*The Study on Comprehensive Disaster Prevention around Mayon Volcano*

# SUPPORTING REPORT (2)

## *(Part II: Feasibility Study)*

## XXVII : Pilot Project

**SUPPORTING REPORT (2) - XXVII**
**PILOT PROJECT**

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# THE PILOT PROJECT

## 1. THE OBJECTIVE OF THE PILOT PROJECT

The Specification of the Study prepared by the JICA defines the objective of the Pilot Project as follows:

Through the execution of the Pilot Project, the Study shall identify the key issues to make the forecasting, warning and evacuation systems proposed in the Study comply with the needs of the Study Area.

## 2. SELECTION OF HAZARD

### 2.1 Candidate Hazard and Criteria of Selection

The hazards to be selected will be ones that are incurred by the eruption of Mayon Volcano and have possibility to bring about considerable damages to the selected barangay. Such hazards are:

- Pyroclastic flow (including Nuee ardente)
- Lava flow
- Ash fall
- Mud and debris flow

In order to select one hazard, the Study established evaluation criteria in the light of the objectives and specifications of the Study as follows:

a. Hazard that will bring about a considerable damage should be selected.
b. Hazard that frequently occurs should be selected.
c. Hazard that occurs commonly all over the Study Area should be selected.
d. Hazard forecasting system thereof that will contribute much should be selected.

### 2.2 Evaluation and Selection of Hazard

The Study evaluated these hazards. Of the hazards, the damages incurred by pyroclastic flow and mud and debris flow stand out above others in the Study Area. The former has claimed the most significant casualties repeatedly. In the case of the eruption in 1993, 70 fatal casualties were recorded. Meanwhile the latter has devastated fertile wealthy land that otherwise would enjoy a rich harvest and deprived the farmer of their volition. Further it is rather often that mud and debris flow causes casualties.

The same record indicates seven persons were killed by mud and debris flow. Meanwhile lava flow devastates lands by its debris. However, the area devastated is limited because of the high viscosity of the lava of Mayon volcano and mostly it does not reach the fertile flat land. The high viscosity affects the movement of lava flow. The slow movement of lava flow claims casualties seldom. According to the record, ash fall could be seen at each occasion of eruption of Mayon Volcano. Ash fall of Mayon Volcano is, however, of small scale. So the damages it causes is not significant. Along this line, it is concluded that either of pyroclasic flow and mud and debris flow should be selected for the Pilot Project.

Most eruptions are accompanied by pyroclastic flow in the case of Mayon Volcano. According to records, 90.5% of the eruptions have been accompanied by pyroclastic flow. The volcano is exceptionally active and has erupted with an interval of about ten years recently. The occurrence frequency of mud and debris flow is higher than that of eruption, because the first mud and debris flow occurs immediately after the eruption being triggered by the heavy rainfall and a heavy rainfall by typhoon or monsoon later will cause a second mud and debris flow, the second lahar. The first lahar accompanied the eruption in 1993 brought remarkable damage to the areas extending in the southeastern slope of the mountain. No official record is available with regard to the occurrence of mud and debris flow but, as of now, at least 11 flows are confirmed since 1993.

The heavy rainfalls of Typhoon Monang in 1993, Akang and Rosing in 1994 and Mameng in 1995 caused lahar which affected about 4,000 to 40,000 families. Mud and debris flow is the most frequent disaster in the Study Area related to the eruption of Mayon volcano.

The eruption of Mayon Volcano is of Vulucanian type and pyroclastic flow may head for any direction of the slope. All the slopes, accordingly, have the possibility to suffer the damage by the pyroclastic flow although recent occurrences of this disaster seem to concentrate to south to southeastern areas. Mud and debris flow have the possibility to occur through out the Study Area as well because the debris of pyroclastic flow and lava flow, the source of mud and debris flow, might silt on the slope arbitrarily as mentioned above. The old deposit might be weathered and liable to supply the source of mud and debris flow. Thus, mud and debris flow can be acknowledged as the common disaster in the Study Area.

PHIVOLCS has monitored the activity of the Mayon Volcano. It disseminates warnings of five levels in accordance with the forecast through the assessment of the monitored data, seismicity, ash puff, crater glow, lava trickles, and others. The

technical standards adopted by PHIVOLOCS are considered to be of a sufficient level although strengthening of facility might be necessary.

The JICA established telemetered rainfall and debris flow gauging stations to forecast mud and debris flow. The river channels to be monitored by the stations and the installed equipment are as follows:

| River Channels | | Observation Item | Installed Equipment |
|---|---|---|---|
| • Maninila river | : | rainfall | - |
| • Pawa-Burabod | : | rainfall | wire sensor |
| • Padang | : | rainfall | wire sensor |
| • Basud | : | rainfall | wire sensor |
| • Budia | : | - | wire sensor |

Rainfall is the direct trigger of mud and debris flow. According to the data recorded in Japan, the effective cumulative rainfall and effective rainfall intensity are the imperative causes of mud and debris flow no matter what the geologic and topographic conditions are. Mud and debris flow affected by volcano, like Sakurajima in Japan, have close relation with effective rainfall as well. In most cases, the occurrence of mud and debris flow delays 2 to 3 hours to rainfall. This implies that a lead time of 2 to 3 hours might be secured if warning is disseminated on the basis of the measured rainfall. OCD once tried to disseminate warning on the basis of the information obtained by the system. However, the results were not successful according to the then staff of OCD in charge. The reason of this is not identified; however, the conceivable reasons are as follows:

- assumed initial data were kept and used although they were to be elaborated on the basis of the experienced data.
- a civil engineer was not involved despite the fact that this hazard is one of the main subjects of civil engineering.

The cooperation of OCD, DPWH, and the Study Team may improve the forecasting system, warning system and evacuation system to some extent. In the light of occurrence frequency and the contribution to improvement, the Study selected mud and debris flow as the target hazard of the Pilot Project

## 3. SELECTION OF BARANGAY

### 3.1 Candidate Barangay and Selection Criteria

The proposed pilot project is to be conducted for one selected barangay. In this respect, most of the barangays located in the areas within 10km are subject to the mud and debris flow because the topographic slopes thereof are steeper than 1:30.

To predict the flow direction of the next eruption is difficult. To point out the site in which the next eruption will deposit the debris of pyroclastic flow, Nuee ardente, or ash fall, which are all source materials of mud and debris flow, is not to be done. So other factors must be conceived to select the barangay. With this regard, the following criteria or assumptions were established to select the Barangay for the Pilot Project:

1) Barangay located along or downstream reaches of the existing gullys should be selected because the mud and debris flow tend to travel along the depressed area such as a prominent gully .
2) Gullies that extend along the south to east slope should be highlighted because the hazards caused by the eruption with a small magnitude are controlled by the cone developed at the summit and will take the direction to south to southeast because the cone in this direction is broken off.
3) The barangay located along the channel which has been once monitored should be selected because the data and the experiences obtained thereby are useful to elaborate the standard to judge the warning.

Consequently, the barangays located in the downstream areas of Bonga and Basud gullies were selected as the candidates as follows:

| Gully | River | Barangay |
|---|---|---|
| Budiao | Budiao | Budiao, Banadero, Busay, Culliat, Banag, and Tagas,Bagumbayan, Malobago, and Bogtong |
| Bonga | Pawa-Burabod | Mabinit, Pawa, and Bonga |
| Basud | Basud | Buyuan, Bigaa, and Padang |

### 3.2 Evaluation of Gully and Barangay

The existing Bonga gully (channel) is most prominent and provides the deepest depression. The hazard travels this channel most probably. Basud channel follows Bonga gully.

Both rainfall and mud and debris flow are measured once in the downstream reaches of Bonga gully (Pawa-burabod River) and Basud gully (Basud River). However, only a wire sensor is installed in the downstream reach of Budiao gully.

According to the preliminary surveys, the Pawa-burabod River is considered to reserve the highest potential of mud and debris flow even now.

In this accord, the Study proposes to adopt the Bonga gully (Pawa-Burabod River) as the target of the Pilot Project. Of the three barangays located in the Pawa-Burabod River basin the Barangay Pawa extends over an area from 9.5 to 10.5km from the crater. The remaining two located at 8km are supposed to be more critical with regard to evacuation.

Barangay Mabinit is located at the right bank of the Pawa-Burabod River. Meanwhile Bonga is located at the left bank. The site reconnaissance survey identified that the right bank is more critical against mud and debris flow as compared with the left bank. Consequently, Barangay Mabinit was selected as the target Barangay.

## 4. FIRST PILOT PROJECT

### 4.1 Scenario

The proposed pilot project conducts forecasting and warning using the facilities proposed by the Study. The project further conducts evacuation of the selected Barangay Mabinit. This forecasting, warning, and evacuation were conducted in line with the following scenario.

(1) 1st warning /ROCD

OCD monitor the rainfall in the watershed area of the Pawa-burabod River on the basis of the rainfall data transmitted from the rainfall gauging stations established on the right bank of the Pawa-burabod River and the left bank of the Buyuan river. The rainfall depth in the watershed area is to be estimated automatically in accordance with the program installed in the data processor.

In case the combination of accumulated rainfall and rainfall intensity exceeds the designated value, the processor will disseminate the first warning to the staff of OCD. The first warning is to arouse the attentions of the staff of the agency. The responsible staff of the agency must sit in front of the monitor and watch the fluctuations of rainfall. Staff of ROCD will watch and wait for further development in accordance with the manual.

(2) 2nd warning/ROCD, PDCC, MDCC, BDCC and individual person

The next warning will be disseminated automatically if the rainfall increase further, either accumulated rainfall or intensity or both, and exceed the designated value. The second warning is to urge to start the preparations for evacuation. The information will be transmitted through the existing VHF radio system to the provincial and city DCC from ROCD. The information will be transmitted to barangay DCC from CDCC through cellar telephone. The BDCC disseminates the 2nd warning to individual person in accordance with the procedure stipulated in the Manual. Each family commence to prepare for evacuation in accordance with the procedure written in the Manual.

(3) 3rd warning/ROCD, PDCC, CDCC, BDCC and individual person

The 3rd warning is to be disseminated when the occurrence of hazard is convinced. The information is to be transmitted from ROCD to PDCC, MDCC through VHF radio and to BDCC through cellar telephone. BDCC advises the individual person to evacuate. ROCD, PDCC, and CDCC will monitor evacuation through the communication system.

(4) Release

When rainfall subsides and hazard is confirmed not to occur any more, release information is to be disseminated and all the staff and individual person may resume the ordinary activity.

## 4.2 Preparation

### 4.2.1 Confirmation of the Availability of Resources

Forecasting facility

The availability of the forecasting facilities were confirmed through field reconnaissance survey at the gauging station sites and the monitoring site in the office of ROCD. The survey identified some defects to be repaired prior to the execution of the pilot project. They are:

- Filter for rain gauge equipment should be replaced
- Liquid of battery should be supplemented
- Some IC board should be replaced
- IC of printer should be replaced
- Software for warning decision should be enhanced

Warning facility

VHF radio equipment of ROCD, PDCC, CDCC, were all in good condition. Telephone, facsimile equipment of those agencies were all in satisfactorily conditions as well. The survey revealed that no VHF radio is allocated in Barangay Mabinit.

Evacuation facility

Legazpi city disaster coordinating council designated Albay Central School as the evacuation center for Barangay Mabinit. The evacuation center has sufficient room with an area of 3,600$m^2$ to accommodate around 800 evacuees. However, the number of faucets 9, and toilets 9, are not sufficient. The stocks of blankets, water, and food were just sufficient.

Barangay Mabinit designated 5 pickup points for evacuee. There are two pickup points without roof.

There are two evacuation routes: Kirikaw road on the west and Bonga road on the east. Both roads have one lane with a width of less than 4m and are partially paved.

CDCC possesses two trucks to carry evacuees. CDCC reserve the right to borrow buses and other vehicles owned by other agencies.

Organization and staff

CDCC has established the procedure to organize Disaster Prevention Center at the most convenient site. The center will manage various disaster prevention teams as follows:

- Evacuation
- Warning
- Relief
- Security
- Communication
- Transportation
- Medical
- Information
- Evacuation camp

DECS, PNP, CSWDO, and other related agencies are to collaborate with the center in addition to city, Barangay OCD, DPWH, PAGASA, and PHIVOLCS. Red cross, BSBI and other NGO are to be involved with the center. The staff are observed to be well trained.

Barangay has established BDCC comprising Purok leader. Information, warning are disseminated to each family by BDCC. It helps family to evacuate. However, it has not prepared on operation manual for emergency activity. The staff of BDCC are well trained.

### 4.2.2 Preparation of Resources

The specification for rehabilitation of forecasting facilities were prepared. The specifications are duly submitted to JICA to purchase. Preparation to rent VHF radio equipment for Barangay was carried out.

- Manual for the emergency activity of BDCC was prepared.
- Manual for the emergency activity of barangay people was prepared in visual style (comics).
- Manual for activity of ROCD against mud and debris flow was prepared.

### 4.2.3 Preparation of Plan of Operation

Plan of operation was prepared to confirm the activities on the project. The contents of the plan of the operation are as follows:

- Background of the pilot project
- Objective of the pilot project
- Concept of the pilot project
  - Scenario
  - Participant
  - Facility and equipment
  - Observation and analysis
  - Time table
- Schedule
  - The date of preparatory meeting
  - The date of execution 27 Nov. 1999

### 4.2.4 Meeting and others

As the preparation works, official meetings were held three times with CDCC, BDCC, DPWH, and the Study Team as follows:

Sept. 10 1999
Nov . 19 1999
Nov . 26 1999

The main objectives of the meetings were to obtain the common understanding on the procedures and the tasks by organization of the pilot project.

Workshop were held at the Barangay hall of Mabinit to explain the pilot project for the residents. BDCC, CDCC, and the Study Team gave the explanations. The other objectives of the workshop was the explanation of emergency activity manual to the local people.

Through the meeting, following amendments of the plan of operation were agreed;

- Quasi-warning is to be issued because the rehabilitation of the forecasting equipment is not to be completed before November 27, 1999.
- The site for the evacuation center is shifted from Albay Central School to Gogon Elementary School because the former have been occupied by the evacuee due to the abnormal activity of Mayon Volcano

### 4.3 Pilot Project

The pilot project is to introduce the system and equipment proposed by the Master Plan to the selected area prior to the substantial installation to the whole target area. This comprises:

- Forecasting method and equipment
- Forecasting software
- Warning method and equipment
- Operation manual for warning
- Disaster prevention organization
- Evacuation method and manual
- Management of evacuation center

On 27 November, 1999, a quasi warning was issued to CDCC as scheduled. And disaster prevention works were activated by the various agencies and the residents of Mabinit in line with the method and equipment proposed. The detailed time table is briefed as follows:

06:58 Level-1 warning was issued to the ROCD staff
ROCD staff in charge stationed in the office for watch and waite
06:59 ROCD staff requested PAGASA weather forecast bulletin and
confirmed no climatic change
07:03 ROCD checked the availability of telephone, fax and VHF
07:30 Availability were confirmed
07:35 ROCD received quasi-level-2 warning
07:40 Mud and debris bulletin

07:45 Warning to CDCC and PDCC
07:50 CDCC operation center
07:55 CDCC issued warning to BDCC
preparation of evacuation center
08:00 setting up of center clinic
setting up of CSWD office
setting up of registration desk
08:13 BDCC meeting
08:15 BDCC issued warning to residents upto 08:30
08:25 Arrival of medical team to Mabinit
08:35 Arrival of PNP to Mabinit
08:40 Set up of field clinic
08:41 ROCD received level-3 warning
08:43 CDCC receive level-3 warning
08:44 CDCC issue level-3 warning to BDCC
08:45 CDCC dispatch vehicle to Mabinit
BDCC evacuation order to residents
Residents move to pickup point
09:00 Arrival of the first vehicle to Mabinit
The final order of evacuation
09:15 Arrival of the last resident to the pickup point
09:30 Arrival of the first evacuee to evacuation center
09:35 Registration of evacuee
09:40 Room assignment
09:45 Orientation
10:39 Arrival of the last batch of evacuee
10:42 Distribution of food
13:20 Release
16:00 Return

The residents participating in the project was 507 persons from 174 families. The participation ratio is around 50% against the then population of 1,080 persons. Other agencies that participated were DECS, DPWH, PHIVOLCS, PAGASA, PDCC, and PDMO.

The prepared and used bulletin for warning of mud and debris flow is shown in Table XXVII 6.1. The location of the pilot project is shown in Figure XXVII 6.1.

### 4.4 Assessment

The proposed procedures and the prepared manuals functioned well in general. Their availability were confirmed through the simulation. There were a few events to be noted for the further enhancement as follows:

1) BDCC consumed 15 minutes to disseminate warning to each family by means of house to house visit although the 12 staffs in charge tried their best. The adopted method is reliable and not to be revised. In this connection, the problem is the communication between BDCC and the disseminating staff to provide the most updated information to the disseminator. All the disseminators who will scatter all over the Barabngay should be equipped with VHF radio terminal to receive the most updated information.
2) ROCD consumed 30 minutes to confirm the availability of the communication facility after receiving level-1 warning. This is because PDCC staff is not stationed yet at that time. This imply that the first warning should be sent to a 24-hour manned site like a guard house to shorten the time to 10 minutes.
3) BDCC spent 20 minutes to order evacuation after receiving the warning from CDCC. This should be shortened by 10 minutes.
4) It took 30 minutes by vehicle for about 6km. This is because only Kirikaw road was passable and it was too narrow to cross two vehicles (come and go). The necessary time is estimated to be 15 minutes if Bonga road is available.
5) A defect of Bonga road was found when the first batch of evacuees were directed to the evacuation center. It is apparent that emergency response of DPWH to inspect infrastructure and the emergency rehabilitation infrastructure is important.
6) The time period for warning and evacuation may be shortened by 30 to 45 minutes in total.

## 5. SECOND PILOT PROJECT

### 5.1 Second Pilot Project (Emergency Response by DPWH)

#### 5.1.1 Scenario

The proposed second pilot project aimed to conduct a simulation of emergency response in line with the Standard Operation Procedure (SOP) issued as Department Order 36/1988. Said emergency responses are based on forecasting and warning obtained from the system newly installed.

a. 1st warning

The DPWH region V monitors the rainfall in the Pawa-Burabod river basin on the basis of the telemetered rainfall data at Barangay Mabinit and Buyuan. The data processing unit of the telemeter issues the 1st level warning in case the features of observed rainfall exceed the 1st level warning line (WL-1) generated by the processing unit. The warning is relayed to the staff in charge. The staff in charge inform the situation to the department to organize Regional Disaster Coordinating Body (RDCB). The RDCB duly establish the Operation Center. The staff in charge sit in front of the monitor and watch and wait for the development as the monitoring team.

b. 2nd warning

The installed telemetered monitoring system issues 2nd warning in case rainfall exceeds the 2nd level warning line (WL-2) generated by the processing unit. The monitoring team relay the warning to the Operation Center. The Operation Center dispatch survey teams to inspect the conditions of infrastructures. Survey team send the information on the conditions of infrastructure as the surveyed results. Technical planning staff of the Operation Center design the measures of emergency response to reinforce the infrastructures. The Operation Center dispatch Repair and Restoration Team to the sites. The team repair the defects of infrastructures. The Operation Center disseminate the warning to the relevant MDCC and CDCC. It inform the warning to ROCD and PDCC as well.

c. 3rd warning

The Operation Center relay the 3rd warning to relevant DCCS and ROCD. The Center instructs all the staff and teams in accordance to respond to the request by DCCS and ROCD.

d. Release

The Operation Center issue release statement and send it to the relevant DCCS and ROCD when the snake curve goes down to the zone below the WL-1 and the rainfall is considered to subside. It send the statement to each team and staff dispatched to fields.

### 5.1.2 Preparation

(1) Confirmation of the Availability of Resources

1) Forecasting facility

The supervisory controller, monitoring unit, processing unit, and transmitter and receiver were checked in the office of the DPWH region V. The receiver did not function well and was replaced to new one. The system was confirmed to function well including peripheral unit like the printer. The staffs of planning division were assigned as the staff in charge to monitor lahar. Thus monitoring team of the Disaster Coordinating Body was established by three staff of the planning division. The team made an investigation tour to Mabinit and Buyuan rainfall gauging stations on June 6 and 7. The functions of two gauging stations were confirmed sound by the investigation.

2) Inspection facility

No vehicle and SSB telephone is available for the exclusive use for inspection. For the pilot project, the Study Team agreed to provide a vehicle for the inspection. However, one vehicle was made available by the district engineer's office.

3) Repair facility

The Regional Equipment Service (RES) made one dump truck available for the use of pilot project.

4) Organization and Staff

The participants of the pilot project are as follows:

| | | |
|---|---|---|
| Monitoring Team | : | Staff of planning division |
| Investigation Team | : | Staff of maintenance division<br>Staff of district engineers office |
| Technical Planning Staff | : | Staff of planning division<br>Staff of district engineer's office |
| Repair Team | : | Staff of equipment division |

(2) Preparation of material

The main material for the pilot project is the fuel for the dump truck. The application and approval to consume the fuel was made by the maintenance division.

(3) Meeting

The first workshop was held to understand the monitoring system on June 5. The discussion focussed on the theory adopted to the software of the data processing unit. The participants thereto are the staff member of the monitoring team of the DPWH and two staffs from ROCD.

The second workshop was held to confirm the scenario and staffing of the pilot project on June 9. The plan of operation prepared by the Study Team and DPWH Regional Disaster Coordinating Body were materialized in the meeting. The participant are DPWH staffs assigned for Monitoring team, investigation team and repair team including the staffs from the district engineer's office.

### 5.1.3 Pilot Project

All the managing staff of the DPWH region-V were not available because of other meeting and the establishing of the Operation Center could not be conducted on June 13 when the second pilot project was held. The main activities of the project are dispatching of inspection team and repair team to the sites. The timetable of the project are shown below:

09:15 Assumed to have warning level 1
Monitoring team relayed the warning
Assumed to have established Operation Center

09:50 Assumed to have warning level 2
Monitoring team relayed the warning
Assumed to have ordered inspection

10:00 Survey team started the office to barangay Mabinit
District engineer's office started to the barangay Mabinit

10:15 Arrival of survey team to the barangay and commencement of inspection of evacuation road and the river channel

10:30 Information on the status was assumed to be sent by the survey team to the Operation Center. The survey team moved to the Padan river.

10:45 Decision was assumed to be made by the Operation Center and the repair team was dispatched to the site. The survey team moved to Padan.

11:00 The repair team arrived to the site.

11:30 Repair was assumed to be completed at Mabinit and the repair team was ordered to move to Padan.

11:45 The Repair team arrived to Padan.

12:00 Release statement was issued to all the team.

### 5.1.4 Assessment

The 3rd workshop was held to assess the pilot project on June 13. The participants are members of the monitoring team, the survey team and the repair team. The issues discussed therein are as follows:

- The alarm corresponding to the warning level 1 should be given to the site where a man stationed for 24 hours like a guard house.
- The guard house should have a facility to communicate with the members of the monitoring team to relay the level 1 warning to the members.
- To have a service vehicle is preferable for the members of the monitoring team to come to the office to monitor the system without delay.
- Survey team should prepare a manual to inspect infrastructures.
- Vehicles with 4 wheel drive are indispensable to survey along the mountain slope.
- Communication tool is indispensable to survey and to inform the surveyed results to the Operation Center.
- Inventory of hydrology and structure are fundamental to plan the emergency response.
- Transfer of competence to utilize heavy equipment and to consume fuel because the procedure in normal case is complicated and take time.
- Materials should be reserved and stocked in a specific places for the use of emergency.

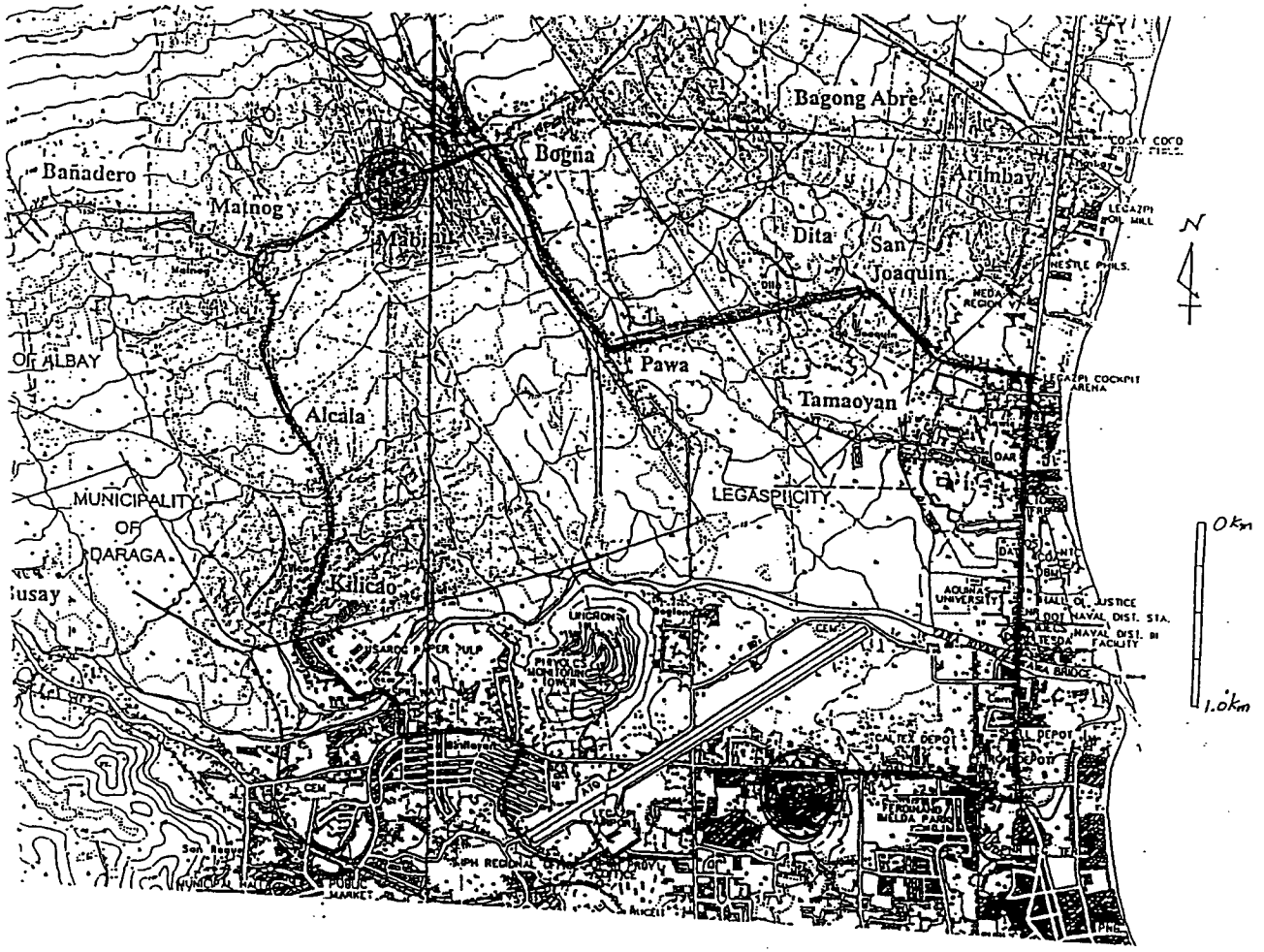
**Table XXVII 6.1 Warning Bulletin for Mud and Debris Flow**

**OFFICE OF CIVIL DEFENSE**
**REGIONAL DISASTER MANAGEMENT CENTER**
Camp General Simeon A. Ola
Legazpi City

MUD AND DEBRIS FLOW BULLETIN

Bulletin No._____
Time & Date issued_____

| MONITORED PARAMETERS | OBSERVATION ON RAINGAUGE STAN NO. | | | | |
|---|---|---|---|---|---|
| | No. 1 Site A | No. 2 Site B | No. 3 Site C | No. 4 Site D | No. 5 Site E |
| **OBSERVATION TIME** | | | | | |
| Accumulated Effective Rainfall (mm) | | | | | |
| Total Rainfall Intensity (mm/h) | | | | | |
| Rain Intensity for the past 60 minutes | | | | | |
| Area at Risk | Maninila, Masarawag, Tandarora, San Rafael, Maipon, all of Guinobatan, Baligang, Basag, Nasisi, allof Ligao | Mabinit, Pawa, Bonga, Bogtong, all of Legazpi City, Budiao, Bañadero, Busay, Culliat, Bañag, Bagumbayan, Malobago, Tagas, Matnog, all of Daraga | Buyuan, Bigaa, Padang, all of Legazpi City | Sta. Mesirecordia, Fidel Surtida, Lidong, San Isidro, all of Sto. Domingo | San Vicente, Mariroc and Buang, all of Tabaco. |
| Alert Status | Level_____ | Level_____ | Level_____ | Level_____ | Level_____ |




| | |
|---|---|
| **COMPREHENSIVE DISASTER PREVENTION AROUND MAYON VOLCANO IN THE REPUBLIC OF THE PHILIPPINES** | **Figure XXVII 6.1**<br>**Location Map of Pilot Project** |
| **JAPAN INTERNATIONAL COOPERATION AGENCY** | |