

DB. II

DRAINAGE SYSTEM AND
FLOOD DAMAGE

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1 INTRODUCTION

The survey involves the drainage system of Laoag City and the flood damages caused by Typhoon Gloring in 1996. The survey area covers the entire Laoag City poblacion area and nearby barangays. The respondents are those households who actually experienced the flood caused by typhoon Gloring. Special attention is given to the depth of flooding, duration of flood, and flood flow direction. Other factors that contributed to the intensity of flooding such as the condition of existing drainage system and the irrigation system were also considered.

2 OBJECTIVE OF THE SURVEY

The objective of the survey is to know the existing conditions of the drainage system in the San Mateo River Basin and the built-up area of Laoag City, as well as the extent of flood damage caused by typhoon Gloring in 1996.

3 METHODOLOGY

To satisfactorily realize the objective of the survey, the survey team conducted actual interviews with the residents of the area. Questionnaires were accomplished by barangay captains. Inputs from the barangay captains were verified through exhaustive interviews with the residents specially for those critically flooded areas. Data gathered were plotted and updated. Activities during the course of the survey involves the following:

- Coordination with local governments concerned.
- Actual interview with barangay captains and residents.

- Inspection of bridges along Daorao creek.
- Inspection of drainage canals in the city proper.
- Verification of data gathered.
- Regular reporting of survey results.

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TABLE 4.1-1

**CONDITIONS OF THE OPERATION AND MAINTENANCE
FOR DRAINAGE SYSTEM FACILITIES**

A	Administration The City Engineer's Office is the main implementing and coordinating organization for the Operation and Maintenance of the drainage system for the Laoag City. The barangay units assist in the implementation of operation and maintenance activities in their respective area of coverage. Most of the time these barangay units initiates the repair and maintenance of the drainage system. There is no master plan for the improvement of the present drainage system.
B	Budget The total yearly budget for the Operation and Maintenance for the drainage system is estimated to be six hundred pesos only (P 600,000) which constitute 50% of the total City Engineer's budget for the maintenance of roads and bridges.
C	Activities for the Operation and Maintenance includes the following:
1	Desilting and cleaning of silted drainage canals either by the use of desilting equipment or done manually.
2	Demolition of existing structure on top of drainage canals.
3	Repair of damage canal lines and structure.

TABLE 4.2-1

**OBSERVED DEPTHS, DURATION AND FLOW DIRECTIONS
OF FLOOD AT SURVEY POINTS**

Point No.	Depth of Flood	Duration (Hours)		Direction ↑ North
		To peak	Recession/ Falling Limb	
1	1.0	2	12	↑
2	0.5	2	12	↑
3	2.5	2	12	↑
4	0.3	2	12	↑
5	0.9	2	12	↑
6	2	2	12	↑
7	2	2	12	↘
8	1	2	12	↘
9	0.4	2	12	↑
10	1	2	12	↑
11	0.8	2	12	↑
12	0.5	2	12	↑
13	1	2	12	↑
14	0.8	2	12	↑
15	0.6	2	12	↑
16	0.5	1	12	↘
17	0.8	1	12	
18	1.3	2	12	↑
19	NF			
20	NF			
21	0.4	2	12	↘
22	1.5	2	12	↘
23	1.5	2	12	↘
24	NF			
25	0.3	2	12	↘
26	0.3	2	12	↘
27	0.5	2	12	↘
28	0.5	2	12	↘
29	0.5	2	12	↘ ↗

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
30	1.0	2	12	↗
31	0.5	2	12	↗
32	1.8	2	12	↗
33	0.5	2	12	↗
34	1.1	2	12	↗
35	NF			↗
36	0.5	2	12	↗
37	0.2	2	12	↗
38	1.0	2	12	↗
39	0.3	2	12	↗
40	0.8	2	12	↗
41	0.2	2	12	↘
42	NF			
43	NF			
44	1.4	2	12	↘
46	0.2	2	12	↗
47	1.3	2	12	↗
48	0.5	0.5	12	↗
49	NF			
50	0.3	0.5	12	↗
51	0.8	0.5	12	↗
52	NF			
53	2.3	0.5	12	↗
54	1.0	0.5	12	↗
55	1.45	0.5	12	↗
56	NF			
57	NF			
58	0.7	0.5	12	↗
59	0.5	0.5	12	↗
60	NF			
61	0.9	0.5	12	↗
62	0.38	0.5	12	↗

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
63	0.2	0.5	12	↖
64	0.85	0.5	12	↗
65	0.6	0.5	12	↖
66	1.0	0.5	12	↑
67	0.9	2	12	↖
68	NF			
69	0.3	2	12	
70	1.9	2	12	↙
71	0.5	2	12	
72	3.0	2	12	↙ ↗
73	0.5	2	12	
74	1.8	2	12	↖
75	0.5	2	12	↖
75	0.5	2	12	↖
76	0.9	2	12	↖
77	0.4	2	12	
78	NF			↖
79	1.0	2	12	↖
80	2.7	2	12	↖
81	0.6	2	12	
82	NF			
83	NF			
84	0.6	2	12	↖
85	0.5	2	12	↖
86	0.3	2	12	↖
87	1.2	2	12	
88	1.6	2	12	
89	0.6	2	12	↙
90	2.7	2	12	↖ ↙ ↗
91	2.3	2	12	↙ ↗
92	0.6	2	12	↙
93	0.15	2	12	↖

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
94	1.0	2	12	↖
95	NF			
96	0.4			
97	0.6	2	10	↖
98	0.5	2	10	↗
99	1.2	2	10	↗
100	0.5	2	12	→
101	0.4	2	12	↘
102	NF			
103	0.3	2	12	←
104	0.4	2	12	←
105	0.3	2	12	←
106	NF			
107	0.3	2	12	↖
108	1.3	2	12	↑
109	1.5	2	12	↘
110	1.5	2	12	↖
111	0.9	2	12	↗
112	1.3	2	12	↖
113	1.2	2	12	↘
114	1.3	2	12	↖
115	NF			
116	1.3	2	12	↖
117	NF			
118	1.6	2	12	↖
119	0.8	2	12	↖
120	1.5	2	12	↖
121	1.0	2	12	↖
122	0.9	2	12	
123	1	2	12	
124	1	2	12	
125	1	2	12	

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
126	1.9	2	12	
127	2.3	2	12	
128	0.7	2	12	
129	0.5	2	12	
130	0.7	2	12	↗
135	NF			
136	NF			
137	1.0	2	12	↗
138	1.5	2	12	↗
139	1.5	2	12	
140	NF			
141	0.15	2	12	
142	0.1	2	12	
143	NF			
144	0.3	2	12	
145	0.1	2	12	
146	NF			
147	0.2	2	12	
148	NF			
149	NF			
150	NF			
151	NF			
152	NF			
153	NF			
154	NF			
155	NF			
156	NF			
157	NF			
158	0.2	2	12	
159	0.2	2	12	
160	0.1	2	12	
161	0.0	2	12	

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
162	0.0	2	12	
163	0.1	2	12	
164	0.2	2	12	
165	0.2	2	12	
166	0.5	2	12	
167	0.6	2	12	
168	0.2	2	12	↘
169	0.2	2	10	↙
170	0.2	2	10	↙
171	0.2	2	10	↓
172	0.2	2	11	
173	0.15	2	10	
174	NF			
175	NF			
176	0.3	2	12	
177	0.3	2	11	
178	0.4	2	12	
179	0.4	2	12	↘
180	0.5	2	10	↗
181	0.4	2	10	
182	0.15	2	10	
183	0.3	2	12	↑
184	0.4	2	12	↑
185	0.4	2	12	↑
186	1.5	2	10	↓
187	0.6	2	10	
188	0.2	2	10	
189	0.3	2	10	
190	0.8	2	12	←
191	0.3	2	12	↑
192	0.6	2	12	
193	0.4	2	10	↗

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
194	0.6	2	10	↗
195	0.1	2	10	↗
196	1.3	2	12	↗
197	1.2	2	12	↗
198	0.5	2	10	↗
199	1.14	2	11	
200	1.14	2	12	↗
201	0.1	2	10	
202	0.1	2	10	
203	0.1	2	10	
204	0.2	2	8	
205	0.4	2	8	
206	0.3	2	10	
207	0.4	2	12	
208	0.1	2	10	
209	0.1	2	10	
210	0.1	2	12	
211	0.1	2	10	
212	0.0			
213	0.1	2	10	
214	0.1	2	5	
215	0	2	4	
216	NF			
217	0.36	2	8	↗
218	NF			
219	NF			
220	0.6	4	11	↘
221	0.2	4	11	↘
222	0.2	4	10	↗
223	0.7	4	10	↗
224	0.2	2	10	
225	NF			

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
226	0.2	2	10	↑
227	NF			
228	NF			
229	NF			
230	NF			
231	0.4	2	10	→
231	0.4	2	10	→
232	0.2	3	10	↙
233	0.6	2	12	↑
234	0.3	2	5	↗
235	0.5	2	5	↗
236	0.3	2	7	↗
237	NF			
238	0.3	2	8	↗
239	NF			
240	NF			
241	NF			
242	1.0	2	12	↗
243	0.8	2	12	↗
245	0.9	2	12	
246	1.1	2	8	
247	1.0	2	10	
248	1.0	2	10	
249	1.0	2	10	
250	0.3	2	8	
251	0.1	2	10	
252	0.2	2	10	
253	0.1	2	8	
254	NF			
255	0.4	2	8	
256	0.2	2	10	
257	0.2	2	12	

Point No.	Depth of Flood (meters)	Duration (Hours)		Direction
		To peak	Recession/ Falling Limb	
258	0.2	2	12	
259	NF			
260	0.3	2	8	
261	0.5	2	10	
262	NF			
263	0.1	2	10	
264	1	2	12	
265	1.0	2	10	
266	NF			
267	NF			
268	NF			
269	NF			
270	NF			
271	NF			
272	NF			
273	0.3	1.5	10	
274	1.0	2	10	
275	0.2	2	10	
276	NF			
277	1.0	2	10	
278	1.5	2	10	
279	3.0	2	12	
280	0.5	2	12	
281	0.3	2	12	
282	NF			
283	0.5	2	10	
284	NF			
285	0.5	2	12	
286	0.3	2	12	
287	0.5	2	12	

TABLE 4.2-2

FLOOD CONTROL MEASURES

The following activities by residents are noted during the flood caused by Typhoon Gloring:

- A Information dissemination to villagers as to the probability of flood during typhoons.
- B Bringing all household furniture and domestic animals at the highest level of their house, usually at the second floor for two level dwelling.
- C Anchoring their house to surrounding trees or structure.
- D Preparing bamboo raft which can be used for evacuation during worst condition.
- E At the downstream of the Daorao creek is a sand dune which will clog flood water. Villagers sometimes need to excavate shallow canal to initiate the flow of water to the sea as its outlet.
- F Erections of temporary barbed wire barricades to divert the flow of water to their crops.
- G If things comes to worst, evacuation to a higher place is their ultimate remedy.

TABLE 4.2-3

SUMMARY OF FLOOD DAMAGES

Particulars	Number/Amount
Total No. of Families Affected	4,592
Total No. of Persons Affected	19,697
Number of Persons Dead	1
Number of Totally Damaged Houses	25
Number of Partially Damaged Houses	11
Total Agricultural Area Affected (Ha.)	31.5
Total Damage to Crops (Pesos)	1,009,132.00
Total Damage to Fisheries (Pesos)	59,860.00
Total Damage to Linstock and Poultry (Pesos)	863,600.00
Total Damage to Infrastructure (Pesos)	12,138,340.00

TABLE 4.2-4

AFFECTED FAMILIES PER BARANGAY

No.	Name of Barangay	Affected Population			Damage Houses	
		Families	Persons	Dead	Total	Partial
42	Apaya	26	109		16	
36	Araniw	80	245		5	
56 - A	Bacsil North	52	192			
56 - B	Bacsil South					
41	Balacad	58	283			
40	Balatong	105	489			
55 - A	Barit-Pandan					
47	Bengcag					
50	Buttong	81	383			
60 - A	Caaoacan	105	387			
48 - A	Cabungaan North					
48 - B	Cabungaan South	34	135		3	
37	Calayab					
54 - B	Camangaan					
58	Casili					
61	Cataban					
43	Cavit	80	331			
49 - A	Darayday	29	115			
59 - B	Dibua North					
59 - A	Dibua South					
34 - B	Gabu Norte East	129	516			
34 - A	Gabu Norte West	121	607		1	
35	Gabu Sur	128	494			
32 - C	La Paz East					
33 - B	La Paz Proper	121	605			
32 - B	La Paz West	60	241			
54 - A	Lagui-Sail	69	305			
32 - A	La Paz East	51	242			
33 - A	La Paz Proper	45	182			
52 - B	Lataag	40	150			4
60 - B	Madiladig	4	20			4
38 - A	Mangató East					
38 - B	Mangató West					
62 - A	Navotas North	1	5			1
62 - B	Navotas South					
46	Nalbo	154	616			
51 - A	Nangalisan East	227	908			
51 - B	Nangalisan West	208	832			
24	Nstra. Sra. De Consolacion (Pob)	116	465			
7 - A	Nstra. Sra. De Natividad (Pob.)					
7 - B	Nstra. Sra. De Natividad (Pob.)	48	192			
27	Nstra. Sra. De Soledad (Pob.)	170	680			
13	Nstra. Sra. De Visitacion (Pob.)	28	438			
3	Nstra. Sra. Del Rosario (Pob.)	89	336			
57	Pila	199	995			
49 - B	Raraburan					
53	Rioeng	96	384			
55 - B	Salet-Bulangon	29	120			
6	San Agustin (Pob.)	83	352			
22	San Andres (Pob.)	50	211			
28	San Bernardo (Pob.)	41	163			
17	San Francisco (Pob.)	60	285			
4	San Guillermo (Pob.)	38	127			
15	San Guillermo (Pob.)	47	231			
12	San Isidro (Pob.)	152	605			

No.	Name of Barangay	Affected Population			Damage Houses	
		Families	Persons	Dead	Total	Partial
16	San Jacinto (Pob.)	87	322			
10	San Jose (Pob.)	54	216			
1	San Lorenzo (Pob.)	86	354			
26	San Marcelinno (Pob.)	82	328			
52 - A	San Mateo					
23	San Matias (Pob.)	20	120			
20	San Miguel (Pob.)	65	195			
21	San Pedro (Pob.)	22	110			
5	San Pedro (Pob.)					
18	San Quirino (Pob.)					
8	San Vicente (Pob.)	116	464			
9	Santa Angela (Pob.)	103	412			
11	Santa Balbina (Pob.)	75	240			
25	Santa Cayetana (Pob.)	70	353			
2	Santa Joaquina (Pob.)					
19	Santa Marcela (Pob.)	76	304			
30 - B	Santa Maria	175	855			
39	Santa Rosa	75	321	1		
14	Santo Tomas (Pob.)	52	262			
29	Santo Tomas (Pob.)	30	125			1
30 - A	Suyo	15	78			
31	Talingaan	15	75			
45	Tangid	70	339			
55 - C	Vira					
44	Zamboanga	50	248			1
	Total	4,592	19,697	1	25	11

Note:

- 1) Rice - Seedling stage (newly planted)
- 2) Infrastructure Damage - includes Roads & Drainage; River Control Irrigation System (RIS)

TABLE 4.2-5

FLOOD DAMAGE TO CROPS

No.	Name of Barangay	Area (Ha)	Agricultural Product (in pesos)								Total (P)			
			G. Beans	Eggplant	Patola	Ampalaya	Squash	Peanut	Yellow Corn	Green Corn		Rice		
42	Apaya													
36	Araniw													
56	A Bacsil North	3.00										22,750	20,000	42,750
56	B Bacsil South	5										45,500	30,000	75,500
41	Balacad													
40	Balatong													
55	A Barit-Pandan													
47	Bengcag													
50	Burtong	0.35	27,273	16,000										43,273
60	A Caoacan													
48	A Cabungaan North	0.70	27,273	16,000	15,000	24,000								82,273
48	B Cabungaan South	1	27,273	24,000	15,000	24,000								90,273
37	Calayab	4.00											2,880	2,880
54	B Camangaan	1.75	27,273										360	28,033
58	Casili	2.45	27,273		60,000	60,000	24,000			400			540	171,813
61	Cataban													
43	Cavit	0.40	27,273	24,000										51,273
49	Darayday													
59	B Dibua North													
59	A Dibua South													
34	B Gabu Norte East													
34	A Gabu Norte West													
35	Gabu Sur													
32	C La Paz East													
33	B La Paz Proper													

No.	Name of Barangay	Area (Ha)	Agricultural Product (in pesos)							Total (P)			
			G. Beans	Eggplant	Patola	Ampalaya	Squash	Peanut	Yellow Corn		Green Corn	Rice	
32 - B	La Paz West												
54 A	Lagui-Sail												
32 A	La Paz East												
33 A	La Paz Proper												
52 - B	Lataag												
60 - B	Madladig	3.00									2,160	2,160	
38 A	Mangato East												
38 - B	Mangato West												
62 A	Navotas North	0.25	27,273										27,273
62 - B	Navotas South	1.05			90,000		36,000						126,000
46	Naibo												
51 A	Nangalisan East												
51 - B	Nangalisan West	1.00								400			400
24	Nstra. Sra. De Consolacion (Pop.)												
7 A	Nstra. Sra. De Natividad (Pop.)												
7 - B	Nstra. Sra. De Natividad (Pop.)												
27	Nstra. Sra. De Soledad (Pop.)												
13	Nstra. Sra. De Visitacion (Pop.)												
3	Nstra. Sra. Del Rosario (Pop.)												
57	Pila	2.40	27,273		18,000								46,713
49 - B	Raraburan	0.25		40,000									40,000
53	Rioeng	1.50											1,080
55 - B	Salet-Bulangon												
6	San Agustin (Pop.)												
22	San Andres (Pop.)												
28	San Bernardo (Pop.)												
17	San Francisco (Pop.)												
4	San Guillermo (Pop.)												
15	San Guillermo (Pop.)												
12	San Isidro (Pop.)												
16	San Jacinto (Pop.)												

TABLE 4.2-6

FLOOD DAMAGE TO FISHERIES, LIVESTOCK AND POULTRY

No.	Name of Barangay	Fisheries	Livestock and Poultry	Total
42	Apaya			0
36	Araniw			0
56 - A	Bacsil North	6,550		6,550
56 - B	Bacsil South	7,350		7,350
41	Balacad			0
40	Balatong			0
55 - A	Barit-Pandan			0
47	Bengcag			0
50	Buttong			0
60 - A	Caoocan	3,000		3,000
48 - A	Cabungaan North	2,160	12,000	14,160
48 - B	Cabungaan South			0
37	Calayab			0
54 - B	Camangaan			0
58	Casili		17,000	17,000
61	Cataban			0
43	Cavit	5,700	3,000	8,700
49 - A	Darayday			0
59 - B	Dibua North			0
59 - A	Dibua South		2,400	2,400
34 - B	Gabu Norte East			0
34 - A	Gabu Norte West			0
35	Gabu Sur			0
32 - C	La Paz East			0
33 - B	La Paz Proper			0
32 - B	La Paz West			0
54 - A	Lagui-Sail			0
32 - A	La Paz East	7,350		7,350
33 - A	La Paz Proper			0
52 - B	Lataag			0
60 - B	Madiladig	1,500		1,500
38 - A	Mangato East			0
38 - B	Mangato West			0
62 - A	Navotas North	14,250		14,250
62 - B	Navotas South		1,200	1,200
46	Nalbo		600,000	600,000
51 - A	Nangalisan East			0
51 - B	Nangalisan West			0
24	Nstra. Sra. De Consolacion (Pob.)			0
7 - A	Nstra. Sra. De Natividad (Pob.)			0
7 - B	Nstra. Sra. De Natividad (Pob.)			0
27	Nstra. Sra. De Soledad (Pob.)			0
13	Nstra. Sra. De Visitacion (Pob.)			0
3	Nstra. Sra. Del Rosario (Pob.)			0
57	Pila			0
49 - B	Raraburan			0

No.	Name of Barangay	Fisheries	Livestock and Poultry	Total
53	Rioeng			0
55 - B	Salet-Bulangon			0
6	San Agustin (Pob.)			0
22	San Andres (Pob.)			0
28	San Bernardo (Pob.)			0
17	San Francisco (Pob.)			0
4	San Guillermo (Pob.)			0
15	San Guillermo (Pob.)			0
12	San Isidro (Pob.)			0
16	San Jacinto (Pob.)			0
10	San Jose (Pob.)			0
1	San Lorenzo (Pob.)			0
26	San Marcelinno (Pob.)			0
52 - A	San Mateo			0
23	San Matias (Pob.)			0
20	San Miguel (Pob.)			0
21	San Pedro (Pob.)			0
5	San Pedro (Pob.)			0
18	San Quirino (Pob.)			0
8	San Vicente (Pob.)			0
9	Santa Angela (Pob.)			0
11	Santa Balbina (Pob.)			0
25	Santa Cayetana (Pob.)			0
2	Santa Joaquina (Pob.)			0
19	Santa Marcela (Pob.)			0
30 - B	Santa Maria			0
39	Santa Rosa			0
14	Santo Tomas (Pob.)			0
29	Santo Tomas (Pob.)	9,000		9,000
30 - A	Suyo			0
31	Talingaan			0
45	Tangid			0
55 - C	Vira			0
44	Zamboanga	3,000	228,000	231,000
	Total	59,860	863,600	923,460

TABLE 4.2-7

LIST OF INFRASTRUCTURE FACILITIES

No.	Name of Barangay	Health Facility			Educational Facility				Industrial Establishment		
		Hospital	RHU	BHS	Pre School	Elementary	Secondary	Tertiary	Manufacturing	Trading	
42	Apaya										
36	Araniw										2
56 - A	Bacsil North			1		1					
56 - B	Bacsil South										
41	Balacad					1				1	
40	Balatong					1				1	
55 - A	Barit-Pandan					1				1	
47	Bengcag									3	
50	Buttong	1			1	2	1	1			2
60 - A	Caoocan			1		1				1	
48 - A	Cabungaan North			1							
48 - B	Cabungaan South					1				4	
37	Calayab										1
54 - B	Camangaan					1				2	
58	Casili					1					3
61	Cataban					1					1
43	Cavit					1					
49 - A	Darayday					1					
59 - B	Dibua North			1							

No.	Name of Barangay	Health Facility			Educational Facility				Industrial Establishment		
		Hospital	RHU	BHS	Pre School	Elementary	Secondary	Tertiary	Manufacturing	Trading	
59 - A	Dibua South				1						
34 - B	Gabu Norte East					1			1		
34 - A	Gabu Norte West				1						
35	Gabu Sur			1							
32 - C	La Paz East										
33 - B	La Paz Proper			1					4		
32 - B	Le Paz West					1					
54 - A	Lagui-Sail				1						
32 - A	La Paz East								1		
33 - A	La Paz Proper										
52 - B	Lataag										
60 - B	Madladig			1							
38 - A	Mangato East		1						2		
38 - B	Mangato West						1				
62 - A	Navotas North			1					1		
62 - B	Navotas South						1				
46	Naibo										2
51 - A	Nangalisan East								14		10
51 - B	Nangalisan West								4		1
24	Nstra. Sra. De Consolacion (Pob.)								1		1
7 - A	Nstra. Sra. De Natividad (Pob.)								4		5
7 - B	Nstra. Sra. De Natividad (Pob.)				2			1	3		1
27	Nstra. Sra. De Soledad (Pob.)								5		2
13	Nstra. Sra. De Visitacion (Pob.)				2			1	2		26
3	Nstra. Sra. Del Rosario (Pob.)							1	1		2

No.	Name of Barangay	Health Facility					Educational Facility				Industrial Establishment	
		Hospital	RHU	BHS	Pre School	Elementary	Secondary	Tertiary	Manufacturing	Trading		
2	Santa Joaquina (Pop.)		1		1						2	
19	Santa Marcela (Pop.)				1	2						3
30 - B	Santa Maria			1								
39	Santa Rosa					1					1	
14	Santo Tomas (Pop.)	1									2	14
29	Santo Tomas (Pop.)										1	1
30 - A	Suyo					1						
31	Talingaan											
45	Tangid					1						1
55 - C	Vira					1						
44	Zamboanga	5										
Total		10	3	13	13	40	13	4	130	339		

TABLE 4.2-8

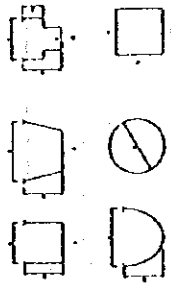
CITY ROADS AND STREETS

Name of Roads	Road (km)			Total
	Concrete	Asphalt	Gravel	
San Mateo - Lataag Bacsil Road	1.050		3.565	4.615
Laoag-Salet-Pasaqui-Vintar Road	0.350		1.898	2.248
Laoag-Ganagan Road	0.415		2.749	3.164
Laoag-Darayday Road			2.964	2.964
Laoag-Caoacan Road	7.000		1.540	8.540
Laoag-Vintar Road	4.270	0.240		4.510
Laoag-Navotas Road	0.650	0.100	2.109	2.859
Laoag-Vintar-Sarrat Road	0.150		3.385	3.535
Laoag-Vira Road	0.410		1.596	2.006
Prov'l. High Sch.-Vira Road	0.600		3.531	4.131
Laoag-La Paz Road	5.150	2.164	1.742	9.056
Barit Reservoir Road		0.200	0.834	1.034
Cavit-Gabu Norte Road	1.482		0.332	1.814
Pila-Dibua Norte Road	0.100		2.400	2.500
Navotas-Cataban Road	0.875	0.100	1.025	2.000
Cataban-Masayad Road	0.250		2.75	3.000
Siazon-Agustin Road	0.375		2.125	2.500
Abadilla Street	0.350	0.133	0.245	0.728
Don Mauricio Castro Avenue	0.083	0.418		0.501
Almazan Street			0.380	0.380
A. Mabini Street		1.933		1.933
Ambaristo Street			0.770	0.770
A. Novales Street	0.250		0.272	0.522
Andrés Castro Street	0.190	0.414	0.238	0.842
Anacleto Del Rosario Street	0.495			0.495
A. Bonifacio Street	0.319			0.319
A. Regidor Street	0.166		0.222	0.388
5 De Agosto 1912 Street	0.200		0.170	0.370
Bagumbayan Street	1.614	0.450		2.064
Balintawak Street	0.378	1.035		1.413
Gov. Ablan Avenue	0.246			0.246
Biaknabato Street	0.440		0.220	0.660
Blas Cid Street	0.160			0.160
Claro Caluya Street	0.072	0.134	0.094	0.300
Diego Silang Street	0.100		0.446	0.546
Dandan Street	0.348			0.348
Evangelista Street #2	0.123		0.422	0.545
Evangelista Street #1		0.162	0.128	0.290
Emilio Jacinto Street	0.360		0.427	0.787
Francisco Rivera Street			0.797	0.797
F.Roxas Street			0.080	0.080

Name of Roads	Road (km)			
	Concrete	Asphalt	Gravel	Total
Evangelista Street			0.160	0.160
Don Eleuterio Ruiz Street	0.255	0.329	0.016	0.600
Gov. Villanueva Street	0.183	0.078	0.257	0.518
F. Calderon Street	0.170		0.376	0.546
Gen. Malvar Street	0.180	0.636		0.816
Guerrero Street		0.100	0.310	0.410
Gen. G. Del Pilar Street			0.823	0.823
Gen. Antonio Luna Street	2.740	0.600		3.340
Hernando Street	0.105		0.700	0.805
Herrera Street			0.491	0.491
Jose Zulueta Street	0.100	0.260		0.360
Jose M. Basa Street	0.316		0.114	0.430
Jose Palma Street	0.091		0.140	0.231
Juan Luna Street	2.150	0.340		2.490
Katipunan Street	0.290		0.547	0.837
Lincoln Street			0.621	0.621
Legaspi Street			0.586	0.586
Lopez Jaena St. (Tupas Ave.)	0.176	0.068	0.332	0.576
Lampitoc Street	0.315		0.345	0.660
Listo Street	0.090		0.100	0.190
Magallanes Street			0.496	0.496
Norayta Street	0.600		0.441	1.041
Marina Dizon Street	0.052	0.228		0.280
P. Matias Castro Street	0.120		0.501	0.621
Manuel Nolasco Street	0.268	0.603	0.698	1.569
Gen Hizon Street	0.917	1.306		2.223
M. Bitanga Street			0.249	0.249
M.H. Del Pilar Street	1.723			1.723
A.P. Santos Street	0.315		0.605	0.920
Mckinley Street	1.728	0.200		1.928
N. Adriano Street			0.300	0.300
Natalia Del Castillo Street			0.465	0.465
O. Franco Street			0.220	0.220
Prietó Street			0.481	0.481
Don Vicente Llanes Avenue	0.520	0.332	1.112	1.964
Don Severo Hernando Street	1.033		0.955	1.988
Paco Roman Street	0.347	0.534	0.490	1.371

Name of Roads	Road (km)			Total
	Concrete	Asphalt	Gravel	
Proscritos De Guam Street			0.080	0.080
P. Zamora Street (Gomburza)	0.882	1.630		2.512
Gov. P. Lazaro Avenue		1.258		1.258
Rajah Matanda Street	0.115		0.436	0.551
R. Hidalgo Street	0.664	0.116		0.780
Salcedo Street			0.501	0.501
Solidaridad Street			0.586	0.586
Soriano Street			0.360	0.360
Salvador Street			0.150	0.150
Valentin Lagasca Street	0.481	0.224	1.693	2.398
D.J. Samonte Street		2.350		2.350
Pasion Avenue (1913 St.)		1.041	1.202	2.243
4 De Abril 1908 Street			0.694	0.694
Teodora Alonzo Street	0.210		0.430	0.640
Zacarias Flores Street	0.415	0.255	0.098	0.768
Lakandula Street			0.220	0.220
Soliman Street			0.506	0.506
Torres Bugallon Street			0.020	0.020
Herbosa Street			0.320	0.320
Magat Salamat Street			0.291	0.291
M. Gomez Street	0.870	0.400	0.330	1.600
Gov. Solano Street			0.200	0.200
Prov'l. Capitol Road	0.100			0.100
TOTAL	47.542	20.371	60.504	128.417

FIGURES



MANHOLE, CHECK, BARRIAGE STRUCTURE

NO.	NAME	TYPE	DATE	STATUS
1
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50

FIGURE 4.1-1 EXISTING DRAINAGE SYSTEM LAYOUT OF
LAOAG CITY WITH MAIN CANAL ELEMENTS

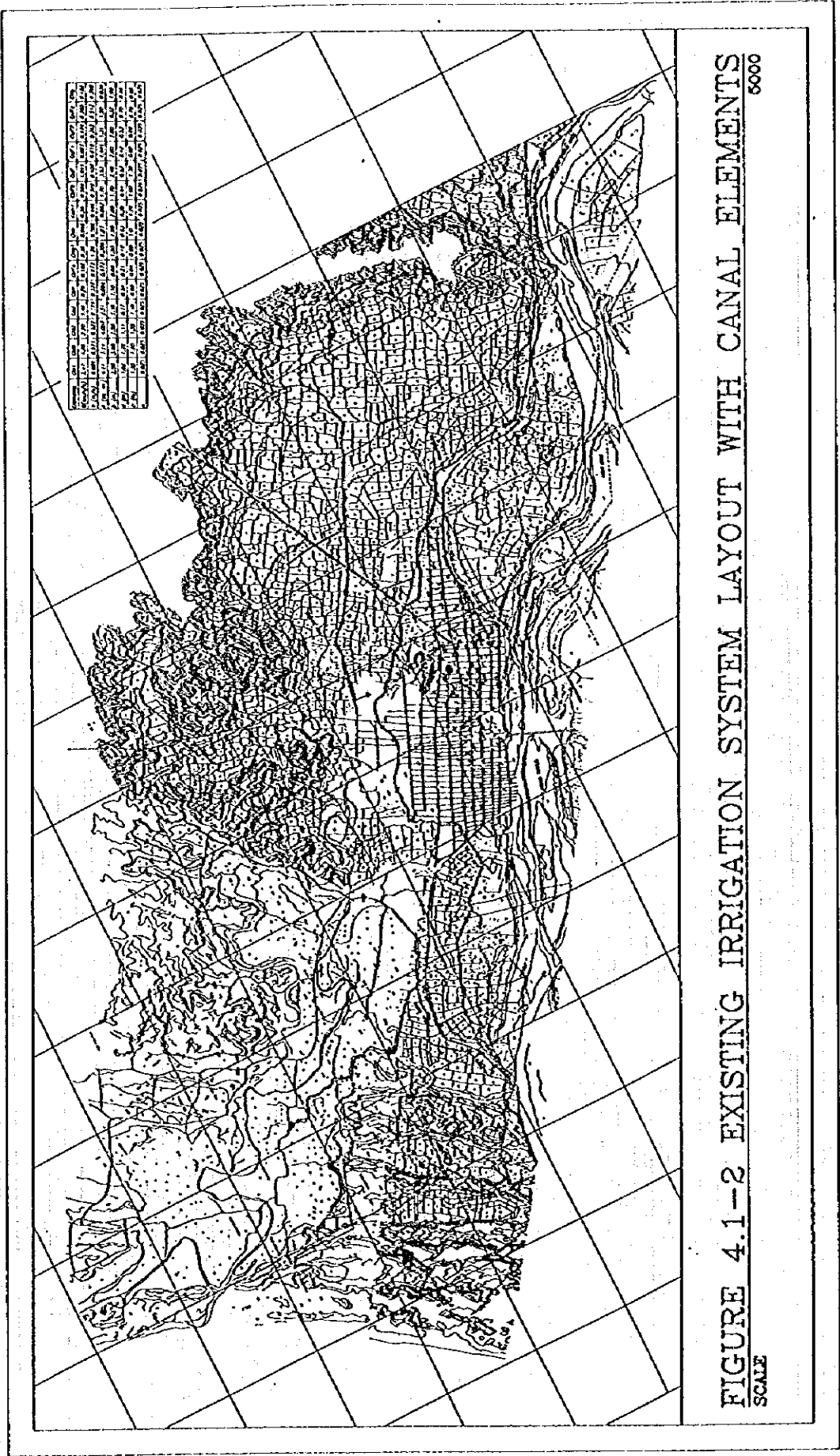


FIGURE 4.1-2 EXISTING IRRIGATION SYSTEM LAYOUT WITH CANAL ELEMENTS
 SCALE 6000

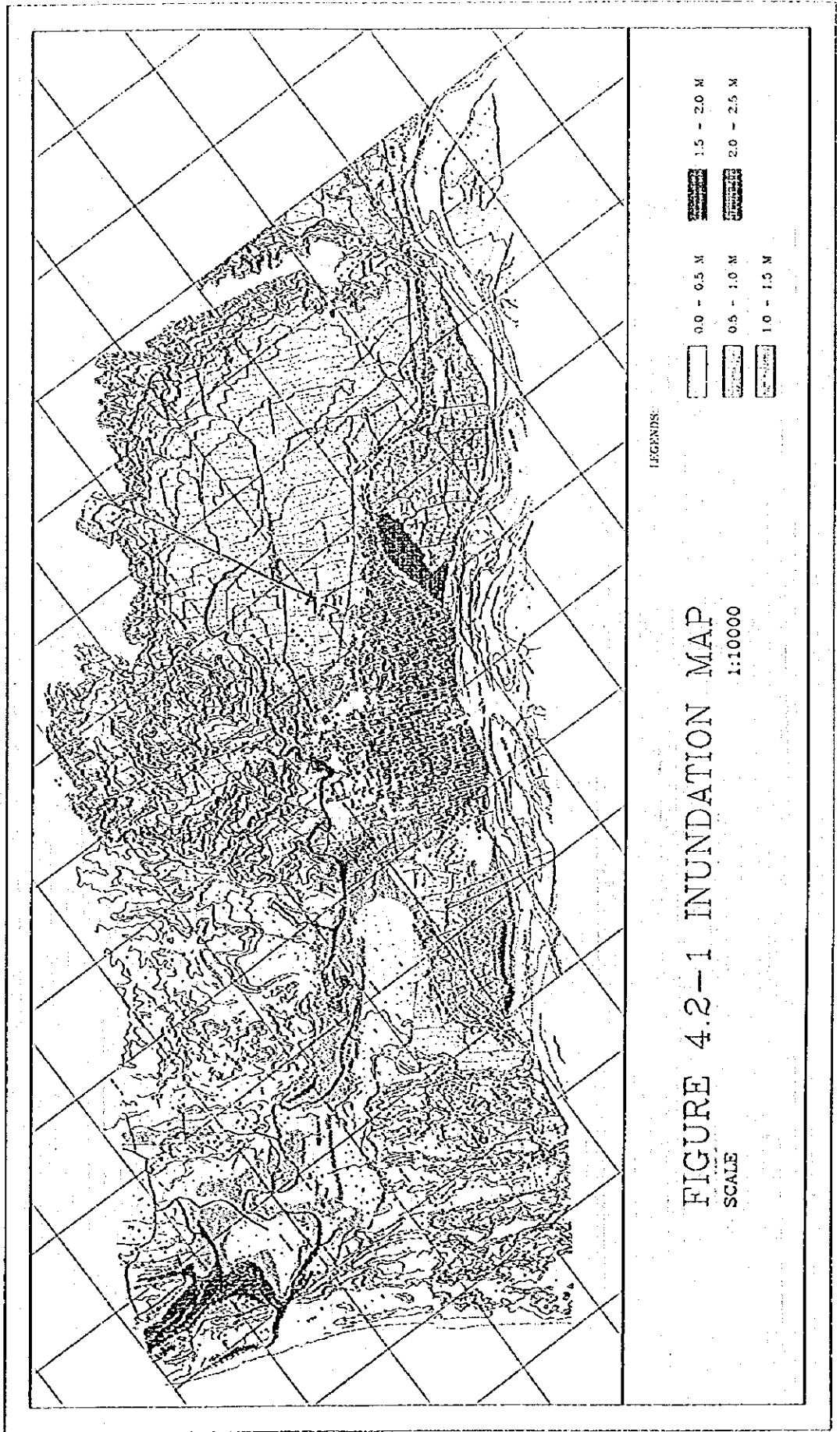


FIGURE 4.2-1 INUNDATION MAP

SCALE 1:10000

LEGEND:

- 0.0 - 0.5 M
- 0.5 - 1.0 M
- 1.0 - 1.5 M
- 1.5 - 2.0 M
- 2.0 - 2.5 M
- 2.5 - 3.0 M

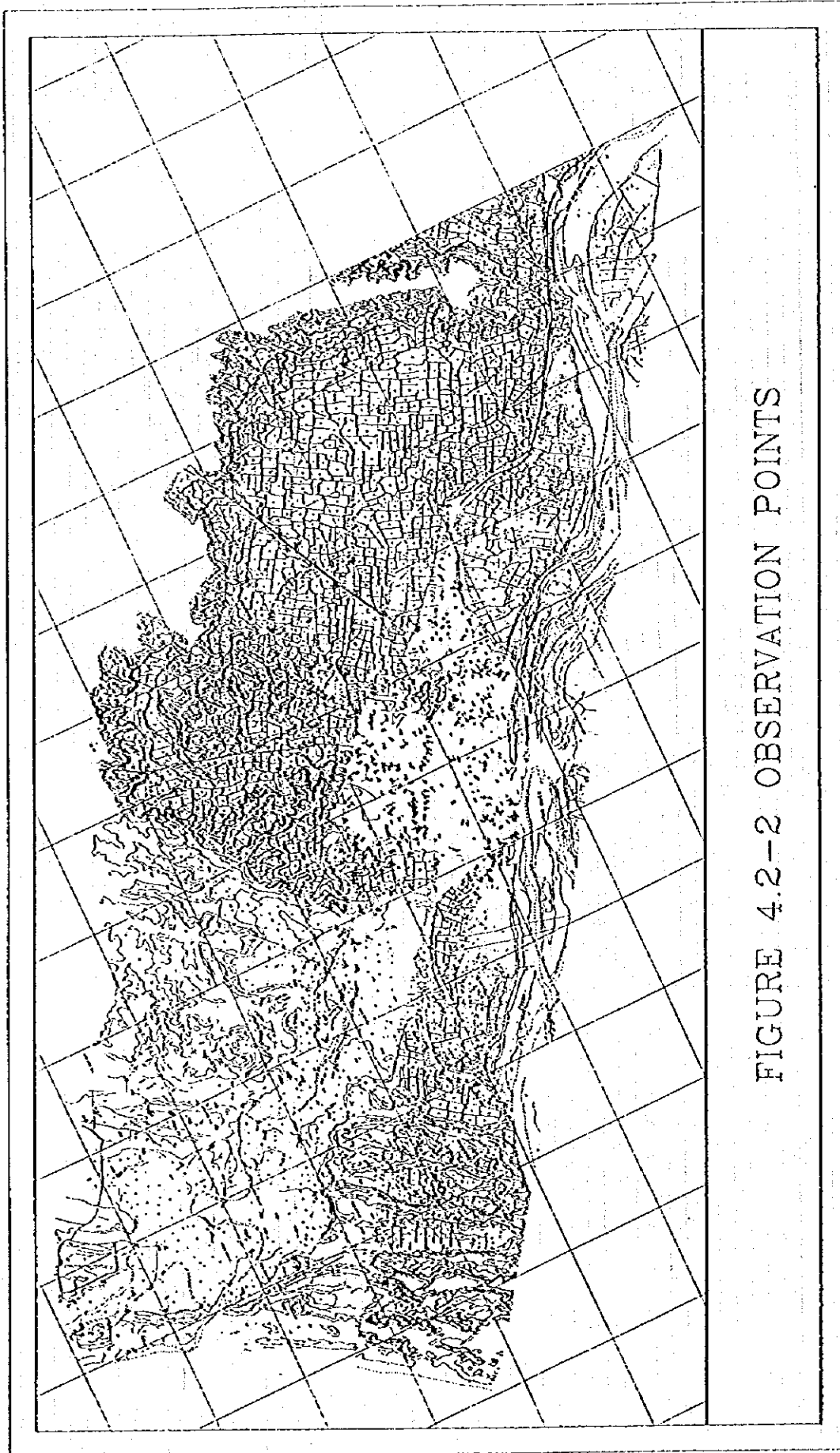


FIGURE 4.2-2 OBSERVATION POINTS

DB. III

THE RIVERBED MATERIAL

TABLE OF CONTENTS

1.0 Introduction	III - 1
2.0 Field Investigation Procedures	III - 1
3.0 Laboratory Test Procedures	III - 2

Appendix

Laboratory Test Results

1. Location Map of Sampling Points
2. Visual Description of Samples
3. Sieve Analysis/Specific Gravity
4. Particle Size Distribution Curves

THE RIVERBED MATERIAL SURVEY
for
THE STUDY ON SABO AND FLOOD CONTROL
IN LAOAG RIVER BASIN
PHILIPPINES

1.0 INTRODUCTION

This riverbed material survey was performed for the Study on Sabo and Flood Control in Laoag River Basin, Philippines. Thirty one (31) samples were taken by manual excavation from the Laoag River and its tributaries and two mountain slopes to determine the distribution of the particle size and specific gravity of the riverbed materials. The samples were brought to soils laboratory in Manila for sieve analysis and specific gravity testing.

This report incorporates all the field and laboratory procedures and results adopted in the investigation and the pictures of the riverbed sampling sites.

2.0 FIELD INVESTIGATION PROCEDURES

Thirty one (31) samples were obtained from seven rivers and two mountain slopes last May 16 to June 7, 1996. Mr. Kanehiro Morishita of CTI Engineering Co., Ltd. specified the location and number of sampling points, as shown below, and supervised the sampling procedures. The approximate location of sampling points are shown in the map in Appendix I.

Name of Sampling Point	No. of Sampling Points	Name of Samples
Laoag River	7 points	L-1 to L-7
Bongo River	6 points	B-1 to B-6
Guisit River	1 point	G-1
Cura/Labugaon River	5 points	C-1 to C-5
Solsona River	4 points	S-1 to S-4
Madongan River	3 points	M-1 to M-3
Papa River	3 points	P-1 to P-3
Mountain Slope	2 points	MS-1 and MS-2
Total	31 points	

During sampling, the upper 30 cm surface materials were first removed before the riverbed sampling was done. Photographs of the river channel at the sampling site from bank to bank, and the sampling point were taken and are compiled in Appendix II.

Most of the samples obtained from the riverbeds were either sandy gravel or gravelly sand in varying proportions. Cobbles and boulders were present in other samples. The sizes of these rocks that littered the river may be seen in the pictures. One sample obtained from the mouth of the Laoag River (L-1) yielded purely sand while that from the mountain slopes (MS-1 and MS-2) yielded mostly silty sand.

3.0 LABORATORY TEST PROCEDURES

The following laboratory tests were carried out on the riverbed samples obtained.

3.1 Sieve Analysis of Soils

Soil is passed thru a series of sieves that have a progressively smaller opening of the weight of soil retained in each sieve is determined. The results are tabulated showing the percent finer by weight and the sieve size. The percentage of gravel, sand and fine-grained soils can be obtained. For soils passing the No. 200 sieve, hydrometer test was done.

The set of sieves used and the corresponding diameter of the openings are shown below:

Sieve No.	Diameter (mm)
3"	76.2
2"	50.8
1 - 1/2"	38.1
1"	25.4
3/4"	19.1
3/8"	9.52
No. 4	4.76
No. 10	2.00
No. 20	0.84
No. 40	0.42
No. 100	0.15
No. 200	0.074

The test method used was AASHTO T88-49.

3.2 Specific Gravity

The specific gravity is the ratio of the mass of a unit volume of material at a stated temperature to the mass in air of the same volume of gas-free distilled water at a stated temperature.

The test methods used are as follows:

For particles < 0.074 mm	AASHTO T100-38
For particles 0.074 mm to 9052 mm	AASHTO T84-45
For particles > 9.52 mm	AASHTO T85-45

A compilation of all laboratory test results is presented in Appendix I of this report.

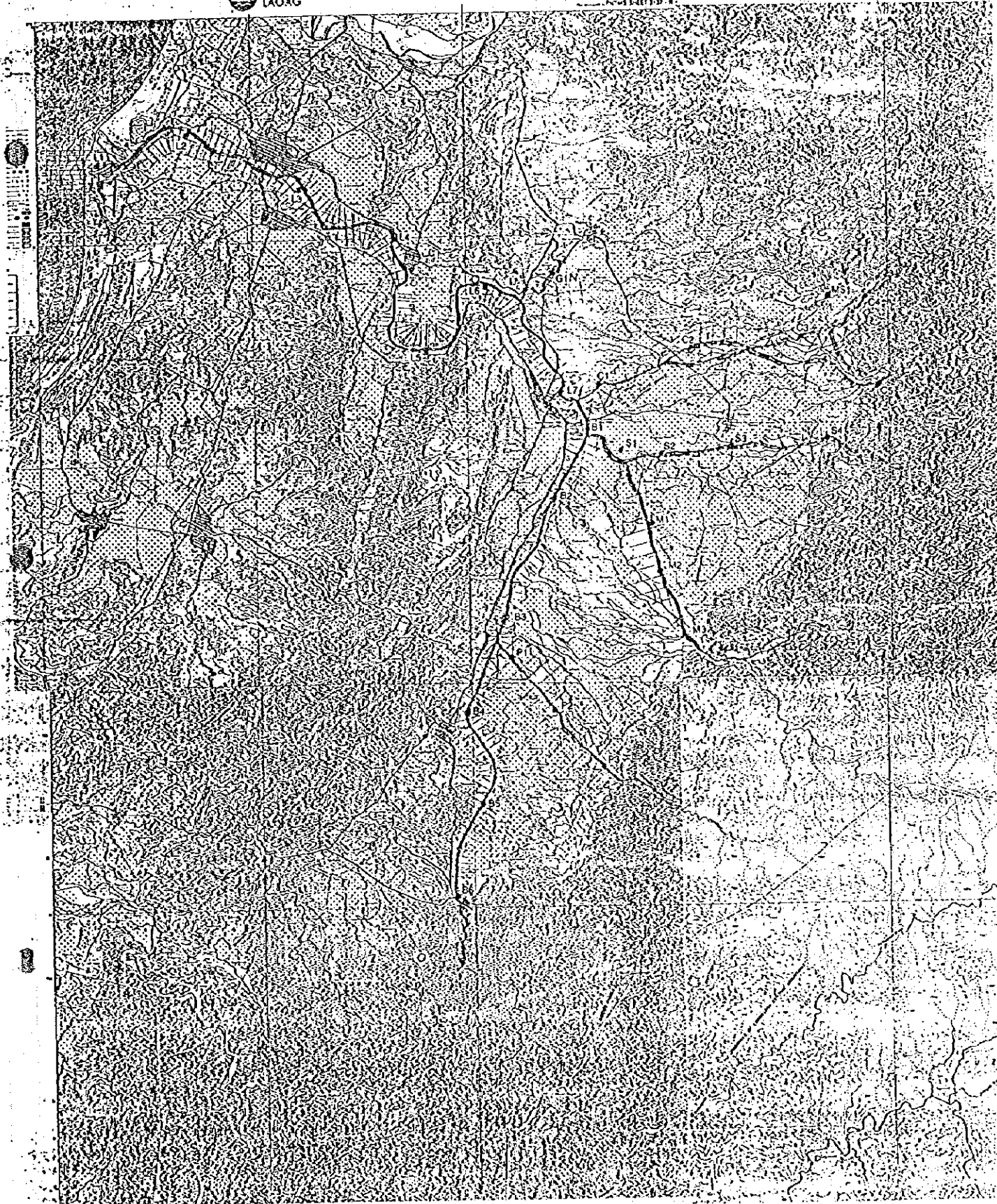
APPENDIX

LABORATORY TEST
RESULT

1. Location Map of Sampling Points

LAOAG

SOLS



GEOGRAPHICAL LOCATIONS OF SAMPLING POINTS

SAMPLE NO.	NORTHING / EASTING
L-4	N 18 10' 00.4" E 120 38' 19.3"
L-5	N 18 07' 28.6" E 120 39' 06.7"
L-6	N 18 08' 50.1" E 120 40' 25.1"
G-1	N 18 09' 08.4" E 120 42' 02.3"
C-1	N 18 06' 32.0" E 120 43' 08.6"
C-2	N 18 07' 27.8" E 120 45' 16.1"
C-3	N 18 07' 35.0" E 120 47' 54.0"
C-4	N 18 08' 29.1" E 120 49' 24.1"
C-5	N 18 06' 30.3" E 120 49' 44.4"
MS-1	N 18 08' 31.8" E 120 48' 33.2"
MS-2	N 18 05' 35.8" E 120 44' 28.8"
M-1	N 18 03' 30.9" E 120 44' 17.7"
M-2	N 18 02' 29.6" E 120 44' 28.8"
M-3	N 18 01' 02.2" E 120 45' 03.8"
S-1	N 18 05' 05.2" E 120 43' 35.2"
S-2	N 18 05' 09.5" E 120 44' 32.4"
S-3	N 18 05' 10.7" E 120 46' 12.6"
S-4	N 18 05' 20.1" E 120 48' 30.0"

2. Visual Description of Samples

PROJECT : RIVERBED MATERIAL SURVEY

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO.	VISUAL DESCRIPTION OF SAMPLES
L-1	Medium grained SAND; traces of silt; grayish brown
L-2	Gravelly SAND; grayish brown
L-3	Sandy GRAVEL; traces of silt; grayish brown
L-4	Medium grained SAND; with gravel; traces of silt; grayish brown
L-5	Gravelly SAND; grayish brown
L-6	GRAVEL; traces of sand; grayish brown
L-7	Sandy GRAVEL; grayish brown
B-1	Sandy GRAVEL; grayish brown
B-2	Sandy GRAVEL; grayish brown
B-3	Sandy GRAVEL; grayish brown
B-4	Sandy GRAVEL; grayish brown
B-5	Sandy GRAVEL; with cobbles; grayish brown
B-6	Sandy GRAVEL; with cobbles and boulders; grayish brown
G-1	Sandy GRAVEL; grayish brown
C-1	Sandy GRAVEL; grayish brown
C-2	GRAVEL; with sand, cobbles and boulders; grayish brown
C-3	Sandy GRAVEL; grayish brown
C-4	GRAVEL; with sand, cobbles and boulders; traces of silt; grayish brown
C-5	Sandy GRAVEL; grayish brown
S-1	Sandy GRAVEL; grayish brown
S-2	Sandy GRAVEL; traces of silt; brownish gray
S-3	Gravelly SAND; with cobbles and boulders; grayish brown
S-4	Sandy GRAVEL; with cobbles and boulders; grayish brown
M-1	Sandy GRAVEL; with cobbles and boulders; grayish brown
M-2	Sandy GRAVEL; with cobbles; traces of silt; grayish brown
M-3	Sandy GRAVEL; with cobbles and boulders; grayish brown
P-1	Sandy GRAVEL; with boulders; grayish brown
P-2	Sandy GRAVEL; with cobbles; grayish brown
P-3	Sandy GRAVEL; with cobbles and boulders; grayish brown
MS-1	Silty SAND; with gravel; grayish brown
MS-2	Sandy SILT; with gravel; brown

3. Sieve Analysis/Specific Gravity

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-1

SIEVE ANALYSIS

DATE TESTED : 06-08-98			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			
1 1/2"			
1"			
3/4"			
1/2"			
3/8"			
No. 4.	5.00	2853.00	100
No. 10	34.00	2819.00	99
No. 20	483.00	2336.00	82
No. 40	1660.00	676.00	24
No. 100	623.00	53.00	2
No. 200	35.00	18.00	1
REMARKS: Dm = 0.718 mm			

75
 62.5
 50
 37.5
 25
 19
 12.5
 5.4
 0.76 mm
 0.60 mm
 0.425 mm
 0.30 mm
 0.15 mm
 0.075 mm

14
 17
 18
 22
 1
 1

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE :	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of saturated sample in water,	W3
$w1-w2$	
Absorption =	$\frac{w1-w2}{w2} \times 100$
Bulk specific gravity, (SSD) $W1 / W1-W3$	
Bulk specific gravity, (DRY) $W2 / W1-W3$	
Apparent specific gravity $W2 / W2-W3$	

FINE AGGREGATE :	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of pycnometer bottle and water,	W3
Weight of pycnometer bottle, water and sample,	W4
$w1-w2$	
Absorption =	$\frac{w1-w2}{w2} \times 100$
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	
Apparent specific gravity $W2 / W2+W3-W4$	

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-2

SIEVE ANALYSIS

DATE TESTED : 06-10-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			
1 1/2"			100
1"	816.00	7596.00	90
3/4"	190.00	7406.00	88
1/2"	802.00	6604.00	79
3/8"	630.00	5974.00	71
No. 4	1703.00	4271.00	51
No. 10	1567.00	2704.00	32
No. 20	977.00	1727.00	21
No. 40	1440.00	287.00	3
No. 100	265.00	22.00	0
No. 200	21.00	1.00	0

REMARKS: Dm = 7.672 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5067.00
Weight of oven-dry sample in air, g W2	4970.00
Weight of saturated sample in water, W3	3162.00
absorption = $\frac{w1-w2}{w2} \times 100$	1.952
Bulk specific gravity, (SSD) W1 / W1-W3	2.660
Bulk specific gravity, (DRY) W2 / W1-W3	2.609
Apparent specific gravity W2 / W2-W3	2.749

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	487.30
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	978.40
absorption = $\frac{w1-w2}{w2} \times 100$	2.606
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.661
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.593
Apparent specific gravity W2 / W2+W3-W4	2.781

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-3

SIEVE ANALYSIS

DATE TESTED : 06-10-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			100
1 1/2"	299.00	6598.00	96
1"	503.00	6095.00	88
3/4"	612.00	5483.00	79
1/2"	950.00	4533.00	66
3/8"	565.00	3968.00	58
No. 4	1182.00	2786.00	40
No. 10	1113.00	1673.00	24
No. 20	852.00	821.00	12
No. 40	307.00	514.00	7
No. 100	410.00	104.00	2
No. 200	69.00	35.00	1
REMARKS:			
Dm = 11.033 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6692.00
Weight of oven-dry sample in air, g W2	6592.00
Weight of saturated sample in water, W3	4156.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.517
Bulk specific gravity, (SSD) W1 / W1-W3	2.639
Bulk specific gravity, (DRY) W2 / W1-W3	2.599
Apparent specific gravity W2 / W2-W3	2.706

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	293.70
Weight of pycnometer bottle and water, g W3	371.50
Weight of pycnometer bottle, water and sample, g W4	558.80
Absorption = $\frac{w1-w2}{w2} \times 100$	2.145
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.662
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.606
Apparent specific gravity W2 / W2+W3-W4	2.760

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-4

SIEVE ANALYSIS

DATE TESTED : 06-11-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			
1 1/2"			
1"			100
3/4"	87.00	5193.00	98
1/2"	161.00	5032.00	95
3/8"	270.00	4762.00	90
No. 4	730.00	4032.00	76
No. 10	1325.00	2707.00	51
No. 20	1698.00	1009.00	19
No. 40	707.00	302.00	6
No. 100	253.00	49.00	1
No. 200	15.00	34.00	1

REMARKS: $D_m = 3.758 \text{ mm}$

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	1814.00
Weight of oven-dry sample in air, g W2	1774.00
Weight of saturated sample in water, W3	1096.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.255
Bulk specific gravity, (SSD) $W1 / W1-W3$	2.526
Bulk specific gravity, (DRY) $W2 / W1-W3$	2.471
Apparent specific gravity $W2 / W2-W3$	2.617

FINE AGGREGATE : (Passing at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	488.80
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	978.20
Absorption = $\frac{w1-w2}{w2} \times 100$	2.291
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	2.658
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	2.599
Apparent specific gravity $W2 / W2+W3-W4$	2.763

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-5

SIEVE ANALYSIS

DATE TESTED: 06-12-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			100
1 1/2"	228.00	7464.00	97
1"	178.00	7286.00	95
3/4"	127.00	7159.00	93
1/2"	341.00	6818.00	89
3/8"	395.00	6423.00	84
No. 4	1276.00	5147.00	67
No. 10	2031.00	3116.00	41
No. 20	1522.00	1594.00	21
No. 40	1061.00	533.00	7
No. 100	472.00	61.00	1
No. 200	49.00	12.00	0

REMARKS: Dm = 5.970 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	4460.00
Weight of oven-dry sample in air, g W2	4407.00
Weight of saturated sample in water, W3	2803.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.656
Bulk specific gravity, (SSD) W1 / W1-W3	2.671
Bulk specific gravity, (DRY) W2 / W1-W3	2.628
Apparent specific gravity W2 / W2-W3	2.748

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	493.00
Weight of pycnometer bottle and water, g W3	656.30
Weight of pycnometer bottle, water and sample, g W4	978.10
Absorption = $\frac{w1-w2}{w2} \times 100$	1.420
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.657
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.620
Apparent specific gravity W2 / W2+W3-W4	2.721

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-6

SIEVE ANALYSIS

DATE TESTED: 06-13-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			100
1 1/2"	1085.00	6612.00	86
1"	1210.00	5402.00	70
3/4"	1309.00	4093.00	53
1/2"	1252.00	2841.00	37
3/8"	627.00	2214.00	29
No. 4	933.00	1281.00	17
No. 10	580.00	701.00	9
No. 20	309.00	392.00	5
No. 40	202.00	190.00	2
No. 100	165.00	25.00	0
No. 200	9.00	16.00	0
REMARKS:			
Dm = 18.837 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6465.00
Weight of oven-dry sample in air, g W2	6357.00
Weight of saturated sample in water, W3	4063.00
$\frac{w1-w2}{w2} \times 100$	
Absorption =	2.692
Bulk specific gravity, (SSD) W1 / W1-W3	2.692
Bulk specific gravity, (DRY) W2 / W1-W3	2.647
Apparent specific gravity W2 / W2-W3	2.771

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	292.10
Weight of pycnometer bottle and water, W3	371.50
Weight of pycnometer bottle, water and sample, W4	551.10
$\frac{w1-w2}{w2} \times 100$	
Absorption =	2.705
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.717
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.646
Apparent specific gravity W2 / W2+W3-W4	2.850

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : L-7

SIEVE ANALYSIS

DATE TESTED : 06-14-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	499.00	8550.00	94
1 1/2"	533.00	8017.00	89
1"	1012.00	7005.00	77
3/4"	763.00	6242.00	69
1/2"	858.00	5384.00	59
3/8"	535.00	4849.00	54
No. 4	1013.00	3836.00	42
No. 10	920.00	2916.00	32
No. 20	1011.00	1905.00	21
No. 40	1344.00	561.00	6
No. 100	499.00	62.00	1
No. 200	36.00	26.00	0
REMARKS:			
Dm = 14.422 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5115.00
Weight of oven-dry sample in air, g W2	5060.00
Weight of saturated sample in water, W3	3296.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.087
Bulk specific gravity, (SSD) W1 / W1-W3	2.812
Bulk specific gravity, (DRY) W2 / W1-W3	2.782
Apparent specific gravity W2 / W2-W3	2.868

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	491.00
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	960.30
Absorption = $\frac{w1-w2}{w2} \times 100$	1.833
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.688
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.640
Apparent specific gravity W2 / W2+W3-W4	2.774

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-1

SIEVE ANALYSIS

DATE TESTED: 06-15-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	684.00	10919.00	94
2 1/2"	690.00	10229.00	88
2"	1141.00	9088.00	78
1 1/2"	354.00	8734.00	75
1"	1528.00	7206.00	62
3/4"	630.00	6576.00	57
1/2"	1010.00	5566.00	48
3/8"	576.00	4990.00	43
No. 4	1122.00	3868.00	33
No. 10	938.00	2930.00	25
No. 20	917.00	2013.00	17
No. 40	1388.00	625.00	5
No. 100	575.00	50.00	0
No. 200	34.00	16.00	0
REMARKS: Om = 24.112 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6400.00
Weight of oven-dry sample in air, g W2	6322.00
Weight of saturated sample in water, W3	3993.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.234
Bulk specific gravity, (SSD) W1 / W1-W3	2.648
Bulk specific gravity, (DRY) W2 / W1-W3	2.616
Apparent specific gravity W2 / W2-W3	2.703

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	488.10
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	980.50
Absorption = $\frac{w1-w2}{w2} \times 100$	2.438
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.691
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.627
Apparent specific gravity W2 / W2+W3-W4	2.807

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-2

SIEVE ANALYSIS

DATE TESTED : 06-17-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	986.00	7594.00	89
1 1/2"	320.00	7274.00	85
1"	327.00	6947.00	81
3/4"	840.00	6107.00	71
1/2"	1004.00	5103.00	59
3/8"	668.00	4435.00	52
No. 4	1321.00	3114.00	36
No. 10	1068.00	2046.00	24
No. 20	1072.00	974.00	11
No. 40	620.00	354.00	4
No. 100	312.00	42.00	0
No. 200	27.00	15.00	0
REMARKS: Dm = 15.363 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6218.00
Weight of oven-dry sample in air, g W2	6135.00
Weight of saturated sample in water, W3	3861.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.353
Bulk specific gravity, (SSD) W1 / W1-W3	2.638
Bulk specific gravity, (DRY) W2 / W1-W3	2.603
Apparent specific gravity W2 / W2-W3	2.698

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	295.50
Weight of pycnometer bottle and water, g W3	371.50
Weight of pycnometer bottle, water and sample, g W4	561.30
Absorption = $\frac{w1-w2}{w2} \times 100$	1.523
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.722
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.681
Apparent specific gravity W2 / W2+W3-W4	2.796

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-3

SIEVE ANALYSIS

DATE TESTED : 06-17-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	368.00	8397.00	96
1 1/2"	765.00	7632.00	87
1"	1196.00	6436.00	73
3/4"	882.00	5554.00	63
1/2"	1178.00	4376.00	50
3/8"	613.00	3763.00	43
No. 4	999.00	2764.00	32
No. 10	715.00	2049.00	23
No. 20	543.00	1506.00	17
No. 40	1021.00	485.00	6
No. 100	445.00	40.00	0
No. 200	31.00	9.00	0
REMARKS:			
Dm = 17.030 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6235.00
Weight of oven-dry sample in air, g W2	6105.00
Weight of saturated sample in water, W3	3913.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.129
Bulk specific gravity, (SSD) W1 / W1-W3	2.685
Bulk specific gravity, (DRY) W2 / W1-W3	2.629
Apparent specific gravity W2 / W2-W3	2.785

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	486.10
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	978.30
Absorption = $\frac{w1-w2}{w2} \times 100$	2.859
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.660
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.586
Apparent specific gravity W2 / W2+W3-W4	2.792

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-4

SIEVE ANALYSIS

DATE TESTED :		06-18-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			100
2 1/2"			94
2"	440.00	7450.00	94
1 1/2"	237.00	7213.00	91
1"	734.00	6479.00	82
3/4"	483.00	5996.00	76
1/2"	968.00	5028.00	64
3/8"	661.00	4367.00	55
No. 4	1344.00	3023.00	38
No. 10	1182.00	1841.00	23
No. 20	966.00	875.00	11
No. 40	630.00	245.00	3
No. 100	199.00	46.00	1
No. 200	19.00	27.00	0

REMARKS: Dm = 13.674 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5095.00
Weight of oven-dry sample in air, g W2	4945.00
Weight of saturated sample in water, W3	3135.00
Absorption = $\frac{w1-w2}{w2} \times 100$	3.033
Bulk specific gravity, (SSD) W1 / W1-W3	2.599
Bulk specific gravity, (DRY) W2 / W1-W3	2.523
Apparent specific gravity W2 / W2-W3	2.732

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	487.20
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	975.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.627
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.614
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.547
Apparent specific gravity W2 / W2+W3-W4	2.729

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-5

SIEVE ANALYSIS

DATE TESTED : 06-19-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	930.00	8435.00	90
2 1/2"	1078.00	7357.00	79
2"	335.00	7022.00	75
1 1/2"	652.00	6370.00	68
1"	820.00	5550.00	59
3/4"	507.00	5043.00	54
1/2"	928.00	4115.00	44
3/8"	461.00	3654.00	39
No. 4	887.00	2767.00	30
No. 10	857.00	1910.00	20
No. 20	684.00	1226.00	13
No. 40	835.00	391.00	4
No. 100	313.00	78.00	1
No. 200	53.00	25.00	0
REMARKS:			
Dm = 28.009 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6411.00
Weight of oven-dry sample in air, g W2	6252.00
Weight of saturated sample in water, W3	3900.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.543
Bulk specific gravity, (SSD) W1 / W1-W3	2.553
Bulk specific gravity, (DRY) W2 / W1-W3	2.490
Apparent specific gravity W2 / W2-W3	2.658

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	478.10
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	975.60
Absorption = $\frac{w1-w2}{w2} \times 100$	4.581
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.622
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.507
Apparent specific gravity W2 / W2+W3-W4	2.832

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : B-6

SIEVE ANALYSIS

DATE TESTED : 06-20-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			100
1 1/2"	1365.00	7130.00	84
1"	735.00	6395.00	75
3/4"	1082.00	5313.00	63
1/2"	816.00	4597.00	55
3/8"	1370.00	3327.00	39
No. 4	699.00	2628.00	31
No. 10	1323.00	1305.00	15
No. 20	692.00	613.00	7
No. 40	281.00	332.00	4
No. 100	206.00	126.00	1
No. 200	60.00	66.00	1

REMARKS: Dm = 15.906 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6131.00
Weight of oven-dry sample in air, g W2	5980.00
Weight of saturated sample in water, W3	3717.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.525
Bulk specific gravity, (SSD) W1 / W1-W3	2.540
Bulk specific gravity, (DRY) W2 / W1-W3	2.477
Apparent specific gravity W2 / W2-W3	2.643

FINE AGGREGATE :	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	476.50
Weight of pycnometer bottle and water, g W3	686.30
Weight of pycnometer bottle, water and sample, g W4	972.70
Absorption = $\frac{w1-w2}{w2} \times 100$	4.932
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.583
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.461
Apparent specific gravity W2 / W2+W3-w4	2.801

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY: RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : G-1

SIEVE ANALYSIS

DATE TESTED: 06-21-95			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	255.00	7520.00	97
1 1/2"	1000.00	6520.00	84
1"	995.00	5525.00	71
3/4"	662.00	4863.00	63
1/2"	740.00	4123.00	53
3/8"	505.00	3618.00	47
No. 4	895.00	2723.00	35
No. 10	1075.00	1648.00	21
No. 20	1080.00	568.00	7
No. 40	330.00	238.00	3
No. 100	107.00	131.00	2
No. 200	22.00	109.00	1
REMARKS:			
Dm = 17.094 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5598.00
Weight of oven-dry sample in air, g W2	5481.00
Weight of saturated sample in water, W3	3343.00
$\text{Absorption} = \frac{w1-w2}{w2} \times 100$	2.13
Bulk specific gravity, (SSD) W1 / W1-W3	2.48
Bulk specific gravity, (DRY) W2 / W1-W3	2.43
Apparent specific gravity W2 / W2-W3	2.56

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	476.60
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	962.30
$\text{Absorption} = \frac{w1-w2}{w2} \times 100$	4.910
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.451
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.336
Apparent specific gravity W2 / W2+W3-W4	2.639

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : C-1

SIEVE ANALYSIS

DATE TESTED :		06-22-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	299.00	5637.00	95
1 1/2"	192.00	5445.00	92
1"	734.00	4711.00	79
3/4"	746.00	3965.00	67
1/2"	667.00	3298.00	56
3/8"	430.00	2868.00	48
No. 4	670.00	2198.00	37
No. 10	595.00	1603.00	27
No. 20	615.00	988.00	17
No. 40	860.00	128.00	2
No. 100	103.00	25.00	0
No. 200	13.00	12.00	0

REMARKS: Dm = 14.699 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	4998.00
Weight of oven-dry sample in air, g W2	4924.00
Weight of saturated sample in water, W3	3113.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.503
Bulk specific gravity, (SSD) W1 / W1-W3	2.651
Bulk specific gravity, (DRY) W2 / W1-W3	2.612
Apparent specific gravity W2 / W2-W3	2.719

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	489.70
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	979.20
Absorption = $\frac{w1-w2}{w2} \times 100$	2.103
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.672
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.617
Apparent specific gravity W2 / W2+W3-W4	2.770

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : C-2

SIEVE ANALYSIS

DATE TESTED : 06-24-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	1142.00	10992.00	91
2 1/2"	1511.00	9481.00	78
2"	757.00	8724.00	72
1 1/2"	1070.00	7654.00	63
1"	1083.00	6571.00	54
3/4"	812.00	5759.00	47
1/2"	853.00	4906.00	40
3/8"	445.00	4461.00	37
No. 4	983.00	3478.00	29
No. 10	1065.00	2413.00	20
No. 20	997.00	1416.00	12
No. 40	670.00	746.00	6
No. 100	363.00	383.00	3
No. 200	70.00	313.00	3

REMARKS: Dm = 30.240 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	4870.00
Weight of oven-dry sample in air, g W2	4814.00
Weight of saturated sample in water, W3	3040.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.163
Bulk specific gravity, (SSD) W1 / W1-W3	2.661
Bulk specific gravity, (DRY) W2 / W1-W3	2.631
Apparent specific gravity W2 / W2-W3	2.714

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	481.00
Weight of pycnometer bottle and water, g W3	686.30
Weight of pycnometer bottle, water and sample, g W4	960.00
Absorption = $\frac{w1-w2}{w2} \times 100$	3.950
Bulk specific gravity, (SSD) W1 / W1-W3	2.424
Bulk specific gravity, (DRY) W2 / W1-W3	2.332
Apparent specific gravity W2 / W2-W3	2.568

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : C-3

SIEVE ANALYSIS

DATE TESTED : 06-24-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	308.00	8241.00	96
1 1/2"	654.00	7587.00	89
1"	1346.00	6241.00	73
3/4"	554.00	5687.00	67
1/2"	920.00	4767.00	56
3/8"	516.00	4251.00	50
No. 4	1110.00	3141.00	37
No. 10	1125.00	2016.00	24
No. 20	1245.00	771.00	9
No. 40	672.00	99.00	1
No. 100	78.00	21.00	0
No. 200	9.00	12.00	0
REMARKS:			
Dm = 15.684 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5395.00
Weight of oven-dry sample in air, g W2	5311.00
Weight of saturated sample in water, W3	3484.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.582
Bulk specific gravity, (SSD) W1 / W1-W3	2.794
Bulk specific gravity, (DRY) W2 / W1-W3	2.750
Apparent specific gravity W2 / W2-W3	2.875

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	493.50
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	983.10
Absorption = $\frac{w1-w2}{w2} \times 100$	1.317
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.729
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.694
Apparent specific gravity W2 / W2+W3-W4	2.793

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : C-4

SIEVE ANALYSIS

DATE TESTED : 06-25-98			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	982.00	6750.00	87
2 1/2"	617.00	6133.00	79
2"	540.00	5593.00	72
1 1/2"	191.00	5402.00	70
1"	496.00	4906.00	63
3/4"	315.00	4591.00	59
1/2"	295.00	4296.00	56
3/8"	331.00	3965.00	51
No. 4	548.00	3417.00	44
No. 10	854.00	2563.00	33
No. 20	1240.00	1323.00	17
No. 40	1010.00	313.00	4
No. 100	195.00	118.00	2
No. 200	49.00	69.00	1
REMARKS:			
Dm = 25.564 mm			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retaine at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5645.00
Weight of oven-dry sample in air, g W2	5580.00
Weight of saturated sample in water, W3	3517.00
w1-w2	
Absorption = $\frac{\quad}{\quad} \times 100$	1.556
w2	
Bulk specific gravity, (SSD) W1 / W1-W3	2.653
Bulk specific gravity, (DRY) W2 / W1-W3	2.622
Apparent specific gravity W2 / W2-W3	2.705

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	483.60
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	972.20
w1-w2	
Absorption = $\frac{\quad}{\quad} \times 100$	3.391
w2	
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.576
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.491
Apparent specific gravity W2 / W2+W3-W4	2.721

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : C-5

SIEVE ANALYSIS

DATE TESTED : 06-26-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	330.00	6255.00	95
1 1/2"	208.00	6047.00	92
1"	521.00	5526.00	84
3/4"	250.00	5276.00	80
1/2"	390.00	4886.00	74
3/8"	287.00	4599.00	70
No. 4	690.00	3919.00	60
No. 10	908.00	3011.00	46
No. 20	1475.00	1536.00	23
No. 40	1178.00	358.00	5
No. 100	288.00	70.00	1
No. 200	34.00	36.00	1
REMARKS:			
Dm =		10.380 mm	

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	4535.00
Weight of oven-dry sample in air, g W2	4435.00
Weight of saturated sample in water, W3	2755.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.255
Bulk specific gravity, (SSD) W1 / W1-W3	2.548
Bulk specific gravity, (DRY) W2 / W1-W3	2.492
Apparent specific gravity W2 / W2-W3	2.640

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	294.50
Weight of pycnometer bottle and water, g W3	371.50
Weight of pycnometer bottle, water and sample, g W4	557.40
Absorption = $\frac{w1-w2}{w2} \times 100$	1.858
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.629
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.581
Apparent specific gravity W2 / W2+W3-W4	2.712

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : S-1

SIEVE ANALYSIS

DATE TESTED : 06-27-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	500.00	7968.00	94
1 1/2"	823.00	7145.00	84
1"	1007.00	6133.00	72
3/4"	595.00	5543.00	65
1/2"	600.00	4943.00	58
3/8"	755.00	4188.00	49
No. 4	1135.00	3053.00	36
No. 10	953.00	2100.00	25
No. 20	1310.00	790.00	9
No. 40	684.00	106.00	1
No. 100	75.00	31.00	0
No. 200	19.00	12.00	0
REMARKS:			
Dm =		16.387 mm	

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5052.00
Weight of oven-dry sample in air, g W2	4978.00
Weight of saturated sample in water, W3	3192.00
$\frac{w1-w2}{w2} \times 100$	
Absorption =	1.487
Bulk specific gravity, (SSD) W1 / W1-W3	2.716
Bulk specific gravity, (DRY) W2 / W1-W3	2.676
Apparent specific gravity W2 / W2-W3	2.787

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	494.00
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	991.10
$\frac{w1-w2}{w2} \times 100$	
Absorption =	1.215
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.700
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.667
Apparent specific gravity W2 / W2+W3-W4	2.757

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : S-2

SIEVE ANALYSIS

DATE TESTED :		06-28-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			100
2 1/2"	618.00	9267.00	94
2"	1183.00	8084.00	82
1 1/2"	442.00	7642.00	77
1"	912.00	6730.00	68
3/4"	680.00	6050.00	61
1/2"	818.00	5232.00	53
3/8"	582.00	4650.00	47
No. 4	1216.00	3434.00	35
No. 10	993.00	2441.00	25
No. 20	1052.00	1389.00	14
No. 40	903.00	486.00	5
No. 100	387.00	99.00	1
No. 200	38.00	61.00	1

REMARKS:
D_m = 20.665 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	6575.00
Weight of oven-dry sample in air, g W2	6485.00
Weight of saturated sample in water, W3	4134.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.388
Bulk specific gravity, (SSD) W1 / W1-W3	2.694
Bulk specific gravity, (DRY) W2 / W1-W3	2.657
Apparent specific gravity W2 / W2-W3	2.758

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	293.60
Weight of pycnometer bottle and water, g W3	371.50
Weight of pycnometer bottle, water and sample, g W4	561.10
Absorption = $\frac{w1-w2}{w2} \times 100$	2.180
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.717
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.659
Apparent specific gravity W2 / W2+W3-W4	2.823

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : S-3

SIEVE ANALYSIS

DATE TESTED : 06-29-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			100
1 1/2"	398.00	8387.00	95
1"	365.00	8022.00	91
3/4"	338.00	7684.00	87
1/2"	855.00	6829.00	78
3/8"	587.00	6242.00	71
No. 4	1635.00	4607.00	52
No. 10	1855.00	2752.00	31
No. 20	2014.00	738.00	8
No. 40	625.00	113.00	1
No. 100	95.00	18.00	0
No. 200	10.00	8.00	0

REMARKS: Dm = 8.607 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5725.00
Weight of oven-dry sample in air, g W2	5625.00
Weight of saturated sample in water, W3	3590.00
absorption = $\frac{w1-w2}{w2} \times 100$	1.778
Bulk specific gravity, (SSD) W1 / W1-W3	2.681
Bulk specific gravity, (DRY) W2 / W1-W3	2.635
Apparent specific gravity W2 / W2-W3	2.764

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	492.60
Weight of pycnometer bottle and water, W3	666.30
Weight of pycnometer bottle, water and sample, W4	983.10
absorption = $\frac{w1-w2}{w2} \times 100$	1.502
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.729
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.689
Apparent specific gravity W2 / W2+W3-W4	2.802

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : S-4

SIEVE ANALYSIS

DATE TESTED :		07-01-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	777.00	10959.00	93
2 1/2"	542.00	10417.00	89
2"	323.00	10094.00	86
1 1/2"	558.00	9536.00	81
1"	965.00	8571.00	73
3/4"	705.00	7866.00	67
1/2"	996.00	6870.00	59
3/8"	764.00	6106.00	52
No. 4	1575.00	4531.00	39
No. 10	1744.00	2787.00	24
No. 20	1600.00	1187.00	10
No. 40	655.00	532.00	5
No. 100	346.00	186.00	2
No. 200	94.00	92.00	1

REMARKS:
Dm = 19.676 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	4529.00
Weight of oven-dry sample in air, g W2	4487.00
Weight of saturated sample in water, W3	2874.00
Absorption = $\frac{w1-w2}{w2} \times 100$	0.936
Bulk specific gravity, (SSD) W1 / W1-W3	2.737
Bulk specific gravity, (DRY) W2 / W1-W3	2.711
Apparent specific gravity W2 / W2-W3	2.782

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	486.00
Weight of pycnometer bottle and water, W3	666.30
Weight of pycnometer bottle, water and sample, W4	982.50
Absorption = $\frac{w1-w2}{w2} \times 100$	2.881
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.720
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.644
Apparent specific gravity W2 / W2+W3-W4	2.862

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : M-1

SIEVE ANALYSIS

DATE TESTED: 07-01-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			100
2 1/2"	1120.00	8176.00	88
2"	221.00	7955.00	86
1 1/2"	1043.00	6912.00	74
1"	1051.00	5861.00	63
3/4"	980.00	4881.00	53
1/2"	715.00	4166.00	45
3/8"	485.00	3681.00	40
No. 4	927.00	2754.00	30
No. 10	1110.00	1644.00	18
No. 20	977.00	667.00	7
No. 40	507.00	160.00	2
No. 100	130.00	30.00	0
No. 200	12.00	18.00	0

REMARKS: $D_m = 23.038 \text{ mm}$

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	7592.00
Weight of oven-dry sample in air, g W2	7528.00
Weight of saturated sample in water, W3	4847.00
Absorption = $\frac{w1-w2}{w2} \times 100$	0.850
Bulk specific gravity, (SSD) $W1 / W1-W3$	2.766
Bulk specific gravity, (DRY) $W2 / W1-W3$	2.742
Apparent specific gravity $W2 / W2-W3$	2.808

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	494.60
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	987.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.092
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	2.789
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	2.759
Apparent specific gravity $W2 / W2+W3-W4$	2.844

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : M-2

SIEVE ANALYSIS

DATE TESTED :		07-02-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	689.00	7395.00	91
2 1/2"	0.00	7395.00	91
2"	311.00	7084.00	88
1 1/2"	360.00	6724.00	83
1"	1100.00	5624.00	70
3/4"	917.00	4707.00	58
1/2"	895.00	3812.00	47
3/8"	478.00	3334.00	41
No. 4	845.00	2489.00	31
No. 10	829.00	1660.00	21
No. 20	1093.00	567.00	7
No. 40	411.00	156.00	2
No. 100	90.00	66.00	1
No. 200	8.00	58.00	1

REMARKS: Dm = 21.255 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5635.00
Weight of oven-dry sample in air, g W2	5582.00
Weight of saturated sample in water, W3	3535.00
Absorption = $\frac{w1-w2}{w2} \times 100$	0.949
Bulk specific gravity, (SSD) W1 / W1-W3	2.683
Bulk specific gravity, (DRY) W2 / W1-W3	2.658
Apparent specific gravity W2 / W2-W3	2.727

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	496.20
Weight of pycnometer bottle and water, W3	666.30
Weight of pycnometer bottle, water and sample, g W4	985.50
Absorption = $\frac{w1-w2}{w2} \times 100$	0.766
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.765
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.744
Apparent specific gravity W2 / W2+W3-W4	2.803

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : M-3

SIEVE ANALYSIS

DATE TESTED: 07-03-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	626.00	11315.00	95
2 1/2"	587.00	10728.00	90
2"	1540.00	9188.00	77
1 1/2"	1836.00	7352.00	62
1"	1367.00	5985.00	50
3/4"	645.00	5340.00	45
1/2"	623.00	4717.00	40
3/8"	382.00	4335.00	36
No. 4	725.00	3610.00	30
No. 10	803.00	2807.00	24
No. 20	1201.00	1606.00	13
No. 40	1410.00	196.00	2
No. 100	159.00	36.00	0
No. 200	32.00	6.00	0

REMARKS: $D_{95} = 28.537 \text{ mm}$

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5365.00
Weight of oven-dry sample in air, g W2	5320.00
Weight of saturated sample in water, W3	3405.00
Absorption = $\frac{w1-w2}{w2} \times 100$	0.846
Bulk specific gravity, (SSD) $W1 / W1-W3$	2.737
Bulk specific gravity, (DRY) $W2 / W1-W3$	2.714
Apparent specific gravity $W2 / W2-W3$	2.778

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	489.40
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	982.10
Absorption = $\frac{w1-w2}{w2} \times 100$	2.166
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	2.714
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	2.657
Apparent specific gravity $W2 / W2+W3-W4$	2.819

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : P-1

SIEVE ANALYSIS

DATE TESTED : 07-04-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	708.00	8815.00	93
2 1/2"	0.00	8815.00	93
2"	297.00	8518.00	89
1 1/2"	740.00	7778.00	82
1"	1193.00	6585.00	69
3/4"	897.00	5688.00	60
1/2"	1042.00	4646.00	49
3/8"	552.00	4094.00	43
No. 4	1098.00	2996.00	31
No. 10	962.00	2034.00	21
No. 20	704.00	1330.00	14
No. 40	584.00	746.00	8
No. 100	674.00	72.00	1
No. 200	67.00	5.00	0

REMARKS: $D_m = 20.688 \text{ mm}$

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5030.00
Weight of oven-dry sample in air, g W2	4971.00
Weight of saturated sample in water, W3	3228.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.187
Bulk specific gravity, (SSD) $W1 / W1-W3$	2.791
Bulk specific gravity, (DRY) $W2 / W1-W3$	2.759
Apparent specific gravity $W2 / W2-W3$	2.852

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	300.00
Weight of oven-dry sample in air, g W2	295.00
Weight of pycnometer bottle and water, g W3	371.50
Weight of pycnometer bottle, water and sample, g W4	561.20
Absorption = $\frac{w1-w2}{w2} \times 100$	1.695
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	2.720
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	2.675
Apparent specific gravity $W2 / W2+W3-W4$	2.802

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : P-2

SIEVE ANALYSIS

DATE TESTED : 07-05-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	890.00	8981.00	91
2 1/2"	0.00	8981.00	91
2"	543.00	8438.00	85
1 1/2"	662.00	7776.00	79
1"	1222.00	6554.00	66
3/4"	727.00	5827.00	59
1/2"	1015.00	4812.00	49
3/8"	572.00	4240.00	43
No. 4	1093.00	3147.00	32
No. 10	1090.00	2057.00	21
No. 20	1003.00	1054.00	11
No. 40	745.00	309.00	3
No. 100	225.00	84.00	1
No. 200	35.00	49.00	0
REMARKS:			
Dm =		22.206 mm	

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5975.00
Weight of oven-dry sample in air, g W2	5905.00
Weight of saturated sample in water, W3	3822.00
Absorption = $\frac{w1-w2}{w2} \times 100$	1.185
Bulk specific gravity, (SSD) W1 / W1-W3	2.775
Bulk specific gravity, (DRY) W2 / W1-W3	2.743
Apparent specific gravity W2 / W2-W3	2.835

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	488.30
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and water, g W3	986.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.396
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.773
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.708
Apparent specific gravity W2 / W2+W3-W4	2.896

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY: RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : P-3

SIEVE ANALYSIS

DATE TESTED: 07-06-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"	1447.00	9310.00	87
2 1/2"	0.00	9310.00	87
2"	779.00	8531.00	79
1 1/2"	1358.00	7173.00	67
1"	1148.00	6025.00	56
3/4"	441.00	5584.00	52
1/2"	741.00	4843.00	45
3/8"	445.00	4398.00	41
No. 4	1005.00	3393.00	32
No. 10	962.00	2431.00	23
No. 20	878.00	1553.00	14
No. 40	914.00	639.00	6
No. 100	571.00	68.00	1
No. 200	55.00	13.00	0

REMARKS:
Dm = 27.010 mm

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	5085.00
Weight of oven-dry sample in air, g W2	4972.00
Weight of saturated sample in water, W3	3236.00
Absorption = $\frac{w1-w2}{w2} \times 100$	2.273
Bulk specific gravity, (SSD) W1 / W1-W3	2.750
Bulk specific gravity, (DRY) W2 / W1-W3	2.689
Apparent specific gravity W2 / W2-W3	2.864

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g W1	500.00
Weight of oven-dry sample in air, g W2	491.00
Weight of pycnometer bottle and water, g W3	666.30
Weight of pycnometer bottle, water and sample, g W4	982.80
Absorption = $\frac{w1-w2}{w2} \times 100$	1.833
Bulk specific gravity, (SSD) W1 / W1+W3-W4	2.725
Bulk specific gravity, (DRY) W2 / W1+W3-W4	2.676
Apparent specific gravity W2 / W2+W3-W4	2.814

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY: RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : MS-1

SIEVE ANALYSIS

DATE TESTED:		07-08-96	
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			
2"			
1 1/2"			100
1"	90.70	2423.30	96
3/4"	28.40	2394.90	95
1/2"	65.00	2329.90	93
3/8"	57.60	2272.30	90
No. 4	202.60	2069.70	82
No. 10	262.00	1807.70	72
No. 20	370.00	1437.70	57
No. 40	162.90	1274.80	51
No. 100	339.60	935.20	37
No. 200	67.20	868.00	35

REMARKS: Dm = 3.066 m_r w/ hydrometer
3.078 m_r w/out hydrometer

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of saturated sample in water, g	W3
Absorption = $\frac{w1-w2}{w2} \times 100$	
Bulk specific gravity, (SSD) W1 / W1-W3	
Bulk specific gravity, (DRY) W2 / W1-W3	
Apparent specific gravity W2 / W2-W3	

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of pycnometer bottle and water, g	W3
Weight of pycnometer bottle, water and sample, g	W4
Absorption = $\frac{w1-w2}{w2} \times 100$	
Bulk specific gravity, (SSD) W1 / W1+W3-W4	
Bulk specific gravity, (DRY) W2 / W1+W3-W4	
Apparent specific gravity W2 / W2+W3-W4	

PROJECT : RIVERBED MATERIAL SURVEY

TESTED BY : RMR, NGA

LOCATION : Laoag River Basin, Ilocos Norte

SAMPLE NO : MS-2

SIEVE ANALYSIS

DATE TESTED: 07-08-96			
SIEVE NO.	DRY SOIL WT. RET.	WEIGHT PASSING	PERCENT PASSING
3"			
2 1/2"			100
2"	366.70	2581.30	88
1 1/2"	232.10	2349.20	80
1"	52.00	2297.20	78
3/4"	30.50	2266.70	77
1/2"	35.80	2230.90	76
3/8"	27.50	2203.40	75
No. 4	53.60	2149.80	73
No. 10	83.30	2066.50	70
No. 20	194.60	1871.90	63
No. 40	335.40	1536.50	52
No. 100	348.60	1187.90	40
No. 200	76.40	1111.50	38
REMARKS:			
Dm = 11.361 mm w/ hydrometer 11.361 mm w/out hydrometer			

SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE : (Retained at 3/8" Sieve)	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of saturated sample in water, g	W3
Absorption = $\frac{w1-w2}{w2} \times 100$	
Bulk specific gravity, (SSD) $W1 / W1-W3$	
Bulk specific gravity, (DRY) $W2 / W1-W3$	
Apparent specific gravity $W2 / W2-W3$	

FINE AGGREGATE : (Passing 3/8" Sieve)	
Weight of saturated surface dry sample in air, g	W1
Weight of oven-dry sample in air, g	W2
Weight of pycnometer bottle and water, g	W3
Weight of pycnometer bottle, water and sample, g	W4
Absorption = $\frac{w1-w2}{w2} \times 100$	
Bulk specific gravity, (SSD) $W1 / W1+W3-W4$	
Bulk specific gravity, (DRY) $W2 / W1+W3-W4$	
Apparent specific gravity $W2 / W2+W3-W4$	

PROJECT : RIVERBED MATERIAL SURVEY
 LOCATION : Laoag River Basin, Ilocos Norte

DATE : 07-11-96
 TESTED BY : RMR

DESCRIPTION OF SAMPLE :

SAMPLE NO.: MS-1

Gs of Solids : 2.56
 Wt. of Soil : 50 g

GRAIN SIZE ANALYSIS (HYDROMETER METHOD)

DATE	TIME OF READING	ELAPSED TIME (i) (min)	TEMP. (C)	ACTUAL HYDROMETER READING Ra	CORRECTED HYDROMETER READING Rc	% FINER	L (cm)	L/t (cm/min)	K	DIAMETER (D) (mm)
7-11-96	8:05									
	8:05.30	0.5	30.0	1.01100	1.01121	36.78	13.236	26.473	0.01252	0.06442
	8:06	1	30.0	1.01000	1.01021	33.50	13.509	13.509	0.01252	0.04602
	8:07	2	30.0	1.00900	1.00921	30.22	13.783	6.8916	0.01252	0.03287
	8:09	4	30.0	1.00800	1.00821	26.94	14.056	3.5141	0.01252	0.02347
	8:13	8	30.0	1.00750	1.00771	25.30	14.193	1.7741	0.01252	0.01668
	8:20	15	30.0	1.00700	1.00721	23.66	14.329	0.9553	0.01252	0.01224
	8:35	30	30.0	1.00600	1.00621	20.37	14.603	0.4867	0.01252	0.00874
	9:05	60	30.0	1.00500	1.00521	17.09	14.876	0.2479	0.01252	0.00623
	10:05	120	30.0	1.00100	1.00121	3.96	15.969	0.1330	0.01252	0.00457
	12:05	240	30.5	1.00050	1.00071	2.35	16.104	0.0671	0.012455	0.00323
7-12-96	8:06	1440	29.0	1.00000	1.00019	0.64	16.247	0.0112	0.01265	0.00134

PROJECT : RIVERBED MATERIAL SURVEY
 LOCATION : Laoag River Basin, Ilocos Norte

DATE : 07-11-96
 TESTED BY : RMR

DESCRIPTION OF SAMPLE :

SAMPLE NO.: MS-2

Gs of Solids : 2.61
 Wt. of Soil : 50 g

GRAIN SIZE ANALYSIS (HYDROMETER Method)

DATE	TIME OF READING	ELAPSED TIME (t) (min)	TEMP. (C)	ACTUAL HYDROMETER READING Ra	CORRECTED HYDROMETER READING Rc	% FINER	L (cm)	L/t (cm/min)	K	DIAMETER (D) (mm)
7-11-96	8:16									
	8:16.30	0.5	30.0	1.01250	1.01271	20.60	12.826	25.653	0.012322	0.06241
	8:17	1	30.0	1.01100	1.01121	18.17	13.236	13.236	0.012322	0.04483
	8:18	2	30.0	1.01000	1.01021	16.55	13.509	6.7549	0.012322	0.03203
	8:20	4	30.0	1.00900	1.00921	14.93	13.783	3.4458	0.012322	0.02287
	8:24	8	30.0	1.00800	1.00821	13.31	14.056	1.7570	0.012322	0.01633
	8:31	15	30.0	1.00700	1.00721	11.68	14.329	0.9553	0.012322	0.01204
	8:46	30	30.0	1.00600	1.00621	10.06	14.603	0.4867	0.012322	0.00860
	9:16	60	30.0	1.00500	1.00521	8.44	14.876	0.2479	0.012322	0.00614
	10:16	120	30.0	1.00200	1.00221	3.58	15.696	0.1308	0.012322	0.00446
	12:16	240	30.0	1.00150	1.00171	2.77	15.833	0.0659	0.012322	0.00316
7-12-96	8:16	1440	29.0	1.00000	1.00019	0.31	16.247	0.0112	0.012452	0.00132

PROJECT : RIVERBED MATERIAL SURVEY

DATE TESTED : 07-10-96

LOCATION : Laoag River Basin, Ilocos Norte

TESTED BY : NGA

SPECIFIC GRAVITY (minus no. 4)

BOREHOLE/TESTPIT NO.	MS-1	MS-2		
Sample No.	SS-1	1		
Flask No.	1	2		
Temperature, C	29.0c	29.0c		
Dry Weight Sample, (Wo)	30.30	33.30		
Weight of Flask & Water, (Wa)	154.36	149.12		
Wa + Wo	184.66	182.42		
Weight of Flask + Water + Sample, (Wb)	172.82	169.66		
$S = \frac{W_o}{W_a + W_o - W_b}$	2.56	2.61		
Specific Gravity (average)				

SPECIFIC GRAVITY (minus no. 4)

Dry weight, W				
Volume displaced, V				
$S = \frac{W}{V}$				
Specific gravity				