

Table3. Results of Landslide Assessment

| Location | Landslide Susceptibility Rating | Remarks/ Recommendations |
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| Barangay Andap | | |
| Sitio Liboton along highway to Maragusan (GPS reading: N 7° 27' 35.2"/E 126° 10' 32") | Very High | <p>Several translational, rotational and wedge landslides were observed on the eastern slopes bounding Sitio Liboton. A spring emerges at the foot of these slopes flowing northwest towards and along the highway. Ground seeps indicate a crack on the top slope and an incipient landslide.</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 8, Sitio Liboton tophill (GPS reading: N 7° 28' 18.4"/E 126° 10' 32") | High | <p>A creep was observed on the top slope of Purok 8. Translational and wedge landslides were observed on the eastern slopes bounding the area. Gullies produce debris accumulation zones at the foot of the slopes towards Mayo River. Settlements on these areas are highly discouraged.</p> <p>The lower portions of Sitio Liboton near the Mayo River are debris flow paths and should not be utilized for residential purposes.</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 8, Sitio Liboton along highway (GPS reading: N 7° 27' 5.1"/E 126° 10' 20.8") | High | <p>Active translational landslides are present on the eastern and southwestern slopes bounding the area, as seen along the road. On the western slopes are several wedge landslides present along gully developments. Debris accumulates at the end of the gullies draining towards the Calyawan Creek. Settlement at the toe of these slides and debris accumulation zones are highly discouraged.</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</p> |

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| | | warning system (e.g. signages). |
| Sitio del Pilar (GPS reading: N 7° 28' 51.3"/E 126° 9' 55") | High | Translational and wedge landslides were observed on the southwestern and western slopes bounding the barangay along the road in Sitio del Pilar. Install early warning system (e.g. signages). Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). |
| Sitio Pagsilaan | High | Several translational landslides were observed from an adjacent Sitio Liboton hill. Settlement at the base of these 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. Develop early warning system (e.g. signages). |
| Sitio Langwan (GPS reading: N 7° 29' 33.0"/E 126° 9' 37") | High | Several translational slides were observed on the eastern slopes bounding the area. A translational slide is also present on the western slope. Discourage settlement at the foot of these slopes. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Develop early warning system (e.g. signages). |
| Purok 4 (GPS reading: N 7° 31' 1.9"/E 126° 9' 41.3") | High | An active translational slide was observed on the eastern slopes bounding the area. Avoid settlement at the foot of slopes. The area may be used for agricultural but not for residential purposes. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Develop early warning system (e.g. signages). |
| Northern slopes bounding Sitio Taytayan, Purok 7 (GPS reading: N 7° 31' 52.6"/E 126° 10' 31.1") and Puroks 6, 5 and 5A | High | Several translational landslides are present on the north-northeastern slopes bounding the following areas. Avoid settlement on the foot of these slopes. Gully developments are also present in Sitio Taytayan where Maa River headwaters are situated. Debris accumulation zones are present on the downstream paths of these gullies. Portions near and along the riverbanks are debris flow paths and therefore should not be utilized for residential purposes. 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 |

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| | | warning system (e.g. signages). |
| Puroks 1, 1A, 14 | High | <p>Several translational and rotational landslides were observed on the western slopes bounding these areas.</p> <p>Portions of the barangay, especially those along the Calyawan River are affected by debris flows. Residents should be relocated to higher and stable areas.</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> |

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| Barangay Batinao | | |
| Purok 2 (GPS reading: N 7° 33' 57.5"/E 126° 4' 25.2") | Very High/Critical | <p>Active earthflow is present in the area with an approximate slope height of 20m. Agricultural zone is the primary element at risk presenting tilted trees as an evidence of creep.</p> <p>Recommendations: Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Constant communication and updates with Brgy. Batinao on geohazard situation is advised.</p> |

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| Brgy. Camanlangan (N 7° 30' 55.8" E 126° 6' 0.2") | | |
| Purok 16 N 7° 30' 30.8" E 126° 6' 2.5" | Very High | <p>Residential community of Purok 16 suffered series of debris flow, a water saturated movement of unconsolidated rock masses made up of sand, pebbles, cobbles and boulders. Rock fragments are mostly angular to sub-angular, supporting the fact that the source of the slide is quite near the accumulation zone. Landslide occurrence started back in 2009 after a portion of the mountain slopes failed due to instability after several days of raining. Thirty-seven (37) families were affected by the event, damaging road networks and houses. The whole area affected by the flow is approximately 5000 - 6000 m² with an average thickness of 2 m. The estimated volume of debris flow is 10,000 – 12,000 m³. Rill erosion and gully development are present in the site.</p> <p>Recommendations:</p> |

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| | | This area should be declared as danger zone prohibited for residential settlements because of threats of future debris flow and flashflooding. Immediate relocation for residents of Purok 16 should be prioritized. Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. |
| Purok 20 N 7° 29' 29.5" E 126° 7' 8.8" | Very High | A very steep cliff adjacent to the Agusan River exhibits evidences of active landslide occurrences. The eroded material is composed of cohesive soil, mainly clay-sized sediments. A planar slope with an approximate steepness of 85° – 90° along a section of Agusan River collapsed, destroying the road in the top of the creek. Recommendations: This area should be declared as danger zone prohibited for residential settlements and major infrastructure such as roads and bridges. Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. |

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| Barangay Fatima (N 7° 32' 27.8" E 126° 6' 14.4") | | |
| Purok 1 N 7° 34' 16.9" E 126° 5' 54.2" | Very High | This is located along the outer bend of Agusan River where riverbank erosion is active. The slope is very steep planar surface with an approximate steepness of 70° – 90°. The underlying material is dominantly cohesive soil, made up of clay-sized sediments and minor rock fragments. A shallow, ~10 m slide has been observed in the location. Seepages going to Agusan River are also present. Although, residential houses are minimal in the area, the most affected structure is the road connecting Brgy. Fatima and Brgy. Panag. Recommendations: This area should be declared as danger zone prohibited for residential settlements. Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. Immediate relocation for residents near the steep slope should be prioritized. |
| Purok 2 N 7° 32' 27.8" E 126° 6' 14.4" | Very High | Several landslide scars have been observed in the mountainous slopes adjacent to Agusan River, southeast from Brgy. Fatima proper. From a distance, these are moderately deep slide of unconsolidated soil material. No residential settlement was affected by these slides, but tree crops |

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| | | and some agricultural areas. Recommendations: This area should be declared as permanent danger zone prohibited for residential settlements. Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. |
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| Brgy. Magangit (N 7° 32' 33.2" E 126° 4' 28.1") | | |
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| Purok 1 N 7° 34' 0.9" E 126° 4' 1.3" | High | A section of old logging road going to Batinao – Magangit area is assessed to be highly susceptible to landslide. This road cut has convex shaped-slope characterized by 70° – 80° steepness. Underlying material is made up of unconsolidated rock fragments, sand and clay components. Although, active landslide is absent, indications of possible mass movement have been observed during the fieldwork. Soil creep is manifested by titled trees along the slope. Recommendations: Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. |
| Purok 4 N 7° 32' 43.4" E 126° 4' 25.5" | High to Moderate | Steep slopes of mountainous portion of Purok 4, Brgy. Magangit are assessed to be highly susceptible to rain-induced landslide due to heavy continuous rainfall. Small landslide scars were observed during the field mapping. Near the footslopes of the ridge, landslide assessment turned to be moderately susceptible to landslide due to gradual change in the steepness of the slope. Recommendations: Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. Limit the residential houses in the area. Settlement along this area should be carefully studied including effective slope modification project and drainage system. |
| Purok 5 N 7° 33' 54.4" | High | Slopes adjacent to the road of Purok 5, Brgy. Magangit are assessed to be highly susceptible to rain-induced landslide due to heavy continuous rainfall. Small landslide scars were observed during |

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| E 126° 5' 2.5" | | <p>the field mapping. Residential houses are at risk of landslide occurrence due to slope instability.</p> <p>Recommendations:</p> <p>Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard. Relocate houses built along the footslope of the landslide prone area.</p> |
| Purok 6 N 7° 31' 37.6" E 126° 4' 49.7" | High | <p>A section of National Road in Brgy. Magangit going to Camanlangan and Maragusan is assessed to be highly susceptible to landslide. Slope along the road is characterized by 70° – 80° steepness. Small incised valley is located at the other side of the road. Although, active landslide is absent, indications of possible mass movement such as seepages have been observed during the fieldwork.</p> <p>Recommendations:</p> <p>Local residents and barangay officials should observe and/or monitor for presence of mass movement. Any further landslide occurrence should be reported to the MGB office concerned and the municipal authorities. Local government unit should implement immediate mitigating measure to reduce the risk of the existing hazard.</p> |

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| Barangay Kahayag | | |
| Eastern slopes bounding Purok 6 (GPS reading: N 7° 35' 56"/E 126° 8' 58") | High | <p>An active translational debris slide was seen on a slope along the road of Purok 6. Ground seeps at the base of the slope indicate a crack on the top slope and an incipient slide.</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>Settlement at the base of this slope should be discouraged. The lands may be utilized for agricultural but not for residential purposes.</p> |

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| Eastern slopes bounding Purok 7 (GPS reading: N 7° 36' 36.5"/E 126° 8' 45.8") | High | <p>An active landslide is present on the eastern slopes bounding Purok 7. Southeastern portions of the area near its boundary with Purok 6 are possible debris flow paths due to a stream emerging on its footslope.</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 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>Settlement at the base of this slope should be discouraged. The lands may be utilized for agricultural but not for residential purposes.</p> |
| Eastern slopes bounding Purok 10 (GPS reading: N 7° 37' 12.7"/E 126° 8' 29.6") | High | <p>An old landslide scarp was observed in the area. A spring emerging at the base of slope indicates a crack and an incipient slide. The area should not be utilized for residential purposes.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Develop early warning system (e.g. signages).</p> |

Table 4. Results of Flood Hazard Assessment

| Location | Flood Susceptibility Rating | Remarks/ Recommendations |
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| Barangay Andap | | |
| Purok 8, Sitio Liboton, Mayo River alluvial fan head (GPS reading: N 7° 33' 19.7"/E 126° 8' 15.6") | Very High | <p>Lower portions of Sitio Liboton along the floodplains of Mayo River are possible debris flow paths while the Mayo River alluvial fan head is a flashflood exit point. Discourage settlement on these areas.</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> |

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| <p>Purok 3, near Nawasa Creek (GPS reading: N 7° 31' 1.6"/E 126° 9' 40.1")</p> | <p>High</p> | <p>Nawasa Creek traverses the purok flowing northwest, joining Manlubong River and draining towards Maa River. The area is a possible flashflood exit point.</p> <p>Avoid settlement on the banks of rivers.</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 4, near Manlubong Creek (GPS reading: N 7° 31' 2.0"/E 126° 9' 41.3")</p> | <p>High</p> | <p>Manlubong Creek overflows during extreme heavy rains and inundates the area. The downstream portion of Purok 4 is a possible flashflood exit point. Settlements at the base of the gully developments and along river banks are highly discouraged.</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).</p> |
| <p>Purok 3, near Langoan River (GPS reading: N 7° 30' 19.5"/E 126° 9' 43.0")</p> | <p>High</p> | <p>Langoan River traverses the area flowing northwest from Purok 11. Scouring of river banks is present. Flood protection structures (e.g. dikes riprap) are advised to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged.</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).</p> |
| <p>Purok 11, headwaters of Langoan River</p> | <p>High</p> | <p>The headwaters of Langoan River are found in the area, making it a possible flashflood exit point. Settlement along the banks should be prohibited.</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).</p> |
| <p>Sitio Taytayan, Purok 7 (GPS reading: N 7° 31' 52.6"/E 126° 10' 31.1"); and Puroks 6, 5 and 5A along Maa River</p> | <p>High</p> | <p>The headwaters of Maa River originate in Sitio Taytayan and thus downstream portions are critical to flashfloods. Meanwhile, portions of Puroks 6, 5 and 5A along the banks of Manlubong creek towards Maa River are possible debris flow paths. Settlements on these areas are highly discouraged. River bank erosion is also present. Flood structures (e.g. dikes, riprap) may be built to prevent further scouring of banks.</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).</p> |

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| Puroks 1, 1A, 14 | Very High | <p>Portions of these areas along the Calyawan River are prone to flashfloods and debris flows. Relocation of affected residents is advised.</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).</p> |
| Barangay Bantacan | | |
| Brgy. Proper (GPS reading: N 7° 36' 39.8"/E 126° 7' 31.6") | Low | <p>Presence of old river channel east of the national highway could bring severe flooding or flashflood if the main river in the upper portion has been clogged or dammed by debris.</p> <p>Recommendations: Develop an early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p> |
| Purok 3B (GPS reading: N 7° 36' 4.5"/E 126° 7' 1.5") | Low | <p>The area suffers minor sheet floods and surface run-offs from the elevated portion of the purok.</p> <p>Recommendations: Develop an early warning device/system.</p> |
| Purok 3A (GPS reading: N 7° 36' 23.1"/E 126° 7' 34.2") | Low | <p>Presence of old river channel along the provincial highway could bring severe floods in the area.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses within the abandoned river channel.</p> |
| Purok 5A (GPS reading: N 7° 36' 30.7"/E 126° 7' 36.5") | Moderate | <p>Presence of old river channel near the provincial highway could bring floods in the area.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses within the abandoned river channel.</p> |

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| <p>Purok 2B (GPS reading: N 7° 36' 24.8"/E 126° 7' 45.2")</p> | <p>Moderate</p> | <p>Presence of old river channel east and west of the purok proper could bring severe flashfloods within the area if the river at the upper portion (headwaters) has been clogged or dammed by debris.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses along abandoned river channel. The old channel could be used as flood direction of flashflood if damming or clogging of main river channel happens at the headwater.</p> |
| <p>Purok 2A (GPS reading: N 7° 36' 43.5"/E 126° 7' 23.7")</p> | <p>Low</p> | <p>Although the area is rated as low susceptibility to flooding, sheet flooding could affect the area if the river shifts to its original course located along the national highway.</p> <p>Recommendations: Develop an early warning device/system.</p> |
| <p>Purok 1 (GPS reading: N 7° 36' 39.8"/E 126° 7' 13.5")</p> | <p>High to Critical</p> | <p>The area is along the path of converging river system. The area is highly prone to flashfloods.</p> <p>Recommendations: Develop an early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Relocation/evacuation for residents to the designated safe site.</p> |
| <p>Purok 5C (GPS reading: N 7° 36' 47.2"/E 126° 7' 3.8")</p> | <p>Low</p> | <p>Presence of braided and meandering river east of the area could bring moderate to high flood depths in the vicinity.</p> <p>Recommendations: Develop an early warning device/system.</p> |

Barangay Batinao

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| Brgy Hall (GPS reading: N 7° 34' 20.1"/E 126° 3' 32.9") | Low | The Typhoon Pablo is considered as the worst flooding event experienced in Brgy. Batinao. No flooding was recorded in the barangay hall but the adjacent areas suffer low to moderate flood rating. The most affected area within the barangay is Purok 8. Recommendations: Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). |
| Purok 2 (GPS reading: N 7° 34' 8.8"/E 126° 4' 9.7") | Moderate | The site is considered as an upper exit point of the tributaries from the eastern mountainous area. The area is flashflood prone considering its location and altitude. Recommendations: Develop early warning device/system. Observe for flashflood signs(e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). |
| Purok 8 (GPS reading: N 7° 34' 18.4"/E 126° 3' 20.9") | High | The creek in the area serves as the lower exit point of the west-flowing water from the western slopes bounding the barangay. Recommendations: Develop early warning device/system. Observe for flashflood signs(e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). |

| Barangay Cabinuangan | | |
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| Poblacion/ Barangay Center (GPS reading: N 7° 33' 19.7"/E 126° 8' 15.6") | High | An old tributary of the Calyawan River was reactivated after a flashflood brought by Typhoon Pablo hit the area. Dikes and riprap were destroyed. Install flood protection structures (e.g. dikes, riprap) and ensure its design and quality to withstand flashfloods. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during extreme heavy rains. 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. |
| Purok 4A, near the San Antonio de Padua Parish (GPS reading: N 7° 32' 49.7"/E 126° 8' 13.7") | Very High | An old channel of the Calyawan River was reactivated after Typhoon Pablo brought a flashflood in the area. Purok 4A is also a debris flow path. Further buildup on these areas is highly discouraged. Relocation of affected residents is advised. 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. |

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| Purok 4B, path of Calyawan River (GPS reading: N 7° 32' 32.8"/E 126° 8' 4.5") | Very High | The area is flashflood prone and a path for debris flows as Calyawan River passes through it. Further buildup in the area is highly discouraged. Affected residents should be relocated. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). |
| Purok 19 (near Calyawan River debris flow path) (GPS reading: N 7° 32' 12.1"/E 126° 8' 28.9") | Very High | Calyawan River passes through the area from Brgy. Andap. This mid-(alluvial) fan area is susceptible to flashfloods and debris flows, making it unsuitable for settlement. 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. |
| Purok 14 (near Calyawan River debris flow path) | Very High | Several small active and reactivated channels of Calyawan River pass through Purok 14. This mid-(alluvial) fan area is susceptible to flashfloods and debris flows, making it unsuitable for settlement. 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. |
| Purok 1A (GPS reading: N 7° 32' 18.6"/E 126° 8' 11.4") | Very High | A tributary of Calyawan River passes through the area. Dredging of the creek may be done to increase the capacity of the stream. Settlements along banks of rivers should be removed. Further buildup in the area should be discouraged. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). |
| Purok 7A, near boundary with Brgy. San Roque (GPS reading: N 7° 34' 3.9"/E 126° 8' 9.3") | High | Langoan River passes through the flashflood-prone area. Sheet flooding is also experienced by surrounding flat lands. Settlement on banks of rivers should be discouraged. 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. |

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| Brgy. Camanlangan (N 7° 30' 55.8" E 126° 6' 0.2") | | |
| Purok 2 & 3 N 7° 30' 23.4" E 126° 5' 55.4" | Very High | Residential areas of Purok 3 and Purok 2 are located along the floodplain of Batoto River making these areas very susceptible to flooding and flashflooding. Large volume of debris was deposited in the river after Typhoon Pablo incident. Inundation of the residential areas was prevented after a dredging project was conducted by the barangay a week before the typhoon. The elevations of |

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| | | <p>stream bed and the road became similar after the flashflood. Flood height could reach up to 2.0 m, carrying an enormous flow energy The foundation of steel bridge was destabilized due to river erosion. Dismantling of the steel bridge is now on progress to prevent damming that could result to severe flooding in the barangay proper.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Establish a well-studied and safer evacuation site in case of severe flooding and relocate residents along the floodplain of Batoto River. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion. Relocation of San Isidro Labrador Parish Church, situated at the immediate bank of the river, should be considered.</p> |
| <p>Purok 5 N 7° 30' 26.3" E 126° 6' 18.9"</p> <p>N 7° 30' 18.0" E 126° 6' 24.7"</p> | <p>Very High</p> <p>Very High</p> | <p>An abandoned channel of Tarale 1 River, ~200 m westward from the present river course, near the confluence of Tarale 1 and Agusan River. Large boulders have been observed around the area. This abandoned channel is accompanied by river terraces on both sides. This channel served as diversion route of floodwaters in 1998 affecting 10 families. Flood depth: 2.0 – 2.5 m</p> <p>Near the confluence of Tarale 1 River and Agusan River where large volume of sand, pebbles, cobbles, and boulders were deposited. Stream width and floodplain, approximately ~250 – 300m from both sides, should be declared as permanent danger zone.</p> <p>Recommendations: This area should be declared as danger zone prohibited for residential settlements. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Residents situated in the river terraces should be advised to evacuate during rainy and/or typhoon season. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used.</p> |
| <p>Purok 6 N 7° 30' 26.3" E 126° 6' 18.9"</p> | <p>Very High</p> | <p>This area is underlain with unconsolidated flood deposits made up of cobble and boulders in sandy matrix, most probably deposited by Agusan River. The present river course has shifted westward from the old course. Flood could reach up to 2.0 m on worst cases. River bank erosion is an active process in the system.</p> <p>Recommendations: This area should be declared as danger zone prohibited for residential settlements. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Residents situated in the river terraces should be advised to evacuate during rainy and/or typhoon season. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for</p> |

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| | | emergency used. |
| <p>Purok 7 N 7° 30' 35.1" E 126° 6' 1.1"</p> <p>N 7° 30' 45" E 126° 6' 3.0"</p> | <p>High</p> <p>Moderate</p> | <p>River terraces were observed almost parallel to the road. This evidence indicates that an old river channel might run along the road. This old channel will become a diversion route of floodwaters from Batoto River that might cause severe flooding in the area.</p> <p>Flood height during typhoon and rainy season might reach up to 1.0 m.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Residents should be advised to evacuate during rainy and/or typhoon season. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used.</p> |
| <p>Purok 8 N 7° 31' 36.9" E 126° 5' 54.2"</p> | High | <p>Floodwater from Batoto River was diverted towards the residential community in Purok 8 during Typhoon Auring last January 2013. Flood height could reach 1.5 m.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Residents should be advised to evacuate during rainy and/or typhoon season. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used.</p> |
| <p>Purok 9 N 7° 31' 50.1" E 126° 5' 57.0"</p> | High | <p>Floodwater from Agusan River was diverted towards the residential community in Purok 9 during Typhoon Auring last January 2013. Flood height could reach 1.5 m.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Residents should be advised to evacuate during rainy and/or typhoon season. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used.</p> |
| <p>Purok 13 N 7° 30' 39.1" E 126° 5' 51.3"</p> | Very High | <p>Box culvert was proven ineffective after it was destroyed due to large volume of water due to heavy rainfall during the onslaught of Typhoon Pablo.</p> <p>Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Relocate local residents permanently. Construct a well-engineered culvert that could accommodate large volume of water.</p> |

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| <p>N 7° 29' 43.5" E 126° 6' 1.2"</p> | <p>Very High</p> | <p>During heavy rains, water overflows from the river towards the road.</p> <p>Recommendations: This area should be declared as danger zone prohibited for residential settlements. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used. Relocate local residents permanently.</p> |
| <p>Purok 19</p> <p>N 7° 29' 43.1" E 126° 6' 36.5"</p> | <p>Very High</p> | <p>Box culvert was destroyed during Typhoon Pablo due to high energy water and large volume of debris flowing in Tarale 2 river.</p> <p>Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Relocate local residents permanently. Construct a well-engineered culvert that could accommodate large volume of water.</p> |
| <p>Purok 20</p> <p>N 7° 29' 39.5" E 126° 6' 57.2"</p> <p>N 7° 29' 34.7" E 126° 7' 9.4"</p> | <p>Very High</p> <p>Very High</p> | <p>Residential community of Purok 20 is situated at the immediate bank of Agusan River. Agusan River carries large amount of water from its headwaters. Riverbanks could be inundated due to swelling of river water due to heavy rain. It could reach more than 2 meters for worst case scenario.</p> <p>Kalamatan creek overflows during a typhoon in 2010 diverted it flows into an old river channel going to residential areas beside Agusan River.</p> <p>Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Relocate local residents permanently. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used.</p> |

Barangay Cogonon

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| <p>Brgy Hall (GPS reading: N 7° 34' 25.2"/E 126° 6' 51.4")</p> | <p>High</p> | <p>The brgy. hall is situated in between two active river channels namely, Batutu River and Calyawan Creek. Though the flood depth is recorded to be 0.5m only, the area is susceptible to high flood due to the old boulder sized river deposits within the area. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation of residents to the elevated portion of Purok 6 is advised during intense rain or typhoon.</p> |
| <p>Purok 4 (GPS reading: N 7° 35' 5"/E 126° 6' 48.9") Purok 5 (GPS reading: N 7° 34' 5"/E 126° 7' 0.4")</p> | <p>Critical</p> | <p>The areas are located at the contiguous zones of flashflood deposits. Silt to boulder sized sediments is present in the area explaining the high-velocity river current during Typhoon Pablo. The flood level in the area is manifested by the flood marks recorded by the enduring houses. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation of residents to the elevated portion of Purok 6 is advised during intense rain or typhoon.</p> |
| <p>Purok 8 (GPS reading: N 7° 35' 7.2"/E 126° 6' 54.8")</p> | <p>High to Critical</p> | <p>The adjacent river is connected to north-flowing Calyawan Creek. The area is covered with flashflood deposits of mostly sand and pebble sized sediments. Maximum flood depth of about 2m was experienced for over 1 week in the neighboring areas. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation of residents to the elevated portion of Purok 6 is advised during intense rain or typhoon.</p> |
| <p>Purok 2 (GPS reading: N 7° 34' 27.2"/E 126° 6' 21.3")</p> | <p>High to Critical</p> | <p>The area is situated along the Batutu River. The neighboring areas were reported to have experienced >2m depth of flood. The flashflood event in the upper Brgys. of Cabinuangan and Andap were accounted as the primary cause of overflow during Typhoon Pablo. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation of residents to the elevated portion of Purok 6 is advised during intense rain or typhoon.</p> |

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| <p>Barangay Fatima (N 7° 32' 27.8" E 126° 6' 14.4")</p> | | |
| <p>Purok 1 N 7° 33' 32.7" E 126° 6' 16.8"</p> | <p>Moderate</p> | <p>Small creeks and old channels run perpendicular in the area flowing towards Agusan River. These creeks could generate moderate (flood depth: 0.5 – 1.0 m) flooding in the area.</p> |

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| | | <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Observe rapid increase in water level and murky coloration of river water, possibly accompanied by increased water turbidity. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion.</p> |
| <p>Purok 2 N 7° 32' 27.5" E 126° 6' 12.7"</p> | High to Very High | <p>The area is situated between two river systems, the Batoto and Agusan River. These rivers drain northward going to the northeastern barangays of the municipality. Agusan River shifted several meters westward after a typhoon in 2009. Large boulders are scattered randomly suggesting that it was part of the river, either floodplain or stream bed, in the earlier times. Flood in the road could reach up to 0.5 m while ~1.0 m flood in the banks.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level. Establish a well-studied and safer evacuation site in case of severe flooding. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion.</p> |
| <p>Purok 3 N 7° 32' 27.5" E 126° 6' 12.7"</p> | High | <p>This area is dissected by old channels perpendicular to Agusan and Batoto River. These channels could be the flow path of floodwaters from the river resulting to flooding of the residential areas along the road. Usual depth of flood in the road is 0.5 m – 0.8 m, but it can reach up to >1.0 m for worst case scenario.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level and possibly increased water turbidity. Establish a well-studied and safer evacuation site in case of severe flooding. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion. Conduct dredging/desilting to increase the water flow capacity of the river.</p> |
| <p>Purok 4 N 7° 33' 14.7" E 126° 6' 22.2"</p> | High to Very High | <p>After Typhoon Pablo, large boulders and cobbles were deposited in the confluence of Batoto and Agusan River around this area. Active river erosion is present resulted to severe damage on the foundation of the bridge. Flood could reach up to 2.0 m along riverbanks during heavy rains.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Observe rapid increase in water level and murky coloration of river water, possibly accompanied by increased water turbidity. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion. Conduct flood hazard drills and trained local residence for rescue operation, stock relief goods and medicine for emergency used. Relocate residents located in the banks of the river.</p> |

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| <p>Purok 5 N 7° 32' 58.0" E 126° 6' 20.9"</p> | <p>High</p> | <p>Old river channels, running perpendicular to the present river systems, were identified during the mapping survey. Accumulation of old subrounded boulders, possibly flashflood deposits, is evident in the area. Flood depth can reach up to 1.5 m if the flow of the river shifted towards the residential areas.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Observe rapid increase in water level and murky coloration of river water, possibly accompanied by increased water turbidity. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion. Establish a well-studied and safer evacuation site in case of severe flooding.</p> |
| <p>Purok 7 N 7° 32' 10.6" E 126° 6' 8.3"</p> | <p>High</p> | <p>Old river channels are located in the both sides of the road manifested by the presence of river terraces. Large boulders (flashflood deposits) are concentrated along these river terraces. These channels can be reactivated when floodwaters from the river overflow and diverted towards the road. Flood can reach up to >1.0 m in worst case scenario.</p> <p>Recommendations: Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level and possibly increased water turbidity. Establish a well-studied and safer evacuation site in case of severe flooding. Install mitigating structure along the steep slopes of the banks to prevent riverbank erosion.</p> |

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| <p>Barangay Kahayag</p> | | |
| <p>Purok 4 (GPS reading: N 7° 35' 27.3"/E 126° 8' 42.5")</p> | <p>Moderate</p> | <p>Tubuan Creek passes through the area draining northwest into the Agusan River. This braided stream channel overflows to its surrounding flatlands. Areas along the river are prone to flashfloods while surrounding flatlands are affected by sheet flooding. The area is also a possible debris flow path.</p> <p>Dredging of the creek may be done to increase its capacity and prevent further shifting of the channels. In addition, flood structures may be installed to prevent scouring if riverbanks. Settlement on banks of rivers should be discouraged.</p> <p>Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p> |
| <p>Purok 7 (GPS reading: N 7° 36' 10.8"/E 126° 8' 44.3")</p> | <p>Moderate</p> | <p>The downstream waters of Inototan Creek exits in the area. It flows northwest joining Tubuan Creek draining into the Agusan River. Settlement near the stream is discouraged since it is a possible flashflood path.</p> |

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| | | Develop early warning system/device. Observe for flashfloods signs: rapid increase/decrease in creek/river water levels, possibly accompanied by increased turbidity (soil content). |
| Purok 8 (GPS reading: N 7° 36' 24.0"/E 126° 8' 10.8") | High | Inototan Creek traverses the flatlands of Purok 8. Sheet flooding occurs due to continuous heavy rains. Areas along the river are possible flashflood paths. Settlement on banks of rivers should be discouraged. 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 and identify nearest evacuation site. |
| Purok 9 (GPS reading: N 7° 36' 37.2"/E 126° 8' 29.9") | Moderate | Matikdaon Creek cuts across Purok 8 and Purok 9, flowing west, joining Inototan Creek and Tubuan Creek then draining northwest into the Agusan River. Dredging of the creek may be done to increase the capacity of water and prevent shifting of stream channels. Settlement on banks of rivers should be discouraged. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content) during heavy rains. |
| Purok 7A (GPS reading: N 7° 36' 29.4"/E 126° 8' 30.1") | Moderate | Inototan Creek overflows during strong typhoons/continuous heavy rains, inundating the surrounding flat lands. Settlement along the banks of stream is discouraged. Surrounding lands are swampy areas prone to sheet flooding, thus practically for useful for agricultural purposes. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content) during heavy rains. Develop early warning system/device. |
| Purok 2 (GPS reading: N 7° 35' 54"/E 126° 8' 23.9") | Moderate | The area is prone to sheet flooding. Tubuan Creek passing through the area is the source of floodwaters. Avoid settlements on banks of rivers unless flood structures (e.g. riprap) are built to protect residents. Dredging of the creek may also be done to increase the capacity of water and prevent shifting of stream channels. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content) during heavy rains. Develop early warning system/device. Organize emergency evacuation protocols with municipal authorities for the community. |

Barangay Katipunan

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| <p>Brgy Hall (GPS reading: N 7° 36' 54.3"/E 126° 5' 57.7")</p> | <p>Low</p> | <p>The Katipunan Brgy. Hall is proximate to a ridge making it elevated compared to the western portion of the brgy. The area is only affected by sheet flooding from the eastern mountainous part. Recommendations: Develop early warning device/system. Ensure proper maintenance of all drainage canals/outlets. Constant declogging and broadening of the drainage and irrigation canals are advised.</p> |
| <p>Purok 4A (GPS reading: N 7° 36' 36.1"/E 126° 5' 37.2")</p> | <p>High to Critical</p> | <p>Majority of the portions of Purok 4A are situated at the old channels of Agusan River considering them critically susceptible to flood. Some of the areas are located at more elevated old sandbars of the braided Agusan River. These sites may also suffer critical flooding during heavy rains or typhoon. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation of residents to the higher portion near the brgy. hall is advised during intense typhoon.</p> |
| <p>Purok 1A (GPS reading: N 7° 37' 11.4"/E 126° 5' 10.7")</p> | <p>High to Critical</p> | <p>The areas situated near creek connected to Agusan River are highly to critically susceptible to flood. The maximum recorded flood depth is about 2m during Typhoon Pablo and recedes after 1week. Recommendations: Develop an early warning device / system. Consider relocating houses along the banks of the creek connected to Agusan River. Observe for rapid increase in the water levels of the river, possibly accompanied by increased turbidity. Existing bank protection measures (e.g. dike) along the creeks must be reoriented / elevated.</p> |

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| <p>Brgy. Magangit (N 7° 32' 33.2" E 126° 4' 28.1")</p> | | |
| <p>Purok 1 N 7° 33' 40.5" E 126° 3' 54.9"</p> | <p>Very High</p> | <p>This area, situated along the banks of Batinao(?) river, is dominantly agricultural area (banana plantation), with minor settlements several meters from the river. Floodwaters could reach up to 2.0 – 2.5 m at the immediate banks. Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Relocate local residents permanently. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level.</p> |
| <p>Purok 2 N 7° 32' 32.0" E 126° 4' 27.3"</p> | <p>Very High</p> | <p>Magangit Creek is a narrow creek, approximately 2 – 3 m from both ends, dissecting the barangay center of Magangit. Areas near the banks including Barangay Hall and Magangit Elementary School are prone to flashflooding and sheet flooding.</p> |

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| | | <p>Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Relocate local residents permanently. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level.</p> |
| <p>Purok 3</p> <p>N 7° 32' 39.3"</p> <p>E 126° 4' 27.3"</p> | High | <p>This is located in the confluence of Magangit Creek and Batinao(?) River. Floodwater could overflow during heavy rain and flood height could reach more than 1.0 m. River deposits are made up of sand, pebbles, cobbles and boulders.</p> <p>Recommendations: Areas along the banks should be declared as danger zone prohibited for residential settlements. Relocate local residents permanently. Develop an early warning device/system during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level.</p> |
| <p>Purok 6</p> <p>N 7° 32' 14.0"</p> <p>E 126° 4' 38.5"</p> | Very High | <p>Recent flashflood event occurred in the area manifested by large boulder deposits. This stream has an approximate width of 2 – 3 m carrying high energy water during heavy rainfall.</p> <p>Recommendations: This area is prone to flashflooding and should be declared as danger zone prohibited for residential settlements. Relocate local residents permanently. Develop an early warning device/system (i.e signages) during typhoon and rainy season. Monitor rapid murky coloration of river water accompanied by increase of water level.</p> |

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| Barangay Magsaysay | | |
| <p>Brgy Hall</p> <p>(GPS reading: N 7° 36' 7.5"/E 126° 6' 6.9")</p> | Low | <p>The barangay hall and its surrounding regions were not affected by severe flooding during typhoon Pablo which is regarded as the worst flooding event experienced in the barangay. The area is only affected by minor sheet flooding.</p> <p>Recommendations: Develop early warning device/system. Ensure proper maintenance of all drainage canals/outlets.</p> |
| <p>Purok 4</p> <p>(GPS reading: N 7° 35' 58.8"/E 126° 5' 52.1")</p> | Critical | <p>The area is situated near the north-draining Agusan River from the lower Cogonon. The river is reported to shift annually for about 5m. It must me noted that the area is located within the broad flood plain of Agusan River.</p> <p>Recommendations: Develop an early warning device / system. Consider relocating houses along the banks of the creek</p> |

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| | | connected to Agusan River. Observe for rapid increase in the water levels of the river, possibly accompanied by increased turbidity). If feasible, construction of ripraps and perimeter wall along tributaries of rivers must be addressed. |
| Purok 3 (GPS reading: N 7° 36' 20.9"/E 126° 6' 50.2") | Critical | New river course was formed in area as a product of Typhoon Pablo severe floods. This creek serves as an exit route of the overflowed Calyawan Creek to the east. In some areas the flood depth is recorded to be 1m only but since it is located in between the new and old river course, they are considered also as critical areas. Recommendations: Develop an early warning device / system. Consider relocating houses along the banks of the creek connected to Agusan River. Observe for rapid increase in the water levels of the river, possibly accompanied by increased turbidity). Relocation/evacuation for residents is advised to the elevated area at the vicinity of brgy. hall. |

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| Barangay Panag | | |
| Brgy Hall (GPS reading: N 7° 35' 47"/E 126° 5' 26.6") | Moderate | The brgy. hall of Panag is situated approximately 200m east of the active Agusan River. However, the area has moderate susceptibility to flooded during Typhoon Pablo due to its high elevation in contrast to the adjacent riverbanks. Recommendations: Develop an early warning device / system. Consider relocating houses along the banks of the Agusan River. Observe for rapid increase in the water levels of the river, possibly accompanied by increased turbidity. |
| Purok 9 (GPS reading: N 7° 37' 11.8"/E 126° 4' 54.4") | Critical | Purok 9 is sandwiched by two active water channels that repeatedly inundate the area. The eastern Agusan River severely contributes to the periodic floods and being supplemented by creeks at the western side. Recommendations: Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Observe for sunken or displaced road surfaces. |
| Purok 4 (GPS reading: N 7° 36' 32.3"/E 126° 5' 6.0") | High | The purok hall is adjacent to Agusan River making it vulnerable to some side effects (e.g., scouring) of flashfloods during heavy rains/typhoons. Recommendations: Develop early warning device/system. Observe for flashflood signs (e.g.,rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Relocation/evacuation for residents is advised to the elevated area of Purok 15. |

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| <p>Purok 2 (GPS reading: N 7° 35' 20.4"/E 126° 5' 42.9")</p> | <p>Moderate</p> | <p>Flood height of about 0.6m was noted in Purok 2 Hall. Sheet flood is due to the overflow of the north-flowing Agusan River. Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in river water levels, possibly accompanied by increased turbidity (soil content).</p> |
| <p>Purok 14 (GPS reading: N 7° 36' 44.9"/E 126° 5'0.3")</p> | <p>High</p> | <p>The edge of the purok hall is scoured by the active shifting/movement of Agusan River. It must be noted and expected that the nearby banana plantations will be damaged if the Agusan River is not properly controlled by engineering mitigating measures. Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in river water levels, possibly accompanied by increased turbidity (soil content). Riverbank protection measures (e.g., dike) along the outer part Agusan River must be built.</p> |
| <p>Purok 13 (GPS reading: N 7° 36' 8.3"/E 126° 4'45.2")</p> | <p>High</p> | <p>The creek in the site serves as an exit point of the north-flowing water from the southern mountainous areas. Recommendations: Develop early warning device/system. Observe for flashflood signs(e.g., rapid increase/decrease in river water levels, possibly accompanied by increased turbidity (soil content).</p> |
| <p>Purok 8 (GPS reading: N 7° 36' 44.5"/E 126° 4'47.8")</p> | <p>High</p> | <p>The area is considered as the exit point of water from the upstream creek of Purok 13. It remarkably inundates the neighboring zones critically affecting numerous plantations. Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in river water levels, possibly accompanied by increased turbidity (soil content).</p> |
| <p>Purok 3 (GPS reading: N 7° 34' 26.9"/E 126° 5'59.2")</p> | <p>Critical</p> | <p>The area below Panag Bridge has an approximate extent of 100m covered by sand to boulder sized deposits from the upstream of Calyawan Creek. This site and its vicinity are considered as critical to flashfloods due to its proximity to the active river channel. Recommendations: Develop early warning device/system. Observe for flashflood signs(e.g., rapid increase/decrease in river water levels, possibly accompanied by increased turbidity (soil content). If feasible, construction of ripraps and perimeter wall along tributaries of rivers must be addressed.</p> |

Barangay San Roque

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| Purok 3C | Moderate | <p>Sheet flooding at the Purok Proper is brought by the overflow of waters from Lipgusan Creek during extreme heavy rains/typhoons. Other areas southwest of the purok have low susceptibility to flooding.</p> <p>Recommendations: Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p> |
| Purok 3B (GPS reading: N 7° 34' 47.6"/E 126° 9' 7.3") | Low | <p>River terraces were observed 10 meters from the active river channel of Tubuan River. Floodwaters could encroach below the river terrace. The northern portion of the purok is prone to river migration/shifting of river channels making it a probable path for rising floodwaters in the future.</p> <p>Recommendations: Develop early warning device/system. Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content). Avoid construction of houses along or near the banks of Tubuan River.</p> |
| Purok 3 | Low | <p>The area experiences sheet flooding during extreme heavy rains/typhoons. Flood heights reach up to about 0.2 meter in the area.</p> <p>Recommendation: Develop early warning device/system.</p> |
| Purok 5 (GPS reading: N 7° 35' 0.9"/E 126° 7' 28.2") | Moderate | <p>The area is flashflood-prone due to damming of gullies present in the upstream area of the river. Residents should be vigilant in observing the migration/shifting of river course. River clogging could result to the diversion of stream flow towards the purok. Meanwhile, surrounding flatlands are affected by sheet flooding with flood heights reaching up to a meter during extreme heavy rains/typhoons.</p> <p>Recommendations: Develop early warning system/device. Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content).</p> |
| Purok 5A (GPS reading: N 7° 34' 34.5"/E 126° 7' 35.6") | Moderate | <p>Areas along the river are flashflood-prone while surrounding flat lands experience sheet flooding during extreme heavy rains/typhoons. Flood heights reach up to about a meter in the area.</p> <p>Recommendations: Develop early warning system/device. Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content).</p> |
| Purok 4 (GPS reading: N 7° 35' 37.2"/E 126° 7' 46.4") | Low | <p>Several old/abandoned river channels are present in the following areas:</p> <ol style="list-style-type: none"> 1. ~250 meters east of the national highway 2. ~400 meters east of the previous river channel (650 meters east of national highway). |

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|---|---------------------------|---|
| | | <p>Reactivation of these channels could increase the area's susceptibility to flooding.</p> <p>Recommendations: Develop early warning system/device.</p> |
| <p>Purok 2 (GPS reading: N 7° 34' 19.8"/E 126° 8' 3.7")</p> | <p>Very High/Critical</p> | <p>Residents living along/near meandering curve of Langoan River (near the bridge) should be relocated. The area is prone to flashfloods. Moreover, sheet flood flow direction is also towards the area.</p> <p>Recommendations: Develop early warning system/device. Relocate residents living along, near and on outer curve of the Langoan River (at the bridge area).</p> |
| <p>Purok 1 (GPS reading: N 7° 35' 3.6"/E 126° 7' 52.8")</p> | <p>High</p> | <p>Moderate to high flooding susceptibility were observed along the western portion of the Purok where a new river course has been developed. The purok proper could experience severe flooding if river shifts towards the north from its present course.</p> <p>Recommendations: Develop early warning system/device. Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content).</p> |
| <p>Purok 5B (GPS reading: N 7° 36' 34.8"/E 126° 7' 27.2")</p> | <p>High</p> | <p>An old river channel which is located east of the national highway could be a possible path for flashflood. Settlement near the banks of the old river channel is highly discouraged.</p> <p>Recommendations: Develop early warning system/device. Observe for flashflood signs (e.g., rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity or soil content).</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.