



Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. XIII

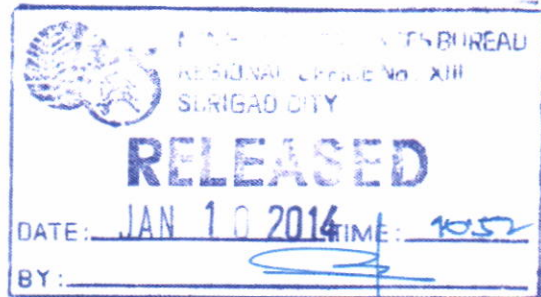
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January 9, 2014

RD-G-14-01-10

HONORABLE GLENN M. PLAZA

Municipal Mayor
Municipality of Sta. Josefa
Province of Agusan del Sur



Dear Hon. Mayor Plaza:


Respectfully furnishing your end the document entitled "Results of the MGB Landslide and Flood Assessment and Mapping (1:10,000 scale) of the Municipality of Sta. Josefa Agusan del Sur". The assessment is in line with the government's effort aimed at reducing, if not totally mitigating the destructive effects and impacts of natural hazards to the populace.

The Office expresses its deep gratitude for the support and assistance rendered to the Geohazard Mapping and Assessment Team of our Regional Office during the conduct of the field survey.

We look forward to a continuing partnership and collaboration with the LGU of Sta. Josefa, Agusan del Sur in the nation's overall disaster risk reduction program.

Very truly yours,

BY THE AUTHORITY OF THE REGIONAL DIRECTOR:


NOLI N. ARREZA
OIC, Mine Management Division



GSD-13-01-Ghz-10

Cc: **DIRECTOR, MGB CO**
HON. GOVERNOR, Agusan del Sur
HON. REPRESENTATIVE, 2nd District, ADS
Office of Civil Defense, RDRRMC Caraga

REGIONAL EXECUTIVE DIRECTOR, DENR, R-XIII
PENRO, Agusan del Sur
CENRO, Bunawan, ADS
REGIONAL DIRECTOR, DILG-Caraga

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**"MINING SHALL BE PRO-PEOPLE AND PRO-ENVIRONMENT
IN SUSTAINING WEALTH CREATION AND IMPROVED QUALITY OF LIFE."**

RESULTS OF THE MGB LANDSLIDE AND FLOOD ASSESSMENT AND MAPPING (1:10,000 SCALE) OF THE MUNICIPALITY OF STA. JOSEFA, PROVINCE OF AGUSAN DEL SUR

The Mines and Geosciences Bureau-Department of Environment and Natural Resources (MGB-DENR) conducted landslide and flood assessment and mapping (1:10,000 scale) of areas within the municipality of Sta. Josefa on October 10-18, 2013. 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 Joel A. Calugcugan, Melvin A. Mantilla, Elaine L. Galido, geologists from MGB – Caraga Region XIII with the assistance of GSD personnel Mr. Evangelino M. Morales, Jr., Dionesio A. Surigao and Julius A. Sulapas.

The MGB-DENR particularly covered the following areas:

- Puroks 1 to 24 in Barangay Angas
- Puroks 1 to 15 in Barangay Aurora
- Puroks 1 to 11 in Barangay Awao
- Puroks 1 to 5 in Barangay Concepcion
- Puroks 1 to 7 in Barangay Pag-asa
- Puroks 1 to 8 in Barangay Patrocinio
- Puroks 1 to 12 in Barangay Poblacion
- Puroks 1 to 7 in Barangay San Jose
- Puroks 1 to 11 in Barangay Santa Isabel
- Puroks 1 to 10 in Barangay Sayon
- Puroks 1 to 9 in Barangay Tapaz

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

Likewise, the assessed areas were also rated as having low, moderate or high susceptibility to flooding. The flood susceptibility parameters are as follows:

High : Areas likely to experience flood heights of greater than 1.0 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 areas prone to flashfloods

Moderate : Areas likely to experience flood heights of 0.5 to 1.0 meter and flood duration of 1 to 3 days. These areas are subject to widespread inundation during periods of prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and infilled valleys are areas subjected to moderate flooding

Low : Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than one day. These areas include low hills and gentle slopes. They also have sparse to moderate drainage density

The barangay officials were presented with a *Landslide and Flood Threat Advisory* when appropriate. This advisory informs them of their area's susceptibility to landslides and floods and contains the corresponding recommendations.

Summarized below are the results of the assessment of the covered areas:

Table 1. Results of Landslide and Flood Assessment at Barangay Angas

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°58'30.8"N/126°01'56.1"E
2	None	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°58'18.3"N/126°01'58.1"E
3	None	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates

			07°58'12.7"N/126°01'57.6"E
4 (Lower Angas)	Low to Moderate	Low	Observe for presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report observations to the concerned municipal authorities or to the MGB; for vigilance of the residents located at the foot of slope during inclement weather conditions. Prohibit future settlement directly located at the foot of slopes. Observe for rapid increase/decrease on the water level at Angas Creek possibly accompanied with increased turbidity (soil content). Prohibit settlement at the creeks embankments. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°57'55.8"N/126°02'00.1"E
6 (Sitio Bacilisi)	Low	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Activate BDCC at all times. Geographic coordinates 07°57'59.1"N/126°02'25.1"E
7 (Sitio Bacilisi)	Low	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Activate BDCC at all times. Geographic coordinates 07°58'00.2"N/126°02'23.8"E
8 (Sitio Bacilisi)	Low	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Activate BDCC at all times. Geographic coordinates 07°58'00.7"N/126°02'24.6"E
9 (Sitio Bacilisi)	Low to Moderate	Low	Observe for presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report observations to the concerned



			<p>municipal authorities or to the MGB; for vigilance of the residents located at the foot of slope during inclement weather conditions. Prohibit future settlement directly located at the foot of slopes. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times.</p> <p>Geographic coordinates 07°58'00.6"N/126°02'25.8"E</p>
10 (Sitio Bacilisi)	Moderate	None	<p>Monitor and observe for progress of mass movements on the road cut. Observe for other presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report such observations to the concerned municipal authorities or to the MGB; for vigilance of the residents located at the foot of slopes during inclement weather conditions. Prohibit future settlement directly located at the foot of slopes. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Stabilize the reported mass movements present at the purok. Activate BDCC at all times.</p> <p>Geographic coordinates 07°57'58.3"N/126°02'28.5"E</p>
11 (Sitio Cebuli)	Low	Low	<p>Observe for rapid increase/decrease on the water level at Angas Creek possibly accompanied with increased turbidity (soil content). Prohibit settlement at the creeks embankments. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times.</p> <p>Geographic coordinates 07°57'23.5"N/126°01'54.7"E</p>
12	Moderate	None	<p>Observe for presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report observations to the concerned municipal authorities or to the MGB; for vigilance of the residents located at the foot of slope during inclement weather conditions. Prohibit future settlement at the foot of slopes and on the ridge edges. Provide an evacuation site which is safe from</p>

			landslide and flooding. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. Activate BDCC at all times. Geographic coordinates 07°57'27.9"N/126°01'35.7"E
13	Moderate to High	None	Observe for presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report observations to the concerned municipal authorities or to the MGB; for vigilance of the residents located at the foot of slope during inclement weather conditions. Develop an early warning system regarding landslide. Prohibit future settlement at the foot of slopes and on the ridge edges. Provide an evacuation site which is safe from landslide and flooding. Residents located at the ridge edges characterized with steep slopes are recommended to be relocated. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. Activate BDCC at all times. Geographic coordinates 07°57'27.6"N/126°01'30.4"E
14 (Proper Angas)	Moderate	None	Observe for presence of mass movements (e.g. landslide, tension cracks). Observe for saturated grounds or seeps. Report observations to the concerned municipal authorities or to the MGB; for vigilance of the residents located at the foot of slope during inclement weather conditions. Prohibit future settlement at the foot of slopes and on the ridge edges. Provide an evacuation site which is safe from landslide and flooding. Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. Activate BDCC at all times. Geographic coordinates 07°57'31.2"N/126°01'31.8"E
15 (Sitio Durian)	Low	Low	Recommend proper drainage canals to facilitate surface run-off during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°57'44.8"N/126°01'17.6"E
16 (Sitio Durian)	Low	Low	Recommend proper drainage canals to facilitate surface run-off during heavy precipitation. The barangay should provide an evacuation site

			which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°57'44.0"N/126°01'15.4"E
17 (Sitio Durian)	Low	Low	Recommend proper drainage canals to facilitate surface run-off during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°57'42.1"N/126°01'11.5"E
18 (Sitio Dao)	None	Low to Moderate	Observe for rapid increase/decrease on the water level at the creek traversing the purok possibly accompanied with increased turbidity (soil content). Prohibit settlement at the creeks embankments. Develop an early warning system regarding flooding thru periodic conduct of evacuation drills. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended if storm signal warnings are raised or unusual flooding is experienced. Recommend to conduct regular maintenance on the existing drainage canals. Concrete line canals are also recommended. Activate BDCC at all times. Geographic coordinates 07°57'48.4"N/126°00'40.3"E
19 (Sitio Dao)	None	Low to Moderate	Develop an early warning system regarding flooding thru periodic conduct of evacuation drills. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended if storm signal warnings are raised or unusual flooding is experienced. Recommend to conduct regular maintenance on the existing drainage canals. Concrete line canals are also recommended. Activate BDCC at all times. Geographic coordinates 07°57'51.0"N/126°00'34.4"E
20 (Sitio Dao)	None	Low to Moderate	Develop an early warning system regarding flooding thru periodic conduct of evacuation drills. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended if storm signal warnings are raised or unusual flooding is experienced. Recommend to conduct regular maintenance on the existing drainage canals. Concrete line canals are also recommended. Activate BDCC at all times.

			Geographic coordinates 07°57'51.4"N/126°00'37.4"E
21 (Sitio Dao)	None	Low to Moderate	Develop an early warning system regarding flooding thru periodic conduct of evacuation drills. Pre-emptive evacuation is recommended if storm signal warnings are raised or unusual flooding is experienced. Provide an evacuation site which is safe from landslide and flooding. Recommend to conduct regular maintenance on the existing drainage canals. Concrete line canals are also recommended. Activate BDCC at all times. Geographic coordinates 07°57'51.8"N/126°00'40.0"E
22	None	Moderate to High	Observe for rapid increase/decrease on the water level at Hinalinan Creek possibly accompanied with increased turbidity (soil content). Develop an early warning system thru periodic conduct of evacuation drills. Prohibit settlement at the creeks embankments. Pre-emptive evacuation is recommended if storm signal warnings are raised or unusual flooding is experienced. Provide an evacuation site which is safe from landslide and flooding. For long term solutions, relocating the entire purok is recommended. Activate BDCC at all times. Geographic coordinates 07°58'32.0"N/126°01'25.1"E
23	None	Low	The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°58'34.0"N/126°01'37.0"E
24	Low	Low	The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°58'13.1"N/126°01'28.3"E
25	None	Low	Recommend to provide concrete line canals to facilitate surface run-off especially during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and flooding. Activate BDCC at all times. Geographic coordinates 07°58'24.8"N/126°01'58.7"E
26 (Sitio Durian)	Low	Low	Recommend proper drainage canals to facilitate surface run-off during heavy precipitation. The barangay should provide an evacuation site which is safe from landslide and



			flooding. Activate BDCC at all times. Geographic coordinates 07°57'39.2"N/126°01'24.1"E
Proposed Relocation Site (Purok 13) Site 1- 07°57'27.6"N/ 126°01'31.3"E Site 2- 07°57'26.6"N/ 126°01'28.3"E			The proposed relocation sites are subject for detailed mapping and/or The proposed relocation site is subject for detailed mapping and/or Geohazard Identification Report (GIR).

Table 2. Results of Landslide and Flood Assessment at Barangay Aurora

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Low	Provide concrete line canals.
2	None	Low	Provide concrete line canals. Provide concrete line canals at Aurora Elem. School and at Aurora Nat'l High School.
3	None	Moderate; partly high	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Agusan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Prohibit future settlement and construction of new structures near the riverbanks. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Provide proper drainage canals.
4	None	Moderate with High portion at the boundary near Purok 5	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Agusan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Prohibit future settlement and construction of new structures near the riverbanks. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Elevate the road, define and deepen existing drainage canals and replace RCP

			into box-type culvert at the boundary between Purok 4 and 5.
5	None	Low with High portion at the boundary near Purok 4	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Agusan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Prohibit future settlement and construction of new structures near the riverbanks. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Elevate the road, define and deepen existing drainage canals and replace RCP into box-type culvert at the boundary between Purok 4 and 5.
6	None	Low	Define and deepen existing drainage canals.
7	None	Low	Define and deepen existing drainage canals.
8 (Kaangayan 1)	None	Low	Define and deepen existing drainage canals.
9 (Kaangayan 1)	None	Low	Define and deepen existing drainage canals.
10 (Kaangayan 1)	None	Low	Define and deepen existing drainage canals.
11 (Kaangayan 1)	None	Low	Define and deepen existing drainage canals and also conduct regular maintenance on drainage canals near Kaangayan Primary School.
12 (Kaangayan 2)	None	Moderate	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Lucad Creek's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Prohibit future settlement and construction of new structures near the banks of creek. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Elevate barangay road. Provide proper drainage canals.
13 (Kaangayan 2)	None	Moderate	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Buhanginon Creek's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation.

			Prohibit future settlement and construction of new structures near the banks of creek. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Provide proper drainage canals. Rechanel Buhanginon creek. Elevate barangay road. Provide additional box-type culvert.
14 (Kaangayan 2)	None	Moderate with High portion along the Buhanginon creek banks	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Buhanginon Creek's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Rechanel Buhanginon creek. Elevate barangay road. Relocate all houses and prohibit future settlement and construction of new structures at or near the creek banks.
15 (Kaangayan 2)	None	Moderate	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Lucad Creek's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Prohibit future settlement and construction of new structures near the banks of creek. Identify evacuation site that is safe from landslide and flooding. Activate BDCC at all times for quick response. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. At Pag-asa Elem. School, elevate the school grounds, concretize existing canal and define its outlet. Also, provide proper drainage system at the school. Remove obstructions (e.g. access road, plants and structure like culvert) under Lucad Bridge. Realign and elevate barangay road. Provide protective structure on Lucad Creek. Rechanel Lucad creek.

Table 3. Results of Landslide and Flood Assessment at Barangay Awao

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	High	<p>Observe for rapid increase/decrease of water level along the Awao River possibly accompanied with increased turbidity (soil content). Develop an early warning system thru periodic conduct of evacuation drills. Pre-emptive evacuation is recommended during inclement weather conditions or if abnormalities in the water level along creeks/rivers are observed; thus, provision of evacuation sites which is safe from landslide and flooding is highly recommended. Prohibit future settlement along creeks/rivers embankments. A flood protective structure is also recommended to install along Awao River where flooding usually starts from near the steel bridge (07°58'02.4"N/126°00'11.5"E). Proper concrete drainage canals are also recommended to install. The barangay is recommended to acquire rubber boats and/or mobile trucks for rescue operation purposes. Activate BDCC at all times.</p> <p>Geographic coordinates 07°58'05.0"N/126°00'02.6"E</p>
2	None	High	<p>Observe for rapid increase/decrease of water level along the Awao River possibly accompanied with increased turbidity (soil content). Develop an early warning system thru periodic conduct of evacuation drills. Pre-emptive evacuation is recommended during inclement weather conditions or if abnormalities in the water level along creeks/rivers are observed; thus, provision of evacuation sites which is safe from landslide and flooding is highly recommended. Prohibit future settlement along creeks/rivers embankments. The barangay is recommended to acquire rubber boats and/or mobile trucks for rescue operation purposes. Activate BDCC at all times.</p> <p>Geographic coordinates 07°58'07.2"N/126°00'01.5"E</p>
3	None	Moderate	<p>Observe for rapid increase/decrease of water level along the Awao River possibly accompanied with increased turbidity (soil content). Develop an early warning system thru periodic conduct of evacuation drills. Pre-</p>