COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1966/77

INSPECTION OF JERVIS BAY, A.C.T. DUNE SAND DEPOSITS OCTOBER, 1965.

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	Page No.
INTRODUCTION	1
TOPOGRAPHY AND GENERAL GEOLOGY	1
DESCRIPTION OF THE TWO SAND DUNES VISITED	1
(a) Dune 1. One Half Mile along Caves Beach Road from Jervis Bay Road.	1
(b) Dune 2. Near Main Nowra-Jervis Bay Road.	2
(c) General Observations	2
SUITABILITY FOR USE AS FOUNDRY SAND	2
POSSIBLE USE AS GLASS-MAKING SAND	2
CONCLUSIONS AND RECOMMENDATIONS	2
REFERENCES	3

APPENDIX - Petrographic examination of three dune sands from Jervis Bay, A.C.T.

PLATES - 1. Locality map, showing geology.

2. Distribution of grain sizes in three sands from Jervis Bay, A.C.T.

3. Cumulative frequency diagram of grain sizes of three sands from Jervis Bay, A.C.T.

INSPECTION OF JERVIS BAY, A.C.T., DUNE SAND DEPOSITS, OCTOBER, 1965

INTRODUCTION

At the request of Peter F. Daly and Co., Solicitors, acting on behalf of a client, an inspection was made on October 5th, 1965, of dune sand deposits in Commonwealth Territory at Jervis Bay, for possible use as foundry sand.

Three pits were visited, all of them about 1 mile west of the Jervis Bay Naval Station. Two of the pits are in a dune about half a mile along the Caves Beach Road from the main Nowra-Jervis Bay road (Reference 1:50,000 Sheet No. 9027-N; 368600E, 066200N). The third pit is near the Nowra-Jervis Bay road half a mile from the Territory boundary (Grid reference 368600E, 066300N). For locations of the pits, see the accompanying locality map (Plate 1).

Small samples, about one handful, were taken at one-foot vertical intervals in each pit and combined to give a representative sample from each pit. The samples were examined petrographically by Dr. W.Oldershaw (see Appendix).

TOPOGRAPHY AND GENERAL GEOLOGY

The region is gently undulating. Bedrock throughout the area is composed of Jervis Bay Sandstone, of Permian age (Perry and Dickins, 1952). Dunes of Recent wind-blown sand cover much of the area; they are largely covered with trees and scrub except near the sea shore. The dunes tend to be aligned in a north-north-east direction.

DESCRIPTION OF THE TWO SAND DUNES VISITED

Dune 1. One Half Mile along Caves Beach Road from Jervis Bay Road.

Two pits about 25 yards apart have exposed vertical sections of the dune. The dune rests on soil overlying the sandstone bedrock mentioned above.

In the northern pit the vertical section is, from the top:

0 - 2 feet. White sand with numerous roots and decayed vegetation decreasing downwards from the surface.

2 - 6 feet. White sand with occasional roots.

6 -12 feet. Yellow sand (The contact with the white sand above is sharp but irregular).

Below 12 feet. Dark brown soil.

In the second pit, 25 yards to the south, the section is:-

0 - 2 feet. White sand with numerous roots and decayed vegetation decreasing downwards from the surface.

2 - 7 feet. White sand with very occasional roots.

Below 7 feet. Dark brown soil.

Behind the two pits the dune rises to a maximum height of about 15 feet. Sample 65360068, from the northern pit, was found in the laboratory to contain limonite nodules (see Appendix), which accounts for the yellow colour of the lower section of the dune. Perry and Dickins found deposits of ferruginous gravel close by. The limonite is probably derived by capilliary action from ferruginous gravel underlying the dune.

Dune 2 - Near Main Nowra-Jervis Bay Road.

A pit left by excavation on the south-sloping side of the dune was examined. The vertical section is, from the top:-

0 - 2 feet. White sand containing roots and decayed vegetation.

2 - 6 feet. White sand with a few roots.

Below 6 feet. Dark brown soil.

General Observations

The sand in all pits and other exposures appeared to be of very uniform size grading, and this was borne out by the laboratory work (see Appendix and Plates 2 and 3 for size ranges and distributions of the samples). The whiteness of most of the sand is very striking and a high quartz content is evident from field observation. The percentage of quartz is in fact over 99 per cent (see Appendix).

SUITABILITY FOR USE AS FOUNDRY SAND

Desirable properties for foundry sand include good permeability, infusibility, cohesion and durability (Ladoo and Myers, 1951, p. 467).

Permeability. The sand is well graded and would have a high permeability.

Infusibility. Owing to the extremely high percentage of quartz, which has a very high melting point unless combined with alkalies, there would be very little tendency for the sand to fuse at temperatures attained in foundry work. Permeability should therefore remain high with repeated use of the sand.

Cohesion. The sand, because of its purity, has little cohesion between the sand grains. A suitable bonding agent would therefore need to be added for use as a foundry sand. As quartz is a hard, durable and inert mineral and has a very high melting point the dune sand should prove very durable if used as foundry sand.

POSSIBLE USE AS GLASS-MAKING SAND

The clean-looking white sand could, owing to the high percentage of quartz and lack of significant amounts of undesirable impurities (see Appendix) be used for glass-making. At least 95%, by weight, of the grains are of an acceptable size, and none are too large. However the yellow sand, which contains limonite, would probably contain too high a percentage of iron to be a good glass sand.

CONCLUSIONS AND RECOMMENDATIONS

The sand appears to be very suitable, as to permeability, infusibility, and durability, for use as foundry sand. Cohesion, however, is lacking and a bonding agent would be needed. Probably only the white sand is suitable for glass-making.

The roots and decayed vegetation should be removed as far as possible before excavation. the smaller rootlets may have to be removed by washing; the fine fraction, which contains much of the impurities, would also be largely removed in the process.

Very extensive dunes, covering several square miles, occur to the south-west of those visited, and are likely to be similar in composition. However, the conclusions reached for the samples examined do not necessarily apply to sand from other dunes. Further samples should be analysed if it is desired to exploit other deposits. The two dunes observed cover an area of approximately 40 acres - 10 acres on the Caves Beach Road and 30 acres near the main Nowra-Jervis Bay road. The maximum height is about 15 feet. This gives a volume of at least 300,000 cubic yards of sand.

Finally, it should be noted that any conclusions reached in this report as to the suitability of the sand, for foundry and glass-making sand, are based on three samples only. Before exploitation is considered systematic sampling should be undertaken and a representative bulk sample should be submitted to a practical mould-making test.

REFERENCES

LADOO, R.B. & MYERS, W.M., 1951 - NON-METALLIC MINERALS. McGraw-Hill Book Company Inc., New York.

PERRY, W.J. & DICKINS, J.M., 1952 - Report on a geological survey of Commonwealth Territory, Jervis Bay. Bur. Min. Resour. Aust. Rec. 1952/88. (unpubl.)

APPENDIX - PETROGRAPHIC EXAMINATION OF THREE DUNE SANDS FROM JERVIS BAY, A.C.T.

by

W. Oldershaw

Three samples of dune sand from the Caves Beach road about a mile west of Jervis Bay were submitted by G.A.M. Henderson for examination as a possible foundry sand.

Sample 6530068 consists of a dry, free-flowing, white sand containing rootlets and brown nodules of limonite-cemented sand.

Sample 65360069 consists of a dry, free-flowing, white sand, containing rootlets but no nodules nor any signs of iron staining.

Sample 65360070 consists of a dry, free-flowing, white sand containing rootlets and fragments of charcoal, but no nodules nor any signs of iron staining were seen.

No sodium chloride, calcium carbonate nor feldspars were detected in any of the samples. Ninety nine percent of the samples consist of quartz, less than 0.1 percent of clay minerals and less than 0.2 percent of heavy minerals.

Size analyses of the samples show them to consist mainly of grains 0.4 to 0.1 mm across, mostly 0.3 to 0.2 mm across. The silt and clay fraction, less than 0.05 mm across, comprises less than 3 percent of the samples.

The degree of rounding of the grains decreases with decreasing grain size. The 0.4 to 0.2 mm fractions consist of rounded and subrounded grains with minutely pitted surfaces, grains in the 0.2 to 0.1 mm fraction are more angular, and the silt fraction (less than 0.05 mm across) consists of minute angular chips and shards.

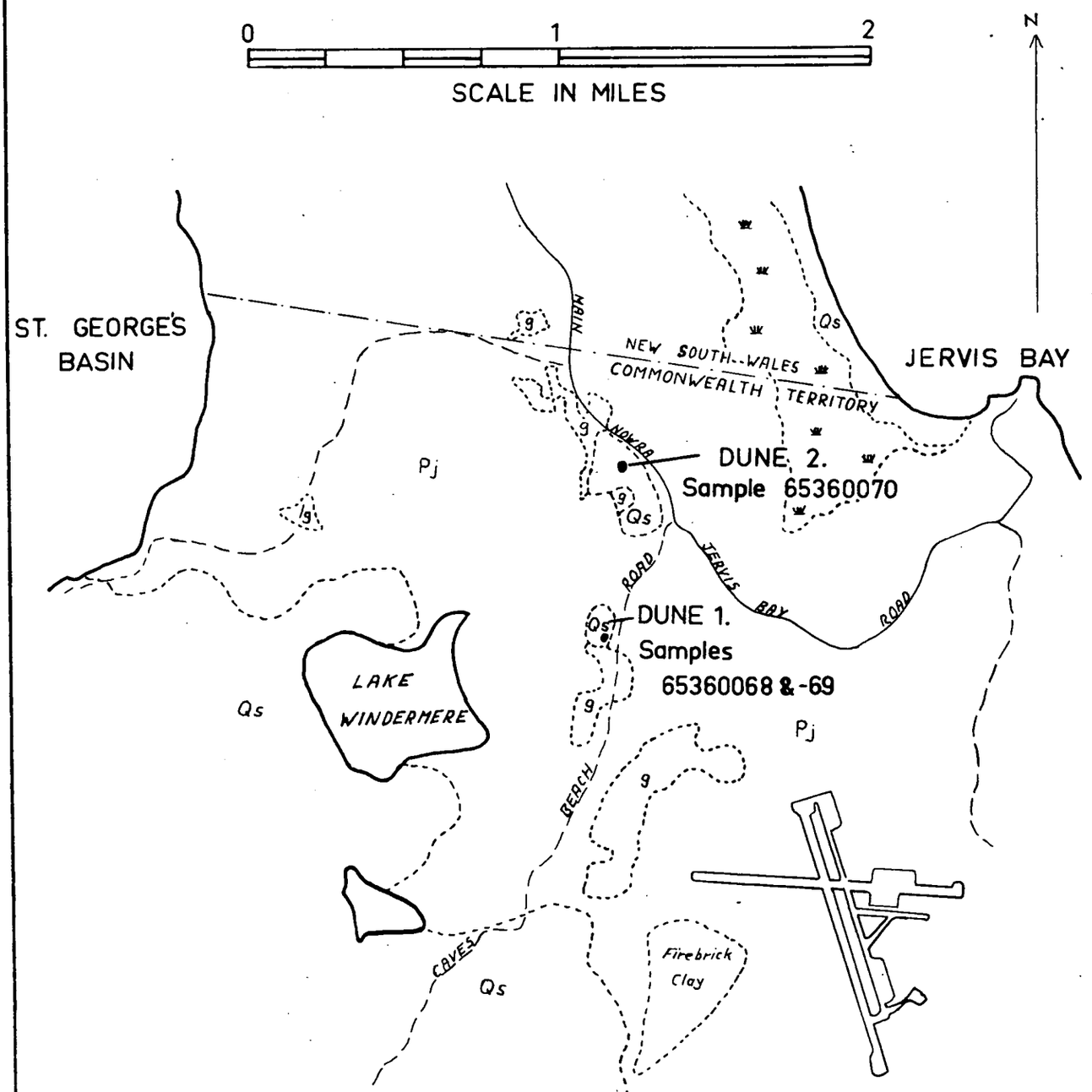
Over 99 percent of the samples consists of quartz: clear quartz, milky quartz crowded with bubbles or cut by bands and zones of bubbles, and clear quartz containing twisted ribbons of rutile. Heavy minerals comprise about 0.2 percent of the samples and occur mainly in the silt fraction. They consist of magnetite, tourmaline, zircon, apatite, garnet, spinel, hypersthene and rutile. The silt fraction contains numerous minute fragments of siliceous porifera. No clay minerals were detected under the microscope, and when the silt fraction was stirred up in water less than 10 percent of it remained in suspension after allowing it to settle for 10 minutes - the liquor being only slightly turbid.

The samples consist of well graded sand and would thus have a high permeability. They contain no constituents which would preclude their use as foundry sand, but a bonding agent would have to be added. Samples 65360069 and 65360070 could be used as a glass sand, their content of iron, chromium and cobalt being within the limits of tolerance, but sample 65360068 contains iron which in places may exceed acceptable limits.

PLATE 1

JERVIS BAY SAND DEPOSITS

LOCALITY MAP SHOWING GEOLOGY



REFERENCE

Qs	*Sand areas, covered with vegetation except near sea shore*
Pj	*Jervis Bay Sandstone*
------	*Geological boundary*
9	*Areas probably underlain by ferruginous gravel*
W	*Swampy areas*
——	*Sealed road*
– – –	*Track*

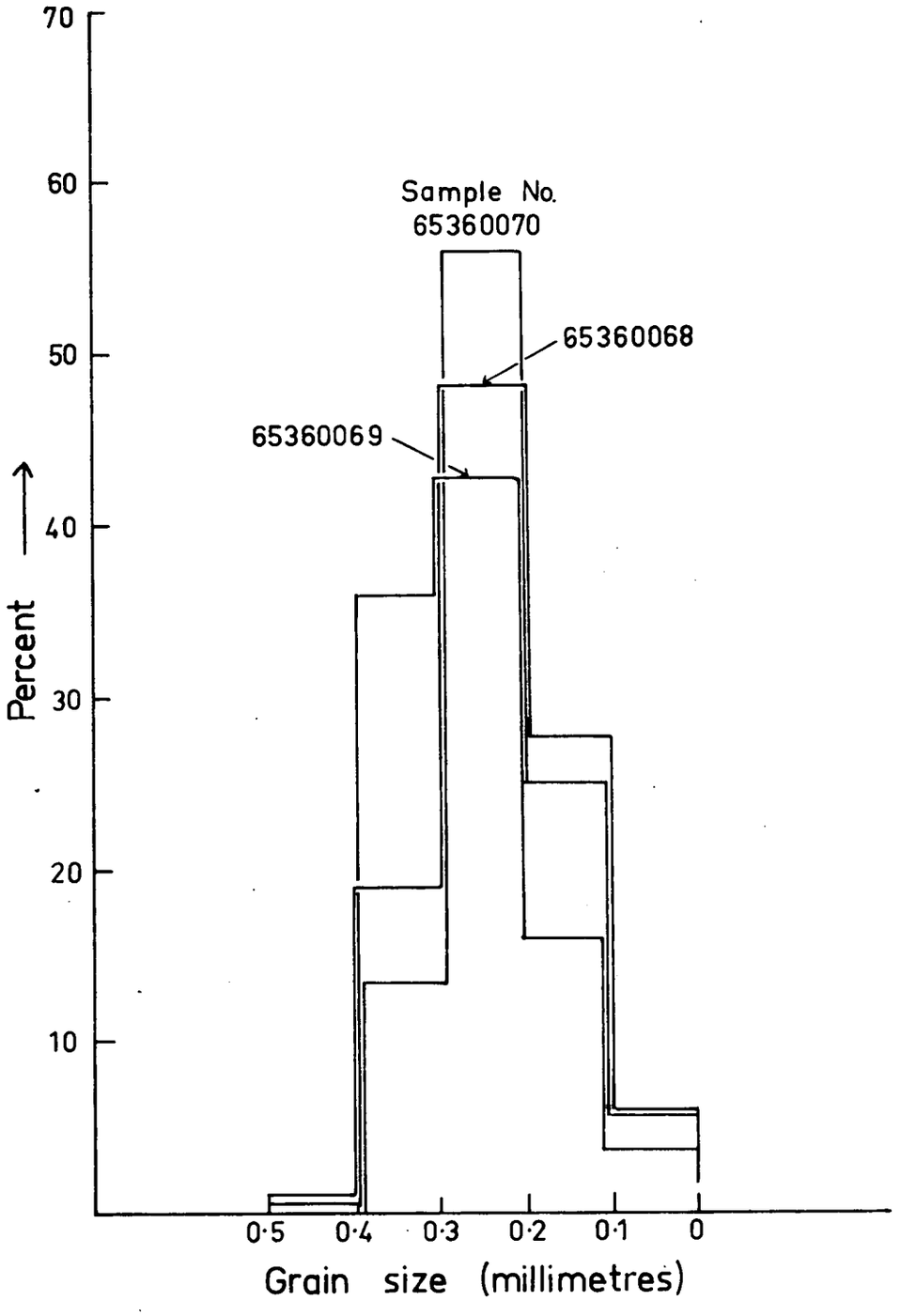
Geology by
W.J. Perry & J.M. Dickins

Bureau of Mineral Resources, Geology and Geophysics, November 1965 I56/A13/1
To accompany Record 1966/80

PLATE 2

JERVIS BAY SAND DEPOSITS

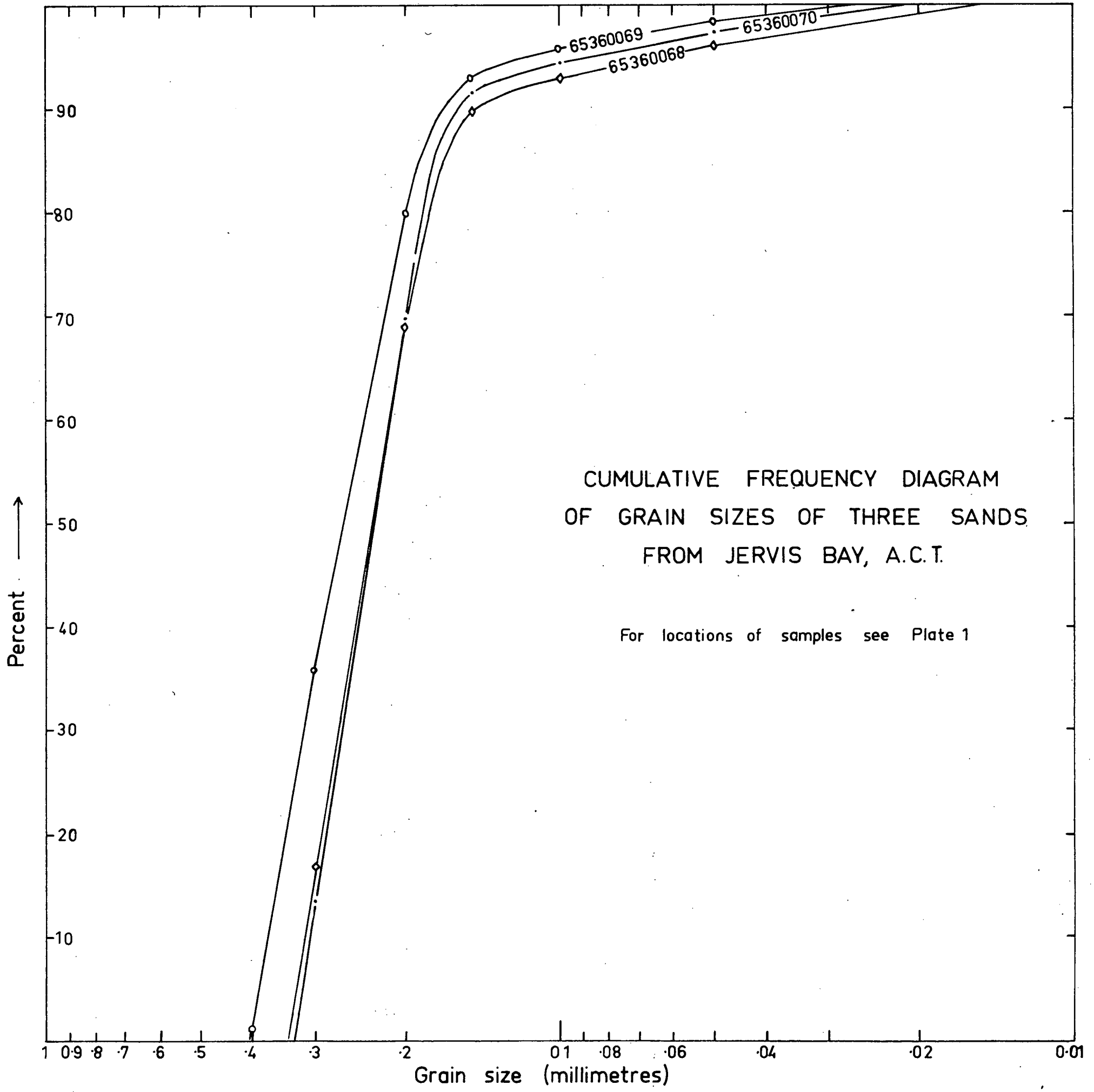
DISTRIBUTION OF GRAIN SIZES IN THREE SANDS FROM JERVIS BAY, A.C.T.



For locations of samples see Plate 1

Bureau of Mineral Resources, Geology and Geophysics, November 1965 156/A13/2
To accompany Record 1966/77

JERVIS BAY SAND DEPOSITS



CUMULATIVE FREQUENCY DIAGRAM OF GRAIN SIZES OF THREE SANDS FROM JERVIS BAY, A.C.T.

For locations of samples see Plate 1

Bureau of Mineral Resources, Geology and Geophysics, November 1965

I 56/A13/3

To accompany Record 1966/77