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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

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PRELIMINARY REPORT ON OPERATIONS FROM MAWSON BASE, AUSTRALIAN NATIONAL ANTARCTIC RESEARCH EXPEDITION, 1954-1955

by

B.H. Stinear

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SECTION PAGE NO.

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PRELIMINARY REPORT ON OPERATIONS FROM MAWSON BASE.

AUSTRALIAN NATIONAL ANTARCTIC RESEARCH EXPEDITION

1954 - 1955.

1. ESTABLISHMENT OF MAWSON STATION

(1) Introduction.

Mawson Base of the Australian National Antarctic Research Expedition is located on a horseshoe-shaped area of ice free rock extending out from the continental ice sheet of the Antarctic mainland, in Latitude 67° 36' 21"S., and Longitude 62° 52' 48" E.

Major features of the location are its accessibility to the ice plateau, thus permitting year-round travel into the interior, and its proximity to four prominent coastal ranges and numerous islands extending in an unbroken chain for nearly 200 miles westward.

The base had a complement of 10 men who were selected from Government Departments and industry. The members of the first wintering party at Mawson in 1954 were:-

R.G. Dovers,	Officer-in-charge and Surveyor
R.J. Dingle,	Meteorologist
J.D. Gleadell,	Cook
W. Harvey,	Carpenter
L.E. Macey,	Technical Superintendent
J.R. Russell,	Engineer
G. Schwartz,	French Observer
B.H. Stinear,	Geologist
W.J. Storer,	Radio Operator
R.O. Summers,	Medical Officer

Transportation facilities initially included 3 weasels, 1 tractor and 25 dogs.

Three major journeys were successfully completed during the year:

(a) Eastern journey to Scullin Monolith,

(b) Western journey to King Edward VIII Gulf,

(c) Southern journey to nunataks 150 miles S.S.E. of Mawson.

The areas visited by the Expedition and the location of its Base are shown on Plate 1.

(ii) Historical.

The area of the Antarctic land mass, including the adjacent islands and the firmly attached shelf ice, is nearly 5,500,000 square miles, almost all of which lies within the Antarctic Circle. Antarctica is almost completely covered by an ice cap of varying thickness, the average depth of which has been estimated at 2,000 feet. Exposed land occurs in the form of bare mountain peaks; "oases" or areas of exposed land essentially at glacial level and surrounded by glacial ice, eg. Vestfold Hills; sea cliffs; exposed islands and glacial moraines. The total area of such rock outcrops occurring on the continent itself may not exceed 10,000 square miles, the bulk of which is probably distributed along the Ross Sea coasts. The lack of accessibility and the short and infrequent periods of time available for field research in the Antarctic have imposed serious limitations to the scientific investigation of this continental area.

For several years before the last war, Sir Douglas Mawson had stressed the importance of Australia taking an active interest in her Antarctic Dependencies. However, since no definite plans had been formulated by 1939, it thus became necessary at that time to defer any further idea of an immediate Australian expedition to the Antarctic. After the war, interest in Australia's southern Dependencies was again aroused and various committees were formed and plans discussed. On 28th. May, 1947, Group Captain S. Campbell was appointed leader and chief executive officer to organise an expedition, and an Antarctic Planning Committee was appointed to advise the Government. On 16th. August, 1947, Cabinet agreed to the setting-up of scientific and meteorological stations on Heard and Macquarie Islands and to the carrying out, by the "Wyatt Earp", a systematic reconnaissance of the coast of the Australian Antarctic Territory over a number of years, with a view to establishing eventually, a permanent scientific station on the Antarctic continent. In December of the same year a party was landed on Heard Island and in March, 1948, the Macquarie Island Station was established. During February and March, 1948, the "Wyatt Earp" cruised along the coast of King George V Land, but owing to heavy pack ice conditions it was found impossible to approach the coast, hence no landing could be made. The cruise showed however, that the "Wyatt Earp" was not suitable for any long range reconnaissance, and as a result further exploration work along the Antarctic coast was suspended, pending the availability of a more suitable vessel.

At the end of 1948, the Antarctic Division of Department of External Affairs was established, whose functions were to direct the operations of the A.N.A.R.E., and advise the Government upon all matters appertaining to Australian interests in the Antarctic. Mr. P.G. Law was appointed Officer-in-charge of the Antarctic Division as from 1st. January, 1949.

Although the earlier recommendations for the establishment of a scientific base on the Antarctic mainland were kept under active consideration, five years elapsed before further definite planning was undertaken. Late in 1952, the Executive Planning Committee of the A.N.A.R.E., recommended to the Australian Government that a new Station be established on the coast of Mac-Robertson Land, western Australian Antarctic Territory, at the earliest opportunity, and that the new Danish polar vessel "Kista Dan" be chartered to assist in this project. Government approval was given to the proposal on 6th. February, 1953.

The region chosen for the new Station is in a comparatively well-known part of Antarctica, a number of explorers having visited the coast of the area at various times. On 2nd. March, 1831, Captain Biscoe who was in command of Enderby Brothers' vessel

"Tula" sighted for the first time a portion of the Antarctic continent - Cape Ann, in Enderby Land. The first recorded landing on the mainland of the Antarctic continent, exclusive of possible landings of sealers on the northern portions of Graham Land, was undertaken on 24th. January, 1895, by a Norwegian, H.J. Bull, at Cape Adare, at the easterly inlet to the Ross Sea.

A number of expeditions concerned with and equipped for scientific exploration were sent in to the Antarctic during the period between this first landing and the First World War. Also, during the past 27 years many important scientific expeditions, led by Mawson, Wilkins, Byrd and others, have added greatly to the scientific knowledge of Antarctica. Sir Douglas Mawson led three major scientific expeditions to the Antarctic, viz. the Australasian Antarctic Expedition of 1911-1914 and the British Australian and New Zealand Antarctic Research Expedition of 1929-1931, when many important territorial claims were made for the British Crown. Sir Hubert Wilkins, for the first time, employed with success aviation as a means of exploration in the Antarctic. On his first flight over Graham Land on 20th. December, 1928, Wilkins took the first Antarctic aerial photographs which proved later to be of great value.

In recent years, landings have been made along the coast of the western sector of Australian Antarctic Territory by the following expeditions:-

(A) Enderby Land. (Comprises that portion of the Antarctic continent lying between 45°E. and 55°E. Long.)

(a) Riiser Larsen, on 22nd. December, 1929.

(b) Sir Douglas Mawson, at Proclamation Island, 13 Jan. 1930.

(B) Kemp Land. (55°E. - 60°E. Long.)

(a) Sir Douglas Mawson, at Cape Bruce, 18th. February, 1931.

(b) Mr. G.W. Rayner and Commander C.R.U. Boothby, at Bertha Island, William Scoresby Bay, 27th. February, 1936.

(C) Mac-Robertson Land. (60°E. - 73°E. Long.)

(a) D. Mawson at Scullin and Murray Monoliths, 13th. Feb. 1931.

(b) Klarius Mikkelsen at MacKenzie Bay, February, 1931.

(c) Rayner and Boothby, at Scullin Monolith, 26th. Feb. 1936.

(d) Lars Christensen, at Scullin Monolith, 30th. January, 1937

(D) Princess Elizabeth Land. (73°E. - 86°E. Long.)

(a) Klarius Mikkelsen at Vestfold Hills, 20th. February, 1935.

(b) Lincoln Ellsworth and Sir Hubert Wilkins, at Svenner Islands, 3rd. Jan. 1939; Rauer Islands, 6th. Jan. 1939; Vestfold Hills, 9th. January, 1939.

(c) A.N.A.R.E. at Vestfold Hills, 3rd. March, 1954.

(d) A.N.A.R.E. at Vestfold Hills, 30th. January, 1955.

(e) A.N.A.R.E. at Lorten Island, 4th. February, 1955.

Comprehensive aerial photographs of the Antarctic coastline between Long. 45°E. and Long. 86°E. were taken by the Lars Christensen Expedition, 1937, and by the U.S. Operation High Jump, 1947. Reports and photographs indicated that certain regions of this area were generally rich in rock features and were reasonably accessible from the sea.

Details of the localities visited by the earlier expeditions recorded above, are shown on Plate 2.

(iii) Narrative.

On 4th. January, 1954, the "Kista Dan" sailed from Melbourne with personnel, stores and equipment required for the establishment of the new A.N.A.R.E. Station on the Antarctic mainland. Calls were made at Heard Island from 19 - 21st. January, and at Iles de Kerguelen from 22 - 27th. January. After leaving Kerguelen, a course was set almost due south for Mac-Robertson Land; the first ice was seen on the evening of 30th. January, at approximately Latitude 61° 52' S. and Long. 65° 50' E. The ship entered the pack ice belt on 1st. February, at approx. Lat. 66°S. and Long. 63°E. Six days after leaving Kerguelen, the coastal ranges of this sector of Mac-Robertson Land, viz. Henderson, Masson, David and Casey, were sighted. Progress through the pack was satisfactory until fast ice which averaged 3 feet in thickness was encountered some 20 miles off the coast. Whilst the "Kista Dan" was endeavoring to force its way through this belt of fast ice, full use was made of the Auster aircraft whenever conditions permitted. On 4th. February, with Sgt. R. Seaver, pilot, an aerial reconnaissance of the coastal ranges was undertaken and once again, useful information was obtained. The ship's progress through the fast ice continued to be very slow and it was 11th. February, before the "Kista Dan" anchored in the horse-shoe shaped harbour that had been selected as the most promising site for the new Station during an aerial reconnaissance on 2nd. February. Aerial photographs taken during the U.S. Operation High Jump, 1947, and supplied by the U.S. Navy, had aided materially in selecting this most favorable location for the base.

Unloading operations commenced on 13th. February, and that afternoon the Australian flag was raised on the mainland and the Station named "Mawson". Work continued uninterruptedly for 16 hours a day and by the afternoon of 17th. February, the unloading of 400 tons of cargo including stores, huts, plant and equipment had been completed. During the next five days, before the ship departed, three huts were erected, aircraft operations were resumed, geological specimens were collected, gravity and magnetic observations were made, and many other tasks were undertaken to assist the wintering party as far as possible in the establishment of the new Station.

2. OPERATIONS AND EXPLORATIONS

(i) Station Construction.

The "Kista Dan" sailed from Mawson at 1130 hours on 23rd. February. Long days of hard work followed, during which time the entire efforts of the wintering party were directed to the erection and fitting up of all the buildings. All the major construction work which included six buildings, power-house installation, etc., was completed by the end of March, and the Station generally was brought into operational order in early April.

The Station is situated on the northern slopes of the southern arm of a horseshoe-shaped area of ice free rock, whose eastern and western arms extend out from the ice sheet of the Antarctic mainland into the sea, thus providing a good harbour within the bay with deep water from 60 - 90 metres only 100 yards from shore. All buildings are erected on solid rock, the space between the floors and irregular rock surfaces being filled up with morainic material collected from the adjacent slopes which provide a small amount of shelter from the prevailing winds.

Details of the general lay-out of Mawson station are shown on Plate 3.

(ii) Operations.

Although the base had been reported fully operational, much work remained to be done before the winter set in. Every opportunity was taken to secure seal meat as a winter supply for the dogs, and whenever possible, work was concentrated on tasks which had yet to be completed out-doors. The meteorological station was operational by the end of February, and the Dines Anemometer was recording on 1st. May. A summary of meteorological observations made at Mawson during the year is given in Appendix C.

In the latitude of Mawson, the sun is below the sensible horizon at noon from early June until the beginning of July, but during the hours near noon there is a considerable amount of twilight. At that time of the year therefore, necessary outdoor camp work was performed during the middle of the day and the remainder of working hours was devoted to lectures, plans and physical preparations for spring and summer journeys. The duties of every member of the party were defined, but everybody shared in some degree in the general work around the Station, such as routine maintenance, kitchen duties, night watch, etc.. When summer returned, considerable time was spent on building maintenance and Station improvements, so that when the "Kista Dan" arrived at Mawson on 9th. February, 1955, the base generally was in good order. The first annual changeover of Mawson Station was completed at 1415 hours on 1st. March, when the "Kista Dan" sailed for Melbourne via Heard Island and Iles de Kerguelen. No difficulty was experienced with pack ice on the way north, and after spending 4 days at Heard Island and one day at Kerguelen, the journey was concluded at Melbourne on 23rd. March, 1955.

(iii) Reconnaissance Journeys.

The scientific work carried out at Mawson was not only meteorological, but comprised also important geological, geographical, glaciological and oceanographic investigations. One of the major problems confronting the operations at Mawson was to explore the plateau region south of the base and find a route through or around the coastal ranges which would ensure safe travel for weasel and sledging parties proceeding into the interior. In 1932, Sir Douglas Mawson stated that he was strongly of the opinion that Mac-Robertson Land would form one of the best bases for access to the interior of the Antarctic continent. As has been proved since, Mawson Station has indeed fulfilled this claim.

Any sort of field work on the Antarctic continent presents more than ordinary difficulties. A primary problem of all Antarctic expeditions is to find a suitable location for a base camp as close as possible to the scene of field operations. Closely associated with the location of bases is the problem of transportation. Fortunately, conditions at Mawson allowed for full use to be made of mechanical transport, although it was proved that there is no satisfactory substitute for dog teams when working in mountainous Antarctic terrain. A further problem associated with more distant journeys on the plateau is the brevity of the Antarctic summer season which lasts at the most for approximately 3 months only. The time that ~~xxxx~~ can be spent on actual field work during extended plateau journeys is further restricted by the necessity of returning to base in early January in order to complete all work before the annual relief at the beginning of February. The weather too, is a controlling factor, subject to sudden and violent changes which on outward journeys in particular, may cause the loss of a number of days work on account of wind and snow and associated bad visibility. Travel in mountainous areas is further handicapped by crevasses which often result in wide detours being necessary to avoid dangerous areas. In many cases, outcrops which would otherwise be easy to reach are inaccessible because of the "bad ice" conditions around them.

It must be appreciated, therefore, that field work in the Antarctic is slow, difficult and at times hazardous. The results of such work are necessarily meagre when compared with results acquired by the expenditure of an equal amount of time and effort in temperate latitudes.

On all major sledging journeys a Wild T.2 Theodolite was carried for survey and navigation purposes. During the spring and summer journeys, whenever possible, the practice was adopted of taking morning and evening longitude determinations, with a noon latitude, carrying position lines by course and distance. All courses were run on the astro-compass and distances were measured by weasel speedometer or sledge-meter. Radio equipment mounted in each weasel consisted of one SCR.694C. set complete, and in the dog sledge was carried one Gibson Girl transmitter with a battery-powered SCR.694C. receiver. During operation, a full wave-length antenna was laid out direct on the snow or ice and was always oriented towards or away in the azimuth of Mawson Station. Time signals ex WWVH were relayed from base at least once per day so that accurate rates on the chronometers could be maintained. All parties were provided with aneroid barometers for recording heights and for meteorological observations. For future work on the plateau, it is considered that 10,000 ft. altimeters should be supplied to each party. The standard barograph set up at Mawson was used as the control instrument for all survey aneroids. Meteorological observations were logged by all field parties at regular intervals each day. Magnetic variation was determined at several selected localities, east, west and south of Mawson base.

During the year, the following weasel and dog-sledge journeys were undertaken by parties operating from Mawson:-

(a) The first exploratory trip to the Henderson Range, using one weasel, was undertaken on 11th. April. A satisfactory route was found through the crevassed coastal area, after which the ice slopes, although steep and very slippery, presented reasonably good travelling until a dangerous crevassed zone was encountered about one mile from the north-east end of the Range. Time and conditions did not permit a reconnaissance through this zone. In failing light, the return to base was commenced; the outward tracks which had been marked by trail flags were followed back to the Station, which was reached in darkness.

(b) On 26th. April, the second reconnaissance party driving two weasels with caravan and sledges in tow, left base for Mt. Henderson. The earlier route was followed and camp was established near the crevassed area which had not been negotiated on the previous journey. A foot reconnaissance was carried out across this zone during the following two days, when it was evident that there was no safe route across for weasel transport. A brief visit was made to the north-eastern member of the Henderson Range and several geological and botanical specimens were collected. The following day the party descended along the flagged route to a point about 3½ miles N.N.W. of Mt. Henderson. From this position a reconnaissance was made around the west and south-west side of the mountain; one area of crevasses was safely negotiated and the route was considered satisfactory for weasel transport. Deteriorating weather, rising drift and bad light prevented further progress south, so, with the object of marking out a safe route through the mountains achieved, the party returned to base under extremely difficult conditions.

(c) During the next few weeks final preparations were made for a major sea-ice reconnaissance to the east. The initial object of the journey was to visit the Scullin and Murray Monoliths, approximately 110 miles east of Mawson, and to carry out scientific observations there; then to proceed eastwards exploring the coast around Cape Darnley and southwards into the MacKenzie Sea as far as petrol and party security permitted. The trip was the first of its type undertaken in the Antarctic for the entire journey was made in weasels over sea-ice in winter; there was little daylight so the party travelled mainly by starlight and moonlight.

The eastern coastal journey commenced on 17th. May, the party consisting of 4 men, 2 weasels, 2 sledge caravans, 2 weasel sledges and one emergency man-hauling sledge. Five months' rations were carried to cover the risk of the party being stranded by a break-out of sea-ice. The first camp was established on Austskjera Island, 34 miles from base, where the party was delayed for a day by a blizzard; two geological specimens were collected during this period. The journey was continued as soon as the weather improved and the next camp was made 60 miles further on, in a small bay surrounded by cliffs of the continental ice sheet. When the party arrived at the Scullin Monolith late on 20th. May, winds of hurricane force were encountered, heavy drift was blowing overhead and the moon was completely obscured. There are no islands or rock exposures along the coast between Austskjera and the Monolith and no places were observed where the continental ice slope could be gained, as generally, ice cliffs rise sheer from the sea-ice to a height of about 150 - 200 feet. After arriving at the Scullin, a search was made around the bay by weasel headlights for a place of access to the rock from the sea-ice, but under the conditions existing, rock cliffs appeared to rise sheer from the sea throughout the length of the Monolith. It was found necessary therefore, to camp on the sea-ice. Unfortunately the hurricane increased in force during the night, and at dawn thin cracks were observed to be developing in the sea-ice, the result of a heavy ocean swell. From then on, the break-up of the sea-ice was rapid, and a few minutes later the bay was a mass of broken ice and detached floes, the largest of which measured about 20 X 30 feet, all heaving up and down in the heavy swell. Every effort was made to reach a small inlet about half way along, but there, 20 feet of swirling brash ice separated the loose floes from the shore. At this stage, there appeared to be no hope of saving the weasels; from then on the party was fighting for mere survival. The sledge caravan containing the emergency rations offered the only hope for the party's survival, so attempt after attempt was made to haul the caravan ashore by using a chain block and laboriously winching by hand. By this time, exposure was taking its toll of the party, and when a large hole was smashed in the hull of the caravan by a jagged floe, it became evident that under the prevailing conditions, the caravan could not be hauled across the water from the floe on which it was floating to the land attached ice. A line was made fast between the caravan and the rocks, a distance of about 100 feet, and the party then battened down in the caravan for the night. The bombardment by flying ice continued throughout the night, accompanied by the jarring and scraping of moving ice floes as they piled against the thin plywood hull. Conditions improved the next day and at dawn it was possible to survey the damage. One weasel was over on its side and hopelessly jammed between two floes; the other weasel however, was still upright on a detached floe, but the doors had been blown out and other superficial damage was evident. The wind-shattered wreck of the second caravan and the two weasel sledges were floating around on other floes, whilst the man-hauling sledge was washing about in the sea in the tide crack. The tide crack had frozen over by 28th. May, when the living caravan was winched across on to land based ice. On 30th. May, a hidden rock platform was discovered and the remaining weasel was then driven across the dangerous tide crack on to land. Four days later, all sledges, caravan and equipment that could be salvaged were transferred to this beach; all attempts at salvaging the capsized weasel were unsuccessful.

At this stage, plans were formulated for the return to Mawson and preparations proceeded whenever conditions permitted. The prospect of an 80 mile journey to the nearest land over newly frozen sea ice, under the prevailing weather conditions, was not a pleasant one. It was apparent that in order to accomplish the journey safely and in the minimum of time, relatively fine weather and a full moon, since there was practically no daylight at this time of the year, were essential. The party was ready for departure on the morning of 13th. June; that afternoon the weather cleared suddenly so the return journey was commenced. Within a few hours the weather deteriorated again almost as rapidly as it had cleared, and the party was finally halted by a full blizzard when 70 miles out from the Monolith. Another enforced camp on the sea ice resulted. Fortunately, about 12 hours later, the snow drift stopped but the wind continued at 60 m.p.h. The improved visibility enabled the party to proceed and the remaining 10 miles to Austskjera were completed with some difficulty, as it was found necessary to relay sledges one-by-one in 2 mile stages over very slippery ice and heavy drifts. An hour after the party reached the island the weather broke once again and a full blizzard blew for the next four days. Conditions cleared early on 19th. June; an immediate departure was made for Mawson and after further relaying of loads over heavy snowdrifts, the party finally arrived back at base late that morning.

Whilst at the Scullin Monolith, weather conditions prevented any extensive field work being undertaken; hurricane force winds and heavy drift generally prevailed. Geological investigations were carried out on four days when representative rock samples of the area were collected. Tidal, magnetic and astronomical observations were also made, but a large part of these results were later destroyed in a weasel fire.

(d) On 26th. July, another weasel trip was made to Mt. Henderson to measure glaciological stakes along the route. The north-western end of the Range was examined and three rock specimens and ten erratics were collected. Since the previous journey to Mt. Henderson in April, snow drifts had disappeared and the net ice ablation over the three month period was three inches.

(e) Another one day reconnaissance to the Henderson Range was undertaken on 4th. October, when a site for a depot was chosen near the south-west end of the Range. Glaciological observations were made along the route and a brief geological investigation was made of the southern area of the Range.

(f) Planning and preparations for the western journey commenced soon after the return from the Scullin Monolith. Dogs had to be trained, equipment built up and plans organised to the last detail. The western dog-sledging party finally departed from Mawson on 12th. October; the plan of operations was to proceed along the coast over the sea ice to King Edward VIII Gulf. The object of the journey was to survey the coasts of Mac-Robertson Land and Kemp Land for approximately 175 miles west of Mawson to King Edward VIII Gulf, and to explore the region that lies inland from the Gulf; geological and oceanographic investigations were to be undertaken whenever possible.

For the first week, sledging over the sea ice was heavy going and at times hazardous owing to a thick cover of soft new snow which held up the sledges and concealed wide cracks in the ice. On 21st. October, the party discovered an Emperor Penguin rookery at Bretangen, about 60 miles west of Mawson, close to Cape Bruce. Progress westwards continued to be slow due to weather and surface conditions. The party finally reached Kvarsnes, a coastal rock outcrop at the north-east entrance of King Edward VIII Gulf, on 28th. October, and there established a depot before proceeding southwards three days later to determine the extent and configuration of the Gulf. Inside the Gulf, sea ice was replaced by shelf ice which afforded relatively good travelling. The party sledged south-eastward down the extent of the Gulf for 60 miles and returned to Kvarsnes on 8th. November. During this part of the journey several inland mountains were observed, but no islands or coastal outcrops were found. The journey back to Mawson was completed 14 days later, during which time several astrofixes were made at identifiable points along the track and 36 hours' tidal observations were made at Mule. The total sledging distance was 550 miles and the average distance covered on travelling days was 19.5 miles per day.

A continuous chain of islands extends between Mawson and the Gulf; also many rock exposures were observed along the coast. Many islands and coastal outcrops were examined and a representative series of rock specimens were collected on the outward and return journeys.

(g) The establishment of the Henderson Depot, which was sited on 4th. October, (refer to section (e) above), was undertaken during early November. The first trip with supplies of seal meat for dog food was made on 13th., and on the following day a sledge caravan loaded with field rations was towed to the Depot. The remainder of the Depot supplies consisting of food and fuel were unloaded at the site on 17th., and another trip was made from base the next day to re-flag the route to the Depot. On each of these trips to Mt. Henderson, glaciological and geological observations were made whenever time and conditions permitted.

(h) It was planned to establish a second depot on the plateau in a position approximately 50 miles south-east of Mawson. The plateau south of the Henderson Depot was almost unknown, since the only reconnaissance of the route that had been possible was a brief aerial flight over the area in the previous February. To explore a route south and to establish the proposed new depot, a weasel and dog reconnaissance party left base on 2nd. December. Three zones of crevassing were negotiated and a relatively good route south was marked at regular intervals by trail flags. Unfortunately, the weasel broke down 48 miles out, so it was necessary to return to Mawson by dog team, the party reaching base on 6th. December.

(i) A party of four men with two dog teams left Mawson on 9th., carrying replacement parts for the weasel, which was reached the next day. Repairs were effected and an immediate return was made to base the ~~next~~ following day. The depot known as the 50 Mile Depot was established at the site of the weasel break-down.

(j) As a result of the delays experienced during the depot reconnaissance, the main southern journey did not commence until 13th. December, one week behind schedule. The party consisted of 3 men, one weasel, two weasel sledges, one team of 8 dogs and one dog sledge. The object of the journey was to carry out a reconnaissance to Latitude 70°S., checking on the existence of suspected mountain ranges and an extension of an area of shelf ice from Cape Amery to south of Mawson; carrying out geological and glaciological investigations whenever possible; and surveying a satisfactory route south into the interior.

South from the 50 Mile Depot the plateau continued to rise at a steady grade affording a relatively good travelling surface. Typical plateau weather conditions were encountered about 80 miles out from base and the usual plateau conditions of morning and evening drift were first observed about 30 miles further on. Three days after leaving the 50 Mile Depot, the first nunatak was sighted. The route continued southwards, until, when about 110 miles out, the way ahead was found to be blocked by two heavily crevassed ice ridges, so at this point a direct course, S.S.E., was set for the observed nunatak, thus avoiding the dangerous crevassed zone. Travelling on this course was very rough and progress was slow, due mainly to the high sastrugi (18" - 24"), and the bad angle at which the sastrugi had to be crossed. In this area, the true bearing of the sastrugi was 170°. On 18th. December, two miles from the nunatak which was later named Depot Mountain, evidence of crevassing was again encountered. It was considered unsafe to proceed into this area with the weasel, so camp was established on solid terrain. Blizzard conditions prevented any further movement until 23rd. That afternoon Depot Mountain was visited with the dog team and a rapid reconnaissance was made of the nunatak. The western side is precipitous and inaccessible, but at the south-eastern end a large snow drift has built up from which the main ridge, except for the sharp high peak, can be easily reached. A deterioration in the weather prevented further work that day; however, another visit was made to the nunatak on 24th., when brief geological investigations were carried out. In this region, the elevation of the plateau is approximately 5,600 feet above sea level, while the height of Depot Mountain was surveyed at 6,083 feet.

From the mountain, a group of nunataks was observed on the southern horizon; this was the party's next objective which was reached on 28th. The nunatak area, consisting of six major peaks, marks the crest of the plateau (6,200 feet above sea level), in that region; southwards the ice was observed to fall away in elevation to the main mountain ranges which extended to the south-eastern horizon. Two days were spent at the southern nunataks during which time a rapid geological reconnaissance was made of the area. A representative collection of rock specimens was made from the various nunataks visited.

The lateness of the season, mechanical damage to the weasel, and other factors rendered further travel south inadviseable; thus the party was unable to proceed to the main ranges 40 - 50 miles distant. The return journey from a position Latitude 69° 42'S., Longitude 65° 42'E., was commenced as soon as the survey and geological work had been completed. On 4th. January, 1955, a brief visit was made to a small nunatak about 16 miles south-east of Henderson Depot, where a series of magnetic, geological and glaciological observations were carried out. About 12 miles south-east of the Henderson Depot, signs of intense coastal ablation became evident, and about 10 miles from the Depot a zone of crevasses had opened up considerably since outward bound. On the descent to Mawson from the northern end of Mt. Henderson, rivulets of thaw water were encountered running down old crevasse channels, some up to 5 feet wide and fairly deep. Over the latter stages of the return journey, bad weather and mechanical troubles in the weasel, caused several lengthy delays and Mawson was not reached until 7th. January.

Although the party did not reach its objective of Latitude 70°S., other results achieved were considered satisfactory, the most important of which were:-

(i) A safe weasel route had been explored, surveyed and marked out by flags to a position 150 miles south of Mawson.

(ii) A single mountain and a group of six others had been discovered and visited.

(iii) High mountain ranges had been discovered south of Lat. 70°S., extending south-east from Long. 64°E., to beyond Long. 67°E.

(iv) Geological collections had been made at all mountains visited.

(v) Glaciological observations had been made at regular intervals along the route and at the southern nunataks.

(vi) Meteorological records had been kept on a 12 hourly basis.

(vii) Magnetic variation had been observed at 3 points along the

The southern reconnaissance was the last major journey undertaken by the 1954 wintering party.

(k) Besides the major journeys and depot laying trips recorded above, numerous visits were made over the sea ice to islands within a radius of 15 miles of Mawson. Geological and biological observations were carried out and specimens collected. Early in January, the sea ice around Mawson commenced to break up, with open water increasing from the north daily. As a result, no further islands could be visited after the return from the southern mountains.

3. SCIENTIFIC OBSERVATIONS

(1) Geological.

(a) East Antarctica.

It is not possible to include here a general discussion of the numerous contributions to the geology of Antarctica. Of the 40 expeditions to the Antarctic regions since early nineteenth century, nearly all have brought back information bearing on the geology of the continent and its surrounding islands.

The eastern two-thirds of Antarctica extending from Coats Land in Long. 30°W., eastwards through Queen Maud Land, Enderby Land, Kemp Land, Mac-Robertson Land, Princess Elizabeth Land, Kaiser Wilhelm II Land, Queen Mary Land, Wilkes Land, Adelie Land, King George V Land to South Victoria Land in Long. 170°E., embracing the main plateau of Antarctica and the South Pole itself, constitutes the Great Antarctic Shield of David. This important geologic unit extending from the Weddell Sea to the Ross Sea has the character of a region of block uplift and is known as the Antarctic Horst. Both in its geological structure and in its history, it has much in common with Australia and South Africa. Stratigraphically, the outstanding characteristic of this section of Antarctica is the immense development of a crystalline Pre-Cambrian complex and the limited nature of Post-Triassic sediments. The Pre-Cambrian rocks which appear to be mainly of Archaean age, and consist of numerous granites with a great variety of metamorphosed igneous and sedimentary rocks, gneisses and schists, compose the basement complex. This is overlain by a great series of nearly flat lying Palaeozoic and early Mesozoic sandstones, arkoses and shales. Cambrian and Devonian beds are notable. Permian and Triassic beds are fairly widespread and carry thin seams of a poor grade of coal. Near the close of the Mesozoic era, this region was subjected to a period of block faulting; the Antarctic Horst was formed at that time. A period of volcanic activity accompanied and followed these tectonic disturbances and is even continuing today. Basaltic lavas have a considerable development through late Pleistocene and Recent times and morainic debris is scattered far and wide.

(b) Mac-Robertson Land.

Fully one-third of the continental coastline of Antarctica has never been approached by ship at any time; the principal cause of this inaccessibility is pack ice of the consolidated pack variety. Conventional surface ships can reach the Antarctic coast only during the brief southern summer and only then at a limited number of favorable locations. In recent years, conditions have permitted several expeditions to land on and examine the Mac-Robertson Land coast.

The work conducted in Antarctic waters through the two summer seasons 1929-1930 and 1930-1931, by the British, Australian, New Zealand Antarctic Research Expedition under the leadership of Sir Douglas Mawson, resulted in the amassing of an immense amount of data regarding the southern continental region lying between the forty-fifth and the one hundred and eightieth meridians of East Longitude. Long stretches of new coastline ~~were~~ were discovered, and Mac-Robertson Land and Princess Elizabeth Land were added to the map. During the Expedition's first summer voyage the coast of Mac-Robertson Land had been seen only at a great distance and had been only approximately located. However, Mawson's second voyage west along the Mac-Robertson Land coast in February, 1931, proved of great interest and value, for ice conditions permitted the "Discovery" to steam close along the coast thus enabling the party to make landings at the Scullin and Murray Monoliths and at Cape Bruce, and to chart other coastal features accurately. Bold rock headlands such as the monoliths and Cape Bruce and striking ranges of rocky mountains, eg. Henderson, Masson, David and Casey Ranges, were observed to protrude at intervals from the continental ice-cap, and a chain of ice free islands was found to extend westwards from near the meridian of 64°E. Mawson landed at the Scullin Monolith on 13th. February, 1931, and collections of bird life and rock specimens were obtained. The landing at Cape Bruce was made on 18th. February; there the flag was raised and further rock specimens were collected.

The principal rock formations of Mac-Robertson Land and adjacent Kemp Land examined by Mawson represent a great variety of crystalline schists and gneisses, chiefly of deep-seated origin, with occasional intrusions of crystalline igneous rocks. Quartz, felspar, mica, cordierite, sillimanite and garnet are the most obvious or abundant constitutent minerals. The most outstanding feature of the rocks is the abundance of garnet distributed throughout the formations. A notable feature of Enderby Land, adjacent to Kemp Land, is the fairly widespread occurrence of charnockites, including a new variety "Enderbite", and acid member of the charnockite series characterized by rhombic pyroxene and preponderating plagioclase among the felspar constitutents. The charnockites are a group of crystalline rocks which appear among the Archaean gneisses in Southern India. The distinguishing features of the unaltered members of the series are the constant even-grained granulitic structure and the constant presence of the mineral hypersthene, while garnet appears uniformly in the gneissose forms, just as in the Antarctic rocks. The chief types range from acid charnockites to basic norites and ultrabasic pyroxenites and hornblendites, all of which are represented along the Enderby Land - Mac-Robertson Land coastline. It can be stated therefore, that geologically this is a very ancient region, almost certainly Pre-Cambrian.

(c) Mawson Station.

In the ice-free regions of the Mac-Robertson Land coast the terrain generally consists of bedrock sloping down to tidewater, as at Mawson and near coastal exposures, or of precipitous rock bluffs, as at Scullin and Murray Monoliths. The exposed rock at Mawson occupies an area of approximately 70 acres. To the east and west of Mawson, ice cliffs form the boundary between the sea and the continent, but in isolated localities a few small rock outcrops occur at the base of the ice cliffs. The Station is situated on the southern arm of a horseshoe-shaped land area enclosing a north-facing bay whose entrance is approximately 1,050 feet across. The centre of the horseshoe slopes up to form a natural amphitheatre about 108 feet high, the upper slopes and broad top of which are strewn with erratics and many large boulders. The crestal rock surface of the southern arm falls gently to the main continental ice sheet which rises fairly steeply to the south to an elevation of 2,000 feet above sea level at Mt. Henderson. Steep bluffs occur along the west face of the western arm which rises to nearly 60 feet above sea level; this arm is generally clear of glacial erratics. The eastern arm has a maximum elevation of nearly 47 feet, with a rather broad top and gently sloping surfaces on either side. Very few erratics were observed north of survey station M.7, the highest point on the eastern arm. A prominent feature of the northern end of the eastern arm is a "salt pan", approximately 60 feet diameter, the flat surface of which has an elevation of about 11 feet above sea level. The salt consists of almost entirely pure crystalline hydrated sodium sulphate, or Mirabilite, with a very small percentage of sodium chloride. To the east of the main Station area occurs another small ice-free area of low relief, known as Magnetic Flat, on which are located the magnetic huts and absolute station, at an elevation of about 33 feet above sea level. The magnetic variation at Mawson was determined to be 58°W; all bearings mentioned in this report refer to true north.

The typical basement rock at Mawson consists generally of massive, brownish, medium to coarse grained charnockitic granite-gneiss, containing many large porphyritic crystals of purplish-grey orthoclase up to $1\frac{1}{2}$ inches across. Garnets in the country rock are rare, except in small irregular lenses and veins, some of which also contain well formed plates of biotite. The garnetiferous lenses occurring in the basement rock vary in character; some consist of light colored, medium grained rock showing typical schistose structure, (garnetiferous granulite), while others are more typical of a felspar-garnet-quartz gneiss. In the gneissic bands, the garnets are generally not evenly distributed, but are concentrated into irregular clots measuring up to 2 inches across. The basement rock of the western arm is cut by a system of small irregular dykes, generally only several inches wide, but a few range in width up to about 7 feet. The most prominent dyke in the area, having an average width of 7 feet, crosses the middle of the western arm in a general N.E. - S.W. direction. The dominant strike directions of the dyke system are between 040° and 060° and dips are nearly vertical. The dyke rock is a dark, medium grained hypersthene granulite with a linear granulose texture. Coarse pegmatitic veins varying in width from 1 inch to 5 inches, occur on the eastern arm and on Magnetic Flat, mainly as crosscutting, sharp-bordered bodies of small dimensions, generally less than 100 feet in length. They are irregular in width and occurrence, striking in an east - west direction. Generally, the same mineral assemblage is present in the pegmatites as in the surrounding rocks; the coarsest veins consist of large porphyritic crystals of purplish-grey orthoclase, some crystals measuring up to 2 inches across, embedded in a medium grained buff-colored matrix of oligoclase, quartz, prominent biotite plates and few garnets. Three of these veins showed slight "spot" radioactivity, some observations indicating up to three times background count, but this occurred only in isolated positions. An irregular, oval-shaped quartz intrusion measuring approximately 18 x 12 feet, occurs about 10 feet above sea level on the east side of the eastern arm. This outcrop is interesting since it contains prominent pale purple crystals of sapphirine together with conspicuous crystals of light blue-grey apatite embedded in a mass of medium grained muscovite. A few small pockets up to 6 inches diameter of bluish and glassy quartz are found scattered over the area. Aplitic material is relatively rare and was found only in occasional erratics.

The charnockitic and garnetiferous acid gneisses and granulites occurring at Mawson are typical of areas of intense high-grade metamorphism. The gneissic rocks appear to be of igneous origin.

The area reveals abundant evidence of glaciation. Glacial erratics and boulders which are thickly strewn over the broad slopes of the southern arm, are generally foreign to the Henderson - Mawson area. The erratics include a wide variety of igneous and metamorphic rocks, but in the main consist of garnetiferous gneisses. Facetting and striations are notable by their absence, but the erratics generally have rounded edges while some are split and fractured by weathering. A small moraine about 200 feet in length occurs in the ice about 100 feet south of the ice - rock contact near the middle of the southern arm. The morainic material is generally angular and consists of a large percentage of local rock common to the Mt. Henderson - Mawson area; a few rounded erratics as already described, do occur however, throughout the deposit.

The present topographic features have resulted from ice, wind and frost action; the latter two are playing the leading roles in the erosion that is taking place today. Generally the rock has weathered with an even surface but on the eastern and western slopes the effect of extreme wind erosion is evident, where the rock surface is often etched and pitted into a light honeycomb structure. The prevailing winds blow from the south-east, and the constant blast of snow grains against the rock makes all surfaces minutely rough and pitted. No polished, striated or grooved surfaces were observed in the basement rock. During the summer months, melt-water can be seen on those rocks subjected to direct sunlight. The thaw water apparently finds its way down into the cracks and joints of the underlying rock and the wedging action that follows when the water freezes causes disintegration and thin beds of unconsolidated rock debris are collected in flat protected places. Many large, uneroded felspar crystals are found in the debris, the finer material having been transported away by the winds. The power of wind erosion is substantiated by the fact that after a period of gales , large quantities of fine rock material, originating at the Henderson Range, are found on the snow and ice surfaces extending from Mt. Henderson as far as Mawson, a distance of at least 8 miles. Soil deposition around Mawson is prevented by the winds; the rock surface is swept clean of all fine rock detritus, except that which is lodged in the cracks, joint planes and sheltered parts of the basement. Small marginal lakes which receive the melt-water from the inland ice sheet are located along the line of contact of the continental ice and the ice free rock. No permanent streams are known to exist; the length of a typical surface run-off stream is very short, merely extending downslope to the ocean, while some slopes drain directly into the ocean.

Plant, bird and animal life in the Mawson area is limited and elementary in form. On the north-west facing slopes of the southern arm, brightly colored lichens and mosses have taken advantage of the shelter afforded from the prevailing south-east wind . (More than 300 species of lichens and 70 species of mosses are known to exist in the Antarctic). Snow Petrels and Wilson Storm Petrels nest under the rocks and skuas and giant petrels are also present. A few Emperor Penguins appear during the summer season and remain on the sheltered slopes during the moult; the nearest known Emperor rookery is at Bretangen, 60 miles west of Mawson. Larger numbers of Adelie Penguins also crowd the rocks at Mawson during the summer moulting season. Adelie rookeries occur on several islands within a few miles of Mawson, but the largest near rookery was found on the island of Innerskjera, about 10 miles west of Mawson. Numbers of Weddell seals appeared in the Station area during the summer but in the other seasons excursions had to be made to outlying islands in order to find a few seals for dog food. The nearest Weddell seal rookery was at Bretangen.

During autumn and winter, whenever opportunities permitted, rock specimens were collected and geological observations made in the vicinity of the base. No evidence was observed of economic mineralisation. A total of 66 rock samples from in situ and 580 erratics were collected from the Mawson Station area. Details of samples and sample localities are recorded in Appendix A; for positions of survey stations, refer to Plate 3, Map of Mawson Station Locality.

(d) Islands and Coastal Outcrops within 15 Miles Radius of Mawson.

The many ice-free islands and isolated fringing rock exposures along the shoreline of the Mac-Robertson Land coast are still dwarfed by the continental ice from which they are emerging. The ice-free rock reflects the recent presence of the continental ice ~~sheet~~ sheet more through its rounded contours than from glacial polish or large deposits of moraine.

Forty one islands, the largest of which is Welsh Island measuring approximately 4,000 x 5,000 feet and rising to 427 feet above sea level, and six rock exposures along the coast, were visited and briefly examined and a representative collection of rock specimens ~~were~~ was obtained.

During the initial unloading operations at Mawson, an airborne scintillometer survey, using the Auster aircraft, was carried out over most of the islands and coastal rock exposures for distances approximately 100 miles east and west of Mawson. The region covered by the survey included all exposed rock areas along the Mac-Robertson Land coast between Scullin Monolith and Stefansson Bay, as well as the coastal ranges Henderson, Masson, David and Casey south and south-west of the Station. Only one significant radio-active anomaly was recorded and that was over the island Flatoy-holmane, 2.2 miles west of Mawson. The basement rock of this island consists of a massive, coarse grained, garnetiferous variety of the typical charnockitic granite-gneiss of the area. Crossing the country rock in a general east - west direction are a few short, irregular pegmatitic veins containing garnets, up to nine inches in width. It was observed that some of these veins contained small quantities of radioactive material; field measurements with a ratemeter averaged over several veins from 3 to 5 times background count. The radioactivity of the veins has been checked in the laboratory and found to be due to Thorium; microscopic examination of the sample has indicated that monazite is the mineral responsible. All pegmatitic veins found on other islands were checked with the ratemeter but no further significant radioactive anomalies were encountered.

The islands in the area are relatively ice-free, except during the winter season when the lower sections are covered by snow drifts. For about 11 months of the year the islands are completely surrounded by fast sea ice; at times however, tide cracks and pressure ice make access to the islands rather difficult.

Generally, the predominant country rock of the islands and coastal exposures is a variety of the brownish, coarse grained charnockitic granite-gneiss as found at Mawson, sometimes garnetiferous as observed at Flatoyholmane. The predominating structure is crystalloblastic and the commonest mineral constituents that can be recognised in hand-specimen are orthoclase, hypersthene, biotite and garnet. Foliation of the gneisses is noticeable in some areas where it is gently dipping to nearly horizontal. Westwards from Mawson the basement rock appears finer grained and more typically charnockitic, while some pink granites were encountered at the southern end of Innerskjera. Small dyke-like intrusions having a general trend N.E. - S.W., occur irregularly through the islands. Typical pegmatite veins were noticed on many of the islands, the veins crossing the country rock in a general east - west direction. The pegmatites are of simple mineralogical composition, comprising the same minerals as the average country rock. Almost all are very acidic in composition and are composed mainly of porphyritic crystals of purplish-grey orthoclase embedded in medium grained buff-colored matrix of oligoclase, quartz and hypersthene. Garnets and biotite are common in some, but absent in others.

Compared with Mawson, there is a noticeable absence of morainic material on the islands visited. A few scattered, very large erratics were found on several islands near the coast, but otherwise erratics on the islands were rare. Erratics were found on the coastal outcrops and prominent moraines occur at Ringoya where they are banked up in parallel lines and close to the ice front. These moraines contain a great variety of rocks which are not found in situ in the area. Many of the erratics are much worn, but generally not well-rounded; some are sub-angular with plane and bevelled faces, while striations were observed on two or three rocks only. The moraines are ill-sorted and contain boulders ranging in size from 2 feet in diameter down to pebbles of 2 inches or less. Prominences on the islands and coastal exposures are generally well-rounded. No polished surfaces or striae were found; in most places the rock surfaces show the effects of frost and wind action or other disintegrating agencies.

Plant life was non-existent on the islands but fairly large Adelie penguin rookeries were found on several of the larger islands, in particular Innerskjera. Lichens and mosses occur on most of the coastal exposures, but penguin rookeries were not found inside the islands.

A total of 108 rock samples from in situ and 3 erratics were collected from the islands, whilst 15 samples from rock in situ and 64 erratics were obtained from the six exposures visited along the coast. During the winter, visits were made to two overturned icebergs, one 7.8 miles north of Mawson and the other 1.1 miles north of the Station. The upturned surfaces of the bergs were strewn with erratics which were generally foliated garnetiferous gneisses, but of somewhat different composition to the erratics found at Mawson. 78 erratics were collected from the two bergs.

Details of samples and sample localities are recorded in Appendix A; for map positions refer to Plate 4, Map of Mawson, Scale 1:100,000.

(c) <u>Scullin Monolith.</u>

The Scullin Monolith is situated in Latitude 67° 47'S.; Longitude 66° 43'E.; about 110 miles east of Mawson. Magnetic variation in the area is 61° 16'W.

The monolith is a crescent-shaped rock massif, surrounded by the continental ice on the east, south and west, and rising to a maximum height of 1,430 feet near its eastern extremity. The massif which is about 1.8 miles long and 2,000 feet wide at the widest point, encloses a north facing bay whose entrance is 4,000 feet across. To the east and west of the rock exposure coastal ice cliffs of the continental plateau rise to a height of 150 feet, while the ice surface of the plateau behind the massif rises steeply to the south. A zone of very heavy crevassing occurs on the eastern side of the monolith. Precipitous rock slopes, sometimes falling sheer to near the water's edge, mark the upper parts of the massif throughout its length. The slopes of the lower 200 - 300 feet generally fall steeply to the sea, and are strewn with boulders or are covered by scree which has fallen and accumulated from the rock cliffs above.

Survey work at the Scullin Monolith was handicapped by bad weather, limited resources and very short daylight. Representative sampling was carried out across the Monolith, but a geological reconnaissance of the upper slopes could not be undertaken. A topographic survey was made of the area and tidal and magnetic observations were also carried out.

The basement rock consists of grey-brown, medium to coarse grained gneisses of granitic composition, generally containing garnets. The dominant type is a coarse grained quartz-microperthite gneiss with garnet and biotite as the chief ferro-magnesian constitutents; the quartz is typically a smoky black. The types of gneisses include both even-grained and porphyritic varieties, some carrying large porphyritic crystals of microperthite up to an inch in length. Foliation and banding are noticeable, striking generally east - west with steep southerly dips. The banding which is revealed by the contrast of light and dark minerals, arises partly from the streaky development of smoky quartz in bands between the lighter colored felspathic constitutents, and more generally from the segregation of ferro-magnesian minerals into bands. The structures exhibited are for the most part those of primary igneous rocks. Fine to medium grained dark colored dyke-like intrusions, pyroxene granulites, occur irregularly over the central area of the massif. Near the southern end of the eastern limb of the monolith, two bodies of pink and grey rock were observed which were more uniform in character and more granitic.

The massive bluffs which extend throughout the length of the monolith are generally weathered rounded, smooth and even. Sharp, steep ravines filled with scree, the result of ice, frost and wind action, are a prominent feature in the central section. In this area also, jointing along nearly horizontal and vertical planes is prominent in the massive bluffs which rise sheer above the sea.

Eighteen rock specimens from in situ were collected from the Scullin Monolith. Two samples of coarse grained garnetiferous granitic gneiss, typical basement rock, were collected from Austskjera Island, about 30 miles east of Mawson. Details of samples and sample localities are recorded in Appendix A; topographic details are shown on Plate 5, Sketch Map of the Scullin Monolith.

(f) Islands and Coastal Outcrops between Bryggeholmen and King Edward VIII Gulf.

An almost continuous chain of ice-free rocky islands ranging up to 250 feet in height extends approximately 175 miles westwards from Mawson to King Edward VIII Gulf. Along this section of the Antarctic coastline many steep rock headlands and low coastal hills showing relief of the order of 750 feet, rise prominently out of the continental ice sheet. Southwards, this ice plateau generally slopes gently upwards to an even skyline at a height of about 2,000 feet above sea level. The larger islands extending westwards from Foldoya to Utoy are ice-capped, but except for these the islands are relatively snow and ice free.

During the Western Journey 27 localities were visited and 141 rock specimens were collected. On account of the nature of the journey, the specimens had necessarily to be limited in size and number, and reconnaissance sampling only could be undertaken throughout the journey. In contrast to the Mawson and

Ringoya areas, there was a noticeable absence of morainic material and only very few scattered erratics were observed.

The collection includes a great variety of metamorphic rocks varying considerably in texture, structure and mineral content. The main rock types consist generally of a group of deep-seated medium to coarse grained gneisses of sedimentary and igneous origin, many rich in garnets. Foliation parallel to the original bedding is exhibited to a marked degree in the paragneisses. Strike of the foliation is generally east - west, with steep to near vertical dips to the south. These foliated garnetiferous gneisses ranging from fine to coarse grained, occur from Tongskjera Island to Kvarsnes on the eastern entrance of King Edward VIII Gulf. A notable feature of the rocks of the Stokholmen area is the occurrence of aggregates of garnets up to 9 inches in diameter. Between Broka and Mule a group of rocks of basic and intermediate character occur as bands in the country rock ranging in width from a few inches up to 30 feet. These rocks occurring in dyke-like intrusions striking east - west, are coarse grained hypersthenites, the principal constitutents being hypersthene, hornblende and diopside. In the same area, a few thin macrocrystalline veins containing segregations of almost pure crystals of diopside are prominent. A conspicuous body of coarse grained hypersthenite first encountered at the southernmost cape of Broka was found again at Mule and then at Soroya Island, Karm Sund, but was not observed again further west. Smaller dyke-like intrusions of pyroxene granulites and quartz-felspar orthogneisses and irregular veins of quartz-felspar pegmatites occur throughout the area. In the Stedet - Ufsoy area granitic gneisses were encountered. These are medium to coarse grained highly felspathic rocks with smoky black quartz, generally containing garnets. Even grained and porphyritic varieties occur and foliation is evident; at Stedet foliation is parallel to the dyke system, the dominant strike being between 300° and 320°, ~~[illegible]~~ with very steep southerly dips. Typical charnockites occur on many of the islands between Mawson and Tongskjera Island, 25 miles west of the Station.

Many of the rock exposures visited showed the effects of extreme ice, frost and wind erosion. In some areas the rocks showed a normal form of exfoliation, but generally the exposures exhibited an etched and pitted surface especially on the windward side, resulting in a typical honeycomb structure in many places. Small, well-rounded pot-holes varying in size up to several inches in diameter were also observed in the steep rock slopes and bluffs at many localities.

No radioactivity was observed in any of the rocks from this western area. In order to assess fully the economic potential of the region however, it is considered that further geological work is necessary, particularly in the area between Stefansson Bay and King Edward VIII Gulf.

Details of samples and sample localities are recorded in Appendix A. Coastal features between Mawson and King Edward VIII Gulf are shown on Plates 6, 7, and 8, Norwegian maps resulting from the Lars Christensen Expedition, 1936-1937.

(g) Henderson Range.

The Henderson Range is situated in Latitude 67° 43'S. and Longitude 63° 04'E., about 8 miles S.S.E. of Mawson. The exposed rock of the Range occupies an area of approximately 2 square miles. The main ridge running nearly north - south rises to the high peak, elevation 3,066 feet above sea level, and falls away to the south to a prominent peak near its southern extremity, elevation 2,489 feet above sea level. The Range which is approximately 2½ miles long and about 1 mile wide in the widest part, is surrounded by the continental ice sheet on all sides. The level of the ice plateau at the northern ice - rock contact is about 1,850 feet above sea level and the ice rises gently to approximately 2,000 feet at the southern rock contact. Some of the gently sloping surfaces of the Range are covered with snow and ice, but generally the rock slopes are largely exposed. Steep bluffs fall away on the north-western side of the main ridge to a flat lake-like ice area some acres in extent. This area is enclosed on two other sides by the western and southern ridges of the Range. The northern and north-eastern slopes are covered by angular talus, resulting from the effects of severe weathering of the steep rock bluffs above. Lateral moraine, rising to a height of about 12 feet, extends along the base of the eastern side of the Range. Beyond the moraine extends a zone of crevasses which barred travel along the eastern side of the mountain.

The generally rugged outline of the Henderson Range is certainly not the immediate result of glacial action. Its upper surfaces are very steep to near vertical, and as already reported, rise approximately 1,200 feet above the surface of the surrounding ice. It is clear therefore, that this outcrop has been free from ice for a relatively long period of time and its present outline is largely due to mechanical weathering. Here again, wind and frost action are playing the leading roles in the erosion of the exposed rocks today. The weathering due to freezing and thawing is slow since there are relatively few days in the year when the rocks get warm enough to melt adjacent snow and ice. The slopes and steep bluffs of massive granite-gneiss show the typical effects of wind erosion, a rough etched surface and numerous pot-holes which are generally well rounded and vary in size from 6 - 18 inches in diameter. Small collections of rock fragments occur in many of these holes.

The typical basement rock at the Henderson Range consists generally of massive, brownish, medium to coarse grained charnockitic granite-gneiss, usually containing many large porphyritic felspar crystals up to one inch long. Garnets are rare. Sometimes irregular banding due to the segregation of ferro-magnesian minerals, is apparent in the gneisses. A few dyke-like intrusions of dark pyroxene granulites, generally striking north - south, occur through the area. Some isolated erratics remain on the massive rock surfaces up to 100 feet above the present ice level. The material forming the moraine, ranging in size from small boulders to sand, is composed mainly of gneisses and schists foreign to the locality, mixed with angular blocks, large and small, of the local country rock. No indications of economic mineralisation were observed in the area and no radioactive anomalies were recorded.

Ten rock specimens and 25 erratics were collected from the Henderson Range area. Details of the samples and sample localities are recorded in Appendix A.

(h) Russell Nunatak.

A brief visit was made to this small, rather isolated nunatak during the return from the southern mountains. It is situated about 16 miles south-east of Mt. Henderson, in Latitude 67° 53'S., and Longitude 63° 26'E. The nunatak is approximately 750 feet long (E. - W.), and about 250 feet wide at the widest part, and rises above the surrounding continental ice sheet to a height of about 150 feet. The level of the ice plateau in this area is approximately 2,800 feet above sea level.

The nunatak is composed of massive, brown, medium to coarse grained charnockitic granite-gneiss containing large porphyritic felspar crystals. The rock and erosional features are generally similar to the Mt. Henderson area, except that morainic material is absent. No indications of mineralisation of economic value were encountered.

Eight rock specimens were collected from in situ in the area. Details of the samples and sample localities are recorded in Appendix A. The route of the southern plateau journey is shown on Plate 9, Preliminary Map, Southern Reconnaissance.

(i) Depot Mountain.

A rapid geological reconnaissance was made of this isolated nunatak during the southern journey. Depot Mountain is situated in Latitude 69° 02½'S., and Longitude 64° 36½'E., about 102 miles distant from Mawson. On 24th. December, 1954, magnetic variation in this area was determined to be 61° 01'W.

The nunatak rises above the surrounding ice plateau to a height of 6,083 feet above sea level or about 500 feet above the level of the ice sheet. The exposed rock ridge forming the nunatak is nearly one mile long and is elongated in a north - south direction; at its widest part it is approximately 600 feet wide. The precipitous high peak rises near the northern end of the nunatak; the southern half of the ridge is relatively flat and broad, with sheer bluffs at the northern end and along the western side. The general ruggedness of the mountain indicates that it has been free from ice for some time; its present form is no doubt due to mechanical weathering. This sharp, apparently frost-riven topography extends right to the present ice level. Lying on the ice at the foot of the western bluffs throughout the length of the nunatak, are considerable deposits of scree and talus which have fallen from the rock faces above. Some of the large boulders weighing hundreds of tons, are indicative of the power of frost and wind erosion in the area. The broad southern ridge is generally covered with a layer of sharp angular blocks of many sizes, the result of frost action on the exposed rock surfaces. No erratics were found on the nunatak and no moraines were observed around its flanks. Zones of crevassing occur to the west and north of the mountain, the latter zone being particularly difficult on account of large open crevasses, generally extending east - west, but with very few safe bridges for crossing. About 10 miles E.S.E. of Depot Mountain, a crevassed ice ridge was observed, with a small rock exposure showing near the top.

The dominant country rock of the area consists of medium grained garnetiferous gneisses showing foliation and banding which appear to be due to segregation of ferro-magnesian minerals. The foliation strikes approximately north - south, coincident with the direction of the axis of the nunatak, with irregular easterly dips. At the southern end of the main ridge leading to the low peak occurs a prominent, rather irregular, coarse pegmatitic vein up to 12 inches wide, composed mainly of felspar and quartz with biotite for the most part a minor accessory. The pegmatite is sharp bordered, of small linear dimensions and cuts across the general strike of the area. No radioactive anomalies or any indications of economic mineralisation were encountered in the area.

Twelve rock specimens were collected from in situ in the area. Details of the samples and sample localities are recorded in Appendix A; for actual locations of samples refer to Plate 10, Sketch Map Depot Mountain.

(j) Southern Nunataks.

This group of six major nunataks is situated in Latitude 69° 42'S., and Longitude 65° 42'E., about 45 miles south of Depot Mountain. Magnetic variation in this area on 29th. December, 1954, was found to be 61° 58'W. A rapid geological reconnaissance was made of the area and 24 rock specimens were collected.

The ice plateau in the region of the nunataks has an elevation of approximately 6,200 feet above sea level, and the highest mountain of the group rises about 1,100 feet above the level of the ice sheet. Southwards, the continental ice falls away in altitude to the main southern mountain ranges which extend in an unbroken chain to the south-east, the western limit of which is approximately 40 miles south of the nunatak area. A series of survey observations were taken on to these newly discovered ranges, tentatively named Prince Charles Ranges, thus enabling their approximate position to be plotted on the map. The Ranges occur south of Latitude 70°S., and extend south-eastwards from near Longitude 64°E., to beyond Longitude 67°E.; several parallel chains of mountains also appeared to continue to the south. It is considered that these Ranges constitute a major geographical feature of Antarctica; on account of their vast extent it will be necessary for field parties to spend many seasons in the area to complete a reconnaissance of this mountainous region.

The southern nunataks are composed generally of a related complex of metamorphic rocks, mainly medium to coarse grained garnetiferous gneisses containing, in some areas, large porphyritic felspar crystals. A few irregular dyke-like bands of dark granulites cut across the gneisses of the basement complex. The gneisses are generally massive, but occasional foliation and banding, striking north - south, were observed, with steep easterly dips. Once again, the foliation and banding are apparently due to segregation of ferro-magnesian minerals. Pegmatitic veins up to six inches in width, containing an intermixture of very coarse and fine grained felspar crystals occur irregularly through the area.

In this region, as at Depot Mountain, the effects of wind and frost action are most prominent. The characteristic alpine topography with steep, frost shattered cliffs and talus slopes of sharp angular fragments of country rock indicate that a considerable time has elapsed since the area was overridden by ice. Only the small northernmost nunatak of the group which protrudes above the ice for about 75 feet, has a typical ice-rounded profile, but the effects of frost action are already evident over its surface. Evidence of previous glaciation such as polished surfaces or striae, [illegible] was not found on the rock surfaces of these southern nunataks. No doubt the reason for the disappearance of glacial groves, striae and polished surfaces is largely explained by the weathering processes that have been operating since the recession of the ice. The exposed surfaces of almost all the rock areas must be affected by differential expansion and contraction resulting in a type of concentric weathering with the surface layers flaking off.

No indications of economic mineralisation or any radioactive anomalies were observed in the area. Details of samples and sample localities are recorded in Appendix A. Plate 9, Preliminary Map, Southern Reconnaissance, shows the positions of the southern nunataks and the extensive mountain ranges.

(ii) Glaciological Observations.

(a) Continental Ice Sheet.

At Mawson, the continental ice is similar to that in many sectors of the Antarctic where the ice moves over the surface of the continent and into the ocean without forming channel glaciers, ice tongues or shelf ice. The edge of the ice is afloat forming precipitous ice cliffs. In the Station area, above these cliffs the surface of the continental ice sheet rises steeply towards the interior at an initial average rate of one in ten; the surface then levels off considerably, and at the Henderson Depot, 10 miles S.S.E. of Mawson, the elevation of the surface of the ice plateau is approximately 2,000 feet above sea level. Southwards from this Depot, the level of the ice continues to rise at a steady but low rate, until the increase is no slight that it is hardly noticeable. ~~Refer to Plate 9 for~~ Details of elevations along the route followed from Mawson to the southern nunataks are shown on Plate 9. During the southern journey, the crest of the ice plateau, about 6,200 feet above sea level, was found in the region of the southern nunataks in Latitude 69° 42'S., 145 miles distant from Mawson. Typical Antarctic plateau surface conditions were first encountered about 30 miles south of Mawson. Sastrugi aligned parallel to the direction of the prevailing wind and in some areas up to 24 inches high, made travelling difficult when cross-wind courses had to be followed. Between Mawson and Latitude 68° 30'S., the true bearing of the sastrugi was 150°; south of this position the bearing was 170°. Some large dunes were also encountered, generally crossing sastrugi, with true bearings of approximately 120° - 130°. These dunes are great snowdrifts thrown up by blizzards. The surface of the continental ice near Mawson and extending southwards to the coastal ranges consists basically of hard, light-blue colored glacier ice, which in this region is largely snow free throughout the year. In some areas, above the coastal ice cliffs the ice sheet is badly crevassed and broken into an impassable terrain, as occurs west of Mawson between Ringoya and Bryggа. As the continental ice nears the coast downslope tension crevasses are generally developed. These long tension crevasses which are usually parallel to the contours of the slope are often interrupted by shoster crevasses caused by obstructions in the underlying rock topography. Similar short crevasses perpendicular to the edge of the ice sheet occur where the ice meets the sea near a fringing rock or rock shoal. Along the coastline of Mac-Robertson Land occur numerous exposures of fringing rocks, many of which have probably been uncovered recently through glacial recession. Along the line of contact of the continental ice sheet with the ice free terrain, small marginal moraines often occur; such moraines are prominent at Mawson and at Ringoya, 5 miles west of the Station.

Endeavors were made to obtain regular ice measurements on the plateau, but in general these proved incomplete and unsatisfactory. During April, a route was marked out between Mawson and Mt. Henderson, and bamboo and duralium stakes were distributed along it. The ice or snow level at each stake was measured each time a sledging party covered the route during the following nine months. The measurements on these plateau stakes between the Station and Mt. Henderson proved unreliable after mid-November due to the melting-in of the stakes. In this region it was found that surfaces with a north-facing downslope showed negligible accumulation. There was, in fact, ablation in this area throughout most of the year, a result due partly to winderosion and partly to evaporation, so that the surface consisted generally of hard, smooth blue ice. The term "ablation" means the general lowering of the surface of ice or snow from whatever cause, except that of mechanical movement. It may thus be due to (a) generation of ice vapour direct without the actual thawing of the ice surface, (b) generation of water vapour from thaw water, or (c) mechanical abrasion of an ice surface by drifting snow or by rock dust impelled by blizzard winds. Thus, to summarise, ice drainage occurs by ablation, subaqueous solution and the calving of ice-bergs. Radiation melting is a common phenomenon where ice-free dark rock absorbs and re-radiates sufficient heat to affect the surrounding ice.

During the southern journey, bamboo stakes with pennant flags attached were set up as trail markers along the route at approximately 5 mile intervals, and the ice or snow level was measured at each stake. Beyond the zone of coastal ablation, about 20 miles distant from Mawson, these stakes will probably remain set for several years, hence, sledging parties passing along the route in subsequent years should obtain useful ice measurements from the stakes, which will assist in ascertaining the magnitude and distribution of the overall snow accumulation in this region. At each 25 miles along the route to the southern nunataks, plateau neves temperatures were measured at a depth of 5 metres. These sub-surface temperatures decreased from - 20.8°C. at a distance of 25 miles from Mawson, elevation 2,638 feet above sea level, to - 31.2°C. at the southern nunataks. On the return journey from the south, when about 20 miles from Mawson, the first signs of intense coastal ablation became evident. Zones of crevasses which were mere cracks on the outward journey, had opened up considerably; a deviation of route was necessary in order to negotiate several of these zones. From the northern end of the Henderson Range, rivulets of thaw water 4 to 5 feet wide and up to 8 feet deep were encountered running down old crevasse channels. In places, below the running water could be seen the blue depths of the crevasses, separated from the water by a thin layer of clear ice. Some of these thaw streams necessitated wide detours before safe bridges were found suitable for crossing. On arrival at Mawson, several water-falls were observed in the coastal ice cliffs.

Reconnaissance and detailed investigations in many parts of the Antarctic continent indicate that not only is the current trend one of glacial recession, but also that former glaciation was considerably more extensive than at present. Glacial striae, perched moraines and erratics demonstrate that the glacier ice rose previously to altitudes of from one to three thousand feet higher than its present level, as shown in many instances in the Ross Sea area. In this same region too, are occurrences of coal seams and fossiliferous sediments formed in late Mesozoic times, thus indicating that the present continental ice sheet cannot be older than late Tertiary. Such evidence as this, however, is not to be found in Mac-Robertson Land.

(b) <u>Sea Ice.</u>

Neither time nor resources allowed any detailed glaciological observations to be undertaken at Mawson. Early in March, 1954, the sea ice in the Station area commenced breaking up and by 10th. March, open water surrounded the base. Nineteen days later however, the sea was frozen over once more. During the first week of January, 1955, open water was observed about 12 miles north of Mawson, and by 21st. January, the sea ice had disappeared completely from the Station area. The water remained open until 1st. March, when once again, the base was surrounded by sea ice.

At Mawson, the thickness of the sea ice was measured at monthly intervals; the maximum thickness was 66 inches on 2nd. October, 1954. In mid-August a line of stakes was surveyed across the sea ice between the western arm of Mawson and Flatoy Island. The stakes were set up at intervals of 300 feet, along a line of sight between Survey station M.2., Mawson, and the northern summit of Flatoy. The ice or snow level at each stake was measured weekly or whenever conditions permitted. Accumulation on the sea ice occurred throughout August; the net accumulation over the surveyed line during the period 15 - 30th. August, was 0.61 inches. Ablation of the sea ice surface set in early in September, and continued throughout the remainder of the year. Between the beginning of September, and the middle of November, the average monthly ablation was 0.70 inches, but after 22nd. November, the ablation rate increased considerably. As experienced on the plateau, during late November and December, the stakes melted into the ice, and measurements during this period were thus unreliable. Throughout the test period there was no lateral movement observed in the line of stakes. The above measurements indicated that during September, while the upper surface of the sea ice was ablating, its underneath surface was still freezing up for an overall accumulation was recorded during the period. Sea water temperatures and sea ice salinities were also measured.

Details of glaciological measurements on the plateau and sea ice are recorded in Appendix B.

(iii) Meteorological Observations.

Regular six hourly routine meteorological observations were commenced at Mawson on 1st. March, 1954, and daily pilot balloon flights for determining upper winds were commenced on 1st. April. Incoming and outgoing radiation were measured regularly throughout the year. During field trips, meteorological observations were made at regular twelve hourly intervals or more frequently if circumstances permitted, when temperature, pressure, wind, cloud and surface conditions were recorded.

Summaries of observations made at Mawson and during the eastern and southern journeys are recorded in Appendix C.

4. SCIENTIFIC RESULTS

(i) Geology.

During the year, a reconnaissance examination was made of the following areas:-

(a) Mawson Station area;

(b) 41 Islands and 6 coastal rock exposures within a radius of 15 miles of Mawson Station;

(c) the crescent-shaped rock massif of the Scullin Monolith;

(d) 20 Islands and 7 coastal exposures between Bryggeholmen and King Edward VIII Gulf;

(e) Henderson Range;

(f) Russell Nunatak;

(g) Depot Mountain;

(h) Southern Nunataks.

The total collection of rock specimens included 404 rock samples from in situ and 750 glacial erratics.

The areas examined consist generally of a variety of gneisses, chiefly of deep-seated origin, with occasional intrusions of crystalline igneous rocks. The abundance of garnets distributed throughout the formations is an outstanding feature of the areas.

No definite information is available regarding the age of the metamorphic rocks of this region of Antarctica. It is suggested that the scanty evidence at present available indicates that the metamorphic rocks examined during this expedition belong to a "shield type" basement complex which probably underlies a great part of this region of the Antarctic continent, and represents part of the ancient stable core of Antarctica. As already recorded, in South Victoria Land, similar metamorphic rocks underlie Cambrian sediments, so it is considered that the metamorphic complex of Mac-Robertson Land is almost certainly Pre-Cambrian.

During the survey, no indications of economic mineralisation were encountered. The only significant radioactive anomaly was recorded on the island of Flatoyholmane, 2.2 miles west of Mawson Station. The radioactivity, due to thorium, was traced to thin, irregular, garnetiferous pegmatitic veins, containing small quantities of monazite.

(ii) Glaciology.

Sea ice studies included determinations at regular intervals, of thickness, salinity, surface accumulation and surface ablation. Mawson Bay was permanently frozen over from 29th. March, 1954, until 21st. January, 1955. The thickness of the sea ice was observed to increase at a steady rate throughout the winter and spring seasons; the maximum thickness measured was 66 inches on 2nd. October, 1954.

As shown by surface stake measurements, a certain amount of superficial thaw takes place on the surface of the sea ice in summer, but by far the most important thawing occurs beneath the ice, the result of the circulation of relatively warm convection currents in the sea water. Between 2nd. October, and 2nd. December, the overall thickness of the ice decreased by 9 inches, while the total surface ablation for the same period was only 1.3 inches.

Glaciological measurements of the surface of the continental ice sheet were observed around Mawson by means of bamboo and duralium stakes which were set up at regular intervals along the sledging routes on the plateau. In the area between Mawson and Mt. Henderson, ablation occurred generally throughout most of the year. Information is not yet available on surface conditions inland from Mt. Henderson. Subsurface temperatures were measured at a depth of 5 metres at several locations between Mt. Henderson and the southern nunataks; at a plateau elevation of 2,688 feet above sea level, the temperature recorded was - 20.8°C., while at the southern nunataks, elevation approximately 6,200 feet, the recorded temperature was - 31.2°C.

(iii) Meteorology.

Standard observations were made at Mawson at 6 hourly intervals throughout the year. From 1st. March, 1954, to 28th. February, 1955, a total of 1,810 synoptic observations were carried out. In addition, between 1st. April, 1954, and 28th. February, 1955, some 370 pilot balloon flights were undertaken, the average flight height over the period being approximately 30,000 feet. The minimum temperature recorded at Mawson was - 21.8°F., on 17th. September, 1954, and the maximum temperature was 45.0°F., on 19th. December. The maximum wind gust recorded on the Dines Anemometer was one of 91 knots from 130°(T)., on 16th. October. During the southern plateau journey, the lowest temperature recorded was - 1.3°F., on 29th. December, at the southern nunataks.

Extensive studies of the radiation balance were also made at the Station.

(iv) Topographical Surveys.

A detailed topographical survey was made of the Mawson Station area, and a map, scale 1 inch = 200 feet, was completed. In order to assist in the identification of the many islands that occur in the vicinity of Mawson, a ground survey was made of the coastline between Longitude 62° 15'E., and Longitude 63° 15'E. A suitable map was produced , scale 1:100,000, showing all islands and coastal exposures in the area, the Henderson Range and the northern limits of the Masson, David, and Casey Ranges. A limited ground survey was also made of the Scullin Monolith, which enabled a contour map, scale 1 inch = 400 feet, to be completed with a fair degree of accuracy.

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APPENDIX A.

ROCK SAMPLES EX ANTARCTICA

1. Mawson Station Area.

(i) "M" Series.

1. Country Rock at Survey Station M.1.
2. Dyke Rock at Survey Station M.1.
3. Dyke Rock - Country Rock contact at Station M.1.
4. Vein Rock 85 feet from Survey Station M.1., on bearing 340° (T).
5. Vein Rock 300 feet from Survey Station M.4., on bearing 340° (T).
6. Country Rock at Survey Station M.4.
7. Biotite from thin veins in Country Rock near Survey Station M.4.
8. Biotite from thin veins in Country Rock 300 feet S.E. of Survey Station M.4.
9. Vein Rock at Survey Station M.5.
25. Country Rock from South end of Western arm, near sea-level.
26. Outside band on West side of quartz outcrop, 372 feet on bearing 303° (T) from Survey Station M.9.
27. Second outer band on west side of same quartz outcrop.
28. Third outer band on west side of same quartz outcrop.
29. Central core, southern end, of same quartz outcrop.
30. Central core, near middle of same quartz outcrop.
31. First band outside core on eastern side of same outcrop.
32. Outside band on East side of same quartz outcrop.
33. Second outer band on East side of same quartz outcrop.
34. Outside band at Northern end of same quartz outcrop.
35. Outside band at North-eastern side of quartz outcrop.
40. Country Rock at Survey Station M.6.
41. Vein Rock from near Survey Station M.7.
42. Country Rock from N.E. corner of Eastern Arm.
43. Country Rock from N.W. corner of Eastern Arm.
44. Rock from small lens in Country Rock near Sample M.43.
45. Country Rock from S.W. corner of Southern Arm.
46. Country Rock from N.W. corner of Southern Arm.
47. Country Rock from southernmost outcrop of Southern Arm.
48. Country Rock from S.E. corner of Southern Arm.
59. Country Rock from near contact with intrusion at North end of "salt pan", Eastern Arm.
60. Outside band on West side of same intrusion.
61. Irregular band 8 feet from South end of same intrusion.
62. Irregular band 2 feet outside M.61 band.
63. Micaceous band near centre of same intrusion.
64. Outside band on North side of same intrusion.
65. Irregular band 4 feet East of M.64 band.
66. Short irregular band 8 feet South of M.64 band.
67. Outside band on East side of same intrusion.
68. Micaceous rock from small lens in Country Rock 35 feet East of North end of same intrusion.
69. Micaceous rock from small lens in Country Rock 50 feet N.W.. of North end of "salt pan".
70. Pegmatitic vein 130 feet South of South end of "salt pan".
71. Country Rock - pegmatitic vein contact at West end of M.70 vein.
72. Vein rock 220 feet South of Survey Station M.8.
79. Country Rock at Survey Station M.9.
87. Country Rock 200 feet East of Survey Station M.9.
88. Core of intrusion in Country Rock 60 feet East of Magnetic Station, Magnetic Flat.
89. Outside band on East side of same intrusion.
90. Country Rock - M.89 band contact.
109. Vein Rock 55 feet East of Survey Station M.9.
110. Vein rock 55 feet East of Survey Station M.9.
112. Pegmatitic vein 35 feet North of Sample M.109.

(i) <u>"M" Series. (Cont'd.)</u>

115. Vein Rock 220 feet East of Survey Station M.9.
116. Vein Rock 200 feet E.N.E. of Survey Station M.9.
119. Vein rock at Magnetic Station, Magnetic Flat.
125. Vein rock 480 feet E.N.E. of Survey Station M.7.
144. Pegmatitic vein 130 feet South of South end of "salt pan".
171. Vein Rock near S.E. corner of Southern Arm.
172. Country Rock around vein M.171.
173. Lesser facies of Country Rock on N.E. side of Eastern Arm, 350 feet on bearing 163° (T) from Survey Station M.8.
174. From large boulder at N.W. corner of Eastern Arm.
175. From 30 ft. band in Country Rock on S.E. side of boulder M.174.
176. Country Rock around M.175 band.
177. Lesser facies of Country Rock 50 feet South of Survey Station M.7.
178. Band at N.W. corner of M.177 facies.
179. Country Rock on Eastern side of M.177 facies.
180. Vein Rock 300 feet North of Survey Station M.6.

(ii) <u>"E" Series. (Erratics).</u>

1 - 16.	From area around Survey Station M.6.
17 - 28.	From South-eastern area, Southern Arm.
25 - 36.	From central area, Southern Arm.
37 - 51.	From Eastern area, Southern Arm.
52 - 59.	From central area, Southern Arm.
60 - 66.	From central area, Southern Arm.
67 - 81.	From Western area, Southern Arm.
92 - 108.	From Eastern area, Southern Arm.
109 - 122.	From Western area, Southern Arm.
123 - 136.	From North-eastern area, Southern Arm.
137 - 148.	From central area, Southern Arm.
151 - 162.	From central area, Southern Arm.
163 - 172.	From Eastern area, Southern Arm.
173 - 186.	From Western area, Southern Arm.
188 - 197.	From central part of Southern Arm.
198 - 211.	From Eastern area, Southern Arm.
212 - 221.	From Western area, Southern Arm.
222 - 235.	From central area, Southern Arm.
236 - 240.	From Eastern area, Southern Arm.
282 - 293.	From Eastern area, Southern Arm.
294 - 321.	From Magnetic Flat.
322 - 333.	From Eastern area, Southern Arm.
334 - 352.	From Western area, Southern Arm.
385 - 396.	From Western area, Southern Arm.
397 - 415.	From Eastern area, Southern Arm.
416 - 421.	From Western area, Southern Arm.
422 - 431.	From Magnetic Flat.
432 - 443.	From Central area, Southern Arm.
444 - 465.	From Eastern area, Southern Arm.
466 - 475.	From central area, Southern Arm.
476 - 500.	From Western area, Southern Arm.
501 - 510.	From Eastern area, Southern Arm.
511 - 535.	From central area, Southern Arm.
536 - 547.	From Eastern area, Southern Arm.
632 - 643.	From Eastern area, Southern Arm.
644 - 678.	From central area, Southern Arm.
679 - 689.	From Eastern area, Southern Arm.
690 - 693.	From central area, Southern Arm.
694 - 713.	From small moraine South of Station.
714 - 727.	From central area, Southern Arm.
728 - 739.	From Eastern area, Southern Arm.
740 - 750.	From Western area, Southern Arm.

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2. Islands and Coastal Outcrops within 15 Miles Radius of Mawson.

(i) "F" Series - Flatoy Island.

1. Country Rock at N.E. corner of Flatoy Island.
2. Country Rock at N.W. corner of Flatoy Island.
3. Pegmatitic vein 50 feet South of Sample F.2.
4. Country Rock at S.W. corner of Flatoy Island.
5. Country Rock at summit of Flatoy Island.

(ii) "M" Series.

10. Country Rock at Survey Station MA.1, Island MA.1.
11. Country Rock at N.W. end of Island MA.1.
12. Pegmatitic vein 480 feet West of Survey Station MA.1.
13. Vein Rock 220 feet North of Survey Station MA.1.
14. Country Rock 350 feet East of Survey Station MA.1.
15. Vein Rock at Survey Station MA.1.
16. Country Rock at Survey Station MA.2., Island MA.2.
17. Large boulder (?erratic) near Survey Station MA.2.
18. Vein Rock 280 feet West of Survey Station MA.2.
19. Country Rock at sea-level at N.W. corner of Island MA.2.
20. Erratic from near Sample M.18.
21. Country Rock from near ice - rock contact, 300 feet South of Survey Station MC.1., Coastal Outcrop MC.1.
22. Country Rock at Survey Station MC.1.
23. Country Rock 25 feet below Survey Station MC.1.
24. Country Rock from crest of hill 250 feet N.E. of Survey Station MC.1.
36. Country Rock at base of hill referred to under Sample M.21
37. Country Rock at Southern crest of Island MB.5.
38. Vein Rock at N.W. corner of Island MB.5.
39. Country Rock at North end of Eastern arm, Ringoya.
49. Country Rock at crest of Island MA.6.
50. Vein Rock at crest of Island MA.6.
51. Country Rock at East end of Island MA.5.
52. Vein Rock 20 feet North of Survey Station MA.5, Island MA.5.
53. Country Rock at crest of Island MA.5.
54. Country Rock (lesser facies) 30 feet S.E. of Survey Station MA.5.
55. Country Rock at crest of Island MA.8.
56. Vein Rock 250 feet South of Survey Station MA.8., Island MA.8.
57. Pegmatitic vein 260 feet South of Survey Station MA.8.
58. Country Rock from North side of Island MA.8., near sea-level, North of Survey Station MA.8.
73. Country Rock at N.E. end of Island MA.2.
74. Vein Rock 300 feet N.W. of Survey Station MA.2.
75. Vein Rock 6 feet North of Sample M.74.
76. Vein Rock 250 feet N.W. of Survey Station MA.2.
77. Country Rock around Sample M.76.
78. Vein Rock 1 ft. West of Sample M.76 vein.
80. Country Rock at crest of Island MD.2.
81. Country Rock at crest of Coastal Outcrop MC.3.
82. Country Rock at crest of Island MA.9.
83. Country Rock at Western crest of Island SA.2.
84. Country Rock at Eastern crest of Island SA.2.
85. Garnets from 8" lens in Country Rock, mid-northern slope of Island SA.2.
86. Country Rock at crest of Coastal Outcrop MC.2.
91. Pegmatitic vein near base of summit bluff on Western side of Coastal Outcrop MC.1.
92. Country Rock around Sample M.91 vein.
93. Country Rock at North-eastern crest of Island MB.5.
94. Pegmatitic vein 100 feet N.W. of Survey Station MB.5., Island MB.5.
95. Country Rock at crest of Island MB.6.

2. (ii) "M" Series (Cont'd.)

96. Country Rock at Southernmost outcrop at head of Ringoya Bay.
97. Country Rock at N.W. end of Western arm, Ringoya.
98. Vein Rock 350 feet S.W. of Survey Station on Ringoya West
99. Country Rock 500 feet East of Ringoya W. Survey Station.
100. Country Rock at summit of North Peak, Innerskjera Island.
101. Country Rock at summit of South Peak, Innerskjera Island.
102. Vein Rock 20 feet below Sample M.101.
103. Country Rock at S.W. end of Innerskjera Island.
104. Country Rock at saddle between North and South Peaks, Innerskjera Island.
105. Vein Rock 30 feet below summit of North Peak, Innerskjera Island.
106. Country Rock at Northern end of Island IA.2.
107. Vein Rock near Sample M.106.
108. Country Rock at mid-northern side of Island IA.1.
111. Country Rock at crest of Island MA.4.
113. Country Rock at North-east end of Island FA.1.
114. Erratic 400 feet West of Eastern end of Island FA.1.
117. Vein Rock 15 feet above sea-level, near N.E. end of Island MA.3.
118. Country Rock at crest of Island MA.3.
120. Vein Rock 10 feet above sea-level near mid-northern side of Island FA.1.
121. Large boulder (?erratic) at sea-level near mid-northern side of Island FA.2.
122. Country Rock at crest of Island FA.2.
123. Country Rock at N.W. end of Island FA.2.
124. Country Rock at Western end of Island FA.3.
126. Country Rock at crest of Island SA.1.
127. Country Rock at North-western corner of Island SA.1.
128. Country Rock at crest of Island SA.3.
129. Pegmatitic vein 150 feet S.E. of Survey Station SA.3., Island SA.3.
130. Country Rock at crest of Island PA.1.
131. Country Rock at South end of Island PA.1.
132. Country Rock from middle area of Island PA.2.
133. Country Rock at crest of Island PA.3.
134. Country Rock at crest of Island Spotoy 1.
135. Country Rock at North end of Island Spotoy 1.
136. Country Rock at S.W. end of Island Spotoy 1.
137. Country Rock at crest of Rundoy Island.
138. Vein Rock near southern crest of Rundoy Island.
139. Country Rock at crest of eastern high area, Ringoya East.
140. Country Rock at crest of Island KA.1.
141. Pegmatitic vein 20 feet below Survey Station KA.1., Island KA.1.
142. Vein Rock 200 feet West of Survey Station KA.1.
143. Country Rock at S.W. corner of Island KA.2.
145. Country Rock at crest of Island SA.4.
146. Country Rock at crest of Island MB.1.
147. Vein Rock 10 feet below Survey Station MB.1., Island MB.1.
148. Vein Rock at S.E. corner of Island MB.1.
149. Vein Rock 100 feet North of Survey Station MB.1.
150. Country Rock (lesser facies) near SampleM149.
151. Vein Rock 10 feet North of Sample M150.
152. Vein Rock 150 feet North of Survey Station MB.1.
153. Country Rock (lesser facies) near West end of Island MB.1
154. Country Rock at crest of Island MB.2.
155. Pegmatitic vein 10 feet below Survey Station MB.2., Island MB.2.
156. Vein Rock 30 feet above sea-level near Eastern end of Island MB.2.
157. Vein Rock 10 feet East of Sample M.156.
158. Country Rock at Eastern end of Island MB.2.
159. Country Rock at Survey Station MB.3., Island MB.3.
160. Vein Rock at crest of N.E. end of Island MB.3.

2. (ii) "M" Series (Cont'd.)

161. Country Rock at Eastern end of Island MB.4.
162. Country Rock at crest of Island IA.3.
163. Country Rock at Southern crest of Island IA.4.
164. Country Rock at Northern crest of Island IA.4.
165. Country Rock at crest of Island MA.7.
166. Country Rock at Northern end of Island MA.7.
167. Country Rock at Western end of Island FA.4.
168. Vein Rock 75 feet North of Sample M.167.
169. Pegmatitic vein near mid-southern side of Island FA.4.
170. Country Rock at crest of Island FA.4.

(iii) "W" Series - Welsh Island.

1. Country Rock at summit of Welsh Island.
2. Vein Rock 320 feet below summit on Western side of Welsh Island.
3. Country Rock at North-west corner of Welsh Island.
4. Country Rock at South-east corner of Welsh Island.

(iv) "E" Series - Erratics.

140.- 150.	From Island MA.2.
187.	From mid-eastern slopes of Welsh Island.
242 - 249.	From overturned berg 7.8 miles North of Mawson.
250 - 281.	From coastal outcrop MC.2.
353 - 366.	From coastal outcrop MC.1.
367 - 384.	From moraine at Ringoya.
548 - 617.	From overturned berg 1.1 miles North of Mawson.

....

3. Scullin Monolith.

(i) "S" Series.

1. Country Rock from Western end of Scullin Monolith.
2. Country Rock 600 feet South-east of Western end of Scullin Monolith.
3. Country Rock from Southern side of Refuge Inlet, Scullin Monolith.
4. Country Rock from Eastern end of Scullin Monolith.
5. Country Rock 630 feet N.N.E. of Magnetic Station, Scullin Monolith.
6. Country Rock 840 feet E.S.E. of Magnetic Station, Scullin Monolith.
7. Country Rock 800 feet E.S.E. of Magnetic Station, Scullin Monolith.
8. Country Rock 2,090 feet W.S.W. of Magnetic Station, Scullin Monolith.
9. Country Rock 1,410 feet S.W. of Magnetic Station, Scullin Monolith.
10. Country Rock 900 feet S.W. of Magnetic Station, Scullin Monolith.
11. Country Rock 280 feet North of Magnetic Station, Scullin Monolith.
12. Dyke Rock 1,160 feet East of Magnetic Station, Scullin Monolith.
13. Country Rock 690 feet East of Magnetic Station, Scullin Monolith.
14. Country Rock 680 feet E.N.E. of Magnetic Station, Scullin Monolith.
15. Country Rock 600 feet S.W. of Magnetic Station, Scullin Monolith.
16. Country Rock 500 feet S.W. of Magnetic Station, Scullin Monolith.
17. Country Rock 220 feet W.S.W. of Magnetic Station, Scullin Monolith.
18. Country Rock near Magnetic Station, Scullin Monolith.

(ii) "C" Series.

1. Country Rock at North-west end of Austskjera Island.
2. Country Rock at mid-northern side of Austskjera Island.

....

4. Islands and Coastal Outcrops between Bryggeholmen and King Edward VIII Gulf.

(i) "WJ" Series.

1. Country Rock at Northern end of Bryggeholmen Island.
2. Country Rock at Southern end of Bryggeholmen Island.
3. Dyke Rock near middle of Bryggeholmen Island.
4. Country Rock at Northern end of Tongskjera Island.
5. Country Rock from small island near South-east end of Tongskjera Island.
6. Vein Rock near middle of Tongskjera Island.
7. Typical Country Rock near middle of Logtangen.
8. "Lesser facies" of Country Rock, 250 feet South of Sample WJ.7., Logtangen.
9. Vein Rock near Southern end of Logtangen.
10. Same vein as Sample WJ.9., but further East, Logtangen.
11. Same vein as Sample WJ.9., but further East than Sample WJ.10., Logtangen.
12. Samples of Vein Rock from WJ.9 - 11 area, not in situ.
13. Erratic from South- west end of Logtangen.
14. Country Rock at Svartodden.
15. Typical Vein Rock at Svartodden.
16. Irregular Vein Rock at Svartodden.
17. Typical Country Rock of Eastern area, Stedet Island.
18. Country Rock at Eastern side of North-west arm, Stedet Is.
19. Dyke Rock near Eastern side of North-west arm, Stedet Is.
20. Country Rock at middle of North-west arm, Stedet Island.
21. Vein Rock near Western side of North-west arm, Stedet Is.
22. Typical Country Rock at Western end of Stedet Island.
23. Typical Country Rock at Northern end of Ufsoy Island.
24. Vein Rock at mid-eastern side of Ufsoy Island.
25. Intrusive Rock near South-west end of Ufsoy Island.
26. Typical Country Rock at coastal outcrop South of Ufsoy.
27. "Lesser facies" of Country Rock at same coastal outcrop.
28. Typical Country Rock of Ufsoyvagen Island, off mid-western coast of Ufsoy Island.
29. Intrusive Rock at South-east end of Cape Bergnes.
30. Typical Country Rock of Eastern area, Cape Bergnes.
31. Country Rock at North-eastern end of Cape Bergnes.
32. Typical Country Rock of Northern area, Kollskjer Island.
33. Country Rock at Southern end of Kollskjer Island.
34. Vein Rock at South-west end of Kollskjer Island.
35. Typical Country Rock of Northern Stokholmen Island.
36. Typical Country Rock of Southern Stokholmen Island.
37. Vein Rock near North-east end of Stokholmen Island.
38. Vein Rock near mid-western side, Stokholmen Island.
39. Typical Country Rock at Cape Wilkins.
40. Vein Rock at Cape Wilkins.
41. Typical Country Rock at Systerkellane Island.
42. Vein Rock at Systerkellane Island.
43. Typical Country Rock at Sundvika.
44. Country Rock of Eastern area, Sundvika.
45. Vein Rock near Northern end of Sundvika.
46. Country Rock of Southeastern area, Sundvika.
47. Vein Rock near Southwestern end of Sundvika.
48. Country Rock of Southern area, Sundvika.
49. Intrusive Rock near Southern end of Broka Island.
50. Typical Country Rock of Southern area, Broka Island.
51. Vein Rock at Southern end of Broka Island.
52. Rock at contact zone between vein and Country Rock, Southern end of Broka Island.
53. Typical Country Rock at crest of Mule.
54. Country Rock South of crestal area, Mule.
55. "Lesser facies" of Country Rock South of crestal area, Mule
56. Country Rock at South end of Mule.
57. Vein Rock in WJ.55., Country Rock, Southern Mule.
58. Vein Rock at Eastern end of Mule.

59 - 60. Vein Rock near South-eastern end, Mule.

4. (i) "WJ" Series (Cont'd).

61. Typical Country Rock at crest of Kvarsnes.
62. Country Rock from North-eastern area, Kvarsnes.
63. Country Rock from North-western area, Kvarsnes.
64. Typical Country Rock from Eastern area, Kvarsnes.
65 - 66. Intrusive Rock from Eastern area, Kvarsnes.
67 - 68. Vein Rock from near crest of Kvarsnes.
69. Vein Rock from Northern end of Kvarsnes, not in situ.
70. Typical Country Rock from Northern area near sea-level, Kvarsnes.
71. Typical Country Rock from crest of Tvillingane Island.
72. "Lesser facies" of Country Rock near crestal area of Tvillingane Island.
73. Country Rock at Eastern end of Tvillingane Island.
74. Typical Country Rock from South-eastern area, Soroya Is.
75. "Lesser facies" of Country Rock, South-eastern area, Soroya Island.
76 - 81. From South to North across "mineralised" zone, Eastern side, Soroya Island.
82. Typical Country Rock from Southern area of Meoya Island.
83. "Lesser facies" of Country Rock, South-eastern Meoya Is.
84. Typical Country Rock, mid-northeastern area, Soroya Is.
85. Country Rock, mid-northern area, Soroya Island.
86 - 87. Vein Rock near crest of small island, North-east of Austoya Island.
88. Country Rock from near crest of same small island.
89. Typical Country Rock, Northern area, same small island.
90. Typical Country Rock, Southern area, same small island.
91. Typical Country Rock, Northern area, Austoya Island.
92. "Lesser facies" of Country Rock, Northern area, Austoya Island.
93. Typical Country Rock from crestal area, Austoya Island.
94. "Lesser facies" of Country Rock, crestal area, Austoya Is.
95. Vein Rock, North-western area, Austoya Island.
96. Vein Rock, North-eastern area, Austoya Island.
97 - 99. Intrusive Rocks, crestal area, Austoya Island.
100. Country Rock from South-eastern area, Mule.
101 - 105. Across "contact" zone between Country Rock and vein, on Southern side of vein, South-east Mule.
106. Vein Rock, as referred to above, South-east Mule.
107. Country Rock on Northern side of above vein, S.E. Mule.
108. Country Rock on Western side of vein, Eastern Mule.
109 - 111. Vein rock from same vein as Sample WJ.58., E. Mule.
112. Typical Country Rock, Southern area, small island N.N.W. of Meskjera Island, Langsundet East.
113. Vein Rock from Southern area, same small island.
114. Vein Rock from South-eastern area, same small island.
115. Typical Country Rock from Sea-level to ca. 40 feet, North-western area, Meskjera Island.
116. Vein Rock in WJ.115 Country Rock, N.W. Meskjera Island.
117. Vein Rock, crestal area, Western Meskjera Island.
118. Typical Country Rock from crestal area, W. Meskjera Is.
119. Typical Country Rock from Western area, Tverrholmen Is.
120. Vein Rock from South-western Tverrholmen Island.
121 - 122. Vein Rock from S.W. area, Tverrholmen Island.
123. Intrusive Rock near Sea-level, S.W. Tverrholmen Island.
124. Typical Country Rock from South-eastern end, Foldoya Is.
125. "Lesser facies" of Country Rock, S.E. area, Foldoya Is.
126. Typical Country Rock, Northern area, Bertha Island.
127. Country Rock, Northern area, Bertha Island.
128. "Lesser facies" of Country Rock, N.E. area, Bertha Island.
129. Vein Rock, North-eastern area, Bertha Island.
130. Typical Country Rock near Sea-level, W. area, Uksen Is.
131. Typical Country Rock, crestal area, central Uksen Island.
132. Vein Rock near South-west end of Uksen Island.
133. Vein Rock from Eastern crestal area, Uksen Island.
134. Contact zone between WJ.133 vein and WJ.131 Country Rock.
135. Typical Country Rock near Sea-level, E. area, Uksoy Is.
136. Typical Country Rock from crestal area, Uksoy Island.

4. (i) "WJ" Series. (Cont'd.)

137. Vein Rock about 60 feet above Sea-level, mid-eastern area, Uksoy Island.
138. "Lesser facies" of Country Rock, ca. 60 feet above Sea-level, mid-eastern area, Uksoy Island.
139. Vein Rock about 60 feet above Sea-level, Eastern area, Uksoy Island.
140. Typical Country Rock from Western area, Isvika Island.
141. Vein Rock in WJ.140 Country Rock, Western end, Isvika Is.

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5. Henderson Range.

(i) "H" Series.

1. Country Rock from North-east end of Henderson Range, at ice - rock contact.
2. Dyke Rock, 600 feet South of Sample H.1., Henderson Range.
3. Country Rock at base of bluff below Mt. Henderson Peak, Eastern side of Range.
4. Country Rock at base of bluff below Mt. Henderson Peak, Eastern side of Range, 500 feet South of Sample H.3.
5. Vein Rock in H.4., Country Rock, 70 feet above Sample H.4.
6. Erratic on plateau surface, 400 yards South of Flag B6A.
7. Country Rock from summit of low Western Peak, Henderson R.
8. Country Rock from Northern end of Western Peak, 30 feet above ice-rock contact, Henderson Range.
9. "Lesser facies" of Country Rock, 20 feet below Sample H.8.
10. Country Rock at Henderson Depot, South-west end of Henderson Range.

(ii) "E" Series - Erratics.

82 - 91.	From Western slopes of Henderson Range.
241.	From Western slopes of Henderson Range.
618 - 631.	From Henderson Depot, South-west end of Henderson Range.

....

6. Russell Nunatak.

(i) "SJ" Series.

37. Country Rock from Western end of Russell Nunatak.
38. Country Rock from crestal area, Western side, Russell Nun.
39. "Lesser facies" of Country Rock from Western area, Russell Nunatak.
40. Country Rock from North-east end of Russell Nunatak.
41. Country Rock from Eastern end of Russell Nunatak.
42. Country Rock from South-eastern end of Russell Nunatak.
43. Country Rock from crestal area, Eastern side, Russell Nunatak.
44. Vein Rock at North-east end of Russell Nunatak.

....

7. Depot Mountain.

(i) "SJ" Series.

1. Typical Country Rock, low peak area, Depot Mountain.
2. Vein Rock, ca. 40 feet below summit of low peak on Southern side, Depot Mountain.
3. Vein Rock, ca. 60 feet below summit of low peak on Southern side, Depot Mountain.
4. From band in Country Rock, ca. 80 feet below summit of low peak on Southern side, Depot Mountain.
5. From band in Country Rock, at saddle in summit ridge, 1,150 feet South of low peak, Depot Mountain.
6. From band in Country Rock, near saddle in summit ridge, 1,290 feet South of low peak, Depot Mountain.
7. Country Rock from gap area in summit ridge, 1,460 feet South of low peak, Depot Mountain.
8. From thick band at ice-rock contact, below low peak, Western side, Depot Mountain.
9. From 4 feet band near ice-rock contact, below low peak, Western side, Depot Mountain.

10A. From ½" band around outside of 9' x 3' oval inclusion in SJ.9 band, below low peak, W. side, Depot Mountain.
10B. From 1" band inside SJ.10A band, Depot Mountain.
10C. Core Rock of inclusion, inside SJ.10B band, Depot Mt.
11. Typical Country Rock at base of summit ridge, South end of range, Depot Mountain.
12. Vein Rock at crest of South-east end of summit ridge, Depot Mountain.

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8. Southern Nunataks.

(i) "SJ" Series.

13. Country Rock from crest of rock peak, 1.4 miles N.E. of Peak 7, Southern Nunataks.
14. Country Rock from crest of rock peak, 1.3 miles S.E. of Peak 7, Southern Nunataks.
15. Vein Rock from crestal area of rock peak as for SJ.14.
16. Country Rock from low peak at Northern end of summit ridge to rock peak, as for Sample SJ.14.
17. Country Rock from crestal area of Peak 7, S. Nunataks.
18. Vein Rock from summit of Peak 7, Southern Nunataks.
19. Country Rock from Southern end of summit ridge from Peak 7, Southern Nunataks.
20. From band in Country Rock SJ.19, Southern Nunataks.
21. Country Rock at Northern end of summit ridge from Peak 7, Southern Nunataks.
22. Vein Rock from Northern side of summit of Peak 7, Southern Nunataks.
23. Vein Rock from North-eastern side of summit of Peak 7.
24. "Lesser facies" of Country Rock, 50 feet North along summit ridge from Peak 7, Southern Nunataks.
25. Vein Rock 100 feet North of Peak 7, Southern Nunataks.
26. Contact Rock between SJ.25 vein and Country Rock, Peak 7.
27. Country Rock containing SJ.25 vein, Peak 7, S. Nunataks.
28. Country Rock at Northernmost exposure of Summit Ridge, Peak 7, Southern Nunataks.
29. Vein Rock at Northern end of summit ridge, Peak 7.
30. Typical Country Rock at F.10 Depot, 1 miles N. of Peak 7.
31. Country Rock from crestal area, Peak X, 6 miles W.S.W. of Peak 7, Southern Nunataks.
32. "Lesser facies" of Country Rock from Crestal area, Peak X.
33. Country Rock from Northern area, Peak X, S. Nunataks.
34. Country Rock from Western area, Peak X, S. Nunataks.
35. Country Rock from Southern area, Peak X, S. Nunataks.
36. Vein Rock from s mmit of Peak X, Southern Nunataks.

SAMPLE LOCALITY LIST

1. **Mawson Station Area.**

Reference: Plate 3 - Map of Mawson Station.

Survey Stations at Mawson Base:

(i) M.1; M.2; M.4; M.5 - Stations along Western Arm.

(ii) M.6 - Southern Arm; highest Station in area.

(iii) M.7; M.8 - Stations along Eastern Arm.

(iv) M.9; Magnetic Station - Stations on "Magnetic Flat".

2. **Islands and Coastal Outcrops within 15 miles Radius of Mawson.**

Reference: Plate 4 - Map of Mawson, Scale 1:100,000.

3. **Scullin Monolith.**

Reference: Plate 5 - Map of Scullin Monolith.

Austskjera Island - Position about 30 miles East of Mawson; Lat. 67° 30½'S; Long. 64° 05'E.

4. **Islands and Coastal Outcrops between Bryggeholmen and King Edward Vlll Gulf.**

Reference: Plates 6, 7 and 8 - Norwegian Maps of Antarctica.

Locality.	Latitude (S).	Longitude (E).
Bryggeholmen Island	67° 34'	62° 27'
Tongskjera Island	67° 33'	62° 07'
Logtangen	67° 33½'	62° 07'
Svartodden	67° 33'	61° 49'
Stedet Island	67° 34½'	61° 34'
Isvika Island	67° 30½'	61° 26'
Ufsoy Island - Cape Bergnes	67° 30'	61° 13'
Kollskjer Island	67° 26'	60° 48'
Uksoy Island	67° 25½'	60° 47'
Uksen Island	67° 23'	60° 17'
Stokholmen Island	67° 22'	60° 01'
Kalven Island (Bertha Island)	67° 23'	59° 46'
Foldoya Island	67° 22½'	59° 35'
Systerkellane Island	67° 18'	59° 30'
Tverrholmen Island	67° 22'	59° 23'
Cape Wilkins	67° 17'	59° 22'
Meskjera Island	67° 17'	59° 09'
Island in Langsundet East	67° 12½'	59° 01'
Sundvika	67° 12'	58° 45'
Broka Island	67° 10½'	58° 38'
Mule	67° 07½'	58° 17'
Austoya Island	67° 04½'	57° 54'
Island N.E. of Austoya	67° 03½'	57° 54'
Meoya Island	67° 01'	57° 29'
Soroya Island	67° 01½'	57° 28'
Kvarsnes	67° 06'	57° 04'
Tvillingane Island	66° 55'	56° 47'

5. Henderson Range.

Reference: Plate 4 - Map of Mawson, Scale 1:100,000.
Plate 9 - Reconnaissance Map, Scale 1:500,000.

6. Russell Nunatak.

Reference: Plate 9 - Reconnaissance Map, Scale 1:500,000.

7. Depot Mountain.

Reference: Plate 9 - Reconnaissance Map, Scale 1:500,000.
Plate 10 - Map of Depot Mountain.

8. Southern Nunataks.

Reference: Plate 9 - Reconnaissance Map, Scale 1:500,000.

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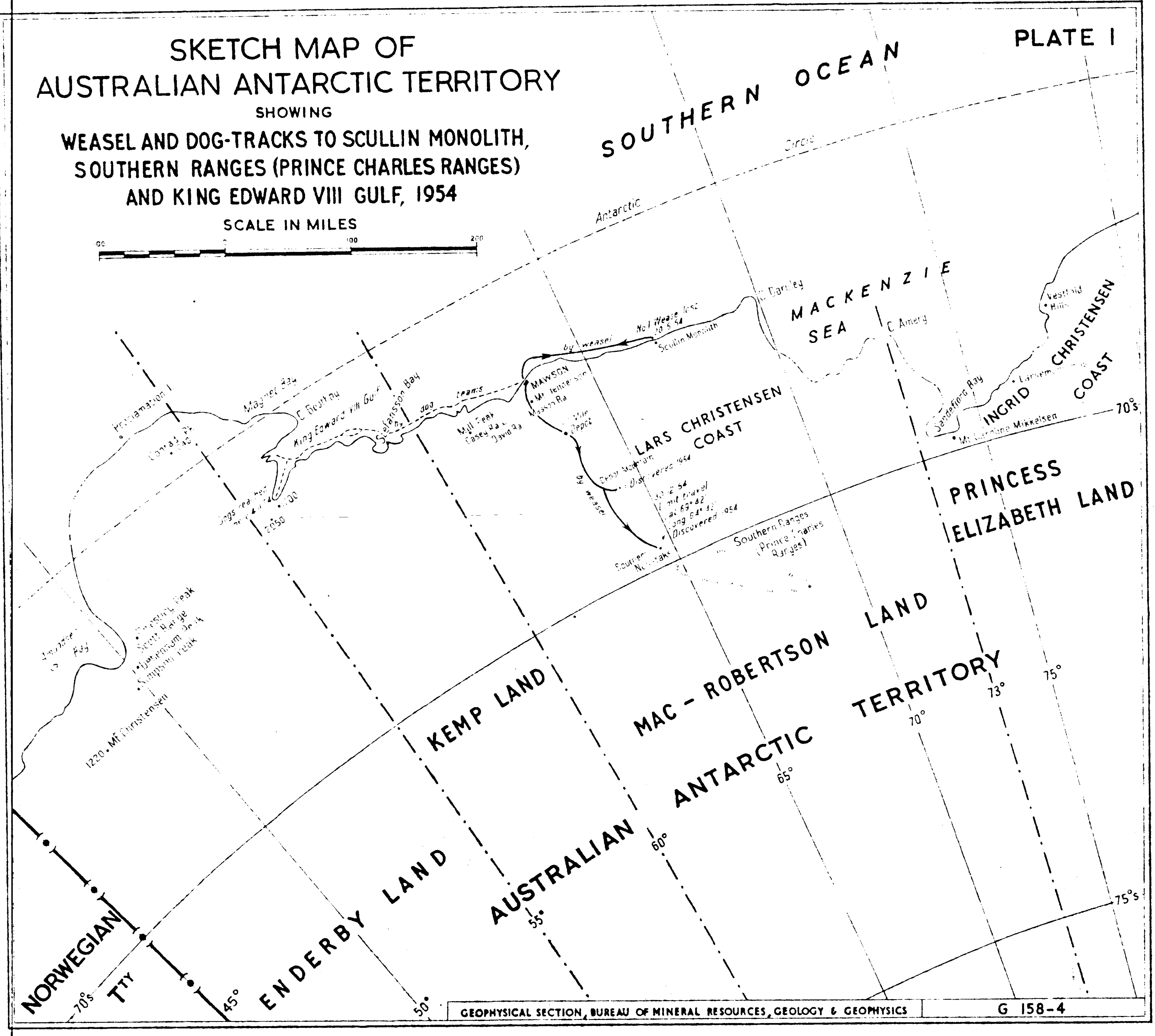
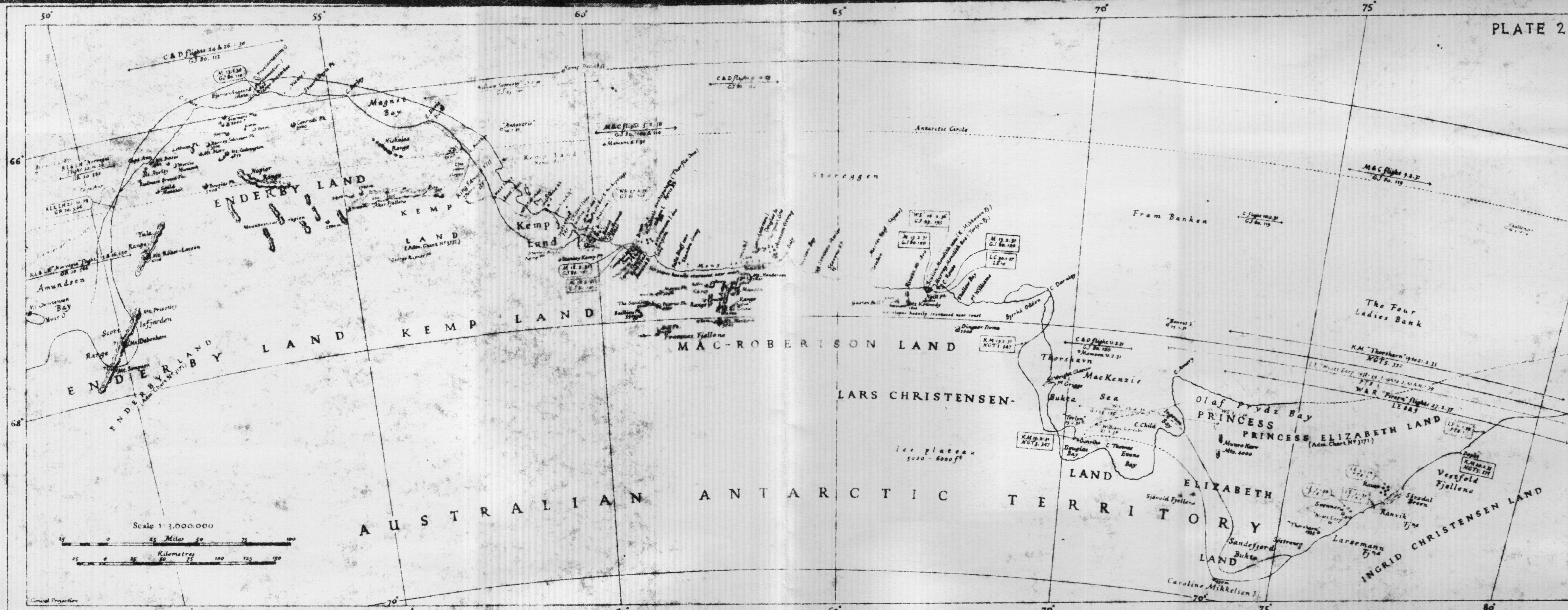
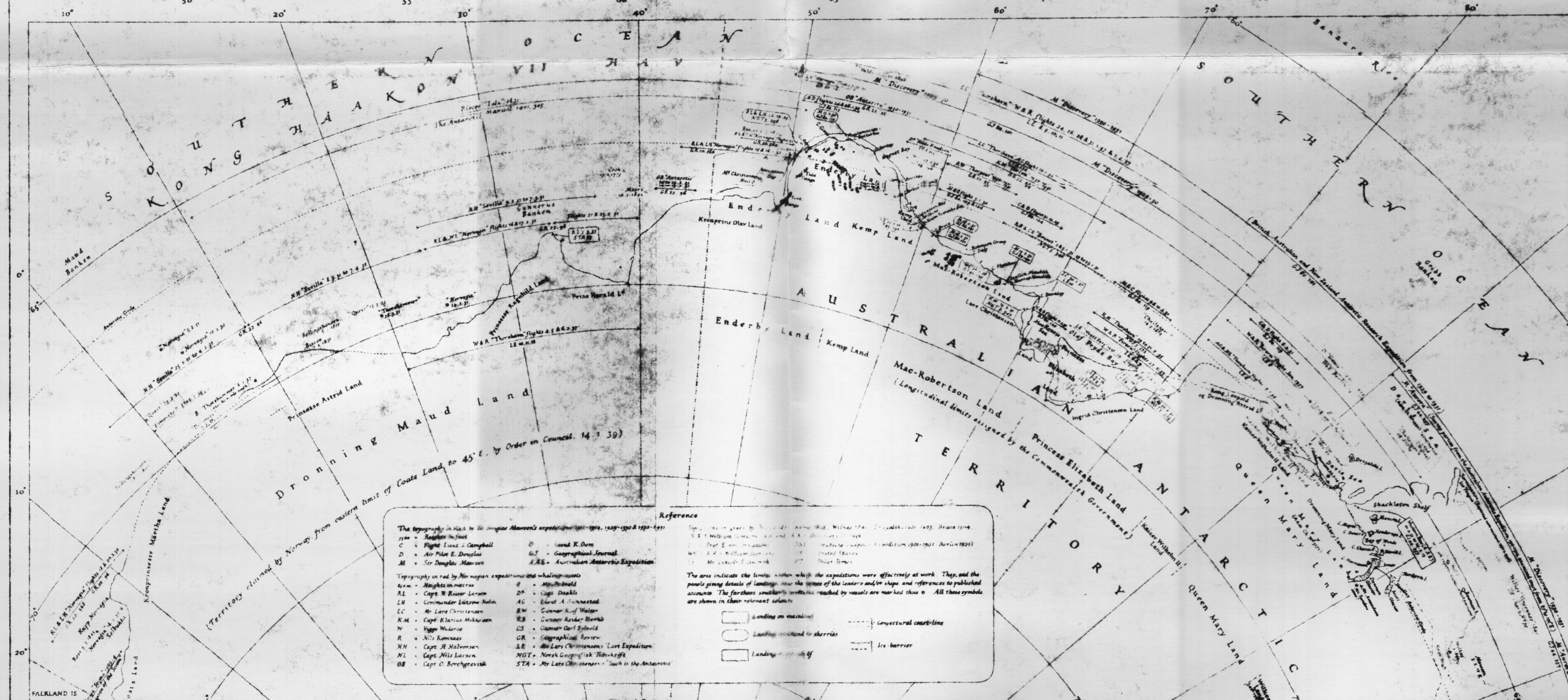


PLATE I
SKETCH MAP OF AUSTRALIAN ANTARCTIC TERRITORY
SHOWING
WEASEL AND DOG-TRACKS TO SCULLIN MONOLITH, SOUTHERN RANGES (PRINCE CHARLES RANGES) AND KING EDWARD VIII GULF, 1954
SCALE IN MILES
100
200
SOUTHERN OCEAN
Antarctic
Circle
MACKENZIE SEA
C. Darnley
C. Amery
Scullin Monolith
by weasel
dog teams
MAWSON
Masson Ra
David Ra
Casey Ra
Stefansson Bay
King Edward VIII Gulf
C. Boothby
Magnet Bay
Proclamation I.
LARS CHRISTENSEN COAST
Southern Ranges (Prince Charles Ranges)
Discovered 1954
Sandefjord Bay
Vestfold Hills
INGRID CHRISTENSEN COAST
Mt Caroline Mikkelsen
PRINCESS ELIZABETH LAND
MAC-ROBERTSON LAND
KEMP LAND
ENDERBY LAND
AUSTRALIAN ANTARCTIC TERRITORY
NORWEGIAN TTY
1220 Mt Christensen
70°S
75°S
45°
50°
55°
60°
65°
70°
73°
75°
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS
G 158-4

PLATE 2



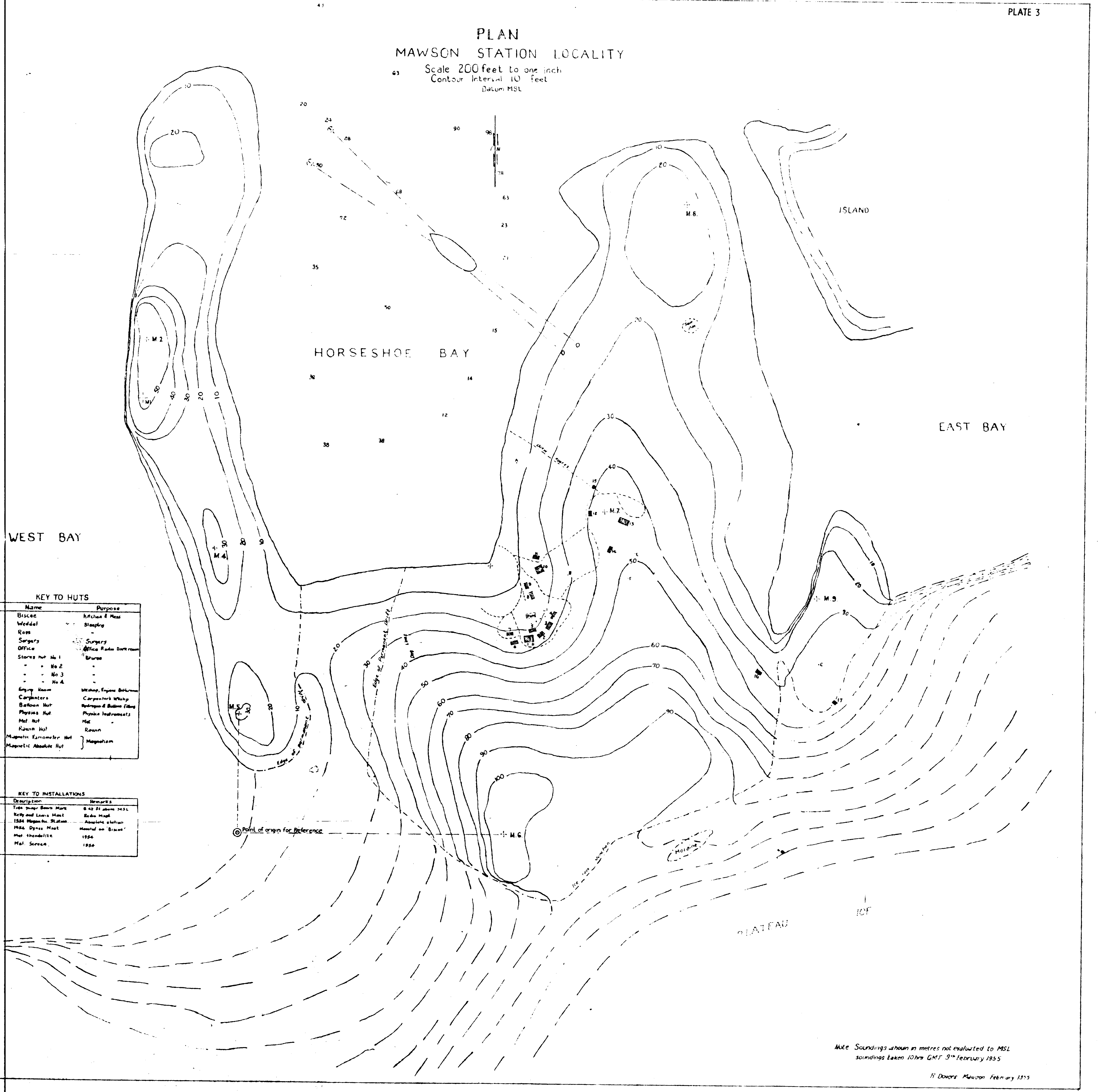


Compilation and outline by H.F. Milnes: writing by C.E. Davey.

Published by the Royal Geographical Society

ANTARCTIC

PLATE 3



KEY TO HUTS

Number	Name	Purpose
1	Biscoe	Kitchen & Mess
2	Weddel	Sleeping
3	Ross	"
4	Surgery	Surgery
5	Office	Office Radio Darkroom
6	Stores hut No 1	Stores
7	" " No 2	"
8	" " No 3	"
9	" " No 4	"
10	Engine Room	Wkshop, Engines Bathroom
11	Carpenters	Carpenter's Wkshp
12	Balloon Hut	Hydrogen & Balloon Filling
13	Physics Hut	Physics Instruments
14	Met. Hut	Met "
15	Rawin Hut	Rawin
16	Magnetic Variometer Hut	Magnetism
17	Magnetic Absolute Hut	Magnetism

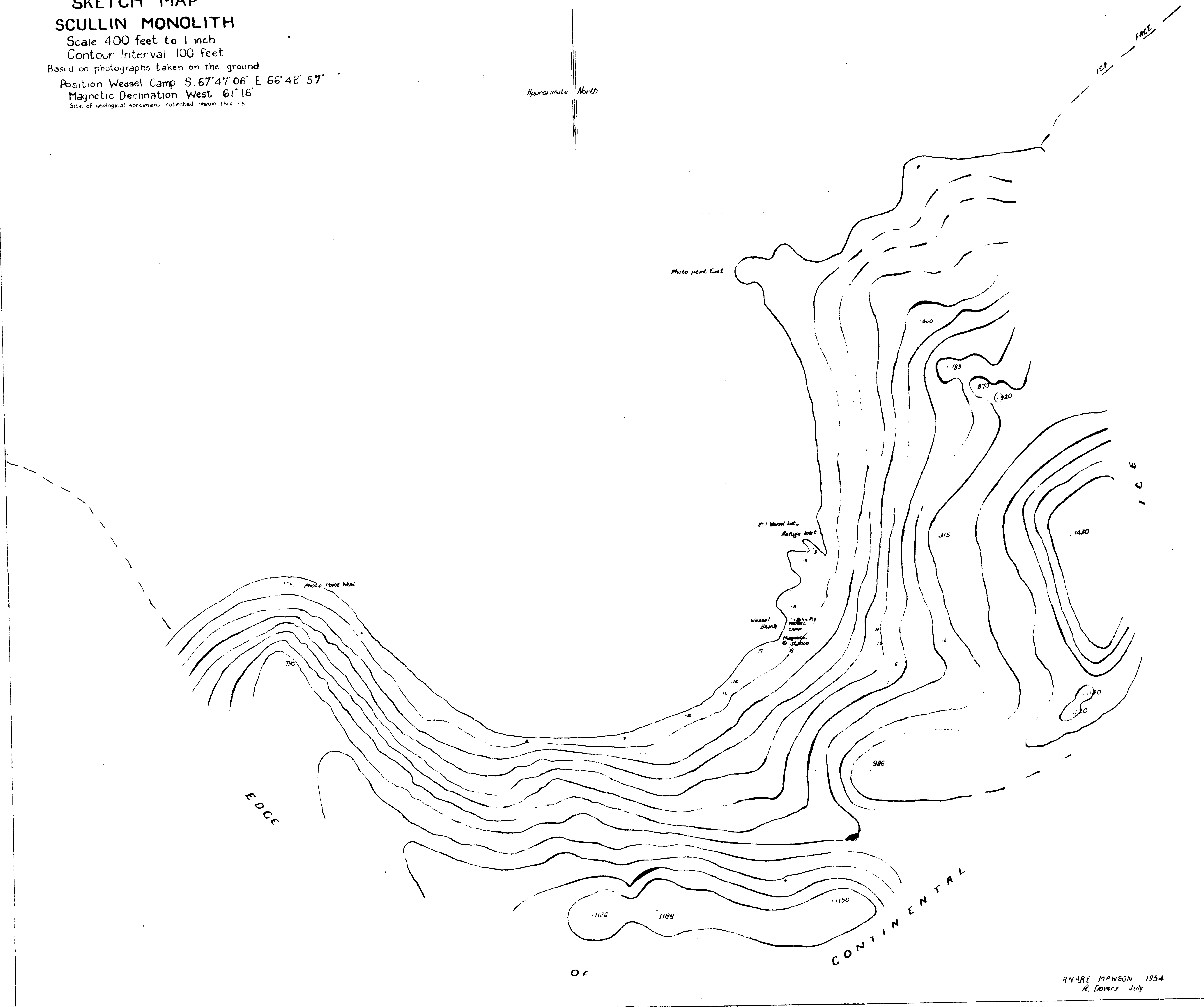
KEY TO INSTALLATIONS

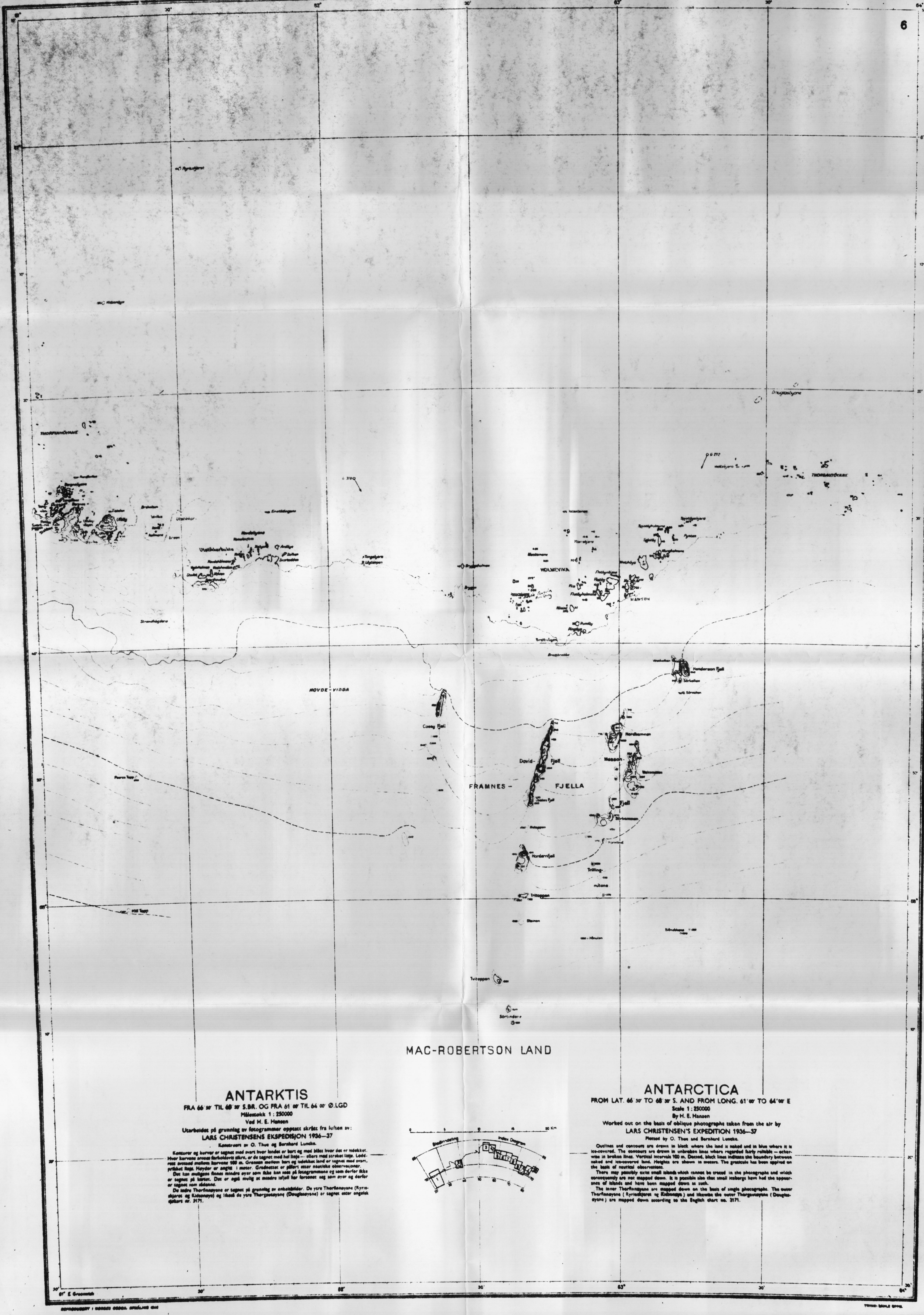
Letter	Description	Remarks
A	Tide gauge Bench Mark	6.42 ft above MSL
B	Kelly and Lewis Mast	Radio Mast
C	1954 Magnetic Station	Absolute station
D	1954 Dynes Mast	Mounted on 'Biscoe'
E	Met. theodolite	1954
F	Met. Screen.	1954

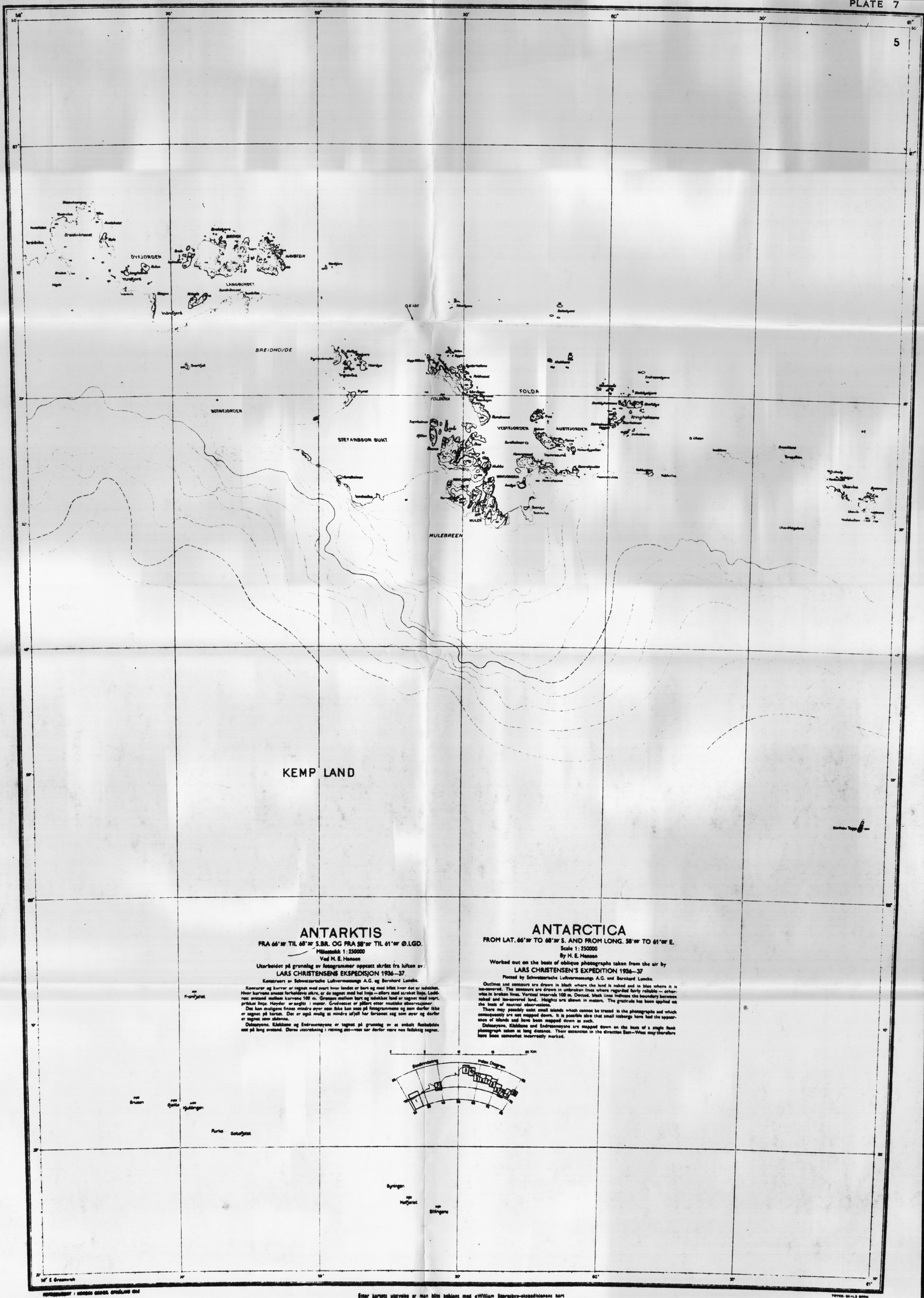
Based on an exploratory triangulation with detail from terrestial and oblique aerial photography R Dovers Mawson 8 October 1954

SKETCH MAP
SCULLIN MONOLITH

Scale 400 feet to 1 inch
Contour Interval 100 feet
Based on photographs taken on the ground
Position Weasel Camp S. 67°47'06" E 66°42'57"
Magnetic Declination West 61°16'
Site of geological specimens collected shown thus · 5




6
MAC-ROBERTSON LAND
FRAMNES-
FJELLA
David-
Fjell
Masson
Casey Fjell
Henderson Fjell
HOLMEVIKA
HOVDE-VIDDA
ANTARKTIS
FRA 66°30′ TIL 68°30′ S.BR. OG FRA 61°00′ TIL 64°00′ Ø.LGD
Målestokk 1 : 250000
Ved H. E. Hansen
Utarbeidet på grunnlag av fotogrammer opptatt skrått fra luften av:
LARS CHRISTENSENS EKSPEDISJON 1936–37
Konstruert av O. Thue og Bernhard Luncke.
Konturer og kurver er tegnet med svart hvor landet er bart og med blått hvor det er isdekket. Hvor kurvene anses forholdsvis sikre, er de tegnet med hel linje — ellers med streket linje. Loddrett avstand mellom kurvene 100 m. Grensen mellom bart og isdekket land er tegnet med svart, prikket linje. Høyder er angitt i meter. Gradnettet er påført etter nautiske observasjoner.
Det kan muligens finnes mindre øyer som ikke kan sees på fotogrammene og som derfor ikke er tegnet på kartet. Det er også mulig at mindre isfjell har fortonet seg som øyer og derfor er tegnet som sådanne.
De indre Thorfinnøyane er tegnet på grunnlag av enkeltbilder. De ytre Thorfinnøyane (Ryrisskjeret og Kidsonøya) og likeså de ytre Thorgautøyane (Douglasøyane) er tegnet etter engelsk sjøkart nr. 3171.
ANTARCTICA
FROM LAT. 66°30′ TO 68°30′ S. AND FROM LONG. 61°00′ TO 64°00′ E
Scale 1 : 250000
By H. E. Hansen
Worked out on the basis of oblique photographs taken from the air by
LARS CHRISTENSEN'S EXPEDITION 1936–37
Plotted by O. Thue and Bernhard Luncke.
Outlines and contours are drawn in black where the land is naked and in blue where it is ice-covered. The contours are drawn in unbroken lines where regarded fairly reliable — otherwise in broken lines. Vertical intervals 100 m. Dotted, black lines indicate the boundary between naked and ice-covered land. Heights are shown in meters. The graticule has been applied on the basis of nautical observations.
There may possibly exist small islands which cannot be traced in the photographs and which consequently are not mapped down. It is possible also that small icebergs have had the appearance of islands and have been mapped down as such.
The inner Thorfinnøyane are mapped down on the basis of single photographs. The outer Thorfinnøyane (Ryrieskjeret og Kidsonøya) and likewise the outer Thorgautøyane (Douglasøyane) are mapped down according to the English chart no. 3171.
61° E Greenwich
30′
62°
63°
64°


5
ØYFJORDEN
HAVSTEIN
LANGSUNDET
BREIDHOVDE
BOTNFJORDEN
STEFANSSON BUKT
FOLDØYA
FOLDA
VESTFJORDEN
AUSTFJORDEN
MULEN
MULEBREEN
KEMP LAND
ANTARKTIS
FRA 66°30' TIL 68°30' S.BR. OG FRA 58°00' TIL 61°00' Ø.LGD.
Målestokk 1:250000
Ved H. E. Hansen
Utarbeidet på grunnlag av fotogrammer opptatt skrått fra luften av:
LARS CHRISTENSENS EKSPEDISJON 1936–37.
Konstruert av Schweizerische Luftvermessungs A.G. og Bernhard Luncke.
Konturer og kurver er tegnet med svart hvor landet er bart og med blått hvor det er isdekket. Hvor kurvene ansees forholdsvis sikre, er de tegnet med hel linje — ellers med streket linje. Loddrett avstand mellom kurvene 100 m. Grensen mellom bart og isdekket land er tegnet med svart, prikket linje. Høyder er angitt i meter. Gradnettet er påført etter nautiske observasjoner.
Det kan muligens finnes mindre øyer som ikke kan sees på fotogrammene og som derfor ikke er tegnet på kartet. Det er også mulig at mindre isfjell har fortonet seg som øyer og derfor er tegnet som sådanne.
Dalesøyane, Klakkane og Endresenøyane er tegnet på grunnlag av et enkelt flankebilde tatt på lang avstand. Deres utstrekning i retning øst—vest tør derfor være noe feilaktig tegnet.
ANTARCTICA
FROM LAT. 66°30' TO 68°30' S. AND FROM LONG. 58°00' TO 61°00' E.
Scale 1:250000
By H. E. Hansen
Worked out on the basis of oblique photographs taken from the air by
LARS CHRISTENSEN'S EXPEDITION 1936–37
Plotted by Schweizerische Luftvermessungs A.G. and Bernhard Luncke.
Outlines and contours are drawn in black where the land is naked and in blue where it is ice-covered. The contours are drawn in unbroken lines where regarded fairly reliable — otherwise in broken lines. Vertical intervals 100 m. Dotted, black lines indicate the boundary between naked and ice-covered land. Heights are shown in meters. The graticule has been applied on the basis of nautical observations.
There may possibly exist small islands which cannot be traced in the photographs and which consequently are not mapped down. It is possible also that small icebergs have had the appearance of islands and have been mapped down as such.
Dalesøyane, Klakkane and Endresenøyane are mapped down on the basis of a single flank photograph taken at long distance. Their extention in the direction East—West may therefore have been somewhat incorrectly marked.
20 Km
Bladinndeling
Index Diagram

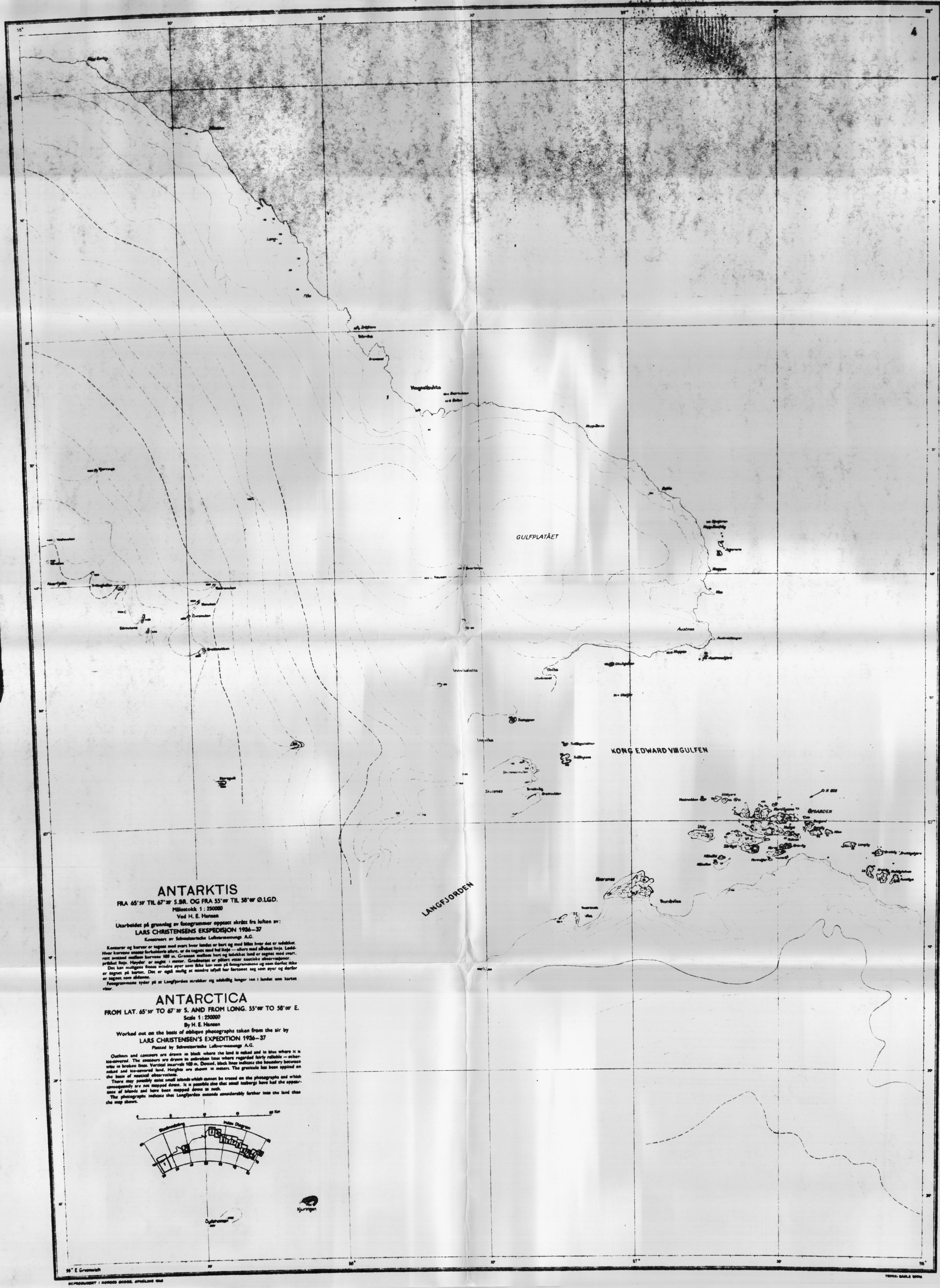
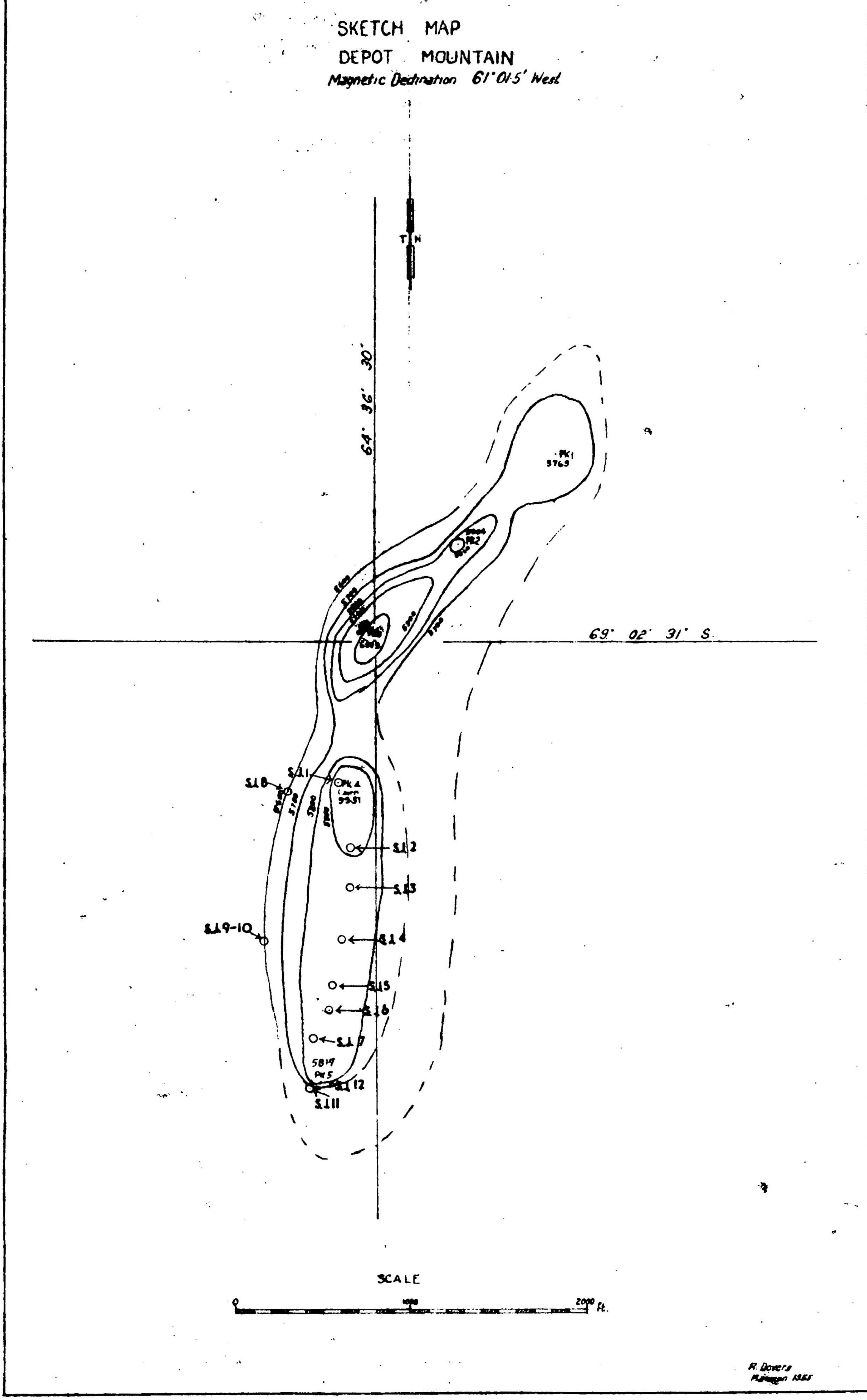

4
GULFPLATÅET
KONG EDWARD VIII GULFEN
LANGFJORDEN
Kjuringen
ANTARKTIS
FRA 65°55′ TIL 67°35′ S.BR. OG FRA 55°00′ TIL 58°00′ Ø.LGD.
Målestokk 1 : 250000
Ved H. E. Hansen
Utarbeidet på grunnlag av fotogrammer opptatt skrått fra luften av:
LARS CHRISTENSENS EKSPEDISJON 1936—37
Konstruert av Schweizerische Luftvermessungs A.G.
Konturer og kurver er tegnet med svart hvor landet er bart og med blått hvor det er isdekket. Hvor kurvene ansees forholdsvis sikre, er de tegnet med hel linje — ellers med stiplet linje. Loddrett avstand mellom kurvene 100 m. Grensen mellom bart og isdekket land er tegnet med svart, prikket linje. Høyder er angitt i meter. Gradnettet er påført etter nautiske observasjoner.
Det kan muligens finnes mindre øyer som ikke kan sees på fotogrammene og som derfor ikke er tegnet på kartet. Det er også mulig at mindre isfjell har fortonet seg som øyer og derfor er tegnet som sådanne.
Fotogrammene tyder på at Langfjorden strekker sig adskillig lenger inn i landet enn kartet viser.
ANTARCTICA
FROM LAT. 65°55′ TO 67°35′ S. AND FROM LONG. 55°00′ TO 58°00′ E.
Scale 1 : 250000
By H. E. Hansen
Worked out on the basis of oblique photographs taken from the air by
LARS CHRISTENSEN'S EXPEDITION 1936—37
Plotted by Schweizerische Luftvermessungs A.G.
Outlines and contours are drawn in black where the land is naked and in blue where it is ice-covered. The contours are drawn in unbroken lines where regarded fairly reliable — otherwise in broken lines. Vertical intervals 100 m. Dotted, black lines indicate the boundary between naked and ice-covered land. Heights are shown in meters. The graticule has been applied on the basis of nautical observations.
There may possibly exist small islands which cannot be traced on the photographs and which consequently are not mapped down. It is possible also that small icebergs have had the appearance of islands and have been mapped down as such.
The photographs indicate that Langfjorden extends considerably farther into the land than the map shows.
Km
Index Diagram

PLATE 9b

SHOWING APPROXIMATE POSITION OF WESTERN EXTREMITY OF SOUTHERN MOUNTAINS (PRINCE CHARLES RANGES)

Plate 9a
60°E
61°
62°
63°
64°
65°
66°
67°
68°
69°
70°E
PRELIMINARY MAP
SOUTHERN RECCONNAISSANCE
Shewing approximate position south mountains
Scale 1·500 000
70°S
70°S
71°S

PLATE 10


SKETCH MAP
DEPOT MOUNTAIN
Magnetic Declination 61°01·5' West
T
M
64° 36' 30"
69° 02' 31" S.
PK1
5763
PK2
PK4
5551
S.L.1
S.L.2
S.L.3
S.L.4
S.L.5
S.L.6
S.L.7
S.L.8
S.L.9-10
S.L.11
S.L.12
5819
PK5
SCALE
0
1000
2000 Ft.
R. Dovers
Mawson 1955