ABSTRACTS

REPRESENTATIVE AND EXPERIMENTAL BASIN SEMINAR

A seminar on Experimental and Representative Basins was held in Wellington, 15-16 December 1965. It was organised by the New Zealand Hydrological Society and financed by the Soil Conservation and Rivers Control Council and the Hutt Valley Underground Water Authority. The following are abstracts of papers presented.

Report of the International Working Group on Experimental and Representative Basins, Budapest, 1965. C. Toebes, Ministry of Works — a member of the Working Group.

The Working Group considered four questions:

(a) Objects of research on Representative and Experimental Basins.

(b) Methodological principles to guide the choice of investigation zones and organisation of work. The group recommended that
(i) research should be intensive for relatively short periods,
(ii) a trained hydrologist should be in charge,
(iii) data should be continually processed and analysed, and
(iv) there should be regular publication of data — in the metric system.

(c) Minimum equipment for basins and special equipment problems.

(d) Cooperation on establishment and operation of basins, on specific problems common to several countries and on publication of basic analysed data.

It was recommended that the group be a permanent one.

A Broad Scale Water-Balance Study for New Zealand. J. Coulter, N.Z. Meteorological Service.

Distributions of annual, seasonal and monthly rainfalls in New Zealand were discussed in relation to average rates of potential evapotranspiration (PE).

Maps for Summer (Dec, Jan, Feb) and Winter (June, July, Aug) were shown to illustrate:

(a) Average rainfall total (R)
(b) Standard deviation of R (SD)
(c) Average seasonal PE values
(d) Average seasonal water deficit or surplus in wet seasons (R + SD — PE), and in dry seasons (R — SD — PE).

Schematic distribution maps were shown to illustrate:

(a) Average total seasonal water deficits.
(b) Percentage of years in which a deficit occurs.

(c) Percentage of years in which a deficit occurs in at least three successive months.
(d) Percentage of years in which a large deficit (6in. or more) occurs.
(e) Average deficit in January.
(f) Average surplus in July.

New Zealand Programme for Representative and Experimental Basins and a Comparison with Overseas Proposals. C. Toebes, Ministry of Works.

New Zealand has an extensive programme of Representative and Experimental Basins and, being a late-comer in the field of research, is able to take advantage of overseas experience. It appears from the recent International Symposium on Representative and Experimental Basins at Budapest that considerable criticism is being made of the old idea of the replicated catchment approach based on the utilisation of existing statistical techniques. One problem is that a control catchment is really a changing base and therefore not a control; and statistical analyses recommended for these experiments are frequently not admissible because the data do not comply with the premises for valid estimates of error.

International opinion is that more fundamental research should be done on Representative and Experimental Basins and New Zealand is following this practice by setting up a network of Representative and Experimental Basins (Representative Basins in hydrological regions and Experimental Basins on important soil-vegetation complexes) and by carrying out detailed research to determine the hydrological characteristics.

Vegetation Measurements in Experimental Basins. M. E. Yates, Dept. of Agriculture.

When one first enters a Basin it is important to appraise the vegetation form i.e., whether it is forest, scrub, grassland (tussock or sown), agricultural crops, etc. This appraisal is followed by an investigation to determine species composition, and finally an assessment is made of the vegetation status. This is a quantative analysis and can give a measure of such factors as ground cover, density, productivity or utilization according to the varied methods of measurement that may be employed.

Derivation of Annual Suspended Sediment Yield. W. J. Fraser, Ministry of Works.

The largest sediment quantities yet measured are those for the Waipaoa River near Gisborne. In 1960 this river discharged 30,700,000 tons of sediment — more than double the amount of spoil put into the earth dam at Benmore.

Marked variations in rates of erosion are indicated by the following.

River	Location	Year	Rainfall (in.)	Annual Suspended Sediment Discharge (tons/sq. mile/yr)
Porewa	Tributary of Rangitikei River near Hunterville	1963	40	640
Mangonui	NE slopes of Mt Egmont	1962	149	25
		1963	111	14
Wanganui	Gauging station on slopes of Mt Tongariro	1960	92	85
		1961	—	213
		1962	124	164
		1963	67	65
Waipaoa	Five miles from Gisborne	1960	78	50,330
		1961	55	10,160
		1962	—	20,160
		1963	—	5,900
		1964	—	2,460
Whakapapa	Western slopes of Ngauruhoe and Ruapehu mountains.	1960-63	—	2,369
Mangatepopo	NW slopes of Tongariro and Ngauruhoe	1960-64	—	1,849
Tongariro	Desert Road area; near Lake Taupo	1960-63	104	1,071

Hydrological Desiderata. Prof. J. R. Burton. Lincoln College. Desiderata for applied hydrology in New Zealand are:

(a) The need to make a complete appraisal of the objectives of the Experimental Basin programme and to develop a plan of research to which the instrumentation, experimental design and data processing can be orientated.

(b) The need to realise the futility of empiricism and to plan all hydrological endeavour in such a way that the results can be generally applicable, or at least useful in shedding further light on basic problems.

(c) The need to provide as quickly as possible a cadre of qualified applied hydrologists.

(d) The need for soil and water agencies to encourage hydrological education in a positive and practical manner.

Design of Hydrologic Land-use Experiments. L. M. Eiselstein, Lincoln College.

Present experimental designs to determine the effects of vegetation and land use on run-off are inadequate for the most part, in that they do not produce results which can be extrapolated to areas other than the original basin in which the study was performed and they do not allow for the reconstruction and/or prediction of run-off records for ungauged basins. If hydrological experimentation is to remedy this deficiency, some methodology which can correlate streamflow with basin characteristics must be utilized. Factor analysis offers such a multi-variate technique whereby the many factors which affect streamflow, may be correlated with streamflow from a basin.

A factor analysis is described of run-off plot data from the Camp Stream Catchment as an example of the importance of factor analysis as the "key" technique in the improved design of hydrological land-use studies.

Definition and Determination of Morphological Characteristics of Experimental Basins in New Zealand. R. J. Pittams, Ministry of Works.

The derivation of the following morphological characteristics is described: catchment area, catchment perimeter, maximum elevation, minimum elevation, median elevation, aspect, channel slope, catchment slope, maximum valley-side slope, maximum channel order, bifurcation ratio, length of channels of given order, length of principal channel, drainage density, average junction angle, mean slope curve, principal channel profile, contour interval, accumulated channel length and hypsometric curve.

Evaluating Small Area Dominant Discharge by Theory and Observation. G. J. Hall and A. P. Campbell, Ministry of Works.

Small area dominant discharge (SADD) is a parameter giving quantitative expression to flood discharges experienced on small areas i.e., on 10 acres or less. It has particularly valuable applications in codes of practice for the investigation of erosive processes.

A theoretical method for evaluating SADD is given for any location where values of infiltration, vegetative - retardance, land slope and rainfall depth-duration are known.

Values obtained from field studies are presented and correlated with theoretical values for the same location.

Rainfall Measurement — A Neglected Problem in N.Z.

P. J. Grant, Hawke's Bay Catchment Board.

Some of the more serious misconceptions and sources of error are discussed under (a) Instrumental, (b) Observational, (c) Raingauge exposure, and (d) Areal depth. Emphasis is given to quantitative effects.

Most errors result in rainfall catches being lower than they should be; and in mountainous regions the error can easily exceed 50 per cent. On mountains, unless an altitudinal series of gauges is installed in close relation to a "reliable" gauge that is maintained regularly, it is most difficult to determine the standard of catches of each remote gauge. Examples are presented.

Tilted versus vertical raingauges are considered in the light of the standard of sampling required and the maintenance possible.

On many Basins, streamflow is being measured within much smaller margins of error than is rainfall.

Each Basin should have an adequate network of raingauges — numbers and locations depend on many factors. Initially, more gauges should be installed than is common practice.

A special IHD subcommittee should be formed to study the problems of precipitation measurements and to initiate suitable research.

Measurement of Interception Loss in Teatree.

G. J. Blake, Ministry of Works.

Data for May-September 1965 were analysed from a 10.05-acre, sealed flat under teatree (**Leptospermum scoparium**) which is the dominant species of the Puketurua Experimental Basin, and much of Northland. Twenty nine plants, (average height 12ft) provided a canopy density in excess of 50%, on a 4° slope. Stem sizes ranged for 0.50 in. to 1.68 in. — average of 0.97 in. one foot above ground level.

Annual rainfall is 50 to 60 in. which falls mainly as short-duration high-intensity storms.

The results based on daily storm totals, are:

	Inches	Percent
Interception loss	7.69	31.2
Throughfall	9.29	37.6
Stemflow	7.72	31.2
Gross rainfall	24.70	100%

Extension from Experimental Basins to Large Catchments: Forecasting Downstream Effects from Dominant Discharge and Other Interpretative Data. A. P. Campbell, Ministry of Works.

To combat rapid erosion and aggrading river channels which are characteristic of parts of New Zealand with high precipitation, a wide variety of working methods and basic research is necessary. So diverse are the possible approaches that works and research will lack focus unless there is a broad appreciation of both projects and requirements in fundamental work.

Such broad appreciation requires relatively simple methods and this paper deals with an approach using concepts of "dominant discharge hydrology" and of the "hydrological characteristics of soils". The approach includes the use of approximate parameters in codes of practice that serve generally for the plannig and design of works, for determining data and research requirements, and for overall forecasting.

Although relatively simple methods are used in dominant discharge hydrology, they are related to the firm hydrological basis that is being provided through data collected in Representative and Experimental Basins.

Forecasting is considered for treatments applied to an idealized river basin comprising three separate zones: an upstream zone, a sediment storage zone, and a control channel zone. The upstream zone being the critical area in forecasting is considered in separate ways — the nature and condition of the surface, the gully head, the channel below the gully head, and secondary erosional effects.

The present status of parameters used in dominant discharge hydrology is that of a first approximation to be refined when adequate data are available and through review of the theoretical considerations involved in codes of practice.

Brief Addresses

Mr C. Toebes introduced **Research Observation Programmes** which are compiled for each basin at the start of a water year. They cover land management, surveys, installation, data collection reduction and analysis, special studies and publications. The aim is to coordinate all aspects of research within and between basins.

Mr P. Noble (Soil Physicist, Ruakura Agricultural Research Station) spoke of the hitherto satisfactory **gravimetric reconnaissance soil survey** which has been carried out on the Puketurua Research Station and of the master sites established for sampling. A delay in the delivery of the instrument has held up further work.

Mr A. N. Glass, (District Soil Conservator, Auckland) reported on the successful operation of the **Northfork infiltrometer** in the Auckland area. Reliable comparative values can now be obtained, but absolute values are still in doubt. Pressures at the nozzles have been regulated and the water application pattern studied. There is evidence to justify the need for a larger plot with overhead sprinklers.

Dr R. Wooding (C.S.I.R.O., Australia) showed slides of a **run-off model** developed from the concept of an impervious catchment and including the various parameters that influence the hydrograph.

Mr D. A. Campbell (Dept of Agriculture) outlined the **pattern of soil conservation** in New Zealand and pointed to some of its more notable achievements. Emphasis was placed on the need for more quantitative data to assist with this work.

NEWS

NEW ZEALAND HYDROLOGICAL SOCIETY

Present membership is 205. This comprises 87 Members, 94 Affiliate members (including 41 libraries and other organisations) and 24 Student members. A list of members will be distributed with the next issue of the Journal.

ENGINEERING HYDROLOGY COURSE THE UNIVERSITY OF NEW SOUTH WALES

A full-time, 12-week special course in Engineering Hydrology will be conducted by the Water Engineering Department, School of Civil Engineering, the University of New South Wales, from 5 September to 25 November, 1966, subject to sufficient applications being received.

The course will cover the principles, practice, and applications of Engineering Hydrology from the elementary to the post graduate level. In general, a first degree in engineering or science will be required for admission to the course, but consideration will be given to applicants holding a lower qualification with suitable experience in the field of hydrology.

Enquiries about the course should be addressed to Professor C. H. Munro, School of Civil Engineering, The University of New South Wales, Post Office Box 1, Kensington, New South Wales. Australia.