ENVIRONMENT CANADA

INLAND WATERS DIRECTORATE

MONITORING AND INFORMATION BRANCH

ANNUAL CONSTRUCTION REPORT 1992/1993

FIELD INVESTIGATIONS CONSTRUCTION, UPGRADING AND MAINTENANCE FOR ONTARIO REGION

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1.0 INTRODUCTION

This annual construction report, prepared by the Monitoring and Information Branch of the Ontario Region, is for the fiscal year 1992/1993.

The purpose of this report is to detail the construction activities within the Ontario Region's hydrometric and sediment network of 410 stations.

The network is operated and maintained under the terms of the Federal/Provincial Cost Share Agreement. The cooperating parties of the Agreement within the Region are: Environment Canada, Ontario Ministry of the Environment, Ontario Hydro and Ontario Ministry of Natural Resources and their associated 38 Conservation Authorities.

Funds for the construction activities are provided for under the Cost Share Agreement. The capital cost of constructing new stations and the upgrading or major maintenance of existing stations is the responsibility of the requesting or ownership party. General maintenance at individual stations is charged to operation and maintenance funds and the expenditures contribute to the unit station operating cost for the network.

Environment Canada provides the basic water level recorder for all new stations. Any additional or specialized equipment is the responsibility of the requesting party.

Projects and priorities are established with the cooperation of and in consultation with the Cost Share Agreement members and/or their agencies.

Under a separate Memorandum of Understanding between Environment Canada and the Canadian Hydrographic service of Fisheries and Oceans Canada similar activities are carried out with regard to water level gauges on the Great Lakes and connecting waterways.

Construction activities are divided into four categories:

1. Field Investigations

   Reconnaissance, surveys, preparation of plans, meetings and correspondence to obtain approval to construct new hydrometric installations or to upgrade or maintain existing stations.

2. Construction

   Installation of stilling wells, intakes, instrument shelters, artificial controls, cableways, access roads, and vertical control markers.

3. Upgrading

   Construction of controls, erection of larger shelters to house more sophisticated instruments, installation of electrical and telephone service at existing stations, installation of sediment sampling apparatus and other appurtenances.

4. Maintenance

   General maintenance carried out at existing gauging stations. (Does not include minor repairs done by hydrometric field staff.)

2.0 CONSTRUCTION PROGRAM 1992/1993

During the fiscal year twenty-eight (28) field investigations were carried out to select new installation sites or to assess current sites for upgrading or maintenance.

Six (6) new construction projects were completed by MIB Staff or were carried out jointly with the requesting agency.

One (1) upgrading project was carried out.

Forty-two (42) maintenance projects were carried out that ranged from Shelter repairs to replacing heating cables.

2.1 Definitions for Project Cost Breakdown

The following is an interpretation of the headings used in this report for station cost breakdown:

Salaries

Hourly rate of pay for engineers, supervisors, foreman, terms employees and hydrometric personnel associated with field investigations, construction, upgrading and maintenance of the stations in this report.

Materials/Supplies

Instrument shelter, stilling well, plumbing and electrical materials, concrete, gravel/fill, lumber, steel, excavating machinery, rental equipment and contract services.

Meals/Accommodation

Living expenses for field personnel.

Transportation

Cost of operation and depreciation of government owned vehicles, shipping and freight charges, ferry charges and airfare.

2.2 Equipment and Personnel

One standard Suburban equipped with a roll-out bed, mounted vice, trailer hitch, heavy duty suspension, and a safety screen installed for personnel protection, and a one-ton 4x4 crewcab pick-up equipped with fibreglass cap, tailgate mounted vice and trailer hitch were used to carry out the construction program.

Two heavy duty boat trailers modified to carry stilling wells, intake pipes, hydro poles, and instrument shelters were used to transport equipment and material to the job site.

Tools include an air operated pavement breaker equipped with a pile driving head, electric 'skill' saws, electric drills, hammer drills, pipe threaders, grinders, 3 ton and ¾ ton pullers, oxyacetylene cutting torches, 120 volt gasoline generator and other necessary hand tools.

Work was performed by the Construction Supervisor, Construction Foreman, Construction Labourer and on some projects assistance was provided by the Hydrometric Section. Projects solely carried out by the hydrometric staff have been noted as such in the project description section. Excavating equipment with operator, compressors, scuba divers, and other specialized services were rented on an hourly basis under service contract. Materials such as fill, concrete, riprap and lumber were purchased by service contract, or Field Purchase Authority.

TABLE 1
FIELD INVESTIGATION EXPENDITURES 1992/1993

		Cost ($)
1.	Lake St. Clair at Tecumseh	$479.88
2.	Thames River at Ingersol	464.30
3.	Thames River near Ealing	
4.	Ausable River near Springbank	
5.	Laurel Creek at Waterloo	80.84
6.	Speed River near Armstrong Mills	
7.	Humber River at Weston	210.36
8.	Little Don at Don Mills	
9.	Don River at York Mills	
10.	West Branch Credit River at Norval	
11.	Bowmanville Creek at Bowmanville	230.40
12.	Lake Erie at Port Colborne	164.15
13.	Nonquon River near Port Perry	844.10
14.	Thames River at Ingersol	160.81
15	Eels Creek near Apsley	294.53
16.	Mayhew Creek near Trenton	399.54
17.	Moira River near Deloro	475.66
18.	Ausable River near Parkhill	271.81
19.	Pukaskwa River at Pukaskwa National Park	1,694.30
20.	Lake Timiskiming at Haileybury	890.45
21.	Lac des Quinze a la Pointer du Pin Rouge	
22.	Lac Temiscaminque a Ville Marie	
23.	Nottawasaga River below Edenvale	225.79
24.	Hamilton Creek near Holland Centre	206.68
25.	Tay River at Perth	624.75
26.	Speed River below Guelph	58.57
27.	Redhill Creek at Hamilton	186.90
28.	Hunsburger Creek near New Hamburg	215.14
	TOTAL	$8,178.96

TABLE 2
NEW CONSTRUCTION EXPENDITURES 1992/1993

		Cost ($)
1.	Nonquon River near Port Perry	$10,262.70
2.	Mayhew Creek near Trenton	9,766.74
3.	Nottawasaga River below Edenvale	7,351.88
4.	Ausable River below Parkhill	4,452.96
5.	Hamilton Creek near Holland Centre	8,354.10
6.	Trent River below Glen Ross	3,419.00
	TOTAL	$43,607.38

TABLE 3
UPGRADING EXPENDITURES 1992/1993

		Cost ($)
1.	Pukaskwa River at Pukaskwa National Park	$9,183.57

TABLE 4
MAINTENANCE EXPENDITURES 1992/1993

		Cost ($)
1.	Laurel Creek at Waterloo	$1,590.61
2.	Tributary to Wye River below Elmvale	1,181.01
3.	Redhill Creek at Hamilton	394.25
4.	Lake Erie at Port Dover	499.52
5.	Credit River West Branch at Norval	687.83
6.	Thames River at Ealing	870.61
7.	Niagara River above IBM #35	412.17
8.	Ausable River near Springbank	3,843.44
9.	Speed River near Armstrong Mills	235.70
10.	Humber River at Weston	1,142.24
11.	Bayfield River near Varna	1,143.37
12.	Shelter Valley Brook near Grafton	1,141.56
13.	Kettle Creek above St. Thomas	6,719.76
14.	Thames River at Ingersol	2,367.00
15.	South Nation River at Casselman	1,659.54
16.	Etobicoke Creek at Brampton	197.46
17.	Don River at York Mills	202.46
18.	Little Don River at Don Mills	210.26
19.	Don River at Todmorden	213.97
20.	Little Rouge Creek near Locust Hill	237.86
21.	Bowmanville Creek near Bowmanville	680.50
22.	Turkey Creek at Windsor	364.28
23.	Lake St. Clair at Tecumseh	1,904.73
24.	Schomberg River near Schomberg	615.25
25.	Ministry of the Environment (4 discontinued sites)	1,507.94
26.	Detroit River at Amherstburg	2,507.75
27.	Lake Superior at Rossport	1,884.78
28.	Lake Huron at Little Current	1,376.81
29.	Lac des Quinze a la Pointer du Pin Rouge	9,225.39
30.	Lake Erie at Port Colborne	5,923.04
31.	Catfish Creek near Sparta	6,394.12
32.	Speed River below Guelph	772.75
33.	La Peche River a St. Louis de Masham	1,139.32
34.	Napanee River at Camden East	1,323.33
35.	Black River at Actinolite	5,913.90
36.	Lac Temiscaminque at Ville Marie	9,228.44
37.	Redhill Creek at Hamilton	1,421.92
38.	Wawa Creek at Wawa	1,893.52
39.	Petawawa River near Petawawa	3,831.75
40.	Lake Erie at Port Dover	705.63
41.	Bowmanville Creek near Bowmanville	274.98
42.	Lake Ontario at Toronto	104.03
	TOTAL	$83,944.78

TABLE 5
BREAKDOWN OF TOTAL EXPENDITURES 1992/1993

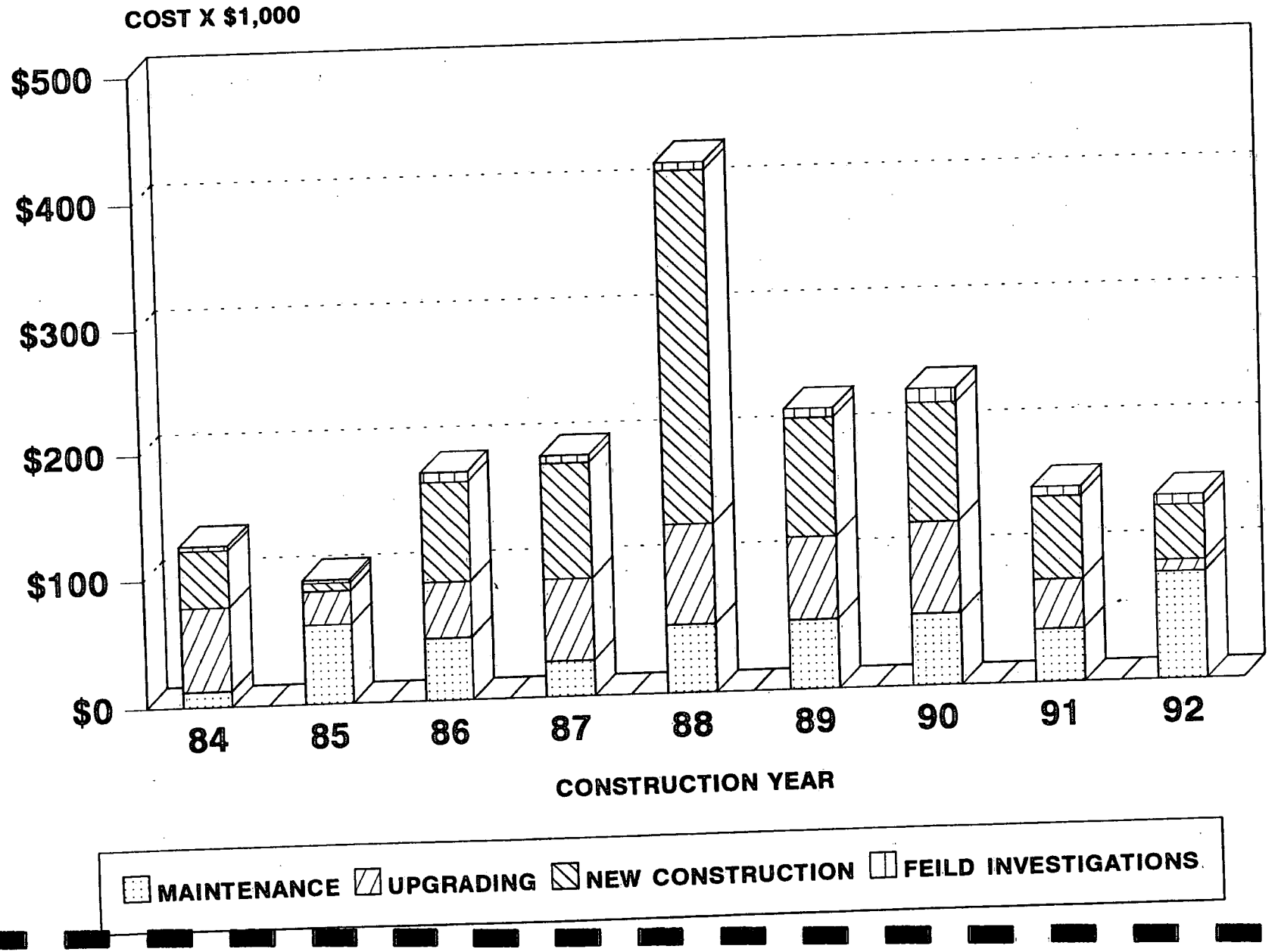
Direct Cost to Agencies

	No. of Projects			Federal			Provincial			Sub-Totals		
	F	F/P	P	Salaries	O&M	Capital	Salaries	O&M	Capital	Salaries	O&M	Capital
New Stations	1	0	4	1,770.46	0.00	3,842.09	7,091.16	0.00	20,044.14	8,861.62	0.00	23,886.23
Relocations	1	0	0	1,741.97	1,677.03	0.00	0.00	0.00	0.00	1,741.97	1,677.03	0.00
Upgrading	1	0	0	1,798.39	0.00	10,149.48	0.00	0.00	0.00	1,798.39	0.00	10,149.48
Maintenance	4	1	1	12,155.04	6,292.64	13,833.50	1,709.98	0.00	3,207.84	13,865.02	6,292.64	17,041.34
TOTAL	7	1	5	17,465.86	7,969.67	27,825.07	8,801.14	0.00	23,251.98	26,267.00	7,969.67	51,077.05
										GRAND TOTAL		85,313.72

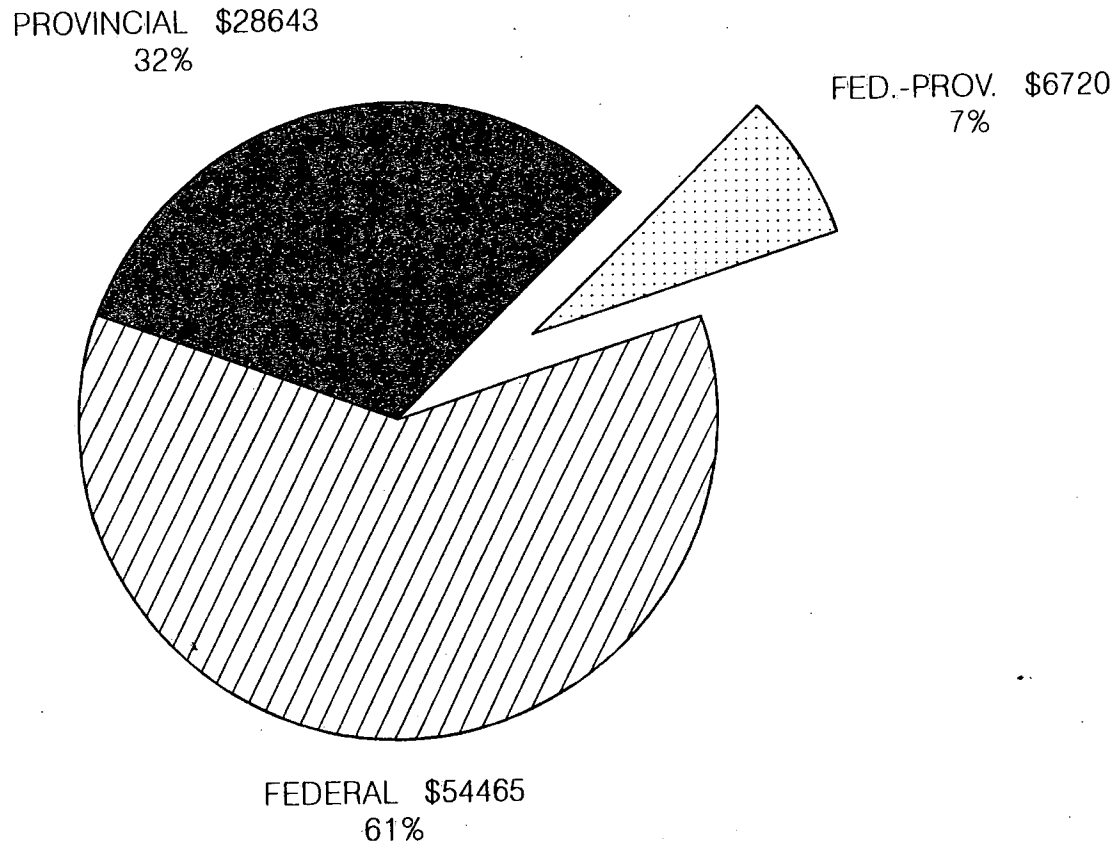
Other Costs

	Totals			
	Salaries	O&M	Capital	Total
Maintenance (included in station unit cost)	15,361.45	19,238.04	0.00	34,599.49
Field Investigations	1,736.15	557.11	522.10	2,815.36
Instrumentation (Basic Recorder)	0.00	0.00	8,844.69	8,844.69
Tides and Water Level Stations	5,529.40	10,020.52	0.00	15,549.92
TOTAL	22,627.00	29,815.67	9,366.79	61,809.46
TOTAL CONSTRUCTION PROGRAM COST	48,894.40	37,785.34	60,443.84	147,123.58

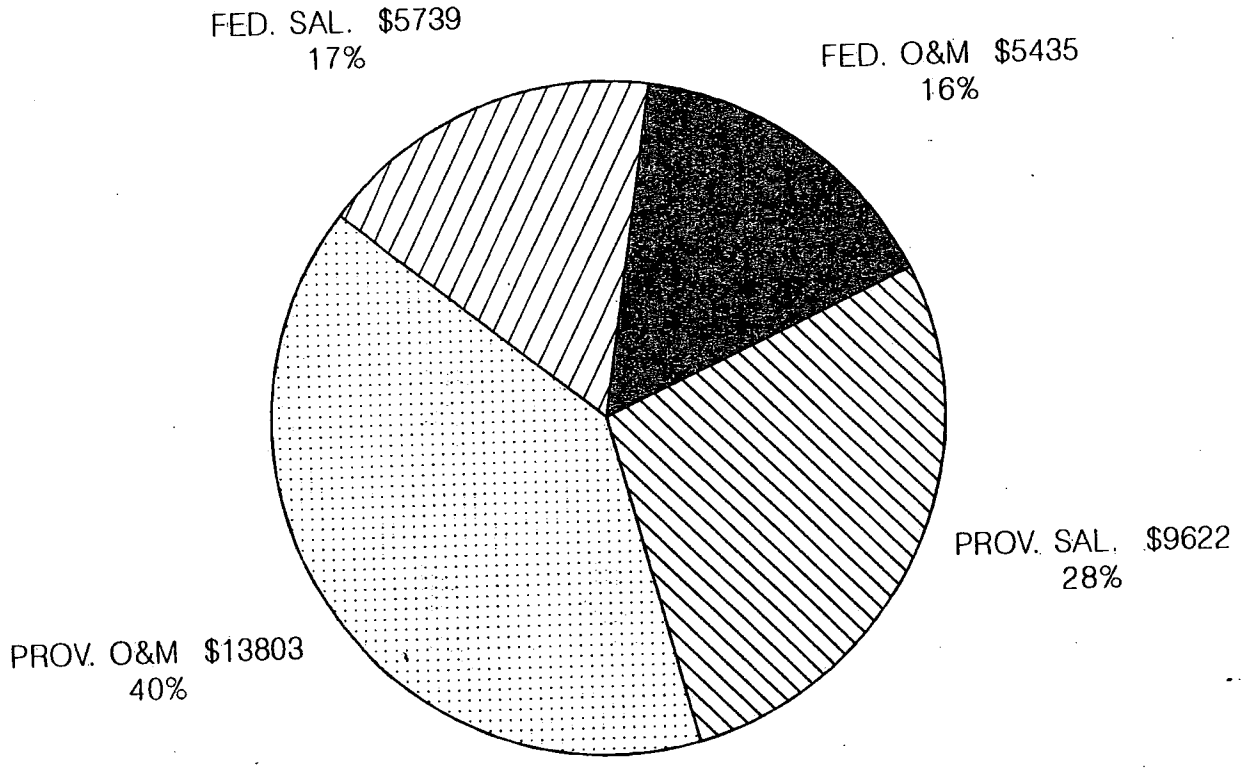
CONSTRUCTION COST COMPARISON
1984/85 TO 1992/93



CONSTRUCTION COSTS 1992-93
CAPITAL NON-SHAREABLE EXPENDITURES



CONSTRUCTION COSTS 1992-93
DISTRIBUTION OF SHAREABLE EXPENDITURES



3.0 CONSTRUCTION PROJECT DESCRIPTIONS AND COSTS

3.1 Field Investigations

1. Lake St. Clair at Tecumseh 32378 F

The Construction Foreman assessed the above gauge shelter for electrical upgrading, door replacement, and exterior maintenance requirements.

Salaries	$213.10
Travel Expenses (meals and lodging)	102.28
Vehicle	164.50
Miscellaneous	0.00
TOTAL	$479.88

2. Thames River at Ingersol P
3. Thames River at Ealing P
4. Ausable River near Springbank 32494F

The Construction Supervisor and Foreman assessed the above sites for required maintenance.

Salaries	$345.30
Travel Expenses (meals and lodging)	17.50
Vehicle	101.50
Miscellaneous	0.00
TOTAL	$464.30

5. Laurel Creek at Waterloo
6. Speed River near Armstrong Mills 32494 P

The Construction Foreman assessed the above gauge shelters for maintenance requirements.

Salaries	$55.59
Travel Expenses (meals and lodging)	8.75
Vehicle	16.50
Miscellaneous	0.00
TOTAL	$80.84

7. Humber River at Weston
8. Little Don River at Don Mills
9. Don River at Don Mills
10. Credit River West Branch at Norval 32494 F/P

The Construction Foreman visited the above gauging installations to assessed maintenance requirements.

Salaries	$143.61
Travel Expenses (meals and lodging)	8.75
Vehicle	58.00
Miscellaneous	0.00
TOTAL	$210.36

11. Bowmanville Creek at Bowmanville 32494 P

An on site meeting was held with a representative from a consulting firm to discuss stream re-channelization and the operation of our stream gauge.

Salaries	$141.05
Travel Expenses (meals and lodging)	8.75
Vehicle	80.60
Miscellaneous	0.00
TOTAL	$230.40

12. Lake Erie at Port Colborne 32378 F

The Construction Foreman completed arrangements for the installation of a hydro pole and for hydro service connection.

Salaries	$76.36
Travel Expenses (meals and lodging)	8.75
Vehicle	79.04
Miscellaneous	0.00
TOTAL	$164.15

13. Nonquon River near Port Perry 32431 P

An on site meeting was held with representatives from the Regional Municipality of Durham and a Consulting firm to select a feasible site for a hydrometric gauging site. A subsequent construction reconnaissance was completed with the Area Head. The station will be used to assist in the monitoring of a water treatment facility.

Salaries	$632.47
Travel Expenses (meals and lodging)	26.25
Vehicle	185.38
Miscellaneous	0.00
TOTAL	$844.10

14. Thames River at Ingersol 32494 P

The Construction Foreman made final arrangements with a contractor for the exterior refurbishing of the gauge shelter.

Salaries	$105.00
Travel Expenses (meals and lodging)	8.75
Vehicle	47.06
Miscellaneous	0.00
TOTAL	$160.81

15. Eels Creek near Apsley 32430 P

A site visit was made to assess and determine the feasibility of repairing a lumping river bank at the gauging station control.

Salaries	$155.16
Travel Expenses (meals and lodging)	36.15
Vehicle	103.22
Miscellaneous	0.00
TOTAL	$294.53

16. Mayhew Creek near Trenton 32431 P

A reconnaissance was carried out with representatives from the Ministry of the Environment and the Lower Trent River Conservation Authority. A site was selected for a hydrometric gauging station. The local township was approached regarding the installation of the gauge on their property.

Salaries	$239.79
Travel Expenses (meals and lodging)	70.05
Vehicle	89.70
Miscellaneous	0.00
TOTAL	$399.54

17. Moira River near Deloro 32431 P

The natural control for the above gauging station was assess for stabilization works. A property tittle search was initiated at the Land Registry Office.

Salaries	$239.79
Contracts and Services	72.50
Travel Expenses (meals and lodging)	60.15
Vehicle	103.22
Miscellaneous	0.00
TOTAL	$475.66

18. Ausable River near Parkhill 32431 P

A field reconnaissance was carried out to confirm the site selection of a water level monitoring station. The installation will be operated by the local Conservation Authority.

Salaries	$155.16
Travel Expenses (meals and lodging)	8.75
Vehicle	107.90
Miscellaneous	0.00
TOTAL	$271.81

19. Pukaskwa River at Pukaskwa National Park 32433 F

A mutually suitable site for a cableway was selected by Park Officials and Water Resources Branch. A site survey was conducted.

Salaries		$1,050.82
Travel Expenses (meals and lodging)		202.26
Vehicle		441.22
Miscellaneous (aircraft charter)	1,070.00	
TOTAL		$1,694.30

20. Lake Timiskiming at Haileybury
21. Lac des Quinze a la pointer du Pin Rouge
22. Lac Temiscaminque a Ville Marie 32378 F

The Construction Supervisor and a representative from Public Works met to discuss the current state of the Haileybury gauge and the options for relocating it. The two other gauges were assess for replacing the deteriorated shelters.

Salaries	$460.86
Travel Expenses (meals and lodging)	116.29
Vehicle	313.30
Miscellaneous	0.00
TOTAL	$890.45

23. Nottawasaga River below Edenvale 32431 P

A construction survey was completed for the above proposed station.

Salaries	$155.16
Travel Expenses (meals and lodging)	8.75
Vehicle	61.88
Miscellaneous	0.00
TOTAL	$225.79

24. Hamilton Creek near Holland Centre 32433 F

The selected hydrometric site was surveyed for the installation of a stilling well and shelter. The station will be part of the Ontario Reference Network for water quality.

Salaries	$126.95
Travel Expenses (meals and lodging)	8.75
Vehicle	70.98
Miscellaneous	0.00
TOTAL	$206.68

25. Tay River at Perth 32431 P

The Area Head North and the Construction Supervisor met with a representative from the Rideau Valley Conservation Authority to select a site for a hydrometric gauging station.

Salaries	$338.52
Travel Expenses (meals and lodging)	118.27
Vehicle	167.96
Miscellaneous	0.00
TOTAL	$624.75

26. Speed River below Guelph 32494 P

Electrical service problems were investigated.

Salaries	$57.27
Travel Expenses (meals and lodging)	0.00
Vehicle	1.30
Miscellaneous	0.00
TOTAL	$58.57

27. Redhill Creek at Hamilton 32494 P

A field investigation was carried out to assess the performance of the artificial weir and to determine possible modification to facilitate fish movement within the stream.

Salaries	$148.10
Travel Expenses (meals and lodging)	12.80
Vehicle	26.00
Miscellaneous	0.00
TOTAL	$186.90

28. Hunsburger Creek near New Hamburg 32431 P

Several reconnaissances were conducted to select a hydrometric gauging station site that was mutually agreeable to the Regional Municipality of Waterloo, Wilmot Township, Kitchener-Wilmot Hydro, and Environment Canada. The gauge will be used by the Regional Municipality to assess long term water supply and to assist in developing a water resource protection strategy.

Salaries	$154.86
Travel Expenses (meals and lodging)	8.80
Vehicle	51.48
Miscellaneous	0.00
TOTAL	$215.14

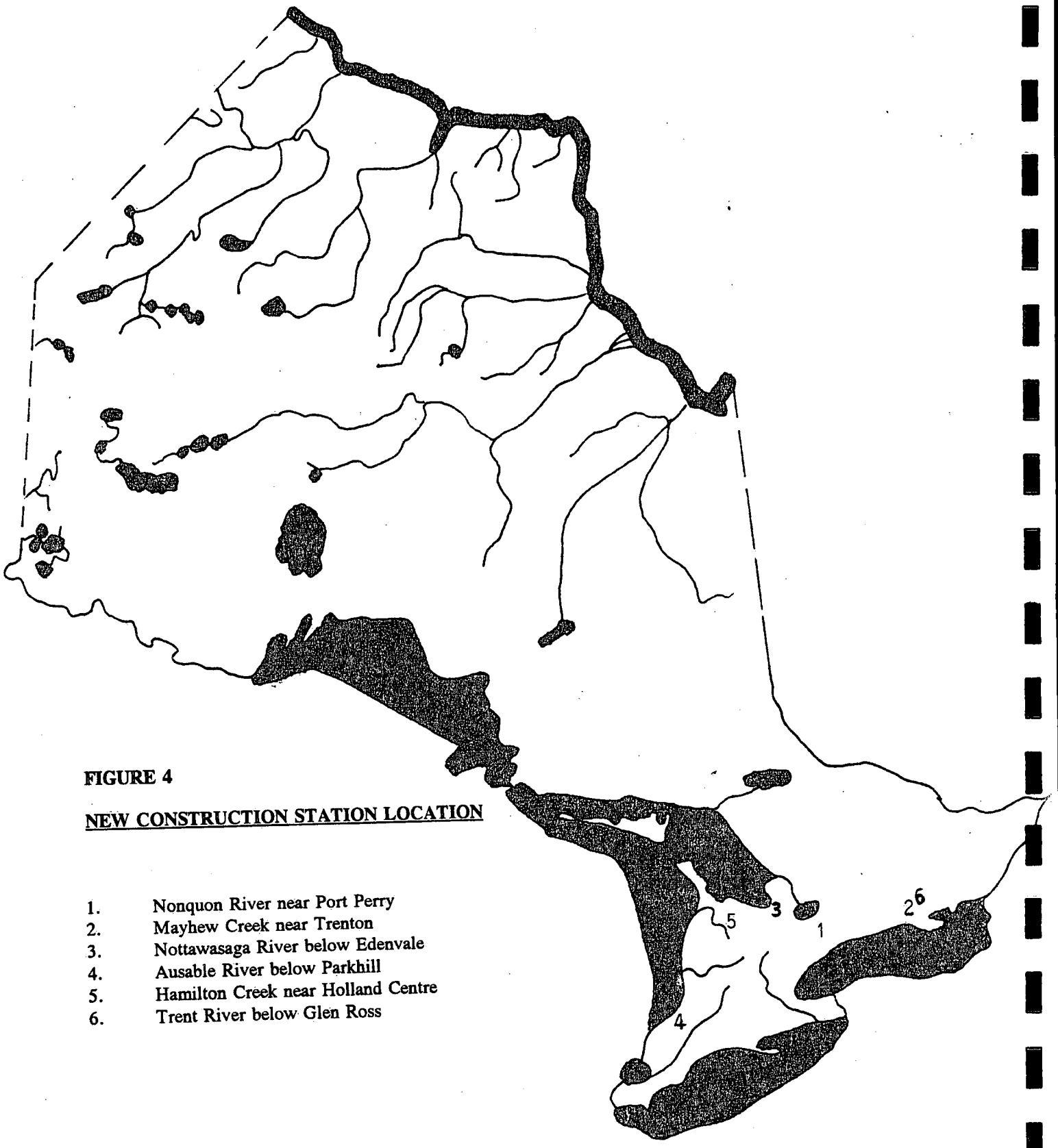


FIGURE 4

NEW CONSTRUCTION STATION LOCATION

1. Nonquon River near Port Perry
2. Mayhew Creek near Trenton
3. Nottawasaga River below Edenvale
4. Ausable River below Parkhill
5. Hamilton Creek near Holland Centre
6. Trent River below Glen Ross

3.2 New Construction

1. Nonquon River near Port Perry 32431 P

A stilling well, complete with intakes and heating cable, was installed. An aluminum shelter was insulated, panelled, electrical wired for a 30 ampere under ground service and placed atop the stilling well.

Salaries	$1,555.59
Building Materials & Supplies	4,121.74
Contracts, Services & Equipment Rental	770.85
Travel Expenses (meals and lodging)	564.19
Vehicle	302.10
Miscellaneous	$0.00
TOTAL	$7,314.47

2. Mayhew Creek near Trenton 32431 P

A stilling well, complete with intakes and heating cable, was installed. An aluminum shelter was insulated, panelled, electrical wired for a 30 ampere over head service and placed atop the stilling well.

Salaries	$1,487.57
Building Materials & Supplies	4,091.67
Contracts, Services & Equipment Rental	454.65
Travel Expenses (meals and lodging)	594.72
Vehicle	189.90
Miscellaneous	0.00
TOTAL	$6,818.51

3. Nottawasaga River below Edenvale 32431 P

An aluminum shelter was insulated, panelled, electrically wired with a 30 ampere under ground and placed on a pedestal. The pedestal was designed to accommodate a nitrogen cylinder for the operation of a Tavis pressure transducer.

Salaries	$1,970.43
Building Materials & Supplies	3,716.41
Contracts, Services & Equipment Rental	398.00
Travel Expenses (meals and lodging)	893.84
Vehicle	373.20
Miscellaneous	0.00
TOTAL	$5,381.45

4. Ausable River below Parkhill 32431 P

A refurbished steel clad walk-in shelter was installed on a concrete base. A 60 ampere electrical over head service was provided. The shelter will house electronic equipment for monitoring water levels via a pressure transducer.

Salaries	$1,329.99
Building Materials & Supplies	1,754.11
Contracts, Services & Equipment Rental	598.64
Travel Expenses (meals and lodging)	415.92
Vehicle	354.30
Miscellaneous	0.00
TOTAL	$4,452.96

5. Hamilton Creek near Holland Centre 32433 F

A stilling well, complete with intakes and heating cable, was installed. A wooden look-in shelter was wired with a 30 ampere under ground electrical service and mounted atop the stilling well.

Salaries	$1,643.51
Building Materials & Supplies	2,038.38
Contracts, Services & Equipment Rental	834.50
Travel Expenses (meals and lodging)	536.68
Vehicle	352.80
Miscellaneous	0.00
TOTAL	$5,405.87

6. Trent River below Glen Ross 32433 F

Modification were made to an existing building to provide an enclosure for an AFFRA unit and computer. Two river monitoring cameras were mounted on a standard adjacent to the river bank. Monitoring, conduit, and power lines were buried from the enclosure to the camera units.

Salaries	$1,741.97
Building Materials & Supplies	847.44
Contracts, Services & Equipment Rental	199.29
Travel Expenses (meals and lodging)	352.50
Vehicle	277.80
Miscellaneous	0.00
TOTAL	$3,419.00

3.3 Upgrading

1. Pukaskwa River at Pukaskwa National Park 32433 F

Materials for the construction of a cableway were transported as close as possible to the gauging site by road. The materials were slung by helicopter the remainder of the way.

Salaries	$747.57
Building Materials & Supplies	5,499.51
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	207.69
Vehicle	356.40
Miscellaneous (aircraft charter)	2,372.40
TOTAL	$9,183.57

3.4 Maintenance

1. Laurel Creek at Waterloo — 32494 P

A flushing system was installed in the stilling well and repairs were made to the intake pipe.

Salaries	$1,011.66
Building Materials & Supplies	356.55
Contracts, Services & Equipment Rental	60.00
Travel Expenses (meals and lodging)	70.00
Vehicle	92.40
Miscellaneous	0.00
TOTAL	$1,590.61

2. Tributary to Wye River below Elmvale — 32494 F/P

The sheet steel weir was extended and rip rap was placed on the downstream side of the weir.

Salaries	$510.73
Building Materials & Supplies	226.48
Contracts, Services & Equipment Rental	45.00
Travel Expenses (meals and lodging)	285.70
Vehicle	113.10
Miscellaneous	0.00
TOTAL	$1,1181.01

3. Redhill Creek at Hamilton — 32494 P

The lower intake pipe was extended to the centre of the concrete channel.

Salaries	$271.60
Building Materials & Supplies	65.55
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	17.50
Vehicle	39.60
Miscellaneous	0.00
TOTAL	$394.25

4. Lake Erie at Port Dover — 32378 F

Repairs were made to the electrical service and a branch circuit.

Salaries	$318.24
Building Materials & Supplies	19.33
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	26.35
Vehicle	135.60
Miscellaneous	0.00
TOTAL	$499.52

5. Credit River West Branch at Norval 32494 P

Granular fill was placed around the concrete base of the gauge shelter.

Salaries	$271.60
Building Materials & Supplies	160.28
Contracts, Services & Equipment Rental	220.50
Travel Expenses (meals and lodging)	8.75
Vehicle	26.70
Miscellaneous	0.00
TOTAL	$687.83

6. Thames River at Ealing 32494 P

The exterior of the concrete shelter was painted. The roof was sealed and painted. A ladder guard was fabricated and installed on the exterior access ladder.

Salaries	$305.55
Building Materials & Supplies	337.20
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	185.26
Vehicle	42.00
Miscellaneous	0.00
TOTAL	$870.61

7. Niagara River above IBM #35 32494 F

The wooden look-in shelter was painted and the roof was reshingled.

Salaries	$169.75
Building Materials & Supplies	67.27
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	109.15
Vehicle	66.00
Miscellaneous	0.00
TOTAL	$412.17

8. Ausable River near Springbank 32494 F

The concrete roof of the cement block shelter was replaced. The shelter exterior was painted.

Salaries	$1,777.98
Building Materials & Supplies	570.71
Contracts, Services & Equipment Rental	35.00
Travel Expenses (meals and lodging)	1,092.55
Vehicle	367.20
Miscellaneous	0.00
TOTAL	$3,843.44

9. Speed River at Armstrong Mills 32494 P

Granular fill was placed around the concrete base of the gauge shelter.

Salaries	$59.40
Building Materials & Supplies	151.90
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.80
Vehicle	15.60
Miscellaneous	0.00
TOTAL	$235.70

10. Humber River at Weston 32494 F

The wood and asphalt shingle roof of the gauge shelter was replaced.

Salaries	$790.80
Building Materials & Supplies	136.64
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	52.50
Vehicle	162.30
Miscellaneous	0.00
TOTAL	$1,142.24

11. Bayfield River near Varna 32494 P

The intake heating cable was replaced.

Salaries	$428.35
Building Materials & Supplies	346.26
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	227.46
Vehicle	141.30
Miscellaneous	0.00
TOTAL	$1,143.37

12. Shelter Valley Brook near Grafton 32494 P

The intake heating cable and controlling thermostat was replaced.

Salaries	$527.20
Building Materials & Supplies	229.66
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	247.30
Vehicle	137.40
Miscellaneous	0.00
TOTAL	$1,141.56

13. Kettle Creek above St. Thomas 32494 P

The sheet steel weir was straightened and extended. Cable-crete and rip rap was used to protect the stream banks and downstream side of the weir.

Salaries	$1,894.06
Building Materials & Supplies	993.80
Contracts, Services & Equipment Rental	2,968.50
Travel Expenses (meals and lodging)	551.70
Vehicle	311.70
Miscellaneous	0.00
TOTAL	$6,719.76

14. Thames River at Ingersol 32494 P

The exterior of the concrete shelter repaired and painted.

Salaries	$0.00
Building Materials & Supplies	0.00
Contracts, Services & Equipment Rental	2,367.00
Travel Expenses (meals and lodging)	0.00
Vehicle	0.00
Miscellaneous	0.00
TOTAL	$2,367.00

15. South Nation River at Casselman 32494 P

The intake valve system was repaired.

Salaries	$790.80
Building Materials & Supplies	35.46
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	498.78
Vehicle	334.50
Miscellaneous	0.00
TOTAL	$1,659.54

16. Etobicoke Creek at Brampton 32494 P

The wooden shelter was painted and the roof was reshingled.

Salaries	$118.80
Building Materials & Supplies	24.31
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.75
Vehicle	45.60
Miscellaneous	0.00
TOTAL	$197.46

17. Don River at York Mills 32494 P

The exterior trim of the walk-in shelter was repaired/replaced and painted.

Salaries	$118.80
Building Materials & Supplies	14.31
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.75
Vehicle	60.60
Miscellaneous	0.00
TOTAL	$202.46

18. Little Don River at Don Mills 32494 P

The exterior trim of the walk-in shelter was repaired/replaced and painted.

Salaries	$118.80
Building Materials & Supplies	14.31
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.75
Vehicle	68.40
Miscellaneous	0.00
TOTAL	$210.26

19. Don River at Todmorden 32494 F

The exterior trim of the walk-in shelter was repaired/replaced and painted. A soffit vent was installed.

Salaries	$118.80
Building Materials & Supplies	18.02
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.75
Vehicle	68.40
Miscellaneous	0.00
TOTAL	$213.97

20. Little Rouge Creek near Locust Hill 32494 P

The exterior trim of the walk-in shelter was repaired/replaced and painted.

Salaries	$118.80
Building Materials & Supplies	13.71
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.75
Vehicle	96.60
Miscellaneous	0.00
TOTAL	$237.86

21. Bowmanville Creek near Bowmanville 32494 P

The lower intake pipe was located and rerouted to a suitable gauging pool.

Salaries	$387.69
Building Materials & Supplies	30.96
Contracts, Services & Equipment Rental	54.25
Travel Expenses (meals and lodging)	26.10
Vehicle	181.50
Miscellaneous	0.00
TOTAL	$660.50

22. Turkey Creek at Windsor 32494 P

The security fence surrounding the gauge shelter was repaired.

Salaries	$195.67
Building Materials & Supplies	11.51
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	72.50
Vehicle	84.60
Miscellaneous	0.00
TOTAL	$364.28

23. Lake St. Clair at Tecumseh 32378 F

The electrical service and circuits were upgraded and replaced. A new metal entrance door was installed and the shelter exterior trim was painted.

Salaries	$763.60
Building Materials & Supplies	322.73
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	523:20
Vehicle	295.20
Miscellaneous	0.00
TOTAL	$1,904.73

24. Schomberg River near Schomberg 32494 P

The plugged stand pipe was replaced.

Salaries	$281.60
Building Materials & Supplies	254.65
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	17.50
Vehicle	61.50
Miscellaneous	0.00
TOTAL	$615.25

25. Ministry of the Environment 32431 P

Four gauging stations owned and operated by the Ministry were removed at their request.

Salaries	$712.95
Building Materials & Supplies	395.00
Contracts, Services & Equipment Rental	213.69
Travel Expenses (meals and lodging)	52.50
Vehicle	133.80
Miscellaneous	0.00
TOTAL	$1,507.94

26. Detroit River at Amherstburg 32378 F

The corroded 3" intake value was removed, refurbished, and reinstalled.

Salaries	$1,094.89
Building Materials & Supplies	50.20
Contracts, Services & Equipment Rental	482.90
Travel Expenses (meals and lodging)	606.46
Vehicle	273.30
Miscellaneous	0.00
TOTAL	$2,507.75

27. Lake Superior at Rossport 32378 F

The electrical system was upgraded and general maintenance of the shelter exterior was carried out.

Salaries	$959.14
Building Materials & Supplies	150.54
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	309.20
Vehicle	465.90
Miscellaneous	0.00
TOTAL	$1,884.78

28. Lake Huron at Little Current 32378 F

The electrical service entrance was repaired. The exterior of the shelter was repaired.

Salaries	$529.75
Building Materials & Supplies	142.54
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	329.52
Vehicle	375.00
Miscellaneous	0.00
TOTAL	$1,376.81

29. Lac Des Quinze a la Pointer du Pin Rouge 32358 F

The deteriorating wooden shelter was replaced with a steel clad walk-in shelter. The shelter was insulated, panelled, and electrically wired.

Salaries	$3,912.74
Building Materials & Supplies	2,657.94
Contracts, Services & Equipment Rental	107.41
Travel Expenses (meals and lodging)	1,886.10
Vehicle	661.20
Miscellaneous	0.00
TOTAL	$9,225.39

30. Lake Erie at Port Colborne 32378 F

The electrical service was upgraded by installing a hydro pole and independent service. The shelter wiring was upgraded.

Salaries	$987.69
Building Materials & Supplies	125.07
Contracts, Services & Equipment Rental	4,187.86
Travel Expenses (meals and lodging)	408.82
Vehicle	213.60
Miscellaneous	0.00
TOTAL	$5,923.04

31. Catfish Creek near Sparta — 32494 F/P

The concrete weir was removed.

Salaries	624.22
Building Materials & Supplies	1,800.00
Contracts, Services & Equipment Rental	3,525.75
Travel Expenses (meals and lodging)	299.85
Vehicle	144.30
Miscellaneous	0.00
TOTAL	$6,394.12

32. Speed River below Guelph — 32494 P

The electrical service was repaired.

Salaries	$57.27
Building Materials & Supplies	0.00
Contracts, Services & Equipment Rental	772.75
Travel Expenses (meals and lodging)	0.00
Vehicle	1.30
Miscellaneous	0.00
TOTAL	$831.32

33. La Peche River a St. Louis de Masham — 32494 F

The shelter from the discontinued station was removed. The stilling well was cut off below grade and was filled with earth.

Salaries	$677.04
Building Materials & Supplies	32.00
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	236.48
Vehicle	193.80
Miscellaneous	0.00
TOTAL	$1,139.32

34. Napanee River at Camden East — 32431 P

Repairs were made to the gauge shelter and electrical service. The shelter had been damaged by a storm.

Salaries	$825.14
Building Materials & Supplies	86.31
Contracts, Services & Equipment Rental	35.00
Travel Expenses (meals and lodging)	151.20
Vehicle	225.68
Miscellaneous	0.00
TOTAL	$1,323.33

35. Black River at Actinolite 32494 P

Gabion baskets were installed to support the stream bank adjacent to the gauge shelter.

Salaries	$2,780.47
Building Materials & Supplies	1,283.75
Contracts, Services & Equipment Rental	499.16
Travel Expenses (meals and lodging)	897.22
Vehicle	453.30
Miscellaneous	0.00
TOTAL	$5,913.90

36. Lac Temiscaminque at Ville Marie 32374 F

The deteriorating wooden shelter was replaced with a steel clad walk-in shelter. The shelter was insulated, panelled, and electrically wired.

Salaries	$4,057.03
Building Materials & Supplies	2,415.79
Contracts, Services & Equipment Rental	716.95
Travel Expenses (meals and lodging)	1,649.57
Vehicle	389.10
Miscellaneous	0.00
TOTAL	$9,228.44

37. Lake Huron at Little Current 32378 F

The electrical service entrance was repaired. The exterior of the shelter was repaired.

Salaries	$529.75
Building Materials & Supplies	142.54
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	329.52
Vehicle	375.00
Miscellaneous	0.00
TOTAL	$1,376.81

38. Wawa Creek at Wawa 32494 P

Filter cloth and rip rap were placed on the eroded stream bank adjacent to the natural rock control.

Salaries	$571.25
Building Materials & Supplies	408.42
Contracts, Services & Equipment Rental	522.00
Travel Expenses (meals and lodging)	95.75
Vehicle	296.10
Miscellaneous	0.00
TOTAL	$1,893.52

39. Petawawa River near Petawawa 32494 F

The deteriorated wooden platform of the cableway was replaced.

Salaries	$1,948.95
Building Materials & Supplies	400.37
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	906.43
Vehicle	576.00
Miscellaneous	0.00
TOTAL	$3,831.75

40. Lake Erie at Port Dover 32378 F

Repairs were made to the telephone conduit that is strapped to the side of the wharf.

Salaries	$516.50
Building Materials & Supplies	56.63
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	64.40
Vehicle	68.10
Miscellaneous	0.00
TOTAL	$705.63

41. Bowmanville Creek near Bowmanville 32494 P

The gauge shelter electrical circuitry was checked and well heat lamps were installed.

Salaries	$126.95
Building Materials & Supplies	35.73
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	8.80
Vehicle	103.50
Miscellaneous	0.00
TOTAL	$274.96

42. Lake Ontario at Toronto 32378 F

A railing, which was no longer required, along the lake side of the shelter was removed.

Salaries	$70.53
Building Materials & Supplies	2.00
Contracts, Services & Equipment Rental	0.00
Travel Expenses (meals and lodging)	0.00
Vehicle	31.50
Miscellaneous	0.00
TOTAL	$104.03

4.0 DESCRIPTION OF CONSTRUCTION METHODS AND PROCEDURES

4.1 Well Construction

Stilling Wells for Streamflow Gauges

These are inbank installations of 2.0 mm thickness (14 gauge), 800 mm diameter galvanized "Hel-Cor" pipe. The stilling well is fabricated at a welding shop at the Regional Headquarters and consists of welding in a 5 mm steel bottom and a 51 mm galvanized tee and coupling for attachment of intake pipes, gate valve and stand pipe. (Figure 5)

At the job site, while the excavating is underway, the lower intake, valve, valve handle extension and heating cable are attached to the well ready for installation. When the excavation is at the required depth, the complete well assembly, with the intake supported by 3 mm wire, is picked up by the excavating machine and lowered into the hole. The well is held plumb by guylines while the machine places backfill equally around the well. When the backfill reaches the 51 mm coupling, the upper intake is attached and supported by suitable timbers or posts to maintain a horizontal position while the rest of the fill is placed.

When the lower intake exceeds 20 M in length, additional sections of 6 M are connected from a boat or raft before the backfilling is started in order to lift the end of the 20 M length above the water surface to make these connections, after which normal backfilling takes place.

If a concrete pad is to be poured for the erection of a walk-in shelter, all the backfill above the water line is compacted at 30 cm intervals with a mechanical tamper. (Figure 6)

Walk-in Shelter for Bubble Gauges

An "Armco" walk-in shelter mounted on a poured-in-place concrete pad is used for the installation of a stacom servometer.

The bubble tube is buried in the bank and supported in the river inside a length of steel conduit. This conduit is buried in the bank at one end and fastened securely to two steel fence posts driven into the river bottom or other anchoring structure. (Figure 7)

Stilling Wells for Tides and Water Level Gauges

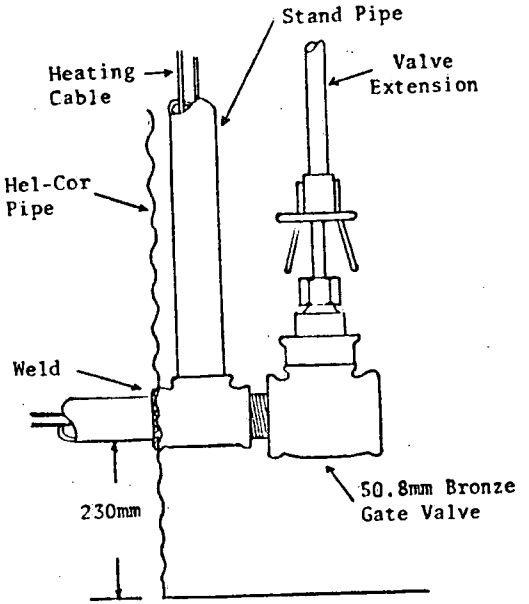
This type is fabricated by welding a 900 mm diameter and a 1,600 mm diameter galvanized "Hel-Cor" pipe to a common 5 mm steel bottom. A 1.5 M long 51 mm diameter intake pipe is attached to a 51 mm gate valve and stand pipe. (Figure 8)

The stilling well is lowered over the side of the dock and while resting plumb and evenly on the bottom is secured to the dock by a cable while the top is formed to accommodate an "Armco" house. Concrete is placed and fills the 35 cm space between the two pipes from the bottom of the well to the top of the formwork.

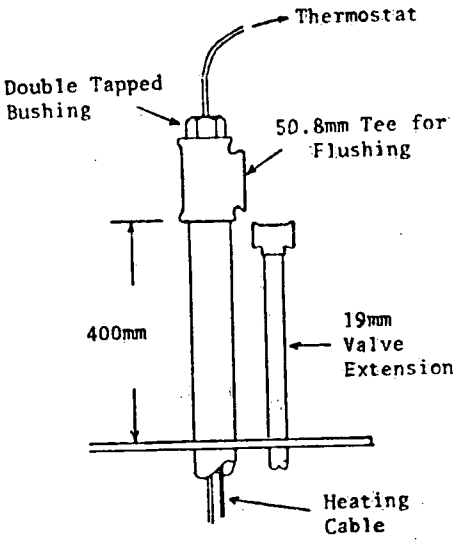
4.2 Inlet Systems

Lower Intake (Active)

The lower intake is a 51 mm diameter galvanized steel pipe screwed into a 51 mm galvanized steel tee that is welded onto the inside of the well 230 mm up from the bottom which allows room to screw the 51 mm bronze gate valve on the inside and also leaves a 230 mm sediment sump at the bottom of the well. A pyrotenax heating cable of suitable length is installed from the end of this intake up the stand pipe through a 51 mm x 13 mm x 13 mm double tapped bushing and connected to a number 4688 "Pyrotenax" thermostat (where electricity is available). The length of this lower intake is determined by the distance the stilling well is set back from the water's edge and may vary from 3 M to 36 M or longer.



DETAIL "A"



DETAIL "B"

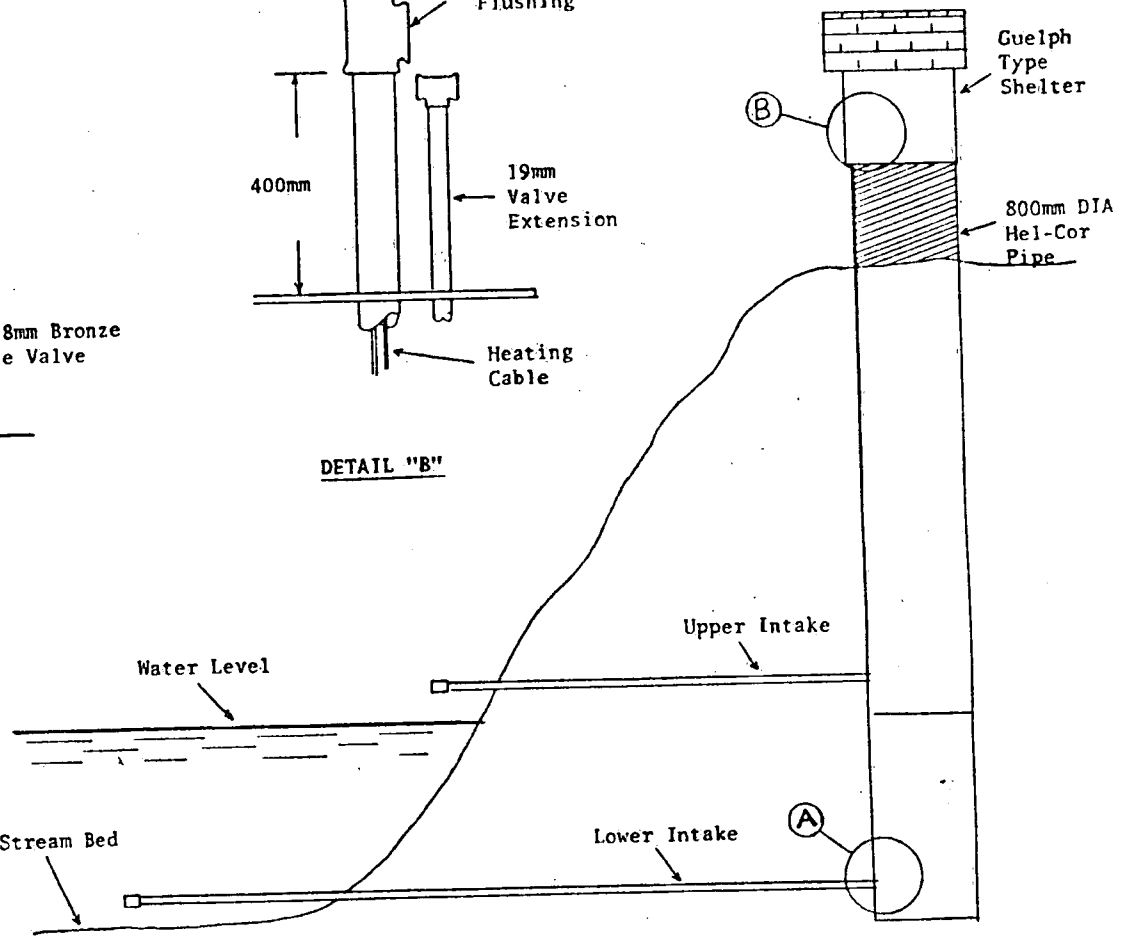


FIG. 5

INBANK STILLING WELL

FIG. 6

INBANK STILLING WELL
WITH ARMCO SHELTER

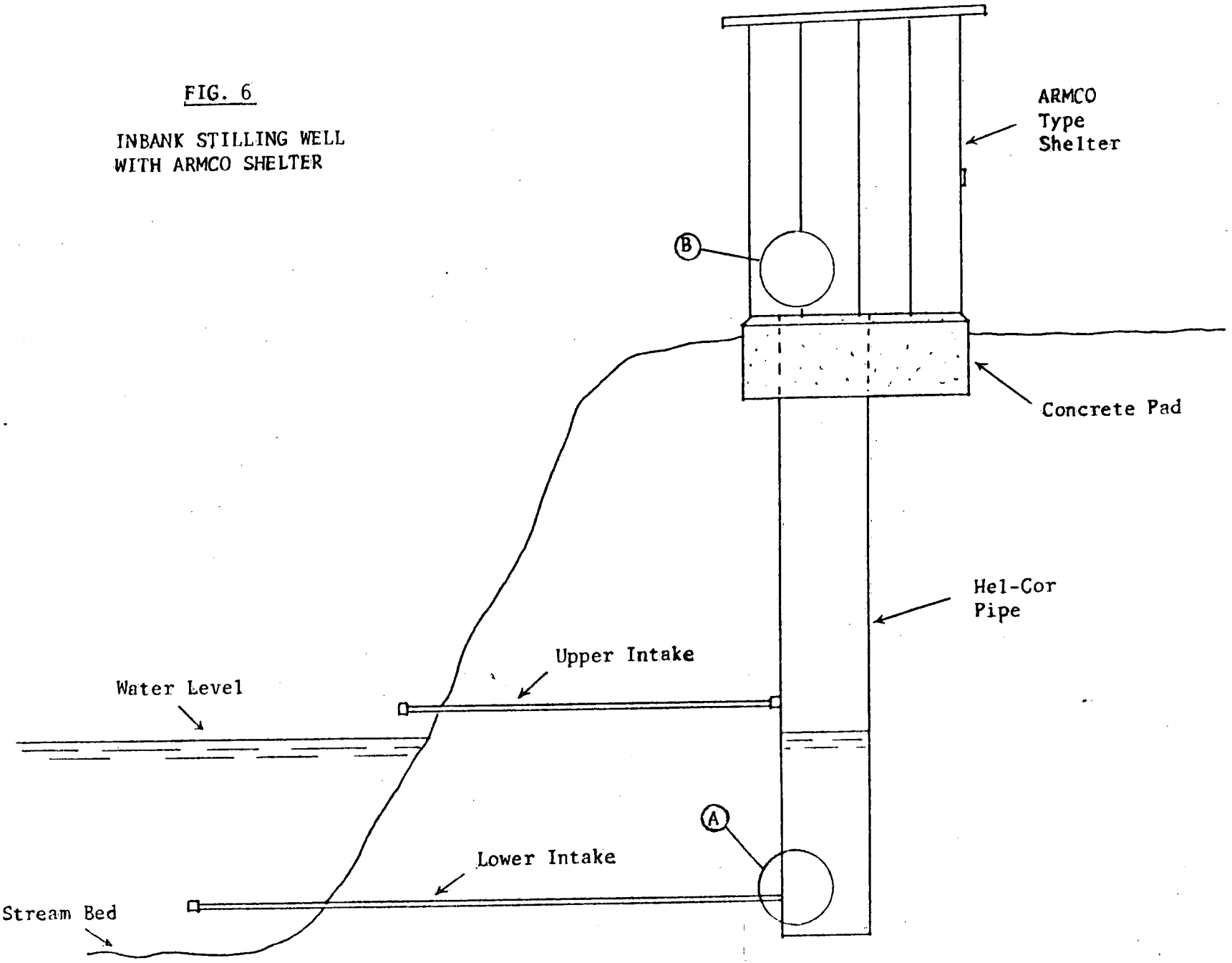


FIG. 7

STACOM SERVOMANOMETER GAUGE
WITH ARMCO SHELTER

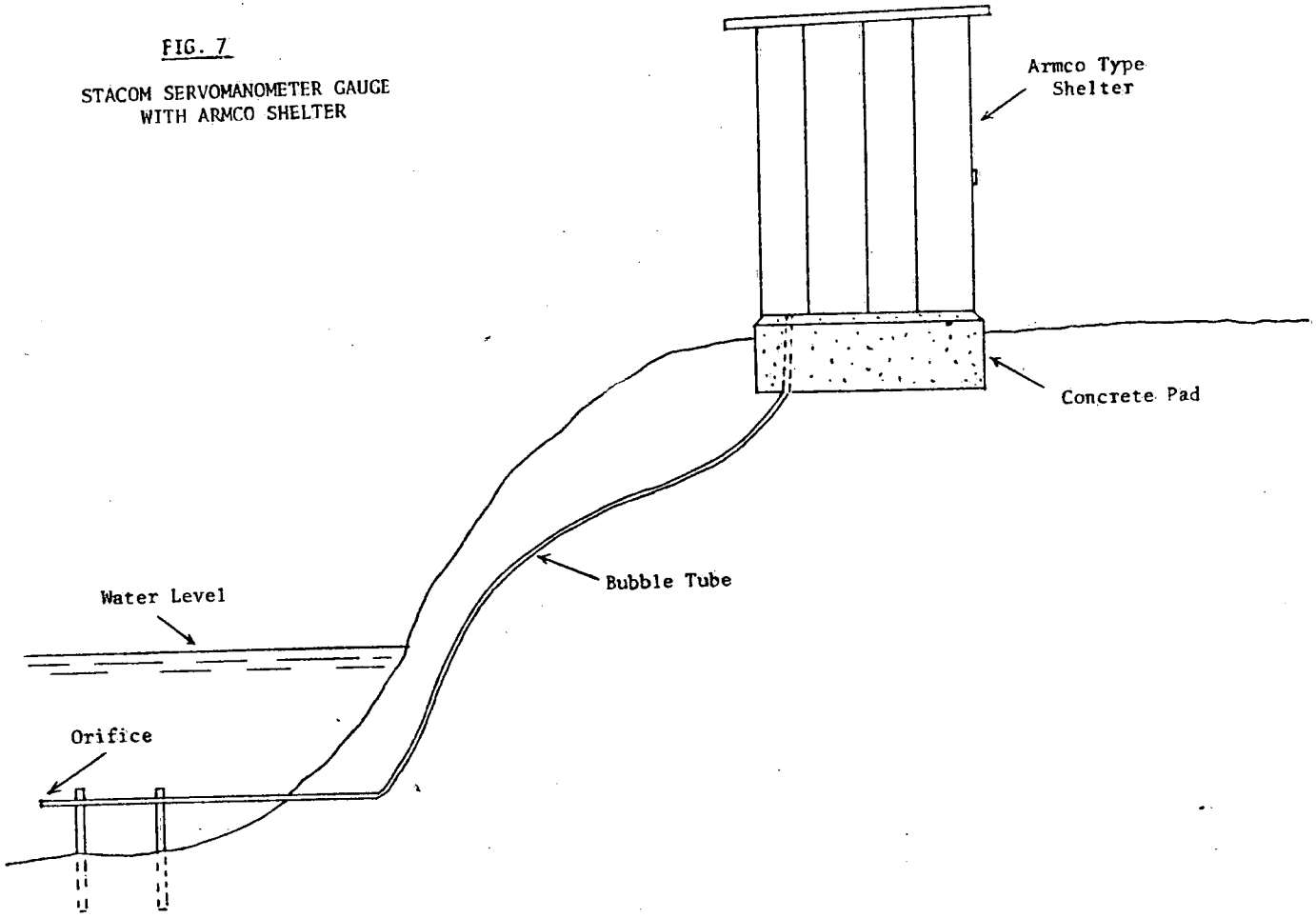
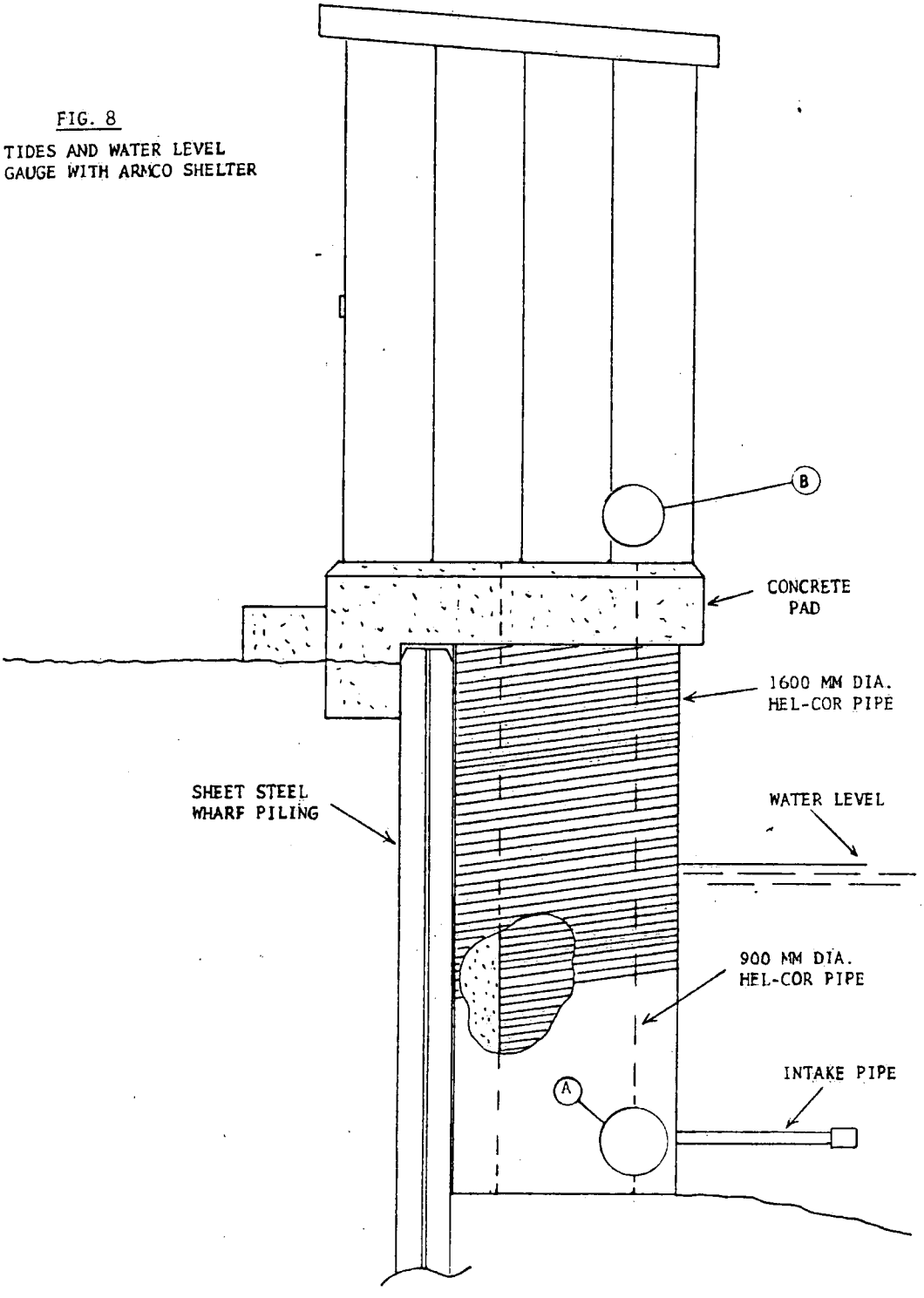


FIG. 8

TIDES AND WATER LEVEL
GAUGE WITH ARMCO SHELTER



Upper Intake (Auxiliary)

The upper intake is a 51 mm galvanized steel pipe screwed into a 51 mm galvanized coupling that is welded onto the outside of the stilling well at a distance above the lower intake to be about 15 cm above the winter ice cover level.

Flushing

Flushing of the active intake is accomplished by attaching the discharge hose of a gasoline driven pump to the 51 mm tee at the top of the stand pipe and with the valve in the well closed forcing water under pressure through intake system.

4.3 Instrument Shelters

Look-in Shelter

The standard wooden Guelph-type look-in shelter is installed at all sites where the instrumentation consists of the Stevens A-71 analogue recorder. An aluminum look-in shelter has been designed and fabricated for installation that requires an analogue recorder and a data logger. The shelter is constructed of 6 mm high strength aluminum which provides good protection from vandalism. The interior is insulated with rigid or sprayed insulation and a wooden floor is installed over the well to facilitate instrument placement. Both shelters are mounted on an 800 mm diameter stilling well.

Where electricity is available, a 30 ampere service is installed with well heating cable and thermostat, light, and outlets. Propane 'Cata-Dyne' heaters are used at stations where electricity is not available.

Walk-in Shelter

Armco metal buildings from 1,626 mm x 1,626 mm x 2,438 mm to 4,876 mm x 3,658 mm x 2,438 mm in size are used at all sites requiring room for several instruments and/or personnel accommodation. These buildings are insulated, paneled, and where electricity is available, provided with a 60 ampere service complete with well heaters, baseboard heaters, thermostats, lights and out lets. Propane heaters or wood stoves are used where power is not available.

Sediment Shelters

Bridge mounted manual sediment sampling equipment is housed in the Guelph-type sediment sampler shelter.

4.4 Artificial Controls and Weirs

Steel

Most controls are made from Armco steel sheeting type M581, 690 mm in width, 5 mm thick available in lengths from 1.83 M to 4.88 M.

The sections are cut and pointed on the job and driven into the streambed with a hand operated pneumatic pile driver. The top is trimmed by flame cutting to approximately a 5 percent grade from the centre to each side and riprapped on the downstream side to prevent erosion.

Concrete

Concrete controls and weirs of various design are constructed. They may be formed or free-formed and poured-in-place in the streambed.

Timber

Timber controls used on small streams are constructed of preservative treated planks and plywood.

4.5 Cableways

Wire Rope

6 x 19 Independent Wire Rope Core right regular lay, preformed, galvanized, improved plow steel wire rope of 19 mm or 22 mm diameter, depending on the span, is used on most installations. Spelter or swaged sockets are installed on the ends of the wire rope at the factory.

Tower backstays are of 10 mm or 13 mm guy strand and attached by means of preformed guy strips or cable clips.

Towers

The cable is supported on 'A' towers made from 203 mm x 203 mm preservative treated timbers mounted on concrete pedestals or 101 mm x 101 mm galvanized "H" beams (19.35 kg/m wide flange) resting on a concrete footing or steel pad. Aluminum and steel landing platforms are constructed where required.

Anchors

The cable is anchored at each end to a poured-in-place concrete block, rock anchor or steel deadman and equipped at one end with a turnbuckle for adjustment of sag.

Cablecars

Cablecars are two-man sit-down design constructed of aluminum and equipped with safety finger guards.

Aircraft Warning Markers

Where required, Transport Canada approved international orange coloured, spherical shaped aircraft warning markers are suspended on a separate 10 mm wire rope cable above the main cable. Cable towers are also painted inter national orange and white to Transport Canada specifications.

Fittings

Sockets, turnbuckles, thimbles, shackles, saddles, sheaves, wire rope clips and all other metal parts are hot-dipped galvanized.