COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

REPORT No.

RECORDS 1951/17.

NOTES ON FLUCTUATIONS OF WATER LEVEL AT LAKE GEORGE

by

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NOTES ON FLUCTUATION OF WATER LEVEL AT LAKE GEORGE.

Introduction.

As a result of abnormal rains in 1950, a considerable body of water has been impounded in Lake George, situated in New South Wales, but only 20 miles north of Canberra, Australian Capital Territory. Local reports claim a depth of water of 30 feet in the Lake and these reports have prompted the Advisory Council of the Australian Capital Territory to investigate the possibility of developing the lake as a recreational resort. As a first step in this investigation the Council has asked the Bureau of Mineral Resources, Geology and Geophysics for an opinion as to how long a considerable body of water may be retained in the lake.

The Lake George catchment area is an internal drainage basin of which Lake George occupies the lowest part. In normal years, with well distributed rain fall of approximately 23 - 24 inches per annum the "run in" of water is relatively heavy and little water is discharged into the lake. However, when annual rainfall is abnormally high or when rainfall normal for a year is concentrated into one season, "run off" increases and the Lake George plain is inundated. There is no surface outlet for this water and there is no evidence to suggest that significant quantities could escape by seepage, so that the quantity of water retained in the lake represents the balance between water supplied by "run off" and that removed from the lake by evaporation - factors which are almost entirely dependant on climatic conditions.

Since meteorological conditions cannot be reliably forecast for years ahead it is not possible to estimate the probable fluctuations in water level at Lake George, but records of fluctuations of water level in the past do indicate alternate trends which the water level may follow in the future. The basis of these records is the work of H.C. Russell (1886)* who compiled a graph of fluctuations in water level in Lake George from 1818 to 1886 and established a datum from which the depth of water in the lake could be measured. Russell's graph has been extended to cover the years from 1886 to 1928 by the Department of Works and Local Government, New South Wales, but there is apparently no official record of fluctuations since 1928. The Bureau of Mineral Resources established the water level from Russell's datum in December, 1950, and will ensure that adequate records of water level will be kept in future.(see Plate1).

Present Depth of the Lake.

Before any conclusion could be drawn from past records the present depth of water relative to the datum established by Russell had to be determined. Russell's datum was 65.9 feet below the top of the survey pillar at the south end of the Lake George Base Line - a survey bench mark well known and still in use. The lowest portion of the lake bed was estimated by Russell to be 3 feet below this datum and hence 68.9 feet below the top of the South Pillar. The maximum depth of water in the lake, relative to Russell's datum, can therefore be determined by measuring the difference in elevation between water level and the top of the South Pillar and subtracting this measurement from 68.9.

The difference in elevation between water level and the top of the South Pillar was measured by the Property and Survey Branch, Department of Interior, on 20th December, 1950, and found to be 59.15 feet and this established the maximum depth of water

* Russell H.C. 1886."Notes upon Floods in Lake George." Jour.Roy.Soc.N.S.W. 20, 241-260

in the lake, at that time, as 9.75 or roughly 10 feet. On the same day the writer measured the difference in elevation between water level and a peg near Geary's Gap Trig. Station, which is situated on the shores of the lake, and subsequent checks on water level will be made at this point. The depth of water was checked on 20th January, 1951 and found to be 4 inches lower than in the previous month.

The established depth of water of approximately 10 feet is at marked variance with the depths of 20 - 30 feet which have been reported by local inhabitants. Although the matter could best be cleared up by systematically sounding the lake, the work which this would involve seems unwarranted since other evidence strongly suggests that the maximum depth of the lake is in fact about 10 feet. Records compiled by Russell (1886) show, on a map, the outline of the lake shore at various maximum depths of water and the position of the present shore line at the north end is very close to that mapped in 1887 when the maximum depth of water in the lake was 9 feet. Again the maximum recorded depth of water is 24 feet, measured in 1874, and the northern shore of the lake, at that time, extended approximately 1 mile farther north than at present, indicating that the maximum depth now is much less than 24 feet. A further point of interest is that soundings were taken over most of the lake in 1887 and that the maximum depth was found to be 9 feet in accordance with the maximum depth determined by relating water level to Russell's datum.

It is therefore fairly safe to assume that, with the exception of any small holes which might exist, the maximum depth of water in Lake George in January 1951, is approximately 10 feet.

Fluctuations in Water Level.

Records of fluctuations in water levels since 1818 (see plate 1) show that, with the water level at 10 feet maximum, there are in general two trends which subsequent fluctuations may follow:

1. the volume of water may increase consequent on a succession of abnormal wet seasons. For example, maximum depth of water in the lake was 10 feet in 1869 but steadily rose to the maximum flood level of 24 feet in 1874, thereafter declining until the maximum depth of 10 feet was again reached in 1886 - 17 years during which the maximum depth of the lake stood above 10 feet.

2. The volume of water may steadily diminish under the influence of a succession of normal or dry seasons. For example, the lake filled up rapidly to a maximum depth of 10 feet in 1851, 1916 and 1924 and in each case steadily declined until little or no water remained after intervals ranging from 2 to 7 years.

In considering the possibility of development at the lake, it is obviously wise to take a conservative view of possible future fluctuations in water level and suppose that fluctuations will follow the second of the two alternate trends. An analysis of declines rates, below a maximum depth of 10 feet indicates that water level is likely to fall at the rate of:

1. 22 inches per year where the amount and distribution of rainfall is normal.
2. 36 inches per year where unusually dry conditions pertain.
3. 15 inches per year where the amount of distribution

of rainfall is above normal but not such as to produce major floods.

Under these conditions the lake would be more or less dry in five to six years under normal climatic conditions; in three to four years under dry conditions, and in eight years where climatic conditions slow down evaporation or produce abnormal "run off" in the catchment area.

An additional factor to be considered in planning and development is the minimum depth and size of the lake required for recreation. It is probable that the lake would be of little use at a maximum depth of less than 5 feet and if this is so the effective life of the lake may only be from two to four years.

Conclusion.

The maximum depth of water in Lake George has been established as 10 feet, relative to Russell's datum on which all previous records are based, and, although there may be some small holes, the reports of depths of up to 30 feet in January, 1951 are considered unreliable.

Future fluctuations of water level will be almost entirely dependent on climatic conditions which cannot be reliably forecast and, from the point of view of development, it is wise to assume that the lake will steadily diminish as it did following the floods of 1916 and 1924. The lake may, therefore, be almost dry in three to eight years dependent on weather conditions but the effective life of the lake as a recreational resort may only be of the order of two to four years.

(L.C. Noakes).
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March, 1951.

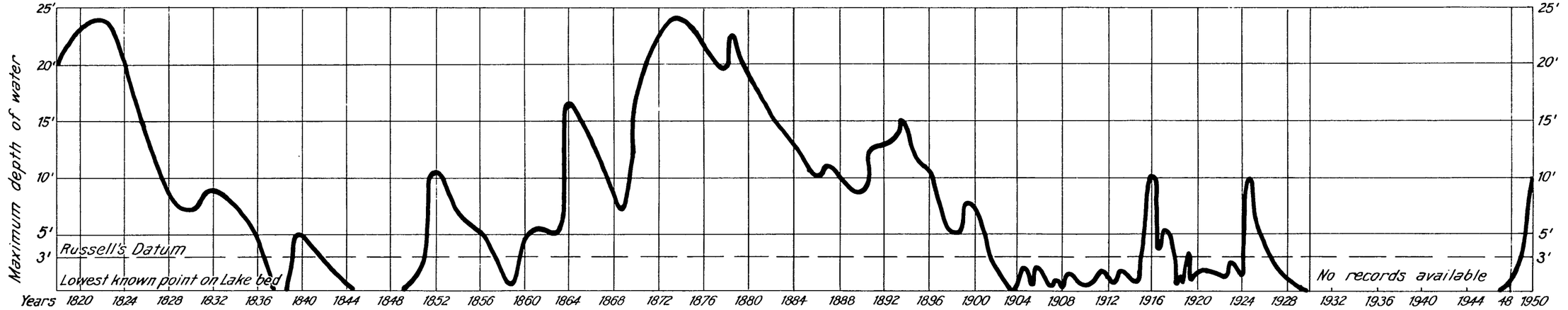
Fluctuation in Water Level

LAKE GEORGE

N.S.W.

1818 - 1950

Plate 1



Russell's datum is 65·9' below top of South Pillar - Lake George Base Line

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FLUCTUATIONS IN WATER LEVEL OF LAKE GEORGE IN RELATION TO ACTUAL AND AVERAGE RAINFALL IN CANBERRA

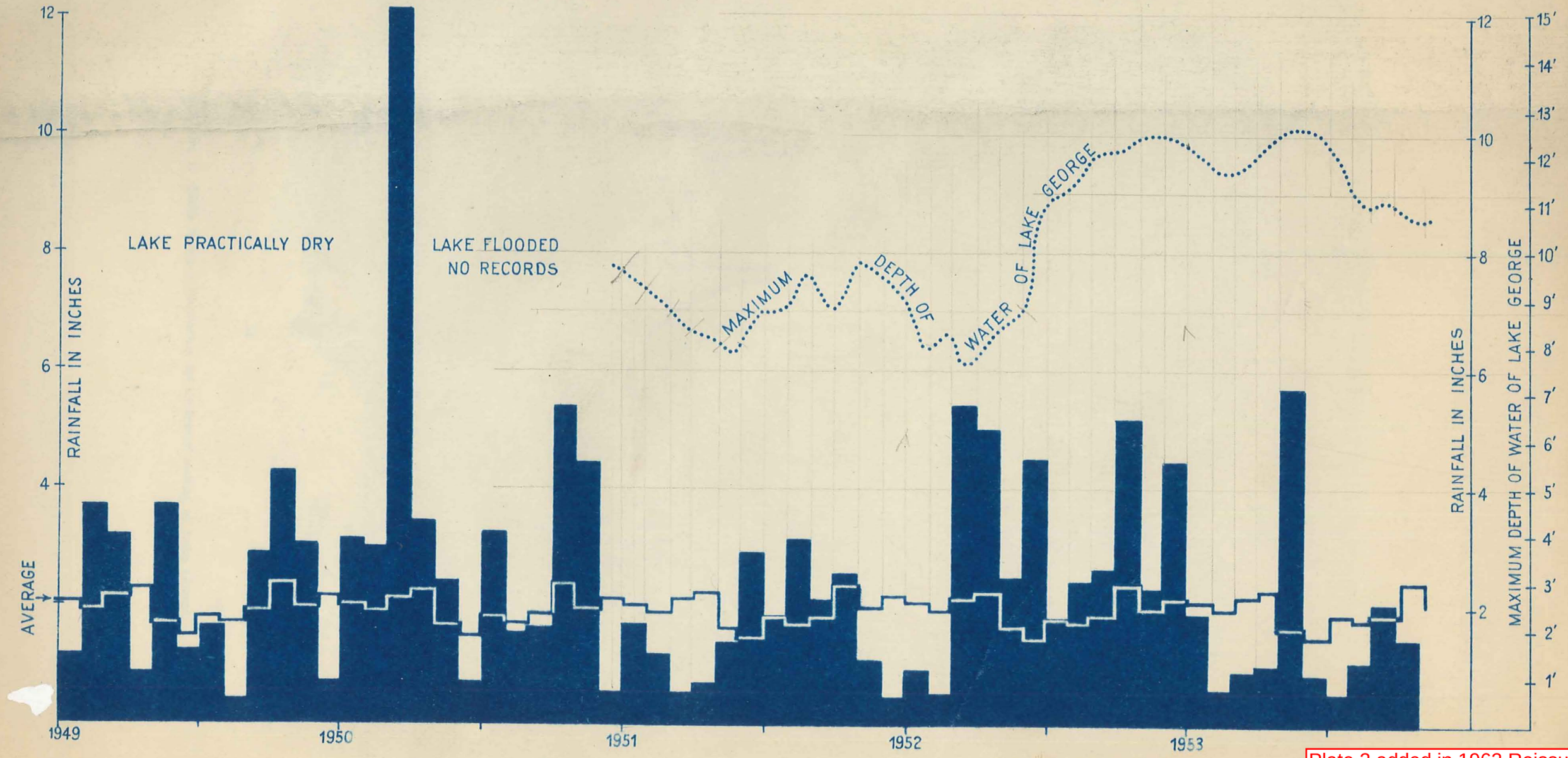

Plate 2 added in 1962 Reissue.