

# Appendix 6-2. Results of Natural and Environmental Survey

## Appendix 6-2-1. Topographic Map on Land



Figure A.6.2.1-1 Topographic Map on Land



Figure A.6.2.1-2 Topographic Map on Land

## Appendix 6-2-2. Location Map of Trees around North Dock

Figure A.6.2.2-1 shows the growing conditions of trees near North Dock. Large Casuarinas trees and coconuts trees and Chosms (Palauan name) trees are growing. One casuarinas tree is growing at the west shore area of North Dock. And about ten casuarinas trees are growing east grand area of North Dock. Casuarinas trees have much leaves and make shades. These areas are useful place for resting of citizen of Peleliu. Coconuts and chosms trees are rather small and have few leaves.

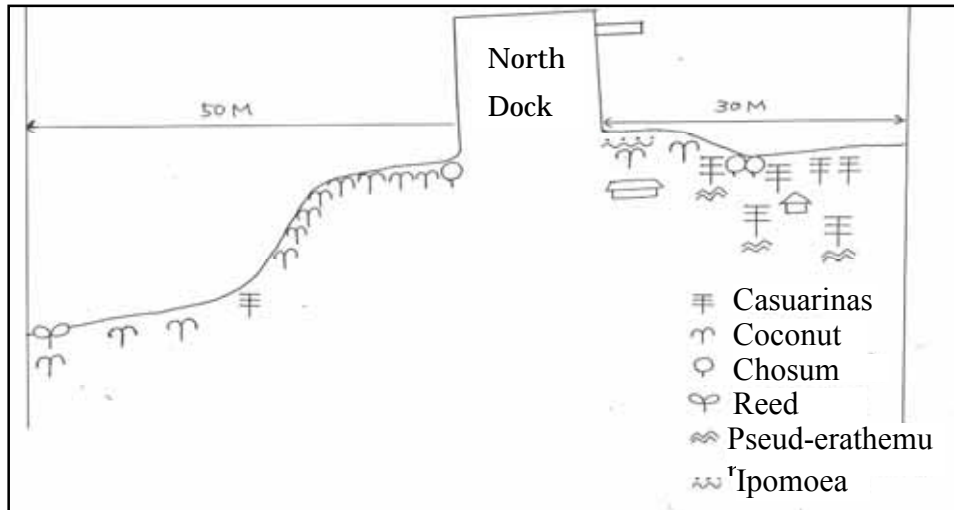


Figure A.6.2.2-1 Layout Map of Trees around North Dock

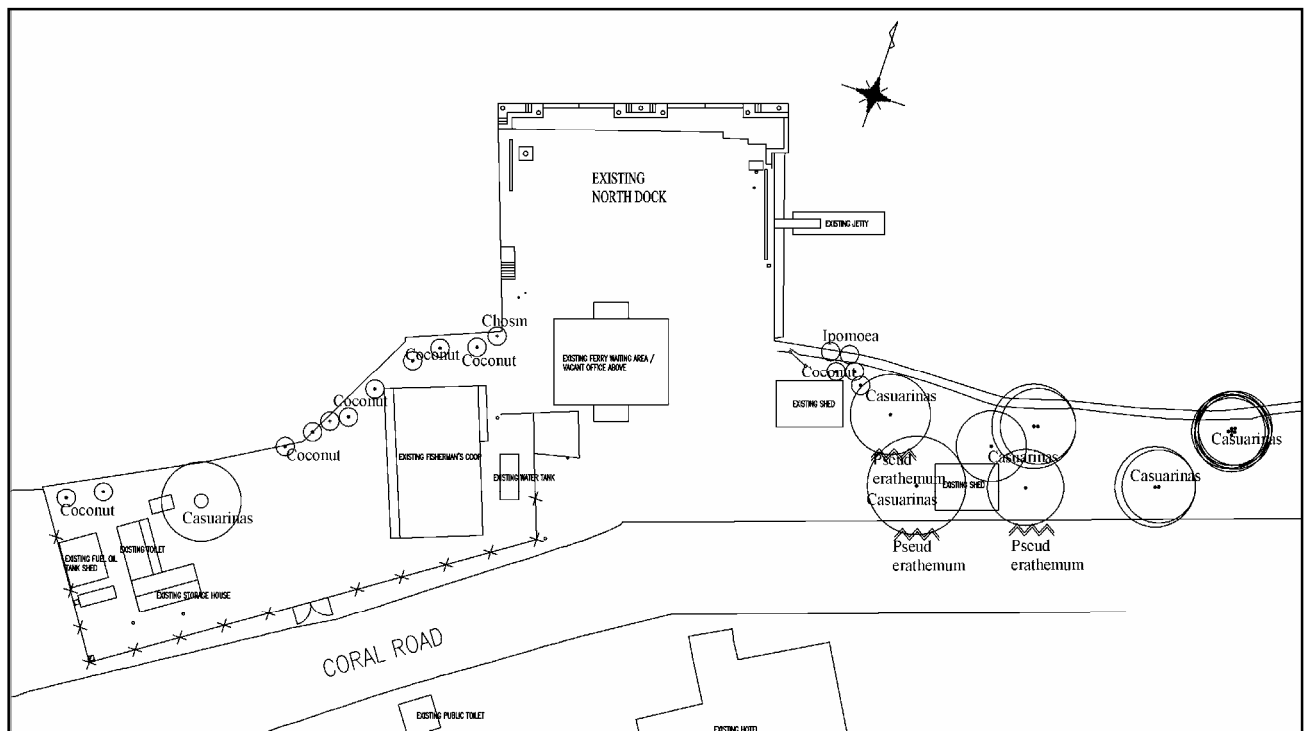


Figure A.6.2.2-2 Location Map of Trees

Appendix 6-2-3. Bathymetric Survey Result

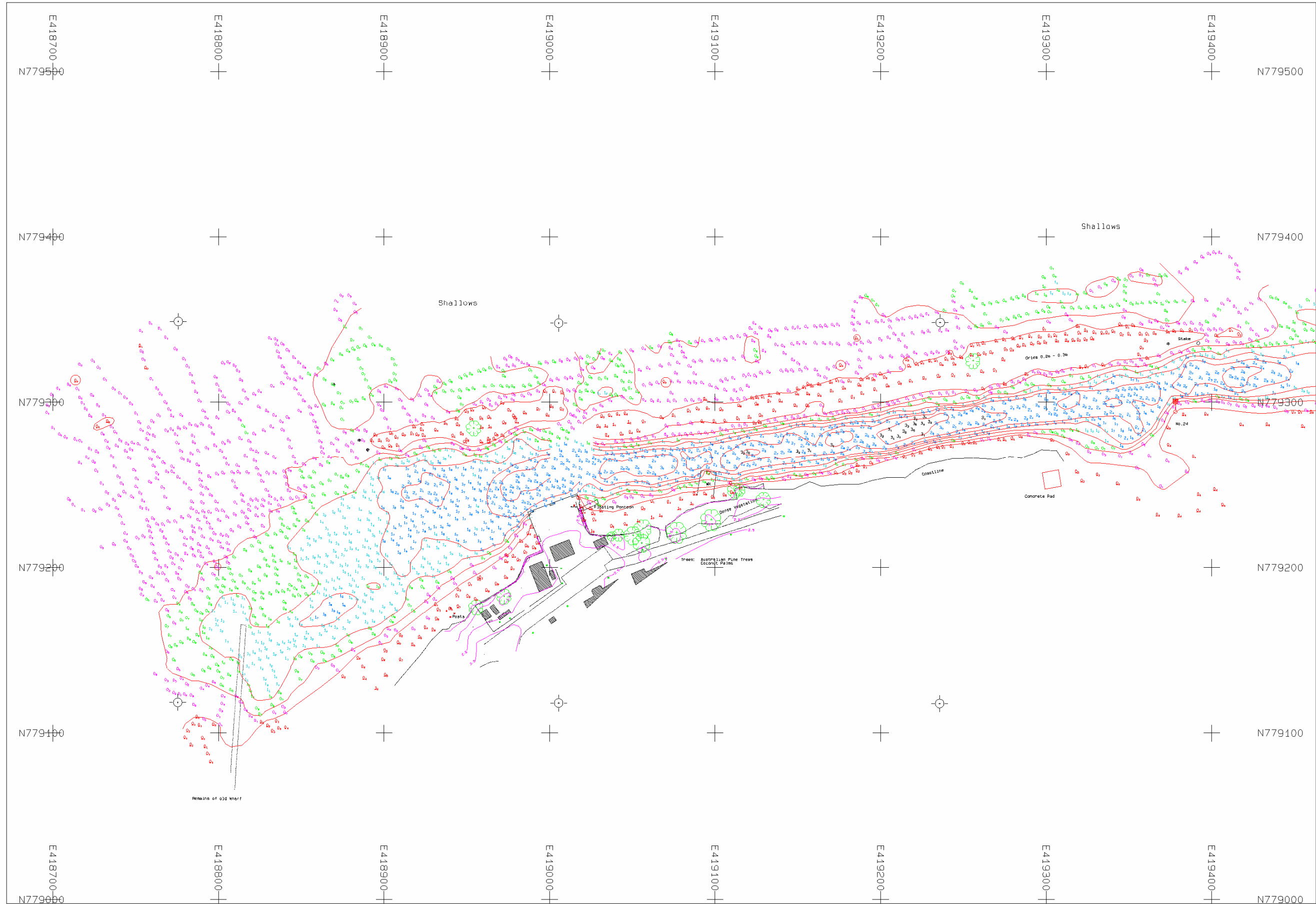
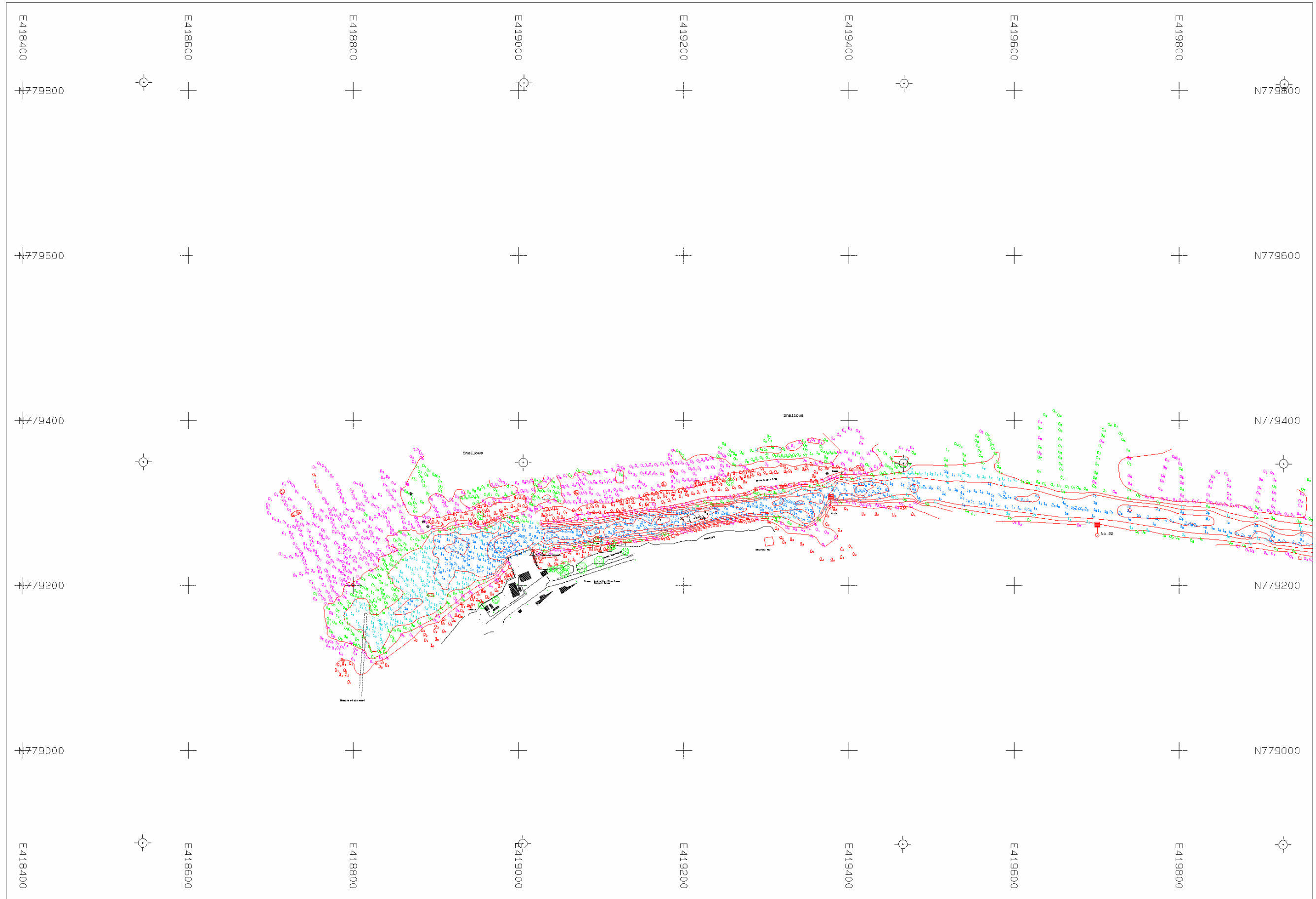
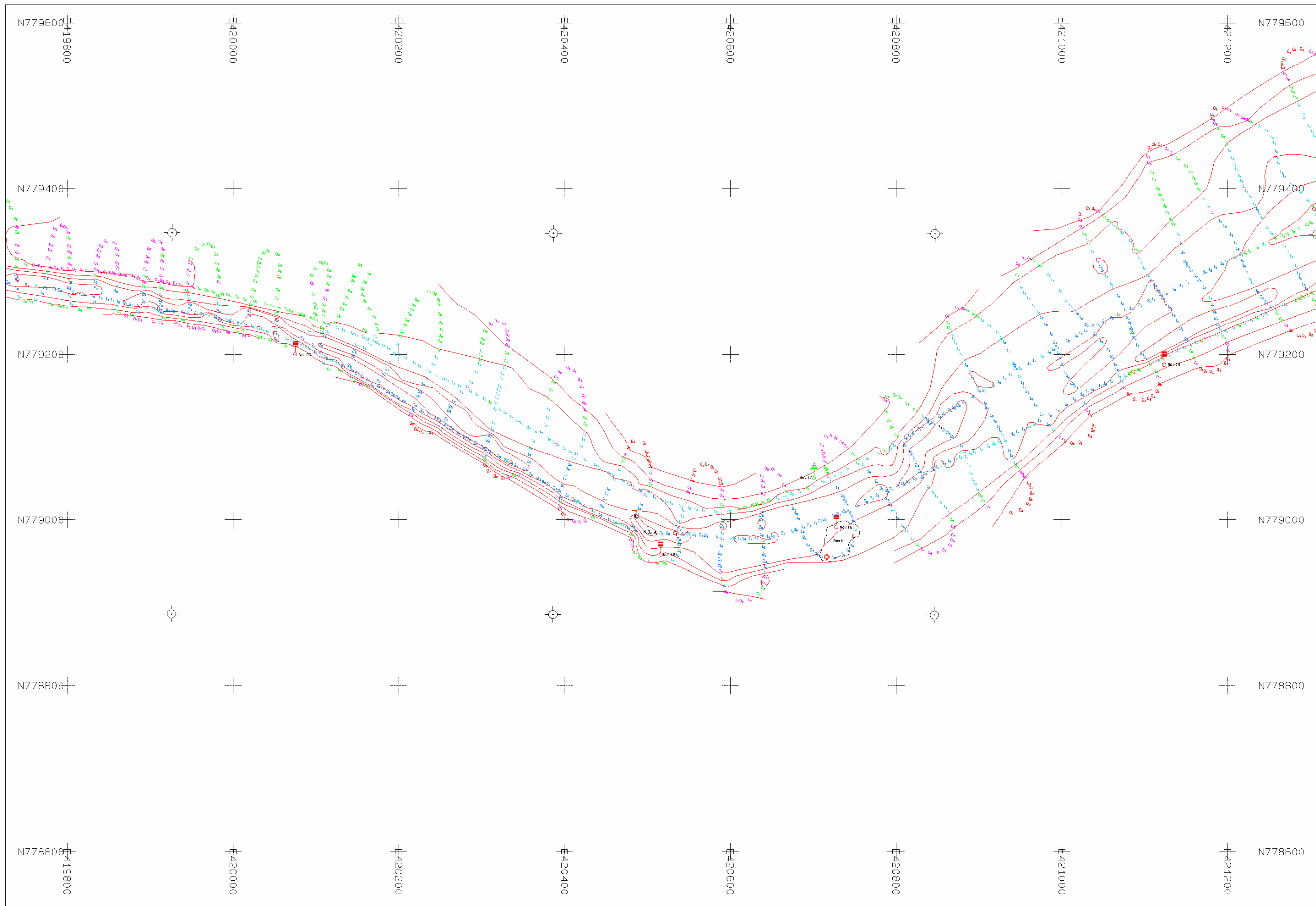


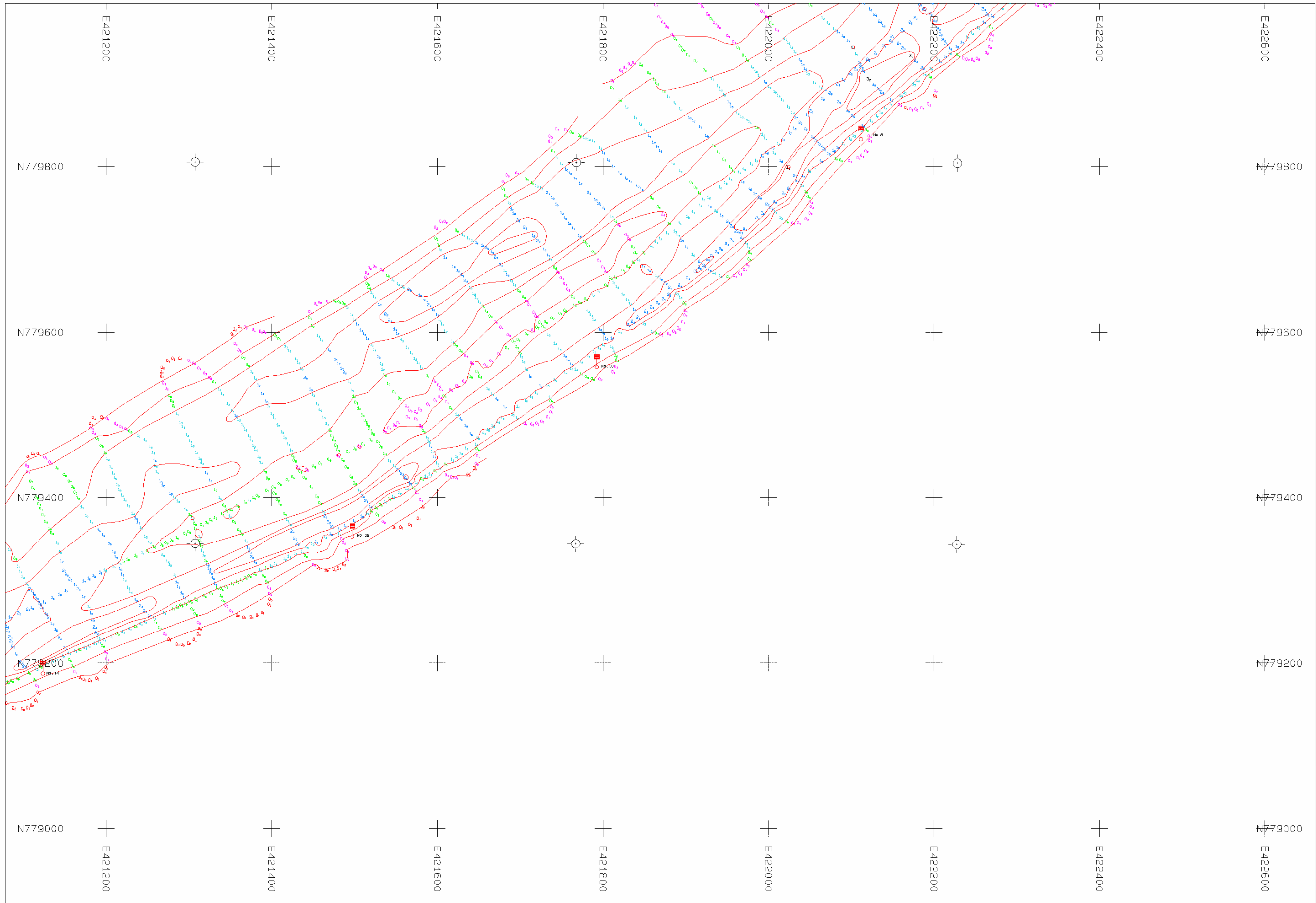
Figure A.6.2.3-1 Bathymetric Map (Around North Dock)



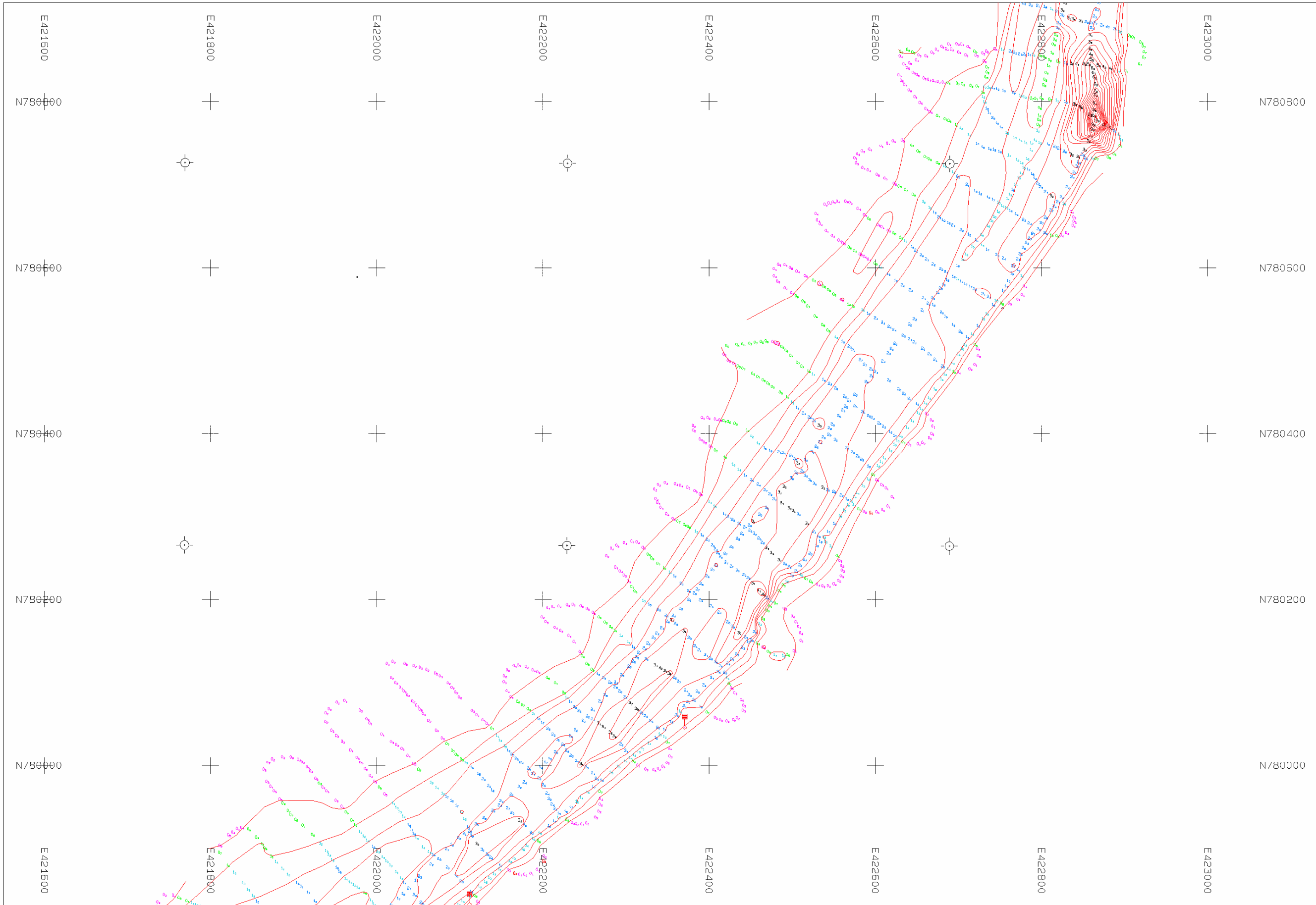
Figur A.6.2.3-2 Bathymetric Map (Access Channel 1)



Figur A.6.2.3-3 Bathymetric Map (Access Channel 2)

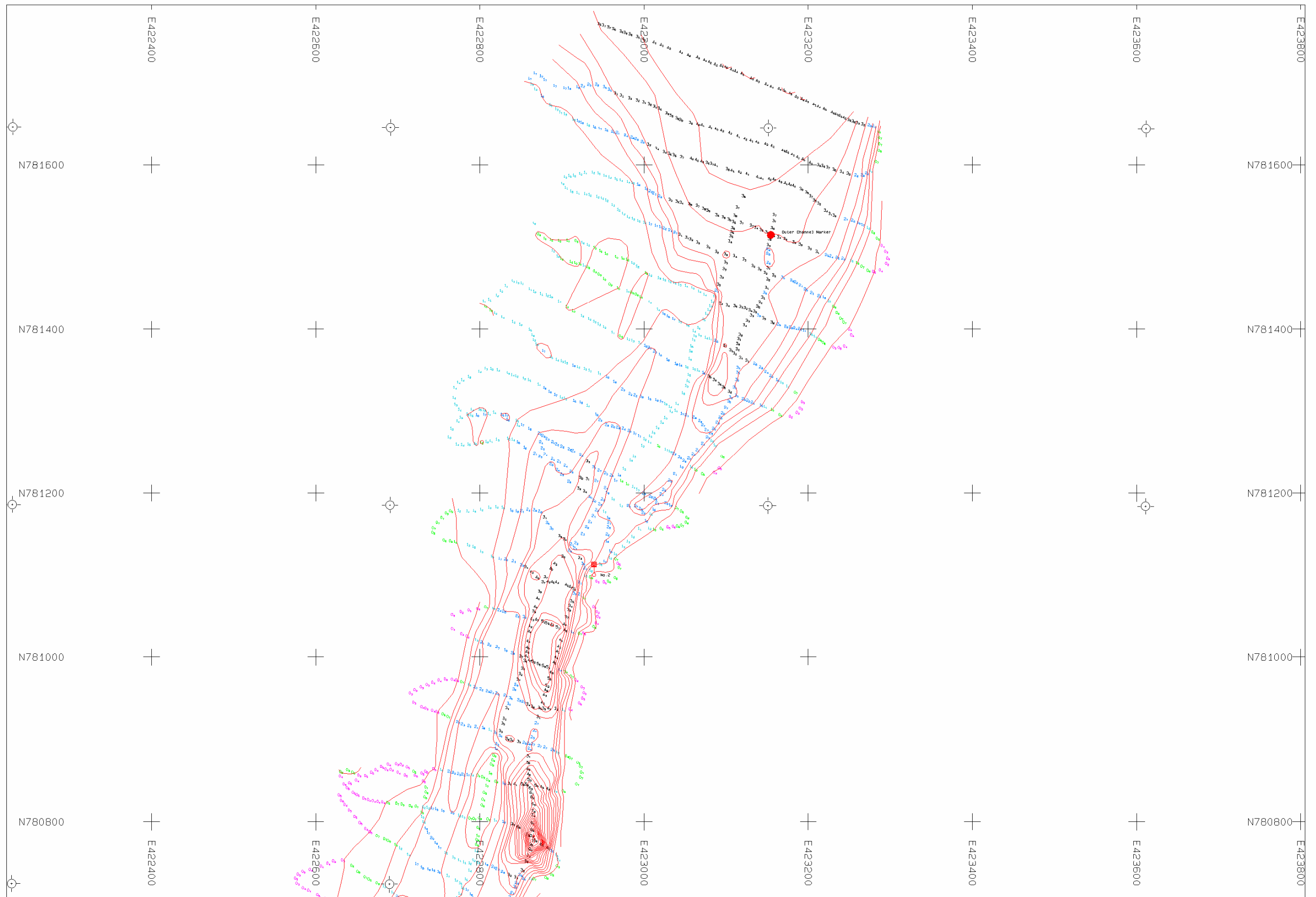


Figur A.6.2.3-4 Bathymetric Map (Access Channel 3)



Figur A.6.2.3-5 Bathymetric Map (Access Channel 4)





Figur A.6.2.3-6 Bathymetric Map (Access Channel 5)

Appendix 6-2-4. Results of Marine Life Observation

Pelelu, Mine Life Observation by Quadrat method  
2005/Aug/12

Zone	Observation Time	Depth (m)	Seagrass % Cover	Sea bed Material	Fish's Scientific name	Quantity	Times	Fish's Scientific name	Scientific name	Berthos
A-1 NF-2-57 E134-15-57	10:10 ~ 10:40 30min	2.1	75<	Fine sand/Mud	<i>Chelodactylus guntherianus</i>	Side	1	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Leptocottus armatus</i>	Side	3	<i>Leptocottus armatus</i>	<i>Leptocottus armatus</i>	At first sight in the vicinity
					<i>Stethacanthus</i>	Side	2	<i>Stethacanthus</i>	<i>Stethacanthus</i>	At first sight in the vicinity
					<i>Halichoeres bartolini</i>	Side	1	<i>Halichoeres bartolini</i>	<i>Halichoeres bartolini</i>	At first sight in the vicinity
					<i>Aluterus monoceros</i>	Side	1	<i>Aluterus monoceros</i>	<i>Aluterus monoceros</i>	At first sight in the vicinity
					<i>Chelodactylus guntherianus</i>	Side	4~5	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Halichoeres bartolini</i>	Side	2	<i>Halichoeres bartolini</i>	<i>Halichoeres bartolini</i>	At first sight in the vicinity
					<i>Urolophycis</i>	Side	1	<i>Urolophycis</i>	<i>Urolophycis</i>	At first sight in the vicinity
					<i>Chelodactylus guntherianus</i>	Side	2	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Urolophycis</i>	Side	1	<i>Urolophycis</i>	<i>Urolophycis</i>	At first sight in the vicinity
A-2 NF-2-56 E134-15-56	11:10 ~ 12:10 60min	3.1	75<	80% Coarse sand 20% Coral rocks	<i>Leptocottus armatus</i>	School 10	2	<i>Leptocottus armatus</i>	<i>Leptocottus armatus</i>	At first sight in the vicinity
					<i>Scorpaenidae</i>	Side	3	<i>Scorpaenidae</i>	<i>Scorpaenidae</i>	At first sight in the vicinity
					<i>Stethacanthus</i>	Side	1	<i>Stethacanthus</i>	<i>Stethacanthus</i>	At first sight in the vicinity
					<i>Halichoeres bartolini</i>	Side	1	<i>Halichoeres bartolini</i>	<i>Halichoeres bartolini</i>	At first sight in the vicinity
					<i>Chelodactylus guntherianus</i>	Side	1	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Aluterus monoceros</i>	Side	1	<i>Aluterus monoceros</i>	<i>Aluterus monoceros</i>	At first sight in the vicinity
					<i>Urolophycis</i>	Side	1	<i>Urolophycis</i>	<i>Urolophycis</i>	At first sight in the vicinity
					<i>Chelodactylus guntherianus</i>	School 5	1	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Urolophycis</i>	School 5	1	<i>Urolophycis</i>	<i>Urolophycis</i>	At first sight in the vicinity
					<i>Aluterus monoceros</i>	School 5	1	<i>Aluterus monoceros</i>	<i>Aluterus monoceros</i>	At first sight in the vicinity
A-3 NF-2-57 E134-16-2	13:00 ~ 14:00 60min	3.8	75<	100% Sand	<i>Chelodactylus guntherianus</i>	Side	4	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Leptocottus armatus</i>	School 50	2	<i>Leptocottus armatus</i>	<i>Leptocottus armatus</i>	At first sight in the vicinity
					<i>Leptocottus armatus</i>	Side	1	<i>Leptocottus armatus</i>	<i>Leptocottus armatus</i>	At first sight in the vicinity
					<i>Prognathodes multispinatus</i>	Side	1	<i>Prognathodes multispinatus</i>	<i>Prognathodes multispinatus</i>	At first sight in the vicinity
					<i>Chirocentrus arcuatus</i>	Side	3	<i>Chirocentrus arcuatus</i>	<i>Chirocentrus arcuatus</i>	At first sight in the vicinity
					<i>Chelidactylus</i>	Side	1	<i>Chelidactylus</i>	<i>Chelidactylus</i>	At first sight in the vicinity
					<i>Stethacanthus</i>	School 5	1	<i>Stethacanthus</i>	<i>Stethacanthus</i>	At first sight in the vicinity
					<i>Halichoeres bartolini</i>	Side	1	<i>Halichoeres bartolini</i>	<i>Halichoeres bartolini</i>	At first sight in the vicinity
					<i>Chelodactylus guntherianus</i>	School 30	1	<i>Chelodactylus guntherianus</i>	<i>Chelodactylus guntherianus</i>	At first sight in the vicinity
					<i>Aluterus monoceros</i>	Side	1	<i>Aluterus monoceros</i>	<i>Aluterus monoceros</i>	At first sight in the vicinity

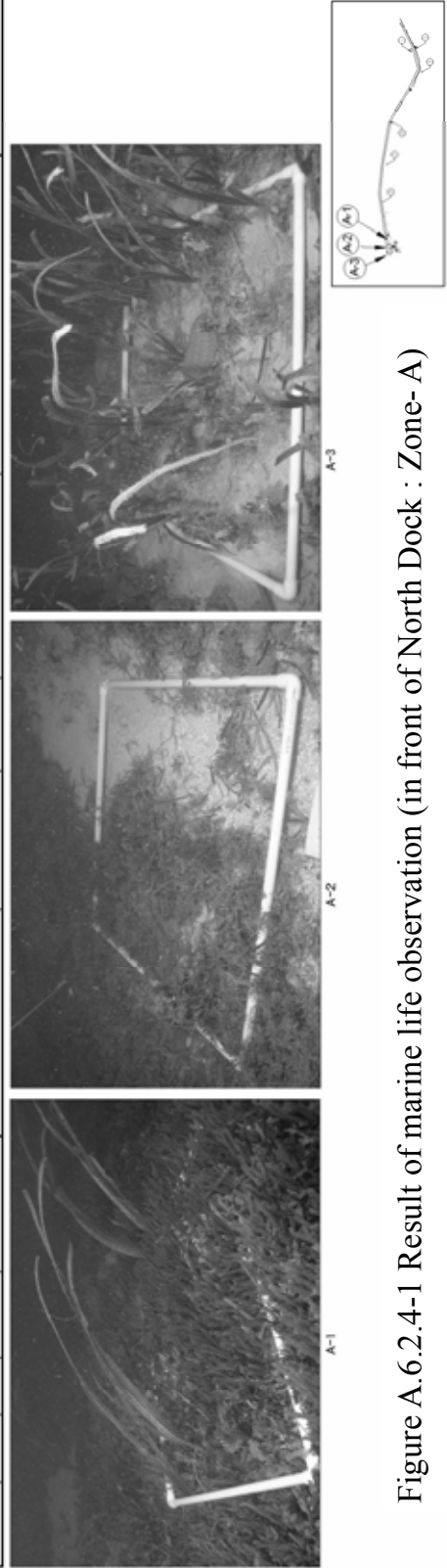


Figure A.6.2.4-1 Result of marine life observation (in front of North Dock : Zone-A)

Zone	Observation Time	Depth (m)	Seagrass % Cover	Sea bed Material	Fish's Scientific name Passing cor. Quadrat	Quantity	Times	Fish's Scientific name At first sight in this vicinity	Scientific name Seagrass/Seamoss	Beerbios At first sight in the vicinity
B-1	10:30 ~ 11:00 30min	4	75 <	100% Sand	<i>Lethrinus ramak</i> <i>Scolopsis taeniata</i> <i>Micropoma hartwegii</i> <i>Amphiprion aeneus</i> <i>Stethacanth affinis</i> <i>Acanthaluteres armatus</i>	Sole Sole Sole School 11 5 Always	1 2 3 2 1 5 Always	1 <i>Amblygobius phalaena</i> 2 <i>Ovalis lemnis</i>	<i>Enhalus acrodon</i> <i>Thalassia hemprichii</i> <i>Halimeda macroloba</i> <i>Halimeda sp. 1</i> <i>Halimeda sp. 2</i> <i>Halimeda sp. 4</i> <i>Clavellina sp. 1</i>	<i>Tridacna striata</i> <i>Halobryonia leucopogona</i>
B-2	15:00 ~ 15:30 30min	3.2	75 <	100% Sand	<i>Chromis rubra</i> <i>Micropoma hartwegii</i> <i>Acanthaluteres armatus</i>	Sole Sole Sole	1 8 8	1 <i>Lethrinus ramak</i> 1 <i>Sparisoma virgatum</i> 8 <i>Sparisoma virgatum</i> 1 <i>Chromis rubra</i> 1 <i>Chromis rubra</i> 1 <i>Paracaris nigrofasciatus</i>	<i>Enhalus acrodon</i> <i>Halophila ovalis</i> <i>Halimeda macroloba</i> <i>Halimeda sp. 1</i> <i>Halimeda sp. 2</i> <i>Myriophorum</i>	<i>Psychrolutes sp.</i> <i>Gobius sp.</i>
B-3	14:00 ~ 14:30 30min	2.7	75 <	100% Sand	<i>Lethrinus ramak</i> <i>Chromis rubra</i>	Sole Sole	1 1	1 <i>Paracaris nigrofasciatus</i> 1 <i>Paracaris nigrofasciatus</i> 1 <i>Amblygobius phalaena</i> 1 <i>Rhinogobius aculeatus</i> 1 <i>Amblygobius phalaena</i>	<i>Enhalus acrodon</i> <i>Thalassia hemprichii</i> <i>Halimeda macroloba</i> <i>Halimeda sp. 1</i>	
									<i>Halimeda sp.</i> <i>Clavellina sp. 1</i>	

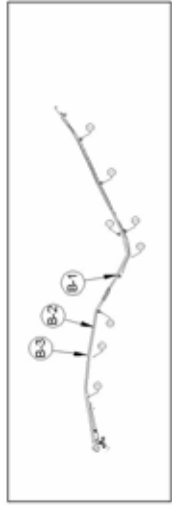
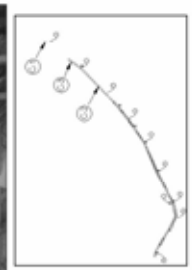
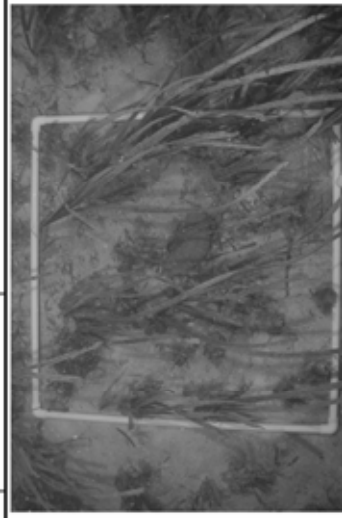


Figure A.6.2.4-2 Result of marine life observation (Access channel: Zone-B)

Preimu, Minne Life Observation by Quadrat method  
2005/Aug/11

Zone	Observation Time	Depth (m)	Seagrass % Cover	Sea bed Material	Fish's Scientific name Passing over Quadrat	Quantity	Times	Scientific name Seagrass/Seaweed	Benthos At First sight in the vicinity
G-1 N7-3-42 E134-18-	10:40 ~ 40min	3.8	75 <	100% Sand	<i>Scorpaenopsis ciliata</i> <i>Paripomacentrus barberinus</i> <i>Choroerodon aeneochoro</i> <i>Chelodactylus inermis</i> <i>Oxycottus bimaculatus</i> <i>Coloatonus japonicus</i> <i>Asterropteryx acuminatifata</i> <i>Amblygobius phillipi</i>	Sole Sole School 2 School 10~20 Sole Pair 3	2 4 2 4 1 Always Always	<i>Halimeda macroloba</i> <i>Enhalus acoroides</i> <i>Thalassia hemprichii</i> <i>Didymnum molle</i>	<i>Tricentrus grallata</i> <i>Holothuria nobilis</i> <i>Holothuria atra</i> <i>Stichopus variegatus</i>
G-3 N7-3-31 E134-17-	13:25 ~ 40min	3.7	75 <	100% Sand	<i>Emipheleus polyphetaodon</i> <i>Pseudochromis fuscus</i> <i>Lutjanus gibbus</i> <i>Lethrinus harak</i> <i>Paripomacentrus barberinus</i> <i>Paripomacentrus barberinus</i> <i>Scorpaenopsis ciliata</i> <i>Pomacentrus nagasakiensis</i> <i>Dischistodus prosopilepterus</i> <i>Chelodactylus inermis</i> <i>Lebistes dimidiatus</i> <i>Scarus hypselopterus</i> <i>Calotomus japonicus</i> <i>Zabrisoma veliferum</i>	Sole School 5 Sole Sole Sole School 20 Sole School School 40~50 Sole 2 Sole School 3 Sole Sole	Always Many Times 3 3 3 Often Many Times Often Always Always Always Always Always Always	<i>Pontes cylindrica</i> <i>Hymnea parvosa</i> <i>Thalassia hemprichii</i> <i>Halimeda macroloba</i> <i>Halimeda sp. 1</i> <i>Rhodoglossum sp.</i>	<i>Cypraea cylindrica f. soerbyana</i> <i>Hypolyte ventricosa</i> <i>Protoscastra nodosus</i> <i>Echinaster lucanicus</i>
G-2 N7-3-20 E134-18-	14:20 ~ 30min	3.7	75 <	100% Sand	<i>Lethrinus harak</i> <i>Scorpaenopsis ciliata</i> <i>Paripomacentrus barberinus</i> <i>Chelodactylus inermis</i> <i>Scarus hypselopterus</i> <i>Calotomus japonicus</i> <i>Acanthistius tomentosus</i>	Sole School 20 Sole Sole Sole School 10 Sole	1 5 2 3 Always 1 1	<i>Halimeda sp. 1</i> <i>Enhalus acoroides</i> <i>Royde</i> <i>Didymnum molle</i>	<i>Peloclinemus imperator</i> <i>Stichopus variegatus</i>



C-1  
C-2  
C-3

Figure A.6.2.4-3 Result of marine life observation (Access channel: Zone-C)



# Appendix 6-2-5. Results of Current Observation

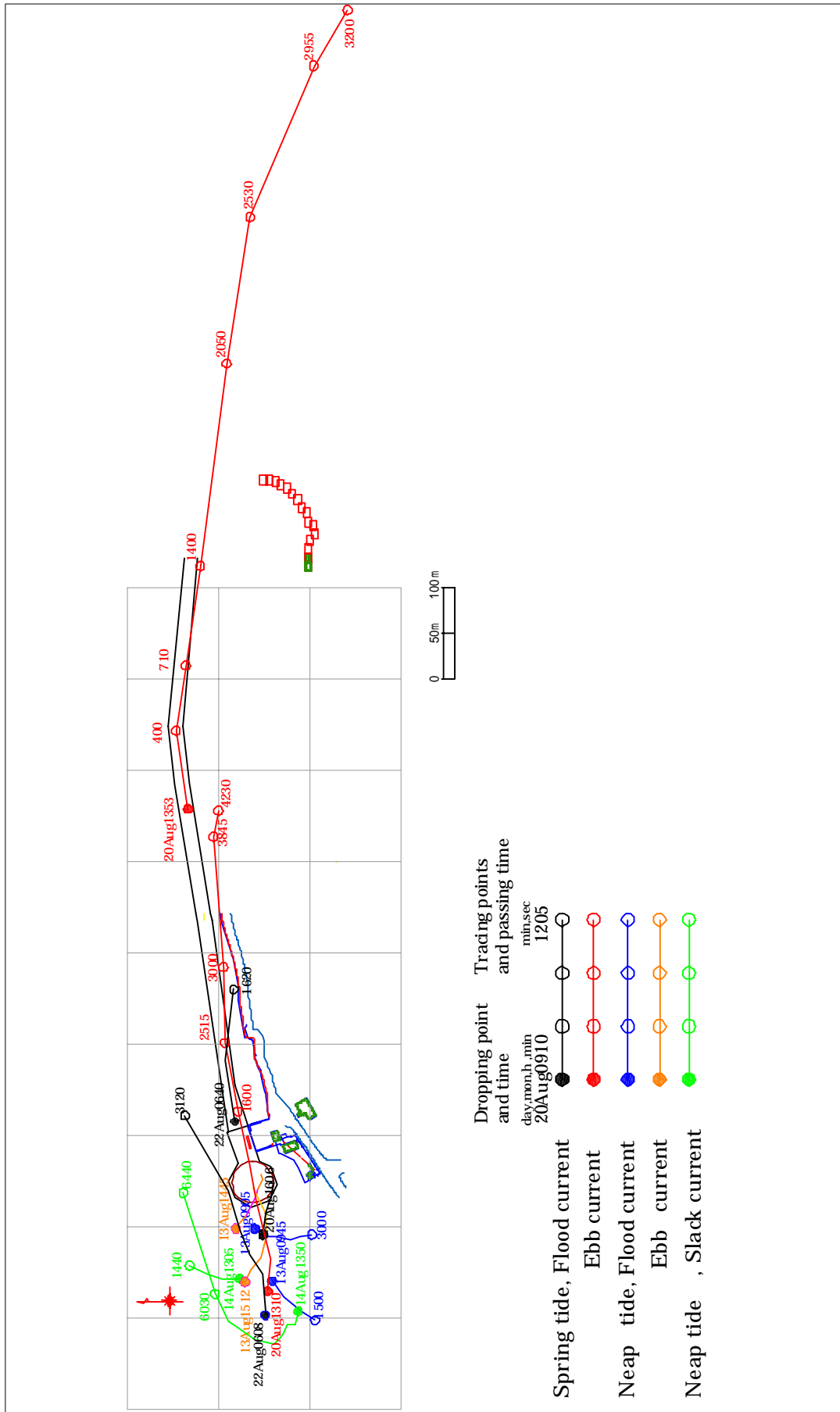


Figure 4.6.2.5-1 Result of Float Tracking (Zone A)

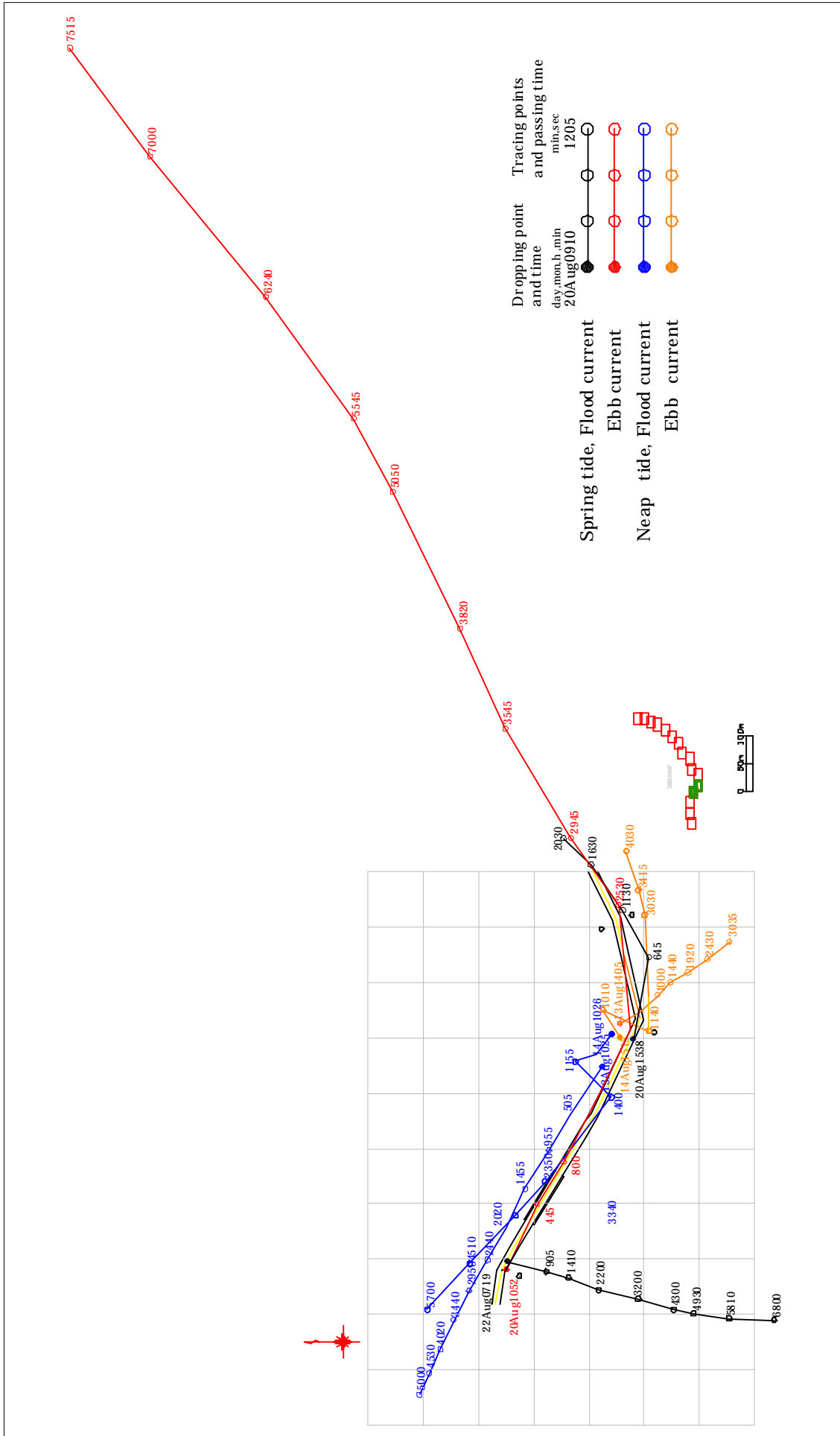


Figure 6.2.5-2 Result of Float Tracking (Zone B)





## Appendix 6-2-6. Results of Seabed Analysis

Seabed sediment quality analysis has been carried out at the site shown in Figure A.6.2.6-1. Samples were collected from seabed by diver. Results of grain size analysis are shown in Figure A.6.2.6-2 to A.6.2.6-4.

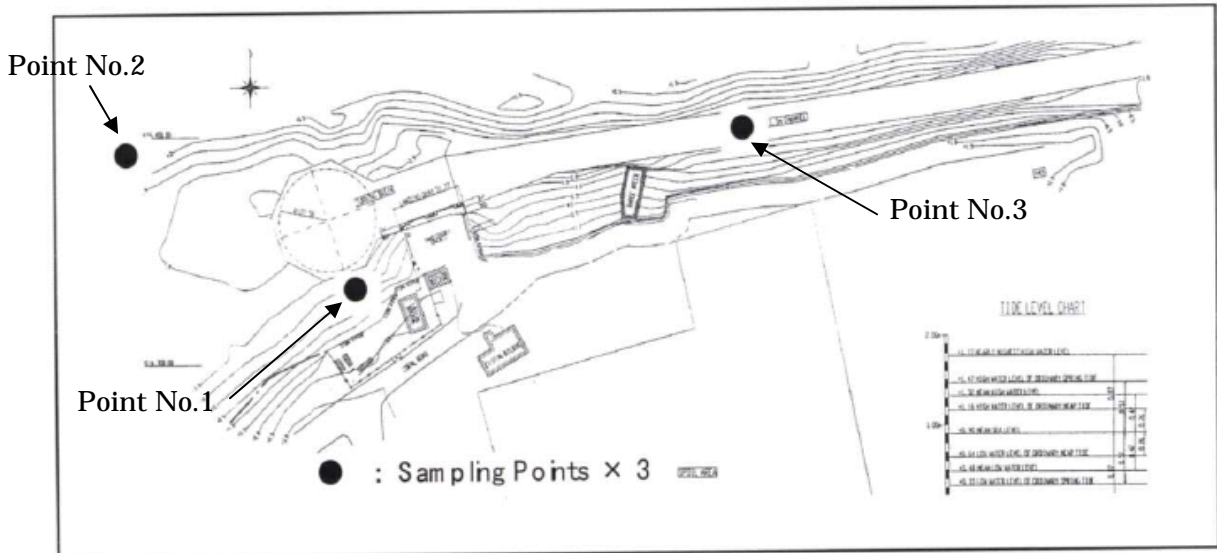
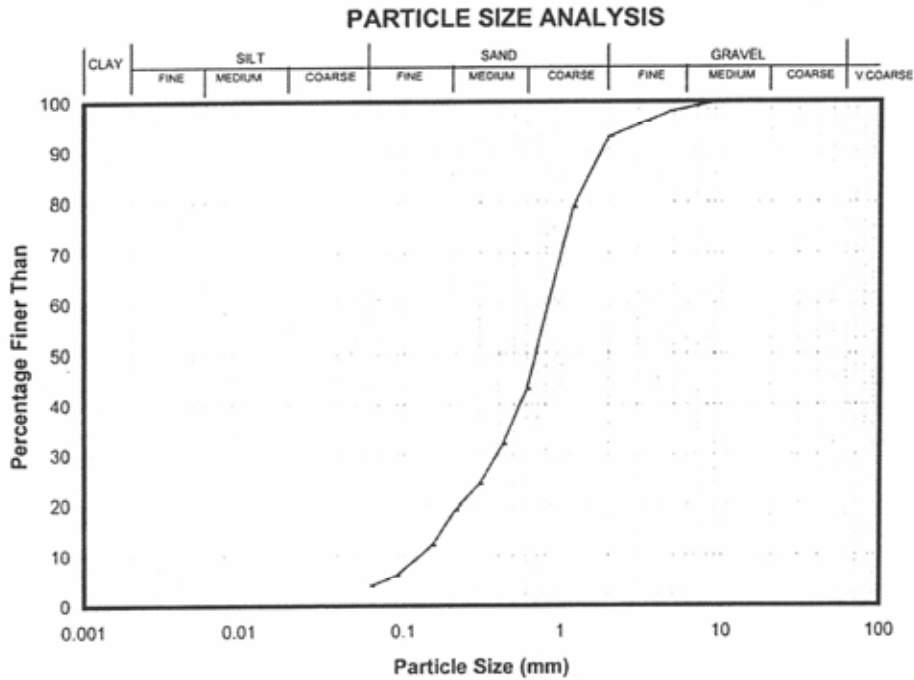


Figure A.6.2.6-1 Location of sampling points



Plate No.:  
 Site : **North Dock, Pelelieu Island, Palau**  
 BH No.: --- Sample No.: S1  
 Test Method Used : NZS 4402 : 1986 Test 2.8.2 Dry Sieve

Page of  
 Job No. : **750485**  
 Depth : --- (m)



Sieve (mm)	Total % Passing
63.0	---
53.0	---
37.5	---
26.5	---
19.0	---
13.2	---
9.50	100
6.70	99
4.75	98
3.35	96

Sieve (mm)	Total % Passing
2.00	93
1.18	79
0.600	43
0.425	32
0.300	24
0.212	19
0.150	12
0.090	6
0.063	4

Sample history : As received at natural water content.

Description : Coral mixed with shell fragments and sand, loose/free water, light grey with white.

Remarks : The percentage Loss = 0

Entered by : SJ

Date : 22/8/05

Checked by : KNO

Date : 23/8/05

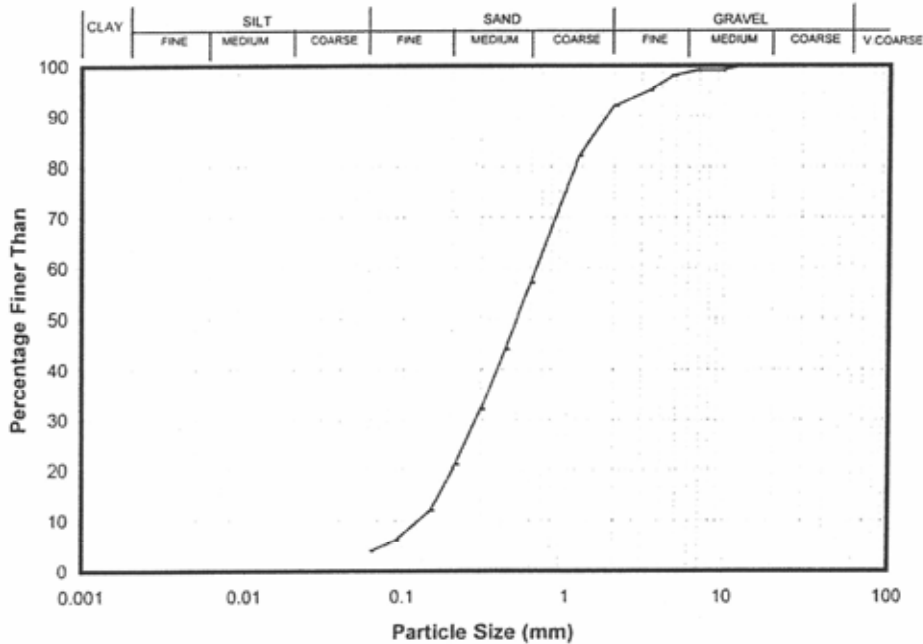
Figure A.6.2.6-2 Result of sediment quality investigation (Point No.1 )



Plate No.:  
Site : North Dock, Pelelieu Island, Palau  
BH No.: --- Sample No.: S2  
Test Method Used : NZS 4402 : 1986 Test 2.8.2 Dry Sieve

Page of  
Job No. : 750485  
Depth : --- (m)

### PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing
63.0	---
53.0	---
37.5	---
26.5	---
19.0	---
13.2	100
9.50	99
6.70	99
4.75	98
3.35	95

Sieve (mm)	Total % Passing
2.00	92
1.18	82
0.600	57
0.425	44
0.300	32
0.212	21
0.150	12
0.090	6
0.063	4

Sample history : As received at natural water content.

Description : Coral mixed with shell fragments and sand, loose/free water, light yellow with grey/ white.

Remarks : The percentage Loss = 0

Entered by : ST

Date : 22/8/02

Checked by : KND

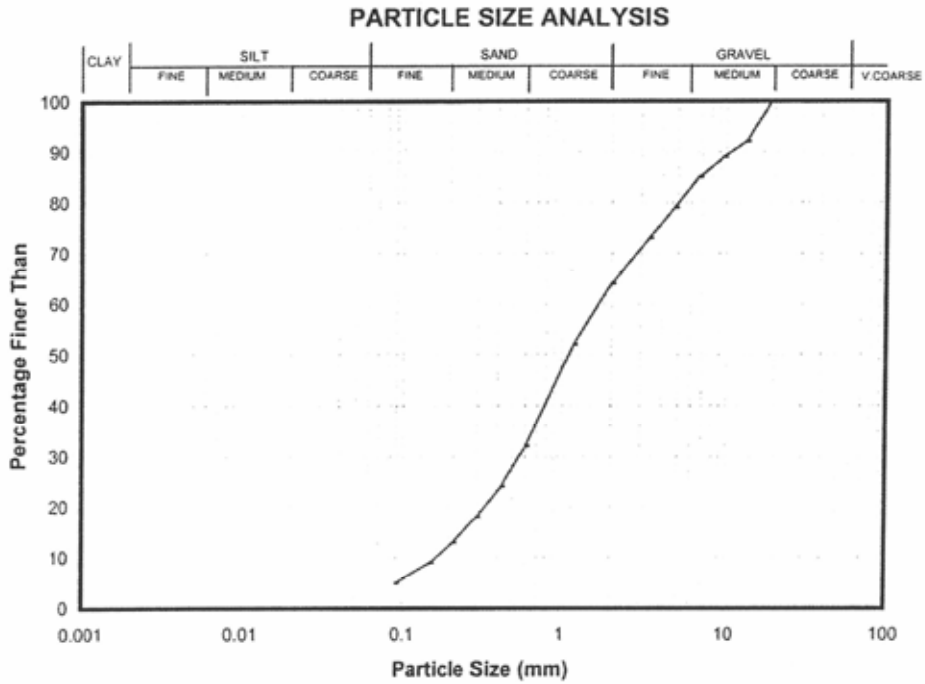
Date : 23/8/05

Figure A.6.2.6-3 Result of sediment quality investigation (Point No.2)



Plate No.:  
 Site : **North Dock, Pelelieu Island, Palau**  
 BH No.: --- Sample No.: S3  
 Test Method Used : NZS 4402 : 1986 Test 2.8.2 Dry Sieve

Page of  
 Job No. : **750485**  
 Depth : --- (m)



Sieve (mm)	Total % Passing
63.0	---
53.0	---
37.5	---
26.5	---
19.0	100
13.2	92
9.50	89
6.70	85
4.75	79
3.35	73

Sieve (mm)	Total % Passing
2.00	64
1.18	52
0.600	32
0.425	24
0.300	18
0.212	13
0.150	9
0.090	5
0.063	4

Sample history : As received at natural water content.

Description : Coral mixed with shell fragments and sand, loose/free water, dark grey with white.

Remarks : The percentage Loss = 0

Entered by : sj

Date : 22/8/05

Checked by : KND

Date : 23/8/05

Figure A.6.2.6-4 Result of sediment quality investigation (Point No.3 )

Appendix 6-2-7. Results of Material Analysis

Material analysis was carried out. Two samples of sand and gravels from two quarry sites were sampled. The samplings were carried out at two quarry site of PTC (Palau Transportation Company) and Hawaiian Belau Rock (HBR).Laboratory result test are shown in Table A.6.2.7-1 to A.6.2.7-2. Results of particle size analysis are shown in Figure A.6.2.7-1 to A.6.2.-4.

Table A.6.2.7-1 Laboratory test result ( PTC )

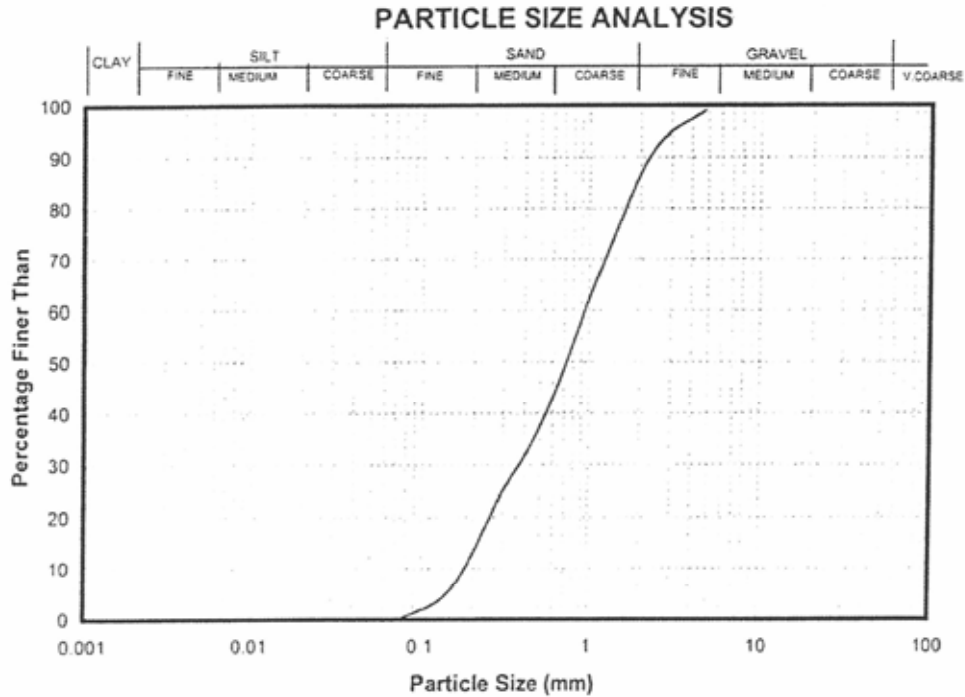
Item	Relative Gravity	Moisture Content	Particle size analysis
Sand	2.69	13%	Figure A.6.2.7-1
Cobble	2.77		Figure A.6.2.7-2
Gravel	2.80		

Table A.6.2.7-2 Laboratory test result ( HBR )

Item	Relative Gravity	Moisture Content	Particle size analysis
Sand	2.64	6.6%	Figure A.6.2.7-3
Cobble	2.55		Figure A.6.2.7-4
Gravel	2.61		



Plate No.: 1 Page of  
Site : Pelelieu Island, Palau Job No. : 750485  
Sample No. : PTC Quarry - Sand Depth : --- (m)  
Test Method Used : NZS 3111: 1986: Test 6 Sieve Analysis and Calculation of Fineness modulus



Total % Passing	Sieve (mm)
---	13.2
---	9.5
100	6.7
99	4.75
91	2.36
68	1.18
43	0.600
33	0.425
25	0.300
6	0.150
0	0.075

Sample history : As received condition  
Description : SAND (coarse to fine), loose, some gravel

Remarks: Fineness Modulus = 2.70

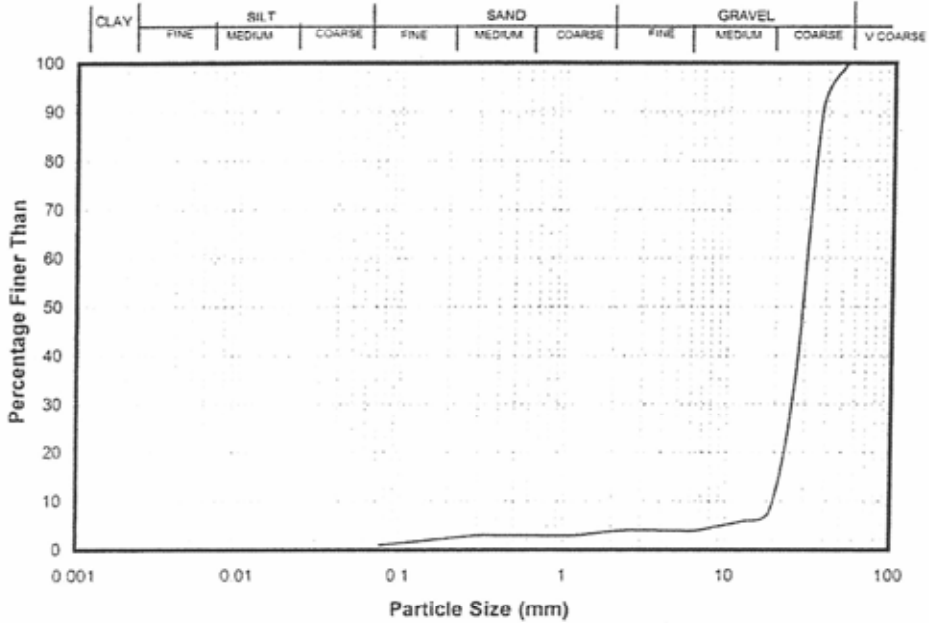
Entered by : SA Date : 2/09/05 Checked by : ST Date : 2/11/05

Figure A.6.2.7-1 Particle size analysis (PTC, sand)



Plate No.: 2 Page of  
 Site: Pelelieu Island, Palau Job No.: 750485  
 Sample No.: PTC Quarry - Cobble Depth: --- (m)  
 Test Method Used: NZS 3111: 1986: Test 6 Sieve Analysis and Calculation of Fineness modulus

### PARTICLE SIZE ANALYSIS



Total % Passing	Sieve (mm)
100	53
91	37.5
35	26.5
8	19
6	13.2
5	9.5
4	6.7
4	4.75
4	2.36
3	1.18
3	0.600

Total % Passing	Sieve (mm)
3	0.425
3	0.300
2	0.150
1	0.075

Sample history : As received condition  
 Description : GRAVEL (Coarse), Loose, some sand and small gravels

Remarks: None

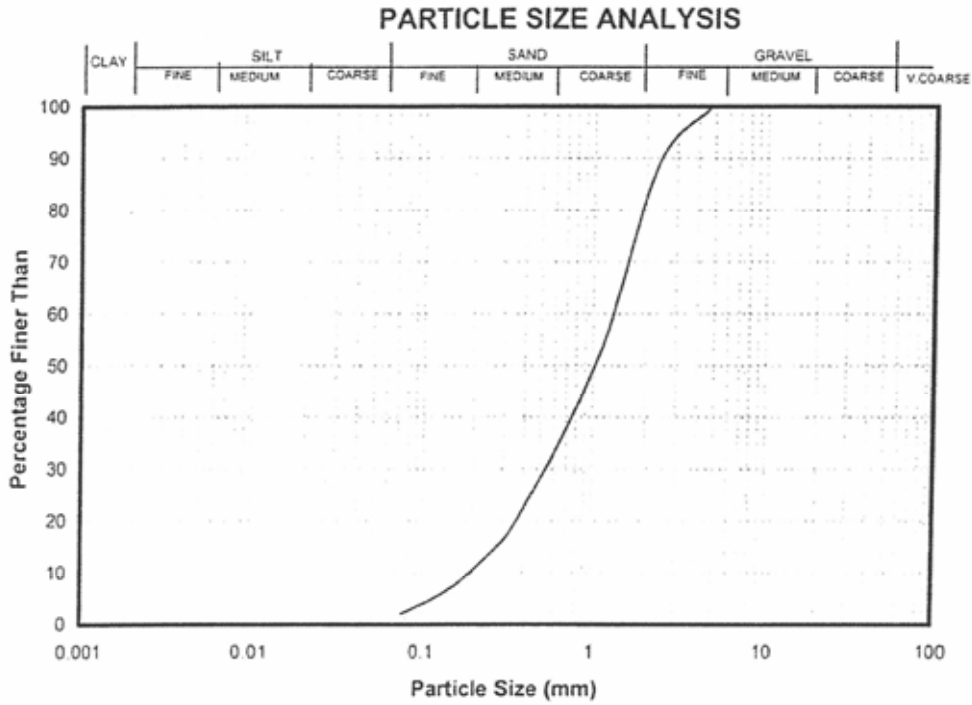
Entered by : SA Date : 2/09/05 Checked by : s j Date : 2/1/05

Figure A.6.2.7-2 Particle size analysis (PTC, gravel)





Plate No.:	3	Page	of
Site:	<b>Pelelieu Island, Palau</b>	Job No.:	750485
Sample No.:	<b>Hawaiian Rock Corp - Sand</b>	Depth:	--- (m)
Test Method Used:	<b>NZS 3111: 1986: Test 6 Sieve Analysis and Calculation of Fineness modulus</b>		



Total % Passing	Sieve (mm)
---	13.2
---	9.5
---	6.7
100	4.75
89	2.36
55	1.18
33	0.600
24	0.425
16	0.300
7	0.150
2	0.075

Sample history : As received condition  
 Description : SAND (coarse to fine), loose, some gravel

Remarks: Fineness Modulus = 3.00

Entered by : *SA*      Date : 2/09/05      Checked by : *SJ*      Date : 2/9/05

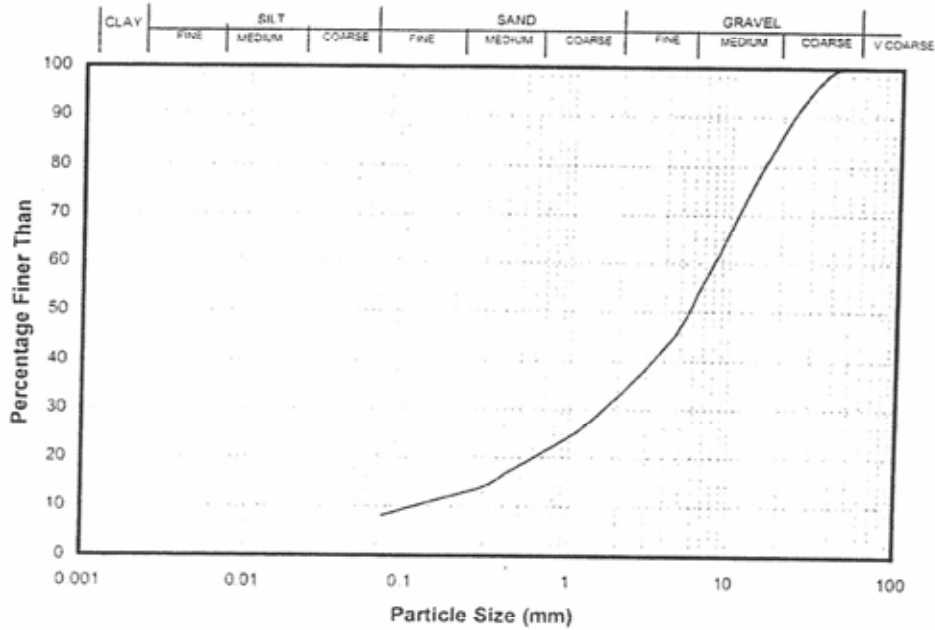
Figure A.6.2.7-3 Particle size analysis (HBR, sand )





Plate No.: 4 Page of  
 Site : Peleliu Island, Palau Job No. : 750485  
 Sample No. : Hawaiian Rock Corp Quarry - Cobble Depth : --- (m)  
 Test Method Used : NZS 3111: 1986: Test 6 Sieve Analysis and Calculation of Fineness modulus

**PARTICLE SIZE ANALYSIS**



Total % Passing	Sieve (mm)
100	53
99	37.5
93	26.5
85	19
75	13.2
65	9.5
55	6.7
46	4.75
35	2.36
26	1.18
20	0.600

Total % Passing	Sieve (mm)
17	0.425
14	0.300
11	0.150
8	0.075

Sample history : As received condition  
 Description : GRAVEL (Coarse to fine), sandy, loose,

Remarks: None

Entered by : 84 Date : 2/09/05 Checked by : 57 Date : 2/9/05

Figure A.6.2.7-4 Particle size analysis (HBR, gravel )

## Appendix 6-2-8. Results of Soil Investigation

Soil investigation has been conducted at 4 locations of the project site. Figure A.6.2.8-1 shows the bore hole points. Bore hole has been drilled to -7m depth at BH-1 and BH-2, -4.5m at BH-3, -9.5m at BH-4. At all bore hole bearing layer had appeared (refer to Figure A.6.2.8-2 to A.6.2.8-5).

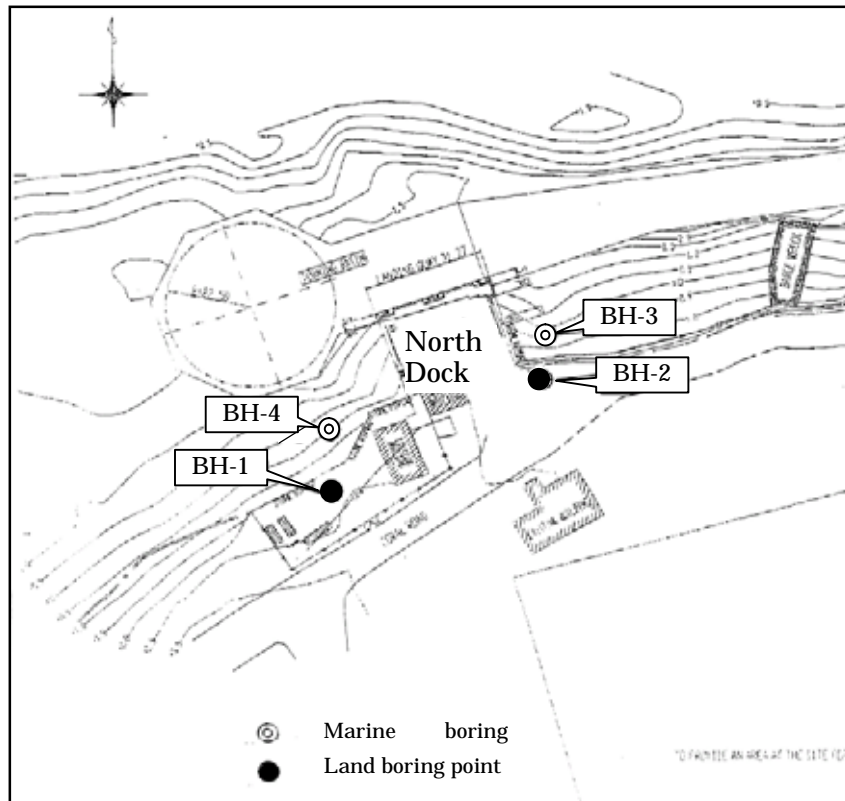


Figure A.6.2.8-1 Location of Bore Holes

Table A.6.2.8-1 Result of Soil Investigation

Point	BH-1				BH-2			
	-2.0m	-4.0m	-6.0m		-2.0m	-4.0m	-6.0m	
Depth	-2.0m	-4.0m	-6.0m		-2.0m	-4.0m	-6.0m	
N-Value	19	33	20		27	more than 20	more than 50	
Relative Density	2.312	2.280	2.271		2.236	-	-	
SO <sub>3</sub> (mg/l)	67	28	-		34	25	-	
Water Contents (%)	27.5	24.1	22.6		23.0	-	-	

Point	BH-3				BH-4			
	-2.0m	-4.0m			-2.0m	-4.0m	-6.0m	-8.0m
Depth	-2.0m	-4.0m			-2.0m	-4.0m	-6.0m	-8.0m
N-Value	17	more than 50			34	more than 20	more than 50	more than 50
Relative Density	2.395	-			2.228	2.263	-	-
SO <sub>3</sub> (mg/l)								
Water Contents (%)	31.4	-			27.8	17.0		

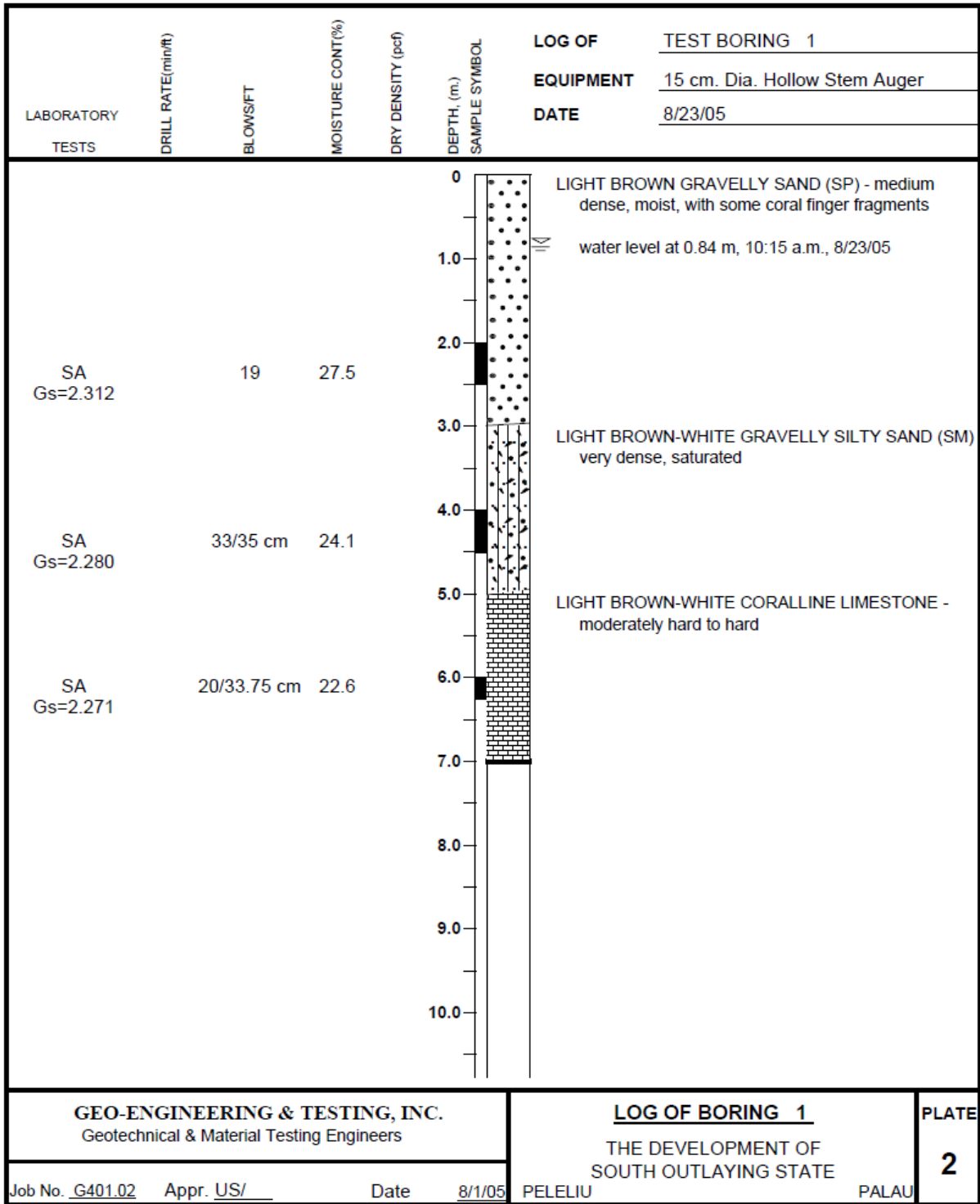


Figure A.6.2.8-2 Result of soil investigation ( BH-1 )

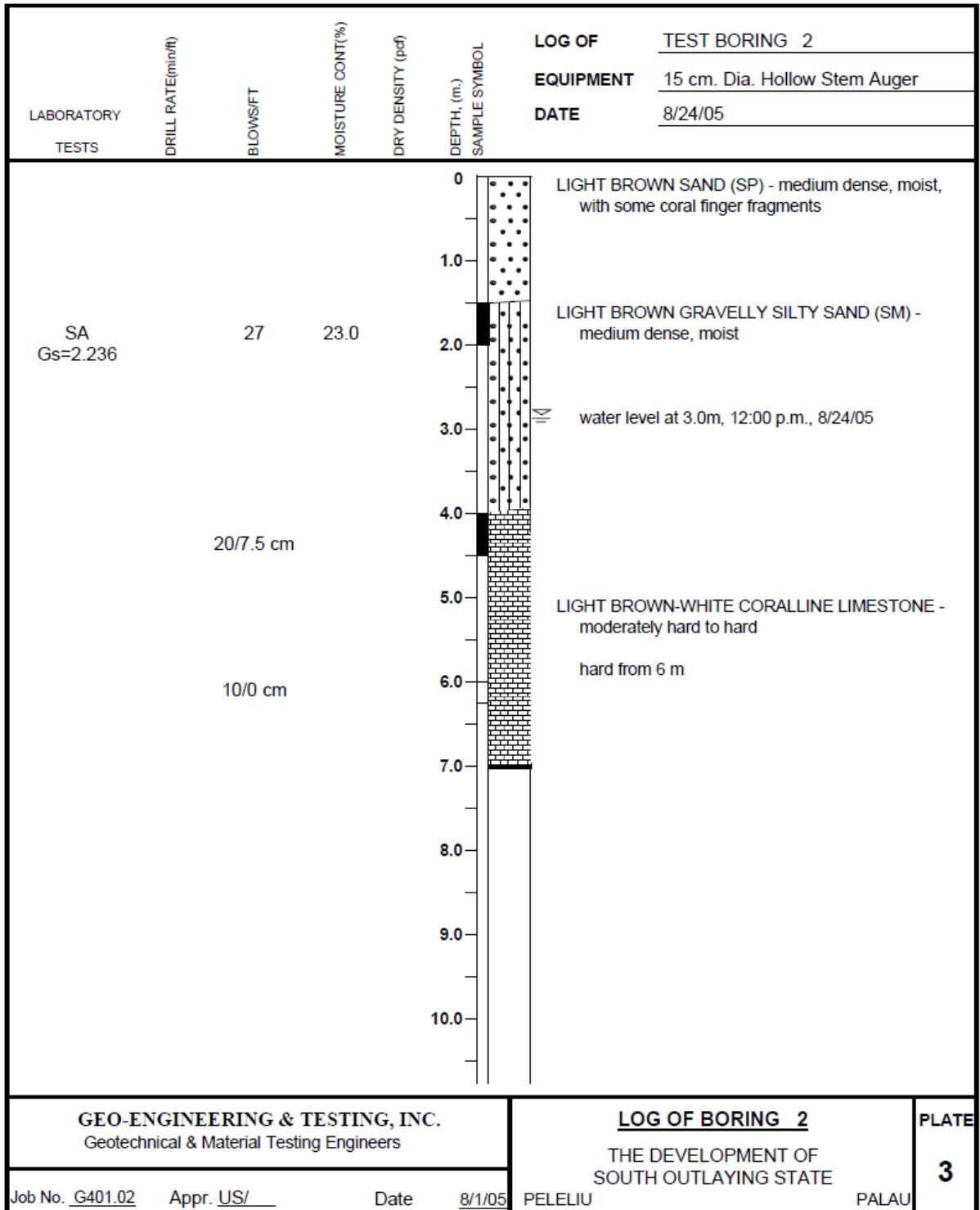


Figure A.6.2.8-3 Result of soil investigation ( BH-2 )

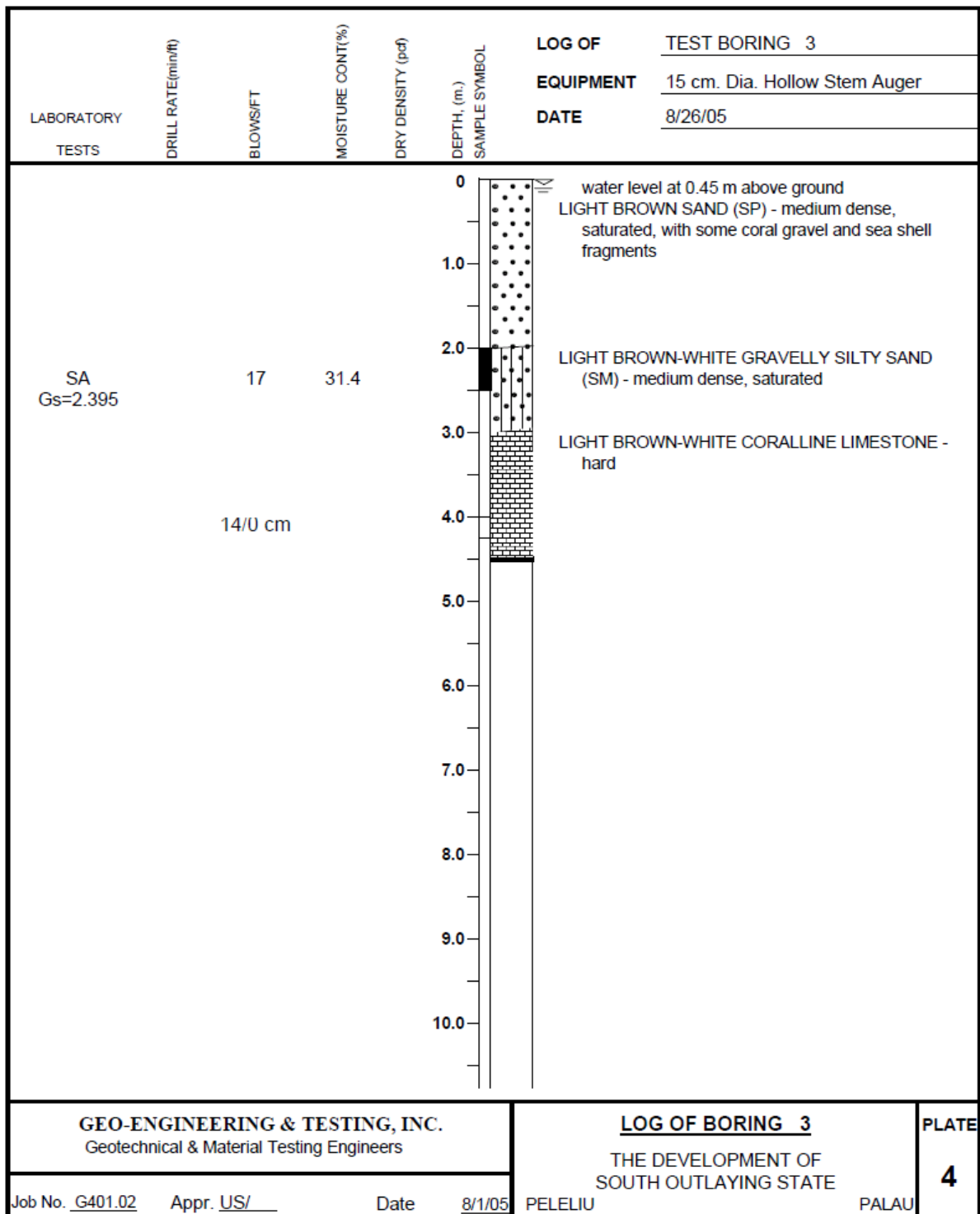


Figure A.6.2.8-4 Result of soil investigation ( BH-3 )

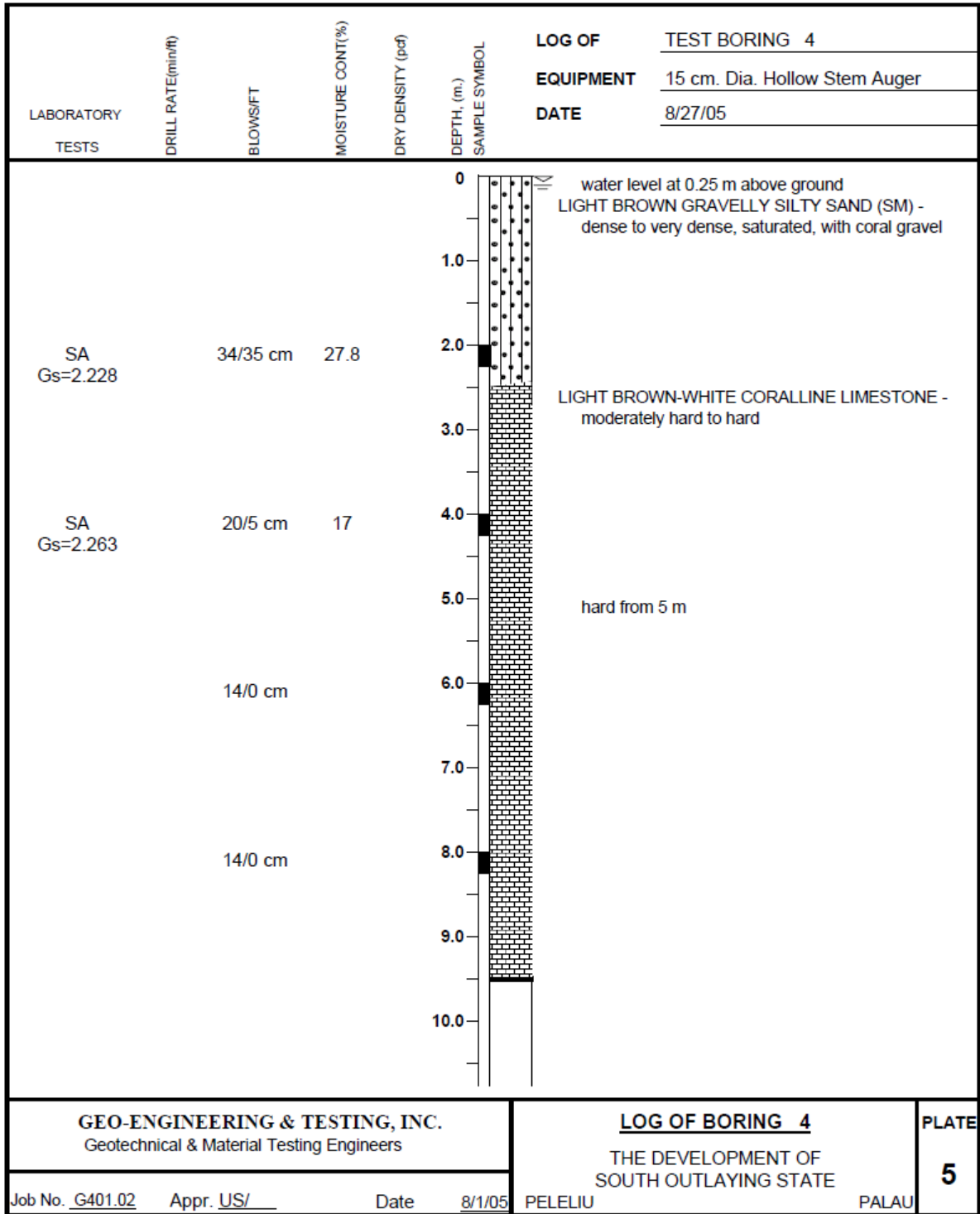


Figure A.6.2.8-5 Result of soil investigation ( BH-4 )