Table VI-30(1/4) POTENTIONAL SEDIMENT DISASTER SITES ON ARTERIAL ROAD

Location No.	Catchment Area(ha)	Slope/Torrent		** Vegetation Cover	Geology	Potential Disaster	
		Lentgh(m)	Gradient*			Type***	Rank
1	126	2,750	12.50	1	Peis	S	6
2	40	500	7.14	1	Peis	S	6
3	247	3,125	12.50	1	Peis	S	1
4	10	625	8.33	1	Peis	S	6
5	55	1,000	4.17	1	Peis	S	6
6	41	1,125	5.00	1	Peis	S	6
7	39	500	2.78	1	Peis	D	1
8	408	3,250	12.50	1	Peis	S	1
9	406	2,875	12.50	1	Peis	S	1
10	31	250	1.79	1	Peis	S	6
11	34	750	3.57	1	Peis	D	5
12	151	1,500	8.33	1	Peis	S	1
13	318	3,250	12.50	1	Pet	S	6
14	88	1,250	3.57	1	Pet	D	1
15	28	1,750	2.78	1	Pet	D	5
16	46	1,500	5.00	1	Pet	S	6
17	278	2,250	12.50	1	Pet	S	6
18	128	1,750	5.00	1	Pet	S	1
19	115	1,500	6.25	1	Pet	S	6
20	145	2,250	8.33	1	Pet	S	1
21	64	1,250	6.25	1	Pet	S	6
22	245	3,250	8.33	1	Pet	S	6
23	41	750	5.00	1	Pet	S	6
24	148	1,750	6.25	1	Pet	S	6
25	230	2,625	5.00	1	Pet	S	6
26	444	3,875	8.33	1	Pet	S	6
27	123	1,250	4.17	1	Pet	S	6
28	341	3,875	8.33	1	Pet	S	6
29	58	1,000	2.78	1	Pet	D	5
30	29	500	2.50	1	Pet	D	5
31	31	500	2.50	1	Pet	D	5
32	14	500	2.78	1	Pet	D	5
33	13	250	2.50	1	Pet	D	5
34	8	250	3.13	1	Pet	D	5
35	26	1,375	2.50	1	Pet	D	5
36	24	500	2.08	1	Pet	D	5
37	40	1,250	2.78	1	Pet	D	5
38	21	500	1.67	1	Pet	D	5
39	31	625	1.92	1	Pet	D	5
40	33	875	2.78	4	Pet	D	3
41	30	625	2.50	4	Pet	D	3
42	21	625	2.08	4	Kp	D	3
43	21	875	3.57	4	Kcp	D	3
44	36	500	2.50	4	Kag	D	3
45	56	1,250	6.25	4	Gr	S	4
46	66	1,250	5.00	4	Kag	S	4
47	196	2,000	25.00	4	Karn	S	1
48	231	3,500	25.00	4	Pcs	S	1

Note is presented in Table VI-30(4/4).

Table VI-30(2/4) POTENTIONAL SEDIMENT DISASTER SITES ON ARTERIAL ROAD

Location No.	Catchment Area(ha)	Slope/Torrent Lengh(m)	Slope/Torrent Gradient*	** Vegetation Cover	Geology	Potential Disaster Type***	Potential Disaster Rank
49	26	500	1.67	4	Peis	F	2
50	39	875	2.08	4	Peis	D	3
51	169	2,000	3.13	4	Peis	D	3
52	46	1,250	1.47	4	Peis	F	2
53	58	1,250	1.67	4	Peis	F	2
54	274	2,750	1.79	4	Pet	D	1
55	470	3,750	4.17	4	Pet	S	1
56	103	1,500	2.50	4	Peis	D	3
57	85	750	1.67	4	Peis	F	2
58	33	750	3.57	4	Pet	D	3
59	18	500	3.13	4	Pet	D	3
60	75	1,250	5.00	4	Pet	S	4
61	21	750	6.25	4	Pet	S	4
62	26	625	8.33	4	Pet	S	4
63	186	2,125	12.50	4	Pet	S	4
64	126	2,625	8.33	4	Pet	S	4
65	24	750	12.50	4	Pet	S	4
66	98	1,500	8.33	4	Qpt	S	4
67	303	3,250	8.33	4	Qpt	S	4
68	104	2,000	12.50	4	Qpt	S	4
69	145	2,750	6.25	4	Qpt	S	4
70	94	750	6.25	4	Pet	S	4
71	86	1,250	8.33	4	Pet	S	4
72	47	750	12.50	4	Pet	S	4
73	20	1,000	3.13	1	Qpt	D	1
74	74	1,750	4.17	1	Qpt	S	4
75	139	1,750	8.33	1	Peis	S	4
76	316	3,500	8.33	1	Peis	S	6
77	109	1,250	6.25	1	Peis	S	6
78	410	2,875	5.00	1	Peis	S	1
79	32	750	2.78	1	Peis	D	1
80	193	2,000	6.25	1	Peis	S	6
81	21	500	2.08	2	Peis	D	5
82	54	1,000	4.17	2	Peis	S	6
83	22	1,250	3.57	2	Peis	D	5
84	27	1,000	3.57	2	Peis	D	5
85	34	1,250	4.17	2	Peis	S	6
86	46	1,250	5.00	2	Peis	S	6
87	183	3,250	12.50	2	Gr	S	6
88	96	2,250	6.25	2	Gr	S	6
89	190	2,250	8.33	2	Gr	S	1
90	468	3,375	8.33	2	Gr	S	6
91	18	375	3.13	2	Peis	D	5
92	16	500	3.13	2	Peis	D	5
93	18	625	3.57	2	Peis	D	5
94	13	250	3.13	2	Peis	D	1
95	157	2,125	8.33	2	Peis	S	6
96	300	3,000	6.25	2	Peis	S	6

Note is presented in Table VI-30(4/4).

Table VI-30(3/4) POTENTIONAL SEDIMENT DISASTER SITES ON ARTERIAL ROAD

Location No.	Catchment Area(ha)	Slope/Torrent Lengh(m)	Slope/Torrent Gradient*	** Vegetation Cover	Geology	Potential disaster Type***	Potential disaster Rank
97	532	4,250	12.50	2	Peis	S	6
98	983	5,875	12.50	2	Peis	S	6
99	91	1,250	8.33	2	Qpl	S	6
100	21	500	2.50	2	Peis	D	5
101	36	750	3.13	2	Peis	D	5
102	22	625	2.27	2	Peis	D	5
103	483	4,250	3.57	2	Peis	D	5
104	109	750	2.50	2	Peis	D	5
105	118	1,750	3.13	2	Peis	D	5
106	104	875	2.50	2	Peis	D	5
107	669	5,000	6.25	2	Peis	S	6
108	348	3,000	6.25	5	Gr	S	6
109	75	875	2.27	5	Peis	D	3
110	68	1,125	2.50	5	Peis	D	3
111	147	2,250	2.27	5	Gr	D	3
112	65	1,250	2.08	5	Peis	D	3
113	31	750	1.92	5	Peis	D	3
114	535	4,250	5.00	5	Gr	S	6
115	87	750	2.78	5	Peis	D	3
116	132	1,500	5.00	5	Peis	S	6
117	181	1,625	6.25	5	Peis	S	6
118	50	1,000	5.00	5	Peis	S	6
119	169	2,000	12.50	5	Peis	S	6
120	700	4,500	8.33	5	Gr	S	6
121	82	1,250	4.17	5	Peis	S	6
122	94	1,625	3.13	5	Peis	D	3
123	468	4,250	8.33	5	Pcm	S	6
124	264	2,875	5.00	5	Peis	S	6
125	273	2,750	6.25	5	Peis	S	6
126	58	1,000	3.57	5	Pcm	D	1
127	53	750	3.57	5	Pcm	D	3
128	73	1,250	6.25	5	Peis	S	6
129	300	2,625	6.25	5	Peis	S	6
130	64	750	3.57	5	Peis	D	3
131	45	1,625	3.13	5	Pcm	D	3
132	58	1,625	3.57	5	Pcm	D	3
133	313	2,750	3.57	5	Pcm	D	3
134	33	750	2.50	5	Pcm	D	3
135	33	750	2.50	5	Pcm	D	3
136	268	2,250	8.33	5	Pcm	S	6
137	321	3,000	5.00	1	Pet	S	5
138	87	750	6.25	1	Pet	S	5
139	21	250	3.13	1	Pet	D	5
140	29	750	1.92	1	Pet	D	5
141	79	1,375	2.08	1	Pet	D	5
142	27	375	2.34	1	Pet	D	5
143	238	1,625	6.25	1	Pet	S	6
144	37	500	2.27	1	Pet	D	5

Note is presented in Table VI-30(4/4).

Table VI-30(4/4) POTENTIONAL SEDIMENT DISASTER SITES ON ARTERIAL ROAD

Location No.	Catchment Area(ha)	Lengh(m)	Gradient*	** Vegetation Cover	Geology	Potential Disaster Type***	Potential Disaster Rank
145	81	750	3.13	1	Pet	D	5
146	63	375	6.25	1	Tmpa	S	1
147	76	500	2.78	1	Tmpa	D	5
148	24	500	1.92	1	Tmpa	D	5
149	9	250	1.79	1	Tmpa	D	1
150	166	2,000	6.25	2	Tpev	S	6
151	36	1,250	8.33	2	Tpev	S	6
152	41	250	12.50	2	Tpev	S	6
153	31	750	6.25	1	Tmi	S	6
154	21	750	6.25	1	Tmi	S	6
155	350	2,000	12.50	1	Tmi	S	5
156	34	875	3.57	1	Tmi	D	6
157	755	8,500	12.50	2	Qpt	S	6
158	474	5,375	6.25	2	Qpt	S	6
159	39	1,000	8.33	2	Tpev	S	6
160	197	2,000	12.50	2	Qpt	S	6
161	100	1,250	8.33	2	Qpt	S	6
162	277	4,000	12.50	2	Tpev	S	6
163	855	7.875	12.50	2	Qpt	S	6
164	-	-	-	1	Tmpa	B	1
165	-	-	-	1	Tmpa	B	1
166	-	-	-	1	Tmpa	B	6
167	-	-	-	2	Qpt	B	6
168	-	-	-	2	Qpt	B	6
169	-	-	-	2	Qpt	B	6
170	-	-	-	2	Pcm	B	1

Note: *: Gradient is expressed with a reciprocal.
**: Vegatation cover is classified as below:
1: High forest area
2: Low forest area
3: Cultivation area
4: Low shrab area
5: Grassland
***: Type of disaster is classified as below:
S: Sediment Flow
D: Debris Flow
F: Slope Failure
B: Bank Erosion

Table VI-31 COMPARISON OF APPLICABLE SABO DAM TYPE (ACTION PLAN)

Item	Gravity Dam	Fill Dam	Arch Dam	Steel Frame Dam	Concrete Block Dam
Structure	Concrete, rubble concrete or wet masonry type is applicable; overflow and debris flow are treated safely; and, the most conventional type	Embankment type of rock or earth; spillway is indispensable to discharge flood flows.	Thin concrete structure, all loads are supported by river bank and bed; concrete volume for dam body is smaller than that of gravity dam.	Gabion mattresses formed by steel bars are mounted; dam body is permeable and sustainable against deviation of dam foundation; dam height is limited to 15 m at maximum.	Dam body is piled up of concrete blocks; and hence permeable and sustainable against deviation of dam foundation; dam height is limited to 15 m at maximum.
Topography and Foundation	Compacted sand and gravel or rock foundation; countermeasures are required for piping in the fine-sand foundation.	Foundation treatment is indispensable; wide river section is most applicable for this type.	Dam base and abutment shall be composed of hard and massive rock.	This type is applicable for the sites of river deposit consisting fine and coarse sand and gravel.	This type is applicable for the sites of river deposit consisting fine and coarse sand and gravel.
Materials	Concrete or rubble concrete	Earth or rock, and concrete for spillway	Concrete	Steel bars and boulders or cobble stones	Concrete
Construction Method	Multi-stage construction is possible since concrete may withstand overflowing.	Construction is generally difficult due to complicated structure.	River diversion is indispensable by means of diversion channel or tunnel.	Rapid and easy; river diversion and foundation treatment are simple.	Rapid and easy; river diversion and foundation treatment are simple.

Table VI-32 TOPOGRAPHICAL AND GEOLOGICAL CONDITIONS OF SABO DAM SITES (ACTION PLAN)

Item	Description	C-1 Dam Site	C-5 Dam Site	N-1 Dam Site
Riverbed	Width	60m	40m	100m
	Elevation	EL. 161.4 m	EL. 469.6 m	EL. 850.3 m
Dam Crest	Width	105m	80m	165m
	Elevation	EL. 181.0 m	EL. 480.0 m	EL. 870.0 m
Right Bank	Geology	Fresh outcrop of fine sandstone	Terrace Deposit	Gneiss with schist
	Slope	1/1.1	1/4.0	1/0.8
	Land Use	Forest	Pan American Highway, field	Sugarcane field
Left Bank	Geology	Debris deposit (Muck of PAN-AM Highway)	Bluffs of black schist	Debris deposit
	Slope	1/1.75	1/0.1	1/3.3
	Land Use	Banana plantation	Existing road	Waste land
Riverbed condition	Estimated Depth to Bedrock	More than 10 m	More than 10 m	More than 10 m
	Gravel Diameter	10 - 30 cm	10 - 50 cm	10 - 30 cm
	Bearing Capacity	More than 50 t/m2	More than 50 t/m2	More than 50 t/m2
Remarks		Construction of a 20 m high dam is possible if the debris deposit on the left bank is removed	Dam height should be less than 10 m judging from the topographical condition	Construction of a 20 m high dam is possible if the debris deposit on the left bank is removed

Table VI-33 STRUCTURAL DIMENSIONS OF PROPOSED SABO DAMS (ACTION PLAN)

Item	C-1 Dam	C-5 Dam	N-1 Dam
Location	Chama River 3.0km upstream of confluence with Mocacay River	Chama River 500m downstream of Chama No. 4 Bridge	Nuestra Senora River 300m upstream of confluence with Chama River
Dam Site			
- River Gradient	1/110	1/100	1/30
- River Width	160 m	70 m	100 m
- Design Flood (1/100)	2,300 m3/s	1,950 m3/s	610 m3/s
Dam type	Rubble Concrete (Gravity Dam)	Steel Frame Dam	Rubble Concarete (Gravity Dam)
Height	22 m (20 m)*	9 m (8 m)*	22 m (20 m)*
Length			
- Top	160 m	234 m	180 m
- Bottom	100 m	65 m	125 m
Overflow Depth	5.4 m	5.9 m	2.3 m
Overflow Width	100 m	75 m	100 m

* : Figures in parentheses indicate the height of dam crest above riverbed

Table VI-34 STRUCTURAL DIMENSIONS OF PROPOSED CONTINUOUS LOW DAMS (ACTION PLAN)

Item	Mucusas	Mucusuru	Mucusos
Number of Low Dams	10	5	3
Average River Gradient	1/20	1/10	1/10 - 1/6.7
Average River Width	30 m	20 m	35 m
Design Flood (1/100)	30 m3/s	60 m3/s	20 m3/s
Dam Type	Wet Masonry (Gravity) Dam	Wet Masonry (Gravity) Dam	Wet Masonry (Gravity) Dam
Dam Height	4 m (3 m)*	4 m (3 m)*	4 m (3 m)*
Dam Length			
- Top	27 - 68 m	25 - 58 m	22 - 39 m
- Bottom	10 - 36 m	17 - 36m	10 - 20 m
Overflow Section			
- Depth	5.6 m	5.6 - 6.0 m	5.6 m
- Width	20 - 30 m	15 m	10 m

* : Figures in parentheses indicate the height of dam crest above riverbed.

Table VI-35 STRUCTURAL PLAN OF PROPOSED RETAINING WALLS (Action Plan)

No.	Location	Length (m)	Height (m)	Type *
1.	Mesa de Virgen	200	2.0	Concrete
2.	La Honda	150	2.0	Concrete
3.	La Palmita	150	2.0	Concrete
4.	La Providencia	50	2.0	Concrete
5.	Cacute	70	2.0	Concrete
6.	La Vega **	200	2.0	Concrete
	T o t a l	820	---	---

Note *: Leaning-to-slope type with a slope of 1.0:0.5.
**: Around the confluence between the Chama and the Nuestra Senora Rivers.

Table VI-36 STRUCTURAL PLAN OF PROPOSED REVETMENT (Action Plan)

No.	Location/River	Length (m)	Height (m)	Type *
1.	El Pedregal/ Chama	20	4.5	Wet masonry
2.	Cacute/ Chama	160	4.5	Wet masonry
3.	Tampaul/ Chama	60	4.5	Wet masonry
4.	El Salado/ Chama	60	4.5	Wet masonry
5.	La Vega*/ Chama	400	4.5	Wet masonry
6.	La Vega/ Qd. El Diablo	20	4.5	Wet masonry
	T o t a l	720	---	---

Note *: Slope of revetment is generally set at 1.0:0.5 to protect the rever bank from scouring by flood
**: La Vega is located at around the confluence of the Chama and Nuestra Senora rivers.

Table VI-37 Relationship Between Grain Size and Justin's Critical Velocity

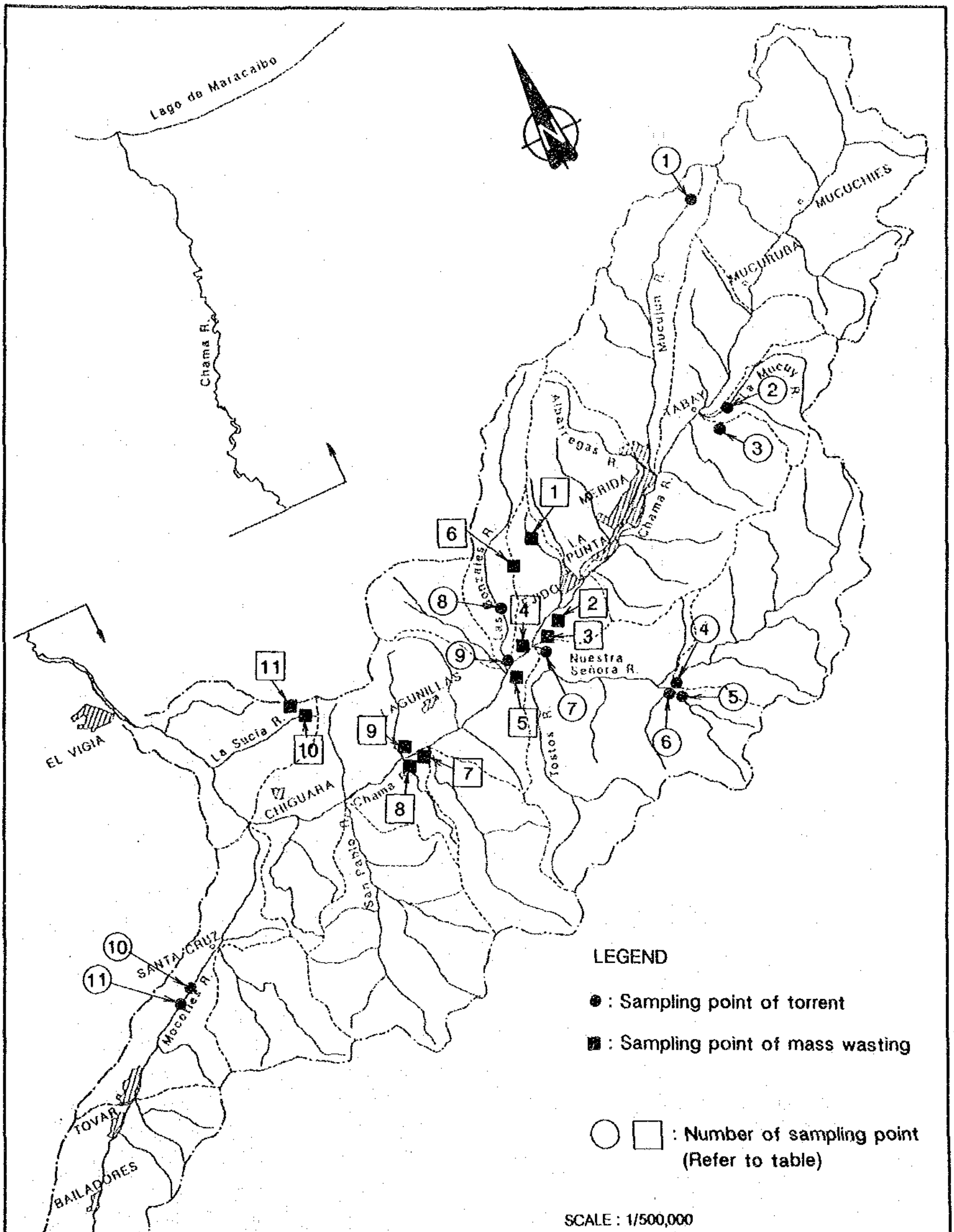
Grain Size (mm)	Justin's Critical Velocity (cm/sec)
5.00	22.86
3.00	17.71
1.00	10.22
0.80	9.14
0.50	7.23
0.30	5.60
0.10	3.23
0.08	2.89
0.05	2.29
0.03	1.77
0.01	1.02

Table VI-38 COEFFICIENT OF PERMEABILITY FOR VARIOUS RIVERBED MATERIALS

	Coefficient of Permeability (cm/s)												
	10^{3}	10^{2}	10^{1}	10^{0}	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}
Reverbed Materials		Gravel			Sand, Layor of sand and gravel				Fine sand, Silt, etc.			Clay, Nonpermeable soil	

Table VI-39 Porosity Depending on Geologic Stratum

Geologic Stratum	Porosity (%)	Water Content (%)	Effective Porosity (%)
Alluvium	25	10	15
Granule	35	20	15
Sand-Dune	30-35	10-15	20
Mad	45-50	30	15-20
Diluvium	30	10-15	15-20
Sand	35-40	5-10	30
Loam	50-70	30-50	20
Clay	50-70	45-60	5-10

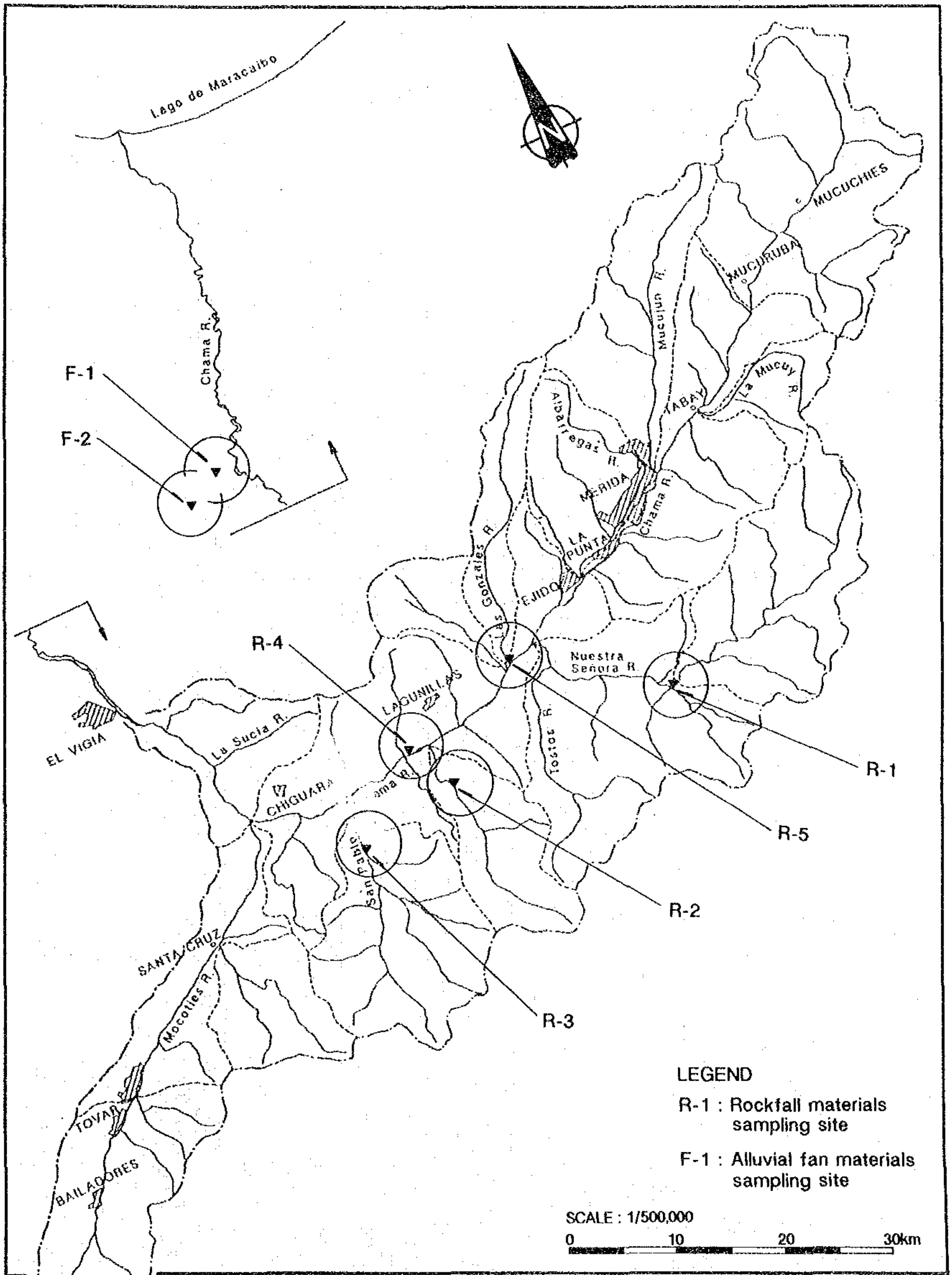


LOCATION MAP OF SAMPLING SITES
FOR TORRENT EROSION AND MASS WASTING

Fig. VI-1

STUDY ON CHAMA RIVER BASIN
CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

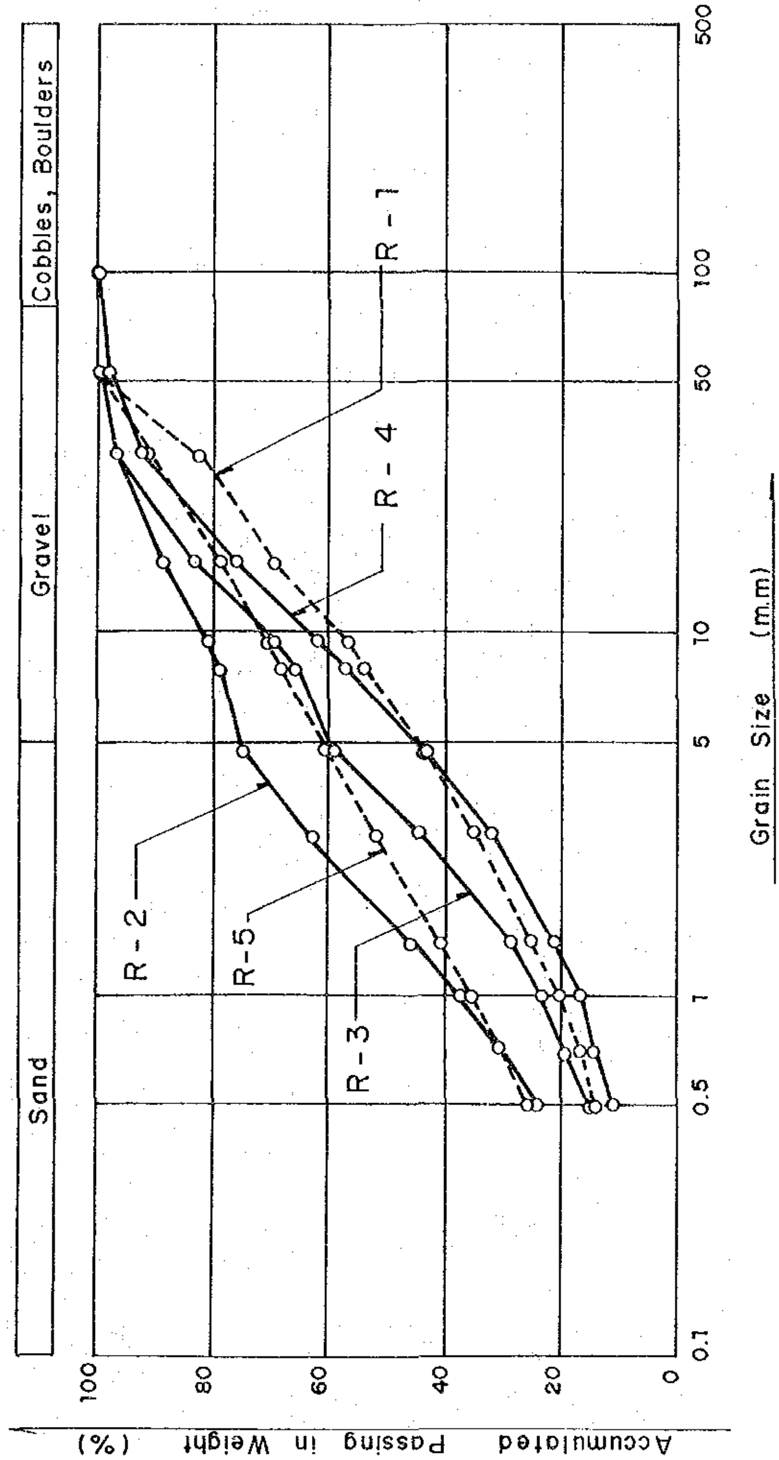


LOCATION MAP OF SAMPLING SITES
FOR ROCKFALL AND ALLUVIAL FAN MATERIALS

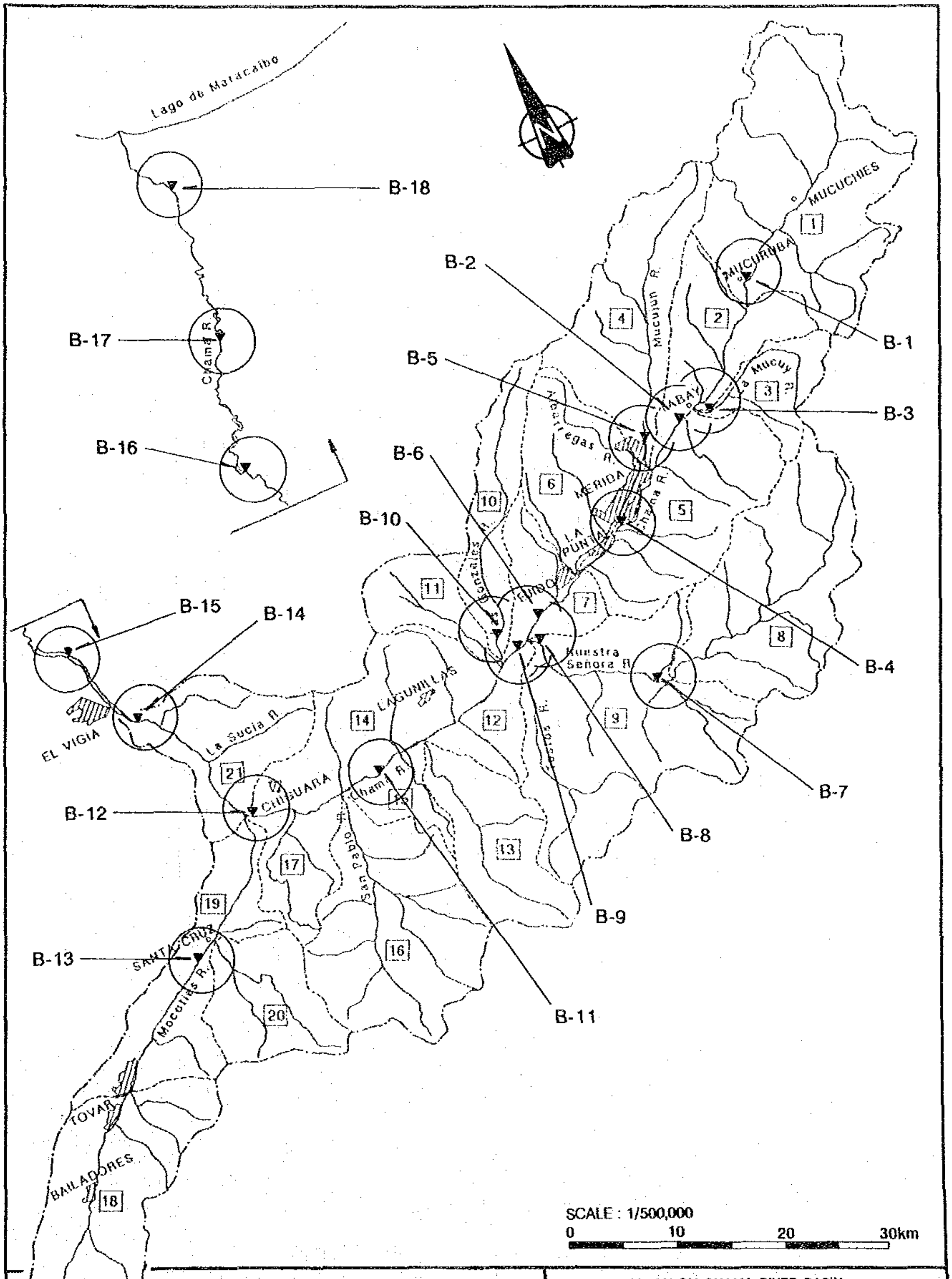
Fig. VI-2

STUDY ON CHAMA RIVER BASIN
CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



GRAIN SIZE ACCUMULATION CURVES OF ROCKFALL MATERIALS	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-3	JAPAN INTERNATIONAL COOPERATION AGENCY

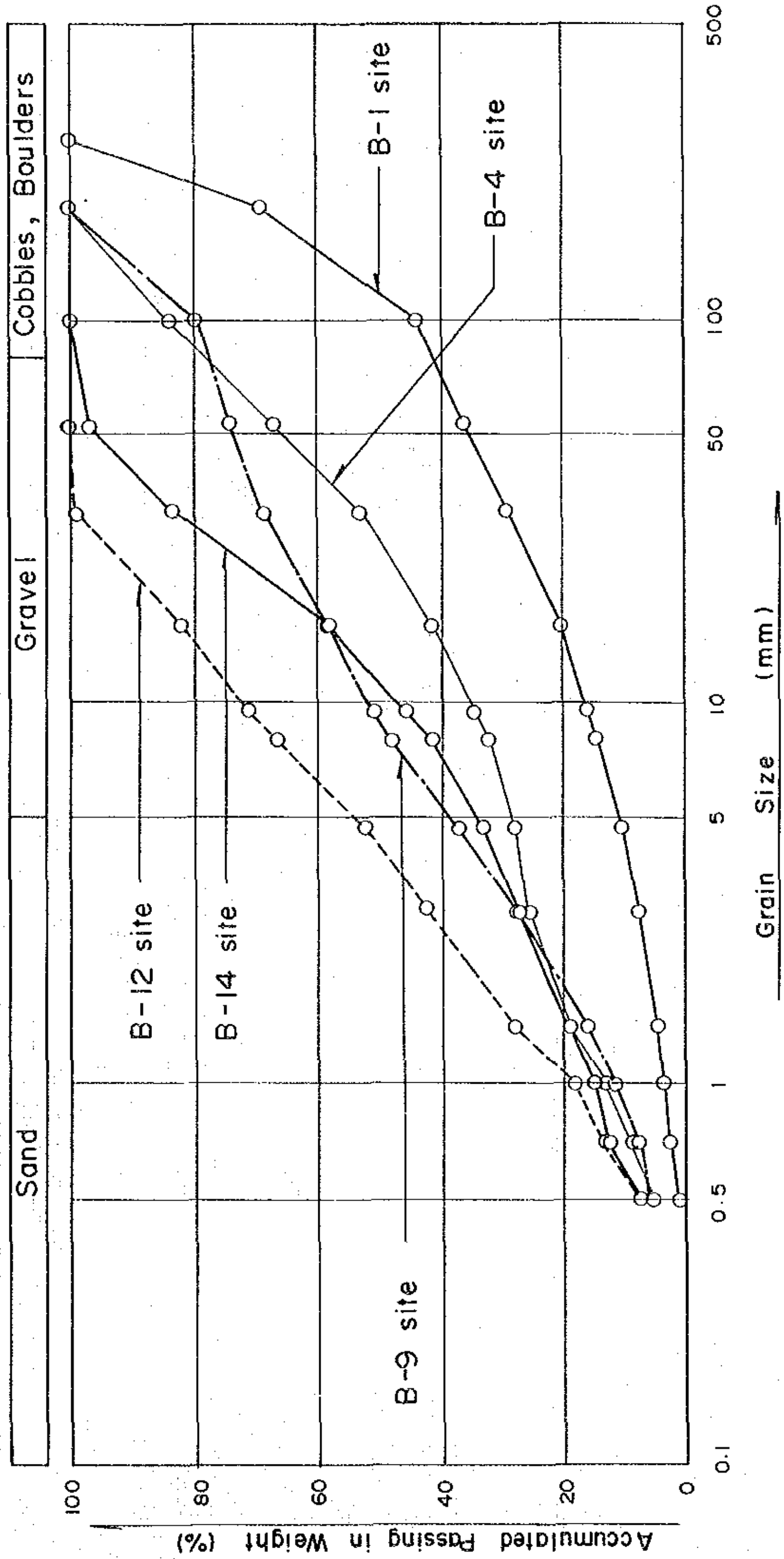


LOCATION MAP OF SAMPLING SITES FOR RIVERBED MATERIALS

Fig. VI-4

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

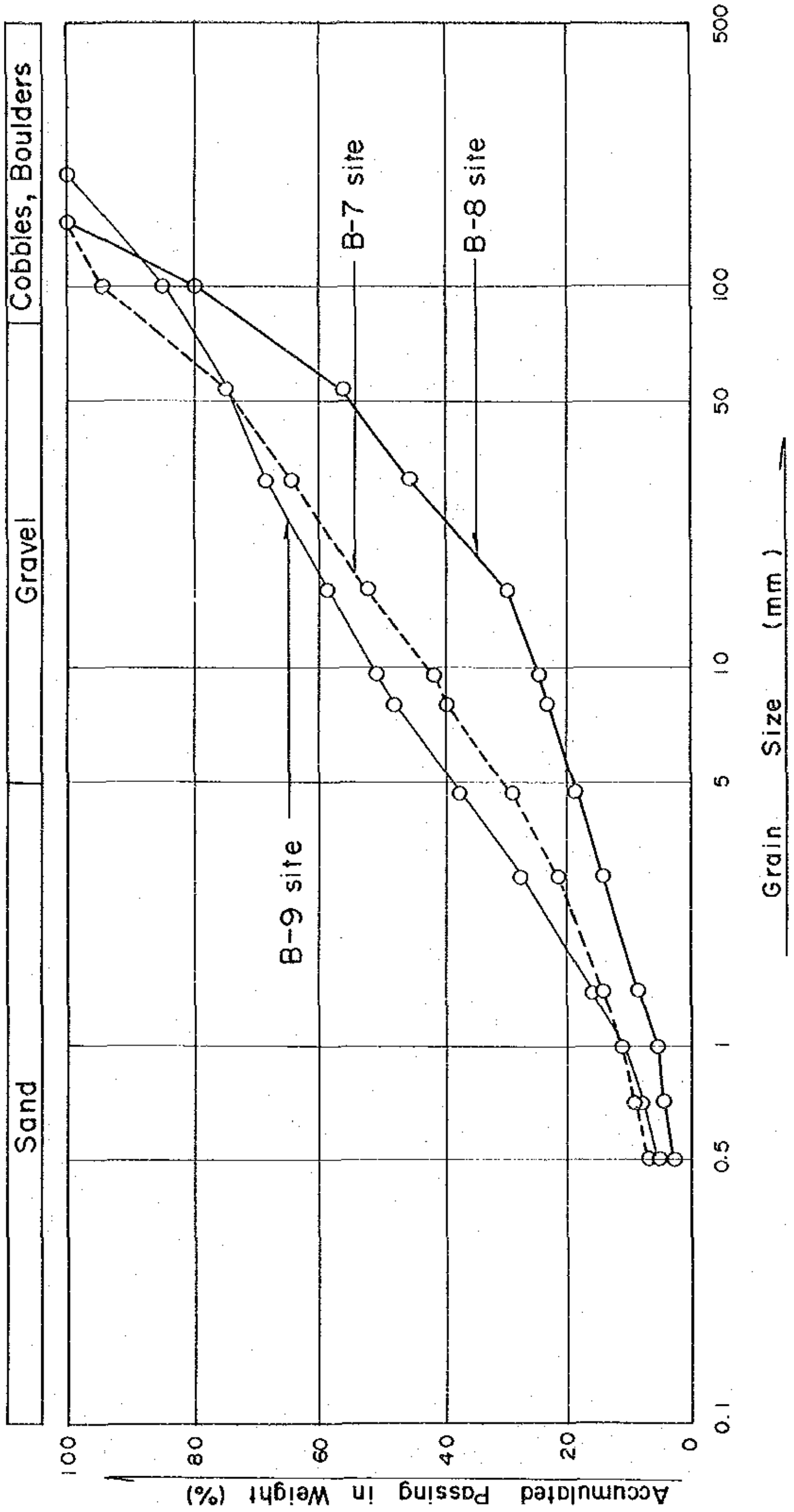


GRAIN SIZE ACCUMULATION CURVES OF RIVERBED MATERIALS IN CHAMA RIVER

Fig. VI-5

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

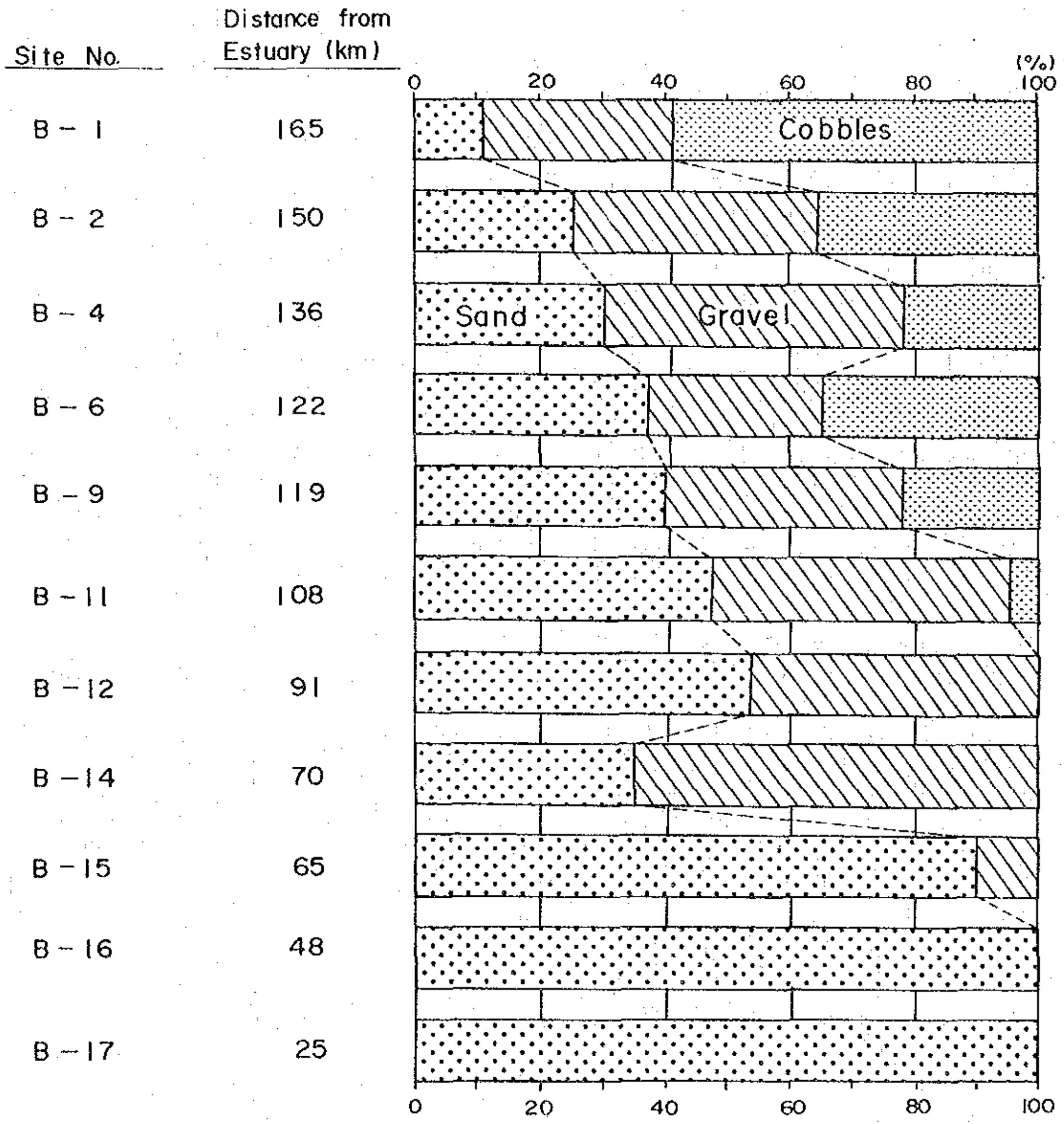


GRAIN SIZE ACCUMULATON CURVES OF RIVERBED MATERIALS
IN NUESTRA SENORA RIVER

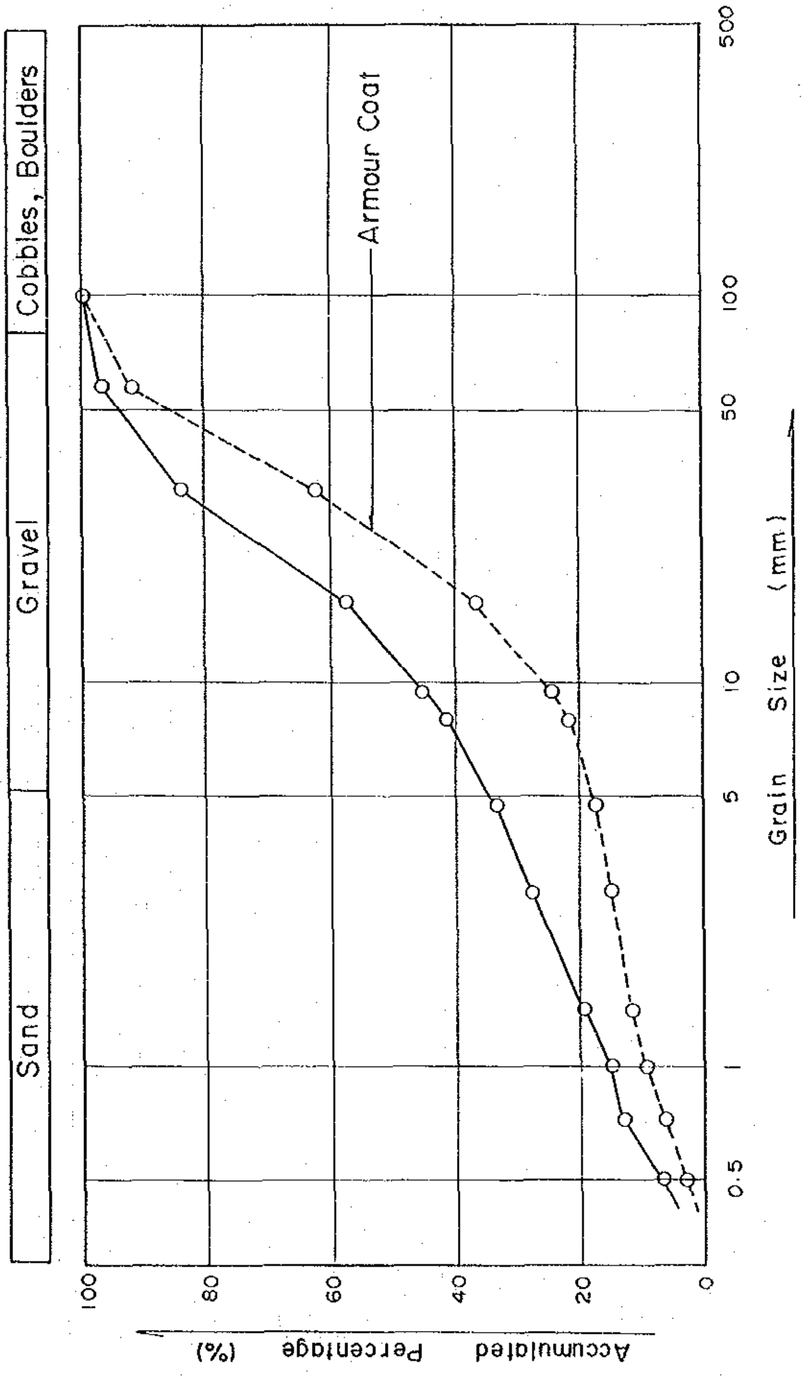
Fig. VI-6

STUDY ON CHAMA RIVER BASIN
CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



COMPARISON OF GRAIN SIZE DISTRIBUTION FOR RIVERBED MATERIALS IN CHAMA RIVER	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-7	JAPAN INTERNATIONAL COOPERATION AGENCY

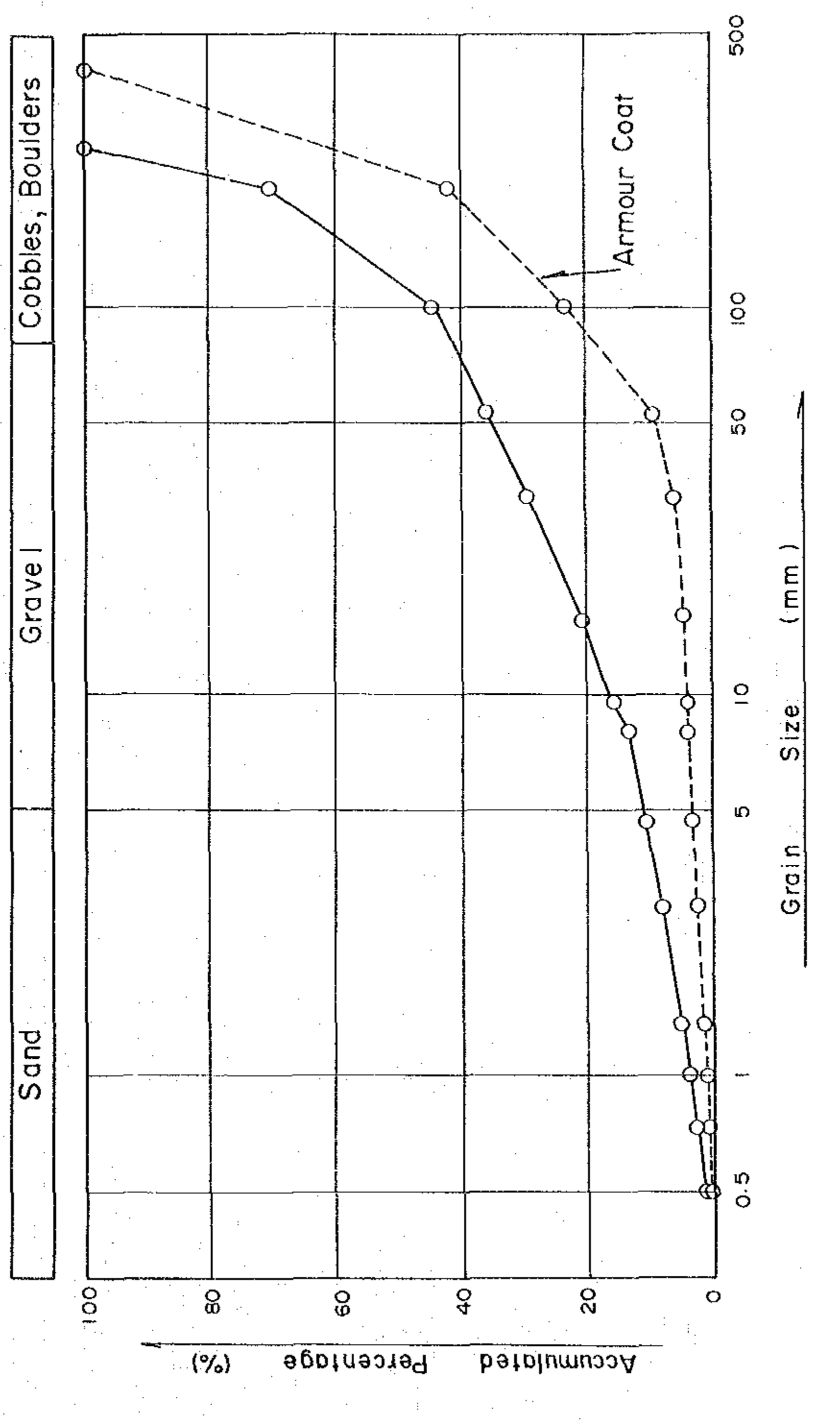


COMPARISON OF GRAIN SIZE ACCUMULATION CURVES FOR RIVERBED MATERIALS WITH ARMOR COAT IN CHAMA RIVER AT MUCURUBÁ

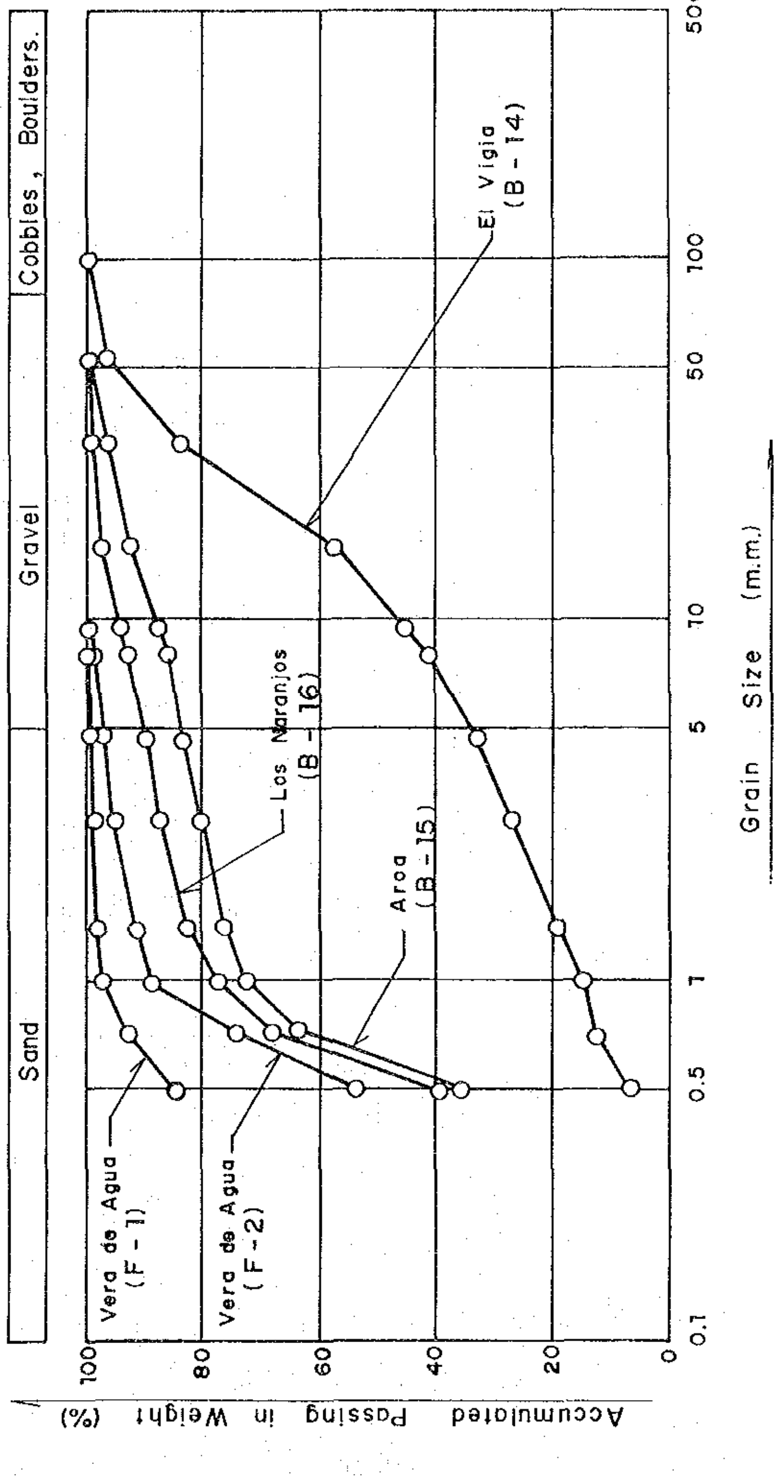
Fig. VI-8

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

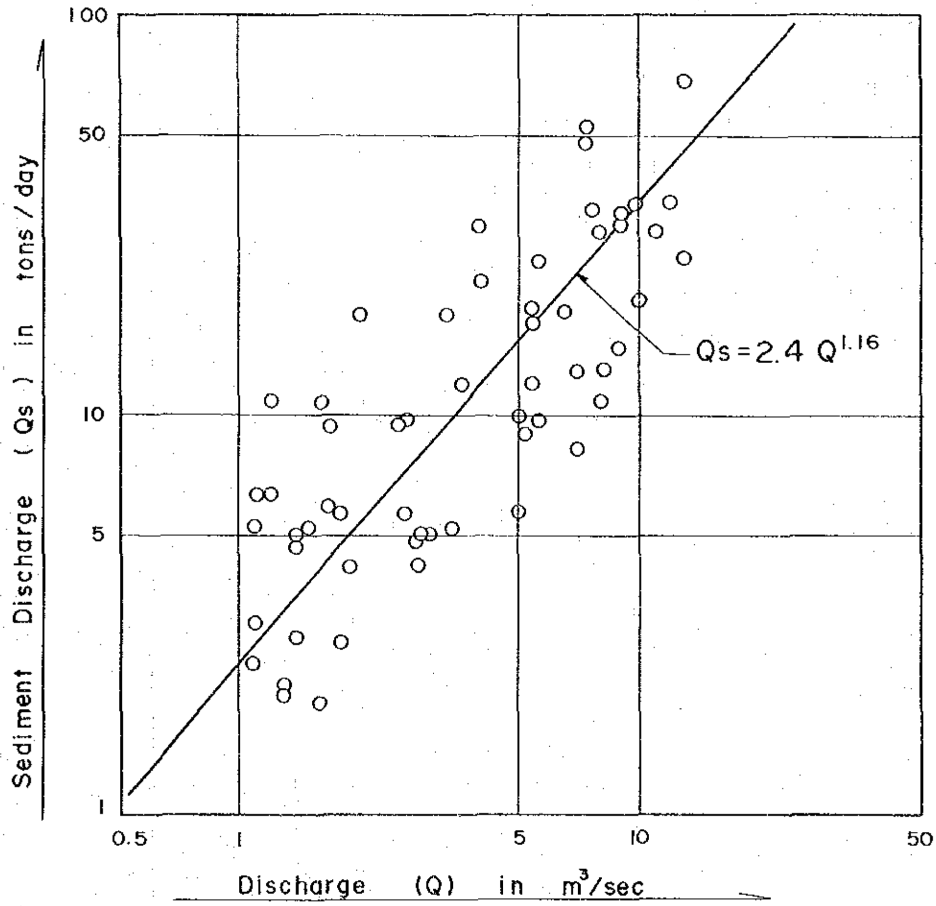
JAPAN INTERNATIONAL COOPERATION AGENCY



COMPARISON OF GRAIN SIZE ACCUMULATION CURVES FOR RIVERBED MATERIALS WITH ARMOR COAT IN CHAMA RIVER AT EL VIGÍA Fig. VI-9	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY



COMPARISON OF GRAIN SIZE ACCUMULATION CURVES FOR RIVERBED MATERIALS WITH ALLUVIAL FAN MATERIALS IN LOWER REACHES OF CHAMA RIVER Fig. VI-10	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY

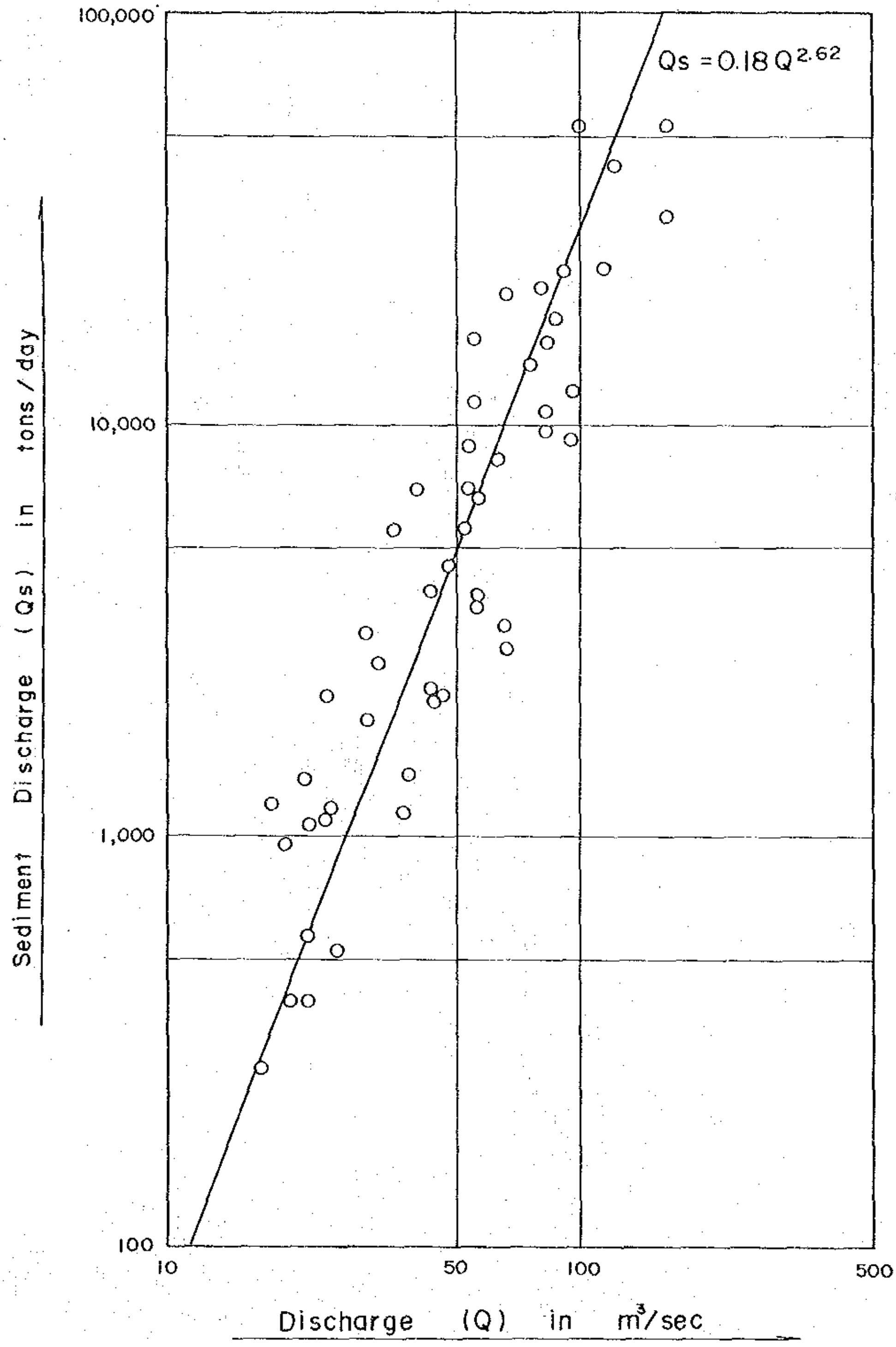


SUSPENDED LOAD RATING CURVE AT MUCURUBÁ STATION

Fig. VI-11

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

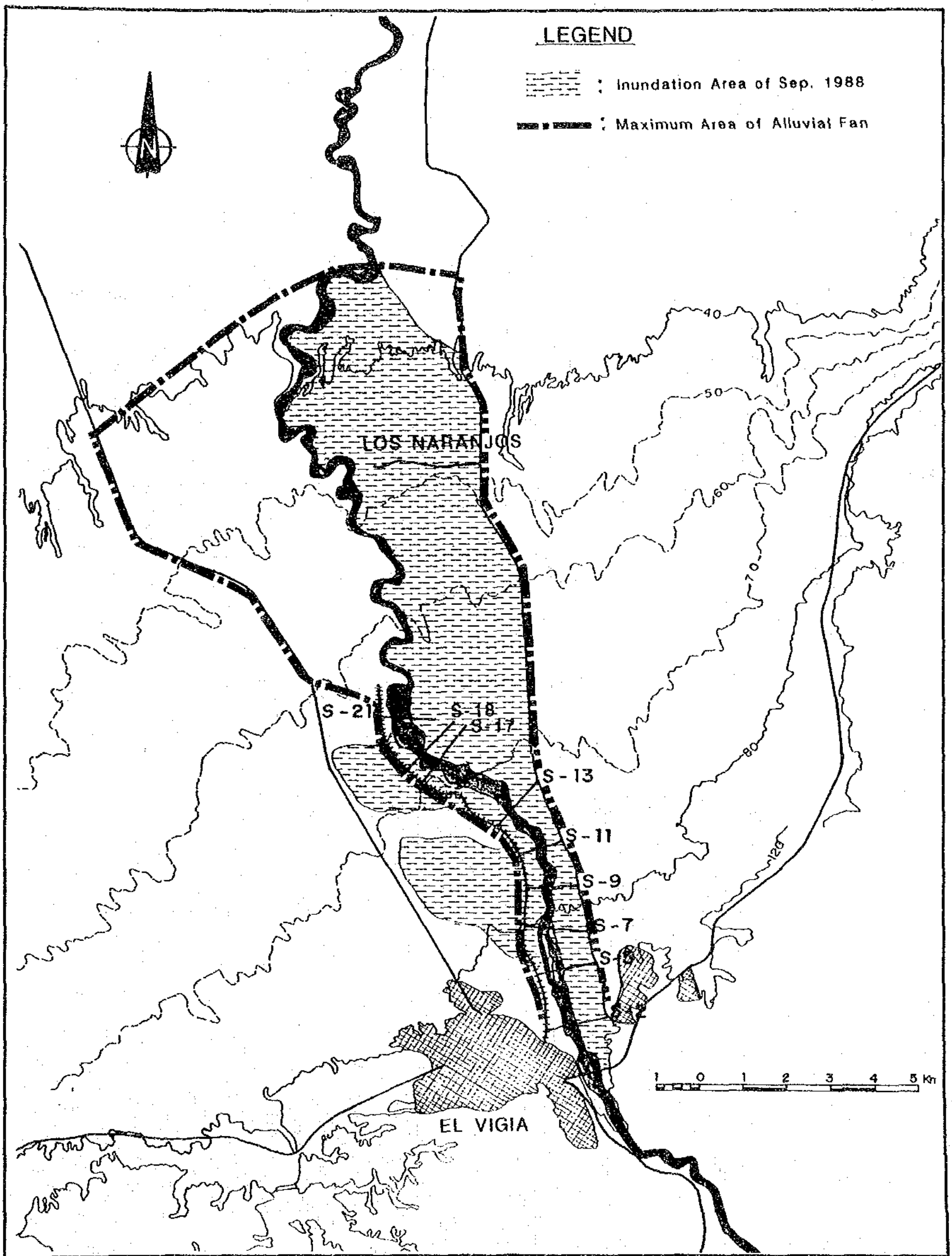


SUSPENDED LOAD RATING CURVE AT PUERTO CHAMA BRIDGE

Fig. VI-12

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

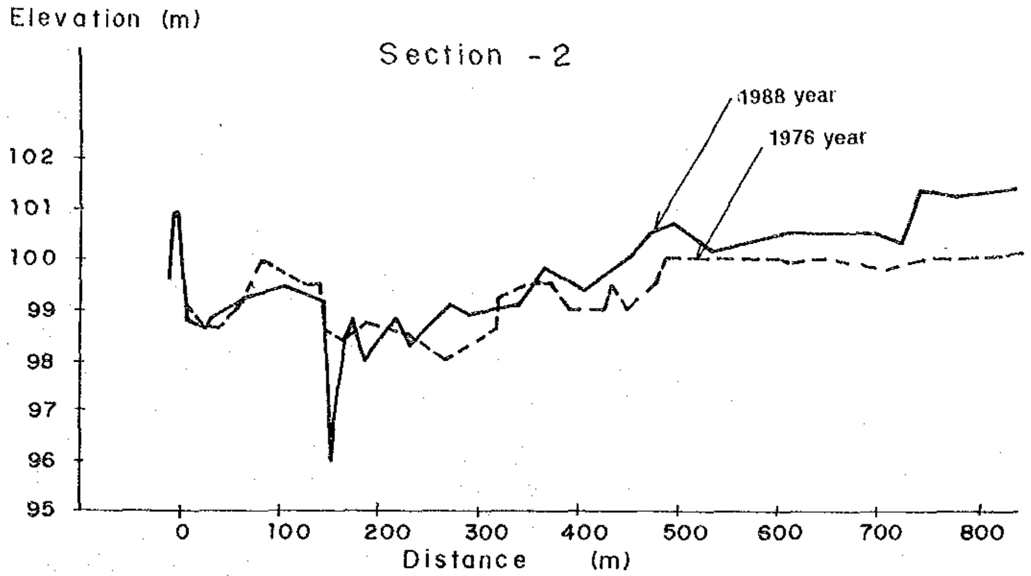


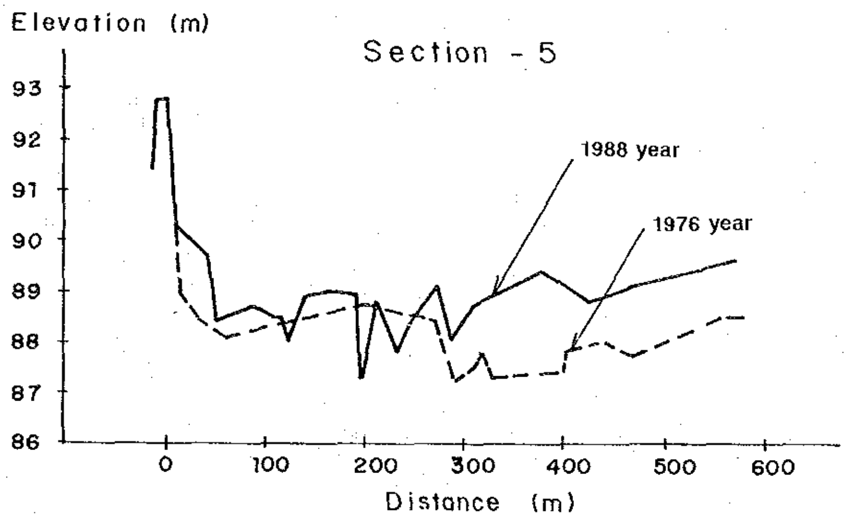
ALLUVIAL FAN AREA AND LOCATIONS OF RIVER CROSS SECTIONS

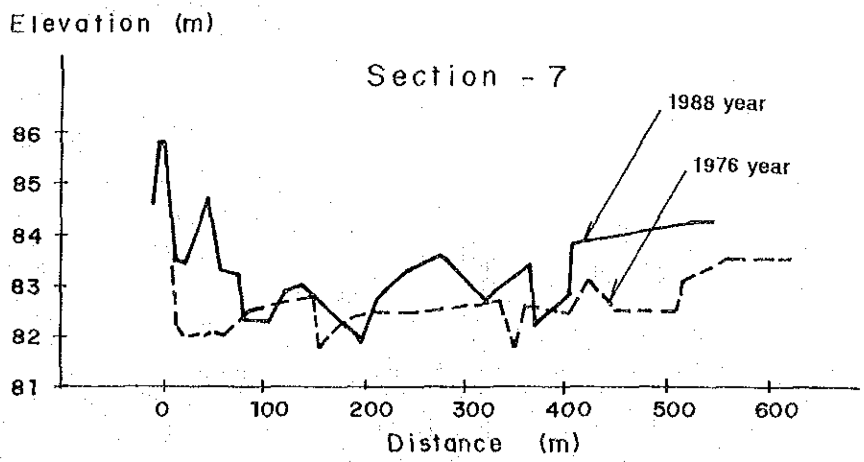
Fig. VI-13

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

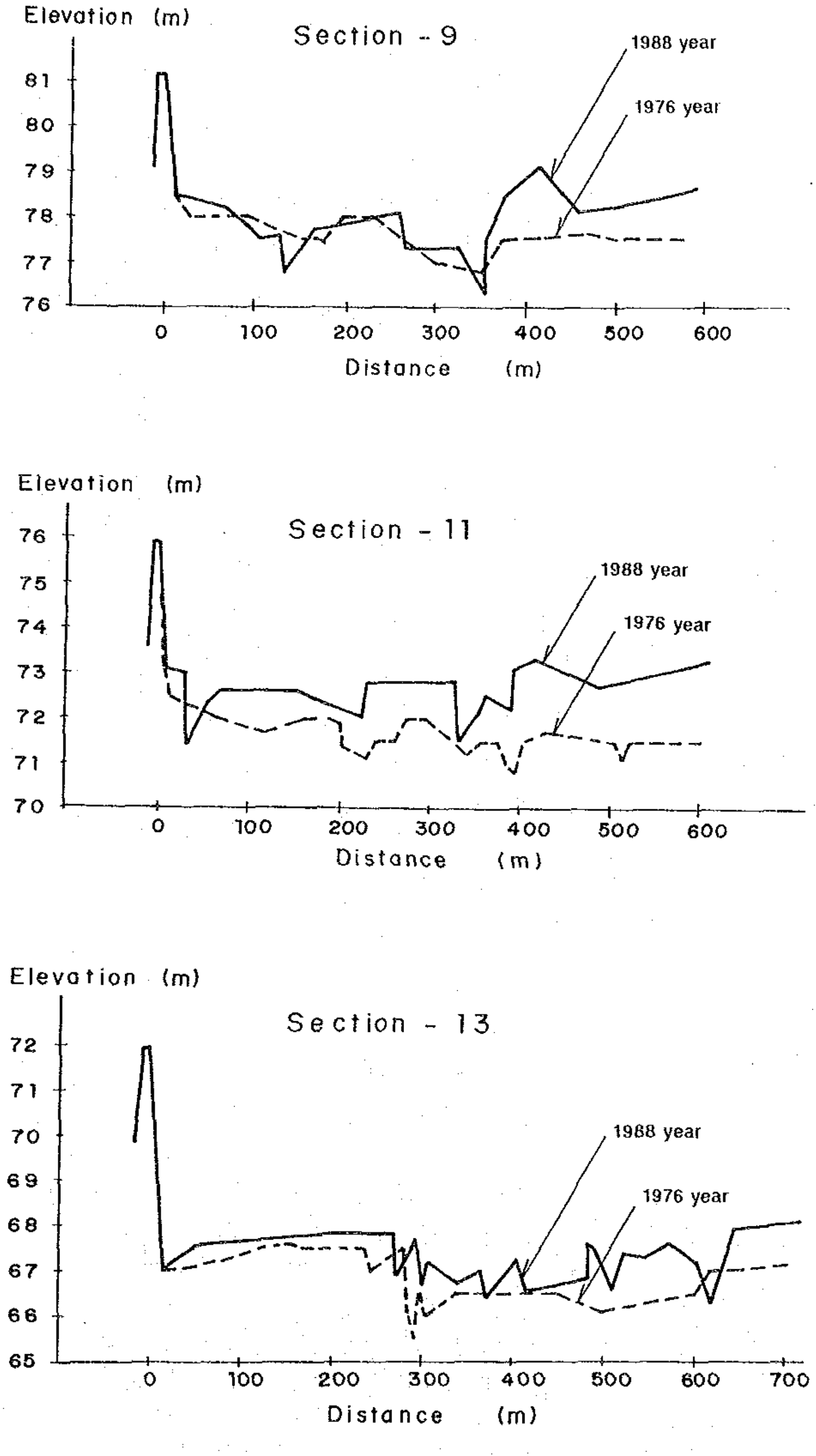
JAPAN INTERNATIONAL COOPERATION AGENCY







COMPARISON OF RIVER CROSS SECTION	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-14 (1/3)	JAPAN INTERNATIONAL COOPERATION AGENCY

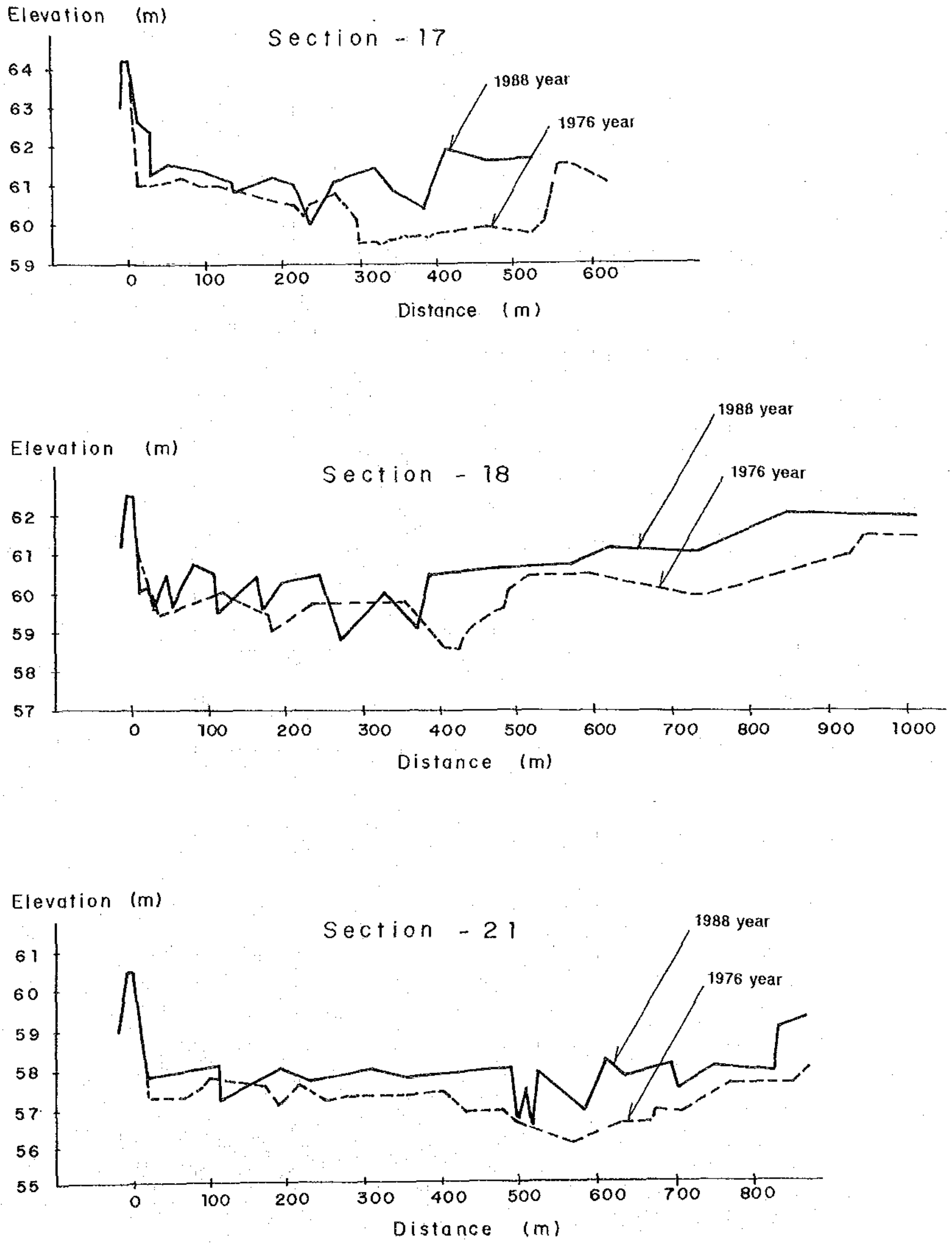


COMPARISON OF RIVER CROSS SECTION

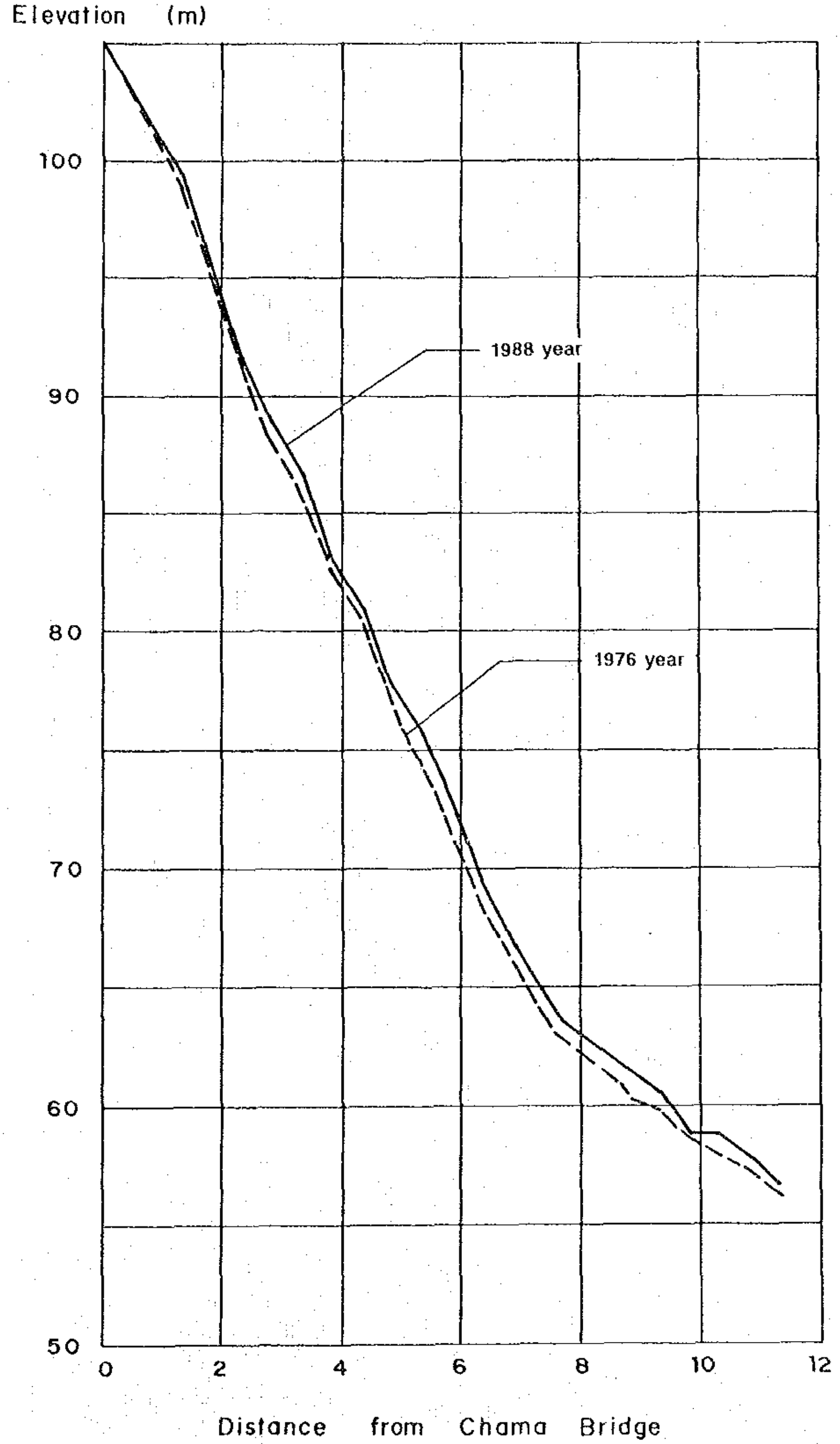
Fig. VI-14 (2/3)

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



COMPARISON OF RIVER CROSS SECTION	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-14 (3/3)	JAPAN INTERNATIONAL COOPERATION AGENCY

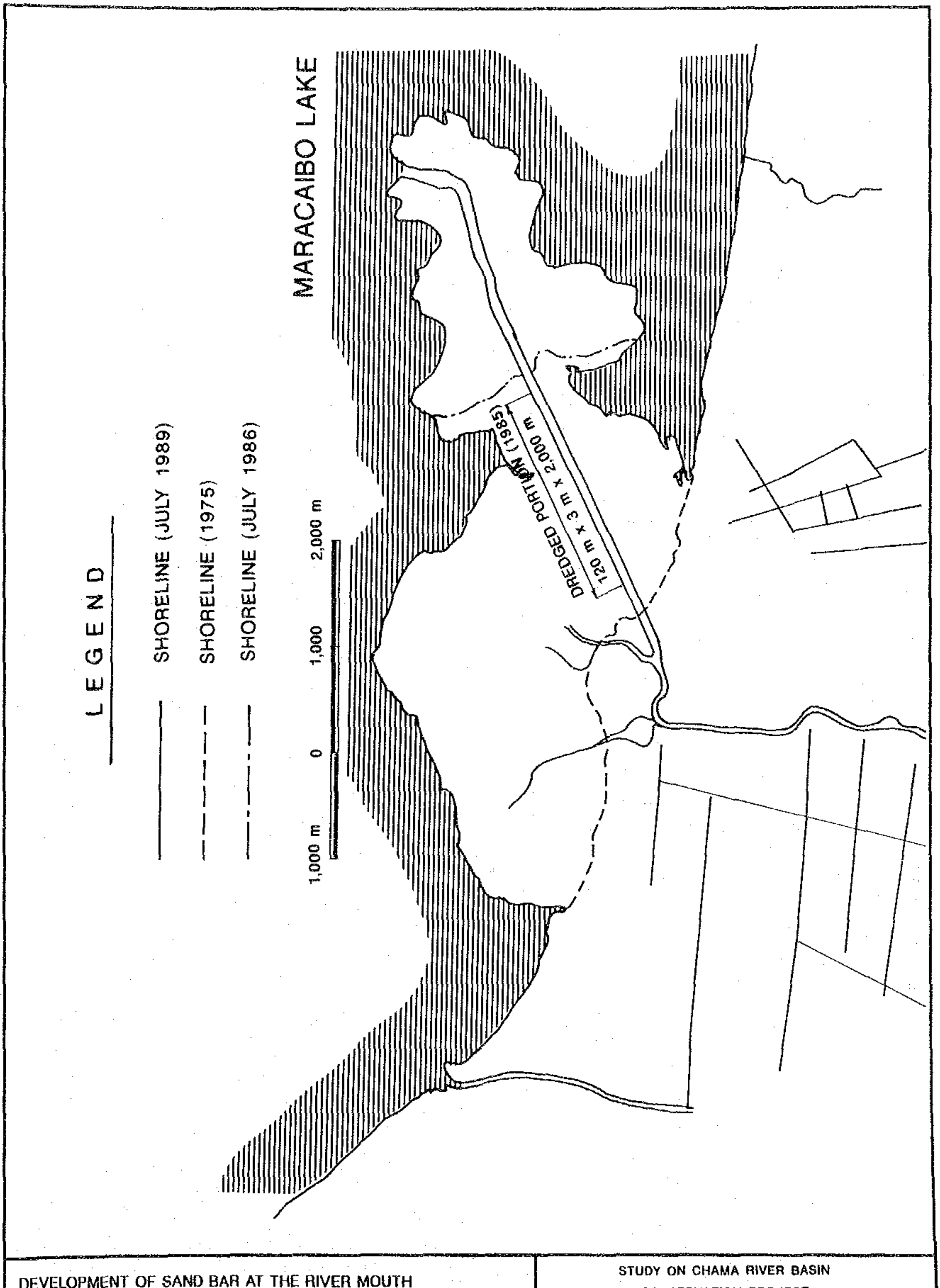


COMPARISON OF LONGITUDINAL RIVER PROFILES IN LOWER REACHES OF CHAMA RIVER

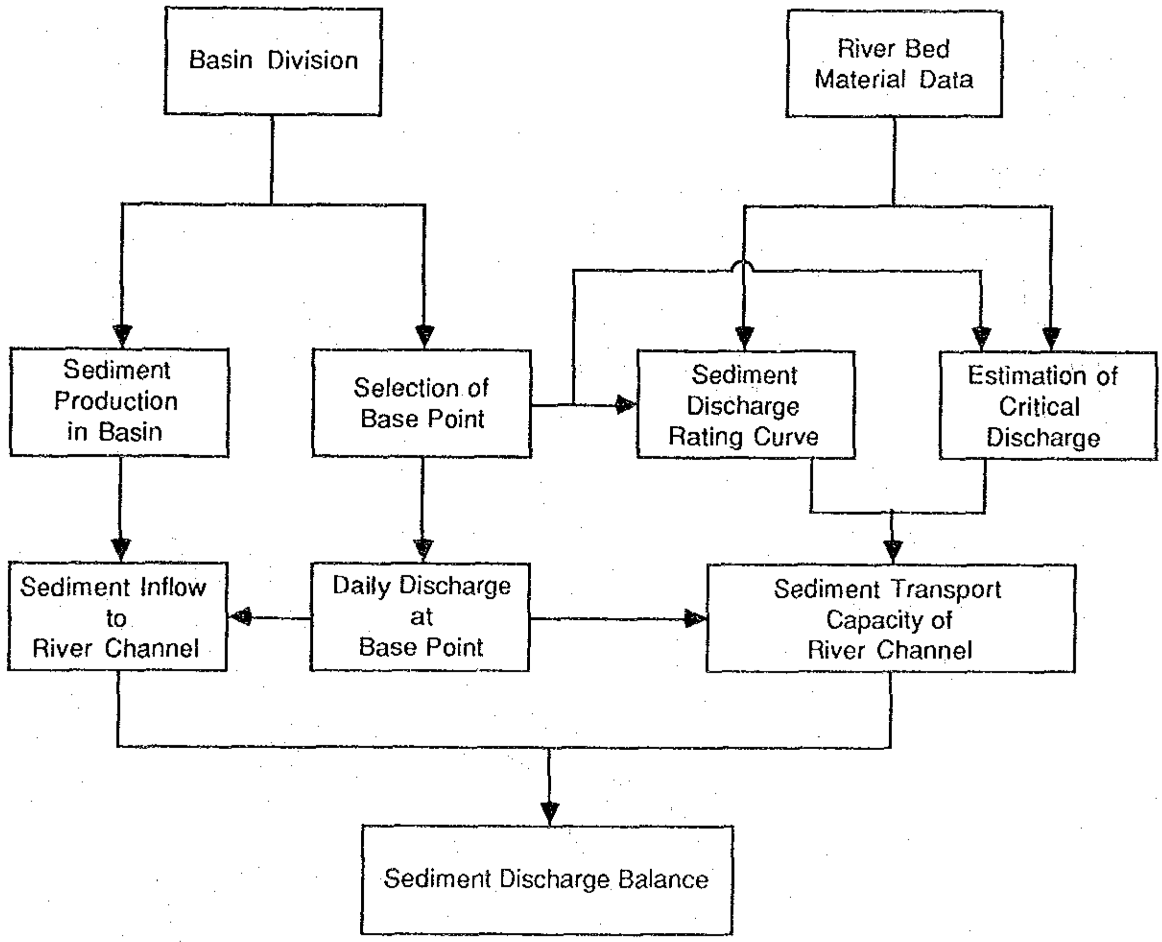
Fig. VI-15

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



DEVELOPMENT OF SAND BAR AT THE RIVER MOUTH	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-16	JAPAN INTERNATIONAL COOPERATION AGENCY

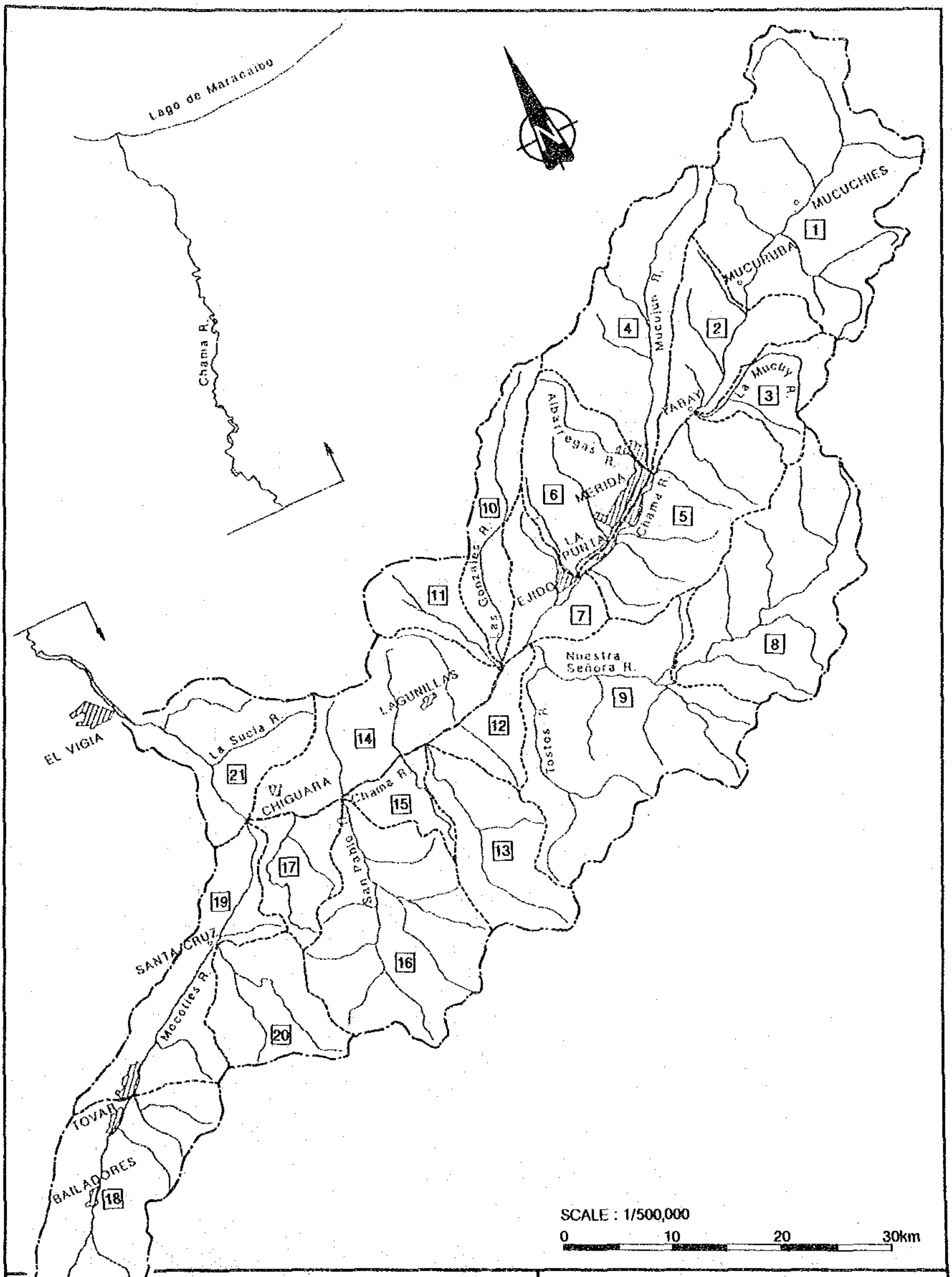


GENERAL PROCEDURE OF SEDIMENT TRANSPORTATION AND BALANCE STUDY

Fig. VI-17

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

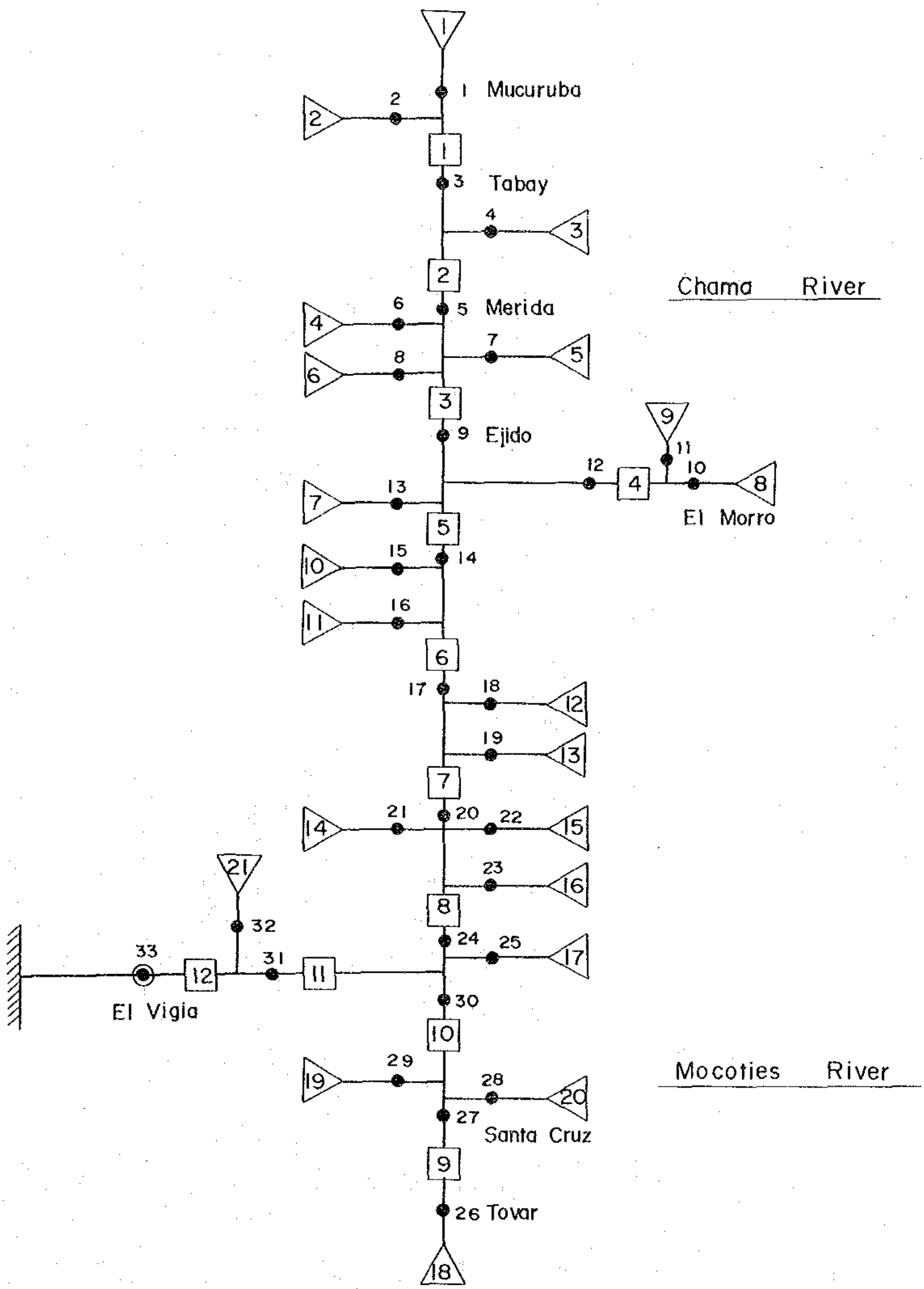


BASIN DIVISION FOR SEDIMENT TRANSPORTATION AND BALANCE STUDY

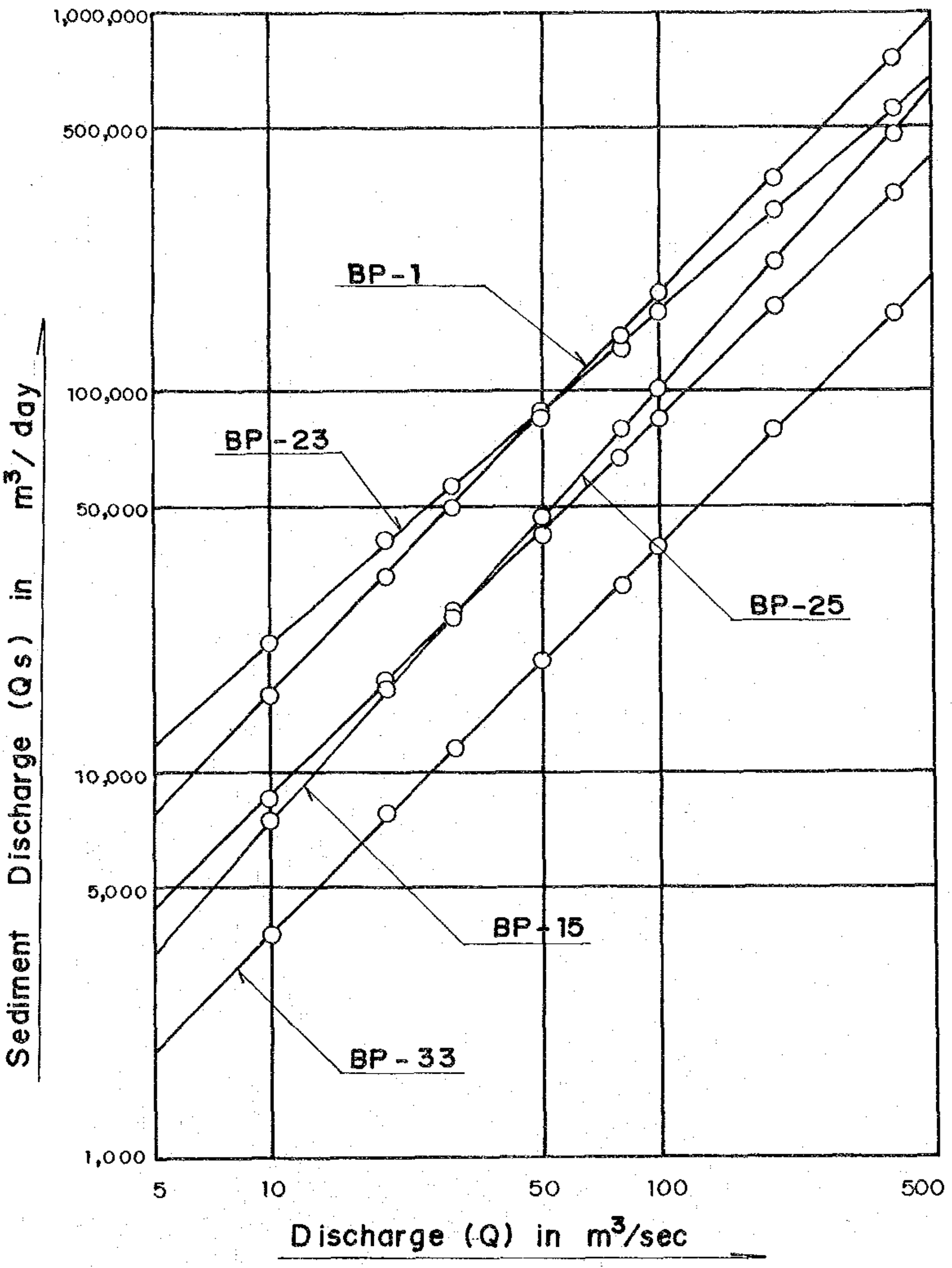
Fig. VI-18

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

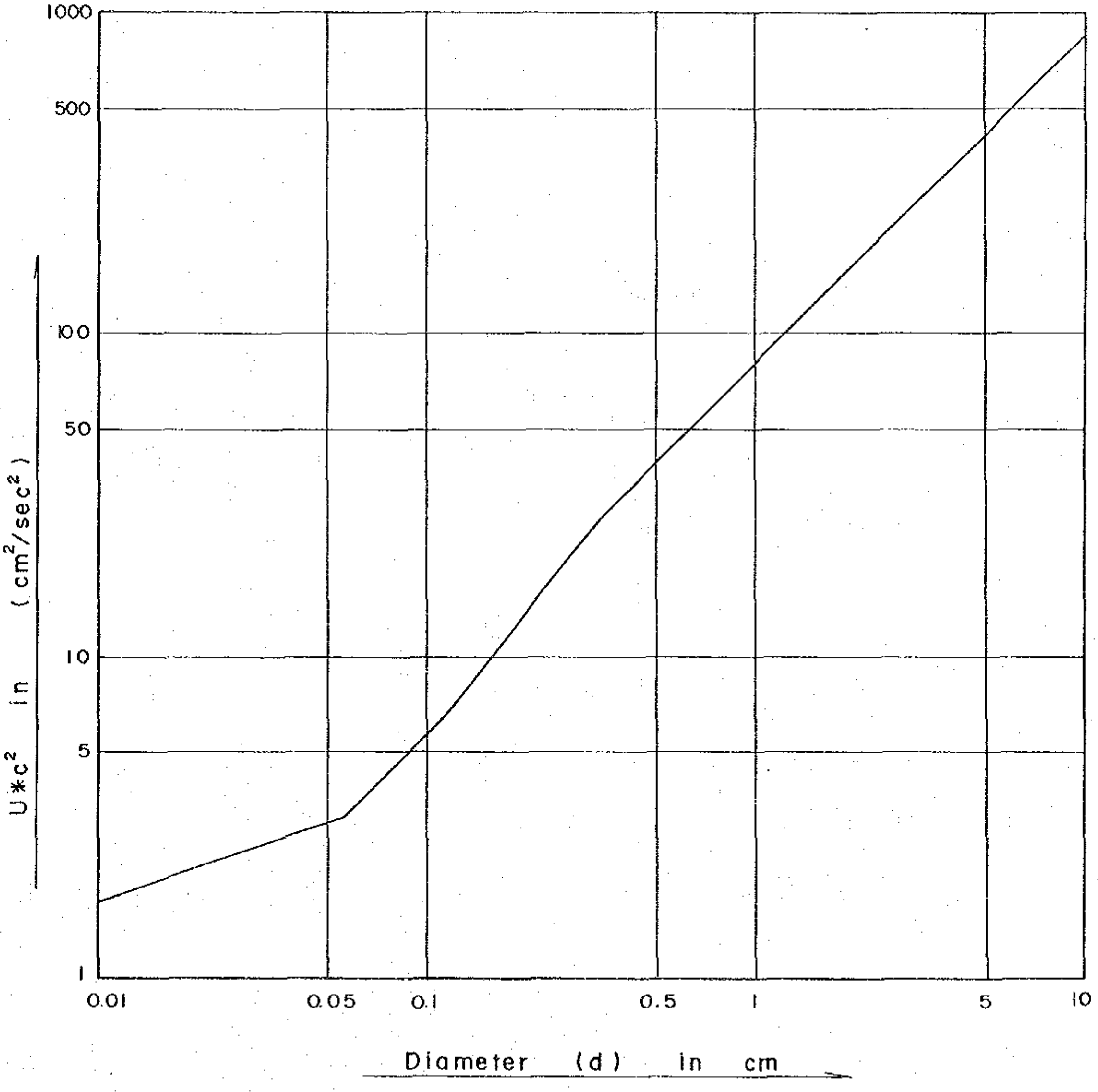
JAPAN INTERNATIONAL COOPERATION AGENCY



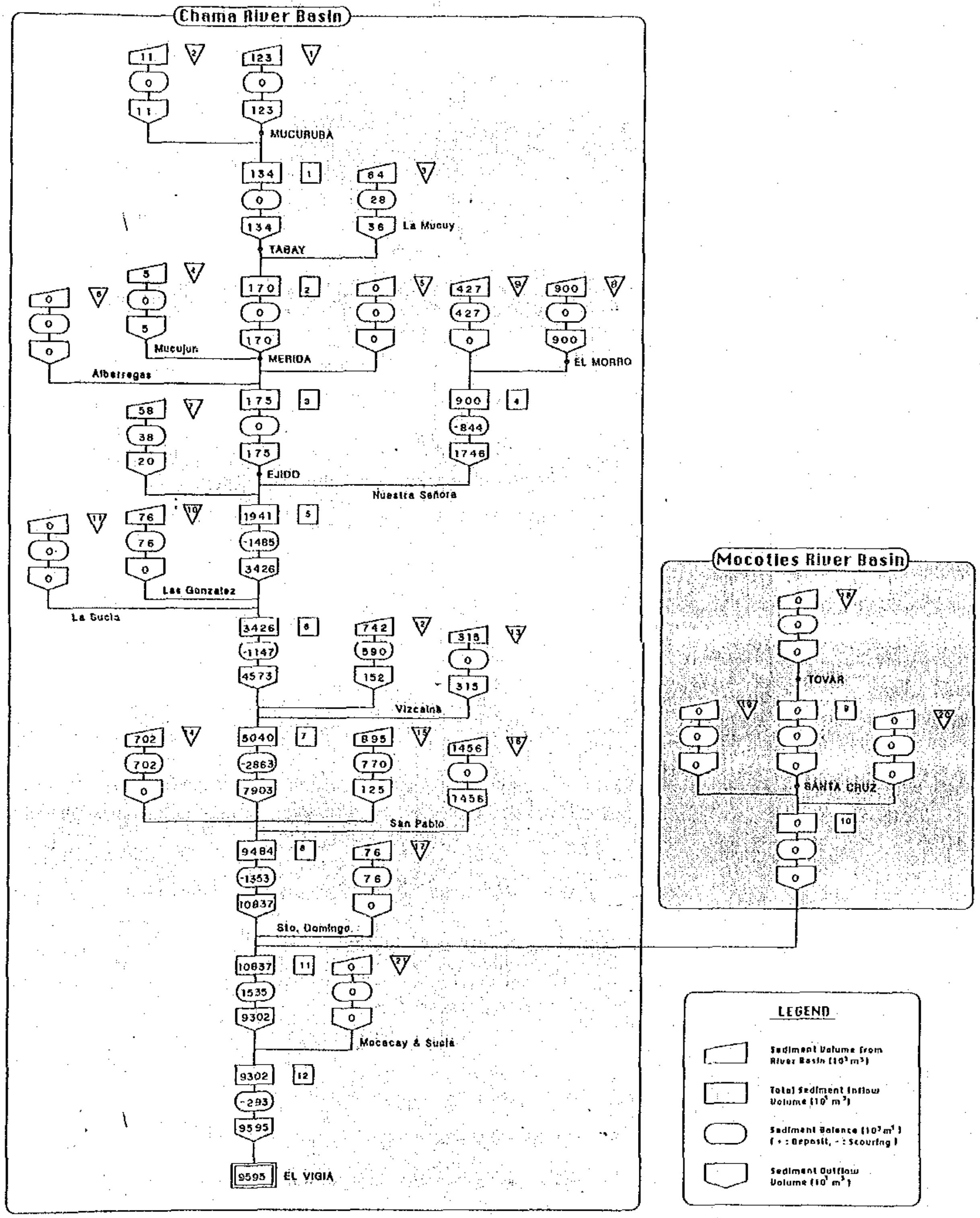
MODEL DIAGRAM FOR SEDIMENT TRANSPORTATION AND BALANCE STUDY Fig. VI-19	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY



BED LOAD RATING CURVES AT BASE POINT	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-20	JAPAN INTERNATIONAL COOPERATION AGENCY



RELATION BETWEEN CRITICAL TRACTIVE FORCE AND GRAIN SIZE	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-21	JAPAN INTERNATIONAL COOPERATION AGENCY

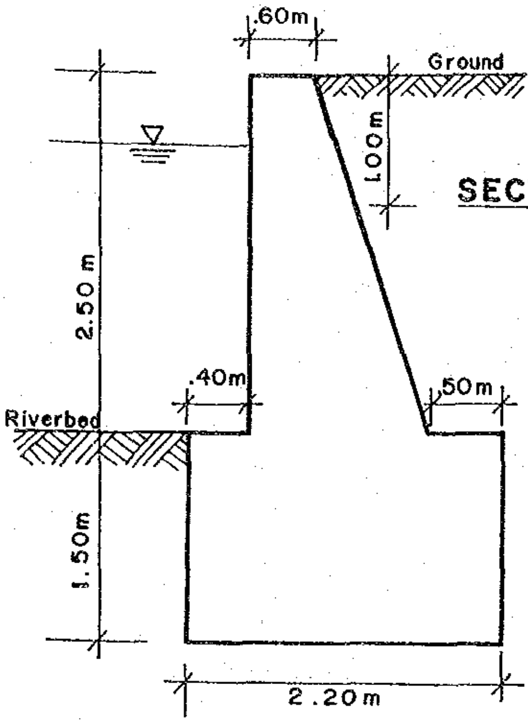


DESIGN SEDIMENT BALANCE

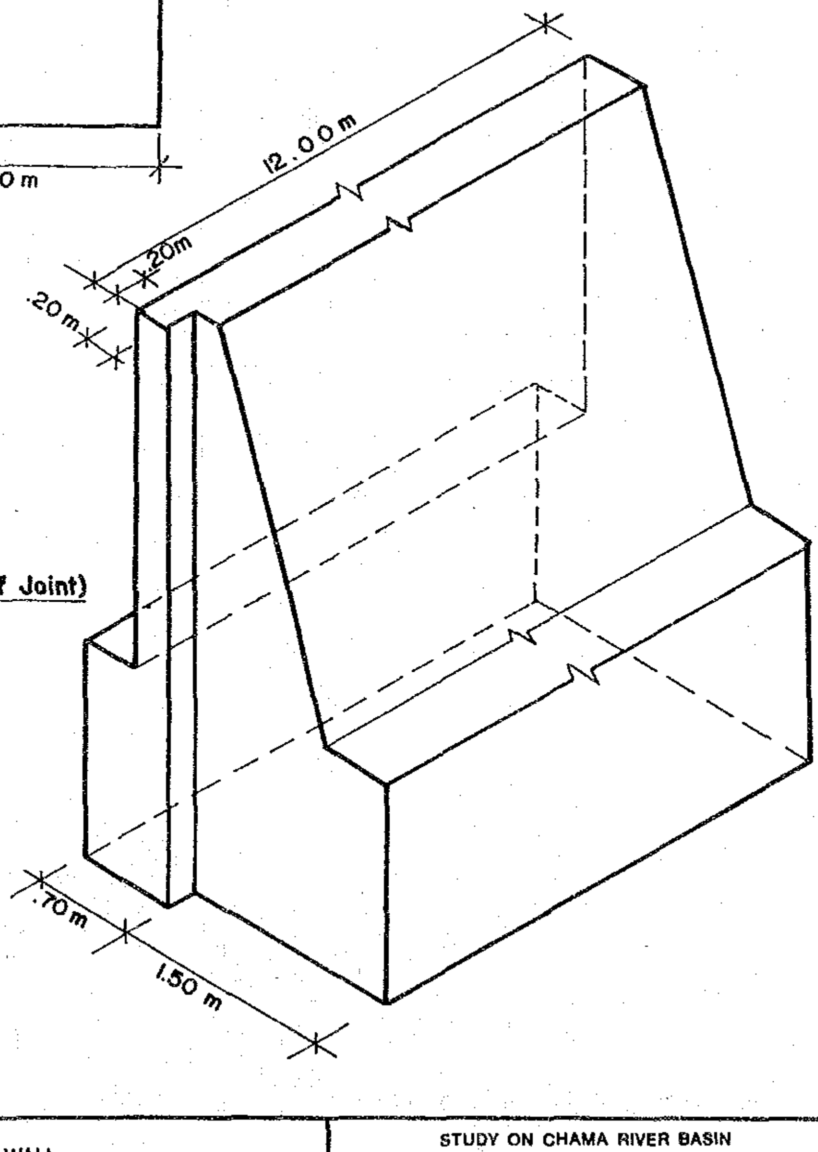
Fig. VI-22

STUDY ON CHAMA RIVER BASIN
CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

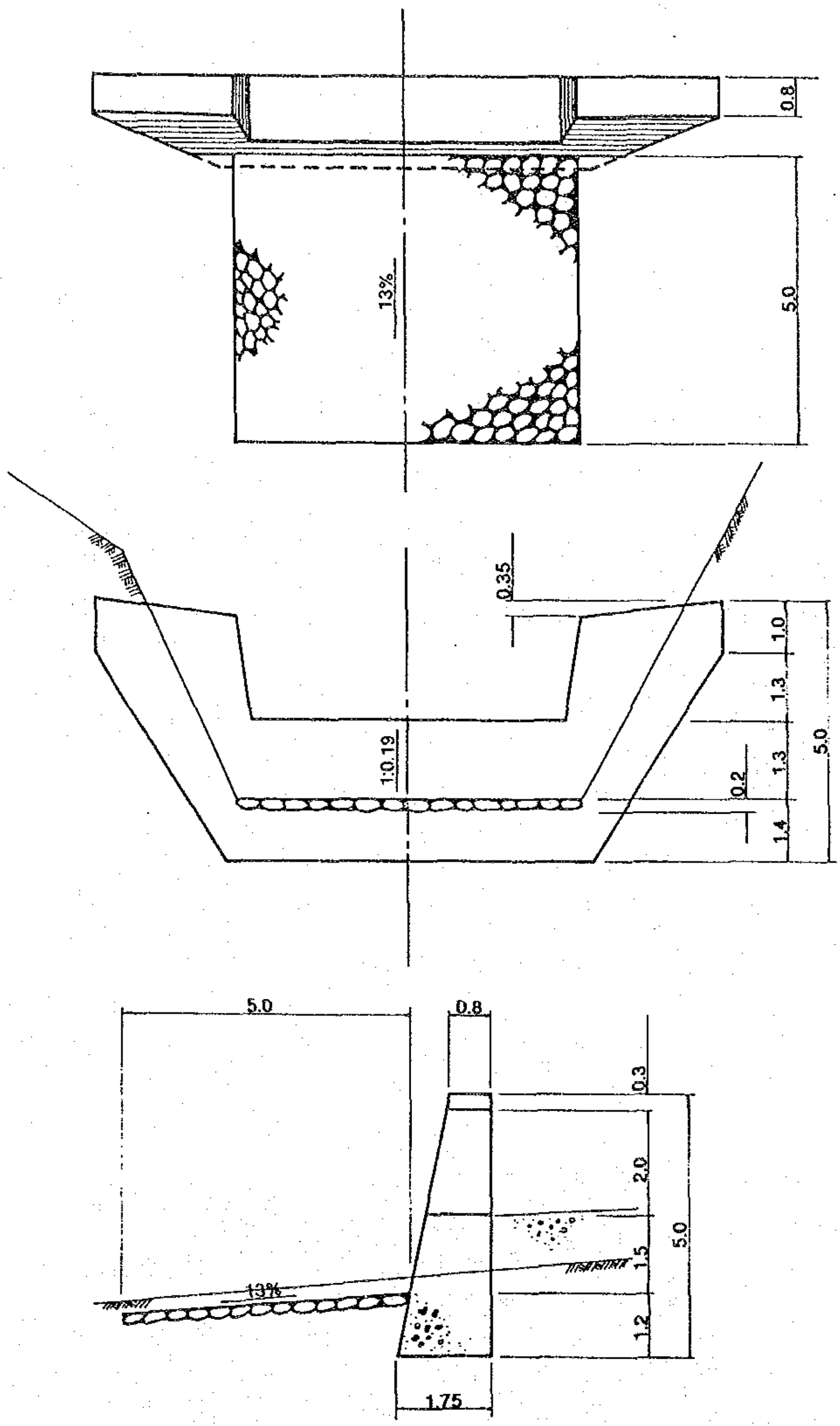


SECTION



PERSPECTIVE (Details of Joint)

TYPICAL STRUCTURE OF RETAINING WALL	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-23	JAPAN INTERNATIONAL COOPERATION AGENCY

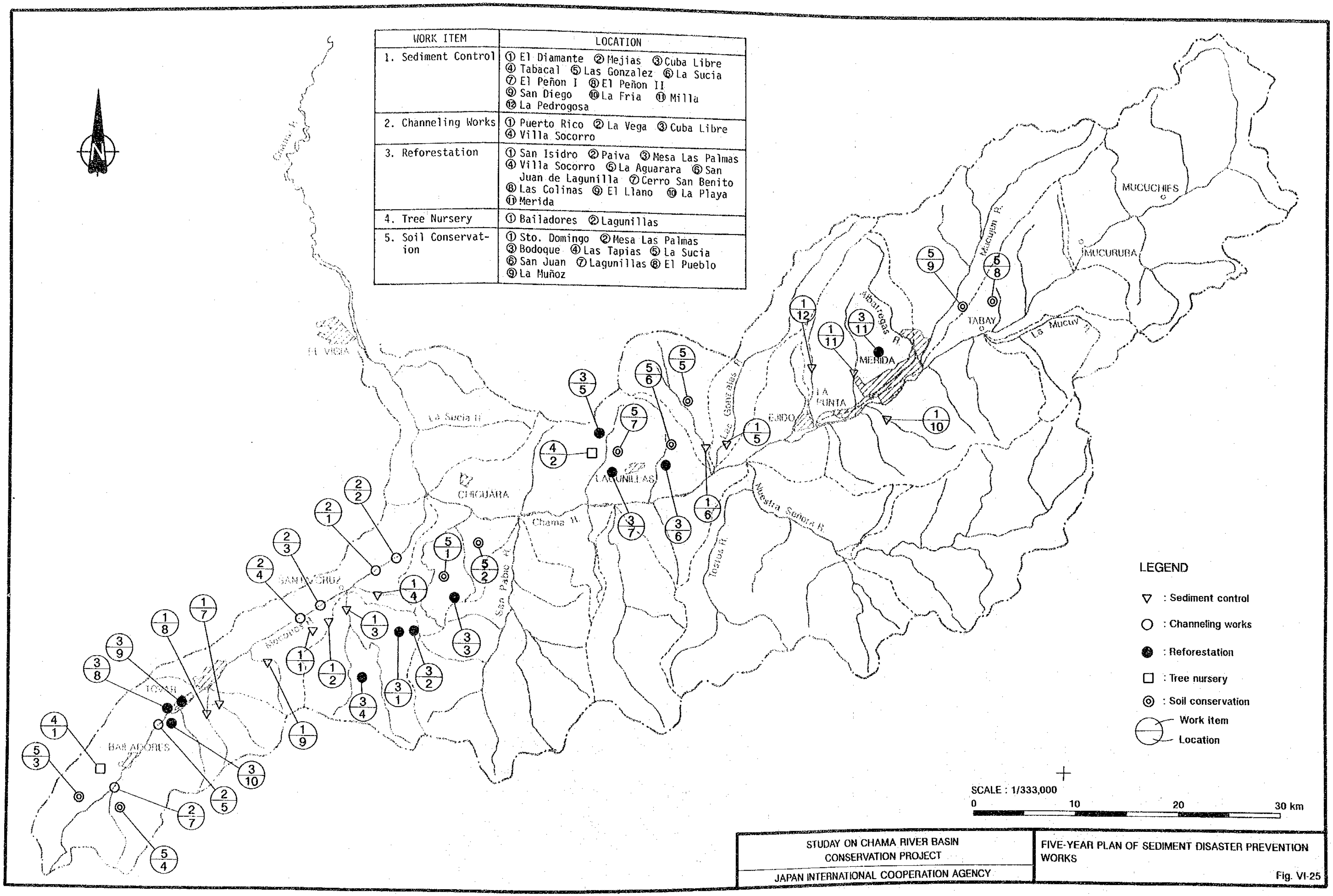


TYPICAL STRUCTURE OF CHECK DAM

Fig. VI-24

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



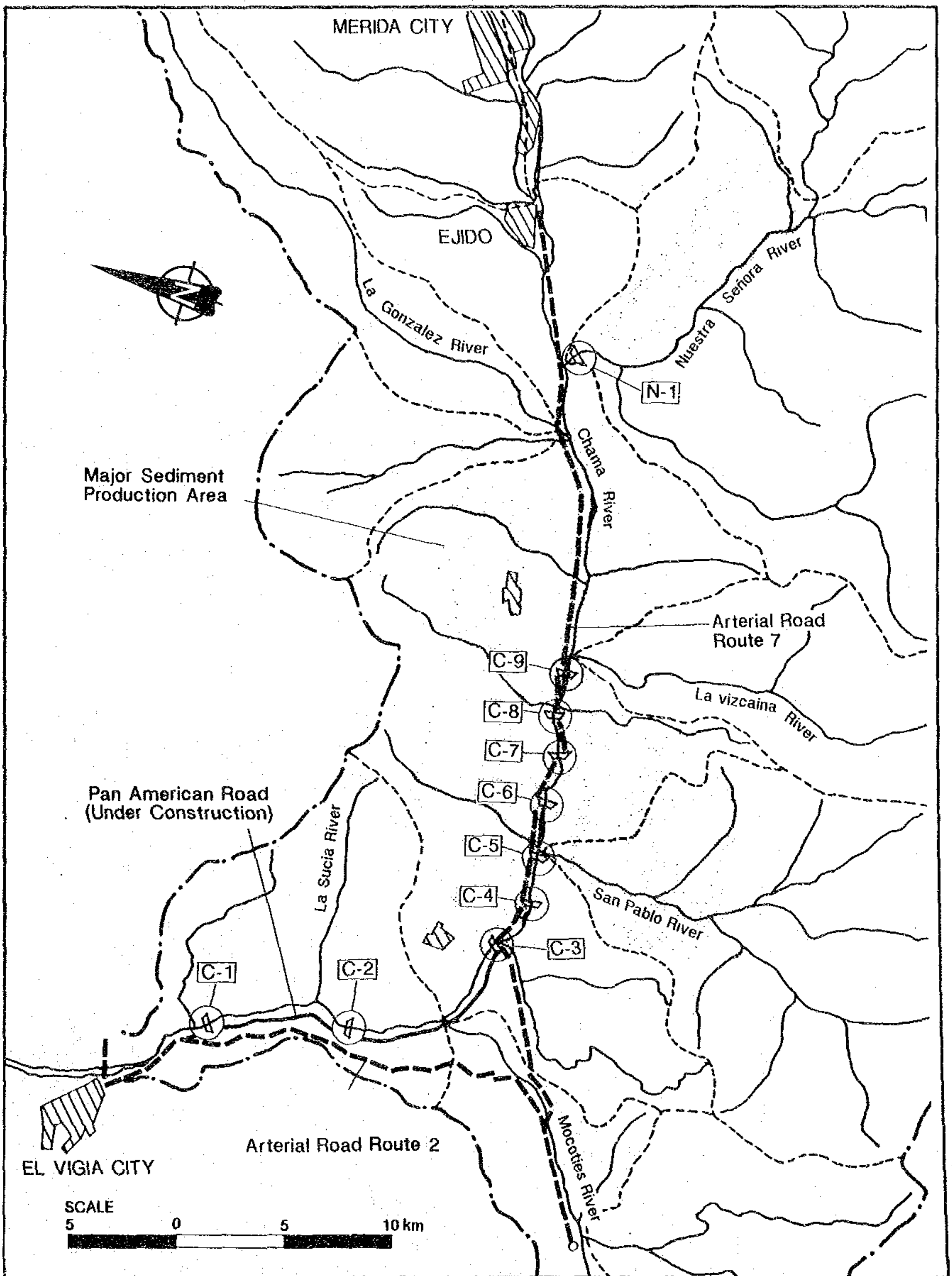
WORK ITEM	LOCATION
1. Sediment Control	① El Diamante ② Mejias ③ Cuba Libre ④ Tabacal ⑤ Las Gonzalez ⑥ La Sucia ⑦ El Peñon I ⑧ El Peñon II ⑨ San Diego ⑩ La Fria ⑪ Milla ⑫ La Pedrogosa
2. Channeling Works	① Puerto Rico ② La Vega ③ Cuba Libre ④ Villa Socorro
3. Reforestation	① San Isidro ② Paiva ③ Mesa Las Palmas ④ Villa Socorro ⑤ La Aguarara ⑥ San Juan de Lagunilla ⑦ Cerro San Benito ⑧ Las Colinas ⑨ El Llano ⑩ La Playa ⑪ Merida
4. Tree Nursery	① Bailadores ② Lagunillas
5. Soil Conservation	① Sto. Domingo ② Mesa Las Palmas ③ Bodoque ④ Las Tapias ⑤ La Sucia ⑥ San Juan ⑦ Lagunillas ⑧ El Pueblo ⑨ La Muñoz

STUDAY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

FIVE-YEAR PLAN OF SEDIMENT DISASTER PREVENTION WORKS

Fig. VI-25

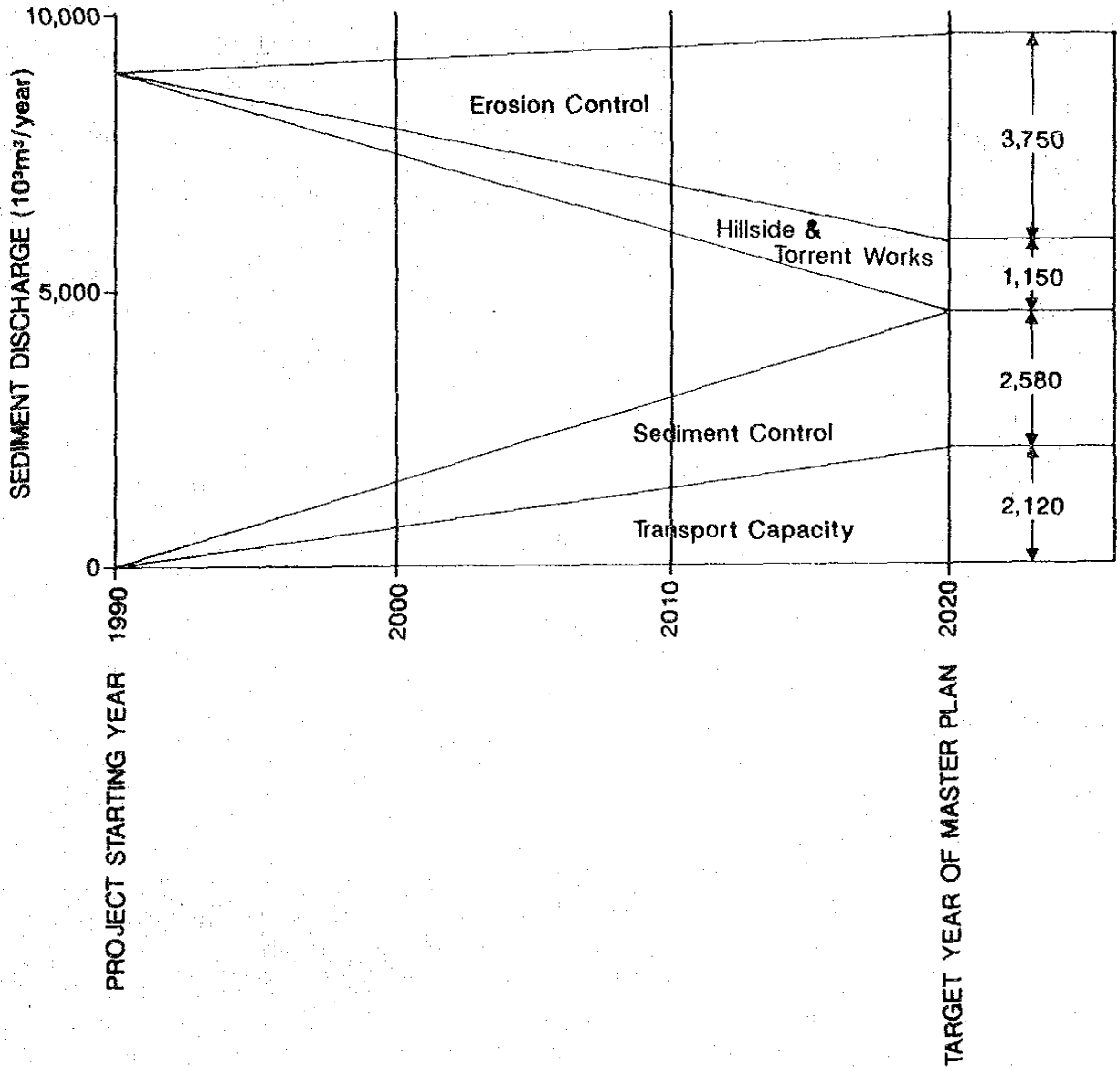


LOCATION MAP FOR PROPOSED BASIN-WIDE SEDIMENT CONTROL PLAN

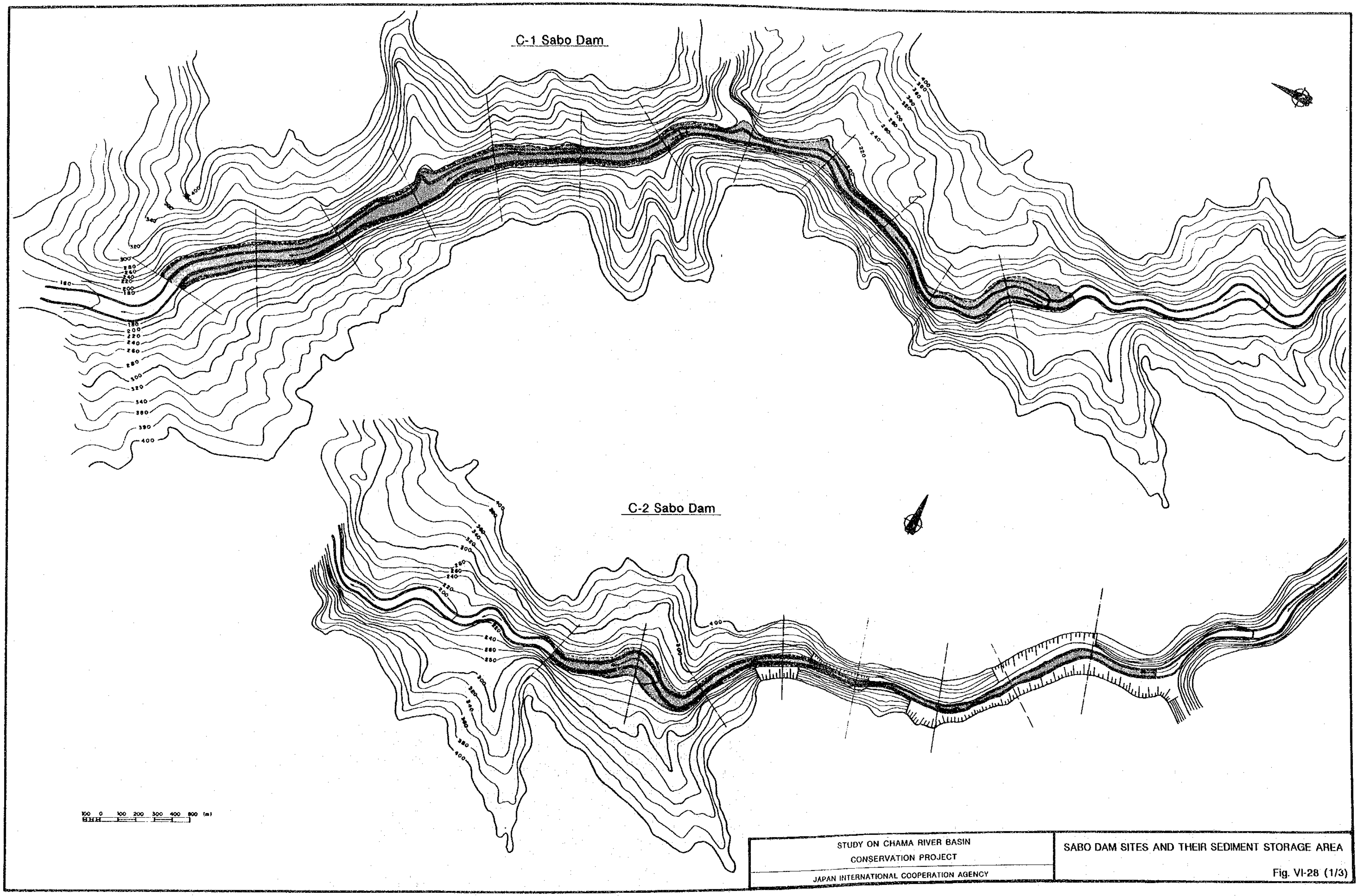
Fig. VI-26

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

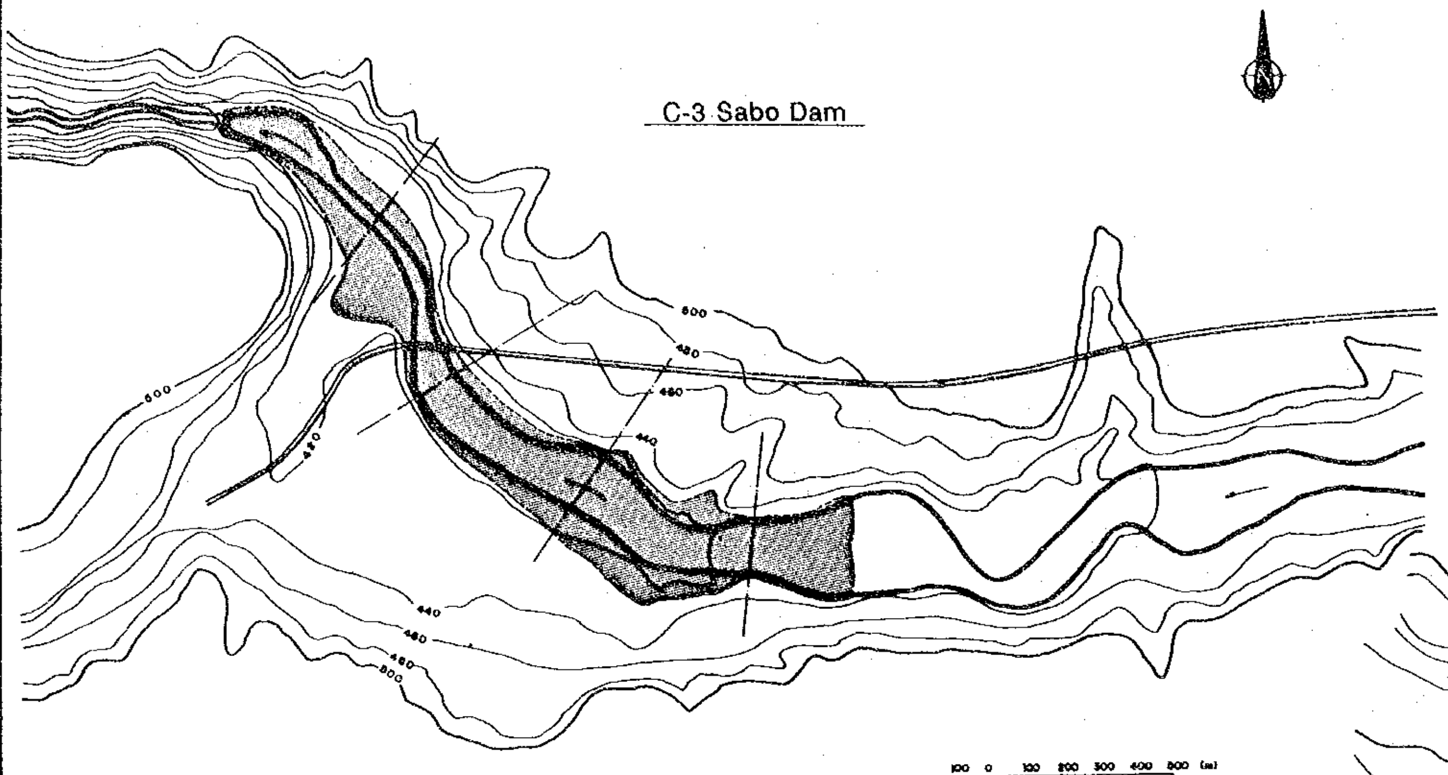
JAPAN INTERNATIONAL COOPERATION AGENCY

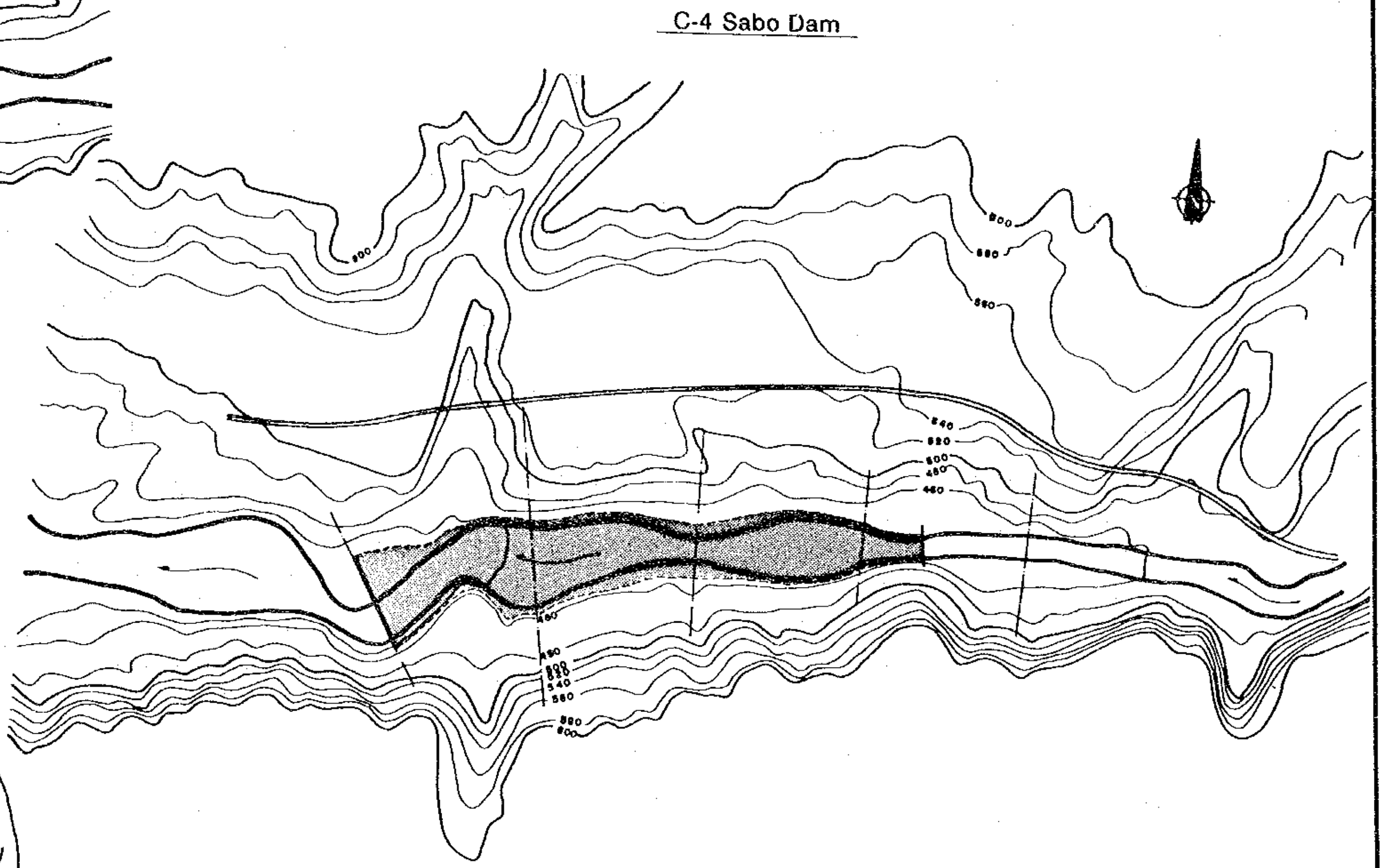


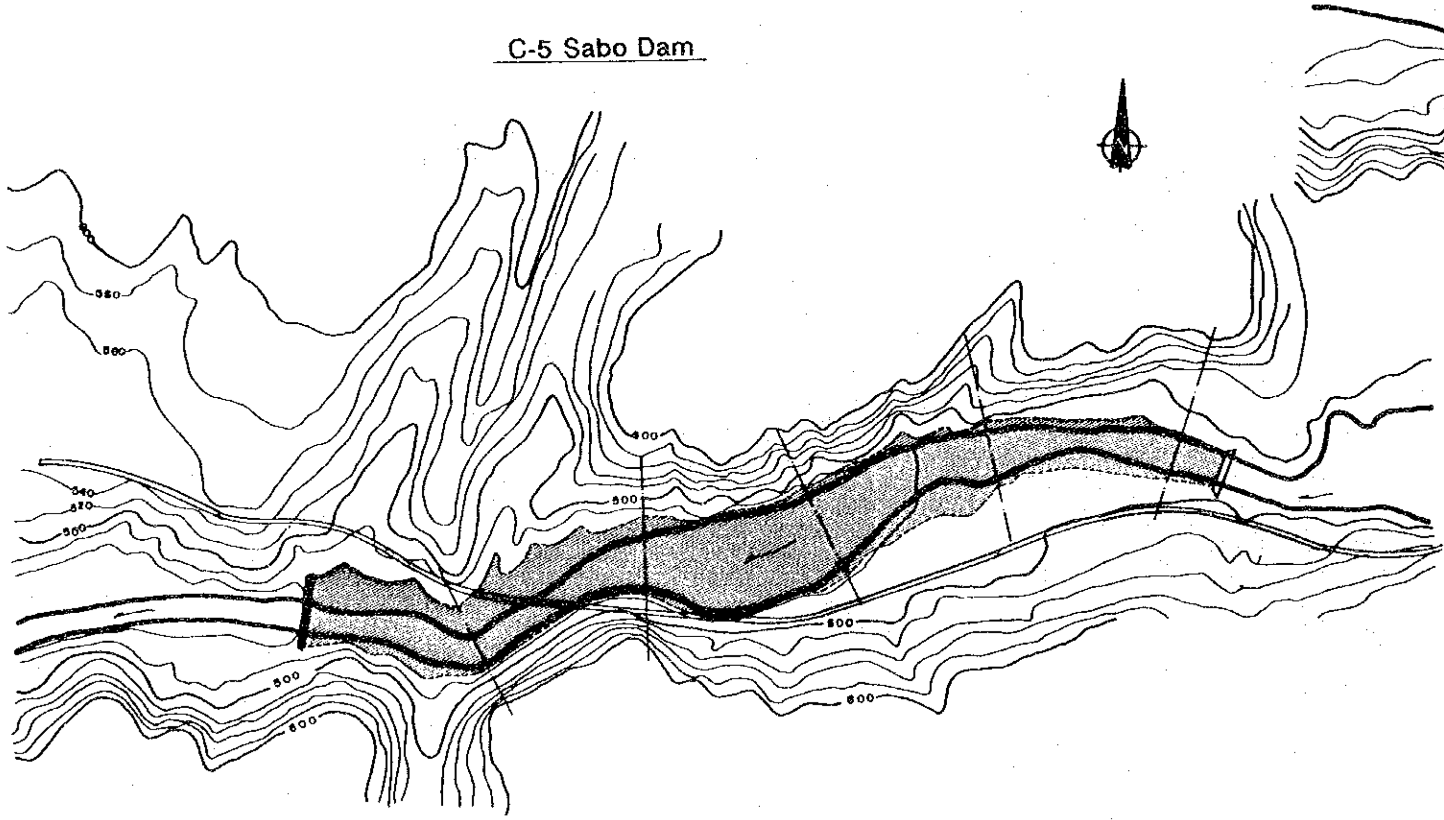
SCHEMATIC DIAGRAM OF SEDIMENT CONTROL PLAN	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-27	JAPAN INTERNATIONAL COOPERATION AGENCY



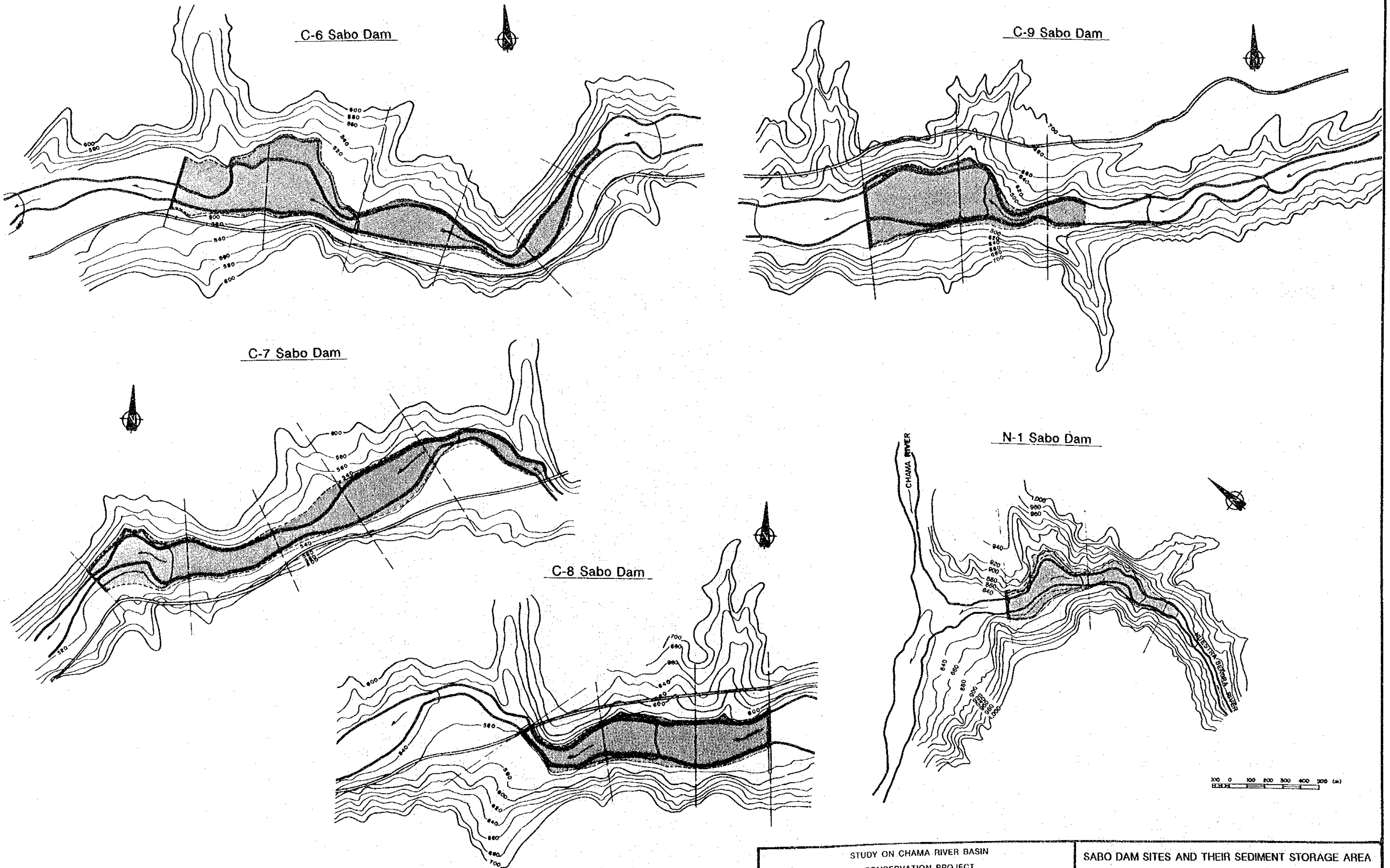
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	SABO DAM SITES AND THEIR SEDIMENT STORAGE AREA
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-28 (1/3)



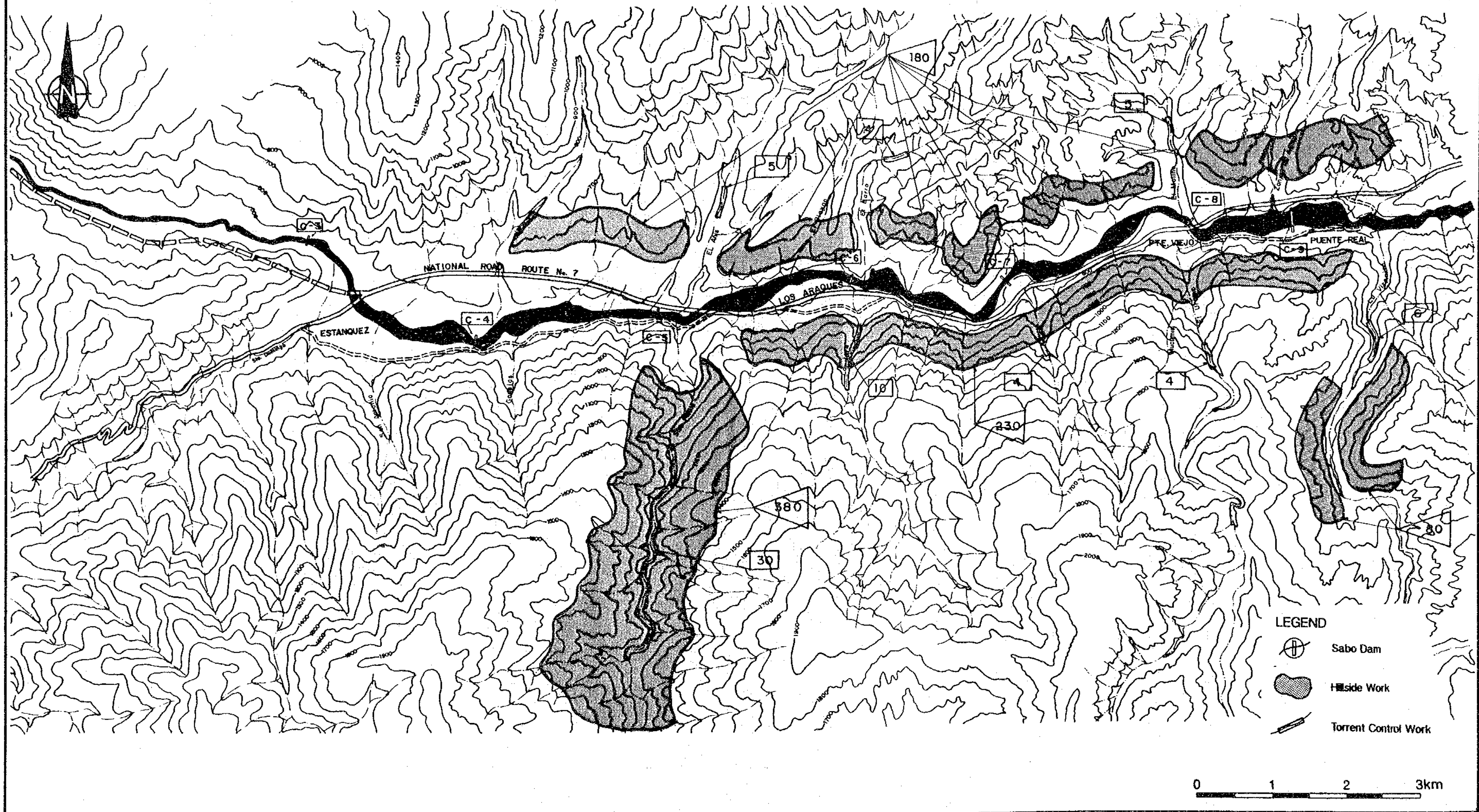




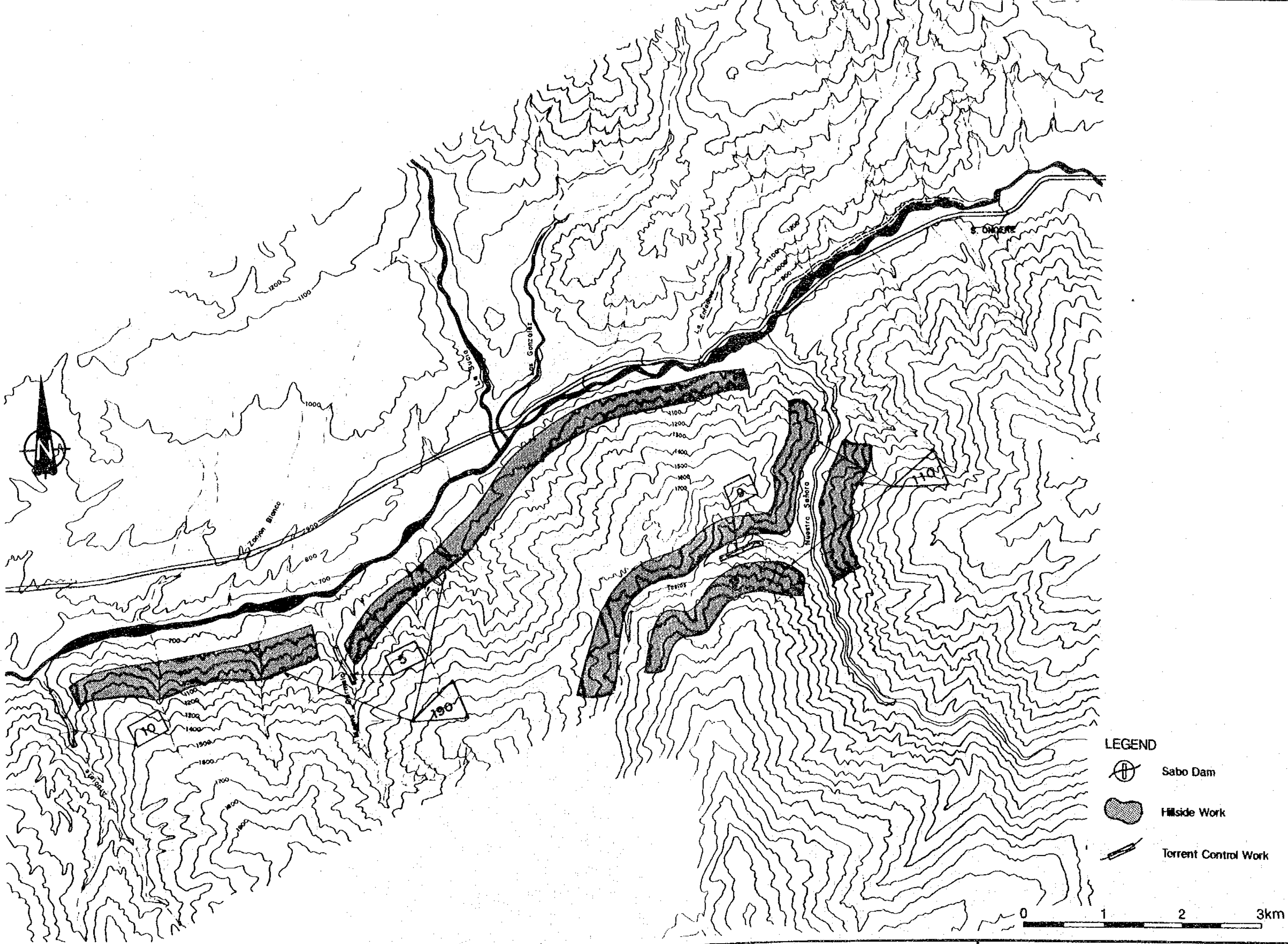
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	SABO DAM SITES AND THEIR SEDIMENT STORAGE AREA
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-28 (2/3)



STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	SABO DAM SITES AND THEIR SEDIMENT STORAGE AREA
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-28 (3/3)



STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	LOCATION OF PRPOSED TORRENT AND HILLSIDE WORKS
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-29 (1/2)

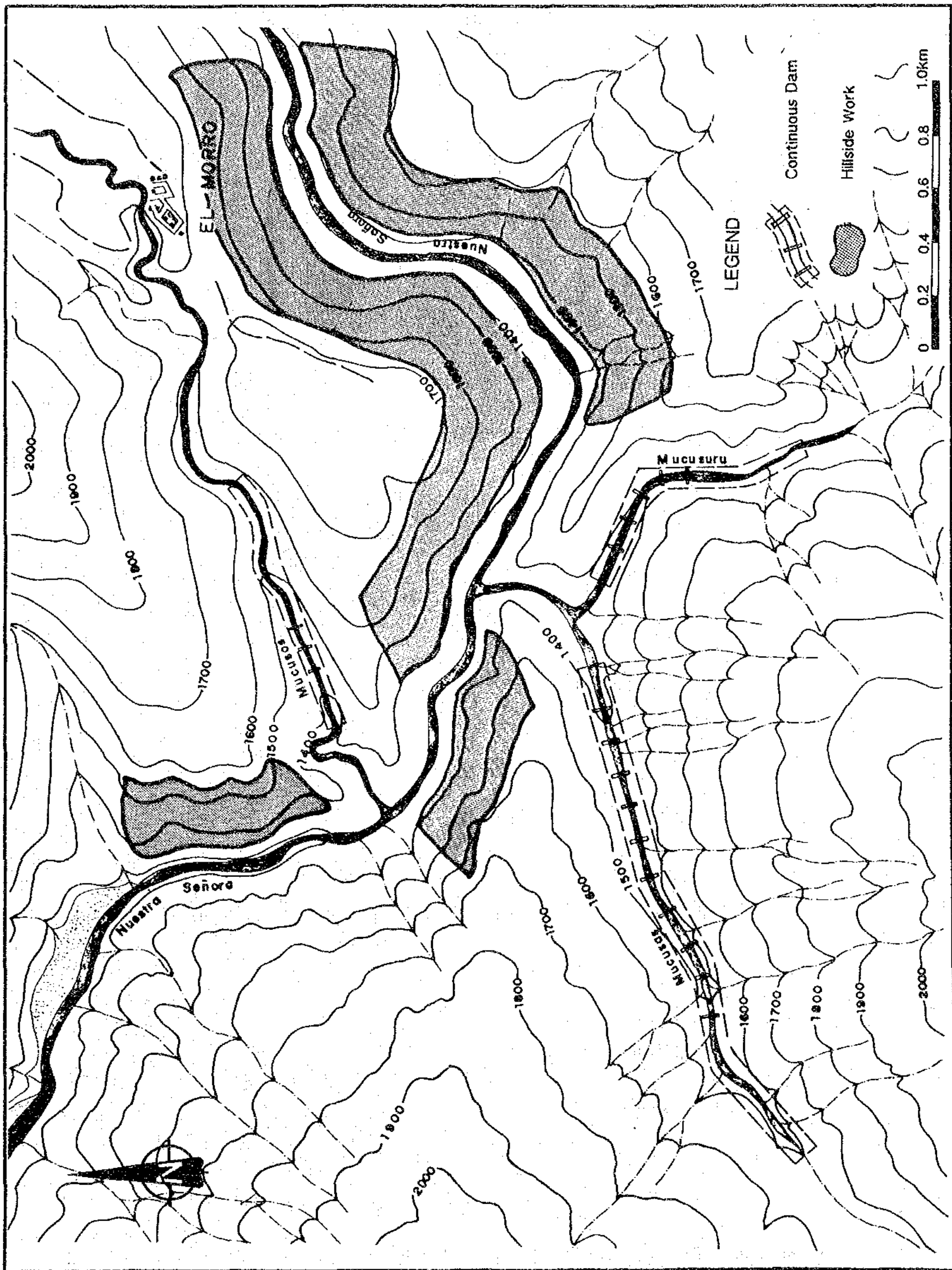


STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

LOCATION OF PRPOSED TORRENT AND HILLSIDE WORKS

Fig. VI-29 (2/2)

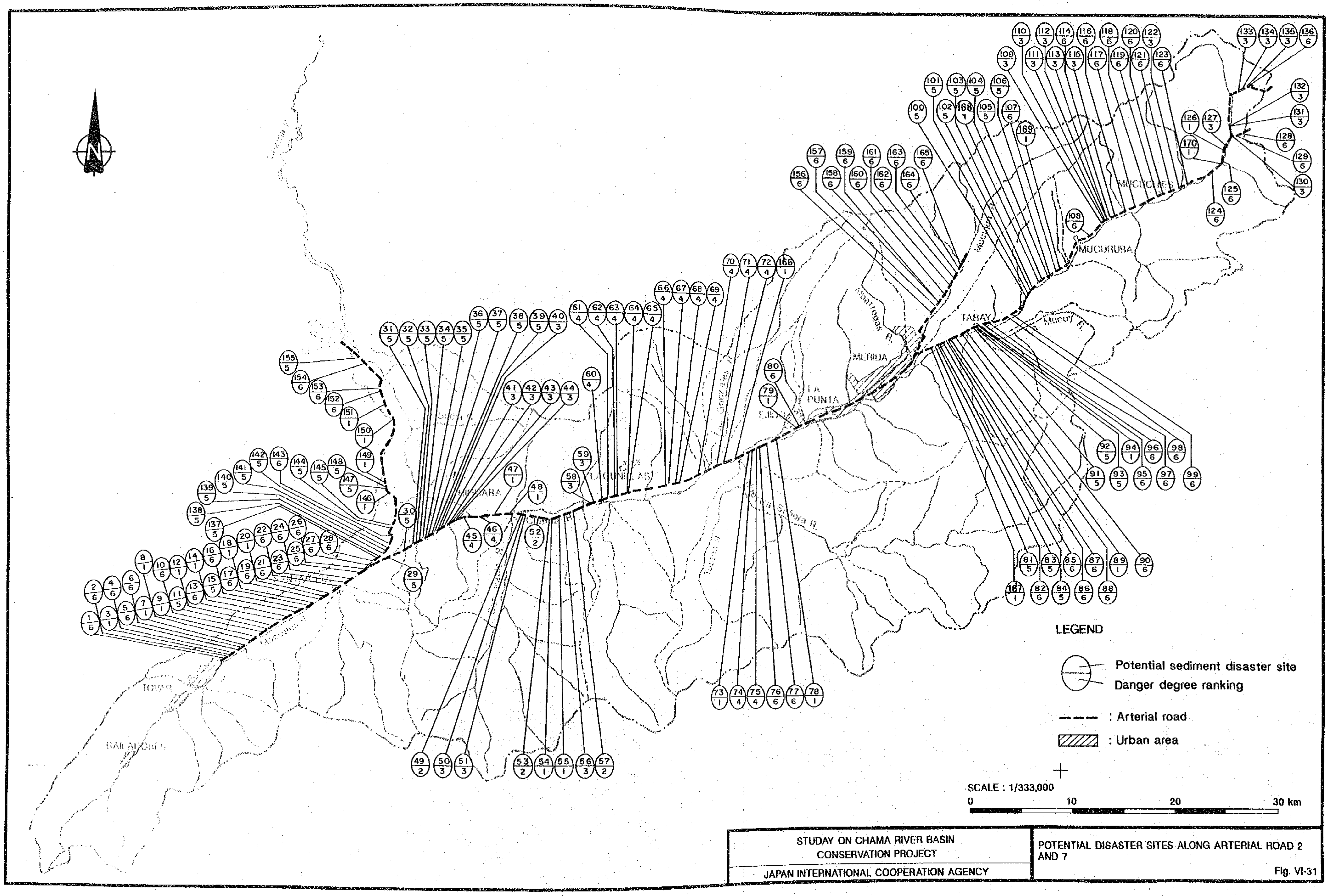


LOCATION OF CONTINUOUS LOW DAMS AND RETAINING WALLS (ACTION PLAN)

Fig. VI-30

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

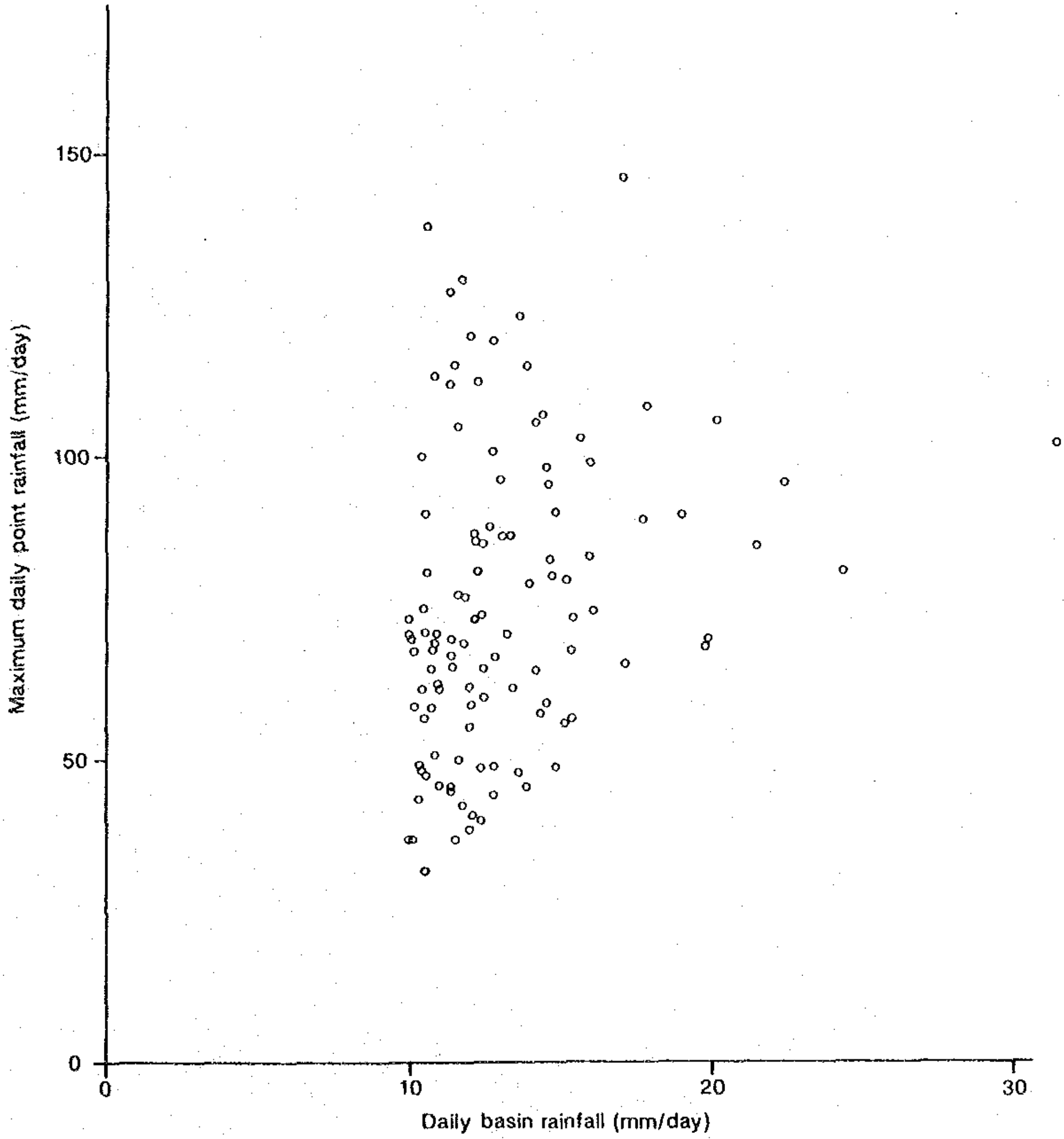


STUDAY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

POTENTIAL DISASTER SITES ALONG ARTERIAL ROAD 2 AND 7

Fig. VI-31

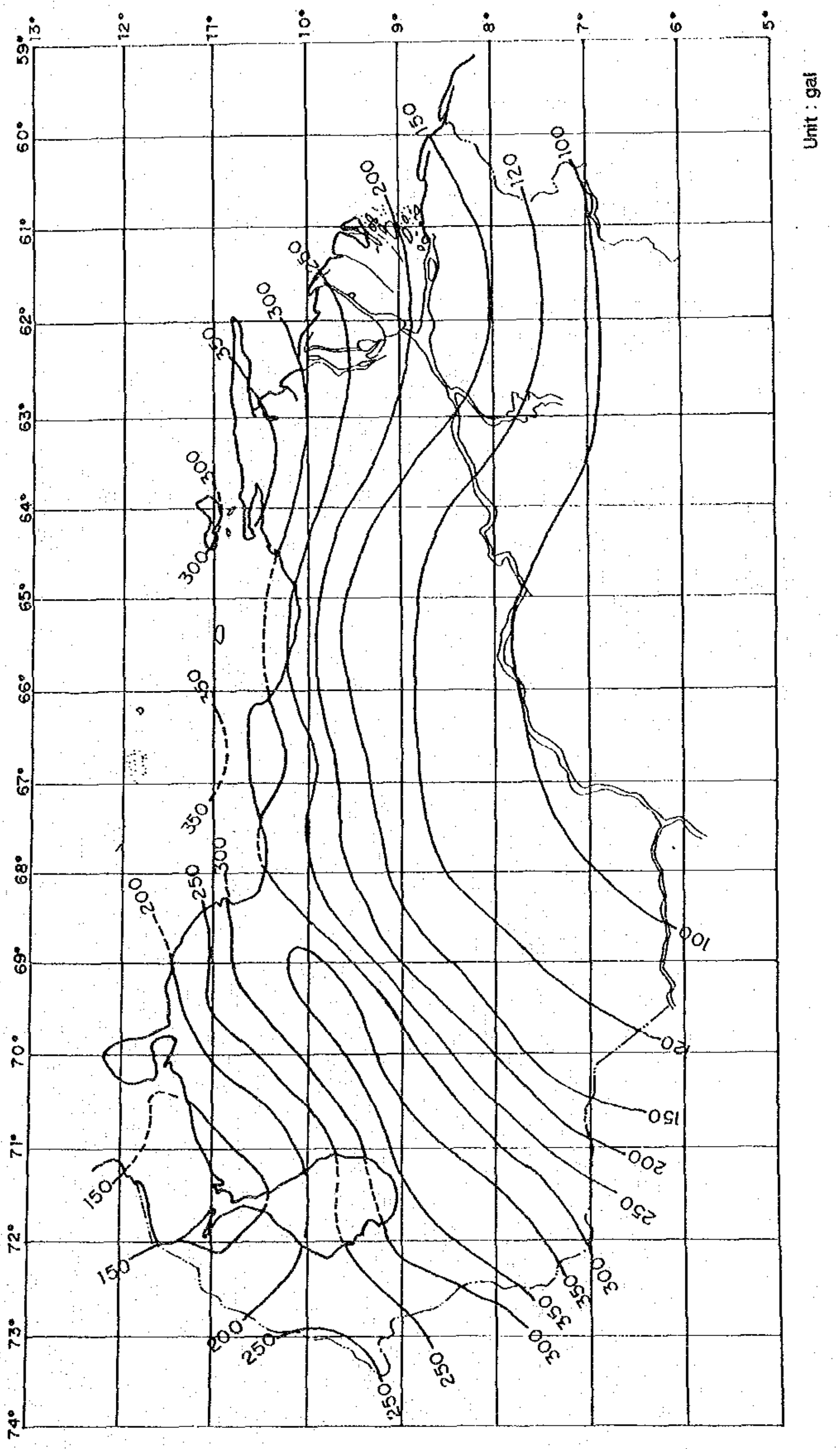


RELATIONSHIP BETWEEN BASIN AVERAGE DAILY RAINFALL AND MAXIMUM POINT RAINFALL

Fig. VI-32

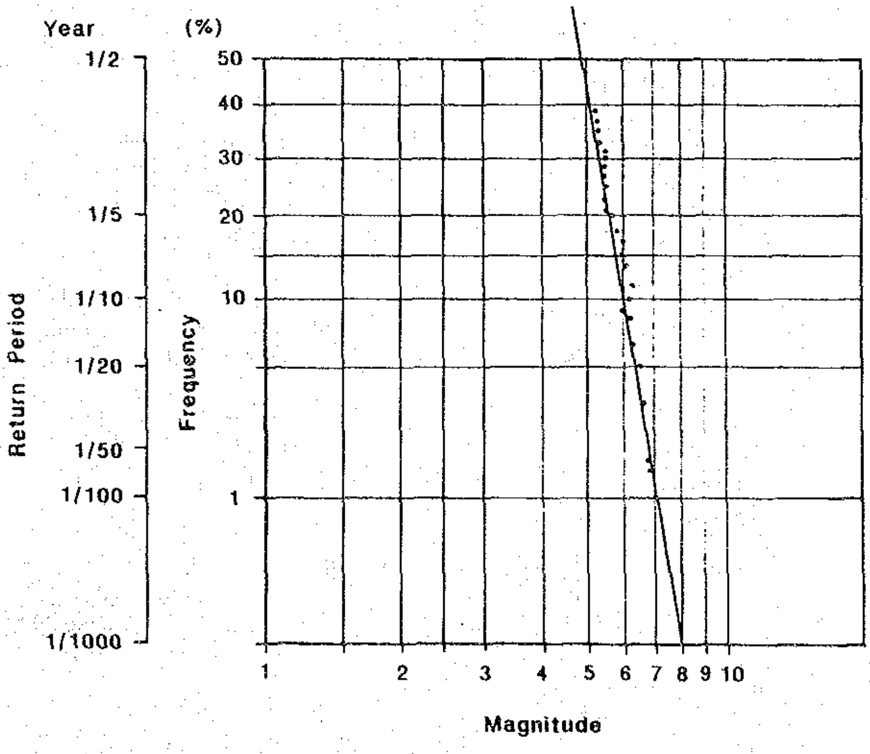
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



RECOMMENDABLE MAXIMUM ACCELERATON FOR STRUCTURAL DESIGN Fig. VI-33	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY

No.	Day	Month	Year	Magnitude	Frequency	Return Period
1	19	Apr	1952	6.88	0.0167	1/ 60.0
2	3	Aug	1950	6.75	0.0333	1/ 30.0
3	21	Apr	1957	6.63	0.0500	1/ 20.0
4	14	Mar	1932	6.25	0.0667	1/ 15.0
5	13	Nov	1921	6.25	0.0833	1/ 12.0
6	10	Jul	1919	6.25	0.1000	1/ 10.0
7	10	Jul	1919	6.25	0.1167	1/ 8.6
8	22	Mar	1910	6.10	0.1333	1/ 7.5
9	4	Nov	1933	6.00	0.1500	1/ 6.7
10	4	Nov	1933	6.00	0.1667	1/ 6.0
11	4	Aug	1910	5.80	0.1833	1/ 5.5
12	27	Jan	1970	5.70	0.2000	1/ 5.0
13	27	Dec	1911	5.50	0.2167	1/ 4.6
14	22	Jan	1947	5.50	0.2333	1/ 4.3
15	21	Jun	1912	5.50	0.2500	1/ 4.0
16	16	Mar	1929	5.50	0.2667	1/ 3.8
17	13	Nov	1921	5.50	0.2833	1/ 3.5
18	12	Aug	1944	5.50	0.3000	1/ 3.3
19	11	Oct	1926	5.50	0.3167	1/ 3.2
20	21	Dec	1967	5.40	0.3333	1/ 3.0
21	18	Jul	1965	5.30	0.3500	1/ 2.9
22	7	Jan	1965	5.30	0.3667	1/ 2.7
23	19	May	1970	5.10	0.3833	1/ 2.6
24	19	Sep	1965	5.00	0.4000	1/ 2.5
25	10	Nov	1956	5.00	0.4167	1/ 2.4
26	9	Sep	1966	5.00	0.4333	1/ 2.3



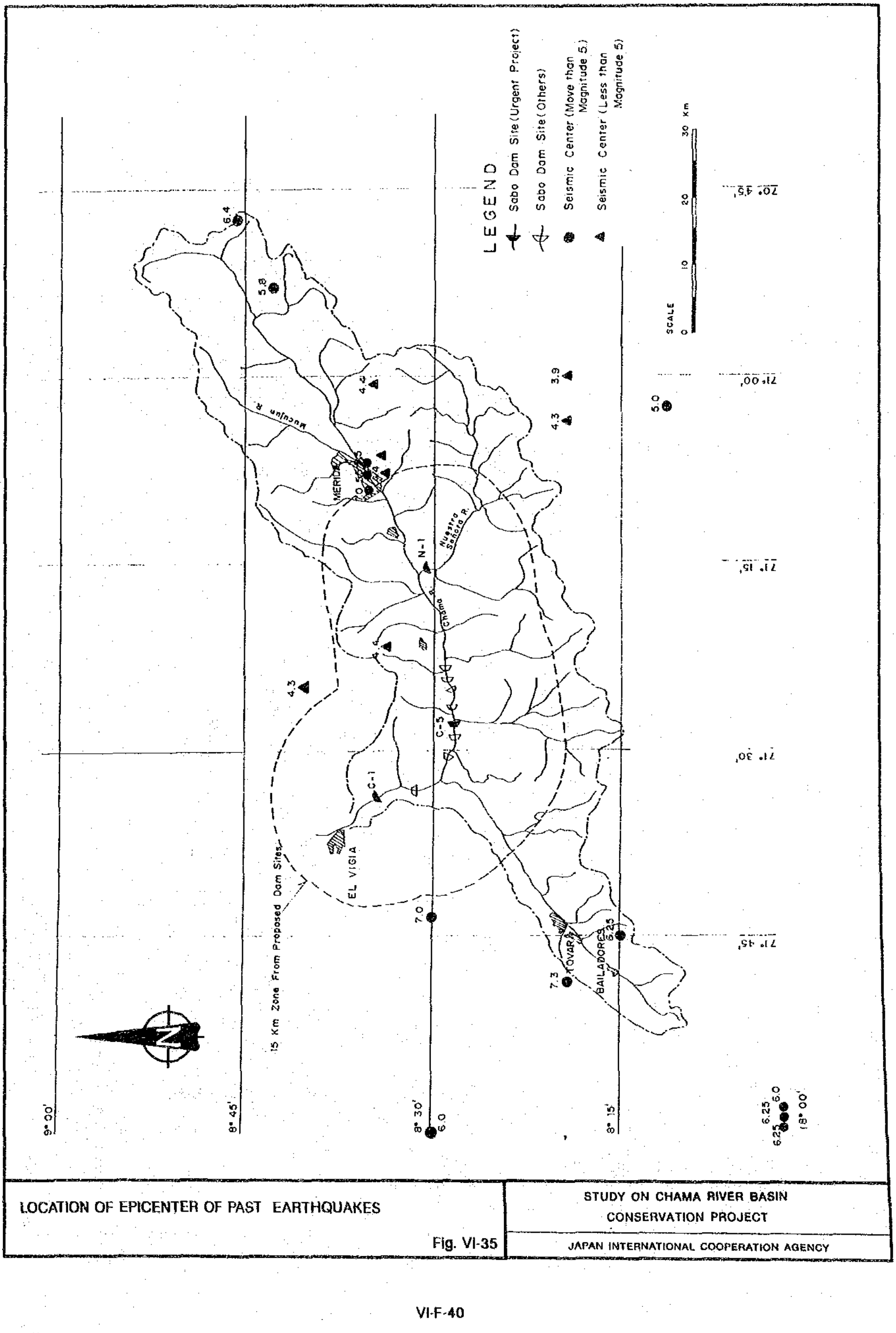
Data : 1910 – 1970

RESULTS OF FREQUENCY ANALYSIS FOR SEISMISITY

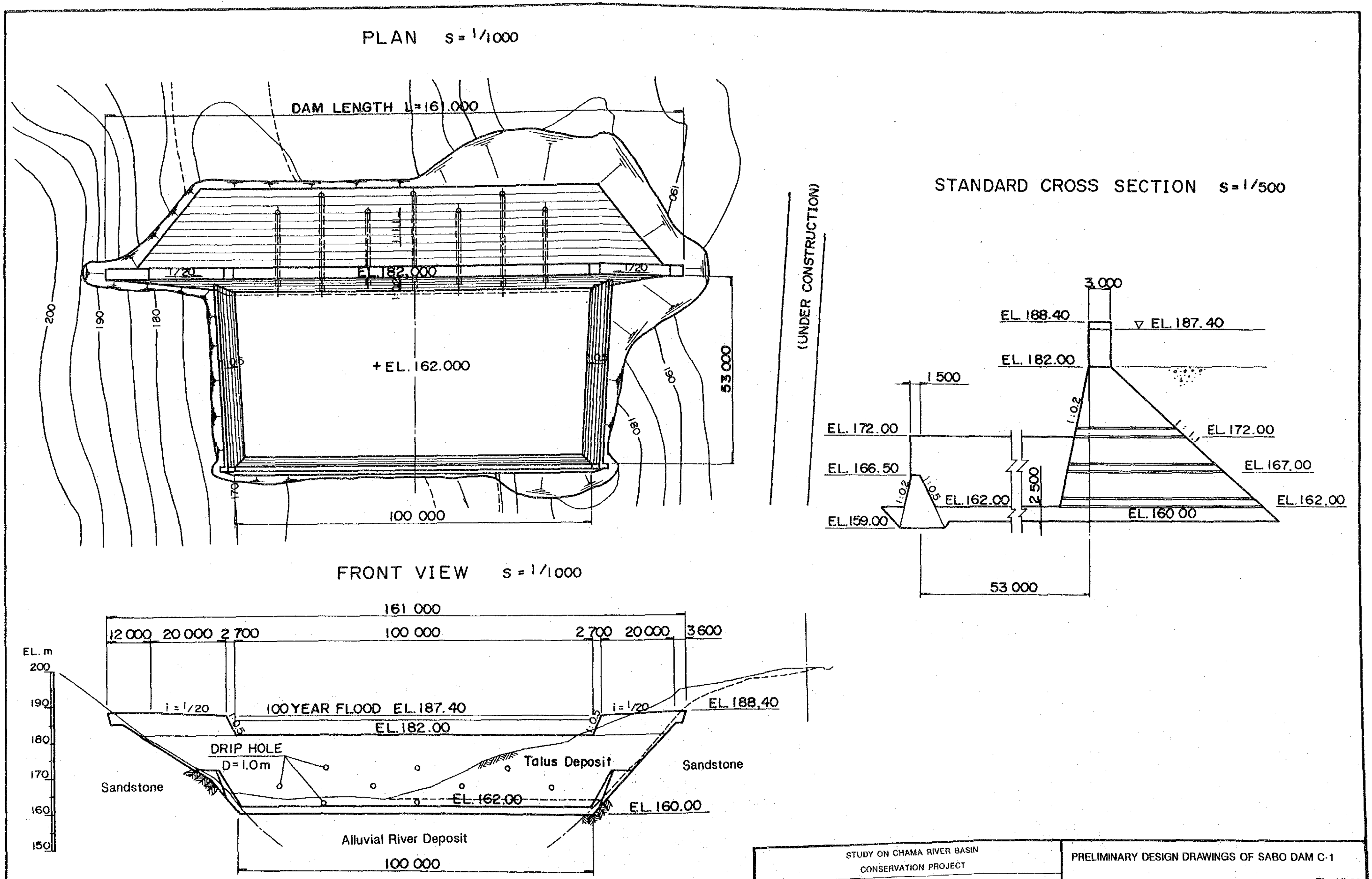
Fig. VI-34

STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY



LOCATION OF EPICENTER OF PAST EARTHQUAKES	STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT
Fig. VI-35	JAPAN INTERNATIONAL COOPERATION AGENCY

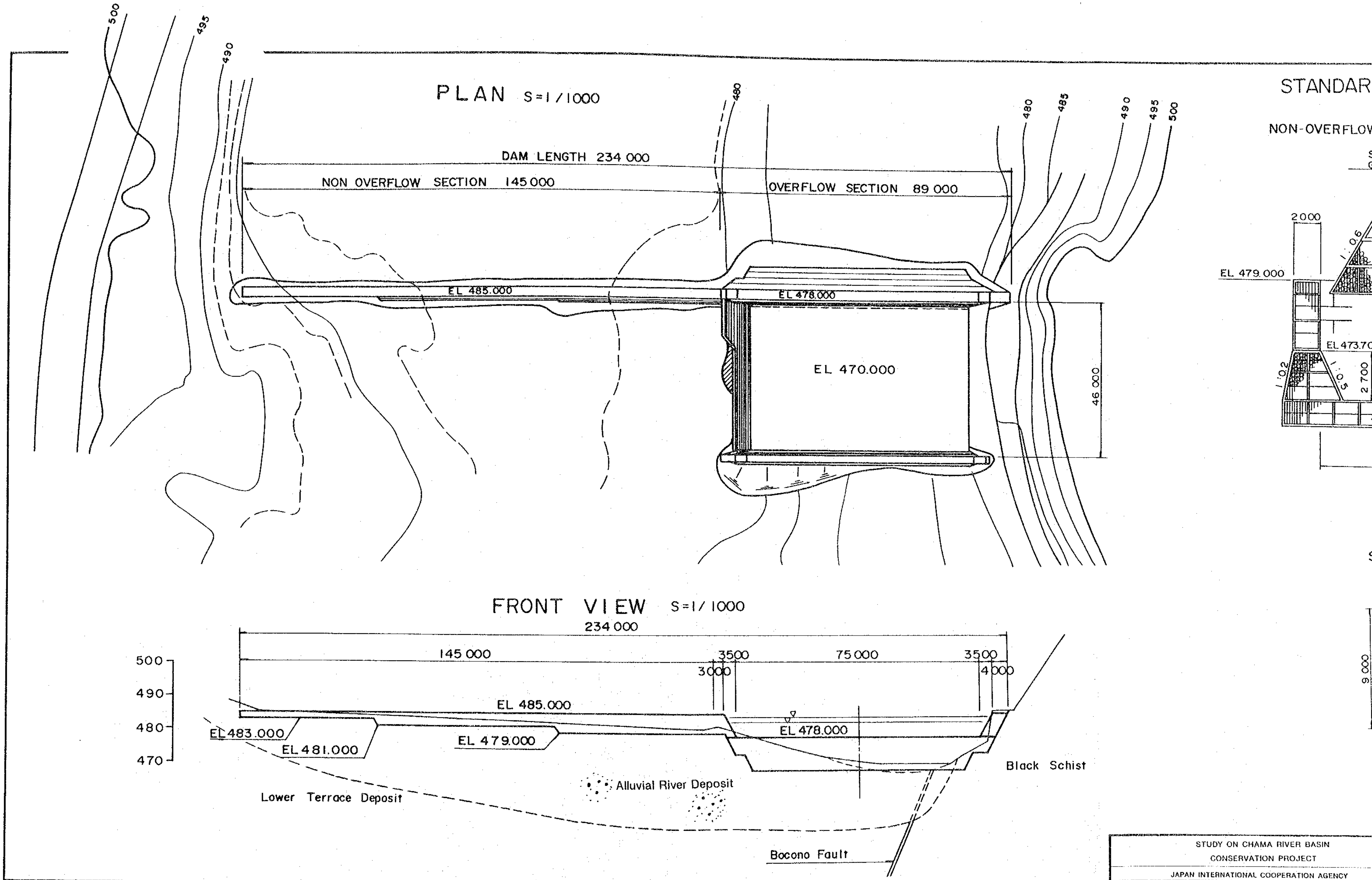


STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

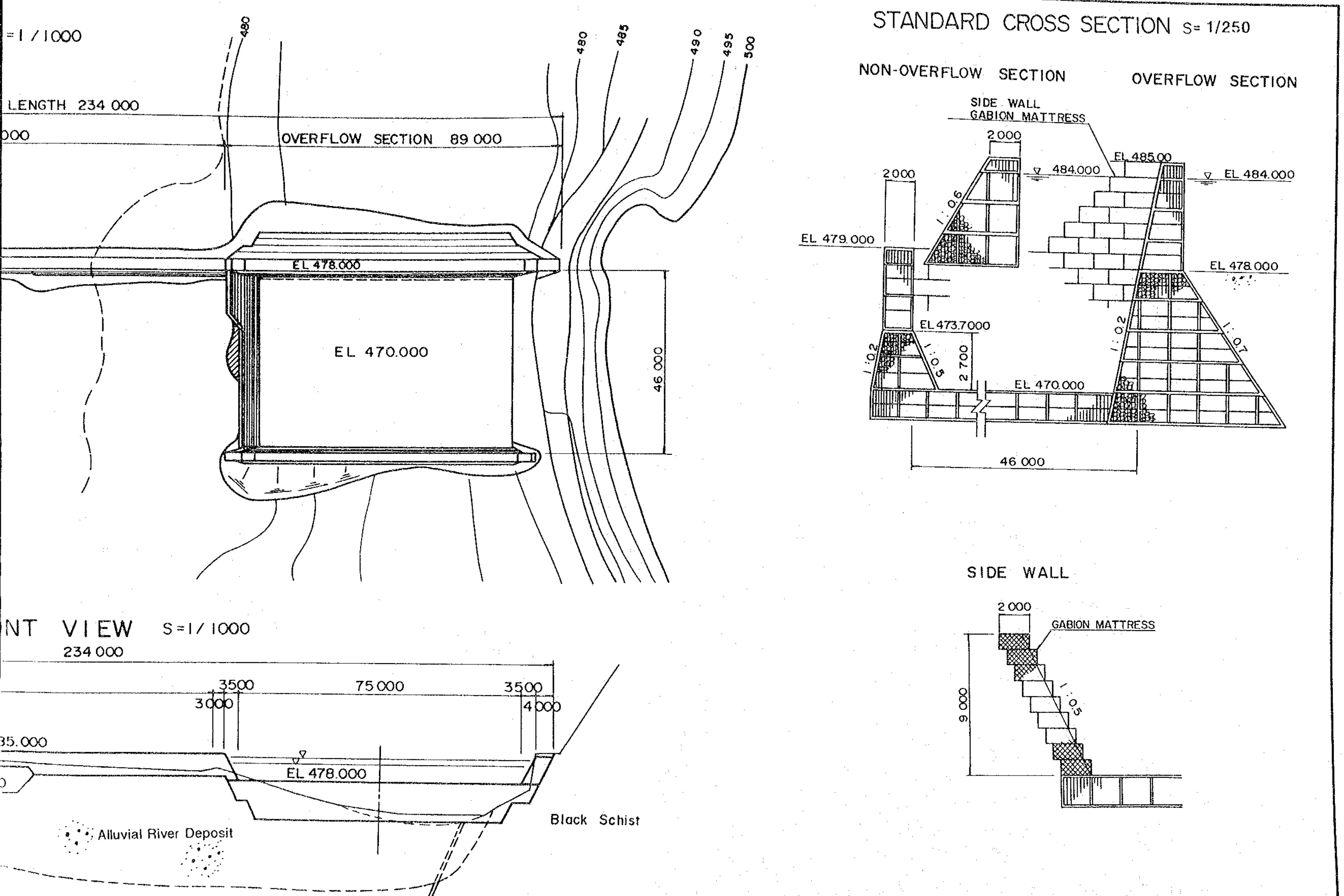
PRELIMINARY DESIGN DRAWINGS OF SABO DAM C-1

Fig. VI-36



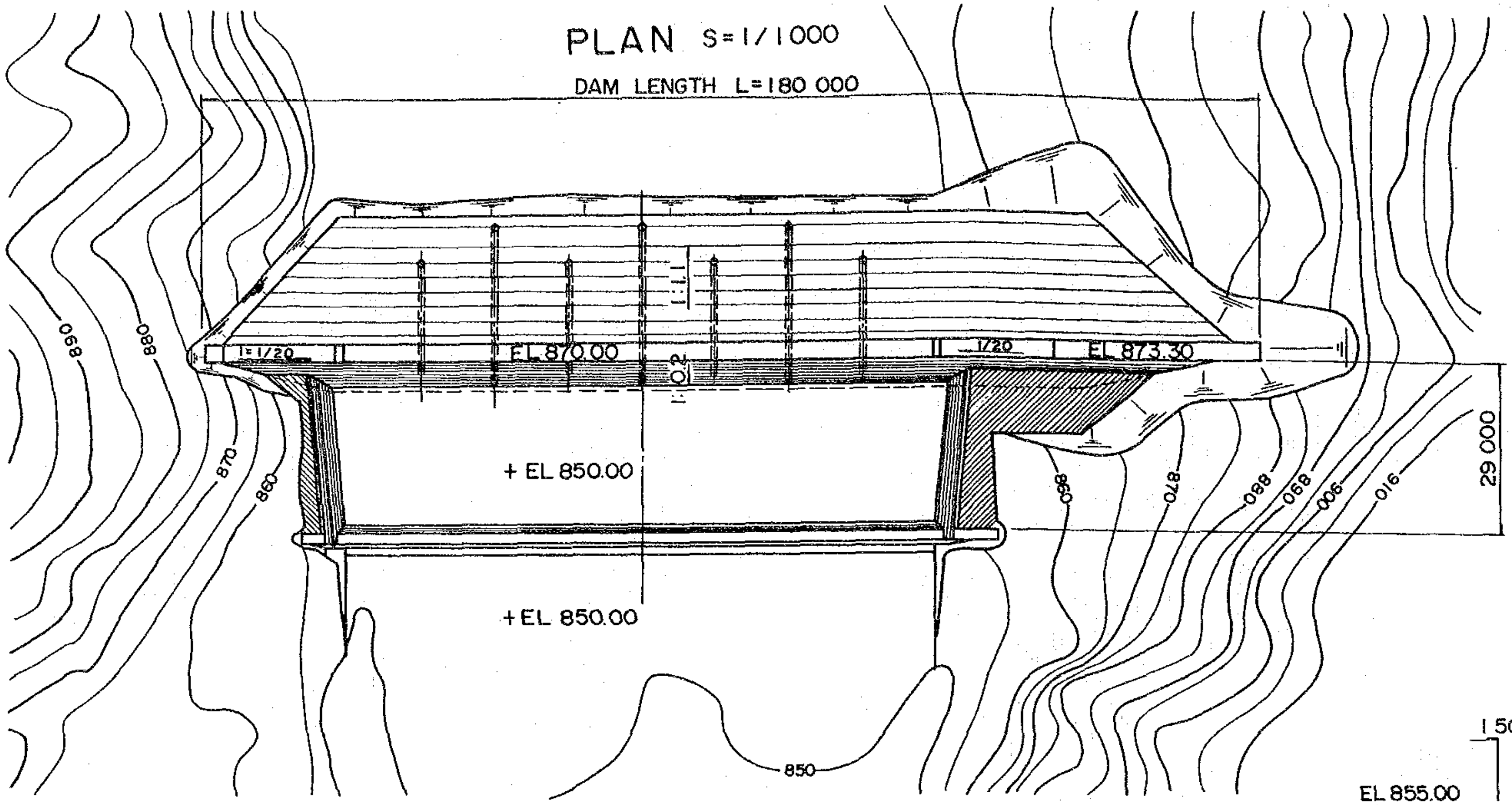
STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

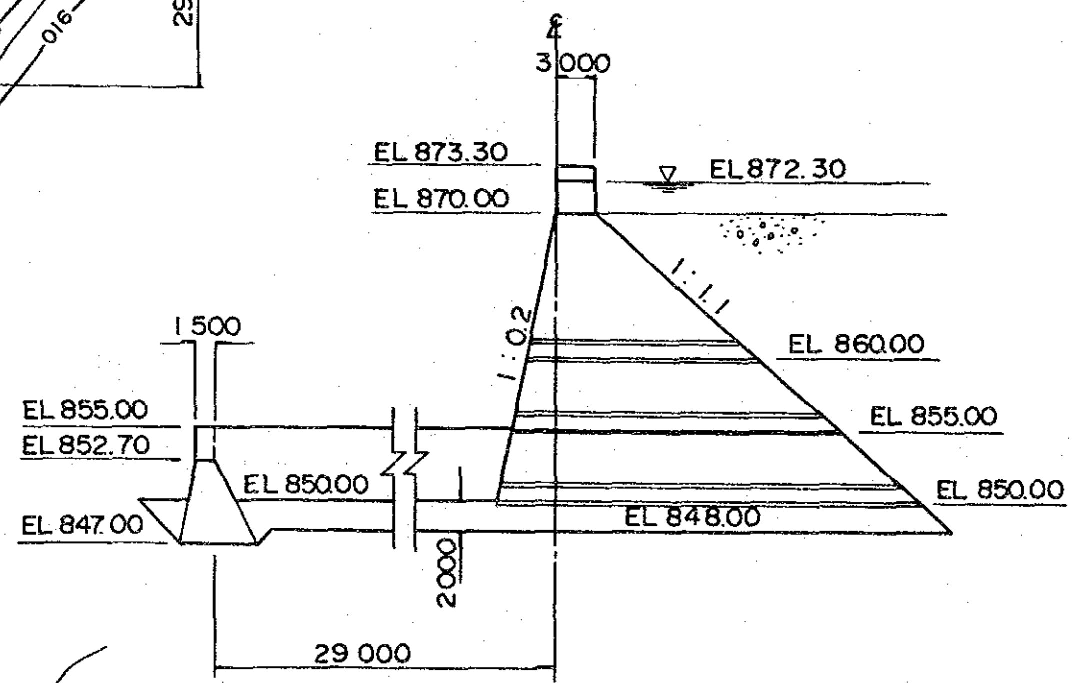


STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	PRELIMINARY DESIGN DRAWINGS OF SABO DAM C-5
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-37

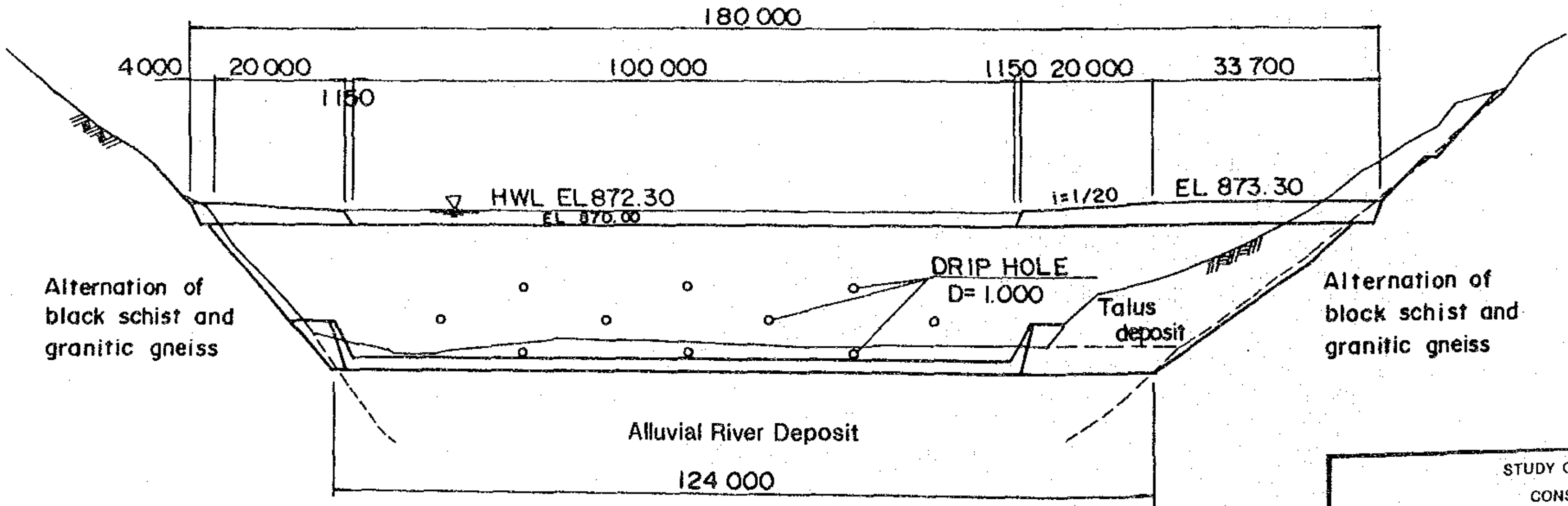
PLAN S=1/1000



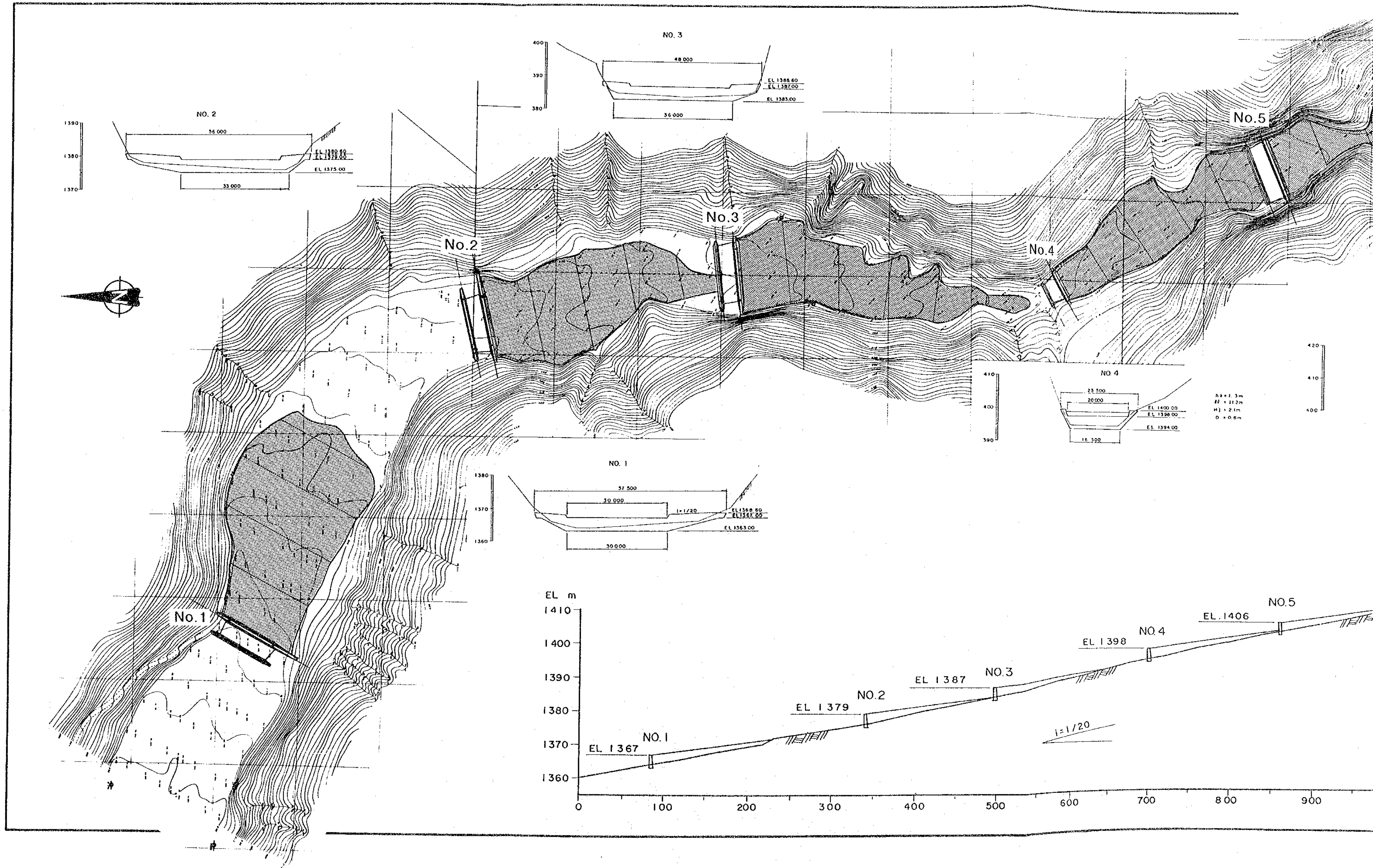
STANDARD CROSS SECTION S=1/500



FRONT VIEW S=1/1000



STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT	PRELIMINARY DESIGN DRAWINGS OF SABO DAM N-1
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. VI-38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No.2
No.3
No.4
No.5
NO. 1
NO. 2
NO. 3
NO. 4
EL m
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1400
1390
1380
1370
1360
EL 1367
NO.1
EL 1379
NO.2
EL 1387
NO.3
EL 1398
NO.4
EL.1406
NO.5
i=1/20
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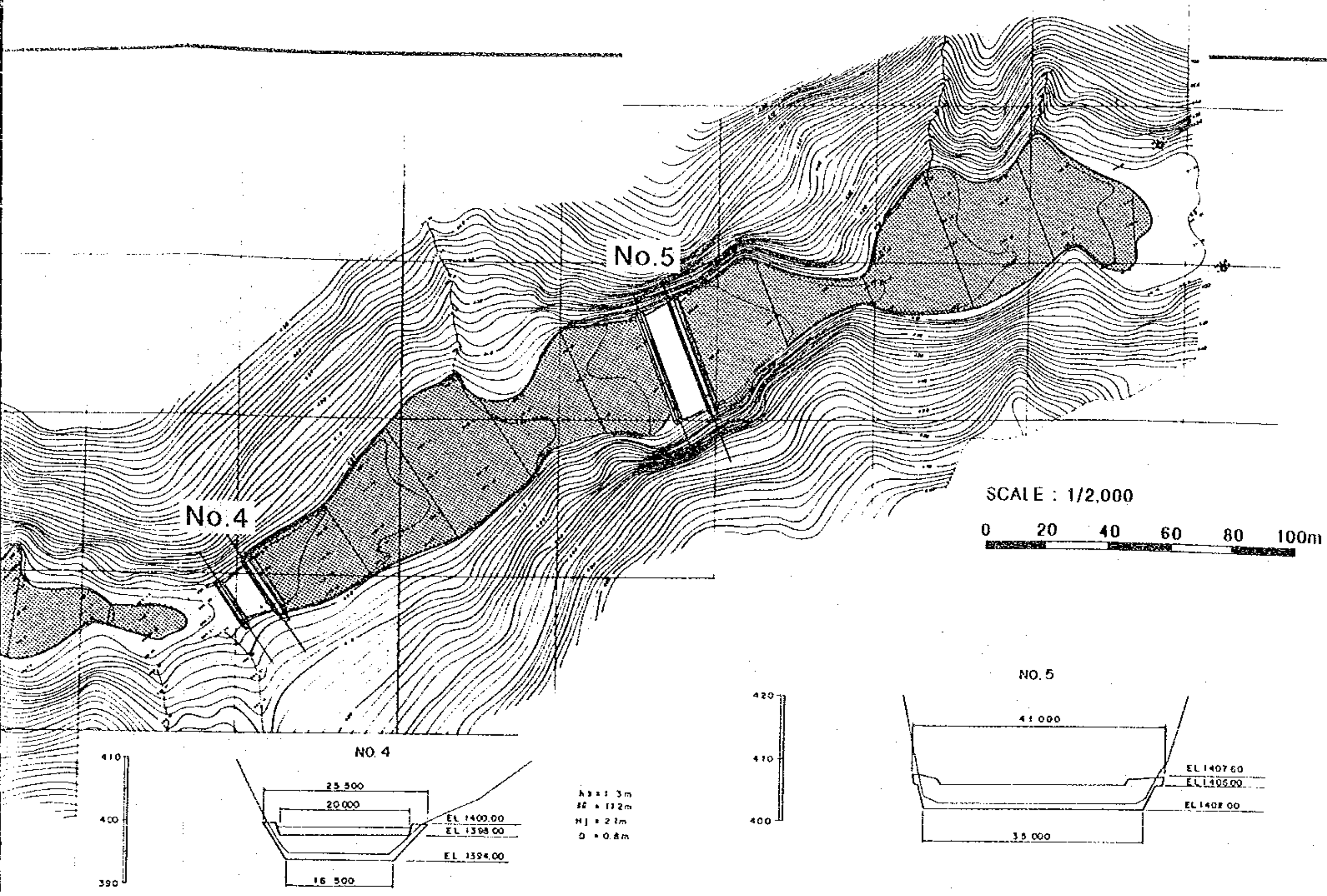
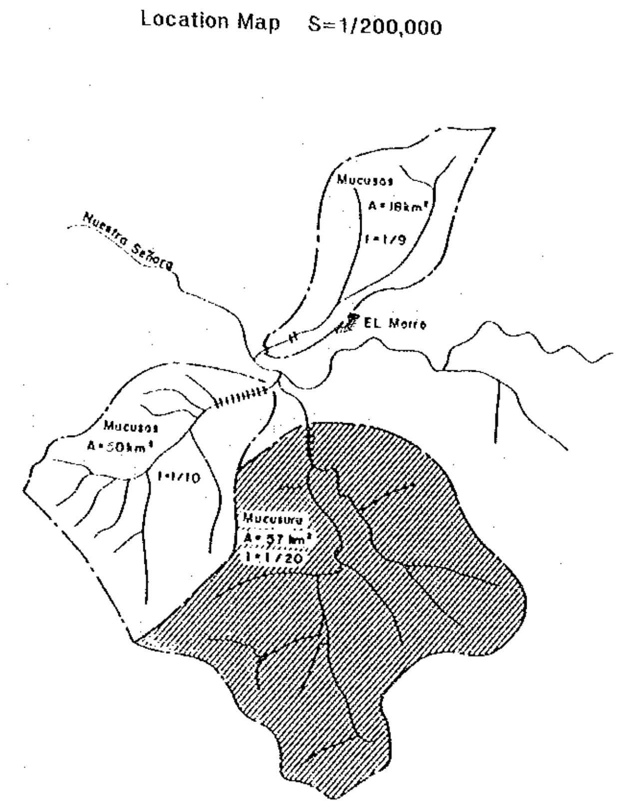
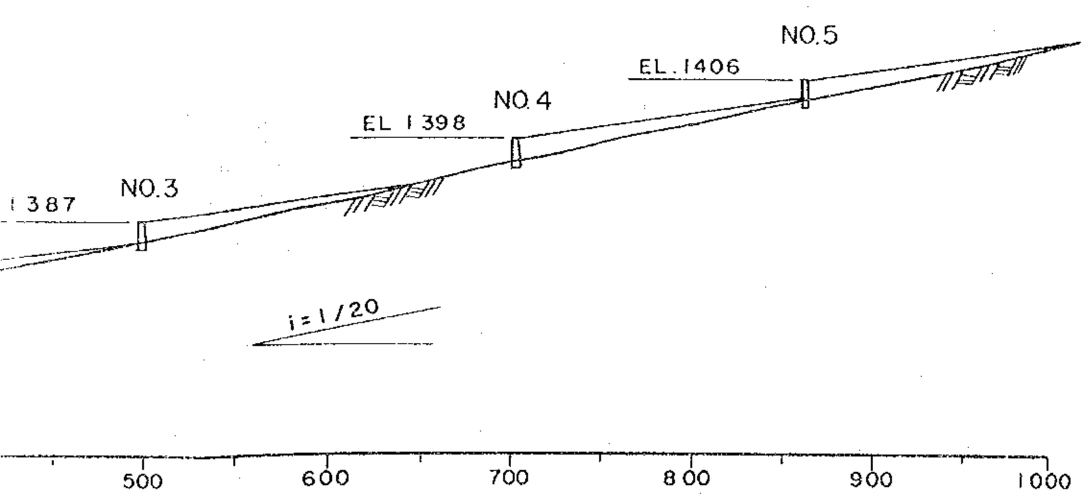
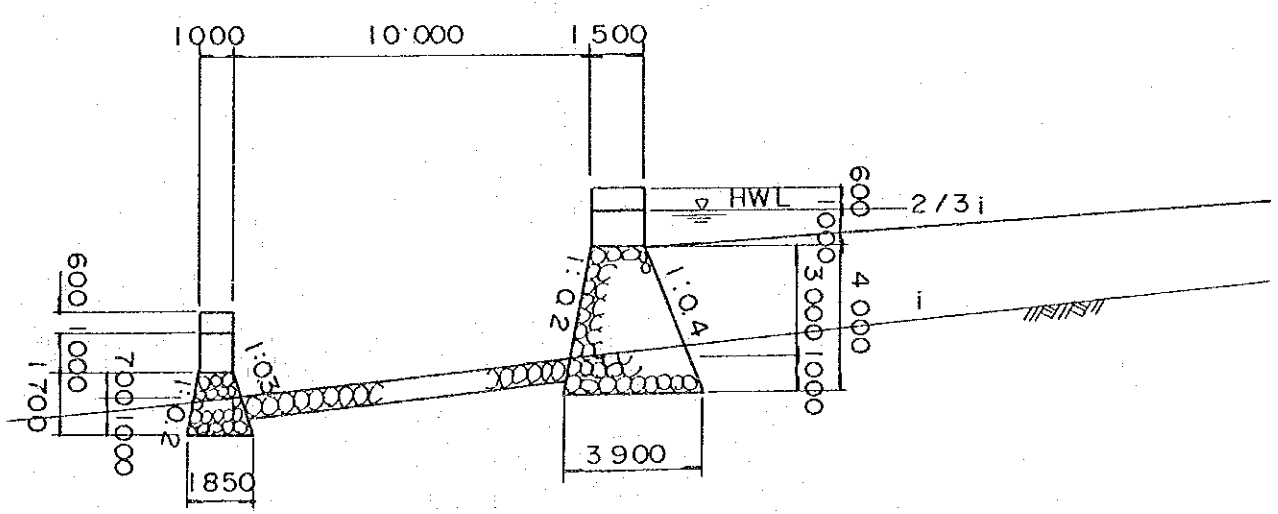
200
300
400
500
600
700
800
900







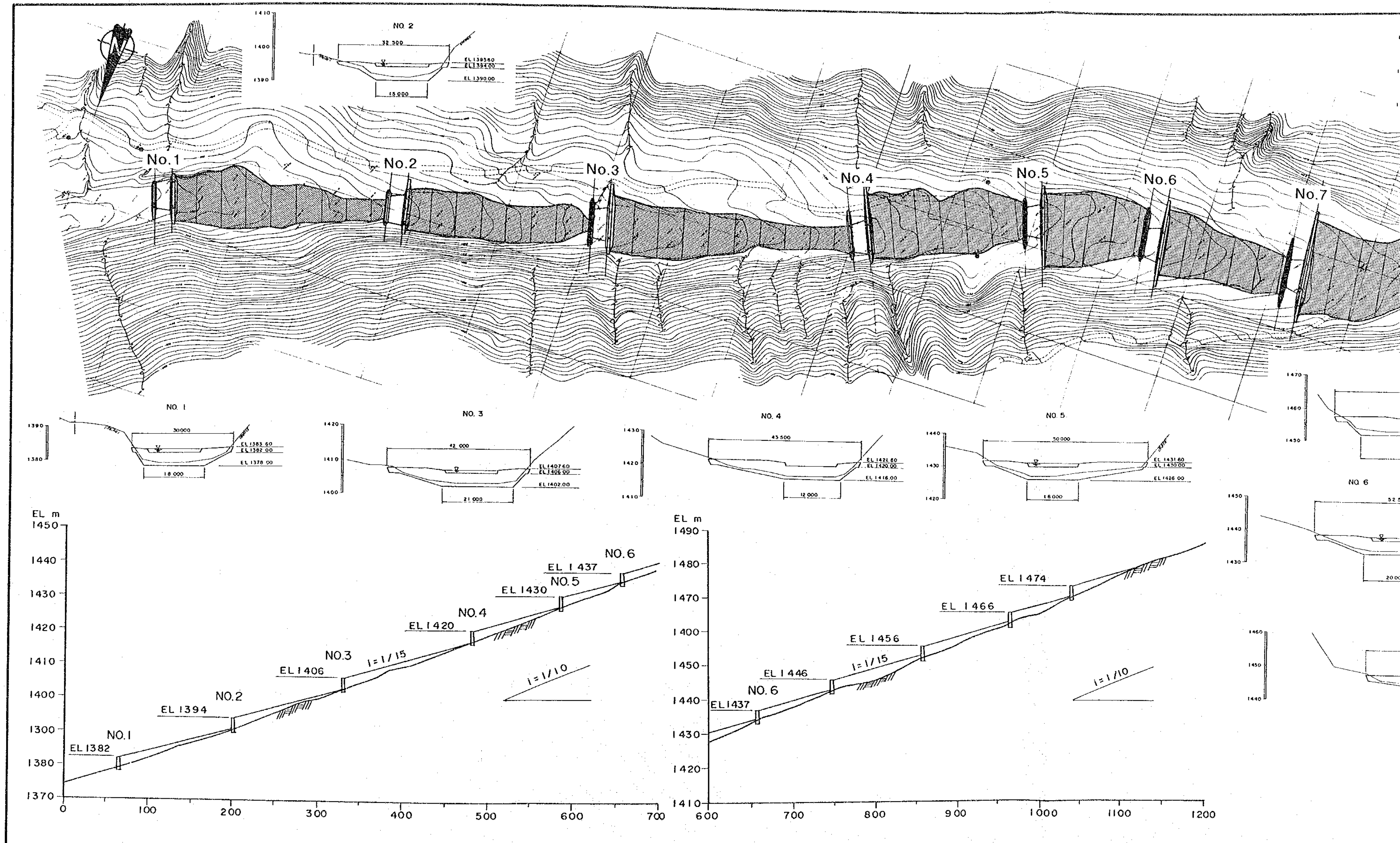


STUDY ON CHAMA RIVER BASIN CONSERVATION PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

LAYOUT OF CONTINUOUS LOW DAM ON THE MUCUSURU RIVER

Fig. VI-39



No.1
No.2
No.3
No.4
No.5
No.6
No.7
NO. 1
NO. 2
NO. 3
NO. 4
NO. 5
NO. 6
EL m
EL 1382
EL 1394
EL 1406
EL 1420
EL 1430
EL 1437
EL 1446
EL 1456
EL 1466
EL 1474
I=1/15
I=1/10