

# Ground Control Point Survey Report

“CA\_FEMA R9 Lidar\_2016\_D17”

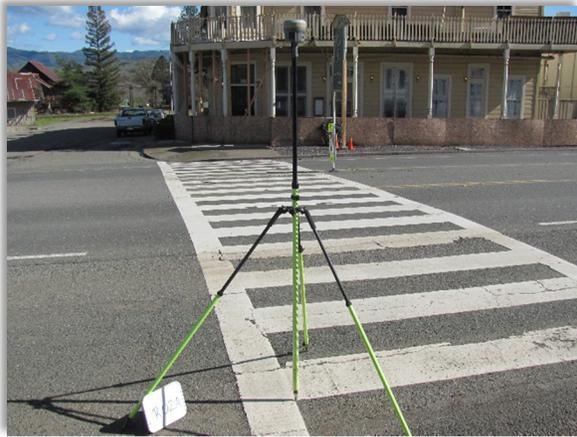
**RUSSIAN RIVER**

**USGS Contract: G10PC00013**

**Task Order Number: G17PD00044**

**Prepared for:**

***United States Geological Survey (USGS)***



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6.	Deliverables .....	Sent via Electronic Transfer
	Including: a) Point Documentation Report & Photos of Survey Points	
	b) Final Coordinate List in Excel Format	
	c) NGS Data Sheets for Project Controls	

# 1. INTRODUCTION

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## 1.1 *Project Summary*

Dewberry Consultants LLC is under contract to the United States Geological Survey to provide 18 Ground Control Points in the State of California. Under the above referenced USGS Task Order, Dewberry is tasked to complete the quality assurance of LiDAR products. As part of this work Dewberry staff will complete Ground Control Point surveys that will be used to evaluate vertical and horizontal accuracy. The ground survey was conducted February 22 thru February 24, 2017.

Existing NGS Control Points were located and surveyed to check the accuracy of the RTK/GPS survey equipment with the results shown in Section 2.4 of this Report.

As an internal QA/QC procedure and to verify that the Ground Control Points meet the 95% confidence level approximately 50% of the points were re-observed and are shown in Section 5 of this report.

Final horizontal coordinates are referenced to CA State Plane, NAD83 in US Survey Feet. Final Vertical elevations are referenced to NAVD88 in US Survey Feet using Geoid model 2012B (Geoid12B).

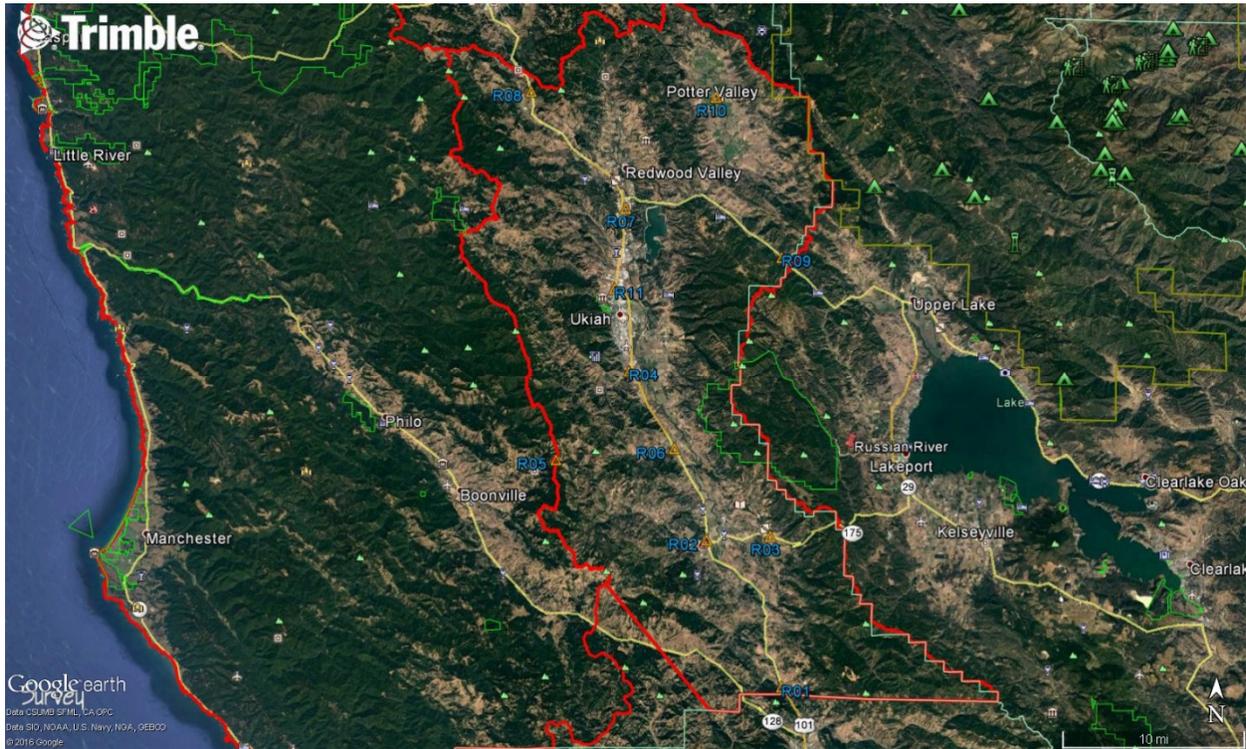
## 1.2 *Points of Contact*

Questions regarding the technical aspects of this report should be addressed to:

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### 1.3 Project Area



## **PROJECT DETAILS**

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### **2.1 *Survey Equipment***

In performing the GPS observations Trimble R-10 GNSS receiver/antenna attached to a two meter fixed height pole with a Trimble TSC3 Data Collector to collect GPS raw data were used to perform the field surveys.

### **2.2 *Survey Point Detail***

The 18 Ground Control Points were well distributed throughout the project area.

A sketch was made for each location and a nail was set at the point where possible or at an identifiable point. The Ground Control Point locations are detailed on the “Check Point Documentation Report” sheets attached to this report.

### **2.3 *Network Design***

The GPS survey performed by Dewberry Consultants LLC office located in Lanham, MD was tied to a Real Time Network operated by CRTN. The network is a series of “real-time” continuously operating, high precision GPS reference stations. All of the reference stations have been linked together using Trimble GPSNet software, creating a Virtual Reference Station System (VRS).

The Trimble NetR5 Reference Station is a multi-channel, multi-frequency GNSS (Global Navigation Satellite System) receiver designed for use as a stand-alone reference station or as part of a GNSS infrastructure solution. Trimble R-Track technology in the NetR5 receiver supports the modernized GPS L2C and L5 signals as well as GLONASS L1/L2 signals.

## 2.4 Field Survey Procedures and Analysis

Dewberry field surveyors used Trimble R-10 GNSS receivers, which is a geodetic quality dual frequency GPS receiver, to collect data at each surveyed location.

All locations were occupied once with approximately 50% of the locations being re-observed. All re-observations matched the initially derived station positions within the allowable tolerance of  $\pm 5\text{cm}$  or within the 95% confidence level. Each occupation which utilized the VRS network was occupied for approximately three (3) minutes in duration and measured to 180 epochs.

Each occupation which utilized OPUS (if used) was occupied between 20 and 30 minutes.

Field GPS observations are detailed on the “Control Point Documentation Reports” submitted as part of this report.

Four (4) existing NGS monument listed in the NSRS database were located as an additional QA/QC method to check the horizontal and vertical accuracy of the VRS network as well as being the primary project control monuments designated as DH6534, JT9639, AE2064 and AI7782. The results are as follows:

PT. #	Observed Values			Data Sheet Values			$\Delta X$	$\Delta Y$	$\Delta Z$
	NORTHING	EASTING	ELEVS.	NORTHING	EASTING	ELEVS.			
20MEN38.05	2217528.77	6242796.91	857.01	2217528.76	6242796.95	857.00	0.01	-0.04	0.01
HPGNDC A01B7	2081936.83	6248367.20	1270.40	2081936.69	6248367.20	1270.04	0.14	0.00	0.36
UKIC	2174913.28	6221252.80	603.80	2174913.10	6221252.86	603.80	0.18	-0.06	0.00
HOP A	2123895.50	6256271.22	1016.81	2123895.57	6256271.26	1016.77	-0.07	-0.04	0.04

The above results indicate that the VRS network is providing positional values within the 5cm parameters for this survey.

## NGS Monuments



## **2.5    *Adjustment***

The survey data was collected using Virtual Reference Stations (VRS) methodology within a Virtual Reference System (VRS).

The system is designed to provide a true Network RTK performance, the RTKNet software enables high-accuracy positioning in real time across a geographic region. The RTKNet software package uses real-time data streams from the CRTN system user and generates correction models for high-accuracy RTK GPS corrections throughout the network. Therefore, corrections were applied to the points as they were being collected, thus negating the need for a post process adjustment.

## **2.6    *Data Processing Procedures***

After field data is collected the information is downloaded from the data collectors into the office software. The Software program used is called Trimble Business Center.

Downloaded data is run through the TBC program to obtain the following reports; points report, point comparison report and a point detail report. The reports are reviewed for point accuracy and precision.

After review of the point data an “ASCII” or “txt” file which is the industry standard is created. Point files are loaded into our CADD program (Carlson Survey 2016) to make a visual check of the point data (Pt. #, Coordinates, Elev. and Description). The data can now be imported into the final product.

### 3. ***FINAL COORDINATES/ELEVATIONS***

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<b>CA SPCS NAD83, NAVD88, Geoid 12B</b>			
<b>Point #</b>	<b>Northing (ft)</b>	<b>Easting (ft)</b>	<b>Elevation (ft)</b>
R01	2076036.44	6265976.75	374.24
R02	2118125.02	6244309.61	500.69
R02A	2118141.50	6244253.14	503.17
R03	2119295.51	6262626.82	776.07
R04	2166554.99	6221824.73	582.01
R04A	2166558.99	6221835.76	582.05
R05	2141203.51	6200862.17	2104.60
R06	2144297.72	6234961.90	564.74
R06A	2144208.50	6234920.50	563.85
R07	2213409.98	6220800.28	676.77
R07A	2213417.26	6220778.55	677.32
R08	2246662.57	6193546.98	1630.74
R08A	2246635.73	6193545.14	1629.06
R09	2199302.02	6265754.93	1319.83
R09A	2199336.38	6265751.85	1318.20
R10	2245149.68	6246831.85	949.40
R10A	2245149.95	6246811.32	950.08
R11	2190498.78	6217610.83	653.90

#### 4. GPS OBSERVATIONS

POINT ID	OBSERV. DATE	JULIAN DATE	TIME OF DAY (AST)	RE-OBSERV. DATE	RE-OBSERV. TIME
R01	2/22/2017	53	13:54	N/A	N/A
R02	2/22/2017	53	9:43	N/A	N/A
R02A	2/23/2017	54	13:38	2/23/2017	11:35
R03	2/22/2017	53	11:07	2/23/2017	13:02
R04	2/22/2017	53	10:22	N/A	N/A
R04A	2/23/2017	54	9:36	N/A	N/A
R05	2/22/2017	53	11:49	N/A	N/A
R06	2/22/2017	53	9:06	2/23/2017	15:33
R06A	2/23/2017	54	16:01	N/A	N/A
R07	2/22/2017	53	14:23	2/23/2017	10:48
R07A	2/23/2017	54	11:15	2/24/2017	8:20
R08	2/24/2017	55	12:15	2/24/2017	12:18
R08A	2/24/2017	55	12:26	N/A	N/A
R09	2/22/2017	53	16:41	2/23/2017	13:25
R09A	2/23/2017	54	13:53	N/A	N/A
R10	2/23/2017	54	17:12	2/24/2017	9:12
R10A	2/24/2017	55	9:20	N/A	N/A
R11	2/22/2017	53	13:26	2/24/2017	12:40

#### 5. POINT COMPARISON

Point ID	Point CK	Delta North (ft)	Delta East (ft)	Vertical Difference (ft)
R02A	R02ACK	-0.02	0.00	-0.01
R03	R03CK	0.01	0.00	0.11
R06	R06CK	0.00	0.00	0.00
R07	R07CK	-0.12	0.02	-0.04
R07A	R07ACK	-0.12	0.04	0.02
R08	R08CK	-0.02	0.00	0.04
R09	R09CK	0.00	0.00	-0.01
R10	R10CK	0.00	-0.01	0.01
R11	R11CK	0.00	0.00	-0.01