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WATER RESOURCES DIVISION  
1577 DUBLIN AVENUE  
WINNIPEG, MANITOBA  
R3E 3J5

ROYAL COMMISSION ON FLOOD-COST BENEFIT

REPORT NO. 1

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REVISION OF COSTS OF GREATER WINNIPEG FLOODWAY

OCT. 22/57

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TEMPLETON ENGINEERING COMPANY  
CONSULTING ENGINEERS  
1632 Portage Avenue  
WINNIPEG 12, MANITOBA

57-24



CHANGE OF ALIGNMENT (cont'd.)

A slight revision is also included at the extreme north end of the floodway to miss some buildings and give an angle less acute for the railway and highway bridge crossings.

The revised locations are shown on the attached plan.

We understand that the C. N. R. operations require the perimeter road and floodway to be east of Navin Station. From the property the C. N. R. has acquired and registered in the Land Titles Office, it would appear that both the highway and floodway could be located approximately midway between the Red River Basin Investigation route and the route east of Navin. To illustrate the magnitude of this a floodway of design capacity of 40,000 cfs would cost \$23,514,000 for excavation by the Navin route, \$21,820,000 for the mid route and \$20,550,000 for the original Red River Basin Investigation route. Similarly the costs for a 60,000 cfs floodway would be \$31,602,000, \$29,120,000 and \$27,538,000 respectively. For a 145,000 cfs floodway the costs would be \$57,552,000, \$52,730,000 and \$50,238,000 respectively.

Perhaps the location can be more closely tied down before the final report is ready, but in the meantime it might be well to remember that by relocation a saving of from \$3,000,000 to \$5,000,000 might be made.

CHANGES IN STRUCTURES DUE TO DEVELOPMENT OF THE ROUTE SINCE 1952

As mentioned above, two bridges will be required under Highway 59, which were not allowed for in the Red River Basin Investigation estimate. The change of alignment also requires a bridge under Dawson Road.

The costs of these structures are included in the detailed estimates to follow.

These are the only new structures required at this time, provided a policy of limited access to the perimeter road is maintained.

INCREASE OF CONSTRUCTION COSTS BETWEEN 1952 and 1957

On going over the estimates it was found that in general the estimating prices used by the Red River Basin Investigation for the various components such as concrete, structural steel for bridges, etc. is higher than the price normally allowed today for detailed designs. However the designs are not in detail and it is therefore customary to allow higher unit prices than one would expect to get in bids based on detailed design. Therefore, rather than make completely new estimates, we have merely applied factors to the prices in the Red River Basin Investigation to bring them up to date. For example, the Red River Basin Investigation used the figure of \$600.00 per ton for structural steel bridge superstructures. The going price today for a similar type of superstructure would be between \$550.00 and \$600.00 per ton. In reviewing the estimate we have used \$680.00 per ton, which was arrived at by applying a figure of 13% price rise from 1952 to 1957 for structural steel erected in bridges. This factor was obtained from Dominion Bridge, who are the principal erectors of structural steel in this area.

The largest item of cost in the floodway schemes is the cost of excavation. This is the most difficult to estimate because it is hard to compare dirt jobs of this magnitude. Price indices are of little value because large jobs in Ontario or British Columbia, where dirt prices are several times the price in Manitoba, would put the average out of line.

In a letter to the Commission, Mr. Gordon MacKenzie said that he felt that the 30 cents per yard dirt should be raised to 40 cents because of the 'probable extra increase in haul' due to growth of the area and right of way problems. He also said that it might be in order to revise the cost of moving hardpan by 10% to bring it to \$1.10. Since side embankments are to be used, we believe that the haul will not be any greater now than it was in 1952, but the cost of right of way will be greatly increased. This appears as a separate item rather than as a dirt moving price, so that an increase in the estimated cost of right of way for either the embankment or the cut would not change the 30 cents per cubic yard for dirt or the \$1.00 per cubic yard for hardpan.

Construction Aggregates Inc. advised using a price of 40 cents per cubic yard. Despite the fact that this Contractor is versed in jobs approaching this magnitude, it could be very well argued that he is biased and anxious to see that the estimates are high enough to cover any eventualities if he gets the job. When actually bidding the jobs, items such as job costs, amortization of equipment, construction cost trends and other jobs in progress, as well as other bidders, would greatly influence the price.

INCREASE OF CONSTRUCTION COSTS BETWEEN 1952 and 1957 (cont'd.)

From the information available, we do not recommend increasing the price of dirt, hardpan, gravel or rip rap. The attached estimate reflects the unit costs on these items unchanged from 1952 to 1957.

It is possible that the Commission might wish to get a panel of construction men together to discuss this item. As an example of the magnitude, a 10 cent price rise in dirt would increase the cost of a -

40,000 cfs floodway by	\$7,640,000
60,000 cfs floodway by	\$11,600,000
80,000 cfs floodway by	\$14,300,000
145,000 cfs floodway by	\$18,750,000

A 10 cent price rise in hardpan excavation would increase the price of a -

40,000 cfs floodway by	\$327,000
60,000 cfs floodway by	\$410,000
80,000 cfs floodway by	\$277,000
145,000 cfs floodway by	\$136,000

It can be seen that a 10 cent price rise in the dirt quantities represents a very large sum and should be considered very carefully. Most people on first thought consider that there has been a definite price rise for dirt between 1952 and 1957, but on more detailed consideration, usually come to the conclusion that any rise in price of labor and equipment is offset by the increased efficiency of the machinery and any fluctuations are still within the range of accuracy of the estimate.

The unit prices used in the Red River Basin Investigation were 30 cents per cubic yard for dirt and \$1.00 per cubic yard for hardpan. To each of the above mentioned prices was added a factor of 12% to cover engineering and contingencies. In the estimates to follow these unit prices have not been changed.

In revising the costs of the structures such as intake, outfall and bridges, more accurate price indices are available for Winnipeg, Canadian and American sources.



INCREASE OF CONSTRUCTION COSTS BETWEEN 1952 and 1957 (cont'd.)

The Engineering News Record, and American publication, shows a price rise for heavy concrete works such as bridge abutments and piers of 25% between 1952 and 1957 for the U. S.

The MacLean Building Reports, which uses information from the Dominion Bureau of Statistics, shows a price rise for heavy concrete construction in Canada as 13%.

Winnipeg prices have risen in the following percentages:

Cement	6%
Ready Mix Concrete	7 1/2%
Reinforcing Steel	14%
Labor: Carpenters and Laborers	20%
Aggregate	0 - 5%
Formwork Material	2%

As an example the Red River Basin Investigation estimated the cost of the intake structure concrete at \$45.00 per cubic yard. Listed below is an estimate of the breakdown of cost of a cubic yard of concrete in 1952 and the estimated percentage increase for each of the components:

	<u>1952</u> <u>Price</u>	<u>%</u> <u>Increase</u>	<u>1957</u> <u>Price</u>
<u>Material</u>			
Transit Mix	\$14.60	7 1/2%	\$15.70
Formwork	7.60	2%	7.75
Reinforcing Steel	5.15	14%	5.87
<u>Labor</u>			
Placing Concrete	4.10	20%	4.92
Placing Reinforcing Steel	1.00	20%	1.20
Placing Formwork	6.45	20%	7.74
Labor Mark Up 10% *	1.23	20%	1.48
<u>Overhead and Profit 12%</u>	<u>4.87</u>		<u>5.36</u>
<b>TOTAL</b>	<b>\$45.00</b>		<b>\$50.02</b>

\* Workmen's Compensation, Unemployment Insurance, Holiday Pay, etc.

INCREASE OF CONSTRUCTION COSTS BETWEEN 1952 and 1957 (cont'd.)

The figure of 13% was used as the price rise between 1952 and 1957 for concrete works such as diversion structure, outfall structure, and bridge sub structures.

Gates and gate hoists for the diversion structure were raised 20%--a figure obtained from Armco Metal and Drainage Products Ltd who are the largest supplier of this type of equipment here.

The breakdown of the costs for the Diversion Structure is shown on Plate 2. The cost is estimated to have increased from \$3,000,000 to \$3,417,000.

*high* In combination with the Diversion Structure, a Dyke west of the Red River is required to divert the water into the floodway. This dyke will run parallel to and adjoining the perimeter road. The perimeter road will be mainly at a lower elevation so that it will not be possible to use it as a dyke. Possibly some of the perimeter road right of way could be used but we have not contemplated this in the estimate shown on Plate 3. The only change between the 1957 and 1952 estimate is the cost of right of way. We have used a figure of \$800 per acre, whereas the Red River Basin Investigation was \$125 per acre.

The estimated cost of the Dyke to the rest of the Diversion Structure is shown on Plate 3.

The estimated costs of the Highway Bridges at 1957 prices are shown on Plate 4. Three bridges are included in this estimate which were not included in the 1952 estimate. These are two bridges under Highway 59 and one under Dawson Road.

The price rise used was 13%. The angle of skew of the bridge with the floodway has been changed due to relocation of the floodway in some cases and these changes are reflected in the costs.

Plate 5 shows the estimated cost of the Railway Bridges revised to the 1957 prices. No new bridges are contemplated. No additional costs were included for the minor changed angles of skew of some bridges.



INCREASE OF CONSTRUCTION COSTS BETWEEN 1952 and 1957 (cont'd.)

Plate 6 shows the revised cost of the Outlet Structure. No changes in the estimate were made except for the cost of concrete which was increased by 13%.

Plate 7 shows the excavation costs of the floodway revised as to:

- (1) Length of relocation.
- (2) Profile of relocation.

It does not reflect the additional cost due to reduced capacity due to lengthening the floodway. This could run as high as \$1,400,000. It was felt that until the route was more firmly located that this figure could be omitted for the preliminary study.

This plate shows the original 1952 estimate as Location 1, and the revised location which is shown dotted on Plate 1 as Location 3. The increase for each item is also shown.

*trial*  
IN SUMMARY the revised costs are shown on Plate 8. The control structure is revised to show concrete and steel price rise. The dykes are increased to show increased right of way costs. The right of way column is increased from the rate of \$125 per acre to \$800 per acre. This average cost might be amended later in light of the Province's experience with the perimeter road. Excavation is increased due to relocation, but unit costs are not increased. Highway bridges are increased due to increase in number and price of concrete and steel. The aqueduct crossing is increased by 13%. The Seine River diversion is decreased because of the works under way by the Province. The outlet structure is increased by the increased concrete and steel costs. The miscellaneous items are increased by 13%.


ACCURACY

The right of way costs and the quantities due to relocation around the perimeter road and the C. N. R. Paddington Yards are the items which could change appreciably. The costs will be revised as soon as the shortest acceptable road is known.

This report is submitted as preliminary information so that the studies can proceed. It is not contemplated that very drastic total changes will result.

Yours very truly,

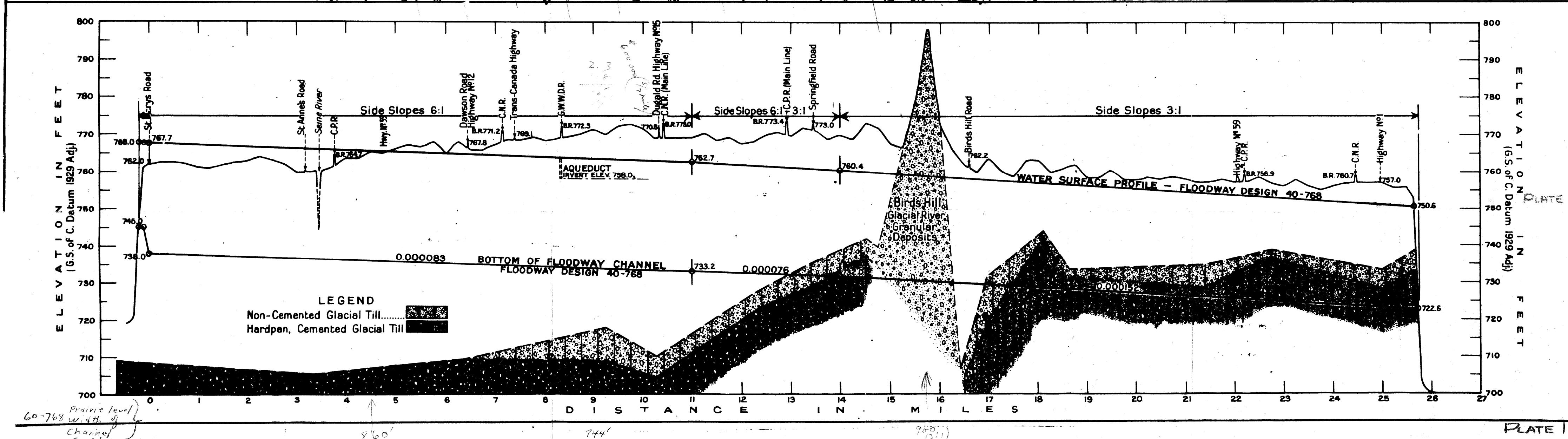
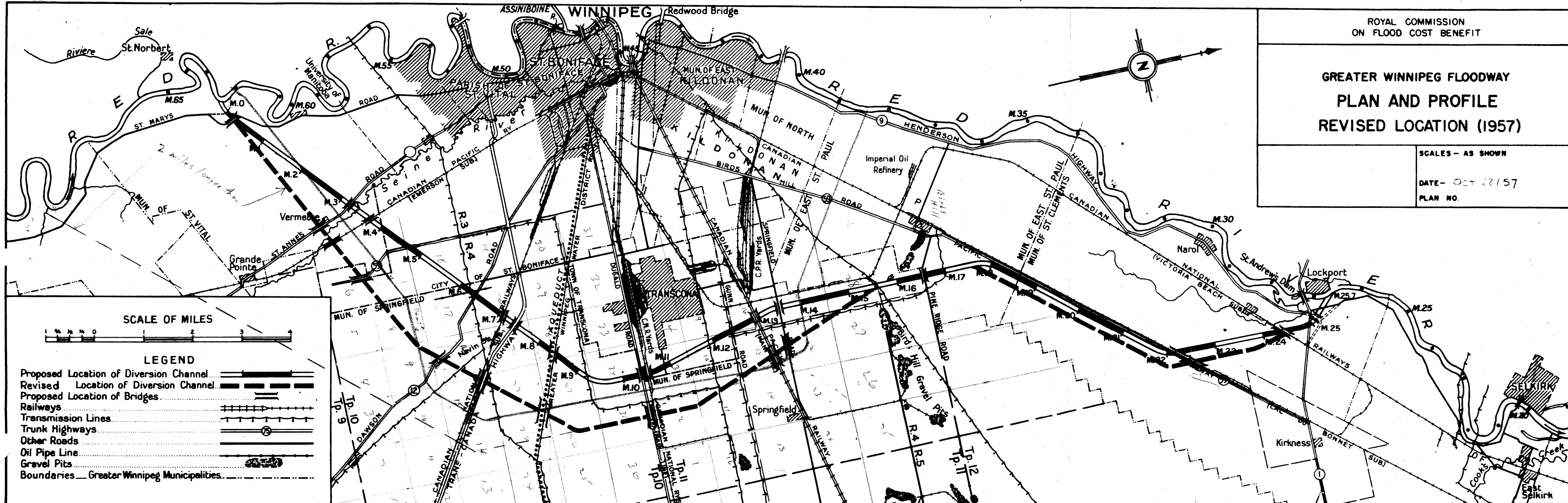
Templeton Engineering Company,



C. H. Templeton, - P. Eng.

CHT:am





T.E.C.  
OCT 22/57

FLOODWAY COST ESTIMATE

DIVERSION STRUCTURE

ITEM	ESTIMATED QUANTITY	1953 UNIT PRICE	1957 UNIT PRICE	1953 COST	1957 COST
<del>RIGHT OF WAY</del>	<del>400 ac</del>	<del>125<sup>00</sup></del>	<del>400<sup>00</sup></del>	<del>① 50,000</del>	<del>① 160,000</del>
<u>DIKE</u>					
COMPACTED FILL	1,245,816 CY	40 <sup>00</sup>	40 <sup>00</sup>	738,326	738,326
ROCK RIP-RAP	85,223 Y	5 <sup>00</sup>	5 <sup>00</sup>	426,115	426,115
GRAVEL FILL	56,815 Y	4 <sup>00</sup>	4 <sup>00</sup>	227,260	227,260
STRIPPING	213,500 Y	26 <sup>00</sup>	26 <sup>00</sup>	55,510	55,510
SUB TOTAL DIKE				② 1,497,211	② 1,607,211
ENG & CONT 12%				③ 179,665	③ 192,789
TOTAL 1,243				<u>1,676,876</u>	<u>1,960,000</u>
<u>CONCRETE CONTROL STRUCTURE</u>					
COMMON EXCAV	48,290 CY	42 <sup>00</sup>	42 <sup>00</sup>	20,282	20,282
HARD-PAN EXCAV	3,511 Y	1.50	1.50	8,267	8,267
HAND EXCAV	1,000 Y	4.00	4.00	4,000	4,000
COMPACTED FILL	99,370 Y	32 <sup>00</sup>	40 <sup>00</sup>	31,789	39,748
ROCK RIP-RAP	18,156 Y	5 <sup>00</sup>	5 <sup>00</sup>	90,780	90,780
CONCRETE	33,822	45 <sup>00</sup>	51 <sup>00</sup>	1,521,990	1,724,922
REIN. STEEL	2,312,250 #	17 <sup>00</sup>	19 <sup>00</sup>	393,083	439,328
STRUCT STEEL	45 T	600 <sup>00</sup>	680 <sup>00</sup>	27,600	30,600
HAND RAIL	1,360 lf	5 <sup>00</sup>	5 <sup>00</sup>	6,800	6,800
RADIAL GATES	610 T	600 <sup>00</sup>	720 <sup>00</sup>	366,000	439,500
GATE HOISTS	4 ea	42,500	51,000	170,000	204,000
SUB TOTAL				① 2,640,591	① 3,008,227
<u>MISCELLANEOUS</u>					
ROAD APPROACHES, TEL Lines, Etc				② 10,000	② 12,000
SUB TOTAL 1 & 2				2,650,591	3,020,227
ENG & CONT				349,409	386,973
TOTAL FOR CONTROL STR				<u>3,000,000</u>	<u>3,417,000</u>

14%



FLOODWAY COST ESTIMATE

7 MILES OF DIKE WEST FROM DIVERSION STRUCTURE  
(Increase in right-of-way costs only).

ITEM	ESTIMATED QUANTITIES	1952 UNIT PRICE	1957 UNIT PRICE	1952 COST	1957 COST
1 <u>WL 774</u>					
COMP. EARTH DIKE	2,456,215 cu	40¢	40¢	982,486	982,486
ROCK RIP-RAP 1'	95,000	5.00	5.00	475,000	475,000
GRAVEL FILL 8"	63,407	4.00	4.00	253,628	253,628
STRIPPING 1'	220,000	26¢	26¢	57,200	57,200
RT OF WAY	2000 AL	125¢	800¢	62,500	400,000
				1,830,814	2,168,314
+ 12%				219,617	260,198
TOTAL				2,050,511	2,428,512
2 <u>WL 773</u>					18%
COMP. EARTH DIKE	1,845,816 cu	40¢	40¢	738,326	738,326
ROCK RIP-RAP 1'	85,223	5.00	5.00	426,115	426,115
GRAVEL FILL 8"	56,815	4.00	4.00	227,260	227,260
STRIPPING 1'	213,500	26¢	26¢	55,517	55,517
RT OF WAY	4000 AL	125¢	800¢	50,000	320,000
				1,497,218	1,767,218
+ 12%				179,668	212,066
TOTAL				1,676,883	1,979,284
3 <u>WL 770</u>					18%
COMP. EARTH DIKE	1,190,134	40¢	40¢	476,053	476,053
ROCK RIP-RAP 1'	65,376	5.00	5.00	327,880	327,880
GRAVEL FILL 8"	49,182	4.00	4.00	196,728	196,728
STRIPPING 1'	154,333	26¢	26¢	40,126	40,126
RT OF WAY	3000 AL	125¢	800¢	37,500	240,000
				1,078,287	1,280,787
+ 12%				129,394	153,694
TOTAL				1,207,681	1,434,481
<u>WL - 767</u>					
COMP. EARTH DIKE	791,730	40¢	40¢	316,692	316,692
ROCK RIP-RAP 1'	46,690	5.00	5.00	233,450	233,450
GRAVEL FILL 8"	31,126	4.00	4.00	124,504	124,504
STRIPPING 1'	118,518	26¢	26¢	30,814	30,814
RT OF WAY	1800 AL	125¢	800¢	22,500	144,000
				727,960	849,460
+ 12%				87,355	101,935
TOTAL				815,315	951,395

PLATE 3

## GREATER WINNIPEG FLOODWAY

## HIWAY BRIDGES - COST ESTIMATE (REVISED 1957)

(IN THOUSANDS OF DOLLARS)

13 1/2 increase over 1952

DESIGN			20-766-1				40-766-1				60-766-1				40-768-1				60-768-1				80-768-1				60-770-1				80-770-2				100-770-3				145-773-1			
CROSSING	SUPER STRUCT.	SKING ANGLE	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.	LENGTH	HT. TO ROAD	COST X \$1000	COST PER S.F.T.
ST. MARY'S RD	THRU TRUSS	90°	360	31	250	29.00	510	35	352	29.40	870	31	580	27.75	480	35	330	28.60	840	31	560	27.75	960	31	640	27.75	840	31	565	28.00	960	32	637	27.68	1080	31	721	27.75	1380	31	929	28.00
STANNEB RD	THRU TRUSS	90°	360	31	249	28.80	510	35	358	29.20	870	31	580	27.20	480	34	330	28.30	840	32	562	27.75	960	31	644	27.75	840	31	565	28.00	960	31	637	27.60	1080	31	721	27.75	1380	32	929	28.00
HIWAY #59	GIRDER	90°	420	34	333	26.40	540	38	403	24.90	840	33	648	25.20	560	36	479	28.55	800	32	627	26.05	960	32	742	25.80	780	31	614	26.20	960	31	740	25.80	1080	31	838	25.80	1440	32	1119	25.90
TRANS CANADA HIWAY	GIRDER	90°	420	34	333	26.40	540	38	403	24.90	840	33	648	25.20	560	36	479	28.55	800	32	627	26.05	960	32	742	25.80	780	31	614	26.20	960	31	740	25.80	1080	31	838	25.80	1440	32	1119	25.90
DUGALD RD	GIRDER	90°	420	34	333	26.40	540	38	407	24.90	800	35	651	27.50	560	37	479	28.60	400	38	604	25.15	960	32	745	25.80	780	31	610	26.20	960	31	750	25.95	1080	31	838	25.80	1380	30	1079	28.05
SPRINGFIELD ROAD	THRU TRUSS	90°	300	39	214	29.75	420	43	286	28.90	600	40	399	27.60	480	41	304	25.45	600	38	398	27.60	780	37	475	27.50	600	36	399	27.60	720	38	478	27.60	840	37	553	27.40	1140	38	760	27.75
PINE RIDGE ROAD	GIRDER	90	240	31	198	27.40	320	34	271	28.20	520	32	430	27.50	320	34	275	28.55	520	34	427	28.00	680	31	544	26.50	480	31	402	26.30	720	29	562	25.95	840	31	655	25.95	1100	32	885	26.80
HIWAY #59	GIRDER	90°	480	32	392	26.05	640	34	535	27.10	1040	32	830	26.80	680	35	545	26.90	1080	34	811	25.08	1400	32	1085	25.15	960	32	749	25.40	1440	29	1122	25.95	1680	31	1270	25.15	2200	32	1722	26.05
LOCKPORT ROAD HIWAY #1 EAST	GIRDER	90°	240	33	180	25.00	320	34	252	27.20	520	32	399	25.50	360	37	284	28.20	540	34	396	24.95	720	33	517	23.90	480	32	350	24.35	720	29	562	25.95	840	31	610	24.20	1080	32	814	25.20
DANSON ROAD	GIRDER	90°	420	34	333	26.40	540	38	403	24.90	840	33	648	25.20	560	36	480	28.35	400	37	627	26.05	960	32	742	25.80	780	31	614	26.20	960	31	740	25.80	1080	31	838	25.80	1440	32	1119	25.90
TOTAL LENGTHS & COSTS			3660		2815		4880		3680		7746		5823		5040		3989		7640		5633		9310		6844		7320		5162		9360		6958		10,680		7882		13,980		10475	



GREATER WINNIPEG FLOODWAY  
RAILWAY BRIDGES - ESTIMATED COSTS. (REVISED 1957)  
(IN THOUSANDS OF DOLLARS)

13% increase

DESIGN				20-766-1				40-766-1				60-766-1				40-768-1				60-768-1				80-768-1				60-770-1				80-770-2				100-770-3				145-773-1			
RAILWAY CROSSING	SUPER-STRUC-TURE TYPE	CROSSING ANGLE	NO OF TRKS.	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FT.	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$	LGTH IN FEET	HT. TO B/R	COST IN THOUS-ANDS \$	COST PER LIN. FT. \$				
CANADIAN PACIFIC EMERSON SUB.	T.P.G.	76°	1	395	29	481	1218	581	35	688	1183	810	31	925	1140	581	36	695	1195	790	31	915	1160	996	31	1134	1138	830	31	962	1162	1039	31	1186	1140	1162	31	1329	1139	1440 (D.P.G.)	33	1643	1140
CANADIAN NATIONAL SPRAGUE SUB	D.P.G.	76°	1	458	35	439	960	624	39	583	935	873	35	781	896	624	39	583	936	830	36	758	913	1059	35	941	887	913	31	829	910	1079	35	971	900	1225	36	1102	896	1480	34	1366	921
GREATER WINNIPEG WATER DIST. RIV.	"	70°	1	541	37	521	962	707	41	671	948	996	37	915	920	707	39	666	943	976	35	893	915	1205	35	1087	903	976	35	899	925	1165	35	1062	910	1328	35	1207	910	1600	34	1476	921
CANADIAN NATIONAL MINAKI SUB.	"	90°	2	498	38	823	1660	600	42	1017	1695	893	38	1399	1569	624	40	1008	1613	873	36	1361	1558	1079	36	1674	1551	873	35	1370	1570	1079	35	1690	1567	1185	35	1821	1538	1430	34	2260	1580
CANADIAN PACIFIC KEEWATIN SUB	"	90°	2	332	39	561	1689	480	43	797	1661	664	40	1030	1555	498	41	793	1592	664	38	1030	1551	830	37	1270	1530	644	35	988	1535	830	35	1267	1525	956	35	1438	1503	1190	34	1850	1556
CANADIAN PACIFIC LAC DU BONNET SUB	"	45°	1	541	36	547	1011	720	38	761	1057	1122	35	1091	972	790	38	803	1018	1079	35	1056	977	1454	34	1408	966	1122	35	1089	971	1474	34	1415	960	1683	35	1618	962	2190	34	2158	985
CANADIAN NATIONAL VICTORIA BEACH SUB	"	44°	1	415	38	403	970	560	39	555	991	830	36	751	905	581	38	554	954	830	35	749	903	1079	33	947	880	830	35	752	908	1102	33	956	869	1268	34	1110	875	1645	33	1506	916
TOTAL LENGTHS & COSTS				3180		3779		4272		5072		6188		6892		4405		5102		6042		6762		7702		8461		6188		6889		7768		8547		8807		9625		10975		12259	

TEMPLETON ENGINEERING CO.

Oct. 22, 1957

# OUTLET STRUCTURE

TEC  
Oct 22/57

DESIGN	EXCAV & B. FILL @ 3.00/cy		GRAVEL DRAIN @ 3.50/cy		CONCRETE @ 68 <sup>00</sup> /cy		RIP. RAP @ 3.50/cy		ENGINEERING & CONTINGENCIES 12%	TOTALS
	C.Y.	#	C.Y.	#	C.Y.	#	C.Y.	#	#	#
20-766	236		552		45,27		1281			
	—	708	—	1,932	—	294,000	—	4483	36,134	337,257
40-766	695		1250		7057		1995			
	—	2085	—	4,375	—	480,000	—	6982	59,213	552,655
60-766	1024		2340		3771		2747			
	—	3072	—	8,190	—	596,000	—	9615	74,025	690,902
40-768	519		1208		7441		1886			
	—	1559	—	4,228	—	506,000	—	6601	62,206	580,592
60-768	1255		2281		9696		2650			
	—	3765	—	7,983	—	659,000	—	9278	81,603	761,629
80-768	1494		3000		12,692		2889			
	—	4482	—	10,500	—	864,000	—	10,111	106,691	995,784
60-770	1504		2148		10,802		2392			
	—	4612	—	7,518	—	735,000	—	8,372	90,660	846,162
80-770	1655		2888		13,480		3253			
	—	4965	—	10,108	—	918,000	—	11,385	113,334	1,057,792
100-770	1913		3760		16,910		3777			
	—	5739	—	13,160	—	1,150,000	—	13,219	141,854	1,323,972
145-773	3290		6690		27,407		8000			
	—	9870	—	23,400	—	1,860,000	—	28,000	230,552	2,151,822

Unit Prices unchanged from 1952 estimate except for Concrete which was raised from \$60/yd to \$68/yd. *TE*

= 13% on concrete only

FLOODWAY EXCAVATION COST LOCATION #3 TABLE ONE

DESIGN		CLAY EXCAV. C.Y.	H.A.R. PAN EXCAV. C.Y.	COST. OF CLAY EXCAV. @ 30¢ + 12% E&C	COST. OF H. PAN EXCAV. @ \$1.00 + 12% E&C	TOTAL COST OF EXCAV.
Original by R.R. Report	LOCATION #1	37,045,000	1,086,000	\$12,464,000	\$1,217,000	\$13,681,000
1	20-766 ADD FOR LOC #3	6,037,000	45,000	2,030,000	50,000	2,080,000
2000' E	NAVIN → LOCATION #3	43,132,000	1,131,000	14,494,000	1,267,000	15,671,000
ditto.	LOCATION #1	59,471,000	2,830,000	19,982,000	3,170,000	23,152,000
2	40-766 ADD FOR LOC #3	8,720,000	85,000	2,930,000	95,000	3,025,000
	LOCATION #3	68,191,000	2,915,000	22,912,000	3,265,000	26,177,000
	LOCATION #1	89,998,000	3,331,000	30,239,000	3,954,000	34,193,000
3	60-766 ADD FOR LOC #3	13,468,000	136,000	4,520,000	152,000	4,672,000
	LOCATION #3	103,466,000	3,667,000	34,759,000	4,106,000	38,865,000
	LOCATION #1	54,577,000	1,981,000	18,331,000	2,219,000	20,550,000
4	40-768 ADD FOR LOC #3	8,619,000	62,000	2,895,000	64,000	2,964,000
	LOCATION #3	63,196,000	2,043,000	21,226,000	2,288,000	23,514,000
	LOCATION #1	84,471,000	2,254,000	28,382,000	2,525,000	30,907,000
5	60-768 ADD FOR LOC #3	12,550,000	106,000	4,220,000	119,000	4,339,000
	LOCATION #3	97,021,000	2,360,000	32,602,000	2,644,000	35,246,000
	LOCATION #1	111,828,000	2,351,000	37,574,000	2,640,000	40,214,000
6	80-768 ADD FOR LOC #3	16,182,000	112,000	5,430,000	125,000	5,555,000
	LOCATION #3	128,010,000	2,469,000	43,034,000	2,765,000	45,769,000
	LOCATION #1	77,791,000	1,250,000	26,138,000	1,400,000	27,538,000
7	60-770 ADD FOR LOC #3	11,864,000	75,000	3,980,000	84,000	4,064,000
	LOCATION #3	89,655,000	1,325,000	30,118,000	1,484,000	31,602,000
	LOCATION #1	104,516,000	1,153,000	35,117,000	1,292,000	36,409,000
8	20-770 ADD FOR LOC #3	15,448,000	67,000	5,190,000	75,000	5,265,000
	LOCATION #3	119,964,000	1,220,000	40,307,000	1,367,000	41,674,000
	LOCATION #1	119,040,000	2,097,000	39,991,000	2,348,000	42,345,000
9	100-770 ADD FOR LOC #3	17,331,000	104,000	5,820,000	116,000	5,936,000
	LOCATION #3	136,371,000	2,201,000	45,917,000	2,464,000	48,281,000
	LOCATION #1	145,715,000	1,141,000	48,160,000	1,278,000	50,238,000
10	145-773 ADD FOR LOC #3	21,492,000	75,000	7,230,000	84,000	7,314,000
	LOCATION #3	167,207,000	1,216,000	56,190,000	1,362,000	57,552,000

Unit prices unchanged from 1952  
but quantities increased due to increased  
length & depth of cut on new location



T.E.C.  
Oct. 22/57

REVISED GREATER WINNIPEG FLOODWAY COST ESTIMATES  
(In Thousands of Dollars)

Floodway Design	Control Struct.	Dykes	Right of Way	Excavation	Hwy. Bridges	R. R. Bridges	Aque-duct	Seine River Div.	Outlet Struct.	Misc.	Total Cost	Increase over 1952 Estimate
20-766	3,417	951	5,490	15,671	2,815	3,779	215	70	337	565	33,310	9,930 42%
40-766	3,417	951	7,700	26,177	3,680	5,072	226	70	553	565	48,411	12,371 34%
60-766	3,417	951	8,570	38,865	5,823	6,892	260	70	691	565	66,104	15,944 32%
40-768	3,417	1120	7,170	23,514	3,989	5,102	226	70	581	565	45,754	11,984 35%
60-768	3,417	1120	8,040	35,246	5,639	6,762	260	70	762	565	61,881	15,047 32%
80-768	3,417	1120	8,910	45,769	6,844	8,461	294	70	996	565	76,446	17,733 30%
60-770	3,417	1434	8,300	31,602	5,462	6,889	260	70	846	565	58,845	15,875 37%
80-770	3,417	1434	9,370	41,674	6,968	8,547	294	70	1058	565	73,397	18,087 33%
100-770	3,417	1434	10,440	48,281	7,882	9,625	317	70	1324	565	83,355	20,125 32%
145-773	3,417	1979	11,660	57,552	10,475	12,259	396	70	2152	565	100,525	24,725 32%