

WHITEMUD RIVER INTEGRATED WATERSHED MANAGEMENT PLAN

SURFACE WATER HYDROLOGY REPORT

1. General Description¹

Figure 1 provides a map of the Whitemud River Watershed.

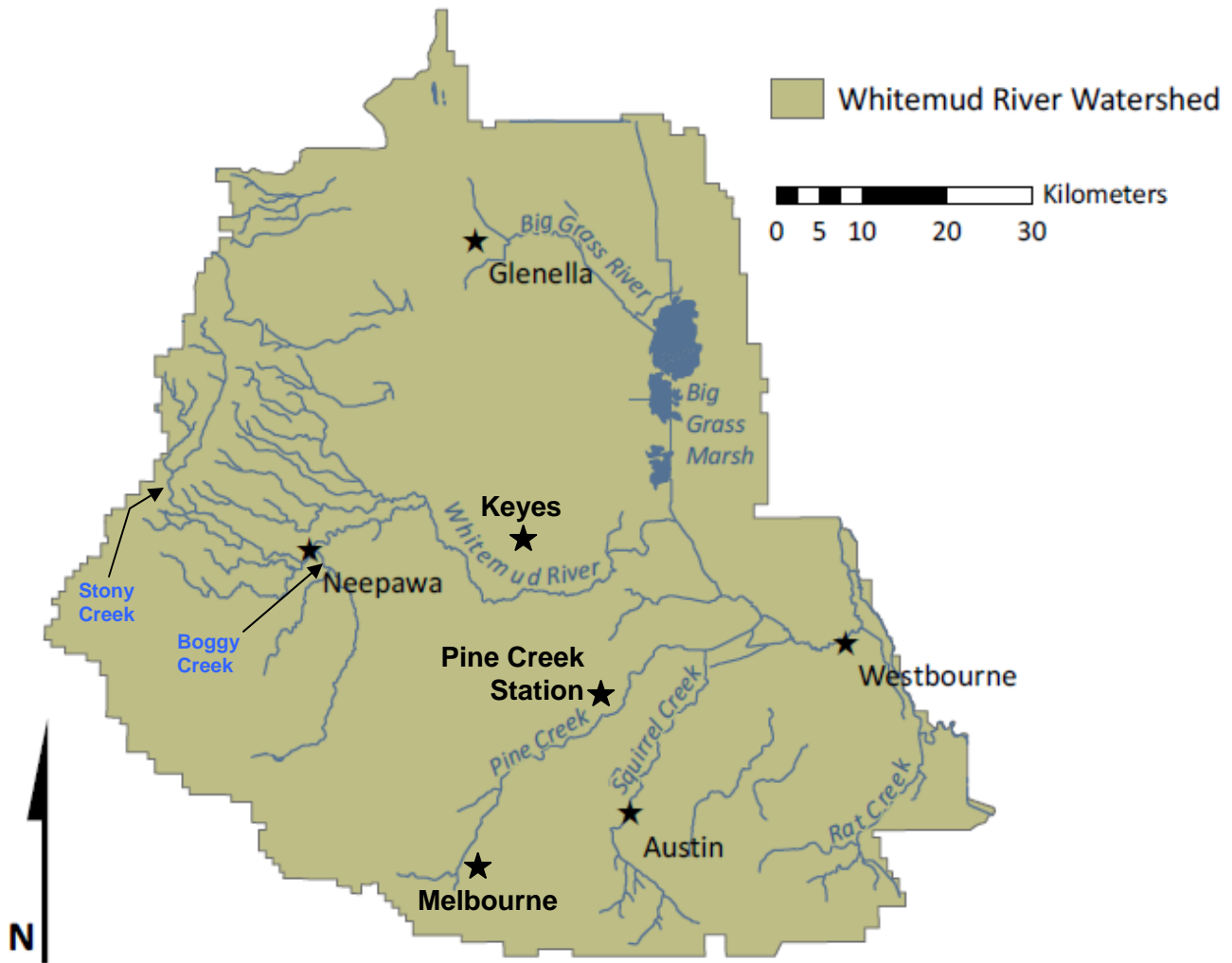


Figure 1: Whitemud River Watershed

¹ Excepts for this section have been taken from various reports (see references)

The Whitemud River originates in the southeastern slopes of Riding Mountain and in the plains area north of the Trans Canada highway. Neepawa Creek joins the Whitemud River near the Town of Neepawa. It then flows in an easterly direction through the Towns of Neepawa, Arden, Gladstone and Westbourne and then turns north toward Lake Manitoba. In the Gladstone-Woodside reach and downstream of Westbourne, the deep river valley, which is prominent in the other areas, disappears resulting in flooding in the abovementioned areas during high spring flows. The flooding causes damage to urban areas as well as to farmlands, roads, bridges and railways.

By definition, a watershed is the land area that contributes surface water runoff to a common point. It is separated from adjacent watersheds by a land ridge or divide. Watersheds can vary in size, from a few hectares to thousands of square kilometers. A larger watershed can contain many smaller sub-watersheds which are defined in the same manner as a watershed. On a larger scale, a basin is defined as a collection of watersheds that feed into a common main tributary or large body of water (e.g. the Red River Basin). A sub-basin is a division of a basin and will be made up of multiple watersheds. The planning area in this case is a watershed, but is made up of a number of sub-watersheds, the main ones being Neepawa Creek (350 km²), Arden Tributaries (396 km²), Big Grass Marsh (2551 km²), Pine Creek (842 km²), Squirrel Creek (401 km²), Westbourne Drain (376 km²) and Willow Bend Creek (492 km²).

Topographic information of the Whitemud River Basin is given in Figure 2. The basin varies in elevation from about 670 m a.s.l. in the vicinity of Riding Mountain down to 250 m a.s.l. where the Whitemud River discharges into Lake Manitoba. The area lying above 400 m a.s.l. varies from a steep wooded escarpment along the south end of Riding Mountain to a slope plain in the western portion of the Whitemud Watershed. The steep escarpment is deeply cut by many streams which originate in Riding Mountain. The area lying between 365 and 400 m a.s.l. is composed of flat well-drained plains. In the area between Neepawa and Carberry these flat plains are bordered by wooded sand hill areas. The area lying between 335 and 365 m a.s.l. south of the Whitemud River is composed of a wooded plain. Stream channels are deeply incised into the plain and the topography is generally rough. With the exception of the RM of Glenella, the area north of the Whitemud River between 275 and 365 m a.s.l. and the area south of the river between 275 and 335 m a.s.l. are composed of flat sandy plains with large, shallow but well-defined stream channels. The portion of the Whitemud River Basin below 335 m a.s.l. and the area constituting the RM of Glenella is flat and has poor natural drainage.

No large natural lakes exist in the Whitemud River Basin. A large shallow depression north of Gladstone makes up the Big Grass Marsh. Large marshes existed in the lower reaches of the Pine and Squirrel Creeks before they were artificially drained.

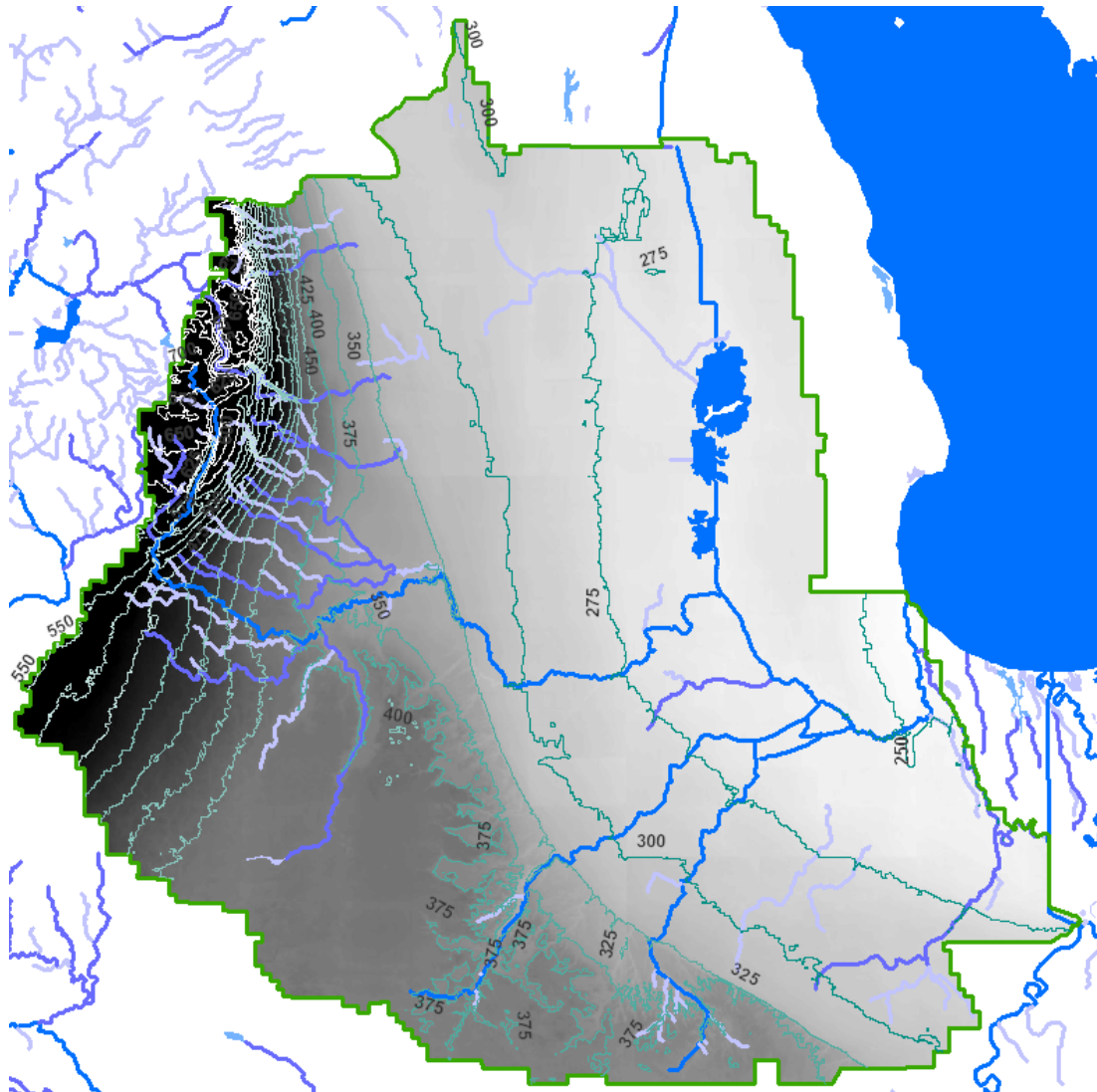


Figure 2: Digital elevation map of the Whitemud River Basin with contour lines (m a.s.l.)

2. Climate

Climate data was extracted from Environment Canada’s data base for Neepawa Water and Langruth West (see Figure 3 for locations). The meteorological station at Neepawa Water is situated in the western portion of the watershed and the Langruth West station is situated in the eastern portion of the watershed. The monthly totals of precipitation, both as rain and as snow, for both stations are provided in Figure 4. Monthly precipitation normals for a 30 year time span (1971 – 2000) are provided in Figure 5. From 1971 to 2000, Neepawa and Langruth received an annual average of 516.3 mm and 546.2 mm of precipitation, respectively. Monthly temperature

normals between 1971 and 2000 are provided in Figure 6. The average annual temperatures at Neepawa and Langruth were respectively 2.5°C and 2.4°C.

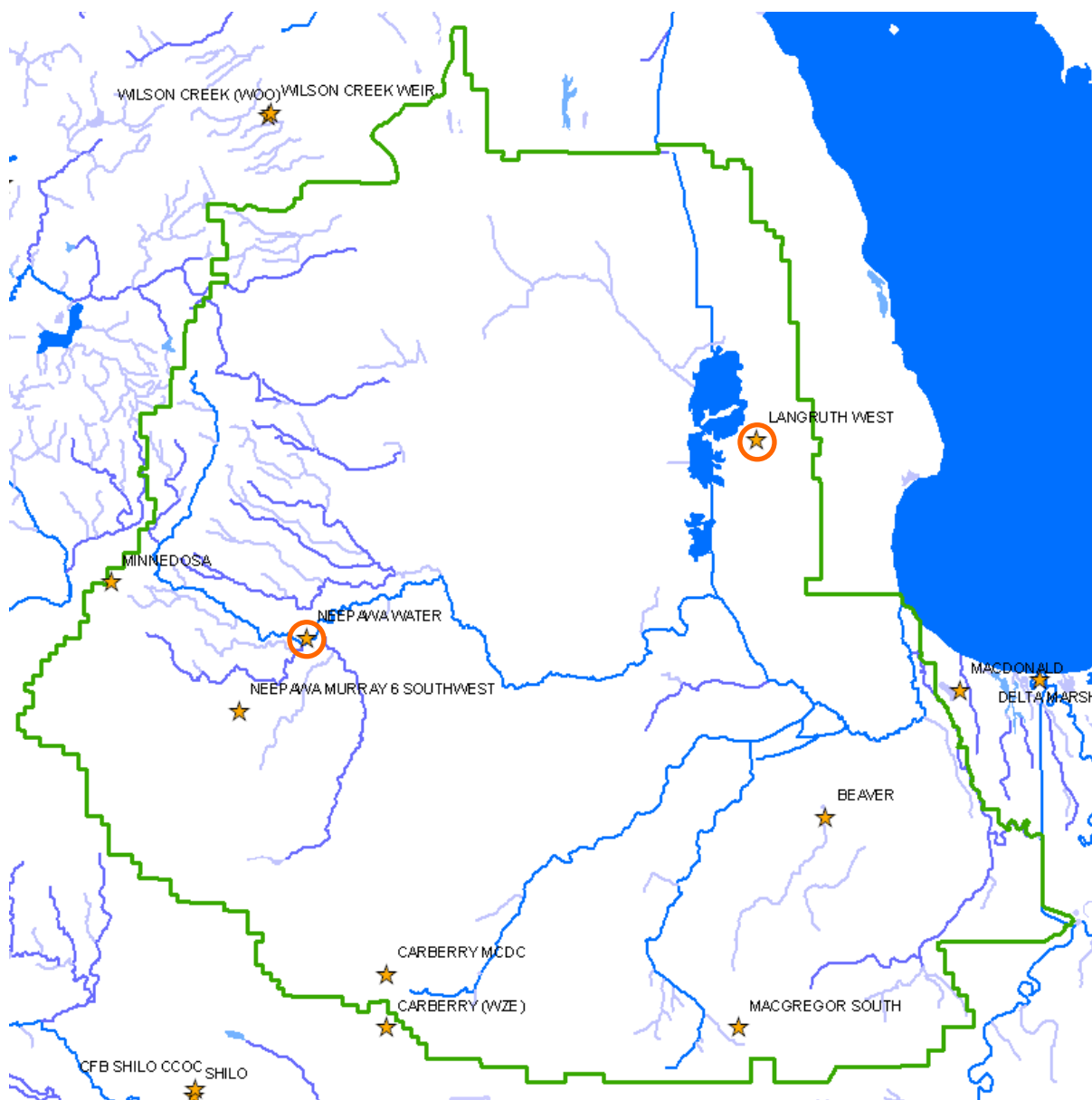
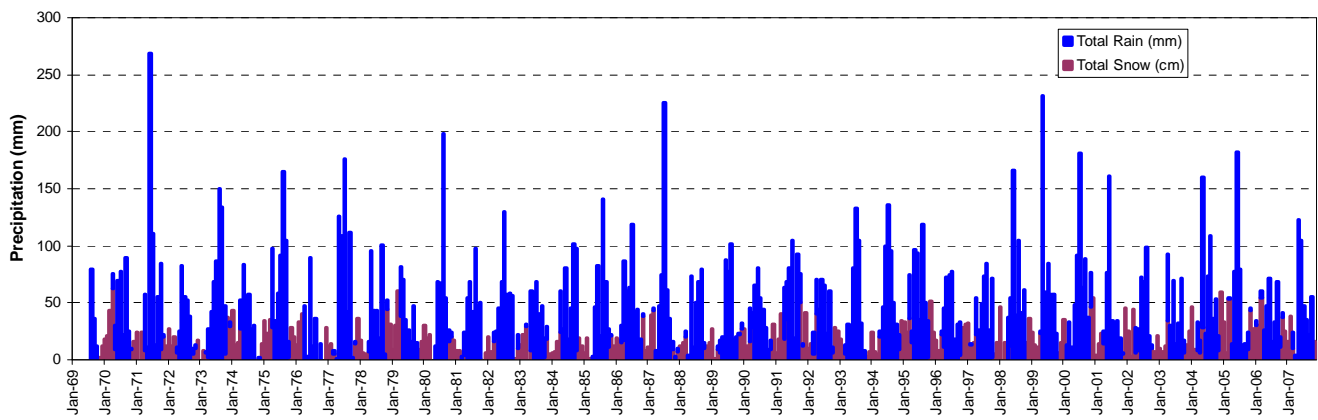


Figure 3: Location of meteorological stations. Those used for this study are encircled.

Neepawa Water (1969 – 2007):



Langruth West (1970 – 2001):

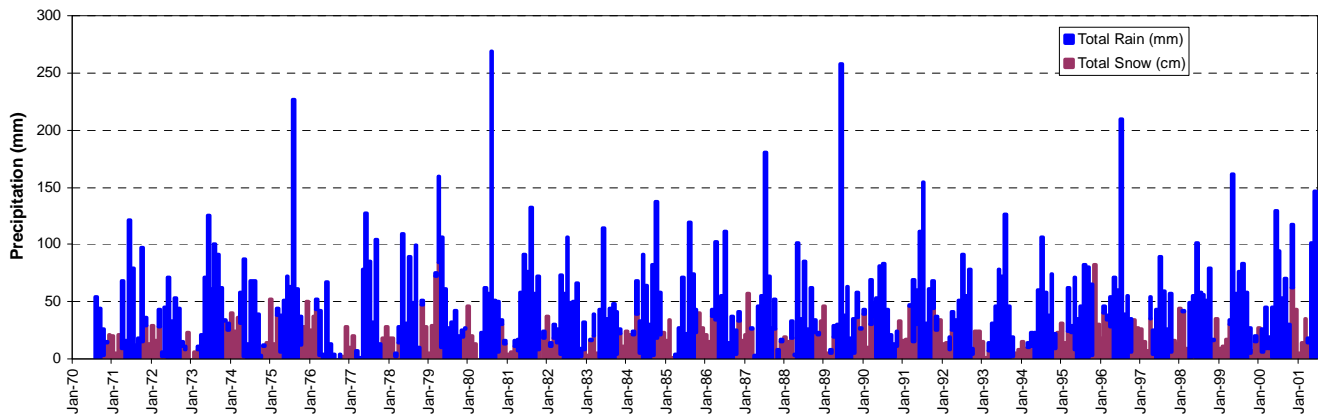
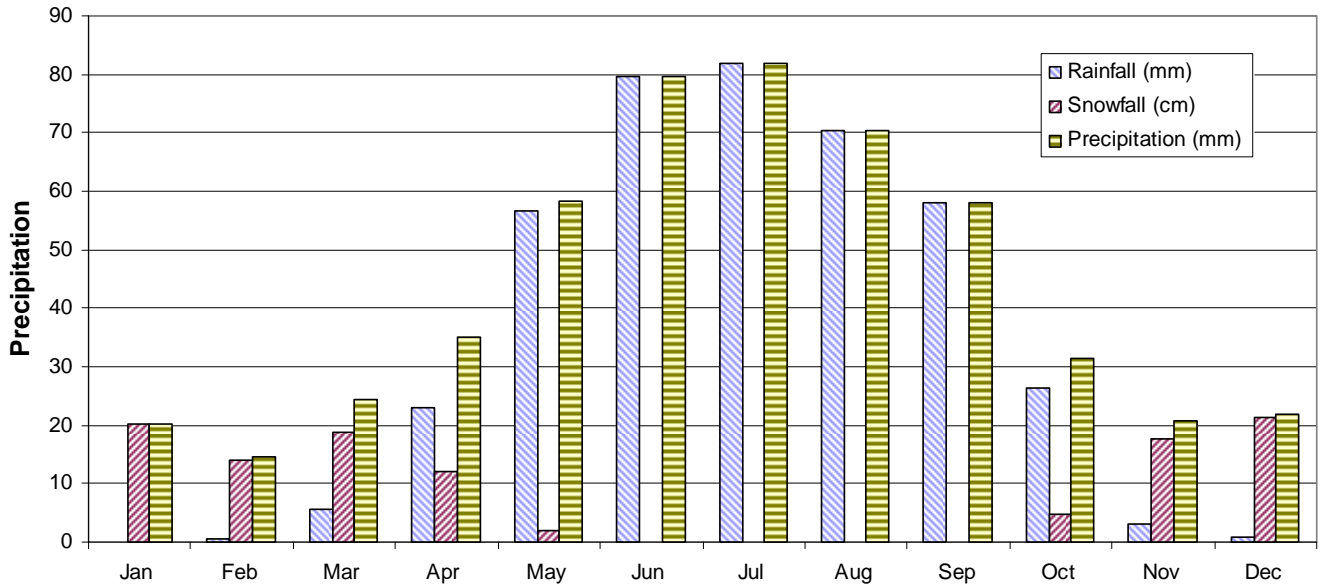


Figure 4: Monthly precipitation totals

Neepawa Water:



Langruth West:

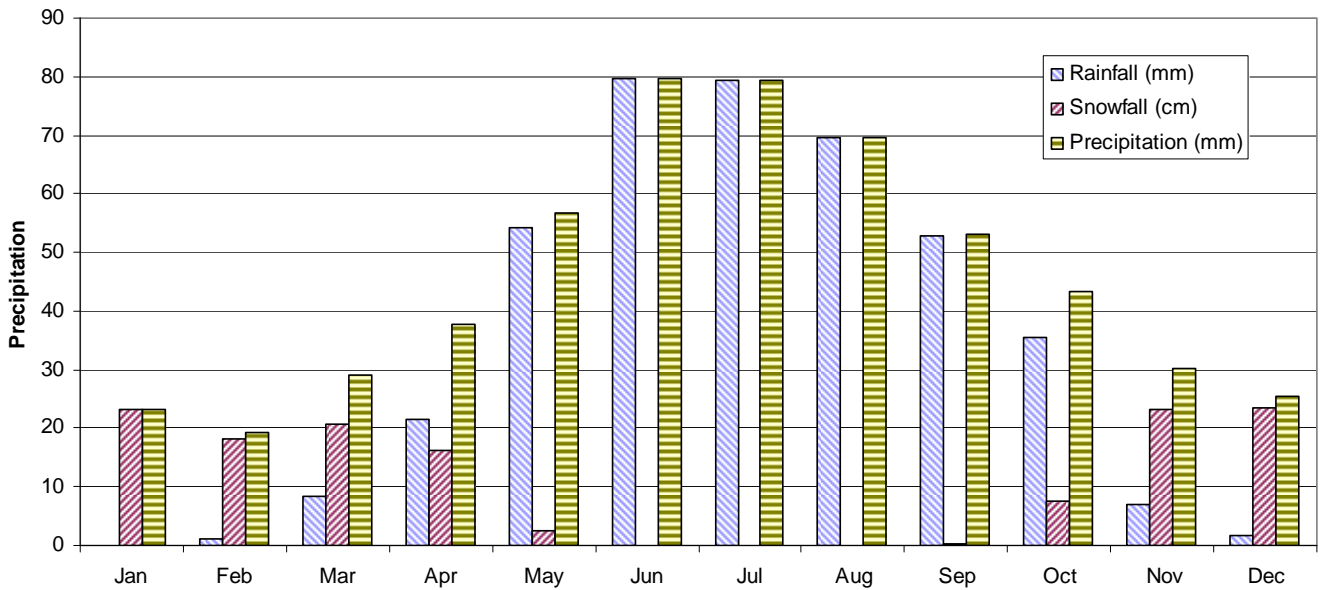
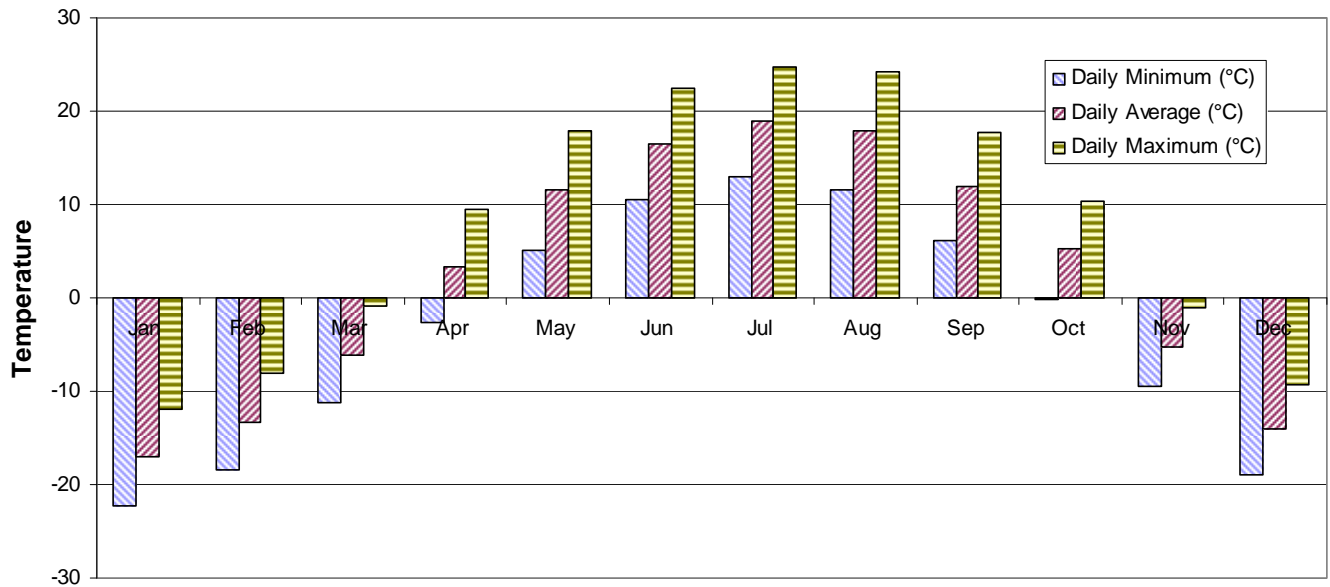


Figure 5: Long-term monthly precipitation normals

Neepawa Water:



Langruth West:

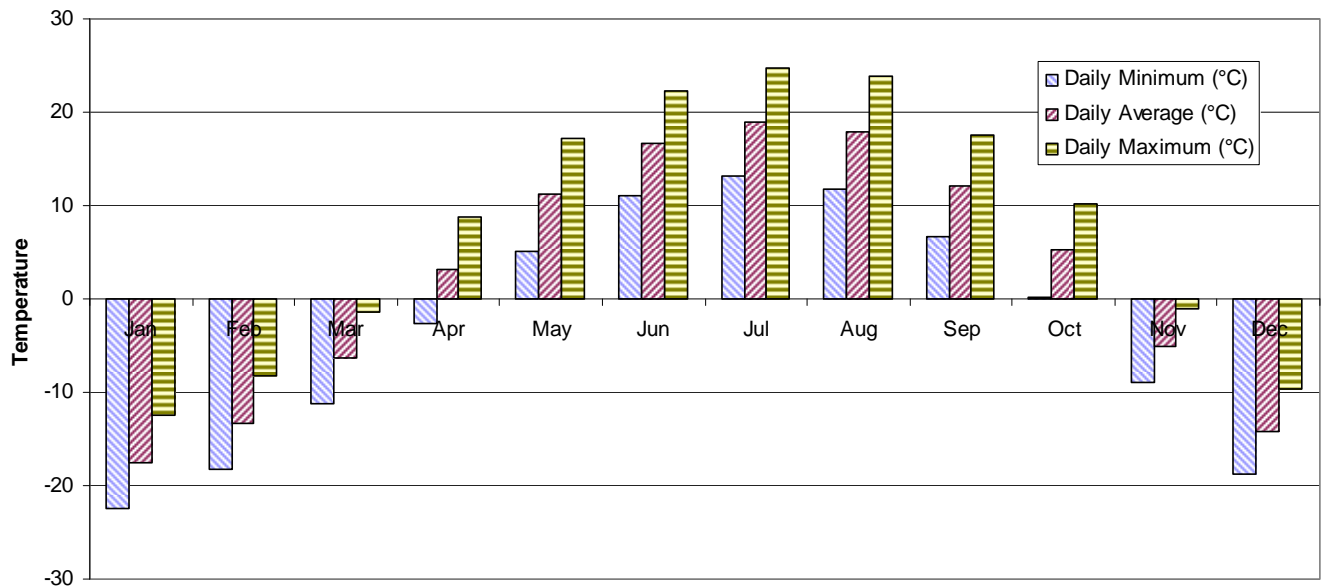


Figure 6: Long-term monthly temperature normals

3. Hydrometric Data

The collection of hydrometric data is critical to the understanding of the availability, variability and distribution of water resources and provides the basis for responsible decision making on the management of this resource. Historic hydrometric data provides the basis for understanding the potential extent and limitation of the resource. Water level and stream flow data collected under the Canada-Manitoba Hydrometric Agreement, which is part of a National Hydrometric Program, supports activities such as policy development, operation of water control works, flow forecasting, water rights licensing, water management investigations and hydrologic studies, ecosystem protection and scientific studies. Environment Canada, the Province of Manitoba and Manitoba Hydro operate 143 discharge and 133 water-level gauging stations under this Agreement.

An overview of selected flow gauges within the basin is provided in Table 1. The extent of available data and the months of operation are also provided in the table. Locations of streams and towns near which the gauges are located are provided in Figure 1.

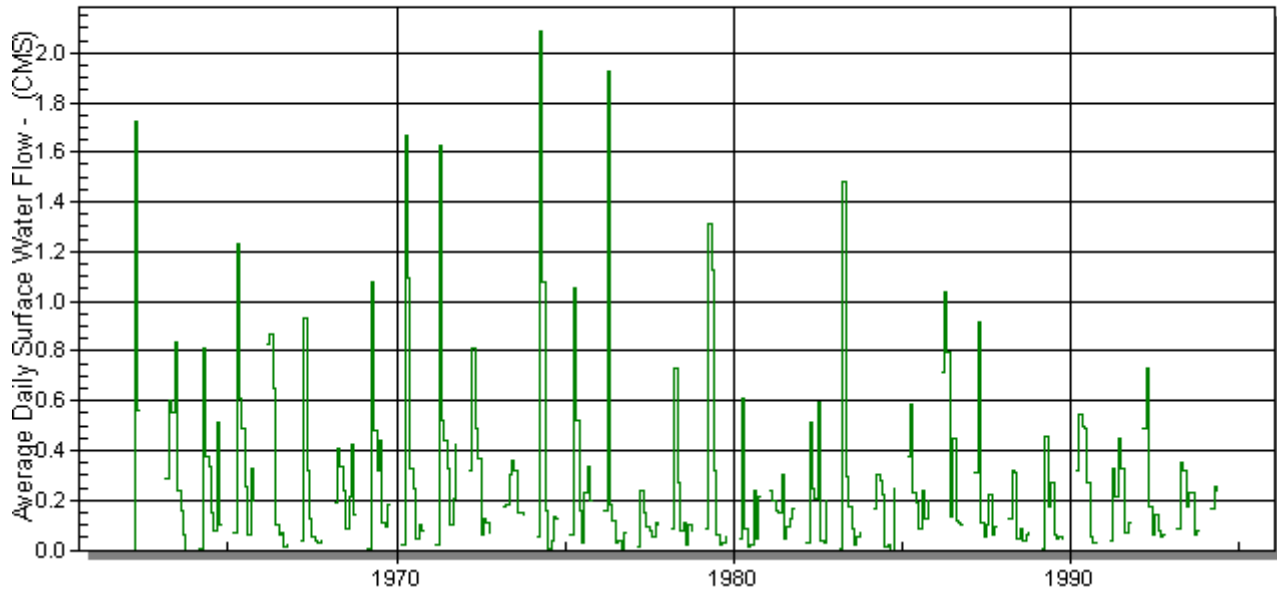
Table 1: Selected gauges from the Whitemud River Watershed

Gauge number	Gauge name	Season	Series
05LL001	West Squirrel Creek near Austin	8 months (March – October)	1963 – 1993
05LL002	Whitemud River at Westbourne	All year	1972 – 2009
05LL005	Whitemud River near Keyes	All year 8 months (March – October)	1965 – 1996 1997 – 2008
05LL007	Pine Creek near Pine Creek Station	8 months (March – October) 4 months (March – June) 8 months (March – October)	1959 – 1977 1978 – 1990 1991 – 1995
05LL009	Stony Creek near Neepawa	8 months (March – October)	1959 – 1992
05LL009	Boggy Creek near Neepawa	8 months (March – October)	1961 – 1993
05LL014	Pine Creek near Melbourne	8 months (March – October) All year	1965 – 1969 1970 – 2009
05LL015	Big Grass River near Glenella	8 months (March – October)	1965 – 2009

The mean monthly flows at these gauges are provided in Figure 7. The reports of the flows are appended to this report.

WEST SQUIRREL CREEK NEAR AUSTIN

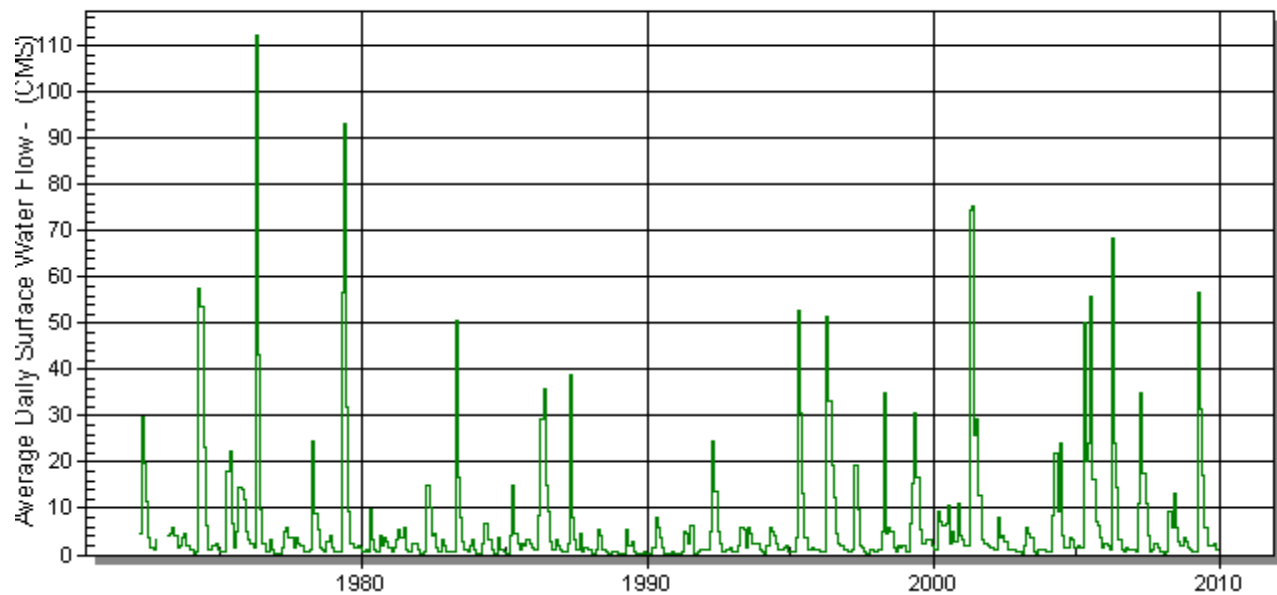
WATER SURVEY OF CANADA DATA



2010-11-29 16:53, 6.082

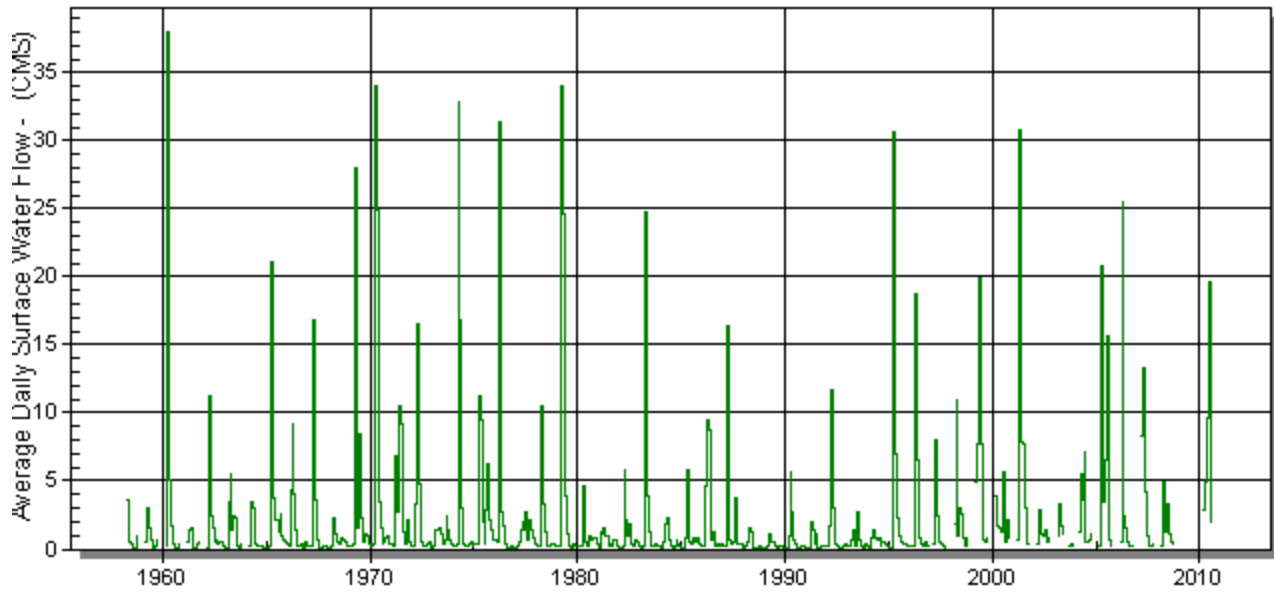
WHITEMUD RIVER AT WESTBOURNE

WATER SURVEY OF CANADA DATA



WHITEMUD RIVER NEAR KEYS

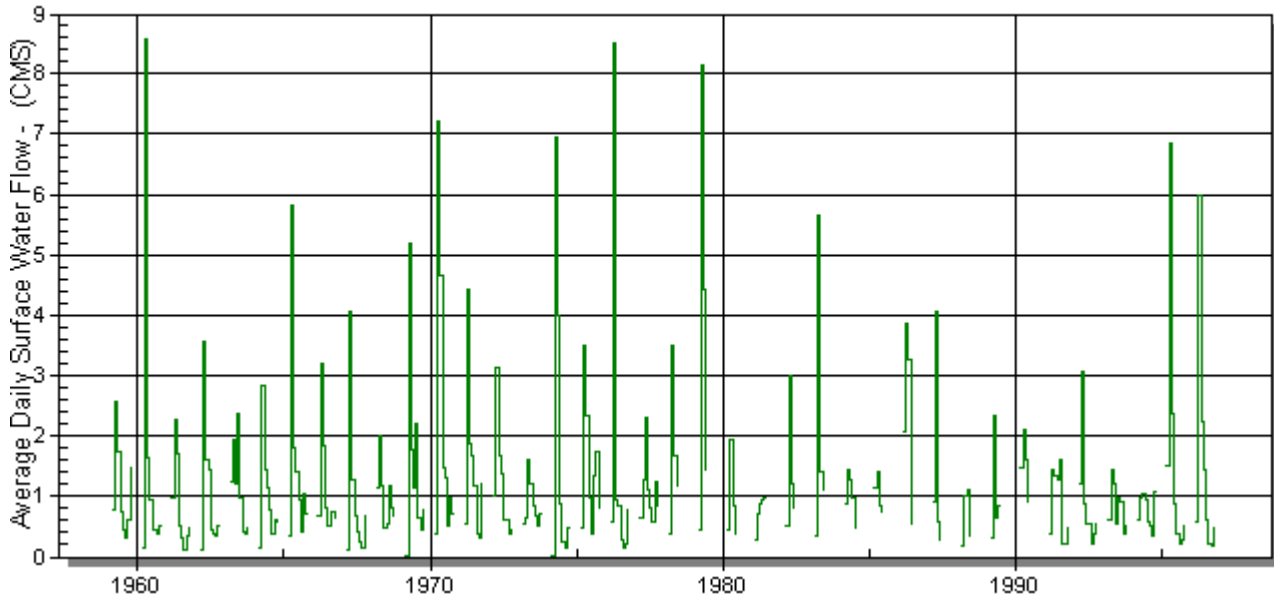
WATER SURVEY OF CANADA DATA



98-3-29 3:52, 0.431

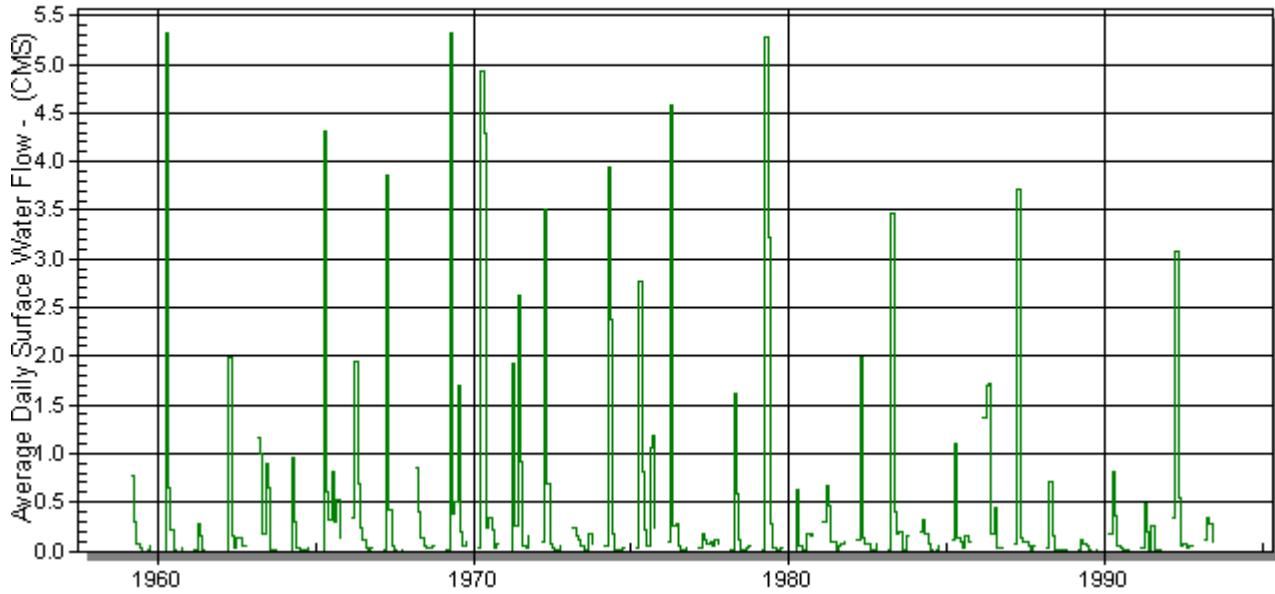
PINE CREEK NEAR PINE CREEK STATION

WATER SURVEY OF CANADA DATA



STONY CREEK NEAR NEEPAWA

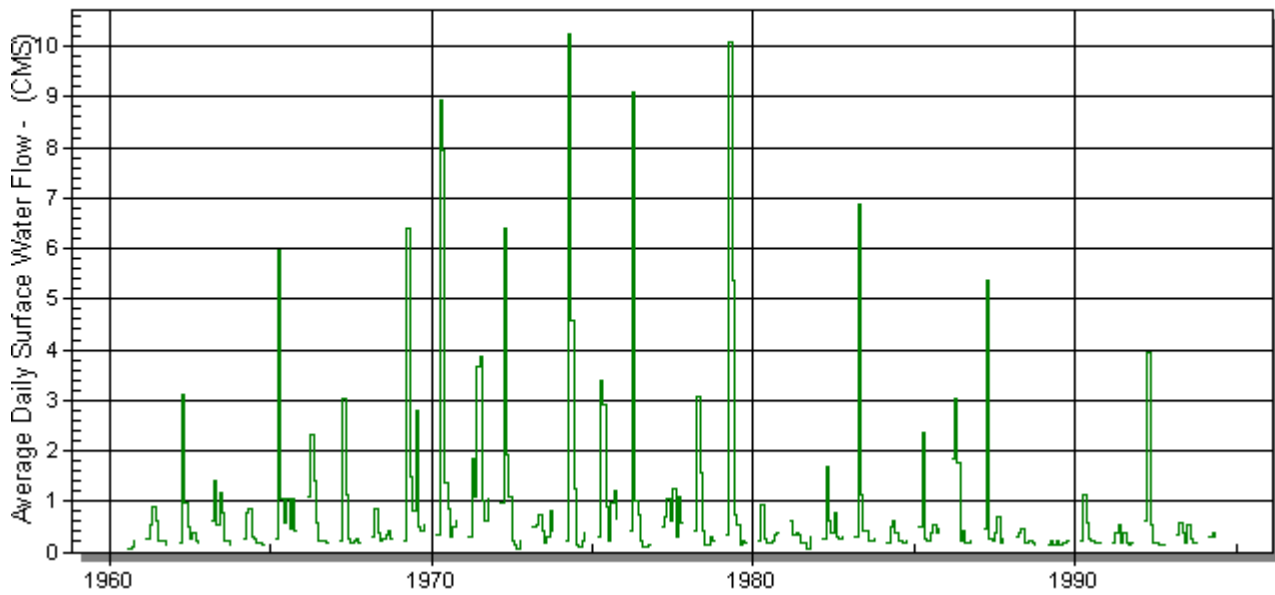
WATER SURVEY OF CANADA DATA



60-8-9 5:29, 0.159

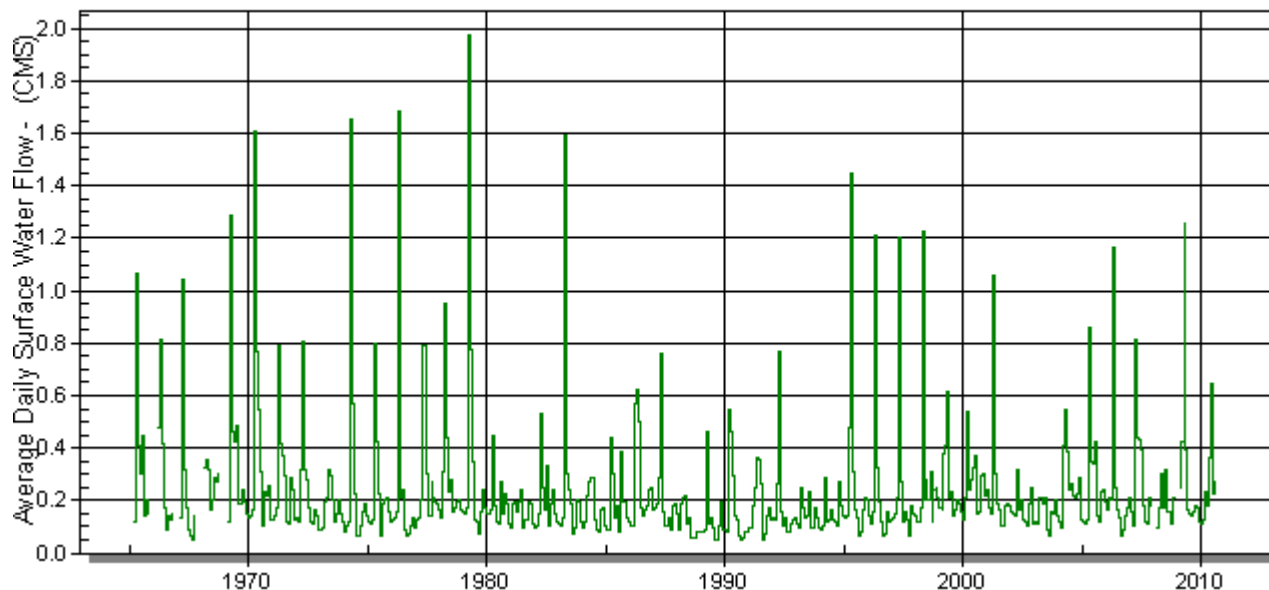
BOGGY CREEK NEAR NEEPAWA

WATER SURVEY OF CANADA DATA



PINE CREEK NEAR MELBOURNE

WATER SURVEY OF CANADA DATA



2011-5-31 11:58, 5.186

BIG GRASS RIVER NEAR GLENELLA

WATER SURVEY OF CANADA DATA

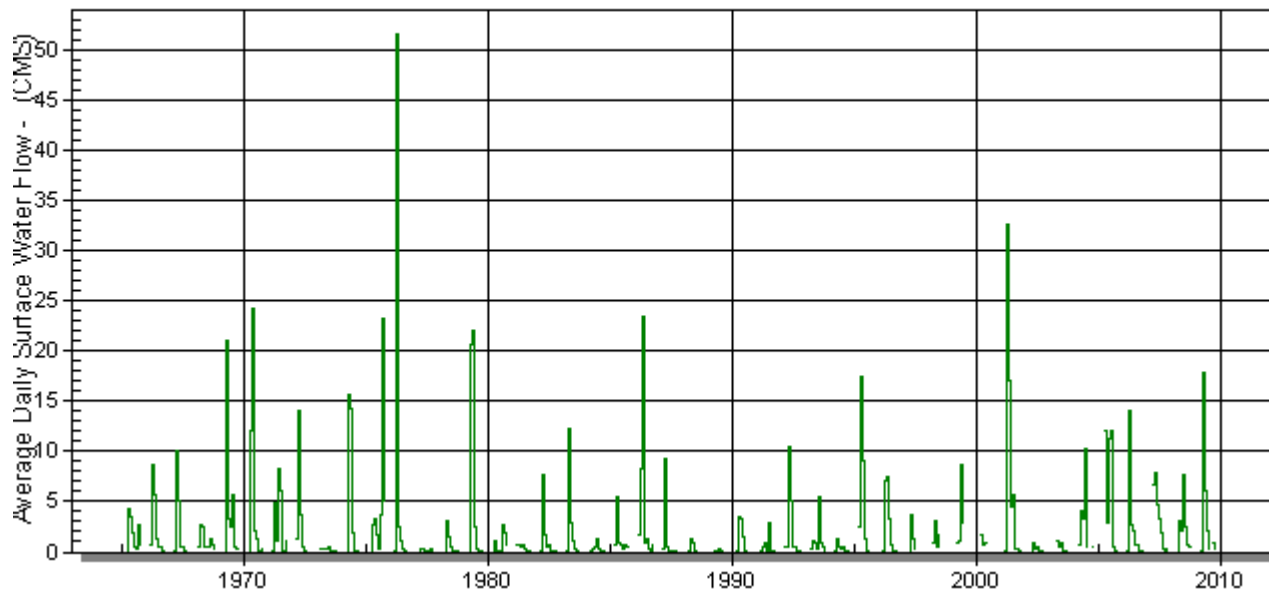


Figure 7: Mean monthly flows

The flows at Westbourne and Keyes along the Whitemud River deserve further scrutiny. The annual total flows for the years during which the gauges were in operation for the entire year are provided in Figure 8 for the gauge at Westbourne and in Figure 9 for the gauge near Keyes.

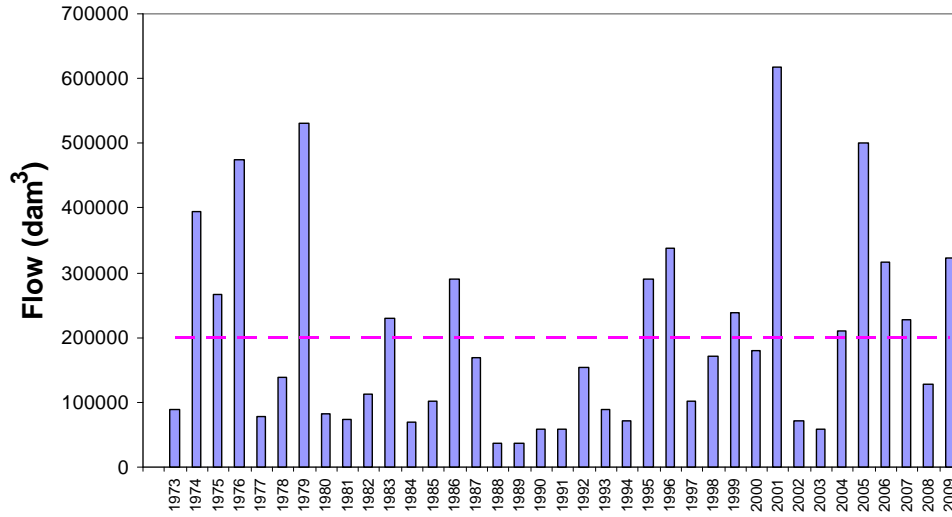


Figure 8: Annual total flows and average flow for the Whitemud River at Westbourne

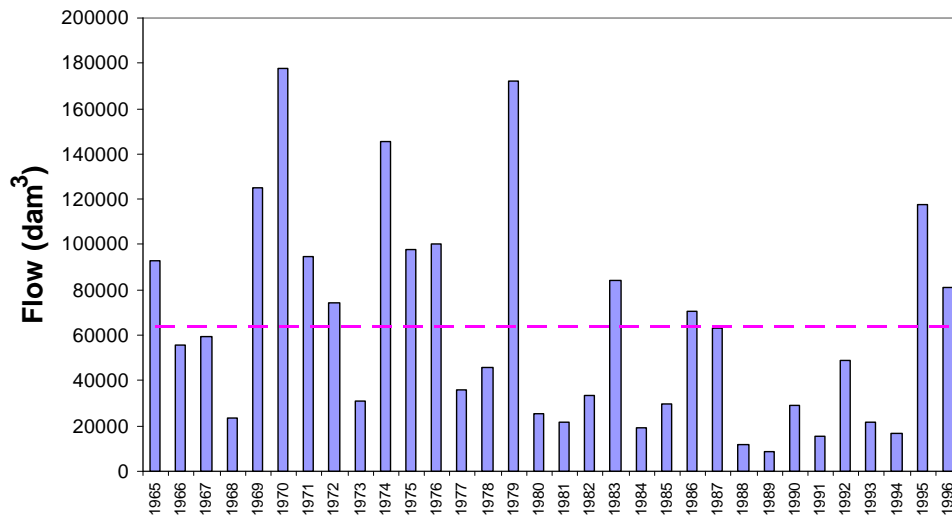


Figure 9: Annual total flows and average flow for the Whitemud River near Keys

Since Westbourne is closer to the watershed outlet than Keys, the average annual flow at Westbourne (199,542 dam³) is greater than near Keys (63,512 dam³). However the specific water production (flow ÷ subbasin area) is less at Westbourne than at Keys, which is depicted with specific discharge duration curves for each gauge in Figure 10. The flows have been divided by the upstream catchment area at each gauge to make the values comparable to precipitation depths. The specific water production at Keys is higher because the rivers leading to it are supplied by the Assiniboine Delta Aquifer. The catchment area between the gauge near Keys and the gauge at Westbourne has substantially reduced supply from the aquifer.

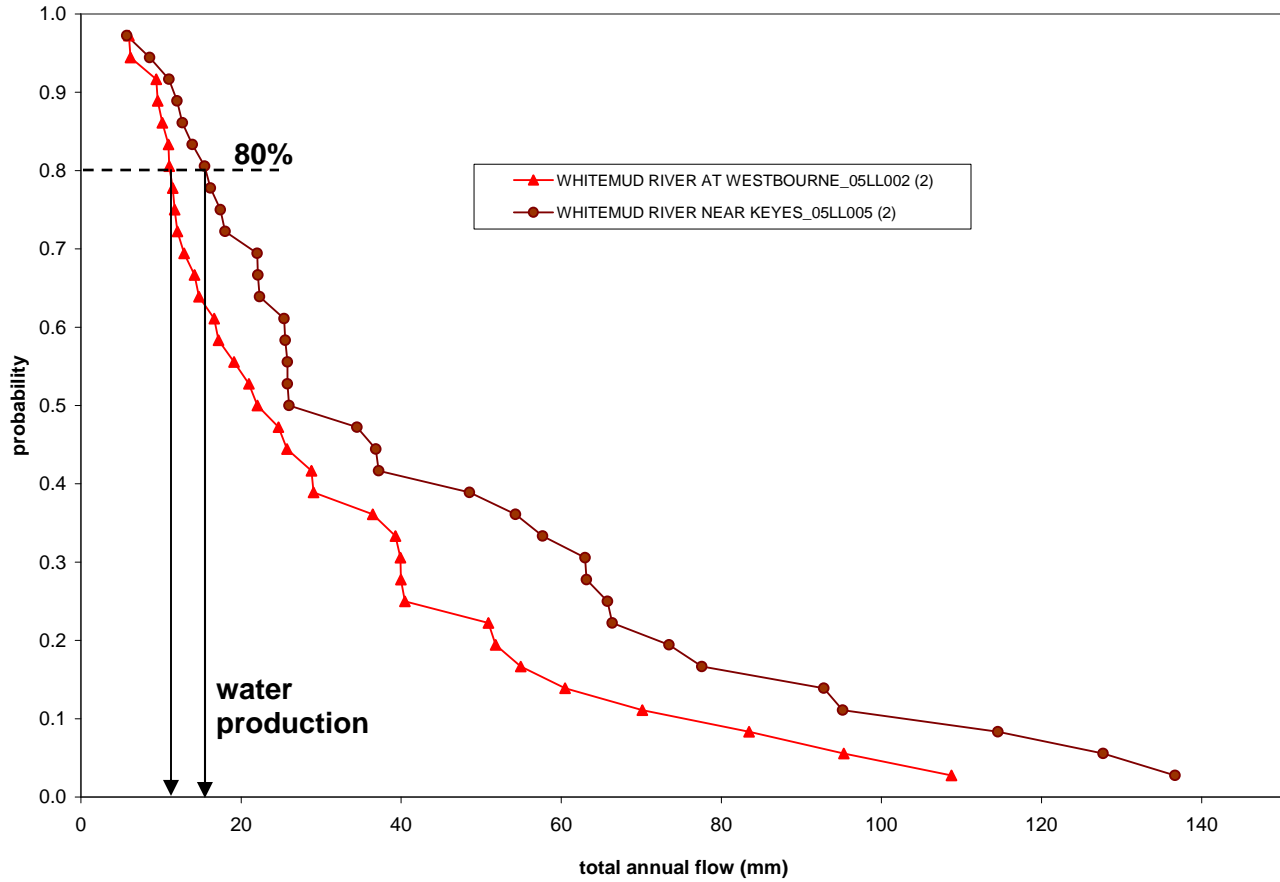


Figure 10: Specific discharge (flow ÷ subbasin area) duration curves at the gauges at Westbourne and near Keyes for the eight months between March and October for the series 1972 – 2008. Water production is taken to be the specific discharges that are not exceeded 80% of the time.

The monthly distribution of the total annual flows averaged over the data time period is provided in Figure 11 for each station. The majority of the annual flow discharges ($\approx 70\%$) during the spring freshet in the months of April and May.

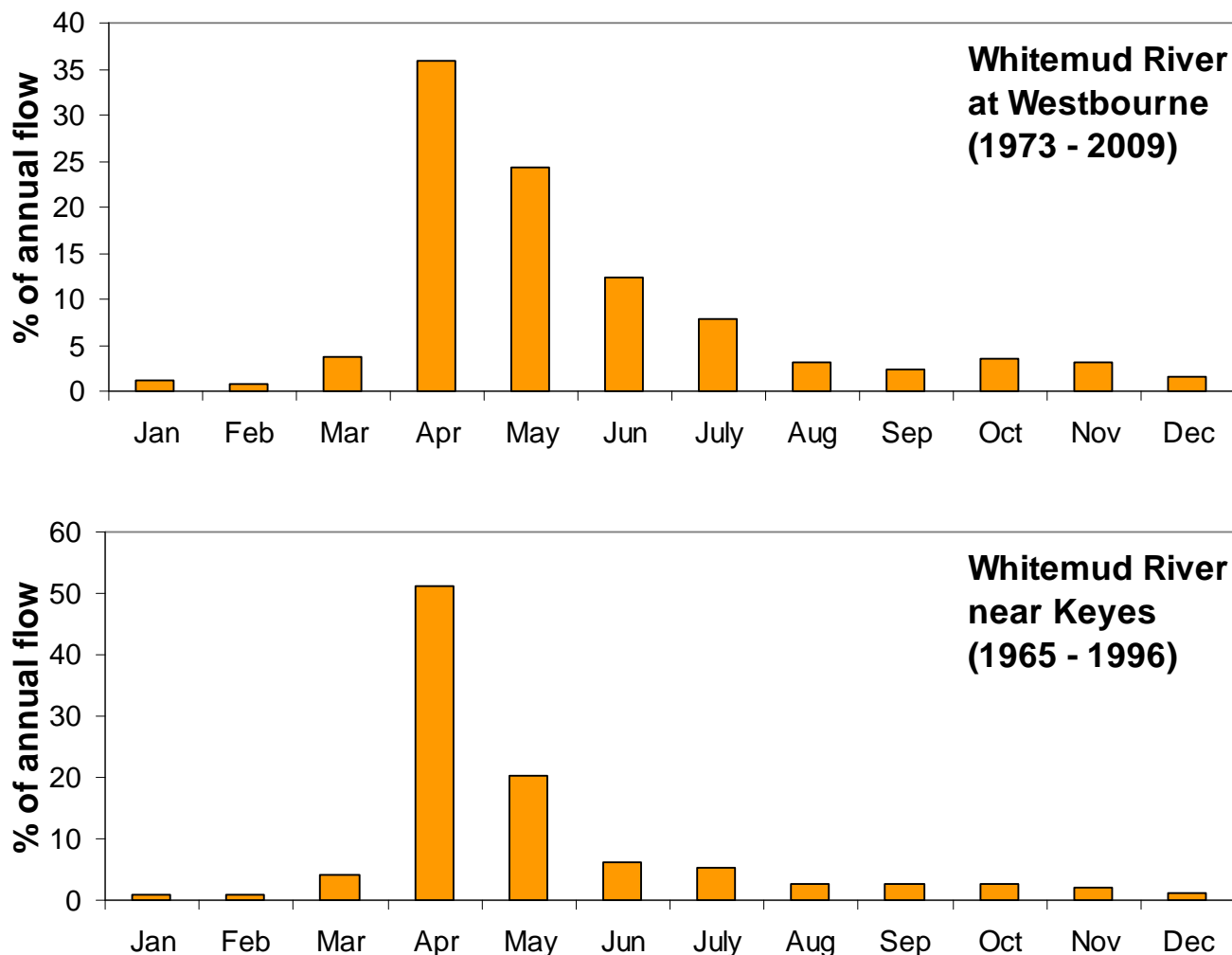


Figure 11: Monthly distribution of total annual flows averaged over the data time period for each gauge

4. Water supply and licensed allocations

Figure 12 shows graphs of yearly total municipal water withdrawals for the towns of Neepawa, Gladstone, Glenella and Westbourne. Note that the y-axis of the graph is logarithmic because the abstractions at Neepawa are one to two orders of magnitude large than at the other locations. Throughout the 2000s, most abstractions have reached or are approaching a plateau.

The water production is one to two orders of magnitude more than municipal water withdrawals and licensed abstractions at each studied river gauges (see Figure 13). However, $\approx 70\%$ of the annual discharge occurs in the months of April and May.

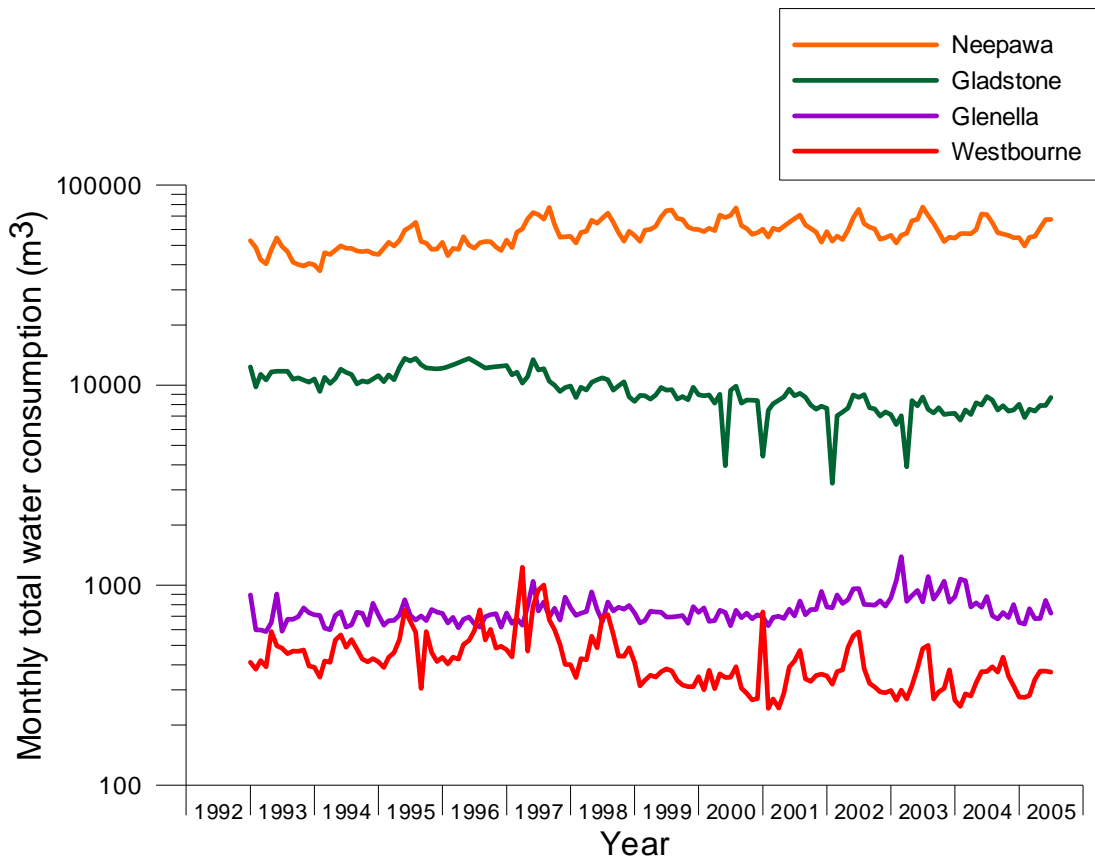


Figure 12: Municipal water abstractions at Neepawa, Gladstone, Glenella and Westbourne

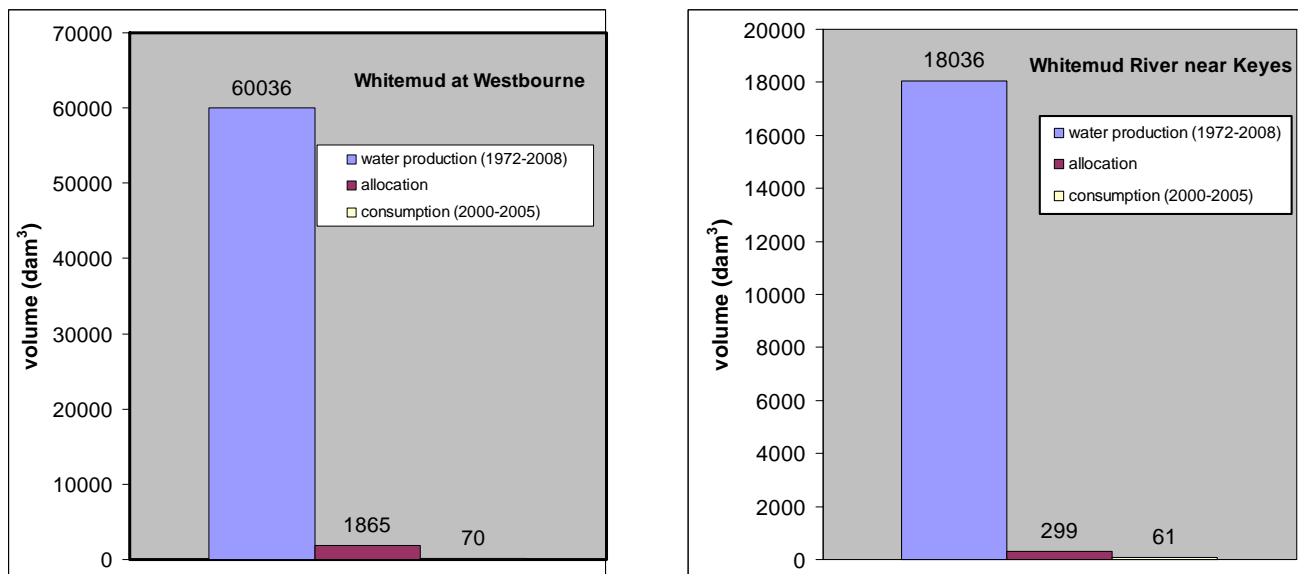


Figure 13: Comparison of water production, licensed allocations and municipal abstractions within the water basins at Westbourne (left panel) and at Keys (right panel).

5. Specific question

What are the ways that watershed stakeholders (rural municipalities, conservation districts, NGO's and government agencies) can help ensure a more natural and ecologically-supportive flow regime in this watershed?

Potentially, there are opportunities for the construction of waterway control structures to reduce extreme peak flows and ensure a more natural and ecologically-supportive flow regime in this watershed. This question of water storage is important, but is beyond the scope of a typical submission by the Surface Water Management section. Valuable input on this topic could be provided by locals during the planning activities and studied in more detail at a later date.

Which water quantity indicators can be used to best estimates surface water production in this watershed?

The water production, licensed allocations and municipal withdrawals for drinking water displayed in Figure 13 could potentially be used as input parameters for a surface water quantity indicator. Since the indicators are very dependent on the goals of the watershed management plan, development and application of such an indicator must be employed directly by the watershed planner.

6. References

Whitemud River Basin planning study report Part 1. Prepared by the Planning Division of the Water Control and Conservation Branch of the Highways Department of the Province of Manitoba, January 1968.

Whitemud River Watershed Resource Study Phase 1: Water resource inventory and problem identification. Prepared by the Water Resources Branch of the Department of Mines, Resources and Environmental Management of the Province of Manitoba, July 1972.

Surface Water Management Plan for the upper Whitemud River Watershed (Watershed no. 40). Prepared by the Water Resources Branch of the Department of Natural Resources of the Province of Manitoba, January 1981.

MEAN MONTHLY FLOWS IN CMS
05LL001
WEST SQUIRREL CREEK NEAR AUSTIN
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1962	-	-	0.000	1.72	0.561	-	-	-	-	-	-	-	-
1963	-	-	0.285	0.600	0.551	0.834	0.241	0.160	0.059	0.000	-	-	-
1964	-	-	0.008	0.812	0.379	0.331	0.147	0.080	0.513	0.099	-	-	-
1965	-	-	0.068	1.23	0.610	0.485	0.250	0.060	0.323	0.198	-	-	-
1966	-	-	0.827	0.871	0.653	0.102	0.060	0.072	0.012	0.023	-	-	-
1967	-	-	0.037	0.934	0.316	0.123	0.051	0.035	0.028	0.039	-	-	-
1968	-	-	0.193	0.409	0.337	0.239	0.087	0.211	0.425	0.139	-	-	-
1969	-	-	0.003	1.08	0.481	0.318	0.442	0.113	0.093	0.178	-	-	-
1970	-	-	0.018	1.67	1.09	0.324	0.245	0.047	0.097	0.079	-	-	-
1971	-	-	0.023	1.62	0.517	0.443	0.328	0.097	0.206	0.425	-	-	-
1972	-	-	0.320	0.810	0.492	0.368	0.064	0.123	0.108	0.071	-	-	-
1973	-	-	0.171	0.181	0.302	0.356	0.319	0.152	0.146	0.142	-	-	-
1974	-	-	0.051	2.08	1.08	0.157	0.005	0.035	0.130	0.127	-	-	-
1975	-	-	0.064	1.05	0.525	0.159	0.032	0.231	0.335	0.197	-	-	-
1976	-	-	0.156	1.92	0.180	0.118	0.026	0.033	0.005	0.069	-	-	-
1977	-	-	0.015	0.237	0.149	0.090	0.079	0.049	0.109	0.099	-	-	-
1978	-	-	0.088	0.733	0.273	0.077	0.112	0.017	0.101	0.074	-	-	-
1979	-	-	0.087	1.31	1.13	0.323	0.062	0.024	0.024	0.054	-	-	-
1980	-	-	0.042	0.612	0.081	0.010	0.019	0.235	0.045	0.218	-	-	-
1981	-	0.236	0.200	0.157	0.146	0.304	0.046	0.092	0.122	0.168	-	-	-
1982	-	-	0.031	0.513	0.244	0.203	0.591	0.036	0.026	0.202	-	-	-
1983	-	-	0.001	1.48	0.294	0.173	0.082	0.018	0.049	0.072	-	-	-
1984	-	-	0.163	0.300	0.276	0.224	0.015	0.016	0.000	0.243	-	-	-
1985	-	-	0.376	0.584	0.229	0.190	0.087	0.235	0.129	0.195	-	-	-
1986	-	-	0.713	1.03	0.793	0.129	0.445	0.117	0.110	0.101	-	-	-
1987	-	-	0.313	0.915	0.109	0.050	0.102	0.220	0.063	0.094	-	-	-
1988	-	-	0.128	0.320	0.312	0.046	0.088	0.037	0.058	0.069	-	-	-
1989	-	-	0.001	0.454	0.170	0.272	0.062	0.042	0.049	0.043	-	-	-
1990	-	-	0.317	0.547	0.494	0.489	0.272	0.052	0.028	0.029	-	-	-
1991	-	-	0.035	0.327	0.213	0.448	0.328	0.072	0.072	0.112	-	-	-
1992	-	-	0.491	0.727	0.174	0.062	0.144	0.079	0.053	0.064	-	-	-
1993	-	-	0.088	0.355	0.318	0.172	0.233	0.232	0.064	0.075	-	-	-
1994	-	-	0.169	0.253	0.242	-	-	-	-	-	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	-	0.236	0.000	0.157	0.081	0.010	0.005	0.016	0.000	0.000	-	-	-
MAX	-	0.236	0.827	2.08	1.13	0.834	0.591	0.235	0.513	0.425	-	-	-
MEAN	-	0.236	0.166	0.844	0.416	0.246	0.163	0.097	0.116	0.119	-	-	-

WHITEMUD RIVER AT WESTBOURNE
WATER SURVEY OF CANADA DATA

MEAN MONTHLY FLOWS IN CMS
05LL002

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1972	-	-	4.77	29.9	19.6	11.3	3.78	1.70	1.09	3.43	-	-	-
1973	-	-	4.00	4.66	5.81	4.12	1.72	2.14	3.54	4.39	1.95	1.27	-
1974	0.883	0.301	0.437	57.7	53.7	23.3	6.21	1.21	1.08	1.99	2.45	1.17	12.5
1975	0.801	0.574	0.742	18.2	22.3	6.63	1.39	4.91	14.4	14.0	12.0	4.95	8.41
1976	3.35	2.39	1.74	112	43.2	9.90	2.46	0.786	0.606	3.24	1.20	0.214	15.1
1977	0.187	0.257	1.33	4.80	5.75	3.54	3.63	1.40	3.55	2.60	1.75	0.828	2.47
1978	0.793	0.623	1.13	24.6	8.77	5.49	1.56	0.869	0.824	2.67	4.26	1.50	4.42
1979	0.753	0.481	0.630	56.5	93.4	31.8	9.39	2.53	1.35	1.54	1.89	1.39	16.8
1980	0.765	0.884	0.806	9.75	3.16	1.13	0.632	4.12	1.81	3.55	2.84	1.49	2.58
1981	0.511	1.34	3.15	5.30	3.74	5.85	0.921	0.750	0.662	2.45	2.39	0.948	2.33
1982	0.185	0.181	0.526	15.0	10.2	4.29	4.37	1.44	0.684	3.13	2.09	0.720	3.57
1983	0.651	0.516	0.497	50.4	16.7	7.90	3.01	0.915	0.438	1.99	3.47	1.14	7.31
1984	0.281	0.409	2.41	6.59	6.57	3.23	1.03	0.433	0.267	3.63	1.07	0.718	2.22
1985	0.406	0.297	4.19	14.9	4.78	2.27	1.12	2.35	1.75	3.17	2.28	1.35	3.24
1986	0.877	0.925	8.42	29.5	35.7	15.1	9.13	2.89	1.25	3.28	1.88	1.22	9.17
1987	0.791	0.726	2.39	39.0	7.84	3.27	1.20	4.63	0.708	1.52	1.68	1.17	5.41
1988	0.226	0.126	0.973	5.33	3.92	0.948	0.791	0.149	0.189	0.489	0.625	0.385	1.18
1989	0.175	0.207	0.236	5.58	1.99	2.93	0.714	0.414	0.190	0.392	0.659	0.262	1.15
1990	0.210	0.286	1.49	8.10	5.70	3.54	1.41	0.349	0.160	0.350	0.563	0.298	1.87
1991	0.254	0.357	0.623	5.03	4.44	2.38	6.27	0.340	0.192	0.483	1.11	0.882	1.86
1992	1.26	1.13	5.08	24.7	13.7	4.89	2.57	0.538	0.644	1.21	1.52	0.837	4.85
1993	0.608	0.616	1.75	5.66	5.24	1.64	5.71	4.57	2.18	2.44	2.52	0.894	2.82
1994	0.470	0.321	2.06	6.01	5.14	4.25	2.40	0.924	1.23	1.73	1.83	0.708	2.26
1995	0.571	0.661	3.71	52.7	30.5	13.5	3.54	0.873	1.21	1.72	1.11	0.892	9.25
1996	0.722	0.489	0.713	51.6	33.3	19.1	12.2	4.41	2.28	1.96	1.22	1.02	10.8
1997	0.685	0.719	0.964	19.5	9.68	2.10	1.67	0.465	0.406	0.949	0.938	0.675	3.23
1998	0.598	1.02	4.98	34.8	4.43	6.02	5.15	1.67	0.803	2.10	1.72	1.84	5.43
1999	0.842	0.641	6.67	15.5	30.6	16.9	5.31	2.56	2.60	3.36	3.11	1.80	7.50
2000	1.04	1.10	9.47	7.33	6.20	6.69	10.8	2.41	5.10	2.88	11.2	3.94	5.68
2001	3.07	1.86	1.93	74.6	75.4	25.9	29.2	12.6	3.13	2.21	2.56	1.95	19.5
2002	1.67	1.27	0.918	8.04	3.70	3.94	2.65	1.17	1.10	1.18	0.909	0.637	2.27
2003	0.634	0.330	1.75	5.97	4.58	3.82	0.756	0.336	1.13	1.26	1.16	0.833	1.88
2004	0.701	0.633	8.46	21.9	9.19	24.1	3.94	1.49	1.69	3.71	3.06	1.47	6.69
2005	1.38	1.78	1.50	50.0	20.0	24.2	56.0	16.1	7.34	6.33	3.54	1.72	15.8
2006	2.25	1.83	1.29	68.3	24.0	14.7	3.14	0.870	0.814	1.62	1.10	1.08	10.1
2007	0.968	0.543	11.0	34.8	17.8	11.2	4.11	0.822	0.952	2.27	1.33	0.726	7.21
2008	0.723	0.414	0.594	9.44	5.87	13.1	5.91	2.74	2.14	3.77	2.83	1.43	4.08

MEAN MONTHLY FLOWS IN CMS
 05LL002
 WHITEMUD RIVER AT WESTBOURNE
 WATER SURVEY OF CANADA DATA

2009	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
	1.09	0.768	0.818	56.7	31.5	17.2	5.79	1.93	1.87	1.99	2.59	1.17	10.3

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	0.175	0.126	0.236	4.66	1.99	0.948	0.632	0.149	0.160	0.350	0.563	0.214	
MAX	3.35	2.39	11.0	112	93.4	31.8	56.0	16.1	14.4	14.0	12.0	4.95	
MEAN	0.872	0.750	2.74	27.6	18.1	9.53	5.83	2.39	1.88	2.66	2.44	1.23	

MEAN MONTHLY FLOWS IN CMS
0511L005

WHITEMUD RIVER NEAR KEYES
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1958	-	-	-	3.56	1.21	0.527	0.367	0.052	0.103	0.928	-	-	-
1959	-	-	0.509	3.03	1.47	0.660	0.253	0.021	0.269	0.658	-	-	-
1960	-	-	0.170	37.9	5.01	1.76	0.418	0.134	0.140	0.518	-	-	-
1961	-	-	0.529	1.46	1.57	0.634	0.040	0.067	0.348	0.578	-	-	-
1962	-	-	0.114	11.2	2.49	1.53	0.511	0.614	0.417	0.498	0.542	0.182	-
1963	0.003	0.000	3.42	5.58	1.42	2.40	2.24	0.163	0.120	0.380	0.427	-	-
1964	-	-	0.265	3.41	3.04	0.657	0.318	0.198	0.247	0.179	0.143	0.097	-
1965	0.108	0.153	0.199	21.2	3.76	2.06	2.15	1.22	2.60	0.977	0.666	0.548	2.97
1966	0.302	0.193	4.39	9.13	4.02	1.43	0.270	0.254	0.367	0.099	0.489	0.355	1.78
1967	0.268	0.209	0.240	16.8	3.60	0.682	0.223	0.117	0.094	0.197	0.205	0.146	1.90
1968	0.098	0.208	1.80	2.26	1.12	0.487	0.319	0.740	0.689	0.496	0.533	0.158	0.743
1969	0.158	0.242	0.329	28.1	3.60	1.61	8.46	2.26	0.587	1.06	1.00	0.383	3.98
1970	0.194	0.294	0.319	34.0	24.9	3.53	1.55	0.397	0.467	0.738	0.907	0.337	5.63
1971	0.311	0.260	0.321	6.89	2.77	10.4	9.22	1.23	0.437	2.18	1.41	0.521	3.00
1972	0.253	0.209	3.35	16.5	4.82	1.29	0.542	0.270	0.157	0.386	0.454	0.116	2.36
1973	0.156	0.197	1.45	1.41	1.60	1.07	0.389	0.682	2.43	1.34	0.708	0.441	0.989
1974	0.253	0.280	0.421	32.9	16.9	3.00	0.380	0.148	0.170	0.433	0.485	0.265	4.63
1975	0.305	0.304	0.348	11.3	9.47	1.99	0.361	2.91	6.23	2.09	1.34	0.610	3.10
1976	0.640	0.614	0.549	31.4	2.67	1.75	0.377	0.045	0.024	0.246	0.251	0.130	3.22
1977	0.144	0.157	0.551	1.37	1.98	1.40	2.70	0.703	2.17	1.34	0.786	0.387	1.14
1978	0.383	0.220	0.275	10.5	3.31	1.24	0.286	0.170	0.246	0.356	0.348	0.266	1.47
1979	0.231	0.172	0.300	34.0	24.6	3.97	1.09	0.154	0.133	0.366	0.333	0.206	5.46
1980	0.173	0.196	0.241	4.61	0.576	0.246	0.170	0.994	0.627	0.793	0.821	0.297	0.812
1981	0.144	1.26	1.04	1.55	0.988	0.969	0.293	0.307	0.167	0.647	0.629	0.259	0.688
1982	0.081	0.089	0.189	5.80	2.10	0.901	1.79	0.369	0.229	0.601	0.456	0.184	1.07
1983	0.198	0.103	0.181	24.7	3.92	1.18	0.749	0.202	0.282	0.400	0.292	0.148	2.70
1984	0.100	0.203	0.556	1.82	2.21	0.727	0.191	0.136	0.219	0.675	0.299	0.159	0.608
1985	0.091	0.081	0.779	5.84	0.886	0.524	0.312	0.877	0.513	0.742	0.438	0.274	0.946
1986	0.273	0.258	4.67	9.46	8.77	0.625	1.21	0.208	0.182	0.367	0.287	0.355	2.22
1987	0.239	0.238	0.733	16.4	0.614	0.382	0.533	3.69	0.301	0.413	0.397	0.304	2.02
1988	0.056	0.152	0.467	1.53	1.30	0.244	0.098	0.136	0.089	0.177	0.146	0.130	0.377
1989	0.111	0.094	0.149	1.04	0.450	0.497	0.148	0.141	0.099	0.176	0.173	0.137	0.268
1990	0.138	0.145	0.901	5.60	2.73	0.677	0.300	0.100	0.086	0.151	0.154	0.126	0.926
1991	0.117	0.107	0.127	1.94	1.40	0.323	1.03	0.119	0.076	0.168	0.280	0.185	0.489
1992	0.203	0.218	1.68	11.7	2.95	0.400	0.290	0.115	0.104	0.278	0.291	0.397	1.55
1993	0.216	0.155	0.654	1.44	1.14	0.248	2.73	0.676	0.222	0.117	0.431	0.183	0.685
1994	0.090	0.113	0.805	1.35	0.803	0.705	0.804	0.269	0.460	0.449	0.386	0.160	0.533
1995	0.118	0.142	1.85	30.7	7.00	2.22	0.967	0.521	0.404	0.436	0.432	0.294	3.76
1996	0.289	0.235	0.263	18.8	6.50	2.48	0.859	0.382	0.239	0.451	0.290	0.270	2.59
1997	-	-	0.304	6.07	2.40	0.480	0.361	0.206	0.127	0.279	-	-	-

MEAN MONTHLY FLOWS IN CMS

051L005

WHITEMUD RIVER NEAR KEYES

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1998	-	-	1.82	11.0	0.977	2.98	2.52	0.775	0.220	0.804	-	-	-
1999	-	-	4.89	7.76	20.0	7.66	2.36	0.665	0.556	0.790	-	-	-
2000	-	-	3.91	1.73	1.50	1.19	5.73	0.555	2.09	0.704	-	-	-
2001	-	-	0.646	30.9	9.76	7.86	7.66	2.95	0.344	0.398	-	-	-
2002	-	-	0.356	2.86	1.07	1.01	1.38	0.536	0.528	0.748	-	-	-
2003	-	-	0.997	3.32	1.69	1.04	-	-	0.253	0.230	0.405	0.212	-
2004	-	-	1.22	5.47	3.53	7.18	0.451	0.498	0.597	1.16	-	-	-
2005	-	-	0.262	20.8	3.46	6.55	15.6	0.678	0.254	0.404	-	-	-
2006	-	-	0.568	25.5	2.46	1.59	0.586	0.152	0.220	0.289	-	-	-
2007	-	-	8.30	13.3	4.21	2.16	0.983	0.208	0.167	0.339	-	-	-
2008	-	-	0.181	4.94	1.31	3.25	1.06	0.550	0.330	0.491	-	-	-
2010	-	-	2.87	4.86	9.69	19.6	5.31	1.98	-	-	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	0.003	0.000	0.114	1.04	0.450	0.244	0.040	0.021	0.024	0.099	0.143	0.097	-
MAX	0.640	1.26	8.30	37.9	24.9	19.6	15.6	3.69	6.23	2.18	1.41	0.610	-
MEAN	0.195	0.227	1.21	11.7	4.45	2.31	1.74	0.618	0.557	0.583	0.490	0.264	-

MEAN MONTHLY FLOWS IN CMS
05LL007

PINE CREEK NEAR PINE CREEK STATION
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1959	-	-	0.783	2.58	1.75	0.734	0.450	0.301	0.625	1.47	-	-	-
1960	-	-	0.142	8.56	1.65	0.931	0.443	0.440	0.376	0.501	-	-	-
1961	-	-	0.972	2.28	1.72	0.523	0.301	0.126	0.348	0.469	-	-	-
1962	-	-	0.116	3.57	1.60	1.45	0.454	0.365	0.337	0.513	-	-	-
1963	-	-	1.23	1.94	1.20	2.38	0.980	0.425	0.373	0.497	-	-	-
1964	-	-	0.142	2.84	1.45	1.16	0.768	0.392	0.611	0.568	-	-	-
1965	-	-	0.335	5.81	1.79	1.41	0.955	0.401	1.04	0.703	-	-	-
1966	-	-	0.668	3.20	1.84	0.805	0.515	0.762	0.740	0.650	-	-	-
1967	-	-	0.107	4.05	1.29	0.673	0.404	0.240	0.153	0.692	-	-	-
1968	-	-	1.14	2.00	1.19	0.497	0.552	1.17	0.829	0.679	-	-	-
1969	-	-	0.012	5.18	1.76	1.14	2.19	0.633	0.433	0.782	-	-	-
1970	-	-	0.391	7.21	4.65	1.48	1.32	0.526	0.990	0.723	-	-	-
1971	-	-	0.544	4.44	1.89	1.67	1.17	0.383	0.328	1.22	-	-	-
1972	-	-	1.00	3.15	1.67	1.37	0.611	0.620	0.380	0.441	-	-	-
1973	-	-	0.540	0.663	1.60	1.22	0.845	0.676	0.509	0.721	-	-	-
1974	-	-	0.011	6.96	4.00	0.867	0.237	0.137	0.476	0.465	-	-	-
1975	-	-	0.473	3.48	2.32	0.963	0.381	1.35	1.73	0.796	-	-	-
1976	-	-	0.584	8.50	0.956	0.841	0.281	0.152	0.218	0.775	-	-	-
1977	-	-	0.661	1.28	2.30	1.11	0.804	0.565	1.26	0.857	-	-	-
1978	-	-	0.388	3.50	1.67	1.16	-	-	-	-	-	-	-
1979	-	-	0.463	8.14	4.44	1.45	-	-	-	-	-	-	-
1980	-	-	0.442	1.94	0.852	0.388	-	-	-	-	-	-	-
1981	-	0.276	0.707	0.869	0.953	0.988	-	-	-	-	-	-	-
1982	-	-	0.507	3.01	1.22	0.800	-	-	-	-	-	-	-
1983	-	-	0.341	5.64	1.42	1.11	-	-	-	-	-	-	-
1984	-	-	0.884	1.45	1.27	0.975	0.480	-	-	-	-	-	-
1985	-	-	1.14	1.42	0.837	0.734	-	-	-	-	-	-	-
1986	-	-	2.09	3.85	3.28	0.544	-	-	-	-	-	-	-
1987	-	-	0.919	4.07	0.564	0.279	-	-	-	-	-	-	-
1988	-	-	0.199	1.01	1.10	0.359	-	-	-	-	-	-	-
1989	-	-	0.310	2.33	0.653	0.854	-	-	-	-	-	-	-
1990	-	-	1.47	2.10	1.59	0.915	-	-	-	-	-	-	-
1991	-	-	0.397	1.45	1.33	1.28	1.60	0.227	0.229	0.487	-	-	-
1992	-	-	1.22	3.07	0.869	0.562	0.553	0.203	0.368	0.550	-	-	-
1993	-	-	0.610	1.44	1.21	0.562	0.969	0.902	0.367	0.504	-	-	-
1994	-	-	0.622	0.978	1.04	0.949	0.589	0.517	0.361	1.09	-	-	-
1995	-	-	1.52	6.85	2.37	0.887	0.383	0.220	0.290	0.511	-	-	-

MEAN MONTHLY FLOWS IN CMS

PINE CREEK NEAR PINE CREEK STATION

051L007

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1996	-	-	0.582	6.00	2.23	1.45	0.612	0.204	0.196	0.493	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	-	0.276	0.011	0.663	0.564	0.279	0.237	0.126	0.153	0.441	-	-	-
MAX	-	0.276	2.09	8.56	4.65	2.38	2.19	1.35	1.73	1.47	-	-	-
MEAN	-	0.276	0.649	3.60	1.73	0.986	0.725	0.477	0.543	0.687	-	-	-

MEAN MONTHLY FLOWS IN CMS
 0511009
 STONY CREEK NEAR NEERAWA
 WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1959	-	-	0.762	0.306	0.081	0.024	0.000	0.000	0.003	0.060	-	-	-
1960	-	-	0.000	5.31	0.657	0.214	0.014	0.000	0.000	0.028	-	-	-
1961	-	-	0.010	0.283	0.159	0.009	0.000	0.000	0.000	0.000	-	-	-
1962	-	-	0.000	1.99	0.159	0.037	0.137	0.141	0.054	0.061	-	-	-
1963	-	-	1.17	0.993	0.180	0.890	0.638	0.010	0.009	0.008	-	-	-
1964	-	-	0.000	0.951	0.304	0.035	0.011	0.003	0.007	0.025	-	-	-
1965	-	-	0.000	4.31	0.599	0.329	0.803	0.294	0.535	0.130	-	-	-
1966	-	-	0.334	1.94	0.687	0.241	0.108	0.026	0.001	0.026	-	-	-
1967	-	-	0.014	3.86	0.424	0.057	0.010	0.000	0.000	0.011	-	-	-
1968	-	-	0.857	0.405	0.125	0.044	0.038	0.038	0.046	0.043	-	-	-
1969	-	-	0.017	5.31	0.379	0.496	1.70	0.186	0.049	0.082	-	-	-
1970	-	-	0.025	4.92	4.30	0.231	0.348	0.219	0.032	0.076	-	-	-
1971	-	-	0.000	1.92	0.258	2.62	0.906	0.043	0.031	0.160	-	-	-
1972	-	-	0.101	3.51	0.680	0.077	0.033	0.015	0.017	0.049	-	-	-
1973	-	-	0.233	0.150	0.116	0.042	0.008	0.006	0.173	0.068	-	-	-
1974	-	-	0.054	3.95	2.38	0.176	0.015	0.002	0.018	0.032	-	-	-
1975	-	-	0.028	2.77	0.804	0.211	0.050	1.06	1.19	0.229	-	-	-
1976	-	-	0.083	4.58	0.249	0.283	0.053	0.012	0.008	0.039	-	-	-
1977	-	-	0.032	0.175	0.105	0.062	0.091	0.059	0.117	0.075	-	-	-
1978	-	-	0.020	1.62	0.581	0.111	0.011	0.005	0.036	0.045	-	-	-
1979	-	-	0.015	5.28	3.22	0.269	0.027	0.004	0.017	0.041	-	-	-
1980	-	-	0.000	0.620	0.051	0.012	0.007	0.166	0.160	0.177	-	-	-
1981	-	0.307	0.672	0.457	0.092	0.091	0.003	0.048	0.065	0.089	-	-	-
1982	-	-	0.118	1.98	0.135	0.066	0.073	0.016	0.019	0.075	-	-	-
1983	-	-	0.014	3.47	0.402	0.181	0.199	0.000	0.005	0.150	-	-	-
1984	-	-	0.203	0.324	0.176	0.082	0.006	0.000	0.001	0.058	-	-	-
1985	-	-	0.108	1.10	0.125	0.095	0.027	0.150	0.096	0.094	-	-	-
1986	-	-	1.38	1.70	1.72	0.179	0.433	0.041	0.041	0.035	-	-	-
1987	-	-	0.069	3.71	0.139	0.100	0.093	0.045	0.016	0.045	-	-	-
1988	-	-	0.041	0.710	0.144	0.016	0.001	0.000	0.002	0.016	-	-	-
1989	-	-	0.003	0.120	0.067	0.042	0.015	0.000	0.000	0.001	-	-	-
1990	-	-	0.182	0.808	0.355	0.060	0.021	0.004	0.000	0.017	-	-	-
1991	-	-	0.033	0.486	0.197	0.016	0.247	0.018	0.007	0.016	-	-	-
1992	-	-	0.348	3.07	0.542	0.050	0.063	0.025	0.045	0.047	-	-	-

MEAN MONTHLY FLOWS IN CMS

05LL009

STONY CREEK NEAR NEEPAWA

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1993	-	-	0.122	0.335	0.282	0.085	-	-	-	-	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	-	0.307	0.000	0.120	0.051	0.009	0.000	0.000	0.000	0.000	-	-	-
MAX	-	0.307	1.38	5.31	4.30	2.62	1.70	1.06	1.19	0.229	-	-	-
MEAN	-	0.307	0.201	2.10	0.596	0.215	0.182	0.078	0.082	0.062	-	-	-

MEAN MONTHLY FLOWS IN CMS
05LL011

BOGGY CREEK NEAR NEEPAWA

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1960	-	-	-	-	-	-	-	0.040	0.109	0.225	-	-	-
1961	-	-	0.274	0.535	0.880	0.627	0.223	0.204	0.219	0.147	-	-	-
1962	-	-	0.170	3.09	0.987	0.485	0.240	0.384	0.225	0.186	-	-	-
1963	-	-	0.618	1.41	0.550	1.15	0.777	0.208	0.202	0.153	-	-	-
1964	-	-	0.273	0.789	0.856	0.297	0.243	0.186	0.186	0.155	-	-	-
1965	-	-	0.241	5.96	1.06	0.589	1.03	0.464	1.06	0.435	-	-	-
1966	-	-	1.10	2.33	1.39	0.583	0.207	0.227	0.206	0.196	-	-	-
1967	-	-	0.230	3.03	1.14	0.239	0.185	0.198	0.238	0.173	-	-	-
1968	-	-	0.304	0.864	0.396	0.221	0.238	0.324	0.407	0.246	-	-	-
1969	-	-	0.210	6.39	1.49	0.796	2.81	0.485	0.403	0.521	-	-	-
1970	-	-	0.323	8.95	7.94	1.37	0.836	0.290	0.488	0.595	-	-	-
1971	-	-	0.283	1.85	1.09	3.67	3.86	1.02	0.603	1.04	-	-	-
1972	-	-	0.986	6.40	1.93	1.07	0.232	0.134	0.065	0.212	-	-	-
1973	-	-	0.488	0.522	0.714	0.419	0.159	0.287	0.813	0.415	-	-	-
1974	-	-	0.204	10.2	4.59	1.26	0.149	0.113	0.228	0.363	-	-	-
1975	-	-	0.294	3.37	2.92	0.884	0.207	0.989	1.22	0.671	-	-	-
1976	-	-	0.398	9.10	1.02	0.749	0.203	0.082	0.117	0.152	-	-	-
1977	-	-	0.479	0.675	1.07	0.613	1.23	0.306	1.09	0.584	-	-	-
1978	-	-	0.434	3.05	1.56	0.428	0.139	0.153	0.292	0.200	-	-	-
1979	-	-	0.334	10.1	5.39	0.735	0.525	0.126	0.231	0.196	-	-	-
1980	-	-	0.203	0.936	0.261	0.191	0.161	0.228	0.325	0.385	-	-	-
1981	-	-	0.595	0.337	0.369	0.327	0.185	0.190	0.073	0.280	-	-	-
1982	-	-	0.254	1.67	0.620	0.358	0.791	0.307	0.248	0.285	-	-	-
1983	-	-	0.285	6.88	1.13	0.406	0.415	0.201	0.202	0.263	-	-	-
1984	-	-	0.195	0.482	0.622	0.375	0.222	0.210	0.173	0.212	-	-	-
1985	-	-	0.481	2.37	0.253	0.219	0.366	0.539	0.365	0.439	-	-	-
1986	-	-	1.84	3.02	1.75	0.221	0.409	0.181	0.190	0.218	-	-	-
1987	-	-	0.470	5.37	0.261	0.227	0.389	0.680	0.192	0.244	-	-	-
1988	-	-	0.306	0.395	0.448	0.174	0.175	0.209	0.165	0.151	-	-	-
1989	-	-	0.130	0.231	0.152	0.215	0.135	0.176	0.185	0.204	-	-	-
1990	-	-	0.224	1.13	0.582	0.258	0.226	0.188	0.175	0.160	-	-	-
1991	-	-	0.161	0.359	0.532	0.198	0.362	0.166	0.136	0.183	-	-	-
1992	-	-	0.613	3.95	0.554	0.168	0.172	0.157	0.134	0.132	-	-	-
1993	-	-	0.337	0.556	0.394	0.190	0.516	0.256	0.198	0.191	-	-	-

MEAN MONTHLY FLOWS IN CMS

BOGGY CREEK NEAR NEEPAWA

05LL011

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1994	-	-	0.297	0.392	0.314	-	-	-	-	-	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	-	-	0.130	0.231	0.152	0.168	0.135	0.040	0.065	0.132	-	-	-
MAX	-	-	1.84	10.2	7.94	3.67	3.86	1.02	1.22	1.04	-	-	-
MEAN	-	-	0.413	3.14	1.33	0.597	0.546	0.291	0.328	0.300	-	-	-

MEAN MONTHLY FLOWS IN CMS
05LL014
PINE CREEK NEAR MELBOURNE
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1965	-	-	0.117	1.06	0.406	0.299	0.444	0.141	0.202	0.150	-	-	-
1966	-	-	0.474	0.814	0.414	0.172	0.090	0.140	0.125	0.148	-	-	-
1967	-	-	0.132	1.04	0.314	0.176	0.089	0.064	0.051	0.142	-	-	-
1968	-	-	0.328	0.353	0.317	0.162	0.204	0.288	0.271	0.300	-	-	-
1969	-	-	0.119	1.29	0.464	0.424	0.487	0.189	0.184	0.243	0.196	0.152	-
1970	0.135	0.140	0.161	1.61	0.765	0.545	0.312	0.105	0.230	0.220	0.253	0.126	0.383
1971	0.124	0.138	0.170	0.793	0.415	0.368	0.291	0.119	0.110	0.289	0.239	0.130	0.266
1972	0.136	0.118	0.316	0.803	0.319	0.279	0.172	0.122	0.114	0.161	0.145	0.085	0.231
1973	0.089	0.097	0.195	0.210	0.319	0.296	0.205	0.116	0.148	0.200	0.146	0.118	0.178
1974	0.084	0.106	0.116	1.66	0.567	0.226	0.064	0.063	0.106	0.159	0.190	0.144	0.290
1975	0.118	0.113	0.125	0.797	0.425	0.225	0.065	0.188	0.205	0.211	0.154	0.119	0.229
1976	0.129	0.135	0.154	1.68	0.210	0.243	0.091	0.068	0.075	0.103	0.132	0.098	0.260
1977	0.122	0.136	0.203	0.201	0.790	0.320	0.302	0.143	0.275	0.213	0.197	0.184	0.257
1978	0.164	0.134	0.308	0.949	0.438	0.235	0.276	0.160	0.170	0.197	0.204	0.168	0.284
1979	0.157	0.147	0.171	1.97	0.773	0.344	0.127	0.121	0.072	0.154	0.238	0.169	0.370
1980	0.146	0.146	0.161	0.448	0.177	0.118	0.109	0.275	0.151	0.227	0.186	0.110	0.188
1981	0.097	0.185	0.198	0.160	0.196	0.244	0.096	0.125	0.122	0.196	0.185	0.110	0.160
1982	0.093	0.106	0.146	0.533	0.245	0.167	0.335	0.105	0.185	0.241	0.147	0.119	0.202
1983	0.110	0.102	0.133	1.59	0.300	0.242	0.189	0.071	0.096	0.205	0.197	0.119	0.280
1984	0.094	0.118	0.218	0.275	0.286	0.284	0.125	0.086	0.077	0.167	0.169	0.102	0.167
1985	0.084	0.087	0.439	0.302	0.136	0.179	0.084	0.385	0.198	0.198	0.137	0.117	0.195
1986	0.102	0.107	0.566	0.620	0.497	0.171	0.139	0.163	0.180	0.240	0.249	0.164	0.266
1987	0.169	0.188	0.284	0.763	0.153	0.100	0.102	0.136	0.085	0.182	0.185	0.148	0.208
1988	0.090	0.105	0.184	0.209	0.217	0.114	0.135	0.054	0.058	0.059	0.077	0.077	0.115
1989	0.077	0.077	0.086	0.459	0.109	0.135	0.095	0.048	0.051	0.101	0.192	0.087	0.126
1990	0.085	0.077	0.543	0.462	0.292	0.145	0.124	0.062	0.048	0.061	0.079	0.082	0.172
1991	0.093	0.097	0.176	0.247	0.363	0.355	0.267	0.052	0.072	0.139	0.175	0.125	0.180
1992	0.133	0.128	0.266	0.768	0.159	0.103	0.134	0.082	0.080	0.109	0.126	0.131	0.185
1993	0.114	0.096	0.251	0.173	0.136	0.140	0.234	0.092	0.099	0.176	0.136	0.094	0.145
1994	0.090	0.107	0.283	0.122	0.129	0.165	0.126	0.118	0.106	0.274	0.179	0.140	0.153
1995	0.133	0.139	0.476	1.45	0.312	0.164	0.133	0.068	0.084	0.161	0.208	0.206	0.294
1996	0.139	0.114	0.159	1.21	0.324	0.199	0.121	0.062	0.075	0.155	0.119	0.123	0.233
1997	0.136	0.146	0.209	1.20	0.268	0.118	0.154	0.126	0.067	0.178	0.150	0.140	0.241
1998	0.118	0.122	0.173	1.23	0.205	0.280	0.202	0.312	0.119	0.238	0.252	0.206	0.288
1999	0.169	0.167	0.379	0.407	0.615	0.213	0.231	0.141	0.165	0.204	0.190	0.157	0.253
2000	0.129	0.207	0.539	0.238	0.278	0.322	0.367	0.152	0.159	0.296	0.299	0.215	0.267
2001	0.241	0.169	0.147	1.06	0.300	0.186	0.163	0.105	0.105	0.181	0.190	0.181	0.252
2002	0.153	0.146	0.145	0.314	0.167	0.202	0.125	0.119	0.102	0.185	0.248	0.108	0.168
2003	0.116	0.108	0.207	0.207	0.190	0.212	0.089	0.064	0.156	0.148	0.200	0.141	0.153
2004	0.115	0.099	0.409	0.544	0.387	0.243	0.262	0.222	0.211	0.223	0.285	0.128	0.261

MEAN MONTHLY FLOWS IN CMS

PINE CREEK NEAR MELBOURNE

05LL014

WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
2005	0.121	0.110	0.124	0.856	0.350	0.342	0.425	0.138	0.121	0.234	0.242	0.196	0.272
2006	0.162	0.214	0.199	1.17	0.248	0.165	0.132	0.067	0.085	0.145	0.176	0.212	0.248
2007	0.160	0.102	0.813	0.441	0.432	0.392	0.178	0.115	0.111	0.210	0.176	-	-
2008	-	0.097	0.168	0.301	0.173	0.315	0.156	0.156	0.111	0.208	0.207	-	-
2009	-	0.250	0.421	1.26	0.393	0.161	0.152	0.143	0.160	0.180	0.172	0.118	-
2010	0.110	0.123	0.236	0.183	0.360	0.646	0.223	0.271	-	-	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	0.077	0.077	0.086	0.122	0.109	0.100	0.064	0.048	0.048	0.059	0.077	0.077	0.077
MAX	0.241	0.250	0.813	1.97	0.790	0.646	0.487	0.385	0.275	0.300	0.299	0.215	0.215
MEAN	0.124	0.129	0.257	0.748	0.333	0.242	0.188	0.133	0.128	0.187	0.186	0.137	0.137

MEAN MONTHLY FLOWS IN CMS
05LL015

BIG GRASS RIVER NEAR GLENELLA
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
1965	-	-	0.000	4.22	3.52	1.85	0.480	0.267	2.69	0.712	-	-	-
1966	-	-	0.780	8.60	5.69	1.22	0.410	0.499	0.130	0.054	-	-	-
1967	-	-	0.002	10.0	5.03	0.497	0.412	0.041	0.000	0.000	-	-	-
1968	-	-	0.459	2.72	2.54	0.465	0.534	1.33	0.740	0.318	-	-	-
1969	-	-	0.000	21.1	3.29	2.51	5.65	0.540	0.206	0.227	-	-	-
1970	-	-	0.000	12.1	24.3	2.08	1.25	0.052	0.001	0.210	-	-	-
1971	-	-	0.001	4.88	1.09	8.35	6.17	0.165	0.049	1.01	-	-	-
1972	-	-	1.24	14.1	3.73	0.499	0.039	0.000	0.000	0.000	-	-	-
1973	-	-	0.336	0.351	0.384	0.593	0.013	0.000	0.021	0.002	-	-	-
1974	-	-	0.000	15.6	14.3	1.81	0.106	0.000	0.000	0.000	-	-	-
1975	-	-	0.000	2.73	3.21	1.68	0.326	3.65	23.1	5.12	-	-	-
1976	-	-	0.168	51.5	2.48	1.04	0.227	0.000	0.000	0.000	-	-	-
1977	-	-	0.000	0.271	0.373	0.144	0.141	0.000	0.248	0.137	-	-	-
1978	-	-	0.000	3.02	1.44	0.400	0.048	0.000	0.014	0.013	-	-	-
1979	-	-	0.000	20.6	22.0	2.40	0.225	0.013	0.005	0.001	-	-	-
1980	-	-	0.000	1.14	0.098	0.002	0.000	2.64	1.82	0.729	-	-	-
1981	-	-	0.621	0.744	0.486	0.664	0.225	0.094	0.003	0.159	-	-	-
1982	-	-	0.039	7.74	1.63	0.412	0.751	0.187	0.005	0.185	-	-	-
1983	-	-	0.003	12.2	2.87	1.07	0.397	0.006	0.000	0.000	-	-	-
1984	-	-	0.109	0.370	0.577	1.23	0.267	0.000	0.000	0.190	-	-	-
1985	-	-	0.707	5.57	0.803	0.646	0.358	0.646	0.437	0.588	-	-	-
1986	-	-	1.61	8.28	23.4	0.969	1.25	0.358	0.125	0.690	-	-	-
1987	-	-	0.237	9.21	0.578	0.138	0.031	0.012	0.000	0.000	-	-	-
1988	-	-	0.004	1.34	0.843	0.025	0.000	0.000	0.000	0.000	-	-	-
1989	-	-	0.000	0.105	0.009	0.331	0.012	0.000	0.000	0.000	-	-	-
1990	-	-	0.112	3.50	3.25	1.59	0.139	0.000	0.000	0.000	-	-	-
1991	-	-	0.019	0.493	0.988	0.065	2.92	0.105	0.001	0.003	-	-	-
1992	-	-	0.482	10.5	5.12	0.492	0.419	0.092	0.034	0.059	-	-	-
1993	-	-	0.342	1.15	0.957	0.394	5.51	0.940	0.406	0.176	-	-	-
1994	-	-	0.173	1.36	0.557	0.278	0.405	0.048	0.192	0.177	-	-	-
1995	-	-	2.57	17.5	8.98	1.29	0.101	0.000	0.000	0.000	-	-	-
1996	-	-	0.000	7.08	7.50	3.26	0.689	0.119	0.000	0.021	-	-	-
1997	-	-	0.000	3.60	1.20	0.298	-	-	-	-	-	-	-
1998	-	-	0.940	3.13	0.586	1.73	-	-	-	-	-	-	-
1999	-	-	0.798	1.06	8.67	2.92	-	-	-	-	-	-	-
2000	-	-	1.67	0.660	0.852	0.838	-	-	-	-	-	-	-
2001	-	-	0.031	32.6	17.0	4.56	5.64	0.283	0.011	0.020	-	-	-
2002	-	-	0.000	0.970	0.230	0.571	0.018	0.003	0.000	0.000	-	-	-
2003	-	-	-	1.19	0.491	0.874	0.094	0.005	0.000	0.000	-	-	-
2004	-	-	0.733	4.03	3.34	10.3	0.452	-	-	0.451	-	-	-

MEAN MONTHLY FLOWS IN CMS
05LL015
BIG GRASS RIVER NEAR GLENELLA
WATER SURVEY OF CANADA DATA

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
2005	-	-	-	12.1	2.90	11.3	12.1	0.482	0.154	0.186	-	-	-
2006	-	-	0.069	14.1	2.60	2.04	0.635	0.001	0.035	0.039	-	-	-
2007	-	-	6.61	7.93	4.67	3.22	1.82	0.281	0.006	0.235	-	-	-
2008	-	-	0.000	3.06	2.18	7.74	2.54	0.653	0.507	0.502	-	-	-
2009	-	-	0.016	17.8	5.99	2.13	0.338	-	0.896	0.344	-	-	-

MONTHLY SUMMARY FOR PERIOD OF RECORD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	MEAN
MIN	-	-	0.000	0.105	0.009	0.002	0.000	0.000	0.000	0.000	-	-	-
MAX	-	-	6.61	51.5	24.3	11.3	12.1	3.65	23.1	5.12	-	-	-
MEAN	-	-	0.486	8.05	4.50	1.93	1.30	0.347	0.797	0.306	-	-	-