

RESULTS OF THE MINES AND GEOSCIENCES BUREAU'S (MGB) 1:10,000 SCALE GEOHAZARDS (LANDSLIDE AND FLOOD) ASSESSMENT AND MAPPING OF NABUNTURAN, COMPOSTELA VALLEY PROVINCE

The Mines and Geosciences Bureau (Central Office)-Department of Environment and Natural Resources (MGB-DENR) conducted geohazards (landslide and flood) assessment and mapping (1:10,000 scale) of areas within the municipality of Nabunturan on March 11 to 19, 2013. Comprising the geohazards assessment team are geologists from the MGB-Central Office (MGB-CO) namely Mr. Salvio B. Laserna, Ms. Christine Jeiselle G. Guarino, Ms. Vanessa Andrea V. Llagas, Mr. Kevin L. Garas, Mr. Mel Anthony A. Casulla and Ms. Princess Danielle B. Matas.

The assessment is in line with the government's efforts aimed at reducing, if not, totally mitigating the destructive effects and impacts of natural hazards on the populace. The assessment is also a follow-up to the geohazards assessment and mapping (1:50,000 scale) previously conducted by geologists from MGB Region XI.

The assessment was only limited to areas covered by the 1:10,000 scale base maps provided to the team. The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. Similar flood susceptibility rating (i.e., high, moderate or low) was also given to the assessed barangays. **Tables 1 and 2** show the parameters used for the assessment.

When appropriate, the barangay officials were presented with *Landslide and/or Flood Threat Advisories*. These advisories inform them of their area's susceptibility to landslide and flooding and also contain the corresponding recommendations.

Notable results were obtained by the MGB-DENR from the following barangays: Anislagan, Antequera, Basak, Cabacungan, Cabidianan, Katipunan, Libasan, Linda, Magading, Magsaysay, Mainit, Manat, Matilo, Mipangi, New Dauis, New Sibonga, Ogao, Panggutosan, Poblacion, San Isidro, San Roque, San Vicente, Santa Maria, Santo Niño, Sasa, Tagnoccon, Bayabas, Bukal. These results are tabulated in **Tables 3 and 4**.

Table 1. Landslide susceptibility parameters used during the assessment

Landslide Susceptibility Parameters	Low	Moderate	High	Very High
A. Slope Gradient	Low to moderate (<18°)	Moderate to steep (18°-35°)	Steep to very steep (>35°)	Steep to very steep (>35°)
B. Weathering/ Soil Characteristics	Slight to moderate	Moderate	Intense; Soil usually non-cohesive	Intense; Soil usually non-cohesive
C. Rock mass strength	Very good to good	Fair	Poor to very poor	Poor to very poor
D. Ground Stability	Stable with no identified landslide scars, either old, recent or active	Soil creep and other indications for possible landslide occurrence are present.	Inactive landslides evident; tension cracks present	Active landslides evident; tension cracks, bulges, terracets, seepage present.
E. Human Initiated effects				May be an aggravating factor

Table 2. Flood susceptibility parameters used during the assessment

Very high/Critical flood susceptibility	Areas likely to experience flood heights in excess of 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
High flood susceptibility	Areas likely to experience flood heights of 1.0 to 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
Moderate flood susceptibility	Areas likely to experience flood heights of 0.5 to 1.0 meters and/or flood duration of 1 to 3 days. These areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and in-filled valleys are areas moderately subjected to flooding.
Low flood susceptibility	Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than 1 day. These areas include low hills and gentle slopes. They also have sparse to moderate drainage density

Table3. Results of Landslide Assessment

Location	Landslide Susceptibility Rating	Remarks/ Recommendations
Barangay Bayabas		
<p>Bayabas Brgy. Hall (GPS reading: N 7° 36' 11.4"/E 125° 54' 21.1")</p> <p>Purok 1 (GPS reading: N 7° 36' 13.6"/E 125° 54' 21.4")</p> <p>Purok 4 (GPS reading: N 7° 47' 7.4"/E 125° 55' 40.7")</p>	<p>Moderate to High</p>	<p>These areas are situated on a ridge making them not critical to mass movements. Though the Brgy. Hall and Purok 1 & 4 Centers are on a moderately sloping terrain, the southwestern part of Purok 1 and southern/southeastern portions of Purok 4 are still considered as highly susceptible to landslide. Active landslides are present on the eastern side of the Brgy. Hall. The creek draining due north to the east of Purok 1 also affects the landslide susceptibility in the area. Generally, the area is underlain by clastic rocks with patches of limestone.</p> <p>Recommendations: Settlement on the steep slopes should be discouraged. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 2 (GPS reading: N 7° 36' 29.1"/E 125° 54' 13.5")</p>	<p>High to Critical</p>	<p>The area is underlain by highly weathered clastic rocks and limestone. The northern portion of the purok center has steep slopes resulting to several landslides during Typhoon Pablo. There were recorded wide landslides on the northernmost side of the purok. These landslides were noted on very steep slopes adjacent to a north-flowing tributary.</p> <p>Recommendations: Settlements on steep slopes to the northern part of purok center are highly discouraged. Households on steep slopes must be relocated to the western portion of the purok center with moderate slope gradient.</p>

		Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
<p>Purok 3 (GPS reading: N 7° 36' 3.8"/E 125° 54' 14.1")</p> <p>Purok 6 (GPS reading: N 7° 35' 37.6"/E 125° 53' 41.6")</p>	High to Critical	<p>Generally speaking, the lithology in the area is identified to be highly weathered clastic rocks (e.i., sandstone, and conglomerate) dipping due east. These highly weathered rocks situated on steep slopes are highly susceptible to mass movements. Purok 3 and 6 are located on a steep topography. Active landslides were noted on the western sides of Purok 3 and 6 Centers. To the western side of Purok 3 is a creek that caused wide landslides in the area.</p> <p>Recommendations: The Purok 6 Center must be transferred to a safer area with moderate slope and far from an active landslide. Areas adjacent to creeks with steep slopes must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 7 (GPS reading: N 7° 47' 43.2"/E 125° 54' 35.9")</p>	High	<p>The purok center is bounded by several translational and wedge landslides to its north, northeast and south sides. Rocks in the vicinity are identified as highly weathered sandstone and conglomerate. This lithology is prone to mass movements if placed on a steep topographic high.</p> <p>Recommendations: In case of heavy rain or typhoon, residents situated on steep slopes must transfer to areas with moderate slope gradient to western side of the purok center. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or</p>

		seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 5	Moderate	<p>Generally, Purok 5 is situated on rolling topography which can be considered to have moderate susceptibility to landslide. Local landslides were reported to the southeasternmost portion of the purok.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
Barangay Bukal		
Purok 14 Center: N 7° 27' 44.1" E 126° 2' 41.6"	Very High	<p>Several rotational and translational landslides along steep slopes of the area. This area is debris flow path manifested by large boulders in the stream bed of Manat River.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 6 Center: N 7° 27' 47.1" E 126° 2' 40.0"	High	<p>Several rotational and translational landslides along steep slopes of the area. This area is debris flow path manifested by large boulders in the stream bed of Manat River. Overloading of houses on a steep slope may induce slope failure or landslide.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 13 Center: N 7° 28' 0.5" E 126° 2' 36.0"	High	<p>A large rock slide was observed in the area. This occurrence suggests that the slope is prone to future rockslides. Presence of old debris deposits is evidence that the area is prone to debris flow.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the</p>

		government.
Purok 5 Center: N 7° 28' 16.8" E 126° 2' 23.9"	Very High	<p>A massive debris flow was observed from the western side of Purok 5. Cobble to boulder sized rock debris were deposited to the area. Rocks are identified as breccia, andesite, sandstone and diorite. Landslide escarpments, most probably the source of debris, were observed in the top portion of the slope. This flow is highly influenced by stream channel flow.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 4 Center: N 7° 28' 27.3" E 126° 2' 14.1" Purok 15 Center: N 7° 28' 33.0" E 126° 2' 6.8"	Very High	<p>Similar to other puroks, several landslide escarpments were seen in the area.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 1 Center: N 7° 28' 45.8" E 126° 2' 0.4"	Very High	<p>Landslide occurrences are present in slopes in the eastern side of the constricted valley. Overloading of houses affects the stability of the area. Improper management of mining operations such as unorganized tunneling will contribute to the impending landslide and rockslides in the area.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government. Constant monitoring in mining operations should be done in the area. Illegal mining operations must be closed immediately.</p>
Purok 2 Center: N 7° 28' 51.4"	Very High	<p>Large translational slide of rock and soil material occurred along a road cut in Purok 2. Overloading of houses affects the stability of the area. Improper management</p>

E 126° 1' 51.6"		<p>of mining operations such as unorganized tunneling will contribute to the slope failure and incipient landslide and rockslides that will happen in the area.</p> <p>This rock is also prone to rock fall due to the presence of extremely jointed massive exposure of altered rocks. Conjugate shear joints are present. Spaces between joints, in average, are 2 – 5 mm. Alteration of the host rock to sulfides was observed in the rock.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government. Constant monitoring in mining operations should be done in the area. Illegal mining operations must be closed immediately.</p>
Purok 3 N 7° 29' 6.8" E 126° 1' 33.4"	High	<p>Overloading of houses affects the stability of the area. Improper management of mining operations such as unorganized tunneling will contribute to the slope failure and incipient landslide and rockslides that will happen in the area. Ground seeps are present indicating cracks in the slope.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government. Constant monitoring in mining operations should be done in the area. Illegal mining operations must be closed immediately.</p>
Barangay Cabidanan		
Purok 3 (GPS reading: N 7° 32' 43.2"/E 125° 59' 52.9")	Very High/Critical	<p>An active rotational landslide is present on the upper portion of Purok 3. Affected areas are mostly agricultural lands; however, a house sits near the toe of the slide. Relocation should be considered, unless landslide mitigating measures are built to prevent further mass movements. Settlement on the slope affected by the landslide is discouraged.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks)</p>

		<p>in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
Purok 5	High	<p>Rotational and translational landslides are observed on the southwestern slopes bounding the area, as observed from the adjacent Purok 2. Settlement on these slopes is discouraged.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once the landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
Southwestern slopes bounding the barangay	High	<p>Rocks found in some of the exposed outcrops are highly weathered, fractured and have poor rock mass class. These slopes are unsuitable for increased buildup. Heavy rainfall and earthquakes may trigger mass movements in these areas. Settlements on the slopes and along footslopes are highly discouraged. They may be utilized as agricultural lands but not for residential purposes. Residents should be wary of impending landslides especially during extreme heavy rains. Thus, nearest evacuation sites should be identified for affected residents; however, relocation is best advised.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
Barangay Katipunan		

Purok 2 (GPS reading: N 7° 32' 2.1"/E 126° 02' 21.6")	Low	
Purok 3 (GPS reading: N 7° 31' 11.3"/E 126° 3' 26.2")	Moderate	The area has moderate slopes and characterize by narrow ridges. Relict landslide escarpments were observed in the area especially along valley slopes. Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 6 (GPS reading: N 7° 31' 35.3"/E 126° 03' 00")	Low	
Purok 1-B (GPS reading: N 7° 31' 52.6"/E 126° 2' 31.7")	Low	
Purok 1-A (GPS reading: N 7° 31' 49.8"/E 126° 02' 20.4.0")	Low	
Purok 5 (GPS reading: N 7° 31' 34.1"/E 126° 02' 16.3")	Low	
Barangay Linda		
Purok 5 (GPS reading: N 7° 35' 2.9"/E 125° 55' 54.4")	Moderate to High	The Purok 5 and 6 centers are both situated on a rolling topography underlain by weathered clastic rocks. The area is utilized as agricultural field and some are as residential zones. Minute landslides were

<p>Purok 6 (GPS reading: N 7° 34' 59.1"/E 125° 55' 51.7")</p>		<p>reported adjacent to creek to the westernmost portion of Purok 6. Creek draining due south also affects the landslide susceptibility in the steep areas.</p> <p>Recommendations: Lands at the westernmost side of Purok 6 are recommended to be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 7 (GPS reading: N 7° 35' 49.2"/E 125° 56' 09.3")</p>	<p>Moderate to High</p>	<p>Purok 7 and its vicinity are underlain by weathered clastic rocks. Though the purok center is on a moderately sloping terrain, the northeastern and northwestern portions of the area are still rated as high in landslide susceptibility. To the northwestern side of purok center is an active landslide with moderate depth. The area is mainly used as agricultural zone with some portion as dumping site. The southern area has rolling topography which is considered as relatively safe for deep landslides.</p> <p>Recommendations: If the area will be developed as residential site, proper engineering mitigating measures must be done. Observe for and/or monitor for presence of mass movement and report to the municipal authorities (e.g., landslides, cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the municipal authorities.</p>
<p>Purok 2 (GPS reading: N 7° 33' 54.2"/E 125° 57' 31.2")</p>	<p>Moderate to High</p>	<p>Small landslides were reported to the eastern and southwestern side of the purok center. Generally, the whole purok has rolling topography underlain by weathered clastic rocks.</p> <p>Recommendations: Areas of steep slopes are recommended to be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor</p>

		for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Barangay Magsaysay		
Purok 4 along highway to Montevista (GPS reading: N 7° 38' 52.6"/E 125° 58' 48.1")	High	<p>The east-facing slopes in Purok 4 as seen from the highway have moderate slope gradient and convex shape. Some portions have cuts which were reported to be old excavation sites. These excavations have exposed steeper unstable slopes that are not suitable for settlement.</p> <p>Slope stabilization measures must be implemented along steeply sloping unstable grounds in the purok. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
Purok 1, upslope (GPS reading: N 7° 37' 41.4"/E 125° 58' 00.6")	Very High	<p>Situated upslope of Purok 1 is a quarry site for limestone where steep to very steep unstable slopes are exposed. Several rotational and translational slides were observed in the area. A recent rotational slide was noted to be about 15-20 m wide and 3 to 5 m deep. This part of the purok bounded by steep slopes is highly susceptible to landslides and other types of mass movement thus daunting settlements within the area.</p> <p>Slope stabilization measures must be implemented along steeply sloping unstable grounds in the purok. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g.</p>

		signages).
Purok 6, upslope (GPS reading: N 7° 39' 33.4"/E 125° 58' 39.1");	Very High	<p>This portion of the purok is bounded on the western side by steep slopes which are highly prone to landslide. A rotational slide about 5 to 8m wide was observed in the vicinity.</p> <p>Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
Eastern slopes bounding purok center 9 (GPS reading: N 7° 37' 59.6"/E 125° 58' 12.7");	Very High	<p>An old rotational landslide was observed on the eastern slopes bounding the purok. It outlines a u-shaped escarpment and the detached earth and debris were now vegetated. Further east of these old slide is an active rockslide site along a steeply sloping ridge. All slopes bounding the purok are relatively steep.</p> <p>Settlement at the base of these slopes should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>

<p>northeaster slopes bounding purok center 10 sited from Purok 4 (GPS reading: N 7° 39' 09.2"/E 125° 58' 34.2")</p>	<p>Very High</p>	<p>Along the northeastern slopes of Purok 10 are several active translational and rotational slides. Gullies produce debris accumulation zones at the foot of the slopes. Settlements on these areas are highly discouraged.</p> <p>The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
<p>Western slopes bounding Purok 5 (GPS reading: N 7° 39' 33.4"/E 125° 58' 39.1");Purok 13 ; Purok 14; Purok 15;</p>	<p>High</p>	<p>Along the western slopes bounding these puroks are several translational, wedge and rotational landslides which makes these portions of the purok highly susceptible to landslides and other types of mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
<p>Barangay New Sibonga</p>		
<p>Boundary of Purok 6 (GPS reading: N 07° 34' 00.2"/ E 125° 54' 30.2")</p>	<p>High</p>	<p>Two residential houses situated at the foot of the steep slope which is made up of loosely compacted soil materials are at risk, escarpments are visible on the said area, thus rating it with high susceptibility to landslide.</p> <p>Recommendation:</p> <p>Avoid settlement at the foot slope.</p>

<p>Purok 8 (GPS reading: N 07° 32' 57.6"/ E 125° 56' 39.3")</p>	<p>Moderate</p>	<p>Characterized by moderate slope gradient with gently rolling hills. Displaced road surface had also been noted in the area.</p> <p>Recommendation:</p> <p>Settlement at the edge of the ridge and foot slope must be discouraged.</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
<p>Barangay Mainit</p>		
<p>Upper Inupuan (Purok 15) (GPS reading: N 7° 29' 11.9"/E 126° 01' 51.0")</p>	<p>Very High/Critical</p>	<p>A major landslide was observed on a slope fronting the valley of the river where there are tunneling activities. The valley slopes of the river has very high susceptibility to landslide The area is also prone to debris flow especially the houses along river banks. The mining activity should be monitored constantly. Tunneling should be stopped on areas with landslide occurrences. The river is prone to landslide damming.</p> <p>Recommendations:</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Relocation/evacuation of houses along steep slopes..</p>
<p>Purok 17 (GPS reading: N 7° 30' 44.9"/E 125° 59' 40.1")</p>	<p>Moderate</p>	<p>Recommendations:</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further</p>

		saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 12 (Damsite) (GPS reading: N 7° 29' 30.4"/E 126° 01' 10.4")	High	<p>The purok site is prone to rock fall. The site is bounded by steep slopes on the west and river on the east. Boulders of rock were observed along the footslopes manifesting rock fall in the area.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of housing along footslopes and riverbanks.</p>
Purok 11 (GPS reading: N 7° 31' 5.9"/E 126° 00' 55.4")	Low	<p>The area is characterized by flat to gently sloping area. The purok site was newly transferred after the old site was devastated by typhoon Pablo. Several gold processing plant were constructed in the area.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
Barangay Matilo		
Purok 7, purok center (GPS reading: N 7° 32' 11.9"/E 126° 03' 13.1")	Moderate	<p>The purok has generally rolling to hilly topography. The purok is bounded by moderately inclined slopes on its southeastern and southwestern sides. These areas have moderate susceptibility to landslide and mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further</p>

	High	<p>saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p> <p>Further southwest of the purok are steeper slopes which have higher susceptibility to landslide as evidenced by terracetes observed atop the hills.</p> <p>Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
Purok 6, purok center (GPS reading: N 7° 32' 11.9"/E 126° 03' 13.1")	Low	<p>The purok center and neighboring regions are positioned in a generally mildly sloping topography making it less susceptible to landslide as well as flooding.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks).</p>
Barangay Mipangi		
Purok 6 (GPS reading: N 7° 32' 36.6"/E 125° 54' 13.1")	High	<p>The area is situated on steep slopes underlain by coralline limestone. Active translational landslides are observed on the northern to northwestern slopes of the purok. Though, most of these areas are utilized as agricultural lands. Avoid settlement on edges slopes and along foot slopes that are affected by landslides.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road</p>

		surfaces and report to MGB/municipal authorities.
Purok 5 (GPS reading: N 7° 32' 51.5"/E 125° 53' 22.1")	High	<p>Several active rotational and translational landslides are present on the slopes of Purok 5. Southwestern to northwestern slopes of the area have high susceptibility to landslides. Avoid settlement on edges of steep slopes as tension cracks and landslide scarps tend to develop on these areas. Buildups along the foot of steep slopes should also be discouraged. Buffer zones may be allotted from the toe of slides/and or steep slopes.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.</p>
Barangay Poblacion		
Purok 17 (GPS reading: N 07° 36' 31.3"/E 125° 57' 36.7")	High	<p>West portion of Purok 17, Brgy Poblacion is bounded by steep slope composed of moderately weathered rocks. Two residential houses fronting to the slope and the Purok house 10 meters away are at risk to rock fall and slide active landslides along the road leading to Purok 6 were also noted.</p> <p>Recommendations:</p> <p>Settlement at the edge of the ridge and foot slope must be discouraged.</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard

		situation.
Barangay San Isidro		
<p>San Isidro Brgy. Hall (GPS reading: N 7° 37' 23.9"/E 125° 56' 27.5")</p> <p>Purok 6 (GPS reading: N 7° 37' 20.3"/E 125° 56' 21.6")</p> <p>Purok 2 (GPS reading: N 7° 37' 17.7"/E 125° 56' 28.1")</p>	Moderate to High	<p>Generally, Purok 6 and 2 Centers including San Isidro Brgy. Hall are situated on a moderately sloping ridges. The whole area is bounded by creeks to its southern and northwestern side. Active landslides adjacent to the creek were noted to the south of Purok 2. Majority of the area is underlain by clastic rocks with patches of limestone. The eastern zone of brgy hall is considered to be relatively safe to landslide compared to other areas.</p> <p>Recommendations: Settlement at the edges of the steep slopes should be discouraged. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 3 (GPS reading: N 7° 37' 33.7"/E 125° 56' 27")</p>	Moderate to High	<p>The Purok 3 Center is also located on a ridge to the north of Brgy. Hall. The western side of the area has minute tributaries adjacent to steep slopes. These slopes are underlain by highly weathered clastic rocks that produced local landslides.</p> <p>Recommendations: The steep areas must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 5 (GPS reading: N 7° 37' 20.3"/E 125° 56' 21.6")</p>	High	<p>Purok 5 is also underlain by highly weathered clastic rocks. The purok center is sandwiched by two creeks to its western and eastern side. During extreme rain/typhoon, these creeks induce active</p>

		<p>landslides parallel to the steep sloping terrain. Wide landslides were noted to the west of Purok 5.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g., landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the municipal authorities. The steep areas must be maintained for agricultural purposes only.</p>
<p>Purok 1 (GPS reading: N 7° 38' 14.7"/E 125° 56' 43.2")</p>	<p>High</p>	<p>The purok center is situated on a steep slope underlain by limestone and clastic rocks. To the southeastern side of the purok center is an active landslide affecting the agricultural areas. The eastern portion of the purok has active creek that drains southwest. This creek also generates localized landslides on steep slopes during heavy rain/ typhoon. Other reported landslides are concentrated to the southwestern area where steep slopes and gullies coincide.</p> <p>Recommendations: The steep areas must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 4 (GPS reading: N 7° 38' 14.7"/E 125° 56' 43.2")</p>	<p>High</p>	<p>The purok center is bounded by several translational and wedge landslides to its north, northeast and south sides. The rocks in the vicinity are noted as highly weathered sandstone and conglomerate with patches of limestone. A creek adjacent to steep slopes increases the landslide susceptibility to the eastern portion of the purok.</p> <p>Recommendations: In case of heavy rain or typhoon, households on steep slopes must be transferred to a moderately sloping terrain</p>

		to the western side of the purok center. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Barangay San Roque (Brgy. Hall GPS reading: N 07° 35' 43.8"/E 125° 57' 8.2")		
Purok 1 Center (N 07° 35' 43.8"/E 125° 57' 8.2")	Moderate	<p>Purok 1 is situated beside the national highway. Characterized by gentle and rolling terrain. It was observed with moderate susceptibility to landslide during the inspection.</p> <p>Recommendation:</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
Purok 1-A Center (GPS reading: N 07° 35' 45.4"/E 125° 57' 45.4")	Moderate	<p>As it lies just a few meters from Purok 1, purok 1-A has geological and geomorphological conditions similar with Purok1. It was observed with moderate susceptibility to landslide during the inspection.</p> <p>Recommendation:</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities.

		<ul style="list-style-type: none"> -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
<p>Purok 2 Center (GPS reading: N 07° 36' 20.1/ E 125° 57' 00.2")</p>	High	<p>Purok 2 is characterized by steep slope gradient composed of highly weathered rocks which were deemed to be inherently weak rocks thus rating it with high susceptibility to landslide.</p> <p>Recommendation:</p> <p>Settlement at the edge of the ridge and foot slope must be discouraged.</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
<p>Purok 3 Center (GPS reading: N 07° 35' 40.4"/ E 125° 57' 08.8")</p>	Moderate	<p>Purok 3 has moderate susceptibility to landslide.</p> <p>Recommendation:</p> <p>Settlement at the edge of the ridge and foot slope must be discouraged.</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.

<p>Purok 4 Center (GPS reading: N 07° 36' 27.9"/ E 125° 57' 27.7")</p>	<p>High</p>	<p>Purok 2 is characterized by steep slope gradient composed of highly weathered rocks which are deemed to be inherently weak rocks thus rating it with high susceptibility to landslide.</p> <p>Recommendation:</p> <p>Settlement at the edge of the ridge and foot slope must be discouraged.</p> <ul style="list-style-type: none"> -Observe for and/or monitor for the presence of mass movement (e.g. landslide, tension cracks). Report situation to MGB office and the municipal/city authorities. -Observe for saturated ground/seeps and sunken or displaced road surfaces. Report situation to MGB office and the municipality/city authorities. -Develop an early warning device (e.g. signage) (for critical areas only) -Constant communication and updates with the barangay officials on geohazard situation.
<p>Barangay San Vicente</p>		
<p>Purok 1 (GPS reading: N 7° 33' 39.8"/E 125° 58' 33.5")</p>	<p>Low</p>	<p>Flat to gently undulating terrain characterize the topography of the area. Northern and western portions are utilized as rice fields, while the southern gently sloping hills have low susceptibility to landslides.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.</p>
<p>Purok 3 (GPS reading: N 7° 33' 47.8"/E 125° 58' 58.4")</p>	<p>Low</p>	<p>Most of the residential areas are located on flat to low-lying slopes. The northeastern slopes bounding the purok have low susceptibility to landslides.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal</p>

		authorities.
Barangay Sasa		
Purok 2 (GPS reading: N 7° 33' 54.2"/E 125° 57' 31.2")	Moderate High	to The purok center is situated on a rolling topography underlain by highly weathered clastic rocks. There were recorded landslides to southern part of purok center affecting the agricultural areas. These landslides are due to the unconsolidated clastic rocks placed on steep slopes. The unconsolidated sedimentary deposits were easily washed away during Typhoon Pablo. Recommendations: Settlement at the edge of the steep slopes should be discouraged. Lands on steep slopes may be utilized for non-residential purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 3 (GPS reading: N 7°34' 44.9"/E 125° 57' 16")	Moderate High	to The purok center is located on the moderately sloping terrain. Generally, the area is also underlain by highly weathered conglomerate and sandstone that resulted to several landslides to the southwestern part of purok center. Mass movements extremely damaged the agricultural areas situated on steep slopes. Recommendations: Settlements on steep slopes at the southwestern part of purok center are highly discouraged. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Purok 4 (GPS reading: N 7° 34' 47.9"/E 125°	Moderate High	to Though the purok center is on a gently sloping terrain, majority of the southern areas are still considered as highly

57' 37.5")		<p>susceptible to landslide. Zones of steep slopes along the road connecting Purok 4 and Brgy. Hall have high susceptibility to landslide. The southern and southeastern portions of the purok center also have reported active landslides. The vicinity is underlain by highly weathered clastic rocks too.</p> <p>Recommendations: The steep slopes must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
<p>Purok 1 (GPS reading: N 7° 34' 11.5"/E 125° 57' 27")</p>	Moderate	<p>Purok 1 Center is located near to Brgy. Hall. Weathered clastic rocks have underlain the entire area. To the east side of purok center are steep slopes resulting to minute mass movements. In general, the purok center is on relatively good location due the area's rolling topography.</p> <p>Recommendations: The steep slopes must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.</p>
Barangay Tagnocon		
<p>Purok 3 (GPS reading: N 7° 30' 51.5"/E 126° 2' 18.7")</p>	Low	<p>Flat to gently sloping terrain characterize the site. The area is elevated and has no flooding incident. No landslide were observed in the area.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further</p>

		saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 2 (GPS reading: N 7° 30' 52.5"/E 126° 2' 16.6")	Low	Flat to gently sloping area with no observed landslides. Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 4 (GPS reading: N 7° 31' 34.3"/E 126° 01' 50.4")	Low	Flat to gently sloping area with no observed landslides. Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 1 (GPS reading: N 7° 30' 50.4"/E 126° 02' 8.2")	Low	Flat to gently sloping area with no observed landslides Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Purok 6 (GPS reading: N 7° 30' 46.2"/E 126° 02' 82.7")	Low	Flat to gently sloping area with no observed landslides Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides,

		tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).
Lower Inupuan (Purok 7) (GPS reading: N 7° 30' 5.8"/E 126° 01' 51.0")	High	<p>The site was located along unstable slopes with observed landslide escarpment. Bulging and creeping movement were noticeable along the slopes where five houses are erected.. Relocation/evacuation for residents (lugas, sinsano, viore, dumagnao) is recommended. The area is also prone to debris flow due to mining activity. River (inupuan river) is silted with muck ore.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. For relocation/evacuation for residents seven houses (lugas, sinsano, viore, dumagnao). The area is also prone to debris flow due to mining activity. River (inupuan river) is silted with muck ore.</p>

Table 4. Results of Flood Hazard Assessment

Location	Flood Susceptibility Rating	Remarks/ Recommendations
Barangay Anislagan		
Anislagan Brgy. Hall ((GPS reading: N 7° 32' 14.9"/E 126° 0' 40.5")	Moderate to Low	Vicinity of purok and Barangay Hall has low susceptibility to flooding due to its flat topography. Agricultural areas, covered by banana plantation, are prone to moderate flooding.

Purok 1 (GPS reading: N 7° 32' 17.2"/E 126° 1' 12.1")	High	Overflowing of the nearby Manat River can inundate the area during typhoon and extreme heavy rainfall.
Purok 3 (GPS reading: N 7° 32' 13.0"/E 126° 0' 34.4")	Moderate to Low	Due to its flat terrain, this purok has low susceptibility to flooding. Agricultural areas are prone to moderate flooding.
Purok 4 (GPS reading: N 7° 32' 39.0"/E 126° 0' 33.8")	Moderate to Low	Similar to other purok, it has low susceptibility to flooding. Other portions such as agricultural lands, has moderate susceptibility to flooding.
Barangay Antequera		
Purok 1-A Center (GPS reading: N 07° 35' 09.3"/ E 126° 00' 26.6")	Low	A 2.5m creek bounding Southeast of Purok 1-A causes an ankle depth flood when it overflows during excessive precipitation. Recommendation: Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 2 Center (GPS reading: N 07° 34' 28.0"/ E 126° 00' 26.1")	Low	No significant flood report in the area. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 3 Center (GPS reading: N 07° 34' 54.1"/ E 126° 00' 09.1")	Low	Portion of purok 3 towards south experienced creek overflow last typhoon Pablo. An ankle-deep flood was reported and drained in three (3) hours. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 4 Center (GPS reading: N 07° 35' 31.4"/ E 126° 00' 40.7")	Moderate	Depressed area of Purok acts as catch basin of water of up to 0.8m high emanating from a nearby creek. Water subsides within hours after the rain.

		<p>Recommendation:</p> <p>Settlement along the creek is highly discouraged. Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 5 Center (GPS reading: N 07° 35' 25.8"/ E 126° 00' 36.0")</p>	<p>Low</p>	<p>No significant flood report in the area.</p> <p>Recommendation:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 6 Center (GPS reading: N 07° 35' 10.8"/ E 126° 00' 46.2")</p>	<p>Moderate</p>	<p>A 0.6m flood was reported to inundate lowlands of the Purok. A nearby 2m-3m wide creek made the area moderately susceptible to flood. Water subsided within hours after the rain.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 7 Center (GPS reading: N 07° 35' 07.7"/ E 126° 00' 32.3")</p>	<p>Low</p>	<p>No significant flood report in the area.</p> <p>Recommendation:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 8 Center (GPS reading: N 07° 34' 55.3"/ E 126° 00' 17.8")</p>	<p>Moderate</p>	<p>A meter-wide creek resulted to 0.8m flood to low portions of Purok 8 last typhoon Pablo.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Barangay Basak</p>		

<p>Purok 1 N 7° 36' 26.9" E 126° 0' 36.1"</p> <p>Center: N 7° 36' 19.7" E 126° 0' 17.9"</p>	<p>High</p> <p>Moderate</p>	<p>Masulog Creek is a north-northwest creek traversing portions of Brgy. Basak. High rate of siltation decreases the depth of the channel. This condition decreases water capacity of the channel which caused severe flooding along its banks last December 2012. Flood height along the banks is more than 1.0 m.</p> <p>Vicinity of purok and Barangay Hall has moderate susceptibility to flooding. Purok center has experienced 0.5 m flooding.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.</p> <p>Restrict residential settlements along the banks of Masulog Creek. Regular desilting of the creek should be done.</p>
<p>Purok 2 N 7° 36' 22.3" E 126° 1' 12.6"</p> <p>N 7° 36' 27.0" E 126° 0' 554.2"</p>	<p>Very High</p> <p>High</p>	<p>Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. High sedimentation rate in the stream bed resulted to heavily silted channel. This condition decreases water capacity of the channel and will bring severe flood. River bank erosion has been observed along the river channel.</p> <p>A north-northeast flowing tributary transects portion of Purok 2 and causes flooding in the area. Flood height could reach up to 1.2 m and persisted for 48 hours.</p> <p>Construction of dike along the banks of Manat River to avoid further erosion should be carefully studied by municipal engineers. Desilting of the river should be done to increase stream depth and lessen the affected areas of flood during typhoon.</p> <p>Residents along river channel and creek should be evacuated during typhoon. Proceed to relocation if necessary especially, those who reside along Manat River.</p>

<p>Purok 4 N 7° 36' 24.6" E 126° 59' 59.1"</p>	<p>Very High</p> <p>High</p>	<p>Cabidianan Creek flows northwest traversing the boundary between Brgy. Basak and Brgy. Pangutosan. River bank erosion was observed along the creek. Flood in the immediate bank is 2.5 – 3.0 m.</p> <p>Community near the Cabidianan Creek experienced 1.0 – 1.5 m flooding which lasted for 72 hours.</p> <p>Habitation along the creek should be prohibited. Mitigating structure such as dike should be constructed to prevent further erosion.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.</p>
<p>Purok 5 N 7° 36' 40.4" E 126° 0' 1.1"</p>	<p>Moderate</p>	<p>Residents of Purok 5 were inundated by 0.5 – 0.75 m flood last December 2012 when Typhoon Pablo hit the province.</p> <p>Early warning device/system (i.e. siren) should be put up in the area. Evacuation of residents should be done during heavy and prolonged rainfall.</p>
<p>Purok 6 N 7° 37' 28.5" E 126° 0' 18.2"</p>	<p>High</p>	<p>Residential and agricultural areas of Purok 6 were able to experience 1.2 m flooding. This was due to the overflowing of drainage canals which suspected to be natural creeks converted into drainage systems.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall. Proper maintenance such as desilting should be spearheaded by the barangay to reduce the effect of flooding as well as the duration of inundation.</p>
<p>Purok 7 N 7° 37' 49.3" E 125° 59' 33.1"</p>	<p>Very High</p>	<p>This area is at the confluence of Cabidianan and Masulog creeks. During Typhoon Pablo, 20 households experienced more than 2.0 m flood. They</p>

<p>Center: N 7° 37' 44.0" E 125° 59' 51.7"</p>	<p>High</p>	<p>reside along the bank of Cabidianan Creek which is continuously undergoing erosion. After these recent typhoon events, stream bed depth decreases due to high siltation rate.</p> <p>The area is highly susceptible to flooding due to its flat topography. Last December 2012 during Typhoon Pablo, residents of Purok 7 experienced 1.5 m flooding for a week.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.</p> <p>Habitation along the creek should be prohibited. Relocation of 20 household at the confluence of two channels should be prioritized by the government. Mitigating structure such as dike should be constructed to prevent further erosion.</p>
<p>Purok 3 N 7° 38' 12.4" E 126° 0' 48.0"</p> <p>Center: N 7° 37' 48.1" E 126° 0' 14.5"</p>	<p>Very High</p> <p>High</p>	<p>Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. High sedimentation rate in the stream bed resulted to heavily silted channel. This condition decreases water capacity of the channel and will bring severe flood. River bank erosion has been observed along the river channel. Flood height in the immediate banks is 2.0 – 3.5 m.</p> <p>Natural creeks in the area were converted into drainage/irrigation canals. Overflowing of waters from these canals resulted to severe flooding in the area.</p> <p>Construction of dike along the banks of Manat River to avoid further erosion should be carefully studied by municipal engineers. Desilting of the river should be done to increase stream depth and lessen the affected areas of flood during typhoon.</p> <p>Residents along river channel should be evacuated during typhoon. Proceed to</p>

		relocation if necessary especially, those who reside along Manat River.
Barangay Bukal		
Purok 14 Center: N 7° 27' 44.1" E 126° 2' 41.6"	Very High	<p>This area is located in a constricted V-shaped valley parallel to the course of Manat River. This V-shaped valley also serves as the floodplain of the upstream Manat River. Stream bed is composed of pebble, cobbles and boulder-sized sediments. Residential areas reside on the banks of Manat River that are unstable due to river erosion. These banks are also underlain by fluvial deposits suggesting that those areas are part of the river channel. Flood height in this area is 1.6 m.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 6 Center: N 7° 27' 47.1" E 126° 2' 40.0"	Very High	<p>Similar to other purok, this area reside along Manat River. This is highly susceptible to flashflooding due to its constricted channel and high elevated. This area is possible debris flow path suggested by the presence of large boulders in the area.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 13 Center: N 7° 28' 0.5" E 126° 2' 36.0"	High	<p>Even if the present elevation is higher than the stream, its susceptibility to flashflooding is high due to presence of old debris deposits in the area.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
Purok 10 Center:	Very High	Geomorphologic setting of this area is similar to other puroks. It is situated along

<p>N 7° 28' 12.8" E 126° 2' 31.2"</p>		<p>the Manat River which makes it susceptible to flashflooding. River bank erosion is present revealing that the whole purok is underlain by old fluvial deposits. This suggests that the area is unstable since it is part of the river system.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 12 Center: N 7° 28' 17.5" E 126° 2' 24.3"</p>	<p>Very High</p>	<p>Similar to other purok, this area reside along Manat River. This is highly susceptible to flashflooding due to its constricted channel and high elevated. This area is possible debris flow path suggested by the presence of large boulders in the area.</p> <p>Some of the houses are settled in river terrace in the confluence of a creek and Manat River. River bank erosion resulted to damages on bridges and houses these recent typhoon events.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 5 Center: N 7° 28' 16.8" E 126° 2' 23.9"</p>	<p>Very High</p>	<p>Purok 5 is situated along the Manat River which makes it susceptible to flashflooding. River bank erosion is present revealing that the whole purok is underlain by old fluvial deposits. These unstable deposits are manifestations that those areas are part of the dynamic river system. River channel is continually encroaching in present residential areas of the purok.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 4 Center: N 7° 28' 27.3" E 126° 2' 14.1"</p>	<p>Very High</p>	<p>Manat River is located in eastern side of the purok. This area is unstable due to river bank erosion. It is highly susceptible to flashflooding.</p>

		<p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 15 Center: N 7° 28' 33.0" E 126° 2' 6.8"</p>	<p>Very High</p>	<p>Similar to other puroks, this area is prone to flashflooding due to its location along the constricted valley and distance with Manat River. River bank erosion poses great danger in residents along the banks during flashflood.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 1 Center: N 7° 28' 45.8" E 126° 2' 0.4"</p>	<p>Very High</p>	<p>This area is located in a constricted V-shaped valley parallel to the course of Manat River. Residential areas reside on the banks of Manat River that are unstable due to river erosion. A flashflood occurred last December 2012 with flood height of 1.7 – 2.0 m which lasted for 5 – 6 hours.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 2 Center: N 7° 28' 51.4" E 126° 1' 51.6"</p>	<p>Very High</p>	<p>Along the confluence of a mountain creek and Manat River, boulders are scattered in the area. This manifests that large amount of high energy – waters run along this area that may correspond to a flashflood.</p> <p>This area is not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>
<p>Purok 3 N 7° 29' 6.8" E 126° 1' 33.4"</p>	<p>High</p>	<p>Those areas along the Manat River are highly susceptible to flashflooding and river bank erosion.</p> <p>Areas along the banks of Manat river are not suitable for residential purposes. Relocation of the present residents should be prioritized by the government.</p>

Barangay Cabacungan		
<p>Cabacungan Brgy. Hall (GPS reading: N 7° 34' 12.5"/E 126° 02' 51.9")</p>	<p>Low</p>	<p>Cabacungan Brgy. Hall is flanked by a minute creek to the west and a vigorous creek to the east. The area is inundated of about 0.2- 0.4m during Typhoon Pablo. Floodwaters came from the northern tributary of Purok 3, Brgy. Sto. Niño.</p> <p>Recommendations: Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 2 (GPS reading: N 7° 34' 32"/E 126° 2' 58.7")</p>	<p>High</p>	<p>Purok 2 Hall is adjacent to the north flowing active creek making the low-lying areas highly susceptible to flooding. In average, Purok 2 residents reported 1m flood depth during Typhoon Pablo that receded after a day.</p> <p>Recommendations: Avoid settlement on the banks of creeks. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Purok 5 (GPS reading: N 7° 35'11"/E 126° 2' 42.8")</p>	<p>High</p>	<p>The area is located near to a creek at the northern area of Brgy. Cabacungan. This creek inundates almost the entire expanse of purok 5. When there is a heavy rain/typhoon, the highest recorded flood depth is about 1m and totally receded after 1 day.</p> <p>Recommendations: Evacuate to the western elevated portion in the vicinity of purok 6 in case of heavy rain or typhoon. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Widening and frequent dredging of creek channels may be done to increase the capacity and</p>

		ensure efficient flow of floodwaters during strong typhoons/heavy rains.
<p>Purok 1 (GPS reading: N 7° 34' 06.3"/E 126° 2' 55.1")</p> <p>Purok 3 (GPS reading: N 7° 34' 31.4"/E 126° 2' 48.4")</p>	Moderate	<p>Purok 1 and 3 both received moderate (0.5m) flooding during Typhoon Pablo. Floodwaters drain from north and overflow from the creeks to the east. During Typhoon Pablo, the duration of inundation in lowlands of Purok 5 is 2 days while the flood in Purok 1 receded after 1 day.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Flood protection structures (e.g. dikes riprap) must be constructed in order to lessen overflow of creeks during extreme heavy rains. Settlement along the banks of creek is still discouraged.</p>
<p>Purok 7 (GPS reading: N 7° 34' 16.7"/E 126° 03' 14")</p>	Moderate	<p>The area is covered majority by rice fields submerged for about 0.6m during Typhoon Pablo. The duration of inundation is 1 day draining from the mountainous area of Brgy. Batinao. Other portions including areas along creeks and rice plantation suffer 1m flood depth once heavy rain/typhoon occurs.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Flood protection structures must be constructed in order to lessen overflow of creeks during heavy rains. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
Barangay Cabidanan		
<p>Purok3 (GPS reading: N 7° 33' 50"/E 125° 59' 59.8")</p>	Moderate	<p>Several small creeks traverse the area. These creeks seldom overflow; however, settlement on the banks is still discouraged. Debris along the stream should be cleared so as not to impede the flow of receding floodwaters. Regular declogging of canals</p>

		<p>and creeks may be adopted to alleviate flooding.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community in coordination with the municipal authorities.</p>
<p>Purok 5, near creek (GPS reading: N 7° 33' 39.2"/E 125° 59' 49.3")</p>	Low	<p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 2B (GPS reading: N 7° 34' 15.7"/E 126° 0' 3.4")</p>	Low	<p>Scouring is observed along the banks of creeks that traverse the area. Settlement along these banks is not advisable, unless flood protection structures (e.g. riprap) are built to stabilize the slope.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 4 (San Roque Dam) (GPS reading: N 7° 34' 54.6"/E 125° 59' 51.0")</p>	Moderate	<p>Residents on the lower portions of Purok 4 are critical to flashflood in case of San Roque Dam failure. Intent and careful monitoring of the dam's structures should be done prevent such events. Report to municipal authorities once structures are observed to be unstable (e.g. cracks on walls and posts).</p> <p>Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Identify nearest evacuation site for affected residents.</p>
Barangay Libasan		
<p>Libasan Brgy. Hall (GPS reading: N 7° 34' 4.1"/E 125° 58' 18.8")</p>	Low	<p>The area is relatively far from the active creek to the east rating it as low in flood susceptibility. The eastern side has lower topography that invites moderate to high</p>

		<p>inundation in comparison to the western part with rolling topography. During Typhoon Pablo, the recorded flood height is only 0.1 to 0.2m that totally receded after an hour.</p> <p>Recommendations: Develop an early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 5 (GPS reading: N 7° 35' 36.3"/E 125° 57' 46.3")</p>	<p>High</p>	<p>The purok center and its vicinity are bounded by active creeks draining from the southwest mountainous portion of Poblacion. Majority of the area is rated as high since the spot is noted as the merging point of two active tributaries. During Typhoon Pablo, the flood depth in the area is 1.2m and receded after 1 day.</p> <p>Recommendations: Extend the riprap in the area to address the scouring caused by the active Libasan Creek. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 3 (GPS reading: N 7° 34' 38.8"/E 125° 58' 6.7")</p>	<p>Moderate</p>	<p>The east portion of purok hall is utilized as rice field area. It rated to have moderate to high susceptibility to flooding. The creek that causes the main inundation drains from the southern part of Brgy. Libasan. To the west of purok center is a minute tributary that contributes to the minor sheet flooding in the area. The duration of 0.5m inundation in the area during Typhoon Pablo is more or less 1 day.</p> <p>Recommendations: Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>

<p>Purok 2 (GPS reading: N 7° 33' 7.7"/E 125° 58' 24.4")</p>	<p>Moderate</p>	<p>Though the area is relatively elevated compared to other puroks, it is still rated as moderate due to its nearness to the eastern creek channel. To the southern part of Purok 2 is an artificial dam that controls the water level of the low-lying area. The failure of dam may cause immediate high to critical inundation in the area.</p> <p>Recommendations: Residents must be vigilant during heavy rain/typhoon due to the fact that the dam may be damaged when flashflood occurs to the southern mountainous area. In case of heavy rain/ typhoon, residents are recommended to evacuate/relocate to the western elevated area. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 4 (GPS reading: N 7° 35' 21.5"/E 125° 57' 48.2")</p>	<p>Low to Moderate</p>	<p>Though the purok center has low susceptibility to flooding, the eastern portions including areas along creeks and rice plantation received a maximum flood depth of 1.2(high) during Typhoon Pablo. The northeastward flow of floodwater receded after 1 day in average.</p> <p>Recommendations: In case of heavy rain/ typhoon, residents are recommended to evacuate/relocate to the southwestern elevated area. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Barangay Linda</p>		
<p>Linda Brgy. Hall (GPS reading: N 7° 34' 56.8"/E 125° 56' 00.9")</p>	<p>High</p>	<p>Brgy. Hall and Purok 3 Center are proximate to each other and situated west of the active Linda Creek. The creek has an approximate width of 15m and normal</p>

<p>Purok 3 (GPS reading: N 7° 34' 56.9"/E 125° 56' 1.8")</p>		<p>depth of 3m. During Typhoon Pablo, the bridge connecting the national road and Brgy. Hall was washed away by extreme flood coming from the north. The maximum flood depth recorded within the area is 1.3m that totally receded after 2.5days.</p> <p>Recommendations: In case of heavy rain/ typhoon, residents are recommended to evacuate to the western elevated area of Brgy. Hall. Develop an early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 4 (GPS reading: N 7° 34' 55.5"/E 126° 56' 00")</p>	<p>High to Critical</p>	<p>The purok center was transferred near to the Brgy. Hall due to the devastation brought by critical flooding of Typhoon Pablo. The original location of Purok 4 Center is adjacent to Linda Creek at the western side of national road. The said river is the main cause of inundation with maximum flood depth of 2m that receded after 3 days.</p> <p>Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities. In case of heavy rain/ typhoon, residents are recommended to evacuate to the western elevated area of purok center.</p>
<p>Barangay Mainit</p>		
<p>Purok 8 (GPS reading: N 7° 30' 11.8"/E 126° 01' 00")</p>	<p>Low</p>	<p>Flood depth reaches only at 0.2 meters. The purok site is elevated.</p>
<p>Purok 9 (GPS reading: N 7° 30' 06.1"/E 125° 00' 57.7")</p>	<p>High</p>	<p>Flood reaches 1.2 meters at the purok proper. Flood flows northward parallel to the river. Install proper drainage canal in the area.</p>

Purok 10 (GPS reading: N 7° 29' 57"/E 126° 00' 59.6")	Low	Flood depth reaches only at 0.2 meters. The purok site is elevated
Purok 1 (GPS reading: N 7° 31' 48.5"/E 126° 1' 10.9")	Low	River channel is silted due to the waste materials from the ball mills. Avoid building of houses along river banks. Improve drainage canals in the area to avoid localized flooding.
Purok 2 (GPS reading: N 7° 31' 07.6"/E 126° 01' 06.3")	Low	Flood depth reaches only at 0.2 meters. The purok site is elevated. River is silted due to the mining activity at the upper portion of the river.
Purok 4 (GPS reading: N 7° 30' 47.6"/E 126° 01' 11.5")	Moderate	Flood depth reached 0.5 meters at the purok site. The purok is adjacent to the river. Avoid construction of houses along river banks.
Purok 16 (GPS reading: N 7° 30' 47.9"/E 126° 01' 11.5")	High	Flood depth reaches 1.5 meters at the purok proper. The siltation brought by mining activity aggravated the flooding situation in the area. Construction of dike or desilting of river channel should be done to minimize the effect of flooding in the area.
Purok 5 (GPS reading: N 7° 30' 34.6"/E 126° 01' 16.1")	Moderate	Flood depth reaches 0.5 meter. The purok site is elevated. River is silted due to the mining activity at the upper portion of the river.
Purok 7 (GPS reading: N 7° 30' 28.8"/E 126° 01' 41.9")	Moderate	Flood depth reaches 0.5 meter. The purok site is elevated. River is silted due to the mining activity at the upper portion of the river.
Purok 6 (GPS reading: N 7° 30' 28.8"/E 126° 01' 12.2")	High	. Flood depth reaches 1.2 meters. The purok site is elevated. River is silted and braided due to the mining activity at the upper portion of the river. Avoid construction of houses along river banks.

Barangay Magading		
Purok 1 Center (GPS reading: N 07° 37' 04.0"/ E 126°02'07.6")	Low	Minimal flood report in the area. Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 2 Center N 07°36'58.1" E 126°02'03.7"	Low	Flood report up to knee level. Characterized by flat terrain. Low/depressed area acts as catch basin of water without sufficient waterways to drain surface runoff during heavy rains. Recommendation: Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 3 Center N 07°37'03.9" E 126°02'08.9"	Low	No significant flood report in the area. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 4 Center N 07°37'04.4" E 126°02'07.9"	Low	No significant flood report in the area. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 5 Center N 07°37'54.4" E 126°01'22.1"	Moderate	Residents experienced waist level flood last typhoon Pablo. Stagnant water in the rice fields and inadequate drainage systems contributed to such flood height. Recommendation: Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.

<p>Purok 6</p> <p>Center N 07°37'33.9" E 126°01'27.1"</p>	<p>Very high</p>	<p>Within the rice field areas, flood height reported reached up to 2m or greater. Manat River overflow caused the extreme flooding, having a very high susceptibility to flooding of the purok.</p> <p>Recommendation:</p> <p>Dredging of Manat River is highly suggested.</p> <p>Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 7</p> <p>Center N 07°36'35.9" E 126°01'53.9"</p>	<p>Low</p>	<p>Reported knee level flood during the height of typhoon Pablo. Clogged drainage system was the main reason pointed out hampering water flow and caused flood.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 8</p> <p>Center N 07°38'14.5" E 126°01'17.1"</p>	<p>Very high</p>	<p>Within the rice field areas, flood height reported reached up to 1m. Manat River overflow caused the extreme flooding, having a very high susceptibility of flood to the Purok.</p> <p>Recommendation:</p> <p>Dredging of Manat River is highly suggested.</p> <p>Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek</p>

		water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.
Purok 9 Center N 07°36'24.2" E 126°01'23.0"	Very high	The location of Purok 9 makes it very highly susceptible to flooding caused by the overflow of Manat River. Recommendations: Settlement along river banks is highly discourage thus relocation of affected residents must be persisted. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/river should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.
Purok 11 Center N 07°37'05.4" E 126°01'47.8"	Low	Stagnation of water up to 0.1m during heavy rains was the only reported flooding in the area. This may due to the oversaturation of soil materials during heavy downpours. The 17 vacant lots in the purok were also proposed to be the relocation area for those families living proximal to Manat River. Recommendation: Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff. Backfilling up to 1 meter is also an option to elevate the area.
Barangay Magsaysay		
Purok 8, purok center (GPS reading: N 7° 38' 54.8"/E 126° 00' 5.8"); across Manat River (GPS reading: N 7° 38'	Very High / High	The purok center is situated in the natural floodplains of Manat River thus is consequently highly susceptible to flooding. A huge portion of the purok encompasses rice plantations and palm tree farms where majority is still submerged to floodwater after being hit by typhoon Pablo. Areas

<p>54.8"/E 126° 00' 5.8")</p>		<p>adjacent to Manat River may experience critical flood levels of about 3 m. Settlement along these areas is highly discouraged.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Flood mitigating structures must be constructed along the banks of the river to prevent further inundation during extremely heavy rains.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 7, purok center (GPS reading: N 7° 38' 24.6"/E 126° 00' 01.3")</p> <p>Along Manat River (GPS reading: N 7° 38' 37.8"/E 125° 59' 26.1")</p>	<p>Moderate</p> <p>Very High</p>	<p>The purok center and neighboring areas have moderate susceptibility to floods. They would likely experience 0.5 to 1 m flood levels during excessive downpours and typhoons.</p> <p>Ensure proper maintenance of all drainage canals/outlets within the vicinity of affected areas. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p> <p>Within the purok are rice plantations, coconut and palm tree farms which are relatively lower-lying than the purok center. These areas are highly susceptible to flood particularly portions that are immediately adjacent to the river which are critically prone to flooding.</p> <p>Residents are advised to be on alert for bank erosion/river undercutting and flashflood especially during intense rainfall. Activate BDCC. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Flood mitigating structures must be constructed along the banks of the river to prevent further inundation during extremely heavy rains. Develop early warning device/system. Organize emergency evacuation protocols</p>

		in the community together with municipal authorities.
Along Manat River crossing Purok 4(GPS reading: N 7° 38' 37.8"/E 125° 59' 26.1")	Very High	<p>Manat River goes across Purok 4 critically inundating neighboring regions and low-lying areas in the purok. This includes residences, rice plantations, coconut, lemon, and palm tree farms which receives >2m flood levels during typhoons and extremely heavy rains.</p> <p>Residents are advised to be on alert for bank erosion/river undercutting and flashflood especially during intense rainfall. Activate BDCC. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Flood mitigating structures must be constructed along the banks of the river to prevent further inundation during extremely heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
Headwaters of Manat River transecting Purok 1 (GPS reading: N 7° 37' 41.4"/E 125° 58' 00.6")	Very High	<p>A new river channel has emerged in Purok 1 during typhoon Pablo to accommodate water approaching from the uplands. A sudden increase in water levels was reported to occur during the typhoon indicating a flashflood event that has quickly inundated areas downslope. Huge amount of sediments were transported downstream thus shallowing the channel.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 11, debris flow path (GPS reading: N 7° 37' 10.3"/E 125° 58' 02.1")</p>	<p>Very High</p>	<p>Water of critical level rushed downhill the steeply sloping grounds bounding purok 11 during typhoon Pablo. This flow path taken by floodwater has deposited pebble to cobble-sized sediments at the foot of the slopes. This area is highly susceptible to flashfloods during excessive downpours and typhoons. Settlement near and along the flow path must be avoided.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Creek across Purok 13 – spillway entry (GPS reading: N 7° 39' 06.2"/E 125° 58' 50.3")</p>	<p>High</p>	<p>The creek which serves as spillway for water from the irrigation dam in Purok 4 is severely flooded during excessive rainfall and typhoons.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Flood mitigating structures must be constructed along the banks of the river to prevent further inundation during extremely heavy rains. However, settlement along the banks of the creek is highly discouraged.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Along a tributary creek of Manat River in Purok 5 (GPS reading: N 7° 39' 24"/E 125° 58' 52.8")</p>	<p>High</p>	<p>The tributary creek of Manat River transecting Purok 5 has created high floods of about 1.8m in heights in its immediate vicinity during typhoon Pablo. This makes the area highly susceptible to floods during excessive rains as well as typhoons. Settlement near and along the creek is highly discouraged.</p> <p>Develop early warning device/system.</p>

		<p>Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Flood mitigating structures must be constructed along the banks of the river to prevent further inundation during extremely heavy rains.</p>
<p>Purok 6, purok Center (GPS reading: N 7° 39' 34.5"/E 125° 58' 55.1")</p>	<p>Moderate</p>	<p>Water emanating from Casangay Creek bounding Barangay Magsaysay and Linoan moderately inundates the center of Purok 6 during extremely heavy rains and typhoons such as the recent typhoon Pablo.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Avoid settlement along banks of rivers unless flood structures are built.</p>
<p>Debris flow path bounded by Northwestern slopes of Purok 9 (GPS reading: N 7° 39' 34.5"/E 125° 58' 55.1")</p>	<p>Very High</p>	<p>A new debris flow path has emerged upslope of Purok 9 during typhoon Pablo. What's left of the channel is an approximately 1m thick deposit of sand to boulder-sized sediments carried by the brisk floodwater from upslope brought by excessive rains of typhoon Pablo. This site in the Purok is critically susceptible to flashfloods thus settlement in these areas must be avoided.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the river and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>

Barangay Manat		
<p>Purok 1, purok center (GPS reading: N 7° 32' 58.8"/E 126° 01' 23.9")</p>	<p>Low</p>	<p>The purok center and immediate vicinity are likely to experience low floods of about 0.2 to 0.5 m during heavy rainfall and typhoons. Water is usually derived from surface runoff which can no longer be accommodated by clogged drainages.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Purok 9, purok center (GPS reading: N 7° 32' 38.3"/E 126° 01' 17.3")</p>	<p>Low to moderate</p>	<p>The purok center lies on a relatively elevated terrain thus receives low floods of about 0.1 to 0.5m high during excessive downpours and typhoons. Water typically comes from surface runoff which fails to drain along canals and waterways.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Along banks of Manat River (GPS reading: N 7° 32' 30.1"/E 126° 01' 22.2")</p>	<p>High to very high</p>	<p>Manat River traverses the purok on the southwestern region. This portion of the purok adjacent to the river is highly susceptible to sheet flooding during extensive rainfall and typhoons. Water from the river overflows and highly inundates neighboring regions including residences on the other side of the river belonging to Purok 4. It is evident that the channel's size has increased and the course of the river has changed and widened during typhoon Pablo. River scouring along its banks are also active.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged. Frequent dredging of river channels may be done to increase the capacity of the river and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early</p>

		<p>warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 2, purok center (GPS reading: N 7° 33' 35.4"/E 126° 01' 05.8")</p>	Low	<p>The purok is prone to low floods of 0.2 to 0.5m during typhoons and extremely heavy downpours. Flooding is frequently due to clogged drainages and canals in the area.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Purok 3, purok center, near Maan Creek (GPS reading: N 7° 32' 52.7"/E 126° 00' 53.5")</p>	High	<p>Maan Creek traversing the purok inundates the area during seasons of heavy downpours and typhoons. Flooding in regions immediately adjacent to creek may experience 1 to 2 m high floods. Settlement along the creek must be discouraged.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 6, purok center (GPS reading: N 7° 32' 58.6"/E 126° 01' 17.2")</p>	Low	<p>The entire purok has low susceptibility to flooding during extensive downpours and typhoons as it sits relatively elevated than other bordering puroks.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Purok 8, purok center (GPS reading: N 7° 33' 08.2"/E 126° 01' 25.3")</p>	Moderate	<p>Manat River passes through the area draining northwest into the Agusan River. This meandering stream channel overflows to its surrounding flatlands. Areas along the river are prone to sheet flooding and are also a possible debris flow path.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so</p>

<p>Part of the purok near Manat River (GPS reading: N 7° 33' 12.3"/E 126° 01' 33.3")</p>	<p>High</p>	<p>that there will be more passages for the receding floodwaters.</p> <p>In purok 8, some sections of the north-flowing Manat River's banks have exceedingly eroded and the river's bed has leveled the floor of bank. Water from the river therefore easily flows and inundates neighboring regions of the purok during extremely heavy rains. Settlement near and along the banks of Manat River is highly discouraged.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 7, purok center (GPS reading: N 7° 32' 56.8"/E 126° 01' 31.5")</p>	<p>High</p>	<p>The purok is situated fairly in the vicinity of the north-flowing Manat River making the purok center and its immediate locality prone to high floods during extremely heavy rains and typhoons. Roughly 50 households were reportedly highly flooded during typhoon Pablo.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. Frequent dredging of river channels may be done to increase the capacity of the river. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 4, purok center (GPS reading: N 7° 33' 18.2"/E 126° 01' 42.2")</p>	<p>Low</p>	<p>The purok center is positioned fairly elevated than other portions of the purok. Floodwater usually comes from surface runoff which fails to drain along drainage canals and waterways.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>

<p>Along banks of Manat River transecting Purok 4 (GPS reading: N 7° 32' 59"/E 126° 01' 36.5")</p>	<p>High</p>	<p>Areas immediately adjacent to Manat River in the purok are susceptible to high to critical flood levels. Active river scouring along banks of Manat River has been noted in this portion of the Purok. In effect, a section of the road bound to Purok 4 center has collapsed. Settlement in areas proximal to Manat River must not be encouraged.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. Frequent dredging of river channels may be done to increase the capacity of the river. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 5, purok center (GPS reading: N 7° 34' 02.0"/E 126° 02' 01.1")</p>	<p>Low</p>	<p>The purok encompassing by and large of coconut and banana plantations is prone to low floods of about 0.3 to 0.5 m high during typhoons and excessive rainfall. Flooding is being attributed to lack of drainages and canals to accommodate water from surface runoff.</p> <p>Improve and maintain drainage canals. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Barangay Matilo</p>		
<p>Purok 4, purok center (GPS reading: N 7° 32' 41.1"/E 126° 02' 21.9")</p>	<p>Low to Moderate</p>	<p>Flooding in this area of the purok is attributed to the overflow of water from a nearby canal which cannot hold enough water during excessive downpours and typhoons. Flood level reaches 0.7 to 1m in regions immediately adjacent to the canal and tapers moving away from the canal.</p> <p>Frequent declogging of canals may be done to ensure efficiency flow of water. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>

<p>Purok 2, purok center (GPS reading: N 7° 32' 54.9"/E 126° 01' 53.7")</p>	<p>Low</p>	<p>Flooding of 0.1 to 0.2 m high is experienced in Purok 2 during episodes of continuous heavy downpours and typhoons. Floodwater is typically derived from surface runoff which cannot be lodged through drainage canals and waterways.</p> <p>Frequent declogging of canals may be done to ensure efficiency flow of water. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>
<p>Purok 1 along highway bound to Katipunan (GPS reading: N 7° 32' 41.0"/E 126° 02' 09.4")</p> <p>Along banks of Pasilianan River traversing Purok 1 (GPS reading: N 7° 32' 24.9"/E 126° 01' 45.9")</p>	<p>Moderate</p> <p>High</p>	<p>Water from Barangay Katipunan and tributary creeks of Manat River drains towards the purok where water accrues during excessive rainfall and typhoons. Localized flooding in some portions of the purok is noted due to lack of drainages and canals creating flood heights of 0.5 to 1 m.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so that there will be more passageways for the receding floodwaters.</p> <p>The northwest-flowing Pasilianan River crossing Purok 1 is an active river channel with stream width of about 8 to 10 m and depth of 3 to 4m. River erosion is excessive along the banks of Pasilianan River. Although floodwater did not reach neighboring residences during heavy downpours and typhoons such as the recent Pablo, this region may still be susceptible to high floods.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community</p>

		together with municipal authorities.
Purok Center of Purok 3 (GPS reading: N 7° 33' 07.5"/E 126° 02' 34.2") and Purok 5 (GPS reading: N 7° 32' 37.2"/E 126° 02' 50")	Low	<p>Puroks 3 and 5 have relatively similar terrain being situated in a gently sloping topography. These puroks may likely experience low floods of 0.1 to 0.5 m during extremely heavy downpours and typhoons.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so that there will be more passageways for the receding floodwaters.</p>
Along Mambusan Creek transecting Purok 7 (GPS reading: N 7° 32' 19.3"/E 126° 03' 18.9")	High	<p>Mambusan Creek is a tributary creek of Manat River which transects the northeastern hills of the purok. Since the headwaters of Manat River are found in the area, it is a possible flashflood exit point. Settlement along the banks should be prohibited.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
Purok 6, purok center (GPS reading: N 7° 32' 11.9"/E 126° 03' 13.1")	Low	<p>The purok center and neighboring regions are positioned in a generally mildly sloping topography making it less susceptible to landslide as well as flooding.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so that there will be more passageways for the receding floodwaters.</p>
Barangay Mipangi		

<p>Purok 2 (GPS reading: N 7° 32' 22.8"/E 125° 55' 0.3")</p>	<p>Low</p>	<p>Flood heights reach less than a half a meter on the low-lying areas of the barangay. Creeks overflow during continuous heavy rains. Thus, settlement along the banks of the creeks should be prohibited. Buffer zones may be established to prevent buildup along the said areas.</p> <p>Frequent declogging of canals may also be done to alleviate flooding.</p>
<p>Purok 1 (GPS reading: N 7° 32' 36.7"/E 125° 55' 17.3")</p>	<p>Moderate</p>	<p>Areas along the banks of creek are not suitable for residential purposes. Overflow of these streams cause inundation in the area. However, flood heights wane as distance increases away from the banks.</p> <p>Dredging of the creeks may be done to increase its capacity for increased volume of water during heavy rains. Regular cleanup drives may also help increase the efficient flow of receding floodwaters and thereby, decrease the duration of inundation.</p>
<p>Purok 10, near Mawab River (GPS reading: N 7° 32' 34.0"/E 125° 55' 26.8")</p>	<p>Moderate</p>	<p>The highly silted Mawab River passes through the area. During strong typhoons, this river overflows inundating the areas along its banks. Flood heights reach up to meter from its immediate banks. River scouring was also observed in some portions of the river.</p> <p>Desilting of the river may be done to increase its capacity for the receding floodwaters. Flood protection structures (e.g. riprap) may be constructed to prevent further bank erosion. Settlement along the banks is discouraged. Floodplains may be utilized for agricultural purposes instead of residential buildups.</p>
<p>Purok 7, near Mawab River (GPS reading: N 7° 32' 37.6"/E 125° 55' 47.5")</p>	<p>Moderate</p>	<p>Overflow of the Mawab River causes inundation in the area. Flood heights in the adjacent rice fields reach up to a meter. The river is highly silted while its banks are already scoured.</p> <p>Desilting of the river may be done to increase its capacity for the receding floodwaters. Flood protection structures (e.g. riprap) may be constructed to prevent</p>

		<p>further bank erosion. Settlement along the banks is discouraged. Floodplains may be utilized for agricultural purposes instead of residential buildups.</p>
<p>Purok 1, 3, 4, 8 and 9</p>	<p>Low</p>	<p>Creeks passing through the areas overflow during continuous heavy rains. Rice fields and other low-lying portions of the puroks often become catch basins during inundation.</p> <p>Settlement on the immediate banks of the river should be discouraged. Establish buffer zones from the riverbanks as non-buildable areas. Floodplain zoning may be adopted by municipal planning developers (e.g. agricultural/recreational utilization of flood prone areas). Houses in the floodplains may adapt by elevating houses to prevent inundation of residences by floodwaters.</p>
<p>Brgy. New Dauis</p>		
<p>Purok 3 Center: N 7° 36' 4.5" E 126° 2' 15.4"</p>	<p>High</p>	<p>The area, in general, has flat topography covered by shrub land, grassland and coconut trees. Several tributaries run across the area that cause severe flooding. One of these tributaries is the Magading River which flows northward, draining water from Brgy. Cabacungan to Brgy. Magading. Erosion along the river banks has been observed. Community was inundated last December 2012 when Typhoon Pablo hit the province. Flood persisted for 48 hours with maximum flood height of 1.2 m.</p> <p>Local government should establish an early warning device (i.e siren). Areas along Magading River should be declared as critical area and not suitable for habitation. Evacuation of residents should be done during heavy and prolonged rainfall. A well-engineered retaining wall or dike wall is suggested to reduce river bank erosion. LGU's should carefully study the construction of such structures.</p>
<p>Purok 2 Center: N 7° 35' 54.8" E 126° 2' 17.5"</p>	<p>High</p>	<p>An intermittent creek the flows southward drains water from Brgy. Cabacungan to Brgy. Magading. The whole area has flat topography, exposing them to flood</p>

		<p>hazards. Sheet flood occurred in the area last December 2012 and February 2013, with maximum flood height of 1.7 m. It lasted for 48 hours. New Daus Elementary School, which happened to be in the vicinity, was also flooded.</p> <p>An early warning system such as siren should be put up in the area Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation of residents should be done during heavy and prolonged rainfall. Proceed to relocation if needed.</p>
<p>Purok 4 Center: N 7° 35' 45.4" E 126° 2' 19.8"</p>	High	<p>Similar to other puroks, Purok 4 experienced sheet flooding during these recent typhoon events. This was mainly caused by flat topography and presence of several tributaries in the area. Flood height could reach up to 1.5 m which lasted for 72 hours.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels.</p>
<p>Purok 5 Center: N 7° 36' 9.8" E 126° 2' 22.6"</p>	<p>High</p> <p>Moderate</p>	<p>A distant SW flowing creek from Brgy. Gabi might aggravate the present flood susceptibility of residential areas of Purok 5.</p> <p>Relative to other areas in Brgy. New Daus, flood in Purok 5 is less severe. Flood in roads is 0.3 – 0.5 m but it can reach up to 1.0 m in open vegetated areas.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.</p>
<p>Purok 1 N 7° 35' 30.7" E 126° 1' 32.8"</p>	Very High	<p>Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. Banks are</p>

<p>Center: N 7° 35' 27.3" E 126° 1' 24.6"</p>	<p>High</p>	<p>prone to very high flooding and erosion. Further erosion will weaken the foundation of the bridge. There are no human settlements adjacent the river.</p> <p>Purok center is highly susceptible to sheet flooding due to its flat topography and distance to the Manat River.</p> <p>Areas along the banks of Manat River are not suitable for residential purposes, thus, it can be utilized as agricultural area. Evacuation protocol should be implemented when there's a typhoon or extreme heavy rainfall.</p> <p>Local government should construct a mitigating structure to reduce river bank erosion. A well-engineered dike wall will lessen the loss of soil material along the bank.</p>
<p>Barangay New Sibonga</p>		
<p>Purok 1 Center (GPS reading: N 07° 33' 46"/ E 125° 55' 43)</p>	<p>High</p>	<p>An overflow of Calinan creek was reported to inundate nearby areas of Purok of up to 1.5m. Knee-level flood height to its Multi Purpose Center located beside their barangay hall.</p> <p>Recommendations:</p> <p>Implement flood control measures. Settlement along the riverbanks is highly discouraged. Dredging of Batoto River is strictly recommended. Observe for rapid increase/decrease in creek/river water levels, possibly accompanied by increased turbidity. Early warning device should be developed.</p>
<p>Purok 2 Center (GPS reading: N 07° 34' 09"/ E 125° 55' 55")</p>	<p>Very high</p>	<p>A >2m flood height was reported to inundate lowlands of Purok 2 due to the overflow of Linda Creek during typhoon Pablo and recently during typhoon Crising. National highway was also inaccessible.</p>
<p>Purok 3 (GPS reading: N 07° 33' 00.4"/ E 125° 56' 01.7")</p>	<p>Very High</p>	<p>A reported flood height of greater than 2m was reported to inundate areas proximal to Mawab River during typhoon Pablo. A family residing 20m away from the river was inundated up to 1m flood height. Water</p>

<p>Center (GPS reading: N 07° 33' 01.6" E 125° 36' 35.7")</p>	<p>Low</p>	<p>subsided in four days after the heavy rain. Riverbank scouring is also widespread. Purok Center of 3 which is distal to river has low susceptibility to flooding.</p> <p>Recommendations:</p> <p>Dredging of Mawab river is highly recommended. Settlement along river banks must be prohibited thus relocation of affected residents should be done. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/ivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 4 Center (GPS reading: N 07° 33' 34.8"/ E 125° 55' 44.2")</p>	<p>Very High</p>	<p>Purok 4 is situated proximal to Mawab river making it very susceptible to flooding during excessive precipitation. More or less ten (10) families were directly affected during the course of typhoon Pablo. Families immediately left for higher grounds.</p> <p>Recommendations:</p> <p>Dredging of Mawab river is highly recommended. Settlement along river banks is highly discourage thus relocation of affected residents must be persisted. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/ivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>

<p>Purok 5 Center (GPS reading: N 07° 33' 37.9"/ E 125° 55' 42.3")</p>	<p>Moderate</p>	<p>Areas proximal to the river have high susceptibility to flooding. Purok Center of 5 was moderately flooded during the height of typhoon Pablo.</p> <p>Recommendation:</p> <p>Dredging of Mawab river is highly recommended. Settlement along river banks must be prohibited thus relocation of affected should be done. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 6 Center (GPS reading: N 07° 33' 45"/ E 125° 55' 35")</p>	<p>Very high</p>	<p>An overflow of Mawab River was reported to inundate Purok 6 and vicinities of up to 2m and greater during typhoon Pablo.</p> <p>Recommendation:</p> <p>Dredging of Mawab river is highly recommended. Settlement along river banks must be prohibited thus relocation of affected should be done. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 7 Center (GPS reading: N 07° 33' 34"/ E 125° 55' 37")</p>	<p>Low</p>	<p>Localized flood of up to 0.3m inundates the area during heavy downpours.</p> <p>Recommendation:</p>

		Must construct adequate drainage systems and maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 8 Center (GPS reading: N 07° 32' 57.6"/E 125° 56' 39.3")	Low	Characterized by gentle to rolling terrain with Low susceptibility to flooding. Recommendation: Construct adequate drainage systems and maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Barangay Ogao		
Purok 4 Center (GPS reading: N 7° 34' 40.7"/E 126° 1' 5.3")	Moderate	The area has flat topography covered by shrub land, grassland and coconut trees. Purok 4 experienced 0.5 m – 1.0 m flooding during Typhoon Pablo. Early warning device such as siren should be devised by the local government unit. Evacuation protocol should be implemented during typhoon season.
Purok 2 Center (GPS reading: N 7° 34' 39.0"/E 126° 1' 46.5") N 7° 34' 43.8"/E 126° 1' 46.9")	High Moderate	Similar to other purok, the area is flat covered by tree crops and shrubs. It has experienced 1.2 m flood which lasted for 24 hours. Vicinity of Barangay Hall and Ogao Elementary School experienced 0.5 m flooding during typhoon. Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 1 Center: N 7° 34' 25.8"/E 126° 2' 0.0")	Moderate	Similar to other purok, the area is flat covered by tree crops and shrubs. Flood in the area during typhoon is around 0.5 m. Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.

<p>Purok 3 Center: N 7° 34' 46.4'' E 126° 2' 6.6''</p>	<p>High</p>	<p>The area has flat topography covered by shrub land, grassland and coconut trees. Several tributaries run across the area that caused high flooding last December 2012 during Typhoon Pablo. Flood height in the area is 1.1m.</p> <p>An early warning system should be developed in the barangay. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Residents should be evacuated when there's an alert warning for heavy rain or typhoon.</p>
<p>Purok 5 N 7° 34' 26.9'' E 126° 1' 23.9''</p> <p>N 7° 34' 22.0'' E 126° 1' 17.0''</p>	<p>Very High</p> <p>Very High</p>	<p>Manat River is a large meandering stream which drains water from the mountainous areas of Nabunturan towards its confluence with Agusan River in Montevista. Stratified weathered material has been observed in the banks of the river. Continuous river erosion and high energy waters pose danger to the foundation of the bridge.</p> <p>Old meander bend, which is converted into banana plantation, was also observed several meters from the present channel. This area is prone to flooding during extreme heavy rainfall.</p> <p>Areas located along the banks of the present channel and in the old meander bend of the river are not suitable for habitation. It can still utilize as agricultural lands.</p> <p>Community near Manat River should be alert due to its high susceptibility to flooding. Evacuation protocol should be carefully planned by the local government in case of disaster.</p>
<p>Purok 6 Center: N 7° 34' 46.0'' E 126° 1' 11.6''</p>	<p>Moderate</p>	<p>Vicinity of the purok center is prone to 0.5 m flooding due to its flat topography.</p> <p>Local government should establish an early warning device (i.e siren). Evacuation of residents should be done during heavy and prolonged rainfall.</p>

Barangay Pangutosan		
Purok 1, purok center (GPS reading: N 7° 36' 17.7"/E 125° 59' 34.8")	Moderate	The purok center and its immediate vicinity experiences moderate floods of about 0.5m during heavy rains and typhoons. Water comes from overflow of rivers transecting the barangay such as the Manat River, Cabidanan River and Pantod River.
Agricultural areas mostly rice plantations	Moderate	These regions experience moderate floods during extensive rains and typhoons. The creek in the area may be dredged to prevent inundating neighboring regions. Frequent declogging of canals may be done to ensure efficient flow of water.
Purok 2, purok center (GPS reading: N 7° 32' 24.7"/E 125° 59' 09.9")	Moderate	The purok proper and closer regions have moderate susceptibility to flooding during typhoons and excessive downpours. The creek in the area may be dredged to prevent inundating neighboring regions. Frequent declogging of canals may be done to ensure efficient flow of water.
Portions of the purok adjacent to the tributary creek of Cabidanan River (GPS reading: N 7° 36' 24.9"/E 125° 59' 02.7")	High	The portion of the purok nearest the creek may experience flood heights of 1-2m during excessive rains. Flooding vastly affects adjacent rice plantations, copra fields, and some residences living near the creek. These areas are not suitable for settlement. Frequent declogging of canals may be done to ensure efficient flow of water. Flood mitigating measures must be installed along the banks of the creek to prevent further inundation. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 6, purok center (GPS reading: N 7° 33' 19.7"/E 126° 8' 15.6")	Moderate	The purok encompasses by and large of rice and coconut plantations. These areas including the purok center experiences moderate floods during heavy rains and typhoons. Water emanating from Pantod and Sta. Maria creek also supplies floodwater in these areas.

<p>Along banks of Pantod River</p>	<p>High</p>	<p>Frequent declogging of canals may be done to ensure efficient flow of water. Flood mitigating measures must be installed along the banks of the creek to prevent further inundation.</p> <p>Pantod Creek which overflows during extensive downpours and typhoons traverses the eastern portion of the purok. Areas near and along the creek are highly susceptible to flooding thus settlements within this region are highly discouraged.</p> <p>Flood mitigating measures must be installed along the banks of the creek to prevent further inundation. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 5, purok center (GPS reading: N 7° 37' 03.8"/E 125° 59' 44.5")</p>	<p>Very High</p>	<p>The purok center is located just beside the Cabidanan Creek which critically floods low-lying areas in the purok. Although a riprap is installed along the banks of the river, it is not continuous all throughout the river course thus spills over the low-lying regions of the purok particularly the rice and coconut plantations where there is no longer a riprap. Settlement in regions near and along Cabidanan Creek is discouraged.</p> <p>The riverbank protection installed along Cabidanan Creek must be extended towards other unprotected banks of the river. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 4, purok center (GPS reading: N 7° 36' 16.4"/E 125° 59' 45.5")</p>	<p>Moderate</p>	<p>Water from Cabidanan Creek overflows during excessive heavy rains and typhoons moderately inundating the purok center and its immediate vicinity.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p>

Near Cabidianan Creek	High	<p>The north-flowing Cabidianan Creek highly inundates adjacent regions during episodes of typhoons and extensive downpours. Settlement near and along banks of the river must be avoided.</p> <p>Flood mitigating measures must be installed along the banks of the creek to prevent further inundation. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 7, purok center (GPS reading: N 7° 37' 03.8"/E 125° 59' 44.5")</p> <p>Near Cabidianan Creek (GPS reading: N 7° 35' 48.4"/E 125° 59' 50.1")</p>	<p>Moderate</p> <p>Very High</p>	<p>Moderate flood heights of about 0.8 to 1 m were experienced in the purok center and neighboring regions. Surface runoff is coupled by water emanating from the north-flowing Cabidinan Creek.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so that there will be more passages for the receding floodwaters.</p> <p>The north-flowing Cabidianan Creek bounding Purok 4 from Barangay Basak critically overflows during typhoons and heavy rains. Flood height reaches >2m in its immediate district. Six households were reported to have been highly affected by such floods.</p> <p>Flood mitigating measures must be installed along the banks of the creek to prevent further inundation. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
Purok 3, purok center (GPS reading: N 7° 37' 03.8"/E 125° 59' 44.5")	Moderate	<p>The purok center and neighboring areas are moderately susceptible to flooding. Water overflowing from Pantod River reaches this area creating floods of about 0.5 to 1m high.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water. Supplementary canals may also be built so</p>

<p>Along low-lying areas in the purok (rice plantations)</p>	<p>High</p>	<p>that there will be more passages for the receding floodwaters.</p> <p>The north-flowing Pantod River inundates this portion of the purok. It is further aggravated by water originating from Sta. Ana, Libasan which drains towards the rice plantations and other low lying areas in the Purok.</p> <p>Flood mitigating measures must be installed along the banks of the creek to prevent further inundation. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Barangay Poblacion</p>		
<p>Purok 1</p> <p>Center N 07°36'07.1" E 125°57'40.5"</p>	<p>Low</p>	<p>Localized flooding reported of up to 0.2m due to clogged and insufficient waterways which cannot drain water effectively during excessive precipitation.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff</p>
<p>Purok 2</p> <p>Center N 07°36'14.9" E 125°57'35.7"</p>	<p>Low</p>	<p>Localized flooding reported of up to 0.3m due to clogged and insufficient waterways which cannot drain water effectively during excessive precipitation.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff</p>
<p>Purok 3</p> <p>Center N 07°36'20.3" E 125°57'35.7"</p>	<p>Low</p>	<p>It is characterized by gentle to rolling terrain with reported flood height of up to 0.2m in lowland areas. Water drains to the nearby creek and other drainage systems in hours.</p> <p>Recommendation:</p>

		Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 4 Center N 07°36'23.1" E 125°57'48.5"	Low	Flood height varies from 0.1m-0.4m depending upon the elevation of the area. Localized flooding was the main cause pointed out. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 5 Center N 07°36'4.6" E 125°58'5"	Moderate	Lower areas proximal to Cabalinan creek experienced flood height of up to 0.8m. Purok house situated in a higher elevation experienced 0.2m flood which readily subsides in few hours after the rain. Recommendation: Dredging of the creek is highly recommended. Develop an early warning device and observe for an increase of water level of a nearby creek/river. Settlement along the creek must be discouraged. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 6 Center N 07°36'10.0" E 125°57'51.5"	Moderate	Localized flooding reported of up to 0.8m due to the overflow of a nearby creek during excessive precipitation. Recommendation: Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff
Purok 7 Center N 07°35'59.9" E 125°57'49.6"	Low	Localized flooding reported of up to 0.3m due to the overflow of a nearby creek during excessive precipitation. Recommendation: Construct adequate drainage systems.

		Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff
Purok 8 Center N 07°35'59.2" E 125°58'00.7"	High	Residents of Purok 8 experienced flood height of up to 1m resulting from the overflow of Cabalinan creek during typhoon Crising. Recommendation: Dredging of the creek is highly recommended. Develop an early warning device and observe for an increase of water level of a nearby creek/river. Settlement along the creek must be discouraged. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 9 Center N 07°36'20.1" E 125°58'9.9"	Low	Experienced localized flooding due to clogged drainage and canals. Recommendation: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 10 Center N 07°36'9.7" E 125°57'55.6"	High	Purok 10 is also situated along the Cabalinan creek. The same creek responsible for the severe flooding of many Puroks in Brgy Poblacion assessing it with high susceptibility to flooding. Residents affected reported for a 1.2m flood in the lower areas of the Purok. Recommendation: Dredging of the creek is highly recommended. Develop an early warning device and observe for an increase of water level of a nearby creek/river. Settlement along the creek must be discouraged. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.

<p>Purok 11</p> <p>Center N 07°36'17.2" E 125°57'47.8"</p>	<p>Low</p>	<p>Area was observed with low susceptibility to flooding. Overflow of creek and drainage in the area was reported to inundate lowlands up to 0.2m but subsided readily in a few hours.</p> <p>Recommendation:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 12</p> <p>Center N 07°35'59.2" E 125°57'39.1"</p>	<p>Low</p>	<p>0.3m localized flood height due to clogged canals and drainages during heavy downpours.</p> <p>Recommendations:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 13</p> <p>Center N 07°36'11.2" E 125°57'49.1"</p>	<p>High</p>	<p>Residents in this Purok residing proximal to the creek experienced flood height of up to 1.5m during typhoon Crising. Flood water coming upstream rushed through the clogged drainage because of sediments and boulders and including logs and obstructed water flow and which had caused severe flooding to the area. Creek scouring was also noted during the observation. Flood hazard in the Purok might worse if not mitigated.</p> <p>Recommendation:</p> <p>Dredging of the creek is highly recommended. Develop an early warning device and observe for an increase of water level of a nearby creek/river. Settlement along the creek must be discouraged.</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 14</p> <p>Center N 07°36'53.8" E 125°57'59.4"</p>	<p>Low</p>	<p>Situated along the national highway. Area was observed with low susceptibility to flooding. Overflow of creek and drainage in the area was reported to inundate lowlands up to 0.3m but subsided readily in a few</p>

		<p>hours.</p> <p>Recommendation:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 15</p> <p>Center N 07°35'47.5" E 125°57'45.9"</p>	<p>Very high</p>	<p>Lowland areas of Purok acts as catch basin of water flow emanating from the stream connected from Cabalanan creek. Affected residents experienced of up to >2m flood height during typhoon Pablo and receded in two days after the rain.</p> <p>Purok house of 15 experienced knee level flood.</p> <p>Recommendation:</p> <p>Dredging of the creek is highly suggested. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 16</p> <p>Center N 07°36'03.9" E 125°57'33.7"</p>		<p>Localized flooding reported of up to 0.3m due to clogged and insufficient waterways during excessive precipitation.</p> <p>Recommendation:</p> <p>Construct adequate drainage systems. Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff</p>
<p>Purok 17</p> <p>Center N 07°36'31.3" E 125°57'36.7"</p>	<p>Moderate</p>	<p>Localized flooding of up to waist level was reported in part of the purok situated along the national highway. A resident reported for an inadequate drainage system approaching the national road restricted water flow causing a 0.8m level flood to</p>

		<p>nearby areas.</p> <p>Recommendation:</p> <p>Must construct adequate drainage systems and maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 18</p> <p>Center N 07°36'24.5" E 125°58'17.3"</p>	Low	<p>Experienced localized flooding of up to 0.2m due to clogged drainage and canals.</p> <p>Recommendation:</p> <p>Must construct adequate drainage systems and maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 19</p> <p>Center N 07°35'56.3" E 125°57'34.1"</p>	Low	<p>Minimal flood report in the area</p> <p>Recommendation:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 20</p> <p>Center N 07°35'40.7" E 125°58'05.9"</p>	High	<p>Purok 20 is situated in a lower elevation. Flood water emanating from higher grounds such as in Purok 15 and 8 is directed in lowlands of this purok such as in rice field areas.</p> <p>Moderate flooding in a subdivision was reported.</p> <p>Recommendation:</p> <p>Must construct adequate drainage systems and maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
<p>Purok 21</p> <p>Center N 07°36'19.2" E 125°57'36.3"</p>	High	<p>Affected residents in the area stated for a higher flood height of up to 1.5m last February during the course of typhoon Crising. It was observed that the creek is already highly silted restricting the flow of water during long heavy rains.</p> <p>Recommendation:</p>

		<p>Dredging of the creek is highly recommended.</p> <p>Settlement along the creek must be discouraged.</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.</p>
Barangay San Vicente		
<p>Purok 1 (GPS reading: N 7° 33' 39.8"/E 125° 58' 33.5")</p>	Low	<p>Overflow of irrigation canals causes inundation of rice fields during heavy rains.</p> <p>Dredging may be done to increase the capacity of canals.</p>
<p>Purok 2 (GPS reading: N 7° 33' 48.0"/E 125° 58' 43.0")</p>	Low	<p>Floods seldom occur in the area. Only the rice fields are flooded during extreme heavy rains when irrigation canals overflow.</p> <p>Dredging of canals may be done to alleviate flooding. Areas along creeks are unsuitable for settlements.</p>
<p>Purok 3 (GPS reading: N 7° 33' 47.8"/E 125° 58' 58.4")</p>	Low	<p>Extreme heavy rains cause flooding in the low-lying portions of the purok. Maximum flood height is less than a half meter. However, settlements along the banks are still discouraged.</p>
Barangay Sasa		
<p>Sasa Brgy. Hall (GPS reading: N 7° 34' 14.9"/E 125° 57' 26.2")</p>	Low	<p>Almost the entire expanse of Brgy. Sasa is on topographic high making the area low to flood susceptibility. To the westernmost side of Purok 4 is an active creek inundating small portions of the low-lying area. Floodwaters drain from the north of Purok 3 towards the Libasan Creek.</p> <p>Recommendations: Avoid settlement adjacent to active creeks if not properly mitigated, Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>

Barangay Sta. Maria		
<p>Sta. Maria Brgy. Hall (GPS reading: N 7° 35' 25.6"/E 125° 58' 48.2")</p>	<p>Low</p>	<p>The brgy. hall is located far from an active creek to the north. It was inundated by only 0.1m and receded after 1 hour during Typhoon Pablo. The area is suitable for evacuation site.</p> <p>Recommendations: Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Purok 7 (GPS reading: N 7° 35' 48.6"/E 125° 58' 19.1")</p>	<p>Moderate</p>	<p>Libasan creek is the nearest tributary bounding the south and east portion of Purok 7. During Typhoon Pablo, the creek brought 0.5m inundation to its vicinity for 12 hours draining from Brgy. Libasan.</p> <p>Recommendations: Households adjacent to the creek must be relocated/ evacuated to the northeastern portion of the purok during heavy rain or typhoon. Avoid settlement on the banks of creeks. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Purok 4 (GPS reading: N 7° 35' 27.3"/E 125° 58' 45.3")</p>	<p>Moderate</p>	<p>Purok center is near to a minute creek to the north making the area moderately susceptible to flood. To the northeastern side of the purok, a maximum flood height of 1.2m was recorded during Typhoon Pablo. Its eastern portion is not severely affected by flood during intense rain/ typhoon.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning</p>

		device/system. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Evacuate to the eastern elevated portion of purok in case of heavy rain or typhoon.
Purok 1 (GPS reading: N 7° 35' 23.8"/E 125° 59' 26.6")	Moderate	Creek to the south and east parts of purok center made the low-lying areas moderately susceptible to flood. Floodwaters drain from Purok 2 to the south and from the rolling topography to the north. 0.6m is the highest flood depth recorded within the vicinity of purok center. Recommendations: Settlement along the banks of creek is discouraged. In case of evacuation, proceed to the elevated eastern part of purok center. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Flood protection structures (e.g. dikes riprap) must be constructed in order to lessen overflow of creeks during extreme heavy rains.
Purok 6 (GPS reading: N 7° 35' 00.9"/E 125° 58' 45")	Moderate	Purok hall is situated adjacent to the foot of the southern mountainous area. Floodwaters drain northward and ended up to the Libasan Creek. The usual flood depth in the area during Typhoon Pablo is 0.6m and receded after 3 hours. Recommendations: Residents are recommended to be evacuated to the elevated eastern side of purok during heavy rain/typhoon. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system.
Purok 2 (GPS reading: N 7° 34' 46"/E 125° 59' 14.2")	Low	Though the purok center has low susceptibility to flooding, other portions including eastern areas along creek received 1.2m (high) flood depth during Typhoon Pablo. In average, the SE flow of floodwater receded after 5 hours day. Recommendations:

		Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning system. Observe for rapid increase in creek water levels for early plan of evacuation. Culverts must be replaced with large diameter ducts to accommodate floodwaters draining from the elevated parts of the purok.
Purok 3 (GPS reading: N 7° 35' 19.2"/E 125° 58' 56.2")	Moderate	Majority of the floodwaters come from the western huge creek and the southern mountainous area. Flood depth of 0.6m is recorded during Typhoon Pablo and receded after 5 hours. Minor creek to the northern part of the purok also contributes to minor sheet floods in the area. Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Evacuate to the NE elevated portion in case of heavy rain or typhoon.
Barangay Santo Niño		
Purok 3 (GPS reading: N 7° 33' 48.6"/E 126° 3' 11.5")	High to Critical	The purok center is bounded to the north and east by tributaries making the area highly susceptible to flood. Majority of the land is utilized as banana plantation. The active creek to the north of purok center is noted to be a merging point of two creeks draining from the southern and eastern mountainous areas. >2m is the highest recorded flood depth in areas proximal to the creek. In average, floodwaters receded after 1day during Typhoon Pablo. Recommendations: Settlement along the banks of creek is highly discouraged. Evacuate to the southwestern elevated portion adjacent to purok 2 in case of heavy rain or typhoon. Develop an early warning device/system. Flood protection structures must be constructed in order to lessen the overflow of creeks during heavy rains.

<p>Purok 5 (GPS reading: N 7° 33' 21.5"/E 126° 3' 12.4")</p>	<p>High</p>	<p>The area is situated to the exit point of floodwaters draining from the elevated portion of Purok 7. The purok center is located adjacent to an active creek making almost entire of the region highly susceptible to flood. Generally, During Typhoon Pablo, the duration of 1m flood is 1 day.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses adjacent to the active river channel. Evacuate to the elevated western portion of Purok 6 in case of heavy rain or typhoon.</p>
<p>Purok 4 (GPS reading: N 7° 33' 25.1"/E 126° 3' 9.7")</p> <p>Purok 6 (GPS reading: N 7° 33' 23.9"/E 126° 3' 7.6")</p>	<p>Moderate</p>	<p>Both of the two puroks were inundated of about 0.5-0.6m during Typhoon Pablo. The floodwaters recede after 1 day draining to the SE area. The eastern portions of purok 4 and 6 are close to the active creek making them more vulnerable to high flooding.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses adjacent to the creek channel. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Purok 8 (GPS reading: N 7° 33' 5.9"/E 126° 3' 41.9")</p>	<p>Moderate</p>	<p>The purok center is situated on a rolling topography to the SE side of brgy. hall. Other areas, particularly those near the tributaries were also flooded of about 0.2 to 0.6m during Typhoon Pablo.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses within/ adjacent to the active creek channel.</p>

It should be noted that these susceptibility ratings were arrived at as of this field assessment. However, the rating could advance (e.g., from low to moderate,

moderate to high). Hence, the MGB constantly recommends strict and continuous monitoring by the barangays.

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