

## RESULTS OF THE MGB LANDSLIDE AND FLOOD ASSESSMENT (1:10,000 SCALE) OF PARTS OF BAGANGA IN THE PROVINCE OF DAVAO ORIENTAL

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Due to the effects of Typhoon Pablo in some parts of Region XI, the Mines and Geosciences Bureau-Department of Environment and Natural Resources Regional Office No. 11 (MGB-DENR XI) prioritized the conduct of landslide and flood assessment and mapping (1:10,000 scale) of areas within the municipality of Baganga, Davao Oriental on January 16 to 26, 2013 being one of the worst hit areas. 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. Comprising the geohazard assessment team are Ms. Beverly Mae M. Brebante, Ms. Abigail June L. Agus and Mr. Allen June B. Buenavista, geologists; Mr. Virgilio C. Torcido, geologic aide, Mr. Pedro P. Calunsag and Mr. Julie P. Benenos, drivers, all from the MGB regional office.

The team particularly covered areas that were previously identified in the 1:50,000 scale geohazard results as having moderate to high susceptibility to landslide and flooding (*Result is presented in a matrix below*).

The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide and were also evaluated and rated as low, moderate or high susceptibility to flooding.

The landslide susceptibility rating parameters are as follows:

**Very high:** Areas usually with steep to very steep slopes and underlain by weak materials. Recent landslides, escarpments and tension cracks are present. Human initiated effects could be an aggravating factor.

**High:** Areas usually with steep to very steep slopes and underlain by weak materials. Areas with numerous old/inactive landslides.

**Moderate:** Areas with moderately steep slopes. Soil creep and other indications for possible landslide occurrence are present.

**Low:** Gently sloping areas with no identified landslides.

The flood susceptibility rating parameters are as follows:

**High:** Areas likely to experience flood heights of greater than 1 meter 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:** Areas likely to experience flood heights of 0.5 to 1 meter 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 infilled valleys are areas moderately subjected to flooding.

**Low:** 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

When appropriate, the barangay official/s were presented with a *Landslide/Flood Threat Advisory*. This advisory informs them of their area's susceptibility to landslides and contains the corresponding recommendations.

Below summarizes the results of the landslide and flood assessment of the covered areas:

**MUNICIPALITY OF BAGANGA, DAVAO ORIENTAL**

<b>BARANGAY/PUROK/SITIO</b>	<b>LANDSLIDE SUSCEPTIBILITY</b>	<b>FLOODING SUSCEPTIBILITY</b>	<b>REMARKS/RECOMMENDATION</b>
<b>Barangay Baculin</b>			
So. Narra – Pugnot	<i>Moderate</i>	<i>None</i>	
So. Acacia	<i>Moderate</i>	<i>None</i>	
So. Mahogany	<i>Low</i>	<i>Low</i>	Flooding due to backflow of canals along roads which could not accommodate the volume of surface runoff during heavy rains  <b>Recommendation:</b> (1) Modification of the existing canal to contain the high discharge during heavy rains and construction of feeder drainages within the residential areas.
So. Tambis	<i>Low</i>	<i>Low</i>	Area is located within a low point in this section of barangay where rain water accumulates.  <b>Recommendation:</b> (1) Establish a comprehensive drainage system which will properly channel surface runoff away from residents and other buildings.
So. Kandiis	<i>Low</i>	<i>None</i>	
So. Mangga	<i>Low</i>	<i>None</i>	
So. Ipil-ipil	<i>Low</i>	<i>None</i>	
So. Lanzones	<i>Low</i>	<i>None</i>	
So. Nangka	<i>Low</i>	<i>None</i>	
So. Sampaguita	<i>Low</i>	<i>Moderate</i>	Flooding is due to coastal inundation and the purok is located at lower elevation where runoff from surrounding areas collect.  <b>Recommendation:</b> (1) Relocation of residents along the coasts which are affected by coastal flooding during high high tides.
So. Bombaya	<i>Low</i>	<i>Moderate</i>	Flooding is due to coastal inundation and the purok is located at lower elevation where runoff from surrounding areas collect.  <b>Recommendation:</b> (1) Relocation of residents along the coasts which are affected by coastal flooding during high h tides.

Barangay Ban-ao			
Purok Masipag A	<b>Low</b> but <b>Moderate to High</b> at the southern slopes	<b>Low, Moderate</b> to <b>High</b> at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Purok Masipag B	<b>Low</b> but <b>Moderate to High</b> at the southern slopes	<b>Low, Moderate</b> to <b>High</b> at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Mahayahay C	<b>Low</b> but <b>Moderate to High</b> at the southern slopes	<b>Moderate</b> at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Mahayahay A	<b>Low</b> but <b>Moderate to High</b> at the southwest slopes	<b>Low</b> adjacent to the creek (near elementary school)	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Set an easement/buffer zone at least five (5) meters from the creeks. (3) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Mahayahay B	<b>Low</b> but <b>Moderate to High</b> at the southwest slopes	<b>Low to Moderate</b> to <b>High</b> along Kadungonan Creek	<b>Recommendation:</b> (1) Relocation of residents adjacent to Kadungonan creek. (2) Elevate or backfilling of low-lying areas to avoid localized flooding and water ponding. (3) Design houses on stilts to allow continuous flow of water during flooding event. (4) Proper drainage system should be installed to efficiently channel water and

			avoid localized flooding. (5) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Magtinabangay A	<b>Low</b>	<b>Moderate</b> to at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Magtinabangay B	<b>Low</b>	<b>High</b> at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
<b>Barangay Batawan</b>			
Po. Centro	<b>Low</b>	<b>Moderate</b>	Flooding caused by incomplete canal at the back of the barangay hall affecting residents around the barangay gym and the ES.  <b>Recommendation:</b> (1) Finish construction of canal at the back of the barangay hall to draw runoff away from residential areas.
Po. Anangilan -Palo Onse	<b>Moderate</b>		
Po. Sampaguita	<b>Moderate</b>	<b>Moderate</b>	Flooding due to accumulation of waters within the depressed section of the purok. Several intermittent creeks were also observed cutting the barangay road which may potentially lead to excessive erosion making the roads inaccessible.  <b>Recommendation:</b> (1) Construction of canals to channel surface runoff and drain to lower elevation areas in order to avoid ponding
<b>Barangay Batiano</b>			
So. Kaiwan	<b>None</b>	<b>High</b>	The sitio is drained/dissected by Kaiwan creek. Flood water during the typhoon was >1 meter high. Flooding in the area is of sheet-type.

			<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas. Maximum surface run-off must be considered in the design of the canals.</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Areas east-southeast of Kaiwan proper should not be developed into a residential area as this is part of the old river channel of Baganga River</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ol>
So. Gmelina	<b>None</b> but slopes at the northwest is <b>Moderate</b>	<b>High</b>	<p>Flooding in the area is of sheet-type.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas. Maximum surface run-off must be considered in the design of the canals.</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Relocate to the hills at the northwest to avoid impacts of flooding</li> </ol>
So. Ipil-ipil	<b>None</b> but slopes at the northwest is <b>Moderate</b>	<b>High</b>	<p>Flooding in the area is of sheet-type.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas. Maximum surface run-off must be considered in the design of the canals.</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Relocate to the hills at the northwest to avoid impacts of flooding</li> </ol>
So. Manganino	<b>None</b>	<b>High</b> in areas near the Balite Tree and in areas proximal to Baganga River but <b>Moderate</b> at the elevated portion west of the barangay road	<p>Flooding in the area is of sheet-type.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas. Maximum surface run-off must be considered in the design of the canals.</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Relocate to the elevated portion of the sitio</li> </ol>

So. Gikob	<b>High</b> at the surrounding slopes	<b>Moderate</b> at the elevated portion but <b>High</b> at the low-lying areas proximal to Baganga River	<p>The low-lying areas especially where Baganga River channel exited from the narrow valley to the wide floodplain are susceptible to flashflooding.</p> <p>Recent slope failures were also noted at the slopes west of So. Gikob and slopes along Baganga River.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Immediate relocation of residents situated near the point where the river enters its floodplain. Declare the area as a permanent danger zone</li> <li>(2) Relocate houses to the elevated portion of the sitio</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> <li>(5) Install rain gauges at the headwater of Baganga river</li> </ol>
So. Lanipga	<b>Moderate</b>	<b>High</b> at the flat areas adjacent to Baganga River	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Observe for and/or monitor for presence of mass movement or saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/LGU authorities (e.g., landslides, tension cracks)</li> </ol>
<b>Barangay Binondo</b>			
Po. Proper	<b>Low</b>	<b>None</b>	High landslide susceptibility in steep slopes flanking Baganga River.
Po. Matutum	<b>Low</b>	<b>None</b>	
Po. Bugak	<b>Moderate</b>	<b>None</b>	
Po. Matanog	<b>Moderate</b>	<b>None</b>	<p>High landslide susceptibility in steep slopes beside access road leading to Po. Kat-ihan.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Relocate two houses located adjacent to a failing road cut along the access to Po. Kat-ihan</li> </ol>
Po. Camamangan	<b>Moderate</b>	<b>None</b>	
Po. Palina	<b>Moderate</b>	<b>None</b>	
<b>Barangay Bobonao</b>			
Bait	<b>Low</b>	<b>Low</b>	<p>Flood due to ponding during heavy rains</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Construction of drainage canals to channel storm water runoff</li> </ol>

Dalikan	<b>Low</b>	<b>Low</b>	Flood due to ponding during heavy rains  <b>Recommendation:</b> (1) Construction of drainage canals to channel storm water runoff
Pungo - Nangka	<b>Moderate</b>	<b>Low</b>	Flood due to ponding during heavy rains  <b>Recommendation:</b> (1) Construction of drainage canals to channel storm water runoff
Bugak	<b>Moderate</b>	<b>None</b>	
Centro	<b>Low</b>	<b>None</b>	
Mangga	<b>Moderate</b>	<b>None</b>	
Tulay	<b>Low</b>	<b>None</b>	
Upper Matiyo	<b>Moderate</b>	<b>None</b>	
Lower Matiyo	<b>Moderate</b>	<b>None</b>	
<b>Barangay Campawan</b>			
Purok Casunugan	<b>Low but High on the southwest slopes</b>	<b>Low</b> at the elevated slopes but <b>High</b> in areas adjacent to Dapnan River	<b>Recommendation:</b> (1) Declare the low-lying area proximal to Dapnan River as no habitation zone (2) Design houses on stilts to allow continuous flow of water during flooding event (3) Install proper canals to confine surface run-off from natural drainages or drainage hollows (4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content) (5) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities
Purok Sta. Cruz	<b>Low but High on the southwest slopes</b>	<b>Low</b> at the elevated slopes and adjacent Panugahan and Mabakog creek but <b>High</b> in areas adjacent to Dapnan River	<b>Recommendation:</b> (1) Declare the low-lying area proximal to Dapnan River as no habitation zone (2) Design houses on stilts to allow continuous flow of water during flooding event (3) Install proper canals to confine surface run-off from natural drainages or drainage hollows (4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content) (5) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities
Purok Capawan	<b>Low but High</b> at the northern slopes where active shallow	<b>High</b> in areas adjacent to Dapnan River	<b>Recommendation:</b> (1) Set an easement/buffer zone at least five (5) meters from the riverbank.

	landslides were noted		<ul style="list-style-type: none"> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Monitor slope failures along the creeks that can possibly result to damming and eventually flashflooding</li> </ul>
Purok San Francisco	<b>Low</b> but <b>Moderate to High</b> at the northern slopes	<b>Low adjacent to Taucogon creek</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Set an easement/buffer zone at least five (5) meters from the Taucogon creek</li> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ul>
Purok Patong	<b>Low</b> but <b>Moderate to High</b> at the southern slopes	<b>Low adjacent to Dapanan River</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Relocate residents at low lying areas near Dapnan River</li> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(5) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Purok Mabacog, Mato, Mayor	<b>Moderate to High</b> towards the northern slopes	<b>Low adjacent to Dapanan River</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(2) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Purok Pagasaan (Marquez)	<b>Moderate to High</b> towards the southwestern slopes	<b>High</b>	<p>Active scouring of the riverbank of Dapnan River. Flood height recorded at the affecting the community about 1.0 meters from overflow of Dapnan River.</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Relocate residents along Dapnan River.</li> <li>(2) Declare the low-lying area proximal to Dapnan River as no habitation zone</li> <li>(3) Design houses on stilts to allow continuous flow of water during flooding</li> </ul>

			<p>event</p> <p>(4) Rip-raping of the riverbank to avoid further scouring of riverbanks.</p> <p>(5) Install proper canals to confine surface run-off from natural drainages or drainage hollows</p> <p>(6) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(7) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</p>
<b>Barangay Central</b>			
Po. Durian	<b>None</b>	<b>None</b>	<p><b>Recommendation:</b></p> <p>(1) Establish buffer zones of 20 meters from the coastal shore</p> <p>(2) Relocate houses along the coastal shore that are affected by coastal erosion</p>
Po. Malinawon	<b>None</b>	<b>None</b>	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage</p>
Po. Sta. Cruz Uno	<b>None</b>	<b>None</b>	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage</p>
Po. Sta. Cruz Dos	<b>None</b>	<b>Moderate</b>	<p>Dike is installed in the southern section of the river</p> <p><b>Recommendation:</b></p> <p>(1) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(2) Declare the area very near to Baganga River as permanent danger zone and relocate residents to safer or more elevated grounds</p> <p>(3) Establish buffer zones of 20 meters from the coastal shore and the river dike</p>
Po. Padada Uno	<b>None</b>	<b>Moderate</b>	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas</p> <p>(2) Declare the area as permanent danger zone and relocate residents to safer or more elevated grounds</p> <p>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p>
Po. Padada Dos	<b>None</b>	<b>Moderate</b> in areas adjacent to Baganga River	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation</p>

			<p>of the adjacent flat areas</p> <p>(2) Declare the area as permanent danger zone and relocate residents to safer or more elevated grounds</p> <p>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p>
Po. Lanzones	<b>Moderate</b> along the slopes to the west	<b>None</b>	<p>Active coastal erosion was evident.</p> <p><b>Recommendation:</b></p> <p>(1) Houses along the coastal line should be relocated</p> <p>(2) Establish a 20-meter buffer zone from the coastal shores</p>
Po. Dawis	<b>None</b>	<b>High</b>	<p>So. Dawis is situated near the confluence of Mahan-ob and Baganga River and is highly susceptible to flashflooding. Moreover, a creek was also noted flowing east-west near the boundary of Dawis and Kaiwan</p> <p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage especially in areas where surface run-off/creek flows to direct the water to Baganga river and prevent inundation of the adjacent flat areas</p> <p>(2) Declare the area as permanent danger zone and relocate residents to safer or more elevated grounds</p> <p>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(4) Install flood/water level sensors along the bridge connecting Padada Uno and Po. Dawis</p>
Po. Crossing Baboy	<b>High</b>	<b>High</b> at the low-lying areas proximal to Baganga River	<p><b>Recommendation:</b></p> <p>(1) Observe for and/or monitor for presence of mass movement or saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/LGU authorities (e.g., landslides, tension cracks)</p> <p>(2) Install gabions along the banks of Nawasa to prevent further scouring</p>
<b>Barangay Dapnan</b>			
So. Proper	<b>None</b>	<b>High</b> in areas along Masao Creek but <b>Moderate</b> in other areas	<p><b>Recommendation:</b></p> <p>(1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.</p> <p>(2) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding</p> <p>(3) Install cross and lateral drains along the national road</p>
So. Likid	<b>None</b>	<b>Moderate</b> but <b>High</b> in areas along	

		natural drainages	
So. Masao	<b>Moderate</b> in the surrounding slopes	<b>Moderate</b> in most areas but <b>High</b> along Masao Creek	Riverbank erosion observed along Masao Creek. In some portions scouring of the barangay road was also observed  <b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding (3) Construct bank protection such as gabions particularly along meanders or bends of Masao creek that may likely affect the barangay road (4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
So. Dum-ag	<b>None</b>	<b>High</b> in areas along Masao Creek but <b>Moderate</b> in other areas	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding
So. Tuajon	<b>Low</b>	<b>Moderate</b>	Coastal flooding and backflow during high tides thru the irrigation canals.  <b>Recommendation:</b> (1) Relocation of 15 houses located on the eastern side of the national highway affected by flooding
So. Cabanbanan	<b>Low</b>	<b>Low</b>	
So. Nonocan	<b>Moderate</b> in the hilly portions to the west	<b>Low</b> to the west but <b>Moderate</b> along the coastal portion	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding (3) Install cross and lateral drains along the national road
<b>Barangay Kinablangan</b>			
So. Daisy	<b>Moderate</b>	<b>None</b>	The original Po. Daisy location is within the coastal area of the barangay and is highly susceptible to coastal flooding  <b>Recommendation:</b> (1) Relocation of residents located along the edge of slopes adjacent to the national highway

So, Cabutongan - Gawaygaway	<b>Moderate</b>	<b>None</b>	<b>Recommendation:</b> (1) Installation of warning signs and slope protection in the section of the barangay road presently in critical condition due to numerous active landslides
Sampaguita	<b>Low</b>	<b>Moderate</b> along beside Talimbung Creek	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Mansanitas	<b>Low</b>	<b>None</b>	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Gumamela	<b>Low</b>	<b>None</b>	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Camia I	<b>Low</b>	<b>None</b>	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Camia II	<b>Low</b>	<b>None</b>	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Jasmin	<b>Low</b>	<b>Low</b>	<b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.
Hobuson	<b>Low but Moderate to High</b> at the southwest slope	<b>Moderate</b> along Hobuson Creek to <b>High</b>	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Set an easement/buffer zone at least five (5) meters from the Hobuson Creek. (3) Proper drainage system should be installed to efficiently channel water and avoid localized flooding. (4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)
Kiagban	<b>Low but Moderate to High</b> at the southwest slope	<b>Moderate to High</b> at rice fields	<b>Recommendation:</b> (1) Design houses on stilts to allow continuous flow of water during flooding event. (2) Set an easement/buffer zone at least five (5) meters from the Hubason Creek. (3) Proper drainage system should be installed to efficiently channel water and

			<p>avoid localized flooding. Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p>
Walingwaling	<b>Low</b>	<b>None</b>	<p><b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid water ponding.</p>
Lima-lima	<b>Low</b>	<b>None</b>	<p>The island is susceptible to storm surge and coastal flooding. <b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</p>
Starfish	<b>Low</b>	<b>None</b>	<p>The island is susceptible to storm surge and coastal flooding. <b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</p>
Bulalo	<b>Low</b>	<b>None</b>	<p>The island is susceptible to storm surge and coastal flooding. <b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</p>
Lerio	<b>Low</b>	<b>None</b>	<p><b>Recommendation:</b> (1) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</p>
<b>Barangay Lambajon</b>			
Block 1	<b>None</b>	<b>Low</b>	<p>Surface run-off noted flowing along the road <b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.</p>
Block 2	<b>None</b>	<b>Low</b>	<p><b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.</p>
Block 3	<b>None</b>	<b>Low</b>	<p><b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.</p>

Block 4	<b>None</b>	<b>Moderate</b> especially in areas proximal to the creek along Faith Tabernacle Church	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding
Block 5	<b>None</b>	<b>Low</b> but <b>Moderate</b> in areas lower than the road	Ponding observed within the low-lying area of Maryknoll School  <b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities and properly direct it to the nearest natural drainage outflow (2) Backfilling of areas where ponding is noted
Block 6	<b>None</b>	<b>Low</b>	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.
Block 7	<b>None</b>	<b>Low</b>	Liquefaction observed due to intrusion of sea water. Houses are regularly affected by strong waves during extreme weather condition  <b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.
Block 8	<b>Low</b>	<b>Low</b> but <b>High</b> at the area proximal to the existing intermittent creek	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Declare the area with high susceptibility to flooding as no habitation zone
Block 9	<b>None</b>	<b>High</b> especially at the eastern side of the road and areas proximal to the creek	Presence of perennial creek  <b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities. (2) Declare the area with high susceptibility to flooding as no habitation zone and relocate to the elevated portion west of the national road
Block 10	<b>Moderate</b> at the surrounding slopes	<b>Low</b>	<b>Recommendation:</b> (1) Install proper drainage system that would accommodate the maximum surface run-off recorded in the area and its vicinities.

<b>Barangay Lucod</b>			
Po. Bougainvilla	<b>Low</b> at the eastern side of the road while <b>Moderate</b> at the western slopes	<b>High</b> to the west of the purok proper and <b>Low</b> to the east	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Install cross drains to prevent ponding of water and allow continuous flow of surface run-off</li> </ol>
Po. Fortune	<b>Moderate</b> at the slopes but <b>None</b> at the flat areas	<b>Moderate</b> at areas near DPWH compound but <b>Low</b> at the rest of the surrounding flat areas	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Install cross drains to prevent ponding of water and allow continuous flow of surface run-off</li> </ol>
Po. Adelfa	<b>None</b>	<b>Low</b>	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> </ol> <p>Install cross drains to prevent ponding of water and allow continuous flow of surface run-off</p>
Po. Santan	<b>None</b>	<b>Moderate</b>	<p>Situated on a spit landform and backswamp vegetated with nipa, coastal erosion is very evident. The area is also affected by strong waves during storm surge. Ponding of water is noted</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Back swamps should not be converted into residential zones as these areas are susceptible to coastal flooding and water ponding</li> <li>(2) Maintain a 20-buffer zone from the coastal shores</li> <li>(3) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(4) Design flood-adaptive houses such as houses on stilts</li> </ol>
Po. Aster	<b>None</b>	<b>Moderate</b>	<p>Situated on a spit landform and backswamp vegetated with nipa, coastal erosion is very evident. The area is also affected by strong waves during storm surge. Ponding of water is noted</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Back swamps should not be converted into residential zones as these areas are susceptible to coastal flooding and water ponding</li> </ol>

			<ul style="list-style-type: none"> <li>(2) Maintain a 20-buffer zone from the coastal shores</li> <li>(3) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(4) Design flood-adaptive houses such as houses on stilts</li> </ul>
So. Angel's Trumpet	<b>None</b>	<b>Low</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Provide suitable canals or spillway to allow excess water to easily flow out during heavy rains</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Install cross drains to prevent ponding of water and allow continuous flow of surface run-off</li> </ul>
<b>Barangay Mahan-ob</b>			
So. Coog	<b>High</b>	<b>Moderate</b> at the elevated slopes but <b>High</b> in areas adjacent to Mahan-ob River	<p>Sheet flooding that affected So. Coog Proper was mainly due to damming of culvert along Coog creek by debris during typhoon Pablo. Flood height in areas proximal to the barangay road including Coog ES reached to about 0.5 meters while houses situated near Coog creek and Mahan-ob river were submerged under 1-meter flood water.</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Declare the low-lying area proximal to Mahan-ob River as no habitation zone</li> <li>(2) Increase the size of round culvert to allow maximum flow of water during heavy or prolonged precipitation. If possible, replace culverts with box culverts of appropriate size.</li> <li>(3) Design houses on stilts to allow continuous flow of water during flooding event</li> <li>(4) Regular maintenance/clean-up of the channel from debris</li> <li>(5) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(6) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(7) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
So. Olin	<b>Low but Moderate</b> at the slopes farther west of the community	<b>High</b>	<p>Debris flow was observed 500 meters (linear distance) south of So. Olin proper but no houses nearby.</p> <p>Abuyuan and Olin creek that drains So. Abuyuan northwest of So. Olin flows</p>

			<p>downstream in So. Olin. Active scouring observed along the bank of Olin creek while debris material was noted at the banks of the creek</p> <p>As per interview, highest flooding event that affected the area was in 1948 where floodwater reached to about 3 meters high while in 1990, flooding also affected the area with almost the same flood level during Typhoon Pablo.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Relocate residents farther north at the elevated portion of the sitio.</li> <li>(2) Elevate spillway and regularly clear the culverts from debris to avoid damming and overflowing of water</li> <li>(3) Install creekbank protection such as gabions along Olin Creek downstream (spillway)</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ol>
So. Abuyuan	<b>Low</b> but <b>High</b> at the northern slopes where active shallow landslides were noted	<b>Moderate</b>	<p>So. Abuyuan is drained by two creeks, Olin and Abuyuan creek. During Typhoon Pablo, flood height ranged from 0.5 to 1 meter. Scouring of 3 meters wide was noted along the bank of Abuyuan creek while micro landslides were also observed along the slopes in Olin creek. NIA dam was damaged due to flood debris.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Transfer houses near creeks to the elevated portion of the sitio.</li> <li>(2) Design flood-adaptive houses such as houses on stilts</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Monitor slope failures along the creeks that can possibly result to damming and eventually flashflooding</li> </ol>
So. RC	<b>Moderate</b>	<b>Moderate</b> in elevated areas but <b>High</b> in low-lying lands adjacent to Mahan-ob River	<p>Areas near drainage hollows and intermittent/perennial creeks are experiencing moderate to high sheet flooding</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Design flood-adaptive houses such as houses on stilts</li> <li>(2) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(3) Declare the low-lying area proximal to Mahan-ob River as no habitation zone</li> </ol>
So. Banahao	<b>Low</b>	<b>High</b> in areas proximal to	<b>Recommendation:</b>

		Magtulod Creek and Mahan-ob River	<p>(1) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(2) Declare the low-lying area proximal to Mahan-ob River as no habitation zone</p>
So. Anislagan	<b>Moderate</b>	<b>Moderate</b> but high in areas proximal to Anislagan creek and Mahan-ob River	<p>During typhoon Pablo, water along Anislagan creek overflowed on the steel bridge.</p> <p>Active shallow slope failures were observed at the hill along the road east of the purok proper</p> <p><b>Recommendation:</b></p> <p>(1) Relocate houses located very near to Anislagan Creek and Mahan-ob River</p> <p>(2) Declare the low-lying area proximal to Mahan-ob River as no habitation zone</p> <p>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(4) Regular maintenance/clean-up of the channel from debris</p> <p>(5) Monitor progress of slope failures and presence or indications of impending landslides along the slopes.</p>
So. Catabuanan 2	<b>Moderate</b>	<b>Moderate</b> but high in the low-lying areas proximal to Mahan-ob River	<p><b>Recommendation:</b></p> <p>(1) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(2) Design flood-adaptive houses such as houses on stilts</p> <p>(3) Declare the low-lying area proximal to Mahan-ob River as no habitation zone</p>
<b>Barangay Mikit</b>			
Purok 1	<b>Low</b> but <b>Moderate to High</b> at the northern slopes	<b>Low</b> along Mikit River	<p><b>Recommendation:</b></p> <p>(1) Declare the low-lying area proximal to Mikit River as no habitation zone</p> <p>(2) Development and community expansion should direct towards the north to northeastern part from the barangay proper to be distant from potential flooding event adjacent to Mikit River.</p> <p>(3) Install proper canals to confine surface run-off from natural drainages or drainage hollows</p> <p>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p> <p>(5) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</p>
Purok 2	<b>Low</b> but <b>Moderate to High</b> at the	<b>High</b> adjacent to Mikit River	<b>Recommendation:</b>

	northern slopes		<ul style="list-style-type: none"> <li>(1) Declare the low-lying area proximal to Mikit River as no habitation zone.</li> <li>(2) Development and community expansion should direct towards the north to northeastern part from the barangay proper to be distant from potential flooding event adjacent to Mikit River.</li> <li>(3) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(5) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Tambinasan	<b>Low</b> but <b>Moderate</b> at the towards the south portions	<b>Low</b> adjacent to Maliwag creek and <b>High</b> adjacent to Mikit River	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Declare the low-lying area proximal to Mikit River as no habitation zone.</li> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Malilong	<b>Moderate</b>	<b>High</b> adjacent to Mikit River	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Declare the low-lying area proximal to Mikit River as no habitation zone.</li> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> <li>(4) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Sitio Magtunod	<b>High</b> but <b>critical</b> on the northwestern portions from the main purok	<b>None</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) No habitation should be allowed along declared critical areas for mass movement and along deep ravine/ valleys.</li> <li>(2) Proper slope modification such as benching along steep slope should be undertaken to ensure stability of slope.</li> <li>(3) Install proper canals should be installed to efficiently channel water and minimized slope erosion</li> <li>(4) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ul>
Sitio Danao	<b>High</b> along southern slopes	<b>None</b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>(1) Install proper canals should be installed to efficiently channel water and</li> </ul>

			<p>minimized slope erosion</p> <p>(2) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</p>
<b>Barangay Salingcomot</b>			
So. Paopagon	<b>Low</b> at the eastern side of the road while <b>Moderate</b> at the western slopes	<b>None</b>	<p><b>Recommendation:</b></p> <p>(1) Observe for and/or monitor for presence of mass movement or saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/LGU authorities (e.g., landslides, tension cracks)</p>
So. Pan-ugan	<b>Low</b> but <b>Moderate</b> in the western slopes	<b>Low</b>	<p>Flood due to ponding during heavy rains</p> <p><b>Recommendation:</b></p> <p>(1) Construction of drainage canals to channel storm water runoff</p> <p>(2) Relocation of approximately 20 houses to higher areas especially those beside the national highway affected by water seepage during heavy rains</p>
So. Batinao	<b>Low</b>	<b>Low</b>	
So. East	<b>Low</b>		
So. West	<b>Low</b>	<b>Low</b>	<p>Flood due to ponding during heavy rains</p> <p><b>Recommendation:</b></p> <p>(1) Construction of drainage canals to channel storm water runoff</p>
So. Catabuanan	<b>Low</b>	<b>Low</b>	
<b>Barangay San Isidro</b>			
So. Lapas	<b>Low</b>	<b>None</b>	
So. Kalinaban	<b>Low</b>	<b>Moderate</b>	<p>Purok center is located within the Dapnan River flood plain</p> <p><b>Recommendation;</b></p> <p>(1) Relocation of the purok center to higher grounds as the area is regularly flooded in times of high rainfall and when the Dapnan River overflows.</p>
Purok C4	<b>Low</b>	<b>Moderate</b>	<p><b>Recommendation:</b></p> <p>(1) Design houses on stilts to allow continuous flow of water during flooding event</p> <p>(2) Set an easement/buffer zone at least five (5) meters from the Niyogan Creek.</p> <p>(3) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</p> <p>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</p>

Purok Bajada	<b>Low</b>	<b>Moderate</b>	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Design houses on stilts to allow continuous flow of water during flooding event</li> <li>(2) Set an easement/buffer zone at least five (5) meters from the Lamudan Creek.</li> <li>(3) Declare the low-lying area proximal to Mikit River as no habitation zone.</li> <li>(4) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</li> <li>(5) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ol>
Purok Mimis	<b>Low</b>	<b>Moderate</b>	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Design houses on stilts to allow continuous flow of water during flooding event</li> <li>(2) Set an easement/buffer zone at least five (5) meters from the Lamudan and Niyogan Creeks.</li> <li>(3) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ol>
Curvada	<b>Low</b>	<b>Moderate</b>	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Design houses on stilts to allow continuous flow of water during flooding event</li> <li>(2) Set an easement/buffer zone at least five (5) meters from Niyogan Creeks.</li> <li>(3) Proper drainage system should be installed to efficiently channel water and avoid localized flooding.</li> <li>(4) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content)</li> </ol>
Veener	<b>Moderate</b> but <b>low</b> adjacent to Dapnan River	<b>High</b> along Dapnan River	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Declare the low-lying area proximal to Dapnan River as no habitation zone</li> <li>(2) Install proper canals to confine surface run-off from natural drainages or drainage hollows</li> <li>(3) Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content).</li> <li>(4) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</li> </ol>
Sitio Sunlon	<b>Moderate</b>	<b>None</b>	<p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>(1) Install proper canals should be installed to efficiently channel water and</li> </ol>

			<p>minimized slope erosion</p> <p>(2) Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal authorities</p>
<b>Barangay San Victor</b>			
Po. Centro	<b>Low</b>	<b>Low</b>	<p>Flooding due to overflow of Ubian Creek and another creek traversing the periphery of the purok</p> <p><b>Recommendation:</b></p> <p>(1) Relocation of residents affected when Ubian creek floods its banks</p>
Po. Ubian	<b>Low</b>	<b>Low</b>	<p>Flooding due to overflow of Ubian Creek and another creek traversing the periphery of the purok</p> <p><b>Recommendation:</b></p> <p>(1) Relocation of residents affected when Ubian creek floods its banks</p>
Po. Mabua	<b>Low</b>	<b>None</b>	
Po. Lower Cabuyawan	<b>Low</b> but <b>Moderate</b> landslide susceptibility in hilly portions of the purok	<b>Low</b> but <b>Moderate</b> flood susceptibility along the adjacent areas of Cabuyawan Creek	
Po. Upper Cabuyawan	<b>Low</b> but <b>Moderate</b> landslide susceptibility in hilly portions of the purok	<b>Low</b> but <b>Moderate</b> flood susceptibility along the adjacent areas of Cabuyawan Creek	
Po. Baongabay	<b>Low</b>	<b>None</b>	Coastal flooding along coasts but residents are located along the national highway
Po, Lumbia	<b>Moderate</b>	<b>Low</b> but <b>Moderate</b> flood susceptibility along low lands adjacent to the Dapnan River which is mostly rice fields.	Residents are located on higher grounds beside the barangay road
<b>Barangay Saoquique</b>			
So. Magum	<b>High</b> at the northern slopes	<b>High</b>	<p>Active slope failures were noted at the northern slopes</p> <p><b>Recommendation:</b></p> <p>(1) Observe for and/or monitor for presence of mass movement or saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/LGU authorities (e.g., landslides, tension cracks)</p> <p>(2) Declare the area along Baganga River as Permanent Danger Zone</p>
So. Magumay	<b>Moderate</b> at the northern slopes	<b>High</b>	<b>Recommendation:</b>

			<p>(1) Observe for and/or monitor for presence of mass movement or saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/LGU authorities (e.g., landslides, tension cracks)</p> <p>(2) Declare the area along Baganga River as Permanent Danger Zone</p>
So. Petron	<b>Moderate</b> at the western slopes	<b>None</b>	
So. Baybay	<b>Moderate</b> at the western slopes	<b>High</b>	<p><b>Recommendation:</b></p> <p>(1) Declare the area as a permanent danger zone</p> <p>(2) Relocate houses at the slopes to the west</p> <p>(3) Installation of proper drainage</p>
So. Rojas	<b>Moderate</b> at the western slopes	<b>None</b>	
So. Nasa	<b>Moderate</b> at the western slopes	<b>High</b> at the eastern side of the national road	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage and cross drains</p> <p>(2) Design flood-adaptive houses such as houses on stilts</p>
So. Mahayahay	<b>Moderate</b> at the western slopes	<b>None</b>	
So. Malinawon	<b>Moderate</b> at the western slopes	<b>None</b>	
So. Paglimasan	<b>Moderate</b> at the western slopes	<b>Low</b> at the eastern side of the road	<p><b>Recommendation:</b></p> <p>(1) Installation of proper drainage and cross drains</p> <p>(2) Design flood-adaptive houses such as houses on stilts</p>
So. Mabua	<b>Moderate</b> at the western slopes	<b>Low</b> at the western side of the road but <b>High</b> at the eastern side of the road	<p>Presence of abundant water along Matab-ang Creek which is presently utilized by ADRA for their distribution of purified drinking water. Flooding in areas proximal to the creek is &gt;1 meter</p> <p><b>Recommendation:</b></p> <p>(1) Declare the area adjacent to Matab-ang creek as no build zone and relocate houses to the elevated portion west of the National Road</p> <p>(2) Installation of proper drainage and cross drains</p> <p>(3) Design flood-adaptive houses such as houses on stilts on areas with low to moderate susceptibility to flooding</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, and moderate to high). Hence, the MGB constantly recommends strict and continuous monitoring by the barangays.

Moreover, as part of the undertaking and in connection to the HUDCC and NHA program which is the ***“Implementation of a Comprehensive and Permanent Housing Program through Integration Resource Sharing Approach”***, the team also assessed proposed relocation sites identified by barangay LGUs which will be utilized as a permanent shelter for residents situated in danger zones. Five relocation sites were assessed by the team.

### **Site 1. Po. Paopagon, Brgy. Salingcomot**

The private land is owned by Mr. Jerry Morales and has a land area of 8 hectares. It is centered approximately in geographic coordinates 7°32'57.1" north latitude and 126°34'7.4" east longitude. The assessed site is characterized by rolling terrain and is located along the National highway. The site is underlain by red silty clay and is presently vegetated with various shrubs and grasses with few remaining coconut trees and bamboos along shallow drainage hollows. Ponding was noted within the property due to the low infiltration capacity of the underlying material. Based on the assessment, the area is ***suitable for residential development*** but proper drainage must be installed in order to confine and direct surface run-off. Minor slope modification is also needed during the development.



*Rolling terrain of the proposed relocation site in So. Paopagon*

## Site 2. Block 10, Nasa, Brgy. Lambajon

The 2-has property is owned by the Baganga Homeowners Association wherein 1 hectare of it is already occupied with 60 houses and based on the land development plan, an additional of 42 lots is still to be developed in the remaining land area which is part of the NHA project in 2005. The site is geographically centered in 7°36'29.5" north latitude and 126°33'17.2" east longitude.

The developed site is situated on a flat to nearly flat land surrounded by moderately steep slopes and is located west of Crispin Roxas National High School. The area can be reached by any type of vehicle through its all-weathered road from the National Highway. The underlying material of the area is composed of limestone. As per interview, the western slope is where the remaining houses are to be built. During the ocular inspection, no slope instability was noted however surface run-off and ponding were observed. Based on the assessment, the area **can be utilized as permanent resettlement site** but installation of proper drainage system must be given emphasis in the development. Slope modification such as benching must also be applied to the west slopes where the additional houses are proposed to be erected.



*Photo of the assessed site taken from Crispin Roxas NHS (looking southwest). The portion encircle is where the additional development is proposed.*

### Site 3. Purok Daisy, Brgy. Kinablangan

The assessed site has a total land area of 6.3 hectares owned by Mr. Bert Madinansel (2.6 hectare) and Ms. Lilia Casano (3.7 hectares). It is approximately centered in 7°40'53.1" north latitude and 126°32'48.4" east longitude. The site is characterized by rolling terrain and is underlain by limestone and siltstone. North of the area is the well-known Balite Hot Spring. Vegetation in the area consists of cogon, coconut and various shrubs. It is also proximal to an existing dirt road towards the quarry site. Assessment of the area shows that the site **can be developed into residential area**. The hilly portions should be leveled to utilized its maximum capacity and avoid soil erosion. Moreover, appropriate slope modification must also be initiated in sloping areas and proper drainage system be installed. Further, houses to be built in the site should conform to the standards set by the National Code for Buildings and Structures with the foundations designed to ensure stability.



*Rolling terrain of the assessed site*

### Site 4. Po. Walingwaling, Brgy Kinablangan

The proposed site in Po. Walingwaling is centered in geographic coordinates 7°41'32.5" north latitude and 126°32'44.9" east longitude and is located proximal to Bankucaan Creek which flows in EW direction. The creek is developed by NIA to irrigate the rice fields at the flat lands. The site is also underlain by calcareous siltstone. At present, the elevated portion of the site is already a built-up area with around 15 houses existing. A drainage/irrigation canal traverses the low-lying area. Based on the inspection, **only the elevated portion should be utilized as a permanent resettlement site** as the

low-lying areas is susceptible to inundation due to the presence of Bankucaan Creek and Irrigation canals. During the development, the hilly section should be leveled and appropriate drainage canals must be installed to direct surface run-off to the creek. Creek bank protection must also be constructed along the Bankucaan creek to mitigate further scouring and erosion.



*Upper or elevated portion of the assessed site*

#### **Site 5. Po. Mahayahay A, Brgy. Ban-ao**

The proposed relocation site is situated at Purok Mahayahay A, Brgy. Banao and is approximately centered by the geographic coordinates of 07°42'57.1" north latitude and 126°32'07.7" east longitude. The property is owned by Elision Domingues and is more or less five (5) hectares of land. It can readily be reached by an all-weathered barangay road from the National Highway turn right from the barangay proper. The general topography of the area is nearly flat to undulating to gently rolling hills with moderate sloping ravines/ valley. The nearly flat terrain is located on the northeastern portion of the property and presently utilized as rice field. Based on interview, water ponding in these area were accounted, though, a drainage culvert was installed. This area represents the lowest portion of the property.

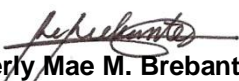
Based on field ocular inspection, the area is ***suitable for relocation site***; however, the following recommendation should be strictly follow upon developmental stage to ensure safety. Well planned grading should be undertaken to maximize the land area for residential settlement. In case of development along ravines/ valleys, proper engineering methods such as above mention and or other slope modification should be employed to ensure safety and stability of the ground. Elevating or


backfilling of lower portions of the property is also advised to avoid localized flooding and water ponding and proper drainage system should be installed to efficiently channel water and minimized slope erosion.




*Gently rolling hill topography of the property.*

#### **MGB GEOHAZARD ASSESSMENT TEAM**

  
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**PHOTOS**



*Spill way of Olin Creek, in So. Olin, Brgy. Mahan-ob. Water regularly overflow in this area during heavy precipitation or long duration of rain*



*Danger zone in So. Coog, brgy. Mahan-ob. Confluence of Coog creek and Mahan-ob River*



*Abuyuan creek in So. Abuyuan, Brgy. Mahan-ob*



*Flood-adaptive houses in So. Abuyuan*



*Scoured footing at the aproach of the bridge to Brgy. Batiano*



*Active shallow landslide in So. Baboy, Brgy. Central*



*Panoramic view of Brgy. Batiano*



*Creek nak scouring in So. Masao, Brgy. Dapnan*



*Flood height in Po. Aster, Brgy Lucod*



*Coastal erosion in Po. Malinawon, Brgy. Central*



*Active coastal erosion in Po. Durian, Brgy. Central*



*Water ponding in Po. Baybay, Brgy. Saoquique*



*Effects of liquefaction in Block 7, Brgy/ Lambajon*

