



**Society of Economic Geologists**  
**Philippine Student Chapter**  
**Davao Field Report**



## **Overview**

The SEG Student Chapter - Philippine Association of Geology Students (PAGS) conducted a mine visit to the epithermal gold, porphyry copper, and skarn deposits of Apex Mining Company Incorporated (AMCI) and Paraiso Consolidated Mining Corporation (PACOMINCO) in Davao de Oro, Philippines, with funding from the Society of Economic Geologists (SEG) Stuart Wallace Funding and Mr. Douglas Kirwin. The visit took place from September 28-30, 2023, and it was attended by 30 geology undergraduate students from Adamson University (AdU), Caraga State University (CSU), Negros Oriental State University (NorSU), Silliman University (SU), University of the Philippines (UP), and the University of the Southeastern Philippines (USEP). Associate Professor Jilian Aira Gabo-Ratio, faculty adviser of the SEG Philippines Student Chapter, Mr. Nichole Anthony Pacle and Ms. Yvonne Olayvar, instructor from CSU, Ms. Florence Annette C. Labis, SU instructor, and Mr. Christian Paul Escarian, an instructor also from the USEP accompanied the students. Students were given tours of the open pit, core house, and mill, as well as lectures. The tour taught students about hydrothermal mineralization, mine operations, mine safety, community relations, and social development.

## **Objectives**

- To provide students and professionals with a firsthand understanding of mining operations, processes, and technologies.
- To deepen knowledge about the geological features, mineralization, and ore extraction methods specific to the visited mine.
- To instill a strong awareness of safety protocols and procedures within a mining environment.
- To educate participants on the importance of adhering to safety guidelines and industry standards in mining operations.
- To assess and comprehend the environmental impact of mining activities on surrounding ecosystems.
- To raise awareness about sustainable mining practices and initiatives undertaken by the mining company to mitigate environmental effects.

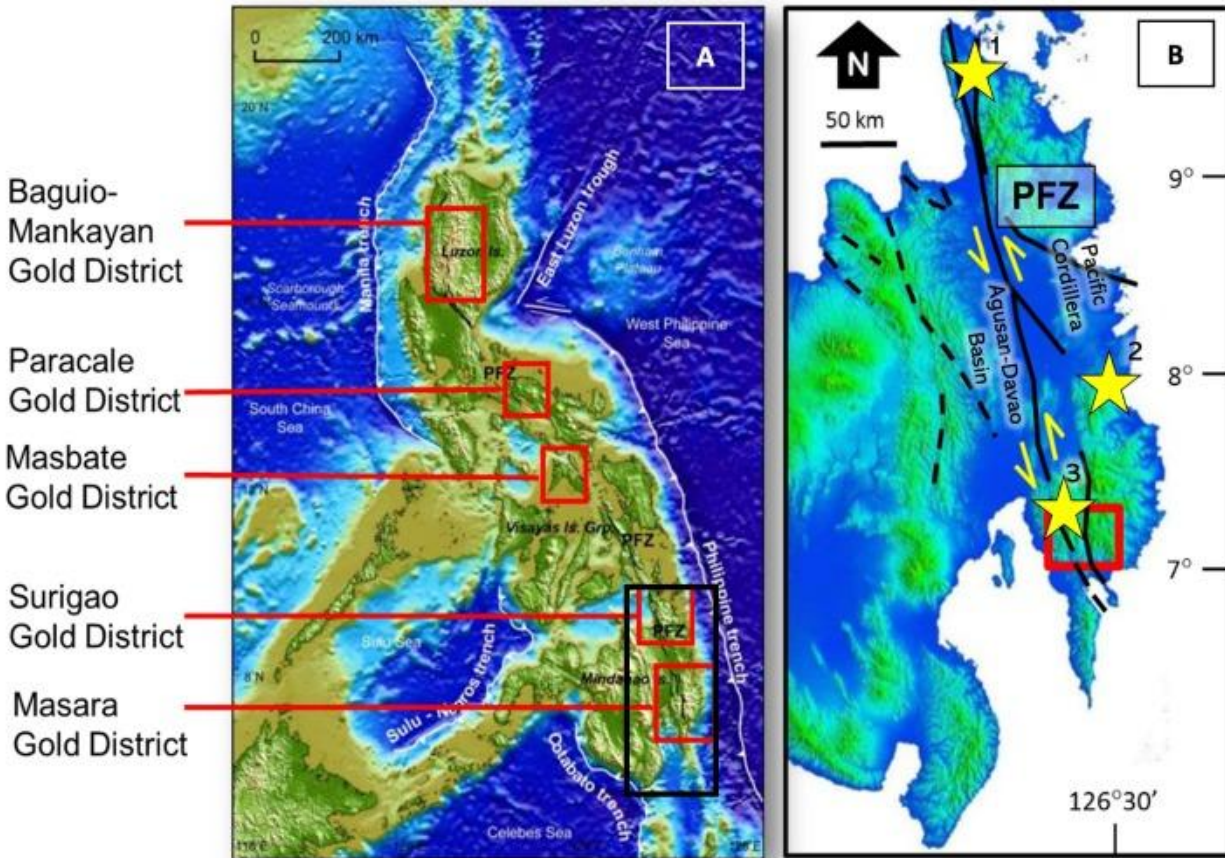
## **Introduction to Apex Mining Company Incorporated (AMCI)**

The Masara Gold Project is situated in the municipality of Maco. Maco is a coastal municipality in the province of Davao de Oro that has a land area of 342.23 square kilometers or 132.14 square miles which constitutes 7.50% of Davao de Oro's total area.



**Figure 1.** Generalized Map of Maco.

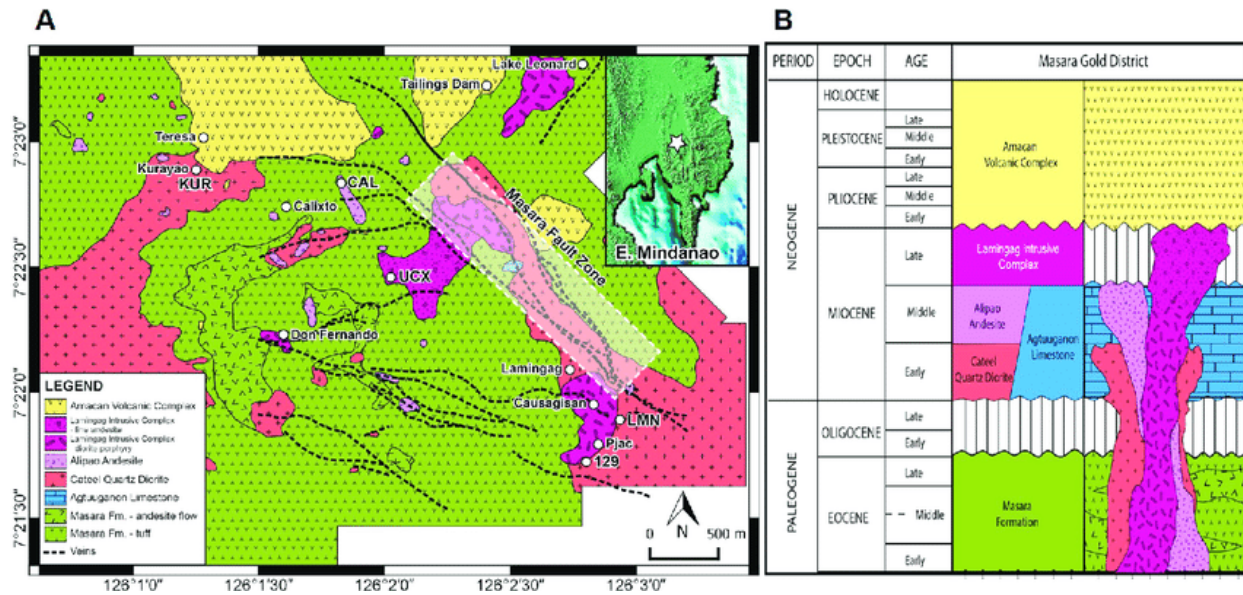
Maco is located in the southern part of Mindanao, Philippines. Mindanao is situated within a complex tectonic setting where the Philippine Sea Plate is subducting beneath the Eurasian Plate. This tectonic activity can influence the structural features in the region.



**Figure 2.** Gold Districts in the Philippines.

The primary mineral resource of the mineral district is gold, thus gold mining operations typically involve extracting gold from the Earth's crust through various methods, including underground mining and open-pit mining. Mining operations at Masara involve the extraction and processing of gold ore to recover gold which undergoes a process including drilling, blasting, and crushing the ore, followed by gold extraction and refining. The company is primarily engaged in gold and copper mining activities. The Compostela Valley Mining Complex is known for its mineral-rich deposits, including porphyry copper and gold. Apex Mining's operations involve exploration, development, and production phases to extract precious metals.

The Masara area is underlain by the Eocene Masara Formation which is composed of tuffs intercalated with andesite flows. It is unconformably overlain by the biohermal limestones of the Early to Middle Miocene Agtuaganon Limestone. These older units were then intruded by multiple stocks and dikes of intermediate composition. The Early Miocene Cateel Quartz Diorite is the main pluton in the area consisting of equigranular quartz diorite characterized by plagioclase, hornblende and minor quartz.



**Figure 3. Geologic Map of Maco**

Apex Mining Company Incorporated (AMCI) has a rich history in the mining industry, with a presence dating back several decades. Over the years, it has played a significant role in the exploration, development, and extraction of valuable minerals in the region. In 2015, it acquired its wholly-owned subsidiary, Itogon-Suyoc Resources Inc.. ISRI's two mines in Benguet are the Sangilo Mine Site in Itogon and the Suyoc Mine Site in Mankayan. Monte Oro Resources & Energy, Inc. (MOREI), a wholly-owned subsidiary acquired in 2014, holds a 30% participating interest in Service Contract 72 (SC72) covering the Sampaguita natural gas field offshore northeast of Palawan. MOREI also has several mining interests and projects located in and outside the Philippines, as well as a 52% interest in a domestic company in solid waste disposal management.

**Introduction to Paraiso Consolidated Mining Corporation**

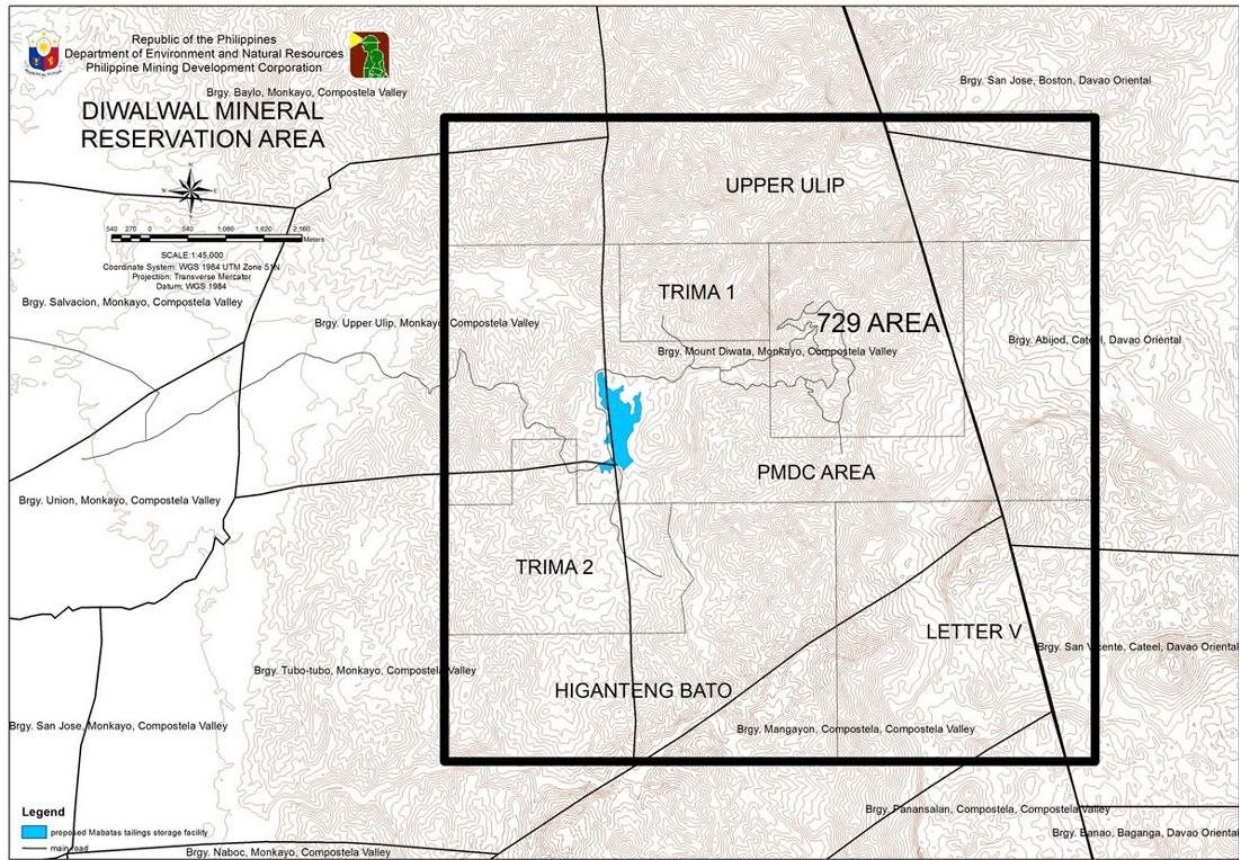
Paraiso Consolidated Mining Corporation (PACOMINCO) is situated in Mt. Diwata, also known as Diwalwal with 1,261-metre (4,137 ft) high range volcanic mountain and biodiversity area in Davao Region in the eastern part of Mindanao island of Philippines.



**Figure 4.** Generalized Map of Monkayo.

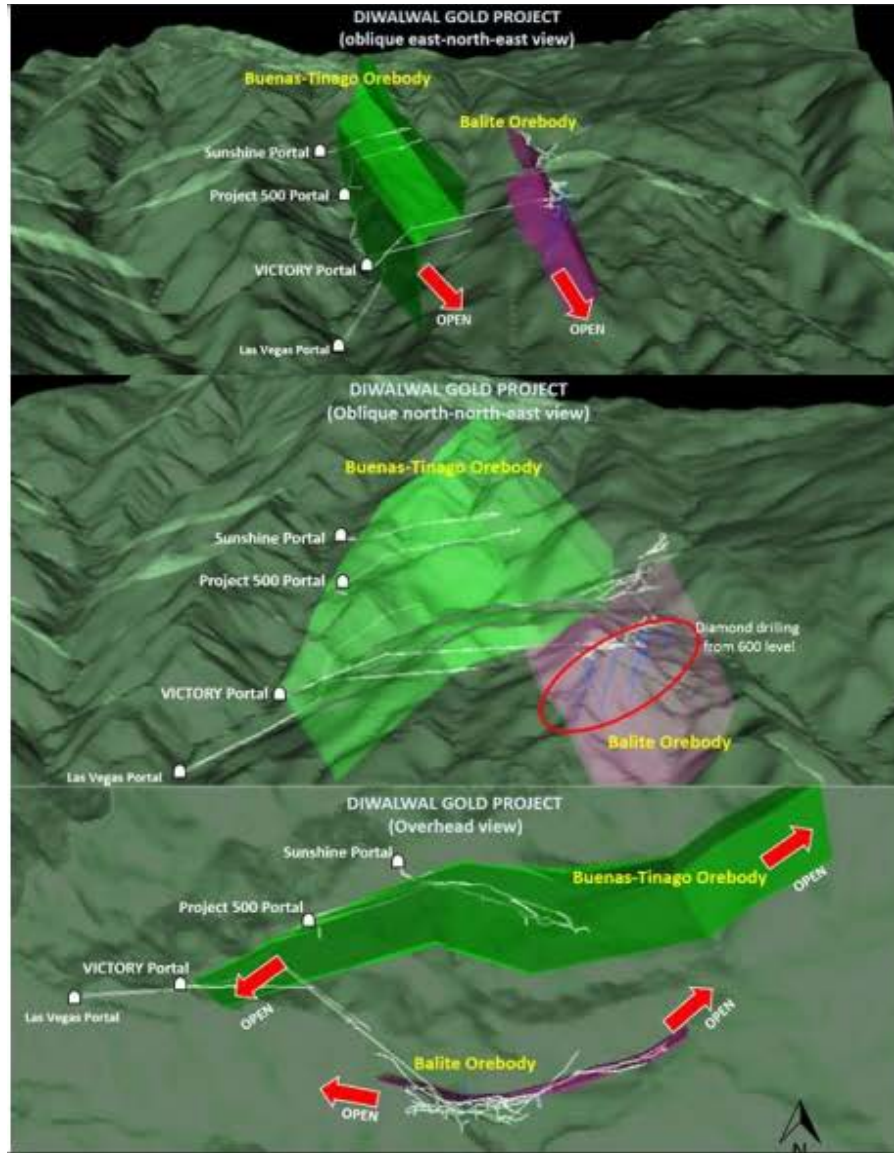
Diwalwal is rich in gold and copper ores that spread across the 3 municipalities such as Monkayo in the province of Davao de Oro; and Cateel and Boston in the province of Davao Oriental. PACOMICO is one of the small-scale miners operating in the area to extract gold from quartz veins, particularly Balite Veins. Diwalwal gold deposits are often associated with quartz vein systems. The structural controls on these vein systems, such as faults and fractures, play a significant role in the mineralization process.





**Figure 5.** Diwalwal Reservation Area.

The Diwalwal Gold Project is located approximately 120 km northeast of Davao City on Mindanao Island in the Philippines. It has a relevant interest in the 729 Area and Upper Ulip subdivisions of the Diwalwal Mineral Reservation. The region is located east of the Philippine fault system in the Southern Pacific Cordillera, which hosts a north striking band of epithermal gold deposits. The Diwalwal Project area geology is dominated by Cretaceous to Paleogene volcanics consisting of andesitic to basaltic lavas, pyroclastics and volcanoclastics. The volcanic units have been intruded by Miocene diorite. These units are unconformably overlain by a series of younger sediments. The gold mineralisation at Diwalwal is classified as low-sulphidation epithermal type with gold-bearing quartz veins hosted in extensional fractures developed predominantly within the lava sequences. The 729 Area and Upper Ulip contain mineralised veins with the most significant located to date being Balite and Buenas Tinago, located within 729 Area. Both of these veins have been exploited by small-scale mine operations via numerous access tunnels and adits for several decades.



**Figure 6.** Balite Vein Orientation.

Mining operations in Diwalwal are often artisanal and small-scale, involving simple tools and techniques for gold extraction. These operations may include activities such as panning, sluicing, and manual extraction from underground veins. Although PACOMINCO has faced challenges related to environmental degradation, unsafe working conditions, and issues of legality, numerous efforts have been made to regulate and formalize small-scale mining activities to address these concerns as they promote responsible mining practices, community development, and environmental stewardship.

## Itinerary

SEPTEMBER 28, 2023 (Thursday)	
11:00 AM	Arrival at Nabunturan
12:00 NN	Lunch
2:00 PM	Travel to Apex Mining Co. Inc.
3:00 PM	Safety Orientation
4:00 PM	Discussion
7:00 PM	Dinner
SEPTEMBER 29, 2023 (Friday)	
7:00 AM	Breakfast
9:00 AM	Travel to Apex Mining Co. Inc.
10:00 AM	Underground Visit
12:00 NN	Lunch
2:00 PM	Surface Fieldwork
3:00 PM	Drill Core Observation
5:00 PM	Discussion
7:00 PM	Dinner
SEPTEMBER 30, 2023 (Saturday)	
7:00 AM	Breakfast
9:00 AM	Travel to PACOMINCO
10:00 AM	Safety Orientation
11:00 am	Discussion
12:00 NN	Lunch
2:00 PM	Adit Visit
3:00 PM	Drill Core Observation
4:00 PM	Departure for Home

**Table 1.** Fieldwork Itinerary.



## Mine Tour Proper

Last September 28, 2023, selected students from Adamson University, Caraga State University, Negros Oriental State University, Silliman State University, University of the Philippines, and University of Southeastern Philippines gathered at Qi Xiang Business Inn in Nabunturan, Davao de Oro. 2:00 in the afternoon, the participants travelled to Apex Mining Company Incorporated to attend their scheduled safety orientation. Upon arriving at the mining site, the participants went to a physical examination to check if they are capable of participating in the activities lined up. After the check-up, the participants proceeded to the session hall where staff of APEX orient and discussed the background of the company, its goals, and community programs.



**Figure 7.** (A) and (B) Introduce Yourself. (C) Mineralization Lecture. (D) Waiver Signing.

Morning of September 29, 2023, the participants prepared early to travel at APEX for their morning activity. Upon arriving at the site, participants wore their safety attire and prepared

to hike at the former open pit at Brgy. Teresa. As the participants reached the peak of Teresa Open Pit, Mr. Subang quickly tackled the structural geology of the area as well as Mr. Kirwin who discussed the different vein types. After lunch, the participants were able to observe the core drills, then proceeded to the Lake Leonard where Mr. Kirwin discussed the structural geology of the inactive volcano and deposits associated with it. As the participants went back to the site, Mr. Subang starts to discuss different career options especially for those participants who are graduating.



**Figure 8.** (A) Mr. Kirwin discusses different types of veins. (B) Mr. Amoroso discussing the mineralization of Maco. (C) Mr. Subang discussing the structural geology of Davao de Oro.. (D) Mr. Riguer discussing the association of quartz veins in gold formation.





**Figure 9.** Core Drill Observation.



**Figure 10.** (A) Mr. Kirwin discusses the structural geology of Lake Leonard. (B) Participants in Lake Leonard viewing deck. (C) and (D) Participants observing the outcrop.





**Figure 11.** Mr. Subang discussing different career opportunities.

On their last day, September 30, the participants packed their things early in preparation for traveling on the way to Paraiso Consolidated Mining Corporation in Monkayo. Upon arriving at the site, the participants were escorted for the security of the trip. After a brief reminder, participants have the opportunity to explore the adit in Mt. Diwata and observe the Balite Vein associated with the formation of gold. After the adit tour, the participants went back to the site and Mr. Malicay started to discuss the mineralization of Diwalwal Gold District. The day was concluded when the staff of PACOMINCO accompanied each participant at Mt. Diwata to see the view and landscape of the Gold District.



**Figure 12.** (A) Participants going to the adit. (B) Victory Tunnel. (C) Dr. Gabo-Ratio observing balite vein specimens. (D) Participants in the adit.



**Figure 13.** (A) Mr. Malicay discussing the mineralization of Diwalwal Gold District. (B) Photo of Mr. Malicay with Mr. Kirwin, Dr. Gabo-Ratio, and Mr. Subang. (C) Participants with their Balite samples. (D) Gold hunting.





**Figure 14.** Participants in Diwalwal Gold District.

**Feedbacks from SEGSC student participants:**

“It was fun and enjoyable, building new friendships and learning a lot of Geological things. The mine visit and fieldwork in Davao De Oro is one of the best experiences in my life as a Geology student.” - Ramos, Negros Oriental State University

“Experienced princess treatment from local soldiers in Diwalwal haha. It was fruitful and fun fieldwork, and I got to know a few people from other schools as well as expert geologists and mentors.” - Chatto, University of Southeastern Philippines

“I learned quite a lot of things. The different kinds of mineral deposits (Porphyry, Epithermal, and Skarn), all kinds of vein types (A, B, C, D, M), the different alterations, the social, political, and economical standpoints of mining operations, and the geology and tectonic of a Diatreme Breccia and its rock identification (Leonard Kniasseff). The experience was amazing and well-worth it. From seasoned professionals that are very willing to teach you, to a



hands-on exposure to mining operations; it's quite a blast..” - Pelonio, University of Southeastern Philippines

“I have learned a lot from the fieldwork. I have learned what geologists do in the field, especially in the mining industry. I get to have the chance to experience firsthand the things geologists do in the workplace. Also, I get to learn and get enlightened about a lot of things from the fieldwork. It was a great experience. More than great, actually. It was a rollercoaster ride; it was fun and interesting but also, tiring. The fieldwork gives emphasis to the crucial role of geologists in the field.” - Clemeno, Caraga State University

“It was fun to learn more about the industry side of economic geology and also to meet new colleagues from other universities!” - Cedino, University of the Philippines

“I learned alot about the exploration and mining geology of both companies, the AMCI's Teresa porphyry copper prospect and its current operations, the structural geology behind Lake Leonard, and the presence of Balite Veins of PACOMINCO's Victory Tunnel. It was tiring but a knowledge-filled, unforgettable experience. You'll be able to appreciate the beauty of Davao de Oro.” - Montaos, Adamson University

“I learned about epithermal mineralization and porphyry copper mineralization, including the kinds of veins associated with the stages of porphyry copper, and diatreme breccias.” - Guevarra, Silliman University

“I learned about the mineralization of some gold-rich areas in our country. It is also my first time to know different types of breccia such as epithermal breccia, diatreme breccia and more. I also learned that mining and exploration geologists offer a really great opportunity for geoscience enthusiasts. It was a very surreal experience, especially when we had to visit the underground mining tunnel of PACOMINCO. It was a once in a lifetime experience to have.” - Manaois, Negros Oriental State University

### **Acknowledgment**

The Society of Economic Geologists Student Chapter - Philippine Association of Geology Students (PAGS-SEGSC) extends its profound gratitude to the Society of Economic Geologists (SEG) for the invaluable support provided through the Stewart R. Wallace Fund. This generous contribution played a pivotal role in financing the initial expenses of our field trip, enabling the participation of aspiring geologists from various universities.

Our heartfelt thanks also go to Dr. Jillian Gabo-Ratio, who, in collaboration with Mr. Nichole Anthony Pacle, Ms. Yvonne Olayvar, Ms. Florence Annette C. Labis, and Mr. Christian Paul Escarian, exhibited tireless efforts in guiding students throughout the intricate planning and fieldwork processes. The success of our endeavor is a testament to their dedication.

We extend our gratitude to all the participating students from Adamson University (AdU), Caraga State University (CSU), Negros Oriental State University (NorSU), Silliman University (SU), University of the Philippines (UP), and the University of the Southeastern Philippines (USEP). Their trust in our organization and commitment to the field trip contributed significantly to its success.

A special acknowledgment is reserved for Mr. Leo Subang, whose knowledge-packed discussion enriched the educational experience for all participants.

On behalf of the entire group, we express our deepest appreciation to Mr. Darwin Riguer of Apex Mining Company Incorporated and Mr. Ahrdo Malicay from Paraiso Consolidated Mining Corporation. Their gracious accommodation and that of their teams facilitated an exceptional learning opportunity, allowing students to gain practical insights into the application of academic learnings. We commend the entire workforce of both companies for their openness in sharing knowledge and expertise through informative lectures on the geology and mineralization of Masara and Diwalwal Gold Districts.

Lastly, we acknowledge Mr. Douglas Kirwin once again for his unwavering generosity and commitment to our organization went beyond financial assistance. This additional funding not only facilitated the involvement of more students but also served as a source of motivation, inspiring heightened dedication to their current field of study. His continuous support has made a significant impact on the education and opportunities provided to Filipino geology students. We are truly grateful for the meaningful contribution to our academic pursuits.

### **Financial Report**

Airfare (Manila-Davao-Davao-Manila)	PhP 9, 300.00
Van Rental + Gas	PhP 7,500.00
Accommodation (Qi Xiang)	PhP 65,080.00
Food	PhP 10,200.00
<b>Total:</b>	<b>PhP 92,080.00</b>

**Table 2.** Particular Cost in PhP.

**References:**

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