

NATIONAL INSTITUTE OF OCEANOGRAPHY

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**Differing water-budgets
in two adjacent reservoirs**

by

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INTRODUCTION

There is a growing interest in the conservation of water by the use of surface films to reduce evaporation. Preliminary observations have been made on two similar reservoirs which are situated side by side in relatively flat country. The method was to apply a surface film to one reservoir and to assess its effect on the evaporation by using the other as a control. Before applying the film, however, water levels were measured on both reservoirs; significant differences in their water-budgets were found and are discussed below.

OBSERVATIONS

The two reservoirs concerned are the Kempton Park East and the Kempton Park West reservoirs, which were used by kind permission of the Chief Engineer of the Metropolitan Water Board.

Their general shape and situation can be seen from Fig. 1. They are of similar construction and both are about 20 feet deep but the East reservoir is 40 acres in area and the West 20 acres. Both were sealed as carefully as possible and no water was pumped in or out.

Their water levels were measured daily to the nearest 0.05 inch by Metropolitan Water Board staff, the East Reservoir observations being made for a sub-committee of the Institution of Water Engineers and the West Reservoir observations at the request of the National Institute of Oceanography.

The observations from May 1957 to April 1958 are shown in Fig. 2, from which it is clear that the level of the West Reservoir rose relative to that of the East Reservoir by three inches in the twelve months. This is about one-tenth of the annual evaporation. The annual evaporation and the annual rainfall are approximately equal.

DISCUSSION

This is a surprising result for reservoirs of this area which are so close together in such flat country. No leaks or deficiencies

in the measuring equipment were found.

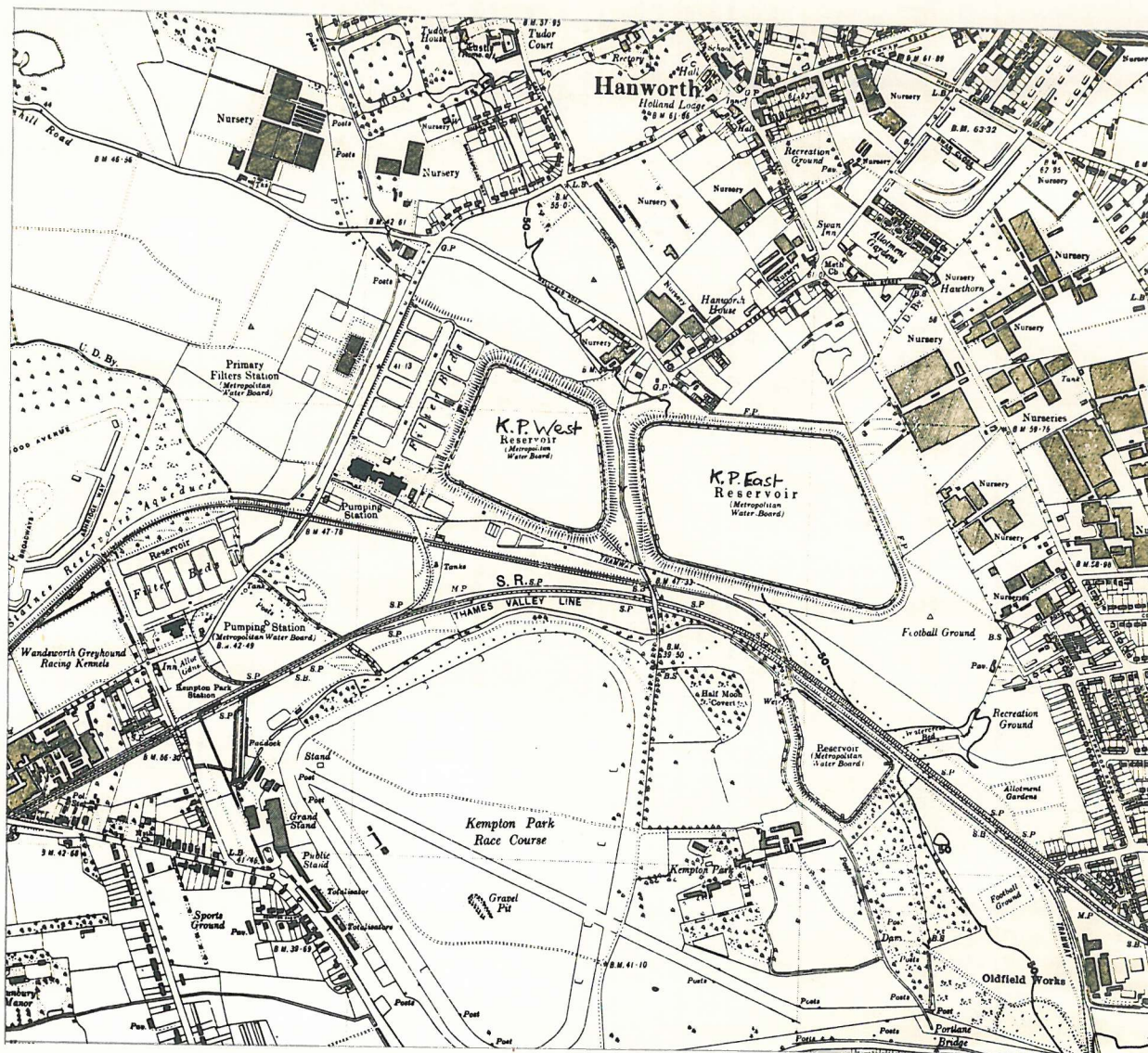
The difference in level can be shown to be linked with the rainfall by using cumulative daily differences of the water-level difference on wet days and dry days separately. Formally, if H_E and H_W are the levels of the East and West Reservoirs respectively, then we take daily differences $\Delta (H_W - H_E)$ and form cumulative sums $\sum \Delta (H_W - H_E)$ for wet days and for dry days. For this purpose a wet day was taken as one on which more than 0.05 inch of rain was reported from Kempton Park 'A' rain gauge and a dry day as one on which the Kempton Park reading was 0.05 inch or less.

Fig. 3 shows the results. It seems clear that changes in relative level are associated with wet days.

The effect can be partially explained by the geometry of the reservoirs, as the ratio of the collecting area to the free surface area is greater in the West Reservoir; but this only accounts for perhaps one-third of the observed effect.

The simplest hypothesis is that the West Reservoir gets, on average, more rain than the East. This does not seem impossible but many meteorologists appear to consider it extremely unlikely. Certainly it would be a large undertaking to confirm it using conventional rain gauges. The two or three gauges in the neighbourhood are said to agree fairly well but no detailed analysis has been reported.

On the other hand the importance of effects such as this to water engineers is considerable: it is hoped that this note will stimulate further discussion of the problem.



Scale: approx. 4 inches to 1 mile

Fig. 1. Map showing situation of Kempton Park West and Kempton Park East Reservoirs

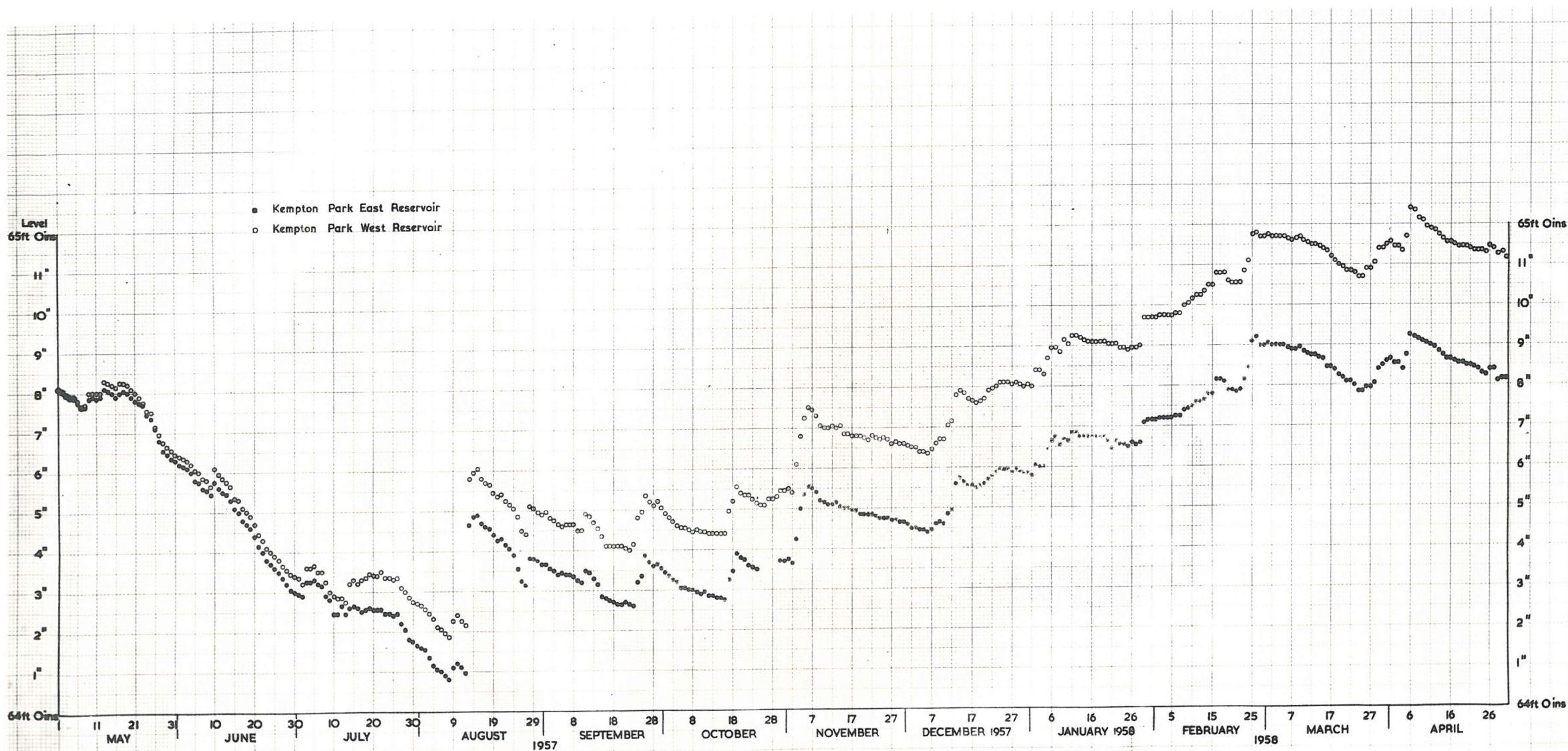
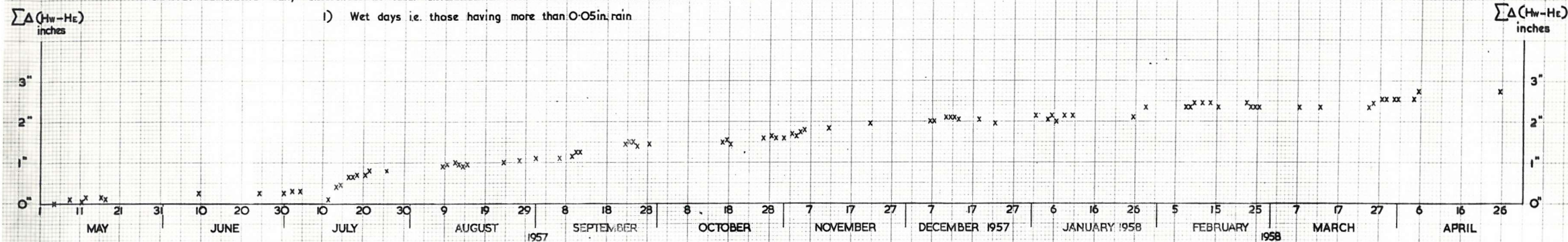


FIG. 2 Levels of Kempton Park East Reservoir and Kempton Park West Reservoir
May 1957—April 1958

FIG. 3. Cumulative daily differences of level difference between K.P. West and East Reservoirs on :-

1) Wet days i.e. those having more than 0.05 in. rain



2) Dry days i.e. those having 0.05 in. rain or less

