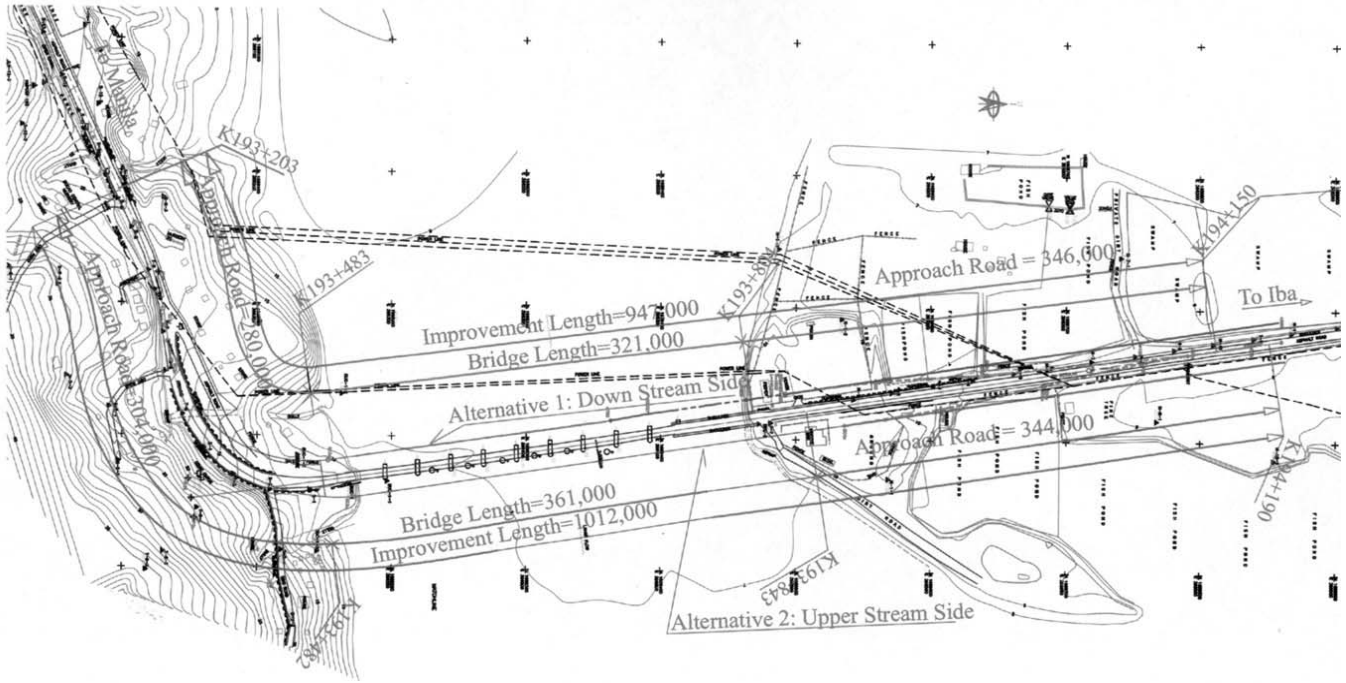
Table 15.1.1 Numerical Proposed Design Water Level in the Bucao River

the Bucao River
Q=3,800m3/s (20yr Probable Flood Discharge)

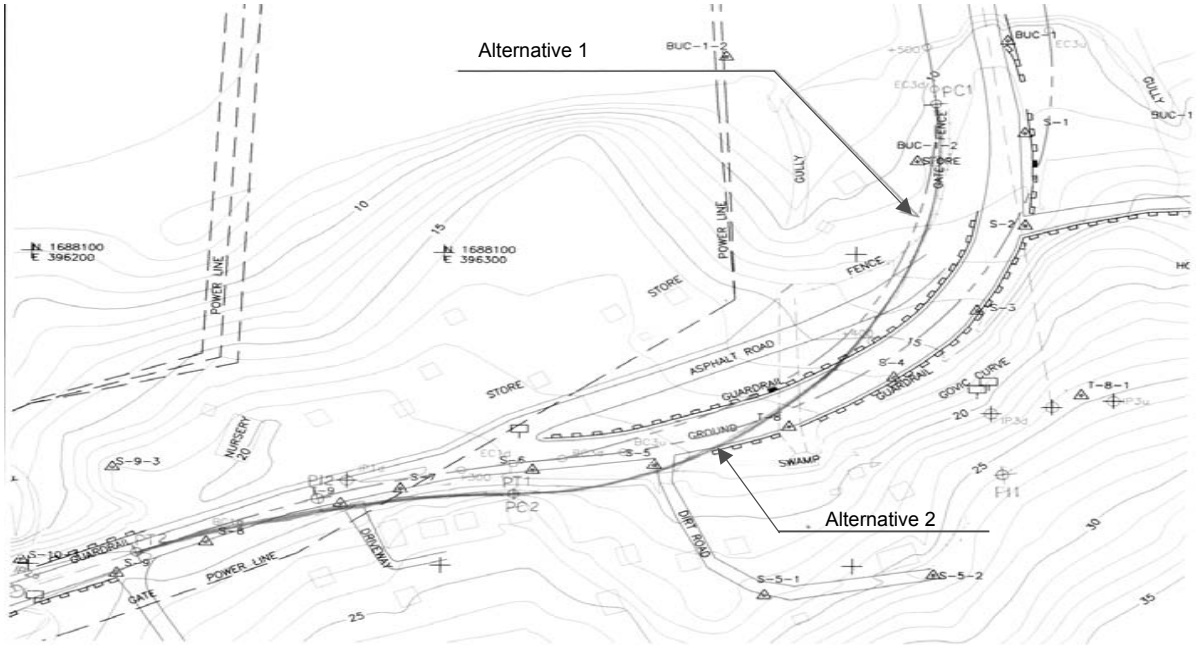
Sta. (km)	Accumulated Distance (m)	Existing Riverbed in 2002 (EL-m)	Existing Dike Crest (EL-m)	Presumed Riverbed after 20 yrs (EL-m)	Design Discharge (m^3/s)	Design Water Level (EL-m)	Design Slope Grade of D.W.L	Design Dike Crest (EL-m)	Remarks
-3.00		-10.00							
-2.40	0	0.54	3.03	1.40	3,800	**2.80**	1/ 230	4.00	River Mouth (Sta. -2.4km)
-2.20	200	1.00	1.50	2.33	3,800	3.67		4.87	
-2.00	400	1.49	3.00	3.25	3,800	4.54		5.74	
-1.75	650	2.20	5.10	4.13	3,800	5.63		6.83	
-1.50	900	2.91	5.10	5.01	3,800	6.71		7.91	
-1.25	1,150	3.55	5.70	5.81	3,800	7.80		9.00	
-1.00	1,400	4.25	6.20	6.61	3,800	8.89		10.09	
-0.85	1,550	4.60	6.20	7.20	3,800	9.54		10.74	
-0.70	1,700	5.05	6.38	7.78	3,800	10.19		11.39	
-0.55	1,850	5.30	6.57	8.18	3,800	10.84		12.04	
-0.40	2,000	5.58	6.63	8.57	3,800	11.50		12.70	
-0.35	2,050	5.73	6.69	8.90	3,800	11.71		12.91	
-0.30	2,100	5.85	6.75	9.23	3,800	11.93		13.13	
-0.25	2,150	5.98	6.82	9.53	3,800	12.15		13.35	
-0.20	2,200	6.11	6.88	9.55	3,800	12.37		13.57	
-0.15	2,250	6.18	6.94	9.75	3,800	12.58		13.78	
-0.10	2,300	6.25	10.66	9.95	3,800	12.80		14.00	
-0.05	2,350	6.33	10.66	10.15	3,800	13.02		14.22	
0.00	2,400	6.40	10.66	10.16	3,800	13.23		14.43	Bucao Bridge (Sta. 0.0km)
0.05	2,450	6.63	10.62	10.42	3,800	13.45		14.65	
0.10	2,500	6.86	10.58	10.68	3,800	13.67		14.87	
0.20	2,600	7.09	10.49	10.94	3,800	**14.10**	1/ 375	15.30	
0.30	2,700	7.35	10.41	11.26	3,800	14.37		15.57	
0.40	2,800	7.59	10.33	11.57	3,800	14.64		15.84	
0.60	3,000	8.09	10.16	11.47	3,800	15.17		16.37	
1.00	3,400	9.80	13.07	13.00	3,800	16.24		17.44	
1.50	3,900	11.32	15.72	15.09	3,800	17.57		18.77	
2.00	4,400	13.64	18.89	17.56	3,800	**18.90**	1/ 285	20.10	
3.00	5,400	16.65	21.36	20.71	3,800	22.41		23.61	
4.00	6,400	18.95	24.20	21.92	3,800	**25.92**	1/ 300	27.12	
5.00	7,400	24.80	28.14	25.40	3,800	29.26		30.46	
5.50	7,900	26.80	31.80	26.67	3,800	30.92		32.12	Baquilan River (Sta. 5.5km)
6.00	8,400	28.75		27.94	2,900	32.59			
6.50	8,900	30.89		31.54	2,900	34.26			
7.00	9,400	34.01		35.01	2,900	**35.92**	1/ 175		
7.50	9,900	37.06		37.44	2,900	38.78			
8.00	10,400	39.65		40.14	2,900	41.64			
8.25	10,650	40.57		41.42	2,900	43.06			
8.50	10,900	41.79		42.66	2,900	44.49			
8.75	11,150	43.31		44.13	2,900	45.92			
9.00	11,400	44.05		45.19	2,900	47.35			
9.25	11,650	44.97		46.87	2,900	48.78			
9.50	11,900	46.19		48.72	2,900	50.21			
9.75	12,150	47.71		49.28	2,900	**51.64**	1/ 90		
10.00	12,400	50.15		51.69	2,900	54.41			Malomboy (Sta. 10.0km)
10.25	12,650	51.67		54.31	2,900	57.19			
10.50	12,900	53.20		56.67	2,900	59.97			
10.75	13,150	54.72		58.53	2,900	**62.75**	1/ 200		
11.00	13,400	57.33		61.70	2,900	64.00			
11.50	13,900	60.38		65.06	2,900	66.50			
12.00	14,400	63.80		66.98	2,900	69.00			Upper Bucao River (Sta. 12.0km)
13.00	15,400	71.02		73.12	1,500	**74.00**	1/ 110		
14.00	16,400	80.11		81.73	1,500	83.09			

Table 15.2.1 Comparison of the Bucao Bridge Location for Reconstruction

			Alternative 1 **Down Stream Side**				Alternative 2 **Upper Stream Side**			
Profile										
Evaluation items	Construction Cost	70	70	Amount (mill.pesos)	Ratio	Balance (mill.pesos)	62	Amount (mill.pesos)	Ratio	Balance (mill.pesos)
				312	1.00	0		351	1.12	38
	Construction Period	5	5	24months			4	28months		
	Structure Aspect	5	5				5			
	Hydrological Advantage	10	10				6	Abutment at Iba side has broken risk by impact from side stream.		
	Alignment of Road	10	8	Radius=105m			10	Radius=120m		
Recommendation		100	98	Recommended			87	Not recommended mainly from cost aspect		

		Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)	Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)
Construction Cost	Bridge	m	321	952	306	m	361	952	344
	Road	m	626	11	7	m	651	11	7
	Total	m	947		312	m	1012		351

Table 15.2.2 Comparison Table of Alignment of Approach Road in Manila Side

			Alternative 1 **Including Straight**				Alternative 2 **Excluding Straight**			
Profile										
Evaluation items	Construction Cost	70	70	Amount (million pesos)	Ratio	Balance (million pesos)	70	Amount (million pesos)	Ratio	Balance (million pesos)
				312	1.00	0		313	1.00	1
	Construction Period	5	5	24months			5	24months		
	Structure Aspect	5	5	Bridge not including horizontal curve			5	Bridge not including horizontal curve		
	Horizontal Curvature	5	5	Radius=290m-->105m			5	Radius=280m-->109m		
	Vertical Curvature	5	5	1.730%-->0.255%			5	1.730%-->0.255%		
	Land Acquisition	5	5				4	Need near K193+300		
	Environmental Consideration	5	5				4	Great excavation near K193+300		
Recommendation		100	100	Recommended			98	Not recommended mainly from cost aspect		

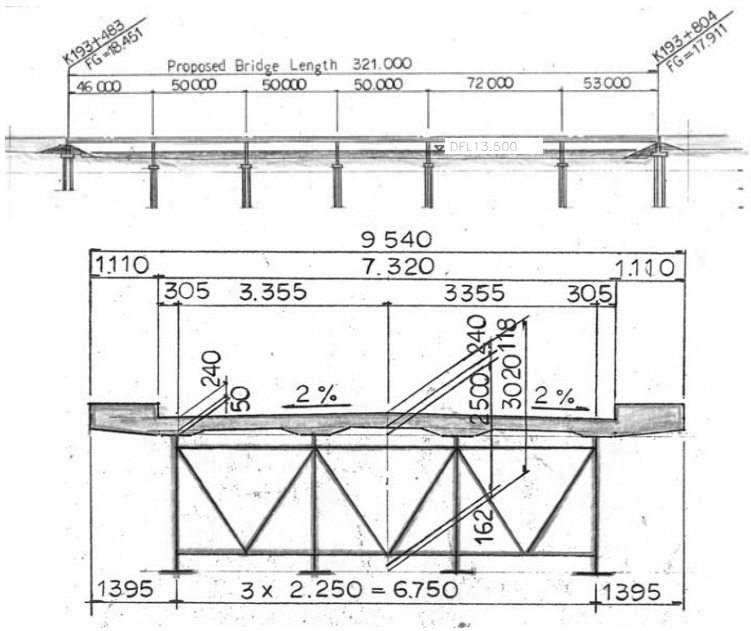
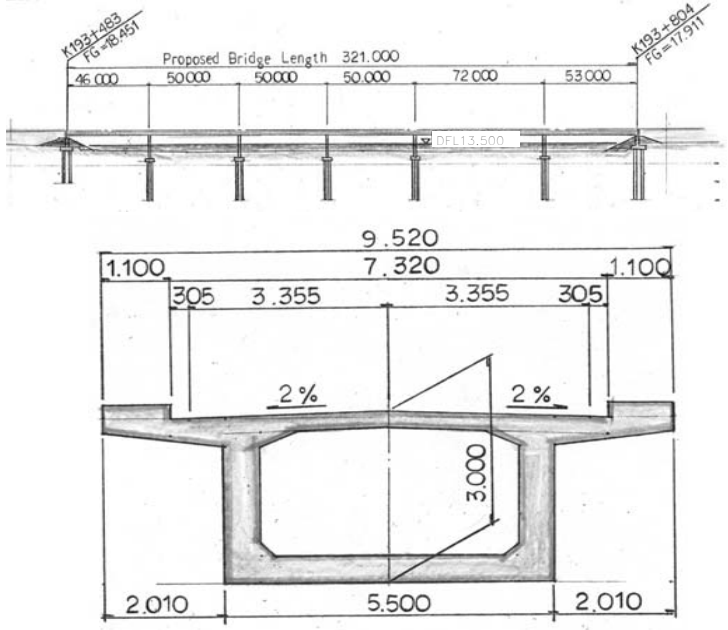
		Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)	Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)
Construction Cost	Bridge	m	321	952	306	m	321	952	306
	Road	m	626	11	7	m	620	12	8
	Total	m	947		312	m	941		313

Table 15.2.3 Applicable Span Length and Superstructure Type

Material	No	Superstructure Type	Applicable Span Length (m)							
			50	100	150	200	250	300	350	400
Steel	S1	Plate Girder								
	S2	Box Girder								
	S3	Truss								
	S4	Arch								
	S5	Cable Stayed								
	S6	Suspension								
Concrete	C1	PC I Girder								
	C2	PC Box Girder								
	C3	PC Extradosed								
	C4	PC Cable Stayed								
Hybrid	H1	Extradosed								
	H2	Cable Stayed								

Note: Generally Applicable Length
Possible Length

Table 15.2.4 Comparison Table of Bucao Bridge Type for Reconstruction

			Alternative 1 **Steel Plate Girder**				Alternative 2 **Prestressed Concrete Box Girder**			
Profile										
Evaluation items	Construction Cost	70	70	Amount (mill.pesos)	Ratio	Balance (mill.pesos)	50	Amount (mill.pesos)	Ratio	Balance (mill.pesos)
				312	1.00	0		435	1.39	122
	Construction Period	5	5	24months			4	30months		
	Structure Aspect	5	5				5			
	Seismicity	5	5				5			
	Construction execution	5	5				4	Quality control of superstructure is required more intensively than Alt. 1		
	Hydrological Advantag	5	5				5			
	Maintenance aspect	5	5	steel material is non-paint type			5			
Recommendation		100	100	Recommended			78	Not Recommended mainly from cost aspect		

		Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)	Unit	Quantities	Unit Cost (thou.pesos)	Amount (mill.pesos)
Construction Cost	Bridge	m	321	952	306	m	321	1333	428
	Road	m	626	11	7	m	626	11	7
	Total	m	947		312	m	947		435

Table 15.3.1 Numerical Proposed Design Water Level in the Sto. Tomas River

the Sto. Tomas River
Q=1,200m3/s (20yr Probable Flood Discharge)

Sta. (km)	Accumulated Distance (m)	Existing Riverbed in 2002 (EL-m)	Existing Dike Left Bank (EL-m)	Existing Dike Right Bank (EL-m)	Presumed Riverbed after 20 yrs (EL-m)	Design Discharge (m^3/s)	Design Water Level (EL-m)	Design Slope Grade of D.W.L	Design Dike Crest (EL-m)	Remarks
-2.00		-10.00								
-1.50	0	1.98	2.23		1.98	1,200	**3.95**	1/ 300	4.95	River Mouth
-1.25	250	3.01	10.54		3.13	1,200	4.78		5.78	
-1.00	500	3.76	10.08		4.00	1,200	5.62		6.62	
-0.85	650	4.26	12.35		4.57	1,200	6.12		7.12	
-0.60	900	5.09	11.51		5.34	1,200	6.95		7.95	
-0.50	1,000	5.93	8.93		5.79	1,200	7.28		8.28	
-0.30	1,200	5.86	9.46	8.05	6.30	1,200	7.95		8.95	
0.00	1,500	6.42	10.82	7.54	7.25	1,200	8.95		9.95	Maculcol Bridge
0.13	1,630	6.60	9.79	10.87	7.69	1,200	9.38		10.38	
0.33	1,830	7.11	12.97	11.24	8.37	1,200	10.05		11.05	
0.50	2,000	7.43	13.67	11.90	8.90	1,200	**10.62**	1/ 420	11.62	
1.00	2,500	9.02	13.70	13.22	10.05	1,200	11.81		12.81	
1.50	3,000	10.38	13.53	14.91	11.38	1,200	13.00		14.00	
2.00	3,500	12.49	15.17	16.46	12.76	1,200	14.19		15.19	
2.50	4,000	13.43	17.47	18.27	13.77	1,200	15.38		16.38	
3.00	4,500	14.88	17.39	17.77	15.15	1,200	**16.57**	1/ 320	17.57	
3.50	5,000	15.40	18.37	18.71	16.82	1,200	18.13		19.13	
4.00	5,500	17.65	19.84	19.93	18.62	1,200	19.69		20.69	
4.50	6,000	19.02	20.74	20.42	19.98	1,200	21.26		22.26	
5.00	6,500	20.17	23.41	22.61	21.17	1,200	22.82		23.82	
5.25	6,750	21.50	23.68	24.91	21.88	1,200	23.60		24.60	
5.50	7,000	21.91	24.32	23.95	22.36	1,200	**24.38**	1/ 330	25.38	
5.75	7,250	23.16	24.65	24.65	23.00	1,200	25.14		26.14	
6.00	7,500	22.99	25.63	25.23	23.58	1,200	25.90		26.90	
6.25	7,750	24.11	26.20	25.90	24.56	1,200	26.65		27.65	
6.50	8,000	24.70	26.51	26.34	25.49	1,200	27.41		28.41	
6.80	8,300	25.24	27.58	27.78	26.36	1,200	28.32		29.32	
7.00	8,500	26.36	26.87	27.50	27.19	1,200	28.93		29.93	
7.25	8,750	27.03	28.16	27.94	28.26	1,200	29.68		30.68	Paete Hill
7.50	9,000	28.12	28.31		29.40	1,200	**30.44**	1/ 260	31.44	
7.70	9,200	28.48	31.19		29.93	1,200	31.21		32.21	
8.00	9,500	30.29	33.79		31.37	1,200	32.37		33.37	
8.50	10,000	32.53	35.92		33.25	1,200	34.29		35.29	
9.00	10,500	35.03	37.03		35.34	1,200	36.21		37.21	
9.50	11,000	36.91	38.78		36.71	1,200	**38.13**	1/ 230	39.13	
10.00	11,500	38.20	39.50		38.57	1,200	40.31		41.31	
10.50	12,000	41.46	47.11		40.89	1,200	42.48		43.48	Vega Hill
11.00	12,500	44.02	47.08		43.54	1,200	44.66		45.66	
11.50	13,000	46.65	49.80		46.12	1,200	46.83		47.83	Santa Fe River
12.00	13,500	48.92	52.35		48.01	860	**49.00**	1/ 170	50.00	
12.50	14,000	51.53	55.28		50.82	860	51.95		52.95	
13.00	14,500	54.65	58.37		53.75	860	54.89		55.89	
13.50	15,000	57.34	61.05		56.07	860	57.83		58.83	
14.00	15,500	60.06	65.28		59.37	860	60.77		61.77	
14.50	16,000	63.62	68.95		63.19	860	**63.71**	1/ 140	64.71	
15.00	16,500	67.25	71.89		66.49	860	67.28		68.28	
15.50	17,000	69.30	77.00		70.00	860	70.85		71.85	
16.00	17,500	73.19	80.56		73.91	860	74.42		75.42	
16.50	18,000	76.92	84.06		77.28	860	78.00		79.00	
17.00	18,500	81.26	87.55		80.55	860	**81.57**	1/ 110	82.57	
17.50	19,000	84.83	92.32		85.10	860	86.11		87.11	
18.00	19,500	90.22	93.29		90.04	860	**90.66**	1/ 130	91.66	
18.50	20,000	95.28			93.25	860	94.50			
19.00	20,500	97.78			97.11	860	**98.35**	1/ 120		
19.50	21,000	103.33			101.78	860	102.52			
20.00	21,500	106.48			106.13	860	106.68			
20.50	22,000	108.48			109.40	860	110.85			
21.00	22,500	114.95			114.53	860	**115.02**	1/ 40		Outlet of Mapanuepe Lake
21.50	23,000	127.95			126.94	680	127.52			Mt. Bagang

Table 15.3.2 Numerical Proposed Design Water Level in the Diversion Channel of the Gabor River

Q=112.1m^3/s (10-yr Probable Flood Discharge)

Sta. (m)	Accumulated Distance (m)	Design Discharge (m3/s)	Design Riverbed (EL-m)	Design Water Level (EL-m)	Design Slope Gradient of D.W.L	Design Dike Crest (EL-m)	Remarks
CA0+000	0.0	112.10	-1.50	1.43	1/ 770	2.03	River Mouth
+100	100.0	112.10	-1.21	1.56		2.16	
+200	200.0	112.10	-0.93	1.69	1/ 430	2.29	
+300	300.0	112.10	-0.64	1.92		2.52	
+400	400.0	112.10	-0.36	2.15		2.75	
+500	500.0	112.10	-0.07	2.39		2.99	
+600	600.0	112.10	0.21	2.62		3.22	
+700	700.0	112.10	0.50	2.85	1/ 350	3.45	
+800	800.0	112.10	0.79	3.14		3.74	
+900	900.0	112.10	1.07	3.42		4.02	
CA1+000	1,000.0	112.10	1.36	3.71		4.31	
+100	1,100.0	112.10	1.64	4.00		4.60	
+200	1,200.0	112.10	1.93	4.28		4.88	
+300	1,300.0	112.10	2.21	4.57		5.17	
+400	1,400.0	112.10	2.50	4.85		5.45	
+500	1,500.0	112.10	2.79	5.14		5.74	
+600	1,600.0	112.10	3.07	5.42		6.02	
+700	1,700.0	112.10	3.36	5.71		6.31	
+800	1,800.0	112.10	3.64	6.00		6.60	
+900	1,900.0	112.10	3.93	6.28		6.88	
CA2+000	2,000.0	112.10	4.21	6.57		7.17	
+100	2,100.0	112.10	4.50	6.85		7.45	Existing Gabor Bridge

Proposed Improvement Stretch

Table 15.7.1 Cost Estimate for River Training Works for Lahar Agriculture Development

Area No.	Location	Barangay	Area (ha)	Training Dike			Separation Dike			Total (P)
				Unit Rate (P)	Quantity (m)	Amount (P)	Unit Rate (P)	Quantity (m)	Amount (P)	
Area-1	Bucao, middle (Right)	Poonbato	225	31,240.02	900	28,116,018	8,053.32	4,000	32,213,280	60,329,298
Area-2	Bucao, Middle (Right)	Malomboy	31	31,240.02	1,500	46,860,030	8,053.32	1,300	10,469,316	57,329,346
Area-3(*1)	Bucao, D-stream (Right)	San Juan	200	31,240.02	0	0	8,053.32	0	0	0
Area-4	Bucao, D-stream (Right)	San Juan	120	31,240.02	2,400	74,976,048	8,053.32	0	0	74,976,048
Area-5	Marella, Left	Aglao	300	31,240.02	1,500	46,860,030	8,053.32	0	0	46,860,030
Area-6	Sto-Tomas, middle (Right)	Santa Fe	600	31,240.02	500	15,620,010	8,053.32	0	0	15,620,010
Area-7	Sto-Tomas, middle (Left)	San Rafael	250	31,240.02	5,000	156,200,100	8,053.32	0	0	156,200,100
	TOTAL		1726			368,632,236			42,682,596	411,314,832

Notes: (*1) Drainage improvement cost (P48,675,385)is not included

For Gabion Made Training Dike (per m)

Item No.	Work Item	Unit	Quantity	Unit Price (P)	Amount (P)
1	Lahar Excavation	m^3	6.00	54.66	327.96
2	Gabion	m^3	14.00	2,172.29	30,412.06
3	Bolder pitching	m^3	1.00	500.00	500.00
	Total Unit Cost per m				31,240.02

For Separation Dike (per m)

Item No.	Work Item	Unit	Quantity	Unit Price (P)	Amount (P)
1	Lahar Embankment	m^3	24.00	94.00	2,256.00
2	Covering borrow soil	m^3	12.00	419.65	5,035.80
3	Sodding	m^3	13.4	56.83	761.52
	Total Unit Cost per m				8,053.32

Table 15.7.2 Market Price, Expenses and Net Income for Selected Crop Products

No.	Item	unit	Rice-direct seeded	Corn	Sweet potato	Mung-bean	Peanut	Water-melon	Squash	Tomato	Garlic	Onion	Cassava	Gabi
1	Gross Yield	kg/ha	3,680	5,810	18,600	1,000	2,000	15,000	6,000	27,000	10,000	15,000	18,000	15,000
2	Market Price	Peso/kg	16.00	7.00	12.00	30.00	25.00	15.00	12.00	15.00	30.00	25.00	5.00	2.00
	Total Revenue	**Pesos/ha**	**58,880**	**40,670**	**223,200**	**30,000**	**50,000**	**225,000**	**72,000**	**405,000**	**300,000**	**375,000**	**90,000**	**30,000**
3	Expenses													
	a) Labor	Pesos	5,750	10,925	11,325	12,200	14,825	12,250	13,350	19,675	27,750	43,750	20,600	10,125
	b) Material Inputs	Pesos	14,206	16,048	22,416	5,366	7,790	15,792	17,706	29,754	60,250	35,306	13,920	10,800
	Total Expenses	**Pesos/ha**	**19,956**	**26,973**	**33,741**	**17,566**	**22,615**	**28,042**	**31,056**	**49,429**	**88,000**	**79,056**	**34,520**	**20,925**
4	**Net Income**	**Pesos/ha**	**38,924**	**13,697**	**189,459**	**12,434**	**27,385**	**196,958**	**40,944**	**355,571**	**212,000**	**295,944**	**55,480**	**9,075**

Souce: Aganon, C.et.al. 1995, Crop Production Technologies in Ash and Lahar Laden Areas.

Table 15.7.3 Construction Cost for Farm Land on Lahar Covered Riverside Area

Area-1 : Bucao, Mid-Stream, Right Side (Barangay Poonbato)

Development Area: 225 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	60,329,298	1	60,329,298
2	Land Development	ha	16,500	225	3,712,500
3	Soil Improvement	ha	5,200	225	1,170,000
4	Fertilizer Provision	ha	9,980	225	2,245,500
5	Water Supply System	unit	59,500	45	2,677,500
	TOTAL				70,134,798
	Project Cost				92,577,933

Area-2 : Bucao, Mid-Stream, Right Side (Barangay Malomboy)

Development Area: 31 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	57,329,346	1	57,329,346
2	Land Development	ha	16,500	31	511,500
3	Soil Improvement	ha	5,200	31	161,200
4	Fertilizer Provision	ha	9,980	31	309,380
5	Water Supply System	unit	59,500	7	416,500
	TOTAL				58,727,926
	Project Cost				77,520,862

Area-3 : Bucao, Downstream, Right Side at Swampy Area (Barangay San Juan)

Development Area: 200 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	48,675,385	1	48,675,385
2	Land Development	ha	16,500	200	3,300,000
3	Soil Improvement	ha	5,200	200	1,040,000
4	Fertilizer Provision	ha	9,980	200	1,996,000
5	Water Supply System	unit	59,500	40	2,380,000
	TOTAL				57,391,385
	Project Cost				75,756,628

Area-4 : Bucao, Downstream, Right Side at River Area (Barangay San Juan)

Development Area: 120 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	74,976,048	1	74,976,048
2	Land Development	ha	16,500	120	1,980,000
3	Soil Improvement	ha	5,200	120	624,000
4	Fertilizer Provision	ha	9,980	120	1,197,600
5	Water Supply System	unit	59,500	24	1,428,000
	TOTAL				80,205,648
	Project Cost				105,871,455

Area-5 : Marella River, Left Side facing Mapanuepe Lake (Barangay Aglao)

Development Area: 300 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	46,860,030	1	46,860,030
2	Land Development	ha	16,500	300	4,950,000
3	Soil Improvement	ha	5,200	300	1,560,000
4	Fertilizer Provision	ha	9,980	300	2,994,000
5	Water Supply System	unit	59,500	60	3,570,000
	TOTAL				59,934,030
	Project Cost				79,112,920

Area-6 : Sto-Tomas, Middle stream, Right Side (Barangay Santa Fe)

Development Area: 600 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	15,620,010	1	15,620,010
2	Land Development	ha	16,500	600	9,900,000
3	Soil Improvement	ha	5,200	600	3,120,000
4	Fertilizer Provision	ha	9,980	600	5,988,000
5	Water Supply System	unit	59,500	120	7,140,000
	TOTAL				41,768,010
	Project Cost				55,133,773

Area-7 : Sto-Tomas, Middle stream, Left Side (Barangay San Rafael)

Development Area: 250 ha

No	Item	Unit	Unit Rate (P)	Quantity	Amount (P)
1	River Training Work	L.S.	156,200,100	1	156,200,100
2	Land Development	ha	16,500	250	4,125,000
3	Soil Improvement	ha	5,200	250	1,300,000
4	Fertilizer Provision	ha	9,980	250	2,495,000
5	Water Supply System	unit	59,500	50	2,975,000
	TOTAL				167,095,100
	Project Cost				220,565,532

Table 15.8.1 Results of Water Quality Survey at Mapanuepe Lake and the Reservoir of Dizon Mine Tailing Dam

ITEM NO.	LABORATORY TEST ITEM	UNIT	METHODS OF ANALYSIS	Sampling Location/Results										Standards	
				Dizon Mining Dam		Mapanuepe Lake									
				A. Reservoir Area		B. U/S near dam		C. Central area		D. D/S near channel		E. Inlet area			
				Surface	Mid-depth	Surface	Mid-depth	Surface	Mid-depth	Surface	Mid-depth	Surface	Mid-depth		
Total Water Depth during sampling				*14.9 meters*		*11.0 meters*		*14.0 meters*		*4.0 meters*		*13.0 meters*		Class C	Class D
1	PH	-	PH meter (determined on-site)	3.57	4.19	6.3	6.16	6.02	6.26	6.36	6.65	6.23	6.56	6.5-8.5	6.0-9.0
2	BOD_5	mg/l	Azide Modification (5-day@20 C)	1.0	1.0	3.0	2.0	1.0	1.0	6.0	1.0	3.0	2.0	7	10
3	COD	mg/l	Open reflux Dichromate	9	9.0	9.0	9.0	12	8.0	16.0	16.0	12.0	16.0	100	200
4	Dissolve Oxygen	mg/l	Azide modification	8.4	8.3	8.2	7.7	8.4	8.1	8.0	7.3	7.3	8.1	5.0(min)	3.0 (min)
5	Colour	PCU	Visual Comparison	15.0	25.0	20.0	25.0	25.0	15.0	25.0	25.0	20.0	15.0	150	None
6	$NO_2^- N$	mg/l	Colorimetric	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	None	None
7	$NO_3^- - N$	mg/l	Colorimetric	7.6	7.9	1.6	1.4	0.96	1.0	0.46	0.66	<0.40	<0.40	10	None
8	$NH_4^- - N$	mg/l	Titrimetric	0.12	0.08	<0.01	0.04	0.01	0.01	0.05	<0.01	<0.01	0.01	None	None
9	Chlorides (Cl)	mg/l	Titrimetric	1.4	1.4	6.1	6.8	6.8	6.4	7.0	7.0	6.2	6.4	350	350*
10	Cyanide (Cn)	mg/l	Ion-Selective	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	None
11	Mercury (Hg)	mg/l	AAS, ColdVapor Technique	0.26	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.42	<0.0004	<0.0004	<0.0004	0.002	0.002
12	Phosphorous (P)	mg/l	Colorimetric	0.16	0.19	<0.16	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	0.4	None
13	Sulfate (SO4)	mg/l	Colorimetric	130.0	138.0	80.0	75.0	80.0	81.0	92.0	96.0	74.0	79.0	None	None
14	Iron (Fe)	mg/l	AAS	579.9	617.0	0.14	0.32	0.16	0.10	0.11	0.13	0.09	0.05	None	5.0*
15	Manganese (Mn)	mg/l	AAS	880.0	880.0	361.0	341.0	331.0	310.0	310.0	320.0	268.0	259.0	None	0.2*
16	Zinc (Zn)	mg/l	AAS	1.7	1.7	0.31	0.32	0.32	0.45	0.28	0.30	0.30	0.32	None	2.0*
17	Lead (Pb)	mg/l	ASV	0.06	0.06	0.11	0.07	0.10	0.14	0.14	0.12	0.15	0.15	0.05	5.0*
18	Chromium (Cr (VI))	mg/l	Colorimetric	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.05	0.01
19	Cadmium (Cd)	mg/l	ASV	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.01	0.05
20	Arsenic (As)	mg/l	AAS, Hydrite generation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.01
21	Fluoride (Fl)	mg/l	Colorimetric	0.95	1.0	0.60	0.54	0.52	0.72	0.80	0.50	0.53	0.50	None	1.0
22	Phenols	mg/l	Colorimetric	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.03	0.02	None
23	Calcium (Ca)	mg/l	AAS, Flame	64.2	61.2	63.8	63.4	63.0	63.8	87.0	84.0	62.0	62.0	None	None
24	Magnesium (Mg)	mg/ml	AAS, Flame	40.8	49.0	32.0	38.0	38.0	38.0	43.0	46.0	41.0	49.0	None	None
25	Copper(Cu)	mg/l	AAS, Flame	391.4	407.0	0.54	0.50	0.53	0.53	0.04	0.19	<0.04	<0.04	0.05	0.2*
26	EC	µ S/cm	EC meter (determined on-site)	1120.0	1110.0	610.0	590.0	630.0	610.0	680.0	700.0	610.0	580.0	None	300*
27	Water Temperature	^0C	Thermometer (determined on-site)	26	26	21.5	21.5	26.0	22.0	27.0	27.0	26.5	26.0	-	-
28	Air Temperature	^0C	Thermometer (determined on-site)	31	31	31	31	29.0	29.0	31.0	31.0	31.0	31.0	-	-

NOTE: Standards are based on DENR Administrative Order # 34 (Class C – intended uses are for Fishery, Recreation and Industrial ; Class D – for Agriculture/Irrigation)
* - Based on Guidelines for Interpretation of water quality for irrigation, Wastewater Engineering

Table 15.8.2 Results of Bed Material Quality Survey for Mapanuepe Lake and Reservoir of Dizon Mine Tailing Dam

ITEM NO.	***LABORATORY TEST ITEM***	***UNIT***	***METHODS OF ANALYSIS***	***Sampling Location/Results***				
				Dizon Mining Dam	Mapanuepe Lake			
				A. Reservoir Area	B. U/S near Dam	C. Central area	D. D/S near channel	E. Inlet area
1	Organic Carbon	mg/kg	Blak& Walky Method	1,200.0	1,200.0	1,200.0	4,100.0	7,600.0
2	Total Nitrogen	mg/kg	Kjeldahl	285	284	443	354	308
3	Total Phosphorous	mg/kg	Colorimetric	8.2	1.53	1.19	2.86	46.4
4	Total Sulfur	mg/kg	Colorimetric	376	276	328	604	124
5	Mercury	mg/kg	Cold Vapor AAS	5.19	1.31	5.47	1.65	1.58
6	Zinc	mg/kg	AAS	70	41.6	67.8	46.4	111
7	Lead	mg/kg	AAS	32	27.5	31.5	9.9	27
8	Copper	mg/kg	AAS	271	120	172	486	382
9	Hexavalent Chromium	mg/kg	Colorimetric	<0.025	<0.025	<0.025	<0.025	<0.025
10	Cadmium	mg/kg	AAS	<0.003	<0.003	<0.003	<0.003	<0.003
11	Arsenic	mg/kg	Colorimetric	1.37	1.13	1.11	<0.01	0.03
12	pH	-	Gas Electrode	6.73	4.21	3.47	6.27	6.87
13	Iron	mg/kg	AAS	15,000.0	15,500.0	20,500.0	15,900.0	12,800.0
14	Manganese	mg/kg	AAS	566	174	351	204	1,952
15	Calcium	mg/kg	AAS	1,700.0	1,000.0	2,200.0	2,200.0	2,300.0
16	Magnesium	mg/kg	AAS	2,200.0	1,900.0	2,200.0	1,700.0	1,800.0

Table 16.4.1 Unit Price of Construction Works

(Unit: Peso)

No.	Description	Unit	Pinatubo Hazard Urgent Mitigation Project, Phase II										Agno River Flood Control Project, Phase II				Represented Unit Price (Average)	Ratio of LC & FC		Escalated Unit Price		
			P-1		P-3		P-4		P-5		P-6		P-III		P-IV			LC	FC	LC	FC	Total
			Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price						
1	**Dike and channel works**																					
(1)	Demolition of Existing Revetment	m^3									101(1)	1,339.40					1,339	53.36%	46.64%	743.32	637.16	1,380.48
(2)	Clearing & Grabbing, t=20cm	m^2	100(1)	7.31	100(1)	12.23	100(1)	7.03	100(1)	18.10	100(1)	10.74					11	52.87%	47.33%	9.075	7.965	17.04
(3)	Backfilling	m^3	103(7)	109.94			103(7)	24.00									67	52.39%	47.61%	36.51	32.53	69.04
(4)	Excavation	m^3			1701(2)	59.71	102(2)	39.00	1701(2)	61.54	1701(2)	52.95					53	56.24%	43.77%	31	23.66	54.66
(5)	Embankment (Lahar Material)	m^3	104(1)a	131.54	1704(1)	76.30	104(1)a	105.00	1704(1)	113.14	1704(1)	76.77					101	53.51%	46.49%	56.21	47.89	104.10
(6)	Base Concrete	m^3			405(6)	2,820.00	405(6)	2,798.00			405(6)	2,170.59					2,596	64.62%	35.38%	1744.58	936.89	2,681.47
(7)	Wet Stone Masonry, t= 30cm	m^3					504(5)	1,993.00									1,993	54.96%	45.04%	1139.08	915.68	2,054.76
(8)	Covering Borrow Soil, t=50cm	m^3	104(1)b	566.90			104(1)c	248.00									407	55.94%	44.05%	236.79	182.86	419.65
(9)	Gabion Mattress, 0.3x2x6m	m^3	509(C)	2,551.75			509(b)	2,211.00	509(2)	2,052.27	509(2)	1,592.87					2,102	67.18%	32.82%	1468.7	703.59	2,172.29
(10)	Filter Cloth, t= 10mm	m^2	SPL-510D	113.56	SPL-510D	89.59	SPL-510c	95.00	SPL-510C	124.31	SPL-510D	104.51					105	64.30%	35.70%	70.22	38.23	108.45
(11)	Gravel Pavement, t=20cm	m^3	300(2)	862.07	300(1)	452.55	300(2)	607.00	300(1)	961.31	300(2)	767.72					730	58.73%	41.28%	445.91	307.34	753.25
(12)	Sodding	m^2	610	80.92	610	60.74	610	53.00	610	48.88	610	30.44					55	66.88%	33.13%	38.25	18.58	56.83
(13)	Leveling Concrete	m^3			405(6)	2,820.00	405(6)	2,798.00			405(6)	2,170.59					2,596	64.16%	35.84%	1665.54	930.46	2,596.00
(14)	Structure Concrete	m^3	405(1)	3,833.59	405(1)	3,340.00	405(1)	2,985.00			405(1)	3,344.49					3,376	62.25%	37.75%	2101.49	1274.51	3,376.00
(15)	Reinforcing steel bar	ton	404	37,120.00	404	23,000.00	404	23,000.00			404	27,930.00					27,763	47.19%	52.79%	13107.64	14655.81	27,763.00
2	**Bridge and Road works**																					
	Road																					
(1)	Clearing & Grabbing, t=20cm	m^2					100(1)	7.03					2.1.1	9.40	cw2.2.2	6.64	8	45.22%	54.79%	3.76	4.47	8.23
(2)	Backfilling	m^3					103(7)	55.00					3.2.1.2	61.00	cw2.5	158.99	92	49.24%	50.76%	47.12	47.63	94.75
(3)	Excavation	m^3					102(5)	56.00	103(2)	154.19	103(2)	114.92	2.1.10.1	137.03	cw2.3.4	139.14	120	50.78%	49.23%	63.37	60.26	123.63
(4)	Embankment (Lahar Material)	m^3					104(1)a	105.00					2.1.3	268.08			187	43.17%	56.84%	83.96	108.41	192.37
(5)	Base Concrete	m^3					405(6)	2,798.00	405(6)	4,381.74	405(6)	2,170.59	2.1.10.3	3,221.02			3,143	67.25%	33.53%	2198.08	1075.05	3,273.13
(6)	Wet Stone Masonry, t=30cm	m^3					504(5)	1,993.00					2.1.7	1,845.97			1,919	65.82%	34.20%	1313.51	669.33	1,982.84
(7)	Covering Borrow Soil, t=50cm	m^3					104(1)c	248.00					2.1.3	268.08	cw6.2.3	695.02	404	51.51%	48.49%	216.42	199.82	416.24
(8)	Gravel Pavement, t=20cm	m^3					300(2)	607.00					2.2.4	486.60	cw6.2.5	752.25	615	54.40%	45.60%	347.94	286.05	633.99
(9)	Sodding	m^2					610	53.00					2.1.8	35.12	cw2.6	73.61	54	57.78%	42.21%	32.45	23.25	55.70
	Superstructure																					
(1)	Steel plate girder	ton													cw8.6.3&4	164,089.81	164,090	38.46%	61.54%	65638.17	102995.91	168,634.08
(2)	Deck slab	m^2													cw10.4(10	8,578.25	8,578	62.25%	37.75%	5553.22	3303.13	8,856.35
	Substructure																					
(1)	Concrete	m^3					405(1)B	5,268.06	405(1)	4,795.56	405(1)	4,220.17			cw3.7(1)	6,356.51	5,160	71.04%	28.96%	3812.29	1524.22	5,336.51
(2)	Reinforcing steel bar	ton					404	23,000.00	404	31,690.00	404	27,360.00			cw3.6(3)	38,857.16	30,227	45.56%	54.44%	14322.59	16784.38	31,106.97
(3)	Cast in place pile, 1.2m Dia.	m					400(16)	33,966.20							cw4.5	44,276.78	39,121	46.03%	53.97%	18726.06	21537.47	40,263.53
	Removal of existing bridge																					
	7m x 35m	m					S2-B	15,186									15,186	53.36%	46.64%	8427.7	7224.1	15,651.80

Note;

1.Source of data

(1) **Pinatubo Hazard Urgent Mitigation Project, Phase II**
- Package 1 : Rehabilitation and Improvement of the Southwest Corner of the Megadike
- Package 3 : Improvement of Baluyot Channel
- Package 4 : Tail Dike, Evacuation Roads and Gugu Channelization
- Package 5 : Dredging in the Delta Area/Pilot Channel Dredging & Third River
- Package 6 : Downstream Channel Improvement Passing Sasmuan

(2) **Agno River Flood Control Project, Phase II**
- Package III : Social Development for Poponto Retarding Basin
- Package IV : Hector Mendoza Bridge

2. Cost of cast in place pile of P-4 includs cost of test and permanebt casing piles.

3. Annual inflation rate appliy : LC = 4%
FC = 2%

Table 16.4.2 Salient Features of Contract Price Obtained from Three Projects

(Unit: Peso)

No.	Description	Time of Bidding	Total Contract Price (P)	Foreign Portion	Local Portion	Amount of Part A (P)	Amount of Part B (P)	General Item /Total A & B	% of Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)=(7)+(8)	(10)=((9)/(4)
1	Pinatubo hazard								
	Package I	10-00	456,471,942			8,845,562	2,109,606	10,955,168	2.4%
	Package III	5-01	233,303,765			7,881,268	1,240,661	9,121,928	3.9%
	Package IV	3-01	419,062,732			17,689,502	8,002,648	25,692,150	6.1%
	Package V	5-01	900,245,064			15,274,495	43,155,517	58,430,011	6.5%
	Package VI	5-01	345,430,948			10,249,672	11,471,900	21,721,572	6.3%
	Average % of General Item for Pinatubo project								5.0%
2	Agno I	11-97	1,121,078,114	68%	32%			129,588,188	11.6%
	F.C(P)		762,213,715	68%				86,662,852	
	L.C(P)		322,408,068		29%			32,668,654	
	VAT(P)		36,456,331		3%			10,256,682	
3	Agno II								
	Package III	12-01	496,940,728	1%	99%			33,954,590	6.8%
	F.C(P)		5,511,412	1%				5,511,413	
	L.C(P)		446,735,769		90%			25,838,965	
	VAT(P)		44,693,546		9%			2,604,212	
	Package IV	1-02	726,231,750	56%	44%			58,475,808	8.1%
	F.C(P)		408,371,682	56%				26,618,312	
	L.C(P)		296,473,407		41%			28,427,998	
	VAT(P)		21,386,661		3%			3,429,499	
	Average % of General Item for Agno project								7.4%
	Average % of General Item for the above three project								8.0%

Note;

1. Data of Item 1 are taken from the Monthly Progress Report (No.33).
2. Item 2 and Item 3 are taken from the Contractor's priced Bill of Quantities.
3. Contract prices of Item 1 do not show the foreign and local currency portion and also VAT.
4. General Item of Item 2 and 3 is not divided into Part A and B.

Table 16.4.3 Unit Price for Land Acquisition

No.	Municipality	Barangay	Selling / Buying Rate (Peso/m^2)
1	Botolan	Porac (Residential)	200 - 400
		Carael (Commercial)	750
		San. Juan (Residential)	100 - 150
2	San Marcelino	San Rafael (Residential)	100 - 200
		Rabanes (Agricultural)	200 - 300
		Mangricmot (Agricultural)	100 - 150
3	San Narciso	Alusius (Residential)	150 - 200
		Paite (Residential)	200
		San Pascual (Residential)	200 - 400

Source: Table 8.1.1 of the report of Resettlement Plan, Appendix XI

Table 16.4.4 Construction Cost of Bucao River Basin

(Unit: Peso)

No.	Description	Unit	Work Quantity	Unit Price			Amount			1. Equipment		2. Labor a. Skilled labor		2. Labor b. Unskilled labor		3. Material a. Cement		3. Material b. Aggregate		3. Material c. Steel		3. Material d. Lumber		3. Material e. Others		4. VAT		5. Overhead	
				LC	FC	Total	LC	FC	Total																				
1	**Dike construction**																												
1.1	**Left bank**																												
	i) New dike																												
	General Item	%	10%				4,549,062	3,340,024	7,889,086	0.1000	1,950,477	0.1000	381,961	0.1000	409,389	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	3,591,697	0.1000	273,871	0.1000	1,281,691
	Clearing & Grabbing	m2	100,500	9.08	7.97	17.04	912,038	800,483	1,712,520	0.6151	1,053,371	0.0630	107,889	0.0437	74,837	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	142,995	0.0720	123,301	0.1227	210,126
	Backfilling	m3	6,300	36.51	32.53	69.04	230,013	204,939	434,952	0.6801	295,811	0.0175	7,612	0.0709	30,838	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	33,404	0.1547	67,287
	Excavation	m3	32,700	31.00	23.66	54.66	1,013,700	773,682	1,787,382	0.5103	912,101	0.0754	134,769	0.0332	59,341	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	287,411	0.0619	110,639	0.1584	283,121
	Embankment (Lahar Material)	m3	254,400	51.00	43.00	94.00	12,974,400	10,939,200	23,913,600	0.5812	13,898,584	0.0429	1,025,893	0.0363	868,064	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	2,776,369	0.0660	1,578,298	0.1575	3,766,392
	Base Concrete	m3	1,100	1,744.58	936.89	2,681.47	1,919,038	1,030,579	2,949,617	0.0131	38,640	0.0109	32,151	0.1089	321,213	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	2,033,171	0.0133	39,230	0.1645	485,212
	Wet Stone Masonry	m3	9,400	1,139.08	915.68	2,054.76	10,707,352	8,607,392	19,314,744	0.0026	50,218	0.0841	1,624,370	0.0664	1,282,499	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	12,892,592	0.0153	295,516	0.1641	3,169,549
	Covering Borrow Soil	m3	31,700	236.79	182.86	419.65	7,506,243	5,796,662	13,302,905	0.1874	2,492,964	0.0015	19,954	0.0085	113,075	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	8,230,507	0.0197	262,067	0.1642	2,184,337
	Gabion Mattress	m3	4,200	1,468.70	703.59	2,172.29	6,168,540	2,955,078	9,123,618	0.0423	385,929	0.0673	614,019	0.0968	883,166	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	5,447,712	0.0206	187,947	0.1759	1,604,844
	Filter Cloth	m2	13,900	70.22	38.23	108.45	976,058	531,397	1,507,455	0.0080	12,060	0.0418	63,012	0.0688	103,713	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	1,059,439	0.0119	17,939	0.1667	251,293
	Gravel Pavement	m3	2,900	445.91	307.34	753.25	1,293,139	891,286	2,184,425	0.0953	208,176	0.0223	48,713	0.0124	27,087	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	1,511,622	0.0130	28,398	0.1650	360,430
	Sodding	m2	46,800	38.25	18.58	56.83	1,790,100	869,544	2,659,644	0.0590	156,919	0.0531	141,227	0.1241	330,062	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	1,535,147	0.0233	61,970	0.1633	434,320
	Sub total (1.1)						**50,039,683**	**36,740,266**	**86,779,948**		**21,455,251**		**4,201,569**		**4,503,284**		**0**		**0**		**0**		**0**		**39,508,662**		**3,012,578**		**14,098,603**
1.2	**Right bank**																												
	i) New dike																												
	General Item	%	10%				5,719,557	4,238,120	9,957,677	0.1000	2,609,155	0.1000	474,880	0.1000	505,182	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	4,395,516	0.1000	358,514	0.1000	1,614,430
	Clearing & Grabbing	m2	126,600	9.08	7.97	17.04	1,148,895	1,008,369	2,157,264	0.6151	1,326,933	0.0630	135,908	0.0437	94,272	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	180,132	0.0720	155,323	0.1227	264,696
	Backfilling	m3	7,000	36.51	32.53	69.04	255,570	227,710	483,280	0.6801	328,679	0.0175	8,457	0.0709	34,265	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	37,116	0.1547	74,763
	Excavation	m3	36,900	31.00	23.66	54.66	1,143,900	873,054	2,016,954	0.5103	1,029,252	0.0754	152,078	0.0332	66,963	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	324,326	0.0619	124,849	0.1584	319,486
	Embankment (Lahar Material)	m3	351,700	51.00	43.00	94.00	17,936,700	15,123,100	33,059,800	0.5812	19,214,356	0.0429	1,418,265	0.0363	1,200,071	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	3,838,243	0.0660	2,181,947	0.1575	5,206,919
	Base Concrete	m3	1,300	1744.58	936.89	2681.47	2,267,954	1,217,957	3,485,911	0.0131	45,665	0.0109	37,996	0.1089	379,616	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	2,402,838	0.0133	46,363	0.1645	573,432
	Wet Stone Masonry	m3	11,400	1139.08	915.68	2054.76	12,985,512	10,438,752	23,424,264	0.0026	60,903	0.0841	1,969,981	0.0664	1,555,371	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	15,635,696	0.0153	358,391	0.1641	3,843,922
	Covering Borrow Soil	m3	40,700	236.79	182.86	419.65	9,637,353	7,442,402	17,079,755	0.1874	3,200,746	0.0015	25,620	0.0085	145,178	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	10,567,244	0.0197	336,471	0.1642	2,804,496
	Gabion Mattress	m3	4,700	1468.70	703.59	2172.29	6,902,890	3,306,873	10,209,763	0.0423	431,873	0.0673	687,117	0.0968	988,305	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	6,096,249	0.0206	210,321	0.1759	1,795,897
	Filter Cloth	m2	15,600	70.22	38.23	108.45	1,095,432	596,388	1,691,820	0.0080	13,535	0.0418	70,718	0.0688	116,397	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	1,189,011	0.0119	20,133	0.1667	282,026
	Gravel Pavement	m3	3,200	445.91	307.34	753.25	1,426,912	983,488	2,410,400	0.0953	229,711	0.0223	53,752	0.0124	29,889	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	1,667,997	0.0130	31,335	0.1650	397,716
	Sodding	m2	62,600	38.25	18.58	56.83	2,394,450	1,163,108	3,557,558	0.0590	209,896	0.0531	188,906	0.1241	441,493	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	2,053,422	0.0233	82,891	0.1633	580,949
	Sub total (i)						**62,915,125**	**46,619,321**	**109,534,446**		**28,700,703**		**5,223,679**		**5,557,001**		**0**		**0**		**0**		**0**		**48,350,675**		**3,943,654**		**17,758,733**
	ii) Dike heightening																												
	General Item	%	10%				23,794,707	18,108,299	41,903,007	0.1000	12,566,357	0.1000	2,002,599	0.1000	1,906,478	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	17,012,548	0.1000	1,630,880	0.1000	6,784,145
	Demolition of Existing Revetment	m3	28,300	743.32	637.16	1380.48	21,035,956	18,031,628	39,067,584	0.5234	20,447,973	0.0468	1,828,363	0.0084	328,168	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	7,965,880	0.0540	2,109,650	0.1635	6,387,550
	Clearing & Grabbing	m2	471,500	9.08	7.97	17.04	4,278,863	3,755,498	8,034,360	0.6151	4,941,935	0.0630	506,165	0.0437	351,102	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	670,869	0.0720	578,474	0.1227	985,816
	Backfilling	m3	22,100	36.51	32.53	69.04	806,871	718,913	1,525,784	0.6801	1,037,686	0.0175	26,701	0.0709	108,178	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	117,180	0.1547	236,039
	Excavation	m3	156,400	31.00	23.66	54.66	4,848,400	3,700,424	8,548,824	0.5103	4,362,465	0.0754	644,581	0.0332	283,821	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	1,374,651	0.0619	529,172	0.1584	1,354,134
	Embankment (Lahar Material)	m3	1,189,200	62.33	52.56	114.89	74,126,800	62,499,067	136,625,867	0.5812	79,406,954	0.0429	5,861,250	0.0363	4,959,519	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	15,862,263	0.0660	9,017,307	0.1575	21,518,574
	Base Concrete	m3	3,900	1744.58	936.89	2681.47	6,803,862	3,653,871	10,457,733	0.0131	136,996	0.0109	113,989	0.1089	1,138,847	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	7,208,515	0.0133	139,088	0.1645	1,720,297
	Wet Stone Masonry	m3	44,300	1139.08	915.68	2054.76	50,461,244	40,564,624	91,025,868	0.0026	236,667	0.0841	7,655,275	0.0664	6,044,118	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	60,759,767	0.0153	1,392,696	0.1641	14,937,345
	Covering Borrow Soil	m3	154,600	236.79	182.86	419.65	36,607,734	28,270,156	64,877,890	0.1874	12,158,117	0.0015	97,317	0.0085	551,462	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	40,139,951	0.0197	1,278,094	0.1642	10,652,950
	Gabion Mattress	m3	14,800	1468.70	703.59	2172.29	21,736,760	10,413,132	32,149,892	0.0423	1,359,940	0.0673	2,163,688	0.0968	3,112,110	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	19,196,701	0.0206	662,288	0.1759	5,655,166
	Filter Cloth	m2	49,200	70.22	38.23	108.45	3,454,824	1,880,916	5,335,740	0.0080	42,686	0.0418	223,034	0.0688	367,099	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	3,749,958	0.0119	63,495	0.1667	889,468
	Gravel Pavement	m3	9,900	445.91	307.34	753.25	4,414,509	3,042,666	7,457,175	0.0953	710,669	0.0223	166,295	0.0124	92,469	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	5,160,365	0.0130	96,943	0.1650	1,230,434
	Sodding	m2	245,000	38.25	18.58	56.83	9,371,250	4,552,100	13,923,350	0.0590	821,478	0.0531	739,330	0.1241	1,727,888	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	8,036,558	0.0233	324,414	0.1633	2,273,683
	Sub total (ii)						**261,741,780**	**199,191,294**	**460,933,073**		**138,229,922**		**22,028,587**		**20,971,257**		**0**		**0**		**0**		**0**		**187,138,025**	0.0000	**17,939,682**		**74,625,600**
	iii Spur dike																												
	General Item	%	10%				1,910,688	1,123,550	3,034,238	0.1000	144,167	0.1000	87,657	0.1000	290,902	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	1,959,910	0.1000	52,065	0.1000	499,537
	Demolition of Existing Revetment	m3	400	743.32	637.16	1380.48	297,328	254,864	552,192	0.5234	289,017	0.0468	25,843	0.0084	4,638	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	112,592	0.0540	29,818	0.1635	90,283
	Clearing & Grabbing	m2	7,400	9.08	7.97	17.04	67,155	58,941	126,096	0.6151	77,562	0.0630	7,944	0.0437	5,510	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	10,529	0.0720	9,079	0.1227	15,472
	Backfilling	m3	1,200	36.51	32.53	69.04	43,812	39,036	82,848	0.6801	56,345	0.0175	1,450	0.0709	5,874	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	6,363	0.1547	12,817
	Excavation	m3	7,600	31.00	23.66	54.66	235,600	179,816	415,416	0.5103	211,987	0.0754	31,322	0.0332	13,792	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	66,799	0.0619	25,714	0.1584	65,802
	Embankment (Lahar Material)	m3	8000	51.00	43.00	94.00	408,000	344,000	752,000	0.5812	437,062	0.0429	32,261	0.0363	27,298	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	87,307	0.0660	49,632	0.1575	118,440
	Base Concrete	m3	8,000	1744.58	936.89	2681.47	13,956,640	7,495,120	21,451,760	0.0131	281,018	0.0109	233,824	0.1089	2,336,097	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	14,786,698	0.0133	285,308	0.1645	3,528,815
	Wet Stone Masonry	m3	2,400	1139.08	915.68	2054.76	2,733,792	2,197,632	4,931,424	0.0026	12,822	0.0841	414,733	0.0664	327,447	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	3,291,726	0.0153	75,451	0.1641	809,247
	Covering Borrow Soil	m3	0	236.79	182.86	419.65	0	0	0	0.1874	0	0.0015	0	0.0085	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	0	0.0197	0	0.1642	0
	Gabion Mattress	m3	800	1468.70	703.59	2172.29	1,174,960	562,872	1,737,832	0.0423	73,510	0.0673	116,956	0.0968	168,222	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	1,037,659	0.0206	35,799	0.1759	305,685
	Filter Cloth	m2	2,700	70.22	38.23	108.45	189,594	103,221	292,815	0.0080	2,343	0.0418	12,240	0.0688	20,146	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	205,790	0.0119	3,484	0.1667	48,812
	Gravel Pavement	m3	0	445.91	307.34	753.25	0	0	0	0.0953	0	0.0223	0	0.0124	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	0	0.0130	0	0.1650	0
	Sodding	m2	0	38.25	18.58	56.83	0	0	0	0.0590	0	0.0531	0	0.1241	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	0	0.0233	0	0.1633	0
	Sub total (iii)						**21,017,569**	**12,359,052**	**33,376,621**		**1,585,832**		**964,230**		**3,199,925**		**0**		**0**		**0**		**0**		**21,559,011**		**572,714**		**5,494,909**
	Sub total (1.2)						**345,674,474**	**258,169,667**	**603,844,141**		**168,516,457**		**28,216,495**		**29,728,184**		**0**		**0**		**0**		**0**		**257,047,711**		**22,456,050**		**97,879,242**
	Total (1)						**395,714,156**	**294,909,933**	**690,624,089**		**189,971,708**		**32,418,064**		**34,231,468**		**0**		**0**		**0**		**0**		**296,556,374**		**25,468,628**		**111,977,846**
2	**Diversion channel of swampy area**																												
2.1	**Open channel**																												
	General Item	%	10%				2,022,708	1,558,428	3,581,136	0.1000	413,111	0.1000	156,281	0.1000	146,383	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	2,208,713	0.1000	71,433	0.1000	585,213
	Clearing & Grabbing	m^2	25,700	9.08	7.97	17.04	233,228	204,701	437,928	0.6151	269,370	0.0630	27,589	0.0437	19,137	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	36,567	0.0720	31,531	0.1227	53,734
	Backfilling	m^3	0	36.51	32.53	69.04	0	0	0	0.6801	0	0.0175	0	0.0709	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	0	0.1547	0
	Excavation	m^3	21,400	31.00	23.66	54.66	663,400	506,324	1,169,724	0.5103	596,910	0.0754	88,197	0.0332	38,835	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	188,092	0.0619	72,406	0.1584	185,284
	Embankment (Borrow Soil)	m^3	39,700	236.79	182.86	419.65	9,400,563	7,259,542	16,660,105	0.1874	3,122,104	0.0015	24,990	0.0085	141,611	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	10,307,607	0.0197	328,204	0.1642	2,735,589
	Wet Stone Masonry	m^3	7,700	1139.08	915.68	2054.76	8,770,916	7,050,736	15,821,652	0.0026	41,136	0.0841	1,330,601	0.0664	1,050,558	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	10,560,953	0.0153	242,071	0.1641	2,596,333
	Sodding	m^2	30,300	38.25	18.58	56.83	1,158,975	562,974	1,721,949	0.0590	101,595	0.0531	91,435	0.1241	213,694	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	993,909	0.0233	40,121	0.1633	281,194
	Sub total (2.1)						**22,249,790**	**17,142,704**	**39,392,494**		**4,544,226**		**1,719,095**		**1,610,218**		**0**		**0**		**0**		**0**		**24,295,840**		**785,767**		**6,437,348**
2.2	**Box culvert**																												
	General Item	%	10%				474,814	369,086	843,899	0.1000	110,361	0.1000	25,710	0.1000	67,002	0.1000	5,083	0.1000	1,921	0.1000	171,322	0.1000	0	0.1000	302,308	0.1000	20,300	0.1000	139,892
	Clearing & Grabbing	m^2	3,400	9.08	7.97	17.04	30,855	27,081	57,936	0.6151	35,636	0.0630	3,650	0.0437	2,532	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	4,838	0.0720	4,171	0.1227	7,109
	Backfilling	m^3	9,900	36.51	32.53	69.04	361,449	322,047	683,496	0.6801	464,846	0.0175	11,961	0.0709	48,460	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	52,492	0.1547	105,737
	Excavation	m^3	13,200	31.00	23.66	54.66	409,200	312,312	721,512	0.5103	368,188	0.0754	54,402	0.0332	23,954	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	116,019	0.0619	44,662	0.1584	114,288
	Embankment (Borrow Soil)	m^3	0	236.79	182.86	419.65	0	0	0	0.1874	0	0.0015	0	0.0085	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	0	0.0197	0	0.1642	0
	Wet Stone Masonry	m^3	0	1139.08	915.68	2054.76	0	0	0	0.0026	0	0.0841	0	0.0664	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	0	0.0153	0	0.1641	0
	Sodding	m^2	0	38.25	18.58	56.83	0	0	0	0.0590	0	0.0531	0	0.1241	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	0	0.0233	0	0.1633	0
	Leveling Concrete	m^3	100	1665.54	930.46	2596.00	166,554	93,046	259,600	0.0088	2,284	0.0193	5,010	0.1464	38,005	0.1958	50,830	0.0740	19,210	0.0000	0	0.0000	0	0.3712	96,364	0.0174	4,517	0.1671	43,379
	Concrete	m^3	1,200	2101.49	1274.51	3376.00	2,521,788	1,529,412	4,051,200	0.0446	180,684	0.0208	84,265	0.0606	245,503	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6926	2,805,861	0.0126	51,045	0.1688	683,843
	Reinforcing steel bar	ton	96	13107.19	14655.81	27763.00	1,258,290	1,406,958	2,665,248	0.0195	51,972	0.0367	97,815	0.1169	311,567	0.0000	0	0.0000	0	0.6428	1,713,221	0.0000	0	0.0000	0	0.0173	46,109	0.1668	444,563
	Sub total (2.2)						**5,222,950**	**4,059,941**	**9,282,891**		**1,213,971**		**282,813**		**737,024**		**55,913**		**21,131**		**1,884,544**		**0**		**3,325,390**		**223,296**		**1,538,810**
	Total (2)						**27,472,740**	**21,202,645**	**48,675,385**		**5,758,197**		**2,001,908**		**2,347,242**		**55,913**		**21,131**		**1,884,544**		**0**		**27,621,230**		**1,009,063**		**7,976,158**
3	**Maintenance road to Bucao bridge**																												
	General Item	%	10%				142,548	111,132	253,680	0.1000	84,559	0.1000	9,491	0.1000	10,097	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	98,378	0.1000	10,402	0.1000	40,751
	Clearing & Grabbing	m^2	1,400	9.08	7.97	17.04	12,705	11,151	23,856	0.6151	14,674	0.0630	1,503	0.0437	1,043	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	1,992	0.0720	1,718	0.1227	2,927
	Backfilling	m^3	120	36.51	32.53	69.04	4,381	3,904	8,285	0.6801	5,634	0.0175	145	0.0709	587	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	636	0.1547	1,282
	Excavation	m^3	220	31.00	23.66	54.66	6,820	5,205	12,025	0.5103	6,136	0.0754	907	0.0332	399	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	1,934	0.0619	744	0.1584	1,905
	Embankment (Lahar Material)	m^3	12,440	51.00	43.00	94.00	634,440	534,920	1,169,360	0.5812	679,632	0.0429	50,166	0.0363	42,448	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	135,763	0.0660	77,178	0.1575	184,174
	Base Concrete	m^3	30	1744.58	936.89	2681.47	52,337	28,107	80,444	0.0131	1,054	0.0109	877	0.1089	8,760	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	55,450	0.0133	1,070	0.1645	13,233
	Wet Stone Masonry	m^3	180	1139.08	915.68	2054.76	205,034	164,822	369,857	0.0026	962	0.0841	31,105	0.0664	24,558	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	246,879	0.0153	5,659	0.1641	60,694
	Covering Borrow Soil	m^3	1,530	236.79	182.86	419.65	362,289	279,776	642,065	0.1874	120,323	0.0015	963	0.0085	5,458	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	397,245	0.0197	12,649	0.1642	105,427
	Gravel Pavement	m^3	130	445.91	307.34	753.25	57,968	39,954	97,923	0.0953	9,332	0.0223	2,184	0.0124	1,214	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	67,762	0.0130	1,273	0.1650	16,157
	Sodding	m^2	2,340	38.25	18.58	56.83	89,505	43,477	132,982	0.0590	7,846	0.0531	7,061	0.1241	16,503	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	76,757	0.0233	3,098	0.1633	21,716
	Total (3)						**1,568,028**	**1,222,448**	**2,790,476**		**930,152**		**104,401**		**111,068**		**0**		**0**		**0**		**0**		**1,082,161**		**114,427**		**448,266**
4	**Bucao bridge replacement**																												
4.1	General Item	%	10%				13,999,888	17,007,888	31,007,776	0.1000	6,527,649	0.1000	3,858,454	0.1000	1,698,576	0.1000	0	0.1000	0	0.1000	8,047,397	0.1000	0	0.1000	4,366,852	0.1000	1,118,867	0.1000	5,389,981
4.2	Superstructure																												
	Steel plate girder	ton	1,000	65888.33	105415.67	171304.00	65,888,328	105,415,672	171,304,000	0.1981	33,935,322	0.2119	36,299,318	0.0512	8,770,765	0.0000	0	0.0000	0	0.3107	53,224,153	0.0000	0	0.0050	856,520	0.0410	7,023,464	0.1821	31,194,458
	Deck slab	m^2	3,062	6224.80	3775.20	10000.00	19,060,338	11,559,662	30,620,000	0.0446	1,365,652	0.0208	636,896	0.0606	1,855,572	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0	0.6926	21,207,412	0.0126	385,812	0.1688	5,168,656
	Sub total (4.2)						84,948,665	116,975,335	201,924,000		35,300,974		36,936,214		10,626,337		0		0		53,224,153		0		22,063,932		7,409,276		36,363,114
4.3	Substructure																												
	Concrete	m^3	1,420	9574.77	3903.23	13478.00	13,596,175	5,542,585	19,138,760	0.0446	853,589	0.0208	398,086	0.0606	1,159,809	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6926	13,255,505	0.0126	241,148	0.1688	3,230,623
	Reinforcing steel bar	ton	142	22186.38	26509.62	48696.00	3,150,467	3,764,365	6,914,832	0.0195	134,839	0.0367	253,774	0.1169	808,344	0.0000	0	0.0000	0	0.6428	4,444,854	0.0000	0	0.0000	0	0.0173	119,627	0.1668	1,153,394
	Cast in place pile	m	936	32196.11	37755.89	69952.00	30,135,557	35,339,515	65,475,072	0.3730	24,422,202	0.0100	654,751	0.0647	4,236,237	0.0000	0	0.0000	0	0.3483	22,804,968	0.0000	0	0.0000	0	0.0448	2,933,283	0.1592	10,423,631
	Sub total (4.3)						46,882,198	44,646,466	91,528,664		25,410,630		1,306,611		6,204,390		0		0		27,249,822		0		13,255,505		3,294,058		14,807,648
4.4	Approach road																												
	Embankment	m^3	88,000	38.00	49.00	87.00	3,344,000	4,312,000	7,656,000	0.1874	1,434,734	0.0015	11,484	0.0085	65,076	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	4,736,767	0.0197	150,823	0.1642	1,257,115
	Pavement	m^2	4,200	473.28	396.72	870.00	1,987,776	1,666,224	3,654,000	0.0953	348,226	0.0223	81,484	0.0124	45,310	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	2,528,568	0.0130	47,502	0.1650	602,910
	Sub total (4.4)						5,331,776	5,978,224	11,310,000		1,782,961		92,968		110,386		0		0		0		0		7,265,335		198,325		1,860,025
4.5	Removal of existing bridge	m	350	8103.55	7082.45	15186.00	2,836,244	2,478,856	5,315,100	0.5234	2,781,923	0.0468	248,747	0.0084	44,647	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	1,083,749	0.0540	287,015	0.1635	869,019
	Total (4)						**153,998,772**	**187,086,769**	**341,085,540**		**71,804,137**		**42,442,994**		**18,684,335**		**0**		**0**		**88,521,372**		**0**		**48,035,373**		**12,307,542**		**59,289,787**
	Grand Total (1 to 4)						**578,753,695**	**504,421,794**	**1,083,175,490**		**268,464,195**		**76,967,367**		**55,374,113**		**55,913**		**21,131**		**90,405,915**		**0**		**373,295,138**		**38,899,661**		**179,692,057**
	Ratio of LC and FC						53%	47%	100%																				

Note: Item 2 (Diversion channel of swampy area) is not included in the priority project

Table 16.4.5 Construction Cost of Sto. Tomas River Basin

(Unit: Peso)

No.	Description	Unit	Work Quantity	Unit Price			Amount			1. Equipment		2. Labor				3. Material										4. VAT		5. Overhead	
				LC	FC	Total	LC	FC	Total			a. Skilled labor		b. Unskilled labor		a. Cement		b. Aggregate		c. Steel		d. Lumber		e. Others					
1	**Dike construction**																												
1.1	**Left bank**																												
	i) Dike strengthening																												
	General Item	%	10%				17,250,812	12,796,779	30,047,591	0.1	8,600,273.71	0.1	985,626.43	0.1	1,102,600.53	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	13,442,560.70	0.1	1,061,203.36	0.1	4,849,457.94
	Demolition of Existing Revetment	m3	10,900	743.32	637.16	1,380.48	8,102,188	6,945,044	15,047,232	0.5234	7875721.229	0.047	704210.4576	0.008	126396.7488	0	0	0	0	0	0	0	0	0.2	3009446.4	0.05	812550.528	0.164	2460222.432
	Clearing & Grabbing	m2	612,100	9.08	7.97	17.04	5,554,808	4,875,377	10,430,184	0.6151	6415606.178	0.063	657101.592	0.044	455799.0408	0	0	0	0	0	0	0	0	0.08	870920.364	0.07	750973.248	0.123	1279783.577
	Backfilling	m3	8,300	36.51	32.53	69.04	303,033	269,999	573,032	0.6801	389719.0632	0.018	10028.06	0.071	40627.9688	0	0	0	0	0	0	0	0	0	0	0.08	44008.8576	0.155	88648.0504
	Excavation	m3	403,400	31.00	23.66	54.66	12,505,400	9,544,444	22,049,844	0.5103	11252035.39	0.075	1662558.238	0.033	732054.8208	0	0	0	0	0	0	0	0	0.16	3545614.915	0.06	1364885.344	0.158	3492695.29
	Embankment (Lahar Material)	m3	569,100	56.21	47.89	104.10	31,989,111	27,254,199	59,243,310	0.5812	34432211.77	0.043	2541537.999	0.036	2150532.153	0	0	0	0	0	0	0	0	0.12	6878148.291	0.07	3910058.46	0.158	9330821.325
	Base Concrete	m3	1,500	1,744.58	936.89	2,681.47	2,616,870	1,405,335	4,022,205	0.0131	52690.8855	0.011	43842.0345	0.109	438018.1245	0	0	0	0	0	0	0	0	0.69	2772505.907	0.01	53495.3265	0.165	661652.7225
	Wet Stone Masonry	m3	8,200	1,139.08	915.68	2,054.76	9,340,456	7,508,576	16,849,032	0.0026	43807.4832	0.084	1417003.591	0.066	1118775.725	0	0	0	0	0	0	0	0	0.67	11246728.86	0.02	257790.1896	0.164	2764926.151
	Covering Borrow Soil	m3	283,800	236.79	182.86	419.65	67,201,002	51,895,668	119,096,670	0.1874	22318715.96	0.002	178645.005	0.009	1012321.695	0	0	0	0	0	0	0	0	0.62	73685109.73	0.02	2346204.399	0.164	19555673.21
	Gabion Mattress	m3	5,600	1,468.70	703.59	2,172.29	8,224,720	3,940,104	12,164,824	0.0423	514572.0552	0.067	818692.6552	0.097	1177554.963	0	0	0	0	0	0	0	0	0.6	7263616.41	0.02	250595.3744	0.176	2139792.542
	Filter Cloth	m2	18,500	70.22	38.23	108.45	1,299,070	707,255	2,006,325	0.008	16050.6	0.042	83864.385	0.069	138035.16	0	0	0	0	0	0	0	0	0.7	1410045.21	0.01	23875.2675	0.167	334454.3775
	Gravel Pavement	m3	14,300	445.91	307.34	753.25	6,376,513	4,394,962	10,771,475	0.0953	1026521.568	0.022	240203.8925	0.012	133566.29	0	0	0	0	0	0	0	0	0.69	7453860.7	0.01	140029.175	0.165	1777293.375
	Sodding	m2	496,600	38.25	18.58	56.83	18,994,950	9,226,828	28,221,778	0.059	1665084.902	0.053	1498576.412	0.124	3502322.65	0	0	0	0	0	0	0	0	0.58	16289610.26	0.02	657567.4274	0.163	4608616.347
	Sub total (i)						**189,758,933**	**140,764,570**	**330,523,502**		**94,603,011**		**10,841,891**		**12,128,606**		**0**		**0**		**0**		**0**		**147,868,168**		**11,673,237**		**53,344,037**
	ii) Dike heightening																												
	General Item	%	10%				21,350,638	15,724,113	37,074,751	0.1	8600273.709	0.1	1,777,528.83	0.1	1,730,750.03	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	17,367,450.50	0.1	1,220,144.45	0.1	6,054,079.84
	Demolition of Existing Revetment	m3	37,200	743.32	637.16	1,380.48	27,651,504	23,702,352	51,353,856	0.5234	26878608.23	0.047	2403360.461	0.008	431372.3904	0	0	0	0	0	0	0	0	0.2	10270771.2	0.05	2773108.224	0.164	8396355.456
	Clearing & Grabbing	m2	414,500	9.08	7.97	17.04	3,761,588	3,301,493	7,063,080	0.6151	4344500.508	0.063	444974.04	0.044	308656.596	0	0	0	0	0	0	0	0	0.08	589767.18	0.07	508541.76	0.123	866639.916
	Backfilling	m3	26,700	36.51	32.53	69.04	974,817	868,551	1,843,368	0.6801	1253674.577	0.018	32258.94	0.071	130694.7912	0	0	0	0	0	0	0	0	0	0	0.08	141570.6624	0.155	285169.0296
	Excavation	m3	316,700	31.00	23.66	54.66	9,817,700	7,493,122	17,310,822	0.5103	8833712.467	0.075	1305235.979	0.033	574719.2904	0	0	0	0	0	0	0	0	0.16	2783580.178	0.06	1071539.882	0.158	2742034.205
	Embankment (Lahar Material)	m3	498,800	56.21	47.89	104.10	28,037,548	23,887,532	51,925,080	0.5812	30178856.5	0.043	2227585.932	0.036	1884880.404	0	0	0	0	0	0	0	0	0.12	6028501.788	0.07	3427055.28	0.158	8178200.1
	Base Concrete	m3	4,700	1,744.58	936.89	2,681.47	8,199,526	4,403,383	12,602,909	0.0131	165098.1079	0.011	137371.7081	0.109	1372456.79	0	0	0	0	0	0	0	0	0.69	8687185.174	0.01	167618.6897	0.165	2073178.531
	Wet Stone Masonry	m3	41,500	1,139.08	915.68	2,054.76	47,271,820	38,000,720	85,272,540	0.0026	221708.604	0.084	7171420.614	0.066	5662096.656	0	0	0	0	0	0	0	0	0.67	56919420.45	0.02	1304669.862	0.164	13993223.81
	Covering Borrow Soil	m3	173,800	236.79	182.86	419.65	41,154,102	31,781,068	72,935,170	0.1874	13668050.86	0.002	109402.755	0.009	619948.945	0	0	0	0	0	0	0	0	0.62	45124989.68	0.02	1436822.849	0.164	11975954.91
	Gabion Mattress	m3	17,900	1,468.70	703.59	2,172.29	26,289,730	12,594,261	38,883,991	0.0423	1644792.819	0.067	2616892.594	0.097	3763970.329	0	0	0	0	0	0	0	0	0.6	23217631.03	0.02	801010.2146	0.176	6839694.017
	Filter Cloth	m2	59,400	70.22	38.23	108.45	4,171,068	2,270,862	6,441,930	0.008	51535.44	0.042	269272.674	0.069	443204.784	0	0	0	0	0	0	0	0	0.7	4527388.404	0.01	76658.967	0.167	1073869.731
	Gravel Pavement	m3	11,900	445.91	307.34	753.25	5,306,329	3,657,346	8,963,675	0.0953	854238.2275	0.022	199889.9525	0.012	111149.57	0	0	0	0	0	0	0	0	0.69	6202863.1	0.01	116527.775	0.165	1479006.375
	Sodding	m2	284,200	38.25	18.58	56.83	10,870,650	5,280,436	16,151,086	0.059	952914.074	0.053	857622.6666	0.124	2004349.773	0	0	0	0	0	0	0	0	0.58	9322406.839	0.02	376320.3038	0.163	2637472.344
	Sub total (ii)						**234,857,020**	**172,965,238**	**407,822,258**	**3.3178**	**89047690.41**	**0.527**	**17775288.32**	**0.678**	**17307500.32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**173674505**	**0.45**	**12201444.47**	**1.921**	**60540798.43**
	Sub total (1.1)						**424,615,952**	**313,729,808**	**738,345,760**	**3.3178**	**183650701.2**	**0.527**	**28617179.07**	**0.678**	**29436106.19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**321542672.8**	**0.45**	**23874681.43**	**1.921**	**113884835.8**
1.2	**Right bank**																												
	i) New dike																												
	General Item	%	10%				2,852,774	1,996,621	4,849,395	0.1	8600273.709	0.1	240,972.02	0.1	274,289.06	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	2,474,257.01	0.1	143,510.60	0.1	794,890.68
	Demolition of Existing Revetment	m3	0	743.32	637.16	1,380.48	0	0	0	0.5234	0	0.047	0	0.008	0	0	0	0	0	0	0	0	0	0.2	0	0.05	0	0.164	0
	Clearing & Grabbing	m2	61,200	9.08	7.97	17.04	555,390	487,458	1,042,848	0.6151	641455.8048	0.063	65699.424	0.044	45572.4576	0	0	0	0	0	0	0	0	0.08	87077.808	0.07	75085.056	0.123	127957.4496
	Backfilling	m3	5,800	36.51	32.53	69.04	211,758	188,674	400,432	0.6801	272333.8032	0.018	7007.56	0.071	28390.6288	0	0	0	0	0	0	0	0	0	0	0.08	30753.1776	0.155	61946.8304
	Excavation	m3	49,300	31.00	23.66	54.66	1,528,300	1,166,438	2,694,738	0.5103	1375124.801	0.075	203183.2452	0.033	89465.3016	0	0	0	0	0	0	0	0	0.16	433313.8704	0.06	166804.2822	0.158	426846.4992
	Embankment (Lahar Material)	m3	77,100	56.21	47.89	104.10	4,333,791	3,692,319	8,026,110	0.5812	4664775.132	0.043	344320.119	0.036	291347.793	0	0	0	0	0	0	0	0	0.12	931831.371	0.07	529723.26	0.158	1264112.325
	Base Concrete	m3	1,100	1,744.58	936.89	2,681.47	1,919,038	1,030,579	2,949,617	0.0131	38639.9827	0.011	32150.8253	0.109	321213.2913	0	0	0	0	0	0	0	0	0.69	2033170.998	0.01	39229.9061	0.165	485211.9965
	Wet Stone Masonry	m3	5,800	1,139.08	915.68	2,054.76	6,606,664	5,310,944	11,917,608	0.0026	30985.7808	0.084	1002270.833	0.066	791329.1712	0	0	0	0	0	0	0	0	0.67	7955003.34	0.02	182339.4024	0.164	1955679.473
	Covering Borrow Soil	m3	19,800	236.79	182.86	419.65	4,688,442	3,620,628	8,309,070	0.1874	1557119.718	0.002	12463.605	0.009	70627.095	0	0	0	0	0	0	0	0	0.62	5140821.609	0.02	163688.679	0.164	1364349.294
	Gabion Mattress	m3	3,900	1,468.70	703.59	2,172.29	5,727,930	2,744,001	8,471,931	0.0423	358362.6813	0.067	570160.9563	0.097	820082.9208	0	0	0	0	0	0	0	0	0.6	5058590	0.02	174521.7786	0.176	1490212.663
	Filter Cloth	m2	12,900	70.22	38.23	108.45	905,838	493,167	1,399,005	0.008	11192.04	0.042	58478.409	0.069	96251.544	0	0	0	0	0	0	0	0	0.7	983220.714	0.01	16648.1595	0.167	233214.1335
	Gravel Pavement	m3	2,600	445.91	307.34	753.25	1,159,366	799,084	1,958,450	0.0953	186640.285	0.022	43673.435	0.012	24284.78	0	0	0	0	0	0	0	0	0.69	1355247.4	0.01	25459.85	0.165	323144.25
	Sodding	m2	23,300	38.25	18.58	56.83	891,225	432,914	1,324,139	0.059	78124.201	0.053	70311.7809	0.124	164325.6499	0	0	0	0	0	0	0	0	0.58	764293.0308	0.02	30852.4387	0.163	216231.8987
	Sub total (i)						**31,380,516**	**21,962,827**	**53,343,343**		**9214754.23**		**2409720.193**		**2742890.633**		**0**		**0**		**0**		**0**		**24742570.14**		**1435105.99**		**7948906.813**
	ii) Dike strengthening							53,343,343																					
	General Item	%	10%				6,135,812	4,444,726	10,580,537	0.1	2,299,847.03	0.1	523,035.50	0.1	496,136.51	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	5,192,005.56	0.1	323,491.18	0.1	1,737,837.93
	Demolition of Existing Revetment	m3	15,200	743.32	637.16	1,380.48	11,298,464	9,684,832	20,983,296	0.5234	10982657.13	0.047	982018.2528	0.008	176259.6864	0	0	0	0	0	0	0	0	0.2	4196659.2	0.05	1133097.984	0.164	3430768.896
	Clearing & Grabbing	m2	100,600	9.08	7.97	17.04	912,945	801,279	1,714,224	0.6151	1054419.182	0.063	107996.112	0.044	74911.5888	0	0	0	0	0	0	0	0	0.08	143137.704	0.07	123424.128	0.123	210335.2848
	Backfilling	m3	9,200	36.51	32.53	69.04	335,892	299,276	635,168	0.6801	431977.7568	0.018	11115.44	0.071	45033.4112	0	0	0	0	0	0	0	0	0	0	0.08	48780.9024	0.155	98260.4896
	Excavation	m3	123,000	31.00	23.66	54.66	3,813,000	2,910,180	6,723,180	0.5103	3430838.754	0.075	506927.772	0.033	223209.576	0	0	0	0	0	0	0	0	0.16	1081087.344	0.06	416164.842	0.158	1064951.712
	Embankment (Lahar Material)	m3	35,800	56.21	47.89	104.10	2,012,318	1,714,462	3,726,780	0.5812	2166004.536	0.043	159878.862	0.036	135282.114	0	0	0	0	0	0	0	0	0.12	432679.158	0.07	245967.48	0.158	586967.85
	Base Concrete	m3	1,700	1,744.58	936.89	2,681.47	2,965,786	1,592,713	4,558,499	0.0131	59716.3369	0.011	49687.6391	0.109	496420.5411	0	0	0	0	0	0	0	0	0.69	3142173.361	0.01	60628.0367	0.165	749873.0855
	Wet Stone Masonry	m3	12,200	1,139.08	915.68	2,054.76	13,896,776	11,171,296	25,068,072	0.0026	65176.9872	0.084	2108224.855	0.066	1664519.981	0	0	0	0	0	0	0	0	0.67	16732938.06	0.02	383541.5016	0.164	4113670.615
	Covering Borrow Soil	m3	47,000	236.79	182.86	419.65	11,129,130	8,594,420	19,723,550	0.1874	3696193.27	0.002	29585.325	0.009	167650.175	0	0	0	0	0	0	0	0	0.62	12202960.39	0.02	388553.935	0.164	3238606.91
	Gabion Mattress	m3	6,200	1,468.70	703.59	2,172.29	9,105,940	4,362,258	13,468,198	0.0423	569704.7754	0.067	906409.7254	0.097	1303721.566	0	0	0	0	0	0	0	0	0.6	8041861.026	0.02	277444.8788	0.176	2369056.028
	Filter Cloth	m2	20,500	70.22	38.23	108.45	1,439,510	783,715	2,223,225	0.008	17785.8	0.042	92930.805	0.069	152957.88	0	0	0	0	0	0	0	0	0.7	1562482.53	0.01	26456.3775	0.167	370611.6075
	Gravel Pavement	m3	4,100	445.91	307.34	753.25	1,828,231	1,260,094	3,088,325	0.0953	294317.3725	0.022	68869.6475	0.012	38295.23	0	0	0	0	0	0	0	0	0.69	2137120.9	0.01	40148.225	0.165	509573.625
	Sodding	m2	68,500	38.25	18.58	56.83	2,620,125	1,272,730	3,892,855	0.059	229678.445	0.053	206710.6005	0.124	483103.3055	0	0	0	0	0	0	0	0	0.58	2246955.906	0.02	90703.5215	0.163	635703.2215
	Sub total (ii)						**67,493,929**	**48,891,981**	**116,385,909**		**183,958,504**		**28,894,201**		**30,083,535**		**0**		**0**		**0**		**0**		**324,553,922**		**23,996,237**		**114,736,771**
	iii Dike heightening																												
	General Item	%	10%				11,363,033	8,411,823	19,774,856	0.1	5,272,752.23	0.1	871,864.84	0.1	886,615.63	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	8,823,094.98	0.1	693,606.73	0.1	3,218,145.57
	Demolition of Existing Revetment	m3	16,300	743.32	637.16	1,380.48	12,116,116	10,385,708	22,501,824	0.5234	11777454.68	0.047	1053085.363	0.008	189015.3216	0	0	0	0	0	0	0	0	0.2	4500364.8	0.05	1215098.496	0.164	3679048.224
	Clearing & Grabbing	m2	236,900	9.08	7.97	17.04	2,149,868	1,886,909	4,036,776	0.6151	2483020.918	0.063	254316.888	0.044	176407.1112	0	0	0	0	0	0	0	0	0.08	337070.796	0.07	290647.872	0.123	495312.4152
	Backfilling	m3	12,800	36.51	32.53	69.04	467,328	416,384	883,712	0.6801	601012.5312	0.018	15464.96	0.071	62655.1808	0	0	0	0	0	0	0	0	0	0	0.08	67869.0816	0.155	136710.2464
	Excavation	m3	131,900	31.00	23.66	54.66	4,088,900	3,120,754	7,209,654	0.5103	3679086.436	0.075	543607.9116	0.033	239360.5128	0	0	0	0	0	0	0	0	0.16	1159312.363	0.06	446277.5826	0.158	1142009.194
	Embankment (Lahar Material)	m3	393,200	56.21	47.89	104.10	22,101,772	18,830,348	40,932,120	0.5812	23789748.14	0.043	1755987.948	0.036	1485835.956	0	0	0	0	0	0	0	0	0.12	4752219.132	0.07	2701519.92	0.158	6446808.9
	Base Concrete	m3	2,300	1,744.58	936.89	2,681.47	4,012,534	2,154,847	6,167,381	0.0131	80792.6911	0.011	67224.4529	0.109	671627.7909	0	0	0	0	0	0	0	0	0.69	4251175.723	0.01	82026.1673	0.165	1014534.175
	Wet Stone Masonry	m3	17,000	1,139.08	915.68	2,054.76	19,364,360	15,566,560	34,930,920	0.0026	90820.392	0.084	2937690.372	0.066	2319413.088	0	0	0	0	0	0	0	0	0.67	23316389.1	0.02	534443.076	0.164	5732163.972
	Covering Borrow Soil	m3	106,800	236.79	182.86	419.65	25,289,172	19,529,448	44,818,620	0.1874	8399009.388	0.002	67227.93	0.009	380958.27	0	0	0	0	0	0	0	0	0.62	27729280.19	0.02	882926.814	0.164	7359217.404
	Gabion Mattress	m3	8,600	1,468.70	703.59	2,172.29	12,630,820	6,050,874	18,681,694	0.0423	790235.6562	0.067	1257278.006	0.097	1808387.979	0	0	0	0	0	0	0	0	0.6	11154839.49	0.02	384842.8964	0.176	3286109.975
	Filter Cloth	m2	28,400	70.22	38.23	108.45	1,994,248	1,085,732	3,079,980	0.008	24639.84	0.042	128743.164	0.069	211902.624	0	0	0	0	0	0	0	0	0.7	2164609.944	0.01	36651.762	0.167	513432.666
	Gravel Pavement	m3	5,700	445.91	307.34	753.25	2,541,687	1,751,838	4,293,525	0.0953	409172.9325	0.022	95745.6075	0.012	53239.71	0	0	0	0	0	0	0	0	0.69	2971119.3	0.01	55815.825	0.165	708431.625
	Sodding	m2	179,700	38.25	18.58	56.83	6,873,525	3,338,826	10,212,351	0.059	602528.709	0.053	542275.8381	0.124	1267352.759	0	0	0	0	0	0	0	0	0.58	5894568.997	0.02	237947.7783	0.163	1667676.918
	Sub total (iii)						**124,993,362**	**92,530,050**	**217,523,413**	**3.3178**	**52727522.32**	**0.527**	**8718648.442**	**0.678**	**8866156.304**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**88230949.84**	**0.45**	**6936067.271**	**1.921**	**32181455.71**
	Sub total (1.2)						**223,867,807**	**163,384,857**	**387,252,665**	**3.3178**	**245900780.4**	**0.527**	**40022570.09**	**0.678**	**41692582.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**437527441.7**	**0.45**	**32367410.65**	**1.921**	**154867133.4**
	Total (1)						**648,483,760**	**477,114,665**	**1,125,598,425**	**6.6356**	**429551481.6**	**1.053**	**68639749.15**	**1.357**	**71128688.28**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10.2**	**759070114.5**	**0.9**	**56242092.07**	**3.841**	**268751969.2**
2	**Diversion channel of the Gabor River**																												
2.1	**Open channel**																												
	General Item	%	10%				3,352,269	2,424,024	5,776,293	0.1	849,249.29	0.1	292,858.08	0.1	324,398.84	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	3,217,349.39	0.1	146,500.63	0.1	945,936.87
	Demolition of Existing Revetment	m3	0	743.32	637.16	1,380.48	0	0	0	0.5234	0	0.047	0	0.008	0	0	0	0	0	0	0	0	0	0.2	0	0.05	0	0.164	0
	Clearing & Grabbing	m2	30,700	9.08	7.97	17.04	278,603	244,526	523,128	0.6151	321776.0328	0.063	32957.064	0.044	22860.6936	0	0	0	0	0	0	0	0	0.08	43681.188	0.07	37665.216	0.123	64187.8056
	Backfilling	m3	34,300	36.51	32.53	69.04	1,252,293	1,115,779	2,368,072	0.6801	1610525.767	0.018	41441.26	0.071	167896.3048	0	0	0	0	0	0	0	0	0	0	0.08	181867.9296	0.155	366340.7384
	Excavation	m3	125,200	31.00	23.66	54.66	3,881,200	2,962,232	6,843,432	0.5103	3492203.35	0.075	515994.7728	0.033	227201.9424	0	0	0	0	0	0	0	0	0.16	1100423.866	0.06	423608.4408	0.158	1083999.629
	Embankment (Lahar Material)	m3	0	56.21	47.89	104.10	0	0	0	0.5812	0	0.043	0	0.036	0	0	0	0	0	0	0	0	0	0.12	0	0.07	0	0.158	0
	Base Concrete	m3	1,900	1,744.58	936.89	2,681.47	3,314,702	1,780,091	5,094,793	0.0131	66741.7883	0.011	55533.2437	0.109	554822.9577	0	0	0	0	0	0	0	0	0.69	3511840.815	0.01	67760.7469	0.165	838093.4485
	Wet Stone Masonry	m3	10,500	1,139.08	915.68	2,054.76	11,960,340	9,614,640	21,574,980	0.0026	56094.948	0.084	1814455.818	0.066	1432578.672	0	0	0	0	0	0	0	0	0.67	14401299.15	0.02	330097.194	0.164	3540454.218
	Covering Borrow Soil	m3	33,600	236.79	182.86	419.65	7,956,144	6,144,096	14,100,240	0.1874	2642384.976	0.002	21150.36	0.009	119852.04	0	0	0	0	0	0	0	0	0.62	8723818.488	0.02	277774.728	0.164	2315259.408
	Gabion Mattress	m3	2,300	1,468.70	703.59	2,172.29	3,378,010	1,618,257	4,996,267	0.0423	211342.0941	0.067	336248.7691	0.097	483638.6456	0	0	0	0	0	0	0	0	0.6	2983271.026	0.02	102923.1002	0.176	878843.3653
	Filter Cloth	m2	7,600	70.22	38.23	108.45	533,672	290,548	824,220	0.008	6593.76	0.042	34452.396	0.069	56706.336	0	0	0	0	0	0	0	0	0.7	579261.816	0.01	9808.218	0.167	137397.474
	Gravel Pavement	m3	0	445.91	307.34	753.25	0	0	0	0.0953	0	0.022	0	0.012	0	0	0	0	0	0	0	0	0	0.69	0	0.01	0	0.165	0
	Sodding	m2	25,300	38.25	18.58	56.83	967,725	470,074	1,437,799	0.059	84830.141	0.053	76347.1269	0.124	178430.8559	0	0	0	0	0	0	0	0	0.58	829897.5828	0.02	33500.7167	0.163	234792.5767
	Sub total (2)						**36,874,957**	**26,664,267**	**63,539,224**	**3.3178**	**8492492.857**	**0.527**	**2928580.811**	**0.678**	**3243988.448**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**32173493.93**	**0.45**	**1465006.29**	**1.921**	**9459368.663**
3	**Maintenance road to Maculcol bridge**																												
	General Item	%	10%				153,175	118,708	271,883	0.1	44,059,920.50	0.1	7,185,473.12	0.1	7,469,212.53	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	79,461,044.71	0.1	5,802,280.87	0.1	27,952,420.48
	Clearing & Grabbing	m^2	1,560	9.08	7.97	17.04	14,157	12,425	26,582	0.6151	16350.83424	0.063	1674.6912	0.044	1161.65088	0	0	0	0	0	0	0	0	0.08	2219.6304	0.07	1913.9328	0.123	3261.66048
	Backfilling	m^3	170	36.51	32.53	69.04	6,207	5,530	11,737	0.6801	7982.19768	0.018	205.394	0.071	832.13912	0	0	0	0	0	0	0	0	0	0	0.08	901.38624	0.155	1815.68296
	Excavation	m^3	290	31.00	23.66	54.66	8,990	6,861	15,851	0.5103	8088.96942	0.075	1195.19556	0.033	526.26648	0	0	0	0	0	0	0	0	0.16	2548.90512	0.06	981.20166	0.158	2510.86176
	Embankment (Lahar Material)	m^3	10,710	56.21	47.89	104.10	602,009	512,902	1,114,911	0.5812	647986.2732	0.043	47829.6819	0.036	40471.2693	0	0	0	0	0	0	0	0	0.12	129441.1671	0.07	73584.126	0.158	175598.4825
	Base Concrete	m^3	40	1,744.58	936.89	2,681.47	69,783	37,476	107,259	0.0131	1405.09028	0.011	1169.12092	0.109	11680.48332	0	0	0	0	0	0	0	0	0.69	73933.49084	0.01	1426.54204	0.165	17644.0726
	Wet Stone Masonry	m^3	180	1,139.08	915.68	2,054.76	205,034	164,822	369,857	0.0026	961.62768	0.084	31104.95688	0.066	24558.49152	0	0	0	0	0	0	0	0	0.67	246879.414	0.02	5658.80904	0.164	60693.50088
	Covering Borrow Soil	m^3	1,870	236.79	182.86	419.65	442,797	341,948	784,746	0.1874	147061.3067	0.002	1177.11825	0.009	6670.33675	0	0	0	0	0	0	0	0	0.62	485522.0409	0.02	15459.48635	0.164	128855.2111
	Gravel Pavement	m^3	180	445.91	307.34	753.25	80,264	55,321	135,585	0.0953	12921.2505	0.022	3023.5455	0.012	1681.254	0	0	0	0	0	0	0	0	0.69	93824.82	0.01	1762.605	0.165	22371.525
	Sodding	m^2	2,680	38.25	18.58	56.83	102,510	49,794	152,304	0.059	8985.9596	0.053	8087.36364	0.124	18900.97604	0	0	0	0	0	0	0	0	0.58	87910.09968	0.02	3548.69252	0.163	24871.30852
	Total (3)						**1,684,927**	**1,305,789**	**2,990,715**	**2.7441**	**851743.5093**	**0.371**	**95467.06785**	**0.504**	**106482.8674**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3.61**	**1122279.568**	**0.36**	**105236.7817**	**1.414**	**437622.3058**
	Grand Total (1 to 3)						**687,043,644**	**505,084,720**	**1,192,128,364**	**13**	**438,895,718**	**2**	**71,663,797**	**3**	**74,479,160**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**792,365,888**	**2**	**57,812,335**	**7**	**278,648,960**
	Ratio of LC and FC						58%	42%	100%																				

Table 16.4.6 Summary of Cost for Land Acquisition and Compensation

(Unit: Peso)

Description	Bucao R.B	Sto. Tomas River Basin				Total
	Botolan	S. Marcelino	S. Felipe	S. Narciso	Sub total	
1 Land	34,807,300.00	4,750,000.00	1,125,000.00	4,735,944.00	10,610,944.00	45,418,244.00
2 House	3,264,402.70	2,184,177.02	9,109.16	407,077.26	2,600,363.44	5,864,766.14
3 Structure						
(1) Business establishments	973,657.79				0.00	973,657.79
(2) Rest house	150,719.43	6,599.49	1,115.41	2,974.42	10,689.32	161,408.75
(3) Kitchen	1,161.88	3,392.69			3,392.69	4,554.57
(4) Toilet	36,111.32	7,319.86			7,319.86	43,431.18
(5) Storage	27,885.19				0.00	27,885.19
(6) Deepwell	15,000.00	30,000.00	15,000.00		45,000.00	60,000.00
(7) Pigpens	16,173.42	27,885.18		6,692.44	34,577.62	50,751.04
Sub total (3)	1,220,709.03	75,197.22	16,115.41	9,666.86	100,979.49	1,321,688.52
4 Trees	5,234,602.38	7,046,580.13	201,330.86	3,422,624.63	10,670,535.62	15,905,138.00
5 Disturbance compensation	351,000.00	472,500.00	13,500.00	229,500.00	715,500.00	1,066,500.00
Total (1 to 5)	44,878,014.11	14,528,454.37	1,365,055.43	8,804,812.75	24,698,322.55	69,576,336.66
6 Additional Land &	0.00	13,289,890.00	0.00	0.00	13,289,890.00	13,289,890.00
House compensation(*1)						
7 Total (1 to 6)	44,878,014.11	27,818,344.37	1,365,055.43	8,804,812.75	37,988,212.55	82,866,226.66

Source: The report of Resettlement Plan in the appendix XI

Note: (*1) Additional compensation at Barangay San Rafael of 23 families, which newly resettled after February 2003.

Table 16.4.7 Project Cost of Bucao River Basin

(Unit: x1000 Peso) (Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	395,714	294,910	690,624																
	(2) Maintenance road	1,568	1,222	2,790																
	Sub total ((1) to (2))	**397,282**	**296,132**	**693,414**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**59,592**	**44,420**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
	(3) Bucao bridge replacement																			
	i) General item	14,000	17,008	31,008	0	0	0	0	11,200	13,606	1,400	1,701	1,400	1,701	0	0	0	0	0	0
	ii) Super structure	84,949	116,975	201,924	0	0	0	0	0	0	25,485	35,093	59,464	81,883	0	0	0	0	0	0
	iii) Substructure	46,882	44,646	91,529	0	0	0	0	14,065	13,394	32,817	31,252	0	0	0	0	0	0	0	0
	iv) Approach road	5,332	5,978	11,310	0	0	0	0	0	0	0	0	5,332	5,978	0	0	0	0	0	0
	v) Removal of existing bridge	2,836	2,479	5,315	0	0	0	0	0	0	0	0	2,836	2,479	0	0	0	0	0	0
	Sub total (1)	**551,281**	**483,219**	**1,034,500**	**0**	**0**	**0**	**0**	**25,265**	**27,000**	**59,702**	**68,046**	**128,625**	**136,460**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
2	Land acquisition and compensation cost	44,878	0	44,878	0	0	0	0	8,976	0	22,439	0	13,463	0	0	0	0	0	0	0
3	Administration cost	31,035	0	31,035	0	0	0	0	4,655	0	6,207	0	7,759	0	4,655	0	4,655	0	3,104	0
4	Engineering services cost	88,205	77,315	165,520	0	0	0	0	13,231	11,597	17,641	15,463	22,051	19,329	13,231	11,597	13,231	11,597	8,821	7,732
	Sub total (1 to 4)	**715,399**	**560,534**	**1,275,933**	**0**	**0**	**0**	**0**	**52,126**	**38,597**	**105,989**	**83,509**	**171,898**	**155,789**	**137,071**	**100,437**	**137,071**	**100,437**	**111,245**	**81,765**
5	Price contingency	**182,428**	**67,101**	**249,529**	0	0	0	0	6,509	2,362	18,003	6,884	37,242	16,215	36,367	12,671	43,305	14,934	41,001	14,036
6	Physical contingenc 10%	**89,783**	**62,763**	**152,546**	0	0	0	0	5,863	4,096	12,399	9,039	20,914	17,200	17,344	11,311	18,038	11,537	15,225	9,580
	Total (1 to 6)	**987,609**	**690,399**	**1,678,008**	**0**	**0**	**0**	**0**	**64,498**	**45,056**	**136,391**	**99,432**	**230,054**	**189,204**	**190,782**	**124,419**	**198,413**	**126,907**	**167,470**	**105,380**

Table 16.4.8 Project Cost of Sto. Tomas River Basin

(Unit: x1000 Peso) (Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	648,484	477,115	1,125,598																
	(2) Diversion channel of the Gabor river	36,875	26,664	63,539																
	(3) Maintenance road	1,685	1,306	2,991																
	Sub total (1)	**687,044**	**505,085**	**1,192,128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**137,409**	**101,017**	**206,113**	**151,526**	**206,113**	**151,526**	**137,409**	**101,017**
2	Land acquisition and compensation cost	37,988	0	37,988	0	0	0	0	0	0	18,994	0	18,994	0	0	0	0	0	0	0
3	Administration cost	35,764	0	35,764	0	0	0	0	0	0	7,153	0	8,941	0	7,153	0	7,153	0	5,365	0
4	Engineering services cost	109,927	80,814	190,741	0	0	0	0	0	0	21,985	16,163	27,482	20,204	21,985	16,163	21,985	16,163	16,489	12,122
	Sub total (1 to 4)	**870,723**	**585,899**	**1,456,621**	**0**	**0**	**0**	**0**	**0**	**0**	**48,132**	**16,163**	**192,826**	**121,221**	**235,251**	**167,688**	**235,251**	**167,688**	**159,262**	**113,139**
5	Price contingency	**245,391**	**79,459**	**324,850**	0	0	0	0	0	0	8,176	1,332	41,776	12,617	62,417	21,156	74,323	24,933	58,699	19,421
6	Physical contingenc 10%	**111,611**	**66,536**	**178,147**	0	0	0	0	0	0	5,631	1,750	23,460	13,384	29,767	18,884	30,957	19,262	21,796	13,256
	Total (1 to 6)	**1,227,726**	**731,894**	**1,959,619**	**0**	**0**	**0**	**0**	**0**	**0**	**61,939**	**19,245**	**258,062**	**147,221**	**327,435**	**207,729**	**340,532**	**211,883**	**239,758**	**145,817**

Table 16.4.9 Disbursement Schedule of Bucao River Basin

(Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	395,714	294,910	690,624																
	(2) Maintenance road	1,568	1,222	2,790																
	Sub total ((1) to (2))	**397,282**	**296,132**	**693,414**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**59,592**	**44,420**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
	(Annual progress rate)												0.15	0.15	0.3	0.3	0.3	0.3	0.25	0.25
	(3) Bucao bridge replacement																			
	i) General item	14,000	17,008	31,008	0	0	0	0	11,200	13,606	1,400	1,701	1,400	1,701	0	0	0	0	0	0
	(Annual progress rate)								0.8	0.8	0.1	0.1	0.1	0.1						
	ii) Super structure	84,949	116,975	201,924	0	0	0	0	0	0	25,485	35,093	59,464	81,883	0	0	0	0	0	0
	(Annual progress rate)										0.3	0.3	0.7	0.7						
	iii) Substructure	46,882	44,646	91,529	0	0	0	0	14,065	13,394	32,817	31,252	0	0	0	0	0	0	0	0
	(Annual progress rate)								0.3	0.3	0.7	0.7								
	iv) Approach road	5,332	5,978	11,310	0	0	0	0	0	0	0	0	5,332	5,978	0	0	0	0	0	0
	(Annual progress rate)												1	1						
	v) Removal of existing bridge	2,836	2,479	5,315	0	0	0	0	0	0	0	0	2,836	2,479	0	0	0	0	0	0
	(Annual progress rate)												1	1						
	Sub total (1)	**551,281**	**483,219**	**1,034,500**	**0**	**0**	**0**	**0**	**25,265**	**27,000**	**59,702**	**68,046**	**128,625**	**136,460**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
2	Land acquisition and compensation cost	44,878	0	44,878	0	0	0	0	8,976	0	22,439	0	13,463	0	0	0	0	0	0	0
	(Annual progress rate)								0.2		0.5		0.3							
3	Administration cost	31,035	0	31,035	0	0	0	0	4,655	0	6,207	0	7,759	0	4,655	0	4,655	0	3,104	0
	(Annual progress rate)								0.15		0.2		0.25		0.15		0.15		0.1	
4	Engineering services cost	88,205	77,315	165,520	0	0	0	0	13,231	11,597	17,641	15,463	22,051	19,329	13,231	11,597	13,231	11,597	8,821	7,732
	(Annual progress rate)								0.15	0.15	0.2	0.2	0.25	0.25	0.15	0.15	0.15	0.15	0.1	0.1
	Sub total (1 to 4)	**715,399**	**560,534**	**1,275,933**	**0**	**0**	**0**	**0**	**52,126**	**38,597**	**105,989**	**83,509**	**171,898**	**155,789**	**137,071**	**100,437**	**137,071**	**100,437**	**111,245**	**81,765**
5	Price contingency	**182,428**	**67,101**	**249,529**	0	0	0	0	6,509	2,362	18,003	6,884	37,242	16,215	36,367	12,671	43,305	14,934	41,001	14,036
	LC : 4% FC: 2%				0.0400	0.0200	0.0816	0.0404	0.1249	0.0612	0.1699	0.0824	0.2167	0.1041	0.2653	0.1262	0.3159	0.1487	0.3686	0.1717
6	Physical contingency : 10%	**89782.67**	**62763.44**	**152546.11**	0	0	0	0	5,863	4,096	12,399	9,039	20,914	17,200	17,344	11,311	18,038	11,537	15,225	9,580
	Total (1 to 6)	**987,609**	**690,399**	**1,678,008**	**0**	**0**	**0**	**0**	**64,498**	**45,056**	**136,391**	**99,432**	**230,054**	**189,204**	**190,782**	**124,419**	**198,413**	**126,907**	**167,470**	**105,380**
				1,678,008																

Table 16.4.10 Disbursement Schedule of Sto. Tomas River Basin

(Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	648,484	477,115	1,125,598																
	(2) Diversion channel of the Gabor River	36,875	26,664	63,539																
	(3) Maintenance road	1,685	1,306	2,991																
	Sub total (1)	**687,044**	**505,085**	**1,192,128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**137,409**	**101,017**	**206,113**	**151,526**	**206,113**	**151,526**	**137,409**	**101,017**
	(Annual progress rate)												0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2
2	Land acquisition and compensation cost	37,988	0	37,988	0	0	0	0	0	0	18,994	0	18,994	0	0	0	0	0	0	0
	(Annual progress rate)										0.5		0.5							
3	Administration cost	35,764	0	35,764	0	0	0	0	0	0	7,153	0	8,941	0	7,153	0	7,153	0	5,365	0
	(Annual progress rate)										0.2		0.25		0.2		0.2		0.15	
4	Engineering services cost	109,927	80,814	190,741	0	0	0	0	0	0	21,985	16,163	27,482	20,204	21,985	16,163	21,985	16,163	16,489	12,122
	(Annual progress rate)										0.2	0.2	0.25	0.25	0.2	0.2	0.2	0.2	0.15	0.15
	Sub total (1 to 4)	**870,723**	**585,899**	**1,456,621**	**0**	**0**	**0**	**0**	**0**	**0**	**48,132**	**16,163**	**192,826**	**121,221**	**235,251**	**167,688**	**235,251**	**167,688**	**159,262**	**113,139**
5	Price contingency	**245,391**	**79,459**	**324,850**	0	0	0	0	0	0	8,176	1,332	41,776	12,617	62,417	21,156	74,323	24,933	58,699	19,421
	LC : 4% FC: 2%				0.0400	0.0200	0.0816	0.0404	0.1249	0.0612	0.1699	0.0824	0.2167	0.1041	0.2653	0.1262	0.3159	0.1487	0.3686	0.1717
6	Physical contingency : 10%	**111,611**	**66,536**	**178147.2413**	0	0	0	0	0	0	5,631	1,750	23,460	13,384	29,767	18,884	30,957	19,262	21,796	13,256
	Total (1 to 6)	**1,227,726**	**731,894**	**1,959,619**	**0**	**0**	**0**	**0**	**0**	**0**	**61,939**	**19,245**	**258,062**	**147,221**	**327,435**	**207,729**	**340,532**	**211,883**	**239,758**	**145,817**

Table 16.4.11 Summary of Supply and Installation Cost for Flood/Mudflow Monitoring & Warning System

(Unit : Peso)

No.	Description	Unit	Quantity	Amount
1	Observatory system (11 stations)			
	(1) Equipment purchase cost	lot	1	10,081,883
	(2) Installation cost	%	15%	1,512,282
	Sub total (1)			11,594,166
2	Monitoring system (4 sites)			
	(1) Equipment purchase cost	lot	1	7,022,595
	(2) Installation cost	%	10%	702,259
	(3) Vehicle for maintenance	no	1	1,856,540
	Sub total (2)			9,581,395
3	Warning post (35 posts)			
	(1) Equipment purchase cost	lot	1	11,257,595
	(2) Installation cost	%	10%	1,125,759
	Sub total (3)			12,383,354
	Total (1 to 3)			33,558,915
	Equivalent in JPY, P1.0 = JPY	2.37		79,534,627

Table 16.4.12 Project Cost for Flood/Mudflow Monitoring & Warning System

(Unit : Thousand Peso)

No.	Description		Amount
1	Supply and installation cost for Flood/Mudflow Monitoring & Warning System		33,559
2	Government administration cost	3%	1,007
3	Engineering service cost		
	(i) Remuneration, 35M/M x JPY2,500,000		36,920
	(ii) Direct cost, 20% of (i)		3,116
	Sub total (3)		40,035
	Sub total (1 to 3)		74,601
4	Contingency	10%	7,460
	Total (1 to 4)		82,061

Table 16.4.13 Unit Price for Evacuation Center Construction

No.	Description	Unit	Quantity	Total Cost (P)	Unit Price
(1)	(2)	(3)	(4)	(5)	(6)=(5)/(4)
Local Base (Obtained from Provincial Office)					
1	One family dwelling				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			7,370
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			6,530
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			5,040
2	School building				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			6,340
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			5,940
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			4,960
3	Condominium, Hotel, Bank, Hospital, Office				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			7,810
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			6,530
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			5,600
Local Base (Obtained from Agno II Project)					
1	Provincial road paved with 3.05m wide concrete, W=10.1m	m	6,660	55,124,779	8,277
2	Barangay road paved with gravel , W=5m	m	12,092	69,860,618	5,777
3	Mound dike (Embankment)	m^2	113,000	53,480,197	473
4	Evacuation center building : Reinforced concrete, 2 floor	m^2	25,300	270,516,025	10,692
	Foundation pile works	m^2	11,725	16,212,520	1,383
	Evacuation center building without foundation pile	m^2	13,575	136,449,410	10,052
	Evacuation center building with foundation pile	m^2	11,725	134,066,614	11,434
JICA Base (Obtained from Vietnam project)					
1	Training center building : Reinforced concrete, 3 floor with foundation pile	m2	1,598	127,763,713	79,952

Unit Price for Land Acquisition (Prevailing market price)

No.	Municipality	Barangay	Selling / Buying Rate (Peso/m2)
1	Botolan	Porac (Residential)	200 - 400
		Carael (Commercial)	750
		San. Juan (Residential)	100 - 150
2	San Marcelino	San Rafael (Residential)	100 - 200
		Rabanes (Agricultural)	200 - 300
		Mangricmot (Agricultural)	100 - 150
3	San Narciso	Alusius (Residential)	150 - 200
		Paite (Residential)	200
		San Pascual (Residential)	200 - 400

(Source: Table 8.1.1 of the report of Resettlement Plan, Appendix XI)

Table 16.4.14 Summary of Construction Cost of Schools for Evacuation

(Unit : Thousand Peso)

No.	Description	Number of School	Amount
1	Renovation of existing school	35	178,700
2	New construction		
	(1) Initial stage	10	143,700
	(2) Middle term stage	22	442,500
	(3) Long term stage	28	601,400
	Sub total (2)	60	1,187,600
	Total (1 to 2)	95	1,366,300

Note: 1. Land acquisition cost is included in the above construction cost.

Table 16.4.15 Unit Price for Forest Management

(Unit : Peso/Hectare)

No.	Description	Standard Unit Price Estimated by Forest Sector Project										Provincial Office	
		Forest tree (Gmelina, Mangium, Eucalyptus, Falcata)		Agroforestry : (a) Agroforest tree & (b) Other tree				Silvopasture				"Adopt Mountain Project" (Botolan)	
		spacing 5 x 2	4 x 4	(a)10x10 (b) 2x2	(a) 6x6 (b) 6x6	(a) 4x4	3x3 (Coffee)	Grass & Legume		Grass & Hedgerow		Total Cost	Per ha
								w/o fence	w/ fence	w/o fence	w/ fence		
A	Operation Cost												
1	Nursery operation	3,639.36	2,395.54	9,639.36	9,577.16	2,395.54	3,874.57	8,059.70	8,059.70	8,509.70	8,509.70	1,468,400.00	8,157.78
2	Plantation Establishment	4,875.00	3,121.88	6,372.76	5,507.95	3,785.63	6,442.22	7,040.75	7,040.75	7,032.33	7,246.72	1,337,580.00	7,431.00
3	Maintenance & protection	18,107.31	12,186.67	17,885.61	14,211.54	16,591.96	24,312.79	10,168.43	10,678.43	13,894.13	15,765.44	713,142.50	3,961.90
4	Infrastructure	1,043.83	1,043.83	1,043.83	1,043.83	1,043.83	1,043.83	113.33	113.33	113.33	113.33	242,000.00	1,344.44
5	Establishment of live fence								2,699.98				
	Sub total (A)	27,665.50	18,747.92	34,941.56	30,340.48	23,816.96	35,673.41	25,382.21	28,592.19	29,549.49	31,635.19	3,761,122.50	20,895.13
B	Project Management	2,213.24	1,499.83	2,795.32	2,427.24	1,905.36	2,853.87	2,030.58	2,287.38	2,363.96	2,530.82	450,000.00	2,500.00
	(8% of A)												
	Grand Total (A + B)	29,878.74	20,247.75	37,736.88	32,767.72	25,722.32	38,527.28	27,412.79	30,879.57	31,913.45	34,166.01	4,211,122.50	23,395.13

Note;

1 Standard Unit Price Estimated by Forest Sector Project is based on the MC2000-19 which is the guidelines governing the updating of cost estimates and intensification of plantation maintenance and protection activities for the project in the forestry sector.

2 Cost of establishment of live fence for Grass and Hedgerow is included in the cost of Item 2 and Item 3.

3 Adopt Mountain Project is scheduled to carry out under the provincial office from 2003 to 2007.

4 Plants of Adopt Mountain Project are Mahogany, Gmelina, Eucalyptus and fruit trees including Mango and Cashew.

Table 16.4.16 Plantation Cost for Forest Management

Unit: Pesos

No.	Description	Quantity (ha)	Unit Price	Amount
1	Tree plantation	18,370	25,064	460,425,680
2	Agro-forestry			
	(1) Mango	1,470	31,701	46,600,470
	(2) Cashew	1,102	31,701	34,934,502
	(3) Corn	1,102	31,701	34,934,502
	Total (2)			116,469,474
	Grand Total (1 to 2)			576,895,154

Source: Agriculture development research for lahar area, JBJ Consulting, Inc., February 2003

Table 16.4.17 Summary of Unit Prices of Land Development for Agriculture in Lahar Areas

Unit: Pesos/ha

Item	Description	Option		
		A	B	C
1	Development areas with no plants			
	(1) Land development	16,500	10,500	7,500
	(2) Soil improvement	5,200	2,700	1,500
	(3) Fertilizer provision	9,980	7,480	6,000
	(4) Water supply	59,500	41,500	30,500
	(5) Cropping pattern	27,542	12,476	13,956
	Total	**118,722**	**74,656**	**59,456**
2	Development areas with pioneer plants			
	(1) Land development	14,000	9,500	6500
	(2) Soil improvement	5,200	2,700	1,700
	(3) Fertilizer provision	9,980	7,480	4,000
	(4) Water supply	59,500	41,500	30,500
	(5) Cropping pattern	27,542	12,476	12,476
	Total	**116,222**	**73,656**	**55,176**
3	Development for cultivated areas			
	(1) Land development	1,500	1,500	1,500
	(2) Soil improvement	3,500	6,300	6,300
	(3) Fertilizer provision	9,980	13,840	17,720
	(4) Water supply	500	500	500
	(5) Cropping pattern	27,542	39,587	33,292
	Total	**43,022**	**61,727**	**59,312**

Source: Agriculture development research for lahar area, JBJ Consulting, Inc., February 2003

Table 16.4.18 Production Cost of Seasonal and Perennial Crops per Hectare

Unit: Pesos/ha

Item	Description	Labor cost	Material cost	Tool & Equipment cost	Total
A	Seasonal and medium term				
1	Rice - direct seeded	5,750	14,206	0	19,956
2	Corn	10,925	16,048	0	26,973
3	Sweet potato	11,325	22,416	0	33,741
4	Mungbean	12,200	5,366	0	17,566
5	Peanut	14,825	7,790	0	22,615
6	Watermelon	12,250	15,792	0	28,042
7	Squash	13,350	17,706	0	31,056
8	Tomato	19,675	29,754	0	49,429
9	Garlic	27,750	60,250	0	88,000
10	Onion	43,750	35,306	0	79,056
11	Cassava	20,600	13,920	0	34,520
12	Gabi	10,125	10,800	0	20,925
B	Perennials				
13	Banana				
	1 year	21,150	34,060	6,200	61,410
	2 year	7,750	12,580	0	20,330
	3 year	7,750	12,580	0	20,330
	4 year	7,750	37,699	0	45,449
	5 year	7,750	62,818	0	70,568
	Total	52,150	159,737	6,200	218,087
14	Pineapple				
	1 year	40,500	23,800	6,600	70,900
	2 year	42,250	9,810	0	52,060
	3 year	6,250	1,010	0	7,260
	4 year	40,500	8,800	0	49,300
	5 year	46,750	9,810	0	56,560
	6 year	6,250	1,010	0	7,260
	Total	182,500	54,240	6,600	243,340
15	Papaya				
	1 year	19,475	49,600	5,700	74,775
	2 year	24,500	11,980	0	36,480
	3 year	24,500	11,980	0	36,480
	4 year	24,500	11,980	0	36,480
	5 year	24,500	11,980	0	36,480
	Total	117,475	97,520	5,700	220,695

Source: Agriculture development research for lahar area, JBJ Consulting, Inc., February 2003

Table 16.4.19 Production Cost of Mango Orchard per Hectare

Unit: Pesos/ha

Year	Fixed costs	Pruning	Weeding	Fertilization	Irrigation	Flower Induction	Fruit Bagging	Integrated Pest Management	Harvesting	Total Cost
1	117,477		5,500	175	1,250			601		125,003
2	3,920	180	5,500	350	1,250			811		12,011
3	800	180	5,500	462	1,250			2,496		10,688
4	800	283	5,500	575	1,875	705	2,155	13,074	300	25,267
5	800	283	5,500	688	1,875	888	2,348	15,952	510	28,844
6	11,700	385	4,250	100	1,875	1,150	2,843	18,831	925	42,059
7	3,920	385	4,250	1,562	1,875	1,412	3,463	21,709	1,450	40,026
8	800	447	4,250	2,125	2,500	1,675	5,058	24,857	1,995	43,707
9	800	487	4,250	2,688	2,500	1,938	5,110	27,446	2,770	47,989
10	400	613	4,250	3,250	2,500	2,200	6,285	30,344	3,565	53,407
11	11,300	613	4,000	3,812	2,500	2,462	6,380	34,873	5,340	71,280
12	3,520	863	4,000	4,375	2,500	2,725	7,765	37,661	7,135	70,544
13	400	863	4,000	4,938	3,125	2,988	7,780	40,540	8,910	73,544
14	400	1,050	4,000	5,500	3,125	3,250	9,395	43,418	11,955	82,093
15	400	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	89,920
16	11,300	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	100,820
17	3,520	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	93,040
18	400	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	89,920
19	400	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	89,920
20	400	1,050	4,000	6,562	3,125	3,512	9,495	46,296	15,480	89,920
Total	173,457	12,932	88,750	69,972	48,750	42,465	115,552	590,389	137,735	1,280,002

Source: Agriculture development research for lahar area, JBJ Consulting, Inc., February 2003

Table 16.4.20 Construction Cost of Agriculture Development in Lahar Area

Unit: Pesos

Area-1 : Bucao, Mid-Stream, Right Side (Barangay Poonbato)

Development Area: 225 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	60,329,298	1	60,329,298	50%	50%	
2	Land Development	ha	16,500	225	3,712,500		100%	
3	Soil Improvement	ha	5,200	225	1,170,000		50%	50%
4	Fertilizer Provision	ha	9,980	225	2,245,500		50%	50%
5	Water Supply System	unit	59,500	45	2,677,500		50%	50%
	TOTAL				70,134,798	30,164,649	36,923,649	3,046,500

Area-2 : Bucao, Mid-Stream, Right Side (Barangay Malomboy)

Development Area: 31 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	57,329,346	1	57,329,346	50%	50%	
2	Land Development	ha	16,500	31	511,500		100%	
3	Soil Improvement	ha	5,200	31	161,200		50%	50%
4	Fertilizer Provision	ha	9,980	31	309,380		50%	50%
5	Water Supply System	unit	59,500	7	416,500		50%	50%
	TOTAL				58,727,926	28,664,673	29,619,713	443,540

Area-3 : Bucao, Downstream, Right Side at Swampy Area (Barangay San Juan)

Development Area: 200 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	48,675,385	1	48,675,385	50%	50%	
2	Land Development	ha	16,500	200	3,300,000		100%	
3	Soil Improvement	ha	5,200	200	1,040,000		50%	50%
4	Fertilizer Provision	ha	9,980	200	1,996,000		50%	50%
5	Water Supply System	unit	59,500	40	2,380,000		50%	50%
	TOTAL				57,391,385	24,337,693	30,345,693	2,708,000

Area-4 : Bucao, Downstream, Right Side at River Area (Barangay San Juan)

Development Area: 120 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	74,976,048	1	74,976,048	50%	50%	
2	Land Development	ha	16,500	120	1,980,000		100%	
3	Soil Improvement	ha	5,200	120	624,000		50%	50%
4	Fertilizer Provision	ha	9,980	120	1,197,600		50%	50%
5	Water Supply System	unit	59,500	24	1,428,000		50%	50%
	TOTAL				80,205,648	37,488,024	41,092,824	1,624,800

Area-5 : Marella River, Left Side facing Mapanuepe Lake (Barangay Aglao)

Development Area: 300 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	46,860,030	1	46,860,030	50%	50%	
2	Land Development	ha	16,500	300	4,950,000		100%	
3	Soil Improvement	ha	5,200	300	1,560,000		50%	50%
4	Fertilizer Provision	ha	9,980	300	2,994,000		50%	50%
5	Water Supply System	unit	59,500	60	3,570,000		50%	50%
	TOTAL				59,934,030	23,430,015	32,442,015	4,062,000

Area-6 : Sto-Tomas, Middle stream, Right Side (Barangay Santa Fe)

Development Area: 600 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	15,620,010	1	15,620,010	50%	50%	
2	Land Development	ha	16,500	600	9,900,000		100%	
3	Soil Improvement	ha	5,200	600	3,120,000		50%	50%
4	Fertilizer Provision	ha	9,980	600	5,988,000		50%	50%
5	Water Supply System	unit	59,500	120	7,140,000		50%	50%
	TOTAL				41,768,010	7,810,005	25,834,005	8,124,000

Area-7 : Sto-Tomas, Middle stream, Left Side (Barangay San Rafael)

Development Area: 250 ha

No	Item	Unit	Unit Rate	Quantity	Amount	Disbursement Rate		
						Year-1	Year-2	Year-3
1	River Training Work	L.S.	156,200,100	1	156,200,100	50%	50%	
2	Land Development	ha	16,500	250	4,125,000		100%	
3	Soil Improvement	ha	5,200	250	1,300,000		50%	50%
4	Fertilizer Provision	ha	9,980	250	2,495,000		50%	50%
5	Water Supply System	unit	59,500	50	2,975,000		50%	50%
	TOTAL				167,095,100	78,100,050	85,610,050	3,385,000

Table 16.4.21 Construction Cost of Community Road

Unit: Pesos

No.	Work Item	(as of 2002)	Year 2002	2003	2004	2005	2006	2007
Route-A1 (L=16.0km)								
1	Civil Work							
	Road Improvement	64,913,000			12,982,600	32,456,500	19,473,900	
	Bridge	53,434,000			10,686,800	37,403,800	5,343,400	
	Causeway	0				0	0	
	Retaining Wall	0						
	Total of Civil Works	118,347,000		0	23,669,400	69,860,300	24,817,300	0
2	Administration and Engineering Service	35,504,100		14,201,640	7,100,820	7,100,820	7,100,820	
3	Phisical Contingency (10%)	15,385,110		1,420,164	3,077,022	7,696,112	3,191,812	0
4	Total (1+2+3)	169,236,210		15,621,804	33,847,242	84,657,232	35,109,932	0
5	Price Escalation (4% per year)	19,921,170		624,872	2,761,935	10,570,641	5,963,722	0
6	Total Cost (4+5)	189,157,380		16,246,676	36,609,177	95,227,873	41,073,654	0
Route-A2 (L=32.0km)								
1	Civil Work							
	Road Improvement	131,782,000			26,356,400	65,891,000	39,534,600	
	Bridge	331,348,000			66,269,600	231,943,600	33,134,800	
	Causeway	57,782,000				28,891,000	28,891,000	
	Retaining Wall	0						
	Total of Civil Works	520,912,000		0	92,626,000	326,725,600	101,560,400	0
2	Administration and Engineering Service	156,273,600		62,509,440	31,254,720	31,254,720	31,254,720	
3	Phisical Contingency (10%)	67,718,560		6,250,944	12,388,072	35,798,032	13,281,512	0
4	Total (1+2+3)	744,904,160		68,760,384	136,268,792	393,778,352	146,096,632	
5	Price Escalation (4% per year)	87,854,452		2,750,415	11,119,533	49,168,740	24,815,764	0
6	Total Cost (4+5)	832,758,612		71,510,799	147,388,325	442,947,092	170,912,396	0
Route-B (L=14.8km)								
1	Civil Work							
	Road Improvement	56,086,000			16,825,800	39,260,200		
	Bridge	23,913,000			4,782,600	11,956,500	7,173,900	
	Causeway	6,521,000				3,260,500	3,260,500	
	Retaining Wall	0						
	Total of Civil Works	86,520,000		0	21,608,400	54,477,200	10,434,400	0
2	Administration and Engineering Service	25,956,000		10,382,400	5,191,200	5,191,200	5,191,200	
3	Phisical Contingency	11,247,600		1,038,240	2,679,960	5,966,840	1,562,560	0
4	Total (1+2+3)	123,723,600		11,420,640	29,479,560	65,635,240	17,188,160	0
5	Price Escalation (4% per year)	13,977,392		456,826	2,405,532	8,195,479	2,919,556	0
6	Total Cost (4+5)	137,700,992		11,877,466	31,885,092	73,830,719	20,107,716	0
Route-C (L=44.9km)								
1	Civil Work							
	Road Improvement	183,043,000			54,912,900	128,130,100		
	Bridge	131,521,000			26,304,200	65,760,500	39,456,300	
	Causeway	14,130,000				7,065,000	7,065,000	
	Retaining Wall	94,565,000						
	Total of Civil Works	423,259,000		0	81,217,100	200,955,600	46,521,300	0
2	Administration and Engineering Service	126,977,700		50,791,080	25,395,540	25,395,540	25,395,540	
3	Phisical Contingency	55,023,670		5,079,108	10,661,264	22,635,114	7,191,684	0
4	Total (1+2+3)	605,260,370		55,870,188	117,273,904	248,986,254	79,108,524	
5	Price Escalation (4% per year)	56,331,038		2,234,808	9,569,551	31,089,420	13,437,260	0
6	Total Cost (4+5)	661,591,408		58,104,996	126,843,455	280,075,674	92,545,784	0
OVERALL								
1	Civil Work							
	Road Improvement	435,824,000			130,747,200	305,076,800		
	Bridge	540,216,000			108,043,200	270,108,000	162,064,800	
	Causeway	78,433,000				39,216,500	39,216,500	
	Retaining Wall	94,565,000						
	Cost for Route-C	1,149,038,000		0	238,790,400	614,401,300	201,281,300	0
2	Total of Civil Works	1,149,038,000		0	238,790,400	614,401,300	201,281,300	0
3	Administration and Engineering Service	344,711,400		137,884,560	68,942,280	68,942,280	68,942,280	
4	Phisical Contingency	149,374,940		13,788,456	30,773,268	68,334,358	27,022,358	0
5	Total (1+2+3)	1,643,124,340						
5	Price Escalation (4% per year)	178,036,287		6,066,921	27,622,085	93,857,514	50,489,767	0
6	Total Cost (4+5)	1,821,160,627		157,739,937	366,128,033	845,535,452	347,735,705	0

Table 18.1.1 List of Proposed Priority Structure Measures

No	River Basin	Priority Projects	Project Cost (Million Pesos)
1	Bucao	The Bucao River dike construction and heightening, including re-construction of the Bucao Bridge	1,678 (Equivalent to US$ 33.2 million)
2	Sto. Tomas	The Sto. Tomas River dike construction, heightening and strengthening, excluding re-construction of the Maculcol Bridge	1,960 (Equivalent to US$ 38.8 million)

Table 18.1.2 Socio-Economic Surveys and Other Consultative Activities

Date	Activity	Location
Jan. 25, 2003	Consultation Workshop for Botolan Resettlement Centers	Botolan South Central School
Jan. 28, 2003	Consultation Workshop for Bucao Midstream Area	Baquilan Multipurpose Hall
Jan. 30, 2003	Consultation Workshop for San Felipe Resettlement Centers	Maloma National High School
Feb. 1, 2003	Consultation Workshop for Pure Aeta	San Marcelino Terraces
Feb. 4, 2003	Consultation Workshop for Sto. Tomas Midstream Area	San Marcelino Terraces
Feb. 7, 2003	Household Survey of PAPs	San Juan and Carael, Botolan
Feb. 8, 2003	Household Survey of PAPs	San Rafael, San Marcelino
Feb. 9, 2003	Household Survey of PAPs	San Rafael, San Marcelino and Alusiis, San Narciso
Feb. 10, 2003	Survey of Landowners Affected	Owner's residence
Feb. 11, 2003	Interview of Barangay Captains	(Aglao, Manglicmot, Alusiis, etc.)
Feb. 12, 2003	Survey of Landowners Affected	Owner's residence
Feb. 13, 2003	Survey of Landowners Affected	Owner's residence
Feb. 14, 2003	Perception Survey on Integrated Resettlement Center	(Tektek, Lalec, and Bantay Carmen)

Table 18.2.1 Summary Matrix of Potential Geo-hazards to Structures (Dams / Dikes)

Hazard	Potential	Adverse Factors	Potential Impacts	Possible Mitigation Measures
Differential Settling	Moderate - high	- underlying soft , loose sediments/soil - shallow water table - water saturation of sediments/soil - abrupt variations in load bearing capacity of underlying material	- fissuring / cracking of concrete finish - subsidence of structure - possible failure of portions of the dike	- ground preparation (compaction)
Intense Ground Shaking	Moderate	- proximity to active earthquake generator - magnitude of earthquake - poor ground conditions	- damage to, or collapse of structures	- ground preparation - use of proper design and construction materials
Liquefaction	Moderate Low	- intense ground shaking - shallow water table - thick, loose, fine grained, well sorted, water saturated underlying material	- subsidence of structures - possible collapse of structure	- ground preparations - foundation depth to consolidated material - floating foundations
Lahars	High	- availability of large amounts of loose debris - intense and prolonged rainfall - sudden release of impounded water (e.g. dam breaching)	- burial of structures - erosion and possible failure of structures - in-channel aggradations can cause piping in the structures	- appropriate design and location
Flooding and Erosion	High	- high rainfall - high concentration of sediment and other debris	- possible erosion, overtopping, and consequent failure of structure	- appropriate design

Table 18.2.2 Biological Environmental Impacts and Mitigation/Enhancement Measures for Sto.Tomas River Dike Heightening and Construction (1/2)

Environmental Issues	Potential Impacts	Nature/Degree of Impacts	Mitigation/Enhancement Measures
PRE AND CONSTRUCTION PHASE			
A. FLORA			
A.1 Diversity and Population	1. Loss of standing biomass/timber (*Casuarina equisitifolia*) volume along the dike, construction camps and transportation routes.	D; LT; M	a. Harvest of standing timber prior to construction. b. Collection of germplasm materials for nursery establishment to be used for replanting and rehabilitation.
	2. Death and removal of low lying plant species, on the river bed due to spur dike, training channel and consolidation dam construction.	D; LT; M	a. Collection of important/rare and important species to be used for future rehabilitation of affected banks.
	3. Death and removal of small trees and shrubs, among others, in streambanks, riverbanks and riparian zone.	D; LT; M	a. Germplasm collection of rare and important species to be used for future rehabilitation of affected banks.
	4. Decline diversity and plant composition especially in areas affected by dike heightening, road construction and establishment of construction camps.	D; ST; M	a. Germplasm collection for future rehabilitation of the affected areas. b. Conduct enrichment planting on areas.
A.2 Ecology and Productivity	1. Interruption of nutrient cycling and exchange of materials due to destruction and removal of standing trees/plants that provide litter biomass.	D; ST; M	a. Enrichmnet planting of open spaces to increase nutrient load through litter production.
	2. Reduction of plant productivity e.g. pasture plants and other low lying species, due to clogging of stomates and lenticels brought about by dust formation.	D; ST; M	a. Enrichment planting with shrubs and grass species in less dense or open spaces devoid of any vegetation.
B. FAUNA			
B.1 Diversity and Population	1. Disturbance and loss of microhabitat due to inundation.	D; LT; Mo	a. Rehabilitate the affected area with suitable plants as alternative habitat for disturbed wildlife.
	2. Decrease population of faunal species adapted to lotic environment.	I; lt; Mo	a. Trap some population of the affected species and transfer to nearby area with lotic environment.
	3. Reduce wildlife population due to removal of feeding trees, perching posts and nesting areas.	D; LT: Mo	a. Replanting/enrichment of degraded and open spaces with the same sets of species removed.

Table 18.2.2 Biological Environmental Impacts and Mitigation/Enhancement Measures for Sto.Tomas River Dike Heightening and Construction (2/2)

Environmental Issues	Potential Impacts	Nature/Degree of Impacts	Mitigation/Enhancement Measures
	4. Disturbances of wildlife (Avian) species due to sounds caused by blasting, use of equipment and general construction works.	D; ST; Mi	a. Construction of sound barriers and muffling devices.
	5. Reduce population of cattle and fish (fishpond) along the dikes.	D; ST; Mi	a. Replanting/introduction of forage/ fodder crops and transfer of fishpond.
B.2 Ecology	1. Disruption of food chain	I; LT; Mo	a. Immediate rehabilitation of denuded open and less dense plant communities in affected areas.
OPERATIONAL AND MAINTENANCE			
A. FLORA			
A.1 Diversity and Population	1. Decimation of plants along the river floodplain	D; ST;Mi	a. Planting of robust and deep rooted plants e.g. Talahib *(Saccharum spontaneum).*
	2. Death of plants inundated by lahar along the consolidation dam.	D; S; Mi	a. Transplantation of plant species to nearby unaffected floodplains.
	3. Favor the growth of plants trapped along the spur dikes and consolidated dam hence assist habitat build-up.	I; LT; Mi	a. Allow the plants to grow
A.2 Ecology and Productivity	1. Re-invasion of low lying plant species e.g. forb, grass, vines and small trees, in the accreted lahar along the consolidation dam and spur dike.	I; LT; Mo	a. Introduce shrubs or small trees species to ecological balance.
B.1 FAUNA			
B.1 Diversity and Population	1. Reduce number and diversity of wildlife due to disturbance but can recover with improvement of habitat.	D; ST; Mo	a. Conduct IEC on the ecological role of wildlife in order to maintain their population in the area.
B.2 Ecology	1. With gradual increase of population the overall ecology of the area can be achieved in no time.		a. Deputize LGU as wildlife warden.
	2. With gradual increase of population the overall ecology of the area can be achieved in no time	D; ST; Mo	b. Conduct IEC and deputize LGU and other government offices to apprehend poachers hunters.

D- Direct I – Indirect Mo- Moderate Mi- Minor ST- Short Term LT- Long Term

Table 18.2.3 Biological Environmental Impacts and Mitigation/Enhancement Measures for Bucao River Dike Heightening and Reconstruction/Relocation of Bucao Bridge (1/2)

Environmental Issues	Potential Impacts	Nature/Degree of Impacts	Mitigation/Enhancement Measures
PRE- AND CONSTRUCTION PHASE			
A. FLORA			
A.1 Diversity and Population	1. Removal of standing plant biomass in areas affected by dike heightening and construction/relocation of the Bucao bridge.	D; LT; M	a. Harvest of standing trees with commercial diameter and height.
A. 2 Ecology and Productivity	1. Disturbance of cycle of materials (plant biomass) especially the removal of *C. equisitifolia* with dike heightening.	I; ST; Mi	a. Enrichment planting in areas with low plant density.
	2. Reduction of primary plant productivity due to dust formation as a result of the construction activities.	I; ST; Mi	a. Enrichment planting in low plant density areas.
B. FAUNA			
B.1 Diversity and Population	1. Disturbance and loss of microhabitat due to inundation.	D; LT; Mo	a. Rehabilitate the affected area with suitable plants as alternative habitat for disturbed wildlife.
	2. Decrease population of faunal species adapted to lotic environment.	I; lt; Mo	a. Trap some population of the affected species and transfer to nearby area with lotic environment.
	3. Reduce wildlife population due to removal of feeding trees, perching posts and nesting areas.	D; LT: Mo	a. Replanting/enrichment of degraded and open spaces with the same sets of species removed.
	4. Disturbances of wildlife (Avian) species due to sounds caused by blasting, use of equipment and general construction works.	D; ST; Mi	a. Construction of sound barriers and muffling devices.
	5. Reduce population of cattle and fish (fishpond) along the dikes.	D; ST; Mi	Replanting/introduction of forage/fodder crops and transfer of fishpond.
B.2 Ecology	1. Disruption of food chain	I; LT; Mo	a. Immediate rehabilitation of denuded open and less dense plant communities in affected areas.

Table 18.2.3 Biological Environmental Impacts and Mitigation/Enhancement Measures for Bucao River Dike Heightening and Reconstruction/Relocation of Bucao Bridge (2/2)

OPERATIONAL AND MAINTENANCE			
A. FLORA			
A. 1 Diversity and Population	1. Death and loss of plants smothered by lahar in the floodplain.	I; ST; Mo	a. Enrich the area by planting deep rooted plants e.g. Talahib (*Saccharum spontaneum*)
A. 2 Ecology and Productivity	1. Gradual increase of plant population along dike heightened.	I; ST; Mo	a. Introduce other plant species adapted to the existing substrate.
	2. Improvement of plant cover in the flood plain	I; ST; Mo	a. Need protection from the astray animals so that it can grow to adulthood.
B. FAUNA			
B.1 Diversity and Population	1. Decrease population of animals due to disturbed habitat.	D; ST; Mo	a. Improve the habitat through rehabilitation (planting).
	2. Reduce number of wildlife adapted to lotic environment.	D; ST; Mo	a. Plant riparian adapted species in order to facilitate habitat development.
	3. Gradual improvement of wildlife population due to natural improvement of micro-habitat with plant succession.	I; ST; Mo	a. Conduct IEC on the ecological role of animals in the environment.
	4. Decrease area of pasture/range area for livestocks but interim in nature as plants can recover gradually.	D; ST; Mo	a. Introduction of new fast growing pasture species solely for livestock (cattle) consumption.
B.2 Ecology	1. With natural succession, there is improvement of habitat hence gradual increase in their ecology role e.g. seed dispersal, ect.	I; ST; Mo	a. Conduct IEC on the importance of wildlife to achieve ecological stability.

D- Direct I – Indirect Mo- Moderate Mi- Minor ST- Short Term LT- Long Term

Table 18.4.1 Summary Matrix of the Environmental Monitoring Plan (1/2)

Parameter	Location	Schedule and Frequency	Procedure	Applicable Standard	Responsible Party	Estimated Annual Cost (PhP)
Noise Levels	Construction areas exposed to heavy equipment	Daily	Using Weighted-Sound Level Meter	NPCC 1978	PCO	100,000
Air Quality						
TSP	Along the road of construction sites	Quarterly	Gravimetric Method/High Volume Air Sampling	DAO 2000-81	PCO	1,000,000
PM_{10}	Along the road of construction sites	Quarterly	Gravimetric Method/High Volume Air Sampling	DAO 2000-81	PCO	
NO_2	Along the road of construction sites	Semi-Annual	Griess-Saltzman, or Chemiluminescence Method/ Gas Bubbler(s) or Gas Impinger(s) or Chemiluminescence $NO/NO_X/NO_2$ analyzers	DAO 2000-81	PCO	
SO_2	Along the road of construction sites	Semi-Annual	Gas Bubbler and Pararosaniline Method (West and Gaeke Method), or Flame Photometric Detector / Gas Bubbler(s) or Gas Impinger(s)	DAO 2000-81	PCO	
CO	Along the road of construction sites	Semi-Annual	Non-dispersive Infra-red Spectrophotometry (NDIR), USEPA 40 CFR, Part 50, Appendix C	DAO 2000-81	PCO	
Lead	Along the road of construction sites	Semi-Annual	Atomic Absorption Spectrophotometry, USEPA 40 CFR, Part 50, Appendix G	DAO 2000-81	PCO	
Water Quality						
pH	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Glass Electrode Method	DAO 90-35	PCO	1,000,000
BOD_5	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Azide Modification (Dilution Technique)	DAO 90-35	PCO	
TSS	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Gravimetric Method (dried at 103°-105°C)	DAO 90-35	PCO	
Phenols	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Chloroform Extraction	DAO 90-35	PCO	

Table 18.4.1 Summary Matrix of the Environmental Monitoring Plan (2/2)

Parameter	Location	Schedule and Frequency	Procedure	Applicable Standard	Responsible Party	Estimated Annual Cost (PhP)
Oil and Grease	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Gravimetric Method (Petroleum Ether Extraction)	DAO 90-35	PCO	
Total Coliforms	Discharge points At least two river locations (upstream and downstream) per construction site	Quarterly	Multiple-Tube Fermentation Technique or Membrane Filter	DAO 90-35	PCO	
Cd	Discharge points At least two river locations (upstream and downstream) per construction site	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DAO 90-35	PCO	
Cr^{+6}	Discharge points At least two river locations (upstream and downstream) per construction site	Semi-annual	US EPA SW846 or APHA Standard Method 19th Ed. 1995	DAO 90-35	PCO	
Hg	Discharge points At least two river locations (upstream and downstream) per construction site	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DAO 90-35	PCO	
Pb	Discharge points At least two river locations (upstream and downstream) per construction site	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DAO 90-35	PCO	
Soil Quality						
Cd	At least three locations near Mapanuepe Lake	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DIV	PCO	300,000
Cr^{+6}	At least three locations near Mapanuepe Lake	Semi-annual	US EPA SW846 or APHA Standard Method 19th Ed. 1995	DIV	PCO	
Hg	At least three locations near Mapanuepe Lake	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DIV	PCO	
Pb	At least three locations near Mapanuepe Lake	Semi-annual	US EPA 6010B (ICP), 7470/1 (CVAA)	DIV	PCO	

Table 19.1.1 Probable Damage Amount

Bucao River Basin (Unit : Peso)

Return Period (years)	Hazard Area (km2)	House			Road		Paddy Field (ha)	Damage Cost						
		Resid.	Non-Res	Total (nos)	National (m)	Others (m)		House		Road		Paddy Field	Livestock	Total
								Resid.	Non-resi	National	Others			
2	7.7	751	7	758	1,370	16,330	330	214,502,873	7,797,524	4,027,800	38,408,160	11,489,610	10,964,600	287,190,567
5	8.7	913	9	922	1,730	20,780	378	260,773,799	10,025,388	5,086,200	48,874,560	13,160,826	13,329,800	351,250,573
10	9.6	1,037	10	1,047	1,800	24,190	417	296,191,051	11,139,320	5,292,000	56,894,880	14,518,689	15,140,200	399,176,140
20	11.1	1,191	12	1,203	2,230	29,110	508	340,176,993	13,367,184	6,556,200	68,466,720	17,687,036	17,388,600	463,642,733
30	11.9	1,301	13	1,314	2,510	31,510	547	371,595,523	14,481,116	7,379,400	74,111,520	19,044,899	18,994,600	505,607,058
50	12.9	1,411	14	1,425	2,780	34,110	609	403,014,053	15,595,048	8,173,200	80,226,720	21,203,553	20,600,600	548,813,174
100	14.4	1,546	15	1,561	3,170	36,790	670	441,573,158	16,708,980	9,319,800	86,530,080	23,327,390	22,571,600	600,031,008

Maloma River Basin (Unit : Peso)

Return Period (years)	Hazard Area (km2)	House			Road		Paddy Field (ha)	Damage Cost						
		Resid.	Non-Res	Total (nos)	National (m)	Others (m)		House		Road		Paddy Field	Livestock	Total
								Resid.	Non-resi	National	Others			
2	4.8	81	0	81	740	19,420	207	23,135,463	0	2,175,600	45,675,840	7,207,119	1,182,600	79,376,622
5	5.1	109	1	110	740	20,930	226	31,132,907	1,113,932	2,175,600	49,227,360	7,868,642	1,591,400	93,109,841
10	5.3	125	1	126	780	21,700	234	35,702,875	1,113,932	2,293,200	51,038,400	8,147,178	1,825,000	100,120,585
20	5.5	134	1	135	800	22,880	242	38,273,482	1,113,932	2,352,000	53,813,760	8,425,714	1,956,400	105,935,288
30	5.6	140	1	141	800	23,420	248	39,987,220	1,113,932	2,352,000	55,083,840	8,634,616	2,044,000	109,215,608
50	5.7	166	1	167	1,000	24,530	255	47,413,418	1,113,932	2,940,000	57,694,560	8,878,335	2,423,600	120,463,845
100	5.9	192	1	193	1,110	25,930	261	54,839,616	1,113,932	3,263,400	60,987,360	9,087,237	2,803,200	132,094,745

Sto. Tomas River Basin (Unit : Peso)

Return Period (years)	Hazard Area (km2)	House			Road		Paddy Field (ha)	Damage Cost						
		Resid.	Non-Res	Total (nos)	National (m)	Others (m)		House		Road		Paddy Field	Livestock	Total
								Resid.	Non-resi	National	Others			
2	39.9	1,484	14	1,498	4,130	166,190	2,387	423,864,532	15,595,048	12,142,200	390,878,880	83,108,179	21,666,400	947,255,239
5	48.9	2,201	22	2,223	4,910	218,630	2,862	628,656,223	24,506,504	14,435,400	514,217,760	99,646,254	32,134,600	1,313,596,741
10	54.0	2,657	26	2,683	5,540	247,890	3,175	758,900,311	28,962,232	16,287,600	583,037,280	110,543,975	38,792,200	1,536,523,598
20	58.9	3,150	31	3,181	5,020	273,750	3,465	899,712,450	34,531,892	14,758,800	643,860,000	120,640,905	45,990,000	1,759,494,047
30	62.2	3,431	34	3,465	6,260	289,540	3,656	979,972,513	37,873,688	18,404,400	680,998,080	127,290,952	50,092,600	1,894,632,233
50	65.9	3,800	38	3,838	6,910	307,530	3,868	1,085,367,400	42,329,416	20,315,400	723,310,560	134,672,156	55,480,000	2,061,474,932
100	71.0	4,341	43	4,384	7,620	333,840	4,168	1,239,889,443	47,899,076	22,402,800	785,191,680	145,117,256	63,378,600	2,303,878,855

Table 19.1.2 Annual Damage Calculation

Bucao River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Mudflow Damage up to Indicated Return Period (Million Peso)	Average Mudflow Damage (Million Peso)	Average Annual Mudflow Damage within Interval (Million Peso)	Avrage Annual Mudflow Damage up to Indicated R.P. (Million Peso)
2	0.50		287.2			0.0
		0.30		319.2	95.8	
5	0.20		351.3			95.8
		0.10		375.2	37.5	
10	0.10		399.2			133.3
		0.05		431.4	21.6	
20	0.05		463.6			154.9
		0.03		506.2	15.2	
50	0.02		548.8			170.0
		0.01		574.4	5.7	
100	0.01		600.0			175.8

Maloma River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Mudflow Damage up to Indicated Return Period (Million Peso)	Average Mudflow Damage (Million Peso)	Average Annual Mudflow Damage within Interval (Million Peso)	Avrage Annual Mudflow Damage up to Indicated R.P. (Million Peso)
2	0.50		79.4			0.0
		0.30		86.2	25.9	
5	0.20		93.1			25.9
		0.10		96.6	9.7	
10	0.10		100.1			35.5
		0.05		103.0	5.2	
20	0.05		105.9			40.7
		0.03		113.2	3.4	
50	0.02		120.5			44.1
		0.01		126.3	1.3	
100	0.01		132.1			45.3

Sto. Tomas River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Mudflow Damage up to Indicated Return Period (Million Peso)	Average Mudflow Damage (Million Peso)	Average Annual Mudflow Damage within Interval (Million Peso)	Avrage Annual Mudflow Damage up to Indicated R.P. (Million Peso)
2	0.50		947.3			0.0
		0.30		1,130.4	339.1	
5	0.20		1,313.6			339.1
		0.10		1,425.1	142.5	
10	0.10		1,536.5			481.6
		0.05		1,648.0	82.4	
20	0.05		1,759.5			564.0
		0.03		1,910.5	57.3	
50	0.02		2,061.5			621.3
		0.01		2,182.7	21.8	
100	0.01		2,303.9			643.2

Table 19.1.3 Calculation of Average Annual Detour Days for Bridge Damage

Bucao River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		0.0			0.0
		0.30		0.0	0.0	
5	0.20		0.0			0.0
		0.10		142.5	14.3	
10	0.10		285.0			14.3
		0.05		285.0	14.3	
20	0.05		285.0			28.5
		0.03		285.0	8.6	
50	0.02		285.0			37.1
		0.01		285.0	2.9	
100	0.01		285.0			39.9

Maloma River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		0.0			0.0
		0.30		0.0	0.0	
5	0.20		0.0			0.0
		0.10		0.0	0.0	
10	0.10		0.0			0.0
		0.05		90.0	4.5	
20	0.05		180.0			4.5
		0.03		180.0	5.4	
50	0.02		180.0			9.9
		0.01		180.0	1.8	
100	0.01		180.0			11.7

Sto. Tomas River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		0.0			0.0
		0.30		0.0	0.0	
5	0.20		0.0			0.0
		0.10		157.5	15.8	
10	0.10		315.0			15.8
		0.05		315.0	15.8	
20	0.05		315.0			31.5
		0.03		315.0	9.5	
50	0.02		315.0			41.0
		0.01		315.0	3.2	
100	0.01		315.0			44.1

Table 19.1.4 Estimation of Additional Transportation Cost for Bucao Bridge Damage

1 Traffic Volume at Bucao Bridge — Unit:AADT

Year	Car/P-up	Jeepney	Bus	Truck	Total
2002	2,022	175	412	412	3,021
2007	2,790	199	468	510	3,967
2017	5,312	251	590	781	6,934

*Source: JICA Study Team

2 Detour Distance

30% of traffic is cosidered from San Fernando to IBA

70% of traffic is considered from Olongapo to IBA — Unit:km

San Fernando - IBA	30% (Assumed)				Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen	70% (Assumed)				Total	
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3 Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS

* Price Level:Apr.2002

* Road Condition: Paved road, Fair condition

4 Number of Detour Days

Existing flow capacity of Bucao River at Bucao Bridge is less than 20-year probable flood.

The bridge is considered to break by those flood more than 20-year probability.

Construction period of temporary steel bridge is estimated at 10.5 months including the material procument of 4 months.

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Bridge Break	0	0	285	285	285	285	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	0	0	28.5	14.25	5.7	2.85	
Accum.Days		0	28.5	42.75	48.45	51.3	
Av.prob within intervals	0.30	0.10	0.05	0.03	0.01		
Av.detour days within intervals	0.0	142.5	285.0	285.0	285.0		
Av.annual detour days	0.0	14.3	14.3	8.6	2.9		
Accum.av.annual detour days		0.0	14.3	28.5	37.1	39.9	37.1

5 Annual Detour Cost

1) SF-TLC-LGY-IBA		Car/P-up	Jeepney	Bus	Truck	Total
	Total AADT	2,022	175	412	412	3,021
	% of traffic	30%	0%	30%	30%	
	AADT from SF	606.6	0	123.6	123.6	854
	% of cancel	20%	50%	10%	20%	
	Actual AADT	485.28	0	111.24	98.88	695
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	37.1	37.1	37.1	37.1	
	Amount	16,325,319	0	11,376,087	7,926,156	35,627,561
2) OLG-SF-TLC-□LGY - IBA		Car/P-up	Jeepney	Bus	Truck	Total
	Total AADT	2,022	175	412	412	3,021
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1415.4	175	288.4	288.4	2,167
	% of cancel	30%	100%	20%	30%	
	Actual AADT	990.78	0	230.72	201.88	1,423
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	37.1	37.1	37.1	37.1	
	Amount	64,133,170	0	45,399,739	31,137,493	140,670,402

6 Additional Damage cost due to repair of abutment

Total cost	Life time	Discount rate	Conv.Rate	Annual cost
5,000,000	50	10%	0.091619	458,095

*Right abutment of the bridge is seriously damaged and the bridge will be easily broken without repair of abutment

7 TOTAL Annual Damages **176,756,058**

Table 19.1.5 Estimation of Additional Transportation Cost for Maloma Bridge Damage

1. Traffic Volume at Maloma Bridge — Unit:AADT

	Year	Car/P-up	Jeepney	Bus	Truck	Total
Maloma	2002	1,905	144	401	394	2,844
	2007	2,628	164	457	488	3,737
	2017	5,004	206	576	750	6,536

*Source: JICA Study Team

2. Detour Distance
30% of traffic is cosidered from San Fernando to IBA
70% of traffic is considered from Olongapo to IBA — Unit:km

San Fernando - IBA	30% (Assumed)				Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen	70%	(Assumed)				
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3. Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS
* Price Level:Apr.2002
* Road Condition: Paved road, Fair condition

4. Number of Detour Days
Existing flow capacity of Maloma River at Maloma Bridge is less than 10-year probable flood.
The bridge is considered to break by those flood more than 20-year probability.
Construction period of temporary steel bridge is estimated at 6 months including the material procument of 4 months.

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Bridge Break	0	0	0	180	180	180	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	0	0	0	9	3.6	1.8	
Accum.Days	0	0	0	9	12.6	14.4	
Av.prob within intervals	0.30	0.10	0.05	0.03	0.01		
Av.detour days within intervals	0.0	0.0	90.0	180.0	180.0		
Av.annual detour days	0	0	4.5	5.4	1.8		
Accum.av.annual detour days		0	0	4.5	9.9	11.7	9.9

5. Annual Detour Cost

		Car/P-up	Jeepney	Bus	Truck	Total
1) SF-TLC-LGY -IBA	Total AADT	1,905	144	401	394	2,844
	% of traffic	30%	0%	30%	30%	
	AADT from SF	571.5	0	120.3	118.2	810
	% of cancel	20%	50%	10%	20%	
	Actual AADT	457.2	0	108.27	94.56	660
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	9.9	9.9	9.9	9.9	
	Amount	4,109,817	0	2,958,605	2,025,390	9,093,812
2) OLG-SF-TLC - LGY - IBA		Car/P-up	Jeepney	Bus	Truck	Total
	Total AADT	1,905	144	401	394	2,844
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1333.5	144	280.7	275.8	2,034
	% of cancel	40%	100%	20%	40%	
	Actual AADT	800.1	0	224.56	165.48	1,190
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	9.9	9.9	9.9	9.9	
	Amount	13,838,746	0	11,807,216	6,819,976	32,465,937

6. TOTAL Annual Damages **41,559,749**

Table 19.1.6 Estimation of Additional Transportation Cost for Maculcol Bridge Damage

1. Traffic Volume at Maculcol Bridge — Unit:AADT

	Year	Car/P-up	Jeepney	Bus	Truck	Total
Sto.Tomas	2002	2,367	99	555	447	3,468
	2007	3,266	113	630	554	4,563
	2017	6,217	142	794	849	8,002

*Source: JICA Study Team

2. Detour Distance
30% of traffic is cosidered from San Fernando to IBA
70% of traffic is considered from Olongapo to IBA — Unit:km

San Fernando - IBA	30% (Assumed)				Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen	70% (Assumed)					
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3. Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS
* Price Level:Apr.2002
* Road Condition: Paved road, Fair condition

4 Number of Detour Days
Existing flow capacity of Sto.Tomas River at Maculcol Bridge is less than 2-year probable flood.
The bridge is considered to break by those flood more than 10-year probability.
Construction period of temporary steel bridge is estimated at 10.5 months including the material procument of 4 months.

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Bridge Break	0	0	315	315	315	315	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	0	0	31.5	15.75	6.3	3.15	
Accum.Days		0	31.5	47.25	53.55	56.7	
Av.prob within intervals	0.3	0.1	0.05	0.03	0.01		
Av.detour days within intervals	0.0	157.5	315.0	315.0	315.0		
Av.annual detour days	0.0	15.8	15.8	9.5	3.2		
Accum.av.annual detour days		0.0	15.8	31.5	41.0	44.1	41.0

5. Annual Detour Cost

		Car/P-up	Jeepney	Bus	Truck	Total
1) SF-TLC-LGY-IBA	Total AADT	2,367	99	555	447	3,468
	% of traffic	30%	0%	30%	30%	
	AADT from SF	710.1	0	166.5	134.1	1,011
	% of cancel	20%	50%	10%	20%	
	Actual AADT	568.08	0	149.85	107.28	825
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	41.0	41.0	41.0	41.0	
	Amount	21,122,459	0	16,937,697	9,504,704	47,564,860
2) OLG-SF-TLC-LGY-IBA		Car/P-up	Jeepney	Bus	Truck	Total
	Total AADT	2,367	99	555	447	3,468
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1656.9	99	388.5	312.9	2,457
	% of cancel	40%	100%	20%	40%	
	Actual AADT	994.14	0	310.8	187.74	1,493
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	41.0	41.0	41.0	41.0	
	Amount	71,124,417	0	67,595,038	32,004,633	170,724,088

6. TOTAL Annual Damages — **218,288,948**

Table 19.1.7 Calculation of Average Annual Detour Days due to Road Inundation by Flood/mudflow

Bucao River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		4.0			0.0
		0.30		4.5	1.4	
5	0.20		5.0			1.4
		0.10		5.5	0.6	
10	0.10		6.0			1.9
		0.05		6.5	0.3	
20	0.05		7.0			2.2
		0.03		7.5	0.2	
50	0.02		8.0			2.5
		0.01		8.5	0.1	
100	0.01		9.0			2.5

Maloma River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		2.0			0.0
		0.30		2.5	0.8	
5	0.20		3.0			0.8
		0.10		3.0	0.3	
10	0.10		3.0			1.1
		0.05		3.5	0.2	
20	0.05		4.0			1.2
		0.03		4.5	0.1	
50	0.02		5.0			1.4
		0.01		5.0	0.1	
100	0.01		5.0			1.4

Sto. Tomas River Basin

Return Period (years)	Average Annual Probability of Exceedance for Return Period	Average Annual Events within interval	Detour days up to Indicated Return Period (days)	Average Detour days (days)	Average Annual Detour days (Days)	Average Annual Detour days up to Indicated R.P. (Days)
2	0.50		3.0			0.0
		0.30		3.5	1.1	
5	0.20		4.0			1.1
		0.10		4.5	0.5	
10	0.10		5.0			1.5
		0.05		5.5	0.3	
20	0.05		6.0			1.8
		0.03		6.5	0.2	
50	0.02		7.0			2.0
		0.01		7.5	0.1	
100	0.01		8.0			2.0

Table 19.1.8 Estimation of Additional Transportation Cost for Bucao River Flood/mudflow on Road

1. Traffic Volume at Bucao Bridge — Unit:AADT

Year	Car/P-up	Jeepney	Bus	Truck	Total
2002	2,022	175	412	412	3,021
2007	2,790	199	468	510	3,967
2017	5,312	251	590	781	6,934

*Source: JICA Study Team

2. Detour Distance

30% of traffic is considered from San Fernando to IBA — Unit:km

70% of traffic is considered from Olongapo to IBA

San Fernando - IBA		30%	(Assumed)		Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen		70%	(Assumed)			
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3. Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS

* Price Level:Apr.2002

* Road Condition: Paved road, Fair condition

4. Number of Detour Days

The detour day due to break of existing dike was considered as indirect damage

As the lahar deposition is expected on the road, cleaning period is added to the days of inundation

Cleaning days of road is considered 2-days after the flood

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Road Inundation	4	5	6	7	8	9	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	2	1	0.6	0.35	0.16	0.09	
Accum.Days		3	3.6	3.95	4.11	4.2	
Av.prob within intervals	0.3	0.1	0.05	0.03	0.01		
Av.detour days within intervals	4.5	5.5	6.5	7.5	8.5		
Av.annual detour days	1.4	0.6	0.3	0.2	0.1		
Accum.av.annual detour days		1.4	1.9	2.2	2.5	2.5	2.2

5. Annual Detour Cost

		Car/P-up	Jeepney	Bus	Truck	Total
1) SF-TLC-LGY-IBA	Total AADT	2,022	175	412	412	3,021
	% of traffic	30%	0%	30%	30%	
	AADT from SF	606.6	0	123.6	123.6	854
	% of cancel	20%	50%	10%	20%	
	Actual AADT	485.28	0	111.24	98.88	695
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	2.2	2.2	2.2	2.2	
	Amount	980,400	0	683,179	475,997	2,139,577

		Car/P-up	Jeepney	Bus	Truck	Total
2) OLG-SF-TLC-LG -IBA	Total AADT	2,022	175	412	412	3,021
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1415.4	175	288.4	288.4	2,167
	% of cancel	30%	100%	20%	30%	
	Actual AADT	990.78	0	230.72	201.88	1,423
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	2.2	2.2	2.2	2.2	
	Amount	3,851,452	0	2,726,435	1,869,930	8,447,818

6. TOTAL Annual Damages — **10,587,395**

Table 19.1.9 Estimation of Additional Transportation Cost for Maloma River Flood/mudflow on Road

1. Traffic Volume at Maloma Bridge — Unit:AADT

Maloma	Year	Car/P-up	Jeepney	Bus	Truck	Total
	2002	1,905	144	401	394	2,844
	2007	2,628	164	457	488	3,737
	2017	5,004	206	576	750	6,536

*Source: JICA Study Team

2. Detour Distance
30% of traffic is considered from San Fernando to IBA
70% of traffic is considered from Olongapo to IBA

Unit:km

San Fernando - IBA		30%(Assumed)			Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen		70%(Assumed)				
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3. Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS
* Price Level:Apr.2002
* Road Condition: Paved road, Fair condition

4. Number of Detour Days
The detour day due to break of existing dike was considered as indirect damage

Cleaning days of road is considered 1-day after the flood

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Road Inundation	2	3	3	4	5	5	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	1	0.6	0.3	0.2	0.1	0.05	
Accum.Days	1	1.6	1.9	2.1	2.2	2.25	
Av.prob within intervals	0.3	0.1	0.05	0.03	0.01		
Av.detour days within intervals	2.5	3.0	3.5	4.5	5.0		
Av.annual detour days	0.8	0.3	0.2	0.1	0.1		
Accum.av.annual detour days		0.8	1.1	1.2	1.4	1.4	1.2

5. Annual Detour Cost

		Car/P-up	Jeepney	Bus	Truck	Total
1) SF-TLC-LGY-IBA	Total AADT	1,905	144	401	394	2,844
	% of traffic	30%	0%	30%	30%	
	AADT from SF	571.5	0	120.3	118.2	810
	% of cancel	20%	50%	10%	20%	
	Actual AADT	457.2	0	108.27	94.56	660
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	1.2	1.2	1.2	1.2	
	Amount	508,538	0	366,090	250,616	1,125,244

		Car/P-up	Jeepney	Bus	Truck	Total
2)OLG-SF-TLC-LGY-IBA	Total AADT	1,905	144	401	394	2,844
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1333.5	144	280.7	275.8	2,034
	% of cancel	40%	100%	20%	40%	
	Actual AADT	800.1	0	224.56	165.48	1,190
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	1.2	1.2	1.2	1.2	
	Amount	1,712,370	0	1,460,994	843,886	4,017,250

6. TOTAL Annual Damages **5,142,494**

Table 19.1.10 Estimation of Additional Transportation Cost for Sto. Tomas River Flood/mudflow on Road

1. Traffic Volume at Maculcol Bridge — Unit:AADT

	Year	Car/P-up	Jeepney	Bus	Truck	Total
Sto.Tomas	2002	2,367	99	555	447	3,468
	2007	3,266	113	630	554	4,563
	2017	6,217	142	794	849	8,002

*Source: JICA Study Team

2. Detour Distance
30% of traffic is considered from San Fernando to IBA
70% of traffic is considered from Olongapo to IBA — Unit:km

San Fernando - IBA		30%(Assumed)			Total	Additional Distance
W/Bridge	SF-OLG	OLG-IBA				
	67	77			144	**145**
W/o Brg.	SF-TLC	TLC-LGY	LGY-IBA			
	58	83	148		289	
Olongapo - IBA - Lingayen			70%	(Assumed)		
W/Bridge	OLG-IBA					
	77				77	**279**
W/o Brg.	OLG-SF	SF-TLC	TLC-LGY	LGY-IBA		
	67	58	83	148	356	

3. Detour Cost — Unit:Peso/km

Car/P-up	Jeepney	Bus	Truck
6.262	5.804	19.036	14.921

*Source: DPWH, PMO-FS
* Price Level:Apr.2002
* Road Condition: Paved road, Fair condition

4. Number of Detour Days
The detour day due to break of existing dike was considered as indirect damage
As the lahar deposition is expected on the road, cleaning period is added to the days of inundation
Cleaning days of road is considered 2-days after the flood

	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year	Annual
Road Inundation	3	4	5	6	7	8	
Probability	0.5	0.2	0.1	0.05	0.02	0.01	
Days	1.5	0.8	0.5	0.3	0.14	0.08	
Accum.Days	1.5	2.3	2.8	3.1	3.24	3.32	
Av.prob within intervals	0.3	0.1	0.05	0.03	0.01		
Av.detour days within intervals	3.5	4.5	5.5	6.5	7.5		
Av.annual detour days	1.1	0.5	0.3	0.2	0.1		
Accum.av.annual detour days		1.1	1.5	1.8	2.0	2.0	1.8

5. Annual Detour Cost

		Car/P-up	Jeepney	Bus	Truck	Total
1) SF-TLC-LGY-IBA	Total AADT	2,367	99	555	447	3,468
	% of traffic	30%	0%	30%	30%	
	AADT from SF	710.1	0	166.5	134.1	1,011
	% of cancel	20%	50%	10%	20%	
	Actual AADT	568.08	0	149.85	107.28	825
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	145	145	145	145	
	Detour days	1.8	1.8	1.8	1.8	
	Amount	915,564	0	734,174	411,987	2,061,725

		Car/P-up	Jeepney	Bus	Truck	Total
2) OLG-SF-TLC-LGY-IBA	Total AADT	2,367	99	555	447	3,468
	% of traffic	70%	100%	70%	70%	
	AADT fr. OLG	1656.9	99	388.5	312.9	2,457
	% of cancel	40%	100%	20%	40%	
	Actual AADT	994.14	0	310.8	187.74	1,493
	Unit rate	6.262	5.804	19.036	14.921	
	Distance	279	279	279	279	
	Detour days	1.8	1.8	1.8	1.8	
	Amount	3,082,927	0	2,929,944	1,387,258	7,400,128

6. TOTAL Annual Damages — **9,461,853**

Table 19.1.11 Loss of Non-agricultural Production from Flood and Lahar

Sto.Tomas River

Number of House

Depth(m)			2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05	～	0.10	1305	1445	1496	1412	1409	1424	1537
0.10	～	0.20	984	1483	1647	1914	1912	1895	1954
0.20	～	0.30	713	784	873	980	1137	1263	1365
0.30	～	0.50	455	805	1100	1278	1343	1405	1598
0.50	～	0.75	211	313	351	462	572	773	925
0.75	～	1.00	65	120	165	238	279	292	375
1.00	～	1.50	26	70	100	122	140	198	262
1.50	～	3.00	23	25	29	37	39	45	61
3.00	～	10.00	0	0	1	1	1	1	2
Total			3782	5045	5762	6444	6832	7296	8079
Effective total houses			3782	1263	717	682	ignore values for return periods of > 20 years		
Probability of event in one year			0.5	0.2	0.1	0.05			
Most probable houses affected per year			1891	253	72	34			

Total most probable houses affected per year	2,249
Total most probable urban houses affected per year	1,350
Number of adults affected (3.04 adults per HH in Region 3 in 2000) per year	4,103
Number of days per year for average flood/lahar event (see Table 19.1.12 for notes on calculation)	4.74
Number of productive days lost in 2004 (base year)	19,448
Non-agricultural GRDP per adult per day in Region 3 in 2000 = P199billion/(4.965 millionx365)	109.81
Total non-agricultural GRDP lost in 2004 = 32,413 x 109.81 x 1.05^4 (million pesos)	2.60

Maloma River

Number of House

Depth(m)			2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05	～	0.10	14	6	2	3	8	63	43
0.10	～	0.20	12	9	10	4	3	38	73
0.20	～	0.30	32	20	9	8	5	2	25
0.30	～	0.50	38	54	52	41	38	22	7
0.50	～	0.75	21	33	46	49	53	63	57
0.75	～	1.00	8	13	15	27	29	37	41
1.00	～	1.50	3	8	15	20	23	21	35
1.50	～	3.00	0	1	1	2	2	7	11
3.00	～	10.00	0	0	0	0	0	0	0
Total			128	144	150	154	161	253	292
Effective total houses			128	16	6	4	Ignore values for return periods of > 20 years		
Probability of event in one year			0.5	0.2	0.1	0.05			
Most probable houses affected per year			64	3	1	0			

Total most probable houses affected per year	68
Total most probable urban houses affected per year	41
Number of adults affected (3.04 adults per HH in Region 3 in 2000) per year	124
Number of days per year for average flood/lahar event (see Table 19.1.12 for notes on calculation)	6.18
Number of productive days lost in 2004 (base year)	767
Non-agricultural GRDP per adult per day in Region 3 in 2000 = P199billion/(4.965 millionx365)	109.81
Total non-agricultural GRDP lost in 2004 = 1,278 x 109.81 x 1.05^4 (million pesos)	0.10

Bucao River

Number of House

Depth(m)			2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05	～	0.10	130	163	154	291	244	241	271
0.10	～	0.20	303	297	295	332	441	489	450
0.20	～	0.30	250	224	244	253	245	269	395
0.30	～	0.50	346	392	406	457	473	471	467
0.50	～	0.75	126	176	233	258	302	355	394
0.75	～	1.00	48	100	96	106	112	121	150
1.00	～	1.50	43	59	99	135	147	165	184
1.50	～	3.00	30	49	64	76	74	74	89
3.00	～	10.00	0	0	0	0	2	6	6
Total			1276	1460	1591	1908	2040	2191	2406
Effective total houses			1276	184	131	317	Ignore values for return periods of > 20 years		
Probability of event in one year			0.5	0.2	0.1	0.05			
Most probable houses affected per year			638	37	13	16			

Total most probable houses affected per year	704
Total most probable urban houses affected per year	422
Number of adults affected (3.04 adults per HH in Region 3 in 2000) per year	1,284
Number of days per year for average flood/lahar event (see Table 19.1.12 for notes on calculation)	5.41
Number of productive days lost in 2004 (base year)	6,944
Non-agricultural GRDP per adult per day in Region 3 in 2000 = P199billion/(4.965 millionx365)	109.81
Total non-agricultural GRDP lost in 2004 = 1,278 x 109.81 x 1.05^4(million pesos)	0.93

Total for Three Rivers

Gross total houses	5186	6649	7503	8506	9033	9740	10777
Effective total houses	5186	1463	854	1003	Ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			
Most probable houses affected per year	2593	293	85	50			

Total most probable houses per year	3,021
Total most probable urban houses affected per year	2,266
Number of adults affected (3.04 adults per HH in Region 3 in 2000) per year	6,888
Number of days per year for average flood/lahar event	not computed
Number of productive days lost in 2004 (base year)	27,159
Non-agricultural GRDP per adult per day in Region 3 in 2000 = P199billion/(4.965 millionx365)	109.81
Total non-agricultural GRDP lost in 2004 = 93,069 x 109.81 x 1.05^4(million pesos)	3.63

Table 19.1.12 Base Data for Estimate of GRDP Loss caused by Flood and Lahar

Population

Adult population in Region 3 in 2000	4,965,000
Number of households in Region 3 in 2000	1,632,047
Number of adults per household	3.04

GRDP Loss

Non-agricultural GRDP in Region 3 at current prices in 2000 (million pesos)	199,025
Growth in non-agricultural GRDP in Region 3 (per cent per annum)*	5.00
Projected growth in population in Zambales (rough estimate based on national projection to 2004*	
and past Zambales rates since 1980) (per cent per annum)	2.00

Loss of GRDP caused by interruption of economic activities

= number of affected population x urban/rural ratio x daily per capita non-agricultural GRDP x days (see below)

Urban:rural population ratio:

1990 Region 3 urban population = 3.73m; total population = 6.20m Therefore Zambales urban/rural ratio ~ 60/40

Data specific to Sto.Tomas River

Assumed duration of interruption of economic activities (days per year)** 4.74

Data specific to Maloma River

Assumed duration of interruption of economic activities (days per year)*** 6.18

Data specific to Bucao River

Assumed duration of interruption of economic activities (days per year)**** 5.41

Notes:

1 *Average growth rate for Region 3 (1999 to 2004) plus national population growth rates extracted from Philippine Medium Term Development Plan (1999-2004)

2. Calculation of productive days lost is based on standard Japanese statistics as follows:

Days/depth (cms)	4.4/50	6.3/50-99	10.3/100-199	16.8/200-299	22.6/300	
For the following frequencies for 20-year return flood:						
Sto. Tomas River**						
- houses inundated to depth indicated/total houses inundated to any depth:	5584/6444	700/6444	159/6444	-	1//6444	
Therefore most probable days lost for each inundation depth =	3.80	0.68	0.25	-	0.00	Total 4.74
Maloma River***						
- houses inundated to depth indicated/total houses inundated to any depth:	56/154	76/154	22/154	-	0//154	
Therefore most probable days lost for each inundation depth =	1.60	3.11	1.47	-	0.00	Total 6.18
Bucao River****						
- houses inundated to depth indicated/total houses inundated to any depth:	1333/1908	364/1908	211/1908	-	0//1908	
Therefore most probable days lost for each inundation depth =	3.07	1.20	1.14	-	0.00	Total 5.41

Table 19.1.13 Evacuation Cost from Flood and Lahar

Sto.Tomas River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	1305	1445	1496	1412	1409	1424	1537
0.10 ～ 0.20	984	1483	1647	1914	1912	1895	1954
0.20 ～ 0.30	713	784	873	980	1137	1263	1365
0.30 ～ 0.50	455	805	1100	1278	1343	1405	1598
0.50 ～ 0.75	211	313	351	462	572	773	925
0.75 ～ 1.00	65	120	165	238	279	292	375
1.00 ～ 1.50	26	70	100	122	140	198	262
1.50 ～ 3.00	23	25	29	37	39	45	61
3.00 ～ 10.00	0	0	1	1	1	1	2
Total	3782	5045	5762	6444	6832	7296	8079
Effective total houses	3782	1263	717	682	ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			

Households affected by 20-year flood	6444
Most probable number of households	322.2
Evacuation period (weeks) per flood event	1.0
Total evacuation weeks	322.2
Weekly cost per household (216 pesos + 53% cost inflation increase):	330.48
STO. TOMAS RIVER COST PER YEAR	106,481

Maloma River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	14	6	2	3	8	63	43
0.10 ～ 0.20	12	9	10	4	3	38	73
0.20 ～ 0.30	32	20	9	8	5	2	25
0.30 ～ 0.50	38	54	52	41	38	22	7
0.50 ～ 0.75	21	33	46	49	53	63	57
0.75 ～ 1.00	8	13	15	27	29	37	41
1.00 ～ 1.50	3	8	15	20	23	21	35
1.50 ～ 3.00	0	1	1	2	2	7	11
3.00 ～ 10.00	0	0	0	0	0	0	0
Total	128	144	150	154	161	253	292
Effective total houses	128	16	6	4	ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			

Households affected by 20-year flood	154
Most probable number of households	7.7
Evacuation period (weeks)	1.0
Total evacuation weeks	7.7
Weekly cost per household (216 pesos + 53% cost inflation increase):	330.48
MALOMA RIVER COST PER YEAR	2,545

Bucao River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	130	163	154	291	244	241	271
0.10 ～ 0.20	303	297	295	332	441	489	450
0.20 ～ 0.30	250	224	244	253	245	269	395
0.30 ～ 0.50	346	392	406	457	473	471	467
0.50 ～ 0.75	126	176	233	258	302	355	394
0.75 ～ 1.00	48	100	96	106	112	121	150
1.00 ～ 1.50	43	59	99	135	147	165	184
1.50 ～ 3.00	30	49	64	76	74	74	89
3.00 ～ 10.00	0	0	0	0	2	6	6
Total	1276	1460	1591	1908	2040	2191	2406
Effective total houses	1276	184	131	317	ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			

Households affected by 20-year flood	1908
Most probable number of households	95.4
Evacuation period (weeks)	1.0
Total evacuation weeks	95.4
Weekly cost per household (216 pesos + 53% cost inflation increase):	330.48
BUCAO RIVER COST PER YEAR	31,528

Total for Three Rivers

Households affected by 20-year flood	8506
Probability of event in one year	0.05
Most probable houses affected per year	425
Total evacuation weeks	425.3
TOTAL RIVERS COST PER YEAR (PESOS)	140,553

Table 19.1.14 Cleanup Cost from Flood and Lahar (1/2)

Sto. Tomas River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	1305	1445	1496	1412	1409	1424	1537
0.10 ～ 0.20	984	1483	1647	1914	1912	1895	1954
0.20 ～ 0.30	713	784	873	980	1137	1263	1365
0.30 ～ 0.50	455	805	1100	1278	1343	1405	1598
0.50 ～ 0.75	211	313	351	462	572	773	925
0.75 ～ 1.00	65	120	165	238	279	292	375
1.00 ～ 1.50	26	70	100	122	140	198	262
1.50 ～ 3.00	23	25	29	37	39	45	61
3.00 ～ 10.00	0	0	1	1	1	1	2
Total	3782	5045	5762	6444	6832	7296	8079
Effective total houses	3782	1263	717	682	ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05		Totals	
to 0.50	455	805	1100	1278			
Effective total houses	455	350	295	178			
Most probable houses per year	228	70	30	9			
Cleaning days per house	7.5	7.5	7.5	7.5			
Total cleaning days needed	1,706	525	221	67		2,519	
0.50 to 1.00							
Effective total houses	276	157	83	184			
Most probable houses per year	138	31.4	8.3	9.2			
Cleaning days per house	13.3	13.3	13.3	13.3			
Total cleaning days needed	1,835	418	110	122		2,486	
1.00 to 2.00							
Effective total houses	26	44	30	22			
Most probable houses per year	13	9	3	1			
Cleaning days per house	26.1	26.1	26.1	26.1			
Total cleaning days needed	339	230	78	29		676	
2.00 to 3.00							
Effective total houses	23	2	5	8			
Most probable houses per year	12	0	1	0			
Cleaning days per house	42.4	42.4	42.4	42.4			
Total cleaning days needed	488	17	21	17		543	
STO TOMAS CLEANING DAYS						6,224	
STO TOMAS CLEANING COST (days*(150+53%))						1,428,346	

Maloma River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	14	6	2	3	8	63	43
0.10 ～ 0.20	12	9	10	4	3	38	73
0.20 ～ 0.30	32	20	9	8	5	2	25
0.30 ～ 0.50	38	54	52	41	38	22	7
0.50 ～ 0.75	21	33	46	49	53	63	57
0.75 ～ 1.00	8	13	15	27	29	37	41
1.00 ～ 1.50	3	8	15	20	23	21	35
1.50 ～ 3.00	0	1	1	2	2	7	11
3.00 ～ 10.00	0	0	0	0	0	0	0
Total	128	144	150	154	161	253	292
Effective total houses	128	16	6	4	Ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			
	64	3	1	0			
to 0.50							
Effective total houses	38	16	-2	-11			
Most probable houses per year	19	3	0	-1			
Cleaning days per house	7.5	7.5	7.5	7.5			
Total cleaning days needed	143	24	0	0		167	
0.50 to 1.00							
Effective total houses	29	17	15	15			
Most probable houses per year	14.5	3	2	1			
Cleaning days per house	13.3	13.3	13.3	13.3			
Total cleaning days needed	193	45	20	10		268	
1.00 to 2.00							
Effective total houses	3	5	7	5			
Most probable houses per year	2	1	1	0			
Cleaning days per house	26.1	26.1	26.1	26.1			
Total cleaning days needed	39	26	18	7		90	
2.00 to 3.00							
Effective total houses	0	1	1	2			
Most probable houses per year	0	0	0	0			
Cleaning days per house	42.4	42.4	42.4	42.4			
Total cleaning days needed	0	8	4	4		17	
MALOMA CLEANING DAYS						504	
MALOMA CLEANING COST (days*(150+53%))						115,737	

Table 19.1.14 Cleanup Cost from Flood and Lahar (2/2)

Bucao River

Number of House

Depth(m)	2Year	5Year	10Year	20Year	30Year	50Year	100Year
0.05 ～ 0.10	130	163	154	291	244	241	271
0.10 ～ 0.20	303	297	295	332	441	489	450
0.20 ～ 0.30	250	224	244	253	245	269	395
0.30 ～ 0.50	346	392	406	457	473	471	467
0.50 ～ 0.75	126	176	233	258	302	355	394
0.75 ～ 1.00	48	100	96	106	112	121	150
1.00 ～ 1.50	43	59	99	135	147	165	184
1.50 ～ 3.00	30	49	64	76	74	74	89
3.00 ～ 10.00	0	0	0	0	2	6	6
Total	1276	1460	1591	1908	2040	2191	2406
Effective total houses	1276	184	131	317	Ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			

to 0.50					
Effective total houses	346	46	14	51	
Most probable houses per year	173	9	1	3	
Cleaning days per house	7.5	7.5	7.5	7.5	
Total cleaning days needed	1298	69	11	19	1,396
0.50 to 1.00					
Effective total houses	174	102	53	35	
Most probable houses per year	87	20	5	2	
Cleaning days per house	13.3	13.3	13.3	13.3	
Total cleaning days needed	1157	271	70	23	1,522
1.00 to 2.00					
Effective total houses	43	16	40	36	
Most probable houses per year	22	3	4	2	
Cleaning days per house	26.1	26.1	26.1	26.1	
Total cleaning days needed	561	84	104	47	796
2.00 to 3.00					
Effective total houses	30	19	15	12	
Most probable houses per year	15	4	2	1	
Cleaning days per house	42.4	42.4	42.4	42.4	
Total cleaning days needed	636	161	64	25	886
BUCAO CLEANING DAYS					4,601
BUCAO CLEANING COST (days*(150+53%))					1,055,819

Total for Three Rivers

Gross total houses	5186	6649	7503	8506	9033	9740	10777
Effective total houses	5186	1463	854	1003	Ignore values for return periods of > 20 years		
Probability of event in one year	0.5	0.2	0.1	0.05			
Most probable houses affected per year	2593	293	85	50			
Total most probable houses per year						3,021	
TOTAL CLEANING DAYS						11,329	
TOTAL CLEANING COST (PESOS)						2,599,902	

Table 19.1.15 Economic Evaluation for Bucao River Flood/Mudflow Control Project (including re-construction of Bucao Bridge)

(Unit : million Peso)

No.	Year	COST			BENEFIT			
		Initial	O&M	Total	Direct	Indirect	Total	B - C
1	2004			0.00				0.00
2	2005	82.79		82.79				-82.79
3	2006	165.59		165.59				-165.59
4	2007	295.70		295.70				-295.70
5	2008	224.73		224.73			0.00	-224.73
6	2009	224.73		224.73			0.00	-224.73
7	2010	189.24		189.24			0.00	-189.24
8	2011		17.74	17.74	131.63	152.03	283.66	265.92
9	2012		17.74	17.74	131.63	152.03	283.66	265.92
10	2013		17.74	17.74	131.63	152.03	283.66	265.92
11	2014		17.74	17.74	131.63	152.03	283.66	265.92
12	2015		17.74	17.74	131.63	152.03	283.66	265.92
13	2016		17.74	17.74	131.63	152.03	283.66	265.92
14	2017		17.74	17.74	131.63	152.03	283.66	265.92
15	2018		17.74	17.74	131.63	152.03	283.66	265.92
16	2019		17.74	17.74	131.63	152.03	283.66	265.92
17	2020		17.74	17.74	131.63	152.03	283.66	265.92
18	2021		17.74	17.74	131.63	152.03	283.66	265.92
19	2022		17.74	17.74	131.63	152.03	283.66	265.92
20	2023		17.74	17.74	131.63	152.03	283.66	265.92
21	2024		17.74	17.74	131.63	152.03	283.66	265.92
22	2025		17.74	17.74	131.63	152.03	283.66	265.92
23	2026		17.74	17.74	131.63	152.03	283.66	265.92
24	2027		17.74	17.74	131.63	152.03	283.66	265.92
25	2028		17.74	17.74	131.63	152.03	283.66	265.92
26	2029		17.74	17.74	131.63	152.03	283.66	265.92
27	2030		17.74	17.74	131.63	152.03	283.66	265.92
28	2031		17.74	17.74	131.63	152.03	283.66	265.92
29	2032		17.74	17.74	131.63	152.03	283.66	265.92
30	2033		17.74	17.74	131.63	152.03	283.66	265.92
31	2034		17.74	17.74	131.63	152.03	283.66	265.92
32	2035		17.74	17.74	131.63	152.03	283.66	265.92
33	2036		17.74	17.74	131.63	152.03	283.66	265.92
34	2037		17.74	17.74	131.63	152.03	283.66	265.92
35	2038		17.74	17.74	131.63	152.03	283.66	265.92
36	2039		17.74	17.74	131.63	152.03	283.66	265.92
37	2040		17.74	17.74	131.63	152.03	283.66	265.92
TOTAL		1,182.78	408.06	1,590.84	3,027.47	3,496.71	6,524.19	4,933.35

EIRR = 15.7%

NPV(15%) 36

Table 19.1.16 Economic Evaluation for the Sto.Tomas Flood/Mudflow Control Works (cost for Maculcol Bridge is added)

(Unit : million Peso)

No.	Year	COST			BENEFIT			
		Initial	O&M	Total	Direct	Indirect	Total	B - C
1	2004			0.00				0.00
2	2005			0.00				0.00
3	2006	64.97		64.97				-64.97
4	2007	341.09		341.09				-341.09
5	2008	438.54		438.54			0.00	-438.54
6	2009	454.78		454.78			0.00	-454.78
7	2010	324.85		324.85			0.00	-324.85
8	2011		24.36	24.36	479.43	189.04	668.47	644.11
9	2012		24.36	24.36	479.43	189.04	668.47	644.11
10	2013		24.36	24.36	479.43	189.04	668.47	644.11
11	2014		24.36	24.36	479.43	189.04	668.47	644.11
12	2015		24.36	24.36	479.43	189.04	668.47	644.11
13	2016		24.36	24.36	479.43	189.04	668.47	644.11
14	2017		24.36	24.36	479.43	189.04	668.47	644.11
15	2018		24.36	24.36	479.43	189.04	668.47	644.11
16	2019		24.36	24.36	479.43	189.04	668.47	644.11
17	2020		24.36	24.36	479.43	189.04	668.47	644.11
18	2021		24.36	24.36	479.43	189.04	668.47	644.11
19	2022		24.36	24.36	479.43	189.04	668.47	644.11
20	2023		24.36	24.36	479.43	189.04	668.47	644.11
21	2024		24.36	24.36	479.43	189.04	668.47	644.11
22	2025		24.36	24.36	479.43	189.04	668.47	644.11
23	2026		24.36	24.36	479.43	189.04	668.47	644.11
24	2027		24.36	24.36	479.43	189.04	668.47	644.11
25	2028		24.36	24.36	479.43	189.04	668.47	644.11
26	2029		24.36	24.36	479.43	189.04	668.47	644.11
27	2030		24.36	24.36	479.43	189.04	668.47	644.11
28	2031		24.36	24.36	479.43	189.04	668.47	644.11
29	2032		24.36	24.36	479.43	189.04	668.47	644.11
30	2033		24.36	24.36	479.43	189.04	668.47	644.11
31	2034		24.36	24.36	479.43	189.04	668.47	644.11
32	2035		24.36	24.36	479.43	189.04	668.47	644.11
33	2036		24.36	24.36	479.43	189.04	668.47	644.11
34	2037		24.36	24.36	479.43	189.04	668.47	644.11
35	2038		24.36	24.36	479.43	189.04	668.47	644.11
36	2039		24.36	24.36	479.43	189.04	668.47	644.11
37	2040		24.36	24.36	479.43	189.04	668.47	644.11
TOTAL		1,624.23	560.36	2,184.59	11,026.87	4,347.92	15,374.79	13,190.20
							EIRR =	26.3%
							NPV(15%)	815

Notes: Cost for Maculcol bridge: 327 million Pesos is added to the Project Cost.

Table 19.2.1 Economic Evaluation on CBFM Program for Community Based Disaster Prevention Activities (For Pilot Scheme Development of 2,200ha)

Year	Cost			Benefit					B-C
	Re-forestation		Agro-forestry	Stumpage of Tree-Plantation	Agro-forestry			Sediment Reduction	
	Initial Development Cost	Replacement Cost			Mango	Cashew	Corn		
				1,837	147	110	110		
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
1	20.795	0.000	5.851	0.000	-0.712	-0.577	0.000	0.000	-27.935
2	14.972	0.000	3.069	0.000	-0.451	-0.381	0.201	0.000	-18.672
3	6.779	0.000	1.690	0.000	-0.451	-0.647	0.402	0.000	-9.165
4	3.498	0.000	1.037	0.000	-0.392	-0.410	0.634	0.000	-4.702
5		0.000		0.000	-0.399	-0.140	0.866	0.000	0.326
6		0.000		0.000	-0.593	0.263	0.866	0.000	0.536
7		0.000		0.000	-0.546	0.605	0.866	0.000	0.925
8		0.000		0.000	-0.467	0.853	0.866	0.000	1.252
9		0.000		43.774	0.153	1.172	0.866	0.000	45.965
10		20.795		43.774	1.446	1.542	0.866	4.600	31.432
11		14.972		43.774	4.637	1.911	0.866	4.600	40.816
12		6.779		43.774	9.143	2.247	0.866	4.600	53.852
13		3.498		43.774	13.546	2.496	0.866	4.600	61.783
14		0.000		0.000	17.260	2.496	0.866	4.600	25.221
15		0.000		0.000	21.858	2.496	0.866	4.600	29.819
16		0.000		0.000	23.230	2.496	0.866	4.600	31.192
17		0.000		0.000	24.751	2.496	0.866	4.600	32.713
18		0.000		43.774	26.541	2.496	0.866	4.600	78.276
19		20.795		43.774	28.216	2.496	0.866	4.600	59.156
20		14.972		43.774	29.493	2.496	0.866	4.600	66.257
21		6.779		43.774	29.463	2.496	0.866	4.600	74.420
22		3.498		43.774	29.036	2.496	0.866	4.600	77.273
23		0.000		0.000	28.976	2.496	0.866	4.600	36.937
24		0.000		0.000	28.976	2.496	0.866	4.600	36.937
25		0.000		0.000	28.976	2.496	0.866	4.600	36.937
26		0.000		0.000	28.946	2.496	0.866	4.600	36.907
NPV (15%)	20.50	7.48	5.21	35.22	14.63	1.90	2.25	4.52	25.31
EIRR									**21.5%**

Table 19.2.2 Economic Evaluation for Agriculture Development on Lahar Area
(For Pilot Development Area : Full Development Scheme)

Area-4 : Bucao, Downstream, Right Side at River Area (Barangay San Juan)

Development Area: 120 ha

EIRR									
98968383.36	2613600	823680	1580832	1884960	105871455.4	33741	156240	122499	
						120	120		

Year	Cost						Benefit (Sweet Potato)			B-C
	River training	Land develop	Soil improve	Fertilizer	Water supply	Total	Expenses	Revenue	Net Income	
						0			0	0
						0			0	0
2004	40,577,037					40,577,037			0	-40,577,037
2005	40,577,037	2,143,152	337,709	648,141	772,834	44,478,873			0	-44,478,873
2006			337,709	648,141	772,834	1,758,684			0	-1,758,684
2007							3,441,582	15,936,480	12,494,898	12,494,898
2008							3,441,582	15,936,480	12,494,898	12,494,898
2009							3,441,582	15,936,480	12,494,898	12,494,898
2010							3,441,582	15,936,480	12,494,898	12,494,898
2011							3,441,582	15,936,480	12,494,898	12,494,898
2012							3,441,582	15,936,480	12,494,898	12,494,898
2013							3,441,582	15,936,480	12,494,898	12,494,898
2014							3,441,582	15,936,480	12,494,898	12,494,898
2015							3,441,582	15,936,480	12,494,898	12,494,898
2016							3,441,582	15,936,480	12,494,898	12,494,898
2017							3,441,582	15,936,480	12,494,898	12,494,898
2018							3,441,582	15,936,480	12,494,898	12,494,898
2019							3,441,582	15,936,480	12,494,898	12,494,898
2020							3,441,582	15,936,480	12,494,898	12,494,898
2021							3,441,582	15,936,480	12,494,898	12,494,898
2022							3,441,582	15,936,480	12,494,898	12,494,898
2023							3,441,582	15,936,480	12,494,898	12,494,898
2024							3,441,582	15,936,480	12,494,898	12,494,898
2025							3,441,582	15,936,480	12,494,898	12,494,898
2026							3,441,582	15,936,480	12,494,898	12,494,898
2027							3,441,582	15,936,480	12,494,898	12,494,898
2028							3,441,582	15,936,480	12,494,898	12,494,898
2029							3,441,582	15,936,480	12,494,898	12,494,898
2030							3,441,582	15,936,480	12,494,898	12,494,898
2031							3,441,582	15,936,480	12,494,898	12,494,898
2032							3,441,582	15,936,480	12,494,898	12,494,898
2033							3,441,582	15,936,480	12,494,898	12,494,898
NPV (15%)						52,985,377			40,156,410	-12,828,967

Area-7 : Sto-Tomas, Middle stream, Left Side (Barangay San Rafael)

Development Area: 250 ha

EIRR									
206184132	5445000	1716000	3293400	3927000	220565532	79056	262500	183444	
						250	250		

Year	Cost						Benefit (Onion)			B-C
	River training	Land develop	Soil improve	Fertilizer	Water supply	Total	Expenses	Revenue	Net Income	
						0			0	0
						0			0	0
2004	84,535,494					84,535,494			0	-84,535,494
2005	84,535,494	4,464,900	703,560	1,350,294	1,610,070	92,664,318			0	-92,664,318
2006			703,560	1,350,294	1,610,070	3,663,924			0	-3,663,924
2007							16,799,400	55,781,250	38,981,850	38,981,850
2008							16,799,400	55,781,250	38,981,850	38,981,850
2009							16,799,400	55,781,250	38,981,850	38,981,850
2010							16,799,400	55,781,250	38,981,850	38,981,850
2011							16,799,400	55,781,250	38,981,850	38,981,850
2012							16,799,400	55,781,250	38,981,850	38,981,850
2013							16,799,400	55,781,250	38,981,850	38,981,850
2014							16,799,400	55,781,250	38,981,850	38,981,850
2015							16,799,400	55,781,250	38,981,850	38,981,850
2016							16,799,400	55,781,250	38,981,850	38,981,850
2017							16,799,400	55,781,250	38,981,850	38,981,850
2018							16,799,400	55,781,250	38,981,850	38,981,850
2019							16,799,400	55,781,250	38,981,850	38,981,850
2020							16,799,400	55,781,250	38,981,850	38,981,850
2021							16,799,400	55,781,250	38,981,850	38,981,850
2022							16,799,400	55,781,250	38,981,850	38,981,850
2023							16,799,400	55,781,250	38,981,850	38,981,850
2024							16,799,400	55,781,250	38,981,850	38,981,850
2025							16,799,400	55,781,250	38,981,850	38,981,850
2026							16,799,400	55,781,250	38,981,850	38,981,850
2027							16,799,400	55,781,250	38,981,850	38,981,850
2028							16,799,400	55,781,250	38,981,850	38,981,850
2029							16,799,400	55,781,250	38,981,850	38,981,850
2030							16,799,400	55,781,250	38,981,850	38,981,850
2031							16,799,400	55,781,250	38,981,850	38,981,850
2032							16,799,400	55,781,250	38,981,850	38,981,850
2033							16,799,400	55,781,250	38,981,850	38,981,850
NPV (15%)						110,386,202			125,280,826	14,894,624

Table 19.2.3 Economic Evaluation for Community Road Rehabilitation (For Priority Scheme: Route-A1:16km)

Benefit Estimation:

1	Beneficial Population:	11,000	persons
2	Saving Travel Time by Community Road:Route-A1:	3	hours
3	GRDP per capita for Region III (as of 2002):	30,784	Peso/year
4	Hourly value of time saving:	10.54	Peso/capita/hour
5	Assumed travel opportunity per person:	12	Trip/year
6	Total time saving by community road Route-A	792,000	hours/year
7	Annual value for time saving:	8,349,633	Pesos/year

Cost Estimation:

1	Project Cost for Route-A1:	189	million Pesos
2	Economic Cost for Route-A1:	161	million Pesos

(Unit : million Peso)

No.	Year	COST			BENEFIT			
		Initial	O&M	Total	Direct	Indirect	Total	B - C
1	2004	32.20		32.20				-32.20
2	2005	48.30		48.30				-48.30
3	2006	48.30		48.30				-48.30
4	2007	32.20		32.20				-32.20
5	2008		0.81	0.81	8.35	0.00	8.35	7.54
6	2009		0.81	0.81	8.35	0.00	8.35	7.54
7	2010		0.81	0.81	8.35	0.00	8.35	7.54
8	2011		0.81	0.81	8.35	0.00	8.35	7.54
9	2012		0.81	0.81	8.35	0.00	8.35	7.54
10	2013		0.81	0.81	8.35	0.00	8.35	7.54
11	2014		0.81	0.81	8.35	0.00	8.35	7.54
12	2015		0.81	0.81	8.35	0.00	8.35	7.54
13	2016		0.81	0.81	8.35	0.00	8.35	7.54
14	2017		0.81	0.81	8.35	0.00	8.35	7.54
15	2018		0.81	0.81	8.35	0.00	8.35	7.54
16	2019		0.81	0.81	8.35	0.00	8.35	7.54
17	2020		0.81	0.81	8.35	0.00	8.35	7.54
18	2021		0.81	0.81	8.35	0.00	8.35	7.54
19	2022		0.81	0.81	8.35	0.00	8.35	7.54
20	2023		0.81	0.81	8.35	0.00	8.35	7.54
21	2024		0.81	0.81	8.35	0.00	8.35	7.54
22	2025		0.81	0.81	8.35	0.00	8.35	7.54
23	2026		0.81	0.81	8.35	0.00	8.35	7.54
24	2027		0.81	0.81	8.35	0.00	8.35	7.54
25	2028		0.81	0.81	8.35	0.00	8.35	7.54
26	2029		0.81	0.81	8.35	0.00	8.35	7.54
27	2030		0.81	0.81	8.35	0.00	8.35	7.54
28	2031		0.81	0.81	8.35	0.00	8.35	7.54
29	2032		0.81	0.81	8.35	0.00	8.35	7.54
30	2033		0.81	0.81	8.35	0.00	8.35	7.54
31	2034		0.81	0.81	8.35	0.00	8.35	7.54
32	2035		0.81	0.81	8.35	0.00	8.35	7.54
33	2036		0.81	0.81	8.35	0.00	8.35	7.54
34	2037		0.81	0.81	8.35	0.00	8.35	7.54
TOTAL		161.00	20.93	181.93	217.07	0.00	217.07	35.14

EIRR =	2.1%
NPV(15%)	-86

Table 19.3.1 Results of Barangay Accessibility Ranking Study

ID No.	Municipality Name	Barangay Name	Development Accesibility	Suitability for Agriculture	Degree of Urbanization	Sufficiency of social infrastructure	Accessibility to education facilities	Degree of government subsidence	Total	Ranking	Cluster
1	Botolan	Bancal	1.277	0.693	-1.398	-0.448	0.196	-0.353	0.337	40	1
2	Botolan	Bangan	-0.669	-0.744	-0.265	-2.696	-1.265	1.002	-0.666	108	5
3	Botolan	Batonlapoc	0.829	1.010	-0.891	0.104	0.212	-0.757	0.364	37	7
4	Botolan	Belbel	-4.759	-1.763	-1.241	1.339	0.766	-1.267	-1.838	116	2
5	Botolan	Beneg	1.441	0.262	-0.553	-0.814	0.566	-0.528	0.360	38	2
6	Botolan	Binuclutan	-1.675	-0.116	0.152	0.340	0.738	0.852	-0.371	103	5
7	Botolan	Burgos	-4.178	-1.864	-1.810	1.286	0.860	-0.819	-1.729	115	3
8	Botolan	Cabatuan	-3.972	-1.569	-1.090	1.256	1.226	-0.659	-1.488	113	1
9	Botolan	Capayawan	1.348	0.066	-1.335	-0.555	0.430	-0.240	0.229	46	1
10	Botolan	Carael	0.522	1.231	0.416	-0.150	0.489	0.076	0.513	22	4
11	Botolan	Danacbunga	0.399	0.906	0.742	-0.549	0.674	-0.095	0.405	33	2
12	Botolan	Maguisguis	-6.267	-1.631	-0.493	-0.939	-3.039	-1.259	-2.623	122	3
13	Botolan	Malomboy	-3.344	0.116	1.753	0.347	1.404	-1.474	-0.707	109	3
14	Botolan	Mambog	-1.817	0.768	0.389	1.299	1.095	-1.119	-0.178	91	2
15	Botolan	Moraza	-5.632	-2.003	-1.447	1.429	-0.433	-1.519	-2.260	121	2
16	Botolan	Nacolcol	-4.332	-2.183	-2.076	-0.483	-2.381	2.034	-2.099	117	2
17	Botolan	Owaog-Nebloc	-3.796	-2.058	-2.227	2.164	0.799	0.858	-1.545	114	4
18	Botolan	Paco	1.577	-0.842	0.787	-0.848	0.577	-0.798	0.269	43	1
19	Botolan	Palis	-5.044	-2.415	-2.646	2.232	0.353	-0.422	-2.134	118	4
20	Botolan	Panan	-2.638	-0.304	1.059	-0.183	0.636	0.603	-0.662	107	1
21	Botolan	Parel	0.688	0.014	-1.180	-0.047	0.897	-0.218	0.120	59	1
22	Botolan	Paudpod	1.332	1.975	-1.334	1.432	-0.471	0.629	0.834	9	1
23	Botolan	Poonbato	-5.420	-1.193	0.858	-2.125	-3.345	-0.089	-2.185	119	4
24	Botolan	Porac	-1.677	0.323	1.515	0.009	0.891	0.679	-0.146	88	1
25	Botolan	San Isidro	1.169	0.593	-0.652	-0.503	0.579	-0.169	0.395	34	1
26	Botolan	San Juan	-2.717	0.739	1.951	0.894	0.118	0.663	-0.279	98	1
27	Botolan	San Miguel	0.758	0.613	-1.907	-1.964	-1.982	-0.202	-0.163	90	3
28	Botolan	Santiago	1.208	1.877	-0.238	0.021	0.144	-0.683	0.743	13	2
29	Botolan	Tampo	1.542	0.900	-1.118	-0.493	0.333	-0.481	0.492	25	1
30	Botolan	Taugtog	-1.842	0.957	3.814	-0.260	1.376	0.836	0.228	47	1
31	Botolan	Villar	-6.023	-1.609	-0.151	0.974	-0.137	-2.390	-2.205	120	4
32	San Felipe	Amagna	0.963	-0.269	1.309	0.214	0.587	0.614	0.453	28	2
33	San Felipe	Apostol	0.580	3.199	1.256	1.528	-0.560	0.201	1.167	4	6
34	San Felipe	Balincaguing	0.928	0.740	-0.699	0.106	0.488	0.453	0.435	31	6
35	San Felipe	Faranal	-0.911	-0.453	0.463	-0.596	1.226	0.563	-0.257	97	2
36	San Felipe	Feria	-1.391	-0.026	-0.314	0.458	0.988	0.019	-0.336	101	5
37	San Felipe	Maloma	-2.737	3.139	4.192	1.851	-1.434	0.002	0.468	26	2
38	San Felipe	Manglicmot	-0.045	1.187	1.326	0.490	0.681	1.129	0.565	19	6
39	San Felipe	Rosete	-1.707	-0.678	0.219	-0.176	1.220	0.928	-0.513	105	3
40	San Felipe	San Rafael	0.335	0.296	-0.056	-1.205	1.049	-0.566	0.098	65	1
41	San Felipe	Sindol	-0.585	0.964	0.411	-0.528	-1.067	1.252	0.052	71	5
42	San Felipe	Sto.Nino	0.346	-0.580	2.073	-1.268	1.225	-0.374	0.146	56	3
43	Cabangan	Anonang	0.147	0.740	-1.139	0.356	0.183	0.160	0.145	57	1
44	Cabangan	Apo-Apo	0.920	-0.437	-1.507	-1.875	-1.371	0.717	-0.220	93	1
45	Cabangan	Arew	0.733	-0.049	-0.989	-0.528	0.658	-0.619	0.059	69	2
46	Cabangan	Banuanbayo(pob.)	1.388	-2.090	-1.387	1.396	0.457	2.608	0.055	70	1
47	Cabangan	Cadmang-Reserva	-1.358	-0.786	-0.331	-0.102	1.515	-0.073	-0.525	106	3
48	Cabangan	Camiing	0.289	-0.104	-0.271	-0.780	0.679	-0.473	-0.017	79	1
49	Cabangan	Casabaan	1.589	-0.746	-1.314	-0.665	-0.160	-0.163	0.064	68	4
50	Cabangan	Del carmen	0.842	-1.534	-1.012	0.323	0.963	1.778	-0.036	80	1
51	Cabangan	Dolores	0.305	1.553	-1.438	1.161	-0.162	-0.363	0.367	36	1
52	Cabangan	Felmida-Diaz	0.233	-0.535	-2.029	0.722	0.836	0.169	-0.152	89	1
53	Cabangan	Laoag	-0.090	0.367	-1.052	0.788	1.075	-1.002	0.032	72	4
54	Cabangan	Lomboy	1.147	0.184	-1.605	-0.204	0.012	0.505	0.211	49	1
55	Cabangan	Longos	-0.066	0.407	-0.795	0.331	0.569	0.388	0.079	66	7
56	Cabangan	Mabanglit	0.028	0.588	-1.035	-1.463	-1.202	-0.128	-0.184	92	5
57	Cabangan	New San Juan	-1.084	-0.907	-0.329	-0.183	1.431	0.377	-0.462	104	1
58	Cabangan	San Antonio	0.861	-0.433	-0.689	-0.539	0.925	0.378	0.110	62	1
59	Cabangan	San Isidro	1.001	1.167	-0.189	-0.386	0.466	-0.378	0.524	21	1
60	Cabangan	San Juan(pob)	-0.836	-0.578	0.399	-0.760	1.367	0.492	-0.280	99	1
61	Cabangan	San Rafael	0.043	-0.328	-0.890	-0.280	0.585	0.909	-0.097	87	1
62	Cabangan	Sta.Rita	0.439	-0.002	-0.097	-0.729	0.892	-0.083	0.110	61	1
63	Cabangan	Sto.Nino	-0.333	-0.252	-0.469	-1.791	-0.694	1.084	-0.352	102	5
64	Cabangan	Tondo	1.077	-0.296	-1.176	-0.794	0.150	-0.859	0.008	76	1
65	San Narciso	Alusiis	0.518	0.547	-0.694	0.219	0.936	-0.917	0.236	45	1
66	San Narciso	Beddeng	1.270	5.236	2.128	2.322	-1.481	-0.625	1.905	1	1
67	San Narciso	Candelaria	2.411	-2.634	0.523	0.145	-0.243	-0.559	0.103	64	1
68	San Narciso	Dallipawen	1.675	3.088	-1.890	1.579	-1.119	-0.785	1.025	6	1
69	San Narciso	Grullo	0.950	2.296	0.079	0.485	-0.225	-0.453	0.829	10	1
70	San Narciso	La Paz	1.679	-1.263	0.175	3.660	-0.006	5.226	0.815	11	1
71	San Narciso	Libertad	3.440	-5.280	1.683	1.448	-1.056	-0.629	-0.041	81	7
72	San Narciso	Namatacan	1.293	2.912	-0.460	0.505	-1.201	-0.504	0.946	7	6
73	San Narciso	Natividad	0.784	0.411	0.191	-0.423	0.820	0.256	0.380	35	1
74	San Narciso	Omaya	-1.825	0.234	-0.025	1.055	0.311	1.017	-0.309	100	5
75	San Narciso	Paite	1.508	2.690	-2.028	2.523	-1.496	1.083	1.027	5	1
76	San Narciso	Patro cinio	0.987	0.979	0.398	-0.550	0.592	-0.323	0.537	20	2
77	San Narciso	San Jose	3.516	-5.602	1.579	1.870	-1.154	-0.709	-0.081	86	1
78	San Narciso	San Juan	0.778	-0.126	-0.238	-0.655	0.642	0.051	0.161	55	1
79	San Narciso	San Pascual	0.843	0.203	-0.349	-0.465	0.313	-1.249	0.167	53	1
80	San Narciso	San Rafael	1.500	-0.975	0.130	-0.647	0.425	-0.354	0.174	51	4
81	San Narciso	Simminublan	1.634	4.870	-0.235	2.558	-1.783	-1.290	1.627	2	3
82	Castellejos	Buenayista	0.673	2.717	-2.269	2.445	-0.879	-1.517	0.656	14	2
83	Castellejos	Looc	0.862	1.187	-0.488	-0.344	0.102	-0.194	0.444	29	1
84	Castellejos	Magsaysay	0.705	1.371	0.968	-0.796	0.178	-0.060	0.575	18	1
85	Castellejos	Nagbayan	0.495	1.290	0.164	-0.209	0.107	-0.001	0.455	27	3
86	Castellejos	Nagbunga	1.135	-0.029	-0.394	-0.817	0.471	-0.068	0.238	44	3
87	Castellejos	San Agustin	0.706	1.142	1.677	-0.600	0.752	-0.253	0.645	16	3
88	Castellejos	San Jose	0.701	0.506	0.872	-0.484	0.831	0.130	0.442	30	2
89	Castellejos	San Juan	1.521	-0.894	-0.522	0.014	0.315	-0.049	0.195	50	1
90	Castellejos	San Nicolas	0.515	-0.600	0.340	-2.546	-1.135	0.060	-0.251	96	7
91	Castellejos	San Pablo	-2.791	1.134	3.929	-0.213	0.709	0.450	-0.057	84	1
92	Castellejos	San Roque	1.258	-1.947	0.642	-0.131	0.551	0.119	0.010	73	1
93	Castellejos	Sta.Maria	1.199	0.251	-0.278	-0.870	0.532	-0.394	0.317	42	2
94	Iba	Dirita	0.474	1.952	1.302	-0.945	-0.647	0.114	0.621	17	6
95	Iba	Lipay Dingin	0.573	-0.456	0.429	-0.918	0.947	-0.271	0.077	67	5
96	Iba	Palanginan	0.352	3.582	3.503	0.880	-0.260	-0.244	1.378	3	1
97	Iba	Sta Barbara	0.028	1.967	1.274	0.438	0.235	-0.392	0.645	15	6
98	Iba	Sto Rosario	0.498	-0.935	1.069	-1.010	0.748	-1.046	-0.052	83	1
99	Iba	Zone1	1.119	-0.663	0.227	-0.589	0.794	-0.663	0.161	54	1
100	Iba	Zone2	4.274	-6.006	2.095	1.501	-1.542	-1.557	-0.005	78	1
101	Iba	Zone3	3.379	-4.922	0.717	1.847	-0.998	0.264	0.007	77	5
102	Iba	Zone4	3.905	-5.444	1.374	1.624	-1.322	-0.804	0.009	75	4
103	Iba	Zone5	2.781	-4.070	2.050	0.337	-0.434	-1.175	0.009	74	1
104	Iba	Zone6	1.246	-0.414	-0.944	0.036	0.539	0.186	0.212	48	1
105	San Marcelino	Aglao	-2.928	-0.942	0.402	-1.565	-0.144	0.469	-1.150	111	3
106	San Marcelino	Buhawen	-2.839	-1.257	0.413	-1.137	-0.081	1.439	-1.103	110	3
107	San Marcelino	Burgos	0.471	-0.185	0.588	-0.728	0.995	0.119	0.170	52	1
108	San Marcelino	Central(pob.)	2.088	-3.613	0.751	0.037	-1.440	0.490	-0.232	94	2
109	San Marcelino	Consuelo Norte	0.683	0.448	-0.515	-1.362	-0.447	0.384	0.120	60	1
110	San Marcelino	Consuelo Sur	1.252	-1.237	0.089	-1.233	-0.658	0.136	-0.063	85	1
111	San Marcelino	La Paz	1.114	0.160	-0.959	-1.321	-0.639	0.183	0.108	63	3
112	San Marcelino	Laoag	-0.056	0.565	0.327	-0.731	0.490	0.003	0.123	58	1
113	San Marcelino	Linasin	0.898	0.672	0.067	-1.160	0.254	-0.261	0.329	41	2
114	San Marcelino	Linusungan	1.404	2.531	-1.034	-0.071	-1.326	-0.486	0.768	12	3
115	San Marcelino	Lucero	0.578	-0.303	-0.111	-1.293	-0.440	0.183	-0.048	82	4
116	San Marcelino	Nagbunga	0.914	2.056	0.507	0.795	0.059	0.548	0.910	8	6
117	San Marcelino	Rabanes	0.222	1.569	0.076	0.444	-0.570	0.983	0.496	23	3
118	San Marcelino	Rizal	1.136	1.019	-1.157	-0.645	-1.005	0.448	0.343	39	1
119	San Marcelino	San Guillermo	1.365	1.399	-1.500	-0.563	-1.265	0.140	0.434	32	2
120	San Marcelino	San Isidro	1.159	1.638	-0.703	-0.868	-1.085	-0.043	0.494	24	2
121	San Marcelino	San Rafael	-2.562	0.923	1.600	1.073	0.090	0.274	-0.237	95	1
122	San Marcelino	Sta.Fe	-4.807	0.057	2.232	-0.892	-3.534	0.781	-1.419	112	1

Table 19.4.1 Overall Economic Evaluation for Basin-wide Integrated Disaster Prevention Activities

No.	Year	Structural Measures						Non-Structural Measures						Community-Based Disaster Prevention Measures												BASIN-WIDE INTEGRATED DISASTER PREVENTION		
		Bucao River with Bridge			Sto. Tomas River w/Bridge			Warning & Evacuation			Hydro/Sediment/Water Quality Monitoring			Community Road			Lahar Agriculture (Pilot)			CBFM (Pilot)			AETAS (Pilot)					
Activities		Bucao Downstream			Sto.Tomas Downstream			Whole Study Area			Whole Study Area			Bucao			Bucao/Sto.Tomas Downstream			Bucao/Sto.Tomas Upstream			Bucao/Sto.Tomas Upstream			Whole Basin & Communities		
Beneficial Area		Bucao Downstream			Sto.Tomas Downstream			Downstream Flood Prone Area			Downstream Flood Prone Area			Bucao			Bucao/Sto.Tomas Downstream			Bucao/Sto.Tomas Upstream			Bucao/Sto.Tomas Upstream			Whole Basin & Communities		
Implementation		MPE-PMO / DPWH			MPE-PMO / DPWH			PDCC / Zambales			MPE-PMO / DPWH			Zambales / District Office-DPWH			Zambales / DA-Region III			Zambales / DENR-Region III			Zambales / NGO					
Financial Arrange		GOP w/Foreign Assistance			GOP w/Foreign Assistance			Provincial / LGU			GOP			GOP / Provincial Government			GOP w/Foreign Assistance			GOP / Provincial Government			Grant Aid / NGO					
		Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C	Cost	Benefit	B-C
1	2004	0.0	0.0	0.0	0.0	0.0	0.0	2.0		-2.0	1.0		-1.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5		-2.5	5.5	0.0	-5.5
2	2005	82.8	0.0	-82.8	0.0	0.0	0.0	2.0		-2.0	1.0		-1.0	32.2		-32.2	0.0	0.0	0.0	0.0	0.0	0.0	2.5		-2.5	120.5	0.0	-120.5
3	2006	165.6	0.0	-165.6	65.0	0.0	-65.0	2.0		-2.0	1.0		-1.0	48.3		-48.3	0.0	0.0	0.0	0.0	0.0	0.0	2.5		-2.5	284.4	0.0	-284.4
4	2007	295.7	0.0	-295.7	341.1	0.0	-341.1	27.3		-27.3	1.0		-1.0	48.3		-48.3	6.7	0.0	-6.7	26.6	-1.3	-27.9	2.5		-2.5	749.3	-1.3	-750.6
5	2008	224.7	0.0	-224.7	438.5	0.0	-438.5	27.3		-27.3	1.0		-1.0	32.2		-32.2	6.7	0.0	-6.7	18.0	-0.6	-18.7	2.5		-2.5	751.1	-0.6	-751.7
6	2009	224.7	0.0	-224.7	454.8	0.0	-454.8	27.3		-27.3	1.0		-1.0	0.8	8.4	7.5	1.9	0.0	-1.9	8.5	-0.7	-9.2	2.5		-2.5	721.5	7.7	-713.9
7	2010	189.2	0.0	-189.2	324.9	0.0	-324.9	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5	1.9	0.0	-1.9	4.5	-0.2	-4.7			0.0	524.4	8.2	-516.2
8	2011	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5	1.9	0.0	-1.9	0.0	0.3	0.3			0.0	47.8	960.8	913.0
9	2012	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	0.5	0.5			0.0	45.9	963.6	917.7
10	2013	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	0.9	0.9			0.0	45.9	964.0	918.1
11	2014	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	1.3	1.3			0.0	45.9	964.3	918.4
12	2015	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	45.1	45.1			0.0	45.9	1,008.2	962.3
13	2016	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	20.8	52.2	31.4			0.0	66.7	1,015.3	948.6
14	2017	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	15.0	55.8	40.8			0.0	60.9	1,018.9	958.0
15	2018	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	6.8	60.6	53.9			0.0	52.7	1,023.7	971.0
16	2019	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	3.5	65.3	61.8			0.0	49.4	1,028.4	979.0
17	2020	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	25.2	25.2			0.0	45.9	988.3	942.4
18	2021	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	29.8	29.8			0.0	45.9	992.9	947.0
19	2022	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	31.2	31.2			0.0	45.9	994.3	948.4
20	2023	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	32.7	32.7			0.0	45.9	995.8	949.9
21	2024	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	78.3	78.3			0.0	45.9	1,041.4	995.4
22	2025	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	20.8	80.0	59.2			0.0	66.7	1,043.0	976.3
23	2026	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	15.0	81.2	66.3			0.0	60.9	1,044.3	983.4
24	2027	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	6.8	81.2	74.4			0.0	52.7	1,044.3	991.6
25	2028	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	3.5	80.8	77.3			0.0	49.4	1,043.9	994.4
26	2029	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	36.9	36.9			0.0	45.9	1,000.0	954.1
27	2030	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	36.9	36.9			0.0	45.9	1,000.0	954.1
28	2031	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	36.9	36.9			0.0	45.9	1,000.0	954.1
29	2032	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	36.9	36.9			0.0	45.9	1,000.0	954.1
30	2033	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6	0.0	36.9	36.9			0.0	45.9	1,000.0	954.1
31	2034	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6							45.9	963.1	917.2
32	2035	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6							45.9	963.1	917.2
33	2036	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6							45.9	963.1	917.2
34	2037	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6							45.9	963.1	917.2
35	2038	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0	0.8	8.4	7.5		2.6	2.6							45.9	963.1	917.2
36	2039	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0					2.6	2.6							45.1	954.7	909.6
37	2040	17.7	283.7	265.9	24.4	668.5	644.1	2.0		-2.0	1.0		-1.0					2.6	2.6							45.1	954.7	909.6
38	2041																	2.6	2.6							0.0	2.6	2.6
39	2042																									0.0	0.0	0.0
40	2043																									0.0	0.0	0.0
41	2044																									0.0	0.0	0.0
42	2045																									0.0	0.0	0.0
43	2046																									0.0	0.0	0.0
44	2047																									0.0	0.0	0.0
45	2048																									0.0	0.0	0.0
46	2049																									0.0	0.0	0.0
47	2050																									0.0	0.0	0.0
48	2051																									0.0	0.0	0.0
49	2052																									0.0	0.0	0.0
50	2053																									0.0	0.0	0.0
NPV (15%)		664.4	700.2	35.8	834.6	1,650.0	815.4	51.2	0.0	-51.2	6.6	0.0	-6.6	102.4	54.8	-75.1	9.4	5.6	-3.8	38.2	67.7	29.5	9.5	0.0	-9.5	1,716.3	2,450.8	734.5
EIRR				**15.7%**			**26.3%**			Un-countable			Un-countable			**2.1%**			**9.8%**			**21.5%**			Un-countable			**20.0%**