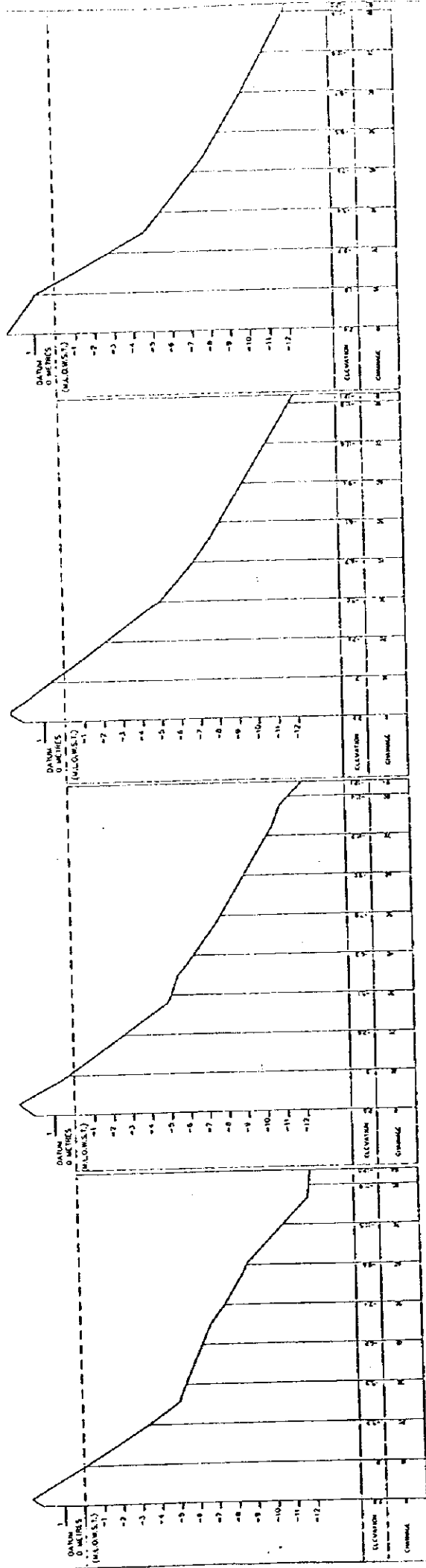








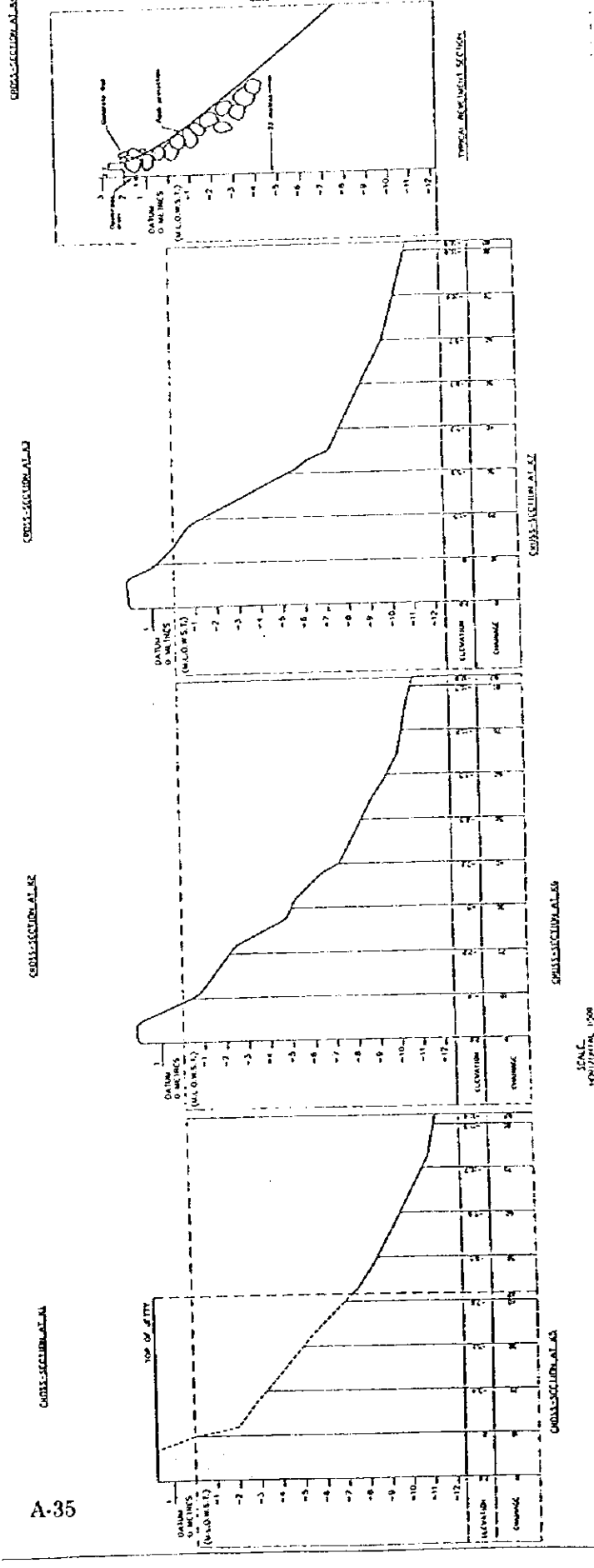
- 1. The top of the ground surface.
- 2. The existing cut for water control.
- 3. The proposed cut for water control.
- 4. The proposed cut for drainage.



CROSS-SECTION AT ST. 1.0		CROSS-SECTION AT ST. 2.0		CROSS-SECTION AT ST. 3.0		CROSS-SECTION AT ST. 4.0	
DATE	1/1/72	DATE	1/1/72	DATE	1/1/72	DATE	1/1/72
BY	J. J. YOUNG	BY	J. J. YOUNG	BY	J. J. YOUNG	BY	J. J. YOUNG
CHECKED		CHECKED		CHECKED		CHECKED	
APPROVED		APPROVED		APPROVED		APPROVED	

FISHERIES CENTRES  
ST VINCENT  
KINGSTOWN

J. J. YOUNG & PARTNERS  
CONSULTING ENGINEERS & ARCHITECTS LIMITED  
101, Market Street, Kingstown, St. Vincent



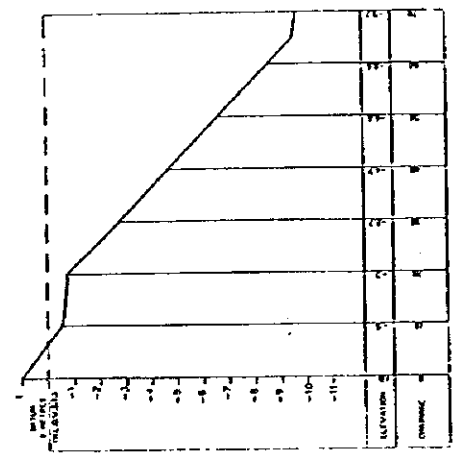
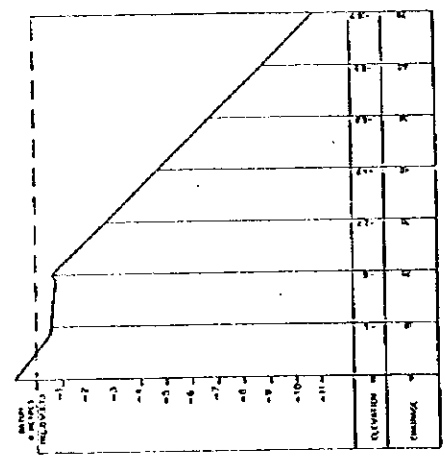
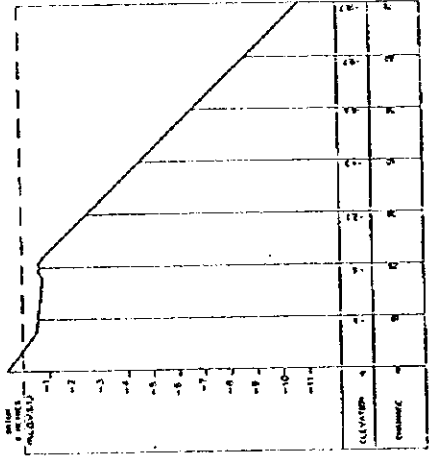
A-35

SCALE  
1:100 (PLAN)  
1:100 (SECTION)

- 1. All work shall be done in accordance with the specifications and drawings.
- 2. All work shall be done in accordance with the specifications and drawings.
- 3. All work shall be done in accordance with the specifications and drawings.

DATE	1/15/19	PROJECT	FISHERIES CENTRES ST. VINCENT
DRAWN BY	...	CROSS-SECTIONS	5
CHECKED BY	...	DESIGNED BY	...
SCALE	...	DATE	...

LEE YOUNG & PARTNERS  
CONSULTANTS IN CIVIL ENGINEERING  
100-1000, ROAD 10, ST. VINCENT, TRINIDAD & TOBAGO

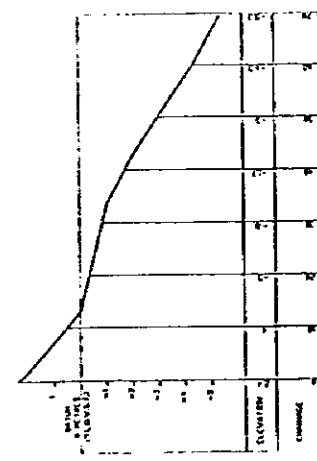
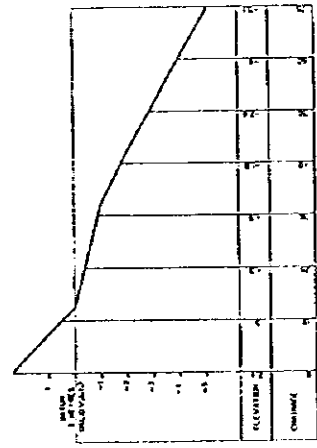
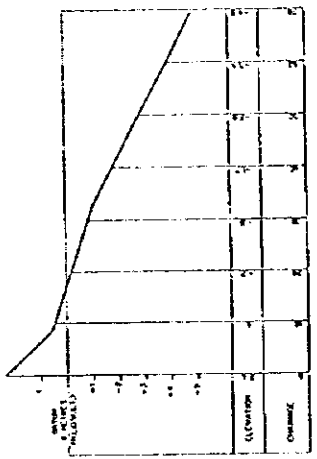


SCALE  
HORIZONTAL 1:500  
VERTICAL 1:100

1. For all work done under contract  
 2. The Engineer shall be responsible for  
 3. The design of the structure and its  
 4. The construction of the structure.

6

NO. OF SHEETS	NO. OF SHEETS	NO. OF SHEETS
1/1	1/1	1/1
DATE	DATE	DATE
1/1	1/1	1/1
1/1	1/1	1/1
<b>FISHERIES CENTRES</b> <b>ST VINCENT</b>		
CROSS-SECTION	CROSS-SECTION	CROSS-SECTION
CHATELAIN	CHATELAIN	CHATELAIN
SCALE: AS SHOWN	SCALE: AS SHOWN	SCALE: AS SHOWN
<b>LEE YOUNG &amp; PARTNERS</b> CONSULTING ENGINEERS & ARCHITECTS 100, WATERLOO STREET, ST. VINCENT, ST. VINCENT		



SCALE  
 HORIZONTAL 1:500  
 VERTICAL 1:100

LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT  
BOREHOLE TEST RECORD

JOB No. W 690

BORING No. 1

SHEET \_\_\_\_\_ OF \_\_\_\_\_

PROJECT Fisheries - Kingstown

DATE STARTED 18.11.97

LOCATION St. Vincent

TYPE BORING \_\_\_\_\_

DATE COMPLETED 26.11.97

GROUND ELEVATION \_\_\_\_\_

DEPTH	SAMPLE TYPE	NUMBER	SOIL PROFILE		S.P.T. VALUE (Blows/300mm)	MOISTURE CONTENT (%)	BULK UNIT WT. (kN/m <sup>3</sup> )	SHEAR STRENGTH (kN/m <sup>2</sup> )											LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRES TEST	SIEVE (W & D)	Cu (kN/m <sup>2</sup> )	φ DEGREES	UNCONFINED COMP. PRESSION TEST (kN/m <sup>2</sup> )	POCKET PEN	SHEAR VALUE (kN/m <sup>2</sup> )									
			SOIL CLASSIFICATION	% FINES				% SAND	10	20	30	40	50	60	70	80	90	100												110								
9	X	1	SP-SM	9	4	28	272																															
10																																						
11	X	2			6																																	
12	X	3			9																																	
13	X	4			8																																	
14	X	5	SM	20	5	25																																
15	X	6			10																																	
16	X	7			10																																	
17	X	8			10																																	
18	X	9	SP-SM	12	16	33	24.4																															
19	X	10			16																																	

SOIL CLASSIFICATION AS PER ASTM D 2487-93: SP-SM 12 88 Poorly graded Sand with silt  
 WATER DEPTH: \_\_\_\_\_ HOURS AFTER DRILLING: \_\_\_\_\_  
 POCKET PEN (kN/m<sup>2</sup>) & Cu: \_\_\_\_\_  
 DRILLER: \_\_\_\_\_ WATER ENCOUNTERED: \_\_\_\_\_

**LEGEND**


STANDARD SPLIT SPOON  
 UNDISTURBED (S-E.S.)  
 UNDISTURBED (NO RECOVERY)  
 RUPTURE  
 PLASTIC LIMIT  
 LIQUID LIMIT  
 NATURAL WATER CONTENT W  
 N - VALUE (SPT)  
 φ (ANGLE OF INTERNAL FRICTION)  
 SHEAR VALUE  
 POCKET PENETROMETER  
 UNCONFINED COMPRESSION TEST  
 TRIAXIAL TEST  
 VANE SHEAR TEST  
 SIEVE (W & D)  
 UNCONFINED COMPRESSION TEST (kN/m<sup>2</sup>)  
 SHEAR VALUE (kN/m<sup>2</sup>)





LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT  
BOREHOLE TEST RECORD

JOB No. W690  
PROJECT Fisheries Kingston  
TYPE BORING \_\_\_\_\_

BORING No. 2  
DATE STARTED 18/11/97  
DATE COMPLETED 26/11/97

SHEET \_\_\_\_\_ OF \_\_\_\_\_  
LOCATION St. Vincent  
GROUND ELEVATION \_\_\_\_\_

DEPTH	SOIL PROFILE				S.P.T. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	SOLUC. UNIT WT. (kN/m <sup>3</sup> )	TEST RESULTS										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRIC TEST	SIEVE (W & D)	Cu (kN/m <sup>2</sup> )	TRIAXIAL	UNCONFINED COMP. PRESSION TEST (kN/m <sup>2</sup> )	POCKET PEN	SHEAR VANE (kN/m <sup>2</sup> )			
	SAMPLE NUMBER	STRATIGRAPHIC PLOT	SOIL CLASSIFICATION	DESCRIPTION				7% FINES	7% SAND	10	20	30	40	50	60	70	80												90	100	110
1	X			SEA BED																											
10	X			Poorly graded Sand with Silt	4	27.1			Δ	Φ															24						
11	X			SP-SM 11 89	4	41			Δ	Φ	X														24						
12	X				4				Δ	Φ															24						
13	X				4				Δ	Φ															24						
14	X				6				Δ	Φ															24						
15	X				6				Δ	Φ															24						
16	X			SP-SM 12 88 Poorly graded Sand with silt	8	32	32.4		Δ	Φ	X														25						
17	X				8				Δ	Φ															27						
18	X				10				Δ	Φ															28						
19	X				10				Δ	Φ															28						
20	X			SM 26 74 Silty sand	17	18	30.4		Δ	Φ	X														32						
21	X				25				Δ	Φ															36						
22	X				25				Δ	Φ															36						
23	X				100	30			Δ	Φ	X														46						

SOIL CLASSIFICATION AS PER ASTM D 2487-93  
WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_  
POCKET PEN (kN/m<sup>2</sup>) & Cu \_\_\_\_\_  
DRILLER \_\_\_\_\_ WATER ENCOUNTERED \_\_\_\_\_

**LEGEND**

	MADE GROUND		GRAVEL		SILT		UNCEMENTED CALCAREOUS WATER		CLAY		PEAT		COAL		SCHIST
	SAND		CLAY		UNCEMENTED CALCAREOUS WATER		PEAT		LIVESTONE		MARO SHALE				

STANDARD SPLIT SPOON  
 UNDISTURBED (SPL. B.)  
 UNDISTURBED (NO RECOVERY)  
 BLOWER

**PLASTIC LIMIT** \_\_\_\_\_ **LIQUID LIMIT** \_\_\_\_\_  
 X NATURAL WATER CONTENT W  
 Δ N-VALUE (SPT)  
 Φ RANGE OF PENETRATION TEST  
 X POCKET PEN

Y POCKET PENETROMETER  
 ■ UNCONFINED COMPRESSION TEST  
 ⊖ TRIAXIAL TEST  
 Δ VANE SHEAR TEST  
 ● (C) (UNSAT.)  
 ○ (C) (SAT.)  
 ● (C) (UNSAT.)  
 ○ (C) (SAT.)

LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT  
BOREHOLE TEST RECORD

JOB No. 11690  
PROJECT Fisheries Keystron  
TYPE BORING \_\_\_\_\_

BORING No. 2  
DATE STARTED 18/11/97  
DATE COMPLETED 26/11/97

SHEET \_\_\_\_\_ OF \_\_\_\_\_  
LOCATION St. Vincent  
GROUND ELEVATION \_\_\_\_\_

DEPTH	SAMPLE TYPE	SOIL PROFILE				S.P.T. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	BULK UNIT WT. KN/m <sup>3</sup>	SHEAR STRENGTH KN/m <sup>2</sup> WATER CONTENT % STD. PENETRATION TEST N-VALUE (BLOW/300mm) C <sub>u</sub> (KN/m <sup>2</sup> ) & $\phi$	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRIES TEST	SIEVE (W & O)	C <sub>u</sub> (KN/m <sup>2</sup> )	$\phi$ DEGREES	UNCONFINED COMPRESSION TEST (KN/m <sup>2</sup> )	POCKET PEN	SHEAR VANE (KN/m <sup>2</sup> )
		NUMBER	STRATIGRAPHIC PLOT	SOIL CLASSIFICATION	% FINES															
4	X	4																		
5.4					54															
10.0		6	SM	35	65	100	27.2									67				

SOIL CLASSIFICATION AS PER ASTM D 2487-93: SM 35 65 Silty Sand  
 WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_  
 POCKET PEN (KN/m<sup>2</sup>) & C<sub>u</sub> \_\_\_\_\_  
 DRILLER \_\_\_\_\_ WATER ENCOUNTERED \_\_\_\_\_

**LEGEND**

MADE GROUND	GRAVEL	SILT	UNCEMENTED CALCAREOUS WATER	LOAM	SCHIST
SAND	CLAY	PEAT	UNVESTONIC	HARD SHALE	

STANDARD SPLIT SPOON  
 UNDISTURBED (SFC, B\*)  
 UNDISTURBED (NO RECOVERY)  
 FLUXED

**PLASTIC LIMIT**  
 X NATURAL WATER CONTENT %  
 Δ N-VALUE (SPT)  
 ○ UNCONFINED COMPRESSION TEST  
 ▲ VANE SHEAR TEST  
 ○ (C<sub>u</sub>, C<sub>l</sub>)  
 ○ UNCONFINED COMPRESSION TEST

**LIQUID LIMIT**  
 ▼ POCKET PENETROMETER  
 ■ UNCONFINED COMPRESSION TEST  
 ○ TRIAXIAL TEST  
 ▲ VANE SHEAR TEST  
 ○ (C<sub>u</sub>, C<sub>l</sub>)  
 ○ UNCONFINED COMPRESSION TEST

# LEE YOUNG & PARTNERS -- GEOTECHNICAL DEPARTMENT

## BOREHOLE TEST RECORD

JOB No. W690

BORING No. 5

SHEET 1 OF 2

PROJECT Fisheries Centre Kingston

DATE STARTED 18.11.97

LOCATION St. Vincent

TYPE BORING \_\_\_\_\_

DATE COMPLETED 25.11.97

GROUND ELEVATION \_\_\_\_\_

DEPTH	SAMPLE NUMBER	SOIL PROFILE DESCRIPTION			SPT. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	DULK UNIT WT. (kN/m <sup>3</sup> )	SHEAR STRENGTH (kN/m <sup>2</sup> )											LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRICS TEST	SIEVE (W & D)	Cu (kN/m <sup>2</sup> )	φ DEGREES	UNCONFINED COMPRESS. TEST (kN/m <sup>2</sup> )	POCKET PEN	SHEAR VALUE (kN/m <sup>2</sup> )	
		STRATIGRAPHIC	SOIL CLASSIFICATION	% FINES				% SAND	STANDARD PENETRATION TEST																					
									10	20	30	40	50	60	70	80	90	100												110
5	1																													
6	2				3	27.1		Δ	○																	22				
7	3				4			Δ	○																	24				
8	5	SP-94	12	88	9	19.2		Δ	○	X															28					
9	4				4			Δ	○																	24				
10	5				5			Δ	○																	25				
11	6				5			Δ	○																	25				
12	7	SM	20	80	7	24.9	24.4	Δ	○	X															26					
13	8				8			Δ	○																	27				
14	9				7			Δ	○																	26				
15	10	SM	29	71	11	30.9	30.5	Δ	○	X																29				

SOIL CLASSIFICATION AS PER ASTM D 2487-93: 100 200 300 400 500  
 WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING: \_\_\_\_\_  
 POCKET PEN (kN/m<sup>2</sup>) & Qu: \_\_\_\_\_  
 DRILLER: \_\_\_\_\_ WATER ENCOUNTERED: \_\_\_\_\_

**LEGEND**

MADE GROUND	GRAVEL	SILT	UNCEMENTED CALCAREOUS MATTTER	LOAM	SCHIST
SAND	CLAY	PEAT	LIMESTONE	HARD SHALE	

STANDARD SPLIT SPOON  
 UNDISTURBED (SHELL)  
 UNDISTURBED (NO RECOVERY)  
 RANGE

PLASTIC LIMIT: \_\_\_\_\_ LIQUID LIMIT: \_\_\_\_\_  
 X NATURAL WATER CONTENT, W  
 Δ N-VALUE (SPT)  
 ○ RANGE OF UNCONFINED COMPRESSION TEST  
 Δ POCKET PENETROMETER  
 ■ UNCONFINED COMPRESSION TEST  
 ⊙ TRIAXIAL TEST  
 ▲ PLANE SHEAR TEST  
 ○ (W & D)  
 Cu UNCONFINED COMPRESSION TEST (kN/m<sup>2</sup>)  
 φ UNCONFINED COMPRESSION TEST (DEGREES)

# LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT

## BOREHOLE TEST RECORD

JOB No. W690      BORING No. 3      SHEET 2 OF 2  
 PROJECT Estheries Centre - Kingston      DATE STARTED 18.11.97      LOCATION St. Vincent  
 TYPE BORING \_\_\_\_\_      DATE COMPLETED 26.11.97      GROUND ELEVATION \_\_\_\_\_

DEPTH	SAMPLE TYPE	NUMBER	SOIL PROFILE DESCRIPTION			S.P.T. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	DULK UNIT WT. (kN/m <sup>3</sup> )	SHEAR STRENGTH (kN/m <sup>2</sup> )	WATER CONTENT (%)	STD. PENETRATION TEST (N-VALUE) (BLOW/300mm)	Cu (kN/m <sup>2</sup> ) & φ	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRICS TEST	SIEVE (W & D)	Cu (kN/m <sup>2</sup> )	φ DEGREES	UNCONFINED COMPRESSION TEST (kN/m <sup>2</sup> )	ROCKET PEN	SHEAR VANE (kN/m <sup>2</sup> )
			SOIL CLASSIFICATION	% FINES	% SAND																		
20	X	11				17																	
22	X	12	SM	22	78	32	17.3	24.4	X														
23	X	13				87																	
25	X	14				57																	
26	X	15	CU	37	63	68		22.2															

SOIL CLASSIFICATION AS PER ASTM D 2487-93: SM      POCKET PEN (kN/m<sup>2</sup>) & Cu: 17, 32, 87, 57, 68  
 WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_      DRILLER \_\_\_\_\_ WATER ENCOUNTERED \_\_\_\_\_

**LEGEND**

MADE GROUND	GRAVEL	SILT	UNCEMENTED CALCAREOUS MATTER	LOAD	SCHIST
SAND	CLAY	PEAT	LIMESTONE	UNCONFINED COMPRESSION TEST	HARD SHALE

STANDARD SPLIT SPOON	PLASTIC LIMIT	LIQUID LIMIT	POCKET PENETROMETER
UNDISTURBED (SPT)	NATURAL WATER CONTENT, w	TRIAXIAL TEST	VANE SHEAR TEST
UNDISTURBED (NO RECOVERY)	N-VALUE (SPT)	CONE PENETRATION TEST	SHEAR VANE TEST
WATER	RANGE OF INTENDED TEST	STANDARD PENETRATION TEST	

**LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT**  
**BOREHOLE TEST RECORD**

JOB No. W1690 BORING No. 1 SHEET      OF       
 PROJECT Fisheries - Barronville DATE STARTED 18.9.97 LOCATION       
 TYPE BORING      DATE COMPLETED 26.9.97 GROUND ELEVATION     

DEPTH	SAMPLE NUMBER	STRATIGRAPHIC	SOIL PROFILE DESCRIPTION		S.P.T. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	BULK UNIT WT. (KN/m <sup>3</sup> )	SHEAR STRENGTH KN/m <sup>2</sup> WATER CONTENT 3 STD. PENETRATION TEST N-VALUE (BLOW/300mm) C <sub>v</sub> (KN/m <sup>2</sup> ) & φ											LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRICS TEST	SIEVE (W & D)	C <sub>v</sub> (KN/m <sup>2</sup> )	φ DEGREES	UNCONFINED COMPRESSION TEST	POCKET PEN	SHEAR VANE (KN/m <sup>2</sup> )
			% FINES	% SAND				10	20	30	40	50	60	70	80	90	100	110											
1																													
2	1		SP	1	99	4	10	39.4	AK	φ																			24
3	2					18			A	φ																			33
4																													
5	3					23			Δ	φ																			35
6	4		SP-SM	7	93	26	16	27.1	X	Δ	φ																		36
7																													
8	5					35																							40
9																													
10	6					20	27		Δ	φ																			34
11																													
12	7					22																							36
13	8		SW-SM	11	89	25	20	27.1	X	Δ	φ																		41
14	9					47																							41
15	10					36																							41

SOIL CLASSIFICATION AS PER ASTM D 2487-93  
 WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 WATER ENCOUNTERED \_\_\_\_\_

**LEGEND**

MADE GROUND	GRAVEL	SILT	UNCEMENTED CALCAREOUS MATTER	LOAM	SCHIST
SAND	CLAY	PEAT	Limestone	HARD SHALE	

STANDARD SPLIT SPOON  
 UNDISTURBED (S.P.T.)  
 UNDISTURBED END PROXIMITY  
 A.C.P.  
 PLASTIC LIMIT  
 LIQUID LIMIT  
 NATURAL WATER CONTENT %  
 VALUES (S.P.T.)  
 VALUES (S.P.T.)  
 VALUES (S.P.T.)  
 VALUES (S.P.T.)

POCKET PENETROMETER  
 UNCONFINED COMPRESSION TEST  
 TRIAXIAL TEST  
 VANE SHEAR TEST  
 VANE SHEAR TEST  
 VANE SHEAR TEST  
 VANE SHEAR TEST

# LEE YOUNG & PARTNERS - GEOTECHNICAL DEPARTMENT

## BOREHOLE TEST RECORD

JOB No. \_\_\_\_\_ BORING No. \_\_\_\_\_ SHEET \_\_\_\_\_ OF \_\_\_\_\_

PROJECT \_\_\_\_\_ DATE STARTED \_\_\_\_\_ LOCATION \_\_\_\_\_

TYPE BORING \_\_\_\_\_ DATE COMPLETED \_\_\_\_\_ GROUND ELEVATION \_\_\_\_\_

DEPTH	SOIL PROFILE					S.P.T. VALUE* (Blows/300mm)	MOISTURE CONTENT (%)	DULK UNIT WT. kN/m <sup>3</sup>	SHEAR STRENGTH kN/m <sup>2</sup> WATER CONTENT % STD. PENETRATION TEST N-VALUE (BLOW/300mm) C <sub>u</sub> (kN/m <sup>2</sup> ) & ϕ	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRICS TEST	SIEVE (W & D)	C <sub>u</sub> (kN/m <sup>2</sup> )	TRIAXIAL	UNCONFINED COMPRESSION TEST (kPa)	POCKET PEN	SHEAR VALUE (kN/m <sup>2</sup> )	
	TYPE	NUMBER	STRATIGRAPHIC PLOT	SOIL CLASSIFICATION	% FINES																% SAND
	DESCRIPTION																				10
6.5	X	11		SP-SM 6 74		38	21	24.3													
				Poorly graded sand with silt													41				

SOIL CLASSIFICATION AS PER ASTM D 2487-93 \_\_\_\_\_

WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_

POCKET PEN (kN/m<sup>2</sup>) & C<sub>u</sub> \_\_\_\_\_

DRILLER \_\_\_\_\_ WATER ENCOUNTERED \_\_\_\_\_

**LEGEND**

STANDARD SPLIT SPOON	GRAVEL	SILT	UNCEMENTED CALCAREOUS MATTER	LOAM	SCHIST
UNDISTURBED (S&B)	SAND	CLAY	PEAT	LIMESTONE	HARD SHALE
UNDISTURBED (NO RECOVER)		PLASTIC LIMIT	LIQUID LIMIT	POCKET PENETROMETER	UNCONFINED COMPRESSION TEST
ALTER		NATURAL WATER CONTENT W	N-VALUE (SPT)	TRIAXIAL TEST	VANE SHEAR TEST
		CONE PENETRATION TEST	CONE PENETRATION TEST	CONE PENETRATION TEST	CONE PENETRATION TEST

LEE YOUNG & PARTNERS -- GEOTECHNICAL DEPARTMENT  
 BOREHOLE TEST RECORD

JOB No. W 690.

BORING No. 1

SHEET 1 OF 1

PROJECT Fisheries - Chateaubelair

DATE STARTED 19.11.97

LOCATION St. Vincent

TYPE BORING \_\_\_\_\_

DATE COMPLETED 26.11.97

GROUND ELEVATION \_\_\_\_\_

DEPTH	SAMPLE NUMBER	SOIL CLASSIFICATION	SOIL PROFILE DESCRIPTION		S.P.T. VALUE (BLOWS/300mm)	MOISTURE CONTENT (%)	DULC UNIT WT. (KN/m <sup>3</sup> )	SHEAR STRENGTH (KN/m <sup>2</sup> )	WATER CONTENT (%)	STD. PENETRATION TEST - N-VALUE (BLOW/300mm)	C <sub>u</sub> (KN/m <sup>2</sup> ) & σ	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	CONSOLIDATION TEST	HYDROMETRICS TEST	SIEVE (W & D)	C <sub>u</sub> (KN/m <sup>2</sup> )	TRIAXIAL	UNCONFINED COMPRESSION TEST (KN/m <sup>2</sup> )	POCKET PEN	SHEAR VANE (KN/m <sup>2</sup> )
			% FINES	% SAND																		
1	1	SW-SM	9	91	4	10.7	27.2	4	27											24		
2	2				4															24		
3	3																					
4	4				7															27		
5	4	SM	17	83	32	25.6	27.2													39		
6	5				30															38		
7	5																					
8	6	SM	16	84	50	21.2														45		
9	7				61															48		
10	8	SC-SM	43	54	87	23.4	22.2													55		
12																						

SOIL CLASSIFICATION AS PER ASTM D 2487-93  
 WATER DEPTH \_\_\_\_\_ HOURS AFTER DRILLING \_\_\_\_\_

POCKET PEN (KN/m<sup>2</sup>) & C<sub>u</sub>

DRILLER \_\_\_\_\_  
 WATER ENCOUNTERED \_\_\_\_\_

LEGEND

STANDARD SPLIT SPOON	CRAVEL	SILT	UNCEMENTED CALCAREOUS MATTER	LOAM	SCHIST
UNDISTURBED (S-C-9)	SAND	CLAY	PEAT	LIMESTONE	HARD SHALE
UNDISTURBED (NO RECOVERY)					
PLASTIC LIMIT					
LIQUID LIMIT					
NATURAL WATER CONTENT					
N-VALUE (BLOW)					
SHEAR STRENGTH (KN/m <sup>2</sup> ) & C <sub>u</sub>					
UNCONFINED COMPRESSION TEST					
TRIAXIAL TEST					
VANE SHEAR TEST					
POCKET PENETRATION TEST					

## Estimation of design wave

Offshore wave, equivalent wave and design wave at the location of the fish center at Kingstown were described hereinafter.

### Characteristic of offshore wave

At the Saint Vincent, waves have not been observed. At time of the study of "Basic design study on fishing center in Saint Vincent and the Grenadines, JICA, 1996", offshore wave has studied. At this study, wave estimation data are based on the study since no hurricane has been attacked the Country since the previous study. In this study, ordinary wave and hurricane wave have been estimated as follow.

### Ordinary wave

A recurring wave height for ordinary wave was estimated as follows from the ship observation data of offshore wave and wind. (Source: Kocks Consult GmbH)

#### Recurring Period and height for ordinary wave (Ho m)

Recurring Period	Wave direction							
	NE	E	SE	S	SW	W	NW	N
1 year	3.8	4.1	2.8	1.6	0.8	0.7	1.0	2.4
10 years	4.9	5.2	3.5	2.8	3.3	1.8	2.6	3.8
20 years	5.2	5.5	3.8	3.2	3.8	2.2	3.1	4.2
50 years	5.6	6.0	4.0	3.8	4.5	2.5	3.7	4.8

Waves of S to SW is determined for the ordinary waves which affect directly the Kingstown area.



### Hurricane wave

In the same study report, hurricane wave have been also estimated and showed the wave height and Recurring period as follow.

Recurring Period (years)	Wave height (m)
20	6.51
30	6.96
40	7.28
50	7.50

In this table, as wave direction is not clear, the estimation points and S to SW waves, which attack the Kingstown area directly, have been reexamined based on the study report. The estimation points of the report are 5 points. They are at southwest (St. Vincent 1) and southeast (St. Vincent 2) offshore of Kingstown, the main Island of the Country. Others are at the south of Bequia Island, and west and southeast of Canouan Island. As for hurricane, Allen (1980), Iris (1995) and Flora (1963) were selected among hurricane, which passed near the Country and made damages during 1955 to 1994. Beside the actual course of Flora, other two courses are considered for the estimation of the waves. One is the course, which passes on the Saint Vincent country. And other is the course, which is similar route as of Allen. Two estimation points, St. Vincent 1 and St. Vincent 2, were selected for the wave estimation points for Kingstown. At these 2 points, maximum significant wave (height, period, and direction) and, for the Kingstown, waves (height, period, and direction) from SW to S direction were selected as follow.

Maximum significant wave

H:height, P:Period, D:Direction

Hurricane (year)	Maximum						Maximum from SW to S					
	St. Vincent 1			St. Vincent 2			St. Vincent 1			St. Vincent 2		
	H	P	D	H	P	D	H	P	D	H	P	D
	m	Sec		m	sec		m	sec		M	sec	
Allen (1980)	4.59	10.3	E	4.55	10.4	E	—	—	—	—	—	—
Iris (1995)	3.35	7.7	NW	3.01	7.7	WNW	—	—	—	2.9	7.5	WSW
Flora(1963) Case 1	3.03	9.3	ESE	4.75	10.9	ESE	2.5	9.3	SW	2.4	7.9	SW
Case 2	7.31	13.1	E	9.10	14.2	E	5.0	10.2	SW			
Case 3	3.47	9.0	NNW	3.32	10.6	ENE	—	—	—	—	—	—

Offshore wave

Maximum significant wave, which were estimated from hurricane, have the wave direction of WNW to ESE. As these waves are not waves which attack the area of Kingstown directly, it is not proper to adopt as the waves for the Kingstown. However, waves which comes from S to SW are generated as the progress of hurricane. These S to SW waves will attack the Kingstown area directly and have severe effect for the area. The characteristics of the S to SW wave are wave height of 2.4 m to 5.0 m, wave period of about 10 second and wave direction of SW to WSW as shown in the above table. Among the waves in this table, wave height of 5.0 m height, period of 10 second and direction of SW is determined as the design offshore wave. Ordinary wave (50 years of recurring period) and hurricane wave are as shown in the following table.

Characteristic of offshore wave(Kingstown)

Wave Direction	SW	SSW	S	SW*
Wave Height (m)	4.5	4.2	3.8	5.0
Wave Period (sec)	10.0	10.0	9.0	10.0

\* shows hurricane wave

Equivalent wave

The estimation of the equivalent wave height from the offshore is computed by the Conservation Equation of Energy Flux Method by Karlsson, considering the sea contour condition obtained from the Chart. The result of distribution of the coefficient of the value of  $K_r \times K_d$  at Kingstown site is shown in the Attachment -

The equivalent wave at each site is shown bellow.

Kingstown

Sea bottom slope	1 : 06			
Design water level (DL, m)	+0.64			
Wave direction	SW	SSW	S	SW*
Height of offshore wave (m)	4.2	4.2	3.8	5.0
Period of offshore wave (sec)	10.0	10.0	9.0	10.0
Length of offshore wave (m)	156.0	156.0	126.4	156.0
$K_r \times K_d$	0.833	0.773	0.567	0.833
Equivalent wave height $H_o' = H_o \times K_r \times K_d$ (m)	3.75	3.25	2.15	4.17

\*wave of hurricane

The design waves for the structure was selected from these results as follows.

	Kingstown
Wave Height (m)	4.17
Wave Period (sec)	10.0
Wave Length (m)	156.0
Wave Steepness	0.0267

Wave Characteristic at the structure

At Kingstown, the waves at the location of different water are calculated considering the water depth as follows.

Water depth (m)	8.0	6.0	4.6	4.0	3.0
Water level (m)	0.62	0.62	0.62	0.62	0.62
Design water depth (m)	8.62	6.62	5.22	4.62	3.62
$h / H_0'$	2.07	1.59	1.25	1.11	0.87
$H / H_0'$	1.05	1.20	1.37	1.30	1.10
Wave Height H (m)	4.38	5.00	5.71	5.42	4.59

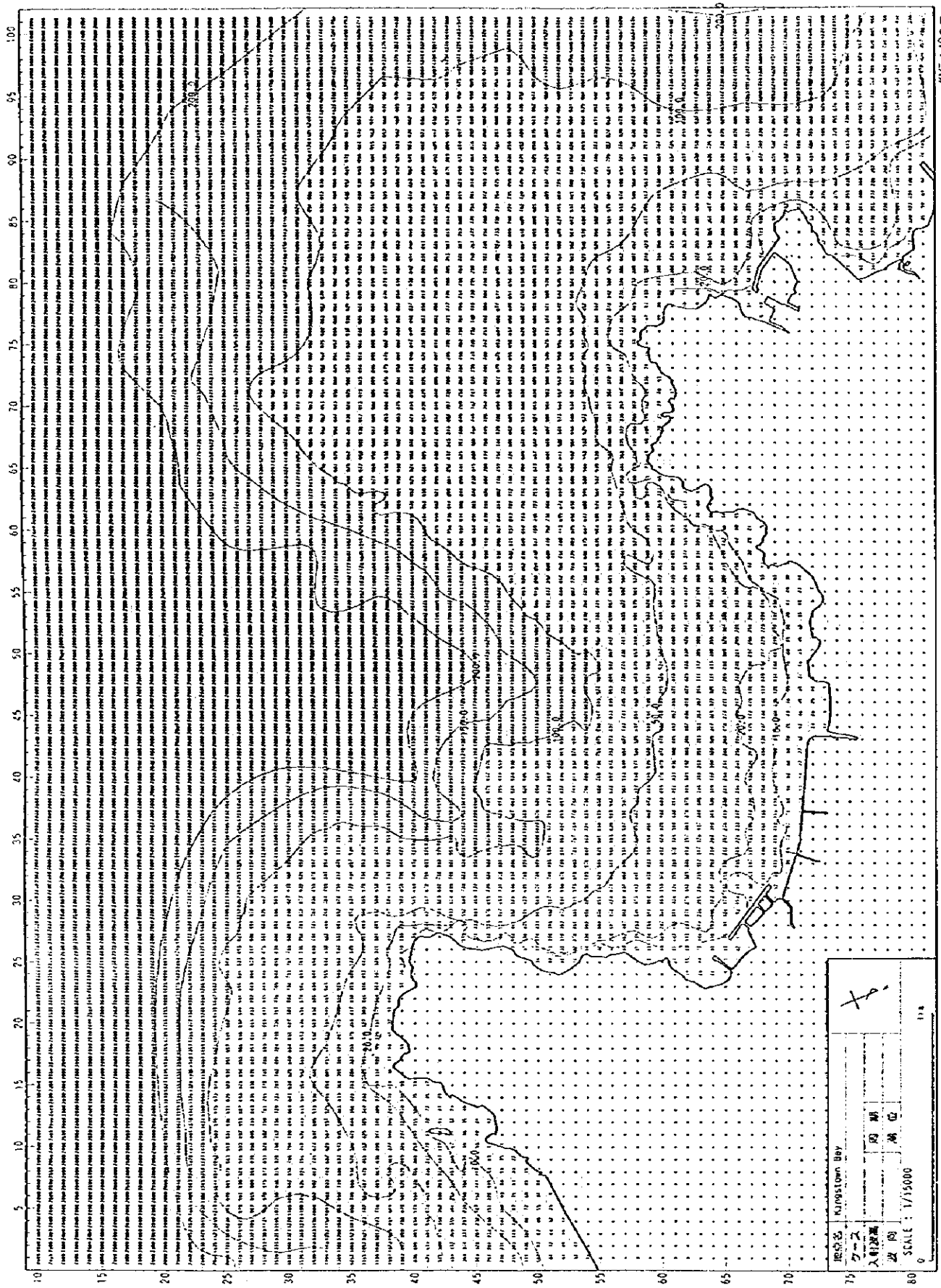


Figure 1 Model Bathymetry of Kingstown Bay ( $\Delta x = 50 \text{ m}$ )

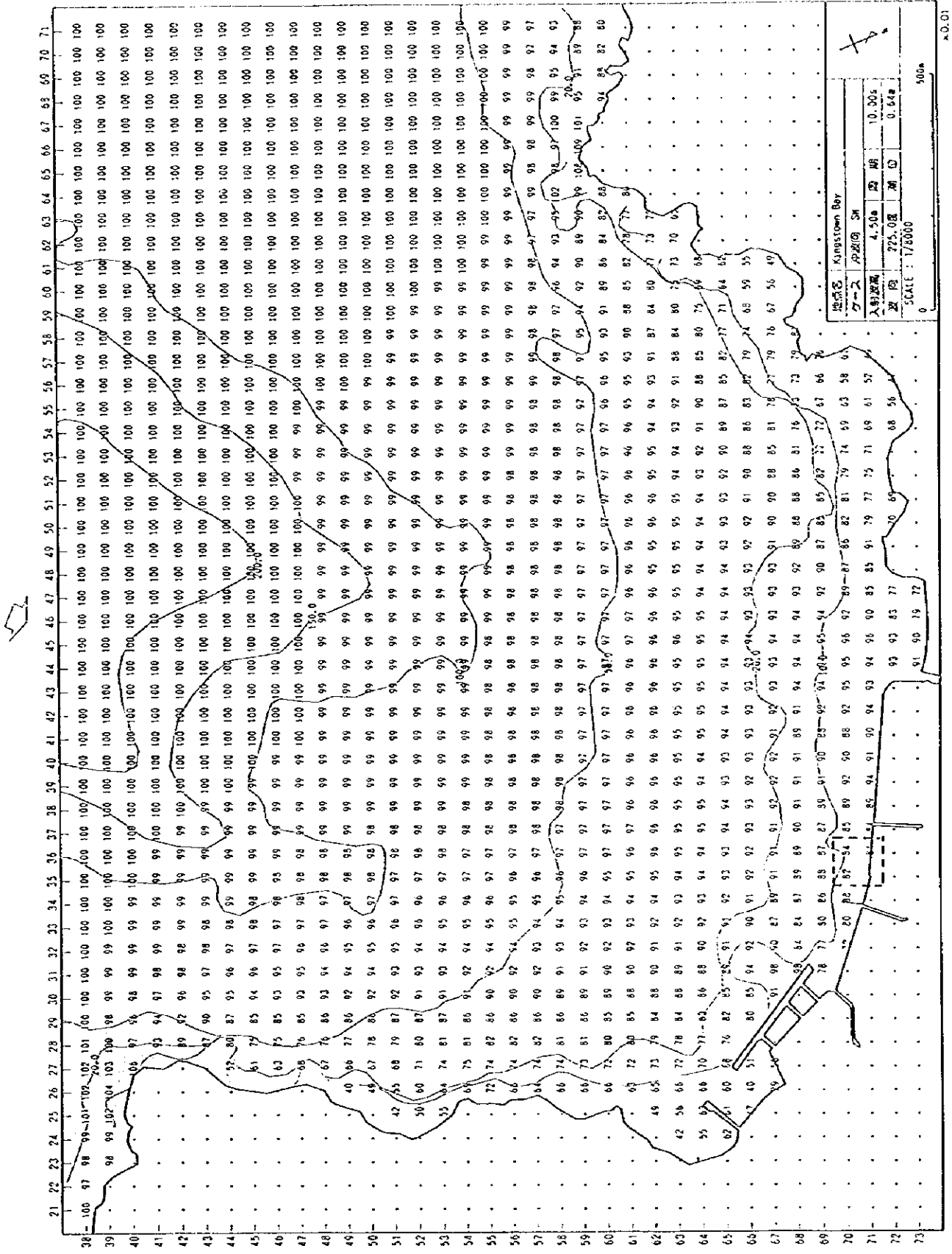


Figure Distribution of  $K_r \times K_d$  (Kingsdown Bay)











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