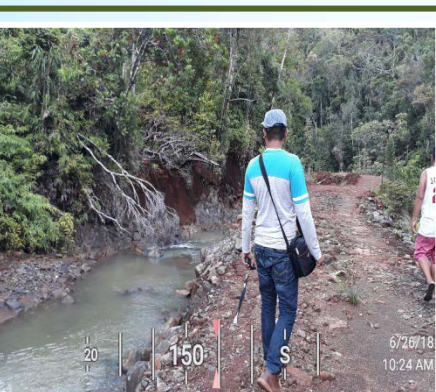


# SEMI ANNUAL REPORT 2018



## MGB-XIII PHYSICAL ACCOMPLISHMENTS FOR THE FIRST SEMESTER OF CY 2018



# **Geosciences Development Services**



## GEOSCIENCES DIVISION

### VULNERABILITY AND RISK ASSESSMENT

With the completion of the 1:10,000-scale geohazard mapping project, the Mines and Geosciences Bureau was tasked to continue its contribution to the Disaster Risk Reduction Management / Climate Change Adaptation initiatives of the National Government thru a new project, Vulnerability and Risk Assessment (VRA) which started in year 2015. With the accomplished geohazard maps as a key input, VRA primarily aims to update the geohazard maps and generate exposure maps of the population, build-up areas and lifeline infrastructures such as roads to hydrometeorological hazards such as fluvial / coastal flooding and rain-induced landslides.

For this semester, six (6) municipalities of Caraga Region all within the Province of Surigao del Sur were covered by the VRA program namely:

1. Tagbina
2. Lianga
3. San Agustin
4. Marihatag
5. Cagwait
6. Bayabas

Photo documentation is attached in Annex A.

### CAPACITY BUILDING FOR GEOSCIENCES DIVISION PERSONNEL

As part of its continuing advocacy to capacitate technical personnel to further enhance their knowledge and skill in the performance of their tasks and/or promote their professional growth thru participation in seminars / conferences in their respective discipline, the following training programs were attended by staff of the division:

#### A. Analytical Laboratory Personnel

Title of Training Program	Organizer / Sponsor	Date of Program	Venue	Name of Attendees
1. 33 <sup>rd</sup> Philippine Chemistry Congress	Integrated Chemist of the Philippines	May 30, 2018 – June 1, 2018	Philippine International Convention Center	Cecilia L. Consuegra Christie A. Apale
2. Training Course on Measurement of Uncertainty and Internal Quality Control in the	Mines and Geosciences Bureau	April 10-14, 2018	Greenhills Elan Hotel in San Juan, Metro Manila	Cecilia L. Consuegra Jusrit Elvie B. Seguis

## **CONDUCT OF INFORMATION, EDUCATION AND COMMUNICATION (IEC) CAMAPAIN OF VULNERABILITY AND RISK ASSESSMENT (VRA) TO LOCAL GOVERNMENT UNITS (LGUs)**

Information, Education, and Communication (IEC) Campaign for the VRA Project was conducted to two (2) city/ municipality namely Butuan City and Buenavista, Agusan del Norte.

Other geohazard IEC materials such as flyers, pamphlets, posters and VCD's were also provided during the Women Summit held in Gateway Hotel, Surigao city on March 30, 2018 and during the Mine Convention held in Gateway Hotel, Surigao City on June 13-16, 2018.

## **GEOHAZARD OPERATION CENTER**

The Geohazard Operation Center was operationalized during the occurrence of the Typhoon Basyang. Teams were organized to assess the extent of the damage from this event which includes assessments of rain-induced landslides and resulting slope instability and ground subsidence. Reports were generated and provided to the concerned LGU's and stakeholders affected by the typhoon.

## **GEOLOGIC QUADRANGLE MAPPING**

Geologic quadrangle mapping at 1:50,000 scale was undertaken in Siargao Islands, Surigao del Norte. Three (3) of the five (5) quadrangles targeted for this year were covered by the survey this semester namely updating of the Sapao quadrangle, Numancia quadrangle and Esperanza quadrangle, all in Siargao Islands, Surigao del Norte.

Selected photographs of the geological mapping highlights is provided in Annex B.

## **GROUNDWATER RESOURCE ASSESSMENT**

Two (2) Provinces of Caraga Region are the targets of the Groundwater Resource Assessment program for this year namely the Province of Surigao del Norte (Tier 1) and the Province of Agusan del Sur. For this semester, the Office duly accomplished the conduct of groundwater resource assessment of twenty (20) of the twenty one (21) LGU's of Surigao del Norte namely Claver, Bacuag, Tubod, Mainit, Alegria, Placer, Dapa, Del Carmen, General Luna, San Benito, San Francisco, Sta. Monica, Burgos, Pilar, San Isidro, Socorro, Sison , Taganaan and Surigao City .

Pictorials of the groundwater resource assessment activities are attached in Annex C.



## MISCELLANEOUS GEOLOGICAL SERVICES

A total of fourteen (14) geological services were provided to various clienteles during the year in review. This could be further categorized based on purpose as follows:

### Geohazard Identification Survey

As one of the mandatory requirement for securing an Environmental Clearance Certificate for housing projects and, optionally, other land development projects as deemed applicable by the Environmental Management Bureau (EMB), Geohazard Identification Survey (GIS) was conducted on the following proposed sites:

NAME OF PROJECT	PROPONENT	LOCATION
1. VCDU-Palmsville	VCDU Realty Corp.	Brgy. Ambago, Butuan City, Agusan del Norte
2. VCDU Price Town Subdivision	VCDU Realty Corp.	Brgy. Libertad, Butuan City, Agusan del Norte
3. Telaje Housing Project Phase I	Federation of Tandag City Homeowners Assc.	Brgy. Telaje, Tandag City, Surigao del Sur
4. Telaje Housing Project Phase II	Federation of Tandag City Homeowners Assc.	Brgy. Telaje, Tandag City, Surigao del Sur
5. Alegria Socialized Housing Project	Mun. of Alegria,SDN	Brgy. Julio Ouano, Alegria, SDN
6. Bienvenido Montalban Calo Homes	Kaugmarin Homedev, Inc.	Brgy. Mahay, Butuan City
7. COL Pag-asa Home Owner's Association Inc. Project	Col Pag-asa Homeowners Association, Inc.	Brgy. Trinidad, Surigao City
8. Dream Village Phase 2	Mun. of Prosperidad,ADS	Purok 28, Brgy. Poblacion, Prosperidad, /ads
9. Globe Meadows Subdivision Project	Globe Construction Corp.	Brgy. Rosario, Tandag City, Surigao del Sur
10. Casa Evangeline Subdivision	Sheland Inc.	Brgy. Victoria, Tago, Surigao del Sur
11. VCDU Realty Corp. Residential Subdivision Project	VCDU Realty Corp.	Brgy. Baan, Butuan City

### **Solid Waste Disposal Site Suitability Assessment**

As part of its technical support to the Environmental Management Bureau in evaluating the geological site suitability of proposed solid waste disposal sites prior to issuance of Notice to Proceed (NTP), Five (5) proposed sanitary landfill (SLF) / ecological solid waste management park (Eco-SWM Park) projects were assessed by the Office namely:

Name of Project	Proponent	Location
1. Sanitary Land Fill	Arnilo C. Milaor Resident Manager Cagdianao Mining Corp	Sitio Baliwan, Brgy. Valencia, Cagdianao, PDI
2. Sanitary Land Fill	Municipality of Loreto, PDI	Purok 1 Lauban, Brgy. Sta. Cruz, Loreto, PDI
3. Sanitary Landfill Site	Elmer T. Luzon General Manager SFWD	Brgy. Bitan-agan, San Francisco, Agusan del Sur

### **Geohazard Assessment in Response to Tropical Storm on February 10, 2017.**

Nine (9) reports were generated to assess the damage and consequent risks posed after the occurrence of heavy rainfall experienced during the passage of Tropical Storm “Basyang”. These reports are as follows:

1. Geohazard Assessment of the reported landslide at Purok Pag-asa, Washington, Surigao City
2. Geohazard Assessment of the reported landslide at Roberta C. Ouano Memorial Elem. School, Brgy. Cagniog, Surigao City
3. Geohazard Assessment of the reported landslide and flood affected areas in the Muns. of Carrascal, Cantilan, Madrid, Carmen & Lanuza, Surigao del Sur
4. Geohazard Assessment of the reported landslide and flood affected areas in Agusan del Norte & Surigao del Norte vicinity.
5. Geohazard Assessment of the reported tension cracks & landslides in P-4 Proper, Canlanipa, Surigao City, Surigao del Norte
6. Initial Geohazard Spot Report of the extraction of Sand & Gravel near the river which leads/contributes to flooding of Sitio Kabugwason, Brgy. Ipil, Surigao City, Surigao del Norte
7. Post Disaster landslide & Flood Assessment of Typhoon Basyang of Bacuag, Surigao del Norte
8. Incident Report on the effects of Typhoon Basyang in the Mun. of Gigaquit Surigao del Norte
9. Geohazard Assessment on the flashflood event in Claver, Surigao del Norte during Typhoon Basyang

## **Geohazard Certifications**

A total of seventy two (72) geohazard certifications were issued upon the request of Provincial / Local Government Units, National Line Agencies and schools for their proposed projects school buildings and eco-tourism sites. Geohazard certifications for proposed relocation/resettlement sites were also catered for budgetary purposes only since areas greater than one (1) hectare or if it has no Certificate of Non-Coverage for ECC from Environmental Management Bureau is still subject for Geohazard Identification Survey.

# **GDS Annexes**





## Tagbina



Figure 1. Flood height near the Iglesia Ni Cristo (INC) church in Purok 4 in Barangay Sta. Maria. Intense rainfall during the 2014 typhoon Basyang caused the adjacent Tagasaka River to overflow



Figure 2. Heavily silted drainage canal near the barangay gym located in Purok 6 in Barangay Lago. The congested canal is the main contributor of flooding within the barangay.

## Bayabas



Figure 3. Recent landslide documented along the barangay road of Purok 3 in Barangay Amag. The unconsolidated soil materials were saturated with water during Typhoon Basyang. No casualties were reported.



Figure 4. River channel scouring by the Barayong River in Purok 3 in Barangay Cagbaoto. Residential houses situated along the cut bank are susceptible to landslide due to scouring.



## Marihatag



Figure 5. The actual conduct of geotagging of the government infrastructures such as waiting shed, as shown in the picture, at Purok 2 in Brgy. Amontay.



Figure 6. Confined meteoric water in the passageway of Purok 2, Brgy. San Antonio and the established drainage canals surrounding it.

## Cagwait



Figure 7. The geotagging of Aras-Asan Elementary School and an interview with a resident regarding the flooding and landslide cases (present and past) within the area



Figure 8. The gymnasium of Barangay Bacolod which also serves as the residents' evacuation center during calamities such as flood and landslide located at Purok Tambis alongside the highway.



## Lianga



Figure 9. Purok 1-4 houses in Brgy. Liamtico vulnerable to tidal flooding due to proximity in shoreline



Figure 10. Agac-Ac River in Purok 4 Brgy. Poblacion with no levee or dike to protect the nearby houses and road.

## San Agustin



Figure 11. Drainage canal in Brgy. Hornasan near Sto. Niño National High School is not sufficient and may cause localized flooding in the area.



Figure 12. Extensive flooding occurs when the river channel overflow during heavy rains in Purok 3 Brgy. Janipaan

## GEOLOGICAL QUADRANGLE MAPPING PROJECT

The Mines and Geosciences Bureau, Geologic Quadrangle Mapping is set forth pursuant to DAO 96-40, Section 7. B. “to undertake geological, mining, metallurgical, chemical and other researches, as well as mineral exploration surveys”.

Geologic Quadrangle Mapping is a term used to conduct a semi-detailed Geologic Mapping using a base map with the scale of 1:50,000 topographic map. This activity aims to have a nationwide published semi-detailed geologic map. The geologic maps generated in this program will serve as one of the primary data needed for other geological surveys such as but not limited to geohazard, hydrogeological and georesources, etc. These maps can also be useful in the creation of the Land Use and Development Plan of the Local Government Units (LGUs).

Three (3) out of five (5) quadrangles were mapped during the first semester for CY 2018 namely: Sapao, Numancia and Esperanza Quadrangles. The fieldwork is conducted by four (4) MGB personnel namely: Liza T. Pacete (Senior Geologist), Janeth S. Aparri (Geologist II), Vernie A. Nonato (Geologist II) and Dionesio A. Surigao (Geologic Aide). The fieldwork was done on March-May 2018.

A total of 26 samples were considered for the petrography and paleontological analysis (*see Table 1*). This is to confirm the megascopic rock identification and also the age of the lithologies based on the fossil assemblage.



**Table 1. Field data file of acquired samples for petro/paleo analysis.**

Type of Analysis	Sample Tag	Date Taken	Barangay	City/ Municipality	Province	Quadrangle	Megascopic ID	Coordinates	
								Longitude	Latitude
PALEO	PAL NUM SB BONG LS 01	4/11/2018	Bongdo	San Benito	Surigao del Norte	Numancia	Limestone	125.99859	9.94118
PALEO	PAL NUM DC HAL LS 03	4/12/2018	Halian Island	Del Carmen	Surigao del Norte	Numancia	Limestone	125.80888	9.92236
PALEO	PALNUM SB MAR LS 05	4/13/2018	Maribojoc	San Benito	Surigao del Norte	Numancia	Limestone	125.94044	9.92088
PALEO	PAL NUM DC DUM MS 06	4/14/2018	Dumoyog	Del Carmen	Surigao del Norte	Numancia	Mudstone	125.9836	9.84241
PALEO	PAL NUM DC DUM LS 09	4/14/2018	Dumoyog	Del Carmen	Surigao del Norte	Numancia	Limestone	125.96115	9.83176
PALEO	PAL_EZP_SI_TIG_LS_19	2-May-18	Tigasao	San Isidro	Surigao del Norte	Esperanza	Limestone	9.92185	126.1024
PALEO	PAL_EZP_DC_KAN_LS_13	11-Apr-18	Kancohoy	Del Carmen	Surigao del Norte	Esperanza	Limestone	9.89685	126.00047
PALEO	PAL_EZP_SI_PAC_LS_16	28-Apr-18	Pacifico	San Isidro	Surigao del Norte	Esperanza	Limestone	9.95453	126.09636
PALEO	PAL_EZP_PIL_SAL_LS_23	9-May-18	Salvacion	Pilar	Surigao del Norte	Esperanza	Limestone	9.83802	126.1063
PALEO	PAL_EZP_SM_ABA_LS_06	22-Mar-18	Abad Santos	Sta. Monica	Surigao del Norte	Esperanza	Limestone	9.99269	126.01806
PALEO	PAL_EZP_BUR_SM_LS_03	14-Mar-18	San Mateo	Burgos	Surigao del Norte	Esperanza	Limestone	9.99401	126.08149
PALEO	PAL-SAP-BUR-BIT-LS-10	16-Mar-18	Bitaug	Burgos	Surigao del Norte	Limestone	Limestone	126.06947	10.03194
PALEO	PAL-SAP-BUR-POB1-LS-13	17-Mar-18	Poblacion 1	Burgos	Surigao del Norte	Limestone	Limestone	126.06711	10.00386
PALEO	PAL-SAP-SM-TAN-LS-15	20-Mar-18	Tangbo	Santa Monica	Surigao del Norte	Limestone	Limestone	126.05231	10.05756
PETRO	PET NUM DC SUG OX 04	4/12/2018	Sugba Lagoon	Del Carmen	Surigao del Norte	Numancia		125.89903	9.90754
PETRO	PET NUM DC DUM MS 06	4/14/2018	Dumoyog	Del Carmen	Surigao del Norte	Numancia	Mudstone	125.9836	9.84241
PETRO	PET_EZP_SI_ROX_TUF_14	26-Apr-18	Roxas	San Isidro	Surigao del Norte	Esperanza	Tuff	9.92366	126.05998
PETRO	PET_EZP_SI_SP_AGG_15	27-Apr-18	Santa Paz	San Isidro	Surigao del Norte	Esperanza	Agglomerate	9.90039	126.05461
PETRO	PET_EZP_SM_ABA_AGG_O7	23-Mar-18	Abad Santos	Sta. Monica	Surigao del Norte	Esperanza	Agglomerate	9.99229	126.02636
PETRO	PET_EZP_PIL_MAB_SST_24	9-May-18	Mabuhay	Pilar	Surigao del Norte	Esperanza	Sandstone	9.83433	126.10667
PETRO	PET_EZP_SM_ABA_SLST_08	23-Mar-18	Abad Santos	Sta. Monica	Surigao del Norte	Esperanza	Siltstone	9.99365	126.02673
PETRO	PET_EZP_SB_SJ_BAS_O9	24-Mar-18	San Jose	San Benito	Surigao del Norte	Esperanza	Basalt	9.96583	126.00963
PETRO	PET-SAP-BUR-BIT-BAS-07	15-Mar-18	Bitaug	Burgos	Surigao del Norte	Basalt	Basalt	126.06958	10.03347
PETRO	PET-SAP-BUR-BIT-DIA-08	16-Mar-18	Bitaug	Burgos	Surigao del Norte	Diabase	Diabase	126.06989	10.03472
PETRO	PET-SAP-BUR-BIT-BAS-09	16-Mar-18	Bitaug	Burgos	Surigao del Norte	Basalt	Basalt	126.07019	10.03669
PETRO	PET-SAP-BUR-BIT-TUF-11	16-Mar-18	Bitaug	Burgos	Surigao del Norte	Welded Tuff	Welded Tuff	126.07036	10.03558
PETRO	PET-SAP-SM-GAR-TS-14	20-Mar-18	Garcia	Santa Monica	Surigao del Norte	Tuffaceous Sandstone	Tuffaceous Sandstone	126.06128	10.05136



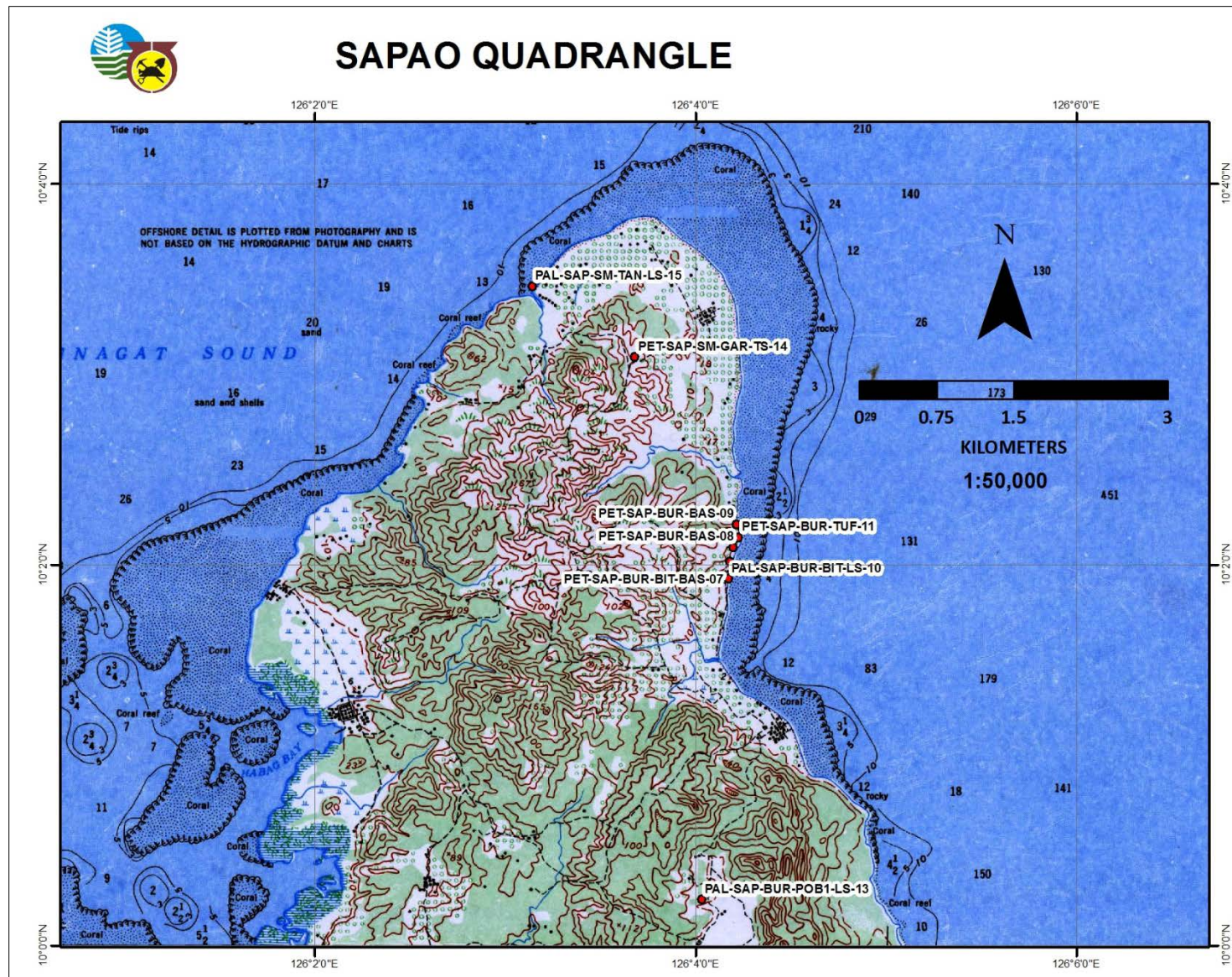
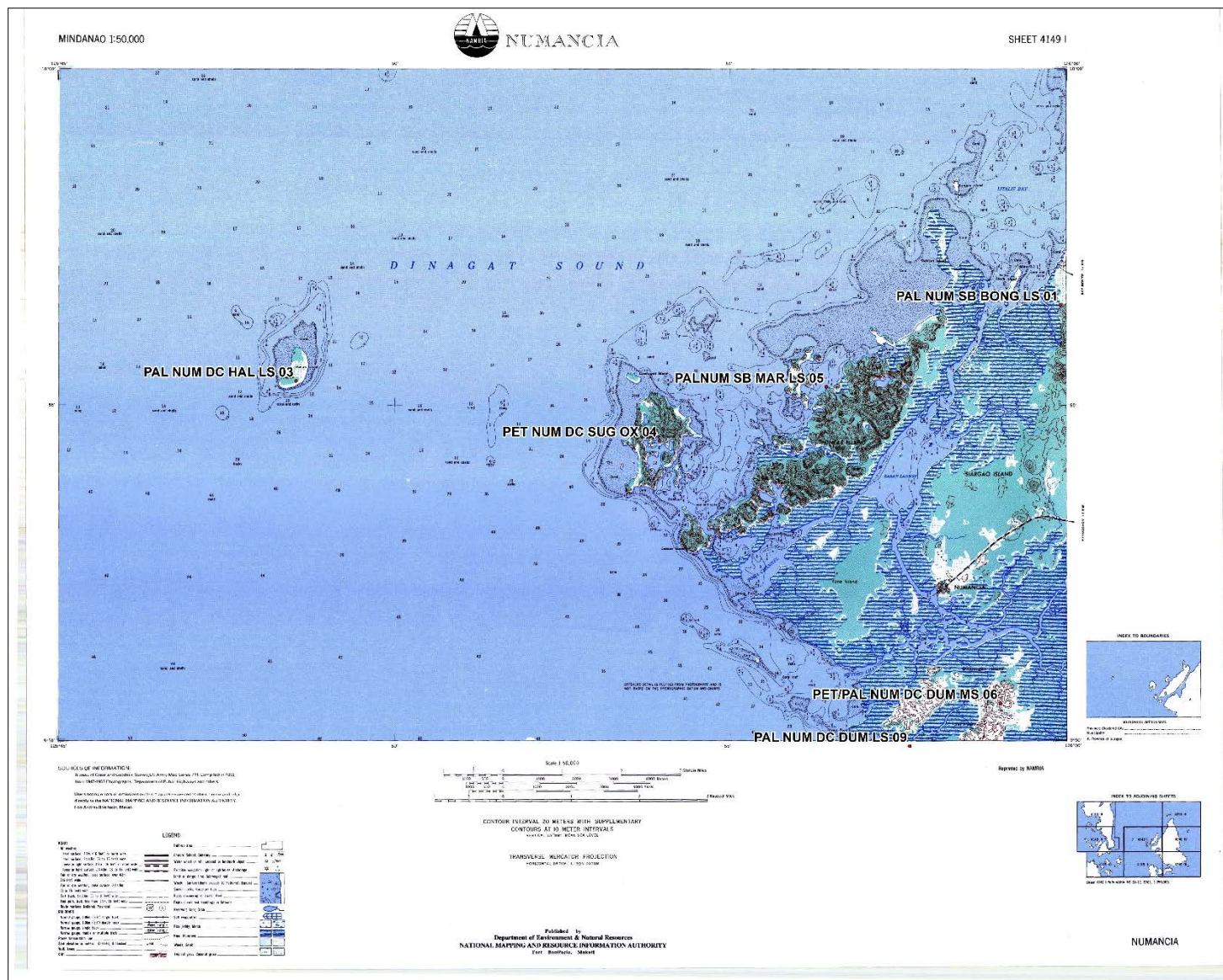


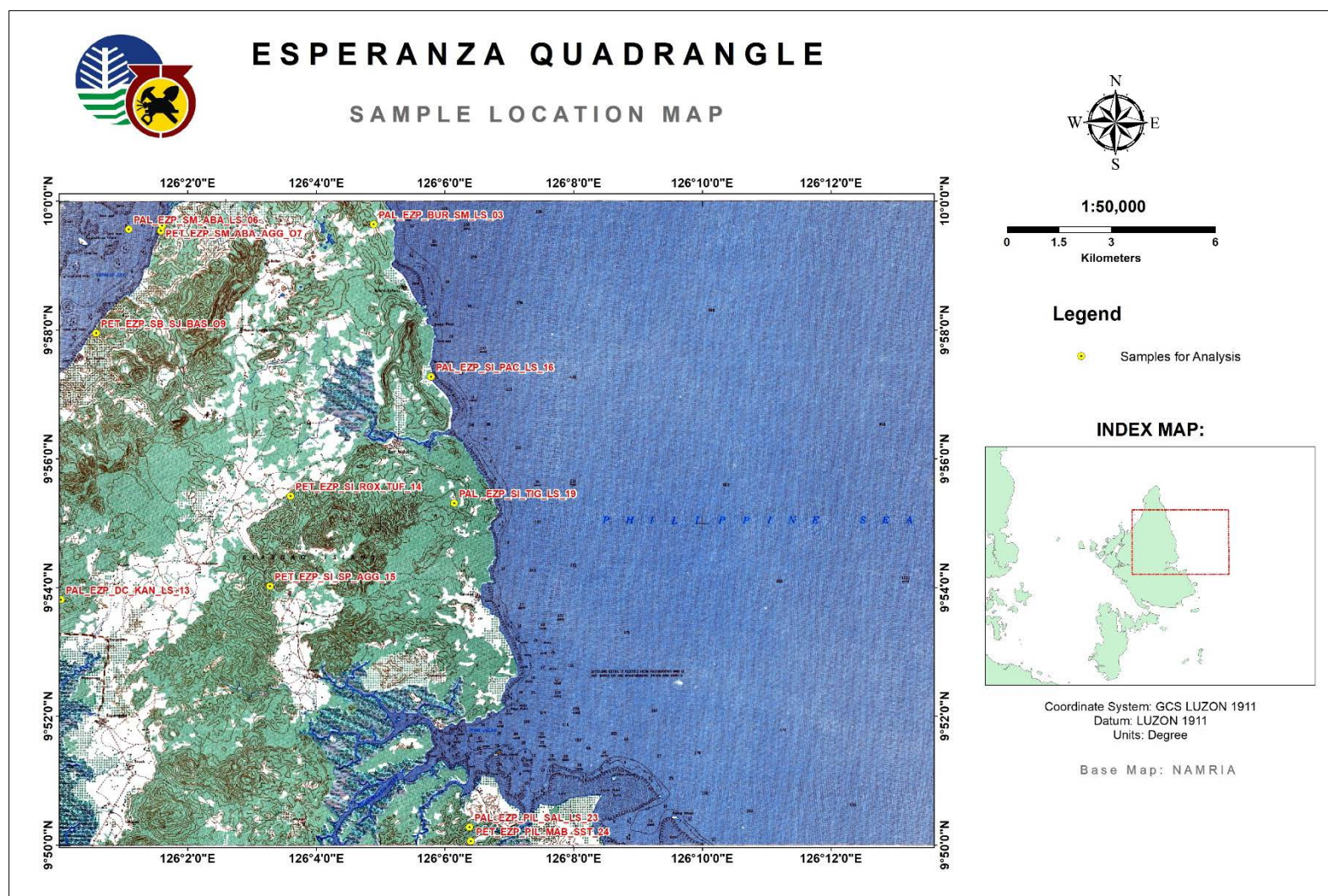
Figure 1. Sample Location Map of Sapao Quadrangle.





**Figure 2. Sample Location Map of Numancia Quadrangle.**





**Figure 3. Sample Location Map of Esperanza Quadrangle.**



## Photo/Documentation



**Photo 1. A roadcut outcrop of 7 meter-thick altered basalt of Sapao Formation (Dinagat Ophiolite?, Lexicon of the Philippines) located in Brgy. Bitaug, Burgos.**

**(GPS: coordinates: 10° 02' 11.0" N, 126° 04' 13.2" E)**



**Photo 2. Oolitic limestone of Siargao formation taken in the coastal area of Barangay Bitaug, Burgos. (GPS: coordinates: 10° 01' 55.0" N, 126° 04' 10.1"E)**





**Photo 3. Outcrop of Sapao Formation located in Barangay Rizal in Santa Monica.**  
(GPS Coordinates: 10° 02' 16.1' N, 126° 02' 31.6" E )



**Photo 4. Outcrop of Siargao Limestone located in Barangay Tangbo in Santa Monica.**  
(GPS Coordinates: 10° 03' 27.2' N, 126° 03' 08.3" E )





***Photo 5: Photo showing an exposed limestone platform (about 900 meters long) in Halian Island probably belongs to Siargao Limestone. The SE-dipping limestone beds with an average thickness of 5 inches were oolitic with masses of broken corals and shells (Photo 2). Geographic coordinates: N9°55 '20.6"/E125°48'32.0"***



***Photo 6: closed-up view of the limestone beds exposed in Halian Island (Photo 1). Geographic coordinates: N9°55 '20.6"/E125°48'32.0"***





**Photo 7:** photo showing an exposed mudstone outcrop at a creek in Barangay Dumuyog probably belongs to Loreto Formation. It is slightly calcareous and weakly magnetic although magnetism is mostly concentrated along bedding planes. Geographic coordinates: N9°50'32.3"/E125°59'01.1"



**Photo 8:** closed up view of mudstone exposed in Barangay Dumuyog (Photo 3). Geographic coordinates: N9°50'32.3"/E125°59'01.1"



## SURIGAO DEL NORTE GROUNDWATER RESOURCES MAPPING PHOTO DOCUMENTATIONS

### ALEGRIA



Brgy. Pongtud spring source is located in Purok 6, just adjacent to the highway. This water system (level 3) project was constructed thru its Social Development Management Program (SDMP) year 2016 and 2017 in partnership with BLGU Pongtud, MLGU Alegria and MGB Caraga. The operation and maintenance of this facility has been turned over to the barangay.



Spring source is located upstream from Lumondo waterfalls in Brgy. Budlingin. GPS Coordinates: N9 28 42.6 E125 36 14.2 (GCS–Luzon Philippines). This source is a Municipal Project.



## BACUAG



A spring source (Pag-alimpay spring) located in Purok Strada, Barangay Poblacion managed by Water District that supplies the Barangays of Poblacion, Campo, Dugsangon, Pautao, Kabugao, and Anibongan. The water source is installed in a closed concrete box. Residents experienced low discharge of water especially during summer and slightly turbid during heavy rain. Geographic coordinates: N9°36'16.9" E125°38'10.0"



Due to low discharge of water that the residents experienced and to address the increasing demand, the Water District utilized another potable water source which is a deep well located in Purok C-4, Barangay Dugsangon. Although most of its equipment were heavily damaged during the typhoon Basyang. Geographic coordinates: N9°34'50.1" E125°38'00.8"

## CLAVER



Submersible and centrifugal pumps used at Purok 6, Brgy. Cagdianao, Claver. GPS coordinates: 9°31'34.15"N/ 125°51'21.11"E.



Spring source at Purok 5, Brgy. Taganito, Claver used for domestic purposes. GPS coordinates: 9°32'41.87"N/ 125°48'53.55"E.

## DAPA





Photo 1. Additional water source of Barangay Bagakay. The Bisay Creek, the surface water source, supply to all three puroks with connections to 7 faucets on the entire barangay. The residents have been using this creek for almost 15 years, rehabilitated year 2014, for domestic use as well as their drinking water. It gets turbid when it heavily rains and dries off during dry season.



Photo 2. An unnamed creek is the water source of Sitio Uba of Barangay San Carlos. This surface water is utilized for almost 15 years of the residents of the sitio as drinking water and other domestic use, it supply estimated 26 household, it is still in level 2 system of water distribution. The water has been tested by the health office from the LGU and it is potable according to the result. Insufficient water supply especially during dry season and gets turbid when it rains.

## DEL CARMEN



Photo 1. Source 1 of Barangay Bagacay is connected to Anaub Creek, water distribution is 50% level 3 and the remaining is still at level 2 system. This source served as drinking water of the entire barangay, and constructed by year 2015 and funded by the KALAHI. It gets turbid when heavily rains and insufficient during dry season.



Photo 2. This spring source within a sinkhole is the proposed water source of Barangay Mabuhay and it is still on-going construction. It has an estimated depth of 2.5 to 3.0 meters from ground to water level.

## GENERAL LUNA, SIARGAO ISLANDS





Open concrete shallow well was noted in Brgy. Poblacion 1, GPS Coordinates: N9 46 54.4 E126 09 15.2 (GCS–Luzon Philippines). Water table estimated around 1 meter from the ground surface.



Brgy. Consuelo shallow well is located in Purok 3. It supplies Purok 2 and 3. GPS Coordinates: N9 47 46.6 E126 06 27.9 (GCS–Luzon Philippines).

**GIGAQUIT, SDN**



**A)** LGU Gigaquit – Water District’s main source is a spring type, caught by concrete box with divisions is located at the headwaters of Purok 8, Brgy. Mahanub. GPS Coordinates: N9 29 23.6 E125 39 15.0 (GCS–Luzon Philippines). **B)** At around six (6) linear kilometers distance from the source, water runs through the reservoir, connected via four (4) inches G.I pipe.



Shallow well, driven Jetmatic Pump of Purok 2, Brgy. Anibongan, GPS Coordinates: N9 35 47.8 E125 39 46.1 (GCS–Luzon Philippines). Seven (7) household use this as their drinking source. Other households/purok (barangay compose of 2 puroks) are connected to the water district of Bacuag Municipality. According to interviews being conducted, before they drink, residents wait atleast 1 hour until the suspended solids settles down.

## MAINIT





Photo of intake box located in Sitio Mahocdam, Barangay Capayahan, Tubod, is the primary source of potable water in residents of Barangay Magasaysay (Poblacion). The type of source utilize by the residents is spring. Geographic location 9° 34' 38.2" north latitude 125° 31' 49.5" east longitude.



Taking up water sample at Purok 2 Barangay Silop. The type of source use by the residents of Barangay Silop is spring. Geographic location 9° 36' 31.0" north latitude 125° 31' 18.5" east longitude.

## PILAR





Taking up water sample of primary source in residents of Barangay Centro (Poblacion) located at Sitio Lambog Barangay San Roque. Type of source is surface water. Geographic coordinates 9° 53' 17.4" north latitude 126° 03' 18.1" east longitude.



Photo of submersible (electric) pump with 18 meters depth located at Purok 2 Barangay Jaboy, as the primary source of the residents of the barangay. Geographic location 9° 54' 01.0" north latitude 126° 05' 07.1" east longitude.

## SAN FRANCISCO



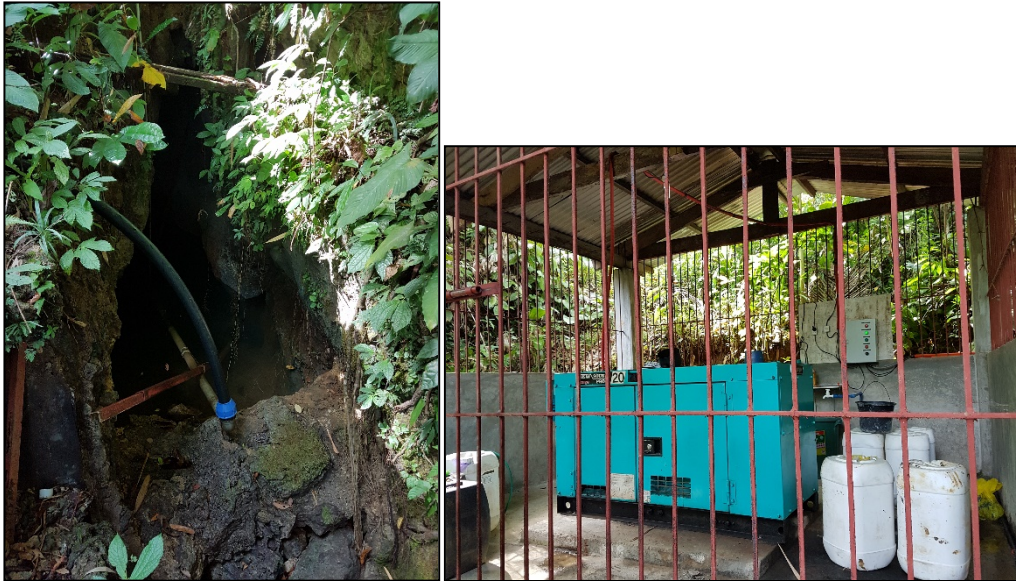


Figure 1. Actual collecting of water sample in Purok 6 in Barangay Oslao. The old intake box was damaged and replaced by a new one when the Typhoon Basyang struck the area.



Figure 2. A closed type concrete intake box in Purok 7 in Barangay Balite constructed approximately 20 years ago. The Balite Creek supplies all seven (7) puroks except purok 1. The local residents now refuse to use this as their source of potable water.

## SAN BENITO, SIARGAO ISLANDS



The municipal spring source is located in Brgy. Talisay, GPS Coordinates: N9 56 57.4 E126 01 15.4 (GCS–Luzon Philippines). The system is using electric pump to deliver the supply to its reservoir and distribute to the Poblacion area via gravity.



Brgy. Bongdo water source is a shallow well type located in Purok 4, just at the back of the barangay office.



## SAN ISIDRO



Water source in Brgy. Tambacan is a creek that is easily exposed to contamination.



Main water source in San Isidro is a lake located in Brgy. Buhing Calipay. The local government developed the lake and opened the area for tourists.



## TUBOD



One of the three spring sources located in Sitio Paragayo, Timamana, Tubod.



A view of the location of one of the main spring sources in Brgy. San Isidro, Tubod.

## PLACER, SURIGAO DEL NORTE



Spring source located in Barangay Boyongan which is managed by the Placer Water District. Geographic coordinates 9°36'31.6" N/125°33'15.6" E



A spring source along Binabag creek in Barangay Tagbongabong which is hosted in volcanic rocks. This water source supplies drinking water to Tagbongabong and Barangay Panuntungan. Geographic coordinates 9°36'40.7" N/125°35'58.8" E



## SANTA MONICA, SURIGAO DEL NORTE



A surface water in a creek flowing N40°W in Barangay Rizal which is tapped by the LGU for Level III water supply. Geographic coordinates 10°02'16.5" N/126°02'36.4" E



A spring source hosted in bedded clastic sedimentaries in Bisay, Barangay Alegria which was installed with a closed concrete box. Reported water scarcity is reported to this source during dry spells. Geographic coordinates 10°03'01.5" N/126°03'45.5" E

## BURGOS, SURIGAO DEL NORTE



Level III water source of the LGU-Water District which is located in Barangay Bitaug. Four springs are being tapped in this location in a closed concrete box. These sources supply the barangays of Poblacion 1, Poblacion 2 and Bitaug. Geographic coordinates 10°01'56.9" N/126°03'38.3" E



Surface water is the water source being tapped by Barangay San Mateo which is not used for drinking. Geographic coordinates 9°59'56.6" N/126°03'48.7" E



## SOCORRO, SURIGAO DEL NORTE



Surface water along a perennial creek in Kalangugan area which is managed by the Socorro Water District to supply Level III water system in the poblacion barangays of Navarro, Rizal and Taruc. Geographic coordinates 9°38'33.7" N/125°58'11.7" E



A spring source in ultramafic rocks is tapped by Barangay Honrado for potable water. The source was installed with a closed concrete box. Water discharge becomes scarce during dry spells. Geographic coordinates 9°39'15.7" N/125°56'41.0" E