TASK ORDER 014 FINAL REPORT

Sacramento-San Joaquin Delta Lidar

19 November 2009

Prepared for

California Department of Water Resources
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1. PROJECT OVERVIEW

The objective of this project was to obtain and process high resolution topographic data for the purpose of assisting engineers, geologists, and hydrogeologists with the identification of additional levee sites that may require expedited repairs to prevent the loss of life or property. The aerial lidar survey collected for this purpose was collected at a nominal 1-meter post spacing.

1.1. PROJECT AREA

The project area encompassed the Sacramento-San Joaquin Delta, Suisan Marsh, and the Los Vaqueros reservoir in California. Total project area in square miles is 1646 with a 100-ft buffer along the project boundary. The following graphic, *Figure i*, depicts the project boundary and lidar tile layout for the project.

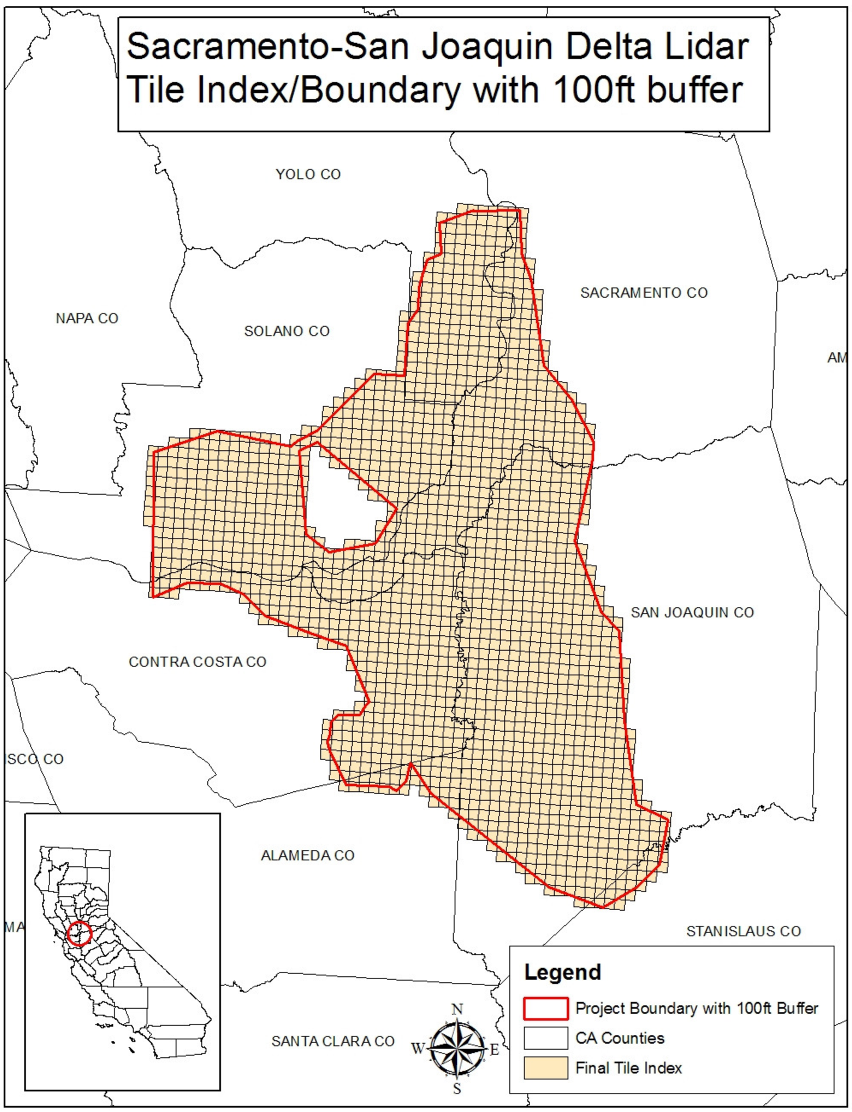

Figure i

1.2. PROJECT TEAM

On November 3, 2006 the URS Corporation was selected by the California Department of Water Resources (CADWR) to complete the scope of work defined as Task Order 14. This report reflects the execution of the lidar acquisition, ground control, and processing portion of that task order. The URS Corporation acted as the prime contractor and subcontracted the lidar work to Fugro EarthData, known at the time of the tasking as EarthData International Inc. Fugro EarthData employed two subcontractors. Airborne 1 was tasked with the lidar acquisition and boresight calibration while Towill Inc. was tasked to survey the project ground control. All project team members were approved by CADWR prior to tasking.

The URS Corporation as part of Task Order 14 subcontracted the QA/QC review to Spectrum Mapping LLC.

1.3. PROJECT METHODOLOGY

1.3.1. LIDAR ACQUISITION

Airborne 1's flight planning and data collection methodology used the following steps:

1. Sensor – Sensor installation and configuration including survey of offsets from sensor head to GPS antenna.
2. Flight planning – Using manufacturer's software to obtain required spot spacing and related accuracy requirements.
3. Ground survey – A minimum of two GPS base stations to collect data at 1Hz on known HARN monuments.
4. Sensor calibration – Calibration flights are flown regularly over a building with known coordinates to check for any roll, pitch, scale, and TIM errors of the sensor. Each survey flight is also tested using TerraSolid's TerraMatch to determine if any calibration errors are apparent and correct if necessary.
5. Airborne data collection – The project is flown and data collected by Airborne 1 operators after thorough training and with constant support from experienced Optech lidar system operators.

1.3.2. GROUND CONTROL

Towill's control survey used the following methodology:

1. Site – Each site shall be reasonably flat with no buildings or structures within a radius of approximately 25'-30', with an open, unobstructed view of the sky.
2. Ground – Ground surface shall be bare dirt, gravel, or short grassy areas.
3. Contrast – Areas that are very light or dark, such as bright concrete or dark paved areas are to be avoided.

Surveys were performed using Federal Geodetic Control Subcommittee guidelines for First Order GPS Surveys. A network of properly formed closed loop traverses was constructed with sufficient redundancy to allow determination of loop closures. Equipment consisted of dual frequency Trimble 4000SSE, 4700 and R8 receivers with corresponding geodetic antennae, ground planes and fixed-height tripods. GPS surveys were conducted during periods with at least five common satellites visible and a predicted PDOP of 4.0 or less. Simultaneous observations were recorded of sufficient length to produce fixed baseline solutions.

1.3.3. PRE-PROCESSING OF LIDAR

Airborne 1 was responsible for the lidar data pre-processing, which consisted of the following methodology:

1. GPS data processing and optimization – The aircraft trajectory was computed using Waypoint's Grafnav GPS software to tie in the air and ground GPS and ensuring solutions computed from the different ground stations compare. IMU data is processed in Applanix's POSPAC to refine the trajectory with the aircraft's attitude information.
2. Raw data processing – Laser points are computed and outputted using Optech's REALM software.
3. QA/QC – The laser points are compared to the QA/QC points collected on the ground and statistics generated in Excel of the standard deviation, mean, skewness, and kurtosis.

1.3.4. LIDAR DATA PROCESSING

Fugro EarthData used the following methodology for the lidar data processing:

1. Classification of first and last pulse – The first return, or "reflective surface," dataset consists of only the first returns of the lidar data collection, minus noise points.
2. Canopy Data – The canopy dataset is created from the points classified as "above ground," points not part of the bare-earth.
3. Automated filtering – The goal of automated processing is to identify and remove elevation points falling on vegetation, buildings, and other above-ground structures to generate a bare-earth elevation model.
4. Manual filtering – Vegetation and artifacts remaining after automatic data post-processing are removed manually through interactive editing.

1.3.5. BREAKLINE COLLECTION/HYDRO ENFORCED DEM

Fugro EarthData used the following methodology for the breakline collection and the hydro enforced DEM:

1. 2D Breaklines – Collection of 2D lines from the available imagery/hillshades/intensity images, approximating the stream bank in areas of significant vegetation overhang.
2. Polygon – Creation of a bounding polygon, created from the edge of bank lines.
3. Water points – Removal of points within the water.
4. Elevation vertices – Automated processes assign elevations to the vertices of the centerline based on surrounding lidar points.
5. Smoothing – Lines are smoothed to ensure a continuous downhill flow.
6. Edge-of-bank vertices are adjusted vertically to match the stream centerline vertices
7. 3D Breaklines – 3D breaklines are viewed in profile to correct any anomalies which cause "spikes" or "dips" in the breakline.
8. TIN – The new TIN is created from the lidar mass points and the newly created breaklines.

1.3.6. 1' CONTOUR EXTRACTION AND GRID GENERATION

Fugro EarthData used the following methodology for the creation of the contours and the lidar grid:

1. Grid – The lidar-derived DEM will be converted to a regular grid with a 5-m post spacing. The regular-grid DEM is then imported into the TerraModel software.
2. Contours – Through a dialog menu that sets the contour interval and the attribute levels in the CAD file, the 1' contours are automatically extracted.
3. Data Merge – In MicroStation, the contours are merged into a project-wide file and adjustments are carried out to this file to ensure that line weights, patterns, and layer assignments are consistent throughout the dataset.
4. Snapping – The editor runs an automated routine to snap contour lines together within pre-set tolerances and to highlight any dangling nodes.

1.4. PROJECT DATUMS, REFERENCE SYSTEM

The following datums and reference system was used for this project:

- **Horizontal Datum:** *North American Datum of 1983 (NAD83);*
- **Reference Network:** *NGS Network*
- **Vertical Datum:** *North American Vertical Datum of 1988 (NAVD88);*
- **Reference Network:** *NGS Network*
- **Geoid Model:** *Geoid03 Continental US*
- **Ellipsoid:** *GRS-80*

1.5. DELIVERABLES

Deliverables for the project were derived from the lidar aerial survey and ground survey data and delivered on external hard drives. All data deliverables were provided in UTM Zone 10, NAD 83, NAVD88. The following table outlines the deliverables produced:

Deliverable	Format
Lidar bare ground files	.LAS, ASCII, ESRI GDB
Lidar above ground points	.LAS, ESRI GDB
Lidar point clouds (all returns)	.LAS, ESRI GDB
Contour data, 1-ft, RAW	AutoCAD .dxf, ESRI GDB
Contour data, 1-ft, SMOOTHED	AutoCAD .dxf, ESRI GDB
DEM, bare ground grid, 1-m	ESRI grid
Lidar intensity images & mosaic	Geotiff
Ground control points	ESRI GDB vector
As flown flightlines	ESRI GDB vector
Project metadata for points, contours, and grids	.PDF and .XML
QA/QC Data	Various
Interim Report	.DOC
Final Report	.DOC

Other than the Final Report, the deliverables were provided under a separate cover.

1.6. ACCURACY STATEMENT

1.6.1. VERTICAL ACCURACY

Task Order 14 required the following vertical accuracy specifications be met.

Vertical Accuracy 95% at 0.6' (<18.5 cm) and 90% at 0.5' (15 cm)

Utilizing the control surveyed by Towill Inc. the following accuracy check was performed on the lidar data

The control check was done using an automated proprietary software package which first ingested the surveyed ground control and the lidar data. A search radius was defined to be 5 meters. Then for each control point the software selected the lidar points that fell within the defined radius. The selected lidar points were then used to create a TIN surface. The final processing step was for the software package to read the control value at the location of each surveyed point. The differences were calculated, statistical calculations completed, and the accuracy report output.

The result of the measurements confirmed that the lidar data was meeting the contractual specifications as the Root Mean Square Error (RMSE) value registered as 0.074 m.

The calculated readings were also inserted into Fugro EarthData's QC Master spreadsheet, inserted below. The spreadsheet performs statistical calculations and outputs results consistent with industry standards (ASPRS, NSSDA, and NMAS) and with a confidence reading at 90% and 95% so results can be measured against contractual performance metics. The measurements showed an RMSE at 95% to be 0.15m and an RMSE at 90% to be 0.12m.

Statistically the results show that the measured control passed at 95% confidence as the root mean square error of 15cm at 95% was less then the contractual maximum value of 18.5cm. The 90% confidence measurements also passed as the results measured 12cm at 90% confidence with a contractual maximum allowable of 15cm.

```
CheckLAS  1.3  13-March-08 rlb
--------------------------------------------------------
Project Name:          final_sac
Control File:          D:\sacramento_september\Control\final\finalgroundcontrol.txt
Date:                  Wed Dec 17 14:51:33 2008

Radius:                5.000

LAS File(s) Processed:
   D:\sacramento_september\Control\final\sac0016.las
   D:\sacramento_september\Control\final\sac0059.las
   D:\sacramento_september\Control\final\sac0077.las
   D:\sacramento_september\Control\final\sac0206.las
   D:\sacramento_september\Control\final\sac0212.las
   D:\sacramento_september\Control\final\sac0218.las
   D:\sacramento_september\Control\final\sac0225.las
   D:\sacramento_september\Control\final\sac0391.las
   D:\sacramento_september\Control\final\sac0394.las
   D:\sacramento_september\Control\final\sac0399.las
   D:\sacramento_september\Control\final\sac0429.las
   D:\sacramento_september\Control\final\sac0452.las
   D:\sacramento_september\Control\final\sac0460.las
   D:\sacramento_september\Control\final\sac0461.las
   D:\sacramento_september\Control\final\sac0474.las
   D:\sacramento_september\Control\final\sac0507.las
   D:\sacramento_september\Control\final\sac0707.las
   D:\sacramento_september\Control\final\sac0719.las
```

D:\sacramento_september\Control\final\sac0725.las
D:\sacramento_september\Control\final\sac0751.las
D:\sacramento_september\Control\final\sac0760.las
D:\sacramento_september\Control\final\sac0806.las
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D:\sacramento_september\Control\final\sac1723.las
D:\sacramento_september\Control\final\sac1726.las
D:\sacramento_september\Control\final\sac1731.las
D:\sacramento_september\Control\final\sac1737.las

Full Point Set

Root Mean Square Error = 0.074
Standard Deviation = 0.068
Minimum Difference = -0.144
Maximum Difference = 0.195
Mean Difference = 0.032
Total Control Points = 39
Num Valid Control Pts = 39

Three Sigma Point Set

Root Mean Square Error = 0.074
Standard Deviation = 0.068
Minimum Difference = -0.144
Maximum Difference = 0.195
Mean Difference = 0.032
Total Control Points = 39
Num Valid Control Pts = 39
Num Outside 3 Sigma = 0

Point differences (control minus surface):
HS0512 : -0.144
AC9892 : -0.023
AE9887 : 0.023
AE9889 : -0.066

AE9891 :	0.195
704 :	-0.026
710 :	-0.095
711 :	-0.025
714 :	0.021
723 :	0.044
724 :	0.046
709 :	0.051
713 :	0.092
736 :	0.110
735 :	0.021
722 :	0.098
737 :	0.129
708 :	0.098
701 :	0.007
707 :	0.027
706 :	0.012
705 :	0.014
715 :	0.141
716 :	0.070
721 :	-0.064
738 :	0.032
718 :	-0.026
720 :	0.041
725 :	0.094
733 :	-0.020
726 :	0.025
727 :	0.106
728 :	0.042
729 :	-0.011
731 :	0.079
732 :	0.032
702 :	-0.031
717 :	0.107
703 :	0.035

Block ID:		Ortho/stereo/DEM measured by EarthData			QA/QC Points as surveyed in the Field			Residual error = Measured coordinates – surveyed coordinates			Normalized error = Residuals - bias		
		UTM zone 10	California-HARN	NAVD88	UTM zone 10	California-HARN	NAVD88						
Point ID	Block/Model/ Sheet ID	Easting (E) (Meter)	Northing (N) (Meter)	Elevation (H) (Meter)	Easting (E) (Meter)	Northing (N) (Meter)	Elevation (H) (Meter)	ΔE (Easting) (Meter)	ΔN (Northing) (Meter)	ΔH (Elevation) (Meter)	ΔE (Easting) (Meter)	ΔN (Northing) (Meter)	ΔH (Elevation) (Meter)
701		597726.193	4230210.238	16.854	597726.193	4230210.238	16.847	0.000	0.000	0.007	0.000	0.000	-0.025
702		594206.435	4231680.458	2.398	594206.435	4231680.458	2.429	0.000	0.000	-0.031	0.000	0.000	-0.063
703		582281.346	4229891.841	2.307	582281.346	4229891.841	2.272	0.000	0.000	0.035	0.000	0.000	0.003
704		575561.348	4230038.265	7.438	575561.348	4230038.265	7.464	0.000	0.000	-0.026	0.000	0.000	-0.058
705		577430.982	4210135.936	3.215	577430.982	4210135.936	3.201	0.000	0.000	0.014	0.000	0.000	-0.018
706		586382.335	4210866.964	27.117	586382.335	4210866.964	27.105	0.000	0.000	0.012	0.000	0.000	-0.020
707		595267.132	4209694.828	2.984	595267.132	4209694.828	2.957	0.000	0.000	0.027	0.000	0.000	-0.005
708		603639.29	4208569.774	2.486	603639.290	4208569.774	2.388	0.000	0.000	0.098	0.000	0.000	0.066
709		623571.076	4262396.628	8.102	623571.076	4262396.628	8.051	0.000	0.000	0.051	0.000	0.000	0.019
710		627297.515	4245166.417	8.728	627297.515	4245166.417	8.823	0.000	0.000	-0.095	0.000	0.000	-0.127
711		632315.214	4261795.93	4.635	632315.214	4261795.930	4.660	0.000	0.000	-0.025	0.000	0.000	-0.057
713		618789.927	4244959.781	8.441	618789.927	4244959.781	8.349	0.000	0.000	0.092	0.000	0.000	0.060
714		638291.893	4245261.934	7.8	638291.893	4245261.934	7.779	0.000	0.000	0.021	0.000	0.000	-0.011
715		638265.477	4220292.839	1.305	638265.477	4220292.839	1.164	0.000	0.000	0.141	0.000	0.000	0.109
716		632023.641	4220536.668	3.288	632023.641	4220536.668	3.218	0.000	0.000	0.070	0.000	0.000	0.038
717		623958.69	4220285.366	3.532	623958.690	4220285.366	3.425	0.000	0.000	0.107	0.000	0.000	0.075
718		613894.051	4220740.042	10.646	613894.051	4220740.042	10.672	0.000	0.000	-0.026	0.000	0.000	-0.058
720		600646.005	4234040.655	10.607	600646.005	4234040.655	10.566	0.000	0.000	0.041	0.000	0.000	0.009
721		613085.14	4234592.281	0.554	613085.140	4234592.281	0.618	0.000	0.000	-0.064	0.000	0.000	-0.096
722		616999.112	4210050.108	-2.211	616999.112	4210050.108	-2.309	0.000	0.000	0.098	0.000	0.000	0.066
723		647415.16	4209788.944	4.514	647415.160	4209788.944	4.470	0.000	0.000	0.044	0.000	0.000	0.012
724		652854.046	4188711.472	7.185	652854.046	4188711.472	7.139	0.000	0.000	0.046	0.000	0.000	0.014
725		644727.887	4188458.93	3.051	644727.887	4188458.930	2.957	0.000	0.000	0.094	0.000	0.000	0.062
726		636428.958	4188220.093	3.168	636428.958	4188220.093	3.143	0.000	0.000	0.025	0.000	0.000	-0.007
727		628799.579	4189293.811	0.03	628799.579	4189293.811	-0.076	0.000	0.000	0.106	0.000	0.000	0.074
728		619530.503	4188380.607	22.386	619530.503	4188380.607	22.344	0.000	0.000	0.042	0.000	0.000	0.010
729		614573.692	4182305.448	256.118	614573.692	4182305.448	256.129	0.000	0.000	-0.011	0.000	0.000	-0.043
731		636636.666	4170111.195	82.056	636636.666	4170111.195	81.977	0.000	0.000	0.079	0.000	0.000	0.047
732		642271.483	4169763.301	40.748	642271.483	4169763.301	40.716	0.000	0.000	0.032	0.000	0.000	0.000
733		650173.495	4170275.991	21.328	650173.495	4170275.991	21.348	0.000	0.000	-0.020	0.000	0.000	-0.052
735		627540.425	4210243.772	-4.163	627540.425	4210243.772	-4.184	0.000	0.000	0.021	0.000	0.000	-0.011
736		634255.169	4210383.606	3.697	634255.169	4210383.606	3.587	0.000	0.000	0.110	0.000	0.000	0.078
737		610940.658	4210320.771	3.617	610940.658	4210320.771	3.488	0.000	0.000	0.129	0.000	0.000	0.097
738		606142.461	4233288.805	7.117	606142.461	4233288.805	7.085	0.000	0.000	0.032	0.000	0.000	0.000
AC9892		577896.566	4215854.034	27.131	577896.566	4215854.034	27.154	0.000	0.000	-0.023	0.000	0.000	-0.055
AE9887		634027.853	4204208.018	3.522	634027.853	4204208.018	3.499	0.000	0.000	0.023	0.000	0.000	-0.009
AE9889		636394.578	4185362.099	2.176	636394.578	4185362.099	2.242	0.000	0.000	-0.066	0.000	0.000	-0.098
AE9891		635482.115	4208799.91	3.284	635482.115	4208799.910	3.089	0.000	0.000	0.195	0.000	0.000	0.163
HS0512		649060.701	4183613.707	8.556	649060.701	4183613.707	8.700	0.000	0.000	-0.144	0.000	0.000	-0.176
Unhide rows 31 to 1010 if you need to enter more readings!!					No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
					No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
							Number of check points:	39	39	39	39	39	39
							Mean (Bias)	0.00	0.00	0.03	0.00	0.00	0.00
							StDEV	0.00	0.00	0.07	0.00	0.00	0.07
							RMSE	0.00	0.00	0.07	0.00	0.00	0.07

To remove the vertical bias's effect from the elevation, Lower the vector/DEM data by 0.032

planemetric E, No Bias the vector EASTING the value 0.000

GSD = 7.5 cm (Meter) upported Mapping Scale: 1" = 50' / 1:600

Supported Height RMSE according to map scale = 0.30

Accuracy Computations (before bias removal):

ASPRS		
Vertical RMSE$_h$ =	0.07	Passed :))
NSSDA		
Vertical tested at 95% = (1.96*RMSE$_z$)	0.15	Passed :))
National Maps Accuracy (NMAS)		
Vertical Accuracy at 90%=	0.12	Passed :))

Normalized Accuracy Computations (after bias removal):

ASPRS		
Vertical RMSE$_h$ =	0.07	Passed :))
NSSDA		
Vertical tested at 95% = (1.96*RMSE$_z$)	0.13	Passed :))
National Maps Accuracy (NMAS)		
Vertical Accuracy at 90%=	0.11	Passed :))

1.6.2. HORIZONTAL ACCURACY

The contractual documents for TO14 did include a horizontal accuracy specification.

Horizontal accuracy 1.0' (30cm), 1 sigma

Typically a lidar project is designed to QC the results of the lidar datasets vertical values without a comprehensive horizontal QC. Lidar post spacing making good control locations difficult and available QC/control budgets are two main reasons why the horizontal QC is not rigorously pursued for most projects, this one included. In the absence of a formal horizontal ground control the horizontal quality can still be inferred to a very high degree.

For the Sacramento-San Joaquin Delta dataset the following is being submitted to address to the quality of horizontal values. The current Fugro EarthData approach of ensuring horizontal accuracy without extensive surveying is the following:

- Fugro EarthData does a systematic boresight adjustment to the flight lines not an adjusted boresight angle per individual flight line. For this particular project Airborne 1 did the boresight adjustment but Fugro EarthData did a thorough QC to ensure the results met the quality needs of the project.)
- Profiles are checked along slopes and features to ensure the misalignment of adjacent flight lines does not exceed the required horizontal accuracy amount.

As an additional review of the horizontal quality the following process was utilized.

- Using the customer supplied 2006 orthophotography and ancillary imagery the project area was reviewed and a location selected that had very strong linear features.
- The lidar data was then used to create stereopairs, *Figure ii*.
- In stereo the linear features of the selected area were captured.
- Then using the customer supplied 2006 orthophotography and ancillary imagery the 3D captured features were compared against the linear features contained within the imagery, *Figures iii – viii*.

The results of this process show that there are many of the linear features that match almost perfectly and others that are off slightly but the majority match quite well. These are not a quantitative analysis but one could infer from this review that the quality of the horizontal data is quite high.

Figure ii

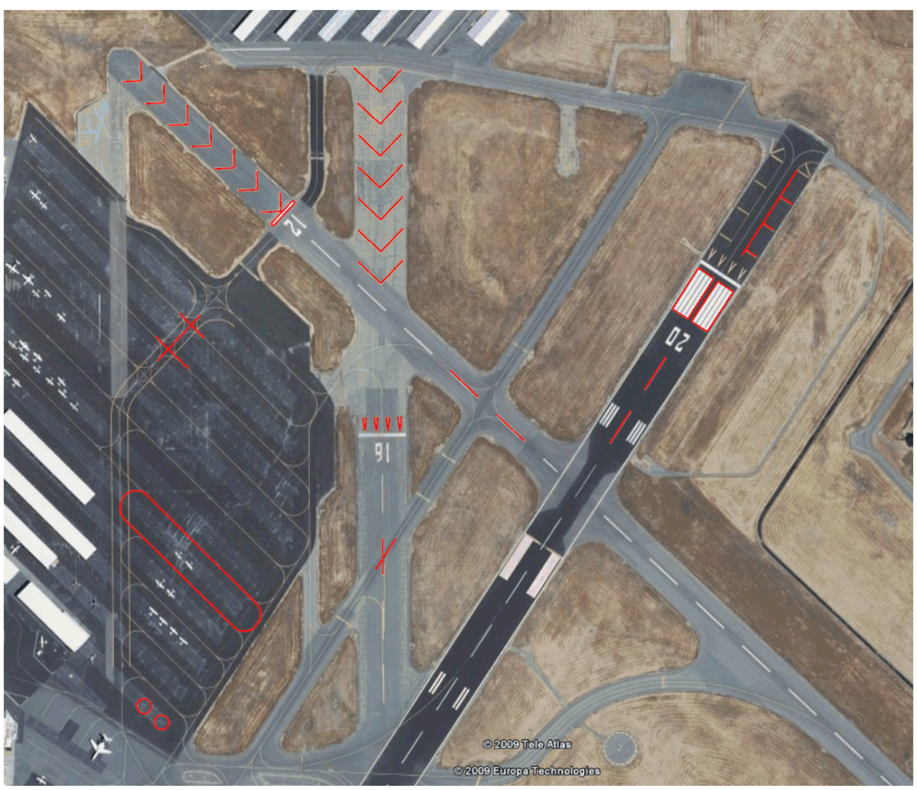


Figure iii – Red lines represent data collected in 3D using lidar generated stereopairs

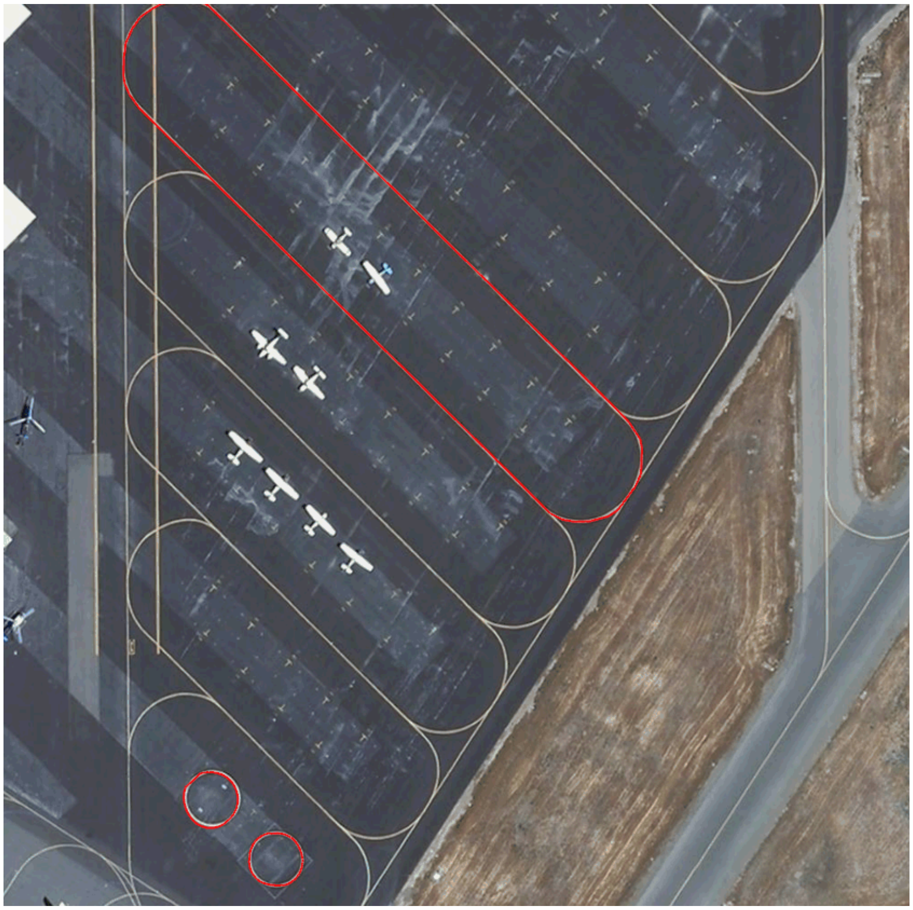


Figure iv – Red lines represent data collected in 3D using lidar generated stereopairs

Figure v – Red lines represent data collected in 3D using lidar generated stereopairs

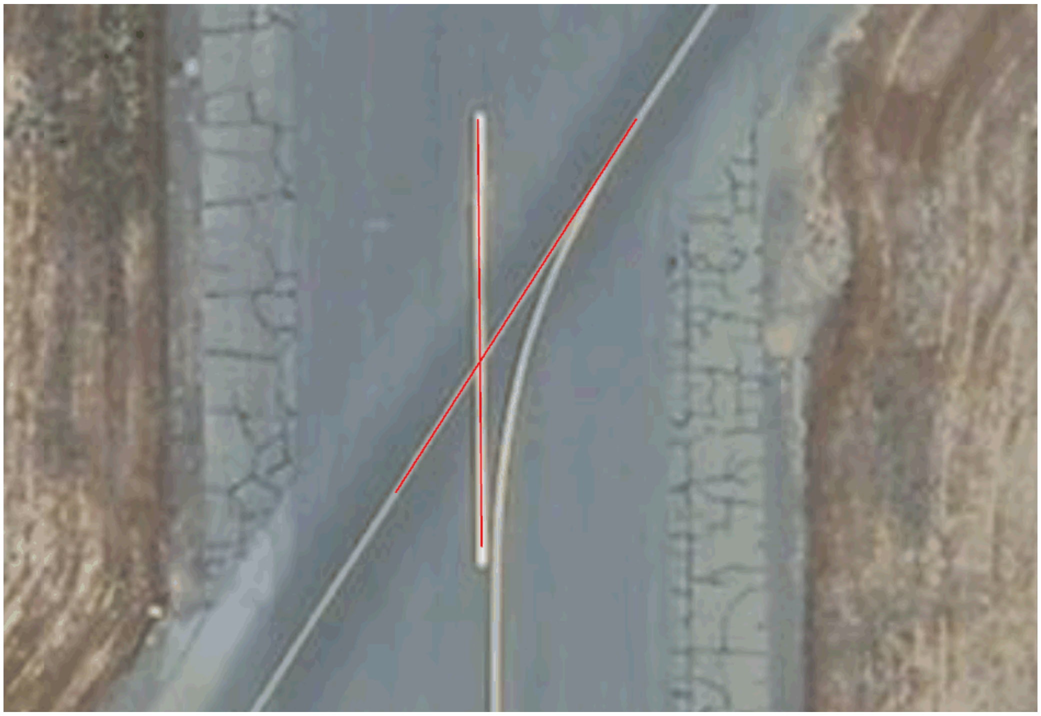


Figure vi – Red lines represent data collected in 3D using lidar generated stereopairs

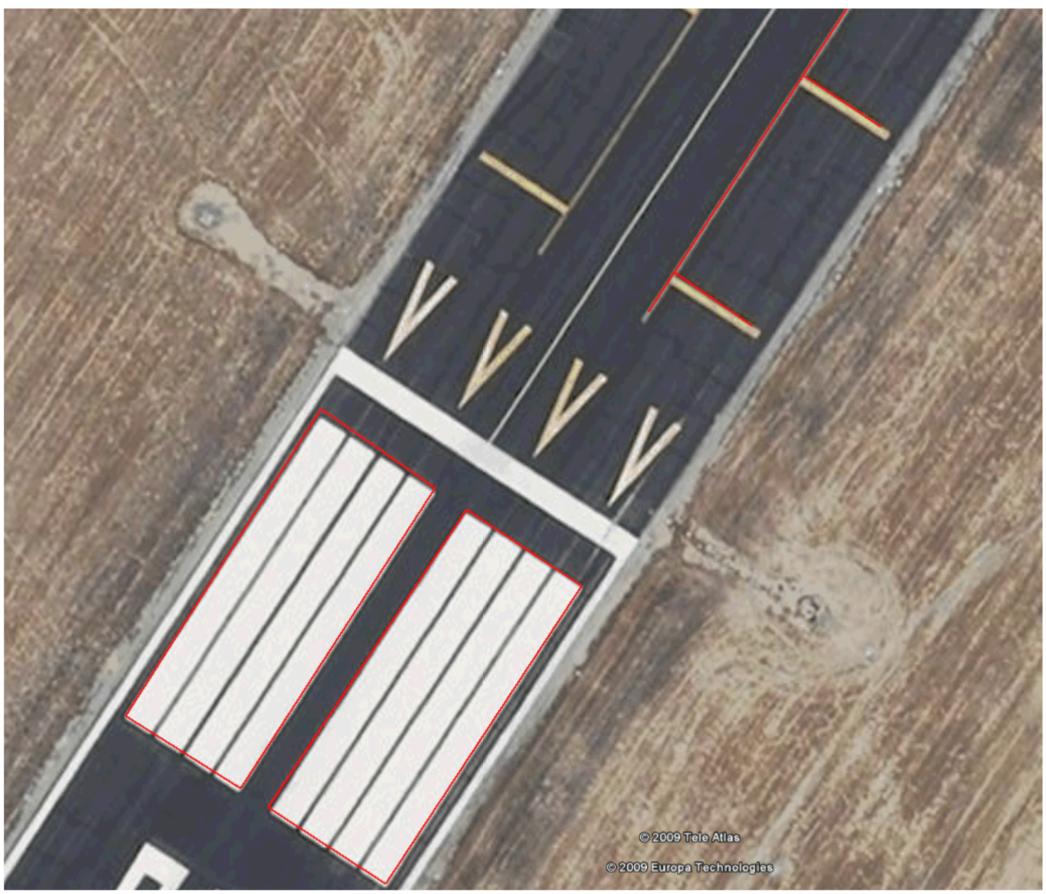


Figure vii – Red lines represent data collected in 3D using lidar generated stereopairs

Figure viii – Red lines represent data collected in 3D using lidar generated stereopairs

2. AERIAL ACQUISITION

Airborne 1, located in El Segundo, California was responsible for the aerial data collection for this project. The aerial acquisition occurred on four separate occasions during the life cycle of the project. The following is a breakdown of the four separate acquisition period.

- Initial Acquisition – 1/14/07 – 2/03/07, *Figure ix*
- First Re-flight Acquisition – 5/07/07 – 5/08/07, *Figure x*
- Second Re-flight Acquisition – 6/18/07 – 6/19/07, *Figure xi*
- Third Re-flight Acquisition – 2/29/08 – 3/2/08, *Figure xii*

The following guidelines were followed for the acquisition lifts:

- The project area was cloud-free below the designated altitude for the mission
- Streams and rivers were within their normal banks
- Leaf off conditions existed
- Low tide, where possible
- The area was free of smoke, fog, haze, or snow
- Any air traffic control (ATC) restrictions were accounted for

2.1. ACQUISITION PARAMETERS

The parameters used for all project flights are outlined below:

Initial Flight/First Re-flight/Third Re-flight:

- **Lidar System:** *Optech ALTM-3100;* **Serial number:** *04SEN163*
- **Airborne GPS:** *Trimble with Novatel 512 Antenna Ht=0.00m*
- **Mirror Scan Angle +/- (degrees):** *12*
- **Swath Overlap (%):** *40*
- **Swath Width (mtrs):** 711.44
- **Mirror Scanner Frequency (Hz):** 39
- **Laser Pulse Rate (khz):** *70*
- **Posting Interval (Spot Spacing) (square mtrs):** 0.787
- **IMU Positioning***: 200 hertz adjusted to the 1 hertz GPS positions*
- **Airport of Operations:** *Stockton, CA. and Sacramento Executive Airport*
- **Boulder K Index:** *0-4 all days*
- **Comments/Problems/Failures:** *none*
- **Altitude:** *5500 ft*
- **Airspeed:** *120 kts*

As noted later, data captured during the second re-flight was not used in the final dataset.

2.2. AS FLOWN FLIGHT LINE MAP

The graphics on the following pages depict the as flown trajectories of the initial flight lines collected, the first re-flights collected, and the final re-flights collected for this project. All re-flights followed the exact trajectories and flight plans of the original plan. Accompanying this project report is an ESRI shapefile (*Sac_Delta_Lidar_Used.shp*) containing the flight trajectories derived from the Airborne GPS (ABGPS) coordinates. The shapefile represents only the flight lines for data actually included as part of the final deliverable.

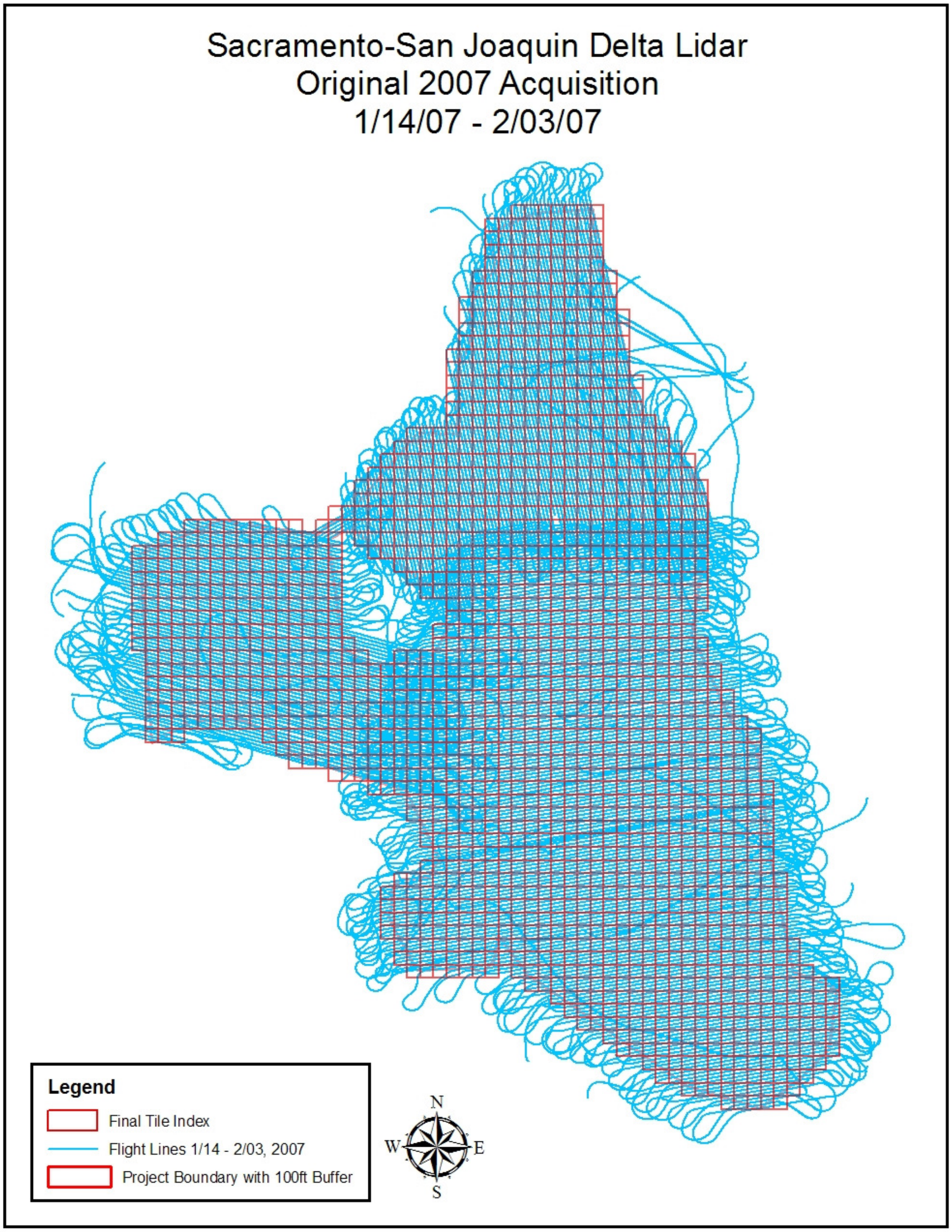


Figure ix: Initial Flight

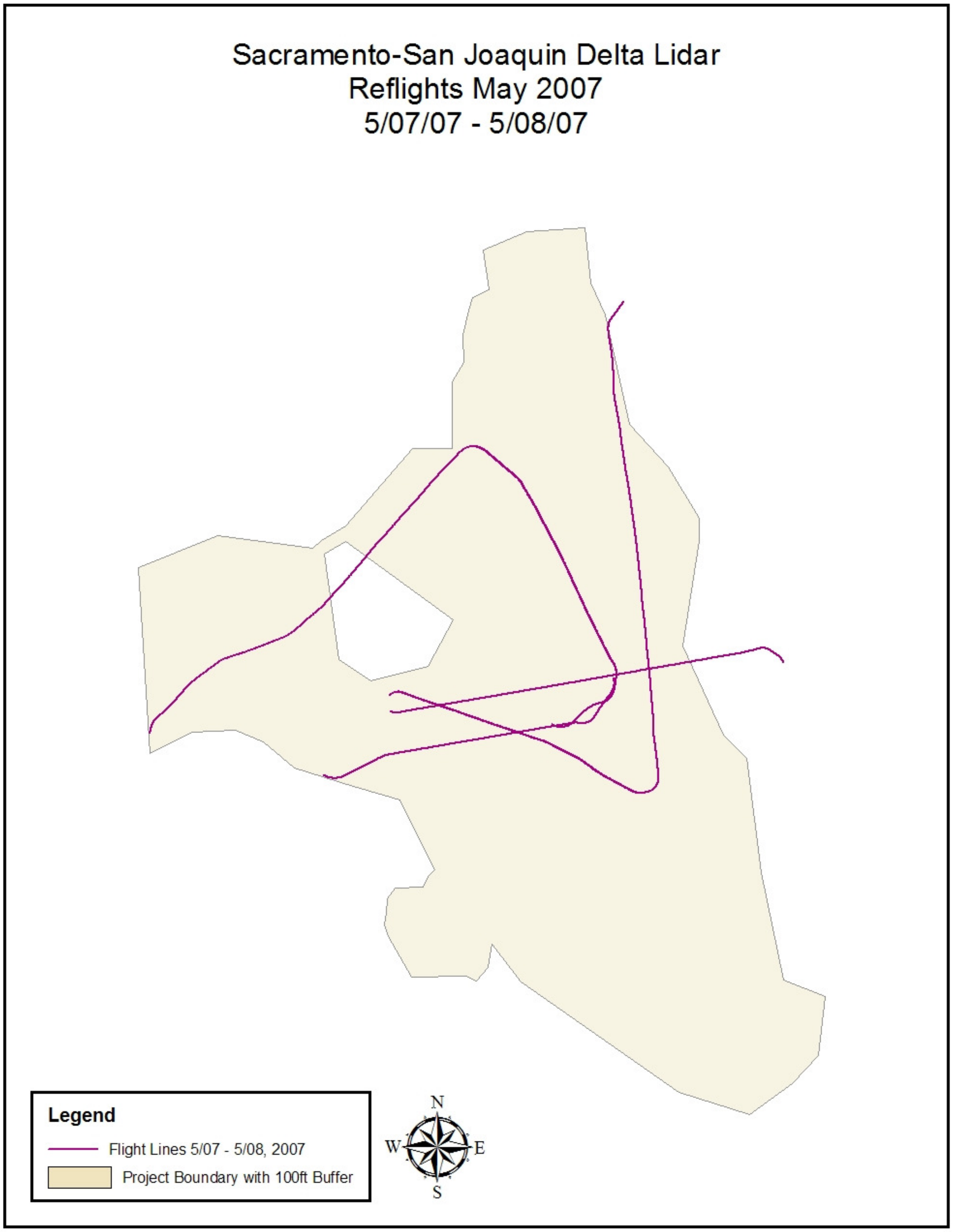


Figure x: First Re-flight

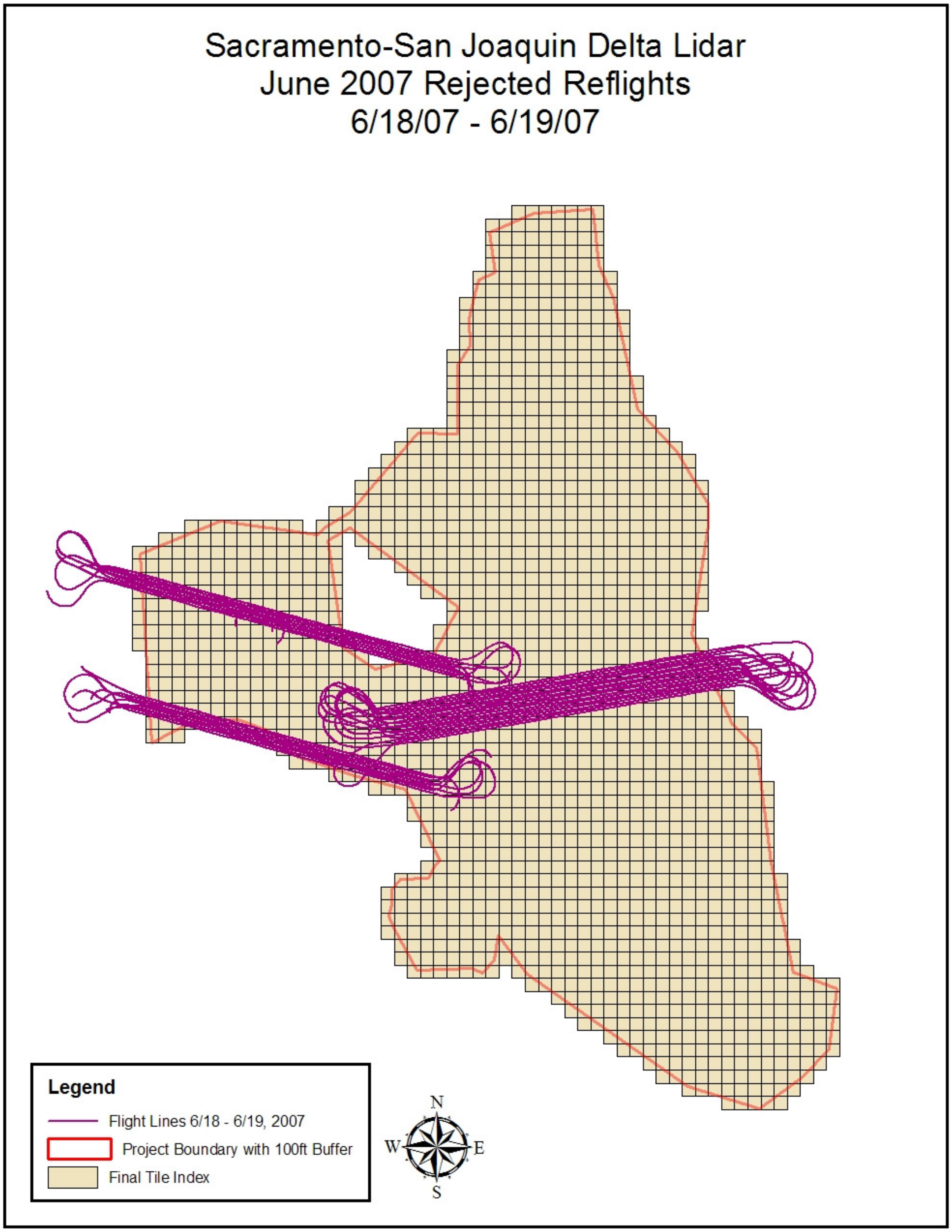


Figure xi: Second Re-flight

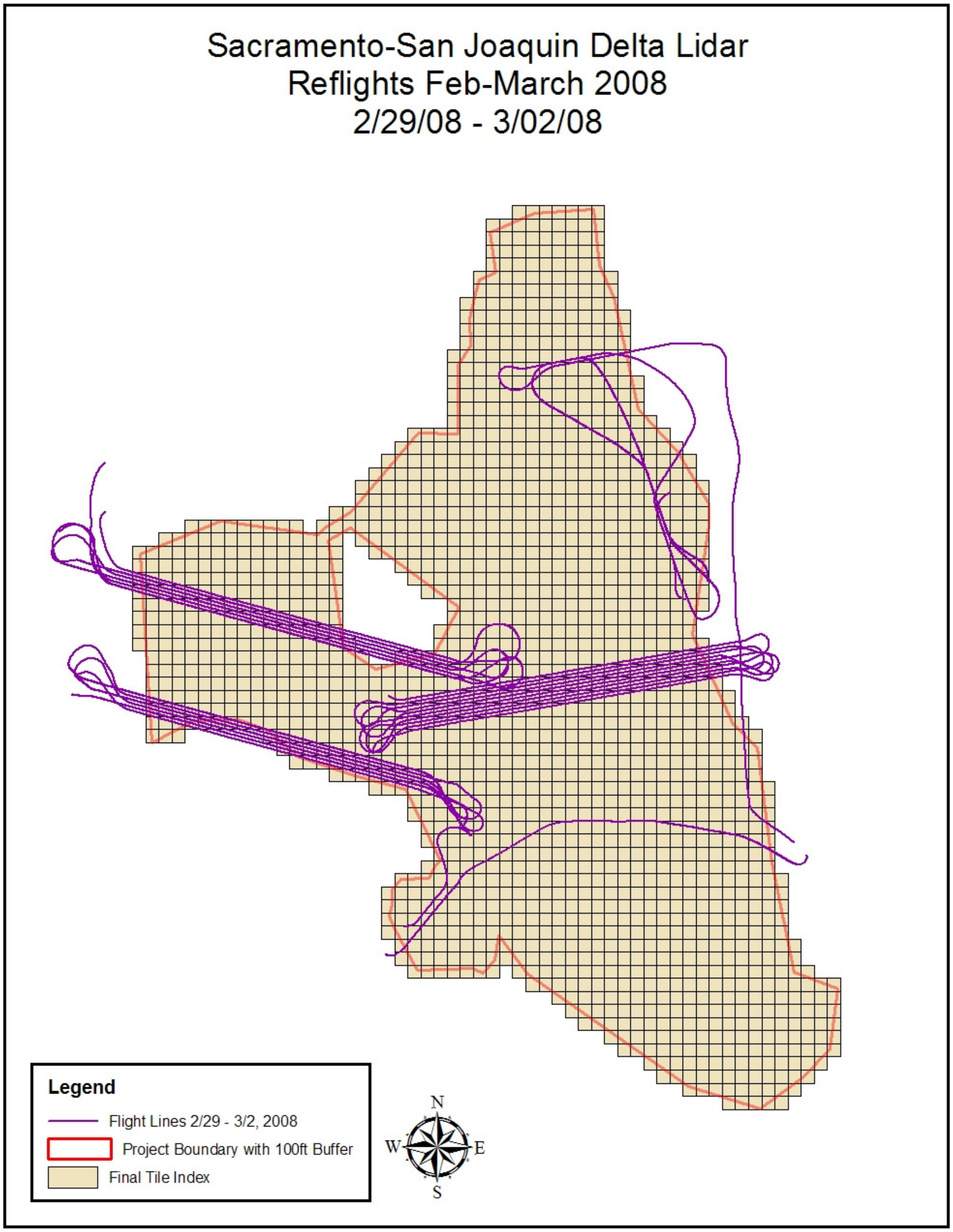


Figure xii: Third Re-flight

2.3. AERIAL ACQUISITION REPORT

The aerial acquisition report provided by Airborne 1 is attached in Appendix A of this document, “Lidar Mapping Report”. The report contains the following information for the initial project flights:

- Sensor and flight parameters
- Information on GPS base station
- Information on static GPS network
- GPS network report
- Mission dates, times, and parameters
- Post-processing kinematic solutions

2.4. ISSUES ENCOUNTERED

The two major issues encountered during the acquisition phase of the project were flight/data anomaly issues during portions of the initial flight and a temporal difference issue caused by the timing of the June 2007 re-flights, identified in section 2 as the Second Re-flight Acquisition. The issues encountered during the initial project flight were significant enough to require the re-flight of two lifts of data. Due to the time of year of this re-flight the temporal differences on this were significant enough to require a final re-flight at a later date during leaf-off conditions.

2.4.1. ISSUES - INITIAL FLIGHT

During the preliminary QA/QC of acquisition and pre-processed lidar data only a few small instances of gaps were identified.

- CA02207_2: Gap 150m*1000m
- CA00307_1: Gap 120m*60m
- CA01707_2: Gap 170m*17000m

These led to the re-flights that commenced on 5/07/07 and ended on 5/08/07, *Figure x*.

The original QA/QC processes used by Airborne 1 to check for errors and anomalies during and after flight operations were based on prior project experiences where the majority of projects were flown for clients that had the ability to refine lift calibration parameters. Because of this, the initial QA/QC processes used by Airborne 1 were not extensive and, instead, consisted of spot checks over a percentage of the project. These spot checks did not catch or identify several issues that were later identified during the QA/QC of the lifts and during the processing of the lidar at Fugro EarthData.

Only when the boresight calibrated data had been supplied to Fugro EarthData by Airborne 1 did further issues get identified. Ultimately, two entire lifts were rejected by Fugro EarthData and scheduled for re-flights. A detailed report submitted by Airborne 1 on these errors is included in Appendix B, “Corrective Action Report”.

The issues encountered included:

- Data gaps
- Timing errors

Data Gaps

Two gaps requiring a re-flight of lines were identified after the original flight. One gap was caused by the QA/QC process not being thorough enough during flight and the other gap was caused by a corrupt file.

During the initial flight, the data was being checked in real time against a theoretical swath coverage based on the flight plan. This swath coverage check results in a ~95% confidence level which can sometimes allow small gaps to go undetected. Lift CA03007_1 of the original flight contained a gap of 0.004 sq. km in size that went undetected until the Fugro EarthData QC of the lift. This lift was tagged for re-flight.

In addition, lift CA017007_2 passed the swath coverage check but a gap in the data was introduced during a data transfer operation resulting in a corrupt file. This data gap was recoverable and did not require a re-flight.

Timing Errors

Two anomalies were introduced into the data of several lifts due to GPS timing errors; gaps and horizontal misalignments between flight lines. The timing errors were missed during the initial data QA/QC by the processing team due to the intermittent nature of the error and the previous methodology of conducting spot checks. The errors were found during the subsequent QC by Fugro EarthData and the lifts were rejected and given back to Airborne 1.

The affected lifts were CA02207_2, CA02307_1, CA02307_2, CA01707_3, and CA01807_2. These lifts were tagged for review and the problem forwarded to Optech for investigation and resolution in an attempt to salvage the data.

The GPS timing errors occurred in the time tag file of the Optech aerial sensor used for this project. The time tag file records timing information from the sensor by linking the GPS seconds of the week to the ALTM time (time recorded with system start up). The loss of portions of this timing information in the file resulted in the gaps and horizontal misalignments. The exact cause of the issue was not known at the time.

To resolve the timing errors, a correction tool developed by Optech was used in an attempt to bridge the missing GPS time information. This correction tool worked and was able to repair all of the corrupt lifts with the exception of lift CA01707_3 and CA01807_2. These lifts were tagged for re-flight and later flown according to the dates and trajectories found in Section 2.2.

2.4.2. ISSUES – RE-FLIGHT

2.4.2.1. JUNE 2007

After significant technical and programmatic discussion between Airborne 1, Fugro EarthData, URS, and CADWR it was decided that the re-flights for initial lifts CA01707_3 and CA01807_2 would occur during the summer of 2007 in order to ensure completion of the project before the end of the year. In addition, it was felt that the temporal difference between the winter 2007 and summer 2007 timeframes could be minimized and dealt with in the processing of the lidar. The delay in identifying the bad lifts was due primarily to the length of time needed to complete the boresight calibrations, and then QC the boresight results. The re-flights started on 6/18/07 and ended on 6/19/07.

The reflown lifts were subsequently reviewed and QC'ed using the updated Airborne 1 processes. During the QC by Fugro EarthData it was found that the lidar sensor used for the re-flights was not a multiple-return system as called for by the project specifications. This was immediately brought to the attention of all project stakeholders.

During a series of discussions with URS and CADWR it was recommended that the re-flight data still be used and that Fugro EarthData would extract just the ground lidar points from the point cloud and combine those with the above-surface points of the original point cloud. The intent of this approach was to ensure that the primary issues with the bare earth points were addressed, while salvaging the data from the re-flight. It was agreed that the re-flight areas would be delivered to URS and CADWR in this manner and that CADWR would make the final determination as to whether or not the approach was acceptable and met the projects specifications.

Upon review of the data in the re-flight areas by CADWR it was determined that the re-flight data did not meet the expectations of the CADWR due to the following reasons and that an additional re-flight was required:

- The re-flight was flown with a single-return lidar sensor instead of a multiple-return sensor as called for by the project specifications.
- The lack of multiple returns did result in fewer ground lidar points in areas of dense vegetation and cover as compared to the original flights.
- The temporal differences between the original flight and the first re-flight were significant enough to cause differences in the surface that were unacceptable to CADWR.

CADWR formally rejected the re-flight data and a plan to conduct the additional re-flight during optimal conditions was developed. This resulted in the third re-flight of the project as mentioned at the beginning of section 2.

2.4.2.2. FEB/MARCH 2008

The timing and execution of the 2008 re-flight was closely coordinated between all team members and CADWR. CADWR provided local intelligence on weather and water saturation conditions and was responsible for giving the approval to mobilize the aircraft and fly the re-flight area.

No issues causing a re-flight or rejection of data were encountered with the final re-flight.

2.5. QA/QC PROCESSES USED

After the initial flight encountered a need to conduct re-flights, Airborne 1 revised internal QA/QC processes in order to better identify data and flight anomalies. The issues encountered that caused this revision in process are documented in section 2.5 of this document.

Airborne 1's revised QA/QC process included the development of a comprehensive QA/QC checklist with the following components:

- GPS processing review and check
- IMU (Inertial Measurement Unit) reviews and checks
- REALM (**RE**sults of **A**irborne **L**aser **M**apping) execution review and checks
- Processing profiles (Static and kinematic GPS)
- Non-conformance report

Note: A copy of the updated checklist is included in Appendix B, "Corrective Action Report".

Upon receipt of the boresighted lidar data from Airborne 1, Fugro EarthData conducted the following QC checks and validations to ensure data quality before processing commenced:

1. Where possible, two to three adjoining lifts were QC'ed at a time in order to check the edge match between lifts. This process would take ~4-5 days (duration based on machine and manual labor) for 2-3 lifts depending upon the size of the lifts.

2. Lifts were imported into the server and then surface subtraction images were generated from the data. This process was used to check for vertical or horizontal differences between flight lines. In the below example (*Figure xiii*), exaggerated roll has been introduced at the edges of overlap to demonstrate. Yellows, Blues, and Greens show a vertical difference between the overlap in the flight lines of 2-3 meters while the Red shows a match within tolerance. The data is reviewed for gaps during this process as well.

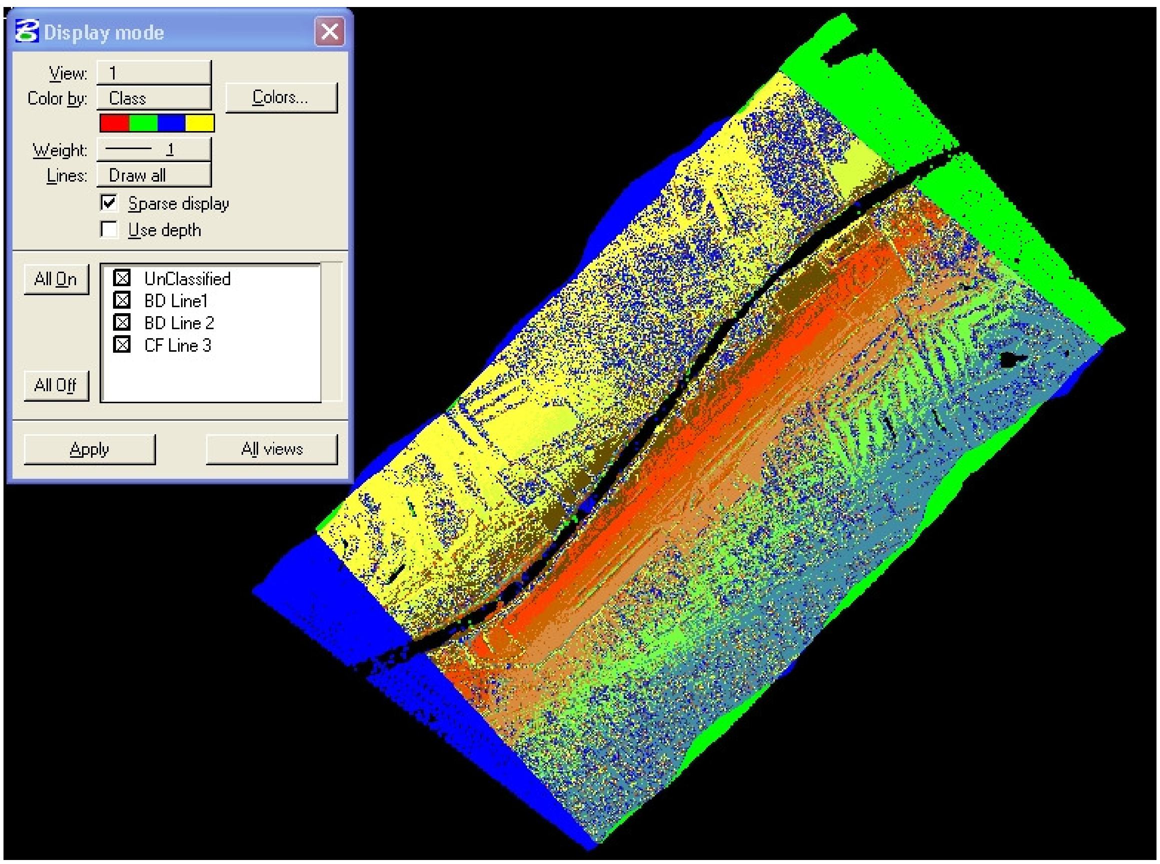


Figure xiii: Example of a surface subtraction image

3. The lifts being QC'ed were then compared against the ground survey points as a final check using proprietary software developed by Fugro EarthData.

4. All results of the checks in bullet 3 were verified against the accuracy specification of the project:
    a. Vertical accuracy: 95% at 0.6' (<18.5cm) and 90% at 0.5' (15cm)

5. Seamlines were then drawn in order to trim the overlap from adjoining flight lines and the coverage was once again checked to ensure that the drawn seamlines did not inadvertently cause any gaps in data coverage.

6. If the coverage checks passed, the overlap was trimmed from the flight lines.

7. If the any of the lifts failed the QC at any step in the process they were rejected back to Airborne 1.

3. DATA PROCESSING

The following section outlines the processes used to create the data deliverables for this project, the QA/QC process for each phase of production, and any issues encountered during production. The production phase was managed and executed by Fugro EarthData.

3.1. AUTOMATED FILTERING

The goal of automated filtering is to identify and remove elevation points falling on vegetation, building and other “above ground” structures to generate a bare-earth elevation model. The automated filtering process also removes as many artifacts as possible automatically, thereby reducing the amount of manual editing that is required to produce an initial bare earth surface.

Automated lidar filtering processes used for this project relied on Fugro EarthData-developed algorithms to evaluate the lidar return data, by removing points that were most likely to be non-bare earth points. Parameters were set in the software to control the size of the filter neighborhood and the aggressiveness with which it removed points that appeared to be mathematically above the bare earth surface. The filter settings were optimized for the particular terrain type and land cover apparent within a given flight line on this project.

Once the automated filtering was completed, the files were run through a visual inspection to ensure that the filtering was not too aggressive or not aggressive enough (see *Figure xiv* below). In cases where the filtering was too aggressive and important terrain features (such as dykes or berms) were filtered out, the data was run through a different filter or was corrected during the manual filtering process (see *Figure xv* below).

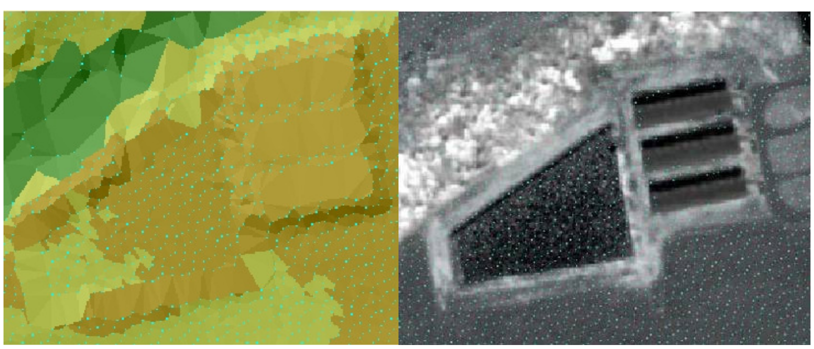


Figure xiv: Overly-aggressive automated filter and associated image

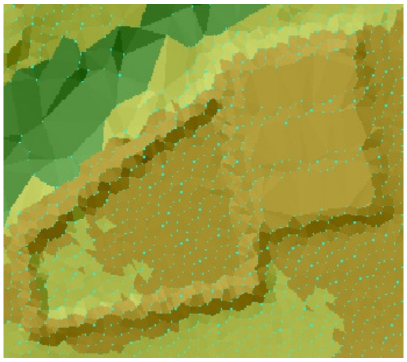


Figure xv: Correction after interactive filtering

3.1.1. AUTOMATED FILTERING QA/QC

After the tiles had been through the automated routine in Terrascan, removing 90% of the non bare earth features, a technician was assigned to check the success of the routine and to finish any edits that may need to be done. Features such as roads, ridges, and landforms, were checked for completeness and the removal of above surface features such as vegetation and buildings was checked. A combination of cross-sections, TINs, and different point attribute displays were used to modify the classification until the bare earth was isolated. Afterwards, a QC technician checked a percentage of tiles for a final QC. Any errors found meant the tile was rejected, corrected, and resubmitted.

3.2. MANUAL FILTERING

Vegetation and artifacts remaining after automatic data post-processing were removed manually through interactive editing. The data was re-processed interactively to re-classify the remaining points falling on vegetation and points falling on other, above ground structures. Because the interpretation of individual points of lidar can in some cases be ambiguous (such as determining the difference between standing water and surrounding ground) any ancillary data available was used as a reference to assist the analysts in making the proper classifications. This ancillary data primarily consisted of imagery over a portion of the project area, provided by CADWR.

Software visualization tools enabled the analyst to quickly scan through a deliverable sector, identifying areas where additional points or artifacts needed to be removed and reclassifying them in the database. The surface was then redrawn which allowed the analyst to immediately see the results of the edit and making further corrections, including ‘undoing’ previous steps if necessary. Reclassified points were stored in the database where they were retrieved at a later date, if required.

3.2.1. MANUAL FILTERING QA/QC

The manual QA/QC process was extensive and involved the following steps:

- *Manual Filtering – Hillshade Checks*

  Hillshade images simulate the appearance of terrain surface, combining shading and coloration to indicate the elevation, slope and aspect (direction of slope) of the terrain in an artificial view of the landscape. Creating a hillshade image from points that have been classified as bare earth provides a view of the data that is useful in detecting errors in the bare earth product. Hillshades are especially useful in detecting points that would actually have been returns from vegetation that protrude above the surface of the surrounding terrain. Hillshades were used both during the manual filtering process, and by the analysts at the end of filtering a tile for a personal QC check. Each tile was then submitted for a peer review. Hillshades were generated using ESRI ArcView software and were not a deliverable of this project.

- *Peer Review*

Due to the number of steps involved in the filtering process and the subjective nature of the task, a peer review offered the opportunity for another layer of review of not only the data, but of the editors' skills and editing abilities. The peer review process was used to promote conformity among the filtering technicians and in the final product wherever possible.

- *Tile/Sheet Edge Matching*

Each group or number of tiles in a project was assigned to a senior technician who was responsible for the quality of the block. The senior technician spent time on the front end exploring the tiles in the block and making recommendations to the manual filtering technicians based on the content (terrain types). Once tiles in the block completed the peer review process, they were checked over by the senior technician and were either approved or sent back to the editing technician for further edits. Once all tiles in a given block were controlled, the senior technician then edge matched all the tiles to ensure that there was conformity across the block between tiles and between completed, adjoining blocks of tiles.

3.2.2. INTEGRATION OF RE-FLIGHT DATA

Each lift of re-flight data used in the final dataset (all except the re-flights of June 2007) is run through the same processing and QA/QC procedures as the originally flown data. A lidar technician checks all ground control within the re-flight lifts to ensure the accuracy of the data is consistent. Next the technician manually reviews the hard surfaces (roads, parking lots, etc.) that are shared by each bordering tile for accuracy. There will always be temporal differences between lidar datasets so it is best to always gauge the quality of the integrated lifts by a review of the hard surfaces.

The hard surface review sometimes reveals small data gaps between lifts. If this is observed then the technician makes adjustments to the lift in order to achieve the best fit for the two datasets.

3.3. CREATION OF LIDAR DELIVERABLES

3.3.1. LAS DATASETS

After completion of the lidar edits the lidar technician imports the point cloud LAS tiles into Terrascan. Utilizing the LAS files echo type only the bare earth points are selected. A new bare earth LAS dataset is then exported. This process is repeated with the above ground points. The result is three datasets in LAS format, all points, bare earth, and above ground.

3.3.2. ASCII DATASET

The bare earth LAS tiles are imported into Terrascan. The software package has the option to output an ascii format. This was selected and the ascii dataset for the bare earth was generated.

3.3.3. 1M GRID DEM

The bare earth LAS tiles are imported into Terrascan. Using the software packages *export lattic model* tool the technician selected a triangulated surface model and set the grid size to 1 meter. The output format was set to an ArcInfo format. The result was the creation of a 1m grid in an ESRI format.

3.3.4. FINAL QA/QC OF LIDAR DELIVERABLES

All final datasets were checked manually for coverage, and gaps. File sizes were reviewed for anomalies. All file formats were reviewed to ensure they adhered to the project scope. And the tile index was used to ensure all data was cut to the correct final boundary.

3.4. HYDRO-BREAKLINE COLLECTION

It should be noted that the 3D hydro breaklines developed for this project differ from traditionally captured stereo-graphic or field survey derived breaklines. The elevation component of the 3D streamlines (breaklines) was derived from the lowest adjacent bare earth lidar point and adjusted to ensure that the streams flowed downstream. The best elevations that could be derived for the 3D streamlines were the water surface elevations on the date that the lidar data was acquired.

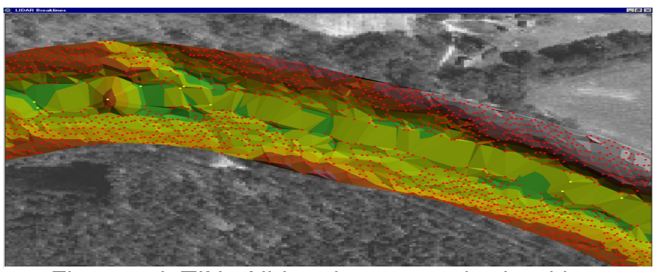


Figure xvi: TIN of lidar along water body without breaklines

Lidar data consists only of points which are not suited to defining sharp breaks on terrain. The problem is most pronounced across stream channels, where lidar is not able to define the stream banks clearly. The TIN surface generated from lidar data alone is unsuitable for H&H modeling, as can be seen in *Figure xvi*.

The surface created with both lidar points and breaklines improves channel definitions for hydraulic cross section takeoffs and better defines the stream invert. The lidar TIN is used simply as the basis for the overbank definition.

Fugro EarthData used proprietary techniques to synthesize 3D break lines using lidar data. The breaklines were digitized in 2D from the lidar surface. A bounding polygon, created from the edge of bank lines, was used to reclassify all points within any channels or water bodies to ensure that no points were classified as ground points within water bodies. Automatic processes assigned elevations to the vertices of the breaklines based on surrounding lidar points. The lines were then smoothed to ensure a continuous downhill flow.

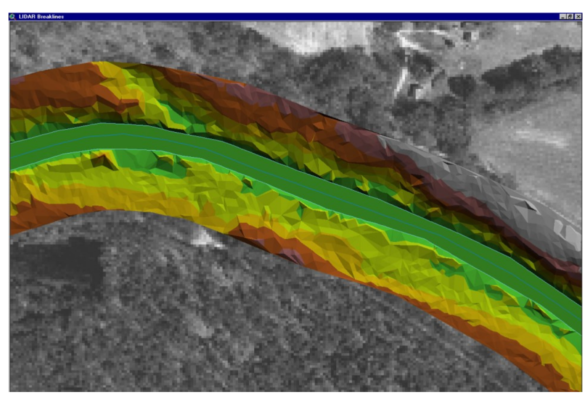


Figure xvii: TIN of lidar along water body with breaklines

Breaklines were collected in the matter described above for all streams using guidance stating the streams are draining greater than approximately one square mile. Although the production guidance was greater than one square mile, observation of the breakline dataset will show a final collection that can well under that tolerance. 2D lines defining the centerline of those streams were manually digitized into an ArcView shape file format from the lidar using hillshades, contours, existing imagery, and intensity imagery. The streamlines were then processed against the bare earth lidar as described above. Once processing and quality control tasks were complete, the bare earth lidar surface and the accompanying breaklines were used to generate the surface for contour generation and bare earth DEM deliverables.

3.4.1. HYDRO-BREAKLINE QA/QC

The QA/QC of the breakline processing is an integrated part of the production process. At different phases of the breakline collection a quality step is performed.

- 2D Breaklines – once the 2D breakline have been collected an automated topology check identifies potential errors within the dataset. A GIS analyst then manual QC's the dataset using the topology check output as a guide. Corrections are made to legitimate calls.
- 3D Breaklines – automated checks are run against the 3D breaklines to ensure there are no errors in the data's z values. The 3D lines were then viewed in profile to correct any anomalous vertices or remove errant points from the lidar DTM, which could cause unrealistic "spikes" or "dips" in the breakline.

3.5. DATA PREPARATION FOR CONTOUR GENERATION

Prior to generating the raw and smoothed contours Fugro EarthData performed a series of data preparation processes utilizing the lidar and breakline data.

1. In Terrascan the lidar dataset was used to create a customer approved 5m grid. Test contours derived from several lidar grid sizes were provided to CADWR so that CADWR could select the grid spacing most suitable for the contour generation.
2. In Terrascan a buffer distance was established around all the breaklines. All lidar points falling within the buffer were reclassified as they would not be needed in the contour generation.
3. Both the 5m grid and the breaklines had their x, y, and z values converted to the following units, x – meter, y – meter, z – feet.
4. Using a proprietary batch file the large datasets were cut into working tiles. Each working tile consisted of 9 deliverable tiles.
    a. The inputs to the batch processing were the breaklines, the 5m grid, and the working tile layout.
    b. First the batch file created overlapping TINs per tile referencing the lidar ground points and breaklines.
    c. The batch file generates tiles clipped to the working layout.

3.6. RAW CONTOUR GENERATION

For the generation of raw contours, the bare ground lidar points in a 5m grid as generated in section 3.5 were used. The 1-ft, raw contour files were generated in Terrascan and outputted in a MicroStation .DGN format. The .DGN files were reviewed using the QA/QC process described in section 3.6.1. Upon completion of the review, the data files were converted into AutoCAD .DWG and ESRI geodatabase formats for delivery.

It is important to note that no edits were made to the raw contours files and that they do not have the same, smooth aesthetic appearance of standard contours.

3.6.1. RAW CONTOUR QA/QC

After the creation of the raw contours the lead technician did a visual QC in MicroStation to ensure completeness of the dataset. When no anomalies were observed, the dataset was finalized.

3.7. SMOOTH CONTOUR GENERATION

The process used to generate the smooth tiles only differed slightly from the process for raw contour generation as described in section 3.6.

For the generation of smoothed contours, the bare ground lidar points in a 5m grid as generated in section 3.5 were used. A batch process was selected to run against the working tiles. This batch utilized an algorithm that "smoothed" the contours. The 1-ft, smooth contour files were generated in Terrascan outputted in MicroStation .DGN format. The .DGN files were reviewed using the QA/QC process described in section 3.7.1. Upon completion of the review, the data files were edited to remove dangles, isolations, and other artifacts. After the edit the data files were converted into AutoCAD .DWG and ESRI geodatabase formats for delivery.

3.7.1. SMOOTH CONTOUR QA/QC

The QA/QC of the smooth contours involved using proprietary AML's (Arc Macro Language) which were run against to check for data gaps, overlaps, and collapsed contours. After a successful automated QC 100% of each work tiles edges were checked manually to ensure all data ties were correct.

3.8. ESRI GEODATABASE CREATION

For deliverables that required an ESRI personal geodatabase format the following conversion process was used.

All clean, passed QA/QC, datasets were imported into ESRI's ArcMap. A proprietary Visual Basic script was run which merged all working tiles into a seamless dataset. Once merged the script created a geodatabase and imported the dataset converting it from a DGN into a feature class dataset.

3.9. GENERATION OF LIDAR INTENSITY IMAGES

Intensity-capable lidar sensors record the raw return intensity for every range. This intensity value represents the peak voltage of the return signal as recorded by the lidar system controller. There are several external factors which influence this value. Among the most significant factors include the range to the target, angle of incidence and atmospheric dispersion. In addition, the system controller also records the state of the AGC (automatic gain control) scaled to an 8-bit value. The AGC circuit, as the name implies, adjusts the return signal gain in response to changes in target reflectance. The gain and intensity values may vary over a scene and from day to day, however the final product represents the correct value of the intensity associated with each lidar pulse.

To create the intensity deliverable the lidar technician imported the point cloud LAS files into Terrascan. The software package has a function that allows the intensity values to be output as a geotiff. The output pixel size was defined as 1m, meaning any lidar points falling within one square meter had their intensity values averaged. The output geotiff images were radiometrically balanced and a MrSID mosaic of the project area was created.

3.9.1. QA/QC OF LIDAR INTENSITY IMAGES

The intensity tiles are manually reviewed in ArcMap to ensure a full coverage has been achieved and the radiometric balancing is correct.

4. PROJECT METADATA

Project level metadata records were developed for all point, contour, or grid deliverables in accordance with FGDC guidelines and the project metadata template. Compliance with FGDC guidelines was verified using the MP metadata parser available on the FGDC web portal. Metadata records were peer reviewed to identify and correct any typographic or other errors that were not be flagged by automated tools.

APPENDIX A

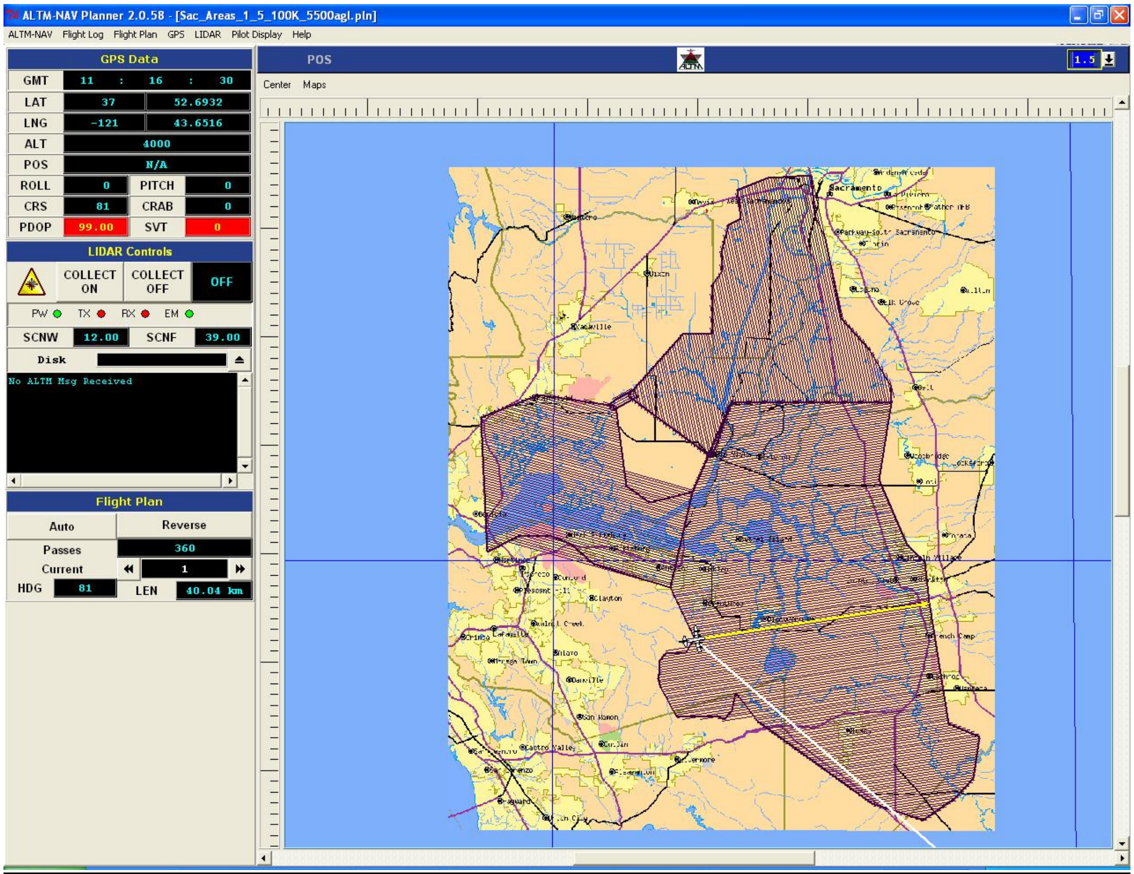
LIDAR MAPPING REPORT

OVERVIEW
Client: Earth Data
Project. Number: A06_EART_001*;* **Project. Name:** Sacramento-San Joaquin Delta, CA
County: Sacramento, Yolo, Solano, Contra Costa, Alameda, San Joaquin, Stanislaus*;* **State:** California
Total Area (Acres): *1,024,204;* **Number of Sites:** *1*
Purpose: *Create a digital elevation map for analysis of terrain.*
Vertical Accuracy Intended Suitability (feet): *95% at 0 .6' (<18.5cm) and 90 % at .5' (15cm*
Horizontal Accuracy: *Estimated at 1/3000 of flight height based on Calibration Surveys*

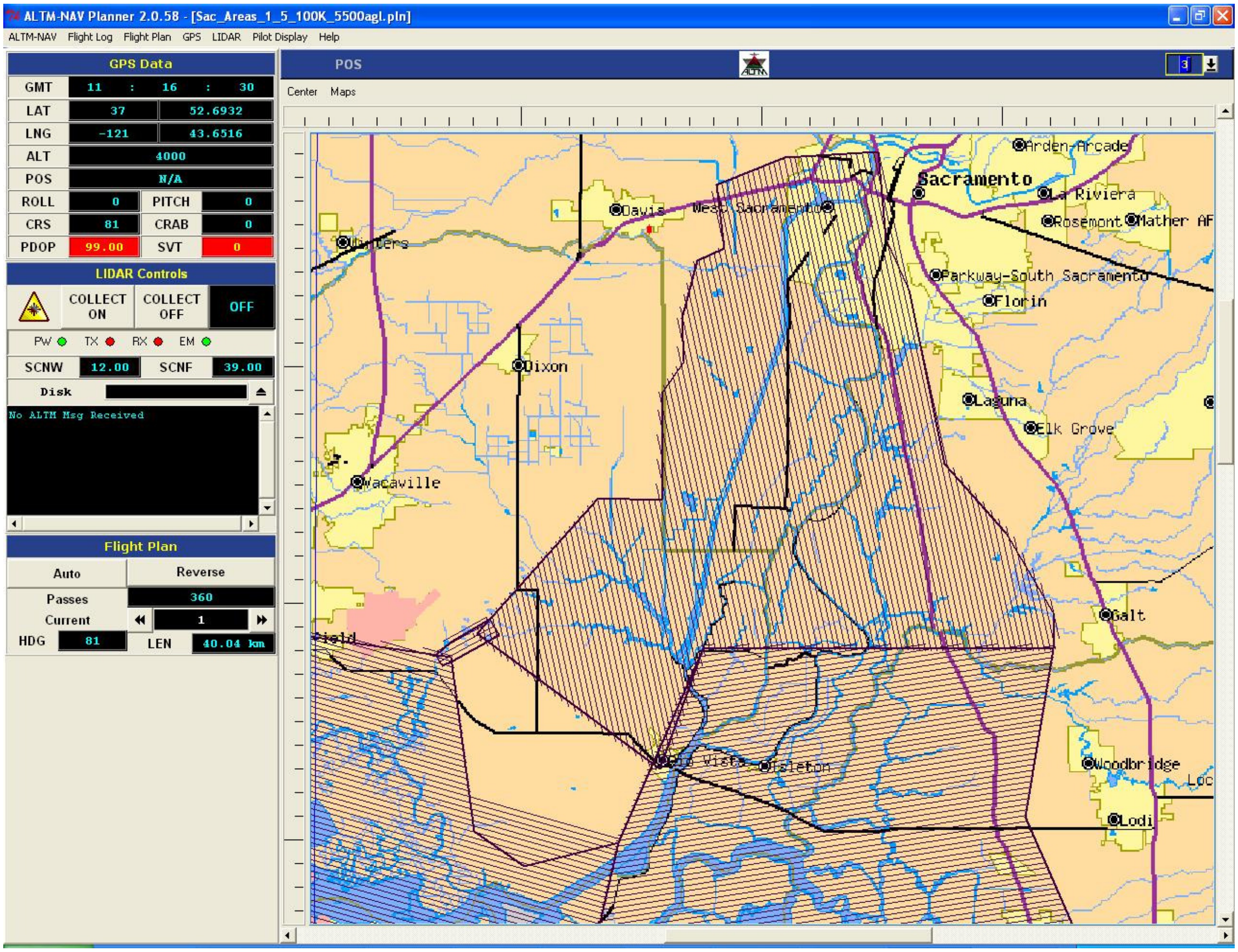
PROJECT DATUMS, REFERENCE SYSTEM
Horizontal Datum: *North American Datum of 1983 (NAD83);*
Reference Network: *NGS Network*
Vertical Datum: *North American Vertical Datum of 1988 (NAVD88);*
Reference Network: *NGS Network*
Geoid Model: *Geoid03 Continental US*
Ellipsoid: *GRS-80*

DATA COLLECTION: AIRBORNE & FIELD SURVEYS
Lidar System: *Optech ALTM-3100;* **Serial number:** *04SEN163*
Airborne GPS: *Trimble with Novatel 512 Antenna Ht=0.00m*
Mirror Scan Angle +/- (degrees): *12*
Swath Overlap (%): *40*
Swath Width (mtrs): 711.44
Mirror Scanner Frequency (Hz): 39
Laser Pulse Rate (khz): *70*
Posting Interval (Spot Spacing) (square mtrs): 0.787
IMU Positioning*: 200 hertz adjusted to the 1 hertz GPS positions*
Airport of Operations: *Stockton, CA. and Sacramento Executive Airport*
Boulder K Index: *0-4 all days*
Comments/Problems/Failures: *none*
Altitude: *5500 ft*
Airspeed: *120 kts*

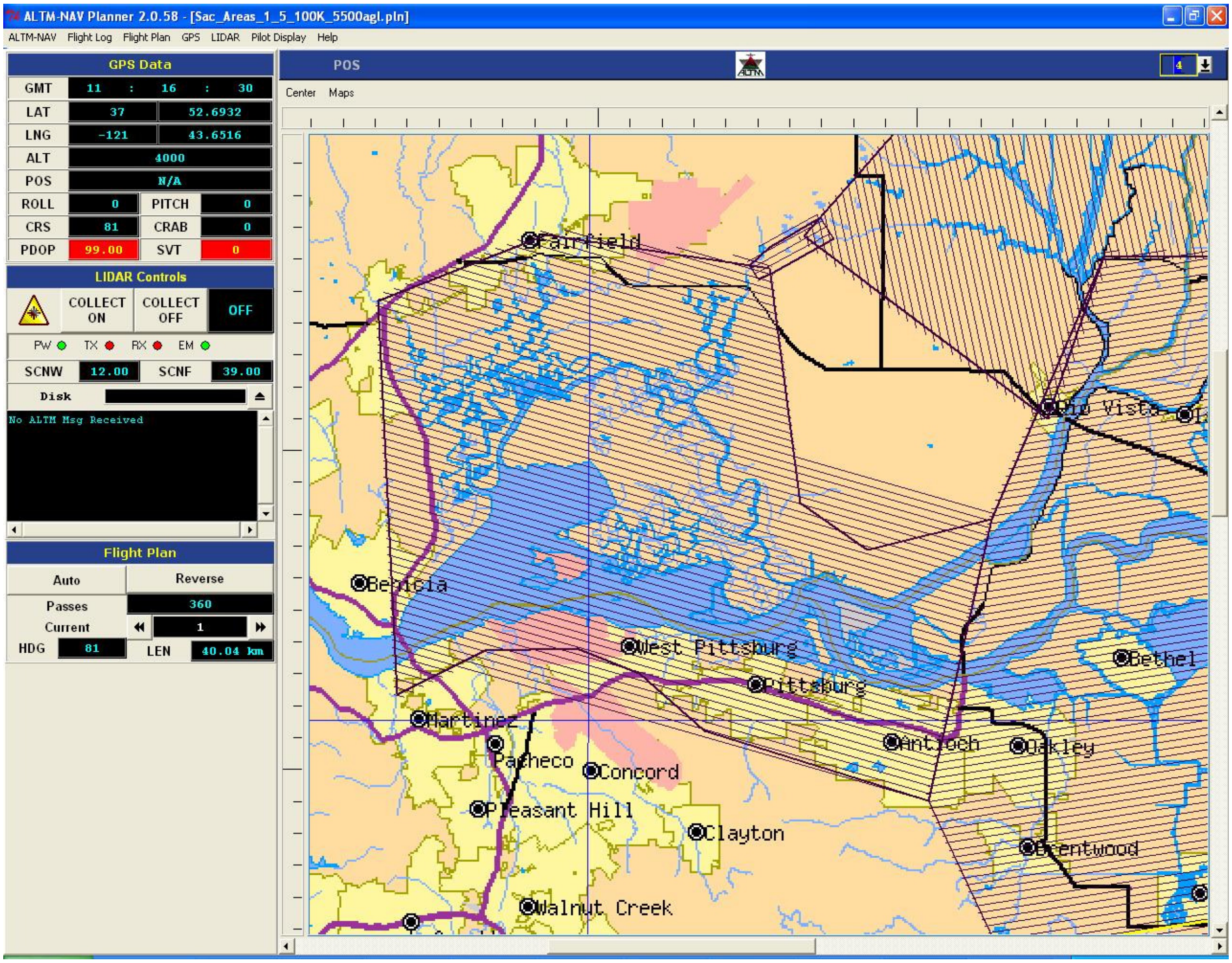
Full View:


ALTM-NAV Planner 2.0.58 - [Sac_Areas_1_5_100K_5500agl.pln]
ALTM-NAV Flight Log Flight Plan GPS LIDAR Pilot Display Help
GPS Data
GMT 11 : 16 : 30
LAT 37 52.6932
LNG -121 43.6516
ALT 4000
POS N/A
ROLL 0 PITCH 0
CRS 81 CRAB 0
PDOP 99.00 SVT 0
LIDAR Controls
COLLECT ON
COLLECT OFF
OFF
PW TX RX EM
SCNW 12.00 SCNF 39.00
Disk
No ALTM Msg Received
Flight Plan
Auto
Reverse
Passes 360
Current 1
HDG 81 LEN 40.04 km
POS
Center Maps
1.5
Sacramento
Clayton
San Ramon
Livermore

North View:

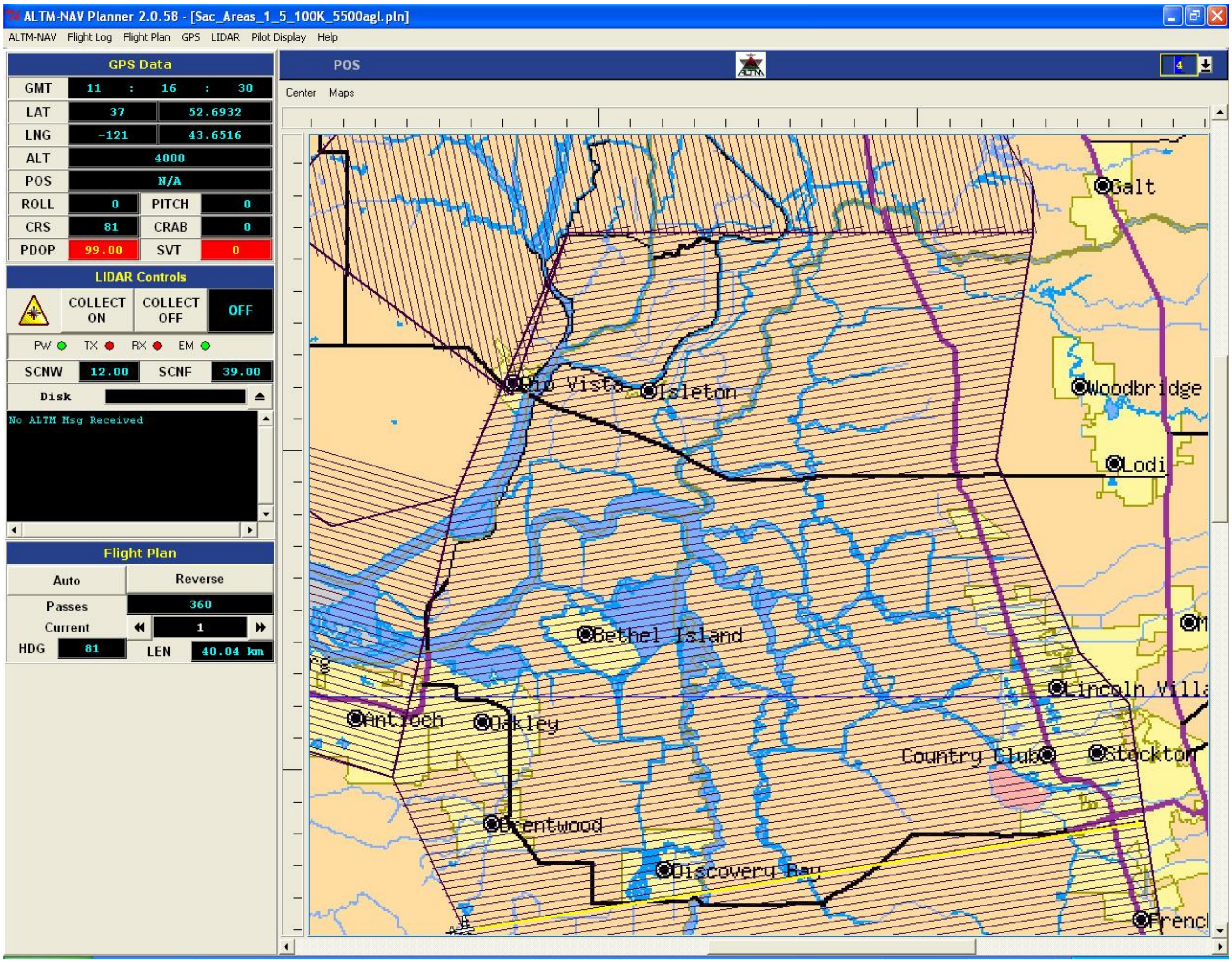

ALTM-NAV Planner 2.0.58 - [Sac_Areas_1_5_100K_5500agl.pln]
ALTM-NAV Flight Log Flight Plan GPS LIDAR Pilot Display Help
GPS Data
GMT 11 : 16 : 30
LAT 37 52.6932
LNG -121 43.6516
ALT 4000
POS N/A
ROLL 0 PITCH 0
CRS 81 CRAB 0
PDOP 99.00 SVT 0
LIDAR Controls
COLLECT ON
COLLECT OFF
OFF
PW TX RX EM
SCNW 12.00 SCNF 39.00
Disk
No ALTM Msg Received
Flight Plan
Auto
Reverse
Passes 360
Current 1
HDG 81 LEN 40.04 km
POS
Center Maps
Arden-Arcade
Sacramento
La Riviera
Davis
West Sacramento
Rosemont
Mather AF
Winters
Parkway-South Sacramento
Florin
Dixon
Laguna
Elk Grove
Vacaville
Galt
Rio Vista
Isleton
Woodbridge
Lodi

West View:

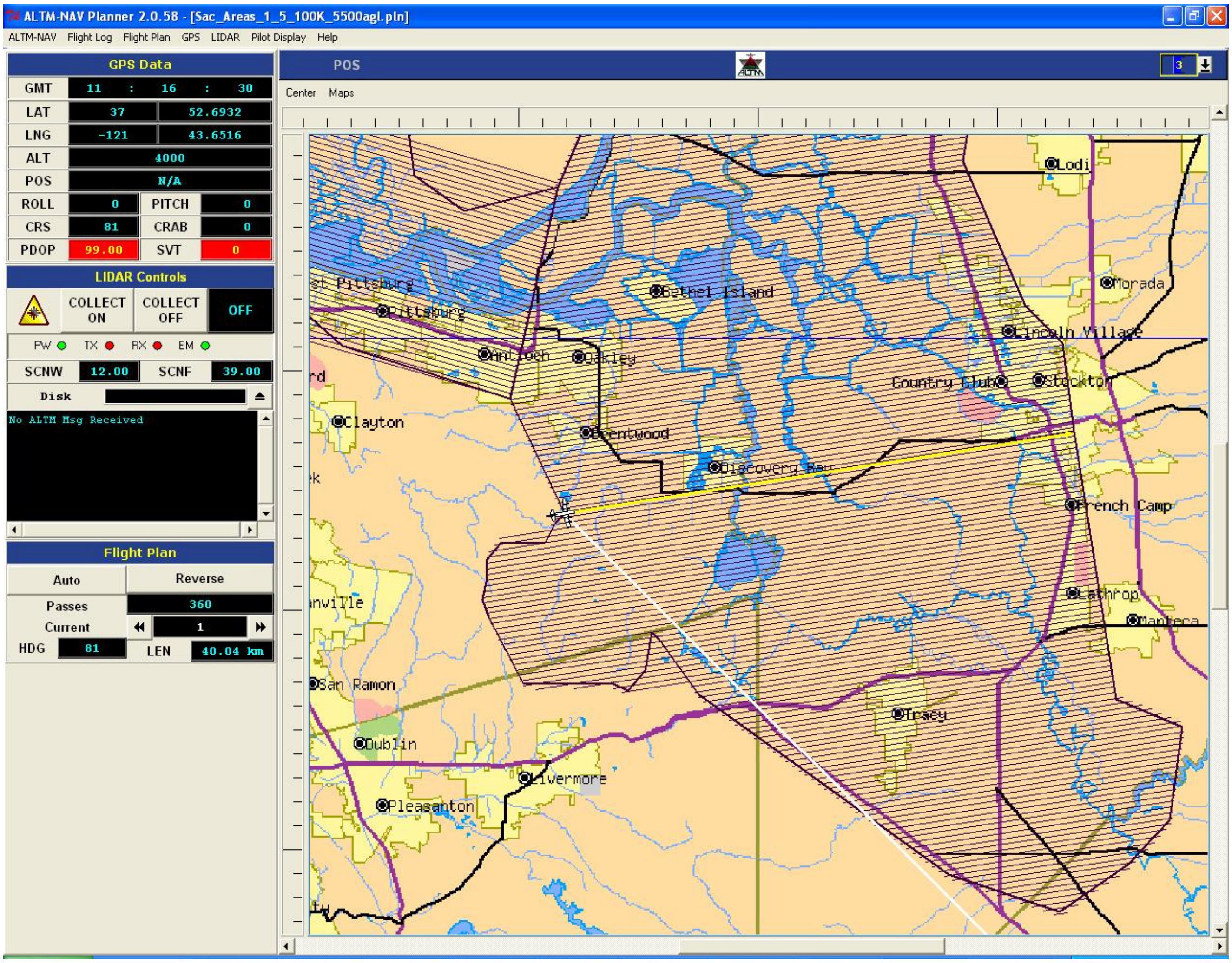


ALTM-NAV Planner 2.0.58 - [Sac_Areas_1_5_100K_5500agl.pln]
ALTM-NAV Flight Log Flight Plan GPS LIDAR Pilot Display Help
GPS Data
GMT 11 : 16 : 30
LAT 37 52.6932
LNG -121 43.6516
ALT 4000
POS N/A
ROLL 0 PITCH 0
CRS 81 CRAB 0
PDOP 99.00 SVT 0
LIDAR Controls
COLLECT ON
COLLECT OFF
OFF
PW TX RX EM
SCNW 12.00 SCNF 39.00
Disk
No ALTM Msg Received
Flight Plan
Auto
Reverse
Passes 360
Current 1
HDG 81 LEN 40.04 km
POS
Center Maps
Fairfield
Rio Vista
Benicia
West Pittsburg
Pittsburg
Bethel
Martinez
Pacheco
Concord
Antioch
Oakley
Pleasant Hill
Clayton
Brentwood
Walnut Creek

Central View:



South View:


ALTM-NAV Planner 2.0.58 - [Sac_Areas_1_5_100K_5500agl.pln]
ALTM-NAV Flight Log Flight Plan GPS LIDAR Pilot Display Help
GPS Data
GMT 11 : 16 : 30
LAT 37 52.6932
LNG -121 43.6516
ALT 4000
POS N/A
ROLL 0 PITCH 0
CRS 81 CRAB 0
PDOP 99.00 SVT 0
LIDAR Controls
COLLECT ON
COLLECT OFF
OFF
PW TX RX EM
SCNW 12.00 SCNF 39.00
Disk
No ALTM Msg Received
Flight Plan
Auto
Reverse
Passes 360
Current 1
HDG 81 LEN 40.04 km
POS
Center Maps
Lodi
Morada
Bethel Island
Pittsburg
Lincoln Village
Antioch
Oakley
Country Club
Stockton
Clayton
Brentwood
Discovery Bay
French Camp
Lathrop
Manteca
San Ramon
Tracy
Dublin
Livermore
Pleasanton

GPS Survey Criteria: (standard unless otherwise noted)
GPS Observables: *L1 & L2 Carrier wave, C/A Code and P-Code***;**
Epoch Rate (seconds): *1;* **Minimum Satellites:** 5; **Elevation Mask (degrees):** *15;*
GPS Ground Receivers (Base Stations): *2 Minimum:*
Base Stations Occupied by: *Airborne 1*
Criteria Exceeded: *no;* Equipment Failures: *none*

Static GPS Network Established by Towill Inc.

Adjusted Positions and Ellipsoid Heights (Meters)

Station	Latitude	Longitude	Ellip Ht	Geoid Ht
704	38-12-54.519402	122-08-12.646495	-24.3316	-31.8073
710	38-20-44.197405	121-32-35.776383	-22.6483	-31.4221
711	38-29-40.919422	121-28-57.857217	-26.3118	-30.9217
714	38-20-41.426229	121-25-02.931635	-23.2919	-31.0505
723	38-01-25.749915	121-19-13.712790	-27.2414	-31.6928
724	37-49-58.923062	121-15-46.836153	-24.8774	-32.0165
AC9892	38-05-13.641860	122-06-42.210180	-4.9111	-32.0648
AE9887	37-58-32.218950	121-28-26.363330	-28.6200	-32.1194
AE9889*	37-48-19.679740	121-27-02.214560	-29.9700	-32.2121
AE9891	38-01-00.378010	121-27-23.653800	-28.9200	-32.0094
CMOD	37-38-28.799500	120-59-59.862820	28.6520	-31.9313
DE8502*	38-01-18.817100	122-01-40.827530	-22.6100	-32.1277
HS0455*	37-44-43.517070	121-27-52.678200	-20.6900	-32.1615
HS0512	37-47-15.845848	121-18-25.733486	-23.4232	-32.1232
JS0755	38-47-09.874500	121-14-32.097030	47.3663	-29.8812
JS1011	38-34-48.821522	121-29-38.037327	42.7335	-30.7894
JS1193	38-24-32.026630	121-19-29.688830	-11.3012	-30.6117
JS1244*	38-13-31.375744	121-29-32.157034	-25.1500	-31.6053
JS1617	38-26-04.042145	121-50-07.262767	-12.9138	-31.6938
JS3889	38-05-09.262950	121-16-30.650780	-19.0300	-31.4157
JT0185	38-13-38.752550	122-07-07.770260	-17.4900	-31.7974
JT0221*	38-18-41.158210	122-01-58.035900	40.3100	-31.6346
JT9527*	38-09-23.349678	122-12-52.470546	91.1878	-31.8688
JT9536	38-06-04.937980	122-15-50.142040	-28.8900	-32.1017
P256	37-55-55.057863	121-36-17.368519	-30.1554	-32.3300
P257	37-45-19.032380	121-27-50.472645	-24.1416	-32.1753
P261	38-09-10.643083	122-13-03.088971	118.6927	-31.8816
P262	38-01-30.520128	122-05-46.064094	-8.0380	-32.1171
P266	38-11-02.271324	121-50-36.641849	22.9954	-32.2587
P267	38-22-49.193753	121-49-23.590429	-16.9492	-31.8704
P268	38-28-24.680525	121-38-47.026235	-23.4015	-31.3125
P271	38-39-26.447765	121-42-52.325132	-17.6678	-30.7248
P273	38-06-56.910332	121-23-17.026738	-25.8469	-31.5974
S300	37-39-59.412687	121-33-29.712440	496.3043	-31.7514
UCD1	38-32-10.449181	121-45-04.379122	0.1520	-31.2477
			Average:	-31.6665

*denotes as base station control for flights

Station Coordinate Standard Deviations (Meters)
Standard Deviations are Scaled by Total Error Factor

Station	N	E	Elev
704	0.008589	0.008911	0.011678
710	0.011868	0.012025	0.016845
711	0.007293	0.007342	0.010964
714	0.010987	0.011194	0.018935
723	0.006135	0.006027	0.008779
724	0.010565	0.010613	0.013609
AC9892	0.000000	0.000000	0.010897
AE9887	0.000000	0.000000	0.000000
AE9889	0.000000	0.000000	0.000000
AE9891	0.000000	0.000000	0.000000
CMOD	0.000000	0.000000	0.000000
DE8502	0.000000	0.000000	0.000000
HS0455	0.000000	0.000000	0.000000
HS0512	0.010167	0.010280	0.000000
JS0755	0.000000	0.000000	0.010730
JS1011	0.007426	0.007446	0.014907
JS1193	0.000000	0.000000	0.012093
JS1244	0.006121	0.006127	0.000000
JS1617	0.007525	0.007574	0.000000
JS3889	0.000000	0.000000	0.000000
JT0185	0.000000	0.000000	0.000000
JT0221	0.000000	0.000000	0.000000
JT9527	0.008191	0.008266	0.010566
JT9536	0.000000	0.000000	0.000000
P256	0.000000	0.000000	0.000000
P257	0.000000	0.000000	0.000000
P261	0.000000	0.000000	0.000000
P262	0.000000	0.000000	0.000000
P266	0.000000	0.000000	0.000000
P267	0.000000	0.000000	0.000000
P268	0.000000	0.000000	0.000000
P271	0.000000	0.000000	0.000000
P273	0.000000	0.000000	0.000000
UCD1	0.000000	0.000000	0.000000

Entire GPS Static Network can be found at end of report:

Oceanit - US Army Corps of Engineers Dam Breach Analysis Flight Report

Flight ID	Mission Date	Time (GMT)	Altitude (agl_ft)	Airspeed (kts)	Scan Angle	Scan Rate (Hz)	Pulse Rate (kHz)	PID Base 1	PID Base 2
CA01407_1	14-Jan-07	23:23:02-00:15:41	5500	120	12	39	70	AE9889	HS0455
CA01407_2	14-Jan-07	02:09:11-04:49:50	5500	120	12	39	70	AE9889	HS0455
CA01407_3	14-Jan-07	05:48:01-09:54:46	5500	120	12	39	70	AE9889	HS0455
CA01507_1	15-Jan-07	16:21:47-17:08:55	5500	120	12	39	70	AE9889	HS0455
CA01507_2	15-Jan-07	19:04:26-22:39:26	5500	120	12	39	70	AE9889	HS0455
CA01507_3	15-Jan-07	00:19:52-03:43:35	5500	120	12	39	70	AE9889	HS0455
CA01507_4	15-Jan-07	05:28:49-08:48:42	5500	120	12	39	70	AE9889	HS0455
CA01607_1	16-Jan-07	16:23:25-20:06:00	5500	120	12	39	70	AE9889	HS0455
CA01607_2	16-Jan-07	00:29:28-04:22:53	5500	120	12	39	70	AE9889	AE9887
CA01707_1	17-Jan-07	13:48:42-17:01:16	5500	120	12	39	70	JS1244	AE9887
CA01707_2	17-Jan-07	19:24:24-22:43:05	5500	120	12	39	70	JS1244	AE9887
CA01707_3	17-Nov-07	00:42:14-03:30:10	5500	120	12	39	70	JS1244	AE9887
CA01707_4	17-Jan-07	05:44:08-09:10:21	5500	120	12	39	70	JS1244	AE9887
CA01807_1	18-Jan-07	21:44:34-01:13:58	5500	120	12	39	70	JS1244	AE9887
CA01907_1	19-Jan-07	21:25:02-00:36:10	5500	120	12	39	70	JS1244	AE9887
CA01907_2	19-Jan-07	04:31:15-06:25:50	5500	120	12	39	70	JS1244	AE9887
CA02007_1	20-Jan-07	22:25:15-02:06:56	5500	120	12	39	70	JS1244	JS1193
CA02107_1	21-Jan-07	22:23:36-23:12:29	5500	120	12	39	70	JS1244	JS1193
CA02107_2	21-Jan-07	23:42:57-00:47:05	5500	120	12	39	70	JS1244	JS1193
CA02207_1	22-Jan-07	20:14:10-23:07:07	5500	120	12	39	70	JS1244	JS1193
CA02207_2	22-Jan-07	01:16:34-04:21:01	5500	120	12	39	70	JS1244	JS1193
CA02307_1	23-Jan-07	18:28:17-21:34:36	5500	120	12	39	70	JS1244	JT0221
CA02307_2	23-Jan-07	23:48:58-03:01:23	5500	120	12	39	70	JS1244	JT0221
CA02507_1	25-Jan-07	22:28:16-01:37:51	5500	120	12	39	70	JT9527	DE8502
CA02507_2	25-Jan-07	04:08:56-05:23:33	5500	120	12	39	70	JT9527	DE8502
CA02607_1	26-Jan-07	22:32:10-00:20:37	5500	120	12	39	70	JT9527	DE8502
CA02807_1	28-Jan-07	02:07:23-04:46:30	5500	120	12	39	70	JT9527	DE8502
CA02807_2	28-Jan-07	07:05:03-09:25:27	5500	120	12	39	70	JT9527	DE8502
CA03007_1	30-Jan-07	01:00:26-02:23:52	5500	120	12	39	70	JT9527	DE8502
CA03407_1	3-Feb-07	18:57:51-21:41:04	5500	120	12	39	70	JT9527	DE8502

POST PROCESSING - KINEMATIC SOLUTIONS
Processing Software: *Applanix Pos-GPS;* **Laser Point Computation Software:** *Optech's REALM*
Ephemeris used*: Broadcast*
Ionosphere: *Ionospheric modeled*
Note: The flight name contains the Julian day of the year, e.g. CA02007_1 was collected on Julian day 020 in the year 2007.

Sensor Calibration

Flight ID	Mission Date	Scanner Scale	IMU			Flight edge mismatches
			Roll	Pitch	Heading	
CA01407_1	14-Jan-07	1.0107	-0.054	0.167	0.169	+/- 10 cm
CA01407_2	14-Jan-07	1.0098	-0.054	0.167	0.169	+/- 10 cm
CA01407_3	14-Jan-07	1.0098	-0.054	0.167	0.169	+/- 10 cm
CA01507_1	15-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01507_2	15-Jan-07	1.0115	-0.051	0.167	0.111	+/- 10 cm
CA01507_3	15-Jan-07	1.0115	-0.057	0.161	0.145	+/- 10 cm
CA01507_4	15-Jan-07	1.0092	-0.057	0.161	0.145	+/- 10 cm
CA01607_1	16-Jan-07	1.0111	-0.054	0.167	0.169	+/- 10 cm
CA01607_2	16-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01707_1	17-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01707_2	17-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01707_3	17-Nov-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01707_4	17-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA01807_1	18-Jan-07	1.0096	-0.051	0.167	0.181	+/- 10 cm
CA01907_1	19-Jan-07	1.0096	-0.051	0.167	0.181	+/- 10 cm
CA01907_2	19-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA02007_1	20-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA02107_1	21-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA02107_2	21-Jan-07	1.0096	-0.051	0.167	0.181	+/- 10 cm
CA02207_1	22-Jan-07	1.0088	-0.051	0.159	0.159	+/- 10 cm
CA02207_2	22-Jan-07	1.0095	-0.059	0.159	0.159	+/- 10 cm
CA02307_1	23-Jan-07	1.0115	-0.049	0.164	0.176	+/- 10 cm
CA02307_2	23-Jan-07	1.0115	-0.049	0.164	0.176	+/- 10 cm
CA02507_1	25-Jan-07	1.0115	-0.049	0.164	0.176	+/- 10 cm
CA02507_2	25-Jan-07	1.0094	-0.065	0.167	0.181	+/- 10 cm
CA02607_1	26-Jan-07	1.0095	-0.051	0.167	0.181	+/- 10 cm
CA02807_1	28-Jan-07	1.0097	-0.051	0.147	0.121	+/- 10 cm
CA02807_2	28-Jan-07	1.0097	-0.051	0.147	0.121	+/- 10 cm
CA03007_1	30-Jan-07	1.0109	-0.042	0.171	0.148	+/- 10 cm
CA03407_1	3-Feb-07	1.0109	-0.042	0.171	0.148	+/- 10 cm

Sensor Calibration Description:

Flight line mismatches are measured visually by the Airborne 1 team of Data Analysts. Calibration parameters are adjusted as necessary on a flight by flight basis. All flight lines from each flight are checked in multiple locations. Visual checks are done using Terrascan software. Terramatch software is also used to supplement visual checks; Terramatch performs an automated statistical analysis of all calibration parameters.

DELIVERABLES

Projection: *UTM Zone 10*
Units: *Meters*
Data format: LAS Binary, one file per flight. Terrascan Project (with fligthline overlap cut) in client desired tiling scheme
Data Delivered via: Hard Drive
Delivery Date: *3/29/07*
Containing: *All points first and last returns*

NGS Datasheets

(flight control stations)

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1         National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 AE9889 ***********************************************************************
 AE9889  HT_MOD       -  This is a Height Modernization Survey Station.
 AE9889  DESIGNATION -  FINCK
 AE9889  PID         -  AE9889
 AE9889  STATE/COUNTY-  CA/SAN JOAQUIN
 AE9889  USGS QUAD   -  UNION ISLAND (1978)
 AE9889
 AE9889                        *CURRENT SURVEY CONTROL
 AE9889  ___________________________________________________________________
 AE9889* NAD 83(1998)-  37 48 19.67937(N)    121 27 02.21264(W)     ADJUSTED
 AE9889* NAVD 88     -         2.23   (meters)       7.3    (feet)  GPS OBS
 AE9889  ___________________________________________________________________
 AE9889  EPOCH DATE  -        2002.86
 AE9889  X           -  -2,632,646.284 (meters)                     COMP
 AE9889  Y           -  -4,304,411.846 (meters)                     COMP
 AE9889  Z           -   3,888,388.196 (meters)                     COMP
 AE9889  LAPLACE CORR-           0.81  (seconds)                    DEFLEC99
 AE9889  ELLIP HEIGHT-         -29.97  (meters)          (10/28/05) GPS OBS
 AE9889  GEOID HEIGHT-         -32.21  (meters)                     GEOID03
 AE9889
 AE9889  HORZ ORDER  -  FIRST
 AE9889  ELLP ORDER  -  FOURTH    CLASS I
 AE9889
 AE9889.The horizontal coordinates were established by GPS observations
 AE9889.and adjusted by the National Geodetic Survey in October 2005..
 AE9889.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 AE9889.DATUM ITEM on the data sheet items page.
 AE9889.The horizontal coordinates are valid at the epoch date displayed above.
 AE9889.The epoch date for horizontal control is a decimal equivalence
 AE9889.of Year/Month/Day.
 AE9889
 AE9889.The orthometric height was determined by GPS observations and a
 AE9889.high-resolution geoid model using precise GPS observation and
 AE9889.processing techniques.
 AE9889
 AE9889.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AE9889
 AE9889.The Laplace correction was computed from DEFLEC99 derived deflections.
 AE9889
```

```
AE9889.The ellipsoidal height was determined by GPS observations
AE9889.and is referenced to NAD 83.
AE9889
AE9889.The geoid height was determined by GEOID03.
AE9889
AE9889;                    North         East     Units Scale Factor Converg.
AE9889;SPC CA 3     -   645,307.175 1,916,292.432   MT  0.99992963   -0 34 55.2
AE9889;SPC CA 3     - 2,117,145.29  6,287,036.09   sFT  0.99992963   -0 34 55.2
AE9889;UTM  10      - 4,185,362.089   636,394.625   MT  0.99982914   +0 56 59.6
AE9889
AE9889!             -  Elev Factor  x  Scale Factor =   Combined Factor
AE9889!SPC CA 3     -   1.00000470  x   0.99992963  =   0.99993433
AE9889!UTM  10      -   1.00000470  x   0.99982914  =   0.99983384
AE9889
AE9889                         SUPERSEDED SURVEY CONTROL
AE9889
AE9889  NAD 83(1992)-  37 48 19.67730(N)    121 27 02.20958(W) AD(1997.30) 1
AE9889  ELLIP H (07/10/98)  -29.98   (m)                       GP(1997.30) 4 1
AE9889  NAD 83(1992)-  37 48 19.67697(N)    121 27 02.20995(W) AD(1997.30) 1
AE9889  ELLIP H (05/14/98)  -29.89   (m)                       GP(1997.30) 3 1
AE9889
AE9889.Superseded values are not recommended for survey control.
AE9889.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AE9889.See file dsdata.txt to determine how the superseded data were derived.
AE9889
AE9889_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFG3639585362(NAD 83)
AE9889_MARKER: DD = SURVEY DISK
AE9889_SETTING: 50 = ALUMINUM ALLOY ROD W/O SLEEVE (10 FT.+)
AE9889_STAMPING: FINCK 1997
AE9889_MARK LOGO: BOR
AE9889_PROJECTION: FLUSH
AE9889_MAGNETIC: N = NO MAGNETIC MATERIAL
AE9889_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AE9889_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AE9889+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2002
AE9889_ROD/PIPE-DEPTH: 3.05 meters
AE9889
AE9889  HISTORY     - Date     Condition        Report By
AE9889  HISTORY     - 1997     MONUMENTED       BOR
AE9889  HISTORY     - 20021101 GOOD             CADWR
AE9889
AE9889                         STATION DESCRIPTION
AE9889
AE9889'DESCRIBED BY US BUREAU OF RECLAMATION 1997 (DWS)
AE9889'THE STATION IS ABOUT 4.4 MI (7.1 KM) NORTH-NORTHWEST OF TRACY AND NEAR
AE9889'THE TRACY BOULEVARD CROSSING OF THE OLD RIVER BRIDGE.  TO REACH THE
AE9889'STATION FROM THE INTERSECTION OF INTERSTATE HIGHWAY 205 AND TRACY BLVD
AE9889'ON THE NORTH SIDE OF TRACY, GO NORTH ON TRACY BLVD FOR 3.5 MI (5.6 KM)
AE9889'TO THE OLD RIVER CROSSING.  CONTINUE NORTH ON TRACY BLVD 0.05 MI (0.08
AE9889'KM) TO THE T-INTERSECTION OF FINCK ROAD, A SIDE ROAD LEFT.  TURN LEFT
AE9889'(WEST) AND GO 0.05 MI (0.08 KM) , PASSING SAMS MARKET ON THE LEFT
AE9889'(SOUTH) SIDE OF THE ROAD, TO THE STATION ON THE RIGHT (NORTH) SIDE OF
AE9889'THE ROAD.  THE STATION IS A 2 1/2 INCH DIAMETER ALUMINUM ALLOY DOMED
AE9889'CAP WITH MAGNET, SET 0.2 FT (0.1 M) BELOW GROUND, ATTACHED TO AN
AE9889'ALUMINUM ALLOY ROD DRIVEN 10.0 FT (3.0 M) TO REFUSAL, ENCASED IN A
AE9889'SAND FILLED 4-INCH DIAMETER PVC PIPE SET TO A DEPTH OF 4 FT (1.2 M) IN
AE9889'A 1 FT (0.3 M) DIAMETER CONCRETE-FILLED HOLE 4 FT (1.2 M) DEEP.  THE
AE9889'STATION IS 286 FT (87.2 M) WEST OF THE CENTERLINE OF TRACY BLVD, 69.9
AE9889'FT (21.3 M) NORTHWEST OF AND ACROSS THE ROAD FROM A FADED ORANGE PIPE
AE9889'WITNESS POST MARKING A REBAR PROPERTY CORNER MARKER, 20.3 FT (6.2 M)
AE9889'NORTH OF THE CENTERLINE OF FINCK ROAD, 5.7 FT (1.7 M) SOUTH OF POWER
AE9889'POLE 591 WHICH IS EAST OF A DIRT TRACK ROAD GOING NORTH FROM FINCK
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AE9889'ROAD TO THE NORTH SIDE OF A DRAINAGE CANAL PARALLELING THE ROAD.  THE
AE9889'STATION IS 2.0 FT (0.6 M) SOUTH OF A CARSONITE WITNESS POST.  THE
AE9889'STATION WAS OCCUPIED AS PART OF THE SAN JOAQUIN-SACRAMENTO RIVER DELTA
AE9889'GPS/VERTICAL PROJECT. (RWK)
AE9889
AE9889                              STATION RECOVERY (2002)
AE9889
AE9889'RECOVERY NOTE BY CA DEPT OF WATER RES 2002 (WLB)
AE9889'RECOVERED AS DESCRIBED. THE STATION WAS OBSERVED AS PART OF THE DWR
AE9889'DELTA 2002 SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1         National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 AE9887 ***********************************************************************
 AE9887  HT_MOD       -  This is a Height Modernization Survey Station.
 AE9887  DESIGNATION -  MARTI
 AE9887  PID          -  AE9887
 AE9887  STATE/COUNTY-  CA/SAN JOAQUIN
 AE9887  USGS QUAD    -  HOLT (1994)
 AE9887
 AE9887                          *CURRENT SURVEY CONTROL
 AE9887  ___________________________________________________________________
 AE9887* NAD 83(1998)-  37 58 32.21892(N)    121 28 26.36097(W)     ADJUSTED
 AE9887* NAVD 88     -          3.49   (meters)      11.5     (feet)  GPS OBS
 AE9887  ___________________________________________________________________
 AE9887  EPOCH DATE  -        2002.86
 AE9887  X            -  -2,628,346.857 (meters)                      COMP
 AE9887  Y            -  -4,293,446.126 (meters)                      COMP
 AE9887  Z            -   3,903,293.259 (meters)                      COMP
 AE9887  LAPLACE CORR-            3.70  (seconds)                     DEFLEC99
 AE9887  ELLIP HEIGHT-          -28.62  (meters)          (10/28/05) GPS OBS
 AE9887  GEOID HEIGHT-          -32.12  (meters)                      GEOID03
 AE9887
 AE9887  HORZ ORDER   -  FIRST
 AE9887  ELLP ORDER   -  FOURTH    CLASS I
 AE9887
 AE9887.The horizontal coordinates were established by GPS observations
 AE9887.and adjusted by the National Geodetic Survey in October 2005..
 AE9887.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 AE9887.DATUM ITEM on the data sheet items page.
 AE9887.The horizontal coordinates are valid at the epoch date displayed above.
 AE9887.The epoch date for horizontal control is a decimal equivalence
 AE9887.of Year/Month/Day.
 AE9887
 AE9887.The orthometric height was determined by GPS observations and a
 AE9887.high-resolution geoid model using precise GPS observation and
 AE9887.processing techniques.
 AE9887
 AE9887.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AE9887
 AE9887.The Laplace correction was computed from DEFLEC99 derived deflections.
 AE9887
 AE9887.The ellipsoidal height was determined by GPS observations
 AE9887.and is referenced to NAD 83.
 AE9887
 AE9887.The geoid height was determined by GEOID03.
 AE9887
```

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AE9887;                     North         East     Units Scale Factor Converg.
AE9887;SPC CA 3     -   664,211.726 1,914,430.768   MT  0.99993683   -0 35 46.7
AE9887;SPC CA 3     - 2,179,167.97  6,280,928.28   sFT  0.99993683   -0 35 46.7
AE9887;UTM  10      - 4,204,208.018   634,027.911   MT  0.99982125   +0 56 20.9
AE9887
AE9887!             -  Elev Factor  x  Scale Factor =   Combined Factor
AE9887!SPC CA 3     -   1.00000449  x   0.99993683  =   0.99994132
AE9887!UTM  10      -   1.00000449  x   0.99982125  =   0.99982574
AE9887
AE9887                          SUPERSEDED SURVEY CONTROL
AE9887
AE9887  NAD 83(1992)-  37 58 32.21670(N)    121 28 26.35829(W) AD(1997.30) 1
AE9887  ELLIP H (07/10/98)  -28.64   (m)                       GP(1997.30) 4 1
AE9887  NAD 83(1992)-  37 58 32.21629(N)    121 28 26.35858(W) AD(1997.30) 1
AE9887  ELLIP H (05/14/98)  -28.55   (m)                       GP(1997.30) 3 1
AE9887
AE9887.Superseded values are not recommended for survey control.
AE9887.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AE9887.See file dsdata.txt to determine how the superseded data were derived.
AE9887
AE9887_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH3402804208(NAD 83)
AE9887_MARKER: DD = SURVEY DISK
AE9887_SETTING: 50 = ALUMINUM ALLOY ROD W/O SLEEVE (10 FT.+)
AE9887_STAMPING: MARTI 1997
AE9887_MARK LOGO: BOR
AE9887_PROJECTION: FLUSH
AE9887_MAGNETIC: N = NO MAGNETIC MATERIAL
AE9887_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AE9887_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AE9887+SATELLITE: SATELLITE OBSERVATIONS - December 02, 2002
AE9887_ROD/PIPE-DEPTH: 5.80 meters
AE9887
AE9887  HISTORY     - Date     Condition        Report By
AE9887  HISTORY     - 1997     MONUMENTED       BOR
AE9887  HISTORY     - 20021202 GOOD             CADWR
AE9887
AE9887                          STATION DESCRIPTION
AE9887
AE9887'DESCRIBED BY US BUREAU OF RECLAMATION 1997 (DWS)
AE9887'THE STATION IS LOCATED ABOUT 10.5 MI (16.9 KM) WEST OF STOCKTON ON THE
AE9887'NORTHWEST CORNER OF ROBERTS ISLAND, NEAR THE BRIDGE OVER TURNER CUT TO
AE9887'MACDONALD ISLAND.  TO REACH THE STATION FROM THE INTERSECTION OF
AE9887'INTERSTATE HIGHWAY 5 AND STATE HIGHWAY 4 AT STOCKTON, GO WEST ON
AE9887'HIGHWAY 4 FOR 5.5 MI (8.9 KM) TO THE INTERSECTION OF INLAND DRIVE.
AE9887'TURN RIGHT AND GO NORTH ON INLAND DRIVE FOR 2.1 MI (3.4 KM) TO WHERE
AE9887'THE ROAD MAKES A 90-DEGREE TURN WEST.  TURN LEFT AND GO WEST ON
AE9887'MACDONALD ROAD FOR 4.5 MI (7.2 KM) TO THE BRIDGE GOING TO MACDONALD
AE9887'ISLAND AND THE STATION ON THE LEFT.  THE STATION IS A 2.5 INCH
AE9887'ALUMINUM ALLOY DOMED CAP WITH MAGNET, SET 0.2 FT (0.1 M) BELOW GROUND,
AE9887'ATTACHED TO A ALUMINUM ALLOY ROD DRIVEN 19 FT (5.8 M) TO REFUSAL,
AE9887'ENCASED IN A 4 INCH DIAMETER PVC PIPE SET TO A DEPTH OF 4 FT (1.2 M)
AE9887'IN A 1 FT (0.3 M) DIAMETER CONCRETE-FILLED HOLE 4 FT (1.2 M) DEEP.
AE9887'THE STATION IS 62.5 FT (19.1 M) SOUTHEAST OF A CHISELED CROSS ON THE
AE9887'CONCRETE CURB AT THE SOUTHEAST END OF THE BRIDGE, 50 FT (15.2 M)
AE9887'SOUTHWEST OF THE STOP SIGN AT THE INTERSECTION TO THE BRIDGE ACCESS
AE9887'ROAD, 21.7 FT (6.6 M) NORTH OF THE EAST (PAINTED WHITE) LEVEE ROAD
AE9887'GATEPOST, AND 1.2 FT (0.4 M) SOUTH OF A CARSONITE WITNESS POST. THE
AE9887'STATION WAS OCCUPIED AS PART OF THE SAN JOAQUIN-SACRAMENTO RIVER DELTA
AE9887'GPS/VERTICAL PROJECT.
AE9887
AE9887                          STATION RECOVERY (2002)
AE9887
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AE9887'RECOVERY NOTE BY CA DEPT OF WATER RES 2002 (WLB)
AE9887'RECOVERED AS DESCRIBED WITH THE FOLLOWING ADDITIONAL NOTES. ADJACENT
AE9887'THE BRIDGE TO MACDONALD ISLAND IS A LARGE SIGN FOR ZUCKERMAN HERITAGE,
AE9887'INC  PACKING SHED AND DELTA BLUEGRASS COMPANY.  THE ROADWAY TO THE
AE9887'BRIDGE IS 0.3 MI SOUTH  OF THE ACCESS ROAD TO THE LAUNCH RAMP OF THE
AE9887'TIKI LAGUN (SIC) RESORT AND MARINA. THE STATION WAS OBSERVED AS PART
AE9887'OF THE DWR DELTA 2002 SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1        National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 HS0455 ***********************************************************************
 HS0455  HT_MOD       -  This is a Height Modernization Survey Station.
 HS0455  DESIGNATION -  F 192 RESET 1939
 HS0455  PID         -  HS0455
 HS0455  STATE/COUNTY-  CA/SAN JOAQUIN
 HS0455  USGS QUAD   -  TRACY (1981)
 HS0455
 HS0455                         *CURRENT SURVEY CONTROL
 HS0455  ___________________________________________________________________
 HS0455* NAD 83(1998)-  37 44 43.51665(N)    121 27 52.67640(W)     ADJUSTED
 HS0455* NAVD 88     -        11.46    (meters)      37.6     (feet)  GPS OBS
 HS0455  ___________________________________________________________________
 HS0455  EPOCH DATE  -        2002.86
 HS0455  X           -  -2,635,834.070 (meters)                       COMP
 HS0455  Y           -  -4,307,256.083 (meters)                       COMP
 HS0455  Z           -   3,883,126.123 (meters)                       COMP
 HS0455  LAPLACE CORR-          -1.31  (seconds)                      DEFLEC99
 HS0455  ELLIP HEIGHT-         -20.69  (meters)          (10/28/05) GPS OBS
 HS0455  GEOID HEIGHT-         -32.16  (meters)                       GEOID03
 HS0455
 HS0455  HORZ ORDER  -  FIRST
 HS0455  VERT ORDER  -  FIRST     CLASS II (See Below)
 HS0455  ELLP ORDER  -  FOURTH    CLASS I
 HS0455
 HS0455.The horizontal coordinates were established by GPS observations
 HS0455.and adjusted by the National Geodetic Survey in October 2005..
 HS0455.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 HS0455.DATUM ITEM on the data sheet items page.
 HS0455.The horizontal coordinates are valid at the epoch date displayed above.
 HS0455.The epoch date for horizontal control is a decimal equivalence
 HS0455.of Year/Month/Day.
 HS0455
 HS0455.The orthometric height was determined by GPS observations and a
 HS0455.high-resolution geoid model using precise GPS observation and
 HS0455.processing techniques.
 HS0455.The vertical order pertains to the NGVD 29 superseded value.
 HS0455
 HS0455.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 HS0455
 HS0455.The Laplace correction was computed from DEFLEC99 derived deflections.
 HS0455
 HS0455.The ellipsoidal height was determined by GPS observations
 HS0455.and is referenced to NAD 83.
 HS0455
 HS0455.The geoid height was determined by GEOID03.
 HS0455
 HS0455;                    North         East     Units Scale Factor Converg.
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HS0455;SPC CA 3     -   638,656.080 1,914,989.439   MT  0.99992918   -0 35 26.1
HS0455;SPC CA 3     - 2,095,324.16  6,282,761.18   sFT  0.99992918   -0 35 26.1
HS0455;UTM  10      - 4,178,679.232   635,269.943   MT  0.99982538   +0 56 24.1
HS0455
HS0455!             -  Elev Factor  x  Scale Factor =   Combined Factor
HS0455!SPC CA 3     -   1.00000325  x   0.99992918  =   0.99993243
HS0455!UTM  10      -   1.00000325  x   0.99982538  =   0.99982863
HS0455
HS0455                          SUPERSEDED SURVEY CONTROL
HS0455
HS0455  NAD 83(1992)-  37 44 43.51505(N)    121 27 52.67384(W) AD(1997.30) 1
HS0455  ELLIP H (07/10/98)  -20.69    (m)                      GP(1997.30) 4 1
HS0455  NAD 83(1992)-  37 44 43.51472(N)    121 27 52.67421(W) AD(1997.30) 1
HS0455  ELLIP H (05/14/98)  -20.60    (m)                      GP(1997.30) 3 1
HS0455  NGVD 29 (??/??/92)   10.671   (m)           35.01    (f) ADJ UNCH    1 2
HS0455
HS0455.Superseded values are not recommended for survey control.
HS0455.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HS0455.See file dsdata.txt to determine how the superseded data were derived.
HS0455
HS0455_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFG3527078679(NAD 83)
HS0455_MARKER: DB = BENCH MARK DISK
HS0455_SETTING: 30 = SET IN A LIGHT STRUCTURE
HS0455_SP_SET: CULVERT HEADWALL
HS0455_STAMPING: F 192 1935 RESET 1939
HS0455_MARK LOGO: CGS
HS0455_MAGNETIC: N = NO MAGNETIC MATERIAL
HS0455_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
HS0455_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HS0455+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2002
HS0455
HS0455  HISTORY     - Date     Condition        Report By
HS0455  HISTORY     - 1939     MONUMENTED       CGS
HS0455  HISTORY     - 1958     GOOD             NGS
HS0455  HISTORY     - 1967     GOOD             NGS
HS0455  HISTORY     - 19970912 GOOD             BOR
HS0455  HISTORY     - 20021101 GOOD             CADWR
HS0455
HS0455                          STATION DESCRIPTION
HS0455
HS0455'DESCRIBED BY NATIONAL GEODETIC SURVEY 1958
HS0455'2.2 MI NW FROM TRACY.
HS0455'2.3 MILES NORTHWEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
HS0455'FROM THE STATION AT TRACY, 112 FEET WEST AND ACROSS THE TRACK FROM
HS0455'MILEPOLE 80, AT 24-INCH VITRIFIED CLAY PIPE CULVERT 79.96,
HS0455'IN THE TOP OF THE SOUTHEAST END OF THE SOUTHWEST CONCRETE HEAD
HS0455'WALL, 7.5 FEET SOUTHWEST OF THE SOUTHWEST RAIL, AND ABOUT 2 FEET
HS0455'LOWER THAN THE TRACK.
HS0455
HS0455                          STATION RECOVERY (1967)
HS0455
HS0455'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1967
HS0455'RECOVERED IN GOOD CONDITION.
HS0455
HS0455                          STATION RECOVERY (1997)
HS0455
HS0455'RECOVERY NOTE BY US BUREAU OF RECLAMATION 1997 (DWS)
HS0455'THE STATION WAS RECOVERED 2.2 MI (3.5 KM) NORTHWEST OF TRACY.  A
HS0455'COMPLETE NEW DESCRIPTION FOLLOWS.  TO REACH THE STATION FROM THE
HS0455'CENTERLINE INTERSECTION OF INTERSTATE HIGHWAY 205 AND GRANT LINE ROAD
HS0455'IN TRACY, GO WEST ON GRANT LINE ROAD FOR 1.2 MI (1.9 KM) TO THE
HS0455'DIAGONAL INTERSECTION OF THE BYRON HIGHWAY.  MAKE A SHARP LEFT TURN
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HS0455'ONTO THE BYRON HIGHWAY AND GO SOUTHEAST FOR 1.2 MI (1.9 KM) TO
HS0455'CALDRONS GENERAL STORE ON THE RIGHT AT 2650 BYRON HIGHWAY, AND THE
HS0455'STATION ON THE LEFT.  ALTERNATE ROUTE-- TO REACH FROM THE INTERSTATE
HS0455'HIGHWAY 205/TRACY BOULEVARD INTERCHANGE, TRAVEL SOUTH ON TRACY BLVD
HS0455'FOR 1.6 MI (2.6 KM) TO THE INTERSECTION OF 11TH STREET.  TURN RIGHT
HS0455'AND GO WEST ON 11TH STREET FOR ABOUT 0.68 MI (1.09 KM) TO THE
HS0455'INTERSECTION OF BYRON ROAD ON THE RIGHT.  BEAR RIGHT AND GO NORTHWEST
HS0455'FOR ABOUT 1.05 MI (1.69 KM) TO THE STATION ON THE RIGHT OPPOSITE
HS0455'CALDRONS GENERAL STORE.  THE STATION IS A BENCH MARK DISK SET IN THE
HS0455'TOP OF THE SOUTHEAST END OF THE SOUTHWEST CONCRETE HEADWALL OF A
HS0455'24-INCH CONCRETE PIPE CULVERT UNDER THE RAILROAD TRACKS, 7.5 FT (2.3
HS0455'M) SOUTHWEST OF THE SOUTHWEST RAIL, 1 FT (0.3 M) FROM THE END OF THE
HS0455'HEADWALL, AND ABOUT 2 FT (0.6 M) LOWER THAN THE TRACKS.  THE STATION
HS0455'WAS OCCUPIED AS PART OF THE SAN JOAQUIN-SACRAMENTO RIVER DELTA
HS0455'GPS/VERTICAL PROJECT.  (RWK)
HS0455
HS0455                        STATION RECOVERY (2002)
HS0455
HS0455'RECOVERY NOTE BY CA DEPT OF WATER RES 2002 (WLB)
HS0455'RECOVERED AS DESCRIBED. THE STATION WAS OBSERVED AS PART OF THE DWR
HS0455'DELTA 2002 SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1        National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 JS1244 ***********************************************************************
 JS1244  HT_MOD       -  This is a Height Modernization Survey Station.
 JS1244  TIDAL BM     -  This is a Tidal Bench Mark.
 JS1244  DESIGNATION -  HOPE RM 3
 JS1244  PID          -  JS1244
 JS1244  STATE/COUNTY-  CA/SAN JOAQUIN
 JS1244  USGS QUAD    -  THORNTON (1978)
 JS1244
 JS1244                        *CURRENT SURVEY CONTROL
 JS1244  ___________________________________________________________________
 JS1244* NAD 83(1998)-  38 13 31.37221(N)    121 29 32.15645(W)     ADJUSTED
 JS1244* NAVD 88      -         6.44   (meters)      21.1     (feet)  GPS OBS
 JS1244  ___________________________________________________________________
 JS1244  EPOCH DATE   -        2002.86
 JS1244  X            -  -2,620,781.549 (meters)                      COMP
 JS1244  Y            -  -4,278,022.944 (meters)                      COMP
 JS1244  Z            -   3,925,111.725 (meters)                      COMP
 JS1244  LAPLACE CORR-           5.37   (seconds)                     DEFLEC99
 JS1244  ELLIP HEIGHT-         -25.15   (meters)          (10/28/05) GPS OBS
 JS1244  GEOID HEIGHT-         -31.61   (meters)                      GEOID03
 JS1244
 JS1244  HORZ ORDER   -  FIRST
 JS1244  VERT ORDER   -  FIRST     CLASS II (See Below)
 JS1244  ELLP ORDER   -  FOURTH    CLASS I
 JS1244
 JS1244.The horizontal coordinates were established by GPS observations
 JS1244.and adjusted by the National Geodetic Survey in October 2005..
 JS1244.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
 JS1244.DATUM ITEM on the data sheet items page.
 JS1244.The horizontal coordinates are valid at the epoch date displayed above.
 JS1244.The epoch date for horizontal control is a decimal equivalence
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```
JS1244.of Year/Month/Day.
JS1244
JS1244.The orthometric height was determined by GPS observations and a
JS1244.high-resolution geoid model using precise GPS observation and
JS1244.processing techniques.
JS1244.The vertical order pertains to the NGVD 29 superseded value.
JS1244
JS1244.This Tidal Bench Mark is designated as VM 8685
JS1244.by the Center for Operational Oceanographic Products and Services.
JS1244
JS1244.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JS1244
JS1244.The Laplace correction was computed from DEFLEC99 derived deflections.
JS1244
JS1244.The ellipsoidal height was determined by GPS observations
JS1244.and is referenced to NAD 83.
JS1244
JS1244.The geoid height was determined by GEOID03.
JS1244
JS1244;                        North         East     Units Scale Factor Converg.
JS1244;SPC CA 3     -   691,949.097 1,913,119.081   MT  0.99996337   -0 36 27.0
JS1244;SPC CA 3     - 2,270,169.66  6,276,624.85   sFT  0.99996337   -0 36 27.0
JS1244;UTM  10      - 4,231,896.573   631,972.492   MT  0.99981450   +0 55 59.0
JS1244
JS1244!             -  Elev Factor  x  Scale Factor =   Combined Factor
JS1244!SPC CA 3     -   1.00000395  x   0.99996337  =   0.99996732
JS1244!UTM  10      -   1.00000395  x   0.99981450  =   0.99981845
JS1244
JS1244:               Primary Azimuth Mark                     Grid Az
JS1244:SPC CA 3     -  THORNTON CANNING CO TANK                090 50 37.6
JS1244:UTM  10      -  THORNTON CANNING CO TANK                089 18 11.6
JS1244
JS1244|---------------------------------------------------------------------|
JS1244| PID    Reference Object                     Distance      Geod. Az  |
JS1244|                                                          dddmmss.s |
JS1244| JS4235 THORNTON CANNING CO TANK          APPROX. 6.7 KM 0901410.6 |
JS1244| DB3791 HOPE AZ MK 2                                     2225608.6 |
JS1244| JS1243 HOPE                               28.419 METERS 33435     |
JS1244| JS1242 TIDAL 11                                         35611     |
JS1244|---------------------------------------------------------------------|
JS1244
JS1244                         SUPERSEDED SURVEY CONTROL
JS1244
JS1244  NAD 83(1992)-  38 13 31.37035(N)    121 29 32.14909(W) AD(1997.30) 1
JS1244  ELLIP H (07/10/98)  -25.31   (m)                       GP(1997.30) 4 1
JS1244  NAD 83(1992)-  38 13 31.36994(N)    121 29 32.14943(W) AD(1997.30) 1
JS1244  ELLIP H (05/14/98)  -25.22   (m)                       GP(1997.30) 3 1
JS1244  NAD 83(1992)-  38 13 31.36849(N)    121 29 32.14562(W) AD(1991.35) 1
JS1244  ELLIP H (10/14/94)  -25.23   (m)                       GP(1991.35) 4 2
JS1244  NAD 83(1992)-  38 13 31.36694(N)    121 29 32.14258(W) AD(1991.35) 3
JS1244  NAD 83(1986)-  38 13 31.36293(N)    121 29 32.14558(W) AD(1984.00) 3
JS1244  NAD 27      -  38 13 31.66656(N)    121 29 28.31639(W) AD(        ) 3
JS1244  NGVD 29 (??/??/92)    5.576  (m)           18.29    (f) ADJ UNCH    1 2
JS1244
JS1244.Superseded values are not recommended for survey control.
JS1244.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JS1244.See file dsdata.txt to determine how the superseded data were derived.
JS1244
JS1244_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH3197231897(NAD 83)
JS1244_MARKER: DR = REFERENCE MARK DISK
JS1244_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
JS1244_SP_SET: SET IN TOP OF CONCRETE MONUMENT
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JS1244_STAMPING: HOPE NO 3 1931
JS1244_MARK LOGO: CGS
JS1244_MAGNETIC: N = NO MAGNETIC MATERIAL
JS1244_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JS1244+STABILITY: SURFACE MOTION
JS1244_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JS1244+SATELLITE: SATELLITE OBSERVATIONS - November 20, 2002
JS1244
JS1244  HISTORY     - Date     Condition        Report By
JS1244  HISTORY     - 1954     MONUMENTED       CGS
JS1244  HISTORY     - 1970     GOOD             NGS
JS1244  HISTORY     - 19940112 GOOD             CADT
JS1244  HISTORY     - 19970829 GOOD             BOR
JS1244  HISTORY     - 20021120 POOR             CADWR
JS1244  HISTORY     - 20040810 POOR             BESTOR
JS1244
JS1244                          STATION DESCRIPTION
JS1244
JS1244'DESCRIBED BY COAST AND GEODETIC SURVEY 1954
JS1244'REFERENCE MARK 3 IS A C AND GS REFERENCE MARK DISK STAMPED HOPE
JS1244'NO 3 1931 SET IN THE TOP OF A 12-INCH CONCRETE CYLINDER PROJECTING
JS1244'0.8 FOOT ABOVE THE GROUND AND IS 87.5 FEET SOUTH OF THE
JS1244'CENTERLINE OF WALNUT GROVE-THORNTON ROAD, 70.8 FEET SOUTH OF THE
JS1244'SOUTHWEST CORNER OF THE WEST CONCRETE ABUTMENT OF THE BRIDGE, 22
JS1244'FEET EAST OF THE CENTERLINE OF A LEVEE ROAD, 1.3 FEET NORTHWEST
JS1244'OF A METAL WITNESS POST, AND ABOUT 1 FOOT HIGHER THAN THE
JS1244'STATION MARK.
JS1244
JS1244                          STATION RECOVERY (1970)
JS1244
JS1244'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1970
JS1244'2.4 MI SE FROM WALNUT GROVE.
JS1244'2.4 MILES SOUTHEAST ALONG WALNUT GROVE-THORNTON ROAD FROM THE
JS1244'POST OFFICE AT WALNUT GROVE, AT THE WEST END OF CONCRETE BRIDGE
JS1244'NO. 1473 OVER THE SOUTH FORK MOKELUMNE RIVER, AT THE NORTH END
JS1244'OF STATEN ISLAND, 93.2 FEET SOUTH-SOUTHEAST OF TRIANGULATION
JS1244'STATION HOPE 1931 = TIDAL 7, 87.5 FEET SOUTH OF THE CENTERLINE
JS1244'OF WALNUT GROVE-THORNTON ROAD, 70.8 FEET SOUTH OF THE SOUTHWEST
JS1244'CORNER OF THE WEST CONCRETE ABUTMENT OF THE BRIDGE, 22 FEET EAST
JS1244'OF THE CENTERLINE OF A LEVEE ROAD, 1.3 FEET NORTHWEST OF A
JS1244'METAL WITNESS POST, AND SET IN THE TOP OF A CONCRETE POST
JS1244'PROJECTING 0.8 FOOT ABOVE THE GROUND.
JS1244
JS1244                          STATION RECOVERY (1994)
JS1244
JS1244'RECOVERY NOTE BY CALTRANS 1994 (DBS)
JS1244'THE STATION WAS RECOVERED.  A COMPLETE NEW DESCRIPTION FOLLOWS.
JS1244'
JS1244'THE STATION IS LOCATED AT THE WEST END OF THE WALNUT GROVE ROAD BRIDGE
JS1244'(NO. 1473) OVER THE SOUTH FORK OF THE MOKELUMNE RIVER, ABOUT 23 MI
JS1244'(37.0 KM) NORTHWEST OF STOCKTON, ABOUT 3.5 MI (5.6 KM) WEST OF
JS1244'THORNTON AND ABOUT 2 MI (3.2 KM) SOUTHEAST OF WALNUT GROVE.
JS1244'
JS1244'TO REACH THE STATION FROM THE INTERSECTION OF INTERSTATE HIGHWAY 5 AND
JS1244'WALNUT GROVE ROAD (THORNTON/WALNUT GROVE EXIT), ABOUT 21 MI (33.8 KM)
JS1244'NORTH-NORTHWEST OF STOCKTON, GO WEST ON WALNUT GROVE ROAD FOR 3.35 MI
JS1244'(5.39 KM) TO THE WEST END OF THE BRIDGE (NO. 1473) OVER THE SOUTH FORK
JS1244'OF THE MOKELUMNE RIVER AND THE STATION ON THE LEFT.
JS1244'
JS1244'THE STATION IS IN THE TOP OF THE RIVER LEVEE, 87.5 FT (26.7 M) SOUTH
JS1244'OF THE CENTERLINE OF WALNUT GROVE ROAD, 70.8 FT (21.6 M) SOUTH OF THE
JS1244'SOUTHWEST CORNER OF THE WEST CONCRETE ABUTMENT OF THE BRIDGE, AND
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 JS1244'PROJECTS 0.8 FT (0.2 M) ABOVE THE GROUND.
 JS1244'
 JS1244'THE STATION WAS OCCUPIED AS PART OF A CALIFORNIA HPGN DENSIFICATION
 JS1244'SURVEY.
 JS1244
 JS1244                          STATION RECOVERY (1997)
 JS1244
 JS1244'RECOVERY NOTE BY US BUREAU OF RECLAMATION 1997 (DWS)
 JS1244'THE STATION WAS RECOVERED AND IS ABOUT 24.25 MI (39.03 KM) SOUTH OF
 JS1244'THE STATE CAPITOL IN SACRAMENTO.  THE STATION IS NOW 2.4 FT (0.7 M)
 JS1244'NORTH-NORTHWEST OF A CARSONITE WITNESS POST, 4.4 FT (1.3 M)
 JS1244'NORTH-NORTHWEST OF A METAL T FENCE POST, AND PROJECTING 1.0 FT (0.3 M)
 JS1244'ABOVE THE GROUND.  THE STATION WAS OCCUPIED AS PART OF THE SAN
 JS1244'JOAQUIN-SACRAMENTO RIVER DELTA GPS/VERTICAL PROJECT.
 JS1244
 JS1244                          STATION RECOVERY (2002)
 JS1244
 JS1244'RECOVERY NOTE BY CA DEPT OF WATER RES 2002
 JS1244'RECOVERED AS DESCRIBED IN POOR CONDITION.  STATION WAS INCLUDED THIS
 JS1244'TIME TO ACQUIRE  DATA FOR COMPARISON WITH PREVIOUS (1997) HT MOD
 JS1244'SURVEY. THE STATION WAS OBSERVED AS PART OF THE DWR DELTA 2002
 JS1244'SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.
 JS1244
 JS1244                          STATION RECOVERY (2004)
 JS1244
 JS1244'RECOVERY NOTE BY BESTOR ENGINEERS INCORPORATED 2004 (SDT)
 JS1244'POINT FOUND UNSTABLE AND PROJECTING APPROXIMATELY 2 FEET ABOVE GROUND.
 JS1244'

 *** retrieval complete.
 Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1        National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 JS1193 ***********************************************************************
 JS1193  DESIGNATION -  M 953
 JS1193  PID         -  JS1193
 JS1193  STATE/COUNTY-  CA/SACRAMENTO
 JS1193  USGS QUAD   -  ELK GROVE (1979)
 JS1193
 JS1193                         *CURRENT SURVEY CONTROL
 JS1193  ___________________________________________________________________
 JS1193* NAD 83(1998)-  38 24 32.02629(N)    121 19 29.68762(W)     ADJUSTED
 JS1193* NAVD 88     -        19.413  (meters)      63.69   (feet)  ADJUSTED
 JS1193  ___________________________________________________________________
 JS1193  EPOCH DATE  -        2004.69
 JS1193  X           -  -2,601,714.373 (meters)                     COMP
 JS1193  Y           -  -4,274,879.958 (meters)                     COMP
 JS1193  Z           -   3,941,102.922 (meters)                     COMP
 JS1193  LAPLACE CORR-            5.97  (seconds)                   DEFLEC99
 JS1193  ELLIP HEIGHT-          -11.21  (meters)        (10/28/05)  GPS OBS
 JS1193  GEOID HEIGHT-          -30.61  (meters)                    GEOID03
 JS1193  DYNAMIC HT  -          19.400 (meters)      63.65   (feet)  COMP
 JS1193  MODELED GRAV-     980,002.6    (mgal)                      NAVD 88
 JS1193
 JS1193  HORZ ORDER  -  B
 JS1193  VERT ORDER  -  FIRST     CLASS II
 JS1193  ELLP ORDER  -  FOURTH    CLASS I
 JS1193
 JS1193.The horizontal coordinates were established by GPS observations
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JS1193.and adjusted by the National Geodetic Survey in September 2005..
JS1193.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
JS1193.DATUM ITEM on the data sheet items page.
JS1193.The horizontal coordinates are valid at the epoch date displayed above.
JS1193.The epoch date for horizontal control is a decimal equivalence
JS1193.of Year/Month/Day.
JS1193
JS1193.The orthometric height was determined by differential leveling
JS1193.and adjusted by the National Geodetic Survey in June 1991..
JS1193
JS1193.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JS1193
JS1193.The Laplace correction was computed from DEFLEC99 derived deflections.
JS1193
JS1193.The ellipsoidal height was determined by GPS observations
JS1193.and is referenced to NAD 83.
JS1193
JS1193.The geoid height was determined by GEOID03.
JS1193
JS1193.The dynamic height is computed by dividing the NAVD 88
JS1193.geopotential number by the normal gravity value computed on the
JS1193.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JS1193.degrees latitude (g = 980.6199 gals.).
JS1193
JS1193.The modeled gravity was interpolated from observed gravity values.
JS1193
JS1193;                    North         East     Units Scale Factor Converg.
JS1193;SPC CA 2     -   582,611.562 2,058,962.287   MT  0.99998372   +0 25 32.2
JS1193;SPC CA 2     - 1,911,451.43  6,755,112.10   sFT  0.99998372   +0 25 32.2
JS1193;UTM  10      - 4,252,512.912   646,252.602   MT  0.99986342   +1 02 27.1
JS1193
JS1193!             -  Elev Factor  x  Scale Factor =   Combined Factor
JS1193!SPC CA 2     -   1.00000176  x   0.99998372  =   0.99998548
JS1193!UTM  10      -   1.00000176  x   0.99986342  =   0.99986518
JS1193
JS1193                          SUPERSEDED SURVEY CONTROL
JS1193
JS1193  NAD 83(1998)-  38 24 32.02591(N)    121 19 29.68663(W) AD(2002.86) 1
JS1193  NAD 83(1992)-  38 24 32.02447(N)    121 19 29.68413(W) AD(1997.30) 1
JS1193  ELLIP H (07/10/98)  -11.21   (m)                       GP(1997.30) 4 1
JS1193  NAD 83(1992)-  38 24 32.02410(N)    121 19 29.68449(W) AD(1997.30) 1
JS1193  ELLIP H (05/14/98)  -11.12   (m)                       GP(1997.30) 3 1
JS1193  NAD 83(1992)-  38 24 32.02206(N)    121 19 29.67990(W) AD(1991.35) 1
JS1193  ELLIP H (06/13/97)  -11.15   (m)                       GP(1991.35) 4 2
JS1193  NAVD 88 (06/13/97)   19.41   (m)          63.7     (f) LEVELING    3
JS1193  NGVD 29 (??/??/92)   18.676  (m)          61.27    (f) ADJ UNCH    1 2
JS1193
JS1193.Superseded values are not recommended for survey control.
JS1193.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JS1193.See file dsdata.txt to determine how the superseded data were derived.
JS1193
JS1193_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH4625352513(NAD 83)
JS1193_MARKER: DB = BENCH MARK DISK
JS1193_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
JS1193_SP_SET: CONCRETE POST
JS1193_STAMPING: M 953 1962
JS1193_MARK LOGO: CGS
JS1193_MAGNETIC: N = NO MAGNETIC MATERIAL
JS1193_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JS1193+STABILITY: SURFACE MOTION
JS1193_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JS1193+SATELLITE: SATELLITE OBSERVATIONS - October 05, 2004
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JS1193
JS1193  HISTORY     - Date     Condition        Report By
JS1193  HISTORY     - 1962     MONUMENTED       CGS
JS1193  HISTORY     - 1987     GOOD             NGS
JS1193  HISTORY     - 19940201 GOOD             CADT
JS1193  HISTORY     - 19970827 GOOD             BOR
JS1193  HISTORY     - 20021105 GOOD             CADWR
JS1193  HISTORY     - 20040408 GOOD             CADT
JS1193  HISTORY     - 20040727 POOR             WOOROD
JS1193  HISTORY     - 20040810 GOOD             BESTOR
JS1193  HISTORY     - 20041005 GOOD             CADT
JS1193
JS1193                          STATION DESCRIPTION
JS1193
JS1193'DESCRIBED BY COAST AND GEODETIC SURVEY 1962
JS1193'2 MI SW FROM SHELDON.
JS1193'2.05 MILES SOUTHWEST ALONG GRANT LINE ROAD FROM THE JUNCTION
JS1193'OF WILTON ROAD AT SHELDON, AT THE JUNCTION OF ELK GROVE BOULEVARD,
JS1193'40 FEET NORTHWEST OF THE CENTER LINE OF THE ROAD, 104 FEET
JS1193'SOUTH OF THE CENTER LINE OF THE BOULEVARD, 17 FEET SOUTHWEST OF
JS1193'A FENCE CORNER, 2 1/2 FEET NORTHEAST OF TELEPHONE POLE 20/1 WITH
JS1193'A GUY WIRE, 5.0 FEET SOUTHEAST OF A FENCE, 1.3 FEET SOUTHWEST
JS1193'OF A WITNESS POST, ABOUT 1 FOOT HIGHER THAN THE ROAD, AND SET
JS1193'IN THE TOP OF A CONCRETE POST PROJECTING 0.4 FOOT ABOVE THE
JS1193'GROUND.
JS1193
JS1193                          STATION RECOVERY (1987)
JS1193
JS1193'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1987
JS1193'RECOVERED IN GOOD CONDITION.
JS1193
JS1193                          STATION RECOVERY (1994)
JS1193
JS1193'RECOVERY NOTE BY CALTRANS 1994 (JCB)
JS1193'THE STATION WAS RECOVERED.  A COMPLETE NEW DESCRIPTION FOLLOWS.  THE
JS1193'STATION IS LOCATED AT THE INTERSECTION OF GRANT LINE ROAD AND ELK
JS1193'GROVE BLVD, ABOUT 15 MI (24.1 KM) SOUTHEAST OF SACRAMENTO AND 2 MI
JS1193'(3.2 KM) EAST OF ELK GROVE.  TO REACH THE STATION FROM THE STATE
JS1193'HIGHWAY 99/GRANT LINE ROAD INTERCHANGE, ABOUT 2 MI (3.2 KM) SOUTH OF
JS1193'ELK GROVE, GO NORTHEAST ON GRANT LINE ROAD FOR 3.1 MI (5.0 KM) TO A
JS1193'SIDE ROAD LEFT, ELK GROVE BLVD AND THE STATION ON THE LEFT.  THE
JS1193'STATION IS LOCATED WEST OF THE CENTERLINE INTERSECTION OF ELK GROVE
JS1193'BLVD AND GRANT LINE ROAD, 89.0 FT (27.1 M) SOUTH OF THE CENTERLINE OF
JS1193'ELK GROVE BLVD, 40.5 FT (12.3 M) NORTHWEST OF THE CENTERLINE OF GRANT
JS1193'LINE ROAD, 3.8 FT (1.2 M) EAST OF A GUYED TELEPHONE POLE, 1.5 FT (0.5
JS1193'M) WEST OF A METAL WITNESS POST, LEVEL WITH GRANT LINE ROAD AND
JS1193'PROJECTS 0.2 FT (0.1 M) ABOVE GROUND.  THIS STATION WAS OCCUPIED AS
JS1193'PART OF A CALIFORNIA HPGN DENSIFICATION SURVEY.
JS1193
JS1193                          STATION RECOVERY (1997)
JS1193
JS1193'RECOVERY NOTE BY US BUREAU OF RECLAMATION 1997 (DWS)
JS1193'THE STATION WAS RECOVERED.  TO REACH THE STATION FROM THE INTERSECTION
JS1193'OF STATE HIGHWAY 99 AND ELK GROVE BOULEVARD, GO EAST ON ELK GROVE
JS1193'BOULEVARD FOR 0.7 MI (1.1 KM) TO WILLIAMSON DRIVE.  CONTINUE EAST ON
JS1193'ELK GROVE BOULEVARD FOR 2.75 MI (4.43 KM) TO A T-INTERSECTION WITH
JS1193'GRANT LINE ROAD AND THE STATION ON THE RIGHT (SOUTH) , JUST NORTH OF A
JS1193'TELEPHONE POLE ON THE WEST SIDE OF GRANT LINE ROAD.  THE STATION WAS
JS1193'OCCUPIED AS PART OF THE SAN JOAQUIN-SACRAMENTO RIVER DELTA
JS1193'GPS/VERTICAL PROJECT.
JS1193
JS1193                          STATION RECOVERY (2002)
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JS1193
JS1193'RECOVERY NOTE BY CA DEPT OF WATER RES 2002 (WLB)
JS1193'RECOVERED AS DESCRIBED. THE STATION WAS OBSERVED AS PART OF THE DWR
JS1193'DELTA 2002 SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.
JS1193
JS1193                          STATION RECOVERY (2004)
JS1193
JS1193'RECOVERY NOTE BY CALTRANS 2004 (RLM)
JS1193'RECOVERED IN GOOD CONDITION.
JS1193
JS1193                          STATION RECOVERY (2004)
JS1193
JS1193'RECOVERY NOTE BY WOOD RODGERS INC 2004 (MJS)
JS1193'APPEARS DISTURBED
JS1193'DID NOT FIT DATASHEET POSITION
JS1193
JS1193                          STATION RECOVERY (2004)
JS1193
JS1193'RECOVERY NOTE BY BESTOR ENGINEERS INCORPORATED 2004 (SDT)
JS1193'RECOVERED IN GOOD CONDITION.
JS1193
JS1193                          STATION RECOVERY (2004)
JS1193
JS1193'RECOVERY NOTE BY CALTRANS 2004 (DWM)
JS1193'THE STATION WAS RECOVERED AS DESCRIBED. THIS STATION WAS OCCUPIED AS
JS1193'PART OF A  CALTRANS NORTH REGION OFFICE OF SURVEYORS GPS HEIGHT
JS1193'MODERNIZATION PROJECT.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1         National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 JT0221 ***********************************************************************
 JT0221  FBN          -  This is a Federal Base Network Control Station.
 JT0221  DESIGNATION -  N 935 RESET
 JT0221  PID         -  JT0221
 JT0221  STATE/COUNTY-  CA/SOLANO
 JT0221  USGS QUAD   -  FAIRFIELD NORTH (1980)
 JT0221
 JT0221                         *CURRENT SURVEY CONTROL
 JT0221  ___________________________________________________________________
 JT0221* NAD 83(1998)-  38 18 41.15729(N)    122 01 58.03461(W)     ADJUSTED
 JT0221* NAVD 88     -        71.945  (meters)      236.04    (feet)  ADJUSTED
 JT0221  ___________________________________________________________________
 JT0221  EPOCH DATE  -        2002.86
 JT0221  X           -  -2,657,912.137 (meters)                      COMP
 JT0221  Y           -  -4,248,137.189 (meters)                      COMP
 JT0221  Z           -   3,932,651.598 (meters)                      COMP
 JT0221  LAPLACE CORR-          -4.69  (seconds)                     DEFLEC99
 JT0221  ELLIP HEIGHT-          40.31  (meters)         (10/28/05) GPS OBS
 JT0221  GEOID HEIGHT-         -31.64  (meters)                      GEOID03
 JT0221  DYNAMIC HT  -          71.899 (meters)     235.89   (feet)  COMP
 JT0221  MODELED GRAV-     979,982.5   (mgal)                        NAVD 88
 JT0221
 JT0221  HORZ ORDER  -  FIRST
 JT0221  VERT ORDER  -  FIRST     CLASS I
 JT0221  ELLP ORDER  -  FOURTH    CLASS I
 JT0221
 JT0221.ITRF positions are available for this station.
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JT0221.The horizontal coordinates were established by GPS observations
JT0221.and adjusted by the National Geodetic Survey in October 2005..
JT0221.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
JT0221.DATUM ITEM on the data sheet items page.
JT0221.The horizontal coordinates are valid at the epoch date displayed above.
JT0221.The epoch date for horizontal control is a decimal equivalence
JT0221.of Year/Month/Day.
JT0221
JT0221.The orthometric height was determined by differential leveling
JT0221.and adjusted by the National Geodetic Survey in June 1991..
JT0221
JT0221.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JT0221
JT0221.The Laplace correction was computed from DEFLEC99 derived deflections.
JT0221
JT0221.The ellipsoidal height was determined by GPS observations
JT0221.and is referenced to NAD 83.
JT0221
JT0221.The geoid height was determined by GEOID03.
JT0221
JT0221.The dynamic height is computed by dividing the NAVD 88
JT0221.geopotential number by the normal gravity value computed on the
JT0221.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JT0221.degrees latitude (g = 980.6199 gals.).
JT0221
JT0221.The modeled gravity was interpolated from observed gravity values.
JT0221
JT0221;                    North         East     Units Scale Factor Converg.
JT0221;SPC CA 2     -   571,574.359 1,997,132.410   MT  1.00000504   -0 01 14.4
JT0221;SPC CA 2     - 1,875,240.21  6,552,258.58   sFT  1.00000504   -0 01 14.4
JT0221;UTM  10      - 4,240,812.517   584,559.244   MT  0.99968806   +0 35 58.7
JT0221
JT0221!             -  Elev Factor  x  Scale Factor =   Combined Factor
JT0221!SPC CA 2     -   0.99999368  x   1.00000504  =   0.99999872
JT0221!UTM  10      -   0.99999368  x   0.99968806  =   0.99968174
JT0221
JT0221                          SUPERSEDED SURVEY CONTROL
JT0221
JT0221  NAD 83(1998)-  38 18 41.15617(N)    122 01 58.03292(W) AD(1998.50) A
JT0221  ELLIP H (04/06/00)   40.29   (m)                       GP(1998.50) 3 1
JT0221  NAD 83(1992)-  38 18 41.15531(N)    122 01 58.03161(W) AD(1997.30) 1
JT0221  ELLIP H (07/10/98)   40.26   (m)                       GP(1997.30) 4 1
JT0221  NAD 83(1992)-  38 18 41.15513(N)    122 01 58.03237(W) AD(1997.30) 1
JT0221  ELLIP H (05/14/98)   40.36   (m)                       GP(1997.30) 3 1
JT0221  NAD 83(1992)-  38 18 41.15192(N)    122 01 58.02778(W) AD(1991.35) 1
JT0221  ELLIP H (06/20/97)   40.43   (m)                       GP(1991.35) 4 2
JT0221  NAVD 88 (10/28/05)   71.94   (m)          236.0     (f) LEVELING    3
JT0221  NAVD 88 (04/06/00)   71.94   (m)          236.0     (f) LEVELING    3
JT0221  NAVD 88 (10/29/98)   71.94   (m)          236.0     (f) LEVELING    3
JT0221  NAVD 88 (06/20/97)   71.94   (m)          236.0     (f) LEVELING    3
JT0221  NGVD 29 (??/??/??)   71.15   (m)          233.4     (f) RESET       3
JT0221
JT0221.Superseded values are not recommended for survey control.
JT0221.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JT0221.See file dsdata.txt to determine how the superseded data were derived.
JT0221
JT0221_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEH8455940813(NAD 83)
JT0221_MARKER: DB = BENCH MARK DISK
JT0221_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
JT0221_SP_SET: SET IN TOP OF CONCRETE MONUMENT
JT0221_STAMPING: N 935 RESET 1965
JT0221_MARK LOGO: CGS
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JT0221_PROJECTION: FLUSH
JT0221_MAGNETIC: N = NO MAGNETIC MATERIAL
JT0221_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JT0221+STABILITY: SURFACE MOTION
JT0221_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JT0221+SATELLITE: SATELLITE OBSERVATIONS - October 06, 2004
JT0221
JT0221  HISTORY     - Date     Condition        Report By
JT0221  HISTORY     - 1965     MONUMENTED       CGS
JT0221  HISTORY     - 1967     GOOD             NGS
JT0221  HISTORY     - 1988     GOOD             USPSQD
JT0221  HISTORY     - 19960514 GOOD             CADT
JT0221  HISTORY     - 19970716 GOOD             NGS
JT0221  HISTORY     - 19971112 GOOD             LOCSUR
JT0221  HISTORY     - 19980507 GOOD             NGS
JT0221  HISTORY     - 19980709 GOOD             GEOMET
JT0221  HISTORY     - 20021126 GOOD             CADWR
JT0221  HISTORY     - 20041006 GOOD             DEWDAV
JT0221
JT0221                          STATION DESCRIPTION
JT0221
JT0221'DESCRIBED BY NATIONAL GEODETIC SURVEY 1967
JT0221'3.8 MI SW FROM VACAVILLE.
JT0221'0.8 MILE SOUTHWEST ALONG MERCHANT STREET FROM THE BANK OF
JT0221'AMERICA AT VACAVILLE, THENCE 2.95 MILES SOUTHWEST ALONG
JT0221'INTERSTATE HIGHWAY 80, 195 FEET EAST AND ACROSS THE HIGHWAY FROM
JT0221'BENCH MARK D 1070, 0.1 MILE SOUTH OF THE CROSSING OF LAUREL
JT0221'CREEK, 51 FEET EAST OF THE SOUTH END OF THE STEEL GUARDRAIL
JT0221'BETWEEN HIGHWAY LANES, 22 FEET WEST OF THE CENTER LINE OF A
JT0221'FRONTAGE ROAD, 2.1 FEET EAST OF A FENCE, 1.6 FEET NORTH OF A
JT0221'WITNESS POST, ABOUT LEVEL WITH THE HIGHWAY, AND SET IN THE TOP
JT0221'OF A CONCRETE POST FLUSH WITH THE GROUND.
JT0221
JT0221                          STATION RECOVERY (1988)
JT0221
JT0221'RECOVERY NOTE BY US POWER SQUADRON 1988 (TM)
JT0221'RECOVERED IN GOOD CONDITION.
JT0221
JT0221                          STATION RECOVERY (1996)
JT0221
JT0221'RECOVERY NOTE BY CALTRANS 1996 (JDD)
JT0221'THE STATION WAS RECOVERED.  A COMPLETE NEW DESCRIPTION FOLLOWS.  THE
JT0221'STATION IS LOCATED ON THE SOUTHEAST SIDE OF INTERSTATE HIGHWAY 80,
JT0221'ABOUT 4 MI (6.4 KM) NORTH OF FAIRFIELD AND 4 MI (6.4 KM) SOUTHWEST OF
JT0221'VACAVILLE.  TO REACH THE STATION FROM THE INTERSTATE 80/AIR BASE
JT0221'PARKWAY-WATERMAN BLVD INTERCHANGE IN FAIRFIELD, GO NORTHEASTERLY ON
JT0221'INTERSTATE 80 FOR 3.9 MI (6.3 KM) TO THE CHERRY GLEN/LAGOON VALLEY
JT0221'ROADS OFF-RAMP.  TAKE THE OFF-RAMP NORTHEAST FOR 0.15 MI (0.24 KM) TO
JT0221'LAGOON VALLEY ROAD.  BEAR RIGHT AND GO EAST ON LAGOON VALLEY ROAD FOR
JT0221'0.1 MI (0.2 KM) TO THE INTERSECTION WITH NELSON ROAD ON THE RIGHT AND
JT0221'RIVIERA ROAD ON THE LEFT.  TURN RIGHT AND GO SOUTH ON NELSON ROAD FOR
JT0221'1.15 MI (1.85 KM) TO THE STATION ON THE RIGHT, 0.25 MI (0.40 KM) NORTH
JT0221'OF THE END OF NELSON ROAD.  THE STATION IS 44.0 FT (13.4 M)
JT0221'SOUTH-SOUTHWEST OF A METAL SIGN POST ON THE WEST SIDE OF NELSON ROAD,
JT0221'19.8 FT (6.0 M) WEST OF THE CENTERLINE OF NELSON ROAD, 2.1 FT (0.6 M)
JT0221'NORTHEAST OF A CARSONITE WITNESS POST AND A METAL WITNESS POST BENT 45
JT0221'DEGREES TO THE NORTH, 1.8 FT (0.5 M) EAST OF THE FREEWAY RIGHT-OF-WAY
JT0221'FENCE, 0.5 FT (0.2 M) LOWER THAN NELSON ROAD AND RECESSED 0.2 FT (0.1
JT0221'M) BELOW GROUND.  THE STATION WAS OCCUPIED AS PART OF A CALIFORNIA
JT0221'HPGN DENSIFICATION SURVEY.
JT0221
JT0221                          STATION RECOVERY (1997)
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JT0221
JT0221'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1997 (JDD)
JT0221'THE STATION WAS RECOVERED AND OCCUPIED AS PART OF THE SAN
JT0221'JOAQUIN-SACRAMENTO RIVER DELTA GPS/VERTICAL PROJECT.
JT0221
JT0221                          STATION RECOVERY (1997)
JT0221
JT0221'RECOVERY NOTE BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 1997 (GLD)
JT0221'RECOVERED AS DESCRIBED.
JT0221
JT0221                          STATION RECOVERY (1998)
JT0221
JT0221'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (CSM)
JT0221'THE STATION IS LOCATED ABOUT 6.1 KM (3.80 MI) SOUTHWEST OF VACAVILLE,
JT0221'ON THE WEST SIDE OF A DEAD END FRONTAGE ROAD (NELSON RD), ON THE
JT0221'EAST-SOUTHEAST SIDE OF INTERSTATE HIGHWAY 80.  OWNERSHIP--CALIFORNIA
JT0221'DEPARTMENT OF TRANSPORTATION.  TO REACH THE STATION FROM THE OVERPASS
JT0221'JUNCTION OF INTERSTATE HIGHWAY 80 AND LAGOON VALLEY RD ABOUT 4.3 KM
JT0221'(2.65 MI) SOUTHWEST OF VACAVILLE, GO EAST FOR 0.17 KM (0.10 MI) ON
JT0221'LAGOON VALLEY RD TO NELSON RD ON THE RIGHT.  TURN RIGHT, SOUTHWESTERLY
JT0221'FOR 1.85 KM (1.15 MI) ON THE FRONTAGE ROAD TO THE STATION ON THE
JT0221'RIGHT.  LOCATED 12.6 M (41.3 FT) WEST-NORTHWEST OF A 40 MPH SIGNPOST,
JT0221'6.0 M (19.7 FT) WEST OF THE CENTER OF NELSON RD, 0.6 M (2.0 FT)
JT0221'NORTH-NORTHEAST OF A FIBERGLASS WITNESS POST, 0.5 M (1.6 FT) EAST OF A
JT0221'RIGHT-OF-WAY FENCE, 0.4 M (1.3 FT) NORTH-NORTHWEST OF A METAL WITNESS
JT0221'POST, ABOUT 0.1 M (0.3 FT) BELOW THE ROAD LEVEL AND RECESSED 5 CM
JT0221'BELOW GROUND.
JT0221
JT0221                          STATION RECOVERY (1998)
JT0221
JT0221'RECOVERY NOTE BY GEOMETRICS GPS INCORPORATED 1998 (GLD)
JT0221'RECOVERED AS DESCRIBED.
JT0221
JT0221                          STATION RECOVERY (2002)
JT0221
JT0221'RECOVERY NOTE BY CA DEPT OF WATER RES 2002 (WLB)
JT0221'RECOVERED AS DESCRIBED. THE STATION WAS OBSERVED AS PART OF THE DWR
JT0221'DELTA 2002 SUBSIDENCE NETWORK HEIGHT  MODERNIZATION SURVEY.
JT0221
JT0221                          STATION RECOVERY (2004)
JT0221
JT0221'RECOVERY NOTE BY DEWBERRY DAVIS 2004 (KEC)
JT0221'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1        National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 JT9527 ***********************************************************************
 JT9527  DESIGNATION -  E 1394
 JT9527  PID         -  JT9527
 JT9527  STATE/COUNTY-  CA/SOLANO
 JT9527  USGS QUAD   -  CORDELIA (1980)
 JT9527
 JT9527                         *CURRENT SURVEY CONTROL
 JT9527  ___________________________________________________________________
 JT9527* NAD 83(1992)-  38 09 23.34383(N)    122 12 52.46371(W)     ADJUSTED
 JT9527* NAVD 88     -       123.013  (meters)     403.59   (feet)  ADJUSTED
 JT9527  ___________________________________________________________________
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JT9527  EPOCH DATE  -        1997.30
JT9527  X           -  -2,677,072.776 (meters)                       COMP
JT9527  Y           -  -4,248,722.437 (meters)                       COMP
JT9527  Z           -   3,919,172.980 (meters)                       COMP
JT9527  LAPLACE CORR-            2.49  (seconds)                      DEFLEC99
JT9527  ELLIP HEIGHT-           91.16  (meters)          (07/10/98) GPS OBS
JT9527  GEOID HEIGHT-          -31.87  (meters)                       GEOID03
JT9527  DYNAMIC HT  -          122.933 (meters)     403.32  (feet)  COMP
JT9527  MODELED GRAV-     979,984.1    (mgal)                        NAVD 88
JT9527
JT9527  HORZ ORDER  -  FIRST
JT9527  VERT ORDER  -  FIRST     CLASS II
JT9527  ELLP ORDER  -  FOURTH    CLASS I
JT9527
JT9527.The horizontal coordinates were established by GPS observations
JT9527.and adjusted by the National Geodetic Survey in July 1998..
JT9527.The horizontal coordinates are valid at the epoch date displayed above.
JT9527.The epoch date for horizontal control is a decimal equivalence
JT9527.of Year/Month/Day.
JT9527
JT9527.The orthometric height was determined by differential leveling
JT9527.and adjusted by the National Geodetic Survey in June 1991..
JT9527
JT9527.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JT9527
JT9527.The Laplace correction was computed from DEFLEC99 derived deflections.
JT9527
JT9527.The ellipsoidal height was determined by GPS observations
JT9527.and is referenced to NAD 83.
JT9527
JT9527.The geoid height was determined by GEOID03.
JT9527
JT9527.The dynamic height is computed by dividing the NAVD 88
JT9527.geopotential number by the normal gravity value computed on the
JT9527.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JT9527.degrees latitude (g = 980.6199 gals.).
JT9527
JT9527.The modeled gravity was interpolated from observed gravity values.
JT9527
JT9527;                     North         East     Units Scale Factor Converg.
JT9527;SPC CA 2     -   554,396.237 1,981,192.796   MT  1.00004479   -0 08 07.0
JT9527;SPC CA 2     - 1,818,881.65  6,499,963.36   sFT  1.00004479   -0 08 07.0
JT9527;UTM  10      - 4,223,468.920   568,812.096   MT  0.99965832   +0 29 07.0
JT9527
JT9527!             -  Elev Factor  x  Scale Factor =   Combined Factor
JT9527!SPC CA 2     -   0.99998570  x   1.00004479  =   1.00003049
JT9527!UTM  10      -   0.99998570  x   0.99965832  =   0.99964402
JT9527
JT9527                          SUPERSEDED SURVEY CONTROL
JT9527
JT9527  NAD 83(1992)-  38 09 23.34348(N)    122 12 52.46370(W) AD(1997.30) 1
JT9527  ELLIP H (03/20/98)   91.25   (m)                        GP(1997.30) 3 2
JT9527  NAVD 88 (03/20/98)  123.01   (m)          403.6    (f) LEVELING    3
JT9527
JT9527.Superseded values are not recommended for survey control.
JT9527.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JT9527.See file dsdata.txt to determine how the superseded data were derived.
JT9527
JT9527_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEH6881223469(NAD 83)
JT9527_MARKER: I = METAL ROD
JT9527_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
JT9527_SP_SET: STAINLESS STEEL ROD
```

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JT9527_STAMPING: E 1394 1987
JT9527_MARK LOGO: NGS
JT9527_PROJECTION: FLUSH
JT9527_MAGNETIC: N = NO MAGNETIC MATERIAL
JT9527_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
JT9527+STABILITY: POSITION/ELEVATION WELL
JT9527_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JT9527+SATELLITE: SATELLITE OBSERVATIONS - April 04, 1997
JT9527_ROD/PIPE-DEPTH: 3.3  meters
JT9527
JT9527  HISTORY     - Date     Condition        Report By
JT9527  HISTORY     - 1987     MONUMENTED       NGS
JT9527  HISTORY     - 19970404 GOOD             NGS
JT9527
JT9527                          STATION DESCRIPTION
JT9527
JT9527'DESCRIBED BY NATIONAL GEODETIC SURVEY 1987
JT9527'2.0 KM (1.25 MI) NE FROM VALLEJO.
JT9527'2.0 KM (1.25 MI) NORTHEASTERLY ALONG INTERSTATE HIGHWAY 80 FROM THE
JT9527'JUNCTION OF STATE HIGHWAY 37 IN VALLEJO, 49.1 M (161.1 FT) NORTHWEST
JT9527'OF THE CENTER OF THE MOST NORTHWESTERLY WESTBOUND LANE OF THE
JT9527'HIGHWAY, AND 37.5 M (123.0 FT) NORTHWEST OF THE NORTHWEST LEG OF A
JT9527'HIGHWAY INFORMATION SIGN (REST AREA). NOTE--ACCESS TO DATUM POINT IS
JT9527'HAD THROUGH A 5-INCH LOGO CAP.
JT9527'THE MARK IS 0.4 METERS  SE FROM  A WITNESS POST AND FENCE
JT9527'THE MARK IS 1.0 M ABOVE THE HIGHWAY.
JT9527
JT9527                          STATION RECOVERY (1997)
JT9527
JT9527'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1997 (JDD)
JT9527'THE STATION WAS RECOVERED.  A COMPLETE NEW DESCRIPTION FOLLOWS.  THE
JT9527'STATION IS LOCATED ABOUT 3.5 MI (5.6 KM) NORTHEAST OF DOWNTOWN
JT9527'VALLEJO, AT THE NORTH END OF A HIGHWAY REST AREA.  TO REACH THE
JT9527'STATION FROM THE INTERSECTION OF INTERSTATE HIGHWAY 80 AND AMERICAN
JT9527'CANYON ROAD, ABOUT 5 1/2 MI FROM DOWNTOWN VALLEJO, GO SOUTHWEST ON
JT9527'HIGHWAY I-80 FOR 1.25 MI (2.01 KM) TO THE STATION ON THE RIGHT AT THE
JT9527'NORTHERNMOST POINT OF THE EXIT TO A HIGHWAY REST AREA.  NOTE-THE
JT9527'STATION CAN ONLY BE REACHED BY TRAVELING SOUTHWEST FROM THE AMERICAN
JT9527'CANYON ROAD EXIT.  THE STATION IS ABOUT 250 FT (76.2 M) NORTH OF THE
JT9527'NORTHERNMOST POINT OF THE EXIT TO THE REST AREA, ABOUT 150 FT (45.7 M)
JT9527'WEST OF THE WEST EDGE OF PAVEMENT OF WESTBOUND I-80, 124 FT (37.8 M)
JT9527'WEST OF THE WEST SUPPORT OF THE SIGN READING, REST AREA TOURIST INFO,
JT9527'AND 1.5 FT (0.5 M) EAST OF A CARSONITE WITNESS POST AND WIRE FENCE.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1        National Geodetic Survey,   Retrieval Date = MARCH 29, 2007
 DE8502 ***********************************************************************
 DE8502  HT_MOD       -  This is a Height Modernization Survey Station.
 DE8502  DESIGNATION -  GPS CONTROL PT 51
 DE8502  PID         -  DE8502
 DE8502  STATE/COUNTY-  CA/CONTRA COSTA
 DE8502  USGS QUAD   -  VINE HILL (1980)
 DE8502
 DE8502                         *CURRENT SURVEY CONTROL
 DE8502  ___________________________________________________________________
 DE8502* NAD 83(1998)-  38 01 18.81380(N)    122 01 40.82524(W)     ADJUSTED
 DE8502* NAVD 88     -          9.44   (meters)      31.0    (feet)  GPS OBS
```

```
DE8502  ___________________________________________________________________
DE8502  EPOCH DATE  -       2000.86
DE8502  X           -  -2,668,064.003 (meters)                      COMP
DE8502  Y           -  -4,265,154.272 (meters)                      COMP
DE8502  Z           -   3,907,344.637 (meters)                      COMP
DE8502  LAPLACE CORR-           0.74  (seconds)                     DEFLEC99
DE8502  ELLIP HEIGHT-         -22.61  (meters)        (11/27/02) GPS OBS
DE8502  GEOID HEIGHT-         -32.13  (meters)                      GEOID03
DE8502
DE8502  HORZ ORDER  -  B
DE8502  ELLP ORDER  -  FOURTH    CLASS I
DE8502
DE8502.The horizontal coordinates were established by GPS observations
DE8502.and adjusted by the National Geodetic Survey in November 2002..
DE8502.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
DE8502.DATUM ITEM on the data sheet items page.
DE8502.The horizontal coordinates are valid at the epoch date displayed above.
DE8502.The epoch date for horizontal control is a decimal equivalence
DE8502.of Year/Month/Day.
DE8502
DE8502.The orthometric height was determined by GPS observations and a
DE8502.high-resolution geoid model using precise GPS observation and
DE8502.processing techniques.
DE8502
DE8502.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DE8502
DE8502.The Laplace correction was computed from DEFLEC99 derived deflections.
DE8502
DE8502.The ellipsoidal height was determined by GPS observations
DE8502.and is referenced to NAD 83.
DE8502
DE8502.The geoid height was determined by GEOID03.
DE8502
DE8502;                     North         East     Units Scale Factor Converg.
DE8502;SPC CA 3     -   669,997.864 1,865,845.260   MT  0.99994032   -0 56 07.8
DE8502;SPC CA 3     - 2,198,151.33  6,121,527.32   sFT  0.99994032   -0 56 07.8
DE8502;UTM  10      - 4,208,689.835   585,314.009   MT  0.99968964   +0 35 55.5
DE8502
DE8502!             -  Elev Factor  x  Scale Factor =   Combined Factor
DE8502!SPC CA 3     -   1.00000355  x   0.99994032  =   0.99994387
DE8502!UTM  10      -   1.00000355  x   0.99968964  =   0.99969319
DE8502
DE8502                          SUPERSEDED SURVEY CONTROL
DE8502
DE8502.No superseded survey control is available for this station.
DE8502
DE8502_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEH8531408690(NAD 83)
DE8502_MARKER: DD = SURVEY DISK
DE8502_SETTING: 50 = ALUMINUM ALLOY ROD W/O SLEEVE (10 FT.+)
DE8502_STAMPING: PT 51 LS 5672 1990
DE8502_MARK LOGO: CA-013
DE8502_PROJECTION: RECESSED 35 CENTIMETERS
DE8502_MAGNETIC: N = NO MAGNETIC MATERIAL
DE8502_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
DE8502_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DE8502+SATELLITE: SATELLITE OBSERVATIONS - 1990
DE8502_ROD/PIPE-DEPTH: 31   meters
DE8502
DE8502  HISTORY     - Date     Condition        Report By
DE8502  HISTORY     - 1990     MONUMENTED       LOCSUR
DE8502
DE8502                          STATION DESCRIPTION
```

```
DE8502
DE8502'DESCRIBED BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 1990 (RZ)
DE8502'THE STATION IS LOCATED ABOUT 5.7 MI (9.2 KM) EAST SOUTHEAST OF
DE8502'MARTINEZ, 4.3 MI (6.9 KM) NORTHEAST OF CONCORD AND NEAR AN ENTRANCE
DE8502'GATE TO THE U.S.  NAVAL WEAPONS STATION CONCORD.  TO REACH THE STATION
DE8502'FROM THE INTERSECTION OF STATE HIGHWAY 4 AND PORT CHICAGO HIGHWAY, GO
DE8502'NORTH ON PORT CHICAGO HIGHWAY FOR 0.75 MI (1.21 KM) TO A RAILROAD
DE8502'TRACK, AND TO THE NORTH OF THE TRACK, MEDBURN STREET. CONTINUE NORTH
DE8502'ON PORT CHICAGO HIGHWAY FOR 0.05 MI (0.08 KM) AND THE STATION ON THE
DE8502'RIGHT ATOP A SMALL BERM.  IT IS ACROSS PORT CHICAGO HIGHWAY FROM A
DE8502'SMALL GUARD SHACK AT THE ENTRANCE TO THE NAVAL WEAPONS STATION.  THE
DE8502'STATION IS ABOUT 55 M (180.4 FT) NORTH OF THE CENTERLINE OF MEDBURN
DE8502'STREET, 20.4 M (66.9 FT) NORTH-NORTHEAST OF A POWER LINE POLE AMD
DE8502'ABOUT 18 M (59.1 FT) EAST OF THE CENTERLINE OF PORT CHICAGO HIGHWAY.
DE8502'THE STATION IS SET ATOP THE BERM INSIDE AN 8 IN PVC PIPE WITH CAP
DE8502'WHICH IS ITSELF INSIDE A PLASTIC MONUMENT HOUSING.  IT IS ABOUT 0.35 M
DE8502'(1.15 FT) BELOW THE TOP OF THE HOUSING. THE AREA IS COVERED WITH BARK
DE8502'MULCH AND THE STATION MAY BE OBSCURED.

*** retrieval complete.
Elapsed Time = 00:00:00
```

GPS Network Report

STAR*NET-PRO Version 6.0.22

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Run Date: Thu Feb 22 2007 12:17:59

Summary of Files Used and Option Settings
===

Project Folder and Data Files

Project Name 3738
Project Folder J:\12204 EARTHDATA DELTA LIDAR\STARNET
Data File List 3738.gps
3738.dat

Project Option Settings

STAR*NET Run Mode : Adjust with Error Propagation
Type of Adjustment : 3D
Project Units : Meters; DMS
Coordinate System : UTM; Zone 0010
Ellipsoid : GRS-80
Major Axis; 1 / Flattening : 6378137.000; 298.257222101000
Geoid Height Model : USA03.GHT
Vertical Deflection : N=0.00 E=0.00 (Defaults, Seconds)
Longitude Sign Convention : Positive West
Input/Output Coordinate Order : North-East
Angle Data Station Order : At-From-To
Distance/Vertical Data Type : Slope/Zenith
Convergence Limit; Max Iterations : 0.010000; 10
Default Coefficient of Refraction : 0.070000
Create Coordinate File : No
Create Geodetic Position File : No
Create Ground Scale Coordinate File : No
Create Dump File : No
GPS Vector Standard Error Factors : 4.0000
GPS Vector Centering (Meters) : 0.00500
GPS Vector Transformations : None

Inline Option Usage Notes

GPS Vectors Ignored by Inline Option:

From	To	Vector ID
P267	JS1193	V31 Postprocessed 07-FEB-2007 15:03:12.0
OHLN	JT9527	V70 Postprocessed 06-FEB-2007 16:49:02.0
P261	OHLN	V71 Postprocessed 05-FEB-2007 23:59:47.0
OHLN	AC9892	V72 Postprocessed 07-FEB-2007 20:33:22.0
JT9536	DE8502	V75 Postprocessed 07-FEB-2007 21:40:22.0
OHLN	704	V76 Postprocessed 06-FEB-2007 16:38:17.0
OHLN	JT0185	V77 Postprocessed 06-FEB-2007 16:52:42.0
DE8502	OHLN	V78 Postprocessed 07-FEB-2007 21:40:22.0
OHLN	JT0221	V81 Postprocessed 06-FEB-2007 18:08:32.0
OHLN	JT0221	V82 Postprocessed 06-FEB-2007 17:00:17.0

AC9892 JS3889 V87 Postprocessed 07-FEB-2007 20:55:02.0
OHLN P257 V115 Postprocessed 15-FEB-2007 23:59:47.
OHLN P261 V116 Postprocessed 15-FEB-2007 23:59:47.
OHLN P262 V117 Postprocessed 15-FEB-2007 23:59:47.

Summary of Unadjusted Input Observations
==

Number of Entered Stations (Meters) = 27
(Elevations Marked with (*) are Ellipsoid Heights)

Fixed Stations	Latitude	Longitude	Elev	Description
AE9887	37-58-32.218950	121-28-26.363330	-28.6200*	
AE9889	37-48-19.679740	121-27-02.214560	-29.9700*	
AE9891	38-01-00.378010	121-27-23.653800	-28.9200*	
CMOD	37-38-28.799500	120-59-59.862820	28.6520*	
DE8502	38-01-18.817100	122-01-40.827530	-22.6100*	
HS0455	37-44-43.517070	121-27-52.678200	-20.6900*	
JS3889	38-05-09.262950	121-16-30.650780	-19.0300*	
JT0185	38-13-38.752550	122-07-07.770260	-17.4900*	
JT0221	38-18-41.158210	122-01-58.035900	40.3100*	
JT9536	38-06-04.937980	122-15-50.142040	-28.8900*	
P256	37-55-55.057863	121-36-17.368519	-30.1554*	
P257	37-45-19.032380	121-27-50.472645	-24.1416*	
P261	38-09-10.643083	122-13-03.088971	118.6927*	
P262	38-01-30.520128	122-05-46.064094	-8.0380*	
P266	38-11-02.271324	121-50-36.641849	22.9954*	
P267	38-22-49.193753	121-49-23.590429	-16.9492*	
P268	38-28-24.680525	121-38-47.026235	-23.4015*	
P271	38-39-26.447765	121-42-52.325132	-17.6678*	
P273	38-06-56.910332	121-23-17.026738	-25.8469*	
UCD1	38-32-10.449181	121-45-04.379122	0.1520*	

Partially Fixed Latitude Longitude Elev Description
N-StdErr E-StdErr StdErr
AC9892 38-05-13.641860 122-06-42.210180 -4.9700*
FIXED FIXED FREE
HS0512 37-47-15.845210 121-18-25.729610 8.7000
FREE FREE FIXED
JS0755 38-47-09.874500 121-14-32.097030 47.4300*
FIXED FIXED FREE
JS1193 38-24-32.026630 121-19-29.688830 -11.2100*
FIXED FIXED FREE
JS1244 38-13-31.372270 121-29-32.158760 -25.1500*
FREE FREE FIXED
JS1617 n/a n/a 18.7800
FREE FREE FIXED

Unused Stations	Latitude	Longitude	Elev	Description
S300	37-39-59.412687	121-33-29.712440	496.3043*	

Number of GPS Vector Observations (Meters) = 117

From DeltaX StdErrX CorrelXY
To DeltaY StdErrY CorrelXZ
DeltaZ StdErrZ CorrelYZ
(V1 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
P271 39669.1323 0.0079 0.1882
JS0755 -13866.6034 0.0092 -0.1350
11189.9036 0.0080 -0.2066
(V2 Postprocessed 06-FEB-2007 21:00:32.0 037 038.asc)

P271 39669.1082 0.0095 0.5318
JS0755 -13866.6448 0.0128 -0.5029
11189.9483 0.0116 -0.6359
(V3 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
JS0755 -19694.0988 0.0086 0.1915
JS1193 -18544.0672 0.0104 -0.1817
-32759.9597 0.0097 -0.2813
(V4 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
P273 7389.5446 0.0088 0.2002
JS3889 -6902.4185 0.0106 -0.1535
-2607.6383 0.0114 -0.3182
(V5 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
JS3889 7807.5190 0.0105 0.4455
JS1193 21220.7584 0.0124 -0.4301
28161.1212 0.0142 -0.5739
(V6 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
723 5600.3209 0.0088 0.3046
JS3889 1559.1440 0.0097 -0.3081
5431.5602 0.0108 -0.4203
(V7 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
P273 1789.1837 0.0106 0.4673
723 -8461.5465 0.0124 -0.4465
-8039.2102 0.0140 -0.5820
(V8 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
P273 1789.1814 0.0086 0.1868
723 -8461.5573 0.0090 -0.1767
-8039.1869 0.0087 -0.1985
(V9 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
JS1011 -2231.6085 0.0122 0.5048
711 -5506.3616 0.0169 -0.4446
-7469.4134 0.0132 -0.6074
(V10 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P268 -15449.7000 0.0083 0.2608
JS1617 6376.3980 0.0106 -0.1801
-3389.4525 0.0082 -0.2633
(V11 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
JS1617 30615.0663 0.0096 0.3818
JS1011 -7096.3059 0.0139 -0.2935
12697.2097 0.0095 -0.3940
(V12 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P271 -17074.6110 0.0083 0.2688
JS1617 -7564.1048 0.0106 -0.1879
-19348.2167 0.0083 -0.2698
(V13 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
P271 11308.8525 0.0080 0.1494
711 -20166.7597 0.0113 -0.1609
-14120.4157 0.0097 -0.3348
(V14 Postprocessed 07-FEB-2007 18:31:02.0 037 038.asc)
P271 11308.8334 0.0080 0.1784
711 -20166.7962 0.0089 -0.1505
-14120.3944 0.0087 -0.2799
(V15 Postprocessed 06-FEB-2007 18:39:32.0 037 038.asc)
P271 13540.4175 0.0104 0.5869
JS1011 -14660.4633 0.0141 -0.5736
-6650.9594 0.0134 -0.7002
(V16 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
P271 13540.4391 0.0113 0.4764
JS1011 -14660.4440 0.0150 -0.4123
-6650.9780 0.0120 -0.5668
(V17 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
P268 12933.7563 0.0078 0.1340

711 -6226.2827 0.0107 -0.1426
1838.3638 0.0093 -0.3020
(V18 Postprocessed 07-FEB-2007 18:31:02.0 037 038.asc)
P268 12933.7499 0.0079 0.1730
711 -6226.2926 0.0089 -0.1470
1838.3652 0.0086 -0.2739
(V19 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
P268 15165.3562 0.0115 0.4868
JS1011 -719.9323 0.0155 -0.4238
9307.7784 0.0123 -0.5783
(V20 Postprocessed 06-FEB-2007 18:39:32.0 037 038.asc)
P268 15165.3381 0.0108 0.6157
JS1011 -719.9546 0.0149 -0.6044
9307.7942 0.0141 -0.7253
(V21 Postprocessed 07-FEB-2007 19:21:12.0 037 038.asc)
714 533.1180 0.0109 0.4490
711 11794.1035 0.0146 -0.3886
13031.2609 0.0115 -0.5419
(V22 Postprocessed 06-FEB-2007 22:01:32.0 037 038.asc)
714 9199.3126 0.0091 0.2241
JS1193 -449.7690 0.0122 -0.2220
5581.6094 0.0106 -0.3629
(V23 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)
714 -9350.5696 0.0088 0.1663
710 5787.1503 0.0120 -0.1809
67.4349 0.0097 -0.3311
(V24 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P267 1066.5693 0.0081 0.2354
JS1617 3727.3595 0.0102 -0.1620
4710.4756 0.0081 -0.2451
(V25 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)
P267 19566.3577 0.0085 0.1651
710 -14882.2297 0.0100 -0.1607
-3025.5701 0.0089 -0.2172
(V26 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
JS0755 -28360.3036 0.0079 0.1373
711 -6300.2015 0.0111 -0.1539
-25310.2914 0.0096 -0.3179
(V27 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
JS0755 -26128.6910 0.0086 0.2795
JS1011 -793.8145 0.0109 -0.2067
-17840.9019 0.0087 -0.3060
(V28 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
P271 19975.0610 0.0088 0.2036
JS1193 -32410.6276 0.0109 -0.1885
-21570.0787 0.0098 -0.3063
(V29 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
P268 41294.0496 0.0077 0.1599
JS0755 73.9003 0.0088 -0.1114
27148.6672 0.0078 -0.1770
(V30 Postprocessed 06-FEB-2007 21:00:32.0 037 038.asc)
P268 41294.0302 0.0095 0.5293
JS0755 73.8632 0.0127 -0.4990
27148.7026 0.0116 -0.6333
(V32 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
P267 38116.2387 0.0089 0.2123
JS1193 -21119.1629 0.0111 -0.1972
2488.6082 0.0099 -0.3115
(V33 Postprocessed 07-FEB-2007 15:03:12.0 037 038.asc)
JS1193 -21599.9147 0.0106 0.4796
P268 18470.1979 0.0128 -0.4513

5611.2556 0.0142 -0.5900
(V34 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
JS1193 -21599.9626 0.0087 0.2019
P268 18470.1446 0.0108 -0.1856
5611.3035 0.0097 -0.2979
(V35 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
JS1617 -19148.2096 0.0099 0.4250
JT0221 1896.1565 0.0135 -0.3390
-10673.1013 0.0097 -0.4418
(V36 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P267 -18081.6380 0.0108 0.6379
JT0221 5623.5253 0.0152 -0.6215
-5962.6341 0.0142 -0.7478
(V37 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P267 -18081.6642 0.0143 0.4049
JT0221 5623.5124 0.0154 -0.3809
-5962.6007 0.0133 -0.3779
(V38 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P271 -36222.8161 0.0107 0.6297
JT0221 -5667.9435 0.0150 -0.6140
-30021.3229 0.0141 -0.7435
(V39 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P271 -36222.8444 0.0139 0.3956
JT0221 -5667.9759 0.0149 -0.3814
-30021.2664 0.0131 -0.3758
(V40 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P273 -3870.1281 0.0082 0.1594
JS1244 11175.4037 0.0097 -0.1318
9562.3532 0.0094 -0.2093
(V41 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P273 -3870.1392 0.0177 0.6288
JS1244 11175.3648 0.0280 -0.5888
9562.3645 0.0175 -0.6861
(V42 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
714 -9867.8416 0.0113 0.4797
JS1244 -3592.7209 0.0166 -0.4118
-10409.5111 0.0113 -0.5383
(V43 Postprocessed 07-FEB-2007 14:58:02.0 037 038.asc)
P273 -8662.3624 0.0098 0.3980
AE9891 -2647.6070 0.0113 -0.3271
-8656.4903 0.0118 -0.4752
(V44 Postprocessed 07-FEB-2007 15:00:17.0 037 038.asc)
AE9891 -2773.0932 0.0075 0.0920
AE9887 -1600.1802 0.0077 -0.0723
-3599.6903 0.0077 -0.1161
(V45 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
723 -13224.6424 0.0103 0.4215
AE9887 4213.7807 0.0117 -0.3470
-4216.9817 0.0120 -0.4798
(V46 Postprocessed 07-FEB-2007 14:58:02.0 037 038.asc)
P256 14131.4912 0.0081 0.1990
AE9891 -1875.6936 0.0086 -0.1652
7421.4523 0.0087 -0.2476
(V47 Postprocessed 07-FEB-2007 15:00:17.0 037 038.asc)
P256 11358.3890 0.0091 0.3395
AE9887 -3475.8615 0.0103 -0.2751
3821.7606 0.0104 -0.4096
(V48 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P256 18923.7428 0.0075 0.0823
JS1244 11947.3382 0.0083 -0.0663
25640.2592 0.0080 -0.1114

(V49 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P256 18923.7413 0.0093 0.3785
JS1244 11947.3333 0.0124 -0.2945
25640.2669 0.0093 -0.4110
(V50 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P268 2532.7719 0.0076 0.0862
JS1244 -21613.1377 0.0083 -0.0706
-21602.3915 0.0081 -0.1190
(V51 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P268 2532.7852 0.0094 0.3851
JS1244 -21613.1234 0.0125 -0.3027
-21602.4047 0.0093 -0.4167
(V52 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P266 -9433.9725 0.0109 0.6461
JT0221 16186.5598 0.0155 -0.6315
11122.7027 0.0145 -0.7569
(V53 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P266 -9433.9886 0.0122 0.3562
JT0221 16186.5613 0.0131 -0.3380
11122.7214 0.0116 -0.3355
(V54 Postprocessed 06-FEB-2007 16:52:42.0 037 038.asc)
JT0185 -1782.2865 0.0077 0.0885
704 129.1999 0.0077 -0.1031
-1075.7414 0.0076 -0.0892
(V55 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
704 11204.8210 0.0151 0.4074
JT0221 727.6118 0.0170 -0.4684
8432.0990 0.0141 -0.4364
(V56 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
JT0185 9422.5132 0.0126 0.3486
JT0221 856.8194 0.0135 -0.3854
7356.3629 0.0124 -0.3461
(V57 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P261 359.2976 0.0074 0.0577
JT9527 85.2816 0.0075 -0.0524
291.0941 0.0074 -0.0579
(V58 Postprocessed 05-FEB-2007 21:54:02.0 037 038.asc)
JT9527 -5624.7076 0.0081 0.1683
JT9536 -806.5675 0.0095 -0.1547
-4886.3917 0.0094 -0.2799
(V59 Postprocessed 07-FEB-2007 21:34:02.0 037 038.asc)
AC9892 -10769.3778 0.0082 0.1676
JT9536 7953.9070 0.0115 -0.1884
1229.9533 0.0102 -0.2951
(V60 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
JT9527 7955.8899 0.0094 0.2511
704 -142.4925 0.0098 -0.2781
5046.3678 0.0092 -0.2652
(V61 Postprocessed 06-FEB-2007 16:38:17.0 037 038.asc)
P261 8315.1796 0.0087 0.2085
704 -57.2289 0.0091 -0.2213
5337.4755 0.0086 -0.2259
(V62 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
AC9892 -5503.9572 0.0074 0.0770
P261 8675.2564 0.0087 -0.0600
5825.2390 0.0079 -0.1330
(V63 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P261 19519.9753 0.0103 0.6031
JT0221 670.3632 0.0142 -0.5881
13769.5736 0.0134 -0.7195
(V64 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)

P261 19519.9861 0.0128 0.3712
JT0221 670.3861 0.0138 -0.3527
13769.5752 0.0121 -0.3501
(V65 Postprocessed 06-FEB-2007 16:38:17.0 037 038.asc)
P266 -20638.7996 0.0094 0.2680
704 15458.9445 0.0097 -0.2936
2690.6256 0.0093 -0.2848
(V66 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
P266 -23449.9991 0.0075 0.0882
AC9892 6840.9264 0.0090 -0.0689
-8472.0988 0.0081 -0.1527
(V67 Postprocessed 06-FEB-2007 16:52:42.0 037 038.asc)
P266 -18856.5011 0.0086 0.1798
JT0185 15329.7432 0.0089 -0.1970
3766.3584 0.0087 -0.1892
(V68 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P266 -28594.6873 0.0093 0.2537
JT9527 15601.4361 0.0096 -0.2533
-2355.7460 0.0093 -0.2756
(V69 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
P262 1092.9451 0.0074 0.0668
AC9892 4317.6593 0.0085 -0.0530
5418.8625 0.0078 -0.1168
(V73 Postprocessed 07-FEB-2007 21:34:02.0 037 038.asc)
P262 -9676.4319 0.0077 0.1184
JT9536 12271.5671 0.0086 -0.1090
6648.8109 0.0086 -0.2076
(V74 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P262 -4051.7245 0.0087 0.2053
JT9527 13078.1746 0.0089 -0.2006
11535.2073 0.0086 -0.2182
(V79 Postprocessed 07-FEB-2007 21:40:22.0 037 038.asc)
P261 9368.0864 0.0180 0.5771
DE8502 -16346.6649 0.0193 -0.4573
-11537.3517 0.0176 -0.5890
(V80 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P261 38668.2034 0.0083 0.2560
JS1617 -1225.7664 0.0106 -0.1780
24442.6531 0.0082 -0.2630
(V83 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
JS1244 -27696.6804 0.0080 0.1383
P266 13699.1531 0.0093 -0.1112
-3582.8905 0.0088 -0.1813
(V84 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
JS1244 -27696.6933 0.0097 0.4091
P266 13699.1472 0.0132 -0.3277
-3582.8827 0.0096 -0.4457
(V85 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)
P266 28214.0251 0.0092 0.2128
710 -4319.1855 0.0113 -0.2101
14059.7634 0.0098 -0.2747
(V86 Postprocessed 07-FEB-2007 21:40:22.0 037 038.asc)
P256 -28358.8218 0.0196 0.5685
DE8502 24816.0000 0.0222 -0.4545
7873.1667 0.0205 -0.6037
(V88 Postprocessed 05-FEB-2007 23:59:47.0 037 038.asc)
P271 -55742.7823 0.0073 0.1021
P261 -6338.3078 0.0077 -0.0917
-43790.8972 0.0076 -0.1395
(V89 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P271 907.8673 0.0100 0.4304

JS1244 -35553.6354 0.0136 -0.3475
-37561.1573 0.0098 -0.4621
(V90 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
HS0512 4922.7829 0.0104 0.2639
724 616.7585 0.0114 -0.2269
3971.3649 0.0098 -0.2232
(V91 Postprocessed 07-FEB-2007 16:39:02.0 037 038.asc)
723 -7367.1540 0.0093 0.2355
HS0512 -14365.4750 0.0100 -0.2228
-20673.2105 0.0093 -0.2400
(V92 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
723 -2444.3790 0.0097 0.2313
724 -13748.7199 0.0107 -0.2000
-16701.8438 0.0093 -0.2059
(V93 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
CMOD -13092.5400 0.0100 0.2462
724 23170.6654 0.0109 -0.2072
16793.7730 0.0095 -0.2048
(V94 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
CMOD -5047.8427 0.0093 0.3545
JS3889 38478.5317 0.0106 -0.3515
38927.1675 0.0118 -0.4821
(V95 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
CMOD -10648.1598 0.0094 0.3764
723 36919.3900 0.0108 -0.3608
33495.6046 0.0117 -0.4888
(V96 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
CMOD -10648.1663 0.0084 0.1722
723 36919.3748 0.0088 -0.1630
33495.6124 0.0085 -0.1850
(V97 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
CMOD -5047.7823 0.0085 0.1760
JS3889 38478.5450 0.0100 -0.1305
38927.1389 0.0101 -0.2560
(V98 Postprocessed 07-FEB-2007 16:49:17.0 037 038.asc)
P257 -397.3616 0.0073 0.0412
HS0455 -545.9247 0.0074 -0.0358
-863.6552 0.0073 -0.0384
(V99 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
AE9889 -3187.7997 0.0105 0.2741
HS0455 -2844.2221 0.0122 -0.2302
-5262.0584 0.0104 -0.2856
(V100 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
P257 2790.4266 0.0103 0.2651
AE9889 2298.2734 0.0118 -0.2258
4398.4208 0.0102 -0.2672
(V101 Postprocessed 07-FEB-2007 16:49:17.0 037 038.asc)
HS0455 13344.7193 0.0093 0.2290
HS0512 -4769.2485 0.0099 -0.2131
3710.8936 0.0091 -0.2196
(V102 Postprocessed 07-FEB-2007 16:39:02.0 037 038.asc)
P257 12947.3448 0.0089 0.2159
HS0512 -5315.1968 0.0094 -0.1992
2847.2561 0.0089 -0.2135
(V103 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
P256 7058.9656 0.0105 0.2721
AE9889 -14441.6287 0.0121 -0.2300
-11083.3170 0.0103 -0.2748
(V104 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
P257 20314.4904 0.0087 0.2979
723 9050.2642 0.0096 -0.2905

23520.4779 0.0103 -0.3997
(V105 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
P257 20314.5004 0.0081 0.1375
723 9050.2757 0.0084 -0.1293
23520.4629 0.0081 -0.1458
(V106 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
P257 17870.1282 0.0088 0.1827
724 -4698.4374 0.0094 -0.1502
6818.6226 0.0085 -0.1493
(V107 Postprocessed 06-FEB-2007 23:59:47.0 037 038.asc)
P257 -4268.5422 0.0073 0.0840
P256 16739.9061 0.0076 -0.0762
15481.7355 0.0075 -0.1153
(V108 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
P257 25914.8789 0.0081 0.1388
JS3889 10609.4277 0.0091 -0.1045
28952.0040 0.0093 -0.2093
(V109 Postprocessed 06-FEB-2007 23:59:47.0 037 038.asc)
P257 30962.6650 0.0075 0.1551
CMOD -27869.1039 0.0081 -0.1400
-9975.1497 0.0079 -0.2115
(V110 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 -11004.7782 0.0080 0.2866
P267 -5827.1279 0.0092 -0.2653
-13562.4213 0.0088 -0.3649
(V111 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 5511.4768 0.0079 0.2511
P268 -8476.1748 0.0089 -0.2323
-5462.4838 0.0086 -0.3283
(V112 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 7136.3943 0.0079 0.2658
P271 5464.3313 0.0090 -0.2479
10496.2743 0.0087 -0.3454
(V113 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
CMOD -30962.6774 0.0088 0.4240
P257 27869.0864 0.0109 -0.3922
9975.1604 0.0101 -0.5136
(V114 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 12437.3578 0.0119 0.6966
CMOD -45380.9271 0.0172 -0.6643
-41534.8194 0.0151 -0.7648
(V118 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P256 4268.5436 0.0079 0.2596
P257 -16739.9053 0.0090 -0.2328
-15481.7361 0.0086 -0.3303
(V119 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 33315.8769 0.0079 0.2624
P256 -28169.7741 0.0090 -0.2380
-8166.4044 0.0086 -0.3375
(V120 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P266 8772.9475 0.0080 0.2913
P256 -25646.4846 0.0093 -0.2647
-22057.3834 0.0088 -0.3686
(V121 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 -22793.8629 0.0117 0.6806
P256 -771.9308 0.0164 -0.6499
-16077.9246 0.0146 -0.7488
(V122 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P257 18525.3215 0.0116 0.6781
P273 17511.8401 0.0164 -0.6487
31559.6578 0.0147 -0.7495

(V123 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 -4411.0239 0.0079 0.2498
P261 12992.8993 0.0089 -0.2272
11244.1132 0.0085 -0.3199
(V124 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P261 28953.9525 0.0081 0.3123
P266 -15516.1897 0.0095 -0.2860
2646.8667 0.0090 -0.3939
(V125 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P261 37601.6167 0.0079 0.2575
P267 -4953.1476 0.0090 -0.2357
19732.2024 0.0086 -0.3350
(V126 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 24542.9295 0.0081 0.3129
P266 -2523.2891 0.0095 -0.2866
13890.9790 0.0090 -0.3946
(V127 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P266 8647.6638 0.0080 0.2934
P267 10563.0412 0.0093 -0.2695
17085.3364 0.0089 -0.3725
(V128 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 -31566.8125 0.0117 0.6845
P266 24874.5489 0.0164 -0.6544
5979.4662 0.0148 -0.7509
(V129 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P267 16516.2517 0.0072 0.0455
P268 -2649.0495 0.0073 -0.0426
8099.9400 0.0073 -0.0655
(V130 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P267 22919.1526 0.0116 0.6783
P273 -35437.5860 0.0164 -0.6484
-23064.8054 0.0146 -0.7498
(V131 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P268 6402.8983 0.0117 0.6844
P273 -32788.5335 0.0166 -0.6542
-31164.7508 0.0148 -0.7543

Adjustment Statistical Summary
==============================

Convergence Iterations = 3

Number of Stations = 34

Number of Observations = 351
Number of Unknowns = 33
Number of Redundant Obs = 318

Observation Count Sum Squares Error
of StdRes Factor
GPS Deltas 351 1700.81 2.31

Total 351 1700.81 2.31

Adjustment Failed Upper Bound of Chi Square Test at 5.00% Level
Adjusted Station Information
============================

Coordinate Changes from Entered Provisionals (Meters)
(Elevations Marked with (*) are Ellipsoid Heights)

Station	dN	dE	dZ
AC9892	0.0000	0.0000	0.0589*
AE9887	0.0000	0.0000	0.0000*
AE9889	0.0000	0.0000	0.0000*
AE9891	0.0000	0.0000	0.0000*
CMOD	0.0000	0.0000	0.0000*
DE8502	0.0000	0.0000	0.0000*
HS0455	0.0000	0.0000	0.0000*
HS0512	0.0180	-0.0952	0.0000
JS0755	0.0000	0.0000	-0.0637*
JS1193	0.0000	0.0000	-0.0912*
JS1244	0.1078	0.0402	0.0000*
JS1617	n/a	n/a	0.0000
JS3889	0.0000	0.0000	0.0000*
JT0185	0.0000	0.0000	0.0000*
JT0221	0.0000	0.0000	0.0000*
JT9536	0.0000	0.0000	0.0000*
P256	0.0000	0.0000	0.0000*
P257	0.0000	0.0000	0.0000*
P261	0.0000	0.0000	0.0000*
P262	0.0000	0.0000	0.0000*
P266	0.0000	0.0000	0.0000*
P267	0.0000	0.0000	0.0000*
P268	0.0000	0.0000	0.0000*
P271	0.0000	0.0000	0.0000*
P273	0.0000	0.0000	0.0000*
UCD1	0.0000	0.0000	0.0000*

Adjusted Coordinates (Meters)

Station	N	E	Elev	Description
704	4230038.2698	575561.3378	7.4757	
710	4245166.4323	627297.5209	8.7738	
711	4261795.9337	632315.2230	4.6100	
714	4245261.9390	638291.8969	7.7585	
723	4209788.9652	647415.1745	4.4514	
724	4188711.4723	652854.0463	7.1391	
AC9892	4215854.0340	577896.5661	27.1537	
AE9887	4204208.0184	634027.8531	3.4994	
AE9889	4185362.0993	636394.5775	2.2421	
AE9891	4208799.9098	635482.1146	3.0894	
CMOD	4167902.7566	676458.9706	60.5833	
DE8502	4208689.9363	585313.9517	9.5177	
HS0455	4178679.2445	635269.8986	11.4715	
HS0512	4183613.7074	649060.7011	8.7000	
JS0755	4294504.8863	652669.1973	77.2475	
JS1011	4271271.1070	631186.3727	73.5229	
JS1193	4252512.9224	646252.5720	19.3105	
JS1244	4231896.6812	631972.4756	6.4553	
JS1617	4254662.8660	601648.5062	18.7800	
JS3889	4216751.2445	651263.2119	12.3857	
JT0185	4231416.4832	577125.9850	14.3074	
JT0221	4240812.5447	584559.2123	71.9446	
JT9527	4223469.0991	568811.9278	123.0567	
JT9536	4217318.3191	564536.4918	3.2117	
P256	4199183.6977	622608.7500	2.1746	
P257	4179774.7659	635305.9084	8.0337	
P261	4223075.2779	568556.8140	150.5743	
P262	4208990.3399	579331.1643	24.0791	
P266	4226858.5083	601284.0559	55.2541	
P267	4248670.3749	602783.9746	14.9212	

P268	4259223.2889	618077.0781	7.9110
P271	4279536.9126	611847.6476	13.0570
P273	4219891.4380	641305.3980	5.7505
S300	4169791.6585	627156.0097	528.0557
UCD1	4266053.2402	608838.6452	31.3997

Adjusted Positions and Ellipsoid Heights (Meters)

Station	Latitude	Longitude	Ellip Ht	Geoid Ht
704	38-12-54.519402	122-08-12.646495	-24.3316	-31.8073
710	38-20-44.197405	121-32-35.776383	-22.6483	-31.4221
711	38-29-40.919422	121-28-57.857217	-26.3118	-30.9217
714	38-20-41.426229	121-25-02.931635	-23.2919	-31.0505
723	38-01-25.749915	121-19-13.712790	-27.2414	-31.6928
724	37-49-58.923062	121-15-46.836153	-24.8774	-32.0165
AC9892	38-05-13.641860	122-06-42.210180	-4.9111	-32.0648
AE9887	37-58-32.218950	121-28-26.363330	-28.6200	-32.1194
AE9889	37-48-19.679740	121-27-02.214560	-29.9700	-32.2121
AE9891	38-01-00.378010	121-27-23.653800	-28.9200	-32.0094
CMOD	37-38-28.799500	120-59-59.862820	28.6520	-31.9313
DE8502	38-01-18.817100	122-01-40.827530	-22.6100	-32.1277
HS0455	37-44-43.517070	121-27-52.678200	-20.6900	-32.1615
HS0512	37-47-15.845848	121-18-25.733486	-23.4232	-32.1232
JS0755	38-47-09.874500	121-14-32.097030	47.3663	-29.8812
JS1011	38-34-48.821522	121-29-38.037327	42.7335	-30.7894
JS1193	38-24-32.026630	121-19-29.688830	-11.3012	-30.6117
JS1244	38-13-31.375744	121-29-32.157034	-25.1500	-31.6053
JS1617	38-26-04.042145	121-50-07.262767	-12.9138	-31.6938
JS3889	38-05-09.262950	121-16-30.650780	-19.0300	-31.4157
JT0185	38-13-38.752550	122-07-07.770260	-17.4900	-31.7974
JT0221	38-18-41.158210	122-01-58.035900	40.3100	-31.6346
JT9527	38-09-23.349678	122-12-52.470546	91.1878	-31.8688
JT9536	38-06-04.937980	122-15-50.142040	-28.8900	-32.1017
P256	37-55-55.057863	121-36-17.368519	-30.1554	-32.3300
P257	37-45-19.032380	121-27-50.472645	-24.1416	-32.1753
P261	38-09-10.643083	122-13-03.088971	118.6927	-31.8816
P262	38-01-30.520128	122-05-46.064094	-8.0380	-32.1171
P266	38-11-02.271324	121-50-36.641849	22.9954	-32.2587
P267	38-22-49.193753	121-49-23.590429	-16.9492	-31.8704
P268	38-28-24.680525	121-38-47.026235	-23.4015	-31.3125
P271	38-39-26.447765	121-42-52.325132	-17.6678	-30.7248
P273	38-06-56.910332	121-23-17.026738	-25.8469	-31.5974
S300	37-39-59.412687	121-33-29.712440	496.3043	-31.7514
UCD1	38-32-10.449181	121-45-04.379122	0.1520	-31.2477
Average:	-31.6665			

Convergence Angles (DMS) and Grid Factors at Stations
(Grid Azimuth = Geodetic Azimuth - Convergence)
(Elevation Factor Includes a Geoid Height Correction at Each Station))

	Convergence	------- Factors -------		
Station	Angle	Scale x	Elevation =	Combined
704	0-32-02.35	0.99967032	1.00000382	0.99967413
710	0-54-13.97	0.99979957	1.00000355	0.99980312
711	0-56-40.36	0.99981560	1.00000413	0.99981973
714	0-58-54.98	0.99983553	1.00000365	0.99983918
723	1-02-05.12	0.99986765	1.00000427	0.99987192
724	1-03-56.20	0.99988778	1.00000390	0.99989168
AC9892	0-32-52.68	0.99967473	1.00000077	0.99967550
AE9887	0-56-20.88	0.99982125	1.00000449	0.99982574
AE9889	0-56-59.61	0.99982914	1.00000470	0.99983384

AE9891 0-57-02.63 0.99982607 1.00000454 0.99983061
CMOD 1-13-18.38 0.99998354 0.99999550 0.99997905
DE8502 0-35-55.49 0.99968964 1.00000355 0.99969319
HS0455 0-56-24.09 0.99982538 1.00000325 0.99982862
HS0512 1-02-14.88 0.99987367 1.00000368 0.99987735
JS0755 1-06-04.65 0.99988702 0.99999257 0.99987959
JS1011 0-56-21.67 0.99981193 0.99999330 0.99980523
JS1193 1-02-27.11 0.99986342 1.00000177 0.99986519
JS1244 0-55-59.00 0.99981450 1.00000395 0.99981844
JS1617 0-43-26.51 0.99972724 1.00000203 0.99972927
JS3889 1-03-50.92 0.99988180 1.00000299 0.99988479
JT0185 0-32-43.02 0.99967326 1.00000274 0.99967600
JT0221 0-35-58.72 0.99968806 0.99999368 0.99968173
JT9527 0-29-06.95 0.99965832 0.99998569 0.99964401
JT9536 0-27-15.16 0.99965129 1.00000453 0.99965583
P256 0-51-27.92 0.99978515 1.00000473 0.99978988
P257 0-56-26.19 0.99982550 1.00000379 0.99982928
P261 0-29-00.25 0.99965788 0.99998138 0.99963927
P262 0-33-24.55 0.99967751 1.00000126 0.99967877
P266 0-42-53.96 0.99972634 0.99999639 0.99972273
P267 0-43-50.53 0.99973010 1.00000266 0.99973276
P268 0-50-32.08 0.99977170 1.00000367 0.99977537
P271 0-48-11.03 0.99975405 1.00000277 0.99975682
P273 0-59-42.49 0.99984592 1.00000406 0.99984997
S300 0-52-52.02 0.99979915 0.99992213 0.99972129
UCD1 0-46-41.09 0.99974588 0.99999998 0.99974585
Project Averages: 0-49-55.36 0.99978217 0.99999857 0.99978074
Adjusted Observations and Residuals
===================================

Adjusted GPS Vector Observations Sorted by Lengths (Meters)

From Component Adj Value Residual StdErr StdRes
To
(V88 Postprocessed 05-FEB-2007 23:59:47.0 037 038.asc)
P271 Delta-N -55868.8471 -0.0081 0.0071 1.1
P261 Delta-E -44087.1804 -0.0031 0.0071 0.4
Delta-U -261.2014 0.0025 0.0084 0.3
Length 71169.3458
(V114 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 Delta-N -52592.0181 -0.0214 0.0078 2.7
CMOD Delta-E 34253.1158 0.0198 0.0075 2.6
Delta-U -254.8295 -0.0061 0.0234 0.3
Length 62763.5344
(V94 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
CMOD Delta-N 49379.6830 0.0007 0.0083 0.1
JS3889 Delta-E -24144.7604 -0.0260 0.0079 3.3*
Delta-U -285.0420 0.0302 0.0144 2.1
Length 54967.2975
(V97 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
CMOD Delta-N 49379.6830 -0.0026 0.0087 0.3
JS3889 Delta-E -24144.7604 -0.0709 0.0081 8.7*
Delta-U -285.0420 0.0813 0.0114 7.1*
Length 54967.2975
(V89 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P271 Delta-N -47925.9222 -0.0085 0.0086 1.0
JS1244 Delta-E 19462.4006 -0.0025 0.0084 0.3
Delta-U -217.7105 0.0392 0.0154 2.5
Length 51727.4246
(V95 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
CMOD Delta-N 42500.9879 0.0089 0.0083 1.1

723 Delta-E -28142.1481 -0.0196 0.0079 2.5
Delta-U -259.9255 0.0395 0.0146 2.7
Length 50974.3272
(V96 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
CMOD Delta-N 42500.9879 0.0127 0.0078 1.6
723 Delta-E -28142.1481 -0.0218 0.0078 2.8
Delta-U -259.9255 0.0217 0.0100 2.2
Length 50974.3272
(V30 Postprocessed 06-FEB-2007 21:00:32.0 037 038.asc)
P268 Delta-N 34773.2523 -0.0146 0.0073 2.0
JS0755 Delta-E 35114.9474 -0.0033 0.0073 0.5
Delta-U -120.8270 -0.0524 0.0167 3.1*
Length 49419.1582
(V29 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
P268 Delta-N 34773.2523 -0.0129 0.0075 1.7
JS0755 Delta-E 35114.9474 -0.0004 0.0074 0.1
Delta-U -120.8270 0.0023 0.0094 0.3
Length 49419.1582
(V130 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P267 Delta-N -29272.1868 -0.0063 0.0077 0.8
P273 Delta-E 38160.1683 -0.0013 0.0075 0.2
Delta-U -190.2747 0.0184 0.0224 0.8
Length 48094.6522
(V38 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P271 Delta-N -38350.1082 0.0057 0.0074 0.8
JT0221 Delta-E -27834.3492 0.0288 0.0074 3.9*
Delta-U -118.2998 -0.0183 0.0207 0.9
Length 47386.6625
(V39 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P271 Delta-N -38350.1082 -0.0119 0.0110 1.1
JT0221 Delta-E -27834.3492 0.0358 0.0113 3.2*
Delta-U -118.2998 -0.0867 0.0184 4.7*
Length 47386.6625
(V80 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P261 Delta-N 31315.6051 0.0002 0.0079 0.0
JS1617 Delta-E 33367.9647 0.0001 0.0078 0.0
Delta-U -295.8779 0.0660 0.0112 5.9*
Length 45762.1649
(V131 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P268 Delta-N -39674.7914 -0.0014 0.0078 0.2
P273 Delta-E 22654.1433 0.0028 0.0075 0.4
Delta-U -166.3777 0.0223 0.0227 1.0
Length 45687.2735
(V119 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 Delta-N -10228.9264 0.0049 0.0072 0.7
P256 Delta-E 43191.5737 0.0024 0.0071 0.3
Delta-U -176.4038 -0.0081 0.0108 0.8
Length 44386.6432
(V28 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
P271 Delta-N -27507.2095 -0.0313 0.0085 3.7*
JS1193 Delta-E 34030.1796 -0.0217 0.0084 2.6
Delta-U -143.7835 0.0431 0.0122 3.5*
Length 43757.5179
(V32 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
P267 Delta-N 3288.2960 -0.0305 0.0085 3.6*
JS1193 Delta-E 43522.6826 -0.0260 0.0085 3.1*
Delta-U -143.5056 0.0534 0.0124 4.3*
Length 43646.9630
(V2 Postprocessed 06-FEB-2007 21:00:32.0 037 038.asc)
P271 Delta-N 14396.0420 -0.0155 0.0073 2.1
JS0755 Delta-E 41035.1508 0.0005 0.0073 0.1

Delta-U -83.0893 -0.0518 0.0168 3.1*
Length 43487.1996
(V1 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
P271 Delta-N 14396.0420 -0.0105 0.0075 1.4
JS0755 Delta-E 41035.1508 0.0017 0.0075 0.2
Delta-U -83.0893 0.0135 0.0098 1.4
Length 43487.1996
(V113 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
CMOD Delta-N 12748.8789 0.0260 0.0073 3.6*
P257 Delta-E -40893.8497 -0.0198 0.0072 2.7
Delta-U -196.5072 -0.0010 0.0138 0.1
Length 42835.4931
(V109 Postprocessed 06-FEB-2007 23:59:47.0 037 038.asc)
P257 Delta-N -12546.2885 -0.0212 0.0071 3.0
CMOD Delta-E 40956.8291 0.0213 0.0071 3.0*
Delta-U -90.9203 -0.0227 0.0092 2.5
Length 42835.4931
(V125 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P261 Delta-N 25312.0963 0.0047 0.0072 0.7
P267 Delta-E 34452.7998 0.0021 0.0071 0.3
Delta-U -278.9463 0.0035 0.0107 0.3
Length 42752.4905
(V3 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
JS0755 Delta-N -41866.2836 -0.0065 0.0084 0.8
JS1193 Delta-E -7220.1018 -0.0225 0.0082 2.7
Delta-U -200.5408 -0.0245 0.0117 2.1
Length 42484.7713
(V128 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 Delta-N 7663.1699 0.0018 0.0078 0.2
P266 Delta-E -39902.7605 -0.0007 0.0075 0.1
Delta-U -80.4350 -0.0071 0.0226 0.3
Length 40632.0187
(V122 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P257 Delta-N 40018.4707 -0.0037 0.0077 0.5
P273 Delta-E 6660.9734 -0.0019 0.0075 0.2
Delta-U -131.0932 0.0079 0.0224 0.4
Length 40569.2464
(V108 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
P257 Delta-N 36713.5173 -0.0278 0.0083 3.4*
JS3889 Delta-E 16566.7833 -0.0528 0.0078 6.8*
Delta-U -122.3524 0.0394 0.0103 3.8*
Length 40278.4761
(V26 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
JS0755 Delta-N -32317.4418 0.0102 0.0082 1.2
711 Delta-E -20979.9047 -0.0019 0.0082 0.2
Delta-U -190.2433 -0.0278 0.0119 2.3
Length 38530.6325
(V86 Postprocessed 07-FEB-2007 21:40:22.0 037 038.asc)
P256 Delta-N 10066.5351 0.0391 0.0142 2.8
DE8502 Delta-E -37157.6871 0.0479 0.0139 3.4*
Delta-U -108.5221 -0.0273 0.0301 0.9
Length 38497.2806
(V5 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
JS3889 Delta-N 35853.1654 0.0018 0.0091 0.2
JS1193 Delta-E -4343.7798 -0.0057 0.0084 0.7
Delta-U -94.8094 -0.0853 0.0177 4.8*
Length 36115.4660
(V120 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P266 Delta-N -27944.5613 0.0015 0.0072 0.2
P256 Delta-E 20983.6647 0.0009 0.0071 0.1
Delta-U -149.0197 -0.0030 0.0112 0.3

Length 34946.1714
(V49 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P256 Delta-N 32574.8847 -0.0014 0.0082 0.2
JS1244 Delta-E 9855.9327 -0.0013 0.0081 0.2
Delta-U -86.0269 0.0135 0.0139 1.0
Length 34033.3649
(V48 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P256 Delta-N 32574.8847 0.0016 0.0076 0.2
JS1244 Delta-E 9855.9327 -0.0000 0.0074 0.0
Delta-U -86.0269 0.0222 0.0087 2.5
Length 34033.3649
(V11 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
JS1617 Delta-N 16236.7875 -0.0011 0.0089 0.1
JS1011 Delta-E 29752.7143 -0.0081 0.0086 0.9
Delta-U -34.3829 0.0238 0.0149 1.6
Length 33894.8147
(V124 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P261 Delta-N 3507.9435 0.0015 0.0072 0.2
P266 Delta-E 32768.1423 0.0010 0.0072 0.1
Delta-U -180.7316 0.0075 0.0116 0.6
Length 32955.8718
(V68 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P266 Delta-N -2985.0167 -0.0122 0.0080 1.5
JT9527 Delta-E -32522.2827 0.0174 0.0082 2.1
Delta-U -15.3174 -0.0420 0.0115 3.6*
Length 32658.9870
(V104 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
P257 Delta-N 29815.0472 -0.0145 0.0079 1.8
723 Delta-E 12603.7123 0.0032 0.0076 0.4
Delta-U -85.4288 -0.0180 0.0124 1.5
Length 32369.7065
(V105 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
P257 Delta-N 29815.0472 -0.0118 0.0076 1.6
723 Delta-E 12603.7123 0.0006 0.0076 0.1
Delta-U -85.4288 0.0031 0.0092 0.3
Length 32369.7065
(V85 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)
P266 Delta-N 17985.3862 -0.0028 0.0087 0.3
710 Delta-E 26246.3988 -0.0042 0.0088 0.5
Delta-U -125.0084 0.0196 0.0125 1.6
Length 31817.6554
(V27 Postprocessed 06-FEB-2007 19:20:32.0 037 038.asc)
JS0755 Delta-N -22821.0167 0.0079 0.0080 1.0
JS1011 Delta-E -21927.8375 0.0061 0.0079 0.8
Delta-U -83.2179 0.0122 0.0118 1.0
Length 31648.6301
(V93 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
CMOD Delta-N 21309.5225 0.0083 0.0089 0.9
724 Delta-E -23156.2793 -0.0159 0.0090 1.8
Delta-U -131.2157 0.0242 0.0121 2.0
Length 31469.4493
(V84 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
JS1244 Delta-N -4539.0516 0.0030 0.0084 0.4
P266 Delta-E -30773.4723 0.0021 0.0083 0.3
Delta-U -27.6180 -0.0156 0.0149 1.0
Length 31106.4358
(V83 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
JS1244 Delta-N -4539.0516 0.0018 0.0081 0.2
P266 Delta-E -30773.4723 -0.0058 0.0078 0.7
Delta-U -27.6180 -0.0015 0.0101 0.1
Length 31106.4358

(V51 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P268 Delta-N -27532.8445 -0.0068 0.0083 0.8
JS1244 Delta-E 13496.0401 -0.0008 0.0082 0.1
Delta-U -75.6048 0.0407 0.0140 2.9
Length 30662.7843
(V50 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P268 Delta-N -27532.8445 -0.0053 0.0077 0.7
JS1244 Delta-E 13496.0401 0.0030 0.0075 0.4
Delta-U -75.6048 0.0175 0.0088 2.0
Length 30662.7843
(V34 Postprocessed 06-FEB-2007 21:50:32.0 037 038.asc)
JS1193 Delta-N 7222.6766 0.0266 0.0084 3.1*
P268 Delta-E -28053.8308 0.0214 0.0084 2.6
Delta-U -77.8185 -0.0045 0.0121 0.4
Length 28968.7855
(V33 Postprocessed 07-FEB-2007 15:03:12.0 037 038.asc)
JS1193 Delta-N 7222.6766 0.0203 0.0090 2.3
P268 Delta-E -28053.8308 0.0082 0.0083 1.0
Delta-U -77.8185 0.0805 0.0181 4.4*
Length 28968.7855
(V126 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 Delta-N 17658.8469 0.0032 0.0072 0.4
P266 Delta-E 22132.4642 0.0016 0.0071 0.2
Delta-U -31.8343 -0.0047 0.0116 0.4
Length 28313.9869
(V121 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P273 Delta-N -20384.1715 0.0058 0.0078 0.8
P256 Delta-E -19056.1466 0.0009 0.0075 0.1
Delta-U -65.4082 -0.0014 0.0224 0.1
Length 27904.3984
(V14 Postprocessed 07-FEB-2007 18:31:02.0 037 038.asc)
P271 Delta-N -18029.3445 -0.0014 0.0075 0.2
711 Delta-E 20221.6055 0.0002 0.0075 0.0
Delta-U -66.2124 -0.0025 0.0103 0.2
Length 27091.9726
(V13 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
P271 Delta-N -18029.3445 -0.0104 0.0083 1.3
711 Delta-E 20221.6055 0.0031 0.0083 0.4
Delta-U -66.2124 0.0429 0.0122 3.5*
Length 27091.9726
(V12 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P271 Delta-N -24735.3028 -0.0030 0.0079 0.4
JS1617 Delta-E -10548.6292 0.0079 0.0078 1.0
Delta-U -52.0564 0.0178 0.0113 1.6
Length 26890.7325
(V91 Postprocessed 07-FEB-2007 16:39:02.0 037 038.asc)
723 Delta-N -26203.8682 0.0007 0.0083 0.1
HS0512 Delta-E 1173.9563 -0.0071 0.0084 0.8
Delta-U -50.2751 0.0321 0.0116 2.8
Length 26230.2003
(V65 Postprocessed 06-FEB-2007 16:38:17.0 037 038.asc)
P266 Delta-N 3501.6282 -0.0050 0.0079 0.6
704 Delta-E -25688.6398 0.0165 0.0083 2.0
Delta-U -99.9570 -0.0474 0.0118 4.0*
Length 25926.3882
(V66 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
P266 Delta-N -10715.2562 -0.0415 0.0077 5.4*
AC9892 Delta-E -23529.8436 0.0293 0.0076 3.9*
Delta-U -80.2807 -0.0151 0.0092 1.6
Length 25854.9164
(V25 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)

P267 Delta-N -3817.0363 -0.0057 0.0082 0.7
710 Delta-E 24472.5232 -0.0038 0.0082 0.5
Delta-U -53.7342 0.0195 0.0108 1.8
Length 24768.4688
(V67 Postprocessed 06-FEB-2007 16:52:42.0 037 038.asc)
P266 Delta-N 4860.6441 -0.0066 0.0078 0.8
JT0185 Delta-E -24106.4276 0.0132 0.0080 1.7
Delta-U -87.8403 -0.0700 0.0102 6.9*
Length 24591.7349
(V64 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P261 Delta-N 17607.2020 -0.0049 0.0103 0.5
JT0221 Delta-E 16157.1166 0.0264 0.0106 2.5
Delta-U -123.1936 0.0012 0.0168 0.1
Length 23897.3044
(V63 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P261 Delta-N 17607.2020 0.0119 0.0073 1.6
JT0221 Delta-E 16157.1166 0.0233 0.0073 3.2*
Delta-U -123.1936 -0.0175 0.0195 0.9
Length 23897.3044
(V118 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P256 Delta-N -19600.1629 -0.0026 0.0072 0.4
P257 Delta-E 12408.1214 0.0012 0.0071 0.2
Delta-U -36.2450 -0.0010 0.0107 0.1
Length 23197.6114
(V107 Postprocessed 06-FEB-2007 23:59:47.0 037 038.asc)
P257 Delta-N 19618.8298 0.0022 0.0071 0.3
P256 Delta-E -12378.5444 -0.0019 0.0071 0.3
Delta-U -48.2730 0.0025 0.0081 0.3
Length 23197.6114
(V79 Postprocessed 07-FEB-2007 21:40:22.0 037 038.asc)
P261 Delta-N -14530.6569 0.0362 0.0126 2.9
DE8502 Delta-E 16640.7112 0.0474 0.0126 3.8*
Delta-U -179.5831 -0.0123 0.0263 0.5
Length 22092.6574
(V35 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
JS1617 Delta-N -13637.6059 0.0088 0.0086 1.0
JT0221 Delta-E -17267.8574 0.0222 0.0084 2.6
Delta-U 15.2576 -0.0443 0.0151 2.9
Length 22003.7139
(V127 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P266 Delta-N 21797.2262 0.0033 0.0072 0.5
P267 Delta-E 1773.0527 0.0011 0.0071 0.1
Delta-U -77.5437 -0.0052 0.0113 0.5
Length 21869.3575
(V53 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P266 Delta-N 14166.1426 -0.0018 0.0100 0.2
JT0221 Delta-E -16554.1108 0.0367 0.0102 3.6*
Delta-U -19.9173 -0.0330 0.0159 2.1
Length 21788.0375
(V52 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P266 Delta-N 14166.1426 0.0085 0.0074 1.1
JT0221 Delta-E -16554.1108 0.0222 0.0074 3.0
Delta-U -19.9173 -0.0158 0.0214 0.7
Length 21788.0375
(V92 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
723 Delta-N -21174.5462 0.0063 0.0088 0.7
724 Delta-E 5058.7583 0.0050 0.0089 0.6
Delta-U -34.8907 -0.0041 0.0118 0.3
Length 21770.4768
(V16 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
P271 Delta-N -8537.7083 -0.0038 0.0089 0.4

JS1011 Delta-E 19225.3584 -0.0040 0.0091 0.4
Delta-U 25.7339 -0.0053 0.0183 0.3
Length 21035.8629
(V15 Postprocessed 06-FEB-2007 18:39:32.0 037 038.asc)
P271 Delta-N -8537.7083 -0.0010 0.0075 0.1
JS1011 Delta-E 19225.3584 0.0043 0.0075 0.6
Delta-U 25.7339 -0.0386 0.0193 2.0
Length 21035.8629
(V37 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
P267 Delta-N -7627.2060 -0.0083 0.0112 0.7
JT0221 Delta-E -18328.8491 0.0416 0.0116 3.6*
Delta-U 26.3840 -0.0467 0.0189 2.5
Length 19852.4980
(V36 Postprocessed 06-FEB-2007 18:08:32.0 037 038.asc)
P267 Delta-N -7627.2060 0.0025 0.0074 0.3
JT0221 Delta-E -18328.8491 0.0261 0.0074 3.5*
Delta-U 26.3840 -0.0065 0.0210 0.3
Length 19852.4980
(V106 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
P257 Delta-N 8648.3551 -0.0141 0.0082 1.7
724 Delta-E 17695.0634 0.0034 0.0082 0.4
Delta-U -31.1317 0.0042 0.0102 0.4
Length 19695.4382
(V103 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
P256 Delta-N -14028.7538 -0.0117 0.0094 1.2
AE9889 Delta-E 13580.2149 -0.0303 0.0095 3.2*
Delta-U -29.7273 -0.0090 0.0136 0.7
Length 19525.0879
(V129 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P267 Delta-N 10359.3421 -0.0015 0.0071 0.2
P268 Delta-E 15430.3572 -0.0005 0.0071 0.1
Delta-U -33.5300 0.0003 0.0077 0.0
Length 18585.2903
(V110 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 Delta-N -17303.6508 -0.0013 0.0072 0.2
P267 Delta-E -6291.3932 0.0005 0.0071 0.1
Delta-U -43.7387 0.0155 0.0111 1.4
Length 18411.9492
(V74 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P262 Delta-N 14585.4806 -0.0142 0.0077 1.8
JT9527 Delta-E -10381.4196 0.0054 0.0079 0.7
Delta-U 74.0629 0.0015 0.0104 0.1
Length 17902.9496
(V19 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
P268 Delta-N 11856.1124 -0.0048 0.0091 0.5
JS1011 Delta-E 13288.0325 -0.0017 0.0092 0.2
Delta-U 41.2607 -0.0067 0.0189 0.4
Length 17808.4505
(V20 Postprocessed 06-FEB-2007 18:39:32.0 037 038.asc)
P268 Delta-N 11856.1124 0.0005 0.0076 0.1
JS1011 Delta-E 13288.0325 0.0020 0.0076 0.3
Delta-U 41.2607 -0.0388 0.0206 1.9
Length 17808.4505
(V123 Postprocessed 15-FEB-2007 23:59:47.0 cors047.asc)
P262 Delta-N 14194.0864 0.0019 0.0072 0.3
P261 Delta-E -10640.4973 0.0007 0.0071 0.1
Delta-U 102.0271 -0.0141 0.0105 1.3
Length 17739.8614
(V21 Postprocessed 07-FEB-2007 19:21:12.0 037 038.asc)
714 Delta-N 16636.9616 0.0034 0.0088 0.4
711 Delta-E -5692.9503 0.0038 0.0090 0.4

Delta-U -27.3173 0.0155 0.0175 0.9
Length 17584.0530
(V10 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P268 Delta-N -4319.6145 -0.0034 0.0079 0.4
JS1617 Delta-E -16497.8947 0.0106 0.0078 1.4
Delta-U -12.2886 0.0031 0.0112 0.3
Length 17054.0244
(V73 Postprocessed 07-FEB-2007 21:34:02.0 037 038.asc)
P262 Delta-N 8474.2749 -0.0516 0.0077 6.7*
JT9536 Delta-E -14717.8383 0.0177 0.0075 2.4
Delta-U -43.4575 -0.0177 0.0096 1.8
Length 16983.2266
(V46 Postprocessed 07-FEB-2007 14:58:02.0 037 038.asc)
P256 Delta-N 9424.0054 -0.0600 0.0076 7.9*
AE9891 Delta-E 13018.4818 -0.0378 0.0074 5.1*
Delta-U -19.0164 0.0121 0.0101 1.2
Length 16071.4999
(V40 Postprocessed 07-FEB-2007 20:30:22.0 037 038.asc)
P273 Delta-N 12167.7174 -0.0027 0.0084 0.3
JS1244 Delta-E -9124.2707 0.0057 0.0079 0.7
Delta-U -17.4610 0.0035 0.0107 0.3
Length 15208.7464
(V41 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
P273 Delta-N 12167.7174 0.0124 0.0132 0.9
JS1244 Delta-E -9124.2707 -0.0051 0.0128 0.4
Delta-U -17.4610 -0.0342 0.0326 1.0
Length 15208.7464
(V42 Postprocessed 07-FEB-2007 19:38:57.0 037 038.asc)
714 Delta-N -13257.4011 -0.0064 0.0095 0.7
JS1244 Delta-E -6548.3543 0.0030 0.0094 0.3
Delta-U -19.0330 0.0754 0.0188 4.0*
Length 14786.4800
(V101 Postprocessed 07-FEB-2007 16:49:17.0 037 038.asc)
HS0455 Delta-N 4708.1209 0.0080 0.0083 1.0
HS0512 Delta-E 13871.9700 0.0096 0.0084 1.1
Delta-U -19.5424 0.0482 0.0113 4.3*
Length 14649.1752
(V45 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
723 Delta-N -5339.2128 -0.0415 0.0088 4.7*
AE9887 Delta-E -13487.9026 -0.0199 0.0083 2.4
Delta-U -17.8633 0.0334 0.0154 2.2
Length 14506.2410
(V17 Postprocessed 06-FEB-2007 21:33:27.0 037 038.asc)
P268 Delta-N 2363.4955 -0.0066 0.0081 0.8
711 Delta-E 14277.3132 -0.0015 0.0081 0.2
Delta-U -19.3085 -0.0015 0.0114 0.1
Length 14471.6328
(V18 Postprocessed 07-FEB-2007 18:31:02.0 037 038.asc)
P268 Delta-N 2363.4955 -0.0004 0.0075 0.1
711 Delta-E 14277.3132 -0.0013 0.0075 0.2
Delta-U -19.3085 -0.0116 0.0102 1.1
Length 14471.6328
(V102 Postprocessed 07-FEB-2007 16:39:02.0 037 038.asc)
P257 Delta-N 3613.0630 -0.0148 0.0080 1.8
HS0512 Delta-E 13818.0047 -0.0037 0.0081 0.5
Delta-U -15.2573 0.0339 0.0108 3.2*
Length 14282.5667
(V55 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
704 Delta-N 10693.3462 0.0001 0.0112 0.0
JT0221 Delta-E 9100.9793 0.0090 0.0123 0.7
Delta-U 49.1672 0.0132 0.0210 0.6

Length 14042.0046
(V112 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 Delta-N 13444.8237 -0.0029 0.0072 0.4
P271 Delta-E 3192.8607 -0.0025 0.0071 0.3
Delta-U -32.8284 0.0142 0.0109 1.3
Length 13818.7814
(V59 Postprocessed 07-FEB-2007 21:34:02.0 037 038.asc)
AC9892 Delta-N 1592.5363 -0.0140 0.0087 1.6
JT9536 Delta-E -13349.8907 -0.0123 0.0084 1.5
Delta-U -38.1317 -0.0336 0.0125 2.7
Length 13444.5977
(V43 Postprocessed 07-FEB-2007 14:58:02.0 037 038.asc)
P273 Delta-N -10990.5799 -0.0521 0.0086 6.0*
AE9891 Delta-E -6015.7845 -0.0360 0.0081 4.4*
Delta-U -15.4033 0.0369 0.0149 2.5
Length 12529.2756
(V47 Postprocessed 07-FEB-2007 15:00:17.0 037 038.asc)
P256 Delta-N 4853.6540 -0.0575 0.0081 7.1*
AE9887 Delta-E 11495.2827 -0.0137 0.0078 1.8
Delta-U -10.6626 0.0123 0.0130 0.9
Length 12477.9644
(V56 Postprocessed 06-FEB-2007 17:00:17.0 037 038.asc)
JT0185 Delta-N 9327.8591 0.0041 0.0102 0.4
JT0221 Delta-E 7524.8445 0.0237 0.0106 2.2
Delta-U 46.5265 0.0381 0.0167 2.3
Length 11984.7572
(V62 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
AC9892 Delta-N 7312.8717 0.0394 0.0076 5.2*
P261 Delta-E -9273.4777 -0.0308 0.0075 4.1*
Delta-U 112.6666 -0.0028 0.0089 0.3
Length 11810.5112
(V7 Postprocessed 07-FEB-2007 15:02:12.0 037 038.asc)
P273 Delta-N -10208.3684 -0.0070 0.0089 0.8
723 Delta-E 5934.4035 0.0077 0.0083 0.9
Delta-U -12.3449 0.0185 0.0177 1.0
Length 11807.9669
(V8 Postprocessed 07-FEB-2007 16:30:07.0 037 038.asc)
P273 Delta-N -10208.3684 -0.0189 0.0079 2.4
723 Delta-E 5934.4035 0.0041 0.0079 0.5
Delta-U -12.3449 -0.0041 0.0102 0.4
Length 11807.9669
(V111 Postprocessed 16-FEB-2007 00:00:02.0 cors047.asc)
UCD1 Delta-N -6956.3400 -0.0033 0.0072 0.5
P268 Delta-E 9147.0678 -0.0014 0.0071 0.2
Delta-U -33.9083 0.0203 0.0106 1.9
Length 11491.7651
(V23 Postprocessed 06-FEB-2007 22:24:02.0 037 038.asc)
714 Delta-N 92.9354 0.0098 0.0085 1.1
710 Delta-E -10996.3627 0.0047 0.0090 0.5
Delta-U -8.8241 -0.0461 0.0128 3.6*
Length 10996.7590
(V22 Postprocessed 06-FEB-2007 22:01:32.0 037 038.asc)
714 Delta-N 7114.4487 -0.0196 0.0089 2.2
JS1193 Delta-E 8085.0574 -0.0116 0.0089 1.3
Delta-U 2.8937 -0.0002 0.0137 0.0
Length 10769.5655
(V4 Postprocessed 07-FEB-2007 20:55:02.0 037 038.asc)
P273 Delta-N -3313.0477 -0.0291 0.0093 3.1*
JS3889 Delta-E 9903.1094 -0.0433 0.0084 5.2*
Delta-U -1.7244 0.0124 0.0128 1.0
Length 10442.5985

(V61 Postprocessed 06-FEB-2007 16:38:17.0 037 038.asc)
P261 Delta-N 6905.8961 -0.0076 0.0077 1.0
704 Delta-E 7065.4067 0.0034 0.0079 0.4
Delta-U -150.6821 -0.0076 0.0105 0.7
Length 9880.9957
(V9 Postprocessed 07-FEB-2007 19:20:02.0 037 038.asc)
JS1011 Delta-N -9494.1167 0.0060 0.0095 0.6
711 Delta-E 973.6846 0.0017 0.0097 0.2
Delta-U -76.2057 -0.0065 0.0206 0.3
Length 9544.2193
(V60 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
JT9527 Delta-N 6513.8928 0.0100 0.0080 1.2
704 Delta-E 6807.0993 -0.0033 0.0083 0.4
Delta-U -122.4831 -0.0027 0.0116 0.2
Length 9422.4414
(V6 Postprocessed 07-FEB-2007 15:09:52.0 037 038.asc)
723 Delta-N 6892.4432 -0.0085 0.0080 1.1
JS3889 Delta-E 3973.7139 -0.0085 0.0077 1.1
Delta-U 3.2402 -0.0046 0.0128 0.4
Length 7955.8900
(V58 Postprocessed 05-FEB-2007 21:54:02.0 037 038.asc)
JT9527 Delta-N -6116.4538 -0.0618 0.0080 7.7*
JT9536 Delta-E -4328.8184 0.0338 0.0078 4.3*
Delta-U -124.4862 0.0043 0.0109 0.4
Length 7494.3427
(V69 Postprocessed 07-FEB-2007 20:33:22.0 037 038.asc)
P262 Delta-N 6879.5423 -0.0407 0.0075 5.4*
AC9892 Delta-E -1368.2237 0.0302 0.0074 4.1*
Delta-U -0.7406 0.0119 0.0086 1.4
Length 7014.2810
(V99 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
AE9889 Delta-N -6664.4337 -0.0126 0.0094 1.3
HS0455 Delta-E -1235.4472 0.0224 0.0095 2.4
Delta-U 5.6684 -0.0047 0.0138 0.3
Length 6777.9818
(V90 Postprocessed 07-FEB-2007 17:20:42.0 037 038.asc)
HS0512 Delta-N 5028.7889 0.0026 0.0092 0.3
724 Delta-E 3885.5197 0.0071 0.0093 0.8
Delta-U -4.6246 -0.0296 0.0128 2.3
Length 6354.9983
(V24 Postprocessed 06-FEB-2007 19:35:52.0 037 038.asc)
P267 Delta-N 6008.1093 -0.0071 0.0078 0.9
JS1617 Delta-E -1059.1947 0.0010 0.0077 0.1
Delta-U 1.1098 0.0254 0.0108 2.4
Length 6100.7599
(V100 Postprocessed 07-FEB-2007 17:19:37.0 037 038.asc)
P257 Delta-N 5569.6327 -0.0103 0.0093 1.1
AE9889 Delta-E 1180.4941 -0.0371 0.0093 4.0*
Delta-U -8.3765 -0.0092 0.0133 0.7
Length 5693.3685
(V44 Postprocessed 07-FEB-2007 15:00:17.0 037 038.asc)
AE9891 Delta-N -4567.9255 0.0050 0.0073 0.7
AE9887 Delta-E -1530.4808 0.0100 0.0072 1.4
Delta-U -1.5239 -0.0052 0.0083 0.6
Length 4817.5011
(V54 Postprocessed 06-FEB-2007 16:52:42.0 037 038.asc)
JT0185 Delta-N -1363.7048 0.0052 0.0073 0.7
704 Delta-E -1578.2028 -0.0075 0.0074 1.0
Delta-U -7.1828 0.0320 0.0083 3.8*
Length 2085.7772
(V98 Postprocessed 07-FEB-2007 16:49:17.0 037 038.asc)

P257 Delta-N -1094.9703 -0.0252 0.0072 3.5*
HS0455 Delta-E -53.9962 -0.0120 0.0072 1.7
Delta-U 3.3571 0.0178 0.0076 2.3
Length 1096.3060
(V57 Postprocessed 06-FEB-2007 16:49:02.0 037 038.asc)
P261 Delta-N 391.7943 -0.0189 0.0072 2.6
JT9527 Delta-E 258.5196 0.0096 0.0072 1.3
Delta-U -27.5222 0.0189 0.0078 2.4
Length 470.2049

GPS Vector Residual Summary (Meters)
(Sorted by 2D Residual Length)

From	To	N	E	Up	2D	3D	Length	VectID
CMOD	JS3889	-0.003	-0.071	0.081	0.071	0.108	54967	97
P256	AE9891	-0.060	-0.038	0.012	0.071	0.072	16071	46
JT9527	JT9536	-0.062	0.034	0.004	0.070	0.071	7494	58
P273	AE9891	-0.052	-0.036	0.037	0.063	0.073	12529	43
P256	DE8502	0.039	0.048	-0.027	0.062	0.068	38497	86
P257	JS3889	-0.028	-0.053	0.039	0.060	0.072	40278	108
P261	DE8502	0.036	0.047	-0.012	0.060	0.061	22093	79
P256	AE9887	-0.057	-0.014	0.012	0.059	0.060	12478	47
P262	JT9536	-0.052	0.018	-0.018	0.055	0.057	16983	73
P273	JS3889	-0.029	-0.043	0.012	0.052	0.054	10443	4
P266	AC9892	-0.042	0.029	-0.015	0.051	0.053	25855	66
P262	AC9892	-0.041	0.030	0.012	0.051	0.052	7014	69
AC9892	P261	0.039	-0.031	-0.003	0.050	0.050	11811	62
723	AE9887	-0.041	-0.020	0.033	0.046	0.057	14506	45
P267	JT0221	-0.008	0.042	-0.047	0.042	0.063	19852	37
P267	JS1193	-0.030	-0.026	0.053	0.040	0.067	43647	32
P257	AE9889	-0.010	-0.037	-0.009	0.038	0.040	5693	100
P271	JS1193	-0.031	-0.022	0.043	0.038	0.058	43758	28
P271	JT0221	-0.012	0.036	-0.087	0.038	0.095	47387	39
P266	JT0221	-0.002	0.037	-0.033	0.037	0.049	21788	53
JS1193	P268	0.027	0.021	-0.004	0.034	0.034	28969	34
CMOD	P257	0.026	-0.020	-0.001	0.033	0.033	42835	113
P256	AE9889	-0.012	-0.030	-0.009	0.033	0.034	19525	103
P257	CMOD	-0.021	0.021	-0.023	0.030	0.038	42835	109
P271	JT0221	0.006	0.029	-0.018	0.029	0.035	47387	38
P273	CMOD	-0.021	0.020	-0.006	0.029	0.030	62764	114
P257	HS0455	-0.025	-0.012	0.018	0.028	0.033	1096	98
P261	JT0221	-0.005	0.026	0.001	0.027	0.027	23897	64
P267	JT0221	0.003	0.026	-0.007	0.026	0.027	19852	36
P261	JT0221	0.012	0.023	-0.018	0.026	0.032	23897	63
CMOD	JS3889	0.001	-0.026	0.030	0.026	0.040	54967	94
AE9889	HS0455	-0.013	0.022	-0.005	0.026	0.026	6778	99
CMOD	723	0.013	-0.022	0.022	0.025	0.033	50974	96
JT0185	JT0221	0.004	0.024	0.038	0.024	0.045	11985	56
JS1617	JT0221	0.009	0.022	-0.044	0.024	0.050	22004	35
P266	JT0221	0.008	0.022	-0.016	0.024	0.029	21788	52
JS0755	JS1193	-0.006	-0.022	-0.025	0.023	0.034	42485	3
714	JS1193	-0.020	-0.012	-0.000	0.023	0.023	10770	22
JS1193	P268	0.020	0.008	0.080	0.022	0.083	28969	33
CMOD	723	0.009	-0.020	0.039	0.021	0.045	50974	95
P266	JT9527	-0.012	0.017	-0.042	0.021	0.047	32659	68
P261	JT9527	-0.019	0.010	0.019	0.021	0.028	470	57
P273	723	-0.019	0.004	-0.004	0.019	0.020	11808	8
AC9892	JT9536	-0.014	-0.012	-0.034	0.019	0.038	13445	59
CMOD	724	0.008	-0.016	0.024	0.018	0.030	31469	93
P266	704	-0.005	0.017	-0.047	0.017	0.050	25926	65
P271	JS0755	-0.015	0.000	-0.052	0.015	0.054	43487	2

P262	JT9527	-0.014	0.005	0.001	0.015	0.015	17903	74
P257	HS0512	-0.015	-0.004	0.034	0.015	0.037	14283	102
P268	JS0755	-0.015	-0.003	-0.052	0.015	0.054	49419	30
P257	723	-0.015	0.003	-0.018	0.015	0.023	32370	104
P266	JT0185	-0.007	0.013	-0.070	0.015	0.072	24592	67
P257	724	-0.014	0.003	0.004	0.014	0.015	19695	106
P273	JS1244	0.012	-0.005	-0.034	0.013	0.037	15209	41
P268	JS0755	-0.013	-0.000	0.002	0.013	0.013	49419	29
HS0455	HS0512	0.008	0.010	0.048	0.012	0.050	14649	101
723	JS3889	-0.008	-0.009	-0.005	0.012	0.013	7956	6
P257	723	-0.012	0.001	0.003	0.012	0.012	32370	105
AE9891	AE9887	0.005	0.010	-0.005	0.011	0.012	4818	44
P268	JS1617	-0.003	0.011	0.003	0.011	0.012	17054	10
P271	711	-0.010	0.003	0.043	0.011	0.044	27092	13
714	710	0.010	0.005	-0.046	0.011	0.047	10997	23
P271	JS0755	-0.010	0.002	0.013	0.011	0.017	43487	1
JT9527	704	0.010	-0.003	-0.003	0.010	0.011	9422	60
P273	723	-0.007	0.008	0.019	0.010	0.021	11808	7
JS0755	711	0.010	-0.002	-0.028	0.010	0.030	38531	26
JS0755	JS1011	0.008	0.006	0.012	0.010	0.016	31649	27
JT0185	704	0.005	-0.007	0.032	0.009	0.033	2086	54
704	JT0221	0.000	0.009	0.013	0.009	0.016	14042	55
P271	JS1244	-0.009	-0.003	0.039	0.009	0.040	51727	89
P271	P261	-0.008	-0.003	0.002	0.009	0.009	71169	88
P271	JS1617	-0.003	0.008	0.018	0.008	0.020	26891	12
P261	704	-0.008	0.003	-0.008	0.008	0.011	9881	61
JS1617	JS1011	-0.001	-0.008	0.024	0.008	0.025	33895	11
723	724	0.006	0.005	-0.004	0.008	0.009	21770	92
HS0512	724	0.003	0.007	-0.030	0.008	0.031	6355	90
P267	JS1617	-0.007	0.001	0.025	0.007	0.026	6101	24
723	HS0512	0.001	-0.007	0.032	0.007	0.033	26230	91
714	JS1244	-0.006	0.003	0.075	0.007	0.076	14786	42
P268	JS1244	-0.007	-0.001	0.041	0.007	0.041	30663	51
P267	710	-0.006	-0.004	0.020	0.007	0.021	24768	25
P268	711	-0.007	-0.002	-0.001	0.007	0.007	14472	17
P267	P273	-0.006	-0.001	0.018	0.006	0.019	48095	130
P273	JS1244	-0.003	0.006	0.003	0.006	0.007	15209	40
JS1011	711	0.006	0.002	-0.006	0.006	0.009	9544	9
JS1244	P266	0.002	-0.006	-0.001	0.006	0.006	31106	83
P268	JS1244	-0.005	0.003	0.017	0.006	0.018	30663	50
JS3889	JS1193	0.002	-0.006	-0.085	0.006	0.086	36115	5
P273	P256	0.006	0.001	-0.001	0.006	0.006	27904	121
P271	JS1011	-0.004	-0.004	-0.005	0.005	0.008	21036	16
P262	P256	0.005	0.002	-0.008	0.005	0.010	44387	119
P261	P267	0.005	0.002	0.004	0.005	0.006	42752	125
P268	JS1011	-0.005	-0.002	-0.007	0.005	0.008	17808	19
P266	710	-0.003	-0.004	0.020	0.005	0.020	31818	85
714	711	0.003	0.004	0.015	0.005	0.016	17584	21
P271	JS1011	-0.001	0.004	-0.039	0.004	0.039	21036	15
P257	P273	-0.004	-0.002	0.008	0.004	0.009	40569	122
UCD1	P271	-0.003	-0.002	0.014	0.004	0.015	13819	112
JS1244	P266	0.003	0.002	-0.016	0.004	0.016	31106	84
UCD1	P268	-0.003	-0.001	0.020	0.004	0.021	11492	111
P262	P266	0.003	0.002	-0.005	0.004	0.006	28314	126
P266	P267	0.003	0.001	-0.005	0.003	0.006	21869	127
P268	P273	-0.001	0.003	0.022	0.003	0.023	45687	131
P257	P256	0.002	-0.002	0.003	0.003	0.004	23198	107
P256	P257	-0.003	0.001	-0.001	0.003	0.003	23198	118
P268	JS1011	0.001	0.002	-0.039	0.002	0.039	17808	20
P262	P261	0.002	0.001	-0.014	0.002	0.014	17740	123
P273	P266	0.002	-0.001	-0.007	0.002	0.007	40632	128

P256 JS1244 -0.001 -0.001 0.014 0.002 0.014 34033 49
P261 P266 0.001 0.001 0.007 0.002 0.008 32956 124
P266 P256 0.001 0.001 -0.003 0.002 0.003 34946 120
P267 P268 -0.002 -0.000 0.000 0.002 0.002 18585 129
P256 JS1244 0.002 -0.000 0.022 0.002 0.022 34033 48
UCD1 P267 -0.001 0.000 0.015 0.001 0.016 18412 110
P271 711 -0.001 0.000 -0.002 0.001 0.003 27092 14
P268 711 -0.000 -0.001 -0.012 0.001 0.012 14472 18
P261 JS1617 0.000 0.000 0.066 0.000 0.066 45762 80

Adjusted Bearings (DMS) and Horizontal Distances (Meters)
===
(Relative Confidence of Bearing is in Seconds)
NOTE - Adjustment Failed the Chi-Square Test
Angular and Distance Errors are Scaled by Total Error Factor

From To Grid Bearing Grid Dist 95% RelConfidence
Grnd Dist Brg Dist PPM
704 JT0185 N48-37-29.69E 2085.0882 2.14 0.0212 10.1582
2085.7660
704 JT0221 N39-51-58.06E 14037.3339 0.32 0.0211 1.5004
14041.8559
704 JT9527 S45-46-31.20W 9418.5211 0.58 0.0261 2.7733
9421.7332
704 P261 S45-10-13.32W 9876.5688 0.45 0.0211 2.1395
9879.9606
704 P266 S82-57-10.89E 25918.5090 0.17 0.0219 0.8438
25926.3450
710 714 N89-30-08.25E 10994.7907 0.62 0.0339 3.0838
10996.7589
710 P266 S54-51-45.49W 31810.0683 0.20 0.0283 0.8889
31817.6226
710 P267 N81-51-55.08W 24762.7052 0.24 0.0297 1.2004
24768.4681
711 714 S19-52-25.69E 17581.0583 0.34 0.0299 1.7033
17584.0528
711 JS0755 N31-53-34.75E 38524.7953 0.10 0.0175 0.4551
38530.5620
711 JS1011 N06-47-38.63W 9542.1807 0.52 0.0241 2.5231
9543.9695
711 P268 S79-45-28.49W 14468.6997 0.26 0.0178 1.2325
14471.6325
711 P271 N49-04-54.33W 27086.2322 0.13 0.0183 0.6755
27091.9712
714 JS1193 N47-40-16.20E 10767.9668 0.54 0.0262 2.4316
10769.5588
714 JS1244 S25-18-21.35W 14783.9508 0.42 0.0281 1.8980
14786.4798
723 724 S14-28-08.64E 21767.9129 0.26 0.0275 1.2638
21770.4766
723 AE9887 S67-22-10.47W 14504.0457 0.21 0.0149 1.0243
14506.2409
723 CMOD S34-44-14.44E 50970.5460 0.06 0.0148 0.2913
50974.2966
723 HS0512 S03-35-49.94E 26226.9304 0.21 0.0265 1.0087
26230.2000
723 JS3889 N28-55-45.62E 7954.9183 0.38 0.0150 1.8895
7955.8858
723 P257 S21-58-18.02W 32364.8958 0.09 0.0150 0.4648
32369.7064
723 P273 N31-09-53.00W 11806.3257 0.26 0.0149 1.2593

11807.9668
724 CMOD S48-36-08.97E 31467.3656 0.17 0.0262 0.8339
31469.4037
724 HS0512 S36-39-13.13W 6354.2643 1.03 0.0309 4.8565
6354.9981
724 P257 S63-00-42.15W 19692.6856 0.27 0.0257 1.3048
19695.4382
AC9892 JT9536 N83-44-42.93W 13440.0788 0.00 0.0000 0.0001
13444.5763
AC9892 P261 N52-17-23.19W 11805.8178 0.00 0.0000 0.0001
11809.8644
AC9892 P262 S11-48-20.09E 7012.0160 0.00 0.0000 0.0001
7014.2803
AC9892 P266 N64-48-06.09E 25847.1107 0.00 0.0000 0.0000
25854.9013
AE9887 AE9891 N17-34-23.17E 4816.6734 0.00 0.0000 0.0002
4817.5011
AE9887 P256 S66-15-03.10W 12475.5647 0.00 0.0000 0.0001
12477.9643
AE9889 HS0455 S09-33-10.70W 6776.8319 0.00 0.0000 0.0001
6777.9755
AE9889 P256 N44-55-32.74W 19521.4144 0.00 0.0000 0.0000
19525.0879
AE9889 P257 S11-01-32.53W 5692.4068 0.00 0.0000 0.0001
5693.3655
AE9891 P256 S53-14-26.93W 16068.4489 0.00 0.0000 0.0000
16071.4998
AE9891 P273 N27-42-01.47E 12527.2754 0.00 0.0000 0.0001
12529.2752
CMOD JS3889 N27-17-03.89W 54963.6336 0.00 0.0000 0.0000
54967.2769
CMOD P257 N73-54-28.74W 42831.2868 0.00 0.0000 0.0000
42835.4605
CMOD P273 N34-03-56.41W 62758.2398 0.00 0.0000 0.0000
62763.5107
DE8502 P256 S75-42-00.45E 38487.2777 0.00 0.0000 0.0000
38497.2798
DE8502 P261 N49-21-18.76W 22084.8301 0.00 0.0000 0.0000
22092.2055
HS0455 HS0512 N70-18-44.54E 14647.0187 0.35 0.0250 1.7044
14649.1750
HS0455 P257 N01-52-57.48E 1096.1131 0.00 0.0000 0.0007
1096.3006
HS0512 P257 S74-24-20.39W 14280.4690 0.36 0.0250 1.7511
14282.5667
JS0755 JS1011 S42-45-27.47W 31643.6448 0.12 0.0180 0.5679
31648.6298
JS0755 JS1193 S08-41-16.57W 42479.3846 0.00 0.0000 0.0000
42484.7308
JS0755 P268 S44-26-04.75W 49410.5841 0.00 0.0000 0.0000
49419.1075
JS0755 P271 S69-51-48.99W 43479.1807 0.00 0.0000 0.0000
43487.1509
JS1011 JS1617 S60-39-08.21W 33886.8592 0.15 0.0236 0.6950
33894.7690
JS1011 P268 S47-24-57.96W 17804.5928 0.21 0.0180 1.0095
17808.3277
JS1011 P271 N66-51-25.37W 21031.1634 0.18 0.0184 0.8742
21035.7762
JS1193 JS3889 S07-58-33.25E 36110.9972 0.00 0.0000 0.0000
36115.4652

JS1193	P267	S84-56-53.83W	43638.1041	0.00	0.0000	0.0000	43646.9626
JS1193	P268	N76-36-13.74W	28963.5542	0.00	0.0000	0.0000	28968.7830
JS1193	P271	N51-51-05.31W	43749.2271	0.00	0.0000	0.0000	43757.5174
JS1244	P256	S15-58-23.44W	34026.7343	0.09	0.0148	0.4358	34033.3645
JS1244	P266	S80-40-36.54W	31099.2329	0.10	0.0149	0.4793	31106.3985
JS1244	P268	N26-57-10.92W	30656.5745	0.10	0.0152	0.4964	30662.7843
JS1244	P271	N22-54-02.96W	51716.5385	0.06	0.0152	0.2937	51727.4241
JS1244	P273	S37-51-41.88E	15206.2258	0.20	0.0153	1.0038	15208.7464
JS1617	JT0221	S50-58-34.86W	21997.1672	0.18	0.0180	0.8183	22003.6495
JS1617	P261	S46-19-55.78W	45747.5225	0.09	0.0180	0.3930	45761.9756
JS1617	P267	S10-43-45.52E	6099.1178	0.62	0.0186	3.0504	6100.7586
JS1617	P268	N74-29-08.98E	17049.7927	0.23	0.0183	1.0718	17054.0212
JS1617	P271	N22-17-42.62E	26883.8368	0.14	0.0181	0.6727	26890.7321
JS3889	P257	S23-20-33.90W	40272.7638	0.00	0.0000	0.0000	40278.4758
JS3889	P273	N72-29-50.45W	10441.2103	0.00	0.0000	0.0001	10442.5963
JT0185	JT0221	N38-20-51.12E	11980.7696	0.00	0.0000	0.0001	11984.6178
JT0185	P266	S79-18-55.57E	24584.2943	0.00	0.0000	0.0000	24591.7016
JT0221	P261	S42-03-23.35W	23889.0641	0.00	0.0000	0.0000	23897.1758
JT0221	P266	S50-09-38.70E	21781.5409	0.00	0.0000	0.0000	21788.0306
JT0221	P267	N66-40-34.02E	19846.5982	0.00	0.0000	0.0000	19852.4155
JT0221	P271	N35-10-18.24E	47373.3614	0.00	0.0000	0.0000	47386.6270
JT9527	JT9536	S34-48-12.04W	7490.7575	0.56	0.0200	2.6735	7493.3807
JT9527	P261	S32-56-05.28W	469.2315	8.91	0.0200	42.6728	469.3997
JT9527	P262	S35-59-58.16E	17896.6143	0.23	0.0202	1.1285	17902.6746
JT9527	P266	N84-02-27.96E	32648.5406	0.13	0.0202	0.6191	32658.9158
JT9536	P262	S60-37-28.81E	16977.5608	0.00	0.0000	0.0000	16983.2138
P256	P257	S33-11-32.54E	23193.1987	0.00	0.0000	0.0000	23197.6107
P256	P262	N77-13-56.87W	44374.7638	0.00	0.0000	0.0000	44386.6377
P256	P266	N37-36-57.16W	34937.6261	0.00	0.0000	0.0000	34946.1310
P256	P273	N42-04-41.93E	27899.3755	0.00	0.0000	0.0000	27904.3980
P257	P273	N08-30-20.18E	40562.8063	0.00	0.0000	0.0000	

40569.2464
P261 P262 S37-24-51.76E 17733.3613 0.00 0.0000 0.0000
17739.4087
P261 P266 N83-24-21.40E 32945.1847 0.00 0.0000 0.0000
32955.7328
P261 P267 N53-12-38.99E 42738.8292 0.00 0.0000 0.0000
42752.2753
P261 P271 N37-28-42.48E 71147.8213 0.00 0.0000 0.0000
71169.2151
P262 P266 N50-51-24.27E 28305.4923 0.00 0.0000 0.0000
28313.9699
P266 P267 N03-56-01.75E 21863.3777 0.00 0.0000 0.0000
21869.3210
P266 P273 S80-07-28.89E 40623.2432 0.00 0.0000 0.0000
40631.9893
P267 P268 N55-23-33.42E 18580.7160 0.00 0.0000 0.0000
18585.2891
P267 P273 S53-14-13.17E 48084.5845 0.00 0.0000 0.0000
48094.6513
P267 UCD1 N19-12-13.93E 18407.1465 0.00 0.0000 0.0000
18411.9413
P268 P273 S30-33-53.79E 45678.7624 0.00 0.0000 0.0000
45687.2735
P268 UCD1 N53-31-28.46W 11488.9895 0.00 0.0000 0.0001
11491.7409
P271 UCD1 S12-34-47.80W 13815.3363 0.00 0.0000 0.0001
13818.7700

Error Propagation
=================

Station Coordinate Standard Deviations (Meters)
NOTE - Adjustment Failed the Chi-Square Test
Standard Deviations are Scaled by Total Error Factor

Station	N	E	Elev
704	0.008589	0.008911	0.011678
710	0.011868	0.012025	0.016845
711	0.007293	0.007342	0.010964
714	0.010987	0.011194	0.018935
723	0.006135	0.006027	0.008779
724	0.010565	0.010613	0.013609
AC9892	0.000000	0.000000	0.010897
AE9887	0.000000	0.000000	0.000000
AE9889	0.000000	0.000000	0.000000
AE9891	0.000000	0.000000	0.000000
CMOD	0.000000	0.000000	0.000000
DE8502	0.000000	0.000000	0.000000
HS0455	0.000000	0.000000	0.000000
HS0512	0.010167	0.010280	0.000000
JS0755	0.000000	0.000000	0.010730
JS1011	0.007426	0.007446	0.014907
JS1193	0.000000	0.000000	0.012093
JS1244	0.006121	0.006127	0.000000
JS1617	0.007525	0.007574	0.000000
JS3889	0.000000	0.000000	0.000000
JT0185	0.000000	0.000000	0.000000
JT0221	0.000000	0.000000	0.000000
JT9527	0.008191	0.008266	0.010566
JT9536	0.000000	0.000000	0.000000
P256	0.000000	0.000000	0.000000
P257	0.000000	0.000000	0.000000

P261	0.000000	0.000000	0.000000
P262	0.000000	0.000000	0.000000
P266	0.000000	0.000000	0.000000
P267	0.000000	0.000000	0.000000
P268	0.000000	0.000000	0.000000
P271	0.000000	0.000000	0.000000
P273	0.000000	0.000000	0.000000
UCD1	0.000000	0.000000	0.000000

Station Coordinate Error Ellipses (Meters)
NOTE - Adjustment Failed the Chi-Square Test
Error Ellipses are Scaled by Total Error Factor
Confidence Region = 95%

Station	Semi-Major Axis	Semi-Minor Axis	Azimuth of Major Axis	Elev
704	0.021906	0.020925	108-13	0.022889
710	0.030317	0.028127	129-57	0.033015
711	0.018297	0.017516	130-33	0.021489
714	0.028137	0.026121	127-44	0.037112
723	0.015044	0.014725	17-07	0.017206
724	0.026242	0.025593	129-50	0.026673
AC9892	0.000001	0.000001	0-00	0.021358
AE9887	0.000001	0.000001	0-00	0.000000
AE9889	0.000001	0.000001	0-00	0.000000
AE9891	0.000001	0.000001	0-00	0.000000
CMOD	0.000001	0.000001	0-00	0.000000
DE8502	0.000001	0.000001	0-00	0.000000
HS0455	0.000001	0.000001	0-00	0.000000
HS0512	0.025319	0.024727	121-08	0.000000
JS0755	0.000001	0.000001	0-00	0.021031
JS1011	0.018432	0.017970	131-57	0.029217
JS1193	0.000001	0.000001	0-00	0.023702
JS1244	0.015275	0.014699	134-14	0.000000
JS1617	0.018972	0.017972	131-34	0.000000
JS3889	0.000001	0.000001	0-00	0.000000
JT0185	0.000001	0.000001	0-00	0.000000
JT0221	0.000001	0.000001	0-00	0.000000
JT9527	0.020268	0.020014	111-54	0.020709
JT9536	0.000001	0.000001	0-00	0.000000
P256	0.000001	0.000001	0-00	0.000000
P257	0.000001	0.000001	0-00	0.000000
P261	0.000001	0.000001	0-00	0.000000
P262	0.000001	0.000001	0-00	0.000000
P266	0.000001	0.000001	0-00	0.000000
P267	0.000001	0.000001	0-00	0.000000
P268	0.000001	0.000001	0-00	0.000000
P271	0.000001	0.000001	0-00	0.000000
P273	0.000001	0.000001	0-00	0.000000
UCD1	0.000001	0.000001	0-00	0.000000

Relative Error Ellipses (Meters)
NOTE - Adjustment Failed the Chi-Square Test
Relative Error Ellipses are Scaled by Total Error Factor
Confidence Region = 95%

Stations From	To	Semi-Major Axis	Semi-Minor Axis	Azimuth of Major Axis	Vertical
704	JT0185	0.021906	0.020925	108-13	0.022889
704	JT0221	0.021906	0.020925	108-13	0.022889
704	JT9527	0.026856	0.025923	108-35	0.028196

704	P261	0.021906	0.020925	108-13	0.022889
704	P266	0.021906	0.020925	108-13	0.022889
710	714	0.034956	0.031974	126-31	0.040811
710	P266	0.030317	0.028127	129-57	0.033015
710	P267	0.030317	0.028127	129-57	0.033015
711	714	0.030487	0.028706	126-17	0.040358
711	JS0755	0.018297	0.017516	130-33	0.027342
711	JS1011	0.024460	0.023698	127-43	0.034412
711	P268	0.018297	0.017516	130-33	0.021489
711	P271	0.018297	0.017516	130-33	0.021489
714	JS1193	0.028137	0.026121	127-44	0.039393
714	JS1244	0.030054	0.027959	127-47	0.037112
723	724	0.027700	0.027101	131-04	0.029396
723	AE9887	0.015044	0.014725	17-07	0.017206
723	CMOD	0.015044	0.014725	17-07	0.017206
723	HS0512	0.026803	0.026276	121-56	0.017206
723	JS3889	0.015044	0.014725	17-07	0.017206
723	P257	0.015044	0.014725	17-07	0.017206
723	P273	0.015044	0.014725	17-07	0.017206
724	CMOD	0.026242	0.025593	129-50	0.026673
724	HS0512	0.031741	0.030859	126-12	0.026673
724	P257	0.026242	0.025593	129-50	0.026673
AC9892	JT9536	0.000001	0.000001	0-00	0.021358
AC9892	P261	0.000001	0.000001	0-00	0.021358
AC9892	P262	0.000001	0.000001	0-00	0.021358
AC9892	P266	0.000001	0.000001	0-00	0.021358
AE9887	AE9891	0.000001	0.000001	0-00	0.000001
AE9887	P256	0.000001	0.000001	0-00	0.000001
AE9889	HS0455	0.000001	0.000001	0-00	0.000001
AE9889	P256	0.000001	0.000001	0-00	0.000001
AE9889	P257	0.000001	0.000001	0-00	0.000001
AE9891	P256	0.000001	0.000001	0-00	0.000001
AE9891	P273	0.000001	0.000001	0-00	0.000001
CMOD	JS3889	0.000001	0.000001	0-00	0.000001
CMOD	P257	0.000001	0.000001	0-00	0.000001
CMOD	P273	0.000001	0.000001	0-00	0.000001
DE8502	P256	0.000001	0.000001	0-00	0.000001
DE8502	P261	0.000001	0.000001	0-00	0.000001
HS0455	HS0512	0.025319	0.024727	121-08	0.000001
HS0455	P257	0.000001	0.000001	0-00	0.000001
HS0512	P257	0.025319	0.024727	121-08	0.000001
JS0755	JS1011	0.018432	0.017970	131-57	0.032057
JS0755	JS1193	0.000001	0.000001	0-00	0.028772
JS0755	P268	0.000001	0.000001	0-00	0.021031
JS0755	P271	0.000001	0.000001	0-00	0.021031
JS1011	JS1617	0.024697	0.023450	134-21	0.029217
JS1011	P268	0.018432	0.017970	131-57	0.029217
JS1011	P271	0.018432	0.017970	131-57	0.029217
JS1193	JS3889	0.000001	0.000001	0-00	0.023702
JS1193	P267	0.000001	0.000001	0-00	0.023702
JS1193	P268	0.000001	0.000001	0-00	0.023702
JS1193	P271	0.000001	0.000001	0-00	0.023702
JS1244	P256	0.015275	0.014699	134-14	0.000001
JS1244	P266	0.015275	0.014699	134-14	0.000001
JS1244	P268	0.015275	0.014699	134-14	0.000001
JS1244	P271	0.015275	0.014699	134-14	0.000001
JS1244	P273	0.015275	0.014699	134-14	0.000001
JS1617	JT0221	0.018972	0.017972	131-34	0.000001
JS1617	P261	0.018972	0.017972	131-34	0.000001
JS1617	P267	0.018972	0.017972	131-34	0.000001
JS1617	P268	0.018972	0.017972	131-34	0.000001

JS1617	P271	0.018972	0.017972	131-34	0.000001
JS3889	P257	0.000001	0.000001	0-00	0.000001
JS3889	P273	0.000001	0.000001	0-00	0.000001
JT0185	JT0221	0.000001	0.000001	0-00	0.000001
JT0185	P266	0.000001	0.000001	0-00	0.000001
JT0221	P261	0.000001	0.000001	0-00	0.000001
JT0221	P266	0.000001	0.000001	0-00	0.000001
JT0221	P267	0.000001	0.000001	0-00	0.000001
JT0221	P271	0.000001	0.000001	0-00	0.000001
JT9527	JT9536	0.020268	0.020014	111-54	0.020709
JT9527	P261	0.020268	0.020014	111-54	0.020709
JT9527	P262	0.020268	0.020014	111-54	0.020709
JT9527	P266	0.020268	0.020014	111-54	0.020709
JT9536	P262	0.000001	0.000001	0-00	0.000001
P256	P257	0.000001	0.000001	0-00	0.000001
P256	P262	0.000001	0.000001	0-00	0.000001
P256	P266	0.000001	0.000001	0-00	0.000001
P256	P273	0.000001	0.000001	0-00	0.000001
P257	P273	0.000001	0.000001	0-00	0.000001
P261	P262	0.000001	0.000001	0-00	0.000001
P261	P266	0.000001	0.000001	0-00	0.000001
P261	P267	0.000001	0.000001	0-00	0.000001
P261	P271	0.000001	0.000001	0-00	0.000001
P262	P266	0.000001	0.000001	0-00	0.000001
P266	P267	0.000001	0.000001	0-00	0.000001
P266	P273	0.000001	0.000001	0-00	0.000001
P267	P268	0.000001	0.000001	0-00	0.000001
P267	P273	0.000001	0.000001	0-00	0.000001
P267	UCD1	0.000001	0.000001	0-00	0.000001
P268	P273	0.000001	0.000001	0-00	0.000001
P268	UCD1	0.000001	0.000001	0-00	0.000001
P271	UCD1	0.000001	0.000001	0-00	0.000001

Elapsed Time = 00:00:01
□26
47
01 00000000 Top of File
01 00000006 Summary of Files Used and Option Settings
02 00000009 Project Folder and Data Files
02 00000016 Project Option Settings
02 00000040 Inline Option Usage Notes
01 00000060 Summary of Unadjusted Input Observations
02 00000063 Entered Stations
03 00000066 Fixed Positions
03 00000088 Partially Fixed Positions
03 00000103 Unused Positions
02 00000106 GPS Vector Observations
01 00000580 Adjustment Statistical Summary
01 00000599 Adjusted Station Information
02 00000602 Coordinate Changes from Entered Provisionals
02 00000633 Adjusted Coordinates
02 00000672 Adjusted Positions and Ellipsoid Heights
02 00000712 Convergence Angles and Grid Factors at Stations
01 00000755 Adjusted Observations and Residuals
02 00000758 Adjusted GPS Vector Observations
02 00001348 GPS Vector Residual Summary
01 00001470 Adjusted Bearings and Horizontal Distances
01 00001671 Error Propagation
02 00001674 Station Coordinate Standard Deviations
02 00001714 Station Coordinate Error Ellipses

02 00001756 Relative Error Ellipses
01 00001859 End of File
0001E316
STARPLU

APPENDIX B

AIRBORNE 1

Corrective Action Report

LiDAR Acquisition of the Sacramento – San Joaquin Delta

MAY 22, 2007

PREPARED BY: BRYANT BERTRAND, VP of Operations

MATT COLEMAN, Director of Data Processing

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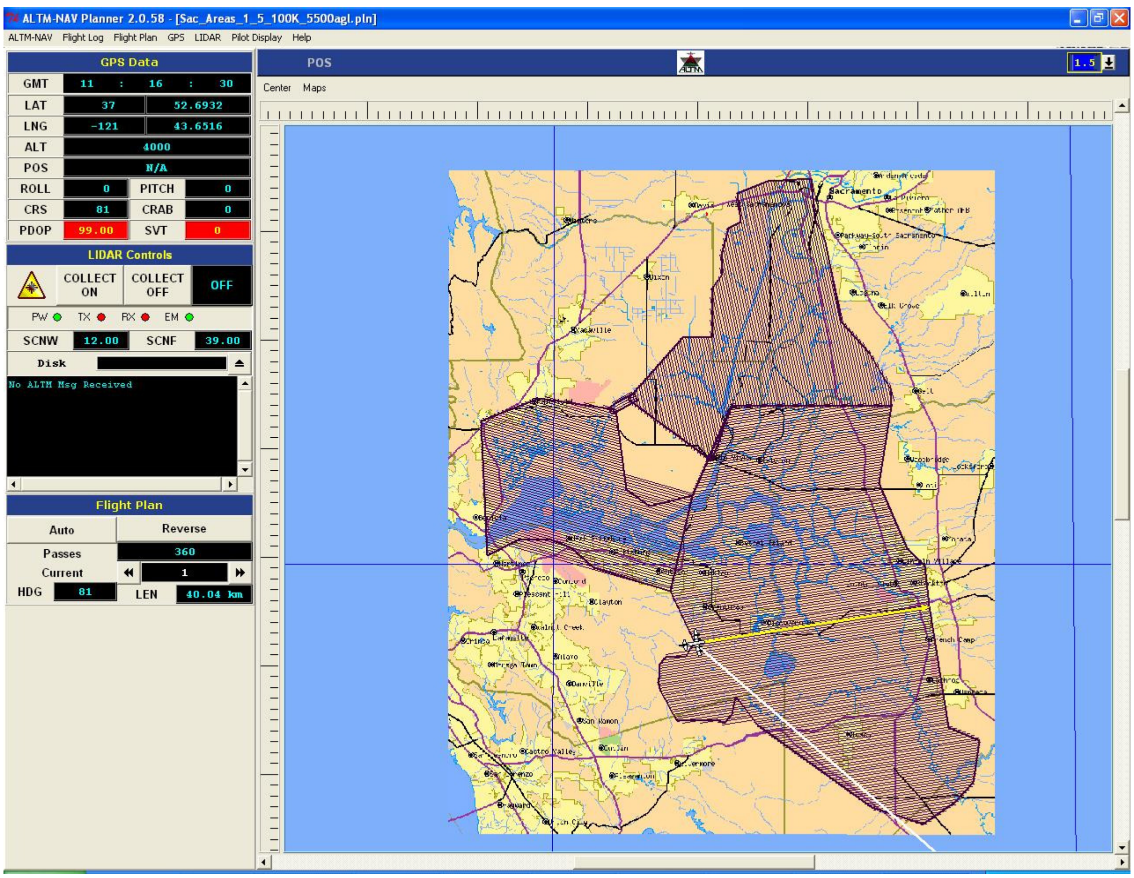
Section

1

INTRODUCTION

Overview

Airborne 1 Corporation was contracted on 12/14/06 to complete LiDAR collection over a total area of 4308 sq. km across the Sacramento-San Joaquin Delta for Earth Data International. The contracted accuracy was to meet a 1ft FEMA mapping standard. The contracted data deliverables were LAS unclassified raw LiDAR flightlines UTM zone 10 NAD83/NAVD88 meters. See image below



Collection of the LiDAR data commenced on 1/14/07 and was completed 2/03/07. During the collection efforts Airborne 1 did not encounter any visible errors in its standard QAQC process. It was later discovered during the processing of the LiDAR data deliverables that errors outside of the contracted specifications were present on number of flight missions.

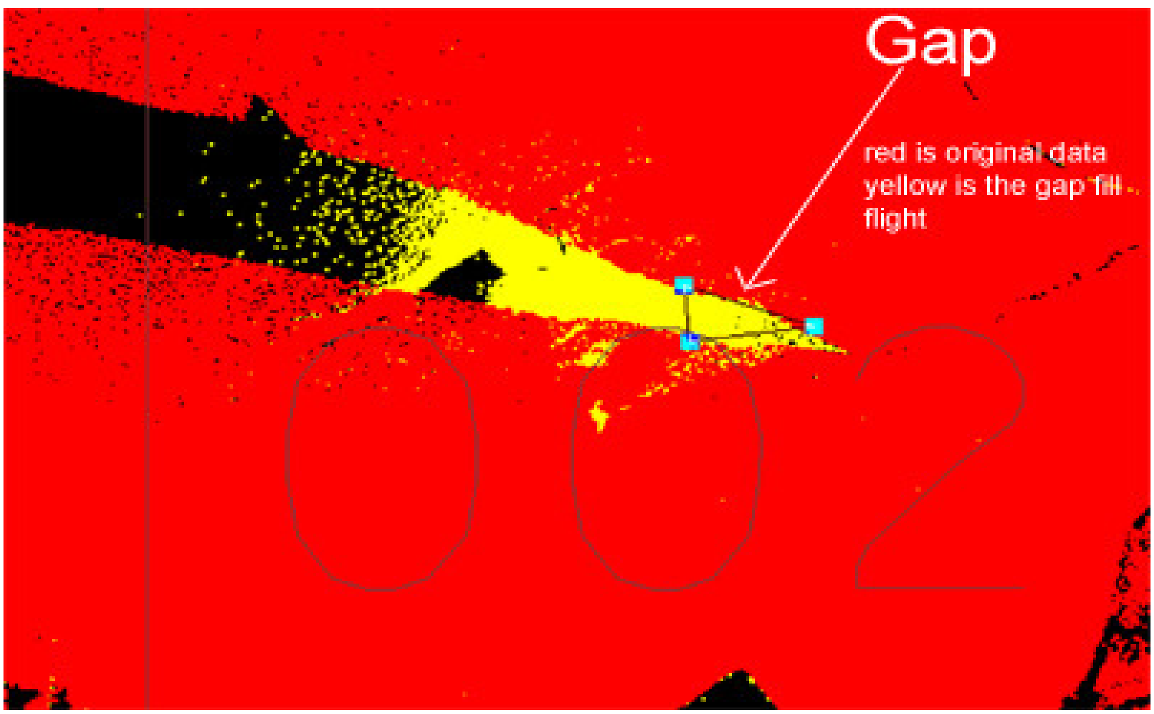
This report is put forth in an effort to help address increasing concerns over data quality and issues experienced with the Delta LiDAR project. A detailed explanation will be presented highlighting the three main causes for delays, their impact to the data and how corrections were made to ensure that accuracy and integrity have not been compromised. The three errors being examined are gaps of LiDAR coverage, timing issues, calibration adjustments.

Section
2

ID & Analysis of Data Gaps

A detailed overview for all flight gaps corrected for the LiDAR acquisition of Sacramento-San Joaquin Delta will be covered in this section.

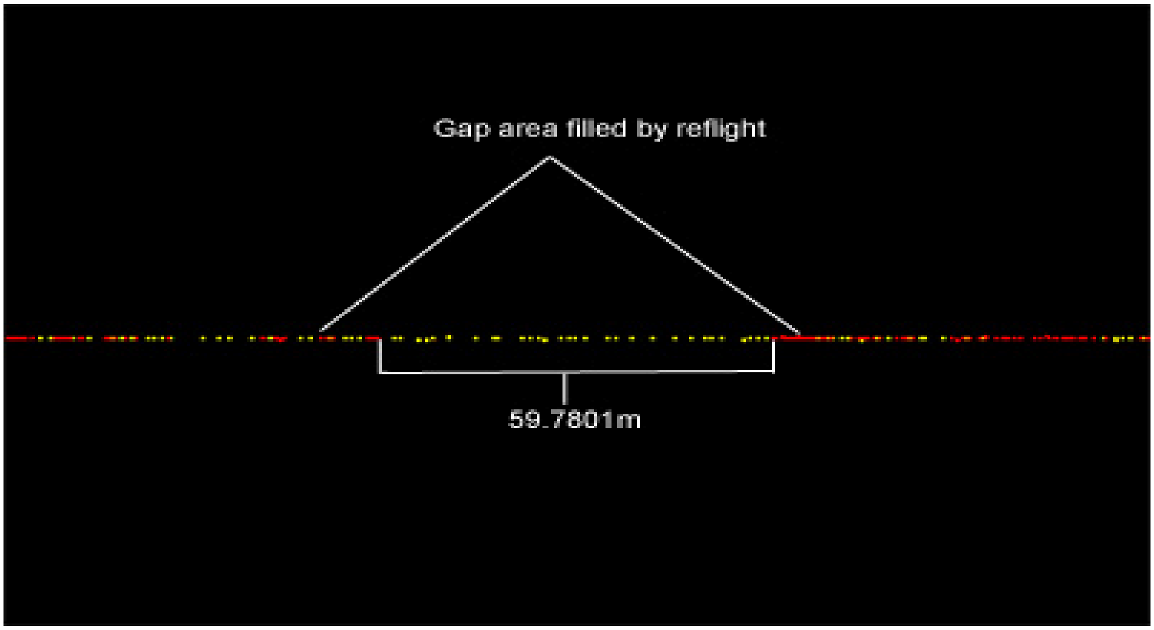
Flight: CA03007_1 contains the first flight Gap identified. The area of the Gap is depicted below



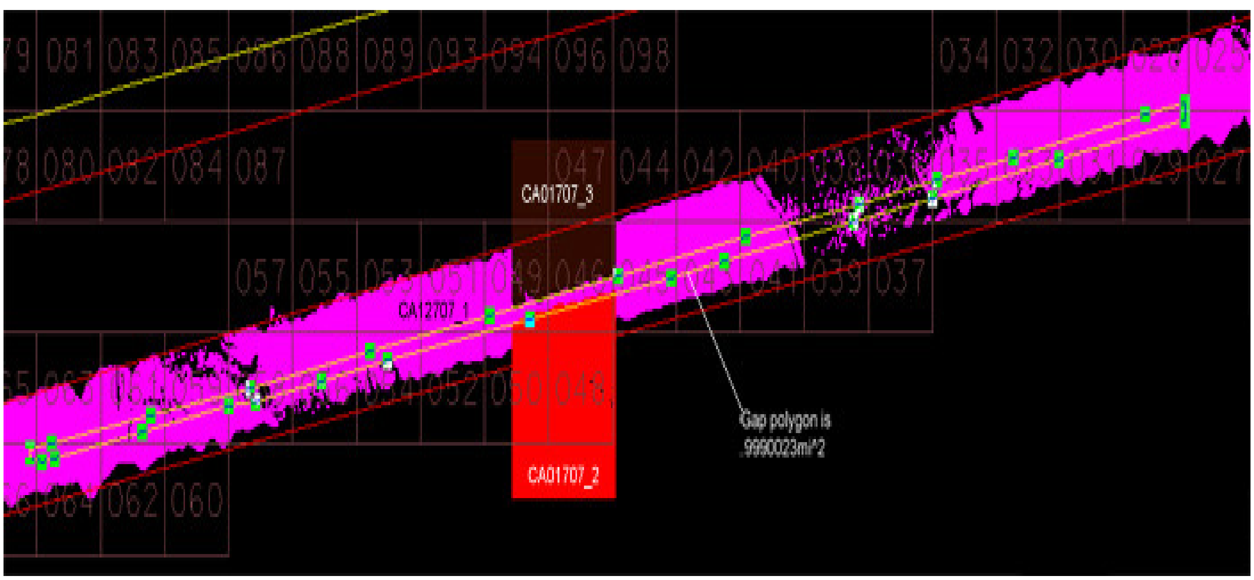
Size: Total area of gap is 0.004 sq. km

Cause: During flight, gaps were being checked real time against a theoretical swath coverage. The real time swath coverage can give assurance at about the 95% confidence level. In the case of flight CA03007_1 the theoretical swath coverage depicted full coverage. However this gap was caused by veering too far off center on the start the lines collection path.

Resolution: A re-flight was performed with flight CA12707_1 to fill the missing data void. The image depicted below illustrates a profile across the original data and the area filled by the re-flight . This re-flight was collected outside the specified collection window in the contract, however the penetration and relative accuracy to the original collection have not been comprised as shown in the image below.



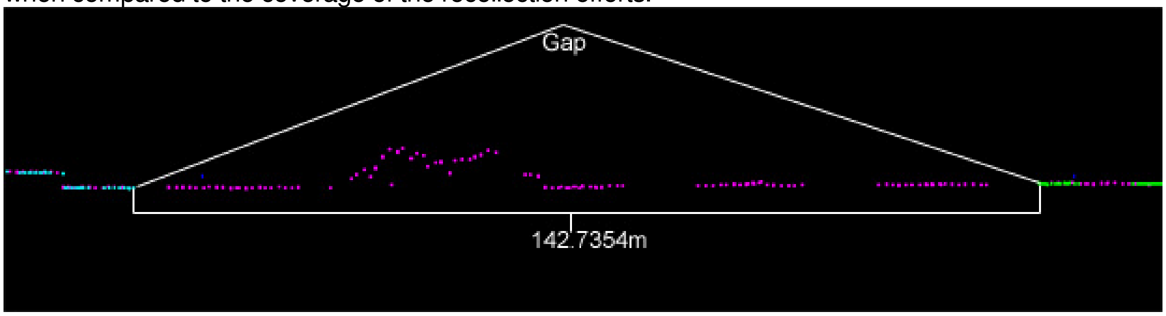
Flight: The Second flight Gap occurred in flight CA01707_2. The image below depicts reflown line in pink in respect to the two adjacent flights depicted in brown and red.



Size: Total area of gap is 9.98 sq. km

Cause: CA01707_2 flight depicted full coverage in the theoretical swath coverage. This gap went undetected until the data was processed. It was discovered that the last line of data was missing due to file corruption from the downloading equipment.

Resolution: The missing line was reflown to fill the gap areas. Flight CA12707_1 was the flight used to fill the gap areas. The image below is a profile depiction of the coverage at the time of the original flights when compared to the coverage of the recollection efforts.

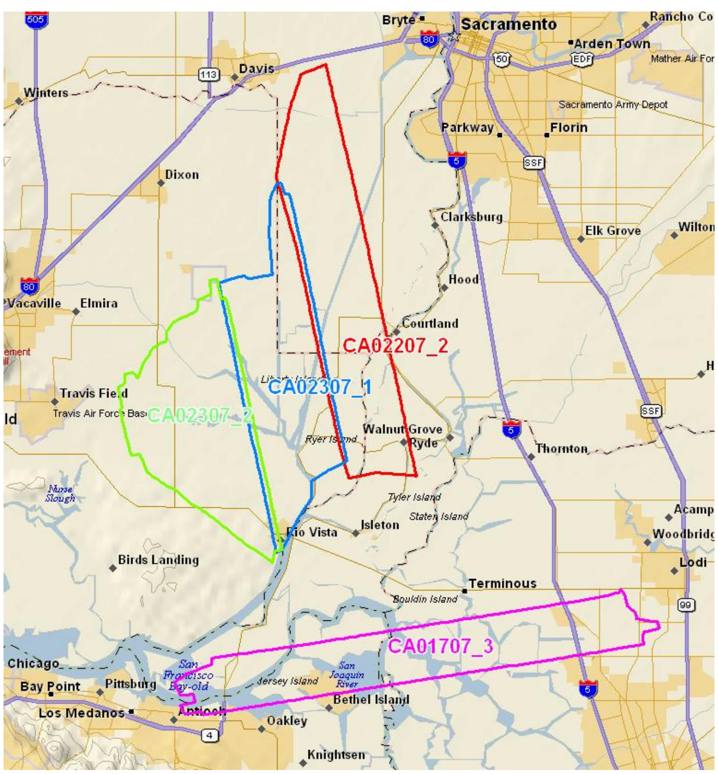


Section
3

ID & Analysis of Timing Errors

A detailed overview for all timing issues found and corrected for the LiDAR acquisition of Sacramento-San Joaquin Delta will be covered in this section.

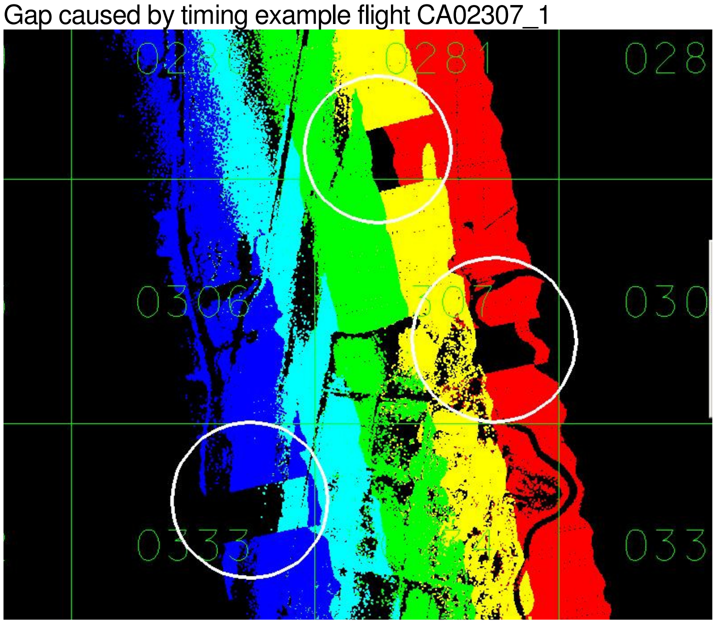
Flights: Flights CA02207_2, CA02307_1, CA02307_2, CA01707_3 are all flights that exhibited timing errors. The Map image below depicts the swath boundary of the flights that exhibited this error.



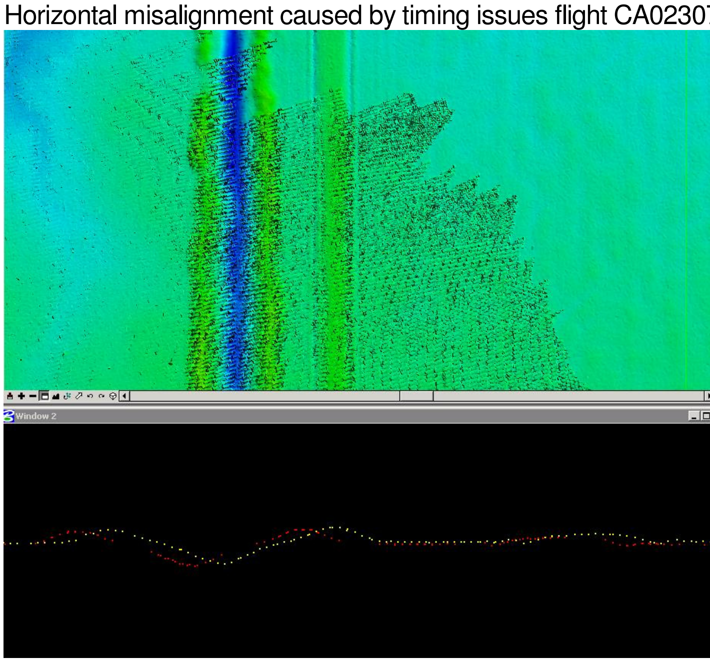
Size: The entire flights were reprocessed

Cause: The timing information with the Optech systems is recorded in a time tag file. This file links the time between GPS seconds of the week and ALTM time (time recorded with system start up). Without a correct correlation of time between the two independently measuring devices, range information would be misrepresented. During the collection effort timing information was lost in the time tag file for the flights listed above. The exact cause of this loss has still not been determined. The system is undergoing corrective maintenance with Optech to determine why these failures occurred. The resulting gaps of timing information resulted in horizontal misalignments and gaps between adjacent flightlines. See images below

Gap caused by timing example flight CA02307_1



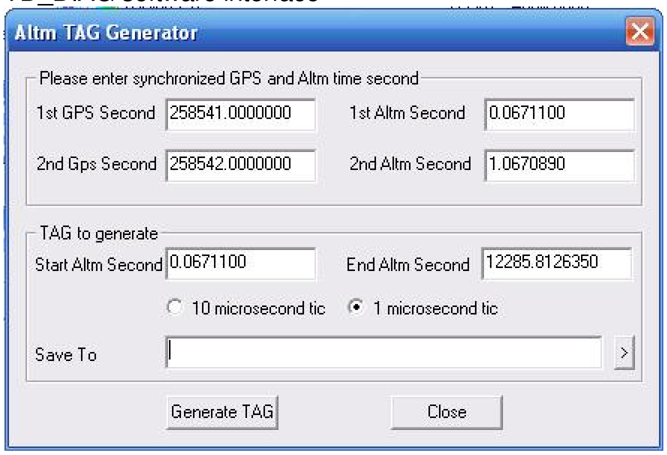
Horizontal misalignment caused by timing issues flight CA02307_2



The timing errors were missed during the initial data review performed by the processing team, because of the intermittent nature of the error. In the image above note the error correcting itself further north along the road in the surface model. When relative accuracy was reviewed areas were chosen that were not exhibiting data shifts . Airborne 1 did not perform a tile by tile check for each flight, instead Airborne 1 performed spots checks at the beginning and end of each flight. This process caused the errors to reach Earth Data.

Resolution: To resolve these errors the correction tool TD_DIAG developed by Optech was implemented. TD_DIAG bridges the gaps of timing information between the GPS seconds of the week and ALTM time. See images below

TD_DIAG software interface



Original tag file for flight CA02307_2. GPS time depicted on the left and ALTM time depicted on the right . Areas highlighted in blue represent the missing time information.

```
        12287,  258541.0000000,  270827.0000000
  258541.0000000,        0.0671100
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  258545.0000000,        4.0670260
  258546.0000000,        5.0670050
  258547.0000000,        6.0669850
  258548.0000000,        7.0669640
  258549.0000000,        8.0669430
  258550.0000000,        9.0669220
  258551.0000000,       10.0669010
  258552.0000000,       11.0668800
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  258582.0000000,       41.0662510
  258583.0000000,       42.0662310
  258584.0000000,       43.0662100
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  258587.0000000,       46.0661470
  258588.0000000,       47.0661260
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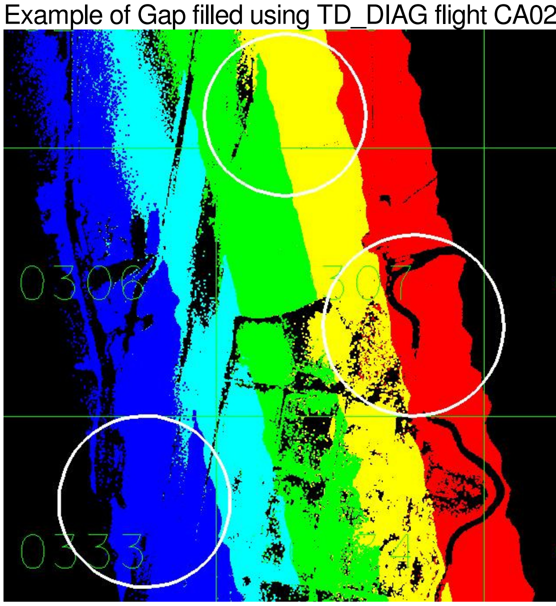
  258594.0000000,       53.0660000
  258595.0000000,       54.0659790
  258596.0000000,       55.0659580
  258597.0000000,       56.0659380
  258598.0000000,       57.0659170
```

Corrected tag file for flight CA02307_2. Areas highlighted in blue represent the corrected data.

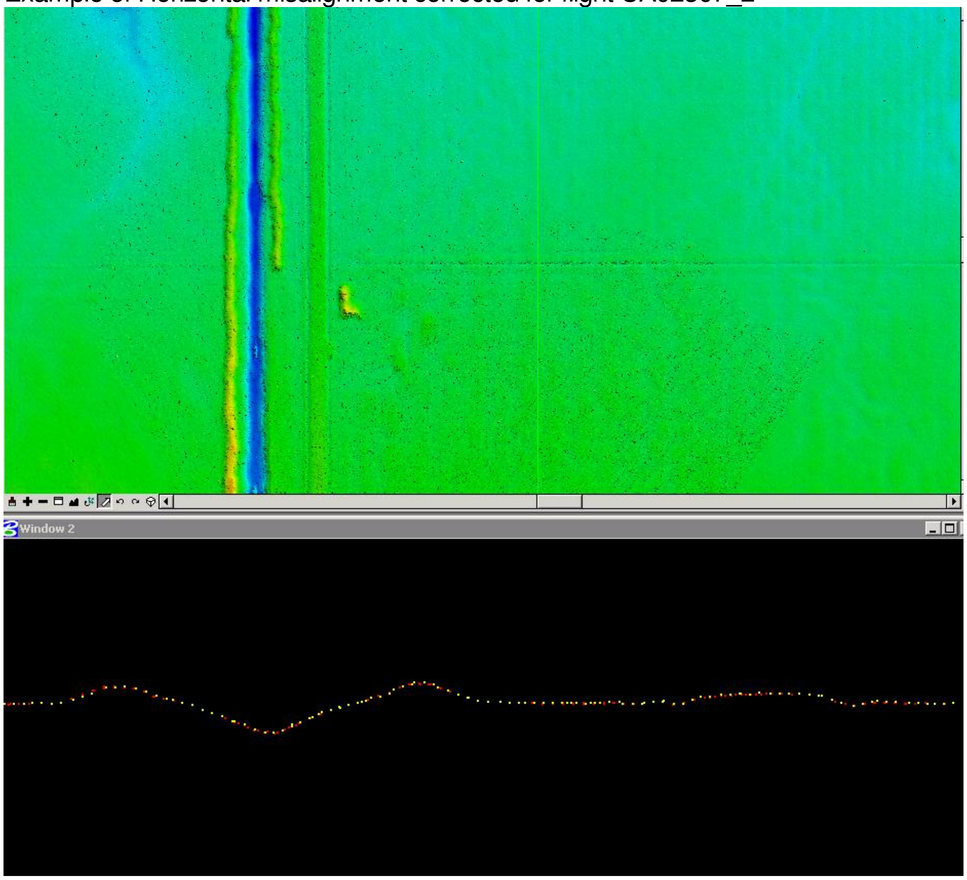
```
     12287, 258541.0000000, 270827.0000000
258541.0000000,      0.0671100
258542.0000000,      1.0670890
258543.0000000,      2.0670680
258544.0000000,      3.0670470
258545.0000000,      4.0670260
258546.0000000,      5.0670050
258547.0000000,      6.0669850
258548.0000000,      7.0669640
258549.0000000,      8.0669430
258550.0000000,      9.0669220
258551.0000000,     10.0669010
258552.0000000,     11.0668800
258553.0000000,     12.0668590
258554.0000000,     13.0668380
258555.0000000,     14.0668170
258556.0000000,     15.0667960
258557.0000000,     16.0667750
258558.0000000,     17.0667540
258559.0000000,     18.0667330
258560.0000000,     19.0667120
258561.0000000,     20.0666910
258562.0000000,     21.0666700
258563.0000000,     22.0666490
258564.0000000,     23.0666280
258565.0000000,     24.0666080
258566.0000000,     25.0665870
258567.0000000,     26.0665660
258568.0000000,     27.0665450
258569.0000000,     28.0665240
258570.0000000,     29.0665030
258571.0000000,     30.0664820
258572.0000000,     31.0664610
258573.0000000,     32.0664400
258574.0000000,     33.0664190
258575.0000000,     34.0663980
258576.0000000,     35.0663770
258577.0000000,     36.0663560
258578.0000000,     37.0663350
258579.0000000,     38.0663140
258580.0000000,     39.0662930
258581.0000000,     40.0662720
258582.0000000,     41.0662510
258583.0000000,     42.0662310
258584.0000000,     43.0662100
258585.0000000,     44.0661890
258586.0000000,     45.0661680
258587.0000000,     46.0661470
258588.0000000,     47.0661260
258589.0000000,     48.0661050
258590.0000000,     49.0660840
258591.0000000,     50.0660630
258592.0000000,     51.0660420
258593.0000000,     52.0660210
258594.0000000,     53.0660000
258595.0000000,     54.0659790
258596.0000000,     55.0659580
258597.0000000,     56.0659380
258598.0000000,     57.0659170
258599.0000000,     58.0658960
258600.0000000,     59.0658750
258601.0000000,     60.0658540
```

Once the timing data for each flight was bridged the LiDAR data was regenerated and checked for misalignments and gaps on a one km tile basis across the corrected flights and uncorrected flights. All data went under this review to ensure that any correction made was consistent with the surrounding flights.

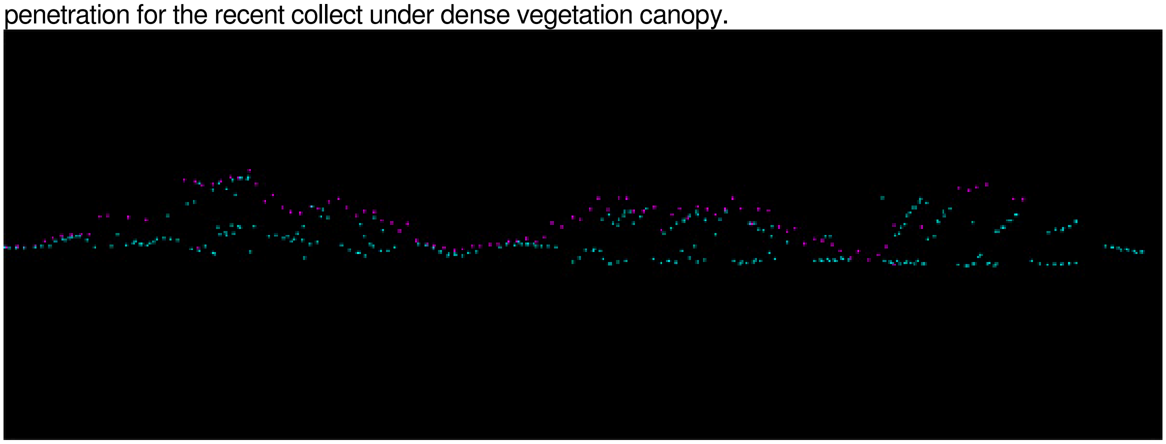
Example of Gap filled using TD_DIAG flight CA02307_1



Example of Horizontal misalignment corrected for flight CA02307_2



After the review it was determined that the TD_DIAG was not able to resolve the misalignment issues for the four most northern flightlines for flight CA01707_3. To correct these issues a re-flight was performed with flight CA12707_1. The data was collected under the same constraints as the original collection efforts using the same network previously established. Profiles below show good ground penetration for the recent collect under dense vegetation canopy.

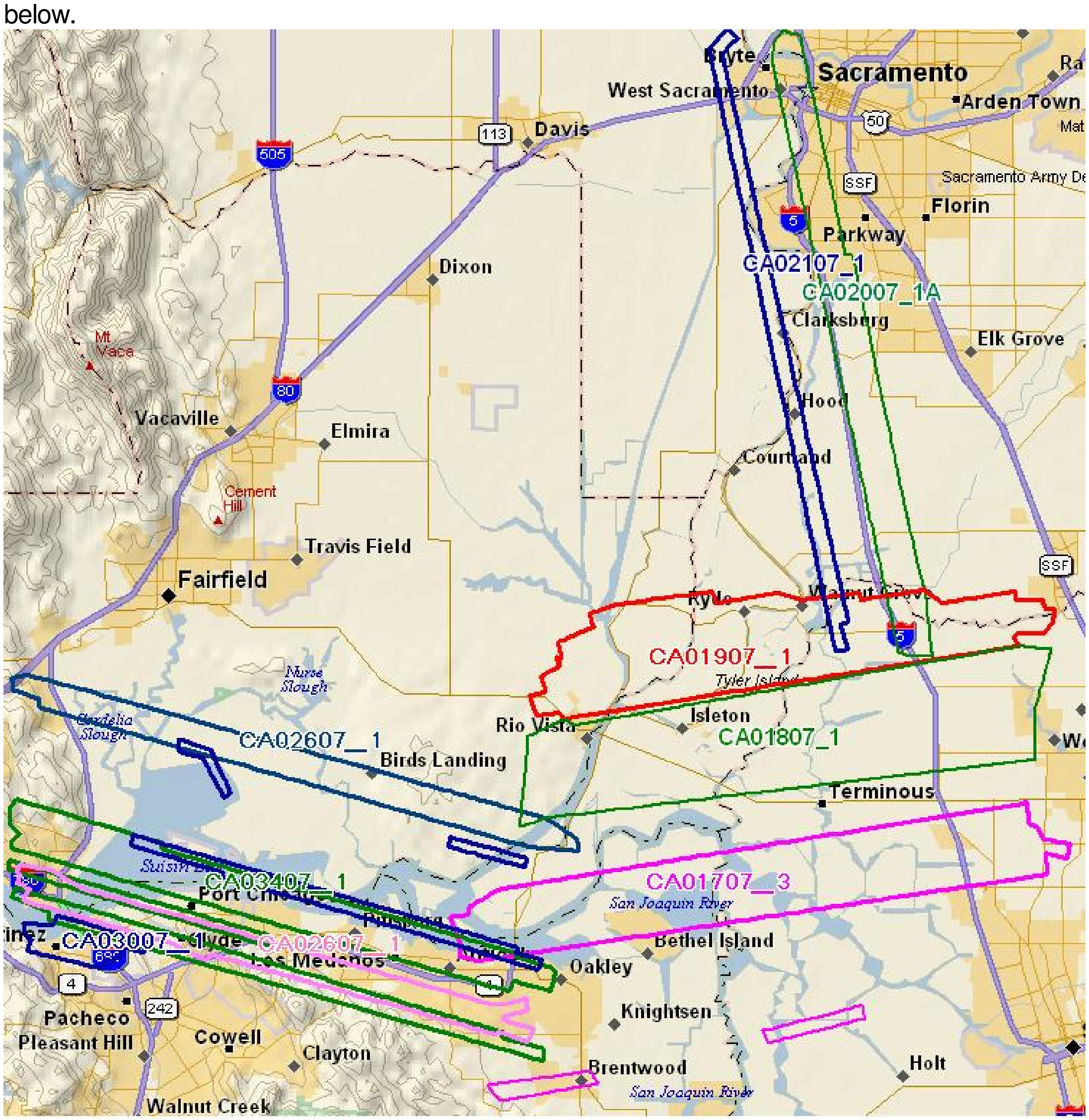


Section
4

Analysis of Calibration Adjustments

A detailed overview for all calibration values adjusted for the LiDAR acquisition of Sacramento-San Joaquin Delta will be covered in this section.

Flight: Normal calibration errors needed to be adjusted for all flights. This is typical for any project with large flights over a long duration of time. Flights that were initially rejected and recalibrated are shown below.



Size: The entire flights

Cause:. At nadir we would expect to see no sensor calibration error other then error presented by the GPS signal during a kinematic collection. Each degree outside of nadir will experience a slightly greater amount of error attributed to the basic sensor mechanics and the typical firing pattern. At 20 degrees either side of nadir we would expect to see a maximum of +/- 0.05m of error attributed to the sensor. It was determined that Airborne 1's initial sampling of areas to calibrate against was too small. This resulted in this data's calibration not holding across the entire flight and being rejected by Earth Data's QC review. While not a common occurrence this can happen when the system is under changes of atmospheric effects such as pressure and temperature under a long firing/collection period.

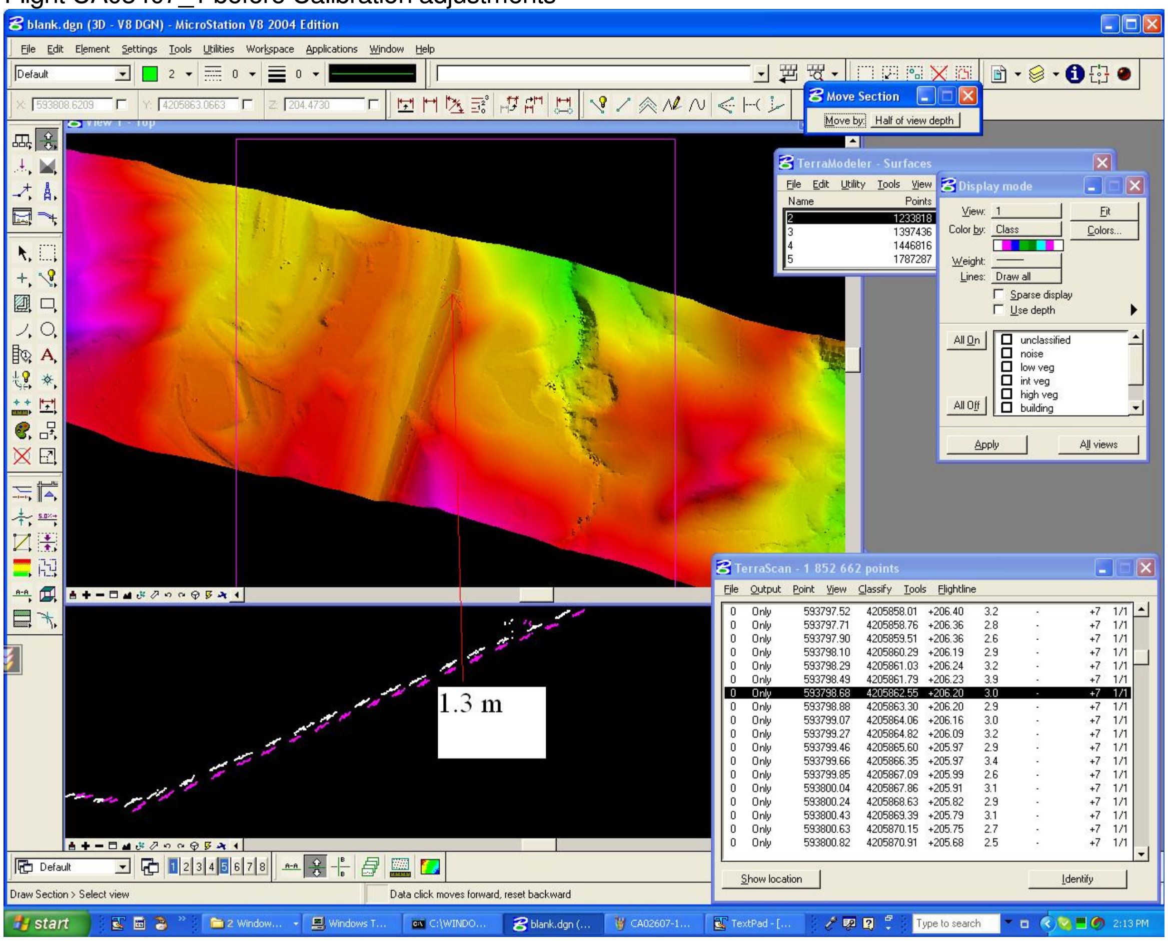
Resolution: Typically calibration is identified through the review of opposing flight lines to compare wing differences. Opposing flight lines are checked to validate the end scans do not exceed +/- .10cm. If errors are present then laser angles are adjusted for roll pitch and heading. The corrections are made to the entire flight to better fit the end scan data across all lines. This is part of the normal QAQC process when dealing with LiDAR data. The values adjusted for calibration on a flight basis are listed below

Flight	Date	Scale	Roll	Pitch	Heading
CA01407_1	14-Jan-07	1.0107	-0.054	0.167	0.169
CA01407_2	14-Jan-07	1.0098	-0.054	0.167	0.169
CA01407_3	14-Jan-07	1.0098	-0.054	0.167	0.169
CA01507_1	15-Jan-07	1.0095	-0.059	0.159	0.159
CA01507_2	15-Jan-07	1.0115	-0.051	0.167	0.111
CA01507_3	15-Jan-07	1.0115	-0.057	0.161	0.145
CA01507_4	15-Jan-07	1.0092	-0.057	0.161	0.145
CA01607_1	16-Jan-07	1.0111	-0.054	0.167	0.169
CA01607_2	16-Jan-07	1.0095	-0.059	0.159	0.159
CA01707_1	17-Jan-07	1.0095	-0.059	0.159	0.159
CA01707_2	17-Jan-07	1.0095	-0.059	0.159	0.159
CA01707_3	17-Jan -07	1.0095	-0.059	0.159	0.159
CA01707_4	17-Jan-07	1.0095	-0.059	0.159	0.159
CA01807_1	18-Jan-07	1.0096	-0.051	0.167	0.181
CA01907_1	19-Jan-07	1.0096	-0.051	0.167	0.181
CA01907_2	19-Jan-07	1.0095	-0.059	0.159	0.159
CA02007_1	20-Jan-07	1.0095	-0.059	0.159	0.159
CA02107_1	21-Jan-07	1.0095	-0.059	0.159	0.159
CA02107_2	21-Jan-07	1.0096	-0.051	0.167	0.181
CA02207_1	22-Jan-07	1.0088	-0.051	0.159	0.159
CA02207_2	22-Jan-07	1.0095	-0.059	0.159	0.159
CA02307_1	23-Jan-07	1.0115	-0.049	0.164	0.176
CA02307_2	23-Jan-07	1.0115	-0.049	0.164	0.176
CA02507_1	25-Jan-07	1.0115	-0.049	0.164	0.176
CA02507_2	25-Jan-07	1.0094	-0.065	0.167	0.181
CA02607_1	26-Jan-07	1.0095	-0.051	0.167	0.181
CA02807_1	28-Jan-07	1.0097	-0.051	0.147	0.121

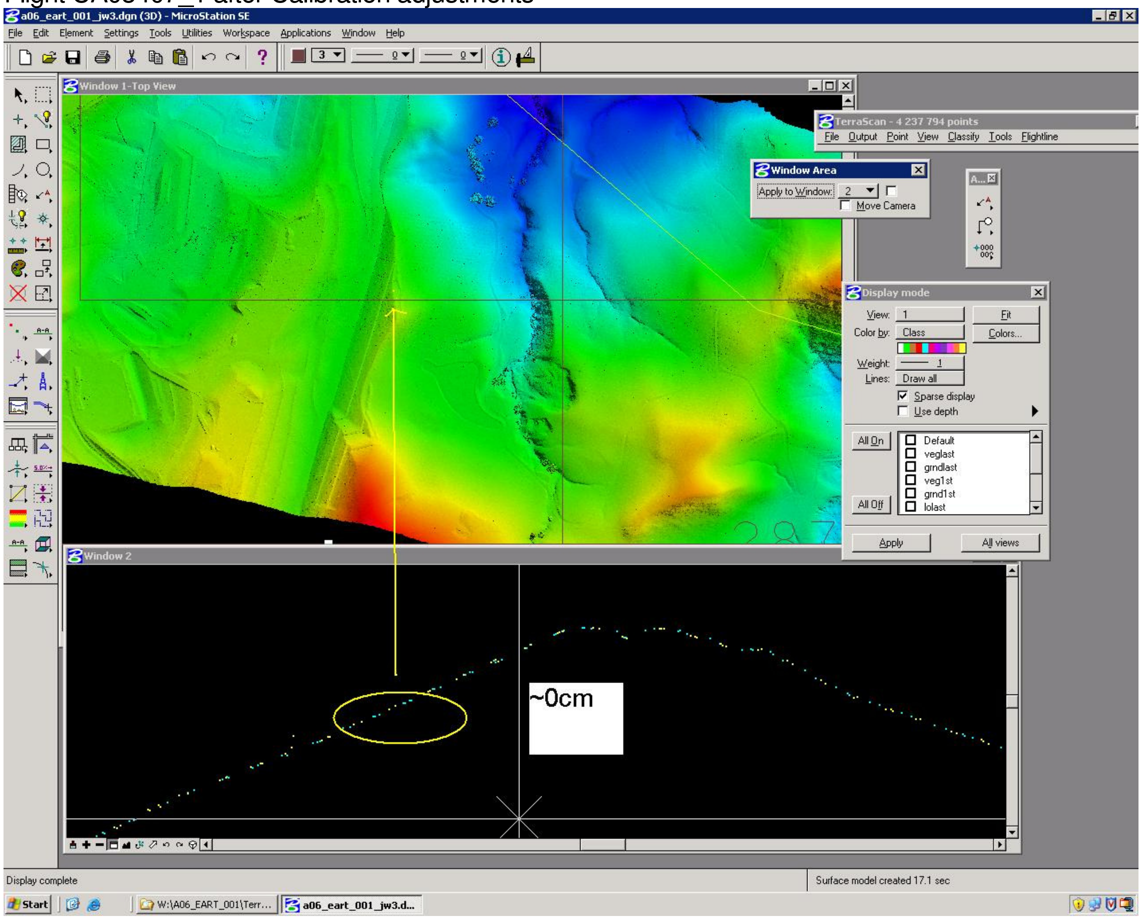
CA02807_2	28-Jan-07	1.0097	-0.051	0.147	0.121
CA03007_1	30-Jan-07	1.0109	-0.042	0.171	0.148
CA03407_1	3-Feb-07	1.0109	-0.042	0.171	0.148

The measurement process can be biased if the areas being reviewed contain large degrees of slope, lack of ground coverage or if the lines show slight changes of calibration over the course of the flight. Airborne 1 reviewed the areas for the initial calibration adjustments and refined them by averaging the changes across a greater number of sampled areas. This method better represents the changes that slightly adjust during a large flight collection. The images of the models below depict the improved relative accuracy with the recalibrated data.

Flight CA03407_1 before Calibration adjustments



Flight CA03407_1 after Calibration adjustments



Section 5

CONCLUSION

In closing we want reiterate great care was taken in the correction and identification of any flights with know errors. Furthermore all the data was reviewed to ensure that any flights not covered in this report do not have any errors present within them. All corrections made were done in accordance to industry acceptable standards and the final product is well within the contractual specifications. Our internal review of data meets the acceptable FEMA standards and anticipate no problems in it passing a independent review.

Airborne 1 wishes to see this project as a success for all parties involved. Airborne 1 is committed to this projects success and any future projects success. We sincerely appreciate the patience as we work to create an excellent data set that is meaningful and meets all desired applications/specifications. We expect to see an excellent review provided from Spectrum for the Independent QAQC analysis, and hope this outshines some of the projects current shortcomings in relation to schedule performance. Once again we sincerely appreciate being part of this team and look forward to many future endeavors.

Included in sections 6 – 8 is an example of the current QAQC system in use to help bullet proof our processes and provide the best possible service to our customers. All areas where the process has a documented failure point has been amended into the current the process flow. This will eliminate any repeat failures and enhance the overall service we are providing.

Airborne 1 Corporation's standard Quality Control procedures were unable to catch a number of problems in the Sacramento Delta LiDAR collection. These issues have been identified and documented to ensure the correction in process and the quality of future data.

For past Airborne 1 projects of this type that are large and where turnkey services are not performed, clients typically have the capacity to refine calibration parameters. Because of this Airborne 1's Quality Control procedures are not as extensive for these types of projects. Instead of visually checking every laser point, (as is our standard operating procedure for turnkey services) spot checks were performed across numerous locations in every flight line to check horizontal and vertical accuracy. The primary causes of problems in this data set were sensor complications and abnormal sensor functionality which resulted in problems regarding sensor calibration and time sequencing. The abnormal nature of these sensor issues added to the difficulty of identifying these problems and spot checks were not sufficient in detecting the issues on first delivery.

After the accuracy issues were detected, all subsequent Quality Control checks were enhanced to visually check all laser points on all redeliveries. For all forward works of this type, Airborne 1 will follow more extensive Quality Control procedures with visual checks of all laser points to ensure that abnormal sensor performance will be detected.

6

Project QA/QC Checklist Example

The QAQC Process Checklist states the step-by-step checks completed to ensure the LiDAR Survey data input correctly before each vital activity is complete/outputted and also acts as a training Manual for new QAQC personnel. The outline of the Process Manual (checklist) is used for every Data Processing Project and is included in the master project folder. Following this process flow ensures a complete review of client desired specifications from the relevant contract documentation, such as conformance to FEMA's Guidelines and Specifications for Mapping Partners. This information is gained from Airborne 1's *PROJECT INFORMATION SHEET* and *BOUNDARY CONFIRMATION SHEET*, which Airborne 1's customers submit following contract commitment, and prior to the data acquisition process.

Project QA/QC Checklist

Client Name:

Project Number:

Flight ID:

Sensor ID:

Aircraft ID:

Start Date: Contractual Due Date:

Projection & Datum:

☐ UTM, Zone:
☐ State Plane, Zone:
☐

☐ NAD27
☐ NAD83
☐ WGS84

☐ NGVD29
☐ NAVD88
☐ WGS84

H V Units
☐ ☐ Meters
☐ ☐ U.S. Survey Feet
☐ ☐ International Feet

☐ Ellipsoid Height ☐ Orthometric Height

Deliverables:

☐ Bald Earth First Pulse
☐ Bald Earth Last Pulse
☐ Extracted Features First Pulse
☐ Extracted Features Last Pulse
☐ All First Pulse
☐ All Last Pulse
☐ All shots
☐ 9-column

☐ Model Keypoints
☐ Intensity
☐ Grid, Spacing:
☐ Contours, Interval:
☐ Time Stamps
☐ Tiling, Dimensions:

☐ Max. Point File Size:

Category GPS Processing

Category Begin Date: *Time:*

Activity: **Kinematic Processing**

Secondary Check correct Antenna Model ☐______

Flights: **Correct Coordinates and Antenna Height**

Task:	**Geiod Applied** **Final Solution within 10cm**	☐______ ☐______

Category End Date: *Time:*

Category IMU Processing

Category Begin Date: *Time:*

Activity:	**POSPROC**	
Task:	**Check GPS and IMU lever arm and INS** settings in POSPROC (Make sure aircraft, sensor-mounting (type of bracket used), antenna and antenna mounting are documented and refer to survey specifications for proper GPS lever arm offsets)	☐______
Flights:		
Task:	**Check for proper IMU and GPS times**	☐______

Category End Date: *Time:*

Category REALM Execution

Category Begin Date: *Time:*

Activity:	**Laser Points Processing**	
Task:	**Check Realm Output Format**	☐______
	-Final Datum in State Plane / Geocentric	

Category End Date: *Time:*

Category Profiles

Category Begin Date: *Time:*

Activity:	**Processing Profiles**	
Task:	**Static GPS Processing of profile base station**	☐______
Task:	**Kinematic GPS processing of profiles**	☐______
Task:	**Filter profiles to quality X Y Z ground control**	☐______

Activity:	**Final Profile Check**	
Task:	**Run profile check in client's projection**	☐______
Activity:	**QAQC report**	
Task:	**Complete QAQC report**	☐______

Category End Date: *Time:*

Category Deliverables

Category Begin Date: *Time:*

Activity:	**Outputs**	**Checks**	**1 2**
Task:	**Bald Earth Last Pulse Coverage Check**		☐_☐
Task:	**Extracted Features Last Pulse Coverage Check (if needed)**		☐_☐
Task:	**Bald Earth 1st pulse Coverage Check (if needed)**		☐_☐
Task:	**Extracted Features 1st pulse Coverage Check**		☐_☐
	Check Projection		☐_☐
	Check Units		☐_☐
Activity:	**Other Deliverables**		
Task:	______**Grids Coverage Checks**		☐_☐
Task:	**Model Keypoints Coverage Checks**		☐_☐
Task:	**Contour Check** (Make sure to export contours '3D' in Terramodel) Interval__________________		☐_☐
Task:	**Tiling Scheme Check**		☐_☐

Category End Date:
Time:

Category Eagle Check

Category Begin Date:
Time:

Activity:	**Preparing Deliverables**	
Task:	**Check ___/___CDs/DVDs Burned with disclaimer**	☐______
Task:	**Check Final Deliverables in Eagle Temp Folder**	☐______
Task:	**Check CDs/DVDs Labels**	☐______
Task:	**Check cover letter**	☐______
Task:	**Check transmittal**	☐______
Task:	**Check Client Contact**	☐______
Task:	**Check Client Quality Survey Form**	☐______

Section

7

Non-Conformance Report Example

The NON-Conformance Report documents holds accountable any area or person that is performing work outside the process flow or contractual scope. The report is completed by both the originator and the responsible Manager. There is a formal follow up performed by the QAQC department to ensure that the errors are documented and steps are taken to ensure they will not be repeated. This report is then documented in the project folder.

AIRBORNE 1

NON-CONFORMANCE / CORRECTIVE - PREVENTATIVE ACTION REPORT

Project:

1) ORIGINATOR (please complete)

Name________________________________Position____
____

Report Type: €Non-conformance / Corrective Action €Opportunity for Improvement / Preventive Action

Report Origin: €Customer Feedback €In-house € Audit Finding

Standard / Procedural Reference: _________________________Responsible Function:________________________
Description of Non-conformance or Opportunity for Improvement request: (Please use reverse if more space is required)

Responsible Authority:___________________ Response Date:
____

Originator's Signature______________________________________ Date________________________________

2) RESPONSIBLE MANAGER (please complete) – Proposed Action

For Corrective / Preventive Action(s), please indicate:
Root Cause of Problem

Proposed Corrective / Preventive Action: Proposed Completion Date
____

Responsible Manager's Signature ____________________________ Date:________________________________

3) RESPONSIBLE MANAGER – Completed Actions

Description of Action(s) Taken:

Completion Date _________________Responsible Manager's Signature_____________________________

4) QUALITY ASSURANCE – Follow up

Comments:

Signature ____ Date _________________________________

Section
8

Service Quality Survey Example

How to Modify This Report

Airborne 1's quality survey is submitted to all clients following the completion of every project, in order to encourage post-delivery communication of client satisfaction related to Airborne 1's marketing, sales, operational, and finance department. Department Managers are measured on the results of these service quality surveys, and annual targets are set for continuous improvement.

AIRBORNE 1

Instructions

In an effort to continuously improve the quality of our products and services, Airborne 1 seeks your feedback in the following survey. Your answers will allow us to more closely tailor our services to meet your needs. Please do not make additional copies of this survey, as only one questionnaire per customer/per contract will be accepted. Return your completed survey in the pre-addressed and pre-stamped envelope enclosed. Please do not include any additional documents with your survey as the postage is fixed.

This questionnaire is divided into 3 parts. In the first section, we are seeking your opinion of what a "perfect" company does. In the second section, we request your input about Airborne 1's quality of service. In the third and final section, we are looking for your help on a few marketing questions.

If you have already completed Part I and III in a past survey, you may skip to Part II. Please mark the checkbox at the beginning of Part I to indicate that choice.

To show you our appreciation we have included a $5 bill with this survey, as a gesture of goodwill. A $20 check has also been included. Upon submission of your completed survey, please feel free to deposit this check in the account of your choosing. Should you have any questions regarding this survey, please contact us at polls@airborne1.com.

Ready? Set? Go!

Part I: What Excellent Geospatial Companies Do

☐ **I have previously submitted my opinions for this section, and am skipping to Part II.**

Based on your past experiences with mapping and software firms and departments, please think about the kind of geospatial firm that offers truly excellent service. Think about the ideal firm that you would most like to do business with.

Please show the extent to which you think this firm would possess the features described by each statement. If you feel a feature is not at all essential for excellent firms such as the one you have in your mind, circle the number 1. If you feel a feature is absolutely essential for excellent geospatial firms, circle the number 7. If a statement is not applicable, please mark it in the corresponding circle.

There is no right or wrong answer. We are just looking for the number that reflects your feelings about a truly excellent geospatial firm. Please select only one option per statement.

Strongly Disagree						**Strongly Agree**
1	**2**	**3**	**4**	**5**	**6**	**7**
○ ○	○	○	○	○	○	

1. Excellent firms' pricing offers the best total value for a customers needs.

○ ○ ○ ○ ○ ○ ○

2. Excellent firms offer the lowest total price for a given need.

○ ○ ○ ○ ○ ○ ○

3. Excellent firms collect and deliver outstanding data.

○ ○ ○ ○ ○ ○ ○

Strongly Disagree						**Strongly Agree**
1	**2**	**3**	**4**	**5**	**6**	**7**
○ ○	○	○	○	○	○	

4. Excellent firms have modern looking, thorough, and understandable deliverables.

○ ○ ○ ○ ○ ○ ○

5. Excellent firms' salespeople respond quickly to inquiries.

○ ○ ○ ○ ○ ○ ○

6. Excellent firms' operations people respond quickly to inquiries.

○ ○ ○ ○ ○ ○ ○

7. Excellent firms deliver early.

○ ○ ○ ○ ○ ○ ○

8. Excellent firms deliver on time, according to contract deadlines.

○ ○ ○ ○ ○ ○ ○

9. Excellent firms offer individual, caring attention to each client's unique needs.

○ ○ ○ ○ ○ ○ ○

10. Excellent firms have my best interests at heart, and want me to succeed.

○ ○ ○ ○ ○ ○ ○

11. Excellent firms respect my time and dollars, and treat them accordingly.

○ ○ ○ ○ ○ ○ ○

12. Excellent firms truly appreciate their clients' business.

○ ○ ○ ○ ○ ○ ○

Listed below are six features pertaining to geospatial firms. We would like to learn how important each of these features is to <u>you</u> when you evaluate the service offered. Please distribute a total of 100 points among the six features according to how important each feature is to you. The more important a feature is to you, the more points you should allocate to it. Please ensure that the points you assign to the six features add up to 100.

13. ____ **points:** Appearance and professionalism of deliverables, reports, communications, schedules, proposals, etc…

14. ____ **points:** Caring, individualized attention to a customer

15. ____ **points:** Willingness to do whatever it takes to help, and do so promptly

16. ____ **points**: Ability to do the job dependably and accurately the first time

17. ____ **points**: Knowledge and courtesy of employees and their ability to convey trust and confidence

18. ____ **points:** Competitive pricing of products and services

100 TOTAL POINTS

<u>For questions 19-21, please enter the feature's question number (#13-#18):</u>

19. Which one of the six features (questions 13-18) listed above is most important to you? #_____

20. Which feature (questions 13-18) is second most important to you? #_____

21. Which feature (questions 13-18) is least important to you? #_____

Part II: Service Quality Questions about Airborne 1

Strongly Disagree						Strongly Agree	
Not Applicable							
1	2	3	4	5	6	7	N/A
O O	O	O	O	O O			O

22. The written proposal and contract clearly defined Airborne 1's different services and their associated costs.

O O O O O O O O

23. The Airborne 1 sales representative did an excellent job of explaining the various options available to me.

O O O O O O O O

24. In terms of <u>*value*</u>, Airborne 1 offered the best package.

O O O O O O O O

25. In terms of <u>*price*</u>, Airborne 1 was the lowest.

O O O O O O O O

26. The data Airborne 1 collected and delivered was of excellent quality.

○ ○ ○ ○ ○ ○ ○ ○

27. The classification of the data to bald earth was excellent, overall.

○ ○ ○ ○ ○ ○ ○ ○

28. My deliverables were clearly and professionally presented and explained.

○ ○ ○ ○ ○ ○ ○ ○

29. The overall quality of the deliverables (contents, appearance, and clarity) was excellent.

○ ○ ○ ○ ○ ○ ○ ○

30. The Airborne 1 sales team responded quickly to my inquiries.

○ ○ ○ ○ ○ ○ ○ ○

31. The Airborne 1 operations team responded quickly to my inquiries.

○ ○ ○ ○ ○ ○ ○ ○

32. Airborne 1 delivered on time or early.

○ ○ ○ ○ ○ ○ ○ ○

33. Airborne 1 discussed any delay with me in a timely manner.

○ ○ ○ ○ ○ ○ ○ ○

34. My product's overall value was perfectly consistent with my needs.

○ ○ ○ ○ ○ ○ ○ ○

35. Overall, the Airborne 1 sales team took excellent care of my project.

○ ○ ○ ○ ○ ○ ○ ○

36. Overall, the Airborne 1 operations team took excellent care of my project.

○ ○ ○ ○ ○ ○ ○ ○

37. Airborne 1's telephone manners are considerate, helpful, and polite.

○ ○ ○ ○ ○ ○ ○ ○

38. The Airborne 1 sales team gave me individual and caring attention.

○ ○ ○ ○ ○ ○ ○ ○

39. The Airborne 1 sales team has my best interests at heart.

○ ○ ○ ○ ○ ○ ○ ○

Strongly Disagree						**Strongly Agree**	
Not Applicable							
1	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
○	○	○	○	○	○	○	○

40. The Airborne 1 sales team understood my specific needs.

○ ○ ○ ○ ○ ○ ○ ○

41. The Airborne 1 operations team gave me individual and caring attention.

○ ○ ○ ○ ○ ○ ○ ○

42. The Airborne 1 operations team has my best interests at heart.

○ ○ ○ ○ ○ ○ ○ ○

43. The Airborne 1 operations team understood my specific needs.

○ ○ ○ ○ ○ ○ ○ ○

44. Airborne 1 respects my time and money, and treats them accordingly.

○ ○ ○ ○ ○ ○ ○ ○

45. Airborne 1 truly appreciates my business.

○ ○ ○ ○ ○ ○ ○ ○

46. I would strongly recommend Airborne 1 to my colleagues, business associates, and clients.

○ ○ ○ ○ ○ ○ ○ ○

Please rate your overall perception of the service quality of the following Airborne 1 departments (0-100): *0 is completely unacceptable, 100 is Nirvana/Perfection*

47. Marketing _______ 49. Data Collection _______ 51. Finance _______

48. Sales _______ 50. Data Processing _______

Part III: Marketing and Other Questions