JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO., LTD)

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

TOPOGRAPHICAL SURVEY FINAL REPORT

Partial Palu Bridge IV Project (PB4 Project)

10 May 2019 [R]

Prepared by;

- Kardi Sukatma
- Frans Segar Gultom

PT. GEOMARINDEX

Graha Simatupang 7th Floor Tower II Blok A & D
Jl. Letjen TB Simatupang Kav. 38, Jakarta 12540 - Indonesia
t. 021 7817777 (Hunting) | f. 021 7829337 | m. +62 811864458
email: geomarindex@gmail.com

PT GEOMARINDEX

No. : U/060/GEO/Adm/V/2019 Jakarta, 2 May 2019

To: **The JICA Project Team**
(A Joint Venture / consortium of Yachico Engineering Co., Ltd., and Oriental Consultants Global Co., Ltd.)
CS Tower, 5-20-8 Asakubasahi, Taito-ku, Tokyo 111-8648, JAPAN

Attn.: Mr. ILAVUNA Erick Kagesi | e-mail: kagesi@ocglobal.jp

Subject: **PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI | TOPOGRAPHICAL SURVEY - Partial Palu Bridge IV Project (PB4 Project)** | Final Report

Dear Sir,

In accordance with the Service Agreement between **The JICA Project Team (A Joint Venture / consortium of Yachico Engineering Co., Ltd., and Oriental Consultants Global Co., Ltd.); and PT GEOMARINDEX, date March 15th, 2019 to carrying out a Topographical Survey for the project for Development of Regional Disaster Risk Resilience Plan in Central Sulawesi,** we herewith submit a set of final report as completion documents to the mentioned agreement.

The report comprising the technical methodology, results of data adjustment and analysis

We hope that data presented in this report will be satisfied for engineering purposes, and finally we thank you for attention.

Yours sincerely,

p.t. geomarindex

Authorized Signature

Name and Title of Signatory:	Frans Segar Gultom President Director
Name of Firm:	PT. GEOMARINDEX
Address:	Graha Simatupang, 7th Floor, Tower II Block A, Jl. Letjen. TB. Simatupang Kav. 38, Jakarta 12540
Contact information (phone and e-mail):	t. +62 21 7884 0421, +62 21 781 7777 | m. +62 811 8644 58 geomarindex@gmail.com, gultom@wiratman.co.id

CONTENTS

APPENDICES

1. INTRODUCTION

This report is written based on the Service Agreement between The JICA Project Team (A Joint Venture / consortium of Yachico Engineering Co., Ltd., and Oriental Consultants Global Co., Ltd.); and PT GEOMARINDEX, date March 15th, 2019 to carrying out a Topographical Survey for the project for Development of Regional Disaster Risk Resilience Plan in Central Sulawesi.

The parties:

- **The JICA Project Team (A Joint Venture / consortium of Yachico Engineering Co., Ltd., and Oriental Consultants Global Co., Ltd.);** which duly organized and existing under the laws of the Japan, with its principal office at CS Tower, 5-20-8 Asakubasahi, Taito-ku, Tokyo 111-8648, JAPAN, thereinafter referred to as "**the Consultant"**, and;

- **PT GEOMARINDEX**, a limited liability company duly incorporated under the laws of the Republic of Indonesia, having its domicile at, 7th Floor Graha Simatupang Tower II A, Jl. Letjen. TB. Simatupang Kav. 38, Jakarta 12540, INDONESIA (thereinafter referred to as **"the Sub-Consultant").**

2. THE OBJECTIVE & PROJECT SITE

The objective of this topographic survey was to collect the topographic data around the project site in order to get an overview of the existing ground surface to produce a topographic map at basic scale of 1: 500 in digital AutoCAD format. This topographic map will also include information on spot height elevation, contour line and existing infrastructure.

The project site:

The project site - Palu Bridge IV or Ponulele Bridge is located in Palu City, Central Sulawesi, Indonesia. Address: Jl. Syaikh Muhammad Al-Khidhir, Central Sulawesi. It's geographically located around the co-ordinates: 0°53'7.15" South, and 119°51'31.40" East. This location is presented in **Figure-1**.

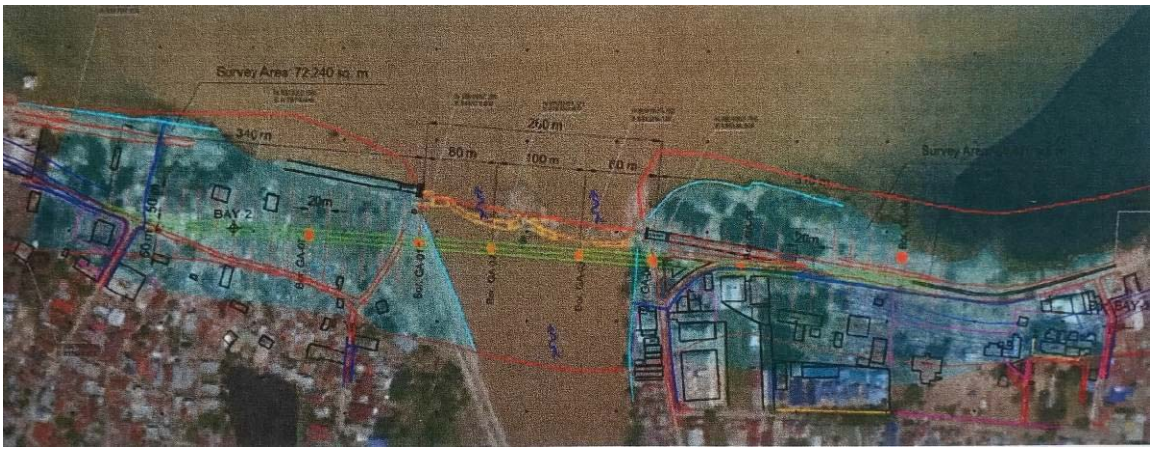


Figure-1: Location Map

3. SCOPE AND COMMENCEMENT OF THE WORK

A. Main scope of work and implementation stage :

To achieve the aims and objectives according to the work mentioned above, the main scope of this topographic survey was to cover the corridor area of the land to be used in the development project. The stages of implementation were carried out as follows;

(1) Office preparation and mobilization, including the team's preparatory work, calibration of equipment, etc.

(2) Field preparation, including the orientation of the project site, determination of the reference points, preparation of survey tools, local transport, local labor, etc.

(3) Selecting the existing reference benchmarks and tied project co-ordinates system

(4) Site reconnaissance and establishing the project area's ground datum points - Benchmarks and their corresponding Control points (BM & CP)

(5) Measurement of the datum points network for mapping, both horizontal and vertical control using the proper equipment, to ensure accuracy.

- Static GPS Survey – Tied project site co-ordinates to the national co-ordinates system (benchmark station : CORS)
- Transverse Survey – Project Horizontal Control Survey
- Leveling Survey – Project Vertical Control Survey

(6) Carrying out a detailed topographic survey in order to obtain a current topographic map of the site to be used in the detailed lay out for development design purposes

(7) Data Processing, Adjustment, Drawing/map plot and Report as data deliverables.

B. Detailed of Scope of Work

Details of the scope of the work plan and actual implementation are presented in the table below.

No	Unit	Qty	Plan Quantity	Actual Quantity	Balanced Quantity	Remark
1	Mobilization & demobilization	Project site	1	1	0	
	1.01 Creation of Project Datum points, tied to the National CORS system :					
	(1) Left Bank	No	3	3	0	
	(2) Right Bank	No	3	3	0	
2	Topographic Survey					
	2.01 Local Plan Survey :					Topographic map
	(1) Left Bank	m^2	72,240	98,963	26,723	
	(2) Right Bank	m^2	86,470	119,738	33,268	
	2.02 Planned road CL Longitudinal survey :					Longitudinal Section survey along proposed center line
	(1) On-land	m	820	707	-113	
	(2) Across river (bathymetry)	m	250	220	-30	
	2.03 Project road Transverse survey from bridge abutment outwards, 20m pitch :					Cross Section survey
	(1) Left Bank (18 @ 100m long section)	m	1,800	1,800	0	
	(2) Right Bank (17 @ 100m long section)	m	1,700	1,700	0	
	(3) River body (13 lines)	m	0	1260	1260	
3	Survey Analysis and Reporting	Report book	1	1	0	

C. Commencement of the Work :

Prior to the survey work, the survey team (equipment and personnel) were mobilized to the project site on March 20th, 2019. Site Reconnaissance was done on March 21, 2018. Data acquisition in the field was carried out from April 4, to April 9, 2018. Subsequently, final data processing and report writing was done at our Jakarta head office.

4. DEFINITIONS & ABBREVIATIONS

The following term a used throughout this document, where used they will have the meanings as defined below:

- WGS-84 World Geodetic System 1984
- DGN-95 Datum Geodesi Nasional 1995 (DGN95 is coincides with WGS84), National Indonesia Geodetic Datum.
- SRGI 2013 Sistem Referensi Geospasial Indonesia 2013 (Indonesia Geospatial Reference System, 2013)
- BIG Badan Informasi Geospasial “Geospatial Information Board”, formerly BAKOSURTANAL (National Survey Mapping and Coordination Board).
- CORS Continuous Operating Reference System which is managed by BIG
- RMS Root Mean Square
- ppm Part Per Million
- EGM Earth Gravitational Model
- ITRF International Terrestrial Reference Frame
- DGPS Differential Global Positioning System
- MSL Mean Sea Level
- CD Chart Datum
- PD Project Datum
- UTM / TM Universal Transverse Mercator / Transverse Mercator
- QA / QC Quality Assurance / Quality Control
- BM / CP Benchmark / Control Point
- TS/ ETS Total Station / Electronic Total Station
- HSE / JSA Health Safety Environmental / Job Safety Analysis

5. PERFORMANCE OF ORGANIZATION, PERSONNEL & EQUIPMENT

5.1. Organization Diagram

To complete this survey work, a project team was organized as presented in the ***Figure-2*** below;

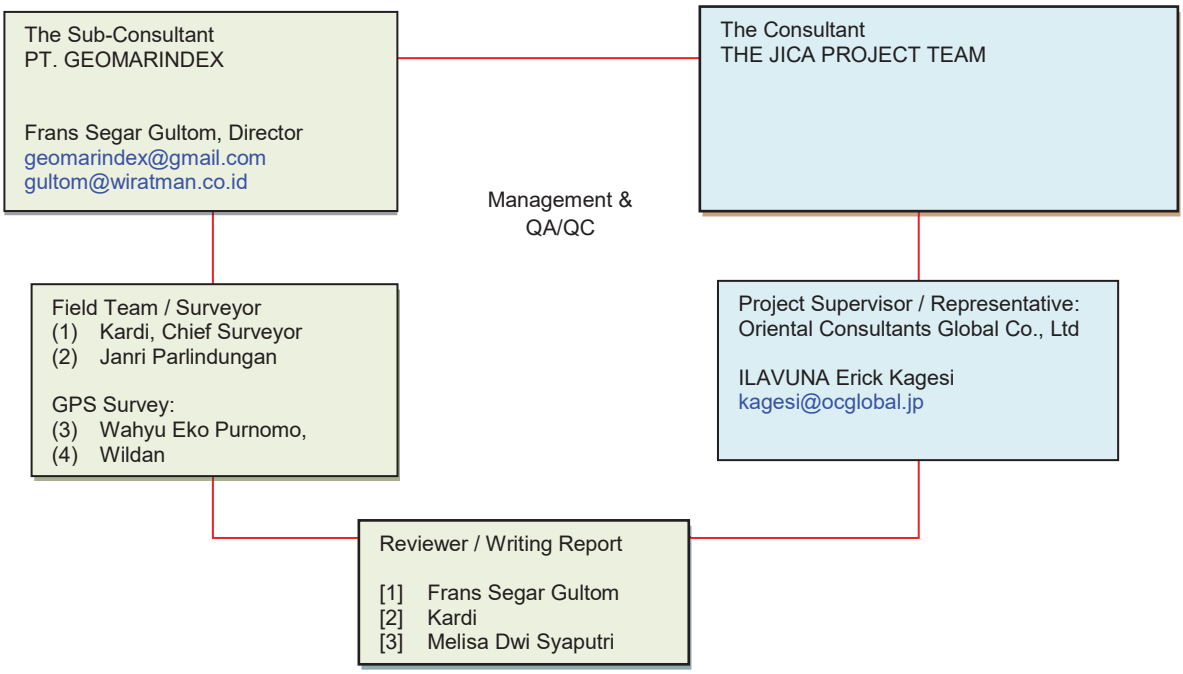


Figure-2: Project Organization

5.2. The Personnel

To complete the work required in this project, a project team was formed comprising of specialists with appropriate support staff and local helper, as follows:

(1) Site Survey Personnel	▪ Kardi Sukatma, Chief Surveyor / Site Engineer ▪ Jandri Parlindungan, Surveyor ▪ Wahyu Eko Purnomo, GPS/Geodetic Engineer ▪ Wildan, GPS operator ▪ Local Labour as Asst Surveyor
(2) Data Processor, Drawing & Reporting	▪ Frans Segar Gultom, QA & QC ▪ Wahyu Eko Purnomo, GPS/ Geodetic Engineer ▪ Kardi Sukatma, Data Processor/ CAD Operator

5.3. The Equipment

The equipment and material support to completion this survey consisted of:

The equipment	*Function Capacity*
▪ 4 (four) units Geodetic GPS, South S86T receiver dual frequency	For GPS Survey, tied project site co-ordinate to the National CORS as reference of co-ordinates
▪ 1 (one) unit Total Station, TOPCON ETS E100 with accessories	For traversing / horizontal control survey and detail topographic data acquisition.
▪ 1 (one) unit Total Station, TOPCON GTS 235N with accessories	For detail topographic data acquisition.
▪ 1 (one) unit Automtic Precise Level TOPCON AT-G2	For leveling survey, vertical control survey
▪ 4 (six) pcs Radio communication (HT)	Communication on the field at the time of measurement, especially the implementation of measurement Polygons/Traversing.
▪ 2 (two) unit Laptop Pentium Intel Core i7	For data processing, analysis and report writing
▪ 1 (one) set PC, printer & plotter	For final data processing, analysis and drawing (at head office)

6. PERFORMANCE OF METHODOLOGY

Survey methods were followed with reference to general standards of terrestrial topographic survey for industrial and engineering standards. Overall stages of activity can be classified into three (3) stages, namely: (1) preparation, (2) Site data acquisition, (3) Data analysis and plotting & reporting.

6.1. Preparation

The preparatory work includes the following items:

a. Office preparation, including preparation of administration, preparation of implementation of the survey team (equipment and personnel), checking and calibration of equipment to be used, coordination with Employer and other related agencies.

b. Field Preparation, include coordination with the consultant on site concerning technical and non-technical matters for the implementation of the work was done. This, consisted of setting up local workers (local labor), local transport, site orientation, preparation of materials and counseling on safety and other related matters for the implementation of the work.

6.2. Corridor of Survey Area – Land Boundary Mapping

The corridor of the survey area was identified in the goggle map by the client and then the co-ordinates of the corners or the turning point of the boundary line then obtained to generate a working map in AutoCAD format and then it brought to the site to study the corridor of survey area. Each turning point, a flag as sign marker installed to make it easier to understand the survey area boundaries at the time of measurement of control survey network and topographic detailed situations (terrestrial topographic data acquisition).

6.3. Installation of Project Benchmarks

Installation of Project Benchmarks was intended to established permanent control points in the survey area. These datum points XYZ co-ordinates were referenced to the national datum points.

In total there are six (6) project benchmarks as permanent control points have been established at the project site. Each benchmark has its corresponding control point, CP, such that both BM and CP can function as reference co-ordinates and the azimuth direction. The location of each benchmark installation is selected and determined by the project Engineer Supervisor directly in the field. These points were made as per the following:

- The benchmarks were installed in a safe, suitable and stable location.

- The benchmarks (BMs) were installed as a concrete column of 20cm x 20cm x100cm with a metal rivet on center top as co-ordinate grid marker.
- The Code name for each benchmark was of the format: BM-01, 02… BM-06, written on the side of the benchmark. As for their corresponding CPs, they were installed with single reinforcement inside a PVC paralon, 4 inches x 100 cm with metal rivets in the upper center as co-ordinate grid markers. The code name of each CP is formatted as CP-01 ... CP-06 is written on the front side of the benchmark. Both BM and CP are painted blue.

- Benchmark (BM) and its corresponding Control Point (CP)

Detailed Information of both BM and CP is presented in **Appendix-3: Description of Benchmark.**

6.4. Reference Benchmark and Co-ordinates System

The nearest national reference benchmark used in this survey were CORS system benchmarks (CPAL and CAMP). The CORS data was procured from BIG (Geospatial Information Board, as Indonesia Survey & Mapping Agency). The description of these Reference benchmarks; CORS CPAL and CAMP are presented in **Appendix-1.**

The reference CORS benchmarks have the geodetic parameters specified below:

▪ Datum / Spheroid	WGS-84
▪ Projection	UTM, Zone 50 South
▪ Central Meridian	117° East
▪ Height Elevation	Ellipsoid WGS-84 Datum
▪ Geoid Datum	EGM 2008 (EGM08)
▪ Unit	Meter, Metric

6.5. Network GPS Survey and Adjustment Co-ordinates

Fundamentally, the GPS (global positioning system) operates by observing distances from receivers located on ground stations of unknown locations to orbiting GPS satellites whose positions are known precisely. Thus, conceptually, GPS surveying is similar to conventional resection, in which distances are observed with EDM instrument from an unknown station to several control points. Of course, there are some differences between GPS position determination and conventional resection. Among them is the process of observing distance and the fact that the control stations used in GPS work are satellites.

The survey method used to both tie the network from national CORS to the project benchmarks was by Static GPS method.

Work Procedure:

GPS measurement was carried out following the steps procedure below;

(i) Preparing a working map as GPS network map (closed loop network)

(ii) Static baseline survey method using 4 units of GPS receiver

(iii) The duration of baseline observation for the tied network from national reference station (CORS) to the project benchmarks was at least 6 hours. The duration of baseline observation for project benchmarks was at least 3 hours.

(iv) Post processing and reviewing data QA/QC was carried out by South GPS Software and the final UTM co-ordinates was adjusted by Trimble TBC Software.

The co-ordinates of each benchmark are summarized in **Table-1** below, and Detailed GPS Network Adjustment Report is presented in **Appendix-2**.

Table-1: Listing of Benchmark as project control point

No.	Station ID#	Geodetic Co-ordinates			UTM Zone 50S Grid Co-ordinates (GPS)			Remark
		Latitude	Longitude	Ellip. Height	Easting	Northing	EGM-08 Elevation	
		South Latitude	East Longitude	h (m)	E (m)	N (m)	H (m)	
1	CORS PALU	0°54'56.85138"	119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	Ref. National CORS
2	CORS AMPANA	0°52'16.67607"	121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
1	BM-01	0°53'14.12957"	119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.047	
2	CP-01	0°53'10.48368"	119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.430	
3	BM-02	0°53'14.89389"	119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.517	
4	CP-02	0°53'11.46472"	119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.075	
5	BM-03	0°53'10.47868"	119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6	CP-03	0°53'07.15717"	119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.995	
7	BM-04	0°53'07.26661"	119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.973	
8	CP-04	0°53'04.05392"	119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.285	
9	BM-05	0°52'46.39211"	119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.350	
10	CP-05	0°52'47.75458"	119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.358	
11	BM-06	0°52'52.17548"	119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.723	
12	CP-06	0°52'50.24008"	119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.746	

Note: The Co-ordinate system was referenced to national CORS PALU (CPAL) and CORS AMPANA (CAMP). The CORS data procured from Indonesia survey mapping agency (BIG, Badan Informasi Geospasial / Geospatial Information Board). BM-01 and BM-03 were the project site datum points used when tying the local site to the national CORS system: CPAL and CAMP.

6.6. Horizontal Control Measurement – Traversing (Polygon)

Measurement of horizontal control network was carried out by traversing method, generally called polygon, with the aim of establishing the XY (East, North) co-ordinates of additional control points within the project area. Observations started from project benchmarks (GPS point) as known reference co-ordinate. Measurements were made through benchmark (BM), traversing pegs and other intermediate help point markers installed for use during the data acquisition activities and any other subsequent purposes.

Traversing measurements were carried out following the procedure below;

Work Procedure:

(i) Preparing a working map as Traverse network map (close- loop network)

(ii) In the traversing survey method, Total Station TOPCON ES-100 was used.

(iii) Observation started from the selected GPS point as project reference control points where the co-ordinates were determined by GPS measurements earlier.

(iv) Measurements were made with a reading on both inside and outside angle of traversing points. In this, the reading to the target set back was 000° 00’ 00”. There were 4 sets data recorded at each occupation station point.

(v) Deviation of the horizontal angle is the angle inside and angle outside are kept to meet the standards (-5 "<d <5"), if it does not comply, then additional reading series should be done.

(vi) The distance is measured from two directions (forward and backward); in each direction with each reading recorded three times. Horizontal distances used in the traversing calculation are the average of measurements from two directions after deduction with vertical angle on each reading measure.

(vii) Post processing and reviewing data QA/QC was carried out by Traversing Software and the final adjusted co-ordinates was adjusted by Bowdith method.

(viii) Accuracy of traversing measurements, angle close error maximum 10 √ N (second) where N is the total number of observation station. And linear error maximum 1/ 10,000

Traversing network measurements were compiled and calculated by Topographic Software and the results can be seen in **Appendix-4: Traversing Computation** of this report.

6.7. Vertical Control Measurement - Precise Leveling

Measurement of vertical control network was carried out by leveling method, starting from project reference points. Measurements routes were made following the traversing network.

Leveling measurements were carried out following the procedure below;

Work Procedure:

(i) Preparing a working map as Leveling network map (close- loop network)

(ii) For this survey, an Automatic Level (TOPCON ATG-2) was used.

(iii) The distance between the levelling staff at the foresight and back sight stations must not be longer than 60 m, while the shortest distance must not be less than 5 m.

(iv) At each measurement, the third reading of the thread: the top hair, middle hair, and bottom hair was recorded.

(v) Measuring cross hair level was carried out as double stand, whereby the height difference between stand-I and-II must be complied less than 3 mm.

(vi) The maximum allowable accuracy of the leveling measurements is 10 √ D (mm) where D is the total distance in units of kilometers.

Leveling network measurements were compiled and calculated by Topographic Software and the results can be seen in **Appendix-5: Leveling Computation** of this report.

6.8. Verification of the Results of GPS Survey

Verification of the GPS survey results was carried out as follows;

(1) Verification of the N-E co-ordinates results obtained by GPS survey was done by comparing with the results of polygon survey

(2) Likewise, the verification of elevation (Z) results obtained by GPS survey was done by comparing the data with the survey results obtained using the precise level.

6.8.1. Verification Co-ordinates

Our GPS software (TBC) can analyze GPS data to generate co-ordinates in both UTM and LOCALIZED. The UTM co-ordinates indicate the measuring distance in the WGS-84 ellipsoid (GPS datum) while the LOCALIZED co-ordinates indicate the measuring distance in the ground distance or straight distance. From these two (2) co-ordinate systems the scale factor is known. Thus, we can convert distances from UTM to LOCALIZED or back (typically known as co-ordinate transformation).

At this project area, the UTM distance is longer than the ground distance. The co-ordinate transformation scale factor value obtained is as follows:

Parameter	Distance conversion from UTM to Localized	Distance conversion from Localized to UTM
Scale factor	0.999158501908837	1.000842207

The result of Polygon survey in both UTM and LOCALIZED can be seen in the **Appendix-4** of this report.

6.8.2. Verification Elevation

Elevation measurements were out in the field using precise leveling equipment as well as by GPS. The results of the two methods were compared and the results of the precise leveling found to be more accurate. Measurements by GPS show error in the order of 2 cm, however those by precise level show sub-millimeter order error. Therefore, the elevation values recommended for this project are the ones obtained by precise leveling. The result of Precise leveling survey can be seen in the **Appendix-5** of this report.

The correlation elevation of benchmark to the sea tides level:

(1) Tidal Information:

- Time Zone : GMT +8:00
- Type of Tidal : Mixed tides tend to semidiurnal
- Tide Range (lowest to highest): 2. 80m
- Chart Datum (Zo), LWS : 1.40 m below MSL

(2) The correlation of benchmark elevation to the tidal elevation was evaluated against the highest tidal level found in the land (High Water Spring: HWS). The elevation difference was then measured from an identified control point (CP-01) using the precise level, and the difference found to be 0.772m, where CP-01 is higher than HWS. This means that the elevation of HWS is: (elevation of CP-01 (3.429m) - 0.772m = 2.657m --> ~= 2.800m HWS datum. As the difference between HWS and LWS (Low Water Spring) is 2.800m, the elevation of LWS is: (elevation of HWS (2.657m) – 2.800m = -0.143m --> ~= 0.000m (LWS)

(3) The discrepancy of EGM and LWS Datum is 0.143m; with EGM-08 datum being 0.143m lower than LWS datum.

The correlation between EGM-08 GPS datum to LWS tidal datum is summarized in the **Table-2** below.

Table-2: Listing of Benchmark at EGM08 and LWS datum

No.	Station ID#	UTM Zone 50S Grid Co-ordinates (GPS)			ELEVATION		REMARK
		Easting	Northing	EGM-08 Elevation	EGM-08 DATUM, Precise Level Network	Elevation Ref to approx. LWS	
		E (m)	N (m)	H (m)	Z (m)	Z (m)	
1	CORS PALU	823,416.883	9,898,646.222	77.566	-	-	Ref. LLh
2	CORS AMPANA	1,010,079.465	9,903,384.730	14.232	-	-	Ref. LLh
1	BM-01	818,370.378	9,901,808.098	3.047	3.045	3.188	
2	CP-01	818,345.531	9,901,920.197	3.430	3.429	3.572	
3	BM-02	818,835.522	9,901,784.242	4.517	4.507	4.650	
4	CP-02	818,856.330	9,901,889.644	4.075	4.068	4.211	
5	BM-03	818,020.148	9,901,920.602	3.039	3.039	3.182	
6	CP-03	818,074.496	9,902,022.668	3.995	3.990	4.133	
7	BM-04	817,538.959	9,902,019.716	2.973	2.944	3.087	
8	CP-04	817,544.028	9,902,118.475	3.285	3.271	3.414	
9	BM-05	815,738.048	9,902,662.797	4.350	4.342	4.485	
10	CP-05	815,765.540	9,902,620.893	4.358	4.350	4.493	
11	BM-06	819,722.195	9,902,481.957	7.723	7.715	7.858	
12	CP-06	819,751.012	9,902,541.433	7.746	7.738	7.881	
Note:							
				-0.142	-0.143	0.000	LWS
The precise elevation of BM-05, CP-05, BM-06 and CP-06 are derived by calculation adjustment from GPS leveling, because these points are not measured with precise level equipment.				1.258	1.257	1.400	MSL
				2.658	2.657	2.800	HWS

6.9. Detail Terrestrial Topographic Survey - Spot Height

Detailed terrestrial topographic survey was carried out to collect the spot height data within the survey area covering natural and man-made objects to produce a topographic map and generate contour lines. This was carried out following the procedure below;

Work Procedures:

(i) In the detailed terrestrial topographic survey method, Total Station TOPCON GTS-235N (ETS, electronic total station) was used.

(ii) Measurements were made from the nearest traverse point and establish additional intermediate marker as help point, if required. However, if the number of intermediate marker more than 5 points, it must be closed to the next nearest traversing peg.

(iii) Raw data was taken and recorded in real time in the internal data-logger, ETS, whereas additional information such as sketches of objects observed were noted/described in the field surveyor's data book, if necessary.

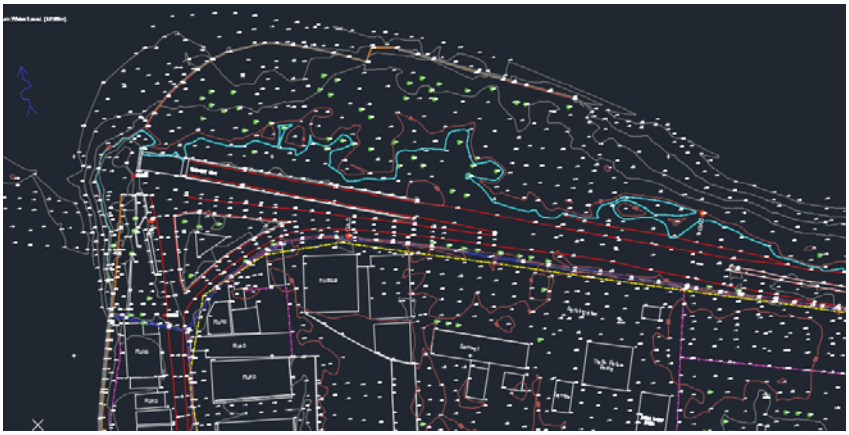
(iv) The data was collected by a combination of grid and ray or radial pattern methods, by adapting to the topographical conditions in the field

(v) The density of spot height data intervals at the topographic terrain relatively flat is 2.0 cm on the map scale, and more dense on sloping / steep / undulated areas.

(vi) Post data and drawing processing was done every day in order to understand the quality and density data collected.

(vii) Raw data was recorded in the field, and then downloaded from the internal data-log of ETS. Data processing was carried out using Topographic Software and drawing plotting was carried out using Civil 3DMap Software.

(viii) The Plotted drawing is based on the adjusted XYZ co-ordinates.



The data measurement results are then compiled and calculated by using Topographic Software and the results can be seen in the **Appendix-6: Topographic Survey Computation.**

7. DATA AND DRAWING PROCESSING

7.1. Data Processing

Daily data processing was carried out at the site base camp. Field data such as measurements of the traversing and leveling data were compiled into a table of measurement. Data checking was also performed to determine the quality of outcome data to measure a predetermined tolerance limits when the measurement is done directly in the field completed. Repeated were measurements done at each measuring point before moving the equipment to the next measuring point.

Data processing was done following the steps outlined below:

(i) Data processing for control points (GPS, traversing and leveling networks),

(ii) Data processing for detailed situation topographic data (detailed spot topography)

(iii) Generating a draft final drawing

(iv) Review and analysis of the draft final drawing (accuracy and density of data in according to the map scale specified). Additional survey must be carried out when the data recorded has not met the requirements.

Data processing was done by using computer software with proven accuracy and feasibility.

(1) Co-ordinate Computation

- The calculation of the co-ordinates from traverse survey follow the shape of a polygon. Correction angle is given on the basis of the average value, and the calculation is done at the project site.
- The calculation refers to the requirement of accuracy has been determined.
- Calculations were done using the traverse computation software
- Measurement accuracy is seconds

Parameter	Accuracy	Allowable accuracy for engineering and construction control survey Ref. US Army Corps of Engineers, EM 1110-1-1005, 1 January 2007.	Remark
▪ Angle close error	2.0 √ N second	10 √ N where, N = number of measurement point	Accepted
▪ Distance Ratio (Linear Error)	1: 35,315	1: 10,000	Accepted

(2) Elevation Difference (Leveling) Computation

- Leveling calculations were done and the results given in mm accuracy (3 decimal points), and control calculations performed on each piece of the calculation by adding up the difference in height.
- Or do the calculation of elevation level closed / close loop on the condition Σ ΔH precision (the number of height difference) = 0 and give the necessary corrections.
- The calculation was carried out using leveling computation software.
- Measurement Accuracy mm:

Parameter	Accuracy	Allowable accuracy for engineering and construction control survey Ref. US Army Corps of Engineers, EM 1110-1-1005, 1 January 2007.	Remark
▪ Angle close elevation	2.55 √ D mm	10 √ D mm where d in kilometer length	Accepted

(3) Spot Height Computation, detailed situation of topographic data

- The height or detailed co-ordinates calculated based on height or co-ordinate traversing point that is used as the measurement point and calculated by trigonometric method.
- The calculation is done using topographic computation software.

7.2. Drawing Map Processing

General provisions regarding the drawing process, including symbols, legend, and other information are adopted from cartographic standard.

Topographic maps as results of this survey are presented in the form of a digital map with a scale of 1: 500 and contour intervals of 0.2m. The scale and contour line interval is set during the plotting process using Civil3DMap-AutoCAD software.

Finally, the map is then converted into AutoCAD format in A1 paper size. The drawing / map as the result in this topographic survey is presented in **Appendix-7** and Longitudinal & cross section drawings are presented in **Appendix-8**.

8. RESULTS AND DOCUMENT DELIVERABLES

The final report includes the technical report and its appendices submitted to the client as a set as shown below;

Task	*Note*	*Document delivery*
(1) Technical Survey Report	Lot	1 set
(2) Index map Topographic Map – at A1 scale to fit (at scale 1: 2000)	1 sheet A1	1 set
(3) Topographic Map – at scale of 1: 1000 with 0.5 meters intervals of contour line.	2 sheet A1	1 set
(4) Longitudinal section (along road / bridge alignment)– at scale of Horizontal 1: 1000 and Vertical 1: 100	2 sheet A1	1 set
(5) Cross section (left and right side of river bank, and river body) – at scale of Horizontal 1: 1000 and Vertical 1: 100	5 sheet A1	1 set
(6) Softcopy of all documents report in CD or sent by email transmission	Lot	1 set

Deliverables format of this survey report includes:

(1) Technical Report, supplied in both in Pdf and AutoCAD format

(2) Digital co-ordinates of all data spots for generating the topographic map, supplied in CSV ASCII format

(3) List of Co-ordinates of Project Benchmarks, in EXCEL format

(4) Topographic Map in both Pdf and AutoCAD format

(5) Cross Section drawing in both in Pdf and AutoCAD format

(6) Longitudinal section drawing of the planned approach road and bridge alignment

ELECTRONIC FILES of above is delivered in CD or email transmission

9. CONCLUSIONS & TOPIC DISCUSSIONS

The following summarized the results of this topographic work;

(1) We certify that the topographic map created upon completion of this survey work under this contract is accurate and therefore fit for use as the basic topographic map for detailed engineering design purposes.

(2) Totally, six (6) project benchmarks each paired with a Control Point (BM & CP) are installed around the project site as listed in the **Table-1** and **Table-2**. They should be maintained and protected from damage.

(3) With proper maintenance and management the installed BMs & CPs will be very useful as reference points for the forthcoming civil works: project design, construction and monitoring.

(4) Detailed information about the ground surface profile of this project area can be seen in the Topographic map and Longitudinal & cross section drawings as the results of this survey.

10. SUGGESTIONS & RECOMMENDATIONS

On September 28, 2018, there was an earthquake, tsunami and liquefaction disaster in this area. For this reason, before conducting construction activities, we recommend that survey, investigation and design work be carried out with good and in-depth study.

To understand the condition of the subsoil structure beneath the riverbed (seabed) along bridge alignment across the river, we recommend that an integrated investigation between geotechnical drilling and geophysical surveys be carried out. Due the soil layer data with geotechnical drilling only describes the structure of the soil at the drilling point. While the data obtained by geophysical surveys, data on soil structure along the survey lines are recorded continuously and

uninterrupted. Both of these data will be analyzed to complement each other. Geophysical surveys must be carried out by a combination of bathymetry and seismic / sub-bottom profiling surveys, thus, riverbed surface profile data and the structure of resistant layers below the riverbed surface can be recorded well and integrated.

Geophysical survey activities for this bridge alignment plan can be carried out at high tide (at low tide, this area is very shallow, tidal range 2.80 m), so that survey vessel with geophysical equipment used can pass safely to record data along the alignment path. We have this technology and can do and complete it within 1 month, including field work, data acquisition, analysis and report.

Sub bottom profiling surveys are used to investigate geological aspects under the watershed (riverbed, seabed), such as determining the boundaries of soil or rock layers, types of lithology, and geological structures. Sub Bottom Profiler is one of the geophysical exploration devices that utilizes the reflection coefficient parameters of the acoustic wave propagation emitted by the wave source, such as: pinger, boomer, sparker, geo-chirp, etc. Continuous emitted waves will propagate in all directions, the reflected waves in a reflector will then be received by a geophone or hydrophone which will then be processed into a subsurface seismic cross section.

This investigation is intended to model conditions under the surface of the bottom of the river or sea floor. By knowing the subsurface geological model, all decision-making in development can consider geological aspects to prevent the occurrence of things that could endanger operations. Sub bottom profiling survey is used to map the subsurface structure that could hamper any designated survey operation. Boulders near seabed, in-filled channels, willow faults, and willow gas accumulations, are some features that have potential hazards for engineering operational such as rig emplacements, anchoring, and top drilling.

The general principle is to send sound energy waves from the equipment in to the Earth, where the different layers within the Earth's crust reflect back this energy. These reflected energy waves are recorded over a predetermined time period (*called the record length*) by using hydrophones. Once the data is recorded onto tape, it can then be processed using specialist software which will result in processed profiles being produced (an example see Figure 3a, 3b, and 3c below).

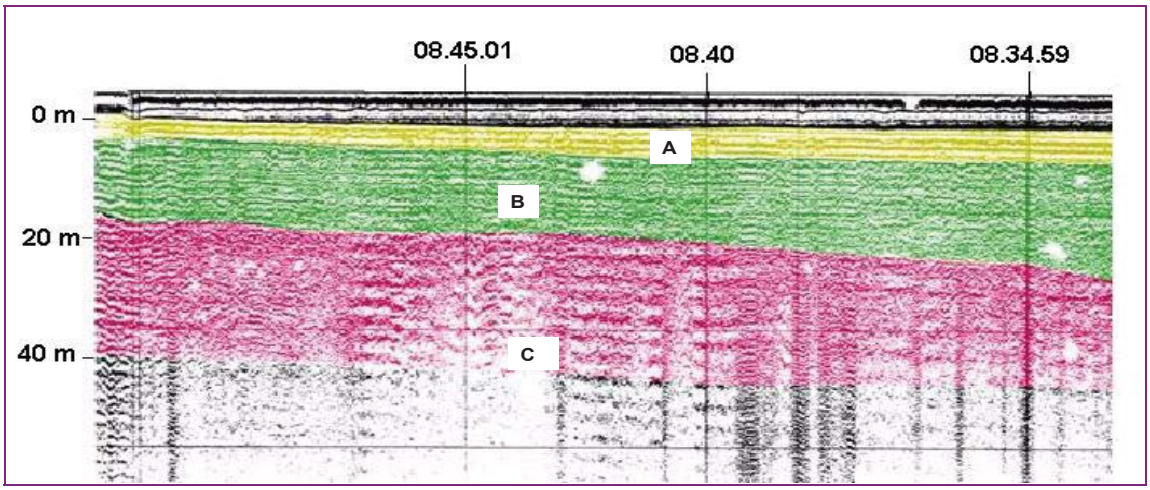


Figure-3a: Data records show the structure of the soil layer

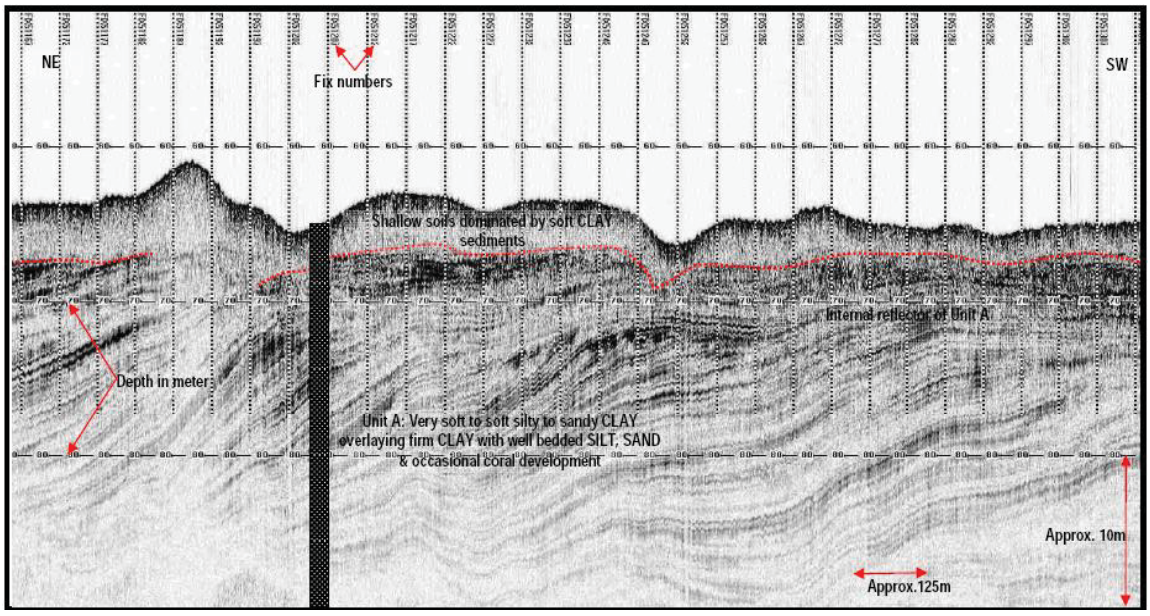


Figure-3b: Section overlaid with geotechnical drilling data

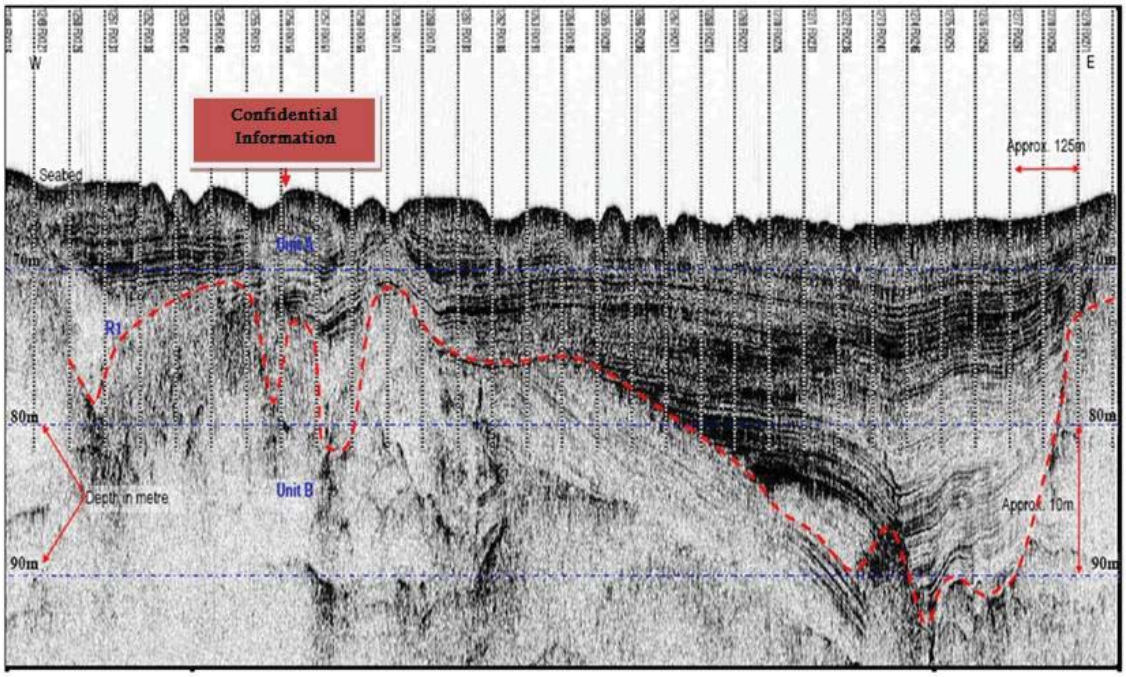


Figure-3c: Sub Seabed Channel

11. ATTENTION TO WARNINGS

This should be a concern for work safety, HSE to work in the river area on this project;

[1] Beware of flooding in the river; if it rains in the upstream (Sigi area), then immediately the river mouth on this project will flood / the water overflows.

[2] Beware of wild animals in the river; as long as our survey team works in this river mouth, crocodiles often appear so we involve the crocodile handler.

[3] Beware of sea tides; this river estuary is strongly influenced by sea tidal conditions, the tidal range is 2.80m.

Appendix-1:

Description of Reference benchmarks
CORS (CPAL and CAMP)

BADAN INFORMASI GEOSPASIAL (BIG)

Jl. Jakarta – Bogor Km. 46 Cibinong 16911 PO Box 46 CBI (021) 8758061
http://srgi.big.go.id email: srgi@big.go.id

DESKRIPSI CORS

PALP

KODE STASIUN	: PALP	NAMA STASIUN	: Palu
DESA/KELURAHAN	: Birobuli	KABUPATEN	: Kota Palu
KECAMATAN	: Palu Selatan	PROVINSI	: Sulawesi Tengah

KOORDINAT GEODETIK
(WGS-84)

LINTANG	: 0º 54' 56.85140' S
BUJUR	: 119º 54' 20.09070'' E
TINGGI ELIPSOID	: 138.468 Meter

KOORDINAT KARTESIAN
(SRGI 2013 Epoch 2012.0)

X	: -3179627.19200 Meter ± 0.00110 Meter
Y	: 5528295.00660 Meter ± 0.00170 Meter
Z	: -101263.45420 Meter ± 0.00050 Meter

LAJU KECEPATAN TOPOSENTRIK

V utara	: 0.00960 Meter/tahun
V timur	: 0.02030 Meter/tahun
V vertikal	: 0.00140 Meter/tahun

LAJU KECEPATAN KARTESIAN

Vx	: -0.01880 Meter/tahun
Vy	: -0.00820 Meter/tahun
Vz	: 0.00920 Meter/tahun

PERANGKAT

RECEIVER	: LEICA GR10	RADOME	: LEIS
ANTENA	: LEIAT504	TINGGI ANTENA	: 0.046 Meter
TAHUN DIBANGUN	: 2002	KET. TINGGI ANTENA	: Bottom of Antenna
KOMUNIKASI DATA	: ONLINE		

URAIAN LOKASI PILAR : Pilar terletak di taman alat BMKG Kelas II Bandara Mutiara Palu

ALAMAT : Kantor BMKG Bandara Mutiara Palu

KENAMPAKAN MENONJOL : Kantor BMKG Bandara Mutiara Palu

SKETSA UMUM (Sumber: Google Maps)

BOX PERANGKAT

FOTO PILAR DAN ANTENA

FOTO LOKASI STASIUN

Data diupdate terakhir :07-12-2018 07:00 AM

BADAN INFORMASI GEOSPASIAL (BIG)

Jl. Jakarta – Bogor Km. 46 Cibinong 16911 PO Box 46 CBI (021) 8758061
http://srgi.big.go.id email: srgi@big.go.id

DESKRIPSI CORS

CAMP

KODE STASIUN	: CAMP	NAMA STASIUN	: Ampana
DESA/KELURAHAN	: Uentanaga Bawah	KABUPATEN	: Tojo Una-Una
KECAMATAN	: Ratolindo	PROVINSI	: Sulawesi Tengah

KOORDINAT GEODETIK
(WGS-84)

LINTANG	: 0º 52' 16.67610' S
BUJUR	: 121º 34' 46.44200" E
TINGGI ELIPSOID	: 76.468 Meter

LAJU KECEPATAN TOPOSENTRIK

V utara	: -
V timur	: -
V vertikal	: -

KOORDINAT KARTESIAN
(SRGI 2013 Epoch 2012.0)

X	: -3339772.79850 Meter ± 0.00150 Meter
Y	: 5433063.64830 Meter ± 0.00220 Meter
Z	: -96340.76980 Meter ± 0.00060 Meter

LAJU KECEPATAN KARTESIAN

Vx	: -
Vy	: -
Vz	: -

PERANGKAT

RECEIVER	: LEICA GR10	RADOME	: LEIM
ANTENA	: LEIAR20	TINGGI ANTENA	: 0.055 Meter
TAHUN DIBANGUN	: 2015	KET. TINGGI ANTENA	: Bottom of Antenna
KOMUNIKASI DATA	: ONLINE		

URAIAN LOKASI PILAR : Pilar berada di atap gedung

ALAMAT : Jl. Muslaeni no. 37

KENAMPAKAN MENONJOL : Trafo Listrik dan Tower Radio Kantor STO Telkom Ampana

SKETSA UMUM (Sumber: Google Maps)

BOX PERANGKAT

FOTO PILAR DAN ANTENA

FOTO LOKASI STASIUN

Data diupdate terakhir :13-09-2017 07:00 AM

Appendix-2:

Detailed GPS Network Adjustment Report

Project Information		Coordinate System	
Name:	D:\PROJECT\JEMBATAN PALU4\GPS\PALU BRIDGE REF PALP & CAMP AND ADD BM.vce	Name:	UTM
Size:	467 KB	Datum:	WGS 1984
Modified:	4/6/2019 4:12:52 PM	Zone:	50 South
Reference number:		Geoid:	EGM-2008
Description:		Vertical datum:	

Network Adjustment Report

Adjustment Settings

Set-Up Errors
GNSS
Error in Height of Antenna: 0.000 m
Centering Error: 0.000 m
Covariance Display
Horizontal:
Propagated Linear Error [E]: U.S.
Constant Term [C]: 0.000 m
Scale on Linear Error [S]: 1.960
Three-Dimensional
Propagated Linear Error [E]: U.S.
Constant Term [C]: 0.000 m
Scale on Linear Error [S]: 1.960

Adjustment Statistics

Number of Iterations for Successful Adjustment: 2
Network Reference Factor: 1.00
Chi Square Test (95%): Passed
Precision Confidence Level: 95%
Degrees of Freedom: 43
Post Processed Vector Statistics
Reference Factor: 1.00
Redundancy Number: 43.00
A Priori Scalar: 2.80

Adjusted Grid Coordinates

Point ID	Easting (Meter)	Easting Error (Meter)	Northing (Meter)	Northing Error (Meter)	Elevation (Meter)	Elevation Error (Meter)	Fixed
BM01	818370.378	0.005	9901808.098	0.004	3.047	0.024	
BM02	818835.522	0.005	9901784.242	0.004	4.517	0.024	
BM03	818020.148	0.005	9901920.602	0.004	3.039	0.024	
BM04	817538.959	0.006	9902019.716	0.004	2.973	0.025	
BM05	815738.048	0.007	9902662.797	0.005	4.350	0.036	
BM06	819722.195	0.006	9902481.957	0.005	7.723	0.025	
camp	1010079.465	?	9903384.730	?	14.232	?	LLh
CP01	818345.531	0.005	9901920.197	0.004	3.430	0.024	
CP02	818856.330	0.005	9901889.644	0.004	4.075	0.024	
CP03	818074.496	0.005	9902022.668	0.004	3.995	0.024	
CP04	817544.028	0.006	9902118.475	0.005	3.285	0.025	
CP05	815765.540	0.007	9902620.893	0.005	4.358	0.036	
CP06	819751.012	0.006	9902541.433	0.005	7.746	0.026	
palp	823416.883	?	9898646.222	?	77.566	?	LLh

Adjusted Geodetic Coordinates

Point ID	Latitude	Longitude	Height (Meter)	Height Error (Meter)	Fixed
BM01	S0°53'14.12957"	E119°51'36.93169"	63.709	0.024	
BM02	S0°53'14.89389"	E119°51'51.96367"	65.180	0.024	
BM03	S0°53'10.47868"	E119°51'25.61100"	63.696	0.024	
BM04	S0°53'07.26661"	E119°51'10.05857"	63.626	0.025	
BM05	S0°52'46.39211"	E119°50'11.84450"	64.969	0.036	
BM06	S0°52'52.17548"	E119°52'20.59933"	68.358	0.025	
camp	S0°52'16.67607"	E121°34'46.44202"	76.468	?	LLh
CP01	S0°53'10.48368"	E119°51'36.12596"	64.087	0.024	
CP02	S0°53'11.46472"	E119°51'52.63343"	64.733	0.024	
CP03	S0°53'07.15717"	E119°51'27.36475"	64.647	0.024	
CP04	S0°53'04.05392"	E119°51'10.21991"	63.933	0.025	
CP05	S0°52'47.75458"	E119°50'12.73397"	64.979	0.036	
CP06	S0°52'50.24008"	E119°52'21.52907"	68.378	0.026	
palp	S0°54'56.85138"	E119°54'20.09068"	138.468	?	LLh

Error Ellipse Components

Point ID	Semi-major axis (Meter)	Semi-minor axis (Meter)	Azimuth
BM01	0.006	0.005	87°
BM02	0.006	0.005	83°
BM03	0.006	0.005	90°
BM04	0.007	0.005	90°
BM05	0.008	0.006	93°
BM06	0.007	0.006	79°
CP01	0.007	0.005	87°
CP02	0.006	0.005	84°
CP03	0.007	0.005	92°
CP04	0.007	0.006	90°
CP05	0.008	0.006	93°
CP06	0.008	0.006	82°

Adjusted GPS Observations

Transformation Parameters

Azimuth Rotation: -0.052 sec (95%) 0.011 sec

Scale Factor: 1.00000019 (95%) 0.00000012

Observation ID		Observation	A-posteriori Error	Residual	Standardized Residual
BM01 --> BM06 (PV52)	Az.	63°27'37"	0.425 sec	0.316 sec	2.310
	ΔHt.	4.648 m	0.008 m	0.009 m	4.344
	Ellip Dist.	1509.164 m	0.003 m	-0.001 m	-1.110
BM03 --> CP06 (PV60)	Az.	70°13'26"	0.391 sec	-0.280 sec	-1.606
	ΔHt.	4.681 m	0.009 m	-0.018 m	-4.057
	Ellip Dist.	1837.258 m	0.004 m	0.001 m	0.560
CP06 --> BM06 (PV61)	Az.	205°48'24"	9.642 sec	0.313 sec	0.125
	ΔHt.	-0.020 m	0.008 m	-0.009 m	-4.000
	Ellip Dist.	66.032 m	0.003 m	-0.002 m	-2.004
CP01 --> BM01 (PV25)	Az.	167°27'30"	4.610 sec	-8.732 sec	-2.145

	ΔHt.	-0.378 m	0.005 m	-0.002 m	-0.462
	Ellip Dist.	114.722 m	0.002 m	0.002 m	1.450
CP01 --> BM01 (PV9)	Az.	167°27'30"	4.610 sec	4.873 sec	1.746
	ΔHt.	-0.378 m	0.005 m	0.002 m	0.853
	Ellip Dist.	114.722 m	0.002 m	0.000 m	-0.076
BM01 --> BM02 (PV12)	Az.	92°53'30"	1.022 sec	-0.259 sec	-0.704
	ΔHt.	1.471 m	0.006 m	-0.001 m	-0.383
	Ellip Dist.	465.357 m	0.003 m	0.002 m	1.742
BM03 --> CP05 (PV58)	Az.	287°12'39"	0.288 sec	0.068 sec	0.363
	ΔHt.	1.282 m	0.027 m	-0.038 m	-1.730
	Ellip Dist.	2358.871 m	0.004 m	0.000 m	-0.047
BM02 --> CP02 (PV16)	Az.	11°07'22"	5.315 sec	2.700 sec	1.613
	ΔHt.	-0.447 m	0.006 m	-0.001 m	-0.274
	Ellip Dist.	107.344 m	0.002 m	0.000 m	0.373
palp --> BM04 (PV37)	Az.	299°48'25"	0.138 sec	0.020 sec	0.168
	ΔHt.	-74.842 m	0.025 m	-0.051 m	-1.554
	Ellip Dist.	6771.297 m	0.005 m	-0.003 m	-0.693
BM05 --> CP05 (PV57)	Az.	146°41'19"	15.424 sec	2.069 sec	0.389
	ΔHt.	0.010 m	0.012 m	0.002 m	1.547
	Ellip Dist.	50.076 m	0.004 m	0.000 m	-0.122
BM01 --> BM05 (PV56)	Az.	287°56'39"	0.251 sec	-0.033 sec	-0.179
	ΔHt.	1.260 m	0.027 m	0.035 m	1.543
	Ellip Dist.	2765.274 m	0.004 m	0.002 m	0.687
BM03 --> BM01 (PV31)	Az.	107°45'51"	0.976 sec	0.056 sec	0.058
	ΔHt.	0.013 m	0.005 m	0.006 m	1.271
	Ellip Dist.	367.542 m	0.002 m	0.000 m	0.140
BM03 --> BM01 (PV54)	Az.	107°45'51"	0.976 sec	-0.401 sec	-0.743
	ΔHt.	0.013 m	0.005 m	0.000 m	0.214

	Ellip Dist.	367.542 m	0.002 m	0.001 m	1.226
CP01 --> CP02 (PV18)	Az.	93°22'44"	0.994 sec	0.114 sec	0.295
	ΔHt.	0.646 m	0.007 m	0.000 m	-0.132
	Ellip Dist.	511.273 m	0.003 m	-0.002 m	-1.220
BM03 --> camp (PV35)	Az.	89°31'10"	0.010 sec	-0.002 sec	-0.427
	ΔHt.	12.771 m	0.024 m	-0.065 m	-1.206
	Ellip Dist.	191727.280 m	0.022 m	0.007 m	0.551
CP03 --> CP01 (PV41)	Az.	110°39'58"	1.874 sec	0.991 sec	0.962
	ΔHt.	-0.560 m	0.007 m	0.004 m	1.145
	Ellip Dist.	289.511 m	0.004 m	-0.003 m	-1.107
BM03 --> CP03 (PV40)	Az.	27°59'25"	4.788 sec	-1.745 sec	-1.031
	ΔHt.	0.951 m	0.005 m	0.002 m	0.904
	Ellip Dist.	115.535 m	0.002 m	-0.001 m	-0.809
camp --> CP03 (PV46)	Az.	269°31'24"	0.010 sec	0.001 sec	0.268
	ΔHt.	-11.821 m	0.024 m	0.049 m	0.967
	Ellip Dist.	191672.230 m	0.022 m	0.000 m	-0.017
palp --> CP02 (PV19)	Az.	305°22'28"	0.162 sec	-0.049 sec	-0.379
	ΔHt.	-73.735 m	0.024 m	0.011 m	0.451
	Ellip Dist.	5591.383 m	0.004 m	0.003 m	0.893
BM03 --> palp (PV33)	Az.	121°12'06"	0.132 sec	0.074 sec	0.870
	ΔHt.	74.772 m	0.024 m	0.009 m	0.413
	Ellip Dist.	6306.883 m	0.004 m	0.000 m	-0.144
BM01 --> CP05 (PV59)	Az.	287°17'08"	0.252 sec	0.067 sec	0.365
	ΔHt.	1.269 m	0.027 m	0.000 m	-0.008
	Ellip Dist.	2726.398 m	0.004 m	-0.002 m	-0.657
palp --> BM02 (PV14)	Az.	304°21'49"	0.159 sec	-0.077 sec	-0.654
	ΔHt.	-73.288 m	0.024 m	-0.006 m	-0.253
	Ellip Dist.	5548.155 m	0.004 m	0.000 m	-0.148

BM03 --> palp (PV32)	Az.	121°12'06"	0.132 sec	0.066 sec	0.122
	ΔHt.	74.772 m	0.024 m	-0.022 m	-0.531
	Ellip Dist.	6306.883 m	0.004 m	-0.002 m	-0.114
BM03 --> BM04 (PV36)	Az.	281°35'41"	1.139 sec	-0.104 sec	-0.250
	ΔHt.	-0.070 m	0.007 m	0.001 m	0.526
	Ellip Dist.	490.873 m	0.003 m	0.000 m	0.261
CP04 --> BM04 (PV48)	Az.	182°53'38"	7.089 sec	0.215 sec	0.098
	ΔHt.	-0.307 m	0.007 m	0.000 m	-0.102
	Ellip Dist.	98.804 m	0.003 m	0.000 m	-0.472
CP03 --> CP04 (PV47)	Az.	280°11'37"	1.120 sec	0.182 sec	0.440
	ΔHt.	-0.715 m	0.008 m	0.000 m	-0.076
	Ellip Dist.	538.593 m	0.004 m	0.000 m	0.168
BM03 --> BM05 (PV55)	Az.	287°58'18"	0.286 sec	-0.069 sec	-0.360
	ΔHt.	1.273 m	0.027 m	0.006 m	0.276
	Ellip Dist.	2397.735 m	0.004 m	0.000 m	-0.125

Covariance Terms

From Point	To Point		Components	A-posteriori Error	Horiz. Precision (Ratio)	3D Precision (Ratio)
BM01	BM02	**Az.**	92°53'30"	1.028 sec	1 : 165585	1 : 165828
		ΔHt.	1.471 m	0.006 m		
		ΔElev.	1.470 m	0.006 m		
		Ellip Dist.	465.357 m	0.003 m		
BM01	BM03	**Az.**	287°45'51"	0.981 sec	1 : 166675	1 : 166658
		ΔHt.	-0.013 m	0.005 m		
		ΔElev.	-0.008 m	0.005 m		
		Ellip Dist.	367.542 m	0.002 m		
BM01	BM05	**Az.**	287°56'39"	0.253 sec	1 : 615859	1 : 615584

		ΔHt.	1.260 m	0.027 m		
		ΔElev.	1.303 m	0.027 m		
		Ellip Dist.	2765.275 m	0.004 m		
BM01	BM06	**Az.**	63°27'37"	0.427 sec	1 : 434010	1 : 434463
		ΔHt.	4.648 m	0.008 m		
		ΔElev.	4.676 m	0.008 m		
		Ellip Dist.	1509.164 m	0.003 m		
BM01	CP05	**Az.**	287°17'08"	0.254 sec	1 : 612461	1 : 612181
		ΔHt.	1.269 m	0.027 m		
		ΔElev.	1.310 m	0.027 m		
		Ellip Dist.	2726.399 m	0.004 m		
BM02	CP02	**Az.**	11°07'22"	5.304 sec	1 : 44628	1 : 44513
		ΔHt.	-0.447 m	0.006 m		
		ΔElev.	-0.442 m	0.006 m		
		Ellip Dist.	107.344 m	0.002 m		
BM03	BM04	**Az.**	281°35'41"	1.144 sec	1 : 148906	1 : 148912
		ΔHt.	-0.070 m	0.007 m		
		ΔElev.	-0.066 m	0.007 m		
		Ellip Dist.	490.873 m	0.003 m		
BM03	BM05	**Az.**	287°58'18"	0.287 sec	1 : 540284	1 : 539998
		ΔHt.	1.273 m	0.027 m		
		ΔElev.	1.311 m	0.027 m		
		Ellip Dist.	2397.735 m	0.004 m		
BM03	CP03	**Az.**	27°59'25"	4.784 sec	1 : 53910	1 : 53982
		ΔHt.	0.951 m	0.005 m		
		ΔElev.	0.956 m	0.005 m		
		Ellip Dist.	115.535 m	0.002 m		
BM03	CP05	**Az.**	287°12'39"	0.289 sec	1 : 536522	1 : 536229
		ΔHt.	1.282 m	0.027 m		
		ΔElev.	1.319 m	0.027 m		
		Ellip Dist.	2358.871 m	0.004 m		

BM03	CP06	**Az.**	70°13'26"	0.393 sec	1 : 443687	1 : 444166
		ΔHt.	4.681 m	0.009 m		
		ΔElev.	4.707 m	0.009 m		
		Ellip Dist.	1837.258 m	0.004 m		
BM04	CP04	**Az.**	2°53'38"	7.076 sec	1 : 35944	1 : 35965
		ΔHt.	0.307 m	0.007 m		
		ΔElev.	0.311 m	0.007 m		
		Ellip Dist.	98.804 m	0.003 m		
BM05	CP05	**Az.**	146°41'19"	15.417 sec	1 : 13481	1 : 13478
		ΔHt.	0.010 m	0.012 m		
		ΔElev.	0.007 m	0.012 m		
		Ellip Dist.	50.076 m	0.004 m		
BM06	CP06	**Az.**	25°48'24"	9.633 sec	1 : 21317	1 : 21322
		ΔHt.	0.020 m	0.008 m		
		ΔElev.	0.023 m	0.008 m		
		Ellip Dist.	66.032 m	0.003 m		
camp	BM03	**Az.**	269°29'35"	0.004 sec	1 : 38880513	1 : 38881583
		ΔHt.	-12.772 m	0.024 m		
		ΔElev.	-11.193 m	0.024 m		
		Ellip Dist.	191727.316 m	0.005 m		
camp	CP03	**Az.**	269°31'24"	0.004 sec	1 : 35101989	1 : 35103553
		ΔHt.	-11.821 m	0.024 m		
		ΔElev.	-10.238 m	0.024 m		
		Ellip Dist.	191672.266 m	0.005 m		
CP01	BM01	**Az.**	167°27'30"	4.603 sec	1 : 62983	1 : 63031
		ΔHt.	-0.378 m	0.005 m		
		ΔElev.	-0.383 m	0.005 m		
		Ellip Dist.	114.722 m	0.002 m		
CP01	CP02	**Az.**	93°22'44"	1.000 sec	1 : 157516	1 : 157549
		ΔHt.	0.646 m	0.007 m		
		ΔElev.	0.645 m	0.007 m		

		Ellip Dist.	511.274 m	0.003 m		
CP01	CP03	**Az.**	290°39'57"	1.882 sec	1 : 80719	1 : 80662
		ΔHt.	0.560 m	0.007 m		
		ΔElev.	0.565 m	0.007 m		
		Ellip Dist.	289.512 m	0.004 m		
CP03	CP04	**Az.**	280°11'37"	1.125 sec	1 : 150826	1 : 150947
		ΔHt.	-0.715 m	0.008 m		
		ΔElev.	-0.710 m	0.008 m		
		Ellip Dist.	538.593 m	0.004 m		
palp	BM02	**Az.**	304°21'49"	0.161 sec	1 : 1235170	1 : 1234012
		ΔHt.	-73.288 m	0.024 m		
		ΔElev.	-73.049 m	0.024 m		
		Ellip Dist.	5548.156 m	0.004 m		
palp	BM03	**Az.**	301°12'03"	0.135 sec	1 : 1357191	1 : 1356618
		ΔHt.	-74.772 m	0.024 m		
		ΔElev.	-74.527 m	0.024 m		
		Ellip Dist.	6306.884 m	0.005 m		
palp	BM04	**Az.**	299°48'25"	0.142 sec	1 : 1286056	1 : 1288106
		ΔHt.	-74.842 m	0.025 m		
		ΔElev.	-74.593 m	0.025 m		
		Ellip Dist.	6771.299 m	0.005 m		
palp	CP02	**Az.**	305°22'28"	0.165 sec	1 : 1214251	1 : 1212634
		ΔHt.	-73.735 m	0.024 m		
		ΔElev.	-73.491 m	0.024 m		
		Ellip Dist.	5591.384 m	0.005 m		

Appendix-3:

Description of Benchmark

JICA PROJECT TEAM

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

Summary of GPS Point Coordinates

Coordinate System

Name:	UTM
Datum:	WGS 1984
Zone:	50 South
Geoid Vertical Datum:	EGM-2008
Scale Factor	1.000844612

Local Site Settings (GPS)

Project latitude:	S0°53'10.47869"
Project longitude:	E119°51'25.61097"
Project height:	63.699 m
Ground scale factor:	0.999156101

No.	Station ID#	GEODETIC COORDINATES			UTM Zone 50S Grid Coordinates (GPS)			ELEVATION		REMARK	UTM Zone 50S Grid LOCALIZED (Polygon TS)		
		Latitude	Longitude	Ellip. Height	Easting	Northing	EGM-08 Elevation	EGM-08 DATUM, Precise Level Network	Elevation Ref to approx. LWS		Easting	Northing	EGM-08 DATUM, Precise Level Network
		South Latitude	East Longitude	h (m)	E (m)	N (m)	H (m)	Z (m)	Z (m)		E (m)	N (m)	H (m)
1	CORS PALU	0°54'56.85138"	119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566			Ref. LLh			
2	CORS AMPANA	0°52'16.67607"	121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232			Ref. LLh			
1	BM-01	0°53'14.12957"	119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.047	3.045	3.188		818,370.079	9,901,808.177	3.045
2	CP-01	0°53'10.48368"	119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.430	3.429	3.572		818,345.254	9,901,920.179	3.429
3	BM-02	0°53'14.89389"	119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.517	4.507	4.650		818,834.809	9,901,784.351	4.507
4	CP-02	0°53'11.46472"	119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.075	4.068	4.211		818,855.602	9,901,889.657	4.068
5	BM-03	0°53'10.47868"	119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	3.039	3.182		818,020.148	9,901,920.602	3.039
6	CP-03	0°53'07.15717"	119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.995	3.990	4.133		818,074.447	9,902,022.598	3.990
7	BM-04	0°53'07.26661"	119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.973	2.944	3.087		817,539.378	9,902,019.679	2.944
8	CP-04	0°53'04.05392"	119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.285	3.271	3.414		817,544.453	9,902,118.363	3.271
9	BM-05	0°52'46.39211"	119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.350	4.342	0.152				
10	CP-05	0°52'47.75458"	119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.358	4.350	4.493				
11	BM-06	0°52'52.17548"	119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.723	7.715	7.858				
12	CP-06	0°52'50.24008"	119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.746	7.738	7.881				
	The precise elevation of BM-05, CP-05, BM-06 and CP-06 are derived by calculation adjustment from GPS leveling, because these points are not measured with precise level equipment.						-0.142	-0.143	0.000	LWS			
							1.258	1.257	1.400	MSL			
							2.658	2.657	2.800	HWS			

Note : (1) Tidal Information

Time zone	GMT + 8.00
Type of Tidal	Mixed tides tend to semidiurnal
Tide Range (lowest to highest)	2. 80 m
Chart Datum (Zo), LWS	1.40 m below MSL

(2) Correlation datum : EGM-08 to LWS (Lowest water spring, the lowest possible tide)

Based on local site identification during spring tide at highest water level

The correlation elevation of benchmark to the elevation of tidal has been identified against the highest tidal level that found in the land. The difference elevation then measured from that identified point to the benchmark CP-01 using precise level, and the difference found 0.772 m, where CP-01 is higher. That means. So, the elevation of highest water level (HWS) = elevation of CP-01 (3.429m) - 0.772m = 2.657 m EGM datum. It's similar with elevation +2.80m LWS datum.

Surveyed by Kardi

Cheked by Frans Segar Gultom

Date: 08 April 2019

by PT. Geomarindex

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

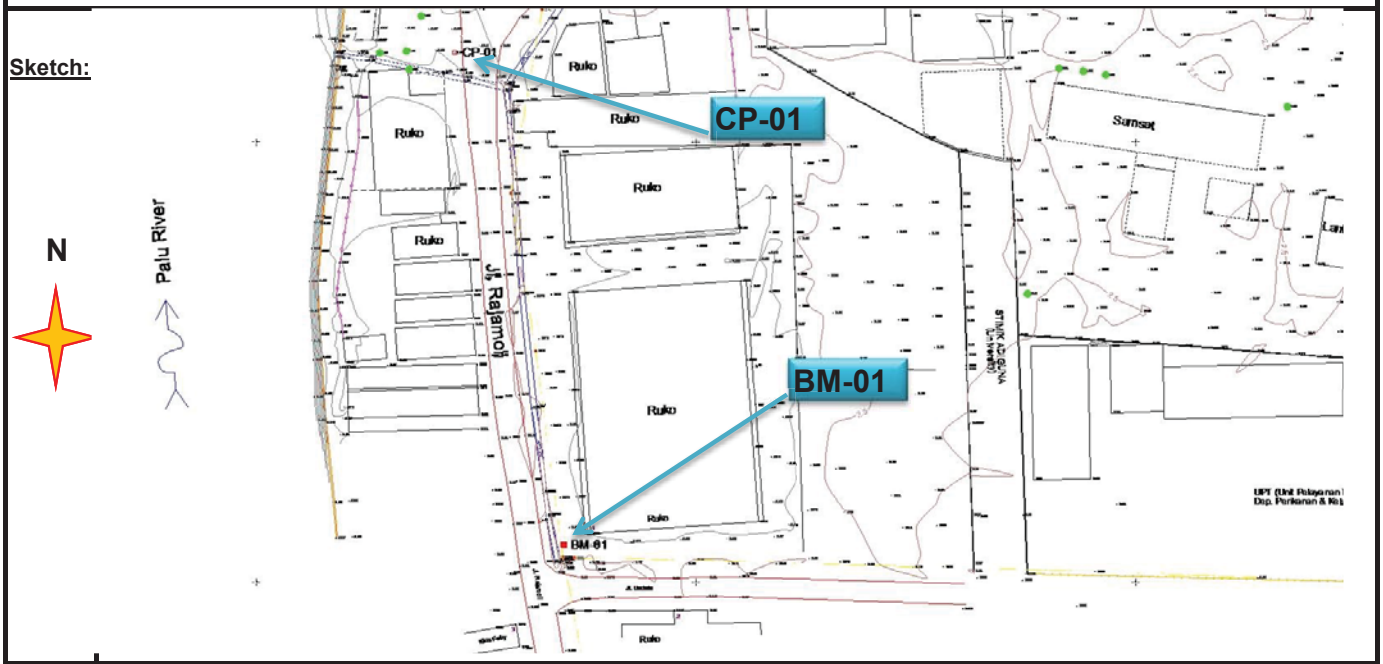
(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'14.12957" S	Easting	818,370.378	Unit : metric
BM-01	Longitude	119°51'36.93169" E	Northing	9,901,808.098	
	Ellip. Height	63.709	Elevation	3.045	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:



Description:

BM-01
is located on Jalan Rajamoli and Jalan Undata, Kelurahan Besusu Kecamatan Palu Timur.

Site Identificaton; Corner of Ruko, close to electric pole (20kv)

BM-01 pair with CP-01

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

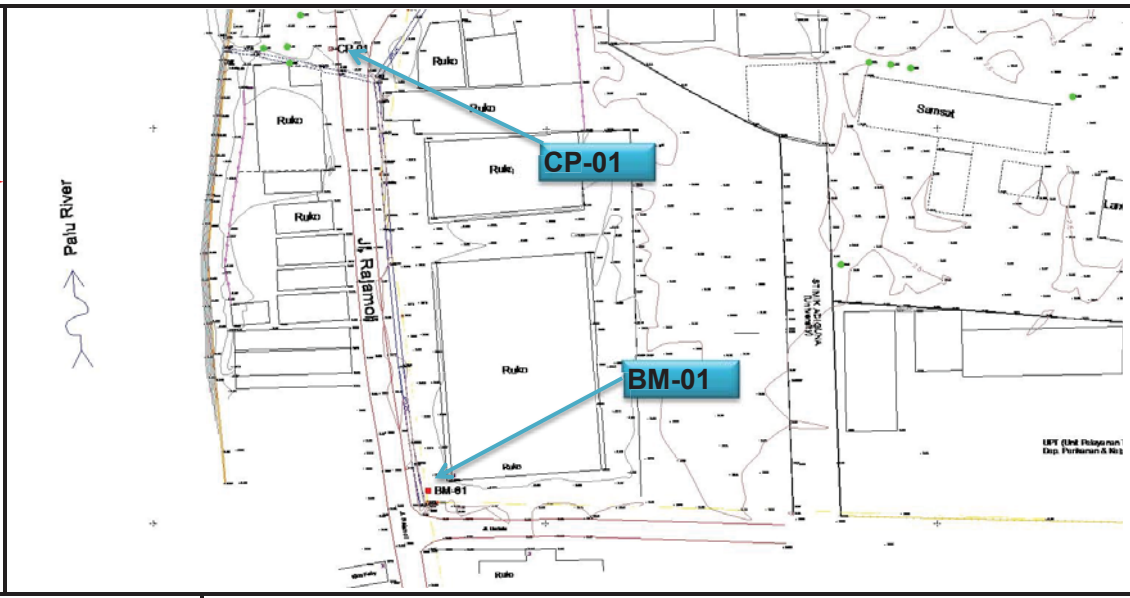
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'10.48368" S	Easting	818,345.531	Unit : metric
CP-01	Longitude	119°51'36.12596" E	Northing	9,901,920.197	
	Ellip. Height	64.087	Elevation	3.429	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

CP-01
is located on Ntovea Garden Jalan Rajamoli , Kelurahan Besusu Kecamatan Palu Timur.

Site Identificaton; Ntovea Garden

CP-01 pair with BM-01

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	THE JICA PROJECT TEAM (A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

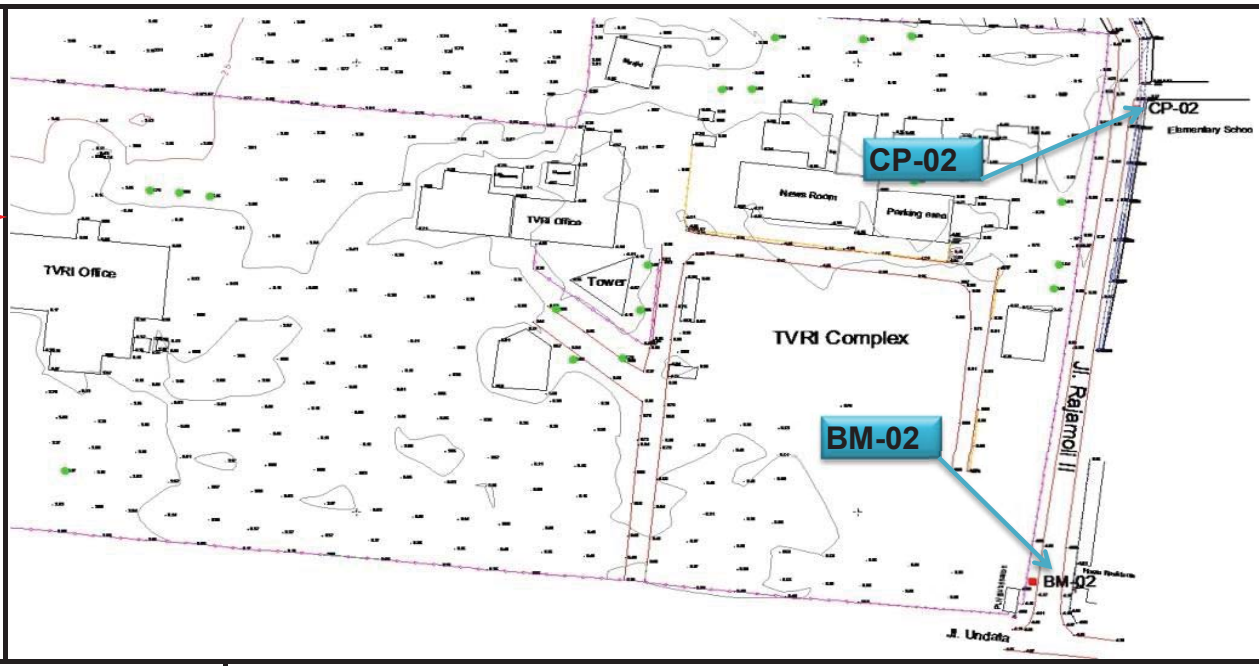
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
BM-02	Latitude	0°53'14.89389" S	Easting	818,835.522	Unit : metric
	Longitude	119°51'51.96367" E	Northing	9,901,784.242	
	Ellip. Height	65.180	Elevation	4.507	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

BM-02
is located on Jalan Rajamoli-II and Jalan Undata, Kelurahan Besusu Kecamatan Palu Timur.

Site Identificaton; Beside electric substation

BM-02 pair with CP-02

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

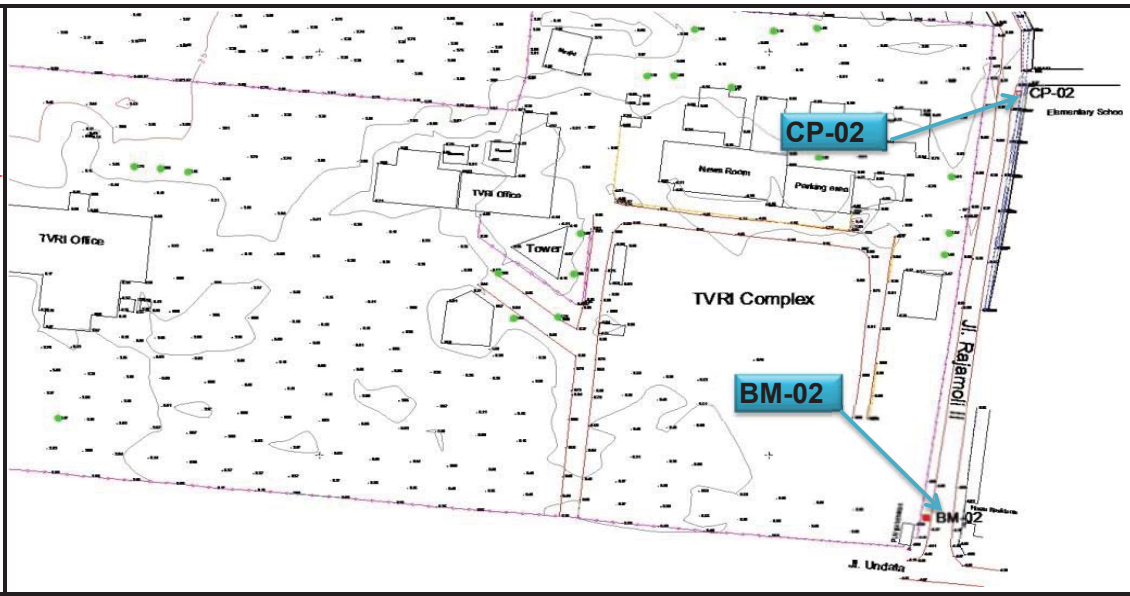
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'11.46472" S	Easting	818,856.330	Unit : metric
CP-02	Longitude	119°51'52.63343" E	Northing	9,901,889.644	
	Ellip. Height	64.733	Elevation	4.068	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

CP-02
is located on Jalan Rajamoli-II and Jalan Undata, Kelurahan Besusu Kecamatan Palu Timur.

Site Identificaton; Primary School

CP-02 pair with BM-02

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

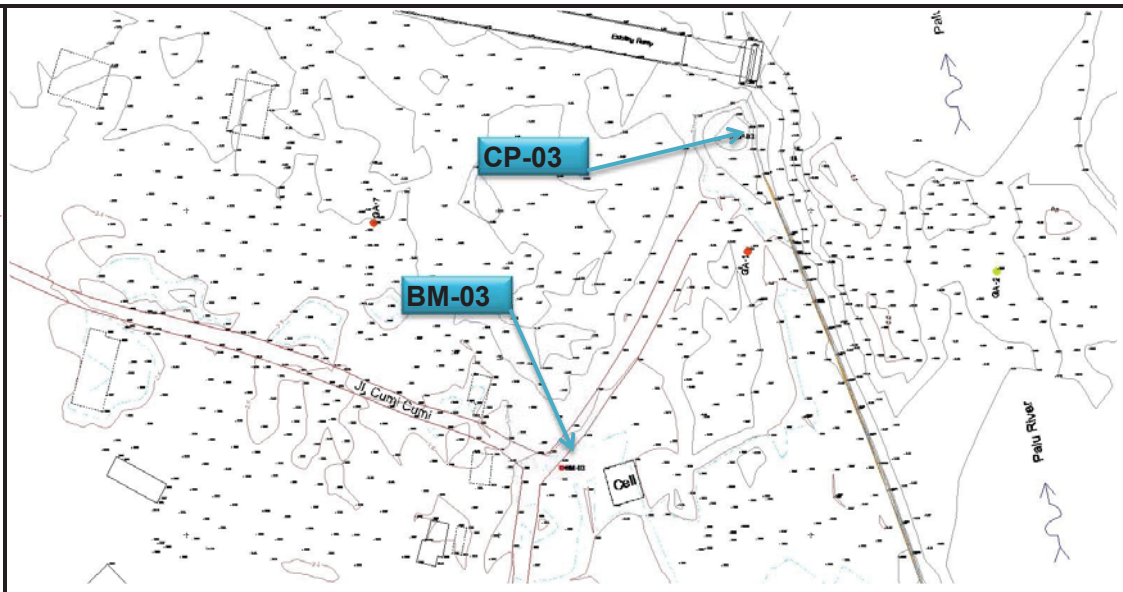
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'10.47868" S	Easting	818,020.148	Unit : metric
BM-03	Longitude	119°51'25.61100" E	Northing	9,901,920.602	
	Ellip. Height	63.696	Elevation	3.039	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

BM-03
is located on Jalan Cumi-Cumi Jalan Undata, Kelurahan Lere Kecamatan Palu Barat.

BM-03 pair with CP-03

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

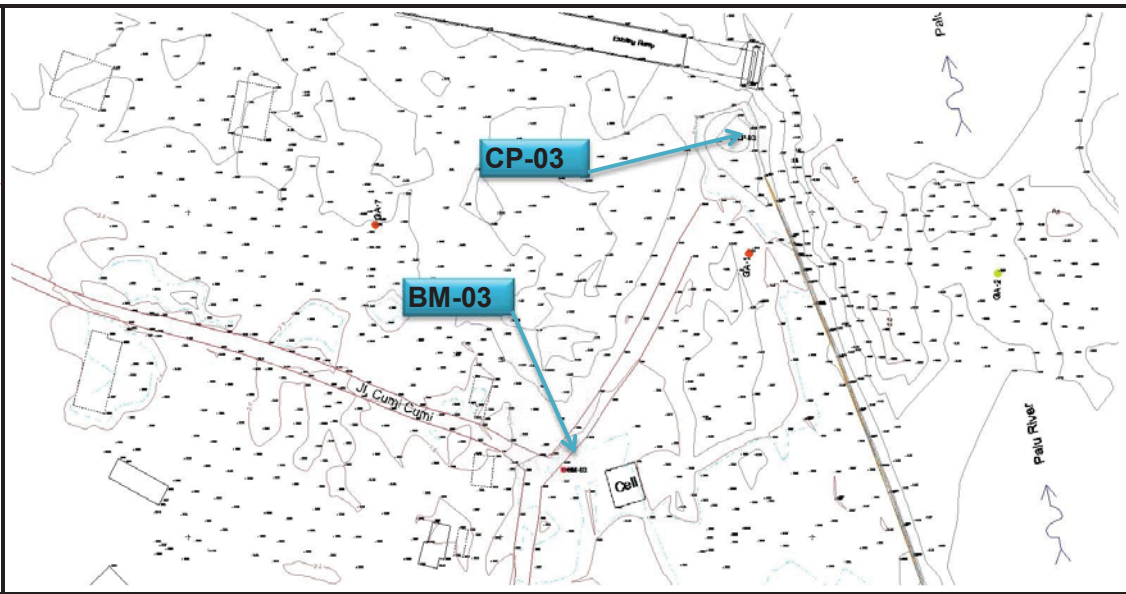
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'07.15717" S	Easting	818,074.496	Unit : metric
CP-03	Longitude	119°51'27.36475" E	Northing	9,902,022.668	
	Ellip. Height	64.647	Elevation	3.990	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

CP-03
is located on the estuary of the Palu River on the left side of the river, Kelurahan Lere Kecamatan Palu Barat.

Site Identificaton; Estuary

CP-03 pair with BM-03

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

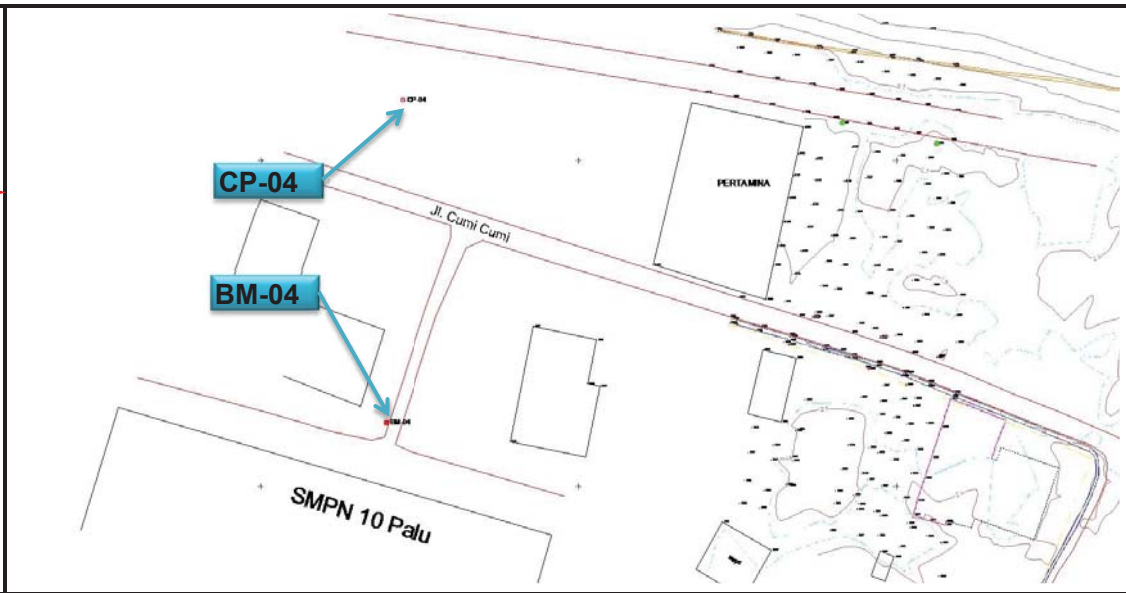
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
	Latitude	0°53'07.26661" S	Easting	817,538.959	Unit : metric
BM-04	Longitude	119°51'10.05857" E	Northing	9,902,019.716	
	Ellip. Height	63.626	Elevation	2.944	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

BM-04
is located on front of the gate of SMPN (State Secondary Schoool) 10 Palu. Kelurahan Lere Kecamatan Palu Barat

Site Identificaton; SMPN 10 Palu

BM-04 pair with CP-04

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

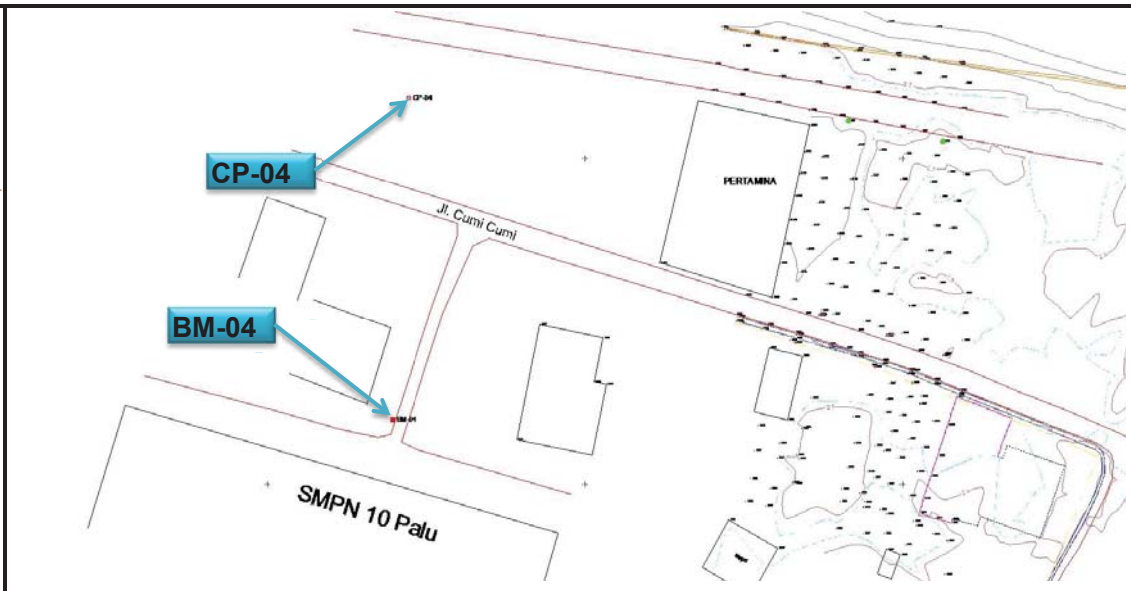
BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
CP-04	Latitude	0°53'04.05392" S	Easting	817,544.028	Unit : metric
	Longitude	119°51'10.21991" E	Northing	9,902,118.475	
	Ellip. Height	63.933	Elevation	3.285	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N



Description:

CP-04
is located on General Garden in front of the gate of SMPN (State Secondary Schoool) 10 Palu. Kelurahan Lere Kecamatan Palu Barat

Site Identificaton; SMPN 10 Palu

CP-04 pair with BM-04

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
BM-05	Latitude	0°52'46.39211" S	Easting	815,738.048	Unit : metric
	Longitude	119°50'11.84450" E	Northing	9,902,662.797	
	Ellip. Height	64.969	Elevation	4.342	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N

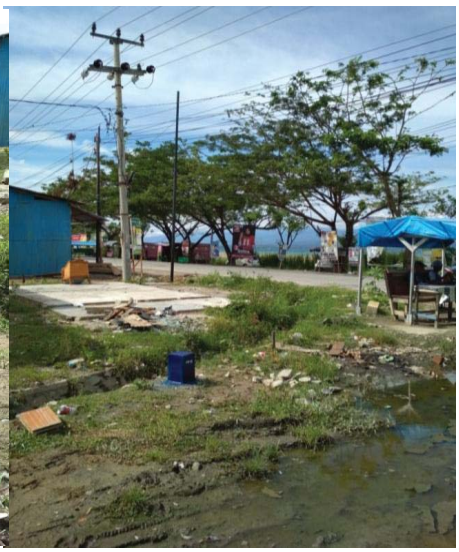
Description:

BM-05
is located on Jalan Munif Rahman Trans Sulawesi Palu-Donggala. Kelurahan Silae Kecamatan Ulujadi

Site Identificaton; Road Intersection

BM-05 pair with CP-05

Photo :



DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
CP-05	Latitude	0°52'47.75458" S	Easting	815,765.540	Unit : metric
	Longitude	119°50'12.73397" E	Northing	9,902,620.893	
	Ellip. Height	64.979	Elevation	4.358	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N

Description:

CP-05
is located on Jalan Trans Sulawesi Palu-Donggala. Kelurahan Silae Kecamatan Ulujadi

Site Identificaton; Pole of Telephone/Cellular

CP-05 pair with BM-05

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
BM-06	Latitude	0°52'46.39211" S	Easting	815,738.048	Unit : metric
	Longitude	119°50'11.84450" E	Northing	9,902,662.797	
	Ellip. Height	64.969	Elevation	4.342	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N

Description:

BM-06
is located on Talise Bridge Jalan Yos Sudarso. Kelurahan Talise Kecamatan Mantikulore

Site Identificaton; Bridge and Mosque

BM-06 pair with CP-06

Photo :

DESCRIPTION OF BENCHMARK

PT GEOMARINDEX

PROJECT FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI

THE JICA PROJECT TEAM

(A JOINT VENTURE OF YACHICO ENGINEERING CO., LTD and ORIENTAL CONSULTANTS GLOBAL CO.,LTD)

BM Name	Geodetic Coordinates in WGS-84		UTM Zone 50S Grid Coordinates		Note
CP-06	Latitude	0°52'50.24008"	Easting	819,751.012	Unit : metric
	Longitude	119°52'21.52907"	Northing	9,902,541.433	
	Ellip. Height	68.378	Elevation	7.738	Geoid : EGM-2008

National Reference: CORS Geodetic Coordinates

PALP (Palu 2018 0317)			CAMP (Ampana 2015 0329)		
South Latitude	East Longitude	Ellip. Height	South Latitude	East Longitude	Ellip. Height
0°54'56.85138"	119°54'20.09068"	138.468	0°52'16.67607"	121°34'46.44202"	76.468

Sketch:

N

Description:

CP-06
is located on near Talise Bridge Jalan Yos Sudarso. Kelurahan Talise Kecamatan Mantikulore

Site Identificaton; Bridge and Kaledo Restaurant

CP-06 pair with BM-06

Photo :

Appendix-4:

Traversing Computation (UTM & LOCALIZED)

Surveys & Site Investigations

Distance Scale factor = 1.0008422

*** TRAVERSE COMPUTATION

File name : PLB4-01A&B.TRV - Page : 1

* Project/Job : B4.01 - B4 (UTM)
* Location : PALU
* Surveyor : KARDI

Date : 12-04-19
Time : 19:05:34

STATION (Na$/No)	Measured Angle	Corrected Azimuth	Distance (m)	d COS Az (m)	d SIN Az (m)	C O O R D I N A T E N = Y (m)	E = X (m)
J-2		257 26 42.86					
BM-03	212 45 45.75					9901920.602	818020.148
		290 12 28.17	434.592	150.132	-407.843		
J-3	124 59 19.50					9902070.734	817612.305
		235 11 47.22	89.308	-50.971	-73.333		
BM-04	307 44 53.25					9902019.762	817538.973
		2 56 40.03	98.895	98.767	5.080		
CP-04	271 38 25.50					9902118.530	817544.052
		94 35 5.09	107.367	-8.579	107.023		
J-4	182 47 44.75					9902109.950	817651.076
		97 22 49.40	117.052	-15.033	116.082		
J-5	185 50 51.00					9902094.918	817767.158
		103 13 39.95	315.713	-72.233	307.335		
CP-03	171 1 30.00					9902022.684	818074.493
		94 15 9.51	250.343	-18.557	249.652		
J-6	242 19 35.50					9902004.127	818324.145
		156 34 44.57	14.981	-13.746	5.954		
CP-1A	124 18 35.50					9901990.381	818330.100
		100 53 19.62	218.147	-41.202	214.218		
J-7	167 11 43.50					9901949.179	818544.318
		88 5 2.68	294.678	9.860	294.512		
J-8	257 47 1.25					9901959.039	818838.830
		165 52 3.49	71.576	-69.408	17.476		
CP-02	205 18 5.50					9901889.631	818856.306
		191 10 8.55	107.432	-105.395	-20.811		
BM-02	176 39 5.00					9901784.236	818835.495
		187 49 13.10	15.681	-15.535	-2.134		

Next Page : 2

*** TRAVERSE COMPUTATION — File name : PLB4-01A&B.TRV - Page : 2

* Project/Job : B4.01 - B4 (UTM)
* Location : PALU — Date : 12-04-19
* Surveyor : KARDI — Time : 19:05:34

STATION (Na$/No)	Measured Angle	Corrected Azimuth	Distance (m)	d COS Az (m)	d SIN Az (m)	C O O R D I N A T E N = Y (m)	E = X (m)
J-9	269 9 39.50					9901768.701	818833.361
		276 58 52.16	181.801	22.102	-180.454		
J-10	174 15 14.00					9901790.803	818652.907
		271 14 5.72	165.873	3.580	-165.835		
J-11	184 12 24.05					9901794.383	818487.073
		275 26 29.32	75.516	7.163	-75.176		
J-12	183 30 12.00					9901801.546	818411.897
		278 56 40.88	42.034	6.537	-41.523		
BM-01	248 33 27.50					9901808.083	818370.374
		347 30 7.94	114.814	112.096	-24.846		
CP-01	154 0 34.25					9901920.179	818345.527
		321 30 41.75	42.026	32.897	-26.156		
J-1	125 12 23.50					9901953.075	818319.372
		266 43 4.80	206.892	-11.839	-206.554		
J-2	170 43 38.50					9901941.237	818112.818
		257 26 42.86	94.940	-20.635	-92.670		
BM-03						9901920.602	818020.148

∑ measured = 21 N — δ X = 0.013 m
* Ang closs Err = 9.3" = 2.0 √ N — δ Y = -0.086 m — 12-04-19
∑ distance = 3059.661 m — * Accuracy = 1 / 35315 m — 19:05:34
** Checked by : — ** Sheet = 2 of 2

*** fsg/surdiv/data processing ==> from : 19:05:31 to : 19:05:33 < 12-04-19 >

STATION (Na$/No)	Measured Angle	Corrected Azimuth	Distance (m)	d COS Az (m)	d SIN Az (m)	C O O R D I N A T E N = Y (m)	E = X (m)
J-2		257 26 42.86					
BM-03	212 45 45.75					9901920.602	818020.148
		290 12 28.17	434.226	150.005	-407.499		
J-3	124 59 19.50					9902070.607	817612.649
		235 11 47.22	89.233	-50.929	-73.271		
BM-04	307 44 53.25					9902019.679	817539.378
		2 56 40.03	98.812	98.684	5.075		
CP-04	271 38 25.50					9902118.363	817544.453
		94 35 5.09	107.277	-8.572	106.933		
J-4	182 47 44.75					9902109.791	817651.386
		97 22 49.40	116.954	-15.020	115.985		
J-5	185 50 51.00					9902094.771	817767.371
		103 13 39.95	315.447	-72.173	307.076		
CP-03	171 1 30.00					9902022.598	818074.447
		94 15 9.51	250.132	-18.541	249.442		
J-6	242 19 35.50					9902004.057	818323.889
		156 34 44.57	14.968	-13.734	5.949		
CP-1A	124 18 35.50					9901990.323	818329.839
		100 53 19.62	217.963	-41.168	214.038		
J-7	167 11 43.50					9901949.155	818543.877
		88 5 2.68	294.430	9.852	294.264		
J-8	257 47 1.25					9901959.007	818838.141
		165 52 3.49	71.516	-69.350	17.461		
CP-02	205 18 5.50					9901889.657	818855.602
		191 10 8.55	107.342	-105.306	-20.793		
BM-02	176 39 5.00					9901784.351	818834.809
		187 49 13.10	15.668	-15.522	-2.132		

Next Page : 2

Surveys & Site Investigations

*** TRAVERSE COMPUTATION — File name : PLB4-02A&B.TRV - Page : 2

* Project/Job : B4.01 - B4
* Location : PALU — Date : 08-04-19
* Surveyor : KARDI — Time : 17:23:08

STATION (Na$/No)	Measured Angle	Corrected Azimuth	Distance (m)	d COS Az (m)	d SIN Az (m)	C O O R D I N A T E N = Y (m)	E = X (m)
J-9	269 9 39.50					9901768.829	818832.677
		276 58 52.16	181.648	22.083	-180.302		
J-10	174 15 14.00					9901790.912	818652.375
		271 14 5.72	165.733	3.576	-165.695		
J-11	184 12 24.05					9901794.489	818486.680
		275 26 29.32	75.452	7.157	-75.112		
J-12	183 30 12.00					9901801.646	818411.567
		278 56 40.88	41.999	6.531	-41.488		
BM-01	248 33 27.50					9901808.177	818370.079
		347 30 7.94	114.717	112.002	-24.825		
CP-01	154 0 34.25					9901920.179	818345.254
		321 30 41.75	41.991	32.869	-26.134		
J-1	125 12 23.50					9901953.048	818319.120
		266 43 4.80	206.718	-11.829	-206.380		
J-2	170 43 38.50					9901941.219	818112.740
		257 26 42.86	94.860	-20.617	-92.592		
BM-03						9901920.602	818020.148

∑ measured = 21 N — δ X = 0.013 m
* Ang closs Err = 9.3" = 2.0 √ N — δ Y = -0.086 m — 08-04-19
∑ distance = 3057.086 m — * Accuracy = 1 / 35315 m — 17:23:08
** Checked by : — ** Sheet = 2 of 2

*** fsg/surdiv/data processing ==> from : 17:23:02 to : 17:23:03 < 08-04-19 >

Appendix-5:

Precise Leveling Computation

PT. GEOMARINDEX

LEVELING COMPUTATION SHEET

Surveyor : Kardi Sukatma
Checked by: FSG (8-Apr-2019)
Survey date: 25-Mar-2019
Printed date: 12-Apr-2019

Project : Palu Bridge
Site : Palu Sulteng

Fixed Elevation — Start: BM-03 **3.039** m; End: BM-03 **3.039** m; *delta h =* *0.000* m

Point ID	Diff. Elevation 1st Way	2nd Way	Mean	Distance d	Corr. c	Elev. Z	Point ID	REMARKS
Nr.	m	m	m	m	m	m	Nr.	
BM-03						3.039	BM-03	Ref. EGM-08
	-0.379	-0.378	-0.379	192.4	0.000			
3						2.661	3	
	0.187	0.188	0.188	241.1	0.000			
J3						2.849	J3	
	0.096	0.095	0.096	89.4	0.000			
BM-04						2.944	BM-04	
	0.327	0.326	0.327	101.9	0.000			
CP-04						3.271	CP-04	
	0.902	0.901	0.902	117.5	0.000			
J4						4.173	J4	
	-1.495	-1.496	-1.496	116.6	0.000			
J5						2.677	J5	
	-0.854	-0.856	-0.855	156.9	0.000			
4						1.822	4	
	2.168	2.166	2.167	163.6	0.000			
CP-03						3.990	CP-03	
	0.097	0.099	0.098	140.6	0.000			
R1						4.088	R1	
	-0.568	-0.566	-0.567	139.8	0.000			
CP1A						3.521	CP1A	
	-0.665	-0.665	-0.665	89.5	0.000			
1						2.856	1	
	-0.198	-0.197	-0.198	119.0	0.000			
J7						2.659	J7	
	0.222	0.222	0.222	128.0	0.000			
2						2.881	2	
	0.262	0.262	0.262	172.0	0.000			
J8						3.143	J8	
	0.924	0.926	0.925	71.3	0.000			
CP-02						4.068	CP-02	
	0.438	0.438	0.438	107.4	0.000			
BM-02						4.507	BM-02	
	-0.425	-0.425	-0.425	15.8	0.000			
J9						4.082	J9	
	-0.815	-0.816	-0.816	161.0	0.000			
J10						3.266	J10	
	-0.687	-0.686	-0.687	165.2	0.000			
J11						2.580	J11	
	-0.098	-0.097	-0.098	75.5	0.000			
J12						2.483	J12	
	0.563	0.562	0.563	13.4	0.000			
BM-01						3.045	BM-01	
	0.384	0.383	0.384	114.3	0.000			
CP-01						3.429	CP-01	
	0.065	0.065	0.065	42.6	0.000			
J1						3.494	J1	
	0.594	0.593	0.594	139.9	0.000			
R1'						4.088	R1'	
	-1.193	-1.192	-1.193	144.3	0.000			
J2						2.895	J2	
	0.143	0.144	0.144	99.8	0.000			
BM-03						3.039	BM-03	
Sum	-0.005	-0.004	-0.005	3118.800	0.005			

Accuracy 2.55 mm√ (D) Km

Appendix-6:

Topographic Survey Computation

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
Survey Date : March, 27 2019												
	J-1				0.000		0.0000	818,319.120	9,901,953.048	3.497	J-1	
CL1		1.515			17.175			818,323.593	9,901,969.630	3.407	279	CL1
	1		1600	6.215	6.212	91.4501	80.1058	818,317.407	9,901,970.201	3.132	1	TGL
	2		1600	11.356	11.356	89.3201	123.2902	818,316.080	9,901,978.145	3.414	2	TGL
	3		1600	10.519	10.443	96.5255	80.0607	818,313.193	9,901,970.576	2.062	3	SNG
	4		1600	14.170	14.124	94.3608	109.2619	818,311.958	9,901,977.637	2.185	4	SNG
	5		1600	16.721	16.542	98.2259	78.3411	818,307.084	9,901,970.688	0.884	5	SNG
	6		1600	20.163	20.020	96.4925	96.1411	818,304.944	9,901,976.913	0.926	6	SNG
	7		1600	22.852	22.656	97.3051	80.3257	818,301.047	9,901,971.859	0.334	7	SNG
	8		1600	24.723	24.556	96.3914	90.1007	818,299.903	9,901,976.095	0.457	8	SNG
	9		1600	33.422	33.291	95.0458	88.3451	818,291.246	9,901,977.501	0.361	9	SNG
	10		1600	29.327	29.189	95.3331	79.1316	818,294.487	9,901,971.827	0.481	10	SNG
	11		1600	36.301	36.189	94.2952	79.0321	818,287.499	9,901,972.250	0.475	11	SNG
	12		1600	38.301	38.191	94.2046	88.1410	818,286.431	9,901,978.437	0.420	12	SNG
	13		1600	44.893	44.828	93.0512	79.2335	818,278.903	9,901,973.139	0.905	13	SNG
	14		1600	45.716	45.651	93.0327	85.5620	818,278.786	9,901,978.368	0.884	14	SNG
	15		1600	52.592	52.534	92.4117	79.1539	818,271.211	9,901,973.621	0.856	15	SNG
	16		1600	53.035	52.977	92.4116	84.4904	818,271.407	9,901,978.751	0.835	16	SNG
	17		1600	59.622	59.566	92.2848	78.3746	818,264.153	9,901,973.500	0.742	17	SNG
	18		1600	60.585	60.530	92.2702	84.0359	818,263.836	9,901,979.268	0.732	18	SNG
	19		1600	65.593	65.533	92.2701	78.1630	818,258.173	9,901,973.484	0.518	19	SNG
	20		1600	66.497	66.436	92.2703	83.2250	818,257.883	9,901,979.423	0.479	20	SNG
	21		1600	71.874	71.820	92.1315	79.2342	818,251.993	9,901,975.254	0.537	21	SNG
	22		1600	72.407	72.351	92.1446	82.2936	818,251.875	9,901,979.186	0.484	22	SNG
	23		1600	77.897	77.853	91.5510	82.5236	818,246.492	9,901,980.428	0.713	23	SNG
	24		1600	77.079	77.033	91.5853	79.2302	818,246.795	9,901,975.647	0.657	24	SNG
	25		1600	83.180	83.135	91.5325	79.1949	818,240.706	9,901,976.046	0.578	25	SNG
	26		1600	85.012	84.964	91.5518	82.3238	818,239.383	9,901,980.926	0.471	26	SNG
	27		1600	89.601	89.555	91.5030	79.1839	818,234.303	9,901,976.511	0.442	27	SNG
	28		1600	90.293	90.248	91.4853	82.2313	818,234.114	9,901,981.383	0.463	28	SNG
	29		1600	95.644	95.603	91.4040	81.5942	818,228.721	9,901,981.432	0.522	29	SNG
	30		1600	95.168	95.123	91.4526	79.1458	818,228.743	9,901,976.838	0.404	30	SNG
	31		1600	102.076	102.040	91.3116	79.1800	818,221.853	9,901,977.452	0.612	31	SNG
	32		1600	102.224	102.190	91.2847	82.0308	818,222.197	9,901,982.346	0.682	32	SNG
	33		1600	111.056	111.023	91.2418	81.1420	818,213.248	9,901,981.880	0.599	33	SNG
	34		1600	109.962	109.928	91.2516	79.1333	818,213.977	9,901,977.914	0.595	34	SNG
	35		1600	115.140	115.108	91.2105	79.1201	818,208.808	9,901,978.254	0.607	35	SNG
	36		1600	116.222	116.190	91.2103	80.5201	818,208.032	9,901,981.701	0.582	36	SNG
	37		1600	116.218	116.186	91.2103	80.5058	818,208.032	9,901,981.665	0.582	37	SNG
	38		1600	120.832	120.797	91.2233	79.1021	818,203.131	9,901,978.621	0.421	38	SNG
	39		1600	121.951	121.917	91.2050	80.5908	818,202.362	9,901,982.547	0.455	39	SNG
	40		1600	127.722	127.690	91.1717	79.0415	818,196.241	9,901,978.908	0.451	40	SNG
	41		1600	128.800	128.767	91.1817	80.5747	818,195.546	9,901,983.222	0.389	41	SNG
	42		1600	134.869	134.835	91.1724	80.5631	818,189.506	9,901,983.813	0.286	42	SNG
	43		1600	134.853	134.819	91.1724	80.5632	818,189.522	9,901,983.812	0.286	43	SNG
	44		1600	140.074	140.043	91.1243	79.0719	818,183.930	9,901,979.931	0.359	44	SNG
	45		1600	141.738	141.706	91.1244	80.4557	818,182.628	9,901,984.103	0.323	45	SNG
	46		1600	145.392	145.359	91.1245	79.1021	818,178.637	9,901,980.450	0.245	46	SNG
	47		1600	147.266	147.234	91.1100	80.5414	818,177.166	9,901,985.020	0.252	47	SNG
	48		1600	153.126	153.098	91.0512	79.1344	818,170.930	9,901,981.176	0.418	48	SNG
	49		1600	155.027	155.000	91.0345	81.0330	818,169.486	9,901,986.248	0.447	49	SNG
	50		1600	164.459	164.440	90.5200	79.1126	818,159.613	9,901,981.922	0.803	50	SNG
	51		1600	165.118	165.099	90.5202	80.4631	818,159.360	9,901,986.519	0.823	51	SNG
	52		1600	175.107	175.090	90.4722	79.1008	818,148.987	9,901,982.652	0.909	52	SNG
	53		1600	176.181	176.164	90.4722	80.4739	818,148.359	9,901,987.709	0.895	53	SNG
	54		1600	185.916	185.900	90.4452	79.1338	818,138.222	9,901,983.644	0.896	54	SNG
	55		1600	186.559	186.543	90.4451	80.4327	818,138.012	9,901,988.547	0.888	55	SNG
	56		1600	194.424	194.403	90.5027	79.1027	818,129.730	9,901,984.106	0.469	56	SNG
	57		1600	194.920	194.898	90.5138	80.2516	818,129.598	9,901,988.369	0.395	57	SNG
	58		1600	200.423	200.399	90.5308	79.0950	818,123.748	9,901,984.516	0.224	58	SNG
	59		1600	201.133	201.109	90.5308	80.2552	818,123.419	9,901,989.001	0.213	59	SNG
	60		1600	206.305	206.281	90.5232	79.1035	818,117.885	9,901,984.998	0.170	60	SNG
	61		1600	207.465	207.440	90.5323	79.5638	818,116.955	9,901,987.854	0.101	61	SNG
	62		1600	212.788	212.764	90.5107	79.0834	818,111.411	9,901,985.357	0.158	62	SNG
	63		1600	214.007	213.983	90.5158	80.0159	818,110.467	9,901,988.761	0.087	63	SNG

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	64		1600	220.051	220.029	90.4807	80.0702	818,104.474	9,901,989.623	0.242	64	SNG
	65		1600	218.179	218.160	90.4537	79.0845	818,106.031	9,901,985.767	0.427	65	SNG
	66		1600	226.407	226.400	90.2733	79.1055	818,097.824	9,901,986.519	1.508	66	SNG
	67		1600	227.377	227.370	90.2734	80.0440	818,097.150	9,901,990.134	1.499	67	SNG
	68		1600	228.205	228.199	90.2408	79.0857	818,096.020	9,901,986.523	1.720	68	B-SAL
	69		1600	229.781	229.776	90.2336	79.5500	818,094.700	9,901,989.752	1.745	69	B-SAL
	70		1600	229.336	229.336	90.0358	79.1223	818,094.903	9,901,986.836	3.057	70	A-SAL
	71		1600	230.788	230.788	90.0358	79.5631	818,093.697	9,901,989.898	3.056	71	A-SAL
	72		1600	229.843	229.841	90.1337	79.1148	818,094.397	9,901,986.835	2.412	72	TGL
	73		1600	232.102	232.101	90.1029	80.0056	818,092.415	9,901,990.310	2.614	73	TGL
	74		1600	226.347	226.345	90.1425	77.0606	818,097.414	9,901,978.310	2.373	74	TGL
	75		1600	223.204	223.203	90.1039	75.2421	818,100.399	9,901,971.586	2.631	75	TGL
	76		1600	222.554	222.554	90.0315	75.2549	818,101.048	9,901,971.675	3.112	76	TGL
	77		1600	225.573	225.573	90.0417	77.0801	818,098.191	9,901,978.406	3.041	77	TGL
	78		1600	224.254	224.249	90.2342	77.1014	818,099.520	9,901,978.499	1.776	78	SNG
	79		1600	221.610	221.605	90.2344	75.2509	818,101.997	9,901,971.623	1.792	79	SNG
	80		1600	212.875	212.862	90.3811	75.1358	818,110.735	9,901,970.852	0.958	80	SNG
	81		1600	215.172	215.158	90.3908	76.4511	818,108.547	9,901,976.573	0.873	81	SNG
	82		1600	209.506	209.481	90.5253	75.0753	818,114.113	9,901,970.462	0.099	82	SNG
	83		1600	211.041	211.016	90.5254	76.2322	818,112.648	9,901,975.101	0.075	83	SNG
	84		1600	205.092	205.065	90.5554	74.5858	818,118.528	9,901,969.913	(0.013)	84	SNG
	85		1600	205.193	205.166	90.5554	76.0313	818,118.468	9,901,973.747	(0.014)	85	SNG
	86		1600	198.796	198.769	90.5704	75.0755	818,124.826	9,901,970.421	0.022	86	SNG
	87		1600	199.489	199.464	90.5440	76.2336	818,124.197	9,901,974.815	0.150	87	SNG
	88		1600	188.372	188.352	90.5016	77.0646	818,135.381	9,901,976.890	0.568	88	SNG
	89		1600	192.006	191.985	90.5126	75.1015	818,131.611	9,901,970.525	0.449	89	SNG
	90		1600	185.157	185.139	90.4808	74.4646	818,138.455	9,901,969.228	0.730	90	SNG
	91		1600	183.237	183.222	90.4328	76.3837	818,140.455	9,901,975.193	1.005	91	SNG
	92		1600	177.385	177.371	90.4327	74.2251	818,146.230	9,901,968.011	1.080	92	SNG
	93		1600	177.956	177.942	90.4327	76.2041	818,145.707	9,901,974.105	1.073	93	SNG
	94		1600	169.175	169.158	90.4817	74.0418	818,154.452	9,901,967.173	0.946	94	SNG
	95		1600	170.556	170.539	90.4818	75.5300	818,153.079	9,901,972.545	0.926	95	SNG
	96		1600	159.514	159.496	90.5144	73.3837	818,164.136	9,901,966.122	0.922	96	SNG
	97		1600	160.333	160.315	90.5145	75.1912	818,163.282	9,901,970.794	0.909	97	SNG
	98		1600	151.667	151.642	91.0257	76.0128	818,171.980	9,901,972.596	0.545	98	SNG
	99		1600	150.430	150.407	91.0038	73.1831	818,173.245	9,901,965.443	0.669	99	SNG
	100		1600	143.568	143.537	91.1110	75.4055	818,180.069	9,901,971.579	0.350	100	SNG
	101		1600	144.231	144.200	91.1111	72.5649	818,179.477	9,901,964.706	0.336	101	SNG
	102		1600	134.492	134.458	91.1742	75.0124	818,189.136	9,901,969.910	0.283	102	SNG
	103		1600	138.709	138.674	91.1713	72.3946	818,185.025	9,901,964.207	0.207	103	SNG
	104		1600	131.898	131.865	91.1712	75.2154	818,191.732	9,901,970.691	0.360	104	SNG
	105		1600	131.969	131.933	91.2037	72.1205	818,191.807	9,901,963.410	0.228	105	SNG
	106		1600	125.532	125.497	91.2108	75.2410	818,198.101	9,901,970.723	0.360	106	SNG
	107		1600	125.182	125.144	91.2444	71.3658	818,198.655	9,901,962.453	0.237	107	SNG
	108		1600	119.724	119.686	91.2610	75.0542	818,203.907	9,901,970.029	0.321	108	SNG
	109		1600	119.005	118.967	91.2716	70.5937	818,204.903	9,901,961.517	0.301	109	SNG
	110		1600	111.965	111.926	91.3115	70.2903	818,212.000	9,901,961.005	0.350	110	SNG
	111		1600	112.055	112.018	91.2758	74.3055	818,211.577	9,901,968.870	0.455	111	SNG
	112		1600	103.964	103.925	91.3338	74.0729	818,219.677	9,901,968.217	0.491	112	SNG
	113		1600	104.576	104.533	91.3849	69.4657	818,219.477	9,901,960.299	0.316	113	SNG
	114		1600	97.348	97.304	91.4337	69.1209	818,226.771	9,901,959.964	0.388	114	SNG
	115		1600	96.746	96.699	91.4644	73.5559	818,226.907	9,901,967.992	0.319	115	SNG
	116		1600	88.644	88.595	91.5439	73.3123	818,235.024	9,901,967.495	0.366	116	SNG
	117		1600	89.627	89.582	91.4841	68.1049	818,234.627	9,901,959.142	0.489	117	SNG
	118		1600	80.004	79.958	91.5701	72.5138	818,243.686	9,901,966.779	0.599	118	SNG
	119		1600	80.989	80.944	91.5506	67.0957	818,243.386	9,901,958.731	0.611	119	SNG
	120		1600	71.439	71.385	92.1402	72.0629	818,252.293	9,901,966.148	0.537	120	SNG
	121		1600	72.430	72.381	92.0652	65.5004	818,252.117	9,901,958.221	0.650	121	SNG
	122		1600	64.777	64.718	92.2705	71.0641	818,259.017	9,901,965.349	0.551	122	SNG
	123		1600	64.865	64.808	92.2426	64.0738	818,259.928	9,901,957.512	0.598	123	SNG
	124		1600	56.106	56.041	92.4500	61.2203	818,269.108	9,901,956.513	0.630	124	SNG
	125		1600	56.047	55.986	92.4011	69.4259	818,267.836	9,901,964.568	0.711	125	SNG
	126		1600	48.671	48.604	93.0017	58.0812	818,277.055	9,901,955.608	0.771	126	SNG
	127		1600	47.156	47.092	92.5909	66.2255	818,277.021	9,901,962.652	0.866	127	SNG
	128		1600	40.245	40.161	93.4248	68.0009	818,283.723	9,901,964.804	0.716	128	SNG
	129		1600	40.951	40.872	93.3316	53.3511	818,285.517	9,901,954.771	0.783	129	SNG
	130		1600	31.498	31.372	95.0720	63.3909	818,292.824	9,901,963.509	0.510	130	SNG
	131		1600	33.257	33.143	94.4459	47.5932	818,294.039	9,901,954.629	0.568	131	SNG

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	132		1600	27.426	27.272	96.0445	62.1953	818,296.975	9,901,963.694	0.418	132	SNG
	133		1600	28.108	27.948	96.0705	41.0716	818,300.364	9,901,954.090	0.326	133	SNG
	134		1600	24.340	24.151	97.0901	32.2406	818,305.788	9,901,953.313	0.292	134	SNG
	135		1600	21.852	21.644	97.5506	53.4753	818,303.401	9,901,961.836	0.312	135	SNG
	136		1600	17.664	17.454	98.5029	47.0826	818,308.148	9,901,961.499	0.607	136	SNG
	137		1600	22.132	22.001	96.1456	25.0259	818,309.408	9,901,952.813	0.913	137	SNG
	138		1600	13.735	13.650	96.2208	33.2124	818,313.377	9,901,960.577	1.798	138	SNG
	139		1600	19.772	19.714	94.2219	15.5450	818,313.436	9,901,952.733	1.815	139	SNG
	140		1600	9.663	9.617	95.3406	24.1604	818,317.493	9,901,962.194	2.384	140	TGL
	141		1600	18.156	18.123	93.2836	7.0106	818,316.771	9,901,952.841	2.221	141	TGL
	142		1600	7.987	7.984	91.3459	11.0712	818,320.066	9,901,962.467	3.101	142	TGL
	143		1600	17.283	17.283	90.1116	359.3041	818,319.234	9,901,952.906	3.265	143	TGL
	144		1600	16.820	16.820	89.5015	352.3258	818,321.355	9,901,952.959	3.370	144	TGL
	145		1600	6.546	6.544	91.2904	358.1450	818,322.083	9,901,963.263	3.152	145	TGL
	146		0	5.309	5.145	104.1723	355.1912	818,322.663	9,901,964.570	3.612	146	TGL-A
	147		0	16.511	16.469	94.0626	350.4543	818,321.912	9,901,953.247	3.739	147	TGL-A
	148		0	25.345	25.322	92.2711	350.1229	818,321.252	9,901,944.417	3.837	148	TGL-A
	149		1600	46.133	46.064	93.0748	90.4126	818,279.266	9,901,982.162	0.803	149	SNG
	150		1600	49.452	49.369	93.1840	100.3053	818,279.074	9,901,990.970	0.466	150	SNG
	151		1600	55.187	55.128	92.3907	91.1905	818,270.712	9,901,985.208	0.769	151	SNG
	152		1600	56.782	56.681	93.2400	94.5636	818,270.343	9,901,989.053	(0.056)	152	SNG
	153		1600	63.655	63.600	92.2325	89.5515	818,262.165	9,901,986.109	0.667	153	SNG
	154		1600	73.246	73.190	92.1423	88.1920	818,252.401	9,901,986.614	0.460	154	SNG
	155		1600	72.899	72.837	92.2157	92.3023	818,254.167	9,901,991.657	0.313	155	SNG
	156		1600	79.706	79.636	92.2434	90.3507	818,246.922	9,901,991.155	(0.029)	156	SNG
	157		1600	86.117	86.056	92.0922	90.0751	818,240.558	9,901,992.232	0.082	157	SNG
	158		1600	87.554	87.504	91.5641	86.4535	818,237.956	9,901,987.608	0.351	158	SNG
	159		1600	90.830	90.770	92.0503	90.4959	818,236.309	9,901,994.542	0.019	159	SNG
	160		1600	95.486	95.447	91.3834	87.0114	818,230.273	9,901,989.665	0.585	160	SNG
	161		1600	94.746	94.705	91.4137	92.0641	818,233.127	9,901,997.647	0.522	161	SNG
	162		1600	102.441	102.409	91.2600	88.0005	818,223.848	9,901,992.837	0.760	162	SNG
	163		1600	99.321	99.313	90.4248	93.1355	818,229.318	9,902,000.860	2.086	163	PULO
	164		1600	105.631	105.624	90.4031	89.1704	818,221.279	9,901,995.863	2.077	164	PULO
	165		1600	104.647	104.644	90.2516	95.0729	818,225.398	9,902,005.799	2.553	165	PULO
	166		1600	108.398	108.398	89.5900	90.2119	818,219.113	9,901,998.510	3.354	166	PULO
	167		1600	117.899	117.899	89.5210	93.2250	818,211.772	9,902,006.994	3.591	167	PULO
	168		1600	110.165	110.165	90.0325	93.3757	818,219.261	9,902,005.003	3.213	168	PULO
	169		1600	119.621	119.620	90.1202	97.4633	818,213.378	9,902,016.123	2.903	169	PULO
	170		1600	112.610	112.610	90.0817	98.3432	818,220.458	9,902,014.842	3.051	170	PULO
	171		1600	116.217	116.209	90.3919	101.4709	818,219.941	9,902,022.175	1.993	171	PULO
	172		1600	128.672	128.672	89.5056	100.3040	818,207.560	9,902,025.242	3.661	172	PULO
	173		1600	124.685	124.672	90.5011	104.4023	818,215.374	9,902,031.530	1.502	173	PULO
	174		1600	133.654	133.652	90.1847	102.0326	818,204.671	9,902,030.625	2.592	174	PULO
	175		1600	137.880	137.865	90.5039	105.5804	818,205.499	9,902,040.768	1.291	175	PULO
	176		1600	129.265	129.250	90.5309	108.2017	818,215.732	9,902,040.844	1.324	176	PULO
	177		1600	141.520	141.505	90.4922	110.4329	818,208.853	9,902,052.447	1.290	177	PULO
	178		1600	131.300	131.284	90.5422	112.3831	818,219.772	9,902,049.983	1.246	178	PULO
	179		1600	119.320	119.290	91.1644	116.5449	818,234.957	9,902,049.466	0.659	179	PULO
	180		1600	124.804	124.783	91.0344	114.5510	818,228.026	9,902,049.865	1.008	180	PULO
	181		1600	112.372	112.343	91.1816	113.1139	818,235.417	9,902,039.243	0.764	181	PULO
	182		1600	118.006	117.987	91.0211	111.1041	818,228.473	9,902,039.437	1.188	182	PULO
	183		1600	101.617	101.584	91.2725	109.0352	818,239.536	9,902,026.671	0.738	183	PULO
	184		1600	110.817	110.798	91.0426	107.1305	818,229.955	9,902,028.858	1.245	184	PULO
	185		1600	94.109	94.075	91.3207	104.3111	818,241.808	9,902,016.120	0.801	185	PULO
	186		1600	101.960	101.939	91.0930	103.3439	818,234.155	9,902,018.542	1.261	186	PULO
	187		1600	90.932	90.898	91.3345	98.5619	818,240.576	9,902,006.652	0.843	187	PULO
	188		1600	97.277	97.259	91.0604	98.5430	818,234.746	9,902,009.196	1.453	188	PULO
	189		1600	96.469	96.456	90.5637	95.4557	818,233.461	9,902,003.980	1.733	189	PULO
	190		1600	91.592	91.554	91.3917	95.4916	818,238.073	9,902,002.316	0.677	190	PULO
	191		1600	100.920	100.887	91.2815	85.5507	818,224.565	9,901,988.906	0.732	191	SNG
	192		1600	105.053	105.034	91.0607	87.5700	818,221.275	9,901,993.360	1.302	192	SNG
	193		1600	110.757	110.723	91.2511	83.1452	818,214.042	9,901,985.698	0.578	193	SNG
	194		1600	109.110	109.083	91.1633	85.3235	818,216.385	9,901,989.769	0.893	194	SNG
	195		1600	113.023	112.997	91.1322	84.4802	818,212.277	9,901,989.051	0.910	195	SNG
	196		1600	110.756	110.721	91.2606	83.1434	818,214.042	9,901,985.688	0.548	196	SNG
	197		1600	113.240	113.229	90.4744	85.5036	818,212.421	9,901,991.118	1.750	197	PULO
	198		1600	112.497	112.492	90.3229	87.3928	818,213.877	9,901,994.464	2.259	198	PULO

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
Survey Date : March, 28 2019												
	CP1		1600	42.067	42.067	89.4648	359.5959	818,345.254	9,901,920.179	3.432	CP1	BS
J1		1.372			41.992			818,319.120	9,901,953.048	3.497	J1	
	J1A		1600	103.442	103.440	89.3655	40.0052	818,316.364	9,901,849.645	3.964	J1A	BS
	1		1600	36.543	36.537	88.5824	39.5759	818,318.177	9,901,916.523	3.924	1	TGL
	2		1600	37.842	37.840	89.2637	37.5029	818,319.547	9,901,915.210	3.636	2	TGL
	3		1600	38.040	38.038	89.2811	35.3558	818,321.037	9,901,915.058	3.621	3	TGL
	4		1600	27.425	27.424	89.3657	35.2541	818,320.584	9,901,925.663	3.453	4	TGL
	5		1600	28.997	28.991	88.4918	38.3140	818,319.100	9,901,924.057	3.865	5	TGL
	6		1600	19.981	19.972	88.1640	35.3544	818,320.128	9,901,933.101	3.870	6	TGL
	7		1600	11.065	11.050	87.0204	28.1222	818,321.092	9,901,942.175	3.841	7	TGL
	8		1600	9.565	9.565	89.2921	49.3303	818,317.285	9,901,943.661	3.354	8	TGL
	9		1600	10.392	10.326	96.2749	60.1914	818,315.280	9,901,943.463	2.099	9	SNG
	10		1600	16.701	16.651	94.2629	48.5444	818,316.107	9,901,936.672	1.976	10	SNG
	11		1600	21.732	21.697	93.1549	47.4627	818,315.619	9,901,931.636	2.032	11	SNG
	12		1600	22.356	22.340	92.1023	39.1840	818,318.799	9,901,930.710	2.421	12	B-SAL
	13		1600	30.211	30.191	92.0423	40.4706	818,317.910	9,901,922.881	2.176	13	B-SAL
	14		1600	29.769	29.740	92.3141	43.3255	818,316.497	9,901,923.424	1.956	14	SNG
	15		1600	27.939	27.939	89.4331	228.0906	818,323.810	9,901,980.590	3.403	15	TGL
	16		1600	19.318	19.315	88.5557	254.2025	818,330.433	9,901,968.703	3.629	16	PHN
	17		1600	14.197	14.193	88.4208	266.0633	818,329.605	9,901,962.615	3.591	17	PHN
	18		1600	9.808	9.797	87.1921	321.2810	818,328.667	9,901,950.847	3.727	18	PHN
	19		1600	15.028	15.021	91.4433	43.3350	818,317.791	9,901,938.086	2.812	19	PHN
	20		1600	1.769	1.768	88.0239	205.3139	818,318.723	9,901,954.771	3.329	20	PHN
	CP1A		0	73.896	73.888	90.5035	5.3428	818,329.839	9,901,990.323	3.524	CP1A	BS
CP1		1.135			71.818			818,345.254	9,901,920.179	3.432	CP1	
	30		1600	70.440	70.439	90.1401	24.5210	818,353.717	9,901,990.108	2.680	30	TGJBT
	31		1600	69.984	69.984	90.0645	26.5427	818,356.128	9,901,989.313	2.830	31	TGJBT
Survey Date : March, 29 2019												
	J1		1600	103.511	103.511	90.0742	0.0000	818,319.120	9,901,953.048	3.497	J1	BS
J1A		1.355			103.440			818,316.364	9,901,849.645	3.964	J1A	
	1		1600	41.939	41.939	90.0629	0.2415	818,317.777	9,901,891.560	3.639	1	J1B
	2		1600	31.753	31.752	89.3130	355.4304	818,314.838	9,901,881.360	3.982	2	TGL
	3		2600	32.281	32.253	92.2219	352.4511	818,313.149	9,901,881.738	1.383	3	TGL
	4		2600	26.455	26.411	93.1838	350.0827	818,312.537	9,901,875.777	1.191	4	TGL
	5		1600	25.708	25.707	89.2420	354.0041	818,314.364	9,901,875.274	3.985	5	TGL
	6		1600	18.931	18.929	89.0601	350.4312	818,313.811	9,901,868.401	4.016	6	TGL
	7		2600	19.180	19.134	93.5849	345.3428	818,312.093	9,901,868.296	1.387	7	TGL
	8		2600	12.786	12.709	96.1735	338.5844	818,312.123	9,901,861.625	1.317	8	TGL
	9		1600	12.575	12.572	88.4429	347.3853	818,314.003	9,901,861.993	3.995	9	TGL
	10		1600	6.906	6.899	87.2928	341.3615	818,314.362	9,901,856.248	4.021	10	TGL
	11		2600	6.587	6.411	103.1705	322.4131	818,312.616	9,901,854.846	1.205	11	TGL
	12		2600	3.842	3.507	114.0603	282.1231	818,312.957	9,901,850.478	1.150	12	TGL
	13		1600	2.179	2.154	81.2138	306.0740	818,314.659	9,901,850.961	4.046	13	TGL
	14		1600	7.067	7.058	87.0451	188.4138	818,315.112	9,901,842.699	4.078	14	TGL
	15		2600	8.363	8.255	99.1200	201.2411	818,313.148	9,901,842.042	1.381	15	TGL
	16		2600	13.259	13.199	95.2728	190.2237	818,313.642	9,901,836.730	1.457	16	TGL
	17		2350	13.510	13.462	85.1107	181.4611	818,315.590	9,901,836.205	4.103	17	TGL
	18		1600	12.866	12.866	89.4518	163.3640	818,319.664	9,901,837.210	3.774	18	TGL
	19		1600	2.645	2.641	93.1318	106.5438	818,318.869	9,901,848.810	3.570	19	TGL
	20		1600	7.286	7.281	92.0425	15.4907	818,318.535	9,901,856.595	3.455	20	TGL
	21		1600	15.571	15.568	91.1044	5.2108	818,318.229	9,901,865.101	3.398	21	TGL
	22		1600	23.034	23.031	90.5148	4.3629	818,318.825	9,901,872.545	3.372	22	TGL
	23		1600	24.966	24.956	91.3936	5.0721	818,319.254	9,901,874.433	2.995	23	TGL
	24		1600	9.164	9.148	93.2506	18.3218	818,319.503	9,901,858.238	3.172	24	TGL
	25		1600	6.684	6.662	94.4153	29.3112	818,319.800	9,901,855.352	3.171	25	RMH
	26		1600	3.914	3.875	98.0604	84.0025	818,320.227	9,901,849.947	3.167	26	RMH
	27		1600	4.387	4.312	100.3729	100.4054	818,320.578	9,901,848.733	2.910	27	RMH
	28		1600	10.672	10.625	95.2220	158.3106	818,319.990	9,901,839.658	2.719	28	RMH
	29		1600	13.500	13.451	94.5229	90.0452	818,329.810	9,901,849.268	2.571	29	RMH
	30		1600	15.748	15.712	93.5358	85.4934	818,332.059	9,901,850.371	2.648	30	RMH
	31		1600	33.843	33.824	91.5519	88.3957	818,350.188	9,901,849.531	2.584	31	RMH
	32		1600	39.861	39.859	90.3042	170.3813	818,321.799	9,901,810.158	3.363	32	TGL
	33		1000	39.729	39.726	90.3851	176.0025	818,318.074	9,901,809.955	3.870	33	TGL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	34		1000	31.570	31.569	90.2026	176.3502	818,317.405	9,901,818.093	4.131	34	TGL
	35		1600	31.594	31.593	90.2026	170.0742	818,320.949	9,901,818.386	3.531	35	TGL
	36		1600	16.507	16.504	88.5240	168.4838	818,319.134	9,901,833.375	4.042	36	LAMPU
	37		1600	13.747	13.747	90.0123	3.5749	818,317.679	9,901,863.329	3.713	37	LAMPU
	J1A		1600	41.959	41.939	91.4500	359.5938	818,316.364	9,901,849.645	3.964	J1A	TGJBT
J1B		1.495			41.939			818,317.777	9,901,891.560	3.639	J1B	
	39		1600	4.412	4.411	91.1923	344.0148	818,318.847	9,901,887.281	3.433	39	TGL
	40		1600	6.639	6.639	89.3430	199.4002	818,320.222	9,901,897.733	3.584	40	TGL
	41		1600	10.976	10.967	92.2052	208.3103	818,323.336	9,901,901.014	3.085	41	TGL
	42		1600	19.212	19.212	89.4904	190.1814	818,321.851	9,901,910.335	3.596	42	TGL
	43		1600	19.318	19.309	91.4748	194.0949	818,323.132	9,901,910.111	2.929	43	TGL
	44		1600	29.018	29.017	90.2947	189.0612	818,323.334	9,901,920.040	3.283	44	TGL
	CP1A		0	71.757	71.749	90.5104	0.0000	818,329.839	9,901,990.323	3.524	CP1A	BS
CP01		1.13			71.818			818,345.254	9,901,920.179	3.432	CP01	
	45		1600	36.489	36.489	90.0350	66.3222	818,374.828	9,901,941.552	2.921	45	K1
	46		1600	48.503	48.503	90.0147	172.3215	818,361.729	9,901,874.560	2.937	46	K2
	47		1600	4.995	4.995	90.1805	224.0333	818,342.632	9,901,915.928	2.936	47	BGN
	48		2500	20.186	20.179	88.3159	270.2358	818,325.515	9,901,915.985	2.579	48	BGN
	49		1600	47.612	47.611	90.1958	176.5801	818,357.919	9,901,874.283	2.685	49	K2A
	CP1		1130	36.505	36.504	89.2928	0.0000	818,345.254	9,901,920.179	3.432	CP1	BS
K1		1.39			36.489			818,374.828	9,901,941.552	2.921	K1	
	51		1600	14.598	14.597	89.1507	293.2414	818,377.976	9,901,927.298	2.902	51	BGN
	52		1600	14.997	14.997	89.5302	290.1605	818,378.858	9,901,927.106	2.742	52	BGN
	53		1600	24.826	24.826	90.1608	233.4504	818,398.453	9,901,933.923	2.595	53	BGN
	54		1600	22.394	22.394	90.1608	256.0834	818,391.910	9,901,927.071	2.606	54	BGN
	55		1600	8.276	8.276	90.1609	261.1108	818,380.646	9,901,935.666	2.672	55	BGN
	56		1600	7.779	7.779	90.1609	283.4221	818,377.761	9,901,934.347	2.675	56	BGN
	57		1600	22.923	22.922	90.2731	205.1751	818,397.363	9,901,945.752	2.528	57	BGN
	58		1600	19.456	19.454	90.5440	292.5214	818,379.199	9,901,922.596	2.402	58	BGN
	59		1600	4.580	4.573	93.1616	286.1133	818,376.367	9,901,937.246	2.450	59	BGN
	60		1600	7.220	7.220	89.4503	216.5811	818,382.047	9,901,941.411	2.743	60	BGN
	61		1000	16.456	16.446	92.0118	193.1719	818,390.015	9,901,947.863	2.731	61	BGN
	CP1		1130	48.503	48.501	89.2928	0.0000	818,345.254	9,901,920.179	3.432	CP1	BS
K2		1.41			48.503			818,361.729	9,901,874.560	2.937	K2	
	62		1600	55.811	55.810	89.4339	111.4458	818,417.509	9,901,872.717	3.012	62	K3
	K2		1410	55.813	55.812	90.1847	0.0000	818,361.729	9,901,874.560	2.937	K2	STN
K3		1.58			55.810			818,417.509	9,901,872.717	3.012	K3	
	64		1600	11.059	11.057	88.5753	42.0916	818,409.561	9,901,880.404	3.192	64	BGN
	65		1600	8.426	8.418	87.2819	327.4802	818,410.242	9,901,868.469	3.364	65	BGN
	66		1600	18.292	18.291	90.4319	61.1654	818,409.255	9,901,889.039	2.762	66	BGN
	67		1600	18.528	18.528	90.2103	60.4723	818,409.006	9,901,889.178	2.879	67	BGN
	68		1600	23.087	23.087	89.5004	283.0112	818,411.568	9,901,850.407	3.059	68	BGN
	69		1600	23.088	23.088	89.5004	283.0059	818,411.569	9,901,850.406	3.059	69	BGN
	70		1600	28.020	28.013	91.1722	69.0205	818,408.355	9,901,899.192	2.362	70	BGN
	71		1600	42.594	42.594	89.5511	274.1700	818,412.927	9,901,830.370	3.052	71	BGN
	72		1600	59.298	59.298	89.5915	271.2614	818,414.065	9,901,813.519	3.005	72	BGN
	73		1600	27.543	27.543	89.4809	72.0401	818,409.898	9,901,899.187	3.087	73	TEMBOK
	74		1600	27.086	27.086	90.0422	96.3725	818,421.520	9,901,899.504	2.958	74	TEMBOK
	75		1600	26.654	26.653	90.3430	82.1435	818,414.786	9,901,899.230	2.725	75	TEMBOK
	76		1600	14.626	14.626	89.3815	82.2016	818,416.039	9,901,887.268	3.085	76	DTL
	77		1600	15.649	15.644	91.2433	104.5703	818,422.042	9,901,887.690	2.607	77	DTL
	78		1600	6.709	6.709	90.1105	82.2022	818,416.835	9,901,879.392	2.971	78	DTL
	79		1600	8.189	8.189	90.1646	123.2743	818,422.247	9,901,879.395	2.952	79	DTL
	80		1600	3.077	3.077	89.5040	8.4548	818,414.485	9,901,873.286	3.001	80	DTL
	81		1600	4.842	4.839	91.5725	164.2844	818,422.212	9,901,873.857	2.827	81	DTL
	82		1600	6.714	6.714	89.4654	273.5040	818,416.838	9,901,866.036	3.018	82	DTL
	83		1600	8.039	8.038	90.4220	229.2614	818,422.532	9,901,866.441	2.893	83	DTL
	84		1600	7.433	7.433	90.0859	309.1637	818,412.616	9,901,867.121	2.973	84	DTL
	85		1600	17.287	17.287	89.5529	284.2532	818,412.652	9,901,856.126	3.015	85	DTL
	86		1600	15.177	15.177	90.0448	247.5753	818,422.735	9,901,858.468	2.971	86	DTL
	87		1600	16.951	16.951	89.5750	267.3525	818,417.662	9,901,855.766	3.003	87	DTL
	88		1600	22.691	22.690	89.3614	254.2931	818,422.851	9,901,850.664	3.149	88	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	89		1600	24.241	24.241	89.5959	278.5004	818,412.997	9,901,848.899	2.992	89	DTL
	90		1600	32.836	32.836	90.0211	275.1055	818,413.465	9,901,840.131	2.971	90	DTL
	91		1600	32.231	32.231	89.5552	267.1946	818,417.947	9,901,840.489	3.031	91	DTL
	92		2500	30.902	30.888	88.1559	257.3042	818,423.189	9,901,842.356	3.027	92	DTL
	93		2500	24.198	24.192	88.4542	252.4114	818,423.942	9,901,849.395	2.615	93	DTL
	94		2500	31.247	31.244	89.1144	253.2514	818,425.431	9,901,842.494	2.531	94	DTL
	95		2500	32.557	32.553	89.0556	245.0906	818,430.205	9,901,842.742	2.604	95	DTL
	96		2500	26.344	26.343	89.2921	239.2710	818,430.141	9,901,849.600	2.327	96	DTL
	97		2500	29.533	29.532	89.3738	227.1333	818,436.838	9,901,850.388	2.284	97	DTL
	98		2500	35.114	35.111	89.1219	232.3928	818,437.873	9,901,844.115	2.579	98	DTL
	99		2500	35.420	35.420	89.5040	212.5316	818,446.601	9,901,852.512	2.188	99	DTL
	100		2500	35.463	35.463	89.5039	212.4800	818,446.663	9,901,852.527	2.189	100	DTL
	101		2500	41.398	41.398	89.4410	225.1434	818,445.671	9,901,842.374	2.283	101	DTL
	102		2500	41.592	41.592	89.4838	206.0342	818,454.248	9,901,853.220	2.230	102	DTL
	103		2500	44.215	44.215	89.4718	220.5122	818,449.978	9,901,842.704	2.256	103	DTL
	104		2500	47.804	47.804	89.5826	201.2454	818,461.412	9,901,853.802	2.114	104	TMBKPGR
	105		2500	48.794	48.794	89.4840	203.4711	818,461.484	9,901,851.573	2.253	105	TMBKPGR
	106		2500	50.275	50.275	89.4841	207.0446	818,461.492	9,901,848.365	2.258	106	TMBKPGR
	107		2500	45.745	45.745	89.5544	195.1056	818,461.238	9,901,859.285	2.149	107	TMBKPGR
	108		2500	44.054	44.054	89.5545	187.0437	818,461.024	9,901,865.848	2.147	108	TMBKPGR
	109		2500	36.995	36.995	89.4733	187.3745	818,453.994	9,901,866.597	2.226	109	TMBKPGR
	110		2500	38.350	38.349	89.4143	196.4522	818,453.845	9,901,860.454	2.296	110	TMBKPGR
	111		2500	38.357	38.356	89.4144	196.4633	818,453.847	9,901,860.439	2.296	111	TMBKPGR
	112		2500	28.000	28.000	89.5241	189.0231	818,445.001	9,901,867.405	2.152	112	TMBKPGR
	113		2500	31.476	31.476	89.4236	202.4804	818,446.106	9,901,859.567	2.252	113	TMBKPGR
	114		2500	21.296	21.295	89.3441	190.3419	818,438.303	9,901,868.120	2.249	114	TMBKPGR
	115		2500	26.290	26.290	89.4321	209.1653	818,440.003	9,901,859.108	2.220	115	TMBKPGR
	116		2500	13.020	13.020	89.3149	191.3041	818,430.174	9,901,869.699	2.199	116	TMBKPGR
	117		2500	17.916	17.914	89.1423	218.3224	818,431.145	9,901,861.098	2.330	117	TMBKPGR
	118		2500	6.358	6.344	86.1325	203.3342	818,423.237	9,901,869.990	2.511	118	TMBKPGR
	119		2500	11.703	11.692	87.3210	236.4954	818,423.579	9,901,862.724	2.595	119	TMBKPGR
	120		2500	8.148	8.143	88.0051	137.0431	818,423.652	9,901,878.063	2.375	120	TMBKPGR
	121		2500	14.110	14.104	88.2044	108.4057	818,422.466	9,901,885.921	2.500	121	TMBKPGR
	122		2500	15.084	15.084	89.5947	148.1650	818,430.595	9,901,880.219	2.093	122	TMBKPGR
	123		2500	17.979	17.978	89.2248	132.3944	818,430.122	9,901,885.527	2.287	123	TMBKPGR
	124		2500	23.365	23.364	89.3001	144.0427	818,436.871	9,901,885.793	2.296	124	TMBKPGR
	125		2500	20.416	20.416	89.5858	162.2503	818,437.164	9,901,878.238	2.098	125	TMBKPGR
	126		2500	30.232	30.230	89.2152	153.0746	818,444.912	9,901,885.482	2.428	126	TMBKPGR
	127		2500	29.103	29.102	89.3330	164.3335	818,445.801	9,901,879.534	2.317	127	TMBKPGR
	128		2500	36.200	36.200	89.4416	167.5147	818,453.132	9,901,879.155	2.258	128	TMBKPGR
	129		2500	38.096	38.095	89.3402	157.2034	818,453.129	9,901,886.223	2.380	129	TMBKPGR
	130		2500	43.675	43.675	90.0209	167.0149	818,460.370	9,901,881.108	2.065	130	TMBKPGR
	131		2500	45.403	45.403	89.5139	158.1653	818,460.221	9,901,888.116	2.203	131	TMBKPGR
	132		2500	49.117	49.117	89.4614	147.1941	818,459.707	9,901,897.851	2.289	132	TMBKPGR
	133		2500	44.867	44.867	89.5917	139.0343	818,452.355	9,901,900.980	2.102	133	TMBKPGR
	134		2500	31.217	31.215	89.1949	121.1505	818,434.576	9,901,898.853	2.457	134	DTL
	135		2500	41.568	41.568	89.5005	111.4231	818,434.151	9,901,910.808	2.212	135	TBK
	136		2500	44.042	44.041	89.3306	98.1319	818,425.243	9,901,916.073	2.437	136	TBK
	137		2500	25.284	25.277	88.3946	112.5338	818,428.106	9,901,895.665	2.682	137	TBK
	138		1600	23.601	23.597	91.0130	105.5006	818,424.694	9,901,895.193	2.570	138	TBK
	139		1600	36.442	36.438	90.5242	97.3736	818,423.535	9,901,908.653	2.434	139	TBK
Survey Date : March, 30 2019												
	CP02		1350	71.512	71.510	89.3503	359.5959	818,855.602	9,901,889.657	4.071	CP02	BS
J8		1.56			71.514			818,838.141	9,901,959.007	3.146	J8	
	2		1600	97.720	97.720	90.0449	92.2254	818,742.469	9,901,939.107	2.969	2	J8A
	3		1600	97.689	97.689	90.0449	92.2446	818,742.488	9,901,939.165	2.969	3	J8A
	4		1600	95.999	95.998	89.4428	88.1649	818,745.794	9,901,932.785	3.540	4	TELKM
	5		1600	103.446	103.446	90.0203	81.3352	818,742.616	9,901,919.307	3.044	5	TL
	6		1600	60.519	60.519	90.0204	75.2748	818,785.041	9,901,929.973	3.070	6	TL
	7		1600	17.037	17.031	88.2842	28.0345	818,834.041	9,901,942.477	3.558	7	TL
	8		1600	21.243	21.176	94.3220	239.1637	818,853.153	9,901,973.943	1.425	8	TL
	9		1600	21.202	21.136	94.3219	239.1637	818,853.124	9,901,973.914	1.428	9	PNT
	10		1600	20.181	20.146	93.2121	249.2659	818,854.708	9,901,970.471	1.925	10	PNT
	11		1600	20.225	20.225	89.4555	258.4230	818,856.407	9,901,967.690	3.189	11	JL
	12		1600	20.250	20.249	89.2529	270.3337	818,857.825	9,901,963.759	3.309	12	JL
	13		1600	20.425	20.424	89.2530	276.5625	818,858.404	9,901,961.564	3.311	13	JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	14		1600	22.928	22.927	89.3005	294.2219	818,860.703	9,901,954.931	3.306	14	JL
	15		1600	23.007	23.001	88.4418	294.4827	818,860.744	9,901,954.746	3.613	15	TRT
	16		1600	23.466	23.460	88.4013	297.3020	818,860.965	9,901,953.581	3.651	16	TRT
	17		1600	23.697	23.692	91.1115	298.2225	818,861.105	9,901,953.179	2.615	17	B-SAL
	18		1600	23.499	23.492	91.2449	300.5127	818,860.639	9,901,952.246	2.526	18	B-SAL
	19		1600	23.748	23.740	88.2927	301.3911	818,860.779	9,901,951.860	3.731	19	A-SAL
	20		1600	29.189	29.180	88.3528	316.2141	818,862.825	9,901,943.445	3.824	20	DTL
	21		1600	44.678	44.670	88.5558	324.3832	818,872.103	9,901,929.990	3.938	21	BGN
	22		1600	41.929	41.917	88.3853	331.1559	818,866.657	9,901,928.284	4.095	22	BGN
	23		1600	35.037	35.026	88.3535	312.3545	818,868.933	9,901,942.313	3.966	23	BGN
	24		1600	30.852	30.843	88.3534	303.3320	818,867.228	9,901,948.750	3.864	24	BGN
	25		1600	38.346	38.338	88.4917	347.5535	818,855.071	9,901,924.610	3.895	25	BGN
	26		1600	27.242	27.233	88.3037	347.2709	818,850.368	9,901,934.674	3.814	26	BGN
	27		1600	28.952	28.938	88.1218	334.1946	818,856.665	9,901,936.775	4.013	27	BGN
	28		1600	16.499	16.492	88.1640	323.3126	818,850.886	9,901,948.541	3.602	28	BGN
	29		1600	14.896	14.888	88.0452	341.5236	818,846.086	9,901,946.417	3.605	29	BGN
	30		1600	16.011	16.009	90.4909	323.3522	818,850.502	9,901,948.833	2.877	30	BGN
	31		1600	14.050	14.050	90.1204	341.4156	818,845.676	9,901,947.149	3.057	31	BGN
	32		1600	15.185	15.182	91.1347	321.4638	818,850.162	9,901,949.735	2.780	32	BGN
	33		1600	12.953	12.953	90.2306	337.3040	818,845.868	9,901,948.611	3.019	33	BGN
	34		1600	12.636	12.632	88.3321	337.5609	818,845.601	9,901,948.813	3.424	34	A-SAL
	35		1600	14.512	14.506	88.2307	322.0255	818,849.585	9,901,950.093	3.515	35	A-SAL
	36		1600	10.476	10.476	90.0606	350.0819	818,842.401	9,901,949.436	3.087	36	JL
	37		1600	12.740	12.740	89.4729	321.0305	818,848.326	9,901,951.354	3.152	37	JL
	38		1600	3.768	3.767	88.2635	347.1217	818,839.847	9,901,955.649	3.208	38	JL
	39		1600	9.420	9.419	89.0554	290.0149	818,847.510	9,901,958.039	3.254	39	JL
	40		1600	1.557	1.556	88.1420	339.2547	818,839.027	9,901,957.728	3.154	40	JL
	41		1600	8.445	8.444	88.5802	276.3914	818,846.513	9,901,960.106	3.258	41	JL
	42		1600	8.773	8.773	89.3649	252.1809	818,845.595	9,901,963.634	3.165	42	JL
	43		1600	2.498	2.498	90.1757	170.2122	818,837.134	9,901,961.293	3.093	43	JL
	44		1600	5.082	4.968	102.0815	173.3751	818,836.401	9,901,963.661	2.037	44	PNT
	45		1600	9.985	9.966	93.3201	240.4407	818,845.382	9,901,965.854	2.491	45	PNT
	46		1600	11.853	11.698	99.1629	177.2658	818,834.783	9,901,970.213	1.196	46	PNT
	47		1600	15.508	15.398	96.4957	220.5214	818,845.069	9,901,972.758	1.261	47	PNT
	48		1600	15.036	14.910	97.2447	139.2850	818,825.979	9,901,967.633	1.166	48	PNT
	49		1600	11.004	10.935	96.2604	119.5955	818,827.623	9,901,961.997	1.873	49	PNT
	50		1600	22.178	22.115	94.1821	114.1214	818,816.366	9,901,962.875	1.441	50	PNT
	51		1600	20.401	20.374	92.5757	102.2624	818,817.776	9,901,958.405	2.050	51	PNT
	52		1600	8.210	8.210	90.3020	101.1430	818,829.942	9,901,958.593	3.034	52	JL
	53		1600	20.443	20.443	89.5134	92.4924	818,818.095	9,901,954.998	3.156	53	JL
	54		1600	7.897	7.897	89.4717	76.1806	818,831.157	9,901,955.320	3.135	54	JL
	55		1600	20.741	20.741	89.4717	83.4033	818,818.708	9,901,951.758	3.183	55	JL
	56		1600	21.265	21.265	89.5336	77.3734	818,819.111	9,901,949.517	3.146	56	JL
	57		1600	8.911	8.911	90.0501	62.4728	818,831.451	9,901,953.121	3.093	57	JL
	58		1600	13.494	13.493	90.3529	35.4410	818,833.173	9,901,946.462	2.967	58	JL
	59		1600	20.287	20.286	90.2600	55.2701	818,824.747	9,901,943.771	2.953	59	JL
	60		1600	30.103	30.103	90.1307	66.3408	818,814.279	9,901,940.655	2.991	60	JL
	61		1600	41.442	41.442	89.5914	73.2520	818,802.511	9,901,937.843	3.115	61	JL
	62		1600	27.529	27.529	89.5314	79.2918	818,813.119	9,901,947.528	3.160	62	JL
	63		1600	39.642	39.642	89.4943	82.5014	818,801.206	9,901,944.610	3.225	63	JL
	64		1600	27.236	27.236	89.5357	84.4116	818,812.458	9,901,949.940	3.154	64	JL
	65		1600	39.632	39.632	89.5010	86.0819	818,800.447	9,901,946.764	3.219	65	JL
	66		1600	26.836	26.833	90.4748	91.5740	818,811.911	9,901,953.350	2.733	66	JL
	67		1600	39.242	39.241	90.1937	90.5447	818,799.939	9,901,950.034	2.882	67	JL
	68		1600	27.201	27.176	92.2720	99.5245	818,811.040	9,901,956.992	1.941	68	PNT
	69		1600	39.394	39.375	91.4641	97.3605	818,799.021	9,901,954.529	1.884	69	PNT
	70		1600	29.004	28.944	93.4148	111.2911	818,809.435	9,901,962.712	1.236	70	PNT
	71		1600	40.870	40.831	92.3026	105.1536	818,797.318	9,901,959.811	1.318	71	PNT
	72		1600	49.665	49.631	92.0638	102.5220	818,788.522	9,901,957.916	1.277	72	PNT
	73		1600	56.782	56.753	91.5005	101.1534	818,781.459	9,901,956.163	1.288	73	PNT
	74		1600	49.259	49.247	91.1525	95.3232	818,789.446	9,901,951.652	2.025	74	PNT
	75		1600	56.363	56.352	91.0801	94.4413	818,782.545	9,901,949.808	1.991	75	PNT
	76		1600	59.843	59.838	90.4319	91.2255	818,779.778	9,901,945.801	2.352	76	JL
	77		1600	49.116	49.116	89.5554	90.1510	818,790.459	9,901,947.225	3.165	77	JL
	78		1600	58.175	58.174	90.1902	87.3239	818,782.388	9,901,942.399	2.784	78	JL
	79		1600	49.131	49.131	89.5232	86.5446	818,791.212	9,901,944.463	3.213	79	JL
	80		1600	49.567	49.567	89.4953	84.2259	818,791.490	9,901,942.258	3.252	80	JL
	81		1600	56.863	56.863	90.0141	84.4545	818,784.496	9,901,940.148	3.078	81	JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	82		1600	50.431	50.431	90.0142	76.1829	818,793.541	9,901,935.468	3.081	82	JL
	83		1600	57.713	57.713	90.0142	77.5114	818,786.392	9,901,933.456	3.077	83	JL
	84		1600	58.498	58.498	90.0653	74.5431	818,787.089	9,901,930.447	2.989	84	PGR
	85		1600	51.406	51.406	90.0435	72.5358	818,794.185	9,901,932.352	3.037	85	PGR
	86		1600	70.469	70.469	89.5349	77.0100	818,775.417	9,901,926.889	3.233	86	PGR
	87		1600	78.896	78.896	90.0417	78.3751	818,766.931	9,901,925.040	3.008	87	DTL
	88		1600	74.701	74.701	89.5913	80.3515	818,769.659	9,901,929.167	3.123	88	JL
	89		1600	86.565	86.565	89.5817	82.3831	818,757.594	9,901,927.295	3.149	89	JL
	90		1600	72.326	72.326	89.5631	86.0235	818,769.390	9,901,936.550	3.179	90	JL
	91		1600	84.369	84.369	89.5740	86.5422	818,757.556	9,901,934.022	3.163	91	JL
	92		1600	72.937	72.937	90.0243	87.5137	818,768.126	9,901,938.571	3.048	92	JL
	93		1600	83.975	83.975	90.0341	88.1509	818,757.371	9,901,936.030	3.016	93	JL
	94		1600	72.309	72.308	90.1430	90.4507	818,767.795	9,901,942.274	2.801	94	JL
	95		1600	82.584	82.584	90.1050	91.4854	818,757.458	9,901,941.390	2.846	95	JL
	96		1600	71.874	71.866	90.5132	94.5300	818,767.209	9,901,947.457	2.029	96	PNT
	97		1600	81.475	81.468	90.4416	95.2543	818,757.611	9,901,946.679	2.057	97	PNT
	98		1600	71.921	71.904	91.1442	99.0941	818,766.507	9,901,952.777	1.543	98	PNT
	99		1600	80.670	80.654	91.0841	99.1837	818,757.773	9,901,952.228	1.494	99	PNT
	100		1600	80.335	80.308	91.2945	102.4131	818,757.859	9,901,956.989	1.009	100	PNT
	101		1600	72.076	72.050	91.3210	102.1335	818,766.131	9,901,956.611	1.174	101	PNT
	102		1600	35.616	35.616	89.5406	64.5117	818,810.571	9,901,936.459	3.167	102	PGR
	103		1600	28.069	28.068	89.2856	56.5625	818,819.068	9,901,938.416	3.360	103	PGR
	104		1600	31.922	31.911	88.3053	47.4458	818,820.473	9,901,932.433	3.933	104	BGN
	105		1600	28.571	28.558	88.1536	38.2246	818,826.413	9,901,932.969	3.974	105	BGN
	106		1600	25.320	25.313	88.4004	26.3709	818,832.668	9,901,934.293	3.695	106	BGN
	107		1600	30.811	30.804	88.4545	10.3742	818,840.023	9,901,928.261	3.771	107	BGN
	108		1600	32.432	32.426	88.5448	21.0503	818,834.216	9,901,926.819	3.721	108	BGN
	109		2000	38.183	38.170	88.2849	16.0623	818,836.826	9,901,920.860	3.719	109	BGN
	110		1600	10.694	10.694	90.0010	358.5053	818,840.960	9,901,948.691	3.105	110	JL
	111		1600	12.334	12.334	90.2824	28.5135	818,835.005	9,901,947.079	3.004	111	JL
	112		1600	42.508	42.508	90.0109	292.3545	818,880.186	9,901,952.750	3.092	112	BGN
	113		1600	23.257	23.256	89.2943	11.4441	818,839.110	9,901,935.771	3.311	113	JL
	114		1600	22.469	22.468	89.2346	358.5149	818,844.058	9,901,937.332	3.343	114	JL
	115		1600	29.779	29.779	89.4259	7.4918	818,841.414	9,901,929.409	3.253	115	JL
	116		1600	28.506	28.506	89.4858	357.3346	818,846.270	9,901,931.685	3.197	116	JL
	117		1600	28.476	28.476	89.4232	357.0113	818,846.520	9,901,931.792	3.251	117	A-SAL
	118		1600	28.567	28.561	91.1309	356.3409	818,846.759	9,901,931.778	2.498	118	B-SAL
	119		1600	28.563	28.558	91.0533	355.1328	818,847.395	9,901,931.990	2.561	119	B-SAL
	120		1600	28.626	28.626	89.4108	354.5828	818,847.535	9,901,931.967	3.263	120	A-SAL
	121		1600	40.616	40.616	89.4718	3.2613	818,845.679	9,901,919.097	3.256	121	JL
	122		1600	39.548	39.547	89.4008	357.4453	818,849.296	9,901,921.066	3.335	122	JL
	123		1600	40.810	40.808	89.2816	5.3833	818,844.165	9,901,918.646	3.483	123	BGN
	124		1600	44.126	44.124	89.2815	4.4153	818,845.373	9,901,915.480	3.514	124	BGN
	125		1600	39.396	39.395	89.3556	356.4920	818,849.862	9,901,921.396	3.382	125	A-SAL
	126		1600	37.880	37.879	90.2214	356.4254	818,849.479	9,901,922.864	2.861	126	B-SAL
	127		1600	37.912	37.912	90.0513	355.4528	818,850.092	9,901,923.028	3.048	127	B-SAL
	128		1600	37.929	37.927	89.2643	355.1152	818,850.448	9,901,923.132	3.473	128	PGR
	129		1600	53.374	53.373	89.4416	0.3102	818,850.705	9,901,907.133	3.350	129	JL
	130		1600	53.057	53.056	89.4104	356.1045	818,854.495	9,901,908.534	3.398	130	JL
	131		1600	53.601	53.600	89.4215	1.2627	818,849.917	9,901,906.716	3.383	131	BGN
	J8		1560	71.513	71.511	90.2815	0.0000	818,838.141	9,901,959.007	3.146	J8	STN
CP02		1.18			71.514			818,855.602	9,901,889.657	4.071	CP02	
	132		1600	16.346	16.341	91.2729	294.5323	818,839.548	9,901,892.707	3.235	132	HK1
	133		1600	40.792	40.789	90.3822	294.3049	818,815.480	9,901,897.007	3.196	133	HK2
	134		1600	54.199	54.198	89.4151	209.2101	818,841.375	9,901,837.359	3.937	134	PGR
	135		1600	54.839	54.838	89.4503	207.4308	818,842.720	9,901,836.353	3.889	135	JL
	136		1600	54.617	54.616	89.3738	203.2038	818,846.859	9,901,835.745	4.006	136	JL
	137		1600	54.711	54.710	89.3621	202.2712	818,847.684	9,901,835.523	4.027	137	A-SAL
	138		1600	54.632	54.631	90.2043	202.1716	818,847.852	9,901,835.578	3.322	138	B-SAL
	139		1600	54.599	54.598	90.2252	201.3750	818,848.477	9,901,835.526	3.288	139	B-SAL
	140		1600	42.587	42.586	89.3542	203.3833	818,848.566	9,901,847.656	3.952	140	JL
	141		1600	42.403	42.403	89.4722	208.0756	818,845.344	9,901,848.514	3.807	141	JL
	142		1600	42.754	42.753	89.3458	211.2824	818,842.859	9,901,848.847	3.962	142	PGR
	143		1600	38.787	38.784	89.2046	200.2104	818,851.401	9,901,851.101	4.094	143	PGR
	144		1600	38.874	38.873	89.3551	200.5204	818,851.043	9,901,851.052	3.924	144	A-SAL
	145		1600	38.964	38.963	90.1841	201.0753	818,850.854	9,901,850.984	3.439	145	B-SAL
	146		1600	38.972	38.971	90.2634	202.0343	818,850.226	9,901,851.059	3.350	146	B-SAL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	147		1600	38.991	38.989	89.2934	202.2510	818,849.982	9,901,851.075	3.996	147	A-SAL
	148		1600	29.809	29.808	89.3357	204.1546	818,850.359	9,901,860.314	3.877	148	JL
	149		1600	29.961	29.961	89.4616	210.4458	818,847.034	9,901,860.947	3.771	149	JL
	150		1600	30.457	30.456	89.2818	215.3808	818,844.438	9,901,861.321	3.932	150	PGR
	151		1600	29.638	29.637	89.3318	199.2711	818,852.854	9,901,860.148	3.881	151	PGR
	152		1600	29.665	29.663	89.2417	199.5911	818,852.576	9,901,860.148	3.959	152	A-SAL
	153		1600	29.495	29.493	89.2417	202.0317	818,851.537	9,901,860.445	3.957	153	A-SAL
	154		1600	29.519	29.515	90.5348	201.4520	818,851.686	9,901,860.402	3.189	154	B-SAL
	155		1600	29.560	29.556	90.5347	200.4125	818,852.226	9,901,860.294	3.189	155	B-SAL
	156		1600	20.816	20.813	90.5347	201.2739	818,852.947	9,901,869.014	3.325	156	B-SAL
	157		1600	20.839	20.836	91.0155	199.4312	818,853.573	9,901,868.920	3.276	157	B-SAL
	158		1600	20.830	20.829	89.3605	204.5354	818,851.711	9,901,869.194	3.796	158	JL
	159		1600	21.544	21.544	89.4558	212.5558	818,848.659	9,901,869.263	3.739	159	JL
	160		1600	20.814	20.813	89.3203	198.0320	818,854.178	9,901,868.892	3.820	160	PGR
	161		1600	22.387	22.386	89.2739	221.0420	818,845.460	9,901,869.700	3.862	161	PGR
	162		1600	20.837	20.836	89.2304	198.5556	818,853.859	9,901,868.894	3.875	162	A-SAL
	163		1600	20.783	20.782	89.2304	201.5206	818,852.805	9,901,869.064	3.874	163	A-SAL
	164		1600	12.278	12.277	89.1536	206.0731	818,853.051	9,901,877.648	3.810	164	JL
	165		1600	12.817	12.817	90.0336	219.0505	818,850.195	9,901,878.036	3.638	165	JL
	166		1600	12.298	12.297	89.1517	194.4928	818,855.453	9,901,877.361	3.811	166	PGR
	167		1600	14.173	14.173	89.5327	232.5723	818,846.717	9,901,878.615	3.678	167	PGR
	168		1600	12.281	12.280	89.0711	195.5740	818,855.210	9,901,877.384	3.840	168	A-SAL
	169		1600	12.258	12.257	89.1027	201.1340	818,854.088	9,901,877.494	3.828	169	A-SAL
	170		1600	12.235	12.230	91.4023	200.3252	818,854.235	9,901,877.504	3.294	170	B-SAL
	171		1600	12.243	12.238	91.3839	200.3252	818,854.235	9,901,877.496	3.300	171	B-SAL
	172		1600	12.279	12.273	91.4620	197.3851	818,854.849	9,901,877.407	3.271	172	B-SAL
	173		1600	4.388	4.388	89.3617	217.1926	818,853.874	9,901,885.624	3.681	173	JL
	174		1600	4.275	4.275	89.2643	212.4617	818,854.236	9,901,885.606	3.692	174	JL
	175		1600	6.215	6.214	91.0800	248.5954	818,850.520	9,901,886.081	3.527	175	JL
	176		1600	8.373	8.373	90.1614	262.3226	818,847.817	9,901,886.576	3.611	176	PGR
	177		1600	4.560	4.559	88.3317	181.0051	818,856.637	9,901,885.217	3.766	177	PGR
	178		1600	4.452	4.448	87.3821	185.2332	818,856.278	9,901,885.260	3.834	178	A-SAL
	179		1600	4.298	4.294	87.3632	198.5629	818,855.242	9,901,885.378	3.830	179	A-SAL
	180		1600	4.361	4.331	96.4020	196.3340	818,855.418	9,901,885.329	3.144	180	B-SAL
	181		1600	4.462	4.430	96.4907	188.2511	818,856.043	9,901,885.249	3.121	181	B-SAL
	182		1600	2.099	2.099	90.4207	1.4650	818,855.153	9,901,891.707	3.625	182	JL
	183		1600	5.450	5.446	92.1054	317.3122	818,851.055	9,901,892.654	3.444	183	JL
	184		1600	7.690	7.689	90.4559	311.4458	818,848.789	9,901,893.221	3.548	184	PGR
	185		1600	2.817	2.816	91.2940	57.5118	818,857.548	9,901,891.692	3.578	185	PGR
	186		1600	2.363	2.328	99.5001	53.3921	818,857.084	9,901,891.453	3.247	186	B-SAL
	187		1600	2.075	2.028	102.1459	35.1757	818,856.334	9,901,891.548	3.211	187	B-SAL
	188		1600	3.422	3.421	91.2459	57.3735	818,857.957	9,901,892.139	3.566	188	JL
	189		1600	6.053	6.053	90.0041	42.2857	818,858.476	9,901,894.984	3.650	189	JL
	190		1600	7.523	7.523	89.4935	52.2459	818,860.263	9,901,895.562	3.674	190	PGR
	191		1600	6.562	6.562	89.4125	38.3944	818,858.326	9,901,895.627	3.686	191	PGR
	192		1600	5.440	5.440	90.1431	18.5013	818,856.048	9,901,895.079	3.628	192	JL
	193		1600	15.773	15.772	90.2950	25.3331	818,858.727	9,901,905.117	3.514	193	PGR
	194		1600	15.825	15.824	90.4557	24.3150	818,858.458	9,901,905.221	3.439	194	A-SAL
	195		1600	15.766	15.765	90.3741	21.4304	818,857.683	9,901,905.284	3.478	195	A-SAL
	196		1600	7.379	7.377	91.1623	341.1934	818,851.605	9,901,895.858	3.487	196	JL
	197		1600	15.471	15.469	90.5312	15.4944	818,856.060	9,901,905.119	3.412	197	JL
	198		1600	15.445	15.442	91.0509	0.3834	818,852.000	9,901,904.673	3.358	198	JL
	199		1600	9.226	9.226	90.1737	329.3753	818,849.135	9,901,896.237	3.604	199	PGR
	200		1600	15.127	15.125	90.5239	353.4029	818,850.316	9,901,903.828	3.419	200	TT
	201		1600	32.653	32.650	89.1533	214.2724	818,844.261	9,901,859.040	4.073	201	TT
	202		1600	57.587	57.585	90.2916	2.2228	818,843.868	9,901,946.034	3.161	202	TT
	J8		1600	109.497	109.497	89.5718	0.0001	818,838.141	9,901,959.007	3.146	J8	STN
J8B		1.545			109.417			818,735.268	9,901,921.736	3.147	J8B	
	203		1600	35.081	35.081	89.5353	355.2610	818,767.195	9,901,936.272	3.154	203	JL
	204		1600	26.407	26.407	89.4750	351.4208	818,758.537	9,901,934.220	3.185	204	JL
	205		1600	34.522	34.522	89.4750	1.5829	818,768.111	9,901,932.370	3.214	205	JL
	206		1600	25.062	25.062	89.4750	359.4530	818,758.795	9,901,930.372	3.180	206	JL
	207		1600	24.803	24.803	89.5740	8.2604	818,759.574	9,901,926.673	3.109	207	JL
	208		1600	34.143	34.143	89.5210	7.5109	818,768.657	9,901,928.871	3.170	208	JL
	209		1600	24.820	24.820	90.1808	12.4049	818,759.890	9,901,924.862	2.961	209	A-SAL
	210		1600	33.813	33.813	89.5410	11.0716	818,768.683	9,901,926.906	3.149	210	A-SAL
	211		1600	24.888	24.871	92.0826	13.0445	818,759.962	9,901,924.696	2.162	211	B-SAL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	212		1600	32.903	32.893	91.2525	11.3333	818,767.811	9,901,926.516	2.274	212	B-SAL
	213		1600	32.886	32.877	91.1823	12.4731	818,767.891	9,901,925.813	2.342	213	B-SAL
	214		1600	24.998	24.981	92.0828	15.2130	818,760.169	9,901,923.721	2.158	214	B-SAL
	215		1600	25.052	25.052	90.1432	15.3626	818,760.249	9,901,923.618	2.986	215	A-SAL
	216		1600	32.985	32.985	90.1839	13.0342	818,768.017	9,901,925.672	2.913	216	A-SAL
	217		1600	26.646	26.646	89.4830	30.5135	818,761.429	9,901,916.677	3.181	217	DTL
	218		1600	34.256	34.256	89.4829	27.0536	818,769.255	9,901,917.456	3.206	218	DTL
	219		1600	35.730	35.729	90.2129	37.2816	818,769.333	9,901,910.959	2.868	219	PGR
	220		1600	27.552	27.551	90.3518	41.2211	818,760.909	9,901,911.659	2.809	220	PGR
	221		1600	21.527	21.526	90.3040	46.2102	818,754.543	9,901,912.153	2.900	221	PGR
	222		1600	44.695	44.695	89.4951	34.3314	818,778.512	9,901,910.441	3.224	222	PGR
	223		1600	20.010	20.010	90.1329	32.4922	818,754.772	9,901,917.266	3.013	223	DTL
	224		1600	43.785	43.775	88.4701	33.3024	818,777.817	9,901,911.449	4.021	224	BGN
	225		1600	16.923	16.894	93.2033	16.4210	818,752.135	9,901,922.683	2.105	225	B-SAL
	226		1600	16.954	16.930	93.0102	14.5223	818,752.133	9,901,923.224	2.199	226	B-SAL
	227		1600	17.008	17.007	90.3517	13.5843	818,752.184	9,901,923.495	2.917	227	A-SAL
	228		1600	15.299	15.296	91.0951	56.2538	818,747.562	9,901,912.635	2.781	228	PGR
	229		1600	12.104	12.101	91.0954	44.3236	818,746.268	9,901,916.693	2.846	229	DTL
	230		1600	10.418	10.417	90.3548	24.2726	818,745.652	9,901,920.911	2.983	230	A-SAL
	231		1600	10.371	10.332	94.5836	23.1329	818,745.582	9,901,921.139	2.192	231	B-SAL
	232		1600	10.343	10.343	89.2622	8.0539	818,745.391	9,901,923.855	3.193	232	JL
	233		1600	16.768	16.768	89.5026	8.4006	818,751.714	9,901,925.006	3.138	233	JL
	234		1600	16.996	16.996	89.4034	359.1704	818,751.173	9,901,927.724	3.188	234	AS-JL
	235		1600	11.092	11.091	89.1827	351.4214	818,745.041	9,901,926.979	3.226	235	AS-JL
	236		1600	13.217	13.216	89.2813	334.4244	818,744.580	9,901,931.114	3.214	236	JL
	237		1600	18.644	18.644	89.4952	345.1119	818,750.591	9,901,932.357	3.147	237	JL
	238		1600	9.860	9.860	90.1048	248.3235	818,728.751	9,901,929.135	3.061	238	JL
	239		1600	8.152	8.151	89.0232	294.4713	818,735.960	9,901,929.857	3.228	239	JL
	240		1600	7.107	7.106	89.0233	239.1201	818,729.768	9,901,926.235	3.210	240	AS-JL
	241		1600	4.323	4.320	87.5630	292.4712	818,735.484	9,901,926.050	3.247	241	AS-JL
	242		1600	8.283	8.282	89.1957	201.2711	818,726.988	9,901,921.958	3.188	242	JL
	243		1600	0.943	0.936	82.4927	293.4342	818,735.330	9,901,922.669	3.210	243	JL
	244		1600	1.674	1.672	92.2746	47.2834	818,736.750	9,901,920.962	3.020	244	A-SAL
	245		1600	6.818	6.817	90.4346	184.2618	818,728.698	9,901,919.916	3.005	245	A-SAL
	246		1600	6.936	6.879	97.2128	183.1719	818,728.676	9,901,919.767	2.203	246	B-SAL
	247		1600	1.955	1.736	117.2256	50.1753	818,736.765	9,901,920.858	2.193	247	B-SAL
	248		1600	2.639	2.489	109.2441	64.2412	818,737.043	9,901,919.992	2.215	248	B-SAL
	249		1600	6.887	6.831	97.1858	174.4150	818,729.088	9,901,918.825	2.215	249	B-SAL
	250		1600	2.672	2.671	91.3629	65.3308	818,737.135	9,901,919.826	3.017	250	A-SAL
	251		1600	6.936	6.934	91.1940	173.5752	818,729.033	9,901,918.701	2.931	251	A-SAL
	252		1600	9.030	9.028	91.0402	93.2637	818,737.828	9,901,913.078	2.924	252	A-SAL
	253		1600	10.687	10.681	91.5419	140.4135	818,729.802	9,901,912.559	2.736	253	DTL
	254		1600	15.506	15.505	90.4502	97.0919	818,738.692	9,901,906.614	2.889	254	DTL
	255		1600	15.899	15.894	91.2703	130.2412	818,729.705	9,901,906.847	2.689	255	DTL
	256		1600	22.078	22.076	90.4212	104.0305	818,737.523	9,901,899.775	2.821	256	DTL
	257		1600	22.183	22.180	90.5319	123.5609	818,729.894	9,901,900.216	2.748	257	DTL
	258		1600	29.004	29.003	90.2311	105.4216	818,737.398	9,901,892.811	2.896	258	DTL
	259		1600	29.124	29.123	90.3038	120.1921	818,730.007	9,901,893.092	2.832	259	DTL
	260		1600	35.553	35.553	90.1408	118.2440	818,730.016	9,901,886.573	2.946	260	PGR
	261		1600	35.991	35.991	90.1407	106.3743	818,737.332	9,901,885.804	2.944	261	PGR
	262		1600	36.573	36.572	90.2017	129.5028	818,722.804	9,901,887.353	2.876	262	PGR
	263		1600	36.838	36.832	88.5908	94.2100	818,745.145	9,901,886.252	3.744	263	PGR
	264		1600	30.274	30.274	90.0248	89.3056	818,745.821	9,901,893.360	3.067	264	PGR
	265		1600	30.969	30.968	90.2650	137.5648	818,720.714	9,901,894.400	2.850	265	DTL
	266		1600	24.877	24.874	90.5037	150.3651	818,719.048	9,901,902.877	2.725	266	DTL
	267		1600	24.064	24.062	90.4201	82.1554	818,746.435	9,901,900.422	2.798	267	PGR
	268		1600	18.215	18.214	90.4201	69.2541	818,747.094	9,901,907.883	2.869	268	PGR
	269		1600	19.816	19.811	91.1850	168.2434	818,718.377	9,901,911.383	2.637	269	PGR
	270		1600	17.009	17.009	90.0411	190.0000	818,718.513	9,901,918.807	3.071	270	A-SAL
	271		1600	16.912	16.890	92.5406	191.4807	818,718.547	9,901,919.352	2.236	271	B-SAL
	272		1600	16.756	16.736	92.4859	194.4331	818,718.601	9,901,920.222	2.268	272	B-SAL
	273		1600	16.791	16.791	90.2249	195.0124	818,718.538	9,901,920.304	2.980	273	A-SAL
	274		1600	16.497	16.497	89.5111	200.1851	818,718.771	9,901,921.850	3.134	274	JL
	275		1600	16.552	16.552	89.4203	210.0334	818,718.975	9,901,924.651	3.178	275	AS-JL
	276		1600	17.703	17.703	89.4730	222.5618	818,718.975	9,901,928.659	3.156	276	JL
	277		1600	26.476	26.476	89.5934	216.2853	818,709.891	9,901,929.284	3.095	277	JL
	278		1600	36.150	36.150	90.1056	212.1625	818,699.956	9,901,929.472	2.977	278	JL
	279		1600	25.108	25.108	89.4528	207.1629	818,710.367	9,901,924.952	3.198	279	AS-JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	280		1600	35.553	35.553	89.5930	206.4826	818,699.972	9,901,926.002	3.097	280	AS-JL
	281		1600	35.398	35.398	89.5931	201.5835	818,699.893	9,901,923.008	3.097	281	JL
	282		1600	25.235	25.235	90.0341	200.5847	818,710.037	9,901,922.204	3.065	282	JL
	283		1600	35.442	35.442	89.5908	200.4329	818,699.829	9,901,922.236	3.101	283	A-SAL
	284		1600	25.644	25.644	90.1353	198.2057	818,709.634	9,901,921.035	2.988	284	A-SAL
	285		1600	35.341	35.333	91.1258	200.2044	818,699.936	9,901,922.001	2.342	285	B-SAL
	286		1600	25.682	25.668	91.5401	197.5351	818,709.616	9,901,920.832	2.240	286	B-SAL
	287		1600	26.070	26.055	91.5542	195.5413	818,709.276	9,901,919.913	2.214	287	B-SAL
	288		1600	35.697	35.690	91.0906	199.0302	818,699.582	9,901,921.197	2.374	288	B-SAL
	289		1600	26.218	26.218	90.1728	195.5141	818,709.116	9,901,919.882	2.959	289	A-SAL
	290		1600	35.748	35.748	90.0504	198.2111	818,699.533	9,901,920.761	3.039	290	A-SAL
	291		1600	34.104	34.104	89.4815	196.5724	818,701.209	9,901,919.975	3.208	291	TL
	292		1600	37.753	37.751	90.3825	186.2027	818,698.572	9,901,912.875	2.670	292	DTL
	293		1600	37.771	37.769	90.3828	186.1752	818,698.561	9,901,912.843	2.669	293	DTL
	294		1600	28.521	28.518	90.5054	180.0902	818,708.430	9,901,912.092	2.669	294	DTL
	295		1600	41.062	41.061	90.2728	177.0327	818,697.432	9,901,905.785	2.764	295	DTL
	296		1600	32.378	32.376	90.3725	168.1213	818,707.725	9,901,904.717	2.739	296	DTL
	297		1600	45.402	45.401	90.2436	169.0104	818,696.310	9,901,898.422	2.767	297	DTL
	298		1600	37.015	37.014	90.2917	159.2932	818,707.090	9,901,897.735	2.776	298	DTL
	299		1600	43.995	43.994	90.2155	151.5108	818,705.866	9,901,889.009	2.811	299	PGR
	300		1600	50.871	50.870	90.1854	161.1511	818,695.546	9,901,889.955	2.812	300	PGR
	301		1600	57.768	57.767	90.1939	167.4225	818,686.390	9,901,890.945	2.762	301	PGR
	302		1600	65.566	65.565	90.1650	172.4641	818,676.921	9,901,891.829	2.771	302	PGR
	303		1600	59.772	59.771	90.2028	179.1442	818,679.345	9,901,900.637	2.736	303	DTL
	304		1600	53.379	53.377	90.2652	175.5137	818,686.526	9,901,899.978	2.675	304	DTL
	305		1600	49.392	49.390	90.2843	184.4133	818,687.611	9,901,908.767	2.679	305	DTL
	306		1600	56.134	56.132	90.2618	186.3943	818,680.631	9,901,908.866	2.662	306	DTL
	307		1600	47.348	47.347	90.1601	194.3229	818,688.128	9,901,917.301	2.871	307	DTL
	308		1600	53.898	53.897	90.2055	194.5558	818,681.574	9,901,917.054	2.764	308	DTL
	309		1600	46.453	46.453	90.1355	200.5249	818,688.822	9,901,922.518	2.904	309	A-SAL
	310		1600	52.740	52.740	90.0918	201.4753	818,682.556	9,901,923.468	2.949	310	A-SAL
	311		1600	46.594	46.586	91.0428	200.5841	818,688.690	9,901,922.599	2.218	311	A-SAL
	312		1600	50.705	50.698	90.5608	201.3705	818,684.592	9,901,923.242	2.264	312	A-SAL
	313		1600	46.520	46.512	91.0437	202.0759	818,688.791	9,901,923.535	2.217	313	A-SAL
	314		1600	50.670	50.665	90.4940	202.3015	818,684.655	9,901,924.024	2.360	314	A-SAL
	315		1600	46.448	46.448	90.0832	202.2546	818,688.865	9,901,923.773	2.976	315	A-SAL
	316		1600	51.194	51.194	90.0710	202.5858	818,684.147	9,901,924.475	2.985	316	A-SAL
	317		1600	46.298	46.298	90.0312	203.2016	818,689.052	9,901,924.499	3.049	317	JL
	318		1600	50.716	50.716	90.0414	203.5134	818,684.672	9,901,925.224	3.029	318	JL
	319		1600	45.737	45.737	89.5456	206.4822	818,689.861	9,901,927.223	3.159	319	AS-JL
	320		1600	45.397	45.397	90.0132	211.5703	818,690.869	9,901,931.201	3.071	320	JL
	321		1600	52.317	52.317	90.0250	211.5432	818,684.093	9,901,932.607	3.049	321	JL
	322		1600	63.078	63.078	90.0002	211.4012	818,673.512	9,901,934.585	3.091	322	JL
	323		1600	71.706	71.706	90.0127	211.2317	818,664.994	9,901,935.997	3.061	323	JL
	324		1600	72.450	72.450	90.0128	208.4245	818,663.670	9,901,932.815	3.061	324	AS-JL
	325		1600	62.740	62.740	90.0128	208.2545	818,673.219	9,901,931.024	3.065	325	AS-JL
	326		1600	63.191	63.191	90.0611	204.4643	818,672.304	9,901,927.092	2.978	326	JL
	327		1600	63.671	63.670	90.1750	203.4118	818,671.736	9,901,925.925	2.761	327	A-SAL
	328		1600	73.030	73.030	90.1227	204.1529	818,662.448	9,901,927.265	2.827	328	A-SAL
	329		1600	63.659	63.652	90.5228	203.3316	818,671.744	9,901,925.775	2.120	329	B-SAL
	330		1600	73.160	73.154	90.4511	204.0931	818,662.315	9,901,927.148	2.130	330	B-SAL
	331		1600	73.327	73.324	90.3148	203.2807	818,662.085	9,901,926.279	2.413	331	B-SAL
	332		1600	63.881	63.874	90.5152	202.4744	818,671.475	9,901,924.945	2.128	332	B-SAL
	333		1600	63.969	63.968	90.1444	202.3554	818,671.369	9,901,924.729	2.818	333	A-SAL
	334		1600	73.380	73.380	90.1153	203.2046	818,662.020	9,901,926.126	2.838	334	A-SAL
	335		1600	74.360	74.357	90.3124	197.5757	818,660.954	9,901,919.205	2.413	335	DTL
	336		1600	64.983	64.980	90.3136	197.1914	818,670.354	9,901,918.793	2.494	336	DTL
	337		1600	67.165	67.158	90.5034	190.0731	818,669.088	9,901,910.316	2.104	337	DTL
	338		1600	75.882	75.876	90.4348	191.5639	818,660.125	9,901,911.213	2.125	338	DTL
	339		1600	78.431	78.426	90.3847	185.4342	818,659.234	9,901,902.514	2.207	339	DTL
	340		1600	69.958	69.952	90.4328	182.5244	818,668.385	9,901,901.240	2.207	340	DTL
	341		1600	73.683	73.679	90.3300	176.4515	818,667.527	9,901,892.755	2.370	341	PGR
	342		1600	82.031	82.028	90.2744	179.5340	818,658.197	9,901,893.651	2.430	342	PGR
	343		1600	90.015	90.012	90.2744	182.1815	818,649.475	9,901,894.501	2.366	343	PGR
	344		1600	98.905	98.902	90.2827	184.3143	818,639.911	9,901,895.493	2.273	344	PGR
	345		1600	87.847	87.843	90.3253	186.5952	818,649.648	9,901,902.098	2.251	345	DTL
	346		1600	94.939	94.934	90.3443	189.3132	818,641.890	9,901,904.614	2.133	346	DTL
	347		1600	86.050	86.045	90.3850	193.0758	818,649.826	9,901,911.573	2.120	347	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	348		1600	92.689	92.684	90.3714	193.4402	818,643.123	9,901,911.755	2.088	348	DTL
	349		1600	84.848	84.844	90.3215	198.3245	818,650.448	9,901,919.707	2.296	349	DTL
	350		1600	91.271	91.266	90.3413	199.0330	818,644.011	9,901,920.370	2.183	350	DTL
	351		1600	83.321	83.321	89.5901	203.2024	818,652.096	9,901,926.712	3.116	351	TL
	352		1600	91.066	91.065	90.1218	202.5812	818,644.332	9,901,926.588	2.766	352	DTL
	353		1600	83.165	83.164	90.1342	203.4941	818,652.297	9,901,927.410	2.760	353	A-SAL
	354		1600	90.958	90.957	90.1344	204.1547	818,644.572	9,901,928.630	2.728	354	A-SAL
	355		1600	83.081	83.077	90.3437	204.0011	818,652.402	9,901,927.657	2.255	355	B-SAL
	356		1600	90.999	90.992	90.4108	204.2502	818,644.556	9,901,928.877	2.003	356	B-SAL
	357		1600	83.020	83.014	90.3949	204.3940	818,652.538	9,901,928.603	2.130	357	B-SAL
	358		1600	90.960	90.953	90.4151	204.5750	818,644.667	9,901,929.739	1.984	358	B-SAL
	359		1600	82.975	82.974	90.1227	204.5143	818,652.602	9,901,928.890	2.791	359	A-SAL
	360		1600	90.973	90.972	90.1512	205.0339	818,644.662	9,901,929.894	2.689	360	A-SAL
	361		1600	90.941	90.940	90.1515	205.0213	818,644.691	9,901,929.853	2.688	361	A-SAL
	362		1600	82.595	82.595	90.0606	206.1018	818,653.165	9,901,930.736	2.945	362	JL
	363		1600	90.659	90.659	90.0835	206.3312	818,645.217	9,901,932.215	2.865	363	JL
	364		1600	81.935	81.935	90.0218	208.3900	818,654.285	9,901,934.193	3.037	364	AS-JL
	365		1600	90.282	90.282	90.0528	208.4810	818,646.070	9,901,935.683	2.948	365	AS-JL
	366		1600	81.400	81.400	90.0340	211.1633	818,655.462	9,901,937.769	3.005	366	JL
	367		1600	90.477	90.477	90.0822	211.1422	818,646.552	9,901,939.501	2.872	367	JL
	368		1600	99.365	99.365	90.0821	211.1324	818,637.832	9,901,941.218	2.850	368	JL
	369		1600	108.729	108.729	90.0713	211.0534	818,628.601	9,901,942.811	2.863	369	JL
	370		1600	99.220	99.220	90.0517	209.0147	818,637.300	9,901,937.452	2.939	370	AS-JL
	371		1600	108.980	108.980	90.0516	209.1916	818,627.753	9,901,939.545	2.925	371	AS-JL
	372		1600	99.274	99.274	90.1054	206.5203	818,636.724	9,901,933.751	2.777	372	JL
	373		1600	109.404	109.404	90.0923	207.1138	818,626.746	9,901,935.595	2.793	373	JL
	374		1600	99.733	99.732	90.1530	205.1857	818,635.978	9,901,931.121	2.642	374	A-SAL
	375		1600	110.870	110.869	90.1243	205.3204	818,624.931	9,901,932.590	2.682	375	A-SAL
	376		1600	99.772	99.766	90.3738	205.1120	818,635.924	9,901,930.904	2.000	376	B-SAL
	377		1600	110.823	110.816	90.3738	205.2509	818,624.962	9,901,932.363	1.879	377	B-SAL
	378		1600	111.026	111.019	90.3738	204.5952	818,624.685	9,901,931.570	1.876	378	B-SAL
	379		1600	100.398	100.392	90.3738	204.3955	818,635.220	9,901,930.048	1.993	379	B-SAL
	380		1600	100.271	100.270	90.1409	204.3229	818,635.324	9,901,929.822	2.679	380	A-SAL
	381		1600	110.901	110.900	90.1241	204.5314	818,624.785	9,901,931.346	2.683	381	A-SAL
	382		1600	101.500	101.498	90.2051	200.0455	818,633.770	9,901,922.030	2.476	382	DTL
	383		1600	110.631	110.631	90.0542	200.3148	818,624.643	9,901,922.921	2.908	383	DTL
	384		1600	102.055	102.052	90.2811	196.1821	818,633.419	9,901,915.310	2.255	384	DTL
	385		1600	111.024	111.021	90.2312	197.2209	818,624.356	9,901,916.803	2.342	385	DTL
	386		1600	111.348	111.344	90.2718	192.5030	818,624.771	9,901,908.023	2.207	386	DTL
	387		1600	103.334	103.330	90.2818	192.1845	818,632.846	9,901,908.063	2.241	387	DTL
	388		1600	106.874	106.871	90.2552	186.0938	818,631.462	9,901,896.324	2.288	388	PGR
	389		1600	113.015	113.012	90.2328	187.1355	818,625.013	9,901,896.921	2.320	389	PGR
	390		1600	126.767	126.765	90.1950	189.1756	818,610.673	9,901,898.380	2.360	390	PGR
	391		1600	131.853	131.850	90.2127	189.5609	818,605.412	9,901,898.885	2.269	391	PGR
	392		1600	124.557	124.555	90.1724	193.3515	818,611.471	9,901,908.006	2.461	392	DTL
	393		1600	130.204	130.201	90.2133	193.4926	818,605.802	9,901,907.918	2.276	393	DTL
	394		1600	124.393	124.391	90.1909	199.0421	818,610.890	9,901,919.905	2.399	394	DTL
	395		1600	128.707	128.704	90.2218	199.0955	818,606.575	9,901,920.050	2.257	395	DTL
	396		1600	128.588	128.586	90.1850	201.4538	818,606.748	9,901,925.875	2.387	396	DTL
	397		1600	123.743	123.742	90.0948	201.5556	818,611.602	9,901,926.089	2.739	397	DTL
	398		1600	123.198	123.197	90.1436	205.1307	818,612.598	9,901,933.121	2.569	398	A-SAL
	399		1600	123.296	123.291	90.3058	205.2021	818,612.529	9,901,933.388	1.981	399	B-SAL
	400		1600	128.279	128.275	90.2844	205.2533	818,607.586	9,901,934.052	2.020	400	B-SAL
	401		1600	123.245	123.240	90.3152	205.4153	818,612.655	9,901,934.152	1.949	401	B-SAL
	402		1600	128.126	128.124	90.1741	205.5820	818,607.859	9,901,935.254	2.433	402	A-SAL
	403		1600	123.230	123.230	90.0736	207.3938	818,613.162	9,901,938.342	2.819	403	JL
	404		1600	127.886	127.886	90.0814	207.4623	818,608.583	9,901,939.218	2.785	404	JL
	405		1600	122.580	122.580	90.0738	211.0455	818,615.008	9,901,945.474	2.820	405	JL
	406		1600	126.788	126.788	90.0834	211.1436	818,610.950	9,901,946.639	2.776	406	JL
	407		1600	65.775	65.770	90.4019	225.3243	818,675.968	9,901,950.185	2.320	407	PHN
	408		1600	25.899	25.881	92.0904	293.1629	818,736.784	9,901,947.572	2.120	408	PHN
	409		1600	28.866	28.846	92.0904	306.0326	818,743.287	9,901,949.444	2.008	409	PHN
	J8		1600	97.721	97.721	89.5131	0.0001	818,838.141	9,901,959.007	3.146	J8	STN
J8A		1.5			97.720			818,742.469	9,901,939.107	2.969	J8A	
	410		250	18.835	18.804	93.1550	124.1601	818,735.268	9,901,921.736	3.147	410	J8B
	411		1600	20.102	20.101	89.2436	17.0314	818,762.484	9,901,937.249	3.076	411	JL
	412		1600	13.587	13.586	89.1849	26.4206	818,755.595	9,901,935.602	3.032	412	JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	413		1600	9.892	9.892	89.4237	1.3356	818,752.205	9,901,940.856	2.919	413	JL
	414		1600	19.614	19.614	90.0543	4.1112	818,761.912	9,901,941.688	2.836	414	JL
	415		1600	12.102	12.079	93.3050	337.0752	818,752.409	9,901,945.969	2.127	415	PNT
	416		1600	21.196	21.180	92.1202	349.2837	818,762.069	9,901,947.135	2.055	416	PNT
	417		1600	23.111	23.079	93.0013	339.3531	818,762.007	9,901,951.391	1.658	417	PNT
	418		1600	16.648	16.591	94.4435	320.2719	818,752.843	9,901,952.054	1.493	418	PNT
	419		1600	21.444	21.372	94.4209	312.1504	818,753.316	9,901,957.521	1.111	419	PNT
	420		1600	25.536	25.485	93.3628	332.2935	818,762.202	9,901,955.234	1.262	420	PNT
	421		1600	20.284	20.208	94.5708	291.2143	818,745.843	9,901,959.031	1.118	421	PNT
	422		1600	15.335	15.265	95.2833	291.4448	818,745.119	9,901,954.140	1.406	422	PNT
	423		1600	16.826	16.775	94.2743	259.5503	818,736.230	9,901,954.678	1.560	423	PNT
	424		1600	15.363	15.293	95.2756	291.5658	818,745.177	9,901,954.158	1.406	424	PNT
	425		1600	8.719	8.679	95.2832	300.3327	818,745.267	9,901,947.322	2.037	425	PNT
	426		1600	8.354	8.340	93.1808	241.0938	818,737.042	9,901,945.440	2.388	426	PNT
	427		1600	3.645	3.645	90.5533	343.5902	818,745.694	9,901,940.805	2.810	427	JL
	428		1600	6.126	6.126	89.4237	186.3827	818,736.367	9,901,938.561	2.900	428	JL
	429		1600	8.747	8.744	88.2305	141.5133	818,736.836	9,901,932.419	3.116	429	JL
	430		1600	6.343	6.340	88.1028	62.4510	818,746.458	9,901,934.180	3.071	430	JL
	431		1600	16.027	16.027	89.4039	162.5126	818,728.437	9,901,931.363	2.959	431	JL
	432		1600	24.440	24.440	89.5912	173.3252	818,719.252	9,901,931.472	2.875	432	JL
	433		1600	13.725	13.725	90.0751	190.1912	818,728.748	9,901,938.764	2.838	433	JL
	434		1600	23.206	23.206	90.0643	191.5128	818,719.263	9,901,939.150	2.824	434	JL
	435		1600	14.147	14.144	91.0647	213.5605	818,729.372	9,901,944.447	2.594	435	PNT
	436		1600	23.887	23.885	90.4611	210.1543	818,719.820	9,901,946.690	2.548	436	PNT
	437		1600	17.020	16.992	93.1716	233.0645	818,729.716	9,901,950.335	1.893	437	PNT
	438		1600	17.017	16.989	93.1716	233.0645	818,729.718	9,901,950.333	1.893	438	PNT
	439		1600	26.769	26.756	91.4601	223.3041	818,719.719	9,901,953.190	2.044	439	PNT
	440		1600	23.190	23.140	93.4605	252.0914	818,731.040	9,901,959.227	1.345	440	PNT
	441		1600	32.171	32.142	92.2506	234.4335	818,718.952	9,901,961.018	1.512	441	PNT
	442		1600	40.917	40.896	91.5032	229.1506	818,710.024	9,901,964.003	1.554	442	PNT
	443		1600	40.907	40.886	91.5031	229.1505	818,710.032	9,901,963.997	1.554	443	PNT
	444		1600	49.862	49.841	91.3840	224.0655	818,700.370	9,901,965.787	1.438	444	PNT
	445		1600	38.491	38.481	91.1634	220.1631	818,708.659	9,901,957.483	2.012	445	PNT
	446		1600	46.579	46.571	91.0227	216.0311	818,700.024	9,901,958.273	2.023	446	PNT
	447		1600	37.020	37.019	90.2558	209.0256	818,707.124	9,901,950.114	2.589	447	PNT
	448		1600	45.624	45.623	90.2559	206.1852	818,698.312	9,901,950.579	2.524	448	PNT
	449		1600	36.023	36.020	90.4552	198.1257	818,706.678	9,901,943.163	2.388	449	PNT
	450		1600	45.726	45.721	90.5231	199.3600	818,697.177	9,901,945.351	2.171	450	PNT
	451		1600	37.105	37.104	90.1920	193.2750	818,705.381	9,901,940.216	2.660	451	JL
	452		1600	45.768	45.767	90.2224	194.5255	818,696.770	9,901,941.607	2.571	452	JL
	453		1600	39.519	39.519	90.1538	181.0349	818,703.636	9,901,931.778	2.689	453	JL
	454		1600	46.699	46.698	90.1649	184.0752	818,696.183	9,901,932.915	2.641	454	JL
	455		1600	56.969	56.969	90.0906	187.3805	818,685.647	9,901,935.018	2.718	455	JL
	456		1600	65.605	65.605	90.0005	189.2833	818,676.916	9,901,936.503	2.867	456	JL
	457		1600	55.252	55.252	90.1304	194.2836	818,687.280	9,901,941.735	2.659	457	JL
	458		1600	64.797	64.796	90.1755	196.2142	818,677.882	9,901,944.316	2.531	458	JL
	459		1600	55.030	55.028	90.2730	202.5608	818,688.486	9,901,949.781	2.429	459	PNT
	460		1600	65.051	65.049	90.2729	202.1201	818,678.499	9,901,950.905	2.349	460	PNT
	461		1600	55.993	55.989	90.4245	210.0646	818,689.331	9,901,956.744	2.173	461	PNT
	462		1600	66.286	66.282	90.3559	208.3218	818,679.011	9,901,958.251	2.175	462	PNT
	463		1600	58.494	58.473	91.3223	219.5759	818,690.944	9,901,966.752	1.297	463	PNT
	464		1600	68.019	68.000	91.2105	216.3158	818,680.731	9,901,967.610	1.265	464	PNT
	465		1600	74.974	74.958	91.1135	214.4802	818,673.495	9,901,968.455	1.308	465	PNT
	466		1600	84.254	84.238	91.0744	213.5552	818,664.465	9,901,970.909	1.209	466	PNT
	467		1600	84.282	84.266	91.0743	213.5432	818,664.427	9,901,970.889	1.209	467	PNT
	468		1600	73.951	73.944	90.4815	210.5020	818,672.591	9,901,963.288	1.831	468	PNT
	469		1600	82.363	82.357	90.4211	209.4055	818,664.112	9,901,964.462	1.858	469	PNT
	470		1600	82.418	82.416	90.2333	204.4515	818,662.166	9,901,957.651	2.304	470	PNT
	471		1600	71.943	71.942	90.1512	203.4728	818,672.109	9,901,954.114	2.551	471	PNT
	472		1600	82.664	82.663	90.1933	199.1847	818,660.525	9,901,949.986	2.399	472	PNT
	473		1600	72.386	72.384	90.2753	198.3455	818,670.599	9,901,947.717	2.282	473	PNT
	474		1600	72.115	72.115	90.0421	195.0000	818,670.470	9,901,943.194	2.778	474	JL
	475		1600	83.760	83.760	89.5659	196.1910	818,658.975	9,901,945.779	2.943	475	JL
	476		1600	85.513	85.513	89.5513	192.0703	818,656.958	9,901,939.654	2.988	476	JL
	477		1600	72.927	72.927	89.5648	190.0851	818,669.570	9,901,937.067	2.937	477	JL
	478		1600	96.220	96.220	89.5838	193.4056	818,646.304	9,901,942.350	2.907	478	JL
	479		1600	108.722	108.722	89.5752	194.3412	818,633.878	9,901,944.455	2.937	479	JL
	480		1600	94.750	94.750	90.0257	198.0507	818,648.297	9,901,949.561	2.788	480	JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	481		1600	108.217	108.217	90.0258	198.4857	818,635.074	9,901,952.417	2.776	481	JL
	482		1600	94.237	94.237	90.0904	201.1934	818,649.545	9,901,954.783	2.621	482	PNT
	483		1600	108.796	108.796	90.0627	202.2317	818,635.543	9,901,959.190	2.665	483	PNT
	484		1600	94.047	94.045	90.2251	205.4840	818,651.242	9,901,961.955	2.244	484	PNT
	485		1600	109.859	109.858	90.1352	206.2929	818,636.227	9,901,967.060	2.426	485	PNT
	486		1600	93.670	93.665	90.3414	209.0706	818,653.074	9,901,967.066	1.936	486	PNT
	487		1600	110.402	110.400	90.1827	208.5428	818,636.981	9,901,971.674	2.277	487	PNT
	488		1600	94.706	94.691	91.0104	214.0233	818,654.855	9,901,975.025	1.187	488	PNT
	489		1600	111.489	111.481	90.4227	211.5821	818,637.860	9,901,977.641	1.492	489	PNT
	490		1600	119.566	119.556	90.4420	211.1458	818,629.770	9,901,979.013	1.327	490	PNT
	491		1600	132.254	132.244	90.4219	211.3309	818,618.045	9,901,983.907	1.241	491	PNT
	492		1600	132.534	132.531	90.2433	209.0105	818,615.911	9,901,978.446	1.923	492	PNT
	493		1600	118.498	118.496	90.1746	207.5041	818,628.617	9,901,971.956	2.257	493	PNT
	494		1600	118.415	118.415	90.0630	203.5011	818,626.679	9,901,963.900	2.645	494	PNT
	495		1600	129.758	129.758	90.0838	206.1254	818,616.824	9,901,971.517	2.543	495	BH6
	496		1600	118.576	118.576	90.0452	200.5723	818,625.420	9,901,958.077	2.701	496	JL
	497		1600	130.413	130.413	90.0451	201.2516	818,613.909	9,901,961.014	2.685	497	JL
	498		1600	118.364	118.364	90.0218	199.1336	818,625.111	9,901,954.507	2.790	498	JL
	499		1600	130.851	130.851	90.0342	199.3614	818,612.845	9,901,956.986	2.728	499	JL
	500		1600	132.064	132.064	89.5909	196.4654	818,610.914	9,901,950.688	2.902	500	JL
	501		1600	118.252	118.252	89.5735	195.1203	818,624.431	9,901,946.223	2.952	501	JL
	502		1600	143.030	143.030	89.5901	197.1313	818,600.090	9,901,952.740	2.910	502	JL
	503		1600	153.204	153.204	89.5901	198.0537	818,590.203	9,901,956.033	2.913	503	JL
	504		1600	153.362	153.362	90.0208	200.5645	818,591.078	9,901,963.614	2.774	504	JL
	505		1600	142.541	142.541	90.0721	200.1257	818,601.481	9,901,960.090	2.564	505	JL
	506		1600	142.052	142.051	90.0938	203.1145	818,603.242	9,901,967.294	2.471	506	PNT
	507		1600	153.520	153.520	90.0654	203.2548	818,592.128	9,901,970.185	2.561	507	PNT
	508		1600	141.562	141.562	90.0309	205.4438	818,605.108	9,901,973.338	2.739	508	PNT
	509		1600	153.469	153.469	90.0210	205.2401	818,593.334	9,901,975.323	2.772	509	PNT
	510		1600	141.701	141.698	90.2247	208.5309	818,607.061	9,901,980.855	1.930	510	PNT
	511		1600	153.789	153.788	90.1241	208.0051	818,594.835	9,901,982.176	2.302	511	PNT
	512		1600	143.166	143.157	90.3818	211.5958	818,608.159	9,901,988.653	1.274	512	PNT
	513		1600	154.568	154.563	90.2817	211.0602	818,596.637	9,901,990.319	1.597	513	PNT
	514		1600	155.026	155.019	90.3232	211.5820	818,597.005	9,901,992.689	1.402	514	PNT
	515		1600	170.546	170.540	90.2820	213.2506	818,583.979	9,902,002.074	1.463	515	PNT
	516		1600	180.684	180.679	90.2443	213.1330	818,574.332	9,902,005.251	1.570	516	PNT
	517		1600	179.210	179.207	90.2034	210.4726	818,573.066	9,901,997.569	1.797	517	PNT
	518		1600	170.602	170.598	90.2403	210.4120	818,581.106	9,901,994.474	1.676	518	PNT
	519		1600	178.498	178.497	90.1113	208.0301	818,571.146	9,901,989.204	2.287	519	PNT
	520		1600	172.051	172.050	90.1358	207.4555	818,577.096	9,901,986.572	2.170	520	PNT
	521		1600	176.253	176.252	90.1045	205.4442	818,571.448	9,901,981.729	2.318	521	PNT
	522		1600	169.503	169.503	90.0422	205.2015	818,577.710	9,901,978.926	2.654	522	PNT
	523		1600	175.821	175.821	90.0343	203.3155	818,570.352	9,901,975.005	2.679	523	PNT
	524		1600	168.797	168.796	90.1059	203.2854	818,577.198	9,901,973.426	2.330	524	PNT
	525		1600	168.866	168.866	90.0341	201.2139	818,575.973	9,901,967.298	2.688	525	PNT
	526		1600	176.279	176.279	90.0246	201.0002	818,568.482	9,901,967.442	2.727	526	PNT
	527		1600	176.151	176.151	90.0245	200.1717	818,568.270	9,901,965.257	2.728	527	JL
	528		1600	168.936	168.936	90.0221	199.4504	818,575.177	9,901,962.620	2.754	528	JL
	529		1600	176.908	176.908	90.0039	198.3106	818,566.794	9,901,959.954	2.836	529	JL
	530		1600	169.713	169.713	89.5940	198.0509	818,573.792	9,901,957.834	2.886	530	JL
	531		1600	177.732	177.732	89.5736	197.1037	818,565.533	9,901,955.914	2.993	531	JL
	532		1600	170.479	170.479	89.5818	196.2446	818,572.554	9,901,952.963	2.953	532	JL
	533		1600	188.353	188.353	89.5819	197.2806	818,555.053	9,901,957.872	2.961	533	JL
	534		1600	199.155	199.155	89.5857	197.4530	818,544.408	9,901,959.951	2.930	534	JL
	535		1600	188.639	188.639	90.0038	198.5317	818,555.292	9,901,962.545	2.834	535	JL
	536		1600	198.646	198.646	90.0121	199.2607	818,545.607	9,901,965.670	2.791	536	JL
	537		1600	188.203	188.203	90.0311	200.2428	818,556.410	9,901,967.435	2.695	537	JL
	538		1600	197.926	197.926	90.0413	200.5704	818,547.089	9,901,970.753	2.626	538	JL
	539		1600	187.696	187.696	90.0725	202.5500	818,558.326	9,901,975.455	2.464	539	JL
	540		1600	197.567	197.567	90.0612	203.0126	818,548.714	9,901,977.729	2.513	540	JL
	541		1600	188.882	188.881	90.1047	206.1351	818,559.588	9,901,986.336	2.277	541	JL
	542		1600	196.810	196.809	90.0801	206.1724	818,551.962	9,901,988.515	2.410	542	JL
	543		1600	188.639	188.638	90.1210	209.1340	818,562.539	9,901,995.760	2.201	543	JL
	544		1600	196.178	196.177	90.0956	209.3110	818,555.650	9,901,998.976	2.302	544	JL
	545		1600	189.705	189.700	90.2446	212.2941	818,565.067	9,902,006.298	1.502	545	PNT
	546		1600	197.035	197.031	90.2314	212.3931	818,558.412	9,902,009.421	1.537	546	PNT
	547		1600	190.502	190.497	90.2558	214.4032	818,567.019	9,902,013.310	1.430	547	PNT
	548		1600	199.221	199.217	90.2034	214.4450	818,559.084	9,902,016.936	1.677	548	PNT

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	549		1600	200.188	200.184	90.2115	216.1900	818,560.421	9,902,022.367	1.632	549	PNT
	550		1600	192.469	192.460	90.3227	216.0934	818,567.211	9,902,018.640	1.052	550	PNT
	551		500	37.693	37.686	91.0718	38.5637	818,775.989	9,901,921.885	3.231	551	BGN
	552		2000	45.747	45.738	88.5022	31.3657	818,785.485	9,901,923.565	3.396	552	BGN
	553		2000	44.333	44.325	88.5615	29.4315	818,784.632	9,901,925.431	3.291	553	BGN
	554		2000	44.333	44.325	88.5615	29.4315	818,784.632	9,901,925.431	3.291	554	BGN
	555		1700	42.915	42.911	89.1138	26.1454	818,784.013	9,901,928.364	3.373	555	BGN
	556		3750	67.073	67.040	88.1121	20.1739	818,808.764	9,901,929.147	2.839	556	BGN
	557		6000	45.666	45.511	85.1642	29.4638	818,785.746	9,901,925.023	2.228	557	BGN
	558		1600	29.723	29.660	93.4435	342.3851	818,768.384	9,901,953.533	0.929	558	PHN
	559		100	27.148	27.116	92.4616	37.0642	818,766.972	9,901,927.492	3.057	559	PHN
	560		100	16.983	16.951	93.3152	106.3158	818,741.056	9,901,922.215	3.323	560	PHN
	561		100	23.616	23.586	92.5322	139.3129	818,728.021	9,901,920.464	3.179	561	PHN
	562		200	44.569	44.557	91.1839	166.5754	818,702.016	9,901,920.427	3.250	562	TEL
	563		200	90.348	90.342	90.4033	183.5938	818,652.954	9,901,926.914	3.203	563	TEL
	564		200	20.443	20.392	94.0316	68.1857	818,753.705	9,901,922.089	2.824	564	TEL
	565		200	42.867	42.855	91.2032	24.1559	818,784.306	9,901,929.820	3.265	565	TEL
	566		800	181.763	181.760	90.1959	209.2418	818,569.269	9,901,994.230	2.613	566	LAMPU
	567		200	108.766	108.761	90.3157	193.5605	818,633.787	9,901,943.252	3.258	567	RKLM
	568		200	108.618	108.613	90.3400	193.5145	818,633.930	9,901,943.109	3.195	568	RKLM
Survey Date : March, 31 2019												
	CP03		70	115.553	115.553	90.0459	359.5959	818,074.447	9,902,022.598	3.993	CP03	BS
BM3		1.217			115.549			818,020.148	9,901,920.602	3.042	BM3	
	1		1600	43.669	43.669	90.0817	264.3726	817,979.848	9,901,937.421	2.554	1	M3A
	2		1600	89.129	89.129	90.0448	261.3607	817,936.200	9,901,950.547	2.535	2	M3B
	3		1600	8.803	8.803	89.4734	205.2316	818,013.079	9,901,915.356	2.691	3	JL
	4		1600	13.818	13.818	89.5930	222.1025	818,007.147	9,901,915.922	2.661	4	JL
	5		1600	19.894	19.894	90.1331	198.0014	818,005.830	9,901,906.791	2.581	5	JL
	6		1600	16.949	16.949	90.2356	179.4158	818,012.262	9,901,905.600	2.541	6	JL
	7		1600	28.930	28.930	90.1119	185.1504	818,004.273	9,901,896.417	2.564	7	JL
	8		1600	26.458	26.458	90.0308	173.2521	818,010.472	9,901,895.977	2.635	8	JL
	9		1600	35.663	35.663	90.0307	177.2817	818,004.794	9,901,888.413	2.627	9	JL
	10		1600	34.202	34.202	89.5915	170.1025	818,009.464	9,901,888.112	2.666	10	JL
	11		1600	44.094	44.094	89.5651	173.3223	818,003.938	9,901,879.596	2.699	11	JL
	12		1600	43.096	43.096	89.5247	167.3603	818,008.537	9,901,879.100	2.749	12	JL
	13		1600	52.798	52.798	90.0252	171.1710	818,002.684	9,901,870.776	2.615	13	JL
	14		1600	52.471	52.471	90.0551	167.1328	818,006.343	9,901,869.980	2.570	14	JL
	15		1600	58.389	58.389	90.0205	171.5825	818,000.175	9,901,865.735	2.624	15	PGR
	16		1600	37.548	37.548	90.0516	167.0718	818,010.334	9,901,884.359	2.601	16	PGR
	17		1600	37.167	37.167	90.1251	158.1607	818,016.071	9,901,883.660	2.520	17	RMH
	18		1600	59.748	59.748	89.4710	181.1629	817,990.905	9,901,868.500	2.882	18	PGR
	19		1600	62.980	62.979	89.4523	191.2904	817,980.076	9,901,872.015	2.927	19	PGR
	20		1600	43.828	43.828	90.0412	130.0525	818,036.481	9,901,879.931	2.605	20	RMH
	21		1600	57.164	57.163	89.4229	196.0911	817,980.308	9,901,879.609	2.950	21	RMH
	22		1600	62.805	62.805	89.5914	193.2546	817,978.566	9,901,873.534	2.673	22	RMH
	23		1600	20.397	20.395	89.1428	97.2239	818,036.771	9,901,908.785	2.929	23	TWR
	24		1600	13.277	13.277	89.4716	63.3444	818,033.420	9,901,920.229	2.708	24	TWR
	25		1600	23.036	23.036	90.1716	56.0055	818,043.059	9,901,922.992	2.543	25	TWR
	26		1600	41.960	41.960	89.5432	202.0133	817,987.979	9,901,893.662	2.726	26	RMH
	27		1600	35.711	35.711	90.0757	210.4014	817,989.634	9,901,902.050	2.576	27	RMH
	28		1600	3.584	3.583	88.4829	158.4850	818,019.721	9,901,917.044	2.734	28	TL
	29		2500	37.999	37.989	88.3926	213.4908	817,986.653	9,901,902.679	2.649	29	RMH
	30		1600	35.609	35.608	90.3015	181.4151	818,002.491	9,901,889.680	2.346	30	TL
	31		1600	44.487	44.487	90.1135	221.1821	817,978.523	9,901,904.903	2.509	31	RMH
	32		1600	16.662	16.658	91.1720	249.1454	818,003.624	9,901,922.712	2.284	32	TL
	33		1600	23.840	23.838	90.4919	228.5248	817,996.930	9,901,915.203	2.317	33	RMH
	34		1600	9.011	9.010	91.0016	272.1638	818,012.370	9,901,925.149	2.501	34	JL
	35		1600	12.053	12.052	89.1749	241.2234	818,008.097	9,901,920.477	2.807	35	JL
	36		1600	19.331	19.331	90.0530	269.3130	818,003.010	9,901,929.544	2.628	36	JL
	37		1600	20.908	20.907	90.2435	257.4552	818,000.030	9,901,926.293	2.509	37	JL
	38		1600	29.901	29.901	90.1936	269.3015	817,993.634	9,901,934.424	2.489	38	JL
	39		1600	29.435	29.435	90.0949	259.5345	817,992.142	9,901,929.661	2.575	39	JL
	40		1600	38.978	38.978	90.0948	260.1759	817,983.148	9,901,932.860	2.548	40	JL
	41		1600	39.239	39.239	90.0544	267.2925	817,984.737	9,901,937.507	2.594	41	JL
	42		1600	32.695	32.695	90.1011	271.1001	817,991.607	9,901,936.551	2.562	42	RMH
	43		1600	28.909	28.909	90.0406	251.3244	817,991.642	9,901,925.411	2.625	43	RMH

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	44		1600	30.002	30.002	90.1856	272.5416	817,994.414	9,901,936.024	2.494	44	RMH
	45		1600	22.496	22.495	90.3255	251.5756	817,997.994	9,901,924.506	2.444	45	RMH
	46		1600	35.717	35.717	90.1217	292.5809	817,997.670	9,901,948.359	2.531	46	RMH
	47		1600	58.746	58.746	90.0732	168.5927	818,002.952	9,901,864.429	2.530	47	M3C
	48		1600	58.727	58.727	90.0732	168.5928	818,002.958	9,901,864.447	2.530	48	M3C
	49		1600	52.553	52.552	90.1721	189.0147	817,988.478	9,901,878.665	2.394	49	DTL
	50		1600	50.575	50.574	90.1534	181.1506	817,995.412	9,901,876.489	2.430	50	DTL
	51		1600	42.368	42.368	90.1613	186.5829	817,995.844	9,901,885.898	2.459	51	DTL
	52		1600	45.436	45.435	90.2120	194.1614	817,989.570	9,901,886.997	2.377	52	DTL
	53		1600	36.529	36.529	90.0810	191.1723	817,997.002	9,901,892.342	2.572	53	DTL
	54		1600	40.154	40.153	90.2844	198.5907	817,990.775	9,901,893.226	2.323	54	DTL
	55		1600	34.990	34.990	90.1753	206.5906	817,991.481	9,901,900.540	2.477	55	DTL
	56		1600	30.815	30.815	90.1753	198.5842	817,997.609	9,901,899.590	2.499	56	DTL
	57		1600	25.199	25.198	90.3120	208.5413	817,999.031	9,901,906.854	2.429	57	DTL
	58		1600	31.570	31.569	90.3121	218.4225	817,991.146	9,901,908.134	2.371	58	DTL
	59		1600	19.838	19.836	90.4947	224.1418	818,001.254	9,901,914.561	2.372	59	DTL
	60		1600	28.326	28.324	90.3853	228.5210	817,992.561	9,901,914.182	2.339	60	DTL
	61		1600	17.217	17.214	91.0844	242.1659	818,002.935	9,901,920.696	2.315	61	DTL
	62		1600	10.088	10.086	91.0340	290.3818	818,013.487	9,901,928.176	2.472	62	DTL
	63		1600	17.271	17.265	91.3105	280.2224	818,006.618	9,901,931.327	2.201	63	DTL
	64		1600	15.740	15.738	90.5514	325.3956	818,018.420	9,901,936.245	2.406	64	DTL
	65		1600	21.096	21.091	91.1609	303.3411	818,010.116	9,901,939.154	2.192	65	DTL
	66		1600	23.612	23.598	92.0015	331.0431	818,019.779	9,901,944.197	1.833	66	DTL
	67		1600	26.662	26.653	91.2857	315.3603	818,012.636	9,901,946.175	1.969	67	DTL
	68		1600	29.120	29.110	91.2856	333.4803	818,021.078	9,901,949.697	1.906	68	DTL
	69		1600	31.101	31.079	92.0909	320.2245	818,013.903	9,901,951.047	1.491	69	DTL
	70		1600	34.939	34.929	91.2128	308.3212	818,006.257	9,901,952.650	1.831	70	DTL
	71		1600	39.178	39.176	90.3436	300.3012	817,999.698	9,901,954.017	2.265	71	DTL
	72		1600	30.612	30.610	90.4159	301.4256	818,004.725	9,901,947.042	2.285	72	DTL
	73		1600	34.269	34.267	90.3529	289.5630	817,997.206	9,901,946.056	2.305	73	DTL
	74		1600	25.897	25.897	90.1240	288.3053	818,002.336	9,901,939.401	2.564	74	DTL
	75		1600	30.761	30.760	90.3335	278.5006	817,995.539	9,901,939.055	2.359	75	DTL
	76		1600	40.173	40.169	90.4636	300.4450	817,999.325	9,901,954.953	2.114	76	DTL
	77		1600	44.985	44.985	90.1248	293.4115	817,992.278	9,901,955.913	2.492	77	DTL
	78		1600	45.500	45.491	91.0642	307.4522	818,001.490	9,901,962.091	1.776	78	DTL
	79		1600	49.826	49.823	90.3658	301.3610	817,994.960	9,901,963.589	2.123	79	DTL
	80		2500	53.529	53.529	90.0907	306.1023	817,996.853	9,901,968.796	1.617	80	DTL
	81		2500	48.907	48.905	90.2849	312.1716	818,003.676	9,901,966.650	1.349	81	DTL
	82		2500	53.846	53.845	90.2109	316.0341	818,005.388	9,901,972.385	1.428	82	DTL
	83		2500	58.302	58.301	90.1919	310.5036	817,999.134	9,901,974.984	1.431	83	DTL
	84		2500	62.178	62.178	90.0839	321.4146	818,009.058	9,901,981.783	1.603	84	DTL
	85		2500	65.374	65.374	90.1114	316.1339	818,002.411	9,901,983.523	1.545	85	DTL
	86		2500	59.961	59.959	90.2440	329.3659	818,017.685	9,901,980.511	1.329	86	DTL
	87		2500	56.315	56.314	90.1759	323.4351	818,012.077	9,901,976.335	1.464	87	DTL
	88		2500	51.341	51.340	90.2601	322.3638	818,011.798	9,901,971.258	1.370	88	DTL
	89		2500	43.441	43.440	90.1918	320.1812	818,011.363	9,901,963.145	1.515	89	DTL
	90		1600	33.497	33.481	91.4626	313.0808	818,009.339	9,901,952.290	1.622	90	DTL
	91		1600	40.165	40.145	91.4927	330.0916	818,018.876	9,901,960.726	1.380	91	DTL
	92		1600	30.888	30.870	91.5801	322.3900	818,015.154	9,901,951.065	1.599	92	DTL
	93		1600	48.336	48.325	91.1329	333.2615	818,021.385	9,901,968.911	1.626	93	DTL
	94		1600	33.727	33.707	91.5921	337.3845	818,023.481	9,901,954.143	1.488	94	DTL
	95		1600	58.127	58.113	91.1524	335.2905	818,023.710	9,901,978.606	1.384	95	DTL
	96		1600	57.166	57.153	91.1325	341.4931	818,029.930	9,901,976.912	1.438	96	DTL
	97		1600	41.373	41.356	91.3945	345.1030	818,029.595	9,901,960.864	1.459	97	DTL
	98		1600	56.361	56.351	91.0414	349.0330	818,036.706	9,901,974.466	1.606	98	DTL
	BM03		1200	58.720	58.720	89.5009	359.5959	818,020.148	9,901,920.602	3.042	BM03	BS
M3C		1.51			58.727			818,002.958	9,901,864.447	2.530	M3C	
	99		1600	45.756	45.755	90.2446	249.1047	817,957.303	9,901,861.416	2.111	99	PGR
	100		1600	37.315	37.314	90.2448	245.0336	817,966.000	9,901,859.306	2.171	100	PGR
	101		1600	31.450	31.449	90.2445	244.3440	817,971.846	9,901,859.852	2.214	101	PGR
	102		1600	20.237	20.236	90.2448	231.0947	817,984.171	9,901,856.927	2.294	102	PGR
	103		1600	13.676	13.674	91.0306	207.2526	817,993.383	9,901,854.685	2.189	103	PGR
	104		1600	11.689	11.687	91.0325	182.4946	817,998.989	9,901,853.455	2.225	104	PGR
	105		1600	43.070	43.070	89.5105	268.5029	817,961.528	9,901,876.220	2.552	105	PGR
	106		1600	43.775	43.775	89.5104	258.5910	817,959.423	9,901,869.028	2.554	106	PGR
	107		1600	18.449	18.449	89.4439	343.5702	818,003.271	9,901,882.894	2.523	107	A-SAL
	108		1600	18.646	18.646	89.4709	341.0908	818,002.363	9,901,883.084	2.510	108	A-SAL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	109		1600	18.566	18.562	91.0812	341.2753	818,002.467	9,901,883.003	2.072	109	B-SAL
	110		1600	18.460	18.457	90.5657	343.0052	818,002.969	9,901,882.905	2.135	110	B-SAL
	111		1600	12.271	12.270	90.4644	341.2915	818,002.638	9,901,876.713	2.273	111	A-SAL
	112		1600	12.463	12.463	90.2238	336.3542	818,001.572	9,901,876.833	2.358	112	A-SAL
	113		1600	12.401	12.395	91.5028	337.2702	818,001.764	9,901,876.784	2.042	113	B-SAL
	114		1600	12.158	12.152	91.4903	339.5529	818,002.310	9,901,876.582	2.055	114	B-SAL
	115		1600	8.742	8.725	93.3552	341.0203	818,002.662	9,901,873.167	1.892	115	B-SAL
	116		1600	10.413	10.406	92.0342	342.3434	818,002.885	9,901,874.853	2.066	116	B-SAL
	117		1600	10.465	10.461	88.2432	343.1929	818,003.021	9,901,874.908	2.731	117	A-SAL
	118		1600	8.770	8.766	88.1142	342.0120	818,002.811	9,901,873.212	2.717	118	A-SAL
	119		1600	9.663	9.659	88.2038	17.5321	818,008.485	9,901,872.368	2.720	119	A-SAL
	120		1600	10.734	10.731	88.3356	15.1807	818,008.695	9,901,873.515	2.709	120	A-SAL
	121		1600	10.758	10.746	92.4311	16.5725	818,008.963	9,901,873.358	1.930	121	B-SAL
	122		1600	9.826	9.809	93.2232	18.5839	818,008.723	9,901,872.383	1.862	122	B-SAL
	123		1600	10.302	10.302	89.3457	27.5806	818,010.241	9,901,871.733	2.515	123	A-SAL
	124		1600	11.527	11.527	89.3810	23.2002	818,010.422	9,901,873.231	2.514	124	A-SAL
	125		1600	11.387	11.377	92.2120	23.5046	818,010.402	9,901,873.051	1.972	125	B-SAL
	126		1600	10.714	10.705	92.2247	27.3357	818,010.472	9,901,872.071	1.995	126	B-SAL
	127		1600	8.832	8.832	89.2621	23.2849	818,008.694	9,901,871.163	2.527	127	A-SAL
	128		1600	13.344	13.344	89.4332	40.5926	818,014.275	9,901,871.516	2.504	128	A-SAL
	129		1600	9.483	9.483	89.3326	29.4302	818,009.863	9,901,870.946	2.514	129	A-SAL
	130		1600	14.136	14.136	89.4533	37.4957	818,014.516	9,901,872.585	2.500	130	A-SAL
	131		1600	13.980	13.978	90.5829	37.5709	818,014.404	9,901,872.470	2.202	131	B-SAL
	132		1600	9.278	9.263	93.1323	29.1557	818,009.653	9,901,870.849	1.919	132	B-SAL
	133		1600	13.557	13.544	92.3256	40.2626	818,014.375	9,901,871.732	1.837	133	B-SAL
	134		1600	8.801	8.777	94.1149	24.4352	818,008.803	9,901,870.996	1.796	134	B-SAL
	135		1600	2.219	2.098	108.5933	288.3629	818,001.252	9,901,865.670	1.718	135	B-SAL
	136		1600	2.880	2.838	99.4954	288.3246	818,000.649	9,901,866.098	1.949	136	B-SAL
	137		1600	2.989	2.983	86.1645	287.4841	818,000.509	9,901,866.151	2.634	137	A-SAL
	138		1600	2.128	2.128	89.3833	298.5254	818,001.477	9,901,865.976	2.454	138	A-SAL
	139		1600	2.149	2.149	89.4914	298.3553	818,001.455	9,901,865.983	2.447	139	A-SAL
	140		1600	5.144	5.144	89.2237	77.2122	818,008.086	9,901,864.055	2.496	140	A-SAL
	141		1600	6.382	6.382	89.2826	76.4113	818,009.326	9,901,864.035	2.499	141	A-SAL
	142		1600	6.183	6.141	96.4054	77.4430	818,009.078	9,901,863.938	1.721	142	B-SAL
	143		1600	5.314	5.279	96.3405	79.0033	818,008.208	9,901,863.893	1.832	143	B-SAL
	144		1600	4.480	4.480	89.5456	77.0743	818,007.426	9,901,864.123	2.447	144	JL
	145		1600	16.774	16.774	89.5432	152.0947	818,006.105	9,901,847.971	2.467	145	JL
	146		1600	17.063	17.063	89.5824	170.0614	818,000.841	9,901,847.516	2.448	146	JL
	147		1600	16.721	16.721	90.0435	149.5047	818,006.757	9,901,848.164	2.418	147	A-SAL
	148		1600	17.207	17.207	89.5812	172.5725	817,999.976	9,901,847.501	2.449	148	A-SAL
	149		1600	17.447	17.447	89.4157	175.5911	817,999.031	9,901,847.448	2.532	149	A-SAL
	150		1600	17.305	17.305	89.4636	146.1904	818,007.919	9,901,847.869	2.508	150	A-SAL
	151		1600	17.394	17.385	91.4913	146.5200	818,007.783	9,901,847.745	1.888	151	B-SAL
	152		1600	17.520	17.508	92.0934	175.3236	817,999.149	9,901,847.359	1.780	152	B-SAL
	153		1600	17.190	17.186	91.1754	149.3128	818,006.956	9,901,847.733	2.051	153	B-SAL
	154		1600	17.385	17.377	91.4218	173.2444	817,999.811	9,901,847.357	1.923	154	B-SAL
	155		1600	17.386	17.378	91.4234	173.2452	817,999.810	9,901,847.357	1.922	155	B-SAL
	156		1600	30.463	30.463	89.5828	168.2900	818,000.030	9,901,834.125	2.454	156	JL
	157		1600	29.859	29.859	90.0028	159.5728	818,004.532	9,901,834.630	2.436	157	JL
	158		1600	30.079	30.079	89.5127	157.4305	818,005.716	9,901,834.495	2.515	158	A-SAL
	159		1600	30.595	30.595	89.5125	170.2351	817,999.007	9,901,834.109	2.517	159	A-SAL
	160		1600	30.312	30.312	89.5127	155.4706	818,006.754	9,901,834.374	2.516	160	A-SAL
	161		1600	30.392	30.385	91.1547	156.0028	818,006.646	9,901,834.287	1.770	161	B-SAL
	162		1600	30.203	30.196	91.1329	157.3254	818,005.816	9,901,834.387	1.795	162	B-SAL
	163		1600	35.610	35.610	89.4917	171.3325	817,997.646	9,901,829.236	2.551	163	A-SAL
	164		1600	35.590	35.584	91.0407	171.2823	817,997.702	9,901,829.254	1.777	164	B-SAL
	165		1600	35.388	35.383	90.5912	170.2620	817,998.364	9,901,829.364	1.831	165	B-SAL
	166		1600	35.267	35.267	89.5347	170.0805	817,998.565	9,901,829.455	2.504	166	A-SAL
	167		2000	17.208	17.203	88.4020	184.3941	817,996.602	9,901,848.461	2.439	167	TL
	168		1600	52.829	52.829	90.0424	159.5318	818,005.806	9,901,811.695	2.373	168	TEL
	169		1600	15.494	15.491	91.0408	142.1539	818,008.438	9,901,849.958	2.151	169	TEL
	170		0	11.233	11.156	96.4231	17.0142	818,009.204	9,901,873.691	2.728	170	PGR
	171		1000	17.281	17.271	91.5658	96.3835	818,018.776	9,901,857.515	2.452	171	RMH
	172		1000	16.764	16.757	91.3702	69.2857	818,019.684	9,901,865.469	2.567	172	RMH
	173		200	15.026	14.952	95.4127	110.0740	818,014.875	9,901,855.418	2.350	173	RMH
	174		800	18.198	18.179	92.3639	125.4215	818,013.968	9,901,849.982	2.411	174	RMH
	175		800	16.368	16.345	93.0159	118.2606	818,014.423	9,901,852.798	2.374	175	RMH
	176		800	16.930	16.912	92.3913	116.5859	818,015.122	9,901,852.699	2.456	176	RMH

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	177		0	25.713	25.669	93.2052	97.5359	818,026.237	9,901,853.631	2.539	177	RMH
	178		500	33.875	33.861	91.3745	93.3315	818,034.659	9,901,852.547	2.577	178	RMH
	179		1800	27.658	27.653	88.5229	63.3955	818,030.246	9,901,868.923	2.783	179	PGR
	180		0	7.577	7.465	99.5300	227.2200	817,996.226	9,901,861.222	2.740	180	DTL
	181		200	19.141	19.113	93.0607	250.0223	817,983.870	9,901,863.467	2.805	181	DTL
	182		1000	30.621	30.605	91.5251	254.0923	817,972.360	9,901,865.076	2.035	182	DTL
	183		0	35.490	35.459	92.2339	306.3140	817,981.890	9,901,892.969	2.558	183	RMH
	184		1000	35.115	35.104	91.2711	301.5244	817,979.881	9,901,890.900	2.150	184	RMH
	185		1000	34.691	34.685	91.0540	311.3444	817,984.887	9,901,894.052	2.378	185	RMH
	BM03		1200	43.667	43.667	89.4646	0.0000	818,020.148	9,901,920.602	3.042	BM03	BS
M3A		1.52			43.669			817,979.848	9,901,937.421	2.554	M3A	
	187		0	13.076	13.002	96.0550	324.1621	817,992.513	9,901,940.363	2.685	187	RMH
	188		0	10.787	10.683	97.5645	316.4930	817,989.854	9,901,941.166	2.583	188	RMH
	189		0	16.476	16.404	95.2137	291.1212	817,991.214	9,901,949.250	2.535	189	RMH
	190		1600	5.770	5.767	88.1640	303.3055	817,984.639	9,901,940.632	2.647	190	DTL
	191		1600	6.791	6.791	89.4802	206.3848	817,975.420	9,901,942.570	2.497	191	DTL
	192		1600	14.719	14.719	90.2107	274.1607	817,986.512	9,901,950.545	2.383	192	DTL
	193		1600	14.455	14.452	91.0657	248.3643	817,980.167	9,901,951.870	2.192	193	DTL
	194		1600	23.863	23.861	90.4458	253.2021	817,982.339	9,901,961.152	2.162	194	DTL
	195		1600	23.553	23.553	89.5118	267.4828	817,988.082	9,901,959.488	2.533	195	DTL
	196		1600	32.537	32.531	91.0754	264.1458	817,989.306	9,901,968.547	1.831	196	DTL
	197		1600	32.728	32.727	90.3213	254.4702	817,984.084	9,901,969.873	2.167	197	DTL
	198		1600	35.883	35.880	90.4609	264.0329	817,990.165	9,901,971.786	1.992	198	DTL
	199		1600	36.602	36.601	90.2609	254.1452	817,984.246	9,901,973.757	2.195	199	DTL
	200		1600	37.505	37.499	90.5927	244.3719	817,978.066	9,901,974.878	1.825	200	DTL
	201		1600	40.479	40.479	90.1513	234.0352	817,970.548	9,901,976.817	2.295	201	DTL
	202		1600	45.632	45.627	90.5046	246.5702	817,979.533	9,901,983.047	1.800	202	DTL
	203		1600	48.395	48.393	90.2726	237.2742	817,971.540	9,901,985.096	2.088	203	DTL
	204		1600	23.906	23.905	90.2314	231.1211	817,973.201	9,901,960.384	2.312	204	DTL
	205		1600	15.871	15.871	90.2315	218.5204	817,972.280	9,901,951.371	2.366	205	DTL
	206		1600	12.742	12.741	90.4409	202.1108	817,970.814	9,901,946.405	2.310	206	DTL
	207		1600	6.857	6.856	88.4812	65.2450	817,980.079	9,901,930.570	2.617	207	DTL
	208		1600	10.652	10.651	90.3753	28.1600	817,986.563	9,901,929.153	2.356	208	DTL
	209		1600	16.246	16.246	89.5637	54.5011	817,983.367	9,901,921.561	2.490	209	DTL
	210		1600	15.028	15.028	90.2008	74.1914	817,978.023	9,901,922.505	2.386	210	DTL
	211		1600	25.286	25.286	89.5635	65.5957	817,980.443	9,901,912.142	2.499	211	DTL
	212		1600	24.443	24.443	90.0317	78.1656	817,975.211	9,901,913.422	2.450	212	DTL
	213		1600	33.117	33.117	90.0050	70.0609	817,978.256	9,901,904.343	2.466	213	RMH
	214		1600	32.602	32.602	89.5621	78.5237	817,973.331	9,901,905.477	2.508	214	DTL
	215		1600	39.320	39.320	90.0028	79.3741	817,971.484	9,901,899.001	2.468	215	DTL
	216		1600	39.445	39.445	89.5831	71.5929	817,976.654	9,901,898.106	2.491	216	RMH
	217		1600	39.420	39.420	90.0443	73.4154	817,975.487	9,901,898.243	2.420	217	RMH
	218		1600	46.316	46.316	90.0828	75.0243	817,973.643	9,901,891.523	2.360	218	RMH
	219		1600	45.676	45.676	90.0147	80.5040	817,969.187	9,901,893.007	2.450	219	DTL
	220		1600	55.117	55.117	90.0219	75.4046	817,971.860	9,901,882.886	2.437	220	DTL
	221		1600	49.988	49.988	90.0107	84.5804	817,964.716	9,901,889.779	2.458	221	RMH
	222		1600	53.619	53.619	90.0539	96.2615	817,953.779	9,901,890.566	2.386	222	RMH
	223		1600	52.615	52.615	90.0035	85.3827	817,963.332	9,901,887.466	2.465	223	RMH
	224		1600	58.429	58.429	90.0342	97.4129	817,950.330	9,901,886.997	2.411	224	RMH
	225		1600	52.906	52.906	90.0352	91.4010	817,958.057	9,901,889.211	2.414	225	RMH
	226		1600	61.125	61.125	90.0723	85.0908	817,961.157	9,901,879.224	2.342	226	PGR
	227		1600	46.173	46.172	90.1621	102.4138	817,953.136	9,901,899.760	2.254	227	DTL
	228		1600	43.826	43.826	90.1003	94.2425	817,959.910	9,901,898.393	2.346	228	DTL
	229		1600	35.119	35.118	90.1933	97.3603	817,962.154	9,901,907.086	2.274	229	DTL
	230		1600	38.261	38.261	89.5332	109.2921	817,954.176	9,901,909.052	2.546	230	DTL
	231		1600	26.437	26.435	90.4314	103.2114	817,964.307	9,901,916.037	2.141	231	DTL
	232		1600	30.051	30.050	90.2444	115.1846	817,957.528	9,901,917.301	2.258	232	DTL
	233		1600	18.877	18.877	89.5149	113.1751	817,966.280	9,901,924.297	2.519	233	DTL
	234		1600	23.988	23.988	90.1537	127.0659	817,959.122	9,901,925.344	2.365	234	DTL
	235		1600	9.975	9.975	89.4543	127.1145	817,971.223	9,901,932.411	2.515	235	DTL
	236		1600	17.967	17.967	89.4000	146.5050	817,962.182	9,901,934.147	2.578	236	DTL
	237		1600	15.552	15.552	89.4825	164.1537	817,964.409	9,901,939.293	2.526	237	JL
	238		1600	7.704	7.703	89.1751	148.3818	817,972.233	9,901,936.255	2.568	238	JL
	239		1600	6.861	6.861	90.0504	183.0146	817,973.665	9,901,940.395	2.464	239	JL
	240		1600	14.577	14.577	90.0504	182.4446	817,966.680	9,901,943.674	2.452	240	JL
	241		1600	25.349	25.349	90.0800	180.4754	817,956.593	9,901,947.510	2.410	241	JL
	242		1600	32.825	32.825	89.5133	181.1933	817,949.856	9,901,950.762	2.554	242	JL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	243		1600	25.618	25.618	89.5743	170.0629	817,954.863	9,901,943.080	2.491	243	JL
	244		1600	32.705	32.705	89.5257	171.5444	817,948.194	9,901,945.646	2.541	244	JL
	245		1600	32.971	32.971	89.5256	163.4220	817,947.080	9,901,941.073	2.542	245	DTL
	246		1600	26.363	26.363	89.5906	161.3052	817,953.555	9,901,939.337	2.481	246	DTL
	247		1600	34.266	34.266	89.5302	153.5432	817,945.644	9,901,935.367	2.543	247	DTL
	248		1600	28.014	28.014	90.0209	151.1147	817,951.995	9,901,934.420	2.456	248	DTL
	249		1600	36.345	36.345	90.0400	144.2711	817,944.420	9,901,929.311	2.431	249	DTL
	250		1600	31.233	31.233	89.4721	140.5325	817,949.895	9,901,928.574	2.589	250	DTL
	251		1600	39.922	39.922	90.0229	136.4251	817,942.487	9,901,923.354	2.445	251	DTL
	252		1600	33.557	33.557	89.5811	130.1322	817,949.982	9,901,922.122	2.492	252	DTL
	253		1600	39.504	39.504	89.4914	121.3546	817,947.788	9,901,914.341	2.598	253	DTL
	254		1600	44.463	44.463	90.0857	127.2915	817,941.288	9,901,915.285	2.358	254	DTL
	255		1600	49.372	49.372	90.1409	121.1359	817,939.963	9,901,908.322	2.271	255	DTL
	256		1600	44.360	44.359	90.1934	113.4722	817,947.701	9,901,906.854	2.221	256	DTL
	257		1600	54.588	54.587	90.1452	116.4049	817,938.443	9,901,901.849	2.238	257	DTL
	258		1600	50.113	50.113	90.0926	109.0513	817,946.485	9,901,900.029	2.336	258	DTL
	259		1600	60.069	60.069	90.0449	112.4635	817,937.056	9,901,895.266	2.390	259	DTL
	260		1600	55.588	55.588	90.0449	106.0538	817,945.056	9,901,894.067	2.396	260	DTL
	261		1600	65.847	65.847	89.5409	111.2601	817,934.035	9,901,890.125	2.586	261	RMH
	262		1600	62.585	62.585	89.5409	105.3030	817,941.178	9,901,888.213	2.580	262	RMH
	263		1600	60.355	60.355	89.5409	100.0611	817,947.192	9,901,886.664	2.576	263	RMH
	264		1600	66.686	66.685	90.1559	98.4155	817,945.152	9,901,880.473	2.164	264	RMH
	265		1600	82.733	82.731	90.2221	112.0122	817,921.680	9,901,878.592	1.936	265	BGN
	266		1600	85.783	85.783	90.0700	116.2929	817,914.965	9,901,881.307	2.282	266	BGN
	267		0	95.114	95.103	90.5259	118.1358	817,906.058	9,901,877.425	2.608	267	BGN
	268		0	86.607	86.593	91.0238	120.1443	817,910.784	9,901,885.186	2.496	268	BGN
	269		0	96.352	96.340	90.5521	131.5600	817,892.831	9,901,896.078	2.523	269	BGN
	270		1600	69.709	69.709	90.0248	116.5740	817,926.751	9,901,892.255	2.417	270	DTL
	271		1600	73.598	73.597	90.2021	121.2515	817,920.251	9,901,894.239	2.038	271	DTL
	272		1600	68.589	68.587	90.2256	124.1907	817,922.344	9,901,900.038	2.016	272	DTL
	273		1600	64.432	64.431	90.1842	120.0726	817,928.542	9,901,898.446	2.123	273	DTL
	274		1600	58.404	58.403	90.1614	124.0032	817,931.055	9,901,905.324	2.198	274	DTL
	275		1600	63.084	63.084	90.1152	128.4704	817,924.442	9,901,907.260	2.256	275	DTL
	276		1600	56.076	56.075	90.1559	137.0849	817,927.222	9,901,918.059	2.213	276	DTL
	277		1600	51.227	51.227	90.1114	132.3955	817,933.301	9,901,916.031	2.306	277	DTL
	278		1600	53.502	53.502	90.1226	140.2955	817,928.643	9,901,921.915	2.280	278	DTL
	279		1600	46.093	46.093	89.5024	140.1332	817,935.798	9,901,923.852	2.602	279	DTL
	280		1600	40.433	40.433	89.4727	143.3443	817,940.577	9,901,927.799	2.621	280	DTL
	281		1600	48.843	48.843	90.1206	149.2823	817,931.466	9,901,930.730	2.302	281	DTL
	282		1600	37.792	37.791	89.4033	153.2151	817,942.148	9,901,934.797	2.688	282	DTL
	283		1600	46.059	46.059	90.1416	154.0326	817,933.865	9,901,934.779	2.283	283	DTL
	284		1600	45.545	45.545	90.1417	159.1722	817,934.330	9,901,938.965	2.285	284	DTL
	285		1600	36.660	36.659	89.2939	161.2451	817,943.282	9,901,940.022	2.797	285	DTL
	286		1600	36.673	36.673	89.5042	167.3645	817,943.762	9,901,943.957	2.573	286	DTL
	287		1600	43.892	43.892	89.5838	169.2554	817,936.929	9,901,946.611	2.491	287	DTL
	288		1600	35.932	35.932	89.5550	172.1758	817,945.133	9,901,946.693	2.517	288	JL
	289		1600	43.536	43.536	89.5549	173.2112	817,938.000	9,901,949.426	2.527	289	JL
	290		1600	35.981	35.981	89.5808	181.0523	817,946.913	9,901,951.909	2.493	290	JL
	291		1600	43.324	43.324	90.0823	180.3921	817,940.060	9,901,954.564	2.368	291	JL
	BM03		1200	89.129	89.129	89.5545	0.0000	818,020.148	9,901,920.602	3.042	BM03	BS
M3B		1.55			89.129			817,936.200	9,901,950.547	2.535	M3B	
	292		0	56.350	56.326	91.4046	120.2823	817,892.986	9,901,914.420	2.433	292	BGN
	293		0	61.332	61.310	91.3213	118.3552	817,890.474	9,901,909.705	2.440	293	BGN
	294		0	64.317	64.297	91.2536	136.0531	817,877.589	9,901,924.111	2.483	294	BGN
	295		1600	14.227	14.227	90.0257	200.0529	817,925.257	9,901,959.639	2.472	295	JL
	296		1600	7.838	7.837	90.4440	215.5309	817,931.763	9,901,957.007	2.383	296	JL
	297		1600	6.207	6.207	89.5326	174.5247	817,930.191	9,901,952.102	2.496	297	JL
	298		1600	14.976	14.976	90.0012	176.2725	817,921.810	9,901,954.697	2.484	298	JL
	299		1600	7.190	7.190	89.3216	146.5101	817,929.209	9,901,948.866	2.543	299	DTL
	300		1600	15.388	15.388	90.0545	164.1346	817,920.847	9,901,951.583	2.459	300	DTL
	301		1600	12.989	12.988	89.2546	118.1025	817,926.577	9,901,941.823	2.614	301	DTL
	302		1600	18.711	18.711	90.1436	138.4234	817,918.810	9,901,943.641	2.405	302	DTL
	303		1600	21.317	21.315	89.1147	105.4945	817,923.834	9,901,933.185	2.784	303	DTL
	304		1600	25.801	25.800	90.3035	123.1610	817,915.622	9,901,934.984	2.255	304	DTL
	305		1600	32.167	32.167	90.0817	113.0114	817,914.405	9,901,926.888	2.407	305	DTL
	306		1600	29.315	29.315	90.1445	101.1020	817,921.188	9,901,925.367	2.359	306	DTL
	307		1600	38.792	38.792	90.1542	108.4538	817,912.109	9,901,920.142	2.307	307	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	308		1600	37.234	37.233	90.2102	99.0816	817,918.280	9,901,917.909	2.257	308	DTL
	309		1600	47.743	47.743	90.1202	105.5759	817,908.409	9,901,911.726	2.317	309	DTL
	310		1600	47.075	47.074	90.1658	98.2451	817,914.067	9,901,909.000	2.252	310	DTL
	311		1600	54.888	54.887	90.2145	98.1859	817,910.476	9,901,902.061	2.137	311	DTL
	312		1600	55.241	55.240	90.2314	104.2352	817,905.287	9,901,904.766	2.111	312	DTL
	313		1600	62.356	62.355	90.2129	103.5533	817,901.732	9,901,898.584	2.095	313	DTL
	314		1600	62.464	62.462	90.2704	98.4438	817,906.515	9,901,895.589	1.993	314	DTL
	315		1600	69.105	69.104	90.1623	98.2244	817,903.746	9,901,889.537	2.155	315	DTL
	316		1600	69.117	69.116	90.1520	104.0109	817,897.901	9,901,893.012	2.176	316	DTL
	317		1600	69.958	69.958	90.1041	110.5311	817,890.749	9,901,897.364	2.267	317	DTL
	318		1600	69.958	69.958	90.1042	110.5253	817,890.754	9,901,897.360	2.267	318	BGN
	319		1600	73.094	73.094	89.5635	110.2144	817,889.222	9,901,894.548	2.557	319	BGN
	320		1600	70.472	70.472	90.0747	112.3332	817,888.871	9,901,898.333	2.325	320	BGN
	321		1600	85.624	85.624	90.0634	116.1739	817,874.684	9,901,890.987	2.321	321	BGN
	322		3000	86.120	86.107	89.0037	110.1756	817,880.931	9,901,884.517	2.572	322	BGN
	323		3000	98.080	98.069	89.0909	109.2949	817,874.312	9,901,874.471	2.535	323	BGN
	324		1600	64.096	64.095	90.1557	118.0111	817,888.830	9,901,907.369	2.187	324	DTL
	325		1600	58.431	58.430	90.1420	111.4515	817,897.570	9,901,906.707	2.241	325	DTL
	326		1600	59.756	59.755	90.1802	118.5934	817,891.360	9,901,911.049	2.171	326	DTL
	327		1600	50.776	50.776	90.0817	114.0223	817,901.138	9,901,913.820	2.362	327	DTL
	328		1600	52.799	52.797	90.2616	121.1210	817,895.265	9,901,917.201	2.081	328	DTL
	329		1600	42.617	42.617	90.0942	117.4243	817,904.858	9,901,921.669	2.364	329	DTL
	330		1600	45.966	45.965	90.1631	125.0453	817,898.680	9,901,923.993	2.264	330	DTL
	331		1600	36.301	36.301	89.5848	124.1333	817,906.885	9,901,929.136	2.497	331	DTL
	332		1600	40.214	40.213	90.1939	131.0746	817,901.110	9,901,930.904	2.255	332	DTL
	333		1600	29.810	29.810	90.1616	135.1943	817,909.192	9,901,937.930	2.343	333	DTL
	334		1600	34.470	34.469	90.2139	140.4231	817,903.740	9,901,938.950	2.267	334	DTL
	335		1600	24.491	24.491	90.1323	151.3536	817,911.996	9,901,946.810	2.389	335	DTL
	336		1600	30.066	30.066	90.0418	154.3945	817,906.283	9,901,947.557	2.447	336	DTL
	337		1600	22.098	22.098	90.1503	170.4857	817,914.468	9,901,954.554	2.388	337	DTL
	338		1600	27.326	27.326	89.5728	171.4146	817,909.406	9,901,955.914	2.505	338	DTL
	339		1600	21.824	21.824	90.0527	177.2130	817,915.328	9,901,956.924	2.450	339	JL
	340		1600	27.272	27.272	90.0313	176.4033	817,910.025	9,901,958.204	2.459	340	JL
	341		1600	27.458	27.458	90.1908	187.1729	817,911.718	9,901,962.979	2.332	341	JL
	342		1600	22.708	22.707	90.2921	191.0332	817,916.673	9,901,962.136	2.291	342	JL
	343		1600	37.445	37.445	90.0347	183.4006	817,901.809	9,901,965.358	2.443	343	JL
	344		1600	48.257	48.257	90.1239	181.4936	817,891.288	9,901,968.200	2.307	344	JL
	345		1600	38.654	38.654	89.5931	176.0956	817,899.006	9,901,961.069	2.490	345	JL
	346		1600	48.257	48.257	90.0125	175.3951	817,889.652	9,901,963.277	2.465	346	JL
	347		1600	39.243	39.243	90.0406	172.2829	817,897.830	9,901,958.777	2.438	347	DTL
	348		1600	48.292	48.292	90.0139	173.4445	817,889.218	9,901,961.719	2.461	348	DTL
	349		1600	49.545	49.544	89.4418	163.3801	817,886.736	9,901,953.368	2.711	349	DTL
	350		1600	41.044	41.044	90.0535	161.4650	817,895.168	9,901,951.558	2.418	350	DTL
	351		1600	52.140	52.139	89.4138	154.2531	817,884.341	9,901,945.148	2.763	351	DTL
	352		1600	45.161	45.161	90.0926	150.3031	817,891.706	9,901,942.813	2.361	352	DTL
	353		1600	57.255	57.255	90.0323	146.2149	817,880.647	9,901,936.691	2.428	353	DTL
	354		1600	52.023	52.022	90.1517	141.4922	817,886.879	9,901,934.000	2.253	354	DTL
	355		1600	63.216	63.216	90.0745	140.2059	817,876.804	9,901,928.906	2.342	355	DTL
	356		1600	58.885	58.885	90.0745	136.2559	817,882.379	9,901,926.656	2.352	356	DTL
	357		1600	63.079	63.078	90.1931	134.2915	817,879.448	9,901,923.013	2.126	357	DTL
	358		1600	67.993	67.992	90.2125	139.1301	817,872.789	9,901,926.013	2.061	358	DTL
	359		1600	74.885	74.884	90.1418	136.3403	817,867.684	9,901,920.326	2.173	359	DTL
	360		1600	78.017	78.017	90.1115	140.4929	817,862.678	9,901,924.448	2.229	360	DTL
	361		1600	74.622	74.622	90.0433	144.0909	817,864.547	9,901,929.708	2.386	361	DTL
	362		1600	64.258	64.258	89.4914	148.5856	817,873.207	9,901,937.861	2.686	362	BGN
	363		1600	68.833	68.833	89.5447	148.0552	817,868.939	9,901,935.917	2.589	363	DTL
	364		1600	62.200	62.199	89.4426	153.2003	817,874.469	9,901,942.929	2.766	364	BGN
	365		1600	55.281	55.280	89.4426	159.2804	817,880.926	9,901,949.677	2.735	365	BGN
	366		1600	54.543	54.542	89.4311	162.5824	817,881.714	9,901,953.025	2.751	366	BGN
	367		1600	58.112	58.111	89.3546	169.2535	817,878.814	9,901,959.695	2.894	367	BGN
	368		1600	51.054	51.054	89.5810	173.1005	817,886.415	9,901,961.857	2.512	368	DTL
	369		1600	58.009	58.009	89.4832	173.2035	817,879.672	9,901,963.570	2.678	369	DTL
	370		1600	50.812	50.812	90.0026	175.2757	817,887.142	9,901,963.781	2.478	370	JL
	371		1600	57.808	57.808	90.0203	175.4213	817,880.450	9,901,965.835	2.450	371	JL
	372		1600	57.877	57.877	90.0615	179.3704	817,881.559	9,901,969.627	2.379	372	JL
	373		1600	51.078	51.078	90.0922	180.2815	817,888.234	9,901,968.102	2.345	373	JL
	374		1600	56.655	56.655	90.0006	174.1842	817,881.214	9,901,964.198	2.483	374	TEL
	375		0	11.492	11.396	97.2347	165.1418	817,924.845	9,901,951.514	2.605	375	TEL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	376		1600	91.377	91.377	89.5742	179.4015	817,849.959	9,901,980.751	2.546	376	M3D
Survey Date : April, 01 2019												
	CP03		70	115.535	115.535	90.0659	0.0000	818,074.447	9,902,022.598	3.993	CP03	BS
BM03		1.19			115.549			818,020.148	9,901,920.602	3.042	BM03	
	1		1600	31.366	31.366	89.4426	168.5128	818,011.037	9,901,890.589	2.774	1	DTL
	2		1600	31.159	31.159	89.5255	153.4010	818,019.224	9,901,889.457	2.696	2	DTL
	3		1600	33.572	33.572	90.1515	137.3522	818,028.486	9,901,888.082	2.483	3	DTL
	4		1600	37.504	37.503	90.2713	126.1047	818,036.465	9,901,886.835	2.335	4	DTL
	5		1600	41.945	41.943	90.3231	116.3533	818,044.432	9,901,886.404	2.235	5	DTL
	6		1600	49.557	49.555	90.2739	115.4133	818,049.470	9,901,880.653	2.233	6	DTL
	7		1600	61.691	61.690	90.1506	115.4302	818,056.629	9,901,870.854	2.361	7	DTL
	8		1600	71.952	71.951	90.1539	115.3953	818,062.750	9,901,862.619	2.304	8	DTL
	9		1600	71.247	71.247	90.1054	120.1338	818,057.632	9,901,860.013	2.406	9	DTL
	10		1600	67.424	67.424	90.0747	123.5523	818,051.851	9,901,861.097	2.479	10	DTL
	11		1600	57.246	57.245	90.2004	122.5913	818,047.887	9,901,870.527	2.298	11	DTL
	12		1600	52.413	52.412	90.1548	128.4416	818,040.823	9,901,872.440	2.391	12	DTL
	13		1600	41.806	41.805	90.1820	128.3920	818,036.694	9,901,882.210	2.409	13	DTL
	14		1600	24.071	24.071	90.1820	126.3153	818,030.488	9,901,898.865	2.504	14	DTL
	15		1600	19.141	19.141	89.5153	148.2547	818,021.330	9,901,901.498	2.677	15	DTL
	16		1600	18.172	18.171	90.3524	172.0606	818,013.894	9,901,903.541	2.445	16	DTL
	17		1600	9.814	9.813	89.0845	180.1645	818,015.495	9,901,911.963	2.778	17	DTL
	18		1600	9.280	9.280	89.3609	136.1710	818,022.657	9,901,911.668	2.696	18	DTL
	19		1600	10.512	10.511	90.5248	102.5314	818,028.091	9,901,913.718	2.471	19	DTL
	20		1600	25.065	25.062	90.4852	101.1550	818,039.544	9,901,904.730	2.276	20	DTL
	21		1600	30.892	30.892	90.0555	90.2827	818,047.296	9,901,905.860	2.579	21	DTL
	22		1600	35.673	35.672	89.3501	86.0120	818,052.723	9,901,906.064	2.891	22	DTL
	23		1600	47.729	47.729	89.5430	99.5807	818,057.760	9,901,891.219	2.708	23	DTL
	24		1600	38.864	38.856	91.1032	79.1506	818,057.250	9,901,909.060	1.835	24	DTL
	25		1600	52.261	52.261	90.0728	90.2354	818,066.107	9,901,895.723	2.518	25	DTL
	26		1600	58.201	58.201	89.4949	84.3947	818,073.843	9,901,898.149	2.804	26	DTL
	27		1600	45.191	45.191	89.5325	74.0314	818,064.338	9,901,911.142	2.719	27	DTL
	28		1600	44.170	44.170	89.5611	64.2306	818,064.279	9,901,918.741	2.681	28	DTL
	29		1600	53.213	53.213	89.4819	68.2834	818,073.018	9,901,914.573	2.813	29	DTL
	30		1600	35.749	35.746	90.4651	65.3127	818,055.825	9,901,918.387	2.145	30	DTL
	31		1600	55.675	55.674	89.4306	74.4500	818,074.443	9,901,908.287	2.906	31	DTL
	BM03		1170	89.131	89.131	89.5445	0.0000	818,020.148	9,901,920.602	3.042	BM03	STN
M3B		1.535			89.129			817,936.200	9,901,950.547	2.535	M3B	
	33		1600	14.138	14.138	89.4304	338.5711	817,950.333	9,901,950.896	2.539	33	DTL
	34		1600	7.973	7.973	90.0718	312.3813	817,943.257	9,901,954.257	2.453	34	DTL
	35		1600	21.344	21.342	90.4901	307.4654	817,954.182	9,901,962.041	2.165	35	DTL
	36		1600	16.927	16.924	88.5640	284.4317	817,945.750	9,901,964.519	2.781	36	DTL
	37		1600	28.057	28.057	90.1846	293.2737	817,955.367	9,901,971.035	2.316	37	DTL
	38		1600	25.666	25.666	90.1353	278.2859	817,948.294	9,901,973.184	2.366	38	DTL
	39		1600	36.342	36.341	90.2638	285.4340	817,957.230	9,901,980.184	2.188	39	DTL
	40		1600	35.002	35.001	90.2040	274.1346	817,950.359	9,901,982.556	2.259	40	DTL
	41		1600	44.875	44.873	90.3504	281.2904	817,959.389	9,901,988.963	2.012	41	DTL
	42		1600	43.899	43.898	90.1850	271.4811	817,952.242	9,901,991.409	2.229	42	DTL
	43		1600	53.158	53.155	90.3710	278.1856	817,961.111	9,901,997.503	1.895	43	DTL
	44		1600	52.241	52.237	90.4406	271.1834	817,954.870	9,901,999.333	1.799	44	DTL
	45		1600	61.484	61.480	90.3649	276.3216	817,963.314	9,902,005.725	1.811	45	DTL
	46		1600	61.082	61.077	90.4331	269.2006	817,956.051	9,902,008.308	1.696	46	DTL
	47		1600	67.733	67.727	90.4614	269.5238	817,958.817	9,902,014.385	1.559	47	DTL
	48		1600	66.876	66.867	90.5624	276.2112	817,965.496	9,902,010.654	1.372	48	DTL
	49		1600	71.272	71.266	90.4350	259.3128	817,947.540	9,902,020.905	1.561	49	DTL
	50		1600	72.587	72.580	90.4921	253.3559	817,940.291	9,902,023.011	1.428	50	DTL
	51		1600	62.281	62.276	90.4448	257.5755	817,944.433	9,902,012.276	1.658	51	DTL
	52		1600	63.614	63.614	90.1128	252.2659	817,938.510	9,902,014.118	2.257	52	DTL
	53		1600	53.100	53.097	90.3528	258.5325	817,944.068	9,902,003.057	1.922	53	DTL
	54		1600	54.276	54.276	90.0210	252.1845	817,938.041	9,902,004.791	2.435	54	DTL
	55		1600	43.414	43.413	90.2752	256.2418	817,940.765	9,901,993.718	2.118	55	DTL
	56		1600	44.717	44.716	90.1953	250.0625	817,935.996	9,901,995.262	2.211	56	DTL
	57		1600	34.219	34.218	90.2500	259.3706	817,941.700	9,901,984.320	2.221	57	DTL
	58		1600	35.614	35.614	90.0624	250.2726	817,936.255	9,901,986.160	2.403	58	DTL
	59		1600	25.284	25.284	90.1942	259.0104	817,940.002	9,901,975.543	2.325	59	DTL
	60		1600	27.187	27.187	89.5906	247.0307	817,934.627	9,901,977.688	2.477	60	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	61		1600	16.512	16.506	88.2618	257.2251	817,938.215	9,901,966.929	2.920	61	DTL
	62		1600	18.257	18.257	90.0424	241.0020	817,933.230	9,901,968.560	2.446	62	DTL
	63		1600	7.776	7.776	89.5327	249.0315	817,936.022	9,901,958.320	2.484	63	DTL
	64		1600	10.779	10.772	87.5944	225.1233	817,931.620	9,901,960.297	2.847	64	DTL
	65		1600	20.047	20.046	90.2841	195.4853	817,919.869	9,901,962.172	2.302	65	DTL
	66		1600	28.196	28.195	89.3503	190.5509	817,911.919	9,901,964.878	2.674	66	DTL
	67		1600	31.722	31.721	90.2944	204.4213	817,913.511	9,901,972.715	2.195	67	DTL
	68		1600	25.505	25.505	90.1623	213.5319	817,921.036	9,901,971.054	2.348	68	DTL
	69		1600	32.404	32.403	90.2106	225.4350	817,922.691	9,901,980.000	2.271	69	DTL
	70		1600	37.610	37.610	90.1721	216.3744	817,915.311	9,901,981.821	2.280	70	DTL
	71		1600	43.595	43.595	90.1348	224.3327	817,917.219	9,901,989.792	2.295	71	DTL
	72		1600	38.600	38.600	90.1102	233.1126	817,924.800	9,901,987.424	2.346	72	DTL
	73		1600	50.039	50.038	90.1646	230.5640	817,919.559	9,901,997.737	2.226	73	DTL
	74		1600	45.968	45.968	90.0511	238.5305	817,927.048	9,901,995.594	2.400	74	DTL
	75		1600	53.845	53.843	90.3140	243.0203	817,929.326	9,902,003.949	1.974	75	DTL
	76		1600	57.292	57.292	90.1420	235.4554	817,921.755	9,902,005.987	2.231	76	DTL
	77		1600	65.582	65.578	90.3601	238.5149	817,923.120	9,902,014.807	1.782	77	DTL
	78		1600	62.547	62.544	90.3603	245.4850	817,931.233	9,902,012.893	1.814	78	DTL
	79		1600	70.151	70.147	90.3605	247.1211	817,932.326	9,902,020.587	1.733	79	DTL
	80		1600	72.480	72.476	90.3750	240.5622	817,924.326	9,902,022.043	1.672	80	DTL
	81		1600	78.832	78.825	90.4646	249.0440	817,934.424	9,902,029.351	1.397	81	DTL
	82		1600	80.706	80.700	90.4011	243.0718	817,926.020	9,902,030.602	1.526	82	DTL
	83		1600	85.318	85.308	90.5304	250.4140	817,936.685	9,902,035.853	1.153	83	DTL
	84		1600	88.113	88.112	90.1445	244.3720	817,927.378	9,902,038.216	2.091	84	DTL
	85		1600	93.838	93.831	90.4138	251.5800	817,938.817	9,902,044.341	1.333	85	DTL
	86		1600	96.383	96.378	90.3419	246.3717	817,929.901	9,902,046.719	1.507	86	DTL
	87		1600	104.926	104.919	90.4014	252.5429	817,940.849	9,902,055.362	1.242	87	DTL
	88		1600	107.755	107.748	90.3758	247.4807	817,931.375	9,902,058.187	1.280	88	DTL
	89		1600	116.759	116.754	90.3035	249.1753	817,934.019	9,902,067.281	1.431	89	TBKJBT
	90		1600	115.595	115.590	90.3117	252.5045	817,941.196	9,902,066.029	1.418	90	TBKJBT
	91		1600	119.063	119.055	90.4020	244.5112	817,924.758	9,902,069.050	1.073	91	TBKJBT
	92		1600	122.084	122.077	90.3540	240.3525	817,915.467	9,902,070.850	1.203	92	DTL
	93		1600	105.808	105.804	90.3110	244.1423	817,924.904	9,902,055.745	1.510	93	DTL
	94		1600	112.629	112.625	90.2937	239.3048	817,914.989	9,902,061.156	1.499	94	DTL
	95		1600	93.054	93.053	90.1532	240.2803	817,920.200	9,902,042.214	2.049	95	DTL
	96		1600	95.987	95.983	90.3105	237.1557	817,914.441	9,902,044.031	1.602	96	DTL
	97		1600	85.031	85.030	90.1734	238.3244	817,918.778	9,902,033.773	2.035	97	DTL
	98		1600	88.145	88.141	90.3133	234.4209	817,912.399	9,902,035.414	1.661	98	DTL
	99		1600	77.950	77.949	90.1951	236.0503	817,916.967	9,902,026.085	2.019	99	DTL
	100		1600	81.778	81.775	90.3055	232.1751	817,910.834	9,902,028.287	1.734	100	DTL
	101		1600	70.789	70.788	90.2210	233.1646	817,915.398	9,902,018.209	2.013	101	DTL
	102		1600	73.834	73.831	90.3030	229.3525	817,910.008	9,902,019.576	1.814	102	DTL
	103		1600	63.914	63.913	90.2223	230.2042	817,914.316	9,902,010.596	2.053	103	DTL
	104		1600	67.449	67.448	90.1856	226.0647	817,908.492	9,902,012.040	2.098	104	DTL
	105		1600	55.675	55.674	90.1507	225.5231	817,913.118	9,902,001.211	2.225	105	DTL
	106		1600	60.673	60.673	90.1142	221.1203	817,906.630	9,902,003.526	2.263	106	DTL
	107		1600	49.516	49.515	90.1904	220.4256	817,911.702	9,901,993.577	2.195	107	DTL
	108		1600	54.826	54.825	90.1712	215.5222	817,905.150	9,901,995.732	2.195	108	DTL
	109		1600	43.931	43.930	90.1925	213.5840	817,910.136	9,901,985.910	2.221	109	DTL
	110		1600	49.330	49.330	90.1422	208.4656	817,903.457	9,901,987.443	2.263	110	DTL
	111		1600	39.179	39.179	90.1421	204.0932	817,907.918	9,901,977.659	2.306	111	DTL
	112		1600	45.082	45.082	90.0215	200.2545	817,901.696	9,901,979.561	2.440	112	DTL
	113		1600	36.138	36.138	90.1630	195.2236	817,906.601	9,901,971.278	2.296	113	DTL
	114		1600	42.392	42.383	88.5104	192.4855	817,900.433	9,901,973.286	3.320	114	DTL
	115		1600	35.029	35.028	89.3552	188.4316	817,905.374	9,901,967.181	2.715	115	DTL
	116		1600	41.400	41.400	90.0817	186.4224	817,899.098	9,901,968.914	2.370	116	DTL
	117		1600	52.505	52.505	90.1043	180.2829	817,886.895	9,901,968.596	2.306	117	DTL
	118		1600	60.955	60.954	90.1546	180.4550	817,879.067	9,901,971.789	2.190	118	DTL
	119		1600	61.482	61.480	89.2940	186.4313	817,881.109	9,901,977.836	3.012	119	DTL
	120		1600	54.040	54.039	89.4508	188.3652	817,888.595	9,901,976.121	2.703	120	DTL
	121		1600	65.249	65.249	90.0603	196.3850	817,883.600	9,901,989.155	2.355	121	DTL
	122		1600	58.145	58.145	90.0330	199.2003	817,890.991	9,901,987.111	2.410	122	DTL
	123		1600	68.938	68.938	90.1251	202.4024	817,885.215	9,901,996.947	2.212	123	DTL
	124		1600	62.158	62.158	90.1252	206.1953	817,892.993	9,901,995.231	2.237	124	DTL
	125		1600	73.005	73.005	90.0706	208.2336	817,887.374	9,902,004.821	2.319	125	DTL
	126		1600	66.035	66.034	90.1719	211.2738	817,894.726	9,902,001.931	2.137	126	DTL
	127		1600	77.174	77.174	89.5942	212.5900	817,889.342	9,902,011.867	2.476	127	DTL
	128		1600	71.455	71.455	90.0556	216.3511	817,896.468	9,902,009.937	2.346	128	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	129		1600	82.235	82.235	90.0746	218.0455	817,892.274	9,902,020.067	2.284	129	DTL
	130		1600	77.017	77.017	90.0900	222.2147	817,900.036	9,902,018.545	2.268	130	DTL
	131		1600	83.618	83.616	90.2505	226.0156	817,901.742	9,902,026.732	1.859	131	DTL
	132		1600	89.024	89.022	90.2220	221.3656	817,893.377	9,902,028.592	1.891	132	DTL
	133		1600	90.062	90.059	90.2747	228.4436	817,903.010	9,902,034.267	1.742	133	DTL
	134		1600	96.769	96.765	90.3257	225.3312	817,895.588	9,902,038.376	1.542	134	DTL
	135		1600	105.702	105.696	90.3547	227.3201	817,895.182	9,902,047.959	1.369	135	DTL
	136		1600	100.748	100.743	90.3258	231.1128	817,903.106	9,902,045.699	1.503	136	DTL
	137		1600	108.285	108.281	90.3000	233.4023	817,905.092	9,902,054.263	1.504	137	DTL
	138		1600	112.927	112.924	90.2605	229.3952	817,896.277	9,902,056.178	1.613	138	DTL
	139		1600	119.607	119.603	90.2754	231.2540	817,897.378	9,902,063.674	1.499	139	DTL
	140		1600	114.329	114.325	90.2755	235.4751	817,907.438	9,902,061.195	1.541	140	DTL
	141		1600	127.569	127.562	90.3636	233.3636	817,899.419	9,902,072.691	1.111	141	DTL
	142		1600	122.242	122.236	90.3502	237.3314	817,909.088	9,902,069.738	1.224	142	DTL
	143		1600	132.914	132.907	90.3529	230.1411	817,890.455	9,902,075.333	1.098	143	DTL
	144		1600	138.801	138.795	90.3132	227.0107	817,881.189	9,902,077.975	1.196	144	DTL
	145		1600	125.889	125.885	90.2825	228.2614	817,889.183	9,902,067.321	1.429	145	DTL
	146		1600	132.000	131.996	90.2542	225.3230	817,880.778	9,902,070.344	1.483	146	DTL
	147		1600	118.123	118.120	90.2407	225.5926	817,887.445	9,902,058.135	1.641	147	DTL
	148		1600	126.201	126.198	90.2215	222.4159	817,877.598	9,902,062.314	1.653	148	DTL
	149		1600	110.603	110.601	90.2031	222.4514	817,884.934	9,902,048.548	1.809	149	DTL
	150		1600	121.108	121.104	90.2917	221.0702	817,877.024	9,902,056.208	1.438	150	DTL
	151		1600	104.507	104.506	90.1702	219.5103	817,883.131	9,902,040.575	1.952	151	DTL
	152		1600	111.347	111.345	90.2008	217.2540	817,875.654	9,902,043.991	1.817	152	DTL
	153		1600	98.419	98.418	90.1711	216.0149	817,880.685	9,902,031.812	1.978	153	DTL
	154		1600	106.179	106.179	90.0147	213.3508	817,872.621	9,902,035.586	2.414	154	DTL
	155		1600	93.932	93.930	90.2043	212.3204	817,878.585	9,902,024.732	1.903	155	DTL
	156		1600	100.206	100.206	90.0316	209.4138	817,870.889	9,902,026.545	2.374	156	DTL
	157		1600	89.401	89.400	90.1241	209.3653	817,877.838	9,902,018.269	2.140	157	DTL
	158		1600	96.089	96.088	90.1409	206.1719	817,869.355	9,902,019.573	2.074	158	DTL
	159		1600	84.397	84.397	90.0726	205.4736	817,876.966	9,902,010.665	2.287	159	DTL
	160		1600	91.481	91.480	90.1141	202.5325	817,868.777	9,902,012.375	2.159	160	DTL
	161		1600	87.836	87.836	90.0920	198.3807	817,867.237	9,902,004.945	2.231	161	DTL
	162		1600	80.103	80.102	90.1631	201.0457	817,875.484	9,902,002.796	2.085	162	DTL
	163		1600	75.992	75.992	89.4937	196.4041	817,874.964	9,901,995.545	2.699	163	DTL
	164		1600	84.337	84.336	89.4633	193.4808	817,865.819	9,901,997.013	2.800	164	DTL
	165		1600	72.880	72.880	90.0740	191.5144	817,874.055	9,901,988.619	2.307	165	DTL
	166		1600	81.761	81.761	89.5750	189.2458	817,864.723	9,901,990.244	2.521	166	DTL
	167		1600	70.972	70.972	89.5356	184.2903	817,871.422	9,901,979.544	2.595	167	DTL
	168		1600	79.595	79.595	89.5201	183.1620	817,862.880	9,901,981.523	2.654	168	DTL
	169		1600	70.415	70.415	90.0800	180.3227	817,870.104	9,901,974.829	2.292	169	DTL
	170		1600	79.489	79.489	89.4931	180.0421	817,861.366	9,901,977.347	2.712	170	DTL
	BM03		1215	180.506	180.506	89.5716	0.0001	818,020.148	9,901,920.602	3.042	BM03	STN
M3D		1.505			180.505			817,849.959	9,901,980.751	2.546	M3D	
	172		1600	3.171	3.171	90.3214	268.1835	817,850.927	9,901,983.771	2.421	172	DTL
	173		1600	8.573	8.572	90.4044	202.1032	817,843.553	9,901,986.447	2.349	173	DTL
	174		1600	11.619	11.619	90.1831	268.1601	817,853.498	9,901,991.818	2.388	174	DTL
	175		1600	13.489	13.489	89.5949	234.2512	817,846.215	9,901,993.710	2.451	175	DTL
	176		1600	18.604	18.603	90.3305	268.2400	817,855.666	9,901,998.458	2.272	176	DTL
	177		1600	19.555	19.554	90.2727	244.3729	817,847.946	9,902,000.202	2.295	177	DTL
	178		1600	26.207	26.204	90.4743	268.0011	817,857.825	9,902,005.747	2.087	178	DTL
	179		1600	26.699	26.698	90.3550	249.0010	817,849.245	9,902,007.439	2.172	179	DTL
	180		1600	34.008	34.006	90.4057	263.5615	817,857.841	9,902,013.831	2.046	180	DTL
	181		1600	34.227	34.222	90.5753	252.2935	817,851.128	9,902,014.954	1.874	181	DTL
	182		1600	43.056	43.053	90.3739	264.2319	817,860.268	9,902,022.552	1.979	182	DTL
	183		1600	43.520	43.516	90.4531	255.5840	817,854.087	9,902,024.071	1.874	183	DTL
	184		1600	51.396	51.393	90.3731	264.5735	817,862.761	9,902,030.524	1.890	184	DTL
	185		1600	51.573	51.570	90.3730	257.5228	817,856.547	9,902,031.899	1.888	185	DTL
	186		1600	51.662	51.659	90.3730	256.1006	817,855.030	9,902,032.161	1.887	186	DTL
	187		1600	55.162	55.162	90.1253	265.5251	817,864.557	9,902,033.946	2.244	187	BGN
	188		1600	56.662	56.657	90.4643	256.3825	817,855.985	9,902,037.087	1.681	188	BGN
	189		1600	54.753	54.753	89.5637	273.2459	817,871.248	9,902,031.196	2.505	189	BGN
	190		1600	54.743	54.732	91.1010	251.5211	817,851.234	9,902,035.468	1.333	190	BGN
	191		1600	54.260	54.253	90.5600	242.3021	817,842.381	9,902,034.472	1.567	191	BGN
	192		1600	54.246	54.239	90.5559	242.3138	817,842.403	9,902,034.461	1.567	192	BGN
	193		1600	57.626	57.618	90.5559	235.2440	817,834.926	9,902,036.374	1.512	193	BGN
	194		1600	46.816	46.811	90.5148	238.2602	817,840.146	9,902,026.522	1.745	194	BGN

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	195		1600	50.705	50.695	91.0703	231.4111	817,833.581	9,902,028.728	1.462	195	BGN
	196		1600	39.411	39.407	90.4606	232.3800	817,837.853	9,902,018.253	1.922	196	BGN
	197		1600	43.233	43.232	90.1815	225.5139	817,831.911	9,902,020.036	2.221	197	BGN
	198		1600	32.503	32.502	90.1940	225.0006	817,835.949	9,902,010.079	2.265	198	BGN
	199		1600	37.031	37.031	89.5818	217.2803	817,829.754	9,902,011.784	2.469	199	BGN
	200		1600	26.543	26.542	89.2434	214.2949	817,834.344	9,902,002.213	2.724	200	BGN
	201		1600	31.786	31.786	90.0456	208.0835	817,828.529	9,902,004.227	2.405	201	BGN
	202		1600	28.031	28.031	89.4532	195.4157	817,827.044	9,901,996.895	2.569	202	BGN
	203		1600	22.577	22.577	89.4830	199.3518	817,832.427	9,901,994.976	2.526	203	BGN
	204		1600	18.832	18.831	89.3223	185.1210	817,832.846	9,901,988.611	2.602	204	JL
	205		1600	26.625	26.624	89.2743	185.2007	817,825.791	9,901,991.919	2.701	205	JL
	206		1600	19.254	19.253	89.2743	172.0020	817,831.091	9,901,984.580	2.631	206	JL
	207		1600	26.849	26.848	89.2742	175.2443	817,824.011	9,901,987.644	2.703	207	JL
	208		1600	35.926	35.925	89.3350	176.5344	817,815.489	9,901,990.870	2.724	208	JL
	209		1600	45.348	45.347	89.3943	178.3032	817,806.825	9,901,994.744	2.718	209	JL
	210		1600	35.617	35.616	89.3251	184.4232	817,817.467	9,901,995.336	2.732	210	JL
	211		1600	44.993	44.992	89.3747	183.4405	817,808.605	9,901,998.475	2.741	211	JL
	212		1600	45.389	45.388	89.4042	188.5720	817,810.041	9,902,002.353	2.706	212	DTL
	213		1600	35.947	35.947	89.4718	190.0141	817,818.671	9,901,998.448	2.583	213	DTL
	214		1600	46.867	46.865	89.2823	196.5813	817,812.255	9,902,008.585	2.882	214	DTL
	215		1600	38.309	38.309	89.5740	201.0922	817,820.881	9,902,005.692	2.477	215	DTL
	216		1600	43.450	43.450	89.4543	211.1524	817,822.452	9,902,014.385	2.631	216	DTL
	217		1600	50.411	50.408	89.2224	205.2453	817,814.241	9,902,016.320	3.002	217	DTL
	218		1600	54.045	54.044	90.1933	212.1015	817,816.416	9,902,023.126	2.143	218	DTL
	219		1600	48.099	48.099	90.0327	217.5056	817,823.984	9,902,021.233	2.402	219	DTL
	220		1600	59.274	59.269	90.4401	218.1257	817,818.272	9,902,030.838	1.692	220	DTL
	221		1600	53.133	53.125	91.0116	223.1854	817,825.659	9,902,027.993	1.504	221	DTL
	222		1600	62.215	62.207	90.5632	221.4306	817,819.975	9,902,035.254	1.428	222	DTL
	223		1600	70.171	70.166	90.3953	217.1638	817,811.479	9,902,039.425	1.637	223	DTL
	224		1600	74.953	74.953	89.5754	213.4057	817,805.005	9,902,040.727	2.496	224	DTL
	225		1600	78.706	78.703	90.3017	216.0215	817,805.384	9,902,045.614	1.757	225	DTL
	226		1600	72.170	72.158	91.0219	219.1543	817,812.500	9,902,042.425	1.143	226	DTL
	227		1600	67.639	67.639	89.5956	214.5117	817,810.508	9,902,035.693	2.452	227	DTL
	228		1600	67.636	67.636	89.5857	214.5140	817,810.516	9,902,035.695	2.471	228	DTL
	229		1600	74.409	74.409	89.5144	211.1143	817,802.790	9,902,038.299	2.630	229	DTL
	230		1600	71.381	71.380	89.3821	205.2503	817,799.383	9,902,031.120	2.900	230	DTL
	231		1600	63.315	63.315	90.0157	208.5334	817,807.888	9,902,028.067	2.415	231	DTL
	232		1600	67.328	67.326	89.3643	199.1148	817,797.387	9,902,022.811	2.907	232	DTL
	233		1600	59.014	59.012	89.3313	202.3957	817,806.195	9,902,020.338	2.910	233	DTL
	234		1600	55.479	55.478	89.3742	194.4122	817,804.050	9,902,011.898	2.811	234	DTL
	235		1600	63.892	63.887	89.1757	192.4434	817,795.903	9,902,014.802	3.232	235	DTL
	236		1600	53.942	53.941	89.4323	186.3323	817,801.486	9,902,004.415	2.711	236	DTL
	237		1600	62.733	62.732	89.3702	186.4157	817,793.655	9,902,008.412	2.870	237	DTL
	238		1600	62.465	62.464	89.3700	183.5826	817,792.650	9,902,005.597	2.869	238	JL
	239		1600	53.856	53.855	89.3700	183.5654	817,800.539	9,902,002.151	2.811	239	JL
	240		1600	62.622	62.621	89.4254	179.4814	817,790.846	9,902,001.416	2.762	240	JL
	241		1600	53.808	53.807	89.4009	179.1700	817,799.011	9,901,998.055	2.761	241	JL
	242		1600	6.343	6.343	89.1700	185.5521	817,844.229	9,901,983.471	2.530	242	JL
	243		1600	7.431	7.431	89.2543	154.5805	817,842.564	9,901,980.030	2.525	243	JL
	244		1600	3.849	3.849	90.1335	1.5451	817,853.544	9,901,979.348	2.435	244	JL
	245		1600	5.305	5.305	90.0306	48.2238	817,851.960	9,901,975.838	2.446	245	JL
	246		1600	11.195	11.195	89.3119	4.0822	817,860.217	9,901,976.269	2.544	246	JL
	247		1600	11.857	11.857	89.5708	22.2514	817,858.787	9,901,972.835	2.461	247	JL
	248		1600	20.397	20.397	90.1001	2.2842	817,868.879	9,901,973.129	2.391	248	JL
	249		1600	20.944	20.944	89.4150	13.1755	817,867.571	9,901,969.417	2.561	249	JL
	250		1600	25.742	25.738	89.0110	22.3110	817,869.091	9,901,963.534	2.891	250	BGN
	251		1600	35.601	35.598	89.1204	16.3158	817,878.759	9,901,959.829	2.947	251	BGN
	252		1600	30.508	30.505	89.1012	17.5812	817,874.182	9,901,962.209	2.893	252	BGN
	253		1600	24.278	24.278	90.2015	24.2258	817,867.468	9,901,963.933	2.308	253	DTL
	254		1600	24.281	24.281	90.2015	24.2259	817,867.470	9,901,963.931	2.308	254	DTL
	255		1600	29.248	29.248	89.4601	37.2712	817,865.924	9,901,956.245	2.570	255	DTL
	256		1600	34.671	34.671	90.1555	44.1337	817,865.326	9,901,949.672	2.290	256	BGN
	257		1600	42.353	42.353	89.4437	52.2920	817,863.080	9,901,940.482	2.640	257	BGN
	258		1600	49.948	49.948	90.0323	59.3907	817,859.390	9,901,931.702	2.402	258	DTL
	259		1600	58.066	58.066	90.0207	63.0541	817,857.479	9,901,923.174	2.415	259	DTL
	260		1600	65.084	65.083	90.1421	67.3054	817,853.389	9,901,915.758	2.179	260	DTL
	261		1600	69.872	69.872	90.0400	68.5000	817,852.035	9,901,910.910	2.369	261	DTL
	262		1600	67.658	67.658	90.0356	74.4908	817,844.906	9,901,913.282	2.373	262	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	263		1600	59.892	59.892	90.1131	73.0612	817,847.276	9,901,920.920	2.250	263	DTL
	264		1600	51.393	51.393	90.0833	71.0707	817,849.436	9,901,929.361	2.323	264	DTL
	265		1600	44.083	44.081	90.3135	68.5956	817,851.141	9,901,936.686	2.046	265	DTL
	266		1600	39.513	39.511	90.3828	67.2342	817,852.124	9,901,941.300	2.009	266	DTL
	267		1600	34.081	34.078	90.4812	63.2818	817,854.150	9,901,946.932	1.973	267	DTL
	268		1600	30.048	30.048	90.0940	59.2840	817,855.722	9,901,951.261	2.366	268	DTL
	269		1600	24.132	24.132	89.5340	51.4934	817,857.700	9,901,957.895	2.495	269	DTL
	270		1600	18.203	18.203	89.3609	37.1450	817,859.950	9,901,965.535	2.577	270	DTL
	271		1600	13.531	13.531	90.0937	65.0346	817,851.250	9,901,967.282	2.413	271	DTL
	272		1600	21.005	21.004	90.3039	73.3023	817,848.871	9,901,959.775	2.263	272	DTL
	273		1600	28.286	28.286	90.1922	77.4313	817,846.422	9,901,952.688	2.291	273	DTL
	274		1600	34.531	34.528	90.4200	79.5910	817,844.290	9,901,946.692	2.029	274	DTL
	275		1600	40.720	40.718	90.3445	80.3351	817,842.869	9,901,940.656	2.039	275	DTL
	276		1600	46.927	46.927	89.5947	82.2433	817,840.304	9,901,934.828	2.454	276	DTL
	277		1600	54.399	54.399	90.1431	83.5347	817,837.389	9,901,927.825	2.221	277	DTL
	278		1600	61.080	61.079	90.1959	85.0124	817,834.679	9,901,921.615	2.096	278	DTL
	279		1600	67.311	67.311	90.1010	85.4217	817,832.346	9,901,915.786	2.252	279	DTL
	280		1600	74.277	74.277	90.0431	86.0503	817,830.049	9,901,909.193	2.353	280	DTL
	281		1600	73.779	73.779	90.0144	88.0303	817,827.755	9,901,910.393	2.413	281	DTL
	282		1600	67.885	67.885	90.0927	87.4541	817,829.856	9,901,915.912	2.264	282	DTL
	283		1600	62.746	62.745	90.1647	88.0058	817,831.112	9,901,920.904	2.144	283	DTL
	284		1600	57.143	57.142	90.2012	88.0153	817,832.780	9,901,926.253	2.115	284	DTL
	285		1600	51.692	51.692	90.0923	88.0420	817,834.384	9,901,931.462	2.310	285	DTL
	286		1600	46.060	46.060	90.0605	87.5953	817,836.138	9,901,936.814	2.369	286	DTL
	287		1600	41.995	41.995	90.1231	88.0710	817,837.273	9,901,940.719	2.298	287	RMH
	288		1600	36.420	36.419	90.3018	88.2351	817,838.789	9,901,946.088	2.130	288	RMH
	289		1600	32.117	32.117	90.0406	88.5355	817,839.841	9,901,950.270	2.412	289	RMH
	290		1600	32.801	32.801	90.1011	101.3503	817,833.042	9,901,952.650	2.354	290	RMH
	291		1600	28.127	28.127	89.5013	103.5752	817,834.464	9,901,957.278	2.531	291	DTL
	292		1600	27.129	27.129	90.0756	89.3018	817,841.141	9,901,955.096	2.388	292	DTL
	293		1600	20.750	20.750	90.0027	89.2859	817,843.222	9,901,961.126	2.448	293	DTL
	294		1600	22.219	22.214	88.4538	108.1349	817,836.377	9,901,963.174	2.931	294	DTL
	295		1600	14.751	14.743	88.0741	120.0718	817,838.734	9,901,971.193	2.933	295	DTL
	296		1600	12.342	12.341	89.2225	90.5754	817,845.652	9,901,969.186	2.586	296	DTL
	297		1600	6.675	6.675	89.3348	88.0708	817,847.943	9,901,974.388	2.502	297	DTL
	298		1600	9.463	9.463	89.5959	135.4201	817,841.372	9,901,976.777	2.451	298	DTL
	299		1600	10.683	10.683	90.0516	148.4525	817,839.501	9,901,978.571	2.434	299	DTL
	300		1600	14.990	14.989	90.4557	121.2518	817,838.330	9,901,971.296	2.250	300	DTL
	301		1600	22.110	22.110	90.0538	108.5853	817,836.212	9,901,963.435	2.414	301	DTL
	302		1600	28.073	28.073	90.0756	104.3803	817,834.221	9,901,957.505	2.386	302	DTL
	303		1600	34.565	34.565	90.0940	102.1205	817,831.814	9,901,951.332	2.353	303	DTL
	304		1600	42.731	42.731	90.0807	102.4302	817,827.201	9,901,944.586	2.350	304	DTL
	305		1600	35.812	35.811	90.1909	105.5317	817,829.239	9,901,951.543	2.251	305	DTL
	306		1600	29.547	29.547	90.1912	110.5216	817,830.835	9,901,958.229	2.286	306	DTL
	307		1600	24.655	24.655	90.1558	117.2649	817,831.954	9,901,963.909	2.336	307	DTL
	308		1600	19.688	19.686	89.0957	128.0041	817,833.361	9,901,970.167	2.737	308	DTL
	309		1600	15.710	15.710	90.2448	144.3427	817,834.855	9,901,976.431	2.337	309	DTL
	310		1600	14.739	14.739	90.1520	160.1519	817,835.221	9,901,980.679	2.385	310	TL
	311		1600	15.702	15.701	89.3113	156.4641	817,834.292	9,901,979.722	2.582	311	DTL
	312		1600	24.410	24.410	90.0017	165.3529	817,825.644	9,901,982.903	2.449	312	DTL
	313		1600	19.797	19.797	89.4434	137.0601	817,831.796	9,901,972.878	2.540	313	DTL
	314		1600	27.772	27.772	89.5632	149.1121	817,822.730	9,901,975.288	2.479	314	DTL
	315		1600	31.579	31.579	89.4311	139.1907	817,820.521	9,901,969.323	2.605	315	DTL
	316		1600	24.319	24.317	89.2042	125.4019	817,830.007	9,901,966.851	2.729	316	DTL
	317		1600	34.838	34.831	88.5038	129.3517	817,820.087	9,901,962.840	3.154	317	DTL
	318		1600	30.249	30.239	88.3141	116.1036	817,828.339	9,901,959.610	3.228	318	DTL
	319		1600	40.090	40.090	89.4932	121.5740	817,818.617	9,901,955.754	2.573	319	DTL
	320		1600	36.644	36.644	89.4448	111.0407	817,826.145	9,901,952.901	2.613	320	DTL
	321		1600	46.249	46.249	89.4852	116.5936	817,816.435	9,901,948.891	2.600	321	DTL
	322		1600	43.792	43.792	89.5052	107.5131	817,823.408	9,901,945.927	2.567	322	DTL
	323		1600	51.158	51.158	89.5856	114.3617	817,814.378	9,901,943.994	2.467	323	DTL
	324		1600	48.737	48.737	89.5529	106.2917	817,821.345	9,901,941.299	2.515	324	DTL
	325		1600	54.159	54.156	90.3754	113.0728	817,813.310	9,901,940.880	1.854	325	DTL
	326		1600	55.450	55.449	90.1651	103.3348	817,819.737	9,901,934.262	2.179	326	DTL
	327		1600	57.175	57.174	90.2239	103.1708	817,819.030	9,901,932.666	2.074	327	DTL
	328		1600	56.354	56.351	90.3749	109.4559	817,814.321	9,901,937.102	1.831	328	DTL
	329		1600	54.371	54.370	90.2425	127.5357	817,804.174	9,901,951.430	2.065	329	DTL
	330		1600	70.210	70.208	90.2423	120.4033	817,796.066	9,901,935.754	1.953	330	RMH

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	331		1600	66.166	66.164	90.2423	116.1259	817,802.621	9,901,934.525	1.981	331	RMH
	332		1600	66.323	66.323	90.0929	111.2951	817,806.481	9,901,930.668	2.268	332	RMH
	333		1600	75.227	75.227	89.5835	109.2732	817,802.696	9,901,922.226	2.482	333	RMH
	334		1000	90.431	90.431	90.0606	105.0648	817,798.638	9,901,906.295	2.890	334	RMH
	335		1000	67.152	67.152	90.0838	101.4927	817,815.084	9,901,923.366	2.882	335	RMH
	336		1600	52.792	52.792	89.5041	128.3358	817,805.174	9,901,952.800	2.594	336	DTL
	337		1600	56.190	56.189	90.2503	132.3820	817,800.300	9,901,954.462	2.041	337	DTL
	338		1600	47.332	47.331	90.1648	134.1244	817,807.536	9,901,959.763	2.219	338	DTL
	339		1600	51.849	51.848	90.2202	136.5911	817,802.429	9,901,960.036	2.118	339	DTL
	340		1600	62.194	62.193	90.2203	136.4958	817,793.013	9,901,955.750	2.052	340	RMH
	341		1600	63.944	63.943	90.2204	135.2235	817,792.083	9,901,953.567	2.040	341	RMH
	342		1600	71.859	71.858	90.2204	134.4616	817,785.245	9,901,949.517	1.989	342	PGR
	343		1600	67.171	67.170	90.2204	129.1457	817,792.557	9,901,945.869	2.020	343	PGR
	344		1600	63.978	63.976	90.2707	123.4005	817,798.777	9,901,942.368	1.946	344	PGR
	345		1600	67.104	67.102	90.2708	121.5247	817,797.559	9,901,938.837	1.921	345	PGR
	346		1600	44.873	44.872	89.3951	137.5951	817,808.514	9,901,963.552	2.714	346	BGN
	347		1600	40.973	40.965	88.5338	145.3858	817,810.369	9,901,970.227	3.242	347	BGN
	348		1600	42.450	42.441	88.4929	142.2439	817,809.624	9,901,967.549	3.321	348	BGN
	349		1600	37.723	37.722	89.3239	148.1400	817,813.102	9,901,972.721	2.751	349	DTL
	350		1600	34.621	34.621	89.5230	159.0159	817,815.350	9,901,979.844	2.526	350	DTL
	351		1600	32.489	32.489	89.4117	172.1711	817,818.152	9,901,987.368	2.628	351	DTL
	352		1600	40.054	40.051	89.2135	174.0120	817,811.012	9,901,990.092	2.898	352	DTL
	353		1600	41.631	41.631	89.4758	163.1354	817,808.375	9,901,982.710	2.596	353	DTL
	354		1600	43.946	43.946	89.4640	154.3345	817,806.252	9,901,976.178	2.621	354	DTL
	355		1600	44.931	44.930	89.3922	151.5216	817,805.542	9,901,973.983	2.720	355	DTL
	356		1600	45.834	45.826	88.5516	149.1911	817,805.009	9,901,971.838	3.314	356	BGN
	357		1600	54.073	54.066	89.0620	153.4137	817,796.278	9,901,974.310	3.295	357	BGN
	358		1600	57.112	57.108	89.1857	154.5516	817,793.125	9,901,975.164	3.133	358	BGN
	359		1600	50.460	50.459	89.3816	156.4745	817,799.608	9,901,977.460	2.770	359	BGN
	360		1600	48.561	48.561	89.5008	164.3507	817,801.520	9,901,984.181	2.590	360	BGN
	361		1600	47.488	47.486	89.3209	173.3542	817,803.701	9,901,991.482	2.835	361	BGN
	362		1600	94.196	94.196	89.5740	155.4154	817,756.099	9,901,972.808	2.515	362	M3E
	M3D		1505	94.189	94.189	90.0057	359.5959	817,849.959	9,901,980.751	2.546	M3D	STN
M3E		1.5			94.196			817,756.099	9,901,972.808	2.515	M3E	
	363		0	7.677	7.548	100.3124	94.3004	817,756.143	9,901,965.261	2.613	363	PGR
	364		0	14.622	14.530	96.2651	60.1713	817,764.339	9,901,960.841	2.373	364	PGR
	365		0	20.887	20.830	94.1432	52.0427	817,770.242	9,901,957.516	2.470	365	PGR
	366		0	27.489	27.444	93.1659	47.2947	817,776.281	9,901,954.211	2.440	366	PGR
	367		0	12.056	11.988	96.0456	106.3124	817,753.671	9,901,961.069	2.737	367	PGR
	368		0	16.779	16.734	94.1306	111.5425	817,751.187	9,901,956.812	2.780	368	PGR
	369		0	21.201	21.160	93.3501	114.4438	817,748.894	9,901,952.913	2.689	369	PGR
	370		600	30.649	30.639	91.2921	117.5500	817,744.083	9,901,944.624	2.618	370	PGR
	371		1600	14.914	14.914	90.0009	54.0118	817,765.847	9,901,961.521	2.414	371	DTL
	372		1600	8.117	8.117	89.4731	77.3736	817,758.501	9,901,965.055	2.444	372	DTL
	373		1600	14.429	14.429	90.1014	20.4235	817,769.978	9,901,968.862	2.372	373	DTL
	374		1600	5.931	5.931	89.5605	17.2128	817,761.889	9,901,971.523	2.421	374	DTL
	375		1600	10.397	10.394	91.2311	339.5241	817,765.522	9,901,977.194	2.163	375	DTL
	376		1600	16.790	16.788	90.4958	351.3016	817,772.435	9,901,976.680	2.171	376	DTL
	377		1600	19.031	19.030	89.3000	326.0650	817,770.946	9,901,984.713	2.577	377	DTL
	378		1600	22.606	22.606	89.4131	339.5212	817,776.592	9,901,982.350	2.536	378	DTL
	379		1600	30.203	30.203	89.5016	330.0157	817,780.899	9,901,990.048	2.500	379	DTL
	380		1600	27.658	27.658	89.4400	319.0327	817,775.388	9,901,992.630	2.538	380	DTL
	381		1600	34.449	34.448	89.2811	317.3814	817,779.504	9,901,998.083	2.733	381	DTL
	382		1600	36.992	36.991	89.4012	325.3708	817,784.758	9,901,996.197	2.628	382	DTL
	383		1600	41.144	41.144	89.4329	335.2523	817,791.939	9,901,993.015	2.612	383	DTL
	384		1600	46.424	46.424	89.4700	342.1302	817,798.952	9,901,990.664	2.581	384	DTL
	385		1600	35.438	35.438	89.5233	342.4902	817,788.952	9,901,986.095	2.491	385	DTL
	386		1600	40.624	40.624	89.4934	350.1350	817,795.410	9,901,983.053	2.538	386	DTL
	387		1600	30.542	30.542	89.5938	354.3741	817,786.157	9,901,978.222	2.418	387	DTL
	388		1600	36.128	36.128	89.5941	357.5139	817,791.959	9,901,977.196	2.418	388	DTL
	389		1600	27.206	27.206	90.1917	6.3050	817,783.293	9,901,972.012	2.262	389	DTL
	390		1600	33.160	33.160	90.0534	8.3806	817,789.186	9,901,970.612	2.361	390	DTL
	391		0	28.459	28.409	93.2253	17.3334	817,783.811	9,901,966.552	2.336	391	DTL
	392		0	28.259	28.210	93.2257	24.4225	817,782.629	9,901,963.220	2.347	392	DTL
	393		0	33.393	33.356	92.4150	27.1212	817,786.945	9,901,960.115	2.443	393	DTL
	394		0	34.018	33.977	92.4912	35.3502	817,785.300	9,901,955.438	2.341	394	DTL
	395		0	32.533	32.489	92.5812	44.5537	817,780.954	9,901,951.886	2.329	395	DTL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	396		0	43.113	43.080	92.1516	40.3958	817,791.026	9,901,947.591	2.319	396	DTL
	397		0	40.640	40.612	92.0629	32.2932	817,792.072	9,901,953.958	2.520	397	DTL
	398		1600	37.590	37.590	89.4934	119.0037	817,740.706	9,901,938.515	2.529	398	PGR
	399		1600	38.577	38.577	89.5913	138.2102	817,729.538	9,901,944.832	2.423	399	PGR
	400		1600	38.472	38.471	89.3903	137.4234	817,729.924	9,901,944.614	2.649	400	A-SAL
	401		1600	37.445	37.445	89.5005	120.0359	817,740.138	9,901,938.936	2.523	401	A-SAL
	402		1600	38.552	38.548	90.4859	137.3259	817,729.951	9,901,944.485	1.865	402	B-SAL
	403		1600	37.431	37.430	90.2800	120.0806	817,740.104	9,901,938.968	2.110	403	B-SAL
	404		1600	37.423	37.422	90.2133	121.5554	817,739.054	9,901,939.493	2.180	404	B-SAL
	405		1600	38.257	38.253	90.4935	136.1249	817,730.813	9,901,944.104	1.863	405	B-SAL
	406		1600	37.401	37.401	89.4944	122.1452	817,738.881	9,901,939.607	2.526	406	A-SAL
	407		1600	37.393	37.393	89.4847	122.1320	817,738.899	9,901,939.606	2.537	407	A-SAL
	408		1600	38.161	38.160	89.4022	135.5527	817,731.020	9,901,944.047	2.633	408	A-SAL
	409		1600	37.730	37.729	89.3130	132.4646	817,732.901	9,901,943.055	2.727	409	TL
	410		1600	37.308	37.307	89.3450	125.0849	817,737.271	9,901,940.601	2.688	410	TL
	411		1600	29.888	29.886	89.2143	125.2652	817,740.881	9,901,947.087	2.747	411	TL
	412		1600	30.754	30.753	89.2953	134.2640	817,736.493	9,901,949.116	2.684	412	TL
	413		1600	31.090	31.089	89.2954	138.3853	817,734.577	9,901,950.374	2.687	413	A-SAL
	414		1600	29.965	29.964	89.3704	121.4040	817,742.570	9,901,946.072	2.615	414	A-SAL
	415		1600	30.113	30.111	90.3425	121.1922	817,742.670	9,901,945.857	2.113	415	B-SAL
	416		1600	32.656	32.653	90.4620	137.5840	817,733.771	9,901,948.982	1.975	416	B-SAL
	417		1600	30.340	30.337	90.4621	118.5519	817,743.718	9,901,945.112	2.006	417	B-SAL
	418		1600	32.862	32.859	90.4622	139.3932	817,732.936	9,901,949.502	1.971	418	B-SAL
	419		1600	32.925	32.924	89.3307	139.5007	817,732.819	9,901,949.527	2.672	419	A-SAL
	420		1600	26.950	26.949	89.3153	142.5557	817,736.042	9,901,954.809	2.635	420	A-SAL
	421		1600	24.642	24.642	89.3919	117.0503	817,746.769	9,901,950.001	2.563	421	A-SAL
	422		1600	24.534	24.522	91.4610	117.2107	817,746.709	9,901,950.155	1.657	422	B-SAL
	423		1600	27.050	27.046	90.5755	142.3606	817,736.074	9,901,954.629	1.959	423	B-SAL
	424		1600	24.516	24.508	91.2730	120.2350	817,745.525	9,901,950.699	1.791	424	B-SAL
	425		1600	26.900	26.895	91.0923	140.4343	817,736.788	9,901,954.089	1.872	425	B-SAL
	426		1600	26.648	26.647	89.3305	140.3823	817,736.994	9,901,954.232	2.623	426	A-SAL
	427		1600	24.367	24.366	89.2827	120.5615	817,745.379	9,901,950.927	2.638	427	A-SAL
	428		1600	23.753	23.751	89.1150	125.2642	817,744.006	9,901,952.367	2.747	428	JL
	429		1600	24.916	24.915	89.2528	137.1532	817,739.292	9,901,954.416	2.665	429	JL
	430		1600	15.493	15.491	89.0903	124.3754	817,748.401	9,901,959.365	2.644	430	JL
	431		1600	16.485	16.482	88.5507	141.1726	817,744.152	9,901,961.453	2.726	431	JL
	432		1600	15.333	15.332	89.2513	118.2432	817,749.968	9,901,958.756	2.570	432	JL
	433		1600	17.139	17.138	89.2136	149.0721	817,742.184	9,901,962.804	2.606	433	JL
	434		1600	15.283	15.267	92.3532	117.3935	817,750.177	9,901,958.736	1.723	434	B-SAL
	435		1600	17.233	17.224	91.4925	149.2507	817,742.062	9,901,962.826	1.866	435	B-SAL
	436		1600	15.621	15.608	92.2058	113.0159	817,751.225	9,901,957.981	1.774	436	B-SAL
	437		1600	17.682	17.672	91.5535	151.5725	817,741.258	9,901,963.215	1.820	437	B-SAL
	438		1600	17.681	17.671	91.5537	152.0000	817,741.251	9,901,963.226	1.820	438	B-SAL
	439		1600	17.775	17.774	89.3057	152.1948	817,741.109	9,901,963.256	2.565	439	A-SAL
	440		1600	15.533	15.532	89.1904	112.1033	817,751.470	9,901,957.982	2.600	440	A-SAL
	441		1600	9.049	9.046	88.3906	102.0003	817,754.971	9,901,963.833	2.628	441	A-SAL
	442		1600	12.528	12.528	89.3648	170.3118	817,743.960	9,901,969.711	2.499	442	A-SAL
	443		1600	11.789	11.782	91.5445	169.3538	817,744.731	9,901,969.711	2.021	443	B-SAL
	444		1600	8.839	8.808	94.4913	103.1256	817,754.815	9,901,964.095	1.672	444	B-SAL
	445		1600	8.309	8.274	95.1653	110.0152	817,753.930	9,901,964.824	1.650	445	B-SAL
	446		1600	11.033	11.024	92.1531	168.5927	817,745.493	9,901,969.798	1.980	446	B-SAL
	447		1600	8.163	8.163	89.3118	111.0838	817,753.807	9,901,964.974	2.483	447	A-SAL
	448		1600	10.149	10.148	89.1400	166.5124	817,746.446	9,901,969.676	2.550	448	A-SAL
	449		1600	7.717	7.715	88.3955	125.0355	817,752.215	9,901,966.143	2.594	449	JL
	450		1600	8.976	8.973	88.3227	156.5730	817,748.167	9,901,968.613	2.643	450	JL
	451		1600	1.455	1.452	86.0625	124.0905	817,755.388	9,901,971.543	2.513	451	JL
	452		1600	5.193	5.191	88.2804	194.2536	817,750.980	9,901,973.673	2.553	452	JL
	453		1600	7.064	7.064	89.3610	199.4941	817,749.275	9,901,974.636	2.464	453	A-SAL
	454		1600	2.413	2.413	91.0856	73.0604	817,756.992	9,901,970.567	2.366	454	A-SAL
	455		1600	2.846	2.726	106.4212	68.5839	817,757.288	9,901,970.355	1.597	455	B-SAL
	456		1600	7.268	7.238	95.1250	200.4523	817,749.139	9,901,974.794	1.754	456	B-SAL
	457		1600	7.280	7.250	95.1308	200.4828	817,749.129	9,901,974.803	1.752	457	B-SAL
	458		1600	3.853	3.784	100.5250	64.3926	817,758.001	9,901,969.538	1.687	458	B-SAL
	459		1600	8.095	8.067	94.4456	201.1056	817,748.358	9,901,975.079	1.744	459	B-SAL
	460		1600	8.179	8.179	89.4510	201.0518	817,748.247	9,901,975.097	2.450	460	A-SAL
	461		1600	4.082	4.082	90.4300	63.5110	817,758.200	9,901,969.309	2.364	461	A-SAL
	462		1600	4.098	4.098	90.4302	63.4430	817,758.215	9,901,969.300	2.363	462	A-SAL
	463		1600	7.164	7.164	89.2155	268.1650	817,755.281	9,901,979.925	2.494	463	A-SAL

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	464		1600	6.154	6.153	90.4817	340.0900	817,761.690	9,901,975.377	2.328	464	A-SAL
	465		1600	9.016	9.016	90.0246	256.2825	817,753.259	9,901,981.365	2.407	465	A-SAL
	466		1600	6.092	6.069	94.5905	338.5151	817,761.555	9,901,975.466	1.885	466	B-SAL
	467		1600	6.092	6.069	94.5934	338.5152	817,761.555	9,901,975.466	1.884	467	B-SAL
	468		1600	9.126	9.071	96.1637	254.4200	817,752.978	9,901,981.326	1.417	468	B-SAL
	469		1600	9.127	9.072	96.1638	254.4201	817,752.976	9,901,981.326	1.417	469	B-SAL
	470		1600	5.502	5.470	96.1343	328.5641	817,760.530	9,901,976.015	1.818	470	B-SAL
	471		1600	9.868	9.827	95.1405	252.3905	817,752.388	9,901,981.908	1.514	471	B-SAL
	472		1600	9.976	9.976	89.5957	252.1308	817,752.262	9,901,982.017	2.415	472	A-SAL
	473		1600	5.347	5.347	89.4145	327.5539	817,760.374	9,901,976.020	2.443	473	A-SAL
	474		1600	4.907	4.907	89.2633	309.0928	817,758.865	9,901,976.861	2.462	474	JL
	475		1600	13.063	13.063	89.4350	306.0802	817,762.885	9,901,983.970	2.476	475	JL
	476		1600	13.845	13.845	89.4750	285.3134	817,758.667	9,901,986.413	2.464	476	JL
	477		1600	13.070	13.070	89.3319	313.5455	817,764.338	9,901,982.954	2.516	477	A-SAL
	478		1600	14.714	14.714	90.0548	277.5943	817,756.910	9,901,987.500	2.390	478	A-SAL
	479		1600	14.836	14.810	93.2234	277.1708	817,756.732	9,901,987.605	1.541	479	B-SAL
	480		1600	13.206	13.189	92.5554	314.5358	817,764.587	9,901,982.902	1.739	480	B-SAL
	481		1600	13.439	13.422	92.5242	319.3811	817,765.556	9,901,982.332	1.740	481	B-SAL
	482		1600	13.495	13.495	90.1416	320.0233	817,765.675	9,901,982.316	2.359	482	A-SAL
	483		1600	24.095	24.095	89.3839	304.5645	817,768.186	9,901,993.652	2.564	483	A-SAL
	484		1600	23.285	23.285	89.4849	292.4650	817,763.273	9,901,994.961	2.490	484	A-SAL
	485		1600	24.364	24.364	90.0215	309.2517	817,769.928	9,901,992.867	2.399	485	A-SAL
	486		1600	23.689	23.689	90.1238	287.0325	817,761.113	9,901,995.961	2.328	486	A-SAL
	487		1600	23.717	23.692	92.3721	286.2906	817,760.882	9,901,996.013	1.329	487	B-SAL
	488		1600	24.633	24.627	91.1806	310.1224	817,770.354	9,901,992.890	1.855	488	B-SAL
	489		1600	24.821	24.811	91.3635	312.5455	817,771.401	9,901,992.339	1.717	489	B-SAL
	490		1600	23.877	23.851	92.4016	284.5840	817,760.298	9,901,996.287	1.302	490	B-SAL
	491		1600	24.840	24.840	90.0810	313.1436	817,771.530	9,901,992.274	2.356	491	A-SAL
	492		1600	24.071	24.071	90.1545	284.2345	817,760.096	9,901,996.545	2.304	492	A-SAL
	493		1600	30.554	30.554	89.5205	293.4425	817,765.998	9,902,001.714	2.485	493	JL
	494		1600	32.251	32.251	89.5810	311.2931	817,775.353	9,901,998.682	2.432	494	A-SAL
	495		1600	30.983	30.983	90.1004	289.0807	817,763.751	9,902,002.832	2.324	495	A-SAL
	496		1600	32.268	32.264	90.5653	311.0805	817,775.198	9,901,998.811	1.881	496	B-SAL
	497		1600	30.984	30.967	91.5435	288.5431	817,763.628	9,902,002.846	1.382	497	B-SAL
	498		1600	32.129	32.125	90.5724	309.0621	817,774.188	9,901,999.356	1.878	498	B-SAL
	499		1600	32.145	32.145	89.5837	308.4835	817,774.062	9,901,999.466	2.428	499	A-SAL
	500		1600	31.960	31.960	89.4506	304.5527	817,772.121	9,902,000.462	2.553	500	JL
	501		1600	31.290	31.273	91.5152	287.2024	817,762.869	9,902,003.340	1.397	501	B-SAL
	502		1600	31.303	31.303	90.1701	286.3906	817,762.508	9,902,003.448	2.260	502	B-SAL
	503		1600	31.905	31.905	90.1352	284.4724	817,761.613	9,902,004.233	2.286	503	TL
	504		1600	9.280	9.275	91.5054	194.4606	817,746.963	9,901,974.408	2.115	504	TL
	505		1600	7.545	7.531	93.2649	90.5038	817,756.623	9,901,965.295	1.961	505	TL
	506		3000	39.581	39.565	88.2126	138.0813	817,728.965	9,901,944.014	2.149	506	TL
	507		1600	8.691	8.685	92.0751	196.2738	817,747.592	9,901,974.558	2.091	507	PGR
	508		1600	11.562	11.554	92.0828	258.0300	817,752.764	9,901,983.871	1.983	508	PGR
	509		1600	17.440	17.437	91.0850	276.0644	817,756.487	9,901,990.241	2.065	509	PGR
	510		1600	27.765	27.763	90.3819	284.5416	817,760.952	9,902,000.144	2.105	510	PGR
	511		1600	36.027	36.027	89.5853	283.4232	817,761.655	9,902,008.404	2.426	511	TEL
	512		1600	14.770	14.769	90.3315	161.5219	817,742.500	9,901,967.046	2.272	512	TEL
	513		1600	35.754	35.753	90.2147	287.1005	817,763.734	9,902,007.737	2.188	513	A-SAL
	514		1600	35.599	35.594	90.5636	286.4432	817,763.442	9,902,007.637	1.829	514	B-SAL
	515		1600	35.535	35.529	91.0038	285.5830	817,762.962	9,902,007.669	1.788	515	B-SAL
	516		1600	35.907	35.906	89.3831	291.2121	817,766.308	9,902,007.233	2.639	516	JL
	517		1600	37.783	37.782	89.3407	308.1115	817,776.870	9,902,004.368	2.699	517	JL
	518		1600	36.585	36.585	89.5624	310.2513	817,777.387	9,902,002.562	2.453	518	A-SAL
	519		1600	36.540	36.537	90.4726	310.4354	817,777.520	9,902,002.406	1.910	519	B-SAL
	520		1600	36.393	36.390	90.4203	312.2533	817,778.297	9,902,001.644	1.969	520	B-SAL
	521		1600	35.487	35.487	90.0127	312.1457	817,777.659	9,902,000.995	2.400	521	A-SAL
	522		1700	14.445	14.445	89.3810	200.0906	817,742.167	9,901,976.624	2.406	522	PGR
	523		1700	18.187	18.187	89.5029	200.3629	817,738.597	9,901,977.752	2.365	523	PGR
	524		1700	21.888	21.888	89.5030	200.4735	817,735.054	9,901,978.825	2.375	524	PGR
	525		1700	25.747	25.747	89.5030	201.2834	817,731.430	9,901,980.181	2.386	525	PGR
	526		1700	27.774	27.774	89.4906	201.4512	817,729.527	9,901,980.890	2.403	526	PGR
	527		1700	33.186	33.186	89.4910	202.0631	817,724.410	9,901,982.661	2.419	527	PGR
	528		1700	35.234	35.234	89.4920	202.1711	817,722.486	9,901,983.374	2.424	528	PGR
	529		1700	35.544	35.544	89.4920	208.5127	817,723.633	9,901,987.277	2.425	529	RMH
	530		1700	43.657	43.657	89.5209	207.0927	817,715.713	9,901,989.389	2.414	530	RMH
	531		1700	35.924	35.924	89.5212	213.3503	817,724.603	9,901,990.086	2.396	531	RMH

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	532		1600	16.686	16.686	89.3414	224.4916	817,743.314	9,901,983.530	2.540	532	RMH
	533		1600	30.612	30.611	89.3645	214.2017	817,729.456	9,901,987.883	2.622	533	RMH
	534		1600	21.115	21.115	89.3645	245.3432	817,745.778	9,901,991.229	2.557	534	RMH
	535		1600	24.691	24.690	89.3711	252.2029	817,746.652	9,901,995.620	2.578	535	RMH
	536		1600	25.558	25.557	89.3710	256.2954	817,748.058	9,901,997.068	2.584	536	RMH
	537		1600	33.490	33.488	90.3200	265.1240	817,750.499	9,902,005.825	2.096	537	RMH
	538		200	57.151	57.141	91.0358	190.2819	817,699.234	9,901,978.419	2.751	538	RMH
	539		1000	59.723	59.716	90.5119	183.0337	817,696.411	9,901,970.957	2.123	539	RMH
	540		300	61.576	61.570	90.4700	191.3631	817,694.958	9,901,980.068	2.861	540	RMH
	541		300	33.946	33.929	91.4755	174.3432	817,722.712	9,901,966.764	2.649	541	RMH
	542		300	37.323	37.306	91.4327	168.1959	817,720.330	9,901,962.211	2.592	542	RMH
	543		500	42.807	42.790	91.3741	184.2130	817,713.311	9,901,972.451	2.298	543	RMH
	544		1000	47.379	47.376	90.3802	180.0702	817,708.883	9,901,968.910	2.490	544	PGR
	545		1000	42.122	42.119	90.3845	174.4505	817,714.630	9,901,965.433	2.540	545	PGR
	546		1000	37.469	37.467	90.3845	168.2225	817,720.168	9,901,962.190	2.592	546	PGR
	547		1000	32.859	32.855	90.5456	159.2054	817,726.442	9,901,958.670	2.490	547	PGR
	548		1000	29.889	29.885	90.5425	148.4746	817,731.934	9,901,955.225	2.542	548	PGR
	549		1000	28.914	28.910	90.5502	144.1420	817,734.147	9,901,953.995	2.552	549	PGR
	550		500	24.583	24.542	93.1756	160.1638	817,733.777	9,901,962.608	2.100	550	DTL
	551		200	18.852	18.797	94.2150	177.4130	817,737.448	9,901,970.470	2.380	551	DTL
	552		200	29.084	29.051	92.4340	186.4458	817,727.064	9,901,973.778	2.430	552	DTL
	553		200	28.416	28.376	93.0139	168.2706	817,728.875	9,901,964.804	2.314	553	DTL
	554		0	13.442	13.383	95.2108	215.5130	817,744.630	9,901,979.706	2.761	554	DTL
	555		0	26.882	26.847	92.5536	210.5645	817,731.991	9,901,984.623	2.642	555	DTL
	556		0	6.400	6.246	102.3507	198.3632	817,750.032	9,901,974.295	2.620	556	PHN
	557		200	9.156	9.063	98.0909	261.5557	817,754.075	9,901,981.643	2.516	557	PHN
	558		200	15.731	15.680	94.3701	282.1128	817,758.106	9,901,988.359	2.548	558	PHN
	559		0	26.423	26.383	93.0948	298.5122	817,766.838	9,901,996.907	2.557	559	AS-JL
	560		0	16.864	16.800	94.5930	297.3859	817,762.613	9,901,988.294	2.547	560	AS-JL
	561		0	5.146	4.934	106.3041	283.5401	817,756.876	9,901,977.681	2.552	561	AS-JL
	562		0	3.864	3.601	111.1638	158.5957	817,752.858	9,901,971.239	2.612	562	AS-JL
	563		0	9.696	9.608	97.4409	136.5153	817,749.667	9,901,965.672	2.709	563	AS-JL
	564		0	14.985	14.930	94.5522	132.2307	817,747.000	9,901,960.972	2.729	564	AS-JL
	565		0	20.562	20.523	93.3107	130.5610	817,744.007	9,901,956.226	2.753	565	AS-JL
	566		0	29.540	29.512	92.2927	129.0235	817,739.508	9,901,948.401	2.731	566	AS-JL
	567		0	42.233	42.214	91.4238	127.4620	817,733.147	9,901,937.379	2.754	567	AS-JL
Survey Date : April, 03 2019												
	BM03		0	115.582	115.562	91.0431	0.0000	818,020.148	9,901,920.602	3.042	BM03	BS
CP03		1.205			115.549			818,074.447	9,902,022.598	3.993	CP03	
	1		1600	118.196	118.186	90.4409	48.1760	817,959.609	9,901,994.666	2.080	1	GA07
	2		1600	23.287	23.185	95.2123	277.4550	818,093.253	9,902,009.038	1.424	2	SNG
	3		1600	28.315	28.233	94.2118	286.5410	818,094.435	9,902,002.658	1.448	3	SNG
	4		1600	41.104	40.969	94.3904	281.1630	818,106.148	9,901,996.647	0.265	4	SNG
	5		1600	37.215	37.062	95.1219	277.5320	818,104.462	9,902,000.857	0.222	5	SNG
	6		1600	61.237	61.169	92.4128	263.0520	818,131.508	9,902,000.559	0.723	6	SNG
	7		1600	58.228	58.154	92.5335	257.0210	818,130.602	9,902,007.483	0.659	7	SNG
	8		1600	67.837	67.789	92.0921	254.4750	818,140.544	9,902,007.549	1.046	8	SNG
	9		1600	68.865	68.817	92.0802	259.4550	818,139.972	9,902,001.569	1.034	9	SNG
	10		1600	79.451	79.410	91.5018	257.1050	818,151.076	9,902,001.764	1.049	10	SNG
	11		1600	76.520	76.475	91.5722	252.1950	818,149.676	9,902,008.846	0.986	11	SNG
	12		1600	86.057	86.006	91.5818	251.3840	818,159.230	9,902,008.146	0.637	12	SNG
	13		1600	88.373	88.326	91.5147	256.3040	818,159.944	9,902,000.423	0.725	13	SNG
	14		1600	92.550	92.495	91.5804	251.4930	818,165.578	9,902,006.768	0.420	14	SNG
	15		1600	93.454	93.403	91.5305	255.4760	818,165.143	9,902,000.272	0.524	15	SNG
	16		1600	125.493	125.455	91.2501	254.5250	818,196.731	9,901,994.569	0.495	16	SNG
	17		1600	124.076	124.043	91.1938	257.3350	818,193.924	9,901,989.255	0.724	17	SNG
	18		1600	128.607	128.575	91.1627	253.3710	818,200.374	9,901,996.637	0.738	18	SNG
	19		1600	128.433	128.427	90.3257	251.1860	818,201.169	9,902,001.742	2.367	19	SNG
	20		1600	130.137	130.134	90.2100	249.5300	818,203.342	9,902,004.683	2.778	20	SNG
	21		1600	120.166	120.134	91.1947	250.4910	818,193.151	9,902,004.118	0.809	21	SNG
	22		1600	112.674	112.639	91.2521	247.1720	818,186.601	9,902,012.158	0.801	22	SNG
	23		1600	126.767	126.767	90.0123	247.0510	818,200.709	9,902,011.295	3.547	23	SNG
	24		1600	120.783	120.777	90.3325	247.0460	818,194.744	9,902,011.835	2.424	24	SNG
	25		1600	118.490	118.486	90.2823	243.1540	818,192.903	9,902,019.930	2.620	25	SNG
	26		1600	110.171	110.136	91.2646	243.2940	818,184.544	9,902,019.669	0.818	26	SNG
	27		1600	110.004	109.968	91.2740	239.0700	818,184.280	9,902,028.052	0.793	27	SNG

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	28		1600	118.166	118.154	90.4947	239.4730	818,192.515	9,902,027.091	1.887	28	SNG
	29		1600	111.743	111.705	91.2910	234.4140	818,185.253	9,902,036.746	0.700	29	SNG
	30		1600	118.970	118.950	91.0345	236.0010	818,192.752	9,902,034.966	1.392	30	SNG
	31		1600	112.604	112.566	91.2950	230.4950	818,184.892	9,902,044.347	0.656	31	SNG
	32		1600	120.629	120.606	91.0624	231.1230	818,192.932	9,902,045.120	1.268	32	SNG
	33		1600	122.415	122.394	91.0416	227.4340	818,193.078	9,902,052.711	1.310	33	SNG
	34		1600	115.922	115.883	91.2928	227.2530	818,186.615	9,902,051.702	0.581	34	SNG
	35		1600	119.234	119.192	91.3104	223.2910	818,187.490	9,902,060.388	0.440	35	SNG
	36		1600	124.748	124.722	91.0951	224.1540	818,193.259	9,902,060.538	1.063	36	SNG
	37		1600	127.893	127.867	91.0950	221.2300	818,194.156	9,902,067.537	1.000	37	SNG
	38		1600	123.271	123.234	91.2349	219.5520	818,188.669	9,902,068.859	0.593	38	SNG
	39		1600	135.000	134.974	91.0752	222.0010	818,201.307	9,902,068.691	0.933	39	SNG
	40		1600	142.126	142.101	91.0455	222.5650	818,208.787	9,902,068.917	0.914	40	SNG
	41		1600	133.233	133.208	91.0648	225.0330	818,201.894	9,902,061.349	1.009	41	SNG
	42		1600	138.981	138.956	91.0526	226.2750	818,208.345	9,902,059.748	0.953	42	SNG
	43		1600	130.838	130.820	90.5734	228.1150	818,201.505	9,902,053.744	1.407	43	SNG
	44		1600	136.384	136.364	90.5855	230.2120	818,208.018	9,902,050.053	1.261	44	SNG
	45		1600	129.173	129.153	91.0000	231.3920	818,201.513	9,902,045.725	1.344	45	SNG
	46		1600	135.601	135.582	90.5703	231.5630	818,207.958	9,902,046.209	1.348	46	SNG
	47		1600	127.699	127.682	90.5614	235.0600	818,201.212	9,902,037.873	1.509	47	SNG
	48		1600	133.829	133.813	90.5350	235.2310	818,207.377	9,902,037.942	1.502	48	SNG
	49		1600	126.933	126.926	90.3654	238.3830	818,201.158	9,902,029.969	2.236	49	SNG
	50		1600	133.043	133.036	90.3421	238.4630	818,207.276	9,902,030.014	2.269	50	SNG
	51		1600	126.624	126.623	90.1338	241.3200	818,201.066	9,902,023.540	3.096	51	SNG
	52		1600	132.691	132.691	89.5631	241.1150	818,207.126	9,902,024.389	3.732	52	SNG
	53		1600	127.975	127.975	90.0401	244.1040	818,202.327	9,902,017.670	3.448	53	SNG
	54		1600	133.080	133.080	90.0845	243.5510	818,207.450	9,902,018.073	3.259	54	SNG
	55		1600	130.362	130.362	90.0618	247.1140	818,204.267	9,902,010.729	3.359	55	SNG
	56		1600	135.171	135.171	90.0440	246.4510	818,209.147	9,902,011.329	3.415	56	SNG
	57		1600	132.300	132.299	90.1006	249.5930	818,205.452	9,902,004.138	3.209	57	SNG
	58		1600	139.176	139.176	90.0843	249.4230	818,212.355	9,902,003.860	3.245	58	SNG
	59		1000	158.186	158.144	91.1853	266.1520	818,218.598	9,901,957.558	0.569	59	SNG
	60		1000	161.296	161.254	91.1839	268.3550	818,218.599	9,901,950.329	0.508	60	SNG
	61		1000	154.636	154.592	91.2137	268.1860	818,212.982	9,901,953.992	0.527	61	SNG
	62		1600	156.789	156.759	91.0720	270.1430	818,212.507	9,901,948.351	0.527	62	SNG
	63		1600	150.847	150.821	91.0410	272.4200	818,204.091	9,901,945.531	0.783	63	SNG
	64		1400	143.982	143.951	91.1104	268.5530	818,202.761	9,901,957.348	0.822	64	SNG
	65		1600	137.566	137.534	91.1345	270.1430	818,195.576	9,901,957.456	0.647	65	SNG
	66		1600	143.130	143.095	91.1536	274.3440	818,194.989	9,901,945.488	0.451	66	SNG
	67		1600	131.764	131.729	91.1923	271.4320	818,188.812	9,901,957.229	0.556	67	SNG
	68		1600	137.198	137.163	91.1806	274.0850	818,190.543	9,901,949.555	0.481	68	SNG
	69		1600	127.857	127.815	91.2809	273.0310	818,183.911	9,901,956.612	0.320	69	SNG
	70		1600	132.154	132.114	91.2428	275.3930	818,184.376	9,901,949.319	0.351	70	SNG
	71		1600	127.410	127.373	91.2200	277.2550	818,178.195	9,901,948.705	0.534	71	SNG
	72		1600	123.084	123.047	91.2417	274.3920	818,178.010	9,901,956.151	0.581	72	SNG
	73		1600	116.721	116.693	91.1549	276.2740	818,170.628	9,901,956.519	1.024	73	SNG
	74		1600	121.107	121.079	91.1324	278.2710	818,171.800	9,901,950.608	1.012	74	SNG
	75		1600	109.482	109.452	91.2051	278.3420	818,162.315	9,901,957.338	1.023	75	SNG
	76		1600	114.434	114.405	91.1747	280.4450	818,163.636	9,901,950.948	1.009	76	SNG
	77		1600	102.327	102.298	91.2146	281.0210	818,153.874	9,901,958.129	1.164	77	SNG
	78		1600	106.867	106.840	91.1648	283.0310	818,154.980	9,901,952.389	1.211	78	SNG
	79		1600	94.723	94.693	91.2647	283.4640	818,145.031	9,901,959.474	1.207	79	SNG
	80		1600	98.810	98.780	91.2447	285.5560	818,145.548	9,901,954.026	1.161	80	SNG
	81		1600	88.762	88.713	91.5403	286.3940	818,137.515	9,901,960.208	0.654	81	SNG
	82		1600	93.940	93.894	91.4742	288.4130	818,138.816	9,901,954.241	0.655	82	SNG
	83		1600	90.811	90.747	92.0908	291.3840	818,133.173	9,901,953.415	0.188	83	SNG
	84		1600	85.395	85.333	92.1131	289.2620	818,132.132	9,901,959.716	0.332	84	SNG
	85		0	21.233	20.883	100.2503	267.3350	818,093.281	9,902,013.577	1.359	85	SNG
	86		1800	30.645	30.377	97.3443	259.2920	818,103.415	9,902,013.454	(0.644)	86	SNG
	87		1300	28.537	28.249	98.0906	269.0350	818,099.596	9,902,009.732	(0.148)	87	SNG
	88		0	25.720	25.381	99.1835	192.5110	818,091.059	9,902,041.788	1.037	88	SNG
	89		0	25.680	25.342	99.1835	179.3940	818,086.223	9,902,045.037	1.044	89	SNG
	90		0	23.355	22.999	100.0109	207.0520	818,093.314	9,902,035.751	1.135	90	SNG
	91		0	21.060	20.681	100.5256	220.1650	818,093.664	9,902,030.242	1.222	91	SNG
	92		0	20.097	19.691	101.3206	230.5030	818,093.768	9,902,026.399	1.179	92	SNG
	93		0	19.840	19.439	101.3207	241.0640	818,093.884	9,902,022.890	1.231	93	SNG
	94		0	20.481	20.081	101.2050	252.2900	818,094.190	9,902,018.930	1.168	94	SNG
	95		0	20.325	19.950	101.0116	261.0560	818,093.296	9,902,016.060	1.312	95	SNG

PT. Geomarindex

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Kardi
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	96		0	20.592	20.218	100.5631	262.5420	818,093.330	9,902,015.374	1.289	96	SNG
	97		1600	68.809	68.745	92.2842	296.4330	818,114.118	9,901,966.455	0.623	97	SNG
	98		1600	75.608	75.552	92.1252	298.0110	818,116.642	9,901,959.927	0.677	98	SNG
	99		1600	67.080	67.036	92.0352	300.2500	818,109.527	9,901,965.473	1.182	99	SNG
	100		1600	74.879	74.839	91.5217	301.1500	818,112.666	9,901,958.254	1.153	100	SNG
	101		1000	33.309	33.058	97.0212	243.1840	818,107.496	9,902,021.825	0.117	101	SNG
	102		1300	58.502	58.363	93.5718	243.1530	818,132.795	9,902,021.287	(0.137)	102	SNG
	103		0	49.942	49.780	94.3709	293.2540	818,105.465	9,901,983.663	1.176	103	SNG
	104		600	26.076	25.760	98.5500	269.0630	818,097.371	9,902,010.848	0.551	104	SNG
	105		400	66.452	66.329	93.2858	250.5410	818,139.972	9,902,012.300	0.761	105	SNG
	106		0	72.474	72.362	93.1107	253.3150	818,145.341	9,902,008.097	1.171	106	SNG
	107		0	76.377	76.272	93.0018	256.4830	818,148.176	9,902,003.066	1.194	107	SNG
	108		0	79.610	79.509	92.5324	259.3560	818,150.222	9,901,998.518	1.184	108	SNG
	109		0	68.722	68.604	93.2108	266.1860	818,136.951	9,901,994.316	1.180	109	SNG
	110		0	66.298	66.176	93.2852	261.4000	818,136.747	9,902,000.283	1.172	110	SNG
	111		0	65.284	65.159	93.3242	257.5330	818,137.107	9,902,004.724	1.161	111	SNG
	112		0	65.794	65.669	93.3157	254.1100	818,138.630	9,902,008.706	1.144	112	SNG
	113		1600	45.393	45.223	94.5757	271.5137	818,113.654	9,902,000.062	(0.331)	113	SNG
	114		1600	52.248	52.114	94.0557	267.5742	818,121.291	9,901,999.760	(0.137)	114	SNG
	115		1600	58.538	58.447	93.1157	265.5413	818,127.869	9,901,998.888	0.331	115	SNG
	116		1600	65.581	65.530	92.1557	263.1833	818,135.485	9,901,998.753	1.005	116	SNG
	117		1600	74.164	74.125	91.5157	260.5722	818,144.539	9,901,998.483	1.183	117	SNG
	118		1600	85.831	85.793	91.4157	258.5003	818,156.551	9,901,997.710	1.053	118	SNG
	119		1600	94.728	94.678	91.5157	258.0848	818,165.377	9,901,996.222	0.514	119	SNG
	120		1600	101.283	101.225	91.5557	257.0940	818,172.136	9,901,996.074	0.183	120	SNG
	121		1600	109.839	109.779	91.5326	256.0427	818,180.917	9,901,995.848	(0.025)	121	SNG
	122		1600	118.664	118.613	91.4026	255.0242	818,189.986	9,901,995.766	0.132	122	SNG

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
Survey Date : March, 26 2019												
	CP1A		1105	71.796	71.796	89.5359	0.0000	818,329.844	9,901,990.340	3.524	CP1A	
CP01		1.122			71.816			818,345.258	9,901,920.198	3.432	CP01	
	1		2500	27.094	27.073	87.4500	283.2507	818,318.189	9,901,920.682	3.118	1	DTL
	2		2500	27.117	27.102	88.0446	273.5112	818,318.457	9,901,916.173	2.963	2	DTL
	3		2500	22.960	22.911	86.1618	272.0048	818,322.722	9,901,916.070	3.547	3	DTL
	4		2500	22.163	22.098	85.3606	283.4240	818,323.166	9,901,920.706	3.754	4	DTL
	5		2500	20.548	20.541	88.2910	270.3722	818,325.149	9,901,916.008	2.597	5	BNGN
	6		2500	17.289	17.263	86.4950	282.4757	818,327.996	9,901,920.320	3.010	6	PHN
	7		2500	11.203	11.153	84.3506	284.4413	818,334.114	9,901,920.654	3.111	7	PHN
	8		2500	11.207	11.172	85.2739	263.0755	818,334.712	9,901,916.513	2.941	8	PHN
	9		1600	5.933	5.932	91.0305	231.2116	818,341.528	9,901,915.585	2.845	9	BG
	10		1600	4.556	4.556	89.2309	290.5251	818,340.752	9,901,920.870	3.003	10	DTL
	11		1600	3.828	3.827	91.0512	183.1116	818,345.870	9,901,916.420	2.881	11	DTL
	12		1600	5.515	5.514	88.5835	4.0608	818,344.463	9,901,925.654	3.053	12	DTL
	13		1600	11.545	11.545	89.5737	5.2745	818,343.865	9,901,931.659	2.962	13	DTL
	14		1600	13.559	13.558	89.2638	342.2307	818,338.477	9,901,931.939	3.086	14	DTL
	15		1600	8.174	8.173	89.1059	324.3739	818,339.206	9,901,925.692	3.071	15	DTL
	16		1600	12.664	12.662	88.5952	309.2153	818,333.973	9,901,925.941	3.176	16	DTL
	17		1600	17.179	17.178	89.2659	326.5113	818,332.997	9,901,932.230	3.119	17	DTL
	18		1600	18.493	18.488	88.4150	300.1506	818,327.661	9,901,925.867	3.374	18	DTL
	19		1600	21.911	21.903	88.2645	317.1442	818,327.284	9,901,932.714	3.548	19	DTL
	20		1600	17.915	17.914	89.1908	291.5822	818,327.594	9,901,923.179	3.167	20	TMN
	21		1600	30.627	30.627	89.4052	343.1045	818,330.310	9,901,946.929	3.124	21	TMN
	22		1600	17.940	17.932	88.1955	292.0747	818,327.584	9,901,923.230	3.476	22	TMN
	23		1600	33.979	33.978	89.3113	344.5226	818,329.558	9,901,950.331	3.238	23	TMN
	24		1600	19.016	18.987	86.5120	291.1511	818,326.497	9,901,923.122	3.997	24	TMN
	25		1600	34.103	34.094	88.4029	344.2650	818,329.280	9,901,950.316	3.743	25	TMN
	26		1900	23.249	23.209	86.3918	289.4540	818,322.240	9,901,923.174	4.011	26	TMN
	27		1600	38.317	38.314	89.1638	334.4709	818,321.877	9,901,950.550	3.437	27	TMN
	28		1600	40.347	40.343	89.1326	332.5626	818,319.622	9,901,951.349	3.501	28	DTL
	29		1600	33.374	33.367	88.4938	333.0334	818,324.108	9,901,946.006	3.637	29	DTL
	30		1600	37.012	37.010	89.2314	325.5903	818,318.452	9,901,945.716	3.350	30	DTL
	31		1600	30.173	30.163	88.3123	325.2542	818,323.211	9,901,940.782	3.732	31	DTL
	32		1600	35.432	35.429	89.1521	322.4915	818,318.288	9,901,943.173	3.414	32	DTL
	33		1600	39.139	39.135	89.0926	339.1749	818,323.888	9,901,952.983	3.530	33	DTL
	34		1600	43.531	43.529	89.2849	336.0113	818,319.443	9,901,955.246	3.349	34	DTL
	35		1600	44.353	44.351	89.2430	345.2842	818,325.181	9,901,959.744	3.412	35	DTL
	36		1600	47.805	47.804	89.4132	339.1144	818,319.083	9,901,960.200	3.211	36	DTL
	37		1600	49.788	49.786	89.2549	349.0621	818,325.575	9,901,965.927	3.449	37	DTL
	38		1600	54.979	54.979	89.4640	343.0807	818,318.387	9,901,968.163	3.167	38	DTL
	39		1600	60.619	60.617	89.2847	345.1950	818,317.679	9,901,974.177	3.504	39	DTL
	40		1600	56.983	56.981	89.2847	350.5909	818,324.460	9,901,973.247	3.471	40	DTL
	41		1600	66.571	66.569	89.3448	346.2554	818,316.115	9,901,980.049	3.442	41	DTL
	42		1600	37.043	37.043	89.5159	351.1759	818,331.926	9,901,954.759	3.040	42	TMN
	43		1600	43.904	43.904	89.4944	353.3744	818,331.135	9,901,961.768	3.085	43	TMN
	44		1600	37.036	37.034	89.2117	351.1958	818,331.949	9,901,954.758	3.371	44	TMN
	45		1600	43.936	43.934	89.2522	353.3243	818,331.064	9,901,961.776	3.397	45	TMN
	46		1600	35.124	35.115	88.4315	344.1617	818,328.706	9,901,951.168	3.738	46	PHN
	47		1600	44.973	44.969	89.1251	352.3606	818,330.031	9,901,962.510	3.571	47	PHN
	48		1600	44.147	44.144	89.1741	353.2242	818,330.875	9,901,961.933	3.497	48	TMN
	49		1600	58.053	58.053	89.5505	358.3809	818,331.452	9,901,976.585	3.037	49	TMN
	50		1600	58.134	58.133	89.3701	358.0357	818,330.872	9,901,976.522	3.343	50	TMN
	51		1600	45.928	45.927	89.3215	354.4411	818,331.327	9,901,963.961	3.325	51	TMN
	52		1600	46.151	46.143	88.5752	354.2717	818,331.045	9,901,964.098	3.788	52	TMN
	53		1600	50.823	50.818	89.1042	355.1426	818,330.270	9,901,968.755	3.683	53	PHN
	54		1600	61.067	61.067	89.4855	2.2108	818,334.610	9,901,980.329	3.151	54	DTL
	55		1700	60.457	60.457	90.0345	5.4244	818,338.224	9,901,980.244	2.788	55	DTL
	56		1600	55.661	55.661	89.5040	1.1517	818,334.505	9,901,974.810	3.105	56	DTL
	57		1600	54.828	54.827	90.1525	5.1310	818,338.410	9,901,974.596	2.708	57	DTL
	58		1600	49.282	49.281	90.2054	5.0858	818,339.043	9,901,969.086	2.654	58	DTL
	59		1600	49.909	49.908	89.3509	359.4638	818,334.357	9,901,968.901	3.315	59	DTL
	60		1600	43.841	43.840	90.2403	4.5900	818,339.604	9,901,963.672	2.647	60	DTL
	61		1600	43.981	43.981	89.5628	358.3251	818,334.732	9,901,962.901	2.999	61	DTL
	62		1600	38.479	38.479	90.1700	4.5058	818,340.206	9,901,958.343	2.764	62	DTL
	63		1600	38.827	38.827	89.5445	357.4948	818,335.495	9,901,957.777	3.013	63	DTL
	64		1600	32.886	32.885	90.2226	5.0129	818,341.040	9,901,952.812	2.739	64	DTL
	65		1600	33.218	33.218	89.5229	357.2620	818,336.686	9,901,952.291	3.027	65	DTL
	66		1600	27.486	27.485	90.2925	5.1829	818,341.868	9,901,947.473	2.719	66	DTL
	67		1600	27.744	27.744	89.4748	356.3301	818,337.684	9,901,946.888	3.052	67	DTL
	68		1600	22.251	22.251	89.4747	355.3214	818,338.806	9,901,941.493	3.033	68	DTL
	69		1600	22.130	22.130	90.2200	5.3530	818,342.637	9,901,942.172	2.808	69	DTL
	70		1600	16.780	16.780	90.0519	5.3949	818,343.291	9,901,936.862	2.928	70	DTL
	71		1600	17.077	17.077	89.3733	347.0410	818,337.954	9,901,935.634	3.066	71	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	72		1600	11.467	11.466	89.2107	329.4515	818,337.491	9,901,928.633	3.084	72	PHN
	73		1600	10.950	10.949	89.1926	131.3617	818,354.815	9,901,914.855	3.083	73	JL
	74		1600	5.111	5.107	87.4530	168.5424	818,347.293	9,901,915.514	3.154	74	JL
	75		1600	7.713	7.710	88.2316	143.4547	818,351.044	9,901,915.102	3.171	75	JL
	76		1600	2.889	2.888	88.2407	45.0159	818,346.816	9,901,922.630	3.035	76	JL
	77		1600	10.611	10.611	90.1904	94.0517	818,355.758	9,901,921.731	2.895	77	JL
	78		1600	5.770	5.767	88.1821	85.4945	818,350.786	9,901,921.842	3.125	78	JL
	79		1600	14.961	14.961	90.1508	54.1542	818,355.243	9,901,931.339	2.888	79	JL
	80		1600	16.673	16.672	90.4310	73.2233	818,359.837	9,901,928.285	2.745	80	JL
	81		1600	11.025	11.025	89.4453	38.0224	818,350.030	9,901,930.137	3.002	81	JL
	82		1600	9.362	9.362	89.4204	18.5210	818,346.314	9,901,929.500	3.003	82	JL
	83		1600	19.058	19.058	90.1159	37.3225	818,353.356	9,901,937.450	2.888	83	JL
	84		1600	16.031	16.031	90.1155	13.5214	818,345.671	9,901,936.224	2.898	84	JL
	85		1600	16.960	16.960	89.4940	24.2236	818,348.779	9,901,936.788	3.005	85	JL
	86		1600	22.142	22.142	90.0612	11.4343	818,345.001	9,901,942.338	2.914	86	JL
	87		1600	24.243	24.243	90.2052	30.0213	818,352.606	9,901,943.300	2.807	87	JL
	88		1600	22.528	22.528	89.5954	19.0234	818,347.866	9,901,942.574	2.955	88	JL
	89		1600	30.352	30.352	90.1315	10.4617	818,344.399	9,901,950.538	2.837	89	JL
	90		1600	31.886	31.886	90.1831	24.1921	818,351.848	9,901,951.395	2.782	90	JL
	91		1600	39.278	39.278	90.1209	9.1434	818,343.099	9,901,959.416	2.815	91	JL
	92		1600	39.682	39.681	90.2149	20.4229	818,350.996	9,901,959.462	2.702	92	JL
	93		1600	39.081	39.081	90.0914	14.0745	818,346.441	9,901,959.261	2.849	93	JL
	94		1600	49.584	49.584	90.1119	8.3908	818,342.022	9,901,969.676	2.791	94	JL
	95		1600	50.245	50.245	90.1454	17.2730	818,349.693	9,901,970.246	2.736	95	JL
	96		1600	49.852	49.852	90.1227	13.0145	818,345.811	9,901,970.047	2.773	96	JL
	97		1600	74.055	74.055	89.5200	63.5951	818,403.297	9,901,966.193	3.112	97	C1
	98		1600	70.535	70.534	90.1421	68.1254	818,403.610	9,901,959.823	2.660	98	JL
	99		1600	73.717	73.717	90.0603	65.0330	818,403.870	9,901,964.906	2.824	99	JL
	100		1600	65.474	65.473	90.1353	67.4901	818,399.166	9,901,957.355	2.690	100	JL
	101		1600	65.703	65.703	90.0450	63.1954	818,396.274	9,901,961.602	2.862	101	JL
	102		1600	65.546	65.546	90.0641	65.3109	818,397.691	9,901,959.530	2.827	102	JL
	103		1600	57.687	57.686	90.2012	66.4903	818,392.176	9,901,953.759	2.615	103	JL
	104		1600	58.309	58.309	90.0936	61.5151	818,389.577	9,901,958.090	2.791	104	JL
	105		1600	57.884	57.884	90.1000	64.1054	818,390.739	9,901,956.004	2.774	105	JL
	106		1600	50.041	50.041	90.1229	60.2337	818,382.445	9,901,953.682	2.772	106	JL
	107		1600	49.569	49.568	90.2336	66.0820	818,385.229	9,901,949.511	2.614	107	JL
	108		1600	49.673	49.672	90.1546	63.1345	818,383.771	9,901,951.569	2.726	108	JL
	109		1600	42.736	42.735	90.2506	65.4752	818,379.568	9,901,945.675	2.642	109	JL
	110		1600	42.395	42.394	90.1751	58.4616	818,375.947	9,901,949.446	2.734	110	JL
	111		1600	41.843	41.843	90.1555	62.1632	818,377.256	9,901,947.160	2.760	111	JL
	112		1600	34.997	34.997	90.1817	58.0235	818,370.283	9,901,944.662	2.768	112	JL
	113		1600	34.778	34.777	90.2329	66.0356	818,373.276	9,901,940.800	2.716	113	JL
	114		1600	34.814	34.813	90.1839	61.5306	818,371.727	9,901,942.812	2.765	114	JL
	115		1600	26.922	26.922	90.1842	56.5235	818,364.122	9,901,939.406	2.808	115	JL
	116		1600	27.247	27.246	90.2511	67.4017	818,367.652	9,901,935.718	2.754	116	JL
	117		1600	26.879	26.879	90.1826	62.1338	818,365.798	9,901,937.535	2.810	117	JL
	118		2000	13.412	13.397	92.4204	134.1425	818,356.638	9,901,913.129	1.922	118	B.SLRN
	119		2000	13.943	13.920	93.1605	139.2419	818,356.374	9,901,911.818	1.759	119	B.SLRN
	120		2000	14.497	14.487	92.1049	134.1055	818,357.572	9,901,912.567	2.002	120	B.SLRN
	121		1600	13.297	13.297	90.2031	132.4215	818,356.737	9,901,913.487	2.875	121	A.SLRN
	122		1600	13.946	13.946	90.2031	140.3935	818,356.207	9,901,911.561	2.871	122	A.SLRN
	123		1600	14.859	14.859	90.1055	133.3116	818,357.978	9,901,912.517	2.907	123	A.SLRN
	124		1600	29.311	29.305	91.1046	75.3518	818,371.414	9,901,933.413	2.351	124	B.SLRN
	125		1600	29.161	29.157	90.5546	73.3032	818,370.788	9,901,934.283	2.481	125	B.SLRN
	126		1600	29.126	29.124	90.3535	73.0058	818,370.637	9,901,934.485	2.653	126	A.SLRN
	127		1600	29.479	29.479	90.1705	75.5921	818,371.661	9,901,933.307	2.808	127	A.SLRN
	128		2000	38.254	38.254	90.0959	71.1359	818,377.992	9,901,939.992	2.443	128	B.SLRN
	129		2000	38.133	38.133	90.1455	72.3503	818,378.345	9,901,939.155	2.389	129	B.SLRN
	130		2000	38.450	38.449	89.3451	71.1023	818,378.139	9,901,940.128	2.835	130	A.SLRN
	131		2000	38.521	38.521	89.5258	72.3354	818,378.675	9,901,939.359	2.633	131	A.SLRN
	132		2000	22.072	22.069	89.0531	75.4957	818,364.998	9,901,930.066	2.904	132	TL
	133		2000	26.148	26.145	89.0531	88.1359	818,370.608	9,901,926.594	2.968	133	BG
	134		2000	22.763	22.759	88.5141	82.0702	818,366.606	9,901,928.085	3.006	134	DTL
	135		2000	19.410	19.404	88.3125	95.1101	818,364.508	9,901,922.633	3.054	135	DTL
	136		2000	17.801	17.793	88.1953	105.3902	818,363.023	9,901,919.187	3.072	136	DTL
	137		2000	18.557	18.552	88.3630	128.5917	818,361.847	9,901,911.893	3.005	137	DTL
	138		2000	22.090	22.086	88.5130	103.4923	818,367.337	9,901,919.647	2.994	138	BG
	139		2000	24.011	24.008	89.0243	126.3306	818,367.163	9,901,910.373	2.954	139	BG
	140		2000	19.700	19.696	88.5134	134.5700	818,361.857	9,901,909.596	2.946	140	BG
	141		2000	17.307	17.303	88.4808	141.4632	818,358.632	9,901,909.219	2.916	141	BG
	142		2000	22.418	22.416	89.1843	155.1845	818,358.774	9,901,902.315	2.823	142	BG
	143		1600	18.088	18.058	93.1649	148.0622	818,357.868	9,901,907.271	1.919	143	B.SLRN
	144		1600	17.570	17.541	93.1649	150.1533	818,357.026	9,901,907.190	1.949	144	B.SLRN
	145		1600	18.228	18.228	90.2512	148.3812	818,357.864	9,901,907.033	2.820	145	B.SLRN
	146		1600	18.214	18.214	90.2513	148.3812	818,357.855	9,901,907.043	2.820	146	B.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	147		1600	17.831	17.831	90.2513	150.5232	818,357.077	9,901,906.848	2.823	147	B.SLRN
	148		1600	24.502	24.477	92.3503	161.5040	818,357.699	9,901,899.119	1.849	148	B.SLRN
	149		1600	24.826	24.810	92.0143	160.0610	818,358.512	9,901,899.225	2.075	149	B.SLRN
	150		1600	24.427	24.427	90.1958	161.5707	818,357.634	9,901,899.139	2.812	150	A.SLRN
	151		1600	24.847	24.847	90.1958	159.5519	818,358.598	9,901,899.236	2.810	151	A.SLRN
	152		1600	31.918	31.918	90.1440	166.1229	818,359.343	9,901,891.556	2.818	152	A.SLRN
	153		1600	31.513	31.513	90.1611	167.5639	818,358.301	9,901,891.511	2.806	153	A.SLRN
	154		1600	31.629	31.606	92.1225	167.5048	818,358.388	9,901,891.449	1.736	154	B.SLRN
	155		1600	31.952	31.930	92.0621	166.2916	818,359.208	9,901,891.476	1.780	155	B.SLRN
	156		1600	34.338	34.337	90.2234	170.4850	818,357.887	9,901,888.268	2.729	156	TL
	157		1600	36.450	36.450	90.1623	171.4108	818,358.147	9,901,886.103	2.780	157	A.SLRN
	158		1600	36.996	36.996	90.1623	169.2246	818,359.722	9,901,886.147	2.778	158	A.SLRN
	159		1600	36.741	36.721	91.5350	169.3423	818,359.500	9,901,886.352	1.738	159	A.SLRN
	160		1600	36.741	36.721	91.5350	169.3421	818,359.501	9,901,886.352	1.738	160	B.SLRN
	CP01		70	74.073	74.062	90.5814	0.0000	818,345.258	9,901,920.198	3.432	CP01	STN
C1		1.562			74.055			818,403.297	9,901,966.193	3.112	C1	
	161		1600	25.343	25.339	90.5747	350.3442	818,386.282	9,901,947.416	2.648	161	PHN
	162		1600	25.462	25.445	92.0640	348.2438	818,386.937	9,901,946.706	2.136	162	B.SLRN
	163		1600	25.602	25.584	92.0914	347.0938	818,387.279	9,901,946.245	2.112	163	B.SLRN
	164		1600	25.588	25.580	91.2431	346.3749	818,387.466	9,901,946.100	2.445	164	B.SLRN
	165		1600	25.464	25.455	91.3107	348.4909	818,386.792	9,901,946.815	2.399	165	B.SLRN
	166		1600	14.535	14.529	91.4023	339.0054	818,395.897	9,901,953.690	2.650	166	PHN
	167		1600	14.632	14.605	93.3031	336.1551	818,396.470	9,901,953.283	2.179	167	B.SLRN
	168		1600	14.905	14.879	93.2308	333.5735	818,396.877	9,901,952.771	2.194	168	B.SLRN
	169		1600	14.947	14.934	92.2310	333.2939	818,396.963	9,901,952.669	2.452	169	A.SLRN
	170		1600	14.515	14.502	92.2309	336.3446	818,396.448	9,901,953.410	2.470	170	A.SLRN
	171		1600	10.725	10.717	92.1523	325.0656	818,400.214	9,901,955.930	2.652	171	PHN
	172		1600	10.507	10.442	96.2403	307.2236	818,403.483	9,901,955.754	1.903	172	B.SLRN
	173		1600	9.901	9.838	96.2857	309.0910	818,403.167	9,901,956.357	1.956	173	B.SLRN
	174		1600	9.808	9.787	93.4649	309.1308	818,403.157	9,901,956.408	2.427	174	B.SLRN
	175		1600	10.517	10.491	94.0222	306.5953	818,403.553	9,901,955.706	2.333	175	B.SLRN
	176		1600	10.471	10.448	93.4551	299.3123	818,404.909	9,901,955.870	2.387	176	BG
	177		1600	15.114	15.101	92.2041	333.1042	818,396.967	9,901,952.483	2.456	177	BG
	178		2800	31.660	31.652	88.4039	340.3609	818,386.428	9,901,939.412	2.605	178	DTL
	179		2800	33.616	33.609	88.5133	345.3045	818,383.016	9,901,939.393	2.543	179	DTL
	180		2800	17.262	17.242	87.1413	333.1910	818,396.031	9,901,950.557	2.706	180	TL
	181		2800	25.548	25.537	88.1738	342.2552	818,389.004	9,901,945.031	2.635	181	TL
	182		2800	29.271	29.262	88.3242	335.4850	818,389.823	9,901,940.219	2.617	182	TL
	183		2800	27.387	27.378	88.3241	330.1410	818,393.112	9,901,940.780	2.570	183	TL
	184		2800	34.127	34.121	88.5712	330.4117	818,390.354	9,901,934.622	2.497	184	TL
	185		2800	35.079	35.071	88.4801	336.1451	818,386.913	9,901,935.185	2.608	185	TL
	186		2800	37.222	37.218	89.0858	330.3217	818,389.270	9,901,931.720	2.427	186	TL
	187		2800	37.117	37.112	89.0150	336.4939	818,385.628	9,901,933.558	2.502	187	BG
	188		2000	41.910	41.909	90.2548	340.2647	818,381.058	9,901,930.672	2.359	188	BG
	189		2800	37.065	37.060	89.0135	344.4641	818,381.315	9,901,936.357	2.504	189	DTL
	190		1600	13.167	13.137	93.5115	252.2539	818,414.184	9,901,958.841	2.189	190	B.SLRN
	191		1600	13.443	13.414	93.4714	254.0527	818,414.191	9,901,958.367	2.186	191	B.SLRN
	192		1600	12.897	12.888	92.1050	251.3858	818,414.075	9,901,959.127	2.583	192	B.SLRN
	193		1600	13.499	13.491	91.5606	254.5539	818,414.138	9,901,958.163	2.618	193	B.SLRN
	194		1600	14.405	14.394	92.1135	260.4808	818,413.926	9,901,956.486	2.523	194	B.SLRN
	195		1600	11.487	11.477	92.2138	243.4702	818,413.666	9,901,961.273	2.601	195	DTL
	196		1600	20.335	20.330	91.1324	228.4802	818,423.293	9,901,962.522	2.640	196	DTL
	197		1600	21.591	21.586	91.1041	251.1926	818,421.416	9,901,954.460	2.630	197	DTL
	198		1600	21.353	21.347	91.2011	234.2512	818,423.815	9,901,960.301	2.576	198	A.SLRN
	199		1600	21.076	21.072	91.1025	238.3247	818,423.079	9,901,958.935	2.642	199	A.SLRN
	200		1600	21.414	21.386	92.5618	235.0304	818,423.786	9,901,960.064	1.976	200	B.SLRN
	201		1600	29.297	29.276	92.1034	232.2351	818,431.703	9,901,959.110	1.962	201	B.SLRN
	202		1600	28.406	28.386	92.1034	231.1613	818,430.969	9,901,959.869	1.995	202	B.SLRN
	203		1600	28.415	28.410	91.0736	231.1200	818,431.000	9,901,959.898	2.515	203	A.SLRN
	204		1600	29.119	29.115	90.5827	232.4736	818,431.498	9,901,958.954	2.579	204	A.SLRN
	205		1600	28.233	28.230	90.4907	226.2457	818,431.251	9,901,962.255	2.671	205	DTL
	206		1600	29.648	29.646	90.4227	242.0335	818,430.450	9,901,954.295	2.708	206	DTL
	207		1600	37.967	37.964	90.4508	225.2855	818,440.971	9,901,961.511	2.576	207	DTL
	208		1600	37.795	37.790	90.5736	229.0402	818,440.433	9,901,959.196	2.441	208	A.SLRN
	209		1600	38.222	38.221	90.2311	231.4045	818,440.496	9,901,957.412	2.816	209	A.SLRN
	210		1600	37.767	37.753	91.3357	229.0730	818,440.390	9,901,959.166	2.042	210	B.SLRN
	211		1600	48.654	48.640	91.2130	227.5435	818,451.269	9,901,958.154	1.921	211	B.SLRN
	212		1600	48.783	48.769	91.2332	228.3603	818,451.294	9,901,957.554	1.889	212	B.SLRN
	213		1600	48.829	48.826	90.3547	228.5005	818,451.315	9,901,957.347	2.566	213	B.SLRN
	214		1600	48.620	48.617	90.3547	227.3856	818,451.282	9,901,958.377	2.568	214	B.SLRN
	215		1600	48.376	48.375	90.2615	224.4804	818,451.370	9,901,960.797	2.705	215	B.SLRN
	216		1600	49.195	49.194	90.1944	232.5234	818,450.929	9,901,953.893	2.792	216	DTL
	217		1600	57.102	57.101	90.2455	224.3900	818,460.057	9,901,959.963	2.660	217	DTL
	218		1600	56.843	56.840	90.3416	233.1125	818,458.253	9,901,951.680	2.507	218	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	219		1600	57.174	57.172	90.2626	226.5514	818,459.838	9,901,957.719	2.634	219	A.SLRN
	220		1600	57.135	57.133	90.2626	227.5950	818,459.630	9,901,956.665	2.635	220	A.SLRN
	221		1600	57.264	57.256	90.5750	227.0719	818,459.890	9,901,957.508	2.111	221	A.SLRN
	222		1600	57.504	57.495	91.0225	227.4552	818,460.025	9,901,956.835	2.030	222	A.SLRN
	223		1600	64.753	64.744	90.5846	227.1221	818,467.277	9,901,956.278	1.967	223	B.SLRN
	224		1600	64.726	64.717	90.5846	226.4027	818,467.339	9,901,956.876	1.968	224	B.SLRN
	225		1600	64.651	64.649	90.2721	226.3219	818,467.294	9,901,957.037	2.560	225	A.SLRN
	226		1600	64.834	64.831	90.3148	227.2753	818,467.318	9,901,955.975	2.474	226	A.SLRN
	227		1600	64.483	64.482	90.1726	224.2607	818,467.421	9,901,959.410	2.747	227	DTL
	228		1600	64.981	64.981	90.0156	232.1428	818,466.390	9,901,950.644	3.037	228	DTL
	229		1600	76.612	76.611	90.1857	224.5827	818,479.404	9,901,957.418	2.652	229	DTL
	230		1600	77.065	77.063	90.2458	227.5819	818,479.286	9,901,953.374	2.514	230	DTL
	231		1600	77.138	77.136	90.2529	227.1359	818,479.517	9,901,954.344	2.502	231	A.SLRN
	232		1600	76.965	76.964	90.2045	226.2854	818,479.496	9,901,955.369	2.609	232	A.SLRN
	233		1600	77.020	77.012	90.4814	227.0646	818,479.420	9,901,954.523	1.993	233	B.SLRN
	234		1600	76.983	76.975	90.4813	226.3453	818,479.488	9,901,955.235	1.994	234	B.SLRN
	235		1600	76.672	76.671	90.1914	223.2625	818,479.671	9,901,959.453	2.645	235	JL
	236		1600	77.103	77.102	90.1350	219.4249	818,480.379	9,901,964.421	2.764	236	JL
	237		1600	77.083	77.083	90.0640	219.1835	818,480.370	9,901,964.965	2.924	237	DTL
	238		1600	76.731	76.730	90.1511	221.2919	818,479.916	9,901,962.054	2.735	238	DTL
	239		1600	66.767	66.766	90.2107	223.1357	818,469.825	9,901,960.565	2.664	239	JL
	240		1600	67.461	67.460	90.1910	218.4416	818,470.756	9,901,965.792	2.698	240	JL
	241		1600	67.626	67.626	90.1112	218.2551	818,470.923	9,901,966.153	2.854	241	DTL
	242		1600	66.857	66.856	90.1818	220.4445	818,470.097	9,901,963.453	2.718	242	AS.JL
	243		1600	57.059	57.057	90.2702	222.5859	818,460.172	9,901,961.631	2.625	243	JL
	244		1600	57.360	57.358	90.2702	217.2818	818,460.648	9,901,967.119	2.623	244	JL
	245		1600	57.352	57.351	90.1601	217.0046	818,460.632	9,901,967.578	2.807	245	DTL
	246		1600	57.117	57.116	90.2215	220.0757	818,460.387	9,901,964.463	2.704	246	AS.JL
	247		1600	46.971	46.969	90.3314	222.4531	818,450.130	9,901,962.621	2.620	247	JL
	248		1600	47.548	47.546	90.3314	215.5038	818,450.796	9,901,968.311	2.614	248	JL
	249		1600	47.563	47.562	90.1838	215.1206	818,450.785	9,901,968.844	2.816	249	DTL
	250		1600	46.903	46.901	90.2816	219.0530	818,450.195	9,901,965.624	2.688	250	AS.JL
	251		1600	37.294	37.291	90.4452	213.3613	818,440.458	9,901,969.309	2.587	251	JL
	252		1600	36.817	36.814	90.4456	223.0601	818,439.987	9,901,963.175	2.593	252	JL
	253		1600	37.402	37.401	90.2644	212.0541	818,440.472	9,901,970.299	2.783	253	DTL
	254		1600	36.729	36.726	90.4126	217.5010	818,440.022	9,901,966.553	2.631	254	AS.JL
	255		1600	37.385	37.384	90.2352	206.0924	818,439.831	9,901,974.119	2.814	255	TMBK
	256		1600	46.654	46.654	90.1447	210.4913	818,449.543	9,901,972.344	2.873	256	TMBK
	257		1600	53.181	53.180	90.1739	213.0136	818,456.244	9,901,971.170	2.801	257	TMBK
	258		1600	24.479	24.475	91.0257	206.2039	818,427.233	9,901,971.304	2.626	258	JL
	259		1600	23.846	23.842	91.0209	223.4743	818,427.033	9,901,963.950	2.643	259	JL
	260		1600	24.615	24.613	90.3855	205.0340	818,427.247	9,901,971.871	2.795	260	DTL
	261		1600	23.526	23.523	90.5340	215.0143	818,426.780	9,901,967.575	2.707	261	AS.JL
	262		1600	26.352	26.351	90.3200	195.4554	818,427.619	9,901,976.333	2.824	262	TMBK JMBT
	263		1600	19.707	19.706	90.4033	182.0930	818,419.191	9,901,977.842	2.842	263	TMBK JMBT
	264		1600	16.872	16.866	91.3449	228.1047	818,419.917	9,901,963.328	2.609	264	JL
	265		1600	16.875	16.870	91.2538	197.2529	818,419.049	9,901,972.231	2.654	265	JL
	266		1600	17.086	17.084	90.5122	194.4608	818,418.949	9,901,973.041	2.819	266	DTL
	267		1600	15.887	15.883	91.1405	213.0545	818,419.112	9,901,967.661	2.732	267	AS.JL
	268		1600	10.483	10.477	91.5207	174.1709	818,410.820	9,901,973.486	2.732	268	JL
	269		1600	7.013	7.006	92.3813	211.0342	818,410.245	9,901,967.088	2.751	269	JL
	270		1600	10.986	10.984	91.0849	171.3047	818,410.804	9,901,974.211	2.854	270	DTL
	271		1600	8.091	8.084	92.2014	185.2153	818,410.075	9,901,970.600	2.744	271	AS.JL
	272		1600	15.279	15.276	91.1128	159.3553	818,411.211	9,901,979.260	2.756	272	TMBK JMBT
	273		1600	7.865	7.857	92.3358	231.0326	818,410.963	9,901,964.471	2.722	273	AS.JL
	274		1600	8.899	8.885	93.1224	246.2159	818,411.144	9,901,962.026	2.576	274	JL
	275		1600	4.006	3.997	93.5225	209.2040	818,407.244	9,901,966.822	2.803	275	TMN
	BM03		1600	94.859	94.859	90.0359	359.5959	818,020.153	9,901,920.621	3.042	BM03	
J2		1.473			94.860			818,112.745	9,901,941.238	2.898	J2	
	280		1600	57.204	57.203	90.2121	66.5745	818,079.454	9,901,987.755	2.416	280	ABT1
	CP01		1600	41.990	41.989	90.2137	0.0000	818,345.258	9,901,920.198	3.432	CP01	STN
J1		1.32			41.992			818,319.125	9,901,953.067	3.497	J1	
	276		1600	161.967	161.951	90.4737	138.4023	818,159.726	9,901,981.707	0.974	276	RB1
	277		1600	24.792	24.787	91.0906	270.4250	818,338.718	9,901,968.250	2.719	277	ABT2
	278		1600	63.252	63.197	92.2355	148.0117	818,259.566	9,901,974.198	0.570	278	RB2
	279		1600	17.156	17.155	89.2155	233.3501	818,323.593	9,901,969.630	3.407	279	CL2
Survey Date : March, 27 2019												
	CP01		1142	74.056	74.056	90.0433	0.0001	818,345.258	9,901,920.198	3.432	CP01	STN
C1		1.497			74.055			818,403.297	9,901,966.193	3.112	C1	
	1		1600	8.777	8.771	92.0905	108.4937	818,400.359	9,901,974.458	2.679	1	JL
	2		1600	3.513	3.507	93.1417	68.3030	818,400.263	9,901,967.953	2.811	2	JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	3		1600	9.722	9.720	91.0514	112.0421	818,400.565	9,901,975.522	2.825	3	DTL
	4		1600	3.346	3.346	89.5104	64.1235	818,400.285	9,901,967.650	3.018	4	TMN
	5		1600	14.940	14.938	90.5146	120.3648	818,401.274	9,901,980.994	2.784	5	TMBK JMBT
	6		1600	5.934	5.928	92.3608	98.0747	818,400.309	9,901,971.313	2.740	6	AS.JL
	7		1600	13.708	13.704	91.2102	80.0150	818,393.055	9,901,975.298	2.686	7	JL
	8		1600	10.966	10.965	90.5328	52.5921	818,392.686	9,901,968.956	2.838	8	JL
	9		1600	10.842	10.842	90.0014	50.0842	818,392.682	9,901,968.401	3.008	9	TMN
	10		1600	14.358	14.357	90.4422	84.2205	818,393.319	9,901,976.516	2.824	10	DTL
	11		1600	11.556	11.554	91.0234	68.3215	818,393.305	9,901,971.995	2.799	11	AS.JL
	12		1600	18.491	18.488	91.0023	99.0835	818,394.262	9,901,982.324	2.684	12	TMBK JMBT
	13		1600	18.656	18.656	90.2424	49.3753	818,384.999	9,901,969.828	2.877	13	JL
	14		1600	20.377	20.375	90.4419	68.0948	818,385.610	9,901,976.309	2.746	14	JL
	15		1600	18.532	18.532	89.4552	47.2456	818,384.994	9,901,969.098	3.085	15	TMN
	16		1600	20.812	20.811	90.2644	71.1903	818,385.828	9,901,977.504	2.847	16	DTL
	17		1600	18.942	18.941	90.4239	59.1121	818,385.590	9,901,972.917	2.774	17	AS.JL
	18		1600	23.867	23.865	90.4020	85.2528	818,387.029	9,901,983.655	2.729	18	TMBK JMBT
	19		1600	27.681	27.680	90.2807	60.5559	818,377.731	9,901,976.802	2.783	19	JL
	20		1600	26.607	26.606	90.2228	47.5837	818,377.062	9,901,970.621	2.835	20	JL
	21		1600	26.535	26.535	89.5643	46.2427	818,377.021	9,901,969.891	3.034	21	TMN
	22		1600	28.024	28.024	90.0644	64.2655	818,378.120	9,901,978.501	2.954	22	DTL
	23		1600	26.894	26.893	90.2558	55.0526	818,377.537	9,901,973.919	2.806	23	AS.JL
	24		1600	30.763	30.762	90.2502	76.2439	818,379.061	9,901,985.138	2.785	24	TMBK JMBT
	25		1600	37.525	37.524	90.2438	71.0833	818,371.736	9,901,986.491	2.740	25	TMBK JMBT
	26		1600	33.977	33.976	90.2438	47.2052	818,369.735	9,901,971.480	2.766	26	JL
	27		1600	34.727	34.726	90.2643	58.0008	818,370.584	9,901,977.845	2.739	27	JL
	28		1600	33.880	33.880	90.0543	46.0250	818,369.719	9,901,970.704	2.953	28	TMN
	29		1600	35.043	35.043	90.1237	60.4825	818,370.901	9,901,979.553	2.880	29	DTL
	30		1600	34.268	34.267	90.2614	52.5917	818,370.135	9,901,974.826	2.747	30	AS.JL
	31		1600	42.557	42.556	90.2421	55.2818	818,362.617	9,901,978.689	2.708	31	JL
	32		1600	41.510	41.509	90.2707	47.0835	818,362.271	9,901,972.505	2.682	32	JL
	33		1600	41.496	41.496	90.1415	45.3137	818,362.122	9,901,971.344	2.837	33	TMN
	34		1600	42.772	42.771	90.1941	58.1630	818,363.074	9,901,980.737	2.764	34	DTL
	35		1600	41.925	41.924	90.2646	51.5511	818,362.536	9,901,975.997	2.683	35	AS.JL
	36		1600	44.926	44.925	90.2123	67.1658	818,363.961	9,901,987.895	2.730	36	TMBK JMBT
	37		1600	52.524	52.524	90.1432	64.3047	818,356.136	9,901,989.314	2.787	37	TMBK JMBT
	38		1600	48.650	48.650	90.1528	45.0031	818,354.971	9,901,971.795	2.790	38	JL
	39		1600	49.827	49.826	90.2410	54.4940	818,355.506	9,901,980.287	2.659	39	JL
	40		1600	48.979	48.977	90.2655	50.5510	818,355.485	9,901,976.813	2.625	40	AS.JL
	41		1600	49.991	49.990	90.2020	56.2425	818,355.756	9,901,981.650	2.713	41	DTL
	42		1600	53.507	53.505	90.2839	46.1625	818,350.297	9,901,973.526	2.563	42	JL
	43		1600	57.586	57.585	90.2337	50.2839	818,346.988	9,901,978.245	2.613	43	JL
	44		1600	47.901	47.901	90.1040	39.4442	818,355.410	9,901,967.320	2.860	44	PHN
	45		1600	48.987	48.987	90.1040	33.1727	818,354.505	9,901,961.834	2.857	45	DTL
	46		1600	42.598	42.598	89.5807	32.3627	818,360.916	9,901,961.897	3.032	46	DTL
	47		1600	40.705	40.705	90.0750	36.2749	818,362.615	9,901,964.820	2.916	47	PHN
	48		1600	42.441	42.441	89.5308	32.1916	818,361.095	9,901,961.701	3.094	48	TMN
	49		1600	37.379	37.377	89.2357	43.3757	818,366.076	9,901,969.604	3.401	49	TL
	50		1600	37.180	37.180	89.5411	32.0724	818,366.340	9,901,962.131	3.072	50	DTL
	51		1600	30.510	30.510	90.1213	37.4039	818,372.790	9,901,965.810	2.901	51	PHN
	52		1600	15.722	15.722	89.3513	29.4757	818,387.752	9,901,963.843	3.122	52	DTL
	53		1600	7.772	7.772	89.2926	28.3413	818,395.639	9,901,964.867	3.078	53	DTL
	54		1600	6.532	6.518	93.4844	283.4149	818,406.021	9,901,960.272	2.575	54	JL
	55		1600	4.094	4.084	94.0450	283.4247	818,405.002	9,901,962.483	2.718	55	AS.JL
	56		1600	4.907	4.906	89.0651	5.5405	818,399.159	9,901,963.558	3.085	56	TMN
	57		1600	14.590	14.590	89.5042	9.3016	818,390.523	9,901,959.144	3.048	57	TMN
	58		1600	36.696	36.696	90.0147	6.5800	818,371.985	9,901,947.058	2.990	58	TMN
	59		1600	57.807	57.807	90.0018	2.2305	818,356.537	9,901,932.206	3.004	59	TMN
	60		1600	51.854	51.854	89.4802	8.0316	818,358.546	9,901,939.999	3.189	60	PHN
	61		1600	49.167	49.167	89.5706	8.0702	818,360.838	9,901,941.402	3.050	61	LMP
	62		1600	45.799	45.796	90.4111	295.2351	818,413.598	9,901,921.571	2.460	62	C2
	63		1600	46.666	46.663	90.4004	292.1933	818,416.215	9,901,921.354	2.465	63	BG FTSL
	64		1600	20.367	20.362	91.1633	272.1818	818,415.292	9,901,949.739	2.555	64	BG FTSL
	65		1600	42.071	42.071	90.1055	240.1023	818,442.366	9,901,950.586	2.875	65	BG FTSL
	CP01		1600	71.799	71.799	89.5909	0.0000	818,345.258	9,901,920.198	3.432	CP01	STN
CP1A		1.069			71.816			818,329.844	9,901,990.340	3.524	CP1A	
	66		1600	9.582	9.577	88.0607	355.2328	818,332.644	9,901,981.182	3.310	66	PPN RKLM
	67		1600	10.386	10.367	86.3012	18.4223	818,328.704	9,901,980.036	3.626	67	LMP
	68		1600	56.476	56.476	89.4617	315.1233	818,377.307	9,901,959.734	3.218	68	TMN
	69		1600	52.476	52.476	89.4855	334.3100	818,362.063	9,901,948.919	3.162	69	TMN
	70		1600	46.479	46.478	89.4244	325.5114	818,363.581	9,901,958.370	3.226	70	LMP
	71		1600	52.289	52.289	90.0651	346.3752	818,352.571	9,901,943.249	2.889	71	TMN
	72		1600	52.241	52.241	89.5713	342.0631	818,356.190	9,901,945.229	3.035	72	DTL
	73		1600	44.875	44.875	90.0145	337.5307	818,355.267	9,901,953.361	2.970	73	DTL
	74		1600	43.470	43.470	90.1454	342.2712	818,351.540	9,901,952.672	2.805	74	TMN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	75		1600	34.942	34.941	90.2515	335.5523	818,350.613	9,901,962.242	2.736	75	TMN
	76		1600	36.877	36.877	90.1215	330.5633	818,354.256	9,901,962.700	2.862	76	TMN
	77		1600	28.279	28.279	90.0728	356.0019	818,337.823	9,901,963.210	2.932	77	TMN
	78		1600	51.158	51.158	90.0153	358.2319	818,342.225	9,901,940.703	2.965	78	TMN
	79		1600	51.046	51.046	89.5655	0.2501	818,340.437	9,901,940.405	3.039	79	TMN
	80		1600	30.057	30.057	90.0203	359.2525	818,336.590	9,901,961.050	2.975	80	TMN
	81		1600	19.742	19.741	90.2555	351.1312	818,336.975	9,901,971.931	2.844	81	TMN
	82		1600	11.287	11.287	90.2555	343.0558	818,335.367	9,901,980.497	2.908	82	TMN
	83		1600	9.484	9.480	88.2152	3.5817	818,331.233	9,901,980.962	3.264	83	TMN
	84		1600	11.233	11.228	88.2113	45.1136	818,323.762	9,901,980.902	3.316	84	TMN
	85		1600	2.867	2.862	86.3012	224.1600	818,331.356	9,901,992.770	3.168	85	TG JMBT
	86		1600	3.299	3.299	89.5737	245.0353	818,332.467	9,901,992.340	2.995	86	TG JMBT
	87		1600	14.087	14.080	88.1458	205.5415	818,333.133	9,902,004.031	3.423	87	TG JMBT
	88		1600	5.827	5.823	92.0642	267.4605	818,335.478	9,901,991.810	2.778	88	DTL
	89		1600	6.497	6.490	92.4507	323.0459	818,334.765	9,901,986.109	2.681	89	DTL
	90		1600	12.949	12.946	91.1952	313.1639	818,340.954	9,901,983.695	2.692	90	DTL
	91		1600	11.072	11.070	91.1149	277.1205	818,340.868	9,901,991.342	2.762	91	DTL
	92		1600	21.570	21.569	90.3112	302.0308	818,350.156	9,901,983.084	2.797	92	DTL
	93		1600	20.746	20.745	90.4117	283.2229	818,350.585	9,901,989.985	2.744	93	DTL
	94		1600	27.180	27.177	90.5403	248.2622	818,352.387	9,902,005.519	2.566	94	C3
	95		2000	26.969	26.969	90.0105	263.3044	818,355.362	9,901,999.068	2.585	95	TG JMBT
	96		2000	23.925	23.925	89.3806	283.0337	818,353.767	9,901,990.062	2.745	96	TG JMBT
	CP1A		1069	71.798	71.798	90.0158	359.5959	818,329.844	9,901,990.340	3.524	CP1A	
CP01		1.142			71.816			818,345.258	9,901,920.198	3.432	CP01	
	97		1600	6.550	6.548	91.2941	179.1752	818,346.742	9,901,913.821	2.803	97	A.SLRN
	98		1600	5.614	5.612	91.2611	174.0417	818,347.022	9,901,914.870	2.833	98	A.SLRN
	99		1600	23.422	23.401	87.3342	306.1816	818,323.866	9,901,929.683	3.970	99	LMP
	100		1600	43.320	43.315	89.0550	348.0423	818,327.419	9,901,959.669	3.657	100	LMP
	101		1600	26.097	26.097	90.1633	157.3511	818,360.154	9,901,898.771	2.848	101	LMP
	102		1600	48.301	48.301	90.1446	175.1421	818,359.504	9,901,874.046	2.767	102	C4
	CP01		1142	48.286	48.285	89.3730	359.5959	818,345.258	9,901,920.198	3.432	CP01	STN
C4		1.454			48.301			818,359.504	9,901,874.046	2.767	C4	
	103		1600	3.996	3.880	103.4949	24.2254	818,359.992	9,901,877.896	1.665	103	B.SLRN
	104		1600	3.882	3.773	103.3654	11.5314	818,359.158	9,901,877.803	1.707	104	B.SLRN
	105		1600	3.801	3.800	91.3615	7.3945	818,358.878	9,901,877.794	2.514	105	A.SLRN
	106		1600	3.873	3.872	91.1349	26.3011	818,360.133	9,901,877.867	2.537	106	A.SLRN
	107		1600	8.501	8.501	89.4721	194.5620	818,359.833	9,901,865.552	2.652	107	A.SLRN
	108		1600	8.454	8.454	89.2251	186.4259	818,361.036	9,901,865.733	2.712	108	A.SLRN
	109		1600	8.456	8.420	95.1724	186.5552	818,360.999	9,901,865.760	1.841	109	B.SLRN
	110		1600	8.444	8.408	95.1627	194.1125	818,359.939	9,901,865.649	1.844	110	B.SLRN
	111		1600	21.919	21.918	89.3420	186.3910	818,363.499	9,901,852.495	2.784	111	TL
	112		1600	34.580	34.572	91.1359	191.4840	818,362.724	9,901,839.624	1.876	112	B.SLRN
	113		1600	34.488	34.479	91.2002	190.3247	818,363.472	9,901,839.797	1.818	113	B.SLRN
	114		1600	34.369	34.369	90.1651	190.0943	818,363.688	9,901,839.933	2.452	114	B.SLRN
	115		1600	34.508	34.508	90.1652	192.0556	818,362.545	9,901,839.673	2.451	115	B.SLRN
	116		1600	53.986	53.977	91.0208	190.5430	818,365.377	9,901,820.389	1.645	116	B.SLRN
	117		1600	53.971	53.961	91.0608	190.0254	818,366.179	9,901,820.500	1.582	117	B.SLRN
	118		1600	54.095	54.095	90.0316	191.0419	818,365.236	9,901,820.256	2.569	118	A.SLRN
	119		1600	54.089	54.089	89.5846	189.5748	818,366.275	9,901,820.383	2.640	119	A.SLRN
	120		1600	90.404	90.404	90.0212	190.1317	818,370.417	9,901,784.303	2.563	120	JL
	121		1600	91.131	91.131	89.5917	194.3313	818,363.639	9,901,783.009	2.640	121	JL
	122		1600	90.696	90.696	89.5843	192.1640	818,367.214	9,901,783.679	2.654	122	AS.JL
	123		1600	81.763	81.763	90.0129	191.0302	818,368.198	9,901,792.747	2.585	123	JL
	124		1600	79.920	79.920	90.0130	195.2254	818,361.976	9,901,794.164	2.586	124	JL
	125		1600	79.460	79.460	89.5857	193.4934	818,364.117	9,901,794.720	2.645	125	AS.JL
	126		1600	69.803	69.803	90.0244	192.0739	818,365.620	9,901,804.512	2.565	126	JL
	127		1600	70.486	70.486	90.0353	196.4950	818,359.902	9,901,803.561	2.541	127	JL
	128		1600	69.777	69.777	90.0048	195.1950	818,361.725	9,901,804.305	2.604	128	AS.JL
	129		1600	60.357	60.357	90.0707	192.3148	818,364.370	9,901,813.886	2.496	129	JL
	130		1600	60.947	60.947	90.0248	198.0822	818,358.456	9,901,813.108	2.571	130	JL
	131		1600	60.643	60.643	89.5939	195.3837	818,361.103	9,901,813.424	2.627	131	AS.JL
	132		1600	50.837	50.837	90.0818	193.2841	818,362.764	9,901,823.314	2.498	132	JL
	133		1600	51.603	51.603	90.0327	199.5252	818,357.049	9,901,822.502	2.569	133	JL
	134		1600	51.124	51.124	89.5740	197.2839	818,359.216	9,901,822.923	2.655	134	AS.JL
	135		1600	41.657	41.657	90.0703	203.0710	818,355.175	9,901,832.615	2.535	135	JL
	136		1600	40.825	40.825	90.1638	194.5739	818,361.067	9,901,833.252	2.423	136	JL
	137		1600	41.273	41.273	90.0146	199.3856	818,357.708	9,901,832.812	2.599	137	AS.JL
	138		1600	31.450	31.450	90.1636	196.4236	818,359.748	9,901,842.598	2.469	138	JL
	139		1600	32.650	32.650	90.0658	207.0508	818,353.873	9,901,841.886	2.554	139	JL
	140		1600	32.070	32.070	90.0156	203.1214	818,356.124	9,901,842.155	2.602	140	AS.JL
	141		1600	22.130	22.130	90.1745	199.3041	818,358.594	9,901,851.935	2.506	141	JL
	142		1600	23.630	23.630	90.0445	213.3146	818,352.842	9,901,851.375	2.588	142	JL
	143		1600	22.777	22.777	90.0446	208.0145	818,355.207	9,901,851.678	2.589	143	AS.JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	144		1600	12.941	12.940	90.4010	205.3809	818,357.596	9,901,861.248	2.469	144	JL
	145		1600	15.055	15.055	89.5940	227.3401	818,351.883	9,901,861.063	2.622	145	JL
	146		1600	14.046	14.046	90.0359	219.5907	818,354.054	9,901,861.101	2.604	146	AS.JL
	147		1600	5.280	5.279	91.0138	233.3142	818,356.373	9,901,869.796	2.526	147	JL
	148		1600	9.497	9.497	89.5658	255.3858	818,351.407	9,901,869.083	2.629	148	JL
	149		1600	7.435	7.435	89.5701	249.3855	818,353.606	9,901,869.519	2.627	149	AS.JL
	150		1600	6.375	6.374	90.4407	344.3944	818,356.080	9,901,879.423	2.539	150	JL
	151		1600	10.291	10.291	89.5959	317.3702	818,350.634	9,901,879.264	2.621	151	JL
	152		1600	8.121	8.121	89.5747	327.3518	818,353.323	9,901,879.313	2.626	152	AS.JL
	153		1600	16.041	16.041	90.0832	3.0643	818,355.612	9,901,889.608	2.581	153	JL
	154		1600	18.047	18.047	89.4709	344.3708	818,349.798	9,901,889.261	2.688	154	JL
	155		1600	16.873	16.873	89.4747	352.4431	818,352.531	9,901,889.411	2.680	155	AS.JL
	156		1600	28.109	28.108	89.3459	354.0536	818,348.494	9,901,899.908	2.825	156	JL
	157		1600	26.507	26.507	89.4604	6.4220	818,354.697	9,901,900.113	2.728	157	JL
	158		1600	27.196	27.195	89.3213	0.1507	818,351.598	9,901,900.067	2.840	158	AS.JL
	159		2000	31.686	31.675	88.3059	346.4124	818,343.445	9,901,901.349	3.041	159	BG
	160		1600	21.239	21.235	88.5332	336.3604	818,345.698	9,901,890.181	3.031	160	LMP
	161		1600	21.839	21.837	89.1137	332.3249	818,344.169	9,901,889.593	2.928	161	BG
	162		1600	22.576	22.576	89.3907	329.3145	818,342.827	9,901,889.262	2.758	162	BG
	163		1600	19.178	19.175	89.0221	317.5135	818,343.017	9,901,883.838	2.942	163	BG
	164		1600	13.434	13.434	89.4823	288.1654	818,346.073	9,901,874.311	2.666	164	BG
	165		1600	15.849	15.849	89.4628	315.3652	818,345.571	9,901,881.599	2.683	165	BG
	166		1600	10.905	10.904	89.0641	282.3413	818,348.635	9,901,873.175	2.790	166	BG
	167		1600	13.066	13.065	89.2131	250.1110	818,349.066	9,901,866.189	2.767	167	BG
	168		1600	13.818	13.818	89.4535	247.0051	818,348.941	9,901,865.138	2.678	168	BG
	169		1600	17.696	17.696	90.0143	233.3921	818,348.978	9,901,859.821	2.612	169	BG
	170		1600	18.433	18.432	89.1829	230.2256	818,349.404	9,901,858.628	2.843	170	BG
	171		1600	24.592	24.591	89.2744	220.1301	818,349.871	9,901,851.421	2.851	171	BG
	172		1600	26.410	26.410	90.0812	217.4445	818,350.216	9,901,849.324	2.558	172	BG
	173		1600	31.310	31.310	89.4935	214.0415	818,350.394	9,901,844.091	2.715	173	BG
	174		1600	37.181	37.181	89.4936	210.5827	818,350.623	9,901,837.942	2.733	174	BG
	175		1600	30.929	30.929	90.0154	214.2647	818,350.311	9,901,844.515	2.603	175	BG
	176		1600	11.174	11.170	88.2737	90.5845	818,370.232	9,901,877.158	2.921	176	BG RK
	177		1600	25.594	25.592	89.1701	39.0155	818,369.041	9,901,897.795	2.941	177	BG RK
	178		1600	7.288	7.288	89.3803	72.0503	818,365.469	9,901,878.234	2.667	178	DTL
	179		1600	25.827	25.825	89.2019	32.3832	818,366.401	9,901,898.934	2.919	179	BG
	180		1600	28.904	28.903	89.3140	29.5127	818,365.860	9,901,902.242	2.859	180	BG
	181		1600	14.227	14.227	90.0101	37.2608	818,364.436	9,901,887.391	2.616	181	DTL
	182		1600	18.668	18.668	89.4157	33.0146	818,364.611	9,901,892.002	2.719	182	DTL
	183		1600	14.166	14.163	88.5219	142.4950	818,371.009	9,901,865.786	2.899	183	BG RK
	184		1600	11.563	11.562	89.2635	156.0701	818,367.096	9,901,865.325	2.733	184	DTL
	185		1600	9.925	9.925	89.3328	174.4159	818,363.295	9,901,864.874	2.697	185	DTL
	186		1600	19.961	19.961	89.4307	172.5943	818,367.674	9,901,855.834	2.719	186	DTL
	187		1600	19.366	19.366	89.4305	182.4943	818,364.296	9,901,855.283	2.716	187	DTL
	188		1600	27.233	27.233	89.5206	185.2822	818,365.018	9,901,847.377	2.683	188	DTL
	189		1600	27.672	27.672	89.4556	178.5800	818,368.141	9,901,847.757	2.734	189	DTL
	190		1600	57.091	57.089	89.3355	106.1821	818,416.587	9,901,874.892	3.054	190	C5
	191		1600	48.391	48.389	89.2744	103.4710	818,407.810	9,901,876.889	3.075	191	DTL
	192		1600	48.293	48.292	89.3334	108.3334	818,407.781	9,901,872.862	2.992	192	DTL
	193		1600	40.894	40.892	89.2415	103.5155	818,400.329	9,901,876.392	3.046	193	DTL
	194		1600	40.822	40.820	89.2416	110.0343	818,400.271	9,901,871.976	3.045	194	DTL
	195		1600	33.569	33.566	89.1340	104.0038	818,393.020	9,901,875.887	3.073	195	DTL
	196		1600	33.877	33.874	89.1549	111.3716	818,393.276	9,901,871.408	3.056	196	DTL
	197		1600	26.015	26.012	89.0358	104.0639	818,385.479	9,901,875.427	3.045	197	DTL
	198		1600	26.201	26.198	89.0837	114.0130	818,385.514	9,901,870.912	3.012	198	DTL
	199		1600	19.036	19.031	88.4152	104.2110	818,378.513	9,901,874.976	3.053	199	DTL
	200		1600	19.455	19.452	88.5548	117.3603	818,378.633	9,901,870.519	2.984	200	DTL
	201		1600	12.101	12.097	88.2841	105.1638	818,371.594	9,901,874.442	2.942	201	DTL
	202		1600	12.604	12.600	88.2841	122.3634	818,371.648	9,901,870.689	2.955	202	DTL
	203		1600	7.890	7.890	89.3844	139.4943	818,366.146	9,901,869.787	2.669	203	DTL
	CP01		1142	114.718	114.717	89.4744	359.5958	818,345.258	9,901,920.198	3.432	CP01	STN
BM01		1.112			114.723			818,370.084	9,901,808.193	3.048	BM01	
	204		1600	7.914	7.866	96.1917	342.0543	818,366.103	9,901,814.977	1.689	204	B.SLRN
	205		1600	7.666	7.630	95.3517	348.1256	818,366.947	9,901,815.148	1.814	205	B.SLRN
	206		1600	7.916	7.916	90.3428	340.5523	818,365.939	9,901,814.937	2.481	206	A.SLRN
	207		1600	7.613	7.613	90.3424	350.2750	818,367.228	9,901,815.250	2.484	207	A.SLRN
	208		1600	4.431	4.430	89.0228	227.2051	818,367.552	9,901,804.557	2.634	208	A.SLRN
	209		1600	3.383	3.383	89.1331	203.4438	818,369.424	9,901,804.875	2.606	209	A.SLRN
	210		1600	4.170	4.088	101.2358	222.4200	818,368.027	9,901,804.661	1.736	210	B.SLRN
	211		1600	3.635	3.563	101.2301	211.0909	818,368.944	9,901,804.817	1.843	211	B.SLRN
	212		1600	3.310	3.308	87.5133	185.2241	818,370.494	9,901,804.911	2.684	212	TL
	213		1600	2.649	2.641	85.3809	197.1942	818,369.862	9,901,805.561	2.762	213	LMP
	214		1600	4.109	4.072	97.4229	192.0528	818,370.113	9,901,804.121	2.009	214	B.SLRN
	215		1600	5.024	4.973	98.0956	191.1909	818,370.186	9,901,803.221	1.846	215	B.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	216		1600	5.103	5.087	85.3016	191.0928	818,370.203	9,901,803.107	2.960	216	A.SLRN
	217		1600	3.857	3.857	89.1504	196.3921	818,369.804	9,901,804.346	2.610	217	A.SLRN
	218		1600	8.999	8.999	90.2407	139.2819	818,377.273	9,901,802.781	2.497	218	A.SLRN
	219		1600	8.307	8.307	90.2407	132.0914	818,377.303	9,901,804.083	2.502	219	A.SLRN
	220		1600	8.424	8.398	94.2909	132.3730	818,377.348	9,901,803.978	1.901	220	B.SLRN
	221		1600	9.032	9.006	94.2006	138.2931	818,377.371	9,901,802.900	1.877	221	B.SLRN
	222		1600	14.797	14.792	88.3335	191.5843	818,370.218	9,901,793.401	2.932	222	JL
	223		1600	6.358	6.344	86.1453	210.1318	818,368.153	9,901,802.150	2.976	223	JL
	224		1600	35.607	35.606	89.3532	339.2647	818,350.665	9,901,838.038	2.813	224	BG
	225		1600	32.983	32.983	89.4105	336.0836	818,350.533	9,901,834.756	2.741	225	BG
	226		1600	27.270	27.267	89.1315	330.5418	818,351.983	9,901,828.586	2.931	226	BG
	227		1600	20.713	20.712	89.2014	320.1421	818,353.706	9,901,820.871	2.800	227	BG
	228		1600	18.766	18.765	89.2837	312.5429	818,353.901	9,901,817.692	2.731	228	BG
	229		1600	17.421	17.420	89.3334	301.1221	818,353.584	9,901,813.781	2.694	229	BG
	230		1600	15.966	15.966	89.3310	275.3133	818,354.237	9,901,806.255	2.685	230	BG
	231		1600	13.526	13.521	88.2913	256.0544	818,357.973	9,901,802.181	2.917	231	TL
	232		1600	15.865	15.865	89.5449	244.1439	818,357.625	9,901,798.370	2.584	232	BG
	233		1600	14.554	14.551	88.4845	256.1613	818,357.031	9,901,801.763	2.862	233	BG
	234		1600	21.027	21.026	89.2522	224.1838	818,359.000	9,901,790.326	2.772	234	BG
	235		1600	22.316	22.315	89.2918	241.2539	818,353.260	9,901,793.533	2.759	235	BG
	236		1600	24.915	24.914	89.2329	216.0522	818,360.113	9,901,785.362	2.825	236	BG
	237		1600	24.694	24.693	89.2851	233.0408	818,354.024	9,901,789.436	2.784	237	BG
	238		1600	31.587	31.586	89.2852	207.2457	818,361.952	9,901,777.672	2.846	238	BG
	239		1600	25.142	25.139	89.0334	214.1807	818,360.746	9,901,784.853	2.973	239	BG
	240		1600	35.849	35.849	89.5044	6.2029	818,366.240	9,901,843.835	2.657	240	DTL
	241		1600	35.229	35.227	89.2126	14.3354	818,371.355	9,901,843.397	2.955	241	DTL
	242		1600	27.296	27.296	89.5208	6.3117	818,367.242	9,901,835.341	2.622	242	DTL
	243		1600	27.255	27.253	89.2002	14.2106	818,370.966	9,901,835.432	2.877	243	DTL
	244		1600	18.778	18.777	89.3452	7.3453	818,368.475	9,901,826.901	2.697	244	DTL
	245		2000	19.408	19.384	87.0745	20.0037	818,372.619	9,901,827.410	3.132	245	DTL
	246		1600	10.839	10.838	89.1356	8.1936	818,369.296	9,901,819.002	2.705	246	DTL
	247		1600	11.358	11.351	87.5523	27.0105	818,372.930	9,901,819.181	2.972	247	DTL
	248		1600	4.216	4.206	86.0459	29.5045	818,371.338	9,901,812.208	2.848	248	DTL
	249		1600	5.470	5.464	87.1330	73.5307	818,374.880	9,901,810.809	2.825	249	BG RK
	CP1A		1085	14.976	14.969	91.4716	359.5957	818,329.844	9,901,990.340	3.524	CP1A	
J6		1.347			14.967			818,323.895	9,902,004.074	3.715	J6	
	250		1600	81.197	81.186	90.5557	27.3636	818,317.962	9,901,923.105	2.141	250	SNG
	251		1600	80.917	80.884	91.3839	31.1305	818,312.920	9,901,923.938	1.140	251	SNG
	252		1600	71.989	71.954	91.4705	32.3905	818,312.351	9,901,933.052	1.220	252	SNG
	253		1600	72.887	72.878	90.5409	27.3207	818,318.664	9,901,931.384	2.314	253	SNG
	254		1600	66.434	66.432	90.2859	28.3652	818,317.880	9,901,937.915	2.902	254	PHN
	255		1600	67.792	67.753	91.5558	33.2604	818,312.112	9,901,937.353	1.176	255	SNG
	256		1600	66.841	66.824	91.1815	30.2441	818,315.761	9,901,937.747	1.941	256	SNG
	257		1600	59.203	59.190	91.1220	30.4103	818,316.410	9,901,945.359	2.216	257	SNG
	258		1600	61.706	61.662	92.0944	35.4625	818,310.702	9,901,943.840	1.134	258	SNG
	259		1600	53.840	53.821	91.3149	32.3449	818,315.326	9,901,950.940	2.024	259	SNG
	260		1600	55.518	55.472	92.1923	37.4347	818,310.184	9,901,950.323	1.212	260	SNG
	261		1600	47.028	47.003	91.5125	34.1307	818,315.088	9,901,957.903	1.938	261	SNG
	262		1600	48.820	48.768	92.3911	39.4912	818,310.125	9,901,957.291	1.202	262	SNG
	263		1600	42.588	42.526	93.0545	43.1518	818,309.465	9,901,964.071	1.162	263	SNG
	264		1600	40.735	40.709	92.0153	37.0932	818,314.226	9,901,964.529	2.018	264	SNG
	265		1600	34.136	34.100	92.3704	44.0244	818,311.883	9,901,972.159	1.903	265	SNG
	266		1600	34.627	34.548	93.5209	53.1648	818,306.694	9,901,974.113	1.125	266	SNG
	267		1600	27.884	27.847	92.5729	53.1653	818,310.030	9,901,979.924	2.023	267	SNG
	268		1600	30.695	30.614	94.0929	62.1323	818,304.711	9,901,980.216	1.236	268	SNG
	269		1600	22.618	22.583	93.1115	63.5719	818,309.218	9,901,986.911	2.204	269	SNG
	270		1600	26.477	26.380	94.5414	75.0145	818,303.218	9,901,987.692	1.199	270	SNG
	271		1600	22.362	22.215	96.3355	89.1554	818,303.625	9,901,994.984	0.905	271	SNG
	272		1600	16.364	16.311	94.3639	73.4719	818,311.333	9,901,993.670	2.147	272	SNG
	273		1600	19.795	19.705	95.2727	84.2331	818,306.665	9,901,994.512	1.579	273	SNG
	274		1600	14.504	14.504	90.0627	64.4849	818,314.304	9,901,993.193	3.435	274	A.SNG
	275		1600	11.972	11.907	95.5736	96.0721	818,312.526	9,902,000.534	2.219	275	A.SNG
	276		1600	20.805	20.684	96.1138	101.2246	818,303.666	9,901,999.760	1.217	276	A.SNG
	277		1600	8.674	8.670	91.4205	81.3410	818,316.530	9,901,999.499	3.204	277	A.SNG
	278		1600	22.605	22.466	96.2139	108.1830	818,301.518	9,902,002.073	0.958	278	SNG
	279		1600	8.269	8.151	99.4225	131.4747	818,316.160	9,902,006.644	2.068	279	SNG
	280		1600	23.112	22.970	96.2056	142.3524	818,303.838	9,902,015.270	0.906	280	SNG
	281		1600	16.262	16.144	96.5346	143.4213	818,309.954	9,902,012.215	1.509	281	SNG
	282		1600	4.659	4.659	89.5017	254.1004	818,327.503	9,902,007.022	3.475	282	A.SNG
	283		1600	9.717	9.695	93.5242	255.0238	818,331.495	9,902,010.093	2.805	283	A.SNG
	284		1600	6.925	6.766	102.1905	194.0444	818,322.797	9,902,010.750	1.985	284	SNG
	285		1600	10.788	10.654	99.0225	219.1357	818,326.798	9,902,014.325	1.767	285	SNG
	286		1600	11.863	11.728	98.3959	177.2736	818,318.761	9,902,014.618	1.674	286	LT
	287		1600	15.878	15.757	97.0348	194.2500	818,321.429	9,902,019.637	1.510	287	LT

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	288		1600	17.785	17.668	96.3354	169.4521	818,314.101	9,902,018.780	1.429	288	LT
	289		1600	25.942	25.862	94.3050	185.2920	818,315.933	9,902,028.679	1.420	289	LT
	290		1600	22.989	22.876	95.4027	167.4746	818,310.571	9,902,022.669	1.189	290	LT
	291		1600	34.399	34.308	94.1006	186.1659	818,313.786	9,902,036.859	0.962	291	LT
	292		1600	17.972	17.876	95.5500	231.5425	818,332.421	9,902,019.786	1.606	292	LT
	293		1600	17.806	17.765	93.5220	235.4634	818,333.403	9,902,019.081	2.260	293	TMBK
	294		1600	18.756	18.648	96.0856	214.0910	818,327.368	9,902,022.396	1.453	294	LT
	295		1600	17.700	17.652	94.1218	242.3226	818,335.033	9,902,017.769	2.164	295	LT
	296		1600	30.793	30.710	94.1217	204.0724	818,324.272	9,902,034.782	1.204	296	LT
	297		1600	32.344	32.266	93.5931	203.5424	818,324.169	9,902,036.338	1.210	297	LT
	298		1600	21.567	21.472	95.2337	233.3433	818,334.681	9,902,022.639	1.435	298	LT
	299		1600	38.801	38.729	93.2913	203.2246	818,323.868	9,902,042.803	1.102	299	LT
	300		1600	30.174	30.089	94.1753	222.2910	818,333.724	9,902,032.512	1.201	300	LT
	301		1600	40.408	40.345	93.1214	213.3805	818,331.050	9,902,043.779	1.204	301	LT
	302		1600	38.447	38.384	93.1724	222.3800	818,336.534	9,902,040.317	1.256	302	LT
	303		1600	47.883	47.818	92.5938	211.0845	818,330.324	9,902,051.458	0.961	303	LT
	304		1600	52.984	52.929	92.3648	221.5521	818,340.692	9,902,054.267	1.046	304	LT
	305		1600	51.680	51.621	92.4458	215.3850	818,334.828	9,902,054.523	0.983	305	LT
	306		1600	59.755	59.705	92.2110	223.5858	818,344.866	9,902,059.975	1.009	306	LT
	307		1600	48.011	47.960	92.3842	231.5422	818,346.770	9,902,046.227	1.246	307	LT
	308		1600	63.508	63.462	92.1022	228.5732	818,351.256	9,902,061.335	1.054	308	LT
	309		1600	49.470	49.423	92.2908	239.0508	818,352.712	9,902,044.227	1.317	309	LT
	310		1600	62.528	62.481	92.1249	233.2535	818,355.142	9,902,058.181	1.047	310	LT
	311		1600	41.097	41.034	93.1057	238.5156	818,347.692	9,902,037.502	1.180	311	LT
	312		1600	40.370	40.305	93.1434	244.1533	818,350.253	9,902,034.567	1.178	312	LT
	313		1600	63.581	63.540	92.0307	242.2910	818,363.940	9,902,053.407	1.185	313	LT
	314		1600	11.793	11.775	93.1022	273.0351	818,334.935	9,902,008.170	2.809	314	MAT
	315		1600	7.236	7.208	95.0454	254.1639	818,329.485	9,902,008.624	2.821	315	MAT
	316		1600	16.426	16.396	93.2822	250.4519	818,335.951	9,902,015.185	2.467	316	TGL
	317		1600	16.657	16.626	93.2822	252.5859	818,336.550	9,902,014.858	2.453	317	TGL
	318		1600	16.588	16.579	91.5450	251.3306	818,336.241	9,902,015.139	2.908	318	TGL
	319		1600	23.520	23.481	93.1849	245.0009	818,339.479	9,902,021.637	2.103	319	TGL
	320		1600	23.793	23.756	93.1124	246.3057	818,340.126	9,902,021.421	2.138	320	TGL
	321		1600	23.683	23.673	91.4212	245.4927	818,339.859	9,902,021.554	2.758	321	TGL
	322		1600	34.766	34.729	92.3916	245.0707	818,346.997	9,902,030.004	1.852	322	TGL
	323		1600	34.988	34.917	93.3916	243.5523	818,346.573	9,902,030.624	1.232	323	TGL
	324		1600	34.677	34.666	91.2708	244.4321	818,346.776	9,902,030.116	2.583	324	TGL
	325		1600	44.681	44.648	92.1123	246.1629	818,354.263	9,902,036.805	1.755	325	TGL
	326		1600	44.865	44.805	92.5812	245.0635	818,353.695	9,902,037.532	1.137	326	TGL
	327		1600	44.652	44.644	91.0606	245.5552	818,354.063	9,902,036.983	2.603	327	TGL
	328		1600	54.346	54.294	92.3037	246.4125	818,361.111	9,902,043.607	1.082	328	TGL
	329		1600	54.152	54.124	91.5042	247.2506	818,361.492	9,902,043.008	1.719	329	TGL
	330		1600	54.235	54.226	91.0245	247.1130	818,361.408	9,902,043.230	2.472	330	TGL
	331		1600	63.321	63.290	91.4724	249.1329	818,369.272	9,902,048.193	1.484	331	TGL
	332		1600	63.442	63.395	92.1243	248.3952	818,368.913	9,902,048.709	1.013	332	TGL
	333		1600	63.376	63.362	91.1203	248.5958	818,369.150	9,902,048.422	2.134	333	TGL
	334		1600	72.424	72.391	91.4433	251.4530	818,377.977	9,902,052.194	1.260	334	TGL
	335		1600	72.631	72.590	91.5509	251.1535	818,377.704	9,902,052.797	1.030	335	TGL
	336		1600	72.480	72.463	91.1452	251.3426	818,377.876	9,902,052.416	1.884	336	TGL
	337		1600	5.040	5.040	89.1935	323.0105	818,328.277	9,902,001.585	3.521	337	DTL
	338		1600	5.755	5.754	89.0452	58.4759	818,320.563	9,901,999.382	3.554	338	DTL
	339		1600	7.636	7.635	89.1728	9.5202	818,325.684	9,901,996.651	3.556	339	DTL
	340		1600	12.986	12.986	90.0532	49.3924	818,318.154	9,901,992.426	3.441	340	DTL
	341		1600	14.846	14.845	90.3229	20.5606	818,324.539	9,901,989.243	3.322	341	DTL
	342		1600	22.990	22.990	90.2100	40.5626	818,316.974	9,901,982.151	3.317	342	DTL
	343		1600	33.477	33.476	90.2101	35.2701	818,316.917	9,901,971.333	3.257	343	DTL
	344		1600	28.978	28.978	89.4652	24.5019	818,323.177	9,901,975.105	3.573	344	TMN
	345		1600	40.504	40.504	89.4757	25.1751	818,322.568	9,901,963.592	3.604	345	TMN
	346		1600	52.560	52.559	89.4339	25.4106	818,321.817	9,901,951.556	3.712	346	TMN
	347		1600	64.846	64.846	89.4719	26.0930	818,320.796	9,901,939.303	3.701	347	TMN
	348		1600	49.107	49.107	90.1122	28.3835	818,319.424	9,901,955.171	3.300	348	PHN
	CP1A		1600	27.184	27.179	88.5253	0.0000	818,329.844	9,901,990.340	3.524	CP1A	
C3		1.518			27.177			818,352.387	9,902,005.519	2.566	C3	
	349		1600	9.325	9.322	88.2736	260.1334	818,358.830	9,901,998.783	2.734	349	TMBK JMBT
	350		1600	14.697	14.692	88.3247	246.1640	818,364.802	9,901,997.663	2.857	350	TMBK JMBT
	351		1600	7.462	7.460	88.4717	216.4546	818,359.838	9,902,005.154	2.642	351	TMBK JMBT
	352		1600	13.954	13.952	88.5527	218.5154	818,366.287	9,902,004.325	2.746	352	TMBK JMBT
	353		1600	18.060	18.060	90.1801	189.2502	818,368.815	9,902,013.019	2.389	353	TMBK JMBT
	354		1600	11.894	11.894	90.0022	174.0140	818,361.508	9,902,013.153	2.482	354	DTL
	355		1600	18.072	18.070	90.4437	165.5924	818,364.486	9,902,018.941	2.249	355	PHN
	356		1600	28.754	28.750	90.5418	176.5243	818,375.325	9,902,022.852	2.030	356	PHN
	357		1600	26.423	26.416	91.1848	150.4203	818,364.275	9,902,029.109	1.878	357	PHN
	358		1600	31.416	31.408	91.1720	155.2956	818,368.818	9,902,032.286	1.777	358	PHN
	359		1600	38.332	38.322	91.1857	169.5436	818,379.932	9,902,032.161	1.603	359	PHN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	360		1600	25.993	25.986	91.1858	163.3631	818,368.970	9,902,025.526	1.887	360	PHN
	361		1600	47.649	47.635	91.2301	165.3758	818,384.061	9,902,041.097	1.333	361	DTL
	362		1600	34.702	34.695	91.1020	143.1807	818,363.881	9,902,038.255	1.774	362	DTL
	363		1600	55.074	55.062	91.1024	163.0342	818,387.118	9,902,048.246	1.356	363	DTL
	364		1600	54.964	54.949	91.1948	163.0245	818,387.035	9,902,048.167	1.208	364	DTL
	365		1600	28.141	28.133	91.2039	130.0335	818,355.379	9,902,033.493	1.824	365	DTL
	366		1600	22.376	22.368	91.3216	119.4002	818,350.714	9,902,027.824	1.883	366	DTL
	367		1600	16.853	16.848	91.2633	124.4822	818,352.637	9,902,022.365	2.059	367	DTL
	368		1600	16.236	16.232	91.1912	103.3212	818,346.724	9,902,020.731	2.110	368	DTL
	369		1600	8.055	8.051	91.4256	93.5044	818,348.348	9,902,012.484	2.243	369	DTL
	370		1600	8.027	8.023	91.4258	93.5336	818,348.367	9,902,012.463	2.243	370	DTL
	371		1600	8.783	8.781	91.2136	120.5620	818,351.925	9,902,014.287	2.275	371	DTL
	372		1600	7.167	7.167	90.2050	39.5753	818,345.259	9,902,006.270	2.440	372	DTL
	373		1600	6.254	6.252	88.4340	324.3914	818,350.176	9,901,999.670	2.623	373	DTL
	374		1600	9.559	9.559	89.2811	9.0454	818,343.715	9,902,001.499	2.572	374	DTL
	375		1551	60.381	60.380	90.2329	195.3247	818,409.677	9,902,024.586	2.120	375	C5
	376		1600	26.242	26.235	88.4306	236.3346	818,376.606	9,901,995.433	3.071	376	TMBK JMBT
	377		1600	33.977	33.973	89.0945	233.4353	818,384.356	9,901,994.024	2.980	377	TMBK JMBT
	378		1600	25.581	25.579	89.1523	225.1144	818,377.475	9,902,000.533	2.816	378	TMBK JMBT
	379		1600	32.753	32.751	89.2346	223.5903	818,384.637	9,901,999.815	2.829	379	TMBK JMBT
	380		1600	25.786	25.786	89.4714	213.2720	818,378.171	9,902,005.744	2.579	380	DTL
	381		1600	32.673	32.673	89.4710	215.0653	818,385.053	9,902,004.858	2.606	381	DTL
	382		1600	29.497	29.496	90.2417	196.4139	818,380.554	9,902,014.271	2.275	382	DTL
	383		1600	34.049	34.049	90.0651	201.2928	818,385.633	9,902,012.867	2.416	383	PHN
	384		1600	35.606	35.603	90.4234	182.2002	818,382.704	9,902,024.186	2.043	384	PHN
	385		1600	38.930	38.928	90.3524	189.3859	818,387.864	9,902,021.541	2.083	385	DTL
	386		1600	46.421	46.415	90.5333	180.4519	818,391.226	9,902,030.934	1.761	386	DTL
	387		1600	46.902	46.888	91.2334	166.2330	818,384.026	9,902,040.123	1.344	387	DTL
	388		1600	55.523	55.516	90.5607	176.5855	818,396.739	9,902,038.908	1.577	388	DTL
	389		1600	64.286	64.277	90.5741	172.5955	818,400.929	9,902,047.651	1.405	389	DTL
	C3		1518	60.381	60.380	89.3724	359.5959	818,352.387	9,902,005.519	2.566	C3	STN
C5		1.551			60.380			818,409.677	9,902,024.586	2.120	C5	
	390		1600	37.758	37.746	88.3327	322.3849	818,388.439	9,901,993.381	3.022	390	TMBK JMBT
	391		1600	36.059	36.047	88.3024	315.0613	818,393.482	9,901,992.382	3.011	391	TMBK JMBT
	392		1600	26.793	26.784	88.3228	319.3226	818,395.828	9,902,001.659	2.753	392	TMBK JMBT
	393		1600	29.598	29.590	88.3950	329.0953	818,390.359	9,902,002.172	2.761	393	PHN
	394		1600	17.258	17.254	88.4541	324.4437	818,399.453	9,902,010.687	2.444	394	DTL
	395		1600	23.466	23.461	88.5209	340.5124	818,391.076	9,902,010.287	2.534	395	DTL
	396		1600	19.726	19.726	89.4224	356.3133	818,391.372	9,902,017.234	2.172	396	PHN
	397		1600	13.495	13.488	88.1037	341.3053	818,398.889	9,902,016.489	2.501	397	PHN
	398		1600	9.026	9.026	90.1136	17.5234	818,400.651	9,902,024.502	2.041	398	DTL
	399		1600	16.703	16.702	90.4439	25.2540	818,393.100	9,902,026.627	1.854	399	DTL
	400		1600	12.129	12.125	91.2958	66.0937	818,401.525	9,902,033.561	1.754	400	DTL
	401		1600	18.124	18.118	91.3000	49.0606	818,394.097	9,902,033.834	1.593	401	DTL
	402		1600	21.387	21.379	91.3519	84.3122	818,401.020	9,902,044.134	1.478	402	DTL
	403		1600	25.453	25.445	91.2516	70.5359	818,394.184	9,902,044.771	1.440	403	DTL
	404		1600	35.115	35.103	91.3040	83.2757	818,394.874	9,902,056.415	1.145	404	TGL
	405		1600	32.951	32.939	91.3254	93.2927	818,401.197	9,902,056.415	1.181	405	TGL
	406		1600	33.601	33.574	92.1737	93.4340	818,401.168	9,902,057.064	0.726	406	TGL
	407		1600	35.604	35.581	92.0429	84.0000	818,394.974	9,902,056.987	0.782	407	TGL
	408		1600	35.264	35.263	90.3134	83.4804	818,394.994	9,902,056.646	1.747	408	TGL
	409		1600	33.162	33.161	90.3012	93.5348	818,401.367	9,902,056.689	1.780	409	TGL
	410		1600	31.189	31.175	91.4130	108.0306	818,409.483	9,902,055.761	1.150	410	TGL
	411		1600	30.746	30.736	91.2735	119.4112	818,415.688	9,902,054.728	1.288	411	TGL
	412		1600	31.830	31.799	92.3232	108.1042	818,409.549	9,902,056.384	0.659	412	TGL
	413		1600	31.358	31.337	92.0518	119.3403	818,415.742	9,902,055.331	0.929	413	TGL
	414		1600	31.470	31.468	90.3435	107.5911	818,409.445	9,902,056.054	1.755	414	TGL
	415		1600	31.005	31.004	90.2640	119.4048	818,415.737	9,902,054.992	1.831	415	TGL
	416		1600	23.599	23.589	91.3937	122.0249	818,415.239	9,902,047.510	1.387	416	TGL
	417		1600	23.299	23.289	91.3939	108.4509	818,409.817	9,902,047.875	1.396	417	TGL
	418		1600	14.398	14.384	92.3007	108.3209	818,409.709	9,902,038.970	1.443	418	TGL
	419		1600	15.390	15.379	92.0709	131.2040	818,415.670	9,902,038.750	1.502	419	TGL
	420		1600	12.994	12.987	91.5608	143.5815	818,417.230	9,902,035.150	1.632	420	PHN
	421		1600	8.209	8.203	92.1257	108.0512	818,409.631	9,902,032.789	1.754	421	DTL
	422		1600	2.772	2.772	89.4813	28.4923	818,406.950	9,902,025.087	2.081	422	DTL
	423		1600	5.611	5.610	89.1352	194.1126	818,415.272	9,902,024.999	2.147	423	DTL
	424		1600	8.376	8.362	86.4309	261.4616	818,413.426	9,902,017.111	2.551	424	DTL
	425		1600	11.141	11.125	86.5807	311.3440	818,405.299	9,902,014.358	2.660	425	PHN
	426		1600	14.805	14.802	88.4644	285.1633	818,410.485	9,902,009.806	2.387	426	DTL
	427		1600	21.443	21.436	88.3128	307.0518	818,402.811	9,902,004.279	2.623	427	DTL
	428		1600	23.355	23.347	88.2822	292.4424	818,407.913	9,902,001.306	2.694	428	DTL
	429		1600	35.161	35.149	88.3008	309.0653	818,397.248	9,901,991.708	2.990	429	TMBK JMBT
	430		1600	34.516	34.500	88.1538	299.5732	818,402.768	9,901,990.785	3.119	430	TMBK JMBT
	431		1600	34.853	34.840	88.2719	291.0227	818,408.076	9,901,989.782	3.011	431	TMBK JMBT

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	432		1600	36.358	36.345	88.2921	280.3909	818,414.581	9,901,988.573	3.030	432	TMBK JMBT
	433		1600	27.975	27.967	88.3536	273.4425	818,416.758	9,901,997.531	2.758	433	DTL
	434		1600	26.490	26.484	88.4357	287.5843	818,409.875	9,901,998.103	2.657	434	DTL
	435		1600	19.888	19.883	88.4518	273.0416	818,414.936	9,902,005.411	2.503	435	DTL
	436		1600	20.841	20.833	88.2657	260.1603	818,419.502	9,902,006.215	2.635	436	DTL
	437		1600	15.862	15.860	89.0203	235.4254	818,422.291	9,902,014.974	2.339	437	DTL
	438		1600	12.243	12.233	87.4359	243.3344	818,418.304	9,902,015.912	2.555	438	DTL
	439		1600	11.379	11.368	87.3153	208.1429	818,420.878	9,902,022.644	2.561	439	DTL
	440		1600	17.267	17.259	88.1634	206.3133	818,426.763	9,902,022.149	2.591	440	DTL
	441		1600	20.166	20.165	89.3006	180.4308	818,428.888	9,902,030.713	2.247	441	PHN
	442		1600	16.395	16.395	90.2150	166.5010	818,423.645	9,902,033.170	1.967	442	PHN
	443		1600	22.380	22.378	90.4026	153.2838	818,425.520	9,902,040.391	1.808	443	PHN
	444		1600	26.429	26.429	89.4814	167.0859	818,432.269	9,902,038.300	2.162	444	PHN
	445		1600	33.837	33.831	91.0517	145.1513	818,429.964	9,902,051.659	1.429	445	TGL
	446		1600	37.510	37.507	90.3943	156.3017	818,437.592	9,902,049.636	1.638	446	TGL
	447		1600	34.627	34.618	91.1910	145.0818	818,430.380	9,902,052.331	1.274	447	TGL
	448		1600	37.954	37.949	90.5459	156.1229	818,437.790	9,902,050.077	1.464	448	TGL
	449		1600	34.216	34.216	89.4914	145.2354	818,430.264	9,902,051.915	2.178	449	TGL
	450		1600	37.740	37.740	90.0306	156.1801	818,437.675	9,902,049.892	2.037	450	TGL
	451		1600	43.796	43.796	90.1016	167.1247	818,447.140	9,902,047.270	1.940	451	TGL
	452		1600	59.574	59.569	90.4629	168.5022	818,461.487	9,902,053.981	1.266	452	TGL
	453		1600	44.218	44.215	90.3654	166.5527	818,447.383	9,902,047.678	1.597	453	TGL
	454		1600	60.561	60.549	91.0935	168.3411	818,462.198	9,902,054.712	0.845	454	TGL
	455		1600	43.921	43.920	89.3317	166.5837	818,447.152	9,902,047.489	2.413	455	TGL
	456		1600	39.501	39.501	89.4740	172.4550	818,445.286	9,902,041.681	2.213	456	DTL
	457		1600	53.878	53.878	89.5718	178.2942	818,460.333	9,902,042.936	2.114	457	DTL
	458		1600	34.513	34.511	89.2330	182.5658	818,442.939	9,902,033.785	2.438	458	DTL
	459		1600	48.538	48.537	89.4245	186.0845	818,457.107	9,902,034.895	2.315	459	DTL
	460		1600	38.148	38.147	89.3228	196.0044	818,447.790	9,902,026.181	2.377	460	DTL
	461		1600	28.613	28.612	89.3903	194.4115	818,438.229	9,902,026.443	2.246	461	DTL
	462		1600	24.867	24.865	89.1758	210.2638	818,433.995	9,902,019.401	2.375	462	DTL
	463		1600	34.805	34.804	89.2840	200.0729	818,444.464	9,902,023.543	2.388	463	PHN
	464		1600	39.837	39.835	89.2837	205.2910	818,449.208	9,902,019.677	2.435	464	PHN
	465		1600	24.285	24.281	89.0113	239.1400	818,428.047	9,902,008.708	2.486	465	PHN
	466		1600	32.949	32.945	89.0841	222.4803	818,439.681	9,902,010.980	2.563	466	DTL
	467		1600	27.046	27.040	88.4653	248.2455	818,427.055	9,902,003.870	2.646	467	PHN
	468		1600	30.388	30.382	88.5221	231.3120	818,435.124	9,902,007.988	2.669	468	PHN
	469		1600	36.009	36.005	89.1037	228.4813	818,440.733	9,902,006.368	2.588	469	PHN
	470		1600	32.607	32.602	88.5758	259.0824	818,425.615	9,901,996.146	2.660	470	DTL
	471		1600	37.124	37.122	89.2054	244.2219	818,435.480	9,901,997.899	2.493	471	DTL
	472		1600	40.138	40.127	88.3922	268.1313	818,423.524	9,901,986.924	3.013	472	TMBK JMBT
	473		1600	42.811	42.799	88.3923	262.3129	818,428.360	9,901,986.080	3.075	473	TMBK JMBT
	474		1600	62.025	62.023	89.3056	209.3640	818,470.517	9,902,012.536	2.596	474	C6
	C5		1551	62.036	62.027	90.5744	359.5958	818,409.677	9,902,024.586	2.120	C5	STN
C6		1.485			62.023			818,470.517	9,902,012.536	2.596	C6	
	475		1600	38.386	38.371	91.3515	81.2707	818,472.295	9,902,050.866	1.417	475	TGL
	476		1600	37.347	37.334	91.3140	94.1019	818,480.416	9,902,048.533	1.485	476	TGL
	477		1600	38.172	38.144	92.1129	94.1616	818,480.695	9,902,049.297	1.021	477	TGL
	478		1600	38.950	38.929	91.5302	81.5444	818,472.634	9,902,051.407	1.200	478	TGL
	479		1600	38.596	38.596	90.0221	81.5147	818,472.582	9,902,051.076	2.454	479	TGL
	480		1600	37.636	37.636	90.0839	94.1137	818,480.510	9,902,048.821	2.386	480	TGL
	481		1600	29.159	29.153	91.0806	77.3232	818,469.879	9,902,041.682	1.903	481	DTL
	482		1600	27.047	27.041	91.1224	88.4201	818,475.168	9,902,039.174	1.911	482	PHN
	483		1600	24.037	24.025	91.4807	74.2812	818,468.705	9,902,036.492	1.725	483	PHN
	484		1600	22.484	22.480	91.0441	103.0718	818,479.777	9,902,033.020	2.058	484	PHN
	485		1600	16.914	16.911	91.0202	66.5939	818,467.059	9,902,029.089	2.175	485	PHN
	486		1600	18.471	18.468	91.0203	106.0911	818,479.004	9,902,028.938	2.147	486	PHN
	487		1600	16.659	16.655	91.1703	88.0157	818,473.191	9,902,028.975	2.107	487	DTL
	488		1600	19.576	19.573	91.0213	113.0144	818,481.528	9,902,028.718	2.126	488	PHN
	489		1600	12.441	12.441	89.5333	37.0618	818,462.243	9,902,021.826	2.504	489	DTL
	490		1600	27.247	27.239	91.2310	107.4755	818,483.724	9,902,036.359	1.822	490	PHN
	491		1600	11.849	11.848	90.3839	358.2519	818,458.836	9,902,014.517	2.347	491	DTL
	492		1600	9.082	9.082	90.1742	111.4047	818,475.448	9,902,020.162	2.434	492	DTL
	493		1600	10.661	10.661	89.4422	318.2641	818,461.318	9,902,007.149	2.529	493	PHN
	494		1600	5.660	5.660	89.3727	257.4703	818,470.617	9,902,006.877	2.518	494	DTL
	495		1600	18.443	18.442	90.3857	337.2326	818,452.440	9,902,008.889	2.272	495	DTL
	496		1600	13.359	13.358	89.1129	257.1045	818,470.894	9,901,999.183	2.669	496	PHN
	497		1600	23.132	23.131	90.3039	326.0827	818,449.171	9,902,003.626	2.274	497	PHN
	498		1600	18.550	18.549	89.2630	280.0053	818,463.804	9,901,995.244	2.661	498	PHN
	499		1600	19.365	19.365	90.1951	296.3722	818,458.642	9,901,997.240	2.369	499	DTL
	500		1600	23.198	23.198	90.1952	311.0458	818,452.166	9,901,998.345	2.347	500	DTL
	501		1600	27.988	27.988	89.4825	292.2735	818,455.003	9,901,989.241	2.575	501	DTL
	502		1600	30.712	30.712	89.5602	305.1427	818,448.260	9,901,991.373	2.516	502	DTL
	503		1600	35.596	35.594	89.2743	289.0755	818,452.540	9,901,981.815	2.815	503	TMBK JMBT

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	504		1600	38.569	38.568	89.3129	299.0234	818,445.600	9,901,983.098	2.801	504	TMBK JMBT
	505		1600	42.605	42.604	89.4159	307.1455	818,438.632	9,901,984.279	2.704	505	TMBK JMBT
	506		1600	33.852	33.850	89.1919	278.1418	818,459.250	9,901,980.616	2.881	506	TMBK JMBT
	507		1600	38.938	38.938	90.0508	319.1252	818,436.655	9,901,993.313	2.423	507	DTL
	508		1600	33.487	33.485	89.1832	267.5504	818,465.209	9,901,979.474	2.885	508	TMBK JMBT
	509		1600	25.485	25.485	89.4908	262.3555	818,468.827	9,901,987.107	2.561	509	DTL
	510		1600	26.220	26.219	89.3821	277.0340	818,462.300	9,901,987.637	2.646	510	DTL
	511		1600	21.704	21.704	89.5445	265.5006	818,467.858	9,901,990.995	2.514	511	DTL
	512		1600	17.920	17.920	89.3635	242.3446	818,475.522	9,901,995.329	2.603	512	PHN
	513		1600	11.489	11.488	89.1654	226.2509	818,476.669	9,902,002.833	2.625	513	DTL
	514		1600	20.564	20.562	89.1008	216.2924	818,484.357	9,901,997.329	2.779	514	DTL
	515		1600	11.824	11.824	89.4518	193.1938	818,481.274	9,902,007.627	2.531	515	DTL
	516		1600	19.169	19.169	89.3652	199.3709	818,486.979	9,902,002.714	2.610	516	DTL
	517		1600	15.814	15.814	89.5844	160.5503	818,486.182	9,902,014.703	2.486	517	PHN
	518		1600	24.162	24.160	89.1740	181.5524	818,494.046	9,902,007.049	2.778	518	PHN
	519		1600	22.655	22.654	90.3050	144.3810	818,491.187	9,902,021.808	2.277	519	DTL
	520		1600	28.556	28.556	89.4726	167.2300	818,499.065	9,902,013.234	2.585	520	DTL
	521		1600	33.622	33.622	90.0354	157.4732	818,503.521	9,902,018.953	2.443	521	DTL
	522		1600	28.575	28.574	90.3159	137.5355	818,495.036	9,902,027.208	2.215	522	DTL
	523		1600	39.831	39.830	90.1939	147.5031	818,507.714	9,902,026.780	2.253	523	DTL
	524		1600	34.180	34.173	91.0713	132.0618	818,497.920	9,902,032.954	1.812	524	PHN
	525		1600	45.331	45.330	90.2658	140.5423	818,510.582	9,902,033.740	2.125	525	PHN
	526		1600	43.147	43.132	91.3117	125.4655	818,502.055	9,902,041.959	1.335	526	TGL
	527		1600	51.837	51.831	90.5257	138.4543	818,515.389	9,902,038.478	1.682	527	TGL
	528		1600	45.139	45.101	92.2150	125.3755	818,503.414	9,902,043.389	0.619	528	TGL
	529		1600	52.473	52.461	91.1410	138.1351	818,515.689	9,902,039.213	1.349	529	TGL
	530		1600	44.139	44.132	91.0024	126.0526	818,502.948	9,902,042.467	1.705	530	TGL
	531		1600	52.078	52.078	89.5834	138.2704	818,515.461	9,902,038.846	2.502	531	TGL
Survey Date : March, 28 2019												
	J8		1518	294.435	294.435	89.5516	0.0000	818,838.146	9,901,959.022	3.146	J8	
J7		1.393			294.429			818,543.882	9,901,949.171	2.662	J7	
	1		1600	115.336	115.336	89.5550	50.5802	818,619.473	9,901,862.060	2.595	1	C8
	3		1600	5.548	5.535	86.0647	163.0439	818,538.643	9,901,947.384	2.831	3	PHN
	4		1600	6.330	6.314	94.0748	150.2954	818,538.494	9,901,945.880	1.999	4	B.SLRN
	5		1600	7.065	7.051	93.3739	145.2050	818,538.219	9,901,944.970	2.008	5	B.SLRN
	6		1600	7.069	7.069	89.2017	145.1627	818,538.210	9,901,944.952	2.537	6	B.SLRN
	7		1600	6.112	6.109	88.1759	151.5808	818,538.588	9,901,946.121	2.636	7	A.SLRN
	8		1600	13.845	13.843	88.5840	181.3250	818,530.039	9,901,949.082	2.702	8	PHN
	9		1600	19.715	19.714	89.1902	183.5313	818,524.180	9,901,949.849	2.690	9	PHN
	10		1600	18.506	18.506	89.3844	177.4514	818,525.425	9,901,947.827	2.569	10	A.SLRN
	11		1600	18.604	18.604	90.0641	174.2014	818,525.441	9,901,946.717	2.419	11	A.SLRN
	12		1600	18.561	18.554	91.3357	174.4305	818,525.474	9,901,946.846	1.948	12	B.SLRN
	13		1600	18.518	18.509	91.4603	176.5005	818,525.446	9,901,947.531	1.884	13	B.SLRN
	14		1600	29.405	29.405	89.4341	186.1027	818,514.558	9,901,951.354	2.595	14	PHN
	15		1600	32.911	32.911	89.5036	177.0714	818,511.086	9,901,946.419	2.545	15	TL
	16		1600	35.166	35.163	90.4220	182.3338	818,508.721	9,901,949.566	2.022	16	B.SLRN
	17		1600	33.614	33.611	90.4847	183.1106	818,510.280	9,901,949.915	1.978	17	B.SLRN
	18		1600	41.048	41.047	89.4145	187.0709	818,503.004	9,901,952.893	2.673	18	PHN
	19		1600	48.007	48.006	89.4145	187.2712	818,496.100	9,901,953.802	2.710	19	PHN
	20		1600	50.690	50.688	90.3136	186.0625	818,493.330	9,901,952.874	1.989	20	B.SLRN
	21		1600	52.450	52.448	90.2842	185.3615	818,491.542	9,901,952.544	2.017	21	B.SLRN
	22		1600	52.460	52.460	89.4840	185.3224	818,491.527	9,901,952.486	2.628	22	A.SLRN
	23		1600	50.561	50.561	89.5220	186.1140	818,493.462	9,901,952.942	2.568	23	A.SLRN
	24		1600	55.468	55.467	89.4258	188.1628	818,488.756	9,901,955.313	2.730	24	PHN
	25		1600	63.612	63.612	89.4633	188.4412	818,480.721	9,901,956.724	2.704	25	PHN
	26		1600	74.473	74.472	89.4442	190.3900	818,470.275	9,901,960.492	2.786	26	JL
	27		1600	74.918	74.917	89.4442	194.3605	818,470.793	9,901,965.621	2.788	27	JL
	28		1600	74.962	74.961	89.3940	195.0023	818,470.869	9,901,966.147	2.898	28	DTL
	29		1600	74.665	74.664	89.4310	192.4141	818,470.535	9,901,963.133	2.821	29	AS.JLN
	30		1600	59.904	59.903	89.4359	191.0946	818,484.757	9,901,958.795	2.734	30	JL
	31		1600	60.318	60.317	89.3822	195.5518	818,485.358	9,901,963.767	2.835	31	JL
	32		1600	59.560	59.559	89.4203	193.3534	818,485.555	9,901,961.224	2.766	32	AS.JLN
	33		1600	60.270	60.268	89.3206	196.1523	818,485.491	9,901,964.097	2.944	33	DTL
	34		1600	41.458	41.458	89.4628	192.0058	818,503.067	9,901,956.440	2.618	34	JL
	35		1600	42.193	42.192	89.3355	198.4515	818,503.499	9,901,961.392	2.775	35	JL
	36		1600	41.620	41.619	89.3708	195.3028	818,503.428	9,901,958.951	2.732	36	AS.JLN
	37		1600	42.179	42.176	89.1747	199.0935	818,503.602	9,901,961.673	2.973	37	DTL
	38		1600	34.824	34.821	89.1209	201.2551	818,511.061	9,901,960.802	2.940	38	DTL
	39		1600	34.983	34.981	89.2244	202.4824	818,511.200	9,901,961.644	2.834	39	DTL
	40		1600	34.743	34.741	89.2245	202.1947	818,511.323	9,901,961.288	2.831	40	DTL
	41		1600	33.816	33.815	89.4007	192.3147	818,510.645	9,901,955.399	2.651	41	JL
	42		1600	34.741	34.740	89.2807	201.0408	818,511.065	9,901,960.568	2.777	42	JL
	43		1600	33.925	33.924	89.3012	197.2505	818,511.192	9,901,958.237	2.749	43	AS.JLN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	44		1600	14.761	14.759	89.0747	196.5412	818,529.625	9,901,952.987	2.679	44	JL
	45		1600	21.419	21.418	89.2100	237.1808	818,531.715	9,901,966.797	2.694	45	JL
	46		1600	17.543	17.539	88.4732	223.0134	818,530.667	9,901,960.703	2.825	46	AS.JLN
	47		1600	10.059	10.051	87.4238	260.5238	818,541.957	9,901,959.036	2.857	47	AS.JLN
	48		1600	4.648	4.644	87.4317	213.2259	818,539.921	9,901,951.595	2.640	48	JL
	49		1600	15.462	15.460	89.0455	269.0421	818,543.115	9,901,964.612	2.703	49	JL
	50		1600	7.131	7.126	87.5032	354.3019	818,550.948	9,901,950.090	2.723	50	JL
	51		1600	16.561	16.559	89.0902	308.0403	818,553.650	9,901,962.542	2.701	51	JL
	52		1600	11.968	11.961	88.0508	319.0905	818,552.663	9,901,957.293	2.855	52	AS.JLN
	53		1600	26.859	26.858	89.2359	5.5920	818,570.672	9,901,947.264	2.736	53	JL
	54		1600	30.837	30.835	89.2400	342.5422	818,573.035	9,901,959.216	2.772	54	JL
	55		1600	28.585	28.582	89.0952	352.1934	818,572.064	9,901,953.933	2.872	55	AS.JLN
	56		1600	46.285	46.284	89.4058	9.3726	818,589.748	9,901,942.964	2.711	56	JL
	57		1600	48.922	48.921	89.3428	354.1513	818,592.366	9,901,955.695	2.818	57	JL
	58		1600	47.102	47.099	89.2355	0.3408	818,590.968	9,901,950.279	2.949	58	AS.JLN
	59		1600	69.183	69.182	89.4121	10.3649	818,612.269	9,901,938.711	2.830	59	JL
	60		1600	71.046	71.045	89.4607	0.0118	818,614.889	9,901,951.521	2.742	60	JL
	61		1600	69.816	69.815	89.3939	4.2550	818,613.630	9,901,946.110	2.868	61	AS.JLN
	62		1600	87.090	87.089	89.4716	11.0845	818,629.844	9,901,935.204	2.778	62	JL
	63		1600	87.709	87.708	89.4718	2.1103	818,631.589	9,901,948.763	2.779	63	JL
	64		1600	86.507	86.506	89.4339	6.1035	818,630.149	9,901,942.747	2.866	64	JL
	65		1600	86.684	86.683	89.4740	4.3903	818,630.467	9,901,945.037	2.766	65	JL
	66		1600	85.438	85.437	89.4625	13.4612	818,627.498	9,901,931.623	2.793	66	C9
	67		1600	82.983	82.982	90.1855	14.0155	818,625.016	9,901,931.756	1.998	67	B.SLRN
	68		1600	82.905	82.904	90.2034	13.3606	818,625.068	9,901,932.381	1.959	68	B.SLRN
	69		1600	83.001	83.001	89.5232	13.2738	818,625.204	9,901,932.562	2.635	69	A.SLRN
	70		1600	82.978	82.978	89.5232	14.0915	818,624.975	9,901,931.584	2.635	70	A.SLRN
	71		1600	77.454	77.453	89.4207	13.0047	818,619.887	9,901,934.265	2.858	71	PHN
	72		1600	66.207	66.206	90.2101	15.0251	818,608.357	9,901,934.131	2.050	72	B.SLRN
	73		1600	66.123	66.122	90.1724	14.1352	818,608.483	9,901,935.069	2.120	73	B.SLRN
	74		1600	66.093	66.093	89.5753	14.0433	818,608.492	9,901,935.251	2.496	74	A.SLRN
	75		1600	65.755	65.755	89.5617	15.2015	818,607.841	9,901,933.910	2.526	75	A.SLRN
	76		1600	65.659	65.659	89.5242	15.4016	818,607.658	9,901,933.561	2.594	76	LMP
	77		1600	63.987	63.987	89.4631	16.3950	818,605.761	9,901,932.884	2.706	77	TL
	78		1600	51.244	51.240	90.4325	15.1107	818,593.754	9,901,937.411	1.808	78	B.SLRN
	79		1600	51.506	51.503	90.3726	16.1022	818,593.799	9,901,936.489	1.894	79	B.SLRN
	80		1600	51.265	51.265	90.0345	15.0627	818,593.795	9,901,937.473	2.399	80	A.SLRN
	81		1600	51.331	51.331	89.5344	16.3022	818,593.558	9,901,936.242	2.549	81	A.SLRN
	82		1600	37.684	37.682	90.3318	17.0438	818,580.253	9,901,939.317	2.090	82	B.SLRN
	83		1600	37.643	37.642	90.2953	18.1806	818,579.995	9,901,938.553	2.128	83	B.SLRN
	84		1600	37.529	37.529	89.5939	16.4515	818,580.160	9,901,939.561	2.459	84	A.SLRN
	85		1600	37.574	37.574	89.5531	18.3813	818,579.867	9,901,938.361	2.504	85	A.SLRN
	86		1600	27.151	27.150	89.3648	16.2204	818,570.173	9,901,942.396	2.638	86	PMPLT PLS
	87		1600	21.633	21.629	91.0559	20.1412	818,564.415	9,901,942.373	2.040	87	B.SLRN
	88		1600	21.924	21.915	91.3902	23.3036	818,564.259	9,901,941.106	1.824	88	B.SLRN
	89		1600	21.543	21.543	90.0036	19.1656	818,564.443	9,901,942.741	2.451	89	A.SLRN
	90		1600	21.830	21.830	89.3840	24.1920	818,564.064	9,901,940.851	2.590	90	A.SLRN
	91		1600	19.058	19.051	88.2842	32.4736	818,560.233	9,901,939.394	2.961	91	TL
	92		1600	17.092	17.090	89.0530	35.3943	818,558.093	9,901,939.678	2.726	92	TL
	93		1600	9.452	9.439	92.5919	36.5611	818,551.612	9,901,943.754	1.962	93	B.SLRN
	94		1600	9.973	9.956	93.1859	42.2553	818,551.451	9,901,942.703	1.878	94	B.SLRN
	95		1600	10.021	10.021	90.0559	44.0203	818,551.315	9,901,942.450	2.438	95	A.SLRN
	96		1600	9.173	9.173	90.0732	36.3717	818,551.423	9,901,943.948	2.435	96	A.SLRN
	97		1600	19.145	19.143	89.1148	64.1254	818,552.781	9,901,932.222	2.723	97	PHN
	98		1600	17.993	17.989	88.5022	116.0339	818,536.524	9,901,932.755	2.819	98	PHN
	99		1600	42.216	42.215	89.3155	104.3715	818,534.599	9,901,907.990	2.800	99	PHN
	100		1600	69.360	69.360	89.5552	154.0418	818,482.553	9,901,916.774	2.538	100	PHN
	101		1600	64.844	64.844	89.5553	151.1415	818,488.114	9,901,916.085	2.533	101	PHN
	102		1600	61.002	61.002	89.5206	148.0806	818,493.180	9,901,915.252	2.595	102	PHN
	103		1600	71.883	71.883	90.0740	151.5941	818,481.581	9,901,913.314	2.295	103	BG
	104		1600	45.577	45.576	89.4243	110.2308	818,529.444	9,901,905.942	2.684	104	BG
	105		1600	68.941	68.941	90.0348	169.5530	818,476.446	9,901,934.846	2.379	105	C10
	J7		1393	85.390	85.389	90.1510	359.5959	818,543.882	9,901,949.171	2.662	J7	STN
C9		1.505			85.437			818,627.498	9,901,931.623	2.793	C9	
	106		1393	7.162	7.159	88.1516	160.4356	818,634.597	9,901,932.546	3.123	106	PHN
	107		1600	13.031	13.014	87.0257	104.2100	818,633.246	9,901,943.298	3.368	107	PHN
	108		1600	6.986	6.951	95.4626	178.2519	818,634.337	9,901,930.383	1.995	108	B.SLRN
	109		1600	6.978	6.943	95.4354	171.5414	818,634.426	9,901,931.168	2.001	109	B.SLRN
	110		1600	6.947	6.947	90.1714	179.2921	818,634.309	9,901,930.256	2.663	110	B.SLRN
	111		1600	6.929	6.928	89.1718	169.5449	818,634.423	9,901,931.409	2.784	111	B.SLRN
	112		1600	24.703	24.700	89.0516	179.0753	818,651.745	9,901,926.916	3.091	112	TL
	113		1600	25.745	25.740	91.1024	174.4906	818,653.063	9,901,928.632	2.170	113	B.SLRN
	114		1600	25.883	25.878	91.1027	176.4106	818,653.089	9,901,927.781	2.167	114	B.SLRN
	115		1600	25.819	25.819	89.4911	174.2009	818,653.166	9,901,928.839	2.779	115	A.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	116		1600	25.871	25.871	89.3903	177.0543	818,653.053	9,901,927.599	2.855	116	A.SLRN
	117		1600	49.397	49.395	90.2924	175.3912	818,676.470	9,901,925.170	2.275	117	B.SLRN
	118		1600	49.411	49.409	90.3407	176.3506	818,676.371	9,901,924.372	2.207	118	B.SLRN
	119		1600	49.374	49.374	89.5240	176.4044	818,676.325	9,901,924.298	2.803	119	A.SLRN
	120		1600	49.347	49.347	89.4853	175.2051	818,676.455	9,901,925.437	2.857	120	A.SLRN
	121		1600	74.250	74.249	89.3929	177.0626	818,700.840	9,901,920.059	3.141	121	TL
	122		1600	74.629	74.628	90.2002	176.1636	818,701.376	9,901,921.069	2.263	122	B.SLRN
	123		1600	74.632	74.631	90.2002	175.3823	818,701.491	9,901,921.891	2.263	123	B.SLRN
	124		1600	74.516	74.515	89.4601	176.2255	818,701.245	9,901,920.950	3.001	124	A.SLRN
	125		1600	74.573	74.573	89.4908	175.2449	818,701.471	9,901,922.190	2.933	125	A.SLRN
	126		1600	101.224	101.223	89.4743	174.3715	818,728.076	9,901,920.210	3.059	126	PHN
	127		1600	101.124	101.123	90.1512	175.2246	818,727.816	9,901,918.892	2.250	127	B.SLRN
	128		1600	101.055	101.054	90.1512	174.5611	818,727.843	9,901,919.676	2.251	128	B.SLRN
	129		1600	100.980	100.980	89.4934	174.4904	818,727.794	9,901,919.893	3.004	129	B.SLRN
	130		1600	100.786	100.786	89.4933	175.2743	818,727.463	9,901,918.790	3.004	130	A.SLRN
	131		1600	101.950	101.950	89.5302	177.2553	818,728.112	9,901,915.175	2.904	131	DTL
	132		1600	103.043	103.043	90.0007	181.2126	818,727.814	9,901,908.075	2.694	132	DTL
	133		1600	91.165	91.165	89.5823	179.4244	818,716.812	9,901,913.346	2.740	133	DTL
	134		1600	92.360	92.360	89.5826	184.2916	818,716.127	9,901,905.637	2.740	134	DTL
	135		1600	77.951	77.951	90.0027	180.4532	818,703.568	9,901,914.602	2.687	135	DTL
	136		1600	79.011	79.011	89.5601	185.3719	818,702.862	9,901,907.897	2.789	136	DTL
	137		1600	58.855	58.855	89.5023	180.5647	818,684.890	9,901,918.584	2.862	137	DTL
	138		1600	60.566	60.566	90.0223	188.1520	818,684.372	9,901,910.800	2.656	138	DTL
	139		1600	42.484	42.484	89.5324	182.1234	818,668.708	9,901,921.300	2.779	139	DTL
	140		1600	44.351	44.346	90.5122	192.0446	818,668.031	9,901,913.633	2.035	140	DTL
	141		1600	30.715	30.715	89.5514	184.5350	818,656.909	9,901,922.771	2.740	141	DTL
	142		1600	32.699	32.695	90.5243	196.5833	818,656.141	9,901,915.857	2.196	142	DTL
	143		1600	19.586	19.586	89.5719	189.5534	818,645.686	9,901,924.356	2.713	143	DTL
	144		1600	21.780	21.774	91.2052	204.1438	818,645.092	9,901,918.794	2.185	144	DTL
	145		1600	7.998	7.998	89.3055	202.0351	818,634.135	9,901,927.160	2.765	145	DTL
	146		1600	14.316	14.310	91.4333	236.1555	818,632.831	9,901,918.344	2.266	146	DTL
	147		1600	6.329	6.322	87.2353	316.3230	818,622.113	9,901,928.309	2.985	147	DTL
	148		1600	15.043	15.034	91.5901	290.1204	818,619.519	9,901,918.881	2.177	148	DTL
	149		1600	16.823	16.823	89.5522	341.5442	818,610.774	9,901,929.795	2.720	149	DTL
	150		1600	21.757	21.750	91.2641	304.4329	818,611.701	9,901,916.672	2.149	150	PHN
	151		1600	28.141	28.141	89.4752	348.1443	818,599.357	9,901,931.671	2.797	151	DTL
	152		1600	28.843	28.843	90.1330	333.1914	818,599.615	9,901,924.242	2.584	152	DTL
	153		1600	30.986	30.986	89.4844	337.0729	818,597.084	9,901,925.698	2.799	153	PHN
	154		1600	39.695	39.695	89.5953	350.5142	818,587.847	9,901,933.503	2.699	154	DTL
	155		1600	32.776	32.776	90.0037	334.3413	818,595.638	9,901,923.928	2.692	155	BG
	156		1600	40.875	40.875	89.4938	338.5859	818,587.145	9,901,925.113	2.821	156	BG
	157		1600	35.633	35.633	90.0058	324.3953	818,594.816	9,901,917.424	2.688	157	BG
	158		1600	40.500	40.499	90.2101	314.2703	818,593.803	9,901,909.154	2.450	158	BG
	159		1600	45.159	45.158	90.1620	308.1522	818,592.849	9,901,902.661	2.483	159	BG
	160		2000	47.253	47.252	89.3404	321.2853	818,585.272	9,901,910.417	2.654	160	BG
	161		2000	41.294	41.294	90.1146	302.5218	818,598.439	9,901,902.283	2.156	161	DTL
	162		1600	38.089	38.089	90.1258	320.1731	818,593.822	9,901,913.826	2.554	162	DTL
	163		1600	36.170	36.170	90.1744	308.4601	818,599.540	9,901,908.674	2.511	163	DTL
	164		1600	31.241	31.239	90.3409	292.3439	818,609.835	9,901,905.856	2.387	164	DTL
	165		1600	24.897	24.892	91.0900	300.3230	818,610.715	9,901,913.239	2.198	165	DTL
	166		1600	19.237	19.233	91.1048	273.3255	818,622.390	9,901,913.080	2.301	166	DTL
	167		1600	27.423	27.417	91.1049	269.3709	818,622.045	9,901,904.753	2.133	167	DTL
	168		1600	19.894	19.890	91.0813	242.4523	818,632.777	9,901,912.446	2.303	168	DTL
	169		1600	28.332	28.327	91.0239	245.4128	818,633.608	9,901,903.962	2.181	169	DTL
	170		1600	34.313	34.309	90.5240	223.2838	818,647.014	9,901,903.405	2.172	170	DTL
	171		1600	29.022	29.016	91.1132	213.1803	818,647.960	9,901,911.050	2.094	171	DTL
	172		1600	37.996	37.992	90.4702	204.3459	818,658.063	9,901,909.058	2.178	172	DTL
	173		1600	41.955	41.951	90.4659	212.1338	818,657.634	9,901,902.439	2.124	173	DTL
	174		1600	51.417	51.415	90.3354	203.5409	818,669.222	9,901,901.580	2.191	174	DTL
	175		1600	47.825	47.822	90.3806	197.4606	818,669.070	9,901,907.986	2.168	175	DTL
	176		1600	62.460	62.460	90.0014	198.3933	818,681.308	9,901,899.910	2.693	176	DTL
	177		1600	60.000	60.000	90.0015	193.2456	818,681.757	9,901,906.011	2.693	177	DTL
	178		1600	71.046	71.046	90.0015	190.2047	818,693.277	9,901,904.779	2.692	178	DTL
	179		1600	72.512	72.512	90.0458	195.2854	818,691.913	9,901,898.326	2.593	179	DTL
	180		1600	82.560	82.560	89.5841	188.2654	818,704.929	9,901,902.978	2.729	180	DTL
	181		1600	83.605	83.605	89.5827	191.3737	818,704.180	9,901,898.312	2.735	181	DTL
	182		1600	94.199	94.199	89.5827	186.1650	818,717.018	9,901,902.305	2.740	182	DTL
	183		1600	95.445	95.445	89.5637	189.0343	818,716.654	9,901,897.551	2.792	183	DTL
	184		1600	106.070	106.070	89.5638	186.4735	818,728.000	9,901,897.710	2.801	184	DTL
	185		1600	105.498	105.498	89.5638	184.3158	818,728.711	9,901,901.861	2.801	185	DTL
	186		1600	115.156	115.156	89.5639	183.3255	818,738.518	9,901,901.039	2.810	186	DTL
	187		1600	116.259	116.259	89.5646	186.1415	818,738.010	9,901,895.522	2.807	187	DTL
	188		1600	123.196	123.196	89.5646	183.1458	818,746.439	9,901,899.525	2.813	188	PGR SENG
	189		1600	124.364	124.364	89.5255	185.5846	818,745.887	9,901,893.538	2.954	189	PGR SENG
	190		1600	124.960	124.956	89.3216	189.4938	818,743.614	9,901,885.461	3.706	190	PGR SENG

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	191		1600	122.264	122.264	89.5527	180.3110	818,746.922	9,901,905.426	2.859	191	PGR SENG
	192		1600	121.575	121.575	89.5526	176.4630	818,747.697	9,901,913.384	2.859	192	PGR SENG
	193		1600	113.912	113.912	89.5358	191.3231	818,732.045	9,901,886.392	2.898	193	PGR SENG
	194		1600	102.644	102.644	89.5400	193.2511	818,720.317	9,901,887.801	2.877	194	PGR SENG
	195		1600	94.119	94.119	89.5645	195.1920	818,711.227	9,901,888.637	2.787	195	PGR SENG
	196		1600	85.000	85.000	89.5523	197.4751	818,701.368	9,901,889.573	2.812	196	PGR SENG
	197		1600	75.019	75.019	90.0018	201.1723	818,690.312	9,901,890.608	2.691	197	PGR SENG
	198		1600	67.172	67.172	90.0017	204.4458	818,681.423	9,901,891.571	2.692	198	PGR SENG
	199		1600	57.072	57.071	90.1934	211.0947	818,669.226	9,901,892.689	2.373	199	PGR SENG
	200		1600	49.847	49.846	90.2225	217.5431	818,659.697	9,901,893.572	2.373	200	PGR SENG
	201		1600	43.095	43.093	90.3325	227.2350	818,649.531	9,901,894.588	2.279	201	PGR SENG
	202		1600	38.002	38.000	90.3832	239.2318	818,639.718	9,901,895.641	2.272	202	PGR SENG
	203		1600	35.020	35.018	90.3832	254.4751	818,629.544	9,901,896.665	2.305	203	PGR SENG
	204		1600	34.816	34.815	90.3001	270.3644	818,619.983	9,901,897.629	2.394	204	PGR SENG
	205		1600	36.834	36.832	90.3321	284.0111	818,611.425	9,901,898.482	2.340	205	PGR SENG
	206		1600	39.190	39.187	90.4137	292.0111	818,605.657	9,901,899.086	2.223	206	PGR SENG
	J7		1393	115.298	115.298	90.0613	0.0000	818,543.882	9,901,949.171	2.662	J7	STN
C8		1.481			115.336			818,619.473	9,901,862.060	2.595	C8	
	207		1600	9.854	9.834	86.1852	101.2923	818,628.035	9,901,866.896	3.109	207	PHN
	208		1600	19.515	19.515	89.5814	43.0706	818,620.212	9,901,881.561	2.486	208	PHN
	209		1600	28.338	28.338	90.0158	24.4357	818,611.559	9,901,889.270	2.460	209	DTL
	210		1600	31.606	31.606	90.0305	14.0502	818,605.190	9,901,890.255	2.447	210	DTL
	211		1600	19.957	19.957	89.5125	17.2705	818,611.516	9,901,880.362	2.526	211	DTL
	212		1600	24.602	24.602	89.5119	4.3059	818,604.862	9,901,881.853	2.538	212	DTL
	213		1600	12.899	12.899	90.2542	357.5620	818,610.675	9,901,871.492	2.379	213	DTL
	214		1600	18.320	18.319	89.3131	345.4742	818,604.439	9,901,872.527	2.628	214	DTL
	215		1600	15.900	15.899	89.1948	327.1415	818,604.213	9,901,866.519	2.662	215	DTL
	216		1600	8.635	8.634	89.0038	334.2405	818,611.553	9,901,865.496	2.625	216	DTL
	217		1600	10.436	10.436	90.2309	277.2754	818,610.770	9,901,856.302	2.406	217	DTL
	218		1600	16.439	16.438	89.1647	290.3846	818,604.057	9,901,856.356	2.682	218	DTL
	219		1600	17.430	17.430	89.5918	250.5910	818,610.749	9,901,846.971	2.479	219	DTL
	220		1600	18.821	18.820	89.3111	272.5507	818,604.649	9,901,850.465	2.634	220	TL
	221		1600	20.387	20.387	89.5828	266.2354	818,604.945	9,901,847.757	2.485	221	TL
	222		1600	24.010	24.007	90.5714	242.5818	818,610.472	9,901,839.805	2.076	222	DTL
	223		1600	24.914	24.912	90.4234	274.4543	818,599.367	9,901,847.351	2.167	223	BG
	224		1600	34.322	34.322	89.5142	238.2222	818,609.197	9,901,829.313	2.559	224	DTL
	225		1600	27.340	27.339	89.2607	260.0427	818,602.223	9,901,840.851	2.745	225	BG
	226		1600	29.165	29.158	88.4502	264.4623	818,599.283	9,901,841.023	3.112	226	BG
	227		1600	42.907	42.906	89.4301	235.5307	818,608.415	9,901,820.603	2.688	227	DTL
	228		1600	30.612	30.609	89.0955	255.0844	818,602.271	9,901,836.743	2.922	228	BG
	229		1600	35.821	35.817	89.0956	249.4726	818,602.196	9,901,830.685	2.997	229	BG
	230		1600	51.612	51.611	89.4341	233.3942	818,608.117	9,901,811.714	2.721	230	DTL
	231		1600	39.150	39.148	89.2132	247.0212	818,602.259	9,901,826.900	2.914	231	BG
	232		1600	40.928	40.926	89.3022	245.5130	818,602.237	9,901,824.940	2.829	232	BG
	233		1600	59.995	59.994	89.4210	233.1501	818,606.693	9,901,803.443	2.787	233	DTL
	234		1600	49.437	49.435	89.3131	241.3209	818,602.092	9,901,815.781	2.885	234	BG
	235		1600	64.632	64.631	89.4131	232.0016	818,607.081	9,901,798.628	2.823	235	PGR SENG
	236		1600	65.228	65.227	89.4122	235.2444	818,603.184	9,901,798.900	2.829	236	TMBK
	237		1600	50.600	50.596	89.1411	239.3248	818,603.338	9,901,814.106	3.150	237	TMBK
	238		1600	58.005	58.003	89.3404	237.0533	818,603.347	9,901,806.344	2.913	238	TMBK
	239		1600	64.497	64.496	89.3910	226.4400	818,612.962	9,901,797.894	2.867	239	PGR SENG
	240		1600	64.544	64.542	89.3603	221.5856	818,618.311	9,901,797.528	2.925	240	PGR SENG
	241		1600	55.320	55.319	89.3630	225.1302	818,615.357	9,901,806.895	2.854	241	DTL
	242		1600	55.642	55.641	89.3627	219.0048	818,621.354	9,901,806.451	2.857	242	DTL
	243		1600	46.442	46.441	89.4148	217.1821	818,622.425	9,901,815.713	2.722	243	DTL
	244		1600	47.739	47.738	89.3701	225.1826	818,615.847	9,901,814.460	2.795	244	DTL
	245		1600	36.864	36.862	89.2844	214.4420	818,623.462	9,901,825.414	2.811	245	DTL
	246		1600	36.174	36.173	89.2846	225.4421	818,616.453	9,901,826.014	2.804	246	DTL
	247		1600	28.280	28.279	90.2908	211.4217	818,624.017	9,901,834.148	2.236	247	DTL
	248		1600	28.014	28.013	90.2910	226.5018	818,616.600	9,901,834.195	2.238	248	DTL
	249		1600	18.720	18.718	90.5448	225.3637	818,617.953	9,901,843.404	2.177	249	DTL
	250		1600	19.951	19.949	90.4845	206.1859	818,624.513	9,901,842.758	2.193	250	DTL
	251		1600	9.902	9.901	90.5710	224.1357	818,618.907	9,901,852.176	2.311	251	DTL
	252		1600	12.568	12.567	89.2611	196.3726	818,624.650	9,901,850.608	2.599	252	DTL
	253		1600	5.726	5.726	89.2037	185.3913	818,622.782	9,901,857.387	2.541	253	PHN
	254		1600	1.781	1.779	87.1029	296.2459	818,617.751	9,901,861.614	2.564	254	PHN
	255		1600	13.039	13.031	87.5631	81.2243	818,627.924	9,901,871.979	2.944	255	DTL
	256		1600	11.121	11.121	89.5748	44.3352	818,620.174	9,901,873.159	2.483	256	DTL
	257		1600	21.583	21.582	90.2337	65.5824	818,628.602	9,901,881.617	2.328	257	DTL
	258		1600	27.773	27.772	90.2337	47.1211	818,622.498	9,901,889.667	2.285	258	DTL
	259		1600	28.311	28.311	90.0710	62.4006	818,629.950	9,901,888.361	2.417	259	DTL
	260		1600	31.648	31.648	90.0708	78.1422	818,638.647	9,901,887.239	2.410	260	DTL
	261		1600	37.985	37.985	90.0254	90.1351	818,648.263	9,901,886.840	2.444	261	DTL
	262		1600	24.105	24.105	90.0005	89.0203	818,637.411	9,901,878.163	2.475	262	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	263		1600	33.913	33.900	88.2352	99.3835	818,648.437	9,901,879.675	3.424	263	T.BNDR
	264		1600	29.095	29.087	88.4001	114.4049	818,647.396	9,901,870.209	3.153	264	DTL
	265		1600	20.428	20.426	89.1520	102.1609	818,637.393	9,901,871.863	2.741	265	DTL
	266		1600	16.783	16.769	87.4128	126.1838	818,636.188	9,901,863.416	3.152	266	DTL
	267		1600	11.180	11.157	86.1800	131.4045	818,630.629	9,901,861.918	3.197	267	BG
	268		1600	25.383	25.376	88.3847	124.1943	818,644.680	9,901,864.986	3.075	268	BG
	269		1600	19.100	19.089	88.0547	192.5956	818,628.421	9,901,845.197	3.110	269	BG
	270		1600	29.289	29.283	88.4809	126.0442	818,648.650	9,901,864.547	3.088	270	BG
	271		1600	24.819	24.809	88.2025	133.4217	818,644.253	9,901,860.868	3.195	271	BG
	272		1600	29.170	29.164	88.4820	134.0901	818,648.592	9,901,860.432	3.084	272	BG
	273		1600	43.462	43.458	89.1149	135.0617	818,662.817	9,901,858.912	3.085	273	BG
	274		1600	43.947	43.941	89.0426	127.2243	818,663.329	9,901,864.797	3.186	274	DTL
	275		1600	35.353	35.353	89.4332	114.4515	818,653.423	9,901,871.921	2.645	275	PHN
	276		1600	34.040	34.034	88.5322	122.4605	818,653.161	9,901,866.904	3.136	276	DTL
	277		1600	40.433	40.432	89.3653	117.3103	818,658.799	9,901,871.453	2.748	277	PHN
	278		1600	46.106	46.105	89.3351	119.4812	818,664.708	9,901,870.973	2.827	278	PHN
	279		1600	40.287	40.287	90.0725	102.2328	818,654.858	9,901,881.320	2.389	279	PHN
	280		1600	45.245	45.245	89.5624	97.4314	818,657.320	9,901,886.854	2.523	280	DTL
	281		1600	51.972	51.971	89.3512	122.0134	818,670.815	9,901,870.122	2.851	281	PHN
	282		1600	55.955	55.950	89.1442	129.5631	818,675.415	9,901,863.045	3.213	282	C8A
	283		1600	32.580	32.571	88.4015	99.4951	818,647.357	9,901,878.894	3.232	283	T.BNDR
	284		1600	34.019	34.011	88.4310	101.3432	818,649.111	9,901,878.743	3.236	284	T.BNDR
	285		1600	33.681	33.673	88.4606	97.3117	818,647.576	9,901,880.611	3.200	285	T.BNDR
	286		1600	50.702	50.701	89.3956	198.2858	818,638.849	9,901,815.207	2.772	286	C8B
	287		1600	31.116	31.114	89.2050	284.4120	818,591.571	9,901,848.293	2.830	287	BG
	288		1600	25.041	25.039	89.1852	288.4842	818,596.280	9,901,852.624	2.775	288	BG
	289		1600	28.978	28.975	89.1420	291.2646	818,592.161	9,901,852.386	2.861	289	BG
	290		1600	25.892	25.892	89.5059	353.5108	818,600.507	9,901,879.686	2.544	290	BG
	J7		1600	68.948	68.948	89.5127	0.0001	818,543.882	9,901,949.171	2.662	J7	STN
C10		1.461			68.941			818,476.446	9,901,934.846	2.379	C10	
	291		1600	10.037	9.986	84.1228	143.5702	818,469.769	9,901,927.421	3.253	291	BG
	292		1600	28.626	28.621	88.5250	212.3210	818,449.645	9,901,944.890	2.799	292	BG
	293		1600	13.800	13.762	85.4453	159.1026	818,464.880	9,901,927.388	3.263	293	BG
	294		1600	14.595	14.587	88.0353	161.2655	818,463.883	9,901,927.433	2.733	294	BG
	295		1600	28.151	28.146	88.5823	179.3001	818,448.966	9,901,928.758	2.744	295	BG
	296		1600	21.530	21.521	88.2004	181.2412	818,455.291	9,901,930.892	2.866	296	DTL
	297		1600	21.409	21.405	88.5107	196.0002	818,455.093	9,901,936.342	2.669	297	DTL
	298		1600	14.583	14.576	88.1215	177.2531	818,462.338	9,901,931.180	2.697	298	DTL
	299		1600	14.168	14.163	88.3153	198.2032	818,462.369	9,901,936.413	2.603	299	DTL
	300		1600	7.041	7.024	86.0012	201.5223	818,469.526	9,901,936.052	2.731	300	DTL
	301		1600	7.728	7.725	88.2128	162.2359	818,469.728	9,901,931.032	2.461	301	DTL
	302		1600	10.713	10.712	89.1129	240.0337	818,469.287	9,901,942.815	2.391	302	DTL
	303		1600	17.453	17.451	89.1131	257.1023	818,469.120	9,901,950.686	2.486	303	DTL
	304		1600	22.813	22.810	89.0353	238.0039	818,460.606	9,901,951.260	2.612	304	DTL
	305		1600	17.464	17.455	88.1110	220.0030	818,461.036	9,901,943.045	2.793	305	DTL
	306		1600	28.947	28.945	89.1807	227.1025	818,452.788	9,901,951.523	2.592	306	DTL
	307		1600	23.647	23.645	89.1613	213.1312	818,454.405	9,901,943.408	2.541	307	DTL
	308		1600	35.732	35.726	88.5856	220.5052	818,445.155	9,901,952.088	2.874	308	DTL
	309		1600	14.943	14.936	88.1256	113.3747	818,473.433	9,901,920.218	2.705	309	PHN
	310		1600	16.965	16.961	88.4401	268.4313	818,472.552	9,901,951.354	2.615	310	TL
	311		1600	16.894	16.865	86.3811	123.5828	818,470.133	9,901,919.207	3.231	311	BG
	312		1600	18.743	18.739	88.4805	116.0157	818,471.900	9,901,916.667	2.632	312	BG
	313		1600	34.145	34.144	89.2944	96.2548	818,479.755	9,901,900.863	2.540	313	BG
	314		1600	39.282	39.280	89.2920	111.2016	818,470.067	9,901,896.087	2.590	314	BG
	315		1600	39.466	39.465	89.3822	108.4648	818,471.781	9,901,895.658	2.488	315	BG.KMPS
	316		1600	34.366	34.365	89.3525	102.0351	818,476.403	9,901,900.481	2.486	316	DTL
	317		1600	57.152	57.152	89.4814	99.5816	818,478.462	9,901,877.730	2.435	317	C10A
	318		1600	21.149	21.147	89.1109	105.1804	818,475.225	9,901,913.735	2.540	318	DTL
	319		1600	14.242	14.239	88.5234	104.5232	818,475.729	9,901,920.625	2.519	319	DTL
	320		1600	5.926	5.915	86.3501	110.1953	818,475.588	9,901,928.993	2.593	320	DTL
	321		1600	10.591	10.588	88.4255	51.5540	818,484.564	9,901,928.049	2.477	321	DTL
	322		1600	16.450	16.448	89.1142	73.4256	818,484.238	9,901,920.361	2.471	322	DTL
	323		1600	18.416	18.415	89.2730	37.2530	818,493.076	9,901,926.938	2.414	323	DTL
	324		1600	21.578	21.577	89.2205	54.2913	818,492.355	9,901,920.271	2.478	324	DTL
	325		1600	29.002	29.000	89.2209	43.5241	818,501.070	9,901,919.528	2.559	325	DTL
	326		1600	27.080	27.079	89.2505	32.0912	818,501.865	9,901,925.514	2.515	326	DTL
	327		1600	37.262	37.261	89.3332	39.3013	818,509.493	9,901,917.635	2.527	327	DTL
	328		1600	35.548	35.547	89.3650	28.5746	818,510.445	9,901,924.471	2.479	328	DTL
	329		1600	44.807	44.806	89.3647	27.0629	818,519.701	9,901,923.163	2.542	329	DTL
	330		1600	45.909	45.909	89.4406	36.3724	818,518.177	9,901,915.713	2.452	330	DTL
	331		1600	55.504	55.503	89.4405	25.2038	818,530.449	9,901,922.030	2.497	331	DTL
	332		1600	56.718	56.717	89.3843	33.1527	818,529.301	9,901,914.276	2.591	332	DTL
	333		1600	63.476	63.475	89.4148	31.3544	818,536.242	9,901,913.550	2.576	333	DTL
	334		1600	62.285	62.284	89.3954	24.4854	818,537.176	9,901,921.024	2.604	334	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	335		1600	70.920	70.919	89.4110	23.5734	818,545.823	9,901,920.142	2.628	335	DTL
	336		1600	71.120	71.119	89.3820	30.0659	818,544.036	9,901,912.723	2.688	336	DTL
	337		1600	80.073	80.072	89.4328	23.1941	818,554.956	9,901,919.108	2.625	337	DTL
	338		1600	80.348	80.347	89.4448	28.5218	818,553.332	9,901,911.517	2.595	338	DTL
	339		1600	90.394	90.393	89.4447	22.3722	818,565.287	9,901,918.172	2.640	339	DTL
	340		1600	91.212	91.211	89.4714	27.3045	818,564.331	9,901,910.441	2.579	340	DTL
	341		1600	101.978	101.977	89.4534	27.1943	818,574.792	9,901,907.876	2.668	341	DTL
	342		1600	99.777	99.773	89.3051	21.5601	818,574.721	9,901,917.622	3.086	342	T.BNDR
	343		1600	98.657	98.656	89.4207	21.3031	818,573.744	9,901,918.536	2.753	343	T.BNDR
	344		1600	99.015	99.014	89.4421	22.4441	818,573.721	9,901,916.374	2.691	344	T.BNDR
	345		1600	101.207	101.206	89.4249	22.2850	818,575.961	9,901,916.424	2.746	345	T.BNDR
	346		1600	108.225	108.224	89.4611	21.5132	818,583.069	9,901,916.302	2.675	346	DTL
	347		1600	110.956	110.955	89.4338	20.2438	818,586.205	9,901,918.603	2.768	347	BG
	348		1600	111.976	111.975	89.4605	26.5540	818,584.638	9,901,905.988	2.693	348	BG
	349		1600	111.065	111.063	89.4014	16.5554	818,587.096	9,901,925.284	2.878	349	BG
	350		1600	101.328	101.327	89.4343	14.4256	818,577.658	9,901,930.033	2.720	350	DTL
	351		1600	100.955	100.954	89.4343	18.2702	818,576.759	9,901,923.492	2.718	351	DTL
	352		1600	91.864	91.863	89.4343	18.2031	818,567.745	9,901,924.687	2.675	352	DTL
	353		1600	91.158	91.157	89.4343	14.3538	818,567.509	9,901,930.709	2.672	353	DTL
	354		1600	81.968	81.967	89.4343	18.2428	818,557.899	9,901,925.688	2.628	354	DTL
	355		1600	81.858	81.857	89.4343	14.4012	818,558.213	9,901,931.023	2.628	355	DTL
	356		1600	71.305	71.304	89.4251	18.3206	818,547.285	9,901,926.722	2.596	356	DTL
	357		1600	70.957	70.956	89.4251	14.4007	818,547.324	9,901,931.534	2.594	357	DTL
	358		1600	62.298	62.298	89.4636	18.2142	818,538.359	9,901,927.936	2.483	358	DTL
	359		1600	62.338	62.338	89.4636	14.4056	818,538.715	9,901,931.921	2.483	359	DTL
	360		1600	53.563	53.562	89.4411	18.3404	818,529.656	9,901,928.713	2.486	360	DTL
	361		1600	53.547	53.546	89.4411	13.0302	818,529.983	9,901,933.858	2.486	361	DTL
	362		1600	44.708	44.708	89.5408	10.4039	818,521.142	9,901,935.872	2.316	362	DTL
	363		1600	44.664	44.664	89.4837	18.4931	818,520.792	9,901,929.533	2.388	363	DTL
	364		1600	34.102	34.101	89.3709	19.4232	818,510.238	9,901,930.268	2.466	364	DTL
	365		1600	35.382	35.381	89.4115	7.4635	818,511.731	9,901,937.448	2.433	365	DTL
	366		1600	26.355	26.354	89.2539	19.2848	818,502.575	9,901,931.412	2.503	366	DTL
	367		1600	27.145	27.144	89.3259	3.4146	818,503.306	9,901,938.763	2.453	367	DTL
	368		1600	17.894	17.893	89.3259	18.2425	818,494.227	9,901,932.847	2.380	368	DTL
	369		1600	18.213	18.213	89.4222	355.4824	818,493.936	9,901,939.923	2.333	369	DTL
	370		1600	8.512	8.512	89.4222	20.3441	818,484.862	9,901,933.576	2.283	370	DTL
	371		1600	10.190	10.190	89.4858	335.5317	818,484.679	9,901,940.851	2.272	371	DTL
	372		1600	7.266	7.263	88.1405	291.5810	818,477.704	9,901,941.999	2.464	372	DTL
	373		1600	13.782	13.780	89.0234	289.4408	818,478.302	9,901,948.501	2.470	373	DTL
	374		1600	16.464	16.464	89.5908	320.3530	818,486.717	9,901,947.713	2.244	374	DTL
	375		1600	22.552	22.552	89.3859	340.5521	818,495.762	9,901,946.485	2.378	375	DTL
	376		1600	29.464	29.464	89.4808	352.1326	818,504.173	9,901,944.812	2.342	376	DTL
	377		1600	38.404	38.404	89.4808	359.1310	818,513.899	9,901,943.337	2.372	377	DTL
	378		1600	46.728	46.728	90.0053	3.1600	818,522.633	9,901,941.935	2.228	378	DTL
	379		1600	55.384	55.383	89.4516	5.0945	818,531.436	9,901,941.433	2.477	379	DTL
	380		1600	63.427	63.427	89.4801	7.2459	818,539.670	9,901,939.907	2.461	380	DTL
	381		1600	72.396	72.395	89.3912	8.1455	818,548.686	9,901,939.574	2.678	381	DTL
	382		1600	81.165	81.164	89.4408	10.1733	818,557.574	9,901,937.254	2.614	382	DTL
	383		1600	88.935	88.934	89.4409	10.3337	818,565.352	9,901,937.069	2.650	383	DTL
	384		1600	97.224	97.223	89.4452	11.2653	818,573.664	9,901,935.770	2.668	384	DTL
	385		2000	106.600	106.596	89.3106	12.4023	818,583.034	9,901,933.581	2.736	385	DTL
	C10		1600	57.146	57.146	90.0021	0.0000	818,476.446	9,901,934.846	2.379	C10	STN
C10A		1.518			57.152			818,478.462	9,901,877.730	2.435	C10A	
	386		1600	7.416	7.414	88.4759	308.5202	818,472.528	9,901,882.176	2.509	386	TMBK
	387		1600	10.830	10.829	89.1522	327.3148	818,472.329	9,901,886.656	2.494	387	TMBK
	388		1600	6.350	6.346	87.5109	245.4042	818,472.775	9,901,874.914	2.591	388	TMBK
	389		1600	11.562	11.561	89.2137	210.0954	818,473.008	9,901,867.536	2.483	389	TMBK
	390		1600	12.606	12.606	89.3057	196.0954	818,475.382	9,901,865.507	2.460	390	PHN
	391		1600	22.147	22.147	89.4430	195.1700	818,473.377	9,901,856.175	2.453	391	TMBK
	392		1600	21.905	21.904	89.3245	181.4202	818,478.584	9,901,855.826	2.527	392	TMBK
	393		1600	23.543	23.542	89.2914	163.5233	818,485.793	9,901,855.359	2.564	393	TMBK
	394		1600	13.727	13.726	89.2139	183.2849	818,478.112	9,901,864.009	2.507	394	DTL
	395		1600	16.169	16.165	88.4027	162.4330	818,483.803	9,901,862.474	2.728	395	DTL
	396		1600	7.432	7.432	89.3207	187.0900	818,477.797	9,901,870.328	2.414	396	DTL
	397		1600	9.464	9.463	89.1656	147.0306	818,483.886	9,901,869.976	2.472	397	DTL
	398		1600	6.003	6.002	88.5815	94.2538	818,484.458	9,901,877.478	2.461	398	DTL
	399		1600	7.030	7.029	88.5815	357.5912	818,477.967	9,901,884.742	2.480	399	DTL
	400		1600	9.221	9.220	89.1527	40.1812	818,484.174	9,901,884.968	2.473	400	DTL
	401		1600	15.761	15.761	89.5434	0.4205	818,478.099	9,901,893.487	2.378	401	DTL
	402		1600	18.024	18.021	88.5528	26.0356	818,485.804	9,901,894.187	2.692	402	PHN
	403		1600	27.262	27.261	89.3655	53.4913	818,499.885	9,901,894.589	2.536	403	BG
	404		1600	21.706	21.705	89.2238	39.4643	818,491.752	9,901,894.890	2.589	404	DTL
	405		1600	24.029	24.027	89.2025	48.5050	818,495.984	9,901,894.170	2.630	405	DTL
	406		1600	16.352	16.350	89.1202	55.1303	818,491.553	9,901,887.525	2.582	406	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	407		1600	22.589	22.589	89.3734	63.4555	818,498.359	9,901,888.424	2.501	407	DTL
	408		1600	13.390	13.388	89.0756	72.2830	818,491.079	9,901,882.210	2.556	408	DTL
	409		1600	13.712	13.710	89.0757	93.5543	818,492.165	9,901,877.274	2.561	409	DTL
	410		1600	28.081	28.081	89.5007	91.4346	818,506.542	9,901,877.873	2.434	410	BG
	411		1600	14.950	14.948	89.0757	119.1954	818,491.744	9,901,870.872	2.580	411	DTL
	412		1600	19.170	19.170	89.5025	87.2129	818,497.568	9,901,879.289	2.407	412	BG
	413		1600	28.171	28.169	89.2333	97.4335	818,506.492	9,901,874.930	2.652	413	DTL
	414		1600	20.113	20.113	89.5323	142.1431	818,491.331	9,901,862.273	2.392	414	DTL
	415		1600	25.356	25.355	89.3347	107.2631	818,502.904	9,901,870.988	2.547	415	DTL
	416		1600	24.522	24.521	89.2352	119.2117	818,500.245	9,901,866.471	2.611	416	DTL
	417		1600	28.031	28.031	89.4303	127.2709	818,501.301	9,901,861.480	2.492	417	DTL
	418		1600	25.927	25.926	89.2556	153.1611	818,490.932	9,901,855.001	2.610	418	TMBK
	419		1600	30.720	30.719	89.3208	141.0127	818,498.614	9,901,854.545	2.602	419	TMBK
	420		0	26.059	26.035	87.3119	153.1413	818,490.998	9,901,854.913	5.080	420	TMBK
	C5		1600	62.066	62.064	90.2533	359.5959	818,409.677	9,902,024.586	2.120	C5	
C6		1.441			62.023			818,470.517	9,902,012.536	2.596	C6	
	421		1600	46.709	46.696	91.2237	52.4407	818,450.003	9,902,054.483	1.314	421	TGL
	422		1600	48.069	48.041	91.5654	52.5449	818,449.546	9,902,055.758	0.802	422	TGL
	423		1600	42.082	42.070	91.2126	45.3550	818,447.482	9,902,047.739	1.440	423	TGL
	424		1600	41.357	41.349	91.0612	45.2254	818,447.746	9,902,047.050	1.640	424	TGL
	425		1600	56.694	56.681	91.1459	142.1450	818,521.221	9,902,037.870	1.200	425	TGL
	426		1600	61.555	61.541	91.1318	146.1200	818,527.334	9,902,036.182	1.124	426	TGL
	427		1600	56.304	56.304	89.4556	142.4408	818,521.096	9,902,037.271	2.667	427	TGL
	428		1600	61.162	61.162	89.4709	146.3318	818,527.128	9,902,035.686	2.665	428	TGL
	429		1600	55.904	55.899	90.4616	142.4847	818,520.766	9,902,037.026	1.684	429	TGL
	430		1600	61.009	61.005	90.4016	146.5253	818,527.114	9,902,035.305	1.722	430	TGL
	431		1600	72.068	72.057	90.5853	152.1716	818,539.604	9,902,033.012	1.202	431	TGL
	432		1600	83.050	83.044	90.4144	156.5257	818,551.772	9,902,029.679	1.428	432	TGL
	433		1600	71.283	71.282	89.4702	152.3802	818,538.983	9,902,032.378	2.706	433	TGL
	434		1600	83.007	83.007	89.5610	157.1049	818,551.824	9,902,029.249	2.529	434	TGL
	435		1600	71.049	71.046	90.2927	152.3852	818,538.761	9,902,032.296	1.828	435	TGL
	436		1600	82.745	82.739	90.4005	157.2623	818,551.637	9,902,028.828	1.472	436	TGL
	437		1600	58.564	58.562	90.2746	155.2126	818,527.476	9,902,026.146	1.964	437	PHN
	438		1600	52.482	52.477	90.4505	152.4613	818,520.955	9,902,027.023	1.748	438	PHN
	439		1600	54.519	54.514	90.4504	153.2822	818,523.094	9,902,026.942	1.722	439	PHN
	440		1600	55.051	55.048	90.3314	163.0739	818,525.297	9,902,017.973	1.904	440	DTL
	441		1600	48.716	48.715	90.2407	161.3851	818,518.854	9,902,018.598	2.095	441	DTL
	442		1600	40.631	40.630	90.1947	168.3901	818,511.148	9,902,012.639	2.203	442	DTL
	443		1600	52.982	52.981	90.2453	172.1539	818,523.401	9,902,009.334	2.053	443	DTL
	444		1600	52.211	52.210	90.1949	178.2719	818,521.987	9,902,003.776	2.136	444	DTL
	445		1600	36.686	36.685	90.1950	180.5359	818,506.387	9,902,004.844	2.225	445	DTL
	446		1600	51.840	51.839	90.1714	187.0144	818,519.754	9,901,996.317	2.177	446	DTL
	447		1600	34.931	34.931	89.5743	191.2611	818,502.757	9,901,999.089	2.460	447	PHN
	448		1600	46.809	46.807	89.2915	194.1124	818,512.802	9,901,992.463	2.855	448	PHN
	449		1600	34.811	34.810	89.3744	198.3212	818,500.743	9,901,995.267	2.662	449	PHN
	450		1600	36.512	36.512	89.4600	206.5552	818,499.236	9,901,989.989	2.578	450	PHN
	451		1600	50.117	50.117	90.0248	202.3346	818,512.180	9,901,984.680	2.396	451	DTL
	452		1600	52.809	52.809	89.5036	209.0216	818,510.828	9,901,978.421	2.581	452	DTL
	453		1600	42.037	42.034	89.1859	218.5433	818,497.473	9,901,980.283	2.938	453	PHN
	454		1600	36.176	36.175	89.3352	225.3103	818,490.367	9,901,982.293	2.712	454	PHN
	455		1600	96.890	96.890	90.0336	209.3248	818,543.918	9,901,949.290	2.335	455	J7
	J8		1518	294.434	294.434	89.5340	359.5958	818,838.146	9,901,959.022	3.146	J8	
J7		1.393			294.429			818,543.882	9,901,949.171	2.662	J7	
	456		1600	35.188	35.187	89.3348	203.4157	818,511.207	9,901,962.228	2.723	456	JL
	457		1600	38.021	38.020	89.3701	216.0950	818,512.454	9,901,970.567	2.709	457	JL
	458		1600	56.029	56.028	89.4053	199.4815	818,490.562	9,901,966.380	2.767	458	JL
	459		1600	57.099	57.098	89.4055	207.5708	818,492.578	9,901,974.233	2.772	459	JL
	460		1600	75.258	75.257	89.4206	197.5137	818,471.520	9,901,969.843	2.847	460	JL
	461		1600	77.095	77.094	89.4213	203.0340	818,471.978	9,901,976.980	2.854	461	JL
	462		1600	77.257	77.256	89.4213	203.4420	818,472.162	9,901,977.889	2.855	462	DTL
	463		1600	76.048	76.047	89.3916	197.0254	818,470.472	9,901,969.022	2.914	463	DTL
	464		1600	77.281	77.279	90.2319	203.5804	818,472.256	9,901,978.184	1.931	464	DTL
	465		1600	75.936	75.934	90.2238	196.4551	818,470.483	9,901,968.629	1.955	465	DTL
	466		1600	118.064	118.044	88.5713	199.1352	818,431.187	9,901,984.303	4.611	466	JL
	467		1600	117.165	117.147	88.5855	195.4756	818,430.157	9,901,977.277	4.537	467	JL
	468		1600	118.239	118.218	88.5432	199.4107	818,431.304	9,901,985.248	4.707	468	DTL
	469		1600	117.151	117.129	88.5350	195.1615	818,429.920	9,901,976.224	4.710	469	DTL
	470		700	117.398	117.386	89.1033	195.0734	818,429.602	9,901,975.995	5.044	470	DTL
	471		700	118.323	118.312	89.1256	199.4955	818,431.307	9,901,985.565	4.975	471	DTL
	472		1600	164.756	164.694	88.2525	197.1414	818,385.041	9,901,992.686	6.987	472	JL
	473		1600	164.182	164.120	88.2525	194.4603	818,383.873	9,901,985.673	6.972	473	JL
	474		1600	164.257	164.190	88.2147	194.2502	818,383.584	9,901,984.709	7.147	474	DTL
	475		1600	164.876	164.809	88.2152	197.3136	818,385.152	9,901,993.519	7.161	475	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	476		700	164.929	164.881	88.3727	197.4202	818,385.217	9,901,994.020	7.315	476	DTL
	477		700	164.306	164.256	88.3520	194.1645	818,383.434	9,901,984.337	7.401	477	DTL
	478		1600	92.788	92.788	89.5635	97.4550	818,534.429	9,901,856.866	2.547	478	C7
Survey Date : March, 29 2019												
	C8		1486	50.706	50.706	90.1301	359.5958	818,619.473	9,901,862.060	2.595	C8	BS
C8B		1.492			50.701			818,638.849	9,901,815.207	2.772	C8B	
	1		1600	20.297	20.296	89.2501	223.5954	818,631.400	9,901,796.328	2.870	1	PGR SENG
	2		1600	19.694	19.693	89.2501	199.0908	818,639.988	9,901,795.547	2.864	2	PGR SENG
	3		1600	23.049	23.048	89.2733	176.3337	818,648.919	9,901,794.475	2.881	3	PGR SENG
	4		1600	28.878	28.877	89.2733	160.5241	818,658.017	9,901,793.610	2.936	4	PGR SENG
	5		1600	36.548	36.546	89.2259	150.1331	818,667.742	9,901,792.829	3.057	5	PGR SENG
	6		1600	44.681	44.678	89.2046	144.1353	818,676.835	9,901,791.687	3.174	6	PGR SENG
	7		1600	52.763	52.761	89.3003	139.4434	818,685.744	9,901,791.028	3.123	7	PGR SENG
	8		1600	60.118	60.117	89.4105	136.5301	818,693.590	9,901,790.357	2.995	8	PGR SENG
	9		1600	70.517	70.516	89.4354	133.5844	818,704.453	9,901,789.349	2.994	9	PGR SENG
	10		1600	82.326	82.325	89.3922	131.4322	818,716.568	9,901,788.058	3.158	10	PGR SENG
	11		1600	91.597	91.595	89.3757	130.2252	818,726.004	9,901,787.033	3.251	11	PGR SENG
	12		1600	99.918	99.916	89.3954	129.1905	818,734.475	9,901,786.243	3.248	12	PGR SENG
	13		1600	118.479	118.476	89.3409	127.2203	818,753.341	9,901,784.742	3.555	13	PGR SENG
	14		1600	132.447	132.445	89.4119	126.3340	818,767.307	9,901,782.954	3.384	14	PGR SENG
	15		1600	140.426	140.424	89.4120	126.0447	818,775.328	9,901,782.157	3.426	15	PGR SENG
	16		1600	150.621	150.619	89.4121	125.3457	818,785.539	9,901,781.029	3.481	16	PGR SENG
	17		1600	165.065	165.063	89.4120	124.5231	818,800.056	9,901,779.739	3.560	17	PGR SENG
	18		1600	182.425	182.421	89.3746	123.1742	818,818.022	9,901,780.937	3.844	18	DTL
	19		1600	182.314	182.310	89.3746	121.3306	818,818.872	9,901,786.421	3.843	19	DTL
	20		1600	173.287	173.284	89.4044	121.3153	818,809.969	9,901,787.907	3.635	20	DTL
	21		1600	173.207	173.204	89.4044	123.2652	818,808.882	9,901,782.215	3.634	21	DTL
	22		1600	164.574	164.571	89.4044	123.3515	818,800.330	9,901,783.465	3.586	22	DTL
	23		1600	164.774	164.772	89.4128	121.3511	818,801.538	9,901,789.092	3.552	23	DTL
	24		1600	156.221	156.219	89.4130	121.4416	818,793.027	9,901,790.040	3.504	24	DTL
	25		1600	157.322	157.320	89.4130	123.5831	818,793.006	9,901,783.820	3.510	25	DTL
	26		1600	148.755	148.752	89.3937	124.1618	818,784.455	9,901,784.776	3.546	26	DTL
	27		1600	147.516	147.513	89.3944	121.5627	818,784.351	9,901,790.926	3.533	27	DTL
	28		1600	138.356	138.354	89.4247	122.0310	818,775.272	9,901,792.168	3.357	28	DTL
	29		1600	139.924	139.922	89.4247	124.0519	818,775.903	9,901,787.020	3.364	29	DTL
	30		1600	130.065	130.063	89.4119	124.4454	818,765.936	9,901,787.541	3.371	30	DTL
	31		1600	128.960	128.958	89.4119	122.1709	818,765.918	9,901,793.215	3.365	31	DTL
	32		1600	121.470	121.467	89.3635	122.3434	818,758.431	9,901,793.887	3.491	32	DTL
	33		1600	121.914	121.911	89.3635	124.5822	818,757.868	9,901,788.808	3.494	33	DTL
	34		1600	117.574	117.571	89.3635	124.5947	818,753.620	9,901,789.701	3.465	34	DTL
	35		1600	117.019	117.016	89.3635	122.3953	818,754.017	9,901,794.490	3.461	35	DTL
	36		1600	108.531	108.528	89.3635	123.0321	818,745.529	9,901,795.264	3.403	36	DTL
	37		1600	109.405	109.402	89.3635	125.4726	818,745.307	9,901,789.995	3.409	37	DTL
	38		1600	101.025	101.023	89.3635	126.2459	818,736.893	9,901,790.854	3.352	38	DTL
	39		1600	100.103	100.102	89.4713	123.2731	818,737.115	9,901,796.121	3.036	39	DTL
	40		1600	91.430	91.429	89.4712	123.5326	818,728.467	9,901,797.098	3.004	40	DTL
	41		1600	92.365	92.362	89.3153	127.1832	818,728.129	9,901,791.548	3.419	41	DTL
	42		1600	84.072	84.069	89.3154	128.4523	818,719.544	9,901,791.627	3.351	42	DTL
	43		1600	83.153	83.152	89.4029	124.1630	818,720.241	9,901,798.191	3.136	43	DTL
	44		1600	74.156	74.155	89.4029	125.1925	818,711.145	9,901,798.707	3.085	44	PHN
	45		1600	75.375	75.372	89.2854	129.4006	818,710.850	9,901,792.917	3.346	45	DTL
	46		1600	67.170	67.167	89.2854	131.1716	818,702.425	9,901,793.538	3.271	46	DTL
	47		1600	65.688	65.687	89.4129	125.3531	818,702.820	9,901,800.291	3.018	47	DTL
	48		1600	56.443	56.442	89.4129	126.2359	818,693.631	9,901,801.617	2.968	48	DTL
	49		1600	58.148	58.145	89.2417	133.1637	818,693.201	9,901,794.550	3.268	49	DTL
	50		1600	50.550	50.546	89.1848	135.4302	818,685.291	9,901,795.254	3.270	50	DTL
	51		1600	47.758	47.757	89.3403	126.5544	818,685.093	9,901,803.281	3.024	51	DTL
	52		1600	41.698	41.696	89.2558	127.2648	818,679.128	9,901,804.430	3.077	52	DTL
	53		1600	43.959	43.955	89.1301	138.2219	818,678.387	9,901,796.004	3.265	53	DTL
	54		1600	36.037	36.032	89.0316	140.5139	818,670.547	9,901,798.073	3.258	54	DTL
	55		1600	33.225	33.223	89.1757	129.5305	818,670.548	9,901,805.262	3.070	55	DTL
	56		1600	25.171	25.169	89.1758	132.3921	818,662.472	9,901,806.521	2.972	56	DTL
	57		1600	28.115	28.111	89.0157	147.1840	818,661.920	9,901,799.146	3.138	57	DTL
	58		1600	17.816	17.815	89.2906	137.3430	818,654.981	9,901,807.648	2.824	58	DTL
	59		1600	21.433	21.431	89.1604	157.2001	818,654.039	9,901,800.088	2.938	59	DTL
	60		1600	11.079	11.078	89.1444	148.3040	818,647.806	9,901,808.689	2.810	60	DTL
	61		1600	16.676	16.675	89.1448	171.4621	818,647.361	9,901,800.869	2.883	61	DTL
	62		1600	6.883	6.880	88.1509	176.0714	818,641.902	9,901,809.042	2.874	62	PHN
	63		1600	13.715	13.714	89.2053	200.0409	818,639.423	9,901,801.505	2.820	63	DTL
	64		1600	8.384	8.383	89.2052	246.0026	818,633.074	9,901,809.130	2.759	64	DTL
	65		1600	14.849	14.848	89.2052	230.5726	818,631.766	9,901,802.157	2.833	65	DTL
	66		1600	7.168	7.163	87.5506	331.5441	818,633.317	9,901,819.758	2.924	66	PHN
	67		1600	5.802	5.802	89.5022	35.5835	818,640.205	9,901,820.849	2.680	67	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	68		1600	8.002	8.000	88.5016	120.3156	818,646.770	9,901,814.085	2.826	68	DTL
	69		1600	10.271	10.270	89.1647	84.4952	818,647.948	9,901,819.971	2.793	69	DTL
	70		1600	17.305	17.304	89.2617	119.1645	818,656.031	9,901,813.155	2.833	70	DTL
	71		1600	18.160	18.159	89.2213	100.0110	818,656.581	9,901,819.121	2.863	71	DTL
	72		1600	26.208	26.206	89.1400	119.2954	818,664.858	9,901,811.999	3.014	72	DTL
	73		1600	25.895	25.892	89.0739	104.1850	818,664.479	9,901,818.879	3.058	73	DTL
	74		1600	35.290	35.289	89.3007	119.0949	818,673.897	9,901,811.092	2.971	74	DTL
	75		1600	35.816	35.814	89.2029	108.0911	818,674.561	9,901,817.901	3.075	75	DTL
	76		1600	43.339	43.337	89.2704	119.0158	818,681.902	9,901,810.252	3.079	76	DTL
	77		1600	44.073	44.071	89.2704	109.4639	818,682.872	9,901,817.275	3.086	77	DTL
	78		1600	53.033	53.031	89.3208	118.5448	818,691.545	9,901,809.253	3.094	78	DTL
	79		1600	53.548	53.546	89.3205	111.2209	818,692.386	9,901,816.233	3.099	79	DTL
	80		1600	61.911	61.909	89.3556	112.4710	818,700.758	9,901,814.862	3.097	80	DTL
	81		1600	61.483	61.482	89.4006	118.5242	818,699.947	9,901,808.342	3.020	81	DTL
	82		1600	70.155	70.154	89.4418	113.0420	818,709.000	9,901,814.466	2.984	82	DTL
	83		1600	70.417	70.416	89.4057	118.4308	818,708.846	9,901,807.539	3.054	83	DTL
	84		1600	79.255	79.254	89.4447	118.4725	818,717.621	9,901,806.478	3.015	84	DTL
	85		1600	78.829	78.828	89.4740	113.5035	818,717.655	9,901,813.314	2.947	85	DTL
	86		1600	87.470	87.469	89.4411	114.3617	818,726.257	9,901,811.944	3.066	86	DTL
	87		1600	87.439	87.438	89.4658	118.4514	818,725.762	9,901,805.632	2.995	87	DTL
	88		1600	96.484	96.483	89.4657	118.4310	818,734.759	9,901,804.699	3.030	88	DTL
	89		1600	96.216	96.215	89.4411	115.1818	818,734.946	9,901,810.443	3.106	89	DTL
	90		1600	104.840	104.839	89.4411	115.1818	818,743.559	9,901,810.016	3.146	90	DTL
	91		1600	105.675	105.674	89.4411	118.5556	818,743.851	9,901,803.308	3.150	91	DTL
	92		1600	116.681	116.677	89.3302	119.0714	818,754.741	9,901,801.688	3.579	92	DTL
	93		1600	116.652	116.648	89.3036	115.4022	818,755.314	9,901,808.684	3.661	93	DTL
	94		1600	121.253	121.250	89.3614	116.1700	818,759.830	9,901,807.137	3.502	94	DTL
	95		1600	121.295	121.291	89.3220	119.1529	818,759.289	9,901,800.864	3.640	95	DTL
	96		1600	131.258	131.257	89.4539	119.2401	818,769.146	9,901,799.362	3.212	96	DTL
	97		1600	130.717	130.715	89.4003	116.2353	818,769.256	9,901,806.246	3.422	97	DTL
	98		1600	138.650	138.647	89.3828	115.5930	818,777.234	9,901,806.683	3.532	98	DTL
	99		1600	139.477	139.476	89.4436	119.2815	818,777.284	9,901,798.200	3.289	99	DTL
	100		1600	145.063	145.061	89.4305	119.3104	818,782.813	9,901,797.401	3.378	100	DTL
	101		1600	144.719	144.717	89.4304	115.3729	818,783.347	9,901,807.235	3.377	101	DTL
	102		1600	145.071	145.069	89.3954	113.3248	818,783.892	9,901,812.473	3.512	102	DTL
	103		1600	145.305	145.303	89.3952	111.1053	818,784.115	9,901,818.467	3.515	103	DTL
	104		1600	136.274	136.272	89.3950	113.1044	818,775.110	9,901,813.514	3.463	104	DTL
	105		1600	137.777	137.774	89.3800	110.4807	818,776.565	9,901,819.210	3.519	105	DTL
	106		1600	130.540	130.537	89.3627	110.1716	818,769.292	9,901,820.171	3.558	106	DTL
	107		1600	128.538	128.535	89.3627	112.4216	818,767.383	9,901,814.674	3.544	107	DTL
	108		1600	122.204	122.201	89.3627	112.1213	818,761.049	9,901,815.769	3.501	108	DTL
	109		1600	122.435	122.432	89.3627	109.4635	818,761.146	9,901,820.954	3.502	109	DTL
	110		1600	117.878	117.873	89.2900	109.3022	818,756.565	9,901,821.296	3.727	110	DTL
	111		1600	117.200	117.195	89.2900	112.0718	818,756.042	9,901,815.913	3.721	111	DTL
	112		1600	108.639	108.638	89.4314	110.5658	818,747.449	9,901,818.084	3.194	112	DTL
	113		1600	109.719	109.717	89.4126	107.5234	818,748.215	9,901,823.989	3.256	113	DTL
	114		1600	100.206	100.204	89.3832	107.0823	818,738.620	9,901,824.510	3.289	114	DTL
	115		1600	99.237	99.235	89.3832	110.2021	818,738.016	9,901,818.891	3.283	115	DTL
	116		1600	93.283	93.281	89.3832	109.4500	818,732.026	9,901,819.629	3.246	116	DTL
	117		1600	86.092	86.090	89.3832	109.0248	818,724.786	9,901,820.343	3.201	117	DTL
	118		1600	77.509	77.508	89.4250	108.2755	818,716.168	9,901,820.616	3.051	118	DTL
	119		1600	77.581	77.580	89.4251	104.2410	818,715.662	9,901,826.090	3.051	119	DTL
	120		1600	69.722	69.721	89.4250	102.3802	818,707.546	9,901,827.114	3.012	120	DTL
	121		1600	69.108	69.107	89.4250	107.3921	818,707.713	9,901,821.003	3.009	121	DTL
	122		1600	60.682	60.680	89.3544	106.0327	818,699.150	9,901,821.981	3.092	122	DTL
	123		1600	60.436	60.434	89.3544	100.3455	818,697.988	9,901,827.653	3.090	123	DTL
	124		1600	52.376	52.375	89.3544	97.5037	818,689.527	9,901,828.430	3.033	124	DTL
	125		1600	52.214	52.212	89.3011	104.0511	818,690.504	9,901,822.817	3.117	125	DTL
	126		1600	43.140	43.138	89.3011	101.4536	818,681.237	9,901,823.222	3.038	126	DTL
	127		1600	43.993	43.992	89.3650	94.0937	818,680.615	9,901,829.025	2.960	127	DTL
	128		1600	35.514	35.513	89.3653	89.3642	818,671.574	9,901,829.001	2.903	128	DTL
	129		1600	34.063	34.061	89.2357	97.4738	818,671.799	9,901,823.835	3.021	129	DTL
	130		1600	25.907	25.905	89.1229	92.3021	818,663.198	9,901,824.051	3.022	130	DTL
	131		1600	28.178	28.176	89.2428	83.1916	818,663.458	9,901,828.930	2.955	131	DTL
	132		1600	18.435	18.434	89.2429	84.2257	818,655.113	9,901,823.885	2.854	132	DTL
	133		1600	21.662	21.657	88.4813	72.3725	818,655.478	9,901,829.083	3.116	133	DTL
	134		1600	12.860	12.855	88.2523	49.5159	818,644.765	9,901,826.620	3.018	134	DTL
	135		1600	18.439	18.436	89.0241	55.4131	818,648.951	9,901,830.630	2.971	135	BG
	136		1600	11.310	11.310	89.3027	19.0439	818,638.181	9,901,826.497	2.761	136	DTL
	137		1600	13.642	13.642	90.0459	346.1909	818,630.802	9,901,826.223	2.644	137	DTL
	138		1600	16.330	16.325	88.3423	21.5322	818,638.685	9,901,831.531	3.070	138	BG
	139		1600	22.173	22.170	90.5619	0.0506	818,630.407	9,901,835.707	2.301	139	DTL
	140		1600	31.938	31.935	89.1208	4.3118	818,629.010	9,901,845.589	3.108	140	BG
	141		1600	29.510	29.506	89.0056	21.4146	818,638.452	9,901,844.710	3.171	141	BG
	142		1600	20.642	20.635	88.3101	19.0419	818,637.627	9,901,835.806	3.198	142	BG

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	143		1600	20.383	20.376	88.2736	22.2358	818,638.825	9,901,835.583	3.212	143	BG
	144		1600	23.692	23.689	89.0149	79.3557	818,658.746	9,901,828.063	3.065	144	C8C
	C8B		1600	23.692	23.691	90.2752	359.5958	818,638.849	9,901,815.207	2.772	C8B	BS
C8C		1.494			23.689			818,658.746	9,901,828.063	3.065	C8C	
	145		1600	11.464	11.458	88.0921	67.5534	818,649.367	9,901,834.645	3.328	145	BG
	146		1600	7.176	7.174	88.3114	90.4910	818,654.939	9,901,834.143	3.144	146	BG
	147		1700	14.848	14.843	88.3115	111.0637	818,655.721	9,901,842.595	3.242	147	BG
	148		1700	14.664	14.661	88.4857	130.2720	818,660.682	9,901,842.596	3.162	148	BG
	149		1600	7.947	7.945	91.1214	132.0120	818,660.010	9,901,835.907	2.792	149	BAK AIR
	150		1600	8.385	8.385	89.4143	148.2441	818,662.362	9,901,835.628	3.003	150	BAK AIR
	151		1600	10.545	10.544	89.0612	144.2835	818,662.629	9,901,837.866	3.124	151	BAK AIR
	152		1600	10.217	10.217	90.3345	131.3807	818,660.303	9,901,838.160	2.858	152	BAK AIR
	153		1600	10.303	10.299	88.2430	124.3801	818,659.063	9,901,838.357	3.245	153	TNGKI AIR
	154		1600	11.071	11.067	88.2430	107.0115	818,655.724	9,901,838.709	3.266	154	TNGKI AIR
	155		1600	8.408	8.403	88.0041	99.4841	818,655.455	9,901,835.795	3.250	155	TNGKI AIR
	156		1600	7.230	7.224	87.3805	122.1638	818,658.672	9,901,835.287	3.257	156	TNGKI AIR
	C8		1486	55.868	55.865	90.3507	359.5958	818,619.473	9,901,862.060	2.595	C8	BS
C8A		1.451			55.950			818,675.415	9,901,863.045	3.213	C8A	
	157		1600	127.491	127.489	89.4109	199.0839	818,796.570	9,901,823.359	3.763	157	C8G?
	158		1600	87.046	87.042	89.2831	198.5243	818,758.257	9,901,836.333	3.861	158	C8G
	159		1600	86.832	86.830	89.3605	163.2725	818,758.203	9,901,889.228	3.668	159	C8E
	160		1600	52.173	52.172	89.3908	159.4404	818,724.032	9,901,881.973	3.381	160	C8D
	161		1600	20.807	20.807	90.0017	292.5618	818,667.644	9,901,843.743	3.062	161	DTL
	162		1600	28.948	28.948	90.0429	288.2821	818,666.727	9,901,835.431	3.026	162	DTL
	163		1600	20.582	20.582	90.1023	269.1821	818,676.026	9,901,842.472	3.002	163	DTL
	164		1600	28.434	28.434	90.1336	270.3158	818,675.651	9,901,834.612	2.952	164	DTL
	165		1600	23.800	23.800	90.1335	247.2901	818,684.914	9,901,841.223	2.970	165	DTL
	166		1600	30.510	30.510	90.0640	254.1134	818,684.241	9,901,833.839	3.005	166	DTL
	167		1600	29.212	29.212	90.0337	232.3113	818,693.595	9,901,840.179	3.033	167	DTL
	168		1600	35.098	35.098	89.5333	239.5843	818,693.507	9,901,832.969	3.130	168	DTL
	169		1600	39.467	39.467	89.5715	232.4129	818,699.884	9,901,832.079	3.096	169	DTL
	170		1600	35.168	35.168	89.5135	224.2423	818,700.967	9,901,838.882	3.150	170	DTL
	171		1600	43.019	43.019	89.5629	216.4733	818,710.313	9,901,837.889	3.108	171	DTL
	172		1600	46.374	46.374	89.5627	224.1846	818,709.162	9,901,831.237	3.112	172	DTL
	173		1600	51.506	51.505	89.3849	212.0820	818,719.502	9,901,836.416	3.381	173	DTL
	174		1600	54.205	54.205	89.4546	218.1139	818,718.598	9,901,830.283	3.289	174	DTL
	175		1600	62.643	62.641	89.3249	215.1902	818,727.157	9,901,827.736	3.559	175	BG
	176		1600	58.626	58.623	89.2758	206.2056	818,728.397	9,901,837.953	3.610	176	BG
	177		1600	62.547	62.545	89.3228	201.5945	818,733.810	9,901,840.642	3.565	177	BG
	178		1600	58.924	58.923	89.4418	198.1410	818,731.694	9,901,845.592	3.333	178	DTL
	179		1600	56.649	56.649	89.4831	192.4021	818,730.894	9,901,851.591	3.253	179	DTL
	180		1600	48.657	48.657	89.4831	200.0043	818,721.420	9,901,847.200	3.227	180	DTL
	181		1600	47.983	47.983	89.4841	193.0231	818,722.343	9,901,853.040	3.222	181	DTL
	182		1600	40.375	40.375	89.5000	192.2440	818,714.993	9,901,855.062	3.182	182	DTL
	183		1600	41.153	41.153	89.4733	203.0224	818,713.562	9,901,847.607	3.213	183	DTL
	184		1600	33.821	33.820	89.3822	207.1125	818,705.765	9,901,848.122	3.277	184	DTL
	185		1600	32.335	32.335	89.4524	191.4532	818,707.182	9,901,857.013	3.201	185	DTL
	186		1600	23.185	23.182	89.0815	192.5809	818,698.094	9,901,858.240	3.413	186	DTL
	187		1600	26.597	26.596	89.3632	212.4553	818,698.029	9,901,849.046	3.246	187	DTL
	188		1600	19.858	19.858	89.5652	223.3002	818,690.057	9,901,849.630	3.082	188	DTL
	189		1600	15.167	15.165	90.5100	193.5048	818,690.201	9,901,859.675	2.839	189	DTL
	190		1600	15.319	15.319	89.4259	242.0520	818,682.823	9,901,849.636	3.140	190	DTL
	191		1600	7.480	7.475	92.0050	195.4240	818,682.645	9,901,861.147	2.801	191	DTL
	192		1600	12.529	12.529	89.4539	276.3201	818,674.208	9,901,850.574	3.116	192	DTL
	193		1600	14.461	14.461	89.4540	308.5000	818,666.547	9,901,851.622	3.124	193	DTL
	194		1600	5.774	5.770	92.0345	117.3248	818,677.993	9,901,868.207	2.856	194	DTL
	195		1600	23.428	23.417	91.4425	54.2353	818,661.450	9,901,881.842	2.353	195	DTL
	196		1600	19.782	19.769	92.0301	72.1529	818,669.060	9,901,881.765	2.356	196	DTL
	197		1600	18.041	18.040	90.2925	98.5024	818,677.873	9,901,880.917	2.910	197	DTL
Survey Date : March, 30 2019												
	C8A		1522	87.053	87.051	90.2247	0.0000	818,675.415	9,901,863.045	3.213	C8A	
C8G		1.48			87.042			818,758.257	9,901,836.333	3.861	C8G	
	1		1600	15.304	15.303	90.3108	332.2644	818,743.172	9,901,833.759	3.603	1	PHN
	2		1600	5.647	5.647	89.3133	318.4101	818,753.077	9,901,834.087	3.788	2	PHN
	3		1600	19.588	19.587	90.2954	343.2555	818,738.675	9,901,836.779	3.571	3	BG
	4		1600	22.855	22.855	90.1731	315.4104	818,737.794	9,901,826.156	3.625	4	BG
	5		1600	20.406	20.405	89.2844	7.1116	818,739.773	9,901,844.976	3.927	5	PHN
	6		1600	53.355	53.355	90.0203	11.5721	818,711.970	9,901,862.871	3.709	6	BG
	7		1600	29.003	29.003	89.5545	19.4129	818,735.267	9,901,854.014	3.777	7	PGR BESI
	8		1600	32.280	32.278	89.2622	27.5547	818,735.754	9,901,859.474	4.057	8	PGR BESI
	9		1600	1.703	1.697	85.1801	17.2428	818,756.872	9,901,837.314	3.881	9	PGR BESI

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	10		1600	0.983	0.974	82.1836	46.4710	818,757.840	9,901,837.214	3.873	10	PGR BESI
	11		1600	1.527	1.523	85.5642	82.4232	818,758.537	9,901,837.831	3.849	11	PGR BESI
	12		1600	19.771	19.770	89.3014	78.0958	818,760.337	9,901,855.994	3.912	12	PGR BESI
	13		1600	21.740	21.736	88.5516	26.1846	818,742.670	9,901,851.483	4.151	13	TWR
	14		1600	8.989	8.980	87.2408	35.5850	818,752.960	9,901,843.585	4.149	14	TWR
	15		1600	8.630	8.624	87.5528	60.4356	818,756.553	9,901,844.788	4.054	15	PHN
	16		1600	14.030	14.026	88.3849	55.0147	818,754.133	9,901,849.740	4.073	16	PHN
	17		1600	18.502	18.500	89.0425	71.2549	818,758.032	9,901,854.832	4.040	17	PHN
	18		1600	23.508	23.505	89.0203	54.4056	818,751.210	9,901,858.757	4.138	18	BG
	19		1600	17.370	17.369	90.2932	97.2414	818,765.673	9,901,852.040	3.592	19	BG
	20		1600	18.416	18.416	90.2213	105.1702	818,768.329	9,901,851.751	3.622	20	BG
	21		1600	10.800	10.799	90.3739	129.0936	818,767.318	9,901,842.210	3.623	21	BG
	22		1600	8.759	8.757	91.2100	118.2919	818,764.594	9,901,842.377	3.533	22	BG
	23		1600	5.863	5.858	87.3801	170.4552	818,764.049	9,901,835.454	3.983	23	BG
	24		1600	7.032	7.028	88.0021	134.1859	818,764.473	9,901,839.612	3.986	24	BG
	25		1600	5.488	5.480	86.5315	203.3618	818,762.363	9,901,832.704	4.039	25	BG
	26		1600	10.565	10.562	88.3927	185.5235	818,767.925	9,901,832.080	3.989	26	POS SCRT
	27		1600	7.430	7.422	87.2237	221.0610	818,762.083	9,901,829.973	4.081	27	POS SCRT
	28		1600	22.260	22.259	90.3336	7.0642	818,738.081	9,901,845.734	3.524	28	JL
	29		1600	23.755	23.753	90.4314	356.1455	818,735.222	9,901,842.128	3.443	29	JL
	30		1600	15.828	15.828	90.2223	341.5637	818,742.430	9,901,836.282	3.638	30	JL
	31		1600	13.481	13.481	90.2224	357.5736	818,745.288	9,901,840.011	3.653	31	JL
	32		1600	10.217	10.217	90.3355	300.4011	818,750.601	9,901,829.569	3.640	32	JL
	33		1600	5.641	5.641	90.3354	310.0816	818,753.473	9,901,833.345	3.686	33	JL
	34		1600	11.942	11.942	89.4214	258.1840	818,756.971	9,901,824.461	3.803	34	JL
	35		1600	5.395	5.395	89.4511	263.1555	818,757.215	9,901,831.040	3.765	35	JL
	36		1600	21.629	21.629	89.4510	257.4014	818,756.169	9,901,814.806	3.835	36	JL
	37		1600	22.270	22.270	90.0146	246.1607	818,760.531	9,901,814.180	3.730	37	JL
	38		1600	13.183	13.183	89.5010	238.4414	818,761.311	9,901,823.509	3.779	38	JL
	39		1600	8.593	8.592	89.1411	228.0020	818,761.769	9,901,828.492	3.856	39	JL
	40		1600	2.197	2.194	87.1140	92.5247	818,759.035	9,901,838.385	3.849	40	JL
	41		1600	4.763	4.762	88.5605	138.4448	818,762.629	9,901,838.223	3.830	41	JL
	42		1600	9.517	9.516	89.1659	81.1930	818,759.778	9,901,845.727	3.860	42	JL
	43		1600	10.650	10.650	89.5528	102.2754	818,763.636	9,901,845.525	3.755	43	JL
	44		1600	19.984	19.983	89.3426	92.1925	818,765.156	9,901,855.088	3.890	44	JL
	45		1600	19.216	19.215	89.2847	79.3817	818,760.769	9,901,855.384	3.916	45	JL
	46		1600	23.177	23.176	89.3319	78.3124	818,760.839	9,901,859.366	3.921	46	JL
	47		1600	22.641	22.640	89.3605	95.0735	818,767.103	9,901,857.175	3.899	47	JL
	48		1600	27.288	27.287	89.3605	87.4923	818,765.639	9,901,862.604	3.931	48	JL
	49		1600	27.188	27.187	89.3605	91.5019	818,767.426	9,901,861.928	3.930	49	JL
	50		1600	23.787	23.786	89.3604	99.3946	818,769.253	9,901,857.426	3.907	50	JL
	51		1600	26.520	26.519	89.3221	111.2530	818,775.053	9,901,856.856	3.955	51	JL
	52		1600	29.794	29.793	89.3624	106.5242	818,775.239	9,901,860.813	3.946	52	JL
	53		1600	31.661	31.660	89.3356	124.1930	818,783.272	9,901,855.740	3.981	53	JL
	54		1600	35.135	35.134	89.2845	120.5715	818,784.703	9,901,859.464	4.061	54	JL
	55		1600	38.734	38.733	89.3252	134.0154	818,792.426	9,901,854.575	4.047	55	JL
	56		1600	41.062	41.060	89.2601	129.2548	818,792.810	9,901,858.515	4.147	56	JL
	57		1000	45.600	45.600	90.1033	124.4602	818,794.501	9,901,864.006	4.201	57	JL
	58		1600	35.652	35.651	89.3143	107.0710	818,778.701	9,901,865.540	4.035	58	BG
	59		1600	37.147	37.145	89.2604	105.3603	818,778.744	9,901,867.318	4.108	59	BG
	60		1600	35.732	35.732	89.4810	100.4731	818,775.396	9,901,867.687	3.864	60	BG
	61		1600	40.084	40.084	89.4443	80.4528	818,764.271	9,901,875.963	3.919	61	PHN
	62		1600	45.991	45.991	89.5353	83.0553	818,767.009	9,901,881.484	3.823	62	PGR BESI
	63		1600	29.954	29.953	89.2841	85.4031	818,765.273	9,901,865.453	4.014	63	PGR BESI
	64		1600	28.116	28.114	89.1644	87.5645	818,765.920	9,901,863.383	4.095	64	PGR BESI
	65		1600	27.843	27.841	89.1942	90.5817	818,767.249	9,901,862.683	4.068	65	PGR BESI
	66		1600	44.661	44.659	89.2959	132.3327	818,797.099	9,901,858.373	4.131	66	PGR BESI
	67		1200	48.358	48.358	89.5938	130.0047	818,799.215	9,901,862.042	4.146	67	PGR BESI
	C8A		1522	52.169	52.169	90.0816	0.0000	818,675.415	9,901,863.045	3.213	C8A	
C8D		1.515			52.172			818,724.032	9,901,881.973	3.381	C8D	
	68		1600	39.779	39.776	90.4300	24.0659	818,684.305	9,901,883.946	2.798	68	DTL
	69		1600	40.811	40.808	90.4301	9.4725	818,684.041	9,901,873.849	2.785	69	DTL
	70		1600	33.638	33.633	90.5654	6.2408	818,691.525	9,901,873.342	2.739	70	DTL
	71		1600	32.498	32.493	90.5919	25.0113	818,691.608	9,901,884.097	2.735	71	DTL
	72		1600	26.554	26.549	91.0427	1.0734	818,699.107	9,901,872.829	2.798	72	DTL
	73		1600	24.810	24.805	91.1025	25.2801	818,699.294	9,901,883.787	2.788	73	DTL
	74		1600	18.085	18.081	91.1617	350.3203	818,708.492	9,901,872.732	2.895	74	DTL
	75		1600	14.448	14.440	91.5427	26.3222	818,709.653	9,901,883.299	2.815	75	DTL
	76		1600	14.755	14.750	88.2919	340.0251	818,712.938	9,901,872.253	3.685	76	BG
	77		1600	4.483	4.467	94.4948	31.3102	818,719.636	9,901,882.768	2.918	77	DTL
	78		1600	8.856	8.848	87.3802	338.3217	818,717.533	9,901,875.969	3.661	78	BG
	79		1600	5.354	5.344	93.2811	193.1655	818,729.324	9,901,882.716	2.972	79	DTL
	80		1600	7.573	7.564	87.1401	269.3504	818,726.827	9,901,874.945	3.661	80	BG
	81		1600	13.019	13.017	90.5422	201.0710	818,737.049	9,901,882.008	3.090	81	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	82		1600	6.286	6.271	86.0313	255.3645	818,727.688	9,901,876.878	3.728	82	BG GNRTR
	83		1600	14.759	14.739	87.0107	218.1949	818,738.123	9,901,877.650	4.063	83	BG GNRTR
	84		1600	10.731	10.720	87.2632	232.1218	818,733.228	9,901,876.463	3.775	84	BG GNRTR
	85		1600	16.325	16.306	87.1604	234.1017	818,737.723	9,901,873.117	4.074	85	BG GNRTR
	86		1600	13.329	13.319	87.4736	250.1107	818,732.786	9,901,871.935	3.809	86	BG GNRTR
	87		1600	20.274	20.257	87.4045	215.0340	818,743.706	9,901,877.145	4.117	87	BG GNRTR
	88		1600	14.190	14.180	87.5314	258.3123	818,731.703	9,901,870.047	3.819	88	BG
	89		1600	13.870	13.861	87.5315	259.5409	818,731.247	9,901,870.139	3.807	89	BG
	90		1600	23.548	23.536	88.1127	234.5214	818,743.636	9,901,868.949	4.039	90	BG
	91		1600	21.418	21.415	89.0526	193.1521	818,745.238	9,901,884.960	3.636	91	BG
	C8A		1522	86.823	86.822	90.1411	359.5958	818,675.415	9,901,863.045	3.213	C8A	
C8E		1.504			86.830			818,758.203	9,901,889.228	3.668	C8E	
	92		1600	32.672	32.667	88.5955	292.5625	818,755.134	9,901,856.705	4.143	92	TWR
	93		1600	8.872	8.868	88.1242	345.0212	818,750.725	9,901,884.462	3.849	93	BG
	94		1600	10.925	10.914	87.2438	332.1203	818,750.533	9,901,881.464	4.066	94	BG
	95		1600	18.083	18.079	88.4940	288.2051	818,757.951	9,901,871.151	3.942	95	DTL
	96		1600	8.144	8.139	87.5505	281.0307	818,759.124	9,901,881.142	3.868	96	DTL
	97		1600	8.664	8.661	88.2723	303.3403	818,755.813	9,901,880.903	3.806	97	DTL
	98		1600	32.416	32.412	89.0253	296.0427	818,753.399	9,901,857.175	4.111	98	DTL
	99		1600	10.355	10.354	89.0252	228.2248	818,767.093	9,901,883.922	3.744	99	TNGK AIR
	100		2400	11.618	11.553	83.5456	238.3914	818,766.908	9,901,881.633	4.004	100	TNGK AIR
	101		1600	14.559	14.559	90.1140	220.5149	818,771.573	9,901,883.466	3.523	101	TNGK AIR
	102		1600	24.215	24.214	89.3638	218.2831	818,780.820	9,901,880.580	3.737	102	BG
	103		1600	15.425	15.421	91.1341	179.3839	818,772.877	9,901,893.969	3.242	103	PHN
	104		1600	23.270	23.270	89.4639	203.5449	818,781.329	9,901,886.649	3.663	104	BG
	105		1600	21.164	21.158	91.1940	184.3410	818,778.821	9,901,893.981	3.082	105	PHN
	106		1600	26.193	26.193	89.4553	203.5310	818,784.236	9,901,886.337	3.680	106	BG
	107		1600	26.488	26.486	90.4158	193.2723	818,784.621	9,901,891.119	3.249	107	BG
	108		1600	33.012	33.011	90.2734	195.1555	818,791.188	9,901,890.544	3.307	108	BG
	109		1600	33.014	33.013	90.2738	195.1635	818,791.190	9,901,890.538	3.307	109	BG
	110		1600	33.444	33.442	90.3521	194.1649	818,791.591	9,901,891.136	3.228	110	PHN
	111		1600	13.175	13.166	92.0344	198.3215	818,771.367	9,901,889.001	3.098	111	BAK AIR
	112		1600	10.181	10.176	91.4712	197.2552	818,768.379	9,901,889.249	3.255	112	BAK AIR
	113		1600	10.079	10.079	89.5651	209.2004	818,768.069	9,901,887.170	3.581	113	BAK AIR
	114		1600	13.211	13.208	91.1043	207.4757	818,771.200	9,901,886.878	3.300	114	BAK AIR
	115		1600	11.176	11.153	93.4128	56.4624	818,749.563	9,901,896.280	2.853	115	MSJD
	116		1600	17.482	17.469	92.1152	86.1513	818,751.858	9,901,905.504	2.902	116	MSJD
	117		1600	4.960	4.949	93.5405	107.4933	818,758.227	9,901,894.176	3.235	117	MSJD
	118		1600	14.304	14.283	93.0718	117.1051	818,760.592	9,901,903.310	2.793	118	MSJD
	119		1501	57.912	57.911	90.2343	189.5603	818,815.603	9,901,896.903	3.272	119	HK2
	C8E		1504	57.912	57.910	89.3126	0.0000	818,758.203	9,901,889.228	3.668	C8E	STN
HK2		1.501			57.911			818,815.603	9,901,896.903	3.272	HK2	
	120		1600	9.961	9.960	89.1958	270.4313	818,816.799	9,901,887.015	3.289	120	BG
	121		1600	20.220	20.219	89.2824	341.4735	818,797.402	9,901,888.096	3.359	121	BG
	122		1600	14.646	14.646	90.1714	330.5201	818,803.867	9,901,888.140	3.099	122	BG
	123		1600	14.410	14.407	88.5226	305.1334	818,808.926	9,901,884.137	3.456	123	BG
	124		1600	11.205	11.203	88.5226	310.4809	818,809.471	9,901,887.528	3.393	124	BG
	125		1600	21.710	21.708	89.1500	313.3326	818,802.861	9,901,879.328	3.457	125	BG
	126		1600	15.221	15.221	89.4320	312.0110	818,807.003	9,901,884.345	3.246	126	BG
	127		1600	23.197	23.185	88.1113	268.1640	818,819.365	9,901,874.025	3.907	127	HK3
	128		1600	18.985	18.984	89.1926	265.3337	818,819.568	9,901,878.338	3.397	128	BG
	129		1600	14.075	14.074	89.1939	259.0756	818,820.065	9,901,883.555	3.338	129	BG
	130		1600	15.812	15.808	88.3842	247.3117	818,823.529	9,901,883.226	3.547	130	BG
	131		1600	17.455	17.451	88.4436	240.3340	818,826.118	9,901,882.976	3.555	131	BG
	132		1600	18.375	18.372	88.5355	236.4107	818,827.639	9,901,883.023	3.526	132	BG
	133		1600	21.865	21.864	89.2651	219.5209	818,834.093	9,901,885.235	3.384	133	BG
	134		2450	16.520	16.480	86.0207	229.0439	818,827.953	9,901,885.991	3.465	134	BG
	135		1600	19.418	19.417	89.2215	153.4541	818,831.727	9,901,907.720	3.386	135	BG
	136		1600	14.987	14.981	88.2618	140.1003	818,825.734	9,901,907.939	3.581	136	BG
	137		1600	14.792	14.785	88.1332	139.1642	818,825.431	9,901,907.949	3.631	137	BG
	138		1600	12.316	12.316	89.5251	82.0312	818,812.298	9,901,908.768	3.198	138	BG
	139		1600	10.174	10.174	89.5251	68.0733	818,810.594	9,901,905.759	3.194	139	PHN
	140		1600	16.704	16.704	89.5500	36.4529	818,801.013	9,901,905.038	3.194	140	PHN
	141		1600	12.518	12.509	87.4714	79.4412	818,811.762	9,901,908.808	3.656	141	PGR SENG
	142		1600	16.991	16.991	89.3817	54.1525	818,803.937	9,901,909.256	3.280	142	PGR SENG
	143		1600	23.738	23.738	89.3816	40.4122	818,795.711	9,901,909.857	3.323	143	PGR SENG
	144		1600	30.945	30.945	89.4641	33.1914	818,787.720	9,901,910.325	3.293	144	PGR SENG
	145		1600	39.078	39.078	90.0700	27.2857	818,778.850	9,901,910.183	3.086	145	PGR SENG
	146		1600	39.224	39.224	89.4938	28.3959	818,778.996	9,901,910.992	3.291	146	PGR SENG
	147		1600	45.526	45.525	90.1843	25.0049	818,772.160	9,901,910.515	2.925	147	PGR SENG
	148		1600	59.966	59.965	90.1512	21.5936	818,757.515	9,901,911.793	2.908	148	PGR SENG
	149		1600	64.937	64.937	90.0203	17.0005	818,751.535	9,901,907.493	3.134	149	DTL
	150		1600	55.829	55.829	90.0519	17.2428	818,760.587	9,901,906.398	3.086	150	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	151		1600	45.338	45.338	90.1504	10.3155	818,770.324	9,901,899.209	2.974	151	DTL
	152		1600	46.156	46.156	90.0926	17.5410	818,770.189	9,901,905.145	3.046	152	DTL
	153		1600	36.624	36.623	90.2256	19.0728	818,779.716	9,901,904.210	2.928	153	DTL
	154		1600	36.627	36.627	90.1338	8.3509	818,778.981	9,901,897.523	3.027	154	DTL
	155		1600	27.406	27.406	90.0800	7.0806	818,788.198	9,901,896.673	3.104	155	DTL
	156		1600	33.295	33.295	90.0314	22.3242	818,783.432	9,901,905.481	3.141	156	PHN
	157		1600	28.055	28.055	90.2018	19.5629	818,788.195	9,901,902.892	3.007	157	DTL
	158		1600	18.697	18.697	90.2018	23.3045	818,797.621	9,901,902.024	3.062	158	DTL
	159		1600	18.764	18.764	89.4956	4.3843	818,796.864	9,901,895.931	3.228	159	DTL
	160		1600	10.340	10.339	90.4849	34.4227	818,806.398	9,901,901.612	3.026	160	DTL
	161		1600	10.336	10.336	89.5849	358.4944	818,805.388	9,901,895.324	3.176	161	DTL
	162		1600	4.527	4.526	90.5608	91.0501	818,815.088	9,901,901.400	3.099	162	DTL
	163		1600	3.222	3.219	87.2739	285.5443	818,815.138	9,901,893.718	3.315	163	DTL
	164		1600	9.598	9.597	90.5427	160.4901	818,824.169	9,901,901.230	3.021	164	DTL
	165		1600	9.064	9.063	89.1318	214.2546	818,823.691	9,901,892.815	3.296	165	DTL
	166		1600	18.239	18.238	90.4403	174.0738	818,833.337	9,901,901.157	2.939	166	DTL
	167		1600	18.322	18.322	89.4332	202.1602	818,833.329	9,901,892.269	3.260	167	DTL
	168		1600	26.490	26.489	90.2112	177.5532	818,841.714	9,901,901.362	3.009	168	DTL
	169		1600	26.893	26.893	90.0256	190.1217	818,842.468	9,901,895.688	3.150	169	DTL
	170		1600	32.755	32.755	89.4157	185.2236	818,848.332	9,901,898.183	3.345	170	TL
	171		1600	22.068	22.063	88.4712	158.0409	818,834.796	9,901,907.783	3.640	171	PGR SENG
	172		1600	29.354	29.352	89.1753	167.2118	818,843.138	9,901,907.068	3.532	172	PGR SENG
	173		1600	19.639	19.636	88.5617	153.1935	818,831.826	9,901,907.965	3.537	173	PGR SENG
	174		1600	35.200	35.200	89.4401	172.0258	818,849.511	9,901,906.349	3.336	174	PGR SENG
	175		1600	24.450	24.450	89.4619	197.4659	818,839.669	9,901,892.587	3.270	175	HK1
	HK2		1501	23.174	23.170	91.0558	359.5959	818,815.603	9,901,896.903	3.272	HK2	STN
HK3		1.298			23.185			818,819.365	9,901,874.025	3.907	HK3	
	176		1600	8.338	8.338	90.1036	277.4038	818,811.030	9,901,873.783	3.579	176	PHN
	177		1600	26.351	26.351	90.0000	292.3208	818,793.710	9,901,880.041	3.605	177	BG
	178		1600	15.281	15.281	89.5652	281.3359	818,804.095	9,901,874.619	3.619	178	BG
	179		1600	29.588	29.587	89.3729	284.3707	818,789.903	9,901,876.748	3.798	179	BG
	180		1600	15.666	15.663	88.5821	271.0359	818,803.864	9,901,871.772	3.886	180	BG
	181		1600	13.621	13.620	90.3550	300.4013	818,806.678	9,901,878.980	3.463	181	BG
	182		1600	4.122	4.111	85.5111	193.1211	818,819.088	9,901,869.923	3.903	182	BG
	183		1600	5.363	5.343	85.0608	192.2830	818,819.072	9,901,868.690	4.062	183	BG
	184		1600	6.973	6.964	87.0605	155.0343	818,823.287	9,901,868.270	3.957	184	BG
	185		1600	5.841	5.837	88.0047	145.2905	818,823.409	9,901,869.815	3.807	185	BG
	186		1600	5.406	5.404	91.2334	51.2158	818,822.983	9,901,878.039	3.473	186	BG
	187		1600	11.644	11.640	88.2657	123.4303	818,829.967	9,901,869.220	3.920	187	BG
	188		1600	7.375	7.375	89.2058	68.5058	818,825.720	9,901,877.767	3.688	188	BG
	189		1600	13.318	13.316	88.5908	100.5022	818,832.676	9,901,873.676	3.840	189	BG
	190		1600	16.220	16.219	89.2933	101.2904	818,835.573	9,901,873.417	3.748	190	BG
	191		1600	21.760	21.760	89.5844	112.5929	818,840.510	9,901,868.889	3.613	191	PHN
	HK2		1501	24.446	24.446	90.0242	359.5959	818,815.603	9,901,896.903	3.272	HK2	STN
HK1		1.468			24.450			818,839.669	9,901,892.587	3.270	HK1	
	192		1700	39.841	39.834	88.5338	268.4528	818,833.489	9,901,853.236	3.807	192	HK4
	193		1600	10.056	10.053	88.3319	294.0321	818,834.015	9,901,884.275	3.392	193	BG
	194		1600	9.204	9.200	88.1518	282.2859	818,836.126	9,901,884.097	3.418	194	BG
	195		1600	9.321	9.321	89.2535	245.0400	818,842.042	9,901,883.574	3.231	195	DTL
	196		1600	18.072	18.071	89.2536	254.4927	818,841.246	9,901,874.585	3.319	196	DTL
	HK1		1468	39.857	39.853	90.5109	359.5958	818,839.669	9,901,892.587	3.270	HK1	STN
HK4		1.491			39.834			818,833.489	9,901,853.236	3.807	HK4	
	197		1600	10.460	10.457	88.3313	329.2042	818,829.617	9,901,862.950	3.962	197	BG
	198		1600	11.830	11.828	88.5357	300.3857	818,824.372	9,901,860.771	3.925	198	BG
	199		1600	13.535	13.530	88.2353	309.5942	818,824.598	9,901,863.435	4.076	199	BG
	200		1600	17.420	17.416	88.4850	289.2746	818,818.167	9,901,861.516	4.059	200	BG
	201		1600	8.004	8.002	91.2222	179.3303	818,832.309	9,901,845.322	3.506	201	BG
	202		1600	9.907	9.904	91.1845	140.2746	818,838.532	9,901,844.712	3.471	202	BG
	203		1600	16.817	16.813	88.4339	284.0731	818,818.018	9,901,859.819	4.072	203	BG
	204		70	35.233	35.215	91.5114	275.0500	818,799.321	9,901,861.761	4.088	204	BG
	205		70	15.464	15.462	89.1056	277.5945	818,818.696	9,901,857.736	5.449	205	PHN
	206		1600	29.630	29.628	89.1850	269.0054	818,804.145	9,901,857.329	4.053	206	JL
	207		1600	29.870	29.869	89.3752	261.0032	818,803.619	9,901,853.202	3.890	207	JL
	208		1600	21.690	21.687	89.0507	268.5242	818,812.002	9,901,856.181	4.044	208	JL
	209		1600	22.128	22.127	89.2110	258.3336	818,811.383	9,901,852.265	3.948	209	JL
	210		1600	12.976	12.972	88.3948	268.5712	818,820.639	9,901,855.014	4.001	210	JL
	211		1600	13.750	13.747	88.5209	251.4626	818,819.922	9,901,851.014	3.969	211	JL
	212		1600	12.721	12.718	88.4830	247.1045	818,821.143	9,901,850.182	3.963	212	JL
	213		1600	5.731	5.720	86.2442	268.5801	818,827.823	9,901,854.021	4.057	213	JL
	214		1600	12.126	12.123	88.4638	240.0220	818,822.173	9,901,848.884	3.957	214	JL
	215		1600	7.803	7.799	88.1131	227.0717	818,827.019	9,901,848.880	3.944	215	JL
	216		1600	15.231	15.231	89.3300	201.0023	818,825.889	9,901,840.037	3.815	216	JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	217		1600	16.729	16.729	89.4913	212.1346	818,822.479	9,901,840.640	3.751	217	JL
	218		1600	23.935	23.935	89.4201	192.4741	818,824.631	9,901,831.001	3.823	218	JL
	219		1600	24.774	24.774	89.4511	200.2727	818,821.333	9,901,831.649	3.805	219	JL
	220		1600	34.650	34.649	89.4053	188.1140	818,823.289	9,901,820.122	3.891	220	JL
	221		1600	36.186	36.186	89.4312	192.4538	818,820.117	9,901,819.612	3.875	221	JL
	222		1600	45.922	45.921	89.4311	185.4120	818,821.902	9,901,808.800	3.923	222	JL
	223		1600	46.680	46.679	89.4311	189.3520	818,818.666	9,901,808.973	3.926	223	JL
	224		1600	40.119	40.119	90.0048	186.1420	818,822.994	9,901,814.514	3.689	224	PGR BESI
	225		1600	45.967	45.967	89.5639	185.1156	818,822.271	9,901,808.659	3.743	225	PGR BESI
	226		1600	32.095	32.095	89.4603	188.2215	818,823.946	9,901,822.593	3.828	226	PGR BESI
	227		1600	12.426	12.426	89.5957	204.5001	818,826.583	9,901,842.905	3.698	227	PGR BESI
	228		1600	5.528	5.516	86.0920	272.0101	818,828.073	9,901,854.283	4.069	228	PGR BESI
	229		1600	15.919	15.916	88.5154	269.5250	818,817.760	9,901,855.673	4.013	229	PGR BESI
	230		1600	16.724	16.722	89.1200	285.4733	818,818.298	9,901,860.229	3.932	230	PGR BESI
	231		1600	15.223	15.222	89.2958	273.0049	818,818.595	9,901,856.385	3.831	231	TL
	232		1600	5.203	5.199	87.4051	304.1908	818,829.702	9,901,856.798	3.909	232	DTL
	233		1600	11.628	11.628	89.5533	41.0826	818,842.405	9,901,860.700	3.713	233	PHN
	234		1600	5.919	5.919	89.3133	355.5820	818,833.994	9,901,859.133	3.747	234	DTL
	235		1600	6.723	6.721	91.1849	66.4930	818,840.003	9,901,854.890	3.544	235	PHN
	236		1600	13.323	13.323	89.5912	357.0008	818,834.865	9,901,866.488	3.701	236	DTL
	237		1600	6.616	6.615	90.4953	115.1337	818,838.963	9,901,849.522	3.602	237	PHN
	238		1600	10.909	10.909	90.1215	49.2647	818,842.777	9,901,858.957	3.659	238	TL
	239		1600	17.691	17.691	90.1214	226.1944	818,818.952	9,901,843.153	3.635	239	PHN
	240		1600	19.477	19.477	89.5212	186.0959	818,828.417	9,901,834.431	3.742	240	BG
	241		1600	8.389	8.388	90.5229	196.3815	818,829.869	9,901,845.669	3.570	241	BG
	J7		1474	92.789	92.789	89.5922	359.5959	818,543.882	9,901,949.171	2.662	J7	STN
C7		1.472			92.788			818,534.429	9,901,856.866	2.547	C7	
	242		1600	49.596	49.595	89.4310	59.2504	818,579.475	9,901,877.617	2.662	242	C7A
	243		1600	20.782	20.782	89.4309	41.1335	818,549.646	9,901,871.019	2.521	243	BG
	244		1600	16.776	16.775	89.1805	17.0525	818,540.967	9,901,872.314	2.624	244	BG
	245		1600	31.791	31.789	89.1836	10.1620	818,543.255	9,901,887.405	2.802	245	BG
	246		1600	31.706	31.706	89.4329	3.3817	818,539.654	9,901,888.138	2.572	246	DTL
	247		1600	31.915	31.915	89.5255	353.1621	818,533.939	9,901,888.777	2.485	247	DTL
	248		1600	23.300	23.300	89.4856	350.5142	818,533.092	9,901,880.127	2.494	248	DTL
	249		1600	21.870	21.868	89.1710	3.5145	818,538.118	9,901,878.421	2.692	249	DTL
	250		1600	15.372	15.371	89.1452	5.2728	818,537.443	9,901,871.938	2.621	250	DTL
	251		1600	15.689	15.689	89.5431	348.5728	818,533.009	9,901,872.490	2.444	251	DTL
	252		1600	6.085	6.085	89.4208	18.0542	818,536.899	9,901,862.427	2.451	252	DTL
	253		1600	6.098	6.098	90.2205	341.2543	818,533.086	9,901,862.814	2.380	253	DTL
	254		1600	7.845	7.843	88.4657	268.5336	818,526.613	9,901,857.514	2.586	254	DTL
	255		1600	17.791	17.790	89.1950	267.0747	818,516.664	9,901,857.790	2.627	255	DTL
	256		1600	11.123	11.114	87.4134	306.1322	818,526.179	9,901,864.313	2.867	256	DTL
	257		1600	19.242	19.241	89.3502	291.4047	818,517.366	9,901,865.759	2.559	257	DTL
	258		1600	18.051	18.047	88.5010	329.0459	818,526.782	9,901,873.213	2.786	258	DTL
	259		1600	23.940	23.940	89.4640	312.4331	818,518.589	9,901,874.816	2.512	259	DTL
	260		1600	28.286	28.286	89.4435	322.1226	818,519.463	9,901,880.868	2.546	260	DTL
	261		1600	25.915	25.915	89.4724	340.2023	818,528.242	9,901,882.031	2.514	261	DTL
	262		1600	32.912	32.911	89.4030	319.1649	818,515.612	9,901,883.867	2.606	262	BG
	263		1600	37.235	37.235	89.4952	349.4457	818,531.570	9,901,893.991	2.529	263	DTL
	264		1600	26.862	26.861	90.2153	335.0546	818,525.659	9,901,882.255	2.248	264	BG
	265		1600	37.503	37.502	89.3334	343.4302	818,527.637	9,901,893.747	2.708	265	BG
	266		1600	34.272	34.271	89.3236	341.3213	818,526.944	9,901,890.309	2.692	266	BG
	267		1600	31.100	31.100	89.4521	259.1852	818,503.440	9,901,854.243	2.552	267	TMBK
	268		1600	23.700	23.699	89.3711	256.2655	818,510.944	9,901,853.689	2.577	268	TMBK
	269		1600	15.929	15.926	88.5731	250.5605	818,518.925	9,901,853.224	2.709	269	TMBK
	270		1600	8.346	8.346	89.3622	232.2012	818,527.338	9,901,852.466	2.477	270	TMBK
	271		1600	5.544	5.536	86.5635	151.3039	818,536.561	9,901,851.756	2.715	271	TMBK
	272		1600	9.712	9.702	87.2124	119.0735	818,542.379	9,901,851.305	2.867	272	TMBK
	273		1600	18.894	18.892	89.1011	103.1522	818,552.281	9,901,850.683	2.693	273	TMBK
	274		1600	25.769	25.768	89.2553	99.0341	818,559.330	9,901,850.236	2.675	274	TMBK
	275		1600	32.501	32.500	89.3337	93.5554	818,566.457	9,901,851.346	2.669	275	BG
	276		1600	40.645	40.644	89.4216	95.0842	818,574.328	9,901,849.116	2.629	276	TMBK
	277		1600	31.816	31.814	89.1717	82.3933	818,566.232	9,901,857.695	2.815	277	T.PRKR
	278		1600	25.860	25.858	89.1717	81.1433	818,560.254	9,901,858.179	2.741	278	T.PRKR
	279		1600	26.663	26.661	89.2132	72.2210	818,560.529	9,901,862.310	2.718	279	T.PRKR
	280		1600	29.875	29.873	89.1559	89.2541	818,564.175	9,901,854.119	2.802	280	DTL
	281		1600	20.191	20.189	89.0758	86.3556	818,554.600	9,901,856.004	2.725	281	DTL
	282		1600	21.344	21.342	89.0758	67.1502	818,554.849	9,901,863.071	2.742	282	DTL
	283		1600	11.703	11.702	89.0758	84.1408	818,546.131	9,901,856.849	2.596	283	DTL
	284		1600	13.390	13.390	89.4316	53.3342	818,545.956	9,901,863.680	2.484	284	DTL
	285		1600	4.251	4.251	89.3034	88.0439	818,538.670	9,901,856.575	2.456	285	DTL
	C7		1600	49.560	49.560	90.0409	359.5958	818,534.429	9,901,856.866	2.547	C7	STN
C7A		1.501			49.595			818,579.475	9,901,877.617	2.662	C7A	

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	286		1600	4.406	4.405	88.5023	103.2713	818,578.613	9,901,881.937	2.652	286	BG
	287		1600	7.820	7.820	89.5127	172.3114	818,586.091	9,901,881.786	2.583	287	BG
	288		1600	28.787	28.787	90.0311	42.0316	818,551.993	9,901,886.188	2.536	288	BG
	289		1600	26.618	26.618	89.4642	120.0232	818,581.937	9,901,904.121	2.666	289	BG
	290		1600	24.770	24.770	89.4643	42.4802	818,555.926	9,901,885.299	2.659	290	BG
	291		1600	24.495	24.495	89.4644	36.1936	818,555.479	9,901,882.540	2.658	291	DTL
	292		1600	24.852	24.852	89.5157	21.3045	818,554.662	9,901,876.221	2.621	292	DTL
	293		1600	15.882	15.882	89.3750	37.4151	818,563.998	9,901,881.180	2.665	293	DTL
	294		1600	16.569	16.569	89.3751	14.5932	818,563.145	9,901,874.814	2.670	294	DTL
	295		1600	8.731	8.731	89.3953	353.3237	818,572.006	9,901,873.096	2.614	295	DTL
	296		1600	8.281	8.281	89.3702	41.5821	818,571.566	9,901,880.071	2.618	296	DTL
	297		1600	5.374	5.374	89.3705	299.2102	818,579.042	9,901,872.261	2.599	297	DTL
	298		1600	11.459	11.459	89.3015	300.0355	818,578.410	9,901,866.208	2.662	298	DTL
	299		1600	9.471	9.471	89.3016	140.3118	818,583.595	9,901,886.145	2.645	299	DTL
	300		1600	14.819	14.819	89.3746	339.5541	818,568.961	9,901,867.175	2.659	300	DTL
	301		1600	14.211	14.211	90.0734	168.3949	818,590.961	9,901,885.985	2.532	301	DTL
	302		1600	21.677	21.677	89.3920	359.3820	818,559.844	9,901,868.424	2.693	302	DTL
	303		1600	22.223	22.223	90.0501	181.3546	818,599.910	9,901,886.350	2.531	303	DTL
	304		1600	27.585	27.585	90.0943	163.1930	818,600.163	9,901,895.863	2.485	304	DTL
	305		1600	23.490	23.490	90.0940	150.1013	818,593.094	9,901,896.756	2.497	305	DTL
	306		1600	21.210	21.210	90.0304	132.3829	818,585.996	9,901,897.800	2.544	306	DTL
	307		1600	8.243	8.243	89.2603	263.4114	818,583.726	9,901,870.556	2.644	307	PINTU
	308		1600	11.947	11.946	89.2603	277.0529	818,583.095	9,901,866.233	2.681	308	PINTU
	309		1600	8.861	8.859	88.5016	259.5924	818,584.524	9,901,870.338	2.743	309	PINTU
	310		1600	12.289	12.287	88.5713	273.5553	818,583.838	9,901,866.132	2.787	310	PINTU
	311		2500	21.672	21.648	87.1901	327.3050	818,567.754	9,901,859.417	2.678	311	BG
	312		1600	22.795	22.794	89.3635	287.4609	818,582.239	9,901,854.991	2.718	312	BG
	313		1600	20.238	20.237	89.2439	288.3358	818,581.649	9,901,857.498	2.771	313	BG
	C7		1600	92.748	92.748	90.0058	359.5959	818,534.429	9,901,856.866	2.547	C7	STN
J7		1.474			92.788			818,543.882	9,901,949.171	2.662	J7	
	314		1600	48.227	48.227	89.5325	0.4344	818,538.359	9,901,901.261	2.628	314	DTL
	315		1600	38.819	38.819	89.4551	358.4451	818,540.772	9,901,910.477	2.696	315	DTL
	316		1600	30.498	30.498	89.4942	352.3740	818,544.694	9,901,918.684	2.627	316	T.PRKR
	317		1600	31.262	31.262	89.4758	345.2138	818,548.660	9,901,918.277	2.645	317	T.PRKR
	318		1600	60.330	60.330	89.5721	356.3942	818,541.241	9,901,888.899	2.583	318	T.PRKR
	319		1600	44.482	44.482	89.5224	334.3132	818,558.823	9,901,907.274	2.634	319	BG
	320		1600	56.450	56.450	89.5225	346.0356	818,551.823	9,901,893.283	2.661	320	DTL
	321		1600	42.243	42.243	89.5226	340.0200	818,554.179	9,901,908.202	2.629	321	DTL
	322		1600	47.312	47.312	89.5225	343.4301	818,552.452	9,901,902.642	2.640	322	DTL
	323		1600	26.263	26.263	90.1856	204.2949	818,557.150	9,901,971.836	2.391	323	DTL
	324		1600	25.374	25.374	90.1537	185.5554	818,549.062	9,901,974.010	2.421	324	DTL
	325		1600	35.366	35.366	90.1551	185.1247	818,550.667	9,901,983.880	2.373	325	DTL
	326		1600	36.475	36.473	90.3323	199.0533	818,559.262	9,901,982.243	2.182	326	DTL
	327		1600	46.680	46.678	90.2908	196.0437	818,561.311	9,901,992.473	2.140	327	DTL
	328		1600	46.573	46.571	90.2909	185.1156	818,552.805	9,901,994.879	2.141	328	DTL
	329		1600	55.150	55.145	90.4722	195.2910	818,563.943	9,902,000.537	1.776	329	DTL
	330		1600	57.494	57.490	90.3946	186.2500	818,556.094	9,902,005.349	1.871	330	DTL
	331		1600	71.574	71.568	90.4437	185.2417	818,557.847	9,902,019.363	1.607	331	DTL
	332		1600	71.555	71.551	90.3701	178.1944	818,549.093	9,902,020.532	1.766	332	DTL
	333		1600	73.183	73.180	90.3117	171.5909	818,541.115	9,902,022.299	1.870	333	DTL
	334		1600	75.863	75.860	90.3100	178.0744	818,549.142	9,902,024.848	1.852	334	PHN
	335		1600	73.747	73.746	90.1724	170.4454	818,539.503	9,902,022.787	2.163	335	PHN
	336		1600	63.117	63.116	90.2329	177.1457	818,547.291	9,902,012.194	2.105	336	DTL
	337		1600	64.485	64.484	90.2326	168.1118	818,537.182	9,902,013.305	2.096	337	DTL
	338		1600	54.610	54.608	90.2654	175.5755	818,545.609	9,902,003.752	2.109	338	DTL
	339		1600	54.612	54.610	90.2613	175.5757	818,545.610	9,902,003.754	2.120	339	DTL
	340		1600	55.624	55.623	90.2025	165.1427	818,535.265	9,902,004.123	2.206	340	DTL
	341		1600	45.207	45.206	90.1628	174.1153	818,543.918	9,901,994.377	2.319	341	DTL
	342		1600	46.962	46.961	90.1630	163.2315	818,535.110	9,901,995.306	2.311	342	DTL
	343		1600	35.759	35.758	90.1947	172.1751	818,542.724	9,901,984.911	2.330	343	DTL
	344		1600	38.865	38.865	90.1428	159.2424	818,533.990	9,901,986.756	2.372	344	DTL
	345		1600	27.038	27.038	90.1341	168.5814	818,541.440	9,901,976.098	2.428	345	DTL
	346		1600	30.524	30.524	90.0009	153.0924	818,532.945	9,901,977.668	2.535	346	DTL
	347		1600	34.766	34.766	90.0456	143.1429	818,526.022	9,901,978.999	2.486	347	DTL
	348		1600	42.594	42.594	90.0455	135.4012	818,517.377	9,901,982.513	2.475	348	DTL
	349		1600	40.628	40.628	90.0541	148.4144	818,526.419	9,901,985.854	2.469	349	DTL
	350		1600	49.289	49.289	90.0926	143.4542	818,518.947	9,901,991.687	2.401	350	DTL
	351		1600	49.186	49.185	90.1610	154.0903	818,527.058	9,901,995.390	2.305	351	DTL
	352		1600	58.165	58.164	90.1930	159.0524	818,528.767	9,902,005.337	2.206	352	DTL
	353		1600	76.205	76.205	89.5558	116.1542	818,479.334	9,901,989.676	2.625	353	DTL
	354		1600	68.251	68.249	90.2516	163.2129	818,531.100	9,902,016.212	2.034	354	DTL
	C1		1600	45.832	45.825	89.0115	359.5958	818,403.297	9,901,966.193	3.112	C1	STN
C2		1.501			45.796			818,413.598	9,901,921.571	2.460	C2	

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	355		1600	15.591	15.591	89.5455	346.4814	818,406.716	9,901,935.561	2.384	355	BG
	356		1600	31.327	31.327	89.5156	4.4940	818,409.146	9,901,952.580	2.435	356	DTL
	357		1600	24.409	24.407	89.2153	17.1237	818,415.391	9,901,945.913	2.632	357	BG
	358		1600	23.617	23.616	89.2154	4.0316	818,409.927	9,901,944.900	2.623	358	DTL
	359		1600	12.258	12.257	89.2607	1.0848	818,411.081	9,901,933.567	2.482	359	DTL
	360		1600	12.433	12.429	88.3643	23.4808	818,415.928	9,901,933.780	2.662	360	BG FTSL
	361		1600	4.155	4.153	88.0805	351.4829	818,412.097	9,901,925.443	2.497	361	DTL
	362		1600	7.212	7.204	87.1702	318.3213	818,407.736	9,901,925.759	2.703	362	PGR SENG
	363		1600	10.964	10.960	88.3053	217.4708	818,409.003	9,901,911.621	2.646	363	PGR SENG
	364		1600	6.471	6.468	88.1231	186.4319	818,414.305	9,901,915.142	2.564	364	DTL
	365		1800	22.477	22.466	88.1024	202.1623	818,409.978	9,901,899.399	2.878	365	PGR SENG
	366		1800	12.916	12.914	89.0435	185.5521	818,415.189	9,901,908.755	2.370	366	DTL
	367		1600	22.060	22.057	89.0434	188.4028	818,415.261	9,901,899.577	2.717	367	DTL
	C2		1600	45.826	45.822	90.4759	0.0001	818,413.598	9,901,921.571	2.460	C2	STN
C1		1.535			45.796			818,403.297	9,901,966.193	3.112	C1	
	368		1600	35.591	35.587	90.5046	292.4936	818,438.362	9,901,960.120	2.521	368	GA.05
Survey Date : March, 31 2019												
	BM03		1202	115.530	115.526	90.2649	359.5959	818,020.153	9,901,920.621	3.042	BM03	BS
CP03		1.144			115.549			818,074.453	9,902,022.616	3.993	CP03	
	1		1600	18.131	18.063	94.5841	171.5733	818,080.628	9,902,039.590	1.964	1	T.JMBTN
	2		1600	17.832	17.761	95.0733	166.5056	818,079.014	9,902,039.781	1.944	2	T.JMBTN
	3		1600	17.282	17.214	95.0600	169.4549	818,079.713	9,902,039.006	2.001	3	T.JMBTN
	4		1600	28.868	28.814	93.3115	165.1153	818,081.046	9,902,050.665	1.764	4	T.JMBTN
	5		1600	16.525	16.444	95.3939	160.2017	818,076.846	9,902,038.885	1.907	5	T.JMBTN
	6		1600	17.091	16.983	96.2706	179.0226	818,082.182	9,902,037.738	1.617	6	T.JMBTN
	7		1600	30.559	30.409	95.4027	161.2014	818,079.403	9,902,052.620	0.516	7	T.JMBTN
	8		1600	27.394	27.347	93.2146	115.3545	818,058.235	9,902,044.635	1.930	8	T.JMBTN
	9		1600	29.340	29.308	92.4011	112.0207	818,055.640	9,902,045.089	2.170	9	T.JMBTN
	10		1600	34.178	34.124	93.1334	126.4213	818,059.888	9,902,053.475	1.614	10	T.JMBTN
	11		1600	29.175	29.143	92.4118	111.2917	818,055.533	9,902,044.782	2.169	11	T.JMBTN
	12		1600	14.960	14.941	92.5438	290.3621	818,084.326	9,902,011.403	2.777	12	TGL
	13		1600	15.308	15.249	95.0236	288.1143	818,085.002	9,902,011.605	2.191	13	TGL
	14		1600	15.000	14.983	92.4323	289.4935	818,084.506	9,902,011.507	2.824	14	TGL
	15		1600	17.911	17.820	95.4549	276.2554	818,089.146	9,902,012.532	1.738	15	SNG
	16		1600	14.097	14.092	91.2805	301.0054	818,081.702	9,902,010.531	3.176	16	DTL
	17		1600	22.096	21.953	96.3059	266.1229	818,094.471	9,902,013.603	1.029	17	SNG
	18		1600	23.696	23.689	91.2352	297.1524	818,087.943	9,902,003.143	2.959	18	TGL
	19		1600	23.917	23.869	93.3842	294.5858	818,088.813	9,902,003.550	2.016	19	TGL
	20		1600	23.698	23.693	91.1137	296.4240	818,088.130	9,902,003.270	3.043	20	TGL
	21		1600	25.627	25.560	94.0827	287.1203	818,092.454	9,902,004.470	1.687	21	SNG
	22		1600	23.238	23.232	91.1725	304.4036	818,085.106	9,902,001.970	3.014	22	DTL
	23		1600	28.651	28.555	94.4123	278.2627	818,097.416	9,902,005.642	1.195	23	SNG
	24		1600	34.467	34.450	91.4748	307.5937	818,088.452	9,901,991.138	2.456	24	DTL
	25		1600	35.284	35.247	92.3657	299.2013	818,093.460	9,901,992.933	1.927	25	TGL
	26		1600	35.172	35.162	91.2219	301.1643	818,092.400	9,901,992.379	2.695	26	TGL
	27		1600	35.187	35.186	90.2652	300.5605	818,092.594	9,901,992.467	3.262	27	TGL
	28		1600	36.321	36.266	93.0905	294.0929	818,096.687	9,901,993.965	1.540	28	SNG
	29		1600	37.697	37.619	93.4144	289.1038	818,100.009	9,901,995.011	1.107	29	SNG
	30		1600	46.261	46.252	91.0849	303.2326	818,096.579	9,901,982.000	2.611	30	TGL
	31		1600	46.532	46.503	92.0135	302.0618	818,097.609	9,901,982.289	1.892	31	TGL
	32		1600	46.185	46.184	90.2609	303.0453	818,096.765	9,901,982.179	3.186	32	TGL
	33		1600	47.771	47.729	92.2407	297.3757	818,101.375	9,901,983.205	1.535	33	SNG
	34		1600	45.843	45.830	91.2045	307.1809	818,093.580	9,901,980.968	2.460	34	DTL
	35		1600	49.453	49.391	92.5243	293.1630	818,105.331	9,901,984.067	1.053	35	SNG
	36		1600	57.067	57.061	90.4748	304.3710	818,100.669	9,901,971.933	2.744	36	TGL
	37		1600	57.326	57.304	91.3518	303.2938	818,101.775	9,901,972.245	1.948	37	TGL
	38		1600	57.053	57.052	90.1755	304.2709	818,100.812	9,901,972.018	3.240	38	TGL
	39		1600	58.363	58.327	92.0055	299.4346	818,105.569	9,901,973.282	1.485	39	SNG
	40		1600	56.816	56.810	90.4751	307.4545	818,097.748	9,901,970.801	2.746	40	DTL
	41		1600	59.715	59.664	92.2129	296.2312	818,109.171	9,901,974.093	1.080	41	SNG
	42		1600	66.251	66.248	90.3142	305.1339	818,104.263	9,901,963.454	2.926	42	TGL
	43		1600	66.515	66.494	91.2546	304.1330	818,105.408	9,901,963.767	1.878	43	TGL
	44		1600	66.314	66.314	90.0952	305.0050	818,104.513	9,901,963.507	3.347	44	TGL
	45		1600	67.234	67.204	91.4237	302.3025	818,107.508	9,901,964.103	1.530	45	SNG
	46		1600	65.983	65.979	90.3533	308.0133	818,101.230	9,901,962.315	2.855	46	DTL
	47		1600	68.034	67.993	91.5857	300.1104	818,110.268	9,901,964.820	1.183	47	SNG
	48		1600	74.945	74.943	90.2613	308.3758	818,104.141	9,901,953.804	2.965	48	DTL
	49		1600	75.129	75.107	91.2219	304.4320	818,108.840	9,901,955.843	1.738	49	TGL
	50		1600	75.112	75.111	90.1935	305.4235	818,107.686	9,901,955.257	3.109	50	TGL
	51		1600	75.136	75.136	90.0657	305.3523	818,107.838	9,901,955.304	3.385	51	TGL
	52		1600	75.544	75.513	91.3832	302.4930	818,111.229	9,901,956.664	1.372	52	SNG
	53		1600	76.004	75.966	91.4908	301.0408	818,113.466	9,901,957.433	1.125	53	SNG

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	54		1600	83.548	83.546	90.2058	306.1017	818,110.813	9,901,947.397	3.027	54	TGL
	55		1600	83.771	83.753	91.1121	305.2324	818,111.928	9,901,947.715	1.798	55	TGL
	56		1600	83.609	83.609	90.0631	306.0208	818,111.018	9,901,947.427	3.379	56	TGL
	57		1600	84.108	84.081	91.2639	303.3951	818,114.322	9,901,948.588	1.417	57	SNG
	58		1600	83.336	83.333	90.3032	308.0321	818,108.233	9,901,946.437	2.797	58	DTL
	59		1600	84.424	84.390	91.3728	301.5758	818,116.653	9,901,949.535	1.144	59	SNG
	60		1600	92.335	92.329	90.3809	308.4235	818,110.914	9,901,937.791	2.512	60	DTL
	61		1600	92.728	92.714	91.0020	305.5207	818,115.243	9,901,939.357	1.910	61	TGL
	62		1600	92.690	92.687	90.2751	306.3535	818,114.176	9,901,938.872	2.786	62	TGL
	63		1600	93.012	92.989	91.1548	304.0951	818,117.830	9,901,940.364	1.486	63	SNG
	64		1600	92.652	92.652	90.0525	306.2632	818,114.381	9,901,939.009	3.391	64	TGL
	65		1600	93.342	93.314	91.2455	302.1928	818,120.609	9,901,941.517	1.232	65	SNG
	66		1600	101.583	101.579	90.3220	306.5242	818,117.529	9,901,930.623	2.582	66	TGL
	67		1600	101.820	101.808	90.5335	306.1351	818,118.665	9,901,930.910	1.950	67	TGL
	68		1600	101.577	101.577	89.5909	306.4428	818,117.748	9,901,930.728	3.562	68	TGL
	69		1600	102.306	102.283	91.1257	303.5720	818,122.494	9,901,932.317	1.366	69	SNG
	70		1600	101.462	101.458	90.2956	308.4202	818,114.534	9,901,929.411	2.654	70	DTL
	71		1600	102.912	102.884	91.2039	301.5229	818,126.043	9,901,933.602	1.123	71	SNG
	72		1600	110.892	110.888	90.2739	308.5653	818,117.819	9,901,920.559	2.645	72	DTL
	73		1600	111.435	111.424	90.4831	306.3224	818,122.299	9,901,921.988	1.964	73	TGL
	74		1600	110.905	110.903	90.2051	307.1142	818,120.927	9,901,921.920	2.864	74	TGL
	75		1600	110.955	110.955	90.0218	307.0237	818,121.215	9,901,921.996	3.463	75	TGL
	76		1600	111.922	111.901	91.0658	304.3411	818,125.950	9,901,923.269	1.357	76	SNG
	77		1600	112.441	112.415	91.1414	302.2815	818,129.807	9,901,924.774	1.109	77	SNG
	78		1600	119.866	119.863	90.2310	307.2624	818,124.216	9,901,913.571	2.729	78	TGL
	79		1600	119.859	119.859	90.0211	307.1606	818,124.541	9,901,913.724	3.461	79	TGL
	80		1600	120.105	120.094	90.4541	306.4527	818,125.610	9,901,913.962	1.941	80	TGL
	81		1600	119.390	119.386	90.2856	309.5847	818,119.157	9,901,911.916	2.532	81	DTL
	82		1600	120.628	120.611	90.5813	305.1756	818,128.591	9,901,914.838	1.494	82	SNG
	83		1600	121.166	121.142	91.0814	303.4945	818,131.588	9,901,915.794	1.132	83	SNG
	84		1600	130.201	130.197	90.2754	309.4714	818,123.610	9,901,902.056	2.480	84	DTL
	85		1600	130.812	130.803	90.4003	307.1018	818,129.315	9,901,903.874	2.013	85	TGL
	86		1600	130.730	130.728	90.1922	307.4220	818,128.175	9,901,903.437	2.801	86	TGL
	87		1600	130.725	130.725	89.5959	307.3640	818,128.370	9,901,903.528	3.538	87	TGL
	88		1600	131.179	131.162	90.5530	305.3906	818,132.604	9,901,905.050	1.419	88	SNG
	89		1600	132.036	132.015	91.0140	304.0237	818,136.280	9,901,905.974	1.169	89	SNG
	90		1600	140.532	140.531	90.1221	307.5935	818,131.560	9,901,894.211	3.032	90	TGL
	91		1600	140.850	140.842	90.3656	307.3131	818,132.735	9,901,894.399	2.024	91	TGL
	92		1600	140.559	140.559	89.5728	307.5236	818,131.832	9,901,894.302	3.641	92	TGL
	93		1600	141.424	141.405	90.5637	305.4552	818,136.896	9,901,895.745	1.208	93	SNG
	94		1600	140.290	140.289	90.1230	309.2500	818,128.260	9,901,893.056	3.027	94	DTL
	95		1600	141.721	141.700	90.5925	304.1523	818,140.350	9,901,897.171	1.088	95	SNG
	96		1600	150.336	150.336	90.0543	309.4110	818,131.459	9,901,883.508	3.287	96	DTL
	97		1600	150.771	150.764	90.3350	307.5005	818,136.099	9,901,885.031	2.053	97	TGL
	98		1600	150.757	150.757	89.5843	308.1629	818,135.038	9,901,884.568	3.593	98	TGL
	99		1600	150.771	150.771	89.5842	308.1307	818,135.178	9,901,884.615	3.594	99	TGL
	100		1600	151.521	151.507	90.4630	305.4602	818,141.350	9,901,886.678	1.488	100	SNG
	101		1600	152.025	152.003	90.5822	304.2732	818,144.666	9,901,887.801	0.956	101	SNG
	102		1600	160.029	160.029	90.0100	308.2526	818,138.382	9,901,875.911	3.490	102	TGL
	103		1600	160.086	160.086	89.5816	308.2156	818,138.554	9,901,875.924	3.618	103	TGL
	104		1600	160.302	160.294	90.3435	307.5858	818,139.617	9,901,876.166	1.924	104	TGL
	105		1600	159.850	159.850	90.0554	309.4850	818,134.737	9,901,874.569	3.263	105	DTL
	106		1600	160.458	160.444	90.4604	306.3207	818,143.360	9,901,877.723	1.387	106	SNG
	107		1600	169.731	169.730	90.0837	309.5234	818,138.292	9,901,865.349	3.112	107	DTL
	108		1600	161.031	161.011	90.5426	304.3833	818,148.369	9,901,879.574	0.987	108	SNG
	109		1600	169.666	169.666	90.0008	308.3228	818,141.914	9,901,866.938	3.530	109	TGL
	110		1600	169.640	169.640	89.5840	308.2953	818,142.020	9,901,867.013	3.603	110	TGL
	111		2000	169.870	169.864	90.2931	308.0424	818,143.262	9,901,867.313	1.679	111	TGL
	112		2000	170.027	170.018	90.3615	306.3908	818,147.159	9,901,868.928	1.344	112	SNG
	113		2000	170.673	170.660	90.4247	304.5625	818,152.009	9,901,870.597	1.013	113	SNG
	114		1600	169.005	169.005	90.0643	309.4723	818,138.256	9,901,866.117	3.207	114	DTL
	115		1600	168.443	168.440	90.2143	311.2525	818,133.569	9,901,864.891	2.473	115	JL
	116		1600	168.417	168.414	90.1905	313.1234	818,128.617	9,901,863.149	2.602	116	JL
	117		1600	156.509	156.506	90.2000	311.2909	818,129.222	9,901,876.006	2.626	117	JL
	118		1600	156.352	156.349	90.2255	313.2449	818,124.209	9,901,874.396	2.495	118	JL
	119		1600	144.564	144.562	90.1919	311.3338	818,124.865	9,901,887.129	2.725	119	JL
	120		1600	144.391	144.388	90.2118	313.3313	818,120.068	9,901,885.622	2.642	120	JL
	121		1600	132.832	132.829	90.2118	311.3755	818,120.619	9,901,898.067	2.714	121	JL
	122		1600	132.623	132.619	90.2602	313.5943	818,115.379	9,901,896.469	2.533	122	JL
	123		1600	120.516	120.512	90.2735	314.0724	818,111.386	9,901,907.903	2.570	123	JL
	124		1600	120.740	120.736	90.2735	311.5247	818,115.926	9,901,909.226	2.568	124	JL
	125		1600	108.211	108.208	90.2736	311.5252	818,111.620	9,901,920.992	2.668	125	JL
	126		1600	107.796	107.792	90.3048	314.2525	818,106.949	9,901,919.839	2.571	126	JL
	127		1600	95.521	95.517	90.2952	312.0113	818,107.043	9,901,932.830	2.707	127	JL
	128		1600	95.723	95.719	90.2952	315.0205	818,102.335	9,901,931.047	2.705	128	JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	129		1600	83.973	83.969	90.3529	311.5454	818,103.247	9,901,943.739	2.670	129	JL
	130		1600	84.099	84.094	90.3819	315.4203	818,098.012	9,901,941.890	2.600	130	JL
	131		1600	71.094	71.090	90.3749	311.5226	818,098.879	9,901,955.854	2.755	131	JL
	132		1600	70.792	70.785	90.4803	316.3612	818,093.210	9,901,954.361	2.548	132	JL
	133		1600	59.091	59.081	91.0211	317.3236	818,089.172	9,901,965.398	2.468	133	JL
	134		1600	59.076	59.070	90.4752	312.1154	818,094.435	9,901,967.028	2.714	134	JL
	135		1600	46.623	46.612	91.1453	312.4213	818,089.833	9,901,978.615	2.522	135	JL
	136		1600	46.666	46.655	91.1452	318.0144	818,085.693	9,901,977.335	2.521	136	JL
	137		1600	34.494	34.476	91.5144	321.1734	818,080.840	9,901,988.737	2.416	137	JL
	138		1600	34.008	33.992	91.4507	313.4728	818,085.058	9,901,990.321	2.497	138	JL
	139		1600	22.899	22.879	92.2448	320.0941	818,079.135	9,902,000.221	2.573	139	JL
	140		1600	26.617	26.596	92.1642	335.3039	818,072.810	9,901,996.071	2.479	140	JL
	141		1600	19.593	19.559	93.2241	331.0459	818,074.756	9,902,003.059	2.383	141	JL
	142		1600	26.581	26.558	92.2315	345.0923	818,068.395	9,901,996.758	2.430	142	JL
	143		1600	19.369	19.342	93.0036	344.4934	818,070.149	9,902,003.759	2.520	143	JL
	144		1600	22.752	22.723	92.5230	358.5303	818,064.167	9,902,002.354	2.396	144	JL
	145		1600	38.778	38.756	91.5657	352.0324	818,061.143	9,901,986.218	2.218	145	JL
	146		1600	36.953	36.930	92.0134	1.0108	818,056.521	9,901,990.332	2.231	146	JL
	147		1600	50.793	50.774	91.3256	0.0032	818,050.585	9,901,977.801	2.164	147	JL
	148		1600	50.779	50.765	91.2122	353.0714	818,056.136	9,901,975.271	2.335	148	JL
	149		1600	62.816	62.803	91.1030	359.4117	818,045.242	9,901,967.020	2.249	149	JL
	150		1600	63.442	63.431	91.0513	354.3754	818,050.014	9,901,964.083	2.334	150	JL
	151		1600	74.632	74.622	90.5611	0.0458	818,039.290	9,901,956.798	2.317	151	JL
	152		1600	75.361	75.354	90.4624	355.4601	818,044.048	9,901,953.668	2.520	152	JL
	153		1600	89.030	89.024	90.4038	0.5501	818,031.365	9,901,944.714	2.485	153	JL
	154		1600	89.545	89.540	90.3758	357.5509	818,035.273	9,901,942.104	2.548	154	JL
	155		1600	102.603	102.597	90.3636	1.4101	818,023.599	9,901,933.509	2.445	155	JL
	156		1600	103.371	103.366	90.3250	359.0103	818,027.449	9,901,930.555	2.550	156	JL
	157		1600	113.787	113.784	90.2541	0.3725	818,019.892	9,901,922.767	2.687	157	JL
	158		1600	113.162	113.157	90.3215	2.5116	818,016.368	9,901,925.504	2.475	158	JL
	159		1600	28.833	28.807	92.2520	329.5450	818,075.486	9,901,993.827	2.318	159	A.SLRN
	160		1600	29.119	29.094	92.2314	331.4234	818,074.585	9,901,993.523	2.324	160	A.SLRN
	161		1600	29.083	29.050	92.4448	330.4422	818,075.077	9,901,993.573	2.143	161	B.SLRN
	162		1600	50.936	50.922	91.2022	321.3556	818,083.620	9,901,972.526	2.346	162	A.SLRN
	163		1600	50.992	50.975	91.2921	322.3855	818,082.709	9,901,972.314	2.212	163	A.SLRN
	164		1600	51.005	50.979	91.4944	322.0027	818,083.272	9,901,972.406	1.909	164	B.SLRN
	165		1600	89.132	89.126	90.3956	316.3633	818,098.062	9,901,936.674	2.502	165	A.SLRN
	166		1600	89.373	89.367	90.3956	317.2030	818,097.022	9,901,936.146	2.499	166	A.SLRN
	167		1600	89.364	89.351	90.5808	316.5602	818,097.633	9,901,936.324	2.026	167	B.SLRN
	168		1600	115.474	115.470	90.2837	315.0621	818,107.951	9,901,912.112	2.576	168	A.SLRN
	169		1600	115.799	115.796	90.2627	315.3500	818,107.121	9,901,911.524	2.646	169	A.SLRN
	170		1600	115.641	115.632	90.4242	315.2127	818,107.512	9,901,911.810	2.101	170	B.SLRN
	171		1600	149.127	149.124	90.2222	314.1828	818,119.697	9,901,880.521	2.567	171	A.SLRN
	172		1600	149.185	149.182	90.2315	314.3739	818,118.921	9,901,880.216	2.528	172	A.SLRN
	173		1600	149.286	149.280	90.3001	314.2740	818,119.364	9,901,880.252	2.234	173	B.SLRN
	174		1600	173.770	173.767	90.2029	313.5541	818,128.270	9,901,857.393	2.502	174	A.SLRN
	175		2500	173.739	173.738	90.1249	314.1529	818,127.309	9,901,857.114	1.989	175	A.SLRN
	176		2500	173.829	173.825	90.2440	314.0405	818,127.884	9,901,857.207	1.390	176	B.SLRN
	177		1600	172.162	172.160	90.1718	315.4532	818,122.516	9,901,857.301	2.671	177	DTL
	178		1600	170.818	170.816	90.1717	317.2438	818,117.393	9,901,857.285	2.678	178	DTL
	179		1600	161.213	161.210	90.1935	316.0925	818,118.382	9,901,867.506	2.619	179	DTL
	180		1600	160.731	160.727	90.2409	318.0039	818,113.225	9,901,866.635	2.408	180	DTL
	181		1600	147.661	147.657	90.2545	318.5330	818,107.865	9,901,878.789	2.431	181	DTL
	182		1600	148.276	148.272	90.2546	316.1907	818,114.454	9,901,879.842	2.426	182	DTL
	183		1600	135.256	135.254	90.1804	319.0128	818,104.753	9,901,890.799	2.826	183	DTL
	184		1600	135.201	135.198	90.2250	316.3920	818,110.161	9,901,892.219	2.639	184	DTL
	185		1600	122.018	122.015	90.2249	317.0622	818,105.752	9,901,904.683	2.727	185	DTL
	186		1600	122.077	122.075	90.1914	319.2520	818,100.974	9,901,903.457	2.854	186	DTL
	187		1600	105.403	105.401	90.1959	318.3748	818,098.772	9,901,920.059	2.924	187	DTL
	188		1600	104.905	104.901	90.2944	321.4156	818,093.157	9,901,919.396	2.630	188	DTL
	189		1600	91.298	91.293	90.3630	321.1021	818,091.555	9,901,932.939	2.568	189	DTL
	190		1600	92.818	92.813	90.3629	324.2303	818,086.705	9,901,930.615	2.552	190	DTL
	191		1600	76.933	76.921	91.0052	323.2702	818,085.848	9,901,946.544	2.175	191	DTL
	192		1600	79.148	79.134	91.0529	327.1017	818,081.073	9,901,943.760	2.029	192	DTL
	193		1600	66.505	66.485	91.2456	325.0801	818,082.367	9,901,956.604	1.894	193	DTL
	194		1600	67.536	67.519	91.1659	330.0655	818,076.638	9,901,955.132	2.025	194	DTL
	195		1600	52.530	52.504	91.4803	326.0711	818,079.805	9,901,970.385	1.886	195	DTL
	196		1600	53.245	53.228	91.2757	332.2258	818,074.069	9,901,969.390	2.175	196	DTL
	197		1600	40.587	40.558	92.0925	329.4457	818,076.025	9,901,982.088	2.009	197	DTL
	198		1600	40.450	40.414	92.2433	336.1320	818,071.456	9,901,982.313	1.837	198	DTL
	199		1600	32.508	32.470	92.4515	333.2939	818,073.589	9,901,990.157	1.975	199	DTL
	200		1600	34.439	34.418	91.5916	343.5252	818,067.349	9,901,988.939	2.342	200	DTL
	201		1600	15.307	15.297	92.0113	320.0819	818,077.589	9,902,007.643	2.997	201	DTL
	202		1600	12.383	12.365	93.0606	353.5800	818,069.819	9,902,011.152	2.867	202	DTL
	203		1600	6.724	6.715	92.5724	337.2734	818,073.811	9,902,015.932	3.190	203	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	204		70	30.418	30.233	96.1929	163.5416	818,080.705	9,902,052.195	1.716	204	F1
	BM03		1202	115.535	115.531	90.2743	359.5959	818,020.153	9,901,920.621	3.042	BM03	BS
CP03		1.144			115.549			818,074.453	9,902,022.616	3.993	CP03	
	205		1600	48.635	48.627	91.0354	348.3843	818,060.500	9,901,976.034	2.633	205	DTL
	206		1600	59.466	59.456	91.0219	351.1811	818,054.769	9,901,966.513	2.459	206	DTL
	207		1600	61.986	61.973	91.1015	344.0452	818,061.450	9,901,962.022	2.270	207	DTL
	208		1600	66.655	66.642	91.0726	347.3427	818,056.527	9,901,958.430	2.230	208	DTL
	209		1600	73.756	73.734	91.2416	340.4351	818,063.222	9,901,949.742	1.729	209	DTL
	210		1600	76.383	76.366	91.1301	343.1334	818,059.547	9,901,947.719	1.915	210	DTL
	211		1600	82.963	82.941	91.1908	336.0915	818,068.401	9,901,939.896	1.627	211	DTL
	212		1600	86.985	86.969	91.0648	338.0043	818,065.299	9,901,936.131	1.847	212	DTL
	213		1600	97.336	97.333	90.2701	330.2534	818,077.075	9,901,925.318	2.772	213	DTL
	214		1600	100.494	100.492	90.2226	332.3615	818,073.340	9,901,922.130	2.881	214	DTL
	215		1600	112.249	112.247	90.1852	329.0411	818,080.132	9,901,910.512	2.921	215	DTL
	216		1600	111.253	111.250	90.2625	326.4339	818,084.618	9,901,911.832	2.682	216	DTL
	217		1600	122.659	122.657	90.2127	324.4257	818,089.941	9,901,900.941	2.772	217	DTL
	218		1600	124.228	124.226	90.2128	328.1946	818,082.341	9,901,898.641	2.761	218	DTL
	219		1600	136.366	136.362	90.2444	326.0614	818,088.389	9,901,886.968	2.556	219	DTL
	220		1600	136.642	136.638	90.2622	322.5252	818,096.037	9,901,887.694	2.489	220	DTL
	221		1600	150.645	150.642	90.2319	320.3609	818,104.144	9,901,874.929	2.515	221	DTL
	222		1600	147.623	147.621	90.1907	323.5403	818,095.174	9,901,876.457	2.716	222	DTL
	223		1600	145.178	145.175	90.2256	329.0459	818,081.764	9,901,877.625	2.569	223	BG
	224		1600	136.178	136.175	90.2254	332.4419	818,072.626	9,901,886.453	2.630	224	BG
	225		1600	135.928	135.926	90.1816	333.5801	818,069.716	9,901,886.772	2.815	225	BG
	226		1600	127.898	127.896	90.1816	336.5427	818,063.445	9,901,895.194	2.857	226	BG
	227		1600	132.149	132.146	90.2220	333.2046	818,071.279	9,901,890.508	2.678	227	DTL
	228		1600	133.385	133.382	90.2115	330.3331	818,077.738	9,901,889.274	2.713	228	DTL
	229		1600	123.422	123.418	90.2810	336.0049	818,065.750	9,901,899.505	2.526	229	DTL
	230		1600	122.058	122.056	90.1920	332.2011	818,073.672	9,901,900.562	2.851	230	DTL
	231		1600	122.005	122.003	90.1925	332.1702	818,073.784	9,901,900.615	2.848	231	DTL
	232		1600	120.704	120.702	90.1924	335.5656	818,066.077	9,901,902.205	2.856	232	DTL
	233		1600	113.237	113.236	90.1601	335.2838	818,067.526	9,901,909.592	3.009	233	DTL
	234		1600	110.721	110.715	90.3544	339.0507	818,060.739	9,901,912.754	2.386	234	DTL
	235		1600	102.906	102.896	90.4815	344.2413	818,052.298	9,901,922.134	2.093	235	DTL
	236		1600	102.779	102.771	90.4308	340.1331	818,059.696	9,901,920.910	2.247	236	DTL
	237		1600	95.968	95.964	90.2936	343.3906	818,055.022	9,901,928.639	2.711	237	DTL
	238		1600	98.308	98.304	90.3248	346.3439	818,049.661	9,901,927.490	2.599	238	DTL
	239		1600	94.326	94.321	90.3503	351.4407	818,042.556	9,901,933.852	2.575	239	DTL
	240		1600	87.765	87.762	90.2956	346.1217	818,052.873	9,901,937.549	2.773	240	DTL
	241		1600	81.672	81.668	90.3327	349.5410	818,049.307	9,901,944.916	2.742	241	DTL
	242		1600	19.267	19.261	91.2445	308.3738	818,082.085	9,902,004.931	3.062	242	F2
	243		1600	23.826	23.779	93.3508	114.5419	818,060.121	9,902,041.591	2.047	243	DTL
	244		1600	18.819	18.759	94.3448	129.5336	818,067.403	9,902,040.000	2.034	244	DTL
	245		1600	25.130	25.097	92.5501	91.4353	818,052.666	9,902,035.074	2.258	245	DTL
	246		1600	13.201	13.162	94.2550	90.3726	818,062.903	9,902,028.927	2.517	246	DTL
	247		1600	16.375	16.291	95.4841	48.5906	818,058.579	9,902,018.956	1.879	247	DTL
	248		1600	24.255	24.173	94.4239	57.0911	818,050.365	9,902,020.586	1.545	248	DTL
	249		1600	23.695	23.647	93.3754	20.0210	818,056.861	9,902,006.813	2.036	249	DTL
	250		1600	30.284	30.219	93.4451	29.3935	818,048.913	9,902,006.464	1.558	250	DTL
	251		1600	32.332	32.297	92.4056	12.0527	818,053.641	9,901,997.919	2.024	251	DTL
	252		1600	37.430	37.381	92.5503	20.5601	818,046.256	9,901,998.074	1.632	252	DTL
	253		1600	44.974	44.935	92.2303	15.4120	818,043.397	9,901,990.140	1.666	253	DTL
	254		1600	44.859	44.832	91.5835	8.0520	818,048.026	9,901,986.401	1.990	254	DTL
	255		1600	54.371	54.351	91.3359	5.3705	818,044.338	9,901,977.371	2.051	255	DTL
	256		1600	56.027	56.002	91.4316	9.5040	818,040.072	9,901,978.411	1.854	256	DTL
	257		1600	67.676	67.650	91.3512	7.4946	818,034.824	9,901,967.789	1.663	257	DTL
	258		1600	64.836	64.828	90.5303	3.3850	818,040.409	9,901,967.446	2.537	258	DTL
	259		1600	78.654	78.643	90.5742	3.4857	818,032.958	9,901,955.811	2.217	259	DTL
	260		1600	80.830	80.807	91.2122	7.4355	818,027.227	9,901,957.045	1.624	260	DTL
	261		1600	62.458	62.427	91.4700	14.5725	818,031.888	9,901,976.950	1.581	261	DTL
	262		1600	66.002	65.972	91.4322	20.1812	818,025.170	9,901,978.758	1.553	262	DTL
	263		1600	54.269	54.230	92.0952	20.3357	818,033.777	9,901,986.750	1.487	263	DTL
	264		1600	62.262	62.220	92.0554	26.3236	818,023.752	9,901,986.550	1.257	264	DTL
	265		1600	57.238	57.194	92.1406	32.4444	818,024.539	9,901,994.692	1.305	265	DTL
	266		1600	50.203	50.158	92.2549	26.1529	818,033.727	9,901,993.338	1.408	266	DTL
	267		1600	45.302	45.264	92.2054	32.2520	818,035.076	9,902,000.294	1.681	267	DTL
	268		1600	50.181	50.134	92.2807	38.0844	818,028.591	9,902,002.365	1.376	268	DTL
	269		1600	40.100	40.051	92.5004	40.1258	818,037.254	9,902,007.772	1.554	269	DTL
	270		1600	49.043	49.006	92.1403	46.4021	818,027.184	9,902,009.687	1.625	270	DTL
	271		1600	36.507	36.454	93.0548	52.1432	818,038.523	9,902,016.457	1.565	271	DTL
	272		1600	43.738	43.691	92.4004	54.3300	818,031.127	9,902,016.982	1.501	272	DTL
	273		1600	35.275	35.242	92.2741	64.0225	818,039.234	9,902,023.889	2.022	273	DTL
	274		1600	40.196	40.180	91.3652	68.0712	818,034.504	9,902,026.921	2.405	274	DTL
	275		1600	35.948	35.910	92.3727	82.3543	818,040.844	9,902,035.266	1.891	275	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	276		1600	44.212	44.194	91.3920	81.3744	818,032.835	9,902,037.484	2.260	276	DTL
	277		1600	38.863	38.822	92.3805	100.4122	818,044.164	9,902,046.899	1.751	277	TMBK JMBTN
	278		1600	43.831	43.797	92.1547	97.1806	818,038.723	9,902,047.944	1.806	278	TMBK JMBTN
	279		1600	54.234	54.196	92.0800	92.2454	818,027.730	9,902,050.078	1.508	279	TMBK JMBTN
	280		1600	59.523	59.484	92.0359	90.3611	818,022.243	9,902,051.121	1.391	280	TMBK JMBTN
	281		1600	54.104	54.077	91.4935	82.3151	818,023.821	9,902,041.608	1.813	281	DTL
	282		1600	65.231	65.210	91.2612	80.4405	818,012.709	9,902,043.593	1.902	282	DTL
	283		1600	66.435	66.410	91.3514	72.3254	818,009.172	9,902,034.808	1.697	283	DTL
	284		1600	53.530	53.493	92.0813	73.0116	818,021.952	9,902,032.870	1.541	284	DTL
	285		1495	86.387	86.369	91.1033	72.2729	817,989.527	9,902,038.338	1.869	285	F3
	CP03		1144	86.387	86.369	88.4938	359.5959	818,074.453	9,902,022.616	3.993	CP03	STN
F3		1.495			86.369			817,989.527	9,902,038.338	1.869	F3	
	286		1600	7.009	7.009	89.3504	102.3453	817,986.781	9,902,031.890	1.815	286	DTL
	287		1600	10.460	10.459	90.5617	49.5857	817,994.682	9,902,029.238	1.593	287	DTL
	288		1600	17.533	17.533	90.1131	94.0636	817,985.108	9,902,021.371	1.706	288	DTL
	289		1600	19.159	19.158	90.3917	60.2616	817,995.788	9,902,020.232	1.545	289	DTL
	290		1600	26.265	26.265	90.1716	93.1137	817,983.315	9,902,012.819	1.632	290	DTL
	291		1600	25.317	25.316	90.3647	72.2427	817,992.658	9,902,013.217	1.493	291	DTL
	292		1600	37.926	37.926	90.1720	91.4649	817,981.468	9,902,001.279	1.573	292	DTL
	293		1600	36.085	36.084	90.2704	81.0529	817,988.532	9,902,002.268	1.480	293	DTL
	294		1600	48.545	48.545	90.0610	91.0709	817,979.760	9,901,990.786	1.677	294	DTL
	295		1600	48.815	48.815	90.0540	82.5907	817,986.569	9,901,989.613	1.684	295	DTL
	296		1600	60.302	60.302	89.5718	91.0646	817,977.400	9,901,979.268	1.812	296	DTL
	297		1600	61.180	61.180	89.4943	84.5357	817,983.783	9,901,977.429	1.947	297	DTL
	298		1600	70.956	70.953	89.2659	91.4111	817,974.564	9,901,968.981	2.446	298	DTL
	299		1600	74.925	74.924	89.4640	87.3742	817,978.948	9,901,964.164	2.055	299	DTL
	300		1600	79.566	79.564	89.3710	91.2341	817,973.144	9,901,960.479	2.293	300	BG
	301		1600	82.598	82.597	89.4120	86.3732	817,979.298	9,901,956.377	2.213	301	DTL
	302		1600	82.693	82.691	89.3851	82.4104	817,984.950	9,901,955.773	2.273	302	DTL
	303		1600	85.535	85.532	89.2910	78.0204	817,991.732	9,901,952.835	2.531	303	DTL
	304		1600	77.934	77.932	89.3537	76.5444	817,993.061	9,901,960.486	2.317	304	DTL
	305		1600	81.913	81.912	89.4201	82.3229	817,985.198	9,901,956.541	2.193	305	DTL
	306		1600	68.376	68.376	89.5112	73.5412	817,996.209	9,901,970.290	1.939	306	DTL
	307		1600	66.740	66.740	89.4901	78.3606	817,990.587	9,901,971.607	1.978	307	DTL
	308		1600	57.413	57.413	89.5626	67.5751	818,001.020	9,901,982.087	1.824	308	DTL
	309		1600	55.201	55.201	89.5117	73.4927	817,994.998	9,901,983.409	1.904	309	DTL
	310		1600	42.843	42.842	90.2124	69.5030	817,996.723	9,901,996.105	1.498	310	DTL
	311		1600	55.721	55.721	90.0644	60.0206	818,008.106	9,901,985.806	1.655	311	DTL
	312		1600	39.986	39.985	90.1943	65.2852	817,999.221	9,901,999.546	1.535	312	DTL
	313		1600	49.244	49.243	90.2432	58.0853	818,007.465	9,901,992.479	1.413	313	DTL
	314		1600	41.333	41.332	90.2848	58.1118	818,004.557	9,901,999.836	1.418	314	DTL
	315		1600	41.373	41.371	90.3131	51.1055	818,009.160	9,902,001.922	1.385	315	DTL
	316		1600	41.361	41.359	90.3129	44.0442	818,013.505	9,902,004.639	1.385	316	DTL
	317		1600	40.128	40.127	90.2249	33.3614	818,018.347	9,902,010.417	1.498	317	DTL
	318		1600	35.089	35.087	90.3914	36.4407	818,013.356	9,902,012.584	1.364	318	DTL
	319		1600	26.787	26.784	90.5344	41.3701	818,005.978	9,902,017.202	1.346	319	DTL
	320		1600	23.339	23.336	90.5709	52.3721	818,000.081	9,902,017.525	1.376	320	DTL
	321		1600	22.178	22.169	91.3734	35.3700	818,004.895	9,902,022.360	1.135	321	DTL
	322		1600	22.543	22.536	91.2705	19.0353	818,009.131	9,902,027.223	1.193	322	DTL
	323		1600	12.933	12.933	89.4835	353.4201	818,002.426	9,902,037.393	1.807	323	DTL
	324		1600	17.482	17.482	90.1415	322.3937	818,005.124	9,902,046.234	1.692	324	DTL
	325		1600	24.844	24.839	91.0636	311.3601	818,009.125	9,902,053.600	1.283	325	TMBK JMBTN
	326		1600	11.728	11.726	90.5934	296.0332	817,996.510	9,902,047.758	1.561	326	DTL
	327		1600	18.803	18.801	90.5118	277.5329	817,995.455	9,902,056.180	1.484	327	TMBK JMBTN
	328		1600	9.760	9.757	91.2418	240.1941	817,986.321	9,902,047.553	1.525	328	DTL
	329		1600	8.561	8.556	88.0148	186.2823	817,981.343	9,902,040.834	2.059	329	DTL
	330		1600	11.466	11.464	88.5950	138.2139	817,979.716	9,902,032.408	1.965	330	DTL
	331		1600	22.458	22.456	90.5022	234.5853	817,980.204	9,902,058.767	1.435	331	TMBK JMBTN
	332		1600	31.410	31.409	90.3244	216.0547	817,967.941	9,902,061.153	1.465	332	TMBK JMBTN
	333		1600	23.647	23.644	90.5335	151.3412	817,967.033	9,902,031.055	1.396	333	DTL
	334		1600	23.486	23.485	89.3634	174.3355	817,966.133	9,902,040.407	1.924	334	DTL
	335		1600	39.643	39.643	90.0816	207.5311	817,958.449	9,902,062.949	1.669	335	TMBK JMBTN
	336		1600	24.987	24.987	89.4931	198.2445	817,967.652	9,902,050.414	1.840	336	DTL
	337		1600	27.432	27.432	90.1450	211.5223	817,969.258	9,902,056.822	1.646	337	DTL
	338		1600	46.384	46.383	90.2431	203.2846	817,951.060	9,902,064.253	1.433	338	TMBK JMBTN
	339		1600	36.522	36.522	90.1006	201.2807	817,958.540	9,902,057.668	1.657	339	DTL
	340		1600	33.986	33.986	89.5656	188.3906	817,957.420	9,902,049.481	1.795	340	DTL
	341		1600	34.719	34.716	90.4311	173.3348	817,954.898	9,902,040.791	1.328	341	DTL
	342		1600	38.486	38.484	90.3351	164.2225	817,951.198	9,902,034.892	1.385	342	DTL
	343		1600	71.928	71.926	90.2630	194.5002	817,924.512	9,902,069.102	1.210	343	TMBK JMBTN
	344		1600	45.727	45.727	90.1505	164.1649	817,943.991	9,902,034.169	1.564	344	DTL
	345		1600	51.495	51.494	90.1912	193.3132	817,942.490	9,902,059.294	1.477	345	DTL
	346		1600	45.957	45.956	90.2608	182.2819	817,944.742	9,902,048.645	1.415	346	DTL
	347		1600	53.683	53.681	90.3201	188.4026	817,938.821	9,902,055.959	1.264	347	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	348		1600	52.900	52.898	90.3148	182.4928	817,938.051	9,902,050.519	1.275	348	DTL
	349		1600	52.936	52.934	90.2720	175.1456	817,936.858	9,902,043.630	1.343	349	DTL
	350		1600	52.907	52.904	90.3719	167.5216	817,936.645	9,902,036.824	1.190	350	DTL
	351		1600	16.367	16.366	90.4618	136.4454	817,975.765	9,902,029.482	1.544	351	DTL
	352		1600	17.432	17.431	90.2943	115.5531	817,979.180	9,902,024.310	1.614	352	DTL
	CP03		1144	315.451	315.449	89.4904	359.5959	818,074.453	9,902,022.616	3.993	CP03	STN
J5		1.518			315.444			817,767.377	9,902,094.790	2.680	J5	
	353		1600	5.154	5.153	90.5926	182.3718	817,762.420	9,902,096.197	2.509	353	PHN
	354		1600	10.641	10.641	90.0920	134.1922	817,758.398	9,902,089.080	2.569	354	BG
	355		1600	15.269	15.268	89.2548	150.2926	817,752.721	9,902,090.509	2.750	355	BG
	356		1600	32.207	32.205	90.3454	102.4028	817,753.309	9,902,065.820	2.271	356	BG
	357		1600	73.048	73.047	89.4432	94.4747	817,744.776	9,902,025.327	2.927	357	DTL
	358		1600	73.766	73.765	89.4429	90.1610	817,750.162	9,902,023.062	2.931	358	DTL
	359		1600	63.454	63.454	89.5800	94.3651	817,747.936	9,902,034.387	2.623	359	DTL
	360		1600	63.752	63.752	89.5256	89.4239	817,753.104	9,902,032.657	2.729	360	DTL
	361		1600	55.217	55.217	89.5920	88.0940	817,756.474	9,902,040.660	2.609	361	DTL
	362		1600	55.022	55.022	89.5407	94.4757	817,750.351	9,902,042.469	2.692	362	DTL
	363		1600	46.556	46.556	90.0703	95.0632	817,752.731	9,902,050.598	2.503	363	DTL
	364		1600	46.968	46.968	90.0704	86.3307	817,759.400	9,902,048.504	2.501	364	DTL
	365		1600	38.057	38.057	90.0702	85.5955	817,761.276	9,902,057.225	2.520	365	DTL
	366		1600	37.550	37.550	90.1735	95.3325	817,755.286	9,902,059.240	2.406	366	DTL
	367		1600	29.404	29.403	90.2813	95.4902	817,757.783	9,902,066.996	2.357	367	DTL
	368		1600	30.103	30.102	90.2226	84.3419	817,763.292	9,902,064.966	2.402	368	DTL
	369		1600	20.756	20.756	89.5755	96.5733	817,760.215	9,902,075.309	2.611	369	DTL
	370		1600	20.721	20.721	90.0800	79.5949	817,766.212	9,902,074.102	2.546	370	DTL
	371		1600	11.380	11.380	89.5843	101.2213	817,762.640	9,902,084.443	2.602	371	DTL
	372		1600	11.530	11.529	90.3929	73.4544	817,767.983	9,902,083.277	2.466	372	DTL
	373		1600	4.246	4.246	89.5344	117.5650	817,764.582	9,902,091.594	2.606	373	DTL
	374		1600	4.708	4.707	91.1727	38.0400	817,770.320	9,902,091.116	2.492	374	DTL
	375		1600	16.868	16.868	90.2624	13.1739	817,782.470	9,902,087.258	2.468	375	DTL
	376		1600	8.719	8.718	90.3846	23.4341	817,774.344	9,902,089.549	2.500	376	DTL
	377		1600	14.341	14.341	90.2610	60.0551	817,771.492	9,902,081.053	2.489	377	DTL
	378		1600	20.655	20.654	90.2608	38.4451	817,780.100	9,902,078.520	2.441	378	DTL
	379		1600	27.879	27.879	90.0224	54.3812	817,777.882	9,902,068.966	2.579	379	DTL
	380		1600	25.770	25.769	90.2812	71.4327	817,769.645	9,902,069.121	2.387	380	DTL
	381		1600	34.822	34.817	90.5600	61.1358	817,776.705	9,902,061.245	2.031	381	DTL
	382		1600	30.280	30.274	91.0752	74.4226	817,768.468	9,902,064.536	2.000	382	DTL
	383		1600	43.138	43.138	90.0902	66.4521	817,774.881	9,902,052.310	2.485	383	DTL
	384		1600	36.788	36.787	90.2400	76.2218	817,767.635	9,902,058.004	2.334	384	DTL
	385		1600	52.316	52.316	90.0710	72.1349	817,771.521	9,902,042.638	2.489	385	DTL
	386		1600	50.040	50.040	89.5658	77.2927	817,766.750	9,902,044.754	2.642	386	DTL
	387		1600	59.402	59.402	90.0156	80.2411	817,763.616	9,902,035.507	2.565	387	DTL
	388		1600	61.557	61.557	90.0605	73.4252	817,770.662	9,902,033.321	2.489	388	DTL
	389		1600	61.447	61.447	89.5317	80.5501	817,762.937	9,902,033.504	2.718	389	PHN
	390		1600	69.721	69.721	90.0949	76.0726	817,768.167	9,902,025.074	2.399	390	DTL
	391		1600	72.166	72.166	89.5835	71.0345	817,774.558	9,902,022.982	2.628	391	DTL
	392		1600	74.851	74.851	89.5118	66.3115	817,780.699	9,902,021.134	2.787	392	DTL
	393		1600	64.333	64.333	90.1048	68.1932	817,776.828	9,902,031.155	2.396	393	DTL
	394		1600	66.067	66.067	90.0308	64.5848	817,780.880	9,902,030.118	2.538	394	DTL
	395		1600	55.341	55.341	90.0704	64.4512	817,778.902	9,902,040.662	2.484	395	DTL
	396		1600	57.029	57.029	90.0704	60.4613	817,783.099	9,902,039.971	2.481	396	DTL
	397		1600	47.618	47.618	89.5531	60.0219	817,781.088	9,902,049.189	2.660	397	DTL
	398		1600	49.558	49.558	89.5040	55.4347	817,785.172	9,902,048.537	2.733	398	DTL
	399		1600	40.223	40.223	90.1308	54.2231	817,782.703	9,902,057.602	2.444	399	DTL
	400		1600	42.567	42.567	90.0440	49.0857	817,787.114	9,902,057.075	2.540	400	DTL
	401		1600	33.433	33.432	90.1957	46.3718	817,784.170	9,902,065.881	2.404	401	DTL
	402		1600	35.126	35.125	90.2032	39.2923	817,788.655	9,902,066.843	2.388	402	DTL
	403		1600	27.356	27.355	90.3142	34.0006	817,785.953	9,902,074.710	2.346	403	DTL
	404		1600	35.263	35.256	91.1053	29.3249	817,793.256	9,902,070.848	1.871	404	DTL
	405		1600	23.544	23.543	90.2941	15.1130	817,788.083	9,902,083.586	2.395	405	DTL
	406		1600	31.552	31.550	90.3743	18.5932	817,794.069	9,902,077.969	2.252	406	DTL
	407		1600	21.864	21.864	90.0655	355.1857	817,788.998	9,902,091.542	2.554	407	DTL
	408		1600	28.374	28.373	90.3145	2.4208	817,794.660	9,902,087.003	2.336	408	DTL
	409		1600	32.157	32.142	91.4430	350.3228	817,799.450	9,902,092.678	1.621	409	B.SLRN
	410		1600	30.620	30.606	91.4430	349.5633	817,797.936	9,902,093.098	1.667	410	B.SLRN
	411		1600	30.650	30.649	90.2421	349.4625	817,797.984	9,902,093.186	2.381	411	A.SLRN
	412		1600	32.460	32.460	90.1145	350.3236	817,799.767	9,902,092.656	2.487	412	A.SLRN
	413		1600	31.849	31.837	91.3454	7.0253	817,797.241	9,902,083.758	1.719	413	B.SLRN
	414		1600	30.389	30.377	91.3454	7.3926	817,795.759	9,902,083.961	1.759	414	B.SLRN
	415		1600	32.489	32.488	90.2308	6.0551	817,798.035	9,902,084.039	2.379	415	A.SLRN
	416		1600	30.041	30.035	91.0724	7.2813	817,795.474	9,902,084.175	2.009	416	A.SLRN
	417		1600	34.184	34.170	91.3747	23.4727	817,794.660	9,902,074.217	1.626	417	B.SLRN
	418		1600	35.245	35.232	91.3407	21.4938	817,796.218	9,902,074.555	1.633	418	B.SLRN
	419		1600	35.188	35.179	91.1747	20.5348	817,796.499	9,902,075.055	1.802	419	A.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	420		1600	33.769	33.762	91.1140	24.0354	817,794.236	9,902,074.335	1.894	420	A.SLRN
	421		1600	36.741	36.731	91.2019	35.1735	817,791.706	9,902,067.272	1.740	421	B.SLRN
	422		1600	37.924	37.906	91.4516	32.2551	817,793.871	9,902,067.680	1.437	422	B.SLRN
	423		1600	36.244	36.241	90.4413	35.4029	817,791.200	9,902,067.479	2.132	423	A.SLRN
	424		1600	41.429	41.420	91.1320	43.4733	817,789.924	9,902,060.045	1.714	424	B.SLRN
	425		1600	42.742	42.731	91.1932	43.0702	817,791.058	9,902,059.222	1.609	425	B.SLRN
	426		1600	41.038	41.033	90.5518	43.5153	817,789.670	9,902,060.341	1.938	426	A.SLRN
	427		1600	42.821	42.819	90.3015	42.5153	817,791.265	9,902,059.253	2.221	427	A.SLRN
	428		1600	47.074	47.064	91.0944	50.0732	817,788.485	9,902,052.725	1.643	428	B.SLRN
	429		1600	47.498	47.491	91.0105	49.1012	817,789.382	9,902,052.705	1.754	429	B.SLRN
	430		1600	47.506	47.505	90.1850	48.5331	817,789.592	9,902,052.799	2.338	430	A.SLRN
	431		1600	46.849	46.845	90.4223	50.1322	817,788.316	9,902,052.885	2.020	431	A.SLRN
	432		2000	52.987	52.985	90.2714	54.0216	817,787.855	9,902,045.922	1.778	432	B.SLRN
	433		2000	52.461	52.460	90.2535	54.5406	817,786.920	9,902,046.106	1.808	433	B.SLRN
	434		2000	52.992	52.991	89.4420	53.4707	817,788.072	9,902,046.007	2.439	434	A.SLRN
	435		2000	52.381	52.380	89.4421	54.5843	817,786.825	9,902,046.154	2.436	435	A.SLRN
	436		1600	61.707	61.703	90.3834	60.4336	817,784.433	9,902,035.491	1.906	436	B.SLRN
	437		1600	62.413	62.409	90.3834	60.0333	817,785.326	9,902,035.018	1.898	437	B.SLRN
	438		1600	62.423	62.423	90.1122	59.5342	817,785.501	9,902,035.056	2.392	438	A.SLRN
	439		1600	61.654	61.654	90.1122	60.4621	817,784.372	9,902,035.525	2.394	439	A.SLRN
	440		1600	75.775	75.773	90.2459	65.0034	817,782.825	9,902,020.608	2.047	440	B.SLRN
	441		1600	82.341	82.339	90.2212	64.3624	817,784.730	9,902,014.300	2.066	441	B.SLRN
	442		1600	76.317	76.317	89.5930	65.3219	817,782.246	9,902,019.935	2.609	442	A.SLRN
	443		1600	82.614	82.613	90.1436	64.2615	817,785.026	9,902,014.084	2.247	443	A.SLRN
	444		1600	83.900	83.898	90.2038	65.2829	817,783.814	9,902,012.517	2.094	444	B.SLRN
	445		1600	84.834	84.833	90.1915	64.4707	817,784.997	9,902,011.807	2.123	445	B.SLRN
	446		1600	84.960	84.960	90.0440	64.3352	817,785.344	9,902,011.752	2.483	446	A.SLRN
	447		1600	83.933	83.933	90.0845	65.3239	817,783.721	9,902,012.464	2.384	447	A.SLRN
	448		1600	92.261	92.261	89.5119	60.3138	817,793.188	9,902,006.213	2.831	448	BG
	449		1600	90.050	90.050	89.5115	62.5928	817,788.830	9,902,007.333	2.827	449	DTL
	450		1600	87.172	87.170	89.3538	56.5020	817,797.097	9,902,012.843	3.216	450	BG
	451		1600	84.974	84.972	89.3358	57.1432	817,795.784	9,902,014.708	3.241	451	BG
	452		1600	83.238	83.236	89.3721	58.4043	817,793.229	9,902,015.670	3.146	452	DTL
	453		1600	81.222	81.221	89.4024	62.0433	817,787.984	9,902,016.227	3.061	453	DTL
	454		1600	76.001	76.000	89.4533	55.5750	817,794.377	9,902,023.747	2.917	454	DTL
	455		1600	73.949	73.949	89.5352	60.1452	817,788.411	9,902,023.896	2.730	455	DTL
	456		1600	66.050	66.050	89.5352	57.3619	817,789.064	9,902,032.402	2.716	456	DTL
	457		1600	68.498	68.498	89.5010	52.2658	817,795.591	9,902,032.373	2.794	457	DTL
	458		1600	61.092	61.092	90.0046	47.5047	817,796.927	9,902,041.320	2.584	458	DTL
	459		1600	57.548	57.547	89.4442	53.3650	817,790.010	9,902,041.880	2.854	459	DTL
	460		1600	52.186	52.184	90.2615	48.0744	817,792.393	9,902,048.992	2.200	460	DTL
	461		1600	57.148	57.146	90.2612	43.1400	817,798.951	9,902,047.158	2.162	461	PHN
	462		1600	61.855	61.855	90.1216	44.3712	817,800.295	9,902,042.422	2.377	462	PHN
	463		1600	54.931	54.928	90.3411	41.0507	817,799.421	9,902,050.177	2.052	463	DTL
	464		1600	48.391	48.375	91.2742	33.3510	817,800.484	9,902,059.518	1.364	464	DTL
	465		1600	42.994	42.980	91.2742	34.5405	817,796.065	9,902,062.785	1.501	465	DTL
	466		1600	44.387	44.371	91.3156	18.2554	817,805.145	9,902,071.502	1.411	466	DTL
	467		1600	38.182	38.174	91.0907	20.1545	817,799.214	9,902,073.726	1.830	467	DTL
	468		1600	42.144	42.138	90.5804	13.5732	817,804.860	9,902,075.538	1.886	468	DTL
	469		1600	35.511	35.509	90.3553	8.3112	817,800.359	9,902,081.634	2.227	469	DTL
	470		1600	40.807	40.805	90.3556	5.1151	817,806.090	9,902,081.894	2.171	470	DTL
	471		1600	39.792	39.791	90.2918	351.1858	817,807.043	9,902,091.638	2.259	471	PHN
	472		1600	69.885	69.884	90.2145	347.0636	817,837.259	9,902,094.379	2.156	472	F4
	473		1600	69.149	69.148	90.1604	348.5658	817,836.475	9,902,092.164	2.275	473	JL
	474		1600	67.821	67.818	90.3022	345.1929	817,835.174	9,902,096.504	1.999	474	JL
	475		1600	59.773	59.773	90.0544	349.4511	817,827.069	9,902,091.683	2.498	475	JL
	476		1600	61.492	61.489	90.3335	344.0641	817,828.800	9,902,097.646	1.997	476	JL
	477		1600	53.848	53.846	90.3133	341.2527	817,820.988	9,902,099.810	2.104	477	JL
	478		1600	51.327	51.327	90.1456	348.1637	817,818.686	9,902,093.443	2.375	478	JL
	479		1600	41.753	41.753	90.0938	347.0942	817,809.129	9,902,094.507	2.481	479	JL
	480		1600	44.184	44.184	90.1351	339.2157	817,811.192	9,902,100.486	2.420	480	JL
	481		1600	33.310	33.310	90.0643	346.4252	817,800.687	9,902,094.824	2.533	481	JL
	482		1600	34.264	34.264	89.4703	335.5452	817,801.027	9,902,101.245	2.727	482	JL
	483		1600	24.454	24.454	90.1123	345.3949	817,791.826	9,902,095.264	2.517	483	JL
	484		1600	25.130	25.130	89.4959	330.4214	817,791.525	9,902,101.746	2.671	484	JL
	485		1600	13.491	13.491	89.5103	341.1857	817,780.807	9,902,096.073	2.633	485	JL
	486		1600	17.101	17.100	89.3202	304.2846	817,780.026	9,902,106.297	2.737	486	JL
	487		1600	3.588	3.588	90.5551	308.2532	817,770.191	9,902,097.016	2.540	487	JL
	488		1600	12.758	12.758	89.4428	283.0406	817,773.029	9,902,106.228	2.656	488	JL
	489		1600	15.374	15.373	89.3044	238.5248	817,762.654	9,902,109.420	2.729	489	JL
	490		1600	5.331	5.331	89.3044	206.0530	817,763.253	9,902,098.168	2.643	490	JL
	491		1600	23.317	23.316	89.3049	211.5408	817,750.927	9,902,111.314	2.796	491	JL
	492		1600	37.988	37.988	89.5937	180.4234	817,730.507	9,902,103.939	2.602	492	JL
	493		1600	38.596	38.596	89.4321	194.2339	817,733.180	9,902,112.684	2.785	493	JL
	494		1600	46.276	46.276	89.5231	180.1729	817,722.383	9,902,105.607	2.699	494	F5

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
Survey Date : April, 01 2019												
	CP03		70	30.246	30.235	88.2514	0.0000	818,074.453	9,902,022.616	3.993	CP03	BS
F1		1.539			30.233			818,080.705	9,902,052.195	1.716	F1	
	1		1600	23.439	23.439	89.5115	82.3059	818,057.337	9,902,054.014	1.715	1	TMBK JMBTN
	2		1600	29.329	29.328	89.3619	84.2926	818,051.561	9,902,055.477	1.857	2	TMBK JMBTN
	3		1600	23.439	23.439	89.5916	83.1513	818,057.362	9,902,054.315	1.660	3	TMBK JMBTN
	4		1600	41.528	41.527	89.3404	85.4541	818,039.552	9,902,057.757	1.968	4	TMBK JMBTN
	5		1600	53.653	53.652	89.4159	86.2703	818,027.626	9,902,060.020	1.936	5	TMBK JMBTN
	6		1600	66.572	66.572	89.5500	86.4935	818,014.910	9,902,062.335	1.739	6	TMBK JMBTN
	7		1600	78.947	78.947	89.4853	87.0825	818,002.747	9,902,064.647	1.910	7	TMBK JMBTN
	8		1600	92.332	92.332	89.5706	87.2339	817,989.594	9,902,067.162	1.733	8	TMBK JMBTN
	9		1600	100.053	100.053	89.5515	87.2923	817,982.003	9,902,068.579	1.793	9	TMBK JMBTN
	10		1600	113.357	113.357	89.5959	87.3710	817,968.920	9,902,071.010	1.656	10	TMBK JMBTN
	11		1600	121.523	121.523	89.5954	87.3901	817,960.878	9,902,072.430	1.659	11	TMBK JMBTN
	12		1600	135.298	135.298	90.0427	87.4810	817,947.356	9,902,075.079	1.480	12	TMBK JMBTN
	13		1600	144.784	144.784	90.0427	87.4909	817,938.014	9,902,076.724	1.468	13	TMBK JMBTN
	14		1600	156.767	156.766	90.0937	89.3657	817,927.113	9,902,083.585	1.217	14	LAUT
	15		1600	158.810	158.809	90.1316	91.2903	817,926.232	9,902,089.050	1.042	15	LAUT
	16		1600	147.596	147.595	90.1059	90.0035	817,936.305	9,902,082.742	1.183	16	LAUT
	17		1600	148.915	148.913	90.1534	91.5831	817,936.158	9,902,087.994	0.981	17	LAUT
	18		1600	138.669	138.668	90.1123	90.1212	817,945.137	9,902,081.353	1.196	18	LAUT
	19		1600	139.847	139.845	90.1758	92.2738	817,945.250	9,902,086.962	0.924	19	LAUT
	20		1600	128.830	128.829	90.1446	90.2358	817,954.850	9,902,079.715	1.102	20	LAUT
	21		1600	130.239	130.238	90.1446	92.4914	817,954.762	9,902,085.366	1.096	21	LAUT
	22		1600	119.948	119.948	90.0814	90.4346	817,963.675	9,902,078.492	1.368	22	LAUT
	23		1600	121.399	121.397	90.2010	93.5109	817,963.887	9,902,085.223	0.943	23	LAUT
	24		1600	110.701	110.700	90.1325	91.0056	817,972.820	9,902,077.004	1.223	24	LAUT
	25		1600	112.572	112.570	90.2141	95.0006	817,973.017	9,902,084.988	0.945	25	LAUT
	26		1600	112.548	112.546	90.2141	95.0209	817,973.060	9,902,085.045	0.945	26	LAUT
	27		1600	110.647	110.646	90.1221	91.0036	817,972.871	9,902,076.981	1.258	27	LAUT
	28		1600	101.963	101.962	90.1221	91.2928	817,981.529	9,902,075.869	1.289	28	LAUT
	29		1600	105.413	105.411	90.2030	95.5324	817,980.354	9,902,084.462	1.026	29	LAUT
	30		1600	93.607	93.607	90.1039	91.5816	817,989.842	9,902,074.691	1.365	30	LAUT
	31		1600	98.321	98.319	90.1931	97.0108	817,987.716	9,902,084.130	1.097	31	LAUT
	32		1600	83.623	83.623	90.1125	92.4206	817,999.796	9,902,073.325	1.377	32	LAUT
	33		1600	86.477	86.476	90.1616	98.3741	817,999.739	9,902,082.568	1.246	33	LAUT
	34		1600	76.622	76.620	90.2549	100.2924	818,009.879	9,902,081.423	1.080	34	LAUT
	35		1600	74.514	74.512	90.2240	93.4126	818,008.946	9,902,072.265	1.164	35	LAUT
	36		1600	65.654	65.652	90.2520	94.4721	818,017.830	9,902,071.087	1.171	36	LAUT
	37		1600	68.530	68.527	90.2934	101.4519	818,017.952	9,902,079.729	1.066	37	LAUT
	38		1600	57.222	57.221	90.2237	96.0602	818,026.296	9,902,069.911	1.279	38	LAUT
	39		1600	60.746	60.743	90.3618	104.0054	818,026.087	9,902,078.775	1.014	39	LAUT
	40		1600	47.703	47.703	90.1534	97.5551	818,035.841	9,902,068.405	1.439	40	LAUT
	41		1600	51.193	51.191	90.3224	108.0849	818,036.409	9,902,077.854	1.173	41	LAUT
	42		1600	38.618	38.616	90.3140	100.0106	818,044.889	9,902,066.632	1.299	42	LAUT
	43		1600	42.396	42.394	90.3140	113.2323	818,046.116	9,902,076.708	1.265	43	LAUT
	44		1600	27.346	27.342	90.5646	103.4642	818,056.070	9,902,064.058	1.204	44	LAUT
	45		1600	31.064	31.061	90.4622	121.3439	818,058.179	9,902,073.581	1.236	45	LAUT
	46		1600	25.155	25.148	91.1919	129.4439	818,065.111	9,902,071.925	1.075	46	LAUT
	47		1600	18.626	18.622	91.1414	110.1436	818,064.944	9,902,062.112	1.253	47	LAUT
	48		1600	11.499	11.478	93.2650	123.1135	818,072.607	9,902,060.330	0.964	48	LAUT
	49		1600	18.583	18.571	92.0412	141.5805	818,072.536	9,902,068.873	0.984	49	LAUT
	50		1600	60.390	60.382	90.5413	115.5536	818,033.033	9,902,089.255	0.703	50	LAUT
	51		1600	95.801	95.797	90.3126	102.5537	817,993.786	9,902,092.471	0.779	51	LAUT
	52		1600	56.092	56.085	90.5524	120.0611	818,039.051	9,902,089.751	0.751	52	LAUT
	53		1600	83.147	83.143	90.3201	105.4111	818,007.037	9,902,090.742	0.881	53	LAUT
	54		1600	50.951	50.943	90.5935	123.3414	818,045.002	9,902,088.534	0.772	54	LAUT
	55		1600	70.794	70.790	90.3739	110.0401	818,020.673	9,902,089.710	0.880	55	LAUT
	56		1600	45.942	45.929	91.2059	129.5312	818,052.315	9,902,088.300	0.573	56	LAUT
	57		1600	39.095	39.083	91.2454	138.3713	818,061.492	9,902,086.230	0.690	57	LAUT
	58		1600	32.880	32.856	92.1129	152.1737	818,071.775	9,902,083.814	0.398	58	LAUT
	59		1600	12.097	12.065	94.1121	150.1556	818,077.017	9,902,063.683	0.771	59	LAUT
	60		1600	8.363	8.339	94.2139	83.4634	818,072.408	9,902,053.025	1.019	60	LAUT
	J5		1488	69.854	69.853	89.3825	359.5959	817,767.377	9,902,094.790	2.680	J5	BS
F4		1.534			69.884			817,837.259	9,902,094.379	2.156	F4	
	61		1600	39.660	39.660	89.5956	29.2604	817,802.834	9,902,114.072	2.091	61	A.SLRN
	62		1600	37.273	37.273	89.5956	30.0145	817,805.100	9,902,113.222	2.091	62	A.SLRN
	63		1600	39.534	39.533	89.3607	34.0121	817,804.624	9,902,116.691	2.365	63	A.SLRN
	64		1600	37.328	37.327	89.3608	34.3030	817,806.625	9,902,115.707	2.349	64	A.SLRN
	65		1600	36.861	36.841	91.5216	42.0623	817,810.073	9,902,119.242	0.886	65	B.SLRN
	66		1600	37.767	37.744	92.0058	42.2854	817,809.574	9,902,120.033	0.761	66	B.SLRN
	67		1600	37.986	37.977	91.1513	42.2229	817,809.355	9,902,120.139	1.259	67	A.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	68		1600	36.647	36.646	90.2029	42.2307	817,810.337	9,902,119.242	1.871	68	A.SLRN
	69		1600	87.152	87.146	90.4154	184.5954	817,924.027	9,902,086.276	1.028	69	LAUT
	70		1600	87.048	87.037	90.5546	179.5645	817,924.295	9,902,093.949	0.678	70	LAUT
	71		1600	74.573	74.562	90.5917	183.5744	817,911.611	9,902,088.790	0.804	71	LAUT
	72		1600	76.853	76.838	91.0656	178.2556	817,914.080	9,902,096.030	0.594	72	LAUT
	73		1600	65.765	65.750	91.1259	186.3141	817,902.538	9,902,086.520	0.694	73	LAUT
	74		1600	66.726	66.706	91.2420	180.0204	817,903.964	9,902,093.947	0.453	74	LAUT
	75		1600	51.654	51.638	91.2421	184.0131	817,888.748	9,902,090.451	0.823	75	LAUT
	76		1600	52.905	52.883	91.3901	178.0552	817,890.123	9,902,095.824	0.566	76	LAUT
	77		1600	41.362	41.337	91.5825	170.4408	817,878.096	9,902,100.794	0.665	77	LAUT
	78		1600	39.487	39.470	91.4158	179.3948	817,876.729	9,902,094.379	0.919	78	LAUT
	79		1600	27.832	27.815	91.5919	172.2636	817,864.854	9,902,097.875	1.124	79	LAUT
	80		1600	32.425	32.397	92.2251	159.1713	817,867.629	9,902,105.659	0.743	80	LAUT
	81		1600	29.901	29.862	92.5554	148.1023	817,862.724	9,902,109.977	0.561	81	TGL
	82		1600	30.787	30.755	92.3556	146.0112	817,862.863	9,902,111.418	0.694	82	TGL
	83		1600	30.037	30.012	92.2043	146.0422	817,862.260	9,902,110.983	0.861	83	TGL
	84		1600	24.387	24.349	93.1229	137.3356	817,855.326	9,902,110.702	0.725	84	TGL
	85		1600	25.974	25.953	92.1805	136.1811	817,856.129	9,902,112.198	1.047	85	TGL
	86		1600	25.207	25.190	92.0602	136.1954	817,855.583	9,902,111.665	1.166	86	TGL
	87		1600	21.216	21.174	93.3722	113.4550	817,845.906	9,902,113.707	0.749	87	TGL
	88		1600	19.598	19.560	93.3512	114.5303	817,845.594	9,902,112.074	0.864	88	TGL
	89		1600	20.335	20.320	92.1041	113.4727	817,845.566	9,902,112.924	1.317	89	TGL
	90		1600	21.351	21.297	94.0428	81.5517	817,834.391	9,902,115.482	0.573	90	TGL
	91		1600	19.723	19.681	93.4412	82.0635	817,834.672	9,902,113.890	0.804	91	TGL
	92		1600	20.482	20.468	92.0914	82.0636	817,834.569	9,902,114.669	1.320	92	TGL
	93		1600	27.672	27.639	92.4649	55.1453	817,821.638	9,902,117.181	0.748	93	TGL
	94		1600	26.799	26.770	92.4037	51.1856	817,820.651	9,902,115.374	0.838	94	TGL
	95		1600	27.751	27.745	91.1418	52.2240	817,820.452	9,902,116.454	1.490	95	TGL
	96		1600	42.032	42.024	91.0505	34.4305	817,802.858	9,902,118.517	1.294	96	TGL
	97		1600	44.726	44.713	91.2234	35.5105	817,801.172	9,902,120.780	1.016	97	TGL
	98		1600	42.412	42.407	90.5427	35.5903	817,803.092	9,902,119.497	1.418	98	TGL
	99		1600	55.981	55.973	90.5901	29.2222	817,788.644	9,902,122.120	1.129	99	TGL
	100		1600	55.392	55.387	90.4540	27.4510	817,788.396	9,902,120.459	1.354	100	TGL
	101		1600	55.103	55.102	90.1545	28.3803	817,789.052	9,902,121.069	1.837	101	TGL
	102		1600	75.006	75.004	90.2506	21.2139	817,767.570	9,902,122.109	1.542	102	TGL
	103		1600	75.402	75.401	90.2056	20.5131	817,766.960	9,902,121.641	1.631	103	TGL
	104		1600	75.379	75.379	89.5529	20.5956	817,767.047	9,902,121.805	2.189	104	TGL
	105		1600	90.279	90.278	90.1459	18.5438	817,752.028	9,902,124.140	1.696	105	TGL
	106		1600	90.686	90.684	90.2058	19.5450	817,752.181	9,902,125.768	1.537	106	TGL
	107		70	90.447	90.442	90.3514	19.2812	817,752.168	9,902,125.026	2.693	107	TGL
	108		2800	232.354	232.354	90.0506	16.3612	817,614.988	9,902,162.082	0.545	108	LAUT
	109		2800	231.818	231.818	89.5257	14.2637	817,613.113	9,902,153.520	1.365	109	LAUT
	110		2800	231.743	231.743	89.5257	14.2618	817,613.180	9,902,153.481	1.365	110	LAUT
	111		2800	232.374	232.374	90.0420	16.3442	817,614.939	9,902,161.991	0.597	111	LAUT
	112		2800	220.407	220.406	89.5206	14.4604	817,624.468	9,902,151.814	1.396	112	LAUT
	113		2800	221.762	221.762	90.0501	16.4252	817,625.246	9,902,159.407	0.566	113	LAUT
	114		2800	206.924	206.924	89.5326	15.3443	817,638.268	9,902,151.122	1.285	114	LAUT
	115		2800	208.781	208.781	90.0124	17.2334	817,638.395	9,902,157.959	0.805	115	LAUT
	116		2800	197.025	197.025	90.0406	18.1150	817,650.454	9,902,157.008	0.655	116	LAUT
	117		2800	194.588	194.588	89.5633	16.1520	817,650.774	9,902,149.947	1.085	117	LAUT
	118		2800	184.735	184.735	89.5252	16.4658	817,660.710	9,902,148.760	1.273	118	LAUT
	119		2800	186.535	186.535	90.0050	18.4918	817,661.056	9,902,155.597	0.845	119	LAUT
	120		2800	173.507	173.507	89.5211	17.0128	817,671.658	9,902,146.154	1.284	120	LAUT
	121		2800	175.029	175.029	90.0630	19.2917	817,672.604	9,902,153.740	0.559	121	LAUT
	122		2800	159.922	159.922	89.5424	17.3609	817,685.113	9,902,143.637	1.150	122	LAUT
	123		2800	160.704	160.704	90.0347	19.5359	817,686.476	9,902,149.967	0.713	123	LAUT
	124		1600	149.696	149.692	90.2506	18.1045	817,695.316	9,902,141.917	0.997	124	LAUT
	125		1600	149.998	149.992	90.3053	20.3531	817,697.163	9,902,147.958	0.742	125	LAUT
	126		1600	135.053	135.049	90.2737	19.3041	817,710.233	9,902,140.233	1.005	126	LAUT
	127		1600	135.707	135.699	90.3600	22.0037	817,711.752	9,902,145.975	0.642	127	LAUT
	128		1600	118.220	118.211	90.4322	23.3224	817,729.166	9,902,142.228	0.599	128	LAUT
	129		1600	117.100	117.096	90.2947	21.0118	817,728.206	9,902,137.026	1.075	129	LAUT
	130		1600	97.104	97.098	90.3848	22.1703	817,747.632	9,902,131.727	0.994	130	LAUT
	131		1600	97.997	97.984	90.5610	25.4549	817,749.268	9,902,137.487	0.489	131	LAUT
	132		1600	76.370	76.359	90.5907	25.2703	817,768.505	9,902,127.598	0.777	132	LAUT
	133		1600	76.958	76.942	91.1105	28.1141	817,769.662	9,902,131.130	0.499	133	LAUT
	134		1600	60.162	60.149	91.1105	29.0908	817,784.903	9,902,123.988	0.846	134	LAUT
	135		1600	61.481	61.459	91.3244	32.3858	817,785.708	9,902,127.840	0.432	135	LAUT
	136		1600	32.099	32.098	90.2550	27.0243	817,808.758	9,902,109.142	1.849	136	DTL
	137		1600	32.642	32.636	91.0633	35.1547	817,810.723	9,902,113.377	1.458	137	DTL
	138		1600	22.571	22.563	91.3048	35.4505	817,819.026	9,902,107.670	1.494	138	DTL
	139		1600	25.261	25.238	92.2749	46.3029	817,819.998	9,902,112.790	1.004	139	DTL
	140		1600	9.417	9.400	93.2744	55.5310	817,832.033	9,902,102.192	1.521	140	DTL
	141		1600	14.417	14.375	94.2124	77.2034	817,834.192	9,902,108.423	0.995	141	DTL
	142		1600	8.134	8.118	93.3331	138.5029	817,843.403	9,902,099.686	1.585	142	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	143		1600	12.070	12.040	94.0034	128.2207	817,844.789	9,902,103.775	1.246	143	DTL
	144		1600	16.791	16.779	92.0817	168.1856	817,853.711	9,902,097.681	1.463	144	DTL
	145		1600	21.498	21.475	92.4015	154.1840	817,856.666	9,902,103.574	1.088	145	DTL
	146		1600	89.122	89.119	90.2923	190.1954	817,924.838	9,902,077.881	1.328	146	JL
	147		1600	89.652	89.650	90.2405	194.5305	817,923.764	9,902,070.841	1.462	147	JL
	148		1600	77.721	77.715	90.4311	190.1951	817,913.631	9,902,079.993	1.114	148	JL
	149		1600	76.721	76.716	90.4016	196.1156	817,910.802	9,902,072.545	1.191	149	JL
	150		1600	65.278	65.272	90.4703	197.0133	817,899.557	9,902,074.901	1.196	150	JL
	151		1600	66.324	66.316	90.5440	190.1330	817,902.451	9,902,082.224	1.035	151	JL
	152		1600	53.797	53.790	90.5441	198.1456	817,888.244	9,902,077.235	1.234	152	JL
	153		1600	53.199	53.188	91.0943	189.5237	817,889.605	9,902,084.948	1.011	153	JL
	154		1600	41.873	41.868	90.5111	199.4821	817,876.567	9,902,079.961	1.466	154	JL
	155		1600	41.363	41.354	91.1211	189.4808	817,877.967	9,902,087.099	1.221	155	JL
	156		1600	31.138	31.135	90.4409	202.0858	817,866.028	9,902,082.471	1.690	156	JL
	157		1600	30.947	30.941	91.0759	189.5036	817,867.713	9,902,088.910	1.478	157	JL
	158		1600	18.786	18.786	90.0201	209.3342	817,853.545	9,902,085.015	2.079	158	JL
	159		1600	18.463	18.458	91.2217	184.2009	817,855.656	9,902,092.876	1.648	159	JL
	160		1600	21.204	21.204	90.0515	338.5845	817,817.422	9,902,086.890	2.057	160	DTL
	161		1600	26.381	26.378	90.4838	328.1755	817,814.736	9,902,080.650	1.717	161	DTL
	162		1600	16.117	16.113	91.1226	319.4622	817,824.896	9,902,084.045	1.750	162	DTL
	163		1600	23.263	23.259	91.0304	313.0431	817,821.275	9,902,077.483	1.663	163	DTL
	164		1600	14.401	14.396	91.2731	289.4642	817,832.308	9,902,080.861	1.723	164	DTL
	165		1600	21.227	21.222	91.1806	283.3633	817,832.145	9,902,073.783	1.608	165	DTL
	166		1600	16.162	16.155	91.4406	253.0225	817,841.881	9,902,078.900	1.601	166	DTL
	167		1600	20.874	20.858	92.1302	263.0914	817,839.624	9,902,073.655	1.282	167	DTL
	168		1600	21.513	21.510	89.0704	230.5111	817,850.741	9,902,077.618	2.421	168	DTL
	169		1600	24.718	24.710	91.2825	247.4256	817,846.495	9,902,071.460	1.454	169	DTL
	170		1600	29.141	29.141	90.0929	222.3138	817,858.619	9,902,074.556	2.009	170	DTL
	171		1600	30.749	30.742	91.1232	239.3248	817,852.684	9,902,067.787	1.441	171	DTL
	172		1600	36.909	36.909	90.1604	217.4241	817,866.325	9,902,071.631	1.917	172	DTL
	173		1600	39.296	39.290	90.5736	229.5227	817,862.404	9,902,064.188	1.431	173	DTL
	174		1600	44.847	44.846	90.2013	213.5529	817,874.324	9,902,069.132	1.826	174	DTL
	175		1600	44.406	44.399	91.0309	222.3905	817,869.737	9,902,064.106	1.274	175	DTL
	176		1600	51.950	51.948	90.3218	211.0025	817,881.626	9,902,067.357	1.602	176	DTL
	177		1600	53.427	53.419	90.5950	222.2209	817,876.514	9,902,058.148	1.160	177	DTL
	178		1600	56.897	56.893	90.3843	228.4538	817,874.512	9,902,051.378	1.449	178	DTL
	179		1600	50.237	50.229	91.0144	235.2632	817,865.507	9,902,052.846	1.188	179	DTL
	180		1600	63.039	63.038	90.1453	231.5732	817,875.813	9,902,044.504	1.817	180	BG
	181		1600	50.132	50.121	91.1305	242.5413	817,859.826	9,902,049.626	1.024	181	BG
	182		1600	46.021	46.016	90.4837	240.4523	817,859.503	9,902,054.096	1.439	182	DTL
	183		1600	43.828	43.823	90.5404	247.3147	817,853.770	9,902,053.786	1.401	183	DTL
	184		1600	42.060	42.049	91.2023	252.4732	817,849.462	9,902,054.140	1.106	184	DTL
	185		1600	51.641	51.637	90.4035	277.2344	817,830.312	9,902,043.211	1.480	185	DTL
	186		1600	47.002	46.992	91.1238	279.1957	817,829.366	9,902,048.055	1.097	186	DTL
	187		1600	48.232	48.228	90.4605	252.4010	817,851.355	9,902,048.257	1.443	187	DTL
	188		1600	38.814	38.806	91.0806	278.0215	817,831.607	9,902,055.987	1.321	188	DTL
	189		1600	45.267	45.255	91.1731	258.5546	817,845.688	9,902,049.916	1.069	189	DTL
	190		1600	31.190	31.178	91.3600	273.2211	817,835.244	9,902,063.267	1.213	190	DTL
	191		1600	28.546	28.542	90.5948	293.3945	817,825.651	9,902,068.305	1.593	191	DTL
	192		1600	41.430	41.424	90.5805	291.2807	817,821.872	9,902,055.919	1.390	192	DTL
	193		1600	44.657	44.651	90.5650	292.2220	817,820.022	9,902,053.190	1.352	193	DTL
	194		1600	33.895	33.886	91.1805	313.5128	817,813.637	9,902,070.084	1.320	194	DTL
	195		1600	45.995	45.991	90.4627	298.2006	817,815.193	9,902,054.028	1.468	195	DTL
	196		1600	48.355	48.351	90.4643	303.2318	817,810.415	9,902,054.166	1.433	196	DTL
	197		1600	43.774	43.769	90.5201	305.5219	817,811.404	9,902,059.063	1.428	197	DTL
	198		1600	42.360	42.354	90.5554	297.4928	817,817.270	9,902,057.039	1.401	198	DTL
	199		1600	50.354	50.349	90.4924	311.1637	817,803.822	9,902,056.737	1.366	199	DTL
	J5		1488	46.258	46.258	90.0118	359.5958	817,767.377	9,902,094.790	2.680	J5	BS
F5		1.451			46.276			817,722.383	9,902,105.607	2.699	F5	
	200		1600	8.743	8.739	91.4713	13.0541	817,730.196	9,902,101.692	2.277	200	PHN
	201		1600	24.886	24.886	90.0702	39.5933	817,737.182	9,902,085.600	2.499	201	PHN
	202		1600	22.448	22.441	91.2732	275.5407	817,729.845	9,902,126.771	1.978	202	TGL
	203		1600	23.105	23.098	91.2733	274.4750	817,729.642	9,902,127.535	1.961	203	TGL
	204		1600	23.643	23.636	91.2333	245.1215	817,717.761	9,902,128.787	1.975	204	TGL
	205		1600	24.336	24.329	91.2333	244.4247	817,717.421	9,902,129.425	1.958	205	TGL
	206		1600	29.511	29.506	91.0459	223.4214	817,706.409	9,902,130.415	1.992	206	TGL
	207		1600	30.162	30.157	91.0140	223.1203	817,705.835	9,902,130.818	2.009	207	TGL
	208		1600	36.411	36.407	90.5230	213.2140	817,697.498	9,902,132.181	1.994	208	TGL
	209		1600	36.004	36.000	90.4820	212.3021	817,697.386	9,902,131.514	2.044	209	TGL
	210		1600	46.295	46.293	90.2853	203.4953	817,685.583	9,902,133.693	2.161	210	TGL
	211		1600	46.192	46.191	90.1822	202.4922	817,685.176	9,902,132.980	2.303	211	TGL
	212		1600	55.584	55.584	89.5518	197.3515	817,674.792	9,902,134.323	2.626	212	TGL
	213		1600	56.228	56.228	90.1211	197.5815	817,674.436	9,902,134.977	2.350	213	TGL
	214		1600	68.701	68.701	90.0231	193.4059	817,661.280	9,902,137.012	2.499	214	TGL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	215		1600	68.448	68.448	89.5454	193.1713	817,661.291	9,902,136.475	2.651	215	TGL
	216		1600	76.852	76.852	89.5821	191.2401	817,652.686	9,902,137.988	2.587	216	TGL
	217		1600	76.874	76.873	90.1816	191.5513	817,652.964	9,902,138.628	2.141	217	TGL
	218		1600	85.432	85.432	89.5006	189.4823	817,643.934	9,902,139.434	2.796	218	TGL
	219		1600	86.512	86.510	90.2027	190.0725	817,643.134	9,902,140.300	2.035	219	TGL
	220		1600	84.123	84.123	89.5038	176.5645	817,639.660	9,902,120.886	2.779	220	JL
	221		1600	84.937	84.937	89.5041	182.2729	817,640.727	9,902,128.986	2.780	221	JL
	222		1600	76.010	76.010	89.5042	182.5530	817,649.482	9,902,127.124	2.755	222	JL
	223		1600	75.346	75.346	89.5034	177.0210	817,648.312	9,902,119.409	2.756	223	JL
	224		1600	63.713	63.713	89.5034	176.5416	817,659.722	9,902,117.134	2.725	224	JL
	225		1600	64.167	64.167	89.5036	184.0949	817,661.248	9,902,125.097	2.725	225	JL
	226		1600	53.117	53.117	89.4513	186.0326	817,672.337	9,902,123.404	2.778	226	JL
	227		1600	52.341	52.341	89.4724	176.4116	817,670.871	9,902,114.882	2.742	227	JL
	228		1600	43.134	43.133	89.3223	176.3044	817,679.910	9,902,113.120	2.896	228	JL
	229		1600	43.901	43.900	89.4139	188.0241	817,681.555	9,902,121.742	2.784	229	JL
	230		1600	32.492	32.491	89.3937	176.2153	817,690.374	9,902,111.184	2.742	230	JL
	231		1600	34.553	34.552	89.3847	191.2632	817,691.058	9,902,120.188	2.763	231	JL
	232		1600	23.808	23.808	89.3847	176.0718	817,698.912	9,902,109.594	2.697	232	JL
	233		1600	26.436	26.435	89.3036	195.5030	817,699.344	9,902,118.568	2.776	233	JL
	234		1600	17.707	17.706	89.2408	206.1658	817,708.780	9,902,116.941	2.734	234	JL
	235		1600	16.797	16.797	89.5539	175.3959	817,705.802	9,902,108.288	2.571	235	JL
	236		1600	5.594	5.594	90.3621	172.4522	817,716.823	9,902,106.219	2.491	236	JL
	237		1600	10.602	10.599	88.3931	232.3018	817,718.076	9,902,115.292	2.798	237	JL
	238		1600	9.652	9.649	88.2855	290.1935	817,727.757	9,902,113.621	2.805	238	JL
	239		1600	4.458	4.458	89.0912	358.3521	817,726.742	9,902,104.672	2.616	239	JL
	240		2000	51.805	51.792	88.4236	171.3527	817,670.797	9,902,110.220	3.316	240	PERTMN
	241		1600	39.800	39.799	89.3236	175.0318	817,683.029	9,902,111.540	2.867	241	PHN
	242		1600	53.353	53.350	89.2601	162.3605	817,669.155	9,902,101.997	3.077	242	DTL
	243		1600	47.982	47.976	89.0422	160.1759	817,674.686	9,902,100.441	3.326	243	DTL
	244		1600	55.747	55.743	89.1702	155.4818	817,667.605	9,902,095.280	3.246	244	DTL
	245		1600	49.525	49.520	89.0850	152.4646	817,674.273	9,902,093.878	3.287	245	DTL
	246		1600	58.768	58.765	89.2801	149.3418	817,666.158	9,902,088.515	3.096	246	DTL
	247		1600	52.758	52.754	89.1526	145.0314	817,673.276	9,902,086.335	3.234	247	DTL
	248		1600	62.870	62.865	89.1845	143.2851	817,664.515	9,902,081.043	3.304	248	DTL
	249		1600	57.077	57.072	89.1600	139.0845	817,671.684	9,902,079.400	3.269	249	DTL
	250		1600	67.584	67.583	89.4211	138.1702	817,662.820	9,902,073.673	2.900	250	DTL
	251		1600	62.122	62.118	89.1839	133.5306	817,670.050	9,902,072.143	3.297	251	DTL
	252		1600	71.633	71.633	89.5506	134.3506	817,661.566	9,902,067.758	2.652	252	DTL
	253		1600	68.081	68.079	89.3503	129.5751	817,667.669	9,902,065.096	3.044	253	DTL
	254		1600	79.692	79.692	89.5126	129.0809	817,659.029	9,902,057.265	2.748	254	PERTMN
	255		1600	75.569	75.568	89.4325	126.0145	817,664.880	9,902,056.578	2.914	255	DTL
	256		1600	70.848	70.847	89.3952	119.0242	817,674.462	9,902,053.427	2.965	256	DTL
	257		1600	69.317	69.317	89.4920	116.0526	817,678.190	9,902,052.205	2.765	257	DTL
	258		1600	61.411	61.411	89.5213	119.1513	817,680.680	9,902,060.528	2.689	258	DTL
	259		1600	63.912	63.912	89.5155	122.4647	817,676.178	9,902,061.450	2.700	259	DTL
	260		1600	54.830	54.830	89.5155	122.5151	817,682.688	9,902,067.784	2.679	260	DTL
	261		1600	57.848	57.848	89.4905	127.0551	817,677.672	9,902,068.902	2.733	261	DTL
	262		1600	47.741	47.741	89.4904	127.5338	817,685.066	9,902,075.831	2.702	262	DTL
	263		1600	51.484	51.481	89.2451	132.3342	817,679.663	9,902,076.879	3.076	263	DTL
	264		1600	41.249	41.249	89.5426	135.0017	817,687.204	9,902,084.069	2.617	264	DTL
	265		1600	46.078	46.074	89.1312	139.1418	817,681.420	9,902,084.516	3.177	265	DTL
	266		1600	33.826	33.825	90.2808	147.3408	817,690.384	9,902,094.644	2.273	266	DTL
	267		1600	40.621	40.616	89.0516	149.1503	817,683.590	9,902,093.576	3.196	267	DTL
	268		1600	29.751	29.751	90.1823	160.2956	817,692.795	9,902,102.506	2.391	268	DTL
	269		1600	36.477	36.470	88.5424	164.0133	817,685.946	9,902,104.045	3.246	269	DTL
	270		1600	21.993	21.993	90.2122	155.3401	817,700.788	9,902,101.443	2.413	270	DTL
	271		1600	13.776	13.775	90.4916	145.1510	817,709.543	9,902,100.620	2.352	271	DTL
	272		1600	25.827	25.827	90.1413	138.2944	817,699.576	9,902,093.488	2.443	272	DTL
	273		1600	18.756	18.756	89.4138	123.0205	817,708.766	9,902,092.709	2.650	273	DTL
	274		1600	32.487	32.487	90.0555	126.2856	817,697.496	9,902,084.725	2.494	274	DTL
	275		1600	29.537	29.537	89.4514	116.0706	817,703.541	9,902,082.861	2.677	275	DTL
	276		1600	40.103	40.103	89.5752	119.3924	817,694.943	9,902,076.362	2.575	276	DTL
	277		1600	38.081	38.081	89.5750	113.0425	817,699.682	9,902,075.032	2.574	277	DTL
	278		1600	48.245	48.245	89.5921	114.2711	817,692.699	9,902,067.575	2.559	278	DTL
	279		1600	46.894	46.894	89.4807	109.2021	817,696.941	9,902,066.216	2.712	279	DTL
	280		1600	56.356	56.356	89.5329	110.5947	817,690.451	9,902,059.171	2.657	280	DTL
	281		1600	54.852	54.852	89.5326	106.3309	817,694.898	9,902,058.138	2.655	281	DTL
	282		1600	65.578	65.578	89.5357	108.1808	817,687.806	9,902,049.886	2.665	282	DTL
	283		1600	64.714	64.714	89.5759	104.1627	817,692.208	9,902,048.359	2.588	283	DTL
	284		1600	63.472	63.472	89.5406	97.2404	817,699.720	9,902,046.319	2.659	284	DTL
	285		1600	63.453	63.453	89.5049	91.2816	817,705.971	9,902,044.314	2.719	285	DTL
	286		1600	54.763	54.763	89.5626	98.0405	817,702.235	9,902,054.685	2.607	286	DTL
	287		1600	54.881	54.881	89.5332	91.2616	817,708.219	9,902,052.586	2.653	287	DTL
	288		1600	45.198	45.198	90.0706	90.4150	817,711.284	9,902,061.793	2.456	288	DTL
	289		1600	45.776	45.776	90.0811	98.4250	817,705.063	9,902,063.235	2.441	289	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	290		1600	37.072	37.072	89.4306	100.0715	817,707.518	9,902,071.646	2.732	290	DTL
	291		1600	35.812	35.812	89.5447	91.2501	817,713.153	9,902,071.005	2.604	291	DTL
	292		1600	29.070	29.070	89.4313	101.5813	817,709.873	9,902,079.367	2.692	292	DTL
	293		1600	27.950	27.950	89.3933	91.5303	817,714.960	9,902,078.662	2.716	293	DTL
	294		1600	20.340	20.340	89.5531	107.1231	817,711.990	9,902,088.123	2.576	294	DTL
	295		1600	19.652	19.652	89.4848	93.4123	817,716.569	9,902,086.835	2.614	295	DTL
	296		1600	11.075	11.075	90.1221	93.3210	817,719.135	9,902,095.019	2.510	296	DTL
	297		1600	12.540	12.540	90.0452	115.3037	817,714.487	9,902,095.866	2.532	297	DTL
	298		1600	4.230	4.227	92.0132	96.1349	817,720.955	9,902,101.628	2.400	298	DTL
	299		1600	9.667	9.666	90.5643	163.3847	817,712.729	9,902,105.129	2.390	299	PHN
	300		1600	7.642	7.641	90.5645	30.4637	817,727.852	9,902,100.271	2.424	300	PHN
	301		1600	14.150	14.149	90.4703	18.0856	817,734.425	9,902,098.179	2.356	301	PHN
	302		1600	14.399	14.399	89.4913	63.0323	817,725.726	9,902,091.602	2.595	302	DTL
	303		1600	18.242	18.242	90.0123	44.3346	817,732.028	9,902,090.123	2.542	303	DTL
	304		1600	23.978	23.978	89.5532	70.5310	817,724.721	9,902,081.743	2.581	304	DTL
	305		1600	25.332	25.332	89.5854	59.5306	817,729.619	9,902,081.330	2.558	305	DTL
	306		1600	31.924	31.924	89.4544	75.2035	817,723.017	9,902,073.690	2.682	306	DTL
	307		1600	32.830	32.830	89.5627	66.5338	817,727.851	9,902,073.236	2.584	307	DTL
	308		1600	40.513	40.513	90.0435	71.0725	817,726.166	9,902,065.271	2.496	308	DTL
	309		1600	39.835	39.835	89.5743	78.2337	817,721.054	9,902,065.794	2.576	309	DTL
	310		1600	39.814	39.814	89.5601	64.5337	817,730.380	9,902,066.605	2.596	310	PHN
	311		1600	47.043	47.043	90.0321	79.4215	817,719.738	9,902,058.639	2.504	311	DTL
	312		1600	49.088	49.088	89.5748	70.1748	817,727.671	9,902,056.805	2.581	312	PHN
	313		1600	53.391	53.391	89.5203	71.4618	817,726.767	9,902,052.397	2.673	313	PHN
	314		1600	53.335	53.335	89.5719	80.3355	817,718.585	9,902,052.408	2.591	314	DTL
	315		1600	53.900	53.899	89.4036	76.2050	817,722.509	9,902,051.708	2.854	315	PHN
	316		1600	62.103	62.103	89.5856	74.2526	817,724.613	9,902,043.544	2.569	316	PHN
	317		1600	61.494	61.494	89.5359	79.4332	817,718.903	9,902,044.212	2.657	317	DTL
	318		1600	64.957	64.957	89.5957	69.0647	817,730.714	9,902,041.187	2.551	318	DTL
	319		1600	67.330	67.330	89.5520	64.5849	817,735.808	9,902,039.629	2.641	319	DTL
	320		1600	57.138	57.138	89.5828	65.0245	817,733.712	9,902,049.603	2.575	320	DTL
	321		1600	60.064	60.064	90.0311	60.5402	817,738.516	9,902,047.750	2.494	321	DTL
	322		1600	49.879	49.879	90.0514	60.3905	817,735.989	9,902,057.620	2.474	322	DTL
	323		1600	53.043	53.043	90.0024	55.5652	817,740.988	9,902,055.934	2.544	323	DTL
	324		1600	45.849	45.849	90.0217	49.0353	817,743.495	9,902,064.908	2.519	324	DTL
	325		1600	41.755	41.755	90.0251	54.4954	817,737.788	9,902,066.798	2.515	325	DTL
	326		1600	34.236	34.236	90.0607	46.0131	817,739.737	9,902,076.095	2.489	326	DTL
	327		1600	38.937	38.937	89.5426	40.2446	817,745.307	9,902,074.134	2.613	327	DTL
	328		1600	28.730	28.730	89.5722	35.0728	817,741.366	9,902,084.042	2.572	328	DTL
	329		1600	34.010	34.010	89.5110	29.3927	817,747.185	9,902,082.336	2.637	329	DTL
	330		1600	30.614	30.613	89.2921	16.5115	817,748.794	9,902,090.129	2.823	330	DTL
	331		1600	23.235	23.235	89.5014	22.3125	817,741.170	9,902,091.936	2.616	331	DTL
	332		1600	19.984	19.984	89.4115	4.1858	817,741.406	9,902,099.487	2.659	332	DTL
	333		1600	19.948	19.948	89.4108	4.1920	817,741.372	9,902,099.496	2.659	333	DTL
	334		1600	80.298	80.298	89.5343	88.2209	817,705.842	9,902,027.031	2.696	334	F7
	335		1600	85.753	85.752	89.4744	67.1638	817,736.099	9,902,020.959	2.856	335	F6
	F5		1455	85.755	85.754	90.1239	359.5959	817,722.383	9,902,105.607	2.699	F5	STN
F6		1.488			85.752			817,736.099	9,902,020.959	2.856	F6	
	336		1600	121.934	121.934	90.0903	301.5032	817,623.560	9,902,067.893	2.423	336	PERTMNA
	337		1600	69.674	69.674	89.5923	305.2837	817,673.623	9,902,051.800	2.756	337	A.SLRN
	338		1600	69.698	69.698	89.5834	305.5445	817,673.838	9,902,052.285	2.773	338	A.SLRN
	339		1600	69.548	69.547	90.2047	305.4523	817,673.888	9,902,052.048	2.323	339	B.SLRN
	340		1600	47.990	47.990	89.5902	309.5401	817,694.834	9,902,045.457	2.757	340	A.SLRN
	341		1600	48.074	48.074	90.0126	310.3120	817,695.030	9,902,045.947	2.724	341	A.SLRN
	342		1600	47.947	47.945	90.3144	310.2028	817,695.062	9,902,045.751	2.301	342	B.SLRN
	343		1600	29.935	29.935	89.5713	317.5520	817,712.743	9,902,039.683	2.768	343	A.SLRN
	344		1600	29.939	29.939	89.5846	318.5257	817,713.057	9,902,040.074	2.754	344	A.SLRN
	345		1600	29.825	29.822	90.4457	318.3349	817,713.041	9,902,039.872	2.354	345	B.SLRN
	346		1600	12.109	12.100	92.1506	348.1154	817,731.762	9,902,032.254	2.268	346	B.SLRN
	347		1600	12.009	12.009	90.0747	346.2333	817,731.443	9,902,032.028	2.717	347	A.SLRN
	348		1600	12.217	12.217	90.2333	348.3550	817,731.800	9,902,032.394	2.660	348	A.SLRN
	349		1600	12.754	12.754	89.3309	81.0758	817,748.224	9,902,024.915	2.843	349	A.SLRN
	350		1600	13.143	13.143	89.5004	79.1727	817,748.456	9,902,025.435	2.782	350	A.SLRN
	351		1600	12.954	12.946	92.0159	79.2741	817,748.284	9,902,025.332	2.284	351	B.SLRN
	352		1600	26.618	26.618	90.1154	103.4216	817,762.635	9,902,018.870	2.652	352	A.SLRN
	353		1600	26.771	26.771	90.1155	102.3959	817,762.821	9,902,019.342	2.651	353	A.SLRN
	354		1600	26.630	26.625	91.0603	103.1917	817,762.656	9,902,019.047	2.232	354	B.SLRN
	355		1600	61.486	61.486	89.5653	114.5642	817,795.279	9,902,004.278	2.799	355	JL
	356		1600	61.273	61.273	90.0055	119.1610	817,793.653	9,901,999.936	2.727	356	JL
	357		1600	45.925	45.925	89.5120	119.0430	817,779.290	9,902,005.349	2.859	357	JL
	358		1600	45.199	45.199	89.5120	112.4746	817,780.032	9,902,010.336	2.858	358	JL
	359		1600	29.988	29.988	90.0802	119.2645	817,764.235	9,902,010.583	2.674	359	JL
	360		1600	31.422	31.422	90.0759	108.0842	817,767.139	9,902,016.075	2.671	360	JL
	361		1600	13.690	13.689	89.2542	115.3151	817,749.237	9,902,017.110	2.880	361	JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	362		1600	15.275	15.275	89.3902	92.1446	817,751.262	9,902,022.809	2.837	362	JL
	363		1600	1.665	1.654	83.1719	346.2516	817,735.459	9,902,022.483	2.938	363	JL
	364		1600	7.232	7.230	88.3556	22.1630	817,737.734	9,902,028.001	2.921	364	JL
	365		1600	15.274	15.272	89.0313	304.5247	817,722.335	9,902,027.576	2.996	365	JL
	366		1600	21.171	21.170	89.2050	321.1950	817,720.399	9,902,035.159	2.985	366	JL
	367		1600	37.348	37.347	89.3651	311.4209	817,704.601	9,902,041.025	2.995	367	JL
	368		1600	35.684	35.684	89.4241	302.2542	817,703.307	9,902,035.030	2.923	368	JL
	369		1600	57.902	57.902	89.5030	300.2142	817,682.101	9,902,041.858	2.904	369	JL
	370		1600	56.878	56.878	89.5031	306.4132	817,685.643	9,902,047.212	2.901	370	JL
	371		1600	74.091	74.091	89.5550	304.1816	817,669.005	9,902,052.389	2.834	371	JL
	372		1600	74.776	74.776	89.5259	299.2131	817,665.902	9,902,046.723	2.896	372	JL
	373		1600	93.410	93.410	89.5945	302.3433	817,650.354	9,902,058.015	2.751	373	JL
	374		1600	94.060	94.060	89.5315	298.3412	817,647.362	9,902,052.150	2.928	374	JL
	375		1600	93.069	93.064	90.3433	298.1727	817,648.151	9,902,051.391	1.808	375	B.SLRN
	376		1600	93.069	93.064	90.3535	297.3248	817,647.764	9,902,050.246	1.780	376	B.SLRN
	377		1600	92.889	92.889	90.0136	297.2732	817,647.885	9,902,050.056	2.700	377	B.SLRN
	378		1600	92.998	92.998	90.0136	298.2307	817,648.264	9,902,051.514	2.700	378	A.SLRN
	379		1600	83.773	83.769	90.3406	298.3822	817,657.104	9,902,048.833	1.913	379	B.SLRN
	380		1600	84.659	84.655	90.3129	297.4310	817,655.826	9,902,047.842	1.968	380	B.SLRN
	381		1600	84.718	84.718	89.5933	297.3330	817,655.691	9,902,047.636	2.755	381	A.SLRN
	382		1600	83.673	83.673	89.5933	298.4901	817,657.281	9,902,049.045	2.755	382	A.SLRN
	383		1600	73.822	73.816	90.4318	299.0203	817,666.660	9,902,046.000	1.814	383	B.SLRN
	384		1600	73.721	73.716	90.4035	298.0814	817,666.372	9,902,044.877	1.873	384	B.SLRN
	385		1600	73.649	73.649	90.0341	298.0740	817,666.431	9,902,044.844	2.665	385	A.SLRN
	386		1600	73.771	73.771	90.0005	299.1028	817,666.764	9,902,046.154	2.742	386	A.SLRN
	387		1600	63.300	63.297	90.3344	299.3856	817,676.790	9,902,043.069	2.123	387	B.SLRN
	388		1600	63.201	63.197	90.4019	298.3629	817,676.492	9,902,041.955	2.003	388	B.SLRN
	389		1600	63.120	63.120	90.0301	298.3635	817,676.565	9,902,041.931	2.688	389	A.SLRN
	390		1600	63.240	63.240	90.0025	299.4155	817,676.862	9,902,043.101	2.736	390	A.SLRN
	391		1600	54.191	54.183	91.0001	300.1740	817,685.546	9,902,040.456	1.798	391	B.SLRN
	392		1600	53.674	53.665	91.0341	299.1441	817,685.684	9,902,039.349	1.749	392	B.SLRN
	393		1600	53.596	53.596	90.0145	299.1014	817,685.725	9,902,039.261	2.716	393	A.SLRN
	394		1600	54.214	54.214	90.0435	300.0414	817,685.441	9,902,040.270	2.671	394	A.SLRN
	395		1600	45.854	45.844	91.1039	301.0500	817,693.557	9,902,038.043	1.801	395	B.SLRN
	396		1600	45.781	45.770	91.1625	299.4355	817,693.236	9,902,037.009	1.726	396	B.SLRN
	397		1600	45.873	45.873	90.0317	301.0804	817,693.546	9,902,038.092	2.700	397	A.SLRN
	398		1600	45.807	45.807	90.0130	299.3735	817,693.172	9,902,036.943	2.724	398	A.SLRN
	399		1600	36.983	36.967	91.3936	300.0531	817,701.561	9,902,034.139	1.672	399	B.SLRN
	400		1600	37.108	37.094	91.3444	301.3930	817,701.818	9,902,035.127	1.721	400	B.SLRN
	401		1600	36.679	36.679	89.5256	299.5355	817,701.787	9,902,033.921	2.819	401	A.SLRN
	402		1600	37.118	37.118	89.5024	301.5002	817,701.839	9,902,035.241	2.847	402	A.SLRN
	403		1600	28.165	28.147	92.0229	299.5143	817,709.762	9,902,030.889	1.740	403	B.SLRN
	404		1600	28.710	28.692	92.0232	302.0213	817,709.656	9,902,032.093	1.721	404	B.SLRN
	405		1600	28.669	28.669	89.4338	302.1734	817,709.727	9,902,032.202	2.880	405	A.SLRN
	406		1600	27.982	27.982	89.4338	299.3233	817,709.862	9,902,030.684	2.877	406	A.SLRN
	407		1600	19.852	19.828	92.4759	299.2333	817,717.489	9,902,027.802	1.774	407	B.SLRN
	408		1600	19.891	19.865	92.5537	302.3615	817,717.868	9,902,028.848	1.728	408	B.SLRN
	409		1600	19.854	19.854	89.4508	303.1046	817,717.959	9,902,029.026	2.830	409	A.SLRN
	410		1600	19.875	19.875	89.3807	298.5806	817,717.396	9,902,027.680	2.870	410	A.SLRN
	411		1600	12.757	12.721	94.1918	303.5429	817,724.543	9,902,026.275	1.782	411	B.SLRN
	412		1600	12.849	12.812	94.2145	298.5051	817,724.033	9,902,025.266	1.766	412	B.SLRN
	413		1600	12.662	12.662	89.3112	298.0544	817,724.120	9,902,025.058	2.850	413	A.SLRN
	414		1600	12.747	12.747	89.3510	304.2851	817,724.573	9,902,026.402	2.836	414	A.SLRN
	415		1600	3.651	3.548	103.3814	294.2158	817,732.675	9,902,021.887	1.883	415	B.SLRN
	416		1600	3.697	3.623	101.3002	312.5159	817,733.084	9,902,022.967	2.007	416	B.SLRN
	417		1600	3.609	3.609	89.4106	314.0040	817,733.136	9,902,023.019	2.764	417	A.SLRN
	418		1600	3.481	3.481	89.3231	292.0630	817,732.706	9,902,021.736	2.772	418	A.SLRN
	419		1600	5.656	5.574	99.4538	124.0112	817,741.159	9,902,018.619	1.785	419	B.SLRN
	420		1600	5.847	5.776	98.5540	113.3519	817,741.694	9,902,019.524	1.836	420	B.SLRN
	421		1600	5.795	5.795	90.0549	111.3138	817,741.761	9,902,019.722	2.734	421	A.SLRN
	422		1600	5.567	5.567	89.1516	124.2654	817,741.134	9,902,018.585	2.816	422	A.SLRN
	423		1600	13.909	13.870	94.1557	117.4203	817,749.253	9,902,016.558	1.709	423	B.SLRN
	424		1600	13.935	13.899	94.0741	122.0357	817,748.906	9,902,015.559	1.741	424	B.SLRN
	425		1600	13.869	13.869	89.5712	116.5504	817,749.311	9,902,016.739	2.755	425	A.SLRN
	426		1600	14.227	14.226	90.3215	122.0925	817,749.199	9,902,015.411	2.610	426	A.SLRN
	427		1600	26.474	26.469	91.0557	121.5546	817,760.514	9,902,010.733	2.236	427	B.SLRN
	428		1600	26.202	26.190	91.4425	118.3818	817,760.797	9,902,012.245	1.948	428	B.SLRN
	429		1600	26.210	26.209	90.3327	118.2642	817,760.844	9,902,012.322	2.489	429	A.SLRN
	430		1600	26.499	26.497	90.4405	122.1402	817,760.484	9,902,010.593	2.404	430	A.SLRN
	431		1600	29.086	29.066	92.0903	121.2726	817,763.000	9,902,009.952	1.652	431	B.SLRN
	432		1600	28.483	28.461	92.1637	122.3149	817,762.234	9,902,009.689	1.612	432	B.SLRN
	433		1600	29.365	29.364	90.2341	121.0323	817,763.354	9,902,010.029	2.541	433	A.SLRN
	434		1600	28.265	28.260	91.0306	122.4911	817,761.993	9,902,009.638	2.225	434	A.SLRN
	435		1600	48.981	48.975	90.5222	120.5952	817,781.574	9,902,002.776	1.998	435	B.SLRN
	436		1600	49.964	49.957	90.5536	120.4120	817,782.585	9,902,002.661	1.936	436	B.SLRN

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	437		1600	49.241	49.237	90.4317	112.2040	817,784.047	9,902,009.765	2.124	437	B.SLRN
	438		1600	50.317	50.314	90.3812	112.2741	817,785.072	9,902,009.420	2.185	438	B.SLRN
	439		1600	48.857	48.856	89.3810	120.4944	817,781.517	9,902,002.954	3.054	439	A.SLRN
	440		1600	50.018	50.017	89.3644	120.2855	817,782.706	9,902,002.808	3.082	440	A.SLRN
	441		1600	50.021	50.020	89.3843	112.3228	817,784.770	9,902,009.420	3.053	441	A.SLRN
	442		1600	49.031	49.031	89.4453	112.3225	817,783.808	9,902,009.649	2.959	442	A.SLRN
	443		1600	49.337	49.333	90.4325	122.4437	817,781.327	9,902,001.256	2.121	443	B.SLRN
	444		1600	50.657	50.652	90.4946	122.3159	817,782.610	9,902,000.900	2.010	444	B.SLRN
	445		1600	52.444	52.443	90.1803	119.2924	817,785.290	9,902,002.776	2.468	445	T.TLPN
	446		1600	46.586	46.586	89.5522	111.1401	817,781.662	9,902,011.249	2.807	446	T.L
	447		1600	13.820	13.819	90.4508	214.5426	817,730.106	9,902,008.507	2.562	447	BG
	448		1600	9.693	9.692	90.4459	208.2523	817,732.909	9,902,011.807	2.617	448	BG
	449		1600	13.680	13.680	90.1926	207.4346	817,731.753	9,902,007.988	2.666	449	BG
	450		1600	5.995	5.993	91.2052	168.1631	817,738.240	9,902,015.361	2.603	450	TL
	451		1600	6.462	6.462	90.3107	133.4129	817,741.425	9,902,017.300	2.685	451	TL
	452		1600	2.104	2.099	94.0628	272.4033	817,734.014	9,902,020.720	2.593	452	T.TLPN
	453		1600	6.185	6.185	90.2927	290.1500	817,730.029	9,902,022.145	2.691	453	T.TLPN
	F5		1455	80.283	80.283	90.0000	359.5958	817,722.383	9,902,105.607	2.699	F5	STN
F7		1.491			80.298			817,705.842	9,902,027.031	2.696	F7	
	454		1600	38.408	38.406	89.2441	171.3614	817,703.502	9,901,988.697	2.982	454	DTL
	455		1600	45.832	45.831	89.4316	174.1912	817,700.885	9,901,981.469	2.811	455	DTL
	456		1600	37.671	37.670	89.2937	184.4427	817,695.062	9,901,990.937	2.920	456	DTL
	457		1600	43.644	43.644	89.5548	183.2519	817,694.318	9,901,984.936	2.641	457	DTL
	458		1600	38.578	38.578	89.5341	196.1350	817,687.660	9,901,993.007	2.658	458	DTL
	459		1600	45.985	45.985	89.5338	191.2642	817,687.628	9,901,984.807	2.673	459	DTL
	460		1600	48.611	48.611	89.5337	201.3643	817,679.012	9,901,986.496	2.678	460	DTL
	461		1600	41.051	41.050	90.2300	206.2301	817,680.416	9,901,994.804	2.313	461	DTL
	462		1600	35.357	35.357	90.1256	201.1235	817,686.535	9,901,997.412	2.454	462	DTL
	463		1600	37.827	37.826	90.2607	209.2551	817,680.867	9,901,998.623	2.300	463	DTL
	464		1600	28.679	28.679	90.0427	204.2020	817,688.893	9,902,003.897	2.550	464	DTL
	465		1600	31.879	31.876	90.4537	214.5622	817,682.595	9,902,005.222	2.164	465	DTL
	466		1600	25.514	25.512	90.3924	223.4432	817,684.784	9,902,012.629	2.295	466	DTL
	467		1600	20.953	20.953	90.0426	211.4337	817,691.388	9,902,011.862	2.560	467	DTL
	468		1600	22.294	22.293	90.3910	241.3541	817,684.469	9,902,020.694	2.334	468	DTL
	469		1600	12.610	12.610	89.4911	234.2603	817,694.294	9,902,021.968	2.627	469	DTL
	470		1600	10.987	10.986	89.2537	253.0130	817,694.899	9,902,026.057	2.697	470	DTL
	471		1600	16.994	16.993	89.2345	259.2533	817,688.853	9,902,027.421	2.767	471	DTL
	472		1600	10.754	10.754	89.3232	279.0713	817,695.803	9,902,030.887	2.673	472	DTL
	473		1600	17.133	17.130	88.5802	289.5538	817,691.286	9,902,036.062	2.896	473	T.TLPN
	474		1600	18.590	18.588	89.0844	288.4550	817,689.851	9,902,036.508	2.865	474	T.TLPN
	475		1600	4.960	4.959	88.4513	314.3716	817,703.106	9,902,031.167	2.695	475	TL
	476		1600	42.825	42.824	89.3320	280.3441	817,666.268	9,902,043.396	2.920	476	TL
	477		1600	44.739	44.738	89.3553	280.4105	817,664.531	9,902,044.205	2.901	477	T.TLPN
	478		1600	39.440	39.439	89.3236	276.2513	817,668.400	9,902,039.421	2.902	478	BG
	479		1600	42.667	42.667	89.4442	248.2119	817,663.792	9,902,019.801	2.777	479	BG
	480		1600	49.977	49.975	89.3156	275.2424	817,658.126	9,902,041.889	2.996	480	BG
	481		1600	47.704	47.703	90.2033	224.1310	817,666.244	9,902,000.431	2.302	481	DTL
	482		1600	48.348	48.348	89.4724	225.0000	817,665.346	9,902,000.621	2.765	482	DTL
	483		1600	43.024	43.022	90.3122	231.3703	817,667.338	9,902,007.839	2.195	483	DTL
	484		1600	42.963	42.963	89.5227	233.2535	817,666.805	9,902,009.089	2.682	484	DTL
	485		1600	37.848	37.847	90.2230	243.4553	817,669.175	9,902,017.653	2.340	485	DTL
	486		1600	38.683	38.683	89.4913	243.1902	817,668.442	9,902,017.154	2.709	486	DTL
	487		1600	34.607	34.607	89.5241	257.1342	817,671.239	9,902,026.498	2.661	487	DTL
Survey Date : April, 02 2019												
	F1		70	30.418	30.234	96.1751	0.0000	818,080.705	9,902,052.195	1.716	F1	BS
CP03		1.134			30.233			818,074.453	9,902,022.616	3.993	CP03	
	1		1600	6.823	6.821	91.2535	112.4020	818,080.067	9,902,018.742	3.357	1	DTL
	2		1600	6.260	6.260	90.0318	49.5559	818,079.973	9,902,025.568	3.521	2	DTL
	3		1600	9.552	9.481	96.5826	103.3246	818,083.012	9,902,018.537	2.367	3	DTL
	4		1600	8.670	8.611	96.4025	56.3243	818,082.464	9,902,025.775	2.519	4	DTL
	5		1600	15.807	15.686	97.0620	94.5328	818,089.467	9,902,018.076	1.572	5	SNG
	6		1600	15.867	15.760	96.3935	58.2538	818,089.296	9,902,027.913	1.687	6	SNG
	7		1600	21.259	21.085	97.1939	89.3759	818,095.110	9,902,018.388	0.816	7	SNG
	8		1600	20.796	20.655	96.4005	55.1557	818,093.494	9,902,030.620	1.112	8	SNG
	9		1600	23.155	23.025	96.0503	38.3138	818,092.210	9,902,037.273	1.073	9	SNG
	10		1600	20.596	20.457	96.3856	24.1847	818,086.549	9,902,039.114	1.142	10	SNG
	11		1600	6.863	6.863	90.1217	356.5136	818,075.502	9,902,029.398	3.502	11	DTL
	12		1600	10.230	10.157	96.5050	343.2731	818,073.637	9,902,032.740	2.307	12	DTL
	13		1600	61.773	61.760	91.0934	183.4346	818,057.778	9,901,963.149	2.277	13	DTL
	14		1600	47.645	47.625	91.3938	179.2242	818,065.111	9,901,975.916	2.146	14	DTL
	15		1600	69.857	69.842	91.1130	181.0844	818,058.647	9,901,954.586	2.074	15	DTL
	16		1600	56.526	56.496	91.5126	173.1124	818,069.407	9,901,966.346	1.695	16	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	17		1600	78.381	78.363	91.1345	178.1919	818,060.500	9,901,945.505	1.846	17	DTL
	18		1600	63.314	63.288	91.3739	168.3528	818,073.872	9,901,959.330	1.729	18	DTL
	19		1600	86.373	86.356	91.0812	174.3622	818,064.616	9,901,936.822	1.814	19	DTL
	20		1600	70.176	70.152	91.2913	166.5401	818,075.879	9,901,952.478	1.706	20	DTL
	21		1600	92.308	92.288	91.1138	173.1643	818,066.067	9,901,930.710	1.604	21	DTL
	22		1600	79.765	79.744	91.1802	166.4432	818,076.294	9,901,942.893	1.717	22	DTL
	23		1600	87.824	87.804	91.1246	165.3137	818,078.342	9,901,934.898	1.668	23	DTL
	24		1600	107.957	107.955	90.2257	168.3349	818,073.514	9,901,914.665	2.806	24	DTL
	25		1600	120.118	120.114	90.2618	166.3706	818,077.486	9,901,902.540	2.608	25	DTL
	26		1600	97.693	97.692	90.1138	163.5641	818,081.473	9,901,925.176	3.196	26	DTL
	27		1600	112.405	112.402	90.2428	162.2411	818,085.543	9,901,910.762	2.727	27	DTL
	28		1600	120.106	120.104	90.2204	166.2423	818,077.930	9,901,902.563	2.756	28	DTL
	29		1600	126.481	126.478	90.2203	161.0122	818,089.960	9,901,897.092	2.716	29	DTL
	30		1600	136.718	136.715	90.2203	164.4754	818,082.244	9,901,886.123	2.650	30	DTL
	31		1600	5.993	5.993	90.3914	248.5641	818,068.536	9,902,021.666	3.459	31	DTL
	32		1463	148.026	148.020	90.3116	249.3131	817,928.074	9,902,000.635	2.318	32	F1A
	CP03		1134	148.026	148.020	89.2917	359.5958	818,074.453	9,902,022.616	3.993	CP03	STN
F1A		1.463			148.020			817,928.074	9,902,000.635	2.318	F1A	
	33		1600	41.554	41.544	91.1629	356.0820	817,968.649	9,902,009.556	1.256	33	DTL
	34		1600	35.160	35.150	91.2133	345.4042	817,960.463	9,902,014.291	1.347	34	DTL
	35		1600	29.757	29.755	90.4156	357.4004	817,957.295	9,902,006.247	1.818	35	DTL
	36		1600	41.289	41.289	90.0845	1.5522	817,969.088	9,902,005.392	2.076	36	DTL
	37		1600	28.966	28.964	90.3728	9.5424	817,957.030	9,901,999.944	1.865	37	DTL
	38		1600	40.147	40.147	90.0654	13.4718	817,968.053	9,901,996.962	2.100	38	DTL
	39		1600	30.193	30.193	90.0021	21.4907	817,957.460	9,901,993.700	2.178	39	DTL
	40		1600	40.999	40.999	89.4818	24.4517	817,967.442	9,901,989.186	2.320	40	DTL
	41		1600	42.111	42.111	90.0407	31.0315	817,966.976	9,901,984.510	2.130	41	DTL
	42		1600	31.525	31.525	90.0407	30.1151	817,957.374	9,901,989.000	2.143	42	DTL
	43		1600	34.796	34.796	89.5840	40.3134	817,957.587	9,901,982.203	2.194	43	DTL
	44		1600	44.166	44.165	89.4116	39.4627	817,965.838	9,901,977.733	2.421	44	DTL
	45		1600	37.885	37.885	90.0144	47.3153	817,957.520	9,901,976.797	2.162	45	DTL
	46		1600	47.421	47.418	89.1926	48.0011	817,964.682	9,901,970.497	2.740	46	DTL
	47		1600	41.983	41.981	89.2437	53.4125	817,957.681	9,901,970.872	2.613	47	DTL
	48		1600	49.819	49.817	89.2939	52.5010	817,963.730	9,901,965.844	2.621	48	DTL
	49		1600	46.488	46.488	89.4503	58.1806	817,958.104	9,901,965.148	2.383	49	DTL
	50		1600	52.051	52.051	89.4508	57.3308	817,962.214	9,901,961.344	2.406	50	DTL
	51		1600	50.028	50.028	90.0212	62.3912	817,957.400	9,901,960.103	2.149	51	DTL
	52		1600	21.750	21.746	91.0716	268.1754	817,924.208	9,902,022.034	1.755	52	BG
	53		1600	28.179	28.178	90.2438	245.3721	817,912.762	9,902,024.289	1.979	53	BG
	54		1600	37.635	37.635	90.0501	277.2812	817,927.372	9,902,038.263	2.126	54	BG
	55		1600	30.122	30.111	91.3201	288.5820	817,933.527	9,902,030.248	1.375	55	DTL
	56		1600	24.774	24.766	91.2813	286.4510	817,931.612	9,902,025.147	1.545	56	DTL
	57		1600	18.613	18.608	91.1730	288.2947	817,931.292	9,902,018.963	1.761	57	DTL
	58		1600	13.331	13.328	91.1731	288.4939	817,930.455	9,902,013.748	1.880	58	DTL
	59		1600	6.267	6.264	91.4911	288.5744	817,929.208	9,902,006.795	1.982	59	DTL
	J5		1600	46.257	46.257	89.5305	359.5958	817,767.377	9,902,094.790	2.680	J5	BS
F5		1.5			46.276			817,722.383	9,902,105.607	2.699	F5	
	60		1600	77.877	77.877	89.5633	188.1801	817,650.085	9,902,134.552	2.677	60	DTL
	61		1600	69.230	69.230	89.5333	189.3850	817,658.735	9,902,132.842	2.729	61	DTL
	62		2800	72.561	72.559	89.3544	341.5545	817,794.713	9,902,111.366	1.911	62	DTL
	63		1600	61.068	61.068	89.5443	192.2132	817,667.439	9,902,132.260	2.693	63	DTL
	64		2800	66.569	66.566	89.2956	340.2951	817,788.587	9,902,112.546	1.981	64	DTL
	65		1600	50.699	50.699	89.5449	196.0320	817,678.289	9,902,130.630	2.675	65	DTL
	66		2800	60.835	60.833	89.3057	338.5626	817,782.690	9,902,113.590	1.913	66	DTL
	67		1600	42.679	42.678	90.2454	201.1539	817,687.330	9,902,129.952	2.290	67	DTL
	68		2800	52.329	52.323	89.0727	339.3151	817,774.322	9,902,111.939	2.199	68	DTL
	69		1600	34.339	34.337	90.3654	205.1845	817,695.635	9,902,127.137	2.230	69	DTL
	70		2800	46.141	46.136	89.0729	336.1947	817,767.797	9,902,113.739	2.104	70	DTL
	71		1600	27.539	27.537	90.4458	214.3343	817,703.986	9,902,126.097	2.239	71	DTL
	72		1600	39.535	39.532	90.4057	332.2155	817,760.722	9,902,115.249	2.128	72	DTL
	73		1600	21.904	21.903	90.3826	227.5139	817,711.892	9,902,124.834	2.354	73	DTL
	74		1600	33.820	33.818	90.3828	327.4410	817,754.407	9,902,116.475	2.220	74	DTL
	75		1600	17.583	17.582	90.3828	247.4657	817,719.724	9,902,122.987	2.402	75	DTL
	76		1600	26.756	26.753	90.5216	317.3935	817,745.822	9,902,118.504	2.192	76	DTL
	77		1600	16.858	16.857	90.2744	273.3137	817,727.325	9,902,121.724	2.463	77	DTL
	78		1600	20.383	20.383	90.0633	306.3230	817,738.011	9,902,118.693	2.560	78	DTL
	79		1600	18.360	18.360	90.1041	295.4427	817,734.002	9,902,119.823	2.542	79	DTL
	80		1600	32.877	32.877	89.5731	356.5539	817,754.715	9,902,099.646	2.622	80	JL
	81		1600	33.142	33.141	89.3837	5.5310	817,753.642	9,902,094.596	2.805	81	DTL
	82		1600	26.293	26.293	89.5533	356.4944	817,748.248	9,902,100.884	2.633	82	JL
	83		1600	26.802	26.802	89.4524	6.5256	817,747.504	9,902,096.264	2.713	83	DTL
	84		1600	24.998	24.998	89.4525	14.3304	817,744.441	9,902,093.845	2.705	84	DTL
	85		1600	20.071	20.071	89.5524	356.5638	817,742.120	9,902,101.962	2.626	85	JL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	F5		1500	80.283	80.283	89.5934	359.5958	817,722.383	9,902,105.607	2.699	F5	STN
F7		1.512			80.298			817,705.842	9,902,027.031	2.696	F7	
	86		1500	4.549	4.549	89.1733	253.3732	817,701.307	9,902,026.676	2.765	86	DTL
	87		1500	2.307	2.306	88.3335	174.3226	817,705.584	9,902,024.740	2.766	87	DTL
	88		1500	8.807	8.806	90.3933	216.3042	817,699.257	9,902,021.185	2.607	88	DTL
	89		1500	8.337	8.337	90.1124	186.2052	817,703.233	9,902,019.113	2.681	89	DTL
	90		1500	14.270	14.270	90.1124	209.1548	817,696.452	9,902,016.287	2.661	90	DTL
	91		1500	13.663	13.663	90.1013	184.1941	817,702.026	9,902,013.912	2.668	91	DTL
	92		1600	20.394	20.394	90.1037	203.0842	817,694.135	9,902,010.333	2.546	92	DTL
	93		1600	20.286	20.286	90.1037	189.1154	817,698.543	9,902,008.104	2.546	93	DTL
	94		1600	29.057	29.057	90.0459	198.5440	817,690.964	9,902,002.073	2.566	94	DTL
	95		1600	28.817	28.817	90.0410	189.2908	817,695.339	9,902,000.197	2.574	95	DTL
	96		1600	36.947	36.947	89.5143	196.4719	817,688.112	9,901,994.617	2.698	96	DTL
	97		1600	37.042	37.041	89.4119	188.3057	817,692.928	9,901,992.314	2.810	97	DTL
	98		2800	40.030	40.017	88.3300	154.1219	817,715.460	9,901,988.187	2.414	98	PGR SENG
	99		3800	39.242	39.201	87.2250	153.4227	817,715.594	9,901,989.063	2.202	99	PGR SENG
	100		2800	37.765	37.748	88.1539	161.2428	817,710.248	9,901,989.542	2.555	100	PGR SENG
	101		1600	35.743	35.742	90.2118	168.4719	817,705.420	9,901,991.292	2.387	101	PGR SENG
	102		1600	39.653	39.652	89.3020	170.2020	817,704.301	9,901,987.410	2.951	102	DTL
	103		2600	42.419	42.403	88.2659	163.0217	817,709.592	9,901,984.794	2.756	103	DTL
	104		2600	45.111	45.100	88.4253	157.3658	817,714.057	9,901,982.686	2.620	104	DTL
	105		1600	31.338	31.337	90.2531	166.4703	817,706.568	9,901,995.703	2.376	105	PGR SENG
	106		1600	30.824	30.824	90.0646	175.0927	817,702.061	9,901,996.440	2.548	106	DTL
	107		1600	23.137	23.137	90.0826	170.5933	817,704.679	9,902,003.924	2.552	107	DTL
	108		1600	24.645	24.645	90.0036	160.4813	817,708.977	9,902,002.587	2.604	108	PGR SENG
	109		1600	18.905	18.905	89.4556	152.0422	817,711.065	9,902,008.863	2.686	109	PGR SENG
	110		1600	15.832	15.832	90.0237	166.5833	817,706.156	9,902,011.203	2.596	110	DTL
	111		1600	8.506	8.505	89.0027	141.4040	817,709.628	9,902,019.416	2.756	111	DTL
	112		1600	12.203	12.203	89.4805	125.0054	817,714.179	9,902,018.121	2.651	112	PGR SENG
	113		1600	11.280	11.278	88.5640	78.5058	817,717.119	9,902,026.886	2.816	113	PGR SENG
	114		2800	19.189	19.138	85.5008	87.0807	817,724.743	9,902,024.030	2.802	114	PGR SENG
	115		2800	29.513	29.478	87.1148	91.2949	817,734.519	9,902,020.207	2.852	115	PGR SENG
	116		2800	30.409	30.375	87.1652	115.1736	817,730.042	9,902,008.675	2.851	116	PGR SENG
	117		2800	29.199	29.170	87.2720	105.1925	817,731.784	9,902,013.692	2.705	117	PGR SENG
	118		1600	35.765	35.765	89.4832	70.3359	817,741.297	9,902,031.728	2.728	118	DTL
	119		1600	40.978	40.978	90.0148	57.3623	817,744.224	9,902,041.386	2.587	119	DTL
	120		1600	48.026	48.026	90.0501	47.5131	817,747.327	9,902,051.228	2.538	120	DTL
	121		1600	55.680	55.680	90.1012	40.2824	817,749.934	9,902,061.034	2.443	121	DTL
	122		1600	81.377	81.377	90.0507	209.1502	817,652.305	9,901,965.745	2.487	122	MSJD
	BM04		1600	89.237	89.237	89.4858	359.5959	817,539.383	9,902,019.699	2.947	BM04	BS
J3		1.408			89.232			817,612.654	9,902,070.627	2.852	J3	
	123		1600	34.446	34.446	89.5913	356.0732	817,585.762	9,902,049.101	2.668	123	BG
	124		1600	26.759	26.759	90.0627	319.4630	817,605.740	9,902,044.777	2.610	124	BG
	125		1600	40.303	40.303	90.0119	318.4809	817,602.903	9,902,031.521	2.645	125	BG
	126		1600	40.326	40.326	90.0032	313.1422	817,606.737	9,902,030.738	2.654	126	BG
	127		1600	87.773	87.773	90.0148	282.5736	817,645.309	9,901,989.155	2.614	127	MASJID
	128		1600	102.214	102.214	89.5940	276.4603	817,660.694	9,901,980.406	2.670	128	MASJID
	129		1600	84.856	84.856	89.5845	278.1006	817,650.693	9,901,994.775	2.691	129	DTL
	130		1600	89.124	89.124	89.5442	274.5446	817,657.066	9,901,993.357	2.797	130	DTL
	131		1600	79.406	79.406	90.0041	274.5502	817,652.218	9,902,001.779	2.644	131	DTL
	132		1600	85.251	85.251	89.5830	272.2208	817,658.375	9,901,998.673	2.697	132	DTL
	133		1600	72.726	72.726	89.5924	270.4608	817,653.356	9,902,010.358	2.673	133	DTL
	134		1600	78.753	78.753	89.5924	267.1921	817,660.573	9,902,008.130	2.674	134	DTL
	135		1600	67.185	67.185	89.5535	266.1716	817,654.490	9,902,018.058	2.746	135	DTL
	136		1600	75.650	75.650	89.5848	264.5046	817,661.236	9,902,012.638	2.686	136	DTL
	137		1600	66.354	66.352	89.3137	335.4243	817,578.569	9,902,013.699	3.208	137	BG
	J1A		1600	41.937	41.935	89.2602	359.5959	818,316.364	9,901,849.645	3.964	J1A	STN
J1B		1.479			41.939			818,317.777	9,901,891.560	3.639	J1B	
	138		2650	9.627	9.551	97.1329	25.0255	818,313.444	9,901,883.049	1.258	138	B.TGL
	139		2650	9.322	9.199	80.4057	16.0241	818,314.938	9,901,882.810	3.978	139	A.TGL
	140		2650	5.361	5.197	104.1150	46.2204	818,313.897	9,901,888.103	1.154	140	B.TGL
	141		1600	4.259	4.230	83.1829	30.1130	818,315.528	9,901,887.978	4.015	141	A.TGL
	142		2650	3.905	3.715	107.5741	111.2641	818,314.367	9,901,893.034	1.264	142	B.TGL
	143		1600	2.274	2.223	77.4822	127.3330	818,316.062	9,901,892.974	3.999	143	A.TGL
	144		2650	7.443	7.309	100.5301	154.2905	818,314.853	9,901,898.259	1.063	144	B.TGL
	145		1600	6.668	6.652	86.0116	167.2139	818,316.541	9,901,898.096	3.981	145	A.TGL
	146		2650	11.914	11.843	96.1438	166.2929	818,315.400	9,901,903.163	1.173	146	B.TGL
	147		1600	11.527	11.519	87.4900	174.3723	818,317.085	9,901,903.058	3.955	147	A.TGL
	148		2650	16.343	16.301	94.0740	171.0905	818,315.814	9,901,907.742	1.292	148	B.TGL
	149		1600	16.152	16.145	88.2204	177.0042	818,317.479	9,901,907.703	3.979	149	A.TGL
	150		2650	20.930	20.887	93.4110	173.4935	818,316.232	9,901,912.390	1.123	150	B.TGL
	151		1600	20.835	20.831	88.5030	178.1739	818,317.859	9,901,912.391	3.940	151	A.TGL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	152		2650	25.770	25.731	93.0938	175.5032	818,316.777	9,901,917.272	1.048	152	B.TGL
	153		1600	25.603	25.600	89.0928	179.1856	818,318.334	9,901,917.154	3.895	153	A.TGL
	154		2650	27.754	27.744	91.3126	177.4453	818,317.622	9,901,919.304	1.730	154	GRNG2
	155		2650	27.805	27.787	87.5736	178.0440	818,317.782	9,901,919.348	3.458	155	GRNG2
	156		2650	28.926	28.908	87.5903	178.0313	818,317.769	9,901,920.468	3.486	156	GRNG2
	157		2650	28.687	28.679	91.2033	177.5235	818,317.681	9,901,920.239	1.796	157	GRNG2
	158		1600	27.903	27.903	90.1955	193.0127	818,324.978	9,901,918.518	3.357	158	A.SLRN
	159		1600	28.779	28.779	90.1250	193.0448	818,325.231	9,901,919.357	3.411	159	A.SLRN
Survey Date : April, 03 2019												
	C5		1484	62.023	62.020	90.3348	359.5958	818,409.677	9,902,024.586	2.120	C5	BS
C6		1.481			62.023			818,470.517	9,902,012.536	2.596	C6	
	1		1600	91.068	91.054	90.5915	163.5839	818,561.250	9,902,020.184	0.907	1	LAUT
	2		1600	92.569	92.549	91.1138	161.4746	818,562.376	9,902,023.815	0.548	2	LAUT
	3		1600	96.282	96.269	90.5635	164.5745	818,566.571	9,902,018.972	0.892	3	LAUT
	4		1600	98.149	98.130	91.0813	162.4129	818,568.091	9,902,022.971	0.529	4	LAUT
	5		1600	102.076	102.062	90.5614	166.2921	818,572.497	9,902,016.644	0.807	5	LAUT
	6		1600	102.574	102.553	91.0939	164.2126	818,572.763	9,902,020.473	0.399	6	LAUT
	7		1600	108.500	108.486	90.5557	167.2728	818,578.973	9,902,015.070	0.711	7	LAUT
	8		1600	108.335	108.318	91.0048	166.1531	818,578.729	9,902,017.331	0.561	8	LAUT
	9		1600	114.600	114.587	90.5159	167.5125	818,585.089	9,902,014.414	0.744	9	LAUT
	10		1600	115.109	115.090	91.0208	166.3650	818,585.524	9,902,016.918	0.396	10	LAUT
	11		1600	122.035	122.022	90.5015	167.1804	818,592.498	9,902,015.719	0.693	11	LAUT
	12		1600	122.976	122.955	91.0335	166.0214	818,593.330	9,902,018.454	0.202	12	LAUT
	13		1600	128.103	128.088	90.5148	168.2946	818,598.604	9,902,013.207	0.546	13	LAUT
	14		1600	127.838	127.818	91.0028	167.2319	818,598.297	9,902,015.675	0.228	14	LAUT
	15		1600	131.204	131.192	90.4554	171.0949	818,601.598	9,902,007.116	0.725	15	LAUT
	16		1600	131.202	131.185	90.5451	169.2437	818,601.695	9,902,011.130	0.383	16	LAUT
	17		1600	135.165	135.154	90.4315	172.0352	818,605.452	9,902,004.830	0.776	17	LAUT
	18		1600	135.950	135.936	90.4929	170.1836	818,606.406	9,902,008.945	0.520	18	LAUT
	19		1600	138.444	138.433	90.4244	173.1623	818,608.528	9,902,001.730	0.756	19	LAUT
	20		1600	140.357	140.345	90.4548	171.4509	818,610.675	9,902,005.297	0.607	20	LAUT
	21		1600	143.869	143.859	90.3945	175.1620	818,613.459	9,901,996.310	0.813	21	LAUT
	22		1600	145.198	145.185	90.4636	173.2051	818,615.244	9,902,001.015	0.508	22	LAUT
	23		1600	147.943	147.934	90.3851	176.4452	818,617.029	9,901,992.071	0.805	23	LAUT
	24		1600	150.293	150.279	90.4634	174.2319	818,620.081	9,901,997.891	0.441	24	LAUT
	25		1600	154.446	154.434	90.4216	176.5643	818,623.392	9,901,990.645	0.578	25	LAUT
	26		2000	164.413	164.409	90.2253	179.1557	818,632.190	9,901,982.660	0.982	26	LAUT
	27		1600	164.009	163.997	90.4111	177.4318	818,632.529	9,901,987.092	0.512	27	LAUT
	28		1600	173.542	173.531	90.3906	177.5432	818,641.858	9,901,985.052	0.503	28	LAUT
	29		2000	184.509	184.505	90.2221	179.3145	818,651.795	9,901,978.175	0.877	29	LAUT
	30		1600	184.236	184.225	90.3727	178.1744	818,652.216	9,901,982.132	0.470	30	LAUT
	31		1600	191.339	191.328	90.3609	178.3435	818,659.065	9,901,980.035	0.465	31	LAUT
	32		1600	197.495	197.484	90.3639	178.5145	818,664.961	9,901,978.018	0.371	32	LAUT
	33		2800	53.664	53.657	90.5614	137.3534	818,516.412	9,902,040.334	0.399	33	LAUT
	34		2800	60.051	60.045	90.4739	132.3837	818,519.001	9,902,047.959	0.444	34	LAUT
	35		2800	48.020	48.014	90.5531	129.4221	818,507.783	9,902,042.810	0.501	35	LAUT
	36		2800	54.220	54.213	90.5531	126.1112	818,510.417	9,902,049.238	0.401	36	LAUT
	37		2800	43.609	43.604	90.5214	120.0827	818,499.322	9,902,045.271	0.614	37	LAUT
	38		2800	51.147	51.140	90.5627	118.3617	818,503.259	9,902,051.821	0.437	38	LAUT
	39		2800	40.797	40.791	90.5958	109.5349	818,491.588	9,902,047.463	0.565	39	LAUT
	40		2800	48.275	48.268	90.5959	107.5408	818,493.996	9,902,054.708	0.434	40	LAUT
	41		2800	39.432	39.422	91.1630	99.4310	818,484.596	9,902,049.358	0.399	41	LAUT
	42		2800	46.717	46.708	91.0556	97.1856	818,485.353	9,902,056.825	0.381	42	LAUT
	43		2800	39.227	39.213	91.3118	88.3122	818,477.142	9,902,051.185	0.235	43	LAUT
	44		2800	46.799	46.790	91.0701	83.3200	818,474.391	9,902,059.165	0.364	44	LAUT
	45		2800	47.386	47.377	91.0700	77.1132	818,469.191	9,902,059.894	0.344	45	LAUT
	46		2800	49.381	49.372	91.0455	68.2219	818,461.584	9,902,061.093	0.344	46	LAUT
	47		2800	51.761	51.753	91.0120	62.3437	818,456.062	9,902,062.229	0.353	47	LAUT
	48		2800	45.833	45.827	90.5557	61.2236	818,456.798	9,902,056.261	0.531	48	LAUT
	49		2800	54.056	54.047	91.0305	56.4334	818,450.210	9,902,062.622	0.285	49	LAUT
	50		1600	52.616	52.587	91.5507	42.1746	818,439.238	9,902,054.808	0.715	50	LAUT
	51		1600	59.376	59.343	91.5507	46.4717	818,439.063	9,902,062.857	0.489	51	LAUT
	52		1600	58.254	58.227	91.4421	36.3607	818,431.409	9,902,055.674	0.709	52	LAUT
	53		1600	64.208	64.178	91.4421	41.5701	818,432.032	9,902,063.894	0.528	53	LAUT
	54		1600	62.652	62.627	91.3652	31.5422	818,424.797	9,902,055.335	0.712	54	LAUT
	55		1600	67.995	67.968	91.3651	38.0755	818,426.228	9,902,064.092	0.561	55	LAUT
	56		1600	72.267	72.243	91.2801	34.5641	818,420.468	9,902,064.633	0.627	56	LAUT
	57		1600	66.741	66.718	91.3104	29.2112	818,419.828	9,902,055.916	0.709	57	LAUT
	58		1600	71.275	71.255	91.2055	27.3416	818,414.966	9,902,057.160	0.799	58	LAUT
	59		1600	74.957	74.934	91.2447	32.2801	818,416.316	9,902,064.279	0.628	59	LAUT
	60		1600	77.984	77.965	91.1506	23.5435	818,406.741	9,902,057.381	0.773	60	LAUT
	61		1600	81.527	81.508	91.1506	27.4700	818,407.173	9,902,063.828	0.696	61	LAUT
	62		1600	88.749	88.729	91.1214	25.0844	818,399.053	9,902,065.126	0.612	62	LAUT

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	63		1600	92.018	91.999	91.0909	17.4418	818,390.008	9,902,057.057	0.626	63	LAUT
	64		1600	95.499	95.483	91.0249	21.0734	818,389.836	9,902,063.599	0.732	64	LAUT
	65		1600	101.295	101.283	90.5326	18.0646	818,382.206	9,902,062.127	0.902	65	LAUT
	66		1600	102.708	102.696	90.5218	11.3253	818,375.812	9,902,052.252	0.914	66	LAUT
	67		1600	109.127	109.114	90.5218	14.3311	818,372.244	9,902,059.952	0.817	67	LAUT
	68		1600	114.434	114.425	90.4336	10.2538	818,364.151	9,902,054.716	1.025	68	LAUT
	69		1600	110.476	110.463	90.5247	7.2136	818,365.802	9,902,047.703	0.780	69	LAUT
	70		1600	119.154	119.145	90.4322	6.2326	818,356.946	9,902,048.550	0.974	70	LAUT
	71		1600	115.788	115.779	90.4321	4.2637	818,359.029	9,902,043.763	1.017	71	LAUT
	72		1600	124.170	124.162	90.3922	3.3613	818,350.479	9,902,044.268	1.055	72	LAUT
	73		1600	119.563	119.555	90.3922	2.3726	818,354.427	9,902,041.110	1.108	73	LAUT
	74		1600	127.747	127.740	90.3656	1.3248	818,345.928	9,902,040.728	1.104	74	LAUT
	75		1600	123.487	123.479	90.3949	359.4433	818,349.285	9,902,035.983	1.046	75	LAUT
	76		1600	127.238	127.230	90.3757	357.3256	818,344.769	9,902,031.896	1.072	76	LAUT
	77		1600	131.599	131.591	90.3757	359.1553	818,341.117	9,902,036.445	1.024	77	LAUT
	78		1600	136.076	136.076	89.5824	345.0637	818,334.723	9,902,003.788	2.540	78	T.JMBTN
	79		1600	136.723	136.722	89.4700	345.2726	818,334.027	9,902,004.572	2.967	79	T.JMBTN
	80		1600	141.885	141.873	90.4444	10.3211	818,338.735	9,902,065.085	0.630	80	LAUT
	81		1600	134.966	134.953	90.4706	14.0243	818,348.457	9,902,070.101	0.628	81	LAUT
	82		1600	126.320	126.306	90.5024	16.2306	818,358.573	9,902,071.031	0.625	82	LAUT
	83		1600	116.688	116.674	90.5350	19.1342	818,369.918	9,902,071.633	0.649	83	LAUT
	84		2000	66.258	66.244	88.4854	291.3932	818,434.572	9,901,956.893	3.447	84	TL
	85		1600	108.062	108.044	91.0247	22.0653	818,380.233	9,902,071.883	0.503	85	LAUT
	86		1600	99.152	99.133	91.0754	24.4307	818,390.239	9,902,070.696	0.518	86	LAUT
	87		1600	88.966	88.945	91.1521	27.1329	818,400.840	9,902,067.818	0.527	87	LAUT
	88		1600	80.444	80.421	91.2233	31.3102	818,411.435	9,902,067.095	0.545	88	LAUT
	89		1600	71.942	71.917	91.3003	36.3911	818,422.262	9,902,065.860	0.592	89	LAUT
	90		1600	63.503	63.473	91.4524	42.3945	818,433.089	9,902,063.799	0.530	90	LAUT
	J8		70	97.679	97.671	90.4425	359.5959	818,838.146	9,901,959.022	3.146	J8	BS
J8A		1.534			97.728			818,742.469	9,901,939.107	2.969	J8A	
	91		1600	74.780	74.728	92.0841	223.4237	818,679.063	9,901,978.653	0.105	91	LAUT
	92		1600	72.765	72.730	91.4712	219.5210	818,678.319	9,901,973.376	0.634	92	LAUT
	93		1600	70.263	70.249	91.0847	214.4930	818,677.837	9,901,966.631	1.497	93	LAUT
	94		1600	61.813	61.798	91.1601	217.3226	818,686.823	9,901,965.986	1.536	94	LAUT
	95		1600	65.767	65.711	92.2117	227.5034	818,689.364	9,901,977.809	0.201	95	LAUT
	96		1600	63.706	63.665	92.0254	223.1759	818,688.210	9,901,972.411	0.626	96	LAUT
	97		1600	56.957	56.911	92.1819	228.2549	818,696.823	9,901,973.096	0.612	97	LAUT
	98		1600	60.366	60.305	92.3420	231.3143	818,696.118	9,901,977.685	0.194	98	LAUT
	99		1600	52.734	52.714	91.3459	222.4734	818,697.301	9,901,966.284	1.446	99	LAUT
	100		1600	45.664	45.641	91.4948	227.1130	818,705.281	9,901,965.567	1.445	100	LAUT
	101		1600	52.969	52.908	92.4449	237.0316	818,705.251	9,901,976.711	0.365	101	LAUT
	102		1600	48.941	48.889	92.3834	235.3845	818,707.235	9,901,972.999	0.646	102	LAUT
	103		1600	43.189	43.129	93.0031	241.4809	818,714.771	9,901,972.167	0.636	103	LAUT
	104		1600	46.170	46.096	93.1502	244.4003	818,714.670	9,901,975.876	0.285	104	LAUT
	105		1600	38.898	38.864	92.2427	233.4530	818,713.588	9,901,965.112	1.269	105	LAUT
	106		1600	30.414	30.373	92.5755	239.4615	818,722.150	9,901,961.683	1.330	106	LAUT
	107		1600	42.438	42.352	93.3859	250.4115	818,720.611	9,901,975.382	0.202	107	LAUT
	108		1600	33.000	32.917	94.0325	252.1244	818,726.237	9,901,967.743	0.568	108	LAUT
	109		1600	29.243	29.153	94.3002	260.5729	818,732.117	9,901,966.359	0.608	109	LAUT
	110		1600	35.636	35.525	94.3133	263.2359	818,731.280	9,901,972.824	0.091	110	LAUT
	111		1600	22.467	22.417	93.4843	253.0657	818,731.723	9,901,958.781	1.409	111	LAUT
	112		1600	17.327	17.267	94.4653	275.0258	818,740.452	9,901,956.255	1.459	112	LAUT
	113		1600	32.294	32.168	95.0359	271.5824	818,737.002	9,901,970.807	0.051	113	LAUT
	114		1600	25.612	25.510	95.0712	277.5951	818,740.796	9,901,964.562	0.617	114	LAUT
	115		1600	29.734	29.586	95.4310	291.2510	818,747.434	9,901,968.273	(0.060)	115	LAUT
	116		1600	24.192	24.082	95.2809	303.3158	818,751.402	9,901,961.470	0.597	116	LAUT
	117		1600	29.833	29.683	95.4440	300.0041	818,751.766	9,901,967.296	(0.083)	117	LAUT
	118		1600	17.181	17.133	94.1643	308.5748	818,750.302	9,901,954.344	1.621	118	LAUT
	119		1600	20.965	20.924	93.3513	327.1618	818,757.396	9,901,953.769	1.591	119	LAUT
	120		1600	31.780	31.637	95.2543	314.5741	818,759.794	9,901,965.579	(0.103)	120	LAUT
	121		1600	27.113	27.019	94.4550	318.4721	818,758.741	9,901,960.676	0.651	121	LAUT
	122		1600	34.518	34.440	93.5039	332.1120	818,769.017	9,901,961.045	0.589	122	LAUT
	123		1600	36.458	36.341	94.3545	325.4912	818,767.742	9,901,965.221	(0.018)	123	LAUT
	124		1600	30.328	30.293	92.4517	340.0354	818,768.244	9,901,955.022	1.446	124	LAUT
	125		1600	37.461	37.433	92.1404	345.3023	818,776.041	9,901,955.664	1.443	125	LAUT
	126		1600	43.394	43.285	94.0359	332.0021	818,775.747	9,901,966.786	(0.174)	126	LAUT
	127		1600	40.565	40.501	93.1344	338.0614	818,776.181	9,901,961.551	0.618	127	LAUT
	128		1600	49.596	49.545	92.3634	343.1209	818,785.987	9,901,962.789	0.645	128	LAUT
	129		1600	50.456	50.366	93.2457	337.3537	818,784.143	9,901,967.391	(0.103)	129	LAUT
	130		1600	47.641	47.618	91.4649	349.2101	818,786.491	9,901,957.258	1.423	130	LAUT
	131		1600	55.830	55.813	91.2423	351.4022	818,794.888	9,901,958.274	1.533	131	LAUT
	132		1600	58.367	58.287	92.5927	340.5038	818,792.476	9,901,969.052	(0.142)	132	LAUT
	133		1600	57.161	57.117	92.1529	345.3333	818,793.718	9,901,964.323	0.651	133	LAUT
	134		1600	66.599	66.559	91.5902	347.1153	818,803.006	9,901,966.772	0.598	134	LAUT

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	135		1600	67.099	67.029	92.3645	343.2752	818,801.490	9,901,970.878	(0.155)	135	LAUT
	136		1600	65.436	65.418	91.1932	351.5314	818,803.992	9,901,961.342	1.389	136	LAUT
	137		1600	72.812	72.797	91.0959	352.2852	818,811.184	9,901,963.139	1.421	137	LAUT
	138		1600	74.168	74.105	92.2110	344.4428	818,808.487	9,901,972.769	(0.142)	138	LAUT
	139		1600	73.747	73.712	91.4621	348.1045	818,810.026	9,901,968.592	0.622	139	LAUT
	140		1600	80.588	80.554	91.4005	348.5032	818,816.665	9,901,970.473	0.557	140	LAUT
	141		1600	79.880	79.864	91.0748	352.3126	818,817.875	9,901,965.416	1.328	141	LAUT
	142		1600	81.232	81.168	92.1613	345.2909	818,815.253	9,901,975.035	(0.315)	142	LAUT
	143		1600	87.338	87.326	90.5639	353.2623	818,825.370	9,901,966.553	1.464	143	LAUT
	144		1600	87.801	87.772	91.2736	349.3513	818,823.752	9,901,972.230	0.666	144	LAUT
	145		1600	87.311	87.259	91.5910	346.2731	818,821.358	9,901,976.396	(0.123)	145	LAUT
	146		1600	94.355	94.327	91.2313	349.4929	818,829.969	9,901,974.340	0.619	146	LAUT
	147		1600	94.635	94.584	91.5302	347.0243	818,828.390	9,901,978.649	(0.208)	147	LAUT
	148		1600	93.831	93.818	90.5645	353.0639	818,831.362	9,901,969.104	1.354	148	LAUT
	149		1600	99.979	99.968	90.5154	353.2005	818,837.313	9,901,970.700	1.394	149	LAUT
	150		1600	100.459	100.434	91.1634	350.1042	818,835.863	9,901,976.046	0.666	150	LAUT
	151		1600	100.965	100.916	91.4710	347.1253	818,834.267	9,901,981.025	(0.244)	151	LAUT
	152		1600	117.150	117.127	91.0738	350.3642	818,851.709	9,901,981.361	0.598	152	LAUT
	153		1600	117.335	117.294	91.3000	348.1809	818,850.071	9,901,985.794	(0.191)	153	LAUT
	154		1600	116.346	116.336	90.4454	353.1532	818,852.794	9,901,976.019	1.384	154	LAUT
	J12		1600	75.483	75.483	90.0120	359.5959	818,411.572	9,901,801.662	2.486	J12	BS
J11		1.522			75.453			818,486.685	9,901,794.504	2.583	J11	
	155		1600	25.969	25.969	89.4512	353.0336	818,460.725	9,901,793.826	2.617	155	J11A
	156		1600	24.841	24.841	89.4105	105.5745	818,495.751	9,901,817.631	2.642	156	J11B
	157		1600	41.529	41.524	89.0838	165.3916	818,527.709	9,901,800.929	3.126	157	TL
	158		1600	8.839	8.834	88.0610	112.2637	818,490.817	9,901,802.312	2.798	158	TL
	159		1600	13.821	13.819	89.0705	26.2327	818,474.944	9,901,801.793	2.718	159	BTS STMIK
	160		1600	24.881	24.881	90.0846	13.0646	818,463.098	9,901,802.422	2.442	160	BTS STMIK
	161		1600	13.495	13.495	89.5029	27.1229	818,475.323	9,901,801.785	2.542	161	BTS UPT
	162		1600	13.717	13.716	89.2159	19.4502	818,474.274	9,901,800.343	2.657	162	PNT STMIK
	163		1600	23.598	23.597	89.3238	10.1833	818,463.974	9,901,800.910	2.693	163	PNT STMIK
	J11		1522	24.768	24.768	90.0405	0.0000	818,486.685	9,901,794.504	2.583	J11	STN
J11B		1.497			24.841			818,495.751	9,901,817.631	2.642	J11B	
	164		2300	19.890	19.879	88.0328	85.3733	818,476.745	9,901,823.454	2.513	164	BG UPT
	165		1600	8.354	8.353	89.1211	112.1517	818,489.708	9,901,823.398	2.655	165	BG UPT
	166		1600	36.705	36.703	89.2444	148.1024	818,489.113	9,901,853.729	2.915	166	BG UPT
	167		1600	55.336	55.334	89.3329	227.0954	818,547.261	9,901,837.847	2.966	167	BG UPT
	168		1600	20.855	20.854	89.3330	155.0313	818,494.464	9,901,838.446	2.699	168	BG UPT
	169		1600	36.169	36.167	89.2311	156.0544	818,494.175	9,901,853.764	2.926	169	BG UPT
	J11		1522	25.928	25.928	90.0231	359.5958	818,486.685	9,901,794.504	2.583	J11	STN
J11A		1.508			25.969			818,460.725	9,901,793.826	2.617	J11A	
	170		1600	104.262	104.262	90.0256	270.5645	818,459.725	9,901,898.083	2.436	170	TMBK STMIK
	171		1600	10.599	10.596	88.4032	284.2806	818,463.104	9,901,804.152	2.770	171	TMBK STMIK
	172		1600	91.399	91.399	90.0835	271.1318	818,460.288	9,901,885.224	2.297	172	TMBK STMIK
	173		1600	21.471	21.468	89.0408	276.4124	818,462.669	9,901,815.206	2.874	173	TMBK STMIK
	174		1600	77.836	77.835	90.1334	271.3059	818,460.753	9,901,871.661	2.218	174	TMBK STMIK
	175		1600	31.756	31.756	90.0542	274.2237	818,462.321	9,901,825.542	2.472	175	TMBK STMIK
	176		1600	44.817	44.817	90.0356	272.4843	818,461.755	9,901,838.631	2.474	176	TMBK STMIK
	177		1600	68.397	68.396	90.1435	271.4809	818,461.092	9,901,862.221	2.235	177	TMBK STMIK
	178		1600	55.326	55.326	90.0816	272.1655	818,461.484	9,901,849.147	2.392	178	TMBK STMIK
	179		4100	21.561	21.396	82.5400	280.4917	818,464.192	9,901,814.939	2.690	179	BG STMIK
	180		2800	25.410	25.367	86.3906	304.0813	818,474.407	9,901,815.186	2.809	180	BG STMIK
	181		2800	42.296	42.264	87.4629	273.3744	818,462.298	9,901,836.061	2.967	181	BG STMIK
	182		3000	42.437	42.397	87.3007	275.0525	818,463.383	9,901,836.139	2.974	182	BG STMIK3
	183		1600	24.439	24.439	90.0051	206.0416	818,438.500	9,901,803.990	2.519	183	TL
	184		1600	61.900	61.900	90.0232	191.4317	818,399.808	9,901,804.815	2.479	184	TL
	185		1600	85.816	85.815	89.4438	191.1632	818,376.157	9,901,808.403	2.908	185	DTL
	186		2600	85.334	85.331	89.3138	188.3412	818,376.044	9,901,804.335	2.229	186	DTL
	187		1600	76.960	76.958	89.3753	192.5032	818,385.271	9,901,808.967	3.020	187	DTL
	188		1600	75.692	75.692	90.0221	189.2459	818,385.755	9,901,804.257	2.473	188	DTL
	189		1600	66.180	66.178	89.3527	195.1215	818,396.432	9,901,809.509	2.997	189	DTL
	190		1600	63.742	63.742	90.0152	190.3758	818,397.792	9,901,803.948	2.490	190	DTL
	191		2800	56.045	56.023	88.2306	197.5434	818,406.986	9,901,809.657	2.904	191	DTL
	192		2800	54.254	54.243	88.4932	192.2245	818,407.458	9,901,804.068	2.437	192	DTL
	193		2800	46.102	46.076	88.0507	202.1502	818,417.639	9,901,810.154	2.865	193	DTL
	194		2800	43.780	43.765	88.3039	194.5112	818,418.144	9,901,803.937	2.463	194	DTL
	195		2800	44.125	44.090	87.4246	207.0107	818,420.938	9,901,812.823	3.086	195	DTL
	196		2800	49.560	49.528	87.5549	210.4242	818,417.498	9,901,818.001	3.115	196	DTL
	197		1600	55.615	55.612	89.2339	219.3942	818,417.002	9,901,828.191	3.113	197	DTL
	198		1600	51.860	51.856	89.1821	220.5447	818,420.664	9,901,826.753	3.153	198	DTL
	199		1600	63.943	63.940	89.2715	227.1428	818,416.105	9,901,839.623	3.134	199	DTL
	200		1600	59.711	59.708	89.2250	228.0257	818,419.666	9,901,837.175	3.170	200	DTL

TOPOGRAPHIC SURVEY COMPUTATION SHEET

Surveyor : Parlindungan S
Instrument : Topcon GTS235N
Survey Date : March, 2019

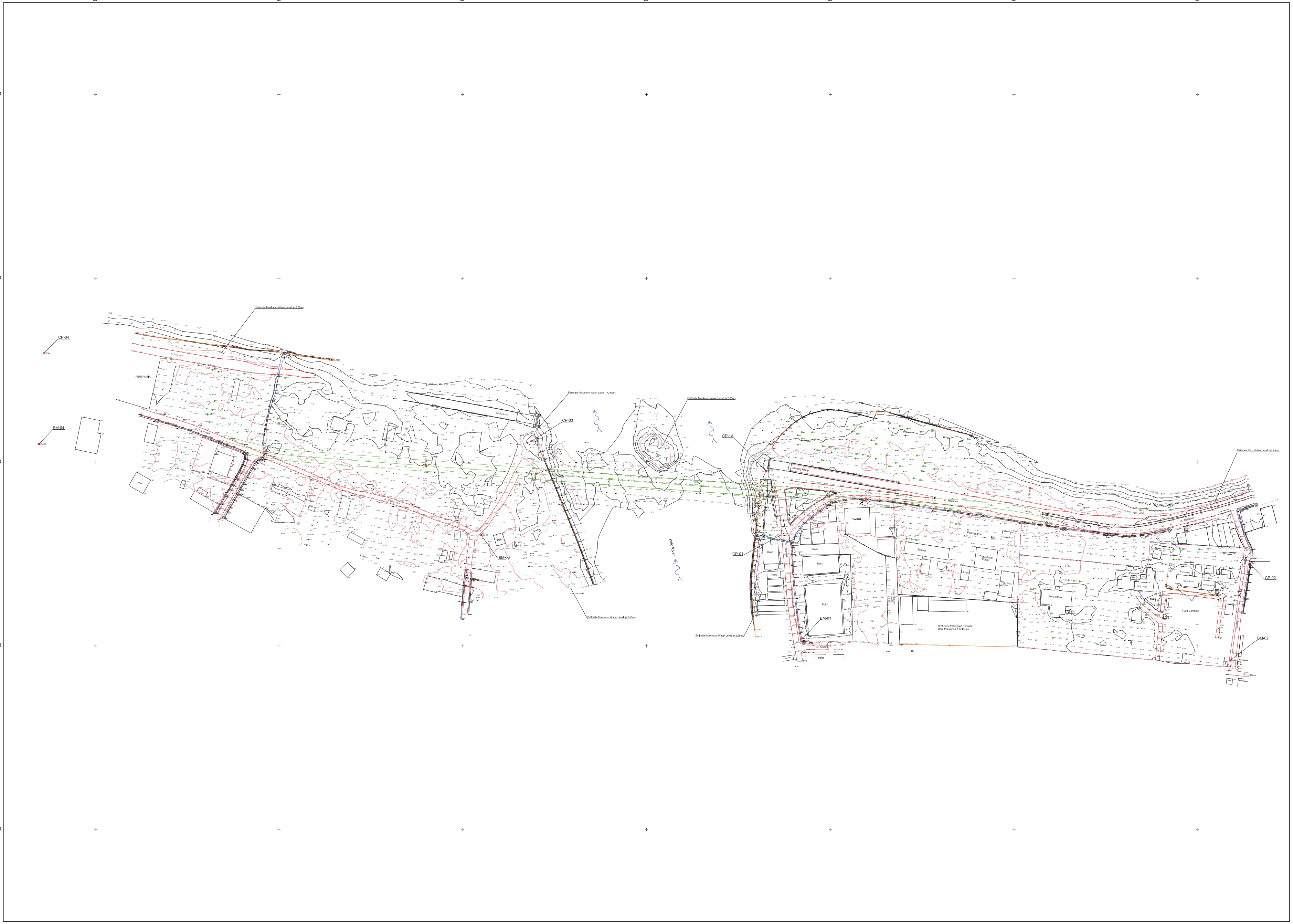
Project Topographic Survey Palu Bridge IV
Client JICA Project Team
Project Site Palu - Cental Sulawesi

Network : Topo
Print date 22-Apr-2019

Instrument		Cross hair		Distance		Angle		Coordinates		Elevation		
Station		Height	M	Slope	Horz.	Vertical	Horizontal	X	Y	Z	Point	Remarks
OCC	OBS	(m)	(mm)	(m)	(m)	(dd.mmss)	(dd.mmss)	(m)	(m)	(m)		
	201		1600	29.900	29.899	89.3318	202.2733	818,432.805	9,901,804.523	2.757	201	DTL
	202		1600	36.823	36.823	90.0143	199.3958	818,425.738	9,901,805.309	2.506	202	DTL
	203		1600	34.836	34.836	90.0136	220.4312	818,433.739	9,901,815.855	2.509	203	DTL
	204		1600	41.791	41.790	89.4039	213.5738	818,425.466	9,901,816.258	2.760	204	DTL
	205		1600	47.587	47.587	89.4824	224.4911	818,426.107	9,901,826.476	2.685	205	DTL
	206		1600	42.991	42.991	90.1314	229.1850	818,431.858	9,901,825.683	2.359	206	DTL
	207		2600	37.585	37.577	88.5003	243.5636	818,443.344	9,901,827.142	2.290	207	DTL
	208		1600	39.478	39.478	90.1614	261.3625	818,453.946	9,901,832.717	2.338	208	DTL
	209		1600	30.497	30.496	90.2124	239.1212	818,444.433	9,901,819.606	2.335	209	DTL
	210		1600	27.819	27.819	90.1037	258.2308	818,454.415	9,901,820.920	2.439	210	DTL
	211		1600	22.973	22.973	90.1330	235.0016	818,447.063	9,901,812.295	2.435	211	DTL
	212		1600	19.838	19.838	89.4736	254.0142	818,454.771	9,901,812.749	2.596	212	DTL
	213		1600	14.822	14.822	90.1601	221.5518	818,449.442	9,901,803.437	2.456	213	DTL
	214		1600	10.648	10.645	88.3701	246.3218	818,456.234	9,901,803.477	2.782	214	DTL
Survey Date : April, 04 2019												
	CP02		1051	107.343	107.341	90.1811	359.5959	818,855.607	9,901,889.672	4.071	CP02	BS
BM02		1.153			107.339			818,834.813	9,901,784.366	4.510	BM02	
	1		1600	10.053	10.053	89.5044	30.2022	818,841.476	9,901,791.894	4.090	1	JL
	2		1600	8.057	8.057	90.0016	3.0736	818,836.803	9,901,792.173	4.062	2	JL
	3		1600	8.990	8.990	90.0359	349.2138	818,834.896	9,901,793.356	4.053	3	PGR SENG
	4		1600	2.949	2.947	87.5640	154.3152	818,835.541	9,901,781.510	4.169	4	JL
	5		1600	6.446	6.445	89.0314	107.5203	818,840.448	9,901,781.238	4.169	5	JL
	6		1600	8.995	8.995	89.3549	131.1352	818,840.301	9,901,777.239	4.126	6	JL
	7		1600	11.453	11.453	89.5850	136.2530	818,840.951	9,901,774.696	4.067	7	JL
	8		1600	14.471	14.471	90.0215	134.2623	818,842.987	9,901,772.424	4.054	8	JL
	9		1600	20.693	20.692	89.3330	118.0210	818,850.847	9,901,771.286	4.223	9	JL
	10		1600	23.836	23.836	89.5814	126.2721	818,850.878	9,901,766.757	4.075	10	JL
	11		1600	18.448	18.448	89.4916	143.0333	818,842.834	9,901,767.753	4.121	11	JL
	12		1600	15.682	15.682	89.5733	175.3653	818,832.960	9,901,768.794	4.074	12	JL
	13		1600	16.208	16.208	90.0157	190.0621	818,828.932	9,901,769.263	4.054	13	JL
	14		1600	11.444	11.444	89.4732	190.2553	818,830.600	9,901,773.726	4.105	14	JL
	15		1600	10.952	10.952	90.1341	180.2743	818,832.605	9,901,773.639	4.019	15	JL
	16		1600	9.214	9.214	90.0145	173.3008	818,834.062	9,901,775.183	4.058	16	JL
	17		1600	7.066	7.066	89.3518	168.0444	818,834.906	9,901,777.301	4.114	17	JL
	18		1650	8.051	8.050	89.2118	87.4454	818,842.766	9,901,783.118	4.104	18	RMH
	19		1600	9.455	9.455	90.1841	54.1005	818,843.405	9,901,788.311	4.012	19	RMH
	20		1600	29.413	29.413	90.1308	11.2618	818,846.120	9,901,811.518	3.951	20	RMH
	21		1600	9.766	9.766	90.0852	120.4548	818,842.078	9,901,777.840	4.038	21	PGR
	22		1600	12.614	12.614	90.0853	125.2625	818,843.478	9,901,775.199	4.030	22	PGR
	23		1600	21.473	21.472	90.3832	144.3201	818,843.648	9,901,764.796	3.822	23	RMH
	24		1600	20.426	20.424	89.1639	161.5350	818,837.278	9,901,764.091	4.321	24	RMH
	25		1600	20.003	20.000	89.0315	180.0157	818,830.927	9,901,764.747	4.393	25	RMH
	26		2650	7.721	7.648	82.0547	195.0438	818,831.431	9,901,777.507	4.075	26	RMH
	27		1600	5.406	5.405	89.0527	190.4449	818,832.795	9,901,779.351	4.149	27	PGR
	28		2650	3.209	3.053	72.0320	225.5253	818,832.251	9,901,782.706	4.002	28	RMH
	J12		1600	41.998	41.998	90.0607	0.0000	818,411.572	9,901,801.662	2.486	J12	BS
BM01		1.1			41.999			818,370.084	9,901,808.193	3.048	BM01	
	29		1600	40.428	40.428	90.1111	1.1008	818,409.883	9,901,801.093	2.416	29	JL
	30		1600	41.594	41.594	90.1442	7.2555	818,409.990	9,901,796.465	2.370	30	JL
	31		1600	34.438	34.438	90.0854	10.3618	818,402.536	9,901,796.668	2.459	31	JL
	32		1600	35.734	35.734	90.1634	15.1652	818,402.670	9,901,793.530	2.376	32	RMH
	33		1600	33.303	33.303	90.1059	3.2947	818,402.605	9,901,801.018	2.442	33	JL
	34		1600	25.208	25.208	90.0315	7.5650	818,394.204	9,901,800.868	2.524	34	JL
	35		1600	27.117	27.117	90.0315	16.3234	818,394.562	9,901,796.524	2.522	35	JL
	36		1600	28.975	28.975	90.0840	21.4042	818,395.018	9,901,793.433	2.475	36	RMH
	37		1600	11.673	11.671	88.5642	29.2139	818,379.242	9,901,800.958	2.763	37	JL
	38		1600	15.016	15.014	89.0705	42.4858	818,379.377	9,901,796.400	2.779	38	JL
	39		1600	17.681	17.680	89.3319	48.3107	818,379.593	9,901,793.287	2.685	39	PGR
	40		1600	12.777	12.772	88.2336	63.1129	818,374.002	9,901,796.037	2.906	40	JL
	41		1600	7.889	7.881	87.2126	56.2952	818,373.359	9,901,801.025	2.912	41	JL
	42		1600	3.318	3.314	87.1715	88.5749	818,369.628	9,901,804.910	2.705	42	JBT
	43		1600	4.535	4.534	88.3715	114.3945	818,367.575	9,901,804.417	2.657	43	JBT
	44		1600	15.348	15.344	88.4154	79.5959	818,370.366	9,901,792.852	2.897	44	JBT
	45		1600	15.347	15.347	89.5918	66.0222	818,374.060	9,901,793.370	2.551	45	JBT
	46		1600	21.071	21.070	89.2503	112.4310	818,359.023	9,901,790.260	2.762	46	RMH
	47		1600	25.072	25.071	89.2648	105.0533	818,359.871	9,901,785.297	2.790	47	RMH
	48		1600	6.630	6.618	86.3655	326.2059	818,376.097	9,901,810.959	2.939	48	RUKO
	49		2800	44.294	44.250	87.2559	344.0417	818,414.005	9,901,813.572	3.332	49	RUKO
	50		1600	3.753	3.742	85.3145	40.4629	818,372.503	9,901,805.339	2.841	50	TL

Appendix-7:

Topographic Map



NOTES

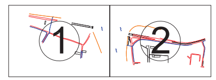
1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station.
   This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ;
   expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Elip. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 20 40 80 120m

Graphic Scalle 1 : 2000



LEGEND

- Contour line 0,5m interval, and 2,5m indexed
- Benchmark
- House/Building
- Alternative-1 Alignment Plan
- Temporary Fences
- Estimate Maximum Water Level (+2,65m)
- Electric Line (20Kv)
- Aspalt Road/Road
- Open Drainage
- Closed Drainage
- Trees
- LPJU (Lamp/pole)
- Telkom/provider (pole)
- Borehole Point

Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 / ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

Index Drawing of Topographic Map
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

The JICA Project Team

The Contractor:

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

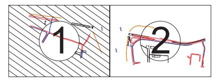
Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/TOPOMAP-2000	
Dated :	March 15, 2019	Sheet No : 1 of 1	
Original Scale H 1:2000 V 1:2000	Drawn by : SKD	Checked by :	App, by :

NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellp. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET



LEGEND

- Contour line 0,5m interval, and 2,5m indexed
- Benchmark
- House/Building
- Alternative-1 Alignment Plan
- Temporary Fences
- Estimate Maximum Water Level (+2,65m)
- Electric Line (20Kv)
- Aspalt Road/Road
- Open Drainage
- Closed Drainage
- Trees
- LPJU (Lamp/pole)
- Telkom/provider (pole)
- Borehole Point

Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

Topographic Map
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

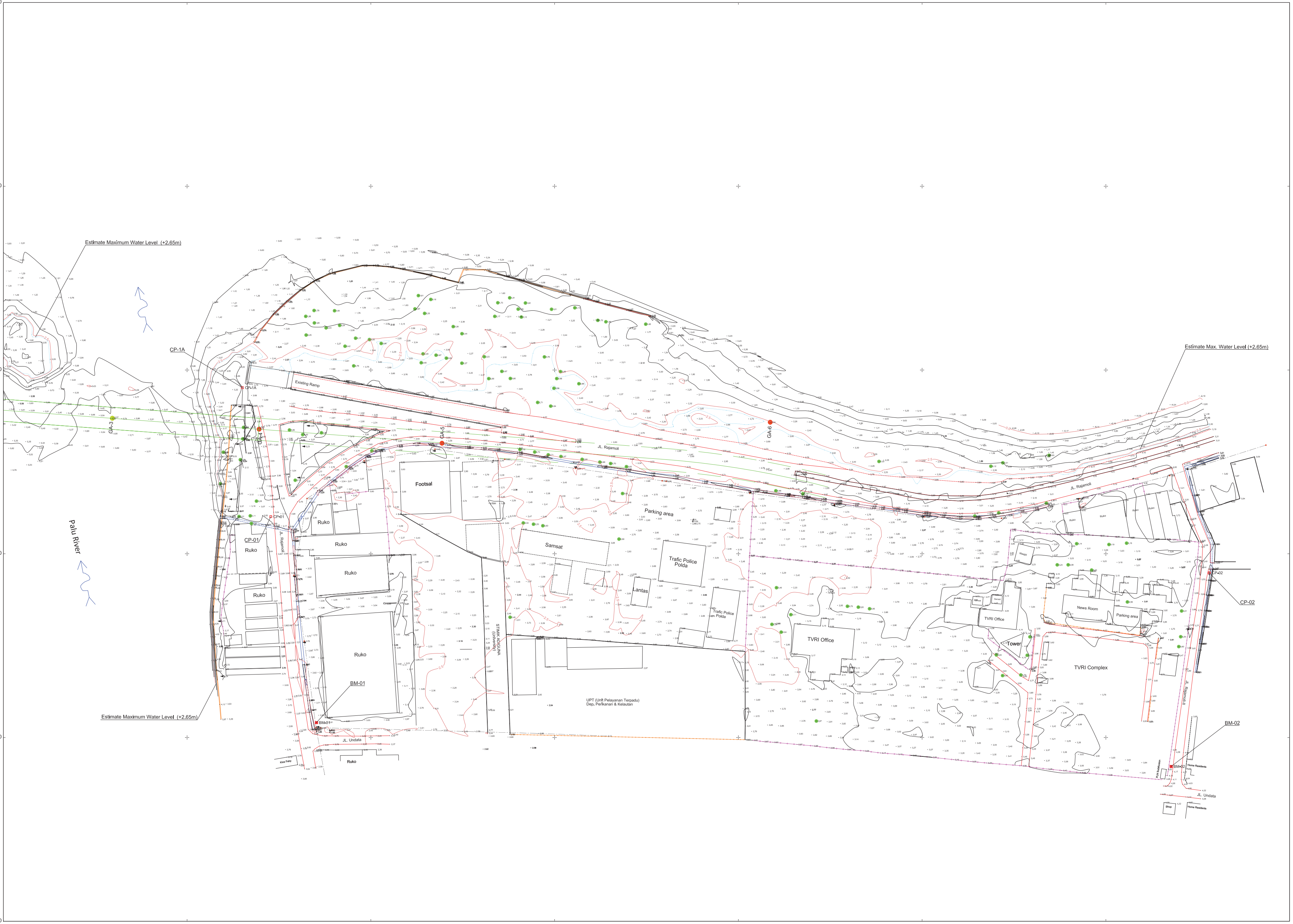
The JICA Project Team

The Contractor:

PT. GEOMARINDEX

Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav, 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/TOPOMAP-1000	
Dated :	March 15, 2019	Sheet No : 1 of 2	
Original Scale H 1:1000 V 1:1000	Drawn by : SKD	Checked by :	App. by :



NOTES

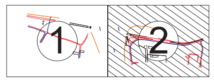
1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station.
   This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ;
   expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellp. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 10 20 40 60m

Graphic Scale 1 : 1000



LEGEND

- Contour line 0,5m Interval, and 2,5m Indexed
- Benchmark
- House/Building
- Alternative-1 Alignment Plan
- Temporary Fences
- Estimate Maximum Water Level (+2,65m)
- Electric Line (20Kv)
- Aspalt Road/Road
- Open Drainage
- Closed Drainage
- Trees
- LPJU (Lamp/pole)
- Telkom/provider (pole)
- Borehole Point

Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

Topographic Map
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

The JICA Project Team

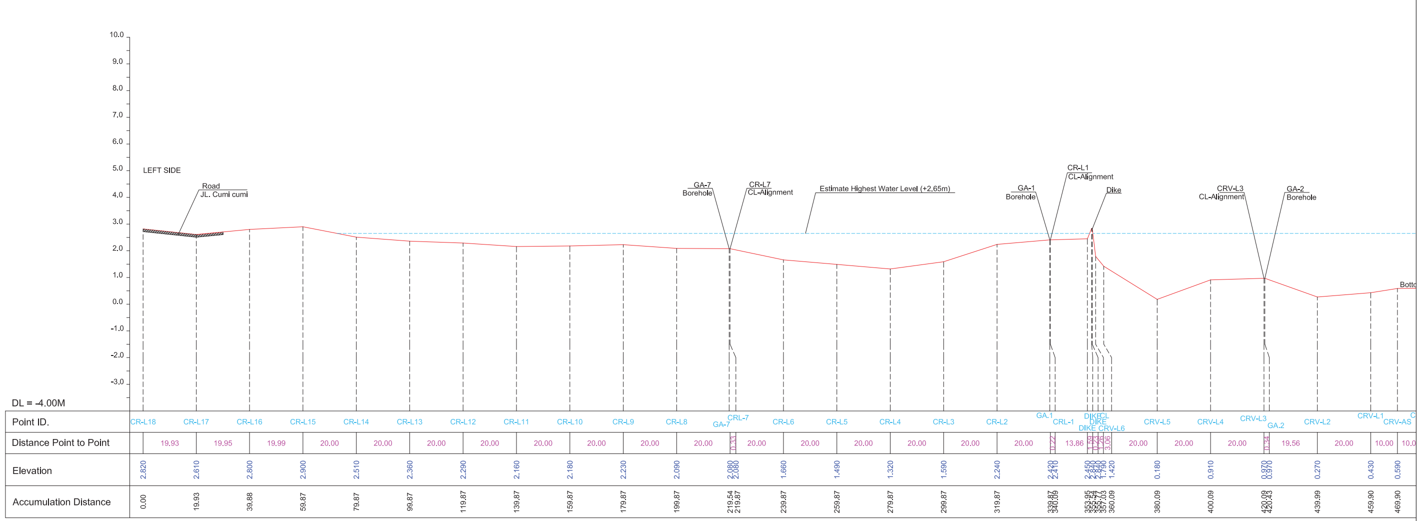
The Contractor:

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/TOPOMAP-1000	
Dated :	March 15, 2019	Sheet No : 2 of 2	
Original Scale H 1:1000 V 1:1000	Drawn by : SKD	Checked by :	App. by :

Appendix-8:

Longitudinal & Cross Section Drawings



Point ID.	CR-L18	CR-L17	CR-L16	CR-L15	CR-L14	CR-L13	CR-L12	CR-L11	CR-L10	CR-L9	CR-L8	GA-7	CRL-7	CR-L6	CR-L5	CR-L4	CR-L3	CR-L2	GA.1	CRL-1	DIKE	DIKE	DIKE	CL	CRV-L6	CRV-L5	CRV-L4	CRV-L3	GA.2	CRV-L2	CRV-L1	CRV-AS
Distance Point to Point		19,93	19,95	19,99	20,00	20,00	20,00	20,00	20,00	20,00	20,00	20,00	0.33	20,00	20,00	20,00	20,00	20,00	20,00	0.22	13,86	1.59	0.23	1.26	3.06	20,00	20,00	20,00	0.34	19,56	20,00	10,00
Elevation	2.820	2.610	2.800	2.900	2.510	2.360	2.290	2.160	2.180	2.230	2.090	2.080	2.080	1.660	1.490	1.320	1.590	2.240	2.420	2.410	2.450	2.840	2.840	1.790	1.420	0.180	0.910	0.970	0.970	0.270	0.430	0.590
Accumulation Distance	0.00	19.93	39.88	59.87	79.87	99.87	119.87	139.87	159.87	179.87	199.87	219.54	219.87	239.87	259.87	279.87	299.87	319.87	339.87	340.09	353.95	355.54	355.77	357.03	360.09	380.09	400.09	420.09	420.43	439.99	459.90	469.90

NOTES

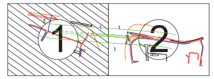
1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates Latitude (S)	Longitude (E)	Ellip. height h (m)	UTM Zone 50S Grid Coordinates Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	Notes
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 10 20 40 60m

Graphic Scale H 1 : 1000
Graphic Scale V 1 : 100



LEGEND

- Contour line 0,5m interval, and 2,5m indexed
- Benchmark
- House/Building
- Alternative-1 Alignment Plan
- Temporary Fences
- Estimate Maximum Water Level (+2,65m)
- Electric Line (20Kv)
- Aspalt Road/Road
- Open Drainage
- Closed Drainage
- Trees
- LPJU (Lamp/pole)
- Telkom/provider (pole)
- Borehole Point

Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

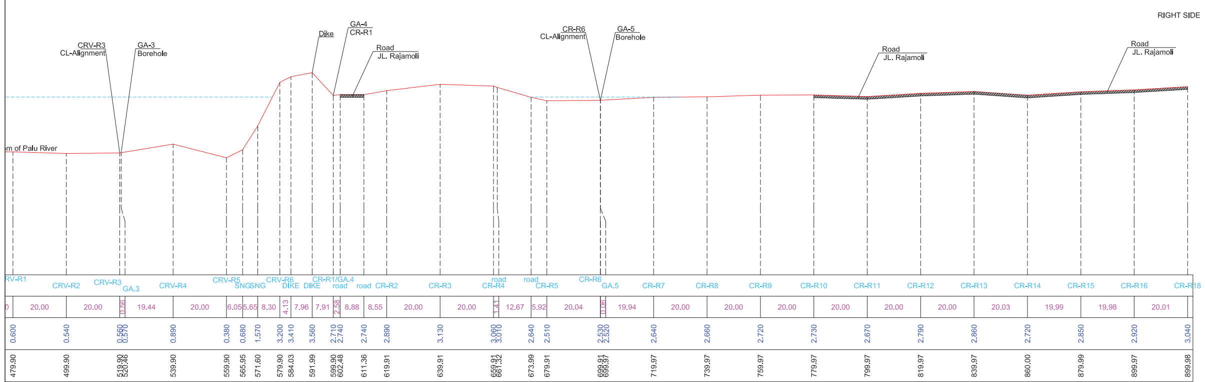
Project Title :
The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :
LONG SECTION DRAWING
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :
The JICA Project Team

The Contractor:
PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/LS-1000	
Dated :	March 15, 2019	Sheet No : 1 of 2	
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by :	App. by :

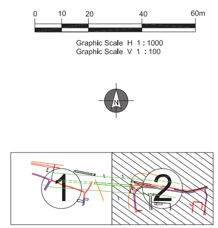


NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellip. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET



LEGEND

- Contour line 0,5m Interval, and 2,5m Indexed
- Benchmark
- House/Building
- Alternative-1 Alignment Plan
- Temporary Fences
- Estimate Maximum Water Level (+2,65m)
- Electric Line (20Kv)
- Aspalt Road/Road
- Open Drainage
- Closed Drainage
- Trees
- LPJU (Lamp/pole)
- Telkom/provider (pole)
- Borehole Point

Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

LONG SECTION DRAWING
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

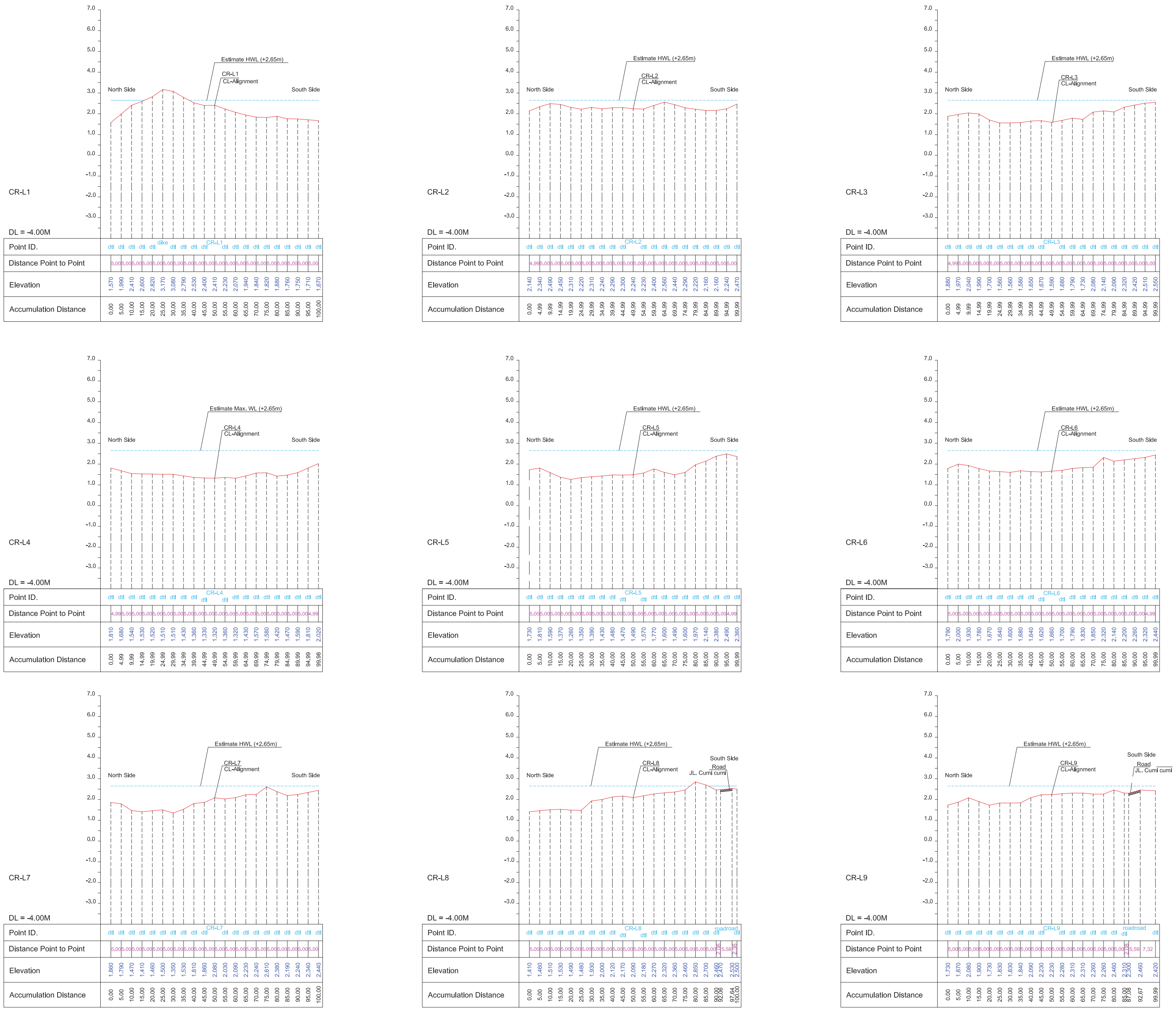
The JICA Project Team

The Contractor:

PT. GEOMARINDEX

Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/TOPOMAP-1000	
Dated :	March 15, 2019	Sheet No : 1 of 2	
Original Scale H 1:1000 V 1:1000	Drawn by : SKD	Checked by :	App. by :

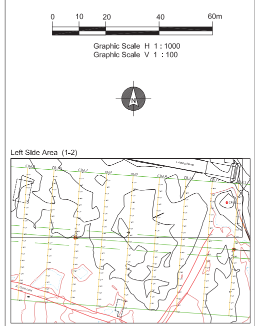


NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellip. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET



Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

CROSS SECTION DRAWING
Left Side Area (1 to 9)
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

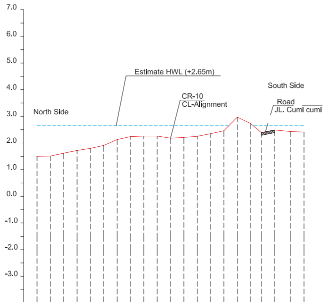
The JICA Project Team

The Contractor:

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/CSD/LS-1000	
Dated :	March 15, 2019	Sheet No : 1 of 2	
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by :	App. by :

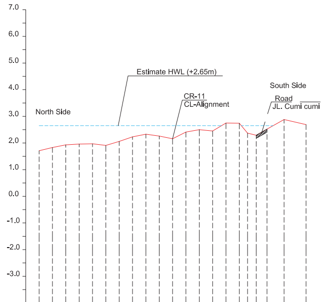
CR-L10



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.500	0.00
dtl	5.00	1.510	5.00
dtl	5.00	1.620	10.00
dtl	5.00	1.720	15.00
dtl	5.00	1.800	20.00
dtl	5.00	1.910	25.00
dtl	5.00	2.130	30.00
dtl	5.00	2.240	35.00
dtl	5.00	2.260	40.00
dtl	5.00	2.260	45.00
CR-10	5.00	2.180	50.00
dtl	5.00	2.210	55.00
dtl	5.00	2.250	60.00
dtl	5.00	2.350	65.00
dtl	5.00	2.460	70.00
dtl	5.00	2.970	75.00
dtl	5.00	2.730	80.00
road	4.01	2.390	84.01
road	5.02	2.490	89.03
dtl	5.97	2.430	95.00
dtl	5.00	2.410	100.00

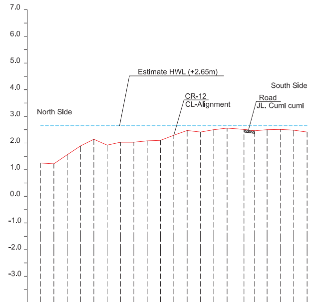
CR-L11



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.710	0.00
dtl	5.00	1.830	5.00
dtl	5.00	1.930	10.00
dtl	5.00	1.960	15.00
dtl	5.00	1.970	20.00
dtl	5.00	1.910	25.00
dtl	5.00	2.060	30.00
dtl	5.00	2.230	35.00
dtl	5.00	2.330	40.00
dtl	5.00	2.260	45.00
CR-11	5.00	2.160	50.00
dtl	5.00	2.410	55.00
dtl	5.00	2.500	60.00
dtl	5.00	2.450	65.00
dtl	5.00	2.750	70.00
dtl	5.00	2.740	75.00
dtl	3.09	2.370	78.09
road	3.24	2.290	81.33
road	4.03	2.520	85.36
rmh	6.39	2.880	91.75
dtl	8.25	2.690	100.00

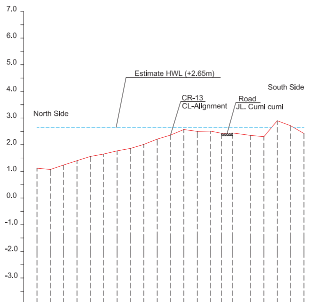
CR-L12



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.250	0.00
dtl	4.99	1.220	4.99
dtl	5.00	1.560	9.99
dtl	5.00	1.890	14.99
dtl	5.00	2.140	19.99
dtl	5.00	1.920	24.99
dtl	5.00	2.030	29.99
dtl	5.00	2.030	34.99
dtl	5.00	2.080	39.99
dtl	5.00	2.100	44.99
CR-12	5.00	2.290	49.99
dtl	5.00	2.470	54.99
dtl	5.00	2.410	59.99
dtl	5.00	2.500	64.99
dtl	5.00	2.560	69.99
road	6.33	2.510	76.32
road	3.99	2.460	80.31
dtl	4.69	2.500	85.00
dtl	5.00	2.510	90.00
dtl	5.00	2.480	95.00
dtl	5.00	2.410	100.00

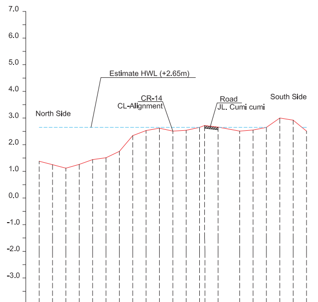
CR-L13



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.120	0.00
dtl	4.99	1.070	4.99
dtl	5.00	1.240	9.99
dtl	5.00	1.400	14.99
dtl	5.00	1.560	19.99
dtl	5.00	1.650	24.99
dtl	5.00	1.770	29.99
dtl	5.00	1.860	34.99
dtl	5.00	2.010	39.99
dtl	5.00	2.210	44.99
CR-13	5.00	2.360	49.99
dtl	5.00	2.570	54.99
dtl	5.00	2.500	59.99
dtl	5.00	2.510	64.99
road	4.06	2.430	69.05
road	4.27	2.440	73.32
dtl	6.66	2.350	79.98
dtl	5.00	2.300	84.98
dtl	5.00	2.900	89.98
dtl	5.00	2.710	94.98
dtl	5.00	2.420	99.98

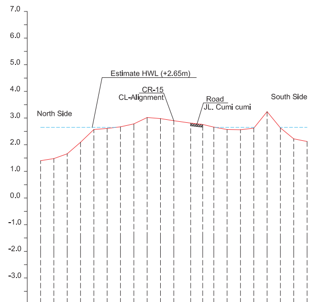
CR-L14



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.380	0.00
dtl	4.99	1.250	4.99
dtl	5.00	1.120	9.99
dtl	5.00	1.260	14.99
dtl	5.00	1.440	19.99
dtl	5.00	1.510	24.99
dtl	5.00	1.750	29.99
dtl	5.00	2.340	34.99
dtl	5.00	2.530	39.99
dtl	5.00	2.620	44.99
CR-14	5.00	2.510	49.99
dtl	5.00	2.540	54.99
dtl	5.00	2.650	59.99
road	1.89	2.720	61.88
road	5.02	2.660	66.90
dtl	8.09	2.510	74.99
dtl	5.00	2.550	79.99
dtl	5.00	2.650	84.99
dtl	5.00	3.000	89.99
dtl	5.00	2.920	94.99
dtl	5.00	2.510	99.99

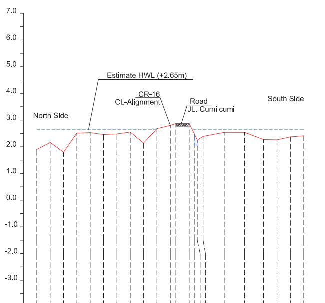
CR-L15



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.400	0.00
dtl	4.99	1.480	4.99
dtl	5.00	1.660	9.99
dtl	5.00	2.090	14.99
dtl	5.00	2.570	19.99
dtl	5.00	2.610	24.99
dtl	5.00	2.670	29.99
dtl	5.00	2.780	34.99
dtl	5.00	3.020	39.99
dtl	5.00	2.980	44.99
CR-15	5.00	2.900	49.99
road	6.31	2.810	56.30
road	4.52	2.760	60.82
dtl	4.17	2.660	64.99
dtl	5.00	2.570	69.99
dtl	5.00	2.560	74.99
dtl	5.00	2.620	79.99
dtl	5.00	3.240	84.99
dtl	5.00	2.630	89.99
dtl	5.00	2.220	94.99
dtl	5.00	2.120	99.99

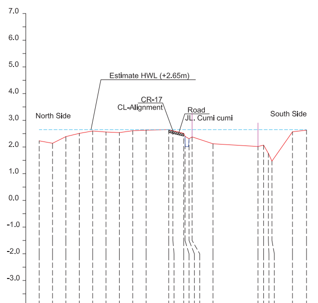
CR-L16



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		1.900	0.00
dtl	5.00	2.160	5.00
dtl	5.00	1.800	10.00
dtl	5.00	2.510	15.00
dtl	5.00	2.530	20.00
dtl	5.00	2.460	25.00
dtl	5.00	2.480	30.00
dtl	5.00	2.550	35.00
dtl	5.00	2.140	40.00
dtl	5.00	2.680	45.00
CR-16	5.00	2.800	50.00
road	2.09	2.870	52.09
road	4.99	2.870	57.08
drain	2.10	2.450	59.18
drain	0.93	2.250	60.11
dtl	2.17	2.390	62.28
dtl	7.92	2.540	70.20
dtl	7.62	2.540	77.82
dtl	7.12	2.270	84.94
dtl	5.06	2.260	90.00
dtl	5.00	2.370	95.00
dtl	5.00	2.410	100.00

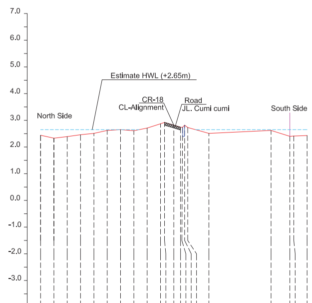
CR-L17



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl		2.230	0.00
dtl	5.00	2.140	5.00
dtl	5.00	2.390	10.00
dtl	5.00	2.510	15.00
dtl	5.00	2.600	20.00
dtl	5.00	2.560	25.00
dtl	5.00	2.540	30.00
dtl	5.00	2.610	35.00
dtl	5.00	2.630	40.00
road	8.45	2.650	48.45
CR-17	1.55	2.610	50.00
road	4.05	2.510	54.05
drain	0.49	2.501	54.54
drain	1.51	2.310	56.05
fences	1.15	2.380	57.20
dtl	7.80	2.120	65.00
fences	16.82	2.020	81.82
drain	2.12	2.070	83.94
drain	1.79	1.760	85.73
drain	1.33	1.470	87.06
road	7.68	2.570	94.74
road	5.26	2.630	100.00

CR-L18



DL = -4.00M

Point ID.	Distance Point to Point	Elevation	Accumulation Distance
dtl	5.00	2.440	0.00
dtl	5.00	2.330	5.00
dtl	5.00	2.390	10.00
dtl	5.00	2.460	15.00
dtl	5.00	2.510	20.00
dtl	5.00	2.620	25.00
dtl	5.00	2.650	30.00
dtl	5.00	2.610	35.00
dtl	5.00	2.710	40.00
dtl	5.00	2.870	45.00
road	1.50	2.920	46.50
road	3.49	2.820	49.99
CR-18	2.53	2.740	52.52
drain	0.49	2.740	53.01
drain	1.04	2.820	54.05
fences	1.15	2.730	55.20
house	7.95	2.510	63.15
house	23.32	2.620	86.47
fences	7.06	2.400	93.53
dtl	1.47	2.410	95.00
dtl	5.00	2.430	100.00

NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

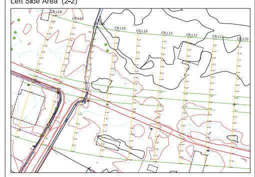
No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellip. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 10 20 40 60m

Graphic Scale H 1 : 1000
Graphic Scale V 1 : 100

Left Side Area (2-2)



Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 / ESTABLISHED			

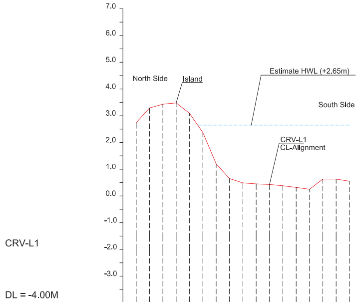
Project Title :
The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :
CROSS SECTION DRAWING
Left Side Area (10 to 18)
Palu IV Bridge
Palu, Cental Sulawesi

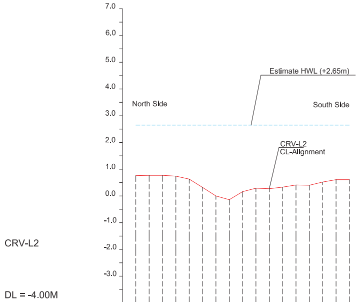
The Owner :
The JICA Project Team

The Contractor :
PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl.T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421~, Fax : +62 021-7828337

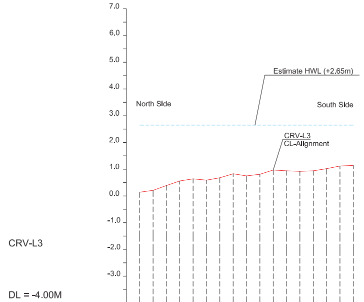
Contract No.	The Contract Agreement	Drawing No : JICA/PB-IV/CSD/LS-1000
Dated :	March 15, 2019	Sheet No : 2 of 2
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by : / App. by :



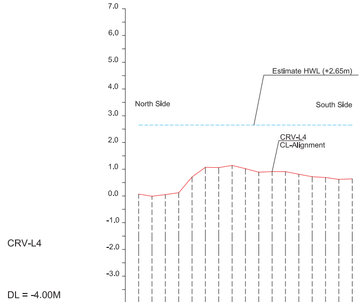
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
island		2.740	0.00
island	5.00	3.290	5.00
island	5.00	3.430	10.00
island	5.00	3.480	15.00
island	5.00	3.090	20.00
island	5.00	2.370	25.00
rvr	5.00	1.200	30.00
rvr	5.00	0.650	35.00
rvr	5.00	0.490	40.00
rvr	5.00	0.450	45.00
CRV-L1	5.00	0.430	50.00
rvr	5.00	0.380	55.00
rvr	5.00	0.320	60.00
rvr	5.00	0.250	65.00
rvr	5.00	0.630	70.00
rvr	5.00	0.630	75.00
rvr	5.00	0.550	80.00



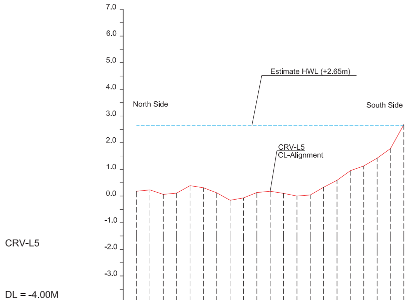
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.760	0.00
rvr	5.00	0.770	5.00
rvr	5.00	0.770	10.00
rvr	5.00	0.740	15.00
rvr	5.00	0.630	20.00
rvr	5.00	0.320	25.00
rvr	5.00	0.000	30.00
rvr	5.00	-0.140	35.00
rvr	5.00	0.160	40.00
rvr	5.00	0.290	45.00
CRV-L2	5.00	0.270	50.00
rvr	5.00	0.330	55.00
rvr	5.00	0.410	60.00
rvr	5.00	0.400	65.00
rvr	5.00	0.520	70.00
rvr	5.00	0.610	75.00
rvr	5.00	0.610	80.00



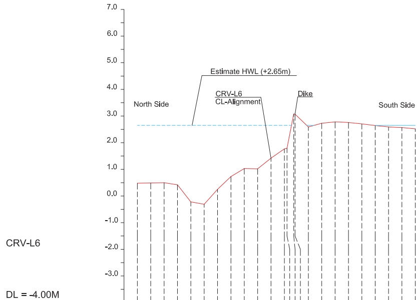
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.140	0.00
rvr	5.00	0.210	5.00
rvr	5.00	0.390	10.00
rvr	5.00	0.560	15.00
rvr	5.00	0.640	20.00
rvr	5.00	0.590	25.00
rvr	5.00	0.680	30.00
rvr	5.00	0.830	35.00
rvr	5.00	0.750	40.00
rvr	5.00	0.810	45.00
GA-2/CRV-L3	5.00	0.970	50.00
rvr	5.00	0.940	55.00
rvr	5.00	0.920	60.00
rvr	5.00	0.940	65.00
rvr	5.00	1.020	70.00
rvr	5.00	1.120	75.00
rvr	5.00	1.140	80.00



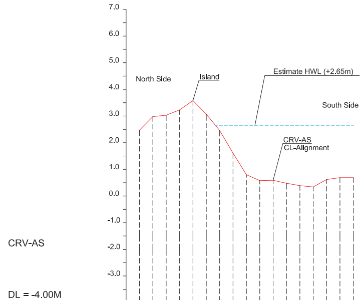
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.070	0.00
rvr	5.00	-0.010	5.00
rvr	5.00	0.050	10.00
rvr	5.00	0.120	15.00
rvr	5.00	0.710	20.00
rvr	5.00	1.070	25.00
rvr	5.00	1.060	30.00
rvr	5.00	1.140	35.00
rvr	5.00	1.020	40.00
rvr	5.00	0.890	45.00
CRV-L4	5.00	0.910	50.00
rvr	5.00	0.910	55.00
rvr	5.00	0.810	60.00
rvr	5.00	0.720	65.00
rvr	5.00	0.690	70.00
rvr	5.00	0.620	75.00
rvr	5.00	0.640	80.00



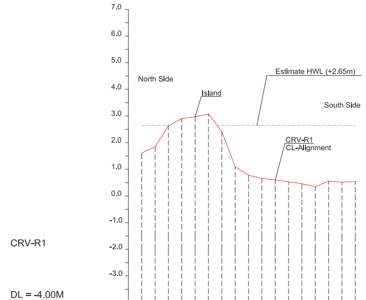
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.180	0.00
rvr	5.00	0.230	5.00
rvr	5.00	0.060	10.00
rvr	5.00	0.110	15.00
rvr	5.00	0.390	20.00
rvr	5.00	0.310	25.00
rvr	5.00	0.120	30.00
rvr	5.00	-0.160	35.00
rvr	5.00	-0.070	40.00
rvr	5.00	0.130	45.00
CRV-L5	5.00	0.180	50.00
rvr	5.00	0.100	55.00
rvr	5.00	0.000	60.00
rvr	5.00	0.040	65.00
rvr	5.00	0.330	70.00
rvr	5.00	0.590	75.00
rvr	5.00	0.950	80.00
rvr	5.00	1.130	85.00
rvr	5.00	1.420	90.00
rvr	5.00	1.780	95.00
rvr	5.00	2.680	100.00



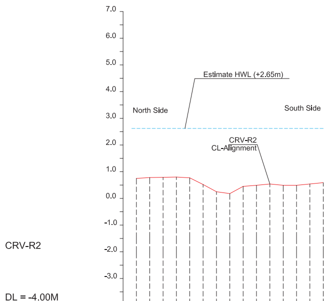
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.480	0.00
rvr	5.00	0.490	5.00
rvr	5.00	0.500	10.00
rvr	5.00	0.420	15.00
rvr	5.00	-0.220	20.00
rvr	5.00	-0.310	25.00
rvr	5.00	0.250	30.00
rvr	5.00	0.730	35.00
rvr	5.00	1.030	40.00
rvr	5.00	1.020	45.00
CRV-L6	5.00	1.420	50.00
rvr	5.00	1.770	55.00
rvr	0.99	1.790	55.99
dike	2.51	3.080	58.50
dike	0.48	3.070	58.98
road	5.00	2.590	63.98
road	5.00	2.730	68.98
road	5.00	2.780	73.98
road	5.00	2.760	78.98
road	5.00	2.700	83.98
road	5.00	2.650	88.98
road	5.00	2.590	93.98
road	5.00	2.570	98.98
road	5.00	2.520	103.98



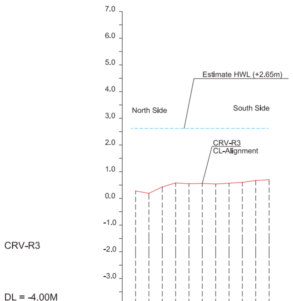
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
island		2.470	0.00
island	4.99	2.980	4.99
island	5.00	3.030	9.99
island	5.00	3.230	14.99
island	5.00	3.580	19.99
island	5.00	3.070	24.99
island	5.00	2.460	29.99
island	5.00	1.610	34.99
sng	5.00	0.800	39.99
sng	5.00	0.580	44.99
CRV-AS	5.00	0.590	49.99
rvr	5.00	0.480	54.99
rvr	5.00	0.390	59.99
rvr	5.00	0.340	64.99
rvr	5.00	0.620	69.99
rvr	5.00	0.690	74.99
rvr	5.00	0.690	79.99



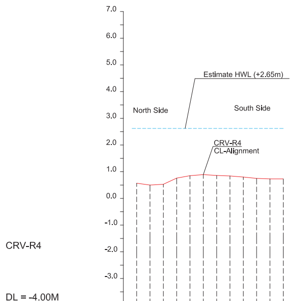
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
island		1.610	0.00
island	4.99	1.850	4.99
island	5.00	2.630	9.99
island	5.00	2.910	14.99
island	5.00	2.970	19.99
island	5.00	3.080	24.99
island	5.00	2.420	29.99
island	5.00	1.100	34.99
rvr	5.00	0.780	39.99
rvr	5.00	0.660	44.99
CRV-R1	5.00	0.600	49.99
rvr	5.00	0.530	54.99
rvr	5.00	0.460	59.99
rvr	5.00	0.350	64.99
rvr	5.00	0.560	69.99
rvr	5.00	0.520	74.99
rvr	5.00	0.540	79.99



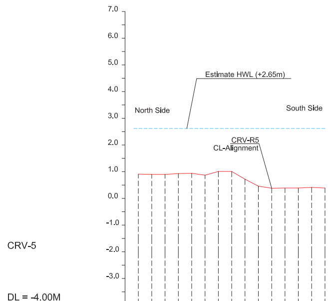
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.750	0.00
rvr	4.99	0.780	4.99
rvr	5.00	0.790	9.99
rvr	5.00	0.800	14.99
rvr	5.00	0.770	19.99
rvr	5.00	0.520	24.99
rvr	5.00	0.250	29.99
rvr	5.00	0.180	34.99
rvr	5.00	0.450	39.99
rvr	5.00	0.490	44.99
CRV-R2	5.00	0.540	49.99
rvr	5.00	0.490	54.99
rvr	5.00	0.490	59.99
rvr	5.00	0.540	64.99
rvr	5.00	0.590	69.99



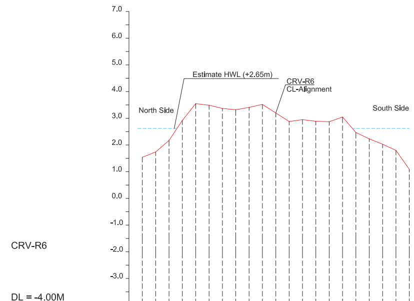
Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.280	0.00
rvr	5.00	0.190	5.00
rvr	5.00	0.430	10.00
rvr	5.00	0.580	15.00
rvr	5.00	0.550	20.00
GA-3/CRV-R3	5.00	0.560	25.00
rvr	5.00	0.540	30.00
rvr	5.00	0.570	35.00
rvr	5.00	0.600	40.00
rvr	5.00	0.670	45.00
rvr	5.00	0.700	50.00



Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.570	0.00
rvr	5.00	0.500	5.00
rvr	5.00	0.530	10.00
rvr	5.00	0.760	15.00
rvr	5.00	0.850	20.00
CRV-R4	5.00	0.890	25.00
rvr	5.00	0.860	30.00
rvr	5.00	0.840	35.00
rvr	5.00	0.800	40.00
rvr	5.00	0.750	45.00
rvr	5.00	0.730	50.00
rvr	5.00	0.730	55.00



Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		0.910	0.00
rvr	5.00	0.900	5.00
rvr	5.00	0.900	10.00
rvr	5.00	0.930	15.00
rvr	5.00	0.940	20.00
rvr	5.00	0.870	25.00
rvr	5.00	1.010	30.00
rvr	5.00	1.010	35.00
rvr	5.00	0.720	40.00
rvr	5.00	0.460	45.00
CRV-R5	5.00	0.380	50.00
rvr	5.00	0.390	55.00
rvr	5.00	0.390	60.00
rvr	5.00	0.410	65.00
rvr	5.00	0.390	70.00



Point ID.	Distance Point to Point	Elevation	Accumulation Distance
rvr		1.540	0.00
rvr	5.00	1.740	5.00
rvr	5.00	2.170	10.00
dike	5.00	2.920	15.00
dike	5.00	3.550	20.00
dike	5.00	3.490	25.00
dike	5.00	3.370	30.00
dike	5.00	3.320	35.00
dike	5.00	3.410	40.00
dike	5.00	3.520	45.00
CRV-R6	5.00	3.200	50.00
dike	5.00	2.880	55.00
dike	5.00	2.950	60.00
dike	5.00	2.890	65.00
dike	5.00	2.870	70.00
rvr	5.00	3.050	75.00
rvr	5.00	2.470	80.00
rvr	5.00	2.230	85.00
rvr	5.00	2.030	90.00
rvr	5.00	1.800	95.00
rvr	5.00	1.090	100.00

NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

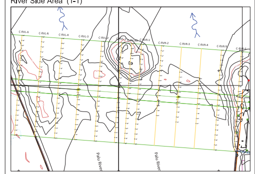
No.	Station BM ID#	Geodetic Coordinates: Latitude (S)	Longitude (E)	Elip. height h (m)	UTM Zone 50S Grid Coordinates: Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	Notes
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 10 20 40 60m

Graphic Scale H 1 : 1000
Graphic Scale V 1 : 100

River Side Area (1-1)



Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

CROSS SECTION DRAWING
River Side Area
Palu IV Bridge
Palu, Cental Sulawesi

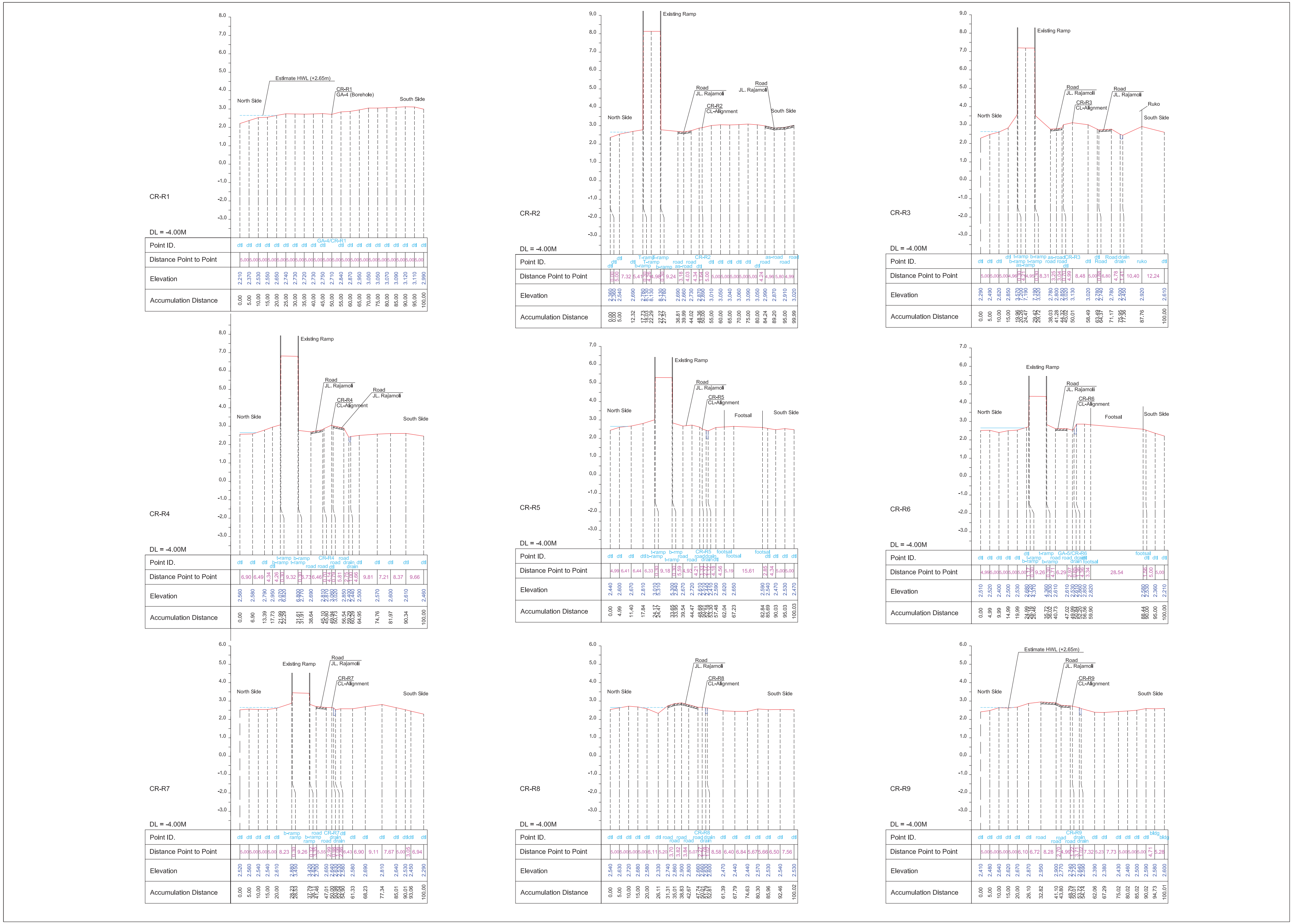
The Owner :

The JICA Project Team

The Contractor:

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/CSD/RVS-1000	
Dated :	March 15, 2019	Sheet No : 1 of 1	
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by :	App. by :

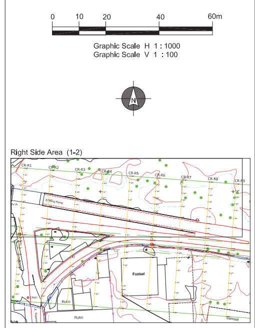


NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

No.	Station BM ID#	Geodetic Coordinates			UTM Zone 50S Grid Coordinates			Notes
		Latitude (S)	Longitude (E)	Ellip. height h (m)	Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET



Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

CROSS SECTION DRAWING
Right Side Area
Palu IV Bridge
Palu, Cental Sulawesi

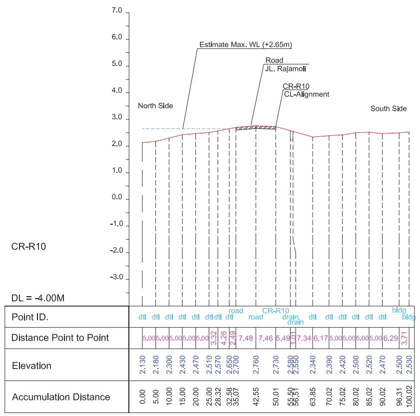
The Owner :

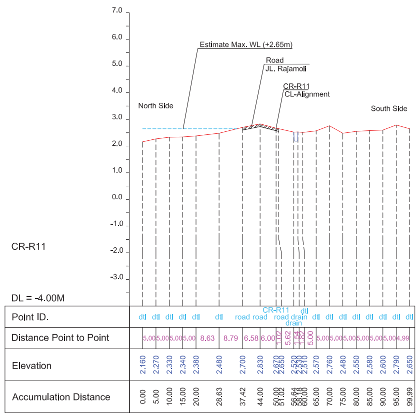
The JICA Project Team

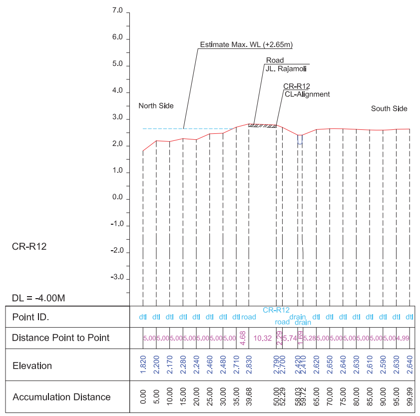
The Contractor:

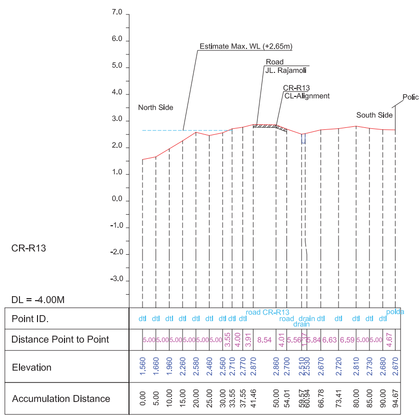
PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

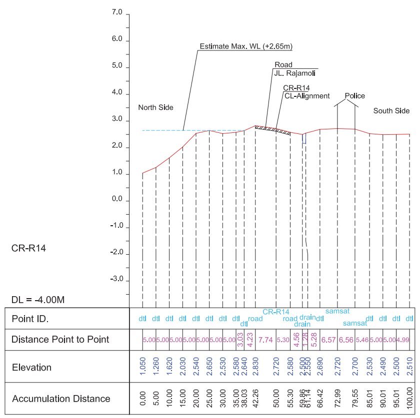
Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/CSD/RS-1000	
Dated :	March 15, 2019	Sheet No : 1 of 2	
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by :	App. by :

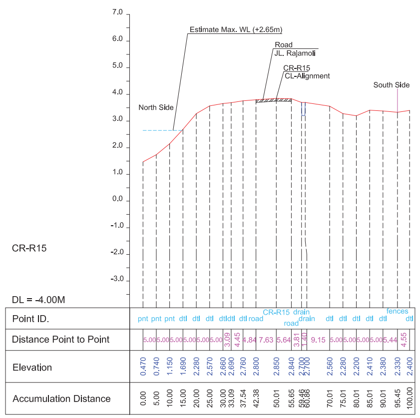


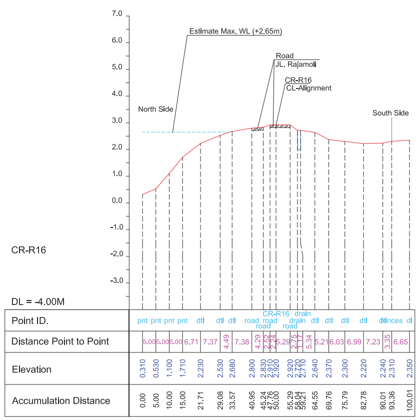


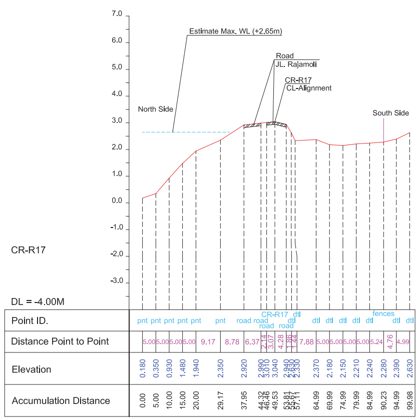












NOTES

1. This map presents the result of Topographic survey which was carried out by PT. GEOMARINDEX in March 2019
2. The Coordinates System and Project Datum used are as follows:
   a. Horizontal Datum/Coordinates system are refer to National CORS PALP Palu Station and CAMP Ampana Station. This map is presented in the UTM Coordinates System.
   b. Vertical Datum / elevation (h) ; expressed to EGM-08 (Elevation Geoid Model 2008) refer to Station PALP and CAMP.
3. The Project Control Points;

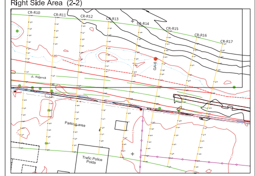
No.	Station BM ID#	Geodetic Coordinates Latitude (S)	Longitude (E)	Ellip. height h (m)	UTM Zone 50S Grid Coordinates Easting E (m)	Northing N (m)	Elevation EGM-08 (m)	Notes
1.	palp	S0°54'56.85138"	E119°54'20.09068"	138.468	823,416.883	9,898,646.222	77.566	National CORS
2.	camp	S0°52'16.67607"	E121°34'46.44202"	76.468	1,010,079.465	9,903,384.730	14.232	
3.	BM-01	S0°53'14.12957"	E119°51'36.93169"	63.709	818,370.378	9,901,808.098	3.045	Fix. Autolevel
4.	BM-02	S0°53'14.89389"	E119°51'51.96367"	65.180	818,835.522	9,901,784.242	4.507	
5.	BM-03	S0°53'10.47868"	E119°51'25.61100"	63.696	818,020.148	9,901,920.602	3.039	
6.	BM-04	S0°53'07.26661"	E119°51'10.05857"	63.626	817,538.959	9,902,019.716	2.944	
7.	BM-05	S0°52'46.39211"	E119°50'11.84450"	64.969	815,738.048	9,902,662.797	4.342	
8.	BM-06	S0°52'52.17548"	E119°52'20.59933"	68.358	819,722.195	9,902,481.957	7.715	
9.	CP-01	S0°53'10.48368"	E119°51'36.12596"	64.087	818,345.531	9,901,920.197	3.429	
10.	CP-02	S0°53'11.46472"	E119°51'52.63343"	64.733	818,856.330	9,901,889.644	4.068	
11.	CP-03	S0°53'07.15717"	E119°51'27.36475"	64.647	818,074.496	9,902,022.668	3.990	
12.	CP-04	S0°53'04.05392"	E119°51'10.21991"	63.933	817,544.028	9,902,118.475	3.271	
13.	CP-05	S0°52'47.75458"	E119°50'12.73397"	64.979	815,765.540	9,902,620.893	4.350	
14.	CP-06	S0°52'50.24008"	E119°52'21.52907"	68.378	819,751.012	9,902,541.433	7.738	

INDEX SHEET

0 10 20 40 60m

Graphic Scale H 1 : 1000
Graphic Scale V 1 : 100

Right Side Area (2-2)



Rev. No.	Descriptions	Drawn by	Checked by	Approved by
0	April 2019 : ESTABLISHED			

Project Title :

The Project For Development Regional Disaster Risk Resilience Plan In Central Sulawesi

Drawing Title :

CROSS SECTION DRAWING
Right Side Area
Palu IV Bridge
Palu, Cental Sulawesi

The Owner :

The JICA Project Team

The Contractor:

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337

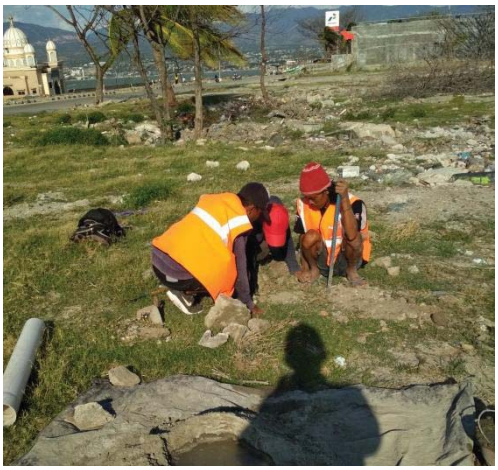
Contract No:	The Contract Agreement	Drawing No : JICA/PB-IV/CSD/RS-1000	
Dated :	March 15, 2019	Sheet No : 2 of 2	
Original Scale H 1:1000 V 1:100	Drawn by : SKD	Checked by :	App. by :

Appendix-9:

Photo Documentations

PHOTO DOCUMENTATIONS
SURVEY ACTIVITIES

BM & CP PVC INSTALLATION

Preparation 	Installation 
Finishing 	**BM Finished** 
BM-02 	**CP-02** 

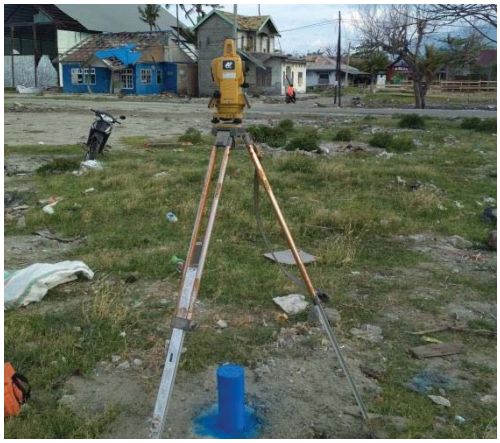
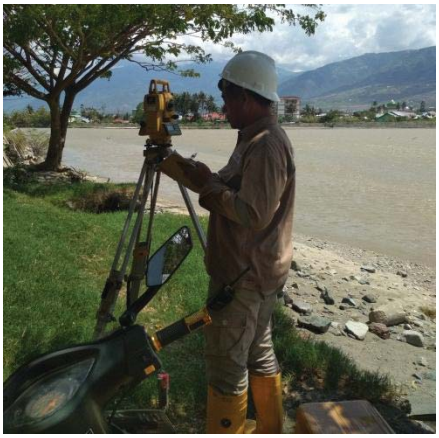
PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

GPS SURVEY

Palp (Palu National CORSS)	Camp (Ampana National CORSS)
	
CP-02	**CP-04**
	
BM-03	**BM-01**
	

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

HORIZONTAL CONTROL / TRAVERSE SURVEY

Polygon-1 (Instrument) 	**Polygon-2 (Target)** 
Polygon-3 (Setting) 	**Polygon-4 (Observ.)** 
Polygon-5 (Back Target) 	**Polygon-6 (Force Target)** 

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

VERTICAL CONTROL / LEVELING SURVEY

Leveling -1 (Observation)	**Leveling -2 (Observation)**
	
Leveling -3 (Observation)	**Leveling -4 (Post-calculation)**
	
Leveling -5 (River Crossing)	**Leveling -6 (River Crossing)**
	

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

DETAIL TOPOGRAPHIC SURVEY

Detail Survey 	**Detail Survey** 
Detail Survey 	**Detail Survey** 

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

Detail Survey (Coastal)	Detail Survey (Land area)
	

PT. GEOMARINDEX
Jakarta : Graha Simatupang Tower II Blok A & D Jl T.B Simatupang Kav. 38, Jakarta 12540
Phone : +62 021-78840421- , Fax : +62 021-7829337, E-mail : geomarindex @gmail.com

TerraDrone

Work Report – Drone Topographic Survey for Development of Regional Disaster Risk Resilience Plan in Central Sulawesi

TERRA DRONE INDONESIA

March 2019
Ver 1.0

Jl. Haji Wasid No. 17
Bandung, West Java, ID 40132
+6222 250 2323

www.terra-drone.co.id
info@terra-drone.co.id

Approval

Terra Drone Indonesia

This report is prepared by:			
Name	Adi Poetra Pratama		
Position	Project Manager		
Signature		Date	29/03/2019
And approved by:			
Name	Michael Wishnu Wardhana		
Position	Managing Director		
Signature		Date	29/03/2019

Yachiyo Engineering

This report is received and checked by:			
Name			
Position			
Signature		Date	_____
And approved by:			
Name			
Position			
Signature		Date	_____

This report concludes that the works is finished.

Table of Contents

Preface

Background and Purpose

Aerial phography is one form of Remote Sensing which often used for observing actual condition of a certain area or object quickly. Aerial photography also become one of the core of data acquisition works for various purpose, e.g aerial mapping and photogrammetry, aerial surveillance, as well as asset inspection from air. Aerial mapping using manned aerial vehicle has been well known in community, as well as aerial inspection and aerial assets inspection. However, along with development of technology, there has been new alternative for data acquisition using unmanned aerial vehicle (UAV) or usually known as drone.

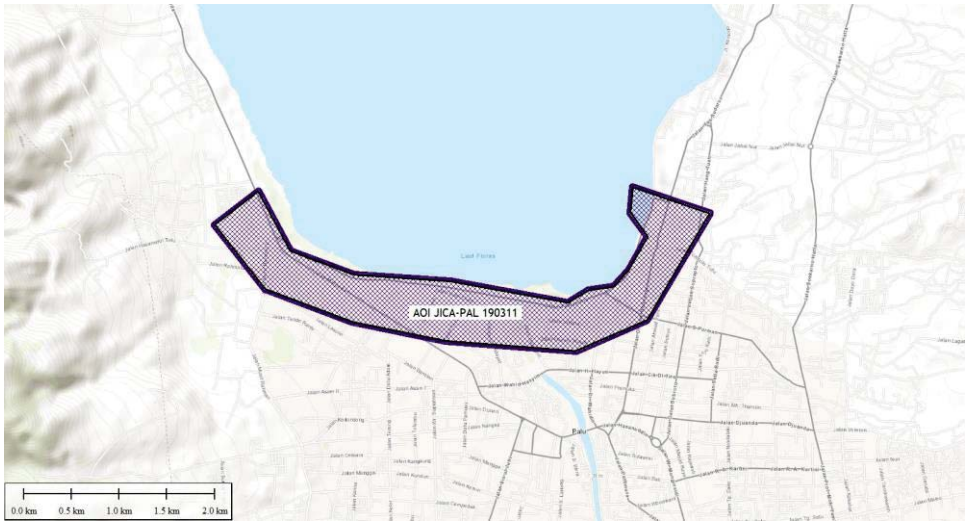
The utilization of the drone itself is now quite extensive and has been used almost throughout the industry in accordance with the needs. For example, airborne drone surveys are generally used for land planning, land management, land use evaluation, environmental impact monitoring, monitoring of work progress, as well as to audit the number of objects within a particular area. Meanwhile, for aerial supervision and inspection of assets purpose, drone are generally used for inspection of assets which classified as dangerous works, pipeline supervision, powerline supervision, inspection of construction equipment, or identification of phenomena in an object or area. Drones become an attractive alternative for these applications because of drones are created to make it easier for humans to do 3D (dull, dangerous, dirty) work. In addition, there are many advantages possessed by drones rather than other technologies such as satellite images and manned aircraft in terms of data quality, economic terms, to the aspect of efficiency.

For that reason, Yachiyo Engineering has asked Terra Drone Indonesia to conduct drone topographic survey for development of regional disaster risk resilience plan in Central Sulawesi. Through this report, team intends to provide an overview of the method, technical specifications of the equipment used, data acquisition process, data processing, and results.

Survey Location

Aerial survey is conducted on Palu City. Survey is conducted to obtain topographical model of AOI for Yachiyo Engineering. Survey is conducted on rural area with the total area of interest is ± 306 Ha. Below is images of Area of interest (AOI) overlaid on google images and world topo map. It can be seen that the AOI is a flat nearshore area.

Picture 1. AOI location



Picture 2. Topography of AOI

Basic Principal

Unmanned Aerial Vehicle or *Drone*

Drone, or Unmanned Aircraft, is basically a flying vehicle equipped with certain technology so that it can be flown without the need for an onboard crew. Drone is one of term for such vehicle, and is also known by other terms such as the Aircraft Non-Air (PUNA), Unmanned Aerial Vehicle (UAV), or Remotely Piloted Aircraft System (RPAS).

Picture 3. Multirotor type (left) dan Fixed Wing type (right)

Drones commonly used today are divided into two types which its utilization are depends on the type of mission or desired output. The two types are:

1. Multirotor
2. Fixed wing

Fundamentally, the difference between Multirotor and Fixed Wing can be seen in the following table:

Table 1. The difference between Multirotor and Fixed Wing

Parameter	Multirotor	Fixed Wing
Stationer Flying	Yes	No
Vertical Take Off & Landing	Yes	No
Flying Duration	15 – 90 minute	1 – 4 hours
Flying Distance	10 – 20 km	50 – 200 km
Communication range	Up to 5 km	Up to 25 km
Propulsion System	Electrical Motor	Electrical Motor Fuel Motor
Utilization	Documentation Cinematography Inspection 3D Remodeling	Mapping Surveillance Patrol

Drone has 3 advantages compared to other technologies, i.e:

1. Image quality and resolution.
2. High productivity and low cost.
3. Human risk free and easy operation.

Ground Survey

GCP Utilization

Ground Control Point (GCP) is an object in the earth surface that can be identified and owns spatial information that fit with mapping reference system. The collected spatial information is in coordinate form of X for latitude, Y for longitude, and Z for altitude. GCP measured by GPS geodetic can produce coordinate with accuracy up to millimeter. For the main purpose, GCP is used in rectification process of geometric so that the photos will have reference system that fit for mapping needs. In the post-processing phase, the GCPs are utilized to aid the geometric correction process in *orthophoto mosaic* so that the accuracy of the map will be high. Specifically, the GCP can also benefits as:

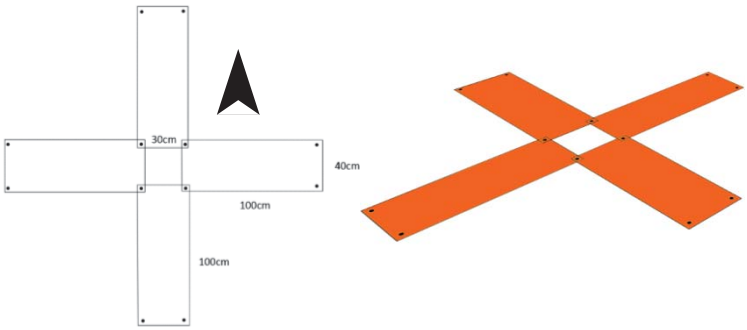
1. Decisive factor of geometry accuracy of the processing result (orthophoto, DSM, and DTM). The more accurate the GCP, the more accurate the geometry output.
2. Factor that ease relative orientation process between photos, so the GCP can increase the geometry accuracy.
3. Correction factor for processing result as bowl effect or error that affect 3D model that has convex shape in the middle of measured area.
4. Factor that ease the process of mosaicking two separated data. For example, combining area A and area B that mapped in different time quickly and effectively, compared with point cloud process that takes a lot of time.

Picture 5. Example of GCP in one of aerial photos

Basically, GCP is an option in aerial mapping. As described before, GCP is used to generate map with high accuracy. However, if GCP is not used, the survey can still be conducted with the consequence of lower accuracy. The GCP installation process takes quite a lot of time and usually needs several days before aerial mapping can be conducted.

Every GCP has to be marked with Premark or any other sign so that it can be identified in the aerial photo. Premark can be in circular or plus-shaped that has 4 sections that cross the control point. The Premark is a mark that is made from orange cloth with minimum dimension of 10 pixels and 3 pixels seen from aerial photo for each section. The dimension of Premark in the field will be adjusted with

ground sampling distance or approximately 100 x 40 cm (as illustrated in picture 3). The section is placed based on cardinal directions.



Picture 6. Premark shape illustration

The coordinate of every GCP will be measured by using Geodetic GPS System. All of the GCP will be referenced to one existing benchmark either owned by Badan Informasi Geospasial (BIG) that is located near the Area of Interest as local base. The GCP then can be settled permanently by installing cemented PVC pipe so that it can be used more than once (reinstallation is not required, so that the survey duration can be cut).

Aerial Photography

Aerial Photogrammetry

The processes in photogrammetry consist of:

1. **Acquisition.**
   Sensor can be metric or non-metric, analog or digital, passive or active, visible spectrum or multispectral, either using airborne, satellite, or terrestrial photo.
2. **Measuring**
   Photogrammetry is a precise measurement using photograph and an alternative way to determine the location either relative or absolute of a point. This measurement makes it possible to calculate the distance, angle, area, volume, height, size, and shape of an object and coordinates
3. **Interpretation**
   Interpretative photogrammetry is basically recognizing and identifying an object through imagery.

a. Data Acquisition Method

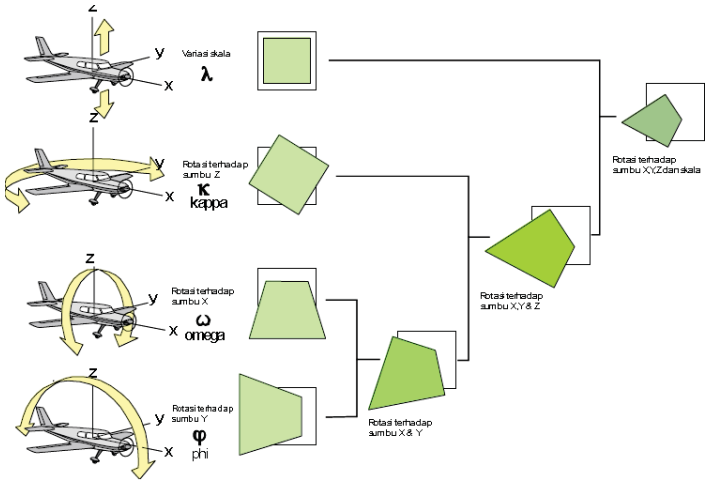
The Unmanned Aerial Vehicle (UAV) that is used for the survey is Ai450. This platform, compared to other platform such as manned aircraft and satellite, has several benefits. First, it is easier to be deployed. After that, by using drone, the operational cost is relatively smaller, and it can be operated in low altitude (lower than 1,500 feet) to avoid clouds and to get higher resolution. Despite, it also has some disadvantages such as there will be more images captured which will affect the post-processing time, and lens distortion will appear as the camera that is used in the drone is non-metric camera.

There are 4 main parameters that affect the quality of data acquired for aerial photogrammetry:

Position and Orientation of Aircraft

The position and orientation of the aircraft during the data acquisition process will definitely affect the aerial photograph result. Several issues that can happen because of this are crab, drift, or tilt. Tilt in the camera axis will cause a difference in the shape of the actual object with the imagery of the object. For example, if the format of the photograph is rectangle, the shape will change to be a trapezium. The combination of tilt in two axes (roll and pitch) will change the object to be a random rectangle.

Crab on the other hand will cause the imagery to slip from the flight path and will lose coverage area that will create a gap between flight path that had been determined. Lastly drift will cause the imagery misalign with the flight path that will also potentially lead to losing a coverage area between flight path.



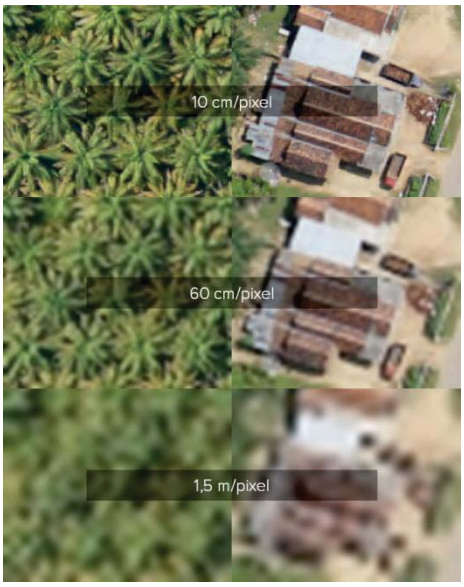
Picture 7. Attitude effects on imagery produced by aerial photograph

Ground Sampling Distance

Ground Sampling Distance (GSD) or Spatial Resolution is a ratio between the size of digital unit (pixel) with the actual size in the real world (cm) that is usually stated in cm/pixel (e.g 5 cm/pixel means 1 pixel in the digital photo represents 5 cm in the real world). It defines the aerial photo quality. As comparison, the GSD in the Google Earth is 60 cm/pixel, Quickird's GSD is 60 cm/pixel, Pleiades's GSD is 50 cm/pixel, while drone's GSD is 15 cm/pixel to 5 cm/pixel. The smaller the GSD value, the better the resolution. The GSD value is determined from the mission altitude, camera's field of view, and camera's resolution.

Picture 8. Comparison between drone imagery with Google Earth imagery

From the picture above, it can be observed the comparison between drone imagery and Google Earth imagery. The drone imagery has GSD value of 10 cm/pixel, and it is much better compared to Google Earth imagery, it has better clarity, and shows information that can be easily interpreted. Besides, the drone imagery is also more factual and actual.

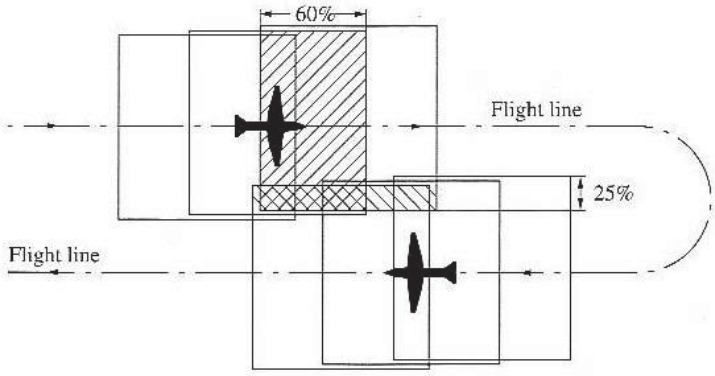


Picture 9. Comparison between several level of GSD

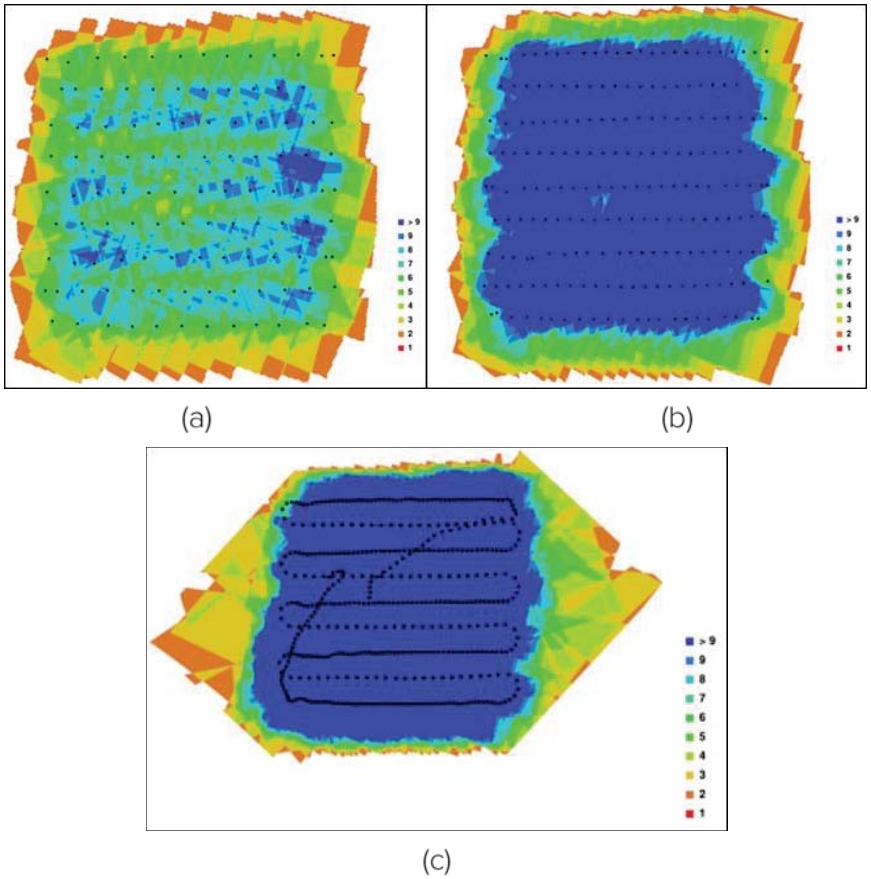
Sidelap & Overlap

Picture 10. Grid Trajectory illustration

The method used in data acquisition is repetitive flight with grid trajectory. This method is used to capture images of an area vertically, that are overlapping each other for aero-triangulation process. This overlapping is used to determine position of two consecutive images and to decide the intersection of object that is appeared in both of the photos, to generate 3 dimensional forms. By having overlapping vertical image, the data processing software can combine those several photos to generate orthophoto mosaic and digital surface model. To achieve high quality photogrammetry and to avoid gap (unmapped area), 4 flight lines with overlap ratio of 80% and sidelap ratio of 70% are required.



Picture 11. Illustration of 60% overlap and 25% sidelap



(a) (b)

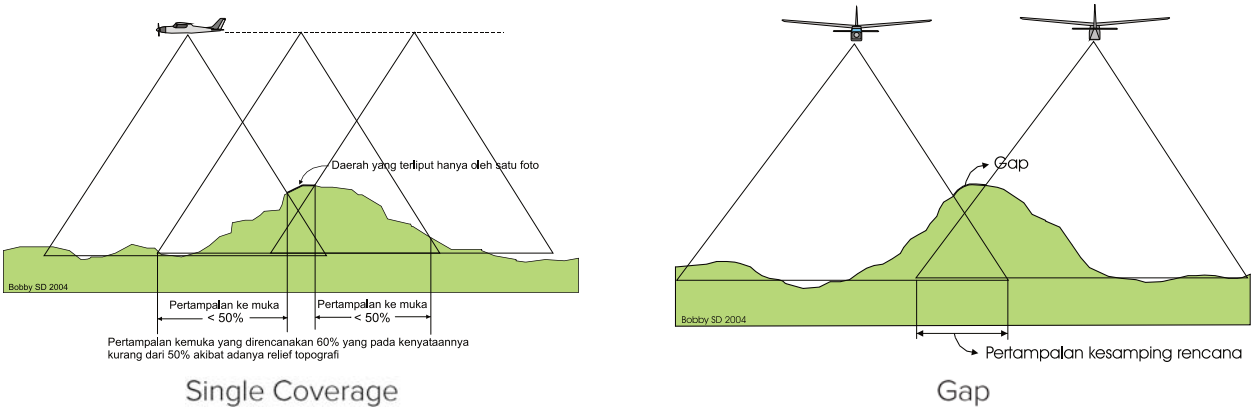
(c)

Picture 12. *Footprint* illustration for, a) overlap 60%, b) overlap 80%, c) overlap >80%

A huge value of overlap between two successive imageries has several purposes, which are:

1. To cover all of the area from two different necessary angles for stereoscopic view. Two successive imageries in one flight path are called stereo-pair photos.
2. To ensure that every center part of the imageries can be observed from minimum of two different necessary angles so that they can be used to generate mosaic (determining tie points).
3. To produce small overlap from three consecutive photos or so called triple overlap. This is needed to create additional ground control for aero-triangulation process.
4. It is necessary to determine the approximate area of every stereo-pair photos.
5. To prevent the occurrence of single overlap and gap.

The small value of overlap can lead to the failure of the software to produce stereo-pair photos either because of the single overlap or gap. Single overlap means that there is an area that only covered in single imagery, while gap means that there is an area that is not covered by any imagery.



Picture 13. Illustration of single overlap dan gap

Photographic Quality

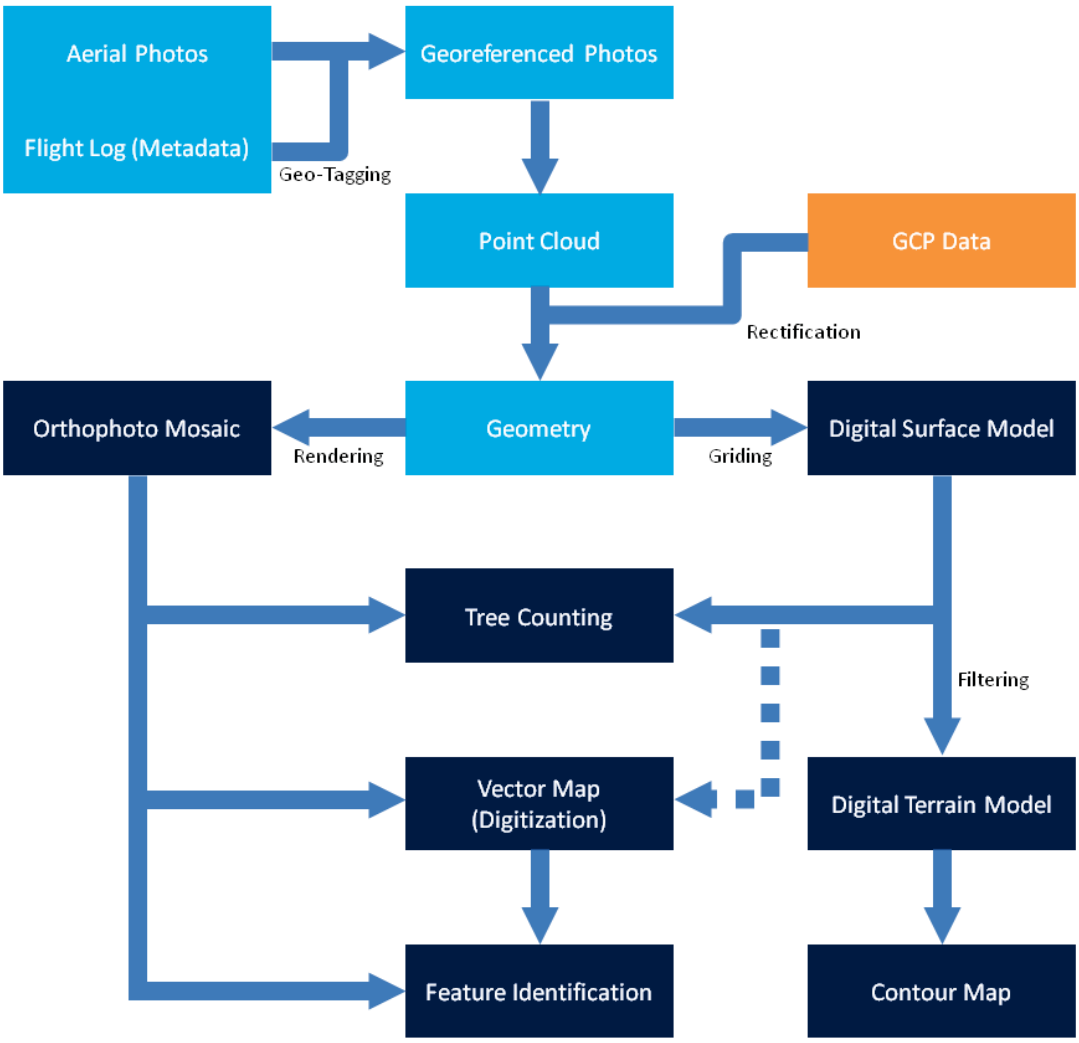
The photographic quality of every produced imagery by camera will determine the quality of aerial imagery that will be generated. There are three main factors:

1. The exposure of imagery, where it has to be proper, not underexposure (dark) or overexposure (glare).
2. The clarity of imagery, where the focus point has to be adjusted based on the focal length and the mission altitude.
3. Atmospheric condition in the time of data acquisition. The weather has to be clear enough (no low altitude cloud, smoke, rain, etc), and the sun angle is suitable to produce good imagery (> 30 degree and < 90 degree).

Picture 14. Example of obstructed photo (left) and photo after rain (right)

Data Processing & Deliverables

This process includes geo-referencing process, rectification process, and mosaicing process to generate crthophoto mosaic. After that, that result can be used to generate Digital Surface Model and visual assessment in form of vector map. All of the process can be pictured as shown below:

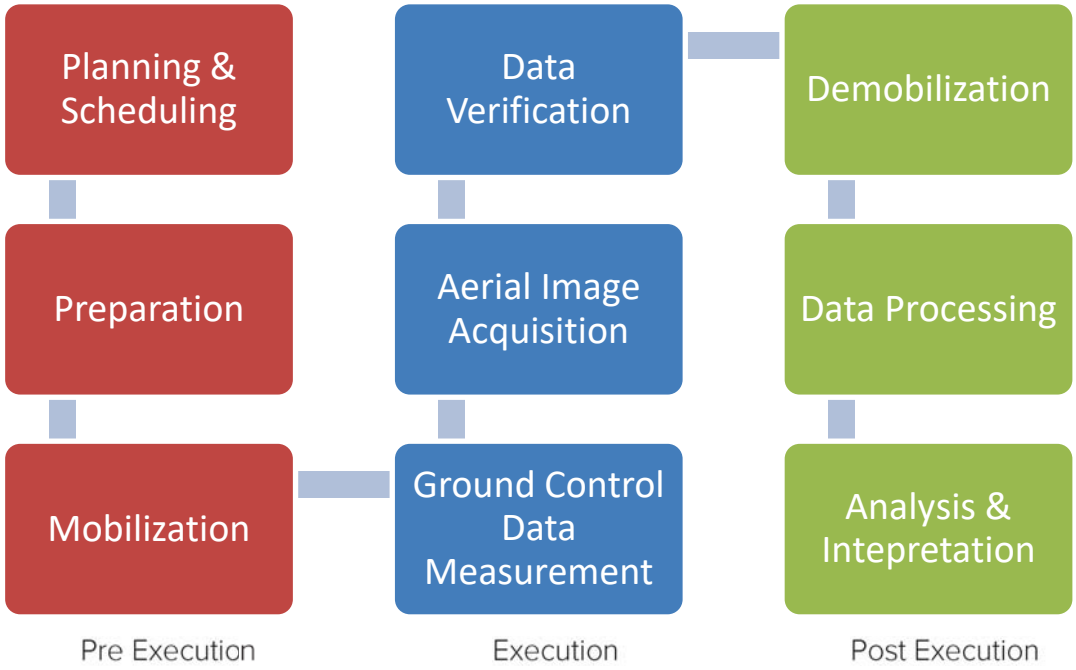


Picture 15. Data Processing Work Flow

Work Plan

General Workflow

In accomplishing unmanned aerial survey, there is a work flow to be referred. This work flow can be described as below:



Picture 16. Unmanned Aerial Survey Work Flow

There are three main parts in the process which are:

1. Pre-Execution, which includes any activities that requires planning, scheduling, staffing, and preparation, which contains task such as tools and equipment calibration, flight test, permit request, work planning, etc. The output will be operation permit letter, work breakdown structure, and work execution plan based on scope of work given.
2. Execution, which is the main part of the work. It includes activities related to data acquisition, which involves ground control data measurement, aerial image acquisition, and initial data processing for data verification. The output will be all record documentation regarding survey activities, raw images, daily reports, and preview of outputs.
3. Post-Execution, which will produce all of the expected outputs. The processes that are involved are data management, backup, processing, and interpretation, as well as reporting and delivery. The output will be all of expected deliverables and final report.

Permit Request

At the moment, drone operation has been regulated by Ministry of Transportation through Transportation Minister Decree Number 163 Year 2015, Number 180 Year 2015, and Number 47 Year 2017, where each decree regulates particular issues as described below:

1. PM No 163 Tahun 2015, which contains appendix as Civil Aviation Safety Regulation (CASR) Part 107 that discusses about Small Unmanned Aircraft Systems. This particular part of CASR regulates technical limitations upon drone operations such as restriction to fly at night, restriction to operate drone from moving vehicle unless it is a vessel, restriction to operate multiple simultaneously, etc. Besides, this decree also regulates about operator certification and aircraft registration and identification. However, until now, Ministry of Transportation has not published the guideline for those two processes, and has not authorized any institution to conduct them. Therefore, in the meantime, to be able to comply to current effective regulations, all of PT Aero Terra Indonesia's operators have been certified internally by following standards and regulations that have been published, and all the trainings conducted have been adjusted to conform Ministry's requirements.
2. PM No 180 Tahun 2015, which had been refined by PM No 47 Tahun 2016, which regulates drone operations inside controlled airspace in Indonesia, which is regulated by either Perum LPPNPI (Airnav) and/or Indonesia Air Force. In the regulation, it is stated that basically to operate drone in Indonesia, operators have to request for permit to Ministry of Transportation, and intensively coordinate their activities with air traffic management services in the location. The process of requesting permit can be described below:
   a. Request for recommendation letter from local air traffic management services. If the AOI is located inside controlled airspace for civil aviation, or located outside controlled airspace but the mission altitude is more than 150 feet above ground level. Then, the required recommendation is from Airnav. If the AOI is located inside restricted or prohibited airspace, then the required recommendation is from local Indonesia Air Force.
   b. After the recommendation letter is received, the recommendation letter then shall be attached to receive operation permit letter from Directorate General of Civil Aviation, Ministry of Transportation. This operation permit letter is the proof that the operation is legally accepted and can be proceed.
   c. Next, operators have to send NOTAM (Notice to Airmen) request to local air traffic management service to that NOTAM can be published before the operation is conducted.
   d. Lastly, during the operation, operators have to intensively communicate with local air traffic management service by requesting flight dispatch before conducting take off and reporting mission status after landing successfully.

   Besides, in the PM No 47 Tahun 2016, it is also has been stated about sanctions if the operators disobey the regulations that apply. Sanctions could be administrative, legal, or penalty up to IDR 300,000,000.

Planning

Before executing a project, a well-prepared plan must be considered to create its success parameter. Every activity and that progress have to be discussed to prevent unwanted and unnecessary incident. Technical issues such as any equipment and tools, personnel allocation, and work methods have to be prepared for the project. To collect all information, Work Breakdown Structure (WBS) is prepared, which contains:

1. **Area of Interest**: Areas are already determined used for planning must be studied first. The results will be considered whether to take a project or not based on equipment availability and personnel skills.
2. **Scheduling**: Departure time, estimated time work and demobilization has been planned well. Plans were made has already buffered to anticipate contingency from problems that can potentially occur. Length of work is also became a consideration for making flight permit on a certain location.
3. **Personnel**: The personnel that involved in the project can be listed as below:

Table 2. Personnel involved and its job description

Project Manager	Responsible for all the activities related to the project, from the making of work plan until the final result presentation.
Team Leader	Responsible for all activities and progress on the field, collaborate with project manager to always update and inform all the issues happen in the field
UAV Operator	Responsible for preparing and operating the drone
UAV Mechanic	Responsible for all the repair of drone in the field
UAV Engineer	Responsible for any troubleshooting in the field
GCS Operator	Responsible for preparing flight mission and also checking photo data quality
GIS Officer	Responsible for processing all the data, the output, and also preparing map layout to complete the final result presentation

4. **Permit**: a permit to do a flight processed after a project has already approved to be done. The departure time for a team determined after permit issued. The contain of a permit clearly stated the recommendation for flight in certain area, the altitude of a flight, and important contacts to make sure that the traffic has clear to do a flight. All flight that have a trajectory to cross that area has already been informed in the beginning.
5. **Equipment Preparation**: A project that has a certain necessity required a different equipment to be prepared. After a schedule and work needs have been determined, amount of equipment will be prepared, whether the UAV to do a test flight and also GPS equipment required.
6. **Accommodation**: Trip from office in Bandung needs a vehicle to bring several devices, equipment, and all personnel.

Preparation & Calibration

All equipment will be taken and prepared due to needs of the project. To list all of it, there will be a checklist form and must be filled right before and after departure for preparation in the field. It is really mandatory because all tools consists of many small parts to be assembled into one big UAV, so it should be listed to prevent lost item.

Calibration must be done right before doing a test flight UAV and another device works properly. It compulsory to do after item replacement enacted. The item that must be calibrated is:

Table 3. Calibration activities

Device	Calibrate
Battery	For equating voltage and current of battery to be monitored in software
Radio Transmitter	For checking every switch and stick functionality in radio transmitter
Level 3-axis	To calibrate sensor IMU accelerometer
Level 1-axis	To calibrate sensor IMU gyro

After calibration, test flight must be done to see UAV performance. Testing conducted by pilots who will be dispatched to the field to see and memorize the characteristics of the UAV. if there is still contain an error when operate it, then trim is enough to adjust it on air.

After all equipment taken out off the plane from a flight, re-calibration must be done to anticipate error. For UAV, the calibration is done just to fix sensor IMU gyro (level 1-axis calibration). While the camera has to be re-adjusted white balance and focus on field.

Mobilization & Pre-survey

Mobilization for personnel and for equipment is differentiated. The team of operators will be mobilized after the operation permit is released, and all of the preparation and calibration activities have been conducted, and the equipment that will be used are in good condition and fit to work. The mobilization and the accommodation for the operators to get to the site determined by PHM will be company's responsibility.

Before performing the flight, there is a place to be surveyed beforehand since it will affect subsequent activity, namely:

1. Checking physical feasibility of BIG's N point BM if there is a need for geodetic GPS measurements.
2. Surveying areas of take-off and landing in accordance with the conditions UAV operator entry requirements. Determination of the area take-off and landing into the pilot's decision under field conditions. The most ideal conditions for making the flight:
   a. Area without a high tree to help the vision of pilots when operating in the air.
   b. Area without base stations or other electrical building so there is no interference to aircraft
   c. Large areas around like a football field so that the position of the take-off and landing can be arranged from any direction based on the direction of the wind.

Besides, before doing the data acquisition, on field calibration will be conducted, and on field pre-work briefing and risk assessment will be done. The data acquisition will be started after the work permit is released from the site's officials.

Data Acquisition

Data retrieval is executed when field condition proposed for take-off and landing is quite conducive and when the weather condition at the limited hours. Before flight, checklist form was prepared and completed by the team leader to anticipate shortages installation procedures. Pilot always had to check configuration and aircraft structures before placed above the launcher. Wind conditions examined condition for making the flight, if not yet possible then flight had to delay until wind is stable.

Previously, Ground Control Station (GCS) has been set up the mission to be uploaded to the UAV and has already calculating the area to be acquired. Dangerous or prohibited area has become a

benchmark for GCS to be avoided in the base of missions flown. The aircraft's altitude is set by the resolution to be obtained and is already considering its contour using elevation data like Shuttle Radar Topography Mission (SRTM).

Data Verification

Any data obtained after the plane finished acquiring data should be checked beforehand to make sure whether the image data obtained in accordance with the requirement for processing. Exposure of a photo can be taken into consideration in making quality results. Even issues such as the camera does not trigger to take a photo can happen and checks can only be done when the aircraft landing.

Weather conditions can be very different in the area of aviation. For example, during take-off weather was sunny, but when looking at areas that will be acquired it produce a dark image because of the clouds. Therefore, before take-off must be ascertained from wind direction that mission area is not a problem, whether it is checked through a website that displays the weather status or simply have to be seen with the vision from afar.

Normal result is the image data that have sufficient brightness levels as well as the parameters of weather problems that can be tolerated. things into consideration whether the image should be repeated or not is when the image contains clouds, dark because of the clouds, fog, smoke, shadow, covered by fuselage, blur, corrupted data photo, etc.

After data acquisition finished in one day of work, all output at field shall be collected and will be given to the client. Starting from raw data of photo and video, data log, until the mission which has been discussed must be checked for initial data processing. If data does not meet requirement because of its quality or deficiency, data will be retaken on the other day.

Temporary output shall be produced on field to be checked by user requirement based on its quality and desired output for orthophoto, Digital Surface Model, and video. Orthophoto has a clear interpretation objects and good texture. Digital Surface Model presents elevation data for all Area of Interest. Video already records all desired scene of places or object. Decision when to modify data or maybe to repeat data acquisition can be determined in all quality form checking from client e.g. raw quality check form for raw photo checklist.

Data Management, Processing, and Interpretation

Data Management is required to store all the data obtained with a predetermined format. Operator in charge of storing the data acquisition (which is usually done by GCS) should adjust the naming and image storage with Standard Operating Procedures that can be understood by anyone, including those who process the image data. This uniformity is also used to geotagging photo, and after that will be given to the user.

Once all the data has been recapitulated with the appropriate naming, all data photos then will be processed using software. Start the process of alignment of the entire photo, optimization point cloud, and mesh-making between point clouds, build its orthomosaic, lastly export orthophoto and DSM with the format of .tiff. At first, export orthophoto have to be set to low resolution (e.g. 1 meter resolution) to earlier checking, after the problem was not detected then export with maximum resolution. if there is a problem, then it must be reprocessed from phase of optimization, alignment, or even doing a re-flight of

mission. For DSM, if resolution lack from requirements, dense clouding process shall be executed for a better output.

When creating a mission of flight, Area of Interest has buffered 150 m beforehand to prevent any loss data information and error. Lastly the output shall be cropped based on original Area of Interest to be delivered. This makes the job so much longer but much safer in most cases like:

- Final output still lack coverage from original Area of Interest target
- Final output contains distortion in edge of orthophoto and DSM
- Final output contains error bundle adjustment at the edge of orthophoto and DSM from software processing.

Interpretation can be executed right after the existing output has been generated. The purpose of this interpretation is to provide clearer information and georeferenced for a specific object. To be able to highlight information is usually done by giving vector information point for many and small objects such as palm trees, line for information such as highway corridors, and areas for large buildings such as the factory area. All interpretation output will be used as a single map to finalize it.

Reporting & Output Delivery

After exporting output to preparing the map, report will be created to inform the quality as well as an explanation of parameters - parameters contained in the data. Contents starting from error reports generated on an output of up to revision. This reporting purposes as well as to inform the user about all the activities related to work activities until the end.

Output delivery will be sent with requested format, whether in from of a map or can be sent its raw data such as .tiff for orthophoto and DSM or .shp. for data vector. Packaging can be using recording media such as hardisk external and can be sent through a courier service or delivered directly to user office as well as presenting the output.

For main contract and additional job, our company will deliver:

Table 4. List of deliverables based on scope of work determined

Deliverables	Point Cloud
	Rectified Orthophoto with resolution of 5 cm or less
	Digital Surface Model (DSM)
	Digital Terrain Model (DTM)
	Contour with interval 1 m
	All daily work form
	Final Report

Equipment Technical Specification

Geodetic GPS

Trimble R8 Series

For GCP Measurement purpose, GPS Geodetic is used for cm-level measurement. Below is the specification of Geodetic GPS used in the survey:

Gambar 17. Trimble R8s

Multirotor UAV

DJI Phantom 4

DJI Phantom 4 is a consumer grade drone that can be used also for industrial application, but limited to only several cases such as documentation and monitoring. The DJI Phantom 4 will be used for any application that needs simple solution. The technical specification of DJI Phantom 4 is listed below:

Table 5. DJI Phantom 4 technical specification

Parameter	Value
Type of UAV	Multirotor – Quadcopter
Manufacture	Dà-Jiāng Innovations Science and Technology Co., Ltd. (DJI)
Year of manufacture	2016
Total flight time of Airframe	10 hours
Number of flying hourse before next major replacement: (if aplicable)	40 hours
Registarsion marks and serial number	AGS-P401
Ownership and nationality	PT. Aero Terra Indonesia
Diagonal Size (cm)	35 cm
Maximum Weight (kg)	1,380 kg
Maximum Speed (m/s)	20 m/s
Ceiling Altitude (meter)	6000 m
Maximum Flight Endurance (minutes)	28 minutes
Maximum Trajectory (km)	15 km
Frequency (MHz/GHz)	2.4GHz ISM
Payload Platform	Integrated Camera
Material Type	Plastic
Telemetry Range (km)	5 km
Battery Type	Li-Po 4S
Battery Capacity (mAh)	5350 mAh

Controller Type	Remote Control
Data Link Type	Digital RF Modem
Streaming Video Link Type	Digital RF Modem

Picture 18. Picture of DJI Phantom 4

The DJI Phantom 4 is using components as listed below:

Table 6. DJI Phantom 4 components

Parameter	Value
Flight Controller	Phantom 4 Integrated Flight Controller
GPS	Integrated DJI GPS
IMU	Integrated IMU
Telemetry	DJI Datalink Pro 2.4 GHz
Video Link	Lightbridge 2 2.4 GHz
Radio Control	Integrated Remote Controller
GCS Software	DJI Ground Station

Data Acquisition Process

Daily Activity Details

Time Table

Table 7. Time Table

Day No. #	Date	Status	Description	Total Flight	Acquired (±ha/km)	GCP Installed	GCP Meas.
1	20-Jul-18	Work	Mobilization Bandung - Palu	-	-	-	-
2	21-Jul-18	Work	Installment GCP: 9 GCP	-	-	9	9
3	22-Jul-18	Work	Installment GCP: 5 GCP Flight Mission: 6 Flight	6	150 Ha	5	5
4	23-Jul-18	Work	Flight Mission: 6 Flight	6	139 Ha	-	-
5	24-Jul-18	Work	Flight Mission: 4 Flight	4	60 Ha	-	-
			Total	**14**	**349 Ha**	**14**	**14**

Ground Control Data Measurement

The GCP data acquisition process was carried out in ± 14 measurements. The coordinate data acquisition technique used is a radial acquisition system. GCP coordinate measurements are performed after the pegs and premarks are installed. This coordinate measurement uses Geodetic type GPS. There are total 2 GPS used in this coordinate measurement process, with 1 base and 1 rover systems. To perform georeferencing, measurements are tied to the BIG point, which is the CORS PALP point.

Picture 19. Sample of GCP Measurement and Premark Installment

GCP data acquisition is conducted in seven days work. Detail of GCP measurement is shown below, with each measurement conducted between 45-60 minutes each except for the base.

Table 8. Date of Measurement of Each GCP

Tanggal Pasang	Kode Titik	Nama Surveyor	Jam Mulai	Jam Selesai
20 Maret 2019	GCP01	Irman	10:02	10:45
20 Maret 2019	GCP02	Irman	11:01	11:48
20 Maret 2019	GCP03	Irman	9:06	9:41
20 Maret 2019	GCP04	Irman	13:03	13:36
20 Maret 2019	GCP05	Irman	15:54	16:28
20 Maret 2019	GCP06	Irman	14:47	15:27
21 Maret 2019	GCP07	Irman	9:26	10:02
21 Maret 2019	GCP08	Irman	15:24	15:59
21 Maret 2019	GCP09	Irman	10:16	10:48
21 Maret 2019	GCP10	Irman	12:47	13:28
20 Maret 2019	ICP01	Irman	12:12	12:47
22 Maret 2019	ICP02	Irman	13:55	17:36
20 Maret 2019	ICP03	Irman	16:51	17:26
21 Maret 2019	ICP04	Irman	14:32	15:07

Aerial Photos Data Acquisition

The data acquisition process of aerial image is performed in seven day in two trip. In first trip in July, there is only one flight as the wind condition is still severe and causing the aircraft have big ground speed during landing, which potentially damaging the aircraft. Therefore, image acquisition was postponed until august where wind condition is better, i.e one month after first trip. Total flight performed is 18 flights.

Image acquisition for the entire area is done with Phantom 4 Pro. The nomenclature for each flight is based on day and number of flights. For example: first flight of the first day is named D1F1, which means day number 1 (first day) and flight number 1 (first flight), then the second flight is named D1F2, and so on. Total flight conducted for photo acquisition is 2 flights, i.e D1F1 and D1F2.

Altitude used by the UAV is 100 m relative above ground level. Average length of mission, i.e the distance traveled by UAV, is 5 km. More than one home location was used for take-off and landing process to cover entire mapping area, with home location should be on an open field, with clear view to horizon and minimum from obstruction on the path of take off, such as buildings, trees, hills, etc. The reason is to maintain signal quality between telemetry and UAV.

After the acquisition is completed, quality checks were made to photos taken. Each photos were checked to see the sharpness level, brightness, level of focus, and any presence of clouds or fog on acquired photos. Then, field processing using Agisoft Photoscan is performed to see whether all images can be aligned or has enough tie point between successive photos. Product of field processing is Mosaic Orthophoto, which then used to clarify the acquisition result. If the result of a photo captures cloud/fog, not-sharp, or can't be aligned, re-flight should be performed to re-cover the area. There was no cloud or fog captured in images, neither blurred images. It is then concluded from data processing that all area has been covered and data can be processed. Data acquisition is then considered done. Resulted GSD from data clarification is approximately 3 cm/pixel.

Data Acquisition Result

GCP Acquisition

Based on the results of the baseline processing, it can be seen that the accuracy obtained for all GCP baselines has met the accuracy standards of Geodetic GPS surveys for mapping. Coordinate of GCP can be seen in table below:

Table 9. GCP Coordinates

ID	Longitude DDMMSS	Latitude DDMMSS	H ELLIPS GROUND [m]
GCP 01	E119°50'07.029683"	S0°52'32.630811"	65.685
GCP 02	E119°49'53.983893"	S0°52'42.735347"	82.052
GCP 03	E119°50'41.827971"	S0°53'00.202786"	63.429
GCP 04	E119°50'42.726393"	S0°53'15.734160"	65.987
GCP 05	E119°51'35.257314"	S0°53'08.282586"	63.927
GCP 06	E119°51'33.554677"	S0°53'22.406895"	64.564
GCP 07	E119°52'07.534558"	S0°53'03.224784"	65.154
GCP 08	E119°52'18.212779"	S0°53'13.701774"	72.048
GCP 09	E119°52'20.991002"	S0°52'32.733104"	63.817
GCP 10	E119°52'37.095063"	S0°52'38.094441"	68.273
ICP 01	E119°50'18.169585"	S0°52'58.407078"	64.093
ICP 02	E119°51'04.872554"	S0°53'10.491210"	63.787
ICP 03	E119°51'54.231719"	S0°53'15.106270"	65.117
ICP 04	E119°52'21.636002"	S0°52'53.815480"	67.559

Coordinates from the processing of GPS data is resulted in a geographical coordinate system, which is a standard result produced in a survey with GPS. For several practical use, coordinate resulted should be transformed to the UTM Projection System. The results of transformation of the coordinates of the Ground Control Point can be seen in the following table:

Table 10. GCP Coordinate in UTM Zone

ID	Projection Datum	X Projection	Y Projection	H ORTHOM GROUND [m]
GCP 01	UTM 50 S; WGS 1984	815589.378	9903085.943	3.705 m
GCP 02	UTM 50 S; WGS 1984	815185.452	9902775.629	20.033 m
GCP 03	UTM 50 S; WGS 1984	816665.543	9902237.537	1.492 m
GCP 04	UTM 50 S; WGS 1984	816692.977	9901760.066	4.038 m
GCP 05	UTM 50 S; WGS 1984	818318.703	9901987.883	2.026 m
GCP 06	UTM 50 S; WGS 1984	818265.68	9901553.723	2.656 m
GCP 07	UTM 50 S; WGS 1984	819317.641	9902142.595	3.253 m
GCP 08	UTM 50 S; WGS 1984	819647.83	9901820.259	10.143 m
GCP 09	UTM 50 S; WGS 1984	819734.775	9903079.64	1.924 m
GCP 10	UTM 50 S; WGS 1984	820232.993	9902914.44	6.373 m
ICP 01	UTM 50 S; WGS 1984	815933.492	9902293.299	2.113 m
ICP 02	UTM 50 S; WGS 1984	817378.403	9901920.712	1.768 m
ICP 03	UTM 50 S; WGS 1984	818905.702	9901777.658	3.180 m
ICP 04	UTM 50 S; WGS 1984	819754.236	9902431.516	5.610 m

Aerial Image Acquisition

Acquired photos are stored in .JPEG formats and ideally acquired during clear weather condition. Below is the example of acquired photos.

Picture 20. Sample of image acquired on survey area

The photo above is a good example of data because the interpreted object has a solid and clear element that makes it easy to merge overlap and sidelap results. Unfavorable photos have difference in objects between overlapped photos, for example in full forest condition, objects that reflect sunlight (roof or water), photos containing clouds and rainwater, and more. Here is an example photo that requires additional data to be processed:

Picture 21. Aerial photo sample that requires additional data to process

Picture above is a sample of acquisition on a dense forest area, making it very difficult to do a photo merging. In order for the photo to be processed, this sample set may require additional flight with more overlap and sidelap on the mission. However, acquired data during survey can be processed without any additional overlapping flight.

Data Processing Process

Geotagging Images

Photos acquired after a flight mission do not have location coordinates metadata. Thus, after the flight mission is done, the Geotagging process is performed to each photo that has been taken. Geotagging purposedly to give the position of each photo in coordinate, and thus to accelerate merging process. Geotagging process is performed on Mission Planner software with the input are raw photos and BIN files downloaded from the UAV.

Photo Alignment (Aerotriangulation)

Aerotriangulation process is a positioning method used in aerial photographs. Furthermore, aerotriangulation is described as the process of determining land and object coordinates in aerial photographs by photogrammetric technique through the process of coordinate transformation from photo coordinates to land coordinates so that a common point between two photographs will have the same coordinates. The automatic triangulation process is done with the help of Agisoft Photoscan software. By using Agisoft Photoscan software, each photos will create point clouds that represent objects, colors, and coordinates. The point cloud is created using the Align Photos function in Agisoft Photoscan.

Picture 22. Point cloud illustration

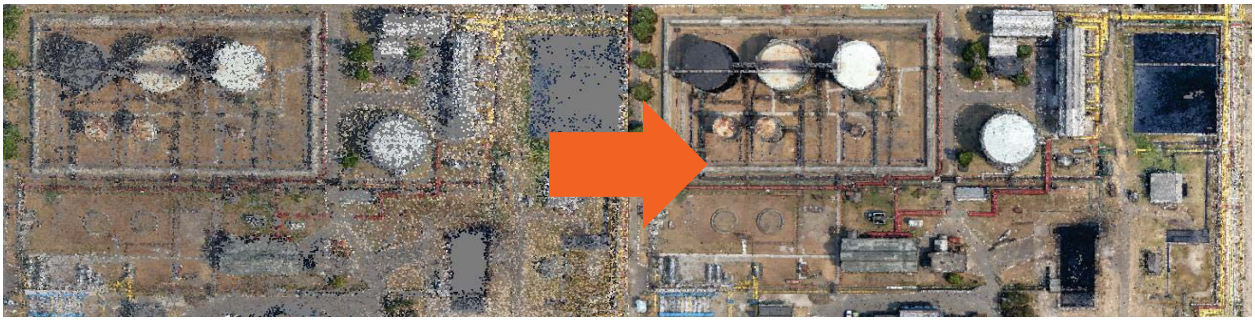
Point cloud is also given on the result of overlap and sidelap a photo. If the objects on multiple photos are identical and overlapped (eg empty ground on the object above) then point cloud will have the same position. Then, point cloud with the position of the same object on some photos will be tied into a tie point. This photo alignment process applies to the overall tie points generated on all the photos so that it affects the length of processing. The photo alignment process for point cloud modeling from the surveyed area takes about 8 hours in total, with Medium parameter level.

Optimization

In Photo Alignment processing, the distribution of existing point cloud still uses references from GPS from UAV. This optimization process is done to get stretched output with GCP point reference, as well as unnecessary point cloud elimination. In areas of water that reflect sunlight, the resulting point cloud can have extreme z value. Consequently, the output might not be considered valid and must be eliminated manually. The optimization process by Agisoft Photoscan software takes less than five minutes. GCP coordinates used for optimization process is acquired from orthophoto mosaic of previous trip, with total six similar ground feature between orthophotos is choosen as GCP.

Dense Cloud

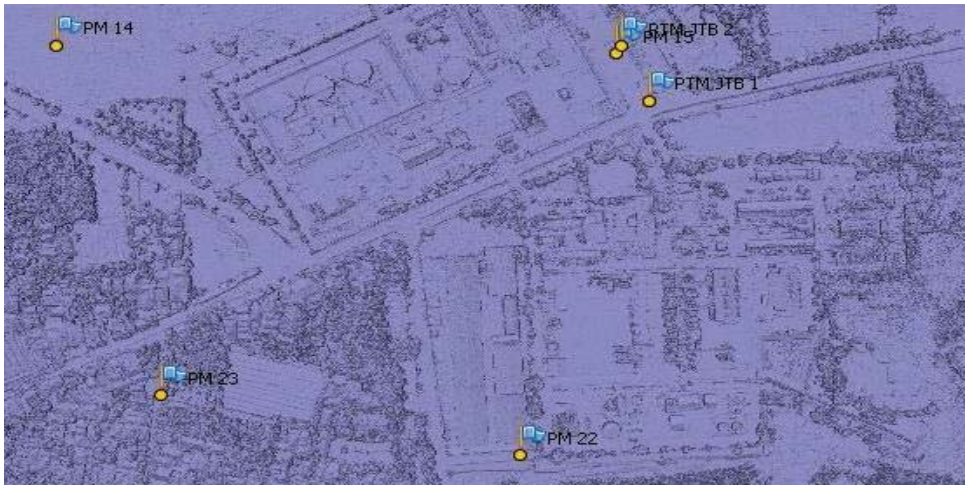
Dense cloud is an process of interpolation of sparse point cloud. In other words, dense cloud process generate additional point in the area between the existed sparse point cloud. This process sharpens the resolution of elevation data because more points are exist. The process of creating dense cloud takes about 8 hours, with dense cloud quality parameter Low.



Picture 23. Illustration of creating Dense Cloud (right) from Sparse Cloud (left)

Build Mesh

This process consists of creating mesh from created point cloud. The more points existed will create more smooth mesh. This process is important for creating mosaic orthophoto step. The build mesh process on agisoft photoscan software takes around three minutes.



Picture 24. Mesh Illustration

Export Output

The outputs that can be generated are orthophoto with the resolution of **3 cm / pixel** and DSM (Digital Surface Model) with resolution of **20 cm / pixel**. Orthophoto is a digital image data that shows the actual visualization of an area from mosaic of processed image with orthogonal projection and contains coordinate in certain coordinate system. DSM is a data that shows the surface relief of an area which still contain elements of objects on the surface. Orthophoto and DSM are then used to create DTM and Contour.

Quality Control

Quality Control (QC) is performed to guarantee the processing result, i.e Orthophoto, DSM, DTM and Contour with specifications and have quality in accordance with the standard. Quality control is done on each processing result, with quality control parameters such as resolution, accuracy, error checking (spectral and geometric), as well as the integrity and suitability of data within scientific principles.

Output Data

Data processing results is shown in Appendix B. Below is the summary of processing report from Agisoft Photoscan:

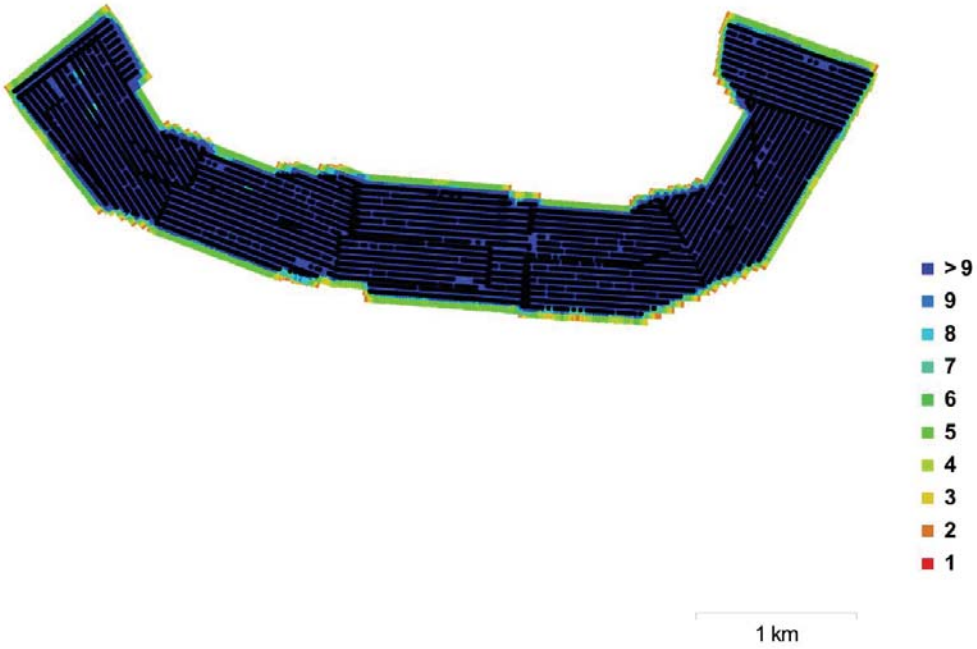


Fig. 1. Camera locations and image overlap.

Number of images:	4,845	Camera stations:	4,789
Flying altitude:	107 m	Tie points:	1,803,795
Ground resolution:	2.65 cm/pix	Projections:	12,399,040
Coverage area:	4.45 km²	Reprojection error:	1.26 pix

Picture 25. Summary of input data used in Agisoft Photoscan

Table 11. X, Y and Z Error of each GCP Correction on Agisoft Photoscan software

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image	Pix
GCP1	-3.33	1.07	0.46	3.53	0.11	-5
GCP2	4.69	0.25	-0.20	4.70	0.21	-21
GCP3	3.26	0.37	-0.09	3.28	0.27	-15
GCP4	2.41	-0.27	-0.06	2.43	0.20	-14
GCP5	-0.08	-1.06	0.17	1.08	0.19	-17
GCP6	-3.74	1.41	-0.14	4.00	0.16	-15
GCP7	2.38	-4.10	-0.09	4.74	0.25	-17
GCP8	1.54	0.91	0.14	1.79	0.13	-11
GCP9	2.27	3.98	0.03	4.58	0.21	-16
GCP10	-4.72	-1.62	-0.02	4.99	0.26	-15
Total	3.15	2.02	0.18	3.74	0.21	

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image	Pix
ICP1	-6.47	0.06	-4.77	8.04	0.23	-22
ICP2	1.85	-3.64	-2.93	5.03	0.25	-13
ICP3	-1.60	3.87	-0.49	4.22	0.24	-23
ICP4	1.39	-1.31	-3.07	3.61	0.16	-17
Total	3.53	2.74	3.20	5.50	0.22	

Mosaic Orthophoto

Mosaic orthophoto is a basic product of aerial photography using a drone, also known as an image map, obtained from the processing a number of interconnected aerial photographs that have been rectified and combined into a single mosaic. It contains spatial information that can be accessed on GIS software for various purposes. Resulted Orthophoto Mosaic has spatial resolution of ± 3 cm / pixel.

Picture 26. Orthophoto Mosaic sample

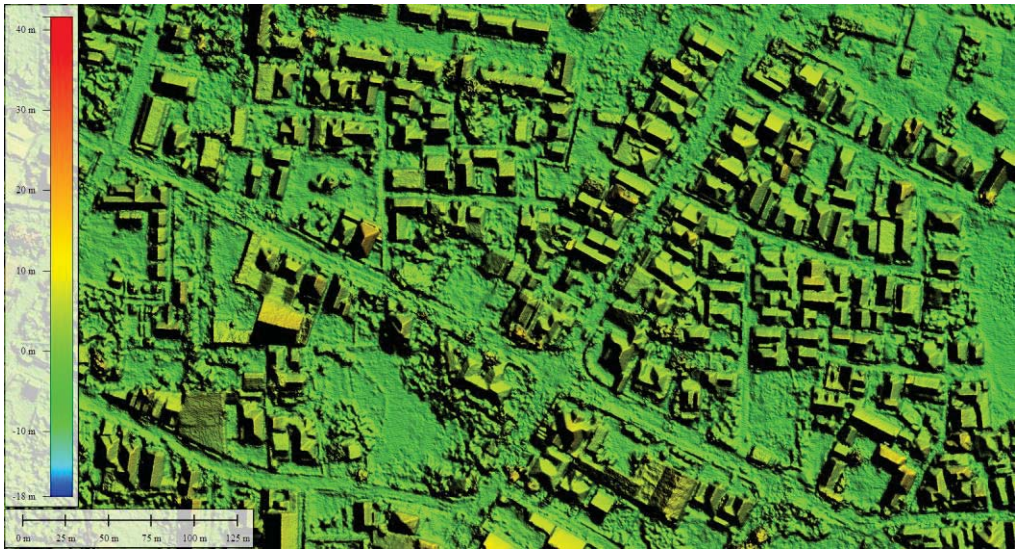
Orthophoto mosaic result is then checked to see the deviation between GCP horizontal value as reference point. The following table shows the deviation on each point between Orthophoto's horizontal value and GCP's horizontal value. RMSE value for total 4 ICPs is 0.04 m.

Table 12. Accuracy assessment of horizontal accuracy of Orthophoto

ID	X Ortho	Y Ortho	X Ref	Y Ref	dX (m)	(dX)^2	dY (m)	(dY)^2	(dX)^2 + (dY)^2
ICP01	815933.424	9902293.318	815933.487	9902293.299	-0.063	0.004	0.019	0.000	0.004
ICP02	817378.431	9901920.695	817378.405	9901920.712	0.026	0.001	-0.017	0.000	0.001
ICP03	818905.703	9901777.68	818905.706	9901777.658	-0.003	0.000	0.022	0.000	0.000
ICP04	819754.268	9902431.505	819754.239	9902431.516	0.029	0.001	-0.011	0.000	0.001
								Total (ICP)	0.007
								Average (ICP)	0.002
								RMSE (ICP)	0.041
								CE90 (ICP)	0.062

Digital Surface Model

DSM is a numerical representation of the relief of earth surface along with all the features and objects on it. DSM can be obtained from further processing of Geo-Referenced Photos as well as spatial information from Ground Control Point. The processed DSM has resolution of ± 20 cm / pixel.



Picture 27. Digital Surface Model sample

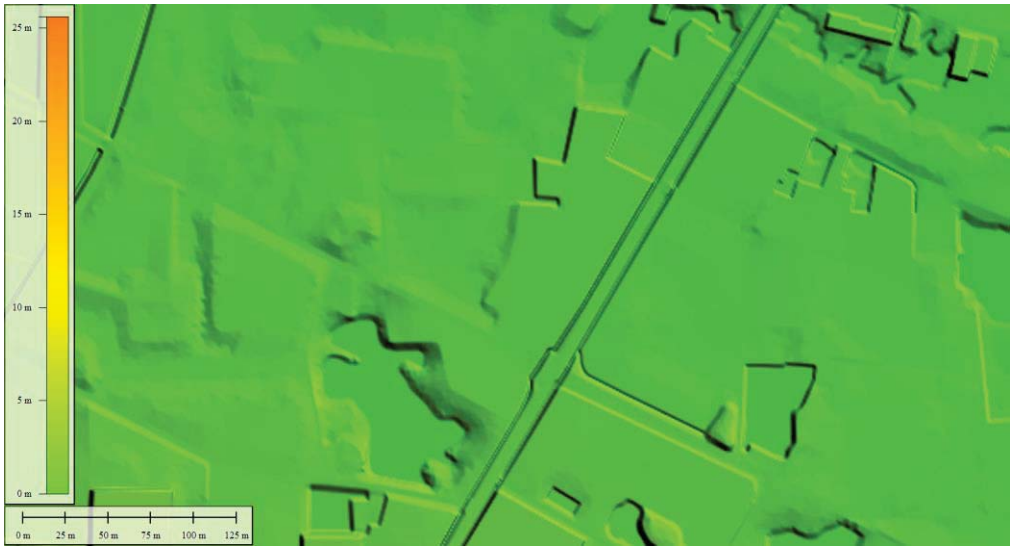
DSM results are then checked to see the deviation between GCP vertical value as reference point. The following table shows the deviation on each point between DSM's vertical value and GCP's vertical value. RMSE value for total 4 ICPs is 0.08 m.

Table 13. Accuracy assessment of vertical accuracy of DSM

ID	Z DSM	ID	Z Referensi	dZ (m)	dZ (cm)	(dZ)^2
ICP01	2.174	ICP01	2.1133	-0.061	-6.070	0.004
ICP02	1.766	ICP02	1.7679	0.002	0.190	0.000
ICP03	3.318	ICP03	3.1797	-0.138	-13.830	0.019
ICP04	5.587	ICP04	5.6104	0.023	2.340	0.001
					Jumlah (ICP)	**0.023**
					Rata-rata (ICP)	**0.006**
					RMSE (ICP)	**0.076**
					LE90 (ICP)	**0.126**

Digital Terrain Model

DTM is a numerical representation of the relief of earth surface without objects or features on it (topography). DTM is obtained by filtering DSM data, either automatically using software filtering algorithm or manually using stereo-vector method. In this case, the stereo-vector method is used to produce DTM with high accuracy.



Picture 28. Digital Terrain Model Sample

DTM results are then checked to see the deviation between GCP vertical value as reference point. The following table shows the deviation on each point between DTM's vertical value and GCP's vertical value. RMSE value for total 4 ICPs is 0.05 m.

Table 14. Accuracy assessment of vertical accuracy of DTM

ID	Z DTM	ID	Z Referensi	dZ (m)	dZ (cm)	(dZ)^2
ICP01	2.112	ICP01	2.1133	0.001	0.130	0.000
ICP02	1.675	ICP02	1.7679	0.093	9.290	0.009
ICP03	3.180	ICP03	3.1797	0.000	-0.030	0.000
ICP04	5.623	ICP04	5.6104	-0.013	-1.260	0.000
					Jumlah (ICP)	**0.009**
					Rata-rata (ICP)	**0.002**
					RMSE (ICP)	**0.047**
					LE90 (ICP)	**0.077**

Contour

Contour is an imaginary line that describes all the points with same height, either above or below an average data set on sea level. Created contours have 1 meter intervals.

Picture 29. Contour lines sample

Closing

Remarks

1. Data acquisition of Drone Topography Survey for a Drone Topographic Survey for Development of Regional Disaster Risk Resilience Plan in Palu for Yachiyo Engineering is performed well and without any casuality.
2. Mobilization and demobilization by Terra Drone Indonesia was conducted smoothly and structured.
3. Aerial mapping acquisition was mostly conducted with Phantom 4 Pro, with total flight mission is ten flights within three day.
4. Total GCP and ICP installed and used is 14 points.
5. All conducted flights provide 100% score of safety for Personnel for take-off and landing process.

APPENDIX A – PROCESSING REPORT – AGISOFT PHOTOSCAN

Processing Report

JICA-PAL-01

29 March 2019

Survey Data

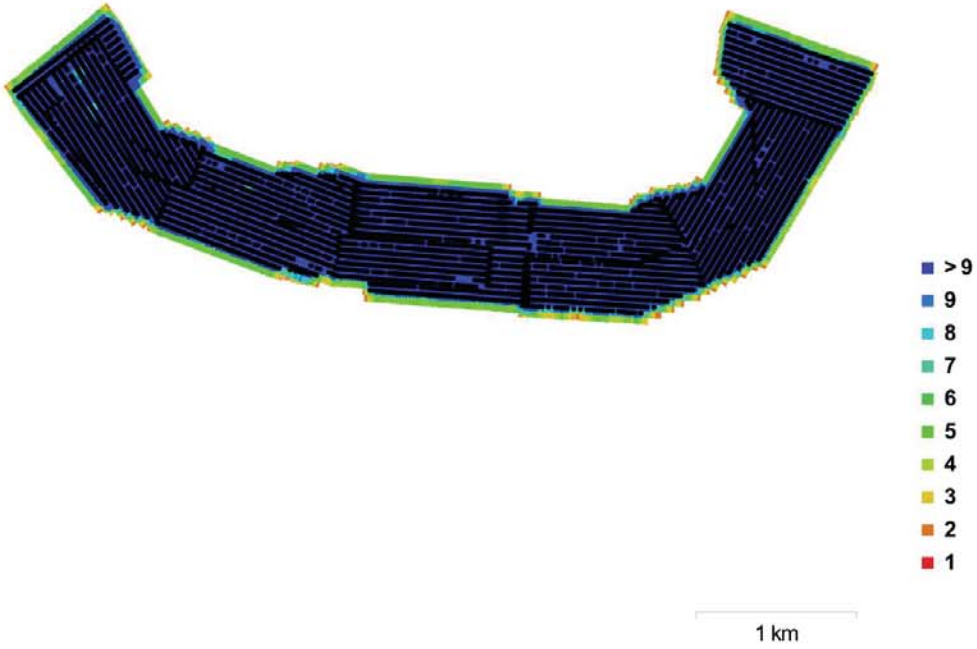


Fig. 1. Camera locations and image overlap.

Number of images:	4,845	Camera stations:	4,789
Flying altitude:	107 m	Tie points:	1,803,795
Ground resolution:	2.65 cm/pix	Projections:	12,399,040
Coverage area:	4.45 km²	Reprojection error:	1.26 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 µm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 µm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 µm	No

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No
FC6310 (8.8 mm)	5472 x 3648	8.8 mm	2.41 x 2.41 μm	No

Table 1. Cameras.

Camera Calibration

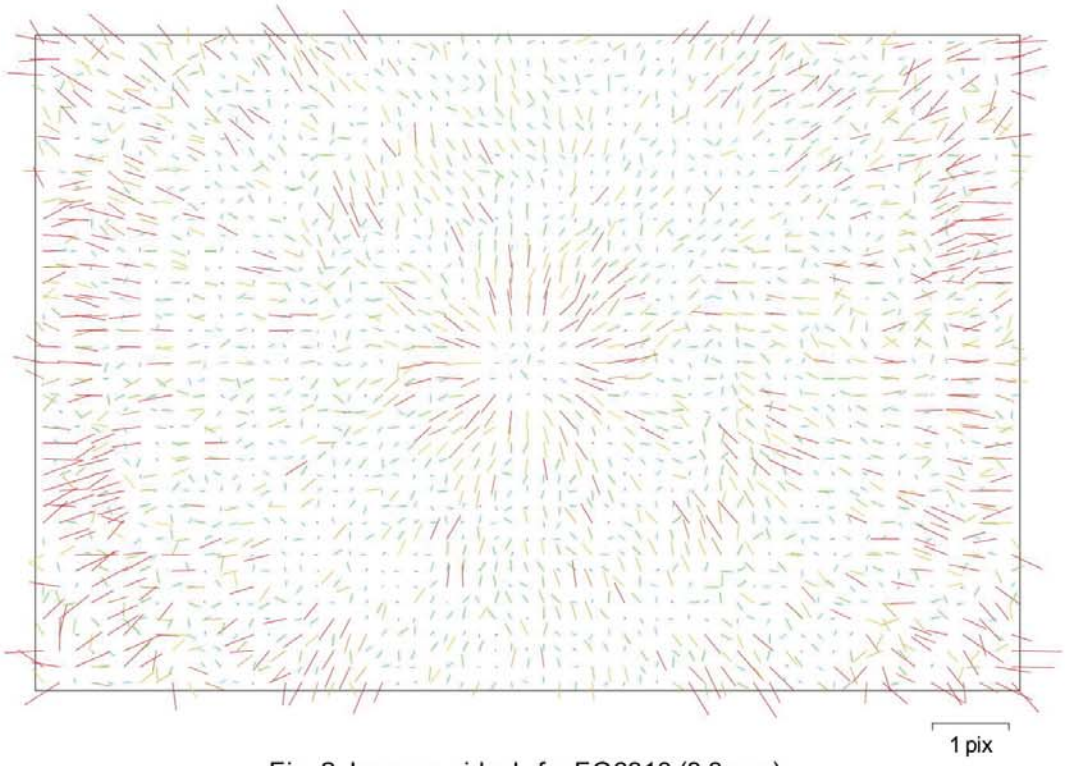


Fig. 2. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
370 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3647.53
Cx:	0.64286	B1:	-3.33809
Cy:	3.69237	B2:	2.48953
K1:	0.0018673	P1:	0.000130192
K2:	-0.00531451	P2:	0.000207569
K3:	0.00589106	P3:	0
K4:	0	P4:	0

Camera Calibration

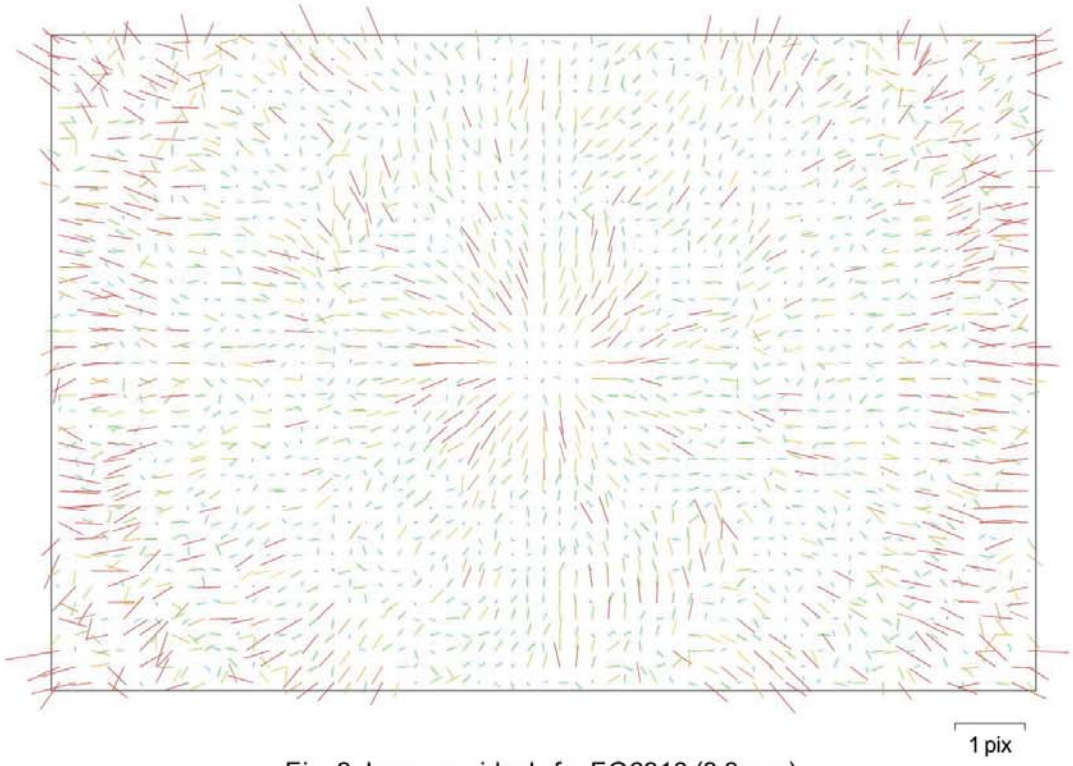


Fig. 3. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
391 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3598.41
Cx:	-1.75728	B1:	-1.36483
Cy:	-1.16414	B2:	-1.67348
K1:	0.000706853	P1:	-0.000110705
K2:	-0.00501783	P2:	-9.55244e-05
K3:	0.00559745	P3:	0
K4:	0	P4:	0

Camera Calibration

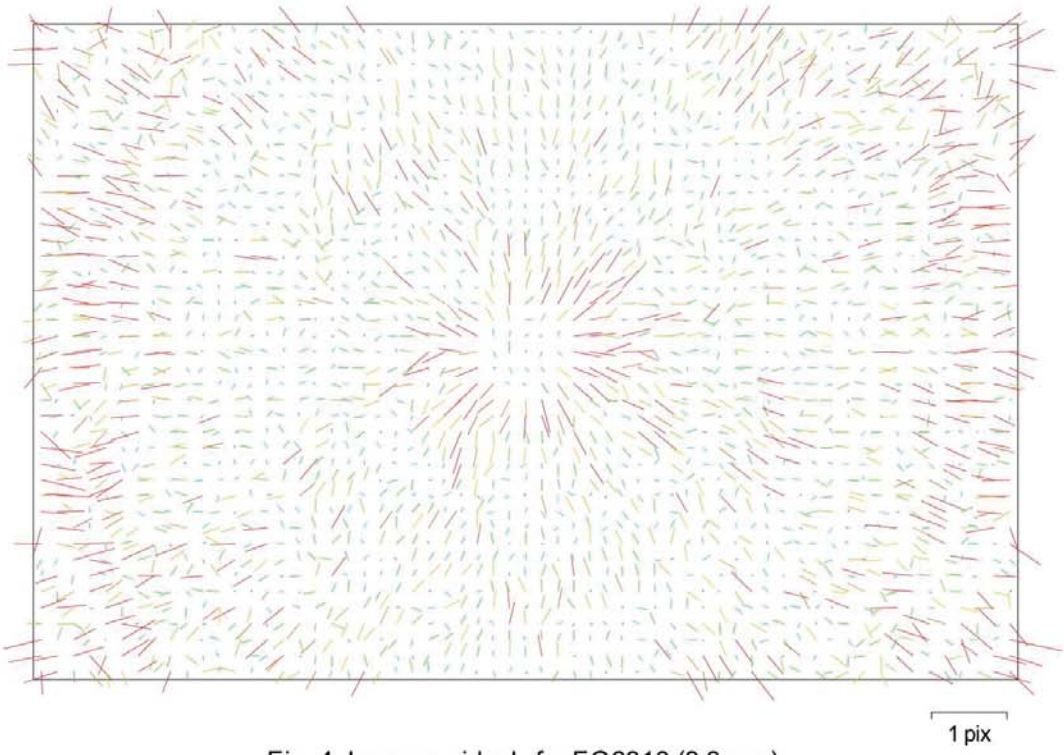


Fig. 4. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
325 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3594.02
Cx:	-0.207823	B1:	-0.867546
Cy:	0.502524	B2:	2.0631
K1:	0.00109575	P1:	0.000101218
K2:	-0.00504443	P2:	0.000152555
K3:	0.00537381	P3:	0
K4:	0	P4:	0

Camera Calibration

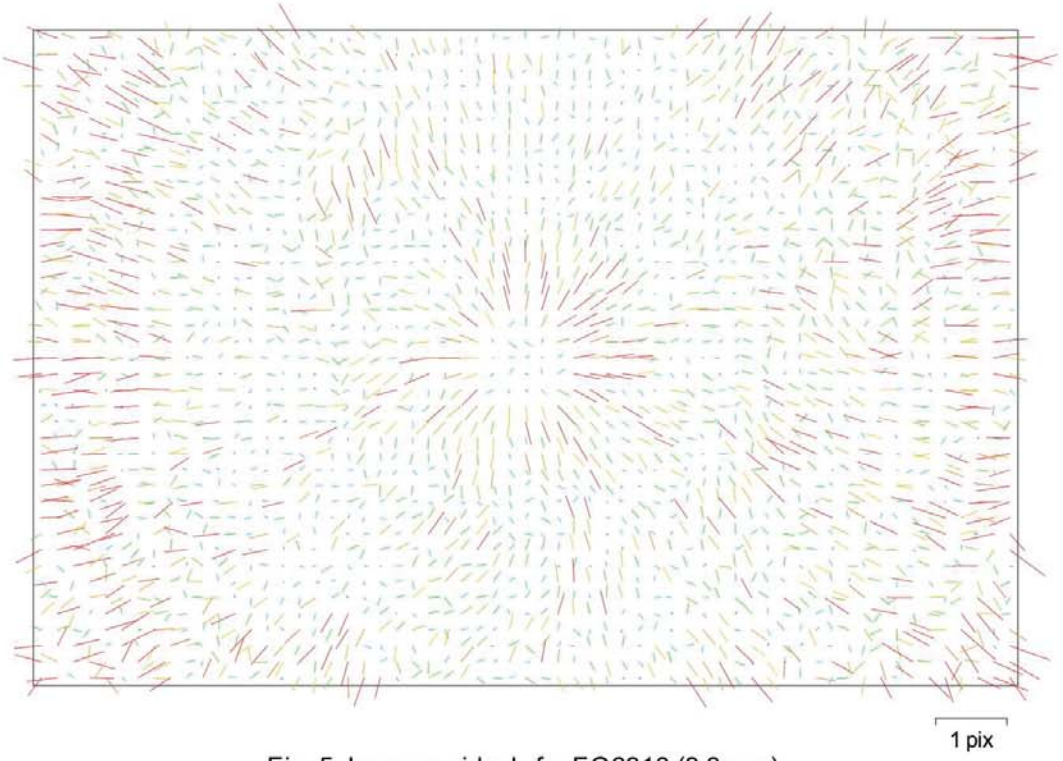


Fig. 5. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
427 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3580.22
Cx:	-1.67201	B1:	-0.785444
Cy:	7.43352	B2:	-3.36405
K1:	0.000793107	P1:	0.000470698
K2:	-0.00466134	P2:	0.000578229
K3:	0.00491836	P3:	0
K4:	0	P4:	0

Camera Calibration

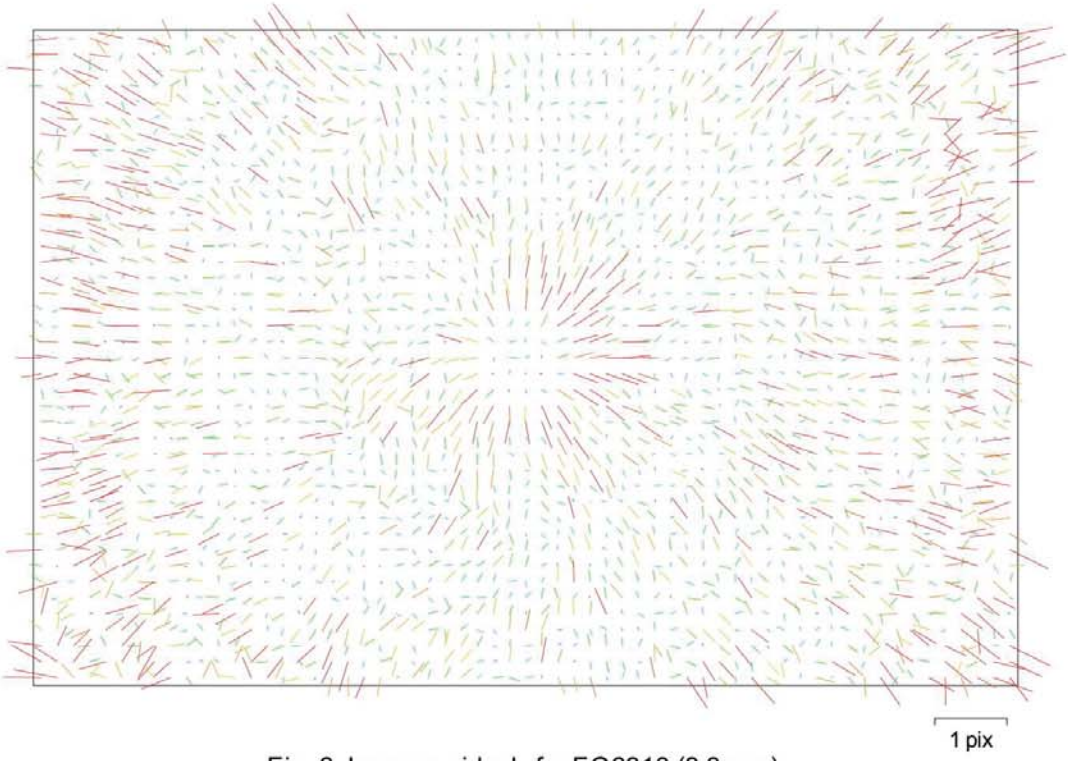


Fig. 6. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
402 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3572.93
Cx:	8.36556	B1:	1.36045
Cy:	9.03952	B2:	1.36325
K1:	0.00106871	P1:	0.000506191
K2:	-0.00400761	P2:	0.000966663
K3:	0.00445055	P3:	0
K4:	0	P4:	0

Camera Calibration

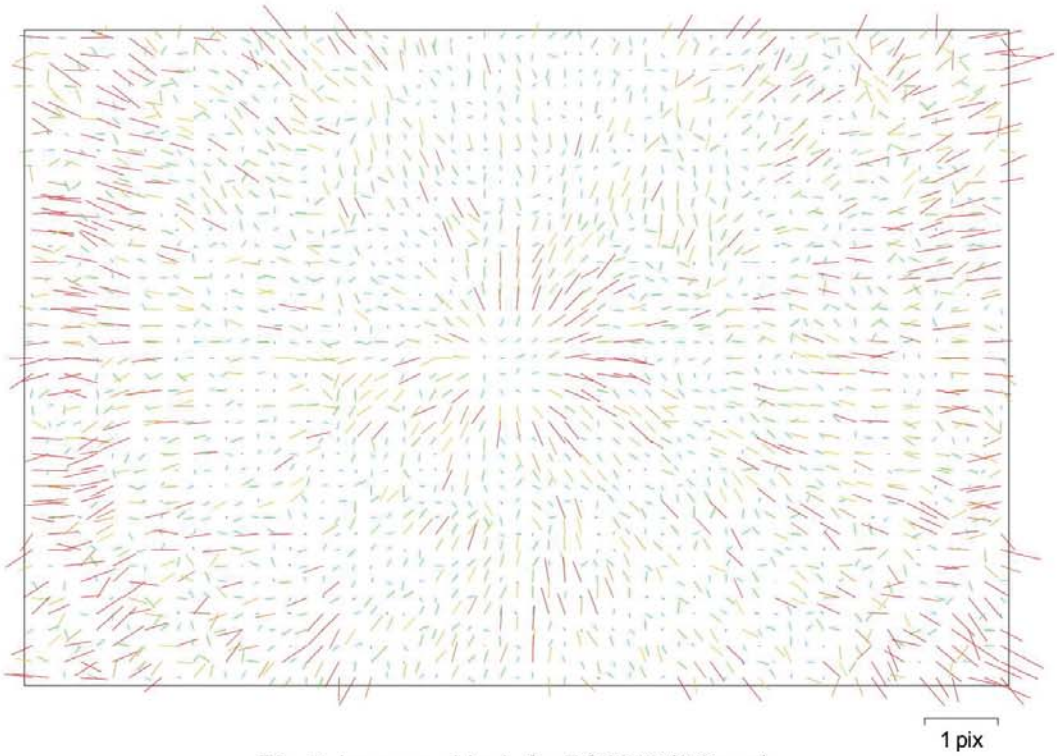


Fig. 7. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
408 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3570.69
Cx:	5.60672	B1:	1.90811
Cy:	8.84214	B2:	2.8355
K1:	0.000713893	P1:	0.000555116
K2:	-0.00393376	P2:	0.0008853
K3:	0.00424927	P3:	0
K4:	0	P4:	0

Camera Calibration

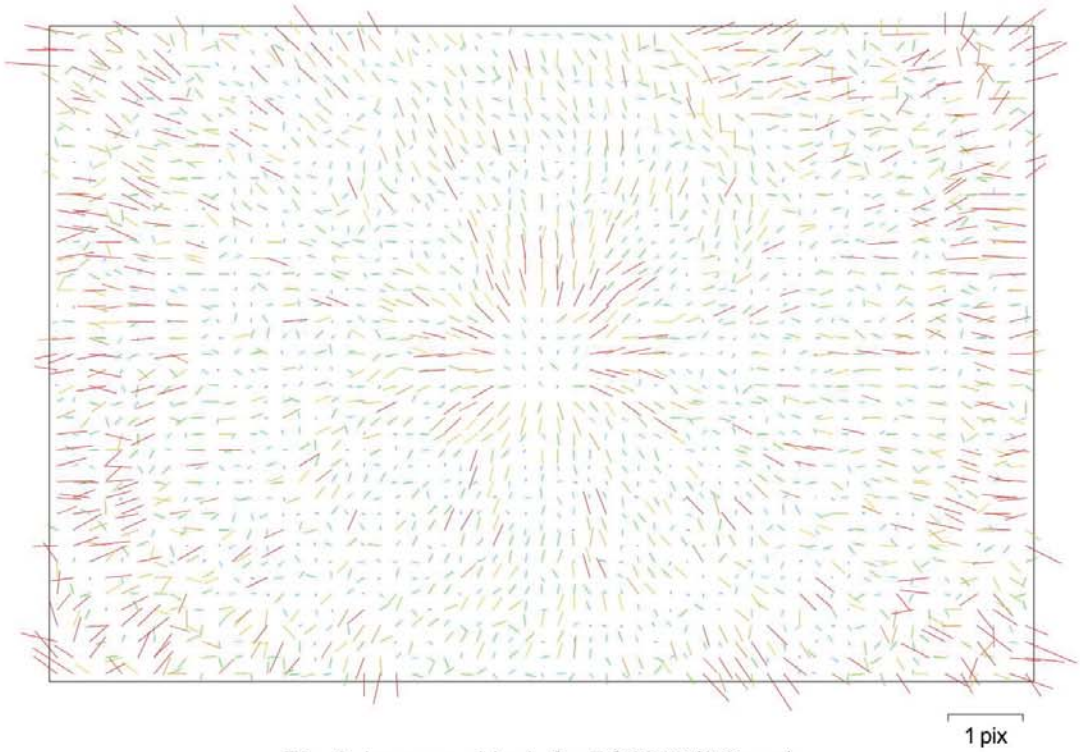


Fig. 8. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
429 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3555.39
Cx:	3.16065	B1:	-1.02483
Cy:	7.91341	B2:	4.11576
K1:	0.000853826	P1:	0.00032643
K2:	-0.004817	P2:	0.000580248
K3:	0.00495485	P3:	0
K4:	0	P4:	0

Camera Calibration

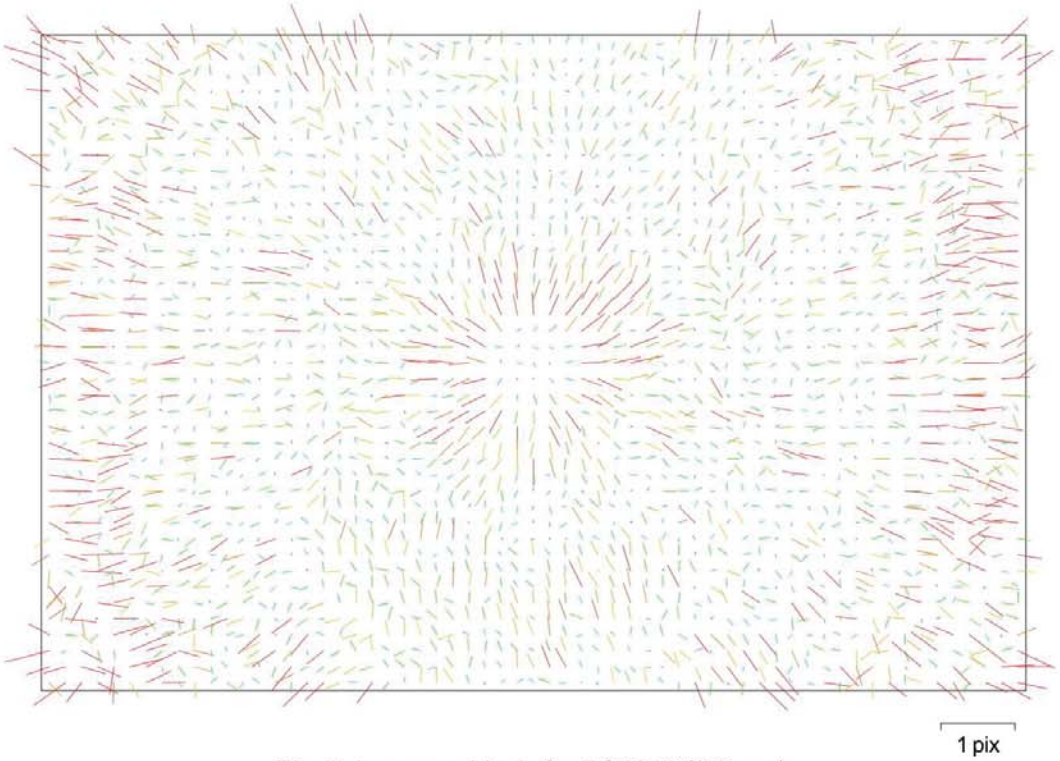


Fig. 9. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
388 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3557.07
Cx:	-1.16148	B1:	-1.70222
Cy:	-3.79105	B2:	4.32209
K1:	0.00106751	P1:	-6.09649e-05
K2:	-0.00542903	P2:	-0.000162203
K3:	0.00562663	P3:	0
K4:	0	P4:	0

Camera Calibration

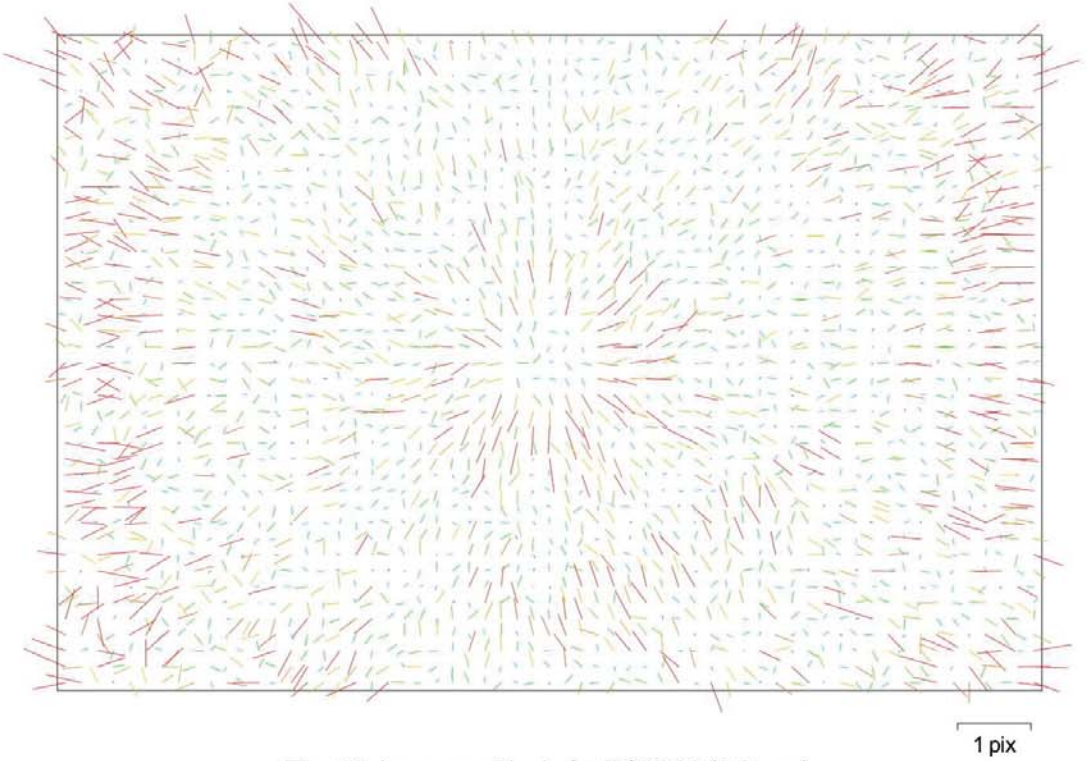


Fig. 10. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
183 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3588.42
Cx:	10.2833	B1:	-1.17296
Cy:	25.4265	B2:	2.92924
K1:	0.000929167	P1:	0.0002548
K2:	-0.00484781	P2:	0.000512758
K3:	0.00521499	P3:	0
K4:	0	P4:	0

Camera Calibration

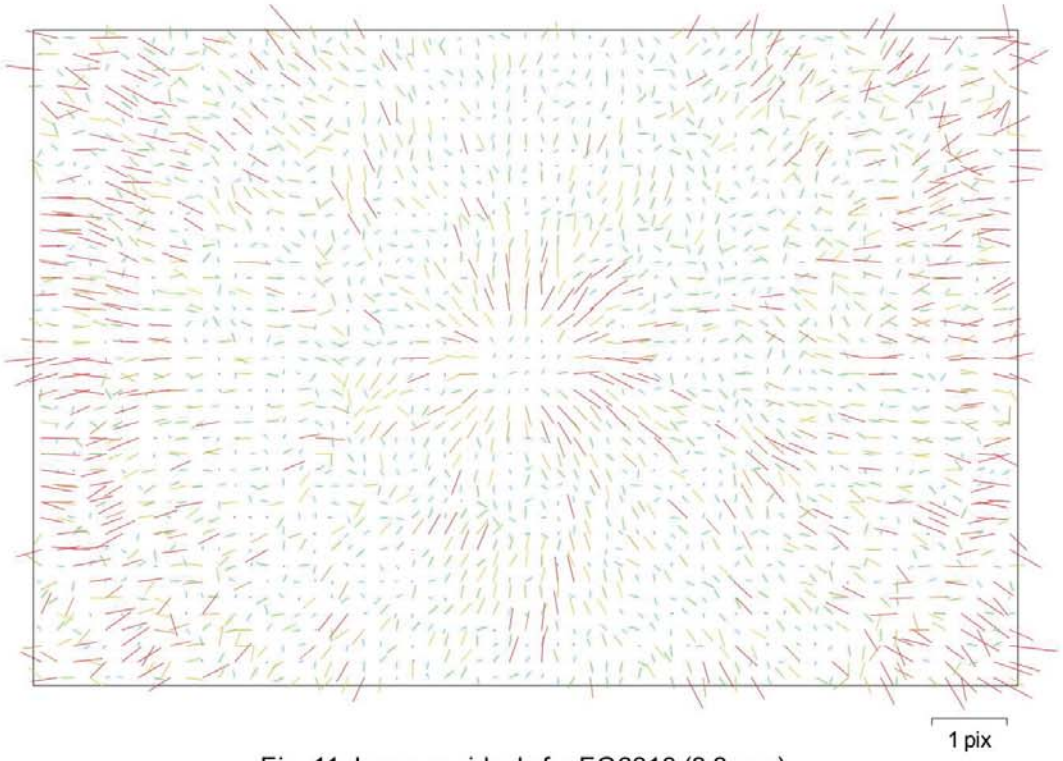


Fig. 11. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
389 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3609.88
Cx:	4.00296	B1:	-5.68
Cy:	5.45179	B2:	2.22069
K1:	0.000529038	P1:	0.000514378
K2:	-0.00439586	P2:	0.000723838
K3:	0.00476547	P3:	0
K4:	0	P4:	0

Camera Calibration

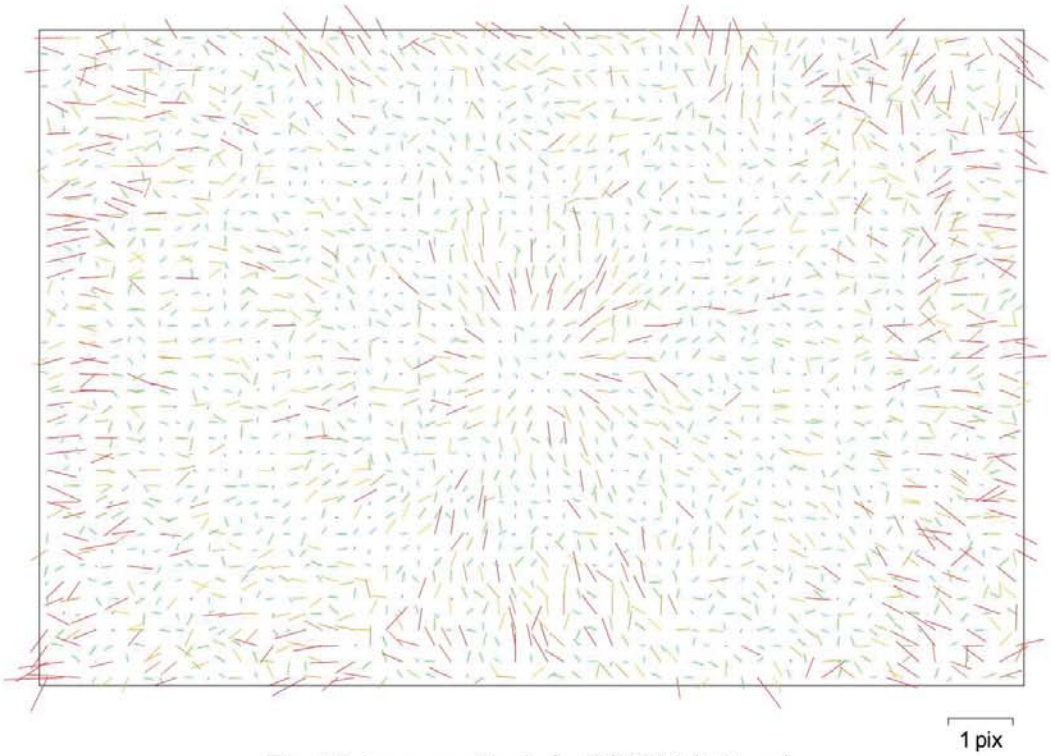


Fig. 12. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
113 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3644.28
Cx:	-1.87465	B1:	-4.51502
Cy:	-7.57505	B2:	1.92597
K1:	0.000535065	P1:	-0.000160568
K2:	-0.00358817	P2:	-0.000409237
K3:	0.00425981	P3:	0
K4:	0	P4:	0

Camera Calibration

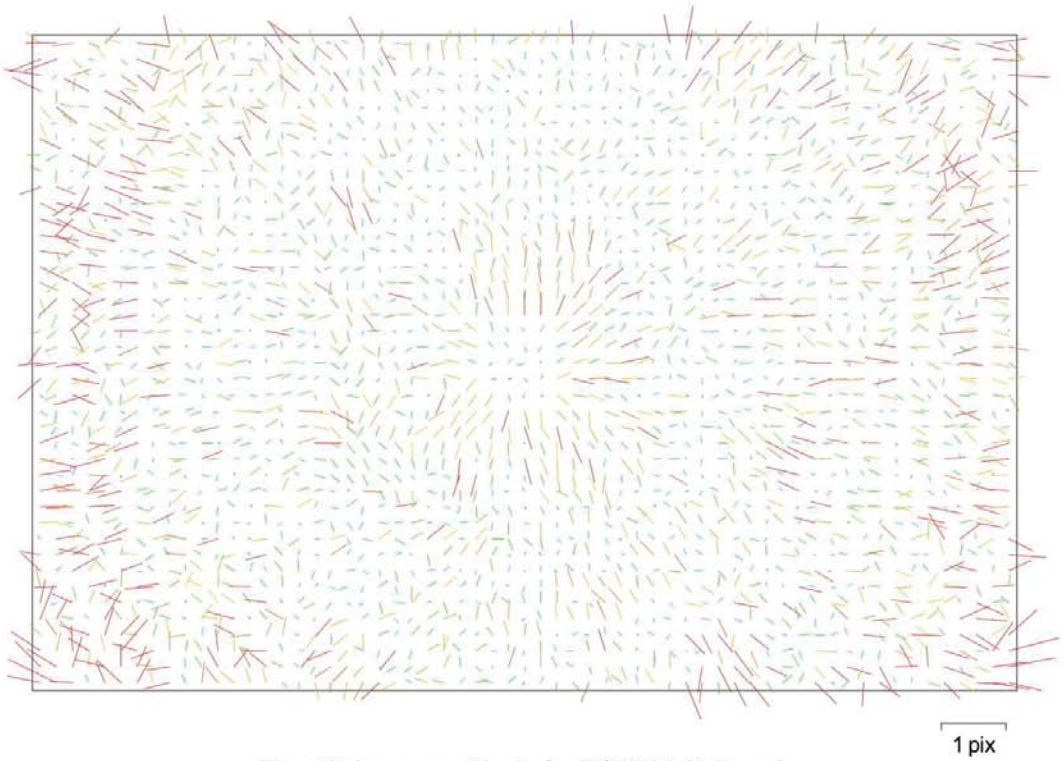


Fig. 13. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
131 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3648.9
Cx:	12.02	B1:	4.28233
Cy:	13.4428	B2:	-0.281826
K1:	0.00216263	P1:	0.000624469
K2:	-0.00594486	P2:	0.000599558
K3:	0.00629984	P3:	0
K4:	0	P4:	0

Camera Calibration

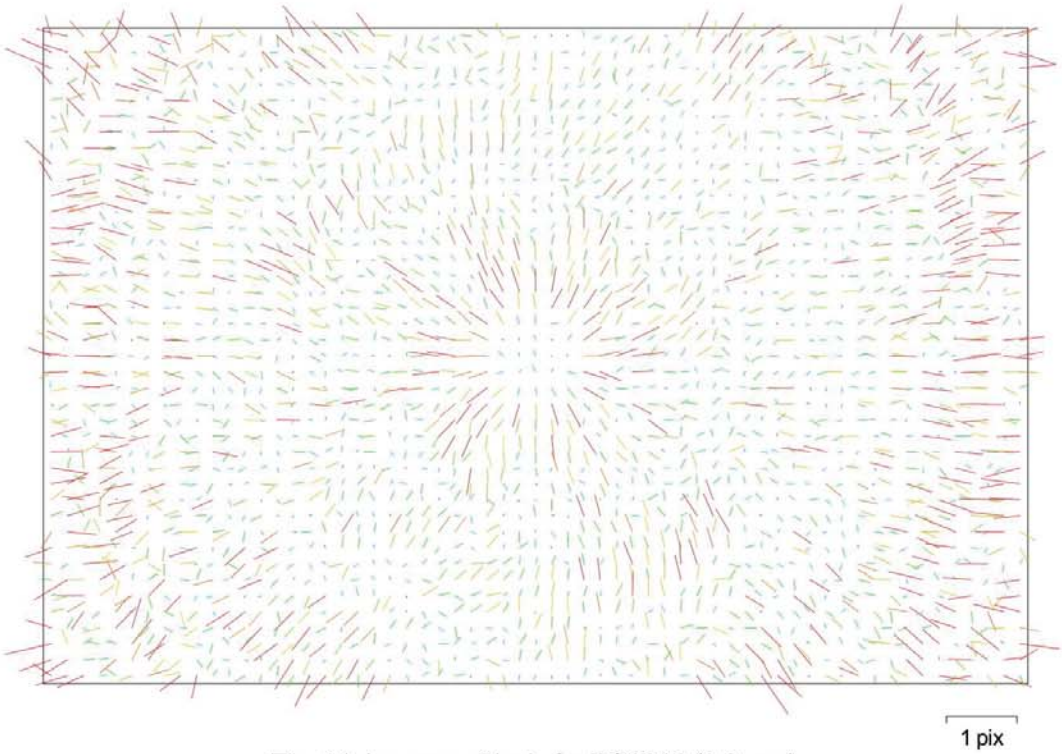


Fig. 14. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
408 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3612.51
Cx:	-2.5612	B1:	-6.7872
Cy:	-2.23511	B2:	-0.637845
K1:	0.000686495	P1:	-0.000240474
K2:	-0.00493783	P2:	-0.000383111
K3:	0.00533537	P3:	0
K4:	0	P4:	0

Camera Calibration

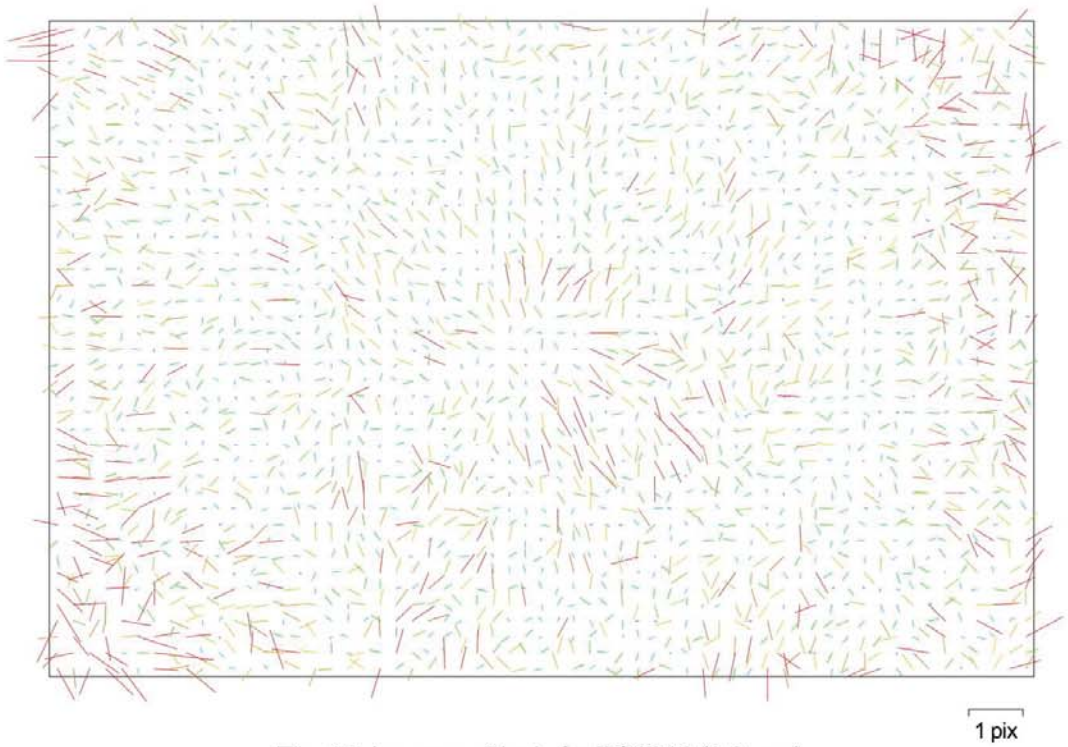


Fig. 15. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
125 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3627.78
Cx:	-5.27687	B1:	3.15768
Cy:	-10.1003	B2:	-1.13226
K1:	0.00200133	P1:	-0.000242343
K2:	-0.00769231	P2:	-0.000555646
K3:	0.00714128	P3:	0
K4:	0	P4:	0

Camera Calibration

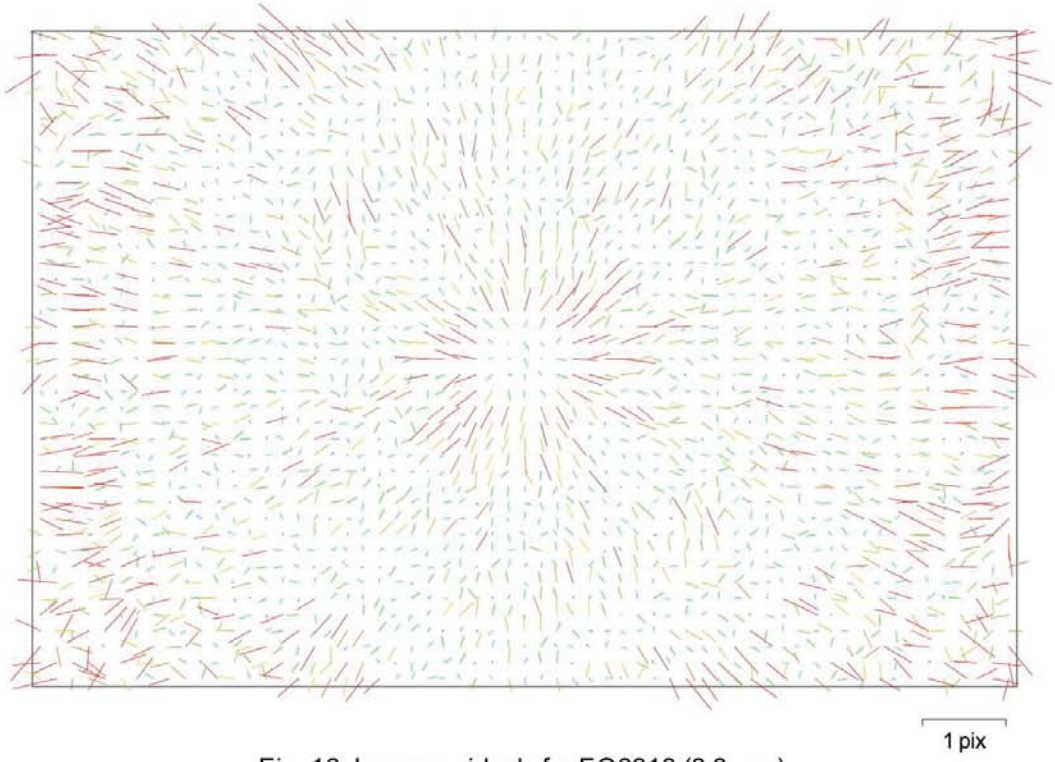


Fig. 16. Image residuals for FC6310 (8.8 mm).

FC6310 (8.8 mm)
356 images

Resolution	Focal Length	Pixel Size	Precalibrated
5472 x 3648	**8.8 mm**	**2.41 x 2.41 µm**	**No**

Type:	Frame	F:	3643.44
Cx:	-0.76373	B1:	-5.01449
Cy:	-0.4818	B2:	-0.39192
K1:	0.000721482	P1:	4.54335e-05
K2:	-0.00307102	P2:	5.5327e-05
K3:	0.00378027	P3:	0
K4:	0	P4:	0

Ground Control Points

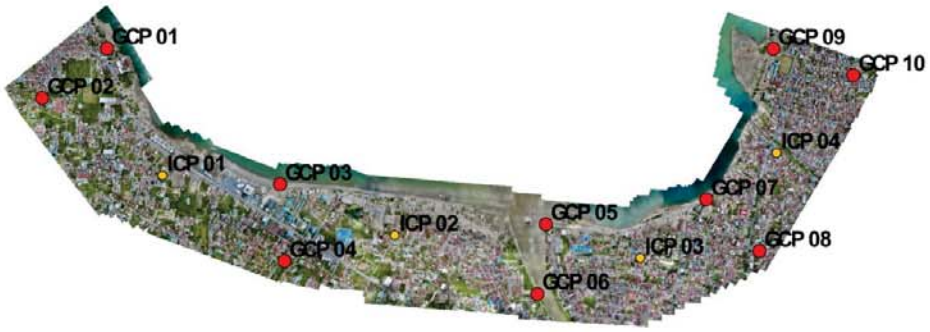


Fig. 17. GCP locations.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)	Image (pix)
10	3.14524	2.01645	0.184144	3.73612	3.74065	0.214

Table 2. Control points RMSE.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)	Image (pix)
4	3.52844	2.73879	3.20339	4.46664	5.4966	0.224

Table 3. Check points RMSE.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
GCP 01	-3.32687	1.0736	0.458698	3.52578	0.106 (5)
GCP 02	4.69353	0.248917	-0.200197	4.70438	0.213 (21)
GCP 03	3.26034	0.371436	-0.0891546	3.28264	0.268 (15)
GCP 04	2.41285	-0.26546	-0.0566338	2.42807	0.196 (14)
GCP 05	-0.0837626	-1.06017	0.16558	1.07629	0.194 (17)
GCP 06	-3.7382	1.41354	-0.139754	3.99897	0.160 (15)
GCP 07	2.37511	-4.09943	-0.0936166	4.7387	0.252 (17)
GCP 08	1.53526	0.91165	0.143753	1.79131	0.133 (11)
GCP 09	2.27041	3.98281	0.0289638	4.58458	0.211 (16)
GCP 10	-4.71617	-1.6175	-0.0153938	4.98586	0.263 (15)
Total	**3.14524**	**2.01645**	**0.184144**	**3.74065**	**0.214**

Table 4. Control points.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
ICP 01	-6.471	0.0610521	-4.77446	8.04195	0.233 (22)
ICP 02	1.8548	-3.64432	-2.93336	5.03249	0.250 (13)
ICP 03	-1.59964	3.87329	-0.490893	4.21927	0.239 (23)
ICP 04	1.38799	-1.31026	-3.06688	3.61235	0.162 (17)
Total	**3.52844**	**2.73879**	**3.20339**	**5.4966**	**0.224**

Table 5. Check points.

Digital Elevation Model

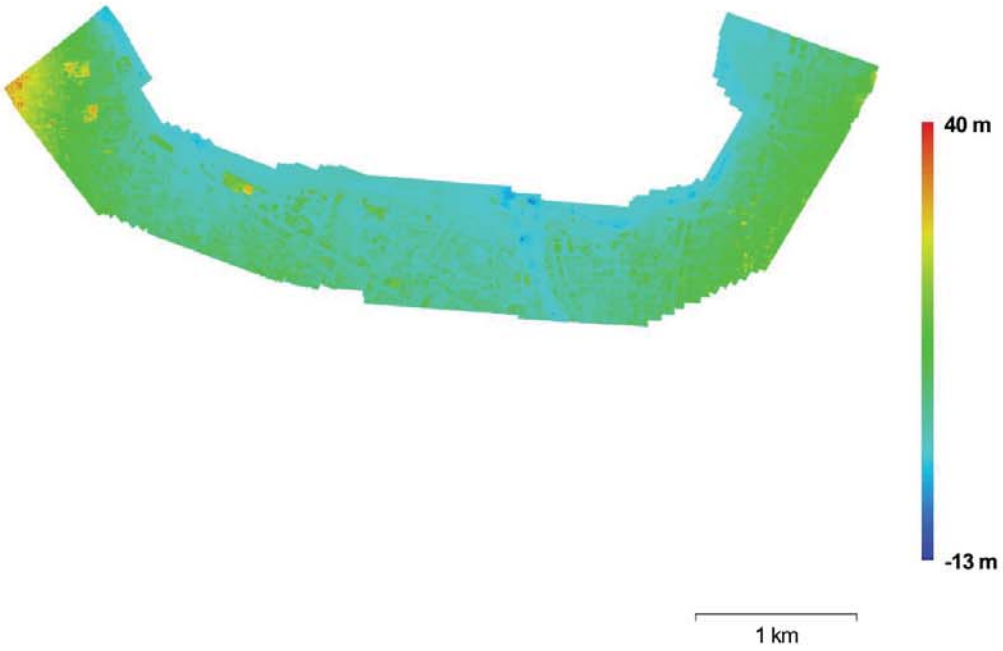


Fig. 18. Reconstructed digital elevation model.

Resolution:	21.2 cm/pix
Point density:	22.2 points/m²

Processing Parameters

General	
Cameras	4845
Aligned cameras	4789
Markers	14
Coordinate system	WGS 84 (EPSG::4326)
Point Cloud	
Points	1,803,795 of 2,141,976
RMS reprojection error	0.18855 (1.26371 pix)
Max reprojection error	2.30467 (66.6789 pix)
Mean key point size	6.03535 pix
Effective overlap	7.27871
Alignment parameters	
Accuracy	Medium
Pair preselection	Reference
Key point limit	30,000
Tie point limit	3,000
Constrain features by mask	No
Adaptive camera model fitting	Yes
Matching time	6 hours 10 minutes
Alignment time	1 hours 39 minutes
Optimization parameters	
Parameters	f, b1, b2, cx, cy, k1-k3, p1, p2
Optimization time	3 minutes 12 seconds
Dense Point Cloud	
Points	126,726,594
Reconstruction parameters	
Quality	Low
Depth filtering	Aggressive
Depth maps generation time	5 hours 59 minutes
Dense cloud generation time	1 hours 40 minutes
Model	
Faces	1,467,355
Vertices	739,394
Reconstruction parameters	
Surface type	Height field
Source data	Dense
Interpolation	Enabled
Quality	Low
Depth filtering	Aggressive
Face count	1,500,000
Processing time	3 minutes 26 seconds
DEM	
Size	35,893 x 14,302
Coordinate system	WGS 84 (EPSG::4326)
Reconstruction parameters	
Source data	Dense cloud
Interpolation	Enabled
Processing time	7 minutes 1 seconds
Orthomosaic	
Size	204,993 x 75,584
Coordinate system	WGS 84 (EPSG::4326)
Channels	3, uint8
Blending mode	Mosaic
Reconstruction parameters	
Surface	Mesh
Enable color correction	No

Processing time	2 hours 31 minutes
Software	
Version	1.2.6 build 2834
Platform	Windows 64 bit

APPENDIX B – DAILY PROGRESS REPORT