#43

TECHNICAL REPORT TO THE
PPWB COMMITTEE ON HYDROLOGY

NATURAL FLOW

DETERMINATION OF IRRIGATION RETURN FLOW IN SOUTHERN ALBERTA

PREPARED BY:

DEPARTMENT OF ENVIRONMENT
WATER SURVEY OF CANADA
ATMOSPHERIC ENVIRONMENT SERVICE

SYNOPSIS

The depletion of naturally flowing watercourses is subject to regulation under terms of the Apportionment Agreement between the Prairie Provinces and the Government of Canada. The responsibility for monitoring the apportionment, as set out by the Agreement, rests with the Prairie Provinces Water Board. Methods used to compute the pertinent flows, consequently, must be sanctioned by the Board. On the basis of natural flow studies the Project Depletion method has been approved for calculation of the natural flow of the South Saskatchewan River at the Alberta - Saskatchewan boundary. The Project Depletion method determines irrigation useage as the difference between measured diversion and irrigation return flow.

In the past, return flow of water taken from the Oldman River system above Lethbridge has been estimated as a percentage of the diversion. The percentage figures were proposed by those with practical experience in irrigation. A series of spot field measurements was made during the 1971 and 1972 irrigation seasons in order to more accurately determine this component of flow. The data was then assembled and analyzed using multiple regression techniques. The results of this analysis indicated that monitoring of flow at nine key return flow channels would be adequate to estimate total return flow.

In the future, estimates of total return flow could be made by appli-

cation of regression equations to data from the nine index gauging stations. The average deviation of these estimates should be less than fifteen per cent. The quality checking procedure presented in the recommendations is intended to maintain the accuracy of return flow estimates on a continuing basis. If anomalies occur it will be necessary to carry out a series of spot field measurements and possibly relocate some index stations.

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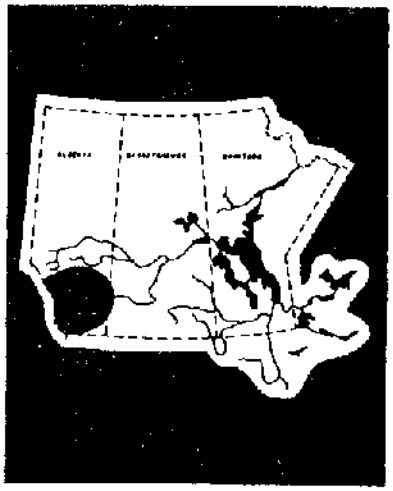
INTRODUCTION

South Saskatchewan River natural flows are calculated using the Project Depletion method. The recorded flow at the point of apportionment is adjusted for all upstream storage and consumptive use of water. The result is a value for natural flow. The consumptive use for an irrigation project is equal to the total water diverted to it less any water returned through surface channels to the stream(s) of origin. Prior to the measurement program, consumptive use for the St. Mary River Irrigation District (S.M.R.I.D.), Taber Irrigation District (T.I.D.), Lethbridge Northern Irrigation District (L.N.I.D.) and several smaller projects was estimated by applying arbitrary usage factors to figures for the gauged diversions. Virtually no measurement of total irrigation return flow from these areas had been made before the initiation of this study.

There are approximately one hundred significant return flow channels distributed along two hundred miles of the Oldman and South Saskatchewan Rivers. It would be impractical to build streamflow gauges on all channels. Similarities in irrigation techniques should result in similar return flow characteristics in many areas. A few channels could, therefore, be representative of the total return flow from a specific area. If this is the case a gauging network of reasonable proportions can produce reliable estimates of total return flow. A measurement program of return flow was conducted during 1971 and 1972. The data was analyzed using multiple regression techniques with the objective to identify key return flow index stations which could be established and used to make reliable estimates of the total return flow from the area.



FIELD PROGRAM

The major return flow channels were identified from topographical or irrigation development maps. Next, a reconnaissance trip was made, mainly by boat along the Oldman and South Saskatchewan Rivers. A procedure was then worked out whereby all return flows could be monitored while making best use of road and river access. A complete check of all return flows was carried out approximately every three weeks during the 1971 and 1972 irrigation seasons. The irrigation season in this area usually extends from the first week of May to the third week of October. Adjustments in the schedule were made so that monitoring would correspond with representative periods of the growing season. Each set of measurements was carried out over a period of five to ten days. Reference maps, Plates 1 - 4, show the location of the data points. Record was also obtained for diversions and main feeder canals with existing streamgauging facilities. Data collected during the program is listed in Appendix A.

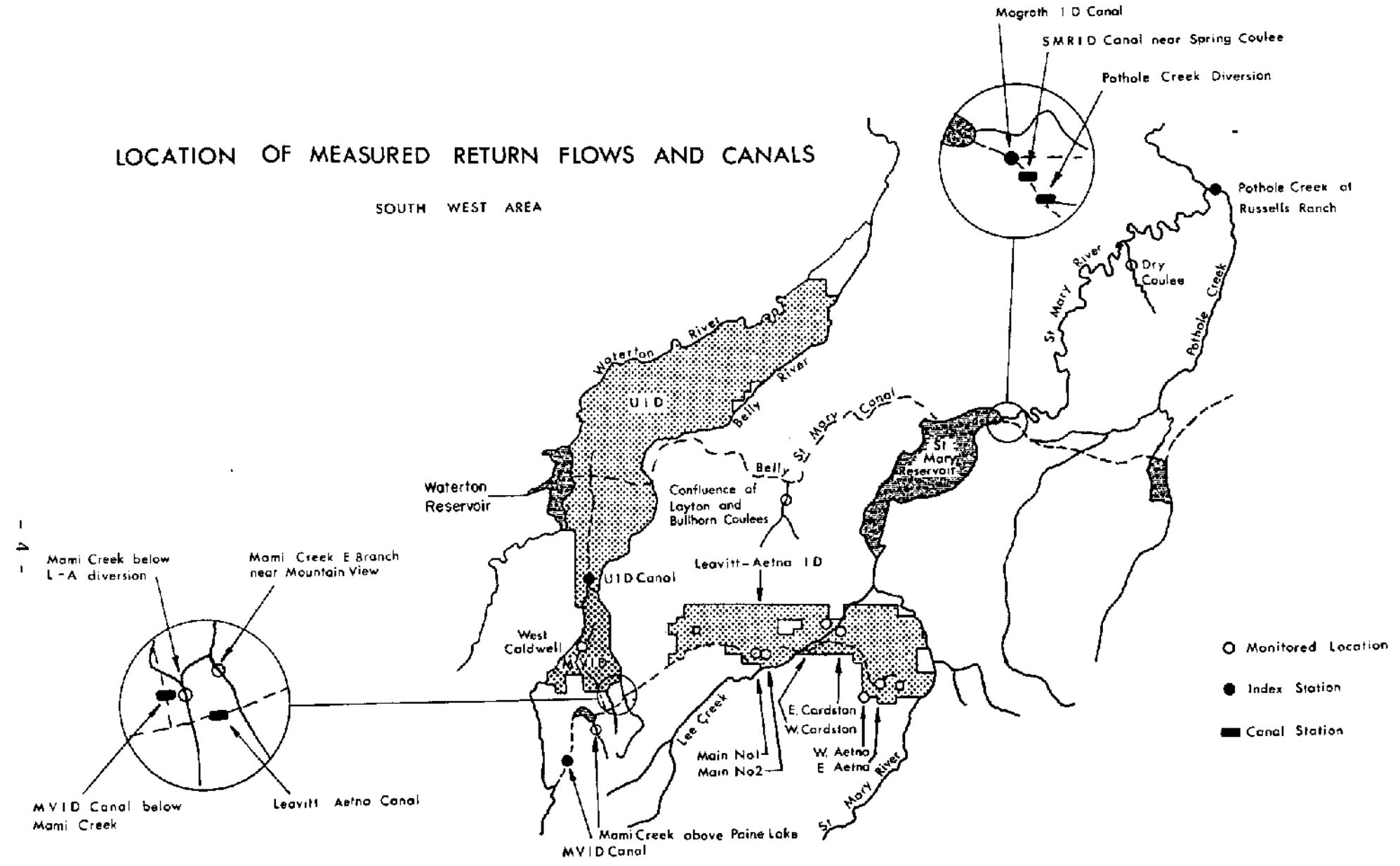

LOCATION OF MEASURED RETURN FLOWS AND CANALS
SOUTH WEST AREA
Magrath I D Canal
S M R I D Canal near Spring Coulee
Pothole Creek Diversion
Pothole Creek at Russells Ranch
St Mary River
Dry Coulee
Pothole Creek
Waterton River
U I D
Belly River
St Mary Canal
St Mary Reservoir
Belly
Waterton Reservoir
Confluence of Layton and Bullhorn Coulees
Leavitt-Aetna I D
U I D Canal
West Caldwell
M V I D
Lee Creek
Main No1
Main No2
E. Cardston
W. Cardston
W. Aetna
E Aetna
St Mary River
Mami Creek below L-A diversion
Mami Creek E Branch near Mountain View
M V I D Canal below Mami Creek
Leavitt Aetna Canal
Mami Creek above Paine Lake
M V I D Canal
Monitored Location
Index Station
Canal Station

PLATE NO. 1

LOCATION OF MEASURED RETURN FLOWS AND CANALS

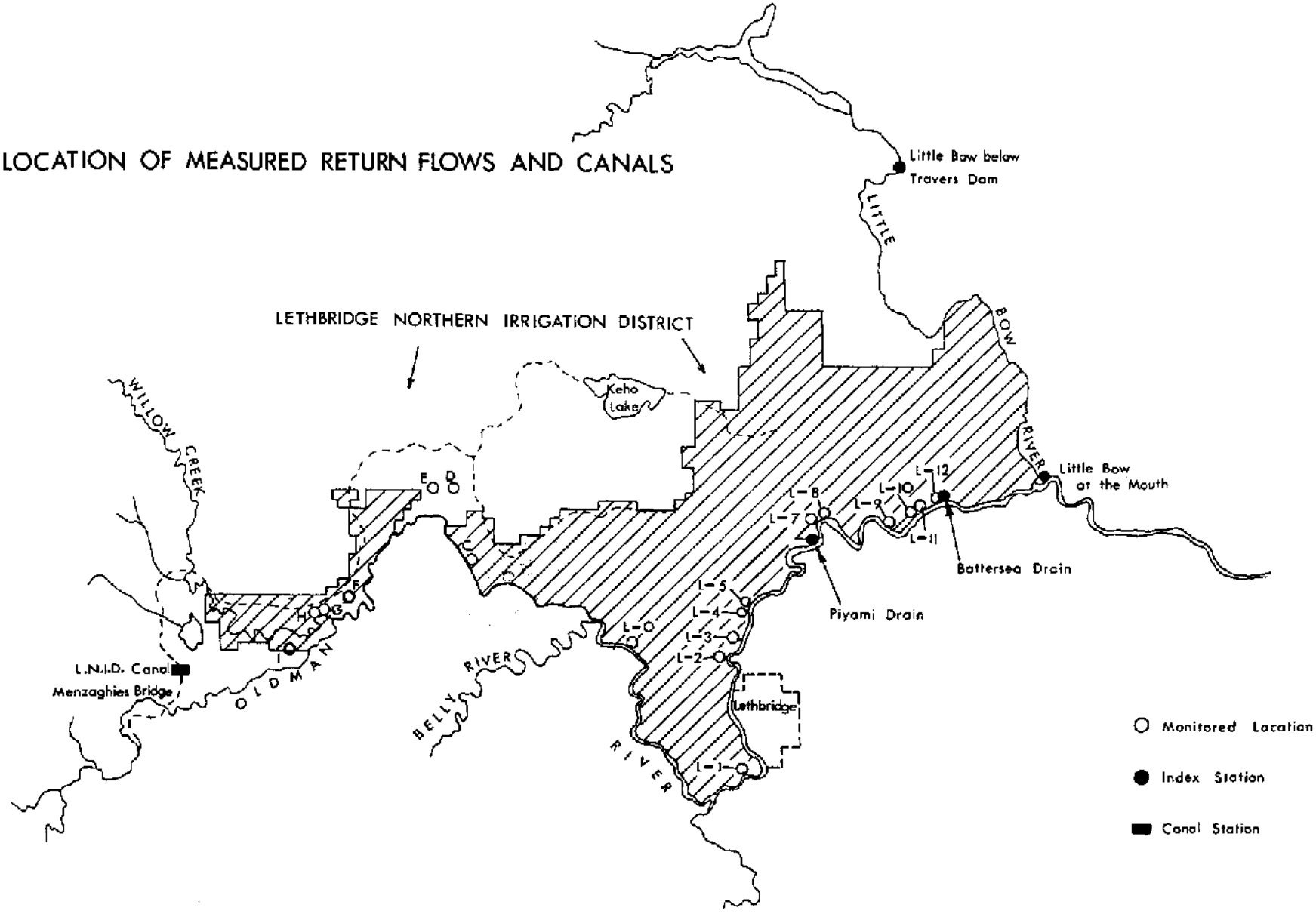


PLATE NO. 2

LOCATION OF MEASURED RETURN FLOWS AND CANALS

MAGRATH I.D., RAYMOND I.D., S.M.R.I.D. WEST SECTION

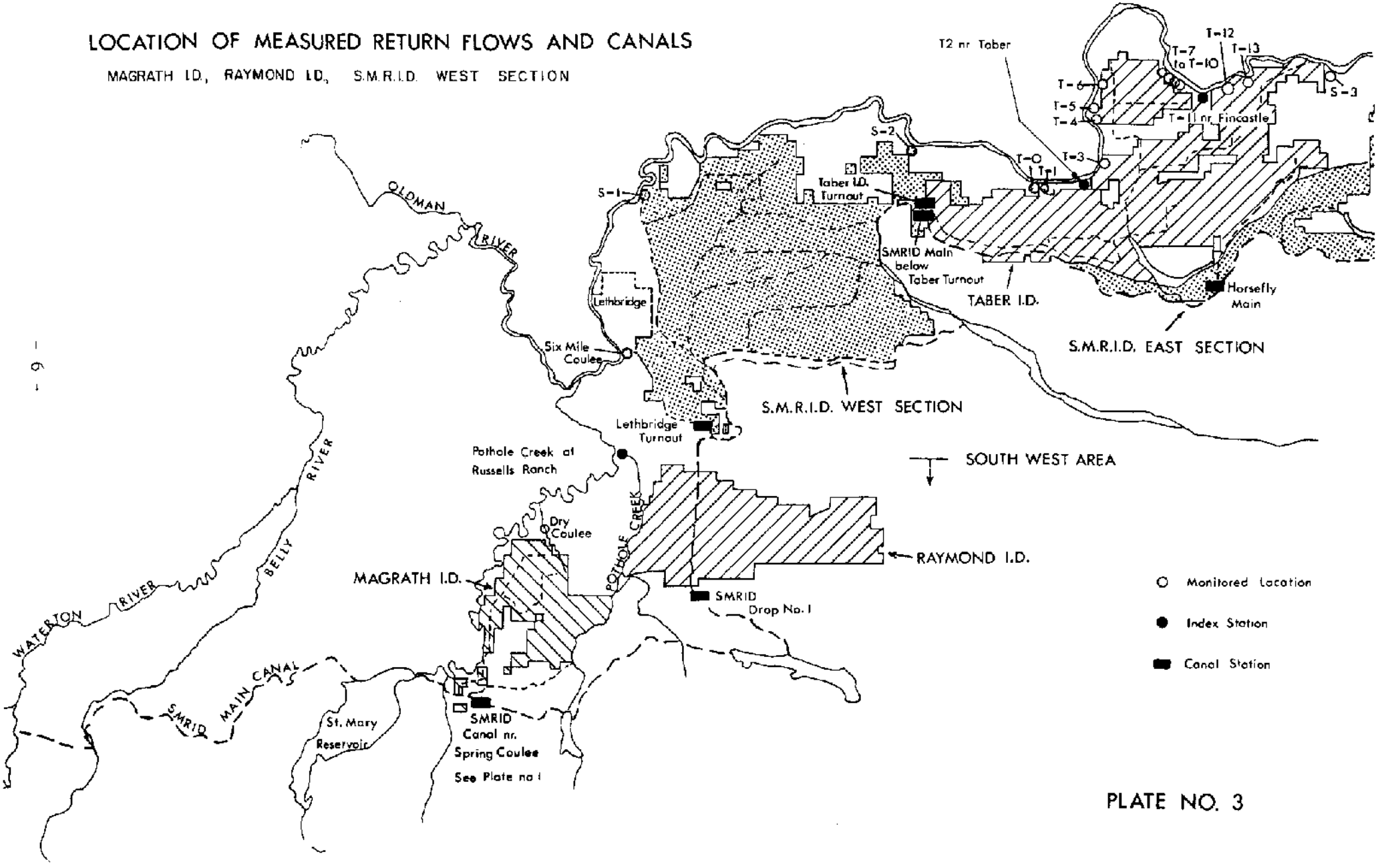


PLATE NO. 3

LOCATION OF MEASURED RETURN FLOWS AND CANALS

S.M.R.I.D. EAST SECTION

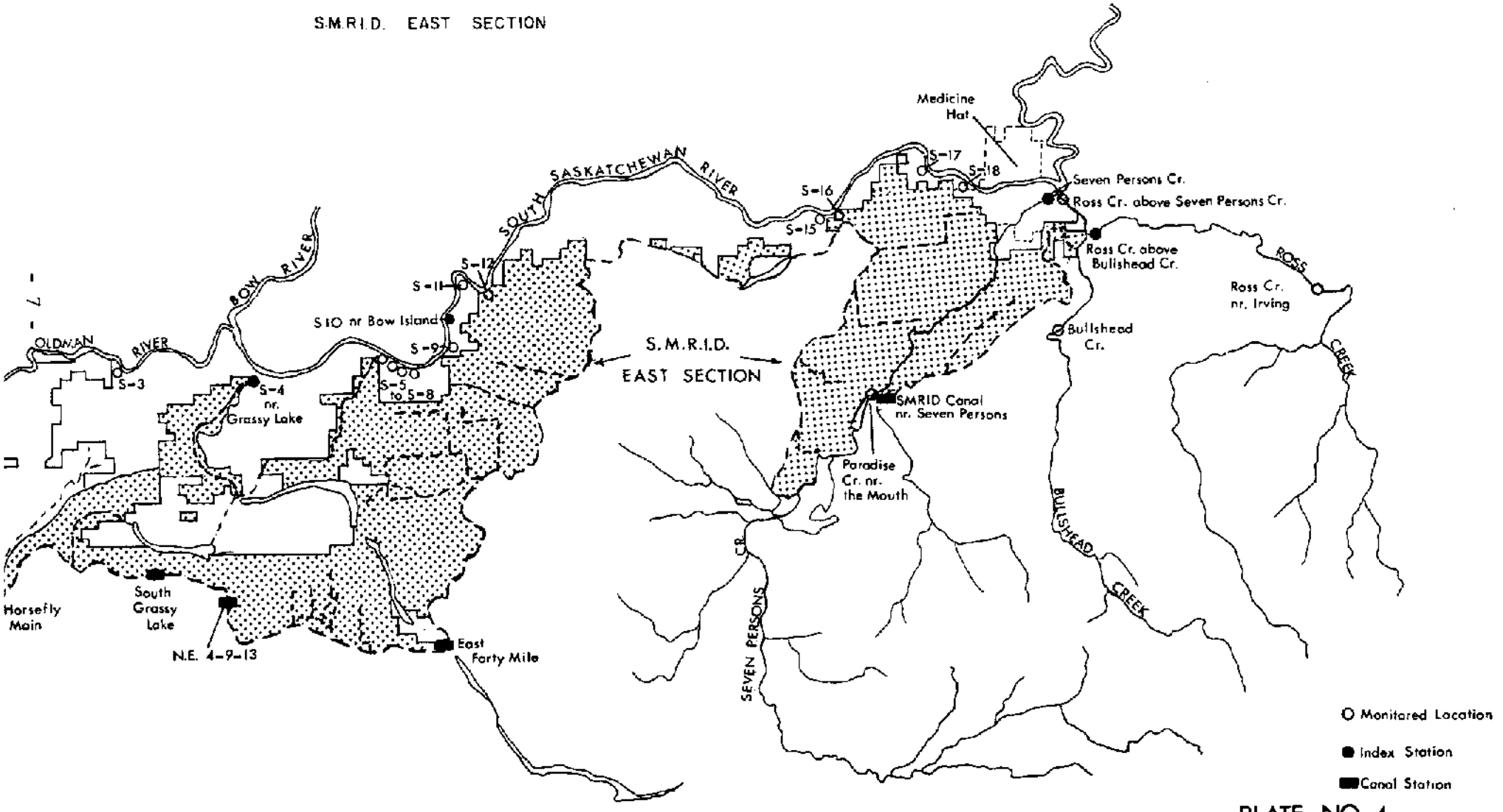


PLATE NO. 4

CONSIDERATIONS FOR REGRESSION ANALYSIS

The program used for the multiple regression analysis was obtained from the Saskatchewan Department of Environment and was modified to fit the CSC Univac 1108 system. Other information can be obtained from Saskatchewan Department of Environment Program Documentation WR-03-02.

Ideally, regression equations for total return flow should be derived using monthly, rather than seasonal, data. The monthly data should produce superior equations because the variation in water use, as the crops develop, may be more closely simulated. The two-year measurement program produced only thirteen sets of return flow data. Due to this data limitation it was necessary to carry out the analysis on a seasonal basis. The St. Mary irrigation system is very large and initially was broken down into several sub-areas for regression analysis. The remaining projects were treated as individual units. Major diversions and main canal flows are shown in Appendix A, Tables 4-71 (pg. A-7) and 4-72 (pg. A-13) and were included in the data regression analysis since they could possibly relate to return flow. A summary of regressions using various input variables can be found in Appendix B. Consistency of the regression equations was examined by first running the 1971 and 1972 data separately and then combined.

An on-site inspection of all index locations which were indicated by preliminary analysis was then carried out. Many of these proved unsuitable

RESULTS OF THE REGRESSION ANALYSES

Tables 2 and 3 are listings of the regression analyses which were used to verify the selection of index gauging networks for the major irrigation projects. The standard per cent deviation of total return flow calculated by the equations given in Tables 2 and 3 is less than 7%. The majority of water used within the large block of Southern Alberta being considered is diverted by the St. Mary River, Taber and Lethbridge Northern Irrigation Districts. The Magrath, Raymond, United, Mountain View and Levitt-Aetna Irrigation Districts, combined, account for only about 10% of the total diversion from the Oldman River System. Complete monitoring of return flow from the smaller Districts was not carried out during the measuring program. The extra expense required to produce sufficient data for regression analysis of this relatively small portion of return flow was not felt to be worthwhile. No attempt was made to assess the complex return flow pattern of the United Irrigation District. It is reasonable to assume that consumptive use in the United Irrigation District is similar to that in the Mountain View - Levitt-Aetna Districts. The Mountain View Irrigation District canal supplies both the Mountain View and Leavitt-Aetna Districts. The data that was obtained from these areas is listed in Appendix A, Table 5-72. This data was extrapolated and adjusted for release from internal storage. Monthly figures for return flow as a percentage of the diversion were then com-

Table 2

Results of Multiple Regression Analysis

Return Flow from Lethbridge Northern Irrigation District

(1972 Data in CFS)

DEPENDENT VARIABLE IS L.N.I.D. TOTAL RETURN FLOW (Y)

1972 MEAN = 113.4 STANDARD DEVIATION = 15.0

INDEPENDENT VARIABLES		MEAN	STANDARD DEVIATION
X_1	Piyami Drain	20.5	6.7
X_2	Little Bow Diff.	47.1	12.2
X_3	Battersea Drain	16.6	5.3

RESULTS OF REGRESSION ANALYSIS

Coefficient of Multiple Correlation = 0.90

Standard Error of Estimate (cfs) = 9.17

Standard Deviation (per cent) = 5.37

REGRESSION EQUATION

$$Y = 42.0 + 0.841X_1 + 0.800X_2 + 0.994X_3$$

TABLE OF RESIDUALS

Case	Y Measured	Y Estimated	% Deviation
1	103.0	104.1	+ 1.1
2	128.0	118.9	- 7.1
3	113.0	119.3	+ 5.6
4	131.0	135.5	+ 3.5
5	118.0	116.4	- 1.4
6	114.0	106.1	- 6.9
7	87.0	93.6	+ 7.6

Table 3

Results of Multiple Regression Analysis

Return Flow from St. Mary River I.D. + Taber I.D.

(1971 and 1972 Data in CFS)

DEPENDENT VARIABLE IS S.M.R.I.D. + T.I.D. TOTAL RETURN FLOW (Y)

1971-72 Mean = 178.6 Standard Deviation = 45.3

Independent Variables	Mean	Standard Deviation
X_1 Bountiful Coulee	16.2	7.4
X_2 Drain T-2	9.1	3.5
X_3 Drain T-11	4.7	2.4
X_4 Drain S-10	5.3	3.3
X_5 Seven Persons Creek	32.5	16.1

Results of Regression Analysis

Coefficient of Multiple Regression = 0.96

Standard Error of Estimate (cfs) = 16.91

Standard Deviation (per cent) = 6.84

Regression Equation

$$Y = 40.7 + 1.252X_1 + 4.545X_2 + 6.913X_3 + 3.165X_4 + 0.841X_5$$

Table of Residuals

Case	Y Measured	Y Estimated	% Deviation
71-1	179.0	182.7	+ 2.1
71-2	209.0	214.4	+ 2.6
71-3	267.0	236.4	-11.5
71-4	176.0	180.9	+ 2.8
71-5	173.0	189.3	+ 9.4
71-6	123.0	109.0	-11.4
72-1	117.0	118.9	+ 1.6
72-2	229.0	225.3	- 1.6
72-3	203.0	211.6	+ 4.2
72-4	195.0	207.2	+ 6.3
72-5	194.0	191.2	- 1.4
72-6	141.0	128.0	- 9.2
72-7	116.0	127.0	+ 9.5

puted. The percentage values are given in Tables 4 and 5.

The combined error due to measurement and regression analysis will therefore be near to, or slightly above, the 15% figure set as a goal. The desired level of accuracy for estimated return flow has been attained while the number of index gauging sites has been kept to a minimum.

RECOMENDATIONS AND CONCLUSIONS

The methods which are recommended to estimate total return flow from the irrigation districts under study are given in Tables 4 to 7.

Table 4

Mountain View - Leavitt-Aetna and United Irrigation Districts

Method for Determination of Return Flow	Streamflow Record Required	Return Flow = Respective Diversion x Indicated Monthly Per Cent Factor				
		June	July	Aug.	Sept.	Oct.
As a percentage of their respective monthly diversions	Mountain View I.D. Canal United I.D. Canal	90	60	40	40	60

Table 5

Magrath and Raymond Irrigation Districts

Method for Determination of Return Flow	Streamflow Record Required	Return Flow = Respective Diversion x Indicated Monthly Per Cent Factor				
		June	July	Aug.	Sept.	Oct.
As a percentage of Magrath I.D. monthly diversions plus 100% Pothole Coulee recorded flow.	Magrath I.D. Canal. Pothole Coulee at Russell's Ranch	40	25	20	40	60

Table 6

Lethbridge Northern Irrigation District

Method for Determination of Return Flow	Streamflow Record Required	Regression Equation (All Figures: Monthly Acre-Feet)
Recorded monthly flows from index stations are substituted into the regression equation.	Piyami Drain. Battersea Drain. Little Bow River below Travers Dam and near Mouth	Return Flow = 42.0 + 0.841 x Piyami Drain - 0.800 x Little Bow below Travers Dam + 0.800 x Little Bow near the Mouth + 0.994 x Battersea Dr.

Table 7

St. Mary River and Taber Irrigation Districts

Method for Determination of Return Flow	Streamflow Record Required	Regression Equation (All Figures: Monthly Acre-Feet)
Recorded monthly flows from index stations are substituted into the regression equation.	Bountiful Coulee near Cranford. Drain T-2 near Taber. Drain T-11 near Fincastle. Drain S-10 near Bow Island. Seven Persons Creek at Medicine Hat.	Return Flow = 40.7 + 1.252 x Bountiful Coulee + 4.545 x Drain T-2 + 6.913 x Drain T-11 + 3.165 x Drain S-10 + 0.841 x Seven Persons Creek

The total diversion to the St. Mary River Irrigation System (Magrath, Raymond, Taber and St. Mary River Irrigation Districts), excluding the Magrath Irrigation Canal, is measured by the gauging station on the main canal at Spring Coulee. The total return flow of this water, excluding flow through Pothole Coulee, is given by the regression equation of Table 7. The gauge on Pothole Coulee records all return flow from the Raymond District plus direct return flow from an unmonitored diversion out of the St. Mary Canal.

Return flow to the Little Bow River from the Lethbridge Northern Irrigation District is computed as the difference in flow of the river between Travers Dam and the mouth.

The preceding procedure will permit estimation of return flow within about ±15%. The error in irrigation consumptive use which is used in the calculation of natural flow for apportionment will increase very slightly as a result of the return flow estimating procedure. The gauging error in the measured diversion is accepted to be ±5.0%. The probable error in the calculated consumptive use will increase from ±5.0% to ±5.2%.

To maintain future reliability of the estimated return flows, the following checking procedure for the regression equations is recommended. Values of return flow as a percentage of diversion are listed in Tables 8 and 9 for dry, normal and wet seasons. These figures were derived by relating results of the measurement program to past record from the Eastern and Bow River Irrigation Districts. The percentages are presented as a guide to indicate when field checks may be required. The total estimated monthly (or seasonal) return flow given by the regression equations should first be computed as a percentage of the diversion. The St. Mary River, Magrath, Raymond and Taber Districts should be combined for this computation. Diversion will be the sum of the flow recorded by the main canal gauge at Spring Coulee and the Magrath I.D. canal. Return flow will be the sum resulting from the procedures of Tables 5 and 7. Judgment must be exercised to classify the current moisture conditions for the irrigated area to which the table applies. To aid in assessing the monthly moisture condition Table 10 can be used as a guide. The corresponding monthly (or seasonal) percentage return flow value is then selected from Table 8 or 9. Some interpolation will usually be required to select an appropriate value. If the table percentage value is significantly different from that computed using the regression equations, a change in irrigation patterns is indicated. May and October return flow values tend to be more erratic since the dates when water distribution begins and ends may be influenced by systems operation and maintenance rather than irrigation demand. A field check should be initiated only if the diverging trend in the two percentage figures persists for two or more months or if the seasonal values vary markedly. In this case a further series of measurements would then be required to adjust the regression equations to suit the altered conditions.

Table 8

Lethbridge Northern Irrigation District

Reliability Guide for Regression Equation

Type of Season	Return Flow = Flow at Menzaghies Bridge x Indicated Monthly Per Cent Factor						
	May	June	July	August	September	October	Seasonal
Dry	6	16	16	15	30	40	16
Normal	6	24	24	22	50	60	24
Wet	15	30	30	30	65	80	35

Table 9

St. Mary River Irrigation District

Reliability Guide for Regression Equation

Type of Season	Return Flow = Flow at Main Canal at Spring Coulee x Indicated Monthly Per Cent Factor						
	May	June	July	August	September	October	Seasonal
Dry	5	5	4	2	5	10	4
Normal	10	15	12	13	20	30	16
Wet	15	30	20	17	25	40	25

Table 10

Indicator of Monthly Irrigation Conditions

All figures based on mean inches of rainfall at Lethbridge, Vauxhall and Medicine Hat.	Sum of previous season's rainfall May 1st to Oct. 31st plus sum of current season's rainfall May 1st to end of month being examined.			Current season's rainfall May 1st to end of month being examined.
	June	July	August	September
Wet Conditions if above	18.7	21.1	23.4	11.5
Dry Conditions if below	13.2	14.5	15.0	6.7

DETERMINATION OF IRRIGATION RETURN FLOW IN SOUTHERN ALBERTA

NATURAL FLOW

APPENDICES

MARCH 1974

APPENDIX A
MEASUREMENT DATA SUMMARY

Table 1-71

Lethbridge Northern Irrigation District

Miscellaneous Measurement Summary – 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge
Return Flow "B"	14th	0.0	15th	0.0	9th	0.0	3rd 23rd	0.0 0.0	15th	0.10
Return Flow "C"	14th	0.1	15th	0.0	9th	1.6	3rd 23rd	0.05 0.02	15th	0.24
Return Flow "D"	14th	1.1	15th	0.0	9th	0.15	3rd 23rd	0.57 0.84	15th	1.6
Return Flow "E"	14th	0.0	15th	0.13	9th	0.0	3rd 23rd	0.0 0.0	15th	0.0
Return Flow "F"	14th	0.0	15th	0.0	9th	0.0	3rd 23rd	0.05 0.02	15th	0.10
Return Flow "G"	14th	0.0	15th	0.0	9th	0.0	3rd 23rd	0.0 0.0	15th	0.0
Return Flow "H"	14th	0.0	15th	0.0	9th	0.0	3rd 23rd	0.0 0.0	15th	0.1
Return Flow "I"	14th	2.4	15th	0.0	9th	0.30	3rd 22nd	1.3 1.6	15th	4.6
Return Flow "L"							22nd	0.05	14th	0.05
Return Flow "M"							22nd	0.10	14th	0.05
Return Flow "N"							22nd	2.0	14th	0.17
Return Flow "O"							22nd	32.7	14th	13.8
Return Flow "P"							22nd	3.9	14th	0.08
Return Flow "Q"							22nd	0.0	14th	0.0
Return Flow "R"							22nd	0.0	14th	0.05
Return Flow "S"							22nd	0.05	14th	0.23

Note: Stations "L" to "Z" are accounted as Little Bow River at Mouth minus Little Bow River below Travers Dam in the 1972 record.

Table 1-71 (cont'd.)

Lethbridge Northern Irrigation District

Miscellaneous Measurement Summary — 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
Return Flow "T"							22nd	0.86	14th	0.46
Return Flow "U"							22nd	0.05	14th	0.05
Return Flow "V"							22nd	0.0	14th	0.0
Return Flow "W"							22nd	0.02	14th	0.05
Return Flow "X"			15th	5.2	6th	6.3	1st 22nd	0.79 0.10	14th	1.4
Return Flow "Y"					6th	12.6	1st 22nd	12.1 11.4	14th	11.4
Return Flow "Z"					6th	0.03	1st 22nd	2.6 5.4	14th	3.0
Return Flow L-0	14th 22nd	0.33 0.0	19th	0.0	9th	0.0	3rd 24th	0.47 0.53	15th	0.40
Return Flow L-1	22nd	3.2	19th	0.53	9th	3.1	3rd 24th	3.2 6.5	15th	4.5
Return Flow L-2	23rd	0.02	15th	0.14	10th	0.03	3rd 24th	1.1 0.17	15th	0.20
Return Flow L-3	23rd	0.0	15th	0.27	10th	0.04	3rd 24th	0.0 0.28	15th	1.6
Return Flow L-4	23rd	0.0	15th	0.25	10th	0.0	3rd 24th	0.0 0.0	15th	0.0
Return Flow L-5	23rd	5.9	15th	7.5	10th	13.0	3rd 24th	12.4 10.9	15th	3.0
Return Flow L-6	23rd	14.2	15th	21.4	10th	32.7	3rd 24th	19.4 18.5	15th	18.4
Return Flow L-7	23rd	2.07	15th	7.21	10th	6.26	3rd 24th	2.0 12.3	15th	10.9
Return Flow L-8	23rd	0.53	15th	0.0	10th	0.0	3rd 24th	0.0 0.0	15th	0.0

Table 1-71 (cont'd.)

Lethbridge Northern Irrigation District

Miscellaneous Measurement Summary — 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge
Return Flow L-9	23rd	4.5	15th	5.4	10th	0.77	3rd 23rd	1.3 0.28	15th	4.3
Return Flow L-10	23rd	0.27	15th	0.86	10th	1.5	3rd 23rd	0.0 0.13	15th	0.0
Return Flow L-11	23rd	0.63	15th	2.8	10th	1.4	3rd 23rd	0.13 1.7	15th	1.2
Return Flow L-12	24th	0.30	16th	0.13	6th	0.25	3rd 24th	0.30 0.47	15th	0.11
Return Flow L-13	24th	8.5	15th	28.5	6th	14.8	3rd 24th	15.4 32.1	15th	15.0
Additional Unspecified Flows from L-0 to L-13	23rd	0.54	15th	0.24	10th	0.58	3rd 24th	0.58 0.28	15th	1.2

Table 2-71

Taber Irrigation District

Miscellaneous Measurement Summary — 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
T-0	24th	33.7	16th	48.8	6th	23.1	7th 23rd	31.6 12.9	13th	33.9
T-1	24th	5.03	16th	8.9	6th	8.7	7th 23rd	5.7 9.6	13th	12.4
T-2	24th	10.0	16th	10.9	12th	12.7	7th 23rd	11.9 10.3	14th	9.1
T-3	16th	0.04	14th	1.5	5th 31st	7.7 5.3	21st	11.0	13th	9.9
T-4	16th	2.5	14th	0.01	5th 31st	1.6 0.05	21st	0.05	13th	0.05
T-5	16th	2.6	14th	0.0	5th 31st	0.22 0.0	21st	0.20	13th	0.10
T-6	16th	0.54	14th	1.2	5th	2.0	1st 21st	0.05 0.0	13th	0.21
T-7	16th	0.0	14th	2.8	5th	2.4	2nd 22nd	1.4 1.0	14th	0.02
T-8	18th	3.3	14th	2.8	5th	2.5	2nd 22nd	4.3 5.5	14th	0.45
T-9	18th	1.5	14th	5.2	5th	16.5	2nd 22nd	4.8 6.3	14th	4.5
T-10	18th	3.7	14th	4.5	5th	3.8	2nd 22nd	4.2 6.7	14th	0.98
T-11	18th	5.2	14th	3.5	5th	6.2	2nd 22nd	6.5 6.0	14th	1.1
T-12	18th	0.73	14th	0.0	5th	0.0	2nd 22nd	0.0 4.5	14th	0.54
T-13	18th	3.4	14th	5.0	5th	14.2	2nd 22nd	11.6 6.7	14th	5.9
Additional Unspecified Flows from T-0 to T-13	18th	0.13	14th	0.17	5th	2.0	2nd 22nd	3.1 1.2	14th	0.01

Table 3-71

St. Mary River Irrigation District

Miscellaneous Measurement Summary — 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge
S-1	23rd	1.3	15th	0.0	10th	0.0	3rd 24th	0.0 0.0	15th	0.0
S-2	24th	1.8	16th	3.0	6th	5.8	7th 23rd	4.3 2.7	14th	0.16
S-3	18th	1.7	14th	2.3	5th	2.1	2nd 22nd	1.5 1.7	14th	3.0
S-4	24th	8.4	14th	6.3	5th 31st	2.6 11.1	21st	2.9	13th	0.09
S-5	17th	5.6	13th	2.2	4th 31st	14.4 3.9	21st	5.8	13th	9.0
S-6	17th	0.05	13th	10.5	4th 31st	3.9 1.5	21st	0.20	13th	3.9
S-7	17th 24th	0.11 0.62	13th	0.21	4th 31st	0.39 0.24	21st	0.49	13th	0.63
S-8	24th	3.9	13th	6.9	4th 31st	12.0 6.8	21st	11.7	13th	6.2
S-9	17th	3.3	13th	0.13	4th 31st	4.2 5.2	21st	1.7	13th	4.1
S-10	17th	2.9	13th	9.6	4th 31st	8.3 3.8	21st	6.0	13th	1.2
S-11	17th	1.7	13th	2.8	4th 31st	2.0 2.2	21st	2.8	13th	2.1
S-12	17th	3.3	13th	2.6	4th 31st	5.9 2.0	21st	0.0	13th	0.0
S-13	17th	5.3	13th	9.8	4th 31st	8.0 2.5	21st	4.7	13th	1.0
S-14			13th	2.3	4th 31st	2.3 0.02	21st	0.0	13th	1.0
S-14A			12th	0.09	3rd 31st	0.97 0.70	20th	1.9	12th	0.10
S-15			12th	0.46	3rd 30th	0.0 0.05	20th	0.02	12th	0.0

Table 3-71 (cont'd.)

St. Mary River Irrigation District

Miscellaneous Measurement Summary — 1971 Return Flow in CFS

Station	June		July		August		September		October	
	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge	Date	Dis-charge
S-16			12th	0.31	3rd 30th	0.21 1.2	20th	0.11	12th	0.16
S-17	15th	1.4	12th	0.34	3rd 30th	0.54 0.0	20th	0.02	12th	4.1
S-18	15th	0.08	12th	1.0	3rd 30th	0.10 1.2	20th	3.5	12th	1.3
I	15th	36.8	12th	41.5	3rd 30th	50.0 13.8	20th	30.8	12th	3.3
II	15th	24.4	12th	15.0	3rd 30th	30.1 19.1	20th	16.0	12th	14.5
III	15th	11.6	12th	3.5	3rd 30th	3.0 2.6	20th	4.5	12th	21.1
IV	15th	0.15	12th	0.26	3rd 30th	0.06 0.05	20th	0.22	12th	0.12
V	15th	0.0	12th	0.0	3rd 30th	0.0 0.0	20th	0.05	12th	0.0
Bountiful Coulee near Cranford	23rd	17.4	15th	27.7	8th	21.4	5th 23rd	14.0 12.3	15th	10.2
Six Mile Coulee near Lethbridge	23rd	10.6	15th	10.0	8th	11.2	5th 23rd	7.0 5.6	15th	6.8
Additional Unspecified Flows from S-1 to S-18	23rd	0.07	13th	0.05	4th	0.90	3rd 21st	1.1 0.05	13th	0.0

Table 4-71

Miscellaneous Measurement Summary

1971 Diversions and Canal Flows Used in Regression Analysis (cfs)

Station	June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
LNID Total Diversions	23rd	319	16th	508	8th	555	4th 23rd	370 208	15th	249
SMRID Forty Mile	19th	368	13th	379	4th 30th	649 234	21st	209	13th	218
SMRID N.E. 4-9-13	19th	412	13th	468	4th 30th	745 280	21st	247	13th	285
SMRID Horsefly Main	19th	534	13th	557	4th 30th	868 342	21st	302	13th	347
SMRID Chin Main	19th	909	13th	916	4th 30th	1,350 605	21st	463	13th	448
SMRID Main Canal East	23rd	389	15th	940	8th	931	5th 23rd	508 604	15th	361
SMRID Lethbridge Turnout	23rd	593	15th	606	8th	510	5th 23rd	307 237	15th	283

Table 1-72

Lethbridge Northern Irrigation District

Miscellaneous Measurement Summary – 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
Return Flow "B"	26th	0.0	21st	0.18	13th	0.36			29th	0.10	20th	0.14
Return Flow "C"	25th	0.85	21st	0.12	13th	0.14	2nd	0.10	29th	0.24	20th	0.10
Return Flow "D"	26th	1.5	21st	0.17	13th	0.19	2nd 31st	0.86 1.7	29th	1.6	20th	0.98
Return Flow "E"	26th	0.73	21st	0.05	13th	0.0			29th	0.15	20th	0.0
Return Flow "F"	26th	0.05	21st	0.0	13th	0.05			29th	0.02	20th	0.02
Return Flow "G"	26th	0.0	21st	0.0	13th	0.0			29th	0.0	20th	0.12
Return Flow "H"	26th	0.0	21st	0.0	13th	0.0			29th	0.0	20th	0.0
Return Flow "I"	29th	0.37	21st	0.30	13th	0.98	31st	1.3	29th	0.33	20th	0.31
Return Flow "J"	26th	0.0	21st	0.0	13th	0.0	2nd 31st	0.0 1.1	29th	0.0	20th	0.0
Little Bow River at the Mouth	25th	96.1	20th	83.6	12th	63.4	3rd 30th	80.3 61.7	28th	47.3	19th	45.7
Little Bow River below Travers Dam	25th	45.5	20th	33.1	12th	28.0	3rd 30th	11.1 10.4	28th	10.4	19th	9.7
Little Bow R. at Mouth minus Little Bow River below Travers Dam	25th	50.6	20th	50.5	12th	35.4	3rd 30th	69.2 51.3	28th	36.9	19th	36.0
Return Flow L-0	29th	0.0	21st	0.01	12th	0.26	3rd 31st	0.0 0.0	29th	1.6	20th	0.91
Return Flow L-1	29th	3.0	21st	4.2	12th	0.47	3rd 31st	2.5 5.1	29th	0.01	20th	1.5
Return Flow L-2	29th	0.0	21st	1.7	13th	0.90	3rd 31st	0.36 0.27	28th	0.0	19th	0.0
Return Flow L-3	29th	0.0	21st	0.43	13th	0.0	3rd 31st	0.29 0.0	28th	0.0	19th	0.01
Return Flow L-4	29th	0.0	21st	0.0	12th	0.0	3rd 31st	0.40 0.0	28th	0.0	19th	0.0

Note: Stations "L" to "Z" are accounted as Little Bow River at Mouth minus Little Bow River below Travers Dam in the 1972 record.

Table 1-72 (cont'd.)

Lethbridge Northern Irrigation District

Miscellaneous Measurement Summary – 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
Return Flow L-5	29th	15.5	21st	22.5	13th	9.9	3rd 31st	1.4 12.4	28th	21.1	19th	6.9
Return Flow L-6	29th	11.9	21st	26.9	13th	31.1	3rd 31st	20.0 21.0	28th	16.3	19th	16.0
Return Flow L-7	30th	5.7	21st	4.8	13th	5.6	3rd 31st	6.5 1.5	28th	8.3	19th	12.4
Return Flow L-8			21st	0.03	13th	0.0	3rd 31st	0.0 0.0	28th	0.0	19th	0.0
Return Flow L-9	30th	0.29	21st	0.02	13th	1.1	3rd 31st	3.5 1.9	28th	5.2	19th	0.11
Return Flow L-10	30th	0.91	21st	0.36	13th	0.0	3rd 31st	0.0 0.1	28th	0.0	19th	0.0
Return Flow L-11	30th	0.09	21st	1.2	13th	0.73	3rd 31st	0.0 3.3	28th	0.35	19th	0.58
Return Flow L-12	26th	0.12	22nd	0.15	13th	0.11	4th	0.23	1st 28th	0.23 0.16	19th	0.26
Return Flow L-13	25th	11.7	22nd	14.0	13th	23.0	4th 30th	21.5 15.8	28th	21.0	19th	9.4
Additional Unspecified Flows from L-0 to L-13	26th	0.41	21st	0.77	13th	3.12	4th 31st	4.19 2.2	28th	0.37	19th	1.86

Table 2-72

Taber Irrigation District

Miscellaneous Measurement Summary — 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
T-0	26th	17.1	22nd	45.6	13th	28.4	4th	33.0	1st 27th	27.4 5.7	18th	11.6
T-1			22nd	6.0	13th	10.9	4th	13.7	1st 27th	11.1 4.5	18th	6.7
T-2	26th	6.1	22nd	5.5	13th	5.7	4th	14.9	1st 27th	12.3 3.9	18th	5.2
T-3	24th	8.7	13th 20th	5.5 9.8	13th	16.8	1st 29th	9.3 10.9	26th	3.0	17th	2.2
T-4	24th	0.37	13th 20th	0.16 0.47	11th	0.23	1st 30th	2.6 0.02	26th	0.19	17th	0.1
T-5	24th	0.03	13th 20th	0.12 0.37	11th	0.15	1st 30th	0.15 0.02	26th	0.11	17th	0.1
T-6	24th	1.8	13th 20th	0.01 0.66	11th	0.35	1st	0.0	26th	0.02	17th	0.05
T-7	25th	0.58	20th	1.3	12th	1.5	2nd 30th	0.61 0.26	26th	0.29	18th	0.42
T-8	25th	6.9	20th	0.35	12th	4.1	2nd 30th	2.3 7.1	27th	1.8	18th	5.4
T-9	25th	0.0	20th	3.2	12th	0.0	1st 30th	0.2 9.6	27th	5.3	18th	4.6
T-10	25th	0.0	20th	5.3	12th	1.0	2nd 30th	0.8 3.8	27th	3.6	18th	2.1
T-11	25th	0.0	20th	8.4	12th	7.2	2nd 30th	3.4 4.4	27th	4.9	18th	3.7
T-12	25th	0.0	20th	0.32	12th	0.0	2nd 30th	0.0 0.52	27th	0.24	18th	0.12
T-13	25th	2.2	20th	6.8	12th	3.3	2nd 30th	11.7 7.4	27th	10.0	18th	8.3
Additional Unspecified Flows from T-0 to T-13			20th	1.4	12th	12.8	1st 30th	0.3 0.0	27th	0.0	18th	2.4

Table 3-72

St. Mary River Irrigation District

Miscellaneous Measurement Summary – 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
S-1	30th	0.0	21st	1.3	15th	0.0	3rd 31st	0.0 0.0	28th	0.0	19th	0.0
S-2	26th	5.0	22nd	4.8	15th	6.8	3rd	0.0	1st 27th	4.9 0.20	18th	0.20
S-3	26th	0.0	20th	0.07	12th	0.03	2nd 20th	0.72 0.10	27th	0.70	18th	0.97
S-4	26th	7.0	20th	2.9	12th	9.1	2nd 30th	6.8 6.0	27th	15.4	18th	7.7
S-5	24th	0.0	13th	4.8	11th	7.3	1st 29th	0.90 2.2	26th	0.12	17th	6.4
S-6	24th	0.05	13th	0.19	11th	4.0	1st 29th	4.8 4.0	26th	2.1	17th	1.8
S-7	24th	0.22	13th	0.42	11th	0.81	1st 29th	0.30 0.66	26th	0.32	17th	0.21
S-8	24th	4.3	13th	13.9	11th	0.0	1st 29th	7.2 9.0	26th	1.0	17th	2.2
S-9	24th	1.0	13th	2.9	11th	0.04	1st 29th	3.8 3.4	26th	2.2	17th	0.46
S-10	24th	0.0	13th	5.0	11th	10.0	1st 29th	8.2 7.3	26th	5.4	17th	1.3
S-11	25th	2.9	13th	6.0	11th	5.1	1st 29th	1.7 3.7	26th	3.2	17th	0.0
S-12	25th	0.39	13th	0.30	11th	0.0	1st 29th	1.4 0.57	26th	0.75	17th	0.0
S-13	25th	0.0	13th	0.0	11th	4.5	1st 29th	6.9 0.0	26th	3.9	17th	2.2
S-14	25th	0.0	13th	0.0	11th	0.0	1st 29th	0.0 1.8	26th	0.25	17th	0.30
S-14A	23rd	1.2	12th	3.9	11th	1.9	1st 29th	4.8 3.4	25th	22.0	17th	0.05
S-15	23rd	0.03	12th	0.01	10th 31st	0.0 0.0	29th	0.0	25th	0.52	16th	0.10
S-16	23rd	0.03	12th	0.0	10th 31st	0.15 0.20	28th	0.41	25th	0.11	16th	0.10
S-17	23rd	2.9	12th	4.1	10th 31st	1.1 0.84			25th	0.0	16th	1.4

Table 3-72 (cont'd.)

St. Mary River Irrigation District

Miscellaneous Measurement Summary – 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
S-18	23rd	1.2	12th	3.5	10th 31st	0.14 2.6	28th	0.23	25th	5.1	16th	0.27
I	23rd	45.1	14th	58.7	10th	47.7	1st 28th	30.2 21.0	25th	17.5	17th	25.7
II	23rd	9.4	14th	28.6	10th	13.4	1st 28th	10.9 22.3	25th	20.6	17th	7.1
III	23rd	3.2	14th	18.1	10th	2.8	1st 28th	1.9 2.1	25th	3.5	16th	3.9
IV	23rd	0.58	14th	0.34	10th	0.14	1st 28th	0.20 0.02	25th	0.42	16th	0.18
V	23rd	0.0	14th	0.0	10th	0.05	1st 28th	0.0 0.0	25th	0.01	16th	0.0
Bountiful Coulee near Cranfield	28th	10.0	21st	29.0	13th	18.7	3rd	19.1	1st 27th	18.7 3.1	19th	9.1
Six Mile Coulee near Lethbridge	28th	0.4	21st	10.4	13th	7.3	3rd	12.7	1st 27th	7.4 1.1	19th	2.0
Additional Unspecified Flows from S-1 to S-18	24th	1.5	13th	5.6	11th	0.01	1st 29th	0.13 0.23	26th	0.06	19th	0.37

Table 4-72

Miscellaneous Measurement Summary

1972 Diversions and Canal Flows Used in Regression Analysis

(cfs)

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
LNID Total Diversions	27th	443	21st	540	12th	533	3rd 31st	462 359	28th	128	19th	118
SMRID Forty Mile	25th	297	17th	440	12th	447	1st 30th	409 202	27th	94	17th	76
SMRID N.E. 4-9-13	25th	222	17th	636	12th	554	1st 30th	460 259	27th	95	17th	111
SMRID Horsefly Main	25th	504	17th	802	12th	692	1st 30th	566 298	27th	139	17th	131
SMRID Chin Main	25th	620	17th	1098	12th	1132	1st 30th	980 573	27th	177	17th	168
SMRID Main Canal East	28th	522	21st	0.0	13th	1078	3rd	960	1st 27th	968 295	19th	183
SMRID Lethbridge Turnout	28th	163	21st	441	13th	562	3rd	531	1st 27th	343 122	19th	205

Table S-72

Southwest Area

Miscellaneous Measurement Summary – 1972 Return Flow in CFS

Station	May		June		July		August		September		October	
	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge	Date	Discharge
Pothole Diversion near Spring Coulee	31st	26.5	19th	24.4	14th 28th	28.7 27.9			5th 22nd	24.6 27.7	23rd	2.1
Dry Coulee near the Mouth	31st	6.0	19th	22.9	14th 28th	7.3 6.3			5th 22nd	2.1 8.1	23rd	4.1
Confluence of Layton and Bullhorn Coulees			23rd	3.3	17th 28th	4.2 5.3			6th 22nd	13.1 7.7	25th	18.3
East Cardston			19th	0.0	17th 27th	0.20 0.01			5th 21st	1.7 0.30	23rd	0.10
West Cardston			23rd	0.71	17th 27th	0.01 0.01			5th 21st	0.25 0.30	23rd	1.4
West Aetna			19th	4.3	17th 27th	10.8 0.82			5th 21st	2.7 3.1	23rd	0.24
East Aetna			19th	0.0	17th 27th	0.92 0.0			5th 21st	0.20 0.0	23rd	0.0
Main No. 1			23rd	1.8	17th 28th	9.7 4.9			6th 21st	16.7 4.1	24th	2.9
Main No. 2			23rd	14.7	17th 28th	10.5 1.3			6th 21st	17.6 7.2	24th	3.1
Mami Creek East Branch near Mountain View			23rd	9.4	18th 28th	1.5 0.46			6th 22nd	4.7 0.95	24th	1.2
Mami Creek above Paine Lake			23rd	10.5	18th 28th	8.9 4.0			6th 22nd	2.3 2.6	24th	1.2
Mami Creek near the Mouth	31st	20.8	23rd	14.6	18th 28th	11.1 1.0			6th 22nd	10.0 4.3	24th	11.6
West Caldwell			23rd	0.15	18th 28th	0.65 0.40			6th 22nd	0.22 0.20	24th	0.55

APPENDIX B
REGRESSION ANALYSES SUMMARY

Mountain View I.D. Canal Correlation for 1972 Data — Run on January 10, 1972

Dependent Variable:		Mountain View I.D. Canal near Mountain View.
Independent Variables:		West Caldwell. Mami Creek near the Mouth — same near Mountain View.
Averaged Per Cent Deviation	=	Excessive.
Multiple Correlation	=	0.44362.

Layton and Bullhorn Coulee Correlation for 1972 Data — Run on January 8, 1973

Dependent Variable:		Confluence of Layton and Bullhorn Coulees.
Independent Variables:		Main No. 1. West Cardston. East Cardston.
Averaged Per Cent Deviation	=	67.54.
Multiple Correlation	=	0.87064.

Mountain View Correlation for 1972 Data

Dependent Variable:		Confluence of Layton and Bullhorn Coulees.
Independent Variables:		Mountain View I.D. Canal near Mountain View. Mami Creek near the Mouth.
Averaged Per Cent Deviation	=	94.33.
Multiple Correlation	=	0.14902.

L.N.I.D. Correlation of 1971 Data — Run on December 11, 1972

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
Menzaghies Bridge.
L-5 (Diamond City).
L-6 (Piyami Drain).
L-7 (Picture Butte Factory).

Averaged Per Cent Deviation = 0.12.

Multiple Correlation = 0.99999.

L.N.I.D. Correlation of 1971 Data — Run on December 18, 1972

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
L-6 (Piyami Drain).
L-9.
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 4.25.

Multiple Correlation = 0.98803

L.N.I.D. Correlation of 1972 Data — Run on January 4, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
L-5 (Diamond City).
L-6 (Piyami Drain).
L07 (Picture Butte Factory).

Averaged Per Cent Deviation = 10.44.

Multiple Correlation = 0.70350.

L.N.I.D. Correlation of 1972 Data — Run on January 4, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
L-9.
L-13 (Battersea Drain).
Menzaghies Bridge.

Averaged Per Cent Deviation = 5.06.

Multiple Correlation = 0.93575.

L.N.I.D. Correlation of 1972 Data — Run on January 10, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
Menzaghies Bridge.
L-1 (opposite Airport).
L-5 (Diamond City).
L-6 (Piyami Drain).

Averaged Per Cent Deviation = 9.74.

Multiple Correlation = 0.64879.

L.N.I.D. Correlation of 1972 Data — Run on January 10, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
Menzaghies Bridge.
L-1 (opposite Airport).
L-7 (Picture Butte Factory).
L-9.
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 3.32.

Multiple Correlation = 0.95723.

L.N.I.D. Correlation of 1971 Data — Run on January 10, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
Menzaghies Bridge.
L-1 (opposite Airport).
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 5.95.

Multiple Correlation = 0.97901.

L.N.I.D. Correlation of 1971 Data — Run on January 10, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables:
L-6 (Piyami Drain).
Menzaghies Bridge.
L-1 (opposite Airport).

Averaged Per Cent Deviation = 23.26.

Multiple Correlation = 0.38446.

L.N.I.D. Correlation of 1971 and 1972 Data — Run on January 25, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables: Menzaghies Bridge.
L-7 (Picture Butte Factory).
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 11.4

Multiple Correlation = 0.84159.

L.N.I.D. Correlation of 1971 and 1972 Data — Run on January 29, 1973

Dependent Variable: L.N.I.D. Total Return Flow.

Independent Variables: L-5 (Diamond City)
L-6 (Piyami Drain).
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 11.79.

Multiple Correlation = 0.83816.

L.N.I.D. Correlation of 1972 Data — Run on February 7, 1973

Dependent Variable: L.N.I.D. Total Apparent Return Flow.

Independent Variables: Little Bow River near Travers Dam — same near the Mouth.
L-13 (Battersea Drain).

Averaged Per Cent Deviation = 6.39.

Multiple Correlation = 0.84311.

L.N.I.D. Correlation of 1972 Data — Run on February 9, 1973

Dependent Variable: L.N.I.D. Total Apparent Return Flow.

Independent Variables: Little Bow River below Travers Dam — same near the Mouth.
L-13 (Battersea Drain).
L-6 (Piyami Drain.

West Section S.M.R.I.D. Correlation of 1971 Data — Run on December 18, 1972

Dependent Variable: S-1 + S-2 + Bountiful Coulee + Six Mile Coulee.

Independent Variables:
Lethbridge Turnout.
Main Canal East.
Main Canal Chin.

Averaged Per Cent Deviation = 7.72.

Multiple Correlation = 0.98010

West Section S.M.R.I.D. Correlation of 1972 Data — Run on January 4, 1973

Dependent Variable: S-1 + S-2 + Bountiful Coulee + Six Mile Coulee.

Independent Variables:
S-1.
S-2.
Six Mile Coulee near Lethbridge.
Bountiful Coulee near Cranford.

Averaged Per Cent Deviation = 0.38.

Multiple Correlation = 0.99999.

West Section S.M.R.I.D. Correlation of 1971 Data — Run on January 4, 1973

Dependent Variable: S-1 + S-2 + Bountiful Coulee + Six Mile Coulee.

Independent Variables:
S-1.
S-2.
Bountiful Coulee near Cranford.
Six Mile Coulee near Lethbridge.

Averaged Per Cent Deviation = 0.78.

Multiple Correlation = 0.99978.

West Section S.M.R.I.D. Correlation of 1972 Data — Run on January 4, 1973

Dependent Variable: S-1 + S-2 + Bountiful Coulee + Six Mile Coulee.

Independent Variables:
Main Canal Chin.
Main Canal East.
Lethbridge Turnout.

Averaged Per Cent Deviation = 20.70.

Multiple Correlation = 0.94146.

Taber I.D. Correlation of 1971 Data — Run on December 11, 1972

Dependent Variable: Taber I.D. Total Return Flow.

Independent Variables:
T-0.
T-1.
T-2.
T-3.

Averaged Per Cent Deviation = 2.12.

Multiple Correlation = 0.97938

Taber I.D. Correlation of 1971 Data — Run on December 11, 1972

Dependent Variable: Taber I.D. Total Return Flow.

Independent Variables:
T-8.
T-9.
T-10.
T-11.

Averaged Per Cent Deviation = 5.02.

Multiple Correlation = 0.88211.

Taber I.D. Correlation of 1971 Data

Dependent Variable: Taber I.D. Total Return Flow.

Independent Variables:
T-2.
T-11.
T-13.

Averaged Per Cent Deviation = 1.16.

Multiple Correlation = 0.99471.

Taber I.D. Correlation of 1972 Data — Run on January 4, 1973

Dependent Variable: Taber I.D. Total Return Flow.

Independent Variables:
T-0.
T-1.
T-2.
T-3.
T-8.

Averaged Per Cent Deviation = 6.11

Multiple Correlation = 0.98159.

Taber I.D. Correlation for 1972 Data — Run on January 4, 1973

Dependent Variable:		Taber I.D. Total Return Flow.
Independent Variables:		T-9. T-10. T-11. T-13.
Averaged Per Cent Deviation	=	20.59.
Multiple Correlation	=	0.81014.

Taber I.D. + S.M.R.I.D. West Section Correlation of 1971 Data — Run on Jan. 10, 1972

Dependent Variable:		Taber + S.M.R.I.D. West Section Total Apparent Return Flow.
Independent Variables:		T-2. Main Canal East. Bountiful Coulee near Cranford. T-11.
Averaged Per Cent Deviation	=	1.80.
Multiple Correlation	=	0.98915.

Taber I.D. + S.M.R.I.D. West Section Correlation of 1971 Data

Dependent Variable:		Taber + S.M.R.I.D. West Section Total Apparent Return Flow.
Independent Variables:		Six Mile Coulee near Lethbridge. T-2. Bountiful Coulee near Cranford.
Averaged Per Cent Deviation	=	3.08.
Multiple Correlation	=	0.97702.

Taber I.D. + S.M.R.I.D. West Section Correlation of 1972 Data — Run on Jan. 10, 1973

Dependent Variable:		Taber + S.M.R.I.D. West Section Total Apparent Return Flow.
Independent Variables:		T-2. Main Canal East. Bountiful Coulee near Cranford. T-11.
Averaged Per Cent Deviation	=	6.86.
Multiple Correlation	=	0.98230.

Taber I.D. + S.M.R.I.D. West Section Correlation of 1972 Data Run on Jan. 10, 1973

Dependent Variable:		Taber + S.M.R.I.D. West Section Total Apparent Return Flow.
Independent Variables:		Six Mile Coulee near Lethbridge. T-2. Bountiful Coulee near Cranford.
Averaged Per Cent Deviation	=	13.50.
Multiple Correlation	=	0.94222.

S.M.R.I.D. Correlation of 1971 Data — Run on December 11, 1972

Dependent Variable:		S-3 to Medicine Hat (inclusive).
Independent Variables:		Horsefly Main. Forty Mile. Chin Main Canal. S-4.
Averaged Per Cent Deviation	=	5.25.
Multiple Correlation	=	0.98954.

S.M.R.I.D. Correlation of 1971 Data

Dependent Variable:		S-3 to Medicine Hat (inclusive).
Independent Variables:		N.E. 4-9-13. S-3. S-4. S-5.
Averaged Per Cent Deviation	=	3.63.
Multiple Correlation	=	0.99541.

S.M.R.I.D. Correlation of 1971 Data

Dependent Variable:		S-3 to Medicine Hat (inclusive).
Independent Variables:		S-6. S-8. S-9. S-10.
Averaged Per Cent Deviation	=	13.98.
Multiple Correlation	=	0.93681.

S.M.R.I.D. Correlation of 1971 Data — Run on December 18, 1972

Dependent Variable:		S-3 to Medicine Hat (inclusive).
Independent Variables:		Ross Creek above Bullshead Creek. S-10. S-4.
Averaged Per Cent Deviation	=	20.87.
Multiple Correlation	=	0.80710.

S.M.R.I.D. + Taber Correlation of 1971 and 1972 Data — Run on January 29, 1973

Dependent Variable:		S.M.R.I.D. + Taber I.D. Total Return Flow.
Independent Variables:		Bountiful Coulee near Cranford. T-2. T-11. S-4. S-10. Seven Persons Creek above Ross Creek.
Averaged Per Cent Deviation	=	6.69.
Multiple Correlation	=	0.96088.

Run on June 14, 1973

Dependent Variable:		S.M.R.I.D. + Taber I.D. Total Return Flow.
Independent Variables:		Bountiful Coulee near Cranford. T-2. T-11. S-10. Seven Persons Creek at Medicine Hat.
Averaged Per Cent Deviation	=	6.84.
Multiple Correlation	=	0.95851.