JULY 2009

SDMP of the Siana Gold Project

Prepared by SMP Environment & Community Care, Inc. for:

MERRILL CROWE CORPORATION

Greenstone
Resources Corporation

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Abbreviations and Symbols Used in the Study

APCFTL	Annual per capita food threshold level
APCPTL	Annual per capita poverty threshold level
APIS	Annual Poverty Indicator Survey
AUSAID	Australian Agency for International Development
BFAR	Bureau of Fisheries and Aquatic Resources
BHW	Barangay Health Worker
BS	Base saturation percentages
BMP	BMP Environment & Community Care, Inc.
CAFIA	Cawilan Farmers Irrigators Association
CEC	Cation exchange capacity
CIDSS	Comprehensive and Integrated Delivery of Social Services
CIL	Carbon-in-leach
CIP	Carbon-in-pulp
CVO	Community Volunteer Officer
Cu	Copper
DA	Department of Agriculture
DAO	DENR Administrative Order
DENR	Department of Environment and Natural Resources
DMF	Declaration of mining feasibility
DSWD	Department of Social Welfare and Development
ECC	Environmental Compliance Certificate
EIA	Environmental impact assessment
ESMAP	Energy Sector Management Assistance Program
FGD	Focus group discussion
GI	Galvanized iron
GRC	Greenstone Resources Corporation
ICMM	International Council on Mining and Metals
IRA	Internal revenue allotment
JCG	JCG Resources Corporation
K	Potassium
LGU	Local Government Unit
LMDA	Lake Mainit Development Authority
MAO	Municipal Agricultural Office
masl	Meters above sea level
mbsl	Meters below sea level

MCC	Merrill Crowe Corporation
MGB	Mines and Geosciences Bureau
Mn	Manganese
MPDO	Municipal Planning and Development Office
MPSA	Mineral Production Sharing Agreement
NIA	National Irrigation Administration
NSCB	National Statistical Coordination Board
NSO	National Statistics Office
P	Phosphorus
PACAP	Philippines – Australia Community Assistance Program
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PFS	Project Feasibility Study
Prov'l	Provincial
RA	Republic Act
RDA	Recommended dietary allowance
RHU	Rural Health unit
SDMP	Social Development and Management Program
SEDF	Surigao Enterprise Development Foundation
SNCAT	Surigao del Norte College of Arts and Trade
SURICON	Surigao Consolidated Mining Company
SURNECO	Surigao del Norte Cooperative
t	Tonnes
TESDA	Technical Education and Skills Development Authority
TPD	Tonnes per day
TPY	Tonnes per year
UCCP	United Church of Christ in the Philippines
UKDFID	United Kingdom Department for International Development

EXECUTIVE SUMMARY

Merrill Crowe Corporation through its contractor, Greenstone Resources Corporation (GRC), filed the Declaration of Mining Feasibility (DMF) for the Siana Gold Project with the MGB. Located within the domain of MPSA No. 184-2002-XIII in the province of Surigao del Norte, the Project will redevelop the former Siana mine of Surigao Consolidated Mining Company (SURICON) to produce gold and silver dore bars. The Project has a total life of 12 years, of which, construction will require 1.5 years, operations 10 years, and mine closure 0.5 year.

One requisite for the approval of the DMF is an approved Social Development and Management Program (SDMP). The SDMP which is to be funded by the mining company at a minimum of 1 % of direct mining and milling costs annually is for the development of the impact communities as well as mining technology and geosciences. The impact communities of the Project include the direct impact barangays of Cawilan of Tubod Municipality and Siana and Dayano of Mainit Municipality and the indirect impact barangays of Del Rosario of Tubod, Magpayang of Mainit, and Pongtud of Algeria. Based on the computations in the Project Feasibility Study, the SDMP fund totals P 128.3 million over the mine life of 10 years. The estimated annual average SDMP fund of P 12.83 million is 3.23 times the combined IRA and 16 times the development fund of the six impact barangays in 2008.

This SDMP for the Siana Gold Project was developed based on an intensive socio-economic, cultural, and site assessment focused on the impact communities. In accordance with best-practice guidelines, participatory baselining; situation, problems, and opportunities analysis; and development planning techniques were adopted.

The 240-ha Project site is inside the 5,700-ha catchment of Magpayang River. The river drains into Lake Mainit; the lake drains toward Bohol Sea. The dominant land uses in the river catchment are rice paddies in the alluvial plains, coconuts in the transitional fringes of the stream corridor, built-up areas along the National Highway and roads in the plains and fringes, and forests in the areas with slopes in excess of 50 %. The site is vulnerable to earthquakes and typhoons.

The impact barangays witnessed the opening, closure, re-opening, and closure of the SURICON mine from 1938 to 1990. Their experiences with the mine with respect to employment, damages to property, land purchases, environmental impacts, community programs, and sudden mine closure were unpleasant and depressing.

GRC commenced its exploration program in the SURICON property in February 2003. Mindful of the community's economic plight and prior experiences, GRC initiated a number of projects to help improve the quality of life in the impact barangays. The most notable project is the provision of potable water and a Level 2 distribution system to the three direct impact barangays. The other projects include provision of medical care through the establishment of a medical clinic with a fulltime doctor and nurse, provision of medicine, feeding programs for the malnourished,

playground construction, repair of schools and provision of schools supplies, tree planting, and benevolent grants.

As of August 1, 2007, a total of 6,527 people live in the impact barangays. The population density is 1.43 persons/ha for the direct impact barangays and 2.42 persons/ha for the indirect impact ones. The major means of livelihood is agriculture, chiefly rice and coconut, and fishery in Lakes Mahukdam and Mainit.

A participatory assessment conducted in 2005 in the impact barangays found that maximum yields in palay increased in the last 30 years due mainly to irrigation and technology improvement. However, the cost of agricultural inputs vis-à-vis palay prices have dramatically increased. Fish catch has been declining since the 80s. In the direct impact barangays, the daily fish catch used to range from 5 to 10 kg. In 2005, the fishermen's daily yield was reported to be only 0.5 to 1 kg.

A household socio-economic and perception survey was administered on the impact barangays in April to May 2005 as part of the EIA of the Siana Gold Project. With a median age of 19, the sample population is young. For household members aged 5 years and above, the bulk of 31 % reached only the elementary school level. Only 11 % and 6 % finished high school and college, respectively. The median income is P 4,456. Approximately 70 % of the samples earn less than the Annual Per Capita Poverty Threshold Level estimated by the National Statistical Coordination Board. The occupational profile is reflective of the educational attainment. Majority of the jobs involve manual labor with farming as the predominant occupation.

Problem assessment conducted with the key leaders and members of the six impact barangays in 2005 and 2009 surfaced four major ones. These are the lack of income and income opportunities, lack of basic social services, lack of basic infrastructures, and lack of technical and financial support to the farmers, fishermen, and other vulnerable groups. All four problem groups are attributable to the lack of economic activities in the area that would spur demand and have multiplier effects such as increase in consumption attributable to an increase in income.

The Sustainable Livelihood Framework of the United Kingdom Department for International Development was employed to analyze the livelihood assets of the impact barangays and to map out the needed interventions. The analysis found the community members severely lacking in financial assets. Physical assets comprise another major area of inadequacy. In terms of the other assets, major interventions are also required - for social assets, the promotion of teamwork; for human assets, skills and leadership training; for personal assets, social preparation, values formation and training. The Siana Gold Project has enormous potentials of building up the financial assets of the impact community members. Through its policy of priority to the impact communities in hiring, household incomes will increase. If said incomes are used wisely by the households, improvements in the other assets such as personal, human, and physical assets, will follow. GRC can also tap the impact community members for the goods and services needed by the Project. A ripple effect will lead to the improvement of the other livelihood assets including the social assets.

Planning for closure is the development strategy adopted for the SDMP. To ensure community sustainability, the bias of the SDMP will be on livelihood projects. The SDMP will also have to provide critical physical assets to support the livelihood projects. The market of the projects will initially be the Siana Gold Project. After sufficient experience and confidence are gained by the project implementers, other non-mining-based markets will be targeted. The other thrusts of the SDMP should be on the basic services and utilities to improve the community quality of life. These include education water, and roads.

The six impact barangays agreed to divide the SDMP fund as follows: Brgy. Cawilan – 24 %, Siana – 22 %, Dayano – 16 %, and the indirect impact barangays of Pongtud, Magpayang, and Del Rosario – 12.7 % each. Over a five-year period, Brgy. Cawilan's SDMP annual fund is expected to range from P 1.9 million in year 2 to P 3.2 million in year 4; Siana from P 1.7 million to P 2.95 million; Dayano from P 1.3 million to P 2.1 million; and the indirect impact barangays from P 1 million to P 1.7 million.

1. INTRODUCTION

1.1 Mining Project Background

1.1.1 Details of the MPSA Holder

MPSA:	MPSA No. 184-2002-XIII
Project Name:	Siana Gold Project
Company Name:	Merrill Crowe Corporation/Greenstone Resources Corporation
Address:	Level 5, NOL Tower, Commerce Avenue corner Acacia Avenue, Madrigal Business Park, Ayala Alabang, Muntinlupa City
Telephone/Facsimile:	632 8072790; 632 8076658
Email Address:	gedwards@red5limited.com, lgovey@red5limited.com
Contact Person:	Gregory C. Edwards
Designation:	Managing Director

MPSA No. 184-2002-XIII was issued to JCG Resources Corporation (JCG) in December 2002. Through a Siana Joint Venture Heads of Agreement with JCG, Greenstone Resources Corporation (GRC) was to undertake due diligence and technical review, initial drilling, exploration, and mining joint venture on the Siana property.

GRC commenced reverse circulation percussion and diamond drilling in February 2003. A major resource diamond drilling program followed from November 2003 to February 2005. By October 2006, a total of 64 holes with an aggregate length of 25,133 m were completed and became the basis of the Bankable Feasibility Study for the Siana Gold Project.

On 15 August 2005, through a Deed of Assignment, JCG assigned to Merrill Crowe Corporation (MCC) its rights and obligations on the Siana MPSA and conveyed to the same entity full possession and control of the entire land area covered by the MPSA. On 19 August 2005, through an Agreement, GRC, among others, affirmed its consent to the assignment of claims. The Agreement likewise provided that MCC will immediately cause the transfer of the Siana MPSA from JCG to MCC and immediately thereafter to a Project company. This Project company is the restructured GRC such that 60 % of the shareholdings is Filipino. After the restructuring is completed, MCC will own 10 % of GRC's shareholdings.

On 11 March 2008, the Mines and Geosciences Bureau approved the transfer of the Siana MPSA to MCC.

1.1.2 Description of the Mining Project

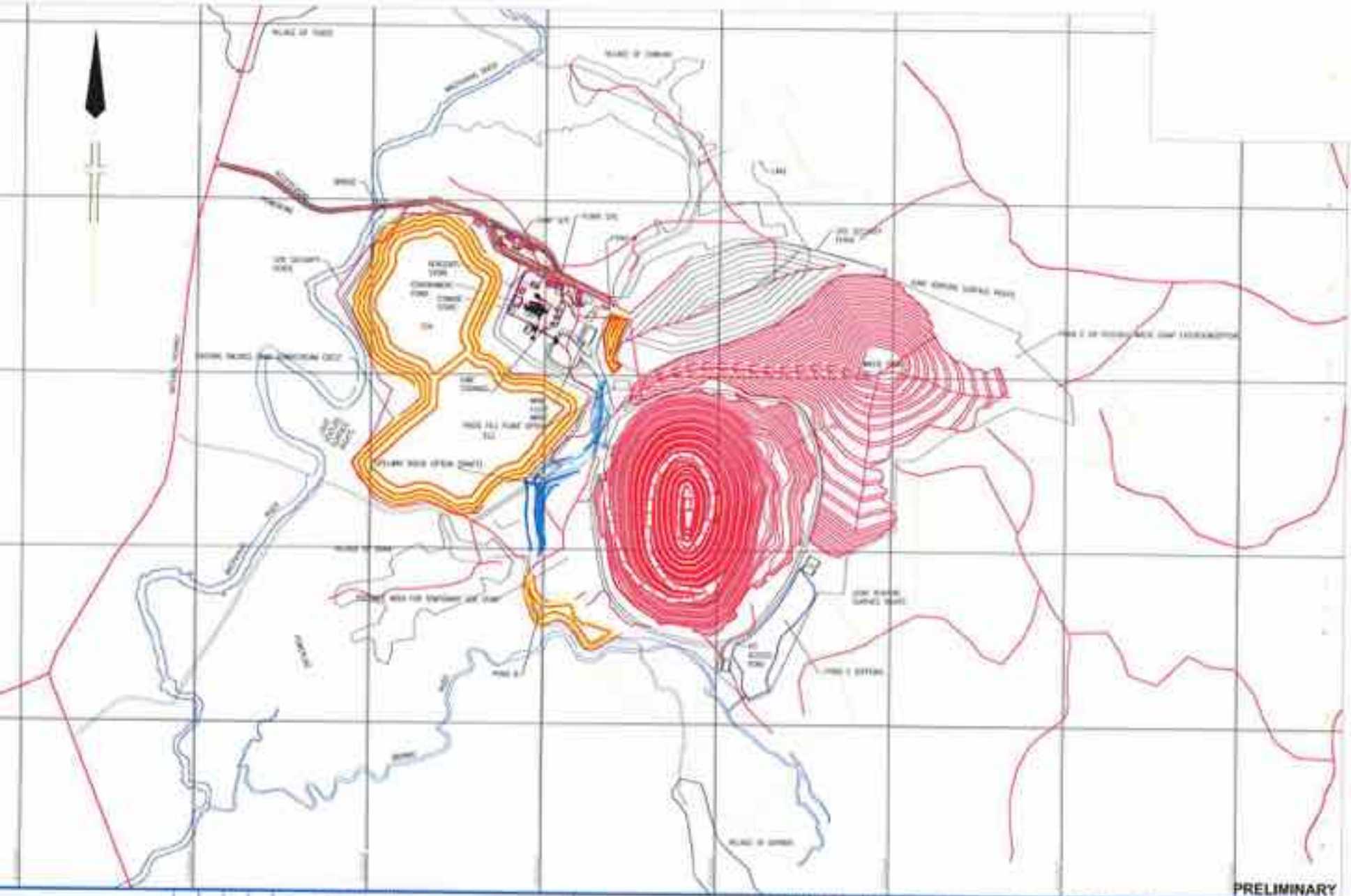
The Siana Gold Project will redevelop the former Siana Mine of Surigao Consolidated Mining Company (SURICON) to produce gold and silver dore bars.

SURICON operated the Siana property as an underground mine between 1938 and 1960. Beginning in 1981, the property was operated as an open pit mine. Two major pit wall failures led to the premature closure and abandonment of operations in 1990. The remnants of the SURICON operations are a flooded open pit, two dried and grassy tailings pond, one tailings pond with a pool of water, three grassy waste rock dumps, and a workshop (Figure 1-1).

Figure 1-1. Remnant features of SURICON operations

The redevelopment of the Siana property will involve the following:

- Dewatering of the 90-m deep open pit
- Construction and use of a 1-km all-weather access road and a 65-t causeway crossing
- Development and use of a mine camp, workshop, administration office, and 750 KVA standby generator
- Construction and operation of a 750,000 t per year (TPY), expandable to 1 million TPY, cyanidation plant
- Construction and operation of mine tailings ponds and waste rock dumps



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SIANA GOLD

Figure 1-2. General arrangements map of the Siana GOld Project

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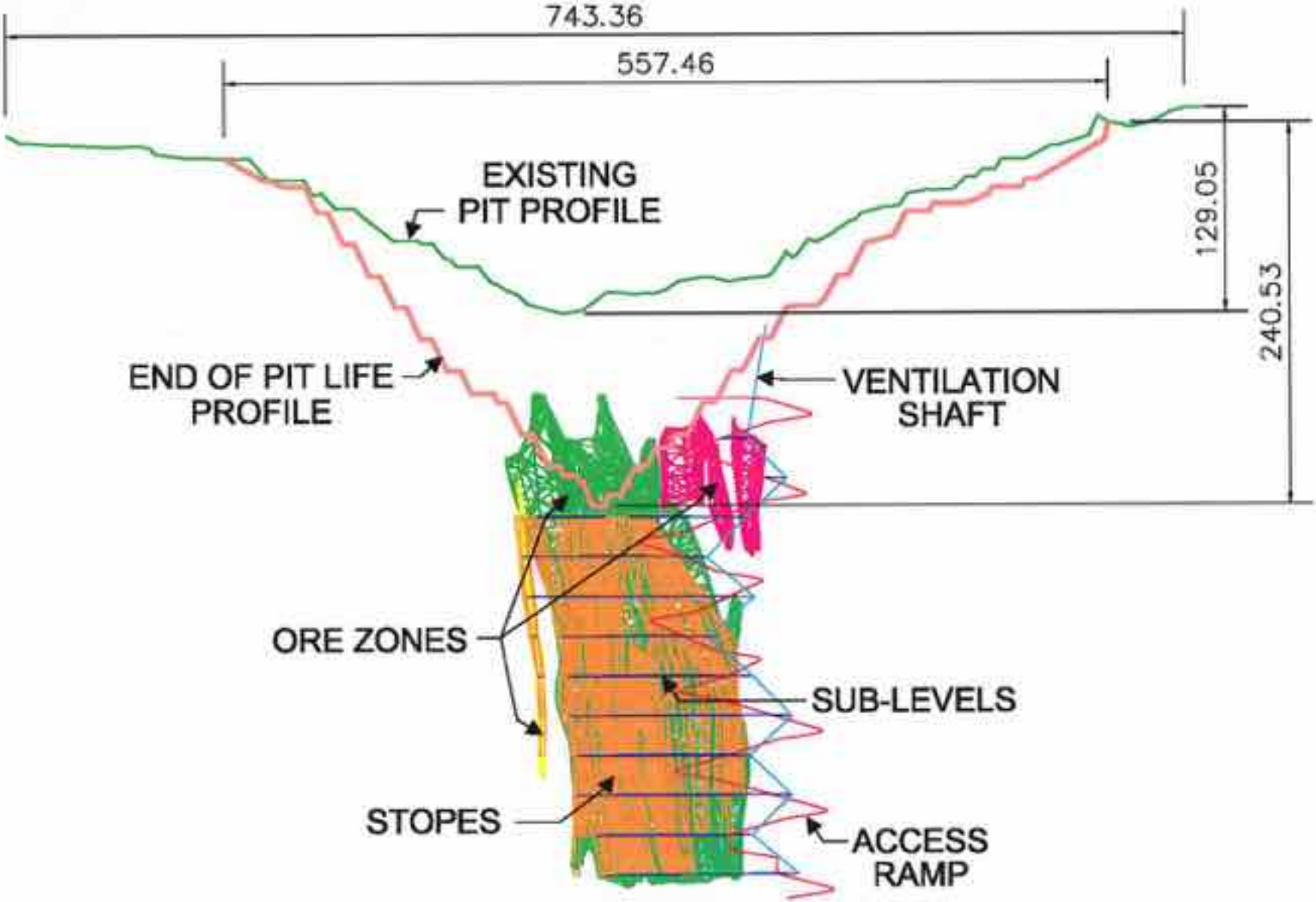
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EXISTING
PIT PROFILE
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STOPES
ACCESS
RAMP

- Mining of the Siana gold deposit by open pit mining to an approximate depth of 200 m below the surface from the existing floor depth of about 90 m, then by underground mining over an approximately 200-m vertical interval and
- Mine decommissioning and rehabilitation.

The major features of the Siana Gold Project are shown in Figure 1-2. Figure 1-3 is a section across the gold deposit that shows the extent of the programmed open pit and underground workings.

The Project has a total life of twelve years. Construction is expected to require 1.5 years; operations will last for ten years; mine closure works will be completed in half a year.

2. OVERVIEW OF THE SDMP

2.1 Rationale

MCC has filed the Declaration of Mining Feasibility (DMF) for the Siana Gold Project with the MGB. The supporting Project Feasibility Study (PFS) is currently being evaluated by the MGB.

The Project was granted an Environmental Compliance Certificate (ECC Reference Code 0811-030-1010) on April 21, 2009. Condition Number 7e of the ECC mandates the company to submit the project's Social Development and Management Program (SDMP) to the MGB. An approved SDMP is also a requisite for the approval of the DMF by the MGB.

Section 134, Chapter XIV of Department of Environment and Natural Resources (DENR) Administrative Order No. 96-40 (DAO 96-40), the revised implementing rules and regulations of the 1995 Philippine Mining Act (Republic Act No. [RA] 7942), requires all mining companies to allot "a minimum of one percent (1%) of the direct mining and milling costs annually for the development of mining community, mining technology and geosciences."

The SDMP is the document that details the projects and programs that will be funded by the mandatory allotment. It is the prescribed "tool for the development and implementation of community programs and projects in consultation and in partnership with the host and mining communities in a mining area."[1] It aims to "create responsible, self-reliant and resource-based communities capable of developing, implementing and managing community development programs in a manner consistent with the principles of people empowerment and sustainable development."[2]

Greenstone Resources Corporation (GRC) commissioned BMP Environment and Community Care, Inc. (BMP) to assist the six impact barangays formulate the SDMP in accordance with DAO 96-40 and international best practice guidelines.

2.2 Goals and Objectives

Based on the PFS, the projected SDMP fund for the ten-year operating life of the Siana Gold Project is P 128.3 million. This averages P 12.83 million per year. It is **3.23 times** the combined Internal Revenue Allotment (IRA) of the six impact barangays of P 3.96 million in 2008. The IRA is the share of the local government units (LGUs) in the taxes collected by the National Government. Almost all barangays in the Philippines subsist on IRA.

The Local Government Code mandates that a maximum of twenty percent (20 %) of the IRA should be allocated as Development Fund for use in infrastructure and other social development

[1] SDMP Procedural Guidelines, DENR-MGB
[2] *Ibid.*

projects. For 2008, the combined Development Fund of the six barangays is P 793,000. The SDMP fund of P 12.83 million is 16 times this amount.

Based on the SDMP contributions alone, GRC is the only company in the impact area that is in a position to support the barangay LGUs attain the Millennium Development Goals (Figure 2-1). The company will ensure that the SDMP Projects are consistent with these goals and the local government's development plans. Through the implementation of viable projects and institutional support, it will capacitate the community so that it will become sustainable at the end of mine life.

The MDGs consist of 8 overarching goals which the global community seeks to achieve by 2015.

1. **Eradicate extreme poverty and hunger**
2. **Achieve universal primary education**
3. **Promote gender equality and empower women**
4. **Reduce child mortality**
5. **Improve maternal health**
6. **Combat HIV/AIDS, malaria and other diseases**
7. **Ensure environmental sustainability**
8. **Develop a global partnership for development**

Figure 2-1. Millennium Development Goals

2.3 SDMP Methodology

The basis of the SDMP is the socio-economic, cultural and site baselines. These are the conditions prevailing in the impact communities of the Siana Gold Project prior to mining operations. The conditions will serve as benchmarks against which the effects of the interventions that the mining company will implement through the SDMP will be measured. Stated succinctly, the baselines will be used to determine whether the impact communities are better-off or worse-off because of the Project.

An intensive socio-economic, cultural and site assessment was undertaken during the conduct of the Environmental Impact Assessment (EIA) for the Siana Gold Project from 2005 through 2008 to generate the baselines. The focus was primarily on the host barangays, also known as direct impact barangays, comprised by Brgy. Cawilan of Tubod Municipality and Brgys. Siana and Dayano of Mainit Municipality and secondarily on the surrounding communities, or the indirect impact barangays, of Del Rosario of Tubod, Magpayang of Mainit, and Pongtud of Alegria Muncipality. The updating of the EIA data is ongoing.

In accordance with best practice guidelines, participatory baselining; situation, problems and opportunities analysis; and development planning techniques were adopted. The methodologies are discussed in the following Sections.

Participatory Agriculture and Fishery Resources and Livelihood Assessment

The Bureau of Fisheries and Aquatic Resources (BFAR) Region 13 with the assistance of the Lake Mainit Development Authority (LMDA) and Municipal Agriculturists and Technicians of Tubod, Mainit and Alegria conducted participatory agriculture and fishery resources and livelihood assessments in Brgy. Cawilan, Tubod Municipality; Brgys. Siana, Dayano, and Magpayang, Mainit Municipality; and Brgy. Pongtud, Alegria Municipality from February 15 to 17, 2005.

This activity established the trend in fish catch and agricultural production over the years. The causes for production increases and decreases were also discussed. The participants made recommendations on how they could improve their situation. They also narrated the effects of SURICON'S mining operations on rice production and fish catch.

A follow-up assessment of the yields and inputs for rice production was made through interviews with the MAOs of Tubod and Mainit in May 2009.

Household and Perception Survey

An EIA Household Socio-economic and Perception Survey was conducted on April 30 to May 1 2005 at the three direct impact and three indirect impact barangays (BMP, 2009). Of the total households of 1,276, fifteen percent (15 %) or 186 were surveyed. Systematic sampling was employed to select the respondents. A landmark, usually the Barangay Hall, was selected as the reference point. For the directly impacted barangays with a sampling intensity of 20 %, the fifth house from the landmark was the first respondent and every fifth house thereafter comprised the other respondents. For the indirect impact barangays with a sampling intensity of 10 %, every tenth house from the reference point was selected as survey respondent. At a 99 % confidence level, the error for questions with two alternative replies, *i.e.*, a binomial situation, is at most ± 9 % for the direct impact barangays and ± 12 % for the indirect impact areas.

Presentation of Results of Household and Perception Survey and of Participatory Agriculture and Fishery Resources and Livelihood Assessment to the Community

During the public consultation on the EIA of the Project which was conducted on December 3 to 4, 2008, the key findings of the household and perception survey and the participatory agriculture and fishery resources and livelihood assessment were presented to the impact barangays. The participants validated the key findings.

Assessment of Community Organizations and Projects

The success of the SDMP depends on the existence of viable and potentially viable organizations or groups that can implement commercially feasible projects. An assessment of organizations operating in the impact barangays was conducted to determine the quality of social capital[4]. On May 17, 2009, the GRC and the BMP team interviewed the officers and members of the following organizations:

[4] Social capital refers to the institutions and structures that allow individuals and groups to develop collaboratively.

- Siana Rice Millers Association
- Cawilan Farmers and Irrigators Association (CAFIA)
- Beneficiaries of the Philippines – Australia Community Assistance Program (PACAP) livelihood funding in Brgy. Dayano
- Molledo Project of Brgy. Siana and
- Mosquito Net Project of Brgy. Siana.

The discussions included the project history, management, profitability of operations, problems encountered, future plans and programs, among others.

SDMP Framework and Guidelines Presentation to Municipal Councils

The GRC Officers and BMP presented the SDMP Framework and Guidelines to the Municipal Councils of Tubod, Mainit and Alegria from May 18 to 19, 2009. Mrs. Marietta Tumulak of MGB Caraga Office was on hand to explain the SDMP's regulatory and monitoring features. The group obtained the advice and suggestions of the Councils on how best to implement the SDMP. The areas of complementation and coordination among GRC, MGB Regional Office, and LGUs were also discussed.

SDMP Planning Workshops

Two SDMP Planning Workshops were conducted. The first was held on May 19, 2009. The participants included the Barangay Captains and Councils of the six impact barangays. The discussions focused on the SDMP Framework and Guidelines. There was also a vigorous discussion on the allocation of the SDMP Fund among the barangays. After serious deliberations, the six barangays agreed on the fund allocation in writing.

The second workshop which was held on May 20, 2009 was attended by the Barangay Captains and Councils as well as officers and representatives of all organizations and sectors in the area (Annex 2). Sessions on problem analysis, solutions formulation, and allocation of the SDMP funds for various undertakings were conducted.

MGB Participation in SDMP Planning Workshops and Presentations

Mrs. Marietta Tumulak of MGB Caraga Office was present during the SDMP Planning Workshops with the Barangay Councils on May 19 and the general assembly on May 20. Mrs. Tumulak also participated during GRC and BMP's presentations to the Municipal Councils of Mainit, Alegria and Tubod from May 18 to 19. Her presence lent credibility to the sessions and ensured that the proceedings were in accordance with the SDMP guidelines.

Database of Community Residents

A database of all residents of the six impact barangays was generated from a census conducted by GRC in April 2009. This database was created to establish the legitimate residents of the impact communities. These people are the rightful beneficiaries of the SDMP and other benefits from the mining operations such as employment and medical assistance.

The database would make possible the tracking of the impact communities at the household level over time. It will be updated annually to coincide with the Annual SDMP preparation and reporting.

Another database will be set up at the appropriate time. This will comprise sample households from a neighboring community that is not affected by the Project. Socio-economic indicators will be monitored for this group, also known as the "control" group, and compared with those of the six impact barangays.

Other Stakeholder Engagements

Other stakeholder engagements conducted by BMP relevant to assessing the socio-economic conditions include:

- Meetings with Alegria Municipal Mayor Jessie Aguilera and Mainit Mayor Rogelio Gatpolintan in January 2005 and Tubod Municipal Mayor Guillermo Romarate, Jr. in April 2005
- Meeting with Engr. Kaiser Recabo, Project Director of the Lake Mainit Development Alliance in January 2005
- Interviews of local residents during the environmental and social baseline surveys of January to May 2005 and
- Meetings with officials, health workers, and leaders and representatives of farmers', irrigators', women's, and youth groups of Brgys. Cawilan, Siana, and Dayano on April 24, 2008 about the Siana Project including the underground mine and stakeholder perceptions and approval.

3. SITE PROFILE

3.1 Geographical Location

The Siana Gold Project is located approximately 39 km south of Surigao City in northeastern Mindanao (Figure 3-1). It is within the 240-ha Siana mine property formerly operated by SURICON. Portions of the property fall within Brgy. Cawilan of Tubod Municipality and Brgys. Siana and Dayano of Mainit Municipality, province of Surigao del Norte. It is covered by Mineral Production Sharing Agreement (MPSA) No. 184-2002-XIII (Figure 3-2).

Access to the Project is either from Surigao City through a 40-minute land trip or from Butuan City through a 2-hour land trip, both via the National Highway. Surigao City and Butuan City can be reached from Manila through commercial planes.

3.2 Physiography

The Landsat Natural Color Image of Northern Mindanao is reproduced as Figure 3-3. As shown, the Project site and vicinities has three main physiographic features:

- NNW-SSE trending predominantly andesitic ridge that is parallel and adjacent to the west coast of the Surigao Peninsula. Marked by steep hillsides and narrow valleys, the peak is Mt. Malimono at the north with an elevation of 900 masl. Geomorphologically, the ridge is a structural landform created by massive earth movements due to plate tectonics. The Philippine Fault Zone Surigao Segment marks the eastern edge of the landform.

- Central portion marked by clusters of volcanic peaks and conical hills, some reaching 600 masl at the north, and the Lake Mainit basin down south. The deepest portion of the lake is at 219 mbsl. Geomorpologically, this is another structural landform.

  The Paco area northwest of the Project site, with a 2-km diameter crater-like depression, resembles a large conical volcanic edifice. Three other depressions are discernible, namely, one in Capayahan and two others, which are probably explosion craters previously, are Lake Mahukdam and the small lake of Brgy. Silop. Mt. Binga, a prominent peak adjacent to Brgy. Binga, is a volcanic plug with slopes covered by coconut trees. Aligned with this plug in a roughly northwest direction are Masapelid Hill and Mt. Maragon-ong.

- Eastern portion which forms the northern extremity of the East Mindanao Ridge. The ridge is marked by gentle to moderate slopes on the western peripheries abruptly interrupted on the east by numerous irregular depressions typical of limestone areas. The maximum elevation is about 1600 masl at the south.

The highlands north of the Lake Mainit catchment are separated by two distinct narrow N-S trending lowlands of the Mayag River valley to the west and Magpayang River valley to the east.

Both are depositional landforms formed from the deposition of surface materials weathered and eroded from the limestone and andesitic ridges. The most productive agricultural lands in the area, they consist of the alluvial floodplains and the transitional upland fringe. The floodplains, which are areas on one or both sides of the stream channel that are inundated by floodwaters at some time, are planted to rice. The transitional upland fringe, a portion of the upland on one or both sides of the floodplain that serves as transitional zone or edge between the floodplain and the surrounding landscape, is planted to coconuts.

The Project site is part of the Magpayang River catchment. As shown in Figure 3-4, the Project site, which occurs southeast of the catchment, is bounded to the north and west by the low river terraces and floodplains of the Magpayang River. The western river terraces have an elevation of 40 to 45 masl and slope of 0 to 3 %. Eastward are the Timamana limestone hills with a local peak elevation of 400 masl and slopes in excess of 50 %. South of the site are the alluvial floodplains of the Magpayang River and Dayano Creek. Magpayang River and Dayano Creek are both meandering streams.

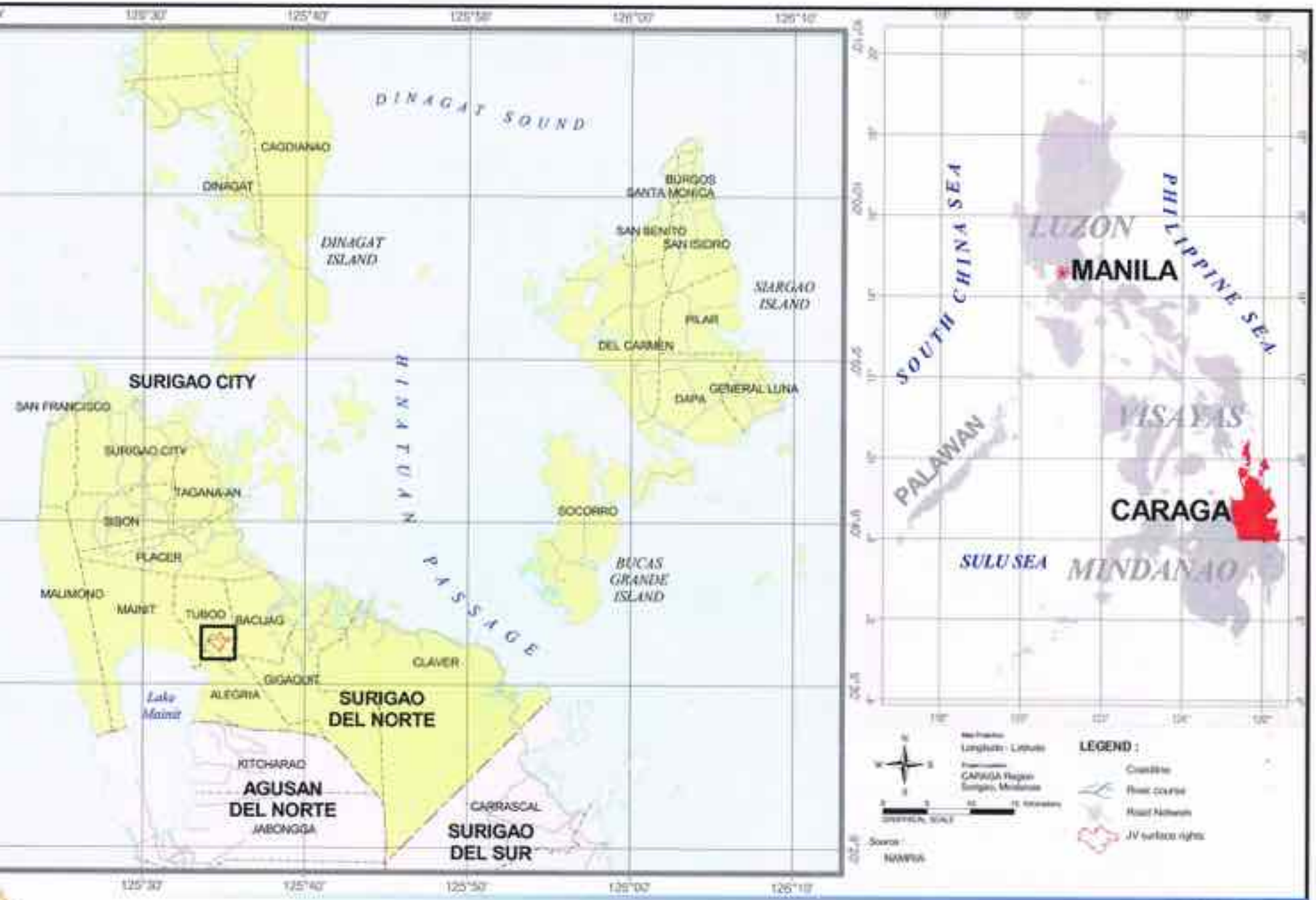
Figure 3-5 is the geomorphological map of the Magpayang River catchment. As shown, the Project site is generally part of the transitional upland fringe. It has a mean elevation of 50 masl and slopes of 8 to 18 %. The tailings surface elevation in the former Tailings dam 1 of SURICON varies between 43 to 45 masl. At Tailings dam 2 and Tailings dam 3, the tailings surface elevations are between 47 and 48 masl and between 51 and 53 masl, respectively. The crest elevation of Tailings dam 1 varies from 47 to 49 masl; for Tailings dam 2, from 48 to 51 masl; and for Tailings dam 3, at roughly 55 masl. The old waste rock dumps adjacent to the open pit have elevations of 55 to 60 masl.

3.3 Natural Drainage System

As discussed previously, the 240-ha Project site is inside the 5,700-ha catchment of Magpayang River. The river, together with 27 other rivers and creeks, drains into Lake Mainit. The lake drains towards Bohol Sea.

From Figure 3-4, the Magpayang River catchment extends as far north as Brgy. Timamana, Tubod; Brgy. Magpayang, Mainit and Brgy. Pongtud, Alegria to the south; and Brgy. Candiis, Alegria to the southeast. The easternmost part of the catchment with slopes in excess of 50 % and where the Timamana Limestone occurs is forested. Forest growth is likewise found at the equally steep northwestern andesitic portion up to the vicinity of the access road to Lake Mahukdam. The gentler slopes adjacent to the forests comprising the transitional fringe of the stream corridor are planted to coconuts. At the alluvial plains of Magpayang River are the ricefields. Along the National Highway and secondary roads that lead to the other barangays are the built-up areas for settlements, markets, eateries, government offices, churches, and variety stores.

The dendritic Magpayang River is 15.3-km long. The river is a fourth-order single-thread stream that flows southeasterly from the headwaters in Brgy. Timamana, Tubod. Before reaching Brgy. Motorpool, the flow becomes southwesterly. At Brgy. Marga, the flow switches again to the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ALEGRIA
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KITCHARAO
AGUSAN DEL NORTE
JABONGGA
CARRASCAL
SURIGAO DEL SUR
SOCORRO
BUCAS GRANDE ISLAND
NAONTUAN PASSAGE
SOUTH CHINA SEA
PHILIPPINE SEA
LUZON
MANILA
VISAYAS
PALAWAN
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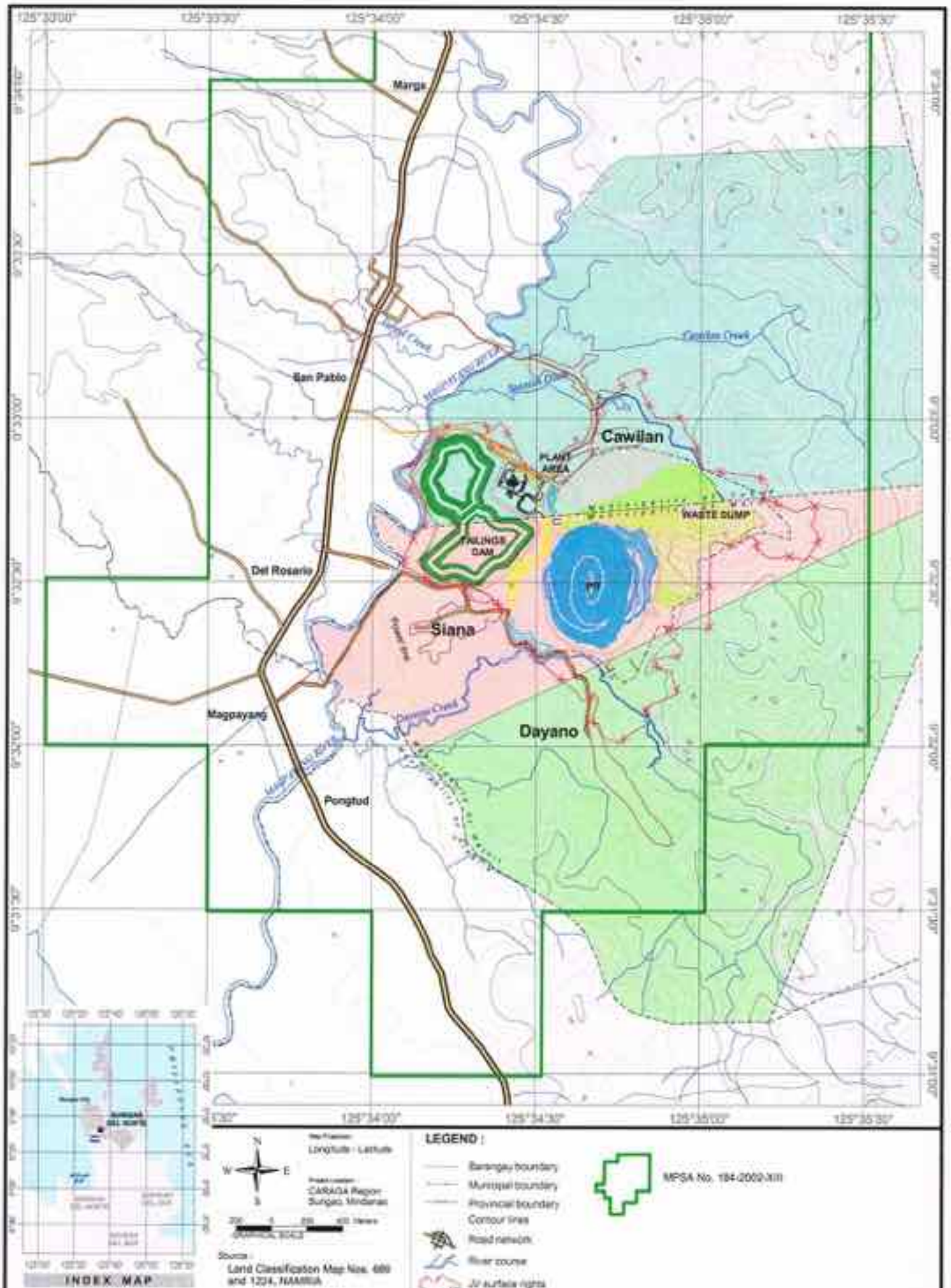
Road course
Road Network
JV surface rights
Source :
NAMRIA


125°32'00"
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125°34'00"
125°34'30"
125°35'00"
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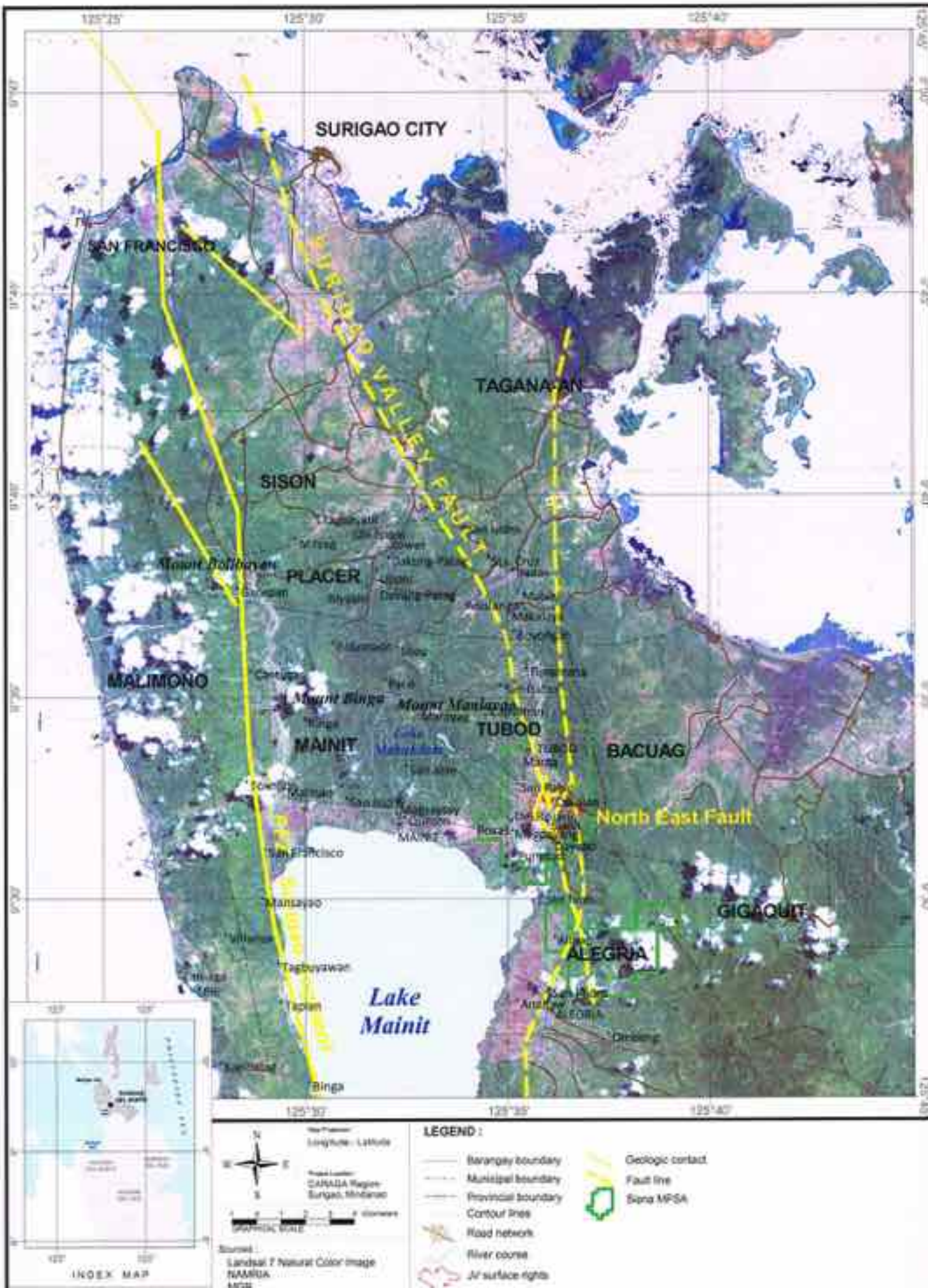
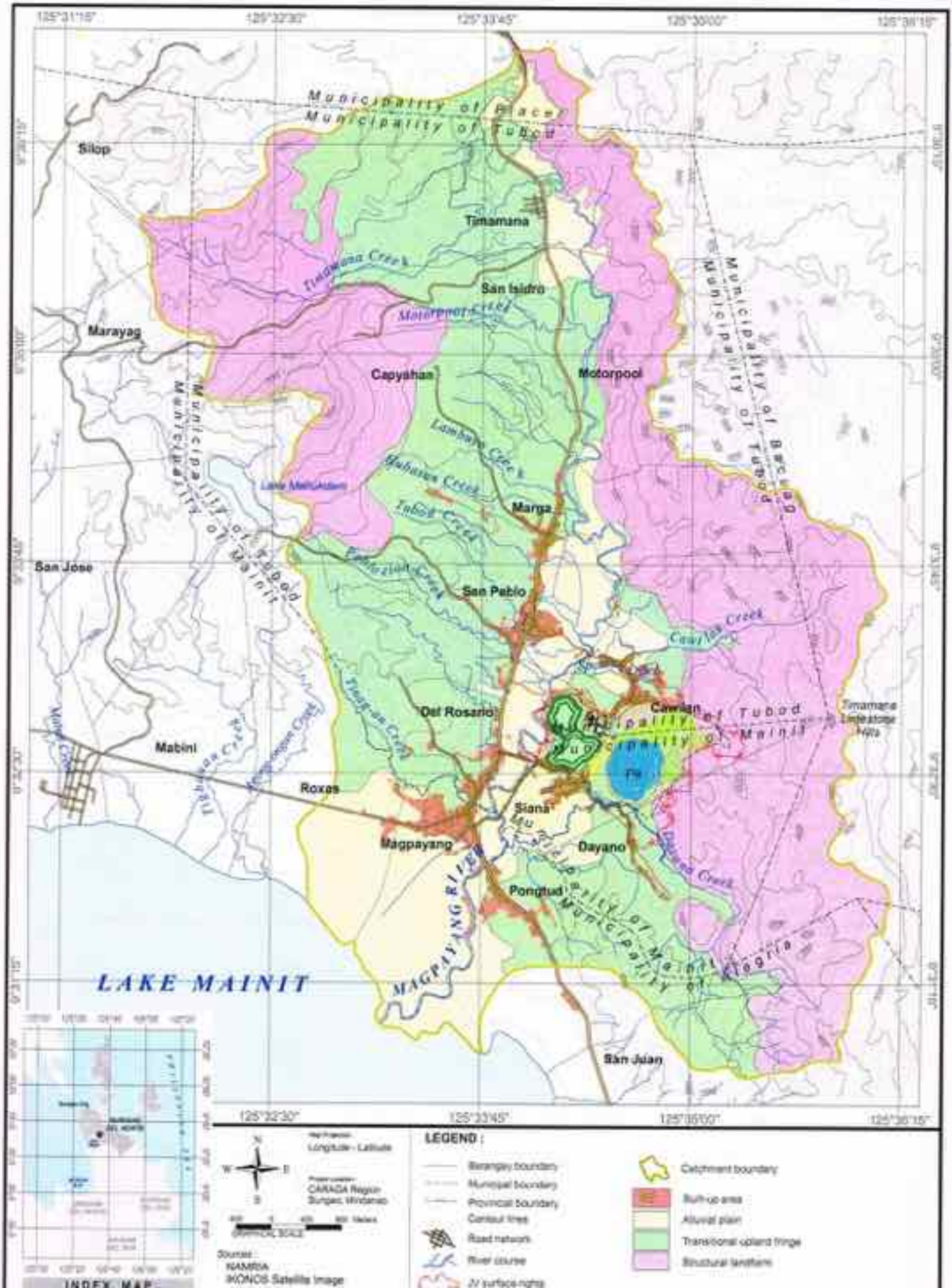
Marga
San Pablo
Cawilan
PLANT AREA
WASTE DUMP
TAILINGS DAM
PIT
Del Rosario
Siana
Magpayang
Dayano
Pongtud
INDEX MAP
SURIGAO DEL NORTE
N
W
E
S
Longitude - Latitude
CARAGA Region
Surigao, Mindanao
Source :
Land Classification Map Nos. 689 and 1224, NAMRIA
LEGEND :
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
MPSA No. 184-2002-XIII



125°25'
125°30'
125°35'
125°40'
SURIGAO CITY
SAN FRANCISCO
SURIGAO VALLEY FAULT
TAGANA-AN
SISON
PLACER
Mount Bolibuyan
MALIMONO
Mount Binga
Mount Manlayan
TUBOD
MAINIT
BACUAG
North East Fault
San Francisco
Mansayao
Tagbuyawan
Taplan
Binga
Lake Mainit
GIGAQUIT
ALEGRIA
LEGEND :
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
Geologic contact
Fault line
Sipna MPSA
Sources :
Landsat 7 Natural Color Image
NAMRIA
INDEX MAP

Municipality of Placer
Municipality of Tubod
Silop
Timamana
Timamana Creek
San Isidro
Motorpool Creek
Marayag
Capyahan
Motorpool
Municipality of Tubod
Municipality of Bacuag
Lambuyo Creek
Ububarian Creek
Tubod Creek
Marga
Lake Mahukdam
Municipality of Tubod
Municipality of Mainit
San Jose
San Pablo
Del Rosario
Cawilan
Mabini
Roxas
Siana
Dayano
Magpayang
Pongtud
Municipality of Mainit
Municipality of Alegria
MAGPAYANG RIVER
LAKE MAINIT
San Juan
125°32'30"
125°33'45"
125°35'00"
125°36'15"
LEGEND :
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
Catchment boundary
Slope Ranges
0 - 3%
8 - 18%
18 - 30%
30 - 50%
Sources:
NAMRIA
IKONOS Satellite Image
GRAPHICAL SCALE
INDEX MAP



Municipality of Placer
Municipality of Tubod
Silop
Timamana
Timamana Creek
San Isidro
Motorpool Creek
Marayag
Capyahan
Motorpool
Municipality of Bacuag
Municipality of Tubod
Municipality of Tubod
Municipality of Mainit
Lambuyo Creek
Hubasan Creek
Tubod Creek
Lake Mahusdam
Marga
San Jose
San Pablo
Cawilan Creek
Del Rosario
Cawilan
Municipality of Tubod
Municipality of Mainit
Timamana Limestone Hills
Mabini
Roxas
Siana
Magpayang
Dayano
Pongtud
Magpayang River
Municipality of Alegria
Municipality of Mainit
LAKE MAINIT
San Juan
125°32'30"
125°33'45"
125°35'00"
125°36'15"
LEGEND :
Longitude - Latitude
CARAGA Region
Surigao, Mindanao
Sources :
NAMRIA
IKONOS Satellite Image
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
Catchment boundary
Built-up area
Alluvial plain
Transitional upland fringe
Structural landform
INDEX MAP

southeast. Starting at Brgy. Poblacion, the river generally flows southwesterly ultimately discharging into Lake Mainit. The overall slope or relief ratio of the Magpayang River is 0.51 %.

Table 3-1 lists and provides some details for the tributaries of Magpayang River. The karst topography at the eastern portion of the catchment reduced the surface water flow. This is apparent in the relatively smaller drainage density of the adjacent creeks, particularly the Spanish Ditch which partially drains the northernmost portion of the Project site, or the complete absence of streams.

Table 3-1. Tributaries of Magpayang River

Tributary	Stream Order	Total Length (m)	Subcatchment Area (ha)	Overall Slope	Drainage Density (m ha^{-1})
Unnamed Creek 1	2	3910	420	2.5 %	9.4
Timamana Creek	2	5660	600	7.2	9.5
Motorpool Creek	2	2655	285	3.7	9.3
Unnamed Creek 2	1	1380	75	4.8	18.6
Unnamed Creek 3	2	2010	190	4.5	10.6
Lambuyo Creek	1	1175	55	5.2	20.6
Hubasan Creek	1	1755	110	5.2	15.7
Unnamed Creek 4	2	2825	155	2.8	18.3
Tubod Creek	1	3515	210	3.1	16.9
Poblacion Creek	2	3555	205	3.6	17.2
Unnamed Creek 5	2	4555	230	2.1	19.8
Tinag-an Creek	2	3295	165	1.4	20.2
Unnamed Creek 6	1	725	35	5.7	20.7
Unnamed Creek 7	1	790	35	2.1	22.6
Cawilan Creek	2	3700	540	7.3	6.8
Spanish Ditch	1	1200	270	5.7	4.4
Dayano Creek	4	7245	915	3.3	7.9

Notes:

1. Stream ordering follows the Strahler System.
2. The overall slope is a weighted average using five sections along the channel.
3. Drainage density is total stream length divided by the subcatchment area.

Source: BMP, 2009

The Spanish Ditch to the north, Magpayang River to the west, and the Dayano Creek to the south drain the Project site.

3.4 Climate Type

The climate at the Project site is classified as Type II under the Modified Coronas Classification (Figure 3-6). This climate type does not have a dry season. A very pronounced maximum rain period occurs from November to February.

Just like other parts of the country, the climate at the Project site is governed by two (2) major climatic controls. These are air streams or masses and tropical cyclones.

The Northeast Monsoon[5], Southwest Monsoon, and the North Pacific Trades are the principal air streams. The Northeast Monsoon generally affects the country in October and gradually weakens in March. The Southwest Monsoon arrives in early May and gradually disappears in October. The North Pacific Trades is dominant in April and early May and over the central and southern Philippines in October. The air stream typically overlies the Northeast Monsoon over the eastern section of the country.

Tropical cyclones are destructive weather disturbances characterized by strong winds and heavy rains. They have a low-pressure center which is called the "eye" of the storm with no clouds and wind. In the northern hemisphere[6], the winds of a tropical cyclone blow around this low-pressure center in a counter clockwise direction with increasing magnitude nearer the center.

Tropical cyclones are classified in the Philippines according to the accompanying maximum winds. A tropical depression has winds of speed less than 63 km/hr, a tropical storm has winds of speed from 63 to 117 km/hr, a typhoon has wind speeds of more than 117 km/hr.

The typhoon season begins in May and lasts until December. Tropical cyclones may form as early as January to April but these are relatively few in number. Most typhoons occur from July to September. According to the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA), an average of 22 typhoons hit the country each year. Of these, five will be destructive (Gonzales, 1994). The paths of tropical cyclones vary with the season. Figure 3-6 plots the average cyclone tracks for each month.

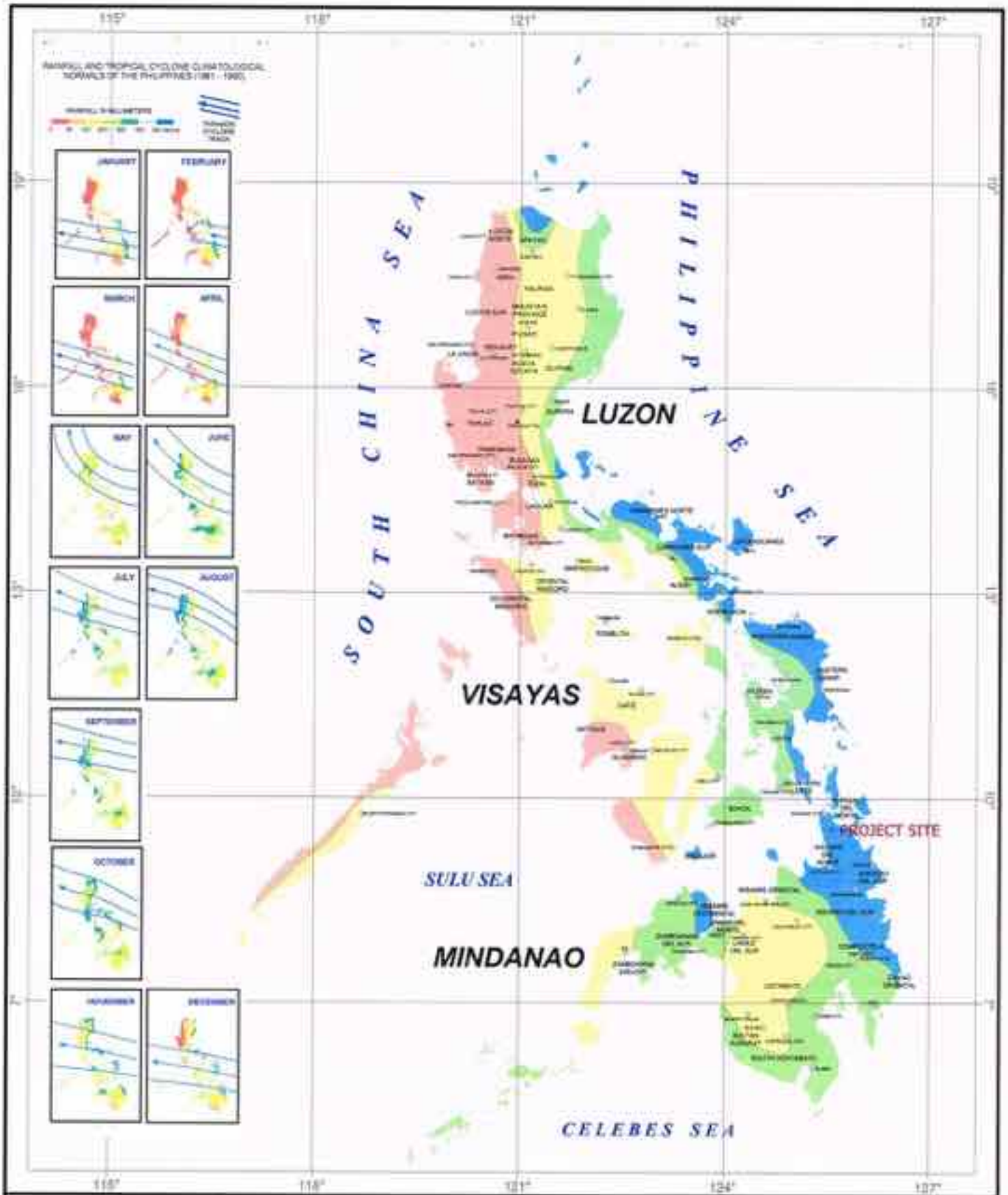
3.5 Rainfall Pattern

The synoptic station closest to the Siana Project site is PAGASA's Station 653 in Surigao City which is 30 km northwest of the site. The succeeding discussions are based on data gathered at the Surigao City station.

The climatological normals shown in Annex 3 are based on data compiled from 1971 to 2000. Annex 4 tabulates the climatological extremes based on various periods up to 2003. Annex 5 is the rainfall intensity-duration-frequency data.

[5] A monsoon is defined as a seasonal shift in wind direction.

[6] The Philippines is part of the northern hemisphere.



Map Projection: Longitude - Latitude

Projection: CARAGA Region Surigao, Mindanao

GRAPHICAL SCALE

Source : PAGASA

LEGEND :

- TYPE I — Two pronounced seasons: dry from November to April, wet during the rest of the year.
- TYPE II — No dry season with a very pronounced maximum rainfall from November to January
- TYPE III — Seasons not very pronounced; relatively dry from November to April and wet during the rest of the year.
- TYPE IV — Rainfall more or less evenly distributed throughout the year.

Based on Annex 3, Figure 3-7 plots the mean monthly rainfall for Surigao City. The months of May to September are less wet, corresponding to the Southwest Monsoon. During this period, rains coming from the southwest are blocked by various landmasses. October to March, the period when the Northeast Monsoon is operative, are wet months. There is not much landmass, *i.e.*, only Dinagat Island, to block the incoming rains. From Figure 3-6 which plots the average cyclone tracks for each month, the heavy precipitation during the months of November to January is also due to the tropical cyclones. During the said period, the mean cyclone path passes very closely to the Project site. The mean annual rainfall stands at 3,556.4 mm.

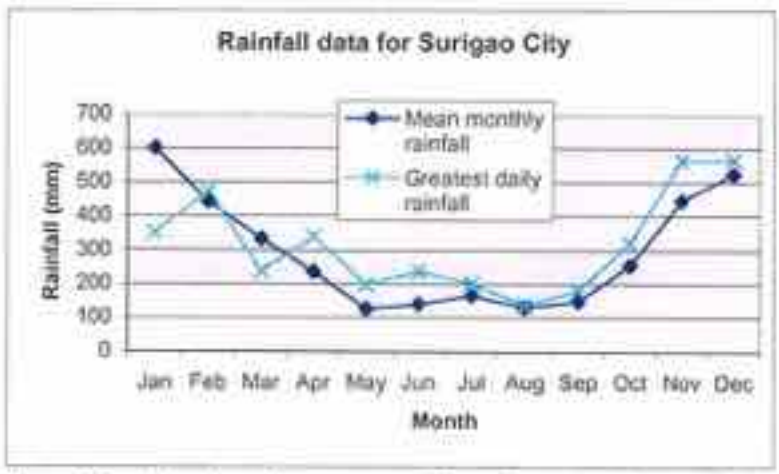


Figure 3-7. Line chart for mean monthly and greatest daily rainfall

Figure 3-7 also plots the greatest daily rainfall recorded for each month as extracted from Annex 4. In some months, *i.e.*, from April to December, the greatest daily rainfall exceeds the average total rainfall for the month.

The average number of rainy days per month is shown in Figure 3-8. The trend closely mimics that of the mean monthly rainfall.

Figure 3-9 is derived from the rainfall intensity-duration-frequency dataset of Annex 5. The two years' 24-hour storm has an estimated precipitation of 204.8 mm. For a hundred years' 24-hour storm, the computed rainfall is 593.6 mm.

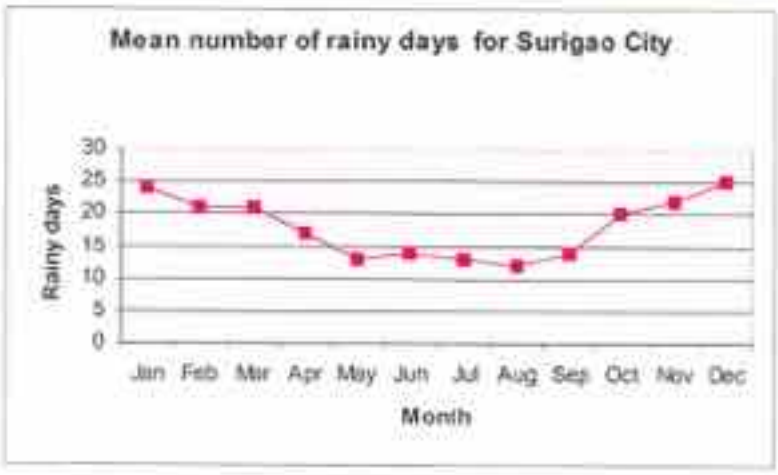


Figure 3-8. Line chart of mean number of rainy days

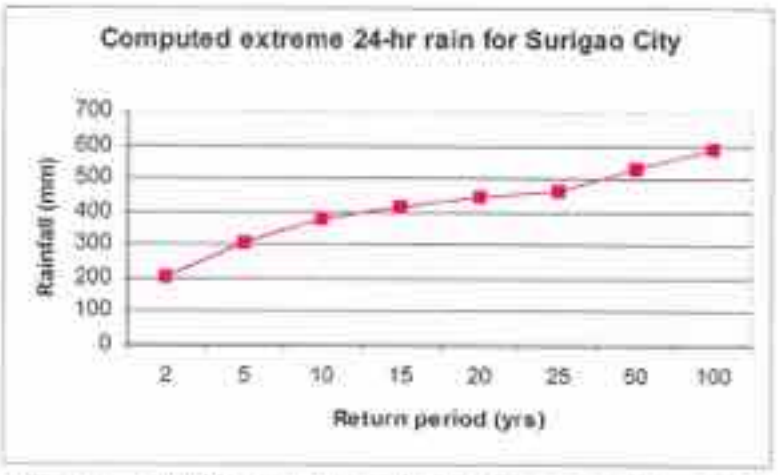


Figure 3-9. Estimated rainfall for 24-hour storms of various return periods

4. ENVIRONMENT, SOCIO-ECONOMICS, AND CULTURE

4.1 Environmental Conditions

4.1.1 Land Use Pattern

The actual land use within the Magpayang River catchment which includes the Project site was inferred from the Ikonos 2005 satellite image. The land use at the Project site and surroundings, roughly 0.5 km from the property line, was verified through a rapid field mapping in April 2008.

Figure 4-1 is the resultant land use map of the Magpayang River catchment. As shown, the catchment is predominantly coconutland. The forests are found in the elevated areas in the northwest and to the east of the catchment. The alluvial plains are planted to rice. There are patches of grasslands near Brgy. Magpayang and in Brgy. Cawilan.

The soils in the catchment are classified into alluvial and upland soil. Upland soil evolved either from igneous rocks or limestone.

The soil of the alluvial plain is clay loam to silty clay loam over clay, deep, and generally poorly drained. It is strongly to moderately acidic with medium to high organic matter. Phosphorus (P), potassium (K), cation exchange capacity (CEC), and base saturation percentage (BS) are all high. Copper (Cu) is very high and manganese (Mn) is low to medium. Overall, the soil has high fertility.

The soil in the upland that developed from igneous rocks is clayey, deep, and well drained. It is very strongly acidic with medium content of organic matter. P is low, K is high, CEC is high, and BS ranges from low to medium. Cu is very low and Mn is from low to medium. Generally, the soil has medium fertility.

The upland soil that developed from limestone is loam over clay, deep, and well drained. It is strongly acidic with medium content of organic matter. P, K, CEC, and BS are high. Cu and Mn are low and medium, respectively. Overall, the fertility of the soil is medium.

The 240-ha Project site is predominantly grassland. The minor exceptions are the ricelands west of the site along the Magpayang River banks, the forests at the Timamana highlands to the east, coconut lands southeast of the property, and the flooded SURICON open pit.

Figure 4-1 shows the households which are concentrated along the National Highway. There are also households occupying the former accommodations facilities of SURICON immediately north of the main waste rock dump. Southwest of the Siana property and at the toe of SURICON's Tailings dam 3 are the households of Brgy. Siana.

Gold small-scale mining without permits is active at the SURICON waste rock dumps and tailings pond areas. The number of miners dramatically increases during the rainy months of October to March. Near the southwestern end of Tailings dam 3, a gold CIL plant operates without a permit.

4.1.2 Availability and Source of Water Supply

Figure 4-2 is the regional geological map which covers the Project site and the Magpayang River catchment. The underlying lithologic formations allow groundwater flow in varying degrees. For the highly permeable sand and gravel deposits of the Quaternary Alluvium, the groundwater occurs mainly in unconfined condition. For the Timamana Limestone, the solution cavities and karstic nature are favorable to groundwater flow. The other stratigraphic units such as andesites and basalt allow groundwater flow either through the weathered mantle, solution-enlarged joints and fractures, or bedding planes (MGB, 2003).

At the Project site, three main aquifers are inferred:

- Alluvial aquifer which is 6 to 12 m thick and located beneath the near-surface soils. It comprises yellow, orange and brown sands and gravels with inter-layered clays.
- Saprolite aquifer is within the highly weathered bedrock and above the fresh bedrock.
- Bedrock fractured aquifer which includes volcaniclastics, basalts on the eastern side of the pit, and karstic limestone.

The results of GRC-commissioned geotechnical investigation and monitoring of water levels around the tailings dam and proposed process plant site suggest that the groundwater in the deeper aquifers flows towards the Siana open pit from the north and west. Groundwater in the near-surface alluvial aquifer flows towards Magpayang River from the east and northeast and the area of the existing tailings dams.

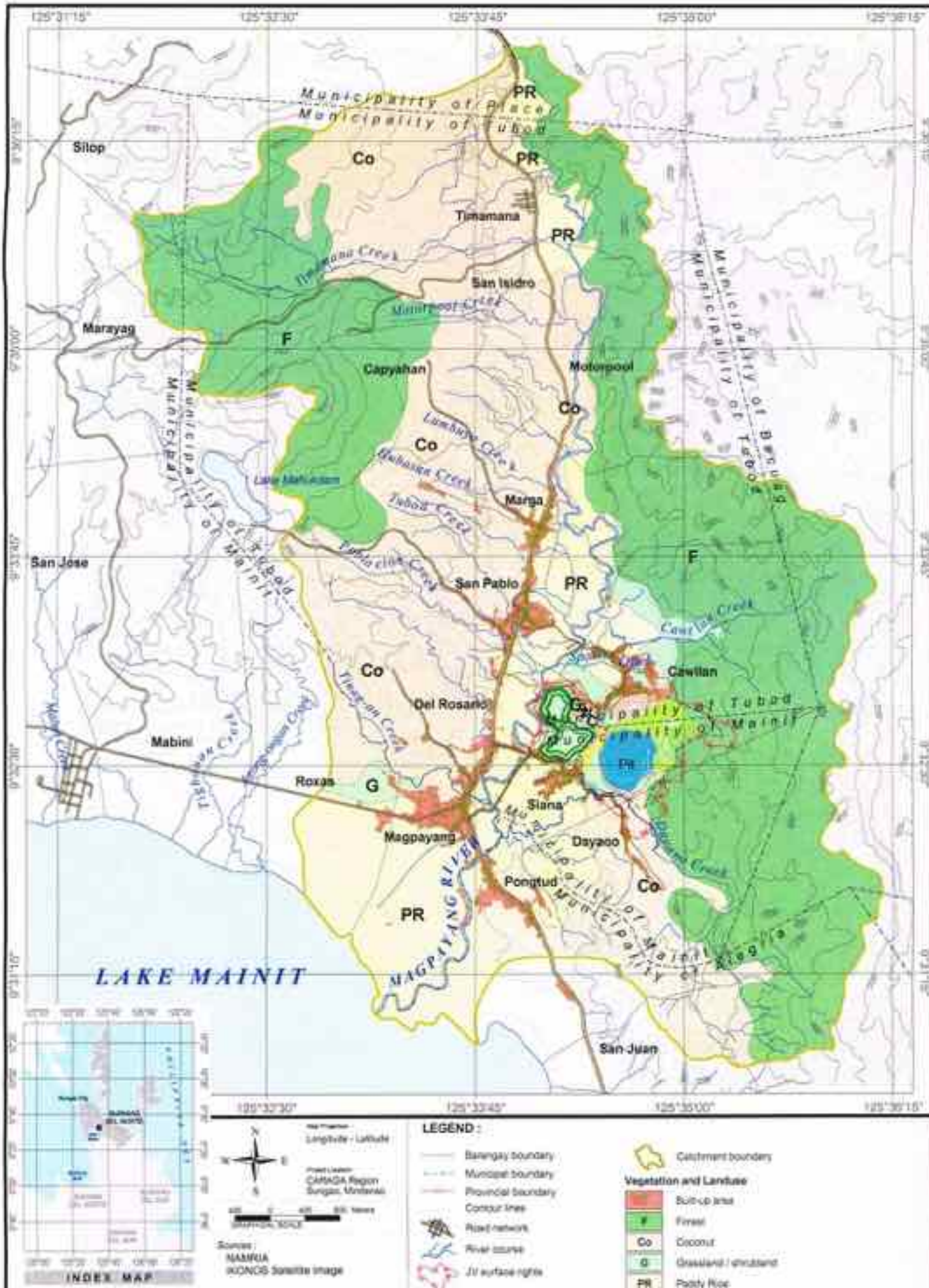
The local residents rely on the Magpayang River for their agricultural needs, washing of clothes, bathing, and care for their animals. The river is also a source of fish.

Water to irrigate the rice fields on the alluvial plains is extracted either by pumping or through irrigation canals (Figure 4-3). At Brgy. Marga, river water is diverted into the irrigation channels of that barangay and Poblacion. Downstream of the discharge point of SURICON's old tailings pond and immediately upstream of the bridge that connects Brgy. Siana to the National Highway is the irrigation intake for the rice fields of Brgy. Magpayang.

The water of Cawilan Creek is also used to irrigate the rice fields. Along Dayano River, downstream of the discharge of the Siana pit, is an irrigation dam for the ricefields of Brgy. Siana. Pumps are also installed at some sections of the river for the fields outside of the irrigation network.

The Siana Pit water is used for washing clothes and bathing by the residents. In 2005, fish cages with fingerlings provided through the DSWD-CIDDS program were observed inside the pit. Currently, the fish cages no longer exist.

Up to 2005, springs and shallow wells are the sources of potable water in Brgys. Cawilan, Siana, and Dayano (Figure 4-3). Songkoy Spring near Lake Mahukdam, which is hosted by diorite and


Municipality of Placer
Municipality of Tubod
Municipality of Mainit
Municipality of Bacuag
Municipality of Alegria
Silop
Marayag
San Jose
Mabini
Roxas
Timamana
San Isidro
Capyahan
Motorpool
Marga
San Pablo
Cawilan
Del Rosario
Siana
Magpayang
Dayaoo
Pongtud
San Juan
Timamana Creek
Lumbuya Creek
Tubod Creek
Cawilan Creek
Magpayang River
Lake Mahusaon
LAKE MAINIT
PR
Co
F
G
125°33'45"
125°35'00"
125°36'15"
INDEX MAP
Longitude - Latitude
CARAGA Region
Surigao, Mindanao
Sources :
NAMRIA
IKONOS Satellite Image
LEGEND :
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
Catchment boundary
Vegetation and Landuse
Built-up area
F Forest
Co Coconut
G Grassland / shrubland
PR Paddy Rice


SURIGAO CITY
SAN FRANCISCO
SURIGAO VALLEY FAULT
TAGANAAN
SISON
PLACER
MALIMONO
Mount Binga
Mount Mamayog
Lake Mahukdum
MAINIT
TUBOD
BACUAG
GIGAQUIT
ALEGRIA
KITCHARAO
PFZ - Surigao Segment
Lake Mainit
INDEX MAP
LEGEND :
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Municipal boundary
Provincial boundary
Contour lines
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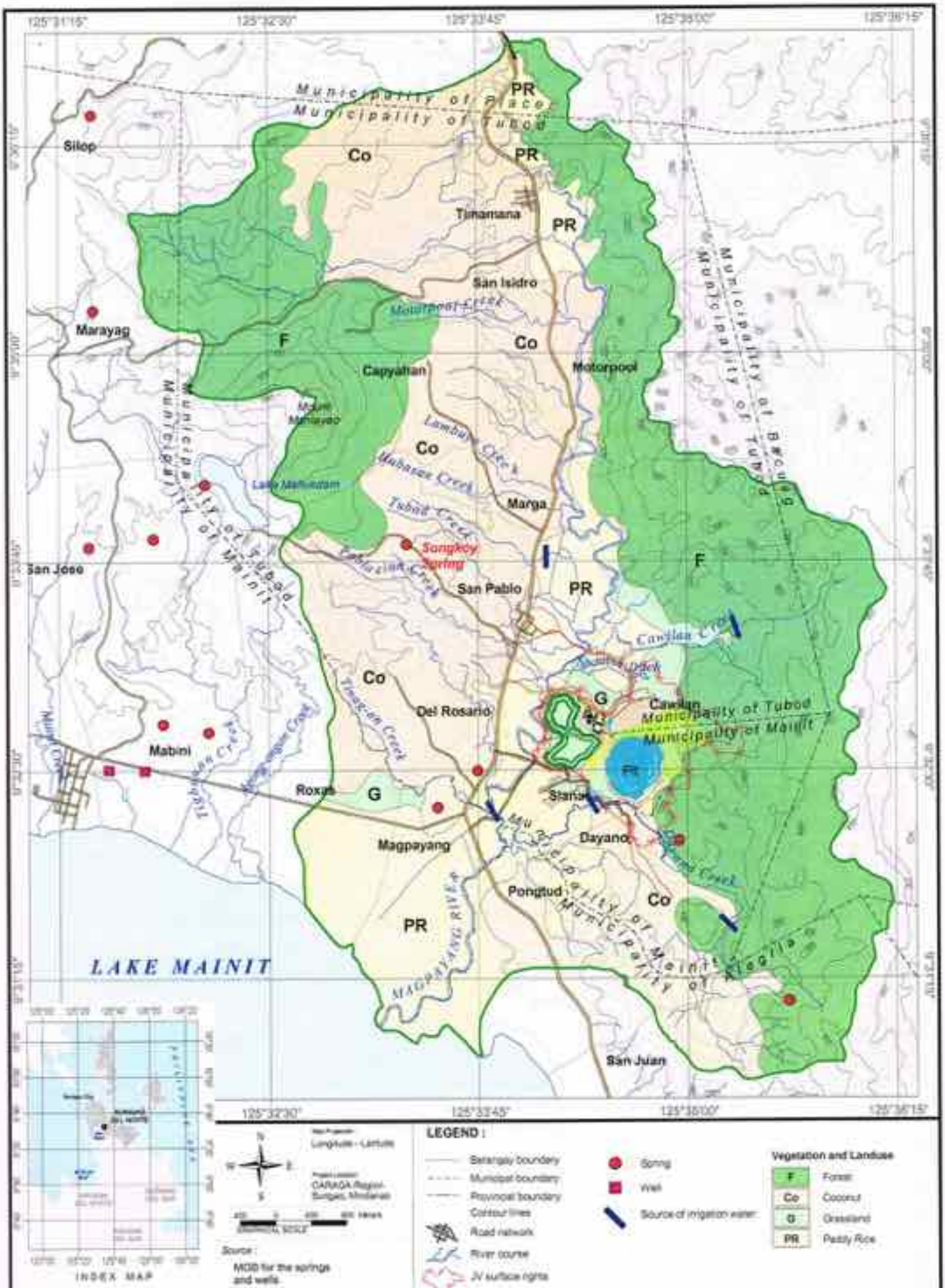
River course
Geologic Contact
Recent
Mainit Formation
Tinamana Limestone
Mabuhay Formation
Bacuag Formation
Fault Line
Mamayo Andesite
Mabuhay Andesite
Igil Andesite
Basalt
Ultramafic Complex
Sources
MGB
Pubellier et al., 1993



125°31'15"
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Municipality of Placer
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Silop
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PR
Timamana
San Isidro
Motorpool Creek
Marayag
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Capyahan
Motorpool
Municipality of Tubod
Municipality of Bacuag
Municipality of Mainit
Lambuyo Creek
Lake Mahusdam
Marga
Songkoy Spring
San Jose
San Pablo
Cawilan Creek
G
Cawilan
Del Rosario
Mabini
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Pongtud
MAGPAYANG RIVER
Municipality of Mainit
Municipality of Alegria
LAKE MAINIT
San Juan
INDEX MAP
LEGEND :
Barangay boundary
Municipal boundary
Provincial boundary
Contour lines
Road network
River course
JV surface rights
Spring
Well
Source of irrigation water
Vegetation and Landuse
F Forest
Co Coconut
G Grassland
PR Paddy Rice
Source :
MGB for the springs and wells

floats of andesite, provides drinking water to Brgys. Marga, Poblacion, San Pablo, Del Rosario, and Cawilan of Tubod and even Brgy. Magpayang of Mainit. A spring in Brgy. Dayano, in an andesite porphyry, provides drinking water to that barangay and Brgy. Siana. Brgy. Pongtud residents get their potable water from a spring and shallow well.

In 2005, GRC established a potable water supply and distribution system for the direct impact barangays. The water source is the open pit. Treatment consists of chlorination and filtration.

4.1.3 Natural Calamities and Disasters

The Project site occurs in a complex tectonic region (Figure 4-4; Rimando, 1994 and Punongbayan, 1994).

- About 25 km west of the Project site is the Philippine Fault Zone (PFZ). The PFZ is about 1,600 km long, extending from the Lingayen Gulf in Western Luzon down to the offshore Pujada Peninsula in southeastern Mindanao. It has been the site of many large historical earthquakes, *i.e.*, M_s larger than 5, and more numerous moderate to small events. The 1879 Surigao earthquake with magnitude M_s of 7.4 was attributed to the fault zone.
- Roughly 135 km eastward of the site is the Philippine Trench where the Philippine Sea Plate is being subducted.
- On the far west side, about 405 km, the seafloor of the Sulu Plate subducts along the Sulu Trench near the northwest side of Zamboanga Peninsula and Sulu Archipelago.
- Southwest of the site, the Celebes Sea Plate subducts near the west side of Central Mindanao along the Cotabato Trench and in Davao Gulf along the Davao Trench.

The major converging subduction zones framing Mindanao such as the Philippine Trench, Sulu Trench, and Cotabato Trench led to the formation of volcanic centers and complexes. Five active volcanoes are within 200 km from the Project site. The most active, Mt. Hibok-Hibok in Camiguin Island, is about 103 km west (Martinez, 1994). Considering the distance, a Mt. Hibok-Hibok eruption can bring ash fall to the Project site.

Faults, subduction zones, and volcanic activity are the primary generators of earthquakes in the Philippines. The hazards associated with earthquakes include ground shaking which can cause building collapse, ground rupture, liquefaction wherein cohesionless layers of sand become liquid, landslides, and tsunamis.

Figure 4-5 locates the epicenters of destructive earthquakes in the country from 1608 to 2002. It also indicates the dates of occurrence, magnitude, and maximum intensity of the earthquakes. Within a 300-km distance from the Project site, the earthquake with the strongest magnitude is the earthquake of 12 July 1911. The M_s is 7.7 with epicenter located 67 km SE of the site. The earthquake wrought great havoc in many parts of Mindanao. It destroyed houses and felled

many big trees. It caused massive landslides and tsunami which penetrated far inland (Mangao *et al.*, 1994).

Thenhaus *et al.* (1994) developed a probabilistic ground-motion hazard model for the Philippines. Through this model, peak horizontal ground accelerations (PGA) that have a 10 % probability of being exceeded in 50 years have been estimated for rock, medium soil, and soft soil. From Figure 4-6, the estimated peak ground accelerations for northern Mindanao range from 0.25 to 0.29g for rock, from 0.40 to 0.56 for medium soil, and from 0.70 to 0.80g for soft soil.

To guide the design of the tailings dams, GRC commissioned a seismic hazard assessment. The study estimated the PGA for an operating basis earthquake (OBE) at 500 years' return period at 0.25g. The PGA for a maximum design earthquake (MDE) at 10,000 years' return period is 0.60g.

Aside from earthquakes, the Project site is also vulnerable to typhoons. During the community consultations as part of the Project's EIA, the residents of the host and surrounding communities recalled the devastating effects of two typhoons. One was Typhoon Ining in 1964. The other was Typhoon Nitang which ravaged the country from 31 August to 4 September 1984.

According to the residents, Typhoon Ining damaged agricultural lands, houses, schools, and other properties. Many carabaos and one person died. Typhoon Nitang was worse. Five persons reportedly died. In Brgy. Pongtud, Municipality of Alegria, around 60 % of the houses were destroyed. Based on the records of the Office of Civil Defense, Typhoon Nitang caused 900 deaths and a total property damage of P 3.913 billion nationwide.

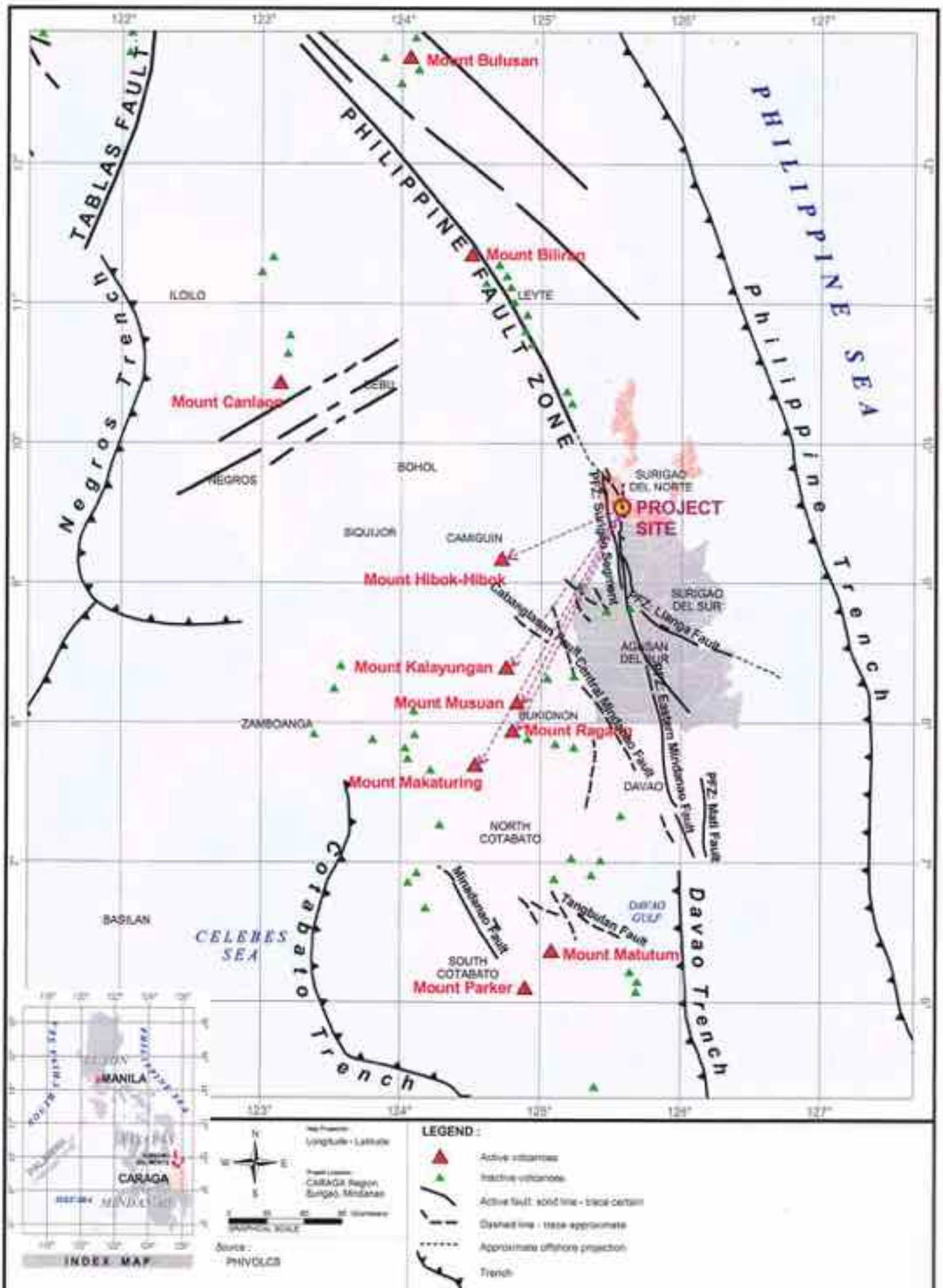
4.2 Socio-economic Conditions

4.2.1 Impact Areas

The Project affects six barangays in three municipalities. Three are directly impacted and another three are indirectly affected.

The primary or direct impact area consists of Brgy. Cawilan in the Municipality of Tubod and Brgys. Siana and Dayano in the Municipality of Mainit (Figure 4-7). The mine, ore processing, and ancillary facilities are located in these barangays.

The secondary or indirect impact area comprises Brgys. Del Rosario in Tubod, Magpayang in Mainit, and Pongtud in Alegria. These villages are in the path of the Magpayang River. The river is the recipient of possible sediments, heavy metals, and chemicals from the Project's tailings ponds and waste rock dumps as well as the 8.2 million m^3 of water to be pumped out of the open pit.


Mount Bulusan
TABLAS FAULT
PHILIPPINE FAULT ZONE
PHILIPPINE SEA
Philippine Trench
Mount Bilinao
ILOILO
LEYTE
Negros Trench
Mount Cantaga
CEBU
BOHOL
NEGROS
SURIGAO DEL NORTE
PROJECT SITE
PFZ: Surigao Segment
SIQUIJOR
CAMIGUIN
Mount Hibok-Hibok
SURIGAO DEL SUR
PFZ: Lianga Fault
Cabanglasan Fault
Central Mindanao Fault
AGUSAN DEL SUR
Mount Kalayungan
Mount Musuan
Eastern Mindanao Fault
BUKIDNON
ZAMBOANGA
Mount Ragang
Mount Makaturing
DAVAO
PFZ: Matti Fault
NORTH COTABATO
Cotabato Trench
Mindanao Fault
Davao Gulf
Tangbulan Fault
BASILAN
CELEBES SEA
Mount Matutum
SOUTH COTABATO
Mount Parker
Davao Trench
MANILA
CARAGA
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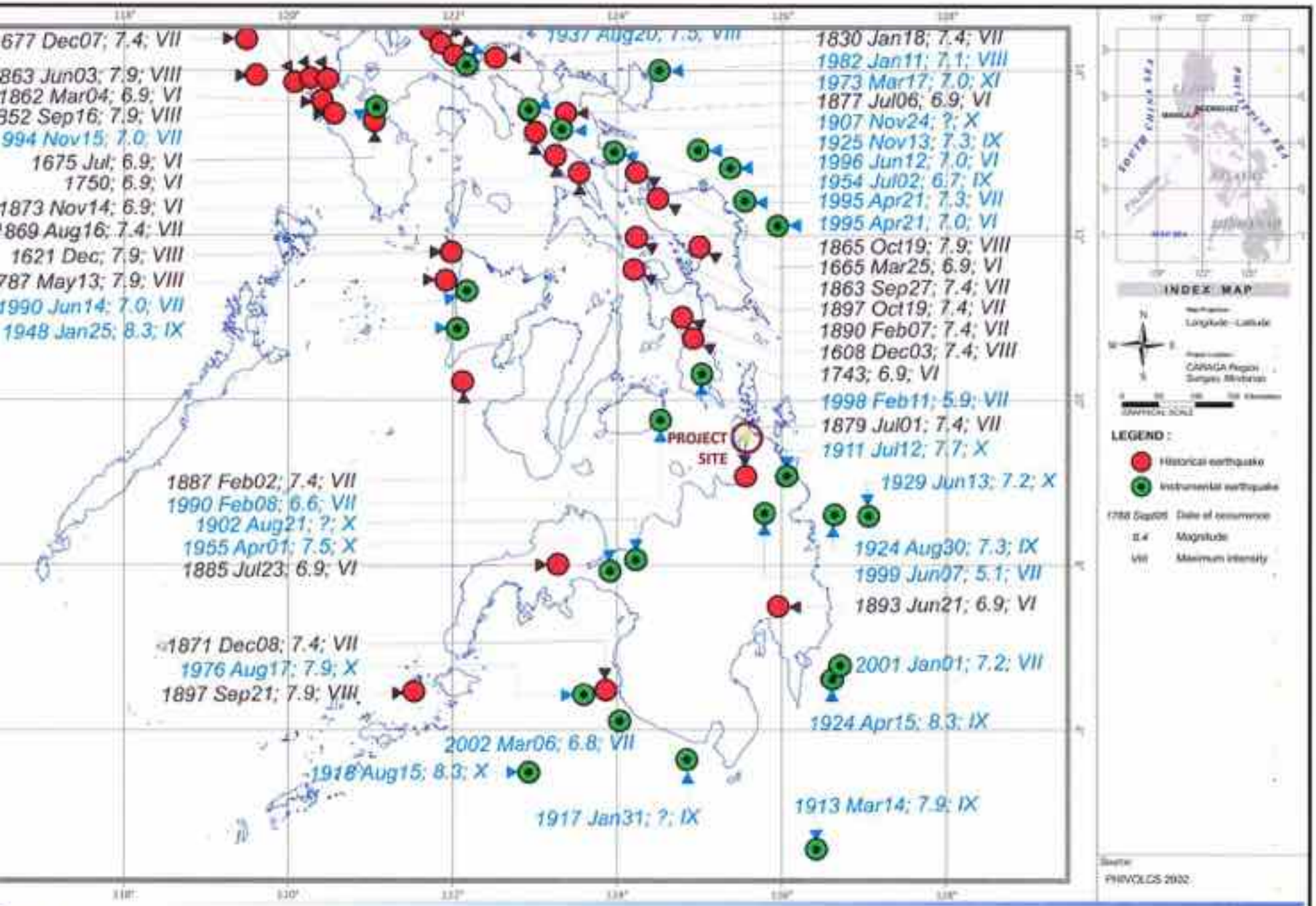
LEGEND :
Active volcanoes
Inactive volcanoes
Active fault, solid line - trace certain
Dashed line - trace approximate
Approximate offshore projection
Trench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863 Jun03; 7.9; VIII
1862 Mar04; 6.9; VI
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869 Aug16; 7.4; VII
1621 Dec; 7.9; VIII
787 May13; 7.9; VIII
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1937 Aug20; 7.5; VIII
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1982 Jan11; 7.1; VIII
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1877 Jul06; 6.9; VI
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1608 Dec03; 7.4; VIII
1743; 6.9; VI
1998 Feb11; 5.9; VII
1879 Jul01; 7.4; VII
1911 Jul12; 7.7; X
PROJECT SITE
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1887 Feb02; 7.4; VII
1990 Feb08; 6.6; VII
1902 Aug21; ?; X
1955 Apr01; 7.5; X
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1924 Aug30; 7.3; IX
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1976 Aug17; 7.9; X
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1924 Apr15; 8.3; IX
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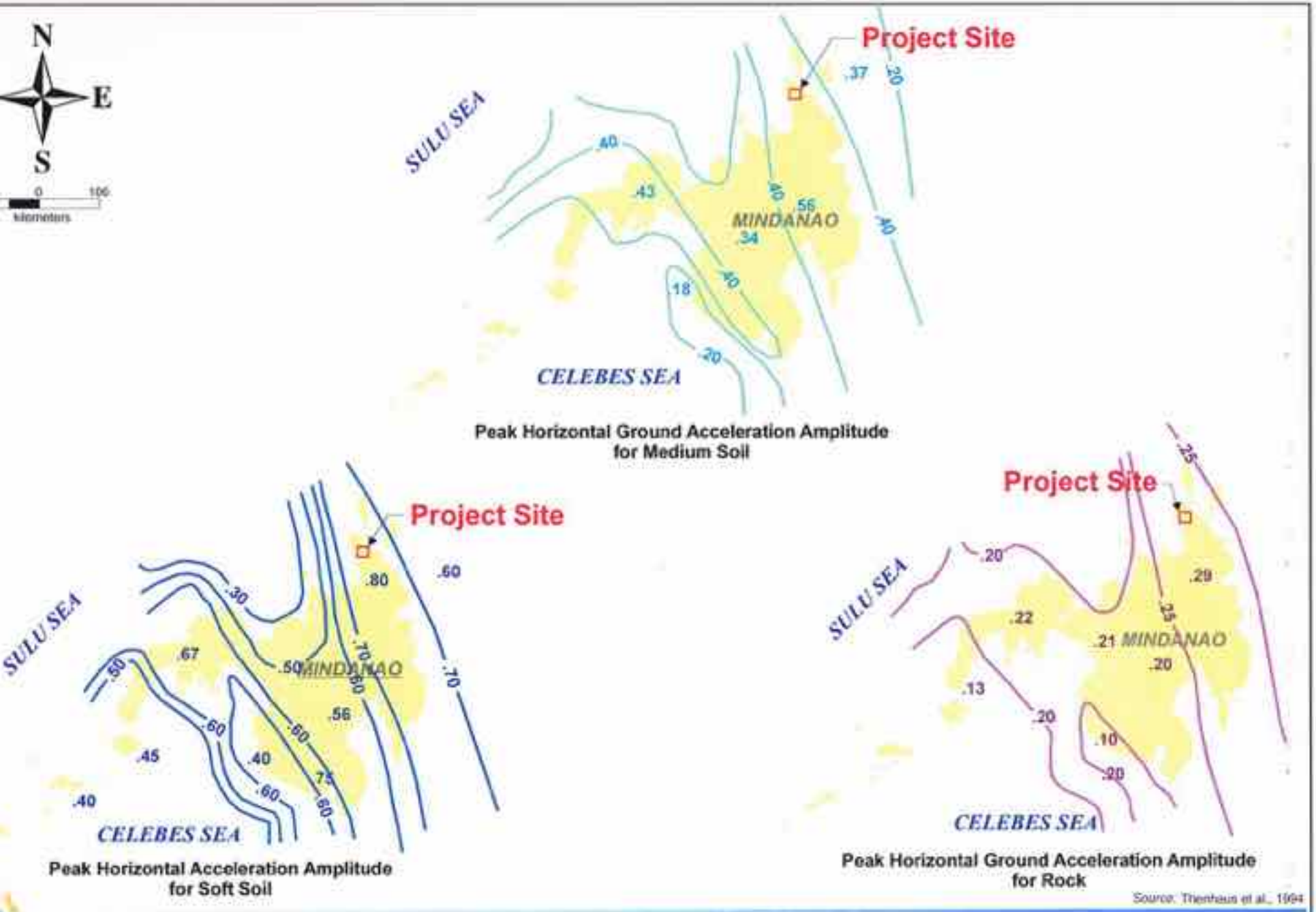
1918 Aug15; 8.3; X
1917 Jan31; ?; IX
1913 Mar14; 7.9; IX
INDEX MAP
LEGEND :
Historical earthquake
Instrumental earthquake
Date of occurrence
Magnitude
Maximum intensity
PHIVOLCS 2002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for Medium Soil
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CELEBES SEA
Peak Horizontal Acceleration Amplitude
for Soft Soil
Project Site
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CELEBES SEA
Peak Horizontal Ground Acceleration Amplitude
for Rock
Source: Thenhaus et al., 1994

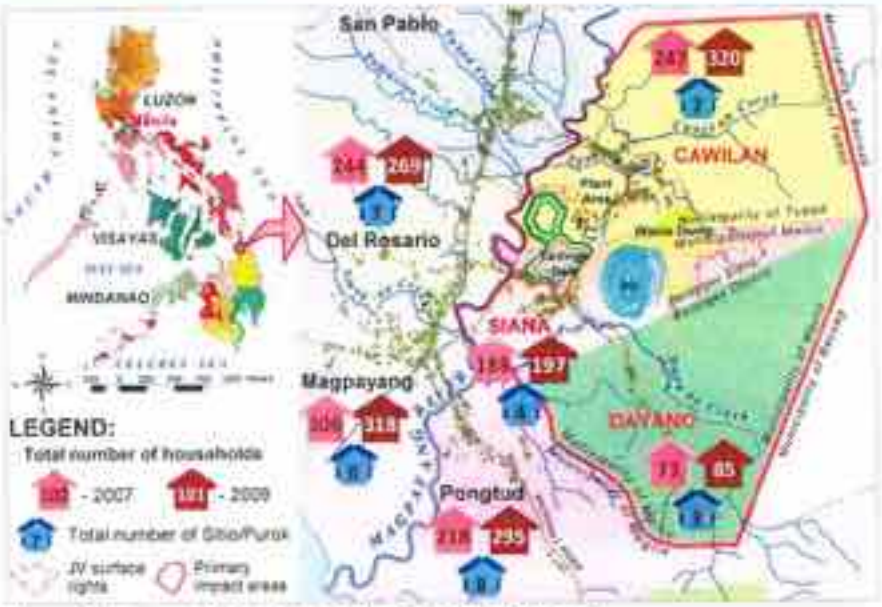

Figure 4-7. Impact barangays of the Siana Gold Project

The Project is likely to impact the residents and other resource users within the six barangays. The latter includes the seasonal gold small-scale miners, fishermen, and farmers who source irrigation water from the rivers.

4.2.2 Impact Municipalities

The municipalities of the direct impact barangays which are Tubod and Mainit are the direct impact municipalities. Alegria Municipality which has jurisdiction over Brgy. Pongtud is the indirect impact municipality.

4.2.2.1 Tubod

Tubod is located in the central part of the mainland province of Surigao del Norte. It is bisected almost equally from north to south by the Philippine National Highway. It is 36 km south of Surigao City, the provincial capital and 88 km from Butuan City, the capital of Agusan del Norte. It is a landlocked municipality bounded by the Municipality of Placer on the north, the Municipality of Bacuag on the east, and on the west and south by the Municipality of Mainit.

Tubod is a fifth class municipality. For 2008, its total IRA is P 20,511,970. Of this, P 4,102,394 is allocated for Development Projects.

Topography and Land Features

The physical land features of Tubod vary from flat and gently sloping to hilly and highly steep with an average elevation of 80 masl. Except in the southern part where the lowlands are located, the municipality is surrounded by mountains and forestland. The barangays with a slope of 0 to 8 %

include Poblacion, San Pablo, Marga, and Del Rosario. The mountain ranges of Mt. Diwata, rising up to 300 masl, border the boundary of Tubod and Bacuag. These ranges have a slope of more than 50 %. Mt. Maniayao with an elevation of 644 masl, divides Tubod and Mainit on the western and southern sides. The boundary has a slope of 30 to 50 %.

The municipality has a total land area of 5,464 ha. The alienable and disposable land covers three-fourths and the balance is classified as forestland.

History

The name Tubod was derived from the Visayan term "Tuburan", meaning spring. This spring, now called Songkoy, is the municipality's major source of domestic and irrigation water.

The Mamanwas were the original settlers of Tubod. They moved to the hinterlands when Christian migrants occupied the area. Agustin Mendez, a Boholano, was the first Christian settler and considered the founder of Tubod. He planted large tracts of land with abaca, rice, root crops, and coconuts. Other migrants from Bohol, Leyte, and Camiguin later settled in the area and engaged in farming.

Tubod was originally a sitio of Timamana, one of the barangays of Placer. In 1909, it became a barangay under the leadership of Agustin Mendez. In 1931, it was declared a barangay of the municipality of Mainit. On September 18, 1957, it was finally classified as an independent municipality by virtue of Executive Order 269 issued by President Carlos P. Garcia. Agustin Mendez was likewise instrumental in its proclamation as a municipality. To support its approval, he donated the lot for the municipal site. The first municipal officials assumed office on 4 October 1958.

Political Subdivisions

Tubod's area comprises 2 % of the land area of Surigao del Norte. It consists of nine barangays shown in Figure 4-8. Six barangays are located along the National Highway, namely: Poblacion, San Pablo, Del Rosario, Marga, Motorpool and Timamana. San Isidro, Capayahan, and Cawilan are in the periphery.

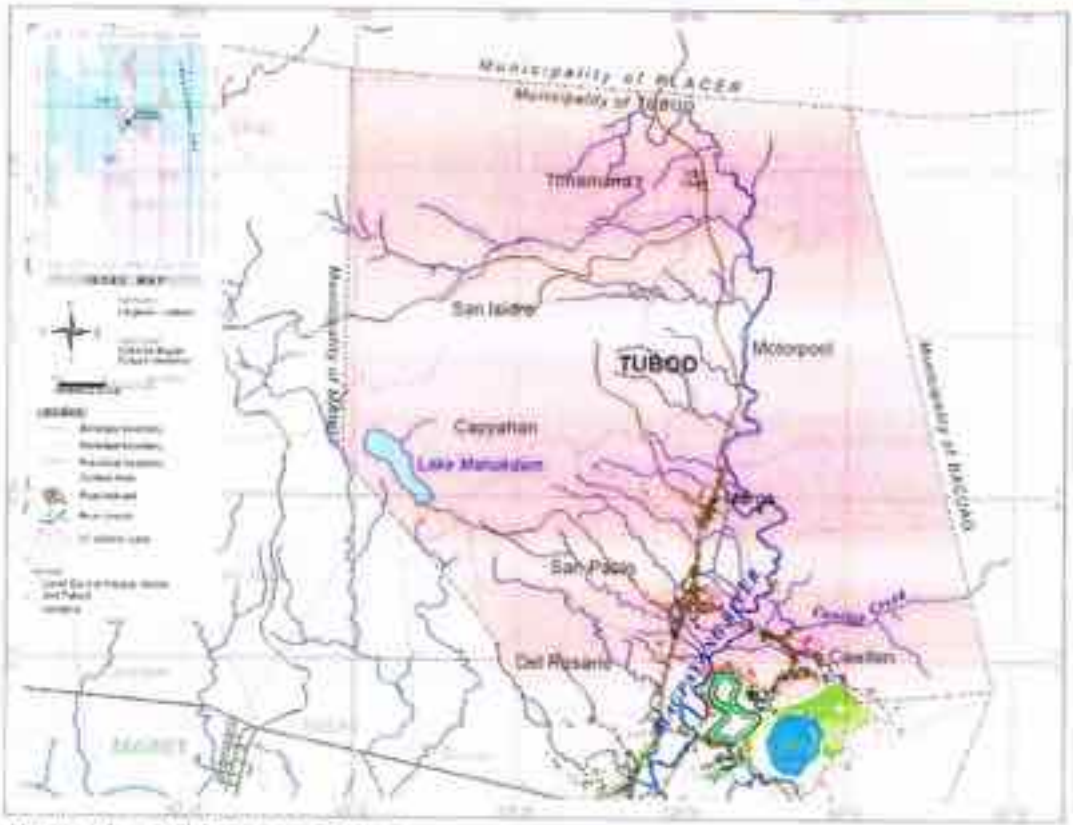

Figure 4-8. Political map of Tubod

Land Area and Population

As of 2007, the total population of Tubod is 11,664 (Table 4-1). The population density is 2.13 persons/ha. The three (3) urban barangays, namely: Timamana, Poblacion, and San Pablo cover a third of the municipality's land area and account for 37 % of the population. Poblacion, the seat of government, is the most densely populated with 7.7 persons/ha while Timamana, the biggest barangay that occupies a fourth of the municipality has the lowest density of 1.27 persons/ha.

Table 4-1. Land area, population and population density, Municipality of Tubod, 2007

Barangay	Area (ha)	2007	Population Density (persons/ha)
URBAN	1,784.50	**4,356**	2.44
Poblacion	198.50	1,529	7.70
San Pablo	270.90	1,162	4.29
Timamana	1,315.10	1,665	1.27
RURAL	3,679.10	7,308	1.99
Capayahan	678.90	906	1.33

Barangay	Area (ha)	2007	Population Density (persons/ha)
Cawilan	541.80	1,290	2.38
Del Rosario	496.10	1,249	2.52
Marga	682.90	1,382	2.02
Motorpool	798.70	1,485	1.86
San Isidro	480.70	996	2.07
TOTAL	5,463.60	11,664.00	2.13

Sources: MPDO and NSO

Table 4-2 presents population data for the municipality in 1995, 2000, and 2007. Over a twelve-year period from 1995 to 2007, Tubod's population grew by an average of 1.1 % per year, less than half of the Philippine average of 2.24 %. With the exception of Poblacion and Cawilan, the population in the other barangays registered increases over the three censal years. The decrease in population from 1995 to 2000 in these two barangays is attributable to the closure of SURICON's mining operations in 1991.

As of 2000, the average household size in Tubod is 5.05, slightly higher than the national average of 5.

Table 4-2. Population and household population, Municipality of Tubod, 2007, 2000 and 1995

Barangay	Population			No. of Households		Average Household Size	
	2007	2000	1995	2000	1995	2000	1995
TUBOD	**11,664**	**10,923**	**10,318**	**2,165**	**2,022**	5.05	5.10
Urban	**4,356**	**4,239**	**4,009**	**840**	**785**	5.05	5.11
Poblacion	1,529	1,455	1,515	294	293	4.95	5.17
San Pablo	1,162	1,280	1,009	238	200	5.38	5.05
Timamana	1,665	1,504	1,485	308	292	4.88	5.09
Rural	**7,308**	**6,684**	**6,309**	**1,325**	**1,237**	5.04	5.10
Capayahan	906	775	690	160	133	4.84	5.19
Cawilan	1,290	1,101	1,243	203	227	5.42	5.48
Del Rosario	1,249	1,302	1,221	249	238	5.23	5.13
Marga	1,382	1,370	1,199	272	232	5.04	5.17
Motorpool	1,485	1,368	1,214	276	248	4.96	4.90
San Isidro	996	768	742	165	159	4.65	4.67

Source: NSO

As of 1995, Boholano is the predominant dialect spoken by 71 % of the population. Surigaonon is the mother tongue of a fifth (22 %) of the population. Minor dialects spoken include Cebuano, Butuanon, and Tagalog.

Crop Production

Tubod's economy is agriculture-based. Three-fifths (3,345 ha) of the land area is planted to various crops. Coconut is the predominant crop, occupying 2,912 ha or 88 % of the total agricultural land. Rice is the major food crop planted to 393 ha. Of this, 365 ha or 93 % is irrigated. The Department of Agriculture (DA) considers the municipality a major rice producing area. Seven of its nine barangays are key grain producers: Timamana, Motorpool, Marga, Cawilan, Poblacion, San Pablo, and Del Rosario.

Fishery

Lake Mahukdam is the main source of freshwater fish in Tubod. Carps and tilapia are grown in fish cages. The fisherfolks employ the traditional fishing methods such as hook and line, spear gun, and gill nets. Most of the fishermen in the municipality come from Capayahan.

Commercial Establishments

Municipal Treasury records show that as of May 2002, there are 181 commercial establishments operating in Tubod. Three-fourths (78 %) are sari-sari or variety stores. The other business establishments are eatery and refreshments 3, pharmacy 2, copra buyer 9, consumer cooperatives 2, tailoring 1, beauty parlor 1, and bakeries 3.

Industry

Two mining companies are present in the area. These are Greenstone Resources Corporation in Cawilan which is set to start mine development and Silangan Mining in Timamana which is still conducting drilling works. Other industrial establishments include rice mills, small welding shops, blacksmiths, and wooden/bamboo furniture manufacturing.

Electricity

The Surigao del Norte Electric Cooperative (SURNECO) supplies electricity to the municipality. As of 2001, 90 % of the urban households and 78 % of the rural households have electricity.

Cooking Fuel

Majority of the households use wood, bamboo, and charcoal as cooking fuel. A third of the households use liquefied petroleum gas. A tenth use electric stove for cooking.

Communications

TELECOM and PHILCOM provide telephone lines with national and international direct dialling services. SMART cell phone signal is available in the whole municipality. There is one post office manned by one person.

The Philippine National Police use radio transceivers that cover the whole Caraga region. The local government provides handheld radios to the Municipal Health Office, Mayor's Office, and the nine Barangay Captains.

Road Network and Transportation

Tubod has a total road network of 48 km. Seven kilometers are national road, 17.4 km provincial road, 5.5 km municipal road, and 18.2 km barangay road. Seventy percent of the roads is gravel filled; 20 % including the entire National Highway is concrete. The balance of 10 % is earth filled.

Buses going to different areas in Mindanao ply the National Highway. There are also multi-cabs and air-conditioned vans that take passengers to Surigao City. Tricycles transport people within and across the municipalities and barangays.

Educational Facilities

Brgy. San Isidro has a primary school. The other barangays have complete elementary schools. The Tubod National High School and Timamana National High School provide secondary education to the municipality residents.

Health Facilities

The Rural Health Unit (RHU) is located in Brgy. Poblacion. Only two out of nine barangays have health centers. These are Timamana and Capayahan.

Protective Services

The Tubod government employs 9 policemen. The police station is equipped with a patrol jeep, communication facilities, and long firearms. Assisting the police force are some 67 Barangay Tanods or guards stationed in their respective areas.

From 1997 to 2001, a total of 486 crimes were committed in the municipality. A third constituted alarms and scandals; 23 % involved physical injury; 17 % murder; 15 % theft, and 6 % robbery.

Sports and Recreation

The municipality has a new 1,550 m^2 gymnasium located in the Poblacion. There is a municipal park, recreational garden, and a cockpit. All barangays except Capayahan have basketball courts. The multi-purpose drying pavements in some barangays are likewise used for recreational and

sports activities. Brgys. Poblacion, Timamana, Capayahan, Cawilan, Marga, Motorpool, and San Isidro have multi-purpose buildings for social and official functions.

Tourism

Tubod has a number of potential tourist spots. The most notable is the Songcoy Cold Spring in Marga which is about 1.4 km from the National Highway. The other tourist attractions are the 26-ha Lake Mahukdam situated at the foot of Mt. Maniayaw and the historical mass graves of local freedom defenders during the 1924 Colorum Uprising.

Social Welfare

The municipality has one Social Welfare Officer who implements programs for the indigent families, malnourished children, out of school youth, women, senior citizens, disaster victims and the disabled. She also supervises the operations of the Day Care Centers located in each of the nine barangays.

4.2.2.2 Mainit

Mainit, literally meaning "hot", is a town by the Lake Mainit. It is approximately 44 km from Surigao City. Located in the southwestern part of the province, Mainit is bounded on the north by the Municipalities of Sison and Placer; on the south by the Municipality of Alegria and Agusan del Norte Province; on the east by the Municipalities of Tubod and Bacuag, and on the west by the municipality of Malimono.

Mainit is a fourth class municipality. For 2008, its IRA is P 31,470,154 and the Development Fund is P 6,294,031.

History

Like Tubod, the Mamanwas were the first settlers of Mainit. According to oral accounts and unpublished studies, the Mamanwas were already living in the area as early as the 1800s. They originally settled near Lake Mainit, in what is now Brgy. San Isidro. They were gradually pushed to the hinterlands by the migrants from Luzon and Visayas.

Mainit's political history started in 1904 when the Americans created it as a barrio of Placer, Surigao. In 1906, it was claimed by Agusan Province as part of its territory and was declared as a separate municipality. The territorial conflict was settled six months later when Mainit was returned to Placer. On January 1, 1931, it became a municipality by virtue of Executive Order 290 dated 27 December 1930. Antonio Mozar was its first mayor. Two barrios of Mainit became separate municipalities. These are Tubod (1958) and Alegria (1968).

Political Subdivisions

The Municipality of Mainit has a land area of 15,354 ha distributed in 21 barangays. The five urban barangays occupy 28 % of the land area and the sixteen rural barangays cover 72 % (Figure 4-9).

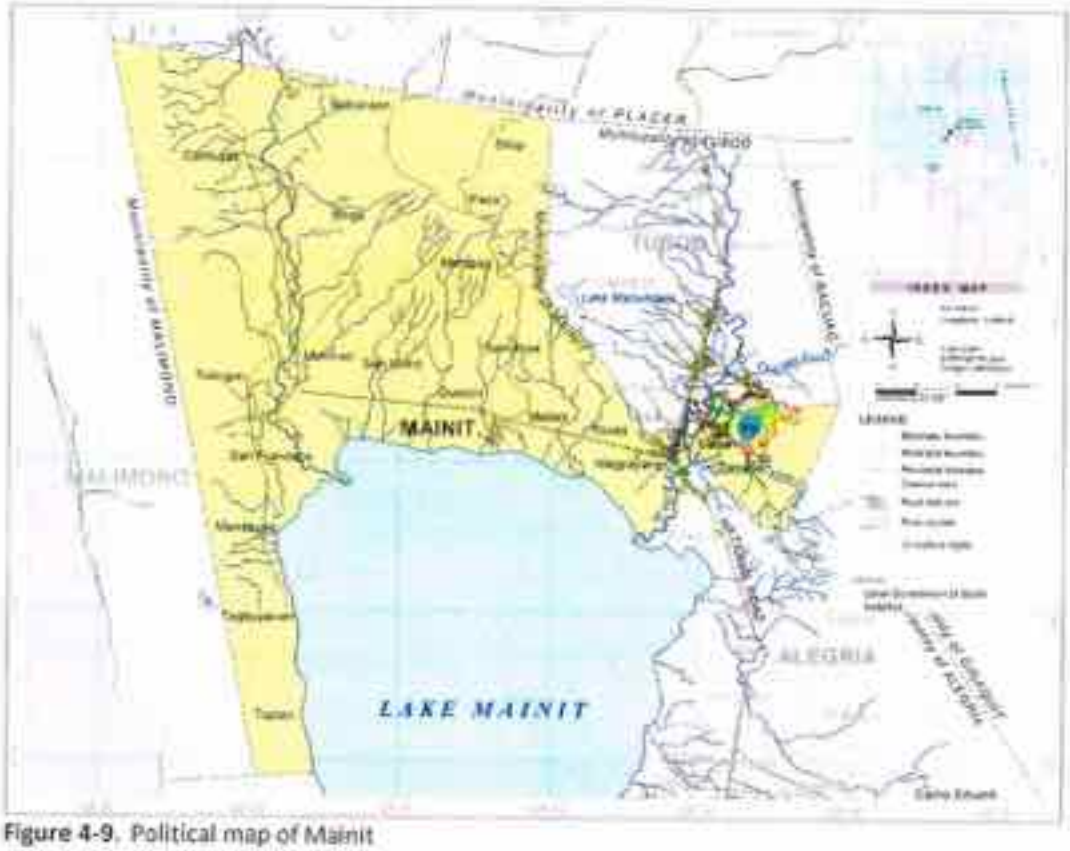

Figure 4-9. Political map of Mainit

Land Area and Population

Table 4-3 presents the land area and the creation dates of the barangays.

Table 4-3. Land area, population and population density, Municipality of Mainit, 2007

Barangay	Land Area (ha)	Population 2007	Population Density (persons/ ha)	% to Total Land Area	Date Created	How Created
MAINIT	**15,353.8**	**23,952.0**	**1.6**			
Urban	4,212.0	12,709.0	**3.0**	27.4		
Magpayang	595.0	1,498	**2.5**	3.9	11/15/1956	Prov'l Board Resolution
Magsaysay	867.0	1,733	**2.0**	5.7	3/16/1960	RA 3590
Matin-ao	965.0	3,810	**3.9**	6.3	11/15/1956	Prov'l Board Resolution

Barangay	Land Area (ha)	Population 2007	Population Density (persons/ ha)	% to Total Land Area	Date Created	How Created
Quezon	865.0	3,547	**4.1**	5.6	3/16/1960	RA 3590
San Francisco	920.0	2,121	**2.3**	6.0	11/15/1956	Prov'l Board Resolution
Rural	11,141.8	11,243.0	**1.0**	72.6		
Binga	665.8	372	**0.6**	4.3	11/15/1956	Prov'l Board Resolution
Bobonaon	668.0	259	**0.4**	4.4	11/15/1956	Prov'l Board Resolution
Cantugas	915.0	1,373	**1.5**	6.0	1/16/1958	Prov'l Board Resolution
Dayano	700.0	402	**0.6**	4.6	2/16/1959	Prov'l Board Resolution
Mabini	600.0	916	**1.5**	3.9	10/8/1960	RA 3590
Mansayao	825.0	634	**0.8**	5.4	11/15/1956	Prov'l Board Resolution
Marayag	565.0	292	**0.5**	3.7	10/5/1960	RA 3590
Paco	946.0	607	**0.6**	6.2	11/15/1956	Prov'l Board Resolution
Roxas	667.0	1,348	**2.0**	4.3	7/27/1972	Prov'l Board Resolution
San Isidro	865.0	1,455	**1.7**	5.6	1/16/1958	Prov'l Board Resolution
San Jose	790.0	705	**0.9**	5.2	10/3/1960	RA 3590
Siana	550.0	872	**1.6**	3.6	11/15/1956	Prov'l Board Resolution
Silop	705.0	253	**0.4**	4.6	6/1/1962	Prov'l Board Resolution
Tagbuyawan	515.0	342	**0.7**	3.4	5/7/1959	Prov'l Board Resolution
Tapian	565.0	206	**0.4**	3.7	1/16/1958	Prov'l Board Resolution
Tolingon	600.0	1,207	**2.0**	3.9	2/16/1959	Prov'l Board Resolution

Sources: MPDO and NSO

In 2000, Mainit's population was 23,365 distributed in 4,621 households, yielding an average household size of 5.05 (Table 4-4). From 2000 to 2007, the population grew by 0.3 %, which is a quarter of the population increment of 1.24 % for Surigao del Norte over the same period. As of August 2007, the gross urban density is 3 persons/ha while the gross rural density is 1 person/ha.

Table 4-4. Population and household population, Municipality of Mainit, 2007 and 2000

Barangay	Population		Household Population 2000	Number of Households 2000
	2007	2000		
MAINIT	**23,952**	**23,417**	**23,365**	**4,621**
Urban	12,709	12,637	12,595	2,535

Barangay	Population		Household Population 2000	Number of Households 2000
	2007	2000		
Magpayang	1,498	1,520	1,520	287
Magsaysay (Pob.)	1,733	1,898	1,897	381
Matin-ao	3,810	3,811	3,774	768
Quezon	3,547	3,273	3,269	663
San Francisco	2,121	2,135	2,135	436
Rural	11,243	10,780	10,770	2,086
Binga	372	405	405	79
Bobona-on	259	169	169	35
Cantugas	1,373	1,381	1,381	246
Dayano	402	405	405	73
Mabini	916	960	960	185
Mansayao	634	588	588	121
Marayag	292	230	230	44
Paco	607	715	715	128
Roxas	1,348	1,141	1,141	218
San Isidro	1,455	1,477	1,477	307
San Jose	705	640	640	128
Siana	872	786	786	156
Silop	253	254	244	49
Tagbuyawan	342	292	292	68
Tapi-an	206	180	180	40
Tolingon	1,207	1,157	1,157	209

Source: NSO

Surigaonon is spoken by 92 % of the population. The minor dialects are Boholano (2 %) and Cebuano (1.65 %).

The dominant religion is Roman Catholic. As of 2000, 70 % of the municipality's population were Catholics. Those affiliated with the Aglipay and United Church of Christ in the Philippines (UCCP) constituted 11 % and 10 %, respectively. Other religions were Seventh Day Adventists, Iglesia ni Cristo, and Church of the Latter Day Saints.

Crop Production

Mainit is an agricultural community. About 11,852 ha or 88 % of the municipality's land area is agricultural land. Rice is the principal crop with a total plantation area of about 1,336 ha. Coconut is the secondary crop with a total area of 7,133 ha. Brgys. Silop, Bobonaon, Marayag, and Paco are highly dependent on coconut. Banana is the third most important crop with an area of 229 ha. Other agricultural crops include vegetables, gabi camote, cassava and other root crops.

Fishery

The municipality is located around Lake Mainit, the fourth largest lake in the country with an area of 14,700 ha. Mainit has jurisdiction over 4,425 ha (29 %) of this lake. This area is suited to the commercial production of ducks and inland fish culture. The most common freshwater species caught in the lake are carp, white goby, catfish, tilapia, mudfish, and eel. Tapyuson and other shells also abound in the lake. Fishing is the main source of livelihood in the lakeshore barangays of Tapi-an, Tagbuyawan and Mansayao. The ten other barangays also derive income from fishing.

Educational Facilities

All twenty-one barangays of Mainit have public elementary schools. Eight have primary schools only while thirteen have complete elementary schools. Brgy. Tolingon has two schools, one complete elementary and a primary school at Sitio Mahayahay. Brgy. Cantugas has a complete elementary school and a Cultural Community School that caters to the Mamanwas.

There are currently two private kindergarten schools: the San Nicolas Academy and the Early Childhood Learning Center which is run by the UCCP. Both schools are located in the Poblacion.

There are four public secondary schools and a private high school, the San Nicolas Academy. It is run by the Catholic Parish of Mainit.

The Surigao del Norte College of Agriculture used to be a tertiary school. It was downgraded to a technical school when management was transferred to the Technical Education and Skills Development Authority (TESDA) in 2004.

Health Facilities

The Mainit Main Health Center is located in the poblacion. There are four Barangay Health Stations located in Brgys. Paco, Magpayang, and Matin-ao.

Protective Services

The municipality employs 17 policemen. It has no police vehicle and lacks communication facilities. Although considered generally peaceful, Mainit has unlawful activities such as illegal fishing, tree cutting, and gambling that could not be controlled due to the lack of manpower and equipment. Insurgency is a major issue.

Sports and Recreational Facilities

Public sports and recreational facilities consist of 34 basketball courts, two volleyball courts, and two tennis courts. There are privately owned billiard halls and two cockpit arenas.

Social Welfare

Six barangays, namely, Roxas, San Jose, Siana, Mabini, San Isidro, and Mansayao are covered by the Comprehensive and Integrated Delivery of Social Services (CIDSS) of the Department of Social Welfare and Development (DSWD). Projects being implemented include water and sanitation, livelihood, facilities and organization of community welfare structures.

Aside from the CIDSS projects, the social welfare staff also supervises the operation of sixteen Day Care Centers in fourteen barangays.

4.2.2.3 Alegria

The Municipality of Alegria is bounded on the north by the Municipality of Mainit, on the south by the Municipality of Kitcharao, Agusan del Norte, on the east by the Municipality of Gigaquit, and on the west by Lake Mainit. It is 48 km away from Surigao City and 75 km from Butuan City, the Caraga Regional Center.

Alegria is a fifth Class Municipality with an IRA of P 22,428,428 for 2008.

History

Alegria was originally known as Sitio Anahaw. The name Alegria, meaning happy or lively in Spanish, was adopted at the suggestion of Judge Sixto Olga. He happened to pass by the place one night when the folks were having a party. The people asked him to join them in their merrymaking. Observing how happy the people were, he advised them to change the name of the place from Sitio Anahaw to "Alegria". Sitio Alegria became a municipality on June 15, 1968 by virtue of RA 5239. Its first mayor was Tomas V. Cosca, an Ilongo from Pilar, Cadiz.

Political Subdivisions

Twelve barangays comprise the municipality (Figure 4-10). Five are urban and seven are rural. As of 2007, the municipality's population is 13,369. Of this, 59 % is urban and 41 % is rural.

Land Area and Population

Table 4-5 shows the land area and 2007 population and population density for Alegria. Alegria has an area of 6,670 ha. The rural barangays occupy 78 % of the total area while the urban barangays cover 22 %. The overall population density is 2 persons/ha. Brgy. Poblacion has the highest population density (5 persons/ha) while Camp Edward has the lowest (0.25 person/ha).

Figure 4-10. Political map of Alegria

Table 4-5. Land area, population and population density, Municipality of Alegria, 2007

Barangay	Land Area (ha)	Population 2007	Population Density (Persons/ha)
ALEGRIA	**6,670**	**13,369**	2
Urban	1,483	7,887	5
Anahaw	160	1,128	7
Julio Cuano	186	1,707	9
San Pedro	484	2,135	4
Poblacion (Alegria)	178	1,701	10
Pongtud	475	1,216	3
Rural	5,187	5,482	1
Alipao	350	1,747	5
Budlingin	1,193	536	0
Camp Edward (Geotina)	1,530	387	0

Barangay	Land Area (ha)	Population 2007	Population Density (Persons/ha)
Ferlda	1,340	326	0
Gamuton 3	175	514	3
Ombong	280	687	2
San Juan	319	1,285	4

Sources: MPDO and NSO

Alegria's population grew at an annual rate of 0.5 % from 2000 to 2007 (Table 4-6). In 2000, its household population of 12,919 was distributed in 2,350 households, giving an average household size of 5.5.

Table 4-6. Population and household population, Municipality of Alegria, 2007 and 2000

Barangay	Population		2000 Household Population	2000 Number of Households
	2007	2000		
ALEGRIA	**13,369**	**12,923**	**12,919**	**2,350**
Urban	7,887	7,825	7,821	1,453
Anahaw	1,128	935	935	182
Julio Ouano	1,707	1,504	1,504	287
San Pedro	2,135	2,411	2,411	448
Poblacion (Alegria)	1,701	1,604	1,600	288
Pongtud	1,216	1,371	1,371	248
Rural	5,482	5,098	5,098	897
Alipao	1,747	1,618	1,618	299
Budlingin	536	551	551	90
Camp Edward (Geotina)	387	284	284	43
Ferlda	326	298	298	48
Gamuton 3	514	464	464	78
Ombong	687	646	646	108
San Juan	1,285	1,237	1,237	231

Source: NSO

Surigaonon is spoken by 9 out of 10 residents. Minor dialects include Cebuano and Boholano.

Roman Catholic is the predominant religion (70 %), followed by Aglipay (13 %), and Iglesia ni Cristo (10 %).

Crop Production

Alegria is one of the major rice producers in Surigao. Total hectarage devoted to rice is 825 ha. Of this, 96 % or 791 ha are irrigated. The average area cultivated per farmer is 1.27 ha. Post-harvest facilities consist of 9 rice mills, 9 warehouses, 9 solar and 4 mechanical dryers. There are also sixteen cereal traders who buy the produce of the farmers.

Coconut is another major crop planted to 1,795 ha. Banana, the third most important crop occupies 196 ha. The Sarabia variety is planted to some 193 ha while the Latundan variety is cultivated in 3 ha of land. Fifty-two (52) hectares are devoted to rootcrops such as cassava (35 ha), sweet potato (20 ha), and yam (2 ha).

4.2.2.4 Livestock

Chickens, ducks, and hogs are grown mainly for consumption. Cattle is raised for milk and meat. They are slaughtered only on very special occasions such as fiestas and weddings. Carabaos and horses are used as farm animals. Dogs are not consumed but the DA conducts a census for its anti-rabies campaign.

Commercial Establishments

Sari-sari stores (small variety stores) dominate the commercial establishments. The other enterprises are rice mills and post-harvest facilities, copra buyers, and fertilizer and agri-supplies retailers. There is a rural bank, two groceries/wholesalers, two mini-hardwares, a beauty parlor, and four body building/welding and vulcanizing shops in the urban barangays.

In the three far-flung barangays of Budligin, Camp Edward, and Ferlda, people purchase their needs on Mondays and Thursdays which are the Tabuan or market days. There are no registered commercial enterprises in these barangays.

Utilities

Smart and Globe signals are available in the municipality. There is a cable network company and a government-run calling center and telegraph office. There is a Post Office that provides mail and money order services. PhilCom also operates a telephone station in Brgy. Ouano.

SURNECO serves eight out of twelve barangays. These are Poblacion, Ouano, Gamuton, Anahaw, San Pedro, Ombong, San Juan, and Pongtud.

Industrial Establishments

The industrial establishments are a jewelry maker, furniture maker, cement factory, hollow block factory, and three trisikad fabricators.

Educational Facilities

There are four complete elementary schools, two complete primary schools, three incomplete primary schools, and one high school in Alegria. None of them has a library, clinic or laboratory.

Protective Services

The municipality employs ten policemen to maintain peace and order. It has a fire station building but no fire personnel and fire-fighting equipment.

Sports and Recreation

Alegria has basketball and volleyball courts. Except for Brgy. Poblacion, all the barangays have basketball courts. There are volleyball courts in Brgys. Anahaw, Ombong, and Alipao.

Tourism

There are two potential tourist attractions in Alegria. These are the Pongtud Hot Springs and the Le Mundo Waterfalls in Budligin.

Social Welfare

Two registered social workers service the needs of the women, children, senior citizens, indigents and other vulnerable groups in the 12 barangays. There are 11 Day Care Centers that cater to the 3 to 5 years old children.

4.2.3 Impact Barangays

4.2.3.1 Social Context

The residents have witnessed the opening, closure, re-opening and closure of the SURICON mine, spanning a total of 52 years from 1938 to 1990. They are familiar with both underground and open pit mining as the company used both methods to extract the gold ore.

The area has a long mining history. In the early 1800s, a Frenchman mined in the area. In 1882, six Spaniards constructed the Spanish Ditch, which still exists but is much smaller and shallower. In 1887, the Spaniards made the first authenticated gold discovery in the then barrio of Magpayang, Mainit, Surigao del Norte which is now called Siana.

SURICON started underground mining in 1938. The mine closed during the Second World War. In 1946, the company was the first gold mine in the country to resume production. Fourteen years later, in 1960, the company was forced to shut down due to severe operational problems aggravated by the low gold price.

In the early 70s, SURICON embarked on reopening the mine. A drilling program and a feasibility study were completed in 1979. In 1981, the company commenced development works for an

open pit mine and a 1,000 TPD per day CIP-CIL mill. In July 1982, the project was fully operational and was producing gold and silver bullion. In 1990, major landslides within the pit led to a premature mine closure.

The community timeline sessions conducted with the impact barangays revealed the people's unpleasant and depressing experiences during the years when the SURICON mine was operating.

In Brgy. Cawilan, the senior citizens recalled that underground mining was done using picks and shovels. Approximately 5 % of the workers came from the barangay. SURICON reportedly did not give any assistance to the community. When the company closed down in the 60s, the caretaker sold the scrap and other materials that were left. The people resorted to small-scale mining to survive.

When the mine reopened in the 80s, the open pit mining method was used. The residents remembered the damage to the rice fields caused by chemical wastes. They said that the company went from house to house to negotiate for the payment of damages. Some landowners were forced to sell their land for P 0.30/m^2 when the going rate was P 5. According to them, a few have not been paid up to now. They also recalled that only one person from the barangay was employed and they lamented the "bata-bata" system or favoritism of the managers.

Brgy. Siana had a similar experience. According to the residents, only a few people from the barangay were employed by the mine. They recounted that in the 60s, many people suffered from the unpleasant odor from the buried trees. In the 80s, the residents remembered the dust, noise, and polluted air and water coming from the mine. The worst incident involved the death of a man who was hit by boulders during blasting operations.

The Siana residents validated the claim of the Cawilan folks that in the 80s, the people were forced to sell their land at P 0.30/m^2. They narrated that SURICON provided a relocation area (now called Purok Relocation) for the landowners but some of them have not been paid until now. The company employed about 5 % of the population but most of them were landowners. It also provided a hospital and high school for the exclusive use of its employees. The residents recalled a one and only medical mission conducted by the company in its entire lifetime.

In Magpayang, the people related the death of some animals and fishes in the river apparently contaminated by SURICON's chemicals. The ricefields were also damaged resulting to a decline in harvest. It was only when the company closed down in 1990 that conditions began to improve.

Reports revealed that insurgency was also one of the causes of SURICON's closure. Some residents claimed that the rebels burned the administration building which contained important records of the mining operation after the mining company left.

GRC commenced its exploration program in the SURICON property in February 2003. Mindful of the community's economic plight and prior experiences, GRC initiated a number of projects to help improve the quality of life in the impact barangays. The most notable project is the provision of potable water and a Level 2 distribution system to the three direct impact barangays.

The other projects include provision of medical care through the establishment of a medical clinic with a fulltime doctor and nurse, provision of medicine, feeding programs for the malnourished, playground construction, repair of schools and provision of schools supplies, tree planting, and benevolent grants.

4.2.3.2 Community Timeline

Pongtud is the oldest among the impact barangays. Created in 1935, it is the only affected barangay that predates SURICON. Magpayang and Siana were delineated as barangays in 1956, Dayano was formed in 1959, and both Cawilan and Del Rosario were officially recognized as barangays in 1960.

The major events in the impact barangays that affected the people's lives are provided in Table 4-7. These were taken from the community timelining sessions conducted in 2005.

ble 4-7. Community timeline of Brgy. Pongtud, Municipality of Alegria; Brgys. Magpayang, Dayano, and Siana, Municipality of Mainit; and Brgy. Cawilan, Municipality of Tubod

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
6 July 1935	The barangay was constituted and made part of the Municipality of Mainit.	Formerly a sitio of Brgy. Pongtud, Municipality of Mainit.			Until 1958, SURICON operated an underground mine. There were 1,000 workers/shift or a total of 3,000 workers.
950 to 1964	Underground mining operations of SURICON. Operations lasted until 1964. Many Pongtud residents were employed. The participants did not recall any community projects undertaken by the mine. Ouring the sixties, domesticated animals and fish died due to chemical releases by SURICON.				
954		There was a massive fishkill and the causes were unknown. A complete elementary school was established.			
1956			The Barangay was organized on 16 February 1956. There was no water in the	Brgy. Siana was established on 11 November 1956. At that time, SURICON facilities	

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
			barangay.	for the underground operations were already established. More than 3,000 workers stayed at Siana. There was poison gas in the underground mine and several workers were killed. The company established a private school. Tuition was by salary deduction.	
1958					SURICON shut down.
15 November 1959		Became Brgy. Magpayang of the Municipality of Mainit			From 1959 to 1961, the residents undertook sluicing and panning of mine waste materials.
15 June 1960					Brgy. Cawilan was created. The hanging bridge was built in 1960.
1961 to 1963		Many people were employed by SURICON. Direct discharge of tailings by the company into	Ten resident landowners were hired by SURICON. The company launched the Dugtong Buhay Program.	SURICON established a pay hospital. Siana had 200 households and everyday was market	

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
		Magpayang River. This caused fishkill, carabao death, and siltation of Magpayang River outlet.	The school building with two teachers handling Grades 1 to 4 in composite classes was built.	day.	
964	Typhoon Ining came and damaged agricultural lands, houses, schools, and other properties.	A destructive typhoon came. One person died.	The typhoon destroyed houses and killed plenty of carabaos. No assistance was extended by SURICON to the calamity victims.		Typhoon Ining.
965		Ricefields were able to recover.			
969	Pongtud became a part of the Municipality of Alegria				
970		There was flooding every last quarter of the year. The residents dammed the river to catch fish.			
971		College MNAS was established.			
976			The potable water system with Dayano spring as the source was built through the joint efforts of Brgys. Dayano and Siana.		
979	Start of exploration works by SURICON				
979 to 1984	A total of 24 residents were	The second SURICON	Many lands were purchased	SURICON bought lands at P	SURICON started to

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
	employed by the mine. The residents remembered SURICON bringing experts at the Provincial Hospital to treat diseases of the residents. During the 80s, plenty of domesticated animals and fishes died due to chemical releases from SURICON. In 1982, a complete elementary school was established in the barangay. The residents noted an upsurge of insurgency. This died down after typhoon Nitang.	operations. Only seven from Magpayang were employed. There were instances of fishkill and carabao death. The ricefield was affected by the chemicals.	by SURICON at P 0.35/m^2. The company hired ten resident landowners. SURICON implemented its Dugtong Buhay program.	0.30 to P 0.35/m^2. The courts assisted the company. Of the total 300 workers of SURICON, only 5 % (as recommended by landowners) came from Siana. One landowner was allowed to bring in one worker.	purchase lands at P 0.30/m^2. The company put up an open pit mine. Non-employees are not admitted to the company's hospital.
1980		The irrigation was completed. Without irrigation, the harvest was 40 sacks/ha. With irrigation, the harvest went up to 90 to 120 sacks/ha			
1981 to 1982			Insurgency became a problem. There were 50 households at the barangay.		

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
1983					Cawilan Elementary School was transferred. SURICON repaired the wooden bridges and barangay road as they were using these facilities.
1984	Typhoon Nitang came. Five residents died (3 at the chapel and 2 in their houses). Agricultural lands, church, and school buildings were damaged. There was a chemical spill from SURICON due to the typhoon.	Typhoon Nitang. Sixty percent of the houses were destroyed.	The typhoon destroyed a lot of houses and killed many animals. SURICON did not extend any assistance to the residents. A youth leader and one farmer was killed by the military. After the typhoon, insurgency went down.	The typhoon washed out Harrison Bridge which connected Siana to the National Highway.	Typhoon Nitang. SURICON did not help the calamity victims.
1984 to 1988	Only two residents worked with the mine.	In 1986, SURICON introduced the golden kuhol which became a pest for the rice.			
1988	NIA established its irrigation system at the barangay. Construction of the				

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
	barangay hall.				
1988 to 1991	Only one resident-employee was left with SURICON.				
1989		The public market was put up.			
1990	The Barangay Medical Center, Barangay Site, and Multi-purpose Hall were established.	Employment became a problem due to the closure of SURICON. The water system was inadequate. The barangay hall was completed.	A total of 54 households lived in the barangay. The cover court, Barangay Hall, school building, and health center were completed. There were no medicines.	One pre-schooler drowned at the company's settling pond. One died due to flyrock from SURICON's blasting. The walls of adjacent houses cracked. The company was forced to do relocation. Thirty-five landowners were relocated to Purok Relocation. SURICON committed to have their new land titles issued. To date, the company has not delivered. The old school of the barangay was relocated to give way for the company's Security Bldg. The new school site was built from	

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
				mine waste rocks. Thus, only grass could grow. One resident who lived near the tailings pond complained of heaving floor in his house. Prior to SURICON's open pit operation, farmlands produced at 80 to 120 sacks/ha. Due to flooding and sedimentation which also affected the irrigation canal, production went down to 30 sacks/ha. Fertilizers bring up the production to 60 sacks/ha. Now, the ricefields have recovered. SURICON did not have settling ponds or embankments for the waste rock dump. Cyanide in the pond overflowed into Magpayang River.	
1994					A complete elementary school was established in the barangay.

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
					The barangay had a share of real property taxes.
1997					The water system was improved to level 2.
2000	The ricelands were infested by blackbugs.	The SNCAT was converted to TESDA. Enrollment suffered and so with the boarding houses that catered to students in Magpayang. Construction of slaughterhouse which was not yet finished to date.	Seventy-eight households currently stay at the barangay. Five percent of the professionals are unemployed. Thirty percent of non-professionals have no jobs.		Flooding in school site every December and landslide in the vicinity.
2002					Payment by SURICON of 50 % of termination pay to workers. The residents are asking whether GRC will pay the balance as part of agreement with JCG.
2003		No Magpayang residents were able to work in Greenstone's exploration project.			The Barangay Hall was completed.
2004					There are 227 households

Year	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
					staying in the barangay. Ten households are unable to send children to school. Only 2 % of the residents is employed. The residents are into small-scale mining and scrap scavenging in addition to farming and subsistence fishing.

4.2.3.3 Socio-economic Profile

Population

As of August 1, 2007, a total of 6,527 people live in the impact barangays (Table 4-8). Two-fifths (40 %) are in the primary impact area and three-fifths (60 %) reside in the secondary impact barangays. Half of the population in the host barangays lives in Cawilan. Of the other half, a third resides in Dayano and two-thirds lives in Siana. In the indirect impact area, four out of ten stay in Magpayang and the balance is shared almost equally by Del Rosario and Pongtud.

Overall population in the impact area increased by an average of 0.09 % per year from 2000 to 2007. Over this period, however, only Cawilan and Siana registered population increases. Dayano's population decreased by 3 people, from 405 in 2000 to 402 in 2007. When an actual household count was conducted in May 2005 as part of the EIA household and perception survey, there were 73 households in this barangay. Applying the average household size of 5 in the area, total population is computed as 365. From 2005 to 2007, this barangay's population actually increased by 37 or 10 %.

Cawilan's average population increase of 2.45 % is slightly higher than the Philippines' 2.16 %; more than double Tubod's 1.03 % and 60 % greater than Surigao del Norte's 1.53 % growth rate for the same period. Siana's population increment of 1.56 % approximates the province's but is nearly double Mainit's 0.80 % growth rate. The population increase in the host barangays is mainly attributable to the Siana Project.

Table 4-8. Population of impact barangays, 1995, 2000 and 2007

BARANGAY	POPULATION CY 1995 CENSUS	POPULATION CY 2000 CENSUS	POPULATION CY 2007 CENSUS
Cawilan	1,243	1,101	1290
Dayano	340	405	402
Siana	878	786	872
Total Direct Impact Area	2,461	2,292	2,564
Del Rosario	1,221	1,302	1249
Magpayang	1438	1,520	1498
Pongtud	1307	1,371	1216
Total Indirect Impact Area	3,966	4,193	3,963
TOTAL	6,427	6,485	6,527

Source: NSO

Population Density

The direct impact barangays, which are classified as rural, occupy 1,792 ha (Table 4-9). The population density is 1.43 persons/ha. The Siana Project's footprint covers 240 ha or 13 % of the direct impact area.

The indirect impact barangays encompass 1,637 ha but its population density is higher at 2.42 persons/ha. Of the three secondary impact barangays, only Del Rosario is rural. Being urban barangays, Magpayang and Pongtud account for the higher population density.

Table 4-9. Population density of impact barangays, 2007

Population Density	Population 2007	Land Area (ha)	Population Density (Persons/ha)
Cawilan	1,290	542	2.38
Dayano	402	700	0.57
Siana	872	550	1.59
Total Direct Impact Area	2,564	1,792	1.43
Del Rosario	1,249	496	2.52
Magpayang	1,498	666	2.25
Pongtud	1,216	475	2.56
Total Indirect Impact Area	3,963	1,637	2.42
TOTAL	6,527	3,429	1.90

Sources: MPDOs

Barangay Income

Practically a hundred percent of the income of the impact barangays comes from the IRA, *i.e.*, the share of the LGUs in the taxes collected by the National Government and is allocated based on population and land area. For 2008, the total IRA for the six impact barangays is P 3.96 million (Table 4-10). The Local Government Code mandates that a maximum of 20 % of the IRA must be allocated as Development Fund. This fund is to be used for infrastructure and other social development projects. For 2008, the Development Fund for the impact barangays is P 793,000. This translates to an average per capita development fund of P 121 or P 10/person-month.

Table 4-10. Internal revenue allotment, impact barangays, 2008

BARANGAY	POPULATION CY 2000 CENSUS	P 80,000 FOR BRGYS. OF 100 OR MORE POPULATION	SHARE BASED ON POPULATION	EQUAL SHARING	TOTAL (ROUNDED)	DEVELOPMENT FUND (20%)	POPULATION CY 2007	PER CAPITA DEVELOPMENT FUND
Cawilan	1,101	80,000	278,631	307,020	665,650	133,130	1,290	103
Dayano	405	80,000	102,494	307,020	489,513	97,903	402	244
Del Rosario	1,302	80,000	329,498	307,020	716,518	143,304	1,249	115
Magpayang	1,520	80,000	384,667	307,020	771,687	154,337	1,498	103
Pongtud	1,371	80,000	346,960	307,020	733,979	146,796	1,216	121
Siana	786	80,000	198,913	307,020	585,933	117,187	872	134
TOTAL	6,485	480,000	1,641,163	1,842,118	3,963,280	792,656	6,527	121

Source: Department of Budget and Management

Barangay Facilities

Table 4-11 presents the facilities in the impact barangays. These were taken from the social maps (Figures 4-11 to 4-16) accomplished by the BHWs and Barangay Officials during the Community Mapping Sessions of May 2009.

Table 4-11. Facilities in the impact barangays, May 2009

Parameter	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	Total
Classification	Rural	Rural	Rural	Rural	Urban	Urban	
2007 Population	1,290	402	872	1,249	1,498	1,216	6,527
Households (May 2005)	247	73	188	244	306	218	1,276
Households (May 2009)	320	85	197	269	318	295	1,484
Number of Puroks	7	3	4	7	6	8	35
School	1	1	1	1	3	1	8
Day Care Center	1	1	1	1		4	8
Chapel/Church	2	2	2	3	3	4	16
Basketball Court	1		1	1	1		4
Gym		1	1			1	3
Multipurpose Hall						1	1
Health Care Center	2				1	2	5
Barangay Hall/Office	1	1	1	1	2	1	7
Waiting Shed		5	3		2	1	11
Potable Water	1					5	6
Cemetery				1		1	2
Cockpit				1			1
Dryer		1	1	1	4	1	8
Rice Mill	1		1			1	3
Green Bank				1		1	2
Public Market					1	1	2

Typical of a rural agricultural setting, the basic facilities consist of health centers, elementary schools, barangay halls, daycare centers, churches and basketball courts that double as solar dryers during harvest time. The Green Bank of Caraga, a rural bank that provides micro-credit to farmers and individuals, has branches in Del Rosario and Pongtud. Of the six barangays, only Del Rosario has a dryer, a cockpit, and a cemetery. Cawilan and Siana have rice mills.

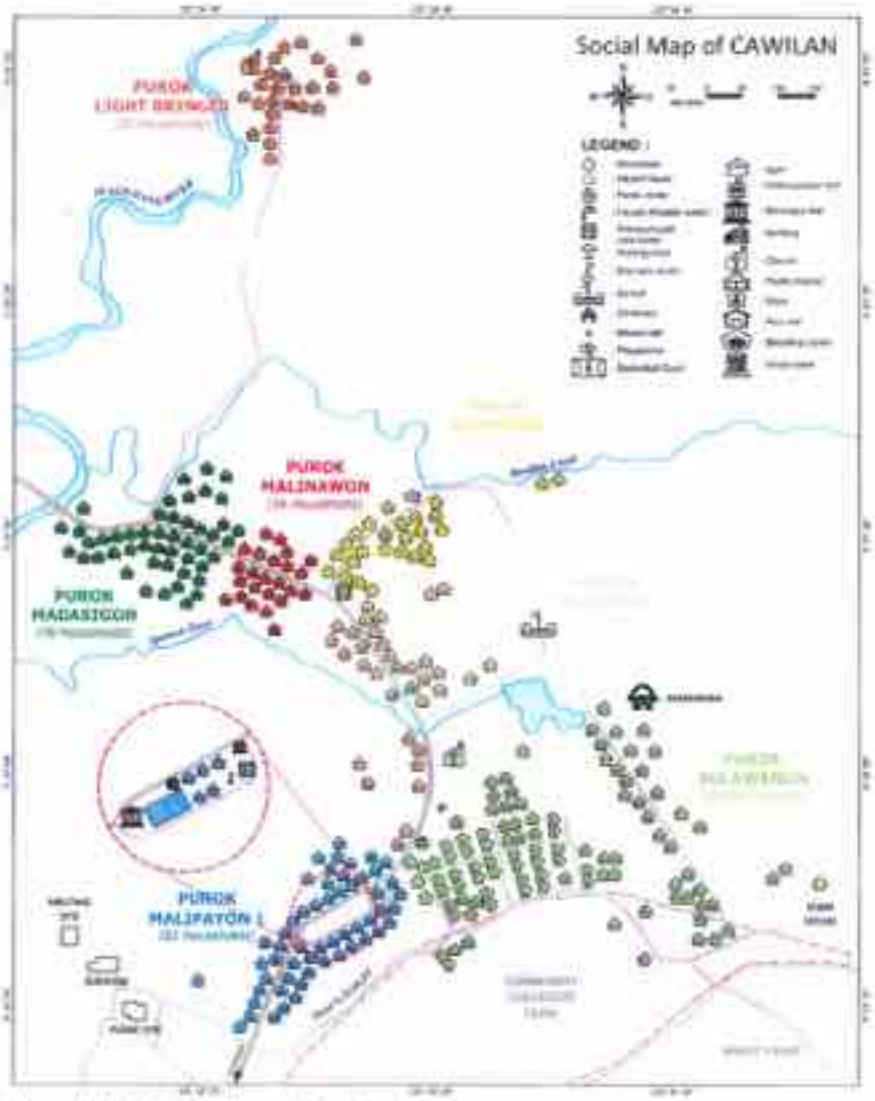

Figure 4-11. Social Map of Cawilan

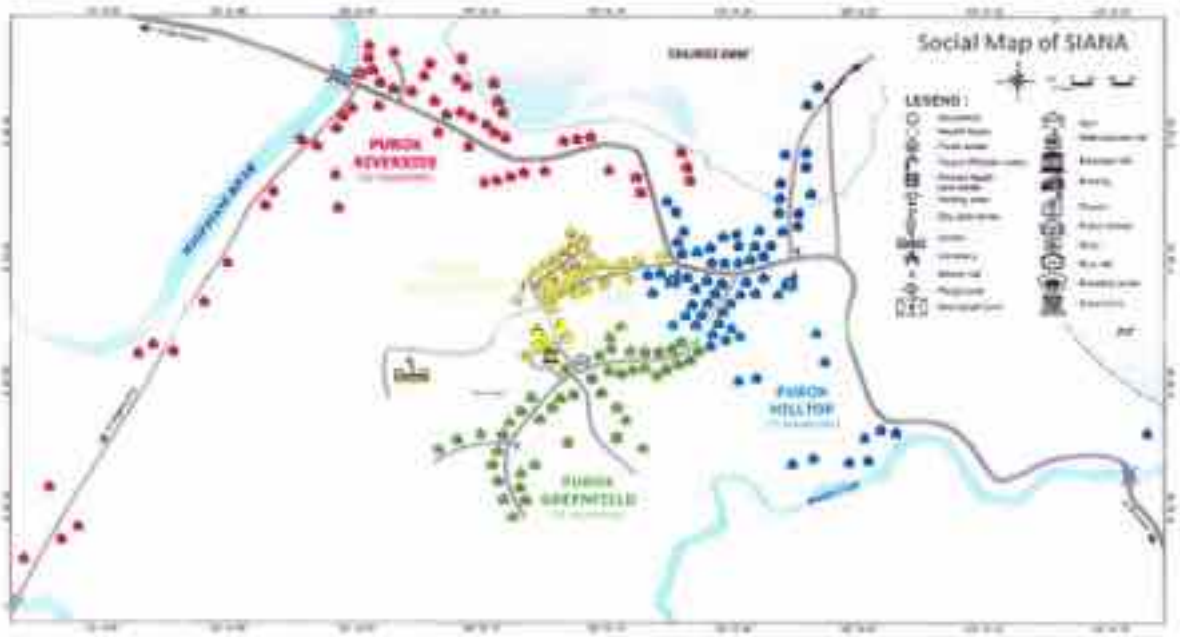

Figure 4-12. Social Map of Siana

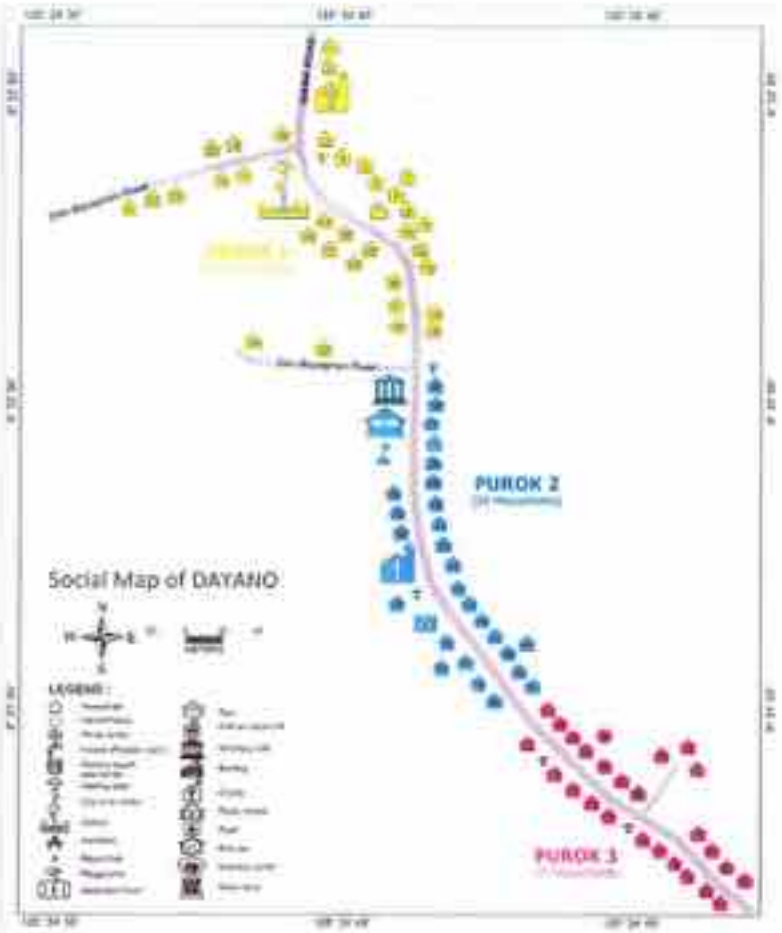

Figure 4-13. Social Map of Dayano

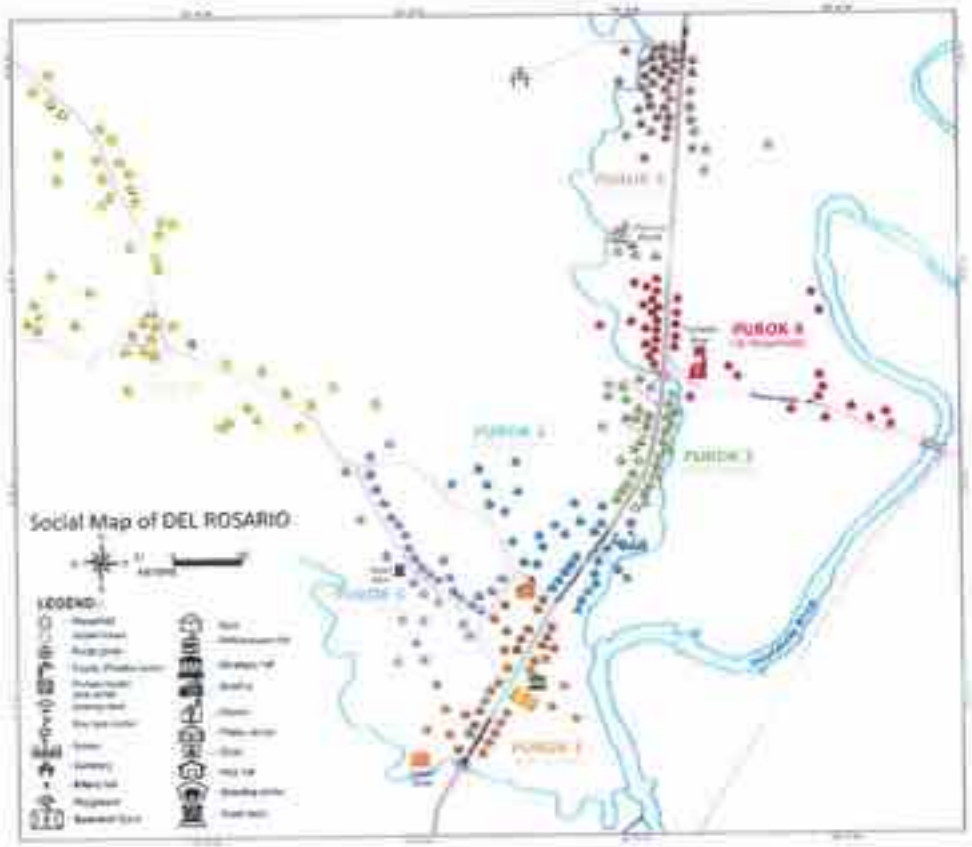

Figure 4-14. Social Map of Del Rosario

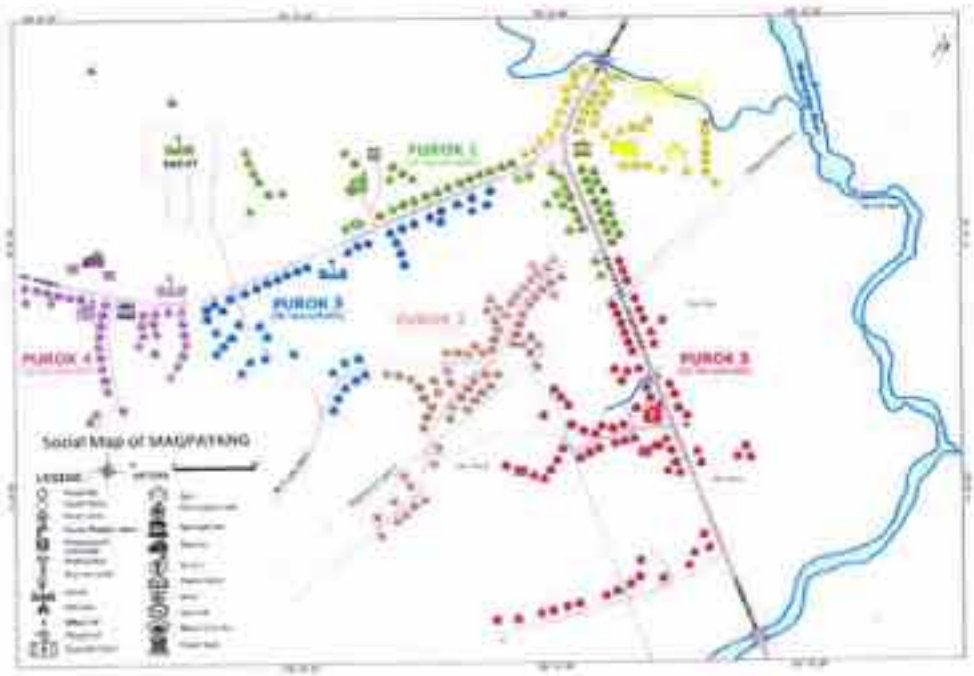

Figure 4-15. Social Map of Magpayang

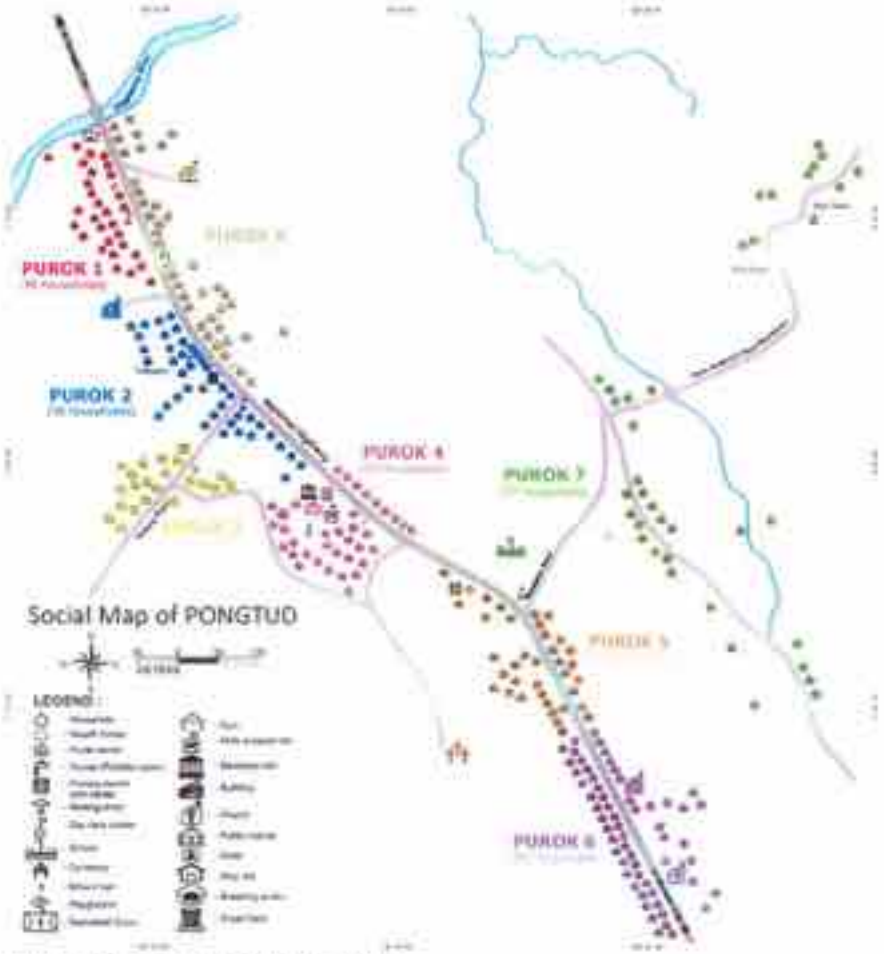

Figure 4-16. Social Map of Pongtud

Educational Facilities

With the exception of Dayano, all impact barangays have complete elementary schools (Table 4-12). The Dayano Primary School offers only Grades 1 and 2. Of the six barangays, only Magpayang has a secondary school, the Magpayang High School. Elementary graduates from the five other barangays pursue high school education in Magpayang High School, San Nicolas Academy or Tubod National High School.

Table 4-12. Elementary Schools in Impact Barangays, May 2005

Parameter	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud
Name of School	Mariano Dapar Elementary School	Dayano Primary School	Siana Elementary School	Calang Custodio Elementary School	Magpayang Elementary School	Pongtud Elementary School
Grades	1 to 6	1 and 2	1 to 6	1 to 6	1 to 6	1 to 6

Parameter	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud
Offered						
Number of Rooms	9	1	8	7	8	8
Number of Teachers	8	1	7	7	7	7
Other Facilities	Mini Library		Mini Library	Mini Library	Complete Library and Mini Laboratory	Mini Library

Sources: School Principals

Agricultural Profile

The following profile is based on the Participatory Agriculture and Fishery Resources and Livelihood Assessment in the impact barangays conducted from 15 to 17 February 2005 by the BFAR Caraga Regional Office with the assistance of the LMDA and Municipal Agriculturists and Technicians of Tubod, Mainit and Alegria.

Crops Planted

The major agricultural crops are rice and coconut. Other crops planted include cassava, sweet potato, gabi, banana, corn, ginger and vegetables. During off-season, farmers plant watermelon and vegetables.

Rice Farming

- The farm sizes range from 1 to 1.8 hectares (Table 4-13).
- Farmers plant twice a year. The first cropping is from January to April and the second is from June to October. Five croppings could be done in a two-year period to maximize the yield (Table 4-14).

Table 4-13. Number of farmers and average farm size, February 2005

Barangay and Municipality	Number of Households, 2005	No. of Farmers	Average Farm Size (ha)
Cawilan, Tubod	257	32	1.50
Siana, Mainit	183	173	1.25
Dayano, Mainit	76	140	1.00
Magpayang, Mainit	350	136	1.50
Pungtod, Alegria	272	67	1.80

Table 4-14. Average yields per hectare, February 2005

Barangay and Municipality	Crops	Yield/ha (average)	Croppings/ Year
Cawilan, Tubod	Rice	70 cavans	2 croppings
Siana, Mainit	Rice	66 cavans	2 croppings
Dayano, Mainit	Rice	66 cavans	2 croppings
Magpayang, Mainit	Rice	77 cavans	2 croppings
Pongtud, Alegria	Rice	85 cavans	2 croppings

- Planting is done at the same time for pest control purposes. Cutting the continuous food supply of pests such as field mice and black bug controls their population.
- Carabao and small machinery such as paddy rotavator or 'turtle' are used in land preparation.
- Average yields vary from 66 cavans to 85 cavans per hectare depending on the technology and inputs.
- Maximum yields over the past 30 years have increased from 70 to 90 cavans per hectare in the 80s to 80 to 120 cavans in 2000s. The increment is mainly due to irrigation and technology improvement (Table 4-15).

Table 4-15. Maximum yield of rice crop in the respondent Barangays for the past 30 years

Barangay and Municipality	Maximum yield/ha-harvest		
	80s	2000s	Remarks
Cawilan, Tubod	90 cavans	110 cavans	Increase in yield attributed to irrigation facility which started in 1985. The use of fertilizer was maximum due to cheaper prices before 1995. Fertilizer price increased after 1995, reducing usage to half.
Siana, Mainit	70 cavans	80 cavans	Before 1965, without an irrigation facility, the average yield was 30 cavans/ha. With irrigation facility, the yield increased to 70 cavans/ha. With tailings run off from mining operation, the yield decreased to 40 - 50 cavans/ha due to "labod".
Dayano, Mainit	80 cavans	108 cavans	All yields are with irrigation facility installed. The water source was perceived to be at critical level due to the establishment by the barangay of a reservoir for potable water purposes. This concern is no longer valid given the potable water supply established by GRC.

Barangay and Municipality	Maximum yield/ha-harvest		
	80s	2000s	Remarks
Magpayang, Mainit	70 cavans	120 cavans	With good irrigation facility. Farmers applied packaged technology for rice. The problem was the high price of certified seeds and fertilizers. Fertilizer usage was reduced to half.
Pongtud, Alegria	70 cavans	100 cavans	With irrigation facility. Usually, limited planting from November to February due to "goob". Rat infestation is a constant problem if there is "goob". "Dogman", a lake grass species, is washed inland when there is "goob" affecting the rice fields.

The residents of Siana narrated that when SURICON was operating, the yield of 70 cavans/ha decreased to 40 to 50 cavans during tailings spill episodes. Sticky mud which they refer to as "labod" cover the fields.

In barangays nearer Lake Mainit such as Magpayang and Pongtud, yields decrease when the lake overflows and inundates the rice fields. The stagnant water, termed "goob", attracts the rats.

There are more owners than tenants in Cawilan (62 %) and Magpayang (54 %). The tenants dominate the rice planters in Siana (68 %), Dayano (75 %) and Pungtod (71 %).

Irrigation is limited in Dayano. The ricefields in Siana, Magpayang and Pongtud are irrigated. Cawilan has a small water impounding project where farms source water (Table 4-16).

Three financing institutions that cater to the needs of farmers operate in the area. These are the Green Bank of Caraga, the Surigao Bank and the Surigao Enterprise Development Foundation (SEDF).

Table 4-16. Existing agricultural facilities in respondent Barangays

Barangays	FMR	Rice Mill	Multi-Purpose Pavement/ Dryer	Irrigation	Small Water Impounding Project	Loan assistance
Cawilan, Tubod	√	√	√	-	√	Green Bank of Caraga; SEDF and Surigao Bank
Siana, Mainit	√	√	√	√	-	
Dayano, Mainit	√	-	√	-	-	
Magpayang, Mainit	√	√	√	√	-	
Pungtod, Alegria	√	√	√	√	-	

- · The farmers estimated the cost of agricultural inputs as P 10,000/hectare in the 80s to 90s. This increased by 50 % to P 15,000/ha in the 2000s. The farmers noted that prices of fertilizer have doubled in January 2005, compared to 2002.
- The farmers identified the problems or causes of decreasing yield as well as the proposed solutions. These include:
    - Planting of trees to prevent flood and soil erosion
    - Stopping of mining operations to prevent the sedimentation of the fields with 'labod' or sticky mud tailings
    - Sanitation, baiting, and use of pesticides to prevent infestations of rodents, tungro, and black bug
    - Use of guano which is abundant in Brgy. Dayano to replace the expensive chemical fertilizers
    - Revival of the seed growers association to address the insufficiency of certified seeds
    - Stopping of small-scale mining operations to stop sedimentation and the depletion of water supply
    - Construction of dikes, canals, and spillways to divert overflows from the lake and mining operations

Fishing

- In the direct impact barangays, the fishermen number 43. All of them fish in the Magpayang and Dayano Rivers. None of the 15 fishermen from Cawilan owns a banca. Of the 18 from Siana, only 5 possess non-motorized bancas. In Dayano, 2 out of ten fisherfolks have non-motorized bancas.
- The fishermen in Magpayang and Pongtud fish in Lake Mainit. Of the 35 fisherfolks in Magpayang, 10 have motorized bancas and 15 own non-motorized ones. In Pongtud, only 7 of 45 fishermen have no banca. The rest owns non-motorized bancas.
- Limas, fish traps, electric fishing, and pole and line are the fishing methods employed in the direct impact barangays. Limas entails temporarily constructing a dike to trap the fishes and then draining out the water manually. Although electric fishing is illegal, it is rampant in the area.
- In the indirect barangays, pole and line, strap fishing, and spear guns are used.

- Fish catch has been declining since the 80s (Table 4-17). In the direct impact barangays, daily fish catch used to range from 5 to 10 kilos. Now, the fishermen yield only 0.5 to 1 kilo per day. In Magpayang and Pongtud, harvest used to be 9 to 10 kilos daily in the 80s. Now, this is down to 2 to 3 kilos.

Table 4-17. Average fish catch by Barangay regardless of gears for the past 20 years

Barangay and Municipality	Average Fish Catch (kg fishing/effort-day)		
	80s	90s	2000s
Cawilan, Tubod (river)	5	2	< 0.5
Siana, Mainit (river)	5	2	1
Dayano, Mainit (river)	10	5	1
Magpayang, Mainit (Lake)	9	6	2
Pongtud, Alegria (Lake)	10	6	3
San Juan, Alegria (Lake)	12	8	6

- The fisherfolks attribute the declining fish catch to the destruction of habitat, increase in population and rampant illegal fishing. Some fishermen also cited the mining operations as a major culprit. They said that when the tailings dam overflows, traces of toxic chemicals end up in the rivers and lake.

- To improve fish catch, the fisherfolks recommend the following:

  - Strict enforcement of fishery laws to stop electric fishing, use of fine mesh nets, and catching of goby fries. The goby used to be abundant in Lake Mainit. Its population is declining because even the fries are being caught.

  - Proper mine waste management

  - Strengthening of the fisherfolks association through provision of training and funding.

Household Socio-economic and Perception Survey

As discussed previously, a household socio-economic and perception survey was conducted from April 30 to May 1, 2005 as part of the EIA of the Siana Gold Project. The survey covered 186 households in the six impact barangays. Table 4-18 details the enumeration samples.

Table 4-18. Distribution of samples by barangay

Barangay	Type	Households	Sample Size	% of Households
Cawilan	Host and impact	247	52	21
Dayano	Host and impact	73	15	21

Barangay	Type	Households	Sample Size	% of Households
Siana	Host and impact	188	36	19
Direct Impact Barangays		508	103	20
Del Rosario	Impact	244	25	10
Magpayang	Impact	306	33	11
Pongtud	Impact	218	25	11
Indirect Impact Barangays		768	83	11
Total		1,276	186	15

The results of the survey were validated by the community in December 2008.

Sample Distribution by Age and Gender

Figure 4-17 shows the distribution of the samples according to age and gender. There is an almost equal distribution of the sexes, *i.e.*, a ratio of 102.6 males per 100 females. Of the 500 females, half belongs to the reproductive age group of 15-49 years. Of this group, 43 % is between 15-24 years old. Filipino women are among those with the highest fertility rates in Southeast Asia at 3.5 births per woman.[7]

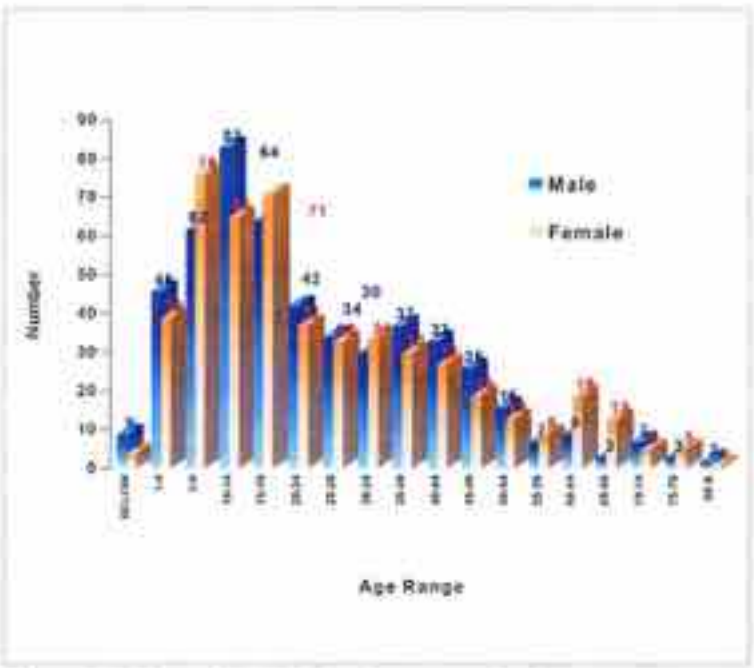

Figure 4-17. Sample distribution by age and gender

[7] Source: WHO Country Health Information Profiles 2005

Figure 4-18 shows almost the same age pattern for the various impact barangays. The population is young. Half (51 %) is below 20. The infants (aged less than 1) comprise 1 %; the children (1-14), 37% and those of schooling age (5 – 24) 49 %. The median age is 19.

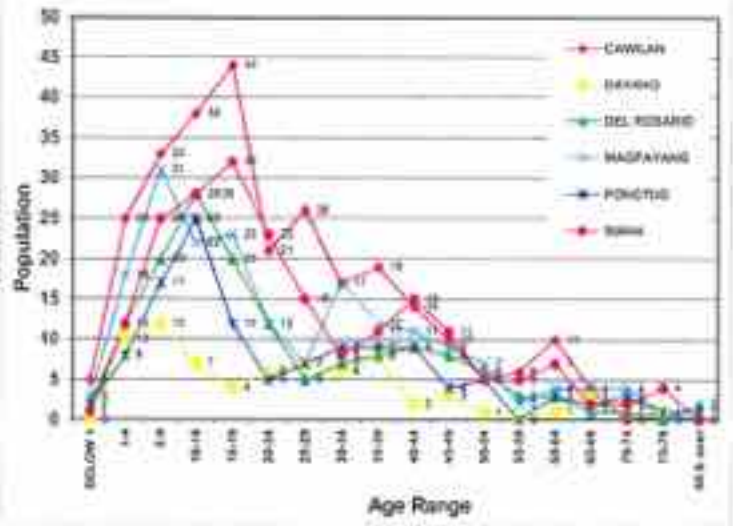

Figure 4-18. Sample distribution by age by barangay

Those belonging to the 15-64 age group, also called the economically productive or working group, number 590 and comprise 58 % of the sample population. Of the non-working age group (42 %), 91 % are child dependents (aged 0 – 14) and 9 % are adult dependents (65 and over). The dependency ratio is 100:72, *i.e.*, for every 100 persons belonging to the working group, there are 72 dependents.

Educational Profile

Figure 4-19 presents the educational profile of the samples aged 5 years old and above. The females are more educated than the males. This trend is consistent with the trend in the Philippines.

As indicated in Table 4-19, the educational attainment of the samples does not vary significantly from the educational statistics for the CARAGA Region published in the 2004 Annual Poverty Indicators Survey.

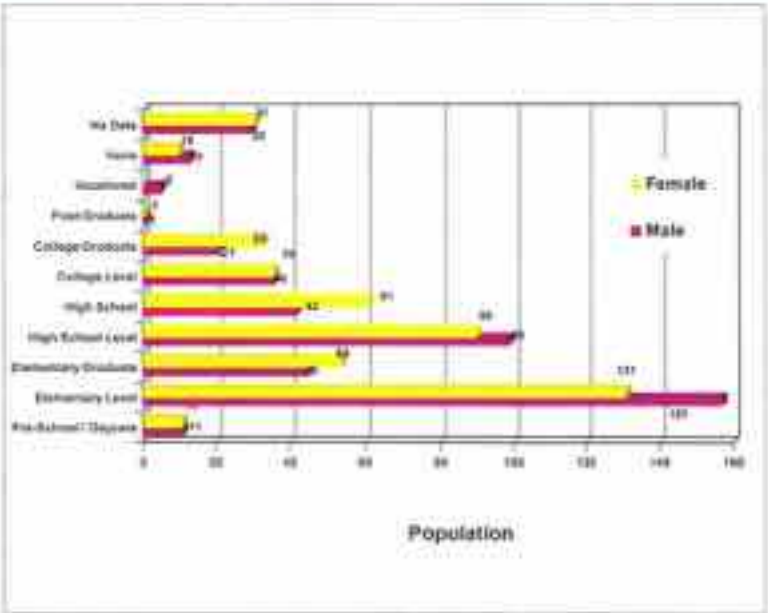

Figure 4-19. Highest educational attainment of samples

Table 4-19. Educational attainment of samples (2005) vs. CARAGA Region (2004)

Highest Grade Completed	TOTAL	Impact Areas (2005)	CARAGA Region (2004)	Difference
Pre-School / Daycare	22	2.40%	2.10%	0.30%
Elementary Level	288	31.37%	30.10%	1.27%
Elementary Graduate	99	10.78%	12.20%	-1.42%
High School Level	189	20.59%	19.30%	1.29%
High School Graduate	103	11.22%	12.60%	-1.38%
College Level	72	7.84%	9.70%	-1.86%
College Graduate or Higher	56	6.10%	6.60%	-0.50%
Vocational	5	0.54%	0.10%	0.44%
None	23	2.51%	7.40%	-4.89%
No data	61	6.64%		6.64%
Total	918	100.00%	100.10%	-0.10%

Sources: APIS 2004 and household survey of impact barangays, May 2005

Religious Profile

Eight out of ten persons in the impact barangays are Roman Catholics. Other religions such as Iglesia ni Cristo, UCCP, Born Again Christians, Church of the Latter Day Saints, and United Peoples Church (UPC) each have a 2% share of the sample population.

Land Tenure

Figure 4-20 shows the house and lot tenure in the project area. Seven out of ten households own their residential house and lot. Some (15 %) are leasing while others (12 %) are allowed to occupy the houses of relatives and friends rent-free.

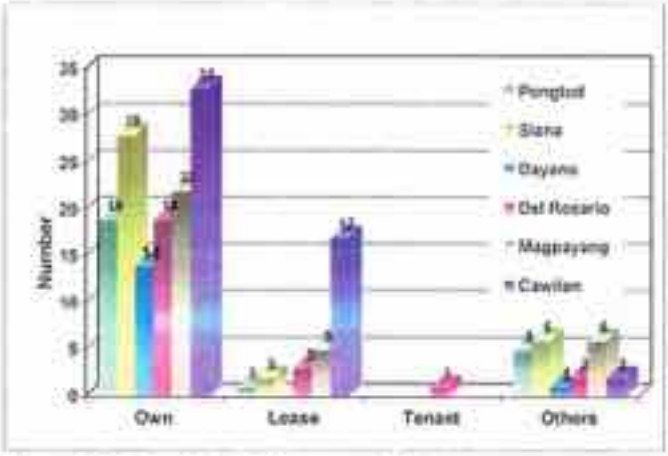

Figure 4-20. Residential house and lot tenure

House and lot ownership is highest in Dayano (93 %) and lowest in Cawilan (63 %). A third of the households in Cawilan said that they are leasing their residential units from SURICON. These are the former company staff houses located in Purok Bulawanon.

Of the 102 households engaged in farming, 43 (42 %) do not own the lots that they cultivate. The tillers are either lessees (67 %), tenants (14 %), caretakers (4 %), contract farmers (4 %) or laborers (10 %). Rental in the form of a 25% share of the harvest is the most common arrangement for rice lands. For crops such as cassava and camote, the harvest is normally divided equally between the landowners and the farmer.

Housing Construction

Strong materials for roofing include GI sheets and tiles. Light materials are cogon, nipa, bamboo and the like. As reflected in Figure 4-21, nearly half (47 %) of the houses of the samples have GI sheet roofing and nearly a third (27 %) have cogon or nipa roofing. Houses that have mixed roofing materials constitute 26 %.

Concrete and brick stone are classified as strong walling materials. Wood, bamboo amakan, lawanit and coco lumber are light materials. Of the samples, 41 % have strong walls and 58 have walls with light materials. There is one house with no walls and another one with tarpaulin walls.

Only four samples reported tiled floors. At the extreme, there are 30 houses with bare earth as flooring. Four out of ten houses have cement floors, three out of ten have wooden floors, and one in ten have bamboo floors.

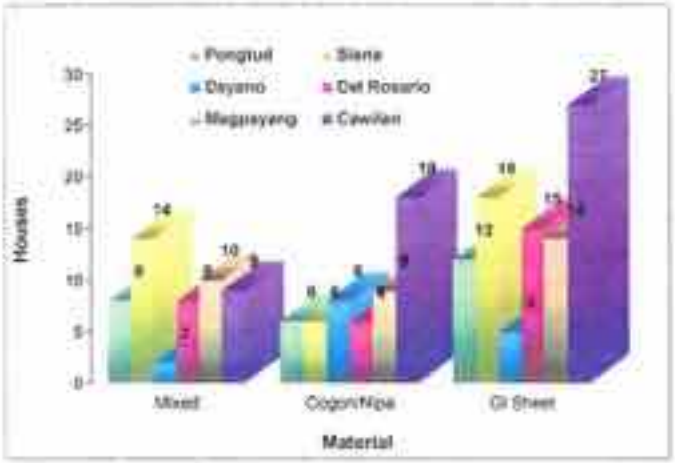

Figure 4-21. Roofing materials

Household Appliances and Work Tools

Among the household conveniences, the color TV is the most visible in the homes of the impact community, *i.e.*, available in 102 out of 186 or 55 % of the samples (Table 4-20). This is followed by the casette recorder (30 %) and refrigerator (25 %).

Table 4-20. Household Appliances

Appliance	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	Total
Color TV	25	5	24	13	20	15	102
Casette Recorder	13	2	13	7	10	8	53
Refrigerator	8	1	11	9	12	6	47
Stereo/ Component	9	2	8	4	11	9	43
Transistor Radio	4	4	6	9	7	4	34
Washing Machine	11	2	5	2	7	2	29
BW TV	2		4	1	1	3	11
CD player						9	9
Electric Fan			1		2	5	8
Rice cooker					2	1	3

Appliance	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	Total
Oven toaster						2	2
Electric iron						1	1
Ceiling fan						1	1
Video 5					1		1
Others		2		1			3
Total	72	18	72	46	73	66	347

As the project area is predominantly agricultural, most households have jungle bolos and grass cutters (karet). A few have hand tractors and carabaos; two residents own tricycles with sidecars; one household owns a chainsaw. Other work tools include carpentry and masonry tools such as hammer, hacksaw and shovel.

Cooking Fuel, Water Sources, and Sanitation

Majority (56 %) of the samples use wood and charcoal as cooking fuel. A third use LPG; a tenth cook with Kerosene gas and 3% use electricity.

The Level 2 system or community faucet is the predominant water source (Figure 4-22). Three fourths (62 %) of the households obtain water from these communal faucets. Nearly a third (31 %) have piped water (Level 3). Fourteen houses (7 %) get water from jetmatic pumps and wells (Level 1).

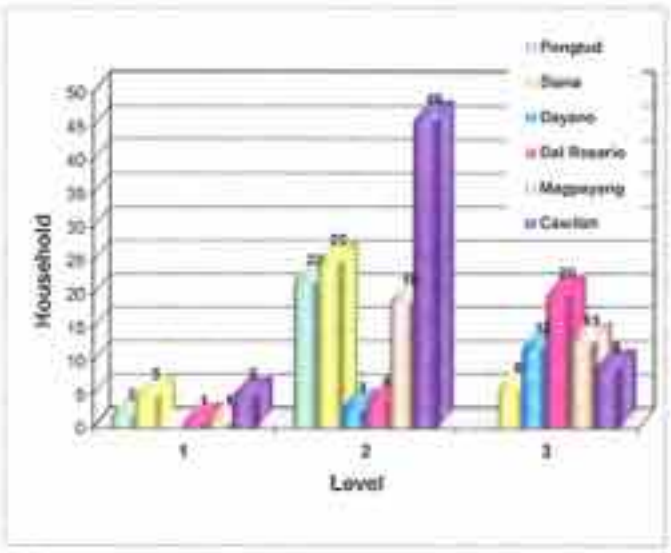

Figure 4-22. Water source

Figure 4-23 shows the types of toilet of the sample population as of May 2005. Overall, the percentage of homes with sanitary toilets (flush and water sealed) is 85 %. Those without toilets

comprise 8 %. Cawilan has the highest proportion of households without toilets. One in five houses in this barangay has no toilet.

Burning is the predominant garbage disposal method practiced by 6 out of 10 households in the project area (Figure 4-24). Three in ten households compost their solid wastes. The rest throw them in open pits, rivers and creeks. Of the six barangays, only Magpayang is serviced by the Municipal Waste Truck.

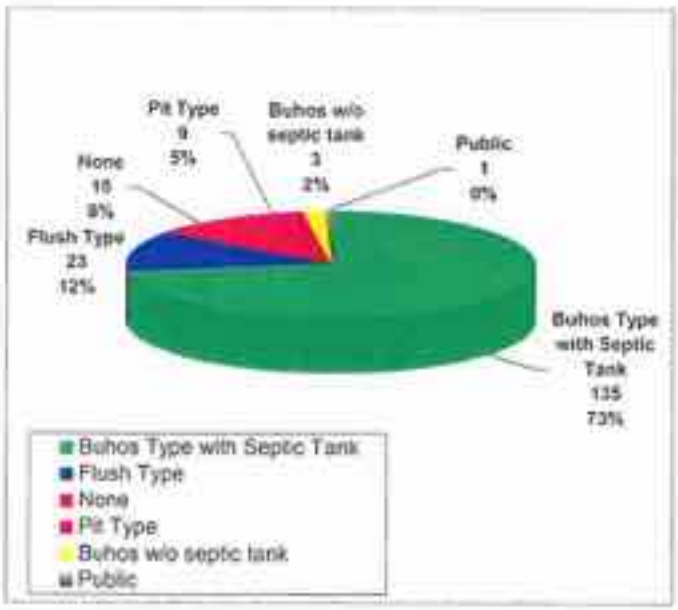

Figure 4-23. Toilet types

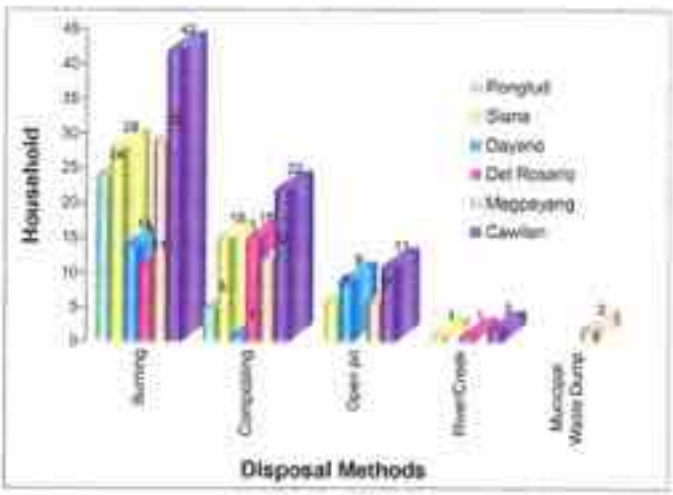

Figure 4-24. Modes of garbage disposal

Household Income and Poverty

Figure 4-25 is the income profile of the samples. More than half (54 %) earns less than P 5,000 a month. Three in ten households subsist on less than P 100 per day. The lowest monthly household income is P 600; the median income is P 4,456; the average income is P 6,189, and the highest is P 32,000.

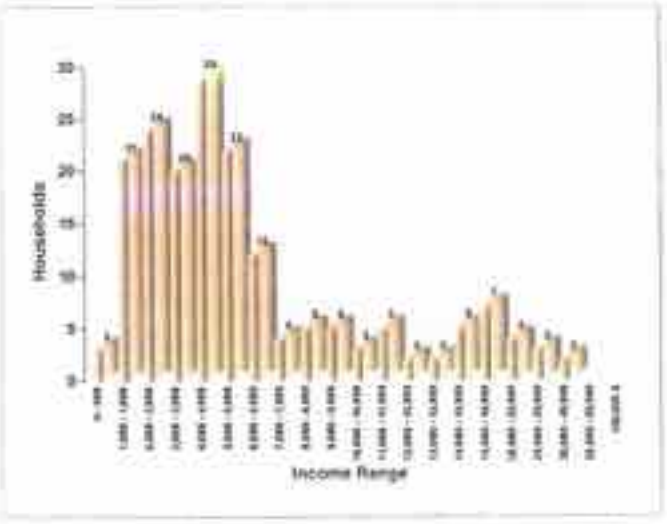

Figure 4-25. Monthly household income of samples

The Annual Per Capita Poverty Threshold Level (APCPTL) is the amount required to satisfy a person's food and non-food basic needs. If a person's income is below this level, he is considered poor. The Annual Per Capita Food Threshold Level (APCFTL), also called subsistence threshold or food poverty line, refers to the cost of the minimum food items that provide 100 % of the recommended dietary allowance (RDA) for protein and energy equivalent of 2,000 kcal and 80 % adequacy for the other nutrients per person. The National Statistical Coordination Board (NSCB) computes these amounts for all the provinces in the Philippines yearly. They are used in determining poverty incidence.

For 2005, the APCPTL and APCFTL for all areas in Surigao del Norte are P 14, 533 and P 10,066, respectively. Using the sample population's average household size of 5.46, the monthly take-home pay required to attain the APCPTL and APCFTL are P 6,613 and P 4,580, respectively. At least half of the sampled households are living below the Food Threshold Level and approximately 70 % exist below the Poverty Level.

The occupational profile detailed in Table 4-21 is reflective of the educational attainment in the Project area. Majority of the jobs involve manual labor with farming as the predominant occupation and income source, *i.e.*, two-fifths. The government and private companies employ 86 people, representing 30 % of the income earners.

Table 4-21. Occupational profile, impact barangays, May 2005

Occupation	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	TOTAL
ABLE SEAMAN					1		1
ASSISTANT COOK			1				1
AUTO PAINTER		1					1
BODYGUARD				1	1		2
BRGY. COUNCIL (KAGAWAD)				1			1
BRGY. COUNCIL/BHW			1				1
BRGY. OFFICIAL		1					1
BRGY. SECRETARY			1			1	2
BRGY. TREAS/FARMER	1						1
BRGY. TREASURER						1	1
BUSINESS	1				4		5
BUSINESS-SEWING			1				1
CARPENTER	4		1	2	2		9
CARPENTER/MASON			1				1
CHAINSAW OPERATOR			1				1
CLERK 2				1			1
COCONUT PLANTER						1	1
COLLECTOR				1			1
COOK					1		1
CUTTING STONE		1					1
DAY CARE WORKER			1				1
DRESSMAKER				1			1
DRILLING	1						1
DRIVER		1	3	2	3	1	10
DRIVER/WELDER				1			1
ELECTRONIC				1			1
ELECTRONIC-CASHIER			1				1
ELECTRONICS			1				1
EMPLOYEE			5				5
FACTORY WORKER – DRESS	2						2
FARMER	40	11	16	10	12	15	104
FARMER/CARPENTER			1				1

Occupation	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	TOTAL
MANICURIST					2		2
MASON	2		3	1			6
MASON/CARPENTER		1					1
MASSAGER (TRAINED HILOT)		1					1
MINER				1		1	2
OFW						1	1
OPERATOR MECHANIC	1						1
PALAY(RICE) BUYER						1	1
PENSIONER			1		1		2
PENSIONER/TRICYCLE			1				1
PREACHER OF GOD & CHRIST					2		2
PRIVATE EMPLOYEE			1	1			2
RESEARCH DIRECTOR					1		1
RICE DRYER (MAGBUYARAYAY HUMAY)					1		1
SALES LADY					1		1
SALES REPRESENTTIVE				1			1
SARI-SARI STORE	1						1
SCRAP(BALBAG)	2						2
SCRAP/FARMER	1						1
SECRETARY					1		1
SECURITY GUARD					2		2
SEWING				1			1
SK CHAIRMAN					1		1
STOREKEEPER						1	1
STUDENT/FARMER			1				1
SURVEYOR			1				1
TEACHER				3	5		8
TECHNICIAN				1			1
TRICYCLE DRIVER	2				1		3
TURTLE OPERATOR			1				1
UTILITY WORKER		1	3				4
VENDOR					1		1

Occupation	Cawilan	Dayano	Siana	Del Rosario	Magpayang	Pongtud	TOTAL
WELDER			2	2	1		5
WORKER			1				1
TOTAL	73	24	55	36	63	32	283

Eight out of ten wives are fulltime housekeepers. A tenth work fulltime as teachers, Barangay Officials, employees, canteen operators, vendors and dressmakers. Some 8 % engage in part-time small businesses such as livestock raising, sari-sari stores, vending and sewing to augment the family income.

Of the 186 households surveyed, 102 are engaged in farming. Rice is the predominant crop planted by 74 farmers. The total area exclusively planted to rice is 42 ha. The average area is 0.6 ha. Other crops planted include coconut, banana, rootcrops, mango, santol, and vegetables.

Nine out of ten households raise livestock for consumption and supplemental income. Poultry and hog are the preferred animals. A few raise goats, carabaos, and cows.

Household Expenditures

Figure 4-26 is the household expense pie of the sampled households. It contains only the basic items. Nearly three-fifths of the budget goes to food; education accounts for 17%. These two together already comprise three-fourths of the total expenditure. The remaining fourth goes to medicine, transportation, clothing, electricity, rent, water and others (soap, toothpaste, cooking fuel).

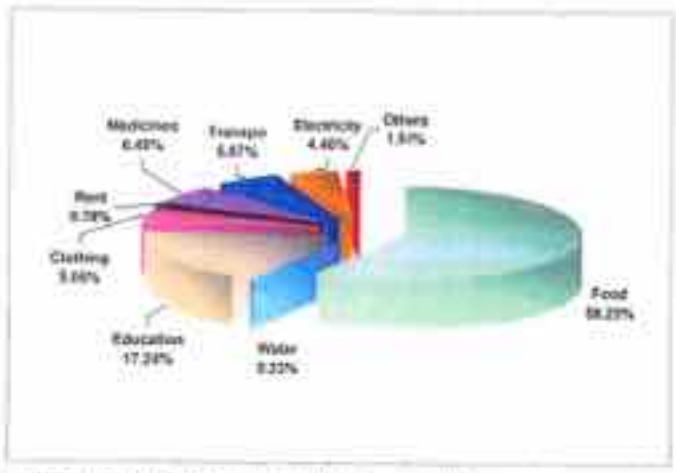

Figure 4-26. Monthly household expenditure

Social Problems

Theft, alcoholism, and gambling are the three major problems of the impact communities (Figure 4-27). These are all economic related. People steal because they have no money to spend and there are no livelihood opportunities in the area. The men drink to forget their problems. Gambling affects both men and women. The most common form is Tong-its, a card game similar to poker. People would risk their food money in the hope of winning.

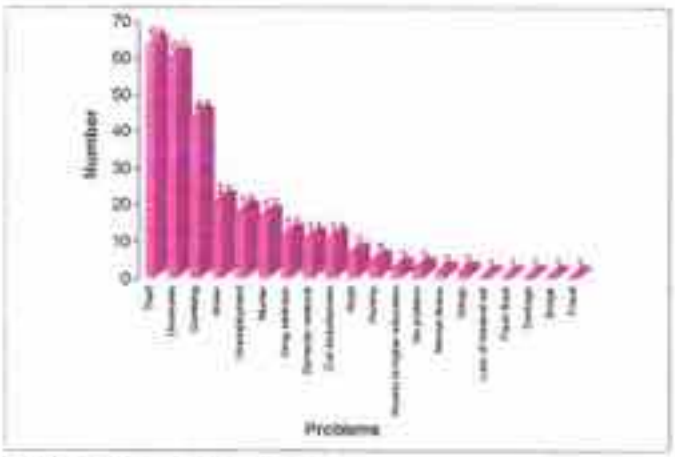

Figure 4-27. Social problems

5. COMMUNITY ASSESSMENT

5.1 FGDs of January 2005

Focus group discussions (FGDs) were conducted from January 13 to 14, 2005 covering all impact barangays of the Siana Gold Project with the exception of Brgy. Del Rosario. As discussed previously, the participants included the Brgy. Captains and Kagawads and representatives of the MGB Caraga Regional Office, MAO, BHWs, irrigators' association, fishermen's association, senior citizens, youth, schools, and the church.

One major activity of the FGD is the discussion of problems of each barangay. Table 5-1 lists the problems that surfaced during the discussions.

Table 5-1. Problems identified during the FGDs of January 2005

Aspect	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
Water	Potable water system is a problem. The current sources such as springs and wells are inadequate. A bigger but farther source needs to be tapped.	Potable water system is a problem.	Potable water system is a problem.	Potable water system is a problem.	Development of a level 3 water system.
Waste management		There is no landfill for domestic waste.			
Education	Family income not enough to send children to school.	Higher education is inaccessible.	Higher education is inaccessible.	Repair of school.	Improvement of school building and fencing.
			Absence of a school stage and electric lighting for the school.		Scholarship program.
			Lack of reading materials.		
Public health and safety	For pedestrian safety especially of children, the road needs to be widened.		Lack of medicines	Construction of a health center with complete facilities.	Lack of medical assistance.
	Lack of medicines.			Risk of tailings dam collapse.	

Aspect	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
Peace and order	Peace and order and insurgency problems.	Illegal gambling. Teen-age or young drug users (rugby and shabu).			
Roads	Inadequate farm-to-market roads.	Inadequate farm-to-market roads.	Inadequate farm-to-market road (Dayano to Bayagnan)	Construction of bridge connecting Siana to Del Rosario. Rehabilitation of bridge connecting Siana to Magpayang.	Maintenance and establishment of farm-to-market roads.
			Poor and inadequate roads.	Concreting of road from Dayano –Siana-Magpayang.	
			Bridge.		
Public facilities	Inadequate funds for maintenance.	Absence of a day care center, multi-purpose building, terminal, and recreation center.	Absence of a day care center.	Repair of day care center.	Concreting of road with drainage from National Highway to the barangay.
			Computer is needed by the barangay.	Absence of sports facilities.	Absence of sports equipment and facility.
			Development of a barangay site.		
Church					Improvement of Roman Catholic chapel.
Flooding	Lake flooding up to Alipao road; farms affected.	Placement of box culvert at the Magpayang to Siana Road.			
Farming	Primitive means of farming and lack of government support for farming.	Less rice production.		Assistance to agriculture in terms of chemicals, certified seeds, fertilizer, and farm facilities.	Price support policy.

Aspect	Brgy. Pongtud	Brgy. Magpayang	Brgy. Dayano	Brgy. Siana	Brgy. Cawilan
	Financial assistance for farmers' associations.	Improvement of leaking irrigation canal.	Absence of irrigation.		Provision of post-harvest facility.
	Expensive inputs but cheap buying price of rice.				Improvement of irrigation system.
Fishing	Primitive means of fishing.	Illegal fishing – poison, dynamite, and electrofishing.			
Employment	Employment is a problem. Only 5 % is employed with the Municipal Office or overseas. The balance is into farming and fishing.	Unemployment and lack of capital. Only 3 % is employed. Lack of trained skilled laborers.	Unemployment.	Unemployment and low income.	Unemployment.
Business	Lack of government support for livelihoods.	Poor business conditions. There is low circulation of money.	Livelihood is a problem.	Livelihood projects.	Livelihood projects for NGOs and senior citizens.
Demography		Out-migration of residents due to crisis.			
Disasters		Often affected by natural calamities.			

Based on Table 5-1, the major problems of the impact barangays were:

- Unemployment and lack of livelihood opportunities

  Unemployment is defined as the lack of a regular or relatively adequate source of income. It is the biggest problem in the area and is common to all barangays. The residents estimate that only 5% of the workforce has regular employment. Majority are farmers and casual laborers. In Pongtud and Magpayang, a number are subsistence fishermen.

  In the absence of regular employment, some engage in livelihood activities such as vending, poultry and hog raising. Unfortunately, only a few can muster the capital to

start these small businesses. Most of the residents cannot avail themselves of loans from financial institutions as they are not credit-worthy by banking standards.

- Lack of potable water

  Insufficient supply of potable water is also common to all the impact barangays. There are sources such as springs and wells. However, there are no funds for the construction of reservoirs and pipelines.

- Inaccessibility of higher education

  The highest educational attainment of the majority of the population is elementary school level. This is because of the presence of an elementary school in every barangay. The participants estimate that the drop-out rate from elementary to high school is 50 %. There are public high schools in some barangays. However, most families do not earn enough to provide transportation money for the children. The approximately 10 % of households who can go to college are considered extremely lucky.

- Inadequate farm-to-market Roads and poor road conditions

  In Pongtud, Magpayang, Cawilan and Dayano, the people complain of inadequate farm-to-market roads. If these were available, they could easily transport their produce and sell them at higher prices. The Siana residents want a bridge that connects them to Del Rosario, an urban barangay. The bridge connecting Siana to Magpayang needs rehabilitation. Flooding is experienced in Magpayang and Siana due to the faulty box culvert. In general, the people complain of poor road conditions. Most of the roads are narrow and unsealed.

- Decreasing income from rice production

  Farmers experience low rice yields due to the absence of irrigation (as in Dayano) or leaking irrigation canals (in the case of Magpayang) and insufficient irrigation system (in Cawilan). In Pongtud, lake flooding up to Alipao road affects the farms.

  Prices of farm inputs such as fertilizers, seeds, and pesticides are prohibitive. The typical farmer has to borrow from informal lenders that charge exorbitant interest. The prices of farm inputs are high and they increase regularly. In contrast, the price of palay remains relatively the same. Hence, farming incomes are reducing over time. Overall, the farmers lament the lack of government support for farming technology and inputs.

- Lack of basic social services and facilities

  Magpayang does not have a day care center, multi-purpose building, terminal, and recreation center. There is no day care center in Dayano. Siana has no health center and recreational facility. Its day care center also needs repairs. There is no sports

facility in Cawilan. The barangay health centers and rural health units can hardly provide the residents with medicines.

- Decreasing Fish Catch

  According to the fishermen in Magpayang and Pongtud, the fish catch is decreasing over time because of primitive fishing methods and rampant dynamite and electrofishing.

5.2 GRC's Response to the Articulated Problems

Based on the results of the community consultations, GRC crafted a Community Assistance Program for the three direct impact barangays in 2006. The following programs were implemented.

5.2.1 Potable Water Supply

Since this was considered the biggest problem by the community, GRC made it the priority community project.

GRC evaluated the different sources of water in the area. These included the Magpayang River, Dayano River, and the Siana open pit. Water in the Magpayang River was found to have traces of aluminum, arsenic, iron, mercury, manganese, and lead making it unsuitable for drinking. The water in Dayano River did not have heavy metals but its turbidity was twice the allowable limit. The water also contained coliforms at levels 50 times the allowable limit. In contrast, the Siana open pit water was clean and coliform was present only in the upper depths. The coliforms can be treated with chlorination. Based on these results, the Siana pit water was found to be the safest alternative.

Hardrock Integrated Mineral Solutions, a consultant of GRC, donated its services for the design of the potable water system. Hydrosol Australia was commissioned to design the chlorination system.

The water system had two phases. Phase 1 involved the installation of a plant to treat water sources from the Siana open pit. Phase 2 entailed the installation of a Level 2 potable water distribution network with a maximum distance of 50 m to a potable water tap.

To accelerate the installation of the pipeline and operation of the water system, GRC conceived an ingenious modus operandi. It sponsored a contest among the three impact barangays. The barangay that could lay the pipeline the fastest would win a "very special prize". Without knowing what the prize was, the competitors went into a frenzy. The excitement and cooperation were palpable. The bayanihan spirit was at its height. The participating barangays really worked hard to outdo and outsmart each other. In the end, Dayano, the smallest barangay with 73 households bested Siana and Cawilan. Like Santa's helpers, the Dayanons worked way into the night to win.

5.2.2 Playgrounds

The prize turned out be a state-of-the-art playground sitting on a bed of white sand imported from the shores of Siargao with the required permits. It was a dream-come-true for the children. The losing barangays felt so bad upon seeing the playground. GRC relented and gave them smaller versions. Now, the children of the direct impact barangays, who comprised two-fifths of the population, have a haven.

5.2.3 Elementary School Education

Assistance has been provided through the donation of books and school supplies to the students. GRC also provided labor and materials for school building repairs.

5.2.4 GRC Medical Clinic

Located in Brgy. Cawilan, this clinic has a full-time doctor and nurse. It provides medical consultation services to the community. It also distributes prescription medicines. The clinic has an ambulance on standby to bring emergency cases to hospitals.

5.2.5 Children's Feeding Programs

GRC conducts feeding programs for the malnourished children twice a week.

5.3 Assessment of Community Organizations

The officers and members of key community organizations were interviewed on May 17, 2009. The results are discussed in the following Sections.

5.3.1 Cawilan Farmers Irrigators Association (CAFIA)

This association with 28 members is headed by Mr. Joel Pacatang.

In 1994, CAFIA received a grant from AUSAID of P 207,000. Counterpart funding was provided by Mayor Romarate and the members. The grant was used to buy a rice milling equipment with a single-piston engine. The counterpart funding went to the building and solar dryer. The acquired facility services mainly the Cawilan farmers. The milling fee is P 2.00 per kilo. The members are entitled to a 3 % rebate.

According to Mr. Pacatang, he attended several training programs in Butuan City so that he could effectively manage the mill. Their operation has been successful so far. For 2008, the gross income was P 60,105 and gross expenses totalled P 33,483. Net income was 44 % of gross earnings or P 26,622. For 2009, the average monthly gross income is P 18,000 and costs and expenses amount to P 10,000. Based on these figures, average palay milled per month is 9,000 kilos or 180 cavans.

The association plans to upgrade operations by buying another rice mill and expanding the solar dryer. They are currently negotiating with another donor agency for the funding of the expansion program.

Mr. Pacatang appears to be a dynamic leader who is respected by the members. To a major extent, the success of the organization can be attributed to his dedication and strong leadership.

5.3.2 Siana Farmers Association

The Siana Farmers Association is composed of 36 members. DSWD gave this group P 80,000 in 2000 to purchase a rice mill. The members contributed sweat equity and P 100 each to build the housing for the mill.

Currently, the mill is operating at a loss. Mr. Domeng, the leader of the group and operator of the mill, said that this is due to the high cost of fuel. The mill engine has a double piston. It consumes about 6 liters of diesel per operating hour. At P 40 per liter, fuel cost for an hour's operation is P 240. Milling capacity per hour is approximately 150 kilos. Mr. Domeng gets 20% of the gross milling fee and another member receives 10 % for being a "watcher" or auditor.

During the meeting with the group, the officers and members could not explain how the business has remained open if they have been losing money for quite some time. Consider this: the association charges a milling fee of P 1.50 per kilo. The income per milling hour is P 225. Diesel costs P 240. On the basis of the fuel cost alone, they lose P 15. Where do they get the funds for the operator's and watcher's fees as well as maintenance expenses that they estimate to be P 2,000 per semester? To make matters more complicated, the Treasurer confirmed that the association has a lot of receivables. A serious evaluation of the operations and accounts is in order to understand exactly where the business stands.

The meeting with the officers and members of the association highlighted several major issues. Firstly, it appears that nobody is in control of the business. Secondly, it is evident that the officers and members were not prepared to manage an enterprise. Thirdly, nobody is monitoring the operations. This group needs a lot of training and guidance to make the business work.

5.3.3 Molledo Project

The Rural Improvement Club (RIC) is the project's owner. It originally had six members but one passed away. In 2004, the DSWD gave this group P 25,000 to implement the project. It entails making Molledo, a candy made from camote, coconut milk, and sugar which is a native delicacy. The group used up P 19,000 to purchase cooking equipment and for working capital. The remaining P 6,000 is in the bank.

The Molledo is packaged in plastic bags that sell for P 25 per package. Each pack contains 25 candies. It comes in different flavors such as ube, plain, and nangka. The group used to sell it to sari-sari stores and Jerry's, a popular store in Surigao City. Production stopped two years ago

when Jerry's ceased to buy the product. It used to order 30 bags weekly. Now, the group makes Molledo only when there are orders.

Jose, the group's leader, narrated that the money in the bank has increased from P 6,000 to P 10,000. In this sense, the project can be considered successful. The group had to stop production because of decreasing demand. They used to cook twice a week. Production was 20 bags per day and selling price was P 20/bag. Each week, they could gross P 800 for 40 bags. Each member received P 2 per bag sold. He recalled earning P 300 a month on the average.

5.3.4 Mosquito Net Project

A group of five women obtained a loan of P 9,000 from the DSWD to start the mosquito net project in 1995. The project involves making mosquito nets in various sizes (small, medium, large, and extra large) out of nylon. The first five years were profitable. Sales were regular. Orders came from neighbors and a dealer who sold the nets in Surigao City. In 1998, the group was able to repay the capital. They stopped regular production in 2000 because their price was not competitive. It was at least P 50 higher than the mosquito nets that were made in China. Now they produce only when there are orders.

BMP gave them an advance of P 2,000 and ordered three large (good for 4 to 6) and three extra large (good for 7 to 10 people) mosquito nets. They charged P 2,500 for the lot. They bought the materials for P 1,800. Seven nets could be made out of these materials. From the BMP sale, they made P 700. Add to this the price of another mosquito net that they could sell for P 350, the profit before labor cost is P 1,050. Each mosquito net takes about a day to make. Labor cost is P 150/day. This is equal to the daily wage of a farm hand.

From the end product, it is evident that these women are skilled sewers. It is a pity that competition from China affected their business. They need capital and assistance in product development and marketing so that they can use their skills and augment their income.

5.3.5 Dayano Animal Dispersal Project

The Philippines-Australia Community Assistance Program (PACAP) gave 16 sows, 20 goats and 20 Caver chickens to the Barangay Dayano Association for an animal dispersal project. Sixteen households got a sow each, four families received 5 goats each and another four families got 5 Cavers each.

The participating households raise the animals for profit. They are assisted by veterinarians who visited regularly. Per the agreement, for each animal received, 8 offsprings had to be given back to PACAP and 1 to the Association. The recipients earn by selling some of the offsprings, making sure that there are enough left to produce a steady income.

Goat raising did not succeed because the goats were not able to acclimatize. A number got sick and died. The recipients of the chickens also met difficulties in selling because of the meat

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Goat raising did not succeed because the goats were not able to acclimatize. A number got sick and died. The recipients of the chickens also met difficulties in selling because of the meat

quality. Some of those who raised pigs had to give up because they could not afford to pay for feeds and medicines.

Former Brgy. Captain Ronnie Orcullo, the leader of the Association, says that only a few of the original recipients remain. However, the Association was able to accumulate P 20,000. It is lent to members at 5 % interest per month. Members borrow to pay for tuition fee and emergency medical expenses and not for business purposes. He said that the group sees to it that the borrowers pay their loans, otherwise, the Association will become bankrupt.

The project participants present in the meeting did not seem enthusiastic about the project. They talked more about their difficulties. It is surmised that most of them could not sustain their small businesses because the cashflows were spent for personal expenses instead of being ploughed back into the business.

5.4 SDMP Planning Workshops of May 2009

SDMP Planning Workshops were held on May 19 to 20, 2009. The participants included the Brgy. Captains and Kagawads as well as officers and representatives of all organizations and sectors in the six impact barangays.

The second day of the workshops was devoted to problems and needs analyses and solutions formulation. Tables 5-2 to 5-7 present the workshop outputs by barangay.

Table 5-2. Problems and solutions, Brgy. Cawilan

Problems	Solution
1. Water supply source is inadequate - pipelines are bursting and leaking	Improve water supply delivery
2. Dilapidated roads	Concreting of access road
3. Poor drainage due to broken culvert	Replace broken culvert
4. Lack of Livelihood Projects	Establish the following: • Bigasan ng Barangay and other livelihood projects for the farmers' association • Mini-market where the women and other groups can sell their produce and other items • Vulcanizing Shop to service the tricycles and other vehicles • Set-up Purok Livelihood Centers
5. Church needs improvement	Repair and refurbish church
6. Lack Barangay community facilities	Build Sports center, multi-purpose hall
7. Need CVO outpost to promote peace and order	Build CVO outposts at strategic areas in the barangay
8. Low level of educational attainment	Scholarship program
9. Lack of Solar dryer	Construction of solar dryer

Problems	Solution
10. Lack of medicines and medical diagnostic tools (blood pressure meter, weighing scale, etc.)	Provide medicines and basic medical kits for BHWs
11. Flooding	Improve drainage

Table 5-3. Problems and solutions, Brgy. Siana

Problems	Solutions
1. Bridge needs major repairs and roads are in bad condition	Repair of bridge connecting Siana and Magpayang
	Barangay road maintenance and improvement of barangay canal
2. Unemployment	Provide Livelihood Projects, provide capital and skills training programs
3. Insufficient water supply (leaking pipes)	Improvement of potable water supply
4. Insufficient basic social services and infrastructure	Improvement of day care center
	Construction of health center
	Construction of waiting shed
	Improvement of mini gym
5. Many cases of Schistosomiasis – no medicines available	Provide medicines and conduct IECs to prevent spread
6. No proper waste disposal facility	Set-up solid waste management facility
7. Low educational attainment	Provide scholarship
8. Lack of capital for livelihood projects	Provide funds for livelihood projects
9. No street lights	Provide street lights
10. No budget for Barangay Tanods	Assistance to Barangay Tanod (uniform, gadget)
11. Limited supply of medicines	Provide medicines particularly to senior citizens
12. Color coding on hiring	Existing MOA between GRC and impact barangays on hiring

Table 5-4. Problems and solutions, Brgy. Dayano

Problems	Solutions
1. Lack of livelihood Projects	Fund livelihood projects such as palay buying and provide an additional farm for the Dayano Farmers Association
2. No solid waste facility	Put up cooperative that will operate a materials recovery facility
3. Poor roads	Concreting of Dayano bridge

Problems	Solutions
4. Inefficient irrigation system	Improvement of irrigation canal – upper and lower
5. Lack of water supply	Repair of broken pipeline
6. No street lighting for Bayagnan	Install street lights
7. Lack of sports facilities	Gym improvement
8. Lack of Health facilities and medical supplies	Construct Health Center
	Purchase medical kits for BHWs and provide medicines to the community

Table 5-5. Problems and solutions, Brgy. Del Rosario

Problems	Solution
1. Water system	Construct reservoir. Change existing pipelines
2. Flooding	Open dam gate of Magpayang dam during heavy rains
3. Livelihood programs	Swine and cattle production, poultry raising, vegetable production, handicrafts, baking, culinary arts, and cosmetology
4. Infrastructure projects	Construct day care center, mini clinic, construct concrete bridge in Purok 2, concreting of farm-to-market road from highway to Harrison bridge. Construction of church. Concreting of Dalitos(?), construction of gym comfort rooms.
5. Health	Medicines. Feeding program. Weighing scale. Blood pressure kit.

Table 5-6. Problems and solutions, Brgy. Magpayang

Problems	Solution
1. Insufficient supply of potable water	Replace old pipes from 2.5" dia to 3" dia.
2. No livelihood projects	Request assistance from GRC
3. Health Center old and dilapidated	Replace with a new one. Request aid from government or GRC
4. No Daycare Center	Construct day care center Request aid from government or GRC
5. Low literacy rate	Scholarship program
6. No Barangay Gym	Construct Gym
7. Farm-to-market road (riverside and barangay site)	Donation or acquisition of land and construction of road
8. Unemployment.	Livelihood programs such as palaypay (?), fish processing, organic fertilizer

Problems	Solution
9. No purok centers, multi-purpose hall, chapel	Construction of purok center, multi-purpose, chapel, etc.
10. Lack of Barangay site	Donation or acquisition (land
11. Irrigation system needs improvement	Repair/improve irrigation system

Table 5-7. Problems and solutions, Brgy. Pongtud

Problems	Solution
1. Insufficient potable water supply – not enough source	Tap Alipao and Dayano water sources
2. High production cost because of absence of access road connecting to Lake Mainit.	Construct road from the lake to the upland area
3. High transportation cost due to absence of farm inputs at barangay side	Establish people's store for farm inputs. Encourage planting of high value crops
4. Lack of post harvest facilities. No dryer. There is dryer but commercial	Provide post harvest facilities
5. Absence of farm-to-market road	Construct farm-to-market road
6. No bleachers at the covered court	Construct of bleachers for the covered court
7. Low income due to unemployment	Provide livelihood projects, (fish processing), fabrication of farm implements Establishment of mini feed mill Produce organic fertilizer
8. Undeveloped marshland	Develop into fishponds Mangrove reforestation Develop Pungtod hotsprings into tourist destinations
9. Low educational attainment	Scholarship program

5.5 Assessment of Community Problems

From Tables 5-2 to 5-7, it is clear that within a span of four years from the first community problem analysis held in January 2005 to the SDMP planning workshop done in May 2009, the problems that the residents previously cited still persist. These problems can be summarized into four categories:

1. Lack of income and income opportunities
2. Lack of basic social services such as water, education and health
3. Lack of basic infrastructure such as farm-to-market roads, roads, bridges and drainage systems and

4. Lack of technical and financial support to the farmers, fishermen and other vulnerable groups such as women, the youth, and the elderly.

The three direct impact barangays of Cawilan, Siana, and Dayano cited lack of water as a major problem. This is perplexing because they get a regular supply of water from the Siana pit. The insufficiency of water in these barangays is temporary because it involves bursting and leaking pipes. How the pipes leaked and burst is the key to the problem. A number of residents have been tapping into the pipelines so that they do not have to walk to get water. Indiscriminate use of precious water is also a major factor for the insufficient supply. While the sign in every tapstand says that the water should be used only for drinking, cooking, bathing, and laundry, a number of residents use it to water the plants, clean the pig pens, and for other purposes. This improper practice deprives other people of their water right.

The barangay local governments are responsible for policing their ranks as the pipeline system and reservoir were turned over to them by GRC when the water system was commissioned. The company will now have to discuss the remedial measures that should be done and the sanctions that have to be imposed on anyone who violates the rules. The company will also have to require the LGUs to organize a Barangay Water Association (BAWASA). This association can collect minimal fees, say P20 a month per household, as the other barangays in some parts of Mindanao have done. The monthly fees could then be used to pay for the honoraria of persons who will monitor the water usage. Part of the collection could be used to repair any leaking pipes. This scheme would make the water system sustainable.

As regards the other problems, the major cause is the lack of economic activities in the area that would spur demand and have multiplier effects such as increase in consumption attributable to an increase in income.

The lack of economic activity is also the reason why the LGUs do not have the funds to assist the farmers, fishermen, and other vulnerable groups. Practically all of the income of the LGUs come from the IRA. Eighty percent of the funds go to personnel and fixed expenses. Only 20 % is left for development projects. If there are businesses and other economic activities in the area, there would be more local taxes, fees, and business permits that would be generated to fund livelihood and other development projects of the LGU.

It is also sad to note that the farmers comprising majority of the population in the impact areas are in a debt trap. Since they generate income during harvest time only, they have to borrow money to pay for personal expenses and agricultural inputs from informal financiers. These people charge exorbitant interest. Come harvest time, they collect the debt in the form of palay. The palay is valued at least 10 % lower than prevailing market price. The farmer ends up with palay just enough for consumption and no money to pay for expenses and agricultural inputs for the next planting season. The debt cycle begins all over again.

During the SDMP workshops, the participants narrated that it is not only the farmer who is in a debt trap. Those who have no regular employment often borrow money to survive when there is

no work. When they are employed as farm hands or laborer, the money that they earn go to the payment of debts. The debt cycle begins all over again.

5.6 Interventions

One useful model for the crafting of interventions to improve the community quality of life is the Sustainable Livelihoods Framework. The United Kingdom Department for International Development (UKDFID) defines a sustainable livelihood as:

> *A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living ... A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future.*

The UKDFID's Sustainable Livelihoods framework is a holistic, asset-based framework for understanding poverty and the work of poverty reduction. The framework is shown in Figure 5-1.

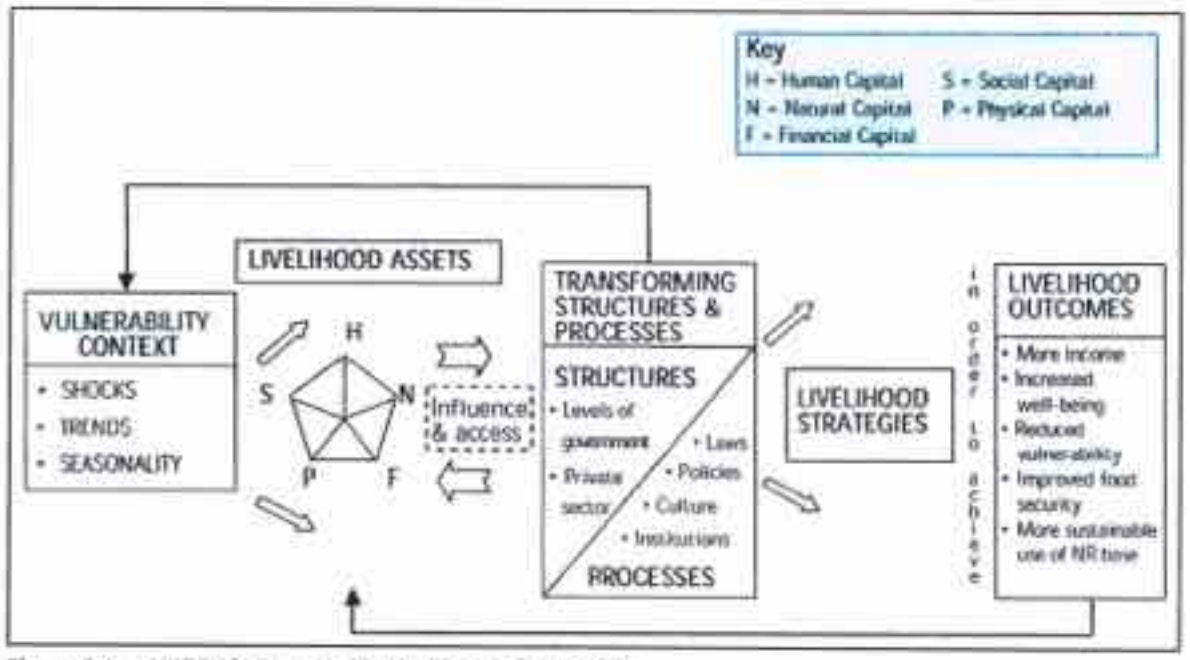


Figure 5-1 UKDFID's Sustainable Livelihoods framework

The Sustainable Livelihoods framework has three key dimensions, namely (UKDFID, 1999 and Ferguson and Murray, 2001):

1. Sustainable Livelihood Assets

   Assets are the building blocks of a sustainable livelihood. By building assets, individuals and households develop their capacity to cope with the challenges encountered and to meet their needs on a sustained basis. Five asset building blocks have been identified, namely:

- Personal assets – Motivation, self-esteem, self-confidence, self-perception, emotional well-being, assertiveness, and spirituality
- Human assets – Skills (both technical and interpersonal), knowledge, ability, employability and earning power, good health, and leadership
- Social assets – Cooperation, networks and interconnectedness, family support, friendships, relationships of trust and exchanges, partnership and collaboration, and political participation
- Physical assets – Child and elder care, secure shelter, clean affordable energy, information, banking and access to related services, basic consumer needs (*e.g.*, local grocery store and other services), affordable transportation, tools and equipment, natural resources, and air and water quality
- Financial assets – Income from productive activity (employment and self-employment), available finances and savings, regular inflows of money (from government transfers, family, gifts, in-kind), credit rating, and access to credits.

2. Vulnerability Context

There are factors that create and perpetuate vulnerability and poverty. They can be viewed at two levels – that of individuals and their circumstances and that of the broader context. Examples may be broken down into three groups:

- Trends – Population, resource and conflicts, national and international economics, governance including politics, and technology
- Shocks – Human health, natural, economic, conflict, crop and livestock health shocks
- Seasonality – Of prices, production, health, and employment opportunities.

The vulnerability factors highlight the need to see changes at the organizational, community and policy levels in addition to building the assets of individuals and households.

3. Techniques and Interventions

Two basic types of intervention to reduce poverty can be pursued. These are:

- Practical interventions which facilitate the efforts of poor households to build their livelihood assets. These include counseling programs, education, employment training, economic literacy and savings programs, and support for small business development.

- Strategic interventions which are directed toward the vulnerability context. Focused on the goal of social and economic change at the systemic level, these methods include community building and organizing, alliance building, policy work, and advocacy.

Table 5-8. Assessment and interventions for community livelihood assets

Livelihood Asset	Assessment	Planned Interventions
Personal assets	There is a general lack of motivation, self-esteem, self-confidence and assertiveness in the community borne by poverty, lack of education, and helplessness that is mainly attributable to government neglect. These areas need to be improved to prepare the people for the SDMP Projects. The beneficiaries should believe in themselves first. An internal affirmation that they are capable of controlling their lives and that they deserve to progress and rise out of poverty are essential to the success of any economic activity that they will undertake	Social preparation, values formation seminars, and training that will help the community develop the confidence and belief in itself. The assurance that the community will be supported by the company and LGU every step of the way is also an imperative.
Human assets	The community members are lacking in technical skills, knowledge, employability, earning power, and leadership.	Training programs that will prepare the residents for employment in GRC, Project contractors, or entrepreneurial activities. <u>Leadership</u> Leaders are critical to the success of SDMP projects. Hence, one major initial component of the SDMP should be leadership training. People nominated by the community organizations will be trained first. They will be followed by those members identified by GRC as having leadership potentials. The trainees will be more equipped to manage their respective organizations. They can also train other leaders of the community. <u>Integrity and Leadership by Example</u> Leaders should "walk the talk" to establish their credibility, earn the

Livelihood Asset	Assessment	Planned Interventions
		respect of the community, and be worthy of emulation. This will be amplified in the leadership training program and the trainees' performance regularly monitored together with the SDMP projects.
Social assets	The household support systems are strong. Support from relatives, neighbors, and friends is very much evident. The community's coping mechanism is anchored on these relationships. Without them, the community members would not be able to survive.	GRC should build upon these relationships to foster the team spirit in the SDMP project undertakings. It has been observed that when opportunities for economic improvement are given to the community, "crab" mentality sets in. This is one major cause of project failure. The promotion and inculcation of the indispensability of teamwork in successful projects will be emphasized in the Social Preparation and value Formation Seminars. Teamwork will also be a criterion for monitoring SDMP projects. In the evaluation of project proposals for SDMP funding, the company will consider whether the businesses contemplated are suited to individual or group implementation.
Physical assets	One major area of inadequacy of the community. The deficiencies are in quality houses, tools and equipment for agriculture, educational facilities, health facilities and services, irrigation facilities, dryer, and access and farm-to-market roads.	GRC's SDMP cannot provide all the needed facilities. The community will just have to wait for the remittance by the national government to the LGUs of the Project's excise and other taxes. What is achievable under the SDMP are the critical physical assets which cannot wait for the taxes and the inculcation of fiscal responsibility on the LGUs and vigilance on the part of the community.
Financial assets	The scantiness of financial assets is graver than the inadequacy of physical assets. Household incomes are inadequate and reducing over time. Savings are practically non-	The Siana Gold Project has enormous potentials of building up the financial assets of the impact community members. Through its policy of priority to the impact communities in

Livelihood Asset	Assessment	Planned Interventions
	existent. Government funds are simply not there. The community members have very limited access to credit	hiring, household incomes will increase. If said incomes are used wisely by the households, improvements in the other assets such as personal, human, and physical assets, will follow. GRC can also tap the impact community members for the goods and services needed by the Project. A ripple effect will lead to the improvement of the other livelihood assets including the social assets.

6. SDMP DEVELOPMENT FRAMEWORK

The Siana Gold Project will adopt the MGB-prescribed development framework shown below:

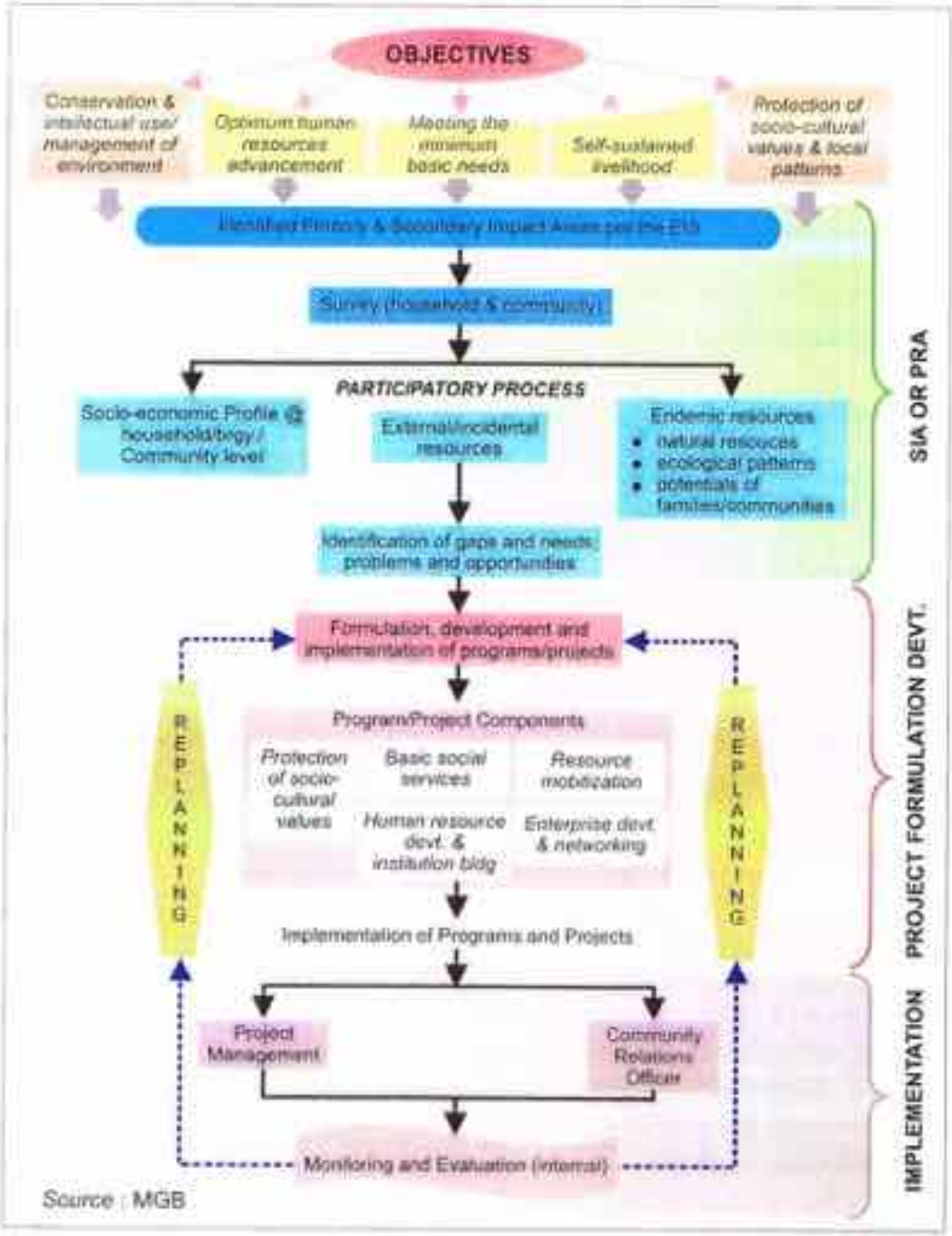


Figure 6-1. MGB's development framework for the SDMP

6.1 Development Strategy

Planning for closure is the development strategy adopted for the SDMP. The basis is the people's bitter experiences during SURICON operations and after the abrupt closure of the mine in 1991. Following the strategy, the community will become sustainable even after the Siana Gold Project has shut down.

To ensure community sustainability, the bias of the SDMP will be on livelihood projects. The SDMP will also have to provide critical physical assets to support the livelihood projects such as a solar dryer. The market of the projects will initially be the Siana Gold Project. After sufficient experience and confidence are gained by the project implementers, markets other than the Project will be targeted.

The other thrusts of the SDMP should be on the basic services and utilities to improve the community quality of life. These include education, water, and roads.

6.2 Program, Project, and Activities

Project, programs and specific activities were arrived at through a series of discussions and workshops which are enumerated below:

- Presentation of the socio-economic profile which was validated by the community.
- Problems, needs and opportunities analysis - The causes of the problems and reasons for the needs and opportunities available in the impact area were tackled.
- The regulatory framework and mechanics of the SDMP were explained at the Municipal and Barangay levels.
- Based on the above, the impact barangays formulated their plans and programs for the first five years of operation.

6.2.1 SDMP Fund Allocation

In compliance with DENR Administrative Order No. 96-40, the Project allocates 1 % of Direct Mining and Milling Cost for the development of its mining community, mining technology and geosciences. Based on the computations of GRC in the Project Feasibility Study, this amounts to P 128.3 million over the mine life of ten years. Table 6-1 shows the calculations of the SDMP fund on an annual basis.

ble 6-1. Estimation of SDMP fund annual allocation

COST		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Total (000)
		Nov										Sep	
ning (Open Pit Underground)		3,349	16,929	11,330	14,081	25,032	21,738	19,951	19,908	19,908	19,922	13,175	$185,323
ocessing		723	7,897	8,176	9,325	11,682	9,489	7,590	7,643	7,754	7,401	4,261	$81,941
tal		4,072	24,826	19,506	23,406	36,714	31,227	27,541	27,551	27,662	27,323	17,436	$267,264
MP (1%)		41	248	195	234	367	312	275	276	277	273	174	$2,673
ilippine Pesos 48 = US$1.00)	48	1,955	11,916	9,363	11,235	17,623	14,989	13,220	13,224	13,278	13,115	8,369	P128,287
MP FUND LOCATION													
ning and osciences	10%	195	1,192	936	1,123	1,762	1,499	1,322	1,322	1,328	1,312	837	P12,829
cial velopment ojects	90%	1,759	10,725	8,427	10,111	15,860	13,490	11,898	11,902	11,950	11,804	7,532	P115,458

During the Strategic Planning Workshop held on 19 May 2009, the Barangay Councils of the six impact barangays agreed to divide the SDMP fund as shown in Table 6-2.

Table 6-2. Allocation of SDMP fund among the six impact barangays for the first 5 years of operations

	Classification	Agreed Percentage Share	Year 1	Year 2	Year 3	Year 4	Year 5	Total
SDMP FUND			**9,626.82**	**7,928.67**	**8,847.53**	**13,412.04**	**12,496.62**	**52,311.68**
Siana	Direct	22.00%	2,117.90	1,744.31	1,946.46	2,950.65	2,749.26	**11,508.57**
Dayano	Direct	16.00	1,540.29	1,268.59	1,415.61	2,145.93	1,999.46	**8,369.87**
Cawilan	Direct	24.00	2,310.44	1,902.88	2,123.41	3,218.89	2,999.19	**12,554.80**
Pongtud	Indirect	12.67	1,219.40	1,004.30	1,120.69	1,698.86	1,582.90	**6,626.15**
Magpayang	Indirect	12.67	1,219.40	1,004.30	1,120.69	1,698.86	1,582.90	**6,626.15**
Del Rosario	Indirect	12.67	1,219.40	1,004.30	1,120.69	1,698.86	1,582.90	**6,626.15**

6.2.2 Project Selection Criteria

In selecting and ranking the projects that would be funded under the SDMP, the set of criteria was adopted from the Opportunity Ranking Section, Chapter 9 of the Community Development Toolkit formulated by ESMAP, The World Bank, and the ICMM.

1. Sustainability – Will the community be able to maintain the project as a going concern on its own after SDMP funding, management and other forms of assistance have ceased?
2. Magnitude, impact, and equitability– What benefits can the community derive out of this project? How many will be benefited and how? Does the project have a negative impact on the environment, people?
3. Cost – How much funds are required? Is it substantial and does it constitute a major percentage of the available funding?
4. Technical feasibility – Does the project require specialized and highly technical expertise to start and to maintain? Is the expertise available in the area? If not, how much and what is the cost of training required?
5. Social/cultural acceptability – Does the project fit within the community's norms?
6. Timetable – How long would it take, from project start-up before the community reaps the benefits of the project?

6.2.3 SDMP Implementation Program

Figure 6-2 is the flowchart of the SDMP implementation system. It will be followed in assessing the projects for funding using the SDMP fund. The projects to be proposed by the impact community should be in accordance with the 5-year SDMP of the Siana Gold Project approved by the Mines and Geosciences Bureau (MGB) Caraga Regional Office.

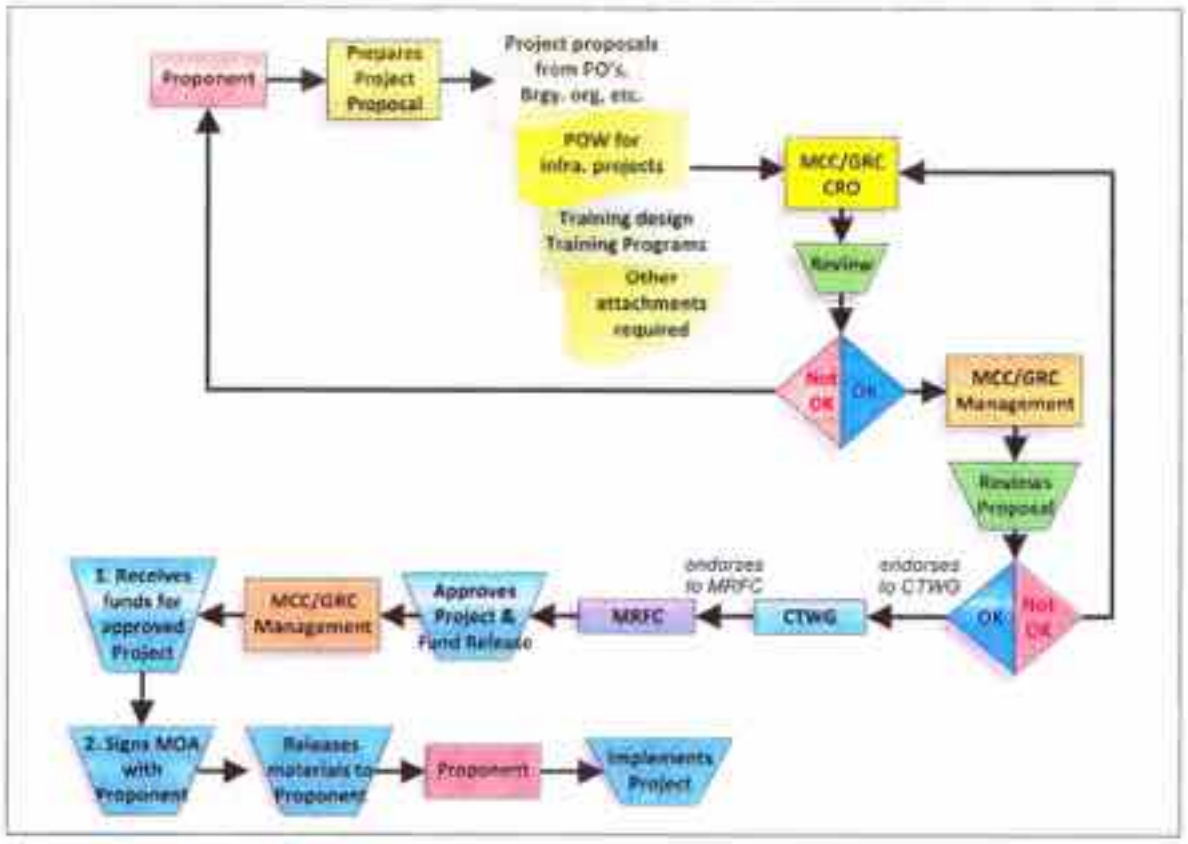


Figure 6-2. Flowchart of the SDMP implementation system

As illustrated in Figure 6-2, the Steps are:

1. The Proponent (Barangay LGU, Women's Group, Senior Citizens Association, Farmers Association, etc.) prepares the project proposal according to guidelines and attaches the required documents. For example, if the project being proposed for funding is an infrastructure project, the Program of Work (POW) should be attached. If the project is a Training Program, the Training Design should be enclosed.

2. The Proponent submits the proposal to the Community Relations Officer (CRO) of MCC/GRC.

3. The CRO evaluates the proposal. If it is acceptable based on the project guidelines, he/she submits it to MCC/GRC Management for approval. If it is not consistent with the guidelines, then the CRO gives it back to the Proponent for revision.

4. MCC/GRC Management evaluates the proposal and approves or disapproves it. If approved, it will endorse the proposal to the Community Technical Working Group (CTWG). If the Proposal is disapproved, MCC/GRC Management gives back the proposal to the CRO who will communicate management's decision to the Proponent.

5. The MCC/GRC Management presents the approved projects to the CTWG who will endorse it to the Mine Rehabilitation Fund Committee (MRFC) for project approval and release of funds.

6. Upon release of the funds, MCC/GRC Management will sign a MOA containing the terms and conditions for project implementation, reporting and monitoring.

7. Upon signing of the MOA, MCC/GRC will purchase any materials and supplies required by the project and issue them to the Proponent.

8. The Proponent implements the project in accordance with the MOA and the plan contained in the Project Proposal.

6.2.3.1 Project Monitoring and Evaluation

MCC/GRC will monitor all projects funded under the SDMP. The CRO is responsible for monitoring all the projects. There may be other persons that the company may hire to evaluate the project if the CRO is not technically qualified to do so.

The MGB Caraga Regional Office shall monitor the project on a quarterly basis as part of its regulatory functions.

6.2.3.2 Criteria for Funding

All projects for funding must fall under the priority areas identified in the SDMP approved by MGB Caraga Regional Office. Funding will be given to legitimate organizations and associations only.

For infrastructure projects, a POW and Bill of Materials are required. The technical designs and drawings should be done by qualified and professionally certified persons.

For Livelihood Projects, the following criteria apply:

- Viability – The project should be able to pay for all costs and expenses and generate income for the proponent on a sustainable basis.
- Beneficiaries – The project should benefit the most number of people.
- Gestation Period – The project should not take more than six months to generate income.
- Resources – The project should make use of resources indigenous to the area.

- Technology – The technology to be applied should be simple and suited to the skills and knowledge of the implementers. If training will be required, the proposal should include the budget for training.

7. MATRIX OF PROGRAMS, PROJECTS, AND ACTIVITIES

Table 7-1 summarizes the SDMP for the first five years of operation of the Siana Gold Project. Figure 7-1 is a pie chart representation of the SDMP projects.

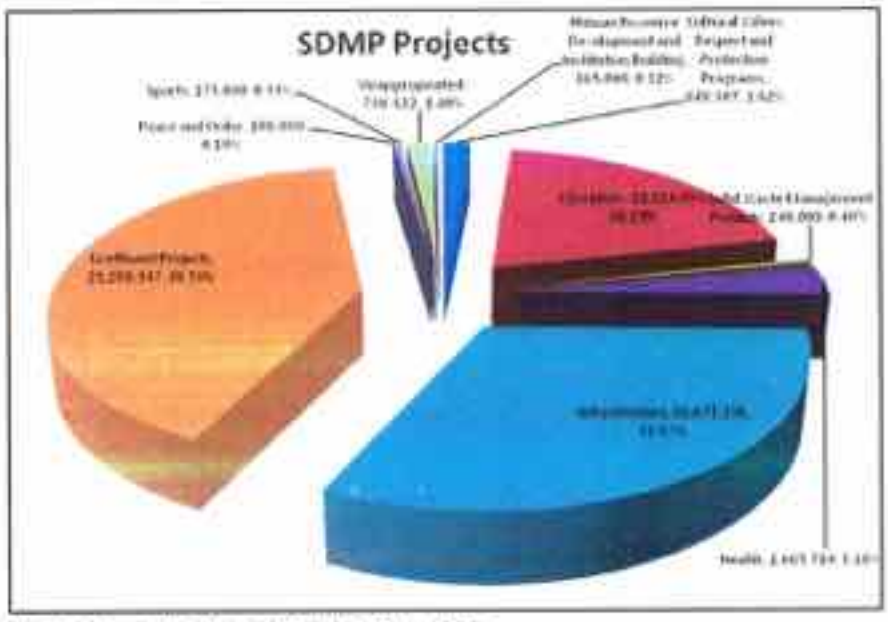


Figure 7-1. Pie chart of the SDMP projects

Of the total SDMP fund of P 52.31 million, two-fifths is earmarked for livelihood projects, one-fifth is allocated for education (scholarships), and nearly a third is provided for Infrastructure Projects such as roads, health centers, water systems and other communal facilities.

Table 7-1. Summary of SDMP Projects for years 1 to 5

Project/Program/Activity	Total	% of Total
Cultural Values Respect and Protection Programs	849,307	1.62%
Education		
Scholarship Fund	10,388,993	19.86%
Educational Equipment/supplies	126,000	0.24%
Sub-total	10,514,993	20.10%
Solid Waste Management Projects	240,000	0.46%
Human Resource Development and Institution Building	165,000	0.32%

Project/Program/Activity	Total	% of Total
Health		
Nutritional and feeding programs	304,719	0.58%
Health Fund	1,135,000	2.17%
Medical diagnostic equipment	226,000	0.43%
Sub-total	1,665,719	3.18%
Infrastructure		
Agricultural Facilities		
Construction of rice field flood control (dike)	108,500	0.21%
Irrigation System Improvement	600,000	1.15%
Solar Dryer	95,000	0.18%
Sub-total	803,500	1.54%
Communal Facilities		
Church Construction and Improvement	760000	1.45%
CVO Outpost	134,298	0.26%
Gym bleachers	870,000	1.66%
Multipurpose Hall of Hubasan	100,000	0.19%
Purok Centers	210,000	0.40%
Sub-total	2,074,298	3.97%
Educational Facilities		
Barangay Training Center	1,500,000	2.87%
Day Care Centers	300,000	0.57%
School Perimeter fencing, covered court and Office improvement	195,000	0.37%
Sub-total	1,995,000	3.81%
Health Facilities		
Health Centers	757905	1.45%
Mini Clinic	200,000	0.38%
Sub-total	957,905	1.83%

Project/Program/Activity	Total	% of Total
Roads and Bridges		
Road Concreting	2,840,000	5.43%
Construction of Farm to Market Road	1,125,000	2.15%
Construction of Galito's / Ajoc St.	208,272	0.40%
Dayano Bridge Concreting	993,000	1.90%
Street Lighting	100,000	0.19%
Sub-total	5,266,272	10.07%
Water Systems		0.00%
Construction of reservoir	737,759	1.41%
Development/Improvement of Potable Water Supply	4,686,457	8.96%
Water maintenance	150,000	0.29%
Sub-total	5,574,216	10.66%
Total Infrastructure	16,671,191	31.87%
Livelihood Projects		
Agricultural Input Merchandizing	800,000	1.53%
Animal Dispersal	993,922	1.90%
Bigasan ng Barangay	365,000	0.70%
Botica sa Barangay	295,000	0.56%
Church Projects	282,900	0.54%
Cooperative	5,697,341	10.89%
Copra and palay buying	455,000	0.87%
Development of Coconut Product's like VCO,feeds	200,000	0.38%
Establishment of Agro Forestry Project	250,000	0.48%
Farm Inputs	1,656,537	3.17%
Fish Vending	150,000	0.29%
Fishing	331,307	0.63%
Funding Support for Dayano Farmers Association Livelihood Program	50,000	0.10%
Hog Fattening	169,397	0.32%
Lime Production	100,000	0.19%
Livelihood programs (culinary, cosmetology and handicraft)	2,384,372	4.56%

Project/Program/Activity	Total	% of Total
including training		
Livelihood Programs (to be identified)	1,620,000	3.10%
Livelihood Support to Peoples Organization	214,046	0.41%
Longaniza Processing	100,000	0.19%
Merchandizing	690,687	1.32%
Moledo Processing	25,000	0.05%
Mosquito Net Making	30,000	0.06%
Organic Fertilizer & Insecticide Enterprise	148,000	0.28%
Palay & Copra Buying	250,000	0.48%
Pongtud Womens Organization Livelihood Projects	331,307	0.63%
Post harvest facilities and farm inputs	150,000	0.29%
Poultry & Livestock Dispersal	354,000	0.68%
Poultry	275,000	0.53%
Rag Making	75,500	0.14%
Repair & Vulcanizing Shop	215,000	0.41%
Rice Buy & Sell	400,000	0.76%
Rice Mill	200,000	0.38%
Senior Citizens Livelihood Projects	531,307	1.02%
Skills Training	5,000	0.01%
Women's organization / PASAKA BDR. Livelihood Projects	1,285,024	2.46%
Youth Livelihood Projects	119,500	0.23%
	21,200,147	40.53%
Peace and Order		
Tanod Uniforms and paraphernalia	100,000	0.19%
Sports		
Sports Fund	175,000	0.33%
Unappropriated	730,322	1.40%
	52,311,679.00	100%

Table 7-2. 5-Year SDMP Program for Brgy. Cawilan

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					2,310,436	1,902,881	2,123,408	3,218,891	2,999,188	12,554,804
1	Development of Potable Water Supply	Infrastructure	326 Families	100% of the household can have enough water supply	500,000	450,000	400,000	500,000	450,000	2,300,000
2	Concreting of Access road & Drainage	Infrastructure	All Cawilanons & neighboring Barangays	Comfortable & Safe Road free from flooding	200,000	250,000	300,000	400,000	400,000	1,550,000
3	Sustainance/ Maintainance of lilivehood programs & projects such as:	Livelihood Projects								
	a.)Bigasan ng Barangay - Women's Org.		Women's Org.	People can buy affordable price	50,000	25,000	50,000	80,000	60,000	265,000
	b.) Botika sa Barangay - Senior Citizens		Senior Citizens	People can buy affordable price	15,000	15,000	15,000	20,000	30,000	95,000
	c.) Post harvest facilities & farm inputs		CAFIA Org.	Provide harvest facilities & fertilizers	30,000	20,000	30,000	40,000	30,000	150,000
	d.) Copra & palay buying		CARBA	Patronizing own products	100,000	150,000	70,000	75,000	60,000	455,000
	e.) Repair & Vulcanizing Shop		Trisikad/Vehicles owners	Can generate funds	50,000	15,000	50,000	50,000	50,000	215,000

e m	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	f.) Construction of Cooperative Market & purchase goods to be displayed -Economic Enterprise (Restaurant & Coffee Shop)		All Cawilanons	Increase household income	500,436	400,881	500,408	763,891	825,188	2,990,804
	Improvement/Rehab/Extension of the following:	Infrastructure	All Cawilanons & School children							
	a.) Health Center				25,000	10,000	25,000	50,000	35,000	145,000
	b.) 7 purok Centers				30,000	10,000	25,000	50,000	35,000	150,000
	c.) Church Improvement &landscaping				30,000	25,000	25,000	50,000	30,000	160,000
	d.) School Perimeter fencing, covered court & Office improvement				55,000	30,000	30,000	50,000	30,000	195,000
	e.) CVO Outpost		11 CVOs		20,000	10,000	20,000	20,000	20,000	90,000
	f.) Multipurpose Hall of Hubasan		25 Families		25,000	10,000	20,000	25,000	20,000	100,000
	g.) Solar Drier		All Cawilanons		20,000	10,000	20,000	25,000	20,000	95,000
	Job Opportunities to identified unemployed individuals-utility works	livelihood	95% of the total no. of families	Can help reduce unemployment rate	30,000	15,000	20,000	30,000	25,000	120,000
	Barangay Scholarship Program	Education	Out of school youth & less fortunate	Can help reduce % of uneducated children	500,000	350,000	400,000	800,000	700,000	2,750,000

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
			families							
7	Improve health & nutrition of all Barangayanons	Health	Identified sick & malnourished individual-children	Can help reduce sickly & malnourished children(people)						
	a.) feeding program				20,000	20,000	20,000	50,000	24,000	134,000
	b.) Medicines, Vitamins, etc.				20,000	20,000	20,000	30,000	25,000	115,000
8	Acquisition of medical tools & apparatus for the BHW & 1 computer set for the school & educational supplies	Health/School/Education	7 BHW/School		50,000	37,000	45,000	55,000	65,000	252,000
9	Construction of rice field flood control (dike)	Infrastructure			20,000	15,500	18,000	25,000	30,000	108,500
10	Youth Development	Livelihood	Youth		20,000	14,000	20,000	30,000	35,500	119,500
	a.) Sport Facilities									
	b.) Livelihood projects such as:									
	*dancing tutorial									
	*cosmetology									
	*welding									
	*dressmaking/tailoring									
	*handicraft making				2,310,436	1,902,381	2,123,408	3,218,891	2,999,688	12,554,804

Table 7-3. 5-Year SDMP Program for Brgy. Dayano

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					1,540,291	1,268,587	1,415,605	1,415,605	1,999,458	**7,639,546**
1	Palay & Copra Buying	Livelihood	Farmers	Generate income to the organization & maintain the price	250,000					**250,000**
2	Organic fertilizers & insecticides	Livelihood	Farmers	Supply organic fertilizers & insecticides to the farmers to improve income	148,000					**148,000**
3	Rag Making	Livelihood	Women	Generate income; recycle used clothing	75,500					**75,500**
4	Funding Support for DFA Livelihood Program	Livelihood	DFA	Increase Income	50,000					**50,000**
5	Establishment of Agro Forestry	Livelihood	All Barangayanons	Verification of Farm protection & Increased Income	50,000		200,000			**250,000**
6	Development of Coconut Products like VCO,feeds	Livelihood	All Barangayanons	Increase Income				200,000		**200,000**
7	Lime Production	Livelihood	All Barangayanons	Increase Income				100,000		**100,000**
8	Poultry & liveStock Disposal	Livelihood	All Barangayanons	Increase Income	100,000			200,000	54,000	**354,000**

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
9	Dayano bridge concreting	Infrastructure	All Barangayanons	Transport of farm produce		993,000				**993,000**
10	Improvement of upper and lower irrigation canal	Infrastructure	Farmers	Sufficient supply of irrigation water	200,000					**200,000**
11	Improvement of Water System	Infrastructure	All Barangayanons	Sufficient Supply of Portable Water	200,000					**200,000**
12	Street lights for Bayagnan	Infrastructure	10 Families	Security	50,000					**50,000**
13	Road Concreting	Infrastructure	All Barangayanons	Ease of travel	140,000		200,000	200,000	500,000	**1,040,000**
14	Construction of Farm to Market Road	Infrastructure	All Barangayanons	Reduced travel time & transportation Cost			275,000		600,000	**875,000**
15	Establishment of MRF	Infrastructure	All Barangayanons	Clean Environment			100,000			**100,000**
16	Educational Fund	Social Services	Poor Families	Educational Benefits for deserving Students	100,000	100,000	200,000	200,000	200,000	**800,000**
17	Sports Fund	Social Services	Youth	Physical Development	25,000	25,000	25,000	50,000	50,000	**175,000**
18	Cultural Fund	Social Services	All Barangayanons	Cultural Development	50,000	50,000	100,000	100,000	100,000	**400,000**
19	Senior Citizens Fund	Social Services	All Senior Citizens				100,000			**100,000**
20	Support to People Organization	Social Services	All Barangayanons	Social Development					214,046	**214,046**

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Organization	Services	Barangayanons							
21	Solid Waste Management	Social Services	All Barangayanons	Clean Environment					100,000	100,000
22	Health Fund	Social Services	All Barangayanons	Healthy	100,000	100,000	200,000	200,000	200,000	800,000
23	Acquisition of Laptop	Equipment	Barangay	Efficient Office Work				40,000		40,000
24	Acquisition of Copying Machine	Equipment	Barangay	Efficient Office Work				75,000		75,000
25	Acquisition of LCD	Equipment	Barangay	Efficient Office Work				50,000		50,000
	TOTAL				**1,538,500**	**1,268,000**	**1,400,000**	**1,415,000**	**2,018,046**	**7,639,546**

able 7-4. 5-year SDMP Program of Brgy. Siana

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					2,117,900	**1,744,307**	**1,946,457**	**2,950,650**	**2,749,255**	**11,508,569**
1	**Development of Potable Water Supply**	**Infrastructure**	**198 Families**	**100% of the households have enough water supply**	540,000		546,457	500,000		1,586,457

ry	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Barangay constituent	100% of the households	50,000					50,000
			300,000	300,000				600,000
			150,000	100,000				250,000
			40,000					40,000
			420,000	700,000	500,000	725,650	1,479,255	3,824,905
				50,000	75,000		75,000	200,000
			50,000	50,000	50,000	50,000	50,000	250,000
						1,500,000		1,500,000
			50,000		50,000			100,000
			30,000					30,000
			25,000					

ine em	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Senior Citizens				20,000	20,000	20,000	20,000	20,000	100,000
	Cultural Programs				40,000	74,307	75,000	75,000	75,000	339,307
	Tanod				20,000	20,000	30,000	30,000		100,000
	Skills Training					5,000				5,000
	Cooperative						550,000		500,000	1,050,000
	Church				82,900	50,000	50,000	50,000	50,000	282,900
										-
	Total				2,117,900	1,744,307	1,946,457	2,950,650	2,749,255	11,508,569

Table 7-5. 5-Year SDMP Program for Brgy. Magpayang

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					1,219,397	1,004,298	1,120,687	1,698,859	1,582,905	6,626,146
1	Potable Water System	Infrastructure	328 Households	100% households served	300,000		200,000		100,000	600,000
2	Livelihood Projects	Livelihood	Residents of Barangay	50% of the total population benefits						
	Rice buy & sell	Livelihood	RIC	Sustainable & profitable income generating	100,000		100,000	100,000	100,000	400,000

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Poultry Raising	Livelihood	BAFC	Sustainable & profitable income generating	100,000			100,000		200,000
	Merchandizing	Livelihood	KMKK & the residents of brgy.	Sustainable & profitable income generating	300,000		190,687	200,000		690,687
	Fish Vending	Livelihood	Fish Vendors Association	Income generating	100,000	50,000				150,000
	Botica sa Barangay	Livelihood	Senior Citizens	Income generating	100,000				100,000	200,000
	Hog Fattening	Livelihood	Farmers Association	Sustainable & profitable income generating	69,397				100,000	169,397
3	Health Center	Infrastructure	Magpayangnon	Operational		350,000			12,905	362,905
4	Day Care Center	Infrastructure	Magpayangnon	Operational			200,000			200,000
5	Irrigation System	Infrastructure	Farmers Association	Increased Production		200,000				200,000
6	Scholarships Fund	Education	Sons & daughters of low-income families	100 % educated Children	130,000	330,000	350,000	278,859	350,000	1,438,859
7	Barangay Training Center	Infrastructure	Barangay Residents	Functional				1,000,000	500,000	1,500,000

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
8	Purok Center	Infrastructure	Magpayangnon	Functional			60,000			60,000
9	Church Improvement	Infrastructure	Magpayangnon	Peripheral Fence Constructed					300,000	300,000
10	Cultural Values Respect and Protection		Mapayangnon		20,000	30,000	20,000	20,000	20,000	110,000
11	CVO Outpost	Infrastructure	Magpayangnon	100% Accomplished		44,298				44,298
					1,219,397	1,004,298	1,120,687	1,698,859	1,582,905	6,626,146

Table 7-6. 5-Year SDMP Program for Brgy. Del Rosario

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					1,219,397	1,004,298	1,120,687	1,698,859	1,582,905	6,626,146
1	Construction of reservoir	Water system	All barangayanons	Sufficient supply of water	487,759		100,000	100,000	50,000	737,759
2	Trainings of culinary, cosmetology and handicraft	Livelihood	All barangayanons	Additional Income	531,638	502,579	300,412	500,000	549,743	2,384,372
3	Day Care	Infrastructure	All barangayanons	Education for children		100,000				100,000

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
4	Mini Clinic	Infrastructure	All barangayanons	Place for health services		50,000	50,000	50,000	50,000	200,000
5	Concreting of Purok II	Infrastructure	All barangayanons	Easy to walk in			50,000	200,000		250,000
6	Farm to market road	Infrastructure	All barangayanons	Easy to transport their farm products			50,000	179,43.60	200,000	250,000
7	Construction of church	Infrastructure	All barangayanons	Barangayanons' comfort while attending the mass.		100,000		100,000	100,000	300,000
8	Construction of Galito's / Ajoc St.	Infrastructure	All barangayanons	Convenience of travel to the highway		50,000	8,272	100,000	50,000	208,272
9	Medicine	Health	All barangayanons	First aid treatment		50,000	20,000	100,000	50,000	220,000
10	Feeding	Health	All barangayanons	Improvement of malnourished children		719	20,000	100,000	50,000	170,719
11	Weighing scale	Health	All barangayanons	For weight monitoring			50,000			50,000
12	BP kit	Health	All barangayanons	To measure their BP			50,000			50,000
13	Water maintenance	Water system	All barangayanons	For the sufficient supply of water				100,000	50,000	150,000

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
			barangayanons	supply of water						
14	Construction of Gym bleacher	Infrastructure	All barangayanons	Ease of watching the games		50,000	200,000	20,000		270,000
15	Women's org. / PASAKA BDR.	Livelihood	All women	Additional Income	200,000	85,022	300,000	300,002	400,000	1,285,024
					1,219,397	988,320	1,198,684	1,670,002	1,549,743	6,626,146

Table 7-7. 5-Year SDMP Program for Brgy. Pongtud

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
					1,219,397	1,004,298	1,120,687	1,698,859	1,582,905	6,626,146
1	LIVELIHOOD	FARM INPUTS (25%)	PONGTUD FARMERS	INCREASED PRODUCTION	304,849	251,075	280,172	424,715	395,726	1,656,537
		ANIMAL DISPERSAL (15%)	PONGTUD FARMERS	INCREASED LIVESTOCK	182,910	150,645	168,103	254,829	237,436	993,922
		COOPERATIVE (25%)	WHOLE COMMUNITY	LOW PRICE COMMODITIES	304,849	251,075	280,172	424,715	395,726	1,656,537
		FISHING (5%)	PONGTUD FISHERMEN	TO IMPROVE QUALITY OF LIFE OF	60,970	50,215	56,034	84,943	79,145	331,307

Line Item	Project/Program/Activity	Category	Beneficiaries	Expected Results/Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total
				FISHERMEN						
		SENIOR CITIZENS (5%)	MORE THAN 30 MEMBERS	ORGANIZE THEIR OWN LIVELIHOOD	60,970	50,215	56,034	84,943	79,145	331,307
		PONGTUD WOMEN'S ORGANIZATION (5%)	WOMEN'S ORG.	ORGANIZE THEIR OWN LIVELIHOOD	60,970	50,215	56,034	84,943	79,145	331,307
2	EDUCATION	SCHOLARSHIP (20%)	COLLEGE STUDENT	INCREASED NUMBER OF PROFESTIONALS	243,879	200,860	224,137	339,772	316,581	1,325,229
	TOTAL PERCENTAGE	100%			1,219,397	1,004,298	1,120,687	1,698,859	1,582,905	6,626,146

8. REFERENCES

BMP Environment & Community Care, Inc., 2009. Environmental Impact Statement of the Siana Gold Project.

Greenstone Resources Corporation and Intermet Engineering, 2007. Feasibility Study Siana Gold Project, Surigao del Norte, Philippines.

Gonzales, E.B., 1994. Tropical Cyclones and Storm Surges in *National Conference on Natural Disaster Mitigation*, 19 – 21 October 1994. DOST PHIVOLCS, Quezon City.

Mangao, E.A., R.G. Gonzales, and O.R. Tesoro, 1994. Seismicity of Mindanao in National Conference on Natural Disaster Mitigation, 19-21 October 1994. DOST PHIVOLCS, Quezon City.

Martinez, M.L., 1994. Volcanoes, Volcanic Hazards and Hazards Mapping in Mindanao, Philippines in National Conference on Natural Disaster Mitigation, 19-21 October 1994. DOST PHIVOLCS, Quezon City.

Merrill Crowe Corporation, 2009. Siana Gold Project Feasibility Study.

Mines and Geosciences Bureau, 2003. Hydrogeological Reconnaissance at Mainit, Surigao del Norte.

Murray, J. and Ferguson, M., 2001. Women in Transition Out of Poverty. Women and Economic Development Consortium, Toronto.

Punongbayan, R.S., 1994. Natural Hazards in the Philippines in National Conference on Natural Disaster Mitigation, 19-21 October 1994. DOST PHIVOLCS, Quezon City.

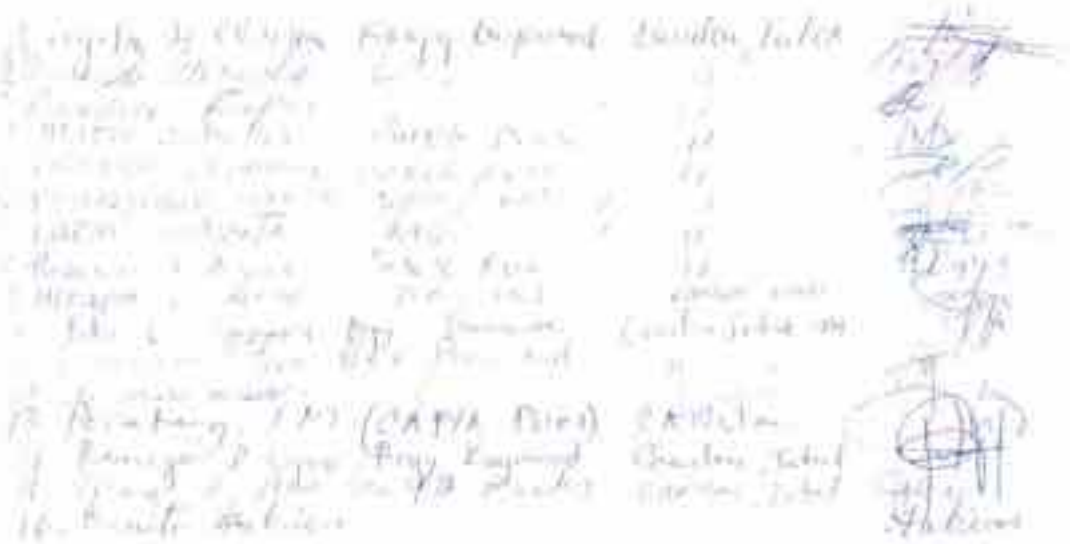
Rimando, R.R., 1994. The Philippine Fault Zone and Hazards due to Faulting in Conference on Natural Disaster Mitigation, 19-21 October 1994. DOST PHIVOLCS, Quezon City.

Thenhaus, P.C., Hanson, S.L., Algermissen, S.T., Bautista, B.C., Bautista, M.L.P., Punongbayan, B.J., Rasdas, A.R., Nillos, J.T.E., and Punongbayan, R.S., 1994. Estimates of regional ground-motion hazards in the Philippines, in Proceedings of the National Conference on Natural Disaster Mitigation in the Philippines, 19-21 October 1994, Quezon City, Philippines, p. 1-10.

United Kingdom Department for International Development, 1999. Sustainable Livelihoods Guidance Sheet: Introduction.

9. ANNEXES

Annex 1 Attendance sheets to FGDs of January 13 to 14, 2005



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SIANA MINE

Company/Organization	Occupation/Position	Signature

Attendance Sheet

Siana Gold Project IEC

Date: [illegible]

Time: [illegible]

Venue: [illegible]

NAME	Company/Organization	Occupation/Position	Signature
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Siana Gold Project IEC
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NAME	Company/Organization	Occupation/Position	Signature

Annex 2 Attendance sheets to SDMP Planning of May 2009

GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY CAWILAN

May 20, 2009

NAME	POSITION	SIGNATURE
1 Lumora C Enriquez	Purok V Pres	[illegible]
2 Evelyn V Caballero	BHW	[illegible]
3 Casimiro D. Borro	Purok Pres	[illegible]
4 Jesnel V. Caballes	Youth Pres	[illegible]
5 Natividad S. Caballes	Sr. C. Sec. Treas	[illegible]
6 Pancelio Carpintas	Tanod Chairman	[illegible]
7 Florencio M Espinosa	CVO Pres.	[illegible]
8 Mary Jane A Delela	Purok Pres	[illegible]
9 Jinky A Dela Peña	BHW	[illegible]
10 Romeo F Lopez	Brgy Kagawad	[illegible]
11 Bernadith S Sanchez	Brgy Kagawad	[illegible]
12 [illegible]	[illegible]	[illegible]
13 MONTA, MERCADITO S.	CFC PRESIDENT	[illegible]
14 [illegible]	Purok Pres	[illegible]
15 [illegible]	[illegible]	[illegible]
16 Reynaldo C [illegible]	BRGY CAPT	[illegible]
17 Vicente H [illegible]	[illegible]	[illegible]
18 [illegible] L Alipan	[illegible]	[illegible]
19 [illegible] P Lopez	[illegible]	[illegible]
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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY SIANA

May 20, 2009

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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY DAYANO

May 20, 2009

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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY DEL ROSARIO

May 20, 2009

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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY MAGPAYANG

May 20, 2009

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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

Tubod Executive Function Hall, Tubod Surigao del Norte

ATTENDANCE SHEET FOR BARANGAY PUNGTOD

May 20, 2009

	NAME	POSITION	SIGNATURE
1	[illegible]	[illegible]	
2	Marilyn B. Pelias	BHW Pres.	
3	[illegible]	[illegible]	
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5	[illegible]	[illegible]	
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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

LGU MAINIT

Tubod Executive Function Hall

ATTENDANCE SHEET
May 20, 2009

NAME	POSITION	SIGNATURE
1 FAISER B. FECARL, JR.	Proj. Dir. - [illegible]	[signature]
2 JESSNAR C. MOSENDO	Vice Mayor	[signature]
3 RONNIE N. BUSENDE	SB MEMBER	[signature]
4 [illegible] B. ENTICE	SB MEMBER	[signature]
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GREENSTONE RESOURCES CORPORATION

SDMP PLANNING

LGU ALEGRIA

Tubod Executive Function Hall

ATTENDANCE SHEET
May 20, 2009

	NAME	POSITION	SIGNATURE
1	NIMFA N [illegible]	[illegible]	
2	[illegible]	[illegible]	
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Annex 3 Climatological normals of PAGASA's Surigao City Station

STATION :653 - SURIGAO, SURIGAO DE NORTE
LATITUDE :09° 48' N LONGITUDE :125° 30' E ELEVATION : 39.0 m
PERIOD :1971 - 2000

MONTH	RAIN-FALL MM	NO OF RD	TEMPERATURE DEG. C MAX.	MIN.	MEAN	DRY BULB	WET BULB	DEW PT.	VP MBS.	RH %	MSLP MBS.	WIND DIR	WIND SPD MPS	CLD OKT	DAYS TSTM	WITH LTNG
JAN.	600.8	24	29.3	22.7	26.0	25.8	24.2	23.6	29.1	88	1010.7	NE	3	6	2	1
FEB.	443.2	21	29.6	22.7	26.2	25.9	24.2	23.6	29.0	87	1011.0	E	3	6	1	0
MAR.	334.6	21	30.4	23.1	26.8	26.5	24.6	23.9	29.6	86	1011.0	E	3	5	1	1
APR.	236.3	17	31.6	23.7	27.7	27.5	25.3	24.5	30.7	84	1010.0	E	2	5	4	3
MAY	127.2	13	32.7	24.2	28.4	28.3	25.8	25.0	31.5	82	1009.1	E	2	5	7	11
JUNE	140.3	14	32.5	24.1	28.3	28.1	25.7	24.9	31.4	82	1009.1	SW	2	6	7	12
JULY	165.9	13	32.2	24.1	28.1	28.0	25.4	24.5	30.6	81	1008.8	SW	2	6	7	15
AUG.	131.4	12	32.6	24.2	28.4	28.2	25.5	24.6	30.8	80	1009.0	WSW	2	6	6	15
SEPT	149.0	14	32.6	24.1	28.4	28.2	25.5	24.6	30.8	80	1009.4	WSW	2	6	8	15
OCT.	255.6	20	31.9	23.8	27.8	27.6	25.4	24.6	30.9	84	1009.2	W	2	6	9	14
NOV.	447.2	22	30.6	23.5	27.1	26.9	25.0	24.3	30.4	86	1009.4	E	2	6	7	8
DEC.	524.9	25	29.8	23.3	26.6	26.3	24.7	24.1	30.0	88	1010.2	NE	2	6	3	3
ANNUAL	3556.4	216	31.3	23.6	27.5	27.3	25.1	24.3	30.4	84	1009.7	E	2	6	62	98

PREPARED BY: PAGASA/CAB/CDS

Annex 5 Rainfall Intensity-Duration-Frequency Data for Surigao Del Norte

Based on 36 years of record

COMPUTED EXTREME VALUES (in mm) of PRECIPITATION

Return Period (yrs)	5 mins	10 mins	15 mins	20 mins	30 mins	45 mins	60 mins	80 mins	100 mins	120 mins	150 mins	3 hrs	6 hrs	12 hrs	24 hrs
2	16.3	24.7	31.8	37.8	47.5	57.4	64.2	74.5	83.8	90.8	100.1	108.6	143.5	177.9	204.8
5	24.5	37.2	48.2	56.9	71.1	85.4	95.2	111.0	125.5	136.8	151.5	164.6	216.8	269.1	308.9
10	29.9	45.5	59.0	69.6	86.8	104.0	115.8	135.2	153.1	167.3	185.6	201.7	265.4	329.4	377.8
15	32.9	50.2	65.1	76.7	95.6	114.5	127.3	148.8	168.6	184.5	204.8	222.6	292.8	363.5	416.7
20	35.0	53.5	69.4	81.7	101.8	121.8	135.5	158.3	179.5	196.5	218.2	237.2	311.9	387.3	443.9
25	36.7	56.0	72.7	85.6	106.5	127.5	141.7	165.7	187.9	205.8	228.6	248.5	326.7	405.7	464.9
50	41.8	63.8	82.8	97.4	121.2	144.9	161.0	188.4	213.8	234.3	260.5	283.2	372.2	462.3	529.5
100	46.8	71.6	92.9	109.2	135.8	162.1	180.1	210.8	239.5	262.6	292.2	317.7	417.6	518.4	593.6

EQUIVALENT AVERAGE INTENSITY (in mm/hr) OF COMPUTED EXTREME VALUES

Return Period (yrs)	5 mins	10 mins	15 mins	20 mins	30 mins	45 mins	60 mins	80 mins	100 mins	120 mins	150 mins	3 hrs	6 hrs	12 hrs	24 hrs
2	195.6	148.2	127.2	113.4	95.0	76.5	64.2	55.9	50.3	45.4	40.0	36.2	23.9	14.8	8.5
5	294.0	223.2	192.8	170.7	142.2	113.9	95.2	83.3	75.3	68.4	60.6	54.9	36.1	22.4	12.9
10	358.8	273.0	236.0	208.8	173.6	138.7	115.8	101.4	91.9	83.7	74.2	67.2	44.2	27.4	15.7
15	394.8	301.2	260.4	230.1	191.2	152.7	127.3	111.6	101.2	92.3	81.9	74.2	48.8	30.3	17.4

Return Period (yrs)	5 mins	10 mins	15 mins	20 mins	30 mins	45 mins	60 mins	80 mins	100 mins	120 mins	150 mins	3 hrs	6 hrs	12 hrs	24 hrs
20	420.0	321.0	277.6	245.1	203.6	162.4	135.5	118.7	107.7	98.3	87.3	79.1	52.0	32.3	18.5
25	440.4	336.0	290.8	256.8	213.0	170.0	141.7	124.3	112.7	102.9	91.4	82.8	54.5	33.8	19.4
50	501.6	382.8	331.2	292.2	242.4	193.2	161.0	141.3	128.3	117.2	104.2	94.4	62.0	38.5	22.1
100	561.6	429.6	371.6	327.6	271.6	216.1	180.1	158.1	143.7	131.3	116.9	105.9	69.6	43.2	24.7

prepared by:

the HYDROMETEOROLOGICAL INVESTIGATIONS and SPECIAL STUDIES SECTION

Flood Forecasting branch, PAGASA