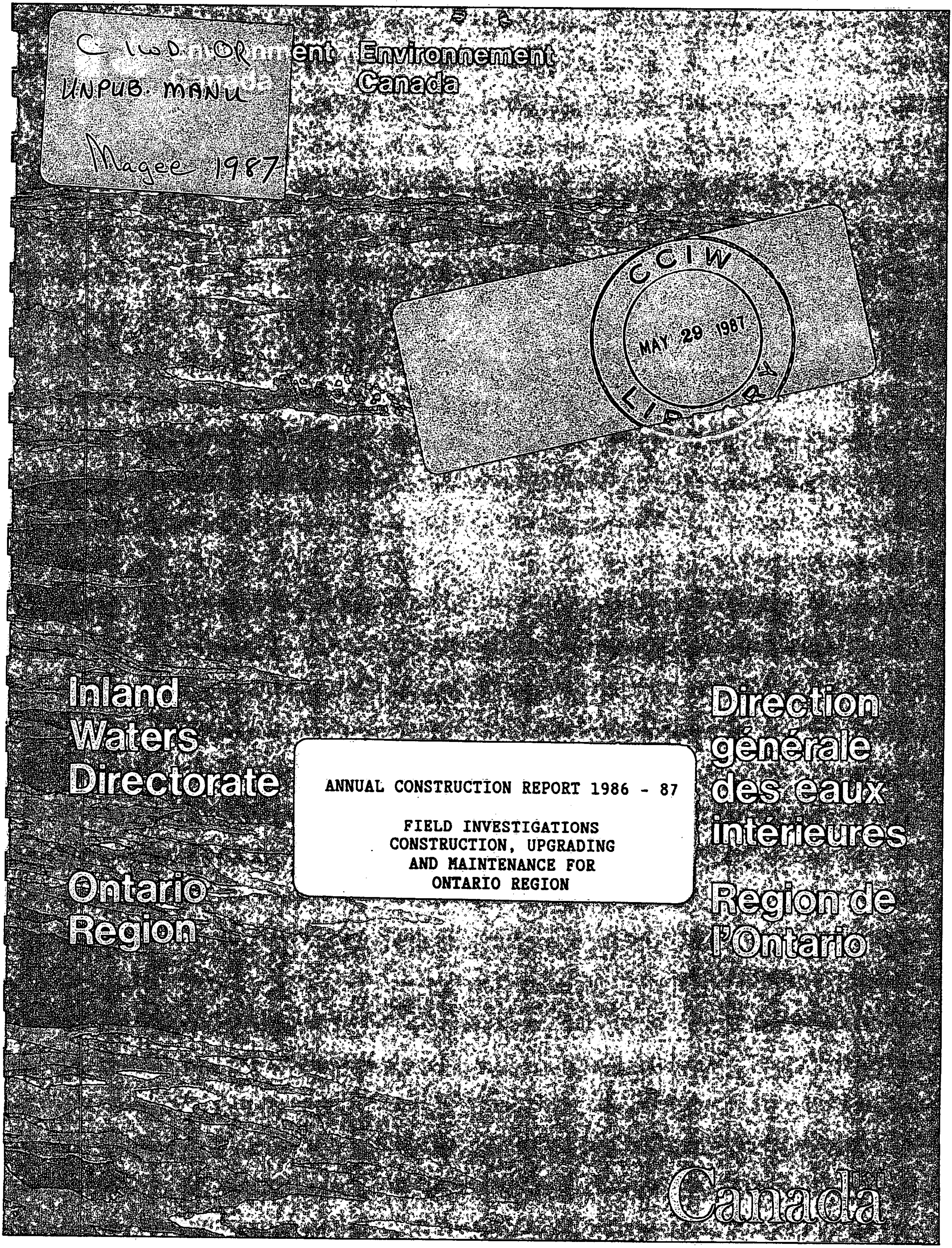

Environment Environnement
Canada Canada

Inland Waters Directorate

Ontario Region

ANNUAL CONSTRUCTION REPORT 1986 - 87

FIELD INVESTIGATIONS CONSTRUCTION, UPGRADING AND MAINTENANCE FOR ONTARIO REGION

Direction générale des eaux intérieures

Région de l'Ontario

Canada

(1393B)

DEPARTMENT OF THE ENVIRONMENT

INLAND WATERS DIRECTORATE

WATER RESOURCES BRANCH

ANNUAL CONSTRUCTION REPORT 1986 - 87

FIELD INVESTIGATIONS CONSTRUCTION, UPGRADING AND MAINTENANCE FOR ONTARIO REGION

REPORT BY:
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MARCH 31, 1987

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1.0 INTRODUCTION

This annual construction report, prepared by the Ontario Region of the Water Resources Branch, is for the fiscal year 1986 - 1987.

The purpose of this report is to detail the construction activities associated with the installation of hydrometric and sediment stations required to compile and provide data for Government and private agencies and the public.

Funds for the construction activities, which include reconnaissance, construction, upgrading and maintenance, are provided for under the Federal-Provincial Cost-Sharing Agreement. Projects and priorities are established with the cooperation of and in consultation with the cost-sharing agreement members and/or their agencies.

Construction activities are divided into four categories:

1. FIELD INVESIGATIONS (F)

Reconnaissance, surveys, preparation of plans, meetings and correspondence to obtain approval to construct hydrometric installations on private or public land.

2. CONSTRUCTION (C)

Installation of stilling wells, intakes, instrument shelters, artificial controls, cableways, access roads, and primary instrumentation.

3. UPGRADING (U)

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 (M)

General maintenance carried out at existing gauging stations. (Does not include minor repairs done by Hydrometric Field Staff).

2.0 CONSTRUCTION PROGRAM 1986-87

During the fiscal year twenty-six (55) field investigations were carried out to select new installation sites or to assess current sites for upgrading or maintenance.

Ten (10) new construction projects were completed by WRB staff or were carried out jointly with the requesting agency.

Eight (8) upgradings were completed by the installation of artificial controls or by installing and/or erecting larger instrument shelters.

Fifty-five (33) maintenance projects were carried out that ranged from repairing door locks to reconstructing gauge shelters.

2.1 DEFINITIONS FOR PROJECT COST BREAKDOWN

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

SALARIES

Engineers, Supervisors, Foreman, Term Employees and Hydrometric Personnel associated with field investigations, construction, upgrading and maintenance of the stations in this report.

MATERIALS/SUPPLIES

Stilling well, plumbing materials, electrical materials, concrete, instrument shelter, gravel, lumber, excavating machinery, rental equipment, steel, 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 air fare.

2.2 EQUIPMENT AND PERSONNEL

One standard Suburban equipped with power tailgate, roof-top carrier, tailgate mounted vice, trailer hitch, heavy duty suspension, and complete with safety screen for personnel protection, and one 3/4 ton crewcab pick-up equipped with fiberglass cap, 110 volt AC motor mounted electric generator, tailgate mounted vice and trailer hitch.

Two heavy duty boat trailers modified to carry wells, hydro poles, intake pipes and instrument shelters are 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 drill, pipe threaders, grinders, 3 ton and 3/4 ton pullers, oxy-acetelene cutting torch, gasoline generator and all other necessary hand tools.

PERSONNEL

All work was performed by the Construction Supervisor, Construction Foreman and assistant(s) (unless otherwise noted). 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, rip-rap and lumber were purchased by service contract, or Field Purchase Authority.

2.3 CONSTRUCTION COSTS SUMMARY 1986-87

	FIELD INVESTIGATIONS	COST
1.	CATFISH CREEK AT AYLMER	$ 268.00
2.	SAUBLE RIVER AT ALLENFORD	196.64
3.	WYE RIVER AT WYEBRIDGE	321.26
4.	BEAVER CREEK NEAR MARMORA	270.13
5.	NOGIES CREEK ABOVE KRAEGER'S BRIDGE	588.22
6.	TWENTY MILE CREEK NEAR SMITHVILLE	251.00
7.	MCINTYRE RIVER AT THUNDER BAY	124.94
8.	DETROIT RIVER AT TECUMSEH	
9.	DETROIT RIVER AT LA SALLE	301.32
10.	DETROIT RIVER AT AMHERSTBURG	
11.	ST. CLAIR RIVER AT PORT LAMPTON	
12.	BEAR CREEK NEAR WILKESPORT	170.70
13.	SYDENHAM RIVER NEAR DRESDEN	
14.	NIAGARA RIVER AT FORT ERIE	382.59
15.	WHITEMAN'S CREEK NEAR MOUNT VERNON	133.32
16.	HOLLAND RIVER AT HOLLAND LANDING	151.34
17.	REDHILL CREEK AT HAMILTON	
18.	GRINDSTONE CREEK NEAR ALDERSHOT	198.58
19.	ANCASTER CREEK AT ANCASTER	
20.	BRONTE CREEK NEAR CARLISLE	
21.	N. SAUGEEN RIVER NEAR PAISLEY	198.20
22.	KETTLE CREEK ABOVE ST. THOMAS	229.57
23.	MOUNT PLEASANT CREEK NEAR BURTCH	
24.	WILTON CREEK NEAR NAPANEE	
25.	MILLHAVEN CREEK NEAR KINGSTON	
26.	E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT	
27.	S. NATION RIVER NEAR PLANTAGENET	1,076.15
28.	BEAR BROOK NEAR BOURGET	
29.	RIDEAU RIVER BELOW MANOTICK	
30.	BONNECHERE RIVER NEAR CASTLEFORD	
31.	PETAWAWA RIVER NEAR PETAWAWA	
32.	MADAWASKA RIVER AT PALMER RAPIDS	
33.	DODDS CREEK NEAR PAYNES MILLS	168.41
34.	CATFISH CREEK NEAR SPARTA	109.50

2.3 CONSTRUCTION COSTS SUMMARY 1986-87

	FIELD INVESTIGATIONS (CONT'D)	COST
35.	SCHOMBERG RIVER NEAR SCHOMBERG	140.02
36.	SPENCER CREEK AT HWY #5	189.88
37.	LAKE ERIE AT PORT COLBORNE	298.55
38.	LAKE HURON AT GODERICH	180.02
39.	WILTON CREEK NEAR NAPANEE	
40.	COLLINS CREEK NEAR KINGSTON	
41.	SHELTER VALLEY BROOK NEAR GRAFTON	
42.	MILLHAVEN CREEK NEAR MILLHAVEN	836.31
43.	E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT	
44.	BONNECHERE RIVER NEAR CASTLEFORD	
45.	CATARAQUI RIVER AT CHAFFEY'S LOCKS	
46.	ST. CLAIR RIVER AT POINT EDWARD	
47.	ST. CLAIR RIVER AT PORT LAMPTON	475.02
48.	DETROIT RIVER AT LA SALLE	
49.	DETROIT RIVER AT AMHERTSBURG	
50.	THAME RIVER NEAR TAVISTOCK	227.00
51.	WHITEMAN'S CREEK NEAR MT. VERNON	
52.	THAMES RIVER NEAR INNERKIP	
53.	TROUT CREEK NEAR FAIRVIEW	417.50
54.	THAMES RIVER NEAR TAVISTOCK	
55.	BLACK RIVER NEAR ACTON	
	TOTAL	$7,904.17

CONSTRUCTION COSTS SUMMARY 1986-87

NEW CONSTRUCTION		COST ($)
1.	ANCASTER CREEK AT ANCASTER	6,172.66
2.	SAUBLE RIVER AT ALLENFORD	20,167.55
3.	BEAVER CREEK NEAR MARMORA	2,245.14
4.	WYE RIVER NEAR WYEVALE	5,074.02
5.	BRONTE CREEK NEAR CARLISLE	2,259.71
6.	TWENTY MILE CREEK NEAR SMITHVILLE	17,474.21
7.	SPENCER CREEK AT HWY #5	8,997.45
8.	MCINTYRE RIVER AT THUNDER BAY	8,368.09
9.	CATFISH CREEK AT AYLMER	7,265.53
10.	NOGIES CREEK ABOVE KRAIGERS BRIDGE	1,220.03
	TOTAL	$ 79,244.39

CONSTRUCTION COSTS SUMMARY 1986-87

	UPGRADING	COST ($)
1.	SAUBLE RIVER AT SAUBLE FALLS	2,655.87
2.	CHIPPEWA CREEK AT NORTH BAY	3,119.33
3.	KETTLE CREEEK ABOVE ST. THOMAS	4,847.08
4.	MILLHAVEN CREEK NEAR MILLHAVEN	4,631.69
5.	WILTON CREEK NEAR NAPANEE	5,838.30
6.	CATFISH CREEK NEAR SPARTA	6,030.96
7.	E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT	7,971.31
8.	BONNECHERE RIVER NEAR CASTLEFORD	8,886.54
	TOTAL	$43,981.08

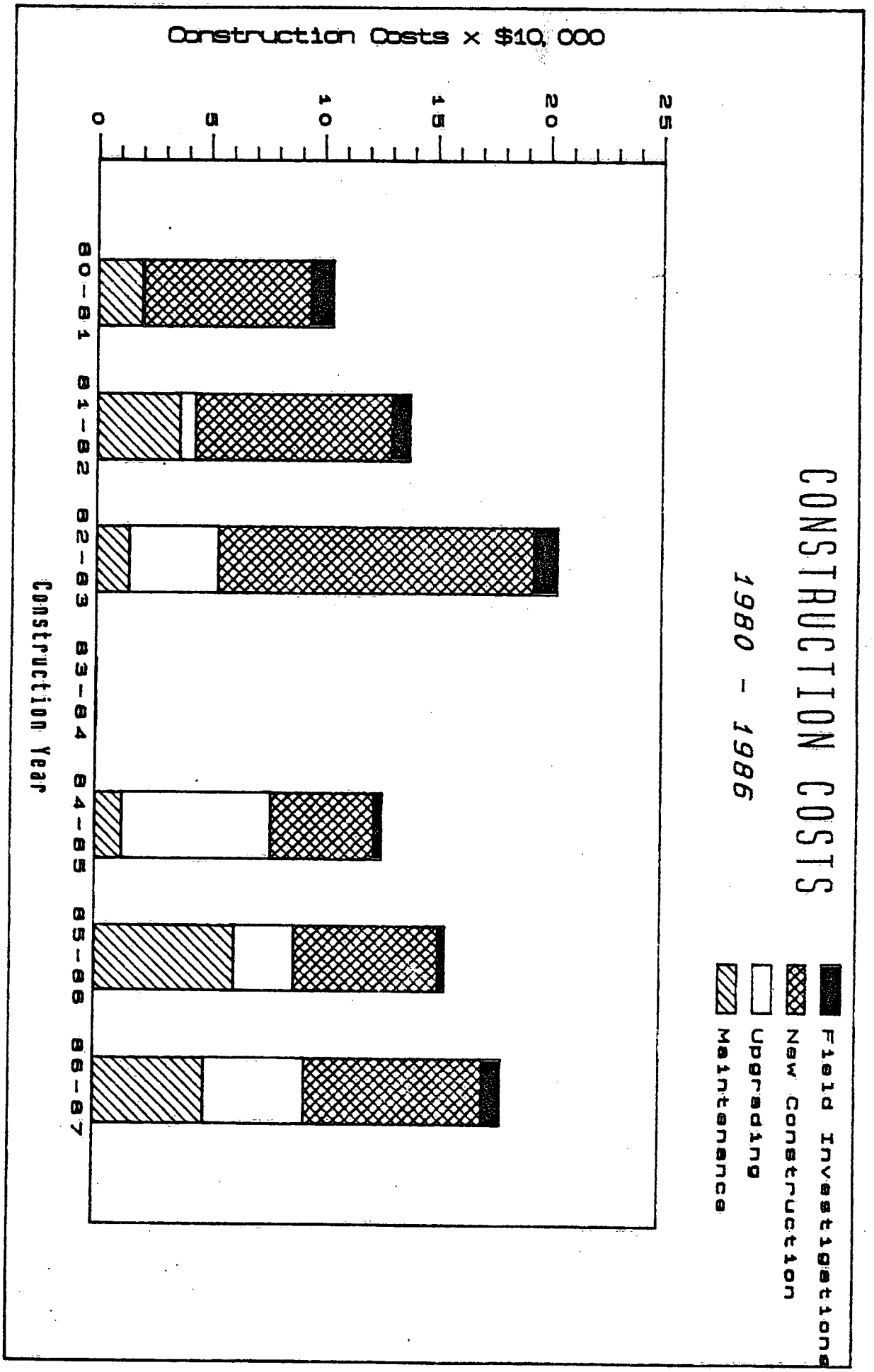
CONSTRUCTION COSTS SUMMARY 1986-87

	MAINTENANCE	COST ($)
1.	SAUGEEN RIVER BELOW DURHAM	308.76
2.	S. SAUGEEN RIVER NEAR HANOVER	449.76
3.	GRAND RIVER BELOW SHAND DAM	1,976.61
4.	SYDENHAM RIVER NEAR DRESDEN	706.87
5.	CATARAQUI RIVER AT KINGSTON MILLS	1,320.62
6.	DETROIT RIVER AT LA SALLE	2,152.51
7.	DETROIT RIVER AT TECHUMSEH	962.80
8.	LAKE ONTARIO AT COBOURG	491.98
9.	STURGEON CREEK NEAR LEAMINGTON	553.61
10.	LAKE SUPERIOR AT GROS CAP	7,726.25
11.	COMMANDA CREEK AT COMMANDA	2,116.33
12.	MOUNT PLEASANT CREEK NEAR BURTCH	511.83
13.	HORNER CREEK NEAR PRINCETON	140.72
14.	LAKE ERIE AT KINGSVILLE	1,089.40
15.	N/W GANARASKA RIVER NEAR OSACA	2,706.19
16.	BEATTY SAUGEEN RIVER NEAR HOLSTEIN	397.71
17.	SHEKAK RIVER AT HWY #11	2,626.16
18.	MATTAGAMI RIVER NEAR TIMMINS	3,913.28
19.	BOB'S CREEK NEAR MINDEN	1,211.05
20.	ROOT RIVER AT SAULT STE. MARIE	238.78
21.	WHITSON RIVER AT CHELMSFORD	1,036.21
22.	ST. MARY'S RIVER AT SAULT STE. MARIE(ABOVE)	1,348.34
23.	ST. MARY'S RIVER AT SAULT STE. MARIE(BELOW)	3,229.31
24.	SPEED RIVER BELOW GUELPH	54.12
25.	MIDDLE MAITLAND RIVER NEAR ETHEL	97.79
26.	LAKE HURON AT GODERICH	740.00
27.	RIDEAU RIVER BELOW MANOTICK	524.92
28.	HUMBER RIVER AT WESTON	261.40
29.	ANCASTER CREEK AT ANCASTER	149.26
30.	WINISK RIVER BELOW ASHEWIG RIVER TRIBUTARY	5,953.09
31.	ROSEBERRY RIVER ABOVE ROSEBERRY LAKE	3,154.28
32.	NITH RIVER NEAR CANNING	177.90
33.	HOLLAND RIVER AT HOLLAND LANDING	251.18
	TOTAL	$48,579.02

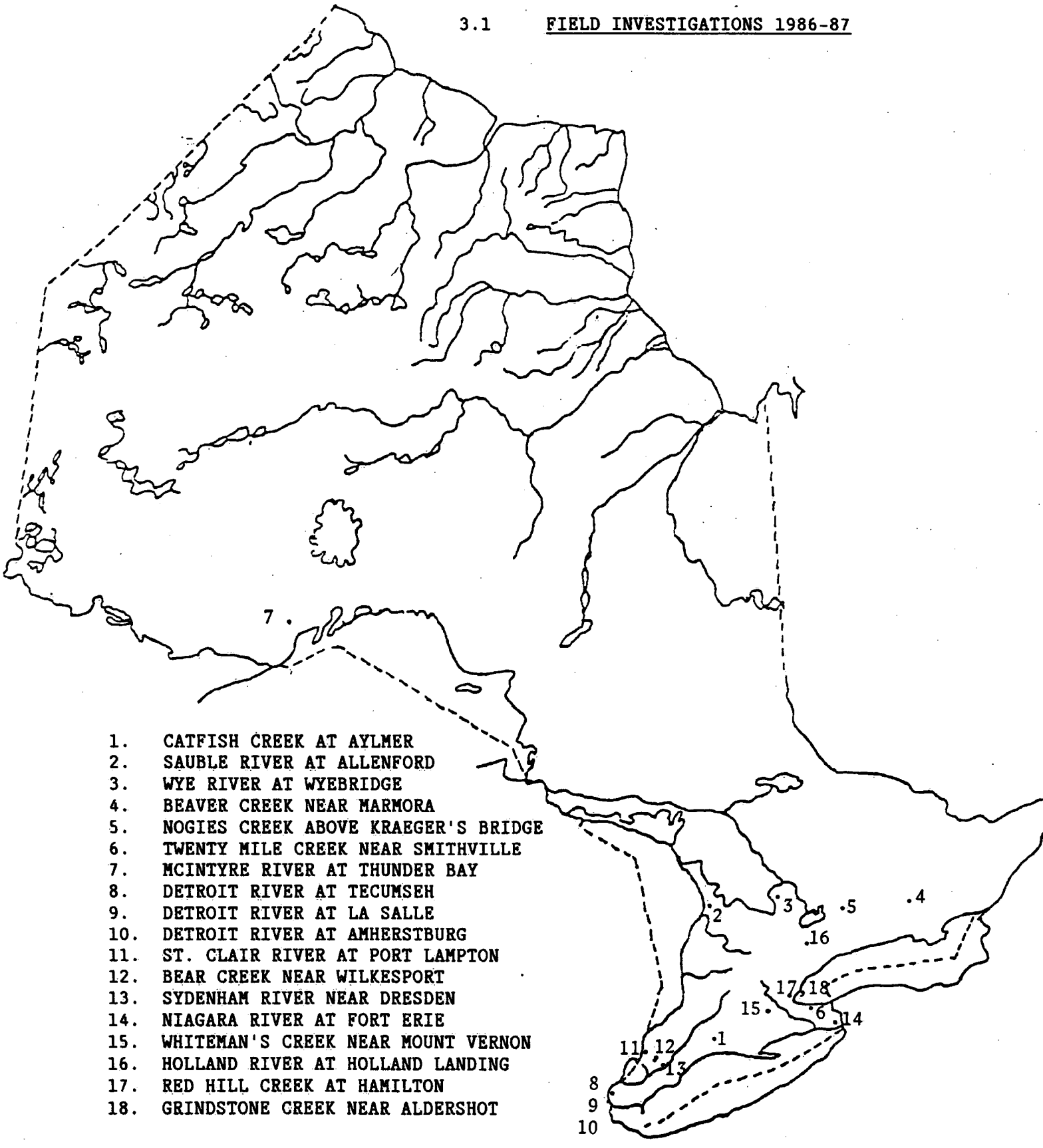
CONSTRUCTION COSTS SUMMARY 1986-87

ITEM	SALARY	O&M	CAPITAL	INSTR.	TOTAL
FIELD INVESTIGATIONS	5,072.77	1,762.72	1,068.68	---	$ 7,904.17
NEW CONSTRUCTION	11,367.91	---	47,640.43	20,236.05	79,244.39
UPGRADING	10,727.68	3,564.50	29,688.90	---	43,981.08
MAINTENANCE	15,099.52	16,896.42	16,583.08	---	48,579.02
TOTALS	$42,267.88	22,223.64	94,981.09	20,336.05	$179,708.66

2.4 CONSTRUCTION COST COMPARISON 1980/81 - 1986/87



3.1 FIELD INVESTIGATIONS 1986-87



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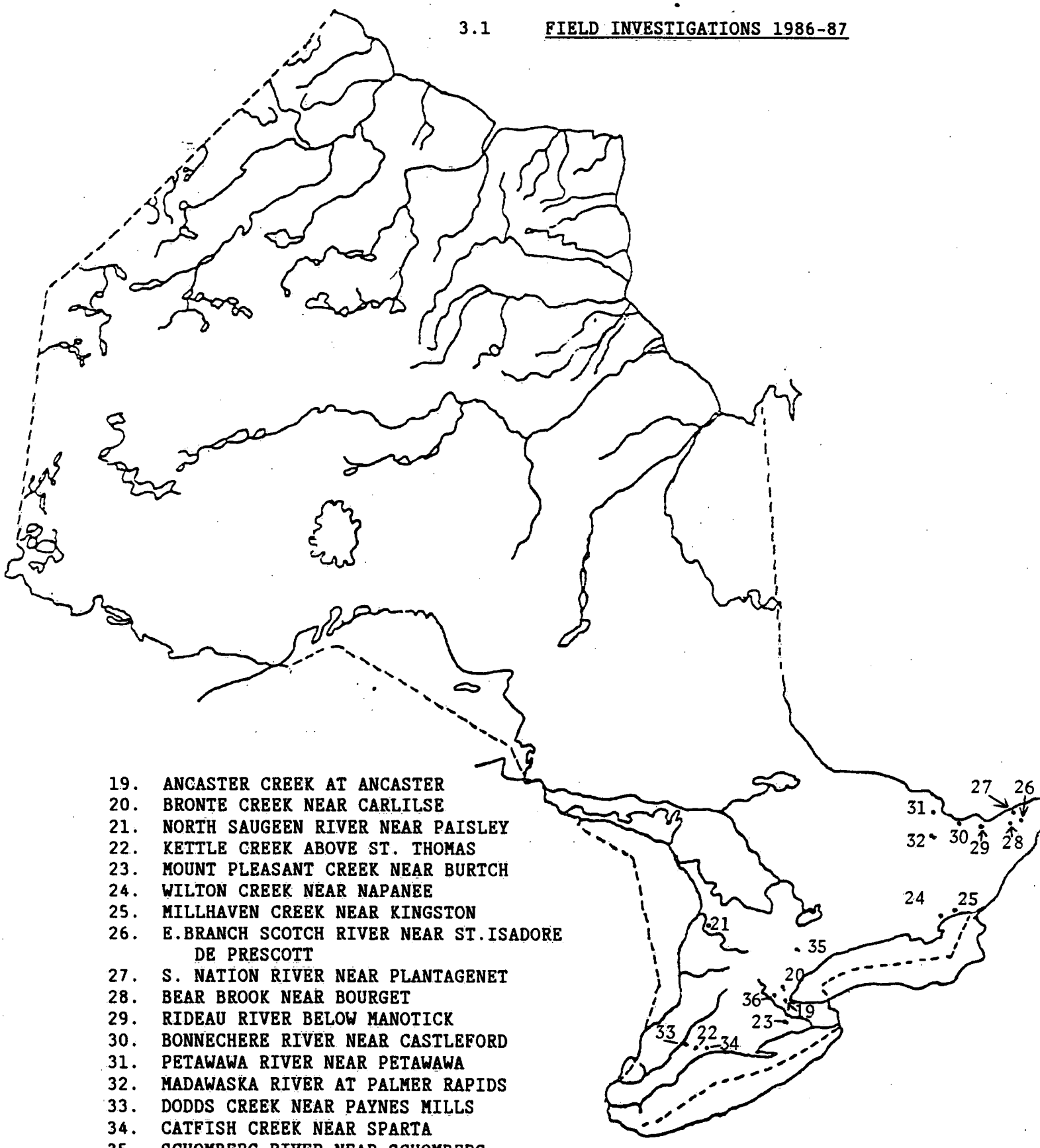
16. HOLLAND RIVER AT HOLLAND LANDING
17. RED HILL CREEK AT HAMILTON
18. GRINDSTONE CREEK NEAR ALDERSHOT

3.1 FIELD INVESTIGATIONS 1986-87



19. ANCASTER CREEK AT ANCASTER
20. BRONTE CREEK NEAR CARLILSE
21. NORTH SAUGEEN RIVER NEAR PAISLEY
22. KETTLE CREEK ABOVE ST. THOMAS
23. MOUNT PLEASANT CREEK NEAR BURTCH
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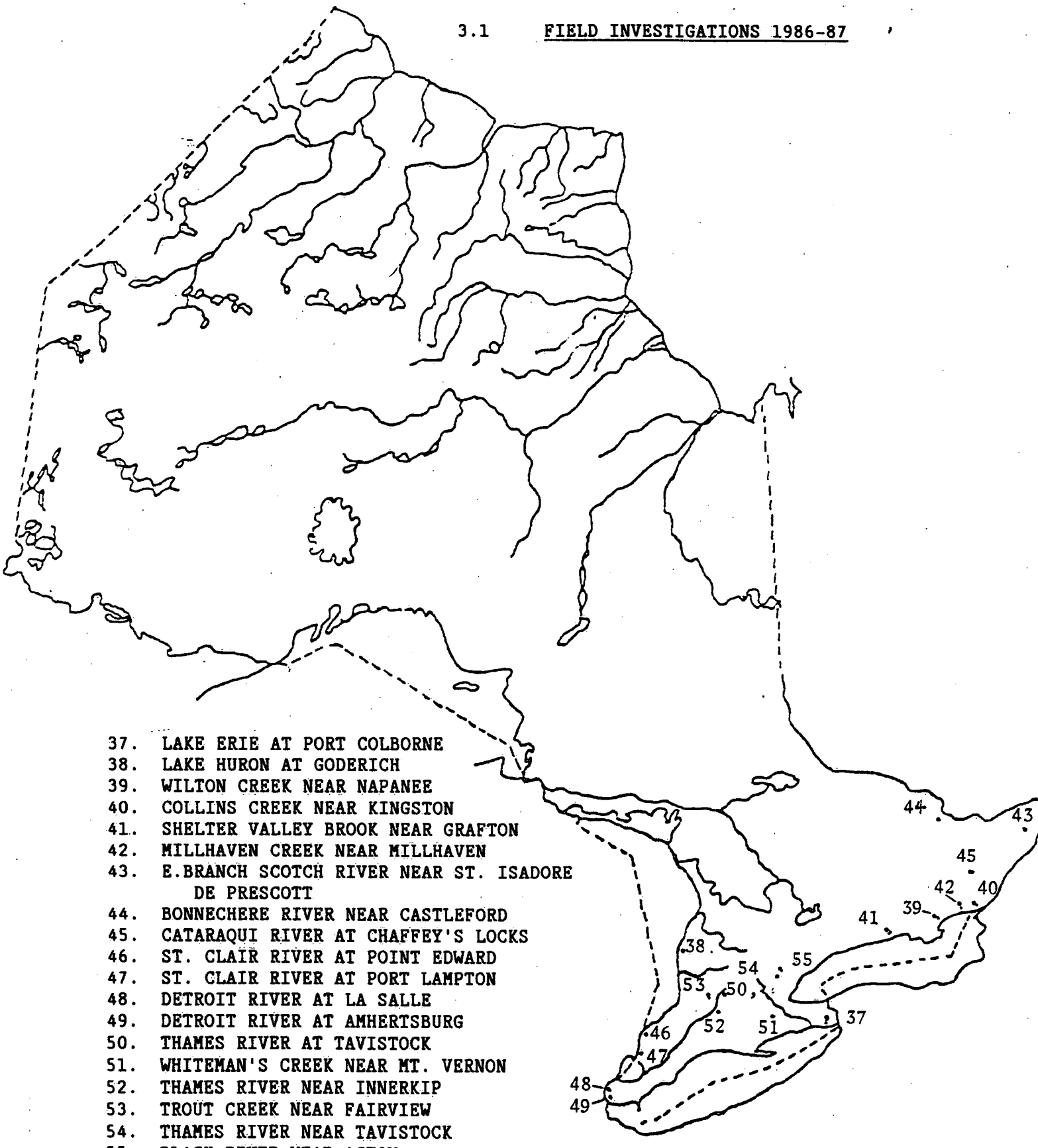
31. PETAWAWA RIVER NEAR PETAWAWA
32. MADAWASKA RIVER AT PALMER RAPIDS
33. DODDS CREEK NEAR PAYNES MILLS
34. CATFISH CREEK NEAR SPARTA
35. SCHOMBERG RIVER NEAR SCHOMBERG
36. SPENCER CREEK AT HWY #5

3.1 FIELD INVESTIGATIONS 1986-87



FIELD INVESTIGATIONS

1. CATFISH CREEK AT AYLMER 39439

Construction and Hydrometric staff met with Conservation Authority Personnel to select a suitable location for a hydrometric gauging station. Data logging instrumentation will be used for flood forecasting and flow monitoring.

Cost:	Salaries	$ 200.00
	Meals/Lodging	---
	Transportation	68.00
	TOTAL	$ 268.00

2. SAUBLE RIVER AT ALLENFORD 39442

Construction and Hydrometric staff met with Conservation Authority personnel to select a suitable location for a hydrometric gauging station. Data logging instrumentation will be used for flood forecasting and flow monitoring.

Cost:	Salaries	$ 130.00
	Meals/Lodging	8.50
	Transportation	58.14
	TOTAL	$ 196.64

3. WYE RIVER AT WYEBRIDGE 39418

The Construction Supervisor and the Area Head carried out a reconnaissance for the relocation of this hydrometric station. A suitable site was located upstream beyond any backwater effects from high lake levels downstream.

Cost:	Salaries	$ 240.00
	Meals/Lodging	17.00
	Transportation	64.26
	TOTAL	$ 321.26

4. BEAVER CREEK NEAR MARMORA 39444

The Construction Supervisor met on site with Conservation Authority personnel to discuss the relocation of the hydrometric gauging station. A suitable site was located upstream where there would be little effect from freshet ice jams.

Cost:	Salaries	$ 135.28
	Meals/Lodging	41.35
	Transportation	93.50
	TOTAL	$ 270.13

5. NOGIES CREEK ABOVE KRAEGER'S BRIDGE 39445

The Construction Supervisor and Area Head met with Conservation Authority personnel to select a suitable hydrometric gauging site.

Cost:	Salaries	$ 320.72
	Meals/Lodging	174.00
	Transportation	93.50
	TOTAL	$ 588.22

6. TWENTY MILE CREEK NEAR SMITHVILLE 39446

Construction and hydrometric staff met on site with a Conservation Authority representative to select a location for a hydrometric station that will be used for flood forecasting and flow monitoring. The more feasible of seven potential sites was chosen.

Cost:	Salaries	$ 200.00
	Meals/Lodging	17.00
	Transportation	34.00
	TOTAL	$ 251.00

7. McINTYRE RIVER AT THUNDER BAY 39441

The Area Head and Thunder Bay supervisor carried out a reconnaissance with the local Conservation Authority to select a site for the relocation of this hydrometric station.

Cost:		
	Salaries	$ 114.94
	Meals/Lodging	--
	Transportation	10.00
	TOTAL	$ 124.94

8. DETROIT RIVER AT TECUMSEH 39430

9. DETROIT RIVER AT LASALLE 39431

10. DETROIT RIVER AT AMHERSTBURG 39433

11. ST. CLAIR RIVER AT PORT LAMPTON 39400

A field investigation was carried out at the above sites to determine the requirements for well extensions and general maintenance.

Cost:		
	Salaries	$ 160.72
	Meals/Lodging	95.60
	Transportation	45.00
	TOTAL	$ 301.32

12. BEAR CREEK NEAR WILKESPORT 39400

13. SYDENHAM RIVER NEAR DRESDEN

A reconnaissance was carried out for the removal of shelters and the filling of wells for the above discontinued stations.

Cost:	Salaries	$ 100.45
	Meals/Lodging	45.25
	Transportation	35.00
	TOTAL	$ 170.70

14. NIAGARA RIVER AT FORT ERIE 39400

On two different occasions the Construction Supervisor met with Water Quality Branch personnel to discuss the installation of a wet well at the Fort Erie water sampling site. Information was also given regarding the reconstruction of the sampling instrument shelter at Niagara on the Lake.

Cost:	Salaries	$ 294.53
	Meals/Lodging	17.00
	Transportation	71.06
	TOTAL	$ 382.59

15. WHITEMAN'S CREEK NEAR MOUNT VERNON 39400

An on site meeting was held with a representative of the Grand River Conservation Authority to discuss the specifications and requirements for an artificial control. The project will be carried out by the Authority.

Cost:	Salaries	$ 96.43
	Meals/Lodging	8.50
	Transportation	28.39
	TOTAL	$ 133.32

16. HOLLAND RIVER AT HOLLAND LANDING 39400

An on site meeting was held with South Lake Simcoe Conservation Authority personnel to determine the modifications that would be necessary in order to install an automatic water quality sampler in the Armco shelter.

Cost:	Salaries	$ 96.43
	Meals/Lodging	8.50
	Transportation	46.41
	TOTAL	$ 151.34

17. REDHILL CREEK AT HAMILTON 39400

18. GRINDSTONE CREEK NEAR ALDERSHOT

19. ANCASTER CREEK AT ANCASTER

20. BRONTE CREEK NEAR CARLISLE

Field inspections were carried out at the above sites by the Construction Supervisor and the Hydrometric Supervisor. The new installations and/or channel problems were examined.

Cost:		
	Salaries	$ 152.00
	Meals/Lodging	17.00
	Transportation	29.58
	TOTAL	$ 198.58

21. NORTH SAUGEEN RIVER NEAR PAISLEY 39400

The Construction Supervisor met on site with Township officials, Saugeen Valley Conservation Authority staff, Ministry of Natural Resources and a consulting firm representative to discuss the proposed plans for bridge reconstruction. The Conservation Authority agreed to undertake the removal and re-installation of the hydrometric gauging station.

Cost:		
	Salaries	$ 120.00
	Meals/Lodging	8.50
	Transportation	69.70
	TOTAL	$ 198.20

22. KETTLE CREEK ABOVE ST. THOMAS 39400

23. MOUNT PLEASANT CREEK NEAR BURTCH

A field investigation was carried out for the installation of a weir and for the removal of a discontinued station, respectively, for the above noted stations.

Cost:	Salaries	$ 160.72
	Meals/Lodging	8.50
	Transportation	60.35
	TOTAL	$ 229.57

24. WILTON CREEK NEAR NAPANEE 39400

25. MILLHAVEN CREEK NEAR KINGSTON

26. E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT

27. S.NATION RIVER NEAR PLANTAGENET

28. BEAR BROOK NEAR BOURGET

29. RIDEAU RIVER BELOW MANOTICK

30. BONNECHERE RIVER NEAR CASTLEFORD

31. PETAWAWA RIVER NEAR PETAWAWA

32. MADAWASKA RIVER AT PALMER RAPIDS

A reconnaissance was carried out with the Hydrometric Supervisor for the upgrading of equipment or structures at these sites.

Cost:	Salaries	$ 634.39
	Meals/Lodging	186.25
	Transportation	255.51
	TOTAL	$1,076.15

33. DODDS CREEK NEAR PAYNES MILLS 39400

A reconnaissance was carried out with Kettle Creek Conservation Authority to select a hydrometric gauging station site for flood forecasting and monitoring purposes. Construction is to take place next year.

Cost:	Salaries	$ 96.50
	Meals/Lodging	8.50
	Transportation	63.41
	TOTAL	$ 168.41

34. CATFISH CREEK NEAR SPARTA 39451

Plans and measurements were made on site for the construction of a concrete low water weir. The local property owner and Conservation Authority were informed of the proposed project.

Cost:	Salaries	$ 75.00
	Meals/Lodging	8.50
	Transportation	26.00
	TOTAL	$ 109.50

35. SCHOMBERG RIVER NEAR SCHOMBERG 39400

An on site meeting was held with South Lake Simcoe Conservation Authority Personnel to discuss the options of relocating the gauging station. The station will have to be removed for future bridge relocation.

Cost:	Salaries	$ 96.50
	Meals/Lodging	8.50
	Transportation	35.02
	TOTAL	$ 140.02

36. SPENCER CREEK AT HWY #5 39440

The Construction Supervisor and Area Head met with Hamilton Region Conservation Authority staff to select a suitable site for a hydrometric gauging station. The gauge will be used to monitor the inflow to an Authority reservoir.

Cost:	Salaries	$ 150.00
	Meals/Lodging	17.00
	Transportation	22.88
	TOTAL	$ 189.88

37. LAKE ERIE AT PORT COLBORNE 39400

The Construction Supervisor and Hydrometric Supervisor carried out a field investigation to determine the construction requirements for the excavation and extension of the intake pipe.

Cost:	Salaries	$ 228.00
	Meals/Lodging	17.00
	Transportation	53.55
	TOTAL	$ 298.55

38. LAKE HURON AT GODERICH 39400

A reconnaissance was carried out to ascertain the potential ice and wave damage to the gauge shelter as a result of high lake levels. A contract was let for the construction and installation of a protective barrier.

Cost:	Salaries	$ 117.12
	Meals/Lodging	8.50
	Transportation	54.40
	TOTAL	$ 180.02

39. WILTON CREEK NEAR NAPANEE 39400

40. COLLINS CREEK NEAR KINGSTON

41. SHELTER VALLEY BROOK NEAR GRAFTON

42. MILLHAVEN CREEK NEAR MILLHAVEN

43. E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT

44. BONNECHERE RIVER NEAR CASTLEFORD

45. CATARAQUI RIVER AT CHAFFEY'S LOCKS

Field investigations and/or general maintenance were carried out at the above sites.

Cost:		
	Salaries	$ 401.80
	Materials/Supplies	30.15
	Meals/Lodging	204.10
	Transportation	200.26
	TOTAL	$ 836.31

46. ST. CLAIR RIVER AT POINT EDWARD 39400

47. ST. CLAIR RIVER AT PORT LAMPTON

48. DETROIT RIVER AT LA SALLE

49. DETROIT RIVER AT AMHERSTBURG

A reconnaissance was carried out at the above sites to ascertain the need for well extensions and the upgrading of the gauge shelters.

Cost:		
	Salaries	$ 234.24
	Meals/Lodging	105.80
	Transportation	134.98
	TOTAL	$ 475.02

50. THAMES RIVER NEAR TAVISTOCK 39400

The Assistant Regional Engineer and the Area Engineer carried out a reconnaissance for a hydrometric gauging station. The station will be used by the Ministry of the Environment to monitor water quality in the stream.

Cost:		
	Salaries	$ 176.00
	Meals/Lodging	17.00
	Transportation	34.00
	TOTAL	$ 227.00

51. WHITEMAN'S CREEK NEAR MT. VERNON 39400

52. THAMES RIVER NEAR INNERKIP

53. TROUT CREEK NEAR FAIRVIEW

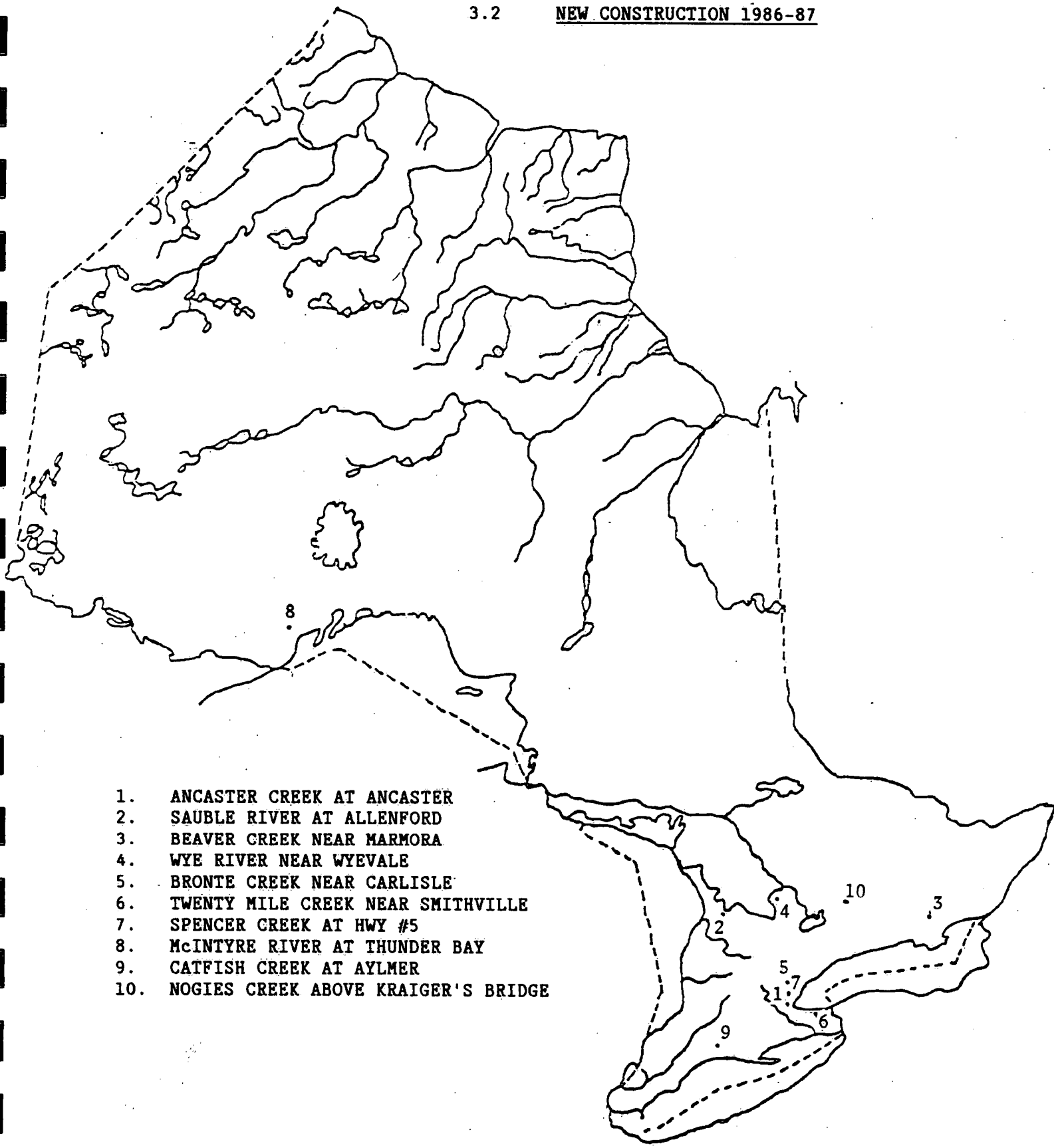
54. THAMES RIVER NEAR TAVISTOCK

55. BLACK RIVER NEAR ACTON

Field investigations were conducted at the above sites by the Assistant Regional Engineer and the Construction Supervisor.

Cost:		
	Salaries	$ 341.00
	Meals/Lodging	17.00
	Transportation	59.50
	TOTAL	$ 417.50

3.2 NEW CONSTRUCTION 1986-87



1. ANCASTER CREEK AT ANCASTER
2. SAUBLE RIVER AT ALLENFORD
3. BEAVER CREEK NEAR MARMORA
4. WYE RIVER NEAR WYEVALE
5. BRONTE CREEK NEAR CARLISLE
6. TWENTY MILE CREEK NEAR SMITHVILLE
7. SPENCER CREEK AT HWY #5
8. McINTYRE RIVER AT THUNDER BAY
9. CATFISH CREEK AT AYLMER
10. NOGIES CREEK ABOVE KRAIGER'S BRIDGE

NEW CONSTRUCTION

1. ANCASTER CREEK AT ANCASTER 39449

Assistance was provided to the Hamilton Region Conservation Authority for the installation of a stilling well, complete with intakes and heating cable. The above material plus an aluminum shelter was supplied by the Branch. The Authority installed the shelter, insulation, and electrical service.

Cost:	Salaries	$ 193.28
	Materials/Supplies	2783.67
	Meals/Lodging	8.50
	Transportation	40.00
	Instrumentation	3147.21
	TOTAL	$ 6172.66

2. SAUBLE RIVER AT ALLENFORD 39442

Due to soil conditions and other factors the installation of a stilling well was unsuccessful. A manometer pressure gauge was installed as an alternative. The instrumentation was housed in an Armco walk-in shelter which was insulated, panelled, and electrically wired with a 60 ampere service.

Cost:	Salaries	$ 4000.21
	Materials/Supplies	4913.63
	Meals/Lodging	2672.81
	Transportation	933.69
	Instrumentation	7647.21
	TOTAL	$20167.55

3. BEAVER CREEK NEAR MARMORA 39444

Assistance and materials were supplied to the Crowe Valley Conservation Authority for the installation of a stilling well, complete with intakes and heating cable. The project was carried out to relocate the existing gauge to a more suitable site upstream.

Cost:		
	Salaries	$ 724.16
	Materials/Supplies	887.75
	Meals/Lodging	482.48
	Transportation	150.75
	Instrumentation	---
	TOTAL	$ 2245.14

4. WYE RIVER NEAR WYEVALE 39418

The existing site at Wyebridge was relocated upstream out of backwater conditions that were caused by high lake levels downstream. A stilling well, complete with intakes and heating cable was installed. A Guelph look-in shelter was mounted on the well. A hydro pole and 30 ampere electrical service was installed.

Cost:		
	Salaries	$ 983.52
	Materials/Supplies	2838.65
	Meals/Lodging	729.60
	Transportation	282.25
	Instrumentation	--
	TOTAL	$ 5074.02

5. BRONTE CREEK NEAR CARLISLE 39448

A stilling well, complete with intakes and heating cable, was installed. A concrete pad was poured around the well to support an Armco shelter. The Halton Region Conservation will be installing the shelter and hydro and telephone services.

Cost:	Salaries	$ 592.20
	Materials/Supplies	1492.91
	Meals/Lodging	99.60
	Transportation	75.00
	Instrumentation	---
	TOTAL	$ 2259.71

6. TWENTY MILE CREEK NEAR SMITHVILLE 39446

A stilling well, complete with intakes and heating cable was installed. An Armco shelter was erected on a poured-in-place concrete pad. The shelter was insulated, panelled, and electrically wired for a 60 ampere service. The project became complicated when extremely hard bedrock was encountered during excavation for the stilling well. As a result, additional resources were required for the project.

Cost:	Salaries	$ 2473.00
	Materials/Supplies	10370.25
	Meals/Lodging	981.25
	Transportation	502.50
	Instrumentation	3147.21
	TOTAL	$17474.21

7. SPENCER CREEK AT HWY #5 39440

A stilling well, complete with intakes and heating cable, were installed. An aluminum shelter was mounted on the well. The shelter was insulated, panelled and electrically wired with a 30 ampere service. A 35 foot hydro pole was installed to bring hydro lines to the shelter.

Cost:	Salaries	$ 1178.30
	Materials/Supplies	4307.44
	Meals/Lodging	117.00
	Transportation	247.50
	Instrumentation	3147.21
	TOTAL	$ 8997.45

8. McINTYRE RIVER AT THUNDER BAY 39441

This station was relocated upstream to a more suitable location. A stilling well, complete with intake and heating cable, was installed by the Lakehead Region Conservation Authority and Water Resources Branch. The shelter, a brick and cement block structure, and the electrical service were contracted out.

Cost:	Salaries	$ 287.47
	Materials/Supplies	7415.76
	Meals/Lodging	168.66
	Transportation	496.20
	Instrumentation	
	TOTAL	$ 8368.09

9. CATFISH CREEK AT AYLMER 39439

A stilling well, complete with intakes and heating cable, was installed in conjunction with a re-channelization project being carried out by the Catfish Creek Conservation Authority. A insulated, panelled, and electrically wired aluminum shelter was mounted on the well.

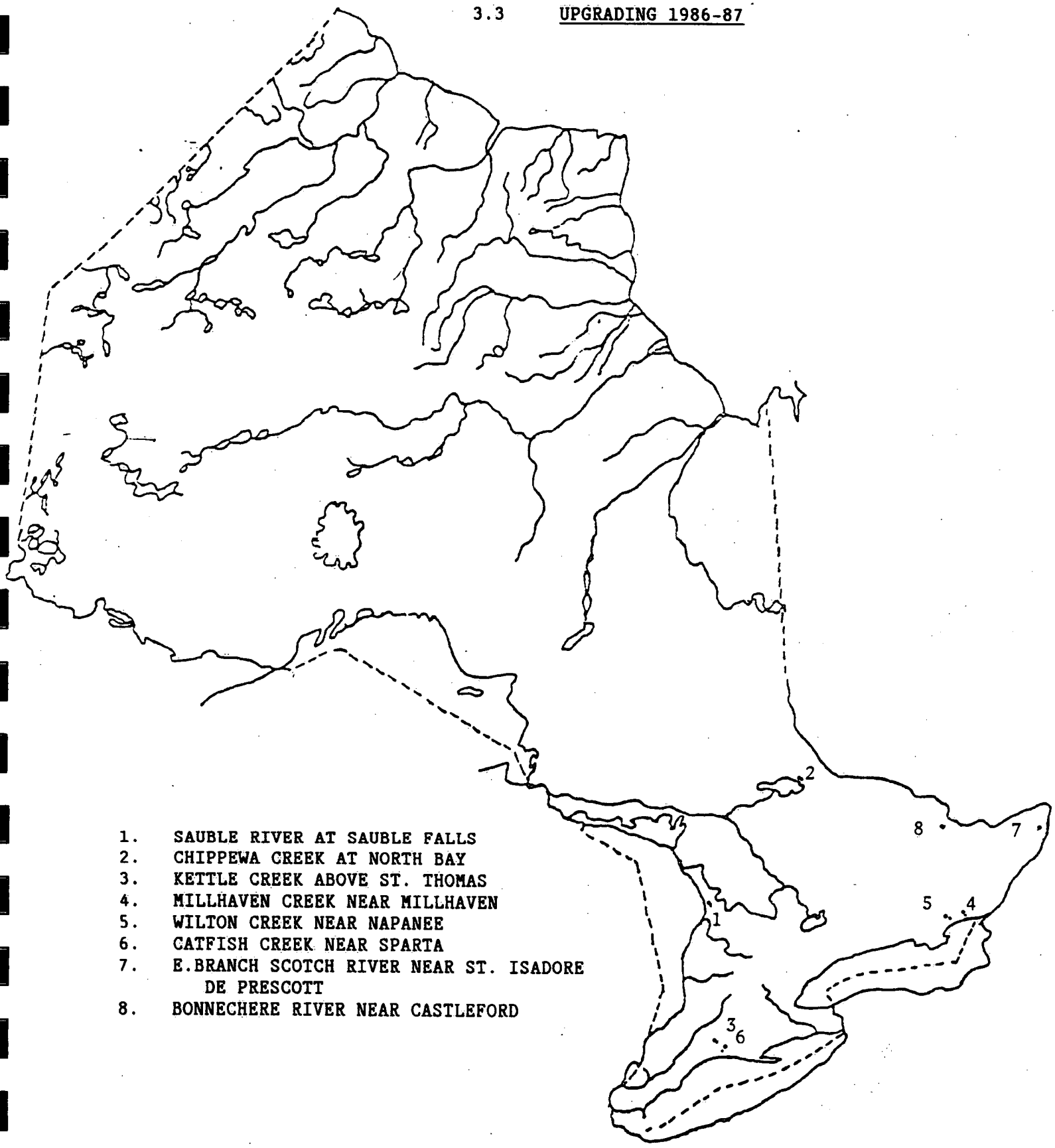
Cost:	Salaries	$ 671.03
	Materials/Supplies	3247.52
	Meals/Lodging	75.50
	Transportation	124.27
	Instrumentation	3147.21
	TOTAL	$ 7265.53

10. NOGIES CREEK ABOVE KRAIGERS BRIDGE 39445

Assistance and materials were provided to the Kawartha Region Conservation Authority for the installation of a stilling well complete with intakes and heating cable.

Cost:	Salaries	$ 264.74
	Materials/Supplies	835.96
	Meals/Lodging	24.30
	Transportation	95.03
	Instrumentation	
	TOTAL	$ 1220.03

3.3 UPGRADING 1986-87



1. SAUBLE RIVER AT SAUBLE FALLS
2. CHIPPEWA CREEK AT NORTH BAY
3. KETTLE CREEK ABOVE ST. THOMAS
4. MILLHAVEN CREEK NEAR MILLHAVEN
5. WILTON CREEK NEAR NAPANEE
6. CATFISH CREEK NEAR SPARTA
7. E.BRANCH SCOTCH RIVER NEAR ST. ISADORE DE PRESCOTT
8. BONNECHERE RIVER NEAR CASTLEFORD

UPGRADING

1. SAUBLE RIVER AT SAUBLE FALLS 39450

The Guelph type look-in shelter was replaced with an aluminum shelter. The installation was upgraded in order to accommodate a data logger.

Cost:	Salaries	$ 431.62
	Materials/Supplies	1992.67
	Meals/Lodging	161.20
	Transportation	70.38
	TOTAL	$ 2655.87

2. CHIPPEWA CREEK AT NORTH BAY 39449

In order to accommodate data logging instrumentation the existing Guelph type look-in shelter was replaced by an aluminum shelter.

Cost:	Salaries	$ 588.38
	Material/Supplies	2039.40
	Meals/Lodging	350.30
	Transportation	141.25
	TOTAL	$ 3119.33

3. KETTLE CREEK ABOVE ST. THOMAS 39486

A sand bar and sediment deposits were removed from the channel at the high water metering section. A sheet steel control and rip rap were installed.

Cost:	Salaries	$ 1282.58
	Materials/Supplies	2891.00
	Meals/Lodging	461.00
	Transportation	212.50
	TOTAL	$ 4847.08

4. MILLHAVEN CREEK NEAR MILLHAVEN 39457

The existing Guelph type look-in shelter was upgraded to an Armco walk-in shelter. The shelter was erected on a concrete pad and was insulated, panelled, and electrically wired with a 60 ampere service.

Cost:	Salaries	$ 1310.00
	Material/Supplies	2050.21
	Meals/Lodging	971.48
	Transportation	300.00
	TOTAL	$ 4631.69

5. WILTON CREEK NEAR NAPANEE 39452

The Guelph type look-in shelter was replaced by an Armco walk-in shelter. The shelter was insulated, panelled, and electrically wired with a 60 amp service. Gabion baskets were used to support the bank around the shelter.

Cost:		
	Salaries	$ 1540.00
	Materials/Supplies	2931.03
	Meals/Lodging	1067.27
	Transportation	300.00
	TOTAL	$ 5838.30

6. CATFISH CREEK NEAR SPARTA 39451

A poured-in-place low water concrete control was constructed at the above site. Rip rap was placed on the downstream side of the weir and on adjacent banks.

Cost:		
	Salaries	$ 907.34
	Material/Supplies	4513.90
	Meals/Lodging	459.72
	Transportation	150.50
	TOTAL	$ 6030.96

7. E. BRANCH SCOTCH RIVER NEAR ST. ISADORE 39453

A poured-in-place low water concrete control was installed. The final pour and the placement of rip rap was interfered with by high flows during the fall. The project will be completed during the following year.

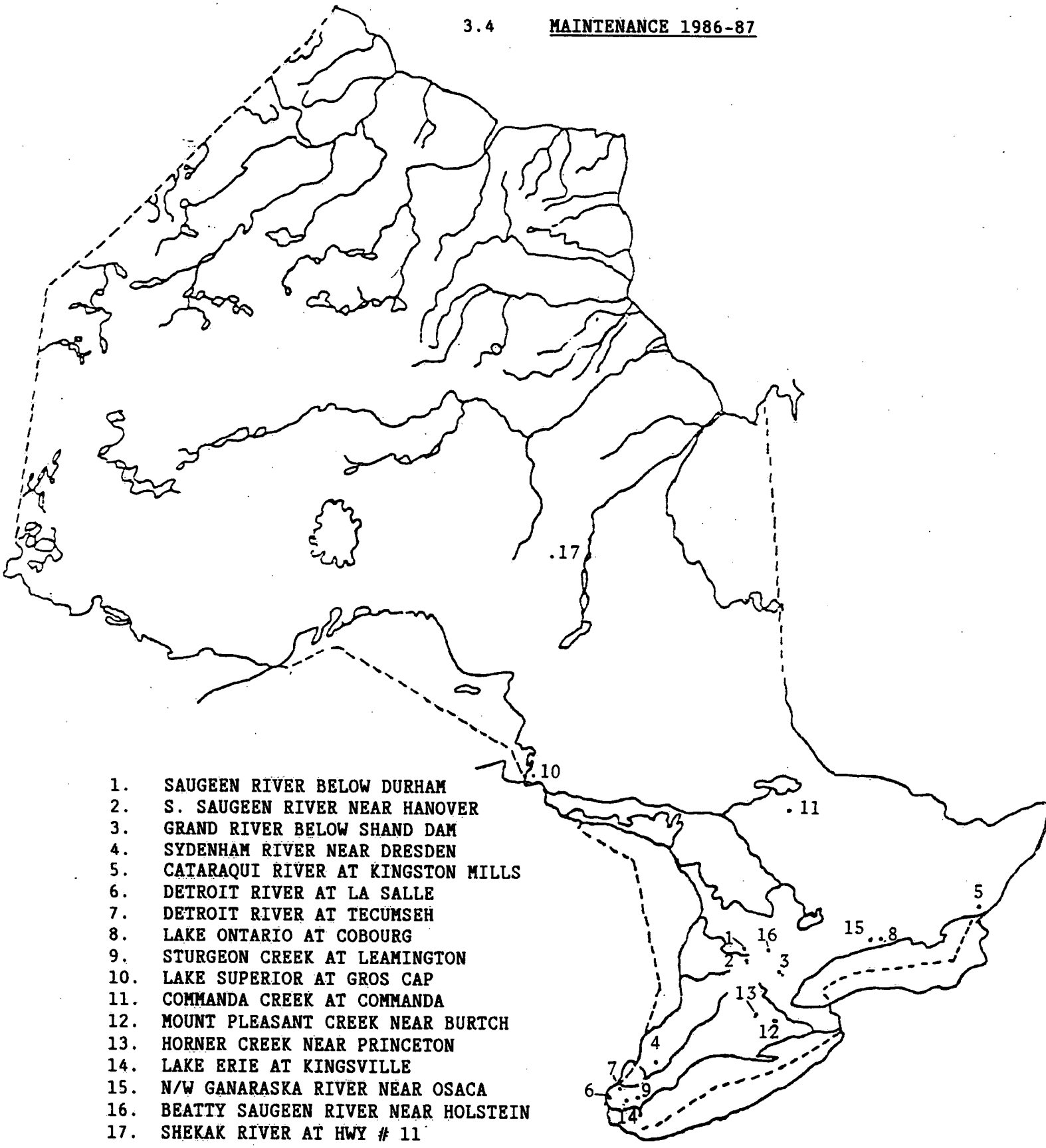
Cost:	Salaries	$ 1929.46
	Materials/Supplies	3929.49
	Meals/Lodging	1270.11
	Transportation	842.25
	TOTAL	$ 7971.31

8. BONNECHERE RIVER NEAR CASTLEFORD 39455

The Guelph type look-in shelter was upgraded to an Armco walk-in shelter. The shelter was erected on a poured-in-place concrete pad. Insulation, panelling, and telephone and hydro services were installed. A hydro pole was installed to carry hydro lines to the shelter.

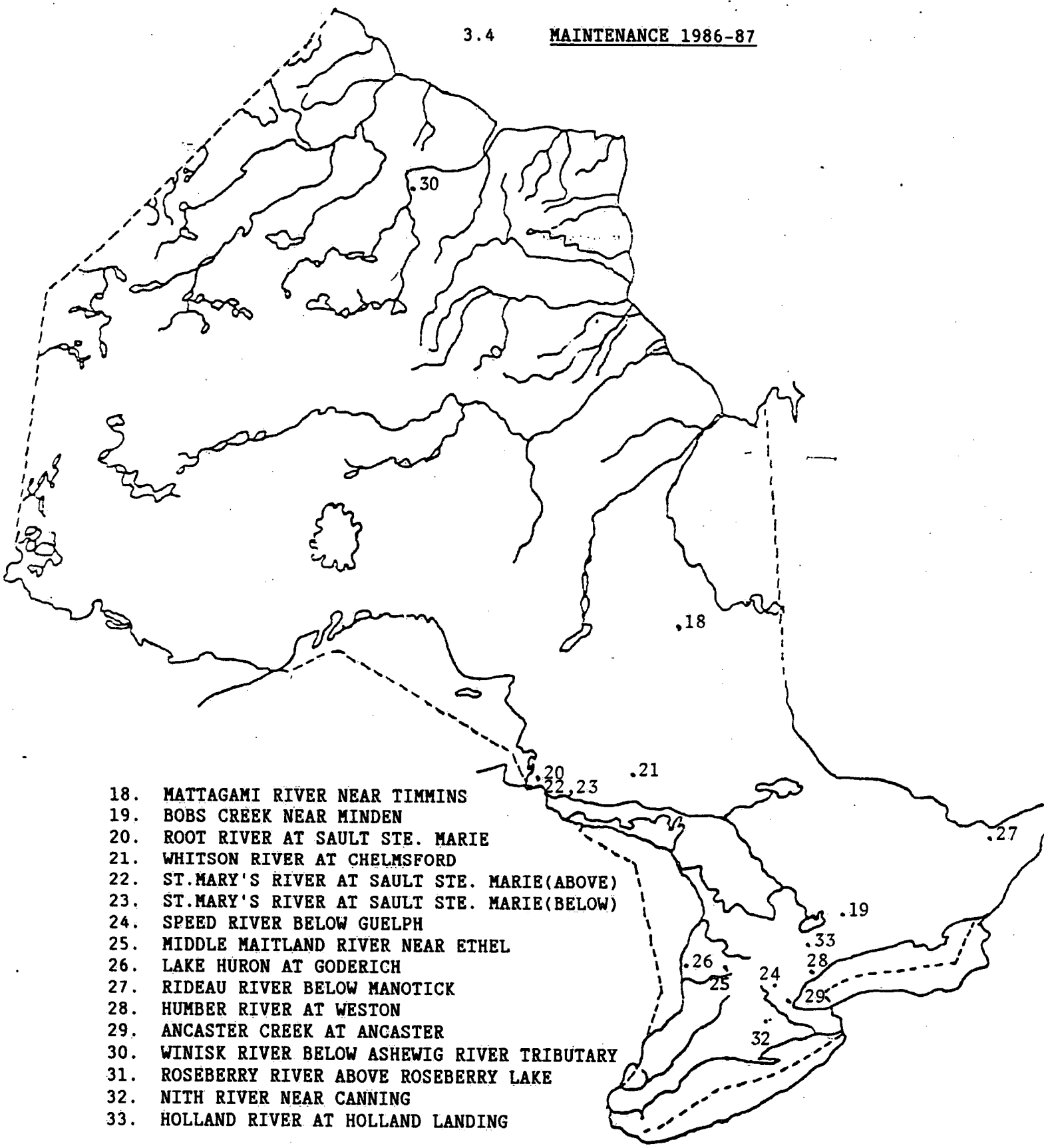
Cost:	Salaries	$ 2738.30
	Material/Supplies	3924.29
	Meals/Lodging	1500.95
	Transportation	723.00
	TOTAL	$ 8886.54

3.4 MAINTENANCE 1986-87



1. SAUGEEN RIVER BELOW DURHAM
2. S. SAUGEEN RIVER NEAR HANOVER
3. GRAND RIVER BELOW SHAND DAM
4. SYDENHAM RIVER NEAR DRESDEN
5. CATARAQUI RIVER AT KINGSTON MILLS
6. DETROIT RIVER AT LA SALLE
7. DETROIT RIVER AT TECUMSEH
8. LAKE ONTARIO AT COBOURG
9. STURGEON CREEK AT LEAMINGTON
10. LAKE SUPERIOR AT GROS CAP
11. COMMANDA CREEK AT COMMANDA
12. MOUNT PLEASANT CREEK NEAR BURTCH
13. HORNER CREEK NEAR PRINCETON
14. LAKE ERIE AT KINGSVILLE
15. N/W GANARASKA RIVER NEAR OSACA
16. BEATTY SAUGEEN RIVER NEAR HOLSTEIN
17. SHEKAK RIVER AT HWY # 11

3.4 MAINTENANCE 1986-87



18. MATTAGAMI RIVER NEAR TIMMINS
19. BOBS CREEK NEAR MINDEN
20. ROOT RIVER AT SAULT STE. MARIE
21. WHITSON RIVER AT CHELMSFORD
22. ST.MARY'S RIVER AT SAULT STE. MARIE(ABOVE)
23. ST.MARY'S RIVER AT SAULT STE. MARIE(BELOW)
24. SPEED RIVER BELOW GUELPH
25. MIDDLE MAITLAND RIVER NEAR ETHEL
26. LAKE HURON AT GODERICH
27. RIDEAU RIVER BELOW MANOTICK
28. HUMBER RIVER AT WESTON
29. ANCASTER CREEK AT ANCASTER
30. WINISK RIVER BELOW ASHEWIG RIVER TRIBUTARY
31. ROSEBERRY RIVER ABOVE ROSEBERRY LAKE
32. NITH RIVER NEAR CANNING
33. HOLLAND RIVER AT HOLLAND LANDING

MAINTENANCE

1. SAUGEEN RIVER BELOW DURHAM 39488

The Guelph type look-in shelter was removed. The well was cut off below ground level and was filled with gravel.

Cost:		
	Salaries	$ 126.73
	Materials/Supplies	55.00
	Meals/Lodging	88.15
	Transportation	38.88
	TOTAL	$ 308.76

2. S. SAUGEEN RIVER NEAR HANOVER 39489

The Guelph type look-in shelter was removed. The well was cut off below ground level and was filled with gravel.

Cost:		
	Salaries	$ 126.73
	Materials/Supplies	196.00
	Meals/Lodging	88.15
	Transportation	38.88
	TOTAL	$ 449.76

3. GRAND RIVER BELOW SHAND DAM 39500

The existing wooden cable car was upgraded to an aluminum car.

Cost:	Salaries	$ 63.36
	Materials/Supplies	1865.00
	Meals/Lodging	17.00
	Transportation	31.25
	TOTAL	$ 1976.61

4. SYDENHAM RIVER NEAR DRESDEN 39499

The Guelph type look-in shelter was removed. The well was cut off below ground level and the well was filled with gravel.

Cost:	Salaries	$ 271.56
	Materials/Supplies	105.56
	Meals/Lodging	180.00
	Transportation	149.75
	TOTAL	$ 706.87

5. CATARAQUI RIVER AT KINGSTON MILLS 39502

Two Chance expanding rock anchors and safety cables were attached to the main cable of the cableway. Modifications were made to the tower and cable car.

Cost:	Salaries	$ 543.13
	Materials/Supplies	199.44
	Meals/Lodging	364.80
	Transportation	213.25
	TOTAL	$ 1320.62

6. DETROIT RIVER AT LA SALLE 39431

With the assistance of scuba divers the intake pipe was located and extended above the river bed. An extension was also installed on the well for higher river levels. The roof was repaired with asphalt roofing and tar.

Cost:	Salaries	$ 777.60
	Materials/Supplies	661.91
	Meals/Lodging	508.25
	Transportation	204.75
	TOTAL	$ 2152.51

7. DETROIT RIVER AT TECUMSEH 39430

An extension was installed on top of the existing stilling well to allow for higher river levels.

Cost:	Salaries	$ 291.60
	Materials/Supplies	345.60
	Meals/Lodging	206.85
	Transportation	118.75
	TOTAL	$ 962.80

8. LAKE ONTARIO AT COBOURG 39432

Repairs were carried out to the shelter roof and trim.

Cost:	Salaries	$ 155.52
	Materials/Supplies	37.56
	Meals/Lodging	186.40
	Transportation	112.50
	TOTAL	$ 491.98

9. STURGEON CREEK NEAR LEAMINGTON 39503

The roof of the Guelph type look-in shelter was replaced.

Cost:		
	Salaries	$ 271.56
	Materials/Supplies	40.95
	Meals/Lodging	155.10
	Transportation	86.00
	TOTAL	$ 553.61

10. LAKE SUPERIOR AT GROS CAP 39438

With the assistance of scuba divers, repairs were made to the main intake. The site gauge intake was located and extended.

Cost:		
	Salaries	$ 1217.00
	Materials/Supplies	5382.16
	Meals/Lodging	702.59
	Transportation	424.50
	TOTAL	$ 7726.25

11. COMMANDA CREEK AT COMMANDA 39498

Repairs were made to the broken lower intake pipe. An upper intake pipe was installed.

Cost:	Salaries	$ 588.38
	Materials/Supplies	1036.40
	Meals/Lodging	350.30
	Transportation	141.25
	TOTAL	$ 2116.33

12. MOUNT PLEASANT CREEK NEAR BURTCH 39501

The hydro pole and Guelph type look-in shelter were removed. The well was cut off below ground level and filled. The sheet steel control was removed.

Cost:	Salaries	$ 362.08
	Materials/Supplies	28.00
	Meals/Lodging	34.00
	Transportation	87.75
	TOTAL	$ 511.83

13. HORNER CREEK NEAR PRINCETON 39490

The lower intake pipe was extended.

Cost:	Salaries	$ 90.52
	Materials/Supplies	12.70
	Meals/Lodging	
	Transportation	37.50
	TOTAL	$ 140.72

14. LAKE ERIE AT KINGSVILLE 39437

An extension was added to the stilling well to accommodate higher water levels on the lake.

Cost:	Salaries	$ 291.60
	Materials/Supplies	461.40
	Meals/Lodging	186.40
	Transportation	150.00
	TOTAL	$ 1089.40

15. N/W GANARASKA RIVER NEAR OSACA 39462

Gabion baskets were installed on the stream bank to support the existing wooden metering bridge.

Cost:	Salaries	$ 1080.70
	Materials/Supplies	872.19
	Meals/Lodging	676.80
	Transportation	76.50
	TOTAL	$ 2706.19

16. BEATTY SAUGEEN RIVER NEAR HOLSTEIN 39505

The area around the gauging station was graded with top soil and seeded with grass.

Cost:	Salaries	$ 112.96
	Materials/Supplies	201.25
	Meals/Lodging	8.50
	Transportation	75.00
	TOTAL	$ 397.71

17. SHEKAK RIVER AT HWY #11 39435

The existing stilling well was straightened and the upper intake was re-installed. A tie back was installed to keep the well plumb.

Cost:	Salaries	$ 1239.64
	Materials/Supplies	740.77
	Meals/Lodging	390.75
	Transportation	255.00
	TOTAL	$ 2626.16

18. MATTAGAMI RIVER NEAR TIMMINS 39447

The existing Armco shelter was relocated to higher ground away from an eroding streambank. An orifice line was burried to the new site. The old stilling well was filled and the surrounding area was graded.

Cost:	Salaries	$ 2055.79
	Materials/Supplies	792.74
	Meals/Lodging	809.75
	Transportation	255.00
	TOTAL	$ 3913.28

19. BOB'S CREEK NEAR MINDEN 39496

Wooden steps were fabricated and installed from the shelter to the river bank. This project was carried out by the hydrometric field staff.

Cost:	Salaries	$ 612.55
	Materials/Supplies	185.00
	Meals/Lodging	337.00
	Transportation	76.50
	TOTAL	$ 1211.05

20. ROOT RIVER AT SAULT STE. MARIE 39400

A thermostat was installed to control the heating cable in the well and intake pipe.

Cost:	Salaries	$ 94.12
	Materials/Supplies	63.76
	Meals/Lodging	30.90
	Transportation	50.00
	TOTAL	$ 238.78

21. WHITSON RIVER AT CHELMSFORD 39487

The door to the discontinued station, which was built into a bridge abutment, was sealed off with cement blocks and mortar.

Cost:	Salaries	$ 564.72
	Materials/Supplies	84.06
	Meals/Lodging	312.43
	Transportation	75.00
	TOTAL	$ 1036.21

22. ST. MARY'S RIVER AT SAULT STE. MARIE (ABOVE) 39429

Repairs were made to the roof, door and wooden trim. The wooden surfaces were painted.

Cost:	Salaries	$ 631.80
	Materials/Supplies	75.48
	Meals/Lodging	453.56
	Transportation	187.50
	TOTAL	$ 1348.34

23. ST. MARY'S RIVER AT SAULT STE. MARIE (BELOW) 39434

Repairs were made to the roof, door and wooden trim.

Under contract repairs were made to the concrete shelter base.

Cost:		
	Salaries	$ 913.68
	Materials/Supplies	1663.23
	Meals/Lodging	464.90
	Transportation	187.50
	TOTAL	$ 3229.31

24. SPEED RIVER BELOW GUELPH 39400

A faulty baseboard heater was replaced, including a thermostat kit.

Cost:		
	Salaries	$ 18.00
	Materials/Supplies	35.12
	Meals/Lodging	
	Transportation	1.00
	TOTAL	$ 54.12

25. MIDDLE MAITLAND RIVER NEAR ETHEL 39400

A 1/2" x 1/2" x 2" double tapped bushing was installed on the top of the stand pipe to seal the heating cable entrance to the intake system.

Cost:	Salaries	$ 63.56
	Materials/Supplies	4.31
	Meals/Lodging	
	Transportation	29.92
	TOTAL	$ 97.79

26. LAKE HURON AT GODERICH 39400

Carried out under contract, a protective barrier was fabricated and installed on two sides of the shelter. The shelter was subject to ice and wave damage.

Cost:	Salaries	$
	Materials/Supplies	740.00
	Meals/Lodging	
	Transportation	
	TOTAL	$ 740.00

27. RIDEAU RIVER BELOW MANOTICK 39400

A wooden platform was fabricated and installed for easier access to the cablecar.

Cost:	Salaries	$ 248.91
	Materials/Supplies	82.71
	Meals/Lodging	93.30
	Transportation	100.00
	TOTAL	$ 524.92

28. HUMBER RIVER AT WESTON 39400

Repairs were made to the low water intake.

Cost:	Salaries	$ 194.40
	Materials/Supplies	
	Meals/Lodging	17.00
	Transportation	50.00
	TOTAL	$ 261.40

29. ANCASTER CREEK AT ANCASTER 39400

A thermostat and electrical circuit was installed and connected to the well and intake heating cable.

Cost:	Salaries	$ 58.00
	Materials/Supplies	62.76
	Meals/Lodging	8.50
	Transportation	20.00
	TOTAL	$ 149.26

30. WINISK RIVER BELOW ASHEWIG RIVER TRIBUTARY 39436

This project was carried out by the Thunder Bay Hydrometric staff. The burned out shelter was reconstructed using an Armco shelter from discontinued site.

Cost:	Salaries	$ 1620.60
	Materials/Supplies	726.09
	Meals/Lodging	206.40
	Transportation	3400.00
	TOTAL	$ 5953.09

31. ROSEBERRY RIVER ABOVE ROSEBERRY LAKE 39459

An aluminum cable car was installed by the Thunder Bay Hydrometric staff.

Cost:	Salaries	$ 147.60
	Materials/Supplies	1914.00
	Meals/Lodging	17.00
	Transportation	1075.68
	TOTAL	$ 3154.28

32. NITH RIVER NEAR CANNING 39400

Repairs were made to the inoperative deadbolt lock. A new core was installed and general maintenance was carried out to the well heating system.

Cost:	Salaries	$ 104.40
	Materials/Supplies	15.00
	Meals/Lodging	8.50
	Transportation	50.00
	TOTAL	$ 177.90

33. HOLLAND RIVER AT HOLLAND LANDING 39400

Modifications were made to the shelter in order to accommodate a water quality sampler.

Cost:	Salaries	$ 160.72
	Materials/Supplies	35.55
	Meals/Lodging	8.50
	Transportation	46.41
	TOTAL	$ 251.18

4.0 DESCRIPTION OF CONSTRUCTION METHODS AND PROCEDURES

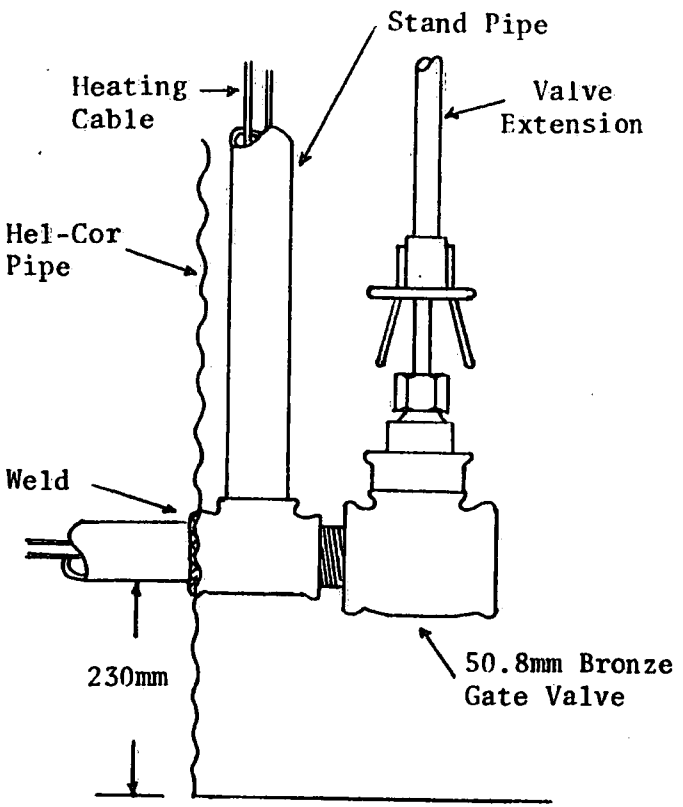
4.1 WELL CONSTRUCTION

STILLING WELLS FOR STREAMFLOW GAUGES

These are in-bank installations of 2.0 mm thickness (14 gauge), 800 mm diameter galvanized "Hel-Cor" pipe. Fabrication of the stilling well is done at Regional Headquarters at a local shop 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. (See Figure 1).

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.



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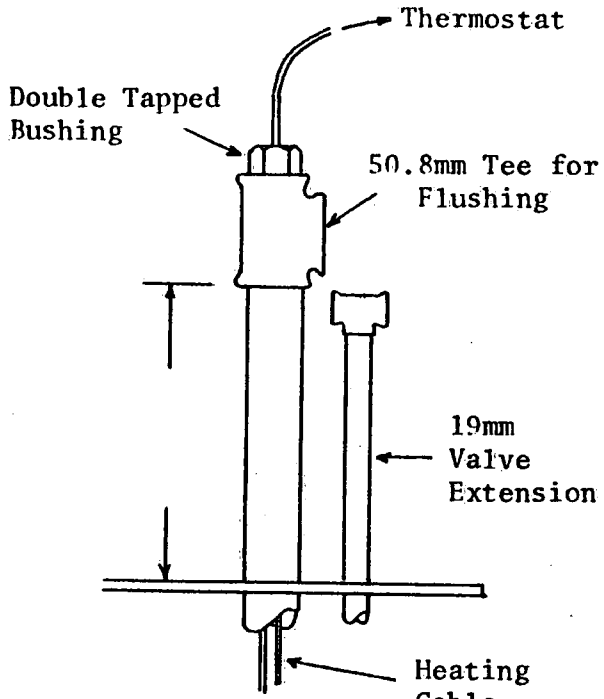

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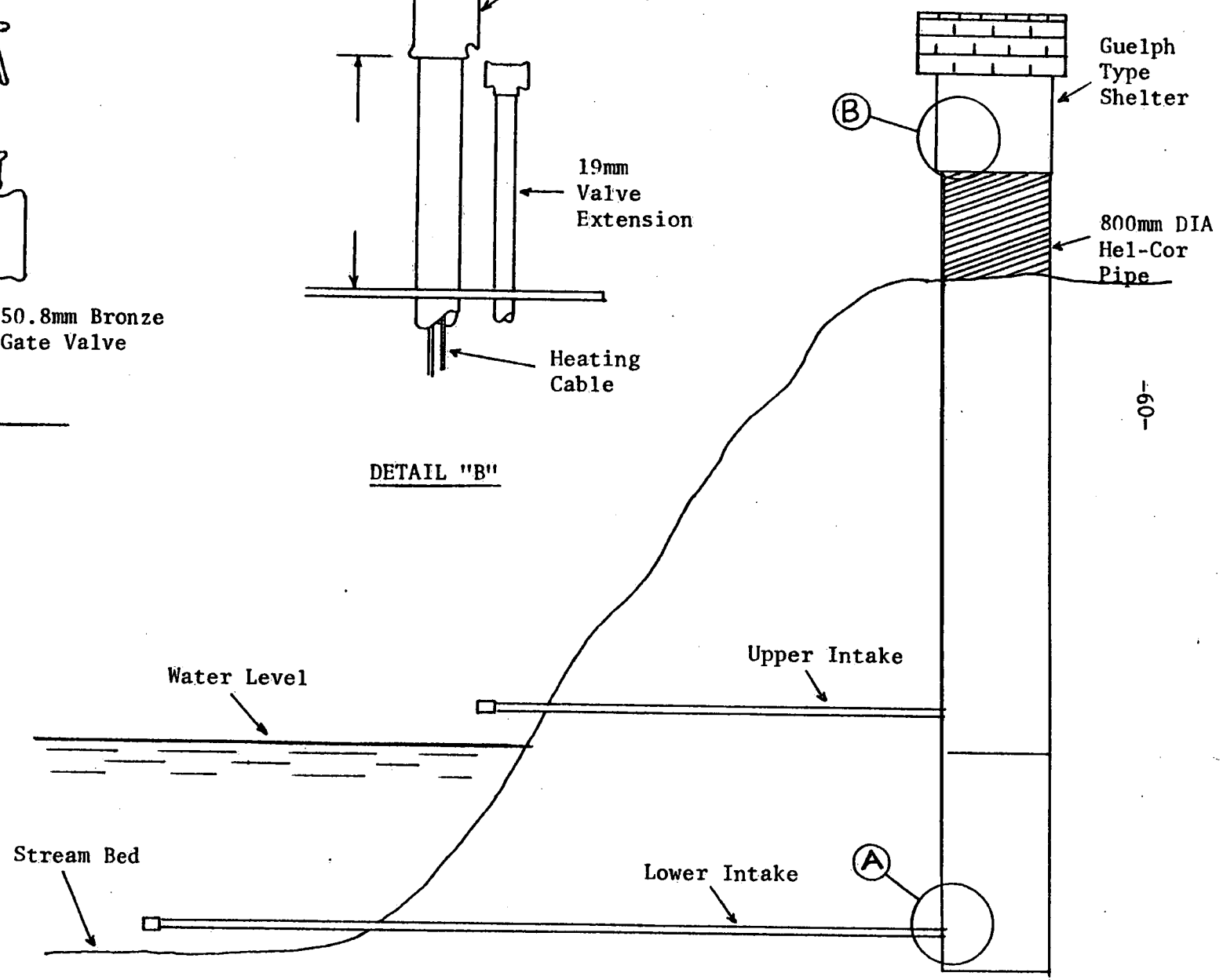


FIG. 1

INBANK STILLING WELL

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. (See Figure 2).

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 stacom servomanometer.

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. (See Figure 3).

STILLING WELLS FOR TIDES AND WATER LEVEL GAUGES

This type is fabricated by welding a 900 mm diameter and a 1600 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. (See Figure 4).

The stilling well is lowered over the side of the dock and while resting plumb and evenly on the bottom it is secured to the dock by a cable while the top is formed to accommodate and "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.

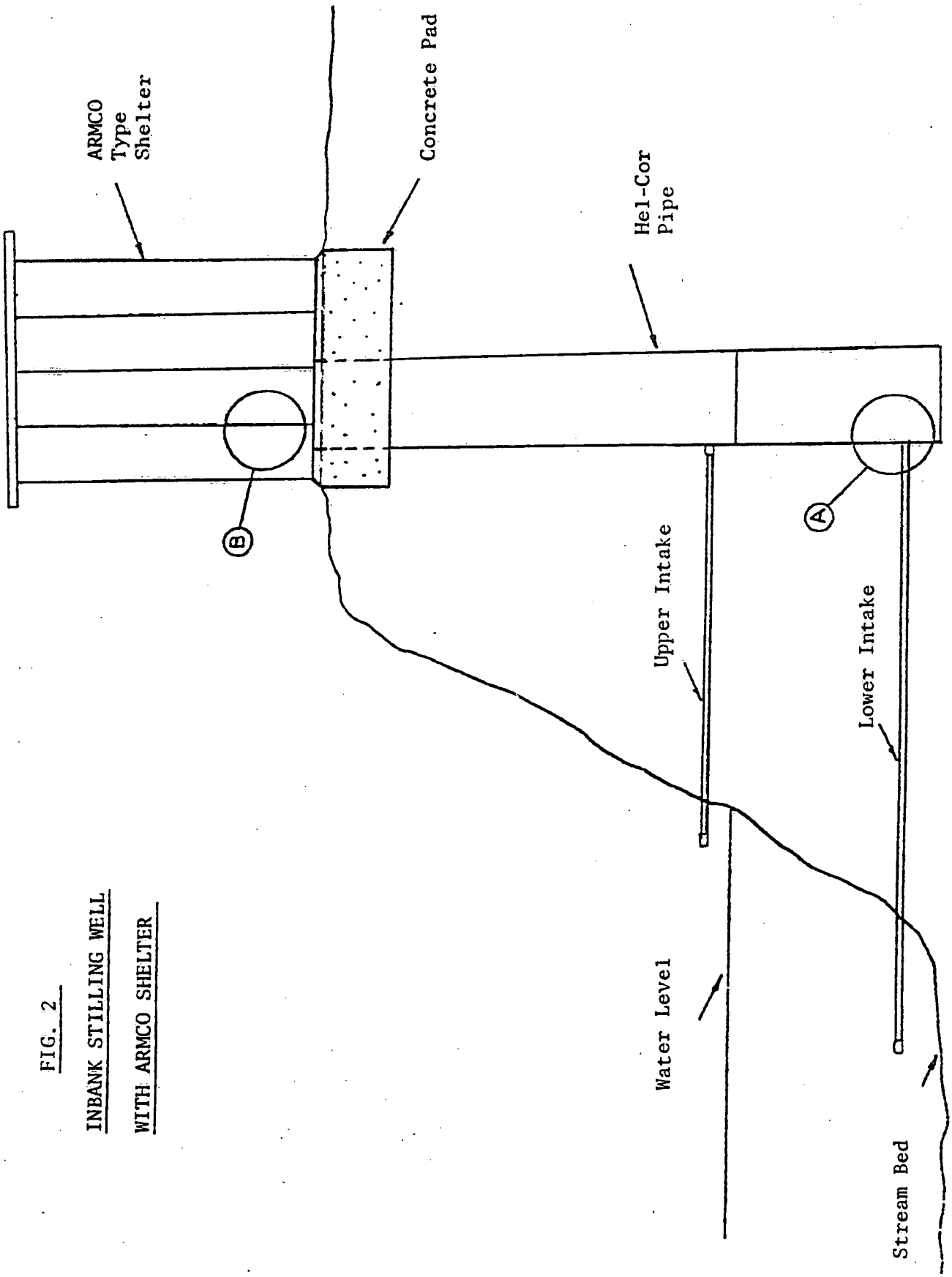


FIG. 2

INBANK STILLING WELL

WITH ARMCO SHELTER

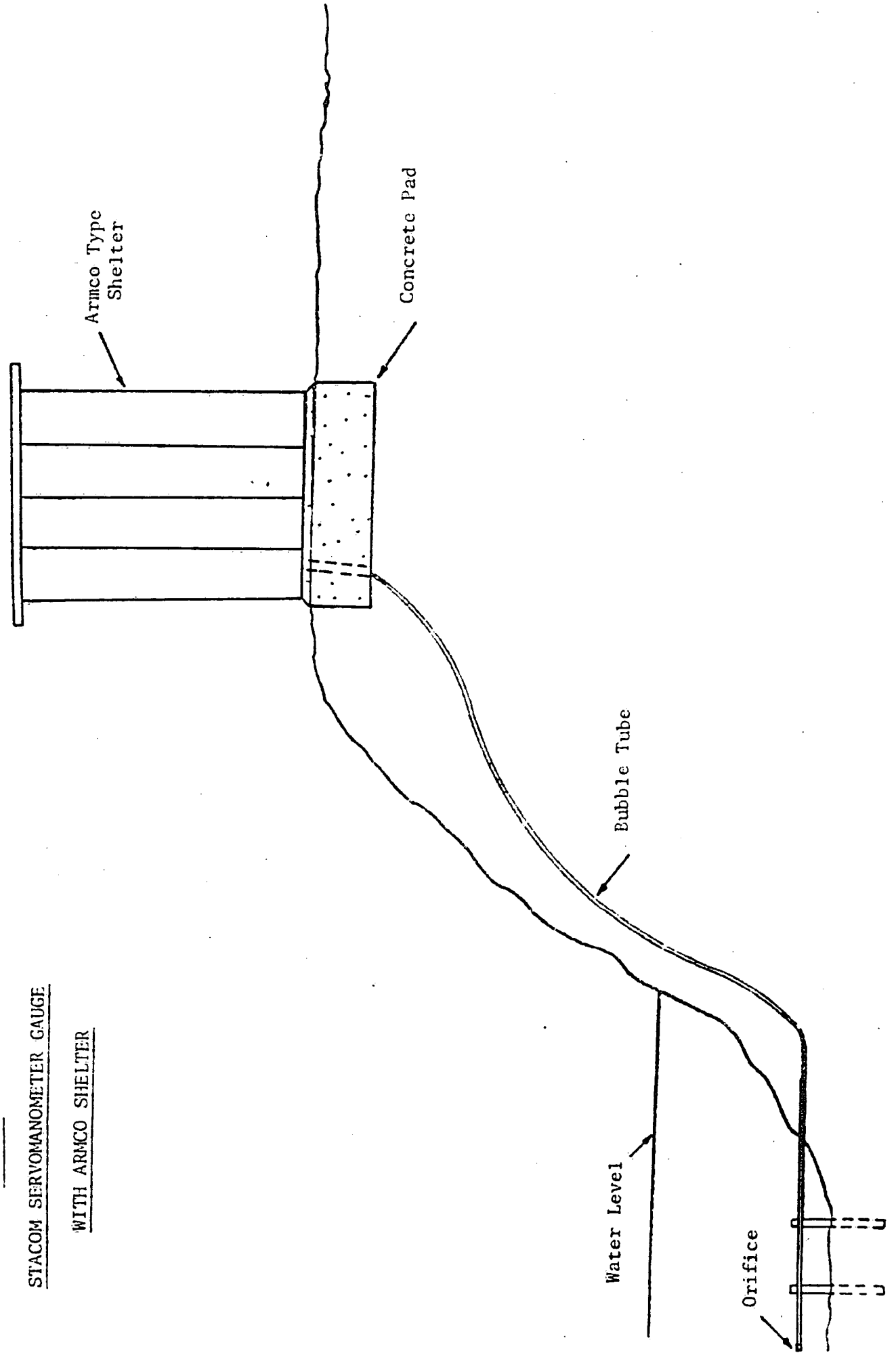


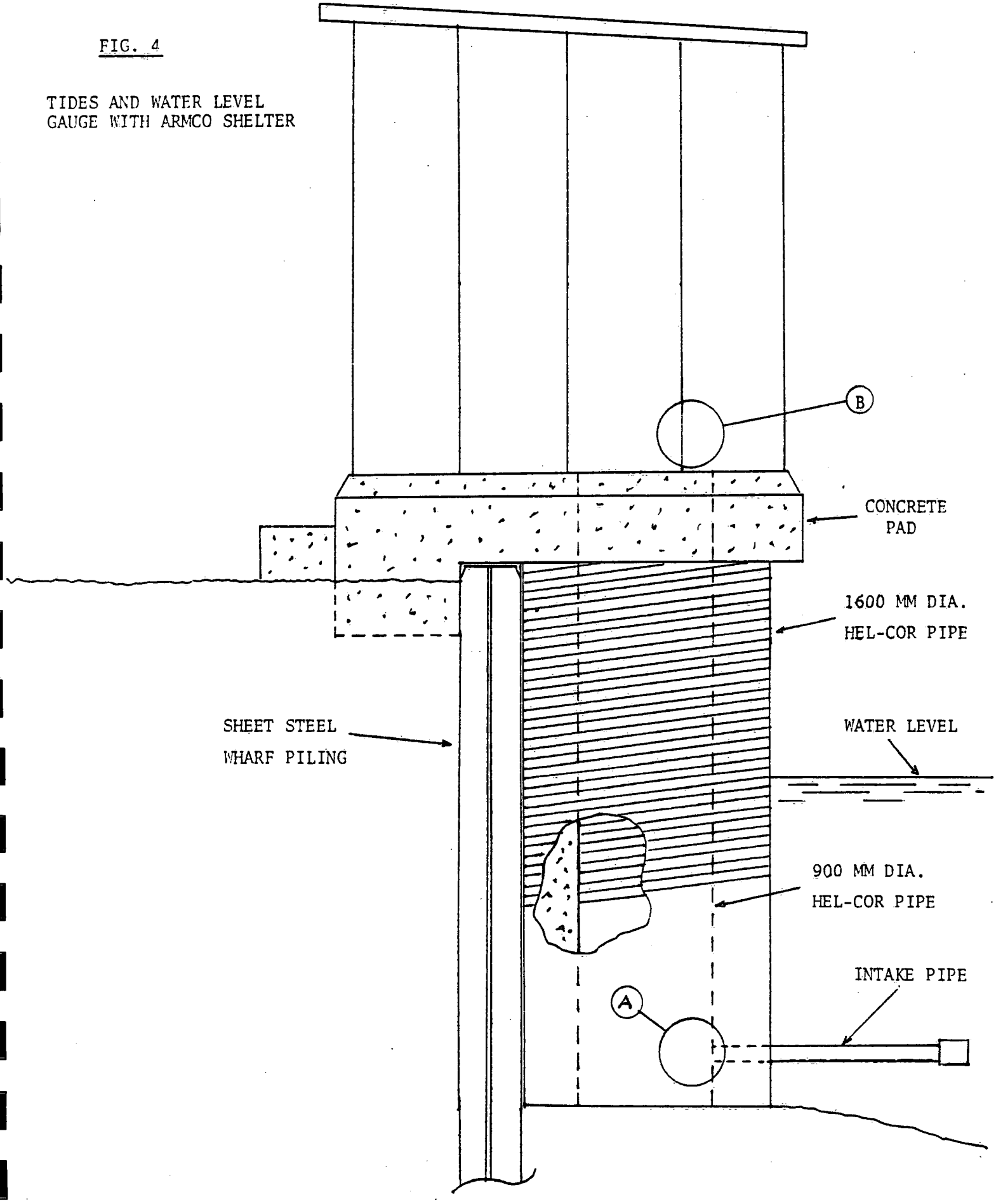
FIG. 3

STACOM SERVOMANOMETER GAUGE

WITH ARMCO SHELTER

FIG. 4

TIDES AND WATER LEVEL
GAUGE WITH ARMCO SHELTER



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.

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 Guelph-type look-in shelter is installed at all sites where the instrumentation consists of the Stevens A-71 analogue recorder only. 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 SHELTERS

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, panelled, and where electricity is available, provided with a 60 ampere service complete with well heaters, baseboard heaters, thermostats, lights and outlets. 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 stream bed 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 rip-rapped on the downstream side to prevent erosion.

CONCRETE

Some concrete controls and weirs of various design are constructed. They may be formed or free-formed and poured-in-place in the stream bed.

TIMBER

Some 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 glavanized "H" beams (19.35 kg/m wide flange) resting on a concrete footing or steel pad. Wooden or 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.

CABLE CARS

Cable cars are two-man sit-down design constructed of aluminum or galvanized steel and plywood and equipped with safety finger guards.

AIRCRAFT WARNING MARKERS

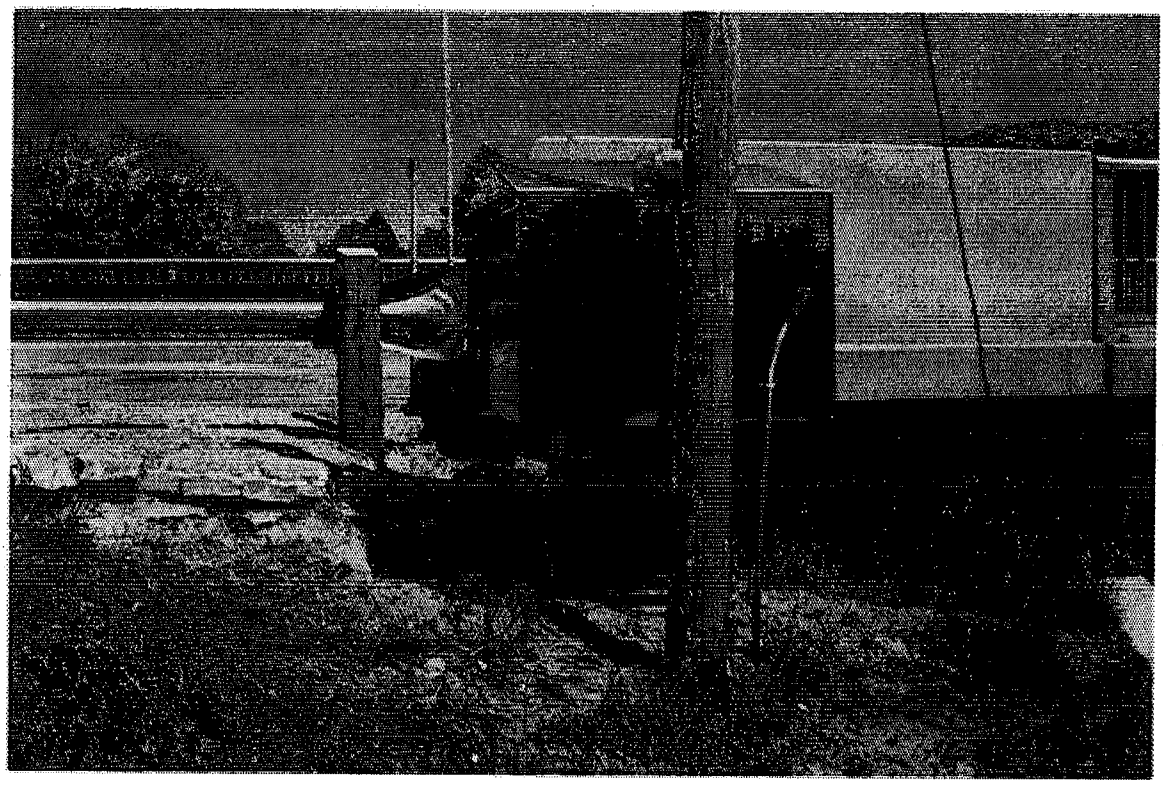
Where required, Department of Transport approved international orange coloured, spherical shaped aircraftwarning markers are suspended on separate 10 mm wire rope cable above the main cable. Cable towers are also painted international orange and white to Department of Transport specifications.

FITTINGS

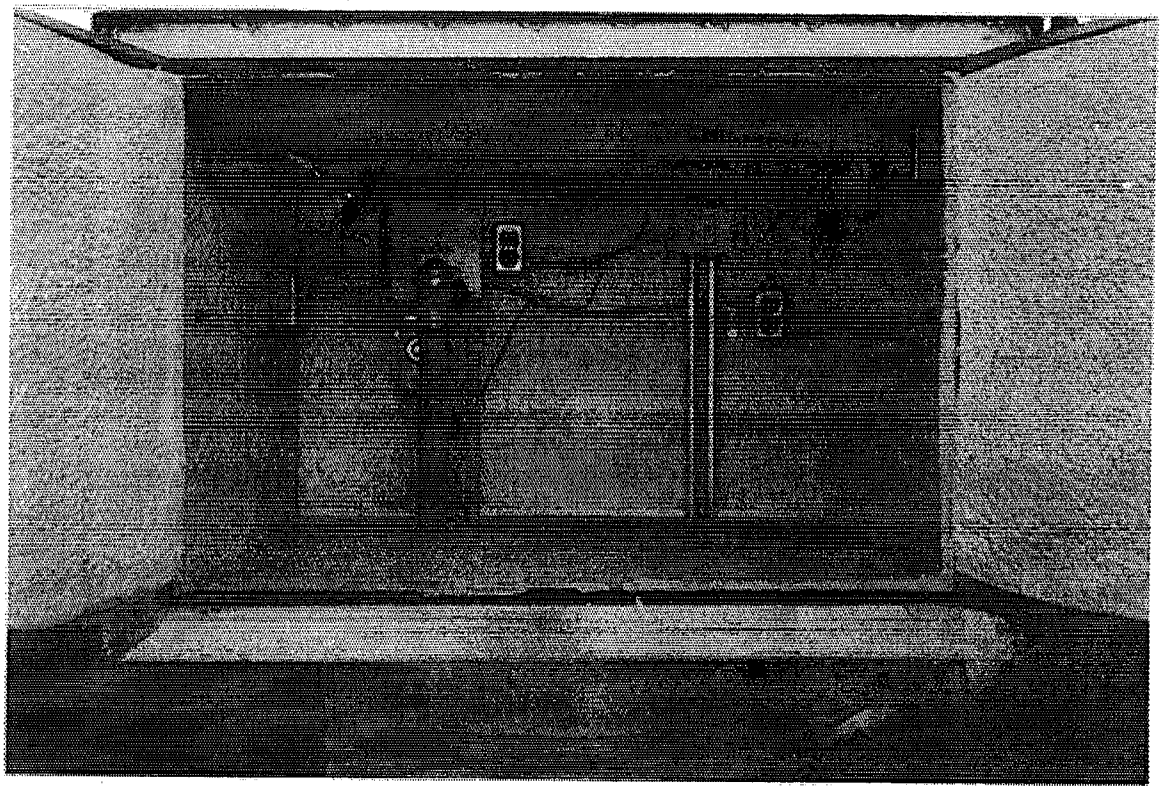
Sockets, turnbuckles, thimbles, shackles, saddles, sheaves, wire rope clips and all other metal parts are hot-dipped galvanized.

5.0 CONSTRUCTION ILLUSTRATIONS

TYPICAL SHELTERS

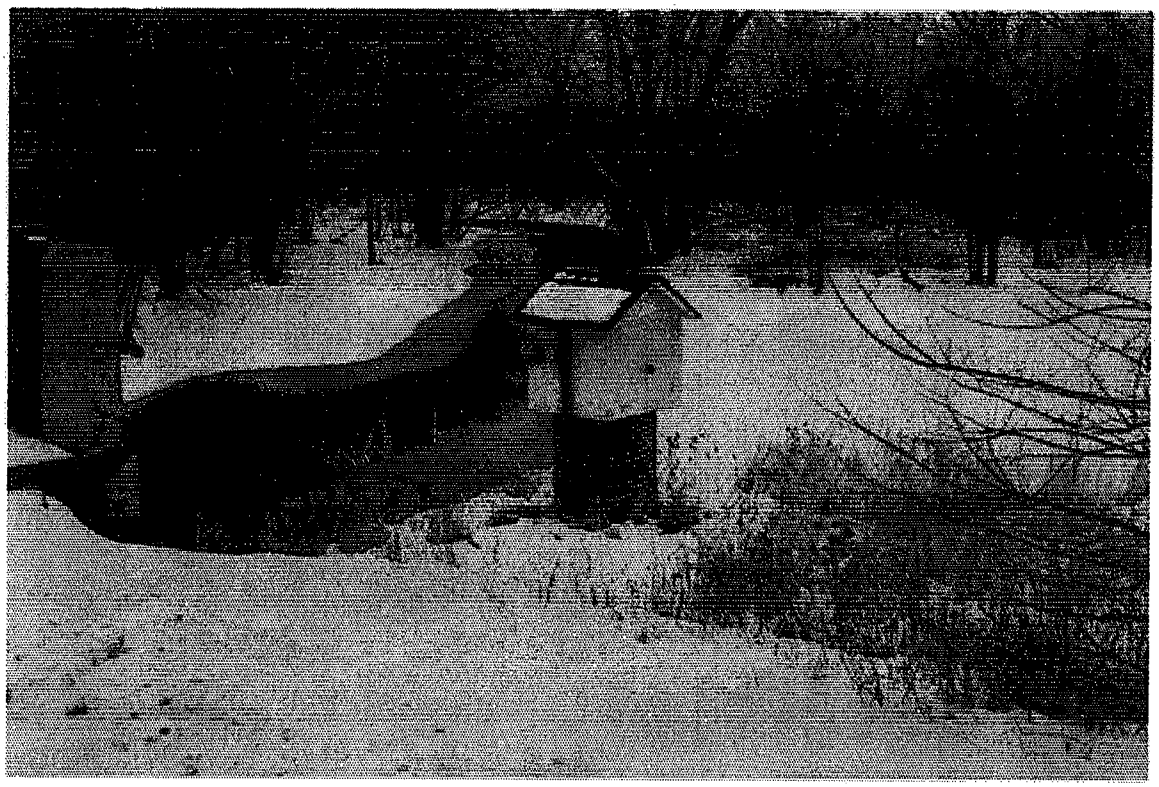


ALUMINUM LOOK-IN SHELTER

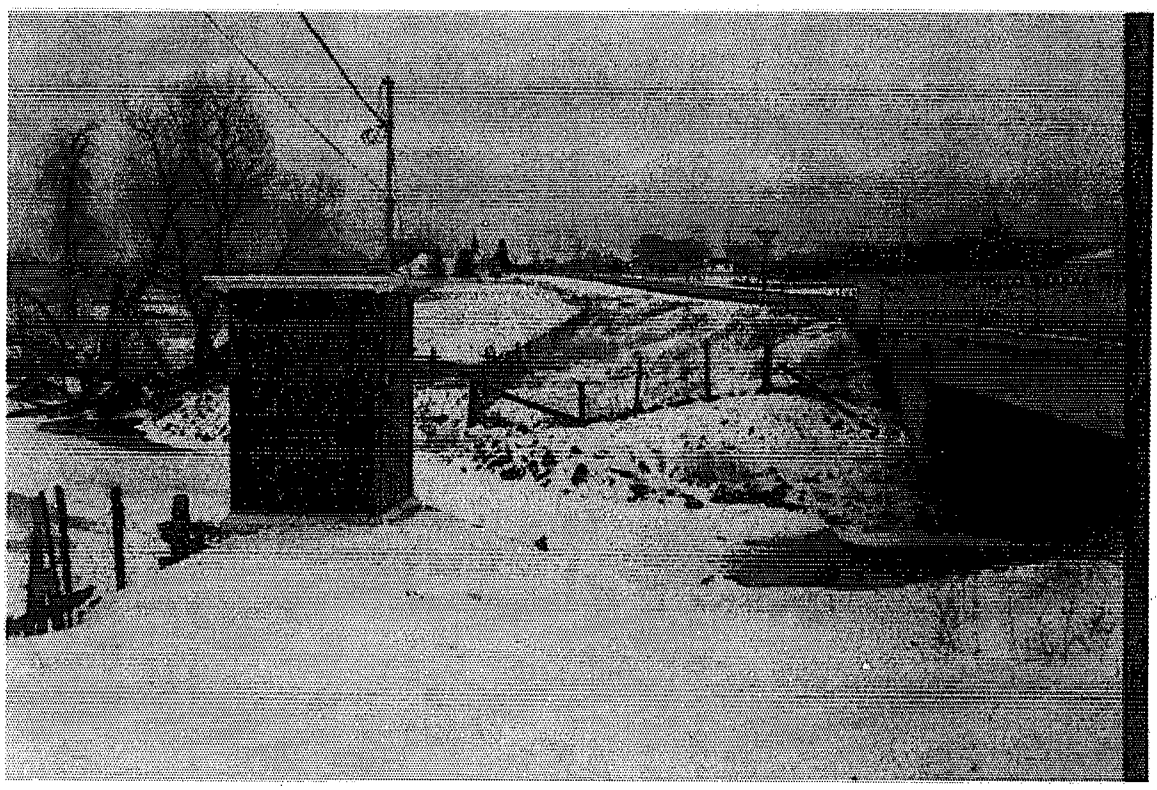


INTERIOR INSULATED WITH SPRAYED ON URETHANE FOAM

TYPICAL SHELTERS

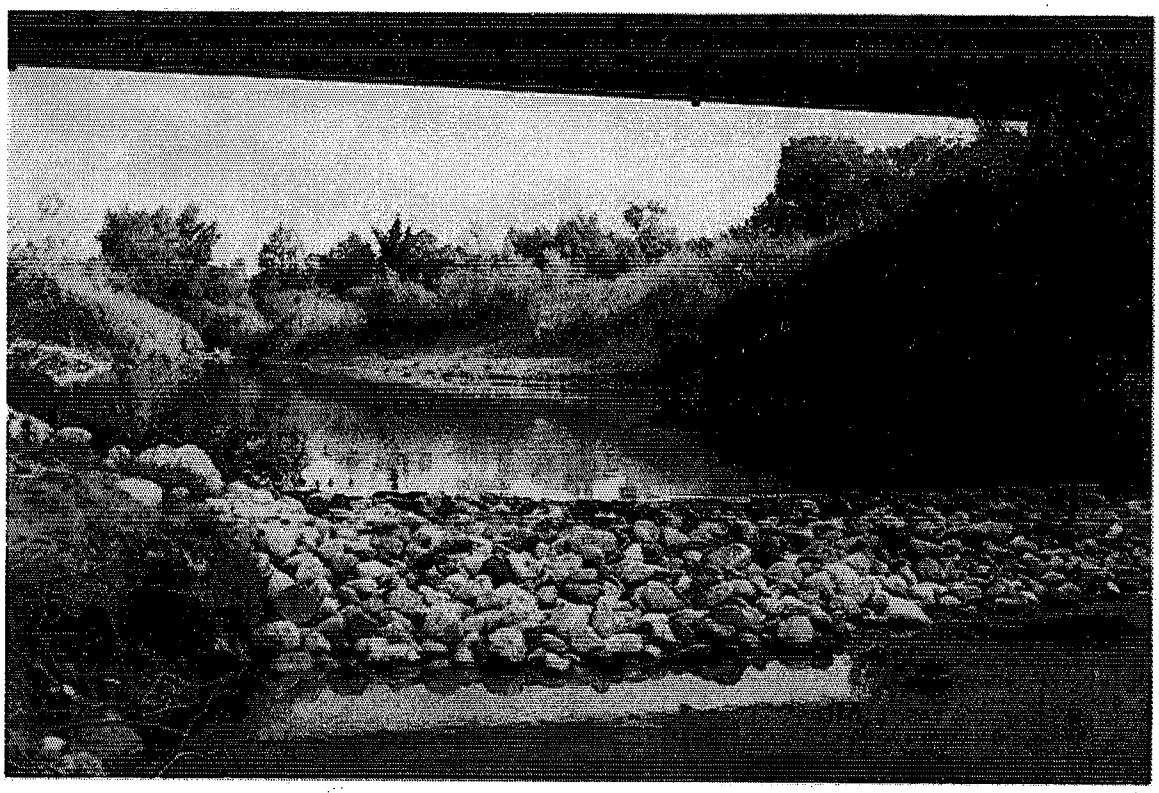


GUELPH TYPE LOOK-IN SHELTER

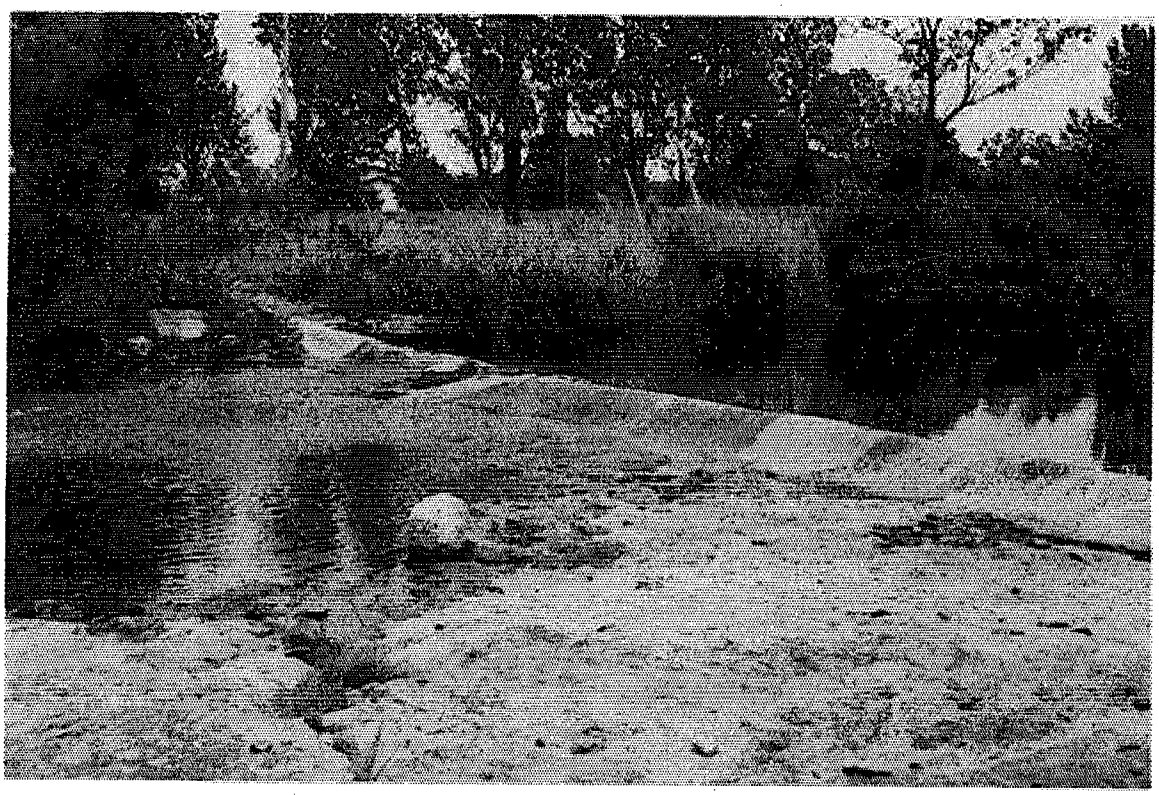


5'4" X 5'4" X 8' ARMCO SHELTER

TYPICAL WEIRS AND LOW WATER CONTROLS

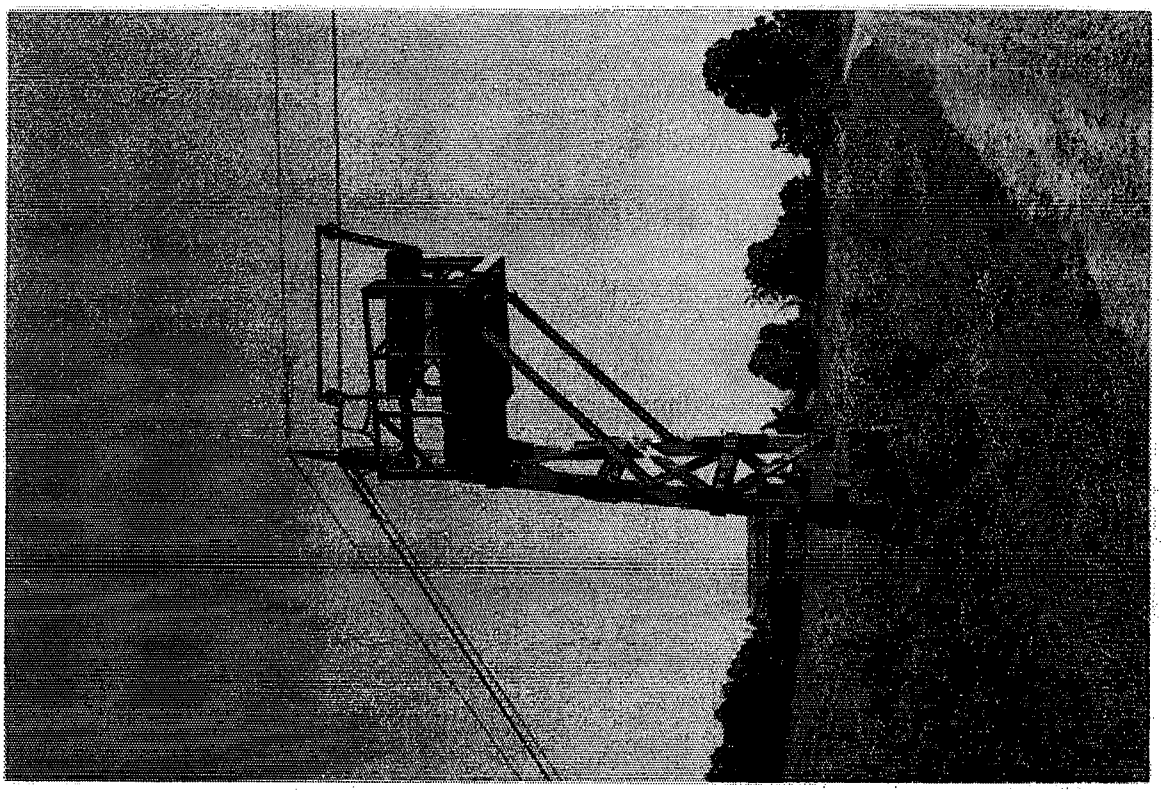


SHEET STEEL WEIR WITH RIP-RAP



CONCRETE WEIR SET IN BEDROCK

TYPICAL CABLEWAYS WITH ALUMINUM CABLE CARS



WOODEN TOWER AND PLATFORM

STEEL TOWER AND CONCRETE GRAVITY ANCHORS

9250