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PROGRESS REPORT

CONSULTANCY SERVICES FOR COMPREHENSIVE PHILIPPINES LOCAL ROAD SATELLITE-SMARTPHONE MINDANAO MAPPING PILOT

WOODFIELDS CONSULTANTS, INC.
A Planning and Engineering Consulting Firm
ISO 9001 : 2008 QUALITY MANAGEMENT SYSTEM

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CHAPTER 1
INTRODUCTION

1.1 GENERAL

Information and Communication Technology (ICT) as of present is making innovative and progressive developments in different fields and institutions across the globe. It has been indispensable in government operations, for instance, where transparency in project implementation and monitoring of government projects is a must that provides clear presentation of project expenditures and effective identification of areas stunted by economic limitations. In the Philippines, the use of ICT coupled with GIS capabilities is in its progressive stage of implementation and utilization, particularly in the latest development initiatives of Department of Public Works and Highways (DPWH).

Just recently, the DPWH has successfully launched the Expanded ARMM Roads Mapping and Management (e-ARMM) System, a project which collaboratively employed ICT and GIS to build a web-based system that allows information acquisition, project prioritization and monitoring, and needs identification in ARMM. The said project created a network system that involves the (8) District Engineering Offices (DEOs) as Data Providers, and the DPWH – ARMM as data repository, and a website that serves as the monitoring medium.

1.2 PROJECT RATIONALE

The geography of the Philippines, with more than 1700 islands isolated from each other, varying terrains, and diverse cultures, is one of its economic limitations in terms of road connectivity and government project implementation and monitoring. Widespread gaps compromise road infrastructure networks, resulting to limited accessibility to key servicing facilities such as schools, police stations, and hospitals, and reduced economic and livelihood opportunities. These problems can be effectively addressed by Comprehensive Local Road Network Mapping (CLRNM), which shall utilize both satellite and smartphone technologies, with engagement from people in local government.

While interactive web-based map systems and tools such as Google, Bing, and Waze are now available to anyone with internet access, these have not yet been utilized in full capacity by government bodies responsible for road and infrastructural developments in the country. The launching of the e-ARMM System is one significant step towards further exploitation of such tools and even online information such as number of Facebook users in a community, for proper and better use in road project initiatives, implementation, management, and monitoring.

The Comprehensive Philippines Local Road Satellite-Smartphone Mindanao Mapping

Pilot Project, as inspired by the success of the e-ARMM System, aims to provide comprehensive road maps to municipalities chosen as pilot areas for the Project through the application of sophisticated tools such as highly defined satellite images taken in real time, which are without limitations in resolution commonly encountered in free platforms such as Google and Bing; and widely acquired road data from first hand route-tracking and geotagging tasks that are easily accomplished through a mobile app. The Project shall also emphasize the economic importance of its accomplishments in its final outputs and findings, particularly on the generation of the following connectivity metrics (see **Figure 1.2-1**):

- rural accessibility indexes/accessibility – refers to the portion of population situated within 2 kilometers of a good road network;
- travel time/efficiency – refers to the shortest time it would take to reach a key facility such as municipal hall; and
- bad road experience ratio/safety – refers to a citizen's experience of bad road segment during a journey.

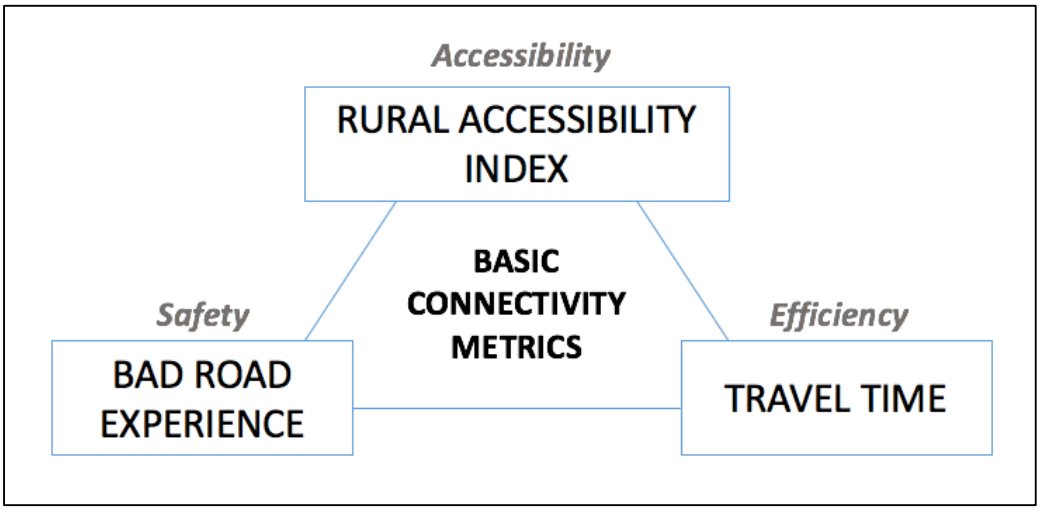


Figure 1.2-1
Basic connectivity metrics

The success of this pilot project shall propose a possible scale up of similar works not only in Mindanao but across the country as well. In fact,

1.3 PROJECT OBJECTIVES

The Project aims to:

- Conceptualize and comprehensively plan the website infrastructure development to enhance its function and extend its reach to the target beneficiaries;
- Collect pertinent road data on the region's infrastructures from District Engineering Offices (DEOs) and Municipal Planning and Engineering departments, as well as from Open Source Maps;
- Prepare road layouts from all data acquired and road predictions from real-time

satellite images;

- Employ **low-cost satellite and smartphone technologies** in local and national road mapping;
- Perform visual inspection, and assessment of road network locations and conditions in pilot areas;
- Establish a data repository where all data acquired from government institutions shall be stored, processed, and managed;
- Generate **indicators of road connectivity (accessibility, safety, and efficiency)** for all households, farmers, and tourism enterprises in study areas; and
- Provide a comprehensive map of all local roads in Study Area to government receptors by June 2016

1.4 SCOPE OF CONSULTING SERVICES

In accordance to the objectives outlined in the Terms of Reference (see **Appendix A**), the Consultant shall perform and accomplish the following services.

1. Collection and processing of all available road data to create base maps for actual ground validation tasks;
2. Perform actual validation of road locations and assessment of road conditions
3. Geotag roads through mobile apps
4. Prepare the following reports:
    - Inception Report (ideally within three weeks after receipt of NTP)
    - Progress Report (a month after submission of Inception Report)
    - Draft Final Report (a month after submission of Progress Report)
    - Final Report

1.5 PURPOSE AND CONTENTS OF THE INCEPTION REPORT

This Inception Report outlines the overall approach proposed for the progressive works of this Project, as well as the initial works already accomplished. It defines a framework of methodologies which will be applied with respect to the general descriptions provided in the Terms of Reference (TOR) and adaptive to the project areas involved.

This report contains the following chapters:

Chapter 1: Introduction – Provides a brief description of the Project, including the rationale and objectives. The scope of work of the Consultant and the purpose and basic contents of the Inception report are also described in this chapter.

Chapter 2: General Description of Works – Describes the latest activities performed for Project accomplishment.

Chapter 3: Summary of Mapping Accomplishments – Presents the map outputs made during and after fieldwork, initial geoprocessing and the next activities.

CHAPTER 2

GENERAL DESCRIPTION OF WORKS

As agreed in the meetings and correspondences held with the Team, a fieldwork was conducted from June 23 to July 9, 2016 at the city of Dipolog, and municipalities of Siayan and Leon B. Postigo (formerly Bacungan). Works included groundwork preparation (courtesy calls, interviews with local officials, and data gathering), road survey, mapping tasks, and geoprocessing. The mapping and geoprocessing activities shall be discussed in separate chapters.

2.1 PREPARATION FOR FIELDWORK

Prior to the dissemination of WCI team to areas of field study, all equipment and necessary documents were prepared and evaluated. Endorsement letters to mayors of pilot LGUs to visit were prepared and signed to facilitate introduction of both the Project and the survey team to local officials, and endorse request for assistance during the road survey proper. Six (6) ASUS Zenfon Max with the following specs were purchased to aid geotaggers in the survey:

NETWORK	Technology	GSM / HSPA / LTE
BODY	Dimensions	156 x 77.5 x 10.6 mm (6.14 x 3.05 x 0.42 in)
	Weight	202 g (7.13 oz)
	SIM	Dual SIM (Micro-SIM, dual stand-by)
DISPLAY	Type	IPS capacitive touchscreen, 16M colors
	Size	5.5 inches (~69.0% screen-to-body ratio)
	Resolution	720 x 1280 pixels (~267 ppi pixel density)
	Multitouch	Yes
	Protection	Corning Gorilla Glass 4 - Asus ZenUI
PLATFORM	OS	Android OS, v5.0.1 (Lollipop), upgradable to v6.0.1 (Marshmallow)
	Chipset	Qualcomm MSM8916 Snapdragon 410
	CPU	Quad-core 1.2 GHz Cortex-A53
	GPU	Adreno 306
MEMORY	Card slot	microSD, up to 64 GB (dedicated slot)
	Internal	8/16 GB, 2 GB RAM
CAMERA	Primary	13 MP, f/2.0, laser autofocus, dual-LED (dual tone) flash, check quality
	Features	Geo-tagging, touch focus, face detection, panorama, HDR
	Video	1080p@30fps, check quality
	Secondary	5 MP, f/2.0

These mobile phones, equipped with Routeshoot app, were installed in a fabricated metal holder. A prototype was made prior to the field work, which was loaded to a

motorcycle, as shown in **Figure 2.1-1**. The prototype was allowed to run with the Routeshoot app on and working.

Figure 2.1-1
Mobile/Camera mounted on motorcycle

2.2 ESTABLISHING GROUNDWORK

On 23rd June, the geotagger team from WCI flew to Dipolog City to officially start with the road survey for pilot city/municipalities in Zamboanga del Norte. During the first day, appointments with personalities, the Regional Director of DILG and the Mayor of Dipolog City, were arranged. On the following day, the Team had a courtesy call with Regional Dir. Paisal O. Abutazil at the DILG Regional Office in Pagadian City, as shown in **Figure 2.2-1**. The Project was introduced during the said meeting, and Dir. Abutazil expressed his appreciation and support for the Project, stating its indispensability to future road works and project management, particularly of the pilot LGUs under his jurisdiction. The Team also requested endorsement from the DILG Office of the region to easily acquire assistance from local officials in pilot LGUs during the survey proper.

Figure 2.2-1
WCI Team Meeting with DILG Regional Dir. Abutazil
*(middle)***:** *Ian Servillon (left) and WCI Team Leader Engr. Joseph Ocampo (right*)

The next two days (June 25 – 26) were spent readying the equipment and app for the road survey. Metal holder supports for mobile phones were fabricated. To practice and familiarize the survey process, geotaggers conducted a dry run using the Routeshoot app while riding on a motorcycle (see **Figure 2.2-2**). Strategies for easier yet smarter conduct of the road survey were designed as well.

Figure 2.2-2
Mobile and Metal Holder Set-up fastened on a motorcycle
(Routeshoot App running)

Prior to the conduct of road survey in Dipolog, the Team successfully met with Budget Officer Romeo Reyes (**Figure 2.2-3**), the OIC Mayor of Dipolog City while the local government is undergoing transition following the recent national elections. The goals of the Project were lauded by the OIC, and in line with this, the team was endorsed to the involved personnel of City Engineering and City Planning and Development, particularly to engineers who can assist in the road survey (**Figure 2.2-4**). During the coordination meeting, local engineers pinpointed to the Team roads which were not included in the road tasking, the current road type and quality of the roads, road names, as well as the status of road responsibility (if under DILG or DPWH). The results of the meeting significantly reduced the time and efforts that are to be consumed should all the roads in the tasking are surveyed by the geotaggers, without compromising the accuracy of completed road maps for the pilot LGUs.

Figure 2.2-3
Members of Project Team
Worldbank's Tristan Cañare (left) and WCI Team Leader Engr. Joseph Ocampo (right) **with OIC Romeo Reyes** *(middle)*

Figure 2.2-4
Coordination Meeting
with the engineers City Engineering Office (CEO) and City Planning and Development Council (CPDC)

2.1 ROAD SURVEY

The Routeshoot + road tracking process were conducted with the local engineers of Dipolog CEO and CPDC for the start of survey proper as well as for demonstration purposes.

Figure 2.3-1
Road tracking survey with engineers from Dipolog CEO and CPDC
(From left to right: Geotagger Ian Servillon, CAD Operator Dawn Syringe C. Pañares, Municipal Engineer Gavina Bontuyan, Team Leader Engr. Joseph Ocampo, Engr. Richard Kagatan, and Geotagger Caleb Elumbaring)

The road tracking was continued up to the next couple of days by the members of the Team, and then by a hired local from Dipolog City, who was taught the survey process and tasked to complete the road tasking while the Team is conducting surveys in the other two (2) municipalities, Siayan and Leon B. Postigo (formerly Bacungan).

On the first week of July, the Team traveled to the said municipalities, which were geographically next to each other. Courtesy calls were made to the mayors of Siayan

and Leon B. Postigo, who then endorsed the Team to the municipal engineers to assist in the road tracking operations.

Figure 2.3-2
Meeting with Siayan MPDC Sixto S. Atuy, Jr.

Figure 2.3-3
Coordination Meeting with the engineers of Siayan MPDC and MEO

The municipality of Leon B. Postigo also lent a four-wheeled vehicle for the road tracking of highly elevated areas with muddy or rocky terrains that render the operations difficult.

Figure 2.3-4
Municipal engineers with geotaggers Ian Servillon *(far left)* and JV Macasieb *(far right)*

Figure 2.3-5
Municipal vehicle used during the first road tracking in Leon B. Postigo

During the road tracking, the Team was introduced to the barangay officials, who in turn assisted in the geotagging activities in their areas of jurisdiction. This strategy was particularly helpful in locating existing roads that are not included in the tasking, as well as making possible the traverse of such roads despite the obstacles that either block them from sight or hinder travel by vehicle (eg. those that lead to rivers or dilapidated bridges). The Team went back to Manila on 9th July, Saturday.

Figure 2.3-6
Coordination with Bgy. Capt. Joyji O. Geromo of Nasibac, Leon B. Postigo*(right)*

Figure 2.3-7 Barangay officials of Nasibac assisting the Geotaggers team

Figure 2.3-8
Road tracking proper in Leon B. Postigo

Figure 2.3-9
Routeshoot App in operation during Road tracking

CHAPTER 3

SUMMARY OF MAPPING ACCOMPLISHMENTS

3.1 MAPPING CAPABILITIES OF LGUS

The pilot LGUs were observed as to the mapping capabilities of the local government. Dipolog City utilizes AutoCAD for mapping purposes, although a road map as shown in **Figure 3.1-1** is manually made, schematic and unscaled. **Figure 3.1-2** on the other hand shows the barangay map of Nasibac in Leon B. Postigo, which was extracted from the Official Administrative Map being used by the municipality.

Figure 3.1-1
Road Map from Dipolog LGU

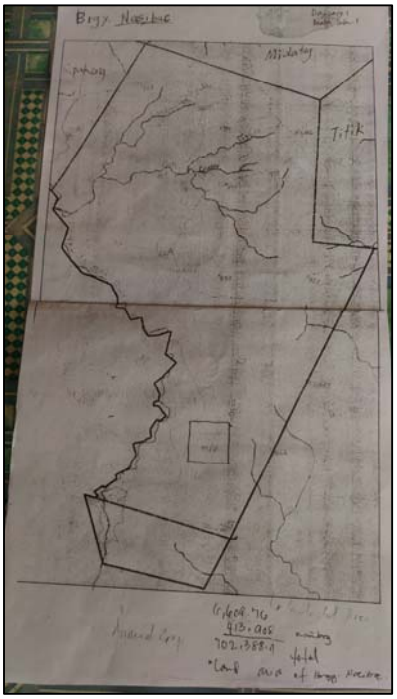


Figure 3.1-2
Baranggay Map of Nasibac, Leon B. Postigo

3.2 MAPPING STRATEGIES DURING ROAD SURVEY

Prior to traveling to pilot LGUs in Zamboanga del Norte, the WCI Team has prepared base maps based on the tasking provided by the World Bank Team. These maps include road data from DPWH – RBIA, OSM, and predictions from high-resolution and real-time satellite captures of Planet Labs. To minimize the required work load and optimize the time for survey operations, the Team has coordinated with the local engineers from the Engineering, and Planning and Development offices.

Due to their familiarity of the roads within their jurisdiction, the engineers have been able to point out to the Team not only the locations, but most importantly, the conditions

of the said roads (i.e. quality and type), the names, and the specific government agencies responsible for the project. The Team was also able to traverse the local roads which were not indicated in the Project's road tasking thru the assistance of the local engineers and barangay officials.

3.2.1 Methods and Tools Used During Road Tracking

Each road tasking has start and end points. The road connecting these points must be traversed while the Routeshoot app (with video) is up and running. The fabricated metal support fastened in the vehicle holds the mobile phone while on move, keeping it safely and conveniently in place despite the bumps of the trek, and ensuring the most stable video capture possible. The Premise App, which contains the survey questions presented in **Table 3.2.1-1**, is switched on only at the start and end of the road tasking, since it is not possible to keep both this app and the Routeshoot on while tracking the road.

Table 3.2.1-1
Information Required by the Premise App for Road Tracking Operations

	Data	Description
1	timestamp	survey date
2	campaign_id	system generated
3	user_id	system generated
4	user_name	contributor who finished and uploaded the task/ end survey
5	status	survey status (accepted, denied, etc)
6	obs_uid	system generated
7	place_uuid	system generated
8	location_accuracy	GPS accuracy of smartphone to task point
9	loc_lat	latitude of end survey based on smartphone GPS
10	loc_lon	longitude of end survey based on smartphone GPS
11	routeshoot_completed	if routeshoot is completed (yes or no)
12	yes_no_road	if there is a road (yes or no)
13	public_road	if road is public (yes or no)
14	road_use	what the use of the road (private, fmr, main, unsure)
15	road_material	type of road (dirt, gravel, concrete, paved)
16	width	road width
17	road_name	name of road
18	road_condition	road condition (bad, poor, fair, good)
19	busy_level	if road is busy
20	road_signs_speed_limit	if speed limit signs are visible
21	road_signs_street_name	if street name is present
22	road_signs_other	if other road signs are present
23	road_signs_ads	if road ads are present
24	image	road image taken in the field
25	place_name	road task name

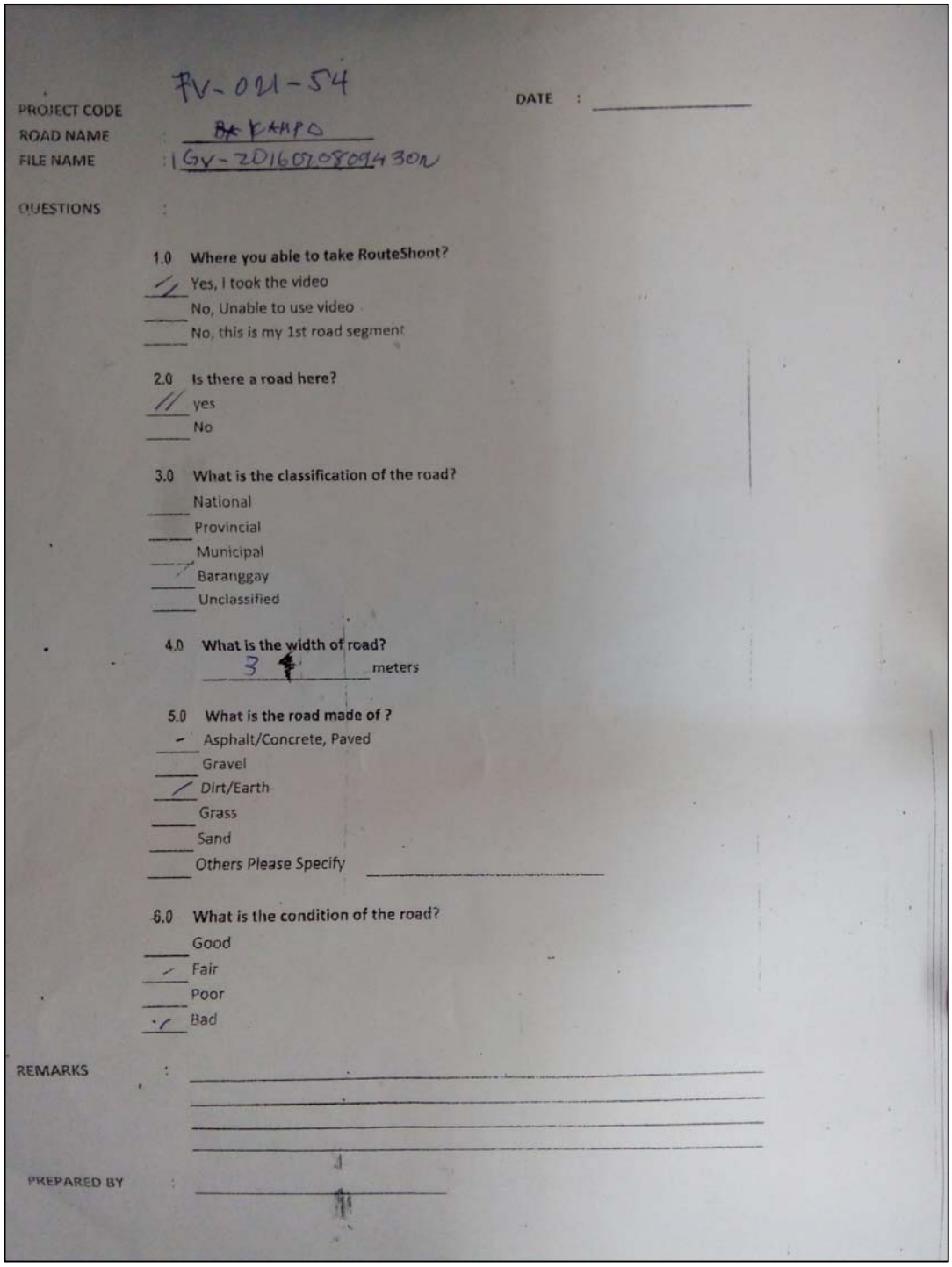
Aside from the Premise survey questionnaire, the geotaggers also noted irregularities encountered during the road survey. All information relevant to the road condition analysis and evaluation were recorded, particularly road and infrastructure projects in construction, bad road conditions such as potholes and large cracks, and bridge and river crossings (see figures below).

Figure 3.2.1-1
Unfinished Bridge Encountered During Road Tracking in Leon B. Postigo

Figure 3.2.1-2
A Bridge Project Being Constructed

3.2.2 Issues

During the road survey, the Premise App was not used by the geotaggers due to some technical issues. The Team was not given account credentials for Premise prior to travel to Zamboanga del Norte, and was put into waitlist by the website when the members tried to create an account. Given the time constraints and the need to mobilize the survey as soon as possible, the Team settled for a survey questionnaire enumerating some queries from the Premise App that were presented during the first Team Meeting with the World Bank (see **Figure 3.2.2-1**).



PROJECT CODE : FV-021-54
ROAD NAME : BA KAMPO
FILE NAME : GV-20160708094302

DATE : _____

QUESTIONS :

1.0 Where you able to take RouteShoot?
/ Yes, I took the video
___ No, Unable to use video
___ No, this is my 1st road segment

2.0 Is there a road here?
// yes
___ No

3.0 What is the classification of the road?
___ National
___ Provincial
___ Municipal
/ Baranggay
___ Unclassified

4.0 What is the width of road?
3 meters

5.0 What is the road made of ?
/ Asphalt/Concrete, Paved
___ Gravel
/ Dirt/Earth
___ Grass
___ Sand
___ Others Please Specify _____

6.0 What is the condition of the road?
___ Good
/ Fair
___ Poor
/ Bad

REMARKS : _____

PREPARED BY : _____

Figure 3.2.2-1
Sample Survey Questionnaire Used by Geotaggers

The videos captured in Routeshoot as well as the notes taken by the geotaggers during the road tracking shall be used for analysis to make up for the questions which were not included in the survey. Moreover, the Team suggested the following queries in **Table 3.2.2-1**, which were based on the results of the road tracking, to be added to the

Premise survey for the next field work in Zamboanga Sibugay.

Table 3.2.2-1
Suggested Additional Queries Based on Fieldwork Evaluations

Data	Questions
routeshoot_completed Query: if routeshoot is completed (yes or no)	Q: If NO, why? • abandoned roads • unpassable due to physical conditions (thick vegetation, very bad road condition, landslide hazard) • bad weather conditions • private ownership • high security risks/threats
For roads excluded in tasking	Q: Is this road included in road tasking? If No, did you take RS?
For bridges/rivers encountered during tracking	Q: Is there a bridge on each river crossing of road tasks?
For analysis/evaluation of road passability based on width and other conditions (thick vegetation, terrain, hazards, etc.)	Q: What mode of travel did you use? • two-wheeled • three-wheeled • four-wheeled • on foot

Another issue is the lack of classification for bridges. The types specified for roads are asphalt, concrete, earth, and gravel. However, there are no specifications provided for bridges. Furthermore, some road tasking include tracks that are rivers on actual ground, without any bridge, like the one presented in **Figure 3.2.2-2**. This area is located in Brgy. Pange in Siayan. During strong rains, the river is impossible to cross by any type of vehicle, and the only mode of transportation is a raft.

The geotaggers also trekked the roads which were not included in the tasking. Upon finishing the required road tasking, they returned to the unidentified roads branching from the road tasking to conduct the survey as well. These additional roads were also uploaded to the ORMA platform during the geoprocessing step.

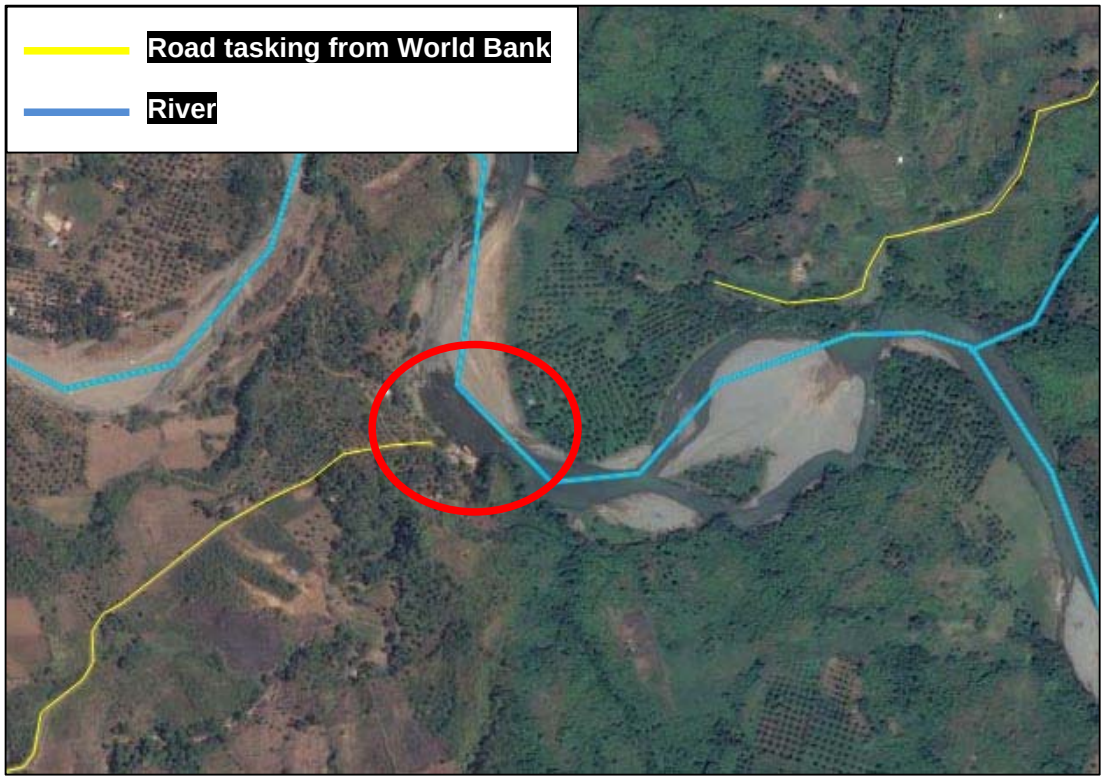
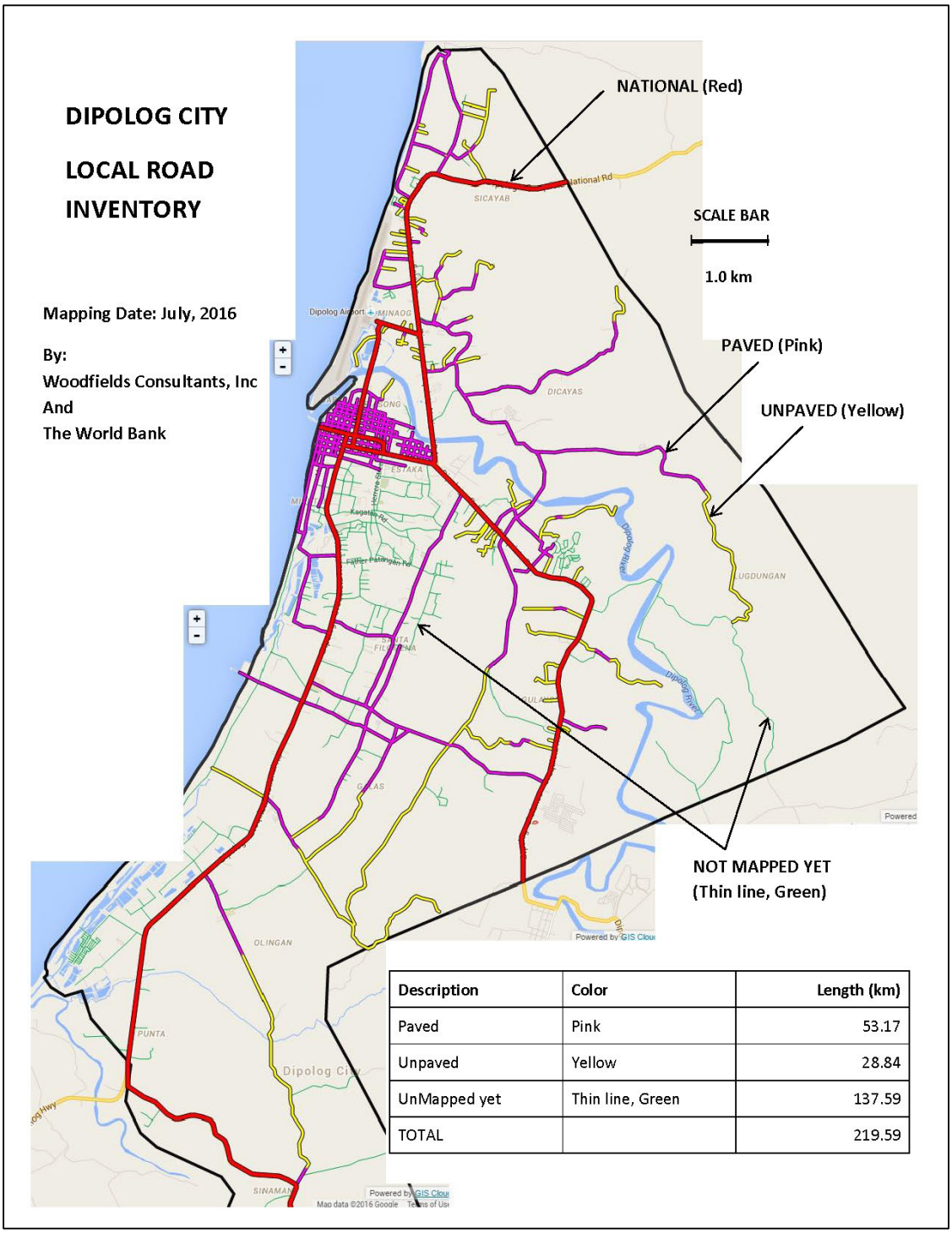


Figure 3.2.2-2
Road Tasking Cut by a River in Pange, Siayan

Local officials in the pilot LGUs appreciate the efforts of the Project. In fact, the staff from Engineering Office, and Planning and Development Council requested copies of road maps from the Team. The said maps show the status of road condition, mainly: paved and unpaved, as well as the total length of each road classification. A sample (for Dipolog City) is presented in **Figure 3.2.2-3** and **3.2.2-4**



Description	Color	Length (km)
Paved	Pink	53.17
Unpaved	Yellow	28.84
UnMapped yet	Thin line, Green	137.59
TOTAL		219.59

Figure 3.2.2-3
Dipolog Road Map Accomplished by the Team during Survey (Upper Portion)

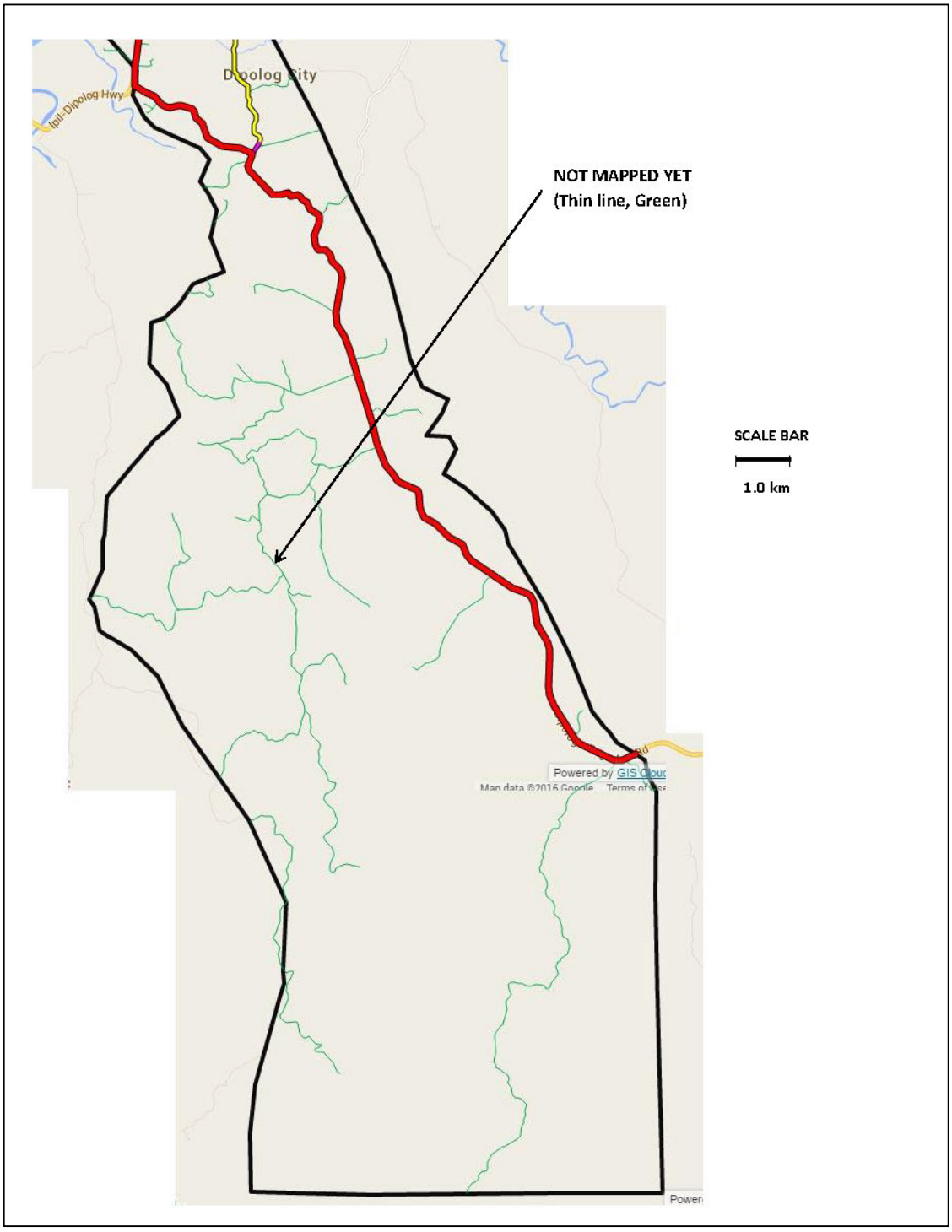


Figure 3.2.2-4
Dipolog Road Map Accomplished by the Team during Survey (Bottom Portion)

3.3 GEOPROCESSING

All road tracking information as well as video captures, were uploaded to the ORMA platform for geoprocessing. Prior to the geoprocessing operations, members of the World Bank Team conducted a workshop with the WCI Team. The said meeting/workshop was held in the World Bank Office on 11th July, 2016. It was spearheaded by Mia Aranas and Marie Parca.

During the workshop, the methods taken during the road survey, as well as observations, issues, and recommendations were discussed. These details shall be used as relevant inputs to the next road survey operations, and future Project scale-up.

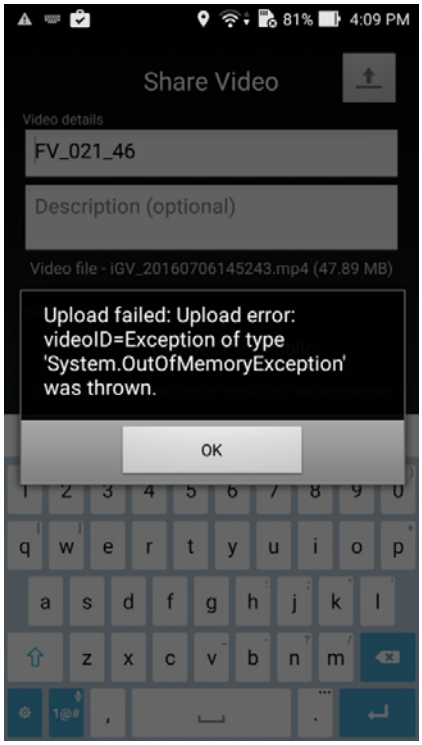
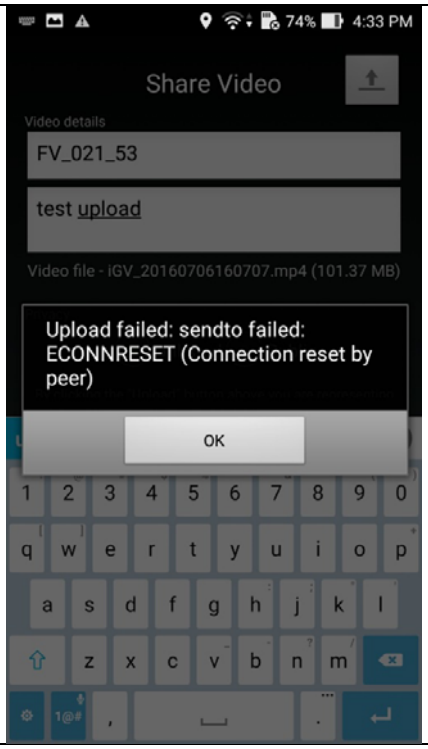
Figure 3.3-1
Workshop/Meeting of Project Team in the World Bank Office

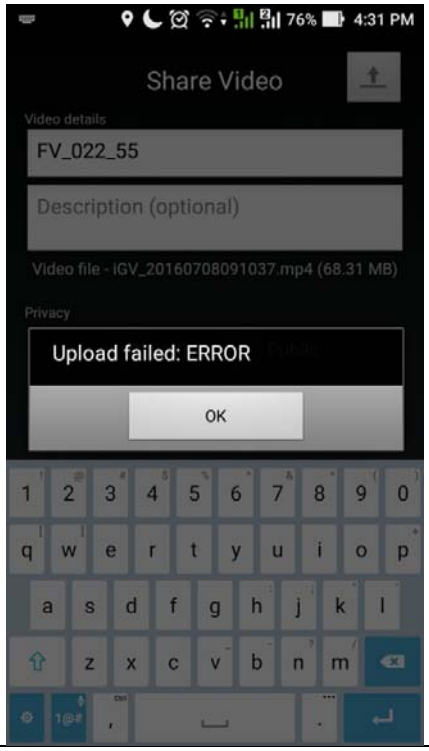
3.3.1 Status and Issues

The WCI Team is currently geoprocessing the road survey outputs for the three (3) pilot LGUs of Siayan, Dipolog City, and Leon B. Postigo. During the geoprocessing operations, the Team has encountered several difficulties, which are enumerated in **Table 3.3.1-1**. These issues were raised to the World Bank Team during the workshop/meeting. However, despite the actions taken to resolve such issues in the system, the WCI Team still experience problems all throughout the uploading stage.

In the geoprocessing operations, the Team noticed some areas for improvement. One of these is the lack of full viewing option of consolidated road network for the whole municipality. This will help in checking and monitoring of mapping progress, specifically the status of delineation i.e. completed or not. As of present, system allows only one Road Tasking per view. However, the World Bank stated that the construction and development of the system is still on-going.

Table 3.3.1-1
Issues Encountered During Geoprocessing

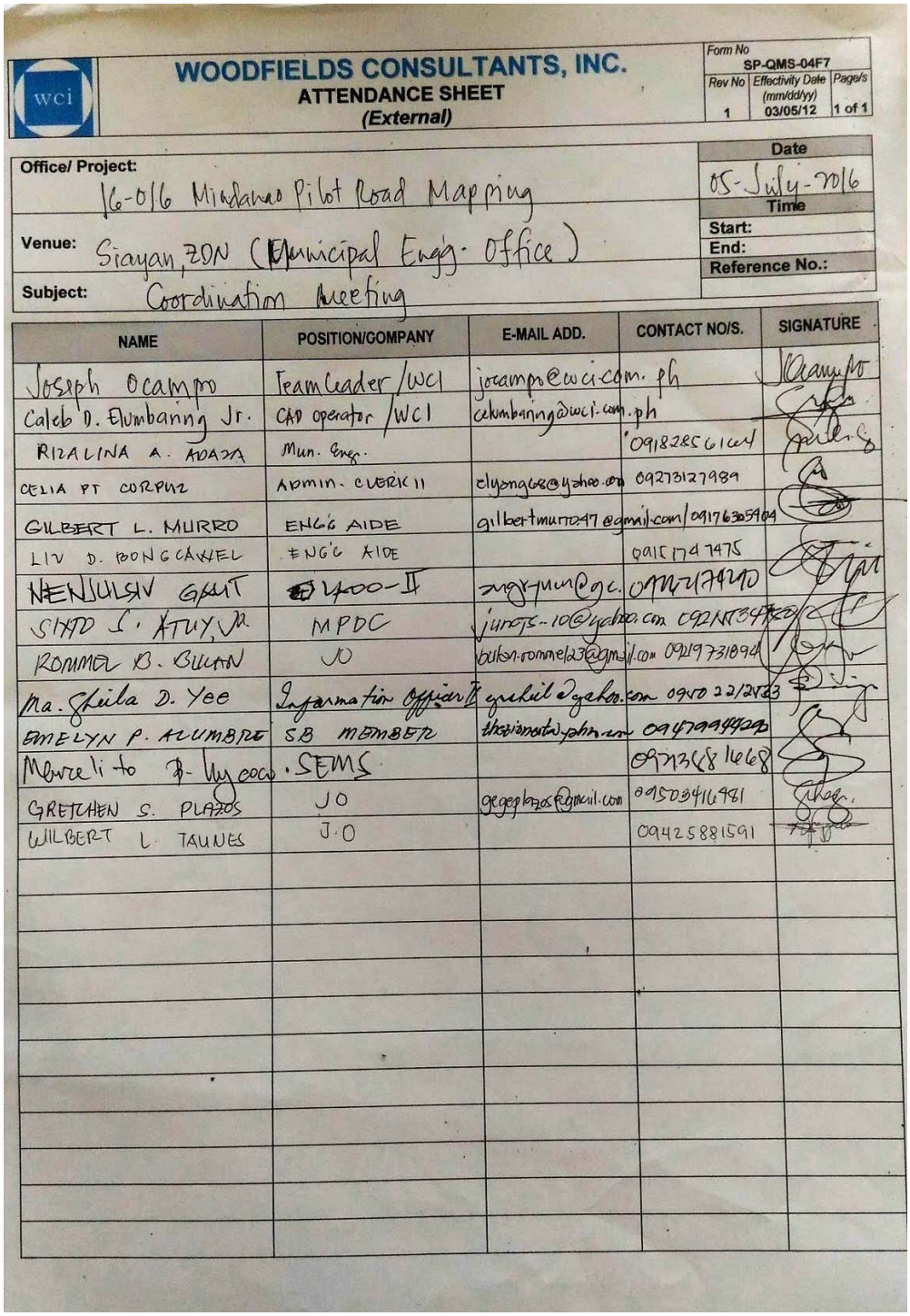
Issues	Remarks
Out of memory	
Connection Reset	

Upload Error	

3.4 NEXT ACTIVITIES

The next road survey operations for Zamboanga Sibugay pilot LGUs (Naga, Diplahan, and Buug) are scheduled on July 19 to 30, 2016. The same geotaggers shall conduct the road tracking, using similar approach performed in the first road survey, although the Team has been required to use the Premise App as the official survey questionnaire (start and exit polls) at the start and end points of each road tasking.

ANNEX A



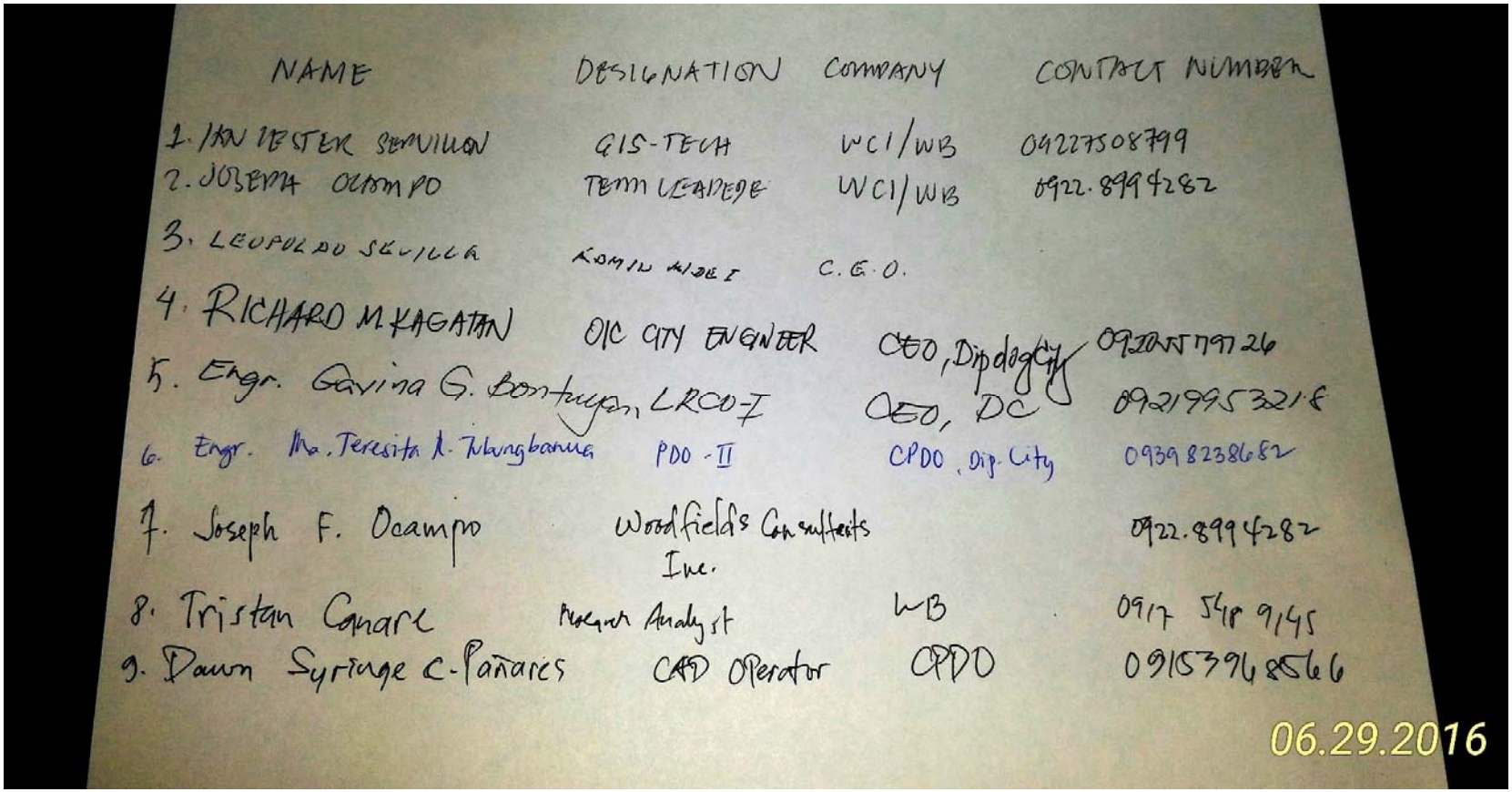
WOODFIELDS CONSULTANTS, INC.
ATTENDANCE SHEET
(External)

Form No	Rev No	Effectivity Date (mm/dd/yy)	Page/s
SP-QMS-04F7	1	03/05/12	1 of 1

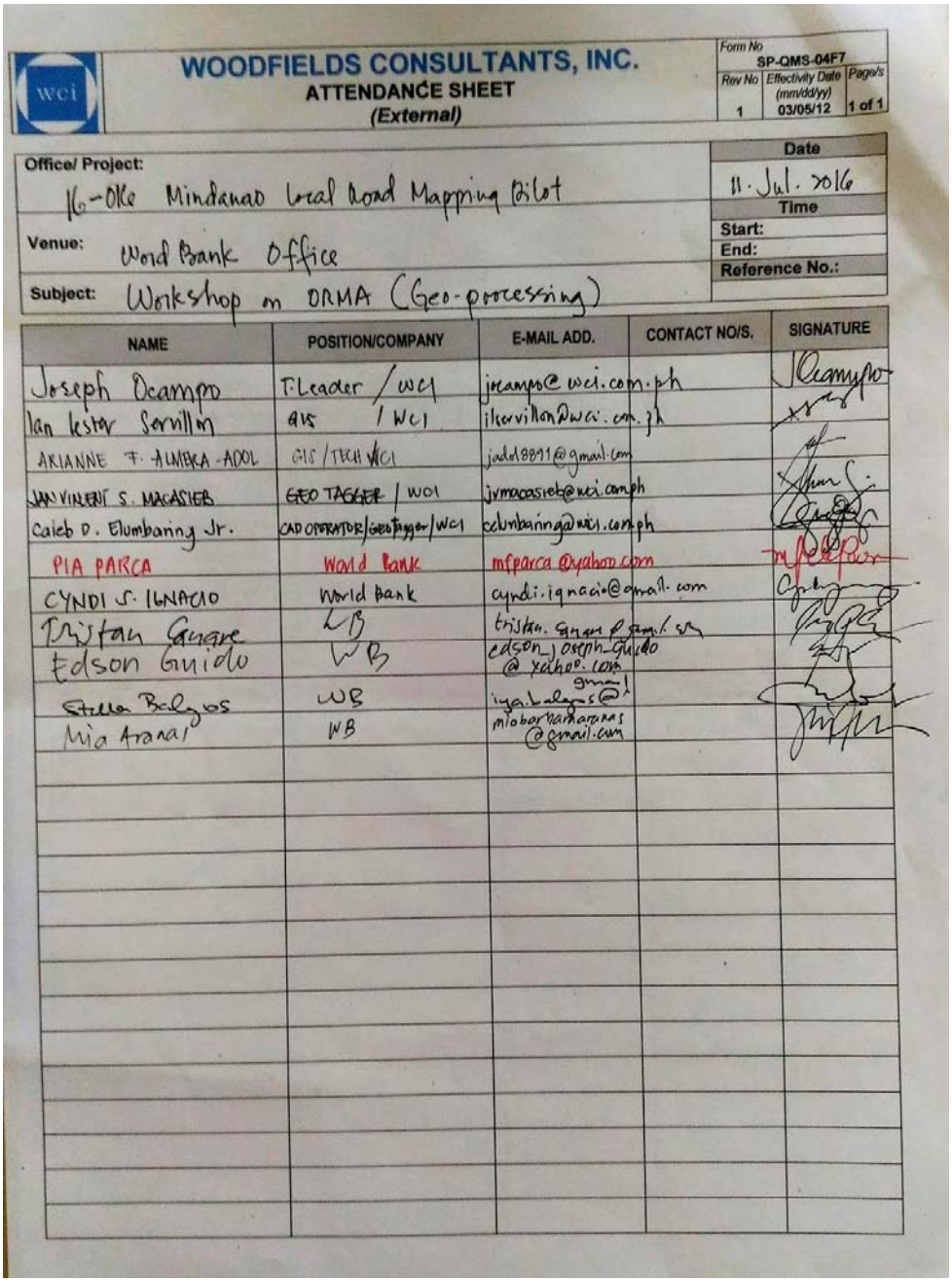
Office/ Project: 16-016 Mindanao Pilot Road Mapping
Venue: Siayan, ZDN (Municipal Engg. Office)
Subject: Coordination Meeting
Date: 05-July-2016
Time
Start:
End:
Reference No.:

NAME	POSITION/COMPANY	E-MAIL ADD.	CONTACT NO/S.	SIGNATURE
Joseph Ocampo	Team Leader / WCI	jocampo@wci.com.ph		
Caleb D. Elumbaring Jr.	CAD operator / WCI	celumbaring@wci.com.ph	09182856164	
RIZALINA A. ADAZA	Mun. Engr.			
CELIA PT CORPUZ	ADMIN. CLERK II	elyngloe@yahoo.com	09273127989	
GILBERT L. MURRO	ENG'G AIDE	gilbertmurro47@gmail.com	09176305904	
LIV D. BONGCAWEL	ENG'G AIDE		09151747475	
[illegible]	[illegible]-II	[illegible]	[illegible]	
SIXTO S. ATUY, JR.	MPDC	[illegible]	[illegible]	
ROMMEL B. BULAN	JO	[illegible]	[illegible]	
Ma. Shiela D. Yee	Information Officer II	[illegible]	0920 22[illegible]	
EMELYN P. ALUMBRE	SB MEMBER	[illegible]	[illegible]	
Marcelito B. Lycoco	SEMS		09173681668	
GRETCHEN S. PLAZOS	JO	[illegible]	09503416981	
WILBERT L. TAUNES	J.O		09425881591	

SIAYAN COORDINATION MEETING MEO MPDC



DIPOLOG COORDINATION MEETING WITH CEO AND CPDC



WOODFIELDS CONSULTANTS, INC.
ATTENDANCE SHEET
(External)

Form No	Rev No	Effectivity Date (mm/dd/yy)	Page/s
SP-QMS-04F7	1	03/05/12	1 of 1

Office/ Project: 16-OKe Mindanao Local Road Mapping Pilot
Venue: World Bank Office
Subject: Workshop on ORMA (Geo-processing)
Date: 11 Jul 2016
Time
Start:
End:
Reference No.:

NAME	POSITION/COMPANY	E-MAIL ADD.	CONTACT NO/S.	SIGNATURE
Joseph Ocampo	T.Leader / WCI	jocampo@wci.com.ph		
Ian Lester Servillon	GIS / WCI	ilservillon@wci.com.ph		
ARIANNE F. ALMERA-ADOL	GIS / TECH WCI	jadd8891@gmail.com		
JAN VINCENT S. MAGASIEB	GEO TAGGER / WCI	jvmagasieb@wci.com.ph		
Caleb D. Elumbaring Jr.	CAD OPERATOR/GeoTagger/WCI	cdelumbaring@wci.com.ph		
PIA PARCA	World Bank	mfparca@yahoo.com		
CYNDI S. IGNACIO	World Bank	cyndi.ignacio@gmail.com		
Tristan Gunare	WB	tristan.gunare@gmail.com		
Edson Guido	WB	edson_joseph_guido@yahoo.com		
Stella Belgos	WB	iya.belgos@gmail.com		
Mia Aranal	WB	miabermarantas@gmail.com		

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