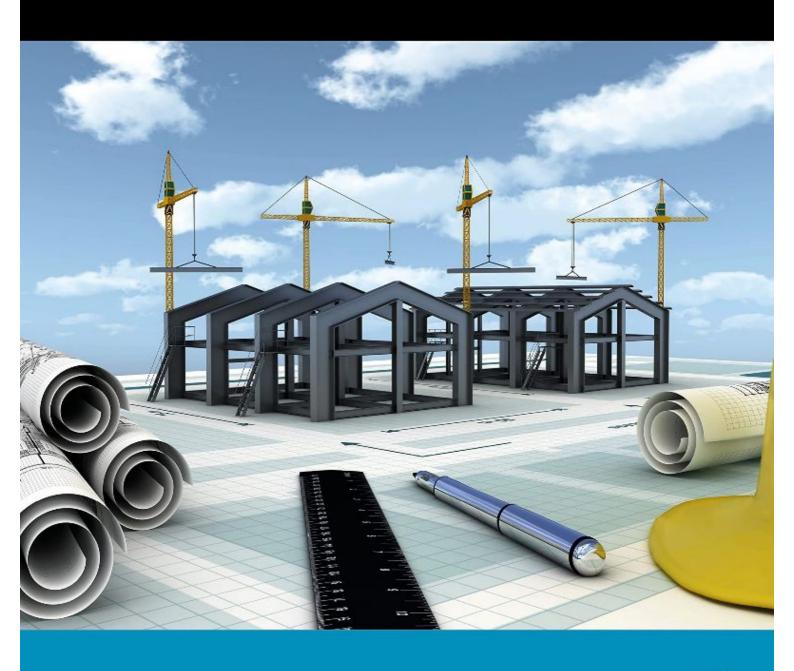
Construction Cost Estimating



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The Study on Sabo and Flood Control for Western River Basins of Mount Pinatubo in the Republic of the Philippines Final Report Supporting Report

APPENDIX-X Construction Plan and Cost Estimate

THE STUDY ON SABO AND FLOOD CONTROL FOR WESTERN RIVER BASINS OF MOUNT PINATUBO IN THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT

SUPPORTING REPORT

APPENDIX X CONSTRUCTION PLAN AND COST ESTIMATE

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CHAPTER 1 CONSTRUCTION PLAN

1.1 General Description of the Works

This Chapter presents the construction plan for the priority projects which are Construction of the Bucao Bridge on the National Road No.7, and Construction of dikes for flood control in the Bucao and Sto. Tomas River basins. Those projects are situated geographically on the western-most part of Luzon Island in the Philippines. The locations of the Bucao Bridge, and the two river dikes of Bucao and Sto. Tomas are shown in Figure 1.1.1.

1.1.1 Bucao Bridge

The existing Bucao Bridge was constructed in 1939. After 64 years of service, the slab is being damaged severely. Moreover, due to the rising riverbed by lahar deposits, the existing bridge may have insufficient clearance against floods. Therefore, there is an absolute need for reconstruction.

Preliminary design of the Bucao Bridge for reconstruction is conducted and the results are as stated below.

(a) Hydrological Condition

1) Design discharge: 4,900 m³/s (50-year probable flood)

2) Flood water level: EL. 13.50 m
3) Existing riverbed level in 2002: EL. 6.40 m
4) Estimated riverbed in 2052: EL. 10.16 m

5) Vertical clearance: 3.45 m

(b) Geological Condition

Bearing layer for abutment at Manila side: EL -10.0 m
 Bearing layer for abutment at Iba side: EL -20.0 m
 Bearing layer for piers: EL -20.0 m

(c) Bridge

1) Location: 15 m downstream side of existing bridge

2) Length: 321 m

3) Type: Steel plate girder

4) Span: 46 m + 2x50 m + 50 m + 72 m + 53 m

5) Width: 9.54 m (two lanes + two side walks)

6) Foundation type: Cast-in-place concrete pile

(d) Road

Approach road at Manila side: 280 m
 Approach road at Iba side: 346 m

3) Width: 10.0 m (two lanes + two shoulders)

1.1.2 Bucao River Basin

Structural measures against flood / mudflow in the Bucao River Basin are the construction of dikes. One is downstream of the Bucao Bridge and the other is upstream of the same Bridge.

(1) Downstream of the Bucao Bridge

This reach from the Bucao Bridge to seashore does not have dike system on both banks at present. The construction of new dike is designed and the lengths are approx. 2.4 km for the right bank and 1.9 km for the left bank.

(2) Upstream of the Bucao Bridge

Construction of the dike for upstream of the Bucao Bridge is designed only on the right bank. The work consists of approx. 7.5 km dike heightening and approx. 0.2 km of strengthening of spur dike near the confluence of the Baquilan River.

1.1.3 Sto. Tomas River Basin

Structural measures for the Sto. Tomas River basin are also construction of dikes. One is downstream of the Maculcol Bridge and the other is upstream of the same bridge. In addition, construction of a diversion channel is also designed for the Gabor River because the existing flow will be totally blocked when the downstream dike on the right bank is constructed.

(1) Downstream of the Maculcol Bridge

This reach from the Maculcol Bridge to the seashore does not have dike system on the right bank at present. Hence, construction of new dike of approx. 2.0 km long is designed for the right bank. On the left bank, 1.4 km of strengthening of the existing dike is designed.

(2) Upstream of the Maculcol Bridge

Construction of dikes for upstream of the Maculcol Bridge is designed for the both banks. The works consist of approx. 3.1 km existing bank strengthening and 4.3 km heightening of existing dike on the right bank, and 9.4 km dike strengthening and 9.0 km dike heightening on the left bank.

(3) Diversion Channel for the Gabor River

The length of the diversion channel will be 1.7 km long and this will be constructed parallel to the proposed dike.

1.2 Basic Conditions

There are various factors and conditions for establishing the construction plan for the projects to be implemented. Such works are much affected by the natural factors particularly the hydrology and geology, and also by the availability of construction resources in and around the project area. The followings are the basic conditions to be adopted for formulating the construction plan.

1.2.1 Hydrology

(1) Rainfall

Heavy rains occur between May and October, which are commonly induced by southwest monsoon winds and tropical cyclones. Rainfall is minimal during the dry season from November to April due to reversal of monsoon wind direction. The monthly mean rainfall at Iba ranges from 4 mm in January to 1,057 mm in August with mean annual rainfall of 3,812 mm. When compared with the amount of rainfall on the western slope of Mount Pinatubo to the eastern slope, the western slope has far greater rainfall.

Monthly rainfall records representing to the Bucao River and the Sto. Tomas River are shown in Figure 1.2.1 "Location of Rainfall Gauge Station," Figure 1.2.2 "Monthly Rainfall in Iba," and Figure 1.2.3 "Monthly Rainfall in San Marcelino." From the records, period from May to October will generally be called as rainy season and from November to April will be called as dry season for this project.

(2) Runoff and Water Level

For construction of the Bucao Bridge in particular, information regarding runoff and water level of the Bucao River based on non uniform flow calculation is expressed in Figure 1.2.4.

1.2.2 Geology

Investigation to determine the prevailing subsoil conditions required for the construction of Bucao Bridge as well as dikes on the Bucao River and Sto. Tomas River has been conducted using triple tube core barrel method and Standard Penetration Test (SPT). Subsoil profile at the Bucao Bridge is shown in Figure 1.2.5. Specific gravity test for the recent lahar deposits results generally ranged from 2.60 to 2.79, with low values ranging from 2.25 to 2.55. The surface deposits usually contain large amount of fines and normally cohesive in nature.

1.2.3 Construction Resources

Locally available construction resources will be used as much as practicable and thus the project becomes economical.

- Skilled and unskilled labors are available in the Philippines and in the Region 3.
- Construction equipment is available in the Philippines for rental or purchase.
- Maximum use of abundant lahar deposits on site.
- Construction materials, such as cement, steel reinforcement bar, and concrete aggregates are available in the Philippines and in the Region 3.
- Boulders for masonry and other works are available in the area.

1.2.4 Other Conditions

Taking into account the above, some other conditions will be applied for the construction.

(1) Annual Workable Days

Annual workable days for the earthworks is determined as 180 days since period from middle May to middle October is considered not practical to carry out due to occasional rainfalls. For concrete and other works, 240 days are workable days but the maintenance of access roads will be difficult and

therefore not much work will be carried out in the rainy seasons.

(2) Working Days and Hours

Working days and hours will be 26 days per month and 10 hours per day in principle but this will need to adjust for each activity.

(3) Access Road

The National Road No.7 from Manila to Lingayen via Iba will be the main access road for this project.

(4) Land for Temporary Work

Necessary space for temporary works, such as construction yard for temporary buildings and repair shops, stockyard and fabrication yard, temporary road, etc. will be provided.

(5) Contract

Construction works are assumed to be implemented by contract system.

1.3 Construction of Bucao Bridge

General view of the designed Bucao Bridge is shown in Figure 1.3.1. Taking the above basic conditions into consideration, general construction procedures will be:-

- Major works will be carried out only in dry seasons as examined at Section 1.2.1 Hydrology.
- Since the new bridge is designed to construct 15 m downstream and parallel to the existing bridge, no detour of National Road No. 7 will be provided.
- Avoiding disturbance of public transportation on the existing bridge, temporary roads will be built on the riverbed for construction purpose.

1.3.1 Temporary Works

(1) Temporary Access Road

Access roads from National Road No. 7 to the riverbed from both banks will be provided parallel to the designed alignment of abutments and piers.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, fabrication yard, motor-pool, etc. for both Manila and Iba side of the bank.

(3) Temporary Buildings and Supplies

Temporary buildings such as offices and stores, and various supply systems, such as water, power and communication, will be installed on site.

(4) Concrete Plant

Since there is no ready-mixed concrete supply facilities existed in the area, concrete plant will be installed on the site. Considering the maximum volume of concrete to be placed at one time, 100 - 120 m³ at footing concrete, capacity of 15 m³/hr concrete batching and mixing plant will be erected.

(5) Cofferdams

Taking into account of the bridge design, hydrological and geological information, major works will only be carried out in the dry season. However, considering unexpected rain during the dry season, cofferdams for every pier may be required based on the following assumption:

Elevation of the existing ground at river flow center:	EL. 6.45 m
Base of footing concrete	EL. 3.45 m
Earth drill working level	EL. 6.45 m
Groundwater level	EL. 4.45 m
Water level of 2 year probable flood	EL. 8.70 m
Cofferdam crest level	EL. 9.20 m

At the stage of construction, above assumption should be reviewed and modified because the riverbed elevation and ground water level change considerably by every flood.

The cofferdams with steel sheet-pile as shown in Figure 1.3.2 or similar will be applied for this type of project.

1.3.2 Construction Method

(1) Substructure

Abutments and piers are numbered from left bank to right bank as shown in Figure 1.3.1.

(a) Pile Foundation

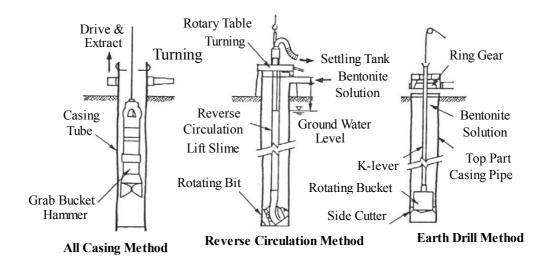
Large diameter of ψ 1.2 m bored cast-in-place concrete pile without taper is designed for the foundation of piers and abutments. Following table shows the length and number of piles for each foundation.

Name of Foundation		Length (m)	Nos.	Total length (m)
Abutment	A 1	18	6	108
Adument	A 2	28	6	168
	P 1	22	6	132
	P 2	22	6	132
Pier	P 3	22	6	132
	P 4	22	6	132
	P 5	22	6	132
Total	42	936		

There are three different drilling methods in cast-in-place concrete piles.

- Earth drill method
- Reverse circulation method

- All casing method (Benoto pile method)



Considering the site conditions, availability of required equipment, speed and economy as well as the experiences in the Philippines, Earth drill method will be employed for this project.

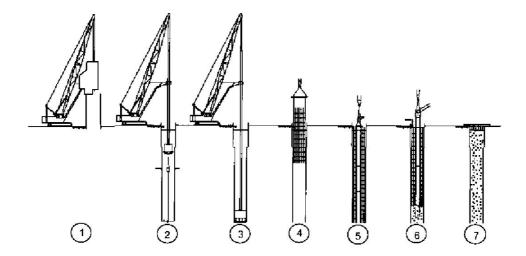
Since the construction site is in the riverbed, water table is high. In addition, as the dominant subsoil is lahar (sand), some underground water flow is expected. Maintaining stability of the sidewall of drilled holes is a key issue. The following measures will be taken:

- Use steel pipe casing (a standpipe), approximately 10 m length.
- Keep water head in the casing 1.5 2.0 m higher than the ground water level.
- Use stabilization fluid with controlled specific gravity and viscosity. The mud fluid will
 provide thin mud films on the surface of sidewall and protect from water seeped into or out.

The most common stabilization agent is bentonite.

General procedure of Earth drill method and its illustrations are -

- 1 Installation of standpipe by a vibrator
- ② Excavation by earth drilling bucket
- 3 Removal of slime by bucket (1st treatment)
- 4 Installation of reinforcing steel bar cages
- (5) Removal of slime by air-lift or suction method (2nd treatment)
- 6 Placing concrete by tremie pipe
- 7 Curing



Two working groups will be established for efficient work through a day and night shift, a 24-hour working system. One group operates the earth drilling equipment for drilling works and the other group with a crane works for installation of a standpipe, installation of reinforcement steel cages and placing concrete. The earth drilling machine should be utilized without idling since this is the most critical work item to complete the project in time. It is estimated that excavation of one pile will take approximately 36 hours, one and a half day, on average and 9-12 days per foundation in calendar days. Once excavation is commenced, operation should be continued until completion of placing concrete to avoid a risk of failures in bored holes.

For the proper use of bentonite's function and for the environmental considerations, bentonite treatment plant will be provided on site.

For quality assurance, it is important to carry out proper supervision of the works and also to conduct the bearing tests for the cast-in-place piles because some activities are difficult to check if the works are carried out properly during construction, in particular the treatment of slime at the bottom of piles.

(b) Footing

This will generally become mass concrete, steady and proper concrete placement will be required to avoid for forming cold joints.

(c) Piers and Abutments

Piers are designed with two columns and abutments are with the reversed T types. Careful concrete placement will be required in particular because some anchors for superstructure will be embedded in the beam support.

(2) Superstructure

Since the height from the ground to the soffit of steel plate girder is approximately 10 m and mobile crane is accessible to erection site through a temporary road in dry seasons, the erection by truck crane with a bent method will be the most economical choice.

Extruder method can be used in the rainy seasons but this will normally require more time and space.

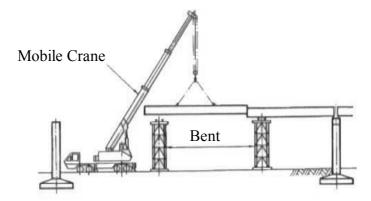
(a) Prefabrication

Steel plate girders will be transported to the site by trailers in about 10 m long piece. This will

be prefabricated to about 20 m in length before erection.

(b) Erection

The prefabricated steel plate girders will be lifted on to the top of bent by a hydraulic truck crane or crawler crane of 120 t capacity on the temporary road. The lifting capacity is determined on the assumption of: 12 ton block weight and 10 m working radius. The bent will be a steel support structure. An image of the erection method is as illustrated as below.



Steel material is designed with non-paint type and therefore no painting is required on site.

(c) Slab and Pavement

Sequence of placing concrete for the deck slab should be arranged to avoid making cracks over the piers due to change of moment and stress during construction.

(3) Approach Road

The construction of approach road will be carried out simultaneously with the construction of the bridge. Because of approx. 10 m high embankment is required, earlier start of embankment work is preferable for less settlement after completion of the project.

(4) Safety Control

Establish safety management code on site and provide safety ropes, hats, life belts to everyone who will go to higher position so as to protect their lives.

(5) Removal of Existing Bridge

The removal of existing bridge will be carried out only after the completion of the Bucao Bridge and after some period of its usage. Therefore, this work will be carried out separately in the following dry season.

1.3.3 Construction Schedule

The proposed construction time schedule for the Bucao Bridge is shown in Figure 1.3.3. Detailed construction schedule for the substructure and typical construction schedule for the bridge pier are also shown in Figure 1.3.3.

Right after the rainy season, construction of abutment A1, left bank - Manila side of the bridge - will be commenced because this foundation is located at the highest place and the designed pile length is the shortest.

Construction period of two years is considered appropriate for this type of bridge construction. However, full use of two dry seasons is the key for completing the project in time. Therefore, some preparatory

works have to be carried out in the rainy seasons and make ready to commence foundation pile drilling in full force from the beginning of dry season.

1.3.4 Construction Resources

(1) Construction plant and equipment

Major construction plant and equipment to be used for this project are listed in the following table.

Major Construction Plant and Equipment

No.	Name	Capacity	Unit	Remarks
1	Earth drill auger	ψ1.2 m, ℓ30 m	1	Drill cast-in-place pile
2	Mobile crane	120 t	1	Erection of girder
3	Mobile crane	50 t	1	General / piling, etc.
4	Backhoe	0.7 m^3	1	General / excavation, etc.
5	Dump truck	10 t	2	General / excavation, etc.
6	Bulldozer	21 t	1	General / road, etc.
7	Concrete plant	20 m ³ /hr	1	Concrete production
8	Vibration hammer	46 - 60 kW	1	Piling
9	Generator	150 – 200 kVA	1	Piling
10	Bentonite plant	Mixer, tank, etc.	1	Bentonite treatment

1.4 Construction of Bucao River Dike

The locations of the Bucao River dikes are shown in Figure 1.4.1. Typical cross sections of the New Dike and Dike Heightening are shown in Figure 1.4.2.

The dike locations, types, lengths, and estimated embankment volumes for construction are summarized below. No rock excavation will be required in the works.

Location	Туре	Length (m)	Embankment Volume (m³)
Bucao Bridge abutment, left bank	New Dike	170	37,300
Downstream of Bucao Bridge, right bank	New Dike	2,350	351,700
Downstream of Bucao Bridge, left bank	New Dike	1,910	217,100
Upstream of Bucao Bridge, right bank	Dike Heightening	5,800	1,096,000
Upstream of Bucao Bridge,	Dike Heightening	1,650	93,200
Baquilan area	Dike Strengthening	200	8,000
Total	·	12,080	1,803,300

Staged implementation in order from the river mouth toward upstream is normally proposed for river improvement works, however the needs of river improvement depends on local factors; such as height of existing dikes with different degrees of overtopping threat, numbers of resident and values of properties to be protected from inundation. Therefore, one of the sequences for the construction, together with the dike locations, types, and lengths, will be as follows.

1) The Bucao Bridge abutment, left bank, and this part will be constructed at the time of bridge construction so that the abutment and approach road of the new bridge will be protected

- 2) Upstream of the Bucao Bridge, right bank
- 3) Downstream of the Bucao Bridge, right bank
- 4) Downstream of the Bucao Bridge, left bank
- 5) Upstream of the Bucao Bridge, Baquilan area, right bank

Taking into the basic conditions for construction, general procedures for the construction of the Bucao River dikes are expressed as follows:

1.4.1 Temporary Works

(1) Access Road

National Road No. 7 is the main access for construction. As a branch from Botolan town, there is road to Baquilan and this will be used for the construction, too. Otherwise needs of access to each site will be solved by construction or use of dikes being built. Considering the required intensive work volume, temporary roads on the riverbed as well as the other landside parallel to the dikes will also be required including necessary ramps to connect the crest of dike.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for the construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, motor-pool, etc.

(3) Temporary Buildings and Supplies

Temporary buildings and various supply systems, such as water, power and communication, will be provided on site for smooth implementation of the works.

1.4.2 Construction Method

Three types of dike are designed for the improvement of the Bucao River banks. One is the construction of new dike and the remains are heightening and strengthening of existing dikes. The new dike is designed for the riverbank section of no existing dike at present. The dike heightening is applied for the section of insufficient height of existing dikes and the dike strengthening is designed for the section where needs strengthening of existing dikes. Typical cross section of these three types of dike is shown in Figure 1.4.2 and Figure 1.4.3.

The works include embankment with lahar deposits to shape the dike, base concrete at the toe, gabion mattresses with filter cloth, grouted riprap for the riverside slope protection, sodding on borrow soil for landside slope protection, and gravel pavement on top of the dike in common. The removal of existing grouted riprap is required before commencement of embankment in the case of dike heightening. In the case of dike strengthening at existing super dike of 200 m at Baquilan, removal of the existing armor and construction of grouted riprap for both side of slopes and top of the dike are required.

An abundant lahar deposit near the construction site will be utilized as much as possible for the embankment.

In general, the construction works will be carried out by combination of earthmoving equipment such as wheel loaders, backhoe shovels, dump trucks, bulldozers, and vibration rollers. Considering the size of the project and hauling distances, motor scrapers can be used if its mobilization and maintenance are reasonably secured.

1.4.3 Construction Schedule

Construction time schedule for the Bucao River dikes is shown in Figure 1.4.4.

(1) Production Rate Study

Using conventional equipment available for the project, monthly production rate of each group is determined as follows:

Group	Name	Capacity	nos.	Monthly Production (m ³)	
Α.	Tractor Shovel	2.1 m^3	1	19,100	
A	Dump Truck	12 t	4	19,100	
В	Backhoe Shovel	1.0 m^3	1	13.100	
	Dump Truck	10 t	4	13,100	

The above table is provided based on the following assumptions and calculations.

(a) Group A

Loading Equipment: Tractor shovel (wheel), Bucket capacity: 2.1 m^3 (heaped) / Loading to 12 ton dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m^3 / Compacted weight at embankment: 2.2 ton/m^3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: $0.8 \text{ / Loading weight per bucket: } 2.1 \text{ x } 0.8 \text{ x } 1.5 = 2.5 \text{ t / Loading time: } 40 \text{ sec / Loading time required for } 12 \text{ t dump truck: } 12 \text{ / } 2.5 = 4.8 \text{ times / } 4.8 \text{ x } 40 \text{ sec } = 192 \text{ sec } = 3.2 \text{ min / Working efficiency in loading hour: } 0.9 \text{ / Production rate in embanked volume: } 60 \text{ / } 3.2 \text{ x } 0.9 = 16.9 \text{ nos. truck / } 16.9 \text{ x } 12 = 203 \text{ t/hr / } 203 \text{ / } 2.2 = 92 \text{ m}^3/\text{hr / } 10 \text{ x } 0.8 \text{ x } 92 = 736 \text{ m}^3 \text{ per day / } 736 \text{ x } 26 = 19,100 \text{ m}^3 \text{ per month / Hauling Equipment: Dump truck, Loading capacity: } 12 \text{ t / Hauling Distance: } 500 \text{ m / Hauling Cycle Time: Loading: } 3.2 \text{ min / Hauling times per hour: } 60 \text{ / } 13.2 = 4.5 \text{ times / Number of Dump Truck required: } 16.9 \text{ / } 4.5 = 3.75 \rightarrow 4 \text{ nos. per Tractor shovel}$

(b) Group B

Loading Equipment: Backhoe shovel, Bucket capacity: $1.0 \, \text{m}^3$ (heaped) / Loading to $10 \, \text{t}$ dump truck / Bucket factor: 0.9 / Loose weight at excavation: $1.5 \, \text{t/m}^3$ / Compacted weight at embankment: $2.2 \, \text{ton/m}^3$ / Working hour per day: $10 \, \text{hrs}$ / Working days per month in dry seasons: $26 \, \text{days}$ / Production efficiency factor in working hour: $0.8 \, \text{l}$ Loading weight per bucket: $1.0 \, \text{x} \, 0.9 \, \text{x} \, 1.5 = 1.35 \, \text{t}$ / Loading time: $30 \, \text{sec}$ / Loading time required for $10 \, \text{t}$ dump truck: $10 \, \text{l} \, 1.35 = 7.4 \, \text{times}$ / $7.4 \, \text{x} \, 30 \, \text{sec} = 222 \, \text{sec} = 3.7 \, \text{min}$ / Working efficiency in loading hour: $0.85 \, \text{l}$ Production rate in embanked volume: $60 \, \text{l} \, 3.7 \, \text{x} \, 0.85 = 13.8 \, \text{nos.}$ truck / $13.8 \, \text{x} \, 10 = 138 \, \text{t/hr}$ / $138 \, \text{l} \, 2.2 = 63 \, \text{m}^3 \, \text{l/hr}$ / $10 \, \text{x} \, 0.8 \, \text{x} \, 63 = 504 \, \text{m}^3 \, \text{per day}$ / $504 \, \text{x} \, 26 = 13,100 \, \text{m}^3 \, \text{per}$ month / Hauling Equipment: Dump truck, Loading capacity: $10 \, \text{t}$ / Hauling Distance: $500 \, \text{m}$ / Hauling Cycle Time: Loading: $3.7 \, \text{min}$ / Hauling: $4 \, \text{min}$ / Unloading: $1 \, \text{min}$ / Returning: $4 \, \text{min}$ / Waiting: $1 \, \text{min}$ / Total: $13.7 \, \text{min}$ / Hauling times per hour: $60 \, \text{l} \, 13.7 = 4.4 \, \text{times}$ / Number of Dump Truck required: $13.8 \, \text{l} \, 4.4 = 3.1 \, \rightarrow 4 \, \text{nos.}$ per Backhoe shovel

(c) Group B - Soil

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: $1.0 \times 0.8 \times 1.5 = 1.2$ t / Loading time: 35 sec / Loading time required for 10 t dump truck : 10 / 1.2 = 8.3 times / 8.3×35 sec = 291 sec = 4.8 min / Working efficiency in loading hour: 0.8 / Production rate in embanked volume: 60 / $4.8 \times 0.8 = 10$ nos. truck : $10 \times 10 = 100$ t/hr / 100 / 2.2 = 45 m3 / hr / $10 \times 0.8 \times 45 = 360$ m3 per day / $360 \times 26 = 9,360$ m3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 20,000 m / Hauling Cycle Time: Loading: 4.8 min / Hauling: 30 min (Borrow area – 5, National read – 10, Site – 15) / Unloading: 1 min / Returning: 30 min / Waiting: 4.2 min / Total: 70 min / Hauling times per hour: 60 / 70 = 0.86 times / Number of Dump Truck required: 10 / 0.86 = $11.6 \rightarrow 12$ nos. per Backhoe shovel

(2) Construction Time Schedule

In the rainy seasons, more precisely from middle May to middle October, it is considered not practical to carry out any works even dike protection works because the maintenance of temporary roads for transporting construction materials as well as finishing the slope of embankment would be difficult. Construction period of four years (three dry seasons) will be appropriate for this type of construction, based on the required average monthly production of 100,000 m³ in the embankment and this equals to 670 m in length. For relaxing the congested site condition, about three different dikes will be constructed simultaneously with monthly production from 30,000 to 60,000 m³ of embankment at each dike, and this corresponds from 200 m to 300 m in length.

Therefore, depends on the required monthly embankment volume for each dikes, combination of Group A and Group B with necessary number of each set will be employed for the works.

1.4.4 Construction Resources

(1) Construction Plant and Equipment

Major construction plant and equipment with its approximate size and numbers to be used for this project are listed in the following table. Exact numbers of fleet will be determined with required individual work volume.

Major Construction Plant and Equipment

No.	Name	Size	Nos.	Remarks		
Embank	Embankment					
1	Wheel loader	2.1 m ³ class	4	Excavation / loading		
2	Backhoe shovel	1.0 m ³ class	2	Excavation / loading / trimming		
3	Dump truck	10 - 12 ton class	20 - 30	Hauling / embankment		
4	Bulldozer	28 ton class	3	Bulldozing / grading		
5	Bulldozer	21 ton, swamp	2	Bulldozing / grading		
6	Vibration roller	10 ton class	3	Compaction		
7	Motor grader	3.1 m class	2	Grading		
8	Water sprinkler	10 m ³ class	1	Watering		
Other w	vorks: Borrow soil, mir					
9	Backhoe shovel	$0.7 \mathrm{m}^3 \mathrm{class}$	2	Excavation / loading		
10	Bulldozer	21 ton class	3	General purpose		
11	Trailer	20 ton class	1	Transportation of Equipment		
12	Dump truck	10 ton	20 - 30	Hauling		
13	Motor grader	2.7 m	1	Grading		
14	Backhoe shovel	0.3 m ³ class	3	Miscellaneous		

1.5 Construction of the Sto. Tomas River Dike

The locations of the Sto. Tomas River dikes are shown in Figure 1.5.1. Typical cross sections of the New Dike, Dike Heightening, and Dike Strengthening, are shown in Figure 1.5.2, 1.5.3 and 1.5.4

The dike locations, types, lengths, and estimated embankment volumes for construction are summarized below. No rock excavation will be required in the works.

Location	Туре	Length (m)	Embankment Volume (m ³)
D/s of Maculcol Bridge, right bank	New Dike	1,950	77,100
D/s & U/s of Maculcol Bridge, left bank	Strengthening	2,800	257,900 (excavation)
U/s of Maculcol Bridge, right bank	Dike Strengthening	3,100	35,800
	Dike Heightening	4,300	393,200
U/s of Maculcol Bridge, left bank	Dike Heightening	9,000	498,800
	Dike Strengthening	8,000	569,100
Total		29,150	1,831,900

Staged implementation in order from the river mouth toward upstream is normally proposed for river improvement works, however the needs of river improvement depends on local factors; such as height of existing dikes with different degrees of overtopping threat, numbers of resident and values of properties to be protected from inundation. Therefore, one of the sequences for the construction, together with the dike locations, types, and lengths, will be as follows.

- 1) Upstream of the Maculcol Bridge, right bank, up to Paete Hill, dike heightening of 4,300 m
- 2) Upstream of the Maculcol Bridge, left bank, up to Vega Hill, dike heightening of 9,000 m
- 3) Upstream of Vega Hill, left bank, dike strengthening of 8,000 m
- 4) Downstream of the Maculcol Bridge, right bank, new dike of 1,950 m together with a diversion channel of the Gabor River, 1,700 m

- 5) Upstream of the Maculcol Bridge, right bank, dike strengthening of 3,100 m
- 6) Downstream and upstream of the Maculcol Bridge, left bank, dike strengthening of 2,800 m

Taking into the basic conditions for construction, general procedures for the construction of Sto. Tomas River dikes are expressed as follows:

1.5.1 Temporary Works

(1) Access Road

National Road No. 7 is the main access for construction. Public road from San Marcelino to San Rafael is available for left bank upstream part of dike construction. Temporary roads from the National Road and other public road to access each site will be solved by construction or use of dikes being built. Considering the required intensive work volume, temporary roads on the riverside as well as the other landside parallel to the dikes will also be required including necessary ramps to connect the crest of dike.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for the construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, motor-pool, etc. for both Manila and Iba side of the bank.

(3) Temporary Buildings and Supplies

Temporary buildings and various supply systems, such as water, power and communication, will be provided on site for smooth implementation of the works.

1.5.2 Construction Method

Three types of dike are designed for the improvement of the Sto. Tomas River banks. One is the construction of new dike and the remains are heightening and strengthening of existing dikes. In addition, a diversion channel of the Gabor River is also designed.

The new dike is designed for the section of no existing dike at present. The dike heightening is applied for the section of insufficient height of existing dikes and the dike strengthening is designed for the section where needs strengthening of existing dikes. Typical cross section of these three types of dike is shown in Figure 1.5.2, 1.5.3 and 1.5.4.

The works include embankment with lahar deposits to shape the dike, base concrete at the toe, gabion mattresses with filter cloth, grouted riprap for the riverside slope protection, sodding on borrow soil for landside slope protection, and gravel pavement on top of the dike. The removal of existing grouted riprap is required before commencement of embankment in the case of dike heightening where applicable.

An abundant lahar deposit near the construction site will be utilized as much as possible for the embankment.

In general, the construction works will be carried out by combination of earthmoving equipment such as

wheel loaders, backhoe shovels, dump trucks, bulldozers, and vibration rollers. Considering the size of the project and hauling distances, motor scrapers can be used if its mobilization and maintenance are reasonably secured.

1.5.3 Construction Schedule

Construction time schedule for the Sto. Tomas River dike is shown in Figure 1.5.5.

(1) Production Rate Study

Using conventional equipment available for the project, monthly production rate of each group is determined as follows:

Group	Name	Capacity	nos.	Monthly Production (m ³)
A	Tractor Shovel	2.1 m^3	1	19,100
	Dump Truck	12 t	4	
В	Backhoe Shovel	1.0 m^3	1	13,100
	Dump Truck	10 t	4	15,100

The above table is provided based on the following assumptions and calculations.

(a) Group A

Loading Equipment: Tractor shovel (wheel), Bucket capacity: 2.1 m3 (heaped) / Loading to 12 ton dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: $2.1 \times 0.8 \times 1.5 = 2.5 \text{ t}$ / Loading time: 40 sec / Loading time required for 12 t dump truck: 12 / 2.5 = 4.8 times / $4.8 \times 40 \text{ sec} = 192 \text{ sec} = 3.2 \text{ min}$ / Working efficiency in loading hour: 0.9 / Production rate in embanked volume: $60 \text{ / } 3.2 \times 0.9 = 16.9 \text{ nos.}$ truck / $16.9 \times 12 = 203 \text{ t/hr}$ / 203 / 2.2 = 92 m3/hr / $10 \times 0.8 \times 92 = 736 \text{ m3}$ per day / $736 \times 26 = 19,100 \text{ m3}$ per month / Hauling Equipment: Dump truck, Loading capacity: 12 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading: 3.2 min / Hauling: 4 min / Unloading: 1 min / Returning: 4 min / Waiting: 1 min / Total: 13.2 min / Hauling times per hour: 60 / 13.2 = 4.5 times / Number of Dump Truck required: $16.9 \text{ / } 4.5 = 3.75 \rightarrow 4 \text{ nos.}$ per Tractor shovel

(b) Group B

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.9 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: $1.0 \times 0.9 \times 1.5 = 1.35$ t / Loading time: $30 \sec$ / Loading time required for 10 t dump truck: 10 / 1.35 = 7.4 times / 7.4×30 sec = $222 \sec = 3.7 \min$ / Working efficiency in loading hour: 0.85 / Production rate in embanked volume: 60 / $3.7 \times 0.85 = 13.8$ nos. truck / $13.8 \times 10 = 138$ t/hr / 138 / 2.2 = 63 m3/hr / $10 \times 0.8 \times 63 = 504$ m3 per day / $504 \times 26 = 13,100$ m3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading: $3.7 \times 10 \times 10^{-10}$ Hauling: $4 \times 10 \times 10^{-10}$ min / Total: 13.7×10^{-10} Hauling times per hour: $60 \times 13.7 = 4.4 \times 10^{-10}$ min / Number of Dump Truck required: 13.8×10^{-10} hos. per Backhoe shovel

(c) Group B - Soil

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at

embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: $1.0 \times 0.8 \times 1.5 = 1.2 \text{ t}$ / Loading time: 35 sec / Loading time required for 10 t dump truck: 10 / 1.2 = 8.3 times / $8.3 \times 35 \text{ sec} = 291 \text{ sec} = 4.8 \text{ min}$ / Working efficiency in loading hour: 0.8 / Production rate in embanked volume: $60 / 4.8 \times 0.8 = 10 \text{ nos}$. truck: $10 \times 10 = 100 \text{ t/hr}$ / 100 / 2.2 = 45 m3 / hr / $10 \times 0.8 \times 45 = 360 \text{ m3}$ per day / $360 \times 26 = 9,360 \text{ m3}$ per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 20,000 m / Hauling Cycle Time: Loading: 4.8 min / Hauling: 30 min (Borrow area -5, National read -10, Site -15) / Unloading: 1 min / Returning: 30 min / Waiting: 4.2 min / Total: 70 min / Hauling times per hour: 60 / 70 = 0.86 times / Number of Dump Truck required: $10 / 0.86 = 11.6 \rightarrow 12 \text{ nos}$. per Backhoe shovel

(2) Construction Time Schedule

In the rainy seasons, more precisely from middle May to middle October, it is considered not practical to carry out any works even dike protection works because the maintenance of temporary roads for transporting construction materials as well as finishing the slope of embankment would be difficult. Construction period of four years (three dry seasons) will be appropriate for this type of construction, based on the required average monthly production of 102,000 m³ in the embankment and this equals to 1,620 m in length. For relaxing the congested site condition, about 3 to 6 different dikes will be constructed simultaneously with monthly production from 6,000 m³ to 36,000 m³ of embankment at each dike, and this corresponds from 360 m to 520 m in length.

Therefore, depends on the required monthly embankment volume for each dike, combination of Group A and Group B with necessary number of each set will be employed for the works.

1.5.4 Construction Resources

Major construction plant and equipment with its approx. size and numbers to be used for this project are listed in the following table. Exact numbers of fleet will be determined with required individual work volume.

Major Construction Plant and Equipment

No.	Name	Size	Nos.	Remarks		
Embank	Embankment					
1	Wheel loader	2.1 m ³ class	4	Excavation / loading		
2	Backhoe shovel	1.0 m ³ class	2	Excavation / loading / trimming		
3	Dump truck	10 - 12 ton class	20 - 30	Hauling / embankment		
4	Bulldozer	28 ton class	3	Bulldozing / grading		
5	Bulldozer	21 ton, swamp	2	Bulldozing / grading		
6	Vibration roller	10 ton class	3	Compaction		
7	Motor grader	3.1 m class	2	Grading		
8	Water sprinkler	10 m ³ class	1	Watering		
Other w	orks: Borrow soil, min	or excavation, etc.				
9	Backhoe shovel	0.7 m ³ class	2	Excavation / loading		
10	Bulldozer	21 ton class	3	General purpose		
11	Trailer	20 ton class	1	Transportation of Equipment		
12	Dump truck	10 ton	20 - 30	Hauling		
13	Motor grader	2.7 m	1	Grading		
14	Backhoe shovel	0.3 m ³ class	3	Miscellaneous		

CHAPTER 2 MAINTENANCE AND ADMINISTRATION

2.1 General Description of the Works

This chapter makes proposals on the maintenance and administration after the completion of structural measures and they are:

- For Bucao River:
 - o Dike heightening / revetment
 - o Bridge reconstruction
- For Sto. Tomas River
 - o Dike heightening / revetment

2.1.1 Extent of the Works

Maintenance work in this chapter will be defined as periodical patrol for checking the condition of structures and repair works if it comes necessary. And administration means the necessary support for carrying out the maintenance operation.

2.1.2 Remedial Works

No significant maintenance work will be required at the Bucao Bridge because the main member of the bridge will be made with non-paint type steel plate girder.

With regards to the dikes of the Bucao River and Sto. Tomas River, it is assumed that three locations will suffer damages of partial breakdowns of the dike from floods every year. Presumed magnitude of each damage required for maintenance operation is as follows:

-	length of damage	300 m
-	lost of embankment material	50,000 m ³
-	removal of damaged protection	900 m^3
-	base concrete	150 m^3
-	gabion mattress	540 m^3
-	grouted riprap	900 m^3
-	gravel pavement	300 m^3

2.2 Present Status

et cetera

(1) Existing Organization

There are five organizations which have been involved with the river basin management and they are Regional Office (III), District Office in Zambales, PMO-MPR, PMO-MPE, Provincial Office of Zambales. Survey results on present status of each office are as follows. District Office at Olongapo City is not included because it will not be involved any of the maintenance works.

Annual Budget of Different Offices

For Year 2002 (in Million Pesos)

Name of Office	Personnel	Equipment	Project	Total
Regional Office (III)	37.25	-	211.80	-
District Office	54.49	-	11.69	-
PMO-MPR	9.27	-	6.50	-
PMO-MPE	12.97	5.46	1,697.15	1,715.58
Provincial Eng. Office	13.12	15.29	0.00	28.41
Total	127.10	-	1,927.14	-

Note: Budget in Project means on-going project's total amount.

Numbers of Personnel at Different Offices (Year 2002)

Name of Office	Engineer	Technician	Others.	Total
Regional Office (III)	49	36	48	133
District Office	28	93	65	186
PMO-MPR	26	39	21	86
PMO-MPE	32	22	30	84
Provincial Eng. Office	23	61	36	120
Total	158	251	200	609

Major Equipment Owned by Different Offices (Year 2002)

Name of Office	Bulldozers	Dump trucks	Others	Total
Regional Office (III)	5	0	33	38
District Office	0	3	24	27
PMO-MPR	26	0	30	56
PMO-MPE	0	0	11	11
Provincial Eng. Office	5	42	151	198
Total	36	45	249	330

Notes: Bulldozers at Regional Office are 24 ton but non-operational, need major repair. One of the Dump trucks at District Office is non-operational. Bulldozers at PMO-MPR are 24 - 26 ton class. Others at PMO-MPE are mostly small cars like pick-ups. Provincial Office's equipment is rather small size, in case of dump truck; their tonnage varies from 15 - 4 ton. Many motor cycles are included in the others.

2.3 Maintenance Works

Required maintenance works will be as follows:

2.3.1 Patrol and Inspection

Through the patrol and inspection, any irregularities or defects of the bridge and dikes are to be detected so that the irregularities and defects can be rectified before they come worse and impair the functions or safety of those structures.

Through the patrol and inspection, places or facilities to be maintained or repaired shall be identified. And the notice to a maintenance and repair section shall be made without delay. When large-scale maintenance and/or repair works are required, action programs should be arranged in order to avoid seriously negative effect on the functions of the structures. In a rainy season, an intensified patrol and

inspection shall be programmed by DPWH. If any irregularities or defects are found in the structures, repair works shall be immediately undertaken to prevent expansion or progression of the irregularities or defects.

Frequency (timing) and objectives of patrol/inspection are described as follows:

Frequency / Objectives of Patrol and Inspection

No.	Patrol / Inspection	Frequency	Objectives
1	Regular Inspection	Once a month (Once a	To find out the followings:
		week during rainy	- Irregularities of structures
		season	- Maintenance manner of structures
2	Semi-Annual	November, every year	To find out changes in structures
	Inspection (End of rainy		To plan the maintenance activity program for the
	season)		coming dry season
3	Semi-Annual	April, every year	To inspect the results of maintenance activities
	Inspection (Before		done before rainy season
	rainy season)		To prepare required material / equipment for
			urgent remedial repair works during rainy
			season
4	Special Inspection	During typhoon	To observe / inspect the conditions of rivers and
			structures during the flood
			To take immediate actions for urgent remedial
			measures to repair structures
			To observe / inspect the flood damages if any

Required arrangements for the respective inspection are as follows:

List of Manpower / Instrument / Material for Inspections

No.	Items	Regular Inspection	Semiannual (Nov)	Semiannual (April)	Special Inspection
1	Manpower				
	1) Civil Engineer	0	0	0	0
	2) Mechanician	0	0	0	0
	3) Survey crew		0	0	
2	Instruments / Material				
	1) 4WD vehicle (1 unit)	0	0	0	О
	2) Poles / Measuring tape	0	0	0	0
	3) Lubricant	0	0	0	0
	4) Survey instrument		0	0	
	5) Painting tools / materials		0	0	
	6) Sand-bags / Bamboo poles				0

2.3.2 Maintenance Work

(1) The Bucao Bridge:

The proposed bridge length is 321 m long and made of non-paint steel plate girder. The approach road for the bridge is 280 m at Manila side and 346 m at Iba side, and its width is 10.0 m.

For maintenance of the bridge, the following aspects should be taken into account at regular and special inspection.

- (a) Surface condition of pavement including approach roads.
- (b) Surroundings of abutments and piers

- (c) Slopes of approach roads
- (d) Condition of bridge bearing and support
- (e) Handrails

(2) Dikes:

Dike embankment was constructed on the both banks of Bucao River and Sto. Tomas river. The total length of Bucao dikes is 12,080 m. The length of Sto. Tomas dikes is 30,850 m in total including 1,700 m diversion channel.

Typical cross sections of each dike are presented in the chapter 1 of this appendix. The top width of the dikes was designed as 8 m consisting of 5 m gravel pavement and 1.5 m shoulder on both sides. Gabion mattress, base concrete and grouted riprap are the parts of revetment and sodding on borrow soil with drain ditch on the landside as slope protection.

For maintenance of dikes, the following aspects should be taken into account at the time of monthly regular inspection and special inspection during the typhoon / flooding:

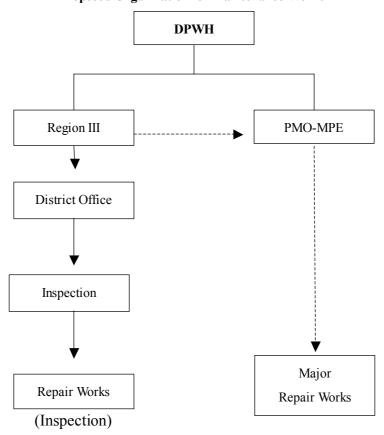
- (a) Gully erosion / sodding on the slope
- (b) Seepage from the riverside to landside
- (c) Settlement of dike
- (d) Crown shape of dike surface

2.4 Organization and Function

(1) Proposed Organization

According to the nature of works, it is suggested that PMO-MPE and the District Office would be required to carry out the maintenance works. Initially because of the location and familiarity of the works, all the works would be managed by the District Office in Zambales, in particular the regular inspection of the structures and following remedial works. However, District Office will report to PMO-MPE about the inspection results together with expected remedial works, and ask PMO-MPE to execute major works which considered beyond the capacity of the District Office.

Proposed Organization for Maintenance Works



Note: Dotted line means the case when such repairs work is considered beyond District Office's capability, the work will be carried out by PMO.

(2) Manpower

In the maintenance of the structure, the District Office and / or PMO-MPE will be required capable to provide following staff when this work comes necessary.

Numbers of personnel:

Engineer	10
Technician	15
Administration	5
Total	30

(3) Instrument and Material

For supporting required regular inspection, cars and instruments with necessary consumables should be arranged for the District Office.

(4) Equipment

The District Office will maintain following equipment through procurement and repair for the maintenance works, all the time.

List of Equipment to be held by the District Office

No.	Name	Size / Capacity	Unit	Remarks
1	Backhoe shovel	0.7 m ³ class	1	
2	Backhoe shovel	0.3 m ³ class	1	
3	Dump truck	10 ton class	6	
4	Bulldozer	21 ton class	1	
5	Bulldozer	13 ton, swamp	1	
6	Motor grader	2.7 m class	1	
7	Vibration roller	8 ton class	1	
8	Truck crane	15 ton class	1	
9	Low-bed Trailer	20 ton class	1	
10	Concrete mixer	0.3 m ³ class	1	

Equipment will be used for 400 working hours every year; based on 4 months per year, 20 days per month, 5 hours per day.

(5) Materials

Following materials will be required for the maintenance operation.

lost of embankment material 150,000 m³
 base concrete 450 m³
 gabion mattress 1,620 m³

- grouted riprap 2,700 m³

- gravel pavement 900 m³

2.5 Schedule and Budget

Expected maintenance schedule with budget is shown in Figure 2.5.1

CHAPTER 3 COST ESTIMATE

3.1 Constitution of Project Cost

The project cost is estimated for major sectors, i.e. (1) Sabo and flood control structure measures (2) Non-structure measures and (3) Community-based disaster prevention measures, which are subdivided into as follows:

- (1) Sabo and flood control structure measures
- i) Bucao River Basin
- ii) Sto. Tomas River Basin
- (2) Non-structure measures
- i) Flood/ Madflow Warning System
- ii) Evacuation System
- (3) Community-based disaster prevention measures
- i) Community Based Forest Management
- ii) Agriculture Development on Lahar Area
- iii) Community Road Rehabilitation
- iv) Establishment of Aeta Assistance Station

The project cost of each sub-item consists of the following components:

- (1) Construction Cost
- (2) Land Acquisition and Compensation
- (3) Administration and Engineering Services Cost
- (4) Contingency
- i) Physical Contingency
- ii) Price Contingency

3.2 Conditions and Method of Cost Estimate

(1) Construction Cost

The construction cost is basically estimated by unit price basis which multiply the work quantity and the unit price.

The unit prices of construction works of the sabo and flood control structure are determined in reference to prevailing unit prices which are collected from the ongoing similar projects in Pampanga and Pangasinan provinces. Unit prices of five contract packages of the Pinatubo Hazard Urgent Mitigation Project, Phase II and two contract packages of Agno River Flood Control Project, Phase II are referred. As the price level of the ongoing similar projects is the year of 2001 mostly and that of this study is September 2002, unit prices represented from those projects are adjusted by price inflation rates for one year. Annual inflation rates of 2% for foreign currency portion and 4% for local currency portion are applied, considering the recent inflation trend (details refer to Appendix I). Table 3.2.1.shows applied

unit prices, which is expressed in Philippine Peso and divided into local currency portion and foreign currency portion according to the following composition presented by NEDA.

		Local portion	Foreign portion
(1)	Material		
a.	Cement, Fuel& Lubricant	30%	70%
b.	Aggregate & Lumber	60%	40%
c.	Steel	20%	80%
d.	Others	50%	50%
(2)	Machinery & Equipment Rental	30%	70%
(3)	Labor	100%	0%
(4)	Indirect costs	100%	0%

While, the cost of general item including miscellaneous items is estimated by lump sum basis which is assumed to be 10% of the sum of construction cost estimated by the unit price basis. Data obtained from the ongoing similar project shows 8% in average for the general item as presented in Table 3.2.2. As for the unit price of non-structure and community based disaster prevention measures, it is discussed in each related section of 3.4 and 3.5.

(2) Land Acquisition and Compensation Cost

The cost estimate for the land acquisition and compensation is based on the cost data obtained from Bureau of Internal Revenue for the zonal valuation of land and village wise information gathered in the field. Data obtained from the field is applied for this study as shown in Table 3.2.3.

(3) Administration and Engineering Cost

Administration and engineering cost to be required for the project implementation is estimated by lump sum basis which is assumed at 3% of the construction cost for the government administration, at 6% of the construction cost for the detail design and 10% for construction supervision as the engineering services cost, which are basis on the DPWH standard.

(4) Contingency

Price contingency until the completion of the project is estimated by annual inflation rates of 4% for local currency and 2% for foreign currency. For the physical contingency, 10 % of construction cost for each item is applied.

3.3 Project Cost for Sabo and Flood Control Structure

The construction cost based on the feasibility design is estimated at P1,035 million for the Bucao River basin including P341 million for the cost of Bucao Bridge replacement and P.1,192 million for the Sto. Tomas River basin, of which detailed breakdowns are shown in Table 3.3.1 for the Bucao River basin and Table 3.3.2 for the Sto. Tomas River basin, respectively. From tables the construction cost of each structure is summarized as follows:

Construction Cost for Each Structure

No.	Description	Amount (P1,000)
1	Bucao River Basin	
(1)	Dike construction	690,624
(2)	Maintenance road	2,790
(3)	Bucao bridge replacement	341,086
	Total (1)	1,034, 500
2	Sto. Tomas River Basin	
(1)	Dike construction	1,125,598
(2)	Diversion channel	63,539
(3)	Maintenance road	2,991
	Total (2)	1,192,128
	Grand Total (1 to 2)	2,226,628

Based on the field investigation and the unit price given in Table 3.2.3, the cost of land acquisition and compensation is estimated at P82.9 million in totals of which summary is given in Table 3.3.3.

Detail calculation for the cost of land acquisition and compensation is presented in the report of Resettlement Plan prepared for this study.

Based on the construction cost, the government administration cost, engineering services cost and contingency are calculated as a lump sum basis. Thus, the project cost is estimated at P1,678 million for the Bucao River basin and at P1,960 million for the Sto. Tomas River basin, as shown in Table 3.3.4 and 3.3.5, respectively, which are summarized as follows:

Project Cost

(Unit: 1,000 Pesos)

No.	Description	LC	FC	Total
1.	Construction cost of civil works			
	Bucao River basin	551,281	483,219	1,034,500
	Sto. Tomas River basin	687,044	505,085	1,192,128
2.	Land acquisition & compensation	44,878	0	44,878
	Bucao River basin	44,878	0	44,878
	Sto. Tomas River basin	37,988	0	37,988
3.	Administration			
	Bucao River basin	31,035	0	31,035
	Sto. Tomas River basin	35,764	0	35,764
4	Engineering service cost			
	Bucao River basin	88,205	77,315	165,520
	Sto. Tomas River basin	109,927	80,814	190,741
5	Sub Total			
	Bucao River basin	715,399	560,534	1,275,933
	Sto. Tomas River basin	870,723	585,899	1,456,621
6	Price contingency			
	Bucao River basin	182,428	67,101	249,529
	Sto. Tomas River basin	245,391	79,459	324,850
7	Physical contingency			
	Bucao River basin	89,783	62,763	152,546
	Sto. Tomas River basin	111,611	66,536	178,147
8	Total			
	Bucao River basin	987,609	690,399	1,678,008
	Sto. Tomas River basin	1,227,726	731,894	1,959,619
9	Grand Total	2,215,335	1,422,293	3,637,627

Assuming an annual progress of construction works from the construction schedule discussed in the foregoing chapter 1, disbursement schedule of project cost is produced as shown in Table 3.3.6 for the Bucao River basin and Table 3.3.7 for the Sto. Tomas River basin. The tables show that if the replacement of Bucao Bridge is expected to commence in the year of 2005 and the construction works of both river basins are expected to commence in the year of 2007, the annual disbursement is indicated as follows:

Annual Disbursement

(Unit: Million Pesos)

Project	Currency	2004	2005	2006	2007	2008	2009	2010
Bucao	LC	0	65	136	230	191	198	167
	FC	0	45	99	189	124	127	105
	Total	0	110	235	419	315	325	272
Sto. Tomas	LC	0	0	62	258	327	340	240
	FC	0	0	19	147	208	212	146
	Total	0	0	81	405	535	552	386
Total	LC	0	65	198	488	518	538	407
	FC	0	45	118	336	332	339	251
	Total	0	110	316	824	850	877	658

3.4 Project Cost for Non-Structure Measure

(1) Flood/Mudflow Monitoring & Warning System

The flood/mudflow monitoring & warning system consists of (i) 11 stations of observatory system, (ii) 4 sites of monitoring system and (iii) 35 warning posts, of which cost is estimated for the purchase cost and installation cost of equipment. Major equipment to be required for the system includes the following equipment:

Observatory system: Rainfall gauge

Water level gauge

Cellular phone system

Power supply unit

Monitoring system: Computer with soft ware

Cellular phone system

UPS

Warning post: Panzer mast

Siren

Power supply unit

Based on the prevailing market price of the above equipment, supply and installation cost is estimated at P33,559 thousand in totals, of which breakdown is listed in Table 3.4.1.

For implementation of the project, government administration cost and engineering services cost is estimated at P1,007 thousand and P40,035 thousand, respectively. As shown in Table 3.4.2, thus, total project cost is estimated at P82,061 thousand including 10% of contingency. The detailed calculation of the estimate is presented in the supporting report: Appendix VIII. The project cost is summarized as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Supply and installation cost	33,559
2	Administration cost	1,007
3	Engineering service cost	40,035
	Sub total	74,601
4	Contingency	7,460
	Total	82,061

(2) Evacuation Center

As discussed in the supporting report: Appendix VIII, thirty six existing schools will be renovated and sixty evacuation centers are scheduled to construct newly dividing into three stages.

Referring to the prevailing price of building construction and land acquisition collected from the district office and similar projects as shown in Table 3.4.3, the construction and renovation cost is estimated at P1,366 million. Table 3.4.4 shows the construction cost summary for the evacuation center.

Based on the construction cost, the project cost is estimated at P1,788 million including the government administration cost, engineering services cost and contingency as shown as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Construction and renovation cost	1,366,300
2	Administration cost	40,989
3	Engineering service cost	218,608
	Sub total	1,625,897
4	Contingency	162,590
	Total	1,788,487

The detailed calculation of the estimate is described in the supporting report: Appendix VIII.

3.5 Project Cost for Community Based Disaster Prevention and Social Development

(1) Community Based Forest Management

For the cost estimate of the community-based forest management, unit prices per hectare of forest development were collected from the Forest Sector Project and provincial office. Table 3.5.1 shows the eleven kinds of collected unit prices.

Unit prices obtained from the Forest Sector Project is based on the MC2000-19, which is the guideline governing the updating of cost estimates and intensification of plantation maintenance and protection activities for the project in the forest sector. The unit price of provincial office is obtained from the ongoing project.

Referring to the collected unit prices, the plantation cost is estimated at P460 million for forest tree and at P116 million for agro-forestry as shown in Table 3.5.2.

The project cost is given as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Plantation cost	576,895
2	Administration cost	17,307
3	Engineering service cost	92,303
	Sub total	686,505
4	Contingency	68,651
	Total	755,156

(2) Agriculture Development

Unit prices of land development in Lahar areas, production cost per hectare for seasonal and perennials crops and production cost of mango per hectare are summarized in Table 3.5.3, Table 3.5.4 and Table 3.5.5, respectively, of which detail analysis of unit prices is referred to the report of Agriculture Development Research for Lahar Area.

Estimated construction cost for 1,726 hectares of seven areas is shown in Table 3.5.6.

The project cost is estimated at P701 million as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Development cost	535,257
2	Administration cost	16,058
3	Engineering service cost	85,641
	Sub total	636,956
4	Contingency	63,696
	Total	700,652

(3) Community Road Rehabilitation

As described in the supporting report: Appendix VII, the community road network is planned to establish three routes as follows:

A line: Along the Bucao River with the length of 48.1 km

B line: Along the Santa Fe River with the length of 14.9 km

C line: Along the Sto. Tomas River, Mapanuepe Lake and Marella River with the length of

44.9 km

Construction works of the above road lines are composed of as follows:

		A line	B line	<u>C line</u>
i)	New road construction (km)	26.06	4.64	23.49
ii)	Improvement of existing road (km)	22.04	10.26	21.41
iii)	Related structures construction			
-	Bridge (no)	5	2	2
-	Spillway (no)	9	5	10
-	Retaining wall (m)	0	0	2900

To estimate the construction cost of the above, referring to the prevailing unit prices of DPWH, unit

prices to be applied are set as follows:

Applied Collected

i) New road construction : P4,200 /m 3,640 (DPWH)

5,777 (Agno II)

ii) Improvement of existing road,

- Road width, less than 3 m : P3,800 (90% of i))
- Road width, more than 3 m : P3,400 (80% of i))

iii) Bridge : P232,000 /m 190,000~280,000

(DPWH)

The construction cost of community road is estimated at P1,149 million of which breakdown is given in Table 3.5.7.

Based on the estimated construction cost, the project cost including government administration cost, engineering services cost and contingency is estimated at P1,821 million for the full development scheme as follows:

Construction Cost for Community Road Rehabilitation (Unit: 1,000 Pesos)

No.	Description	Amount
1	Construction cost	1,149,038
2	Administration and engineering service cost	344,711
3	Physical contingency	149,374
	Sub total	1,643,124
4	Price Escalation	178,036
	Total	1,821,160

(4) Establishment of Aeta Assistance Station

Unit prices shown in Table 3.5.8 can be applied for the cost estimate of building construction, land preparation, land acquisition and so on for the Aeta Assistance Station as well as the evacuation center construction.

Estimated detailed cost is calculated in Appendix IX and cost summary is shown as follows:

Cost for Establishment of the Aeta Assistance Station (Unit: 1,000 Pesos)

	Cost for Establishment of the fieth rissistance Station	(0
No.	Description	Amount
1	Construction cost	
	(1) School of upland entrepreneurship	1,135,000.00
	(2) Ancestral land protection development and	4,941,606.40
	Management	
	(3) Aeta cultural heritage	200,000.00
	(4) Aeta health nutrition and livelihood program	983,200.50
	Sub total (1)	7,259,806.90
2	Administration cost	1,074,905.60
3	Engineering service cost	362,990.35
	Sub total (1 to 3)	8,697,702.85
4	Contingency	869,770.29
	Total (1 to 4)	9,567,473.14

3.6 Overall Project Cost

Based on the project plan discussed in the foregoing chapters, overall project cost is estimated at P7,433 million of which breakdown is given in Table 3.6.1.

The Study on Sabo and Flood Control for Western River Basins of Mount Pinatubo in the Republic of the Philippines Final Report Supporting Report

Tables

Table 3.2.1 Unit Price of Construction Works

Unit:	Peso)
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Description Policy Polic						Pin	atubo Hazer	rd Urgent	Mitigation P	roiect. P	hase II			Agno Ri	iver Flood Control Pro	iect. Phase II	Represated	Rasio of I	.C & FC	Esc	alated Unit F	(Unit: Peso) Price
Dilka and channel works Tell No. Unit price Met No. Unit p	No.	Description	Unit	I	P-1								P-6									
Column C		r. ·		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	(Average)	LC	FC	LC	FC	Total
Columbra & Grabbing, e=20cm m	1	Dike and channel works																				
Column C		(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
Golden G		(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
Columnation		(3) Backfilling	m ³	103(7)	109.94			103(7)	24.00								67	52.39%	47.61%	36.51	32.53	69.04
6 Base Concrete		(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
(7) Wet Stone Masonry, (= 30cm m² 104 10 566 90 104 1) = 248 00 104 104 1) = 248 00 104 104 1) = 248 00 104 104 1) = 248 00 104 104 1) = 248 00 104 104 1) = 248 00 104 104 1) = 248 00 104		(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
68 Covering Borrow Soil, t=50cm m² 104(1)b 566.90 104(1)c 248.00 2.98.27 59(2)c 2.98.27 59(2)c 1.592.87 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102 67.18% 32.82% 1468.7 705.99 2.172.28 2.102		(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
Column C		(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
(10) Filter Cloth, = 10mm		(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
(11) Gravel Pavement, 1=20cm m³ 300(2) 862 07 300(1) 452.55 300(2) 607.00 300(1) 961.31 300(2) 767.72 767.7		(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
(12) Sodding		(10) Filter Cloth, t= 10mm	m ²	SPL-510D	113.56	SPL-510I	89.59	SPL-510c	95.00	SPL-5100	124.31	SPL-510E	104.51				105	64.30%	35.70%	70.22	38.23	108.45
13 Leveling Concrete m² 405(1) 3,833 59 405(6) 2,290 0 405(6) 2,798 0 405(6) 2,170.59		(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
Control Structure Concrete m3 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 27,763 47.19% 52.79% 13107.64 14655.81 27,763.00 404 27,930.00 404 27,930.00 404 27,930.00 404 27,930.00 405(1) 47,930.00 47		(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
Control Cont		(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
Bridge and Road works		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
Road	1	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
Road																						
(1) Clearing & Grabbing, t=20cm m² 100(1) 7.03 2.1.1 9.40 cw2.2 6.64 8 45.22% 54.79% 3.76 4.47 8.23 (2) Backfilling m³ 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 m³ 102(5) 56.00 103(2) 154.19 103(2) 114.92 21.10.1 137.03 cw2.3.4 139.14 120 50.78% 49.23% 63.37 60.26 123.63 (4) Embankment (Lahar Material) m³ 104(1)a 105.00 2.1.3 268.08 187 43.17% 56.84% 83.96 108.41 192.37 (5) Base Concrete m³ 405(6) 2.798.00 405(6) 4.381.74 405(6) 2.170.59 2.110.3 3.221.02 3.143 67.25% 33.53% 2198.08 1075.05 3.273.13 (6) Wet Stone Masonry, t=30cm m³ 504(5) 1.993.00 2.1.1 3268.08 cw6.2.3 695.02 404 51.51% 48.49% 216.42 199.82 416.24 (8) Gravel Pavement, t=20cm m³ 500(2) 607.00 2.2.4 48.60 cw6.2.5 752.25 615 54.40% 45.60% 347.94 286.05 633.99 (9) Sodding m² 504(5) 1.00 53.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (2) Deck slab m² 504(5) 1.00 50.00 404 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 1678.43 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% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar con 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar con 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 1872.60 21537.47 40,263.53 (2) Reinforcing sted bar																						
(2) Backfilling m³ 103(7) 55.00 3.2.1.2 61.00 cw.5 188.99 92 49.24% 50.76% 47.12 47.63 94.75 (3) Excavation m³ 102(5) 56.00 103(2) 154.19 103(2) 114.92 21.10.1 137.03 cw2.3.4 139.14 120 50.78% 49.23% 63.37 60.26 123.63 (4) Embankment (Lahar Material) m³ 104(1)a 105.00 21.3 268.08 187 43.17% 56.84% 83.96 108.41 192.37 (5) Base Concrete m³ 405(6) 2.798.00 405(6) 4.381.74 405(6) 2.170.59 21.10.3 3,221.02 31.43 67.25% 33.53% 2198.08 1075.05 3,273.13 (6) Wet Stone Masonry, t=30cm m³ 504(5) 1.993.00 21.7 1,845.97 1,1919 65.82% 34.20% 1313.51 669.33 1,982.84 (7) Covering Borrow Soil, t=50cm m³ 104(1)e 248.00 21.3 268.08 cw6.2.3 695.02 404 51.51% 48.49% 216.42 199.82 416.24 (8) Gravel Pavement, t=20cm m³ 300(2) 607.00 22.4 486.60 cw6.2.5 752.25 615 54.40% 45.60% 347.94 286.05 633.99 (9) Sodding m² 504(5) 1.993.00 21.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (1) Steel plate girder ton cw8.6.3% 164,089.81 164,090 38.46% 61.54% 65638.17 102995.91 168,634.08 (2) Deck slab m² 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(1) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 400(16) 33,966.20 cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.3 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.3 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.3 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.3 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.0 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.0 (2) Cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 (Reinforcing steel bar ton 50 cw3.61 60.0 (2) Cw4.5 44,2			2																			
(3) Excavation m³ 102(5) 56.00 103(2) 154.19 103(2) 114.92 2.1.10.1 137.03 cw2.34 139.14 120 50.78% 49.23% 63.37 60.26 123.63 (4) Embankment (Lahar Material) m³ 104(1)a 105.00 2.1.3 268.08 187 43.17% 56.84% 83.96 108.41 192.37 (5) Base Concrete m³ 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 m³ 504(5) 1,993.00 2.1.7 1,845.97 1,191 65.82% 34.20% 1313.51 669.33 1,982.84 (8) Gravel Pavement, t=20cm m³ 405(6) 2,300.00 404 22.44 486.60 cw6.2.5 752.25 615 54.40% 45.60% 347.94 286.05 633.99 (9) Sodding m² 504(5) 1.993.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (1) Steel plate girder 101 (1) Steel plate girder 101 (1) Steel plate girder 101 (1) Concrete m³ 405(1)B 5,268.06 405(1) 4,795.56 405(1) 4,795.56 405(1) 4,220.17 cw3.64 (3) Removal of existing bridge 101 (3) Removal of existing bridge 102 (3) Removal of existing bridge 102 (4) Removal of existing bridge 103 (3) Cast in place pile, 1.2m Dia.								- ' /														
(4) Embankment (Lahar Material) m³ 104(1)a 105.00 2.1.3 268.08 187 43.17% 56.84% 83.96 108.41 192.37 (5) Base Concrete m³ 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, =30cm m³ 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 m³ 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 m³ 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 m² 504(0) 50.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (1) Steel plate girder 10n cw8.6.3&c 164,089.81 164,090 38.46% 61.54% 65638.17 102995.91 168,634.08 (2) Deck slab m² 50.00 404 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		()																				
(5) Base Concrete m³ 405(6) 2,798.00 405(6) 4,381.74 405(6) 2,170.59 2.1.103 3,221.02 3,143 67.25% 33.53% 2198.08 1075.05 3,273.13 (6) Wet Stone Masonry, t=30cm m³ 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 m³ 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 m³ 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 m² 610 53.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (Superstructure steel plate girder ton cw8.6.3& 164,089.81 164,090 38.46% 61.54% 65638.17 102995.91 168,634.08 (2) Deck slab m² 510 Concrete m³ 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 27,360.00 cw4.5 44,276.78 39,121 46.03% 53.97% 18726.06 21537.47 40,263.53 Removal of existing bridge		(-)						- ' /		/	154.19	103(2)	114.92			139.14						
(6) Wet Stone Masonry, t=30cm m³		()()						- ' /														
(7) Covering Borrow Soil, t=50cm m³		(-)						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%		2198.08		3,273.13
(8) Gravel Pavement, t=20cm m³ 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 m² 610 53.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (9) Sodding m² 610 53.00 2.1.8 35.12 cw2.6 73.61 54 57.78% 42.21% 32.45 23.25 55.70 (1) Steel plate girder ton 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.0		27						504(5)	1,993.00					2.1.7	1,845.97		1,919	65.82%		1313.51		1,982.84
Column C		(7) Covering Borrow Soil, t=50cm						104(1)c						2.1.3	268.08 cw6.2.3	695.02	404	51.51%	48.49%	216.42	199.82	416.24
Superstructure Supe		,						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
(1) Steel plate girder ton cw8.6.3& 164,090 38.46% 61.54% 65638.17 102995.91 168,634.08 (2) Deck slab m² cw10.4(10 8,578.25 8,578 62.25% 37.75% 5553.22 3303.13 8,856.35 Substructure cw10.1(10 Concrete m³ 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 1524.25 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			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
C2 Deck slab																						
Substructure																						
(1) Concrete m³ 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 m 400(16) 33,966.20 m 60.00 <td></td> <td></td> <td>m</td> <td></td> <td>cw10.4(10</td> <td>8,578.25</td> <td>8,578</td> <td>62.25%</td> <td>37.75%</td> <td>5553.22</td> <td>3303.13</td> <td>8,856.35</td>			m												cw10.4(10	8,578.25	8,578	62.25%	37.75%	5553.22	3303.13	8,856.35
(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			m ⁵					405(1)D	5 269 06	405(1)	1 705 56	405(1)	4 220 17		ow/2 7(1)	6 256 51	5 160	71.049/	28.060/	2012.20	1524.22	5 226 51
(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																						
Removal of existing bridge											51,070.00	707	27,500.00									
								()	,						5 1.0	.,	,		22.5.7.0	0.20.00		,
			m					S2-B	15,186								15,186	53.36%	46.64%	8427.7	7224.1	15,651.80
Note:																						

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. 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%

(2) Agno River Flood Control Project, Phase II

Package III : Social Development for Poponto Retarding Basin

Package IV : Hector Mendoza Bridge

Table 3.2.2 Salient Features of Contract Price Obtained from Three Projects

(Unit: Peso)

									(Ciiit. 1 c 50)
No.	Description	Time of	Total Contract	Foreign	Local	Amount of	Amount of	General Item	% of Total
110.	Description	Bidding	Price (P)	Portion	Portion	Part A (P)	Part B (P)	/Total A &	
(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 C	eneral Ite	m for Pina	atubo 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 I	tem for A	gno project			7.4%
		Ave	erage % of Gen				ct		8.0%
			<i>5</i> : : : : : : : : : : : : : : : : : : :			_I J			

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 3.2.3 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 3.3.1 Construction Cost of Bucao River Basin

 | | | | (Unit: Peso) |
 | | | | |
 | | Basin | | | | |
 | | | ı |
 | |
--	--	--	---
--	--	--	--
--	--	--	--
--	---	---	---
--	--	--	--
No. Description 1 Dike construction	Unit	Work Quantity	LC
 | Total | LC | Amount
FC | Total | 1. E
 | quipment | a. Skilled | 2. Labo
d labor | or
b. Unskil | led labor
 | a. C | ement | b. Ag | gregate | 3. Ma
c. | sterial
Steel | d. Lumber
 | e. C | thers | 4. 1 | VAT
 | 5. Overhead |
1.1 Left bank					
 | | | | |
 | | | | |
 | | | | | | |
 | | | |
 | |
| i) New dike
General Item | % | 10% | 0.00 | 7.05
 | 17.04 | 4,549,062 | 3,340,024 | 7,889,086 |
 | 1,950,477 | 0.1000 | 381,961 | 0.1000 | 409,389
 | | | 0.1000 | | 0.1000 | | 0.1000
 | 0.1000 | 3,591,697 | |
 | 1000 1,281, |
| Clearing & Grabbing Backfilling | m2
m3 | 100,500
6,300 | 9.08
36.51 | 7.97
32.53
 | 17.04
69.04 | 912,038
230,013 | 800,483
204,939 | | 0.6801
 | 1,053,371
295,811 | 0.0630
0.0175 | 107,889
7,612 | 0.0437 | 74,837
30,838
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.0835 | 0 | 0.0720
0.0768 | 33,404 0.
 | 1227 210,
1547 67, |
| Excavation Embankment (Lahar Material) | m3
m3 | 32,700
254,400 | 31.00
51.00 | 43.00
 | 94.00 | 1,013,700
12,974,400 | 773,682
10,939,200 | 1,787,382
23,913,600 |
 | 912,101
13,898,584 | 0.0754
0.0429 | 134,769
1,025,893 | 0.0332 | 59,341
868,064
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.1608 | 287,411 2,776,369 | 0.0619
0.0660 |
 | 1584 283,
1575 3,766, |
| Base Concrete Wet Stone Masonry | m3
m3 | 1,100
9,400 | 1,744.58
1,139.08 | 936.89
915.68
 | | 1,919,038
10,707,352 | 1,030,579
8,607,392 | 2,949,617
19,314,744 |
 | 38,640
50,218 | 0.0109
0.0841 | 32,151
1,624,370 | 0.1089
0.0664 | 321,213
1,282,499
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.6893 | 2,033,171
12,892,592 | |
 | 1645 485,
1641 3,169, |
| Covering Borrow Soil
Gabion Mattress | m3
m3 | 31,700
4,200 | 236.79
1,468.70 | 182.86
703.59
 | 419.65
2,172.29 | 7,506,243
6,168,540 | 5,796,662
2,955,078 | 13,302,905
9,123,618 |
 | 2,492,964
385,929 | 0.0015
0.0673 | 19,954
614,019 | 0.0085 | 113,075
883,166
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.6187 | 8,230,507
5,447,712 | |
 | 1642 2,184,
1759 1,604, |
| Filter Cloth
Gravel Pavement | m2
m3 | 13,900
2,900 | 70.22
445.91 | 38.23
307.34
 | 108.45
753.25 | 976,058
1,293,139 | 531,397
891,286 | 1,507,455
2,184,425 | 0.0080
 | 12,060
208,176 | 0.0418
0.0223 | 63,012
48,713 | 0.0688
0.0124 | 103,713
27,087
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.7028 | 1,059,439
1,511,622 | 0.0119 | 17,939 0.
 | 1667 251,
1650 360, |
| Sodding Sub total (1.1) | m2 | 46,800 | 38.25 | 18.58
 | 56.83 | 1,790,100
50,039,683 | 869,544
36,740,266 | 2,659,644
86,779,948 | 0.0590
 | 156,919
21,455,251 | 0.0531 | 141,227
4,201,569 | 0.1241 | 330,062
4,503,284
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.5772 | 1,535,147
39,508,662 | 0.0233 |
 | 1633 434,
14,098, |
| 1.2 Right bank | | | |
 | | 30,037,083 | 30,740,200 | 80,779,940 |
 | 21,433,231 | | 4,201,309 | | 4,303,264
 | | 0 | | | | | ,
 | | 39,308,002 | | 3,012,376
 | 14,076, |
| i) New dike
General Item | % | 10% | |
 | | 5,719,557 | 4,238,120 | 9,957,677 |
 | 2,609,155 | 0.1000 | 474,880 | 0.1000 | 505,182
 | 0.1000 | | 0.1000 | | 0.1000 | | 0.1000
 | 0.1000 | 4,395,516 | |
 | 1000 1,614, |
| Clearing & Grabbing Backfilling | m2
m3 | 126,600
7,000 | | 7.97
32.53
 | 17.04
69.04 | 1,148,895
255,570 | 1,008,369
227,710 | 2,157,264
483,280 | 0.6801
 | 1,326,933
328,679 | 0.0630
0.0175 | 135,908
8,457 | 0.0437
0.0709 | 94,272
34,265
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.0835 | 0 | 0.0720
0.0768 | 37,116 0.
 | 1227 264,
1547 74, |
| Excavation Embankment (Lahar Material) | m3
m3 | 36,900
351,700 | 31.00
51.00 | 23.66
43.00
 | | 1,143,900
17,936,700 | 873,054
15,123,100 | 2,016,954
33,059,800 |
 | 1,029,252
19,214,356 | 0.0754
0.0429 | 152,078
1,418,265 | 0.0332 | 66,963
1,200,071
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.1608 | 324,326
3,838,243 | 0.0619
0.0660 |
 | 1584 319,
1575 5,206, |
| Base Concrete Wet Stone Masonry | m3
m3 | 1,300 | | 936.89
915.68
 | 2681.47
2054.76 | 2,267,954
12,985,512 | 1,217,957
10,438,752 | 3,485,911
23,424,264 |
 | 45,665
60,903 | 0.0109
0.0841 | 37,996
1,969,981 | 0.1089 | 379,616
1,555,371
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.6893 | 2,402,838 | |
 | 1645 573,
1641 3,843, |
| Covering Borrow Soil Gabion Mattress | m3
m3 | 40,700
4,700 | 236.79
1468.70 | 182.86
703.59
 | 419.65
2172.29 | 9,637,353
6,902,890 | 7,442,402
3,306,873 | 17,079,755
10,209,763 |
 | 3,200,746
431,873 | 0.0015
0.0673 | 25,620
687,117 | 0.0085
0.0968 | 145,178
988,305
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.6187 | 10,567,244
6,096,249 | |
 | 1642 2,804,
1759 1,795, |
| Filter Cloth
Gravel Pavement | m2
m3 | 15,600
3,200 | 70.22
445.91 | 38.23
307.34
 | 108.45
753.25 | 1,095,432
1,426,912 | 596,388
983,488 | 1,691,820
2,410,400 | 0.0080
 | 13,535
229,711 | 0.0418
0.0223 | 70,718
53,752 | 0.0688
0.0124 | 116,397
29,889
 | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000
 | 0.7028 | 1,189,011 | 0.0119 | 20,133 0.
 | 1667 282,
1650 397. |
| Sodding Sub total (i) | m2 | 62,600 | 38.25 | 18.58
 | 56.83 | 2,394,450
62,915,125 | 1,163,108
46,619,321 | 3,557,558
109,534,446 | 0.0590
 | 209,896
28,700,703 | 0.0531 | 188,906
5,223,679 | 0.1241 | 441,493
5,557,001
 | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000
 | 0.5772 | 2,053,422
48,350,675 | 0.0233 |
 | 1633 580,
17,758, |
ii) Dike heightening	0/	100/	
 | | | | |
 | | 0.1000 | | 0.1000 |
 | 0.1000 | | | 0 | 0.1000 | 0 | 0.1000
 | 0.1000 | 17 012 548 | |
 | |
| General Item Demolition of Existing Revetment | m3 | 10%
28,300 | 743.32 | 637.16
 | | 23,794,707
21,035,956 | 18,108,299
18,031,628 | 41,903,007
39,067,584 | 0.5234
 | | 0.1000
0.0468 | 2,002,599
1,828,363 | 0.1000
0.0084 | 1,906,478
328,168
 | | 0 | 0.1000 | 0 | 0.1000
0.0000 | 0 | 0.1000 (
0.0000 (
 | 0.1000 | 7,965,880 | 0.0540 | 2,109,650 0.
 | 1000 6,784,
1635 6,387, |
| Clearing & Grabbing Backfilling | m2
m3 | 471,500
22,100 | 36.51 | 7.97
32.53
 | 17.04
69.04 | 4,278,863
806,871 | 3,755,498
718,913 | 8,034,360
1,525,784 | 0.6801
 | 4,941,935
1,037,686 | 0.0630
0.0175 | 506,165
26,701 | 0.0437
0.0709 | 351,102
108,178
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.0835 | 0 | 0.0720
0.0768 | 117,180 0.
 | 1227 985,
1547 236, |
| Excavation Embankment (Lahar Material) | m3
m3 | 156,400
1,189,200 | 31.00
62.33 | 23.66
52.56
 | 54.66
114.89 | 4,848,400
74,126,800 | 3,700,424
62,499,067 | 8,548,824
136,625,867 | 0.5812
 | 4,362,465
79,406,954 | 0.0754
0.0429 | 5,861,250 | 0.0332
0.0363 | 283,821
4,959,519
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.1608 | 1,374,651
15,862,263 | 0.0660 | 9,017,307 0.
 | 1584 1,354,
1575 21,518, |
| Base Concrete Wet Stone Masonry | m3
m3 | 3,900
44,300 | 1744.58
1139.08 | 936.89
915.68
 | 2681.47
2054.76 | 6,803,862
50,461,244 | 3,653,871
40,564,624 | 10,457,733
91,025,868 | 0.0026
 | 136,996
236,667 | 0.0109
0.0841 | 113,989
7,655,275 | 0.1089
0.0664 | 1,138,847
6,044,118
 | 0.0000 | | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.6893 | 7,208,515
60,759,767 | |
 | 1645 1,720,
1641 14,937, |
| Covering Borrow Soil
Gabion Mattress | m3
m3 | 154,600
14,800 | 236.79
1468.70 | 182.86
703.59
 | 419.65
2172.29 | 36,607,734
21,736,760 | 28,270,156
10,413,132 | 64,877,890
32,149,892 | 0.1874
 | 12,158,117
1,359,940 | 0.0015
0.0673 | 97,317
2,163,688 | 0.0085 | 551,462
3,112,110
 | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000
 | 0.6187 | 40,139,951
19,196,701 | 0.0197 | 1,278,094 0.
 | 1642 10,652,
1759 5,655, |
| Filter Cloth Gravel Pavement | m2
m3 | 49,200 | 70.22 | 38.23
307.34
 | 108.45
753.25 | 3,454,824
4,414,509 | 1,880,916
3,042,666 | 5,335,740
7,457,175 | 0.0080
 | 42,686
710,669 | 0.0418 | 223,034
166,295 | 0.0688 | 367,099
92,469
 | 0.0000 | 0 | 0.0000 | | 0.0000 | 0 | 0.0000
 | 0.7028 | 3,749,958
5,160,365 | 0.0119 | 63,495 0.
 | 1667 889,
1650 1,230, |
| Sodding Sub total (ii) | m2 | 245,000 | 38.25 | 18.58
 | 56.83 | 9,371,250
261,741,780 | 4,552,100
199,191,294 | 13,923,350 | 0.0590
 | 821,478
138,229,922 | 0.0531 | 739,330
22,028,587 | 0.1241 | 1,727,888
20,971,257
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.5772 | 8,036,558
187,138,025 | 0.0233 |
 | 1633 2,273,
74,625, |
iii Spur dike	9/	100/	
 | | | | 3 034 238 |
 | | 0 1000 | | 0 1000 |
 | 0.1000 | 0 | 0 1000 | 0 | 0.1000 | 0 | 0.1000
 | 0 1000 | 1 959 910 | |
 | 1000 499 |
| General Item Demolition of Existing Revetment | m3 | 10%
400 | | 637.16
 | 1380.48 | 1,910,688
297,328 | 1,123,550
254,864 | 552,192 | 0.5234
 | 144,167
289,017 | 0.0468 | 87,657
25,843 | 0.0084 | 290,902
4,638
 | 0.1000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.2039 | 112,592 | 0.0540 | 29,818 0.
 | 1635 90, |
| Clearing & Grabbing Backfilling | m2
m3 | 7,400
1,200 | 36.51 | 7.97
32.53
 | 17.04
69.04 | 67,155
43,812 | 58,941
39,036 | 82,848 | 0.6151
0.6801
 | 77,562
56,345 | 0.0630
0.0175 | 7,944
1,450 | 0.0437
0.0709 | 5,510
5,874
 | 0.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.0835 | 0 | 0.0720
0.0768 | 6,363 0.
 | 1227 15,
1547 12, |
| Excavation Embankment (Lahar Material) | m3
m3 | 7,600
8000 | 31.00
51.00 | 23.66
43.00
 | 54.66
94.00 | 235,600
408,000 | 179,816
344,000 | 752,000 | 0.5103
0.5812
 | 211,987
437,062 | 0.0754
0.0429 | 31,322
32,261 | 0.0332 | 13,792
27,298
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.1608 | | 0.0619
0.0660 |
 | 1584 65,
1575 118, |
| Base Concrete Wet Stone Masonry | m3
m3 | 8,000
2,400 | 1744.58
1139.08 | 936.89
915.68
 | 2681.47
2054.76 | 13,956,640
2,733,792 | 7,495,120
2,197,632 | 21,451,760
4,931,424 |
 | 281,018
12,822 | 0.0109
0.0841 | 233,824
414,733 | 0.1089
0.0664 | 2,336,097
327,447
 | 0.0000 | | 0.0000 | | 0.0000 | - | 0.0000
 | 0.6893 | 14,786,698
3,291,726 | | 285,308 0.
75,451 0.
 | 1645 3,528,
1641 809, |
| Covering Borrow Soil Gabion Mattress | m3
m3 | 800 | 236.79
1468.70 | 182.86
703.59
 | 419.65
2172.29 | 1,174,960 | 0
562,872 | 1,737,832 | 0.1874
 | 73.510 | 0.0015
0.0673 | 0
116,956 | 0.0085
0.0968 | 168,222
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.6187 | 1,037,659 | 0.0197 |
 | 1642
1759 305, |
| Filter Cloth
Gravel Pavement | m2
m3 | 2,700 | 70.22
445.91 | 38.23
307.34
 | 108.45 | 189,594 | 103,221 | 292,815 | 0.0080
 | 2,343 | 0.0418
0.0223 | 12,240 | 0.0688 | 20,146
 | | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.0000
 | 0.7028 | 205,790 | 0.0119 | 3,484 0.
 | 1667 48,
1650 |
| Sodding Sub total (iii) | m2 | 0 | 38.25 | 18.58
 | 56.83 | 21,017,569 | 12.359.052 | | 0.0590
 | 1,585,832 | 0.0531 | 964,230 | 0.1241 | 3,199,925
 | 0.0000 | | 0.0000 | 0 | 0.0000 | | 0.0000
 | 0.5772 | | 0.0233 |
 | 1633 |
Sub total (III)			
 | | | | |
 | | | 704,230 | |
 | | | | U | | U | ,
 | ' I | | |
 | |
| T (1 (1) | | | |
 | | 345,674,474 | 258,169,667 | 603,844,141 |
 | 168,516,457 | | 28,216,495 | | 29,728,184
 | | 0 | | 0 | | 0 |
 | | 257,047,711 | | 22,456,050
 | 97,879, |
| Total (1) Diversion channel of swampy area | | | |
 | | 345,674,474
395,714,156 | 258,169,667
294,909,933 | 603,844,141
690,624,089 |
 | 168,516,457
189,971,708 | | 28,216,495
32,418,064 | | 29,728,184
34,231,468
 | | 0 | | 0 | | 0 |
 | | 257,047,711
296,556,374 | | 25,468,628
 | 97,879,
111,977, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item | % | 10% | |
 | | 395,714,156
2,022,708 | 294,909,933
1,558,428 | 3,581,136 | 0.1000
 | 189,971,708
413,111 | 0.1000 | 32,418,064
156,281 | 0.1000 | 146,383
 | 0.1000 | | 0.1000 | 0 | 0.1000 | | 0.1000
 | 0.1000 | 2,208,713 | 0.1000 | 25,468,628
71,433 0.
 | 111,977, |
| 2 Diversion channel of swampy area 2.1 Open channel | % m² m³ | 10%
25,700
0 | 9.08 | 7.97
32.53
 | 17.04
69.04 | 395,714,156 | 294,909,933 | 3,581,136
437,928 |
 | 189,971,708 | 0.1000
0.0630
0.0175 | 32,418,064 | | 34,231,468
 | 0.1000
0.0000
0.0000 | 0 | 0.1000
0.0000
0.0000 | 0 0 0 | 0.1000
0.0000
0.0000 | 0 | 0.1000 (0
0.0000 (0
0.0000 (0
 | | 2,208,713
36,567 | | 25,468,628
71,433 0.
31,531 0.
 | 111,977, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation | m ³ | 25,700
0
21,400 | 36.51
31.00 | 32.53
23.66
 | 69.04
54.66 | 2,022,708
233,228
0
663,400 | 294,909,933
1,558,428
204,701
0
506,324 | 3,581,136
437,928
0
1,169,724 | 0.1000
0.6151
0.6801
0.5103
 | 413,111
269,370
0
596,910 | 0.0630
0.0175
0.0754 | 32,418,064
156,281
27,589
0
88,197 | 0.1000
0.0437
0.0709
0.0332 | 146,383
19,137
0
38,835
 | 0.0000
0.0000
0.0000 | 0 0 | 0.0000
0.0000
0.0000 | 0 0 0 0 0 0 | 0.0000
0.0000
0.0000 | 0 | 0.0000 (0
0.0000 (0
0.0000 (0
 | 0 0.1000
0 0.0835
0 0.0000
0 0.1608 | 2,208,713
36,567
0
188,092 | 0.1000
0.0720
0.0768
0.0619 | 71,433 0.
31,531 0.
0 0.
72,406 0.
 | 111,977,
1000 585,
1227 53,
1547
1584 185, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling | m ³ | 25,700
0 | 36.51 | 32.53
 | 69.04 | 2,022,708
233,228
0 | 1,558,428
204,701
0 | 3,581,136
437,928 | 0.1000
0.6151
0.6801
0.5103
0.1874
 | 189,971,708
413,111
269,370
0 | 0.0630
0.0175 | 32,418,064
156,281
27,589
0 | 0.1000
0.0437
0.0709 | 34,231,468
146,383
19,137
0
 | 0.0000 | 0
0
0 | 0.0000 | 0
0
0
0
0
0
0 | 0.0000 | 0 0 0 0 | 0.0000 (
0.0000 (
 | 0 0.1000
0 0.0835
0 0.0000 | 2,208,713
36,567 | 0.1000
0.0720
0.0768
0.0619
0.0197 | 71,433 0.
31,531 0.
0 0.
72,406 0.
328,204 0.
 | 111,977,
1000 585,
1227 53,
1547 |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) | m ³
m ³
m ³ | 25,700
0
21,400
39,700 | 36.51
31.00
236.79 | 32.53
23.66
182.86
 | 69.04
54.66
419.65 | 2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,158,975 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974 | 3,581,136
437,928
0
1,169,724
16,660,105 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595 | 0.0630
0.0175
0.0754
0.0015 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435 | 0.1000
0.0437
0.0709
0.0332
0.0085 | 146,383
19,137
0
38,835
141,611
1,050,558
213,694
 | 0.0000
0.0000
0.0000
0.0000 | 0
0
0
0 | 0.0000
0.0000
0.0000
0.0000 | 0
0
0
0
0
0
0
0 | 0.0000
0.0000
0.0000
0.0000 | 0
0
0
0 | 0.0000 (0
0.0000 (0
0.0000 (0
 | 0 0.1000
0 0.0835
0 0.0000
0 0.1608
0 0.6187 | 2,208,713
36,567
0
188,092
10,307,607
10,560,953
993,909 | 0.1000
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233 | 71,433 0.
31,531 0.
72,406 0.
328,204 0.
242,071 0.
40,121 0.
 | 111,977,
1000 585,
1227 53,
1547
1584 185,
1642 2,735,
1641 2,596,
1633 281, |
| 2 Diversion channel of swampy area | m ³ m ³ m ³ m ³ m ³ m ² | 25,700
0
21,400
39,700
7,700
30,300 | 36.51
31.00
236.79
1139.08 | 32.53
23.66
182.86
915.68 |
69.04
54.66
419.65
2054.76 | 2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,158,975
22,249,790 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704 | 3,581,136
437,928
0
1,169,724
16,660,105
15,821,652
1,721,949
39,392,494 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595
4,544,226 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435
1,719,095 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241 | 34,231,468
146,383
19,137
0
38,835
141,611
1,050,558
213,694
1,610,218
 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000 | 0
0
0
0
0 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000 | 0
0
0
0
0 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000 | 0
0
0
0
0
0 | 0.0000 (0.0000
(0.0000 (0.00000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.000 | 0.1000
0.0835
0.0000
0.1608
0.6187
0.6675
0.5772 | 2,208,713
36,567
0
188,092
10,307,607
10,560,953
993,909
24,295,840 | 0.1000
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233 | 71,433 0. 31,531 0. 0 0. 72,406 0. 328,204 0. 242,071 0. 40,121 785,767
 | 111,977,
1000 585,
1227 53,
1547 1584 185,
1642 2,735,
1641 2,596,
1633 281,
6,437, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Exeavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing | m ³ m ³ m ³ m ³ m ² m ² 9% m ² | 25,700
0
21,400
39,700
7,700
30,300
10%
3,400 | 36.51
31.00
236.79
1139.08
38.25 | 32.53
23.66
182.86
915.68
18.58 |
69.04
54.66
419.65
2054.76
56.83 | 2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,158,975
22,249,790
474,814
30,855 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
369,086
27,081 | 3,581,136
437,928
0
1,169,724
16,660,105
15,821,652
1,721,949
39,392,494
843,899
57,936 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595
4,544,226
110,361
35,636 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435
1,719,095
25,710
3,650 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241
0.1000
0.0437 | 34,231,468
146,383
19,137
0
38,835
141,611
1,050,558
213,694
1,610,218
67,002
2,532
 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000 | 0
0
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0
5,083 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000 | 0
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0 | 0.0000
0.0000
0.0000
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0.0000 | 0
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0
171,322 | 0.0000 (0.0000
(0.0000 (0.00000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.000 | 0.1000
0.0835
0.0000
0.1608
0.6187
0.06675
0.5772 | 2,208,713
36,567
0
188,092
10,307,607
10,560,953
993,909
24,295,840
302,308
4,838 | 0.1000
0.0720
0.0768
0.0619
0.0153
0.0233
0.1000
0.0720 | 25,468,628 71,433 0, 31,531 0, 0 0, 72,406 0, 328,204 0, 242,071 0, 40,121 0, 785,767 20,300 0, 4,171 0,
 | 111,977, 1000 585, 1227 53, 1547 1584 185, 1642 2,735, 1641 2,596, 1633 281, 6,437, 1000 139, 1227 7, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfiling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item | m ³ m ³ m ³ m ³ m ² m ² % m ² m ³ | 25,700
0
21,400
39,700
7,700
30,300 | 36.51
31.00
236.79
1139.08
38.25 | 32.53
23.66
182.86
915.68
18.58 |
69.04
54.66
419.65
2054.76
56.83 | 2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,158,975
22,249,790 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
369,086 | 3,581,136
437,928
1,169,724
16,660,105
15,821,652
1,721,949
39,392,494
843,899
57,936
683,496 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.1000
0.6151
0.6801
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595
4,544,226 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630
0.0175 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435
1,719,095 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241 | 34,231,468
146,383
19,137
0
38,835
141,611
1,050,558
213,694
1,610,218
67,002
 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000
0.0000 | 0
0
0
0
0
0
0
0
0
0
0
0
0 | 0.0000
0.0000
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0.0000
0.0000
0.1000 | 0
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0
171,322 | 0.0000 (0.0000
(0.0000 (0.00000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.000 | 0.1000
0.0835
0.0000
0.1608
0.6187
0.0675
0.5772 | 296,556,374 2,208,713 36,567 0 188,092 10,307,607 10,560,953 993,909 24,295,840 302,308 4,838 | 0.1000
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233 | 25,468,628 71,433 0. 31,531 0. 0 0. 72,406 0. 328,204 0. 40,121 0. 785,767 20,300 0. 4,171 0. 52,492 0.
 | 111,977, 1000 585, 1227 53, 1547 1584 185, 1642 2,735, 1641 2,596, 1633 281, 6,437, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation | m3 m3 m3 m3 m2 m2 m3 | 25,700
0
21,400
39,700
7,700
30,300
10%
3,400
9,900 | 36.51
31.00
236.79
1139.08
38.25
9.08
36.51
31.00
236.79 | 32.53
23.66
182.86
915.68
18.58
7.97
32.53
23.66
182.86
 | 69.04
54.66
419.65
2054.76
56.83
17.04
69.04
54.66
419.65 | 2,022,708
233,228
0 663,400
9,400,563
8,770,916
1,158,975
22,249,790
474,814
30,855
361,449 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
369,086
27,081
322,047 | 3,581,136
437,928
0
1,169,724
16,660,105
15,821,652
1,721,949
39,392,494
843,899
57,936
683,496
721,512 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.1000
0.6151
0.6801
0.5103
0.1874
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595
4,544,226
110,361
35,636
464,846 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630
0.0175
0.0754 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435
1,719,095
25,710
3,650
11,961 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241
0.1000
0.0437
0.0709
0.0332
0.0085 | 34,231,468
146,383
19,137
0
38,835
141,611
1,050,558
213,694
1,610,218
67,002
2,532
48,460
 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000
0.0000
0.0000
0.0000 | 0
0
0
0
0
0
0
0
5,083
0
0
0 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000
0.0000
0.0000
0.0000 | 0
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0 | 0.0000
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0.0000
0.0000
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0.0000
0.1000
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0.0000
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0.0000 | 0
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171,322
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(0.0000 (0.00000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.000 | 0.1000
0.0835
0.0000
0.6187
0.6675
0.5772
0.1000
0.0835
0.0835
0.0000
0.1608 | 296,556,374 2,208,713 36,567 0 18,8092 10,307,607 10,560,953 993,909 24,295,840 302,308 4,838 0 116,019 0 | 0.1000
0.0720
0.0768
0.0619
0.0153
0.0233
0.1000
0.0720
0.0768
0.0619
0.0797 | 25,468,628 71,433
 | 111,977, 1000 \$85, 1227 \$53, 1547 1584 \$185, 1642 \$2,735, 1641 \$2,596, 1633 \$281, 6,437, 1000 \$139, 1227 7, 1547 \$105, 1584 \$114, 1642 |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation | m ³ m ³ m ³ m ³ m ² m ² m ² m ³ | 25,700
0
21,400
39,700
7,700
30,300
10%
3,400
9,900 | 36.51
31.00
236.79
1139.08
38.25
9.08
36.51
31.00 | 32.53
23.66
182.86
915.68
18.58
7.97
32.53
23.66 | 69.04
54.66
419.65
2054.76
56.83
17.04
69.04
54.66
 | 2,022,708
233,228
0 663,400
9,400,563
8,770,916
1,158,975
22,249,790
474,814
30,855
361,449 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
369,086
27,081
322,047 | 3,581,136
437,928
0,28
1,169,724
16,660,105
15,821,652
17,221,940
843,899
57,936
683,496
721,512 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.1000
0.6151
0.6801
0.5103
 | 189,971,708
413,111
269,370
0
596,910
3,122,104
41,136
101,595
4,544,226
110,361
35,636
464,846 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630
0.0175
0.0754 | 32,418,064
156,281
27,589
0
88,197
24,990
1,330,601
91,435
1,719,095
25,710
3,650
11,961 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241
0.1000
0.0437
0.0709
0.0332 | 34,231,468
146,383
19,137
0
38,835
141,611
1,050,558
213,694
1,610,218
67,002
2,532
48,460
 | 0.0000
0.0000
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0.0000
0.0000
0.0000 | 0
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5,083
0
0
0 | 0.0000
0.0000
0.0000
0.0000
0.0000
0.0000
0.1000
0.0000
0.0000
0.0000 | 0
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171,322
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(0.0000 (0.00000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.0000 (0.000 | 0.1000
0.0835
0.0000
0.1608
0.6187
0.6675
0.5772
0.1000
0.0835
0.0000
0.1608 | 2208,713 36,567 0 188,092 10,307,607 10,560,953 903,909 24,295,840 302,308 4,838 0 116,019 | 0.1000
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233
0.1000
0.0720
0.0768
0.0619 | 25,468,628 71,433 |
111,977, 1000 585, 1227 53, 1547 1584 185, 1642 2,735, 1643 2,816 6,437, 1000 139, 1227 7, 1584 114, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfiling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfiling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete | m3 m3 m3 m2 m3 | 25,700
0 21,400
39,700
30,300
10%
3,400
9,900
13,200
0 0 | 36.51
31.00
236.79
1139.08
38.25
9.08
36.51
31.00
236.79
1139.08
38.25 | 32.53
23.66
182.86
915.68
18.58
7.97
32.53
23.66
182.86
915.68
930.46
 | 69.04
54.66
419.65
2054.76
56.83
17.04
69.04
54.66
419.65
2054.76
56.83
2596.00 | 395,714,156
2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,158,975
22,249,790
474,814
30,855
361,449
409,200
0
0
166,554 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
17,142,704
369,086
27,081
322,047
312,312
0
0
0
93,046 | 690,624,0899 3,581,136 437,928 0 1,169,724 1,6660,105 15,821,652 1,721,949 57,936 683,496 0 0 0 259,600 259,600 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0026
0.0020
0.0020
0.0020
 | 189,971,708 413,111 269,370 0 596,910 3,122,104 41,136 101,595 4,544,226 464,846 368,188 0 0 0 2,284 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.0193 | 32,418,064 156,281 27,589 0 88,197 24,990 1,330,601 91,435 1,719,095 1,719,095 11,961 54,002 0 0 5,010 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241
0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241 | 34,231,468 146,383 19,137 0 38,835 1411,611 1,050,558 213,694 1,610,218 67,002 2,532 48,460 0 0 0 38,005
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(0.0000) (0.000) (0.000) (0.000) (0.000) | 0.1000
0.0835
0.0000
0.1608
0.6187
0.5772
0.5772
0.0000
0.0835
0.0187
0.6675
0.5732
0.0000
0.0187
0.6675 | 296,556,374 2,208,713 36,577 07 188,092 10,307,607 10,560,953 993,090 24,295,840 302,308 4,838 0 116,019 0 0 96,364 | 0.1000
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233
0.1000
0.0720
0.0720
0.0768
0.0619
0.0197
0.0153 | 25,468,628 71,433
 | 111,977, 1000 585, 1227 53, 1547 1584 185, 1642 2,735, 1641 2,596, 1633 281, 1640 139, 1227 7, 1547 105, 1584 114, 1642 1641 1643 1671 43, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar | m3 m3 m3 m2 m3 m3 m3 m3 m3 m3 m3 m2 m3 m3 m3 m3 m3 m2 m3 | 25,700
0 21,400
39,700
7,700
30,300
10%
3,400
9,900
0 0 | 36.51
31.00
236.79
1139.08
38.25
9.08
36.51
31.00
236.79
1139.08
38.25 | 32.53
23.66
182.86
915.68
18.58
7.97
32.53
23.66
182.86
915.68
 | 69.04
54.66
419.65
2054.76
56.83
17.04
69.04
54.66
419.65
2054.76
56.83 | 395,714,156
2,022,708
233,228
0
663,400
9,400,563
8,770,916
1,188,975
22,249,790
474,814
30,855
361,449
409,200
0
0
0
166,554
2,521,788 | 294,909,933
1,558,428
204,701
0
506,324
7,259,542
7,050,736
562,974
17,142,704
369,086
27,081
322,047
312,312
0
0
0
93,046
1,529,412
1,406,942 | 690,624,0899 3,581,136 437,928 0 1,169,724 1,6660,105 15,821,652 1,721,949 39,392,493 683,496 67,936 683,496 0 0 0 259,600 4,051,200 | 0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.1000
0.6151
0.6801
0.5103
0.1874
0.0026
0.0590
0.0026
0.0026
0.0026
 | 189,971,708 413,111 269,370 0 596,910 3,122,104 41,136 101,595 4,544,246 368,188 368,188 0 0 0 2,284 180,684 | 0.0630
0.0175
0.0754
0.0015
0.0841
0.0531
0.1000
0.0630
0.0175
0.0754
0.0015
0.0841
0.0531 | 32,418,064 156,281 27,589 0 88,197 24,990 1,330,601 91,435 1,719,095 1,719,095 1,719,095 0 0 0 5,010 84,265 97,815 | 0.1000
0.0437
0.0709
0.0332
0.0085
0.0664
0.1241
0.1000
0.0437
0.0709
0.0332
0.0085 | 34,231,468 146,383 19,137 0 38,835 141,611 1,050,558 213,694 1,610,218 67,002 2,532 48,460 0 0 0 38,005 245,503 311,567
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0.0000 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0.0000 (0.0000) (0.00000)
(0.00000) | 0.1000
0.0835
0.0000
0.1608
0.6187
0.6675
0.5772
0.1000
0.0835
0.0000
0.1608
0.6675
0.6675 | 296,556,374 2,208,713 36,567 0 188,092 10,307,607 10,500,933 993,909 24,295,840 302,308 0 116,019 0 0 0 0 0 4,838 0 0 0 0 0 0 4,838 0 0 0 0 0 0 0 4,838 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0.1000
0.0720
0.0720
0.0768
0.0619
0.0197
0.0153
0.0233
0.1000
0.0720
0.0768
0.0619
0.0153
0.0233
0.0174
0.0126
0.01726 | 25,468,628 71,433
 | 111,977, 1000 585, 1227 53, 1547 1584 185, 1642 2,735, 1641 2,596, 1633 281, 6,437, 1000 139, 1227 7, 1547 105, 1584 114, 1642 1641 1633 1671 43, 1688 683, |
| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) | m3 m3 m3 m3 m3 m3 m2 9% m2 m3 | 25,700
0 21,400
39,700
30,300
10%
3,400
9,900
13,200
0 0 | 36.51
31.00
236.79
1139.08
38.25
9.08
36.51
31.00
236.79
1139.08
38.25 | 32.53
23.66
182.86
915.68
18.58
7.97
32.53
23.66
182.86
915.68
915.68
930.46
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| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Utering & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2.) Maintenance road to Bucao bridge General Item | m³ m³ m³ m³ m² m² m³ | 25,700
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| 2 Diversion channel of swampy area 2.1 Open channel Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Uclearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2.) 3 Maintenance road to Bucao bridge | m3 m3 m3 m3 m3 m3 m2 9% m2 m3 | 25,700
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| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling & Grabbing Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) Maintenance road to Bucao bridge General Item Clearing & Grabbing | m³ m³ m³ m³ m² m² m² m² m² m³ m³ m³ m³ m³ m³ m² m³ | 25,700
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| 2 Diversion channel of swampy area 2.1 Open channel Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Underside Southers Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) Maintenance road to Bucao bridge General Item Clearing & Grabbing | m3
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| 2 Diversion channel of swampy area 2.1 Open channel Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) Total (2) Maintenance road to Bucao bridge General Item Clearing & Grabbing Backfilling Excavation Embankment (Lahar Material) Base Concrete Wet Stone Masonry Covering Borrow Soil Gravel Pavement Sodding | m3 m3 m3 m3 m3 m4 m5 m5 m6 m6 m7 m7 m7 m7 m7 m7 | 25,700
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| 2 Diversion channel of swampy area 2.1 Open channel General Item Clearing & Grabbing Backfiling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Backfilling Excavation Uctaring & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) 3 Maintenance road to Bucao bridge General Item Clearing & Grabbing Backfilling Excavation Clearing & Grabbing Backfilling Excavation Clearing & Grabbing Backfilling Excavation Clearing & Grabbing General Item Covering Borrow Soil Grave Pavement Sodding Total (3) 4 Bucao bridge replacement 4.1 General Item | m³ m | 25,700
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| 2 Diversion channel of swampy area 2.1 Open channel Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sub total (2.1) 2.2 Box culvert General Item Clearing & Grabbing Backfilling Excavation Backfilling Excavation General Item Clearing & Grabbing Backfilling Excavation Embankment (Borrow Soil) Wet Stone Masonry Sodding Leveling Concrete Concrete Reinforcing steel bar Sub total (2.2) Total (2) 3 Maintenance road to Bucao bridge General Item Clearing & Grabbing Backfilling Excavation Embankment (Lahar Material) Base Concrete Wet Stone Masonry Covering Borrow Soil Gravel Pavement Sodding Total (3) 4 Bucao bridge replacement 4.1 General Item 4.2 Superstructure Steel plate girder Dock slab | m3 m3 m3 m3 m3 m3 m4 m5 m5 m5 m5 m5 m5 m5 | 25,700
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Note: Item 2 (Diversion channel of swampy area) is not included in the priority project.

Table 3.3.2 Construction Cost of Sto. Tomas River Basin

No. Description	Unit	Work Quantity	LC	Unit Pri	ce Total	LC	Amount FC	(Unit: Peso)	1.	Equipment	a. S	2. Li killed labor		Unskilled labor	a. (Cement b. Aggreg	gate	3. Material c. Steel d. Lumber	e. Others	4. VAT	5	Overhead
1 Dike construction 1.1 Left bank		Q																			=	
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			8,102,188	6,945,044	15,047,232	0.5234	7875721.229	0.047	704210.4576	0.008	126396.7488	0.1	0 0	0	0 0 0 0	0.2 3009446.4 0.0	812550.528	0.164	2460222.432
Clearing & Grabbing Backfilling	m2 m3	612,100 8,300	9.08 36.51	32.5	3 69.04	5,554,808 303,033	4,875,377 269,999	10,430,184 573,032	0.6151 0.6801	6415606.178 389719.0632	0.063 0.018	657101.592 10028.06		40627.9688	0	0 0	0	0 0 0 0	08 870920.364 0.0 0 0 0.0		0.123 0.155	1279783.577 88648.0504
Excavation Embankment (Lahar Material)	m3 m3	403,400 569,100	31.00 56.21			12,505,400 31,989,111	9,544,444 27,254,199	22,049,844 59,243,310	0.5103 0.5812	11252035.39 34432211.77	0.075 0.043	1662558.238 2541537.999	0.033		0	0 0	0		16 3545614.915 0.0 12 6878148.291 0.0		0.158 0.158	3492695.29 9330821.325
Base Concrete Wet Stone Masonry	m3 m3	1,500 8,200	1,744.58			2,616,870 9,340,456	1,405,335 7,508,576	4,022,205 16.849.032	0.0131	52690.8855 43807.4832	0.011	43842.0345 1417003.591	0.109		0	0 0	0	0 0 0 0 0	69 2772505.907 0.0 67 11246728.86 0.0		0.165	661652.722: 2764926.15
Covering Borrow Soil Gabion Mattress	m3 m3	283,800	236.79	182.8	6 419.65	67,201,002 8,224,720	51,895,668 3,940,104	119,096,670 12,164,824	0.1874	22318715.96 514572.0552	0.002	178645.005 818692.6552	0.009	1012321.695	0	0 0	0	0 0 0 0 0	62 73685109.73 0.0 0.6 7263616.41 0.0	2 2346204.399	0.164	19555673.2 2139792.54
Filter Cloth	m2	18,500	70.22	38.2	3 108.45	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 0.0	23875.2675	0.167	334454.377
Gravel Pavement Sodding	m3 m2	14,300 496,600	445.91 38.25			6,376,513 18,994,950	4,394,962 9,226,828	10,771,475 28,221,778	0.0953	1026521.568 1665084.902	0.022	240203.8925 1498576.412	0.012		0	0 0	0		69 7453860.7 0.0 58 16289610.26 0.0		0.165	1777293.37 4608616.34
Sub total (i) ii) Dike heightening						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		53,344,03
General Item Demolition of Existing Revetment	% m3	10% 37,200	743.32	637.1	6 1,380.48	21,350,638 27,651,504	15,724,113 23,702,352	37,074,751 51,353,856	0.1 0.5234	8600273.709 26878608.23	0.1 0.047	1,777,528.83 2403360.461	0.1	1,730,750.03 431372.3904	0.1	0.00 0.1	0.00		0.1 17,367,450.50 0. 0.2 10270771.2 0.0	1 1,220,144.45 5 2773108.224	0.1	6,054,079.8 8396355.45
Clearing & Grabbing	m2	414,500	9.08	7.9	7 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		08 589767.18 0.0	508541.76	0.123	866639.91
Backfilling Excavation	m3 m3	26,700 316,700	36.51 31.00			974,817 9,817,700	868,551 7,493,122	1,843,368 17,310,822	0.6801 0.5103	1253674.577 8833712.467	0.018 0.075	32258.94 1305235.979	0.071		0	0 0	0	0 0 0 0	0 0.0 16 2783580.178 0.0		0.155 0.158	285169.029 2742034.20
Embankment (Lahar Material) Base Concrete	m3 m3	498,800 4,700	56.21 1,744.58			28,037,548 8,199,526	23,887,532 4,403,383	51,925,080 12,602,909	0.5812	30178856.5 165098.1079	0.043	2227585.932 137371.7081	0.036		0	0 0	0	0 0 0 0 0	12 6028501.788 0.0 69 8687185.174 0.0		0.158	8178200 2073178.53
Wet Stone Masonry	m3 m3	41,500 173,800	1,139.08	915.6	8 2,054.76	47,271,820 41,154,102	38,000,720 31,781,068	85,272,540 72,935,170	0.0026	221708.604 13668050.86	0.084	7171420.614 109402.755	0.066	5662096.656	0	0 0	0	0 0 0 0 0	67 56919420.45 0.0	1304669.862	0.164	13993223.8 11975954.9
Covering Borrow Soil Gabion Mattress	m3	17,900	1,468.70	703.5	9 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 0.0	801010.2146	0.176	6839694.01
Filter Cloth Gravel Pavement	m2 m3	59,400 11,900	70.22 445.91			4,171,068 5,306,329	2,270,862 3,657,346	6,441,930 8,963,675	0.008	51535.44 854238.2275	0.042	269272.674 199889.9525	0.069		0	0 0	0	0 0 0 0	0.7 4527388.404 0.0 69 6202863.1 0.0		0.167	1073869.73 1479006.33
Sodding Sub total (ii)	m2	284,200	38.25	18.5	56.83	10,870,650 234,857,020	5,280,436 172,965,238	16,151,086 407,822,258	0.059 3.3178	952914.074 89047690.41	0.053 0.527	857622.6666 17775288.32	0.124		0	0 0	0	0 0 0 0 0	58 9322406.839 0.0 11 173674505 0.4		0.163 1.921	2637472.34 60540798. 4
Sub total (1.1)						424,615,952		738,345,760		183650701.2	0.527	28617179.07			0	0 0	0	0 0 0 0 5			1.921	113884835
1.2 Right bank i) New dike																					\Rightarrow	
General Item Demolition of Existing Revetment	% m3	10%	743.32	2 637.1	6 1,380.48	2,852,774 0	1,996,621 0	4,849,395 0	0.1 0.5234	8600273.709 0	0.1 0.047	240,972.02 0	0.1	274,289.06 0	0.1	0.00 0.1	0.00	011 0100 011 0100	0.1 2,474,257.01 0. 0.2 0 0.0	1 143,510.60	0.1 0.164	794,890.
Clearing & Grabbing Backfilling	m2 m3	61,200 5,800	9.08	7.9	7 17.04	555,390 211,758	487,458 188,674	1,042,848 400,432		641455.8048 272333.8032	0.063	65699.424 7007.56	0.044		0	0 0	0		08 87077.808 0.0 0 0 0 0	75085.056	0.123	127957.44 61946.83
Excavation	m3	49,300	31.00	23.6	6 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		16 433313.8704 0.0	166804.2822	0.158	426846.49
Embankment (Lahar Material) Base Concrete	m3 m3	77,100 1,100	56.21 1,744.58			4,333,791 1,919,038	3,692,319 1,030,579	8,026,110 2,949,617	0.5812 0.0131	4664775.132 38639.9827	0.043	344320.119 32150.8253	0.036		0	0 0	0		12 931831.371 0.0 69 2033170.998 0.0	7 529723.26 1 39229.9061	0.158 0.165	1264112.3 485211.99
Wet Stone Masonry Covering Borrow Soil	m3 m3	5,800 19,800			-,00	6,606,664 4,688,442	5,310,944 3,620,628	11,917,608 8,309,070	0.0026 0.1874	30985.7808 1557119.718	0.084	1002270.833 12463.605	0.066		0	0 0	0	0 0 0 0 0	67 7955003.34 0.0 62 5140821.609 0.0		0.164	1955679.4 1364349.2
Gabion Mattress	m3	3,900	1,468.70	703.5	9 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 0.0	174521.7786	0.176	1490212.6
Filter Cloth Gravel Pavement	m2 m3	12,900 2,600	70.22 445.91	307.3	4 753.25	905,838 1,159,366	493,167 799,084	1,399,005 1,958,450	0.008	11192.04 186640.285	0.042	58478.409 43673.435			0	0 0	0	0 0 0 0 0	0.7 983220.714 0.0 69 1355247.4 0.0	25459.85	0.167	233214.13 323144.
Sodding Sub total (i)	m2	23,300	38.25	18.5	56.83	891,225 31,380,516	432,914 21,962,827	1,324,139 53,343,343	0.059	78124.201 9214754.23	0.053	70311.7809 2409720.193		164325.6499 2742890.633	0	0 0	0	0 0 0 0 0	58 764293.0308 0.0 24742570.14	2 30852.4387 1435105.99	0.163	216231.89 7948906.8
ii) Dike strengthening	0/	10%				6,135,812	53,343,343 4,444,726	10.580.537	0.1	2,299,847.03	0.1	523,035.50			0.1	0.00 0.1	0.00	0.1 0.00 0.1 0.00		1 323,491.18	0.1	1,737,837.
General Item Demolition of Existing Revetment	m3	15,200	743.32			11,298,464	9,684,832	20,983,296	0.5234	10982657.13	0.1 0.047	982018.2528	0.1	176259.6864	0.1	0.00 0.1	0.00	0 0 0 0	0.2 4196659.2 0.0	1133097.984	0.164	3430768.8
Clearing & Grabbing Backfilling	m2 m3	100,600 9,200	9.08			912,945 335,892	801,279 299,276	1,714,224 635,168	0.6151	1054419.182 431977.7568	0.063	107996.112 11115.44	0.044		0	0 0	0	0 0 0 0 0	08 143137.704 0.0 0 0 0.0	7 123424.128 8 48780.9024	0.123	210335.284 98260.489
Excavation Embankment (Lahar Material)	m3 m3	123,000 35,800	31.00 56.21			3,813,000 2,012,318	2,910,180 1,714,462	6,723,180 3,726,780	0.5103 0.5812	3430838.754 2166004.536	0.075	506927.772 159878.862	0.033		0	0 0	0		16 1081087.344 0.0 12 432679.158 0.0	5 416164.842 7 245967.48	0.158 0.158	1064951.7 586967.3
Base Concrete	m3	1,700	1,744.58	936.8	9 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 0.0	60628.0367	0.165	749873.085
Wet Stone Masonry Covering Borrow Soil	m3 m3	12,200 47,000				13,896,776 11,129,130	11,171,296 8,594,420	25,068,072 19,723,550	0.0026 0.1874	65176.9872 3696193.27	0.084	2108224.855 29585.325	0.066		0	0 0	0	0 0 0 0 0 0 0 0 0 0	67 16732938.06 0.0 62 12202960.39 0.0	388553.935	0.164	4113670.61 3238606.9
Gabion Mattress Filter Cloth	m3 m2	6,200 20,500	1,468.70 70.22			9,105,940 1,439,510	4,362,258 783,715	13,468,198 2,223,225	0.0423	569704.7754 17785.8	0.067	906409.7254 92930.805	0.097		0	0 0	0		0.6 8041861.026 0.0 0.7 1562482.53 0.0		0.176	2369056.02 370611.60°
Gravel Pavement	m3 m2	4,100 68,500	445.91 38.25	307.3	4 753.25	1,828,231 2,620,125	1,260,094 1,272,730	3,088,325 3,892,855	0.0953	294317.3725 229678.445	0.022	68869.6475 206710.6005	0.012	38295.23	0	0 0	0	0 0 0 0 0	69 2137120.9 0.0 58 2246955.906 0.0	40148.225	0.165	509573.63 635703.22
Sodding Sub total (ii)	1112	08,300	36.23	10.3	30.63	67,493,929	48,891,981	116,385,909	0.039	183,958,504	0.033	28,894,201	0.124	30,083,535	Ü	0	0	0 0 0	324,553,922	23,996,237	0.103	114,736,7
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.
Demolition of Existing Revetment Clearing & Grabbing	m3 m2	16,300 236,900	743.32 9.08		6 1,380.48 7 17.04	12,116,116 2 149 868	10,385,708	22,501,824 4,036,776	0.5234	11777454.68 2483020.918	0.047	1053085.363 254316.888	0.008		0	0 0	0	0 0 0 0	0.2 4500364.8 0.0 08 337070 796 0.0	5 1215098.496 7 290647.872	0.164	3679048.2 495312.41
Backfilling Excavation	m3 m3	12,800	36.51 31.00			467,328 4,088,900	416,384 3,120,754		0.6801	601012.5312 3679086.436	0.018	15464.96 543607.9116	0.071	62655.1808	0	0 0	0	0 0 0 0	0 0.0 16 1159312.363 0.0	67869.0816	0.155	136710.24 1142009.1
Embankment (Lahar Material)	m3	393,200	56.21	47.8	9 104.10	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 0.0	7 2701519.92	0.158	6446808
Base Concrete Wet Stone Masonry	m3 m3	2,300 17,000				4,012,534 19,364,360	2,154,847 15,566,560	6,167,381 34,930,920	0.0131	80792.6911 90820.392	0.011 0.084	67224.4529 2937690.372	0.066		0	0 0	0		69 4251175.723 0.0 67 23316389.1 0.0	534443.076	0.165 0.164	1014534.1 5732163.9
Covering Borrow Soil Gabion Mattress	m3 m3	106,800 8,600	236.79 1,468.70			25,289,172 12,630,820	19,529,448 6,050,874	44,818,620 18,681,694	0.1874	8399009.388 790235.6562	0.002	67227.93 1257278.006			0	0 0	0		.62 27729280.19 0.0 0.6 11154839.49 0.0		0.164	7359217.4 3286109.9
Filter Cloth	m2	28,400	70.22	38.2	3 108.45	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 0.0	36651.762	0.167	513432.6
Gravel Pavement Sodding	m3 m2	5,700 179,700				2,541,687 6,873,525	1,751,838 3,338,826	4,293,525 10,212,351	0.0953	409172.9325 602528.709	0.022	95745.6075 542275.8381	0.124	1267352.759	0	0 0	0	0 0 0 0 0 0	58 5894568.997 0.0	2 237947.7783	0.165	708431.6 1667676.9
Sub total (iii) Sub total (1.2)			L	L		124,993,362 223,867,807	92,530,050 163,384,857	217,523,413 387,252,665		52727522.32 245900780.4	0.527	8718648.442 40022570.09	0.678	41692582.08	0	0 0	0	0 0 0 0 5 0 0 0 0 5	.11 437527441.7 0.4	32367410.65		32181455. 154867133
Total (1) Diversion channel of the Gabor River	1					648,483,760	477,114,665			429551481.6		68639749.15	1.357	71128688.28	0	0 0	0	0 0 0 0 1				268751969
2.1 Open channel General Item	0/_	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.
Demolition of Existing Revetment	m3	0			6 1,380.48	0	0	0	0.5234	0	0.047	0	0.008	0	0.1	0 0	0.00	0 0 0 0	0.2 0 0.0	5 0	0.164	- É
Clearing & Grabbing Backfilling	m2 m3	30,700 34,300		32.5	3 69.04	278,603 1,252,293	244,526 1,115,779	523,128 2,368,072	0.6151 0.6801	321776.0328 1610525.767	0.063 0.018	32957.064 41441.26	0.071	167896.3048	0	0 0	0	0 0 0 0 0	08 43681.188 0.0 0 0 0.0	181867.9296	0.123 0.155	64187.80 366340.73
Excavation Embankment (Lahar Material)	m3 m3	125,200		23.6	6 54.66	3,881,200	2,962,232	6,843,432	0.5103 0.5812	3492203.35 0	0.075 0.043	515994.7728 0		227201.9424	0	0 0	0	0 0 0 0 0 0	16 1100423.866 0.0 12 0 0.0			1083999.6
Base Concrete	m3	1,900	1,744.58	936.8	9 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 0.0		0.165	838093.44
Wet Stone Masonry Covering Borrow Soil	m3 m3	10,500 33,600		182.8	6 419.65	11,960,340 7,956,144	9,614,640 6,144,096		0.0026 0.1874	56094.948 2642384.976	0.084	1814455.818 21150.36	0.009	119852.04	0	0 0	0	0 0 0 0 0	67 14401299.15 0.0 62 8723818.488 0.0	277774.728	0.164 0.164	3540454.2 2315259.4
Gabion Mattress Filter Cloth	m3 m2	2,300 7,600	1,468.70 70.22			3,378,010 533,672	1,618,257 290,548	4,996,267 824,220	0.0423	211342.0941 6593.76	0.067 0.042	336248.7691 34452.396			0	0 0	0		0.6 2983271.026 0.0 0.7 579261.816 0.0		0.176 0.167	878843.36 137397.4
Gravel Pavement Sodding	m3 m2	25,300	445.91	307.3	4 753.25	967,725	0 470,074	1,437,799	0.0953	0 84830.141	0.022	76347.1269	0.012	0	0	0 0	0	0 0 0 0 0	69 0 0.0 58 829897.5828 0.0	0	0.165	234792.57
Sub total (2)	1112	23,300	30.23	10.3	30.03	36,874,957	26,664,267	63,539,224		8492492.857	0.033	2928580.811			0	0 0	0	0 0 0 0 5				9459368.6
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.	5,802,280.87	0.1	27,952,420
Clearing & Grabbing	m ²	1,560	1	+		14,157	12,425	26,582		16350.83424	0.063	1674.6912			0	0 0	0	0 0 0 0	08 2219.6304 0.0			3261.660
Backfilling Excavation	m ³	170 290	36.51 31.00			6,207 8,990	5,530 6,861	11,737 15,851	0.6801	7982.19768 8088.96942	0.018	205.394 1195.19556	0.071		0	0 0	0	0 0 0 0	0 0.0 16 2548.90512 0.0		0.155 0.158	1815.682 2510.861
Embankment (Lahar Material)	m ³	10,710	56.21	47.8	9 104.10	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 0.0	73584.126	0.158	175598.48
Base Concrete Wet Stone Masonry	m ³	40 180	,	+	9 2,681.47	69,783 205,034	37,476 164,822	107,259 369,857	0.0131	1405.09028 961.62768	0.011	1169.12092 31104.95688			0	0 0	0		69 73933.49084 0.0 67 246879.414 0.0			17644.03
Covering Borrow Soil	m ³	1,870	1 -	+		442,797	341,948		0.0026	147061.3067	0.002	1177.11825			0	0 0	0		62 485522.0409 0.0	15459.48635		128855.21
Gravel Pavement	m ³ m ²	180	445.91	+		80,264	55,321	135,585	0.0953	12921.2505	0.022	3023.5455	0.012		0	0 0	0		69 93824.82 0.0		0.165	22371.5
Sodding Total (3)	m ⁻	2,680	38.25	18.5	56.83	102,510 1,684,927	49,794 1,305,789	152,304 2,990,715	0.059 2.7441	8985.9596 851743.5093	0.053 0.371	8087.36364 95467.06785			0	0 0	0	0 0 0 0 0 0 0 0 0 0 3	.58 87910.09968 0.0 .61 1122279.568 0.3		0.163 1.414	24871.308 437622.30
Grand Total (1 to 3)	1					687,043,644	505,084,720		13	438,895,718	2	71,663,797		74,479,160	0	0 0	0	0 0 0 0	19 792,365,888	2 57,812,335	7	278,648,9
									15	.20,070,710	- 1	. 1,000,171	,	, ., ,,100		, , , , , , , , , , , , , , , , , , ,	,	9 9	22,000,000	0.,012,000		2.0,070,2
Ratio of LC and FC	_		1	1	-	58%	42%	100%	1											1	\rightarrow	

Table 3.3.3 Summary of Cost for Land Acquisition and Compensation

(Unit: Peso)

D : .:	Bucao R.B		Sto. Tomas	River Basin		T. 4.1
Description	Botolan	S. Marcelino	S. Felipe	S. Narciso	Sub total	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
Course: The report of Deget	1 D1	.1 1' 371		·	•	

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 3.3.4 Project Cost of Bucao River Basin

(Unit: x1000 Peso)

Total

690,624

31.035

165.520

152,546

1,678,008

0

FC

294,910

296,132

17.008

44.646

5,978

2,479

483,219

560,534

67,101

62,763

690,399

116,975

1,222

LC

395,714

397,282

14.000

84,949

46,882

5,332

2,836

551,281

44,878

31.035

88.205

715,399

182,428

987,609

89,783

1,568

(Unit: x 1000 Peso) 2003 2004 2005 2006 2007 2008 2009 2010 FC LC FC LC FC LC LC LC FC FC LC LC FC 2,790 693,414 59,592 44,420 88,840 119,185 88,840 99.321 74.033 119,185 31.008 11.200 13.606 1.400 1.701 1.400 1.701 0 0 201,924 25,485 35,093 0 59,464 81,883 32,817 91.529 14.065 13.394 31.252 0 5,332 5.978 11,310 5,315 0 0 2,836 2,479 1,034,500 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 44,878 8,976 22,439 0 13,463 7,759 22,051 4,655 0 4.655 6,207 4,655 3.104 13.231 11.597 17.641 15.463 19.329 13.231 13.231 11,597 11.597 8.821 1,275,933 0 52,126 38,597 105,989 83,509 171,898 155,789 137,071 100,437 137,071 100,437 111,245 81,765 249,529 0 6,509 2,362 18,003 6,884 37,242 16,215 36,367 12,67 43,305 14,934 41,001 14,036 0

9,039

99,432 230,054

20,914

17,200

189,204

17,344

190,782 124,419

11,311

18,038

198,413 126,907

11,537

15,225

167,470

9,580

105,380

12,399

136,391

4,096

45,056

5,863

64,498

No.

Description

Sub total ((1) to (2))

v) Removal of existing bridge

Sub total (1)

2 Land acquisition and compensation cost

Sub total (1 to 4)

Total (1 to 6)

(3) Bucao bridge replacement i) General item

ii) Super structure

iv) Approach road

iii) Substructure

3 Administration cost

5 Price contingency

4 Engineering services cost

6 Physical contingenc 10%

Construction Cost (1) Dike Construction

(2) Maintenance road

Table 3.3.5 Project Cost of Sto. Tomas River Basin

(Unit: x1,000 Peso) (Unit: x1,000 Peso)

			(CIIIt. 2	A1,000 1 C30)															(Omt. A 1,	0001000
	No. Description	LC	FC	Total	200	03	200	4	20	05	20	006	20	07	20	08	20	009	20	10
1	vo. Description	LC	rc	Total	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 Rive	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 contingency : 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
付	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
از																				

X-TS

Table 3.3.6 Disbursement Schedule of Bucao River Basin

(Unit: x 1000 Peso)

																			(Unit: x 10	
No.	Description	LC	FC	Total	200		Ī	04	200	-	200		20	· ·	200			09	20	
110.	1	LC	I C	1 Otal	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)			ĺ									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
									,	- ´	,						- í	, i	ĺ	,
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							
	\ 1 2																			
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)	21,000		21,000	-		-		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)	00,200	,			-	-		0.15	0.15	0.2	0.2	0.25	0.25	0.15	0.15	0.15	0.15	0.1	0.1
	(* ***********************************												***	****	*****		****	0.110		
	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
	540 total (1 to 1)	.10,0>>		1,270,500		·		·	02,120	00,057	100,707	00,000	171,070	100,705	107,071	100,107	107,071	100,107	111,210	01,700
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%	102,120	07,101	21,5,025	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
	20.170 10.270				0.0100	0.0200	0.0010	0.0101	0.12.7	0.0012	0.10//	0.002.	0.2107	0.1011	0.2000	0.1202	0.5107	0.1 107	0.5000	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
	1 hysical contingency . 1070	07/02.07	02/00:44	132370.11	U	U	0	U	2,003	7,070	12,377	7,037	20,714	17,200	17,544	11,711	10,030	11,557	10,440	7,200
	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
	2000 (2000)	207,002	0,0,0,0	1,678,008	•	•	·	Ů	01,170	.0,000	100,071	,,,,,,,,,	20 3,00 1	107,201	1,70,702	12.,117	2,3,110	120,707	20.,170	100,000
				1,070,000																

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Table 3.3.7 Disbursement Schedule of Sto. Tomas River Basin

(Unit: x 1.000 Peso)

																	1	Unit: X 1,	
Description	LC	EC	Total						05										
•	LC	re	Total	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
Construction Cost																			
(1) Dike Construction	648,484	477,115	1,125,598																
(2) Diversion channel of the Gabor Riv	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
Land acquisition and compensation co	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							
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	
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
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
Physical contingency: 10%	111,611	66,536	178147.24	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
	(2) Diversion channel of the Gabor Riv (3) Maintenance road Sub total (1) (Annual progress rate) Land acquisition and compensation co (Annual progress rate) Administration cost (Annual progress rate) Engineering services cost (Annual progress rate) Sub total (1 to 4) Price contingency LC: 4% FC: 2% Physical contingency: 10%	Construction Cost (1) Dike Construction (2) Diversion channel of the Gabor Riv (3) Maintenance road (4) (Annual progress rate) Land acquisition and compensation co (Annual progress rate) Administration cost (Annual progress rate) Engineering services cost (Annual progress rate) Sub total (1 to 4) Sub total (1 to 4) Price contingency LC: 4% FC: 2% Physical contingency: 10% 111,611	Construction Cost (1) Dike Construction (2) Diversion channel of the Gabor Riv (3) Maintenance road (3) Maintenance road (4) Sub total (1) (5) Cannual progress rate) Land acquisition and compensation co (5) Cannual progress rate) Land acquisition and compensation co (6) Annual progress rate) Administration cost (7) Cannual progress rate) Engineering services cost (7) Cannual progress rate) Sub total (1 to 4) Sub total (1 to 4) Price contingency (8) Cannual progress rate) LC: 4% FC: 2% Physical contingency: 10% 111,611 11,611 111,611 11,611 11,611	Construction Cost (1) Dike Construction (2) Diversion channel of the Gabor Riv (3) Maintenance road (1) 687,044 (2) Diversion channel of the Gabor Riv (3) Maintenance road (1,685 (1,306 (2,991 (2,991 (3) Maintenance road (1,685 (1,306 (2,991 (4) 505,085 (1,192,128 (5) 1,192,128 (5) 1,192,128 (6) 1,192,128 (7) 1,192,128 (7) 1,192,128 (8) 1,192,128 (9) 1,192,128 (1,192,128	Description LC FC Total LC	Construction Cost (1) Dike Construction (2) Diversion channel of the Gabor Riv (3) Maintenance road (3) Maintenance road (4) Construction (5) Sub total (1) (5) Construction (648,484	Description LC FC Total LC FC LC	Description LC FC Total LC FC LC FC	Description LC FC Total LC FC LC FC LC Construction Cost C1) Dike Construction 648,484 477,115 1,125,598 C2) Diversion channel of the Gabor Riv 36,875 26,664 63,539 C3) Maintenance road 1,685 1,306 2,991 C4) C4 C5 C5 C5 C5 C5 C5 C5	Description LC FC Total LC FC LC FC LC FC LC FC	Description LC FC Total LC FC LC FC LC FC LC LC	Description	Description	Description	Description	Description LC FC Iolal LC FC LC	Description LC FC Iotal LC FC LC	Description LC FC Total 2003 2004 2005 2006 2007 2008 2009	Description LC FC Total 2003 2004 2005 2006 2007 2008 2009 20 20 20 20 20 20

Table 3.4.1 Summary of Supply and Installation Cost for Flood/Mudflow Monitoring & Warning System

(Unit: Peso)

No.	Description	Unit	Quantity	Amount
	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 3.4.2 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		
	(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
I		

Table 3.4.3 Unit Price for Evacuation Center Construction

No.		Description	Unit	Quantity	Total Cost (P)	Unit Price				
(1)	(2)		(4)	(5)	(6)=(5)/(4)					
Loc	Local Base (Obtained from Provincial Office)									
1	One family dwelling	;	m ²							
	IA: Reinforced concr	ete, steel truss, concrete/masonry wall			7,370					
	IA: Reinforced concr	ete, steel truss, concrete hollow block wall	m ²			6,530				
	IA: Reinforced concr	ete, 1st wood truss, concrete hollow block wall	m ²			5,040				
2	School building									
	IA: Reinforced concr	ete, steel truss, concrete/masonry wall	m ²			6,340				
	IA: Reinforced concr	ete, steel truss, concrete hollow block wall	m^2			5,940				
	IA: Reinforced concr	ete, 1st wood truss, concrete hollow block wall	m ²			4,960				
3	Condominium, Hote	l, Bank, Hospital, Office								
	IA: Reinforced concr	ete, steel truss, concrete/masonry wall	m ²			7,810				
	IA: Reinforced concr	ete, steel truss, concrete hollow block wall	m ²			6,530				
	IA: Reinforced concr	ete, 1st wood truss, concrete hollow block wall	m ²			5,600				
Loc	al Base (Obtained fr	om Agno II Project)								
1	Provincial road pave	ed with 3.05m wide concrete, W=10.1m	m	6,660	55,124,779	8,277				
2	Barangay road paved	d with gravel, W=5m	m	12,092	69,860,618	5,777				
3	Mound dike (Emban	kment)	m^2	113,000	53,480,197	473				
4	Evacuation center by	uilding: Reinforced concrete, 2 floor	m^2	25,300	270,516,025	10,692				
	Foundation pile work	ks	m ²	11,725	16,212,520	1,383				
	Evacuation center by	uilding without foundation pile	m ²	13,575	136,449,410	10,052				
	Evacuation center by	uilding with foundation pile	m ²	11,725	134,066,614	11,434				
JIC.	A Base (Obtained fr	om Vietnam project)								
1	foundation pile	ding: Reinforced concrete, 3 floor with	m2	1,598	127,763,713	79,952				
Uni	t Price for Land Acc	quisition (Prevailing market price)								
No.	Municipality	Barangay		Selling / Buying Rate						
1	Botolan	Porac (Residential)		(Peso/m2) 200 - 400						
		Carael (Commercial)		750						
	San. Juan (Residential)				100 - 150					
2	San Marcelino					100 - 200				
	Rabanes (Agricultural)				200 - 300					
		Mangricmot (Agricultural)	100 - 150							
3	San Narciso	Alusius (Residential)		150 - 200						
		Paite (Residential)		200						
	(C T 11 0 1 1	San Pascual (Residential)	371)		200 - 400					
	(Source: Table 8.1.1	of the report of Resettlement Plan, Appendix	(XI)							

Table 3.4.4 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	
1	Kenovation of existing school	33	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 3.5.1 Unit Price for Forest Management

(Unit : Peso/Hectare)

	Standard Unit Price Estimated by Forest Sector Project								Provincial Office			
No. Description	Forest tree Mangium, I Falc	Eucalyptus,	Agroforestry: (a) Agroforest tree & Other tree			& (b)	Silvopasture			"Adopt Mountain Project" (Botolan)		
	spacing 5	4 x 4	(a)10x10	(a) 6x6 (b)	() 4 4	3x3	Grass &	Legume	Grass & F	Hedgerow	Total Cost	Per ha
	x 2	4 X 4	(b) 2x2	6x6	(a) 4x4	(Coffee)	w/o fence	w/ fence	w/o fence	w/ fence	Total Cost	
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
Nistra												

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 3.5.2 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

Table 3.5.3 Summary of Unit Prices of Land Development for Agriculture in Lahar Areas Unit: Pesos/ha

Item	Description	Option					
пеш	Description	A	В	С			
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			

 Table 3.5.4
 Production Cost of Seasonal and Perennial Crops per Hectare

Unit: Pesos/ha

Total						Jnit: Pesos/na
Description	Ite			Material	Tool &	
A Scasonal and medium term 1 Rice - direct seeded 5,750 14,206 0 19,956		Description	Labor cost		Equipment	Total
Rice - direct seeded	111			Cost	cost	
Corn	Α	Seasonal and medium term				
3 Sweet potato 11,325 22,416 0 33,741	1	Rice - direct seeded	5,750	14,206	0	19,956
Mungbean	2	Corn	10,925	16,048	0	26,973
S Peanut	3	Sweet potato	11,325	22,416	0	33,741
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 3 19,800 0 20,925 B Perennials 3 19,800 0 20,925 B Perennials 34,060 6,200 61,410 2,925 B Perennials 31,980 0 20,330 3,920 0 20,330 3 year 7,750 12,580 0 20,330 3,920 0 45,449 5 year 7,750 12,580 0 20,330 0 45,449 0 5,681 0 70,568 0 218,087 <td>4</td> <td>Mungbean</td> <td>12,200</td> <td>5,366</td> <td>0</td> <td>17,566</td>	4	Mungbean	12,200	5,366	0	17,566
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	5	Peanut	14,825	7,790	0	22,615
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 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 12,580 0 20,330 4 year 7,750 37,699 0 45,449 5 year 7,750 62,818 0 70,568 14 Pineapple 1 year 40,500 23,800 6,600 70,900 2 year 42,250 9,810 0 52,060 3 year 40,500 8,800 0 4	6	Watermelon	12,250	15,792	0	28,042
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 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 12,580 0 20,330 4 year 7,750 12,580 0 20,330 5 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 1 year 40,500 23,800 6,600 70,900 2 year 42,250 9,810 0 52,060 3 year 6,250	7	Squash	13,350	17,706	0	31,056
9 Garlie 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			19,675	29,754	0	49,429
10 Onion	9	Garlic	27,750	60,250	0	
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 1 year 40,500 23,800 6,600 70,900 2 year 42,250 9,810 0 52,060 3 year 40,500 23,800 6,600 70,900 2 year 42,250 9,810 0 52,060 3 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	10	Onion	43,750		0	79,056
12 Gabi 10,125 10,800 0 20,925	11	Cassava	20,600	13,920	0	34,520
13 Banana 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 1,9475 49,600 5,700 74,775 2 year 24,500 11,980 0 36,480 3 year 24,500 11,980 0<	12	Gabi	10,125		0	20,925
13 Banana 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 1,9475 49,600 5,700 74,775 2 year 24,500 11,980 0 36,480 3 year 24,500 11,980 0<			ŕ	•		
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 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 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	В	Perennials				
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	13	Banana				
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	21,150	34,060	6,200	61,410
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 40,500 23,800 6,600 70,900 2 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 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 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 5 year 24,500 11,980 0 36,48		2 year			,	
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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 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	14	Pineapple				<u> </u>
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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 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		•	42,250			52,060
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 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				1,010	0	7,260
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6 year 6,250 1,010 0 7,260 Total 182,500 54,240 6,600 243,340 15 Papaya 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			46,750		0	
Total 182,500 54,240 6,600 243,340 15 Papaya 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		6 year			0	
15 Papaya 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 5 year 24,500 11,980 0 36,480		Total				243,340
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 5 year 24,500 11,980 0 36,480	15		,		,	,
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 3 year 24,500 11,980 0 36,480			19,475	49,600	5,700	74,775
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		•			· ·	
4 year 24,500 11,980 0 36,480 5 year 24,500 11,980 0 36,480		-	,		0	
5 year 24,500 11,980 0 36,480			,	· · · · · · · · · · · · · · · · · · ·		
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10tal 11/.4/5 9/.520 5.700 220.695		Total	117,475	97,520	5,700	220,695