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SHELLFISH GROWING WATER SANITARY SURVEY
OF
BEAVER HARBOUR
BRITISH COLUMBIA, 1971

SURVEILLANCE REPORT EPS 5-PR-73-4
PACIFIC REGION
MARCH, 1973

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1971 SHELLFISH GROWING WATER
SANITARY SURVEY OF BEAVER
HARBOUR, B. C.

by

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Report number EPS 5-PR-73-4

March, 1973

ABSTRACT

A sanitary survey of the waters of Beaver Harbour on the north-east coast of Vancouver Island in the District of Port Hardy was conducted during August, 1971, by personnel of Public Health Engineering, Department of National Health and Welfare. Additional bacteriological data was obtained as a result of further sampling carried out during August, 1972, by the Environmental Protection Service of the Department of the Environment.

The purpose of the survey was to acquire data on the bacteriological quality of the shellfish growing waters prior to the discharge of treated domestic sewage into Beaver Harbour from a proposed Mobile Home Park.

The unacceptably high coliform counts in the surveyed foreshore waters are mainly attributed to direct sewage discharges and seepage from dwellings located on the watershed of the unnamed creek which flows through the Fort Rupert Indian Reserve into Beaver Harbour.

The waters in the vicinity of Shell and Cattle Islands meet the criterion for an approved shellfish growing area, but the discharge of sewage treatment plant effluent to Beaver Harbour could contaminate these waters and cause further deterioration of the foreshore water quality.

A recommendation is made to maintain the existing contaminated area.

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1. INTRODUCTION

As a result of an application dated March 1, 1971, by the Municipality of Port Hardy, to the Pollution Control Branch of the Department of Lands, Forests, and Water Resources of British Columbia for a permit to discharge effluent from a Mobile Home Park at Rupert District into Beaver Harbour, a bacteriological survey was carried out by Public Health Engineering, Department of National Health and Welfare, from August 22 to 26, 1971, to acquire data on the water movement and background water quality of Beaver Harbour.

Beaver Harbour, as well as containing one of the few good beaches accessible to the residents of Port Hardy, is a prime shellfish growing area. The foreshores of Beaver Harbour and Shell Island are a source of commercially and recreationally harvested butter clams and horse clams, and are a traditional food source for the native Indians living at Beaver Harbour.

Included in the report is additional bacteriological data collected as a result of further sampling work carried out on significant fresh water inputs to Beaver Harbour by the Environmental Protection Service of the Department of the Environment from August 1 to 6, 1972.

The geographical location of Beaver Harbour is shown in Figure 1.

2. FIELD PROCEDURES AND METHODS

Sampling stations were selected and a water bacteriological testing program developed to assess the shellfish growing water quality and the source of bacteriological contamination.

2.1 Bacteriological Sampling and Analyses

At each marine station, samples were taken from a boat using sterile six ounce wide-mouth bottles attached to the end of a 5-foot sampling rod.

The samples were collected $\frac{1}{2}$ to 1 foot below the surface at a water depth of 3 feet and stored in coolers

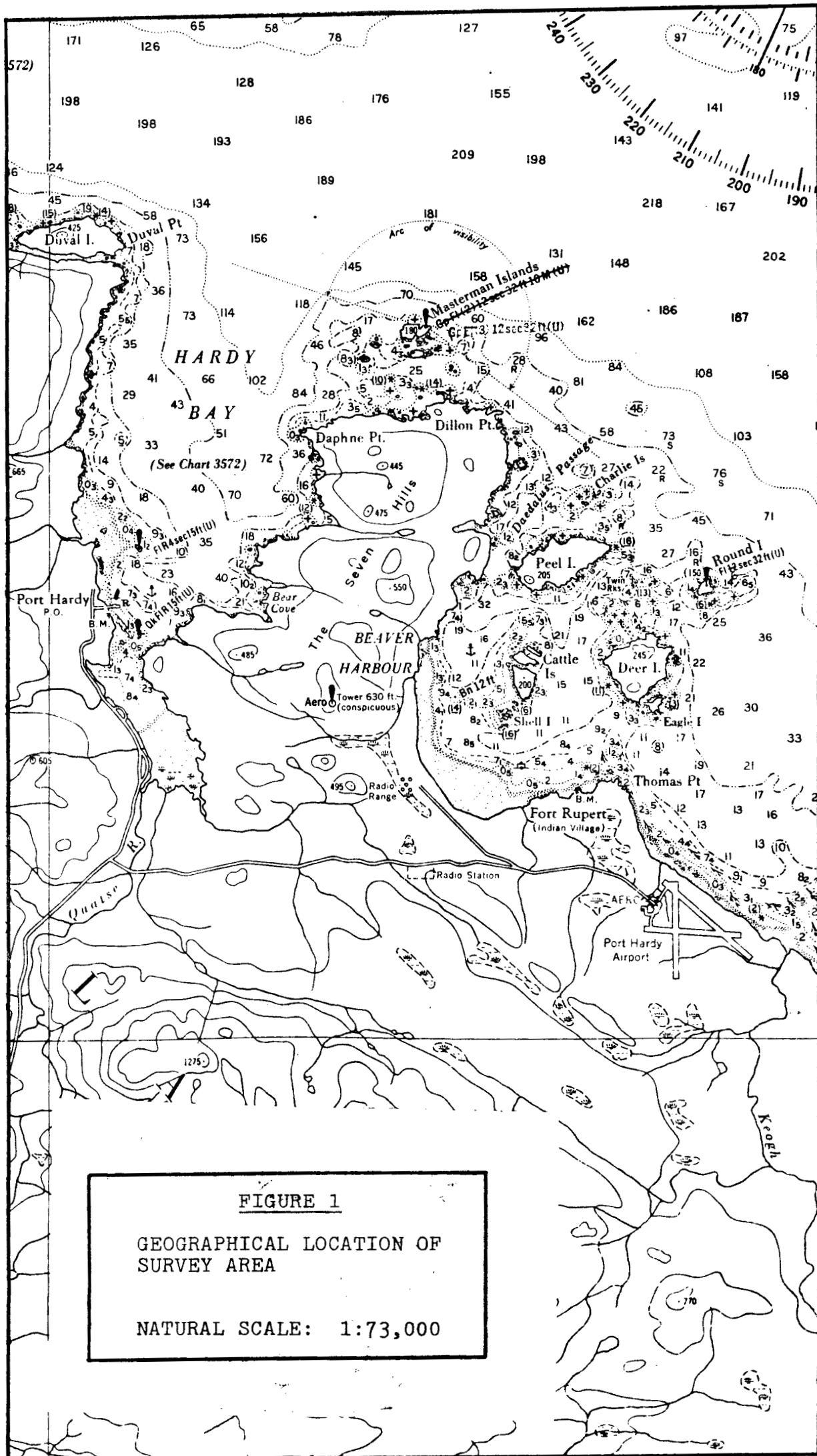


FIGURE 1
 GEOGRAPHICAL LOCATION OF
 SURVEY AREA
 NATURAL SCALE: 1:73,000

until processed.

At each fresh water station, samples were collected 1 to 6 inches below the surface in a sterile 6 ounce wide-mouth bottle attached to the end of a 5 foot sampling rod.

Analyses were carried out in the Public Health Engineering mobile field laboratory located at Port Hardy Airport water treatment plant. Analyses were performed within three hours after collection. The total coliform count was determined using the Membrane Filter Technique as described in the 12th Edition of Standard Methods for the Examination of Water and Wastewater, Part VII, page 610.

Analyses of samples collected in 1972 were carried out within 5 hours (average 2½ hours) after collection using the Environmental Protection Service mobile laboratory located at the water treatment plant. The total coliform MPN was determined using the multiple tube fermentation technique as described in the 13th Edition of Standard Methods for the Examination of Water and Wastewater, Part 407A, page 664.

2.2 Float Studies

Float studies were conducted on August 25 and 26, 1971. Floats were launched from a boat in the vicinity of the proposed outfall in Beaver Harbour. The floats employed were of two types:

- (a) The metal vane type riding at a depth of four feet below the water surface and buoyed by a plastic bottle filled with sufficient water to allow only two inches of the bottle to protrude.
- (b) The surface float type consisting of 3 quart size plastic bottles with sand to allow only the bottle necks and the flagged staff to protrude.

3. DISCUSSION OF RESULTS

The locations of the stream and marine sample stations

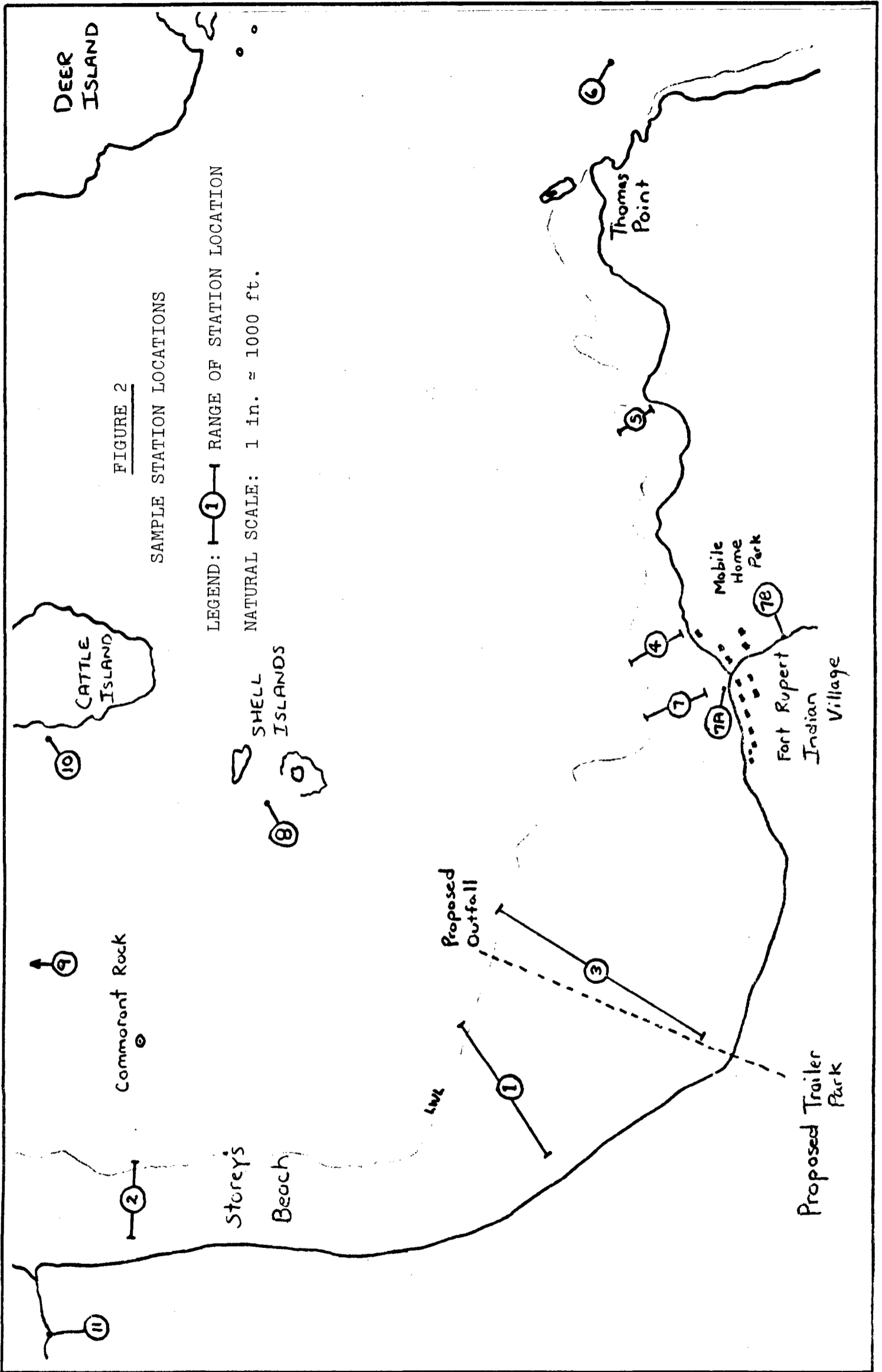



FIGURE 2

SAMPLE STATION LOCATIONS

LEGEND:  RANGE OF STATION LOCATION
 NATURAL SCALE: 1 in. = 1000 ft.

are shown in Figure 2 and described in Appendix 1. Sample station 11 was an additional station established during the course of the further work carried out in 1972. The bacteriological data obtained during the survey is assembled in Tables 1 and 2.

The bacteriological results indicate that the shellfish growing waters are contaminated mainly by the outflow of the unnamed creek at Fort Rupert. Referring to Table 1, samples taken at station 3, 7 and 7B gave results which exceeded the bacteria criterion for an approved shellfish growing area; namely a total coliform median count of the water not exceeding 70 per 100 ml. Although only two samples were collected at station 7A, results of both were extremely high. In addition, for station 6, more than 10% of samples exceeded 230/100 ml. The water quality at station 6, off Thomas Point, is probably affected by the discharge of raw sewage from the Port Hardy Airport outfall situated approximately 3,700 feet south-east of Thomas Point.

Referring to Table 2, sample stations 7A, 7B and 11 gave results which exceeded the bacteria criterion for an approved shellfish growing area. The results show that the median coliform MPN for station 7A is greater than that at station 7B. This was expected as a result of observations made along the creek. The creek condition above station 7B was intermittently stagnant and flowing slowly. The water colour was a dark amber and there was visible drainage from the fields on either side of the creek. There were no visible outfalls upstream of station 7B.

Between station 7A and 7B were located six possible sources of fecal contribution:

- (a) Seepage from on-site disposal systems of eight trailer homes situated on the hill approximately 500 feet north-east of the creek portion between station 7B and the Indian Reserve road crossing.

TABLE 1
TOTAL COLIFORM COLONIES PER 100 ml
BY MEMBRANE FILTRATION METHOD

Date and Sampling Time	SAMPLE STATION										Remarks ² Tide and Weather			
	1	2	3	4	5	6	7	7A	7B	8		9	10	
Aug. 22 1100 to 1200	341	57	350	16	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	Flood 0845 hrs. 2.8' Tide 1459 hrs. 14.1' SE Swells in Strait; Calm wind
Aug. 22 1910 to 2040 (Shore Samples)	3	2	140	13	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	(NS)	Ebb 1459 hrs. 14.1' Tide 2055 hrs. 4.9' SE Swells in Strait; Calm wind
Aug. 23 0850 to 1050 (Shore Samples)	30	134	140	12	0	(NS)	(NS)	2605	(NS)	(NS)	(NS)	(NS)	(NS)	Low slack 0910 hrs. 3.4' to flood 1520 hrs. 14.2'
Aug. 23 1430 to 1620 (Shore Samples)	120	990	80	5	0	540	(NS)	1770	(NS)	(NS)	(NS)	(NS)	(NS)	High Slack 0910 hrs. 3.4' 1526 hrs. 14.2' 2130 hrs. 4.8'
Aug. 24 1210 to 1300	40	23	80	32	12	10	100	(NS)	(NS)	0	(NS)	0	(NS)	Flood 0930 hrs. 4.2' Tide 1544 hrs. 14.2' SW breeze 3 to 5
Aug. 24 1829 to 1915	0	9	270	12	62	360	3500	(NS)	(NS)	0	(NS)	0	0	Ebb 1544 hrs. 14.2' Tide 2205 hrs. 4.8' N and NW breezes
Aug. 25 1307 to 1350	0	3	40	0	0	0	250	(NS)	(NS)	740	0	0	0	Flood 0950 5.0' Tide 1609 14.1' NE breeze 0 - 2

TABLE 1 (Cont'd)
 TOTAL COLIFORM COLONIES PER 100 mL
 BY MEMBRANE FILTRATION METHOD

Date and Sampling Time	SAMPLE STATION										Remarks Tide and Weather		
	1	2	3	4	5	6	7	7A	7B	8		9	10
Aug. 25 1845 to 1945	1	2	0	251	0	0	0	(NS)	1130	0	1	0	Ebb 1609 14.1' 2250 4.9' NW wind 2 - 10 (chop) Sea choppy (rough)
Aug. 26 0724 to 0752	7	9	(NS)	128	16	0	100	(NS)	600	0	2	0	Ebb 0444 12.1' Tide 1020 5.9' Wind NE 0 to 2; Sea calm
Aug. 26 1245 to 1328	0	35	188	0	1	0	60	(NS)	1030	0	0	0	Flood 1020 hrs. 5.9' Tide 1639 hrs. 14.0' NE breeze; Sea NE ripples
No. of Samples	10	10	9	10	8	7	6	2	4	7	5	7	
Range	0-341	12-990	0-350	0-251	0-62	0-540	0-3500	1770-2605	600-1130	0	0-2	0	
Median	5	16	140	13	1	0	100	-	875	0	0	0	
% Over 230	10	10	22	10	0	29	33	100	100	0	0	0	

(NS) - Not Sampled

(1) All times are Pacific Daylight Saving Time.

(2) Tide data is for Alert Bay Reference Port. All compass bearings are true bearings.

TABLE 2

STANDARD TOTAL CONFIRMED COLIFORM MPN PER 100 ml
BY MULTIPLE FERMENTATION TECHNIQUE (1972 SURVEY)

Date	Sampling Time	Run No.	Sample Station 7A	Sample Station 7B	Il	Date	Sampling Time	Run No.	Sample Station 7A	Sample Station 7B	Il
Aug. 1	1425-1635	1	1600	33	540	Aug. 5	0950-1050	8	1.3 x 10 ⁴	110	(NS)
Aug. 2	0935-1050	2	1.7 x 10 ⁴	400	350	Aug. 5	1355-1520	9	9.2 x 10 ⁴	1.8	(NS)
Aug. 2	1545-1655	3	3.5 x 10 ⁴	1300	450	Aug. 6	1000-1200	10	2.8 x 10 ⁴	6.8	(NS)
Aug. 3	1030-1230	4	>1.6 x 10 ⁵	450	1600	No. of Samples			10	10	5
Aug. 3	1705-1805	5	5.4 x 10 ⁴	45	240	Range			1600-	1.8-	240-
Aug. 4	0740-0900	6	>1.6 x 10 ⁵	1300	(NS)	Median			>1.6 x 10 ⁵	2300	1600
Aug. 4	1240-1400	7	9.2 x 10 ⁴	2300	(NS)	% Over 230			4,45 x 10 ⁴	255	450
									100	50	100

(NS) - Not Sampled

- (b) Sewage discharge from a 2" I.D. pipe terminating in the creek bed approximately 30 yards downstream from the Reserve road crossing.
- (c) Sewage discharge from a 2" I.D. pipe terminating in the creek bed approximately 5 yards downstream from (b).
- (d) Sewage discharge from a broken pipe protruding from the bank above the creek approximately 20 yards downstream from (c).
- (e) Sewage discharge from a 4" I.D. steel pipe protruding from the bank 12 feet above the creek, approximately 40 yards downstream from (d).
- (f) Sewage discharge from a 4" I.D. pipe protruding from the bank 12 feet above the creek approximately 30 yards downstream from (e).

Station 7A was located in the creek beneath the last designated outfall. No discharges were observed during the sampling period. It was also noted that the creek bed and the beach at the creek mouth were covered with assorted scrap metal and garbage.

Due to lack of rainfall during the 1972 sampling period, the creek bed downstream from station 11 was dry for a distance of approximately 50 yards to the beach. The creek at the location of station 11 was stagnant and dark ember in colour. Large patches of green algal growth were observed on the beaches adjacent to both stations 11 and 7A.

Floats were launched in the vicinity of the proposed trailer court sewage outfall to determine the flow patterns that discharged sewage would follow. Figures 3A, 3B, 3C and 3D of Appendix 2 show the float movements over a two day period. Float study No. 1 showed that floats launched beyond the low water line travelled at a rate of approximately 1,000 feet per hour on the flood tide and reached shore in less than 4 hours under light winds from the north. In float study No. 2 on the same day, the floats travelled approximately the same distance in a little over

1 hour during the last hour of the flood tide cycle. In float study No. 3 floats launched in the outfall vicinity travelled shoreward during the end of an ebb tide cycle at a rate of approximately 750 feet per hour until running aground in weeds. Winds were light from the north-east during this study. In float study No. 4, the same day on the early flood tide, the depth float travelled almost 1,000 feet in 2½ hours towards shore in a southerly direction under light northeast winds, while the surface float covered approximately 2,5000 feet in less than 3 hours towards shore in a south-west direction.

4. CONCLUSIONS

- (a) The results of the survey show that the bacteriological quality of the surveyed foreshore waters do not meet the criterion for an approved shellfish growing area. Total coliform contributions are mainly attributed to direct sewage discharges and seepage from dwellings located on the watershed of the unnamed creek which flows through the Fort Rupert Indian Reserve into Beaver Harbour.
- (b) The waters in the vicinity of the Shell and Cattle Islands show very low coliform levels, but the discharge of sewage from the trailer court secondary treatment plant through an outfall located within 2,000 feet of Shell Island could contaminate these waters.
- (c) The sewage outfall discharge could also cause further Deterioration of Beaver Harbour foreshore water quality, since the float studies show that outfall effluent could reach the foreshore in less than 2 hours. Under favourable travel tide and wind conditions, the travel time could be considerably shorter.

5. RECOMMENDATIONS

- (a) Contaminated Area 12-3 in Schedule J of the British

Columbia Fishery Regulations should remain unchanged.

ACKNOWLEDGEMENTS

The sanitary survey including the bacteriological membrane filter analyses were conducted by D. Ellis (P.Eng.), and G. Bradshaw (Technician).

Mr. Bradshaw compiled the technical data and Mr. Ellis prepared the report.

The 1972 survey sampling was carried out by D. Low (Field Technician), and N. Hamilton (Student Technician). Bacteriological analyses were performed by J. McKee (Bacteriologist), assisted by B. Kay (Student Technician).

Mr. McKee compiled the bacteriological data. Mr. Low compiled all other data and assembled the report for printing.

A P P E N D I X 1

SAMPLE STATION LOCATION
DESCRIPTIONS

DESCRIPTION OF SAMPLE STATION LOCATIONS

SAMPLE

STATION

DESCRIPTION

1. Fort Rupert boat launching area on a bearing line from northwest shore of Deer Island through south tip of Shell Islands.
2. Storey's Beach on a bearing line from south tip of Cattle Island past Cormorant Rock to shore.
3. Proposed outfall area on a bearing line south of Cormorant Rock.
4. East boundary of Fort Rupert Indian Reserve on a bearing line 65° W. of N. (mag.) to Cormorant Rock.
5. R.C.A.F. wharf location approximately 2000 feet east of Station 4.
6. Opposite Thomas Point.
7. Opposite mouth of creek through Fort Rupert Indian Reserve.
- 7A. Creek through Fort Rupert Indian Reserve at beach.
- 7B. Creek through Fort Rupert Indian Reserve approximately 80 yards upstream from road crossing.
8. Beaver Harbour, approximately 200 feet west of gap between Shell Islands.
9. Midway on a bearing line from bluff at north end of Storey's beach to north tip of Cattle Islands.
10. Beaver Harbour, approximately 200 feet west side of largest Cattle Island.
11. Stream at north end of Storey's Beach, approximately 500 feet upstream.

NOTES:

1. Samples along shore of Beaver Harbour were taken about 6 inches below the surface at wading depth regardless of the tidal stage i.e. not a fixed distance from a shore reference point.
2. Samples at Station 6 were taken approximately 50 to 75 yards offshore due to extensive kelp beds in area.
3. Station 11 established during 1972 survey only.
4. All compass bearing are true bearings unless otherwise noted.

A P P E N D I X 2

FLOAT STUDIES

FIGURE 3(A)	Float Study	August 25
FIGURE 3(B)	Float Study	August 25
FIGURE 3(C)	Float Study	August 26
FIGURE 3(D)	Float Study	August 26

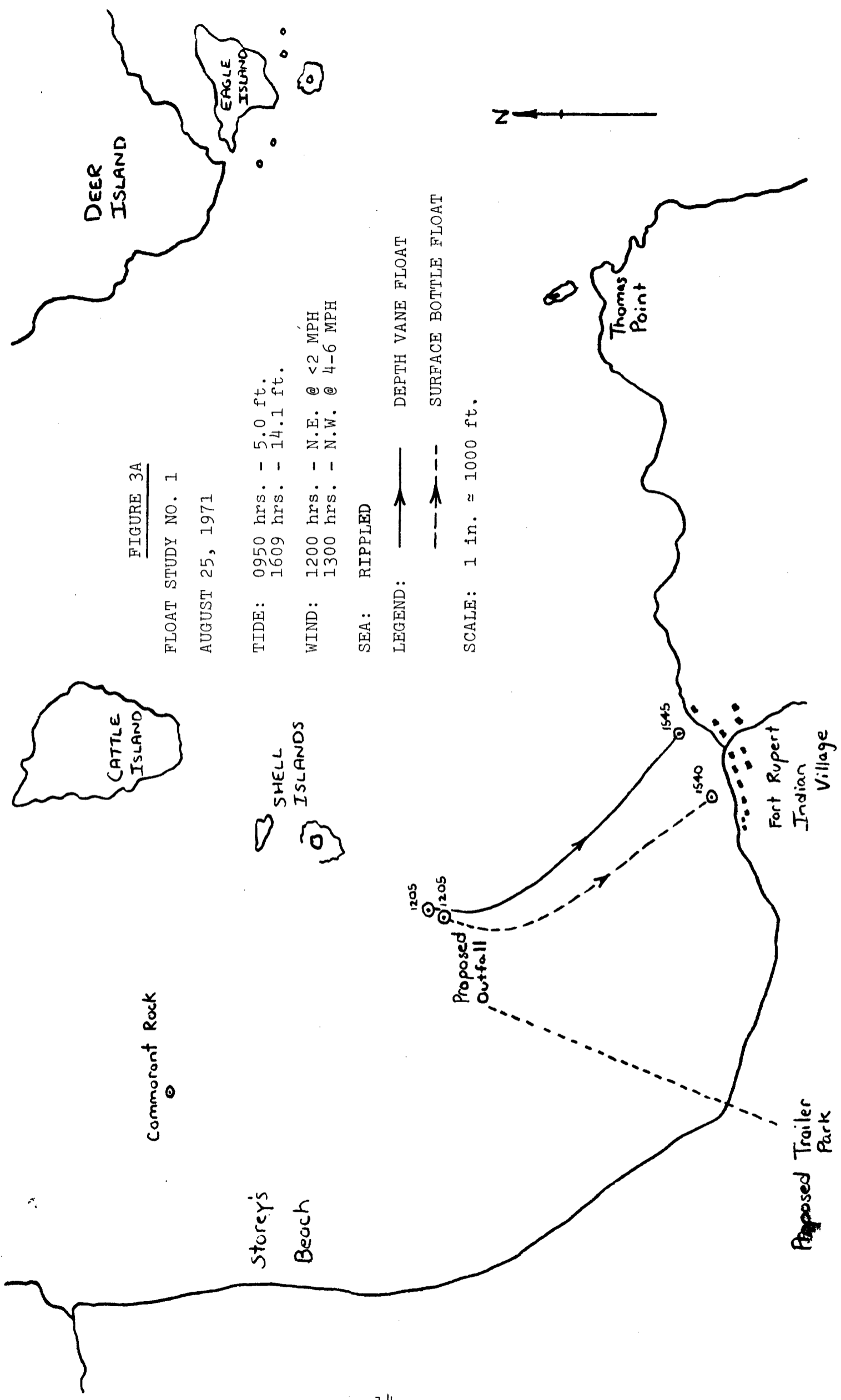


FIGURE 3A



FLOAT STUDY NO. 1

AUGUST 25, 1971

TIDE: 0950 hrs. - 5.0 ft.
 1609 hrs. - 14.1 ft.

WIND: 1200 hrs. - N.E. @ <2 MPH
 1300 hrs. - N.W. @ 4-6 MPH

SEA: RIPPLED

LEGEND:  DEPTH VANE FLOAT
 SURFACE BOTTLE FLOAT

SCALE: 1 in. = 1000 ft.

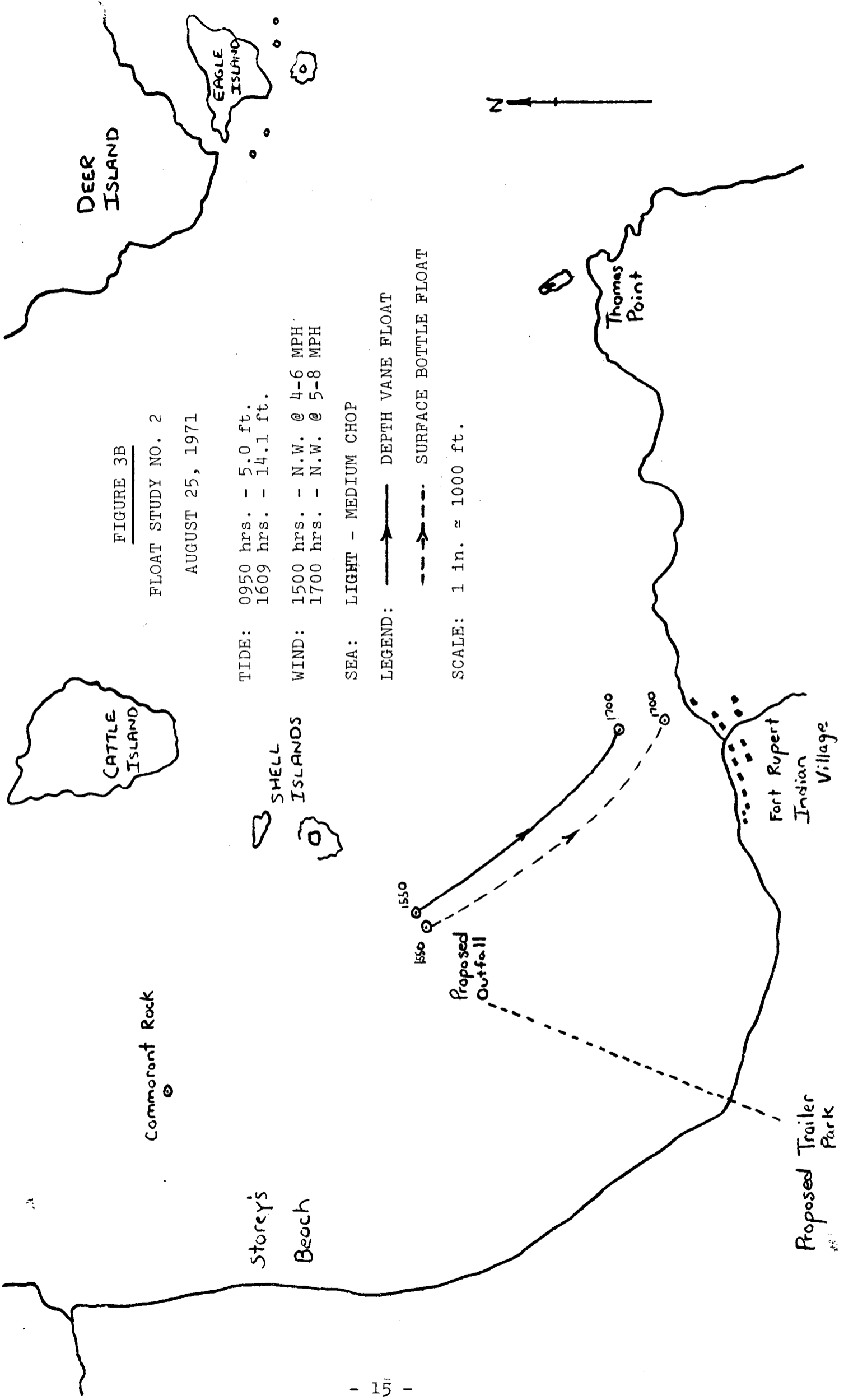


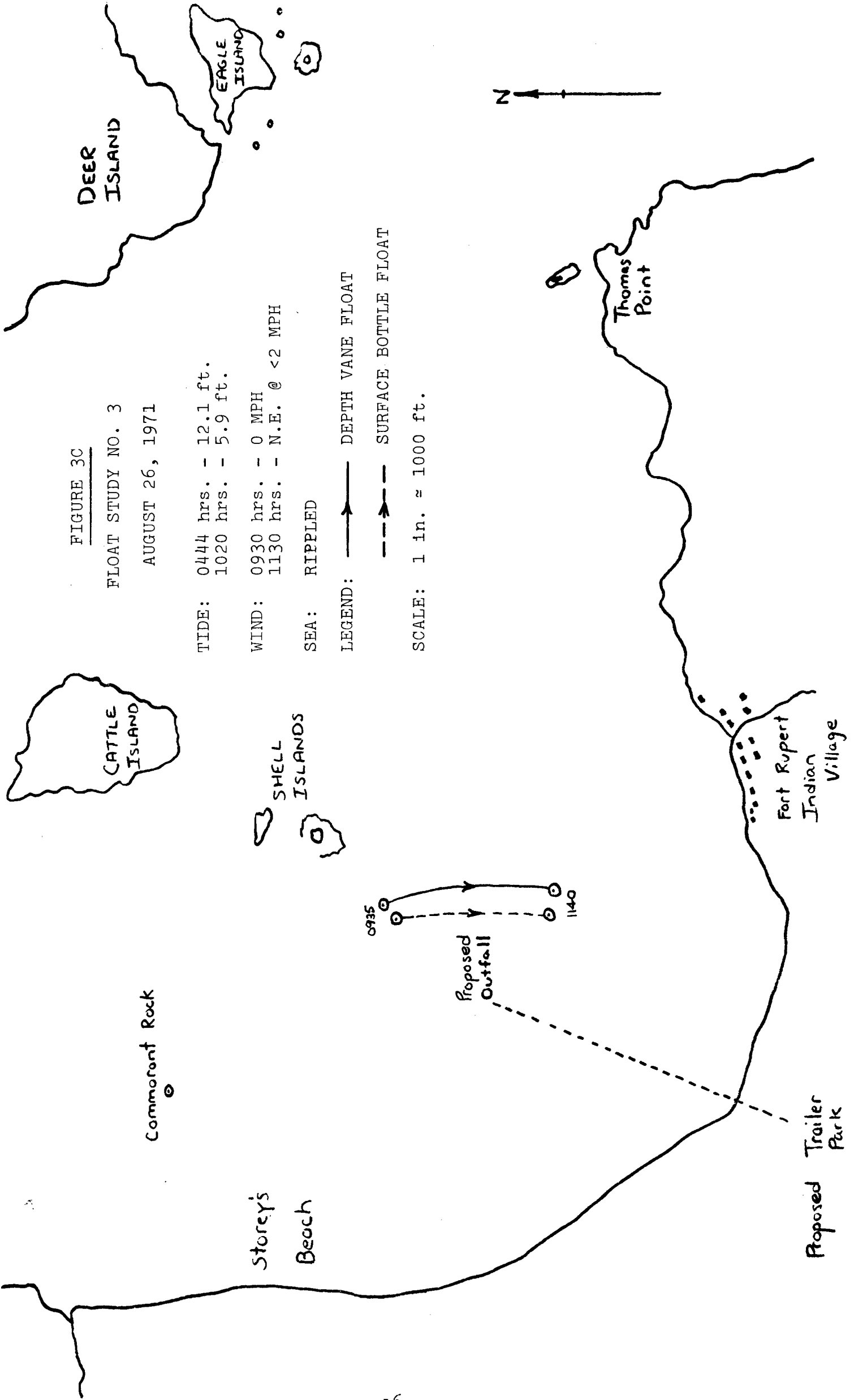
FIGURE 3B
 FLOAT STUDY NO. 2
 AUGUST 25, 1971

TIDE: 0950 hrs. - 5.0 ft.
 1609 hrs. - 14.1 ft.
 WIND: 1500 hrs. - N.W. @ 4-6 MPH
 1700 hrs. - N.W. @ 5-8 MPH

SEA: LIGHT - MEDIUM CHOP

LEGEND: ———> DEPTH VANE FLOAT
 - - - - -> SURFACE BOTTLE FLOAT

SCALE: 1 in. = 1000 ft.



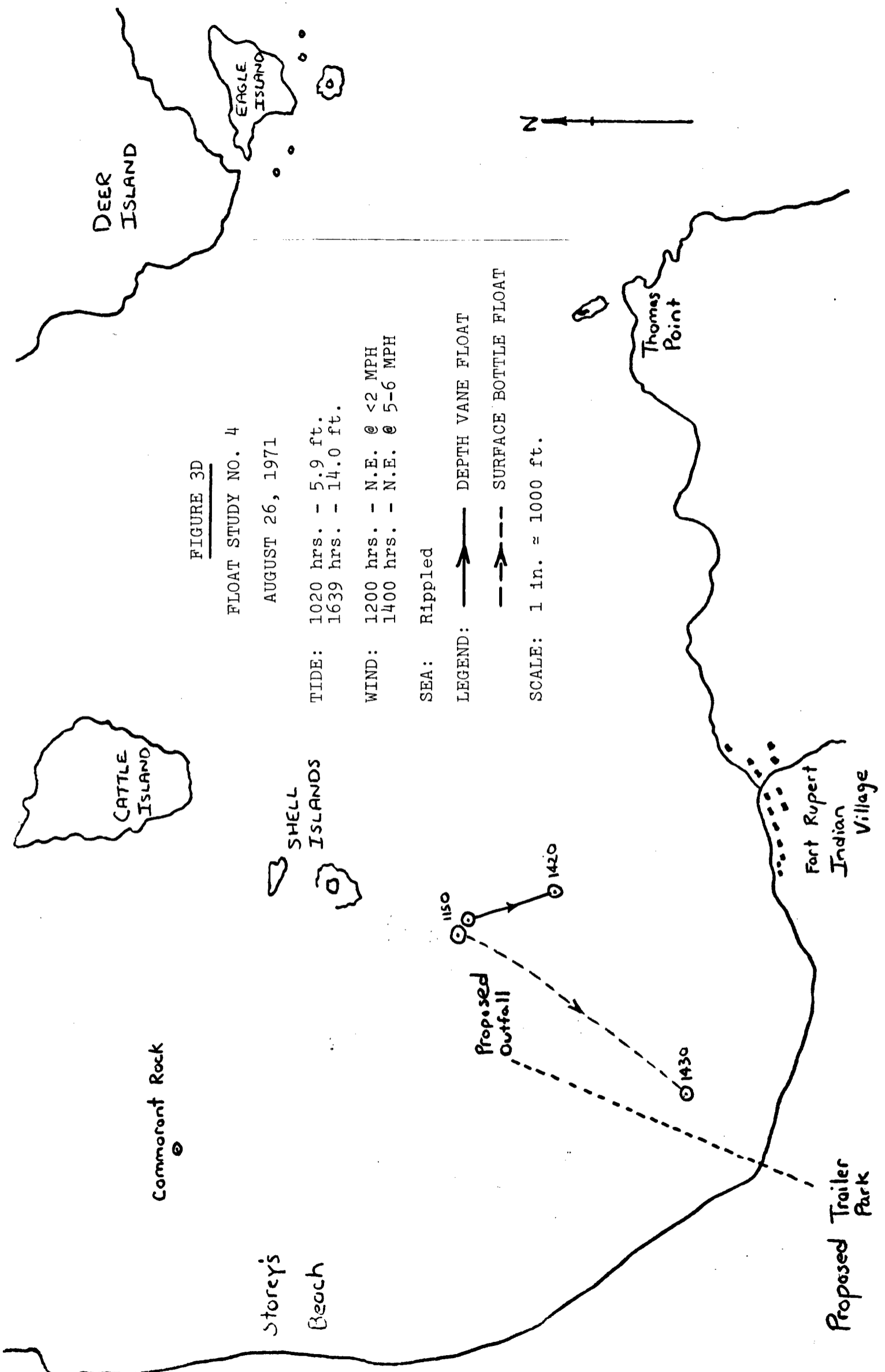


FIGURE 3D

FLOAT STUDY NO. 4

AUGUST 26, 1971

TIDE: 1020 hrs. - 5.9 ft.
1639 hrs. - 14.0 ft.

WIND: 1200 hrs. - N.E. @ <2 MPH
1400 hrs. - N.E. @ 5-6 MPH

SEA: Rippled

LEGEND: ———> DEPTH VANE FLOAT
- - - - -> SURFACE BOTTLE FLOAT

SCALE: 1 in. = 1000 ft.