

(3 alternatives on repair works of portal member and evaluation of 3 alternatives)

Handwritten signature or initials in black ink, appearing to be 'J A'.

	Alternative	Structural aspect	Construction aspect	Cost	Evaluation
A		<p>RC structure(exising steel are driill out and these steel are to be connected new one. Though stiffness around support is depend upon existing steel's condition, degree of deterrioration semms to be not progress as existing steel is apparently sound. Though clearance at shouder is not suffucient(less than 5.00m),passing of vehicle has not specific problem.</p>	<p>New and existing bars are to be joinded with lapping or welding after blushing surface of old bars drilled out from deteriorated concrete. This RC structure has not any specific problem while repairing.</p>	<p>RC member. 3.36 m3 Welding 20 kot</p>	<p>⊙ Recommendable</p>
B		<p>SRC structure(steel plates are installed around arch girder with high tension bolts, and H shaped steel is connected through splice plates. Stiffness at support can be secured as expected, but hitensin bolts and steel plate will be checked periodically.</p>	<p>Arch surface is to be cleaned with plaster mortal. After painting and applying cohesion agent,steel plates will be contacted with high tension bolts. After combining with arch member and steel plates,H shape steel is joined and concrete is embedded to form SRC structure. Construction period is longest.</p>	<p>Steel plate 1.75 t Hightension bolt 22 kot Concrete 1.70 m3</p>	<p>○</p>
C		<p>SRC structure(Arch is to be drilled to insert steel bars to the horizontal direction. Inserted steel bars form connection with H shaped steel through splice plates. Though arch member patially injured,bridge is undertaken only dead load without live load,So Consultant beleive that any other problem will not arrise while repairing.</p>	<p>After hole to be inserted by bars is installed with concrete cutter, SRC structure is formed with H shaped steel plate. It is concened about injuring of existing bars in the arch member, so it needs careful works.</p>	<p>Drilling 9.60 m Steel plate 0.92 t Hightensin bolt 12 kot Concrete 1.70 m3</p>	<p>○</p>

Attachment 5-2-1

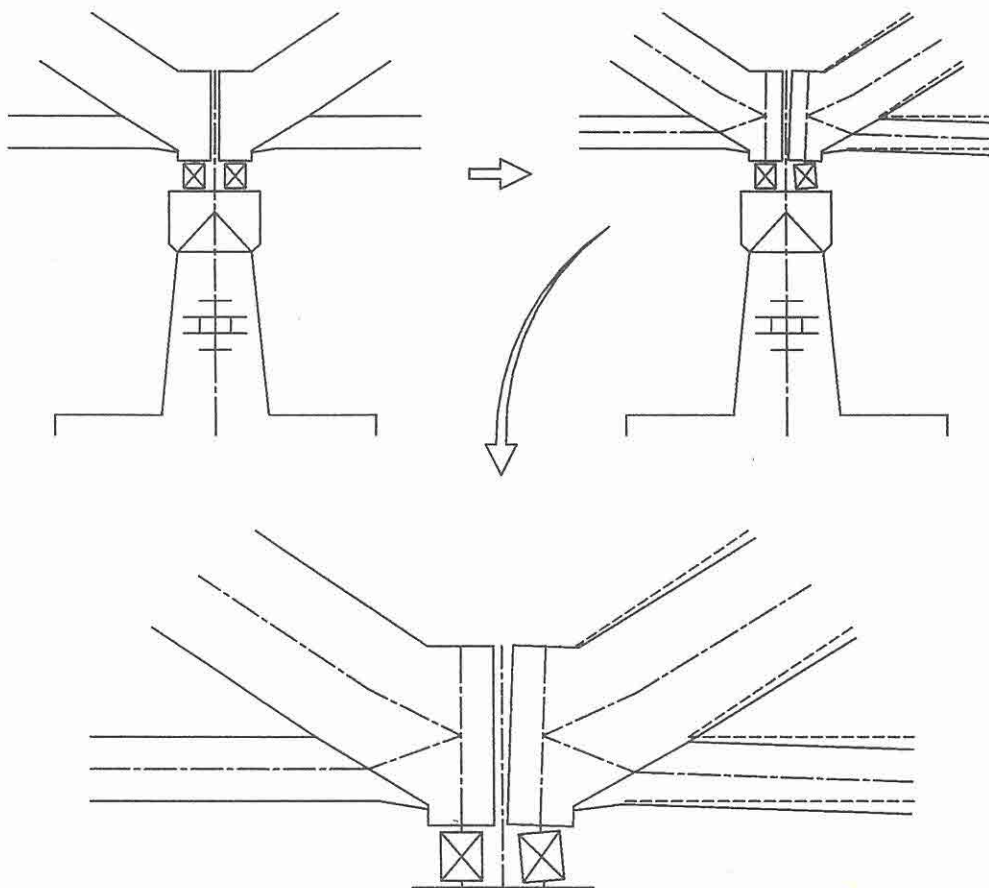
(Observation Results of Movable Bearing Emculu Bridge / Dogali 1 Bridge)

Handwritten signature or initials

No.4 Dogali 1 Bridge / P1(Mov)



No.6 Emculu Bridge / P1(Mov)



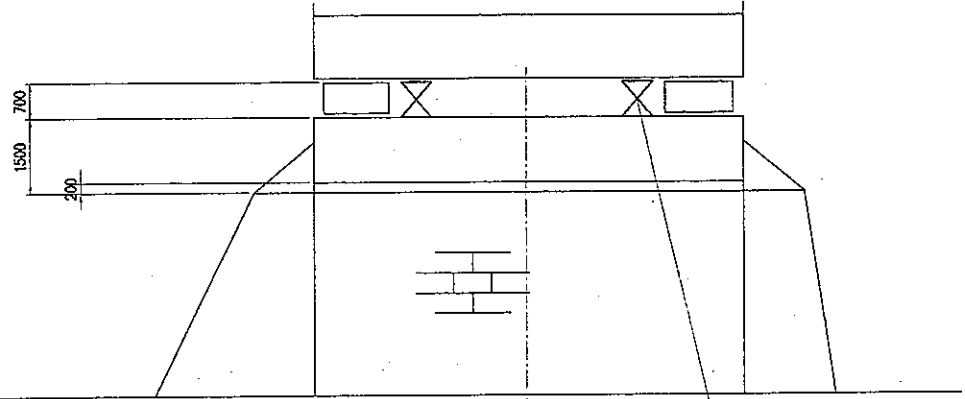
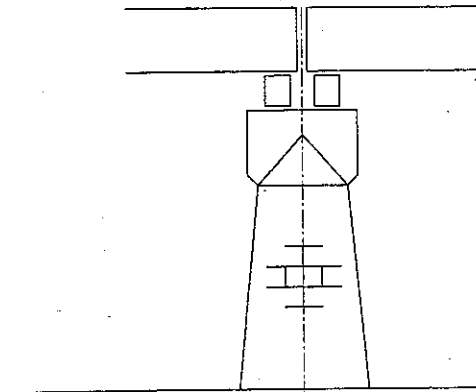
Handwritten signature or initials in blue ink.

Attachment 5-3-2
(Repair work plan on bearing)

Handwritten initials or signature

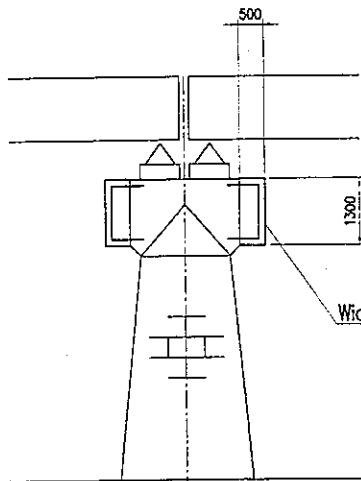
No.6 Emculu Bridge

Mov / (P1),(A2)

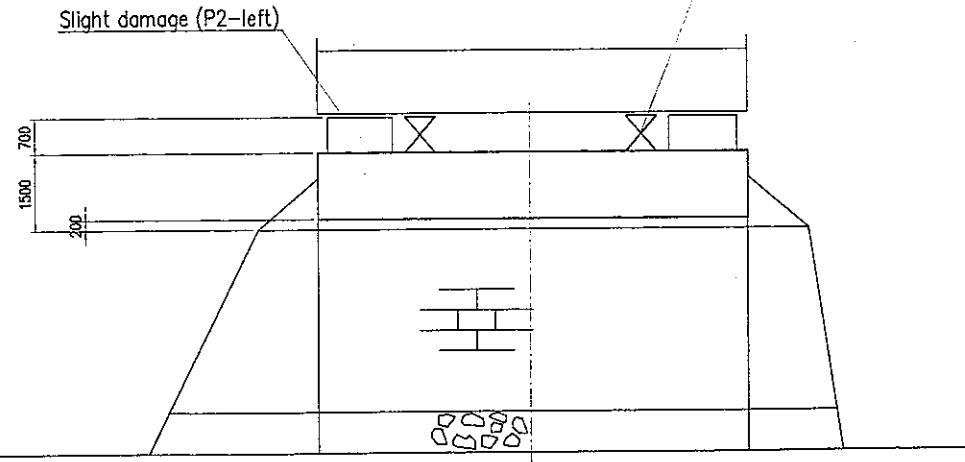


Prevention of bump

Fix / (A1),(P2)



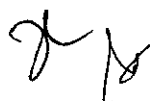
Widen the bridge seat



Slight damage (P2-left)

Handwritten initials or signature.

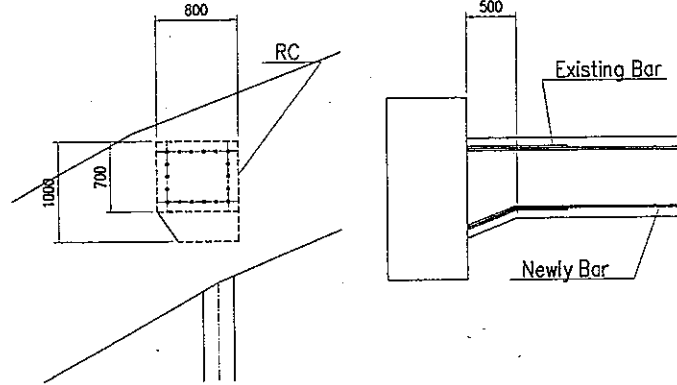
Attachment 5-4
(Repair work plan on main members)



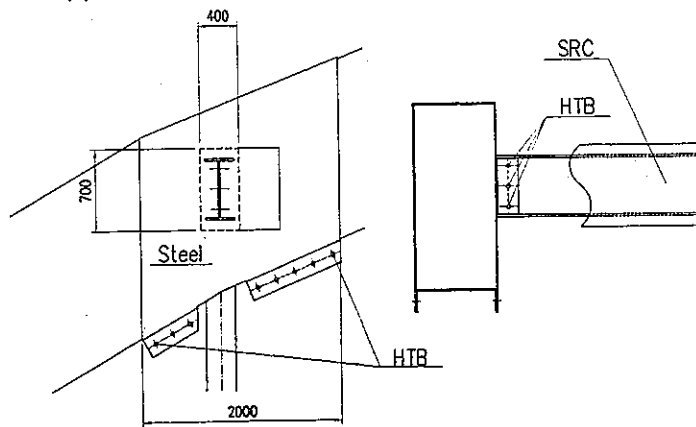
No.6 Emculu Bridge

Mid UCB-1

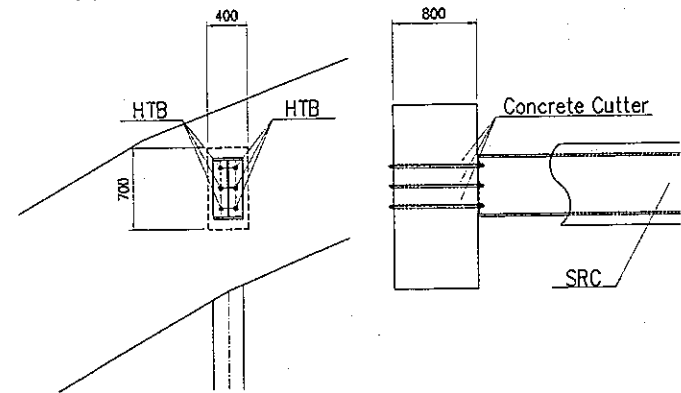
(A)



(B)



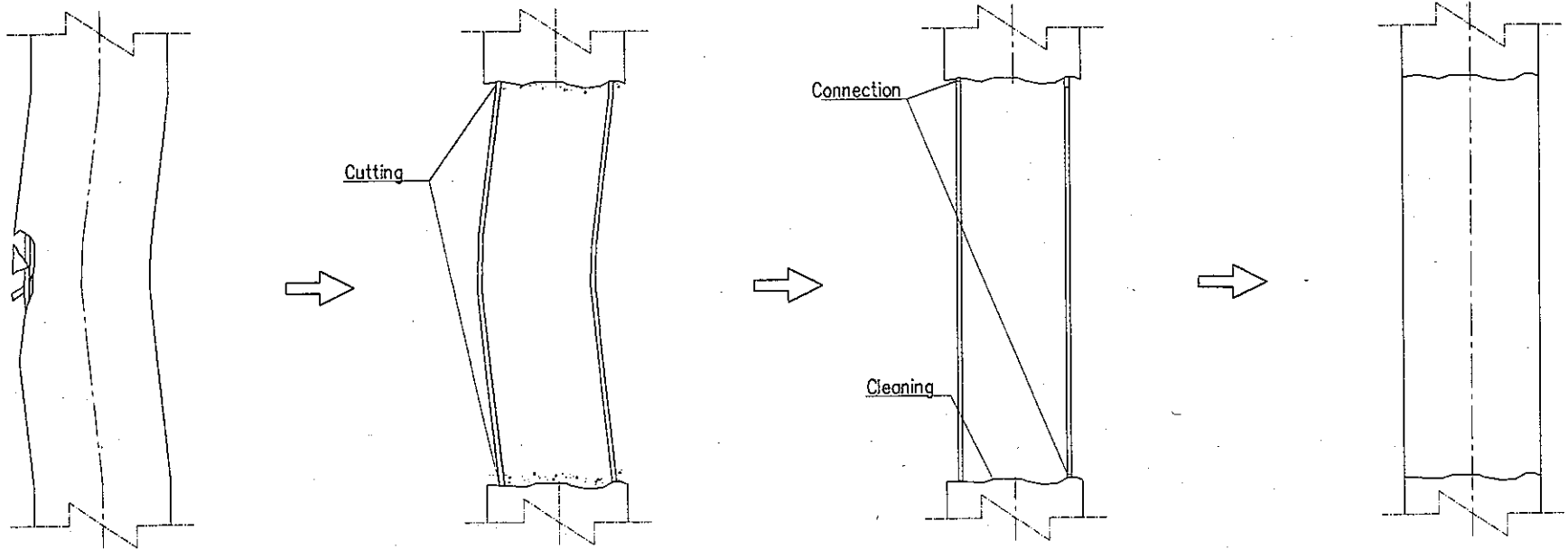
(C)



AL

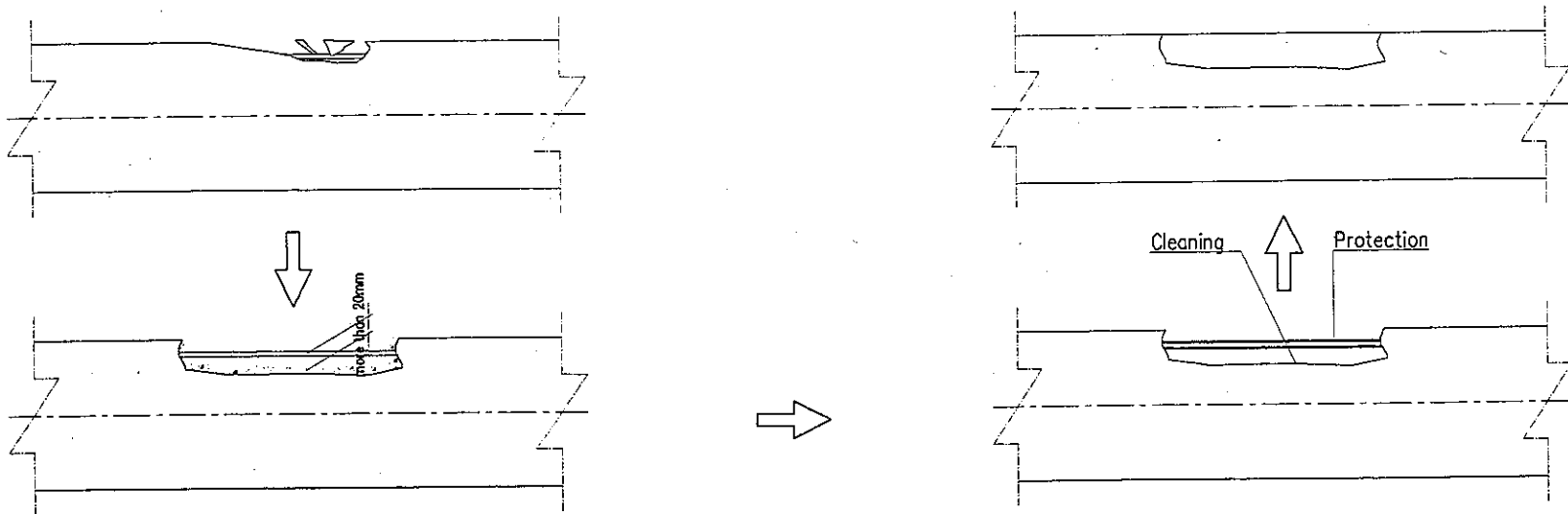
No.6 Emculu Bridge

Terrible damage (Mid RV-4)

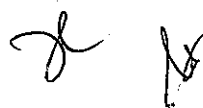


Slight damage (Asm side UCB-6/Mid LC-7,CF-1,UCB-8)

Handwritten initials or signature.



Attachment 6
(Present condition and repair work plan)

Handwritten initials or signature in black ink, consisting of a stylized 'J' followed by a vertical line and a horizontal stroke.

No.4 Dogali 1 Bridge

Asmara side

LV-5

Asmara side

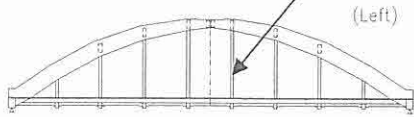
S-1

Massawa side

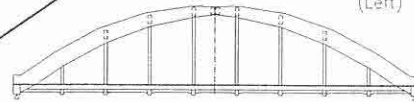
LV-4

Massawa side

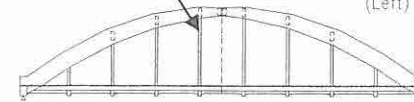
RC-10



(Left)

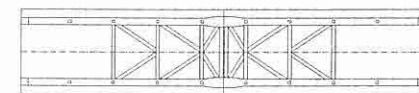
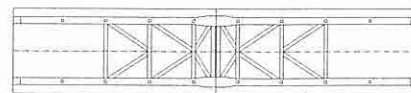
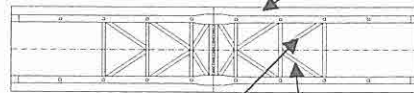


(Left)

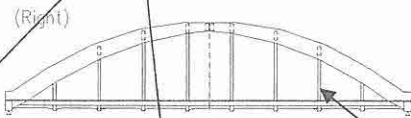


(Left)

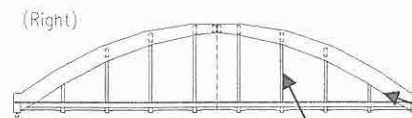
(Asmara Side)



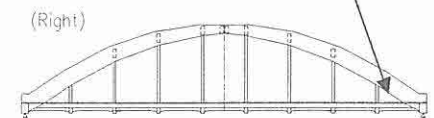
(Massawa Side)



(Right)



(Right)

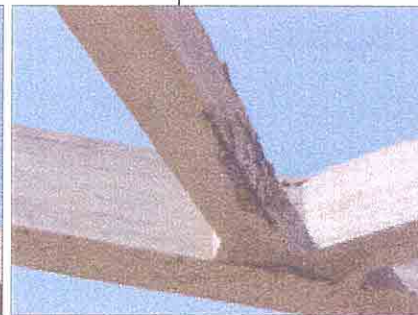


(Right)



Asmara side

CF-11



Asmara side

CF-12



Asmara side

RV-7



Middle

RV-6



Middle

RC-10

Handwritten signature or mark.

No.4 Dogali 1 Bridge

A1-Left



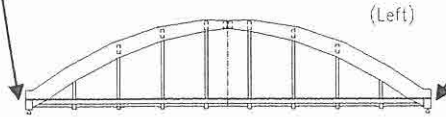
P1-Left



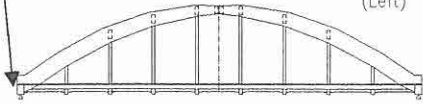
P2-Left



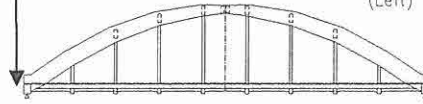
A2-Left



(Left)

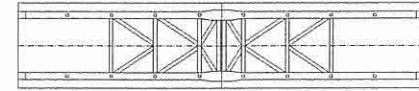
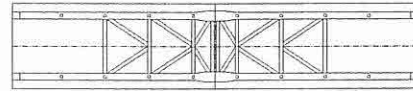
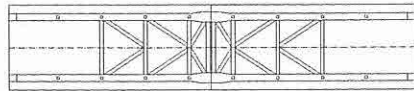


(Left)

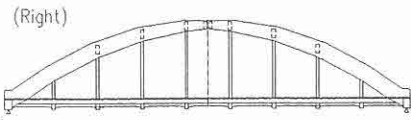


(Left)

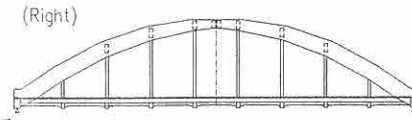
(Asmara Side)



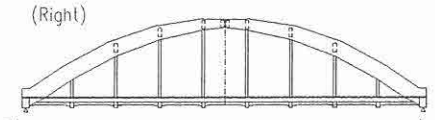
(Massawa Side)



(Right)



(Right)



(Right)



A1-Right



P1-Right



P2-Right

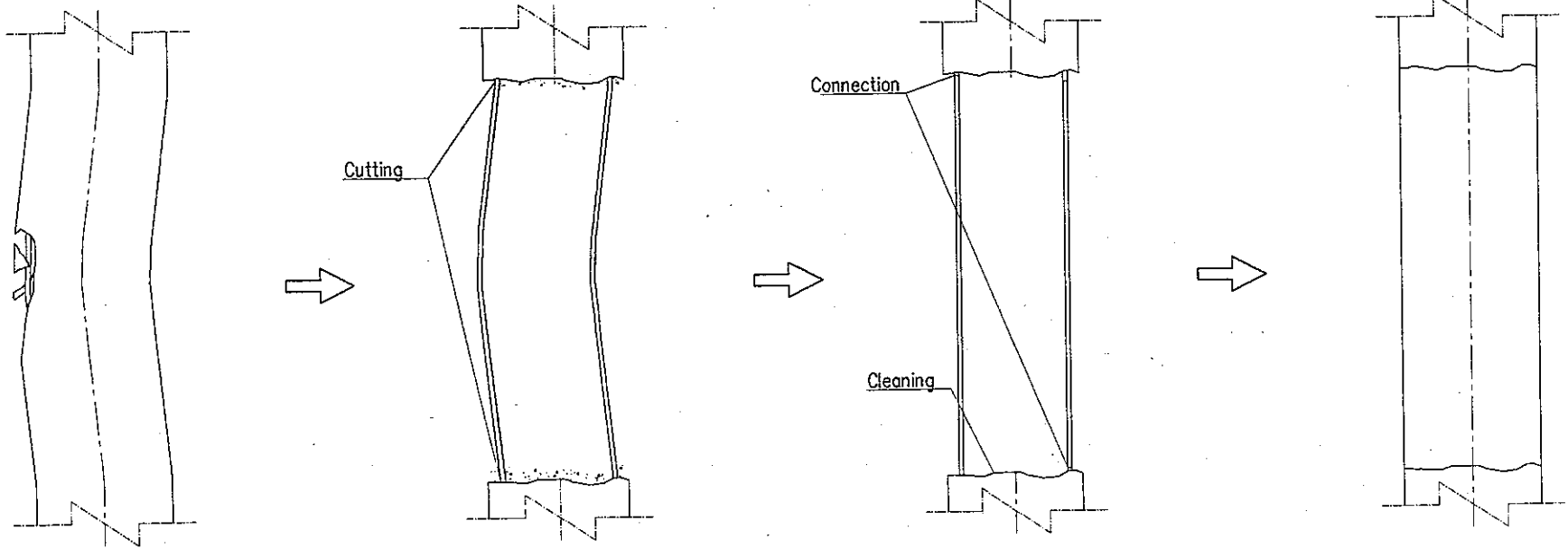


A2-Right

Handwritten signature

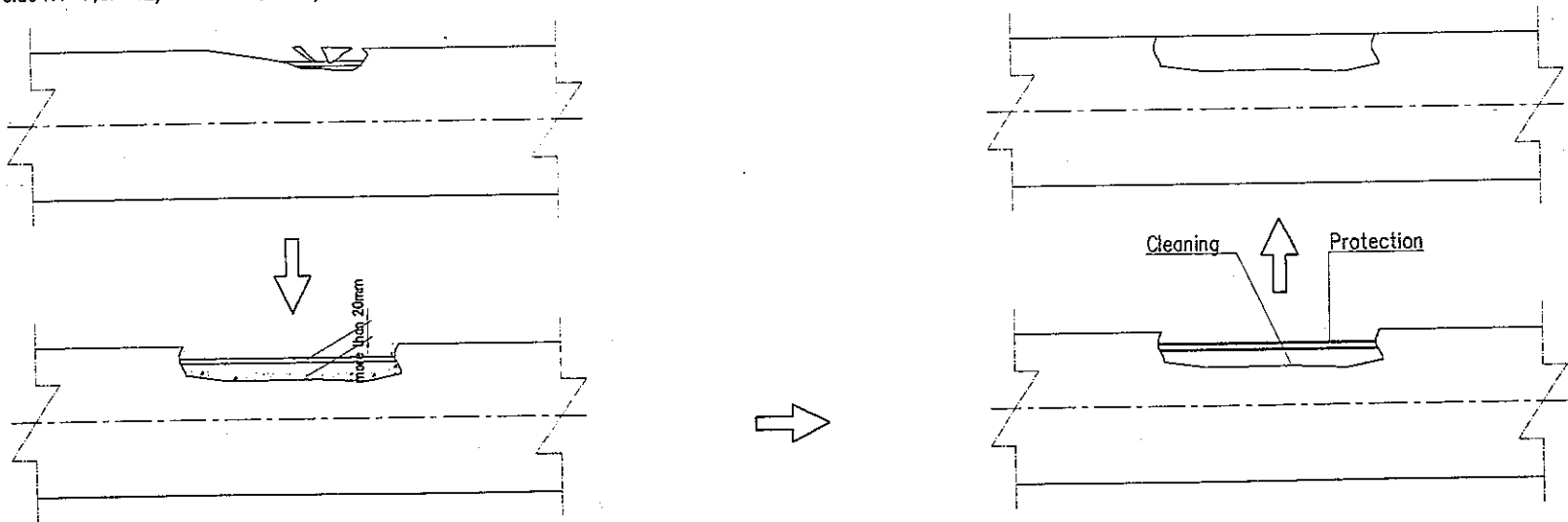
No.4 Dogali 1 Bridge

Terrible damage (Asm side LV-5,S-1,CF-11)



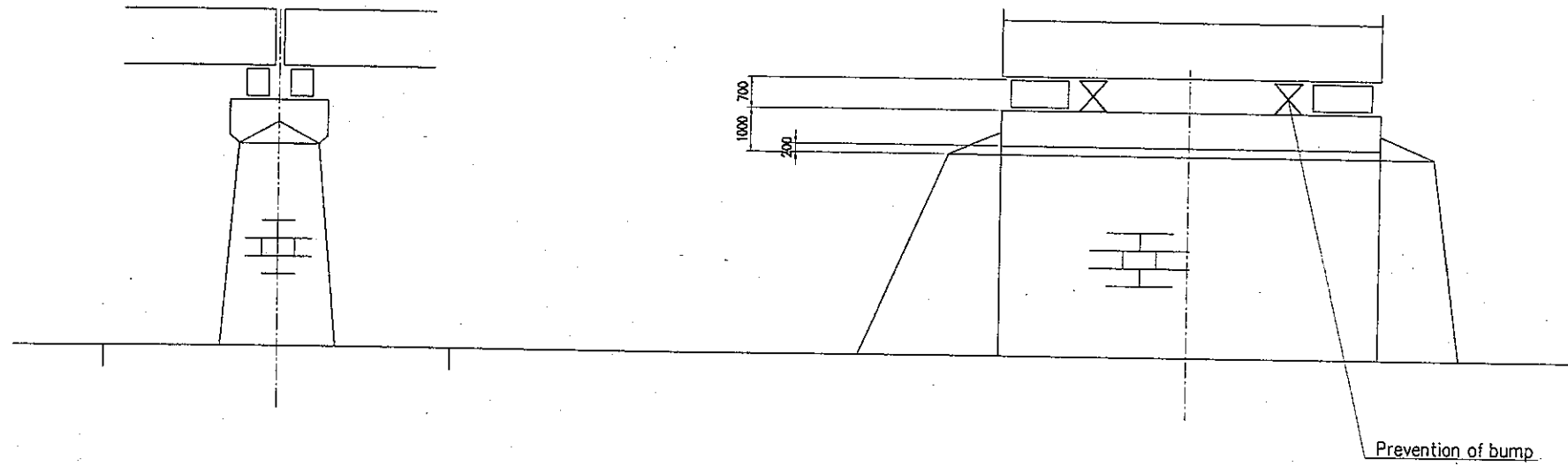
Slight damage (Asm side RV-7,CF-12/Mid RC-10,RV-6/Msw side RC-10,LV-4)

AR



No.4 Dogali 1 Bridge

All Sub-structure



AB



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 Phone: 122440 Fax: 122275

B O R I N G L O G

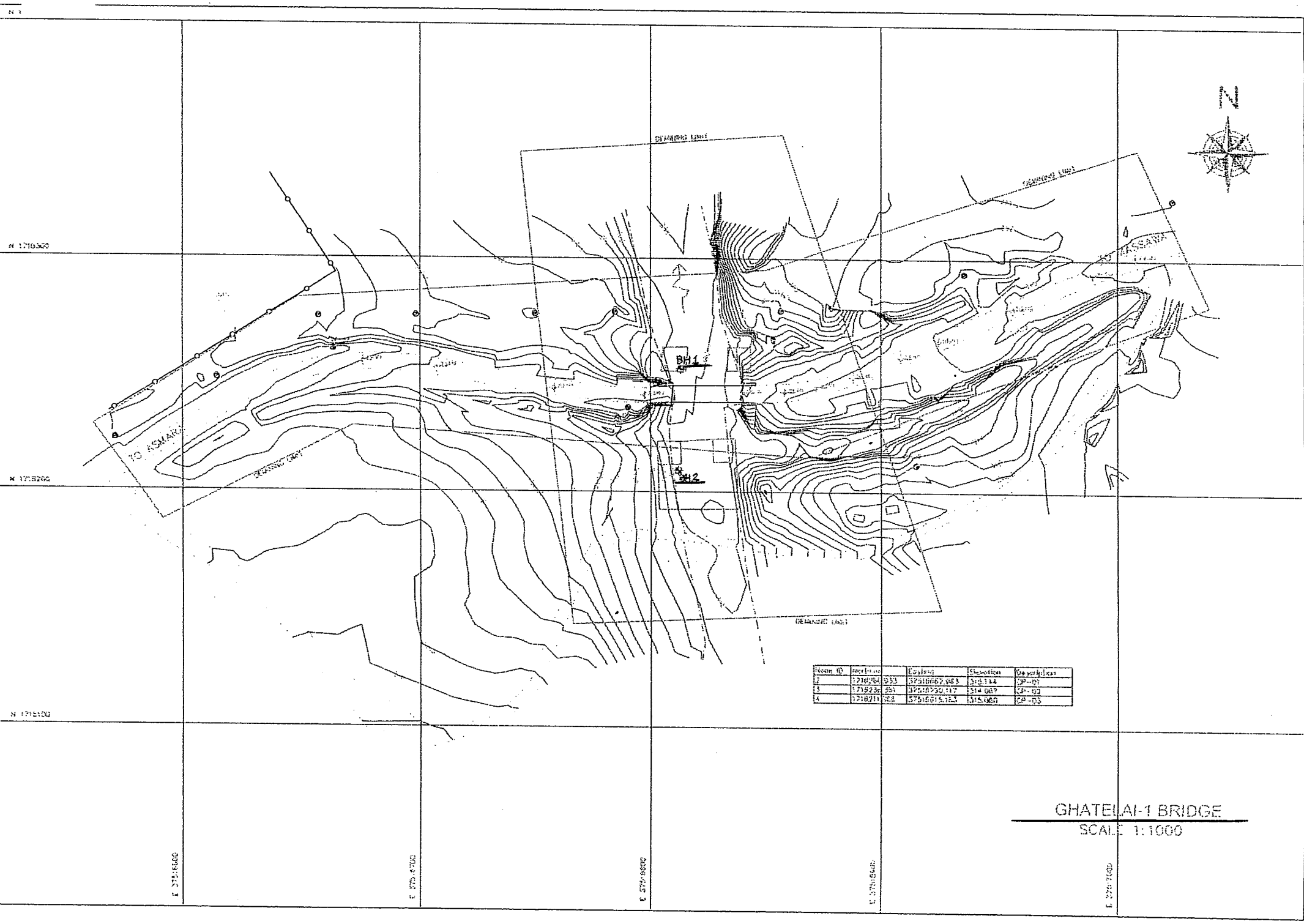
PROJECT	GINDAE BRIDGE		BOREHOLE NUMBER	BH - 1
LOCATION	GINDAE		DATE STARTED	2004/2/
CLIENT	JICA		DATE COMPLETED	2004/2/
COORDINATES	North: 1,706,800.97	East: 37,510,240.99	ELEVATION (m)	899.00
DRILLING METHOD	Augering & Coring		COMPLETION DEPTH (m)	7.00
DRILL RIG TYPE	CME-550		GR. WATER LEVEL (m)	
CORE BARREL / BIT	NQ / Diamond		DRILLED / LOGGED BY	SR/ EA.
SPLIT SPOON DIA.	2.5-in. o.d.		PREPARED BY	

DESCRIPTION	SYMBOL	SAMPLE	CASING, m	DEPTH, m	LABORATORY TEST PROPERTIES				IN-SITU PROPERTIES			REMARKS			
					NMC (%)	ATTERBERG LIMIT		STRENGTH (kPa)	Blows/15-cm N-Values	REC (%)	RQD				
						LL (%)	PL (%)						PI (%)		
Well-graded SAND with silt and few gravel, very dense, gray (SW-SM)				1.00	4.0	0.00	-	0.00		73	100	0			
GRANITE, high to moderately weathered, whitish with grayish spot ...highly weathered	[Symbol]	[Sample]	[Casing]	2.00							50	0.45			
				3.00								82	0.40		
				4.00											
				5.00									80	0.41	
...high to moderately weathered				6.00											
...extremely to highly weathered				7.00						41	0				

End of Boring at 7.0-m

Note:

Legend:
 NV - N-Values q_u - Unconfined Compressive Strength
 RQD - Rock Quality Designation NP - None plastic
 REC - Recovery



Point ID	Coordinate	Easting	Northing	Description
1	1716254.533	5711607.463	5707144	CP-01
2	1716230.261	5711620.117	5707067	CP-02
3	1716211.528	5711615.153	5707060	CP-03

GHA TELAI-1 BRIDGE
 SCALE 1:1000

E 5711600

E 5710500

E 5709400

E 5708300

E 5707200



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B O R I N G L O G

PROJECT	GAHTELAY-I BRIDGE	BOREHOLE NUMBER	BH - 2
LOCATION	GAHTELAY	DATE STARTED	20-Feb-04
CLIENT	JICA	DATE COMPLETED	28-Feb-04
COORDINATES	North: 1,716,207.25 East: 37,516,810.11	ELEVATION (m)	309.79
DRILLING METHOD	Augering & Coring	COMPLETION DEPTH (m)	10.00
DRILL RIG TYPE	CME-550	GR. WATER LEVEL (m)	
CORE BARREL / BIT	NQ / Diamond	DRILLED / LOGGED BY	SR/ EA.
SPLIT SPOON DIA.	2.5-in. o.d.	PREPARED BY	

DESCRIPTION	SYMBOL	SAMPLE	CASING, ft	DEPTH, m	LABORATORY TEST PROPERTIES				IN-SITU PROPERTIES			REMARKS
					NMC (%)	ATTERBERG LIMIT		STRENGTH (kPa)	Blows/15-cm N-Values	REC (%)	RQD	
						LL, (%)	PL, (%)					
Excavated boulders, replaced by Auger and surrounded by sandy soil for easy penetration. Boulder, the diameter of about 30 to 70 cm, smooth surface without cracks and slight greenish gray color granite.	◆◆◆◆◆			1.00								
				2.00								
				3.00								
				4.00								
				5.00								
Deposites of aged river flow having thick boulder layer, with repetitive caving, difficult to recover samples. Boulder, the diameter of about 30 to 50 cm, smooth surface without cracks and slight greenish gray color granite.	◆◆◆◆◆			6.00					CORING	10	0	
				7.50					CORING	18	0	
				9.00					CORING	12	0	
				10.00					CORING	23	0	

Note: End of Boring at 10.0-m

Legend:
 NV - N-Values q_u - Unconfined Compressive Strength
 RQD - Rock Quality Designation
 REC - Recovery



N 1725000

N 1724900

N 1724800

E 37532700

E 37532800

E 37532900

E 37533000

E 37533100

E 37533200

DEMNRNG LIMIT

DEMNRNG LIMIT

DEMNRNG LIMIT

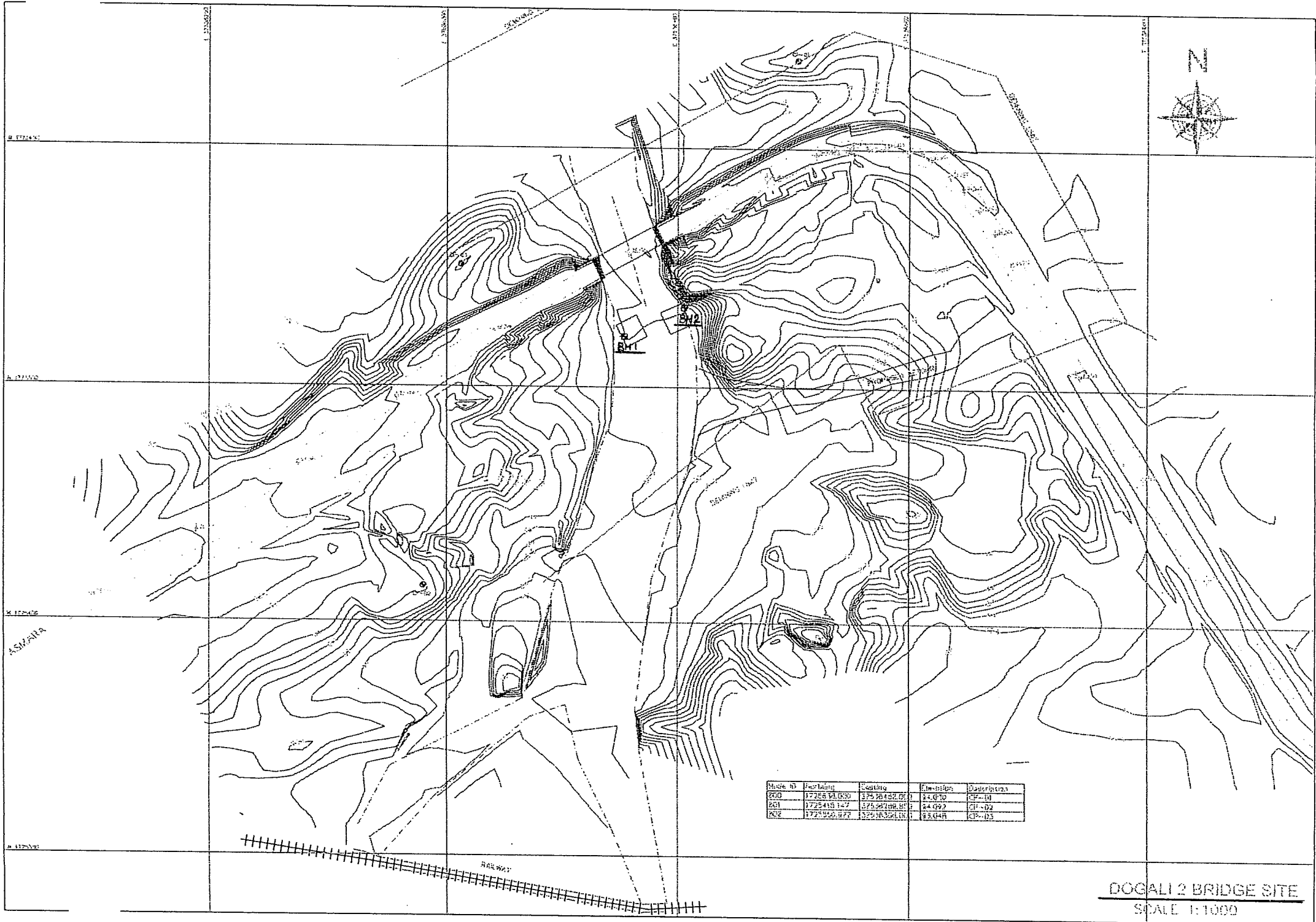
ASMAPA

MASAWA

CIRCULAR CONC.

Node ID	Northing	Easting	Elevation	Description
552	1724909.000	37532855.000	105.000	CP-01
555	1724946.453	37533003.262	104.652	CP-02

DOGALI 1 BRIDGE
SCALE 1:1000





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B O R I N G L O G

PROJECT	DOGALI-II BRIDGE		BOREHOLE NUMBER	BH - 1
LOCATION	DOGALI		DATE STARTED	19-Feb-04
CLIENT	JICA		DATE COMPLETED	20-Feb-04
COORDINATES	North: 1,725,521.82	East: 37,586,376.7	ELEVATION (m)	88.013
DRILLING METHOD	Augering & Coring		COMPLETION DEPTH (m)	11.50
DRILL RIG TYPE	CME-550		GR. WATER LEVEL (m)	9.0
CORE BARREL / BIT	NQ / Diamond		DRILLED / LOGGED BY	SR/ EA.
SPLIT SPOON DIA.	2.5-in. o.d.		PREPARED BY	

DESCRIPTION	SYMBOL	SAMPLE	CASING, m	DEPTH, m	LABORATORY TEST PROPERTIES					IN-SITU PROPERTIES			REMARKS		
					NMC (%)	ATTERBERG LIMIT		STRENGTH (kPa)	Blows/15-cm N-Values			REC (%)		RQD	
						LL, (%)	PL, (%)		PI, (%)						
Fragments of highly weathered out crop rock, volcanic rock of Basaltic origin.				1.00						16	27	39			
SC- Clayey sand with gravel. The soil color is clear brown.				2.00	12.05	39.8	20.85	18.95		9	32	35	100		
				3.00						31	52	50	100		
				4.00						26	40	50	100		
Cohesive soil mixed with fragments of weathered rock. CH- Sandy fat clay with little gravel. MH- Sandy elastic clay, is light brown.				5.00	32.98	65.75	27.68	38.07		3	10	10	100		
				6.00	32.68	70.75	38.54	32.21		8	10	14	100		
Top of highly weathered basaltic bed rock, slight brownish gray color				7.50						35	46	50	70		
The top of fractured basaltic rock with about 1.0m thick. Basement rock of basalt, clear dark gray, smooth surface without cracks. The produced core cylinders during sampling at the site have a maximum length of 15 to 20cm.				9.00						CORING			37	0.04	
				10.50						CORING			77	0.06	
				11.50						CORING			85	0.40	

End of Boring at 11.50-m

Note:

Legend:
 NV - N-Values q_u - Unconfined Compressive Strength
 RQD - Rock Quality Designation NP - None plastic
 REC - Recovery



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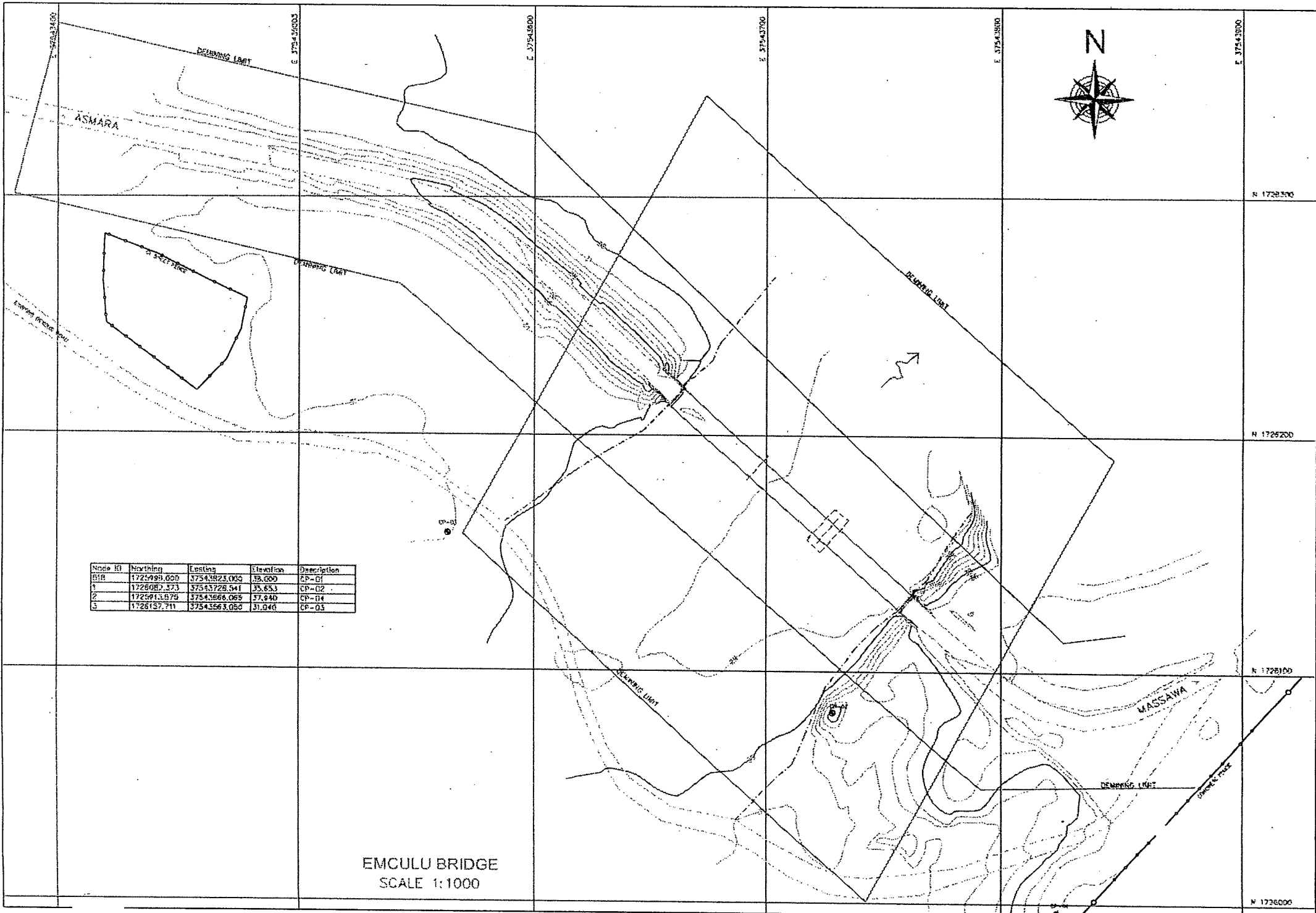
B O R I N G L O G

PROJECT	DOGALI-II BRIDGE	BOREHOLE NUMBER	BH - 2
LOCATION	DOGALI	DATE STARTED	09-Feb-04
CLIENT	JICA	DATE COMPLETED	18-Feb-04
COORDINATES	North: 1,725,533.6 East: 37,536,402.73	ELEVATION (m)	88.055
DRILLING METHOD	Augering & Coring	COMPLETION DEPTH (m)	13.50
DRILL RIG TYPE	CME-550	GR. WATER LEVEL (m)	9.0
CORE BARREL / BIT	NQ / Diamond	DRILLED / LOGGED BY	SR/ EA.
SPLIT SPOON DIA.	2.5-in. o.d.	PREPARED BY	

DESCRIPTION	SYMBOL	SAMPLE	CASING, ft	DEPTH, m	LABORATORY TEST PROPERTIES					IN-SITU PROPERTIES			REMARKS		
					NMC (%)	ATTERBERG LIMIT			STRENGTH (kPa)	Blows/15-cm				REC (%)	RQD
						LL (%)	PL (%)	PI (%)		N-Values					
River deposits.				1.00						10	22	26			
Highly weathered basement rock with cohesive soils CH- Sandy fat clay with traces of gravel. The soil color is clear brown.				2.00	20.19	53.8	24.68	29.12		3	19	27		100	
SC- Clayey sand with traces of gravel.				3.00	21.11	47.8	23.61	24.19		18	42	52		100	
Weathered basalt and some interbedding clay, dark brown color and a maximum thickness of 10 to 15cm.				4.50						CORING				47	0.00
Weathered top of bed rock having basaltic origine and sand stone with some interbedding clay. The clay has brown color and sandy stone has slight greenish gray color. The core cylinders during sampling at the site have a maximum 10 to 15cm.				6.00						CORING				73	0.16
				7.50						CORING				37	0.17
The top of fractured basaltic rock with about 2.0m thick. Basement rock of basalt, clear dark gray, smooth surface without cracks. The produced core cylinders during sampling at the site have a maximum length of 20 to 25cm.				9.00						CORING				43	0.00
				10.50						CORING				86	0.47
				12.00						CORING				83	0.3
				13.50						CORING				90	0.63

Note: End of Boring at 13.50-m

Legend:
 NV - N-Values q_u - Unconfined Compressive Strength
 RQD - Rock Quality Designation
 REC - Recovery



Note	Northing	Easting	Elevation	Description
EMB	1725989.000	37543823.000	58.000	EP-01
1	1726082.373	37543728.941	35.653	EP-02
2	1725913.676	37543666.069	57.940	EP-04
3	1726137.711	37543663.050	31.040	EP-03

EMCULU BRIDGE
SCALE 1:1000

N 1726350

N 1726200

N 1726100

N 1726000

E 37543700

E 37543600

E 37543500

E 37543400

E 37543300

E 37543200