Ground Control Survey Report

CA FEMA LiDAR Ground Control

Panoche San Luis Reservoir Area

Contract Number: G16PC00022
Task Order Number: 140G0220F0003

Contractor: Woolpert, Inc.
Woolpert Project # 80591

February 2020

Ground Control Survey Report

UNITED STATES GEOLOGICAL SURVEY – CA FEMA R9 Panoche San Luis 2019 D20

Task Order #140G0220F0003

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Section 1: Survey Report

TASK ORDER NAME: UNITED STATES GEOLOGICAL SURVEY – CA FEMA R9 Panoche San Luis 2019 D20

Task Order: #140G0220F0003

This report contains a comprehensive outline of the Ground Control Survey that supported the Panoche San Luis reservoir area airborne LiDAR collection. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

Project Area

The project area consists of approximately 340 square miles over portions of Panoche San Luis reservoir area, Fresno and San Benito County, CA.

Purpose

The purpose of this survey was to establish three-dimensional coordinates for 12 LiDAR primary control points and 44 ground classification check points. The points were collected per the flight layout and were uniformly dispersed over the project area.

Date of Survey

Ground control field missions took place January 7 through January 13, 2020.

Monumentation

Prior to aerial acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing NSRS control stations were utilized as checks to ensure that quality x, y, and z coordinate values were computed for each of the newly established LiDAR control stations. Recovery information sheets for the existing NGS control stations can be found in Section 4 of this report. A control diagram showing the ground control stations used to support this mapping project can be found in Section 5 of this report.

Accuracy Standards

The relative accuracy of the lidar data will be ≤ 8 cm RMSEZ between adjacent swaths with a maximum difference of ± 16 cm. The data collected shall meet the National Standard for Spatial Database Accuracy (NSSDA) accuracy standards. The NSSDA standards specify that vertical accuracy be reported at the 95 percent confidence level for data tested by an independent source of higher accuracy. The accuracy (ACCz) for the derived DEM shall be calculated in three ways and reported in the metadata accordingly. The RMSEZ (Non-Vegetated) is required to meet ≤10.0 cm. The Non-Vegetated Vertical Accuracy (NVA) is required to meet ≤19.6 cm at a 95% confidence level, derived according to NSSDA, i.e., based on RMSEZ of 10.0 cm in the “open terrain” and/or “urban” land cover categories. The Vegetated Vertical Accuracy (VVA) is required to meet ≤30.0 cm at a 95th percentile level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for Lidar Data, i.e., based on the 95th percentile error in Vegetated land cover categories combined (Brush Lands/Trees and Forested Areas).

GPS Equipment

Woolpert utilized 1 Trimble Navigation R8 Model 3 GNSS dual-frequency GPS receiver, 1 Trimble Navigation R10 Model GNSS dual-frequency GPS receivers and 1 TSC3 data collectors for this project.

Methodology

Real-Time Kinematic (RTK) GPS

The field crew utilized Real-Time Kinematic (RTK) and GPS Rapid Static methods throughout the ground control data collection process. Using these techniques, observations were performed on a total of 9 LiDAR control points and 36 ground classification check points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this LiDAR / photogrammetric project.

Static GPS

Due to limited cellular coverage in some areas. Static GPS techniques were utilized to establish positions for 3 LiDAR control points and 8 ground classification check points using a minimum of 30 minute observations with each session utilizing a 5-second sync rate.

GPS Data Analysis and Processing

The field crew chief processed all session baselines each day using Trimble Navigation's Trimble Business Center (TBC) Version 5.20 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed and allowed the field crews to immediately reschedule observations of poor baselines.

Datum Reference and Final Coordinates

The spatial reference system for this project is will be UTM Zone 10 North. The datum shall be NAD83 (2011) meters to 2 decimal places horizontal and NAVD88 Meters vertical using the latest geoid model (GEOID18) Units for both the horizontal and vertical datum will be expressed in meters to two (2) decimal places.

Quality Assurance

Existing NSRS published continuously operating reference stations were utilized to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale. The ground control data meets positional accuracies necessary to support 1.0 point per 0.71 meters squared (1' GSD) data at 95% confidence level as outlined in the Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA), published by the Federal Geographic Data Committee (FGDC-STD-007.3-1998).

Section 2: Ground Control / Geodetic Control Coordinate Listings

Coordinate System: World wide/UTM

HORIZONTAL DATUM: NAD 1983 (Conus) 2011
PROJECTION: 10 North
VERTICAL DATUM: NAVD88
GEOID MODEL: GEOID18 (Conus)
UNITS: METER

Ground Control

Point No.	UTM ZONE 10 North		Ortho Height GEOID 18 (Meters)	Description
	Northing (Meters)	Easting (Meters)		
1024A_2020_CA	4042870.31	692679.48	523.14	GCP
1025_2020_CA	4055071.41	678658.68	617.93	GCP
1026_2020_CA	4053465.94	687216.14	423.15	GCP
1027_2020_CA	4058602.84	689829.33	416.65	GCP
1028_2020_CA	4052193.21	707014.58	208.89	GCP
1029_2020_CA	4056336.04	710810.52	158.84	GCP
1030_2020_CA	4061980.03	706867.70	213.50	GCP
1031_2020_CA	4061093.64	710164.22	155.74	GCP
1032_2020_CA	4059238.06	714154.57	130.41	GCP
1033_2020_CA	4058929.10	710139.39	160.59	GCP
1034_2020_CA	4061375.51	714110.33	121.40	GCP
1035_2020_CA	4069887.10	721309.44	75.95	GCP
2068_2020_CA	4053355.54	689906.89	403.27	NVA
2069_2020_CA	4054293.32	681547.36	516.74	NVA
2070_2020_CA	4061141.19	690474.93	469.76	NVA
2071_2020_CA	4065181.27	717256.09	99.86	NVA
2072_2020_CA	4043048.39	694076.30	505.23	NVA
2073_2020_CA	4052178.74	698822.70	332.22	NVA
2074_2020_CA	4039299.76	700888.22	548.59	NVA

Point No.	UTM ZONE 10 North		Ortho Height GEOID 18 (Meters)	Description
	Northing (Meters)	Easting (Meters)		
2075_2020_CA	4037368.33	704501.42	504.85	NVA
2076_2020_CA	4050639.67	704706.61	378.41	NVA
2077_2020_CA	4058395.05	708518.92	194.82	NVA
2078_2020_CA	4052557.73	693142.67	380.89	NVA
2079_2020_CA	4044127.93	687928.72	634.95	NVA
2080_2020_CA	4044527.82	685734.08	706.54	NVA
2081_2020_CA	4054471.16	689899.01	399.48	NVA
2082_2020_CA	4047315.87	693410.42	421.96	NVA
2083_2020_CA	4058577.97	711805.51	144.30	NVA
2084_2020_CA	4057411.66	712099.66	147.72	NVA
2085_2020_CA	4054243.05	707868.30	191.39	NVA
2086_2020_CA	4051295.08	702327.03	381.52	NVA
2087_2020_CA	4052137.82	694300.96	367.11	NVA
2088_2020_CA	4040855.31	696308.96	576.90	NVA
2089_2020_CA	4036718.45	708392.07	493.80	NVA
2090_2020_CA	4035128.78	709834.68	558.81	NVA
2091_2020_CA	4034199.38	708956.65	624.93	NVA
2092_2020_CA	4031912.81	707931.27	1042.31	NVA
2093_2020_CA	4030640.33	708421.09	1142.79	NVA
2094_2020_CA	4053816.27	685064.94	448.35	NVA
3055_2020_CA	4032053.00	708180.29	1052.63	VVA
3056_2020_CA	4055573.64	677358.29	641.76	VVA
3057_2020_CA	4065183.61	717231.34	99.64	VVA
3058_2020_CA	4058588.08	711824.83	143.62	VVA
3059_2020_CA	4058406.65	708499.76	195.18	VVA
3060_2020_CA	4052185.39	698808.25	332.02	VVA
3061_2020_CA	4054642.01	680369.19	557.56	VVA
3062_2020_CA	4054013.96	682986.47	487.54	VVA
3063_2020_CA	4039305.48	700880.77	548.56	VVA
3064_2020_CA	4034254.18	709010.56	621.43	VVA
3065_2020_CA	4054258.21	707891.88	190.34	VVA
3066_2020_CA	4059794.36	690127.79	445.52	VVA
3067_2020_CA	4052961.78	693135.49	381.22	VVA

Point No.	UTM ZONE 10 North		Ortho Height GEOID 18 (Meters)	Description
	Northing (Meters)	Easting (Meters)		
3068_2020_CA	4063399.87	715650.14	109.83	VVA
3069_2020_CA	4068062.31	720465.94	83.17	VVA
3070_2020_CA	4056824.35	709369.15	173.14	VVA
3071_2020_CA	4060088.88	712339.24	133.52	VVA

Geodetic Control

Point No.	UTM ZONE 10 North		Ortho Height GEOID 18 (Meters)	Description
	Northing (Meters)	Easting (Meters)		
151_2020_CA	4057641.71	712727.93	142.31	TSM
152_2020_CA	4054074.34	689887.71	399.83	TSM
153_2020_CA	4039291.90	700841.42	549.11	TSM
ANDREW 2	4062526.32	709208.02	170.73	DH6670

Coordinate System: Geodetic

HORIZONTAL DATUM: NAD 1983 (Conus)
VERTICAL DATUM: NAVD88
UNITS: Meter

Ground Control

Point No.	Geodetic Coordinates: NAD 1983 (Conus)		Ellipsoid Height (Meters)	Description
	Latitude (N)	Longitude (W)		
1024A_2020_CA	N36°30'42.48315"	W120°50'53.90739"	490.62	GCP
1025_2020_CA	N36°37'28.01626"	W121°00'07.05970"	585.57	GCP
1026_2020_CA	N36°36'30.03266"	W120°54'24.14131"	390.64	GCP
1027_2020_CA	N36°39'14.77035"	W120°52'34.44714"	384.13	GCP
1028_2020_CA	N36°35'34.02632"	W120°41'09.00479"	175.82	GCP
1029_2020_CA	N36°37'45.37144"	W120°38'32.26812"	125.53	GCP
1030_2020_CA	N36°40'51.50233"	W120°41'05.41630"	180.25	GCP
1031_2020_CA	N36°40'20.15752"	W120°38'53.57744"	122.36	GCP
1032_2020_CA	N36°39'16.78600"	W120°36'14.81907"	96.94	GCP
1033_2020_CA	N36°39'09.98914"	W120°38'56.71271"	127.25	GCP
1034_2020_CA	N36°40'26.12941"	W120°36'14.45024"	87.91	GCP
1035_2020_CA	N36°44'56.17012"	W120°31'15.80579"	42.40	GCP
2068_2020_CA	N36°36'24.53612"	W120°52'35.99788"	370.69	NVA
2069_2020_CA	N36°37'00.81438"	W120°58'11.48670"	484.35	NVA
2070_2020_CA	N36°40'36.62792"	W120°52'06.19043"	437.24	NVA
2071_2020_CA	N36°42'26.96099"	W120°34'03.93635"	66.30	NVA
2072_2020_CA	N36°30'47.24217"	W120°49'57.62758"	472.68	NVA
2073_2020_CA	N36°35'39.83041"	W120°46'38.45911"	299.42	NVA
2074_2020_CA	N36°28'40.61332"	W120°45'27.46456"	515.99	NVA
2075_2020_CA	N36°27'35.22641"	W120°43'04.21113"	472.25	NVA
2076_2020_CA	N36°34'45.44067"	W120°42'43.30577"	345.46	NVA
2077_2020_CA	N36°38'53.95447"	W120°40'02.45015"	161.56	NVA
2078_2020_CA	N36°35'56.32256"	W120°50'26.55779"	348.22	NVA
2079_2020_CA	N36°31'26.67316"	W120°54'03.67771"	602.51	NVA
2080_2020_CA	N36°31'41.18654"	W120°55'31.52170"	674.12	NVA

Point No.	Geodetic Coordinates: NAD 1983 (Conus)		Ellipsoid Height (Meters)	Description
	Latitude (N)	Longitude (W)		
2081_2020_CA	N36°37'00.72327"	W120°52'35.32227"	366.91	NVA
2082_2020_CA	N36°33'06.12781"	W120°50'20.52923"	389.37	NVA
2083_2020_CA	N36°38'57.27407"	W120°37'50.01106"	110.90	NVA
2084_2020_CA	N36°38'19.21957"	W120°37'39.33465"	114.34	NVA
2085_2020_CA	N36°36'39.82894"	W120°40'32.67858"	158.24	NVA
2086_2020_CA	N36°35'08.52147"	W120°44'18.36374"	348.62	NVA
2087_2020_CA	N36°35'41.85763"	W120°49'40.35224"	334.42	NVA
2088_2020_CA	N36°29'34.47881"	W120°48'29.93370"	544.35	NVA
2089_2020_CA	N36°27'11.13575"	W120°40'28.65036"	461.17	NVA
2090_2020_CA	N36°26'18.45352"	W120°39'32.29227"	526.23	NVA
2091_2020_CA	N36°25'49.00470"	W120°40'08.43231"	592.41	NVA
2092_2020_CA	N36°24'35.65678"	W120°40'51.78655"	1009.94	NVA
2093_2020_CA	N36°23'54.01005"	W120°40'33.36493"	1110.48	NVA
2094_2020_CA	N36°36'42.90691"	W120°55'50.37653"	415.89	NVA
3055_2020_CA	N36°24'40.00872"	W120°40'41.66067"	1020.25	VVA
3056_2020_CA	N36°37'45.18064"	W121°00'58.96804"	609.40	VVA
3057_2020_CA	N36°42'27.05711"	W120°34'04.93067"	66.09	VVA
3058_2020_CA	N36°38'57.58647"	W120°37'49.22371"	110.23	VVA
3059_2020_CA	N36°38'54.34575"	W120°40'03.20983"	161.92	VVA
3060_2020_CA	N36°35'40.05688"	W120°46'39.03395"	299.22	VVA
3061_2020_CA	N36°37'12.92905"	W120°58'58.59441"	525.19	VVA
3062_2020_CA	N36°36'50.76297"	W120°57'13.82550"	455.13	VVA
3063_2020_CA	N36°28'40.80440"	W120°45'27.75820"	515.95	VVA
3064_2020_CA	N36°25'50.73962"	W120°40'06.21590"	588.91	VVA
3065_2020_CA	N36°36'40.30191"	W120°40'31.71546"	157.19	VVA
3066_2020_CA	N36°39'53.19855"	W120°52'21.37054"	413.00	VVA
3067_2020_CA	N36°36'09.43149"	W120°50'26.48145"	348.56	VVA
3068_2020_CA	N36°41'30.51678"	W120°35'10.41593"	76.30	VVA
3069_2020_CA	N36°43'57.71173"	W120°31'51.68703"	49.61	VVA
3070_2020_CA	N36°38'02.35020"	W120°39'29.77751"	139.87	VVA
3071_2020_CA	N36°39'45.83884"	W120°37'27.02729"	100.08	VVA

Geodetic Control

Point No.	Geodetic Coordinates: NAD 1983 (Conus)		Ellipsoid Height (Meters)	Description
	Latitude (N)	Longitude (W)		
151_2020_CA	N36°38'26.17483"	W120°37'13.82616"	108.91	TSM
152_2020_CA	N36°36'47.86198"	W120°52'36.12974"	367.26	TSM
153_2020_CA	N36°28'40.39350"	W120°45'29.35122"	516.50	TSM
ANDREW 2	N36°41'07.37337"	W120°39'30.66001"	137.37	DH6670

Section 3: Ground/Geodetic Control Logs and Photos

This section contains the station recovery information sheets and photographs regarding the ground control positions established for the project. The stations appear as they are ordered in the final coordinate listing of Section 2.

The data is assembled on the following pages.

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1024A_2020_CA	4042870.31	692679.48	523.14

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°30'42.48315"	W120°50'53.90739"	490.62

Location Photo

NORTH

1024A_2020_CA, 3N, 20200111

1024A_2020_CA, 3E, 20200111

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1025_2020_CA	4055071.41	678658.68	617.93
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
GCP	N36°37'28.01626"	W121°00'07.05970"	585.57

Location Photo

NORTH

1025_2020_CA, 3SW, 20200113

1025_2020_CA, 3SE, 20200113

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1026_2020_CA	4053465.94	687216.14	423.15

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°36'30.03266"	W120°54'24.14131"	390.64

Location Photo

NORTH

1026_2020_CA, 3W, 20200109

1026_2020_CA, 3N, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

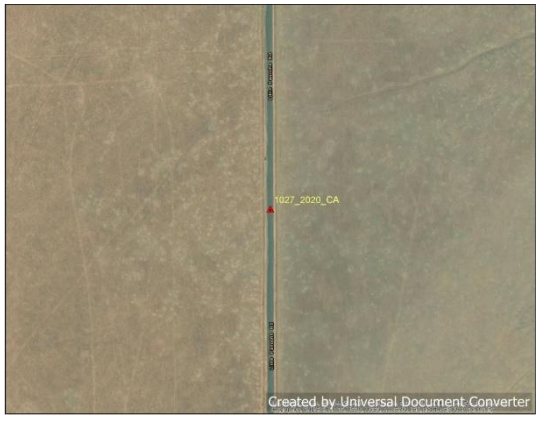
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1027_2020_CA	4058602.84	689829.33	416.65

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°39'14.77035"	W120°52'34.44714"	384.13

Location Photo

NORTH



1027_2020_CA, 3W, 20200109

1027_2020_CA, 3S, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1028_2020_CA	4052193.21	707014.58	208.89

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°35'34.02632"	W120°41'09.00479"	175.82

Location Photo

NORTH

1028_2020_CA, 3SW, 20200108

1028_2020_CA, 3NW, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

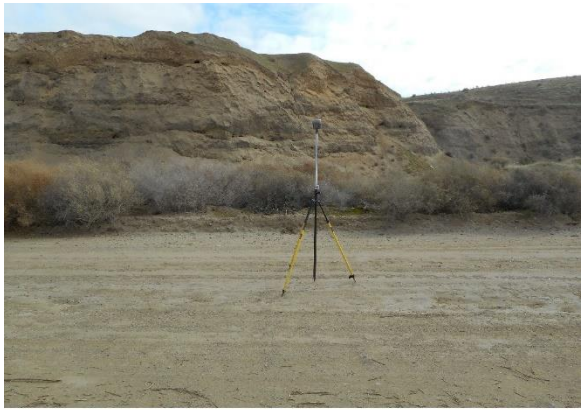
Station ID	Northing (m)	Easting (m)	Elevation (m)
1029_2020_CA	4056336.04	710810.52	158.84

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°37'45.37144"	W120°38'32.26812"	125.53

Location Photo

NORTH

1029_2020_CA, 3S, 20200108



1029_2020_CA, 3E, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1030_2020_CA	4061980.03	706867.70	213.50

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°40'51.50233"	W120°41'05.41630"	180.25

Location Photo

NORTH

1030_2020_CA, 3N, 20200107

1030_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

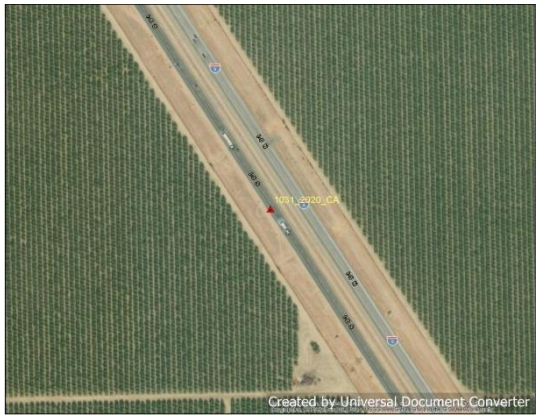
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1031_2020_CA	4061093.64	710164.22	155.74

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°40'20.15752"	W120°38'53.57744"	122.36

Location Photo

NORTH



1031_2020_CA, 3SE, 20200108

1031_2020_CA, 3NE, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1032_2020_CA	4059238.06	714154.57	130.41

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°39'16.78600"	W120°36'14.81907"	96.94

Location Photo

NORTH

1032_2020_CA, 3N, 20200107

1032_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1033_2020_CA	4058929.10	710139.39	160.59

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°39'09.98914"	W120°38'56.71271"	127.25

Location Photo

NORTH

1033_2020_CA, 3W, 20200107

1033_2020_CA, 3N, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1034_2020_CA	4061375.51	714110.33	121.40

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
GCP	N36°40'26.12941"	W120°36'14.45024"	87.91

Location Photo

NORTH

1034_2020_CA, 3S, 20200107

1034_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
1035_2020_CA	4069887.10	721309.44	75.95
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
GCP	N36°44'56.17012"	W120°31'15.80579"	42.40

Location Photo

NORTH

1035_2020_CA, 3W, 20200107

1035_2020_CA, 3N, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2068_2020_CA	4053355.54	689906.89	403.27

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°36'24.53612"	W120°52'35.99788"	370.69

Location Photo

NORTH

2068_2020_CA, 3W, 20200109

2068_2020_CA, 3S, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2069_2020_CA	4054293.32	681547.36	516.74

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°37'00.81438"	W120°58'11.48670"	484.35

Location Photo

NORTH

2069_2020_CA, 3W, 20200109

2069_2020_CA, 3S, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2070_2020_CA	4061141.19	690474.93	469.76

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°40'36.62792"	W120°52'06.19043"	437.24

Location Photo

NORTH

2070_2020_CA, 3SW, 20200109

2070_2020_CA, 3NW, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

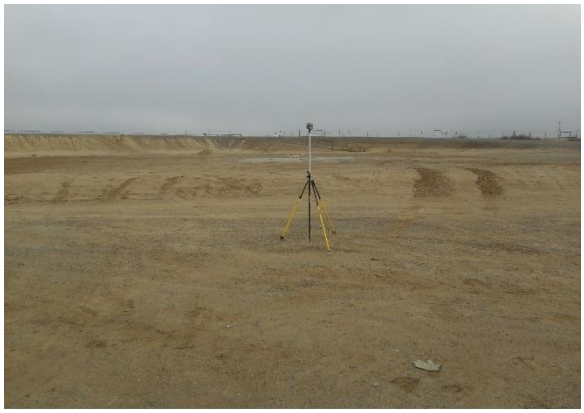
Station ID	Northing (m)	Easting (m)	Elevation (m)
2071_2020_CA	4065181.27	717256.09	99.86

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°42'26.96099"	W120°34'03.93635"	66.30

Location Photo

NORTH

2071_2020_CA, 3N, 20200107



2071_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2072_2020_CA	4043048.39	694076.30	505.23

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°30'47.24217"	W120°49'57.62758"	472.68

Location Photo

NORTH

2072_2020_CA, 3N, 20200110

2072_2020_CA, 3E, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2073_2020_CA	4052178.74	698822.70	332.22

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°35'39.83041"	W120°46'38.45911"	299.42

Location Photo

NORTH

2073_2020_CA, 3S, 20200108

2073_2020_CA, 3E, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2074_2020_CA	4039299.76	700888.22	548.59

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°28'40.61332"	W120°45'27.46456"	515.99

Location Photo

NORTH

2074_2020_CA, 3N, 20200110

2074_2020_CA, 3E, 20200110

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2075_2020_CA	4037368.33	704501.42	504.85
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
NVA	N36°27'35.22641"	W120°43'04.21113"	472.25

Location Photo

NORTH

2075_2020_CA, 3SW, 20200110

2075_2020_CA, 3SE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2076_2020_CA	4050639.67	704706.61	378.41

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°34'45.44067"	W120°42'43.30577"	345.46

Location Photo

NORTH

2076_2020_CA, 3W, 20200108

2076_2020_CA, 3N, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2077_2020_CA	4058395.05	708518.92	194.82

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°38'53.95447"	W120°40'02.45015"	161.56

Location Photo

NORTH

2077_2020_CA, 3N, 20200107

2077_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2078_2020_CA	4052557.73	693142.67	380.89

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°35'56.32256"	W120°50'26.55779"	348.22

Location Photo

NORTH

2078_2020_CA, 3W, 20200109

2078_2020_CA, 3S, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2079_2020_CA	4044127.93	687928.72	634.95

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°31'26.67316"	W120°54'03.67771"	602.51

Location Photo

NORTH

2079_2020_CA, 3NW, 20200111

2079_2020_CA, 3NE, 20200111

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2080_2020_CA	4044527.82	685734.08	706.54

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°31'41.18654"	W120°55'31.52170"	674.12

Location Photo

NORTH

2080_2020_CA, 3SW, 20200111

2080_2020_CA, 3NW, 20200111

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2081_2020_CA	4054471.16	689899.01	399.48

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°37'00.72327"	W120°52'35.32227"	366.91

Location Photo

NORTH

2081_2020_CA, 3W, 20200109

2081_2020_CA, 3S, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2082_2020_CA	4047315.87	693410.42	421.96

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°33'06.12781"	W120°50'20.52923"	389.37

Location Photo

NORTH

2082_2020_CA, 3N, 20200109

2082_2020_CA, 3E, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2083_2020_CA	4058577.97	711805.51	144.30

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°38'57.27407"	W120°37'50.01106"	110.90

Location Photo

NORTH

2083_2020_CA, 3SE, 20200108

2083_2020_CA, 3NE, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2084_2020_CA	4057411.66	712099.66	147.72

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°38'19.21957"	W120°37'39.33465"	114.34

Location Photo

NORTH

2084_2020_CA, 3SW, 20200108

2084_2020_CA, 3NW, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

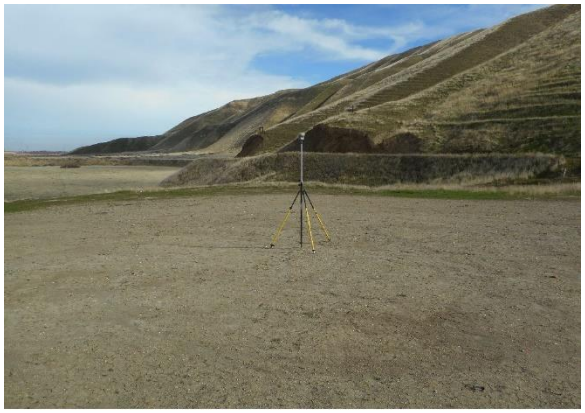
Station ID	Northing (m)	Easting (m)	Elevation (m)
2085_2020_CA	4054243.05	707868.30	191.39

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°36'39.82894"	W120°40'32.67858"	158.24

Location Photo

NORTH

2085_2020_CA, 3W, 20200108



2085_2020_CA, 3E, 20200108

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2086_2020_CA	4051295.08	702327.03	381.52
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
NVA	N36°35'08.52147"	W120°44'18.36374"	348.62

Location Photo

NORTH

2086_2020_CA, 3W, 20200108

2086_2020_CA, 3N, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2087_2020_CA	4052137.82	694300.96	367.11

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°35'41.85763"	W120°49'40.35224"	334.42

Location Photo

NORTH

2087_2020_CA, 3N, 20200109

2087_2020_CA, 3E, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2088_2020_CA	4040855.31	696308.96	576.90

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°29'34.47881"	W120°48'29.93370"	544.35

Location Photo

NORTH

2088_2020_CA, 3NW, 20200110

2088_2020_CA, 3NE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2089_2020_CA	4036718.45	708392.07	493.80

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°27'11.13575"	W120°40'28.65036"	461.17

Location Photo

NORTH

2089_2020_CA, 3SE, 20200110

2089_2020_CA, 3NE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

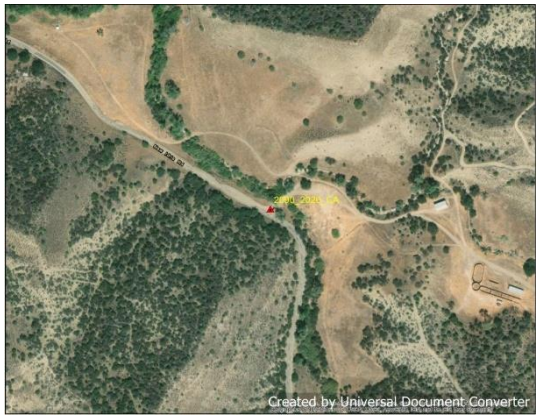
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2090_2020_CA	4035128.78	709834.68	558.81

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°26'18.45352"	W120°39'32.29227"	526.23

Location Photo

NORTH



2090_2020_CA, 3SE, 20200110

2090_2020_CA, 3NE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2091_2020_CA	4034199.38	708956.65	624.93
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
NVA	N36°25'49.00470"	W120°40'08.43231"	592.41

Location Photo

NORTH

2091_2020_CA, 3SW, 20200110

2091_2020_CA, 3NW, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2092_2020_CA	4031912.81	707931.27	1042.31

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°24'35.65678"	W120°40'51.78655"	1009.94

Location Photo

NORTH

2092_2020_CA, 3S, 20200110

2092_2020_CA, 3E, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2093_2020_CA	4030640.33	708421.09	1142.79

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
NVA	N36°23'54.01005"	W120°40'33.36493"	1110.48

Location Photo

NORTH

2093_2020_CA, 3N, 20200110

2093_2020_CA, 3E, 20200110

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
2094_2020_CA	4053816.27	685064.94	448.35
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
NVA	N36°36'42.90691"	W120°55'50.37653"	415.89

Location Photo

NORTH

2094_2020_CA, 3W, 20200109

2094_2020_CA, 3N, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3055_2020_CA	4032053.00	708180.29	1052.63

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°24'40.00872"	W120°40'41.66067"	1020.25

Location Photo

NORTH

3055_2020_CA, 3SE, 20200110

3055_2020_CA, 3NE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3056_2020_CA	4055573.64	677358.29	641.76

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°37'45.18064"	W121°00'58.96804"	609.40

Location Photo

NORTH

3056_2020_CA, 3SW, 20200113

3056_2020_CA, 3SE, 20200113

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3057_2020_CA	4065183.61	717231.34	99.64

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°42'27.05711"	W120°34'04.93067"	66.09

Location Photo

NORTH

3057_2020_CA, 3W, 20200107

3057_2020_CA, 3N, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3058_2020_CA	4058588.08	711824.83	143.62

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°38'57.58647"	W120°37'49.22371"	110.23

Location Photo

NORTH

3058_2020_CA, 3SE, 20200108

3058_2020_CA, 3NE, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3059_2020_CA	4058406.65	708499.76	195.18

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°38'54.34575"	W120°40'03.20983"	161.92

Location Photo

NORTH

3059_2020_CA, 3N, 20200107

3059_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3060_2020_CA	4052185.39	698808.25	332.02

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°35'40.05688"	W120°46'39.03395"	299.22

Location Photo

NORTH

3060_2020_CA, 3W, 20200108

3060_2020_CA, 3N, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3061_2020_CA	4054642.01	680369.19	557.56

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°37'12.92905"	W120°58'58.59441"	525.19

Location Photo

NORTH

3061_2020_CA, 3N, 20200109

3061_2020_CA, 3E, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3062_2020_CA	4054013.96	682986.47	487.54

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°36'50.76297"	W120°57'13.82550"	455.13

Location Photo

NORTH

3062_2020_CA, 3N, 20200113

3062_2020_CA, 3E, 20200113

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

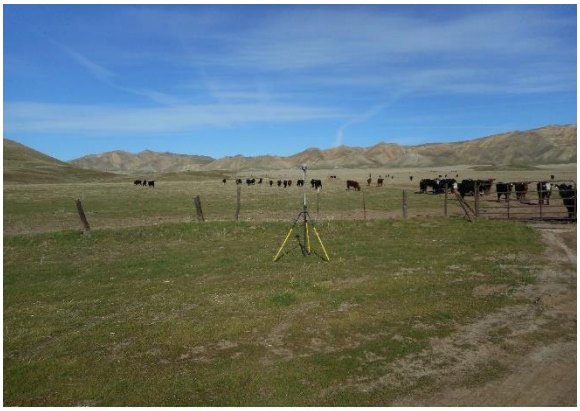
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3063_2020_CA	4039305.48	700880.77	548.56

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°28'40.80440"	W120°45'27.75820"	515.95

Location Photo

NORTH



3063_2020_CA, 3N, 20200110

3063_2020_CA, 3E, 20200110

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3064_2020_CA	4034254.18	709010.56	621.43
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
VVA	N36°25'50.73962"	W120°40'06.21590"	588.91

Location Photo

NORTH

3064_2020_CA, 3SW, 20200110

3064_2020_CA, 3SE, 20200110

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3065_2020_CA	4054258.21	707891.88	190.34

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°36'40.30191"	W120°40'31.71546"	157.19

Location Photo

NORTH

3065_2020_CA, 3S, 20200108

3065_2020_CA, 3E, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3066_2020_CA	4059794.36	690127.79	445.52

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°39'53.19855"	W120°52'21.37054"	413.00

Location Photo

NORTH

3066_2020_CA, 3S, 20200109

3066_2020_CA, 3E, 20200109

GCP OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3067_2020_CA	4052961.78	693135.49	381.22
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
VVA	N36°36'09.43149"	W120°50'26.48145"	348.56

Location Photo

NORTH

3067_2020_CA, 3W, 20200109

3067_2020_CA, 3N, 20200109

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3068_2020_CA	4063399.87	715650.14	109.83

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°41'30.51678"	W120°35'10.41593"	76.30

Location Photo

NORTH

3068_2020_CA, 3W, 20200107

3068_2020_CA, 3N, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3069_2020_CA	4068062.31	720465.94	83.17

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°43'57.71173"	W120°31'51.68703"	49.61

Location Photo

NORTH

3069_2020_CA, 3N, 20200107

3069_2020_CA, 3E, 20200107

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

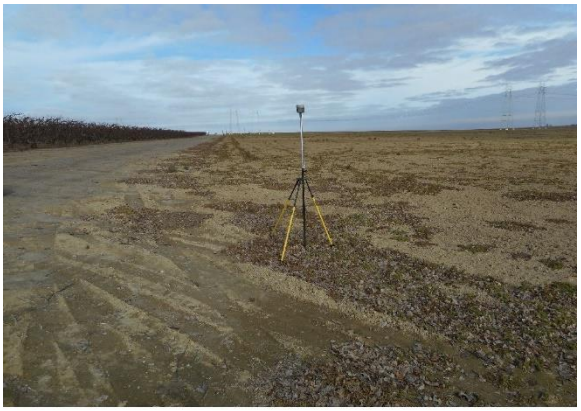
Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3070_2020_CA	4056824.35	709369.15	173.14

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°38'02.35020"	W120°39'29.77751"	139.87

Location Photo

NORTH



3070_2020_CA, 3N, 20200108

3070_2020_CA, 3E, 20200108

GCP OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
3071_2020_CA	4060088.88	712339.24	133.52

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
VVA	N36°39'45.83884"	W120°37'27.02729"	100.08

Location Photo

NORTH

3071_2020_CA, 3W, 20200107

3071_2020_CA, 3S, 20200107

CONTROL OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

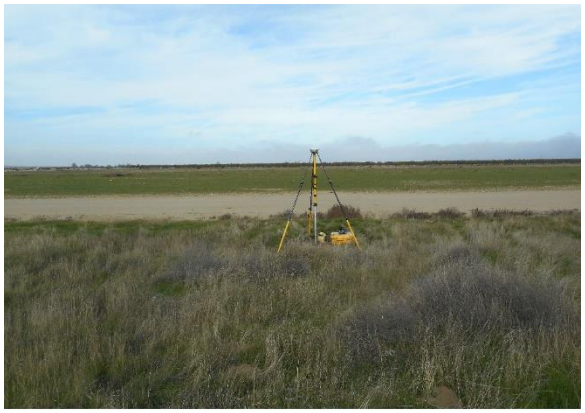
Station ID	Northing (m)	Easting (m)	Elevation (m)
151_2020_CA	4057641.71	712727.93	142.31
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
TSM	N36°38'26.17483"	W120°37'13.82616"	108.91

Location Photo

NORTH

151_2020_CA, 1, 20200107

151_2020_CA, 3NE, 20200107



151_2020_CA, 3NW, 20200107

CONTROL OBSERVATION LOG

Project Number	Project Name		Company	Field Operator
80591	CA FEMA R9 PANOCHE		Woolpert Inc.	BC
Coordinate System	**Hor. Datum**	**Ver. Datum**	**Zone**	**Geoid**
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
152_2020_CA	4054074.34	689887.71	399.83
Point Type	**Latitude (Global)**	**Longitude (Global)**	**Ellipsoid Height (m)**
TSM	N36°36'47.86198"	W120°52'36.12974"	367.26

Location Photo

NORTH

152_2020_CA, 1, 20200109

152_2020_CA, 3N, 20200109

152_2020_CA, 3S, 20200109

CONTROL OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
153_2020_CA	4039291.90	700841.42	549.11

Point Type	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
TSM	N36°28'40.39350"	W120°45'29.35122"	516.50

Location Photo

NORTH

153_2020_CA, 1, 20200110

153_2020_CA, 3NE, 20200110

153_2020_CA, 3NW, 20200110

CONTROL OBSERVATION LOG

Project Number	Project Name	Company	Field Operator
80591	CA FEMA R9 PANOCHE	Woolpert Inc.	BC

Coordinate System	Hor. Datum	Ver. Datum	Zone	Geoid
World wide/UTM	NAD 1983 Conus (2011)	NAVD88	10 North	GEOID18 (Conus)

Station ID	Northing (m)	Easting (m)	Elevation (m)
ANDREW 2	4062526.32	709208.02	170.73

PID	Latitude (Global)	Longitude (Global)	Ellipsoid Height (m)
DH6670	N36°41'07.37337"	W120°39'30.66001"	137.37

Location Photo

NORTH

DH6670-ANDREW_2-1-20200107

DH6670-ANDREW_2-3NW-20200107

DH6670-ANDREW_2-3NE-20200107

Section 4: Geodetic Control Information and Resources

This section contains the solutions returned from Online Positioning User Service (OPUS) solutions for the temporary control stations and the NGS datasheet for the control stations observed that were used to establish 3-dimensional coordinates for each of the newly established ground control survey points for the project.

Station 151

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:07 PM
To: Kuxhausen, Daniel
Subject: OPUS solution : 151_2020_CA TR3203790378227
Attachments: 151_007u.20o.xml

FILE: 151_2020_CA TR3203790378227

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7C2b4040c1fda24c919e0908d79f76b16a%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153204435809121&sdata=zLLR%2B21pd5osmPFCmm742i08jp5iVjMgDmjqrE8nH0I%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 151_007u.20o TIME: 20:07:09 UTC

SOFTWARE: page5 1801.18 master97.pl 160321 START: 2020/01/07 20:06:00
EPHEMERIS: igr20872.eph [rapid] STOP: 2020/01/08 01:02:00
NAV FILE: brdc0070.20n OBS USED: 12830 / 13117 : 98%
ANT NAME: TRMR8_GNSS NONE # FIXED AMB: 52 / 52 : 100%
ARP HEIGHT: 2 OVERALL RMS: 0.012(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.0190)

X:	-2609898.002(m)	0.006(m)	-2609898.980(m)	0.006(m)
Y:	-4409493.715(m)	0.005(m)	-4409492.323(m)	0.005(m)
Z:	3785530.548(m)	0.005(m)	3785530.499(m)	0.005(m)

LAT:	36 38 26.17480	0.002(m)	36 38 26.18704	0.002(m)
E LON:	239 22 46.17383	0.007(m)	239 22 46.11140	0.007(m)
W LON:	120 37 13.82617	0.007(m)	120 37 13.88860	0.007(m)
EL HGT:	108.910(m)	0.005(m)	108.319(m)	0.005(m)
ORTHO HGT:	142.316(m)	0.050(m) [NAVD88 (Computed using GEOID18)]		

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4057641.712	646279.176
Easting (X) [meters]	712727.931	1855095.355
Convergence [degrees]	1.42060000	-0.96677500
Point Scale	1.00015755	0.99994079
Combined Factor	1.00014046	0.99992370

1

US NATIONAL GRID DESIGNATOR: 10SGF1272757641(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DN7580	P288 MOONEYCYN_CN2006 CORS ARP	N360824.731	W1205243.993	60174.7
DN5637	MNMC MNMC_SCGN_CN2001 CORS ARP	N355810.084	W1202602.535	76344.8
DH9030	P301 LILPANOCHECN2004 CORS ARP	N364822.635	W1204434.939	21398.3

NEAREST NGS PUBLISHED CONTROL POINT

GU0084	EYE	N363822.716	W1203720.540	197.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:07 PM
To: Kuxhausen, Daniel
Subject: OPUS solution : 151_2020_CA TR3203563359806
Attachments: 151_008r.20o.xml

FILE: 151_2020_CA TR3203563359806

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7C74f72f406bc64e08a1c208d79f76a9a9%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153204333028025&sdata=NvkNfFgzxeoul36rM9i8Osf7X2DbWMkq1%2BQgMgULxnU%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 151_008r.20o TIME: 20:06:55 UTC

SOFTWARE: page5 1801.18 master94.pl 160321 START: 2020/01/08 17:25:00
EPHEMERIS: igr20873.eph [rapid] STOP: 2020/01/09 01:05:00
NAV FILE: brdc0080.20n OBS USED: 20815 / 21251 : 98%
ANT NAME: TRMR8_GNSS NONE # FIXED AMB: 73 / 78 : 94%
ARP HEIGHT: 2 OVERALL RMS: 0.012(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.0215)

X:	-2609897.998(m)	0.004(m)	-2609898.976(m)	0.004(m)
Y:	-4409493.711(m)	0.006(m)	-4409492.319(m)	0.006(m)
Z:	3785530.547(m)	0.007(m)	3785530.498(m)	0.007(m)

LAT:	36 38 26.17487	0.003(m)	36 38 26.18714	0.003(m)
E LON:	239 22 46.17386	0.005(m)	239 22 46.11144	0.005(m)
W LON:	120 37 13.82614	0.005(m)	120 37 13.88856	0.005(m)
EL HGT:	108.905(m)	0.007(m)	108.314(m)	0.007(m)
ORTHO HGT:	142.311(m)	0.051(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4057641.714	646279.178
Easting (X) [meters]	712727.931	1855095.356
Convergence [degrees]	1.42060000	-0.96677500
Point Scale	1.00015755	0.99994079
Combined Factor	1.00014046	0.99992370

1

US NATIONAL GRID DESIGNATOR: 10SGF1272757641(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DH4087	P287 EMERYRANCHCN2005 CORS ARP	N360129.393	W1204152.142	68686.1
DH9030	P301 LILPANOCHECN2004 CORS ARP	N364822.635	W1204434.939	21398.3
DN7580	P288 MOONEYCYN_CN2006 CORS ARP	N360824.731	W1205243.993	60174.7

NEAREST NGS PUBLISHED CONTROL POINT

GU0084	EYE	N363822.716	W1203720.540	197.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Station 152

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:09 PM
To: Kuxhausen, Daniel
Subject: OPUS solution : 152_2020_CA TR3204540569050
Attachments: 152_009t.20o.xml

FILE: 152_2020_CA TR3204540569050

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7Cf6c3d4a0754048d2d1ce08d79f76fc02%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153205703870274&sdata=TNZsiSdg7cMuFtxwcS4iT6GpKu1pWABz%2F%2Fo577HjMYU%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 152_009t.20o TIME: 20:08:32 UTC

SOFTWARE: page5 1801.18 master52.pl 160321 START: 2020/01/09 19:10:00
EPHEMERIS: igr20874.eph [rapid] STOP: 2020/01/09 22:32:00
NAV FILE: brdc0090.20n OBS USED: 8087 / 8473 : 95%
ANT NAME: TRMR8_GNSS NONE # FIXED AMB: 48 / 50 : 96%
ARP HEIGHT: 2 OVERALL RMS: 0.013(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.0242)

X:	-2630622.988(m)	0.013(m)	-2630623.956(m)	0.013(m)
Y:	-4399509.416(m)	0.015(m)	-4399508.021(m)	0.015(m)
Z:	3783252.496(m)	0.021(m)	3783252.459(m)	0.021(m)

LAT:	36 36 47.86196	0.005(m)	36 36 47.87453	0.005(m)
E LON:	239 7 23.87035	0.004(m)	239 7 23.80811	0.004(m)
W LON:	120 52 36.12965	0.004(m)	120 52 36.19189	0.004(m)
EL HGT:	367.267(m)	0.028(m)	366.682(m)	0.028(m)
ORTHO HGT:	399.845(m)	0.057(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4054074.340	643666.525
Easting (X) [meters]	689887.717	1832130.042
Convergence [degrees]	1.26673611	-1.11961667
Point Scale	1.00004425	0.99994079
Combined Factor	0.99998661	0.99988316

1

US NATIONAL GRID DESIGNATOR: 10SFF8988754074(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DH9030	P301 LILPANOCHECN2004 CORS ARP	N364822.635	W1204434.939	24524.0
DN5648	P237 MOUNTOLDS_CN2007 CORS ARP	N363813.271	W1212312.535	45709.0
DN7580	P288 MOONEYCYN_CN2006 CORS ARP	N360824.731	W1205243.993	52500.3

NEAREST NGS PUBLISHED CONTROL POINT

GU0591	A 663	N363701.000	W1205236.000	405.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:09 PM
To: Kuxhausen, Daniel
Subject: OPUS solution : 152_2020_CA TR3204319659477
Attachments: 152_011q.20o.xml

FILE: 152_2020_CA TR3204319659477

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7C0b352cdeee2e45674adf08d79f76df3e%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153205208111420&sdata=%2B2CFmwTy2GY6d8A9b1DL4N%2BFZvDi37J1Yv1It8JE3RU%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 152_011q.20o TIME: 20:08:25 UTC

SOFTWARE: page5 1801.18 master72.pl 160321 START: 2020/01/11 16:29:00
EPHEMERIS: igr20876.eph [rapid] STOP: 2020/01/11 21:00:00
NAV FILE: brdc0110.20n OBS USED: 12157 / 12580 : 97%
ANT NAME: TRMR8_GNSS NONE # FIXED AMB: 41 / 44 : 93%
ARP HEIGHT: 2 OVERALL RMS: 0.012(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.0295)

X:	-2630622.983(m)	0.006(m)	-2630623.951(m)	0.006(m)
Y:	-4399509.398(m)	0.007(m)	-4399508.003(m)	0.007(m)
Z:	3783252.485(m)	0.004(m)	3783252.448(m)	0.004(m)

LAT:	36 36 47.86200	0.005(m)	36 36 47.87460	0.005(m)
E LON:	239 7 23.87017	0.004(m)	239 7 23.80793	0.004(m)
W LON:	120 52 36.12983	0.004(m)	120 52 36.19207	0.004(m)
EL HGT:	367.246(m)	0.008(m)	366.661(m)	0.008(m)
ORTHO HGT:	399.824(m)	0.051(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4054074.341	643666.526
Easting (X) [meters]	689887.713	1832130.038
Convergence [degrees]	1.26673611	-1.11961667
Point Scale	1.00004425	0.99994079
Combined Factor	0.99998662	0.99988316

1

US NATIONAL GRID DESIGNATOR: 10SFF8988754074(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DN7580	P288 MOONEYCYN_CN2006 CORS ARP	N360824.731	W1205243.993	52500.3
DN5648	P237 MOUNTOLDS_CN2007 CORS ARP	N363813.271	W1212312.535	45709.0
DH9030	P301 LILPANOCHECN2004 CORS ARP	N364822.635	W1204434.939	24524.0

NEAREST NGS PUBLISHED CONTROL POINT

GU0591	A 663	N363701.000	W1205236.000	405.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Station 153

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:11 PM
To: Kuxhausen, Daniel
Subject: OPUS solution : 153_2020_CA TR3205466734999
Attachments: 153_010t.20o.xml

FILE: 153_2020_CA TR3205466734999

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7C15bdc595d26f48690bc208d79f774020%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153206841223713&sdata=4X5%2FnKfuqZVWW3bozvn0Ce%2F6%2F6K%2F2SIscBBlm3b1894%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 153_010t.20o TIME: 20:09:50 UTC

SOFTWARE: page5 1801.18 master57.pl 160321 START: 2020/01/10 19:27:00
EPHEMERIS: igr20875.eph [rapid] STOP: 2020/01/10 23:25:00
NAV FILE: brdc0100.20n OBS USED: 9244 / 10204 : 91%
ANT NAME: TRMR8_GNSS NONE # FIXED AMB: 46 / 47 : 98%
ARP HEIGHT: 2 OVERALL RMS: 0.012(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.0270)

X:	-2626151.942(m)	0.008(m)	-2626152.905(m)	0.008(m)
Y:	-4412735.399(m)	0.007(m)	-4412734.002(m)	0.007(m)
Z:	3771268.813(m)	0.002(m)	3771268.778(m)	0.002(m)

LAT:	36 28 40.39349	0.004(m)	36 28 40.40620	0.004(m)
E LON:	239 14 30.64866	0.006(m)	239 14 30.58674	0.006(m)
W LON:	120 45 29.35134	0.006(m)	120 45 29.41326	0.006(m)
EL HGT:	516.514(m)	0.008(m)	515.924(m)	0.008(m)
ORTHO HGT:	549.122(m)	0.051(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4039291.897	628443.142
Easting (X) [meters]	700841.416	1842457.958
Convergence [degrees]	1.33325278	-1.04889167
Point Scale	1.00009700	0.99994408
Combined Factor	1.00001594	0.99986303

1

US NATIONAL GRID DESIGNATOR: 10SGF0084139291(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DN5648	P237 MOUNTOLDS_CN2007 CORS ARP	N363813.271	W1212312.535	58992.1
DN7580	P288 MOONEYCYN_CN2006 CORS ARP	N360824.731	W1205243.993	39011.1
DH4087	P287 EMERYRANCHCN2005 CORS ARP	N360129.393	W1204152.142	50568.5

NEAREST NGS PUBLISHED CONTROL POINT

GU3545	GRISWOLD	N363012.293	W1204344.447	3852.5

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Kuxhausen, Daniel

From: opus <opus@ngs.noaa.gov>
Sent: Wednesday, January 22, 2020 1:11 PM
To: Kuxhausen, Daniel
Subject: OPUS-RS solution : 153_2020_CA TR3204939300994
Attachments: 153_010x.20o.xml

FILE: 153_2020_CA TR3204939300994

NGS OPUS-RS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cdaniel.kuxhausen%40woolpert.com%7C42dd6cd5e229426c9d4508d79f7745cb%7C987179e81c49493a88e806d464695b5c%7C0%7C0%7C637153206932715130&sdata=jUNUPa8Q5fwKEo485Bt5ppACQmYYuvgqatppaymVnnQ%3D&reserved=0

USER: daniel.kuxhausen@woolpert.com DATE: January 22, 2020
RINEX FILE: 153_010x.20o TIME: 20:10:51 UTC

SOFTWARE: rsgps 1.38 RS72.prl 1.99.3 START: 2020/01/10 23:55:00
EPHEMERIS: igr20875.eph [rapid] STOP: 2020/01/11 01:27:00
NAV FILE: brdc0100.20n OBS USED: 8532 / 9540 : 89%
ANT NAME: TRMR8_GNSS NONE QUALITY IND. 39.01/ 80.57
ARP HEIGHT: 2 NORMALIZED RMS: 0.248

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.02740)

X:	-2626151.926(m)	0.009(m)	-2626152.890(m)	0.009(m)
Y:	-4412735.384(m)	0.017(m)	-4412733.987(m)	0.017(m)
Z:	3771268.800(m)	0.016(m)	3771268.765(m)	0.016(m)

LAT:	36 28 40.39352	0.004(m)	36 28 40.40627	0.004(m)
E LON:	239 14 30.64891	0.004(m)	239 14 30.58692	0.004(m)
W LON:	120 45 29.35109	0.004(m)	120 45 29.41308	0.004(m)
EL HGT:	516.490(m)	0.024(m)	515.900(m)	0.024(m)
ORTHO HGT:	549.098(m)	0.038(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 10))	STATE PLANE COORDINATES (SPC (0404 CA 4))
Northing (Y) [meters]	4039291.898	628443.143
Easting (X) [meters]	700841.422	1842457.965
Convergence [degrees]	1.33325278	-1.04889167
Point Scale	1.00009700	0.99994408
Combined Factor	1.00001594	0.99986303

1

US NATIONAL GRID DESIGNATOR: 10SGF0084139291(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DK6390	MUSB MUSICK MOUNTAIN CORS ARP	N371011.773	W1191833.611	150384.2
DH4087	P287 EMERYRANCHCN2005 CORS ARP	N360129.393	W1204152.142	50568.5
DH7214	P284 AVILARANCHCN2005 CORS ARP	N355559.724	W1205424.587	61899.6
DN5648	P237 MOUNTOLDS_CN2007 CORS ARP	N363813.271	W1212312.535	58992.1
DM6186	P572 SHADEQUARTCS2006 CORS ARP	N363507.843	W1185716.494	161974.9
DH9027	P282 GOLDHILL__CN2004 CORS ARP	N355016.098	W1202042.718	80163.0
DG8341	P295 CHIMNEYRR_CS2004 CORS ARP	N354149.465	W1205032.527	86977.6
DH7211	P242 FRAZIERAIRCN2004 CORS ARP	N365714.141	W1212747.407	82211.9
AF9652	CMBB COLUMBIA COLLEGE CORS ARP	N380203.021	W1202309.693	175857.6

NEAREST NGS PUBLISHED CONTROL POINT

GU3545	GRISWOLD	N363012.293	W1204344.447	3852.5

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

```
1        National Geodetic Survey,   Retrieval Date = FEBRUARY 27, 2020
 DH6670 ***********************************************************************
 DH6670  HT_MOD      -  This is a Height Modernization Survey Station.
 DH6670  DESIGNATION -  ANDREW 2
 DH6670  PID         -  DH6670
 DH6670  STATE/COUNTY-  CA/FRESNO
 DH6670  COUNTRY     -  US
 DH6670  USGS QUAD   -  CHOUNET RANCH (2018)
 DH6670
 DH6670                        *CURRENT SURVEY CONTROL
 DH6670  ______________________________________________________________________
 DH6670* NAD 83(2011) POSITION- 36 41 07.37337(N) 120 39 30.66001(W)   ADJUSTED
 DH6670* NAD 83(2011) ELLIP HT-   137.373 (meters)        (06/27/12)   ADJUSTED
 DH6670* NAD 83(2011) EPOCH   -  2010.00
 DH6670* NAVD 88 ORTHO HEIGHT -   170.73  (meters)      560.1   (feet) GPS OBS
 DH6670  ______________________________________________________________________
 DH6670  NAVD 88 orthometric height was determined with geoid model    GEOID03
 DH6670  GEOID HEIGHT    -        -33.306 (meters)                     GEOID03
 DH6670  GEOID HEIGHT    -        -33.367 (meters)                     GEOID18
 DH6670  NAD 83(2011) X  - -2,611,321.302 (meters)                     COMP
 DH6670  NAD 83(2011) Y  - -4,405,228.655 (meters)                     COMP
 DH6670  NAD 83(2011) Z  -  3,789,533.566 (meters)                     COMP
 DH6670  LAPLACE CORR    -         -5.99  (seconds)                    DEFLEC18
 DH6670
 DH6670  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 DH6670  Standards:
 DH6670         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 DH6670            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 DH6670  ------------------------------------------------------------------
 DH6670  NETWORK    0.46   0.80           0.21   0.16   0.41      0.14453626
 DH6670  ------------------------------------------------------------------
 DH6670  Click here for local accuracies and other accuracy information.
 DH6670
 DH6670
 DH6670.The horizontal coordinates were established by GPS observations
 DH6670.and adjusted by the National Geodetic Survey in June 2012.
 DH6670
 DH6670.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
 DH6670.been affixed to the stable North American tectonic plate. See
 DH6670.NA2011 for more information.
 DH6670
 DH6670.The horizontal coordinates are valid at the epoch date displayed above
 DH6670.which is a decimal equivalence of Year/Month/Day.
 DH6670
 DH6670.The orthometric height was determined by GPS observations and a
 DH6670.high-resolution geoid model using precise GPS observation and
 DH6670.processing techniques.
 DH6670
 DH6670.Significant digits in the geoid height do not necessarily reflect accuracy.
 DH6670.GEOID18 height accuracy estimate available here.
 DH6670
 DH6670.Click photographs - Photos may exist for this station.
 DH6670
```

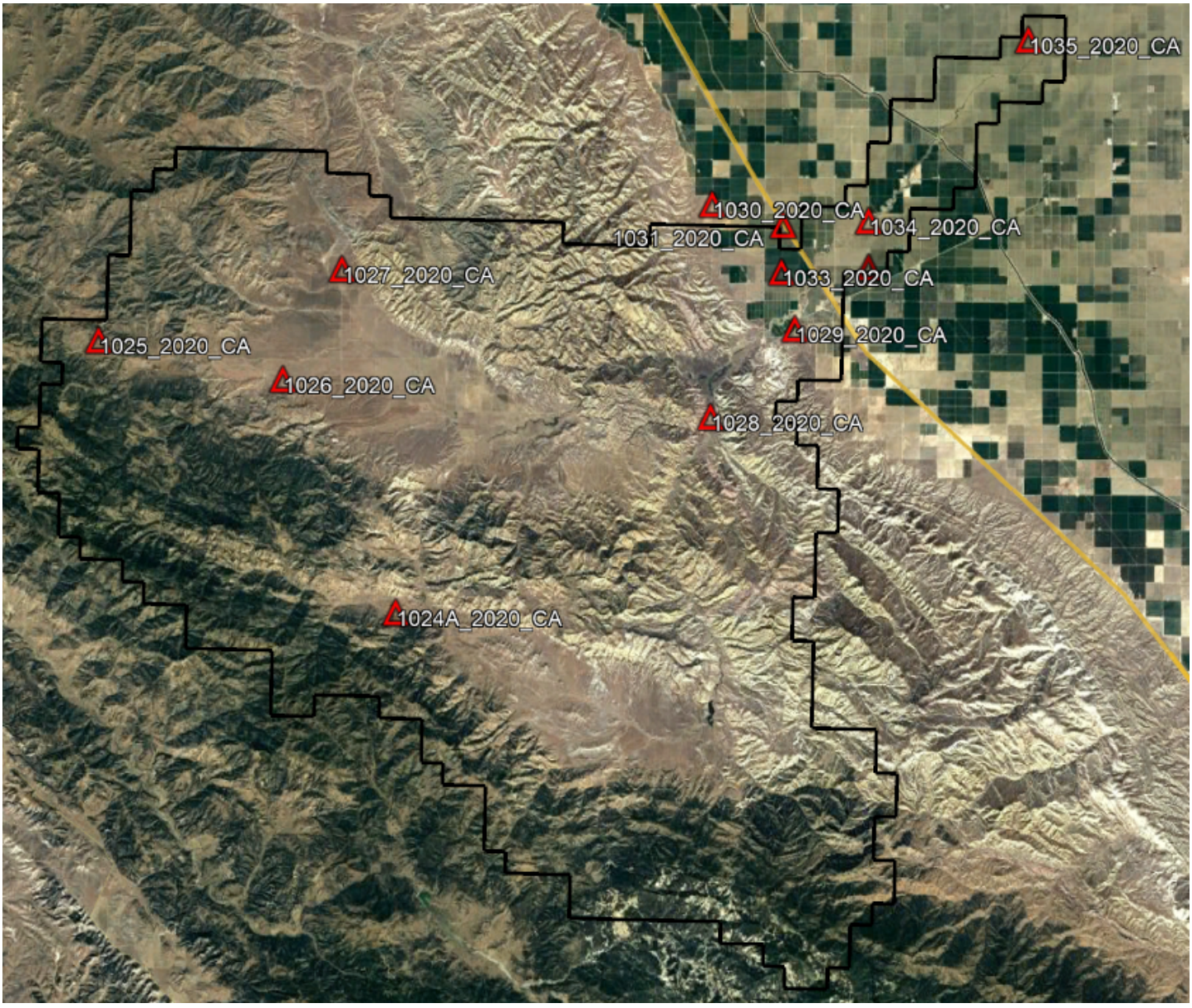
```
DH6670.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DH6670
DH6670.The Laplace correction was computed from DEFLEC18 derived deflections.
DH6670
DH6670.The ellipsoidal height was determined by GPS observations
DH6670.and is referenced to NAD 83.
DH6670
DH6670. The following values were computed from the NAD 83(2011) position.
DH6670
DH6670;                    North         East     Units Scale Factor Converg.
DH6670;SPC CA 4     -   651,305.169 1,851,782.716   MT  0.99994130   -0 59 22.0
DH6670;SPC CA 4     - 2,136,823.71  6,075,390.46   sFT  0.99994130   -0 59 22.0
DH6670;UTM  10      - 4,062,526.321   709,208.015   MT  1.00013925   +1 23 57.7
DH6670
DH6670!             -  Elev Factor  x  Scale Factor =   Combined Factor
DH6670!SPC CA 4     -   0.99997844  x   0.99994130  =   0.99991974
DH6670!UTM  10      -   0.99997844  x   1.00013925  =   1.00011769
DH6670
DH6670_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGF0920862526(NAD 83)
DH6670
DH6670                          SUPERSEDED SURVEY CONTROL
DH6670
DH6670  NAD 83(2007)-  36 41 07.37335(N)    120 39 30.65943(W) AD(2007.00) 0
DH6670  ELLIP H (02/10/07)  137.365  (m)                       GP(2007.00)
DH6670  NAD 83(1998)-  36 41 07.37142(N)    120 39 30.65840(W) AD(2004.50) B
DH6670  ELLIP H (06/30/05)  137.385  (m)                       GP(2004.50) 4 1
DH6670.No superseded survey control is available for this station.
DH6670
DH6670_MARKER: DD = SURVEY DISK
DH6670_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES
DH6670_SP_SET: CONCRETE SIDEWALK
DH6670_STAMPING: ANDREW 2 2003
DH6670_MARK LOGO: CADT
DH6670_MAGNETIC: N = NO MAGNETIC MATERIAL
DH6670_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DH6670+STABILITY: SURFACE MOTION
DH6670_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DH6670+SATELLITE: SATELLITE OBSERVATIONS - February 19, 2003
DH6670
DH6670  HISTORY     - Date     Condition        Report By
DH6670  HISTORY     - 20030219 MONUMENTED       CADT
DH6670
DH6670                          STATION DESCRIPTION
DH6670
DH6670'DESCRIBED BY CALTRANS 2003 (GC)
DH6670'THE STATION IS LOCATED IN FRESNO COUNTY, ABOUT 16 MILES SOUTHWEST OF
DH6670'THE CITY OF  MENDOTA AND ABOUT 18 MILES NORTHWEST OF THE CITY OF
DH6670'TRANQUILITY. TO REACH THE STATION FROM THE INTERSECTION OF INTERSTATE
DH6670'5 AND STATE ROUTE 33 WHICH IS  ABOUT 22 MILES SOUTH OF THE CITY OF
DH6670'MENDOTA, GO NORTHWEST 15.7 MILES ON INTERSTATE 5 TO  MANNING AVENUE,
DH6670'CONTINUE NORTHWEST 6.7 MILES ON INTERSTATE 5 TO THE RUSSELL AVENUE
DH6670'OFFRAMP, CONTINUE 0.2 MILES ALONG OFFRAMP TO RUSSELL AVENUE, TURN LEFT
DH6670'(SOUTH), GO  SOUTH 0.1 MILES ON RUSSELL AVENUE TO THE STATION ON THE
```

DH6670'RIGHT (WEST). THE MONUMENT IS A 3.5 INCH ALUMINUM CADT DISK STAMPED
DH6670'ANDREW2 2003, SET FLUSH IN A CONCRETE SIDEWALK THE STATION IS LOCATED
DH6670'IN THE SOUTHWEST CORNER OF RUSSELL AVENUE OVERCROSSING, ABOUT 100 FT
DH6670'SOUTH OF INTERSTATE 5 CENTERLINE, 15.4 FT WEST OF RUSSELL AVENUE
DH6670'CENTERLINE, 6.6 FT NORTH OF THE SOUTH END OF THE BRIDGE. THIS STATION
DH6670'WAS OBSERVED AS PART OF THE SAN JOAQUIN VALLEY HEIGHT MODERNIZATION
DH6670'SURVEY, A CSRC PROJECT.

Section 5: GPS Control Diagrams

This section contains a graphical representation of the new and existing control stations used for the project.

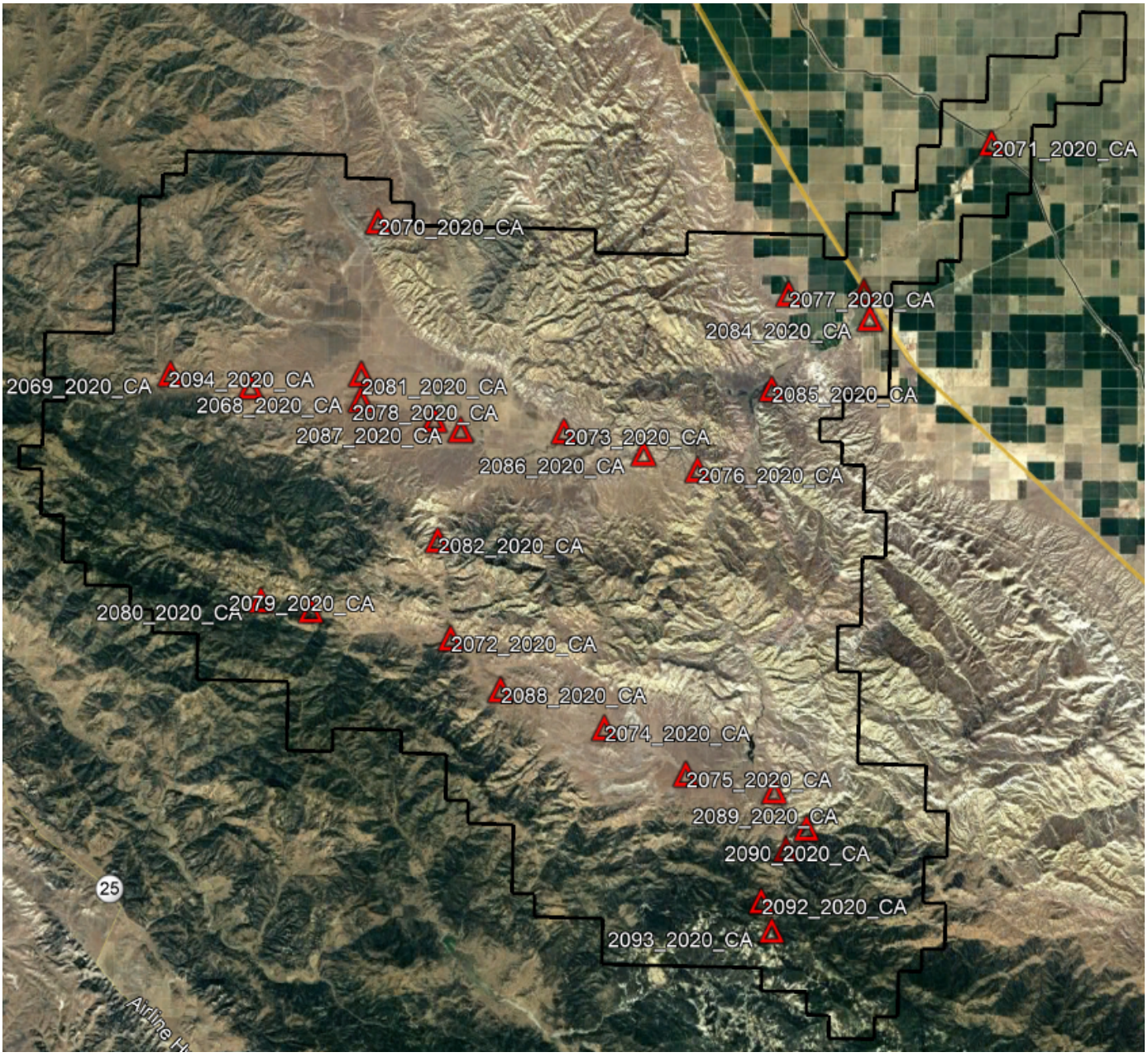
LiDAR Control Stations



N

Not to Scale

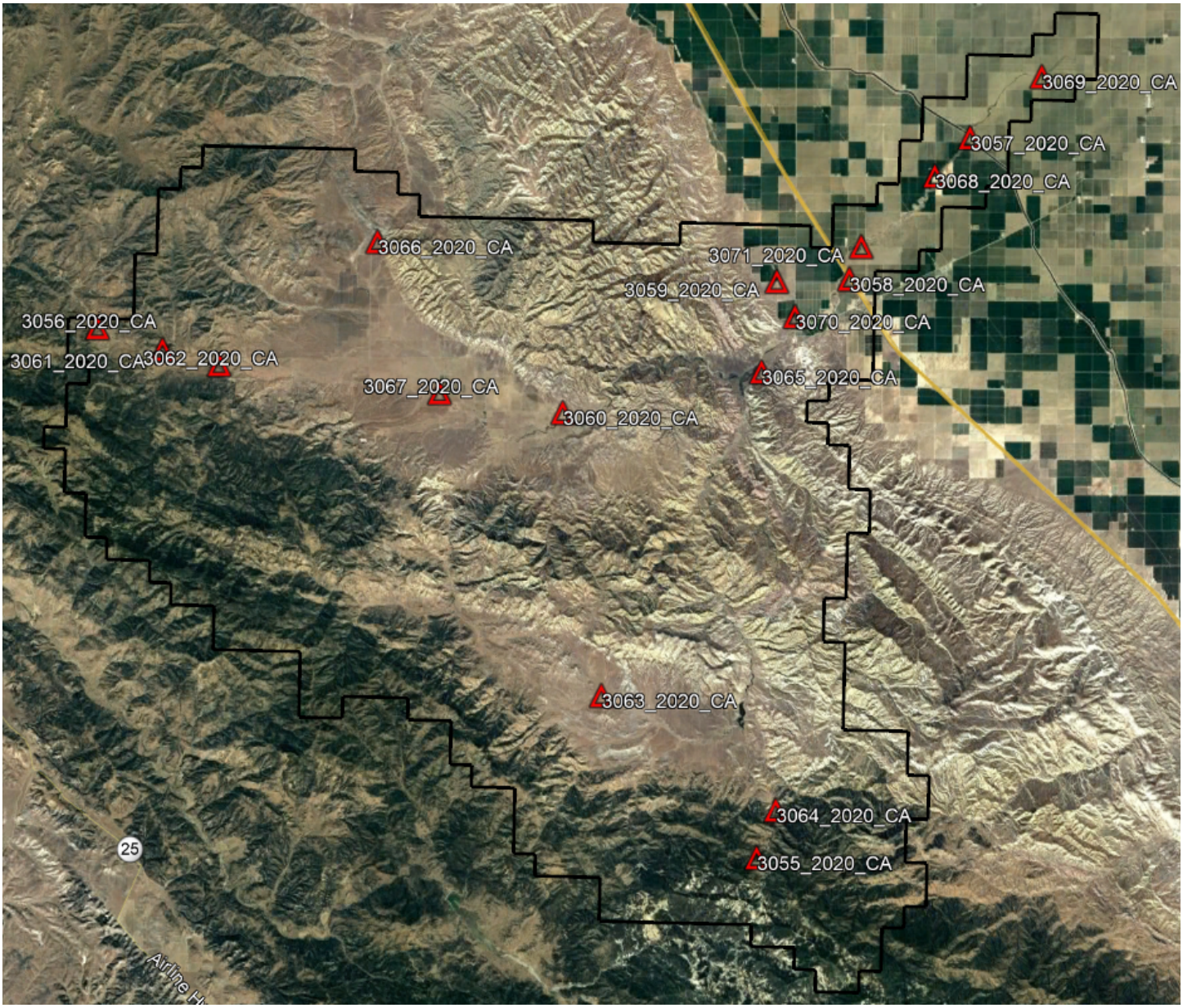
Non-Vegetative Vertical Accuracy (NVA) Stations



N

Not to Scale

Vegetative Vertical Accuracy (VVA) Stations



N

Not to Scale