

PROCEEDINGS  
OF  
HYDROLOGY SYMPOSIUM No. 3

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GROUNDWATER

Prepared and published for the  
Subcommittee on Hydrology  
by  
Water Resources Branch  
Department of Northern Affairs and National Resources  
and  
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## FOREWORD

The Third Symposium of the Subcommittee on Hydrology was held on 8th and 9th November 1962, at the University of Alberta, Calgary.

The form of the Symposium followed that of the two earlier symposia sponsored by the Subcommittee, i.e. the Symposium on Spillway Design Floods (Ottawa 1959) and the Symposium on Evaporation (Toronto 1961). Twelve people were invited to prepare papers on a topic in Groundwater and preprints of these papers were sent to all Symposium participants several weeks before the meeting in Calgary. At the gathering, the authors were allowed ten minutes to introduce and outline their papers. Ample time was then available for prepared and general discussion of the subjects covered by the papers.

The prepared papers and written discussions are printed here as they were received from the authors. The oral discussions have been prepared from notes made by each speaker and by recording secretaries during and after the Symposium. The authors of prepared papers had the opportunity of reviewing the discussions of their papers in order to clarify their replies.

Many participants of the Symposium have commented on the value of the meeting. There is no doubt that the symposia sponsored by the Subcommittee on Hydrology have enlarged and stimulated hydrologic studies in Canada. And it is hoped that these symposia are now an established tradition.

To Dr. Malcolm G. Taylor, Principal of the University of Alberta, Calgary, and his colleagues, must go the first words of gratitude and commendation for providing the participants with such excellent facilities for a scientific gathering.

It is also a pleasure to thank Mr. A. Coulson for editing the proceedings and Mr. G. P. Williams for reviewing the draft; the Session Chairmen for conducting and leading excellent discussions and the recording secretaries for faithfully and diligently gathering together the written discussion notes.

Finally many sincere thanks are due to Dr. T. A. Oliver, University of Alberta; Mr. D. H. Lennox, Research Council of Alberta; and Mr. G. H. Wilderman, Big Indian Drilling Co., Calgary, for their help in organizing the meeting at Calgary; and equal thanks are also due to Mr. R. H. Clark, Chairman of the Subcommittee on Hydrology for much assistance in planning the meeting.

The Water Resources Branch, Department of Northern Affairs and National Resources, and the Geological Survey of Canada, Department of Mines and Technical Surveys, co-operated in providing staff assistance and in arranging the distribution of the preprinted papers and the presentation of this publication.

L. V. Brandon,  
Symposium Chairman.



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## OPENING ADDRESS

R. H. Clark<sup>1</sup>

It is with great pleasure that I welcome you to the Third Canadian Hydrology Symposium.

Some of you may have attended the First Symposium on Spillway Design Floods or the Second Symposium on Evaporation, but since the subject matter of this Symposium has generally attracted a different group of hydrologists, I would like to refer again to the sponsors of these symposia.

It was in 1957 that the Associate Committee on Geodesy and Geophysics of the National Research Council asked me to form a Subcommittee which would

- (1) act as a central organization for the collection and distribution of information on hydrology in Canada;
- (2) encourage and advise on hydrologic research in Canada; and
- (3) act as the Canadian Committee of the International Association of Scientific Hydrology of the International Union of Geodesy and Geophysics.

The membership of the Subcommittee is drawn from federal, provincial and private agencies from various parts of Canada and from several of the universities.

The Subcommittee has felt that one of the best means of encouraging and advising on hydrologic research would be to sponsor symposia on specific hydrologic subjects. The success of the first two symposia and --- judging from the response evidenced here --- the interest in this one has confirmed the need for such a forum in Canada for an exchange of views and discussion of techniques in the field of hydrology.

The first two symposia considered surface water and atmospheric water. This time we move to the third domain of hydrology and deal with sub-surface or groundwater.

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1. Chief Hydraulic Engineer, Water Resources Branch, Department of Northern Affairs and National Resources, Ottawa, Ontario and Chairman, Subcommittee on Hydrology.

Although man has long derived water supply from wells, it is only relatively recently that demands for groundwater have become heavy enough to direct our thoughts to the hydraulics and hydrology of groundwater flow. The use of groundwater supplies for domestic and industrial purposes is constantly increasing - partly because the reasonably constant temperature and quality of groundwater present important economic advantages.

As the use of groundwater increases, it is natural that problems should arise. A wise and full use of this great natural resource requires that these problems be answered. Many of the answers lie in the field of hydrologic and hydrogeologic research. It is our hope that this Symposium will focus attention on some of the problems and perhaps lead to some of the answers.

Aside from its great - and increasing - economic importance as a resource, groundwater is also a very important phase of the hydrologic cycle. Many of our streams derive a great part of their flow from groundwater sources. On the other hand, in some regions a large part of the surface water percolates to --- I hesitate to say "is lost to" --- groundwater. This means that a study of hydrology is incomplete without a consideration of the movements and effects of groundwater. Perhaps too often the surface water hydrologist has neglected to too great an extent to give careful consideration to groundwater -- perhaps this is an illustration of the expression "out of sight - out of mind".

This is another important purpose of the Symposium - to draw groundwater to the attention of the surface water hydrologists and although not to make them into hydrogeologists, at least to show them the sound and rational methods of the trained hydrogeologist so that this important phase of the hydrologic cycle will not be neglected by them.

You have all read the formal papers which will provide a jumping off place for your discussions. Some of you have already submitted discussion papers, and I hope that all of you have come here prepared to discuss or to question in order that our knowledge and yours may be augmented.

Bear in mind, then, that the main objective of this Symposium is an exchange of views, ideas and experiences by experts in the groundwater discipline. You will be under the capable direction of Mr. L. V. Brandon, who is a member of the Subcommittee and Chairman of this Symposium.

We are indeed fortunate to have been given the opportunity to meet here at this new university campus which is growing vigorously and to be provided with such excellent facilities and surroundings in which to carry on our discussions.