CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

MINES BRANCH
INDUSTRIAL MINERALS DIVISION

INDUSTRIAL WATER RESOURCES OF CANADA

WATER SURVEY REPORT NO. 8

MACKENZIE RIVER AND YUKON RIVER DRAINAGE BASINS IN CANADA, 1952-53

BY

J. F. J. THOMAS

Price $1.00

No. 856

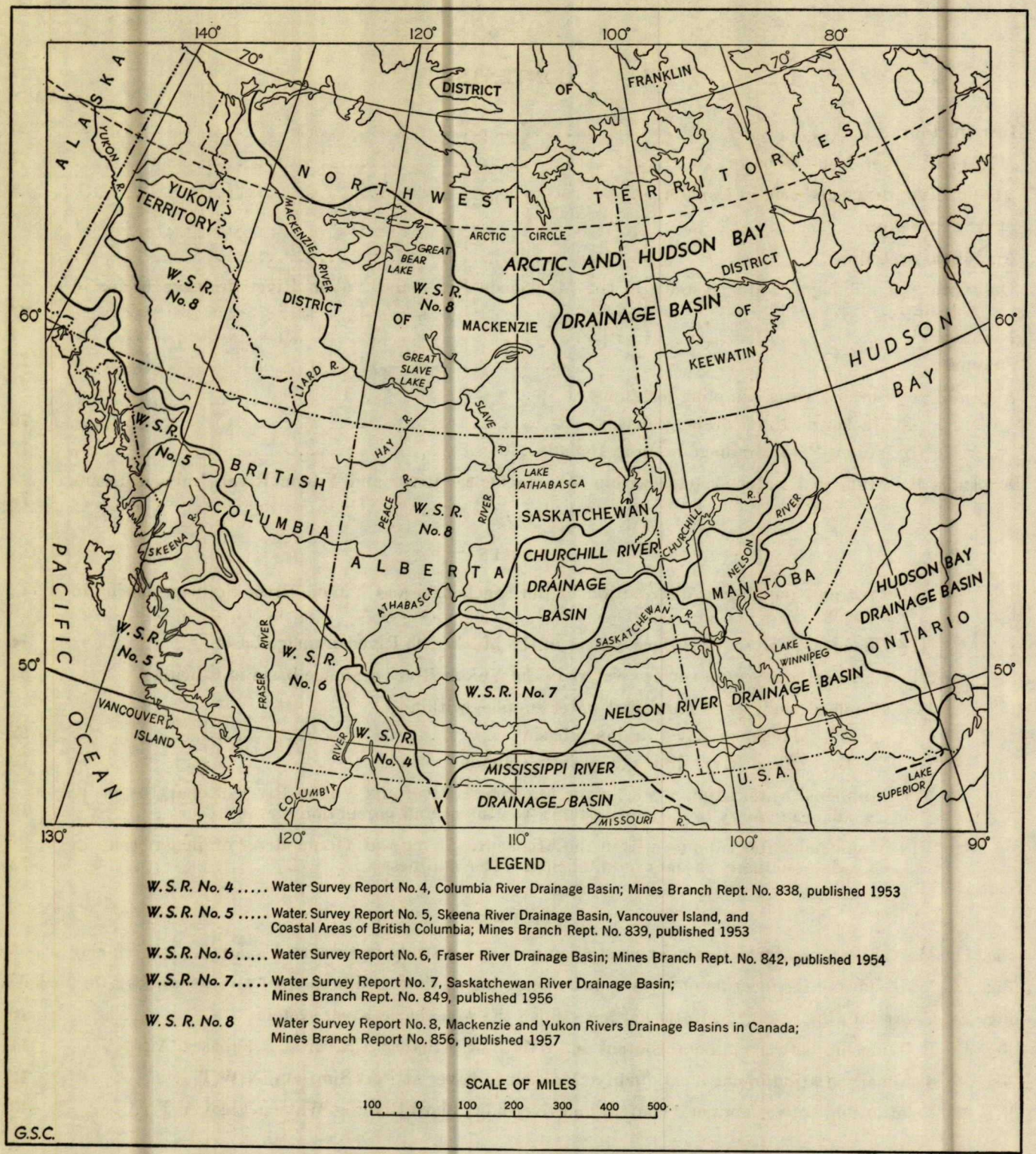
928—2,500—1957

CONTENTS

TABLES

FIGURES

77913—1½



LEGEND

W. S. R. No. 4 ..... Water Survey Report No. 4, Columbia River Drainage Basin; Mines Branch Rept. No. 838, published 1953

W. S. R. No. 5 ..... Water Survey Report No. 5, Skeena River Drainage Basin, Vancouver Island, and Coastal Areas of British Columbia; Mines Branch Rept. No. 839, published 1953

W. S. R. No. 6 ..... Water Survey Report No. 6, Fraser River Drainage Basin; Mines Branch Rept. No. 842, published 1954

W. S. R. No. 7 ..... Water Survey Report No. 7, Saskatchewan River Drainage Basin; Mines Branch Rept. No. 849, published 1956

W. S. R. No. 8 Water Survey Report No. 8, Mackenzie and Yukon Rivers Drainage Basins in Canada; Mines Branch Report No. 856, published 1957

SCALE OF MILES

100 0 100 200 300 400 500

FIGURE 1. MAP SHOWING DRAINAGE BASINS UNDER STUDY IN WESTERN CANADA

INDUSTRIAL WATER RESOURCES OF CANADA

Chemical Quality of Surface and Municipal Water Supplies in the Mackenzie River and Yukon River Drainage Basins in Canada, 1952-53

INTRODUCTION

This report, the eighth in the series on the chemical quality of surface and municipal waters available for industrial and domestic use in Canada, covers the large area drained by the Mackenzie and Yukon Rivers and their tributaries.

Water Survey Report No. 1[1] outlines the aim, scope and procedure of the country-wide survey begun in 1947 and discusses with the assistance of graphs and tables the interpretation of analytical results to be recorded in the subsequent reports.

Water Survey Reports Nos. 2[2] and 3[3] give in detail the results of studies on water quality in the drainage basins of the Ottawa River, and of the Upper St. Lawrence River-Central Great Lakes, respectively.

Figure 1 shows the area covered by this report and its relationship to other major drainage areas or basins in western Canada. It also shows the basins already reported in Water Survey Reports Nos. 4 to 7 inclusive. Similar reports for the remaining basins shown in Figure 1 are in progress.

Table I tabulates the approximate area of the drainage basins shown in Figure 1, and the ratios of population (1951 Census) and area in these basins to each other and to all of Canada.

The drainage basins covered by this report, except for the most southerly part of the Mackenzie River basin (Peace and Athabasca River basins in northern Alberta) are very sparsely settled, generally inaccessible by road and, at this date, of minor industrial importance. Therefore water quality studies were limited compared with studies carried out in many other drainage basins. In recent years appreciation of the natural resources of this large area of Canada is rapidly opening up the country, especially to mining and hydro-electric development. As a result there is an increasing need for knowledge on water resources and it is probable that more detailed studies on water quality, at least in certain parts of these river basins, may be required in the future.

The method of presentation of data in this report is essentially similar to that of previous reports of the series, no attempt being made to discuss in detail all the information recorded during the survey, although some statistics on water use and quality are presented and briefly discussed.

Tables II and III report in detail the analytical results on surface waters collected in 1952-53 and Figure 2 (in pocket) shows the location of the sampling points, listed alphabetically in Appendix A.

Figure 3 shows graphically the variation in water hardness in the Mackenzie River system as determined by these studies.

Figures 4, 5 and 6 show the variation found in chemical quality of the waters of the Athabasca River at Athabasca, Alta., Mackenzie River at Fort Simpson, Northwest Territories and the Liard River at Watson Lake, Yukon respectively. These figures illustrate the type of information that can be obtained from data supplied in Tables II and III.

Table IV reports the chemical quality of the waters supplied by organized systems to municipalities in both basins; these systems are listed alphabetically in Appendix B and their locations are shown on Figure 2 in such a manner as to classify them as to water hardness.

Table V summarizes the available information on source of water, treatment of water and population served in 1951 by organized systems and Table VI presents statistics on these systems with regard to water hardness and population served with different types of water.

A description of the few organized water systems operating up to 1952 in the basins is given under the headings, *population served, ownership* of system, *source of water, treatment* of water, *storage capacity* of the system, *consumption* of water and *industrial use* of the water.

Survey studies in this relatively inaccessible area of Canada were greatly facilitated by the cooperation of federal, provincial and municipal officials who by correspondence or personal contact with engineers of the department, supplied samples of the waters and information on the systems.

The assistance of the Department of Northern Affairs and National Resources, particularly district engineers, E. P. Collier and W. C. Warren, in supplying the writer with data on river and lake stage and river discharge, is gratefully acknowledged.

Acquisition of information on many of the waters in the far northern parts of the basins was made possible through the cooperation of members of the RCMP who collected and forwarded the samples.

Industrial Water Resources of Canada, Department of Mines and Technical Surveys, Ottawa, Ontario.

[1] Water Survey Report No. 1. Scope, Procedure and Interpretation of Survey Studies. Mines Branch Report No. 833, 1952.

[2] Water Survey Report No. 2. Ottawa River Drainage Basin. Mines Branch Report No. 834, 1952.

[3] Water Survey Report No. 3. Upper St. Lawrence River-Central Great Lakes Drainage Basin in Canada. Mines Branch Report No. 837, 1954.

TABLE I

Area and Population Distribution in Mackenzie and Yukon River Drainage Basins

Drainage basins	Approximate area drained[a] (square miles)						Per cent of total provincial or territorial area drained					Estimated population in hundreds in basin area (1951 Census)						Per cent of total provincial or territorial population in basin area (1951 Census)				
	Y.T.	N.W.T.	B.C.	Alta.	Sask.	Total	Y.T.	N.W.T.	B.C.	Alta.	Sask.	Y.T.	N.W.T.	B.C.	Alta.	Sask.	Total	Y.T.	N.W.T.	B.C.	Alta.	Sask.
Yukon River in Canada	120,500	—	8,500	—	—	129,000	58·2	—	2·3	—	—	88·0	—	0	—	—	88·0	96·7	—	—	—	—
Mackenzie River.....	68,260	298,770	116,000	162,855	50,815	696,700	33·0	22·9	31·6	63·8	20·2	2·3	97·9[d]	138·0	1,180·9	11·1	1,430·2	2·6	61·2	1·2	12·6	0·1
Coastal Arctic.....	7,246	264,900	—	—	—	272,146	3·5	20·3	—	—	—	0·3	8·4[e]	—	—	—	8·7	0·3	5·3	—	—	—
Archipelago[b].....	—	541,083	—	—	—	541,083	—	41·5	—	—	—	—	34·3[f]	—	—	—	34·3	—	21·4	—	—	—
Hudson Bay.....	—	200,150	—	—	2,105	202,255	—	15·3	—	—	8·4	—	19·4[g]	—	—	0	19·4	—	12·1	—	—	—
Coastal Pacific.....	11,070	—	89,260[c]	—	—	100,330	5·3	—	24·3	—	—	0·3	—	2,531·1	—	—	2,531·4	0·3	—	21·7	—	—
Total.....	207,076	1,304,903	366,255	255,285	251,700	—	100·0	100·0	58·2	63·8	28·6	91·0[h]	160·0	11,652·0	9,395·4	8,317·3	4,112·0	100·0	100·0	22·9	12·6	0·1
Per cent of Total, Canada.....	5·4	33·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Includes fresh water.
[b] District of Franklin, except for part on mainland.
[c] Includes Vancouver Island and other coastal islands.
[d] About 50% White, 39% Indian, 11% Eskimo.
[e] Only about 5% White, remainder Eskimo.
[f] About 3% White, remainder Eskimo.
[g] About 7% White, remainder Eskimo.
[h] About 9% White, remainder Eskimo.

THE MACKENZIE RIVER DRAINAGE BASIN

The Mackenzie River system drains about 696,700 square miles of Canada, almost 43 per cent of which lies in the Northwest Territories.

It drains the following proportions of adjacent provinces:

Yukon Territory	33%
British Columbia	32%
Alberta	64%
Saskatchewan	20%
Northwest Territories (exclusive of the northern archipelago)	39%

The river, discovered by Alexander Mackenzie in 1789, forms one of the eight great river systems of the world and in North America is exceeded only by the Mississippi River system.

The drainage area and length of the Mackenzie River system are slightly greater than those of the St. Lawrence River-Great Lakes system, extending 2,635 miles in length from the mouth of the Mackenzie River in Northwest Territories, to the headwaters of the Finlay River in British Columbia. This large basin covers an area of about 16 degrees of latitude by 36 degrees of longitude, extending about 1,350 miles north to south, and varying in width from 900 miles near its centre to 100 miles near the Mackenzie River mouth.

A detailed description of the basin is given in "The Mackenzie River Basin" by Charles Camsell and Wyatt Malcolm, Memoir 108, of the Geological Survey of Canada, 1919. Much of the geological data that follow have been extracted from this report.

The Mackenzie River proper is only the northern portion of the system, about 1,000 miles in length from Great Slave Lake to the Arctic Ocean. At its source in Great Slave Lake the river is 7 to 8 miles wide, but overall has an average width of 1 mile with a gradient of 6 inches to the mile and an average flow of 500,000 cu. ft. per second. It is navigable throughout its length. South of Great Slave Lake, the Great Slave River, still part of the system, is navigable to Fort Smith, an additional 200 miles.

The entire drainage area is a large basin, its western side dipping steeply northeast and its eastern side more gently westward to a central depression, the whole tilted with a long, easy slope (2 feet to the mile) northward to the Arctic Ocean.

The eastern side of the basin lies in the Canadian Shield which extends northeast from the west end of Lake Athabasca along the valley of the Slave River to Great Slave Lake, then some 800 miles to MacTavish Bay on Great Bear Lake and then outside the basin to the Arctic Ocean. This Precambrian region varies from 80 to 250 miles wide in the basin and is made up of crystalline or metamorphic rocks. In the south, the Shield merges gradually into the Central Plains area of flat-lying Palæozoic, sedimentary rocks, but elsewhere there is a well-defined line that occurs as an escarpment north of Great Slave Lake. North of Great Bear Lake the Shield becomes lake country, the lakes being usually shallow rock basins with smooth rocky shores and few sand beaches. Rivers of the Shield have no defined valleys or graded profiles but show level stretches followed by rapids and falls; hence their importance for future water power development. The few hills rising above the Shield are never more than 1,000 feet in elevation.

There is little soil within the Shield portion of the basin although in some areas there are deposits of glacial drift or boulder clay. The area is wooded except for the extreme eastern edge and a portion lying north of the eastern end of Great Slave Lake in the basins of Clinton, Alymer and MacKay Lakes.

The western portion of the drainage basin lies in the Cordilleran region, an area varying from 20 to 200 miles wide. A definite break occurs between this area and the Central Plains region, crossing Peace River about Hudson Hope and Liard River at 125 degrees latitude. Up to this point the Cordilleran region is known as the Rocky Mountains. Northwest from the Liard River the area is known as the Mackenzie Mountains. This range touches the Mackenzie River near the mouth of the Nahanni River then follows the Mackenzie north and west around the Peel River basin and dies out at the headwaters of the Peel. From here a lower range known as the Richardson Mountains continues to the Arctic Ocean.

Several rivers of the Mackenzie River system, notably Peace and Liard Rivers, cut through the mountain ranges with headwaters on the western plateau in northern British Columbia and Yukon Territory. The Peace River flows in a wide valley at maximum elevation of about 2,000 feet through the Rocky Mountains. Such major tributary rivers as the Nahanni, Root, Gravel, Carcajou, Arctic Red and Peel rise in the Mackenzie Mountains and have relatively steep gradients to the Mackenzie. The Peel River flows at an elevation some 1,200 feet lower than the Bell River, a tributary of the Yukon River, on the other side of the mountain range.

Between the Cordilleran region and the Canadian Shield lies the Central Plains area. In this broad, level and forested plain flow the Mackenzie River and its continuing tributaries, the Slave, Athabasca, etc. This lowland area varies in width from 420 miles at Fort Vermilion to 200 miles at latitude 63 degrees. Here the river gradients are very low, the flow is slow, and there are extensive areas of lake and muskeg. In the southern

part of the basin the plain is, in reality, a plateau sloping northeastward and bounded by a series of escarpments facing a lowland extending to the sea; the plateau reaches to about the northern boundary of Alberta. A somewhat similar plateau occurs again in the Peel River basin and elsewhere several irregular hills or plateaux break the lowland regions.

The Mackenzie River system includes several large lakes besides the major tributary rivers, among which are Great Bear Lake, 12,000 square miles, Great Slave Lake, 11,170 square miles and Lake Athabasca, 3,058 square miles in area. The size of these lakes is better understood when their areas are compared with well known lakes of other systems—Lake Superior, 31,820 square miles, Lake Ontario, 7,540 sq. miles and Lake Winnipegosis, 2,086 square miles in area.

Although there is considerable variation in climate within the Mackenzie River basin it has in the main a milder climate than those parts of Ontario, Manitoba and Quebec lying in the same latitude. Midsummer temperatures may rise to 85°F. but the nights are cool and frost may occur at almost any time of the year. In the northern parts of the basin the ground is permanently frozen. The summer season is short, June to September, but varies with the latitude. Precipitation is higher than on the prairies and fairly uniform (15 inches to 20 inches a year) with a snowfall of about 2 feet. Agriculture is possible in the Central Plains area and in parts of the Cordilleran region, mainly in the river valleys. Most of the northern lowland area, however, is not suited to agriculture because of muskeg and permanent frost. It is in the southern portion, in the basins of Athabasca and Peace Rivers, that extensive areas (about 10 million acres) suitable for farming are found; this is prairie and slightly-wooded land and in recent years much of the prairie land has been settled.

Because of lack of transportation, this huge basin has been little explored until recent years when the wide use of aircraft has brought about major changes and drawn to the attention of many Canadians the important resources of the area. Until recently the main activity of the basin was fur-trading and most of the settlements were developed for this purpose. Recent important finds of minerals such as lead, zinc, copper and uranium together with increasing transportation facilities will doubtless open up the basin to further development.

YUKON RIVER DRAINAGE BASIN

The Yukon River basin is about half the size of the Mackenzie River basin, and the river itself drains about 330,000 square miles, 129,000 square miles in Canada, 93 per cent of which is in Yukon Territory, the remainder in British Columbia. This system, the fifth largest in North America, has its headwaters in the Pacific coastal range in northern British Columbia, about 18 miles from tide water, yet the rivers continue about 2,300 miles (714 miles in Canada) before emptying into the Bering Sea. The system has no large lakes in Canada and the main tributary rivers are the Yukon (formerly Lewes) and Teslin Rivers.

The Canadian part of the drainage basin lies entirely within the Cordilleran region, mostly on the high plateau between the Pacific coastal ranges and the Dawson and Selwyn Mountains, which lie parallel and west of the Rocky and Mackenzie Mountains. This plateau area is one of wide valleys and rolling hills separated by deeply cut rivers. The coastal ranges are high and include Mount Logan, one of the highest mountains in North America.

Because of terrain and climate there is little farming in the area, although at one time there was considerable agricultural activity near Whitehorse and Dawson. The area is forested, usually up to 4,000 feet above sea level but growth is slow and what lumbering is done is for local uses.

As in the Mackenzie River basin, climate, distance from populated areas and lack of transportation have slowed development of this basin. One railway runs from Whitehorse 110 miles southwest to Skagway, Alaska. The Alaska Highway connects settled areas of northern British Columbia and Alberta with Whitehorse and another road runs north to Mayo, Dawson and several newer mining communities.

In recent years important finds of base metals and developments of water power have occurred. Fur-trading is also important and some gold mining is still carried on in the older goldfields of the Klondike.

SURVEY PROCEDURE

Survey studies in these and other basins were carried out where possible by the procedures detailed in Water Survey Report No. 1.

During the summer of 1951 when field studies were being made on water quality in the Saskatchewan River drainage basin[1], most of the Upper Mackenzie River basin that was accessible by road was visited, and a number of sampling locations established.

In the rest of the Mackenzie River basin and in the Yukon River basin similar sampling locations were established prior to 1952, by correspondence with municipal officials and with the cooperation of other governmental agencies, in particular the RCMP. The number of stations established in these relatively inaccessible

[1] Industrial Water Resources of Canada (Water Survey Report No. 7): Saskatchewan River Drainage Basin, Mines Branch Report No. 849, Dept. Mines and Technical Surveys, Ottawa, 1956.

areas was necessarily limited because of the high cost and difficulty of collection and shipment of samples, especially during the winter period. At certain locations samples collected during this period were sealed and held until shipment could be made after the spring break-up. Consequently, the quality data available in these basins are limited in comparison with those of previous reports in this series.

Only the southern part of the Mackenzie River basin—that portion accessible by road—was visited with the mobile laboratory when field work was carried out in the summer of 1952. At this time samples of many surface waters, not already being sampled in the monthly survey, were obtained and field-tested. These samples are reported in Tables II, III and IV, with some of the field results reported in brackets. The field tests indicate significant changes, if any, in water quality because of storage prior to complete analysis.

During the 1952 field season most of the incorporated municipalities with organized water systems were visited, and information on the operation of the systems and samples of raw and finished municipal waters were collected. Any information on new systems or changes made since then have been obtained by correspondence with municipal or provincial government officials. However it is probable that additional changes in some of the older systems as well as new installations will have occurred by the time this report is available.

Additional data on surface water quality in these basins and in the drainage basins already reported are continually being obtained. It is planned to make such information available as soon as possible in supplements to this series.

ANALYTICAL PROCEDURE

The methods of analyses and of recording analytical results during studies in these basins were essentially the same as those outlined in Water Survey Report No. 1, although some changes in the number of and method of analyses have since been made and reported in Water Survey Reports up to and including No. 7.

Experience has shown that many field tests with normal field equipment are not accurate enough. To carry out these tests satisfactorily in the field would require the use of elaborate equipment in a larger and specially designed mobile laboratory. It has been found that when certain tests can be carried out within a few days, as is now the policy, there is little significant change in most surface waters. This is also true of many ground waters with the exception of those high in iron or manganese. With the latter, collection of a separate acidified sample permits determination of the iron and manganese in solution at the time of sampling. The amount of field testing has, therefore, been cut to a minimum and now only pH, alkalinity, colour and turbidity are usually determined in the field, although at times such tests as total hardness, dissolved oxygen and iron content are carried out.

As pointed out in previous reports in this series the amount of analytical study on each water is governed to a large extent by the number of samples received, the area covered, and the laboratory personnel available to carry out the analytical work.

Because of the demand for information, each succeeding report attempts to present more information on water quality. This is made possible by the use of more sensitive and rapid analytical methods and techniques. However, the methods used are still those published in editions of "Standard Methods"[1] and A.S.T.M. Manual on Industrial Water[2].

As in previous reports no attempt has been made to determine weighted averages on surface waters in these basins, because flow records are not available at many sampling locations. At sampling stations where monthly samples were collected, arithmetical means have been reported for many constituents and per cent sodium, sum of constituents and saturation index calculated for these "average" waters. It is pointed out, however, that these "averages" must be used with caution since they have little meaning for waters which show very wide and rapid variations in flow and quality over the year. Inclusion of abnormal spring run-off water in the calculation will often significantly alter the average reported. The reader is referred to Water Survey Report No. 1 for interpretation of per cent sodium, saturation index and other values reported in Tables II, III and IV.

---

[1] Standard Methods for the Examination of Water, Sewage and Industrial Waters, 9th Edition (1946)—American Public Health Association, 1790 Broadway, New York 17, N.Y.

[2] Manual on Industrial Waters; 1953—American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

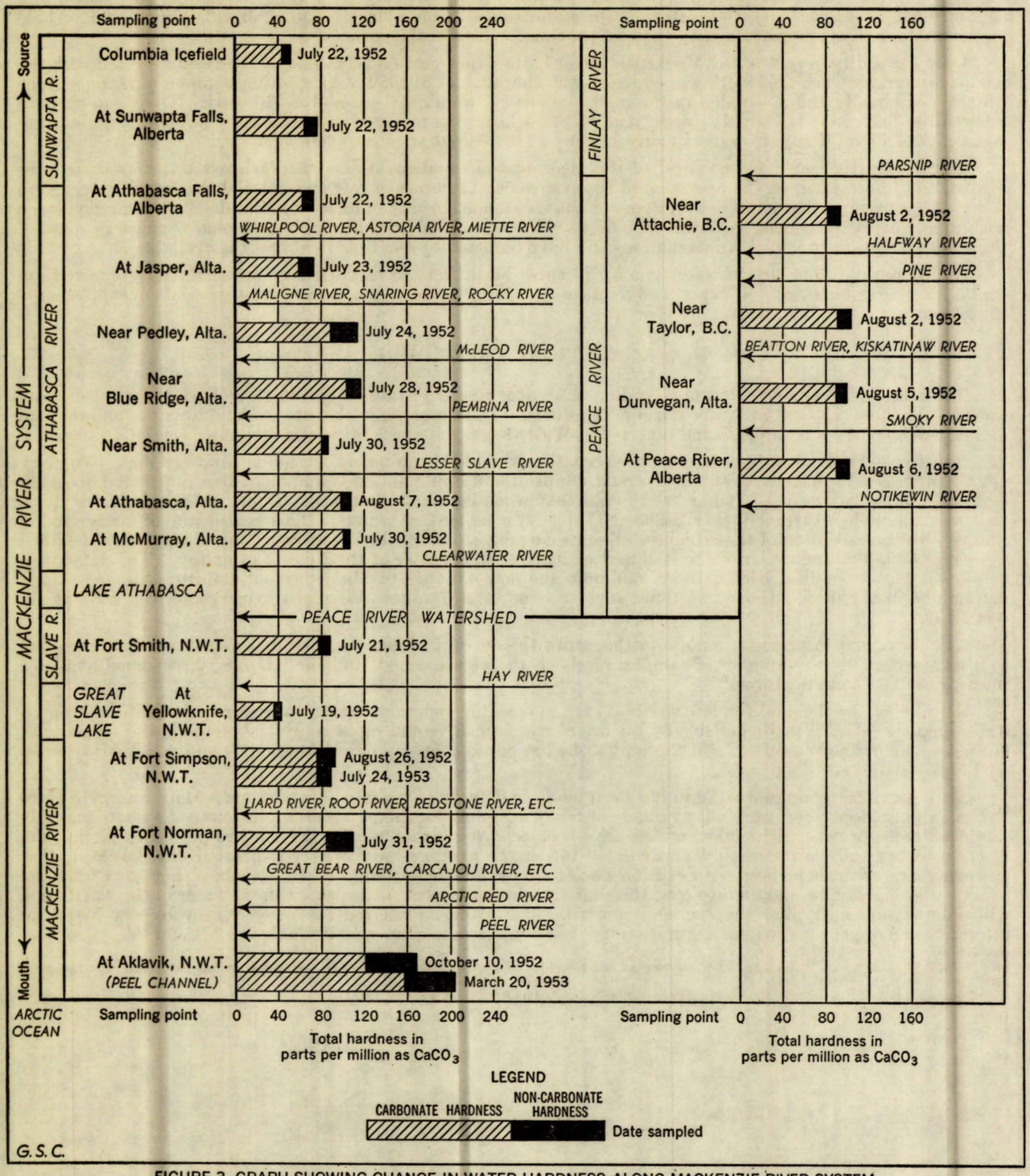


FIGURE 3. GRAPH SHOWING CHANGE IN WATER HARDNESS ALONG MACKENZIE RIVER SYSTEM

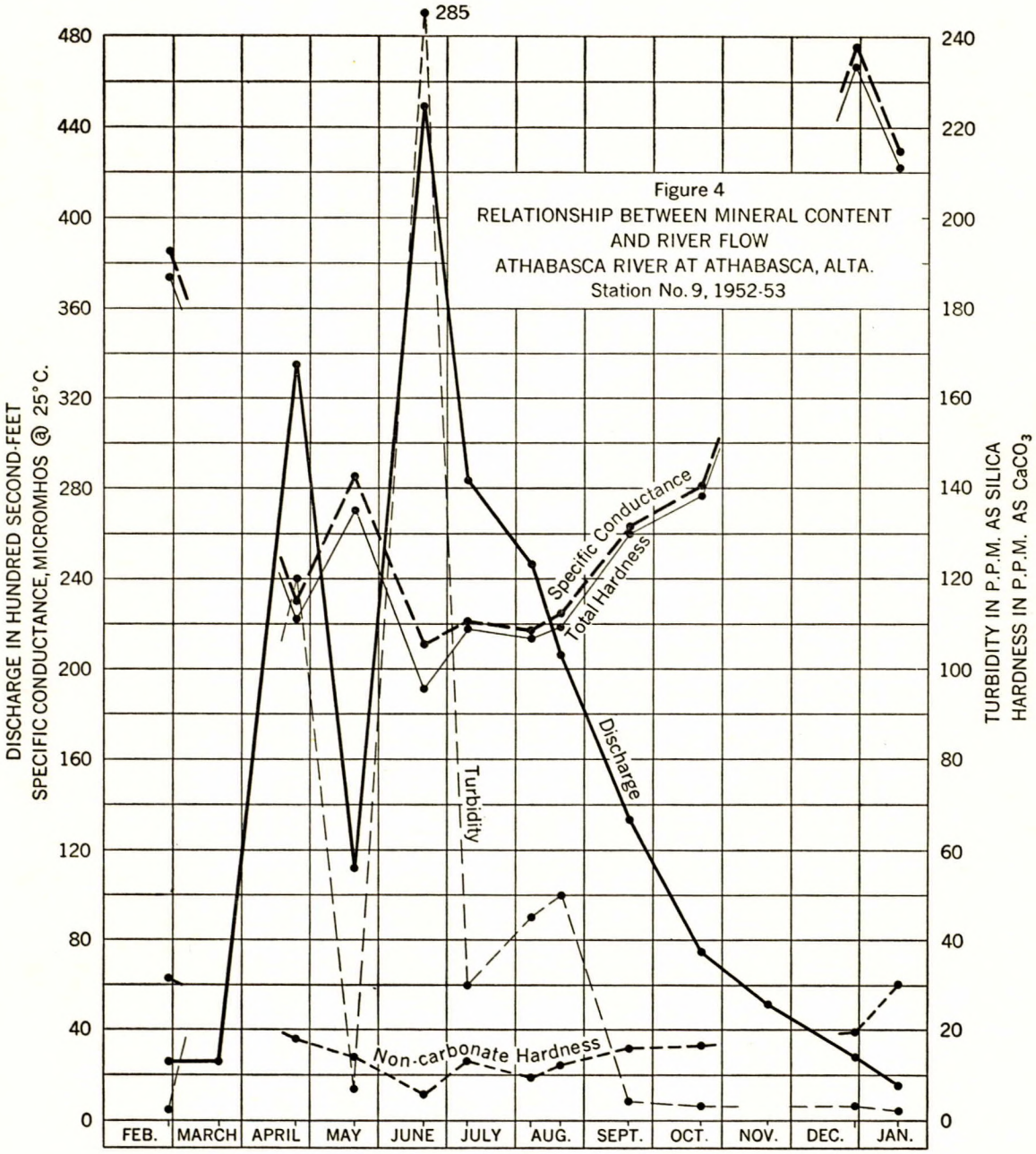


Figure 4
RELATIONSHIP BETWEEN MINERAL CONTENT
AND RIVER FLOW
ATHABASCA RIVER AT ATHABASCA, ALTA.
Station No. 9, 1952-53

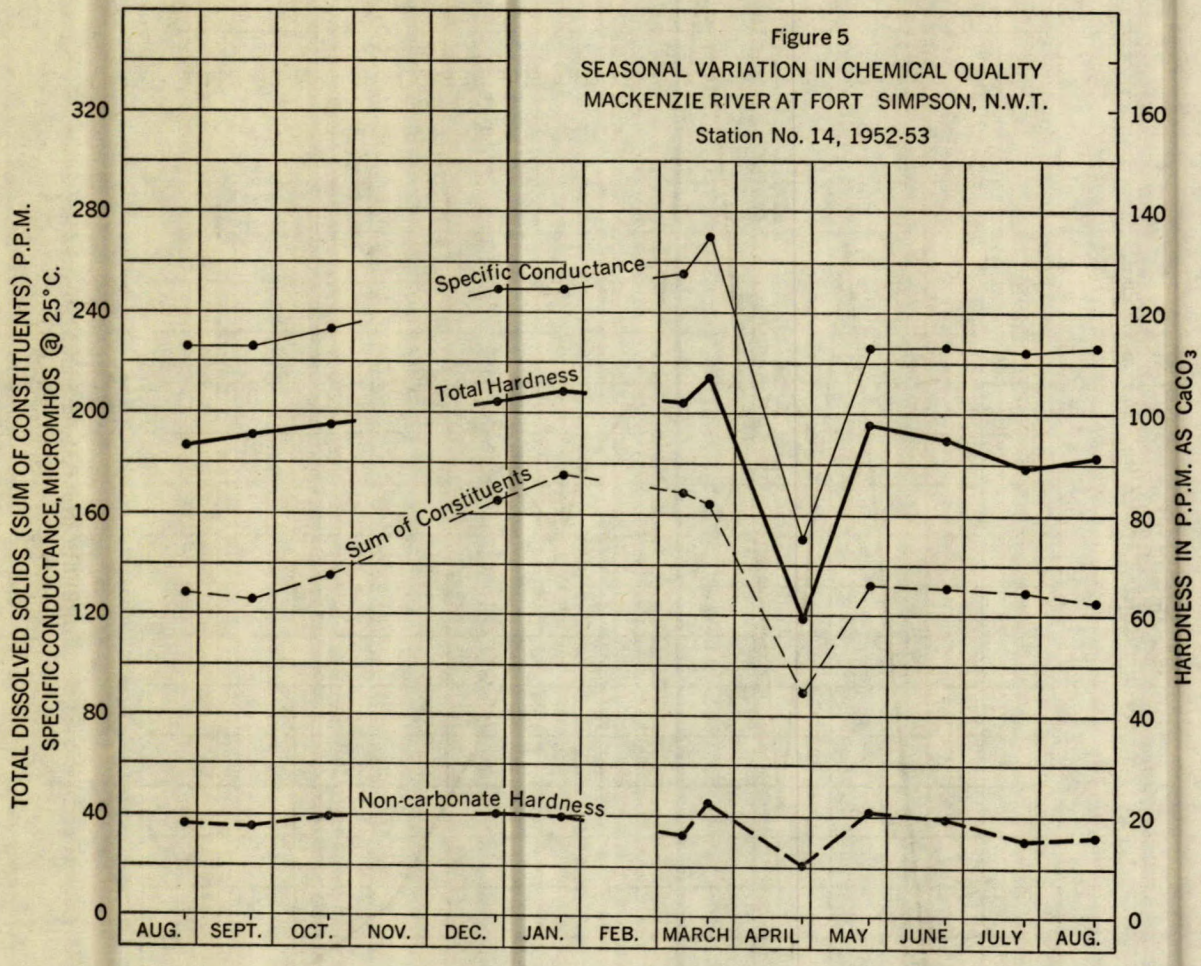


Figure 5
SEASONAL VARIATION IN CHEMICAL QUALITY
MACKENZIE RIVER AT FORT SIMPSON, N.W.T.
Station No. 14, 1952-53
TOTAL DISSOLVED SOLIDS (SUM OF CONSTITUENTS) P.P.M.
SPECIFIC CONDUCTANCE, MICROMHOS @ 25°C.
HARDNESS IN P.P.M. AS $CaCO_3$
Specific Conductance
Total Hardness
Sum of Constituents
Non-carbonate Hardness
0
40
80
120
160
200
240
280
320
0
20
40
60
80
100
120
140
160
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MARCH
APRIL
MAY
JUNE
JULY
AUG.

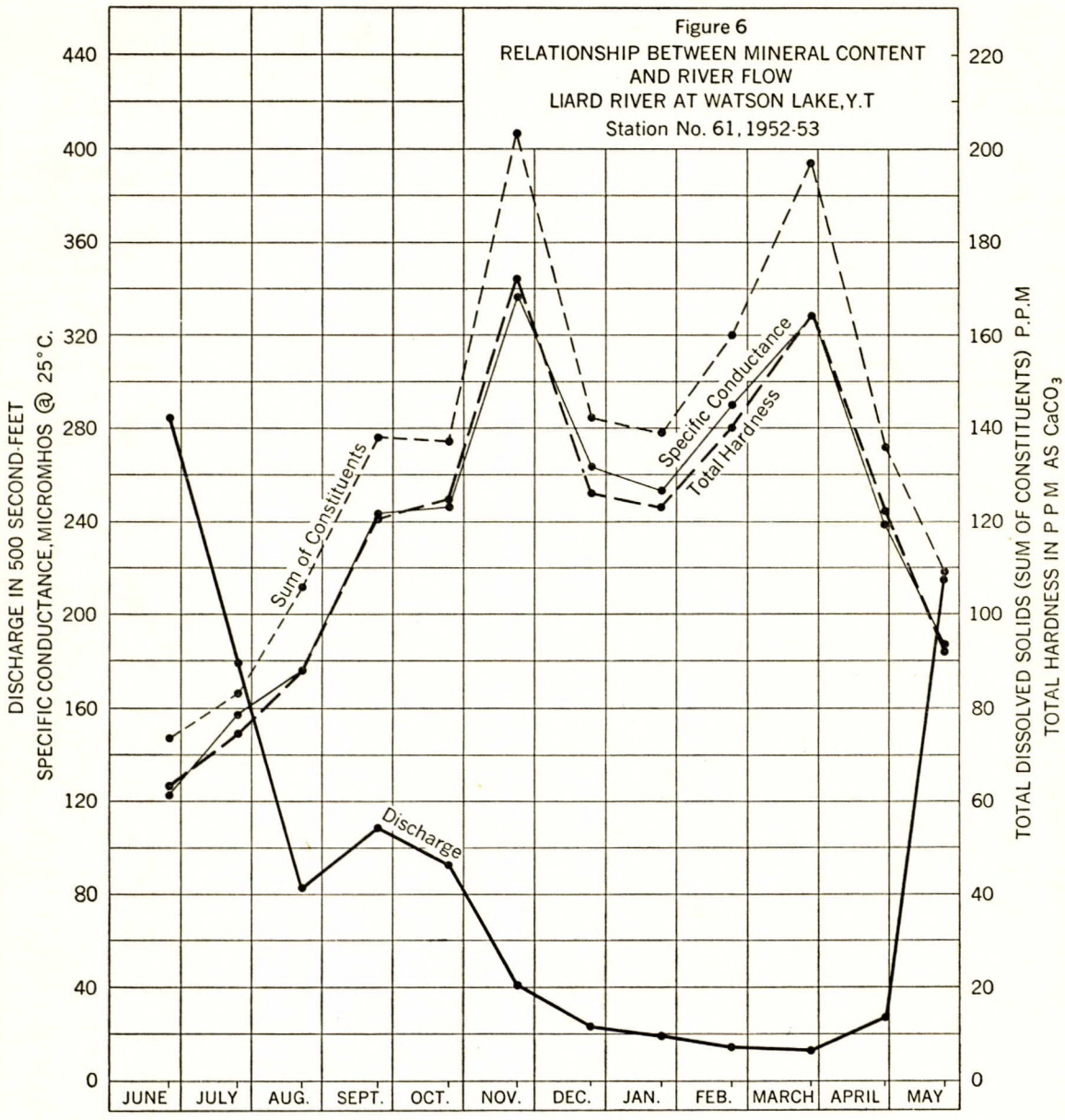


Figure 6
RELATIONSHIP BETWEEN MINERAL CONTENT
AND RIVER FLOW
LIARD RIVER AT WATSON LAKE, Y.T
Station No. 61, 1952-53
DISCHARGE IN 500 SECOND-FEET
SPECIFIC CONDUCTANCE, MICROMHOS @ 25° C.
TOTAL DISSOLVED SOLIDS (SUM OF CONSTITUENTS) P.P.M
TOTAL HARDNESS IN P P M AS $CaCO_3$
Sum of Constituents
Specific Conductance
Total Hardness
Discharge
0
40
80
120
160
200
240
280
320
360
400
440
0
20
40
60
80
100
120
140
160
180
200
220
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MARCH
APRIL
MAY

TABLE II

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet)		Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter		Specific conductance $K \times 10^6$ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids)			Loss on ignition at 550°C.
			On sampling date	Monthly mean					Dried at 105°C.	Ignited at 550°C.		P.P.M.	Tons per acre-foot	Tons per day	
											STATION No. 1—ATHABASCA GLACIER†				
1	July 21/51.....	.....	174††	201††	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	July 22/52.....	8:8*	32·4	58·6	39	8·1 (8·5)	0 (5)	35 (50)	37	35	102	63·2	0·086	5·5	12·4
3	April 6/56.....	—:20	less than 0·05	.....	32	8·1	5	0	.....	.....	217	123	0·167	.....	18·0
											STATION No. 2—SUNWAPTA RIVER				
4	July 22/52.....	8:8	.....	.....	45	7·8 (8·2)	0 (5)	30 (25)	4 5	40	151	102	0·139	.....	24·0
											STATION No. 3—ATHABASCA RIVER				
5	July 22/52.....	8:13	.....	.....	47	7·9 (8·0)	5 (15)	25 (40)	59	57	143	88·2	0·120	.....	35·0
											STATION No. 4—ATHABASCA RIVER				
6	Feb. 19/52.....	7:7	low‡	.....	32	7·9	2	3	.....		213	133	0·181	.....	12·6
7	Mar. 11.....	8:8	low	.....	33	8·0	5	4	.....		215	.....	.....	.....	.....
8	Mar. 19*.....	7:8	"	.....	34	7·8	5	3	.....		407	.....	.....	.....	.....
9	Apr. 12.....	9:11	"	.....	36	7·6	5	1	.....		202	.....	.....	.....	.....
10	May 12.....	4:10	"	.....	38	8·0	25	15	23	22	157	102	0·139	.....	18·8
11	June 14.....	10:23	high	.....	45	8·2	10	15	.....		136	.....	.....	.....	.....
12	July 9.....	5:6	"	.....	51	8·1	10	60	124	110	131	77·2	0·105	.....	9·6
13	July 23*.....	8:12	"	.....	49	8·0 (8·1)	5 (15)	35 (35)	53	48	141	85·2	0·116	.....	28·6
14	Aug. 12.....	8:28	"	.....	52	8·1	10	250	.....		126	.....	.....	.....	.....
15	Sept. 11.....	6:14	normal	.....	48	7·9	5	4	.....		155	.....	.....	.....	.....
16	Oct. 11.....	5:9	low	.....	43	8·0	5	7	.....		164	.....	.....	.....	.....
17	Nov. 19.....	9:21	low	.....	33	8·1	10	1	.....		344	211	0·287	.....	19·5

* Figure preceding colon refers to storage period prior to "immediate" testing, and that following colon to storage period prior to start of final analyses.
† Sampled from pool at base of glacier; this pool is the headwaters of the Sunwapta River.
†† Discharge at Athabasca Glacier.

* Not included in average.
‡ Estimate of river level or flow by sample collector.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
COLUMBIA ICEFIELD																			
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
13·8	4·2	0·9	0·2	0·05	8·9	0·1	0·2	trace	.....	47·8	2·9	1·7	7·7	51·7	56·5	3·6	.....	0·5	2
23·7	11·1	0·7	0·5	0·0	25·5	0·3	0·8	0·0	.....	97·6	0	2·6	24·8	105	113	1·4	.....	0·1	3
at SUNWAPTA FALLS, ALTA.																			
19·7	6·6	1·3	0·2	0·09	13·4	0·2	0·4	0·10	.....	78·1	0	4·0	12·3	70·3	84·5	3·6	.....	0·5	4
at ATHABASCA FALLS, ALTA.																			
20·0	5·4	0·7	0·3	0·07	11·1	1·8	0·2	0·05	.....	76·1	0	3·4	9·9	72·3	80·3	2·1	.....	1·7	5
at JASPER, ALTA.																			
27·2	9·3	1·0	0·2	0·07	16·2	0·7	0	0·60	.....	109	0	4·2	17·1	106	113	.....	.....	.....	6
25·5	9·5	1·6	0·2	.....	20·6	0·1	0·4	.....	.....	107	0	5·3	14·7	103	116	.....	.....	.....	7
53·6	14·6	8·8	1·2	.....	46·9	1·3	0	.....	.....	196	0	5·1	32·8	194	228	.....	.....	.....	8
27·8	8·9	2·0	0·3	.....	28·8	1·6	0	.....	.....	97·6	0	5·3	26·0	106	123	.....	.....	.....	9
21·7	6·8	1·0	1·3	0·11	12·3	1·0	0·2	0·10	.....	86·6	0	4·6	11·1	82·1	92·9	.....	.....	.....	10
17·0	5·8	1·0	0·3	.....	12·8	1·4	0·3	.....	.....	61·7	2·4	4·8	11·6	60·2	76·6	.....	.....	.....	11
17·5	5·1	0·8	0·3	0·10	12·2	0·1	0·2	trace	.....	64·7	0·6	4·4	10·6	64·6	72·9	.....	.....	.....	12
19·4	5·8	0·9	0·3	0·06	11·9	1·1	0·10	0·0	.....	72·7	0	4·1	12·7	72·3	79·5	.....	.....	.....	13
19·0	4·0	0·4	0·2	.....	7·8	0·4	0·3	.....	.....	66·1	1·2	3·2	7·7	63·9	69·1	.....	.....	.....	14
20·9	6·5	0·9	0·4	.....	19·1	0·8	trace	.....	.....	74·7	0	4·6	17·6	78·8	90·0	.....	.....	.....	15
21·0	6·8	0·6	0·2	.....	17·5	2·4	0·2	.....	.....	76·9	0	6·2	17·3	80·3	92·8	.....	.....	.....	16
45·3	12·6	9·3	1·8	0·23	35·0	1·1	0·3	0·10	.....	102	9·6	4·6	15·8	165	200	.....	.....	.....	17

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 4—ATHABASCA RIVER														
1	Dec. /52—No sample taken.														
2	Jan. /53—No sample taken.														
3	Feb. 4	9:36	low		35	8·5	3	1			195	117	0·159		12·6
4	Mar. 4	9:23	"		33	8·2	5	1			207				
5	Apr. 4*	6:49	"		35	8·2	3	5			210				
6	Average (12 samples)	7:16			40	8·1	8	30			187				
	* Not included in average.														
	STATION No. 5—ATHABASCA RIVER,														
7	Sept. 10/50	5:129			47	7·8 (8·2)	7 (—)	10 (20)	200	135	160	106	0·144		33·6
8	Sept. 26/51	13:33			35	7·7	1	8	Carbon dioxide (field test)—1·5 p.p.m. 8·5	5·4	162	104	0·141		16·2
	* At bridge, east of Jasper, Alta.														
	STATION No. 6—ATHABASCA RIVER														
9	July 24/52	7:14			53	8·0 (8·2)	5 (15)	25 (25)			222	140	0·190		22·2
	STATION NO. 7—ATHABASCA RIVER														
			Gauge height in feet‡												
10	Sept. 27/51†	12:34			33	8·1	2	7	8·2	7·2	289	183	0·249		57·0
11	Feb. 11/52	9:9	12′		33	7·6	5	4	2·0	1·5	440	279	0·379		20·4
12	Mar. 12	7:7	11′4″		33	8·0	5	3			434				
13	Apr.—No sample taken.			No											
14	May 7	7:8	8′	discharge	45	7·9	20	1			287	182	0·248		30·6
15	June 12	8:25	14′	records	50	7·8	15	50			210				
16	July 11	11:18	15′	available.	60	8·0	10	25			208				
17	July 28††	9:14			65	8·1 (8·1)	30 (25)	20 (20)	44	41	229	149	0·203		37·8
18	Aug. 18	7:18	15′		52	8·0	10	45		54	217	137	0·186		21·8
19	Sept. 12	10:17	14′		49	8·1	20	7			263				
20	Oct. 13	18:43	14′		45	8·1	5	4	8	6	290	173	0·235		14·0
21	Nov. 9	16:26	12′		33	8·2	10	3			349				

† At ferry, 3 miles north of Blue Ridge; sample not included in average.
†† From highway bridge near Blue Ridge; sample not included in average.
‡ Sample collectors report.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at JASPER, ALTA.—*Concluded*																			
																			1
																			2
25·4	8·6	1·0	0·4	0·06	21·4	0·0	0·4	0·0	.....	96·1	2·9	4·9	15·3	98·9	112	.....	.....	.....	3
27·3	8·9	1·1	0·4	.....	21·8	0·3	0·6	.....	.....	105	0	4·7	18·9	105	117	.....	.....	.....	4
27·0	9·0	3·5	0·8	.....	21·2	0·6	0·4	.....	0·00	109	0	5·1	14·9	105	121	.....	.....	.....	5
24·6	7·7	1·7	0·5	.....	18·8	0·8	0·2	.....	.....	92·3	1·4	4·7	15·2	93·2	163	3·3	.....	0·5	6
near SNARING*, ALTA.																			
23·0	5·9	0·4	0·4	0·10	22·4	0·0	0·4	0·0	.....	83·0	0	3·3	14·0	82·0 (86·0)	97·3	2·3	.....	0·5	7
22·7	7·3	1·3	0·2	0·02	17·0	1·8	0·0	0·10	.....	83·0	0	1·8	18·6	86·6	93·2	3·1	.....	0·6	8
near PEDLEY, ALTA.																			
30·5	9·0	1·9	0·6	0·08	24·7	0·2	0·2	0·10	.....	108	1·4	3·6	24·0 (24·3)	113 (116)	126	3·5	.....	0·0	9
near BLUE RIDGE, ALTA.																			
42·4	11·3	4·5	0·5	0·04	32·3	1·8	0·2	0·13	.....	152	1·2	7·5	25·5	152	177	6·0	0·3	.....	10
62·3	17·8	4·5	0·4	0·02	69·4	2·7	0·4	0·20	.....	203	0	5·5	62·2	229	263	.....	.....	.....	11
60·8	17·4	6·3	0·4	.....	62·1	0·6	0·4	.....	.....	205	0	7·0	55·3	223	256	.....	.....	.....	12
																			13
40·1	10·4	6·6	1·4	0·08	29·8	3·0	0·0	0·10	.....	149	0	3·6	20·8	143	168	.....	.....	.....	14
29·2	8·2	2·6	0·5	.....	22·0	0·5	0·4	.....	.....	110	0	5·2	16·8	107	123	.....	.....	.....	15
29·2	8·2	2·2	0·4	.....	19·0	0·8	trace	.....	.....	110	0	5·2	16·7	107	119	.....	.....	.....	16
33·0	8·3	3·3	0·5	0·09	16·7	1·0	0·2	0·20	.....	123	2·4	7·7	12·1 (10·8)	117 (117)	133	.....	.....	.....	17
31·0	7·1	1·9	0·5	0·10	20·8	0·2	trace	0·0	.....	111	0	4·7	15·8	107	121	.....	.....	.....	18
37·6	9·6	3·1	0·4	.....	27·8	0·4	trace	.....	.....	128	4·1	5·6	21·6	133	152	.....	.....	.....	19
39·0	11·0	3·6	0·6	0·20	33·4	0·5	0·3	0·0	.....	144	0	4·4	24·5	143	164	.....	.....	.....	20
47·9	13·7	5·0	0·5	.....	45·7	0·3	0·4	.....	.....	163	5·5	8·0	33·2	176	207	.....	.....	.....	21

77913—2

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet)		Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter		Specific conductance K x 10^6 at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids)			Loss on ignition at 550°C.
			On sampling date	Monthly mean					Dried at 105°C.	Ignited at 550°C.		P.P.M.	Tons per acre-foot	Tons per day	
	STATION No. 7—ATHABASCA RIVER														
			Gauge height in feet‡												
1	Dec. 11/52.....	25:61	13'6"‡	.....	32	8·4	10	2	.....	.....	466	.....	.....	.....	.....
2	Jan. 13/53.....	10:45	12'	.....	33	8·2	10	2	.....	.....	458	283	0·385	.....	26·4
3	Average..... (11 samples)	12:25	.....	.....	42	8·0	11	13	.....	.....	329	.....	.....	.....	.....
	‡ Collectors report.														
	STATION No. 8—ATHABASCA RIVER														
4	July 30/52.....	8:14	.....	.....	67	7·8 (7·9)	55 (100)	15 (25)	45	41	182	129	0·175	.....	38·0
	* Sampled just below junction of Slave River; water may be mostly Slave River water.														
	STATION No. 9—ATHABASCA RIVER														
5	Feb. 29/52.....	13:14	2,540†	2,623†	34	8·0	5	2	.....	.....	385	234	0·318	1,602	26·0
6	Mar.—No sample taken.....	.....	.....	2,561	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	Apr. 23.....	17:20	33,430	17,800	39	7·5	40	129	.....	.....	230	.....	.....	.....	.....
8	May 19.....	10:18	11,150	15,140	62	8·2	20	7	15	12	285	182	0·248	5,463	30·8
9	June 19.....	11:18	44,870	41,340	60	7·9	60	285	.....	.....	211	.....	.....	.....	.....
10	July 19.....	10:27	28,370	37,400	66	8·0	20	30	.....	.....	221	.....	.....	.....	.....
11	Aug. 7*.....	13:26	24,610	21,280	67	8·1 (8·2)	30 (35)	45 (50)	64	58	217	144	0·196	9,524	19·4
12	Aug. 19.....	10:17	20,580	21,280	61	8·1	20	50	.....	70	224	139	0·189	7,097	31·8
13	Sept. 19.....	5:14	11,300	13,070	54	8·3	20	4	.....	.....	263	.....	.....	.....	.....
14	Oct. 20.....	14:31	7,460	8,893	42	8·1	5	3	.....	.....	281	.....	.....	.....	.....
15	Nov.—No sample taken....	.....	.....	5,108											
16	Dec. 19.....	17:41	2,770	2,289	32·5	8·7	15	3	.....	.....	475	.....	.....	.....	.....
17	Jan. 17/53.....	9:46	1,510	2,108	32·5	8·0	15	2	.....	.....	429	267	0·363	1,084	27·4
18	Average..... (10 samples)	12:25	16,398	16,194	48	8·1	22	50	.....	.....	300	.....	.....	.....	.....
	† Ice conditions Oct. 22/51 to April 19/52; Nov. 6/52 to April 30/53.														

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
near BLUE RIDGE, ALTA.—*Concluded*																			
66·1	18·1	6·5	0·8	.....	62·3	0·8	0·3	.....	.....	221	8·0	8·7	44·7	240	280	.....	.....	.....	1
63·5	18·0	6·0	0·7	0·05	64·3	0·6	0·6	0·15	0·00	223	0	6·2	49·9	233	269	.....	.....	.....	2
46·1	12·7	4·4	0·6	.....	41·5	0·9	0·3	.....	.....	161	1·6	5·8	32·3	167	193	5·4	.....	0·4	3
near SMITH*, ALTA.																			
24·6	6·3	4·7	1·3	0·16	14·0	1·1	0·2	0·40	.....	97·6 (95·2)	0 (0)	6·9	7·1 (8·9)	87·1 (86·9)	108	10·3	.....	0·3	4
at ATHABASCA, ALTA.																			
51·1	14·5	8·0	1·2	0·05	46·7	1·2	0·6	0·20	.....	190	0	4·7	31·1	187	222	.....	.....	.....	5
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
33·9	6·3	3·0	1·8	.....	26·0	0·9	1·4	.....	.....	112	0	5·8	18·5	111	134	.....	.....	.....	7
38·9	9·2	7·5	1·7	0·04	27·9	1·4	0·1	0·30	0·02	145	1·2	5·8	13·7	135	166	.....	.....	.....	8
29·0	5·6	4·3	1·4	.....	12·6	1·6	0·6	.....	.....	110	0	6·5	5·6	95·6	116	.....	.....	.....	9
31·2	7·6	3·3	0·6	.....	17·1	0·2	0·0	0·20	.....	113	2·4	6·4	12·9	109	125	.....	.....	.....	10
31·2	7·0	4·0	1·1	0·15	17·6	0·4	0·3	0·20	.....	114	2·4	8·0	9·9	107	128	.....	.....	.....	11
31·2	7·6	3·4	0·8	0·08	18·6	0·3	0·2	0·10	0·00	112	3·1	5·9	12·0	109	127	.....	.....	.....	12
37·4	9·0	4·7	0·9	.....	24·3	0·7	0·2	.....	.....	129	5·0	4·8	15·8	130	151	.....	.....	.....	13
38·3	10·3	5·1	1·0	.....	25·1	1·4	0·4	.....	.....	138	4·8	3·4	16·8	138	158	.....	.....	.....	14
																			15
64·6	17·4	10·8	1·8	.....	45·9	1·0	0·7	.....	.....	260	0	6·7	19·9	233	277	.....	.....	.....	16
57·7	16·2	8·8	1·7	0·10	50·5	1·3	0·7	0·15	0·00	220	0	6·0	30·1	211	252	.....	.....	.....	17
41·3	10·4	5·9	1·3	.....	29·5	1·0	0·5	.....	.....	153	1·7	5·6	17·6	146	173	8·0	.....	0·4	18

* Not included in average.

77913—2½

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 10—ATHABASCA RIVER†														
			Water elevations in feet												
1	May 31/52	2:425	790·13	.....	63	8·1	10	40	61	56	245	152	0·207	.....	29·2
2	June—No sample taken	.....	.....	.....											
3	July 30	8:16	791·12	.....	71	8·1	50	40	.....	.....	219	.....	.....	.....	.....
4	Aug.														
5	Sept.	No samples taken.													
6	Oct.														
7	Nov. 13/52	11:15	no record		43	8·2	25	4	5·4	4·0	352	216	0·294	.....	29·0
8	Dec. 13	10:35	"		33	8·5	20	2	.....	.....	452	.....	.....	.....	.....
9	Jan. 27/53	10:59	"		32	8·1	10	2	.....	.....	456	.....	.....	.....	.....

Maximum water elevation, June 26/53.
Minimum water elevation, Oct. 31/53.
† Sometimes called Snye River at this location.

	STATION No. 11—SLAVE RIVER														
			Water elevations in feet												
10	Mar. 31/52	259:294	no record, ice		32·5	7·8	.....	0	.....	.....	523	.....	.....	.....	.....
11	Apr. 30	229:264	587·12†	.....	33	7·7	.....	heavy	.....	.....	302	.....	.....	.....	.....
12	June 1	198:233	.....	.....	52	7·8	0	"	.....	.....	213	.....	.....	.....	.....
13	June 23	10:14	592·70†	.....	56	7·7	.....	500	.....	.....	205	138	0·188	.....	59·4
14	July 21	8:25	591·92†	.....	65	7·8	30	60	.....	.....	191	.....	.....	.....	.....
15	Aug. 18	11:22	589·72†	.....	61	7·7	20	35	.....	.....	182	.....	.....	.....	.....
16	Sept. 19	5:19	587·96†	.....	52	7·9	15	25	60	55	193	118	0·160	.....	15·6
17	Oct. 20	11:25	no record, ice		34	7·9	20	40	.....	.....	208	.....	.....	.....	.....
18	Nov. 19	8:16	"		33	7·7	10	10	.....	.....	235	.....	.....	.....	.....
19	Dec. 19	17:57	"		32	7·8	15	15	19	17	216	129	0·175	.....	19·2
20	Jan. 20/53	8:28	658·50††	.....	35	8·3	15	15	.....	.....	329	.....	.....	.....	.....
21	Feb. 18	9:37	656·56††	.....	33	7·8	15	8	.....	.....	353	.....	.....	.....	.....
22	Mar. 18*	14:66	655·93††	.....	34	8·1	15	10	14	11	378	226	0·307	.....	25·6

† Records above Mountain Rapids.
†† Records at Fitzgerald: at Fitzgerald { Maximum water elevation, June 15/53—665·06 feet. Minimum water elevation, March 30/53—655·76 feet.
* Not included in average.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at FORT MACMURRAY, ALTA.																			
31·6	9·1	6·4	1·2	0·07	21·7	1·6	0·4	0·20	0·03	124	1·2	4·1	12·2	116	138	10·6	0·2	.....	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
32·9	7·0	5·1	1·0	.....	12·6	0·9	0·2	0·40	.....	117	2·4	6·6	6·0	106	127	9·4	0·2	.....	3
																			4
																			5
																			6
44·5	12·4	11·0	1·7	0·03	32·0	3·5	0·2	0·15	.....	178	3·1	5·4	11·0	162	203	12·7	0·5	.....	7
59·0	16·4	16·4	2·0	.....	46·3	2·8	0·6	.....	.....	224	11·3	5·1	12·3	215	270	14·1	1·1	.....	8
59·3	17·2	14·8	2·1	.....	50·2	1·4	1·1	.....	.....	241	0	6·7	21·2	219	271	12·7	0·7	.....	9
at FORT SMITH, N.W.T.																			
52·0	11·9	35·4	1·0	.....	60·0	42·2	1·8	.....	.....	169	0	.....	40·5	179	287	.....	.....	.....	10
37·4	8·2	10·0	2·4	.....	37·0	6·8	3·2	.....	.....	124	0	.....	25·2	127	166	.....	.....	.....	11
29·2	5·2	9·0	0·8	.....	18·7	7·6	0·8	.....	.....	103	0	.....	9·5	94·1	122	.....	.....	.....	12
31·5	5·4	3·4	1·7	0·20	13·8	3·3	0·4	.....	.....	111	0	3·1	9·8	101	118	.....	.....	.....	13
25·7	5·7	4·8	1·1	.....	15·0	4·2	0·3	0·20	.....	93·2	0	5·0	11·1	87·5	108	.....	.....	.....	14
29·4	5·1	5·4	0·9	.....	13·2	5·0	0·6	.....	0·00	87·8	0	5·8	10·0	82·0	104	.....	.....	.....	15
23·8	5·3	6·7	1·4	0·04	16·7	8·9	0·3	0·05	.....	85·4	0	4·8	11·2	81·2	110	.....	.....	.....	16
25·9	6·1	6·4	1·2	.....	16·9	7·0	0·4	.....	.....	95·6	0	4·3	11·4	89·8	115	.....	.....	.....	17
26·3	6·4	10·1	1·7	.....	18·3	11·7	0·3	.....	.....	98·6	0	3·7	11·2	92·0	127	.....	.....	.....	18
24·7	5·9	9·9	1·0	0·04	18·6	10·8	3·0	0·20	.....	92·7	0	5·1	9·8	85·8	125	.....	.....	.....	19
36·3	9·0	17·5	1·1	.....	26·0	15·8	0·6	.....	.....	138	0	6·7	14·6	128	181	.....	.....	.....	20
38·9	9·7	18·2	1·2	.....	28·0	22·1	0·6	.....	.....	142	0	6·3	21·2	137	195	.....	.....	.....	21
43·6	9·1	25·7	1·9	0·04	30·9	26·8	.....	0·05	.....	159	0	6·4	15·7	146	223	.....	.....	.....	22

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10^3 at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 11—SLAVE RIVER														
			Water elevation in feet												
1	Apr. 22*.....	10:45	656·05††	.....	32·5	8·0	10	8	.....	.....	707	.....	.....	.....	.....
2	May 15*.....	12:28	591·35† / 663·56††	.....	44	7·6	.....	1,400	.....	.....	546	.....	.....	.....	.....
3	Average..... (12 samples)	64:80	.....	.....	43	7·8	16	.....	.....	.....	263	.....	.....	.....	.....
	STATION No. 12—GREAT SLAVE LAKE														
4	June 15/56†.....	18:53	.....	.....	68	7·8	120	0·3	.....	.....	264	201	0·273	.....	48·0
5	Oct. 23/56†.....	10:19	.....	.....	32	7·8	160	18	.....	.....	391	.....	.....	.....	.....
6	Sept. 19/51*.....	35:42	520‡	.....	48	7·6	3	20	20	19	234	146	0·199	.....	30·8
	STATION NO. 12A—GREAT														
7	June 14/56.....	18:56	low		47	7·9	10	0·9	.....	.....	174	103	0·140	.....	69·9
8	Nov 22/56.....	7:47	.....	.....	34	8·1	40	.....	.....	.....	272	.....	.....	.....	.....
	STATION NO. 12B—GREAT														
9	Aug. 23/56.....	47:90	Very low		54	6·9	20	0·8	.....	.....	26·48	24·4	0·033	.....	9·2
	STATION No. 13—GREAT SLAVE														
			Gauge height in feet†												
10	July 19/52.....	31:32	493·60	493·57	58	7·4	5	0·6	.....	.....	107	71·6	0·097	.....	25·8
11	Aug.—No sample taken.		.....	493·76											
12	Sept. 11.....	11:18	493·57	493·54	52	7·6	15	0·7	.....	.....	207	.....	.....	.....	.....

† Records above Mountain Rapids.
†† Records at Fitzgerald: at Fitzgerald { Maximum water elevation, June 15/53—665·06 feet. / Minimum water elevation, March 30/53—655·76 feet.
* Not included in average.

‡ Elevation at Resolution, N.W.T.— { Maximum water elevation Aug. 22/51—570 feet. / Minimum water elevation, May 12/51—370 feet.

† { Maximum gauge height, Aug. 28-29/53—493·46. / Minimum gauge height, May 9/53—491·76.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at FORT SMITH, N.W.T.—*Concluded*																			
61·9	13·3	68·4	1·6	.....	61·5	114	1·0	.....	.....	148	0	6·8	87·5	209	402	.....	.....	.....	1
56·8	7·7	52·7	2·3	.....	59·1	88·1	0·8	.....	.....	120	0	5·0	74·8	174	332	.....	.....	.....	2
31·8	7·0	11·4	1·3	.....	23·5	12·1	1·1	.....	.....	112	0	5·0	16·5	108	147	18·4	.....	0·2	3
near HAY RIVER SETTLEMENT, N.W.T.																			
33·3	7·5	7·9	2·6	0·43	59·8	4·1	4·8	0·00	.....	79·2	0	3·5	48·9	114	158	12·6	.....	0·3	4
51·1	12·0	14·4	1·5	.....	94·4	4·7	0·8	.....	.....	124	0	6·1	75·2	176	246	14·7	0	.....	5
30·0	6·4	8·5	1·3	0·05	26·0	10·5	0·4	0·15	.....	95·2	0	3·4	23·2	101	134	15·2	.....	0·5	6
SLAVE LAKE at FORT RESOLUTION, N.W.T.																			
21·6	3·9	6·3	0·8	trace	17·4	7·7	2·0	0·00	.....	65·9	0	2·7	15·8	69·9	95·3	15·8	0·4	.....	7
35·1	6·7	11·7	1·2	.....	28·7	11·7	0·8	.....	.....	116	0	5·2	23·6	115	156	17·9	0·2	.....	8
SLAVE LAKE (McLEOD BAY) at FORT RELIANCE, N.W.T.																			
2·2	0·9	0·5	0·4	0·00	0·8	0·6	0·8	0·00	.....	11·0	0	0·5	0·2	9·2	12·2	9·6	.....	3·1	9
LAKE at YELLOWKNIFE, N.W.T.																			
12·3	2·9	3·8	0·8	0·09	11·1	5·0	0·3	0·10	.....	42·2	0	3·6	7·9	42·5	60·8	.....	.....	.....	10
																			11
25·4	4·8	7·1	1·0	.....	20·8	8·7	0·4	.....	.....	83·7	0	4·1	14·7	83·3	114	.....	.....	.....	12

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
STATION NO. 13—GREAT SLAVE															
			Gauge height in feet†												
1	Oct. 20.....	14:39	493·11	493·03	37	7·8	5	2	.....	.....	167	103	0·140	.....	36·4
2	Nov. 19.....	8:21	492·61	492·54	33	7·3	10	0·6	.....	.....	46·7	32·8	0·045	.....	12·2
3	Dec. 26.....	11:40	492·25	492·37	33	7·6	10	2	.....	.....	45·4	32·8	0·045	.....	13·6
4	Jan. 20/53.....	8:28	492·18	492·22	32	7·3	10	1	.....	.....	45·5	.....	.....	.....	.....
5	Feb. 19.....	8:36	492·18	492·18	32	7·1	10	1	.....	.....	55·6	37·2	0·051	.....	14·2
6	Mar. 18.....	9:58	492·03	492·05	32	7·0	15	1	.....	.....	60·1	.....	.....	.....	.....
7	Apr. 20.....	12:47	491·93	491·95	34	7·4	5	0	.....	.....	48·2	.....	.....	.....	.....
8	May 23.....	5:14	492·03	491·97	40	7·0	10	0	.....	.....	48·1	31·6	0·043	.....	13·8
9	June 17.....	9:28	.....	492·41	55	7·5	10	4	.....	.....	91·8	.....	.....	.....	.....
10	Average..... (11 samples)	12:33	492·55	492·63	40	7·4	10	1	.....	.....	83·9	.....	.....	.....	.....

†{Maximum gauge height, Aug. 28-29/53—493·46
{Minimum gauge height, May 9/53—491·76.

STATION NO. 13A—

11	Aug. 21/56.....	66:92	low		46	8·1	10	6	10·2	5·8	230	151	0·205	.....	23·2

STATION No. 14—MACKENZIE RIVER

			Water elevations in feet												
12	Aug. 26/52.....	64:67	10·03	.....	58	8·0	5	9	14	12	226	137	0·186	.....	18·8
13	Sept. 22.....	37:53	9·00	.....	50	8·0	10	20	.....	.....	227	.....	.....	.....	.....
14	Oct. 22.....	127:176	ice, no record		38	8·0	0	slight	.....	.....	233	.....	.....	.....	.....
15	Nov.—No sample taken.														
16	Dec. 27.....	41:90	"		32	7·7	0	considerable	.....	.....	249	.....	.....	.....	.....
17	Jan. 23/53.....	14:36	"		32	7·9	.....	.....	.....	.....	249	186	0·253	.....	52·8
18	Feb.—No sample taken.														
19	Mar. 10.....	167:220	"		32	7·9	10	2	.....	.....	256	.....	.....	.....	.....
20	Mar. 20.....	167:233	"		32	7·6	10	7	.....	.....	270	.....	.....	.....	.....
21	Apr. 27.....	160:172	"		32	7·0	10	6	.....	.....	151	.....	.....	.....	.....

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
LAKE at YELLOWKNIFE, N.W.T.—*Concluded*																			
20·8	4·3	5·7	0·8	0·03	16·6	7·0	0·7	0·15	0·00	68·6	0	3·0	13·6	69·8	92·9	.....	.....	.....	1
4·9	1·7	1·8	0·9	0·07	5·0	1·9	0·3	0·05	.....	19·5	0	0·8	3·2	19·2	27·1	.....	.....	.....	2
4·5	1·6	1·8	0·8	0·04	4·7	2·0	2·0	0·15	0·02	18·8	0	1·2	2·4	17·8	28·1	.....	.....	.....	3
4·9	1·4	3·4	0·9	.....	3·1	5·8	0·4	.....	.....	18·1	0	0·7	3·0	17·8	29·5	.....	.....	.....	4
4·6	1·6	2·4	1·2	0·06	5·1	1·8	0·9	0·10	.....	19·8	0	1·3	2·0	18·2	28·7	.....	.....	.....	5
5·0	1·8	2·3	1·6	.....	4·9	1·4	1·2	.....	.....	22·9	0	0·8	1·0	19·8	30·3	.....	.....	.....	6
4·9	2·1	2·1	1·1	.....	5·3	1·6	0·8	.....	0·00	22·0	0	1·3	2·8	20·8	30·0	.....	.....	.....	7
5·8	0·9	2·0	1·3	0·04	4·4	0·8	0·3	0·03	0·00	21·9	0	0·3	0	18·0	26·7	.....	.....	.....	8
9·2	2·7	5·0	1·2	.....	9·3	3·3	0·4	.....	.....	36·8	0	1·5	3·8	34·0	50·7	.....	.....	.....	9
7·7	2·3	3·4	1·1	.....	8·2	3·6	0·7	.....	.....	34·0	0	1·7	0·8	28·7	45·5	19·7	.....	1·6	10
MACKENZIE RIVER at FORT PROVIDENCE, N.W.T.																			
28·8	5·7	8·5	1·1	0·00	20·8	9·3	1·2	0·00	.....	100	0	4·5	13·3	95·3	129	16·0	.....	0	11
at FORT SIMPSON, N.W.T.																			
27·4	6·1	7·9	1·1	0·02	23·9	10·1	0·3	0·20	0·03	86·6	2·4	5·3	18·6	93·6	128	.....	.....	.....	12
27·8	6·3	7·6	1·1	.....	23·0	9·5	0·4	.....	.....	94·7	0	3·3	17·7	95·3	126	.....	.....	.....	13
27·6	7·0	8·5	1·2	.....	23·9	10·0	0·9	.....	.....	95·2	0	10	19·7	97·7	136	.....	.....	.....	14
																			15
29·1	7·2	11·4	1·2	.....	24·3	11·6	1·0	.....	.....	100	0	30	20·1	102	165	.....	.....	.....	16
29·7	7·2	13·3	1·4	0·18 (total)	28·3	11·8	0·6	.....	.....	102	0	33	19·9	104	176	.....	.....	.....	17
																			18
34·9	3·6	11·0	1·7	.....	26·1	10·5	2·4	.....	.....	105	0	26	16·1	102	168	.....	.....	.....	19
31·6	6·8	12·0	2·1	.....	24·3	17·1	1·8	.....	.....	103	0	17	22·1	107	164	.....	.....	.....	20
17·8	3·7	6·5	1·8	.....	15·8	6·7	0·6	.....	.....	60·3	0	7·2	10·4	59·8	89·8	.....	.....	.....	21

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10³ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
STATION No. 14—MACKENZIE RIVER															
1	May 23	104:159	no record		51	7·9	10	6	.....	.....	226	.....	.....	.....	.....
2	June 23	73:115	>10·18	.....	55	8·1	10	8	13	11	223	152	0·207	.....	34·6
3	July 24/53	109:166	14·00	.....	63	8·2	10	5	.....	.....	224	.....	.....	.....	.....
4	Aug. 22*	80:152	8·90	.....	66	8·2	10	8	12	9·1	226	142	0·193	.....	23·8
5	May 28/56*	30:72	very low		59	7·6	60	75	74	46	179	145	.....	.....	33·2
6	Average (11 samples)	97:135	.....	.....	43	7·8	8	.....	.....	.....	230	.....	.....	.....	.....
STATION No. 15—MACKENZIE RIVER near															
7	July 31/52	7:13	267·22	.....	58	7·9	30	65	143	134	239	153	0·208	.....	52·0
8	Aug. 30	23:30	.....	.....	46	8·0	30	20	.....	.....	251	.....	.....	.....	.....
9	Sept. 27	13:23	264·40	.....	47	7·9	20	10	.....	.....	256	.....	.....	.....	.....
10	Oct.—Lost in transit.		.....	.....	.....										
11	Nov.—No sample taken.		.....	.....	.....										
12	Dec. 26	26:53	.....	.....	35	8·2	20	slight	.....	.....	309	.....	.....	.....	.....
13	Jan./53	No samples taken.	ice, no records												
14	Feb.														
15	Mar.														
16	Apr.														
17	May														
18	June 7	11:25	265·30	.....	55	8·2	10	6	7·9	6·2	158	99·6	0·135	.....	26·6
19	June 29	14:43	266·00	.....	57	8·1	.....	285	.....	.....	228	.....	.....	.....	.....
20	June 11/56	22:57	.....	.....	60	8·0	30	18	9·1	2·3	233	180	0·245	.....	43·2

* Not included in average.

Water elevations { Maximum—July 3/52—16·58; July 28/53—15·65.
Minimum—Oct. 15/52—8·43; June 9/53—6·43.

† Records at Norman Wells { Maximum water elevations—July 5/52—271·58; July 21 to 22/53—268·41.
Minimum water elevations—Aug. 12/52—264·35; Oct. 5/53—262·84.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at FORT SIMPSON, N.W.T.—*Concluded*																			
29·7	5·6	8·5	1·5	.....	25·2	8·9	0·4	.....	.....	93·2	0	6·4	20·9	97·3	132	.....	.....	.....	1
33·0	3·0	8·8	1·5	0·03	24·1	9·2	0·6	0·15	.....	91·5	0	5·3	19·8	94·8	131	.....	.....	.....	2
26·3	5·8	9·0	1·5	.....	22·6	9·9	0·4	.....	0·07	90·8	0	9·2	15·2	89·6	129	.....	.....	.....	3
26·7	6·0	9·0	1·5	0·02	24·9	5·1	0·4	0·10	.....	91·7	0	6·2	16·0	91·2	125	.....	.....	.....	4
28·0	5·6	1·8	1·1	0·06	16·2	1·8	4·0	0·00	.....	92·0	0	4·6	17·4	92·9	109	4·0	.....	0·5	5
28·6	5·7	9·5	1·5	.....	23·8	10·5	0·9	.....	.....	92·9	0·2	14	18·4	94·9	141	17·6	.....	0·3	6
FORT NORMAN, N.W.T.																			
31·5	7·3	5·7	0·8	0·12	27·9	6·6	0·0	0·20	.....	103	0	3·0	24·5	109	134	10·2	.....	0·1	7
33·4	7·5	6·4	0·7	.....	29·4	7·6	trace	.....	.....	108	0	4·6	25·7	114	143	10·8	.....	0·1	8
33·3	7·5	8·1	0·8	.....	30·7	9·4	0·3	.....	.....	108	0	4·6	25·2	114	148	13·3	.....	0·1	9
																			10
																			11
37·9	8·9	13·0	1·3	.....	36·6	12·3	1·2	.....	.....	134	0	6·3	21·4	131	184	17·7	0·4	.....	12
																			13
																			14
																			15
																			16
																			17
17·2	5·6	6·3	1·2	0·03	15·5	6·2	0·8	0·00	.....	69·3	0	2·0	9·2	66·0	88·9	16·9	.....	0·2	18
28·5	6·8	15·8	1·2	.....	27·8	6·2	0·1	.....	0·00	124	0	4·0	0·0	99·0	151	25·4	0·1	.....	19
29·2	7·6	6·6	1·1	0·11	23·3	8·4	4·0	0·00	.....	97·3	0	3·7	24·3	104	132	11·8	0·1	.....	20

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
STATION No. 15A—MACKENZIE															
1	June 13/56.....	26:57	high	.....		7·8	40	11	8·8	3·9	219	134	0·182	.....	39·2
2	Nov. 9/56.....	20:49	low	34		8·2	20	.....	.....	.....	290	.....	.....	.....	.....
STATION No. 16—MACKENZIE RIVER															
3	Dec. 4/49.....	—:30	.....	.....	32	7·5	12	1	.....	.....	388	244	0·332	.....	38·2
4	Oct. 20/52.....	318:361	low‡	.....	32	8·0	10	15	.....	.....	342	.....	.....	.....	.....
5	Nov. 20.....	287:343	"	.....	32	7·8	10	7	.....	.....	399	.....	.....	.....	.....
6	Dec. 20.....	258:300	"	.....	32	8·3	5	2	.....	.....	401	258	0·351	.....	39·4
7	Jan. 20/53.....	225:282	"	.....	32	7·6	10	2	.....	.....	460	.....	.....	.....	.....
8	Feb. 20.....	196:251	normal	.....	32	7·6	5	3	.....	.....	424	.....	.....	.....	.....
9	Mar. 20/53.....	166:210	normal‡	.....	32	7·9	5	3	2·9	0·7	403	253	0·344	.....	43·4

‡ Collector's estimate of river flow or level.

STATION NO. 16A															
10	Sept/56†.....	.....	.....	.....	50	8·3	10	50	.....	.....	267	.....	.....	.....	.....
11	Sept./56†.....	.....	.....	.....	50	8·3	10	40	.....	.....	268	.....	.....	.....	.....
STATION No. 17—WHIRLPOOL RIVER at highway															
12	July 22/52.....	8:13	.....	.....	47	7·9 (8·1)	0 (10)	10 (15)	28	27	123	80·0	0·109	.....	30·6
STATION No. 18—ASTORIA RIVER at highway															
13	July 22/52.....	8:13	.....	.....	47	7·5 (7·8)	5 (15)	7 (10)	12·5	12·4	90·3	64·2	0·087	.....	18·2
STATION No. 19—MIETTE RIVER at															
14	July 22/52.....	8:13	.....	.....	49	7·6 (7·7)	5 (15)	7 (5)	16	15	123	80·2	0·109	.....	45·0

†Sampled at half depth at shore line.
†† Sampled at centre of channels at half depth, opposite wharf.

Carbon dioxide (field test)—0·5 p.p.m.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
RIVER at FORT GOOD HOPE, N.W.T.																			
27·6	6·8	6·1	1·0	0·09	21·9	7·5	4·0	0·00	.....	91·8	0	4·0	21·5	96·8	125	11·7	0·3	.....	1
30·7	12·6	8·8	1·3	.....	31·7	10·2	0·8	.....	.....	126	0	5·3	24·5	128	163	12·9	0·2	.....	2
(PEEL CHANNEL) at AKLAVIK, N.W.T.																			
56·9	17·0	6·8	0·7	0·03	59·9	3·6	0·4	0·20	.....	168	0	.....	74·6	212	234	6·5	.....	0·1	3
48·9	11·3	7·2	1·8	.....	61·9	2·1	0·8	.....	.....	147	0	11	48·1	169	218	8·3	0·4	.....	4
54·0	15·1	8·0	1·8	.....	62·8	3·8	1·2	.....	.....	176	0	12	52·9	197	246	8·0	0·3	.....	5
55·2	15·7	6·1	1·2	0·02	60·3	4·2	2·0	0·05	.....	182	0	8·0	53·5	203	242	6·1	0·8	.....	6
57·4	17·4	8·1	2·4	.....	61·3	5·7	80·0	.....	.....	124	0	8·6	113	215	302	7·5	0	.....	7
57·4	18·0	6·0	1·3	.....	56·4	4·4	2·4	.....	.....	198	0	6·9	54·8	217	251	5·6	0·2	.....	8
55·0	16·1	6·1	1·2	0·02	53·3	4·9	1·6	0·05	.....	193	0	7·2	45·5	204	241	6·1	0·5	.....	9
MACKENZIE RIVER at NEW AKLAVIK, N.W.T.																			
33·5	7·8	7·7	0·9	0·02	30·7	9·5	0·0	0·00	.....	111	0	3·6	24·8	116	148	12·6	0·4	.....	10
33·6	8·0	8·1	1·0	0·04	29·7	9·6	0·0	0·00	.....	114	0	3·0	23·5	117	149	12·9	0·4	.....	11
bridge near ATHABASCA FALLS, ALTA.																			
17·1	4·6	1·3	0·2	0·05	9·2	0·9	0·1	0·00	.....	66·6	0	5·1	7·0	61·6	71·4	4·4	.....	0·5	12
bridge south of JASPER, ALTA.																			
9·2	4·5	1·1	0·2	0·07	14·6	1·0	0·0	0·00	.....	34·2	0	4·1	13·5	41·5	516	5·4	.....	1·4	13
bridge near JASPER, ALTA.																			
12·6	6·5	1·1	0·2	0·06	22·3	0·6	0·1	0·10	.....	45·6	0	4·1	20·9	58·3	70·2	3·9	.....	1·1	14

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage Period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10^6 at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 20—MALIGNE RIVER at														
1	July 23/52.....	8:12	.....	.....	45	7·6 (7·8)	5 (10)	0·6	.....	.....	198	121	0·165	.....	45·4
	Carbon dioxide (field test)—1·0 p.p.m.														
	STATION No. 21—SNARING RIVER at														
2	July 23/52.....	8:12	.....	.....	46	8·0 (8·1)	0 (5)	3 (5)	.....	.....	167	104	0·141	.....	36·4
	STATION No. 22—ROCKY RIVER														
3	July 23/52.....	8:12	.....	.....	46	8·1 (8·2)	0 (15)	60 (>50)	117	112	292	184	0·250	.....	61·6
	* At bridge, east of Jasper, Alta.														
	STATION No. 23—McLEOD RIVER														
4	July 24/52.....	7:74	.....	.....	52	8·1 (8·3)	5 (15)	4 (5)	.....	18	303	179	0·243	.....	23·4
	STATION No. 24—EMBARRAS														
5	July 24/52.....	7:14	.....	.....	56	8·0 (8·3)	40 (50)	2 (<5)	.....	.....	226	160	0·218	.....	31·6
	STATION No. 25—McLEOD RIVER														
6	Sept. 25/51.....	9:34	.....	.....	38	8·3	5	2	.....	.....	312	192	0·261	.....	72·2
7	July 25/52.....	6:13	.....	.....	56	8·1 (8·1)	40 (60)	9 (5)	.....	.....	226	132	0·180	.....	11·4
	STATION No. 26—WOLF RIVER														
8	July 25/52.....	6:13	.....	.....	58	7·8 (8·0)	60 (70)	13 (10)	.....	25	193	142	0·193	.....	35·8
	STATION No. 27—McLEOD RIVER														
9	Sept. 27/51*.....	12:34	>normal†	.....	35	8·0	5	3	.....	.....	322	207	0·282	.....	81·6
10	Feb. 15/52.....	11:11	normal	.....	34	7·5	2	2	.....	.....	450	275	0·374	.....	30·8
11	Mar. 15.....	4:4	.....	.....	33	7·9	5	5	.....	.....	458	.....	.....	.....	.....
12	Apr. 15.....	11:14	.....	.....	34	7·7	40	85	380	360	208	145	0·197	.....	29·0

* Not included in average.

† Collector's estimate of river level or flow.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
canyon near JASPER, ALTA.																			
24·1	9·4	1·7	0·7	0·09	16·7	1·1	0·3	0·05	.....	103	0	6·5	15·0	99·0	111	3·6	.....	0·5	1
bridge east of JASPER, ALTA.																			
22·6	6·7	1·3	0·4	0·17	15·0	1·4	0·1	0·05	.....	86·4	0	3·8 (3·2)	13·0	83·8	94·2	3·4	.....	0·2	2
near POCAHONTAS*, ALTA.																			
41·7	12·3	1·1	0·4	0·05	37·0	2·3	0·2	.....	.....	138	2·4	4·5	37·7	155	170	1·5	0·3	.....	3
near CADOMIN, ALTA.																			
39·7	12·5	5·6	0·9	0·05	27·1	1·1	0·2	0·15	.....	150	6·0	6·1	17·2	150	174	7·4	0·4	.....	4
RIVER near WEALD, ALTA.																			
33·6	6·6	5·9	0·6	0·30	4·1	0·7	0·2	.....	.....	139	2·4	11	0·0	111	134	10·3	0·1	.....	5
at bridge, east of EDSON, ALTA.																			
47·1	10·5	9·1	0·7	0·06	14·8	1·0	0·1	0·10	.....	187	3·8	7·8	0·6	161	187	10·9	0·7	.....	6
33·1	7·7	4·7	0·6	0·12	6·9	0·4	0·2	.....	.....	135	2·4	10	0·0	114	133	8·2	0·2	.....	7
at bridge, east of EDSON, ALTA.																			
29·2	6·5	3·8	0·5	0·14	6·4	0·3	0·3	.....	.....	121	0	10	0·4 (0·0)	99·8 (100)	117	7·6	.....	0·2	8
at WHITECOURT, ALTA.																			
47·0	10·8	10·5	0·9	0·04	12·8	2·0	0·1	0·20	.....	203	0	9·0	0	162	193	12·3	0·4	.....	9
60·5	14·8	15·0	0·5	0·10	7·0	0·8	0·0	0·10	.....	287	0	6·0	0	212	255	.....	.....	.....	10
61·5	14·0	17·9	0·9	.....	14·0	0·4	0·6	.....	.....	284	0	9·6	0	211	259	.....	.....	.....	11
27·5	6·4	7·0	3·4	0·11	7·9	0·8	1·2	.....	.....	133	0	9·7	0	95·4	129	.....	.....	.....	12

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 27—McLEOD RIVER														
1	May 15	6:15	low		62	8·4	10	0·9			275				
2	June 15	9:10	high		52	7·9		350	133	123	171	147	0·200		46·2
3	July 15	7:14	medium		65	8·4	25	2			281				
4	July 28	9:14			67	8·1 (8·2)	45 (70)	9 (10)	23	20	241				
5	Aug.—Sample lost in transit.														
6	Sept. 15	9:14	medium		57	8·2	30	3			277				
7	Oct. 15	6:17	low		43	8·3	10	0·9			357	217	0·295		31·2
8	Nov. 15	15:20	"		33	8·3	20	5			418				
9	Dec. 16	20:38	"		33	8·1	15	2			557				
10	Jan. 15/53	8:47	"		33	8·0	15	3			605	302	0·411		49·6
11	Average (12 samples)	10:18			46	8·1	20	40			358				
	STATION No. 28—FREEMAN RIVER at														
12	July 30/52	7:12			63	7·7 (8·0)	80 (125)	8 (—)	25	22	156	125	0·170		38·0
	STATION No. 29—PEMBINA RIVER														
13	July 25/52	6:13			61	7·8 (8·0)	100 (125)	65 (>50)		128	174	150	0·204		45·4
	STATION No. 30—LOBSTICK RIVER at														
14	July 25/52	6:13			63	7·5 (8·0)	150 (200)	20 (20)		36	181 (180)	168	0·228		60·0
	STATION No. 31—PEMBINA RIVER														
15	Sept. 27/51*	12:34			35	7·9	8	15	13	11	271	176	0·239		53·6
16	Feb. 15/52	11:11	low†		33	7·3	10	4	4·9	2·5	416	270	0·367		56·6
17	Mar. 15	11:12	low		33	7·7	20	7			449				
18	Apr. 15	11:14				7·6	55	235	423	399	172	133	0·181		39·2

* Not included in average.
† Collector's estimate of level.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at WHITECOURT, ALTA.																			
38·6	9·7	9·8	0·8	.....	6·6	3·0	trace	.....	.....	167	4·8	7·4	0	136	163	.....	.....	.....	1
24·9	5·7	4·7	1·1	0·10	9·0	0·2	0·1	0·60	.....	103	0	6·0	1·8	85·6	103	.....	.....	.....	2
40·5	9·7	7·0	0·8	.....	7·2	2·0	trace	.....	.....	166	4·8	10	0	141	164	.....	.....	.....	3
34·9	8·5	5·7	0·6	0·03	10·1	0·8	0·3	0·30	.....	146	2·4	13	0	122	148	.....	.....	.....	4
																			5
40·4	8·5	6·6	0·7	.....	8·2	0·7	trace	.....	.....	162	5·5	10	0	136	160	.....	.....	.....	6
51·4	11·4	10·5	1·0	0·06	13·9	0·5	0·2	0·15	.....	210	9·6	11	0	175	213	.....	.....	.....	7
58·1	14·0	15·0	1·0	.....	12·6	0·4	0·3	.....	.....	253	9·1	5·6	0	203	241	.....	.....	.....	8
79·0	18·7	23·3	1·3	.....	18·7	0·9	0·2	.....	.....	363	6·0	10	0	274	337	.....	.....	.....	9
82·9	20·5	23·4	1·4	0·04	18·8	0·9	0·8	0·06	0·00	401	0	9·3	0	291	356	.....	.....	.....	10
50·0	11·8	12·2	1·1	.....	11·2	1·0	0·4	.....	.....	223	3·5	9·0	0	173	210	13·2	0·7	.....	11
bridge, near FORT ASSINIBOINE, ALTA.																			
22·5	4·5	5·3	0·4	0·22	4·6	1·1	trace	.....	.....	92·4 (92·7)	0 (0)	12	0 (0)	74·8 (74·2)	95·6	13·3	.....	0·5	12
at bridge at EVANSBURG, ALTA.																			
25·6	5·7	4·5	0·8	0·16	4·8	0·8	0·5	.....	.....	106	0	9·0	0·5	87·5	104	10·0	.....	0·3	13
bridge, near EVANSBURG, ALTA.																			
22·5	6·4	8·6	2·3	0·19	8·2	1·8	1·2	.....	.....	107 (105)	0 (0)	6·5	0 (0)	82·6 (85·6)	111	18·0	.....	0·6	14
near SANGUDO, ALTA.																			
37·1	9·0	11·3	1·3	0·05	6·9	1·2	0·6	0·30	.....	174	0	6·5	0	130	160	15·8	.....	0·1	15
53·1	13·3	18·0	2·1	0·11	9·8	1·6	0·0	0·00	.....	264	0	3·3	0	187	240	.....	.....	.....	16
55·4	14·0	19·0	2·0	.....	12·4	1·5	0·1	.....	.....	281	0	6·4	0	196	249	.....	.....	.....	17
22·0	4·5	7·0	3·9	0·24	7·5	1·1	1·4	.....	.....	103	0	6·7	0	73·3	105	.....	.....	.....	18

77913—3

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 31—PEMBINA RIVER														
1	May 15.....	6:15	normal	.....	45	8·3	30	7	.....	.....	250	.....	.....	.....	.....
2	June 15.....	18:22	high	.....	54	7·8	.....	.....	.....	.....	172	.....	.....	.....	.....
3	July 15.....	14:15	normal	.....	54	7·7	.....	375	646	609	249	190	0·258	.....	68·0
4	July 28*.....	9:14	.....	.....	67	7·8 (8·2)	100 (125)	35 (50)	76	69	192	155	0·211	.....	55·8
5	Aug. 16.....	13:20	normal	.....	62	8·0	40	6	.....	12	247	179	0·243	.....	71·8
6	Sept. 17.....	7:12	"	.....	55	8·0	45	10	.....	.....	243	.....	.....	.....	.....
7	Oct. 16.....	15:40	"	.....	43	7·9	30	15	21	13	304	195	0·265	.....	45·8
8	Nov. 15.....	12:20	low	.....	33	8·0	35	8	.....	.....	341	.....	.....	.....	.....
9	Dec. 16.....	20:44	"	.....	32	8·0	40	15	.....	.....	445	.....	.....	.....	.....
10	Jan. 15/53.....	11:44	"	.....	33	7·8	50	20	10·3	5·3	472	318	0·432	.....	70·8
11	Average..... (12 samples)	12:22	.....	.....	43	7·8	35	65	.....	.....	313	.....	.....	.....	.....
	STATION No. 32—PADDLE RIVER														
12	July 30/52.....	7:12	.....	.....	69	7·9 (8·3)	150 (250)	10 (10)	17	14	362	281	0·382	.....	79·2
	STATION No. 33—PEMBINA RIVER														
13	July 30/52.....	7:12	.....	.....	71	7·8 (8·0)	..... (175)	85 (>50)	200	178	211	184	0·250	.....	74·4
	STATION No. 34—WEST PRAIRIE RIVER														
14	Aug. 7/52.....	13:18	.....	.....	73	7·5 (7·8)	240 (350)	10 (10)	15	12	218	211	0·287	.....	86·2
	STATION No. 35—LESSER SLAVE														
15	Oct. 7/51.....	12:32	Water elevation in feet: 1,891·41	.....	48	7·7 (7·9)	5 (25)	2 (<5)	.....	.....	252	166	0·226	.....	52·2
16	July 31/52.....	7:13	no record		72	7·8 (8·4)	30 (50)	6 (7)	.....	.....	222	146	0·199	.....	54·8

† Sampled from wharf. Maximum water elevation—1,891·91, Aug. 6/51; minimum water elsvation—1,891·40 at various times in Sept. and Oct./51.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
near SANGUDO, ALTA.																			
33·0	8·2	10·4	1·4	.....	4·1	3·0	trace	.....	.....	158	0	6·0	0	116	144	.....	.....	.....	1
27·7	4·9	5·4	2·4	.....	7·4	2·3	0·4	.....	.....	103	0	6·4	5·3	89·3	107	.....	.....	.....	2
35·1	8·0	8·1	1·6	0·11	8·1	0·9	1·2	0·20	.....	155	0	9·4	0	121	149	.....	.....	.....	3
28·5	5·6	5·7	1·1	0·23	5·7	2·3	0·6	.....	.....	117	0	10·5	0	94·0	118	.....	.....	.....	4
35·4	7·4	7·3	1·3	0·05	5·6	0·5	0·5	.....	0·00	149	2·9	11	0	119	144	.....	.....	.....	5
34·5	7·6	7·9	1·2	.....	4·5	0·7	0·4	.....	.....	147	3·6	9·0	0	117	142	.....	.....	.....	6
40·4	9·7	11·0	1·8	0·03	7·2	1·1	1·2	.....	.....	191	0	8·2	0	141	175	.....	.....	.....	7
44·4	10·8	14·0	2·0	.....	8·0	1·1	0·8	.....	.....	207	2·9	9·1	0	155	195	.....	.....	.....	8
58·9	14·1	17·7	2·3	.....	6·4	1·1	0·5	.....	.....	288	0	18	0	205	261	.....	.....	.....	9
60·8	14·8	20·9	4·2	0·03	12·9	3·2	4·0	.....	0·01	302	0	16	0	213	285	.....	.....	.....	10
41·7	9·8	12·2	2·2	.....	7·8	1·5	1·0	.....	.....	191	0·8	9·1	0	144	180	15·3	0·2	.....	11
at BARRHEAD, ALTA.																			
44·3	12·3	19·0	3·6	0·39	17·9	3·2	1·4	.....	.....	221	0	11	0	161	222	20·0	0·3	.....	12
at bridge at JARVIE, ALTA.																			
29·0	6·8	7·1	1·8	0·25	11·2	2·0	0·6	.....	.....	124 (123)	0 (0)	11	0 (0)	100 (100)	131	13·1	.....	0·2	13
at bridge at HIGH PRAIRIE, ALTA.																			
32·0	5·7	8·7	1·8	0·77	18·7	1·8	0·8	.....	.....	114 (111)	0 (0)	14	10·4	103	140	15·2	.....	0·4	14
LAKE† at FAUST, ALTA.																			
29·0	8·9	10·3	5·4	0·09	29·5	2·9	2·0	0·20	.....	118	0	1·1 (1)	12·0	109 (107)	148	16·4	.....	0·3	15
23·6	8·2	8·8	4·1	0·11	30·3	1·0	0·0	0·40	.....	104	0	3·8	7·8 (9·7)	92·8 (92·7)	131	16·4	.....	0·3	16

77913—3½

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
STATION No. 36—SWAN RIVER															
1	July 31/52.....	7:13	.....	.....	65	7·3 (7·5)	140 (200)	20	53	49	126	136	0·185	.....	63·2
STATION No. 37—LESSER SLAVE RIVER															
2	Oct. 7/51.....	12:32	.....	.....	47	7·6 (8·4)	2 (25)	10 (10)	14	9·6	186	119	0·162	.....	29·8
3	July 30/52.....	8:14	.....	.....	68	7·9 (8·1)	20 (30)	4 (7)	15	14	186	126	0·171	.....	36·2
STATION No. 38—FAWCETT RIVER															
4	Aug. 7/52.....	13:26	.....	.....	70	7·8 (8·4)	60 (100)	1·2 (1·5)	.....	.....	134	116	0·158	.....	43·8
STATION No. 39—LAC LA BICHE															
			Water elevation in feet												
5	Aug. 8/52.....	13:25	96·84†	.....	69	8·0 (8·6)	10 (25)	3 (algae)	.....	.....	302	204	0·277	.....	47·8
STATION No. 40—WOLLASTON LAKE															
			Water elevation in feet												
6	Aug. 12/53.....	13:96	.....	91·98*	65	7·9	5	3	.....	.....	35·4	.....	.....	.....	.....
STATION No. 41—PEACE RIVER above junction															
7	Aug. 2/52.....	10:13	49,500††	.....	68	8·0 (8·1)	20 (15)	15 (15)	.....	.....	185	.....	.....	.....	.....
STATION No. 42—HALFWAY RIVER															
8	Aug. 2/52.....	10:17	.....	.....	63	8·2 (8·2)	25 (30)	35 (35)	64	53	336	209	0·284	.....	19·8

† Gauge zero—91·44.

* Record at Trading Post.

†† Record at Hudson Hope.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at bridge at KINUSO, ALTA.																			
15·9	3·7	3·6	1·9	1·0	6·0	0·7	0·2	.....	.....	69·5	0	18	0·0	55·0	85·2	12·0	.....	1·1	1
at bridge near SLAVE LAKE, ALTA.																			
22·8	5·2	7·6	3·1	0·03	13·0	0·7	0·4	0·10	.....	102	0	1·0 (1)	0·0 (5·6)	77·9 (82·6)	104	16·8	.....	0·6	2
21·8	5·8	7·7	3·2	0·05	14·5	0·6	0·3	0·30	.....	97·1 (95·2)	0 (0)	2·2	0·0	78·1	104	16·9	.....	0·3	3
at bridge near SMITH, ALTA.																			
18·0	3·7	4·8	2·2	0·16	8·7	0·8	0·8	.....	.....	76·4	0	4·5	0·0 (0)	60·0 (62·2)	81·3	14·2	.....	0·5	4
at LAC LA BICHE, ALTA.																			
34·8	11·4	13·0	3·3	0·07	11·7	3·2	1·8	0·10	.....	173	2·4	11	0·0	134	179	17·0	0·3	.....	5
near north end in SASKATCHEWAN.																			
2·6	1·8	.....	2·5	0·06	5·8	0·4	0·8	.....	.....	19·5	0	.....	0·0	138	.....	.....	.....	1·9	6
with HALFWAY RIVER near ATTACHIE, B.C.																			
27·2	6·2	1·4	0·4	.....	12·3	0·2	0·0	0·20	.....	96·4 (96·4)	1·2 (1·2)	6·7	12·3	93·3 (99·1)	103	3·1	.....	0·1	7
near mouth, near ATTACHIE, B.C.																			
50·5	13·4	2·2	0·6	0·11	28·6	0·9	0·1	0·20	.....	173	7·2	4·6	27·2	181	194	2·6	0·7	.....	8

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 43—PINE RIVER														
1	Apr. 5/52.....	28:33			40	7·9	10	65	150	143	240	152	0·207	.....	21·8
2	May 2.....	19:20			38	8·1	15	0·6	.....	.....	280	169	0·230	.....	42·0
3	June—No sample taken.														
4	July 1.....	28:45	no		46	7·9	25	30	.....	.....	198	.....	.....	.....	.....
5	Aug. 4†.....	10:15	discharge		63	8·1	10	10	18	12	261	155	0·211	.....	46·4
6	Sept. 4.....	28:42	records		42	8·2	5	.....	.....	.....	286	.....	.....	.....	.....
7	Oct.—No sample taken.														
8	Nov. 1.....	76:95			36	8·5	10	4	5·6	3·5	297	178	0·242	.....	15·6
9	Dec. 1.....	46:71			32	8·6	15	.....	.....	.....	341	.....	.....	.....	.....
10	Jan. 1/53.....	15:40			34	8·1	15	7	.....	.....	301	.....	.....	.....	.....
11	Average..... (8 samples)	31:76			41	8·2	13	20	.....	.....	276	.....	.....	.....	.....
	† Above junction with Murray River.														
	STATION No. 44—MURRAY														
12	May 15/52.....	6:7			38	7·9	25	310	590	552	208	138	0·188	.....	52·2
13	June—No sample taken.														
14	July 1.....	28:45	no		46	7·9	.....	15	.....	.....	191	.....	.....	.....	.....
15	Aug. 4†.....	10:15	discharge		65	8·1 (8·1)	40 (25)	90 (>50)	167	146	215 (220)	136	0·185	.....	24·8
16	Sept. 18.....	14:15	records		42	8·1	10	6	.....	.....	244	.....	.....	.....	.....
17	Oct. 1.....	17:27			34	8·0	10	1	.....	.....	253	.....	.....	.....	.....
18	Nov. 1.....	76:95			36	7·9	40	7	4·7	2·8	247	149	0·203	.....	20·2
19	Dec. 1.....	46:71			32	8·3	10	3	.....	.....	303	.....	.....	.....	.....
20	Jan. 1/53.....	19:47			33	7·6	15	10	.....	.....	316	.....	.....	.....	.....
21	Average..... (8 samples)	27:40			41	8·0	20	55	.....	.....	255	.....	.....	.....	.....
	† Above junction with Pine River.														
	STATION No. 45—PEACE RIVER near TAYLOR,														
22	Oct. 5/51†.....	11:31	.....	12,900	47	8·0 (8·4)	2 (15)	5 (5)	3·4	1·7	246	147	0·200	.....	28·8
23	Aug. 2/52††....	12:17	60,900	42,400	67	7·8 (8·1)	10 (15)	20 (15)	38	30	206	125	0·170	20,462	47·6
24	Aug. 16.....	13:20	41,200	42,400	60	8·0	5	15	.....	23	213	131	0·178	14,502	11·6

† Not included in average; sampled from highway bridge; ice conditions Oct. 23/51 to May 9/52; Nov. 12/52 to May 4/53.
†† Sampled from north shore; not included in average.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
at EAST PINE, B.C.																			
37·7	8·4	2·3	0·5	0·16	5·6	1·4	1·8	.....	.....	148	0	4·1	7·6	129	135	.....	.....	.....	1
40·4	10·7	2·8	0·9	0·13	16·0	2·7	0·6	0·20	.....	168	0	3·3	6·8	145	161	.....	.....	.....	2
																			3
30·5	6·3	1·3	0·3	.....	6·6	0·4	0·1	0·10	0·02	115	1·2	4·6	5·3	102	108	.....	.....	.....	4
40·3	8·9	1·8	0·7	0·07	13·6	1·1	0·1	0·10	.....	149	3·6	4·1	9·2	137	148	.....	.....	.....	5
44·5	8·9	2·3	0·4	.....	16·7	1·4	0·1	.....	.....	156	4·1	4·8	12·7	148	160	.....	.....	.....	6
																			7
45·2	10·5	2·4	0·7	0·03	18·7	1·7	0·6	0·10	0·04	161	7·2	5·1	12·5	156	171	.....	.....	.....	8
48·0	12·0	3·7	0·5	.....	23·5	1·8	0·4	.....	.....	173	8·4	5·2	13·4	169	189	.....	.....	.....	9
49·4	10·6	3·2	0·9	.....	20·4	2·1	0·4	.....	.....	190	0	4·3	11·0	167	185	.....	.....	.....	10
42·0	9·5	2·5	0·6	.....	15·1	1·6	0·5	.....	.....	158	3·1	4·4	9·3	144	157	3·6	0·5	.....	11
RIVER at EAST PINE, B.C.																			
30·6	7·5	2·3	1·8	0·28	9·2	3·5	1·2	0·10	.....	124	0	2·8	5·8	107	135	.....	.....	.....	12
																			13
28·2	7·0	1·3	0·4	.....	7·4	0·5	0·6	0·10	0·00	114	0	4·3	6·0	99·0	106	.....	.....	.....	14
31·2	8·0	1·9	0·9	0·41	14·3	0·9	0·1	.....	.....	119	2·4	3·6	9·0	111 (114)	122	.....	.....	.....	15
36·0	8·3	2·2	0·5	.....	14·6	0·7	0·4	.....	.....	131	2·9	3·7	11·6	124	134	.....	.....	.....	16
39·0	7·7	2·4	0·6	.....	13·9	1·4	0·4	.....	.....	151	0	2·7	5·0	129	143	.....	.....	.....	17
36·8	7·9	3·0	1·0	0·07	15·7	1·3	0·5	.....	.....	142	0	3·6	7·8	124	140	.....	.....	.....	18
55·1	12·9	3·5	0·6	.....	22·2	1·8	0·2	.....	.....	199	7·7	5·2	14·5	191	207	.....	.....	.....	19
48·4	10·5	3·4	0·7	.....	17·7	1·6	1·2	.....	.....	185	0	4·4	12·8	164	179	.....	.....	.....	20
38·2	8·7	2·5	0·8	.....	14·4	1·5	0·6	.....	.....	146	1·6	3·8	9·0	131	144	4·0	0·3	.....	21
B.C.—Drainage area, 38,300 square miles																			
38·9	9·0	1·9	1·0	0·04	18·4	1·6 (1·3)	0·0	0·00	.....	144	0	5·5 (5)	16·1	134 (135)	148	3·0	0·2	.....	22
29·7	7·1	2·0	0·9	0·05	17·6	1·4	0·1	0·05	.....	111	0	5·8	12·4	103	119	.....	.....	.....	23
31·9	7·2	1·5	0·6	0·04	17·5	0·2	trace	0·10	0·00	110	2·4	6·1	15·2	109	122	.....	.....	.....	24

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet) On sampling date	Stream discharge (Second-feet) Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter Dried at 105°C.	Suspended matter Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids) P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per day	Loss on ignition at 550°C.
															STATION No. 45—PEACE RIVER
1	Sept. 16.....	8:22	25,100	30,100	50	8·1	5	4	7·3	6·1	223	133	0·181	8,986	8·2
2	Oct. 16.....	13:29	30,200	33,300	40	8·0	5	5	.....	.....	206	.....	.....	.....	.....
3	Nov. 2††.....	11:26	23,900	14,700	36	7·7	10	3	.....	.....	207	126	0·171	8,102	45·4
4	Nov. 16.....	12:19	13,300	14,700	33	8·1	10	2	.....	.....	214	.....	.....	.....	.....
5	Dec. 16.....	20:56	5,200	5,400	32	8·2	10	3	.....	.....	245	.....	.....	.....	.....
6	Jan. 16/53.....	10:45	8,900	8,480	32	8·1	10	3	.....	.....	251	148	0·201	3,542	13·2
7	Feb. 16.....	11:39	7,500	7,640	32	8·2	7	1	.....	.....	257	.....	.....	.....	.....
8	Mar. 16.....	9:68	7,050	7,050	32	8·1	10	0	0	0	260	159	0·216	3,017	11·4
9	Apr.—No sample taken....	.....	.....	10,600											
10	May 22.....	20:21	283,300	160,000	43	8·0	50	300	285	269	176	117	0·159	89,240	31·6
11	Average..... (9 samples)	13:35	46,855	34,341	39	8·1	12	37	.....	.....	227	.....	.....	.....	.....

†† Sampled from north shore; not included in average.

															STATION No. 46—BEATTON RIVER at
12	Aug. 2/52.....	10:17	.....	.....	71	7·6 (8·0)	..... (175)	500	434	378	234	230	0·313	.....	73·8
															STATION No. 47—KISKATINAW RIVER
13	Feb. 18/52.....	15:15	.....	.....	37	8·2	8	6	5·4	4·1	596	350	0·476	.....	36·0
14	Mar. 14.....	12:13	.....	.....	36	7·8	15	6	.....	.....	608	.....	.....	.....	.....
15	Apr. 18.....	15:20	flood††	no	37	7·9	.....	900	1,039	963	181	219	0·298	.....	48·8
16	May 16.....	13:14	normal	discharge	55	8·2	.....	5	.....	.....	267	.....	.....	.....	.....
17	June 17.....	9:20	"	records	56	8·0	.....	1,300	.....	.....	265	.....	.....	.....	.....
18	July 22.....	7:8	"		60	7·6	.....	80	11·4	7·0	390	268	0·364	.....	64·4
19	Aug. 4†.....	10:36	.....		70	8·3 (8·2)	50 (50)	30 (50)	.....	.....	350	.....	.....	.....	.....
20	Aug. 15.....	11:25	normal	.....	62	7·7	60	15	.....	.....	397	.....	.....	.....	.....
21	Sept. 18.....	9:15	> "	.....	54	8·1	60	25	.....	.....	391	.....	.....	.....	.....
22	Oct. 17.....	12:15	normal††	.....	43	8·3	35	15	15	11	450	279	0·379	.....	39·0
23	Nov. 18.....	9:17	"	.....	38	8·3	40	20	.....	.....	526	.....	.....	.....	.....

† From highway bridge, east of Dawson Creek—heavy rain; not included in average.
†† Collector's estimate of river flow or level.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: ±	Saturation index: −	No.
near TAYLOR, B.C.—*Concluded*																				
33·6	7·6	1·6	0·4	0·02	19·0	1·0	0·1	0·05	.....	117	2·4	8·4	15·2	115	132	.....	.....	.....	.....	1
30·0	7·0	1·4	0·5	.....	16·9	0·2	0·3	.....	.....	110	0	4·9	13·6	104	115	.....	.....	.....	.....	2
30·3	7·3	1·5	0·4	0·05	17·4	0·6	0·3	0·10	0·00	112	0	5·4	13·8	106	119	.....	.....	.....	.....	3
31·0	7·0	1·8	0·5	.....	16·7	0·3	0·4	.....	.....	103	6·0	4·6	11·7	106	119	.....	.....	.....	.....	4
36·0	8·4	2·0	0·5	.....	17·8	0·4	0·4	.....	.....	137	0	7·9	12·3	124	142	.....	.....	.....	.....	5
36·8	8·7	1·8	0·5	0·05	16·9	0·5	0·5	0·05	.....	141	0	6·7	12·4	128	142	.....	.....	.....	.....	6
37·0	9·2	1·8	0·4	.....	18·1	0·3	0·8	.....	.....	142	0	6·9	14·4	130	144	.....	.....	.....	.....	7
38·1	9·3	3·5	1·8	0·07	17·8	0·3	0·6	0·00	0·00	146	0	11	13·2	133	155	.....	.....	.....	.....	8
																				9
28·9	5·2	2·2	0·6	0·36	8·1	0·1	0·6	.....	0·00	109	0	.....	4·0	93·6	99·9	.....	.....	.....	.....	10
33·7	7·7	2·0	0·6	.....	16·5	0·4	0·4	.....	.....	124	1·2	7·1	12·4	116	131	3·6	0·2	.....	.....	11
bridge near FORT ST. JOHN, B.C.																				
25·4	7·4	14·3	2·0	1·1	51·2	2·6	trace	.....	0·00	83·0 (85·4)	0 (0)	5·3	25·7 (24·0)	93·7 (94·0)	150	24·4	.....	.....	0·6	12
near DAWSON CREEK, B.C.																				
93·8	22·2	10·8	0·8	0·02	18·6	0·9	0·3	0·10	.....	383	8·4	7·9	0·3	325	353	.....	.....	.....	.....	13
88·5	22·0	12·3	0·6	.....	26·3	0·8	0·0	.....	.....	384	0	6·9	0·0	311	347	.....	.....	.....	.....	14
31·4	3·5	1·6	6·8	4·2	7·7	2·1	0·4	.....	.....	115	0	.....	0·0	93·0	114	.....	.....	.....	.....	15
40·3	8·7	4·3	1·0	.....	6·6	1·0	.....	.....	.....	162	2·4	.....	0·0	136	149	.....	.....	.....	.....	16
39·8	9·5	4·3	1·4	.....	6·5	2·5	0·4	.....	.....	166	0	6·2	2·1	139	153	.....	.....	.....	.....	17
58·5	14·1	6·9	1·7	0·14	30·2	2·9	0·4	0·20	.....	227	0	5·6	17·9	204	234	.....	.....	.....	.....	18
54·1	13·2	5·8	0·8	.....	9·8	1·0	0·6	.....	.....	218	6·7	6·3	0·0	189	206	.....	.....	.....	.....	19
60·5	14·5	6·2	1·1	.....	9·0	2·2	0·2	.....	.....	256	0	7·2	0·6	211	227	.....	.....	.....	.....	20
61·3	14·4	6·4	1·0	.....	8·8	0·7	0·5	.....	.....	244	6·0	5·0	1·9	212	224	.....	.....	.....	.....	21
66·6	17·0	7·9	1·2	0·07	14·5	1·3	0·3	.....	.....	263	15·1	7·0	0·0	236	261	.....	.....	.....	.....	22
79·4	19·6	10·5	1·2	.....	15·6	0·6	0·2	.....	.....	330	11·3	6·8	0·0	279	308	.....	.....	.....	.....	23

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 47—KISKATINAW RIVER														
1	Dec. 17.....	19:43	low	.....	38	8·1	25	25	.....	.....	708	.....	.....	.....	.....
2	Jan. 16/53.....	12:43	"	.....	35	8·1	20	15	12	8·3	972	584	0·794	.....	92·4
3	Average..... (12 samples)	12:21	.....	.....	46	8·0	.....	200	.....	.....	479	.....	.....	.....	.....
	STATION No. 48—KISKATINAW RIVER														
4	Oct. 5/51.....	11:31	.....	.....	41	8·4 (8·3)	5 (25)	15 (7)	14·1	7·4	426	276	0·375	.....	59·6
	STATION No. 49—POUCE COUPÉ														
5	Aug. 1/52.....	11:18	.....	.....	68	7·7 (8·1)	150 (225)	10 (10)	18	12	313 (310)	258	0·351	.....	82·4
	STATION No. 50—PEACE RIVER														
6	Oct. 4/51.....	12:32	.....	.....	44	8·0 (8·2)	2 (15)	7 (clear)	1·7	1·5	310	195	0·265	.....	13·2
7	Aug. 5/52.....	14:16	.....	.....	68	8·1 (8·2)	10 (25)	25 (35)	41	37	195	119	0·162	.....	42·6
	STATION No. 51—WAPITI RIVER at														
8	Aug. 1/52.....	11:12	.....	.....	68	8·2 (8·5)	15 (25)	4 (5)	9·4	7·5	256	151	0·205	.....	48·2
	STATION No. 52—BEAR RIVER														
9	Oct. 4/51	12:32	.....	.....	44	7·7 (8·0)	25 (50)	4 (15)	19	13	255	205	0·279	.....	60·0
	STATION No. 53—SMOKY RIVER														
10	Oct. 6/51*.....	13:33	.....	no discharge records	46	8·1 (8·4)	5 (25)	10 (7)	10·7	7·3	294	179	0·243	.....	32·0
11	Feb. 18/52.....	15:15	very low†		34	7·7	2	3	.....	.....	451	287	0·390	.....	20·4
12	Mar. 17.....	9:10	low		33	7·7	5	2	.....	.....	483	.....	.....	.....	.....
13	Apr. 18.....	15:20	>normal		35	7·8	40	910	1,809	1,698	198	158	0·215	.....	34·4
14	May 21.....	8:28	"		52	7·9	.....	150	.....	.....	185	.....	.....	.....	.....

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: 0	Saturation index: −	No.
near DAWSON CREEK, B.C.—*Concluded*																				
107	26·9	14·6	1·4	.....	9·3	0·5	0·1	.....	.....	488	0	9·2	0·0	378	409	.....	.....	.....	.....	1
149	40·9	19·2	1·7	0·02	27·7	0·8	0·4	0·00	.....	697	0	11	0·0	540	593	.....	.....	.....	.....	2
73·0	17·8	8·8	1·7	.....	15·0	1·4	2·9	.....	.....	310	3·6	7·2	0·0	255	284	6·9	0·8	.....	.....	3
at bridge near SWEETWATER, B.C.																				
59·6	17·5	9·6	1·6	0·04	21·4	0·6	0·0	0·10	.....	248	11·3	4·1 (4)	0·0	221	248	8·6	1·0	.....		4
RIVER near POUCE COUPE, B.C.																				
40·5	11·4	10·1	2·8	0·42	49·1	1·9	1·0	.....	.....	134 (132)	0 (0)	6·1	38·3 (41·0)	148 (149)	189	12·7	.....	0·1		5
from ferry at DUNVEGAN, ALTA.																				
45·5	10·3	6·8	1·2	0·02	38·7	1·9	0·0	0·00	.....	151	0	5·4 (5)	32·1	156	184	8·6	0·3	.....		6
29·2	6·4	1·6	0·6	0·14	14·6	1·5	0·0	0·10	.....	104 (105)	2·4	4·7	10·4	99·4	112	3·4	0·1	.....		7
ferry near GRANDE PRAIRIE, ALTA.																				
38·2	9·0	3·6	0·7	0·05	17·0	0·9	0·1	0·20	.....	137	4·8	4·4	12·3	132	146	5·5	0·4	.....		8
near GRANDE PRAIRIE, ALTA.																				
24·8	7·0	15·0	7·3	0·28	42·8	1·3	0·8	0·30	.....	102	0	4·2	7·1	90·7	147	24·6	.....	0·5		9
near GRANDE PRAIRIE, ALTA.																				
44·1	10·0	5·1	0·4	0·05	28·6	0·5	0·2	0·30	.....	157	1·9	4·1	23·3	155	173	6·7	0·4	.....		10
66·3	16·4	7·5	0·7	0·07	73·3	1·5	0·2	0·20	.....	210	0	4·1	60·9	233	274	.....	.....	.....		11
66·5	17·0	8·8	0·4	.....	76·1	1·1	0·0	.....	.....	217	0	5·2	57·8	236	282	.....	.....	.....		12
31·9	5·3	4·0	4·2	0·84	15·6	1·4	1·6	.....	.....	114	0	.....	8·0	101	121	.....	.....	.....		13
26·2	6·4	2·0	0·9	.....	11·9	0·8	.....	.....	0·05	101	0	4·9	8·7	91·7	103	.....	.....	.....		14

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 53—SMOKY RIVER near														
1	June 17/52	7:8	high	no discharge records	50	8·0	.....	70	103	96	207	136	0·185	.....	29·0
2	July 18	11:12	normal		64	7·9	15	35	46	44	233	147	0·200	.....	38·0
3	July 31*	7:13	.....		70	8·2 (8·4)	30 (25)	35 (50)	49	44	237	152	0·207	.....	41·6
4	Aug. 17	12:23	low		64	8·1	10	25	.....	.....	256	.....	.....	.....	.....
5	Sept. 19	9:15	"		50	8·1	10	7	.....	.....	308	.....	.....	.....	.....
6	Oct. 17	12:15	"		44	8·1	5	4	4·8	2·7	309	181	0·246	.....	16·4
7	Nov. 18	9:17	"		33	8·1	10	2	.....	.....	390	.....	.....	.....	.....
8	Dec. 19	18:53	"		32	8·4	10	2	.....	.....	528	.....	.....	.....	.....
9	Jan. 29/53	8:42	"		32	8·0	3	3	.....	.....	439	281	0·382	.....	21·8
10	Average (12 samples)	11:22	.....	.....	44	8·0	11	100	.....	.....	332				
	STATION No. 54—LITTLE SMOKY RIVER														
11	Oct. 6/51	—:33	.....	.....	48	8·2 (8·1)	15 (40)	9 (10)	5·9	2·3	311	198	0·269	.....	63·0
12	July 31/52	13:19	.....	.....	75	7·6 (8·1)	140 (170)	50 (50)	82	73	173	.....	.....	.....	.....
	STATION No. 55—SMOKY RIVER														
13	Aug. 7/52	13:18	.....	.....	70	8·1 (8·2)	40 (50)	75 (50)	52	41	244	158	0·215	.....	9·2
	STATION No. 56—PEACE RIVER														
14	Oct. 3/51*	13:33	.....	12,900†	47	8·2 (8·2)	5 (20)	20 (10)	7·5	6·6	326	203	0·276	.....	20·4
15	Feb. 23/52	10:10	6,300†	6,550	34	8·0	2	1	.....	.....	326	193	0·262	3,270	21·0
16	Mar. 24	14:30	6,000	6,100	35	8·0	5	2	.....	.....	299	.....	.....	.....	.....
17	Apr. 21	12:17	10,900	9,700	35	7·6	.....	1,500	.....	.....	268	.....	.....	.....	.....
18	May 20	9:17	182,000	106,000	50	7·7	.....	335	654	618	165	118	0·160	57,694	25·0
19	June—No sample taken	.....	.....	161,000											
20	July—No sample taken	.....	.....	105,000											
21	Aug. 6††	13:19	53,500	42,400	69	8·1 (8·0)	10 (25)	25 (35)	44	34	206 (210)	128	0·174	18,404	26·2

* Not included in average.
† Collector's estimate of river flow or level.

* From south bank below town intake; not included in average.
†† From north shore at bridge.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
GRANDE PRAIRIE, ALTA.—*Concluded*																			
28·9	8·0	3·2	0·6	0·20	13·1	1·7	0·2	0·20	0·07	113	0	3·4	12·4	105	115	.....	.....		1
33·3	8·5	3·2	0·5	0·08	21·4	0·5	0·2	.....	.....	122	1·2	4·4	16·0	118	133	.....	.....		2
34·3	8·5	3·2	0·9	0·17	24·2	0·4	0·1	0·20	.....	118	3·1	3·6	18·4 (14·0)	120 (122)	137	.....	.....		3
37·0	8·6	3·5	0·4	.....	27·1	0·4	0·2	.....	.....	120	4·6	3·3	21·7	128	144	.....	.....		4
43·5	11·2	4·7	0·8	.....	38·1	0·1	0·2	.....	.....	146	3·1	3·3	29·7	155	177	.....	.....		5
41·7	11·0	4·2	0·7	0·01	38·5	0·8	trace	0·10	.....	142	4·8	4·1	25·3	149	176	.....	.....		6
53·1	14·1	7·0	1·0	.....	54·7	0·8	0·2	.....	.....	189	0	3·7	35·2	190	228	.....	.....		7
75·7	20·4	8·0	0·8	.....	90·1	1·0	0·2	.....	.....	241	3·4	6·5	70·3	273	324	.....	.....		8
61·6	17·1	6·6	0·7	0·07	79·6	0·8	0·6	0·10	.....	188	0	4·6	70·0	224	264	.....	.....		9
47·1	12·0	5·2	1·0	.....	45·0	0·9	0·3	.....	.....	159	1·4	4·3	34·6	167	196	6·3	0·4	.....	10
near HIGH PRAIRIE, ALTA.																			
46·3	9·5	13·0	1·5	0·05	15·9	0·7	0·6	0·30	.....	189	2·2	5·9	0·0	155	189	15·6	0·6	.....	11
25·9	5·7	6·0	1·1	0·10	12·6	1·8	1·0	.....	.....	101	0	8·4	4·9	87·9 (86·6)	113	12·7	.....	0·5	12
at ferry at WATINO, ALTA.																			
35·9	7·3	4·3	0·9	0·11	21·9	0·9	0·4	0·10	.....	117	4·8	7·4	15·6	120	142	7·2	0·3	.....	13
at PEACE RIVER, ALTA.																			
47·8	12·1	6·8	0·8	0·04	44·4	1·2	0·0	0·10	.....	166 (170)	2·4 (0·0)	4·3 (3)	29·0	169 (169)	201	8·0	0·5	.....	14
47·1	10·6	6·0	0·5	0·10	25·3	4·8	0·2	0·05	.....	176	0	8·7	16·5	161	190	.....	.....	.....	15
40·6	9·9	7·3	0·5	.....	14·8	7·5	0·0	.....	.....	159	0	3·5	12·0	142	162	.....	.....	.....	16
39·1	7·5	3·0	7·8	.....	59·9	1·8	2·4	.....	.....	93·9	0	.....	51·4	128	168	.....	.....	.....	17
25·8	4·2	1·7	1·1	0·30	9·5	0·9	1·6	.....	.....	92·7	0	4·2	5·8	81·8	95·1	.....	.....	.....	18
																			19
																			20
29·6	6·6	3·0	0·6	0·09	13·6	2·9	0·2	0·05	.....	104	2·4	4·8	11·6 (15·1)	101 (104)	115	.....	.....	.....	21

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet) On sampling date	Stream discharge (Second-feet) Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter Dried at 105°C.	Suspended matter Ignited at 550°C.	Specific conductance $K \times 10^6$ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids) P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per day	Loss on ignition at 550°C.
	STATION No. 56—PEACE RIVER at														
1	Sept./52—No sample taken.	.....		30,100†	.....										
2	Oct. —No sample taken.	.....		33,300	.....										
3	Nov. 20	7:20	9,300†	14,700	35	8·1	10	3	.....	.....	253	153	0·208	3,832	16·6
4	Dec. 9	8:45	4,600	5,400	32	8·4	15	5	.....	.....	286	.....	.....	.....	.....
5	Jan. 17/53	6:31	3,000	3,480	33	8·3	15	3	.....	.....	321	.....	.....	.....	.....
6	Feb. 7	6:48	3,100	7,640	33	8·4	10	3	.....	.....	380	231	0·314	5,090	30·0
7	Average (9 samples)	9:26	32,178	22,997	40	8·1	10	210	.....	.....	278	.....	.....	.....	.....

† Discharge records at Taylor, B.C.

	STATION NO. 56A—CLEARWATER														
8	June 11/56	28:59	.....	.....	62	79	70	10	2·8	1·7	239	166	0·226	.....	43.2
	STATION No. 57—NOTIKEWIN RIVER														
9	Aug. 6/52	13:19	.....	.....	71	8·1 (8·4)	20 (50)	6 (7)	14	12	365	249	0·339	.....	55·8
	STATION No. 58—HAY RIVER at														
10	July 19/52	12:19	high	.....	66	7·6	120	4	.....	4·7	411	332	0·452	.....	32·4
11	Oct. 17/52	14:15	.....	.....	33	7·9	160	6	3·7	1·4	360	287	0·390	.....	76·4
12	Jan. 19/53	193:231	.....	.....	32	7·7	100	8	.....	.....	531	.....	.....	.....	.....
13	Apr. 29/53	93:131	.....	.....	33	7·5	80	2	.....	.....	413	.....	.....	.....	.....
	STATION No. 59—SNARE RIVER (BIG														
14	May 22/52*	14:15	.....		40	7·1	10	2	.....	.....	35·8	37·0	0·051	.....	26·0
15	June 8, June 22†	110:135	725·3‡		56	8·8	10	.....	.....	.....	62·8	.....	.....	.....	.....
16	July—No sample taken.														
17	Aug.—No sample taken.														
18	Sept. 18†	14:20	.....		50	7·1	10	0·6	.....	.....	25·0	23·4	0·032	.....	13·2
19	Sept.13, Sept.26††	14:38	726·33		48	7·9	10	.....	.....	.....	37·2	.....	.....	.....	.....

†† Composite samples; not included in average.
† Below Ghost River.
‡ Levels at dam.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
PEACE RIVER, ALTA.—*Concluded*																			
																			1
																			2
34·9	7·8	4·3	0·8	0·27	19·5	3·2	0·3	0·05	.....	132	0	4·6	11·0	119	141	.....	.....	.....	3
40·6	9·8	3·5	0·7	.....	23·7	1·4	0·5	.....	.....	152	2·4	6·7	13·2	142	164	.....	.....	.....	4
45·8	11·3	3·8	0·4	.....	33·6	1·9	0·5	.....	.....	161	3·6	6·0	23·0	161	186	.....	.....	.....	5
52·5	14·3	6·5	1·1	0·12	30·6	5·0	0·7	0·05	.....	204	2·6	10	18·3	190	224	.....	.....	.....	6
39·6	9·1	4·3	1·5	.....	25·6	3·3	0·4	.....	.....	142	1·2	6·1	18·1	136	161	6·3	0·4	.....	7
RIVER at FORT MacMURRAY, ALTA.																			
19·3	5·6	22·0	1·7	0·15	8·2	27·0	4·0	0·00	.....	91·4	0	6·7	0·0	70·8	141	38·8	.....	0·4	8
at bridge at MANNING, ALTA.																			
47·0	10·7	13·5	1·9	0·04	60·3	1·1	0·4	0·20	.....	148	2·9	3·6	34·8	161 (167)	215	15·2	0·4	.....	9
HAY RIVER SETTLEMENT, N.W.T.																			
52·2	13·9	12·7	2·0	0·19	109	4·8	0·7	.....	.....	113	0	5·2	95·3	188	256	12·7	.....	0·2	10
46·0	12·0	11·5	1·4	0·32	83·3	6·0	0·6	.....	0·00	113	0	5·0	72·0	164	222	13·1	.....	0	11
64·9	16·7	22·5	3·0	0·08	13·0	8·2	1·0	.....	.....	163	0	.....	96·8	231	326	17·3	0·1	.....	12
48·1	13·6	15·9	2·9	0·35	96	4·2	1·0	.....	.....	130	0	.....	69·4	176	250	16·1	.....	0·3	13
SPRUCE LAKE) at power plant near RAE, N.W.T.																			
4·3	0·4	1·0	0·9	0·1	4·0	1·0	0·3	0·02	.....	12·2	0	0·8	2·2	12·2	19·0	.....	.....	.....	14
6·9	2·1	2·1	0·8	.....	8·2	1·0	0·5	.....	.....	24·9	4·8	33	0·0	25·9	38·7	.....	.....	.....	15
																			16
																			17
3·8	0·3	1·5	0·5	0·02	5·1	1·0	0·2	0·07	0·00	10·5	0	1·5	2·2	10·8	19·2	.....	.....	.....	18
4·0	1·2	1·6	0·6	.....	4·9	1·4	0·3	.....	.....	18·1	0	12	0·3	15·1	22·9	.....	.....	.....	19

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet) On sampling date	Stream discharge (Second-feet) Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter Dried at 105°C.	Suspended matter Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids) P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids) Tons per day	Loss on ignition at 550°C.
	STATION No. 59—SNARE RIVER (BIG														
1	Oct. 13	85:108	726·85	no	38	9·1	.....	.....	.....	.....	58·5	.....	.....	.....	.....
2	Oct. 29*	69:92	726·8	discharge	36	9·0	.....	.....	.....	.....	53·0	.....	.....	.....	.....
3	Nov. 12	55:78	726·70	records	34	8·8	.....	.....	.....	.....	50·0	.....	.....	.....	.....
4	Nov. 26*	41:64	726·8		32	9·3	.....	.....	.....	.....	60·6	.....	.....	.....	.....
5	Dec. 24	114:150	726·8		32	8·8	15	medium	.....	.....	53·1	.....	.....	.....	.....
6	Jan., 1953—No sample taken.														
7	Feb. 16/53	60:96	726·3		32	9·2	10	medium	.....	.....	59·4	.....	.....	.....	.....
8	Mar. 4	13:49	726·0		32	7·7	10	slight	.....	.....	40·7	.....	.....	.....	.....
9	Mar. 26	22:58	725·0		32	7·6	15	slight	.....	.....	41·2	.....	.....	.....	.....
10	May 10*	107:159	724·15		35	7·5	10	4	.....	.....	47·0	.....	.....	.....	.....
11	May 22	103:147	724·15		38	7·0	5	1	.....	.....	46·2	.....	.....	.....	.....
12	June—No sample taken.														
13	July 16	48:92	726·0		61	9·0	5	1	.....	.....	52·6	.....	.....	.....	.....
14	Aug. 4	29:72	725·7		65	9·0	5	2	.....	.....	53·7	.....	.....	.....	.....
15	Average (10 samples)	54:87	.....		41	8·3	.....	.....	.....	.....	48·0	.....	.....	.....	.....

* Not included in average.

	STATION No. 60—EMILE														
16	Sept. 14/52	18:24	.....	.....	50	7·3	5	0·7	.....	.....	40·7	29·6	0·040	.....	11·4
	STATION No. 61—LIARD RIVER at WATSON LAKE,														
17	June 24/52	28:30	142,000*e*	114,000	50	7·7	20	8	30	27	123	81·8	0·111	31,240	11·8
18	July 23	22:23	89,500	108,000	58	7·8	20	2	.....	.....	157	.....	.....	.....	.....
19	Aug. 21	21:27	41,400	46,800	52	7·0	5	0·9	.....	.....	176	115	0·156	12,793	11·2
20	Sept. 23	17:27	54,200	54,000	46	7·8	10	0·9	.....	.....	243	.....	.....	.....	.....
21	Oct. 23	21:33	46,500	48,800	33	8·0	15	0·9	.....	.....	246	147	0·200	18,368	17·8
22	Nov. 22	215:216	20,300	23,900	33	7·8	10	.....	.....	.....	337	.....	.....	.....	.....
23	Dec. 23	184:185	11,200	13,100	32	7·4	10	.....	.....	.....	263	.....	.....	.....	.....

e Estimated. Ice conditions Oct. 21/51 to May 9/52; Nov. 26/52 to May 13/53.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index:		Saturation index: −	No.
SPRUCE LAKE) at power plant near RAE, N.W.T.																					
7·5	1·4	2·5	0·8	.....	2·5	0·2	.....	.....	.....	12·2	9·6	.....	0·0	24·4	30·5	.....	.....			.....	1
6·6	1·5	2·0	0·6	.....	2·5	0·2	.....	.....	.....	16·1	6·7	.....	0·0	22·8	28·0	.....	.....			.....	2
6·5	1·3	2·0	0·8	.....	3·3	0·6	.....	.....	.....	16·1	5·5	.....	0·0	21·5	27·9	.....	.....			.....	3
6·3	2·1	3·5	0·6	.....	2·5	0·8	.....	.....	.....	17·5	8·0	.....	0·0	24·4	32·4	.....	.....			.....	4
5·5	2·1	9·0	3·5	.....	5·3	0·3	.....	.....	.....	48·8	1·2	.....	0·0	22·2	50·9	.....	.....			.....	5
																					6
6·1	2·2	10·8	2·4	.....	4·1	0·3	.....	.....	.....	46·1	5·5	.....	0·0	24·2	54·1	.....	.....			.....	7
4·7	1·9	3·0	2·4	.....	3·3	0·1	.....	.....	.....	29·3	0	.....	0·0	19·4	29·8	.....	.....			.....	8
4·7	2·2	2·0	1·0	.....	3·3	0·6	.....	.....	.....	25·6	0	.....	0·0	20·6	26·4	.....	.....			.....	9
5·9	1·6	3·5	1·8	.....	.....	1·0	1·6	.....	.....	22·2	0	.....	0·0	21·2	.....	.....	.....			.....	10
4·0	2·5	3·0	1·7	.....	.....	0·8	1·2	.....	.....	24·4	0	.....	0·3	20·3	.....	.....	.....			.....	11
																					12
7·9	0·9	4·5	1·6	0·05	.....	0·8	1·2	.....	.....	18·1	6·2	.....	0·0	23·2	.....	.....	.....			.....	13
6·1	1·3	4·0	1·8	.....	.....	0·8	1·2	.....	.....	17·3	6·2	.....	0·0	20·7	.....	.....	.....			.....	14
5·7	1·6	4·2	1·7	.....	3·8	0·6	.....	.....	.....	24·8	3·4	.....	0	20·8	33	30·3	.....			0·9	15
RIVER near RAE, N.W.T.																					
4·8	1·1	1·2	0·8	0·02	4·7	1·0	0·1	0·05	0·00	17·3	0	1·6	2·2	16·4	23·9	12·9	.....			2·2	16
Y.T.—Drainage area at Lower Crossing, 38,800 square miles																					
18·9	4·1	1·0	0·4	0·05	8·8	0·5	0·3	0·30	.....	66·1	0	6·2	9·7	63·9	73·6	.....	.....			.....	17
22·1	4·7	1·0	0·3	.....	8·8	0·1	0·0	0·20	.....	83·0	0	5·4	6·5	74·5	83·5	.....	.....			.....	18
26·3	5·6	1·0	0·4	0·06	9·5	0·7	trace	0·10	.....	98·6	0	14	8·1	88·9	106	.....	.....			.....	19
34·8	8·4	1·9	0·4	.....	10·3	1·7	0·2	.....	.....	143	0	9·8	4·4	121	138	.....	.....			.....	20
34·5	9·3	2·0	0·8	0·07	8·4	0·9	0·3	0·10	.....	147	0	8·2	3·9	124	137	.....	.....			.....	21
45·1	14·4	2·0	0·6	.....	22·2	0·1	0·4	.....	.....	199	0	20	8·6	172	203	.....	.....			.....	22
35·1	9·1	1·6	0·8	.....	20·2	0·1	0·6	.....	.....	132	0	9·4	18·0	126	142	.....	.....			.....	13

77913—4

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10⁶ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 61—LIARD RIVER at WATSON LAKE,														
1	Jan. 23/53	159:173	9,700	10,200	33	8·1	10	3	.....	.....	253	92·4	0·126	2,415	29·8
2	Feb. 23	122:123	7,300	7,700	33	8·0	5	.....	.....	.....	290	.....	.....	.....	.....
3	Mar. 26	91:92	6,850	6,970	33	7·6	10	.....	.....	.....	328	.....	.....	.....	.....
4	Apr. 28	59:78	13,200	8,780	34	7·8	20	3	4·2	1·4	239	148	0·201	5,254	61·4
5	May 23	32:53	107,000	65,000	47	7·8	40	4	9·4	6·4	187	116	0·158	33,384	47·2
6	Average (12 samples)	81:88	45,765	42,280	40	7·8	15	3	.....	.....	237	.....	.....	.....	.....
	STATION No. 62—LIARD RIVER														
7	Aug. 26/52	64:67	.....		54	8·0	30	430	425	393	265	167	0·227	.....	20·4
8	Sept. 22	37:53	.....		48	8·1	20	15	.....	.....	253	.....	.....	.....	.....
9	Oct. 21	108:142	.....		33	8·2	.....	.....	.....	.....	270	208	0·283	.....	62·0
10	Nov. 27	71:120	.....	No	32	8·2	0	heavy	.....	.....	353	.....	.....	.....	.....
11	Dec. 26	42:91	.....	discharge	32	7·8	0	slight	.....	.....	406	.....	.....	.....	.....
12	Jan. 23/53	223:276	.....	records	32	7·8	5	2	.....	.....	404	.....	.....	.....	.....
13	Feb.—No sample taken	.....	.....												
14	Mar. 10	167:220	.....		32	8·0	10	15	.....	.....	416	.....	.....	.....	.....
15	Mar. 20	167:223	.....		32	7·6	5	2	.....	.....	433	.....	.....	.....	.....
16	Apr. 27	120:185	.....		32	7·1	10	7	.....	.....	223	.....	.....	.....	.....
17	May 23	104:159	low		58	7·9	.....	65	.....	.....	194	.....	.....	.....	.....
18	June 23	73:115	low		58	8·1	.....	heavy	250	225	216	174	0·237	.....	44·0
19	July 24	109:181	.....		60	8·2	30	80	194	184	225	144	0·196	.....	38·2
20	Aug. 22*	80:137	low		62	8·2	20	50	.....	.....	268	.....	.....	.....	.....
21	Average (12 samples)	108:153	.....		42	7·9	12	80	.....	.....	305	.....	.....	.....	.....
	STATION No. 63—GREAT BEAR														
22	1946	.....	.....	.....	.....	7·5	.....	.....	.....	.....	.....	96·0	0·131	.....	.....
23	Aug. 24/52	6:23	normal†	No record	41	7·6	3	0·5	.....	.....	154	96·0	0·131	.....	24·0
24	Nov. 24/52—Sample lost in transit.														
25	Mar. 24/53	129:153	normal†	No record	32	8·9	10	6	.....	.....	.....	20·0	0·027	.....	6·4
26	June 25/53	36:60	normal†	387·93††	35	7·7	100	5	1·1	0	177	104	0·141	.....	26·8

* Not included in average.

† Collector's estimate of river flow.

†† Water elevation.

TABLE II—Continued

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Continued

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
Y.T.—Drainage area at Lower Crossing, 38,800 square miles																			
41·2	4·8	6·0	2·0	0·15	6·8	1·3	0·6	.....	.....	154	0	.....	0·0	123	139	.....	.....	.....	1
39·9	9·8	2·7	0·8	.....	13·6	0·1	0·8	.....	.....	163	0	12	6·4	140	160	.....	.....	.....	2
45·9	12·0	1·7	0·6	.....	10·1	0·2	0·8	.....	.....	193	0	30	5·8	164	197	.....	.....	.....	3
33·4	9·4	2·8	1·2	0·02	7·5	0·2	0·8	0·00	0·00	149	0	7·2	0·0	122	136	.....	.....	.....	4
26·6	6·2	2·5	1·4	0·08	8·3	1·2	0·6	0·10	.....	111	0	7·4	1·4	92·0	109	.....	.....	.....	5
33·7	8·2	2·2	0·8	.....	11·2	0·6	0·5	.....	.....	137	0	12	5·7	118	137	3·9	0·0	.....	6
at FORT SIMPSON, N.W.T.																			
37·1	10·0	2·4	1·4	0·05	31·3	1·2	0·5	.....	0·05	122	3·6	5·5	27·4	134	153	.....	.....	.....	7
35·8	9·2	2·3	0·7	.....	30·5	0·7	0·4	.....	.....	127	0	5·3	23·4	127	147	.....	.....	.....	8
38·1	10·7	4·0	0·6	0·79 (total)	33·1	1·4	0·6	.....	.....	134	0	10	29·6	139	164	.....	.....	.....	9
49·3	14·1	3·8	1·0	.....	39·3	2·2	0·6	.....	.....	182	0	21	32·4	181	224	.....	.....	.....	10
56·6	15·8	7·2	1·1	.....	44·0	2·3	0·0	.....	.....	212	0	11	32·8	206	248	.....	.....	.....	11
57·6	13·6	10·0	2·0	.....	40·1	9·9	0·8	.....	.....	200	0	24	36·0	260	257	.....	.....	.....	12
																			13
52·8	14·0	16·6	2·3	0·68 (total)	40·7	10·8	2·4	.....	.....	206	0	.....	20·9	190	300	.....	.....	.....	14
57·4	15·5	11·5	2·0	.....	37·7	13·7	0·8	.....	.....	209	0	23	35·8	207	265	.....	.....	.....	15
29·7	7·7	4·5	1·8	.....	21·4	3·4	1·2	.....	.....	105	0	10	19·3	106	132	.....	.....	.....	16
29·9	5·3	2·5	1·0	.....	18·9	0·6	1·2	.....	.....	97·8	0	7·3	16·1	96·3	115	.....	.....	.....	17
32·6	6·6	3·0	1·5	1·09	27·1	0·7	0·7	.....	.....	105	0	7·5	26·5	109	131	.....	.....	.....	18
30·1	7·8	2·7	1·6	0·22	23·7	0·5	0·4	.....	.....	109	0	6·9	18·4	107	127	.....	.....	.....	19
37·0	10·3	2·9	1·2	.....	27·9	1·0	0·2	.....	.....	123	5·6	7·4	24·5	135	154	.....	.....	.....	20
42·3	10·9	5·9	1·4	.....	32·3	4·0	1·3	.....	.....	151	0·3	12	26·5	150	185	7·8	0·2	.....	21
LAKE near PORT RADIUM, N.W.T.																			
17·5	8·5	7·1 as Na.		0·12	14·0	5·5	0·7	.....	.....	71·7	0	4·0 (grav.)	19·8	78·6	92·7	.....	.....	0·9	22
16·7	6·5	4·0	0·7	0·02	14·3	5·9	0·5	0·20	.....	65·9	0	4·5	14·5	68·5	85·7	11·1	.....	0·9	23
																			24
2·9	1·4	3·8	1·6	0·04	4·9	1·2	0·0	.....	.....	15·6	2·9	16	0·0	12·9	42·7	35·6	.....	0·8	25
15·4	6·6	6·2	2·0	0·05	16·3	5·1	0·2	0·00	.....	72·0	0	13	6·6	65·6	100	16·5	.....	0·8	26

77913—4½

TABLE II—Concluded

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Concluded

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance K x 10^6 at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
	STATION No. 64—GREAT BEAR RIVER														
1	July 31/52	7:13	low†	.....	46	7·9	0	6	.....	.....	154	94·4	0·128	.....	33·6
2	Aug. 30	23:30	medium		38	7·6	15	3	.....	.....	157	.....	.....	.....	.....
3	Sept. 27	13:23	"	No	40	7·8	30	4	.....	.....	158	.....	.....	.....	.....
4	Oct.—Lost in transit.			discharge											
5	Nov.—No sample taken.			records											
6	Dec. 27	27:52	low		34	8·0	10	slight ..	.....	.....	170	.....	.....	.....	.....
7	Jan., 1953														
8	Feb.	No samples taken;													
9	Mar.	ice conditions.													
10	April														
11	May														
12	June 7/53	9:25	high		45	7·4	30	105	98	88	225	156	0·212	.....	53·8
13	June 29	14:43	"		47	7·9	10	3	.....	.....	161	.....	.....	.....	.....
	STATION NO. 64A—BOSWORTH														
14	Mar./56	.....	.....	.....	.....	8·5	5	.....	.....	.....	554	368	0·500	.....	66·4
15	Oct. 11/56	.....	.....	.....	.....	8·1	20	.....	.....	.....	619	.....	.....	.....	.....
	STATION No. 65—ARCTIC RED RIVER														
16	Sept. 3/52	20:35	.....	.....	46	7·6	60	55	84	76	310	209	0·284	.....	30·8
17	Dec. 1/52	211:220	.....	.....	32	7·8	40	10	5·4	2·6	977	643	0·874	.....	133
18	Mar. 1/53	121:136	low†	.....	34	7·4	10	8	.....	.....	357	.....	.....	.....	.....
19	June 3/53	27:69	high (spring flood)	.....	54	7·6	.....	190	.....	.....	185	.....	.....	.....	.....
	STATION No 66.—PEEL RIVER														
20	Sept. 3/52	16:17	medium†	.....	47	7·8	35	35	67	62	307	216	0·294	.....	41·6
21	Dec. 3/52	204:317	low	.....	33	7·8	10	2	.....	.....	403	.....	.....	.....	.....
22	Mar. 4/53	173:239	low	.....	33	7·7	10	2	.....	.....	423	.....	.....	.....	.....
23	June 1/53	95:137	high	.....	46	7·8	.....	very high	495	456	199	149	0·203	.....	33·4

† Collector's estimate of river flow or level.

TABLE II—Concluded

Chemical Analyses of Surface Waters in the Mackenzie River Drainage Basin—Concluded

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: ±	Saturation index: −	No.
near mouth, at FORT NORMAN, N.W.T.																				
15·3	6·8	4·2	0·3	0·11	14·7	5·8	0·4	0·05	.....	63·4	0	4·2	14·1	66·1	83·1	12·1	.....		0·6	1
16·5	6·5	4·3	0·5	.....	14·2	5·5	0·8	.....	.....	68·3	0	3·7	11·8	67·8	85·6	12·0	.....		1·0	2
18·1	6·1	4·1	0·8	.....	16·5	5·8	0·8	.....	.....	67·8	0	3·8	14·8	70·4	89·4	11·1	.....		0·7	3
																				4
																				5
17·0	7·6	5·4	0·8	.....	17·2	6·2	.....	.....	.....	73·2	0	7·8	13·6	73·6	98·0	13·6	.....		0·4	6
																				7
																				8
																				9
																				10
																				11
29·4	6·3	5·2	1·9	0·09	23·8	7·4	30	0·00	0·00	88·6	0	3·8	26·6	99·2	125	10·1	.....		0·7	12
15·8	6·6	5·5	1·0	.....	16·0	5·8	0·6	.....	.....	70·3	0	4·4	8·9	66·5	90·3	15·0	.....		0·6	13
CREEK at NORMAN WELLS, N.W.T.																				
68·8	26·2	12·6	1·0	0·02	110	12·6	0·4	0·10	.....	195	6·5	4·8	108	279	340	8·8	1·1	.....		14
75·3	26·9	16·5	1·0	0·04	130	16·3	0·8	0·20	.....	216	0	3·8	121	299	379	10·6	0·8	.....		15
near ARCTIC RED RIVER SETTLEMENT																				
39·0	13·2	3·7	0·8	0·53	69·8	1·0	0·6	.....	0·05	108	0	3·1	63·0	152	185	5·0	.....		0·3	16
144	28·1	38·5	4·2	0·32	132	19·4	1·2	.....	.....	431	0	18	123	476	597	14·8	1·1	.....		17
44·5	7·2	14·5	1·7	.....	50·6	18·3	0·6	.....	.....	114	0	14	47·0	141	207	18·1	.....		0·4	18
22·8	7·0	3·4	1·4	.....	34·0	1·4	0·4	.....	.....	70·3	0	2·3	27·9	85·5	107	7·8	.....		0·7	19
at FORT McPHERSON, N.W.T.																				
42·3	12·4	2·8	0·4	0·09	50·3	2·5	0·7	.....	.....	127	0	3·3	52·4	156	177	3·7	.....		0	20
54·5	16·2	6·8	2·0	.....	58·6	3·4	3·2	.....	.....	181	0	30	54·3	203	264	6·7	0·2	.....		21
56·3	15·8	8·6	1·6	.....	53·1	4·6	1·0	.....	.....	201	0	15	40·8	206	255	8·3	0·2	.....		22
26·7	6·6	3·4	1·5	0·79	35·6	1·4	0·6	.....	.....	77·1	0	4·4	30·7	93·9	118	7·1	0·3	.....		23

TABLE III

Chemical Analyses of Surface Waters in the Yukon River Drainage Basin in Canada

(In parts per million)

No.	Date of collection	Storage period (Days)	Stream discharge (Second-feet): On sampling date	Stream discharge (Second-feet): Monthly mean	Water temperature (°F.)	pH	Colour	Turbidity	Suspended matter: Dried at 105°C.	Suspended matter: Ignited at 550°C.	Specific conductance $K \times 10^6$ at 25°C.	Residue on evaporation dried at 105°C. (Dissolved solids): P.P.M.	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per acre-foot	Residue on evaporation dried at 105°C. (Dissolved solids): Tons per day	Loss on ignition at 550°C.
STATION No. 1Y—MAYO RIVER at															
1	Mar. 23/53.....	23:28	.....	.....	.....	7·5	15	slight	.....	.....	194	109	0·148	.....	12·4
STATION No. 2Y—STEWART RIVER at															
2	July 3/52.....	5:14	37,200	26,500	53	8·0	30	50	106	81	175	119	0·162	11,904	20·4
3	Oct. 15/52.....	23:41	13,800	16,100	35	8·0	20	20	20	16	260	165	0·224	6,127	20·4
4	Feb. 7/53.....	151:185	1,340	1,360	32	8·1	5	7	8·3	6·8	378	101	0·137	364·5	9·0
5	June 5/53.....	33:67	31,300	29,700	55	9·3	20	50	54	49	221	71·0	0·097	5,978	9·6
Ice conditions October 27, 1951 to April 3, 1952; November 15, 1952 to May 11, 1953.															
STATION No. 3Y—YUKON (LEWES) RIVER at															
6	Aug. 20/52.....	17:28	17,100	16,900	46	7·5	0	2	.....	.....	87·2	55·4	0·075	2,548	6·6
7	Sept. 29.....	18:29	15,900	16,800	31	7·6	5	0·6	.....	.....	90·1	.....	.....	.....	.....
8	Oct. 21.....	17:35	14,800	15,600	36	7·8	5	0·7	.....	.....	90·0	54·4	0·074	2,161	7·6
9	Nov. 24.....	12:78	9,060	11,000	31	8·0	5	3	.....	.....	96·3	.....	.....	.....	.....
Ice conditions October 31, 1951, to May 28, 1952; December 3, 1952 to May 22, 1953.															
STATION No. 4Y—YUKON RIVER at DAWSON,															
10	June 25/52.....	33:35	155,000	164,000	59	7·8	20	95	161	156	175	121	0·165	50,375	24·0
11	July 24.....	19:22	156,000	163,000	61	7·9	.....	560	.....	.....	189	.....	.....	.....	.....
12	Aug. 6—No sample taken.	.....		112,000											
13	Sept. 3.....	21:26	104,000	109,000	49	7·9	20	30	.....	.....	195	.....	.....	.....	.....
Ice conditions, October 7, 1951, to May 22, 1952.															
STATION No. 5Y—McINTYRE															
14	Jan. 1955.....	.....	.....	.....	.....	7·8	.....	2	7·2	.....	.....	212	0·288	.....	.....
15	May 25/55.....	.....	.....	.....	36	8·6	10	6	.....	.....	360	.....	.....	.....	.....
16	Oct. 12/55.....	13:19	.....	.....	.....	8·3	10	.....	.....	.....	272	.....	.....	.....	.....
17	Nov. 30/55.....	19:29	.....	.....	40	8·3	5	.....	.....	.....	261	.....	.....	.....	.....
18	Jan. 3/56.....	20:28	.....	.....	.....	8·7	5	.....	.....	.....	274	.....	.....	.....	.....
19	Feb. 7/56.....	20:27	.....	.....	.....	8·3	5	.....	.....	.....	264	.....	.....	.....	.....
20	Aug. 26/56.....	65:87	.....	.....	50	8·3	20	3	.....	.....	272	179	0·243	.....	32·4

TABLE III

Chemical Analyses of Surface Waters in the Yukon River Drainage Basin in Canada

(In parts per million)

Calcium (Ca)	Magnesium (Mg)	Alkalis: Sodium (Na)	Alkalis: Potassium (K)	Iron (Fe): Dissolved	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Fluoride (F)	Boron (B)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Silica (SiO_2): Colorimetric	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Sum of constituents	Per cent sodium	Saturation index: +	Saturation index: −	No.
power plant near MAYO, Y.T.																			
28·8	5·5	6·4	2·4	0·11	22·6	1·2	0·5	.....	.....	90·8	0	.....	20·8	94·4	112	12·5	.....	0·6	1
MAYO, Y.T.—Drainage area, 12,600 square miles																			
23·1	5·8	1·3	0·4	0·13	26·1	1·2	0·2	0·10	0·02	69·8	0	4·4	24·4	81·6	96·1	3·3	.....	0·2	2
33·0	11·4	3·4	0·9	0·09	43·6	1·2	0·4	.....	.....	107	0	4·4	41·3	129	151	5·4	0·2	.....	3
55·4	11·5	8·5	.....	.....	45·4	1·3	0·6	0·00	.....	183	0	16	35·7	186	229	.....	0·5	.....	4
26·9	7·7	8·8	2·4	0·02	27·8	1·2	0·4	0·02	.....	81·0	12·0	19	12·6	99·0	146	15·8	1·2	.....	5
WHITEHORSE, Y.T.—Drainage area, 7,500 square miles																			
13·4	1·8	1·3	0·7	0·05	5·8	0·9	0·0	0·15	.....	46·4	0	3·8	3·0	41·0	50·7	6·3	.....	1·5	6
13·7	2·0	1·3	0·8	.....	6·0	1·4	trace	.....	.....	47·1	0	6·5	3·9	42·5	53·9	6·1	.....	1·1	7
13·6	2·2	1·3	0·9	0·08	5·9	0·4	trace	0·10	.....	47·8	0	3·5	3·9	43·1	51·5	6·0	.....	0·9	8
13·3	2·2	1·5	0·8	.....	7·2	0·4	0·2	.....	.....	45·9	0	3·2	4·7	42·3	51·4	7·0	.....	0·8	9
Y.T.—Drainage area, 106,000 square miles																			
24·1	6·0	2·1	1·1	0·13	20·8	0·6	0·4	0·10	.....	81·3	0	6·4	18·2	84·8	102	5·0	.....	0·4	10
25·6	6·8	2·3	1·0	.....	23·0	0·2	0·1	0·20	.....	89·1	0	6·4	19·0	92·0	110	5·0	.....	0·2	11
																			12
26·8	6·5	2·1	1·3	.....	27·2	0·5	trace	.....	.....	87·1	0	7·0	22·3	93·7	114	4·6	.....	0·3	13
CREEK near WHITEHORSE, Y.T.																			
48·8	13·1	.....	.....	.....	7·5	4	.....	.....	.....	186	1	14	0	176	.....	.....	.....	.....	14
49·5	13·3	3·0	1·5	.....	4·9	0·3	0·8	.....	.....	210	6·6	13	0	178	196	.....	1·2	.....	15
38·9	9·3	3·2	1·0	.....	9·3	0·3	1·6	.....	.....	166	0	16	0	135	162	4·8	0·5	.....	16
37·4	9·8	3·9	1·1	.....	7·3	0·4	2·4	.....	.....	162	0	16	0	133	158	5·9	0·6	.....	17
38·8	11·5	4·5	1·1	.....	6·5	0·5	0·8	.....	.....	151	12·0	.....	0·6	144	211	6·3	1·0	.....	18
37·8	9·6	3·5	1·1	.....	8·0	0·3	.....	.....	.....	156	0	22	5·8	134	.....	5·3	0·5	.....	19
41·0	9·3	3·7	1·0	0·00	7·4	0·4	1·2	0·00	.....	175	0	13	0	141	163	5·3	0·7	.....	20

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(A. Mackenzie River Drainage Basin)

Municipality	AKLAVIK, N.W.T.	ATHABASCA, ALTA.
	1953	1951
Population served:		
In municipality	....	1,200 (1,068°)
Outside municipality	....	....
Total	500-700†	1,200
Date(s) of survey	Dec. 1954††	October 2, 1951
Ownership	Owned by Dept. of Northern Affairs and National Resources; operated by local committee.*	Municipally owned and operated
Source of supply	Amuskeg pond: site of Aklavik is being moved in 1954-56 and new source of water (Mackenzie River) and system will then be installed.	Athabasca River
Treatment	Alum added prior to filtration through diatomaceous earth; chlorinated (sodium hypochlorite).	Chlorination (sodium hypochlorite) as river water pumped to reservoir on hill; water then enters system by gravity.
Storage capacity (thousand gallons)	Pressure tank....2	One covered reservoir....1,250
Consumption (average in m.g.d.)	No information (pumping capacity 40 g.p.m.)....	
		1951
		0·04
Industrial use	No industrial use	No industrial use; a lumbering and farming centre.
Remarks	System installed in 1951.	System installed in 1949.

† Wide fluctuations.
†† Data from Dept. of Northern Affairs and National Resources.
* A summer system only; pipes etc. removed during winter.

° Population according to Ninth Census of Canada, 1951.

Municipality	EDSON, ALTA.		FAIRVIEW, ALTA.
	1951	1953	1951
Population served:			
In municipality	2,000 (1956°)	2,345	924 (929°)
Outside municipality	0	0	270
Total	2,000	2,345	1,194
Date(s) of survey	September 25, 1951; 1953†		Sept. 1951; Aug. 6, 1952†
Ownership	Municipally owned and operated		Municipally owned and operated
Source of supply	Three wells, 108, 120 and 145 feet deep.		Water from several lakes which are fed by spring run-off.
Treatment	No treatment; well water pumped to ground reservoir and then to elevated tank and system.		No treatment in 1951; in 1952 water flows by gravity to system from dam reservoir with chlorine dioxide treatment.* Dam reservoir is fed by ditches from small lakes.
Storage capacity (thousand gallons)	Concrete ground reservoir....100 Elevated tank.... 60		One dam reservoir.... 30,000
Consumption (average in m.g.d.)	1951	1953	1951 1952
	0·07 (approx.)	0·08	Not known
Industrial use	A C.N.R. divisional point. The district is a farming and lumbering community with coal mining nearby.		An agricultural school; a farming community with six grain elevators.
Remarks	System installed during 1950-51.		Original system installed in 1950; a treatment plant was under consideration in 1952.

† Data from Dept. of Economic Affairs of Alberta.

° Population according to Ninth Census of Canada, 1951.

* $CuSO_4$ and activated carbon added periodically to reservoir.
† Dept. of Economic Affairs of Alta.

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(A. Mackenzie River Drainage Basin)—Continued

BARRHEAD, ALTA.

1951	1952
1,243°	.....
0	.....
1,243	1,300

July 30, 1952.....
Municipally owned and operated.....

Two wells, 120 feet deep.....

In 1952, no treatment; pumped from one well direct to system; from other well to tank and then to system. In 1953, three deep wells with occasional chlorination.

Elevated tank.....40
No data.....

A farming community.

Original system installed in 1948.

BEAVERLODGE, ALTA.

1951	1955
509 (514°)	400
0	0
509	400

September, 1951†, 1954; February 18, 1955.....
Municipally owned and operated.....

Two wells—210 and 250 ft. deep; in 1955 well 210 feet deep.

No treatment; pumped to reservoir and system..

Reservoir.....50

1954	1955
0·010	0·010

Plant capacity—21,600 g.p.d.
No major industrial user. Main industry is seed growing; six grain elevators.
† Data from the Dept. of Economic Affairs of Alberta.
System installed in 1951.

DAWSON CREEK, B.C.

1951	1952
3,589°	4,000
1,000	1,000
4,589	5,000

October 5, 1951; August 1952.....
Municipally owned and operated.....

Kiskatinaw River, 14 miles distant.....

River water pumped to two earthen reservoirs (settling basins), alum and lime treated, pressure-filtered (sand), chlorinated and pumped to system and concrete ground reservoir on nearby hill.
3 ground reservoirs.....3,000 total

1951	1952
0·2	0·25 {max. 0·3 min. 0·18

No major industrial user. A farming and lumbering community.
River very turbid at times; alum used only during spring breakup and after heavy rains.

FORT NELSON, B.C.†

No data.....

December, 1955.....
Owned and operated by Dept. Nat. Def.....
Previously Muskwa River and treated water from RCAF base: In late 1955, wells.
Well water, lime-softened in central plant, chlorinated and pumped to system.

Elevated tank.....no data
Underground reservoir.....“ “

No data.....

Army camp heating system and other camp uses.

† System supplying D.N.D. camp, Muskwa Garrison, Fort Nelson, B.C.
R.C.A.F. base also has a supply system.

FORT SMITH, N.W.T.

1951	1953
.....	.....
.....	.....
.....	400*

1951: system installed in 1950.
Owned and operated by federal government.
Slave River.†.....

Water coagulated (alum), rapid-sand filtered, treated with soda ash, chlorinated (sodium hypochlorite) and pumped to system which is buried 13 ft. deep.

Underground concrete tank.....40

1953
0·025 (Max. 0·30)

No major industrial user.

† Contaminated usually with varying mixture of ground water, see pages 64-65.
* Only 50 connections; others use street taps, etc.

GRANDE PRAIRIE, ALTA.

1951
..... (2,664°)
.....
3,000

October 4, 1951.....
Municipally owned and operated.....
Bear Creek.....

From impounding reservoir water is pumped, with alum treatment, to coagulating and settling basins, then aerated, rapid-sand filtered, chlorinated and pumped to elevated tank and system.
Impounding reservoir..... 210,000
Elevated tank..... 60

1951
0·080 {Max. 0·095 Min. 0·065

No major industrial user; a farming and lumbering centre.

System installed prior to 1940 and extended in 1949–50.

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(A. Mackenzie River Drainage Basin)—Continued

Municipality	GRIMSHAW, ALTA.	HIGH PRAIRIE, ALTA.
Population served:	1951	1951 / 1952 / 1954
In municipality	568 (564°)	1,141° / ..... / .....
Outside municipality	0	0 / ..... / .....
Total	568	1,141 / 1,140 / 1,402
Date(s) of survey	September 1951†; August 6, 1952	February 6, 1952; May 1955†
Ownership	Municipally owned and operated	Municipally owned and operated
Source of supply	Spring, 2¼ miles distant	One well; in 1955 two wells, 560 and 571 ft. deep.
Treatment	No treatment: water from spring is collected in reservoir from whence it flows to the system by gravity.	Water is pumped with aeration to reservoir and then to system. Aeration of water is carried out to remove iron.
Storage capacity (thousand gallons)	Concrete reservoir 1·5	Ground reservoir 50
Consumption (average in m.g.d.)	No data—(only 25 services in use at time of survey).	1952: 0·207
Industrial use	A farming community; one concrete plant; six grain elevators.	No major industrial user. Industrial use in 1952 was only 7,000 gals.
Remarks	System installed in late 1951. † Dept. of Economic Affairs of Alberta.	† Dept. of Economic Affairs of Alberta.
° Population according to Ninth Census of Canada, 1951.		

Municipality	NORMAN WELLS, N.W.T.	PEACE RIVER, ALTA.
Population served:	1951 / 1953	1951
In municipality	No data /	2,000 (1,672°)
Outside municipality	.....	0
Total	100-150	2,000
Date(s) of survey	December 1954†, February 1955	September 1951†, October 3, 1951
Ownership	Owned and operated by the Imperial Oil Co. Ltd.	Municipally owned and operated
Source of supply	Bosworth Creek	Peace River
Treatment	Water pumped from behind dam on creek to system with chlorination (sodium hypochlorite). Water heated in winter by being buried alongside steam lines.	River water is pumped to plant on nearby hill, is coagulated with alum, settled, rapid-sand filtered and chlorinated; it then flows by gravity to system.
Storage capacity (thousand gallons)	Small dam on creek. Tank reservoir 1·5	Clear well 50
Consumption (average in m.g.d.)	No data (Plant capacity 700,000 g.p.d.)	1951: 0·065
Industrial use	Used by Imperial Oil Co. Ltd., for steam generation, etc.	Main users are a tannery, a meat-packing plant, and a flour and feed mill.
Remarks	System installed in 1944. † Data from Dept. of Northern Affairs and National Resources.	System installed in 1950. † Dept. of Economic Affairs of Alberta.
° Population according to Ninth Census of Canada, 1951.		

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(A. Mackenzie River Drainage Basin)—Continued

JASPER, ALTA.		LAC LA BICHE, ALTA.		MERCOAL, ALTA.
1951		1951	1954	1953
1,800† (1,899°)*		905°	1,200	1,200
.....		0	0	0
1,800		905	1,200	1,200
September 26, 1951		September, 1954		March 16, 1954
Dept. of Northern Affairs and National Resources.		Municipally owned and operated.		Owned and operated by Canadian Collieries, Ltd.
Cabin Lake, 2½ miles distant.		Lac La Biche.		Mercoal Creek
Water flows by gravity from Cabin Lake to two reservoirs, is then chlorinated and flows to system by gravity.		Water pumped with chlorination direct from lake to system.		No treatment; water flows by gravity to system from reservoir.
Cabin Lake 145,940 Two reservoirs (concrete) 600 total		None		Ground reservoir 50
1951		1954		No data
1·0		30,000 g.p.d.		
Major area activity is tourist trade. (Jasper National Park).		No major industrial user		A coal mining community
System installed prior to 1940. * In summer, population rises to 5,000. † Dept. of Economic Affairs of Alberta.				

RYCROFT, ALTA.		SPIRIT RIVER, ALTA.		WESTLOCK, ALTA.	
1951	1953	1951	1953	1951	1952
..... 372°	428	553°	.....	1,111°	1,400
..... 0	0	0	.....	0	0
372	428	553	491	1,111	1,400
1953*		September 1951†; February 26, 1954		1950†; July 30, 1952	
Municipally owned and operated		Municipally owned and operated		Municipally owned and operated	
Small creek		Wells and spring run-off, 1½ miles distant		Six wells, 240 ft. deep	
Chlorination; water is hauled by truck to consumers.		Water is pumped to the system with chlorination.		No treatment; water pumped to elevated tank and system.	
No data		One dugout reservoir		One elevated tank 50	
No data		1953 0·16		1951 0·040	
No data		A lumbering and farming community; no major industrial user.		A farming community	
* Data supplied by the Dept. of Health of Alberta.		System installed in 1952-53. † Dept. of Economic Affairs of Alberta.		System installed in 1947 and extended in 1951-52. † Dept. of Economic Affairs of Alberta.	

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(A. Mackenzie River Drainage Basin)—Concluded

Municipality	**YELLOWKNIFE, N.W.T.**
	1951 / 1953
Population served:	
In municipality	2,724° / .....
Outside municipality	0 / .....
Total	2,724 / 2,000††
Date(s) of survey	December 1954†
Ownership	Municipally owned and operated
Source of supply	Great Slave Lake, Yellowknife Bay
Treatment	Water pumped with chlorination (sodium hypochlorite) to system which is buried in ground; water heated and recirculated in winter.
Storage capacity (thousand gallons)	Inside tank ..... 5,000 gals.
	1953
Consumption (average in m.g.d.)	70,000 g.p.d. (summer)*
Industrial use	No major industrial user.
Remarks	System installed in 1948. † Data from Dept. of Northern Affairs and Nat. Resources. †† Average; winter population is less than summer population. * In winter 300,000 g.p.d. are pumped when recirculating water.

° Population according to Ninth Census of Canada, 1951.

DESCRIPTION OF MUNICIPAL WATER SYSTEMS

(B. Yukon River Drainage Basin)

Municipality	DAWSON, Y.T.		WHITEHORSE, Y.T.	
Population served:	1951	1954	1951	1954
In municipality	783[a]	500	2,954[a]	2,500
Outside municipality	.....	0	Military camp	Military camp
Total	.....	500	.....	.....
Date(s) of survey	1954		December 1954; December 1955	
Ownership	Privately owned and operated by Dawson City Water and Power Co. Ltd.		Owned and operated by Dept. of National Defence (Army).	
Source of supply	Wells		McIntyre Creek; in late 1955 another small creek diverted into McIntyre Creek near intake.	
Treatment	No treatment; pumped to system		Water pumped to storage tanks and system with chlorination (sodium hypochlorite). Plant capacity 3 m.g.d.	
Storage capacity (thousand gallons)	None		Underground reservoirs ..... 50 and 150 Two ground level reservoirs 208	
Consumption (average in m.g.d.)	1954		1954	
	No data		1·0 (Max. 1·6, Min. 0·8)	
Industrial use	No major industrial user		No industrial user; military camp is the largest user.	
Remarks				

[a] Population according to Ninth Census of Canada, 1951.

TABLE IV

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

	Municipality	Aklavik, N.W.T.	New Aklavik, N.W.T.	Athabasca, Alta.		Barrhead, Alta.
	Source(s)	Muskeg Pond North lot 64	Mackenzie River	Athabasca River		Two Wells
		Raw and finished water	—	Raw and finished water		Raw and finished water
	Sampling point	—	—	Town tap		Town tap
1	Date of collection	Dec. 4/49	June 13/56*	**	Oct. 2/51	July 30/52
2	Storage period (days)	About 30	26:57	.....	14:34	7:12
3	Sampling temperature, °C	.....	.....	.....	11·1	7·8
4	Test temperature, °C	21·0	23·5	.....	22·5 (12)	24·3 (16)
5	pH	7·2	7·5	.....	7·9 (7·9)	7·9 (8·0)
6	Colour	45	50	30	2 (15)	20
7	Turbidity	6	20	.....	7 (5)	2 (<5)
8	Suspended matter, dried at 105°C	.....	9·8	.....	2·8	.....
9	Suspended matter, ignited at 550°C	.....	4·9	.....	1·5	.....
10	Residue on evaporation, dried at 105°C	306	107	220	175	1,236
11	Ignition loss at 550°C	79·4	24·0	40	18·8	40·6
12	Specific conductance (micromhos at 25°C)	456	167	.....	281	1,870
13	Calcium (Ca)	55·2	20·9	38	40·5	7 7
14	Magnesium (Mg)	25 8	5 8	16	10·3	0·5
15	Iron (Fe) Total	0·46	.....	2·2	0·1	.....
16	Dissolved	.....	0·40	.....	0·07	0·13
17	Sodium (Na)	7·1	2·3	1 as Na	5·5	508
18	Potassium (K)	3 2	2·0	1 as Na	1·0	2·0
19	Carbonate (CO_3)	0	0	0	0 (0)	13·2 (0)
20	Bicarbonate (HCO_3)	242	73·0	116	151 (142)	1,266 (1,293)
21	Sulphate (SO_4)	43·3	13·2	64	32·4	37·2
22	Chloride (Cl)	3·7	3·7	2	0·8	2·7
23	Fluoride (F)	.....	0 00	.....	0 1	0 25
24	Nitrate (NO_3)	.....	4·8	0	0	trace
25	Silica (SiO_2), Colorimetric	6·0	2·2	2	3·8 (4)	12·5
26	Carbonate hardness, as $CaCO_3$	198	59·9	95	124 (116)	21·4
27	Non-carbonate hardness, as $CaCO_3$	45·9	16·1	67	19·4 (33·8)	0
28	Total hardness, as $CaCO_3$	244	76·0	162	143 (150)	21·4
29	Sum of constituents	264	92·3	182	168	1,207
30	Saturation index	−0·3	+0·8	.....	+0·1	+0·3
	Remarks		*See also Station No. 16A.	**See also Athabasca River at Station No. 9, Table III.		

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

Beaverlodge, Alta.	Dawson Creek, B.C.					Edson, Alta.		Fairview, Alta.		
Wells	Kiskatinaw River					Wells		Small Lakes		
Raw and finished water	Raw water	Finished water				Raw and finished water		Raw and finished water		
Town tap	——	Town tap				Town tap		Town tap		No.
†		.....	Feb. 12/51	Oct. 5/51	Aug. 5/52	†	Sept. 25/51	†	Aug. 6/52	1
.....		.....	9:31	11:34	9:14	.....	9:34	.....	13:15	2
.....		.....	4·4	13·3	14·4 (58)	.....	11:1	.....	13·9	3
.....		.....	22·0	22·3 (11)	27·7 (16)	.....	23·3	.....	24·7 (22)	4
.....		7·8	7·7	8·2 (8·2)	8·3 (8·2)	.....	7·8	.....	7·1 (7·1)	5
.....		10	10	5 (25)	40 (50)	.....	1	.....	100 (125)	6
.....		.....	3	5 (clear)	10 (5)	.....	0·4	.....	2 (<5)	7
.....	*See*	.....	.....	.....	7·4	.....	.....	.....	.....	8
.....	Station No. 47	.....	.....	.....	3·0	.....	.....	.....	.....	9
1414	Table II,	370	361	.....	251	476	442	365	289	10
.....	page 40	36·0	44·4	.....	110	.....	44·0	.....	112	11
.....		.....	594	385	376	.....	725	.....	393 (385)	12
.....		90·7	90·7	58·2	56·9	60·1	51·1	63·6	52·6	13
.....		24·8	23·8	14·3	14·2	28·6	20·5	17·6	12·4	14
.....		.....	.....	.....	0·4	.....	.....	.....	.....	15
.....		trace	0·23	.....	0·14	.....	0·02	trace	0·61	16
.....		2·5	12·4	5·4	5·2	85·2	98·0	2	4·5	17
		as Na	1·0	1·2	1·0	as Na	2·8	as Na	16·0	18
0		0	0·0	4·8 (0)	5·3 (0·7)	.....	0	0	0 (0)	19
1098		476	397	222 (234)	204 (204)	.....	478	158	178 (190)	20
200		17·3	17·8	30·9	29·3	35·2	25·7	97	44·2	21
9		trace	0·0	2·5 (2·1)	2·6	6·1	2·8	2	6·6	22
.....		.....	0·0	.....	0·2	.....	0·1	.....	.....	23
.....		trace	0·0	0	0·2	0	0·1	0	1·0	24
.....		7·2	6·3	2·8 (2)	3·6	.....	8·5	3	8·9	25
60		328	324	190 (192)	176 (178)	.....	211·5	130	146 (156)	26
0		0	0	14·0 (14·8)	24·3 (26·5)	.....	0	130	36·2 (31·2)	27
60		328	324	204 (207)	200 (205)	267	211·5	260	182 (187)	28
.....		377	348	230	220	.....	443	.....	234·5	29
.....		+0·9	+0·7	+0·8	+0·9	.....	+0·6	.....	−0·4	30

Remarks: †1951 Report of Dept. of Economic Affairs of Alberta.

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

No.										
	Municipality	Fort Smith, N.W.T.								
	Source(s)	Slave River*								
	Sampling point	Raw water								
		From river direct					From sump well alongside river*			
1	Date of collection		**Nov. 13/46	Oct. 1/49	July 7/50	Oct. 23/51	July 7/50	April 7/51	July 9/51
2	Storage period (days)		.....	123	17	18	17	131:132	38:44
3	Sampling temperature, °C		.....	.....	.....	0	.....	1·1	17·2
4	Test temperature, °C		.....	19·0	.....	23·3	.....	24·0	24·0
5	pH		8·35	9·0	.....	7·7	.....	8·2	7·5
6	Colour		25	10	.....	10	.....	10	25
7	Turbidity		.....	20	.....	65	.....	1	25
8	Suspended matter, dried at 105°C		16	70	.....	81	.....	.....	119
9	Suspended matter, ignited at 550°C		12	62	.....	73	.....	.....	106
10	Residue on evaporation, dried at 105°C		140	147	.....	125	.....	1,198	147
11	Ignition loss at 550°C		16·0	18·0	.....	12·8	.....	257	58·4
12	Specific conductance (micromhos at 25°C)	*See* Station	.....	240	.....	214	.....	1,615	234
13	Calcium (Ca)	No. 11,	26·1	29·4	.....	25·4	.....	123	31·1
14	Magnesium (Mg)	Table II,	6·2	5·8	.....	6·3	.....	20·0	5·8
15	Iron (Fe) Total	page 20.	.....	.....	.....	.....	.....	.....	.....
16	Dissolved		0·7	0·02	.....	0·09	.....	0·05	0·20
17	Sodium (Na)	.....	8·0 as Na	11·2	.....	8·5	.....	183	5·8
18	Potassium (K)			0·9	.....	1·4	.....	3·0	1·7
19	Carbonate (CO_3)		44·4	16·8	2·4	0	0	1·2	0
20	Bicarbonate (HCO_3)		.....	72·7	102·5	86·9	122	172	114
21	Sulphate (SO_4)		16·9	23·9	23·7	18·0	64·3	133	17·0
22	Chloride (Cl)		12·0	10·9	4·0	10·9	193	375	4·3
23	Fluoride (F)		.....	0·15	.....	0·30	.....	0·10	0·30
24	Nitrate (NO_3)		0·0	0·0	.....	0·2	.....	0·0	1·2
25	Silica (SiO_2) Colorimetric		6·4	4·4	.....	4·3	.....	9·8	3·8
26	Carbonate hardness, as $CaCO_3$		73·9	87·6	88·0	71·2	100	141	93·0
27	Non-carbonate hardness, as $CaCO_3$		16·7	9·7	10·0	18·1	126	268	8·5
28	Total hardness, as $CaCO_3$		90·6	93·7	98·0	89·3	226	409	102
29	Sum of constituents		.....	141	.....	118	.....	933	127
30	Saturation index		.....	+0·9	.....	−0·5	.....	+0·9	−0·5
	Remarks: * Slave River water usually mixed at sump well with ground water.		**Not a Dept'l. analysis.			Low flow.		Very low river flow.	Medium river flow.

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

Fort Smith, N.W.T.												
Slave River*												
Raw water			Finished water									
For sump well alongside river			After filters			Plant tap			Plant tap†			No.
Aug. 19/51	Oct. 23/51	Feb. 13/51	July 10/51	Aug. 19/51	Oct. 24/51	Nov. 30/51	Dec./51	Jan. 11/52	Mar. 31/52	Apr. 30/52	June 1/52	
23:24	18	7:7	37:38	23:24	15:40	368:400	338:370	308:346	259:294	229:264	198:233	2
19·4	1·1	2·8	12·8	.....	1·7	3·3	4·4	4·4	0	0·6	12·2	3
23·8	23·3	25·0	24·0	23·8	23·3	21·9	19·8	19·8	19·8	19·8	19·8	4
7·1	7·6	7·1	7·8	7·3	7·6	7·6	7·5	7·5	7·7	7·3	7·4	5
30	8	5	5	2	5	slight	0	0	0	0	0	6
30	75	7	1	0·7	2	slight	0	slight	slight	considerable	slight	7
83	119	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
69	109	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
176	171	.....	774	440	.....	.....	.....	.....	.....	.....	.....	10
63·6	25·2	.....	163	75·0	.....	.....	.....	.....	.....	.....	.....	11
225	280	2,330	1,112	684	1,014	835	1,234	1,557	496·4	852	501	12
31·4	29·9	179	73·4	62·3	76·2	66·2	92·3	118	49·9	63·4	43·6	13
7·3	6·9	27·0	22·4	11·5	13·0	13·4	17·0	21·3	11·6	11·4	7·4	14
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
0·90	0·14	.....	0·03	0·06	.....	.....	.....	.....	.....	.....	.....	16
4·8	16·2	284	109	57·0	125	79·7	128	162	34·0	91·0	41·0	17
0·6	1·4	29·2	2·6	0·5	0·3	2·0	2·4	2·0	1·0	6·0	0·8	18
0	0	0	0	0	0	0	0	0	0	0	0	19
114	89·1	212	132	115	127	120	126	164	160	108	82·0	20
17·2	23·5	186	92·6	68·3	104	87·2	114	147	61·7	128	69·1	21
6·0	27·6	573	230	119	207	151	259	323	46·0	139	72·0	22
.....	0·30	0·20	0·10	0·15	.....	.....	.....	.....	.....	.....	.....	23
2·4	0·2	0·2	0·0	.....	0·1	.....	.....	0·8	1·2	0·8	0·6	24
3·3	3·6	6·3	6·8	4·1	4·2	.....	.....	.....	.....	.....	.....	25
93·6	73·0	174	108	94·0	104	98	103	134	131	88·2	67·2	26
14·8	30·0	383	167	109	140	122	197	249	41·6	117	72·1	27
108	103	557	275	203	244	220	300	383	172	205	139	28
130	154	1,389	602	379	529	458	674	855	284	493	275	29
−0·9	−0·5	+0·1	+0·2	−0·4	0	−0·2	−0·1	+0·1	+0·1	−0·4	−0·7	30
Medium river flow.	Low river flow.		Medium river flow.						† No chlorine being used.			

77913—5

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

No.			
	Municipality		
	Source(s)	Muskwa River	
		Raw and finished water	
	Sampling point	At tap	
1	Date of collection	Feb. 1955*	April 6/55
2	Storage period (days)		27:35
3	Sampling temperature, °C		1·7
4	Test temperatures, °C	room	24·4
5	pH	7·4	8·0
6	Colour		0
7	Turbidity		10
8	Suspended matter, dried at 105°C	trace	4·9
9	Suspended matter, ignited at 550°C		2·1
10	Residue on evaporation, dried at 105°C	281	314
11	Ignition loss at 550°C		36·8
12	Specific conductance (micromhos at 25°C)		515
13	Calcium (Ca)	63·2	66·2
14	Magnesium (Mg)	18·5	17·4
15	Iron (Fe) Total		
16	Dissolved		0·08
17	Sodium (Na)		15·0
18	Potassium (K)		1·0
19	Carbonate (CO_3)	0	0
20	Bicarbonate (HCO_3)	207	246
21	Sulphate (SO_4)		68·5
22	Chloride (Cl)	4	1·3
23	Fluoride (F)		0·00
24	Nitrate (NO_3)		0·2
25	Silica (SiO_2) Colorimetric	5	4·8
26	Carbonate hardness, as $CaCO_3$	170	202
27	Non-carbonate hardness, as $CaCO_3$	64·0	135
28	Total hardness, as $CaCO_3$	234	337
29	Sum of constituents		296
30	Saturation index		+0·7
31	Copper (Cu)		0·0
32	Aluminum (Al)		0·06
33	Manganese (Mn)		0·01
	Remarks: † Army Camp.	*Data supplied by water-treatment firm.	

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

Fort Nelson, B.C.†							
Wells							
Raw water		Finished water**					
At wells		At Central Heating Plant tap					No.
Jan. 1956	April 25/56	Sept. 22/55	Dec. 15/55	Jan./56	April 25/56	June 4/56	1
.....	9:15	7:54	.....	.....	9:15	29:64	2
0·6	.....	.....	.....	.....	.....	16·7	3
24·1	24·1	22·3	21·8	24·2	24·1	23·3	4
7·3	6·9	8·2	8·3	8·1	8·3	8·0	5
5	10	5	10	5	10	5	6
high △	very high △	.....	.....	1	.....	0·9	7
140	.....	.....	.....	.....	.....	.....	8
.....	.....	.....	.....	.....	.....	.....	9
1,295	.....	.....	.....	819	.....	754	10
86	.....	.....	.....	66·0	.....	80·8	11
1,640	1,457	1,006	1,142	1,039	1,119	943·9	12
332	286	184	194	164	180	132	13
50·4	44·9	22·1	40·6	41·0	51·2	40·5	14
43	.....	.....	.....	.....	.....	0·26	15
0·09	.....	0·05	.....	0·08	.....	0·18	16
8·3	7·0	7·3	8·3	8·3	7·0	7·0	27
3·0	2·7	3·0	3·2	30	2·7	2·7	18
0	0	0	0	0	0	0	19
684	615	145	208	132	263	130	20
472	372	445	488	475	376	381	21
0·7	0·4	0·2	1·0	0·7	0·6	0·8	22
0·00	.....	0·10	.....	0·15	.....	0·00	23
1·2	2·4	1·2	1·6	1·6	3·2	4·0	24
11	11	7·7	5·2	4·1	6·7	3·9	25
561	505	119	170	108	216	106	26
475	393	130	481	471	442	390	27
1,036	898	549	651	579	658	496	28
1,217	1,029	742	844	763	757	636	29
+1·0	+0·4	+1·0	+1·2	+0·8	+1·4	+0·6	30
0·0	.....	0·0	.....	0·0	.....	0·0	31
0·0	.....	0·03	.....	0·28	.....	0·25	32
1·1	high	0·02	.....	0·05	.....	0·04	33

△Precipitated iron.

**Lime-softened.

77913—5½

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

No.	Municipality	Grande Prairie, Alta.				Grimshaw, Alta.	
	Source(s)	Bear Creek (River)				Spring	
		Raw water	Finished water			Raw and finished water	
	Sampling point	—	Town tap			—	Town tap
1	Date of collection	Oct. 4/51	Oct. 4/51	Nov. 16/53†	Jan. 11/54†	**	Aug. 6/52
2	Storage period (days)	12:32	12:32				13:19
3	Sampling temperature, °C	6·7	11·1				11·1
4	Test temperature, °C		22·3 (15·0)				24·7
5	pH	7·7 (8·0)	7·3 (7·0)	7·8	7·0		7·4 (7·0)
6	Colour	25 (50)	2 (15)				5 (15)
7	Turbidity	4 (15)	3	2	2		10 (5)
8	Suspended matter, dried at 105 °C	19					28
9	Suspended matter, ignited at 550°C	13					23
10	Residue on evaporation, dried at 105°C	205	188	250	280	414	442
11	Ignition loss at 550°C	60·0	69·2			86	62·6
12	Specific conductance (micromhos at 25°C)	255	280				653 (660
13	Calcium (Ca)	24·8	25·5	40	48		77·1
14	Magnesium (Mg)	7·0	6·8	9·7	9·8		26·2
15	Iron (Fe) Total			0·2	0·1		3·0
16	Dissolved	0·28	0·08				0·04
17	Sodium (Na)	15·0	15·0				18·4
18	Potassium (K)	7·3	7·3				10·2
19	Carbonate (CO_3)	0	0 (0)	0	0	0	0
20	Bicarbonate (HCO_3)	102	68·0 (61·0)	122	159	238	266
21	Sulphate (SO_4)	42·8	73·5	63	71	80	124
22	Chloride (Cl)	1·3	2·1 (2·0)	1·2	trace	3	6·1
23	Fluoride (F)	0·30	0·30				0·25
24	Nitrate (NO_3)	0·8	0·2			0·3	1·4
25	Silica (SiO_2), Colorimetric	4·2	1·7	5·2	2·2		18
26	Carbonate hardness, as $CaCO_3$	83·6	56·0	100	130	195	218 (217)
27	Non-carbonate hardness, as $CaCo_3$	7·1	32·3	40	30	125	82·5 (98·4)
28	Total hardness, as $CaCO_3$	90·7	88·3	140	160	320	300 (315)
29	Sum of constituents	147	166				413
30	Saturation index	−0·4	−1·0				+0·15
	Remarks:			Carbon dioxide—1·8 p.p.m. (field det'n.)	Carbon dioxide—15·8 p.p.m. (field det'n.)	**Analysis by J. A. Kelso, Provincial Analyst.	
				†Data supplied by Alchem Ltd., Burlington, Ontario.			

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

High Prairie, Alta.				Jasper, Alta.	Lac La Biche, Alta.		
Well				Cabin Lake	Lac La Biche		
Raw water		Finished water		Raw and finished water	Raw water	Finished water	
At well		At reservoir		Town tap	At intake	Town tap	No.
March 3/54	April 27/54	March 3/54	April 27/54	August 26/51	April 9/53	April 9/53	1
9:29	10	9:29	10	13:33	8:26	8:26	2
7·2	7·2	6·7	7·8	10·0	1·1	2·2	3
22·2	.....	22·2	.....	19·2	21·7	21·7	4
8·0	8·4	7·8	.....	7·6	7·9	8·3	5
120	.....	110	.....	5	15	10	6
10	.....	7	.....	3	0·5	0·5	7
18	.....	6·7	.....	.....	.....	.....	8
7·1	.....	3·6	.....	.....	.....	.....	9
879	.....	871	.....	103	215	221	10
161	.....	164	.....	35·0	59·2	70·0	11
1,123	.....	1,127	.....	155	334	336	12
36·0	35·5	35·3	.....	19·3	35·4	36·5	13
20·3	20·6	20·2	.....	7·2	13·5	12·5	14
.....	3·8	.....	1·66	.....	.....	.....	15
.....	.....	.....	.....	0·01	0·11	0·09	16
200	.....	202	.....	3·3	16·0	18·0	17
7·2	.....	7·2	.....	0·7	4·1	4·3	18
0	9·1	0	.....	0	0	0	19
557	529	552	.....	82·7	180	199	20
3·1	.....	3·3	.....	15·0	15·2	13·4	21
115	.....	130	.....	1·8	3·7	5·2	22
.....	.....	.....	.....	0·10	0·05	0·15	23
0·0	.....	3·2	.....	0·0	0·6	0·6	24
8·8	.....	9·3	.....	6·2	2·6	1·7	25
173	174	171	.....	67·8	144	143	26
0	0	0	.....	10·0	0	0	27
173	174	171	.....	77·8	144	143	28
665	.....	682	.....	94·2	185	191	29
+0·7	.....	+0·5	.....	−0·8	+0·15	+0·6	30
Manganese (Mn)=0·0		Mn=0·0					

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

No.	Municipality	Mercoal, Alta.	Norman Wells, N.W.T.			
	Source(s)	Mercoal Creek	Bosworth Creek*			
		Raw and finished water	Raw and finished water			
	Sampling point	Town tap	Town tap, old Canol camp			
1	Date of collection	March 16/54	March 17/54	Feb./56	May 4/56	Oct. 11/56
2	Storage period (days)	9:51	11:20	.....	20	46:40
3	Sampling temperature, °C	.....	4·4	.....	.....	.....
4	Test temperature, °C	21·7	16·4	24·0	21·4	23·4
5	pH	8·2	8·1	8·5	8·5	8·2
6	Colour	10	5	5	0	20
7	Turbidity	0·9	0	.....	0	.....
8	Suspended matter, dried at 105°C	.....	.....	.....	.....	.....
9	Suspended matter, ignited at 550°C	.....	.....	.....	.....	.....
10	Residue on evaporation, dried at 105°C	194	825	368	621	.....
11	Ignition loss at 550°C	21·4	114	66·4	198	.....
12	Specific conductance (micromhos at 25°C.)	326	1,202	554	863	623
13	Calcium (Ca)	39·3	137	68·6	105	74·9
14	Magnesium (Mg)	8·8	42·7	26·2	37·6	27·4
15	Iron (Fe) Total	.....	.....	.....	.....	.....
16	Dissolved	0·04	0·02	0·02	0·02	0·00
17	Sodium (Na)	20·2	58·4	12·6	30·0	16·5
18	Potassium (K)	1·6	1·7	1·0	1·5	1·0
19	Carbonate (CO_3)	0	0	6·5	2·4	0
20	Bicarbonate (HCO_3)	214	302	195	258	216
21	Sulphate (SO_4)	5·2	298	110	212	128
22	Chloride (Cl)	0·2	69·9	12·6	26·8	16·5
23	Fluoride (F)	0·00	0·20	0·10	0·20	0·20
24	Nitrate (NO_3)	0·8	0·4	0·4	1·6	0·8
25	Silica (SiO_2), Colorimetric	15	5·6	4·8	7·0	4·7
26	Carbonate hardness, as $CaCO_3$	135	248	141	215	177
27	Non-carbonate hardness, as $CaCO_3$	0	270	108	202	122
28	Total hardness, as $CaCO_3$	135	518	279	417	299
29	Sum of constituents	196	763	340	551	376
30	Saturation index	+0·5	+0·1	+1·1	+1·2	+0·0
	Remarks:	Manganese (Mn)=0	Aluminum (Al)..0·17 Manganese (Mn)..0·01 Copper (Cu).....0·00	0·39 0·0 0·06	0·17 0·0 slight trace	0·19 0·0 trace

*Sometimes a mixture with Mackenzie River water.

TABLE IV—Continued

Chemical Analyses of Municipal Water Supplies

A. Mackenzie River Drainage Basin

(In parts per million)

Peace River, Alta.			Rycroft, Alta.	Spirit River, Alta.	Westlock, Alta.		Yellowknife, N.W.T.	
Peace River			—	Spring Run-off	Wells		Great Slave Lake	
Raw water	Finished water		Raw and finished water	Raw and finished water	Raw and finished water		Raw and finished water	
Near plant intake	Town tap		Town tap	Town tap	Town tap		—	No.
	†	Oct. 3/51	May 26/54	Mar. 6/54	†	July 30/52	Feb./19/53	1
	.....	13:33	16:27	11:61	.....	7:12	8:36	2
	.....	10·0	10·0	4·4	.....	10·6	0	3
	.....	22·5 (12)	23·2	21·8	.....	24·3 (24)	25·3	4
	7·9	8·0 (8·2)	7·9	8·6	8·5	8·2 (8·3)	7·1	5
	15	3 (15)	.....	20	40	50	10	6
	0	6 (clear)	30	12	0	0·5 (<5)	1	7
	.....	1·7	59	7·4	.....	.....	.....	8
	.....	0·8	26	4·8	.....	.....	.....	9
	173	218	219	454	869	996	37·2	10
	18	21·0	66·8	60·4	64	49·4	14·2	11
	.....	356	269	682	.....	1,509	55·6	12
	34·0	50·3	32·1	40·3	0	4·6	4·6	13
	8	12·0	9·0	26·2	0	0·3	1·6	14
	.....	0·1	0·40	0·53	0·4	.....	.....	15
See	trace	0·05	.....	0·07	.....	0·19	0·06	16
Station No. 56	10 as Na	10·3	9·2	64·1	345 as Na	400	2·4	17
Table II,		0·9	6·8	11·3		1·5	1·2	18
page 44	0	0 (0)	0	9·6	0	21·6	0	19
	118	178 (173)	133	195	858	925	19·8	20
	35	42·4	31·1	174	0	29·0	5·1	21
	6	2·6 (2·5)	1·6	3·0	32	24·2	1·8	22
	.....	0·00	.....	0·30	.....	.....	0·10	23
	0	0·0	2·4	1·6	0	0·2	0·9	24
	3	2·7	5·0	3·6	5	9·5	1·3	25
	97	146 (142)	109	176	0	12·7	16·2	26
	23	28·9 (32·6)	8·4	32·8	0	0	2·0	27
	120	175 (175)	117	208	0	12·7	18·2	28
	.....	209	164	429	807	947	28·7	29
	.....	+0·4	0	+0·9	.....	+0·25	−2·3	30
	†Dept. of Economic Affairs of Alberta, (1951 report).		Manganese (Mn)=0·18	Manganese (Mn)=0·0	†Dept. of Economic Affairs of Alberta, (1950 report).		*See* also Station No. 13, Table II, page 22.	

TABLE IV—Concluded

Chemical Analyses of Municipal Water Supplies

B. Yukon River Drainage Basin in Canada

(In parts per million)

Municipality	Dawson, Y.T.	Whitehorse, Y.T.						
Source(s)	Wells	McIntyre Creek†				McIntyre Creek mixed with small tributary creek		
	Raw and finished water	Raw and finished water				Raw and finished water		
Sampling point	Town tap	Town taps and taps in Army Camp				Tap in Central Heating Plant, at Army Camp		
Date of collection	June 7/56	Mar. 27/43*	Jan. 1/55	Mar. 9/55	May 5/55	Oct. 12/55	Nov. 30/55	Jan. 3/56
Storage period (days)	10:20	17	15:42	13:47	12:33	12:21	13:29	12:28
Sampling temperature, °C	3·9	.....	17	1·1	2·2	.....	4·4	.....
Test temperature, °C	26·4	.....	17·3	20·6	25·4	21·1	23·1	24·6
pH	7·9	7·9	8·3	8·0	8·6	8·3	8·3	8·7
Colour	10	.....	10	0	10	10	5	5
Turbidity	.....	.....	0	0	6	.....	0	0
Suspended matter, dried at 105°C	.....	.....	.....	.....	.....	.....	.....	.....
Suspended matter, ignited at 550°C	.....	.....	.....	.....	.....	.....	.....	.....
Residue on evaporation, dried at 105°C	.....	208	209	198	.....	.....	.....	.....
Ignition loss at 550°C	.....	83·2	22·4	15·6	.....	.....	.....	.....
Specific conductance (micromhos at 25°C)	225	.....	328	353	360	272	261	274
Calcium (Ca)	28·3	54·8	49·3	50·1	49·5	38·9	37·4	38·8
Magnesium (Mg)	7·4	13·9	12·5	12·9	13·3	9·3	9·8	11·5
Iron (Fe) Total	.....	.....	.....	.....	.....	.....	.....	.....
Dissolved	0·0	.....	0	0·05	.....	.....	.....	.....
Aluminum (Al)	0·05	.....	0·0	0·03	.....	.....	.....	.....
Manganese (Mn)	0·0	.....	0·0	trace	.....	.....	.....	.....
Sodium (Na)	2·4	.....	4·7	3·9	3·0	3·2	3·9	4·5
Potassium (K)	0·5	.....	1·2	1·1	1·5	1·0	1·1	1·1
Carbonate (CO_3)	0	0	0	0	6·6	0	0	12·0
Bicarbonate (HCO_3)	86·5	229	215	222	210	166	162	151
Sulphate (SO_4)	34·4	5·1	8·3	8·0	4·9	9·3	7·3	6·5
Chloride (Cl)	0·1	1·3	0·2	0·1	0·3	0·3	0·4	0·5
Fluoride (F)	0·05	.....	.....	0·10	.....	.....	.....	.....
Nitrate (NO_3)	1·6	0·6	1·0	0·8	0·8	1·6	2·4	0·8
Silica (SiO_2), Colorimetric	8·2	13	15	17	13	16	16	.....
Carbonate hardness, as $CaCO_3$	71·0	18·8	174	178	178	135	133	143
Non-carbonate hardness, as $CaCO_3$	30·0	5·7	0	0	0	0	0	0·6
Total hardness, as $CaCO_3$	101	194	174	178	178	135	133	144
Sum of constituents	126	.....	198	203	196	162	158	211
Saturation index	−0·2	.....	+0·7	+0·4	+1·2	+0·5	+0·6	+1·0
Remarks:	Copper (Cu)–trace Total ammonia–0·1	*Not a Dept'l. analysis. †*See* also Station No. 5y, page 54.	Cu-trace	Cu—0·0		Cu—0·0		

TABLE V

Municipal Water Supplies Within the Mackenzie and Yukon River Drainage Basins

Summary of data on systems, treatment and population served, 1951

Drainage basins	Number of municipal water systems studied					Sources of water for municipal systems						Treatment of water in municipal systems			Approximate population served[b] with water in 1951					Percentage of total population of basin area served with water in 1951.				
	N.W.T.	Y.T.	B.C.	Alta.	Total		N.W.T.	Y.T.	B.C.	Alta.	Total	None	Chlorination	Additional or other treatment	N.W.T.	Y.T.	B.C.	Alta.	Total	N.W.T.	Y.T.	B.C.	Alta.	Total
Mackenzie River	4	0	1	12(3)[a]	17(3)	Ground	.....	.....	.....	5(1)	5(1)	5	.....	0(1)	.....	.....	.....	5,436 (1,141)[c]	5,436 (1,141)					
						Surface	4	.....	1	7(1)	12(1)	2	5(1)	5	3,850	.....	4,589	10,542 (905)	18,981 (905)	39	0	33	13·5	17·1
						Mixed	.....	.....	.....	0(1)	0(1)	.....	0(1)	.....	.....	.....	.....	(553)	(553)					
Yukon River in Canada	0	2	0	0	2	Ground	.....	1	.....	.....	1	1	.....	.....	.....	783	.....	.....	783	.....	38	.....	.....	38
						Surface	.....	1	.....	.....	1	.....	1	.....	.....	2,594	.....	.....	2,594					
						Mixed	.....	.....	.....	.....	0	.....	.....	.....	.....	.....	.....	.....	.....					
Total	4	2	1	12·3	19·3	Ground	.....	1	.....	5(1)	6(1)	6	.....	0(1)										
						Surface	4	1	1	7(1)	13(1)	2	6(1)	5	3,850	3,777	4,589	15,987 (2,599)	27,794 (2,599)					
						Mixed	.....	.....	.....	0(1)	0(1)	.....	0(1)	.....										

[a] Values in brackets refer to additional systems installed in 1952 and 1953.
[b] Does not include all military personnel served in the Territories.
[c] Values in brackets refer to population served by systems installed in 1952 and 1953.

TABLE VI

Municipal Water Supplies Within the Mackenzie and Yukon River Drainage Basins

Summary of data on municipal water hardness

Drainage basin	Number of municipal systems	Numbers of systems served with waters classed as					Approximate population served[c] in 1951 with waters classed as				Percent population served[c] in 1951 that is served with waters classed as				Weighted average hardness (1951) of waters in			
		Type	Soft	Medium hard	Hard	Very hard	Soft	Medium hard	Hard	Very hard	Soft	Medium hard	Hard	Very hard	N.W.T.	Y.T.	B.C.	Alta.
Mackenzie River	17(3)[a]	Ground	3	.....	0(1)[a]	3	2,868	.....	(1,141)[b]	2,568								
		Surface	1	2	4(1)	4	2,725	2,271	7,072 (905)	6,913	23	9	29	39	102	.....	257	127 (170)
		Mixed	.....	.....	.....	0(1)	.....	.....	.....	(553)	.....	.....	.....	.....	.....	.....	.....	.....
Yukon River in Canada	2	Ground	.....	1	.....	.....	.....	783	.....	.....								
		Surface	.....	.....	.....	.....	.....	.....	.....	.....	0	23	0	77	.....	160	.....	.....
		Mixed	.....	.....	.....	1	.....	.....	.....	2,594								
Total	19(3)	Ground	3	1	0(1)	3	2,868	783	(1,141)	2,568								
		Surface	1	2	4(1)	4	2,725	2,271	7,072 (905)	6,913	20	11	25·5	43·5				
		Mixed	.....	.....	.....	1(1)	.....	.....	.....	2,594 (553)								

[a] Values in brackets refer to additional systems installed in 1952 and 1953.
[b] Values in brackets refer to population served by systems installed in 1952 and 1953.
[c] Does not include all military personnel in army camps.

DISCUSSION

It is not proposed to discuss in detail all the data recorded in this report, especially the analytical data tabulated in Tables II, III and IV as the interpretation and usefulness of the information varies so widely with reader interest. However, most surface waters in the basins, although not highly mineralized, do contain more dissolved matter than is found in waters from many other areas of Canada, such as the coastal area of British Columbia and the Canadian Shield. This mineralization is essentially carbonate hardness and the waters range generally from medium hard to the lower limit of very hard when classified as follows:

Soft water	Below 61 p.p.m. total hardness as $CaCO_3$
Medium hard water	61-120 p.p.m. total hardness as $CaCO_3$
Hard water	121-180 p.p.m. total hardness as $CaCO_3$
Very hard water	Greater than 180 p.p.m. total hardness as $CaCO_3$

Tables II and III show that those rivers with headwaters in the calcareous Rocky Mountains or northern extensions of them, are generally medium hard in character. In many there is a notable seasonal variation that is probably caused by the rapid run-off from melting mountain snows and glaciers. Some sections of these rivers periodically carry considerable sediment, as indicated by their high turbidity.

Drainage from the east or from the Canadian Shield is not extensive but is generally a softer water, low in mineralization and typical of surface waters found on the Shield. The larger lakes of this region are usually soft and clear unless, like Lesser Slave Lake, they are situated in or fed by drainage from the lowlands or plains region.

Waters of the Yukon system show considerable variation, mainly in carbonate hardness, ranging from soft to hard waters with an estimated average total hardness range of 60 to 90 p.p.m. as $CaCO_3$.

Table I and Figure I clearly show the large size and undeveloped nature of the basins covered by this report. These basins together drain about 91 percent of Yukon Territory and about 23 per cent of Northwest Territories, an area almost one-quarter the area of Canada. However only about 151,820 persons inhabit this area, a little over 1 per cent of Canada's population; 87 per cent of them live in the northern parts of British Columbia, Saskatchewan and Alberta, mostly in the Peace River district of Alberta. Of the 25,000 persons living in these river basins in the Territories, only about one-quarter are white, the remainder being Eskimos and Indians.*

Tables II and III and Figure 2 emphasize the incomplete coverage of water quality in these basins. However, it is believed that these studies are sufficient to show the general chemical quality of the river waters at present most important, and to indicate the quality of water in many lakes and rivers nearby which have not yet been studied.

Figure 3 is a graphical presentation of summer water hardness along the Mackenzie River system. Similar plotting of "average" hardness at various points usually shows a higher hardness but the trend is, in general, similar to the values plotted from data obtained from the summer water samples. There is an increase in hardness as the medium hard waters from the Cordilleran region flow through the lowlands and Alberta plateau. Those rivers flowing just north of the North Saskatchewan River basin show similar changes, but the main Mackenzie River system does not maintain or increase hardness; rather there is a decrease in hardness in the Slave and Mackenzie Rivers caused probably by the inflow of softer waters from the Canadian Shield and by the effect of the large soft-water lakes.

Rivers rising in the Cordilleran region such as Liard, Nahanni etc., do not greatly increase the main river hardness. It is not until the harder waters of the far northern rivers, Arctic Red and Peel, enter the flow that significant changes occur, and at its mouth, waters of the Mackenzie River become quite hard. The wide variability, not only in waters from different rivers but from season to season in most rivers, coupled with the limited data available, confuse the interpretation of effects of each on the main river. Rivers such as McLeod and Pembina, rising in the same locale as the North Saskatchewan, do show hardness characteristics similar to the North Saskatchewan but these harder waters are somewhat balanced by the Peace River which, rising in the interior plateau of British Columbia, is in general a softer water throughout its length, even though it does have some southern tributaries with high hardness, viz; Kiskatinaw River.

From the limited data available on the Yukon River system, it appears to increase slightly in hardness as it flows through the interior plateau, probably because of the inflow of harder water (Stewart River) from the eastern mountain ranges. It is assumed that waters of the Bell River and other northern tributaries are similar in quality to those of Arctic Red and Peel Rivers.

* Since survey work was started in these basins, a considerable increase in population has doubtless occurred because of new defence installations. A survey of water quality at a number of these bases is now under way.

Figure 4, the graphical presentation of changing mineralization in the Athabasca River shows relationships which are typical of many other rivers in these basins. The specific conductance (total dissolved solids content) is paralleled almost identically by total hardness, illustrating that the principal dissolved salts are hardness salts. Deviations in this curve are generally due to an increased sodium sulphate content. The variation in mineral content is quite marked with a peak (higher solids and total hardness) in May and an extreme high in December. The curve of river discharge almost mirrors the curve for conductivity, although there is a lag because a rapid drop in flow is not immediately shown by an increased solids content. High discharge is noted in June after a low in May as conductivity increases. The discharge decreases fairly constantly to a low in January when high conductivity is again noted. This indicates that there may be a local discharge in April followed by decreasing flow until melting snow and ice fields in the mountains cause increased flow of a lower mineralized water around June. From then on, flow steadily decreases to a low around December and January. Turbidity follows generally the curve of discharge, being highest in June but never abnormally high.

Figure 5 shows the variability in chemical quality of the Mackenzie River at Fort Simpson. Discharge records at this point were not available. Despite the many tributaries entering the main river, the Mackenzie maintains a surprisingly constant quality, the only major change being a rapid decrease in total mineral matter in late April when, presumably, spring break-up occurs and the river is affected by run-off from melting snow and ice. Once again carbonate hardness is the main mineral constituent, as evidenced from the similarity of the curves for total hardness, conductivity, sum of constituents and non-carbonate hardness.

Figure 6 shows the relationship between flow and mineral content in the large tributary river, Liard River at Watson Lake, Yukon Territory, at a location well upstream within the Cordilleran region. This river shows increasing mineralization with decreasing discharge to a peak in November. The discharge continues low until its rise with the spring run-off in late April and May at which time total mineralization correspondingly decreases. However, during December and January of 1952-53, there was a decided drop in mineralization which was not reflected in increased discharge. This may be due to some local condition of melting ice and snow; for example, flow from harder tributary streams perhaps decreased in proportion to inflow from melting snow, or from a softer tributary stream. The drop may not be common to all years.

Table V, which summarizes some of the data on municipal systems, illustrates again the heavy settlement in the Alberta part of the basin. Although there is a greater municipal use of surface waters than ground waters, this is not as great as would be expected from the ready availability of surface waters. However, the smallness of many of the systems and the necessity for chlorination or treatment for turbidity or colour in the surface waters, is no doubt the major reason for use of ground waters.

Table VI indicates that a large proportion of these ground waters are soft, or at least as soft as the surface waters. Treatment of supplies is generally by chlorination, although a number of surface waters require treatment for turbidity and colour removal and several should be softened for many industrial uses. The population served is small but considering the extent of the area, a relatively large percentage is served, partly because population is centered in a few areas. This table clearly shows the increased hardness of waters in these basins; of 12 surface water systems, 9 are supplied with hard to very hard water, and 68 per cent of the population served receives hard to very hard water. In the Yukon basin the larger system, at Whitehorse, uses a hard water and greatly influences the limited data. However, the weighted average hardness of waters, served in all areas except British Columbia (one system only) is not excessively high.

SUMMARY

The large area of Canada covered by this report is at present of minor industrial importance but does have available adequate supplies of surface waters suitable for most industrial and municipal uses without extensive treatment.

Many waters of the area have not yet been studied but surface water quality in the areas studied varies rather markedly with location and season; in general, these waters are medium hard to hard. Many will require treatment for turbidity during times of high discharge, and others should be softened for certain uses. Available information on ground waters indicates many of these may be more suitable than surface waters for use by smaller communities.

Municipal use and also industrial use of waters in more northern areas of the basins is complicated by the low winter temperatures and the permanently frozen condition of the ground which necessitates location of systems on the surface with heating of the water during the winter months. In other more southern areas the systems must be deeply buried.

It is expected that additional information on water quality within these basins will be obtained, particularly information on trace elements and heavy metals that may be of assistance in locating mineral deposits.

APPENDIX A

Surface Water Sampling Locations

A. Mackenzie River Drainage Basin

APPENDIX A—Concluded

Surface Water Sampling Locations—Concluded

B. Yukon River Drainage Basin

ERRATA

Page 76, *delete* lines 7 to 15, and *substitute:*

1	Athabasca Glacier, Columbia Icefield	14
9	Athabasca River at Athabasca, Alta.	18
3	" " at Athabasca Falls, Alta.	14
7	" " near Blue Ridge, Alta.	16
10	" " at Fort MacMurray, Alta.	20
4	" " at Jasper, Alta.	14
6	" " at Pedley, Alta.	16
8	" " near Smith, Alta.	18
5	" " near Snaring, Alta.	16

Page 76, *delete* lines 8 to 13 (from bottom) and *substitute:*

15A	Mackenzie River at Fort Good Hope, N.W.T.	28
15	" " near Fort Norman, N.W.T.	26
13A	" " at Fort Providence, N.W.T.	24
14	" " at Fort Simpson, N.W.T.	24
16A	" " at New Aklavik, N.W.T.	28
16	" " at Peel Channel at Aklavik, N.W.T.	28

APPENDIX B

Municipal Water Systems in the Mackenzie River and Yukon River Drainage Basins

—		Data Page	Analysis Page
A. Mackenzie River Basin.			
1	Aklavik, N.W.T., (and New Aklavik)	56	62
2	Athabasca, Alta	56	62
3	Barrhead, Alta	57	62
4	Beaverlodge, Alta	57	63
5	Dawson Creek, B.C	57	63
6	Edson, Alta	56	63
7	Fairview, Alta	56	63
8	Fort Smith, N.W.T	56	64
*9	Fort Nelson, B.C	56	66
10	Grande Prairie, Alta	56	68
11	Grimshaw, Alta	58	68
12	High Prairie, Alta	58	69
13	Jasper, Alta	59	69
14	Lac La Biche, Alta	59	69
15	Mercoal, Alta	59	70
16	Norman Wells, N.W.T	58	70
17	Peace River, Alta	58	71
18	Rycroft, Alta	59	71
19	Spirit River, Alta	59	71
20	Westlock, Alta	59	71
21	Yellowknife, N.W.T	60	71
B. Yukon River Basin.			
1	Dawson, Y.T	61	72
†2	Whitehorse, Y.T	61	72

* Military system not included in statistics.
† Also supplies military camp.

CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS

MINES BRANCH

FIGURE 2

LOCATION OF SURFACE WATER SAMPLING STATIONS AND MUNICIPAL WATER SUPPLIES MACKENZIE AND YUKON RIVERS DRAINAGE BASINS

LEGEND

Municipal Systems

Total Hardness as ppm $CaCO_3$

- 0-60
- 61-120
- 121-180
- Over 180

Sampling Stations

- Monthly Sampling
- Spot Sampling
- Location of place names

Boundary of drainage basins

SCALE IN MILES
25 0 50 100

TO ACCOMPANY MINES BRANCH REPORT NO. 856

CARTOGRAPHY BY THE GEOGRAPHICAL BRANCH, M.&T.S. 1958