ENVIRONMENT CANADA
ENVIRONMENTAL PROTECTION SERVICE
PACIFIC REGION

SHELLFISH GROWING WATER BACTERIOLOGICAL AND SANITARY SURVEY OF SALTSPRING ISLAND, BRITISH COLUMBIA, 1982

Regional Program Report No. 83-22

BY

D.B. Walker
B.H. Kay

JULY 1983

ABSTRACT

Between May 26 and June 4, 1982, and November 23 and December 2, 1982 the Environmental Protection Service conducted bacteriological surveys of bivalve molluscan shellfish growing waters around Saltspring Island. This survey was conducted to re-evaluate the quality of shellfish growing waters since the previous survey in 1977.

A sanitary survey was conducted concurrent with bacteriological studies to identify and evaluate the potential and actual sources of fecal pollution to marine waters and tidal foreshore areas.

During the summer and winter sampling periods a total of 876 marine, 154 freshwater, 14 effluent, and 12 tissue samples were collected and analysed for fecal coliform bacteria. Of the 92 marine stations statistically analyzed, six did not meet the approved shellfish growing water standard. This has resulted in the implementation of two new closures and the retention of seven existing closures to the Pacific Shellfish Regulations Schedule I (Contaminated Areas).

RÉSUMÉ

Du 26 mai au 4 juin 1982 et du 23 novembre au 2 décembre 1982, le Service de la protection de l'environnement a procédé à des analyses bactériologiques des eaux qui entourent l'île Saltspring et ou vivent des mollusques bivalves. Ces analyses avaient pour objet de réévaluer la qualité des eaux où vivent ces molusques, la dernière étude ayant été faite en 1977.

On a en même temps effectué une étude sanitaire pour identifier et évaluer les sources réelles et virtuelles de pollution fécale des eaux de la mer et de la laisse de marée.

Au cours des échantillonnages qui ont eu lieu en été et en hiber on a prélevé respectivement 876 échantillons d'eau de mer, 154 échantillons d'eau douce, 14 échantillons d'eau de déversement et 12 échantillons de mollusques que l'on a analyses pour y détecter la présence des bactéries coliformes d'origine fécale. Des 92 stations marines de prélévement, six ne répondaient pas aux normes établies pour les eaux où vivent les mollusques. A la suite de ces résultats, il a été décidé d'ajouter deux nouvelles zones aux sept déjà interdites et figurant à l'annexe I (zones contaminées) des "Règlements relatifs à la pêche aux mollusques dans le Pacifique".

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BOD_5	5-day biochemical oxygen demand
CRD	Capital Regional District
EPS	Environmental Protection Service
FC	Fecal Coliform
FS	Fecal Streptococci
FC/FS	Fecal Coliform/Fecal Streptococci ratio
G	"greater than"
IG	Imperial Gallon
L	"less than"
m	metres
ml	millilitres
mm	millimetres
m^3	cubic metres
MF	Membrane Filtration
MPN	Most Probable Number
NH_3	Ammonia
NFR	Non-filterable residue
STP	Sewage Treatment Plant
WMB	Waste Management Branch

CONCLUSIONS

1. The waters and tidal foreshore of Ganges Harbour outside of the existing closure meet the approved shellfish growing water standards. Pollution conditions affecting the area presently under Schedule I closure have not changed significantly from the previous study and therefore this closure should be retained.

2. The waters and tidal foreshore of Long Harbour meet the approved growing water standard. The 305 m closure around the ferry dock is sufficient and remains unchanged.

3. The waters and tidal foreshore of the area around the mouth of Cusheon Creek meet the approved growing water standard.

4. The waters and tidal foreshore of Walker Hook are subject to fecal contamination to the extent that consumption of bivalve molluscan shellfish can pose a health hazard. Sources of contaminations to the area are rainfall runoff and bird fecal matter.

5. The marine waters in the vicinity of the C.R.D. wastewater treatment plant at Malaview did not show contamination from the outfall. Dye injections to the outfall did not indicate breaks in the outfall line nor did the dye surface. However, because of the potential for contamination from the S.T.P. the existing closure remains unchanged.

6. The tidal foreshore waters at North Beach are subject to fecal contamination to the extent that the consumption of bivalve molluscan shellfish can pose a health hazard. The cause of this contamination was the drainage from the uplands area along the creek water shed. This drainage area is heavily used for the pasturing and raising of sheep.

7. The tidal foreshore water of Booth Inlet, with the exception of one station, meet the approved growing water quality for the harvesting of shellfish. Stations at the head of Booth Inlet showed persistent contamination most probably due to rainfall induced runoff. The closure of this area should be retained.

8. The waters of Booth Bay are of acceptable quality for the purpose of shellfish harvesting.

9. Waters at the head of Burgoyne Bay continue to show evidence of fecal contamination. Sources of contamination were not specifically identified, however pollution conditions within the area have not changed since the previous survey. The existing closure should remain in effect.

SCHEDULE I CLOSURES

As a result of the studies described herein, the following additions to Schedule I of the Pacific Shellfish Regulations have been instituted.

1. Area 17-9. The tidal foreshore of Walker Hook, Saltspring Island, Area 17 lying within the hook formed by a line connecting the spit and the opposite shoreline of Saltspring Island.

2. Area 17-11. The waters and tidal foreshore lying within a 480 m radius of the unnamed creek entering Houstoun Passage, near the northern terminus of North End Road, Saltspring Island, 2.4 km northwest of the Fernwood Point Dock, Area 17.

Shellfish closures are illustrated in Figure 1.

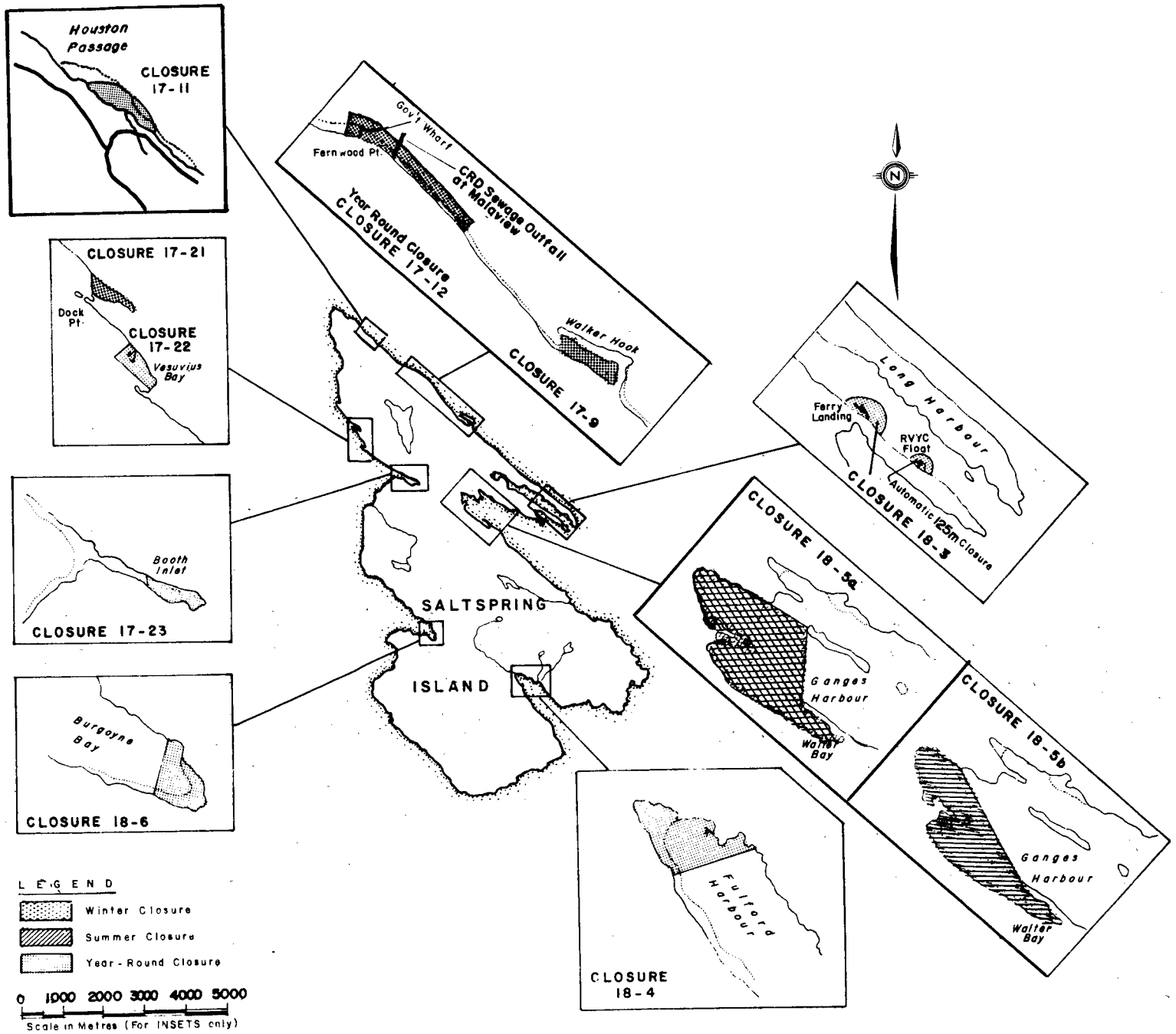

FIGURE 1 EXISTING SCHEDULE I CLOSURES AND CLOSURE ADDITIONS TO THE STUDY AREA

1. INTRODUCTION

Saltspring Island was named by a group of Hudson Bay employees who found the island to be riddled with brine springs, particularly in the present day Fernwood area. In fact these fellows were obviously quite analytical in their approach as they came up with a figure of 5443 grains of salt per Imperial gallon.

The present day Saltspring Island supports a population of 5443 permanent residents as compared with 4410 at the time of the previous shellfish survey of 1977 (Statistics Canada). This represents an increase of 23 percent over the five years. Interestingly, 64% of the population increase has centered in Ganges. Its population has risen by 150% from 444 during the previous survey to 1110 residents as of the 1981 census.

The study areas (Figure 2) were chosen to assess the bacteriological quality of commercially harvested shellfish growing waters and to identify and evaluate sources of bacterial contamination to these waters. Study periods were selected on the basis of the most unfavorable hydrographic and pollution conditions.

Shellfish growing water classification is a requirement of the Canadian Shellfish Safety Program and is undertaken in all areas where bivalve molluscs are harvested.

Saltspring Island has four commercial oyster leases and several commercial clam areas (Figure 3). Incidental to the routine monitoring of shellfish growing waters is the acquisition of data for the purposes of baseline data. In the event of future development within the area this data may be of some use in assessing the impact of such development on the foreshore waters.

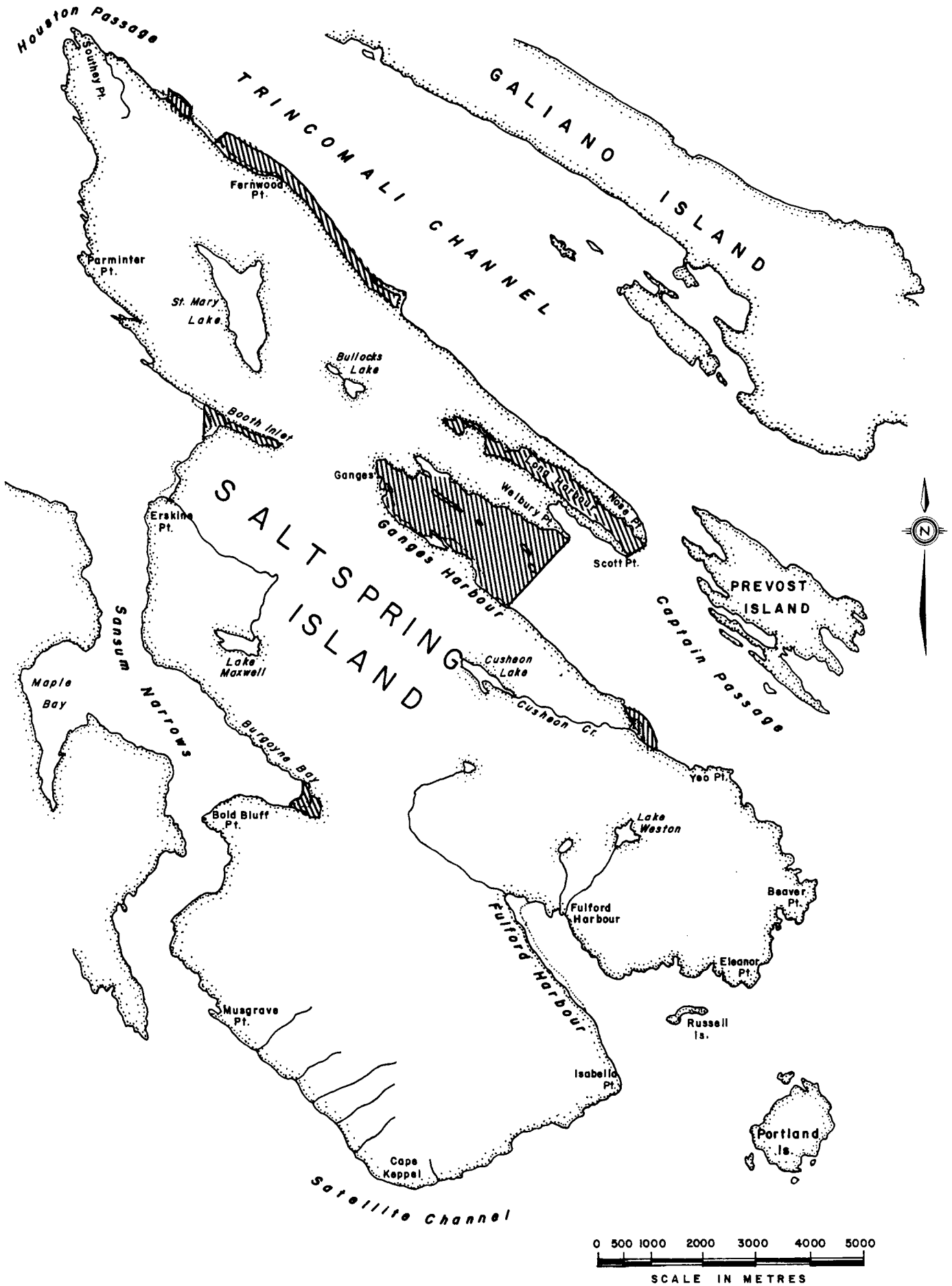

FIGURE 2 STUDY AREAS - 1982

FIGURE 3 COMMERCIAL OYSTER LEASE LOCATIONS - 1982

2. SAMPLE STATION LOCATIONS

Marine sample station locations and descriptions are illustrated in Figures 4 and 5. Freshwater station locations and descriptions are presented in Appendix II. Illustrations are included in Figures 4 and 5 as above.

Raw and effluent samples were taken at the Capital Regional District (CRD) Sewage Treatment Plant at Malaview for chemical and bacteriological analysis. Dye testing of the outfall system was done to evaluate the integrity of the system and to monitor visually, the movement of sewage. Analytical results for these samples are presented in Appendix IV.

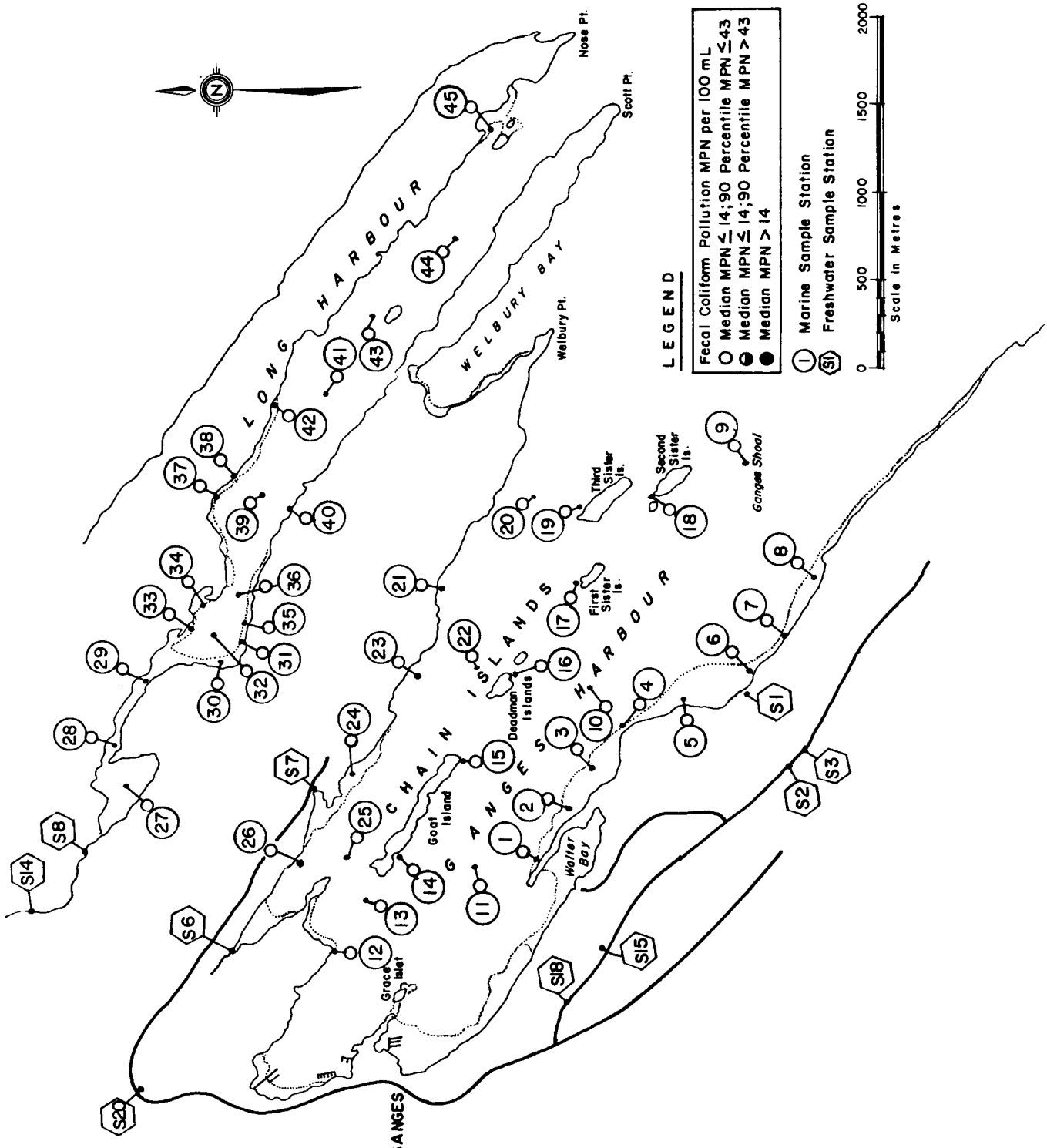

FIGURE 4 MARINE AND FRESHWATER SAMPLE STATION LOCATIONS - SALTSPRING - 1982

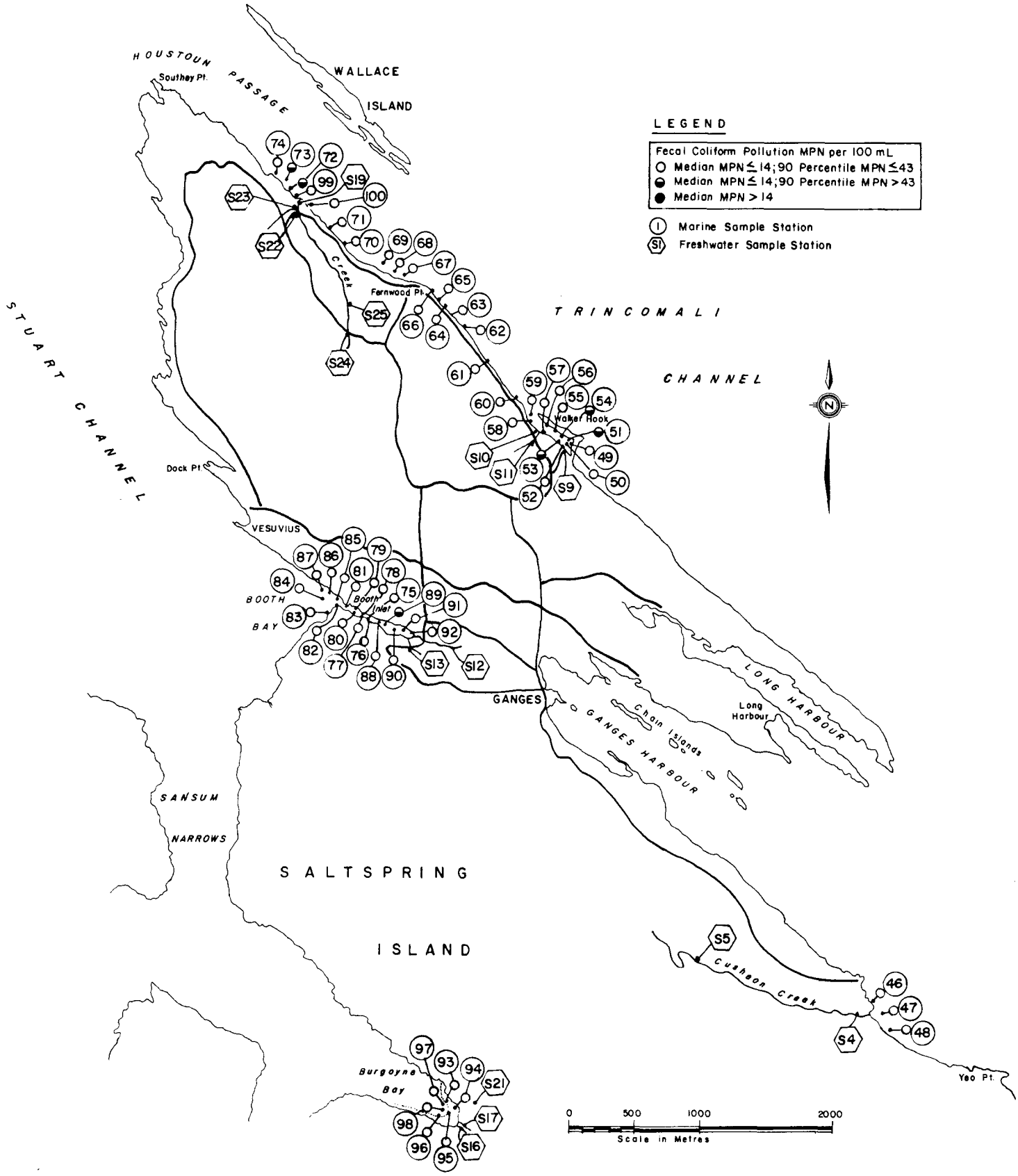

FIGURE 5 MARINE AND FRESHWATER SAMPLE STATION LOCATIONS - SALTSPRING ISLAND- 1982

3. FIELD PROCEDURES AND METHODS

3.1 Bacteriological Sampling and Analyses

All marine water samples for bacteriological analyses were collected in sterile wide-mouth glass bottles, approximately 15 to 30 cm below the water surface. The water depth at collection points over shellfish beds did not exceed two meters. Samples were collected by boat or on foot. The samples were stored in coolers at temperatures not exceeding 10°C until processed. Analyses were carried out within five hours of collection in the mobile microbiology laboratory of the Environmental Protection Service, located at St. Mary Lake, Saltspring Island.

The fecal coliform most probable number (MPN) per 100 ml was determined using the multiple tube fermentation technique (at least three decimal dilutions of five tubes each) as described in Part 908C of the 15th edition of Standard Methods for the Examination of Water and Wastewater (1). The culture medium used was the A-1 medium, as described by Andrews and Presnell (2). An evaluation of the A-1 medium in the Pacific Region has been done by Kay (3) and the reader is referred to this paper for further information.

All freshwater samples were collected in sterile wide-mouth glass bottles and were tested for fecal coliform and fecal streptococci, using the membrane filtration (MF) method described in Part 909 and 910 of the 15th edition of Standard Methods. Media used were m-FC and KF streptococcus agars obtained from Difco Laboratories Detroit, Michigan, USA, for the fecal coliform and fecal streptococcus tests respectively. The membrane filters used were Millipore HC, obtained from Millipore Limited, Mississauga, Ontario.

Biochemical confirmation of fecal coliform isolates obtained from both the MPN and MF procedures was performed on a percentage of all samples collected. Biochemical confirmation results are presented in Appendix VII.

3.2 Physical and Chemical Testing Apparatus and Analyses

Salinity measurements were made on all marine samples using an American Optical refractometer (Catalogue No. 10413) which has a resolution to the nearest 0.5 part per thousand. Salinity data is presented in Appendix III. Tide data used was that for Fulford Harbour (Figure 6) and rainfall data was obtained from the Atmospheric Environment Service (Figure 7).

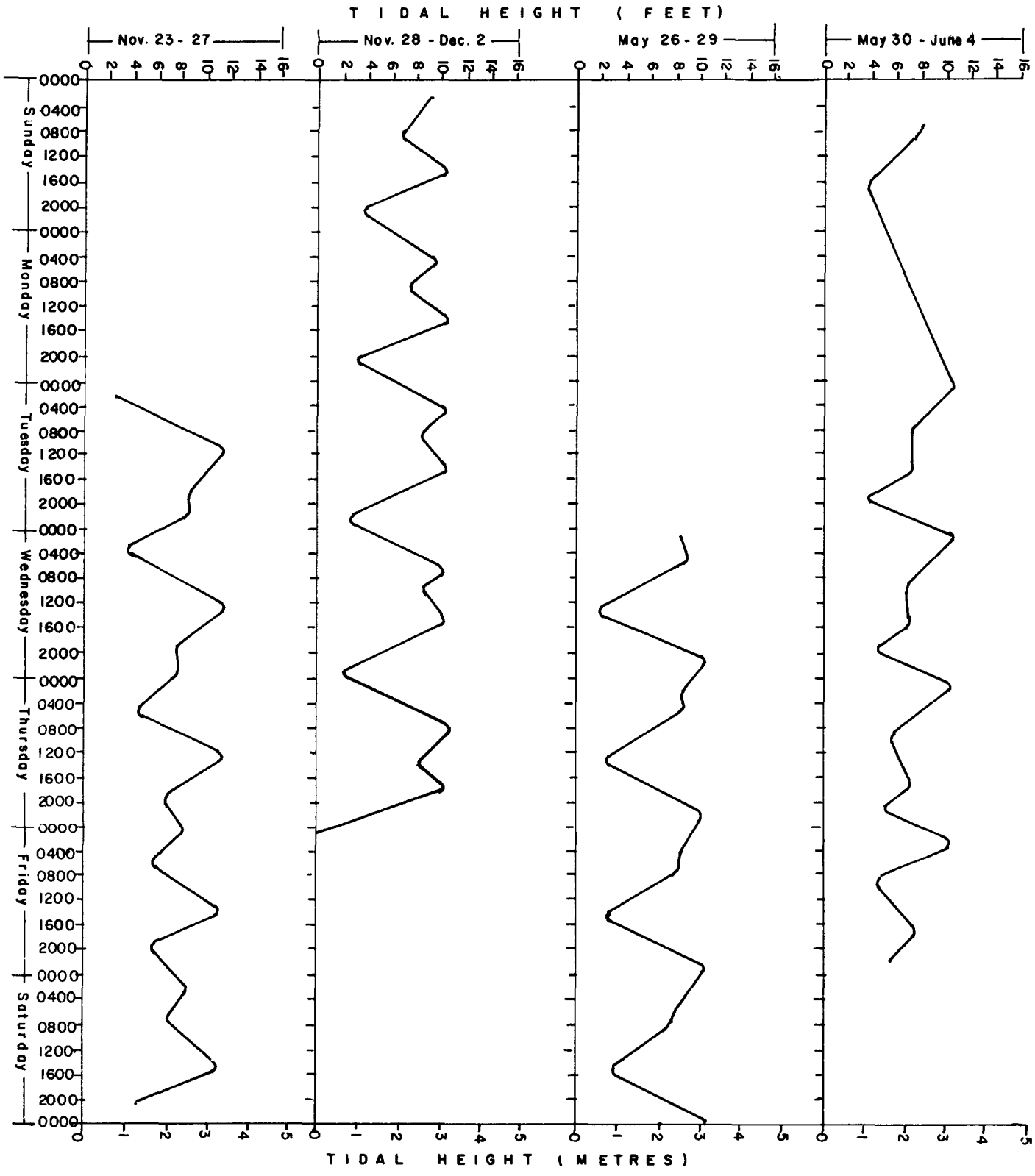

FIGURE 6 TIDAL HEIGHT GRAPH - FULFORD HARBOUR
May 26 - June 4, Nov. 23 - Dec. 2, 1982

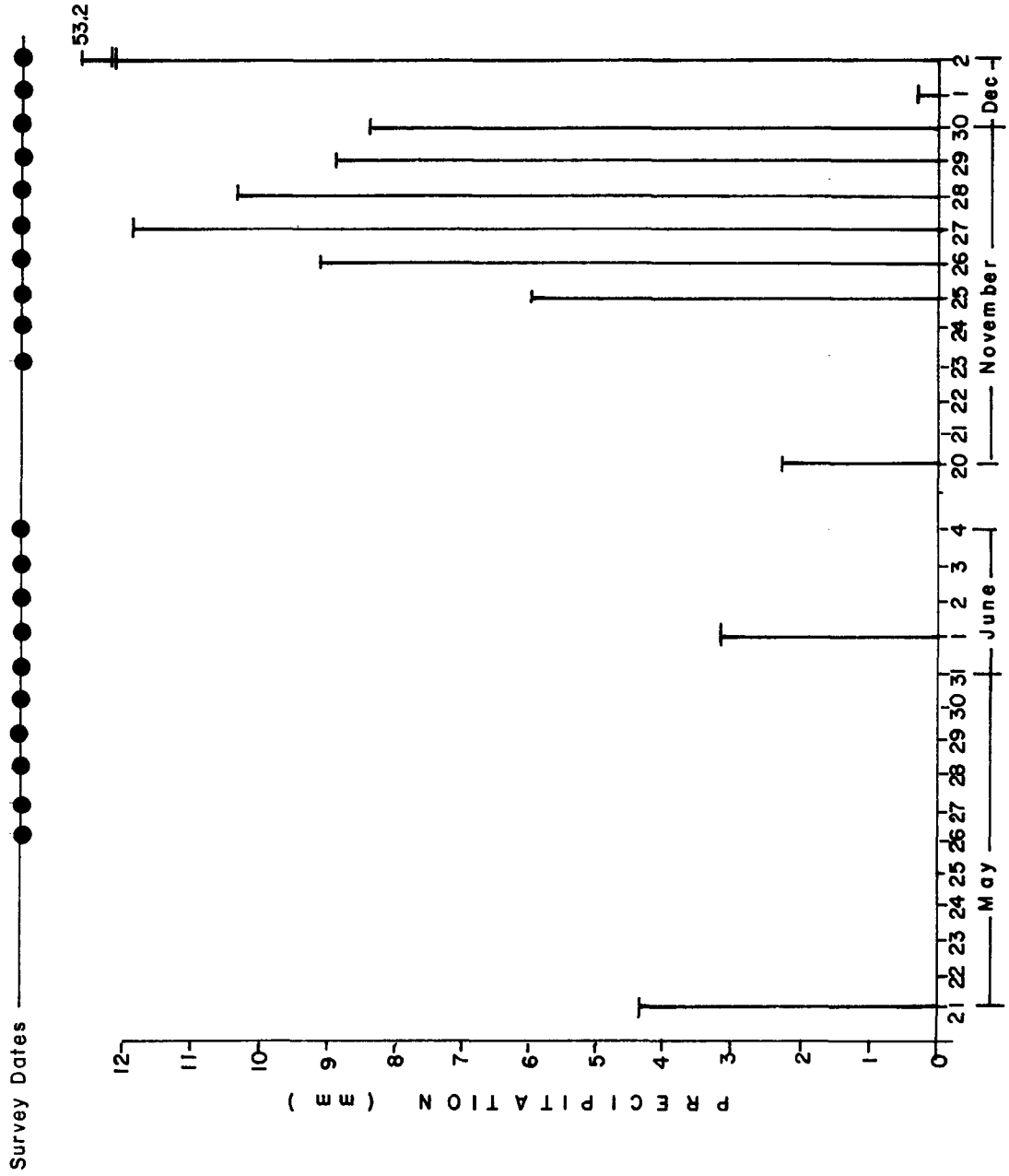

FIGURE 7 TOTAL PRECIPITATION - SAINT MARY LAKE RAINFALL STATION
SALTSPRING ISLAND, B.C. - May-June, November-December Surveys 1982

4 RESULTS AND DISCUSSION

Canadian bivalve molluscan shellfish growing waters are classified according to the following criterion:

> In order that an area be considered bacteriologically safe for the harvesting of shellfish, the fecal coliform median MPN of the water must not exceed 14 per 100 ml, and not more than 10% of the samples ordinarily exceed an MPN of 43 per 100 ml for a 5 tube decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most unfavourable hydrographic and pollution conditions.*

Accordingly, using the combined data for both study periods, 6 of the 92 stations statistically analyzed did not meet the criteria necessary for the bacteriologically safe harvesting of shellfish (Appendix IV).

4.1 Ganges Harbour (Marine Stations 1-26)

Ganges harbour is presently under seasonal closure. Summer and winter closure lines differ significantly and are defined in the Pacific Shellfish Regulations Schedule I (Contaminated Areas). Sampling during this study was confined to the open area, seaward of the closure.

Combined data from the 1982 study showed all marine stations met the shellfish water quality standard. One marine station, 14, exceeded the shellfish growing water standard in the May-June survey. The station was located in a small bay on the west side of Goat Island. The median and 90th percentile were 2 and 46/100 ml respectively. The source of this contamination could not be identified; there were no freshwater streams in the area. The November survey results met shellfish growing water standards.

---

*This report expresses the 10 percent limit in terms of a 90 percentile which must not exceed 43 per 100 ml.

Shellstock samples were collected from the harbour side of Walter Spit, Beddis Beach, and First Sister Island. Counts were 490, 80, and 20/100 g, respectively. The shellstock sample taken at Walter Spit exceeded the shellstock meat standard of 230 MPN/100 mls however, the sample analysed was a horse clam. Since the posterior region of the horse clam gapes, contamination other than that filtered from the growing water may enter the clam through this opening making this species unreliable for analysis.

A total of eight freshwater stations in the Ganges Harbour area were sampled during the survey period. Flows were generally lower or had completely dried during the May-June sampling period. November-December flows were increased, due entirely to the increase in rainfall during this survey period. Stream counts were noticeably higher after rainfall but the bacterial contribution was not enough to affect the quality of the foreshore receiving waters.

4.2 Long Harbour (Marine Station 27-45)

All marine stations in Long Harbour met the shellfish growing water standard during both the dry and wet month survey periods. However, low level contamination was evident during both survey periods.

This contamination occurred near the head of the harbour around marine stations 31 to 35. During May-June station 34 and 35 showed median and 90th percentile MPNs of < 2 and 4.5/100 ml and 2 and 24/100 ml, respectively. During Nov.-Dec. survey stations 33 and 34 showed median and 90th percentile MPNs of 6.5 and 19/100 ml and 11 and 35/100 ml, respectively. Combined data for station 34 in a small bay off of the home of the custodian for Maracaibo Estates, showed a 90th percentile MPN of 25.6/100 ml. There are no freshwater inputs within the immediate vicinity of this station other than a direct discharge of kitchen grey water entering marine waters in close proximity to station 34. This discharge was not sampled. Unpublished data from previous Environmental Protection Service shellfish surveys and conclusions drawn from the

literature have shown the bacteriological characteristic of grey water can contain significant numbers of fecal coliform organisms (4).

Shellstock samples of butter clams taken during the May-June survey at the head of Long Harbour and off the oyster lease showed one sample from the lease area to be contaminated with a MPN of 3500/100 gms. The source of contamination was not identified.

Freshwater stations S-8 and S-14 were sampled to monitor the bacteriological contributions of the Mansell Ranch to the marine water at the head of the Bay. This is a lamb farm and the maximum number of animals during peak season is approximately 110. Station S-8 was sampled during both survey periods. The highest counts coincided with rainfall events suggesting contributions from landwash.

S-14 was sampled during November only and again exhibited higher counts during rainfall events. This station was above the Mansell Ranch and generally lower in fecal counts than station S-8, indicating that the animals on the ranch were the primary source of fecal coliform to the creek.

Marine station 27 was the closest station to the area where the creek enters the head of Long Harbour. Combined MPN data for the median and 90th percentile was 3.5 and 13.4/100 mls, respectively. Although suspect, the data is inconclusive that the creek is the reason for this low level contamination around the head particularly considering the creek flows were quite low.

4.3 Cusheon Creek (Marine Stations 46-48)

Marine stations 46-48 met the approved growing water standard, with median MPNs ranging from < 2 to 17/100 ml. Samples of Cusheon Creek generally had low levels of fecal coliforms that were the cause of contamination noted in the marine samples.

Cusheon Creek drains Cusheon lake along a 2.5 km water course that drops 30 meters in altitude. The creek migration is through steep ravines hence development along most of the creek has not occurred. Between station S-5 and the exit from Cusheon Lake the creek flows through

a ranch which presently supports two horses. Between station S-5 and S-4 at the mouth there was no obvious development boardering the creek. The most likely source of contamination to this watershed would be the result of fecal droppings of resident wildlife.

4.4 Walker Hook (Marine Stations 49-60)

Combined data shows stations 51, 53, and 54 to exceed the 90th percentile standard for the shellfish growing water standard. May-June data showed station 52 exceeded the growing water standard. Rainfall occured on one day during the May/June survey period. Between November 28 and December 2 rainfall occured daily (Figure 7). An increase in fecal counts in the marine waters correlated well with the incidence of rainfall. Generally all stations within Walker Hook showed effects of rainfall/landwash-induced bacterial contamination in the marine waters. FC/FS ratios for freshwater S-10 during both survey periods were less than 0.7 suggesting animal fecal waste may be a contributor to the stream contamination. However, it must be noted that FC/FS values did not always exceed the minimum suggested density counts of 100/100 ml used in calculating FC/FS ratios (5). Freshwater S-11, located upstream at Walker Hook Road, showed a much lower incidence of bacterial contamination. This would seem to indicate that pollution sources existed in the area between the road and the foreshore. This combination of rainfall induced landwash and the large numbers of bird life seen in the area during both surveys would present the most likely source of contamination to Walker Hook. The bacteriological effects of bird populations on aquatic systems has been shown to be quite significant (6, 7).

The previous survey done in July and August of 1977 showed all stations with the exception of one met the shellfish growing water standard. However, there was no rainfall during this survey period.

Clam samples collected during the May/June survey period exceeded the market standard for shellfish of 230/100 g with counts of 1300 and 1700/100 g MPN.

4.5 Malaview Estates/Fernwood Point (Marine Stations 61-71)

Combined data for marine stations 61 to 71 met the shellfish growing water quality standard. Bacteriological results for the wastewater treatment plant raw and final effluents are presented in Table 1. Mean fecal coliform concentrations for the raw and final effluents were 1.71×10^6 FC/100 ml and 4.09×10^6 FC/100 ml, respectively. This represents one order of magnitude lower in concentration as compared to mean values of raw and final effluents for the study done in 1977. Mean values during the 1977 study for raw were 6.3×10^7 FC/100 mls and for final were 1.02×10^7 FC/100 mls. The 1977 data showed a mean fecal coliform reduction of 84% while the 1982 data showed a mean increase in fecal coliforms of 142%. Mean population equivalents[1] for the final effluent based on three days of dry weather flow averaged out to 70. Calculation of population equivalents assist the authors in interpreting the relative pollution causing significance of freshwater or sewage discharges. Additional chemical sampling was also done at this plant and the results are presented and discussed in Appendix VI.

Dye was injected into the outfall on four separate occassions. Rhodamine WT was used three times and Fluorescein once. The effluent outfall terminates 213 meters seaward to Trincomali Channel in 13 meters of water. At no time was there visual evidence of the dye surfacing near the shore areas as in the previous study. It can be concluded that the outfall line remains intact. The CRD wastewater treatment plant at Malaview estates did not have a detrimental effect on the bacteriological quality of water in the vicinity of the outfall at the time of this survey. However, the area around the outfall remains closed to the harvesting of shellfish due to the potential for contamination.

---

[1] A population equivalent of one is equal to 3.2×10^{10} fecal coliforms/person/day.

TABLE 1

BACTERIOLOGICAL RESULTS FOR THE CAPITAL REGIONAL DISTRICT WASTEWATER TREATMENT PLANT AT MALAVIEW (PE 242)

DATE	TIME	FLOW	INFLUENT[1]		MPE[2]	EFFLUENT[1]		MPE[2]	% REDUCTION		FC/FS[4]
		m^3/day	FC	FS	INFLUENT	FC	FS	EFFLUENT	FC	FS	EFFLUENT
May 30	AM		7.5	2.1		2.8	0.64		63	69	4.4
May 31	AM		0.49	< .01		2.8	0.17		(+)471	(+)1600	16.5
31	PM	49	0.4	0.02	6.0	5.7	0.52	87	(+)325	(+)2500	11
June 1	AM	54	2.6	0.11	44.0	4.4	0.67	74	(+)69	(+)509	6.6
	PM	40	0.48	0.07	6.0	4.0	0.64	50	(+)733	(+)814	6.3
June 2	AM		0.31	0.04		4.4	0.28		(+)1319	(+)600	16
	PM		0.21	0.04		4.5	0.88		(+)2042	(+)2100	5.1
Mean			1.7			4.1					

[1] FC/FS counts x 10^6

[2] M.P.E. $= \frac{\text{Fecal Coliform Discharged per Day}}{\text{Fecal Coliforms/Person/Day}}$

$= \frac{\text{Flow x Fecal Coliform Counts}}{3.2 \times 10^{10}}$

(+) indicates a percent increase

[4] FC/FS - Fecal Coliform/Fecal Streptococci Ratios

4.6 North Beach (Marine Stations 72-74, 99-100)

Sampling in this area was confined to commercial oyster leases L.341 BLKA and BLKB. During the May-June survey period all stations met the shellfish growing water standards. During November-December stations 72 and 73 exceeded the growing water standard 90th percentile of 43 FC/100 ml. Counts were 191.5 FC/100 ml and 94.5 FC/100 ml, respectively. Combined data showed stations 72 and 73 with 90th percentile counts of 64.7 FC/100 ml and 82.1 FC/100 ml, respectively.

Freshwater station S-19 (Figure 8) was not flowing during the May-June survey period. Creek flow did occur during the November-December survey period, coincident with rainfall and contamination of the marine foreshore waters. Fecal coliform counts in the creek ranged from 20 FC/100 mls to 1900 FC/100 ml.

Upstream investigation established the source of this contamination as sheep farms along the creeks water course. Animal populations along the creek may approach 400 to 500. Station S-24 was taken at the head waters of S-19; the fecal coliform count was 48 per 100 ml. Station S-25 was sampled the same day at the animal watering pond of the Harkema farm which interrupts the flow of S-19 (Figure 8). Station S-25 had a count of 400 FC/100 ml.

4.7 Booth Inlet (Marine Stations 75-81 and 88-92)

All stations with the exception of Station 89 met the shellfish growing water standard. Station 89 had a median MPN of 8 FC/100 ml and a 90th percentile of 56 FC/100 ml. All stations in the inlet exhibited low levels of contamination with generally higher counts at the head of the inlet by comparison to stations at the mouth. The 1977 survey data showed three marine stations at the head of the inlet exceeded the median standard.

There are a number of homes and small farms around the head of the inlet that pasture a vareity of farm animals including cows, sheep, and chickens. Freshwater stations S12 and S13 showed persistent

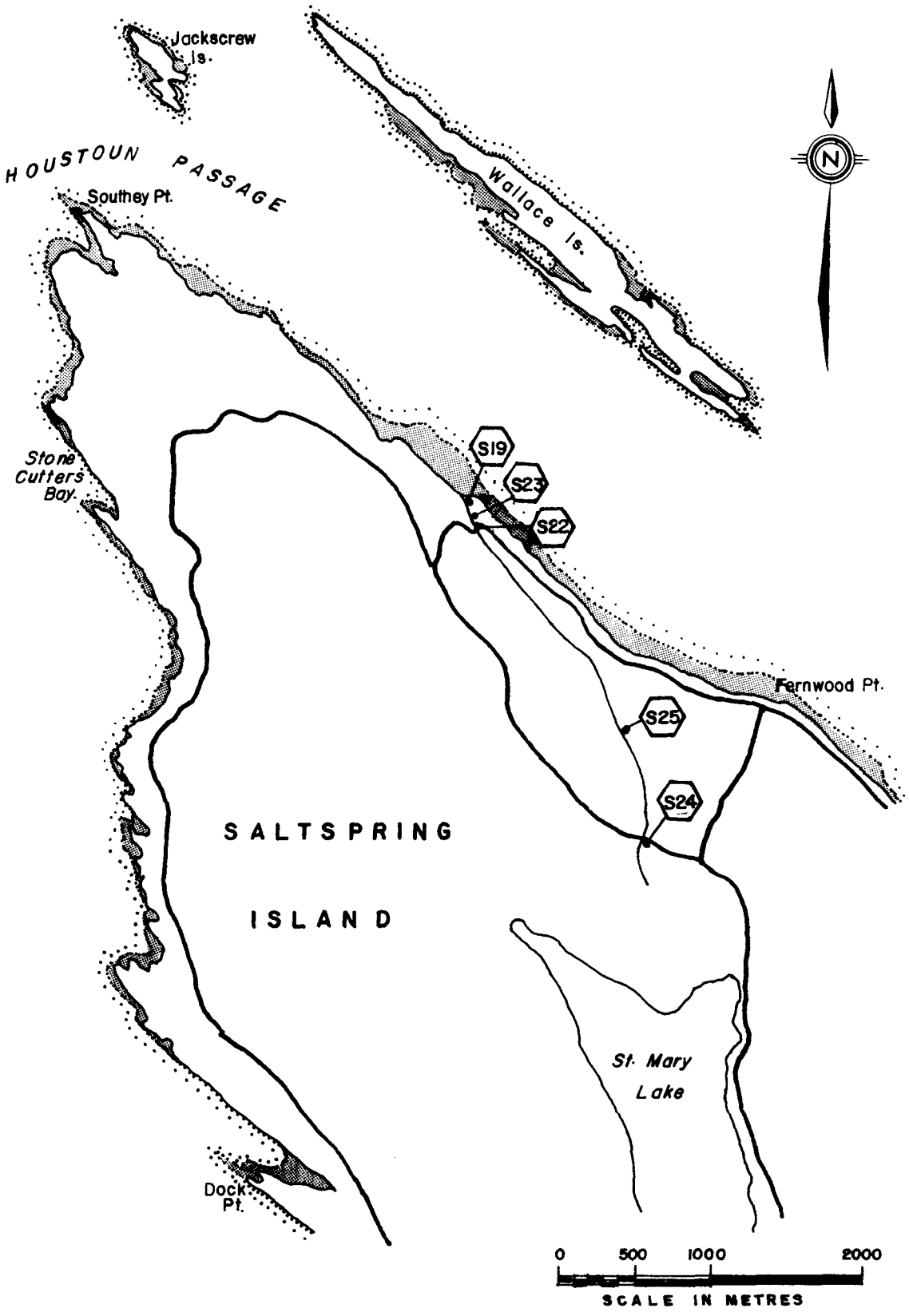

FIGURE 8 FRESHWATER STATIONS - NORTH BEACH AREA

contamination; however, flows for the creeks were low during both survey periods. S-12 had unexpectedly higher counts during the drier spring survey compared to the wetter winter survey. Data is inconclusive that S-12 is a transport route to marine waters for contaminated runoff from pastureland in the water shed. Nevertheless, populations of farm animals would seem to be the most likely cause of fecal coliform loading to the inlet.

A shellstock sample collected at the headwaters had an MPN count of 230 fecal coliform per 100 g while a shellstock sample collected near station 80 exhibited on MPN count of 220/100 g.

4.8 Booth Bay (Marine Stations 82-87)

All stations met the shellfish growing water quality standard. A beach walk of the area showed no potential problems related to bacterial contamination. Shellstocks samples taken from the bay had MPN counts of < 20 and 20 FC/100 ml.

4.9 Burgoyne Bay (Marine Stations 93-98)

Marine stations 93 to 98 were sampled during the November-December survey period only. Combined data of all stations (18 samples) met the shellfish growing water standard median and 90th percentile. Fecal coliform counts were 5 and 42.2 respectively; the highest FC count was at marine station 94 on a low slack tide.

All stations showed elevated counts on December 1st with stations 93 and 94 showing the highest counts of 79 FC/100 ml and 130 FC/100 ml. Although there were no obvious point sources in the immediate vicinity of stations 93 and 94, data from the previous survey corroborates the existence of a source of bacterial contamination.

Freshwater stations S-16 and S-17 demonstrated an increase in bacterial contamination with increased rainfall. With increasing rainfall, hence rising water table, the potential for septic field washout of the homes in the vicinity of these two creeks also increases. This may be an explanation for the rise in bacterial counts in the creeks. An

interview with the owner established that the septic tanks had been pumped out within the past two years. Dye testing was not performed on the systems hence assumptions on the tile field washout are speculative.

Table 2 present medians and 90th percentiles of combined dates for identical stations collected during both the 1977 and 1982 surveys.

TABLE 2
BURGOYNE BAY - COMBINED DATA 1977/1982 MEDIAN AND 90TH PERCENTILE

STATION NUMBERS		MEDIAN	90th PERCENTILE
1975	1982		
114	93	17	79
115	94	17	122
116	95	8	52
117	96	8	88

All stations exceed the shellfish growing water quality standards. Station 94 shows the greatest degree of contamination. This was repeated during both surveys. Freshwater S-21 enters the bay in the vicinity of station 94. At the time of this survey S-21 was not flowing at the mouth but was flowing upstream at the sample point. Counts were not particularly high and flows were low. This creek drains a large farm area and has the potential for large flows. Sampling done during the 1977 study did not show serious bacterial contamination during larger flows of this stream.

Combined data for all stations from both studies give a median of 12.5 and 90th percentile of 79 FC/100 mls.

REFERENCES

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 15th edition, Washington, D.C. (1981).

2. Andrews, W.J., and M.P. Presnell. "Rapid Recovery of Esherichia coli from Estuarine Waters." Applied Microbiology 23:521-523 (1972).

3. Kay, B.H. "Evaluation of the A-1 Medium for the Rapid Recovery of Fecal Coliforms from Marine Waters," Fisheries and Environment Canada, Environmental Protection Service, Pacific Region, Regional Program Report 78-9 (January 1978).

4. Kay, B.H. Shellfish Growing Water Control Program Annual Review - 1981-1982. Environmental Protection Service, Pacific Region, Regional Report EPS-5-PR-82-08.

5. Geldreich E.E., and B.A. Kenner. "Concepts of Fecal Streptococci in Stream Pollution" WPCF Journal 41:R336 (1969).

6. Jon H. Standridge, Joseph J. Delfiwo, Lyle B. Kleppe and Robert Butler. "Effect of Waterfowl (Anas Platyritynchos) on Indicator Bacteria Populations in a Recreational Lake in Madison, Wisconsin", Applied and Environmental Microbiology, 38(3)547 (1979).

7. D. Hussong, J.M. Damare, R.J. Limdert, W.J.L. Sladen, R.M. Weiner and R.R. Colwell. "Microbial Impact of Canada Geese (Branta Canadensis) and Whistling Swans (Cygnos Columbianus Columbianus) on Aquatic Ecosystems", Applied and Environmental Microbiology, 37(1)14 (1979).

ACKNOWLEDGEMENTS

The authors would like to thank the following people who provided information and assistance during the survey.

Mr. P.J. Jammeson, Capital Regional District Community Health Services; Mr. K. Austin, Waste Management Branch; the staff of the Marine Resources Branch; and the staff and student technicians of the Environmental Protection Service who participated in the survey.

The authors also appreciate the hospitality and assistance of Saltspring Island residents during both survey periods.

APPENDIX I

MARINE SAMPLE STATION LOCATIONS

APPENDIX I

MARINE SAMPLE STATION LOCATIONS

SAMPLE STATION	DESCRIPTION	RECEIVING WATER
1	Off Walter Bay spit in line with pasture	Ganges Harbour
2	Off Walter Bay spit at fence gate	"
3	Off house with flag	"
4	Off naked tree	"
5	Off mustard house with white trim	"
6	Off white house with red roof, TV antenna	"
7	Off conspicuous bush on shore	"
8	Off catwalk	"
9	Mid-channel off conspicuous boulder	"
10	Mid-channel in line with boathouse	"
11	Mid-channel in line with pasture	"
12	Off unnamed point	"
13	At BnR NW of Goat Island	"
14	Goat Island off private dock	"
15	Off SE end of Goat Island	"
16	Small bay in S corner of Deddman Island	"
17	N end of First Sister Island by abandoned house	"
18	By A-frame on Second Sister Island	"
19	Off NW end of Third Sister Island	"
20	Mid-channel off NW end of Third Sister Island	"
21	White house with flat roof	"
22	Between Deadman Island and group of rocks	"
23	Off dock by white boat house	"
24	Off yellow house with red trim	"
25	Mid-channel off NW end of Goat Island	"
26	Off wood frame shack	"
27	Off point at "NO TRESSPASSING" sign	"
28	Off the boat ramp at the entrance to the cove	"
29	Off lot 3 sign in cove entrance	"
30	Off arbutus tree	"
31	Off brown boat house	"
32	Mid-channel between 31 and 33	"
33	Off brown house with dock	"
34	Off large white house with dock	"
35	At boat launch	Long Harbour
36	Mid-channel at narrowest point	"
37	West end of lease	"
38	East end of lease	"
39	Mid-channel between 38 and 40	"
40	Between two beaches	"

Continued...

APPENDIX I

MARINE SAMPLE STATION LOCATIONS

(Continued)

SAMPLE STATION	DESCRIPTION	RECEIVING WATER
41	Mid-channel between 38 and 40	Long Harbour
42	Off brown house - hidden	"
43	Off black spar buoy	"
44	Mid-channel across from RVYC	"
45	Bay inside red lone buoy	"
46	N of creek mouth	Cusheon Creek
47	Creek mouth	"
48	S of creek mouth	"
49	Head of Walker Hook	Walker Hook
50	Between 51 and 52	"
51	Off stand of dead fir	"
52	Rock area on beach immediately NW of reeds	"
53	Across from bare rock on Hook	"
54	At bare rock	"
55	Middle of Hook midway between 53-54 and 56-57	"
56	Across from white house with red roof	"
57	Off white house with red roof	"
58	Off red house with dock	"
59	Top of Walker Hook	"
60	White house with brown trim beside tall tree	"
61	Red house with yellow trim on beach	Malaview/Fernwood
62	Clearing with small shed, large arbutus	"
63	Off old log stovecase	"
64	At outfall sign	"
65	Cream house with white metal patio railing NW of outfall	"
66	Off old boat house on shore	"
67	White house with green trim	"
68	Off house bing built at dead tree on shore	"
69	House with stone wall	"
70	Off red house midway between 69 and 71	"
71	Off FRWG beacon	"
72	Off large brown wood house at small point	North Beach
73	Off brown house NW of yellow house	"
74	Off olive house with stairway to beach	"
75	North side of inlet off dock	Booth Inlet
76	Middle of inlet off dock	"
77	South side of inle across from 78	"
78	N side of inlet off A-frame	"
79	N side of inlet off square house with large windows	"

Continued...

APPENDIX I

MARINE SAMPLE STATION LOCATIONS

(Continued)

SAMPLE STATION	DESCRIPTION	RECEIVING WATER
80	S side of inlet off lawn area	Booth Inlet
81	At entrance to inlet	"
82	Booth Bay off shellfish harvesting sign	Booth Bay
83	Across from 86 on south side off brown house on cliff	"
84	Middle of Booth Bay off house with flag pole	"
85	Off Booth Bay resort restaurant	"
86	Off brown house west of resort	"
87	Onshore of house with flagpole	"
88	Off brown house with small dock and 2 anchor buoys (mid)	Booth Inlet
89	Off barn shaped house with large lawn area (mid-channel)	"
90	Off dead tree on north side, west of sailboat (mid)	"
91	Off brown house with white foundation (mid-channel)	"
92	Head of inlet - near bridge	"
93	Off oyster culture sign on N side	Burgoyne Bay
94	Approximately 45 M SE of 93 on shore	"
95	Off white house with TV antenna	"
96	Off road at head of bay - brown house	"
97	Offshore of 94 in line with lease sign 93 and brown house on other side	"
98	In line with 93 and 96 of white house-green trimmed doors	"
99	Immediately SE of small PT at boundary of lease 341 BLKA	North Beach
100	Approximately 100 M SE of 99	"

APPENDIX II

FRESHWATER SAMPLE STATION LOCATIONS

APPENDIX II

FRESHWATER SAMPLE STATION LOCATIONS

SAMPLE STATION	DESCRIPTION
S-1	Creek at end of Cottonwood Road
S-2	Large culvert 100 yds N of S-3 on Beddis
S-3	Upstream S-1 on Beddis at red mailbox
S-4	Mouth of Cusheon Creek
S-5	Cusheon Creek at Horel Road
S-6	Head of NE leg of Ganges Harbour
S-7	Creek entering small bay at Marine St. No. 1
S-8	Creek at the head of Long Harbour
S-9	Creek at the head of Walker Hook
S-10	Creek east of the terminus of Ross Road
S-11	S-10 at Walker Hook road
S-12	Creek at sharp road, head of Booth Inlet
S-13	Creek at Booth Canal Road into Booth Inlet
S-14	S-8 on Mansell Road
S-15	Creek 1.1 km N of Price Road on Beddis
S-16	Westerly most CR on road to Burgoyne Bay
S-17	East of S-16
S-18	Creek 1.5 km NW on Price Road
S-19	McFadden Creek at the mouth
S-20	S-6 at Fulford-Ganges Road
S-21	At bridge on road to Burgoyne Bay
S-22	S-19 at N Beach Road
S-23	Between S-19 and S-22 100 yds upstream S-19
S-24	McFadden Creek at N end Road
S-25	Pond on Harkema property

APPENDIX III

DAILY DATA RECORD
FOR MARINE SAMPLE STATIONS

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI001	48 50.69	123 28.90	82/05/26	0815	EBB	2	29.0
			82/05/27	0805	EBB	<2	28.0
			82/05/28	0820	HIGH SLACK	2	27.5
			82/06/03	1300	FLOOD	2	28.0
			82/06/04	1210	FLOOD	<2	28.0
			82/11/24	1445	EBB	<2	28.0
			82/11/26	0850	FLOOD	2	27.0
			82/11/28	0750	LOW SLACK	23	28.0
			82/11/30	0845	EBB	8	28.0
SI002	48 50.60	123 28.70	82/05/26	0820	EBB	2	29.0
			82/05/27	0810	EBB	2	28.0
			82/05/28	0825	HIGH SLACK	<2	27.5
			82/06/03	1305	FLOOD	2	28.0
			82/06/04	1210	FLOOD	<2	28.0
			82/11/24	1450	EBB	2	28.0
			82/11/26	0855	FLOOD	4	27.5
			82/11/28	0755	LOW SLACK	8	28.0
			82/11/30	0850	LOW SLACK		28.0
SI003	48 50.50	123 28.50	82/05/26	0820	EBB	<2	28.0
			82/05/27	0810	EBB	2	28.0
			82/05/28	0825	HIGH SLACK	2	27.5
			82/06/03	1305	FLOOD	<2	28.0
			82/06/04	1215	FLOOD	<2	28.0
			82/11/24	1450	EBB	<2	28.0
			82/11/26	0855	FLOOD	<2	28.0
			82/11/28	0755	LOW SLACK	2	28.0
			82/11/30	0850	LOW SLACK	2	28.0
SI004	48 50.39	123 28.25	82/05/26	0900	EBB	2	27.5
			82/05/27	0815	EBB	11	28.0
			82/05/28	0830	HIGH SLACK	<2	28.5
			82/06/03	1310	FLOOD	<2	28.0
			82/06/04	1220	FLOOD	2	28.0
			82/11/24	1455	EBB	<2	28.0
			82/11/26	0900	FLOOD	<2	28.0
			82/11/28	0800	LOW SLACK	2	28.0
			82/11/30	0855	LOW SLACK	2	28.0
SI005	48 50.19	123 28.18	82/05/26	0900	EBB	<2	28.5
			82/05/27	0820	EBB	33	28.0
			82/05/28	0830	HIGH SLACK	5	28.0
			82/06/03	1315	FLOOD	<2	28.0
			82/06/04	1220	FLOOD	<2	28.0
			82/11/24	1500	EBB	<2	
			82/11/26	0905	FLOOD	7	
			82/11/28	0800	LOW SLACK	23	28.0
			82/11/30	0855	LOW SLACK	13	27.0

APPENDIX III : Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI006	48 50.20	123 28.08	82/05/26	0905	EBB	<2	29.0
			82/05/27	0820	EBB	17	28.0
			82/05/28	0835	HIGH SLACK	2	28.0
			82/06/03	1320	FLOOD	<2	28.0
			82/06/04	1225	FLOOD	<2	28.0
			82/11/24	1505	EBB	<2	
			82/11/26	0905	FLOOD	7	
			82/11/28	0800	LOW SLACK	8	28.0
			82/11/30	0900	LOW SLACK	5	28.0
SI007	48 49.91	123 27.89	82/05/26	0915	EBB	2	29.0
			82/05/27	0825	EBB	13	28.0
			82/05/28	0840	HIGH SLACK	<2	28.5
			82/06/03	1325	FLOOD	<2	28.0
			82/06/04	1230	FLOOD	<2	28.0
			82/11/24	1505	EBB	<2	28.0
			82/11/26	0910	FLOOD	<2	28.0
			82/11/28	0805	LOW SLACK	5	28.5
			82/11/30	0900	LOW SLACK	8	28.0
SI008	48 49.81	123 27.65	82/05/26	0925	EBB	2	28.0
			82/05/27	0830	EBB	<2	29.0
			82/05/28	0840	HIGH SLACK	<2	28.0
			82/06/03	1325	FLOOD	<2	28.0
			82/06/04	1230	FLOOD	<2	28.0
			82/11/24	1510	EBB	<2	27.5
			82/11/26	0910	FLOOD	<2	28.0
			82/11/28	0810	LOW SLACK	14	28.0
			82/11/30	0905	LOW SLACK	2	28.0
SI009	48 50.05	123 27.25	82/05/26	0950	EBB	2	27.0
			82/05/27	0830	EBB	2	29.0
			82/05/28	0845	HIGH SLACK	<2	28.0
			82/06/04	1230	FLOOD	<2	28.0
			82/11/24	1510	EBB	<2	28.0
			82/11/26	0915	FLOOD	<2	28.0
SI010	48 50.50	123 28.08	82/05/26	0855	EBB	<2	27.5
			82/05/27	1035	EBB	<2	28.0
			82/05/28	0835	HIGH SLACK	<2	28.5
			82/06/04	1350	FLOOD	<2	28.0
			82/11/24	1455	EBB	<2	28.0
			82/11/26	0900	FLOOD	<2	28.0
SI011	48 50.90	123 28.90	82/05/26	0810	EBB	<2	29.0
			82/05/27	1040	EBB	<2	28.0
			82/05/28	0815	HIGH SLACK	2	27.5
			82/06/04	1405	FLOOD	<2	28.0
			82/11/24	1445	EBB	<2	28.0
			82/11/26	0850	FLOOD	<2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI012	48 51.30	123 29.31	82/05/26	0755	EBB	13	28.0
			82/05/27	1050	EBB	<2	29.0
			82/05/28	1045	EBB	2	27.5
			82/06/03	1520	FLOOD	17	27.5
			82/06/04	1420	FLOOD	<2	28.0
			82/11/24	1535	EBB	<2	28.5
			82/11/26	1000	FLOOD	<2	27.5
			82/11/28	0855	LOW SLACK	17	26.5
			82/11/30	1050	LOW SLACK	<2	28.5
SI013	48 51.25	123 29.15	82/05/26	0800	EBB	<2	28.5
			82/05/27	1045	EBB	2	28.0
			82/05/28	1050	EBB	<2	27.5
			82/06/03	1510	FLOOD	<2	28.0
			82/06/04	1415	FLOOD	<2	28.0
			82/11/24	1530	EBB	<2	28.5
			82/11/26	1000	FLOOD	<2	28.0
			82/11/28	0855	LOW SLACK	<2	27.0
			82/11/30	1050	LOW SLACK	<2	28.0
SI014	48 51.10	123 28.90	82/05/26	0810	EBB	79	29.0
			82/05/27	1015	EBB	<2	28.0
			82/05/28	1055	EBB	13	27.5
			82/06/03	1510	FLOOD	2	28.0
			82/06/04	1405	FLOOD	<2	28.0
			82/11/24	1530	EBB	<2	28.5
			82/11/26	1000	FLOOD	<2	28.0
			82/11/28	0850	LOW SLACK	2	28.0
			82/11/30	1045	LOW SLACK	<2	28.0
SI015	48 50.92	123 28.50	80/11/24	1525	EBB	<2	28.5
			82/05/26	0830	EBB	2	27.5
			82/05/27	1040	EBB	2	29.0
			82/05/28	1035	EBB	<2	28.0
			82/06/03	1505	FLOOD	<2	28.0
			82/06/04	1400	FLOOD	<2	28.0
			82/11/24	1525	EBB	<2	28.5
			82/11/26	0955	FLOOD	<2	28.0
			82/11/28	0850	LOW SLACK	<2	28.0
			82/11/30	1045	LOW SLACK	<2	28.0
SI016	48 50.72	123 28.08	82/05/26	0850	EBB	<2	28.0
			82/05/27	1035	EBB	<2	28.0
			82/05/28	1030	EBB	<2	28.5
			82/06/03	1510	FLOOD	<2	28.0
			82/06/04	1350	FLOOD	2	29.0
			82/11/24	1525	EBB	<2	28.5
			82/11/26	0955	FLOOD	<2	28.0
			82/11/28	0845	LOW SLACK	2	28.0
			82/11/30	1045	LOW SLACK	<2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI017	48 50.50	123 27.65	82/05/26	0925	EBB	<2	28.0
			82/05/27	1030	EBB	2	28.0
			82/05/28	1020	EBB	<2	28.0
			82/06/03	1450	FLOOD	<2	28.0
			82/06/04	1345	FLOOD	<2	28.0
			82/11/24	1520	EBB	<2	28.5
			82/11/26	0950	FLOOD	<2	28.0
			82/11/28	0845	LOW SLACK	2	28.0
			82/11/30	1040	LOW SLACK	2	28.0
SI018	48 50.32	123 27.25	00/11/24	1515	EBB	2	29.0
			00/11/26	0940	FLOOD	<2	28.0
			82/05/26	0945	EBB	2	27.0
			82/05/27	1025	EBB	<2	28.0
			82/05/28	1100	EBB	<2	28.0
			82/06/03	1445	FLOOD	<2	28.0
			82/06/04	1340	FLOOD	<2	28.0
			82/11/28	0840	LOW SLACK	2	28.0
			82/11/30	1035	LOW SLACK	<2	28.0
SI019	48 50.50	123 27.30	82/05/26	0940	EBB	2	28.0
			82/05/27	1020	EBB	<2	28.0
			82/05/28	1015	HIGH SLACK	<2	24.0
			82/06/03	1440	FLOOD	<2	28.0
			82/06/04	1340	FLOOD	<2	29.0
			82/11/24	1550	EBB	<2	28.5
			82/11/26	0940	FLOOD	2	28.0
			82/11/28	0835	LOW SLACK	5	27.5
			82/11/30	1035	LOW SLACK	<2	28.0
SI020	48 50.68	123 27.25	82/05/26	0935	EBB	<2	28.0
			82/05/27	1020	EBB	<2	28.0
			82/05/28	1010	EBB	<2	28.5
			82/06/03	1440	FLOOD	<2	28.0
			82/06/04	1340	FLOOD	<2	29.0
			82/11/24	1550	EBB	<2	28.5
			82/11/26	0945	FLOOD	<2	28.0
			82/11/28	0835	LOW SLACK	<2	29.0
			82/11/30	1035	LOW SLACK	<2	29.0
SI021	48 50.98	123 27.65	82/05/26	0930	EBB	2	28.0
			82/05/27	0955	EBB	<2	28.0
			82/05/28	1020	EBB	2	28.5
			82/06/03	1455	FLOOD	2	28.0
			82/06/04	1355	FLOOD	<2	29.0
			82/11/24	1550	EBB	<2	28.0
			82/11/26	1015	FLOOD	2	28.0
			82/11/28	0910	LOW SLACK	<2	28.5
			82/11/30	1110	FLOOD	<2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI022	48 50.88	123 28.08	82/05/26	0845	EBB	<2	28.0
			82/05/27	1015	EBB	<2	27.5
			82/05/28	1030	EBB	<2	28.5
			82/06/03	1500	FLOOD	<2	28.0
			82/06/04	1350	FLOOD	<2	28.0
			82/11/24	1545	EBB	<2	28.5
			82/11/26	1015	FLOOD	<2	28.0
			82/11/28	0905	LOW SLACK	<2	28.5
			82/11/30	1100	FLOOD	2	28.0
SI023	48 51.05	123 28.08	82/05/26	0840	EBB	5	28.0
			82/05/27	1000	EBB	<2	28.0
			82/05/28	1030	EBB	13	28.0
			82/06/03	1500	FLOOD	<2	28.0
			82/06/04	1400	FLOOD	<2	21.0
			82/11/24	1545	EBB	<2	28.5
			82/11/26	1010	FLOOD	2	28.0
			82/11/28	0905	LOW SLACK	2	28.0
			82/11/30	1100	FLOOD	4	28.0
SI024	48 51.28	123 28.50	82/05/26	0835	EBB	5	27.0
			82/05/27	1005	EBB	<2	27.5
			82/05/28	1040	EBB	<2	28.0
			82/06/03	1515	FLOOD	5	28.0
			82/06/04	1410	FLOOD	<2	28.0
			82/11/24	1540	EBB	<2	29.0
			82/11/26	1010	FLOOD	2	28.0
			82/11/28	0900	LOW SLACK	<2	28.5
			82/11/30	1100	FLOOD	2	28.0
SI025	48 51.30	123 28.90	82/05/26	0800	EBB	5	29.0
			82/05/27	1010	EBB	<2	28.0
			82/05/28	1040	EBB	<2	27.5
			82/06/03	1520	FLOOD	<2	28.0
			82/06/04	1410	FLOOD	<2	28.0
			82/11/24	1535	EBB	<2	29.0
			82/11/26	1005	FLOOD	<2	28.0
			82/11/28	0855	LOW SLACK	<2	29.0
			82/11/30	1055	FLOOD	2	28.0
SI026	48 51.40	123 28.91	82/05/26	0800	EBB	23	28.0
			82/05/27	1010	EBB	<2	28.0
			82/05/28	1045	EBB	2	27.5
			82/06/03	1515	FLOOD	<2	28.0
			82/06/04	1415	FLOOD	<2	28.0
			82/11/24	1540	EBB	<2	29.0
			82/11/26	1005	FLOOD	<2	28.0
			82/11/28	0900	LOW SLACK	4	28.0
			82/11/30	1055	FLOOD	11	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI027	48 51.99	123 28.59	82/05/26	0930	EBB	11	28.0
			82/05/27	0830	EBB	2	30.0
			82/05/28	0830	HIGH SLACK	5	29.0
			82/06/03	0900	FLOOD	<2	28.0
			82/11/24	1335	EBB	<2	29.0
			82/11/26	1125	FLOOD	2	26.5
			82/11/28	1025	FLOOD	5	28.5
			82/11/30	1010	LOW SLACK	23	27.5
SI028	48 51.99	123 28.35	82/05/26	1010	EBB	<2	28.0
			82/05/27	0835	EBB	5	30.0
			82/05/28	0835	HIGH SLACK	5	29.5
			82/06/03	0900	FLOOD	13	28.0
			82/11/24	1335	EBB	<2	29.5
			82/11/26	1125	FLOOD	2	28.0
			82/11/28	1025	FLOOD	8	28.0
			82/11/30	1005	LOW SLACK	49	27.0
SI029	48 51.90	123 28.10	82/05/26	1015	EBB	8	28.0
			82/05/27	0840	EBB	<2	30.0
			82/05/28	0840	HIGH SLACK	<2	29.0
			82/06/03	0900	FLOOD	2	28.0
			82/11/24	1330	EBB	<2	29.5
			82/11/26	1120	FLOOD	2	28.0
			82/11/28	1025	FLOOD	13	28.0
			82/11/30	1005	LOW SLACK	8	27.0
SI030	48 51.68	123 27.99	82/05/26	1030	EBB	<2	27.5
			82/05/27	0915	EBB	5	29.0
			82/05/28	0945	EBB	<2	28.5
			82/06/03	1420	FLOOD	<2	28.0
			82/06/04	1320	FLOOD	<2	28.0
			82/11/24	1340	EBB	<2	29.5
			82/11/26	1130	FLOOD	<2	28.5
			82/11/28	1020	FLOOD	<2	28.0
			82/11/30	1000	LOW SLACK	5	28.0
SI031	48 51.65	123 27.90	82/05/26	1030	EBB	17	28.0
			82/05/27	0910	EBB	17	28.0
			82/05/28	0940	EBB	11	28.5
			82/06/03	1415	FLOOD	<2	28.0
			82/06/04	1320	FLOOD	2	28.0
			82/11/24	1340	EBB	<2	28.5
			82/11/26	1130	FLOOD	<2	28.0
			82/11/28	1020	FLOOD	2	28.0
			82/11/30	1000	LOW SLACK	8	28.0
SI032	48 51.70	123 27.89	82/05/26	1035	EBB	11	28.5
			82/05/27	0915	EBB	11	29.0
			82/05/28	0950	EBB	<2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI032	continued...		82/06/03	1420	FLOOD	2	28.0
			82/06/04	1320	FLOOD	2	28.0
			82/11/24	1345	EBB	<2	28.5
			82/11/26	1130	FLOOD	<2	28.0
			82/11/28	1020	FLOOD	2	28.0
			82/11/30	1000	LOW SLACK	<2	28.0
SI033	48 51.75	123 27.85	82/05/26	1035	EBB	5	30.0
			82/05/27	0915	EBB	<2	28.0
			82/05/28	0950	EBB	<2	28.5
			82/06/03	1420	FLOOD	<2	28.0
			82/06/04	1315	FLOOD	<2	28.0
			82/11/24	1345	EBB	<2	28.0
			82/11/26	1130	FLOOD	<2	28.0
			82/11/28	1020	FLOOD	13	28.0
			82/11/30	0955	LOW SLACK	23	28.0
SI034	48 51.70	123 27.72	82/05/26	1040	EBB	<2	29.0
			82/05/27	0920	EBB	23	28.0
			82/05/28	0955	EBB	<2	28.5
			82/06/03	1425	FLOOD	<2	28.0
			82/06/04	1315	FLOOD	<2	28.0
			82/11/24	1345	EBB	14	28.5
			82/11/26	1135	FLOOD	49	28.0
			82/11/28	1015	FLOOD	<2	28.0
			82/11/30	0955	LOW SLACK	8	28.0
SI035	48 51.59	123 27.80	82/05/26	1045	EBB	2	29.0
			82/05/27	0910	EBB	2	28.0
			82/05/28	0940	EBB	46	28.5
			82/06/03	1410	FLOOD	<2	28.0
			82/06/04	1325	FLOOD	<2	28.0
			82/11/24	1350	EBB	2	28.0
			82/11/26	1135	FLOOD	<2	28.5
			82/11/28	1015	FLOOD	<2	28.0
			82/11/30	0950	LOW SLACK	5	28.0
SI036	48 51.59	123 27.80	82/05/26	1045	EBB	<2	29.0
			82/05/27	0905	EBB	<2	28.0
			82/05/28	0955	EBB	<2	28.5
			82/06/03	1430	FLOOD	<2	28.0
			82/06/04	1310	FLOOD	<2	28.0
			82/11/24	1350	EBB	<2	28.0
			82/11/26	1135	FLOOD	<2	29.0
			82/11/28	1015	FLOOD	<2	28.5
			82/11/30	0950	LOW SLACK	2	28.5

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI037	48 51.69	123 27.35	82/05/26	1050	EBB	2	30.0
			82/05/27	0925	EBB	<2	28.0
			82/05/28	1000	EBB	8	28.5
			82/06/03	1405	FLOOD	<2	28.0
			82/06/04	1310	FLOOD	<2	28.5
			82/11/24	1350	EBB	<2	28.5
			82/11/26	1135	FLOOD	<2	29.0
			82/11/28	1010	FLOOD	<2	28.5
			82/11/30	0950	LOW SLACK	<2	28.0
SI038	48 51.61	123 27.18	82/05/26	1055	EBB	2	29.0
			82/05/27	0930	EBB	<2	28.0
			82/05/28	1005	EBB	8	28.5
			82/06/03	1405	FLOOD	13	28.0
			82/06/04	1310	FLOOD	<2	28.0
			82/11/24	1355	EBB	<2	28.0
			82/11/26	1140	FLOOD	<2	29.0
			82/11/28	1010	FLOOD	<2	28.5
			82/11/30	0945	LOW SLACK	5	28.0
SI039	48 51.55	123 27.35	82/05/26	1100	EBB	<2	28.0
			82/05/27	0930	EBB	<2	28.0
			82/05/28	1000	EBB	5	28.5
			82/06/03	1410	FLOOD	<2	28.0
			82/06/04	1305	FLOOD	<2	28.0
			82/11/24	1355	EBB	<2	28.5
			82/11/26	1140	FLOOD	<2	29.0
			82/11/28	1010	FLOOD	<2	29.0
			82/11/30	0945	LOW SLACK	2	28.5
SI040	48 51.45	123 27.35	82/05/26	1100	EBB	7	29.0
			82/05/27	0935	EBB	<2	28.0
			82/05/28	0935	EBB	<2	28.5
			82/06/03	1410	FLOOD	<2	28.0
			82/06/04	1305	FLOOD	<2	28.0
			82/11/24	1355	EBB	<2	28.0
			82/11/26	1145	FLOOD	2	29.0
			82/11/28	1010	FLOOD	2	28.0
			82/11/30	0945	LOW SLACK	2	28.0
SI041	48 51.38	123 26.83	82/05/26	1105	EBB	<2	27.0
			82/05/27	0935	EBB	<2	28.0
			82/05/28	0930	EBB	8	28.5
			82/06/03	1400	FLOOD	<2	28.0
			82/06/04	1300	FLOOD	<2	28.5
			82/11/24	1400	EBB	<2	29.5
			82/11/26	1145	FLOOD	<2	29.5
			82/11/28	1005	FLOOD	<2	28.5
			82/11/30	0940	LOW SLACK	2	28.5

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI042	48 51.50	123 26.83	82/05/26	1105	EBB	<2	27.0
			82/05/27	0940	EBB	<2	28.0
			82/05/28	0930	EBB	<2	28.5
			82/06/03	1400	FLOOD	<2	28.0
			82/06/04	1300	FLOOD	<2	28.5
			82/11/24	1400	EBB	2	28.5
			82/11/26	1145	FLOOD	<2	29.0
			82/11/28	1005	FLOOD	<2	28.5
			82/11/30	0940	LOW SLACK	2	28.0
SI043	48 51.19	123 26.40	82/05/26	1105	EBB	<2	27.0
			82/05/27	0940	EBB	<2	29.0
			82/05/28	0925	EBB	2	28.5
			82/06/03	1335	FLOOD	<2	28.0
			82/06/04	1300	FLOOD	<2	29.0
			82/11/24	1405	EBB	<2	29.5
			82/11/26	1150	FLOOD	<2	
			82/11/28	1000	FLOOD	<2	28.5
			82/11/30	0940	LOW SLACK	<2	28.5
SI044	48 50.91	123 26.00	82/05/26	1110	EBB	5	26.5
			82/05/27	0945	EBB	<2	28.0
			82/05/28	0920	EBB	<2	28.5
			82/06/03	1335	FLOOD	<2	28.0
			82/06/04	1300	FLOOD	<2	29.0
			82/11/24	1410	EBB	<2	28.5
			82/11/26	1150	FLOOD	<2	
			82/11/28	1000	FLOOD	<2	28.0
			82/11/30	0935	LOW SLACK	<2	28.5
SI045	48 50.42	123 25.49	82/05/26	1110	EBB	<2	26.5
			82/05/27	0945	EBB	<2	28.0
			82/05/28	0920	EBB	<2	28.5
			82/06/03	1335	FLOOD	<2	28.0
			82/06/04	1255	FLOOD	<2	28.0
			82/11/24	1410	EBB	<2	28.5
			82/11/26	1150	FLOOD	2	
			82/11/28	0955	FLOOD	4	28.0
			82/11/30	0935	LOW SLACK	<2	28.0
SI046	48 48.41	123 25.35	82/05/26	1000	EBB	2	26.0
			82/05/27	0840	EBB	7	29.0
			82/05/28	0900	HIGH SLACK	<2	29.0
			82/06/03	1335	FLOOD	<2	28.0
			82/06/04	1240	FLOOD	2	29.5
			82/11/24	1210	EBB	4	28.5
			82/11/26	0930	FLOOD	5	
			82/11/28	0820	LOW SLACK	13	28.5
			82/11/30	0915	LOW SLACK	2	28.5

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI047	48 48.35	123 25.21	82/05/26	1000	EBB	<2	26.0
			82/05/27	0840	EBB	5	28.0
			82/05/28	0900	HIGH SLACK	2	29.5
			82/06/03	1335	FLOOD	<2	28.0
			82/06/04	1240	FLOOD	<2	29.0
			82/11/24	1210	EBB	<2	29.5
			82/11/26	0925	FLOOD	<2	28.5
			82/11/28	0820	LOW SLACK	<2	28.5
			82/11/30	0920	LOW SLACK	17	28.0
SI048	48 48.29	123 25.21	82/05/26	1000	EBB	8	26.0
			82/05/27	0845	EBB	<2	29.0
			82/05/28	0900	HIGH SLACK	2	29.0
			82/06/03	1340	FLOOD	<2	28.0
			82/06/04	1240	FLOOD	<2	29.0
			82/11/24	1205	EBB	5	29.0
			82/11/26	0925	FLOOD	<2	28.0
			82/11/28	0820	LOW SLACK	<2	28.0
			82/11/30	0920	LOW SLACK	<2	28.5
SI049	48 53.48	122 29.69	82/05/29	0820	HIGH SLACK	2	28.0
			82/05/30	1225	EBB	33	28.0
			82/05/31	1300	HIGH SLACK	<2	28.0
			82/06/01	1450	HIGH SLACK	<2	27.5
			82/06/02	1620	HIGH SLACK	<2	26.0
			82/11/23	0955	FLOOD	5	27.5
			82/11/25	1010	FLOOD	5	28.0
			82/11/27	1210	FLOOD	5	27.0
			82/11/29	1120	FLOOD	11	28.0
			82/12/01	1010	LOW SLACK	13	28.0
SI050	48 53.40	122 29.70	82/05/29	0825	HIGH SLACK	<2	28.0
			82/05/30	1225	EBB	<2	28.0
			82/05/31	1300	HIGH SLACK	2	28.0
			82/06/01	1450	HIGH SLACK	<2	27.5
			82/06/02	1620	HIGH SLACK	<2	28.0
			82/11/23	0955	FLOOD	<2	28.0
			82/11/25	1005	FLOOD	2	28.5
			82/11/27	1210	FLOOD	33	28.0
			82/11/29	1120	FLOOD	11	28.0
			82/12/01	1010	LOW SLACK	79	27.0
SI051	48 53.55	122 29.69	82/05/29	0830	HIGH SLACK	5	28.0
			82/05/30	1220	EBB	33	28.0
			82/05/31	1300	HIGH SLACK	2	28.0
			82/06/01	1450	HIGH SLACK	<2	27.5
			82/06/02	1615	HIGH SLACK	5	28.0
			82/11/23	0955	FLOOD	<2	28.0
			82/11/25	1010	FLOOD	33	28.0
			82/11/27	1210	FLOOD	79	27.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI051	continued...		82/11/29	1120	FLOOD	13	28.0
			82/12/01	1010	LOW SLACK	79	27.0
SI052	48 53.48	122 59.75	82/05/29	0835	HIGH SLACK	140	28.0
			82/05/30	1220	EBB	5	28.0
			82/05/31	1255	HIGH SLACK	<2	27.5
			82/06/01	1445	HIGH SLACK	<2	27.5
			82/06/02	1615	HIGH SLACK	<2	28.0
			82/11/23	0950	FLOOD	5	28.0
			82/11/25	1005	FLOOD	<2	28.0
			82/11/27	1205	FLOOD	23	27.0
			82/11/29	1115	FLOOD	22	28.5
			82/12/01	1010	LOW SLACK	33	27.5
SI053	48 53.55	122 29.90	82/05/29	0835	HIGH SLACK	<2	28.0
			82/05/30	1220	EBB	7	28.0
			82/05/31	1255	HIGH SLACK	2	27.5
			82/06/01	1445	HIGH SLACK	<2	27.5
			82/06/02	1615	HIGH SLACK	<2	28.0
			82/11/23	0950	FLOOD	5	28.0
			82/11/25	1005	FLOOD	7	28.5
			82/11/27	1205	FLOOD	49	27.5
			82/11/29	1115	FLOOD	23	28.5
			82/12/01	1005	LOW SLACK	49	27.5
SI054	48 53.60	122 29.90	82/05/29	0835	HIGH SLACK	23	28.0
			82/05/30	1215	EBB	2	28.0
			82/05/31	1255	HIGH SLACK	2	28.0
			82/06/01	1445	HIGH SLACK	<2	27.5
			82/06/02	1615	HIGH SLACK	<2	28.0
			82/11/23	0945	FLOOD	<2	28.0
			82/11/25	1005	FLOOD	5	28.5
			82/11/27	1200	FLOOD	240	27.5
			82/11/29	1115	FLOOD	23	28.0
			82/12/01	1005	LOW SLACK	79	25.0
SI055	48 53.60	123 30.00	82/05/29	0840	HIGH SLACK	<2	28.0
			82/05/30	1215	EBB	<2	28.0
			82/05/31	1250	HIGH SLACK	2	27.5
			82/06/01	1440	HIGH SLACK	<2	27.5
			82/06/02	1615	HIGH SLACK	<2	27.0
			82/11/23	0945	FLOOD	2	28.0
			82/11/25	1000	FLOOD	<2	29.0
			82/11/27	1200	FLOOD	5	27.5
			82/11/29	1110	FLOOD	23	28.0
			82/12/01	1005	LOW SLACK	33	27.5

APPENDIX III : Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI056	48 53.70	123 30.05	82/05/29	0845	HIGH SLACK	4	28.0
			82/05/30	1215	EBB	5	28.0
			82/05/31	1250	HIGH SLACK	4	27.5
			82/06/01	1435	HIGH SLACK	33	27.5
			82/06/02	1610	HIGH SLACK	8	28.0
			82/11/23	0940	FLOOD	<2	28.0
			82/11/25	1000	FLOOD	2	29.0
			82/11/27	1200	FLOOD	7	28.0
			82/11/29	1110	FLOOD	4	28.0
			82/12/01	1000	LOW SLACK	33	27.5
SI057	48 53.61	123 30.10	82/05/29	0845	HIGH SLACK	13	28.0
			82/05/30	1215	FLOOD	2	28.0
			82/05/31	1250	HIGH SLACK	<2	28.0
			82/06/01	1435	HIGH SLACK	<2	27.5
			82/06/02	1610	HIGH SLACK	<2	28.0
			82/11/23	0940	FLOOD	<2	28.0
			82/11/25	0955	FLOOD	<2	28.0
			82/11/27	1155	FLOOD	5	28.0
			82/11/29	1110	FLOOD	49	27.5
			82/12/01	0955	EBB	13	28.0
SI058	48 53.70	123 30.21	82/05/29	0850	HIGH SLACK	2	28.0
			82/05/30	1210	HIGH SLACK	<2	28.0
			82/05/31	1245	HIGH SLACK	<2	27.5
			82/06/01	1435	HIGH SLACK	<2	27.5
			82/06/02	1610	HIGH SLACK	13	28.0
			82/11/23	0935	FLOOD	<2	28.0
			82/11/25	0955	FLOOD	<2	28.0
			82/11/27	1155	FLOOD	<2	28.0
			82/11/29	1105	FLOOD	22	28.0
			82/12/01	0955	EBB	13	28.5
SI059	48 53.80	123 30.19	82/05/29	0850	HIGH SLACK	<2	28.0
			82/05/30	1000	FLOOD	<2	28.0
			82/05/31	1100	FLOOD	<2	27.5
			82/06/01	1215	FLOOD	<2	27.5
			82/06/02	1415	FLOOD	<2	28.0
			82/11/23	1000	FLOOD	2	30.0
			82/11/25	0955	FLOOD	<2	28.0
			82/11/27	1155	FLOOD	13	28.0
			82/11/29	1105	FLOOD	2	28.5
			82/12/01	1015	LOW SLACK	7	29.0
SI060	48 53.90	123 30.41	82/05/29	0855	HIGH SLACK	<2	28.0
			82/05/30	1005	FLOOD	2	28.0
			82/05/31	1100	FLOOD	<2	28.0
			82/06/01	1220	FLOOD	<2	27.5
			82/06/02	1420	FLOOD	<2	28.0
			82/11/01	1015	LOW SLACK	5	29.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI060	continued...		82/11/23	1000	FLOOD	<2	29.0
			82/11/25	0950	FLOOD	<2	28.0
			82/11/27	1150	FLOOD	<2	28.0
			82/11/29	1100	FLOOD	4	28.0
SI061	48 54.20	123 30.81	82/05/29	0900	HIGH SLACK	<2	28.0
			82/05/30	1015	HIGH SLACK	8	28.0
			82/05/31	1105	FLOOD	<2	27.5
			82/06/01	1225	FLOOD	2	27.5
			82/06/02	1420	FLOOD	<2	28.0
			82/11/23	1005	FLOOD	2	28.0
			82/11/25	0950	FLOOD	2	28.0
			82/11/27	1150	FLOOD	4	27.0
			82/11/29	1100	FLOOD	4	28.5
			82/12/01	1015	LOW SLACK	<2	29.0
SI062	48 54.60	123 31.23	82/05/29	0905	HIGH SLACK	5	28.0
			82/05/30	1015	HIGH SLACK	23	28.0
			82/05/31	1105	FLOOD	<2	27.5
			82/06/01	1230	FLOOD	5	27.5
			82/06/02	1420	FLOOD	<2	28.0
			82/11/23	1005	FLOOD	2	28.0
			82/11/25	0950	FLOOD	5	28.0
			82/11/27	1145	FLOOD	5	27.0
			82/11/29	1055	FLOOD	4	28.5
			82/12/01	1020	LOW SLACK	<2	29.0
SI063	48 54.56	123 31.39	82/05/29	0910	HIGH SLACK	2	28.0
			82/05/30	1020	HIGH SLACK	5	28.0
			82/05/31	1110	FLOOD	<2	28.0
			82/06/01	1235	FLOOD	<2	27.5
			82/06/02	1425	FLOOD	<2	28.0
			82/11/23	1015	FLOOD	<2	28.5
			82/11/25	0945	FLOOD	8	27.5
			82/11/27	1140	FLOOD	<2	28.0
			82/11/29	1055	FLOOD	2	28.0
			82/12/01	1020	LOW SLACK	2	29.0
SI064	48 54.71	123 31.49	82/05/29	0910	HIGH SLACK	13	28.0
			82/05/30	1020	HIGH SLACK	<2	28.0
			82/05/31	1110	FLOOD	<2	27.5
			82/06/01	1235	FLOOD	2	27.5
			82/06/02	1425	FLOOD	<2	28.0
			82/11/23	1015	FLOOD	2	28.5
			82/11/25	0945	FLOOD	5	28.0
			82/11/27	1135	FLOOD	5	27.0
			82/11/29	1050	FLOOD	<2	28.0
			82/12/01	1020	LOW SLACK	2	29.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI065	48 54.75	123 31.58	82/05/29	0915	HIGH SLACK	<2	28.0
			82/05/30	1025	HIGH SLACK	2	28.5
			82/05/31	1115	FLOOD	<2	27.5
			82/06/01	1240	FLOOD	<2	27.5
			82/06/02	1425	FLOOD	<2	27.0
			82/11/23	1020	FLOOD	<2	28.0
			82/11/25	0940	FLOOD	<2	28.5
			82/11/27	1135	FLOOD	11	27.5
			82/11/29	1050	FLOOD	<2	29.0
			82/12/01	1030	LOW SLACK	5	29.0
SI066	48 54.85	123 31.68	82/05/29	0920	EBB	2	28.0
			82/05/30	1030	HIGH SLACK	8	29.5
			82/05/31	1115	FLOOD	<2	28.0
			82/06/01	1240	FLOOD	2	27.5
			82/06/02	1430	FLOOD	<2	27.0
			82/11/25	0940	FLOOD	<2	28.5
			82/11/27	1135	FLOOD	4	28.0
			82/11/29	1050	FLOOD	<2	28.5
			82/12/01	1030	LOW SLACK	33	29.0
SI067	48 54.96	123 32.00	82/05/29	0925	EBB	<2	28.0
			82/05/30	1030	HIGH SLACK	<2	28.5
			82/05/31	1120	FLOOD	<2	28.0
			82/06/01	1250	FLOOD	<2	27.5
			82/06/02	1430	FLOOD	<2	27.0
			82/11/23	1025	FLOOD	2	28.0
			82/11/25	0935	FLOOD	2	28.0
			82/11/27	1130	FLOOD	23	28.0
			82/11/29	1045	FLOOD	5	28.5
			82/12/01	1030	LOW SLACK	<2	29.0
SI068	48 55.00	123 32.19	82/05/29	0930	EBB	<2	28.0
			82/05/30	1035	HIGH SLACK	2	29.5
			82/05/31	1120	FLOOD	<2	28.0
			82/06/01	1255	FLOOD	4	27.5
			82/06/02	1435	FLOOD	<2	28.0
			82/11/23	1025	FLOOD	<2	28.0
			82/11/25	0935	FLOOD	<2	28.5
			82/11/27	1130	FLOOD	2	28.0
			82/11/29	1045	FLOOD	7	28.5
SI069	48 55.03	123 32.39	82/05/29	0930	EBB	2	28.0
			82/05/30	1040	HIGH SLACK	<2	29.0
			82/05/31	1125	FLOOD	<2	28.0
			82/06/01	1255	FLOOD	<2	27.5
			82/06/02	1435	FLOOD	<2	28.0
			82/11/23	1030	FLOOD	<2	28.0
			82/11/25	0935	FLOOD	<2	28.0
			82/11/27	1130	FLOOD	2	27.5
			82/11/29	1045	FLOOD	5	28.5

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI070	48 55.28	123 32.83	82/05/29	0935	EBB	<2	28.0
			82/05/30	1040	HIGH SLACK	<2	29.0
			82/05/31	1130	FLOOD	<2	28.0
			82/06/01	1255	FLOOD	<2	27.5
			82/06/02	1440	FLOOD	<2	28.0
SI071	48 55.39	123 33.10	82/05/29	0940	EBB	<2	28.0
			82/05/30	1045	HIGH SLACK	2	28.5
			82/05/31	1130	FLOOD	<2	27.5
			82/06/01	1300	FLOOD	<2	27.5
			82/06/02	1440	FLOOD	<2	28.0
SI072	48 55.70	123 33.59	82/05/29	0950	EBB	<2	28.0
			82/05/31	1140	FLOOD	<2	27.5
			82/06/01	....	OTHER	2	27.5
			82/06/02	....	OTHER	<2	28.0
			82/11/28	0955	FLOOD	23	28.0
			82/11/29	1500	HIGH SLACK	33	27.0
			82/11/30	1345	FLOOD	27	26.0
			82/12/01	0900	EBB	350	27.5
			82/12/02	0910	EBB	7	28.5
SI073	48 55.81	123 33.65	82/05/29	0950	EBB	<2	28.0
			82/05/31	1140	FLOOD	<2	27.5
			82/06/01	....	OTHER	4	27.5
			82/06/02	....	OTHER	<2	28.0
			82/11/28	1000	FLOOD	110	28.0
			82/11/29	1455	HIGH SLACK	49	26.5
			82/11/30	1345	FLOOD	11	28.0
			82/12/01	1015	LOW SLACK	79	28.0
			82/12/02	0905	EBB	13	28.0
SI074	48 55.88	123 33.82	82/05/29	0955	EBB	<2	28.0
			82/05/31	1145	FLOOD	<2	27.5
			82/06/01	....	OTHER	<2	27.5
			82/06/02	....	OTHER	<2	28.0
			82/11/28	1005	FLOOD	23	28.0
			82/11/29	1500	HIGH SLACK	33	28.0
			82/11/30	1350	HIGH SLACK	8	28.0
			82/12/01	1020	LOW SLACK	<2	29.0
			82/12/02	0900	EBB	17	28.0
SI075	48 51.96	123 32.45	82/05/29	1130	EBB	13	28.0
			82/05/30	1325	EBB	<2	28.0
			82/05/31	1400	HIGH SLACK	<2	28.0
			82/06/01	1540	HIGH SLACK	49	27.5
			82/06/02	1650	HIGH SLACK	<2	28.0
			82/11/23	1130	HIGH SLACK	2	28.0
			82/11/25	1055	FLOOD	<2	28.0
			82/11/27	1340	HIGH SLACK	7	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI075	continued...		82/11/29	1205	FLOOD	11	26.0
			82/12/01	0850	EBB	7	28.0
SI076	48 51.90	123 32.43	82/05/29	1150	EBB	4	28.0
			82/05/30	1325	EBB	2	27.5
			82/05/31	1350	HIGH SLACK	<2	27.5
			82/06/01	1540	HIGH SLACK	<2	27.5
			82/06/02	1650	HIGH SLACK	5	28.0
			82/11/23	1110	HIGH SLACK	<2	28.0
			82/11/25	1100	FLOOD	<2	28.0
			82/11/27	1340	HIGH SLACK	2	28.0
			82/11/29	1205	FLOOD	2	27.5
			82/12/01	0850	EBB	<2	28.0
SI077	48 51.90	123 32.43	82/05/29	1145	EBB	2	28.0
			82/05/30	1325	EBB	5	28.0
			82/05/31	1345	HIGH SLACK	5	28.0
			82/06/01	1535	HIGH SLACK	5	27.5
			82/06/02	1650	HIGH SLACK	2	28.0
			82/11/23	1130	HIGH SLACK	5	28.0
			82/11/25	1100	FLOOD	<2	28.0
			82/11/27	1340	HIGH SLACK	<2	28.0
			82/11/29	1205	FLOOD	2	27.5
			82/12/01	0850	EBB	13	28.5
SI078	48 51.90	123 32.55	82/05/29	1130	EBB	7	28.0
			82/05/30	1325	EBB	5	28.0
			82/05/31	1400	HIGH SLACK	<2	27.5
			82/06/01	1545	HIGH SLACK	<2	27.5
			82/06/02	1650	HIGH SLACK	<2	28.0
			82/11/23	1130	HIGH SLACK	5	28.0
			82/11/25	1055	FLOOD	2	28.0
			82/11/27	1340	HIGH SLACK	<2	28.0
			82/11/29	1205	FLOOD	8	26.0
			82/12/01	0845	EBB	<2	28.5
SI079	48 51.99	123 32.60	82/05/29	1125	EBB	8	28.0
			82/05/30	1315	EBB	<2	27.0
			82/05/31	1400	HIGH SLACK	5	27.5
			82/06/01	1545	HIGH SLACK	2	27.5
			82/06/02	1655	HIGH SLACK	8	28.0
			82/11/23	1135	HIGH SLACK	2	28.0
			82/11/25	1055	FLOOD	2	28.0
			82/11/27	1335	HIGH SLACK	<2	27.5
			82/11/29	1200	FLOOD	2	27.5
			82/12/01	0845	EBB	2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI080	48 51.90	123 32.62	82/05/29	1115	EBB	<2	28.0
			82/05/30	1300	EBB	2	27.5
			82/05/31	1345	HIGH SLACK	5	27.5
			82/06/01	1530	HIGH SLACK	2	27.5
			82/06/02	1650	EBB	17	28.0
			82/11/23	1135	HIGH SLACK	5	28.0
			82/11/25	1050	FLOOD	<2	28.5
			82/11/27	1335	HIGH SLACK	<2	27.5
			82/11/29	1200	FLOOD	17	26.5
			82/12/01	0845	EBB	17	28.0
SI081	48 51.99	123 32.70	82/05/29	1110	EBB	<2	28.0
			82/05/30	1300	EBB	2	28.0
			82/05/31	1345	HIGH SLACK	2	27.5
			82/06/01	1550	HIGH SLACK	2	27.5
			82/06/02	1700	HIGH SLACK	2	28.0
			82/11/23	1135	HIGH SLACK	8	28.0
			82/11/25	1050	FLOOD	<2	28.0
			82/11/27	1335	HIGH SLACK	<2	28.0
			82/11/29	1200	FLOOD	2	26.5
			82/12/01	0840	EBB	13	28.0
SI082	48 52.00	123 32.88	82/05/29	1205	EBB	5	28.0
			82/05/30	1300	EBB	<2	27.5
			82/05/31	1330	HIGH SLACK	2	27.5
			82/06/01	1600	HIGH SLACK	23	27.5
			82/06/02	1700	HIGH SLACK	2	28.5
			82/11/23	1110	HIGH SLACK	<2	28.0
			82/11/25	1100	FLOOD	<2	28.0
			82/11/27	1340	HIGH SLACK	<2	28.0
			82/11/29	1205	FLOOD	5	27.5
			82/12/01	0850	EBB	2	28.5
SI083	48 52.94	123 32.92	82/05/29	1210	EBB	7	28.0
			82/05/30	1310	EBB	<2	28.0
			82/05/31	1340	HIGH SLACK	33	28.0
			82/06/01	1600	HIGH SLACK		27.5
			82/06/02	1700	HIGH SLACK	2	28.0
			82/11/23	1115	HIGH SLACK	<2	28.0
			82/11/25	1100	FLOOD	2	28.0
			82/11/27	1345	HIGH SLACK	<2	28.0
			82/11/29	1210	FLOOD	<2	28.0
			82/12/01	0855	EBB	4	28.5
SI084	48 52.05	123 33.00	82/05/29	1215	EBB	2	28.0
			82/05/30	1310	EBB	2	28.0
			82/05/31	1340	HIGH SLACK	<2	27.5
			82/06/01	1555	HIGH SLACK	<2	27.5
			82/06/02	1700	HIGH SLACK	<2	28.0
			82/11/23	1115	HIGH SLACK	<2	28.0

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI084	continued...		82/11/25	1100	FLOOD	2	28.0
			82/11/27	1345	HIGH SLACK	2	28.0
			82/11/29	1225	FLOOD	2	27.5
			82/12/01	0855	EBB	<2	29.0
SI085	48 52.04	123 32.88	82/05/29	1210	EBB	33	28.0
			82/05/30	1305	EBB	13	28.0
			82/05/31	1330	HIGH SLACK	9	27.5
			82/06/01	1550	HIGH SLACK	8	27.5
			82/06/02	1700	HIGH SLACK	5	28.0
			82/11/23	1120	HIGH SLACK	<2	28.0
			82/11/25	1105	FLOOD	<2	28.0
			82/11/27	1340	HIGH SLACK	<2	28.0
			82/11/29	1210	FLOOD	2	27.5
			82/12/01	0855	EBB	5	28.0
SI086	48 52.08	123 32.92	82/05/29	1210	EBB	2	28.0
			82/05/30	1305	EBB	<2	28.0
			82/05/31	1340	HIGH SLACK	8	27.5
			82/06/01	1555	HIGH SLACK	2	27.5
			82/06/02	1700	HIGH SLACK	<2	28.0
			82/11/23	1120	HIGH SLACK	<2	28.0
			82/11/25	1105	FLOOD	<2	28.0
			82/11/27	1345	HIGH SLACK	<2	28.0
			82/11/29	1210	FLOOD	<2	28.0
			82/12/01	0855	EBB	<2	28.0
SI087	48 52.08	123 33.00	82/05/29	1215	EBB	5	28.0
			82/05/30	1310	EBB	<2	28.0
			82/05/31	1340	HIGH SLACK	2	27.5
			82/06/01	1550	HIGH SLACK	5	27.5
			82/06/02	1700	HIGH SLACK	<2	28.0
			82/11/23	1115	HIGH SLACK	<2	28.0
			82/11/25	1105	FLOOD	<2	28.5
			82/11/27	1345	HIGH SLACK	<2	28.0
			82/11/29	1220	FLOOD	<2	28.0
			82/12/01	0900	EBB	2	28.0
SI088	48 51.80	123 32.28	82/11/23	1140	HIGH SLACK	<2	28.0
			82/11/25	1050	FLOOD	<2	28.0
			82/11/27	1335	HIGH SLACK	11	27.5
			82/11/29	1200	FLOOD	9	26.5
			82/12/01	0840	EBB	17	27.0
SI089	48 51.78	123 32.15	82/11/23	1140	HIGH SLACK	2	28.0
			82/11/25	1045	FLOOD	<2	28.0
			82/11/27	1335	HIGH SLACK	17	27.0
			82/11/29	1200	FLOOD	8	27.0
			82/12/01	0840	EBB	95	26.5

APPENDIX III Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SI090	48 51.76	123 32.05	82/11/23	1140	HIGH SLACK	2	29.0
			82/11/25	1045	FLOOD	2	28.0
			82/11/27	1335	HIGH SLACK	11	28.0
			82/11/29	1200	FLOOD	33	26.5
			82/12/01	0840	EBB	7	27.5
SI091	48 51.74	123 31.82	82/11/23	1145	HIGH SLACK	<2	28.0
			82/11/25	1040	FLOOD	8	28.0
			82/11/27	1330	HIGH SLACK	7	27.5
			82/11/29	1155	FLOOD	17	26.0
			82/12/01	0835	EBB	11	26.5
SI092	48 51.70	123 31.67	82/11/23	1145	HIGH SLACK	17	28.0
			82/11/25	1040	FLOOD	9	28.0
			82/11/27	1320	HIGH SLACK	8	27.0
			82/11/29	1155	FLOOD	2	26.5
			82/12/01	0835	EBB	33	23.0
SI093	48 47.48	123 31.10	82/11/27	1250	HIGH SLACK	23	27.0
			82/11/29	0900	FLOOD	17	28.0
			82/12/01	1155	LOW SLACK	79	28.5
SI094	48 47.44	123 31.08	82/11/27	1255	HIGH SLACK	<2	28.0
			82/11/29	0905	LOW SLACK	5	27.5
			82/12/01	1155	LOW SLACK	130	27.5
SI095	48 47.47	123 31.06	82/11/27	1300	HIGH SLACK	<2	28.0
			82/11/29	0905	LOW SLACK	<2	27.5
			82/12/01	1205	FLOOD	8	26.0
SI096	48 47.43	123 31.20	82/11/27	1300	HIGH SLACK	5	27.5
			82/11/29	0905	LOW SLACK	<2	28.0
			82/12/01	1210	FLOOD	7	26.0
SI097	48 47.44	123 31.25	82/11/27	1255	HIGH SLACK	<2	28.0
			82/11/29	0905	LOW SLACK	<2	27.5
			82/12/01	1210	FLOOD	17	28.5
SI098	48 47.39	123 31.24	82/11/27	1300	HIGH SLACK	<2	28.0
			82/11/29	0910	LOW SLACK	5	27.0
			82/12/01	1205	FLOOD	33	24.5
SI099	48 55.62	123 33.42	82/12/01	1025	LOW SLACK	<2	29.0
			82/12/02	0915	EBB	46	28.0
SI100	48 55.60	123 33.40	82/12/01	1025	LOW SLACK	2	29.5
			82/12/02	0920	EBB	22	28.0

APPENDIX IV

SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

APPENDIX IV
SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	MAY - JUNE 1982				NOVEMBER - DECEMBER 1982				COMBINED			
	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th
1	5	< 2 - 2	2	2	4	< 2 - 23	5	17.0	9	< 2 - 23	2	9.5
2	5	< 2 - 2	2	2	4	2 - 8	6	8	9	< 2 - 8	2	8
3	5	< 2 - 2	< 2	2	4	< 2 - 2	< 2	2	9	< 2 - 2	< 2	2
4	5	< 2 - 11	2	6.5	4	< 2 - 2	< 2	2	9	< 2 - 11	2	2.9
5	5	< 2 - 33	< 2	19	4	< 2 - 23	10	19	9	< 2 - 33	5	24
6	5	< 2 - 17	< 2	9.5	4	< 2 - 8	6	7.6	9	< 2 - 17	2	8.9
7	5	< 2 - 13	< 2	8.5	4	< 2 - 8	< 2	9.2	9	< 2 - 13	< 2	8.5
8	5	< 2 - 2	< 2	< 2	4	< 2 - 14	< 2	9.2	9	< 2 - 14	< 2	3.2
9	4	< 2 - 2	< 2	2	2	< 2			6	< 2 - 2	< 2	2
10	4	< 2	< 2	< 2	2	< 2			6	< 2		
11	4	< 2 - 2	< 2	< 2	2	< 2			6	< 2 - 2	< 2	< 2
12	5	< 2 - 17	2	15	4	< 2 - 17	< 2	10.2	9	< 2 - 17	< 2	7.6
13	5	< 2 - 2	< 2	< 2	4	< 2	< 2	< 2	9	< 2 - 2	< 2	< 2
14	5	< 2 - 79	2	46	4	< 2 - 2	< 2	< 2	9	< 2 - 79	< 2	19.6
15	5	< 2 - 2	< 2	2	4	< 2	< 2	< 2	9	< 2 - 2	< 2	< 2
16	5	< 2 - 2	< 2	< 2	4	< 2 - 2	< 2	< 2	9	< 2 - 2	< 2	< 2
17	5	< 2 - 2	< 2	< 2	4	< 2 - 2	< 2	2	9	< 2 - 2	< 2	< 2
18	5	< 2 - 2	< 2	< 2	4	< 2 - 2	< 2	2	9	< 2 - 2	< 2	< 2
19	5	< 2 - 2	< 2	< 2	4	< 2 - 5	< 2	3.8	9	< 2 - 5	< 2	2.3
20	5	< 2	< 2	< 2	4	< 2	< 2	< 2	9	< 2		
21	5	< 2 - 2	2	2	4	< 2 - 2	< 2	< 2	9	< 2 - 2	< 2	< 2
22	5	< 2	< 2	< 2	4	< 2 - 2	< 2	< 2	9	< 2 - 2	< 2	< 2
23	5	< 2 - 13	< 2	9	4	< 2 - 4	2	3.2	9	< 2 - 13	2	5.8
24	5	< 2 - 5	< 2	5	4	< 2 - 2	< 2	2	9	< 2 - 5	< 2	5
25	5	< 2 - 5	< 2	2.5	4	< 2 - 2	< 2	< 2	9	< 2 - 5	< 2	2.3
26	5	< 2 - 23	< 2	12.5	4	< 2 - 11	< 2	2.8	9	< 2 - 23	< 2	12.2
27	4	< 2 - 11	3.5	8.6	4	< 2 - 23	3.5	15.8	8	< 2 - 23	3.5	13.4
28	4	< 2 - 13	5	9.8	4	< 2 - 49	5	32.6	8	< 2 - 49	5	20.2
29	4	< 2 - 8	< 2	5.6	4	< 2 - 13	5	11	8	< 2 - 8	2	8
30	5	< 2 - 5	< 2	2.5	4	< 2 - 5	< 2	3	9	< 2 - 5	< 2	5
31	5	< 2 - 17	11	17	4	< 2 - 8	< 2	5.6	9	< 2 - 17	2	17
32	5	< 2 - 11	2	11	4	< 2 - 2	< 2	< 2	9	< 2 - 11	2	11
33	5	< 2 - 5	< 2	2.5	4	< 2 - 23	6.5	19	9	< 2 - 23	< 2	14

Continued...

APPENDIX IV
SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS (Continued)

STATION	MAY - JUNE 1982				NOVEMBER - DECEMBER 1982				COMBINED			
	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th
34	5	< 2 - 23	< 2	11.5	4	< 2 - 49	11	35	9	< 2 - 49	< 2	25.6
35	5	< 2 - 46	2	24	4	< 2 - 5	< 2	3.8	9	< 2 - 46	2	9.1
36	5	< 2	< 2	< 2	4	< 2 - 2	< 2	< 2	9	< 2 - 2	< 2	< 2
37	5	< 2 - 8	< 2	5	4	< 2			9	< 2 - 8	< 2	3.8
38	5	< 2 - 13	2	10.5	4	< 2 - 5	< 2	3	9	< 2 - 13	< 2	8.5
39	5	< 2 - 5	< 2	2.5	4	< 2 - 2	2	< 2	9	< 2 - 5	< 2	2.3
40	5	< 2 - 7	< 2	3.5	4	< 2 - 2	2	2	9	< 2 - 7	< 2	2.6
41	5	< 2 - 8	< 2	4	4	< 2 - 2	< 2	< 2	9	< 2 - 8	< 2	8
42	5	< 2	< 2	< 2	4	< 2 - 2	< 2	< 2	9	< 2 - 2	< 2	< 2
43	5	< 2 - 2	< 2	< 2	4	< 2			9	< 2 - 2	< 2	< 2
44	5	< 2 - 5	< 2	< 2	4	< 2			9	< 2 - 5	< 2	< 2
45	5	< 2	< 2	< 2	4	< 2 - 4	< 2	3.2	9	< 2 - 4	< 2	2.2
46	5	< 2 - 7	2	4.5	4	2 - 13	4.5	9.8	9	< 2 - 13	2	7.6
47	5	< 2 - 5	< 2	3.5	4	< 2 - 17	< 2	10.2	9	< 2 - 17	< 2	6.2
48	5	< 2 - 8	< 2	5	4	< 2 - 5	< 2	3	9	< 2 - 8	< 2	5.3
49	5	< 2 - 33	< 2	17.5	5	5 - 13	5	8	9	< 2 - 33	5	13
50	5	< 2 - 2	< 2	< 2	5	< 2 - 79	11	56	9	< 2 - 79	< 2	33
51	5	< 2 - 33	5	19	5	< 2 - 79	33	79	9	< 2 - 79	9	79
52	5	< 2 - 140	< 2	72.5	5	< 2 - 33	22	28	9	< 2 - 140	5	33
53	5	< 2 - 7	< 2	4.5	5	5 - 49	23	49	9	< 2 - 49	6	49
54	5	4 - 23	2	12.5	5	< 2 - 240	23	159.5	9	< 2 - 240	3.5	79
55	5	< 2 - 2	< 2	< 2	5	< 2 - 33	5	28	9	< 2 - 33	< 2	23
56	5	4 - 33	5	20.5	5	< 2 - 33	4	20	9	< 2 - 33	4.5	33
57	5	< 2 - 13	< 2	7.5	5	< 2 - 49	5	31	9	< 2 - 49	< 2	13
58	5	< 2 - 13	< 2	7.5	5	< 2 - 22	< 2	17.5	9	< 2 - 22	< 2	13
59	5	< 2			5	< 2 - 13	2	5	9	< 2 - 13	< 2	7
60	5	< 2 - 2	< 2	< 2	5	< 2 - 5	< 2	4.5	9	< 2 - 5	< 2	4
61	5	< 2 - 8	< 2	5	5	< 2 - 4	2	4	9	< 2 - 8	2	4
62	5	< 2 - 23	5	14	5	< 2 - 5	4	5	9	< 2 - 23	4.5	5
63	5	< 2 - 5	< 2	3.5	5	< 2 - 8	2	5	9	< 2 - 8	< 2	5
64	5	< 2 - 13	< 2	7.5	5	< 2 - 5	2	5	9	< 2 - 13	2	5
65	5	< 2 - 2	< 2	< 2	5	< 2 - 11	< 2	8	10	< 2 - 11	< 2	5

Continued...

APPENDIX IV
SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS (Continued)

STATION	MAY - JUNE 1982				NOVEMBER - DECEMBER 1982				COMBINED			
	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th
66	5	< 2 - 8	2	5	4	< 2 - 33	2	21.4	9	< 2 - 33	2	10.5
67	5	< 2	< 2	< 2	5	< 2 - 23	2	14	10	< 2 - 23	< 2	5.0
68	5	< 2 - 4	< 2	3	4	< 2 - 7	< 2	5	9	< 2 - 7	< 2	4.3
69	5	< 2 - 2	< 2	< 2	4	< 2 - 5	< 2	3.8	9	< 2 - 5	< 2	2.3
70	5	< 2										
71	5	< 2 - 2	< 2	< 2								
72	4	< 2 - 2	< 2	< 2	5	7 - 350	27	191.5	9	< 2 - 350	7	64.7
73	4	< 2 - 4	< 2	2.4	5	11 - 110	49	94.5	9	< 2 - 110	11	82.1
74	4	< 2			5	< 2 - 33	17	28	9	< 2 - 33	< 2	24
75	5	< 2 - 49	20	31	5	< 2 - 11	7	9	10	< 2 - 13	4.5	13
76	5	< 2 - 5		4.5	5	< 2 - 2	< 2	2	10		< 2	14
77	5	2 - 5	5	5	5	< 2 - 13	2	4	10	< 2 - 8	3.5	5
78	5	< 2 - 7	< 2	6.0	5	< 2 - 8	2	6.5	10	< 2 - 8	< 2	7
79	5	< 2 - 8	5	8	5	< 2 - 2	2	2	10	< 2 - 49	2	8
80	5	< 2 - 17	2	11	5	< 2 - 17	5	12	10	< 2 - 13	3.5	17
81	5	< 2 - 2	2	2	5	< 2 - 13	2	10.5	10	< 2 - 5	2	8
82	5	< 2 - 23	2	14.0	5	< 2 - 5	< 2	3.5	10	< 2 - 23	2	5
83	4	< 2 - 33	4.5	22.6	5	< 2 - 4	< 2	3.0	9	< 2 - 33	2	9.6
84	5	< 2 - 2	< 2	2	5	< 2 - 2	2	2	10	< 2 - 8	< 2	2
85	5	5 - 33	9	23	5	< 2 - 5	< 2	3.5	10	< 2 - 33	5	13
86	5	< 2 - 8	< 2	5	5	< 2	2	2	10	< 2 - 2	< 2	2
87	5	< 2 - 5	2	5	5	< 2 - 2	< 2	< 2	5	< 2 - 5	< 2	5
88					5	< 2 - 17	9	14				
89					5	< 2 - 95	8	56				
90					5	2 - 33	7	22				
91					5	< 2 - 17	8	14				
92					5	2 - 33	9	25				
93					3	17 - 79						
94					3	< 2 - 130						
95					3	< 2 - 8						
96					3	< 2 - 7						
97					3	< 2 - 17						

Continued...

APPENDIX IV
SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS (Continued)

STATION	MAY - JUNE 1982				NOVEMBER - DECEMBER 1982				COMBINED			
	No. of Samples[1]	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th	No. of Samples	MPN PER 100 ML Range	Median	90th
98					3	< 2 - 33						
99					2	< 2 - 46						
100					2	2 - 22						

APPENDIX V

TABLE 1: DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS

TABLE 2: SUMMARY OF BACTERIOLOGICAL DATA FOR FRESHWATER SAMPLE STATIONS MAY-JUNE 1982

TABLE 3: SUMMARY OF BACTERIOLOGICAL DATA FOR FRESHWATER SAMPLE STATIONS NOVEMBER-DECEMBER 1982

APPENDIX V - TABLE 1
DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS

SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.	SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.
S1	May 26/82	17	6	S6	May 27/82	10	< 10
	27	5	78		28	50	108
	28	27	188		June 2	710	38
	June 2	93	125	S7	May 27	30	20
	Nov 23	3	-		28	121	73
	24	1	-		June 2	150	540
	25	1	-		Nov 23	2	-
	26	6	-		24	3	-
	27	26	< 10		25	1	-
	28	257	-		26	14	-
S2	May 27	< 10	< 10		27	13	-
	28	0	20	S8	May 26	420	11
	June 2	0	0		27	100	4
	Nov 28	6	-		28	43	390
S3	May 27	50	100		June 2	190	20
	28	16	43		Nov 23	10	-
	June 2	117	53		24	20	-
	Nov 23	240	-		25	11	-
	24	71	-		26	17	-
	25	62	-		27	160	-
	26	240	-		28	1250	730
	27	220	-	S9	May 30	40	< 10
	28	390	800		31	4	21
S4	May 27	< 10	< 10		June 1	8	-
	28	9	173		2	8	0
S5	May 27	20	20		3	5	0
	28	32	71	S10	May 30	330	1700
	June 2	20	3		31	160	240
	Nov 30	40	30		June 1	60	80

Continued...

APPENDIX V - TABLE 1
DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS
(Continued)

SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.	SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.
S10 (cont.)	June 2/82	88	190	S12 (cont.)	Nov 25	10	-
	3	9	55		26	13	-
	Nov 25	51	-		27	21	-
	26	50	-		28	53	-
	27	8	-		29	84	109
	28	< 10	-	S13	30	46	80
	29	18	108		May 29	8	9
	30	< 10	30		30	22	1
	Dec 1	-	10		31	56	13
S11	May 30	45	72		June 1	10	29
	31	75	148		2	22	3
	June 1	17	96		3	12	10
	2	285	6		Nov 23	16	-
	3	30	7		25	14	-
	Nov 23	0	-		26	41	-
	25	0	-		27	51	-
	26	0	-		28	64	-
	27	1	-		29	40	32
	28	43	-	S14	30	54	73
	30	40	10		Nov 23	12	-
S12	May 29	190	170		24	5	-
	30	280	280		25	5	-
	31	140	50		26	9	-
	June 1	270	160		27	150	-
	2	110	< 10	S15	28	360	69
	3	< 10	100		Nov 23	0	-
	Nov 23	11	-		24	0	-
	25	10	-		25	0	-
					Nov 26	0	-

Continued...

APPENDIX V - TABLE 1
DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS
(Continued)

SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.	SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.
S15 (cont.)	Nov 27/82	10	-	S19	Nov 26	1900	-
	28	13	-		27	320	60
S16	Nov 24	5	-		28	480	60
	25	5	-		Dec 1	20	40
	26	83	-	S20	Nov 26	16	-
	27	170	-		27	180	-
	28	110	31		28	410	200
	30	110	< 10	S21	Nov 27	340	-
	Dec 1	30	< 10		29	70	101
S17	Nov 24	92	-		30	44	41
	25	59	-		Dec 1	20	10
	26	96	-	S22	Nov 28	510	-
	27	760	-		29	270	140
	28	730	150		30	200	100
	29	470	64		Dec 1	500	70
	30	110	< 10		2	140	-
	Dec 1	8	< 10	S23	Nov 28	510	-
S18	Nov 25	0	-		Dec 1	440	40
	26	2	-	S24	Dec 2	48	-
	27	0	-	S25	Dec 2	400	-
	28	13	-				

APPENDIX V - TABLE 2

SUMMARY OF BACTERIOLOGICAL DATA FOR FRESHWATER SAMPLE STATIONS, SALTSPRING ISLAND, MAY-JUNE, 1982

SAMPLE STATION	FECAL COLIFORM/100 mls			FECAL STREPTOCOCCI/100 mls			MEAN[1] FC:FS RATIOS
	No. of Samples	Range	Mean	No. of Samples	Range	Mean	
S1	4	5 - 93	35	4	6 - 188	99	
S2	3	0 - < 10		3	0 - 20		
S3	3	16 - 117	61	3	43 - 100	65	
S4	2	9 - < 10		2	< 10 - 173	10	
S5	3	20 - 32	24	3	3 - 71	31	
S6	3	10 - 710 est.		3	< 10 - 108	52	
S7	3	30 - 150	100	3	20 - 540	211	0.3
S8	4	43 - 420	188	4	4 - 390	107	
S9	5	4 - 40	13	4	0 - 21	7	
S10	5	9 - 330	129	5	55 - 1700	453	0.9
S11	5	17 - 285	90	5	6 - 148	66	
S12	6	< 10 - 280	162	6	< 10 - 280	128	1.3
S13	6	8 - 56	22	6	1 - 29	11	

[1]FC:FS ratios are calculated only when both values exceed 100/100 mL. The ratio is expressed as the mean of the daily ratios.

APPENDIX V - TABLE 3

SUMMARY OF BACTERIOLOGICAL DATA FOR FRESHWATER SAMPLE STATIONS, SALTSPRING ISLAND, NOVEMBER-DECEMBER, 1982

SAMPLE STATION	FECAL COLIFORM/100 mls			FECAL STREPTOCOCCI/100 mls		
	No. of Samples	Range	Mean	No. of Samples	Range	Mean
S1	6	1 - 257	49	1		< 10
S2	1		6			
S3	6	62 - 390	204	1		800
S4	not sampled			not sampled		
S5	1		40	1		30
S6	not sampled					
S7	5	1 - 14	7			
S8	6	10 - 1250	245	1		730
S9	not sampled			not sampled		
S10	6	< 10 - 51	24.5	3	10 - 108	69
S11	6	0 - 43	14	1		10
S12	7	10 - 84	34	2	80 - 109	95
S13	7	14 - 64	40	2	32 - 73	53
S14	6	5 - 360	90	1		69
S15	6	0 - 13	4	-	-	-
S16	7	5 - 170	73	3	< 10 - 31	17
S17	8	8 - 760	291	4	< 10 - 150	59
S18	4	0 - 13	4	-	-	-
S19	4	20 - 1900	680	3	40 - 60	53
S20	3	16 - 410	202	1	-	200
S21	4	20 - 340	119	3	10 - 101	51
S22	5	140 - 510	324	3	70 - 140	103
S23	2	440 - 510	475	1	-	40
S24	1		48			
S25	1		400			

APPENDIX VI

CAPITAL REGIONAL DISTRICT WASTEWATER TREATMENT PLANT - MALAVIEW ESTATES SALTSPRING ISLAND - EVALUATION AND ANALYTICAL RESULTS

1. INTRODUCTION

Sampling of the Capital Regional District Sewage Treatment plant at Malaview was done to assess the performance of the STP and the effects of the STP discharge on the bacteriological water quality of the adjacent foreshore.

The STP at Malaview is a "Spirogester" which is a primary treatment plant capable of removing 40-60% of the suspended matter and 25-40% of the B.O.D., depending on the operation and maintenance schedule of the STP. Design features and operation of the STP are well documented in the previous shellfish survey report of 1977. At the time of this survey, flow sensing/recording equipment was being installed for continuous recording of the final effluent discharge rate. Flows were taken at the time of sampling and/or dye releases and are presented in Table 1.

TABLE 1
CRD - MALAVIEW WASTEWATER TREATMENT PLANT FLOW DATA

DATE	TIME	FLOW (m^3/sec)	(m^3/day)	(IG/day)
May 31	1435	.000582	50.82	11,061
June 1	1000	.000595	51.37	11,307
June 1	1415	.000589	50.89	11,195

The WMB permit issued for the S.T.P. specify permitted flow values of 96.55 m^3/day.

Information obtained from the Capital Regional District on desluging of the digestion chamber indicate this is done approximately bi-weekly by a septic tank cleaning service.

2. PROCEDURES

Grab samples of influent and effluent from the C.R.D. Treatment Plant at Malaview were collected between 0800 hours and 1000 hours and between 1400 hours and 1600 hours on May 31, June 1 and June 2, 1982. Samples were collected in appropriate containers, preserved, and either stored at 4°C or frozen and were submitted for analysis on June 3, 1982. All effluent samples for chemical analysis were submitted to the Environmental Protection Service/Fisheries and Marine Service Chemistry Laboratory, Cypress Creek, West Vancouver, and analyzed according to the most recent edition of the EPS/FMS Laboratory Manual.

Bacteriological samples were collected in sterile wide mouth bottles and submitted to the EPS mobile laboratory, located during the survey at St. Marys Lake, Saltspring Island. Samples were analysed as described in Section 3.1.

3. DISCUSSION

Results of the chemical analyses of the effluent grab samples are presented in Table 2.

Reduction percentages for parameters sampled in the influent and effluent of the S.T.P. at Malaview are presented in Table 3. Values indicate the S.T.P. at the time of the survey was having little or no effective treatment on raw sewage to the plant. Ammonia and total phosphorus increased through the plant by 66% and 45%, respectively. B.O.D., nitrate and nitrite remain unchanged. Suspended solids (Non-filterable residues) were reduced by 23%.

4. CONCLUSIONS

The C.R.D. STP at Malaview as evidenced by the data was not operating efficiently. Quality of the primary effluent could be improved significantly. Plant data and observations of solids floating on the surface of the sedimentation tank indicate maintenance/operational problems.

TABLE 2

C.R.D. MALAVIEW WASTEWATER TREATMENT PLANT ANALYTICAL RESULTS[1]

DATE:	MAY 31				JUNE 4				JUNE 2			
	AM		PM		AM		PM		AM		PM	
	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT	INFLUENT	EFFLUENT
SAMPLE #:	1	2	3	4	5	6	7	8	9	10	11	12
PARAMETER												
B.O.D.[2]	125	114	80	116	117	99	56	117	95	93	179	110
Nitrite (N)	0.022	0.031	0.018	0.035	0.026	0.033	0.015	0.038	0.064	0.035	0.059	0.035
Nitrate (N)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ammonia (N)	23.7	35.5	24.3	30.0	22.5	31.0	8.88	29.5	16.0	36.0	19.5	28.3
Total PO_4 (P)	7.27	8.55	10.10	8.05	6.25	7.80	2.60	10.0	5.95	9.50	5.49	10.3
Non-Filt. R.[2]	308	116	128	140	224	80	76	180	44	80	76	64

[1] All values in mg/L

[2] W.M.B. permit value for BOD and NFR are 100 and 120, respectively.

TABLE 3

CRD-MALAVIEW WASTEWATER TREATMENT PLANT

% Reduction in Analytical Parameter Tested[1]

PARAMETER	MEAN		% REDUCTION
	INFLUENT	EFFLUENT	
BOD	108	108	0
Nitrite	0.034	0.0345	0
Nitrate	< 0.01	< 0.01	0
Ammonia	19.1	31.7	(+) 66
T. PO_4	6.2	9.0	(+) 45
Non. Filt. R.	143	110	23

[1]All results are expressed in mg/L

(+) represents % increase

APPENDIX VII

BIOCHEMICAL CONFIRMATION RESULTS

1 INTRODUCTION

The accuracy of the MPN test procedure in recovering fecal coliforms (specifically Escherichia coli) from the marine environment is routinely tested as part of the microbiology laboratory quality control procedure.

During shellfish surveys, a minimum of 10% of all positive (growth + gas) A-1 media tubes are subjected to biochemical identification to confirm the presence of E. coli in the sample. Positive tubes are generally picked randomly unless anomolous results are observed at individual samples stations.

2 MATERIALS AND METHODS

Inocula from positive A-1 tubes are streaked on Levine's EMB agar to obtain isolated colonies. After 24 hours incubation on Levine's EMB, typical coliform colonies are picked for further biochemical identification. If no typical coliform colonies are present, atypical colonies are selected for biochemical screening.

All isolates are subjected to biochemical screening using the API20E system (Analytab Products, New York).

3 RESULTS AND DISCUSSION

The percentage recovery of E. coli was 100% (150/150) for the study.