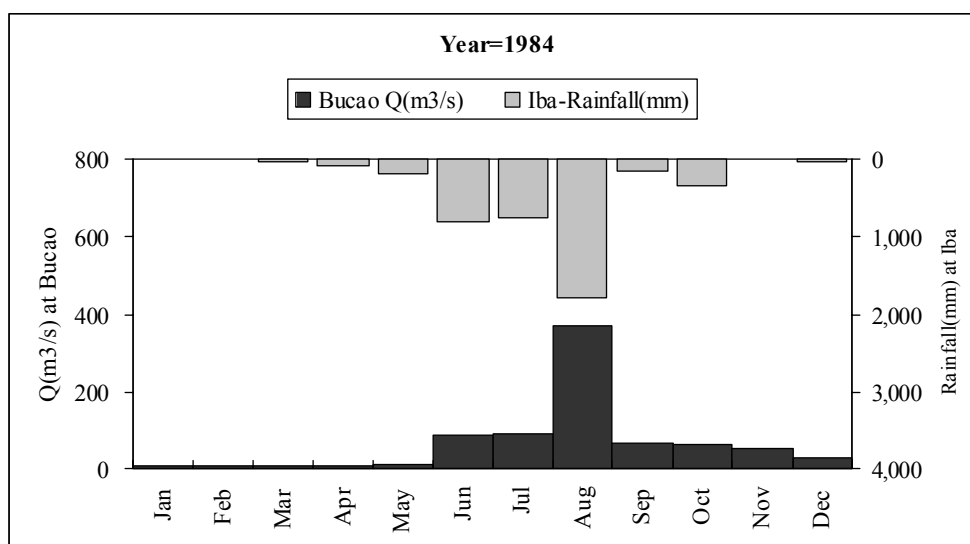
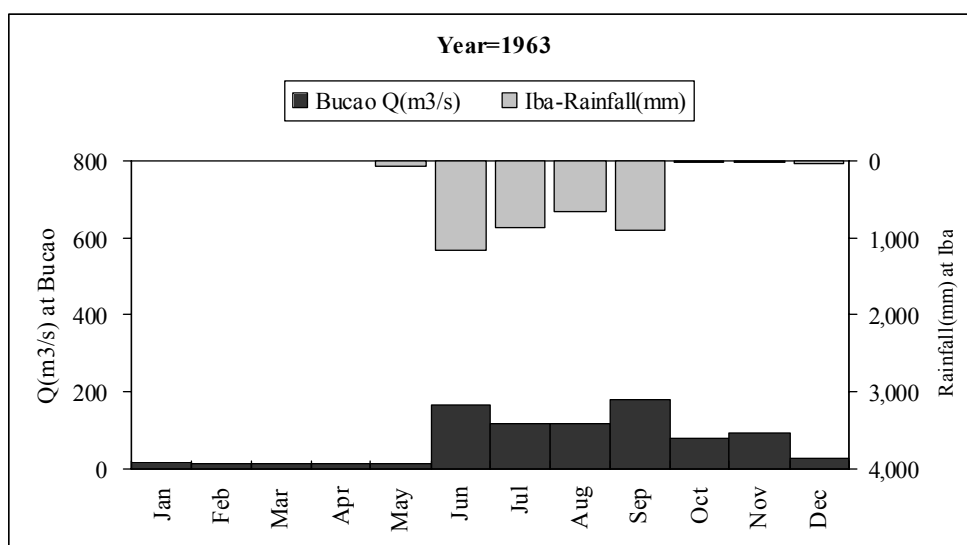


Month	1963		1984	
	Rainfall(Iba) (mm)	Discharge (m3/s)	Rainfall(Iba) (mm)	Discharge (m3/s)
Jan	0.0	15.2	0.0	9.3
Feb	1.1	13.4	0.0	9.1
Mar	0.0	12.4	16.7	9.1
Apr	1.5	11.3	75.7	9.0
May	69.3	13.5	195.1	11.0
Jun	1,166.0	167.7	801.8	86.2
Jul	880.3	118.4	738.4	91.2
Aug	673.2	116.8	1,787.6	369.4
Sep	891.0	180.7	135.0	67.1
Oct	30.6	77.3	326.5	62.0
Nov	20.3	93.3	10.0	53.8
Dec	50.8	23.6	20.4	28.1
Total	3,784.1		4,107.2	
Average		70.3		67.6



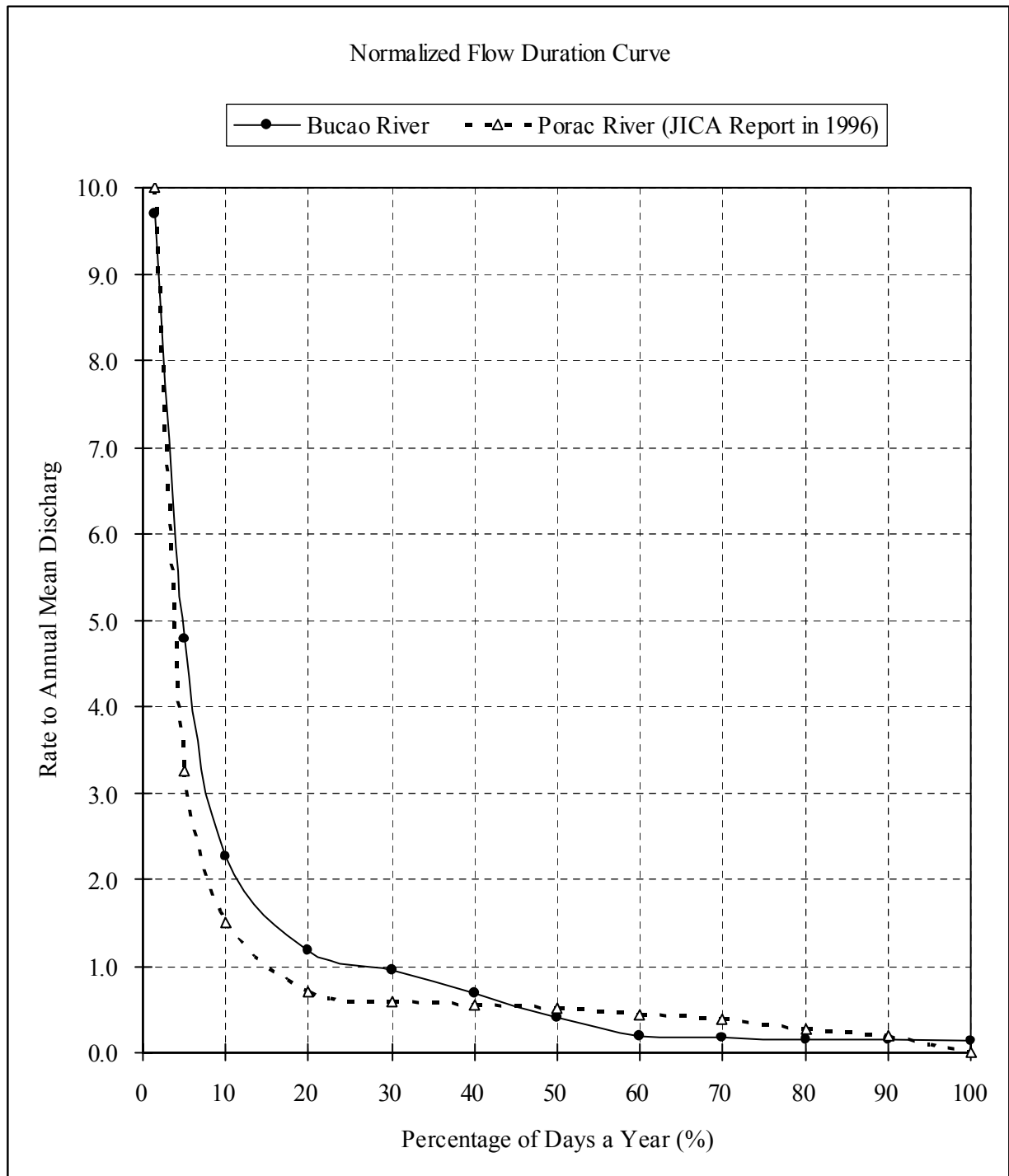
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Figure 4.1.1

**Monthly Rainfall and Discharge in the Bucao
River in 1963 and 1984**



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Figure 4.2.1
**Comparison of Normalized Flow Duration
 Curves**



(1) Overflow from Maloma River to No.7 National Highway (on Right Side)



(2) Maculcol Bridge on July 8, 2002



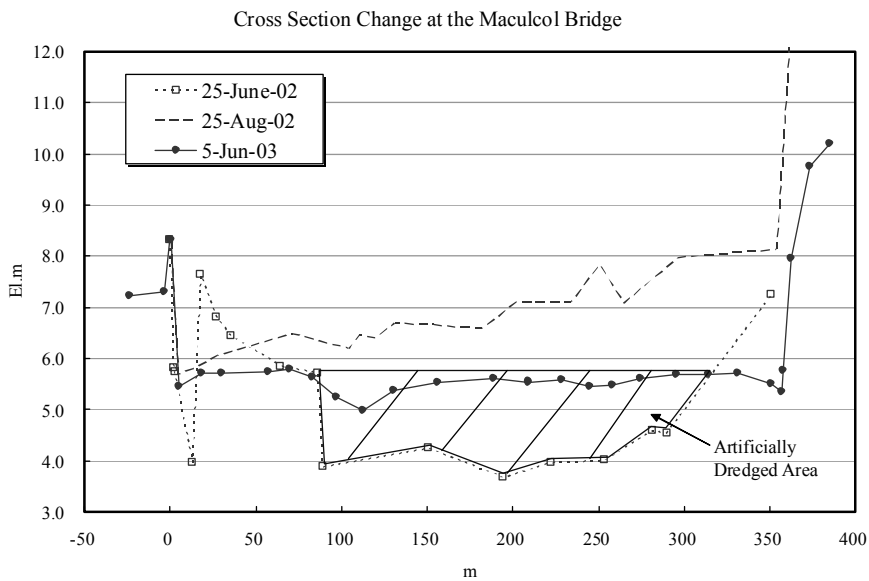
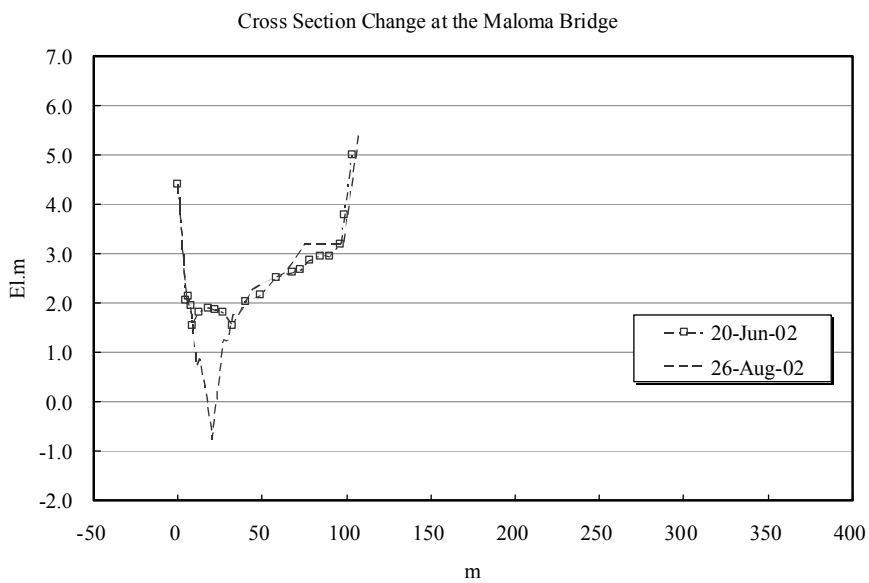
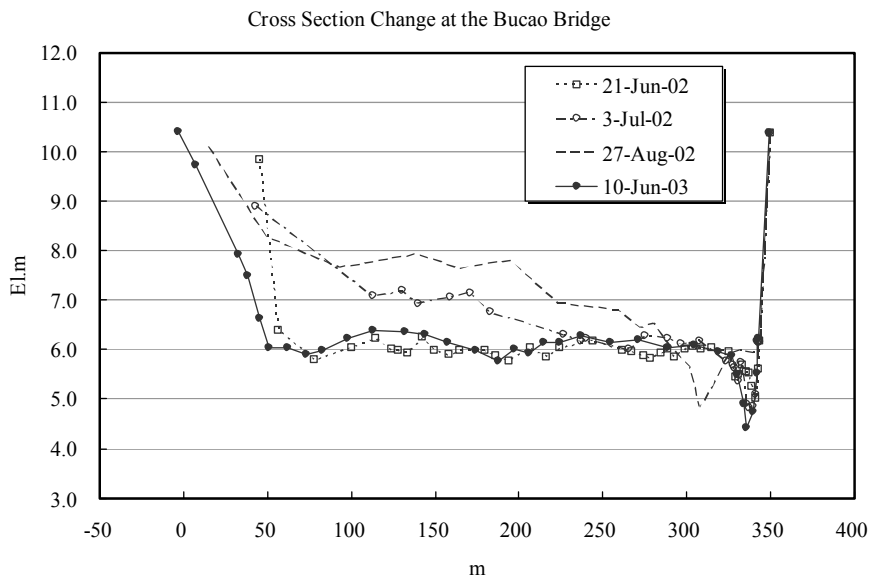
(3) Lahar at the Bucao Bridge (2 Hours after Peak of Lahar Flow)



(4) Erosion of Dike at the Bucao Bridge on July 13, 2002 (Right Bank)

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Figure 5.3.1
Pictures during Flood in July 2002



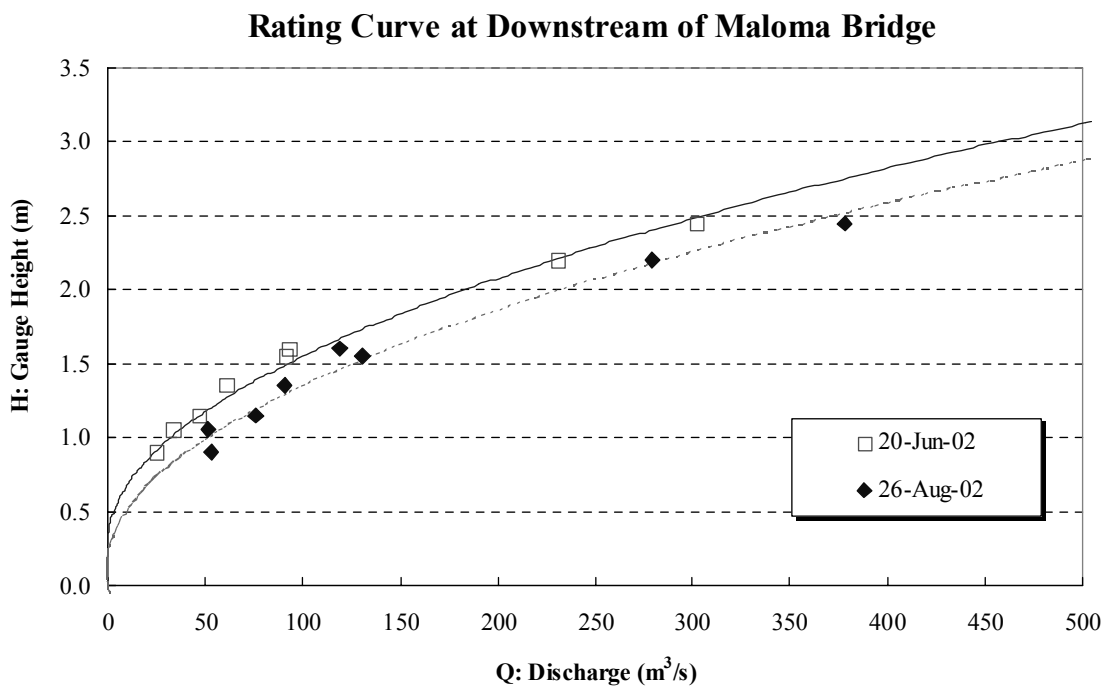
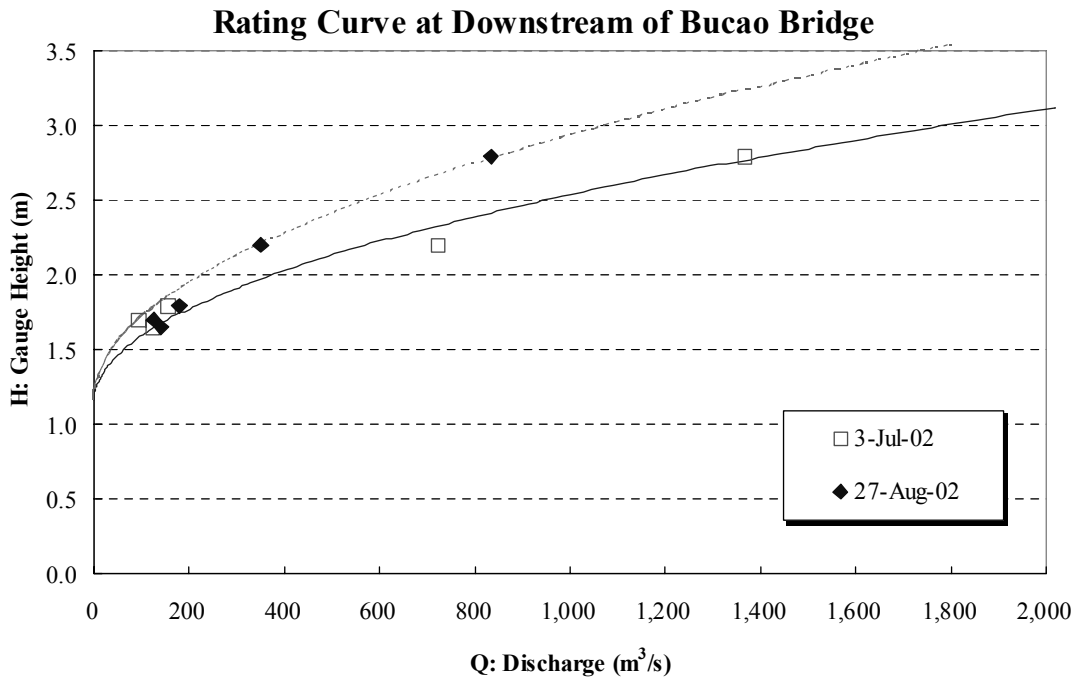
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Figure 5.3.2

**Cross Section Change at the Bucao, Maloma
and Maculcol Bridges**



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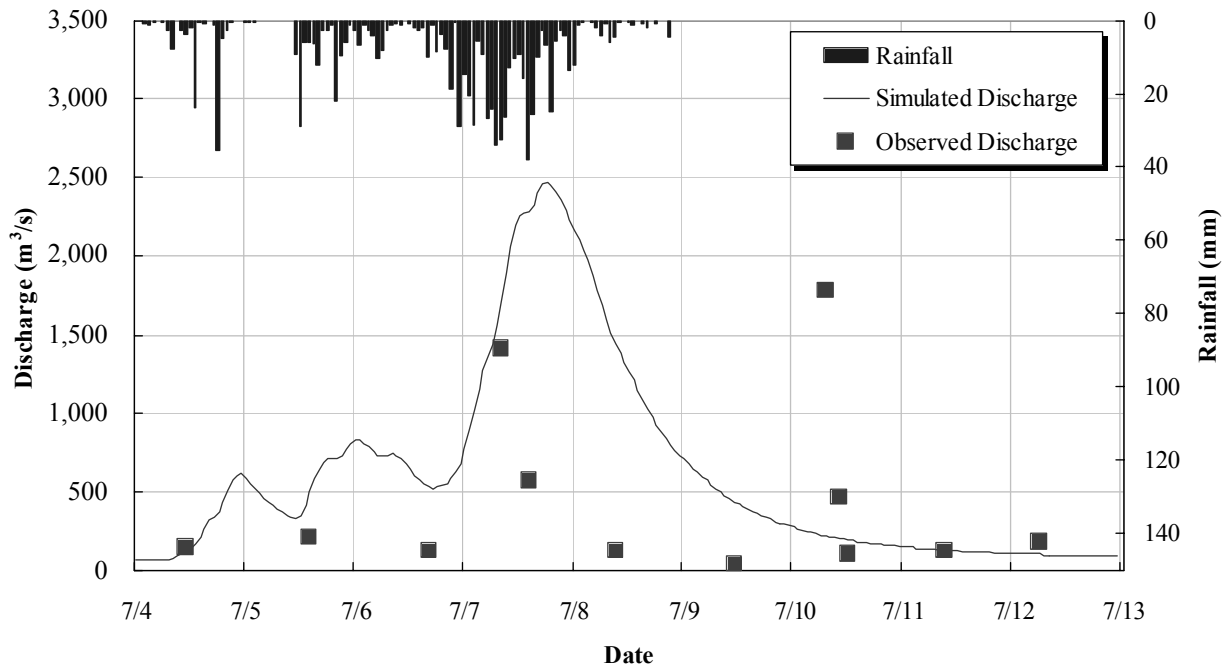
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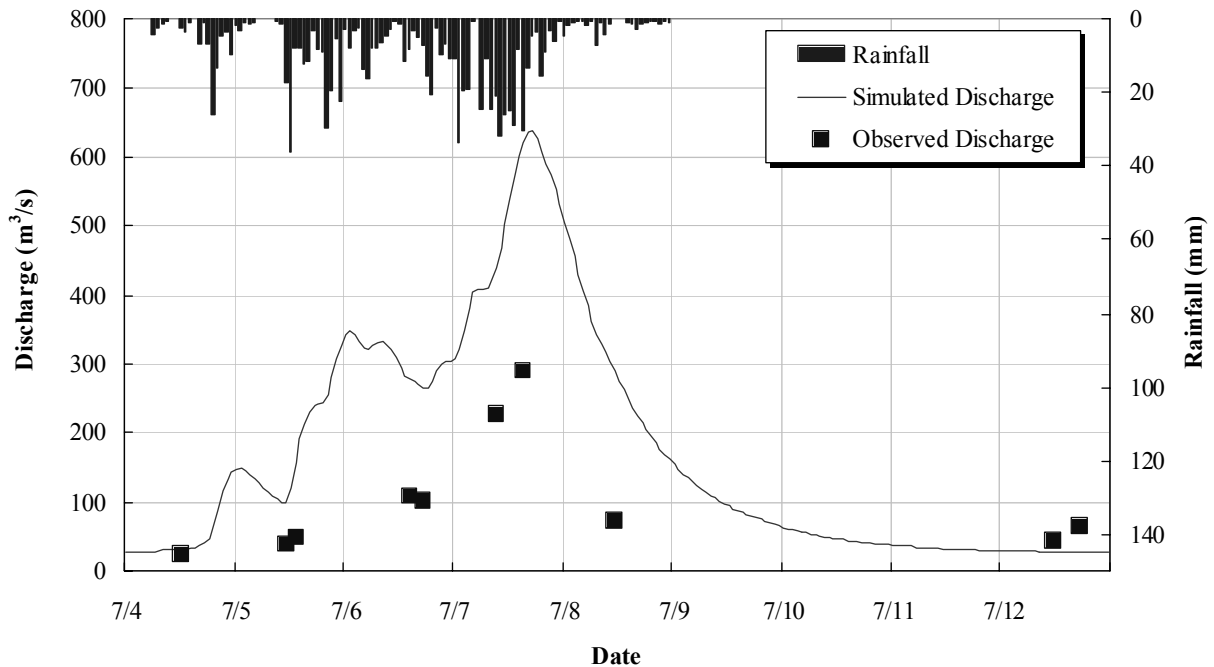
Figure 5.3.3

**Rating Curve at the Bucao and Maloma
Bridges**

Simulated and Measured Discharge at Bucao Bridge



Simulated and Measured Discharge at Maloma Bridge



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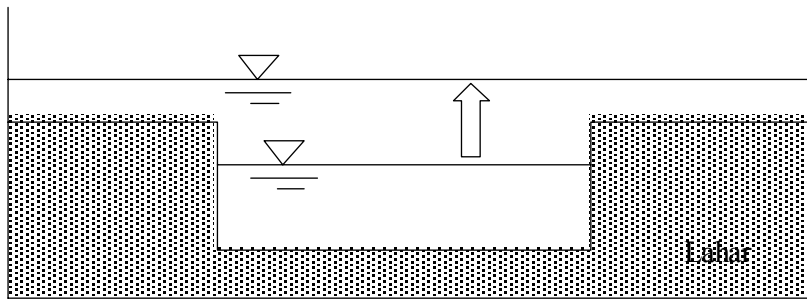
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Figure 5.3.4

**Observed and Simulated Discharge during
Flood in July 2002**

Discharge Measurement during Flood in July 2002



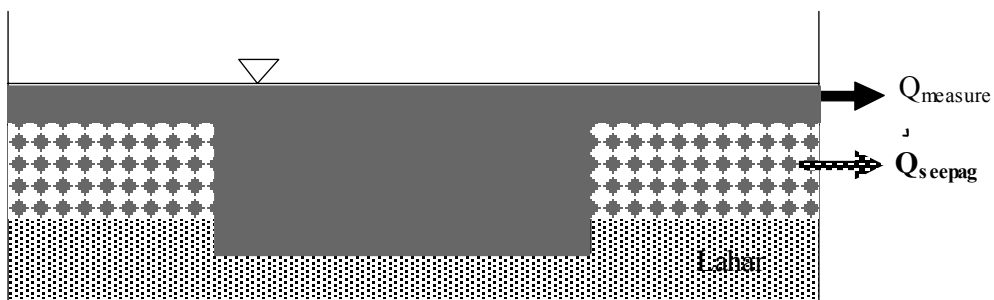
River Cross Section

a) Without Considering Seepage into Lahar Deposits



$$Q_{\text{actual}} > Q_{\text{measured}}$$

b) With Seepage into Lahar Deposits (Storage Effect of Lahar Deposits)



$$Q_{\text{actual}} = Q_{\text{measured}} + Q_{\text{seepage}}$$

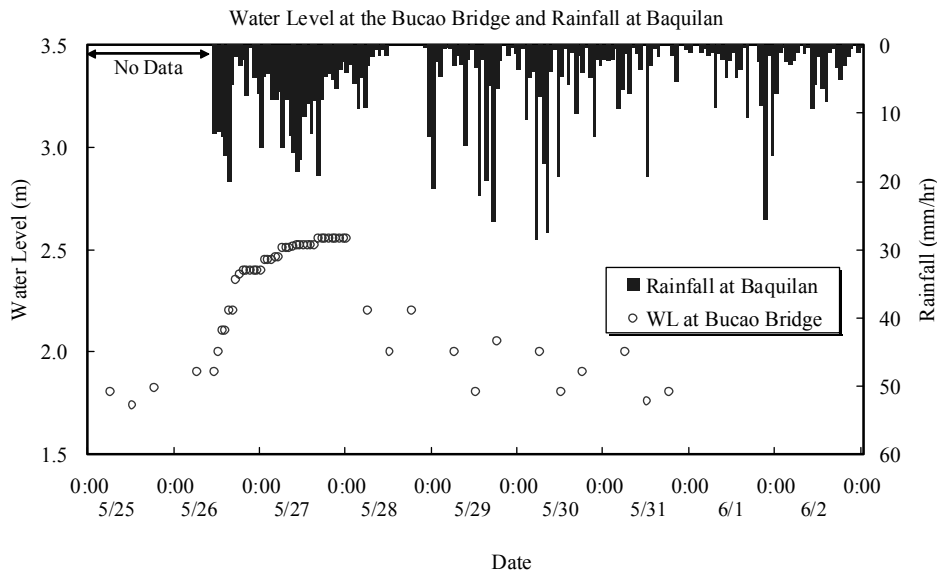
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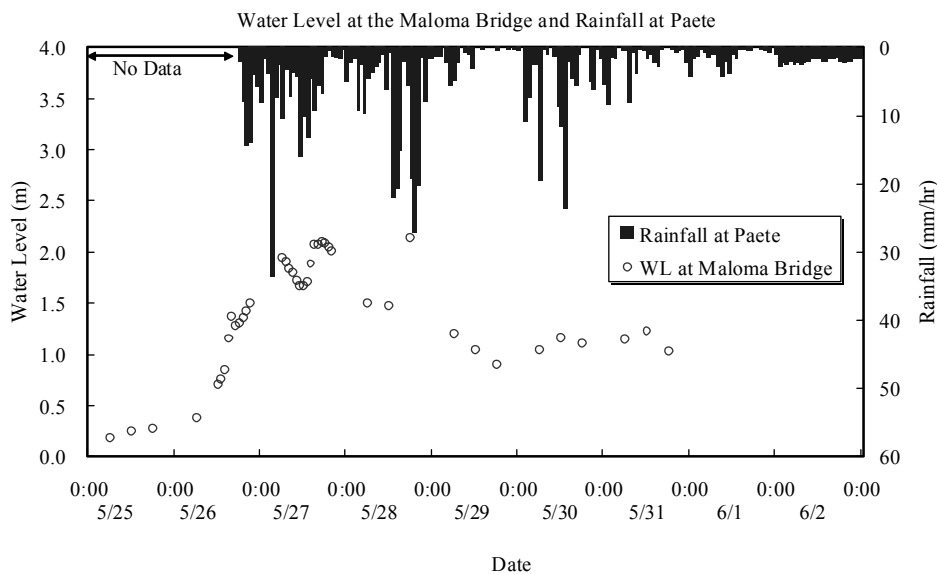
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Figure 5.3.5

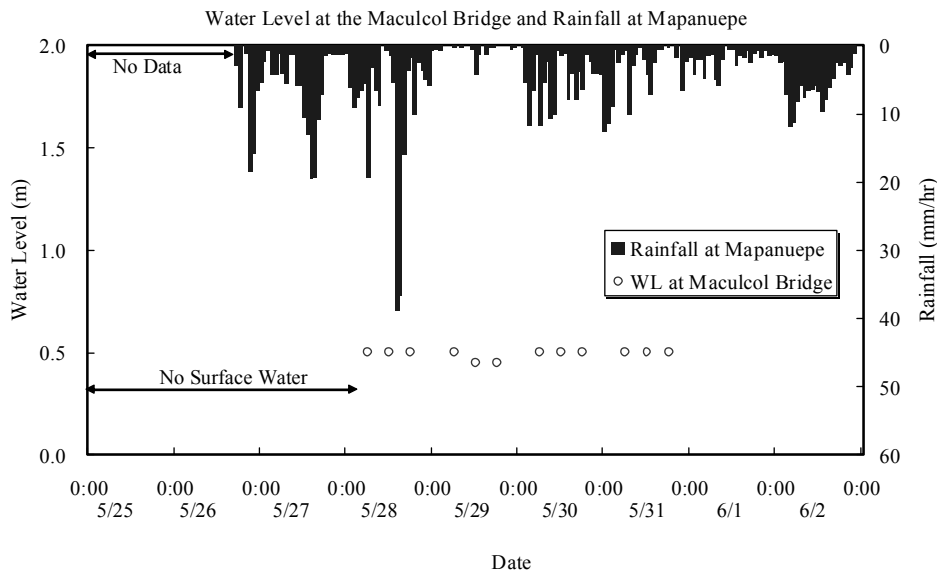
Assumed Storage Effect of Lahar Deposits



Baquilan	
Date	mm/day
5/27	216.1
5/28	75.9
5/29	127.8
5/30	178.0
5/31	67.6
6/1	105.9
6/2	59.7
Accumulated	831.1



Paete	
Date	mm/day
5/27	155.2
5/28	192.0
5/29	24.1
5/30	121.2
5/31	42.7
6/1	27.4
6/2	49.5
Accumulated	612.2



Mapanuepe	
Date	mm/day
5/27	125.5
5/28	205.2
5/29	10.4
5/30	127.2
5/31	69.6
6/1	48.0
6/2	127.3
Accumulated	713.2

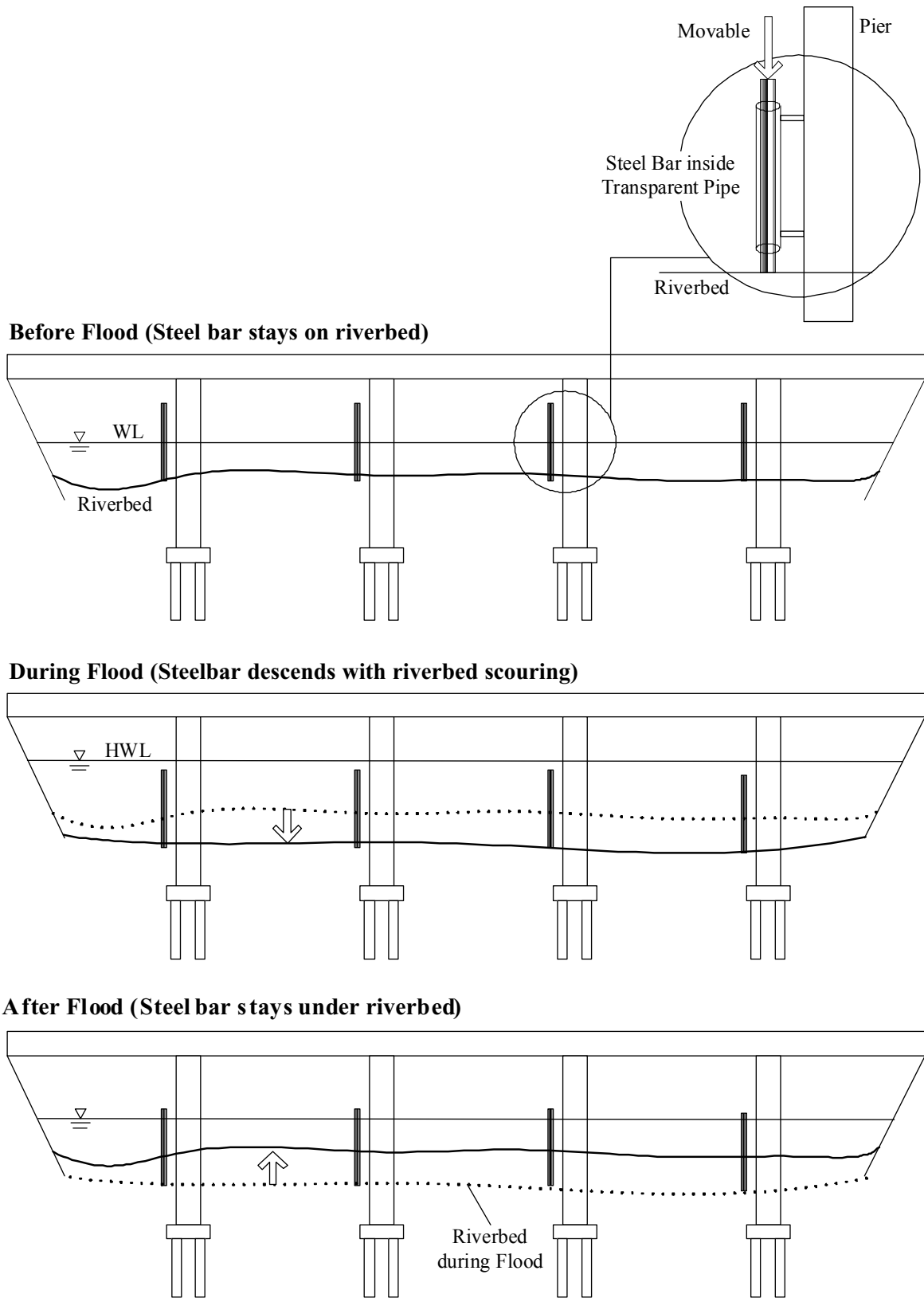
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Figure 5.4.1

**Relationship between Water Level and
Rainfall during Flood in May 2003**



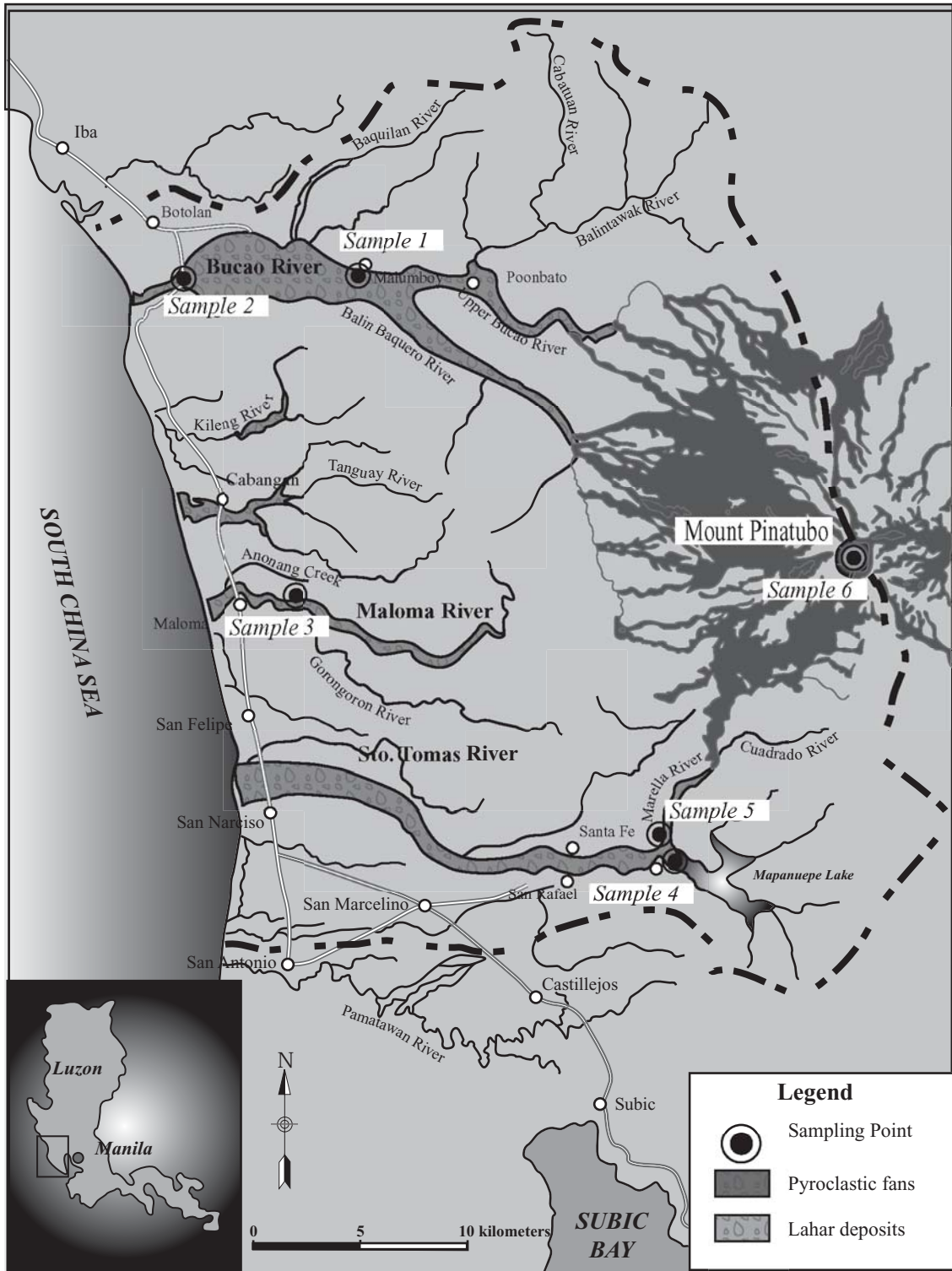
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Figure 5.5.1

**Measurement System for Riverbed Scouring
at Bridge during Floods**



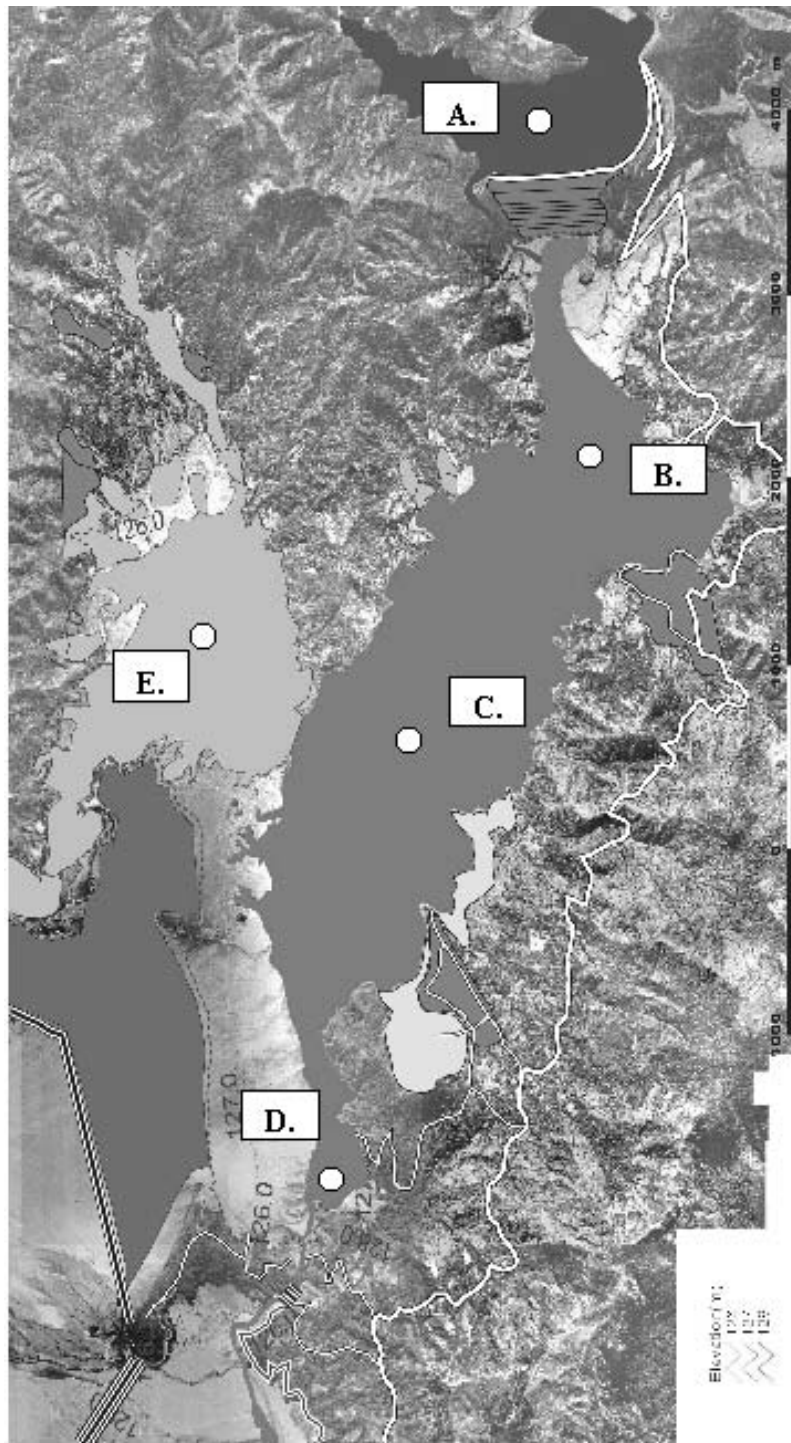
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Figure 6.2.1

Water Quality Sampling Location



○ sampling point

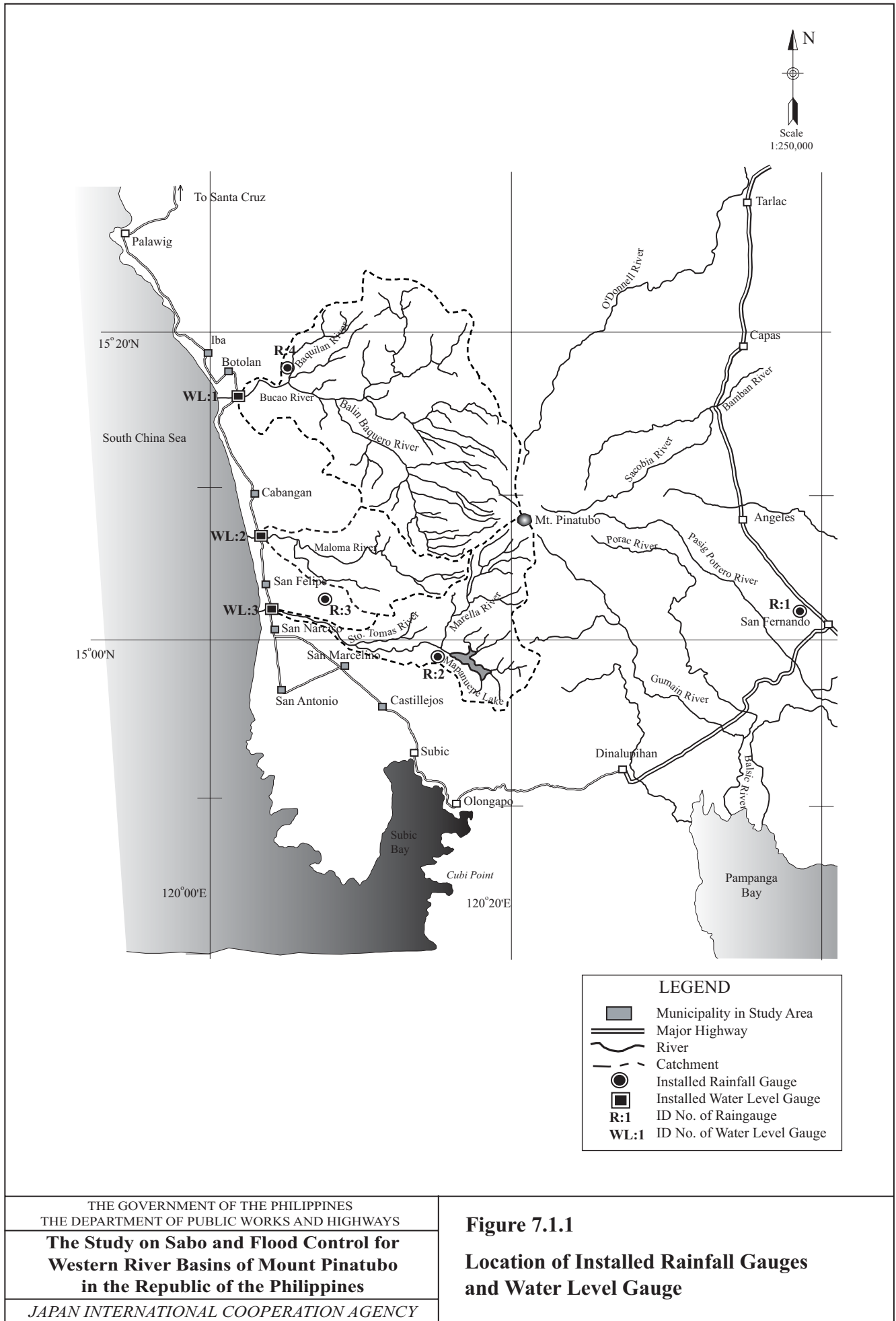
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Figure 6.2.2

**Location of Water and Bottom Material
Samples for Mapanuepe Lake and Dizon Dam**



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Figure 7.1.1

**Location of Installed Rainfall Gauges
and Water Level Gauge**