

FLOOD HAZARD MAP OF HITOMA QUADRANGLE



MAP LEGEND:

Flood Hazard Zones:

- Regularly to frequently flooded areas
- Occasionally to rarely flooded areas
- Non flood prone areas
- Areas prone to riverbank erosion
- Areas affected by coastal floods and/or storm surges

Symbols:

- river
- contour line
- road

EXPLANATIONS:

Flood hazard susceptibility zones were derived based on the geomorphological analysis of landforms and the fluvial system. Information on flood occurrences, flood depths, duration of inundation as well as topographic information supported the geomorphologically-based flood hazard mapping.

Regularly to Frequently Flooded Areas:
Areas that are frequently flooded. Mere heavy rains of 1 to 2 days could bring about flooding in these areas. Moderate to strong typhoons could submerge these areas 1 to 3 meters or more in flood waters for a few days to a few weeks.

Occasionally to Rarely Flooded Areas:
Areas that become inundated during moderate to strong typhoons. Flood depths vary from a few centimeters to 1 meter. Floods last from a few hours to a few days.

Non-Flood Prone Areas:
Areas with no reported flood occurrences except along low lying areas immediately adjoining rivers or creeks.

Areas Prone to Riverbank Erosion:
Areas 0 to 50 meters from river banks of active river channels that are prone to bank erosion.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs



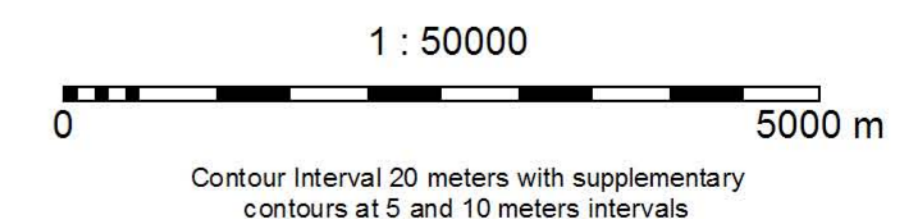
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU - RO5

UNITED NATIONS DEVELOPMENT PROGRAMME
Early Recovery Program for the Typhoon Affected Bicol Region

DEPARTMENT OF SOCIAL WELFARE AND DEVELOPMENT

Published by:
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU - RO5
Rawis, Legazpi City, Albay
2010

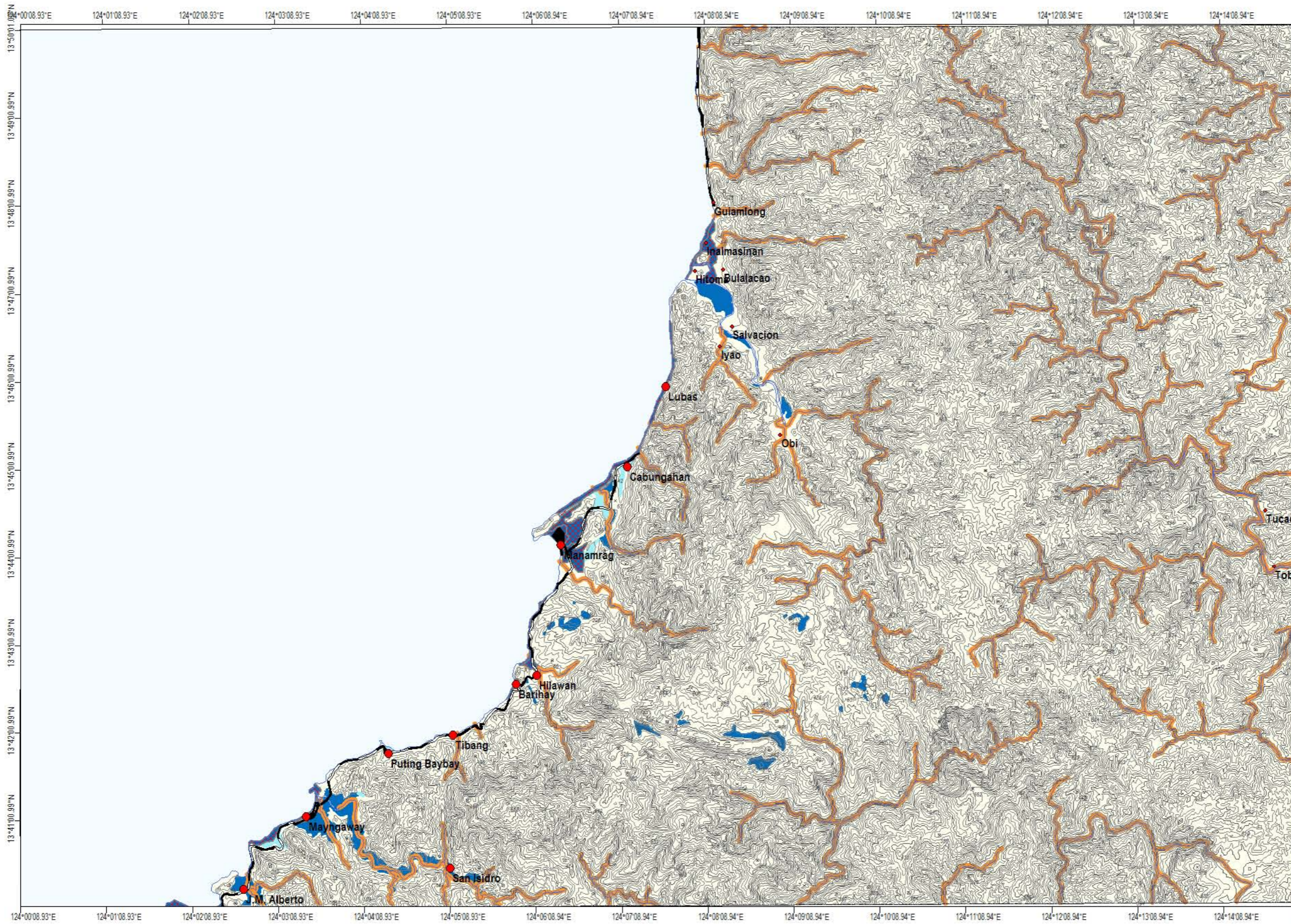
No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.



UNIVERSAL TRANSVERSE MERCATOR PROJECTION

Clarke 1866, Luzon Datum

FLOOD HAZARD MAP OF HITOMA QUADRANGLE



MAP LEGEND:

Flood Hazard Zones:

- Regularly to frequently flooded areas
- Occasionally to rarely flooded areas
- Non flood prone areas
- Areas prone to riverbank erosion
- Areas affected by coastal floods and/or storm surges

Symbols:

- river
- contour line
- road

EXPLANATIONS:

Flood hazard susceptibility zones were derived based on the geomorphological analysis of landforms and the fluvial system. Information on flood occurrences, flood depths, duration of inundation as well as topographic information supported the geomorphologically-based flood hazard mapping.

Regularly to Frequently Flooded Areas:
Areas that are frequently flooded. Mere heavy rains of 1 to 2 days could bring about flooding in these areas. Moderate to strong typhoons could submerge these areas 1 to 3 meters or more in flood waters for a few days to a few weeks.

Occasionally to Rarely Flooded Areas:
Areas that become inundated during moderate to strong typhoons. Flood depths vary from a few centimeters to 1 meter. Floods last from a few hours to a few days.

Non-Flood Prone Areas:
Areas with no reported flood occurrences except along low lying areas immediately adjoining rivers or creeks.

Areas Prone to Riverbank Erosion:
Areas 0 to 50 meters from river banks of active river

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Lagueta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs

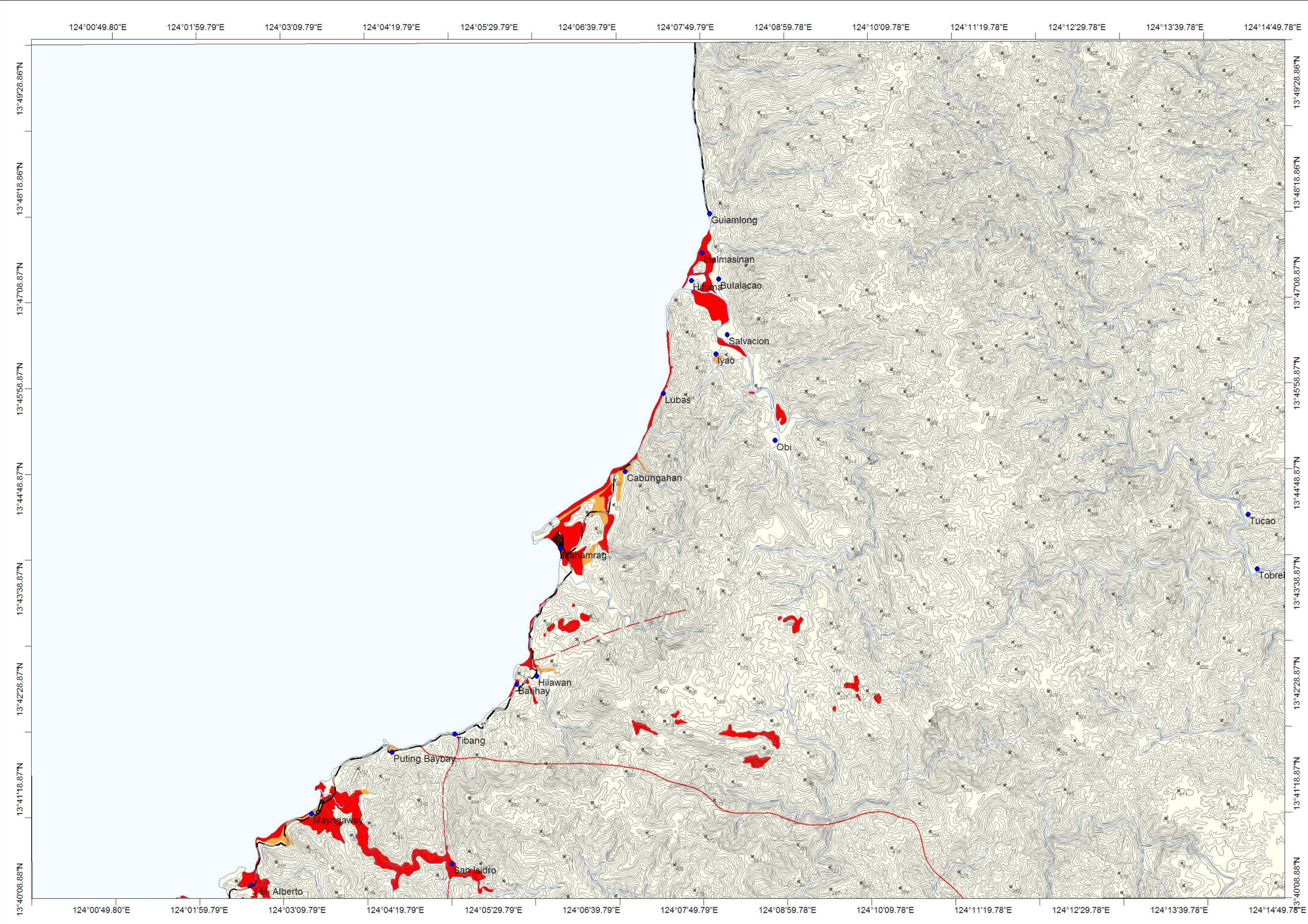
Published by:
 Department of Environment and Natural Resources
 MINES AND GEOSCIENCES BUREAU - RO5
 Rawis, Legazpi City, Albay
 2010



No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.



LIQUEFACTION POTENTIAL MAP OF HITOMA QUADRANGLE



MAP LEGEND:

Liquefaction Potential Zones:

- Areas where liquefaction is likely
- Areas where liquefaction is possible
- Areas where liquefaction is not likely

Symbols:

- river
- fault
- road
- contour line

EXPLANATIONS:

There are no reported liquefaction occurrence in the study area based on several interviews. However, zones of different liquefaction potential were derived based on the geomorphological lay of the study area following criteria made by Iwasaki and Yasuda.

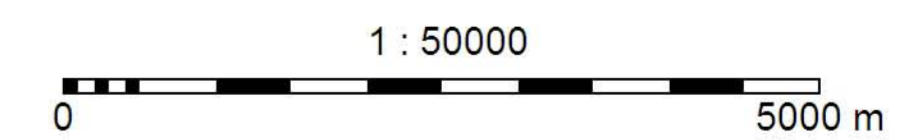
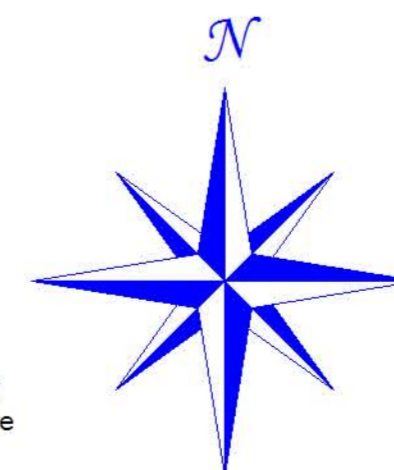
Areas where liquefaction is likely to occur include the riverbeds, mangrove swamps, beach, abandoned over channels and meanders, channel bars and river terraces. These areas are unsuitable for community or urban settlement.

Areas Where Liquefaction is Possible:
The likelihood of liquefaction occurrence is less for these areas.

Areas Where Liquefaction is Not Likely:
Areas where liquefaction is unlikely to occur. Most parts of the Nagumbuya Quadrangle Map sheet is not prone to liquefaction because of the presence of underlying bedrock.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

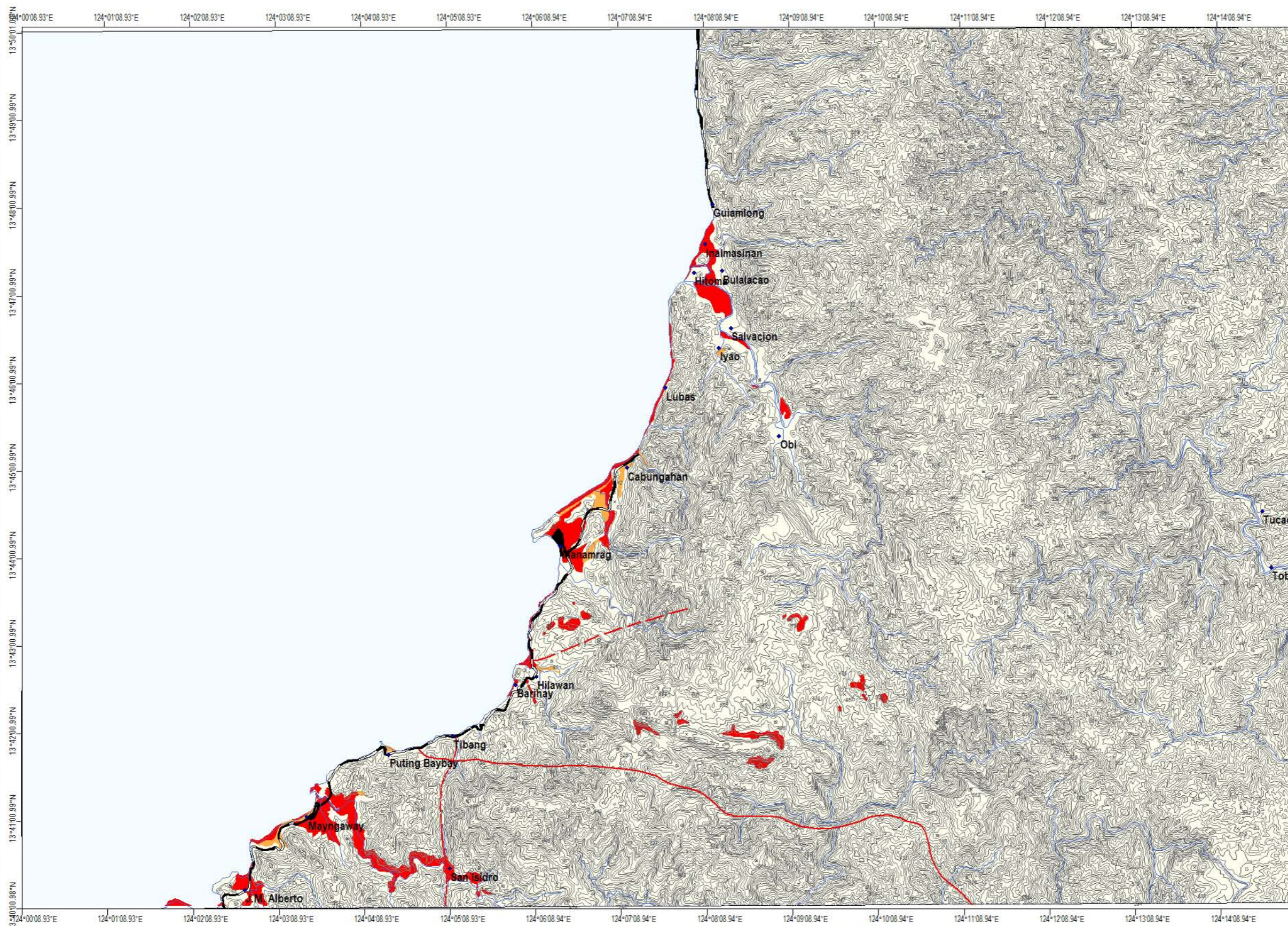
Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs



Contour Interval 20 meters with supplementary contours at 5 and 10 meters intervals

UNIVERSAL TRANSVERSE MERCATOR PROJECTION

Clarke 1866, Luzon Datum



MAP LEGEND:

Liquefaction Potential Zones:

- Areas where liquefaction is likely
- Areas where liquefaction is possible
- Areas where liquefaction is not likely

Symbols:

- river
- road
- fault
- contour line

EXPLANATIONS:

There are no reported liquefaction occurrence in the study area based on several interviews. However, zones of different liquefaction potential were derived based on the geomorphological lay of the study area following criteria made by Iwasaki and Yasuda.

Areas where liquefaction is likely to occur include the riverbeds, mangrove swamps, beach, abandoned over channels and meanders, channel bars and river terraces. These areas are unsuitable for community or urban settlement.

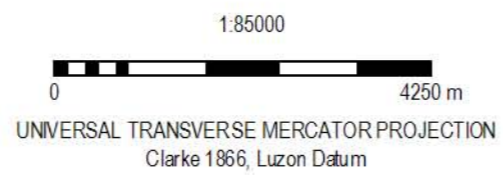
Areas Where Liquefaction is Possible:
The likelihood of liquefaction occurrence is less for these areas.

Areas Where Liquefaction is Not Likely:
Areas where liquefaction is unlikely to occur. Most parts of the Hitoma Quadrangle Map sheet is not prone to liquefaction because of the presence of underlying bedrock.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs

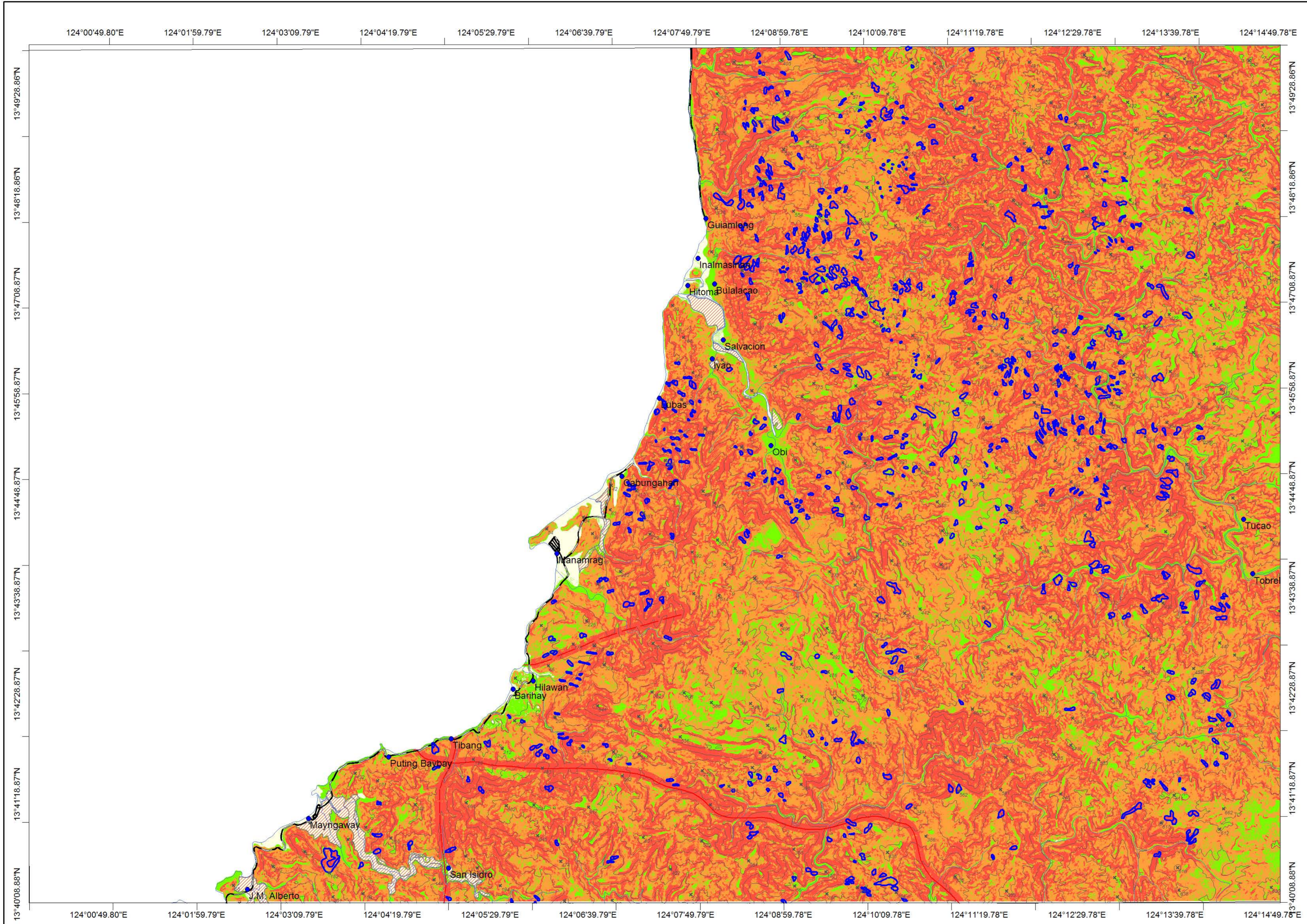
Published by:
 Department of Environment and Natural Resources
 MINES AND GEOSCIENCES BUREAU-RO5
 Legazpi City
 2010



No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing information on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.



LANDSLIDE SUSCEPTIBILITY MAP OF HITOMA QUADRANGLE



MAP LEGEND:

Landslide Susceptibility Zones:

- Absent
- Low susceptibility to absent
- Moderate susceptibility
- High susceptibility
- Debris flow path

Symbols:

- river
- contour line
- road
- landslide
- fault

EXPLANATIONS:

Landslide hazard susceptibility zones were derived through qualitative map combination using lithology, geomorphology, slope gradient, proximity to roadcuts and fault distance. GIS was used in the map combination and subjective weights were assigned to each unit in the parameter map.

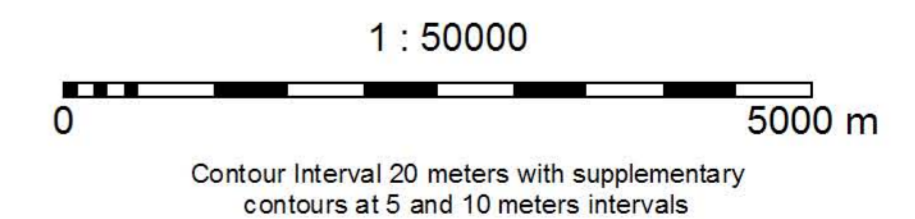
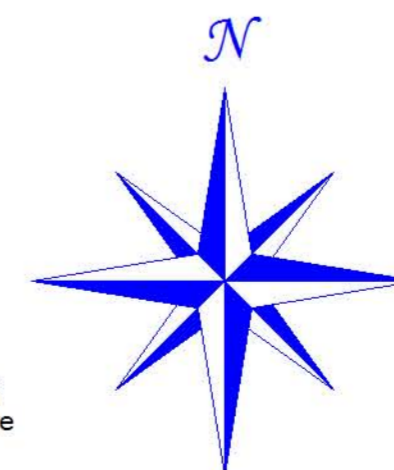
Areas with High Susceptibility to Landslides:
Areas with high probability of occurrence of mass movements particularly rock and debris slides, slumps and debris flows. The very steep V-shaped river valleys and areas traversed by major faults are rated high susceptibility areas and are unsuitable for housing development and human settlement.

Areas with Moderate Susceptibility to Landslides:
Areas having moderate likelihood of occurrence of landslides and are recommended for more detailed engineering geological and geohazard assessment prior to housing development. Most of the highly dissected low hills and slopes underlain by Payo Formation siltstones and shales are rated moderately susceptible to landslides.

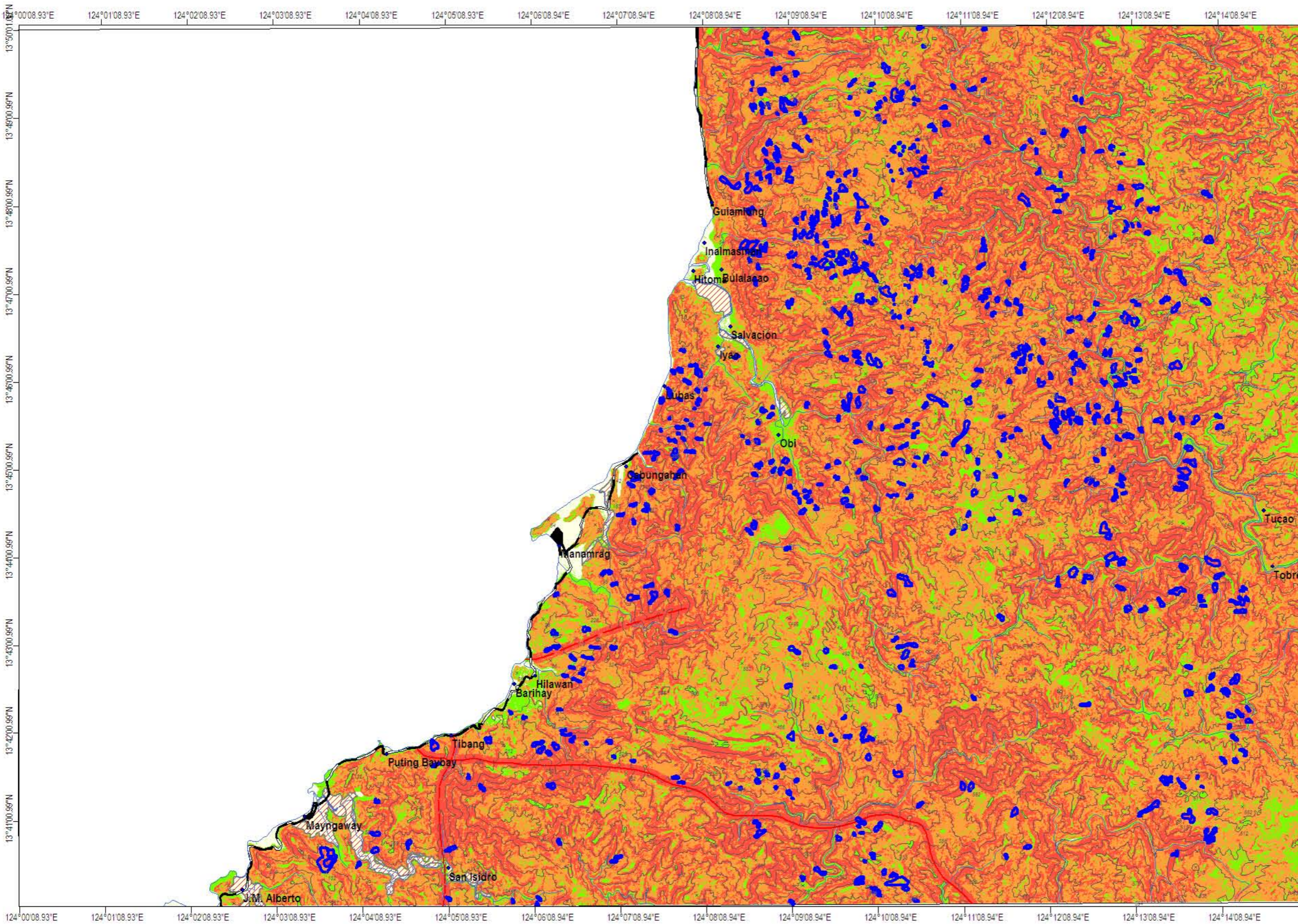
Areas with Absent or Low Susceptibility to Landslides:
Areas where the likelihood of landslide occurrence is either absent or low.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs



LANDSLIDE SUSCEPTIBILITY MAP OF HITOMA QUADRANGLE



MAP LEGEND:

Landslide Susceptibility

- Absent
- Low susceptibility to absent
- Moderate susceptibility
- High susceptibility
- Debris flow path

Symbols:

- river
- road
- fault
- contour line
- landslide

EXPLANATIONS:

Landslide hazard susceptibility zones were derived through qualitative map combination using lithology, geomorphology, slope gradient, proximity to roadcuts and fault distance. GIS was used in the map combination and subjective weights were assigned to each unit in the parameter map.

Areas with High Susceptibility to Landslides:
 Areas with high probability of occurrence of mass movements particularly rock and debris slides, slumps and debris flows. The very steep V-shaped river valleys and areas traversed by major faults are rated high susceptibility areas and are unsuitable for housing development and human settlement.

Areas with Moderate Susceptibility to Landslides:
 Areas having moderate likelihood of occurrence of landslides and are recommended for more detailed engineering geological and geohazard assessment prior to housing development. Most of the highly dissected low hills and slopes underlain by Payo Formation siltstones and shales are rated moderately susceptible to landslides.

Areas with Absent or Low Susceptibility to Landslides:
 Areas where the likelihood of landslide occurrence is either absent or low.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs

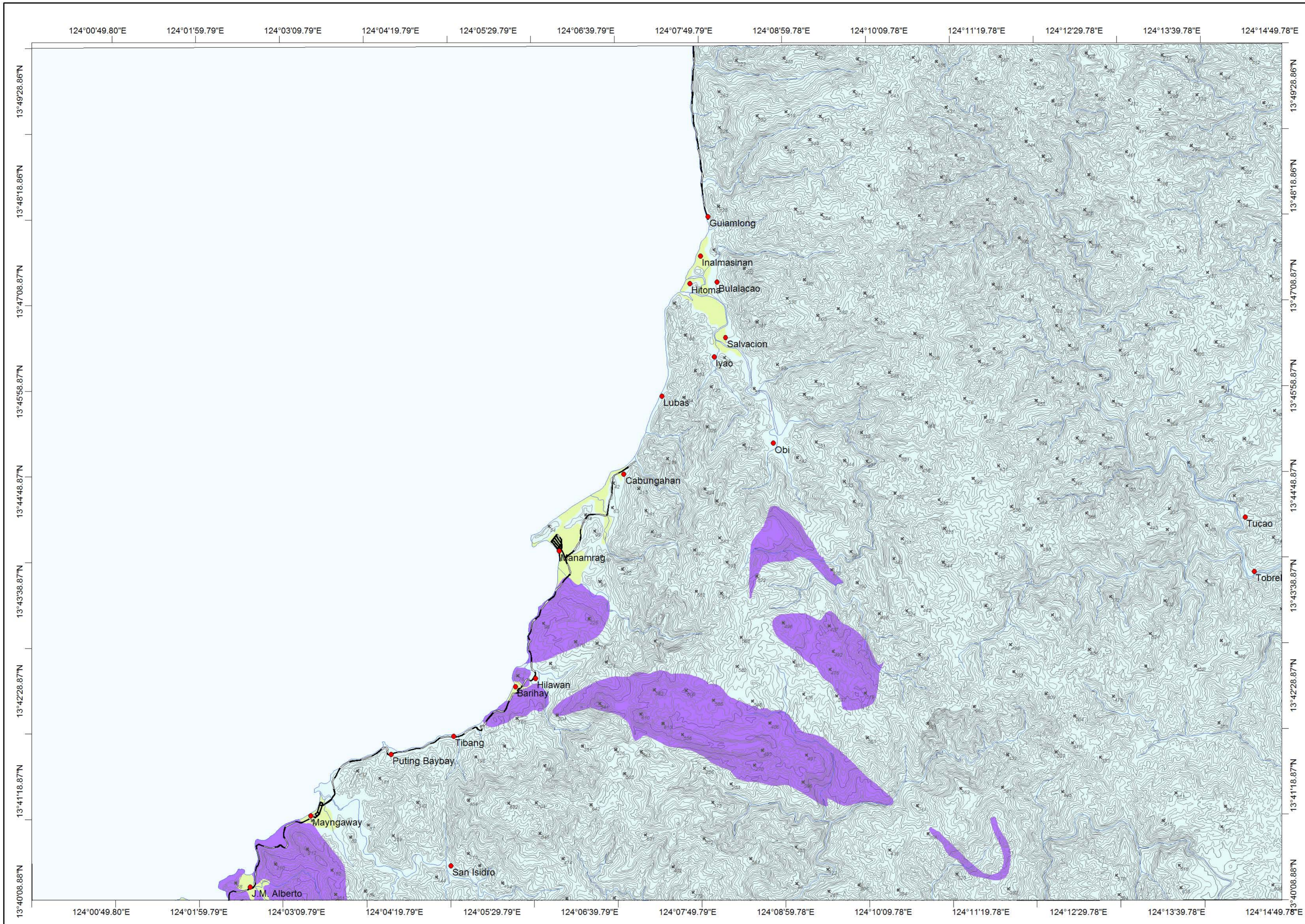


Published by:
 Department of Environment and Natural Resources
 MINES AND GEOSCIENCES BUREAU-RO5
 Legazpi City
 2010



No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.





MAP LEGEND:

Ground Subsidence and Ground Settlement Susceptibility Zones:

- Areas susceptible to ground settlement
- Areas susceptible to ground subsidence
- Areas not susceptible to settlement/subsidence

Symbols:

- river
- contour line
- road

EXPLANATIONS:

Susceptibility map for ground subsidence due to karst or solution processes is primarily derived from the lithologic map of the study area. Field observations on ground subsidence observed on concrete roads and damaged houses supported the mapping. Areas of possible ground settlement were delineated through the analysis of the geomorphological lay of the study area, the sub-surface soils and the ground water levels.

Areas Susceptible to Ground Subsidence:
Areas that are prone to ground cavitation, sinkhole formation and ground subsidence in areas underlain by limestone and calcareous siltstones and shales.

Areas Susceptible to Ground Settlement:
Areas where marine fluvial sands, silts and clays coupled with shallow ground water table are silts of possible ground settlement. Ground settlement may be reduced through appropriate foundation design. Buildings having 3 storeys or more should be tested for settlement and/or consolidation. Buildings having 5 storeys or more should undergo detailed geotechnical studies.

Areas Not Susceptible to Ground Settlement or Ground Subsidence:
Areas where the possibility of ground settlement or ground subsidence is low or absent.

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: A. E. Dayao, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs



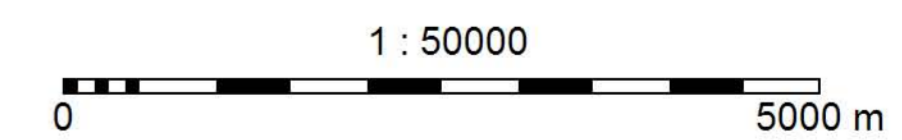
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU - RO5

UNITED NATIONS DEVELOPMENT PROGRAMME
Early Recovery Program for the Typhoon Affected Bicol Region

DEPARTMENT OF SOCIAL WELFARE AND DEVELOPMENT

Published by:
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU - RO5
Rawis, Legazpi City, Albay
2010

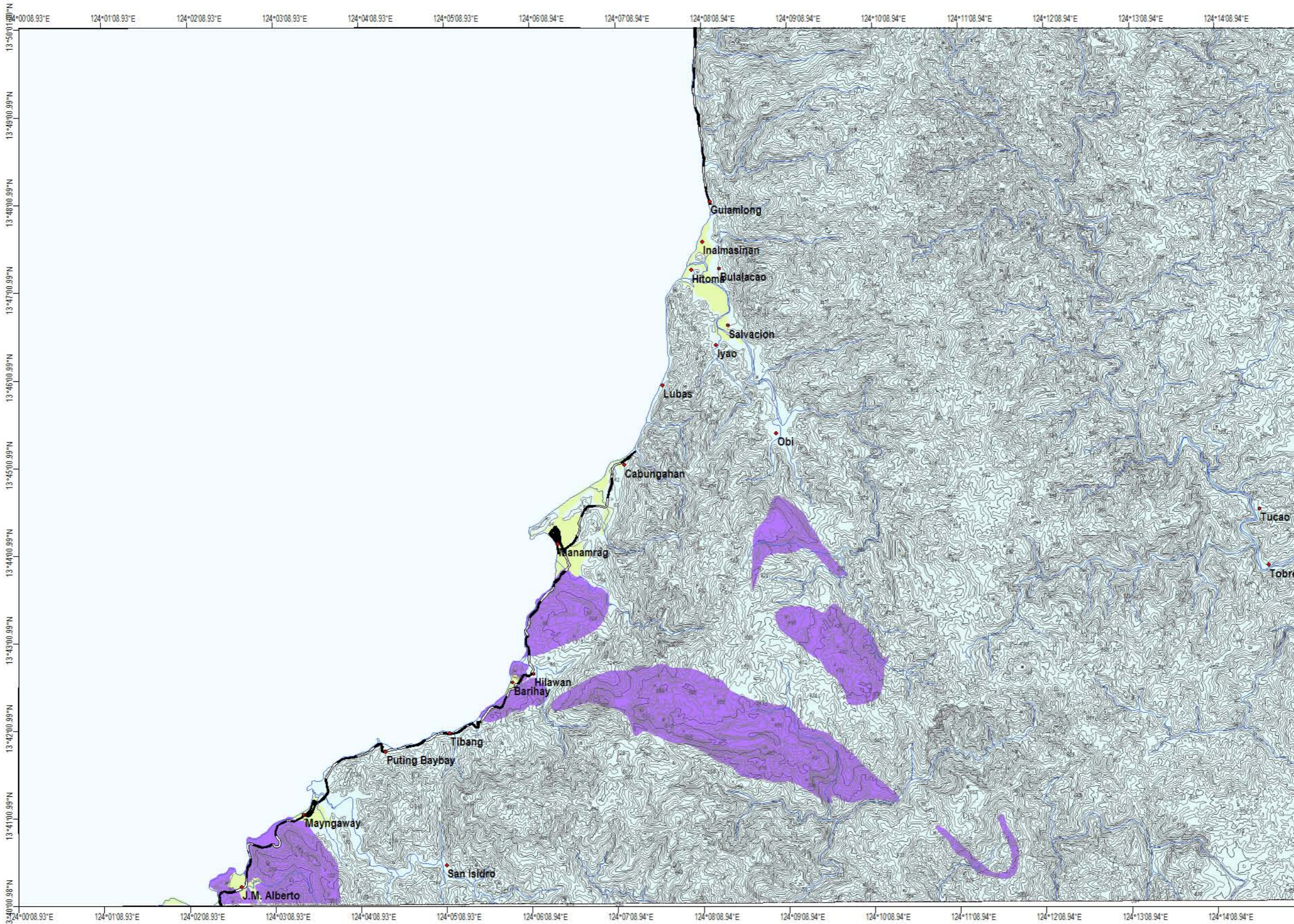
No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.



Contour Interval 20 meters with supplementary contours at 5 and 10 meters intervals

UNIVERSAL TRANSVERSE MERCATOR PROJECTION

Clarke 1866, Luzon Datum



MAP LEGEND:

Ground Subsidence and Ground Settlement Susceptibility Zones:

- Areas susceptible to ground settlement
- Areas susceptible to ground subsidence
- Areas not susceptible to settlement/subsidence

Symbols:

- river
- contour line
- road

EXPLANATIONS:

Susceptibility map for ground subsidence due to karst or solution processes was primarily derived from the lithologic map of the study area. Field observations on ground subsidence observed on concrete roads and damaged houses supported the mapping. Areas of possible ground settlement were delineated through the analysis of the geomorphological lay of the study area, the sub-surface soils and the ground water levels.

Areas Susceptible to Ground Subsidence:
Areas that are prone to ground cavitation, sinkhole formation and ground subsidence in areas underlain by limestone and calcareous siltstones and shales.

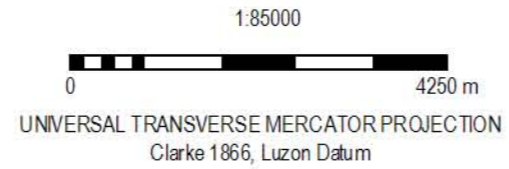
Areas Susceptible to Ground Settlement:
Areas where marine fluviatile sands, silts and clays coupled with shallow ground water table are silts of possible ground settlement. Ground settlement may be reduced through appropriate foundation design. Buildings having 3 storeys or more should be tested for settlement and/or consolidation. Buildings having 5 storeys or more should undergo detailed geotechnical studies.

Areas Not Susceptible to Ground Settlement or Ground Subsidence:
Areas where the possibility of ground settlement or ground

Field data collection by: A. E. Dayao, D. R. Dizon, J. M. S. Laud, E. L. Laguerta, E. T. Avila, D. J. G. Zepeda
 Geomorphological interpretation by: A. E. Dayao, J. N. Malto
 Digital cartographic processing by: J. N. Malto, B. J. E. Dayao, P. M. A. Peralta
 GIS processing by: J. N. Malto
 Checked by: A. E. Dayao
 Approved by: R. A. Juan

Other sources of Information:
 1:50,000 NAMRIA Topographic Map
 1951 B/W Aerial Photographs
 2000 Colored Aerial Photographs

Published by:
 Department of Environment and Natural Resources
 MINES AND GEOSCIENCES BUREAU-RO5
 Legazpi City
 2010



No part of this map may be reproduced in any form or any means without the permission of the Mines and Geosciences Bureau - RO5. Users noticing errors or missing information on this map are urged to refer directly to the Mines and Geosciences Bureau - RO5.

