

**ANTARCTIC SPECIALLY PROTECTED AREA NO. 143 MARINE PLAIN,
MULE PENINSULA, VESTFOLD HILLS, PRINCESS ELIZABETH LAND**

Introduction

Marine Plain was originally designated as Site of Special Scientific Interest No. 25 in 1987 (ATCM Recommendation XIV-5). In accordance with Resolution V (1996), this site is redesignated and renumbered as Antarctic Specially Protected Area (ASP) No. 143.

This revised Plan of Management reaffirms the scientific values of the original designation and accords with Annex V of the Protocol on Environmental Protection.

The Vestfold Hills is an ice-free area of low altitude, undulating hills and hundreds of lakes and ponds. Marine Plain (68°37'50.2" S, 78°07'55.2" E) is located on Mule Peninsula in the southwest of the Vestfold Hills, Princess Elizabeth Land, East Antarctica (Map A). Through ASP designation, this sensitive Area can be protected for future studies of the palaeoenvironment of Antarctica.

1. Description of Values to be Protected

Marine Plain is representative of a major Antarctic terrestrial ice-free ecosystem with outstanding fossil fauna and rare geological features. It is of exceptional ongoing scientific interest and has been subject to several detailed geological, palaeontological, geomorphological and glaciological studies. This is the first time much of this information has been available from the coast of East Antarctica.

Marine Plain is of exceptional scientific interest because of its relevance to the palaeoecological and palaeoclimatic record of Antarctica. The Area has yielded outstanding vertebrate fossil fauna including *Australodelphis mirus*, the first higher vertebrate named from the Oligocene-Pleistocene interval on land in Antarctica, and the first cetacean fossil from the polar margin of circum-Antarctic Southern Ocean that postdates the break-up of Gondwana. Marine Plain has also revealed four other species of cetaceans; a species of fish; and a diverse invertebrate fauna comprising molluscs, gastropods, marine diatoms, and the first Pliocene decapod crustacean from Antarctica.

Marine Plain contains a roughly horizontal section of ca 8 m thick Pliocene marine sediments known as the Sørsdal Formation (Map D), which is in some areas exposed, but elsewhere underlies Holocene sediments, up to about 1 m thick. A diatom biostratigraphy placed the Sørsdal Formation in the *Fragilariopsis barronii* Zone, Early Pliocene (ca 4.5-4.1 Ma). The early Pliocene deposits are crucial as a source of information on the environment at this stage of Antarctic history. The fossil fauna – including deposits of vertebrate and invertebrate species – aids in the greater understanding of the early Pliocene Antarctic environments, including high-latitude climate and oceanography. By examining the diatom microfossils, it is possible to reconstruct the probable palaeoenvironmental conditions relating to the Sørsdal Formation and test hypothetical models of ice sheet behaviour against the geological record. This will also help in exploring the Antarctic ice sheet's response to future global warming.

II. Measures

The Vestfold Hills has an ice-free area of approximately 413 km², and are characterised by their low altitude, typically less than 180 m. The hills have been subject to intermittent glaciation and exposed rocks are characterised by polishing, striation and fracturing. The glacial striae show the direction of past ice movements. These features, together with other periglacial and glacial features have been extensively studied to investigate the region's geomorphological and glacial history.

In addition, Marine Plain provides the largest periglacial thermokarst in East Antarctica. Sediments are normally cemented by permafrost (in addition to any cement formed during diagenesis), however thawing can lead to undercutting and collapse. The thermokarst landforms have been produced by thermal back wearing of low scarps, and include thaw pits, thaw lakes, ground ice sumps, linear depressions and very small scale beaded drainage features. Human impact may accelerate the permafrost thawing resulting in disturbance of important geomorphological values and potentially threatening fossils in the diatomite.

Intrinsically linked to this geological plain is the adjacent Burton Lake. To the west of Marine Plain, Burton Lake is a hypersaline lagoon in seasonal connection with the marine environment. This lagoon represents a stage in the biological and physio-chemical evolution of a terrestrial water body from the marine environment i.e. the geological creation of a lake.

The meromictic and saline Burton Lake, together with several smaller lakes and ponds in the ASPA, provide important examples in the spectrum of hypersaline to fresh water lake types in the Vestfold Hills and present the opportunity for important geochemical and limnological research. The interrelationships between environment and biological communities in lakes such as Burton, provide considerable insights into the evolution of the lake environments and consequently, Antarctic environmental development. It is currently the only meromictic lagoon that has been protected within East Antarctica.

Due to its proximity to Davis station (Australia), the scientific values of the Area may be compromised or damaged by accidental interference. The Area lies on the pedestrian route (Map B) to the Mule Peninsula lakes (Clear, Laternula, and McCallum) from Ellis Rapids and is easily accessible. The Area merits protection, as there is a demonstrable risk of interference which may jeopardise scientific investigation. For this reason, it is critical that fossil fauna be protected from unrecorded sampling, collection, or interference.

2. Aims and Objectives

Management for the Marine Plain ASPA aims to:

- avoid degradation of, or substantial risk to, the values of Marine Plain by preventing unnecessary human disturbance in the ASPA;
- allow scientific research for geological, palaeoclimatic, palaeontological, geomorphological, and limnological purposes, while ensuring protection from over-sampling;
- allow other scientific research provided it is for compelling reasons that cannot be served elsewhere;

- minimise damage to landforms, particularly Marine Plain; the plain south of Poseidon Lake and east of Pickard Ridge (68°37'22.8"S, 78°07'9.9"E); glacial and periglacial features; and potential fossil sites;
- maintain the aesthetic and wilderness values of the Area; 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 the Area:

- 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 the adjacent Davis station, Marine Plain Refuge and will be provided to ships visiting the vicinity;
- install boundary markers to identify boundary turning points;
- signs illustrating the location and boundaries, with clear statements of entry restrictions, shall be placed at appropriate locations at the boundaries of the Area to help avoid inadvertent entry;
- require an environmental impact assessment of any activity within the ASPA in accordance with the requirements of Annex 1 of the Protocol on Environmental Protection to the Antarctic Treaty. A plan for the rehabilitation of the study site related to the activity should be submitted along with the environmental impact assessment application if appropriate;
- 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: Vestfold Hills, East Antarctica, showing the locations of Marine Plain ASPA; Davis station and surrounding refuges; and the two nearby Historic Sites and Monuments. Inset: The location of the Vestfold Hills in Antarctica.

Map Specifications:

Projection: UTM Zone 44

Horizontal Datum: WGS84

II. Measures

Map B: The region immediately surrounding Marine Plain ASPA.

Map Specifications:

Projection: UTM Zone 44

Horizontal Datum: WGS84

Contour Interval: 20m

Map C: Geological map of Marine Plain ASPA illustrating dykes three underlying rock types: Chelnock Paragneiss, Crooked Lake Gneiss, and Mossel Gneiss.

Map Specifications:

Projection: UTM Zone 44

Horizontal Datum: WGS84

Map D: Sørsdal Formation sketch map of Marine Plain ASPA.

Map Specifications:

Projection: UTM Zone 44

Horizontal Datum: WGS84

Map E: Sketch of Surface Geology of Section of Marine Plain ASPA.

Map Specifications:

Sketch map based on three short (2-7 d) field visits and on study of colour aerial photographs of the area. The area covered by the map is contained within the following coordinates on the Second Edition (September 1982) 1:50000 Vestfold Hills map (Australian Division of National Mapping): north-west corner 825 860; north-east corner 860 860; south-east corner 860 820; south-west corner 825 820. This quadrangle is covered by: Run 4, photographs 2-7; Run 5, photographs 11-16 of 26 January 1979 helicopter colour aerial photography flown at 3050 m. Standard photographs were enlarged by some 3:1 and used as a base for field observation and later extrapolation.

6. Description of the Area

6(i). Geographical Co-Ordinates, Boundary Markers and Natural Features

General Description

Marine Plain ASPA lies approximately 10 km southeast of Davis station in the Vestfold Hills. The Area (23.4 km², 68°37'50.2" S, 78°07'55.2" E) opens into an arm of Crooked Fjord on the southern side of Mule Peninsula, the southernmost of the three major peninsulas that comprise the Vestfold Hills. The Vestfold Hills are a largely ice-free oasis of approximately 512 km² of bedrock, glacial debris, lakes, and ponds, at the eastern side of Prydz Bay, Princess Elizabeth Land.

The Area includes Marine Plain (approximately 3 km²), which occupies the centre of the Area in a north-south orientation. Pickard Ridge (maximum elevation of 70 m) separates this site from Poseidon Basin in the northeast. Both locations are low-lying areas less than 20 m above sea level. Sections elsewhere above 20m are mostly low, rugged hills of Precambrian rock, and characterised at their base by a marked change in slope which may represent a Holocene shoreline. The surface of the lower area below 20 m is marked by a

series of concave-to-the-south recessional moraine ridges. A series of south westerly facing sand slopes occupy Marine Plain east of Burton Lake.

The boundary of the ASPA has been slightly altered along its northern boundaries to reduce the possibility of inadvertent entry from a nearby pedestrian route. Starting at the most northerly point of the Area the boundary description is as follows:

Commencing at 68°36'34"S, 78°09'28"E, then south-easterly to 68°36'45"S, 78°10'30"E; then south-easterly to 68°37'30"S, 78°12'30"E, then south along meridian of longitude 78°12'30"E to its intersection with the northern shore of Pineapple Lake; then west along that shore to the edge of the Sørsdal Glacier; then westerly along the northern edge of the Sørsdal Glacier to its intersection with the low water mark of the north eastern shore of Crooked Fjord; then westerly along the low water mark of the northern shore of Crooked Fjord (cutting across the outlet of Burton Lake into Crooked Fjord) to its intersection with the meridian of longitude 78°03'0"E; then north along meridian of longitude 78°03'0"E to its intersection with the parallel of latitude 68°37'30"S, then north-easterly to 68°36'56"S, 78°05'39"E, then north-easterly to the point of commencement.

Geology and Palaeontology

The three major lithologies forming the Vestfold Hills (Map C) are (in order of age) Chelnock Paragneiss, Mossel Gneiss and Crooked Lake Gneiss. This is repeated in units from east-northeast to west-southwest. Intruded into these, are groups of mafic dykes in a rough north-south orientation (Map C). The dykes are a major feature of the Vestfold Hills.

The Precambrian rock is overlain in low-lying areas (approximately 10–17 m above sea level) by ca 8 m of early Pliocene (ca 4.5-3.5 Ma) diatomite with limestone lenses in the upper half. The limestone contains molluscs, especially bivalves including *Chlamys tuftsensis* Turner. Holocene (ca 6.49 ka) glacial debris disconformably covers the marine deposit (0.5-1 m), extending over an area of 8-10 km². A layer of lenticular sandstone separates the Pliocene and Holocene units.

Low scarps in the Pliocene marine sediments have yielded a diverse array of fossil marine vertebrates and invertebrates. The cetacean specimens occur as large assemblages of vertebral columns, skulls, or complete specimens normally about 2m or more in length, in the upper 2m of the Marine Plain section. The main occurrences are along the margins of locally known "Big Ditch", near Burton Lake, and in the scarp on the eastern side of Marine Plain. One notable cetacean fossil is *Australodelphis mirus* which illustrates a remarkable convergence between living dolphins (Family Delphinidae) and the living beaked whale genus *Mesoplodon*.

Marine Plain has also yielded the first Pliocene decapod crustacean from Antarctica. The specimen is incomplete, making it difficult to identify precisely, although it probably belongs with the Palinuridae. Other species include a beaked whale and baleen whale (and others not yet studied), possibly penguins, fish, bivalves, gastropods, serpulid worms, bryozoans, asteroids, ophiuroids, echinoids and abundant leiospheres that are probably planktonic in origin.

II. Measures

Marine Plain has been subject to significant fluvial activity since the mid-Holocene resulting in small patches of lake sediment on its eastern side. Stream valleys and source lakes (now virtually empty) have been identified.

The Pliocene diatomite at Marine Plain appears to be the only such deposit in the Vestfold Hills. In some areas the Holocene till and glacials are very thin and consequently are easily disturbed. A thin crust over the loose powdery surface is easily crushed by footfall, releasing a plume of diatom and sand rich dust, and leaving a sharply defined, colour-contrasting footprint.

Permafrost occurs below ca 1m depth and the local landforms have evolved due to very slow progressive melting of ground ice. Terrain produced by this process is known as periglacial thermokarst because the resulting depressions give the topography an appearance similar to that of conventional limestone karst.

The Sørsdal Glacier (near the edge of the Antarctic ice sheet) is the southern boundary for the ice-free Vestfold Hills. A 1 km length of the northern edge of Sørsdal Glacier has retreated c. 800 m away from the southern edge of Marine Plain in the 40 years from 1947. This retreat is due to the movement through the deep channel that the glacier fills, and the propensity of ice ridges forming in the glacier and collapsing into Crooked Fjord.

Lakes

Burton Lake is a major feature of the western side of the Area. There are number of unnamed ponds and small lakes within the Area. Burton Lake is seasonally isolated marine lagoon is meromictic and hypersaline, with a maximum depth of 18 m. Burton Lake is ice-covered for 10-11 months of the year and is seasonally connected to Crooked Fjord by a tidal channel approximately 20 m wide and up to 2 m deep. The lake is isolated from Crooked Fjord for about 6-7 months of the year by ice.

The lake contains a range of photosynthetic bacteria. The dominant species are *Chlorobium vibriofome* and *C. limiola* while minor species are *Thiocapsa roseopersicina* and *Rhodopseudomonas palustris*. The lake also harbours psychrophilic bacteria which are relatively uncommon (in Antarctic coastal ice zones), and thrive on the increased availability of nutrients from continental inputs, pelagic algal blooms, and breakout of pelagic algae into the water column from ice melting in the spring and summer. One novel species of bacterium is *Psychroserpens burtonensis*, which has not been cultured from or recorded in any other environment.

Marine algae are abundant in Burton Lake. A diatom floristic study of the lagoon revealed 41 diatom species.

The ultrastructure of *Postgaardi mariagerensis* was reported for the first time from research in Burton Lake. This very unusual organism cannot be regarded as a euglenid but regarded as a member of the clade *Euglenozoa* – *Euglenozoa incertae sedis*. Additionally, Burton Lake is one of two Antarctic lakes from which the first account of choanoflagellates, including *Diaphanoeca grandis*, *Diaphanoeca sphaerica* and *Saepicula leadbeateri* were reported. It is also type location for *Spiraloecion didymocostatum* gen. et sp. nov.

Four metazoan species have been regularly recorded in the zooplankton of Burton Lake: *Drepanopus bispinosus* and *Paralabidocera antarctica* (Copepoda), *Rathkea lizzioides*

(Anthomedusae) and an un-named cydippid ctenophore. In addition, many holotrichia, at least two species of nematode, a large marine amphipod have been recorded in the benthic community, and tardigrades are present.

One species of fish, *Pagothenia borchgrevinki*, has been observed in the lake on one occasion. This species is common in coastal areas and fjords of the Vestfold Hills, although it does not appear to inhabit the lake continuously. Due to the seasonal marine connection, it remains probable that additional algae, zooplankton and fish enter the lake but do not survive the winter.

Vegetation

Mosses and lichens occur in the vicinity of small ephemeral watercourses draining radially down the ‘talus skirt’ fringing the Precambrian hills. Numerous small crevices and cracks in the knoll jutting into the northern end of Burton Lake provide a rich lichen site, while the northern end of Poseidon Lake is rich in mosses. The moss and lichen flora of the Area has not been documented, although the Vestfold Hills supports at least six moss species and at least 23 lichens.

Vertebrates

Several vertebrates occur sporadically within the Area during the summer months between November and February. Two bird species, Wilson's storm petrels (*Oceanites oceanicus*) and Snow petrels (*Pagodroma nivea*) nest in the higher Precambrian rocks, while South polar skuas (*Catharacta maccormicki*) nest on marine Plain and occasionally around the water's edge. Weddell seals (*Leptonychotes weddellii*) and Southern Elephant seals (*Mirounga leonina*) along with Adélie penguins (*Pygoscelis adeliae*) and Emperor penguins (*Aptenodytes forsteri*) also occur in small groups in the Area but have not been specifically studied here.

Climate

Meteorological data for the Area are confined almost entirely to observations at Davis station, 10 km northwest of Marine Plain. The Vestfold Hills area has a polar maritime climate that is cold, dry and windy. Summer days are typically sunny, with a midday temperature from -1C to +3C and a summer maximum of +5C, but temperatures are below 0C for most of the year falling to as low as -40.7C in winter. The maximum temperature recorded at Davis station from 1957 to 2001 was +13°C. The record illustrates the seasonal climate expected for high latitudes, but on average Davis station is warmer than other Antarctic stations at similar latitudes. This has been attributed to the “rocky oasis” which results from the lower albedo of rock surfaces compared to ice, hence more solar energy is absorbed and re-radiated as heat.

6(ii). Special Zones within the Area

None.

6(iii). Location of Structures Within and Adjacent to the Site

There are no refuges within the Area but two refuges are located nearby. Marine Plain Refuge (68°36'54"S, 78°65'30"E) is approximately 150 m north of the northern boundary of the Area. A helicopter landing site is immediately adjacent to this refuge.

II. Measures

Watts Hut (68°35'54"S, 78°13'48"E) is located at the eastern end of Ellis Fjord, approximately 5 km east-northeast of the Marine Plain Refuge and 2.9 km east-northeast of the northern-most point of the Area.

A variety of evidence of research activity remains at Marine Plain. Two parallel lines of small boulders mark out a helicopter landing site 30 m north of a fossil site (68°37'37"S, 78°08'11"E). At this fossil site, a black sheet of polythene (3 m x 1.7 m) held down by rocks is currently covering an excavation site. At the north western side of the embayment, there are approximately 10 wooden stakes 1m high in a rough line, north to south. In the next embayment to the north, three red painted rock cairns form a triangle area (of side length approximately 50 m) remaining from field work in 1980.

Within Marine Plain there also remains plastered hessian covering fossil bones; five shallow unfilled pits; a large unfilled pit (near Burton Lake); a major unfilled excavation occurring on one high flank of a natural trough (the trough locally known as "Big Ditch") and some old filled trench sites. On the north western side of Burton Lake lies a pipe and rope (possibly for lake monitoring).

Boundary markers are to be installed at boundary turning points.

6(iv). Location of Other Protected Areas in the Vicinity

Two Historic Sites and Monuments lay in the Vestfold Hills, at least 25 km north of Marine Plain:

1. On the largest of the Tryne Islands (68° 18'29"S, 78° 23'44"E) in Tryne Bay (29 km north-east of Davis), HSM No. 72 is a cairn and wooden mast, erected in 1935 by Captain Klarius Mikkelsen marking the first landing in the Vestfold Hills area.
2. Walkabout Rocks Cairn HSM No. 6 (68°22'14"S, 78°32'19"E) 40 km north-east of Davis, is a rock cairn erected in 1939 by Sir Hubert Wilkins. The cairn contains a canister containing a record of his visit.

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 ASPA are that:

- it is issued only for scientific (palaeontological, palaeoclimatic, geological, geomorphological, glaciological, biological and limnological) research, or for compelling scientific, educational or cultural reasons, or for essential management purposes consistent with the Management Plan;
- actions do not jeopardise the ecological or scientific values of the Area, or other permitted activities;
- actions are consistent with the Plan of Management;
- the Permit (or copy) shall be carried within the ASPA;
- a visit report shall be supplied to the appropriate national authority within three months of the expiry date of the Permit; and
- Permits shall be issued for a stated period.

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

- Movement within the ASPA should be kept to a minimum with every reasonable effort made to minimise impact. The brittle surface crust is easily crushed under foot, risking damage to fossil material and long-term evidence of human impact. Where possible, movement on Precambrian areas is preferred, while movement on the scarps is to be avoided. All movement should be undertaken carefully so as to minimise disturbance to the soil, vegetation, diatomite, thermokarst, sediment outcrops and other geofeatures that provide scientific and environmental value to the site. Landing of aircraft and the use of vehicles is prohibited on the Sørsdal Formation.
- Normally the helicopter landing site is immediately adjacent to the Marine Plain refuge should be used. In order to minimise foot traffic within Marine Plain, a helicopter landing site within the ASPA may be authorised for a particular visit. The landing site shall be:
 - measured against overall usage in keeping with protected area status;
 - on a debris free Precambrian bedrock surface (Map E) where minimal disturbance can be caused by the aircraft to water bodies, vegetation or sediment deposits; and
 - at a location that will minimise the impact of passage to the intended research site.
- Motorised boats are not to be used on Burton Lake.
- Over-flight of lakes should be kept to the minimum necessary to achieve specific research or management requirements.
- Movement within the ASPA by vehicle is prohibited.

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

The following activities may be conducted within the ASPA throughout the year provided access requirements can be met:

- compelling scientific research which cannot be undertaken elsewhere and that will not jeopardise the values of the ASPA;
- sampling, which should be the minimum required for the approved research programs;
- sampling of lakes, ensuring equipment is washed before entry to the ASPA to prevent contamination from other lakes; and
- management activities, including monitoring.

7(iii). Installation, modification or removal of structures

Any structures erected or installed within the Area are to be specified in a Permit. Permanent structures or installations are prohibited. Scientific markers and equipment must be secured and maintained in good condition, clearly identifying the permitting

II. Measures

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. Removal of equipment associated with scientific research before the Permit for that research expires, shall be a condition of the Permit. Details of markers and equipment left *in situ* (GPS locations, description, tags and expected “use by date”) should be reported to the permitting Authority.

7(iv). Location of field camps

Parties should not camp in the Area but use the Marine Plain Refuge (68°36'54”S, 78°6'30”E; see 6(iii)).

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

- No living animals, plant material or microorganisms shall be deliberately introduced into the ASPA and the precautions shall be taken against accidental introductions.
- No herbicides or pesticides shall be brought into the ASPA. Any other chemicals, including radio-nuclides or stable isotopes, authorised for scientific or management purposes, must be removed from the ASPA at or before the conclusion of the activity for which the Permit was granted.
- Organic material (wood, cotton, hessian, etc.) is not to be used for scientific markers or other research unless absolutely necessary. Inorganic materials (stainless steel, polythene, etc.) are to be used.
- Fuel is not to be stored in the ASPA unless required for essential purposes connected with the activity for which the Permit has been granted. Fuel must be removed from the ASPA on or before completion of the associated activity. Permanent fuel depots are prohibited.
- 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 to the environment is minimised.

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

The taking of 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 and removal of anything not brought into the Area by the Permit Holder

- Sample material may be collected or removed from the ASPA 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, displace, remove or damage such quantities of rock, soil,

- 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*. In this event, the appropriate national authority should be notified.

7(viii). Disposal of waste

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

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

- Permits may be granted to enter the ASPA to carry out monitoring and site inspections, which may involve the small-scale collection of samples for analysis or review, or for protective measures.
- Any specific sites of long-term monitoring shall be appropriately marked.
- To help maintain the geological, palaeontologic, geomorphological, biological, limnological, and scientific values of Marine Plain, persons shall take special care walking or skiing over slopes, moraines, rock exposures and diatomite soil. To minimise the risk of damage to these values, foot traffic to and from, Marine Plain and the plain south of Poseidon Basin and east of Pickard Ridge, shall be restricted wherever possible.
- To help maintain the ecological and scientific values derived from the relatively low level of human impact within the ASPA, special precautions shall be taken against introductions. Of particular concern are microbial or vegetation introductions sourced from soils at other Antarctic sites, including stations, or from regions outside Antarctica. To minimise the risk of introductions, footwear and any equipment to be used in the Area shall be thoroughly cleaned – particularly sampling equipment and markers – before entering the ASPA.
- The closure and securing of excavation sites during and at the completion of an activity should ensure to the extent reasonably possible, stratigraphic integrity is preserved and endolithic communities are maintained. Recommended measures include the placing of excavated soil on polythene sheet of adequate thickness, the replacing of soil/sediment in layers in the order in which it has been removed, the replacing of larger clasts by correct orientation, the removing of unnatural surface irregularities, and the reorientation of rock and till during closure.
- Abandoned scientific equipment shall be removed, and excavations rehabilitated, to the maximum extent possible.

7(x). Requirements for reports

Parties should ensure that the principal Permit Holder for each Permit issued submits to the appropriate national authority a report on activities undertaken. Such reports should

II. Measures

include, as appropriate, the information identified in the Visit Report form contained in Appendix 4 of Resolution 2 (1998)(CEPI). 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 Plan of Management. 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 both in any review of the management plan and in organising the scientific use of the Area.

8. Supporting Documentation

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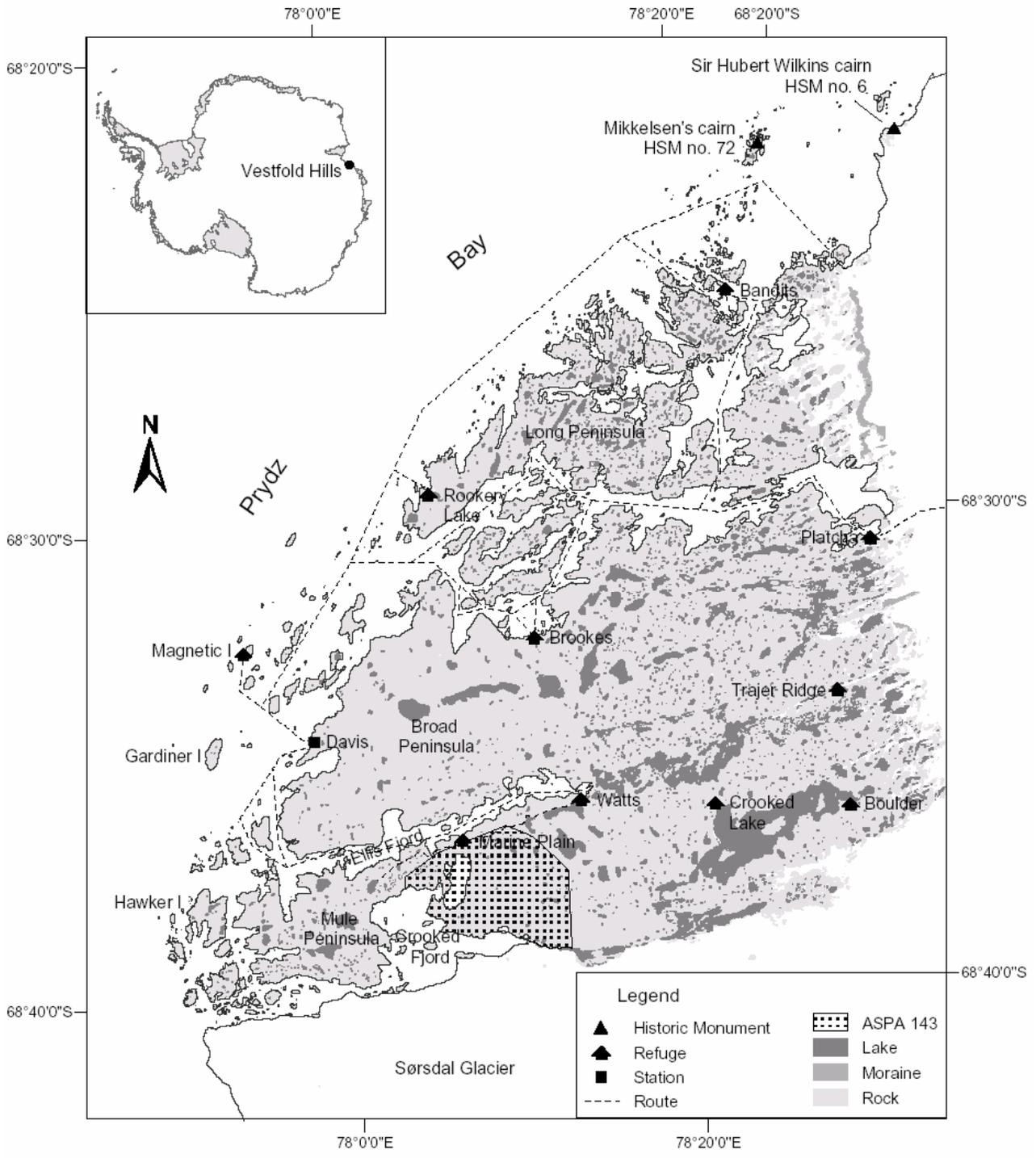
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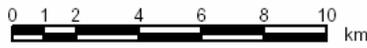
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Map A Marine Plain, Antarctic Specially Protected Area, Vestfold Hills, East Antarctica



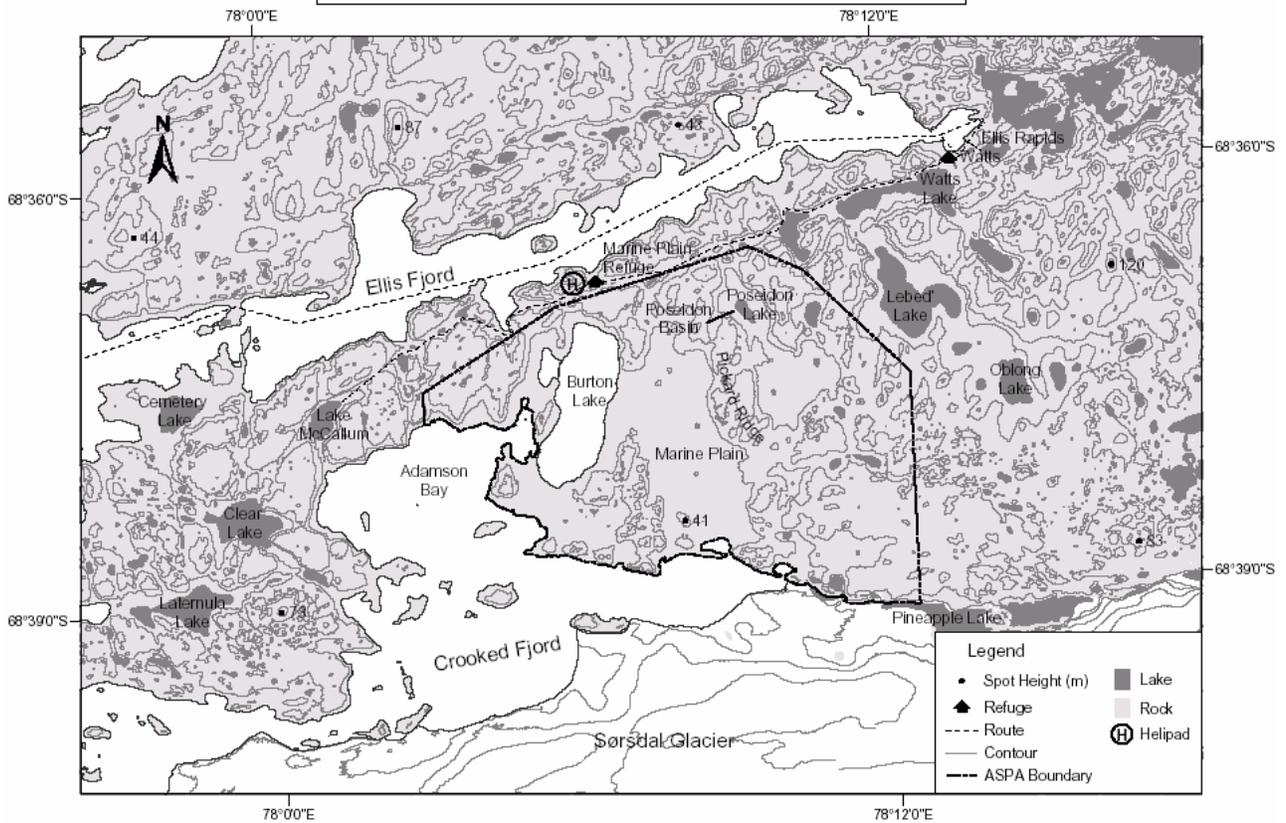
Horizontal Datum: WGS84
 Projection: UTM Zone 44



Produced by the
 Australian Antarctic Division,
 July 2002.



Map B Marine Plain ASPA, Vestfold Hills, East Antarctica



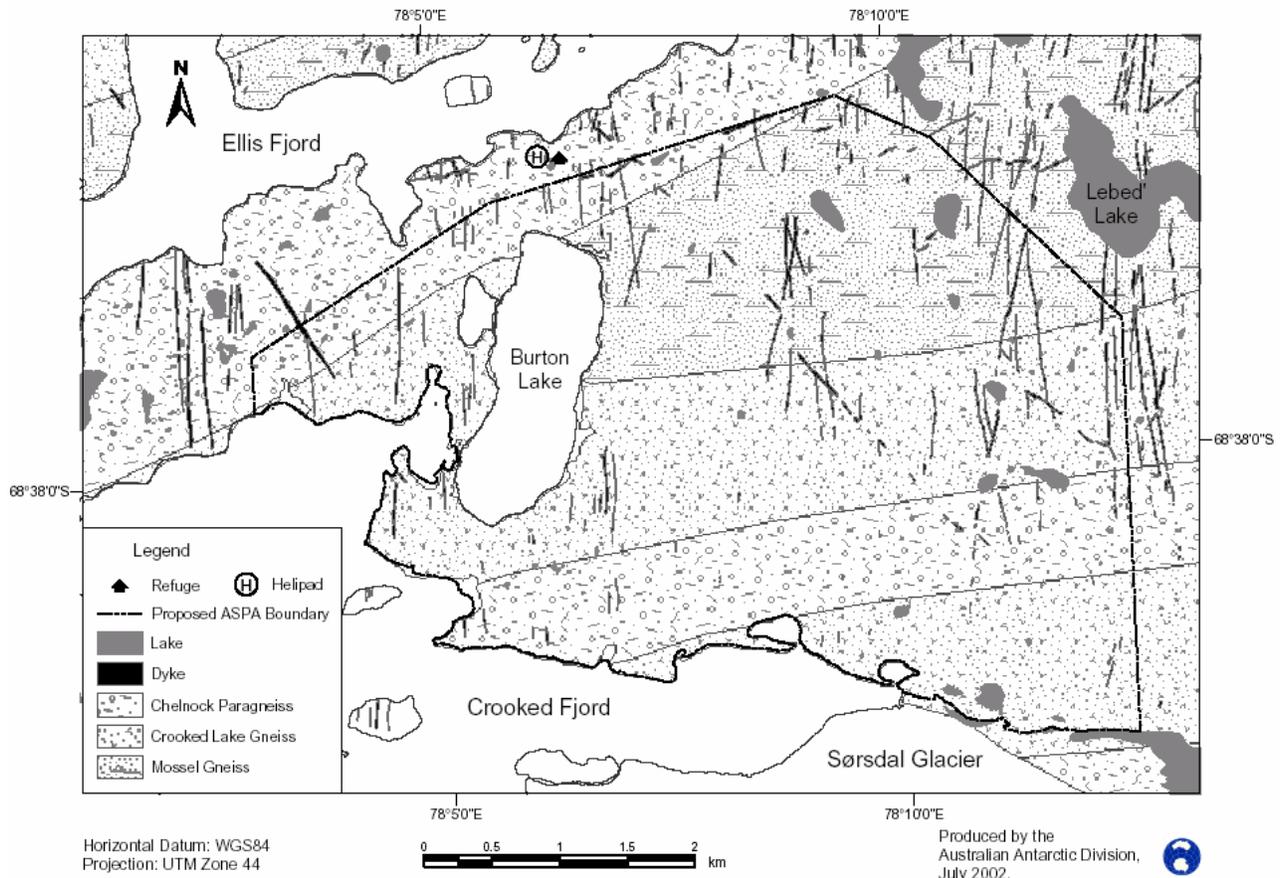
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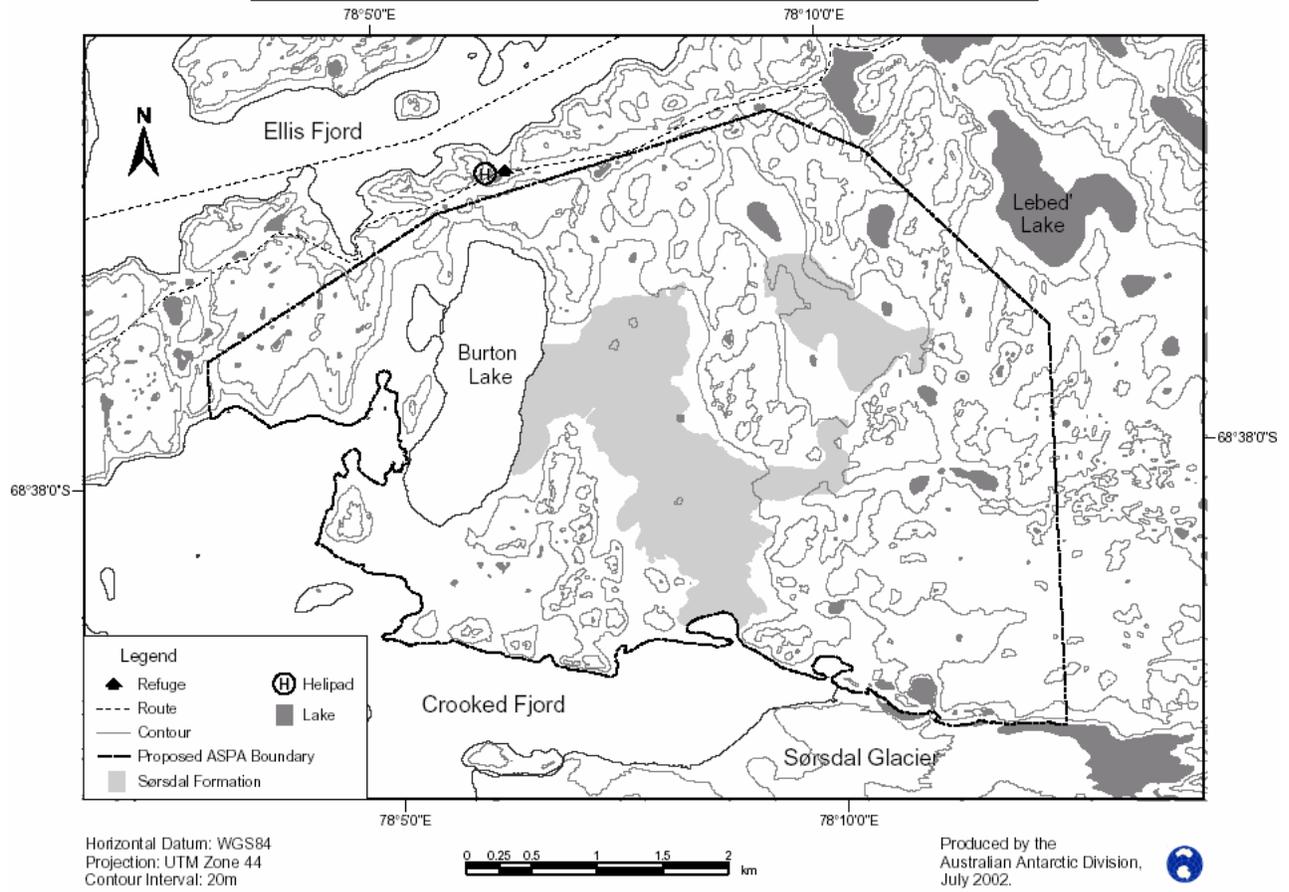
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II. Measures

Map C Basement Geology, Marine Plain ASPA, Vestfold Hills.

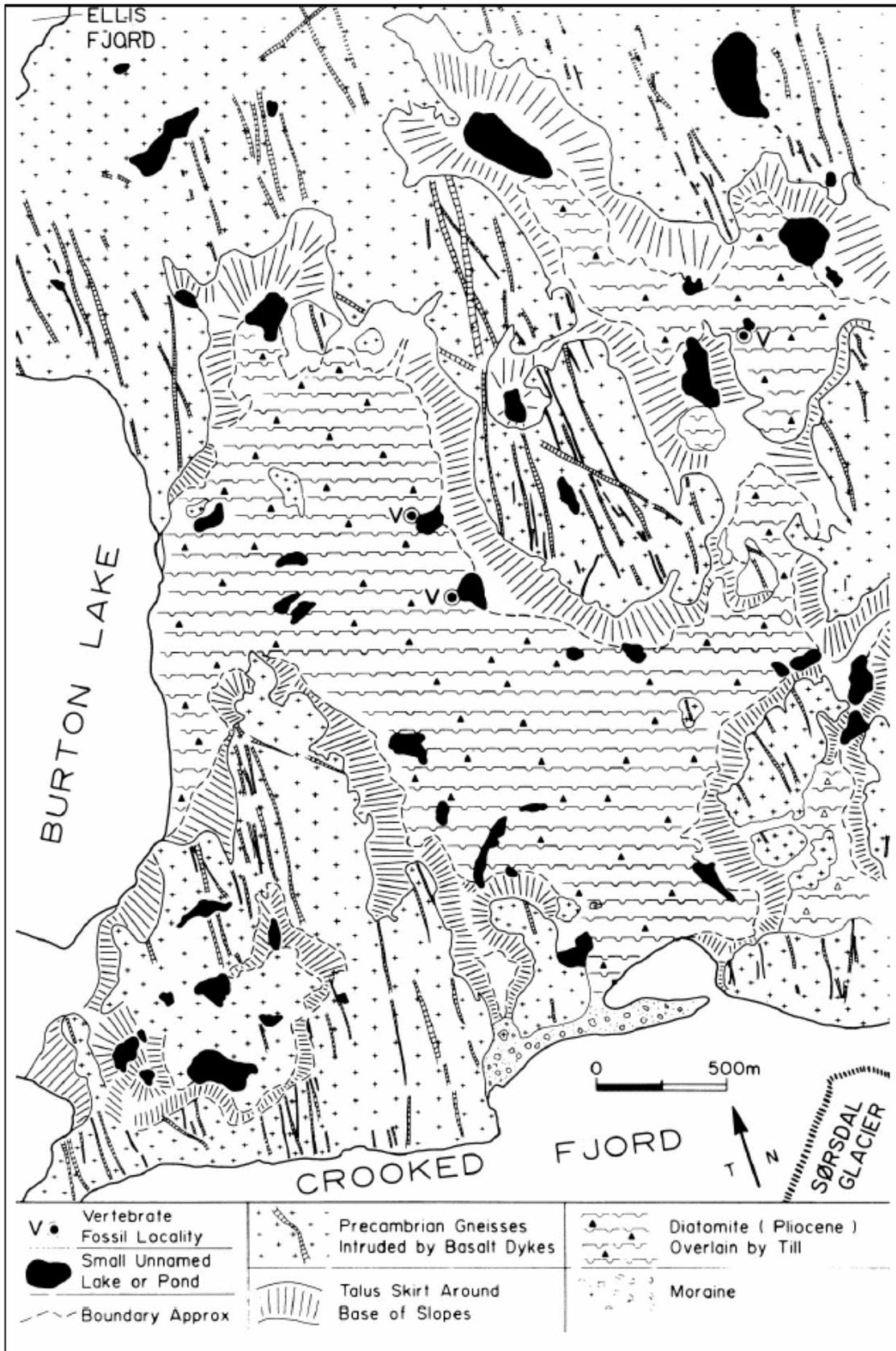


Map D Sørsdal Formation, Marine Plain ASPA, Vestfold Hills.



II. Measures

Map E Sketch Map of Surface Geology of Section of Marine Plain ASPA No. 143, Vestfold Hills



Sketch map of surface geology of section of Marine Plain ASPA, indicating Precambrian Gneisses which may be suitable for helicopter landings. Landing on the diatomite and till of the Sørsdal Formation is prohibited. (from Quilty, 1991), see section 7(i) of Marine Plan ASPA Management Plan