded protection throughout most of the period of scientific activity in the region, with entry permits having been issued for only the most compelling scientific reasons. The island has not been subjected to intensive visitation, research or sampling and is potentially valuable as a baseline site for future studies. Due to the lack of visits and scientific studies, detailed information on the island's geography and ecology is lacking.

The coastline boundary of the original Area has not been changed, but the boundary is defined more precisely to include the whole island above the low tide water level, excluding offshore islets and rocks.

2. Aims and objectives

Management at Green Island 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 of the Area for its potential as a largely undisturbed reference area;
- allow scientific research on the ecosystem in the Area provided it is for compelling reasons which cannot be served elsewhere, in particular research which is expected to improve knowledge of the features and communities identified of special value, and which gathers baseline data on the island's features for which information is poor or not available;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- allow visits for management purposes only in support of the aims of the management plan.

3. Management activities

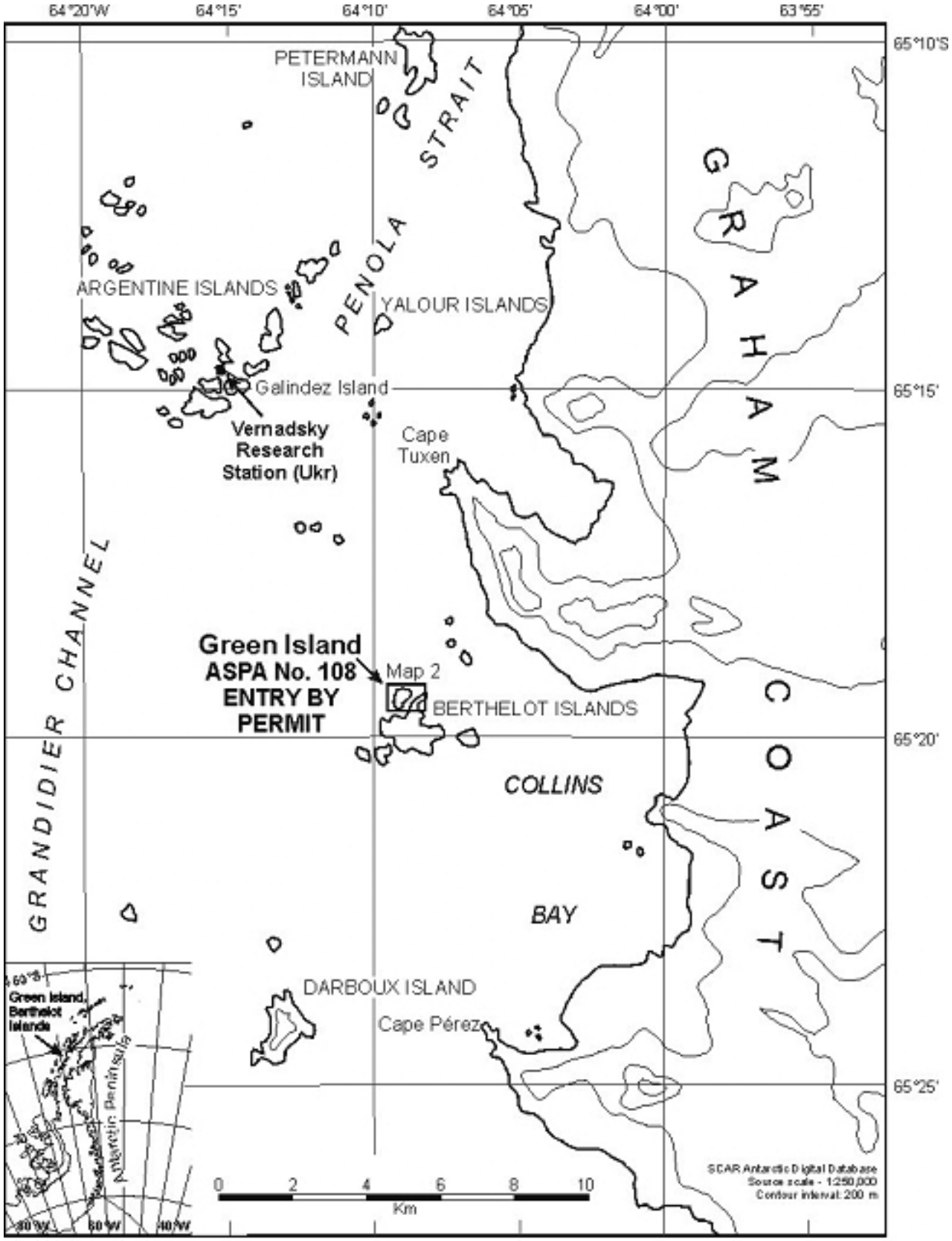
The following management activities shall be undertaken to protect the values of the Area:

- A map showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently at Akademik Vernadsky Station (Ukraine), where copies of this Management Plan shall be made available.
- Markers, signs or other structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition.
- Visits should 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 management and maintenance measures are adequate.

4. Period of designation

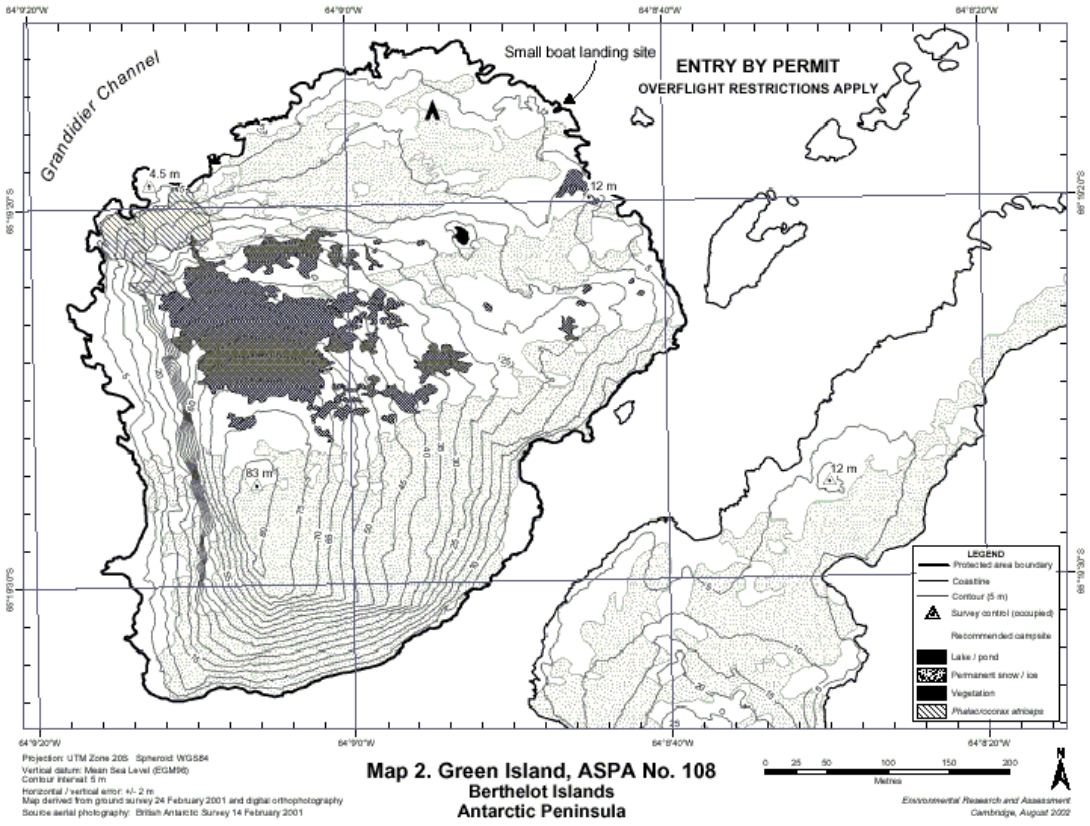
Designated for an indefinite period.

5. Maps and photographs



Map 1. Green Island, Berthelot Islands, ASPA No. 108, location map. Inset: location of Green Island on the Antarctic Peninsula.

Map 1: Green Island, ASPA No. 108, in relation to the Graham Coast, showing the location of Akademik Vernadsky Station (Ukraine). Inset: location of the Berthelot Islands on the Antarctic Peninsula.



Map 2: Green Island, ASPA No. 108, topographic map. Map derived from ground survey 24 February 2001 and digital orthophotography (ground pixel resolution 12 cm; source aerial photography taken 14 February 2001 by the British Antarctic Survey). Ground features (vegetation, permanent snow, colony, coastline and ponds) are digitised from the orthophotograph. Vegetation distribution indicates the principal moss banks, dominated by *Polytrichum strictum*. Map specifications – Projection: UTM Zone 20S; Spheroid: WGS84; Datum: mean sea level (EGM96). Vertical contour interval 5 m. Horizontal and vertical accuracy: ±2.0 m.

6. Description of the Area

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

GENERAL DESCRIPTION

Green Island (65°19' S, 64°09' W, approximately 0.2 km^2) is a small island situated 150 m north of the largest of the Berthelot Islands group, Grandidier Channel, approximately 3 km off the Graham Coast of the Antarctic Peninsula (Map 1). Green Island is 520 m from north to south and 500 m from east to west, rising to a rounded peak at a height of 83 m. The island rises steeply on all sides, with high precipitous cliffs on the south and east side. The largest extent of low

ground occurs above the northern coast, which comprises a gently sloping rock platform. There are several permanent snow patches with the largest occurring around the summit and to the south and east of the summit.

BOUNDARIES

The designated area comprises the entire island, with the boundary defined as the low tide level. Offshore islets and rocks are not included within the Area. Boundary markers have not been installed. The coast itself is a clearly defined and visually obvious boundary feature.

CLIMATE

No climate data are available for Green Island but conditions are expected to be similar to those at Akademik Vernadsky Station (Ukraine) on Galindez Island, Argentine Islands 8 km to the north. The mean summer temperature at Vernadsky is 0°C while the extreme maximum summer temperature is 11.7°C. In winter, the mean temperature is -10°C and the extreme minimum temperature is -43.3°C. The mean wind speed is 7.5 knots.

GEOLOGY AND SOILS

Green Island, together with the rest of the Berthelot Islands, is composed of gabbro of Lower Jurassic to Lower Tertiary age (British Antarctic Survey 1981). No further information is available on the geology of Green Island. Excluding the large peat deposits, soil is sparse and seldom exceeds 20 cm in depth, except occasionally in rock depressions and gullies. This is predominantly an ahumic coarse mineral soil derived from weathering of the parent rock. Ledges and gullies close to the Blue-eyed Cormorant colony contain an organically richer soil derived in part from decayed moss and guano. Over much of the steep northern slopes the mosses *Chorisodontium aciphyllum* and *Polytrichum strictum* have developed a deep turf of living moss overlying at least 1 m of barely altered or decomposed moss peat (Smith 1979, Fenton and Smith 1982). The permafrost layer is found 20-30 cm below ground level. Elsewhere on the island, notably the northeastern side, there are small areas of scree. There are no well-developed periglacial features, although a few small stone circles are occasionally evident.

VEGETATION

The most significant feature of the vegetation is the extensive continuous stand of *Polytrichum strictum* (= *Polytrichum alpestre*) on the northern slopes of the island (Map 2). The stand is approximately 140 m wide, extends from an elevation of approximately 25 m up to 70 m, and covers over 0.5 ha (Bonner and Smith 1985). Growth is lush and the permanently frozen peat in places reaches two metres deep. The surface of the hard compact moss is stepped, which is thought to be a result of slumping of the active layer on the steep slope. *Chorisodontium aciphyllum* (=*Dicranum aciphyllum*) is abundant at the edges of the bank and around the periphery of small gullies in the bank, where there is some shelter and moisture available from drifted snow. Both these tall turf-forming mosses are usually intimately intermixed in such communities further north in the maritime Antarctic; however, in the Grandidier Channel region the more xeric *P. strictum* often occurs alone. *C. aciphyllum* is close to its southernmost limit on Green Island (Smith 1996). Amongst the *C. aciphyllum*, *Pohlia nutans* is frequent, together with the liverworts *Barbilophozia hatcheri* and *Cephaloziella varians*. Epiphytic lichens are not abundant on the live *Polytrichum* and *Chorisodontium*, but *Sphaerophorus globosus* is frequent in the more exposed

northwestern area. Several species of *Cladonia* are widespread on the moss banks. The white encrusting epiphyte *Ochrolechia frigida* is present but not abundant here; black crustose species occur on moribund moss.

Wet hollows among rocks and melt runnels support small stands of the mosses *Warnstorfia laculosa* (= *Calliergidium austro-stramineum*), *Brachythecium austro-salebrosum* and *Drepanocladus uncinatus*. Elsewhere lichens dominate the vegetation. On rocks and boulders away from the shore and the influence of seabirds, a community dominated by *Usnea antarctica* and species of *Umbilicaria* (*U. antarctica, U. decussata* and *U. propagulifera*) prevail, with the mosses *Andreaea depressinervis* and *A. regularis* and various crustose lichens associated. Cliffs above the shore possess the most diverse and heterogenous communities, composed predominantly of lichens. These are a modification of the *Usnea-Umbilicaria* community with various nitrophilous taxa, especially close to seabird nests, including species of *Acarospora, Buellia, Caloplaca, Lecanora, Mastodia, Omphalodina, Physcia* and *Xanthoria*.

The only flowering plant thus far recorded on Green Island is Antarctic hair grass (*Deschampsia antarctica*), which is frequent in small patches above the cormorant colony and on rock ledges on the western side of the island.

BREEDING BIRDS

A sizeable colony of blue-eyed cormorants (*Phalacrocorax atriceps*) is present on the steep, rocky northwestern flank of the island (Map 2). This is one of the largest known blue-eyed cormorant colonies along the Antarctic Peninsula (Bonner and Smith 1985), although numbers may vary substantially from year to year. Approximately 50 pairs were estimated as present in 1971 (Kinnear 1971), while 112 birds were recorded in 1973 (Schlatter and Moreno 1976). 500-600 individuals (of which 300-400 were immatures) were present when visited in March 1981. Harris (2001) recorded 71 chicks on 24 February 2001.

Brown skuas (*Catharacta loennbergi*) are numerous over much of the island, particularly on the extensive moss banks. South polar skuas (*C. maccormicki*) are also present, along with a few possible hybrids. Over 80 birds were noted in March 1981, but only ten breeding pairs were confirmed, most of which were rearing two chicks. No other breeding birds were noted.

INVERTEBRATES, FUNGI AND BACTERIA

There is little information on the invertebrate fauna at Green Island, although 15 species were recorded in a study that suggested the invertebrate fauna on Green Island was comparatively diverse for the region (Usher and Edwards 1986). The most abundant species were *Cryptopygus antarcticus*, *Belgica antarctica* and *Nanorchestes gressitti*. Larval *B. antarctica* were particularly abundant on Green Island compared to neighbouring Darboux Island. Other species recorded in the Area are: *Alaskozetes antarcticus; Ereynetes macquariensis; Eupodes minutus; Eupodes parvus grahamensis; Friesea grisea; Gamasellus racovitzai; Halozetes belgicae; N. berryi; Oppia loxolineata; Parisotoma octo-oculata; Rhagidia gerlachei;* and *Stereotydeus villosus*. A definitive characterisation of the arthropod fauna on Green Island cannot be given until more site-specific research has been conducted. Information on fungal and bacterial communities is not available. There are no permanent freshwater bodies on the island, and there is no information available on seasonal freshwater communities.

HUMAN ACTIVITIES AND IMPACTS

There have been few reported visits to Green Island. The first recorded landing on the island was by the Première Expédition Antarctiques Française in 1903-05. The Deuxième Expédition Antarctiques Française visited Green Island several times during the winter in 1909. The British Graham Land Expedition landed on the island on 18 March 1935. Vegetation studies were undertaken on Green Island by Lewis-Smith in 1981 (Bonner and Smith 1985) and Komárková in 1982-83 (Komárková 1983). Numerous 30 cm lengths of 2.5 mm diameter iron wire, marking the corners of 50 m square quadrats of the *Polytrichum strictum* moss turf overlying the peat banks, were recorded (and left *in situ*) by an inspection team in January 1989 (Heap 1994). It is not known precisely when these markers were installed. The number of markers, their distribution and the nature of any possible contamination these may have had on the moss is unknown.

In recent years a number of important vegetation sites in the Antarctic Peninsula region have been subjected to damage from trampling and nutrient enrichment by increasing numbers of Antarctic fur seals (*Arctocephalus gazella*). While no Antarctic fur seals were observed on Green Island during a site visit made on 24 February 2001, there was some evidence of recent trampling and nutrient enrichment on parts of the lower moss banks. However, damage appeared limited and most of the extensive moss banks remained in tact.

6(ii) Restricted and managed zones within the Area

None.

6(iii) Structures within and near the Area

There are no structures present in the Area. The nearest scientific research station is Akademik Vernadsky (Ukraine) (65°15'S, 64°16'W), approximately 9 km north of the Area on Galindez Island.

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

The nearest protected areas to Green Island are Biscoe Point (ASPA No. 139), 62 km north, and Litchfield Island (ASPA No. 113), 63 km north, both near the southern coast of Anvers Island.

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, or for essential management purposes consistent with plan objectives such as inspection, maintenance or review;
- the actions permitted will not jeopardise the ecological or scientific values of the Area;
- any management activities are in support of the objectives of the Management Plan;
- 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 authority should be notified of any activities/measures undertaken that were not included in the authorised Permit

7(i) Access to and movement within the Area

- Subject to the following restrictions, access to the Area shall be by boat, or over sea ice by vehicle or foot.
- Vehicles are prohibited within the Area and all movement within the Area shall be on foot.
- Access to the island should be made on the rocky northern coast (Map 2). No special restrictions apply to the routes used to move to and from the Area.
- Aircraft are prohibited from landing within the Area year-round, and restrictions apply to overflight (see Table 1 below).
- Vehicle or boat crew, or other people on vehicles or boats, are prohibited from moving on foot beyond the immediate vicinity of their landing site unless specifically authorised by Permit.
- All movement should be undertaken carefully so as to minimise disturbance to the soil and vegetated surfaces and birds present, walking on snow or rocky terrain if practical.
- 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 trampling effects.

Table 1: Aircraft overflight restrictions applying year-round at Green Island.

Aircraft type	Number of engines	Minimum approach distance (m)	
		Vertical (above ground)	
		Feet	Metres
Helicopter	1	*2461*	750
Helicopter	2	*3281*	1000
Fixed-wing	1 or 2	*1476*	450
Fixed-wing	4	*3281*	1000

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 or scientific values of the Area, and which cannot be served elsewhere;
- Essential management activities, including monitoring;

7(iii) Installation, modification or removal of structures

Structures shall not be erected within the Area except as specified in a Permit and permanent structures or installations are prohibited. All 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

When necessary for purposes specified in the Permit, temporary camping is allowed within the Area on the low platform on the northern coast (Map 2). Camps should preferably be located on snow surfaces, which typically persist in this locality, or on gravel / rock when snow cover is absent. Camping on continuously covered vegetated surfaces is prohibited.

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 to prevent accidental introductions. In view of the presence of breeding bird colonies on the island, no poultry products, including products containing uncooked dried eggs, including wastes from such products, shall be released into the Area or into the adjacent sea. 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 specifically authorised by Permit for specific scientific or management purposes. Anything 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 any introduction into the environment is minimised. 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 should be notified of anything released and not removed that was not included in the authorised Permit.

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

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

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

Collection or removal of anything not brought into the Area by the Permit holder shall only be in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Permits shall not be granted in instances where it is proposed to take, remove or damage such quantities of soil, native flora or fauna that their distribution or abundance on Green Island would be significantly affected. Anything 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. Human wastes may be disposed of into the sea.

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 monitoring and site inspection activities, which may involve the small-scale collection of samples for analysis or review, or for protective measuresAny specific long-term monitoring sites shall be appropriately markedTo help maintain the ecological and scientific values of Green Island special precautions shall be taken against introductions. Of concern are microbial, invertebrate or plant introductions from other Antarctic sites, including stations, or from regions outside Antarctica. All sampling equipment or markers brought into the Area shall be cleaned or sterilised. 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.Poultry products and other introduced avian products, which may be a vector of avian diseases, shall not be released into the Area.

7(x) Requirements for reports

Parties should ensure that the principal holder for each Permit issued submits 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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