REPUBLIC OF THE PHILIPPINES NATIONAL POWER CORPORATION

FEASIBILITY REPORT ON AGOS RIVER HYDROPOWER PROJECT

DATA BOOK I TOPOGRAPHIC SURVEY

MARCH 1981

JAPAN INTERNATIONAL COOPERATION AGENCY



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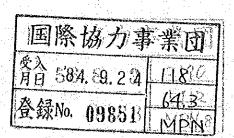
REPUBLIC OF THE PHILIPPINES NATIONAL POWER CORPORATION

FEASIBILITY REPORT ON AGOS RIVER HYDROPOWER PROJECT

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DATA BOOK I TOPOGRAPHIC SURVEY

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AGOS RIVER HYDROPOWER PROJECT FEASIBILITY REPORT

Main Report

Appendix	A	Hydrology and Reservoir Operation
Appendix	В	Geology and Construction Materials
Appendix	C	Power Study
Appendix	D	Optimization Study for the Development on the Agos River System
Appendix	E	Project Works
Appendix	F	Computer Outputs
Data Book	I	Topographic Survey
Data Book	11	Meteorology and Hydrology
Data Book	III	Geological Exploration
Data Book	IV	Construction Materials

DATA BOOK I TOPOGRAPHIC SURVEY

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CHAPTER I

INTRODUCTION

The available maps for planning of the Agos Project were the national maps of scale 1 to 50,000 with 20 meter contours, which cover whole the project area. For the detailed study the following survey works were required to be conducted.

- a) Preparation of aero-photo maps covering the proposed reservoir area (1 to 5,000 scale with 5 meter contours),
- b) Ground control survey by staking points for horizontal and vertical control
- c) Setting bench marks from the estuary of the Agos river to the Agos damsite
- d) River profile and cross-section survey from the estuary of the Agos river to the Agos damsite
- e) Preparation of detailed topographical maps of 1 to 1,000 scale with 1 meter contours covering the following areas
 - i) Agos damsite (1.92 km²)
 - ii) Afterbay weir site (0.32 km²)
 - iii) Kanan No.1 damsite (0.83 km^2)

Out of the survey works listed above, the aerial-photo maps for the reservoir area along the Kanan river were prepared by PICOREM the copy of which was given to us in October 1979. The aerial-photo maps for the remaining reservoir area mainly along the Kaliwa river were prepared by NAPOCOR and were given to us in July 1980. All other topographic surveys were carried out by JICA experts and NAPOCOR surveyors.

Besides the above, the survey works required for the geological and construction material investigations including the line survey of seismic exploration were conducted. Longitudinal cross section survey for Kanan No.5 damsite (previously selected by Lahmeyer Consult Co.) was also made for reference. All the survey works were almost completed by the end of August 1980. The survey works conducted during the whole study period for the Project are summarized in Dwg.1.

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Scope of Works Primary leveling and Bench Mark setting and oless auto level - 2 sets 1) Closing error along the road from Infanta to the Agos Folding hinged staff - 4 pcs. 1) Closing error to the estuary, No. 1 damsite and along Agos River down	od & rs	of leveling for bench survey in km)	of leveling for Branch	ent ion: 3 series ror 10"	ing error of azimuth or 10" + 15" N Measurement by Range	s x 2 series at the control
fark setting 2nd (to the Agos Foldi River down ngle distance) interval, 20 pcs. interval, timber sectional Teles mox. 40 open 0 km in total ance. set up at an Light distance of Theo class (20 km), fluence up Steel i damsite ridamsite rong fluence up Steel classite rong fluence up Folye	Measuring Method allowable Errors	Closing error 10 mm x D mark setting s (D; Distance i	Closing erro 40 mm x leveling	ਕ	Double at Max. clos 5"/sta. Distance	Thuch reading (4 readings) point.
fark setting to the Agos River down interval, 20 pcs. interval, timber sectional rox. 40 open of km in tota ance. Set up at al set up at al fluence of (20 km), I damsite nfluence up I damsite (17 km).	Main Equipment	2nd Class auto level - 2 Folding hinged staff - 4	staff - 4	wave range finder (t D1-35 or Zeiss EI	(50 m) - 2 tape (50 m) - 2	Long distance tranceiver (Camp to Base camp) -2 sets
and the contract of the contra	Scope of Works	1) Primary leveling and Bench Mark setting along the road from Infanta to the Agos No.1 damsite and along Agos River down to the estuary, Distance: about 30 km (single distance Bench Mark: Approx. 2 km interval, concrete post 20 pcs.	Branch leveling: for river section survey; Approx. 40 branches, 30 km in single distance.	Ground control points shall be set up at an average interval of 3 km along i) Agos River up to the confluence of Kanan and Kaliwa Rivers (20 km),		

Measuring Method & allowable Errors	Twice readings x 2 series (4 readings) at he different point set up 3 to 5 meters away from the control point in the same direction. Errors 5 cm + 1/50,000 x D (D: distance)	Angle Measurement of Traversing: 2 series Observation error 40" Double angel error 50"	Distance Measurement Rangefinder or steel 1 set (2 readings) Cross-leveling and p table survey shall b according to ordinar Some special cases,	tants will instruct surveyors in the field according to necessity.
Main Equipment		Light wave rangefinder (Wild 1) distmat Di-3S or Zeiss ELDI-2 class; (common use with Ground Control survey) - 2 sets Theodolite (20" division)	(100 m) - 2 tape (100 m) - 4	Telescopic staff 6 pcs.
Scope of Works	Wooden pegs (12 cm x 12 cm x 80 cm, creosoted) shall be used for the above staking points. Number of pegs required may be around 20 to 25 including 4 or 5 astronomical aximuth survey points.	Topographic survey shall be carried out at prospective damsites (e.g. Agos No.1, Agos No.2, Kanan No.1, Kanan No.5 damsites), quarry site and borrow area. Survey area: approx 7 km ² in total Mapping: Scale of 1/1,000 with 1 m contour	far as teel steel	Kanan No.5; 1 line Other Areas; interval 200 m, 60 lines) Plane table surveying; approx. 7 km ² Concrete post (10cm x 10cm x 80cm) have to be used for Base-line of each area (total approx. 20 nos.)
Item		Topographic survey		

Item	Scope of Works	Main Equipment	Measuring Meth6d & Allowable errors
River cross sectional		2nd class auto level - 2 sets	Sounding interval have to be less than 10 m.
survey	to the estuary.	the T	Closing error of leveling
	Agos No.1 to Agos No.2; 20 lines (to relative	refescopic soaii - 4 pcs.	(D: distance in km)
	height 15 m above the water surface)	Polyester Tape (100 m)-2 pcs.	
	Agos No.2 to estuary; 10 lines (to the shoulders		
	of higher terraces of both banks)		
	Those lines have to be connected to ground control		
	points or 2nd class traverse points and branched		
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CHAPTER 2

GROUND CONTROL SURVEY

The ground control survey was started from Bureau of Land's reference points Infanta BLLM #1 and BLLM #2 whose coordinates were provided by NPC. For the purpose of river cross section survey on Agos river, the route of survey was so arranged to pass the Agos river. On the way to the confluence of Kanan and Kaliwa rivers, the route is connected to BLLM #11 and #12, and finally connected to PICOREM's reference points of S-26 and S-16A established by F.F. Cruz Co., Ltd. (Survey contractor of PICOREM). The difference of bearings to North between NPC's survey results based on Bureau of Land's reference points and PICOREM's results is only 5 seconds, but the difference in coordinates between NPC derived from BLLM's reference points and PICOREM is 17.883 m in X direction and 108.497 m in Y direction. It has been finally concluded that the PICOREM's coordinates of S-26 and S-16A shall be used as the original points for ground control.

Ground Control

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3	369.163	212.315		
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5	533.052	520 - 343		
6	279.357	567 926.013		
	802.787	406.215	•	
8	253.043	194.834	•	
10	961.527	566 736.960		
//	1631 936.921	438.311		
	109.446	340.606		
	202.932	297.790	•	
14	315.491	303.421		
	521.588	367.307		
16	560.692	363. R5		
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18	136 . 434	327.874		= 45
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	341.912	707.104		
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1 24	8/3.938	568 160.790	点换者	≈R 3

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<i>U</i> 35	107.961	816.218	•	
06	1631 868.704	740.943	•	
27	614.369	452.277	•	
39.	503.675	705.971	•	
39	357.449	764.670		
40	251.622	<i>3</i> 07. <i>58</i> 5		
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A.	083.906	892.697		
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7 45	844.336	570 055 828		
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	6 80	1628 806.786	54 829 . 772		
	49	477.611	567.939	•	
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	S DA	408.628	296.868	•	
	S // A R	193 .993 1626 966 .334	022 .69 563 703 .418	•	
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					深航 業 株
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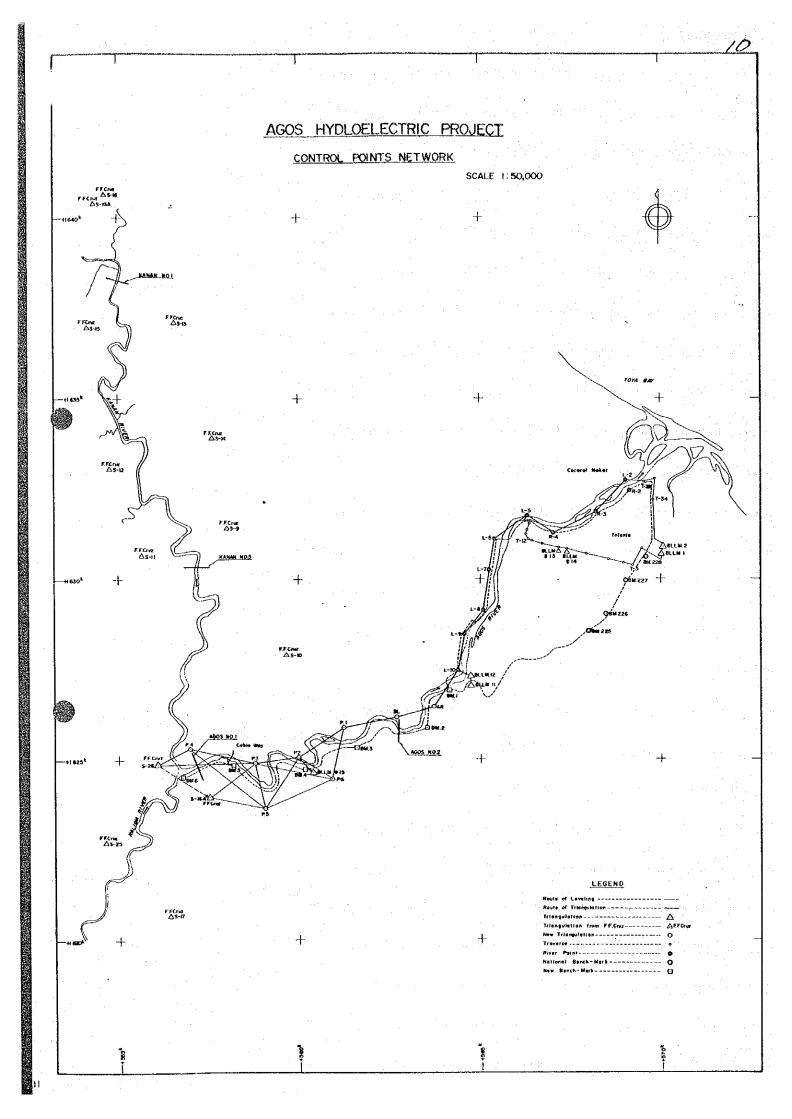
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r ·	8	1633 376.17	56 446 B	127.321	Na a market
	9	1631 334.17	558 020.79	672.449	
	10	1627 893.66	599 801.66	892.591	
		1630 580.14	555 604.65	64.346	
	12	1632 977.95	554 730 16	483.605	
	23	1637 057 58	556 484 57	723.706	
	14	1633 934.40	557 622.35	743.178	
	15	1536 951.46	554 150.46	581.217	
	15 A	1640 425.60	284.76	711.575	
	16	699.91	497.62	721.756	
	16A	1623 944.43	557 527.14	404.241	
	27	1620 682.79	556 451.70	622 . 323	
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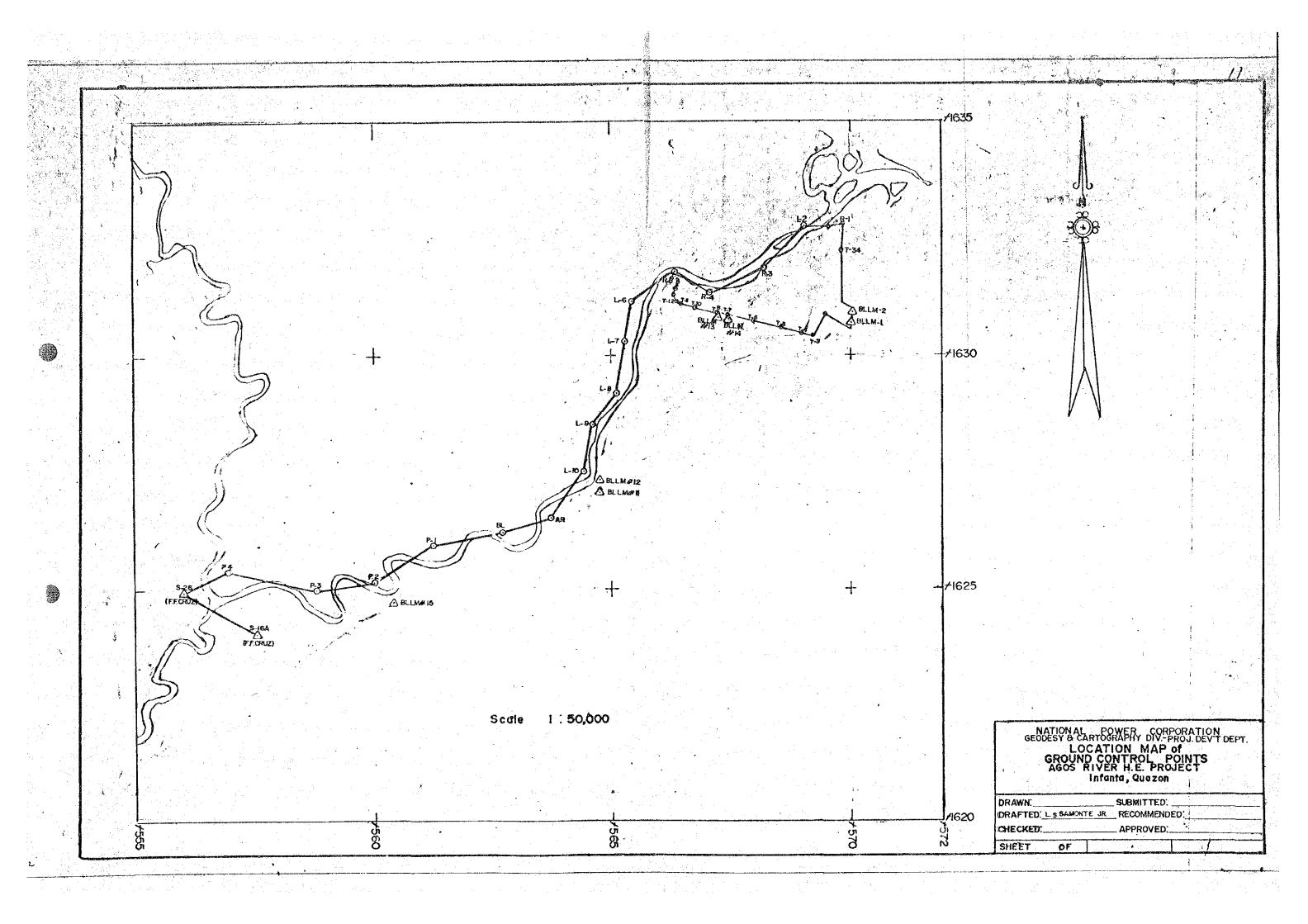
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	30	1635	497.77	552 845.85	742.286	
	3/	1433	772.60	550 103.02	818.208	
	32	1632	628.50	548 621.48	658.405	
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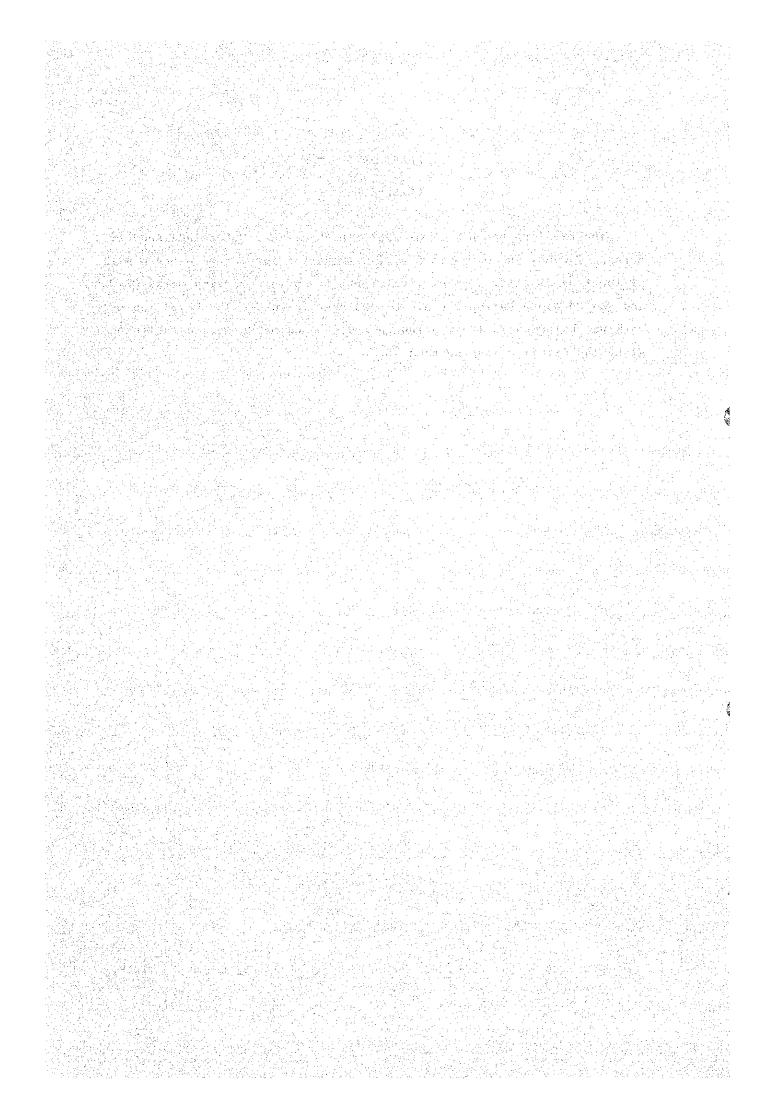


- 프로그램 사람들의 사람들은 사람들이 모르는 사람들이 보고 되는 것이 되고 되었다.
- 현통하다는 이 학생자들의 역하는 전투 하다는 그 마음을 찾는 것이 있는 그는 것이 되는 것이 되었다. 그는 것이 되는 것이 되는 것이 되었다. - 호텔 하는 것은 기록 1000 11일 1000 대한 전략 보고 있는 것이 되었다. 그 것이 되었다. 그는 것이 되었다. 그런 기를 가입니다.
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그렇게 하는 것 같아. 그는 이 얼마 아이들 아이들 아이를 보고 있는데 그렇게 되었다.
그렇게 살림이 모른 바람은 그들이 살아왔다는 아이가 얼마나 하는 그리 밤을 일었다. 이 그 아이는 말이
는 통령합니다 같은 사람이 생활되고 있는 것 같다. 이번 사람들이 되는 사람들이 되는 사람들이 되는 것이 되는 것이다. 그는 것이다. 그는 사람들이 되는 것이다. 그리고 함께 되는 것이 있는 것이 되는 것이다. 그는 것이 되는 것이 되는 것이 되는 것이 되는 것이다. 그런 것이 되는 것이다. 그런 것이다. 그런 것이다.
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그런 농사들은 살림으로 살림하는 동안 하는 사람들은 사람들이 되었다. 그는 그는 그리고 있는 사람
- 선생님의 경우의 그리고 보다는 그는 그 나는 그 그는 그는 그 그리는 생각이 되었다. 그는 생각이
는 경에 가장 들는 사용하다. 그는 사용하다는 사용을 가장 되었다. 그는 사용을 가는 사용을 하는 것이 되었다. 그런 것을 가장 되었다. 그는 것이다는 가장 있다. - 그렇게 하는 것이 말로 하고 있다. 그리고 있는 것이 있다. 그런
- 발표를 하는 분통 등에 가는 기가 있는 하는 분명이 되었다. 그런 이 아는 그는 것으로 하는 모고 되었다. - 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.

CHAPTER 3

LEVELLING

The existing bench mark QZ-226 with EL.6.278 m MSL established by Bureau of Coast and Geodetic Survey was adopted for the base bench mark of the project after a check levelling between the existing marks QZ-225 and QZ-228 along National route No.323 near Infanta. The Levelling network was extended to the confluence and 6 bench marks were established along the existing logging road.



Levelling

c	iZ-1		水準	点成点	表
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		e profesionate.			
4. *					

Levelling 水準点成果表 真 高 図葉名 点 名 所 在 地 TBYF 9 229 2 9.233 3 43.516 56 103 4 31 737 5 6 43.488 33 238 68 30.358 7 50.306 8 9 71.440 65.763 56.240 国際航業株式会社 点検者.

DE # STATION DESIGNATION :

KUER

AGOS

PROJECT

Agos HE Project

Brgy, Megsaysay, Infanta, Quezon

LOCATION

March, 1979 DATE ESTABLISHED

DATUM - HORIZONTAL VERTICAL

COORDINATES -

NORTHING EASTING LATITUDE

LONGITUDE

29.610 ELEVATION

RELATIVE POSITION TO OTHER STATION

DISTANCE AZIMUTH STA.

TO STATION

DESCRIPTION:

1. It is a concrete monument with an approximate diameter of three (3) inches and is located at the right side of the road with an approximate distance of 1.5 meters going to Pinageangahan.

It is situated at the corner of Maclang Coastruction with an approximate distance of three (3) Maway from the gate of the said Construction. ณ่

1455 NO NO to pivagsangradan 9 7 7 7 F. MACLANG COUST COMPOUND

N STATION DESIGNATION . BM #

PROJECT

Sitio Tabiag, Brgy. Magsaysay, Infanta, Quezon Agos HE Project

LOCATION

. March, 1979 DATE ESTABLISHED

DATUM - HORIZONTAL

VERTICAL

NORTHING COORDINATES -

EASTING

LONGITUDE LATITUDE

33.582 **ELEVATION**

RELATIVE POSITION TO OTHER STATION

DISTANCE AZIMUTH STA.

TO STATION

DESCRIPTION:

ent with an approximate diameter dis situated in from the junction Logging road with an approximate meters.

It is situated NE from the Culvert installed along Marcos highway with an approximate of ten (10) meters. 'n

A POR PARTY **20** りるががれたし いてある大

STATION DESIGNATION : BM # 3

PROJECT

. Agos HE Project

LOCATION

Sitio Magipang, Brgy. Magsaysay, Infanta, Quezon

: Apr. 1979 DATE ESTABLISHED

DATUM - HORIZONTAL VERTICAL

COORDINATES -

NORTHING EASTING LATITUDE LONGITUDE

ELEVATION

43.159

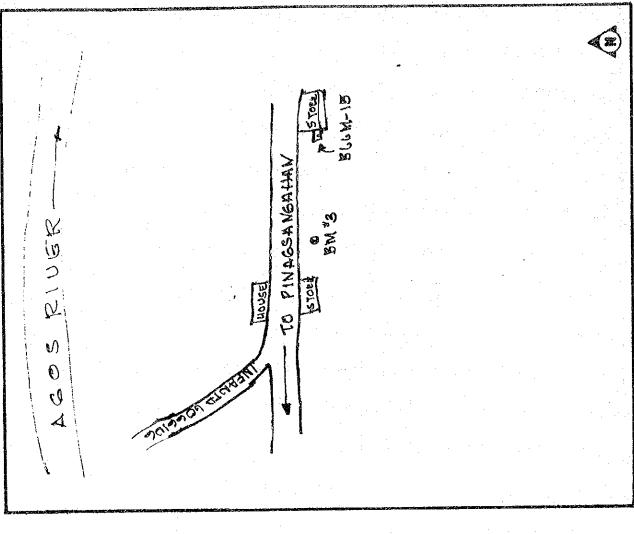
RELATIVE POSITION TO OTHER STATION

DISTANCE AZIMUTH STA.

TO STATION

DESCRIPTION:

with an approximate ů,



BM # 4 STATION DESIGNATION :

Agos HE Project PROJECT Sitio Cacauayan, Brgy. Magsaysay Infanta, Quezon

LOCATION

April, 1979 DATE ESTABLISHED

DATUM - HORIZONTAL

VERTICAL

COORDINATES -

NORTHING EASTING LATITUDE

ELEVATION

48,800

TO OTHER STATION RELATIVE POSITION

DISTANCE AZIMUTH STA.

TO STATION

DESCRIPTION:

ncrete monument with an approximate glame 3) inches and is situated at about forty right angle on the right side of the road going to Pinagsangahan. 1. It is a cor meters at

It is situated due west from the Cacauayan Elementary School with an approximate distance of four (4) meters. ณ้

Sari Sari To Plyage ange hay M בסרסחסחש בחסחם MORITA

Ś 4: E E STATION DESIGNATION :

PROJECT

Sitio Pinagsangahan, Brgy. Magsaysay, Infanta, Quezon Agos HE Project LOCATION

May, 1979 DATE ESTABLISHED

DATUM - HORIZONTAL VERTICAL

COORDINATES -

NORTHING EASTING LATITUDE

ELEVATION

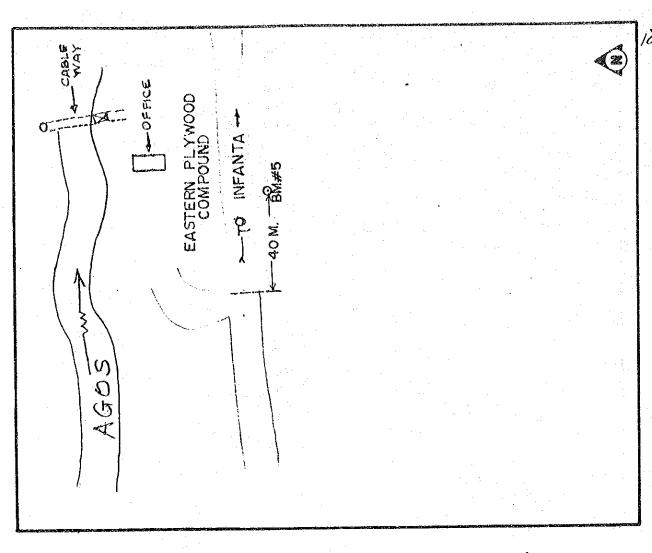
58.239 M.

TO OTHER STATION RELATIVE POSITION DISTANCE AZIMUTH STA.

TO STATION

DESCRIPTION:

- 1. It is a concrete monument with an approximate diameter of three (3) inches and is situated at about 2 meters away at right angle from the right side of the road going to Infanta.
- It is located SW from Eastern Plywood Office and is approximately 700 meters away from it. 2



BM # 6 STATION DESIGNATION :

Agos HE Project

Brgy. Pinagsangahan Infanta, Quezon

May, 1979

LOCATION

PROJECT

DATUM - HORIZONTAL VERTICAL

DATE ESTABLISHED

NORTHING COORDINATES -

LATITUDE LONGITUDE

EASTING

54.465 m. ELEVATION

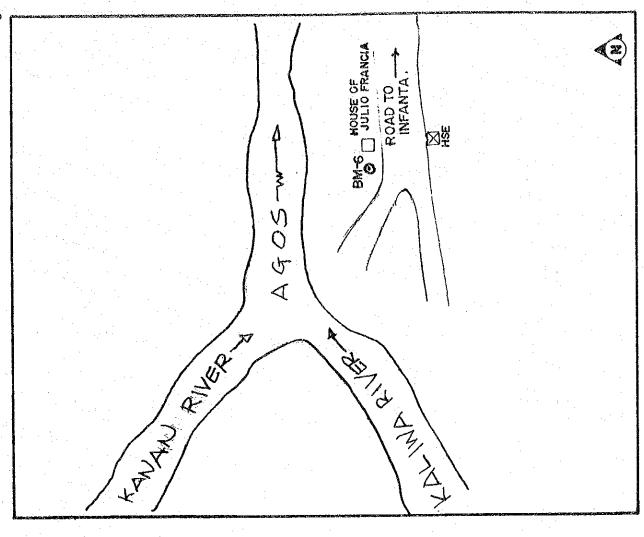
TO OTHER STATION RELATIVE POSITION DISTANCE AZIMUTH STA.

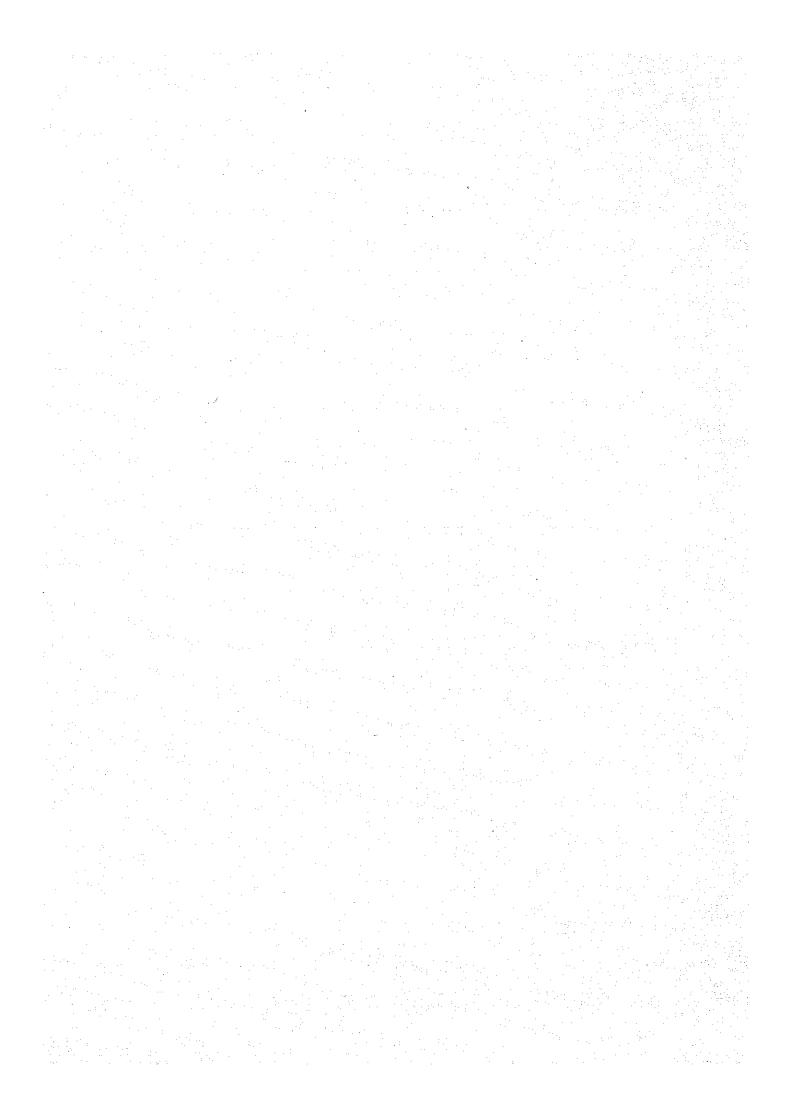
TO STATION

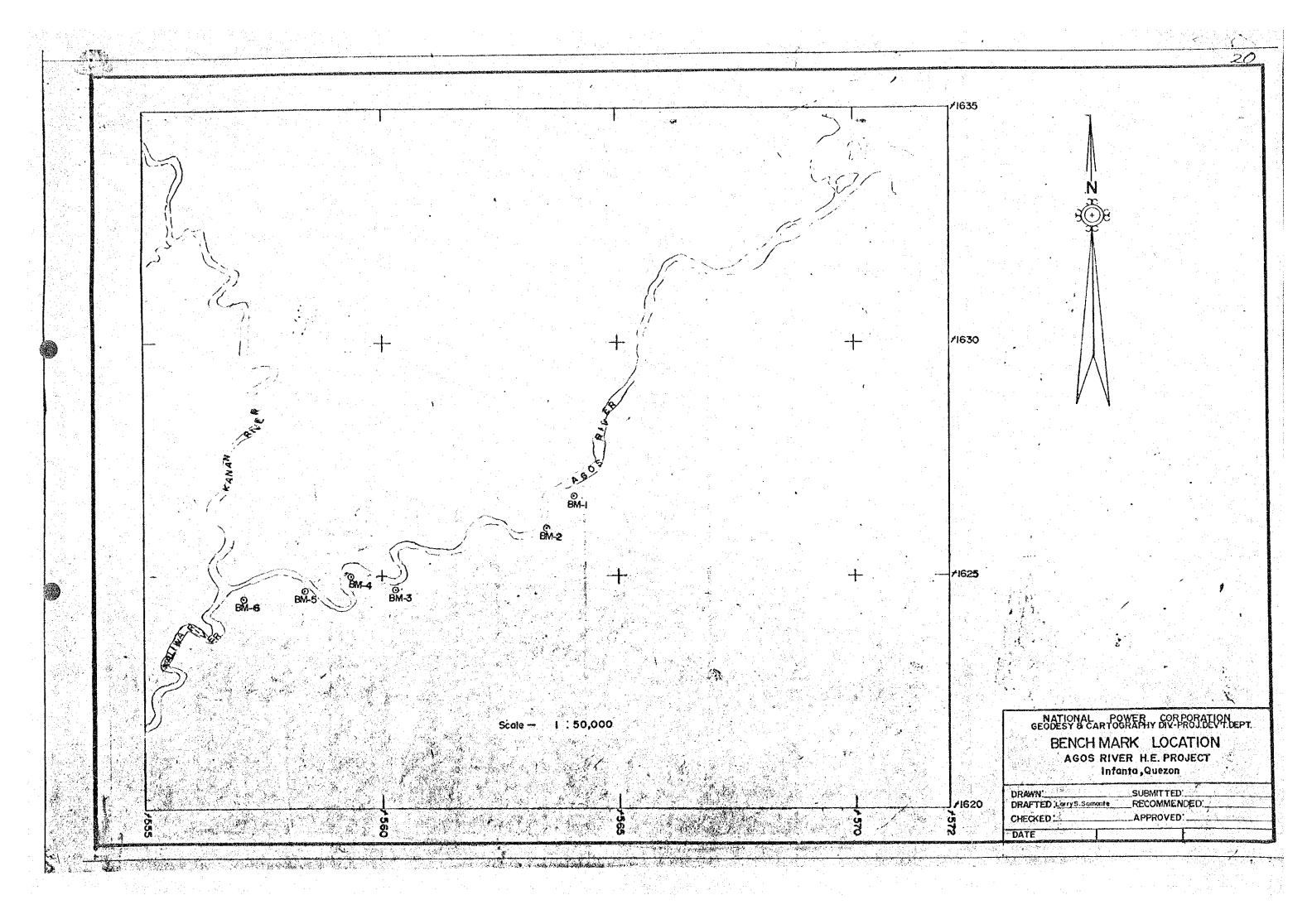
DESCRIPTION:

1. It is concrete monument with an approximate diameter of three (3) inches and is located on the left side of the road going to Infanta and is about six (6) meters due west from the house of Mr. Julio Frangia.

It is situated approximately fifty (50) meters SE from the confluence of Kaliwa and Kanan River. ٥

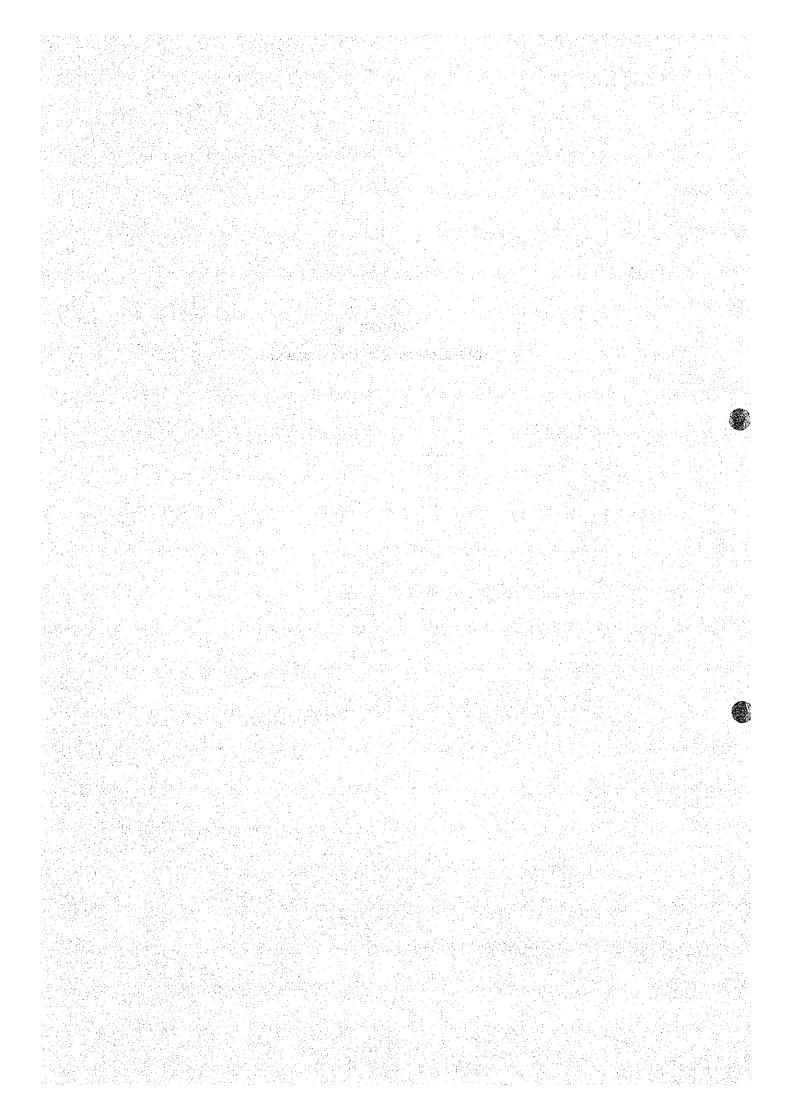






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togram of the same		•		
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	en de grafie de la composition de la c La composition de la			

CHAPTER 4 RIVER CROSS SECTIONAL SURVEY



River cross section

GA-1		成果表			
ti 4	X	Y	Н]
R / 1/6.33	m 287. 200	m \$89 987 225	m 2 • 879		
4 1	416.854	721.518	1.749		
R 2 1632	466.254	015.959	3.23/		
L 2 163C	7/8.101	569 016.520	3.048	-7 27	
R 3 1631	813.938	568 160.790	6.476	= 7 24	
	025.898	667 847. 905	6.559		
2 4 1631	250.209	019.358	8.717	= 7 22	
4	559.928	116.637	8.273		
R 5	569 . 778	236.245	9.009	<i>=7_1</i> 7	
2 5 1600	736 · 434 964 · 069	327.874 565 644.96	10 · 320	= 7 18	
	094.193	418.937	10.945		egase in se
	247.326	506.700			
<i>L</i> 7	264.922	Z14.388	13.305		
R 8 1639	04.056	253.230	12.934		
68	123.671	075.471	13.483		
R 9 1628	° 554.935	564 778·101	14.035		
6 9	477.611	\$67.939	17.107	: : :	
	964.289	484. 113	16.111		
2 10	474.476	380. 479	16.705		[E] 329
2 //	•		•		国際航業株式
2 11	•		20 171		床 式 会 社
					₹1.

À

River cross section

i -A£	 !		成果表	
,ti	名	x	Y	н
۷	12	m'	i g m	m 23.891
R	13			47 - 280
۷.	/3	•		23.170
<u>R</u> _	14			27.257
R	AA		• • • • • • • • • • • • • • • • • • • •	30.453
	14	•	•	22.866
Χ	رن	•	•	24 . 788
	15 A	•		24.119
	15			
R	16	<u> </u>	•	24 311
<u> </u>	16	•	•	27.854
R_	12	<u> </u>		26.804
4	-2		• • • • • •	29.576
R	18		<u> </u>	30 . 737
	18			29.106
8	9			29.214
	19			35.257
尺	20	860.194	013 946	30.388
	20	986.338	072.324	37.904
R	21	1625 020.629	559 560 .767	33./54
	21	128.640	668.099	43.800
R.	22	031.060	235.461	34.290
	22	//7.657	128.691	点换者

D		~ 10 CC	. 14:3		
Killer	(CIUS.	sectio	W	

A-I		成果表		
点 名	X	Υ	Н	
R 23	m 124 346.591	m 559 323.253	m 36 · 178	
L 23	410.288	202.095		
R 24	270.310	558 776 · 003	49.968	
L 24	439.752	907 .773	36.180	
尺 25				
L 25	•	•	•	
R 26	• • • • • • • • • • • • • • • • • • • •			
2 26	•		•	
2 27	161.895	515.265	48 518	
L 27	785.878	593 .688	39.784	
R 27-1	825.919	100 .857	56.965	
L 27-1	1625 035.557	212.918	43.801	
R 28	BEA 902.978	557 943.977	56.727	
L 28	1625 108.979	558 252.422	43.914	
R A	1624 962.881	557 715.632	48 935	
2 29	1625 -72-104	685.893	52.133	=8-27
尺改	1624.589 .588	\$\$6 730.965	51.174	
ک میں	792 .002	397.082	51 .415	
·	•	• • • • • • • • • • • • • • • • • • • •	•	
· 		· · · · · · · · · · · · · · · · · · ·	•	1
	•	•		
<u> </u>			*	
			点换名	

