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USGS/ FEMA Region IX – Placer County, CA LiDAR

Report Produced for U.S. Geological Survey

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Executive Summary

The primary purpose of this project was to develop a consistent and accurate surface elevation dataset derived from high-accuracy Light Detection and Ranging (LiDAR) technology for the USGS FEMA IX – Placer County, CA Project Area.

The LiDAR data were processed to a bare-earth digital terrain model (DTM). Detailed breaklines and bare-earth Digital Elevation Models (DEMs) were produced for the project area. Data was formatted according to tiles with each tile covering an area of 1500m by 1500m. A total of 464 tiles were produced for the project encompassing an area of approximately 308 sq. miles.

Deliverables for the eastern extent of the Placer County, CA project area were produced in UTM zone 11, NAD83 HARN/NAVD88, meters. A total of 197 tiles were produced for the eastern extent of the project area covering an area of approximately 124 sq. miles. Deliverables for the western extent of the Placer County, CA project area were produced in UTM zone 10, NAD83 HARN/NAVD88, meters. A total of 267 tiles were produced for the western extent of the project area covering an area of approximately 184 sq. miles.

THE PROJECT TEAM

Dewberry served as the prime contractor for the project. In addition to project management, Dewberry was responsible for LAS classification, all LiDAR products, breakline production, Digital Elevation Model (DEM) production, and quality assurance.

Dewberry's Steven A. Wood completed ground surveying for the project and delivered surveyed checkpoints. His task was to acquire surveyed checkpoints for the project to use in independent testing of the vertical accuracy of the LiDAR-derived surface model. He also verified the GPS base station coordinates used during LiDAR data acquisition to ensure that the base station coordinates were accurate. Please see Appendix A to view the separate survey report that was created for this project.

Digital Mapping, Inc (DMI) completed LiDAR data acquisition and data calibration for the project area.

SURVEY AREA

The project area addressed by this report falls within the California counties of El Dorado, Nevada, Yuba, and Placer. Portions of the project area also fall within the Nevada county of Washoe.

DATE OF SURVEY

The LiDAR aerial acquisition was conducted from March 25, 2012 thru June 29, 2012.

DATUM REFERENCE

Data produced for the project were delivered in the following reference system.

Horizontal Datum: The horizontal datum for the project is North American Datum of 1983 (NAD 83) HARN

Vertical Datum: The Vertical datum for the project is North American Vertical Datum of 1988 (NAVD88)

Eastern Extent Coordinate System : UTM Zone 11

Western Extent Coordinate System : UTM Zone 10

Units: Horizontal units are in meters, Vertical units are in meters.
Geiod Model: Geoid09 (Geoid 09 was used to convert ellipsoid heights to orthometric heights).

LIDAR VERTICAL ACCURACY

For the FEMA IX-Placer County, CA LiDAR Project, the tested $RMSE_z$ of the classified LiDAR data for checkpoints in open terrain equaled **0.10 m** compared with the 0.125 m specification; and the FVA of the classified LiDAR data computed using $RMSE_z$ x 1.9600 was equal to **0.19m**, compared with the 0.245 m specification.

For the FEMA IX-Placer County, CA LiDAR Project, the tested CVA of the classified LiDAR data computed using the 95^{th} percentile was equal to **0.18 m,** compared with the 0.363 m specification.

Additional accuracy information and statistics for the classified LiDAR data, raw swath data, and bare earth DEM data are found in the following sections of this report.

PROJECT DELIVERABLES

The deliverables for the project are listed below.

1. Raw Point Cloud Data (Swaths)
2. Classified Point Cloud Data (Tiled)
3. Bare Earth Surface (Raster DEM – IMG Format)
4. Intensity Images (8-bit gray scale, tiled, GeoTIFF format)
5. Breakline Data (File GDB)
6. Control & Accuracy Checkpoint Report & Points
7. Metadata
8. Project Report (Acquisition, Processing, QC)
9. Project Extents, Including a shapefile derived from the LiDAR Deliverable

PROJECT TILING FOOTPRINT

Four hundred sixty four (464) tiles were delivered for the project. Each tile's extent is 1,500 meters by 1,500 meters. One hundred and ninety seven (197) tiles were produced for the eastern extent of the project area. Two hundred and sixty seven (267) tiles were produced for the western extent of the project area (see Appendix B for a complete listing of delivered tiles).

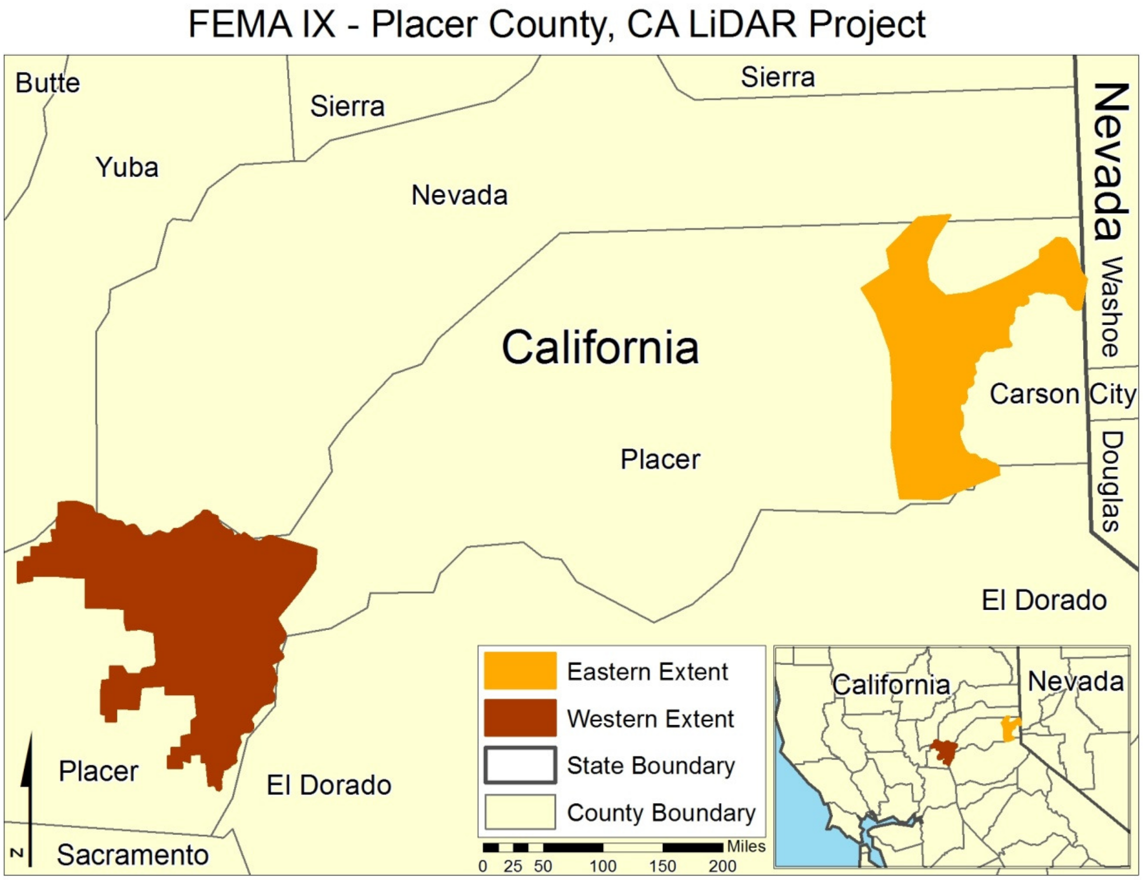


Figure 1 - Project Map

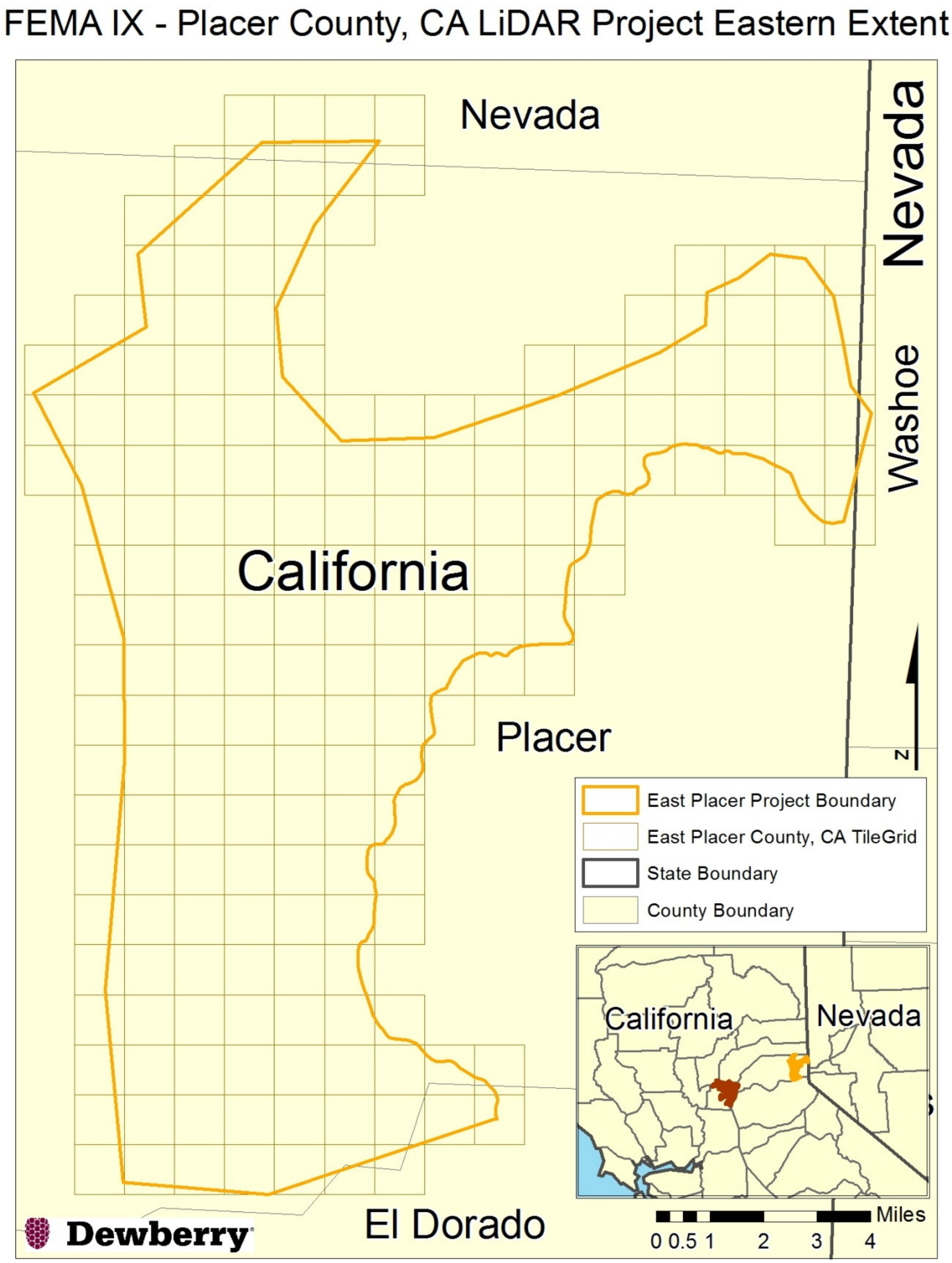


Figure 2- East Placer Tiles

FEMA IX - Placer County, CA LiDAR Project Western Extent

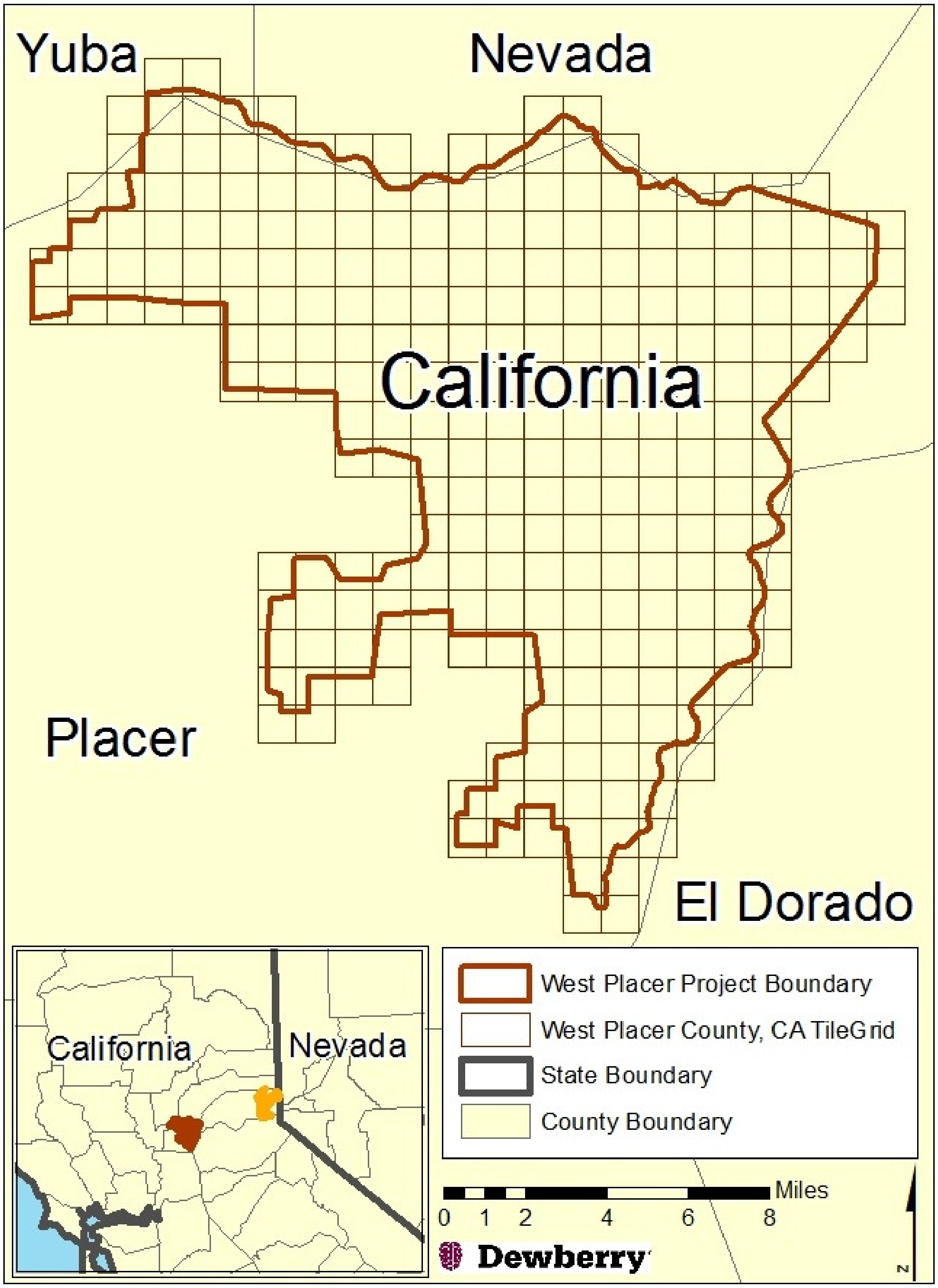


Figure 3 – West Placer Tiles

LiDAR Acquisition Report

Digital Mapping, Inc (DMI) provided high accuracy, calibrated multiple return LiDAR for roughly 308 square miles around the Placer County, CA area. Data was collected and delivered in compliance with the "U.S. Geological Survey National Geospatial Program Base LiDAR Specifications, Version 13 – ILMF 2010."

LiDAR data is remotely sensed high-resolution elevation data collected by an airborne collection platform. By positioning laser range finding with the use of 1 second GPS with 100 Hz inertial measurement unit corrections; LiDAR instruments are able to make highly detailed geospatial elevation products of the ground, man-made structures and vegetation.

LIDAR acquisition for East Placer began on June 20, 2012 and was completed June 28, 2012. A total of 5 survey missions were flown to complete the project. The flight was flown as planned with no modifications. There were no unusual occurrences during the acquisition and the sensor performed within specifications.

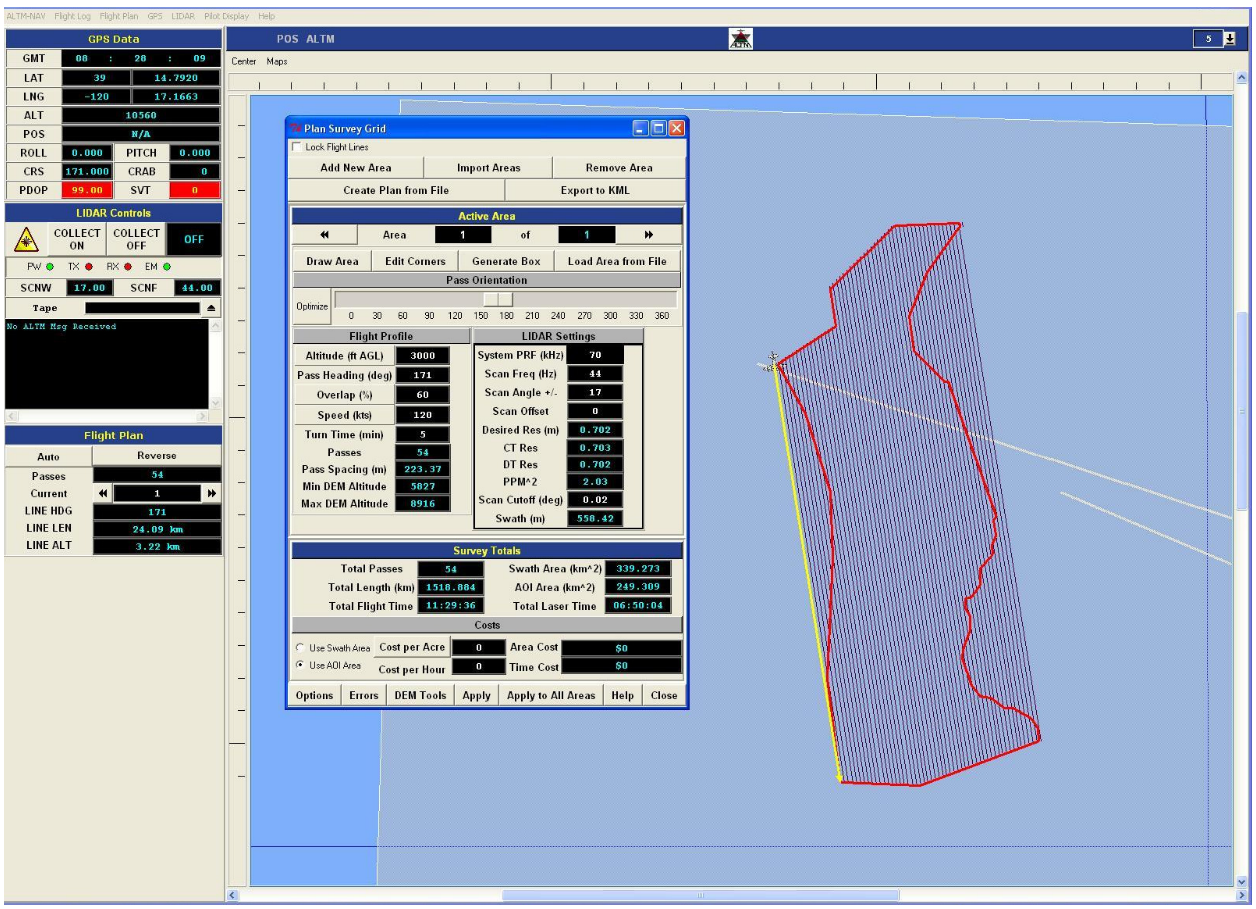


Figure 4 – Placer East Flight Layout A

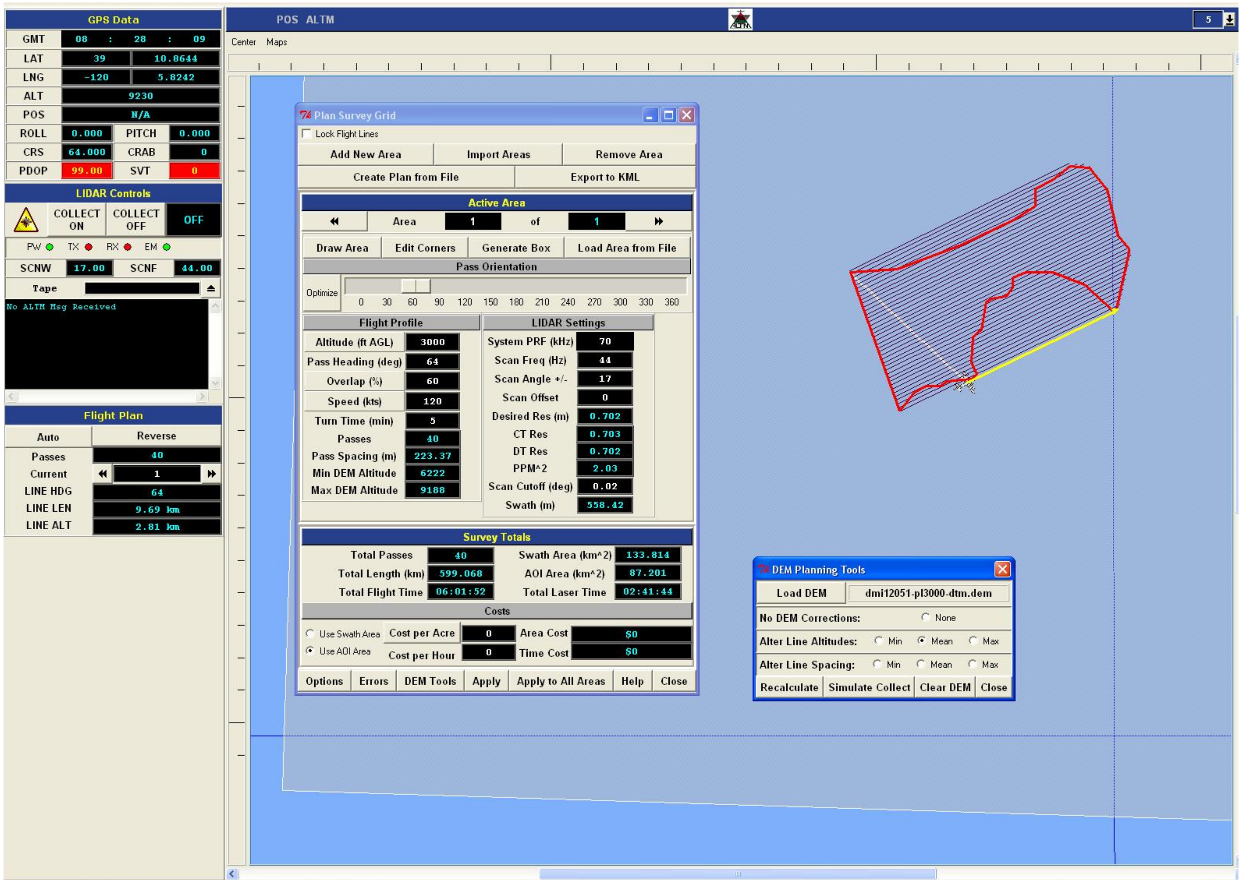


Figure 5 – Placer East Flight Layout B

LIDAR acquisition for West Placer began on April 2, 2012 and was completed April 3, 2012. A total of 3 survey missions were flown to complete the project. The flight was flown as planned with no modifications. There were no unusual occurrences during the acquisition and the sensor performed within specifications.

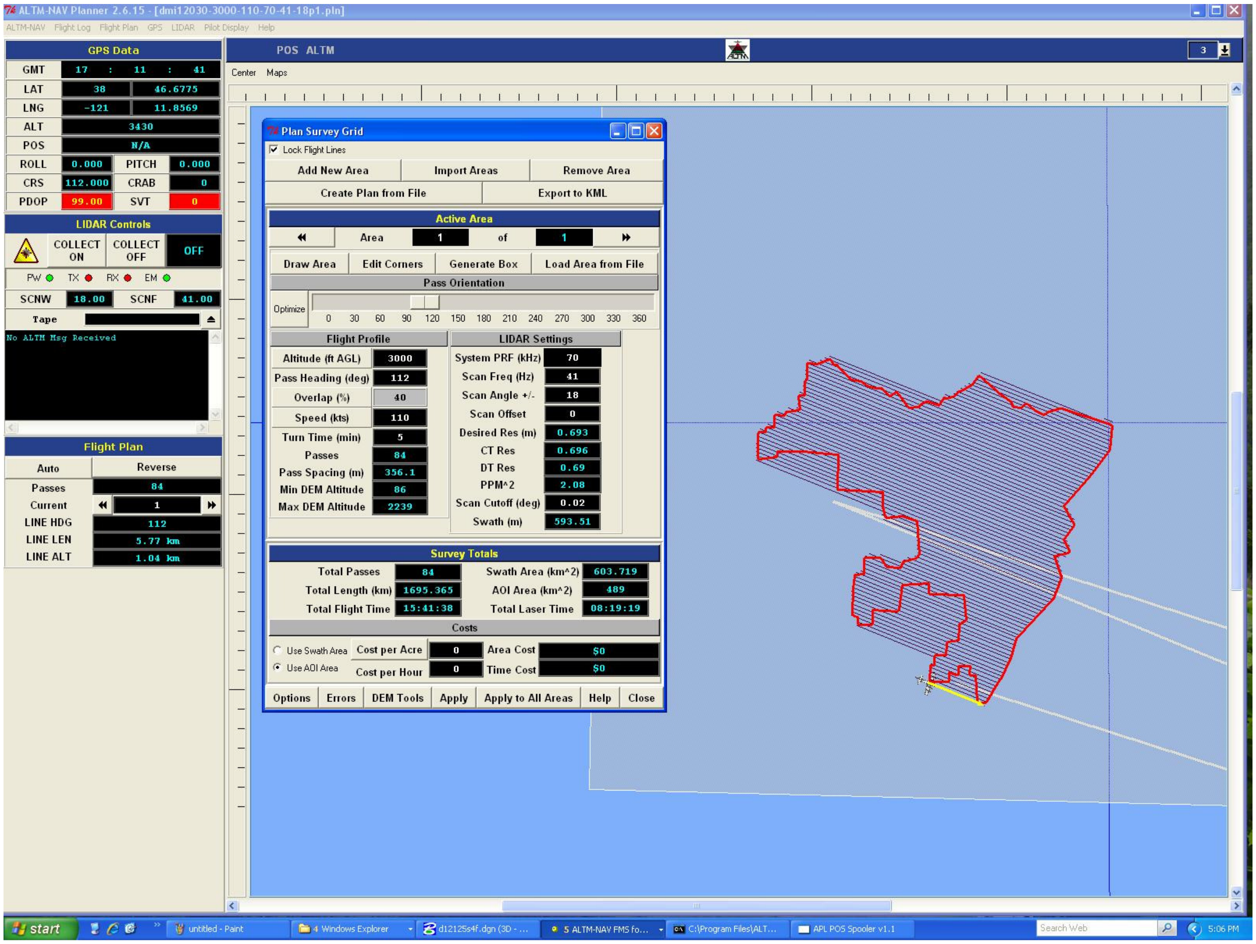


Figure 6 – Placer West Flight Layout

LIDAR ACQUISITION EQUIPMENT

Optech ALTM Gemini LiDAR system was utilized to collect the data. The 167 kHz LiDAR system is a state-of-the-art system that enables the combination of accuracy and rapid collection speed due to its high scanning rate.

The table below represents a list of features and characteristics for the Optech ALTM Gemini system.

Manufacturer	Optech
Platform	Fixed-wing
Scan angle (°)	Variable from 0° to +/- 25°
Laser repetition rate (kHz)	33 – 167
Scan frequency (Hz)	Variable to 100 Hz
Spot distribution	Sawtooth, uniform spot spacing across 96% of scan
Operation altitude (m)	80 – 4,000
Swath width (m)	Variable from 0 to 0.93 x altitude (m)
Beam divergence (mrad)	Dual divergence 0.15/0.25 or 0.80
Across track point spacing (m)	Variable
Along track point spacing (m)	Variable
Point density (points/ sq m)	Variable
Range capture	Up to 4 range measurement for each pulse, including last
Intensity capture	4 intensity readings with 12-bit dynamic range for each measurement
Position orientation system	Applanix-POS/AV including internal 12-channel dual-frequency 10 Hz GPS receiver
Laser classification	Class IV (FDA 21 CFR)
Power requirements	28 VDC @ 35 A (maximum)
Operating temperature (°C)	-10° to +50°
Humidity (%)	0 to 95 non-condensing
Sensor dimensions (cm)	26 x 19 x 57
Sensor weight (kg)	23.4
Sensor mount	Directly to floor
Control rack	Vibration-isolated case
Control rack dimensions (cm)	65 x 59 x 49
Control rack weight (kg)	53.2
Data storage	Ruggedized removable media

Table 1 – LiDAR Sensor Characteristics

The following configuration was used in the acquisition of this project.

Aircraft Speed	110	**knots**
Data Acquisition Height	3000	**ft AGL**
Swath Width	593.5	**m**
Overlap	40	**%**
Scanner Field Of View	18	**+/- degrees**
Scan Cutoff	0.02	**Degrees**
Pulse Repetition Rate	70	**KHz**
Scan Frequency	41	**Hz**

Number of Returns Per Pulse	4	**Discrete returns**
Beam Divergence	Narrow	
Resultant Raw Point Density	2.08	**pt/m2 without overlap**

Table 2 – LiDAR System Parameters

The aircraft used for the survey was Bonanza A36TC with an endurance of approximately 7 hours. Auburn Municipal Airport was used as the base of operation.

Leica 1200 GPS receivers were used to support the airborne operations of this survey and to establish the GPS control network.

LIDAR ACQUISITION DETAILS

The table below shows dates of acquisition along with each mission's name and the sensor used.

Project	Mission	Airport	Sensor	Flight Date
WPC	0402	Auburn	ALTM Gemini	04/02/2012
WPC	0403am	Auburn	ALTM Gemini	04/03/2012
WPC	0403pm	Auburn	ALTM Gemini	04/03/2012
EPC	0620	Truckee	ALTM Gemini	06/20/2012
EPC	0621am	Truckee	ALTM Gemini	06/21/2012
EPC	0621pm	Truckee	ALTM Gemini	06/21/2012
EPC	0627	Truckee	ALTM Gemini	06/27/2012
EPC	0628	Truckee	ALTM Gemini	06/28/2012

Table 3 – Acquisition Dates

The LiDAR data was collected using the specifications outlined in the "U.S. Geological Survey National Geospatial Program Base LiDAR Specifications, Version 13.

LiDAR collection parameters were as follows:

- LiDAR data was collected at a nominal pulse spacing (NPS) of 0.69 meters.
- The LiDAR was collected under cloud-and fog-free conditions
- Multiple return collection (first, last, and intermediate) and Intensity was collected
- The collection area was buffered by 140 meters

Flight logs document the dates, flight crew, weather, flying height and times for each mission. The flight logs for the project are included in Appendix C.

DMI used either existing or newly established survey points to create a GPS network to control all flight missions and to support kinematic and static ground surveys used to quality control the data.

The projection and units for all West Placer deliverables was as follows:

Horizontal Datum	NAD83 HARN
Vertical Datum	NAVD88
Projection	UTM
Zone	10
Units	Meter

Table 4 – Projection for West Placer deliverables

The projection and units for all East Placer deliverables was as follows:

Horizontal Datum	NAD83 HARN
Vertical Datum	NAVD88
Projection	UTM
Zone	11
Units	Meter

Table 5 – Projection for East Placer deliverables

DMI utilized two points as base stations for its West Placer mission. The following are the final coordinates of the control points used in this project:

Station	Latitude (D M S)	Longitude (D M S)	Ellipsoid Height
AP1AB	38 33 50.69135 N	121 17 56.68812 W	-3.7457
AP2AB	38 33 51.10534 N	121 17 45.44288 W	-2.3207

Table 6 – Base Stations

DMI utilized three points as base stations for its East Placer mission. The following are the final coordinates of the control points used in this project:

Station	Latitude (D M S)	Longitude (D M S)	Ellipsoid Height
D3	39 10 41.24677 N	120 11 29.79618 W	1.6658
AP1	39 19 10.36066 N	120 8 44.20839 W	1.7188
AP2	39 10 41.24677 N	120 11 29.79618 W	1.6958

Table 7 – Base Stations

DMI established 19 points that were utilized for quality control and calibration of the West Placer data. The location of these points can be viewed in Appendix C.

DMI established 16 points that were utilized for quality control and calibration of the East Placer data. The location of these points can be viewed in Appendix C.

All elevations were referenced to the GEOID09 model, published by the National Geodetic Survey (NGS), was used to reduce all ellipsoidal heights to orthometric.

QUALITY CONTROL FOR DATA ACQUISITION

The acquisition of overlapping calibration lines for every mission is key to the QC process since it helps identify any systematic issues in data acquisition or failures on the part of the GPS, IMU or other equipment that may not have been evident to the LiDAR operator during the mission.

Ground truth validation is used to assess the data quality and consistency over sample areas of the project. To facilitate a confident evaluation, existing survey control is used to validate the LiDAR data. Published survey control, where the orthometric height (elevation) has been determined by precise differential levelling or GPS observation is deemed to be suitable.

The Field Project Manager performs kinematic post-processing of the aircraft GPS data in conjunction with the data collected at the Reference Station. Double difference phase processing of the GPS data is used to achieve the greatest accuracy. The GPS position accuracy is assessed by comparison of forward and reverse processing solutions and a review of the computational statistics. Any data anomalies are identified and the necessary corrective actions are implemented prior to the next mission.

The system logging software performs automatic system and subsystem tests on power-up to verify proper functionality of the entire data acquisition system. Any anomalies are immediately investigated and corrected by the LiDAR operator if possible. Any persistent problems are referred to the engineering staff, which can usually resolve the issue by telephone and/or email. In the unlikely event that these steps do not resolve the problem, a trained engineer is immediately dispatched to the project site with the appropriate test equipment and spare parts needed to repair the system.

The system logging software continuously monitors the health and performance of all subsystems. Any anomalies are recorded in the System Log and reported to the LiDAR operator for resolution. If the operator is unable to correct the problem, the engineering staffs are immediately notified. They provide the operator with instructions or on-site assistance as needed to resolve the problem.

After the mission is completed, raw LiDAR data on the removable disk drive is transferred to the Field PC at the field operations staging area. An automated QA/QC program scans the System Log as well as the raw data files to detect potential errors. Any problems identified are reported to the operator for further analysis. Data is also retrieved from all GPS Reference Stations, which were active during the mission and transferred to the Field PC. The GPS data is processed and tested for internal consistency and overall quality. Any errors or limit violations are reported to the operator for more detailed evaluation.

The Field Project Manager utilizes a data viewer installed on the Field PC to review selected portions of the acquired LiDAR and imagery data, this permits a more thorough and detailed analysis of the data corrupted files or problems in the data itself are noted. If the data indicates improper settings or operation of the LiDAR sensor and camera, the Field Project Manager determines the appropriate corrective actions needed prior to the next mission.

All LiDAR, imagery and GPS data is copied from the Field PC onto two separate removable hard drives: one for transfer to calibration, and one for local backup. Each hard drive is reviewed to ensure data completeness and readability.

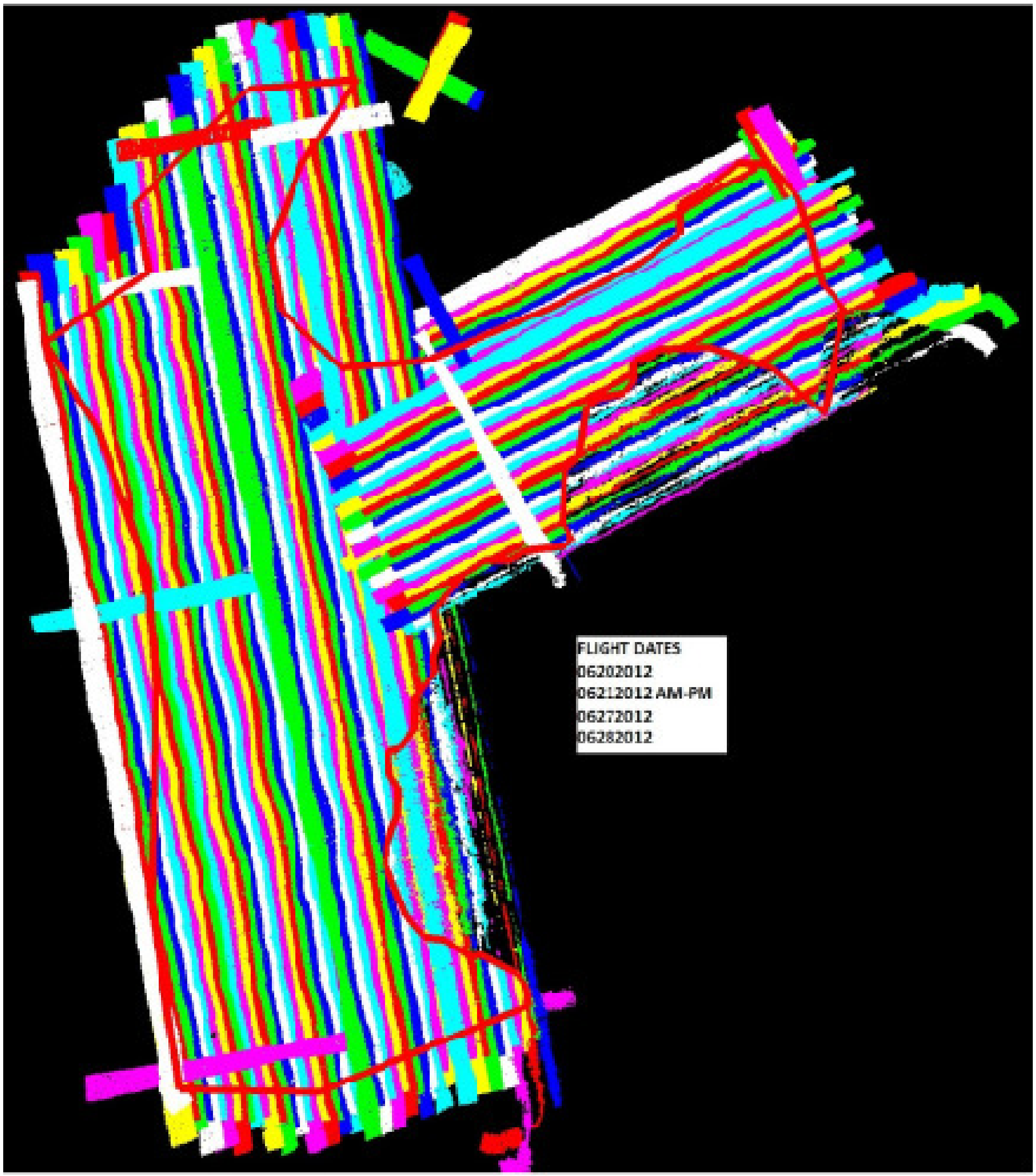


Figure 7 – LiDAR Swath output for East Placer showing complete coverage.

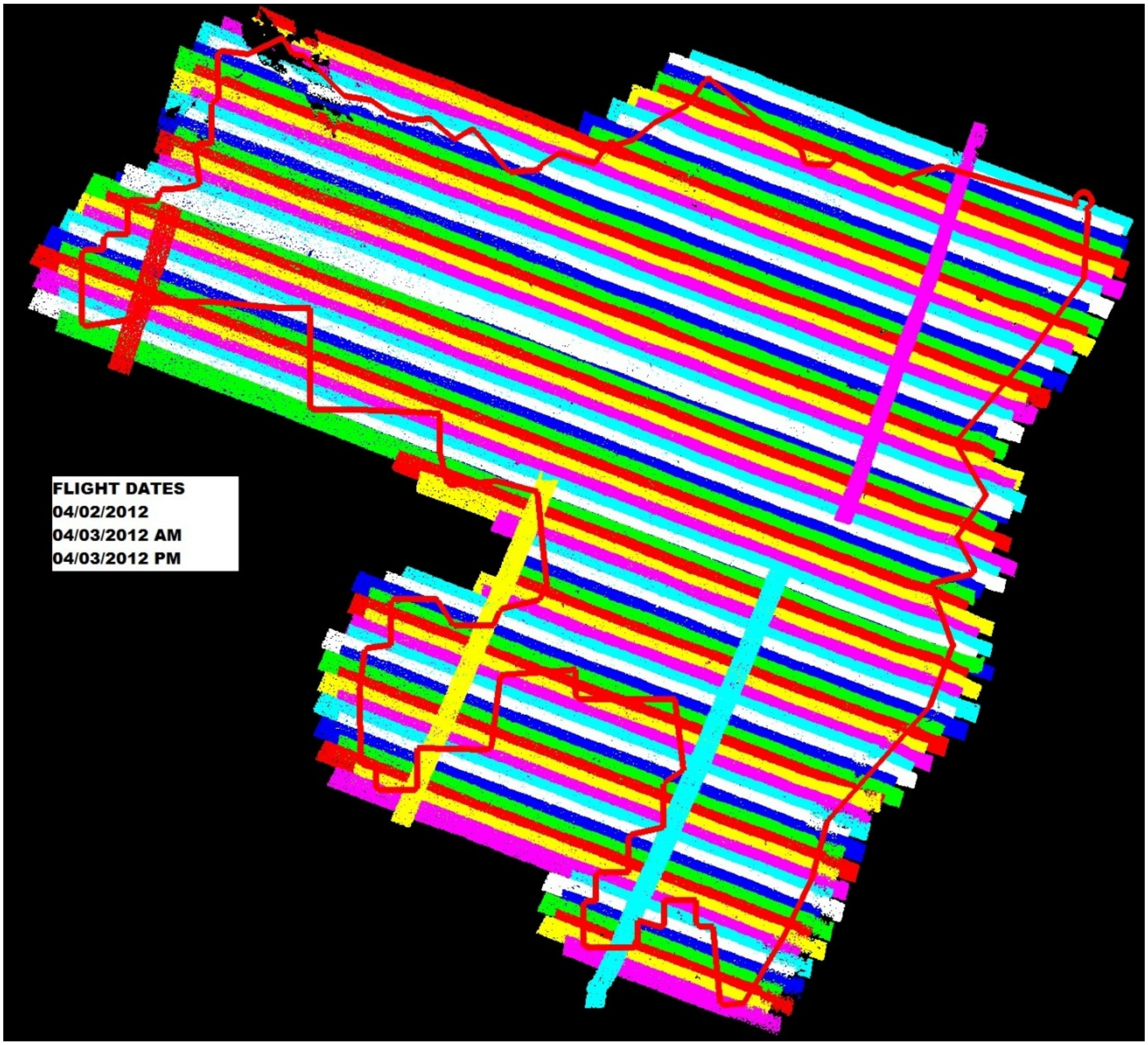


Figure 8 – LiDAR Swath output for West Placer showing complete coverage.

Overall the calibrated LiDAR data products collected by DMI meet or exceed the requirements set out in the Statement of Work. The quality control requirements of DMI's quality management program were adhered to throughout the acquisition stage for this project to ensure product quality.

SWATH ACCURACY RESULTS

Once Dewberry received the calibrated swath data from DMI, Dewberry tested the vertical accuracy of the open terrain swath data prior to additional processing. Dewberry tested the vertical accuracy of the swath data using the twenty three open terrain independent survey check points. The vertical accuracy is tested by comparing survey checkpoints in open terrain to a triangulated irregular network (TIN) that is created from the raw swath points. Only checkpoints in open terrain can be tested against raw swath data because the data has not undergone classification techniques to remove vegetation, buildings, and other artifacts from the ground surface. Checkpoints are always compared to interpolated surfaces from the LiDAR point cloud because it is unlikely that a survey checkpoint will be located at the location of a discrete LiDAR point. Project specifications require a FVA of 0.245 m based on the RMSEz (0.125 m) x 1.96. The dataset for the FEMA IX-Placer County, CA LiDAR Project satisfies the criteria. The raw LiDAR swath data tested 0.20 m vertical accuracy at 95% confidence level in open terrain, based on RMSEz (0.10 m) x 1.9600.

LiDAR Processing & Qualitative Assessment

DATA CLASSIFICATION AND EDITING

LiDAR mass points were produced to LAS 1.2 specifications, including the following LAS classification codes:

- Class 1 = Unclassified, used for all other features that do not fit into the Classes 2, 7, 9, 10, or 11, including vegetation, buildings, etc.
- Class 2 = Bare-Earth Ground
- Class 7 = Noise, low and high points
- Class 9 = Water, points located within collected breaklines
- Class 10 = Ignored Ground due to breakline proximity.
- Class 11 = Withheld, Points with scan angles exceeding +/- 20 degrees.

The data was processed using GeoCue and TerraScan software. The initial step is the setup of the GeoCue project, which is done by importing a project defined tile boundary index encompassing the entire project area. The acquired 3D laser point clouds, in LAS binary format, were imported into the GeoCue project and tiled according to the project tile grid. Once tiled, the laser points were classified using a proprietary routine in TerraScan. This routine classifies any obvious outliers in the dataset to class 7 and points with scan angles exceeding +/- 20 degrees to class 11. After points that could negatively affect the ground are removed from class 1, the ground layer is extracted from this remaining point cloud. The ground extraction process encompassed in this routine takes place by building an iterative surface model.

This surface model is generated using three main parameters: building size, iteration angle and iteration distance. The initial model is based on low points being selected by a "roaming window" with the assumption that these are the ground points. The size of this roaming window is determined by the building size parameter. The low points are triangulated and the remaining points are evaluated and subsequently added to the model if they meet the iteration angle and distance constraints. This process is repeated until no additional points are added within iterations. A second critical parameter is the maximum terrain angle constraint, which determines the maximum terrain angle allowed within the classification model.

The following fields within the LAS files are populated to the following precision: GPS Time (0.000001 second precision), Easting (0.003 meter precision), Northing (0.003 meter precision), Elevation (0.003 meter precision), Intensity (integer value - 12 bit dynamic range), Number of Returns (integer - range of 1-4), Return number (integer range of 1-4), Scan Direction Flag (integer - range 0-1), Classification (integer), Scan Angle Rank (integer), Edge of flight line (integer, range 0-1), User bit field (integer - flight line information encoded). The LAS file also contains a Variable length record in the file header that defines the projection, datums, and units.

Once the initial ground routine has been performed on the data, Dewberry creates Delta Z (DZ) orthos to check the relative accuracy of the LiDAR data. These orthos compare the elevations of LiDAR points from overlapping flight lines on a 1 meter pixel cell size basis. If the elevations of points within each pixel are within 10 cm of each other, the pixel is colored green. If the elevations of points within each pixel are between 10 cm and 20 cm of each other, the pixel is colored yellow, and if the elevations of points within each pixel are greater than 20 cm in difference, the pixel is colored red. Pixels that do not contain points from overlapping flight lines are colored according to their intensity values. DZ orthos can be created using the full point cloud or ground only points and are used to review and verify the calibration of the data is acceptable. Some areas are expected to show sections or portions of red, including terrain variations, slope changes, and vegetated areas or buildings if the full point cloud is used. However, large or continuous sections of yellow or red pixels can indicate the data was not calibrated correctly or that there were issues during acquisition that could affect the usability of the data. The DZ orthos for FEMA IX-Placer County, CA showed that the data was calibrated correctly with no issues that would affect its usability. The figure below shows an example of the DZ orthos.

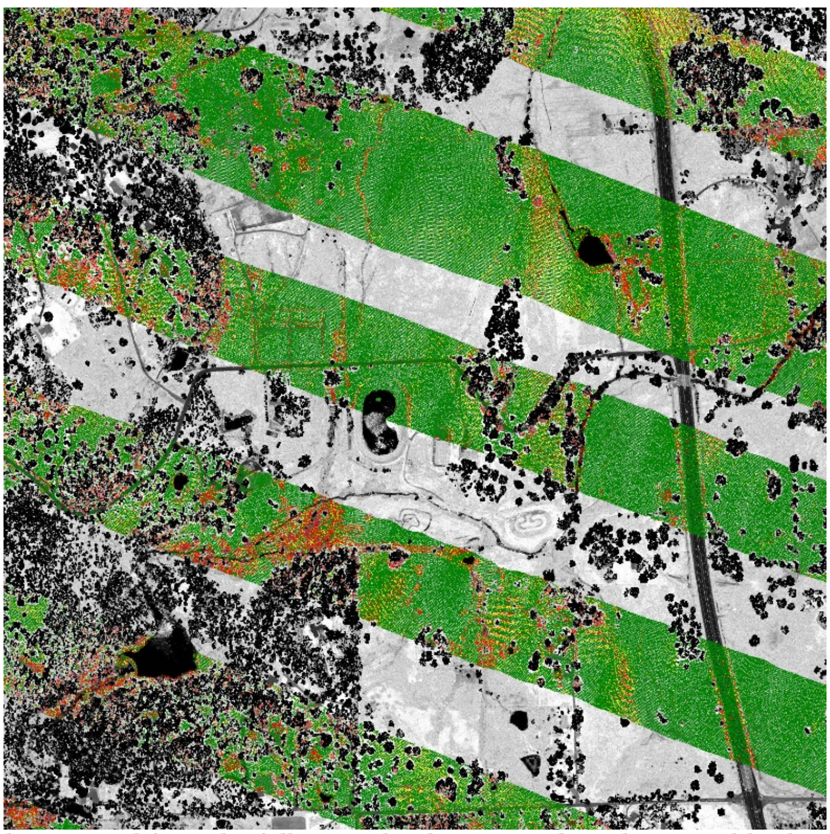


Figure 9 - DZ orthos created from the full point cloud. Some red pixels are visible along embankments, sloped terrain, and in vegetated land cover, as expected. Open, flat areas are green indicating the calibration and relative accuracy of the data is acceptable.

Dewberry utilized a variety of software suites for data processing. The LAS dataset was received and imported into GeoCue task management software for processing in Terrascan. Each tile was imported into Terrascan and a surface model was created to examine the ground classification. Dewberry analysts visually reviewed the ground surface model and corrected errors in the ground classification such as vegetation, buildings, and bridges that were present following the initial processing conducted by Dewberry. Dewberry analysts employ 3D visualization techniques to view the point cloud at multiple angles and in profile to ensure that non-ground points are removed from the ground classification. After the ground classification corrections were completed, the dataset was processed through a water classification routine that utilizes breaklines compiled by Dewberry to automatically classify hydro features. The water classification routine selects ground points within the breakline polygons and automatically classifies them as class 9, water. The final classification routine applied to the dataset selects ground points within a specified distance of the water breaklines and classifies them as class 10, ignored ground due to breakline proximity.

QUALITATIVE ASSESSMENT

Dewberry's qualitative assessment utilizes a combination of statistical analysis and interpretative methodology to assess the quality of the data for a bare-earth digital terrain model (DTM). This process looks for anomalies in the data and also identifies areas where man-made structures or vegetation points may not have been classified properly to produce a bare-earth model.

Within this review of the LiDAR data, two fundamental questions were addressed:

- Did the LiDAR system perform to specifications?
- Did the vegetation removal process yield desirable results for the intended bare-earth terrain product?

Mapping standards today address the quality of data by quantitative methods. If the data are tested and found to be within the desired accuracy standard, then the data set is typically accepted. Now with the proliferation of LiDAR, new issues arise due to the vast amount of data. Unlike photogrammetrically-derived DEMs where point spacing can be eight meters or more, LiDAR nominal point spacing for this project is 1 point per 1 square meter. The end result is that millions of elevation points are measured to a level of accuracy previously unseen for traditional elevation mapping technologies and vegetated areas are measured that would be nearly impossible to survey by other means. The downside is that with millions of points, the dataset is statistically bound to have some errors both in the measurement process and in the artifact removal process.

As previously stated, the quantitative analysis addresses the quality of the data based on absolute accuracy. This accuracy is directly tied to the comparison of the discreet measurement of the survey checkpoints and that of the interpolated value within the three closest LiDAR points that constitute the vertices of a three-dimensional triangular face of the TIN. Therefore, the end result is that only a small sample of the LiDAR data is actually tested. However there is an increased level of confidence with LiDAR data due to the relative accuracy. This relative accuracy in turn is based on how well one LiDAR point "fits" in comparison to the next contiguous LiDAR measurement, and is verified with DZ orthos. Once the absolute and relative accuracy has been ascertained, the next stage is to address the cleanliness of the data for a bare-earth DTM.

By using survey checkpoints to compare the data, the absolute accuracy is verified, but this also allows us to understand if the artifact removal process was performed correctly. To reiterate the quantitative approach, if the LiDAR sensor operated correctly over open terrain areas, then it most likely operated correctly over the vegetated areas. This does not mean that the entire bare-earth was measured; only that the elevations surveyed are most likely accurate (including elevations of treetops, rooftops, etc.). In the event that the LiDAR pulse filtered through the vegetation and was able to measure the true surface (as well as measurements on the surrounding vegetation) then the level of accuracy of the vegetation removal process can be tested as a by-product.

To fully address the data for overall accuracy and quality, the level of cleanliness (or removal of above-ground artifacts) is paramount. Since there are currently no effective automated testing procedures to measure cleanliness, Dewberry employs a combination of statistical and visualization processes. This includes creating pseudo image products such as LiDAR orthos produced from the intensity returns, Triangular Irregular Network (TIN)'s, Digital Elevation Models (DEM) and 3-dimensional models. By creating multiple images and using overlay techniques, not only can potential errors be found, but Dewberry can also find where the data meets and exceeds expectations. This report will present representative examples where the LiDAR and post processing had issues as well as examples of where the LiDAR performed well.

ANALYSIS

Dewberry utilizes GeoCue software as the primary geospatial process management system. GeoCue is a three tier, multi-user architecture that uses .NET technology from Microsoft. .NET technology provides the real-time notification system that updates users with real-time project status, regardless of who makes changes to project entities. GeoCue uses database technology for sorting project metadata. Dewberry uses Microsoft SQL Server as the database of choice. Specific analysis is conducted in Terrascan and QT Modeler environments.

Following the completion of LiDAR point classification, the Dewberry qualitative assessment process flow for the USGS FEMA IX-Placer County, CA LiDAR project incorporated the following reviews:

1. *Format:* The LAS files are verified to meet project specifications. The LAS files for the USGS FEMA IX-Placer County, CA LiDAR project conform to the specifications outlined below.

- Format, Echoes, Intensity
    - LAS format 1.2
    - Point data record format 1
    - Multiple returns (echoes) per pulse
    - Intensity values populated for each point
- ASPRS classification scheme
    - Class 1 – unclassified
    - Class 2 – Bare-earth ground
    - Class 7 – Noise
    - Class 9 – Water
    - Class 10 – Ignored Ground due to breakline proximity
    - Class 11 – Withheld due to scan angles exceeding +/- 20 degrees
- Projection
    - Datum – North American Datum 1983
    - Projected Coordinate System – East Placer UTM Zone 11, West Placer UTM Zone 10
    - Units – Meters
    - Vertical Datum – North American Vertical Datum 1988, Geoid 09
    - Vertical Units - Meters
- LAS header information:
    - Class (Integer)
    - GPS Week Time (0.0001 seconds)
    - Easting (0.003 meters)
    - Northing (0.003 meters)
    - Elevation (0.003 meters)
    - Echo Number (Integer 1 to 4)
    - Echo (Integer 1 to 4)
    - Intensity (8 bit integer)
    - Flight Line (Integer)
    - Scan Angle (Integer degree)

2. *Data density, data voids:* The LAS files are used to produce Digital Elevation Models using the commercial software package "QT Modeler" which creates a 3-dimensional data model derived from Class 2 (ground points) in the LAS files. Grid spacing is based on the project density deliverable requirement for un-obscured areas. For the USGS FEMA IX-Placer County, CA LiDAR project it is stipulated that the minimum post spacing in un-obscured areas should be 1 point per 1 square meter.

    a. Acceptable voids (areas with no LiDAR returns in the LAS files) are present in the majority of LiDAR projects. Voids caused by bodies of water are considered to be acceptable voids.

3. *Bare earth quality:* Dewberry reviewed the cleanliness of the bare earth to ensure the ground has correct definition, meets the project requirements, there is correct classification of points, and there are less than 5% residual artifacts.

    a. *Artifacts:* Artifacts are caused by the misclassification of ground points and usually represent vegetation and/or man-made structures. The artifacts identified are usually low lying structures, such as porches or low vegetation used as landscaping in neighborhoods and other developed areas. These low lying features are extremely difficult for the automated algorithms to detect as non-ground and must be removed manually. The vast majority of these features have been removed but a small number of these features are still in the ground classification. The limited numbers of features remaining in the ground are usually 0.3 meters or less above the actual ground surface, and should not negatively impact the usability of the dataset.

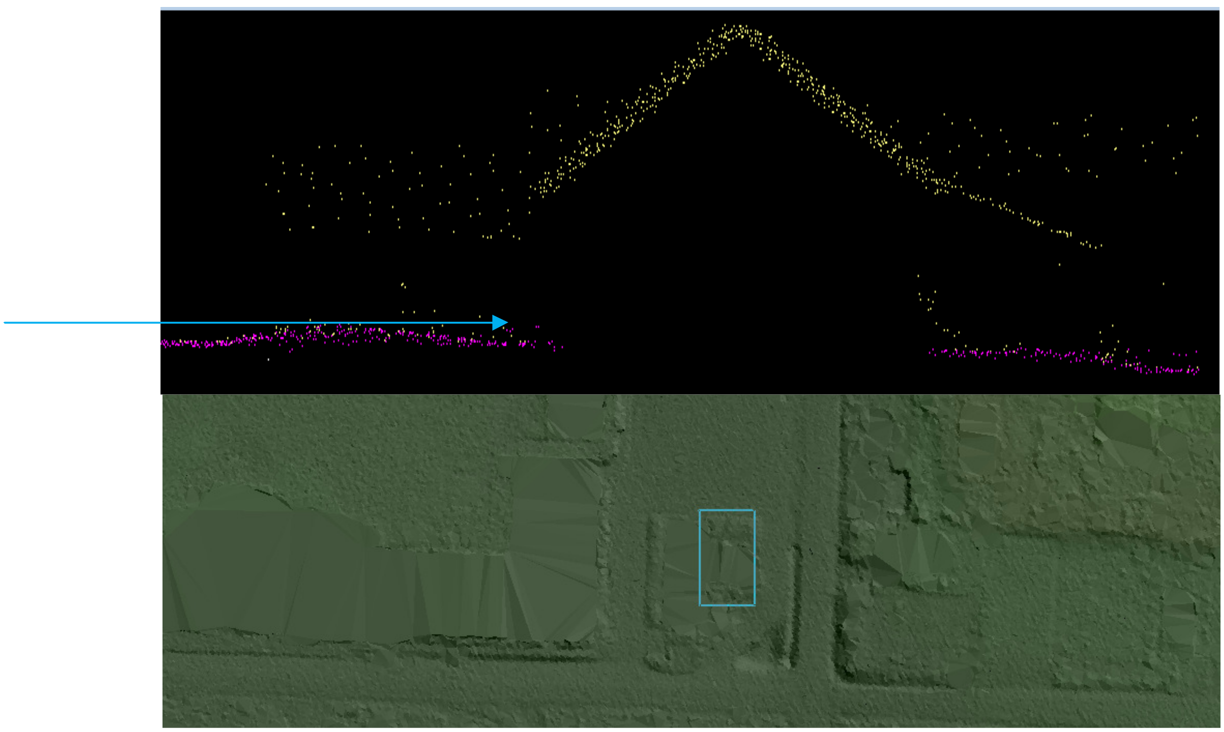


Figure 10 – East Placer tile number 10SGJ375477. Profile with points colored by class (class 1=yellow, class 2=pink) is shown in the top view and a TIN of the surface is shown in the bottom view. The arrow identifies low vegetation points. A limited number of these small features are still classified as ground but do not impact the usability of the dataset.

b. *Building Removal Artifacts:* Large buildings, unique construction, and buildings built on sloped terrain or built into the ground can make a noticeable impact on the bare earth DEM once they have been removed, often in the form of large void areas with obvious triangulation or interpolation across the area and general lack of detail in the ground where the structure stood. In a few areas, this interpolation has resulted in visual artifacts within building footprints. These "artifacts" are only visual and do not exist in the LiDAR points. An example is shown below.

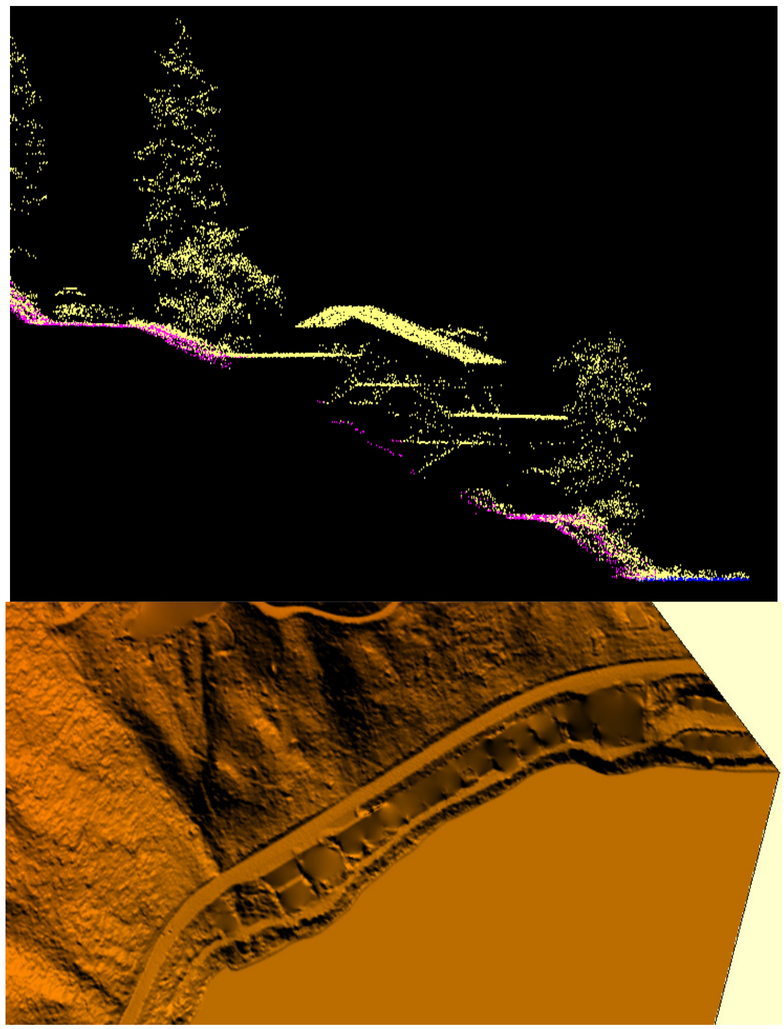


Figure 11 - Placer East Tile 10SGJ405477. The DEM in the bottom view shows visual artifacts because the surface model is interpolating between the available ground points on either side of the building points that were removed. The surface model must make a continuous model and in order to do so, points are connected through interpolation. This can cause visual artifacts in areas where the ground elevation is slightly lower on one side of building than the other. The profile in the top view shows the LiDAR points of this particular feature colored by class. All building points have been removed from ground (pink) and are unclassified (yellow). There are no ground points that can be modified to correct this visual artifact.

c. *Bridge Removal Artifacts:* The DEM surface models are created from TINs or Terrains. TIN and Terrain models create continuous surfaces from the inputs. Because a continuous surface is being created, the TIN or Terrain will use interpolation to triangulate across a bridge opening from legitimate ground points on either side of the actual bridge. This can cause visual artifacts or "saddles." These "artifacts" are only visual and do not exist in the LiDAR points or breaklines.

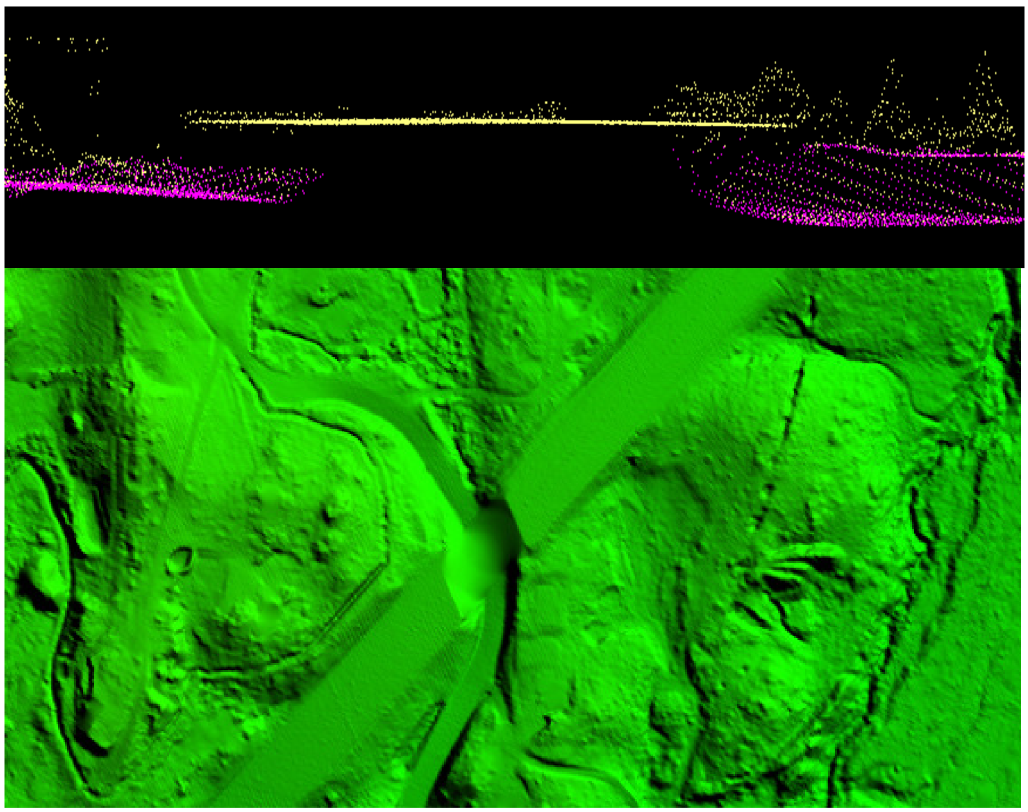


Figure 12 – West Placer Tile number 10SFJ595009. The DEM in the bottom view shows a visual artifact because the surface model is interpolating from the slope leading to the bridge to the lower ground points on either side of the bridge points that were removed. The surface model must make a continuous model and in order to do so, points are connected through interpolation. This can cause visual artifacts when there are features with large elevation differences. The profile in the top view shows the LiDAR points of this particular feature colored by class. All bridge points have been removed from ground (pink) and are unclassified (yellow). There are no ground points that can be modified to correct this visual artifact.

d. *Culverts and Bridges:* Bridges have been removed from the bare earth surface while culverts remain in the bare earth surface. In instances where it is difficult to determine if the feature is a culvert or bridge, such as with some small bridges, Dewberry erred on assuming they would be culverts especially if they are on secondary or tertiary roads. Below is an example of a culvert that has been left in the ground surface.

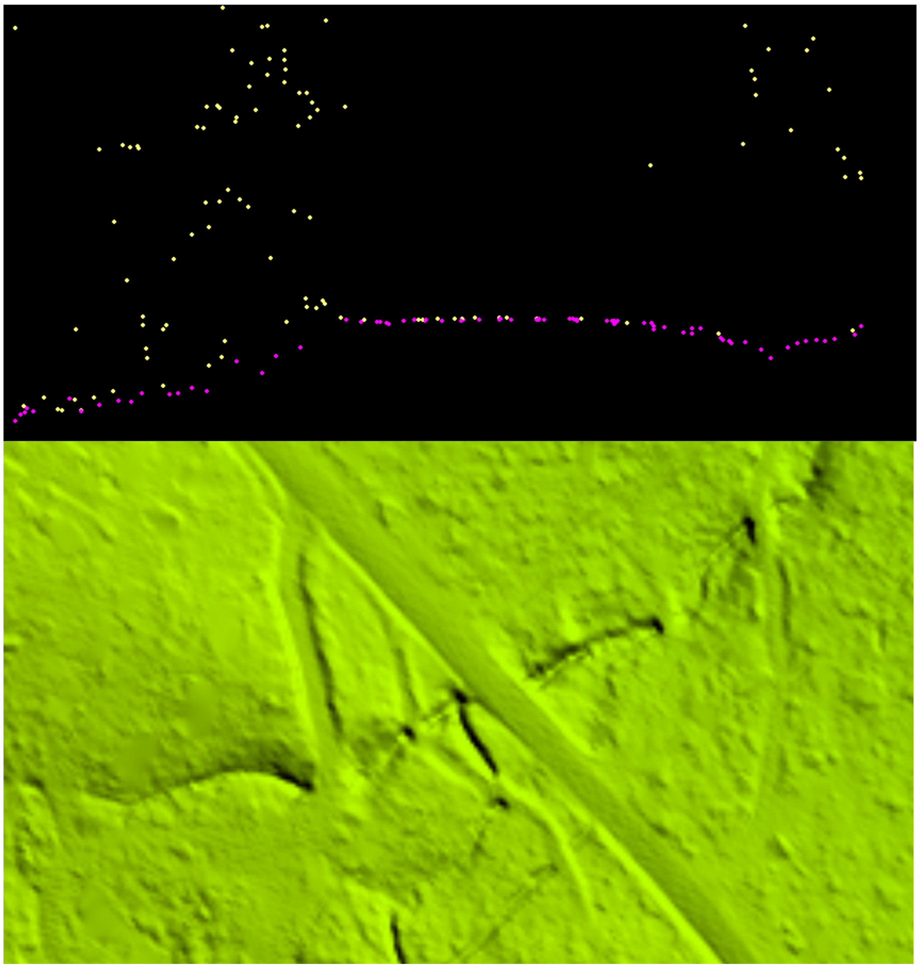


Figure 13 – East Placer tile number 10SGJ285282. Profile with points colored by class (class 1=yellow, class 2=pink) is shown in the top view and the DEM is shown in the bottom view. This culvert remains in the bare earth surface. Bridges have been removed from the bare earth surface and classified to class 1.

e. *Dirt Mounds*: Irregularities in the natural ground exist and may be interpreted as artifacts that should be removed. Small hills and dirt mounds are present throughout the project area. These features are correctly included in the ground.

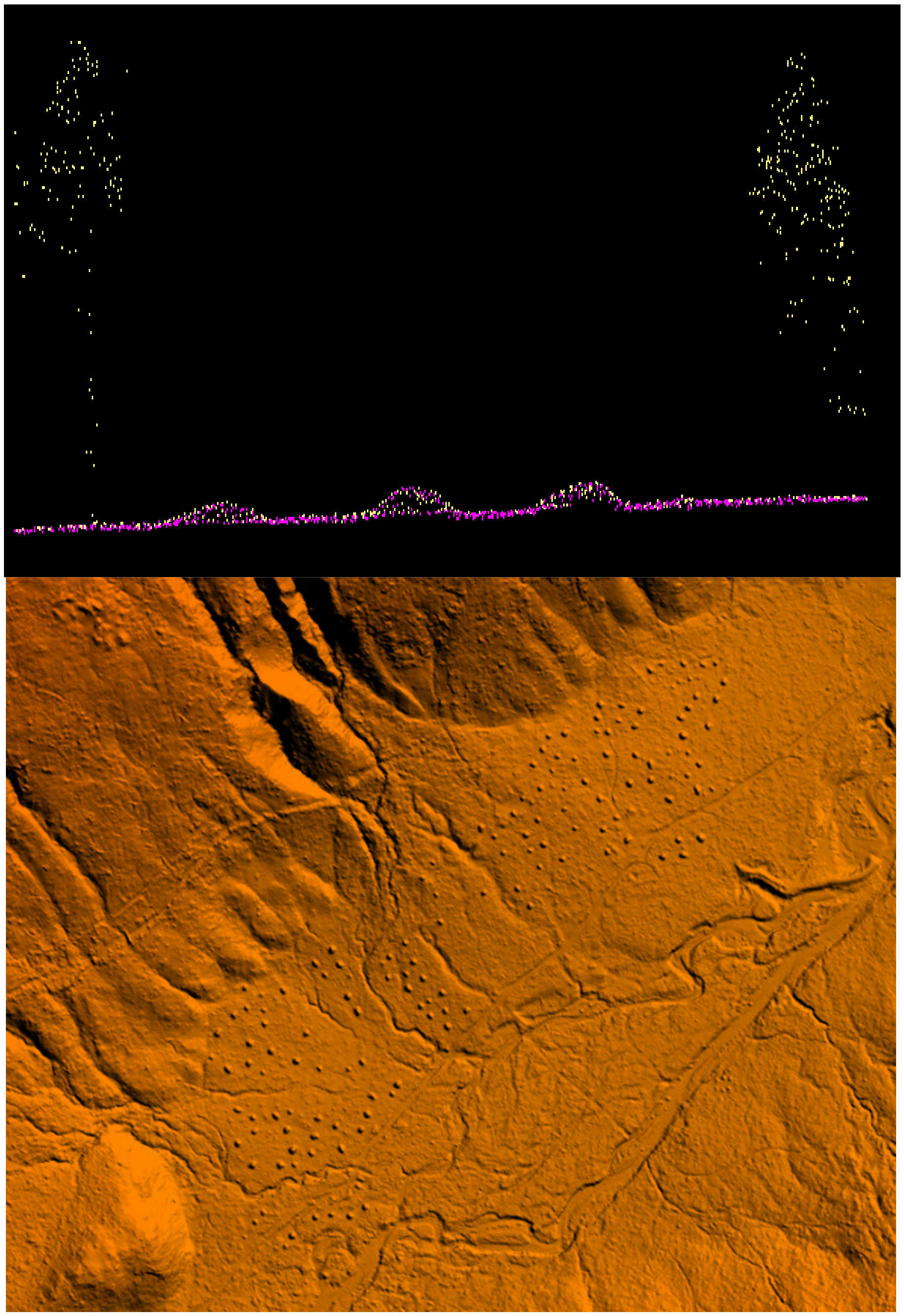


Figure 14 – East Placer Tile 10SGJ225327. Profile with the points colored by class (class 1=yellow, class 2=pink) is shown in the top view and a DEM of the surface is shown in the bottom view. These features are correctly included in the ground classification.

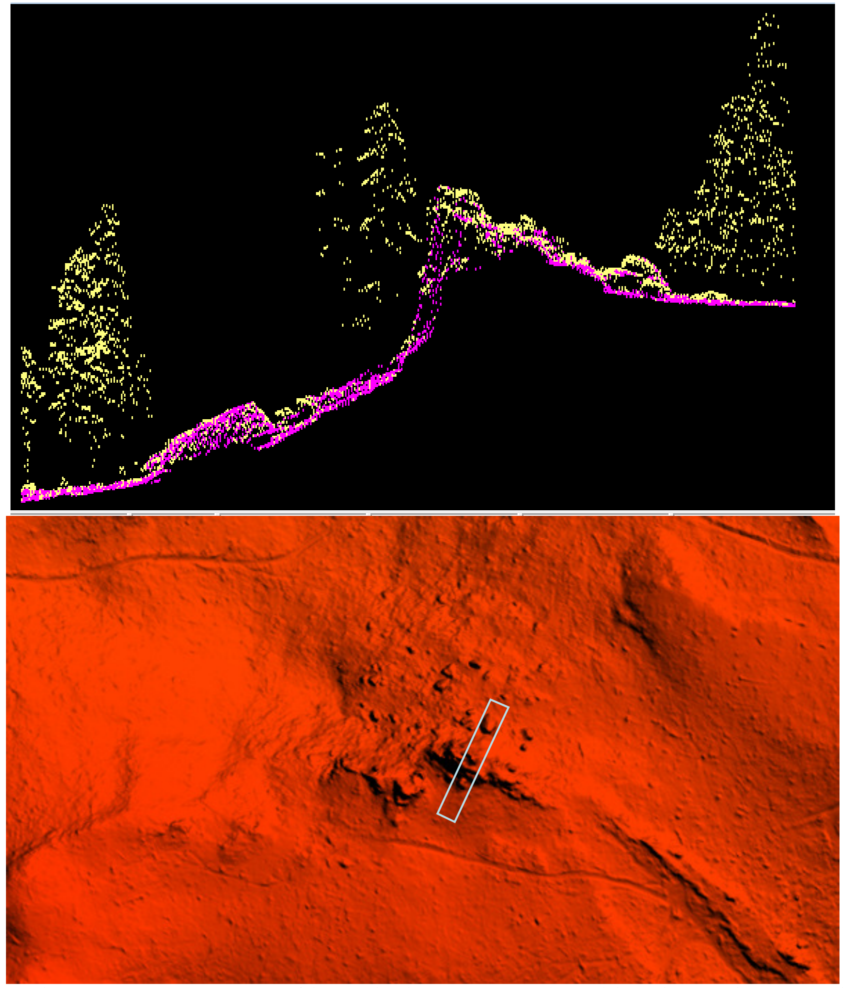


Figure 15 – East Placer Tile 10SGJ285447. Profile with the points colored by class (class 1=yellow, class 2=pink) is shown in the top view and a DEM of the surface is shown in the bottom view. These features are correctly included in the ground classification.

f. *Elevation Change Within Breaklines:* While water bodies are flattened in the final DEMs, other features such as linear hydrographic features can have significant changes in elevation within a small distance. In linear hydrographic features, this is often due to the presence of a structure that affects flow such as a dam or spillway. This can also occur in mountainous areas such as those found throughout the western extent of the project area. Dewberry has reviewed the DEMs to ensure that changes in elevation are shown from bank to bank. These changes are often shown as steps to reduce the presence of artifacts while ensuring consistent downhill flow. An example is shown below.

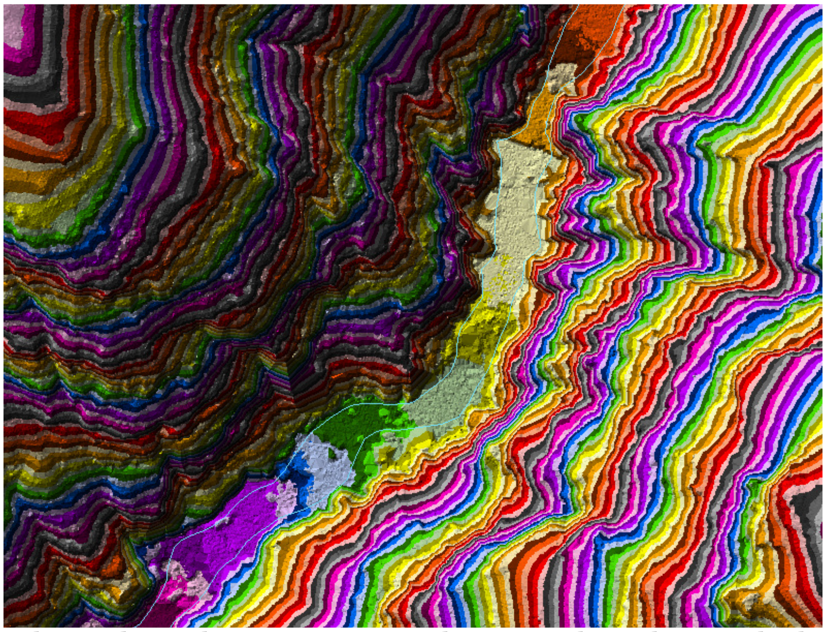


Figure 16 – West Placer Tile number 10SFJ565189. The terrain above shows multiple areas where the elevation changes dramatically as it flows down the mountain. Each color band indicates 1.5 meters of vertical elevation change.

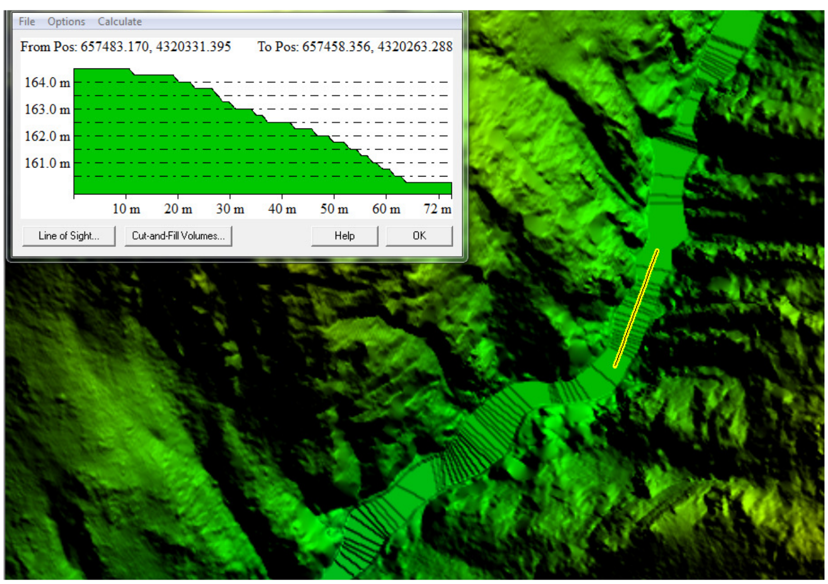


Figure 17 – West Placer Tile number 10SFJ565189. Elevation change has been stair stepped. The steps are flat from bank to bank and flow consistently downhill.

g. *Dams:* Large dams are present in the project area. Some of these features have spillways located at the top of the reservoir pools which were open when the data was acquired. The water was removed from the ground model which results in the appearance of gaps in the structure. All available points have been included in order to best represent the feature and no points can be modified to correct this visual artifact.

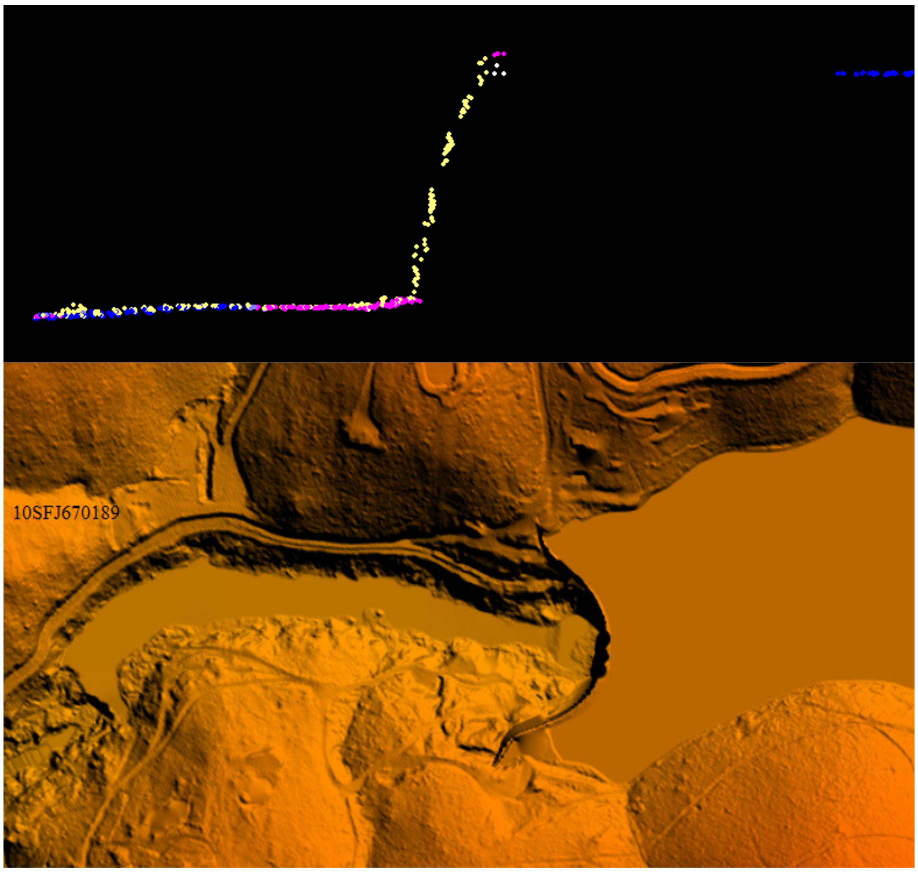


Figure 18 – West Placer Tile 10SFJ670189. The DEM in the bottom view shows visual artifacts because the surface model is interpolating between the available ground points on either side of the water points that were removed. The surface model must make a continuous model and in order to do so, points are connected through interpolation. The profile in the top view shows the LiDAR points of this particular feature colored by class. All water points (blue) have been removed from ground (pink). There are no ground points that can be modified to correct this visual artifact.

Figure 19 - Placer West Tile 10SFJ670189. The Intensity above shows that the dam spillway was open at the time the data was acquired. All available ground points have been included in the ground model. No points can be modified to correct for the visual artifact that occurs at the spillway.

CONCLUSION

Overall the data meets project specifications. The dataset conforms to project requirements for format, header values, and spatial projection information. The classification of points is correct and the final ground points accurately represent the bare earth surface. Minor artifacts and small areas of misclassification are isolated and have minimal impact on the usability of the dataset.

Survey Vertical Accuracy Checkpoints

PLACER COUNTY, CA LiDAR QA			
EAST COORDINATE SYSTEM UTM ZONE 11 and WEST COORDINATE SYSTEM UTM ZONE 10			
	NAD83 (m)		NAVD88 (m)
POINT ID	EASTING (m)	EASTING (m)	ORTHO HEIGHT (m)
Check Points			
E401Base	220931.024	4344340.25	1994.32
E402	223827.833	4356649.67	1787.81
E403	221490.664	4341923.97	1976.36
E404_PID	221954.557	4338012.20	2119.97
E405	225070.552	4336764.48	1971.45
E406_PID	226901.899	4334187.04	1906.29
E407	221971.032	4330598.51	2133.49
E408	235264.304	4349937.64	2162.51
E409	241246.652	4348270.05	1929.30
E410	232288.279	4342969.50	1961.57
E411	226258.472	4339760.12	1898.60
E412W	221017.396	4343704.45	1890.84
E501	223709.738	4344419.27	1863.65
E502	222952.343	4350620.77	1821.62
E503	221738.783	4347911.29	1995.73
E504	228170.593	4339139.37	1914.26
E505	224130.46	4333832.4	1940.44
E506	226542.371	4331058.58	1903.68
E507	238309.294	4347623.59	1904.46
E508	234250.161	4346432.76	1899.65
E509_DP3	224298.029	4341397.36	1889.90
E510	230530.766	4342065.29	1911.74
E701	223581.08	4346397.91	1848.17
E702	224377.31	4354485.68	1940.33
E703	222519.702	4352920.97	1920.13
E704	227150.555	4336430.22	1907.98
E705	225847.828	4326603.01	2033.12
E706	228655.797	4327776.07	1967.34
E707	233241.341	4349035.57	2263.96

E708	228468.008	4347004.04	2396.18
E709	240509.337	4346249.74	1944.50
E710	236609.543	4348854.53	1957.34
E711	222471.258	4353365.56	1928.75
W401	657580.389	4294866.74	127.28
W402	665116.567	4303070.66	342.93
W403	657992.687	4304161.50	273.37
W404	667865.568	4310589.88	474.39
W405	669132.047	4318342.77	586.88
W406	660443.927	4310936.57	339.77
W407	654285.311	4316368.28	116.25
W408	647827.868	4321411.11	106.95
W409	645721.81	4319382.98	60.67
W410	649739.103	4314905.78	73.76
W412	655499.824	4313133.60	169.60
W501	659397.248	4295962.76	149.53
W502	662826.497	4299542.88	203.34
W503	651972.08	4301616.9	121.739
W504	663767.874	4308615.65	351.24
W505	671158.374	4316500.52	575.79
W506	663580.479	4317836.17	408.66
W507	660370.427	4314301.16	379.26
W508	648551.766	4319024.31	109.80
W509	641373.969	4316378.75	36.05
W510	645805.383	4316492.06	55.99
W701	662245.066	4296808.02	160.13
W702	660928.309	4304445.37	267.54
W703	667729.01	4304962.67	396.67
W704	664582.745	4311280.60	436.67
W705	667150.501	4314768.01	427.75
W706	661371.117	4321141.91	417.91
W707	657289.593	4308054.50	119.76
W708	660180.866	4317370.19	381.55
W709	651535.476	4317872.23	111.26
W710	646092.441	4323185.56	100.43

Table 8: Surveyed accuracy checkpoints collected for USGS FEMA IX-Placer County, CA LiDAR Project

LiDAR Vertical Accuracy Statistics & Analysis

BACKGROUND

Dewberry tests and reviews project data both quantitatively (for accuracy) and qualitatively (for usability).

For qualitative assessment (i.e. vertical accuracy assessment), sixty four (64) check points were surveyed for the project and are located within open terrain, tall weeds/crops, and forested/fully grown land cover categories. The checkpoints were surveyed for the project using RTK survey methods. Please see Appendix A to view the survey report which details and validates how the survey was completed for this project.

Checkpoints were evenly distributed throughout the project area so as to cover as many flight lines as possible using the "dispersed method" of placement.

VERTICAL ACCURACY TEST PROCEDURES

FVA (Fundamental Vertical Accuracy) is determined with check points located only in the open terrain (grass, dirt, sand, and/or rocks) land cover category, where there is a very high probability that the LiDAR sensor will have detected the bare-earth ground surface and where random errors are expected to follow a normal error distribution. The FVA determines how well the calibrated LiDAR sensor performed. With a normal error distribution, the vertical accuracy at the 95% confidence level is computed as the vertical root mean square error (RMSEz) of the checkpoints x 1.9600. For the FEMA IX-Placer County, CA LiDAR project, vertical accuracy must be 0.245 meters or less based on an RMSEz of 0.125 meters x 1.9600.

CVA (Consolidated Vertical Accuracy) is determined with all checkpoints in all land cover categories combined where there is a possibility that the LiDAR sensor and post-processing may yield elevation errors that do not follow a normal error distribution. CVA at the 95% confidence level equals the 95th percentile error for all checkpoints in all land cover categories combined. The FEMA IX-Placer County, CA LiDAR Project CVA standard is 0.363 meters based on the 95th percentile. The CVA is accompanied by a listing of the 5% outliers that are larger than the 95th percentile used to compute the CVA; these are always the largest outliers that may depart from a normal error distribution. Here, $Accuracy_z$ differs from CVA because $Accuracy_z$ assumes elevation errors follow a normal error distribution where RMSE procedures are valid, whereas CVA assumes LiDAR errors may not follow a normal error distribution in vegetated categories, making the RMSE process invalid.

SVA (Supplemental Vertical Accuracy) is determined for each land cover category other than open terrain. SVA at the 95% confidence level equals the 95th percentile error for all checkpoints in each land cover category. The FEMA IX-Placer County, CA LiDAR Project SVA target is 0.363 meters based on the 95th percentile. Target specifications are given for SVA's as one individual land cover category may exceed this target value as long as the overall CVA is within specified tolerances. Again, $Accuracy_z$ differs from SVA because $Accuracy_z$ assumes elevation errors follow a normal error distribution where RMSE procedures are valid, whereas SVA assumes LiDAR errors may not follow a normal error distribution in vegetated categories, making the RMSE process invalid.

The relevant testing criteria are summarized in Table 9.

Quantitative Criteria	Measure of Acceptability
Fundamental Vertical Accuracy (FVA) in open terrain only using RMSEz *1.9600	0.245 meters (based on RMSEz (0.125 meters) * 1.9600)
Consolidated Vertical Accuracy (CVA) in all land cover categories combined at the 95% confidence level	0.363 meters (based on combined 95th percentile)
Supplemental Vertical Accuracy (SVA) in each land cover category separately at the 95% confidence level	0.363 meters (based on 95th percentile for each land cover category)

Table 9— Acceptance Criteria

VERTICAL ACCURACY TESTING STEPS

The primary QA/QC vertical accuracy testing steps used by Dewberry are summarized as follows:

1. Dewberry's team surveyed QA/QC vertical checkpoints in accordance with the project's specifications.
2. Next, Dewberry interpolated the bare-earth LiDAR DTM to provide the z-value for each of the checkpoints.
3. Dewberry then computed the associated z-value differences between the interpolated z-value from the LiDAR data and the ground truth survey checkpoints and computed FVA, CVA, and SVA values.
4. The data were analyzed by Dewberry to assess the accuracy of the data. The review process examined the various accuracy parameters as defined by the scope of work. The overall descriptive statistics of each dataset were computed to assess any trends or anomalies. This report provides tables, graphs and figures to summarize and illustrate data quality.

The figure below shows the location of the QA/QC checkpoints within the project area.

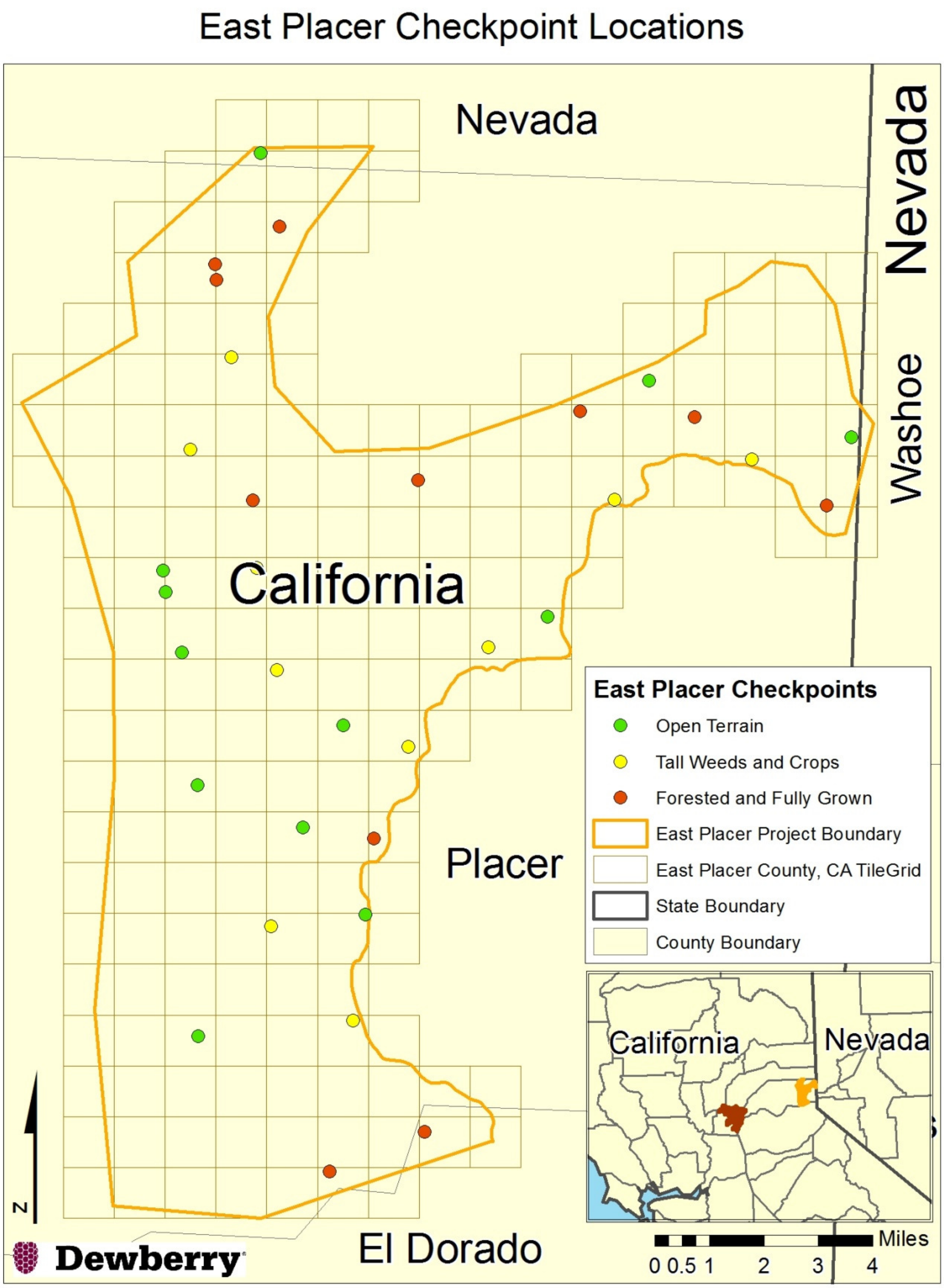


Figure 20 – Location of East Placer QA/QC Checkpoints

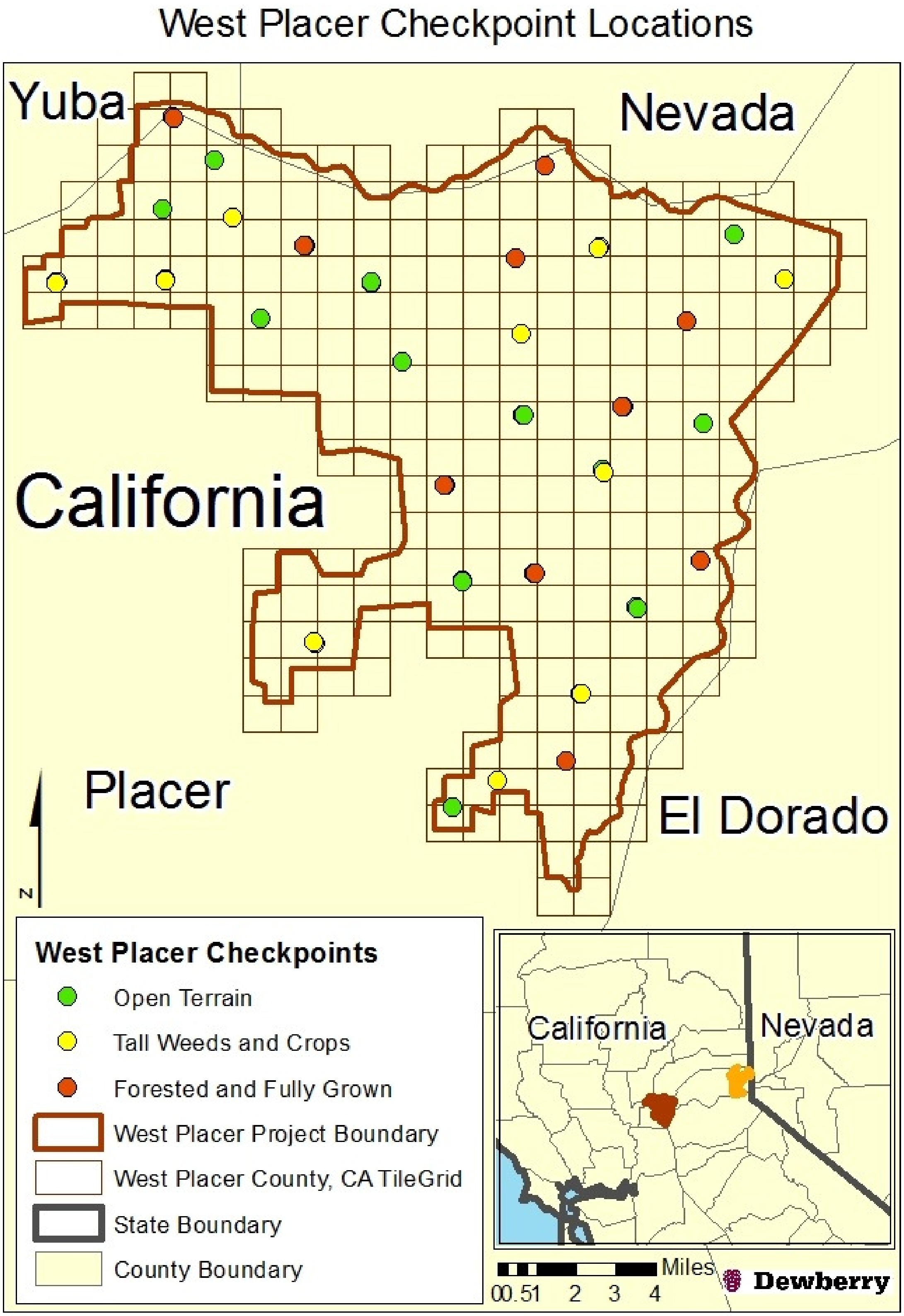


Figure 21 – Location of West Placer QA/QC Checkpoints

VERTICAL ACCURACY RESULTS

The table below summarizes the tested vertical accuracy for the entire FEMA IX – Placer County Project Area resulting from a comparison of the surveyed checkpoints to the elevation values present within the LiDAR LAS files for East and West Placer areas combined.

Land Cover Category	# of Points	FVA – Fundamental Vertical Accuracy (RMSEz x 1.9600) Spec=0.245 m	CVA – Consolidated Vertical Accuracy (95th Percentile) Spec=0.363 m	SVA – Supplemental Vertical Accuracy (95th Percentile) Target=0.363 m
Consolidated	64		0.18	
Open Terrain	23	0.19		
Tall Weeds and Crops	20			0.16
Forested and Fully Grown	21			0.20

Table 10 – FVA, CVA, and SVA Vertical Accuracy at 95% Confidence Level

The $RMSE_z$ for checkpoints in open terrain only tested 0.10 meters, within the target criteria of 0.125 meters. Compared with the 0.245 meters specification, the FVA tested 0.19 meters at the 95% confidence level based on $RMSE_z$ x 1.9600.
Compared with the 0.363 meters specification, CVA for all checkpoints in all land cover categories combined tested 0.18 meters a based on the 95^{th} percentile.
Compared with target 0.363 specification, SVA for checkpoints in the tall weeds and crops land cover category tested 0.16 meters based on the 95^{th} percentile, and checkpoints in the forested and fully grown land cover category tested 0.20 meters based on the 95^{th} percentile.

The figure below illustrates the magnitude of the differences between the QA/QC checkpoints and LiDAR data. This shows that the majority of LiDAR elevations were within +/- 0.15 meters of the checkpoints elevations, but there were some outliers where LiDAR and checkpoint elevations differed by up to +0.21 meters.

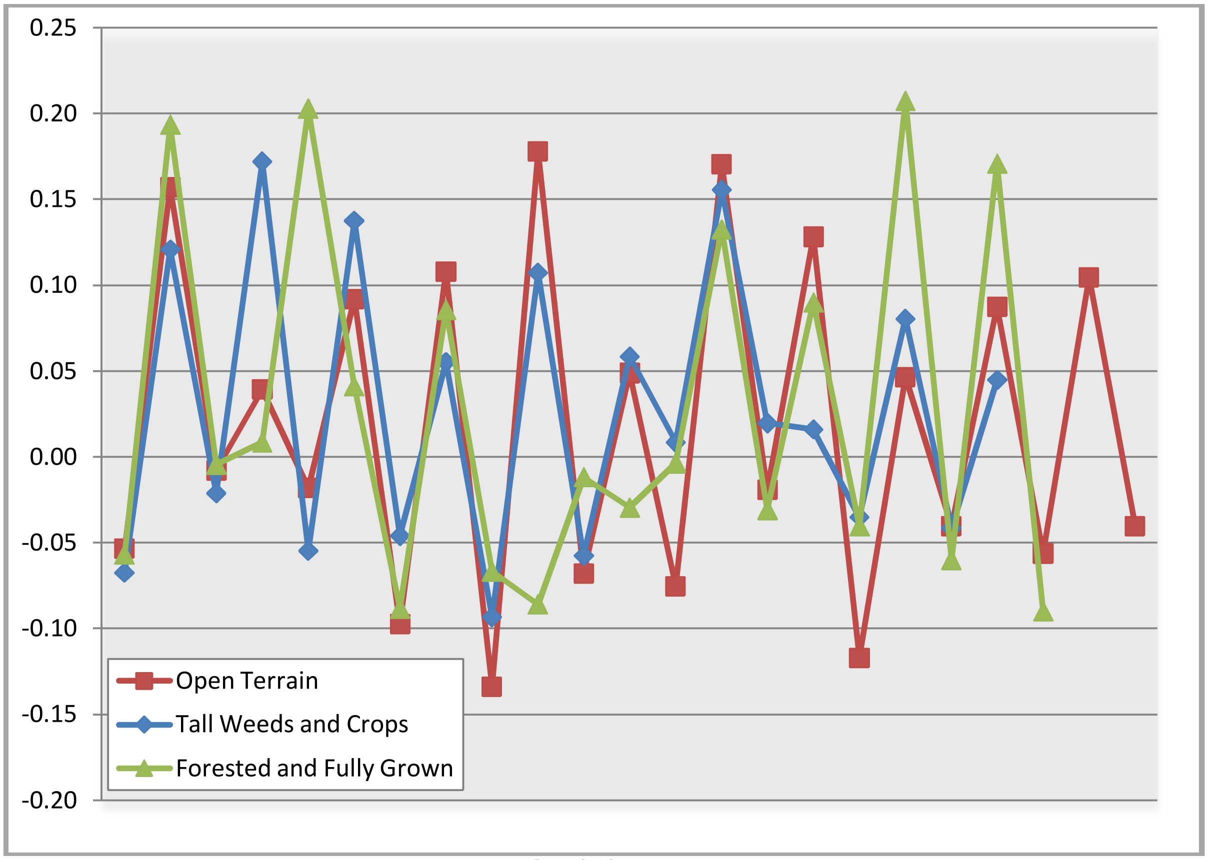


Figure 22 – Magnitude of Elevation Discrepancies

Table 11 lists the 5% outliers that are larger than the 95th percentile.

Point ID	NAD83 UTM North		NAVD88	LiDAR Z (m)	Delta Z	AbsDeltaZ
	Easting X (m)	Northing Y (m)	Survey Z (m)			
W701	662245.066	4296808.02	160.13	160.3244	0.19	0.19
E703	222519.702	4352920.97	1920.13	1920.3317	0.20	0.20
W709	651535.476	4317872.23	111.26	111.4643	0.21	0.21

Table 11 — 5% Outliers

Table 12 provides overall descriptive statistics.

100 % of Totals	RMSE (m) Open Terrain Spec=0.125m	Mean (m)	Median (m)	Skew	Std Dev (m)	# of Points	Min (m)	Max (m)
Consolidated		0.02	0.00	0.40	0.09	64	-0.13	0.21
Open Terrain	0.10	0.02	-0.01	0.18	0.10	23	-0.13	0.18
Tall Weeds and Crops		0.03	0.02	0.32	0.08	20	-0.09	0.17
Forested and Fully Grown		0.03	0.00	0.68	0.10	21	-0.09	0.21

Table 12 – Overall Descriptive Statistics

Figure 23 illustrates a histogram of the associated elevation discrepancies between the QA/QC checkpoints and elevations interpolated from the LiDAR triangulated irregular network (TIN). The frequency shows the number of discrepancies within each band of elevation differences. The discrepancies vary between a low of -0.13 meters and a high of +0.21 meters. The vast majority of points are within the ranges of -0.10 meters to +0.20 meters.

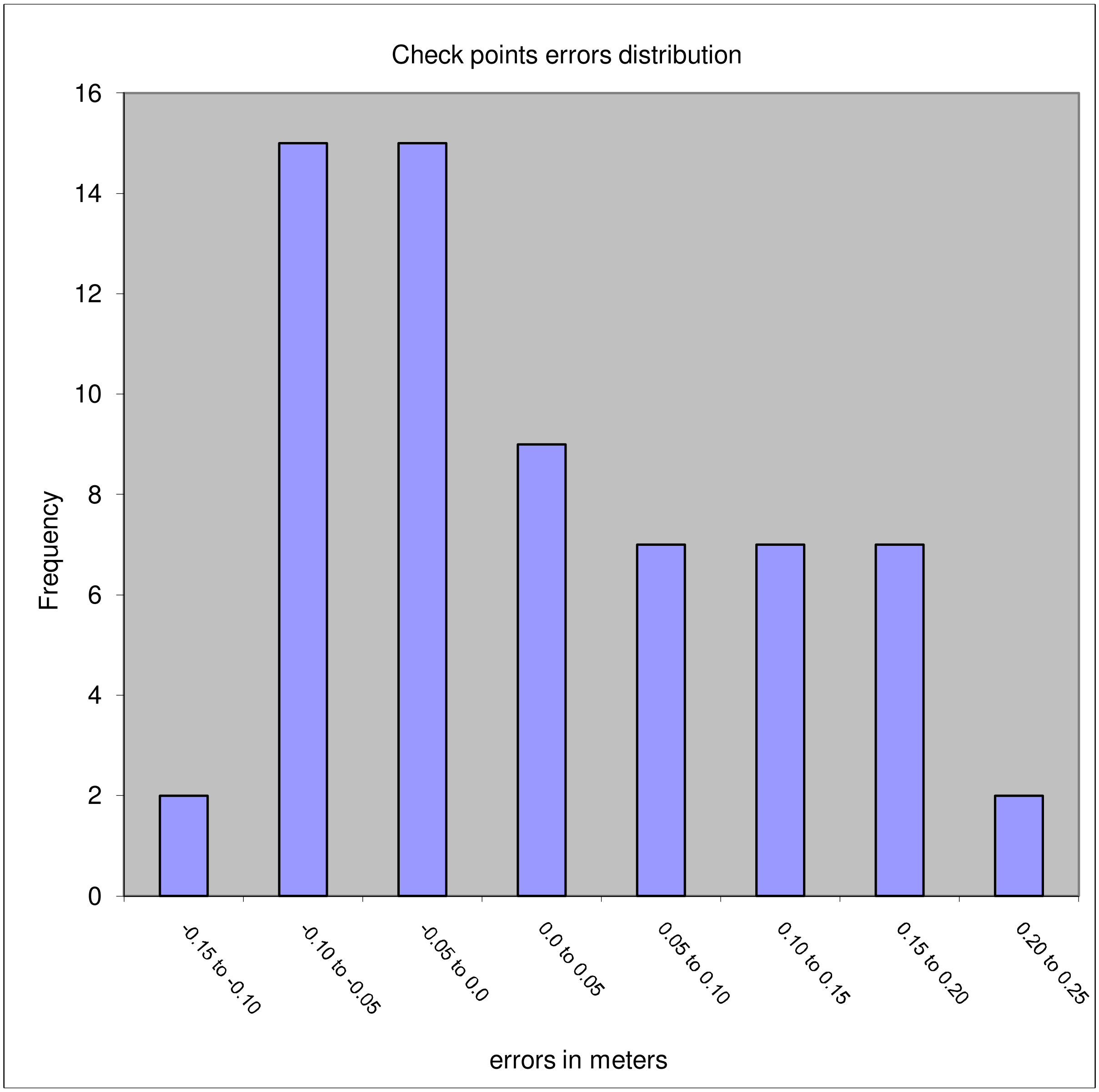


Figure 23– Histogram of Elevation Discrepancies within errors in meters

CONCLUSION

Based on the vertical accuracy testing conducted by Dewberry, the LiDAR dataset for the USGS FEMA IX-Placer County, CA LiDAR Project satisfies the project's pre-defined vertical accuracy criteria.

Breakline Production & Qualitative Assessment Report

BREAKLINE PRODUCTION METHODOLOGY

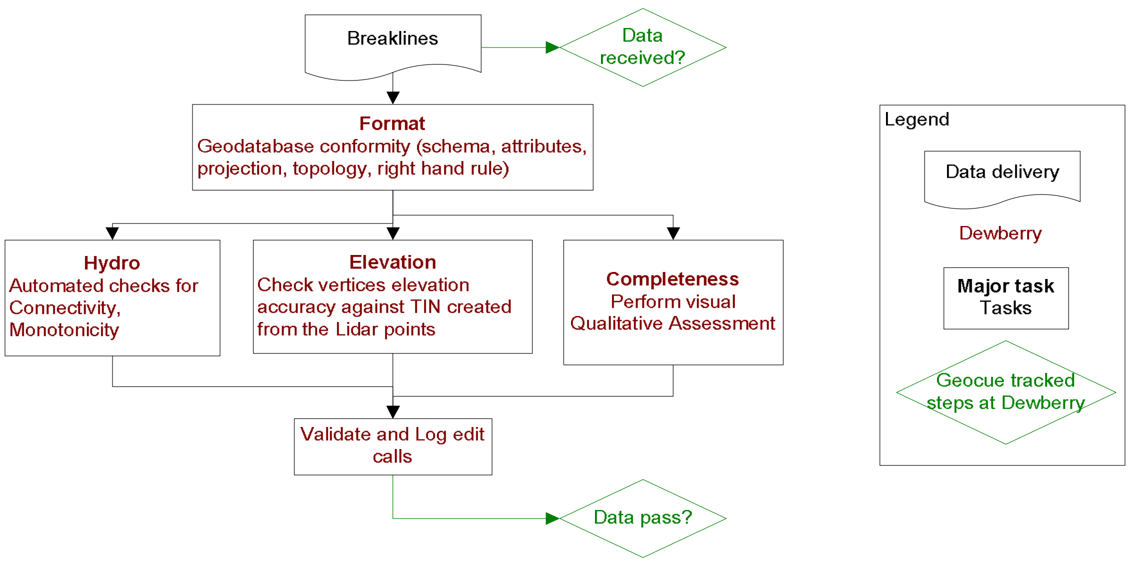
Dewberry used GeoCue software to develop LiDAR stereo models of the USGS FEMA IX-Placer County, CA LiDAR Project area so the LiDAR derived data could be viewed in 3-D stereo using

Socet Set softcopy photogrammetric software. Using LiDARgrammetry procedures with LiDAR intensity imagery, Dewberry used the stereo models developed by Dewberry to stereo-compile the three types of hard breaklines in accordance with the project's Data Dictionary.

All drainage breaklines are monotonically enforced to show downhill flow. Water bodies are reviewed in stereo and the lowest elevation is applied to the entire waterbody.

BREAKLINE QUALITATIVE ASSESSMENT

Dewberry completed breakline qualitative assessments according to a defined workflow. The following workflow diagram represents the steps taken by Dewberry to provide a thorough qualitative assessment of the breakline data.



BREAKLINE TOPOLOGY RULES

Automated checks are applied on hydro features to validate the 3D connectivity of the feature and the monotonicity of the hydrographic breaklines. Dewberry's major concern was that the hydrographic breaklines have a continuous flow downhill and that breaklines do not undulate. Error points are generated at each vertex not complying with the tested rules and these potential edit calls are then visually validated during the visual evaluation of the data. This step also helped validate that breakline vertices did not have excessive minimum or maximum elevations and that elevations are consistent with adjacent vertex elevations.

The next step is to compare the elevation of the breakline vertices against the elevation extracted from the ESRI Terrain built from the LiDAR ground points, keeping in mind that a discrepancy is expected because of the hydro-enforcement applied to the breaklines and because of the interpolated imagery used to acquire the breaklines. A given tolerance is used to validate if the elevations differ too much from the LiDAR.

Dewberry's final check for the breaklines was to perform a full qualitative analysis. Dewberry compared the breaklines against LiDAR intensity images to ensure breaklines were captured in the required locations. The quality control steps taken by Dewberry are outlined in the QA Checklist below.

BREAKLINE QA/QC CHECKLIST

Project Number/Description: TO G10PC00013 FEMA IX-Placer County, CA LiDAR

Date:______11/5/2012____

Overview

☒ All Feature Classes are present in GDB

☒ All features have been loaded into the geodatabase correctly. Ensure feature classes with subtypes are domained correctly.

☒ The breakline topology inside of the geodatabase has been validated. See Data Dictionary for specific rules

☒ Projection/coordinate system of GDB is accurate with project specifications

Perform Completeness check on breaklines using either intensity or ortho imagery

☒ Check entire dataset for missing features that were not captured, but should be to meet baseline specifications or for consistency (See Data Dictionary for specific collection rules). Features should be collected consistently across tile bounds within a dataset as well as be collected consistently between datasets.

☒ Check to make sure breaklines are compiled to correct tile grid boundary and there is full coverage without overlap

☒ Check to make sure breaklines are correctly edge-matched to adjoining datasets if applicable. Ensure breaklines from one dataset join breaklines from another dataset that are coded the same and all connecting vertices between the two datasets match in X,Y, and Z (elevation). There should be no breaklines abruptly ending at dataset boundaries and no discrepancies of Z-elevation in overlapping vertices between datasets.

Compare Breakline Z elevations to LiDAR elevations

☒ Using a terrain created from LiDAR ground points and water points and GeoFIRM tools, drape breaklines on terrain to compare Z values. Breakline elevations should be at or below the elevations of the immediately surrounding terrain. This should be performed before other breakline checks are completed.

Perform automated data checks using PLTS

The following data checks are performed utilizing ESRI's PLTS extension. These checks allow automated validation of 100% of the data. Error records can either be written to a table for future correction, or browsed for immediate correction. PLTS checks should always be performed on the full dataset.

☒ Perform "adjacent vertex elevation change check" on the Inland Ponds feature class (Elevation Difference Tolerance=.001 meters). This check will return Waterbodies whose vertices are not all identical. This tool is found under "Z Value Checks."

☒ Perform "unnecessary polygon boundaries check" on Inland Ponds and Inland Streams feature classes. This tool is found under "Topology Checks."

☒ Perform "duplicate geometry check" on (inland streams to inland streams), (inland ponds to inland ponds), (inland ponds to inland streams). Attributes do not need to be checked during this tool. This tool is found under "Duplicate Geometry Checks."

☒ Perform "geometry on geometry check" on (inland ponds to inland streams). Spatial relationship is contains, attributes do not need to be checked. This tool is found under "Feature on Feature Checks."

☒ Perform "polygon overlap/gap is sliver check" (inland streams to inland streams), (inland ponds to inland ponds), (inland ponds to inland streams). Maximum Polygon Area is not required. This tool is found under "Feature on Feature Checks."

Perform Dewberry Proprietary Tool Checks

☒ Perform monotonicity check on inland streams features using "A3_checkMonotonicityStreamLines." This tool looks at line direction as well as elevation. Features in the output shapefile attributed with a "d" are correct monotonically, but were compiled from low elevation to high elevation. These errors can be ignored. Features in the output shapefile attributed with an "m" are not correct monotonically and need elevations to be corrected. Input features for this tool need to be in a geodatabase. Z tolerance is .01 meters. Polygons need to be exported as lines for the monotonicity tool.

☒ Perform connectivity check between (inland ponds to inland streams) using the tool "07_CheckConnectivityForHydro." The input for this tool needs to be in a geodatabase.

The output is a shapefile showing the location of overlapping vertices from the polygon features and polyline features that are at different Z-elevation. The unnecessary polygon boundary check must be run and all errors fixed prior to performing connectivity check. If there are exceptions to the polygon boundary rule then that feature class must be checked against itself, i.e. inland streams to inland streams.

Metadata

☒ Each XML file (1 per feature class) is error free as determined by the USGS MP tool

☒ Metadata content contains sufficient detail and all pertinent information regarding source materials, projections, datums, processing steps, etc. Content should be consistent across all feature classes.

Completion Comments: **Complete – Approved**

Data Dictionary

HORIZONTAL AND VERTICAL DATUM

The horizontal datum shall be North American Datum of 1983 (HARN), Units in Meters. The vertical datum shall be referenced to the North American Vertical Datum of 1988 (NAVD 88), Units in Meters. Geoid09 shall be used to convert ellipsoidal heights to orthometric heights.

COORDINATE SYSTEM AND PROJECTION

All East Placer data shall be projected to UTM Zone 11, Horizontal Units in Meters and Vertical Units in Meters. All West Placer data shall be projected to UTM Zone 10, Horizontal Units in Meters and Vertical Units in Meters.

INLAND STREAMS AND RIVERS

Feature Dataset: BREAKLINES
Feature Class: STREAMS_AND_RIVERS
Feature Type: Polygon

Contains M Values: No
Contains Z Values: Yes
Annotation Subclass: None

XY Resolution: Accept Default Setting
Z Resolution: Accept Default Setting
XY Tolerance: 0.003
Z Tolerance: 0.001

Description

This polygon feature class will depict linear hydrographic features with a width greater than 100 feet.

Table Definition

Field Name	Data Type	Allow Null Values	Default Value	Domain	Precision	Scale	Length	Responsibility
OBJECTID	Object ID							Assigned by Software
SHAPE	Geometry							Assigned by Software
SHAPE_LENGTH	Double	Yes			0	0		Calculated by Software
SHAPE_AREA	Double	Yes			0	0		Calculated by Software

Feature Definition

Description	Definition	Capture Rules
Streams and Rivers	Linear hydrographic features such as streams, rivers, canals, etc. with an average width greater than 100 feet. In the case of embankments, if the feature forms a natural dual line channel, then capture it consistent with the capture rules.	Capture features showing dual line (one on each side of the feature). Average width shall be great than 100 feet to show as a double line. Each vertex placed should maintain vertical integrity and data is required to show "closed polygon". Generally both banks shall be collected to show consistent downhill flow. There are exceptions to this rule where a small branch or offshoot of the stream or river is present. The banks of the stream must be captured at the same elevation to ensure flatness of the water feature. If the elevation of the banks appears to be different see the task manager or PM for further guidance. Breaklines must be captured at or just below the elevations of the immediately surrounding terrain. Under no circumstances should a feature be elevated above the surrounding LiDAR points. Acceptable variance in the negative direction will be defined for each project individually. These instructions are only for docks or piers that follow the coastline or water's edge, not for docks or piers that extend perpendicular from the land into the water. If it can be reasonably determined where the edge of water most probably falls,

		beneath the dock or pier, then the edge of water will be collected at the elevation of the water where it can be directly measured. If there is a clearly-indicated headwall or bulkhead adjacent to the dock or pier and it is evident that the waterline is most probably adjacent to the headwall or bulkhead, then the water line will follow the headwall or bulkhead at the elevation of the water where it can be directly measured. If there is no clear indication of the location of the water's edge beneath the dock or pier, then the edge of water will follow the outer edge of the dock or pier as it is adjacent to the water, at the measured elevation of the water. Every effort should be made to avoid breaking a stream or river into segments. Dual line features shall break at road crossings (culverts). In areas where a bridge is present the dual line feature shall continue through the bridge. Islands: The double line stream shall be captured around an island if the feature is greater than ½ acre. The island feature will be represented as a "hole" in the hydrographic feature.

INLAND PONDS AND LAKES

Feature Dataset: BREAKLINES
Feature Class: PONDS_AND_LAKES
Feature Type: Polygon

Contains M Values: No
Contains Z Values: Yes
Annotation Subclass: None

XY Resolution: Accept Default Setting
Z Resolution: Accept Default Setting
XY Tolerance: 0.003
Z Tolerance: 0.001

Description

This polygon feature class will depict closed water body features that are at a constant elevation.

Table Definition

Field Name	Data Type	Allow Null Values	Default Value	Domain	Precision	Scale	Length	Responsibility
OBJECTID	Object ID							Assigned by Software
SHAPE	Geometry							Assigned by Software
SHAPE_LENGTH	Double	Yes			0	0		Calculated by Software
SHAPE_AREA	Double	Yes			0	0		Calculated by Software

Feature Definition

Description	Definition	Capture Rules
Ponds and Lakes	Land/Water boundaries of constant elevation water bodies such as lakes, reservoirs, ponds, etc. Features shall be defined as closed polygons and contain an elevation value that reflects the best estimate of the water elevation at the time of data capture. Water body features will be captured for features 2 acres in size or greater. "Donuts" will exist where there are islands within a	Water bodies shall be captured as closed polygons with the water feature to the right. The compiler shall take care to ensure that the z-value remains consistent for all vertices placed on the water body. Breaklines must be captured at or just below the elevations of the immediately surrounding terrain. Under no circumstances should a feature be elevated above the surrounding LiDAR points. Acceptable variance in the negative direction will be defined for each project individually. An Island within a Closed Water Body Feature

	closed water body feature greater than ½ acre in size.	will also have a "donut polygon" compiled. These instructions are only for docks or piers that follow the coastline or water's edge, not for docks or piers that extend perpendicular from the land into the water. If it can be reasonably determined where the edge of water most probably falls, beneath the dock or pier, then the edge of water will be collected at the elevation of the water where it can be directly measured. If there is a clearly-indicated headwall or bulkhead adjacent to the dock or pier and it is evident that the waterline is most probably adjacent to the headwall or bulkhead, then the water line will follow the headwall or bulkhead at the elevation of the water where it can be directly measured. If there is no clear indication of the location of the water's edge beneath the dock or pier, then the edge of water will follow the outer edge of the dock or pier as it is adjacent to the water, at the measured elevation of the water.

TIDAL WATERS

Feature Dataset: BREAKLINES
Feature Type: Polygon

Feature Class: Tidal Waters

Contains M Values: No
Annotation Subclass: None

Contains Z Values: Yes

XY Resolution: Accept Default Setting
XY Tolerance: 0.003

Z Resolution: Accept Default Setting
Z Tolerance: 0.001

Description

This polygon feature class will outline the land / water interface at the time of LiDAR acquisition.

Table Definition

Field Name	Data Type	Allow Null Values	Default Value	Domain	Precision	Scale	Length	Responsibility
OBJECTID	Object ID							Assigned by Software
SHAPE	Geometry							Assigned by Software

SHAPE_LENGTH	Double	Yes			0	0		Calculated by Dewberry
SHAPE_AREA	Double	Yes			0	0		Calculated by Dewberry

Feature Definition

Description	Definition	Capture Rules
TIDAL_WATERS	The coastal breakline will delineate the land water interface using LiDAR data as reference. In flight line boundary areas with tidal variation the coastal shoreline may show stair stepping as no feathering is allowed. Stair stepping is allowed to show as much ground as the collected data permits.	The feature shall be extracted at the apparent land/water interface, as determined by the LiDAR intensity data, to the extent of the tile boundaries. Differences caused by tidal variation are acceptable and breaklines delineated should reflect that change with no feathering. Breaklines must be captured at or just below the elevations of the immediately surrounding terrain. Under no circumstances should a feature be elevated above the surrounding LiDAR points. Acceptable variance in the negative direction will be defined for each project individually. If it can be reasonably determined where the edge of water most probably falls, beneath the dock or pier, then the edge of water will be collected at the elevation of the water where it can be directly measured. If there is a clearly-indicated headwall or bulkhead adjacent to the dock or pier and it is evident that the waterline is most probably adjacent to the headwall or bulkhead, then the water line will follow the headwall or bulkhead at the elevation of the water where it can be directly measured. If there is no clear indication of the location of the water's edge beneath the dock or pier, then the edge of water will follow the outer edge of the dock or pier as it is adjacent to the water, at the measured elevation of the water. Breaklines shall snap and merge seamlessly with linear hydrographic features.

CONTACT INFORMATION

Any questions regarding this document should be addressed to:

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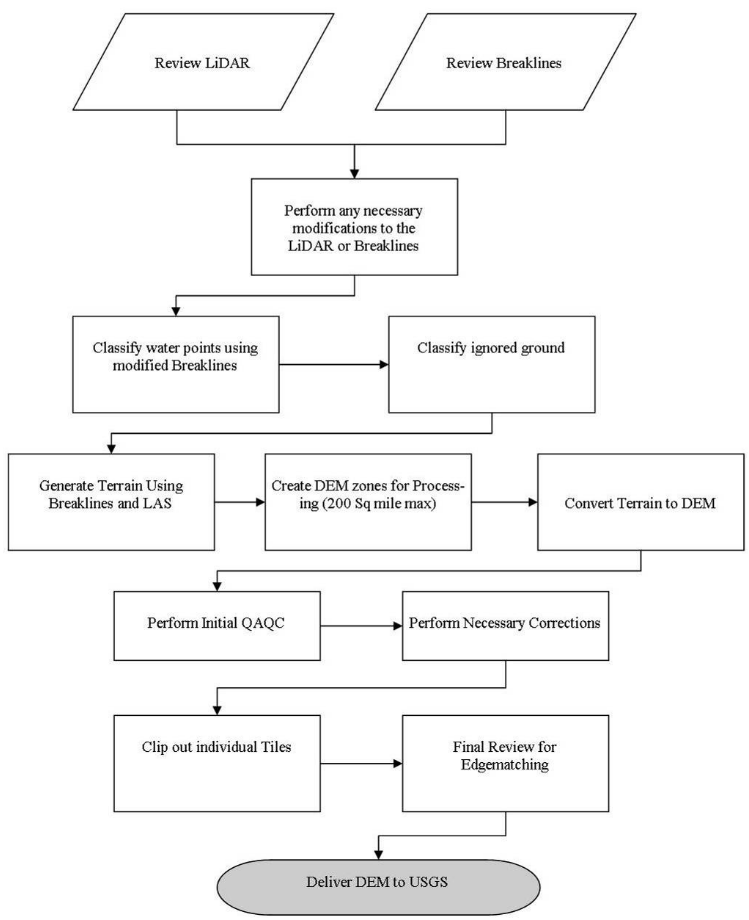
DEM Production & Qualitative Assessment

DEM PRODUCTION METHODOLOGY

Dewberry utilized ESRI software and Global Mapper for the DEM production and QC process. ArcGIS software is used to generate the products and the QC is performed in both ArcGIS and Global Mapper.

Dewberry Hydro-Flattening Workflow



1. Classify Water Points: LAS point falling within hydrographic breaklines shall be classified to ASPRS class 9 using TerraScan. Breaklines must be prepared correctly prior to performing this task.
2. Classify Ignored Ground Points: Classify points in close proximity to the breaklines from Ground to class 10 (Ignored Ground). Close proximity will be defined as no more than 1x the nominal point spacing on the landward side of the breakline. Breaklines will be buffered using this specification and the subsequent file will need to be prepared in the same manner as the water breaklines for classification. This process will be performed after the water points have been classified and only run on remaining ground points.
3. Terrain Processing: A Terrain will be generated using the Breaklines and LAS data that has been imported into Arc as a Multipoint File. If the final DEMs are to be clipped to a project boundary that boundary will be used during the generation of the Terrain.
4. Create DEM Zones for Processing: Create DEM Zones that are buffered around the edges. Zones should be created in a logical manner to minimize the number of zones without creating zones too large for processing. Dewberry will make zones no larger than 200 square miles (taking into account that a DEM will fill in the entire extent not just where LiDAR is present). Once the first zone is created it must be verified against the tile grid to ensure that the cells line up perfectly with the tile grid edge.
5. Convert Terrain to Raster: Convert Terrain to raster using the DEM Zones created in step 4. In the environmental properties set the extents of the raster to the buffered Zone. For each subsequent zone, the first DEM will be utilized as the snap raster to ensure that zones consistently snap to one another.
6. Perform Initial QAQC on Zones: During the initial QA process anomalies will be identified and corrective polygons will be created.
7. Correct Issues on Zones: Dewberry will perform corrections on zones following Dewberry's correction process.
8. Extract Individual Tiles: Dewberry will extract individual tiles from the zones utilizing the Dewberry created tool.
9. Final QA: Final QA will be performed on the dataset to ensure that tile boundaries are seamless.

DEM QUALITATIVE ASSESSMENT

Dewberry performed a comprehensive qualitative assessment of the DEM deliverables to ensure that all tiled DEM products were delivered with the proper extents, were free of processing artifacts, and contained the proper referencing information. This process was performed in ArcGIS software with the use of a tool set Dewberry has developed to verify that the raster extents match those of the tile grid and contain the correct projection information. The DEM data was reviewed at a scale of 1:5000 to review for artifacts caused by the DEM generation process and to review the hydro-flattened features. To perform this review Dewberry creates HillShade models and overlays a partially transparent colorized elevation model to review for these issues. Upon completion of this review the DEM data is loaded into Global Mapper to ensure that all files are readable and that no artifacts exist between tiles.

DEM VERTICAL ACCURACY RESULTS

The same 64 checkpoints that were used to test the vertical accuracy of the LiDAR were used to validate the vertical accuracy of the final DEM products as well. Accuracy results may vary between the source LiDAR and final DEM deliverable. DEMs are created by averaging several

LiDAR points within each pixel which may result in slightly different elevation values at each survey checkpoint when compared to the source LAS, which does not average several LiDAR points together but may interpolate (linearly) between two or three points to derive an elevation value.

Table 13 summarizes the tested vertical accuracy results from a comparison of the surveyed checkpoints to the elevation values present within the final DEM dataset.

Land Cover Category	# of Points	FVA – Fundamental Vertical Accuracy (RMSEz x 1.9600) Spec=0.245 m	CVA – Consolidated Vertical Accuracy (95th Percentile) Spec=0.363 m	SVA – Supplemental Vertical Accuracy (95th Percentile) Target=0.363 m
Consolidated	64		0.17	
Open Terrain	23	0.14		
Tall Weeds and Crops	20			0.17
Forested and Fully Grown	21			0.21

Table 13 – FVA, CVA, and SVA Vertical Accuracy at 95% Confidence Level

The $RMSE_z$ for checkpoints in open terrain only tested 0.07 meters, within the target criteria of 0.125 meters. Compared with the 0.245 meters specification, the FVA tested 0.14 meters at the 95% confidence level based on $RMSE_z$ x 1.9600.

Compared with the 0.363 meters specification, CVA for all checkpoints in all land cover categories combined tested 0.17 meters based on the 95^{th} percentile.

Compared with target 0.363 specification, SVA for checkpoints in the tall weeds and crops land cover category tested 0.17 meters based on the 95^{th} percentile, and checkpoints in the forested and fully grown land cover category tested 0.21 meters based on the 95^{th} percentile.

Table 14 lists the 5% outliers that are larger than the 95^{th} percentile.

Point ID	NAD83 UTM North		NAVD88	DEM Z (m)	Delta Z	AbsDelt aZ
	Easting - X (m)	Northing - Y (m)	Survey Z (m)			
E703	222519.70	4352920.97	1920.13	1920.337954	0.21	0.21
W701	662245.07	4296808.024	160.13	160.337214	0.21	0.21
W709	651535.48	4317872.231	111.26	111.474485	0.22	0.22

Table 14 – 5% Outliers

Table 15 provides overall descriptive statistics.

100 % of Totals	RMSE (m) Open Terrain Spec=0.125 m	Mean (m)	Median (m)	Skew	Std Dev (m)	# of Points	Min (m)	Max (m)
Consolidated		0.02	0.00	0.43	0.09	64	-0.14	0.22
Open Terrain	0.07	-0.05	-0.06	-0.18	0.04	23	-0.14	0.02
Tall Weeds and Crops		0.04	0.05	0.20	0.09	20	-0.08	0.21
Forested and Fully Grown		0.09	0.10	-0.22	0.07	21	-0.07	0.22

Table 15 – Overall Descriptive Statistics

DEM QA/QC CHECKLIST

Project Number/Description: TO G12PC00037 USGS FEMA IX-Placer County, CA LiDAR Date:_______11/5/2012______

Overview

☒ Correct number of files is delivered and all files are in ERDAS IMG format
☒ Verify Raster Extents
☒ Verify Projection/Coordinate System

Review

☒ Manually review bare-earth DEMs with a hillshade to check for issues with hydro-enforcement process or any general anomalies that may be present. Specifically, water should be flowing downhill, water features should NOT be floating above surrounding terrain and bridges should NOT be present in bare-earth DEM. Hydrologic breaklines should be overlaid during review of DEMs.
☒ Overlap points (in the event they are supplied to fill in gaps between adjacent flightlines) are not to be used to create the bare-earth DEMs
☒ DEM cell size is 1 meter
☒ Perform final overview in Global Mapper to ensure seamless product.

Metadata

☒ Project level DEM metadata XML file is error free as determined by the USGS MP tool

☒ Metadata content contains sufficient detail and all pertinent information regarding source materials, projections, datums, processing steps, etc.

Completion Comments: Complete – Approved

Appendix A: Placer County LIDAR QC Survey Control Report 2012

PLACER EAST

The scope of this project included control recovery and GPS surveying to establish x, y, & z positions of 30 plus locations divided into 3 unique ground cover classifications to be used as LIDAR imagery ground truthing quality control checking throughout the new project image area.

Locations were planned from office project limits layouts with some field adjustments. Control points classification points were located then measured by gps surveys for horizontal and vertical locations. Recovered NGS high Order horizontal and vertical monuments were used to establish the horizontal and vertical datum used for this survey. Six existing federal government geodetic control stations were incorporated to our primary control network. Surveyor positioned two secondary base stations to supplement the NGS control stations and to provide shorter vectors and a denser overall network. Control was planned to be at least Second Order horizontal and Third Order vertical. The datum for this project was in NAD83 horizontal and NAVD88 vertical in meter units and the final adjusted data was reported in UTM North Zone 11 datum with orthometric elevations.

This project area is comprised of large unpopulated areas of National Forests and remote hills around the Northern and Western portions of Lake Tahoe.

gps measurements commenced on July 09, 2012 and were completed on July 12, 2012 which is Julian days 191 thru 194 in year 2012. All measurements were made in a static mode. Each site was occupied for several minutes and the base stations ran for several hours. Control point sites were located with two dual frequency receivers running as base stations and a second and third and fourth (sometimes) dual frequency receiver as rovers to the various new locations.

The equipment configuration for this project consists of industry standard gps and conventional surveying equipment. The gps equipment used was a combination of Topcon dual frequency (L1/L2) receivers. The Topcon receivers are the Hiper GD and Hiper Plus type. Topcon Tools gps processing software was used to post process all observed data.

Each observation was logged for site id, receiver type, height of antenna, start time and date. Length of vector, time of day, SV configuration and site obstructions determined the length of observation at each site. Data was downloaded to the PC after each day's sessions. Initial processing was performed to verify we had good vector solutions between sites.

The horizontal and vertical datum for this survey was based on recovered high order NGS monuments NGS PID DH6444, AE9835, DH6446, KS0282, KS0285, and KS0325.

The Topcon Tools processing software reports the horizontal and vertical precision of every vector measured and summarizes the standard deviation in x, y and z position for each individual control point.

The final adjusted coordinate values are as listed herein. gps software adjustment summaries are included for your future reference. Photo references are attached in separate documents.

Steven A. Wood, L.S., C.P.,

Project Area Map

Land Cover Classifications

NUMBER OF POINTS	LAND COVER CLASS	LAND COVER DESCRIPTION
10	Class 1	Bare Earth / Open Terrain
10	Class 3	Tall Weeds and Crops
10	Class 5	Forested and Fully Grown

gps Observation Survey Adjustments

Project Summary

Project name: PlacerEast07092012.ttp

Surveyor:
Comment:
Linear unit: Meters
Projection: UTMNorth-Zone_11: 120W to 114W
Geoid: g2009u05
Adjustment Summary

Adjustment type: Plane + Height, Minimal constraint
Confidence level: 95 %
Number of adjusted points: 80
Number of plane control points: 1
Number of used GPS vectors: 201
Number of rejected GPS vectors by plane: 2
A posteriori plane UWE: 1.205546, Bounds: (0.9105396, 1.089353)
Number of height control points: 1
Number of rejected GPS vectors by height: 8
A posteriori height UWE: 1.13034, Bounds: (0.8702528, 1.129527)

Used GPS Observations					
Name	**dN (m)**	**dE (m)**	**dHt (m)**	**Horz RMS (m)**	**Vert RMS (m)**
401ABase–401Base	5.080	21.906	-2.130	0.002	0.003
401ABase–401Base	5.077	21.907	-2.135	0.001	0.001
401ABase–401Base	5.084	21.906	-2.142	0.001	0.001
401ABase–401Base	5.087	21.902	-2.146	0.001	0.001
401ABase–402	12314.500	2918.710	-208.678	0.008	0.014
401ABase–403	-2411.196	581.542	-20.128	0.003	0.007
401ABase–403A	-2412.124	561.374	-19.091	0.003	0.009
401ABase–405	-7570.695	4161.427	-25.151	0.017	0.021
401ABase–406A_PID	-10158.133	5986.245	-90.332	0.015	0.024
401ABase–406_PID	-10148.134	5992.776	-90.398	0.016	0.025
401ABase–407	-13736.656	1061.913	136.894	0.006	0.017
401ABase–407A	-13728.307	1001.556	138.645	0.018	0.037
401ABase–408	5602.465	14355.179	165.926	0.007	0.010
401ABase–408A_PID	5610.857	14334.595	167.639	0.008	0.011
401ABase–409	3934.884	20337.536	-67.336	0.009	0.015
401ABase–409A	3951.158	20344.444	-68.319	0.010	0.019
401ABase–409B_PID	3965.404	20350.139	-69.217	0.009	0.016
401ABase–409C	3993.840	20385.523	-71.509	0.030	0.054
401ABase–410	-1365.675	11379.154	-35.115	0.009	0.020
401ABase–410A	-1368.545	11394.663	-36.074	0.006	0.014
401ABase–411	-4575.047	5349.354	-98.014	0.006	0.009
401ABase–411A	-4546.282	5326.799	-96.753	0.006	0.009

401ABase–412E	-630.877	112.473	-105.728	0.007	0.015
401ABase–412W	-630.712	108.268	-105.690	0.006	0.015
401ABase–501A	100.590	2809.652	-133.423	0.015	0.016
401ABase–502	6285.615	2043.219	-174.867	0.018	0.027
401ABase–502A	6312.839	2052.566	-175.409	0.010	0.015
401ABase–503	3576.122	829.663	-0.716	0.006	0.012
401ABase–503A	3560.158	839.366	-1.838	0.006	0.012
401ABase–504	-5195.798	7261.474	-82.426	0.006	0.016
401ABase–504A	-5214.003	7261.222	-81.901	0.008	0.023
401ABase–505	-10502.744	3221.337	-56.152	0.005	0.011
401ABase–505A	-10513.396	3204.044	-56.036	0.006	0.013
401ABase–506	-13276.594	5633.246	-93.030	0.006	0.013
401ABase–506A	-13295.049	5652.105	-93.676	0.006	0.012
401ABase–506B_PID	-13392.782	5715.112	-95.443	0.008	0.016
401ABase–507	3288.422	17400.176	-92.192	0.006	0.012
401ABase–507A	3297.953	17414.722	-91.746	0.006	0.012
401ABase–508	2097.590	13341.043	-96.999	0.007	0.013
401ABase–508A	2097.601	13320.957	-96.972	0.007	0.014
401ABase–509A	-2930.779	3381.525	-106.867	0.007	0.024
401ABase–509_DP3	-2937.814	3388.899	-106.750	0.011	0.032
401ABase–510	-2269.876	9621.651	-84.945	0.010	0.014
401ABase–510A	-2229.752	9621.955	-81.839	0.006	0.010
401ABase–701	2062.739	2671.959	-148.320	0.015	0.019
401ABase–701A	2086.675	2665.990	-148.388	0.008	0.010
401ABase–702	10150.523	3468.186	-56.167	0.008	0.020
401ABase–702A	10155.299	3492.785	-54.457	0.021	0.042
401ABase–704	-7904.951	6241.435	-88.699	0.051	0.106
401ABase–704A	-7909.295	6248.475	-88.857	0.012	0.024
401ABase–705	-17732.174	4938.714	36.455	0.009	0.013
401ABase–705A	-17697.856	4891.834	38.461	0.013	0.021
401ABase–705B	-17722.987	4917.672	38.492	0.011	0.017
401ABase–706	-16559.103	7746.681	-29.441	0.018	0.039
401ABase–706A	-16573.461	7732.795	-29.043	0.009	0.021
401ABase–707	4700.403	12332.215	267.410	0.012	0.024
401ABase–707A	4688.129	12357.006	265.309	0.013	0.028
401ABase–708	2668.855	7558.884	399.619	0.009	0.012
401ABase–708A	2666.662	7603.298	399.296	0.015	0.027
401ABase–709	1914.583	19600.220	-52.193	0.007	0.016

401ABase–709A	1900.346	19581.434	-52.895	0.010	0.025
401ABase–710	4519.357	15700.420	-39.261	0.055	0.104
401ABase–710A	4534.142	15734.365	-39.641	0.016	0.022
401ABase–710B_PID	4588.365	15689.559	-29.418	0.010	0.015
401ABase–711	9030.399	1562.139	-67.708	0.005	0.009
401ABase–711A	9000.646	1550.052	-69.977	0.007	0.011
401ABase–711B	9020.121	1571.784	-69.228	0.007	0.014
401ABase–AE9835	189.311	2336.623	-119.421	0.008	0.013
401ABase–AP1	12622.203	7908.945	-198.747	0.006	0.011
401ABase–AP2_A	12642.810	7754.730	-198.550	0.005	0.010
401ABase–DH6444	-7594.070	4176.548	-25.803	0.008	0.013
401ABase–DH6444	-7594.083	4176.542	-25.794	0.013	0.017
401ABase–DH6446	-1336.113	11403.348	-30.756	0.007	0.017
401ABase–K02850s	-4367.970	7437.024	-95.589	0.005	0.014
401ABase–KS0282	-4322.556	7413.604	-95.859	0.012	0.030
401ABase–KS0325	3282.643	17355.727	-92.458	0.011	0.022
401Base–402	12309.417	2896.812	-206.543	0.008	0.015
401Base–403	-2416.273	559.645	-17.965	0.008	0.022
401Base–403A	-2417.197	539.490	-16.889	0.003	0.006
401Base–404A	-6341.559	1017.587	124.888	0.005	0.010
401Base–404_PID	-6328.051	1023.532	125.570	0.005	0.009
401Base–405	-7575.799	4139.505	-23.034	0.020	0.021
401Base–406A_PID	-10163.205	5964.340	-88.227	0.013	0.022
401Base–406_PID	-10153.209	5970.877	-88.273	0.016	0.024
401Base–407	-13741.733	1040.008	139.010	0.006	0.015
401Base–407A	-13733.363	979.638	140.720	0.013	0.022
401Base–408	5597.403	14333.280	168.076	0.007	0.010
401Base–408A_PID	5605.796	14312.698	169.795	0.008	0.010
401Base–409	3929.803	20315.621	-65.207	0.008	0.017
401Base–409A	3946.112	20322.531	-66.291	0.009	0.016
401Base–409B_PID	3960.322	20328.224	-67.094	0.009	0.016
401Base–409C	3988.776	20363.613	-69.439	0.020	0.040
401Base–410	-1370.748	11357.250	-32.987	0.007	0.014
401Base–410A	-1373.616	11372.756	-33.945	0.007	0.012
401Base–411	-4580.133	5327.444	-95.879	0.007	0.011
401Base–411A	-4551.389	5304.873	-94.584	0.012	0.019
401Base–412E	-635.969	90.579	-103.533	0.002	0.004
401Base–412W	-635.802	86.373	-103.485	0.002	0.004

401Base–501	79.027	2778.707	-130.737	0.011	0.016
401Base–501A	95.486	2787.743	-131.286	0.004	0.007
401Base–502	6280.527	2021.321	-172.710	0.004	0.006
401Base–502A	6307.750	2030.666	-173.248	0.006	0.010
401Base–503	3571.065	807.754	1.367	0.023	0.047
401Base–503A	3555.097	817.463	0.260	0.021	0.044
401Base–504	-5200.876	7239.569	-80.286	0.004	0.011
401Base–504A	-5219.081	7239.322	-79.738	0.005	0.013
401Base–505	-10507.809	3199.439	-54.066	0.005	0.011
401Base–505A	-10518.458	3182.146	-53.952	0.005	0.011
401Base–506	-13281.668	5611.349	-90.885	0.005	0.011
401Base–506A	-13300.124	5630.206	-91.524	0.005	0.010
401Base–506B_PID	-13397.854	5693.213	-93.300	0.008	0.016
401Base–507	3283.346	17378.270	-90.058	0.006	0.012
401Base–507A	3292.876	17392.817	-89.607	0.006	0.013
401Base–508	2092.511	13319.134	-94.852	0.010	0.018
401Base–508A	2092.517	13299.050	-94.816	0.008	0.015
401Base–509A	-2935.855	3359.633	-104.614	0.003	0.007
401Base–509_DP3	-2942.888	3367.007	-104.505	0.004	0.008
401Base–510	-2274.953	9599.739	-82.823	0.007	0.010
401Base–510A	-2234.810	9600.029	-79.732	0.008	0.012
401Base–701	2057.673	2650.058	-146.174	0.015	0.017
401Base–701A	2081.586	2644.086	-146.249	0.010	0.013
401Base–702	10145.422	3446.291	-54.000	0.008	0.020
401Base–702A	10150.187	3470.884	-52.274	0.016	0.037
401Base–703A	8554.365	1591.566	-73.586	0.011	0.019
401Base–704	-7910.036	6219.529	-86.568	0.022	0.043
401Base–704A	-7914.374	6226.570	-86.704	0.010	0.021
401Base–705	-17737.240	4916.802	38.575	0.008	0.012
401Base–705A	-17702.922	4869.926	40.583	0.014	0.023
401Base–705B	-17728.059	4895.769	40.625	0.008	0.014
401Base–706	-16564.165	7724.769	-27.335	0.015	0.034
401Base–707	4695.334	12310.310	269.499	0.012	0.024
401Base–707A	4683.049	12335.104	267.428	0.009	0.019
401Base–708	2663.792	7536.985	401.767	0.004	0.008
401Base–708A	2661.499	7581.392	401.357	0.010	0.020
401Base–709	1909.496	19578.315	-50.062	0.008	0.017
401Base–709A	1895.258	19559.520	-50.781	0.008	0.019

401Base–710	4514.282	15678.521	-37.150	0.016	0.023
401Base–710A	4529.071	15712.463	-37.493	0.014	0.018
401Base–710B_PID	4583.305	15667.651	-27.273	0.010	0.015
401Base–711	9025.311	1540.234	-65.565	0.005	0.010
401Base–711A	8995.565	1528.141	-67.858	0.007	0.012
401Base–711B	9015.038	1549.876	-67.081	0.007	0.014
401Base–AE9835	184.226	2314.721	-117.305	0.005	0.009
401Base–AP1	12617.121	7887.053	-196.615	0.006	0.012
401Base–AP2_A	12637.720	7732.837	-196.404	0.006	0.011
401Base–AP2_B	12629.627	7745.771	-196.487	0.025	0.057
401Base–DH6444	-7599.157	4154.637	-23.666	0.010	0.016
401Base–DH6446	-1341.185	11381.443	-28.612	0.007	0.016
401Base–K02850s	-4373.057	7415.119	-93.442	0.005	0.014
401Base–KS0282	-4327.633	7391.720	-93.669	0.012	0.028
401Base–KS0325	3277.568	17333.825	-90.325	0.011	0.024
402–402A_PID	4.434	11.980	-0.524	0.003	0.005
403–403A	-0.926	-20.163	1.050	0.005	0.014
404A–404_PID	13.505	5.949	0.692	0.003	0.006
405–DH6444	-23.383	15.110	-0.639	0.009	0.010
406A_PID–406_PID	10.023	6.531	-0.084	0.014	0.020
407–407A	8.367	-60.364	1.684	0.009	0.017
408–408A_PID	8.394	-20.587	1.724	0.002	0.002
409–409A	16.297	6.913	-1.056	0.004	0.007
409–409B_PID	30.518	12.599	-1.874	0.002	0.003
409–409C	58.951	47.977	-4.207	0.003	0.005
409A–409B_PID	14.219	5.686	-0.817	0.004	0.007
409A–409C	42.652	41.073	-3.153	0.007	0.012
409B_PID–409C	28.429	35.384	-2.319	0.004	0.007
410–410A	-2.869	15.498	-0.943	0.002	0.003
410–DH6446	29.560	24.189	4.389	0.002	0.005
410A–DH6446	32.427	8.688	5.342	0.003	0.007
411–411A	28.763	-22.559	1.258	0.002	0.003
412E–412W	0.166	-4.207	0.047	0.001	0.002
501–501A	16.468	9.022	-0.588	0.006	0.010
502–502A	27.226	9.347	-0.549	0.004	0.005
503–503A	-15.959	9.703	-1.121	0.004	0.008
504–504A	-18.203	-0.249	0.533	0.004	0.011
505–505A	-10.653	-17.293	0.120	0.002	0.004

506–506A	-18.462	18.854	-0.629	0.001	0.002
506–506B_PID	-116.189	81.866	-2.406	0.002	0.003
506A–506B_PID	-97.730	63.012	-1.766	0.001	0.002
507–507A	9.528	14.548	0.450	0.001	0.002
507–KS0325	-5.766	-44.448	-0.303	0.008	0.014
507A–KS0325	-15.292	-58.999	-0.737	0.005	0.010
508–508A	0.006	-20.087	0.038	0.001	0.001
509A–509_DP3	-7.035	7.374	0.113	0.001	0.002
510–510A	40.130	0.296	3.101	0.012	0.018
702–702A	4.782	24.596	1.744	0.007	0.012
703–703A	-26.358	2.887	0.604	0.007	0.023
704–704A	-4.345	7.038	-0.144	0.008	0.014
705–705A	34.310	-46.876	2.004	0.007	0.010
705–705B	9.172	-21.038	2.084	0.007	0.012
705A–705B	-25.146	25.853	0.048	0.012	0.020
706–706A	-14.352	-13.882	0.381	0.009	0.021
707–707A	-12.277	24.779	-2.082	0.005	0.010
708–708A	-2.302	44.404	-0.396	0.009	0.016
709–709A	-14.227	-18.784	-0.717	0.003	0.007
710–710A	14.781	33.943	-0.358	0.013	0.018
710–710B_PID	69.011	-10.868	9.835	0.009	0.013
710A–710B_PID	54.231	-44.805	10.183	0.010	0.013
711–711A	-29.748	-12.090	-2.280	0.008	0.012
711–711B	-10.276	9.645	-1.526	0.003	0.005
711A–711B	19.475	21.723	0.737	0.018	0.034
AP1–AP2_A	20.607	-154.214	0.199	0.001	0.001
AP1–AP2_B	12.492	-141.283	0.163	0.001	0.003

GPS Observation Residuals

Name	dN (m)	dE (m)	dHt (m)	Horz RMS (m)	Vert RMS (m)
401ABase–401Base	5.080	21.906	-2.130	0.002	0.003
401ABase–401Base	5.077	21.907	-2.135	0.001	0.001
401ABase–401Base	5.084	21.906	-2.142	0.001	0.001
401ABase–401Base	5.087	21.902	-2.146	0.001	0.001
401ABase–402	12314.500	2918.710	-208.678	0.008	0.014
401ABase–403	-2411.196	581.542	-20.128	0.003	0.007
401ABase–403A	-2412.124	561.374	-19.091	0.003	0.009
401ABase–405	-7570.695	4161.427	-25.151	0.017	0.021
401ABase–406A_PID	-10158.133	5986.245	-90.332	0.015	0.024

401ABase–406_PID	-10148.134	5992.776	-90.398	0.016	0.025
401ABase–407	-13736.656	1061.913	136.894	0.006	0.017
401ABase–407A	-13728.307	1001.556	138.645	0.018	0.037
401ABase–408	5602.465	14355.179	165.926	0.007	0.010
401ABase–408A_PID	5610.857	14334.595	167.639	0.008	0.011
401ABase–409	3934.884	20337.536	-67.336	0.009	0.015
401ABase–409A	3951.158	20344.444	-68.319	0.010	0.019
401ABase–409B_PID	3965.404	20350.139	-69.217	0.009	0.016
401ABase–409C	3993.840	20385.523	-71.509	0.030	0.054
401ABase–410	-1365.675	11379.154	-35.115	0.009	0.020
401ABase–410A	-1368.545	11394.663	-36.074	0.006	0.014
401ABase–411	-4575.047	5349.354	-98.014	0.006	0.009
401ABase–411A	-4546.282	5326.799	-96.753	0.006	0.009
401ABase–412E	-630.877	112.473	-105.728	0.007	0.015
401ABase–412W	-630.712	108.268	-105.690	0.006	0.015
401ABase–501A	100.590	2809.652	-133.423	0.015	0.016
401ABase–502	6285.615	2043.219	-174.867	0.018	0.027
401ABase–502A	6312.839	2052.566	-175.409	0.010	0.015
401ABase–503	3576.122	829.663	-0.716	0.006	0.012
401ABase–503A	3560.158	839.366	-1.838	0.006	0.012
401ABase–504	-5195.798	7261.474	-82.426	0.006	0.016
401ABase–504A	-5214.003	7261.222	-81.901	0.008	0.023
401ABase–505	-10502.744	3221.337	-56.152	0.005	0.011
401ABase–505A	-10513.396	3204.044	-56.036	0.006	0.013
401ABase–506	-13276.594	5633.246	-93.030	0.006	0.013
401ABase–506A	-13295.049	5652.105	-93.676	0.006	0.012
401ABase–506B_PID	-13392.782	5715.112	-95.443	0.008	0.016
401ABase–507	3288.422	17400.176	-92.192	0.006	0.012
401ABase–507A	3297.953	17414.722	-91.746	0.006	0.012
401ABase–508	2097.590	13341.043	-96.999	0.007	0.013
401ABase–508A	2097.601	13320.957	-96.972	0.007	0.014
401ABase–509A	-2930.779	3381.525	-106.867	0.007	0.024
401ABase–509_DP3	-2937.814	3388.899	-106.750	0.011	0.032
401ABase–510	-2269.876	9621.651	-84.945	0.010	0.014
401ABase–510A	-2229.752	9621.955	-81.839	0.006	0.010
401ABase–701	2062.739	2671.959	-148.320	0.015	0.019
401ABase–701A	2086.675	2665.990	-148.388	0.008	0.010
401ABase–702	10150.523	3468.186	-56.167	0.008	0.020

401ABase–702A	10155.299	3492.785	-54.457	0.021	0.042
401ABase–704	-7904.951	6241.435	-88.699	0.051	0.106
401ABase–704A	-7909.295	6248.475	-88.857	0.012	0.024
401ABase–705	-17732.174	4938.714	36.455	0.009	0.013
401ABase–705A	-17697.856	4891.834	38.461	0.013	0.021
401ABase–705B	-17722.987	4917.672	38.492	0.011	0.017
401ABase–706	-16559.103	7746.681	-29.441	0.018	0.039
401ABase–706A	-16573.461	7732.795	-29.043	0.009	0.021
401ABase–707	4700.403	12332.215	267.410	0.012	0.024
401ABase–707A	4688.129	12357.006	265.309	0.013	0.028
401ABase–708	2668.855	7558.884	399.619	0.009	0.012
401ABase–708A	2666.662	7603.298	399.296	0.015	0.027
401ABase–709	1914.583	19600.220	-52.193	0.007	0.016
401ABase–709A	1900.346	19581.434	-52.895	0.010	0.025
401ABase–710	4519.357	15700.420	-39.261	0.055	0.104
401ABase–710A	4534.142	15734.365	-39.641	0.016	0.022
401ABase–710B_PID	4588.365	15689.559	-29.418	0.010	0.015
401ABase–711	9030.399	1562.139	-67.708	0.005	0.009
401ABase–711A	9000.646	1550.052	-69.977	0.007	0.011
401ABase–711B	9020.121	1571.784	-69.228	0.007	0.014
401ABase–AE9835	189.311	2336.623	-119.421	0.008	0.013
401ABase–AP1	12622.203	7908.945	-198.747	0.006	0.011
401ABase–AP2_A	12642.810	7754.730	-198.550	0.005	0.010
401ABase–DH6444	-7594.070	4176.548	-25.803	0.008	0.013
401ABase–DH6444	-7594.083	4176.542	-25.794	0.013	0.017
401ABase–DH6446	-1336.113	11403.348	-30.756	0.007	0.017
401ABase–K02850s	-4367.970	7437.024	-95.589	0.005	0.014
401ABase–KS0282	-4322.556	7413.604	-95.859	0.012	0.030
401ABase–KS0325	3282.643	17355.727	-92.458	0.011	0.022
401Base–402	12309.417	2896.812	-206.543	0.008	0.015
401Base–402A_PID	12313.817	2908.775	-207.071	0.008	0.018
401Base–403	-2416.273	559.645	-17.965	0.008	0.022
401Base–403A	-2417.197	539.490	-16.889	0.003	0.006
401Base–404A	-6341.559	1017.587	124.888	0.005	0.010
401Base–404_PID	-6328.051	1023.532	125.570	0.005	0.009
401Base–405	-7575.799	4139.505	-23.034	0.020	0.021
401Base–406A_PID	-10163.205	5964.340	-88.227	0.013	0.022
401Base–406_PID	-10153.209	5970.877	-88.273	0.016	0.024

401Base–407	-13741.733	1040.008	139.010	0.006	0.015
401Base–407A	-13733.363	979.638	140.720	0.013	0.022
401Base–408	5597.403	14333.280	168.076	0.007	0.010
401Base–408A_PID	5605.796	14312.698	169.795	0.008	0.010
401Base–409	3929.803	20315.621	-65.207	0.008	0.017
401Base–409A	3946.112	20322.531	-66.291	0.009	0.016
401Base–409B_PID	3960.322	20328.224	-67.094	0.009	0.016
401Base–409C	3988.776	20363.613	-69.439	0.020	0.040
401Base–410	-1370.748	11357.250	-32.987	0.007	0.014
401Base–410A	-1373.616	11372.756	-33.945	0.007	0.012
401Base–411	-4580.133	5327.444	-95.879	0.007	0.011
401Base–411A	-4551.389	5304.873	-94.584	0.012	0.019
401Base–412E	-635.969	90.579	-103.533	0.002	0.004
401Base–412W	-635.802	86.373	-103.485	0.002	0.004
401Base–501	79.027	2778.707	-130.737	0.011	0.016
401Base–501A	95.486	2787.743	-131.286	0.004	0.007
401Base–502	6280.527	2021.321	-172.710	0.004	0.006
401Base–502A	6307.750	2030.666	-173.248	0.006	0.010
401Base–503	3571.065	807.754	1.367	0.023	0.047
401Base–503A	3555.097	817.463	0.260	0.021	0.044
401Base–504	-5200.876	7239.569	-80.286	0.004	0.011
401Base–504A	-5219.081	7239.322	-79.738	0.005	0.013
401Base–505	-10507.809	3199.439	-54.066	0.005	0.011
401Base–505A	-10518.458	3182.146	-53.952	0.005	0.011
401Base–506	-13281.668	5611.349	-90.885	0.005	0.011
401Base–506A	-13300.124	5630.206	-91.524	0.005	0.010
401Base–506B_PID	-13397.854	5693.213	-93.300	0.008	0.016
401Base–507	3283.346	17378.270	-90.058	0.006	0.012
401Base–507A	3292.876	17392.817	-89.607	0.006	0.013
401Base–508	2092.511	13319.134	-94.852	0.010	0.018
401Base–508A	2092.517	13299.050	-94.816	0.008	0.015
401Base–509A	-2935.855	3359.633	-104.614	0.003	0.007
401Base–509_DP3	-2942.888	3367.007	-104.505	0.004	0.008
401Base–510	-2274.953	9599.739	-82.823	0.007	0.010
401Base–510A	-2234.810	9600.029	-79.732	0.008	0.012
401Base–701	2057.673	2650.058	-146.174	0.015	0.017
401Base–701A	2081.586	2644.086	-146.249	0.010	0.013
401Base–702	10145.422	3446.291	-54.000	0.008	0.020

401Base–702A	10150.187	3470.884	-52.274	0.016	0.037
401Base–703	8580.684	1588.673	-73.857	0.016	0.041
401Base–703A	8554.365	1591.566	-73.586	0.011	0.019
401Base–704	-7910.036	6219.529	-86.568	0.022	0.043
401Base–704A	-7914.374	6226.570	-86.704	0.010	0.021
401Base–705	-17737.240	4916.802	38.575	0.008	0.012
401Base–705A	-17702.922	4869.926	40.583	0.014	0.023
401Base–705B	-17728.059	4895.769	40.625	0.008	0.014
401Base–706	-16564.165	7724.769	-27.335	0.015	0.034
401Base–707	4695.334	12310.310	269.499	0.012	0.024
401Base–707A	4683.049	12335.104	267.428	0.009	0.019
401Base–708	2663.792	7536.985	401.767	0.004	0.008
401Base–708A	2661.499	7581.392	401.357	0.010	0.020
401Base–709	1909.496	19578.315	-50.062	0.008	0.017
401Base–709A	1895.258	19559.520	-50.781	0.008	0.019
401Base–710	4514.282	15678.521	-37.150	0.016	0.023
401Base–710A	4529.071	15712.463	-37.493	0.014	0.018
401Base–710B_PID	4583.305	15667.651	-27.273	0.010	0.015
401Base–711	9025.311	1540.234	-65.565	0.005	0.010
401Base–711A	8995.565	1528.141	-67.858	0.007	0.012
401Base–711B	9015.038	1549.876	-67.081	0.007	0.014
401Base–AE9835	184.226	2314.721	-117.305	0.005	0.009
401Base–AP1	12617.121	7887.053	-196.615	0.006	0.012
401Base–AP2_A	12637.720	7732.837	-196.404	0.006	0.011
401Base–AP2_B	12629.627	7745.771	-196.487	0.025	0.057
401Base–DH6444	-7599.157	4154.637	-23.666	0.010	0.016
401Base–DH6444	-7599.179	4154.619	-23.656	0.021	0.021
401Base–DH6446	-1341.185	11381.443	-28.612	0.007	0.016
401Base–K02850s	-4373.057	7415.119	-93.442	0.005	0.014
401Base–KS0282	-4327.633	7391.720	-93.669	0.012	0.028
401Base–KS0325	3277.568	17333.825	-90.325	0.011	0.024
402–402A_PID	4.434	11.980	-0.524	0.003	0.005
403–403A	-0.926	-20.163	1.050	0.005	0.014
404A–404_PID	13.505	5.949	0.692	0.003	0.006
405–DH6444	-23.383	15.110	-0.639	0.009	0.010
406A_PID–406_PID	10.023	6.531	-0.084	0.014	0.020
407–407A	8.367	-60.364	1.684	0.009	0.017
408–408A_PID	8.394	-20.587	1.724	0.002	0.002

409–409A	16.297	6.913	-1.056	0.004	0.007
409–409B_PID	30.518	12.599	-1.874	0.002	0.003
409–409C	58.951	47.977	-4.207	0.003	0.005
409A–409B_PID	14.219	5.686	-0.817	0.004	0.007
409A–409C	42.652	41.073	-3.153	0.007	0.012
409B_PID–409C	28.429	35.384	-2.319	0.004	0.007
410–410A	-2.869	15.498	-0.943	0.002	0.003
410–DH6446	29.560	24.189	4.389	0.002	0.005
410A–DH6446	32.427	8.688	5.342	0.003	0.007
411–411A	28.763	-22.559	1.258	0.002	0.003
412E–412W	0.166	-4.207	0.047	0.001	0.002
501–501A	16.468	9.022	-0.588	0.006	0.010
502–502A	27.226	9.347	-0.549	0.004	0.005
503–503A	-15.959	9.703	-1.121	0.004	0.008
504–504A	-18.203	-0.249	0.533	0.004	0.011
505–505A	-10.653	-17.293	0.120	0.002	0.004
506–506A	-18.462	18.854	-0.629	0.001	0.002
506–506B_PID	-116.189	81.866	-2.406	0.002	0.003
506A–506B_PID	-97.730	63.012	-1.766	0.001	0.002
507–507A	9.528	14.548	0.450	0.001	0.002
507–KS0325	-5.766	-44.448	-0.303	0.008	0.014
507A–KS0325	-15.292	-58.999	-0.737	0.005	0.010
508–508A	0.006	-20.087	0.038	0.001	0.001
509A–509_DP3	-7.035	7.374	0.113	0.001	0.002
510–510A	40.130	0.296	3.101	0.012	0.018
702–702A	4.782	24.596	1.744	0.007	0.012
703–703A	-26.358	2.887	0.604	0.007	0.023
704–704A	-4.345	7.038	-0.144	0.008	0.014
705–705A	34.310	-46.876	2.004	0.007	0.010
705–705B	9.172	-21.038	2.084	0.007	0.012
705A–705B	-25.146	25.853	0.048	0.012	0.020
706–706A	-14.352	-13.882	0.381	0.009	0.021
707–707A	-12.277	24.779	-2.082	0.005	0.010
708–708A	-2.302	44.404	-0.396	0.009	0.016
709–709A	-14.227	-18.784	-0.717	0.003	0.007
710–710A	14.781	33.943	-0.358	0.013	0.018
710–710B_PID	69.011	-10.868	9.835	0.009	0.013
710A–710B_PID	54.231	-44.805	10.183	0.010	0.013

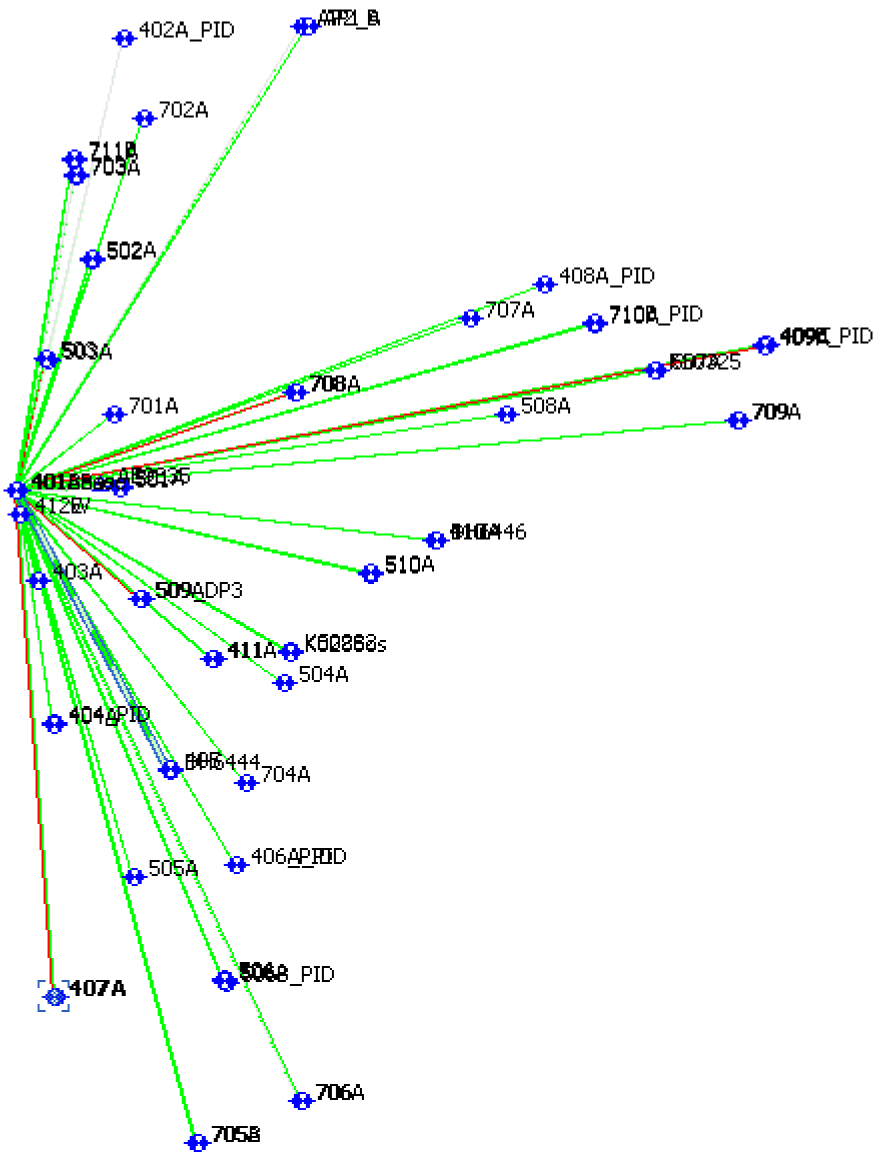
711–711A	-29.748	-12.090	-2.280	0.008	0.012
711–711B	-10.276	9.645	-1.526	0.003	0.005
711A–711B	19.475	21.723	0.737	0.018	0.034
AP1–AP2_A	20.607	-154.214	0.199	0.001	0.001
AP1–AP2_B	12.492	-141.283	0.163	0.001	0.003

Control Points				
Name	**Grid Northing (m)**	**Grid Easting (m)**	**Elevation (m)**	**Code**
AE9835	4344524.474	223245.744	1877.054	

Adjusted Points				
Name	**Grid Northing (m)**	**Grid Easting (m)**	**Elevation (m)**	**Code**
401ABase	4344335.166	220909.120	1996.459	
401Base	4344340.247	220931.024	1994.319	
402	4356649.665	223827.833	1787.813	
402A_PID	4356654.099	223839.813	1787.289	
403	4341923.971	221490.664	1976.363	
403A	4341923.047	221470.506	1977.430	
404A	4337998.689	221948.609	2119.276	
404_PID	4338012.195	221954.557	2119.967	
405	4336764.475	225070.552	1971.453	
406A_PID	4334177.032	226895.366	1906.362	
406_PID	4334187.043	226901.899	1906.291	
407	4330598.512	221971.032	2133.494	
407A	4330606.877	221910.667	2135.182	
408	4349937.638	235264.304	2162.510	
408A_PID	4349946.033	235243.717	2164.232	
409	4348270.050	241246.652	1929.303	
409A	4348286.348	241253.562	1928.245	
409B_PID	4348300.569	241259.250	1927.427	
409C	4348329.000	241294.631	1925.099	
410	4342969.496	232288.279	1961.573	
410A	4342966.627	232303.778	1960.628	
411	4339760.116	226258.472	1898.598	
411A	4339788.879	226235.913	1899.856	
412E	4343704.279	221021.602	1890.792	
412W	4343704.445	221017.396	1890.839	
501	4344419.269	223709.738	1863.647	
501A	4344435.735	223718.766	1863.069	
502	4350620.774	222952.343	1821.615	

502A	4350648.000	222961.690	1821.067	
503	4347911.287	221738.783	1995.734	
503A	4347895.327	221748.486	1994.613	
504	4339139.370	228170.593	1914.256	
504A	4339121.166	228170.345	1914.793	
505	4333832.432	224130.460	1940.439	
505A	4333821.780	224113.168	1940.558	
506	4331058.579	226542.371	1903.680	
506A	4331040.118	226561.226	1903.048	
506B_PID	4330942.389	226624.237	1901.281	
507	4347623.590	238309.294	1904.455	
507A	4347633.118	238323.842	1904.904	
508	4346432.758	234250.161	1899.646	
508A	4346432.764	234230.075	1899.684	
509A	4341404.391	224290.654	1889.782	
509_DP3	4341397.356	224298.029	1889.896	
510	4342065.292	230530.766	1911.735	
510A	4342105.422	230531.066	1914.837	
701	4346397.912	223581.080	1848.167	
701A	4346421.838	223575.110	1848.095	
702	4354485.678	224377.310	1940.333	
702A	4354490.457	224401.905	1942.074	
703	4352920.970	222519.702	1920.129	
703A	4352894.612	222522.590	1920.733	
704	4336430.216	227150.555	1907.982	
704A	4336425.871	227157.594	1907.838	
705	4326603.005	225847.828	2033.124	
705A	4326637.317	225800.951	2035.132	
705B	4326612.180	225826.793	2035.188	
706	4327776.067	228655.797	1967.343	
706A	4327761.710	228641.915	1967.734	
707	4349035.574	233241.341	2263.963	
707A	4349023.297	233266.123	2261.881	
708	4347004.037	228468.008	2396.181	
708A	4347001.739	228512.413	2395.782	
709	4346249.742	240509.337	1944.498	
709A	4346235.513	240490.551	1943.782	
710	4348854.531	236609.543	1957.341	

710A	4348869.312	236643.483	1956.986	
710B_PID	4348923.541	236598.676	1967.179	
711	4353365.561	222471.258	1928.754	
711A	4353335.813	222459.169	1926.473	
711B	4353355.286	222480.902	1927.229	
AP1	4356957.366	228818.070	1797.801	
AP2_A	4356977.973	228663.856	1798.000	
AP2_B	4356969.858	228676.788	1797.963	
DH6444	4336741.093	225085.664	1970.814	
DH6446	4342999.055	232312.467	1965.963	
K02850s	4339967.193	228346.144	1901.085	
KS0282	4340012.613	228322.735	1900.836	
KS0325	4347617.823	238264.845	1904.167	



Final Control Summary

Placer County East Lake Tahoe CA						
Swood	Jul-12					
UTM North Zone 11						
NAD83, NAVD88, Meters						
	LIDAR QC Classification Codes					
	Bare Earth/Open Terrain		400s		OT	
	Tall Weeds and Crops		500s		TW	
	Forested and Fully Grown		700s		F	
Name	Grid	Grid Easting	Elevation		Control	Note

	Northing (m)	(m)	(m)			
DH6444	4336741.093	225085.664	1970.814		None	NGS PID
401ABase	4344335.166	220909.120	1996.459		None	OT
401Base	4344340.247	220931.024	1994.319		None	OT
402	4356649.665	223827.833	1787.813		None	OT
403	4341923.971	221490.664	1976.363		None	OT
405	4336764.475	225070.552	1971.453		None	OT
407	4330598.512	221971.032	2133.494		None	OT
408	4349937.638	235264.304	2162.510		None	OT
409	4348270.050	241246.652	1929.303		None	OT
410	4342969.496	232288.279	1961.573		None	OT
411	4339760.116	226258.472	1898.598		None	OT
501	4344419.269	223709.738	1863.647		None	TW
502	4350620.774	222952.343	1821.615		None	TW
503	4347911.287	221738.783	1995.734		None	TW
504	4339139.370	228170.593	1914.256		None	TW
505	4333832.432	224130.460	1940.439		None	TW
506	4331058.579	226542.371	1903.680		None	TW
507	4347623.590	238309.294	1904.455		None	TW
508	4346432.758	234250.161	1899.646		None	TW
510	4342065.292	230530.766	1911.735		None	TW
701	4346397.912	223581.080	1848.167		None	F
702	4354485.678	224377.310	1940.333		None	F
703	4352920.970	222519.702	1920.129		None	F
704	4336430.216	227150.555	1907.982		None	F
705	4326603.005	225847.828	2033.124		None	F
706	4327776.067	228655.797	1967.343		None	F
707	4349035.574	233241.341	2263.963		None	F
708	4347004.037	228468.008	2396.181		None	F
709	4346249.742	240509.337	1944.498		None	F
710	4348854.531	236609.543	1957.341		None	F
711	4353365.561	222471.258	1928.754		None	F
402A_PID	4356654.099	223839.813	1787.289		None	OT
403A	4341923.047	221470.506	1977.430		None	OT
404_PID	4338012.195	221954.557	2119.967		None	OT
404A	4337998.689	221948.609	2119.276		None	OT
406_PID	4334187.043	226901.899	1906.291		None	OT
406A_PID	4334177.032	226895.366	1906.362		None	OT
407A	4330606.877	221910.667	2135.182		None	OT
408A_PID	4349946.033	235243.717	2164.232		None	OT
409A	4348286.348	241253.562	1928.245		None	OT
409B_PID	4348300.569	241259.250	1927.427		None	OT
409C	4348329.000	241294.631	1925.099		None	OT
410A	4342966.627	232303.778	1960.628		None	OT
411A	4339788.879	226235.913	1899.856		None	OT
412E	4343704.279	221021.602	1890.792		None	OT

412W	4343704.445	221017.396	1890.839		None	OT
501A	4344435.735	223718.766	1863.069		None	TW
502A	4350648.000	222961.690	1821.067		None	TW
503A	4347895.327	221748.486	1994.613		None	TW
504A	4339121.166	228170.345	1914.793		None	TW
505A	4333821.780	224113.168	1940.558		None	TW
506A	4331040.118	226561.226	1903.048		None	TW
506B_PID	4330942.389	226624.237	1901.281		None	TW
507A	4347633.118	238323.842	1904.904		None	TW
508A	4346432.764	234230.075	1899.684		None	TW
509_DP3	4341397.356	224298.029	1889.896		None	TW
509A	4341404.391	224290.654	1889.782		None	TW
510A	4342105.422	230531.066	1914.837		None	TW
701A	4346421.838	223575.110	1848.095		None	F
702A	4354490.457	224401.905	1942.074		None	F
703A	4352894.612	222522.590	1920.733		None	F
704A	4336425.871	227157.594	1907.838		None	F
705A	4326637.317	225800.951	2035.132		None	F
705B	4326612.180	225826.793	2035.188		None	F
706A	4327761.710	228641.915	1967.734		None	F
707A	4349023.297	233266.123	2261.881		None	F
708A	4347001.739	228512.413	2395.782		None	F
709A	4346235.513	240490.551	1943.782		None	F
710A	4348869.312	236643.483	1956.986		None	F
710B_PID	4348923.541	236598.676	1967.179		None	F
711A	4353335.813	222459.169	1926.473		None	F
711B	4353355.286	222480.902	1927.229		None	F
AE9835	4344524.474	223245.744	1877.054		Both	NGS PID
AP1	4356957.366	228818.070	1797.801		None	ABGPS
AP2_A	4356977.973	228663.856	1798.000		None	Temp
AP2_B	4356969.858	228676.788	1797.963		None	Temp
DH6446	4342999.055	232312.467	1965.963		None	NGS PID
K02850s	4339967.193	228346.144	1901.085		None	NGS PID
KS0282	4340012.613	228322.735	1900.836		None	NGS PID
KS0325	4347617.823	238264.845	1904.167		None	NGS PID

Name	Std Dev n (m)	Std Dev e (m)	Std Dev u (m)	Std Dev Hz (m)		Geoid Separation (m)	
DH6444	0.006	0.005	0.012	0.008		-23.671	
401ABase	0.004	0.003	0.009	0.005		-23.515	
401Base	0.004	0.003	0.009	0.005		-23.515	
402	0.007	0.005	0.014	0.008		-23.548	

403	0.005	0.004	0.011	0.006		-23.540	
405	0.010	0.006	0.014	0.012		-23.671	
407	0.006	0.005	0.015	0.007		-23.666	
408	0.006	0.004	0.010	0.007		-23.638	
409	0.005	0.004	0.012	0.007		-23.710	
410	0.005	0.004	0.011	0.006		-23.763	
411	0.005	0.004	0.011	0.007		-23.666	
501	0.007	0.005	0.014	0.009		-23.555	
502	0.005	0.004	0.010	0.007		-23.519	
503	0.006	0.005	0.014	0.008		-23.508	
504	0.005	0.004	0.012	0.006		-23.735	
505	0.005	0.004	0.011	0.006		-23.678	
506	0.005	0.004	0.010	0.006		-23.769	
507	0.005	0.004	0.011	0.006		-23.703	
508	0.006	0.004	0.012	0.007		-23.701	
510	0.006	0.005	0.012	0.008		-23.746	
701	0.013	0.005	0.017	0.014		-23.539	
702	0.006	0.005	0.017	0.008		-23.547	
703	0.013	0.011	0.035	0.017		-23.514	
704	0.009	0.009	0.023	0.012		-23.743	
705	0.006	0.004	0.012	0.008		-23.743	
706	0.010	0.007	0.024	0.012		-23.844	
707	0.006	0.006	0.017	0.009		-23.638	
708	0.006	0.004	0.011	0.007		-23.613	
709	0.006	0.005	0.014	0.007		-23.750	
710	0.009	0.006	0.016	0.011		-23.665	
711	0.005	0.004	0.010	0.006		-23.514	
402A_PID	0.007	0.006	0.016	0.009		-23.549	
403A	0.005	0.003	0.010	0.006		-23.540	
404_PID	0.006	0.004	0.012	0.007		-23.588	
404A	0.006	0.004	0.012	0.007		-23.588	
406_PID	0.011	0.006	0.019	0.012		-23.761	
406A_PID	0.009	0.007	0.018	0.011		-23.761	
407A	0.008	0.006	0.019	0.010		-23.666	
408A_PID	0.006	0.004	0.010	0.007		-23.637	
409A	0.006	0.004	0.012	0.007		-23.709	
409B_PID	0.005	0.004	0.012	0.007		-23.709	
409C	0.006	0.004	0.012	0.007		-23.709	
410A	0.005	0.004	0.011	0.006		-23.764	
411A	0.006	0.004	0.011	0.007		-23.665	
412E	0.004	0.003	0.009	0.005		-23.520	
412W	0.004	0.003	0.009	0.005		-23.520	
501A	0.006	0.004	0.011	0.007		-23.555	
502A	0.006	0.004	0.011	0.007		-23.519	
503A	0.006	0.005	0.014	0.008		-23.508	
504A	0.005	0.004	0.013	0.007		-23.736	
505A	0.005	0.004	0.011	0.006		-23.677	

506A	0.005	0.004	0.010	0.006		-23.770	
506B_PID	0.005	0.004	0.010	0.006		-23.773	
507A	0.005	0.004	0.011	0.006		-23.703	
508A	0.006	0.004	0.012	0.007		-23.701	
509_DP3	0.005	0.004	0.011	0.006		-23.594	
509A	0.005	0.004	0.011	0.006		-23.594	
510A	0.006	0.005	0.012	0.007		-23.746	
701A	0.008	0.004	0.012	0.009		-23.539	
702A	0.008	0.007	0.020	0.010		-23.547	
703A	0.012	0.009	0.023	0.015		-23.514	
704A	0.007	0.006	0.019	0.010		-23.743	
705A	0.007	0.005	0.013	0.009		-23.742	
705B	0.007	0.004	0.013	0.008		-23.742	
706A	0.009	0.006	0.022	0.011		-23.843	
707A	0.006	0.006	0.016	0.009		-23.638	
708A	0.008	0.006	0.017	0.010		-23.613	
709A	0.006	0.005	0.014	0.007		-23.751	
710A	0.008	0.006	0.014	0.010		-23.665	
710B_PID	0.007	0.005	0.013	0.009		-23.663	
711A	0.006	0.004	0.012	0.007		-23.514	
711B	0.005	0.004	0.011	0.007		-23.514	
AE9835	0.000	0.000	0.000	0.000		-23.546	
AP1	0.005	0.004	0.011	0.006		-23.606	
AP2_A	0.005	0.004	0.011	0.006		-23.605	
AP2_B	0.005	0.004	0.011	0.007		-23.605	
DH6446	0.005	0.004	0.011	0.006		-23.763	
K02850s	0.005	0.004	0.014	0.007		-23.726	
KS0282	0.010	0.006	0.025	0.012		-23.725	
KS0325	0.006	0.004	0.013	0.008		-23.703	

Gps Observations Summary Part One

Point Name	Original Name	Antenna Type	Antenna Height (USft)	Ant Height Method	Start Time
DH6444	R0600710b_1LHC	HiPer+	4.41	Vertical	7/10/2012 1:32
401Base	B0560709a_81KW	HiPer+	4.67	Vertical	7/9/2012 16:06
401ABase	B3610709a_ESQO	HiPer GD/GGD	4.35	Vertical	7/9/2012 16:07
AE9835	B38730709q_DO1S	HiPer+	4.41	Vertical	7/9/2012 16:31
501A	B38730709qa_DO1S	HiPer+	4.41	Vertical	7/9/2012 16:50
701A	B38730709r_DO1S	HiPer+	4.23	Vertical	7/9/2012 17:14
AP2_A	B38730709s_DO1S	HiPer+	4.41	Vertical	7/9/2012 18:01
AP2_B	B38730709sa_DO1S	HiPer+	4.41	Vertical	7/9/2012 18:40
702A	B38730709t_DO1S	HiPer+	4.41	Vertical	7/9/2012 19:22
402	B38730709u_DO1S	HiPer+	4.41	Vertical	7/9/2012 20:18
703A	B38730709v_DO1S	HiPer+	4.41	Vertical	7/9/2012 21:12
502	B38730709va_DO1S	HiPer+	4.34	Vertical	7/9/2012 21:43

503A	B38730709w_DO1S	HiPer+	4.41	Vertical	7/9/2012 22:24
403A	B38730709x_DO1S	HiPer+	4.41	Vertical	7/9/2012 23:42
KS0282	B38730710a_DO1S	HiPer+	4.41	Vertical	7/10/2012 0:28
K0285os	B38730710aa_DO1S	HiPer+	4.41	Vertical	7/10/2012 0:52
501	R0600709q_1LHC	HiPer+	4.30	Vertical	7/9/2012 16:49
701	R0600709r_1LHC	HiPer+	4.41	Vertical	7/9/2012 17:12
AP1	R0600709s_1LHC	HiPer+	4.41	Vertical	7/9/2012 18:09
702	R0600709t_1LHC	HiPer+	4.41	Vertical	7/9/2012 19:20
402A_PID	R0600709u_1LHC	HiPer+	4.41	Vertical	7/9/2012 20:19
703	R0600709v_1LHC	HiPer+	4.41	Vertical	7/9/2012 21:10
502A	R0600709va_1LHC	HiPer+	4.41	Vertical	7/9/2012 21:47
503	R0600709w_1LHC	HiPer+	4.41	Vertical	7/9/2012 22:21
403	R0600709x_1LHC	HiPer+	4.41	Vertical	7/9/2012 23:41
706A	R0600710w_1LHC	HiPer+	4.31	Vertical	7/10/2012 22:54
401Base	B0560710a_81KW	HiPer+	4.54	Vertical	7/10/2012 14:06
506B_PID	B3610710a_ESQO	HiPer GD/GGD	4.37	Vertical	7/10/2012 20:26
401ABase	B2850710b_1728	HiPer GD/GGD	4.41	Vertical	7/10/2012 14:15
705B	B3610710b_ESQO	HiPer GD/GGD	3.70	Vertical	7/10/2012 21:28
504	B38730710p_DO1S	HiPer+	4.41	Vertical	7/10/2012 15:19
704	B38730710q_DO1S	HiPer+	4.41	Vertical	7/10/2012 16:03
404_PID	B38730710qa_DO1S	HiPer+	4.41	Vertical	7/10/2012 16:45
DH6444	B38730710r_DO1S	HiPer+	4.41	Vertical	7/10/2012 17:13
406_PID	B38730710ra_DO1S	HiPer+	4.41	Vertical	7/10/2012 17:46
505A	B38730710s_DO1S	HiPer+	3.80	Vertical	7/10/2012 18:25
407A	B38730710t_DO1S	HiPer+	4.41	Vertical	7/10/2012 19:11
506	B38730710u_DO1S	HiPer+	4.41	Vertical	7/10/2012 20:13
705A	B38730710v_DO1S	HiPer+	4.41	Vertical	7/10/2012 21:15
706	B38730710w_DO1S	HiPer+	4.41	Vertical	7/10/2012 22:52
504A	R0600710p_1LHC	HiPer+	4.41	Vertical	7/10/2012 15:19
704A	R0600710q_1LHC	HiPer+	4.41	Vertical	7/10/2012 16:05
404A	R0600710qa_1LHC	HiPer+	4.41	Vertical	7/10/2012 16:46

405	R0600710r_1LHC	HiPer+	4.41	Vertical	7/10/2012 17:14
406A_PID	R0600710ra_1LHC	HiPer+	4.41	Vertical	7/10/2012 17:47
505	R0600710s_1LHC	HiPer+	4.10	Vertical	7/10/2012 18:24
407	R0600710t_1LHC	HiPer+	4.41	Vertical	7/10/2012 19:08
506A	R0600710u_1LHC	HiPer+	4.41	Vertical	7/10/2012 20:15
705	R0600710v_1LHC	HiPer+	4.41	Vertical	7/10/2012 21:13
510	R0600712b_1LHC	HiPer+	4.41	Vertical	7/12/2012 1:30
401Base	B0560711a_81KW	HiPer+	4.48	Vertical	7/11/2012 14:36
401ABase	B2850711a_1728	HiPer GD/GGD	4.54	Vertical	7/11/2012 14:41
707A	B3610711a_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 15:44
708	B3610711b_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 16:32
408A_PID	B3610711c_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 17:17
507	B3610711d_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 18:06
409	B3610711e_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 20:01
710A	B3610711f_ESQO	HiPer GD/GGD	4.41	Vertical	7/11/2012 21:14
410	B3610712a_ESQO	HiPer GD/GGD	4.41	Vertical	7/12/2012 0:28
411	B3610712c_ESQO	HiPer GD/GGD	4.41	Vertical	7/12/2012 2:13
707	B38730711p_DO1S	HiPer+	4.41	Vertical	7/11/2012 15:41
708A	B38730711q_DO1S	HiPer+	4.41	Vertical	7/11/2012 16:35
408	B38730711r_DO1S	HiPer+	4.41	Vertical	7/11/2012 17:16
507A	B38730711s_DO1S	HiPer+	4.37	Vertical	7/11/2012 18:07
709A	B38730711t_DO1S	HiPer+	4.41	Vertical	7/11/2012 19:04
409B_PID	B38730711u_DO1S	HiPer+	4.41	Vertical	7/11/2012 20:03
710	B38730711v_DO1S	HiPer+	4.41	Vertical	7/11/2012 21:10
508A	B38730711w_DO1S	HiPer+	4.37	Vertical	7/11/2012 22:05
509_DP3	B38730711x_DO1S	HiPer+	4.41	Vertical	7/11/2012 23:36

DH6446	B38730712a_DO1S	HiPer+	4.41	Vertical	7/12/2012 0:20
510A	B38730712b_DO1S	HiPer+	4.41	Vertical	7/12/2012 1:28
411A	B38730712c_DO1S	HiPer+	4.41	Vertical	7/12/2012 2:16
409C	R0590711u_UN0G	HiPer+	4.41	Vertical	7/11/2012 20:24
KS0325	R0600711s_1LHC	HiPer+	4.41	Vertical	7/11/2012 18:16
709	R0600711t_1LHC	HiPer+	4.41	Vertical	7/11/2012 19:01
409A	R0600711u_1LHC	HiPer+	4.41	Vertical	7/11/2012 20:02
710B_PID	R0600711v_1LHC	HiPer+	4.32	Vertical	7/11/2012 21:19
508	R0600711w_1LHC	HiPer+	4.41	Vertical	7/11/2012 22:03
509A	R0600711x_1LHC	HiPer+	4.31	Vertical	7/11/2012 23:38
410A	R0600712a_1LHC	HiPer+	4.41	Vertical	7/12/2012 0:32
412W	R0600712p_1LHC	HiPer+	4.41	Vertical	7/12/2012 15:00
401Base	B0560712a_81KW	HiPer+	4.64	Vertical	7/12/2012 13:07
401ABase	B2850712b_1728	HiPer GD/GGD	4.39	Vertical	7/12/2012 13:11
711A	B3610712d_ESQO	HiPer GD/GGD	4.41	Vertical	7/12/2012 13:40
711B	B38730712n_DO1S	HiPer+	4.41	Vertical	7/12/2012 13:45
412E	B38730712p_DO1S	HiPer+	4.33	Vertical	7/12/2012 15:00
711	R0600712n_1LHC	HiPer+	4.41	Vertical	7/12/2012 13:37

Gps Observations Summary Part Two

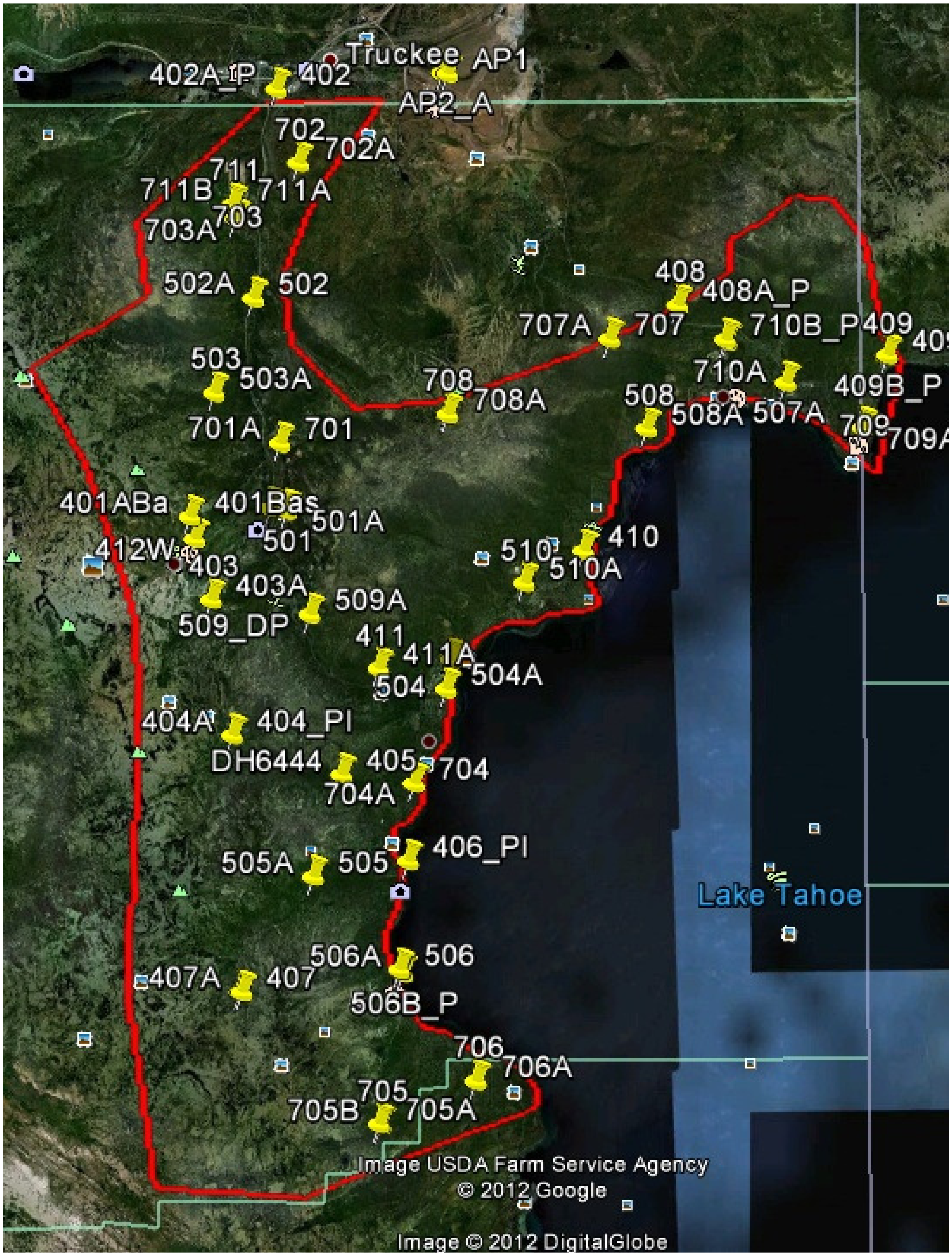
Point Name	Original Name	Stop Time	Duration	Method	Receiver
DH6444	R0600710b_1LHC	7/10/2012 1:49	0:17:25	Static	8RJYCOT1LHC
401Base	B0560709a_81KW	7/10/2012 2:13	10:06:55	Static	8PZFI4M81KW
401ABase	B3610709a_ESQO	7/10/2012 2:16	10:08:10	Static	8PJPJX3ESQO
AE9835	B38730709q_DO1S	7/9/2012 16:42	0:10:35	Static	8RHDWKLDO1S
501A	B38730709qa_DO1S	7/9/2012 17:02	0:11:30	Static	8RHDWKLDO1S
701A	B38730709r_DO1S	7/9/2012 17:32	0:17:35	Static	8RHDWKLDO1S
AP2_A	B38730709s_DO1S	7/9/2012 18:39	0:38:00	Static	8RHDWKLDO1S
AP2_B	B38730709sa_DO1S	7/9/2012 18:47	0:06:55	Static	8RHDWKLDO1S
702A	B38730709t_DO1S	7/9/2012 19:43	0:21:30	Static	8RHDWKLDO1S
402	B38730709u_DO1S	7/9/2012 20:48	0:30:10	Static	8RHDWKLDO1S
703A	B38730709v_DO1S	7/9/2012 21:30	0:17:25	Static	8RHDWKLDO1S
502	B38730709va_DO1S	7/9/2012 22:03	0:19:25	Static	8RHDWKLDO1S

503A	B38730709w_DO1S	7/9/2012 22:39	0:14:35	Static	8RHDWKLDO1S
403A	B38730709x_DO1S	7/10/2012 0:02	0:20:25	Static	8RHDWKLDO1S
KS0282	B38730710a_DO1S	7/10/2012 0:45	0:17:05	Static	8RHDWKLDO1S
K0285os	B38730710aa_DO1S	7/10/2012 1:08	0:16:15	Static	8RHDWKLDO1S
501	R0600709q_1LHC	7/9/2012 17:02	0:13:25	Static	8RJYCOT1LHC
701	R0600709r_1LHC	7/9/2012 17:32	0:19:40	Static	8RJYCOT1LHC
AP1	R0600709s_1LHC	7/9/2012 18:49	0:39:50	Static	8RJYCOT1LHC
702	R0600709t_1LHC	7/9/2012 19:42	0:22:30	Static	8RJYCOT1LHC
402A_PID	R0600709u_1LHC	7/9/2012 20:45	0:26:20	Static	8RJYCOT1LHC
703	R0600709v_1LHC	7/9/2012 21:30	0:20:00	Static	8RJYCOT1LHC
502A	R0600709va_1LHC	7/9/2012 22:02	0:15:30	Static	8RJYCOT1LHC
503	R0600709w_1LHC	7/9/2012 22:39	0:18:05	Static	8RJYCOT1LHC
403	R0600709x_1LHC	7/10/2012 0:03	0:22:10	Static	8RJYCOT1LHC
706A	R0600710w_1LHC	7/10/2012 23:40	0:45:55	Static	8RJYCOT1LHC
401Base	B0560710a_81KW	7/11/2012 0:21	10:15:15	Static	8PZFI4M81KW
506B_PID	B3610710a_ESQO	7/10/2012 20:49	0:23:10	Static	8PJPJX3ESQO
401ABase	B2850710b_1728	7/11/2012 0:25	10:09:15	Static	8R0PSO61728
705B	B3610710b_ESQO	7/10/2012 22:00	0:32:00	Static	8PJPJX3ESQO
504	B38730710p_DO1S	7/10/2012 15:44	0:24:55	Static	8RHDWKLDO1S
704	B38730710q_DO1S	7/10/2012 16:26	0:23:30	Static	8RHDWKLDO1S
404_PID	B38730710qa_DO1S	7/10/2012 17:03	0:18:05	Static	8RHDWKLDO1S
DH6444	B38730710r_DO1S	7/10/2012 17:24	0:11:30	Static	8RHDWKLDO1S
406_PID	B38730710ra_DO1S	7/10/2012 18:14	0:27:15	Static	8RHDWKLDO1S
505A	B38730710s_DO1S	7/10/2012 18:51	0:25:15	Static	8RHDWKLDO1S
407A	B38730710t_DO1S	7/10/2012 19:40	0:29:40	Static	8RHDWKLDO1S
506	B38730710u_DO1S	7/10/2012 20:52	0:38:55	Static	8RHDWKLDO1S
705A	B38730710v_DO1S	7/10/2012 22:02	0:47:05	Static	8RHDWKLDO1S
706	B38730710w_DO1S	7/10/2012 23:41	0:48:20	Static	8RHDWKLDO1S
504A	R0600710p_1LHC	7/10/2012 15:43	0:23:40	Static	8RJYCOT1LHC
704A	R0600710q_1LHC	7/10/2012 16:26	0:21:05	Static	8RJYCOT1LHC
404A	R0600710qa_1LHC	7/10/2012 17:02	0:15:55	Static	8RJYCOT1LHC
405	R0600710r_1LHC	7/10/2012 17:23	0:09:10	Static	8RJYCOT1LHC

406A_PID	R0600710ra_1LHC	7/10/2012 18:13	0:26:05	Static	8RJYCOT1LHC
505	R0600710s_1LHC	7/10/2012 18:51	0:27:30	Static	8RJYCOT1LHC
407	R0600710t_1LHC	7/10/2012 19:42	0:33:15	Static	8RJYCOT1LHC
506A	R0600710u_1LHC	7/10/2012 20:51	0:36:25	Static	8RJYCOT1LHC
705	R0600710v_1LHC	7/10/2012 22:04	0:50:15	Static	8RJYCOT1LHC
510	R0600712b_1LHC	7/12/2012 1:52	0:22:05	Static	8RJYCOT1LHC
401Base	B0560711a_81KW	7/12/2012 2:47	12:11:05	Static	8PZFI4M81KW
401ABase	B2850711a_1728	7/12/2012 2:50	12:08:50	Static	8R0PSO61728
707A	B3610711a_ESQO	7/11/2012 16:11	0:27:45	Static	8PJPJX3ESQO
708	B3610711b_ESQO	7/11/2012 16:56	0:24:40	Static	8PJPJX3ESQO
408A_PID	B3610711c_ESQO	7/11/2012 17:51	0:34:05	Static	8PJPJX3ESQO
507	B3610711d_ESQO	7/11/2012 18:49	0:43:30	Static	8PJPJX3ESQO
409	B3610711e_ESQO	7/11/2012 20:40	0:39:30	Static	8PJPJX3ESQO
710A	B3610711f_ESQO	7/11/2012 21:48	0:33:25	Static	8PJPJX3ESQO
410	B3610712a_ESQO	7/12/2012 0:58	0:30:35	Static	8PJPJX3ESQO
411	B3610712c_ESQO	7/12/2012 2:32	0:18:20	Static	8PJPJX3ESQO
707	B38730711p_DO1S	7/11/2012 16:12	0:31:00	Static	8RHDWKLDO1S
708A	B38730711q_DO1S	7/11/2012 16:55	0:20:15	Static	8RHDWKLDO1S
408	B38730711r_DO1S	7/11/2012 17:52	0:36:00	Static	8RHDWKLDO1S
507A	B38730711s_DO1S	7/11/2012 18:50	0:42:55	Static	8RHDWKLDO1S
709A	B38730711t_DO1S	7/11/2012 19:40	0:36:10	Static	8RHDWKLDO1S
409B_PID	B38730711u_DO1S	7/11/2012 20:39	0:35:50	Static	8RHDWKLDO1S
710	B38730711v_DO1S	7/11/2012 21:47	0:36:25	Static	8RHDWKLDO1S
508A	B38730711w_DO1S	7/11/2012 22:30	0:24:45	Static	8RHDWKLDO1S
509_DP3	B38730711x_DO1S	7/11/2012 23:54	0:17:50	Static	8RHDWKLDO1S
DH6446	B38730712a_DO1S	7/12/2012 0:55	0:35:00	Static	8RHDWKLDO1S
510A	B38730712b_DO1S	7/12/2012 1:53	0:24:45	Static	8RHDWKLDO1S
411A	B38730712c_DO1S	7/12/2012 2:33	0:17:40	Static	8RHDWKLDO1S
409C	R0590711u_UN0G	7/11/2012 20:37	0:13:00	Static	8QCP5IOUN0G
KS0325	R0600711s_1LHC	7/11/2012 18:48	0:32:05	Static	8RJYCOT1LHC

709	R0600711t_1LHC	7/11/2012 19:40	0:38:50	Static	8RJYCOT1LHC
409A	R0600711u_1LHC	7/11/2012 20:40	0:38:05	Static	8RJYCOT1LHC
710B_PID	R0600711v_1LHC	7/11/2012 21:44	0:25:35	Static	8RJYCOT1LHC
508	R0600711w_1LHC	7/11/2012 22:31	0:27:30	Static	8RJYCOT1LHC
509A	R0600711x_1LHC	7/11/2012 23:55	0:16:45	Static	8RJYCOT1LHC
410A	R0600712a_1LHC	7/12/2012 0:58	0:25:45	Static	8RJYCOT1LHC
412W	R0600712p_1LHC	7/12/2012 15:11	0:11:00	Static	8RJYCOT1LHC
401Base	B0560712a_81KW	7/12/2012 15:16	2:09:05	Static	8PZFI4M81KW
401ABase	B2850712b_1728	7/12/2012 15:17	2:06:15	Static	8R0PSO61728
711A	B3610712d_ESQO	7/12/2012 14:05	0:25:35	Static	8PJPJX3ESQO
711B	B38730712n_DO1S	7/12/2012 14:04	0:19:15	Static	8RHDWKLDO1S
412E	B38730712p_DO1S	7/12/2012 15:11	0:10:15	Static	8RHDWKLDO1S
711	R0600712n_1LHC	7/12/2012 14:07	0:29:35	Static	8RJYCOT1LHC

Placer County East Area CP Sketch



NGS DataSheets

DATABASE = NGSIDB , PROGRAM = datasheet95, VERSION = 7.89
1   National Geodetic Survey,   Retrieval Date = JULY 8, 2012
 DH6444 ***
 DH6444 DESIGNATION - WARD CREEK

DH6444 PID - DH6444
DH6444 STATE/COUNTY- CA/PLACER
DH6444 COUNTRY - US
DH6444 USGS QUAD - TAHOE CITY (1992)
DH6444
DH6444 *CURRENT SURVEY CONTROL
DH6444

DH6444* NAD 83(2011) POSITION- 39 08 11.33039(N) 120 10 50.22268(W) ADJUSTED
DH6444* NAD 83(2011) ELLIP HT- 1947.084 (meters) (06/27/12) ADJUSTED
DH6444* NAD 83(2011) EPOCH - 2010.00
DH6444* NAVD 88 ORTHO HEIGHT - 1970.8 (meters) 6466. (feet) GPS OBS
DH6444

DH6444 NAVD 88 orthometric height was determined with geoid model GEOID03
DH6444 GEOID HEIGHT - -23.62 (meters) GEOID03
DH6444 GEOID HEIGHT - -23.73 (meters) GEOID12
DH6444 NAD 83(2011) X - -2,491,159.924 (meters) COMP
DH6444 NAD 83(2011) Y - -4,283,573.820 (meters) COMP
DH6444 NAD 83(2011) Z - 4,005,309.635 (meters) COMP
DH6444 LAPLACE CORR - -7.26 (seconds) DEFLEC09
DH6444
DH6444 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
DH6444 Type Horiz Ellip Dist(km)
DH6444 ---
DH6444 NETWORK 0.76 1.51
DH6444 ---
DH6444 MEDIAN LOCAL ACCURACY AND DIST (003 points) 0.78 1.25 8.00
DH6444 ---
DH6444 NOTE: Click here for information on individual local accuracy
DH6444 values and other accuracy information.
DH6444
DH6444
DH6444.The horizontal coordinates were established by GPS observations
DH6444.and adjusted by the National Geodetic Survey in June 2012.
DH6444
DH6444.NAD 83(2011) refers to NAD 83 coordinates where the reference
DH6444.frame has been affixed to the stable North American tectonic plate. See
DH6444.www.ngs.noaa.gov/web/surveys/NA2011 for more information.
DH6444
DH6444.The horizontal coordinates are valid at the epoch date displayed above
DH6444.which is a decimal equivalence of Year/Month/Day.
DH6444
DH6444.The orthometric height was determined by GPS observations and a
DH6444.high-resolution geoid model.
DH6444
DH6444.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DH6444

DH6444.The Laplace correction was computed from DEFLEC09 derived deflections.
DH6444
DH6444.The ellipsoidal height was determined by GPS observations
DH6444.and is referenced to NAD 83.
DH6444
DH6444. The following values were computed from the NAD 83(2011) position.
DH6444
DH6444; North East Units Scale Factor Converg.
DH6444;SPC CA 2 - 664,731.810 2,157,279.477 MT 0.99991508 +1 08 49.4
DH6444;SPC CA 2 - 2,180,874.28 7,077,674.42 sFT 0.99991508 +1 08 49.4
DH6444;UTM 10 - 4,335,708.095 743,685.773 MT 1.00033125 +1 46 49.4
DH6444
DH6444! - Elev Factor x Scale Factor = Combined Factor
DH6444!SPC CA 2 - 0.99969461 x 0.99991508 = 0.99960971
DH6444!UTM 10 - 0.99969461 x 1.00033125 = 1.00002576
DH6444
DH6444 SUPERSEDED SURVEY CONTROL
DH6444
DH6444 NAD 83(2007)- 39 08 11.32918(N) 120 10 50.22215(W) AD(2007.00) 0
DH6444 ELLIP H (02/10/07) 1947.065 (m) GP(2007.00)
DH6444 NAD 83(1998)- 39 08 11.32892(N) 120 10 50.22115(W) AD(2004.69) B
DH6444 ELLIP H (09/28/05) 1947.094 (m) GP(2004.69) 4 1
DH6444
DH6444.Superseded values are not recommended for survey control.
DH6444
DH6444.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DH6444.See file dsdata.txt to determine how the superseded data were derived.
DH6444
DH6444_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ4368535708(NAD 83)
DH6444
DH6444_MARKER: DD = SURVEY DISK
DH6444_SETTING: 15 = METAL ROD DRIVEN INTO GROUND. SEE TEXT FOR ADDITIONAL
DH6444+WITH SETTING: INFORMATION.
DH6444_STAMPING: WARD CREEK 2004
DH6444_MARK LOGO: CADT
DH6444_PROJECTION: PROJECTING 5 CENTIMETERS
DH6444_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DH6444_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
DH6444_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DH6444+SATELLITE: SATELLITE OBSERVATIONS - July 28, 2004
DH6444_ROD/PIPE-DEPTH: 1.20 meters
DH6444_SLEEVE-DEPTH : N/A meters
DH6444
DH6444 HISTORY - Date Condition Report By
DH6444 HISTORY - 20040728 MONUMENTED CADT
DH6444
DH6444 STATION DESCRIPTION
DH6444
DH6444'DESCRIBED BY CALTRANS 2004 (FTC)

DH6444'THE STATION IS LOCATED IN PLACER COUNTY NEAR SUNNYSIDE ON THE WEST
DH6444'SHORE OF LAKE TAHOE, ABOUT 12.1 KM NORTHWEST OF MEEKS BAY, 8.7 KM
DH6444'SOUTHWEST OF DOLLAR POINT, AND 5.4 KM SOUTHWEST OF TAHOE CITY.
DH6444'
DH6444'TO REACH THE STATION FROM THE INTERSECTION OF STATE HIGHWAY 28 AND
DH6444'STATE HIGHWAY 89 IN TAHOE CITY, PROCEED 3.88 KM SOUTHERLY ON STATE
DH6444'HIGHWAY 89 TO A SIDE ROAD RIGHT, PINELAND DRIVE. TURN RIGHT AND
DH6444'PROCEED WESTERLY ON PINELAND DRIVE 710 M TO A FORK. BEAR LEFT AT THE
DH6444'FORK, ON TWIN PEAKS DRIVE, AND CONTINUE WESTERLY 200 M TO A POINT AT
DH6444'WHICH TWIN PEAKS DRIVE BECOMES WARD CREEK ROAD. CONTINUE ON WARD
DH6444'CREEK ROAD 1.52 KM TO A SMALL GRAVEL PARKING AREA AND THE STATION ON
DH6444'THE LEFT.
DH6444'
DH6444'THE STATION IS A 3/4 IN ALUMINUM ALLOY ROD DRIVEN TO REFUSAL, WITH A
DH6444'CADT/CSRC ALUMINUM SURVEY DISK AFFIXED, SET IN A 6 IN DIAMETER PVC
DH6444'WELL CASING WITH AN ALUMINUM ACCESS COVER. THE STATION LIES 64.0 M
DH6444'SOUTHEAST OF A POWER POLE, 16.7 M NORTH-NORTHWEST OF THE WESTERLY
DH6444'GATE POST OF A METAL FOREST SERVICE GATE, 15.1 M SOUTHWEST OF THE
DH6444'CENTERLINE OF THE ROAD, 10.3 M SOUTHWEST OF POWER POLE NO. 1235, 1.0
DH6444'M NORTHEAST OF A METAL GUARD POST, AND ABOUT 0.5 M LOWER THAN THE
DH6444'ROAD. THIS STATION WAS OCCUPIED AS PART OF A CALTRANS NORTH REGION
DH6444'OFFICE OF SURVEYORS GPS HEIGHT MODERNIZATION PROJECT.
1 National Geodetic Survey, Retrieval Date = JULY 8, 2012
DH6446 ***
DH6446 DESIGNATION - DOLLAR
DH6446 PID - DH6446
DH6446 STATE/COUNTY- CA/PLACER
DH6446 COUNTRY - US
DH6446 USGS QUAD - KINGS BEACH (1992)
DH6446
DH6446 *CURRENT SURVEY CONTROL
DH6446

DH6446* NAD 83(2011) POSITION- 39 11 42.14331(N) 120 05 58.54397(W) ADJUSTED
DH6446* NAD 83(2011) ELLIP HT- 1942.179 (meters) (06/27/12) ADJUSTED
DH6446* NAD 83(2011) EPOCH - 2010.00

DH6446* NAVD 88 ORTHO HEIGHT - 1966.0 (meters) 6450. (feet) GPS OBS
DH6446

DH6446 NAVD 88 orthometric height was determined with geoid model GEOID03
DH6446 GEOID HEIGHT - -23.68 (meters) GEOID03
DH6446 GEOID HEIGHT - -23.84 (meters) GEOID12
DH6446 NAD 83(2011) X - -2,483,038.371 (meters) COMP
DH6446 NAD 83(2011) Y - -4,283,535.656 (meters) COMP
DH6446 NAD 83(2011) Z - 4,010,348.568 (meters) COMP
DH6446 LAPLACE CORR - -4.46 (seconds) DEFLEC09
DH6446
DH6446 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
DH6446 Type Horiz Ellip Dist(km)
DH6446 ---
DH6446 NETWORK 1.02 1.74
DH6446 ---
DH6446 MEDIAN LOCAL ACCURACY AND DIST (003 points) 0.95 1.45 9.19
DH6446 ---
DH6446 NOTE: Click here for information on individual local accuracy
DH6446 values and other accuracy information.
DH6446
DH6446
DH6446.The horizontal coordinates were established by GPS observations
DH6446.and adjusted by the National Geodetic Survey in June 2012.
DH6446
DH6446.NAD 83(2011) refers to NAD 83 coordinates where the reference
DH6446.frame has been affixed to the stable North American tectonic plate. See
DH6446.www.ngs.noaa.gov/web/surveys/NA2011 for more information.
DH6446
DH6446.The horizontal coordinates are valid at the epoch date displayed above
DH6446.which is a decimal equivalence of Year/Month/Day.
DH6446
DH6446.The orthometric height was determined by GPS observations and a
DH6446.high-resolution geoid model.
DH6446
DH6446.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DH6446
DH6446.The Laplace correction was computed from DEFLEC09 derived deflections.
DH6446
DH6446.The ellipsoidal height was determined by GPS observations
DH6446.and is referenced to NAD 83.
DH6446
DH6446. The following values were computed from the NAD 83(2011) position.
DH6446
DH6446; North East Units Scale Factor Converg.
DH6446;SPC CA 2 - 671,374.341 2,164,146.616 MT 0.99991652 +1 11 53.3
DH6446;SPC CA 2 - 2,202,667.32 7,100,204.36 sFT 0.99991652 +1 11 53.3
DH6446;UTM 10 - 4,342,429.198 750,481.892 MT 1.00037260 +1 50 02.0
DH6446

DH6446! - Elev Factor x Scale Factor = Combined Factor
DH6446!SPC CA 2 - 0.99969538 x 0.99991652 = 0.99961192
DH6446!UTM 10 - 0.99969538 x 1.00037260 = 1.00006787
DH6446
DH6446 SUPERSEDED SURVEY CONTROL
DH6446
DH6446 NAD 83(2007)- 39 11 42.14235(N) 120 05 58.54371(W) AD(2007.00) 0
DH6446 ELLIP H (02/10/07) 1942.159 (m) GP(2007.00)
DH6446 NAD 83(1998)- 39 11 42.14196(N) 120 05 58.54248(W) AD(2004.69) B
DH6446 ELLIP H (09/28/05) 1942.187 (m) GP(2004.69) 4 1
DH6446
DH6446.Superseded values are not recommended for survey control.
DH6446
DH6446.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DH6446.See file dsdata.txt to determine how the superseded data were derived.
DH6446
DH6446_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ5048142429(NAD 83)
DH6446
DH6446_MARKER: DD = SURVEY DISK
DH6446_SETTING: 15 = METAL ROD DRIVEN INTO GROUND. SEE TEXT FOR ADDITIONAL
DH6446+WITH SETTING: INFORMATION.
DH6446_STAMPING: DOLLAR 2004
DH6446_MARK LOGO: CADT
DH6446_PROJECTION: PROJECTING 15 CENTIMETERS
DH6446_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DH6446_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
DH6446_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DH6446+SATELLITE: SATELLITE OBSERVATIONS - July 27, 2004
DH6446_ROD/PIPE-DEPTH: 1.50 meters
DH6446_SLEEVE-DEPTH : N/A meters
DH6446
DH6446 HISTORY - Date Condition Report By
DH6446 HISTORY - 20040727 MONUMENTED CADT
DH6446
DH6446 STATION DESCRIPTION
DH6446
DH6446'DESCRIBED BY CALTRANS 2004 (FTC)
DH6446'THE STATION IS LOCATED IN PLACER COUNTY AT DOLLAR POINT, LAKE TAHOE,
DH6446'ABOUT 16.5 KM SOUTHEAST OF TRUCKEE, 7.1 KM SOUTHWEST OF TAHOE VISTA,
DH6446'AND 4.2 KM EAST OF TAHOE CITY.
DH6446'
DH6446'TO REACH THE STATION FROM THE INTERSECTION OF STATE HIGHWAY 89 AND
DH6446'STATE HIGHWAY 28 IN TAHOE CITY, PROCEED 5.20 KM EAST ON STATE HIGHWAY
DH6446'28 TO THE STATION ON THE RIGHT, ON THE OUTSIDE OF A CURVE AT THE TOP

DH6446'OF A LARGE CUT BANK, AT HIGHWAY POST MILE 3.25.
DH6446'
DH6446'THE STATION IS A 3/4 IN ALUMINUM ALLOY ROD DRIVEN TO REFUSAL, WITH A
DH6446'CADT/CSRC ALUMINUM SURVEY DISK AFFIXED, SET IN A 6 IN DIAMETER PVC
DH6446'WELL CASING WITH AN ALUMINUM ACCESS COVER. THE STATION LIES 27.1 M
DH6446'SOUTHEAST OF THE CENTERLINE OF THE HIGHWAY, 14.8 M NORTHEAST OF A
DH6446'TWIN 0.40 M DBH JEFFREY PINE TREE, 11.7 M SOUTHWEST OF A 0.45 M DBH
DH6446'JEFFREY PINE, 5.8 M SOUTHEAST OF A FOOT PATH ALONG THE TOP OF THE CUT
DH6446'BANK, 1.0 M SOUTHEAST OF A METAL GUARD POST, AND ABOUT 9 M HIGHER
DH6446'THAN THE HIGHWAY. THIS STATION WAS OCCUPIED AS PART OF A CALTRANS
DH6446'NORTH REGION OFFICE OF SURVEYORS GPS HEIGHT MODERNIZATION PROJECT.
1 National Geodetic Survey, Retrieval Date = JULY 8, 2012
AE9835 ***
AE9835 DESIGNATION - HPGN D CA 03 HQ
AE9835 PID - AE9835
AE9835 STATE/COUNTY- CA/PLACER
AE9835 COUNTRY - US
AE9835 USGS QUAD - TAHOE CITY (1992)
AE9835
AE9835 *CURRENT SURVEY CONTROL
AE9835

AE9835* NAD 83(2011) POSITION- 39 12 21.33008(N) 120 12 18.19352(W) ADJUSTED
AE9835* NAD 83(2011) ELLIP HT- 1853.465 (meters) (06/27/12) ADJUSTED
AE9835* NAD 83(2011) EPOCH - 2010.00
AE9835* NAVD 88 ORTHO HEIGHT - 1877.0 (meters) 6158. (feet) GPS OBS
AE9835

AE9835 NAVD 88 orthometric height was determined with geoid model GEOID03
AE9835 GEOID HEIGHT - -23.46 (meters) GEOID03
AE9835 GEOID HEIGHT - -23.59 (meters) GEOID12
AE9835 NAD 83(2011) X - -2,490,499.442 (meters) COMP
AE9835 NAD 83(2011) Y - -4,278,238.433 (meters) COMP
AE9835 NAD 83(2011) Z - 4,011,229.267 (meters) COMP
AE9835 LAPLACE CORR - -1.32 (seconds) DEFLEC09
AE9835
AE9835 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
AE9835 Type Horiz Ellip Dist(km)
AE9835 ---
AE9835 NETWORK 0.76 1.47
AE9835 ---
AE9835 MEDIAN LOCAL ACCURACY AND DIST (024 points) 0.87 1.70 38.13
AE9835 ---

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AE9835  NOTE: Click here for information on individual local accuracy
AE9835  values and other accuracy information.
AE9835
AE9835
AE9835.The horizontal coordinates were established by GPS observations
AE9835.and adjusted by the National Geodetic Survey in June 2012.
AE9835
AE9835.NAD 83(2011) refers to NAD 83 coordinates where the reference
AE9835.frame has been affixed to the stable North American tectonic plate. See
AE9835.www.ngs.noaa.gov/web/surveys/NA2011 for more information.
AE9835
AE9835.The horizontal coordinates are valid at the epoch date displayed above
AE9835.which is a decimal equivalence of Year/Month/Day.
AE9835
AE9835.The orthometric height was determined by GPS observations and a
AE9835.high-resolution geoid model.
AE9835
AE9835.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AE9835
AE9835.The Laplace correction was computed from DEFLEC09 derived deflections.
AE9835
AE9835.The ellipsoidal height was determined by GPS observations
AE9835.and is referenced to NAD 83.
AE9835
AE9835. The following values were computed from the NAD 83(2011) position.
AE9835
AE9835;              North         East     Units Scale Factor Converg.
AE9835;SPC CA 2   -   672,397.277 2,155,015.063   MT  0.99991690   +1 07 54.0
AE9835;SPC CA 2   - 2,206,023.40  7,070,245.25   sFT  0.99991690   +1 07 54.0
AE9835;UTM  10    - 4,343,351.131   741,335.636   MT  1.00031720   +1 46 03.2
AE9835
AE9835!           -  Elev Factor  x  Scale Factor =   Combined Factor
AE9835!SPC CA 2   -   0.99970929  x   0.99991690  =   0.99962621
AE9835!UTM  10    -   0.99970929  x   1.00031720  =   1.00002640
AE9835
AE9835                    SUPERSEDED SURVEY CONTROL
AE9835
AE9835  NAD 83(2007)-  39 12 21.32904(N)    120 12 18.19303(W) AD(2007.00) 0
AE9835  ELLIP H (02/10/07) 1853.442  (m)                  GP(2007.00)
AE9835  NAD 83(1998)-  39 12 21.32865(N)    120 12 18.19206(W) AD(2004.69) B
AE9835  ELLIP H (09/28/05) 1853.473  (m)                  GP(2004.69) 4 1
AE9835  NAD 83(1992)-  39 12 21.32489(N)    120 12 18.18599(W) AD(1991.35) 1
AE9835  ELLIP H (05/26/98) 1853.512  (m)                  GP(1991.35) 4 2
AE9835
AE9835.Superseded values are not recommended for survey control.
AE9835
AE9835.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AE9835.See file dsdata.txt to determine how the superseded data were derived.
AE9835
AE9835_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ4133543351(NAD 83)
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AE9835
AE9835_MARKER: DD = SURVEY DISK
AE9835_SETTING: 50 = ALUMINUM ALLOY ROD W/O SLEEVE (10 FT.+)
AE9835_STAMPING: CA-HPGN-DENSIFICATION STA. 03-HQ 1994
AE9835_MARK LOGO: CADT
AE9835_MAGNETIC: N = NO MAGNETIC MATERIAL
AE9835_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AE9835_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AE9835+SATELLITE: SATELLITE OBSERVATIONS - September 30, 2008
AE9835
AE9835 HISTORY - Date Condition Report By
AE9835 HISTORY - 1994 MONUMENTED CADT
AE9835 HISTORY - 20030821 GOOD CADT
AE9835 HISTORY - 20080930 GOOD SPPC
AE9835
AE9835 STATION DESCRIPTION
AE9835
AE9835'DESCRIBED BY CALTRANS 1994 (BES)
AE9835'THE STATION IS LOCATED IN SQUAW VALLEY ON THE NORTH SIDE OF SQUAW
AE9835'VALLEY ROAD, ABOUT 8 MI (12.9 KM) SOUTH OF TRUCKEE AND 4 MI (6.4 KM)
AE9835'NORTHWEST OF TAHOE CITY. TO REACH THE STATION FROM THE JUNCTION
OF
AE9835'INTERSTATE HIGHWAY 80 AND STATE HIGHWAY 89 (SOUTH) IN TRUCKEE, GO
AE9835'SOUTH ON HIGHWAY 89 FOR 0.5 MI (0.8 KM) TO THE NEVADA/PLACER
COUNTY
AE9835'LINE. CONTINUE SOUTH ON HIGHWAY 89 FOR 8.0 MI (12.9 KM) TO A SIDE
AE9835'ROAD RIGHT, SQUAW VALLEY ROAD. TURN RIGHT AND GO WEST ON SQUAW
VALLEY
AE9835'ROAD FOR 0.3 MI (0.5 KM) TO SQUAW VALLEY ACADEMY ON THE LEFT AND
THE
AE9835'STATION ON THE RIGHT AT POST MILE 2.03. THE STATION IS A SURVEY DISK
AE9835'ENCASED IN PVC PIPE WITH ACCESS COVER SET IN CONCRETE FLUSH WITH
THE
AE9835'GROUND, 113 FT (34.4 M) WEST OF JOINT POLE NO 17-A5/CA-24, 98 FT (29.9
AE9835'M) EAST OF JOINT POLE NO J-50950, 53 FT (16.2 M) WEST-NORTHWEST OF A
AE9835'SIERRA PACIFIC POWER CO MANHOLE, 46.0 FT (14.0 M) NORTH OF THE
AE9835'CENTERLINE OF SQUAW VALLEY ROAD, 9.5 FT (2.9 M) SOUTH OF A PEELER
CORE
AE9835'FENCE, 8.0 FT (2.4 M) SOUTH OF A CARSONITE WITNESS POST AND LEVEL
WITH
AE9835'SQUAW VALLEY ROAD. THE STATION WAS OCCUPIED AS PART OF A
CALIFORNIA
AE9835'HPGN DENSIFICATION SURVEY.
AE9835
AE9835 STATION RECOVERY (2003)
AE9835
AE9835'RECOVERY NOTE BY CALTRANS 2003 (DWM)
AE9835'THE STATION WAS RECOVERED AS DESCRIBED. THIS STATION WAS OCCUPIED
AS
AE9835'PART OF A CALTRANS NORTH REGION OFFICE OF SURVEYORS GPS HEIGHT

AE9835'MODERNIZATION PROJECT.
AE9835
AE9835 STATION RECOVERY (2008)
AE9835
AE9835'RECOVERY NOTE BY SIERRA PACIFIC POWER COMPANY 2008 (LDL)
AE9835'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:04

KS0325 ***
KS0325 DESIGNATION - H 181
KS0325 PID - KS0325
KS0325 STATE/COUNTY- CA/PLACER
KS0325 COUNTRY - US
KS0325 USGS QUAD - KINGS BEACH (1992)
KS0325
KS0325 *CURRENT SURVEY CONTROL
KS0325

KS0325* NAD 83(2011) POSITION- 39 14 18.29036(N) 120 01 57.18735(W) ADJUSTED
KS0325* NAD 83(2011) ELLIP HT- 1880.444 (meters) (06/27/12) ADJUSTED
KS0325* NAD 83(2011) EPOCH - 2010.00
KS0325* NAVD 88 ORTHO HEIGHT - 1904.2 (meters) 6247. (feet) GPS OBS
KS0325

KS0325 NAVD 88 orthometric height was determined with geoid model GEOID03
KS0325 GEOID HEIGHT - -23.66 (meters) GEOID03
KS0325 GEOID HEIGHT - -23.78 (meters) GEOID12
KS0325 NAD 83(2011) X - -2,476,476.208 (meters) COMP
KS0325 NAD 83(2011) Y - -4,283,760.204 (meters) COMP
KS0325 NAD 83(2011) Z - 4,014,041.424 (meters) COMP
KS0325 LAPLACE CORR - -0.23 (seconds) DEFLEC09
KS0325
KS0325 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
KS0325 Type Horiz Ellip Dist(km)
KS0325 ---
KS0325 NETWORK 1.04 1.84
KS0325 ---
KS0325 MEDIAN LOCAL ACCURACY AND DIST (021 points) 1.13 2.04 42.69
KS0325 ---
KS0325 NOTE: Click here for information on individual local accuracy
KS0325 values and other accuracy information.
KS0325
KS0325
KS0325.The horizontal coordinates were established by GPS observations
KS0325.and adjusted by the National Geodetic Survey in June 2012.
KS0325

KS0325.NAD 83(2011) refers to NAD 83 coordinates where the reference
KS0325.frame has been affixed to the stable North American tectonic plate. See
KS0325.www.ngs.noaa.gov/web/surveys/NA2011 for more information.
KS0325
KS0325.The horizontal coordinates are valid at the epoch date displayed above
KS0325.which is a decimal equivalence of Year/Month/Day.
KS0325
KS0325.The orthometric height was determined by GPS observations and a
KS0325.high-resolution geoid model.
KS0325
KS0325.The X, Y, and Z were computed from the position and the ellipsoidal ht.
KS0325
KS0325.The Laplace correction was computed from DEFLEC09 derived deflections.
KS0325
KS0325.The ellipsoidal height was determined by GPS observations
KS0325.and is referenced to NAD 83.
KS0325
KS0325. The following values were computed from the NAD 83(2011) position.
KS0325
KS0325; North East Units Scale Factor Converg.
KS0325;SPC CA 2 - 676,311.431 2,169,832.348 MT 0.99991826 +1 14 25.5
KS0325;SPC CA 2 - 2,218,865.09 7,118,858.30 sFT 0.99991826 +1 14 25.5
KS0325;UTM 10 - 4,347,431.529 756,115.072 MT 1.00040774 +1 52 41.1
KS0325;UTM 11 - 4,347,617.838 238,264.866 MT 1.00044358 -1 55 09.6
KS0325
KS0325! - Elev Factor x Scale Factor = Combined Factor
KS0325!SPC CA 2 - 0.99970506 x 0.99991826 = 0.99962334
KS0325!UTM 10 - 0.99970506 x 1.00040774 = 1.00011268
KS0325!UTM 11 - 0.99970506 x 1.00044358 = 1.00014851
KS0325
KS0325 SUPERSEDED SURVEY CONTROL
KS0325
KS0325 NAD 83(2007)- 39 14 18.28962(N) 120 01 57.18742(W) AD(2007.00) 0
KS0325 ELLIP H (02/10/07) 1880.421 (m) GP(2007.00)
KS0325 NAD 83(1998)- 39 14 18.28911(N) 120 01 57.18581(W) AD(2004.69) B
KS0325 ELLIP H (09/28/05) 1880.448 (m) GP(2004.69) 4 1
KS0325 NAD 83(1992)- 39 14 18.28539(N) 120 01 57.18025(W) AD(1991.35) 1
KS0325 ELLIP H (05/26/98) 1880.493 (m) GP(1991.35) 4 2
KS0325
KS0325.Superseded values are not recommended for survey control.
KS0325
KS0325.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KS0325.See file dsdata.txt to determine how the superseded data were derived.
KS0325
KS0325_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ5611547431(NAD 83)
KS0325
KS0325_MARKER: DB = BENCH MARK DISK
KS0325_SETTING: 80 = SET IN A BOULDER
KS0325_STAMPING: H 181 1932
KS0325_MARK LOGO: USGS

KS0325_MAGNETIC: N = NO MAGNETIC MATERIAL
KS0325_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KS0325+STABILITY: SURFACE MOTION
KS0325_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KS0325+SATELLITE: SATELLITE OBSERVATIONS - October 05, 2004
KS0325
KS0325 HISTORY - Date Condition Report By
KS0325 HISTORY - 1932 MONUMENTED USGS
KS0325 HISTORY - 19960804 GOOD CADT
KS0325 HISTORY - 20040916 GOOD INDIV
KS0325 HISTORY - 20041005 GOOD CADT
KS0325
KS0325 STATION DESCRIPTION
KS0325
KS0325'DESCRIBED BY US GEOLOGICAL SURVEY 1932
KS0325'9.1 MI NE FROM TAHOE.
KS0325'9.1 MILES NORTHEAST ALONG STATE HIGHWAY 89 FROM THE POST OFFICE
KS0325'AT TAHOE, PLACER COUNTY, AT THE BROCKWAY GOLF COURSE, 222 FEET
KS0325'NORTH OF THE CENTERLINE OF THE HIGHWAY, 177 FEET SOUTH OF THE
KS0325'CENTER OF A CONCRETE TENNIS COURT, AND IN THE TOP OF A GRANITE
KS0325'BOULDER. A UNITED STATES GEOLOGICAL SURVEY STANDARD DISK,
KS0325'STAMPED H 181 1932.
KS0325
KS0325 STATION RECOVERY (1996)
KS0325
KS0325'RECOVERY NOTE BY CALTRANS 1996 (PTD)
KS0325'THE STATION WAS RECOVERED. A COMPLETE NEW DESCRIPTION FOLLOWS. THE
KS0325'STATION IS LOCATED ON THE GROUNDS OF THE OLD BROCKWAY GOLF COURSE IN
KS0325'KINGS BEACH, ABOUT 10 MI (16.1 KM) SOUTHEAST OF TRUCKEE, 8 MI (12.9
KS0325'KM) NORTHEAST OF TAHOE CITY AND 1.5 MI (2.4 KM) WEST OF THE
KS0325'CALIFORNIA/NEVADA STATE LINE. TO REACH THE STATION FROM THE JUNCTION
KS0325'OF STATE HIGHWAYS 28 AND 267 IN KINGS BEACH, GO WEST ON HIGHWAY 28 FOR
KS0325'0.1 MI (0.2 KM) TO THE OLD BROCKWAY GOLF COURSE AND THE STATION ON THE
KS0325'RIGHT AT POST MILE 9.15. THE STATION IS SET FLUSH IN THE TOP OF A
KS0325'PARTIALLY EXPOSED GRANITE BOULDER THAT PROJECTS 0.5 FT (15.2 CM) ABOVE
KS0325'GROUND, 133 FT (40.5 M) NORTH OF THE CENTERLINE OF HIGHWAY 28, 89 FT
KS0325'(27.1 M) WEST OF THE CENTERLINE OF BASSIE AVENUE, 77 FT (23.5 M) NORTH
KS0325'OF A WOOD FENCE, 63.5 FT (19.4 M) WEST-NORTHWEST OF A 3 FT (0.9 M)
KS0325'DIAMETER PINE TREE, 61.5 FT (18.7 M) SOUTHEAST OF A 4 FT (1.2 M)
KS0325'DIAMETER PINE TREE, 8 FT (2.4 M) WEST OF THE CENTER OF A GOLF CART
KS0325'PATH AND ABOUT 2 FT (0.6 M) HIGHER THAN HIGHWAY 28. THE STATION WAS
KS0325'OCCUPIED AS PART OF A CALIFORNIA HPGN DENSIFICATION SURVEY.
KS0325

KS0325 STATION RECOVERY (2004)
KS0325
KS0325'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2004 (HSI)
KS0325'RECOVERED IN GOOD CONDITION.
KS0325
KS0325 STATION RECOVERY (2004)
KS0325
KS0325'RECOVERY NOTE BY CALTRANS 2004 (DWM)
KS0325'THE STATION WAS RECOVERED AS DESCRIBED. THIS STATION WAS OCCUPIED AS
KS0325'PART OF A CALTRANS NORTH REGION OFFICE OF SURVEYORS GPS HEIGHT
KS0325'MODERNIZATION PROJECT.

1 National Geodetic Survey, Retrieval Date = JULY 8, 2012
KS0282 ***
KS0282 DESIGNATION - G 125
KS0282 PID - KS0282
KS0282 STATE/COUNTY- CA/PLACER
KS0282 COUNTRY - US
KS0282 USGS QUAD - TAHOE CITY (1992)
KS0282
KS0282 *CURRENT SURVEY CONTROL
KS0282

KS0282* NAD 83(1986) POSITION- 39 10 00. (N) 120 08 40. (W) SCALED
KS0282* NAVD 88 ORTHO HEIGHT - 1900.84 (+/-2cm) 6236.3 (feet) VERTCON
KS0282

KS0282 GEOID HEIGHT - -23.81 (meters) GEOID12
KS0282 VERT ORDER - SECOND CLASS 0 (See Below)
KS0282
KS0282.The horizontal coordinates were scaled from a topographic map and have
KS0282.an estimated accuracy of +/- 6 seconds.
KS0282.
KS0282.The NAVD 88 height was computed by applying the VERTCON shift value to
KS0282.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
KS0282
KS0282.The vertical order pertains to the NGVD 29 superseded value.
KS0282
KS0282; North East Units Estimated Accuracy
KS0282;SPC CA 2 - 668,150. 2,160,340. MT (+/- 180 meters Scaled)
KS0282
KS0282 SUPERSEDED SURVEY CONTROL
KS0282
KS0282.No superseded survey control is available for this station.
KS0282
KS0282_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ467391(NAD 83)
KS0282

KS0282_MARKER: DB = BENCH MARK DISK
KS0282_SETTING: 36 = SET IN A MASSIVE STRUCTURE
KS0282_SP_SET: BRIDGE
KS0282_STAMPING: G 125 1932
KS0282_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
KS0282_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
KS0282+SATELLITE: SATELLITE OBSERVATIONS - June 01, 2001
KS0282
KS0282 HISTORY - Date Condition Report By
KS0282 HISTORY - 1932 MONUMENTED CGS
KS0282 HISTORY - 1957 GOOD CGS
KS0282 HISTORY - 20010601 GOOD CADT
KS0282 HISTORY - 20060828 GOOD GEOCAC
KS0282
KS0282 STATION DESCRIPTION
KS0282
KS0282'DESCRIBED BY COAST AND GEODETIC SURVEY 1957
KS0282'0.2 MI SW FROM TAHOE CITY.
KS0282'0.2 MILE SOUTHWEST ALONG STATE HIGHWAY 28 FROM THE POST OFFICE
KS0282'AT TAHOE CITY, AT THE Y JUNCTION OF STATE HIGHWAY 89 LEADING
KS0282'NORTHWEST, AT BRIDGE 19-33 OVER TRUCKEE RIVER, IN THE TOP OF THE
KS0282'WEST CONCRETE CURB, 19 FEET WEST OF THE CENTER OF THE NORTH END
KS0282'OF THE BRIDGE, 12.2 FEET SOUTH OF THE NORTH END OF THE CURB,
KS0282'AND ABOUT 1 FOOT HIGHER THAN THE BRIDGE DECK.
KS0282
KS0282 STATION RECOVERY (2001)
KS0282
KS0282'RECOVERY NOTE BY CALTRANS 2001 (FTC)
KS0282'FOUND AS DESCRIBED. THE BRIDGE IS KNOWN LOCALLY AS FANNY BRIDGE.
KS0282
KS0282 STATION RECOVERY (2006)
KS0282
KS0282'RECOVERY NOTE BY GEOCACHING 2006 (HAN)
KS0282'RECOVERED IN FAIR TO GOOD CONDITION AT N 39 10.018 W 120 08.671, BY
KS0282'HANSOHN. THE DISK HAS BEEN SCRATCHED BY SNOW CLEARING
EQUIPMENT.
1 National Geodetic Survey, Retrieval Date = JULY 8, 2012
KS0285 ***
KS0285 DESIGNATION - L 837
KS0285 PID - KS0285
KS0285 STATE/COUNTY- CA/PLACER
KS0285 COUNTRY - US
KS0285 USGS QUAD - TAHOE CITY (1992)
KS0285
KS0285 *CURRENT SURVEY CONTROL
KS0285

KS0285* NAD 83(1986) POSITION- 39 09 59.22 (N) 120 08 40.50 (W) HD_HELD1
KS0285* NAVD 88 ORTHO HEIGHT - 1900.85 (+/-2cm) 6236.4 (feet) VERTCON

KS0285

KS0285 GEOID HEIGHT - -23.82 (meters) GEOID12
KS0285 VERT ORDER - SECOND CLASS 0 (See Below)
KS0285
KS0285.The horizontal coordinates were established by differentially corrected
KS0285.hand held GPS obs and have an estimated accuracy of +/- 3 meters.
KS0285.
KS0285.The NAVD 88 height was computed by applying the VERTCON shift value to
KS0285.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
KS0285
KS0285.The vertical order pertains to the NGVD 29 superseded value.
KS0285
KS0285.Photographs are available for this station.
KS0285
KS0285; North East Units Estimated Accuracy
KS0285;SPC CA 2 - 668,121.0 2,160,326.2 MT (+/- 3 meters HH1 GPS)
KS0285
KS0285 SUPERSEDED SURVEY CONTROL
KS0285
KS0285.No superseded survey control is available for this station.
KS0285
KS0285_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SGJ4669639132(NAD 83)
KS0285
KS0285_MARKER: DB = BENCH MARK DISK
KS0285_SETTING: 17 = SET INTO TOP OF METAL PIPE DRIVEN INTO GROUND
KS0285_SP_SET: METAL PIPE DRIVEN INTO GROUND
KS0285_STAMPING: L 837
KS0285_MARK LOGO: BOR
KS0285_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
KS0285
KS0285 HISTORY - Date Condition Report By
KS0285 HISTORY - UNK MONUMENTED BPR
KS0285 HISTORY - 1957 GOOD CGS
KS0285 HISTORY - 20060828 GOOD GEOCAC
KS0285
KS0285 STATION DESCRIPTION
KS0285
KS0285'DESCRIBED BY COAST AND GEODETIC SURVEY 1957
KS0285'0.2 MI SW FROM TAHOE CITY.
KS0285'0.2 MILE SOUTHWEST ALONG STATE HIGHWAY 28 FROM THE POST OFFICE
KS0285'AT TAHOE CITY, ON THE SOUTH BANK OF THE TRUCKEE RIVER, 96.4
KS0285'FEET WEST OF THE SOUTHWEST CORNER OF BRIDGE 19-33 OVER TRUCKEE
KS0285'RIVER, 25.3 FEET SOUTHEAST OF A WATER GAGE, 22 FEET SOUTH OF
KS0285'WATERS EDGE OF THE RIVER, 21.8 FEET EAST OF THE EAST SIDE OF
KS0285'A 48-FOOT CORRUGATED METAL BUILDING, 4 FEET NORTHWEST OF A 12-
INCH
KS0285'PINE TREE, 2.1 FEET SOUTH OF A WITNESS POST, AND WELDED ON THE TOP
KS0285'OF A 3-INCH IRON PIPE FLUSH WITH THE GROUND.
KS0285

KS0285 STATION RECOVERY (2006)
KS0285
KS0285'RECOVERY NOTE BY GEOCACHING 2006 (HAN)
KS0285'RECOVERED IN GOOD CONDITION AT N 39 09.988 W 120 08.671, BY HANSOHN.
KS0285'

PLACER WEST

The scope of this project included control recovery and GPS surveying to establish x, y, & z positions of 30 plus locations divided into 3 unique ground cover classifications to be used as LIDAR imagery ground truthing quality control checking throughout the new project image area.

Locations were planned from office project limits layouts with some field adjustments. Control points classification points were located then measured by gps surveys for horizontal and vertical locations. Recovered NGS high Order horizontal and vertical monuments were used to establish the horizontal and vertical datum used for this survey. Six existing federal government geodetic control stations were incorporated to our primary control network. Surveyor positioned one secondary base station to supplement the NGS control stations and to provide shorter vectors and a denser overall network. Control was planned to be at least Second Order horizontal and Third Order vertical. The datum for this project was in NAD83 horizontal and NAVD88 vertical in meter units and the final adjusted data was reported in UTM North Zone 10 datum with orthometric elevations.

This project area is comprised of both populated and more remote areas north and east of the towns of Lincoln and Rocklin California in Placer County. The town of Auburn is in the east central project area. An area map is included within this report.

gps measurements commenced on July 03, 2012 and were completed on July 08, 2012 which is Julian days 185 thru 189 in year 2012. All measurements were made in a static mode. Each site was occupied for several minutes and the base stations ran for several hours. Control point sites were located with one dual frequency receiver running as a base station in addition to the local CORS base stations and a second and third and fourth(sometimes)dual frequency receiver as rovers to the various new locations.

The equipment configuration for this project consists of industry standard gps and conventional surveying equipment. The gps equipment used was a combination of Topcon dual frequency(L1/L2) receivers. The Topcon receivers are the Hiper GD and Hiper Plus type. Topcon Tools gps processing software was used to post process all observed data.

Each observation was logged for site id, receiver type, height of antenna, start time and date. Length of vector, time of day, SV configuration and site obstructions determined the length of observation at each site. Data was downloaded to the PC after each day's sessions. Initial processing was performed to verify we had good vector solutions between sites.

The horizontal and vertical datum for this survey was based on recovered high order NGS monuments NGS PID JS0750, JS0786, JS0801, and CORS stations LNC1, LNC2 and SACR.

The Topcon Tools processing software reports the horizontal and vertical precision of every vector measured and summarizes the standard deviation in x, y and z position for each individual control point.

The final adjusted coordinate values are as listed herein. gps software adjustment summaries are included for your future reference. Photo references are attached in separate documents.

Steven A. Wood, L.S., C.P.,

Project Area Map

Land Cover Classifications

NUMBER OF POINTS	LAND COVER CLASS	LAND COVER DESCRIPTION
10	Class 1	Bare Earth / Open Terrain
10	Class 3	Tall Weeds and Crops
10	Class 5	Forested and Fully Grown

gps Observation Survey Adjustments

Project Summary

Project name: PlacerWest07032012.ttp
Surveyor:
Comment:
Linear unit: Meters

Projection: UTMNorth-Zone_10 : 126W to 120W
Geoid: g2009u05
Adjustment Summary

Adjustment type: Plane + Height, Constraint
Confidence level: 95 %
Number of adjusted points: 71
Number of plane control points: 2
Number of used GPS vectors: 172
Number of rejected GPS vectors by plane: 1
A posteriori plane UWE: 0.8135548 , Bounds: (0.9029723 , 1.096902)
Number of height control points: 3
Number of rejected GPS vectors by height: 3
A posteriori height UWE: 1.217632 , Bounds: (0.8621718 , 1.137581)

Used GPS Observations					
Name	**dN (m)**	**dE (m)**	**dHt (m)**	**Horz RMS (m)**	**Vert RMS (m)**
401–401A_PID	18.284	7.094	0.298	0.001	0.002
401–LNC2	6169.073	-14437.998	-91.269	0.006	0.011
401–SACR	-15090.041	-14375.589	-90.112	0.008	0.015
401A_PID–LNC2	6150.798	-14445.085	-91.554	0.006	0.011
401A_PID–SACR	-15108.317	-14382.675	-90.393	0.008	0.015
402–402A	-30.161	28.893	0.262	0.004	0.006
402–LNC2	-2034.849	-21974.174	-307.934	0.010	0.021
403–403A	-48.859	-14.079	-3.097	0.001	0.002
403–LNC2	-3125.687	-14850.293	-237.868	0.006	0.012
403–SACR	-24384.801	-14787.883	-236.727	0.012	0.020
403A–LNC2	-3076.836	-14836.214	-234.757	0.007	0.012
403A–SACR	-24335.951	-14773.803	-233.613	0.014	0.024
404–404A	9.569	-18.848	-1.016	0.002	0.005
404–411Base	-1889.571	-4144.568	-111.204	0.002	0.004
404A–411Base	-1899.139	-4125.721	-110.184	0.003	0.008
405–405A_PID	-15.635	8.693	0.390	0.003	0.005
405–405B_PID	-14.558	-10.151	0.667	0.004	0.005
405–411Base	-9642.460	-5411.046	-224.262	0.005	0.008
405A_PID–405B_PID	1.077	-18.845	0.274	0.003	0.004
405A_PID–411Base	-9626.835	-5419.740	-224.624	0.005	0.010
405B_PID–411Base	-9627.904	-5400.898	-224.897	0.006	0.009
406–406A	-5.127	64.818	3.649	0.010	0.017
406–411Base	-2236.264	3277.076	23.941	0.008	0.014
406–LNC2	-9900.758	-17301.540	-304.953	0.021	0.035

406A–411Base	-2231.132	3212.252	20.282	0.003	0.004
406A–LNC2	-9895.633	-17366.361	-308.621	0.009	0.015
407–407A_PID	6.549	-1.628	-0.254	0.002	0.004
407–411Base	-7667.980	9435.696	247.523	0.006	0.010
407–LNC2	-15332.458	-11142.926	-81.349	0.009	0.015
407A_PID–411Base	-7674.523	9437.319	247.779	0.007	0.012
407A_PID–LNC2	-15339.004	-11141.299	-81.087	0.009	0.015
408–408A_PID	-51.128	-0.683	0.208	0.005	0.009
408–411Base	-12710.806	15893.132	256.893	0.009	0.018
408–LNC2	-20375.283	-4685.472	-71.942	0.008	0.016
408A_PID–411Base	-12659.693	15893.812	256.701	0.010	0.017
408A_PID–LNC2	-20324.168	-4684.794	-72.142	0.010	0.018
409–409A	-16.998	1.449	-0.356	0.004	0.011
409–411Base	-10682.673	17999.190	303.443	0.006	0.015
409–LNC1	-18346.318	-2552.107	-25.331	0.005	0.014
409–LNC2	-18347.163	-2579.415	-25.393	0.005	0.014
409A–411Base	-10665.680	17997.738	303.810	0.008	0.024
409A–LNC1	-18329.326	-2553.559	-24.970	0.008	0.022
409A–LNC2	-18330.172	-2580.867	-25.031	0.008	0.022
410–410A	-8.132	5.161	0.141	0.004	0.008
410–411Base	-6205.469	13981.891	290.392	0.014	0.026
410–LNC1	-13869.120	-6569.396	-38.367	0.011	0.023
410–LNC2	-13869.965	-6596.705	-38.429	0.010	0.021
410A–411Base	-6197.354	13976.735	290.299	0.008	0.016
410A–LNC1	-13860.984	-6574.565	-38.519	0.007	0.012
410A–LNC2	-13861.829	-6601.874	-38.577	0.007	0.013
411Base–412	4433.292	-8221.174	-194.323	0.004	0.006
411Base–412A	4438.004	-8216.863	-194.046	0.004	0.006
411Base–505	7800.211	7437.371	213.144	0.006	0.010
411Base–505A	7788.101	7458.875	214.515	0.005	0.010
411Base–506	9135.864	-140.518	45.697	0.008	0.017
411Base–506A	9090.575	-145.987	45.461	0.007	0.015
411Base–507	5600.851	-3350.574	15.798	0.004	0.008
411Base–507A	5595.551	-3330.099	15.558	0.004	0.007
411Base–508	10324.002	-15169.233	-254.175	0.007	0.013
411Base–508A	10358.880	-15157.184	-249.317	0.008	0.015
411Base–509	7678.434	-22347.040	-328.485	0.010	0.023
411Base–509A	7701.461	-22326.539	-328.200	0.011	0.024

411Base–509B_PID	7656.296	-22342.242	-328.374	0.015	0.035
411Base–510	7791.753	-17915.625	-308.303	0.009	0.015
411Base–510A	7776.631	-17912.545	-308.694	0.009	0.016
411Base–704	2580.291	861.746	73.315	0.004	0.007
411Base–704A	2584.824	803.327	72.203	0.005	0.009
411Base–705	6067.705	3429.499	64.797	0.005	0.010
411Base–705A	6077.717	3460.882	62.620	0.005	0.008
411Base–706	12441.596	-2349.881	55.013	0.007	0.013
411Base–706A	12450.964	-2332.042	54.049	0.007	0.014
411Base–707	-645.807	-6431.408	-244.413	0.007	0.012
411Base–707A	-634.242	-6483.993	-244.496	0.009	0.017
411Base–708	8669.887	-3540.134	18.312	0.005	0.010
411Base–708A	8664.346	-3570.626	14.970	0.004	0.007
411Base–709	9171.934	-12185.519	-252.624	0.019	0.035
411Base–709A	9171.170	-12201.906	-253.872	0.016	0.034
411Base–710	14485.275	-17628.558	-263.476	0.012	0.019
411Base–710A	14423.196	-17567.315	-262.509	0.013	0.021
411Base–LNC1	-7663.647	-20551.299	-328.807	0.008	0.013
411Base–LNC2	-7664.492	-20578.604	-328.923	0.008	0.013
411Base–LNC2	-7664.493	-20578.608	-328.868	0.008	0.013
411Base–LNC2	-7664.489	-20578.609	-328.862	0.008	0.013
411Base–SACR	-28923.604	-20516.194	-327.745	0.012	0.021
411Base–SACR	-28923.601	-20516.201	-327.677	0.012	0.021
411Base–SACR	-28923.603	-20516.190	-327.657	0.012	0.021
412–412A	4.711	4.310	0.274	0.002	0.003
412–LNC1	-12096.950	-12330.119	-134.476	0.007	0.013
412–LNC2	-12097.796	-12357.428	-134.537	0.007	0.013
412A–LNC1	-12101.660	-12334.428	-134.749	0.008	0.013
412A–LNC2	-12102.507	-12361.738	-134.809	0.008	0.013
501–501A	16.920	11.301	0.996	0.001	0.003
501–LNC2	5073.050	-16254.848	-113.675	0.008	0.016
501–SACR	-16186.054	-16192.446	-112.526	0.010	0.021
501A–LNC2	5056.136	-16266.155	-114.682	0.007	0.016
501A–SACR	-16202.968	-16203.754	-113.531	0.010	0.021
502–502A	-8.363	16.409	0.571	0.002	0.003
502–LNC2	1492.937	-19684.105	-167.955	0.011	0.013
502–SACR	-19766.178	-19621.696	-166.773	0.016	0.017
502A–LNC2	1501.291	-19700.510	-168.522	0.010	0.014

502A–SACR	-19757.816	-19638.096	-167.340	0.015	0.018
503–503A	18.443	-51.373	0.437	0.001	0.001
503–LNC2	-581.084	-8829.685	-85.702	0.004	0.007
503–SACR	-21840.196	-8767.280	-84.548	0.009	0.023
503A–LNC2	-599.528	-8778.312	-86.144	0.004	0.008
503A–SACR	-21858.639	-8715.912	-84.987	0.009	0.023
504–504A	-21.296	-7.237	0.037	0.002	0.003
504–LNC2	-7579.835	-20625.478	-316.513	0.010	0.014
504A–LNC2	-7558.533	-20618.245	-316.522	0.008	0.013
505–505A	-12.108	21.499	1.370	0.002	0.003
506–506A	-45.291	-5.463	-0.214	0.002	0.005
507–507A	-5.300	20.476	-0.244	0.002	0.003
507–LNC2	-13265.335	-17228.035	-344.720	0.009	0.015
508–508A	34.880	12.051	4.865	0.001	0.002
508–LNC2	-17988.495	-5409.374	-74.686	0.008	0.014
508–SACR	-39247.604	-5346.964	-73.523	0.015	0.025
508A–LNC2	-18023.372	-5421.422	-79.545	0.009	0.015
508A–SACR	-39282.478	-5359.011	-78.390	0.017	0.028
509–509A	23.029	20.499	0.290	0.001	0.001
509–509B_PID	-22.141	4.803	0.126	0.002	0.004
509–LNC2	-15342.934	1768.422	-0.399	0.005	0.011
509–SACR	-36602.048	1830.834	0.809	0.011	0.023
509A–509B_PID	-45.171	-15.697	-0.164	0.001	0.003
509A–LNC2	-15365.961	1747.923	-0.677	0.005	0.012
509A–SACR	-36625.075	1810.336	0.525	0.011	0.025
509B_PID–LNC2	-15320.789	1763.619	-0.516	0.010	0.024
510–510A	-15.129	3.075	-0.381	0.002	0.003
510–LNC1	-15455.401	-2635.683	-20.481	0.010	0.019
510–LNC2	-15456.245	-2662.984	-20.544	0.020	0.037
510–LNC2	-15456.247	-2662.992	-20.543	0.010	0.019
510A–LNC1	-15440.278	-2638.759	-20.090	0.009	0.019
510A–LNC2	-15441.124	-2666.069	-20.150	0.009	0.019
510A–LNC2	-15441.130	-2666.069	-20.134	0.044	0.091
701–701A	-47.716	-17.980	-1.640	0.011	0.021
701A–LNC2	4275.503	-19084.688	-122.906	0.010	0.016
701A–SACR	-16983.605	-19022.288	-121.742	0.013	0.021
702–702A	12.785	20.969	0.227	0.006	0.007
702–LNC2	-3409.562	-17785.917	-232.287	0.013	0.017

702A–LNC2	-3422.340	-17806.884	-232.518	0.013	0.016
703–703A	28.206	-5.585	0.552	0.003	0.006
703–LNC2	-3926.858	-24586.615	-361.988	0.011	0.021
703A–LNC2	-3955.064	-24581.034	-362.550	0.012	0.022
704–704A	4.531	-58.415	-1.103	0.004	0.007
705–705A	10.015	31.378	-2.175	0.006	0.010
706–706A	9.362	17.839	-0.950	0.002	0.004
706–LNC2	-20106.086	-18228.714	-383.938	0.012	0.022
706A–LNC2	-20115.458	-18246.557	-382.964	0.010	0.021
707–707A	11.565	-52.589	-0.106	0.009	0.019
707–LNC2	-7018.671	-14147.202	-84.491	0.015	0.029
707A–LNC2	-7030.247	-14094.604	-84.383	0.009	0.018
708–708A	-5.537	-30.490	-3.344	0.005	0.008
708–LNC2	-16334.385	-17038.476	-347.167	0.009	0.017
708A–LNC2	-16328.846	-17007.984	-343.814	0.008	0.017
709–709A	-0.758	-16.377	-1.303	0.008	0.016
709–LNC2	-16836.409	-8393.083	-76.270	0.019	0.033
709A–LNC2	-16835.658	-8376.704	-74.973	0.012	0.025
710–710A	-62.057	61.225	0.895	0.005	0.006
710–LNC2	-22149.735	-2950.039	-65.430	0.012	0.017
710A–LNC2	-22087.687	-3011.267	-66.326	0.012	0.017
JS0750–LNC1	8458.995	-8442.676	-26.185	0.004	0.008
JS0750–LNC2	8458.149	-8469.984	-26.244	0.004	0.008
JS0750–SACR	-12800.967	-8407.575	-25.103	0.005	0.011
JS07860s–LNC1	-6641.016	-24537.225	-376.787	0.011	0.017
JS07860s–LNC2	-6641.861	-24564.534	-376.848	0.011	0.017
JS07860s–SACR	-27900.911	-24502.167	-375.805	0.031	0.030
JS08010s–LNC2	-6412.702	-24309.940	-361.124	0.014	0.019
LNC1–LNC2	-0.849	-27.308	-0.062	0.001	0.001
LNC1–SACR	-21259.948	35.106	1.137	0.010	0.016
LNC2–SACR	-21259.111	62.411	1.147	0.009	0.015
LNC2–SACR	-21259.114	62.408	1.166	0.008	0.012
LNC2–SACR	-21259.098	62.413	1.194	0.009	0.015
LNC2–SACR	-21259.111	62.409	1.181	0.008	0.013
GPS Observation Residuals					
Name	**dN (m)**	**dE (m)**	**dHt (m)**	**Horz RMS (m)**	**Vert RMS (m)**
401–401A_PID	18.284	7.094	0.298	0.001	0.002
401–LNC2	6169.073	-14437.998	-91.269	0.006	0.011

401–SACR	-15090.041	-14375.589	-90.112	0.008	0.015
401A_PID–LNC2	6150.798	-14445.085	-91.554	0.006	0.011
401A_PID–SACR	-15108.317	-14382.675	-90.393	0.008	0.015
402–402A	-30.161	28.893	0.262	0.004	0.006
402–LNC2	-2034.849	-21974.174	-307.934	0.010	0.021
402A–LNC2	-2004.680	-22002.970	-308.175	0.012	0.022
403–403A	-48.859	-14.079	-3.097	0.001	0.002
403–LNC2	-3125.687	-14850.293	-237.868	0.006	0.012
403–SACR	-24384.801	-14787.883	-236.727	0.012	0.020
403A–LNC2	-3076.836	-14836.214	-234.757	0.007	0.012
403A–SACR	-24335.951	-14773.803	-233.613	0.014	0.024
404–404A	9.569	-18.848	-1.016	0.002	0.005
404–411Base	-1889.571	-4144.568	-111.204	0.002	0.004
404–LNC2	-9554.046	-24723.182	-440.206	0.009	0.019
404A–411Base	-1899.139	-4125.721	-110.184	0.003	0.008
404A–LNC2	-9563.611	-24704.339	-439.170	0.009	0.020
405–405A_PID	-15.635	8.693	0.390	0.003	0.005
405–405B_PID	-14.558	-10.151	0.667	0.004	0.005
405–411Base	-9642.460	-5411.046	-224.262	0.005	0.008
405–LNC2	-17306.919	-25989.664	-553.237	0.023	0.031
405A_PID–405B_PID	1.077	-18.845	0.274	0.003	0.004
405A_PID–411Base	-9626.835	-5419.740	-224.624	0.005	0.010
405B_PID–411Base	-9627.904	-5400.898	-224.897	0.006	0.009
406–406A	-5.127	64.818	3.649	0.010	0.017
406–411Base	-2236.264	3277.076	23.941	0.008	0.014
406–LNC2	-9900.758	-17301.540	-304.953	0.021	0.035
406–SACR	-31159.959	-17239.310	-303.906	0.148	0.058
406A–411Base	-2231.132	3212.252	20.282	0.003	0.004
406A–LNC2	-9895.633	-17366.361	-308.621	0.009	0.015
406A–SACR	-31154.815	-17303.948	-307.515	0.102	0.033
407–407A_PID	6.549	-1.628	-0.254	0.002	0.004
407–411Base	-7667.980	9435.696	247.523	0.006	0.010
407–LNC2	-15332.458	-11142.926	-81.349	0.009	0.015
407–SACR	-36591.565	-11080.539	-80.165	0.062	0.069
407A_PID–411Base	-7674.523	9437.319	247.779	0.007	0.012
407A_PID–LNC2	-15339.004	-11141.299	-81.087	0.009	0.015
407A_PID–SACR	-36598.207	-11078.922	-79.821	0.067	0.080
408–408A_PID	-51.128	-0.683	0.208	0.005	0.009

408–411Base	-12710.806	15893.132	256.893	0.009	0.018
408–LNC2	-20375.283	-4685.472	-71.942	0.008	0.016
408–SACR	-41634.406	-4622.986	-70.703	0.056	0.046
408A_PID–411Base	-12659.693	15893.812	256.701	0.010	0.017
408A_PID–LNC2	-20324.168	-4684.794	-72.142	0.010	0.018
408A_PID–SACR	-41583.134	-4622.492	-71.218	0.072	0.088
409–409A	-16.998	1.449	-0.356	0.004	0.011
409–411Base	-10682.673	17999.190	303.443	0.006	0.015
409–LNC1	-18346.318	-2552.107	-25.331	0.005	0.014
409–LNC2	-18347.163	-2579.415	-25.393	0.005	0.014
409–SACR	-39606.286	-2516.881	-24.245	0.057	0.030
409A–411Base	-10665.680	17997.738	303.810	0.008	0.024
409A–LNC1	-18329.326	-2553.559	-24.970	0.008	0.022
409A–LNC2	-18330.172	-2580.867	-25.031	0.008	0.022
409A–SACR	-39589.317	-2518.334	-23.864	0.109	0.058
410–410A	-8.132	5.161	0.141	0.004	0.008
410–411Base	-6205.469	13981.891	290.392	0.014	0.026
410–LNC1	-13869.120	-6569.396	-38.367	0.011	0.023
410–LNC2	-13869.965	-6596.705	-38.429	0.010	0.021
410–SACR	-35129.040	-6534.030	-37.270	0.168	0.071
410A–411Base	-6197.354	13976.735	290.299	0.008	0.016
410A–LNC1	-13860.984	-6574.565	-38.519	0.007	0.012
410A–LNC2	-13861.829	-6601.874	-38.577	0.007	0.013
410A–SACR	-35120.890	-6539.454	-37.359	0.139	0.047
411Base–412	4433.292	-8221.174	-194.323	0.004	0.006
411Base–412A	4438.004	-8216.863	-194.046	0.004	0.006
411Base–505	7800.211	7437.371	213.144	0.006	0.010
411Base–505A	7788.101	7458.875	214.515	0.005	0.010
411Base–506	9135.864	-140.518	45.697	0.008	0.017
411Base–506A	9090.575	-145.987	45.461	0.007	0.015
411Base–507	5600.851	-3350.574	15.798	0.004	0.008
411Base–507A	5595.551	-3330.099	15.558	0.004	0.007
411Base–508	10324.002	-15169.233	-254.175	0.007	0.013
411Base–508A	10358.880	-15157.184	-249.317	0.008	0.015
411Base–509	7678.434	-22347.040	-328.485	0.010	0.023
411Base–509A	7701.461	-22326.539	-328.200	0.011	0.024
411Base–509B_PID	7656.296	-22342.242	-328.374	0.015	0.035
411Base–510	7791.753	-17915.625	-308.303	0.009	0.015

411Base–510A	7776.631	-17912.545	-308.694	0.009	0.016
411Base–704	2580.291	861.746	73.315	0.004	0.007
411Base–704A	2584.824	803.327	72.203	0.005	0.009
411Base–705	6067.705	3429.499	64.797	0.005	0.010
411Base–705A	6077.717	3460.882	62.620	0.005	0.008
411Base–706	12441.596	-2349.881	55.013	0.007	0.013
411Base–706A	12450.964	-2332.042	54.049	0.007	0.014
411Base–707	-645.807	-6431.408	-244.413	0.007	0.012
411Base–707A	-634.242	-6483.993	-244.496	0.009	0.017
411Base–708	8669.887	-3540.134	18.312	0.005	0.010
411Base–708A	8664.346	-3570.626	14.970	0.004	0.007
411Base–709	9171.934	-12185.519	-252.624	0.019	0.035
411Base–709A	9171.170	-12201.906	-253.872	0.016	0.034
411Base–710	14485.275	-17628.558	-263.476	0.012	0.019
411Base–710A	14423.196	-17567.315	-262.509	0.013	0.021
411Base–LNC1	-7663.647	-20551.299	-328.807	0.008	0.013
411Base–LNC2	-7664.486	-20578.610	-328.974	0.008	0.013
411Base–LNC2	-7664.492	-20578.604	-328.923	0.008	0.013
411Base–LNC2	-7664.493	-20578.608	-328.868	0.008	0.013
411Base–LNC2	-7664.489	-20578.609	-328.862	0.008	0.013
411Base–SACR	-28923.604	-20516.194	-327.745	0.012	0.021
411Base–SACR	-28923.601	-20516.201	-327.677	0.012	0.021
411Base–SACR	-28923.603	-20516.190	-327.657	0.012	0.021
412–412A	4.711	4.310	0.274	0.002	0.003
412–LNC1	-12096.950	-12330.119	-134.476	0.007	0.013
412–LNC2	-12097.796	-12357.428	-134.537	0.007	0.013
412–SACR	-33356.904	-12295.014	-133.316	0.014	0.024
412A–LNC1	-12101.660	-12334.428	-134.749	0.008	0.013
412A–LNC2	-12102.507	-12361.738	-134.809	0.008	0.013
412A–SACR	-33361.617	-12299.326	-133.579	0.015	0.025
501–501A	16.920	11.301	0.996	0.001	0.003
501–LNC2	5073.050	-16254.848	-113.675	0.008	0.016
501–SACR	-16186.054	-16192.446	-112.526	0.010	0.021
501A–LNC2	5056.136	-16266.155	-114.682	0.007	0.016
501A–SACR	-16202.968	-16203.754	-113.531	0.010	0.021
502–502A	-8.363	16.409	0.571	0.002	0.003
502–LNC2	1492.937	-19684.105	-167.955	0.011	0.013
502–SACR	-19766.178	-19621.696	-166.773	0.016	0.017

502A–LNC2	1501.291	-19700.510	-168.522	0.010	0.014
502A–SACR	-19757.816	-19638.096	-167.340	0.015	0.018
503–503A	18.443	-51.373	0.437	0.001	0.001
503–LNC2	-581.084	-8829.685	-85.702	0.004	0.007
503–SACR	-21840.196	-8767.280	-84.548	0.009	0.023
503A–LNC2	-599.528	-8778.312	-86.144	0.004	0.008
503A–SACR	-21858.639	-8715.912	-84.987	0.009	0.023
504–504A	-21.296	-7.237	0.037	0.002	0.003
504–LNC2	-7579.835	-20625.478	-316.513	0.010	0.014
504A–LNC2	-7558.533	-20618.245	-316.522	0.008	0.013
505–505A	-12.108	21.499	1.370	0.002	0.003
506–506A	-45.291	-5.463	-0.214	0.002	0.005
506–LNC2	-16800.352	-20438.089	-374.661	0.011	0.024
506A–LNC2	-16755.069	-20432.627	-374.443	0.021	0.044
507–507A	-5.300	20.476	-0.244	0.002	0.003
507–LNC2	-13265.335	-17228.035	-344.720	0.009	0.015
507–SACR	-34524.456	-17165.495	-343.551	0.069	0.028
507A–LNC2	-13260.037	-17248.500	-344.494	0.009	0.016
507A–SACR	-34519.164	-17185.979	-343.332	0.110	0.042
508–508A	34.880	12.051	4.865	0.001	0.002
508–LNC2	-17988.495	-5409.374	-74.686	0.008	0.014
508–SACR	-39247.604	-5346.964	-73.523	0.015	0.025
508A–LNC2	-18023.372	-5421.422	-79.545	0.009	0.015
508A–SACR	-39282.478	-5359.011	-78.390	0.017	0.028
509–509A	23.029	20.499	0.290	0.001	0.001
509–509B_PID	-22.141	4.803	0.126	0.002	0.004
509–LNC2	-15342.934	1768.422	-0.399	0.005	0.011
509–SACR	-36602.048	1830.834	0.809	0.011	0.023
509A–509B_PID	-45.171	-15.697	-0.164	0.001	0.003
509A–LNC2	-15365.961	1747.923	-0.677	0.005	0.012
509A–SACR	-36625.075	1810.336	0.525	0.011	0.025
509B_PID–LNC2	-15320.789	1763.619	-0.516	0.010	0.024
509B_PID–SACR	-36579.879	1825.835	0.647	0.139	0.047
510–510A	-15.129	3.075	-0.381	0.002	0.003
510–LNC1	-15455.401	-2635.683	-20.481	0.010	0.019
510–LNC2	-15456.245	-2662.984	-20.544	0.020	0.037
510–LNC2	-15456.247	-2662.992	-20.543	0.010	0.019
510–SACR	-36715.323	-2600.454	-19.390	0.056	0.028

510–SACR	-36715.342	-2602.282	-19.640	0.714	0.237
510A–LNC1	-15440.278	-2638.759	-20.090	0.009	0.019
510A–LNC2	-15441.124	-2666.069	-20.150	0.009	0.019
510A–LNC2	-15441.130	-2666.069	-20.134	0.044	0.091
510A–SACR	-36700.217	-2603.642	-18.929	0.045	0.024
510A–SACR	-36700.312	-2602.617	-18.624	0.446	0.158
701–701A	-47.716	-17.980	-1.640	0.011	0.021
701–LNC2	4227.790	-19102.633	-124.482	0.027	0.052
701–SACR	-17031.305	-19040.301	-123.419	0.041	0.055
701A–LNC2	4275.503	-19084.688	-122.906	0.010	0.016
701A–SACR	-16983.605	-19022.288	-121.742	0.013	0.021
702–702A	12.785	20.969	0.227	0.006	0.007
702–LNC2	-3409.562	-17785.917	-232.287	0.013	0.017
702A–LNC2	-3422.340	-17806.884	-232.518	0.013	0.016
703–703A	28.206	-5.585	0.552	0.003	0.006
703–LNC2	-3926.858	-24586.615	-361.988	0.011	0.021
703A–LNC2	-3955.064	-24581.034	-362.550	0.012	0.022
704–704A	4.531	-58.415	-1.103	0.004	0.007
704–LNC2	-10244.781	-21440.361	-402.302	0.011	0.019
705–705A	10.015	31.378	-2.175	0.006	0.010
706–706A	9.362	17.839	-0.950	0.002	0.004
706–LNC2	-20106.086	-18228.714	-383.938	0.012	0.022
706–SACR	-41365.210	-18166.366	-382.741	0.089	0.045
706A–LNC2	-20115.458	-18246.557	-382.964	0.010	0.021
706A–SACR	-41374.544	-18184.173	-381.794	0.069	0.034
707–707A	11.565	-52.589	-0.106	0.009	0.019
707–LNC2	-7018.671	-14147.202	-84.491	0.015	0.029
707–SACR	-28277.813	-14084.847	-83.247	0.194	0.106
707A–LNC2	-7030.247	-14094.604	-84.383	0.009	0.018
707A–SACR	-28289.381	-14032.461	-83.303	0.088	0.055
708–708A	-5.537	-30.490	-3.344	0.005	0.008
708–LNC2	-16334.385	-17038.476	-347.167	0.009	0.017
708–SACR	-37593.510	-16975.993	-346.036	0.063	0.033
708A–LNC2	-16328.846	-17007.984	-343.814	0.008	0.017
708A–SACR	-37587.958	-16945.521	-342.673	0.066	0.037
709–709A	-0.758	-16.377	-1.303	0.008	0.016
709–LNC2	-16836.409	-8393.083	-76.270	0.019	0.033
709–SACR	-38095.319	-8330.499	-75.369	0.431	0.439

709A–LNC2	-16835.658	-8376.704	-74.973	0.012	0.025
709A–SACR	-38094.715	-8314.329	-73.851	0.121	0.122
710–710A	-62.057	61.225	0.895	0.005	0.006
710–LNC2	-22149.735	-2950.039	-65.430	0.012	0.017
710–SACR	-43408.889	-2887.608	-64.190	0.056	0.045
710A–LNC2	-22087.687	-3011.267	-66.326	0.012	0.017
710A–SACR	-43346.846	-2948.740	-65.026	0.068	0.057
JS0750–LNC1	8458.995	-8442.676	-26.185	0.004	0.008
JS0750–LNC2	8458.149	-8469.984	-26.244	0.004	0.008
JS0750–SACR	-12800.967	-8407.575	-25.103	0.005	0.011
JS07860s–LNC1	-6641.016	-24537.225	-376.787	0.011	0.017
JS07860s–LNC2	-6641.861	-24564.534	-376.848	0.011	0.017
JS07860s–SACR	-27900.911	-24502.167	-375.805	0.031	0.030
JS08010s–LNC2	-6412.702	-24309.940	-361.124	0.014	0.019
LNC1–LNC2	-0.849	-27.308	-0.062	0.001	0.001
LNC1–SACR	-21259.948	35.106	1.137	0.010	0.016
LNC2–SACR	-21259.111	62.411	1.147	0.009	0.015
LNC2–SACR	-21259.114	62.408	1.166	0.008	0.012
LNC2–SACR	-21259.098	62.413	1.194	0.009	0.015
LNC2–SACR	-21259.111	62.409	1.181	0.008	0.013

Control Points

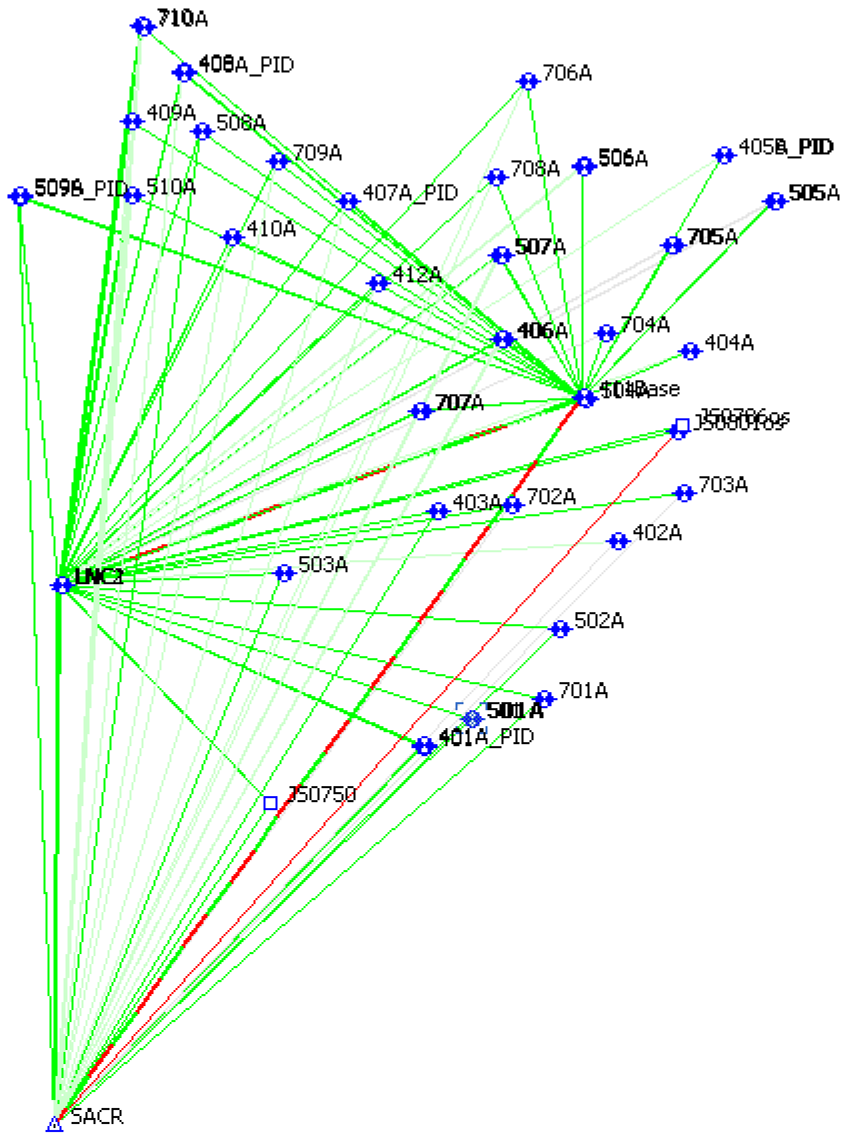
Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
JS0750	4292577.665	651612.378	62.661	
JS07860s	4307677.676	667706.927	411.344	
LNC2	4301035.814	643142.393	36.374	
SACR	4279776.701	643204.805	37.978	

Adjusted Points

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
401	4294866.738	657580.389	127.275	
401A_PID	4294885.021	657587.483	127.570	
402	4303070.663	665116.567	342.933	
402A	4303040.502	665145.460	343.195	
403	4304161.504	657992.687	273.369	
403A	4304112.645	657978.607	270.275	
404	4310589.877	667865.568	474.387	
404A	4310599.445	667846.721	473.371	
405	4318342.769	669132.047	586.876	
405A_PID	4318327.136	669140.741	587.264	

405B_PID	4318328.212	669121.896	587.539	
406	4310936.568	660443.927	339.765	
406A	4310931.438	660508.748	343.414	
407	4316368.278	654285.311	116.246	
407A_PID	4316374.827	654283.684	115.992	
408	4321411.109	647827.868	106.951	
408A_PID	4321359.984	647827.186	107.161	
409	4319382.979	645721.810	60.669	
409A	4319365.983	645723.260	60.312	
410	4314905.779	649739.103	73.760	
410A	4314897.647	649744.266	73.900	
411Base	4308700.306	663721.000	363.602	
412	4313133.602	655499.824	169.598	
412A	4313138.313	655504.135	169.872	
501	4295962.757	659397.248	149.526	
501A	4295979.677	659408.549	150.521	
502	4299542.880	662826.497	203.342	
502A	4299534.517	662842.905	203.912	
503	4301616.898	651972.080	121.739	
503A	4301635.340	651920.707	122.179	
504	4308615.645	663767.874	351.235	
504A	4308594.349	663760.637	351.272	
505	4316500.515	671158.374	575.794	
505A	4316488.407	671179.874	577.163	
506	4317836.171	663580.479	408.658	
506A	4317790.880	663575.016	408.446	
507	4314301.156	660370.427	379.259	
507A	4314295.856	660390.902	379.013	
508	4319024.306	648551.766	109.796	
508A	4319059.187	648563.817	114.657	
509	4316378.745	641373.969	36.052	
509A	4316401.774	641394.468	36.340	
509B_PID	4316356.603	641378.771	36.179	
510	4316492.064	645805.383	55.994	
510A	4316476.935	645808.458	55.613	
701	4296808.024	662245.066	160.131	
701A	4296760.309	662227.085	158.494	
702	4304445.373	660928.309	267.543	

702A	4304458.157	660949.278	267.768	
703	4304962.671	667729.010	396.672	
703A	4304990.877	667723.425	397.223	
704	4311280.597	664582.745	436.669	
704A	4311285.128	664524.330	435.566	
705	4314768.010	667150.501	427.754	
705A	4314778.024	667181.881	425.576	
706	4321141.905	661371.117	417.910	
706A	4321151.268	661388.956	416.957	
707	4308054.496	657289.593	119.759	
707A	4308066.062	657237.002	119.669	
708	4317370.193	660180.866	381.547	
708A	4317364.654	660150.376	378.206	
709	4317872.231	651535.476	111.257	
709A	4317871.473	651519.097	109.961	
710	4323185.563	646092.441	100.428	
710A	4323123.504	646153.667	101.326	
JS0750	4292577.665	651612.378	62.661	
JS07860s	4307677.676	667706.927	411.344	
JS08010s	4307448.516	667452.333	395.669	
LNC1	4301036.661	643169.702	36.436	
LNC2	4301035.814	643142.393	36.374	



Final Control Summary

Placer County West Sacramento CA						
Swood	Jul-12					
UTM North Zone 10						
NAD83, NAVD88, Meters						
	LIDAR QC Classification Codes					
	Bare Earth/Open Terrain		400s		OT	
	Tall Weeds and Crops		500s		TW	
	Forested and Fully Grown		700s		F	
Name	Grid Northing	Grid Easting	Elevation (m)		Control	Note

	(m)	(m)				
401	4294866.738	657580.389	127.275		None	OT
402	4303070.663	665116.567	342.933		None	OT
403	4304161.504	657992.687	273.369		None	OT
404	4310589.877	667865.568	474.387		None	OT
405	4318342.769	669132.047	586.876		None	OT
406	4310936.568	660443.927	339.765		None	OT
407	4316368.278	654285.311	116.246		None	OT
408	4321411.109	647827.868	106.951		None	OT
409	4319382.979	645721.810	60.669		None	OT
410	4314905.779	649739.103	73.760		None	OT
412	4313133.602	655499.824	169.598		None	OT
501	4295962.757	659397.248	149.526		None	TW
502	4299542.880	662826.497	203.342		None	TW
503	4301616.898	651972.080	121.739		None	TW
504	4308615.645	663767.874	351.235		None	TW
505	4316500.515	671158.374	575.794		None	TW
506	4317836.171	663580.479	408.658		None	TW
507	4314301.156	660370.427	379.259		None	TW
508	4319024.306	648551.766	109.796		None	TW
509	4316378.745	641373.969	36.052		None	TW
510	4316492.064	645805.383	55.994		None	TW
701	4296808.024	662245.066	160.131		None	F
702	4304445.373	660928.309	267.543		None	F
703	4304962.671	667729.010	396.672		None	F
704	4311280.597	664582.745	436.669		None	F
705	4314768.010	667150.501	427.754		None	F
706	4321141.905	661371.117	417.910		None	F
707	4308054.496	657289.593	119.759		None	F
708	4317370.193	660180.866	381.547		None	F
709	4317872.231	651535.476	111.257		None	F
710	4323185.563	646092.441	100.428		None	F
401A_PID	4294885.021	657587.483	127.570		None	OT
402A	4303040.502	665145.460	343.195		None	OT
403A	4304112.645	657978.607	270.275		None	OT
404A	4310599.445	667846.721	473.371		None	OT
405A_PID	4318327.136	669140.741	587.264		None	OT
405B_PID	4318328.212	669121.896	587.539		None	OT
406A	4310931.438	660508.748	343.414		None	OT
407A_PID	4316374.827	654283.684	115.992		None	OT
408A_PID	4321359.984	647827.186	107.161		None	OT
409A	4319365.983	645723.260	60.312		None	OT
410A	4314897.647	649744.266	73.900		None	OT
411Base	4308700.306	663721.000	363.602		None	OT
412A	4313138.313	655504.135	169.872		None	OT
501A	4295979.677	659408.549	150.521		None	TW
502A	4299534.517	662842.905	203.912		None	TW

503A	4301635.340	651920.707	122.179		None	TW
504A	4308594.349	663760.637	351.272		None	TW
505A	4316488.407	671179.874	577.163		None	TW
506A	4317790.880	663575.016	408.446		None	TW
507A	4314295.856	660390.902	379.013		None	TW
508A	4319059.187	648563.817	114.657		None	TW
509A	4316401.774	641394.468	36.340		None	TW
509B_PID	4316356.603	641378.771	36.179		None	TW
510A	4316476.935	645808.458	55.613		None	TW
701A	4296760.309	662227.085	158.494		None	F
702A	4304458.157	660949.278	267.768		None	F
703A	4304990.877	667723.425	397.223		None	F
704A	4311285.128	664524.330	435.566		None	F
705A	4314778.024	667181.881	425.576		None	F
706A	4321151.268	661388.956	416.957		None	F
707A	4308066.062	657237.002	119.669		None	F
708A	4317364.654	660150.376	378.206		None	F
709A	4317871.473	651519.097	109.961		None	F
710A	4323123.504	646153.667	101.326		None	F
JS0750	4292577.665	651612.378	62.661		Vertical	NGS PID
JS0786os	4307677.676	667706.927	411.344		Vertical	NGS PID
JS08010s	4307448.516	667452.333	395.669		None	NGS PID
LNC1	4301036.661	643169.702	36.436		None	CORS
LNC2	4301035.814	643142.393	36.374		Horizontal	CORS
SACR	4279776.701	643204.805	37.978		Both	CORS

Name	Std Dev n (m)	Std Dev e (m)	Std Dev u (m)	Std Dev Hz (m)	Geoid Separation (m)
401	0.003	0.002	0.008	0.004	-29.660
402	0.008	0.006	0.026	0.010	-28.646
403	0.003	0.003	0.010	0.004	-29.152
404	0.002	0.002	0.007	0.003	-27.963
405	0.003	0.002	0.009	0.004	-27.410
406	0.005	0.004	0.014	0.007	-28.478
407	0.003	0.002	0.009	0.004	-28.549
408	0.004	0.003	0.012	0.005	-28.645
409	0.002	0.002	0.010	0.003	-28.915
410	0.003	0.003	0.011	0.005	-28.968
412	0.002	0.002	0.007	0.003	-28.702
501	0.004	0.003	0.012	0.004	-29.491
502	0.005	0.003	0.010	0.006	-29.046
503	0.002	0.002	0.007	0.003	-29.683
504	0.005	0.004	0.013	0.007	-28.384
505	0.004	0.003	0.011	0.005	-27.429

506	0.005	0.004	0.015	0.006		-27.752	
507	0.003	0.002	0.008	0.003		-28.232	
508	0.003	0.003	0.009	0.004		-28.758	
509	0.003	0.002	0.009	0.003		-29.316	
510	0.003	0.003	0.010	0.004		-29.094	
701	0.010	0.010	0.030	0.014		-29.235	
702	0.009	0.004	0.015	0.009		-28.901	
703	0.006	0.005	0.019	0.008		-28.327	
704	0.003	0.002	0.009	0.004		-28.136	
705	0.003	0.003	0.011	0.005		-27.737	
706	0.003	0.003	0.011	0.004		-27.668	
707	0.004	0.004	0.013	0.006		-28.941	
708	0.003	0.003	0.010	0.004		-28.017	
709	0.007	0.006	0.022	0.009		-28.635	
710	0.005	0.004	0.013	0.007		-28.648	
401A_PID	0.003	0.002	0.008	0.004		-29.659	
402A	0.008	0.007	0.027	0.011		-28.646	
403A	0.003	0.003	0.010	0.004		-29.156	
404A	0.002	0.002	0.008	0.003		-27.964	
405A_PID	0.003	0.002	0.009	0.004		-27.411	
405B_PID	0.003	0.002	0.009	0.004		-27.411	
406A	0.002	0.002	0.007	0.003		-28.473	
407A_PID	0.003	0.002	0.009	0.004		-28.549	
408A_PID	0.005	0.003	0.013	0.005		-28.648	
409A	0.003	0.002	0.012	0.004		-28.916	
410A	0.003	0.003	0.009	0.004		-28.969	
411Base	0.001	0.001	0.005	0.002		-28.382	
412A	0.002	0.002	0.007	0.003		-28.702	
501A	0.004	0.003	0.012	0.004		-29.489	
502A	0.005	0.003	0.010	0.006		-29.045	
503A	0.002	0.002	0.008	0.003		-29.684	
504A	0.005	0.004	0.013	0.006		-28.386	
505A	0.003	0.003	0.010	0.005		-27.429	
506A	0.005	0.004	0.015	0.006		-27.755	
507A	0.003	0.002	0.008	0.003		-28.231	
508A	0.003	0.003	0.009	0.004		-28.754	
509A	0.003	0.002	0.009	0.003		-29.314	
509B_PID	0.003	0.002	0.009	0.003		-29.317	
510A	0.003	0.003	0.010	0.004		-29.094	
701A	0.006	0.006	0.016	0.008		-29.239	
702A	0.009	0.004	0.015	0.009		-28.899	
703A	0.006	0.005	0.019	0.008		-28.325	
704A	0.004	0.003	0.010	0.004		-28.140	
705A	0.003	0.003	0.010	0.005		-27.735	
706A	0.003	0.003	0.011	0.004		-27.666	
707A	0.005	0.003	0.014	0.006		-28.945	
708A	0.002	0.002	0.009	0.003		-28.020	

709A	0.006	0.005	0.021	0.008		-28.636	
710A	0.005	0.004	0.013	0.007		-28.648	
JS0750	0.002	0.002	0.000	0.003		-30.026	
JS07860s	0.007	0.004	0.000	0.008		-28.159	
JS08010s	0.010	0.009	0.023	0.014		-28.191	
LNC1	0.001	0.001	0.004	0.001		-30.020	
LNC2	0.000	0.000	0.004	0.000		-30.021	
SACR	0.000	0.000	0.000	0.000		-30.473	

Gps Observations Summary Part One

Point Name	Original Name	Antenna Type	Antenna Height (USft)	Ant Height Method	Start Time
501A	B2850703a_1728	HiPer GD/GGD	4.41	Vertical	7/3/2012 19:09
401	B2850703b_1728	HiPer GD/GGD	4.41	Vertical	7/3/2012 19:51
701	B2850703c_1728	HiPer GD/GGD	4.41	Vertical	7/3/2012 20:45
502	B2850703e_1728	HiPer GD/GGD	4.41	Vertical	7/3/2012 21:36
402	B2850703f_1728	HiPer GD/GGD	4.41	Vertical	7/3/2012 22:25
501	R0600703t_1LHC	HiPer+	4.35	Vertical	7/3/2012 19:08
401A_PID	R0600703ta_1LHC	HiPer+	4.41	Vertical	7/3/2012 19:52
701A	R0600703u_1LHC	HiPer+	4.41	Vertical	7/3/2012 20:48
502A	R0600703v_1LHC	HiPer+	4.41	Vertical	7/3/2012 21:38
402A	R0600703w_1LHC	HiPer+	4.41	Vertical	7/3/2012 22:26
SACR	SACR		0.00	Vertical	7/3/2012 0:00
503A	B38730704p_DO1S	HiPer+	4.41	Vertical	7/4/2012 15:57
403A	B38730704q_DO1S	HiPer+	4.41	Vertical	7/4/2012 16:47
702	B38730704r_DO1S	HiPer+	4.41	Vertical	7/4/2012 17:41
703A	B38730704t_DO1S	HiPer+	4.41	Vertical	7/4/2012 19:00
503	R0600704p_1LHC	HiPer+	4.41	Vertical	7/4/2012 15:55
403	R0600704q_1LHC	HiPer+	4.41	Vertical	7/4/2012 16:46
702A	R0600704r_1LHC	HiPer+	4.41	Vertical	7/4/2012 17:43
703	R0600704s_1LHC	HiPer+	4.41	Vertical	7/4/2012 18:58
SACR	SACR		0.00	Vertical	7/4/2012 0:00
LNC2	LNC2	ASH701945E_M SCIT	0.00	Vertical	7/4/2012 0:00
LNC2	LNC2	ASH701945E_M SCIT	0.00	Vertical	7/3/2012 0:00
405B_PID	R0600705v_1LHC	HiPer+	4.47	Vertical	7/5/2012 21:50
504	B0560705a_81KW	HiPer+	4.41	Vertical	7/5/2012 16:31
704	B0560705b_81KW	HiPer+	4.31	Vertical	7/5/2012 18:05
404A	B0560705c_81KW	HiPer+	4.41	Vertical	7/5/2012 18:55
705A	B0560705d_81KW	HiPer+	4.41	Vertical	7/5/2012 19:55
505	B0560705e_81KW	HiPer+	4.41	Vertical	7/5/2012 20:51
405A_PID	B0560705f_81KW	HiPer+	4.41	Vertical	7/5/2012 21:45
506	B0560705g_81KW	HiPer+	4.41	Vertical	7/5/2012 23:02
706	B0560706a_81KW	HiPer+	4.41	Vertical	7/6/2012 0:08

507	B0560706b_81KW	HiPer+	4.25	Vertical	7/6/2012 1:19
406A	B0560706c_81KW	HiPer+	4.41	Vertical	7/6/2012 2:14
707	B0560706d_81KW	HiPer+	4.41	Vertical	7/6/2012 2:59
JS08010s	B3610705a_ESQO	HiPer GD/GGD	4.41	Vertical	7/5/2012 14:57
504A	B3610705b_ESQO	HiPer GD/GGD	4.41	Vertical	7/5/2012 16:32
411Base	B3610705d_ESQO	HiPer GD/GGD	4.41	Vertical	7/5/2012 17:40
704A	B38730705s_DO1S	HiPer+	4.25	Vertical	7/5/2012 18:07
404	B38730705sa_DO1S	HiPer+	4.34	Vertical	7/5/2012 18:53
705	B38730705t_DO1S	HiPer+	4.41	Vertical	7/5/2012 19:53
505A	B38730705u_DO1S	HiPer+	4.41	Vertical	7/5/2012 20:52
405	B38730705v_DO1S	HiPer+	4.41	Vertical	7/5/2012 21:44
506A	B38730705x_DO1S	HiPer+	4.41	Vertical	7/5/2012 23:03
706A	B38730706a_DO1S	HiPer+	4.41	Vertical	7/6/2012 0:10
507A	B38730706b_DO1S	HiPer+	4.41	Vertical	7/6/2012 1:20
406	B38730706c_DO1S	HiPer+	4.41	Vertical	7/6/2012 2:10
707A	B38730706d_DO1S	HiPer+	4.41	Vertical	7/6/2012 3:00
LNC2	LNC2	ASH701945E_M SCIT	0.00	Vertical	7/5/2012 0:00
509B_PID	B0560706e_81KW	HiPer+	4.70	Vertical	7/6/2012 23:16
412	R0600707c_1LHC	HiPer+	4.41	Vertical	7/7/2012 2:22
708	B38730706q_DO1S	HiPer+	4.30	Vertical	7/6/2012 16:00
407	B38730706s_DO1S	HiPer+	4.41	Vertical	7/6/2012 18:00
709A	B38730706t_DO1S	HiPer+	4.41	Vertical	7/6/2012 19:12
508	B38730706ta_DO1S	HiPer+	4.41	Vertical	7/6/2012 19:56
408	B38730706v_DO1S	HiPer+	4.41	Vertical	7/6/2012 21:53
710	B38730706u_DO1S	HiPer+	4.30	Vertical	7/6/2012 20:43
509	B38730706w_DO1S	HiPer+	4.30	Vertical	7/6/2012 22:59
510A	B38730706x_DO1S	HiPer+	4.30	Vertical	7/6/2012 23:50
409A	B38730707a_DO1S	HiPer+	4.41	Vertical	7/7/2012 0:32
410A	B38730707b_DO1S	HiPer+	4.41	Vertical	7/7/2012 1:24
412A	B38730707c_DO1S	HiPer+	4.41	Vertical	7/7/2012 2:24
411Base	R05907060_UN0G	HiPer+	4.50	Vertical	7/6/2012 14:59
708A	R0600706q_1LHC	HiPer+	4.30	Vertical	7/6/2012 16:03
407A_PID	R0600706s_1LHC	HiPer+	4.41	Vertical	7/6/2012 18:02
709	R0600706t_1LHC	HiPer+	4.41	Vertical	7/6/2012 19:10
508A	R0600706ta_1LHC	HiPer+	4.30	Vertical	7/6/2012 19:59
710A	R0600706u_1LHC	HiPer+	4.30	Vertical	7/6/2012 20:46
408A_PID	R0600706v_1LHC	HiPer+	4.41	Vertical	7/6/2012 21:56
LNC2	LNC2	ASH701945E_M SCIT	0.00	Vertical	7/6/2012 0:00
509A	R0600706x_1LHC	HiPer+	4.30	Vertical	7/6/2012 23:01
510	R0600706xa_1LHC	HiPer+	4.30	Vertical	7/6/2012 23:49
409	R0600707a_1LHC	HiPer+	4.41	Vertical	7/7/2012 0:31
410	R0600707b_1LHC	HiPer+	4.41	Vertical	7/7/2012 1:23
JS0750	R0600707q_1LHC	HiPer+	4.30	Vertical	7/7/2012 16:02
JS07860s	B38730707v_DO1S	HiPer+	4.41	Vertical	7/7/2012 21:23

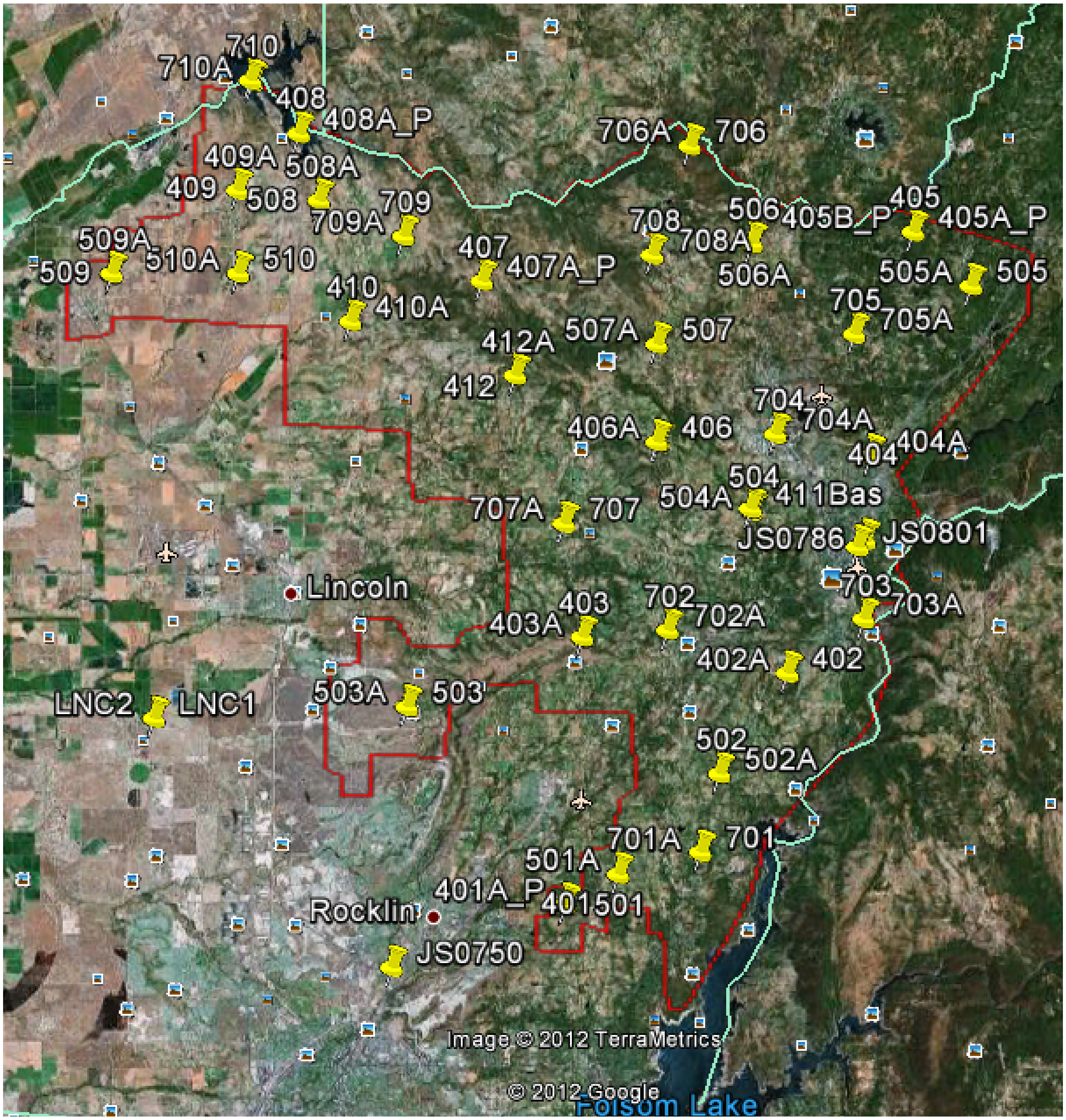
LNC2	LNC2	ASH701945E_M SCIT	0.00	Vertical	7/7/2012 0:00
LNC1	LNC1	ASH701945E_M SCIT	0.00	Vertical	7/7/2012 0:00
SACR	SACR		0.00	Vertical	7/7/2012 0:00
SACR	SACR		0.00	Vertical	7/6/2012 0:00

Gps Observations Summary Part Two

Point Name	Original Name	Stop Time	Duration	Method	Receiver
501A	B2850703a_1728	7/3/2012 19:36	0:27:30	Static	8R0PSO61728
401	B2850703b_1728	7/3/2012 20:27	0:35:50	Static	8R0PSO61728
701	B2850703c_1728	7/3/2012 21:20	0:35:10	Static	8R0PSO61728
502	B2850703e_1728	7/3/2012 22:09	0:33:10	Static	8R0PSO61728
402	B2850703f_1728	7/3/2012 23:01	0:36:30	Static	8R0PSO61728
501	R0600703t_1LHC	7/3/2012 19:36	0:27:20	Static	8RJYCOT1LHC
401A_PID	R0600703ta_1LHC	7/3/2012 20:27	0:35:10	Static	8RJYCOT1LHC
701A	R0600703u_1LHC	7/3/2012 21:21	0:33:40	Static	8RJYCOT1LHC
502A	R0600703v_1LHC	7/3/2012 22:10	0:31:55	Static	8RJYCOT1LHC
402A	R0600703w_1LHC	7/3/2012 23:00	0:33:55	Static	8RJYCOT1LHC
SACR	SACR	7/4/2012 0:00	0:00:00	Static	4624K01578
503A	B38730704p_DO1S	7/4/2012 16:24	0:26:40	Static	8RHDWKLDO1S
403A	B38730704q_DO1S	7/4/2012 17:18	0:30:45	Static	8RHDWKLDO1S
702	B38730704r_DO1S	7/4/2012 18:15	0:34:15	Static	8RHDWKLDO1S
703A	B38730704t_DO1S	7/4/2012 19:30	0:30:05	Static	8RHDWKLDO1S
503	R0600704p_1LHC	7/4/2012 16:22	0:26:55	Static	8RJYCOT1LHC
403	R0600704q_1LHC	7/4/2012 17:19	0:33:10	Static	8RJYCOT1LHC
702A	R0600704r_1LHC	7/4/2012 18:17	0:34:50	Static	8RJYCOT1LHC
703	R0600704s_1LHC	7/4/2012 19:30	0:31:35	Static	8RJYCOT1LHC
SACR	SACR	7/4/2012 23:00	23:00:00	Static	4624K01578
LNC2	LNC2	7/5/2012 0:00	0:00:00	Static	4751143269
LNC2	LNC2	7/4/2012 0:00	0:00:00	Static	4751143269
405B_PID	R0600705v_1LHC	7/5/2012 22:30	0:39:45	Static	8RJYCOT1LHC
504	B0560705a_81KW	7/5/2012 17:35	1:04:40	Static	8PZFI4M81KW
704	B0560705b_81KW	7/5/2012 18:40	0:35:05	Static	8PZFI4M81KW
404A	B0560705c_81KW	7/5/2012 19:29	0:33:55	Static	8PZFI4M81KW
705A	B0560705d_81KW	7/5/2012 20:32	0:36:45	Static	8PZFI4M81KW
505	B0560705e_81KW	7/5/2012 21:31	0:39:45	Static	8PZFI4M81KW
405A_PID	B0560705f_81KW	7/5/2012 22:29	0:44:20	Static	8PZFI4M81KW
506	B0560705g_81KW	7/5/2012 23:46	0:44:05	Static	8PZFI4M81KW
706	B0560706a_81KW	7/6/2012 0:50	0:41:55	Static	8PZFI4M81KW
507	B0560706b_81KW	7/6/2012 1:56	0:37:00	Static	8PZFI4M81KW
406A	B0560706c_81KW	7/6/2012 2:46	0:31:45	Static	8PZFI4M81KW
707	B0560706d_81KW	7/6/2012 3:28	0:29:00	Static	8PZFI4M81KW
JS0801os	B3610705a_ESQO	7/5/2012 15:27	0:29:50	Static	8PJPJX3ESQO
504A	B3610705b_ESQO	7/5/2012 17:36	1:03:45	Static	8PJPJX3ESQO

411Base	B3610705d_ESQO	7/6/2012 3:48	10:07:50	Static	8PJPJX3ESQO
704A	B38730705s_DO1S	7/5/2012 18:41	0:34:50	Static	8RHDWKLDO1S
404	B38730705sa_DO1S	7/5/2012 19:28	0:34:40	Static	8RHDWKLDO1S
705	B38730705t_DO1S	7/5/2012 20:31	0:37:45	Static	8RHDWKLDO1S
505A	B38730705u_DO1S	7/5/2012 21:32	0:39:25	Static	8RHDWKLDO1S
405	B38730705v_DO1S	7/5/2012 22:32	0:48:30	Static	8RHDWKLDO1S
506A	B38730705x_DO1S	7/5/2012 23:45	0:41:30	Static	8RHDWKLDO1S
706A	B38730706a_DO1S	7/6/2012 0:51	0:41:05	Static	8RHDWKLDO1S
507A	B38730706b_DO1S	7/6/2012 1:56	0:35:25	Static	8RHDWKLDO1S
406	B38730706c_DO1S	7/6/2012 2:47	0:36:50	Static	8RHDWKLDO1S
707A	B38730706d_DO1S	7/6/2012 3:29	0:28:35	Static	8RHDWKLDO1S
LNC2	LNC2	7/6/2012 0:00	0:00:00	Static	4751143269
509B_PID	B0560706e_81KW	7/6/2012 23:33	0:17:15	Static	8PZFI4M81KW
412	R0600707c_1LHC	7/7/2012 2:55	0:33:20	Static	8RJYCOT1LHC
708	B38730706q_DO1S	7/6/2012 16:43	0:43:10	Static	8RHDWKLDO1S
407	B38730706s_DO1S	7/6/2012 18:32	0:32:30	Static	8RHDWKLDO1S
709A	B38730706t_DO1S	7/6/2012 19:43	0:31:40	Static	8RHDWKLDO1S
508	B38730706ta_DO1S	7/6/2012 20:30	0:34:10	Static	8RHDWKLDO1S
408	B38730706v_DO1S	7/6/2012 22:32	0:38:50	Static	8RHDWKLDO1S
710	B38730706u_DO1S	7/6/2012 21:29	0:46:35	Static	8RHDWKLDO1S
509	B38730706w_DO1S	7/6/2012 23:36	0:36:50	Static	8RHDWKLDO1S
510A	B38730706x_DO1S	7/7/2012 0:21	0:30:35	Static	8RHDWKLDO1S
409A	B38730707a_DO1S	7/7/2012 1:06	0:34:10	Static	8RHDWKLDO1S
410A	B38730707b_DO1S	7/7/2012 1:56	0:32:05	Static	8RHDWKLDO1S
412A	B38730707c_DO1S	7/7/2012 2:56	0:32:00	Static	8RHDWKLDO1S
411Base	R05907060_UN0G	7/7/2012 3:20	12:21:10	Static	8QCP5IOUN0G
708A	R0600706q_1LHC	7/6/2012 16:44	0:41:05	Static	8RJYCOT1LHC
407A_PID	R0600706s_1LHC	7/6/2012 18:33	0:31:50	Static	8RJYCOT1LHC
709	R0600706t_1LHC	7/6/2012 19:42	0:31:50	Static	8RJYCOT1LHC
508A	R0600706ta_1LHC	7/6/2012 20:29	0:30:05	Static	8RJYCOT1LHC
710A	R0600706u_1LHC	7/6/2012 21:31	0:44:55	Static	8RJYCOT1LHC
408A_PID	R0600706v_1LHC	7/6/2012 22:29	0:32:30	Static	8RJYCOT1LHC
LNC2	LNC2	7/7/2012 0:00	0:00:00	Static	4751143269
509A	R0600706x_1LHC	7/6/2012 23:35	0:33:55	Static	8RJYCOT1LHC
510	R0600706xa_1LHC	7/7/2012 0:20	0:31:30	Static	8RJYCOT1LHC
409	R0600707a_1LHC	7/7/2012 1:07	0:36:05	Static	8RJYCOT1LHC
410	R0600707b_1LHC	7/7/2012 1:56	0:32:35	Static	8RJYCOT1LHC
JS0750	R0600707q_1LHC	7/7/2012 16:51	0:49:30	Static	8RJYCOT1LHC
JS07860s	B38730707v_DO1S	7/7/2012 22:23	1:00:15	Static	8RHDWKLDO1S
LNC2	LNC2	7/8/2012 0:00	0:00:00	Static	4751143269
LNC1	LNC1	7/8/2012 0:00	0:00:00	Static	4751143257
SACR	SACR	7/8/2012 0:00	0:00:00	Static	4624K01578
SACR	SACR	7/7/2012 0:00	0:00:00	Static	4624K01578

Placer County West Area CP Sketch



NGS DataSheets

THE NGS DATA SHEET

See file dsdata.txt for more information about the datasheet.
DATABASE = NGSIDB , PROGRAM = datasheet95, VERSION = 7.89
1 National Geodetic Survey, Retrieval Date = JULY 5, 2012
DF7467 ***
DF7467 CORS - This is a GPS Continuously Operating Reference Station.
DF7467 DESIGNATION - LINCOLN 2 CORS ARP
DF7467 CORS_ID - LNC2

```
DF7467  PID        -  DF7467
DF7467  STATE/COUNTY-  CA/PLACER
DF7467  COUNTRY     -  US
DF7467  USGS QUAD   -  ROSEVILLE (1992)
DF7467
DF7467                    *CURRENT SURVEY CONTROL
DF7467
```

```
DF7467* NAD 83(2011) POSITION- 38 50 47.41588(N) 121 21 01.92687(W)   ADJUSTED
DF7467* NAD 83(2011) ELLIP HT-     6.381 (meters)        (08/??/11)   ADJUSTED
DF7467* NAD 83(2011) EPOCH  -  2010.00
DF7467* NAVD 88 ORTHO HEIGHT -         **(meters)          **(feet)
DF7467
```

```
DF7467  NAD 83(2011) X  - -2,587,855.568 (meters)                 COMP
DF7467  NAD 83(2011) Y  - -4,247,830.076 (meters)                 COMP
DF7467  NAD 83(2011) Z  -  3,979,063.983 (meters)                 COMP
DF7467  GEOID HEIGHT    -        -30.01  (meters)              GEOID12
DF7467  HORZ ORDER      -  SPECIAL (CORS)
DF7467  ELLP ORDER      -  SPECIAL (CORS)
DF7467
DF7467.The coordinates were established by GPS observations
DF7467.and adjusted by the National Geodetic Survey in August 2011.
DF7467
DF7467.NAD 83(2011) refers to NAD 83 coordinates where the reference
DF7467.frame has been affixed to the stable North American Tectonic Plate.
DF7467
DF7467.The coordinates are valid at the epoch date displayed above
DF7467.which is a decimal equivalence of Year/Month/Day.
DF7467
DF7467.The PID for the CORS L1 Phase Center is DG6998.
DF7467
DF7467.The XYZ, and position/ellipsoidal ht. are equivalent.
DF7467
DF7467.The ellipsoidal height was determined by GPS observations
DF7467.and is referenced to NAD 83.
DF7467
DF7467. The following values were computed from the NAD 83(2011) position.
DF7467
DF7467;                 North         East     Units Scale Factor Converg.
DF7467;SPC CA 2     -   631,169.704 2,056,377.346   MT  0.99992327   +0 24 34.1
DF7467;SPC CA 2     - 2,070,762.60  6,746,631.34   sFT  0.99992327   +0 24 34.1
DF7467
DF7467!            -  Elev Factor  x  Scale Factor =   Combined Factor
DF7467!SPC CA 2     -  0.99999900  x   0.99992327  =   0.99992227
DF7467
DF7467                     SUPERSEDED SURVEY CONTROL
DF7467
DF7467  NAD 83(CORS)-  38 50 47.41366(N)    121 21 01.92412(W) AD(2002.00) c
DF7467  ELLIP H (03/??/08)    6.381  (m)                  GP(2002.00) c c
```

Dewberry

DF7467 NAD 83(CORS)- 38 50 47.41360(N) 121 21 01.92404(W) AD(2002.00) c
DF7467 ELLIP H (10/??/04) 6.389 (m) GP(2002.00) c c
DF7467 NAD 83(CORS)- 38 50 47.41355(N) 121 21 01.92408(W) AD(2002.00) c
DF7467 ELLIP H (08/??/03) 6.277 (m) GP(2002.00) c c
DF7467
DF7467.Superseded values are not recommended for survey control.
DF7467
DF7467.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DF7467.See file dsdata.txt to determine how the superseded data were derived.
DF7467
DF7467_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFJ4314201035(NAD 83)
DF7467
DF7467_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS
ANTENNA
DF7467
DF7467 STATION DESCRIPTION
DF7467
DF7467'DESCRIBED BY NATIONAL GEODETIC SURVEY 2011
DF7467'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DF7467'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES
ACCESSIBLE
DF7467'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DF7467' ftp://cors.ngs.noaa.gov/cors/README.txt
DF7467' ftp://cors.ngs.noaa.gov/cors/coord/coord_08
DF7467' ftp://cors.ngs.noaa.gov/cors/station_log
DF7467' http://geodesy.noaa.gov/CORS
1 National Geodetic Survey, Retrieval Date = JULY 5, 2012

DH8725 ***
DH8725 HT_MOD - This is a Height Modernization Survey Station.
DH8725 CORS - This is a GPS Continuously Operating Reference Station.
DH8725 DESIGNATION - SACRAMENTO COOP CORS ARP
DH8725 CORS_ID - SACR
DH8725 PID - DH8725
DH8725 STATE/COUNTY- CA/SACRAMENTO
DH8725 COUNTRY - US
DH8725 USGS QUAD - CITRUS HEIGHTS (1992)
DH8725
DH8725 *CURRENT SURVEY CONTROL
DH8725

DH8725* NAD 83(2011) POSITION- 38 39 17.97131(N) 121 21 15.19332(W) ADJUSTED
DH8725* NAD 83(2011) ELLIP HT- 7.475 (meters) (08/??/11) ADJUSTED
DH8725* NAD 83(2011) EPOCH - 2010.00
DH8725* NAVD 88 ORTHO HEIGHT - 37.97 (meters) 124.6 (feet) GPS OBS
DH8725

DH8725 NAVD 88 orthometric height was determined with geoid model GEOID09
DH8725 GEOID HEIGHT - -30.47 (meters) GEOID09

DH8725 GEOID HEIGHT - -30.47 (meters) GEOID12
DH8725 NAD 83(2011) X - -2,595,053.378 (meters) COMP
DH8725 NAD 83(2011) Y - -4,259,028.356 (meters) COMP
DH8725 NAD 83(2011) Z - 3,962,484.543 (meters) COMP
DH8725 HORZ ORDER - SPECIAL (CORS)
DH8725 ELLP ORDER - SPECIAL (CORS)
DH8725
DH8725.The coordinates were established by GPS observations
DH8725.and adjusted by the National Geodetic Survey in August 2011.
DH8725
DH8725.NAD 83(2011) refers to NAD 83 coordinates where the reference
DH8725.frame has been affixed to the stable North American Tectonic Plate.
DH8725
DH8725.The coordinates are valid at the epoch date displayed above
DH8725.which is a decimal equivalence of Year/Month/Day.
DH8725
DH8725.The orthometric height was determined by GPS observations and a
DH8725.high-resolution geoid model using precise GPS observation and
DH8725.processing techniques.
DH8725
DH8725.The PID for the CORS L1 Phase Center is DI1709.
DH8725
DH8725.The XYZ, and position/ellipsoidal ht. are equivalent.
DH8725
DH8725.The ellipsoidal height was determined by GPS observations
DH8725.and is referenced to NAD 83.
DH8725
DH8725. The following values were computed from the NAD 83(2011) position.
DH8725
DH8725; North East Units Scale Factor Converg.
DH8725;SPC CA 2 - 609,909.477 2,056,208.522 MT 0.99994262 +0 24 25.7
DH8725;SPC CA 2 - 2,001,011.34 6,746,077.46 sFT 0.99994262 +0 24 25.7
DH8725
DH8725! - Elev Factor x Scale Factor = Combined Factor
DH8725!SPC CA 2 - 0.99999883 x 0.99994262 = 0.99994145
DH8725
DH8725 SUPERSEDED SURVEY CONTROL
DH8725
DH8725 NAD 83(CORS)- 38 39 17.96927(N) 121 21 15.19007(W) AD(2002.00) c
DH8725 ELLIP H (03/??/06) 7.482 (m) GP(2002.00) c c
DH8725
DH8725.Superseded values are not recommended for survey control.
DH8725
DH8725.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DH8725.See file dsdata.txt to determine how the superseded data were derived.
DH8725
DH8725_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH4320479776(NAD 83)
DH8725
DH8725_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA

DH8725
DH8725 STATION DESCRIPTION
DH8725
DH8725'DESCRIBED BY NATIONAL GEODETIC SURVEY 2011
DH8725'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DH8725'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES
ACCESSIBLE
DH8725'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DH8725' ftp://cors.ngs.noaa.gov/cors/README.txt
DH8725' ftp://cors.ngs.noaa.gov/cors/coord/coord_08
DH8725' ftp://cors.ngs.noaa.gov/cors/station_log
DH8725' http://geodesy.noaa.gov/CORS

*** retrieval complete.
Elapsed Time = 00:00:02

JS0801 **
JS0801 DESIGNATION - P 201
JS0801 PID - JS0801
JS0801 STATE/COUNTY- CA/PLACER
JS0801 COUNTRY - US
JS0801 USGS QUAD - AUBURN (1981)
JS0801
JS0801 *CURRENT SURVEY CONTROL
JS0801

JS0801* NAD 83(1986) POSITION- 38 53 59. (N) 121 04 10. (W) SCALED
JS0801* NAVD 88 ORTHO HEIGHT - 396.160 (meters) 1299.73 (feet) ADJUSTED
JS0801

JS0801 GEOID HEIGHT - -28.23 (meters) GEOID12
JS0801 DYNAMIC HEIGHT - 395.890 (meters) 1298.85 (feet) COMP
JS0801 MODELED GRAVITY - 979,934.1 (mgal) NAVD 88
JS0801
JS0801 VERT ORDER - FIRST CLASS II
JS0801
JS0801.The horizontal coordinates were scaled from a topographic map and have
JS0801.an estimated accuracy of +/- 6 seconds.
JS0801.
JS0801.The orthometric height was determined by differential leveling and
JS0801.adjusted in June 1991.
JS0801
JS0801.The dynamic height is computed by dividing the NAVD 88
JS0801.geopotential number by the normal gravity value computed on the
JS0801.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JS0801.degrees latitude (g = 980.6199 gals.).
JS0801
JS0801.The modeled gravity was interpolated from observed gravity values.
JS0801
JS0801; North East Units Estimated Accuracy

JS0801;SPC CA 2 - 637,290. 2,080,720. MT (+/- 180 meters Scaled)
JS0801
JS0801 SUPERSEDED SURVEY CONTROL
JS0801
JS0801.No superseded survey control is available for this station.
JS0801
JS0801_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFJ674074(NAD 83)
JS0801
JS0801_MARKER: DB = BENCH MARK DISK
JS0801_SETTING: 36 = SET IN A MASSIVE STRUCTURE
JS0801_SP_SET: BALUSTRADE
JS0801_STAMPING: P 201 1935
JS0801_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
JS0801_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
JS0801+SATELLITE: SATELLITE OBSERVATIONS - March 13, 2004
JS0801
JS0801 HISTORY - Date Condition Report By
JS0801 HISTORY - 1935 MONUMENTED CGS
JS0801 HISTORY - 1935 GOOD CGS
JS0801 HISTORY - 20040313 GOOD CADT
JS0801 HISTORY - 20070322 GOOD GEOCAC
JS0801
JS0801 STATION DESCRIPTION
JS0801
JS0801'DESCRIBED BY COAST AND GEODETIC SURVEY 1935
JS0801'AT AUBURN.
JS0801'AT AUBURN, PLACER COUNTY, AT THE PLACER COUNTY SAVINGS BANK, AT
JS0801'THE FRONT ENTRANCE, IN THE TOP OF THE WEST CONCRETE BALUSTRADE,
JS0801'0.5 FOOT NORTH OF THE SOUTH END OF THE BALUSTRACE, 0.5 FOOT
JS0801'WEST OF THE EAST EDGE, AND 14.5 FEET NORTH OF THE NORTH CURB
JS0801'LINE OF LINCOLN WAY. A STANDARD DISK, STAMPED P 201 1935.
JS0801
JS0801 STATION RECOVERY (2004)
JS0801
JS0801'RECOVERY NOTE BY CALTRANS 2004 (DWM)
JS0801'RECOVERED IN GOOD CONDITION.
JS0801
JS0801 STATION RECOVERY (2007)
JS0801
JS0801'RECOVERY NOTE BY GEOCACHING 2007 (TFW)
JS0801'RECOVERED AS DESCRIBED
1 National Geodetic Survey, Retrieval Date = JULY 4, 2012

JS0786 ***
JS0786 DESIGNATION - T 1200
JS0786 PID - JS0786
JS0786 STATE/COUNTY- CA/PLACER
JS0786 COUNTRY - US
JS0786 USGS QUAD - AUBURN (1981)
JS0786

JS0786 *CURRENT SURVEY CONTROL
JS0786

JS0786* NAD 83(1986) POSITION- 38 54 06.4 (N) 121 03 56.7 (W) HD_HELD2
JS0786* NAVD 88 ORTHO HEIGHT - 412.973 (meters) 1354.90 (feet) ADJUSTED
JS0786

JS0786 GEOID HEIGHT - -28.20 (meters) GEOID12
JS0786 DYNAMIC HEIGHT - 412.692 (meters) 1353.97 (feet) COMP
JS0786 MODELED GRAVITY - 979,934.6 (mgal) NAVD 88
JS0786
JS0786 VERT ORDER - FIRST CLASS I
JS0786
JS0786.The horizontal coordinates were established by autonomous hand held GPS
JS0786.observations and have an estimated accuracy of +/- 10 meters.
JS0786.
JS0786.The orthometric height was determined by differential leveling and
JS0786.adjusted in June 1991.
JS0786
JS0786.Photographs are available for this station.
JS0786
JS0786.The dynamic height is computed by dividing the NAVD 88
JS0786.geopotential number by the normal gravity value computed on the
JS0786.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JS0786.degrees latitude (g = 980.6199 gals.).
JS0786
JS0786.The modeled gravity was interpolated from observed gravity values.
JS0786
JS0786; North East Units Estimated Accuracy
JS0786;SPC CA 2 - 637,520. 2,081,035. MT (+/- 10 meters HH2 GPS)
JS0786
JS0786 SUPERSEDED SURVEY CONTROL
JS0786
JS0786.No superseded survey control is available for this station.
JS0786
JS0786_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFJ6772807655(NAD 83)
JS0786
JS0786_MARKER: DB = BENCH MARK DISK
JS0786_SETTING: 30 = SET IN A LIGHT STRUCTURE
JS0786_SP_SET: FOUNDATION
JS0786_STAMPING: T 1200 1969
JS0786_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
JS0786_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
JS0786+SATELLITE: SATELLITE OBSERVATIONS - March 14, 2004
JS0786
JS0786 HISTORY - Date Condition Report By
JS0786 HISTORY - 1969 MONUMENTED CGS
JS0786 HISTORY - 20040314 GOOD CADT
JS0786 HISTORY - 20070322 GOOD GEOCAC
JS0786

JS0786 STATION DESCRIPTION
JS0786
JS0786'DESCRIBED BY COAST AND GEODETIC SURVEY 1969
JS0786'AT AUBURN.
JS0786'AT AUBURN, 124.6 FEET SOUTH OF THE SOUTHWEST CORNER OF THE
JS0786'SOUTHERN PACIFIC COMPANY RAILROAD STATION, IN THE TOP AND ALONG
JS0786'THE EAST SIDE OF A 3- BY 3-FOOT CONCRETE FOUNDATION OF THE
JS0786'NORTHEAST LEG OF CITY SIREN STEEL TOWER, 50.0 FEET WEST OF THE
JS0786'WEST RAIL OF THE WESTBOUND MAIN TRACK, 58 FEET EAST OF THE CENTER
JS0786'LINE OF LINCOLN WAY NORTH, 5 FEET SOUTHEAST OF THE EXTENDED
JS0786'CENTER LINE OF LINCOLN WAY SOUTHWEST, 9 FEET EAST OF THE CITY
JS0786'FLAGPOLE, 1.0 FOOT EAST OF THE NORTHEAST STEEL LEG OF THE TOWER,
JS0786'AND ABOUT 2 1/2 FEET LOWER THAN THE TRACK.
JS0786
JS0786 STATION RECOVERY (2004)
JS0786
JS0786'RECOVERY NOTE BY CALTRANS 2004 (DWM)
JS0786'RECOVERED IN GOOD CONDITION.
JS0786
JS0786 STATION RECOVERY (2007)
JS0786
JS0786'RECOVERY NOTE BY GEOCACHING 2007 (TFW)
JS0786'RECOVERED AS DESCRIBED
1 National Geodetic Survey, Retrieval Date = JULY 7, 2012

JS0750 ***
JS0750 DESIGNATION - D 566
JS0750 PID - JS0750
JS0750 STATE/COUNTY- CA/PLACER
JS0750 COUNTRY - US
JS0750 USGS QUAD - ROSEVILLE (1992)
JS0750
JS0750 *CURRENT SURVEY CONTROL
JS0750

JS0750* NAD 83(1986) POSITION- 38 46 08. (N) 121 15 17. (W) SCALED
JS0750* NAVD 88 ORTHO HEIGHT - 62.661 (meters) 205.58 (feet) ADJUSTED
JS0750

JS0750 GEOID HEIGHT - -30.01 (meters) GEOID12
JS0750 DYNAMIC HEIGHT - 62.619 (meters) 205.44 (feet) COMP
JS0750 MODELED GRAVITY - 979,959.5 (mgal) NAVD 88
JS0750
JS0750 VERT ORDER - FIRST CLASS I
JS0750
JS0750.The horizontal coordinates were scaled from a topographic map and have
JS0750.an estimated accuracy of +/- 6 seconds.
JS0750.

JS0750.The orthometric height was determined by differential leveling and
JS0750.adjusted in June 1991.
JS0750
JS0750.The dynamic height is computed by dividing the NAVD 88
JS0750.geopotential number by the normal gravity value computed on the
JS0750.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JS0750.degrees latitude (g = 980.6199 gals.).
JS0750
JS0750.The modeled gravity was interpolated from observed gravity values.
JS0750
JS0750;   North   East   Units Estimated Accuracy
JS0750;SPC CA 2   -   622,620.   2,064,770.   MT (+/- 180 meters Scaled)
JS0750
JS0750   SUPERSEDED SURVEY CONTROL
JS0750
JS0750.No superseded survey control is available for this station.
JS0750
JS0750_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFH516925(NAD 83)
JS0750
JS0750_MARKER: DB = BENCH MARK DISK
JS0750_SETTING: 32 = SET IN A RETAINING WALL OR CONCRETE LEDGE
JS0750_SP_SET: HEADWALL
JS0750_STAMPING: D 566 1938
JS0750_MARK LOGO: CGS
JS0750_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JS0750+STABILITY: SURFACE MOTION
JS0750_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JS0750+SATELLITE: SATELLITE OBSERVATIONS - March 13, 2004
JS0750
JS0750 HISTORY   - Date   Condition   Report By
JS0750 HISTORY   - 1938   MONUMENTED   CGS
JS0750 HISTORY   - 1969   GOOD   CGS
JS0750 HISTORY   - 19881111 GOOD   USPSQD
JS0750 HISTORY   - 19890202 GOOD   NGS
JS0750 HISTORY   - 20040313 GOOD   CADT
JS0750
JS0750   STATION DESCRIPTION
JS0750
JS0750'DESCRIBED BY COAST AND GEODETIC SURVEY 1969
JS0750'2.2 MI NE FROM ROSEVILLE.
JS0750'2.15 MILES NORTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
JS0750'FROM THE STATION AT ROSEVILLE, 9 1/2 POLES SOUTHWEST OF MILEPOLE
JS0750'109, 7 RAILS SOUTHWEST OF A PRIVATE ROAD CROSSING, 6 RAILS
JS0750'NORTHEAST OF SEMAPHORE 1087, IN THE TOP AND 1.0 FOOT NORTHEAST
JS0750'OF THE SOUTHWEST END OF THE SOUTHEAST CONCRETE HEAD WALL OF
PIPE
JS0750'CULVERT 108.75, 9.8 FEET SOUTHEAST OF THE SOUTHEAST RAIL OF THE
JS0750'SOUTHEAST TRACK, 55 FEET NORTHWEST OF THE CENTER LINE OF TAYLOR
JS0750'ROAD, AND ABOUT 2 1/2 FEET LOWER THAN THE TRACK.
JS0750

JS0750 STATION RECOVERY (1988)
JS0750
JS0750'RECOVERY NOTE BY US POWER SQUADRON 1988 (EH)
JS0750'RECOVERED IN GOOD CONDITION.
JS0750
JS0750 STATION RECOVERY (1989)
JS0750
JS0750'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1989
JS0750'RECOVERED IN GOOD CONDITION.
JS0750
JS0750 STATION RECOVERY (2004)
JS0750
JS0750'RECOVERY NOTE BY CALTRANS 2004 (DWM)
JS0750'RECOVERED IN GOOD CONDITION.

THE NGS DATA SHEET

See file dsdata.txt for more information about the datasheet.
PROGRAM = datasheet95, VERSION = 7.89.2
1 National Geodetic Survey, Retrieval Date = AUGUST 8, 2012
DF7465 ***
DF7465 HT_MOD - This is a Height Modernization Survey Station.
DF7465 CORS - This is a GPS Continuously Operating Reference Station.
DF7465 DESIGNATION - LINCOLN 1 CORS ARP
DF7465 CORS_ID - LNC1
DF7465 PID - DF7465
DF7465 STATE/COUNTY- CA/PLACER
DF7465 COUNTRY - US
DF7465 USGS QUAD - ROSEVILLE (1992)
DF7465
DF7465 *CURRENT SURVEY CONTROL
DF7465

DF7465* NAD 83(2011) POSITION- 38 50 47.42727(N) 121 21 00.79386(W) ADJUSTED
DF7465* NAD 83(2011) ELLIP HT- 6.443 (meters) (08/??/11) ADJUSTED
DF7465* NAD 83(2011) EPOCH - 2010.00
DF7465* NAVD 88 ORTHO HEIGHT - 36.46 (meters) 119.6 (feet) GPS OBS
DF7465

DF7465 NAVD 88 orthometric height was determined with geoid model GEOID09
DF7465 GEOID HEIGHT - -30.02 (meters) GEOID09
DF7465 GEOID HEIGHT - -30.01 (meters) GEOID12
DF7465 NAD 83(2011) X - -2,587,832.145 (meters) COMP
DF7465 NAD 83(2011) Y - -4,247,844.144 (meters) COMP
DF7465 NAD 83(2011) Z - 3,979,064.296 (meters) COMP
DF7465 HORZ ORDER - SPECIAL (CORS)
DF7465 ELLP ORDER - SPECIAL (CORS)
DF7465
DF7465.The coordinates were established by GPS observations

DF7465.and adjusted by the National Geodetic Survey in August 2011.
DF7465
DF7465.NAD 83(2011) refers to NAD 83 coordinates where the reference
DF7465.frame has been affixed to the stable North American Tectonic Plate.
DF7465
DF7465.The coordinates are valid at the epoch date displayed above
DF7465.which is a decimal equivalence of Year/Month/Day.
DF7465
DF7465.The orthometric height was determined by GPS observations and a
DF7465.high-resolution geoid model using precise GPS observation and
DF7465.processing techniques.
DF7465
DF7465.The PID for the CORS L1 Phase Center is DG6997.
DF7465
DF7465.The XYZ, and position/ellipsoidal ht. are equivalent.
DF7465
DF7465.The ellipsoidal height was determined by GPS observations
DF7465.and is referenced to NAD 83.
DF7465
DF7465. The following values were computed from the NAD 83(2011) position.
DF7465
DF7465; North East Units Scale Factor Converg.
DF7465;SPC CA 2 - 631,170.251 2,056,404.663 MT 0.99992327 +0 24 34.8
DF7465;SPC CA 2 - 2,070,764.40 6,746,720.97 sFT 0.99992327 +0 24 34.8
DF7465
DF7465! - Elev Factor x Scale Factor = Combined Factor
DF7465!SPC CA 2 - 0.99999899 x 0.99992327 = 0.99992226
DF7465
DF7465 SUPERSEDED SURVEY CONTROL
DF7465
DF7465 NAD 83(CORS)- 38 50 47.42507(N) 121 21 00.79111(W) AD(2002.00) c
DF7465 ELLIP H (03/??/08) 6.443 (m) GP(2002.00) c c
DF7465 NAD 83(CORS)- 38 50 47.42500(N) 121 21 00.79097(W) AD(2002.00) c
DF7465 ELLIP H (10/??/04) 6.450 (m) GP(2002.00) c c
DF7465 NAD 83(CORS)- 38 50 47.42500(N) 121 21 00.79110(W) AD(2002.00) c
DF7465 ELLIP H (08/??/03) 6.338 (m) GP(2002.00) c c
DF7465 NAVD 88 (02/03/05) 36.47 (m) GEOID03 model used GPS OBS
DF7465
DF7465.Superseded values are not recommended for survey control.
DF7465
DF7465.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DF7465.See file dsdata.txt to determine how the superseded data were derived.
DF7465
DF7465_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SFJ4316901036(NAD 83)
DF7465
DF7465_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DF7465
DF7465 STATION DESCRIPTION
DF7465

DF7465'DESCRIBED BY NATIONAL GEODETIC SURVEY 2011
DF7465'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DF7465'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES
ACCESSIBLE
DF7465'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DF7465'   ftp://cors.ngs.noaa.gov/cors/README.txt
DF7465'   ftp://cors.ngs.noaa.gov/cors/coord/coord_08
DF7465'   ftp://cors.ngs.noaa.gov/cors/station_log
DF7465'   http://geodesy.noaa.gov/CORS

*** retrieval complete.
Elapsed Time = 00:00:05

Appendix B: Complete List of Delivered Tiles

EAST PLACER TILES

10SGJ165462	10SGJ195522	10SGJ225492	10SGJ255417	10SGJ300447
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10SGJ165492	10SGJ210252	10SGJ225522	10SGJ255447	10SGJ300477
10SGJ180252	10SGJ210267	10SGJ225537	10SGJ255462	10SGJ315402
10SGJ180267	10SGJ210282	10SGJ225552	10SGJ255477	10SGJ315417
10SGJ180282	10SGJ210297	10SGJ225567	10SGJ255537	10SGJ315432
10SGJ180297	10SGJ210312	10SGJ240252	10SGJ255552	10SGJ315447
10SGJ180312	10SGJ210327	10SGJ240267	10SGJ255567	10SGJ315462
10SGJ180327	10SGJ210342	10SGJ240282	10SGJ270252	10SGJ315477
10SGJ180342	10SGJ210357	10SGJ240297	10SGJ270267	10SGJ315492
10SGJ180357	10SGJ210372	10SGJ240312	10SGJ270282	10SGJ330432
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10SGJ180387	10SGJ210402	10SGJ240342	10SGJ270327	10SGJ330462
10SGJ180402	10SGJ210417	10SGJ240357	10SGJ270342	10SGJ330477
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10SGJ180492	10SGJ210507	10SGJ240447	10SGJ270432	10SGJ360462
10SGJ180507	10SGJ210522	10SGJ240462	10SGJ270447	10SGJ360477
10SGJ195252	10SGJ210537	10SGJ240477	10SGJ270462	10SGJ360492
10SGJ195267	10SGJ210552	10SGJ240492	10SGJ270477	10SGJ360507
10SGJ195282	10SGJ225252	10SGJ240507	10SGJ270552	10SGJ360522
10SGJ195297	10SGJ225267	10SGJ240522	10SGJ270567	10SGJ375462
10SGJ195312	10SGJ225282	10SGJ240537	10SGJ285267	10SGJ375477
10SGJ195327	10SGJ225297	10SGJ240552	10SGJ285282	10SGJ375492
10SGJ195342	10SGJ225312	10SGJ240567	10SGJ285387	10SGJ375507
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10SGJ390522
10SGJ405447
10SGJ405462
10SGJ405477
10SGJ405492

WEST PLACER TILES

10SFH610904	10SFJ490009	10SFJ670039	10SFJ595099	10SFJ715129
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10SFH610919	10SFJ520009	10SFJ550054	10SFJ625099	10SFJ415144
10SFH625919	10SFJ535009	10SFJ565054	10SFJ640099	10SFJ430144
10SFH565934	10SFJ565009	10SFJ580054	10SFJ655099	10SFJ445144
10SFH580934	10SFJ580009	10SFJ595054	10SFJ670099	10SFJ460144
10SFH595934	10SFJ595009	10SFJ610054	10SFJ685099	10SFJ475144
10SFH610934	10SFJ610009	10SFJ625054	10SFJ475114	10SFJ490144
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10SFH640934	10SFJ640009	10SFJ655054	10SFJ505114	10SFJ520144
10SFH565949	10SFJ655009	10SFJ670054	10SFJ520114	10SFJ535144
10SFH580949	10SFJ670009	10SFJ685054	10SFJ535114	10SFJ550144
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10SFJ700144	10SFJ415159	10SFJ475159	10SFJ535159	10SFJ595159
10SFJ715144	10SFJ430159	10SFJ490159	10SFJ550159	10SFJ610159
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10SFJ400159	10SFJ460159	10SFJ520159	10SFJ580159	

Appendix C: GPS Processing Reports for Each Mission

EAST PLACER ACQUISITION LOG

DMI acquired LiDAR data over an Area of Interest (AOI) covering all or portions of East of Placer County, California. The acquisition plan entailed a nominal point spacing of 2.03 points per meter square and a side lap of 50% between flight lines. The AOI covers 365 square miles.

Flight Plan

LiDAR Acquisition Details

Collections (Lifts): 5

Collection Dates: 2012 June 20, 21, 27, 28

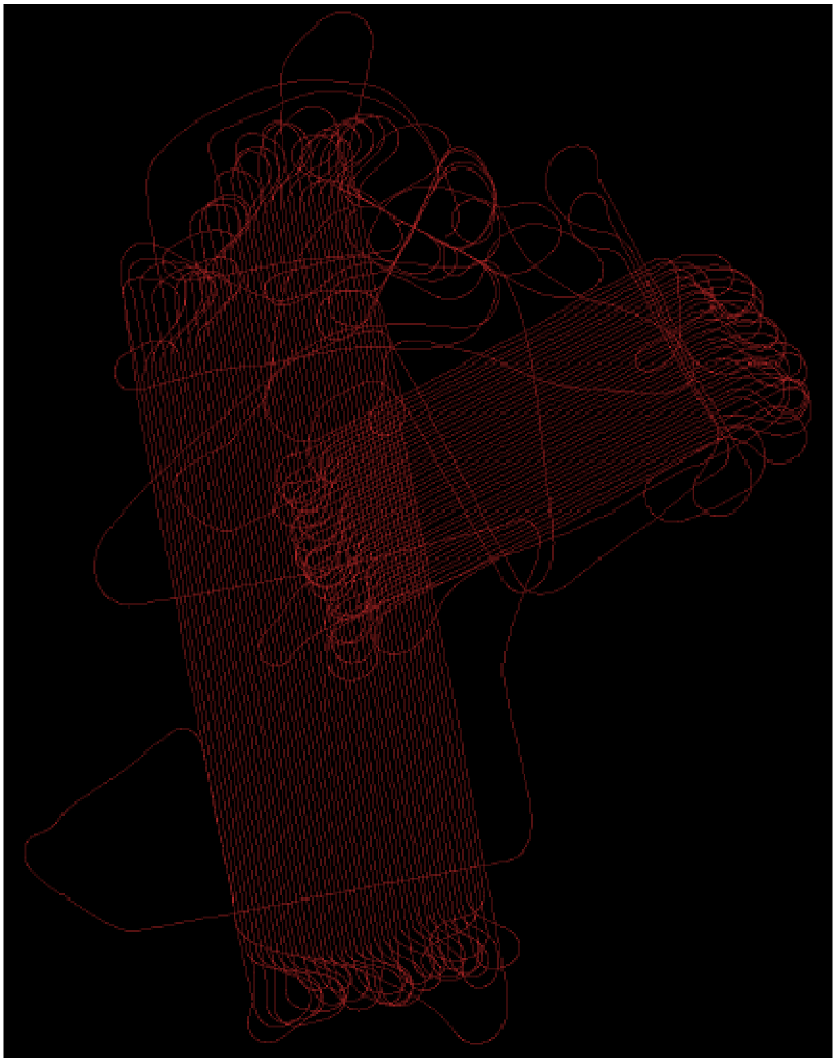
Field of View (FOV): 17 degrees

Average Point Density (planned): 0.76 m

Flight Level(s): 914 / 3000 m/ft

Sensor Type: Optech Gemini **Sensor Serial Number(s):** 07SEN204

All acquired LiDAR data was initially quality controlled after every mission for coverage and further verified for content and adherence to flight plan at DMI production facilities Huntington Beach, CA. All data was accepted for processing.

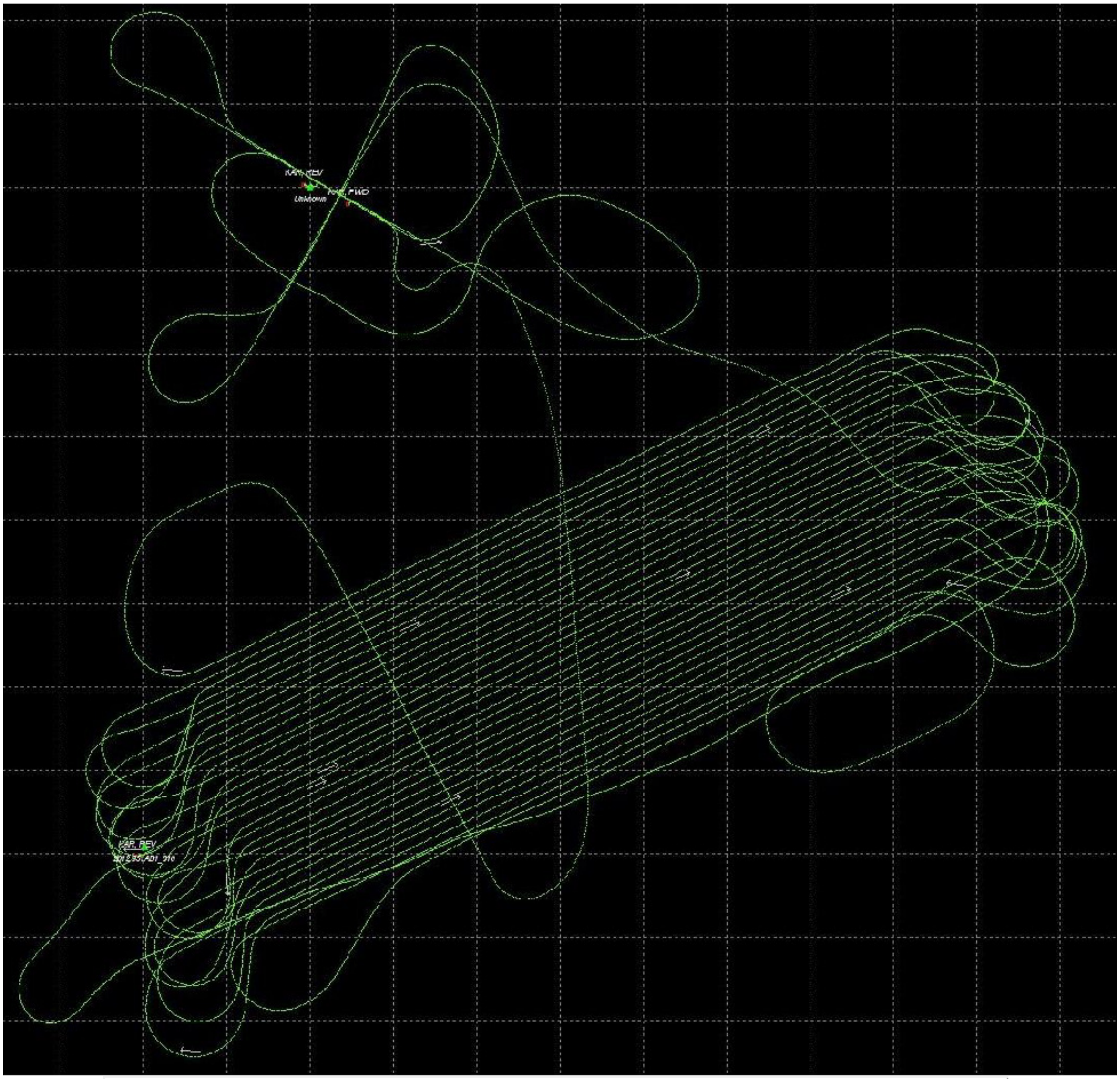


East Placer AOI Flight Trajectories

Output Results for 06202012

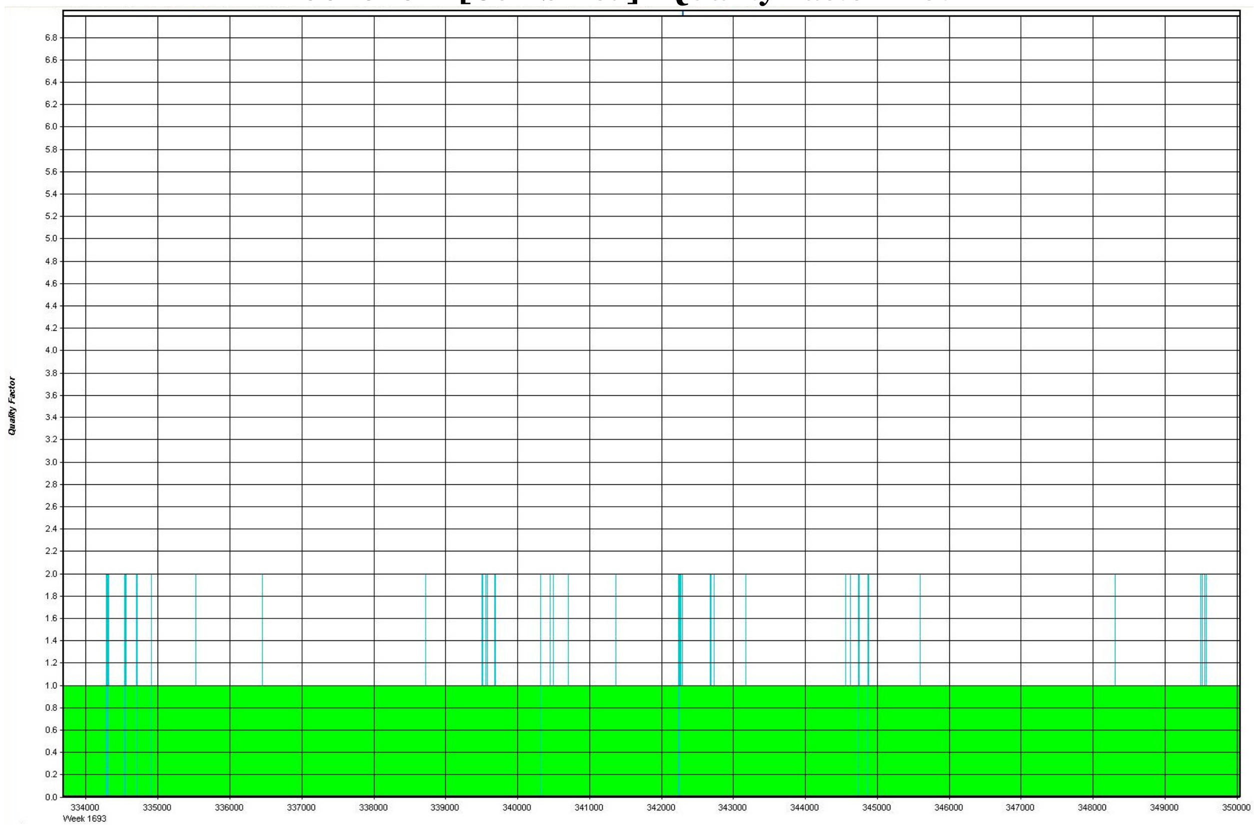
POSPAC Version 4.31

Combined



Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined] - Quality Factor Plot

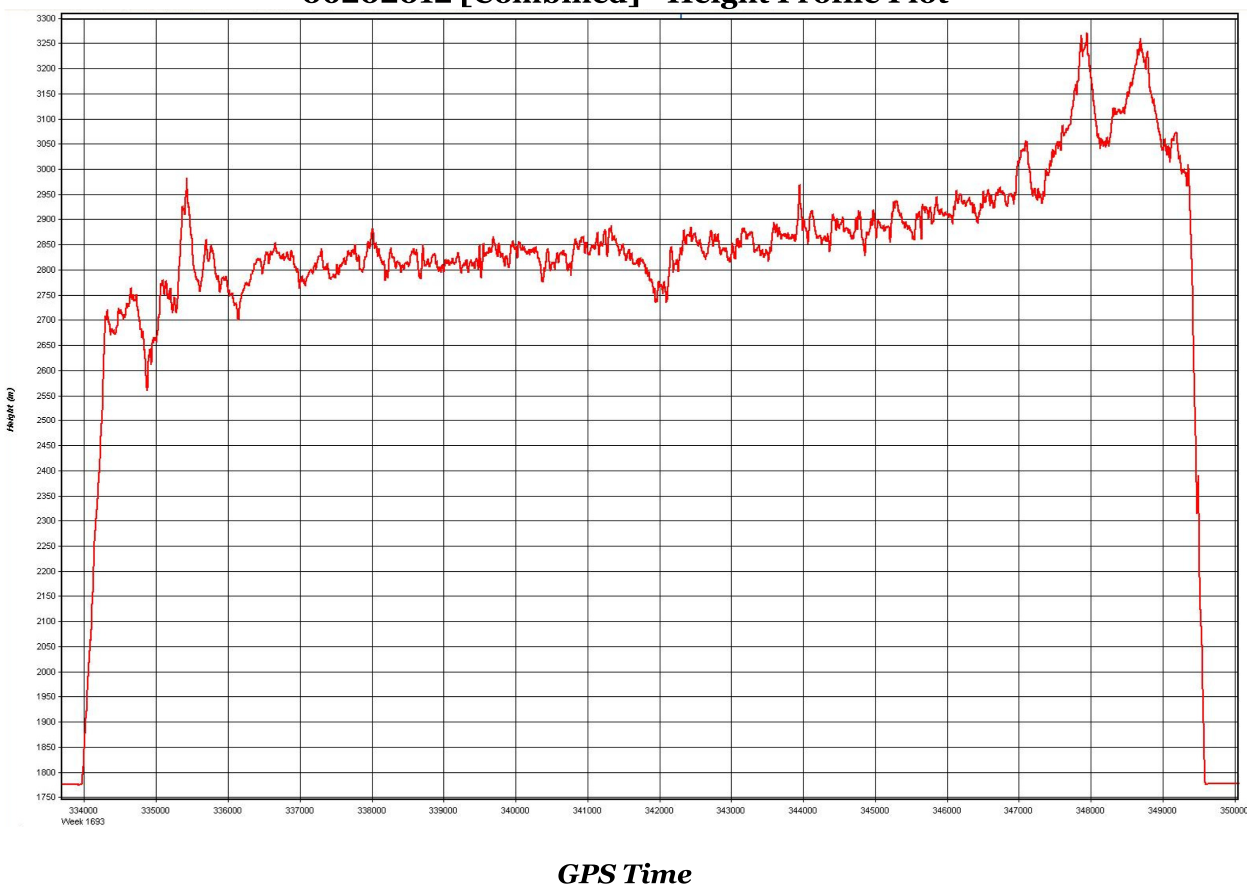


GPS Time [UTM, NAD83]

— Fixed Integer — Stable float — Converging float — DGPS or worse — Single Point — No solution

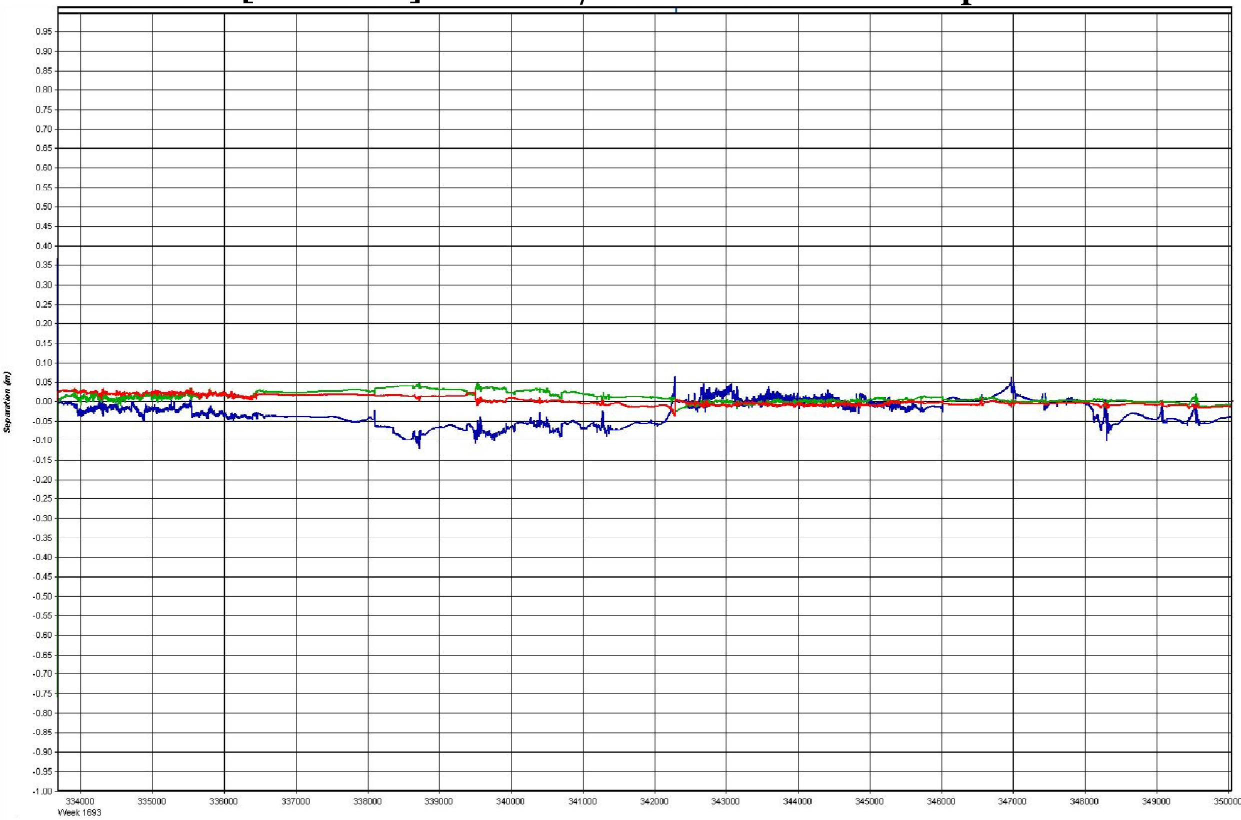
Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined] - Height Profile Plot



Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

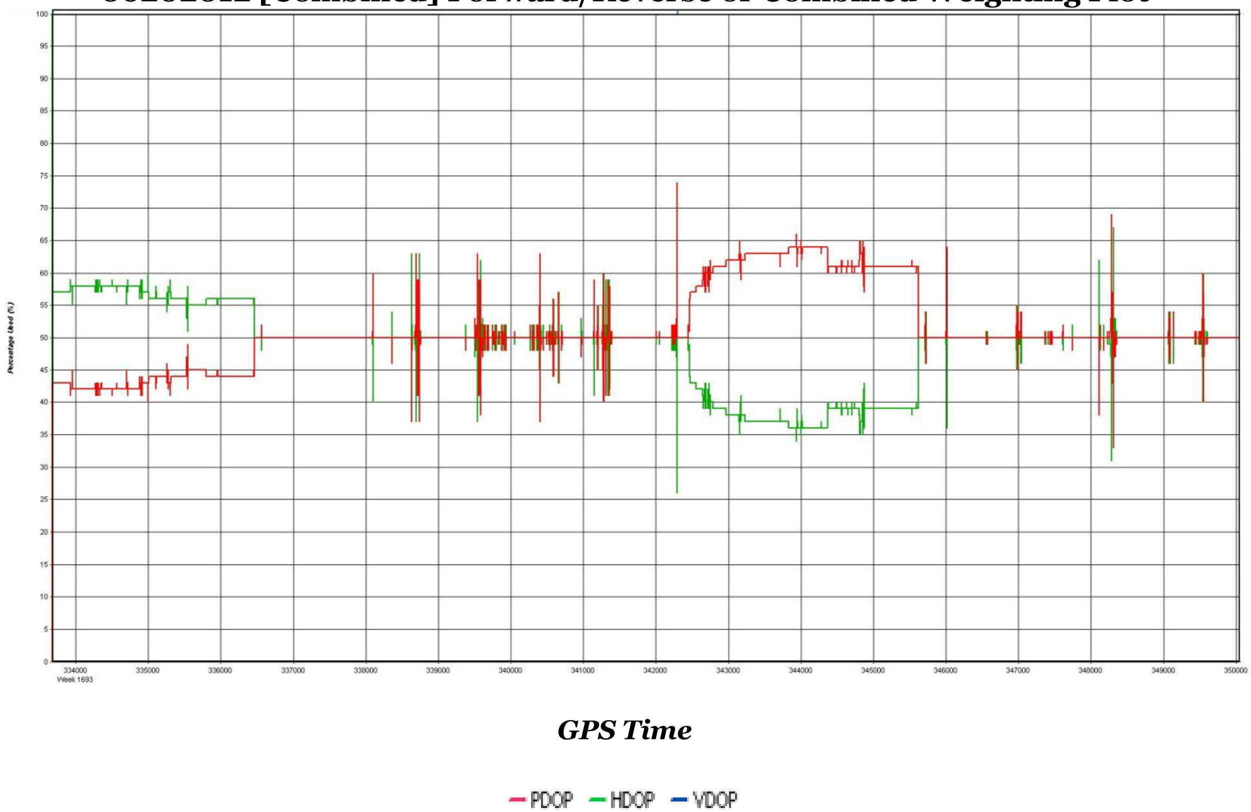
06202012 [Combined] - Forward/Reverse or Combined Separation Plot



GPS Time

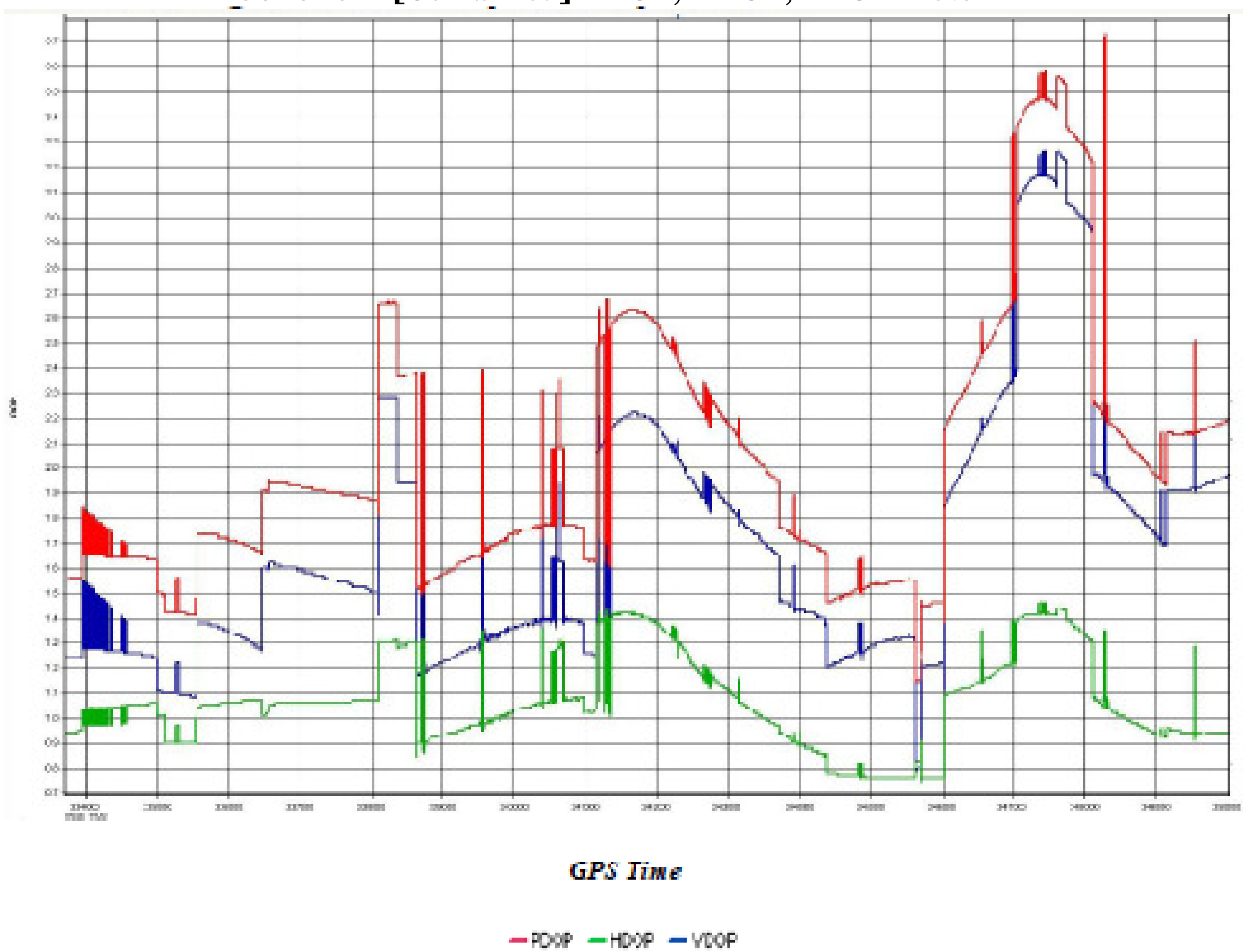
Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined] Forward/Reverse or Combined Weighting Plot



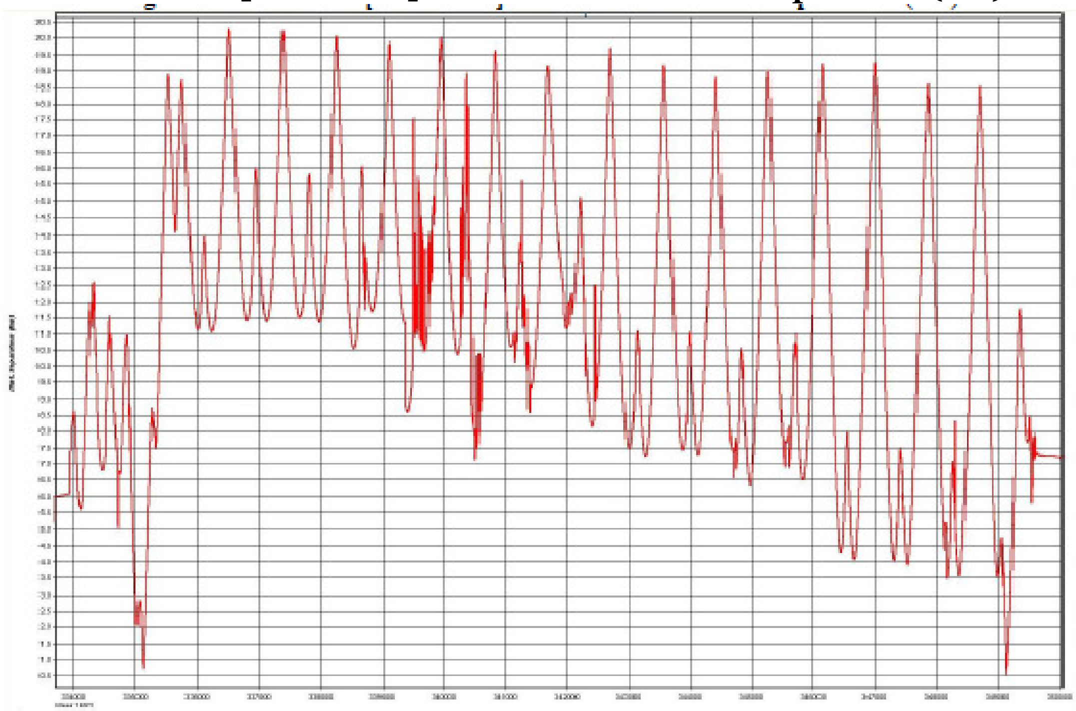
Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined]-PDOP, HDOP, VDOP Plots



Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined] - Horizontal Distance Separation (km)

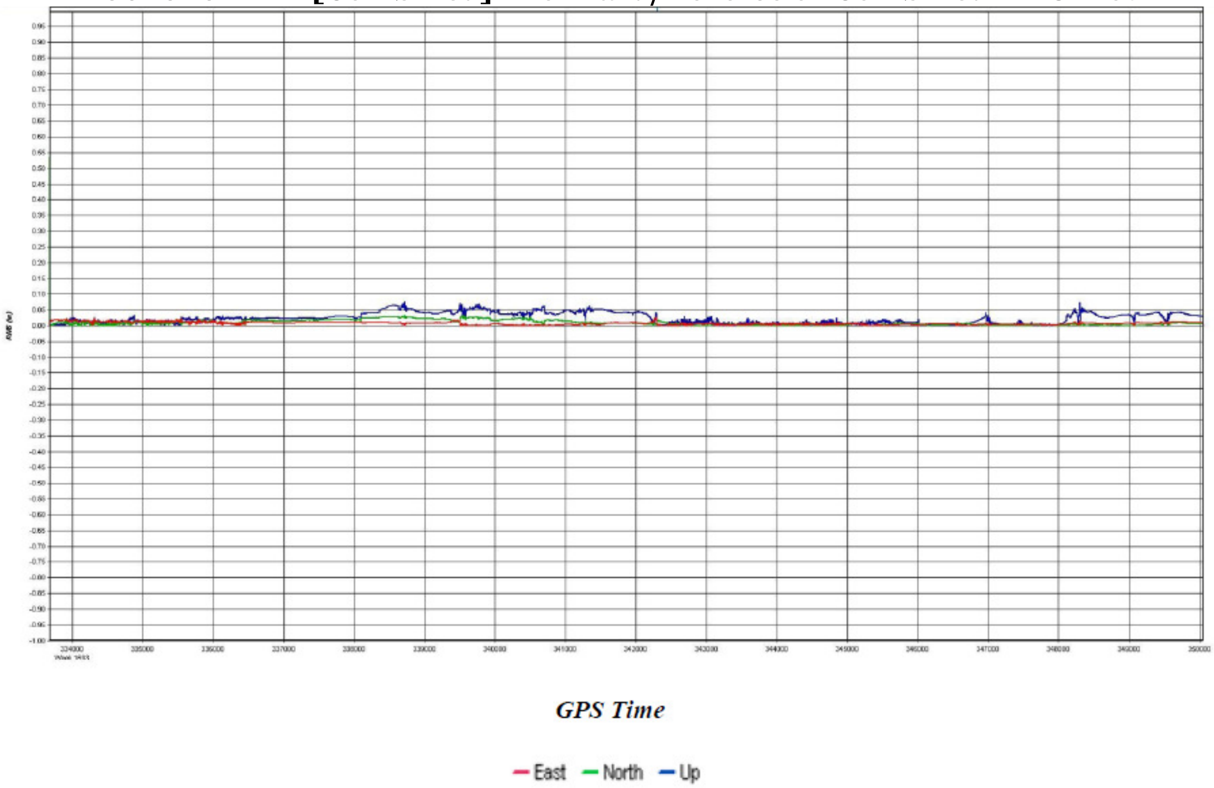


GPS Time

Distance

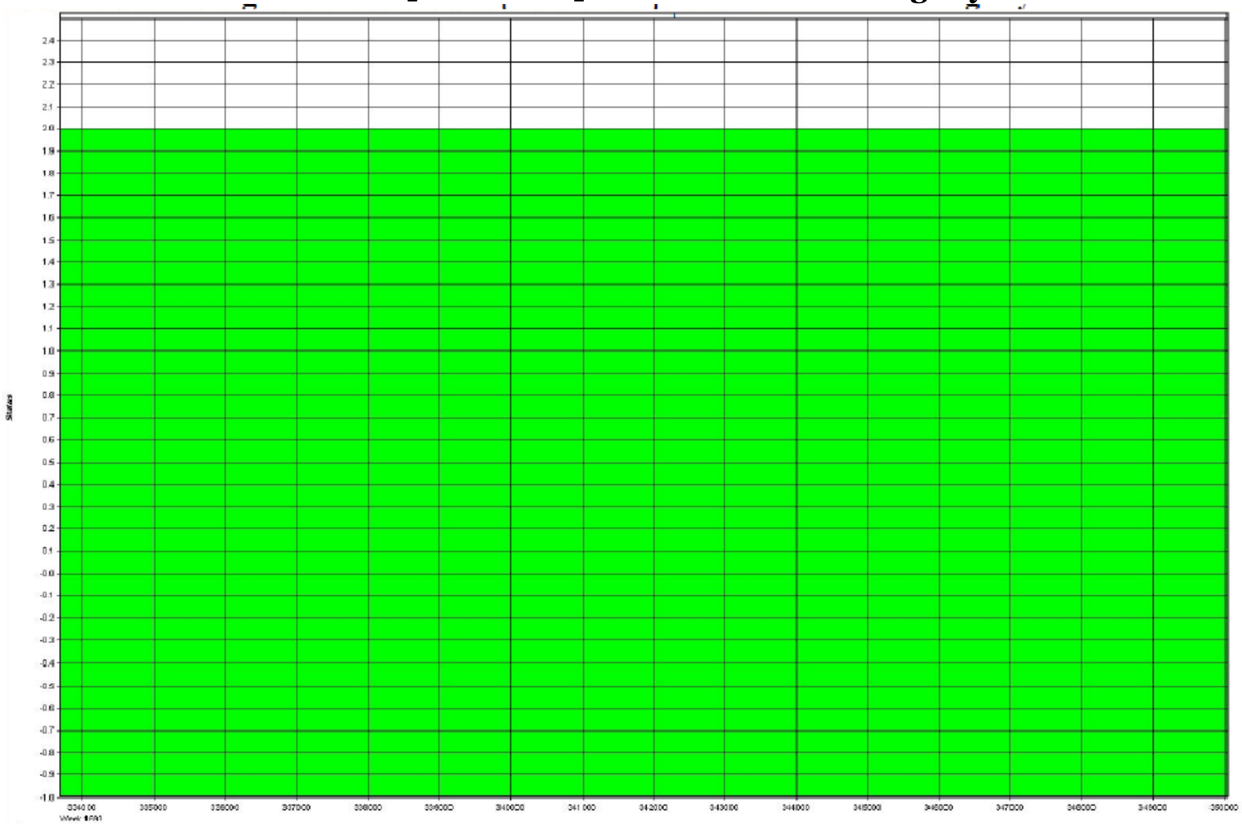
Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012AM [Combined] - Forward/Reverse or Combined RMS Plot



Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

06202012 [Combined] - Float or Fixed Ambiguity



GPS Time

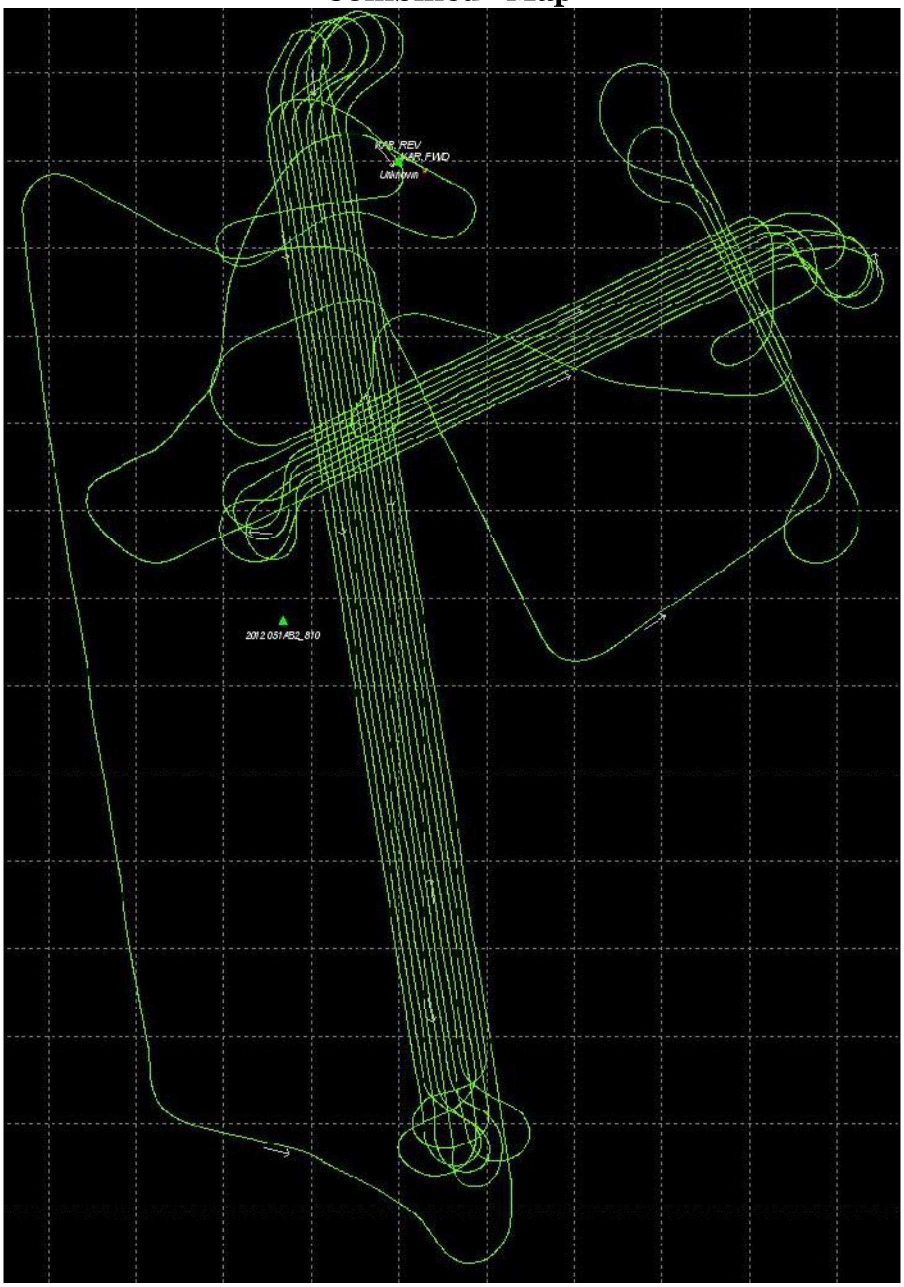
— Float — Fixed (1 baseline) — Fixed (2 or more)

Process	Run (32)	by Unknown	on 06/20/2012	at 13:45

Output Results for 06212012AM

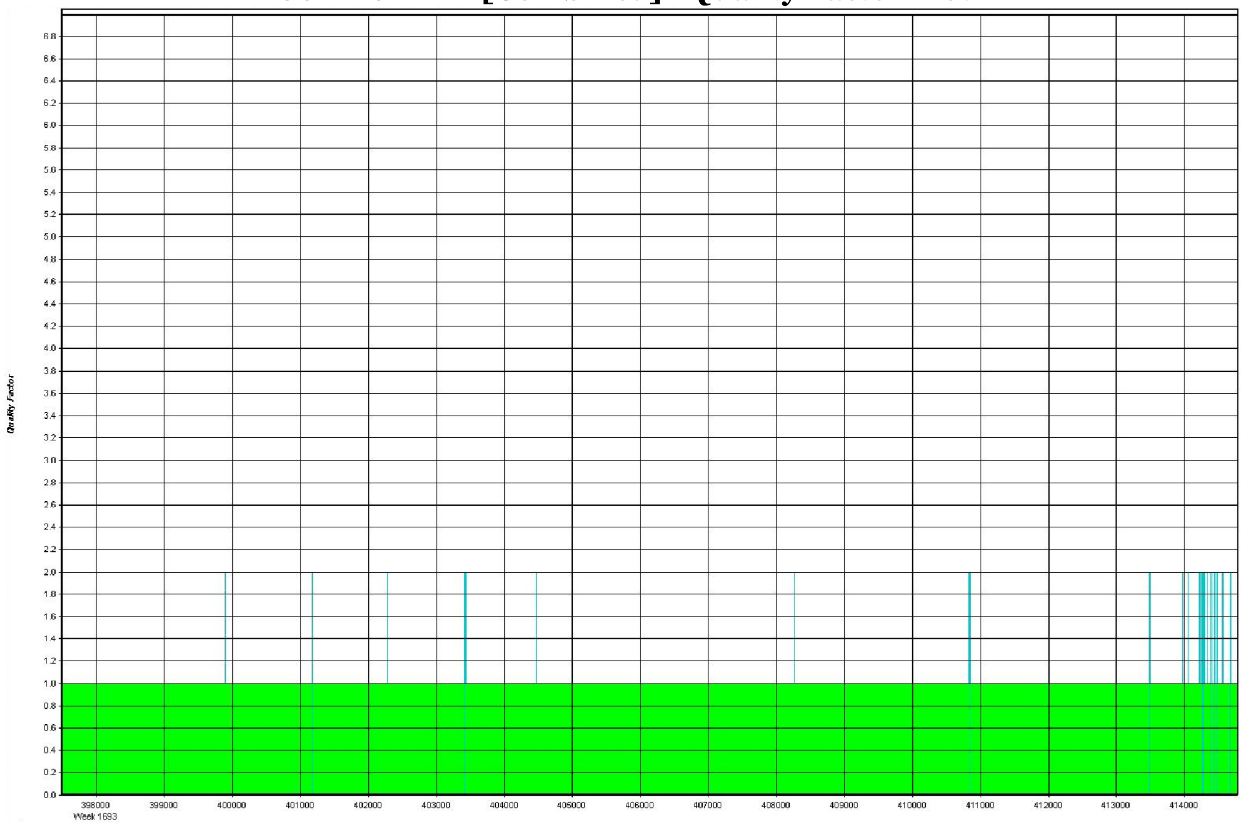
POSPAC Version 4.31

Combined - Map



Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

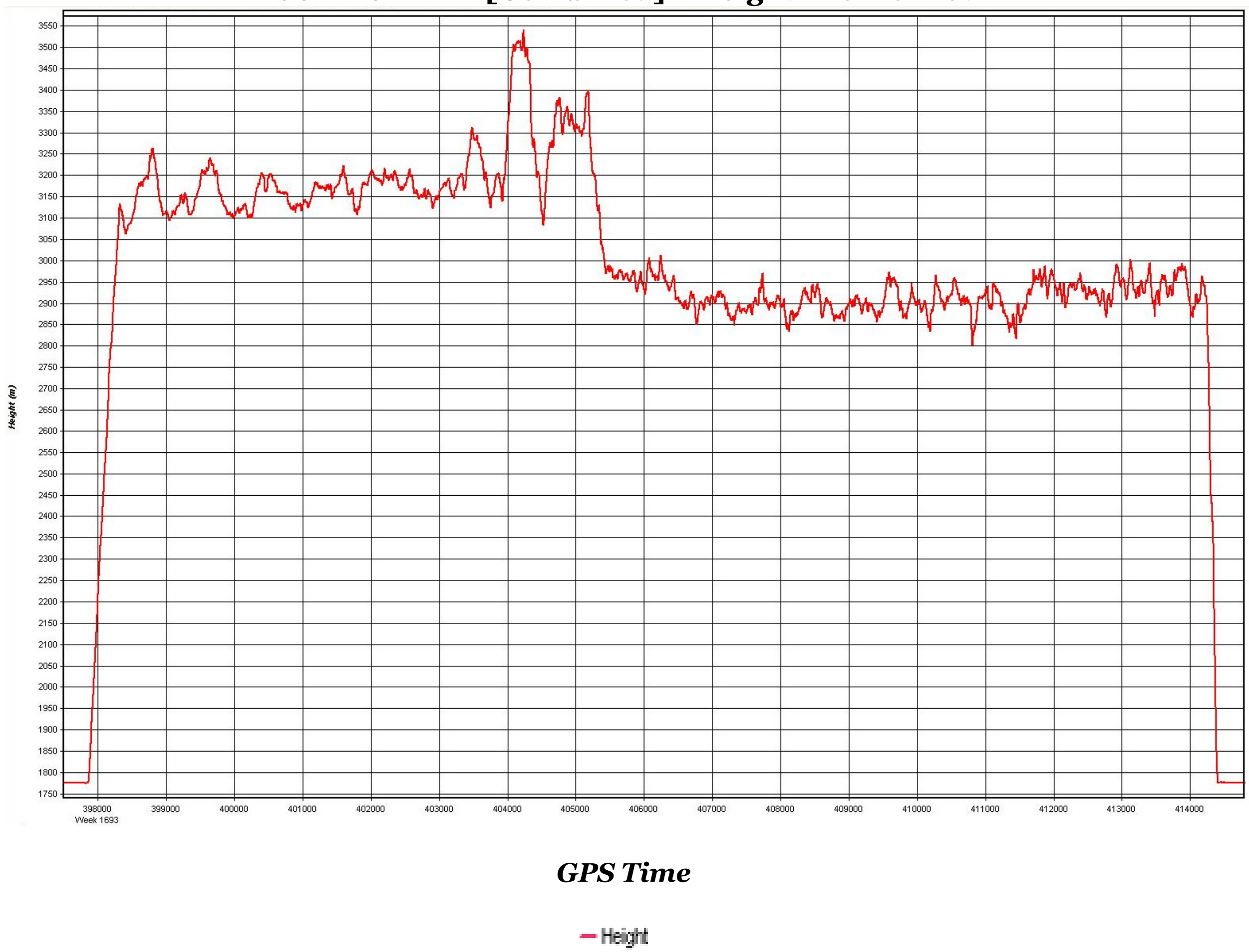
06212012AM [Combined] - Quality Factor Plot



GPS Time

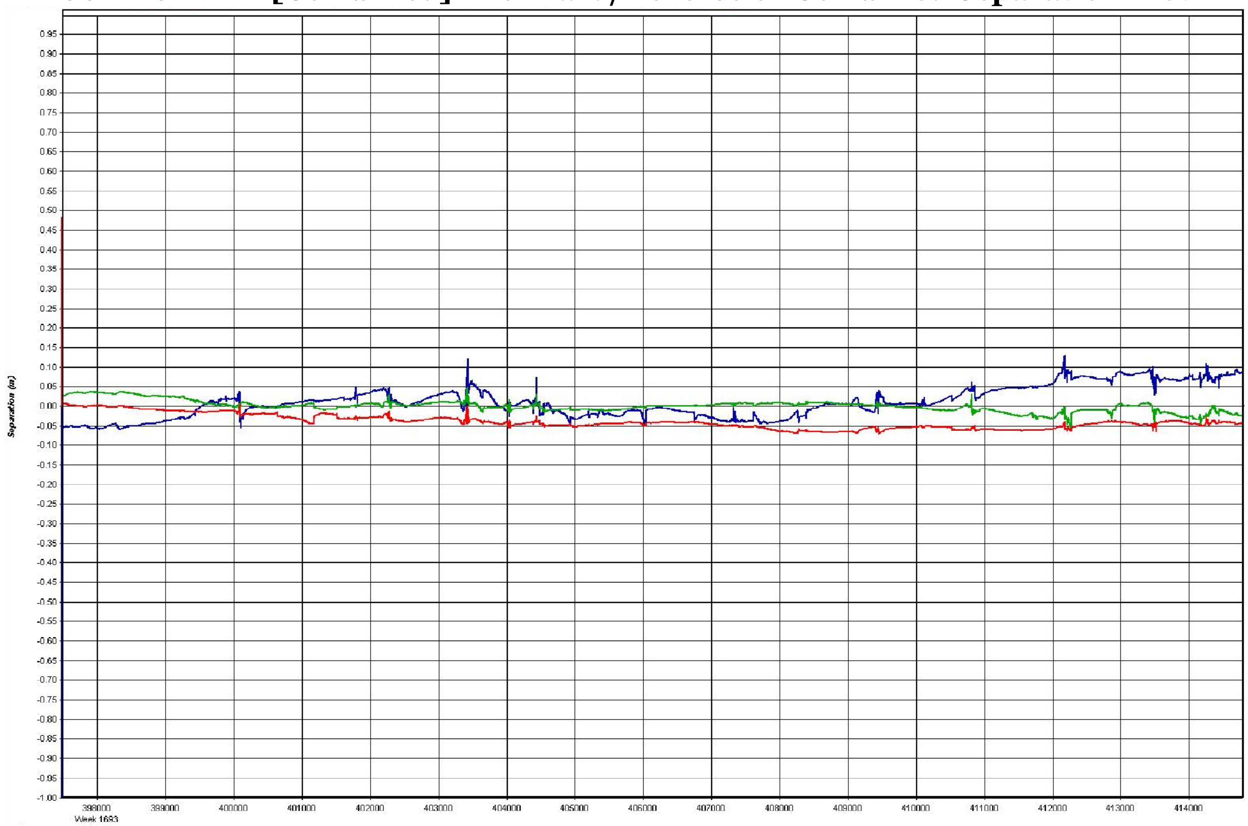
Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - Height Profile Plot



Process	Run (31)	by Unknown	on 6/21/2012	at 07:30

06212012 AM [Combined] - Forward/Reverse or Combined Separation Plot

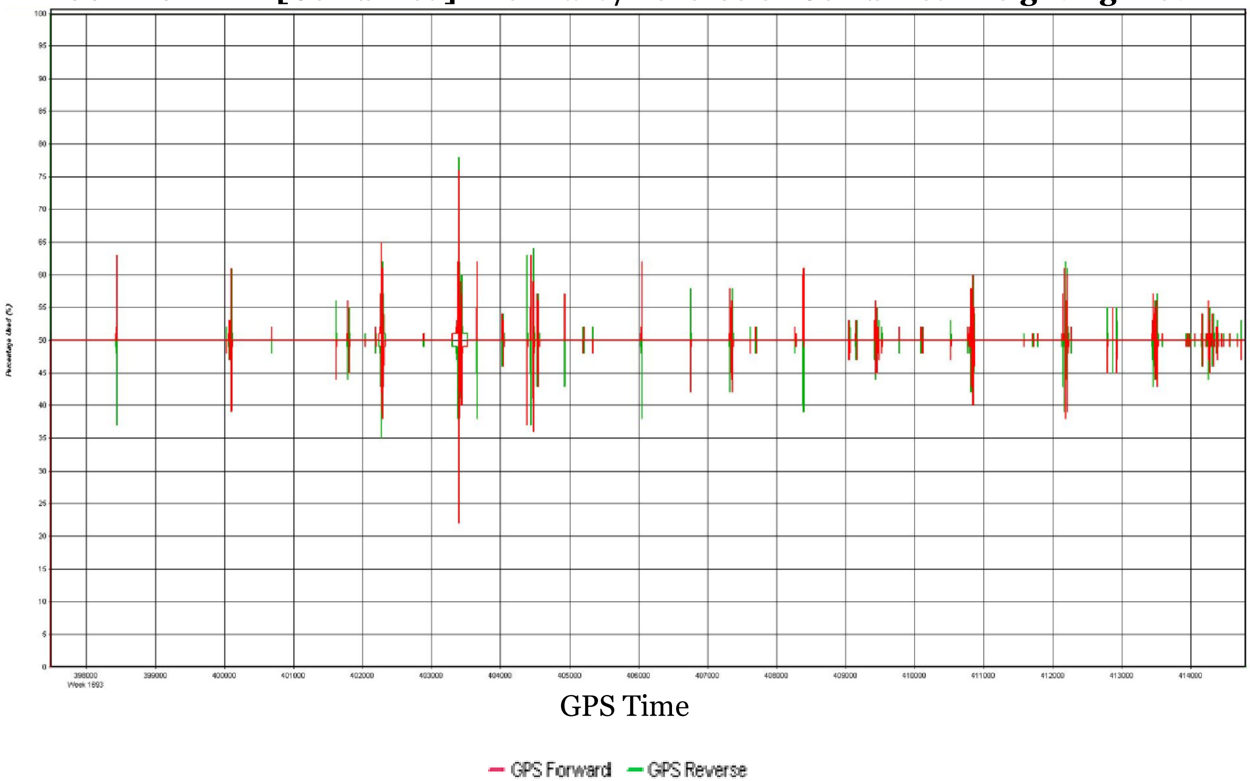


GPS Time

— East — North — Up

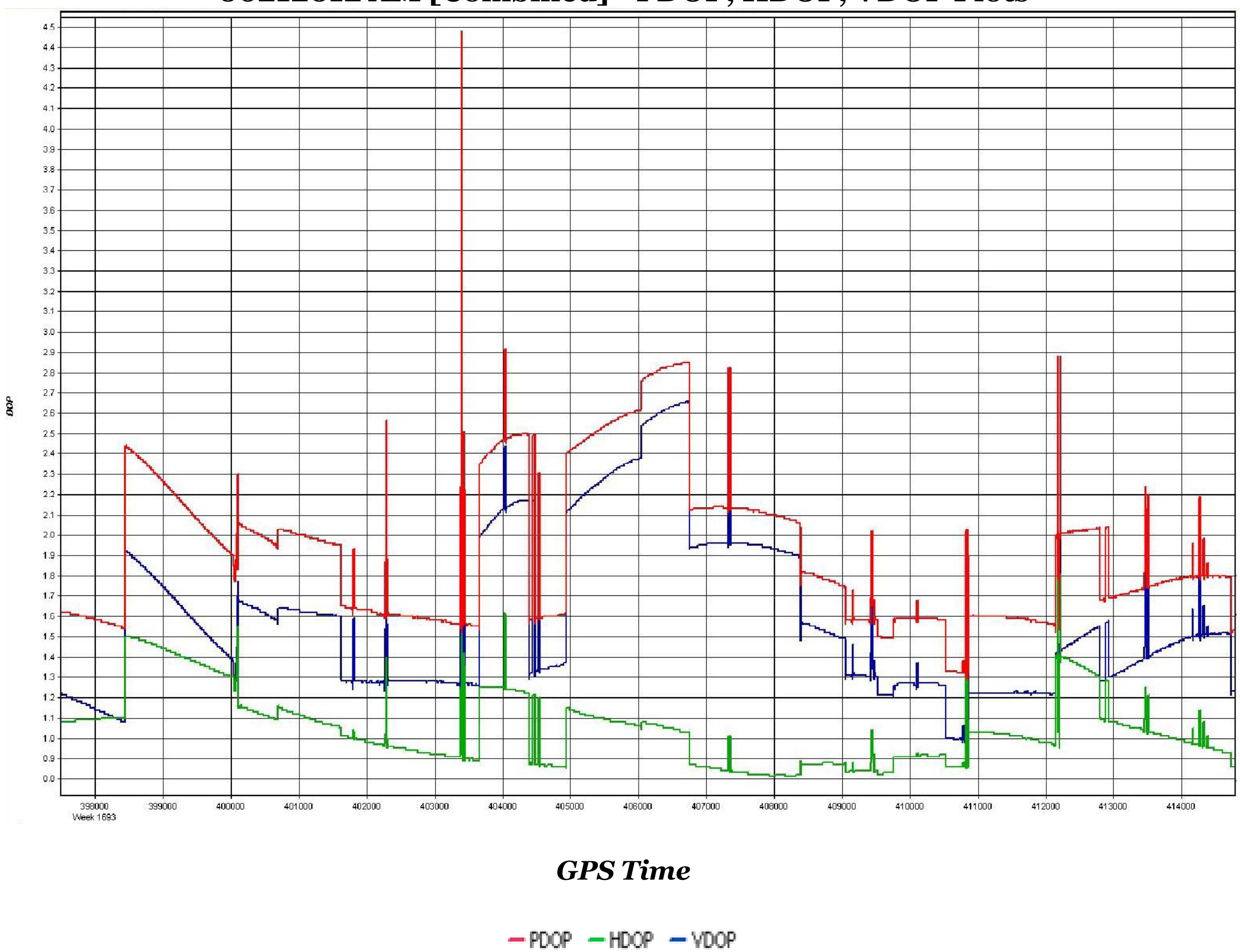
Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - Forward/Reverse or Combined Weighting Plot



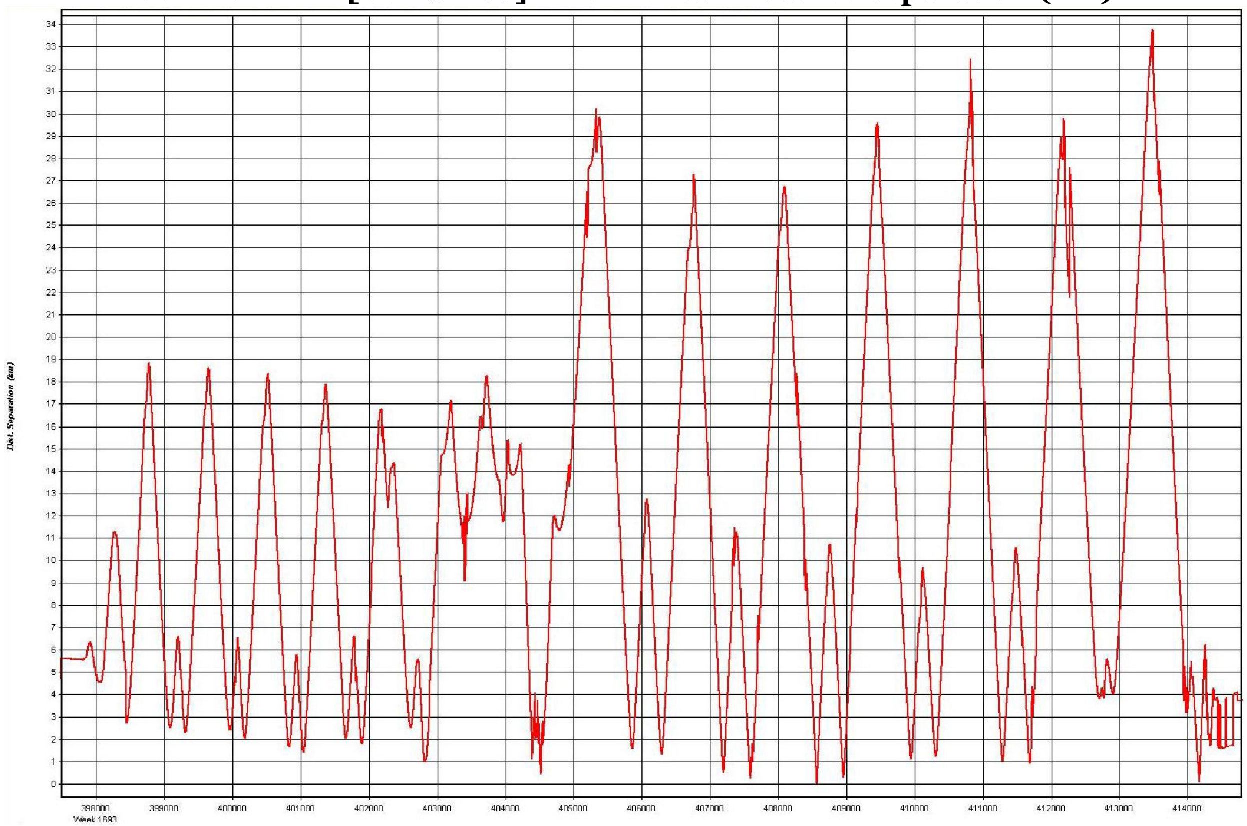
Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - PDOP, HDOP, VDOP Plots



Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - Horizontal Distance Separation (km)

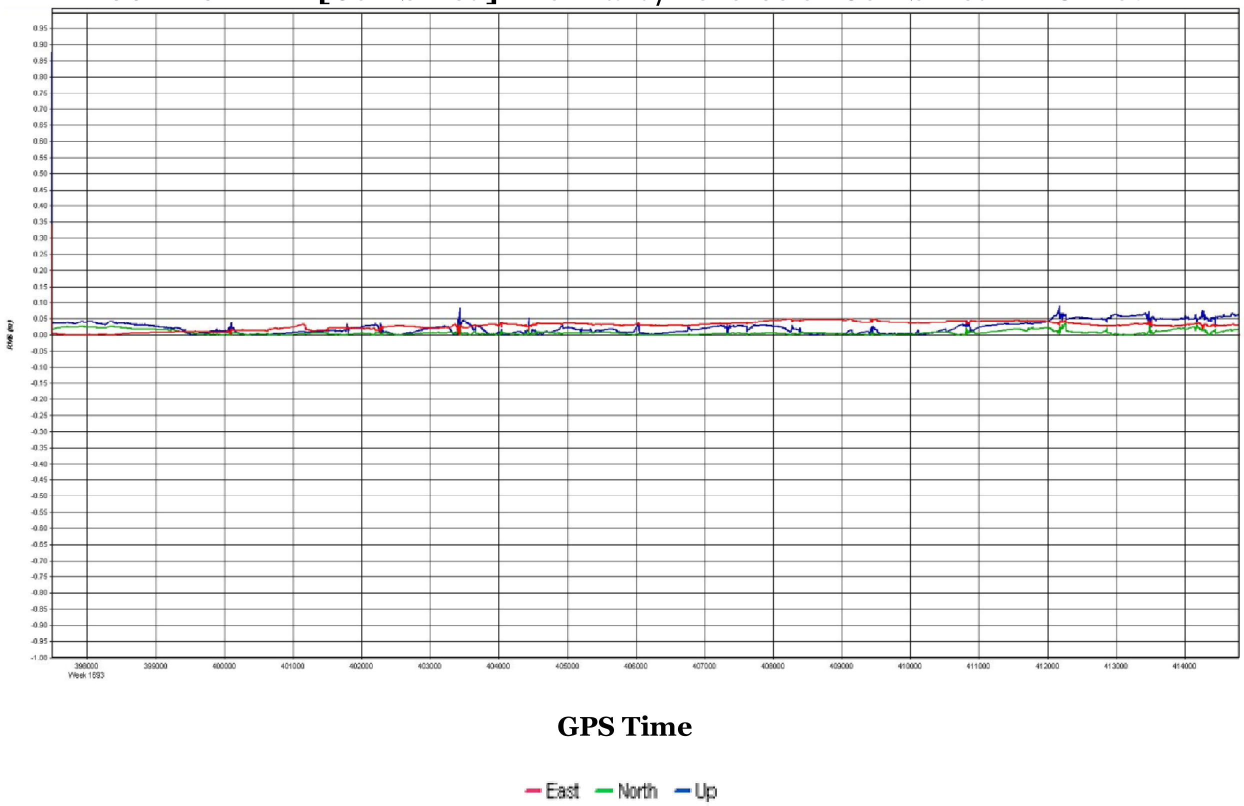


GPS Time

— Distance

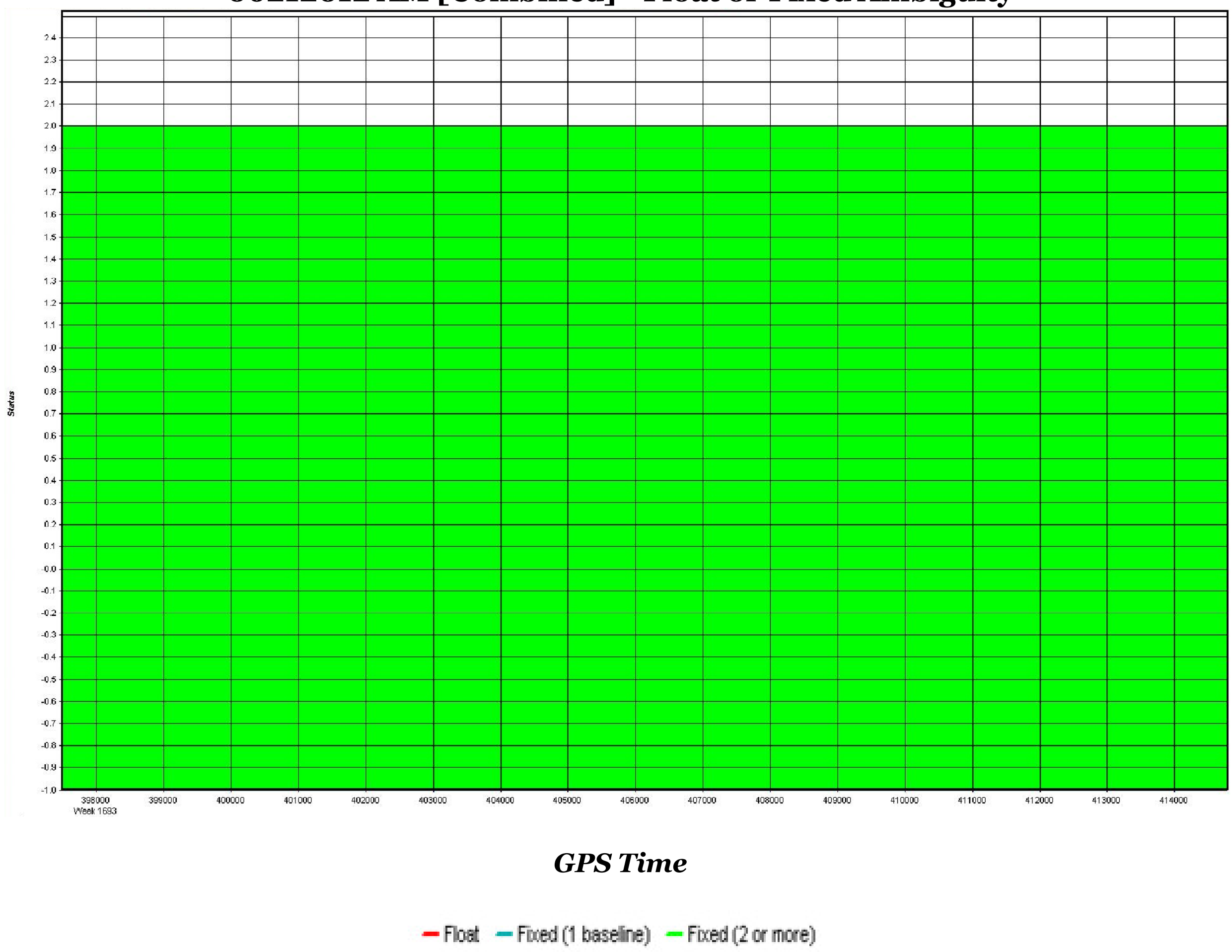
Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - Forward/Reverse or Combined RMS Plot



Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

06212012 AM [Combined] - Float or Fixed Ambiguity

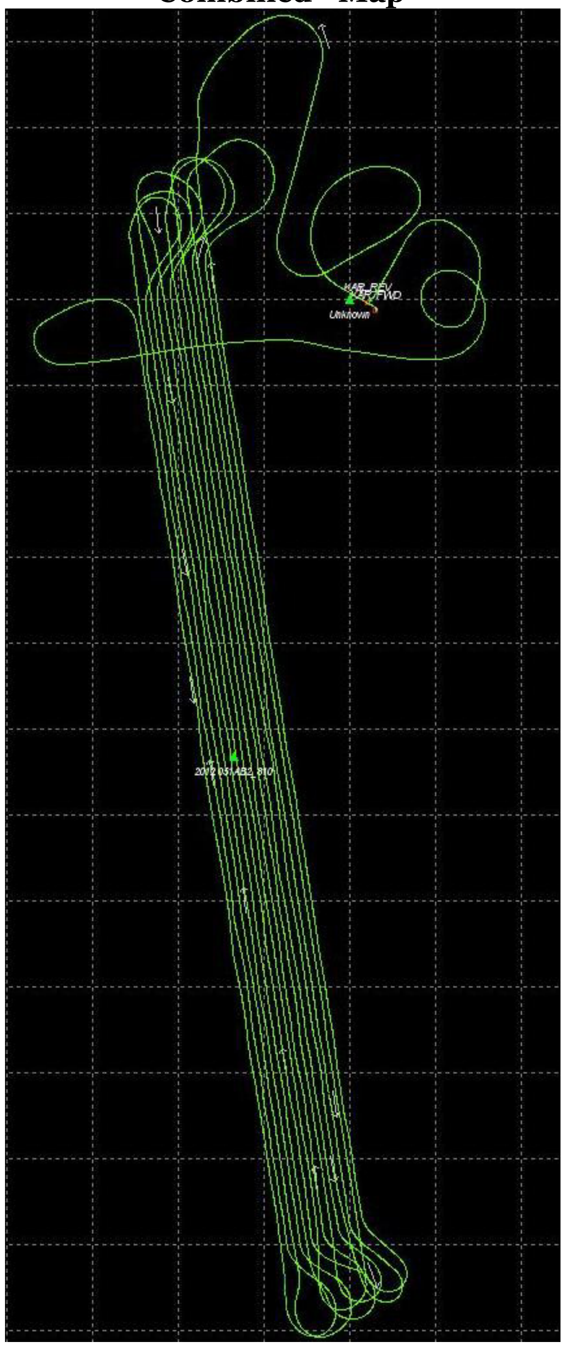


Process	Run (31)	by Unknown	on 06/21/2012	at 07:30

Output Results for 06212012PM

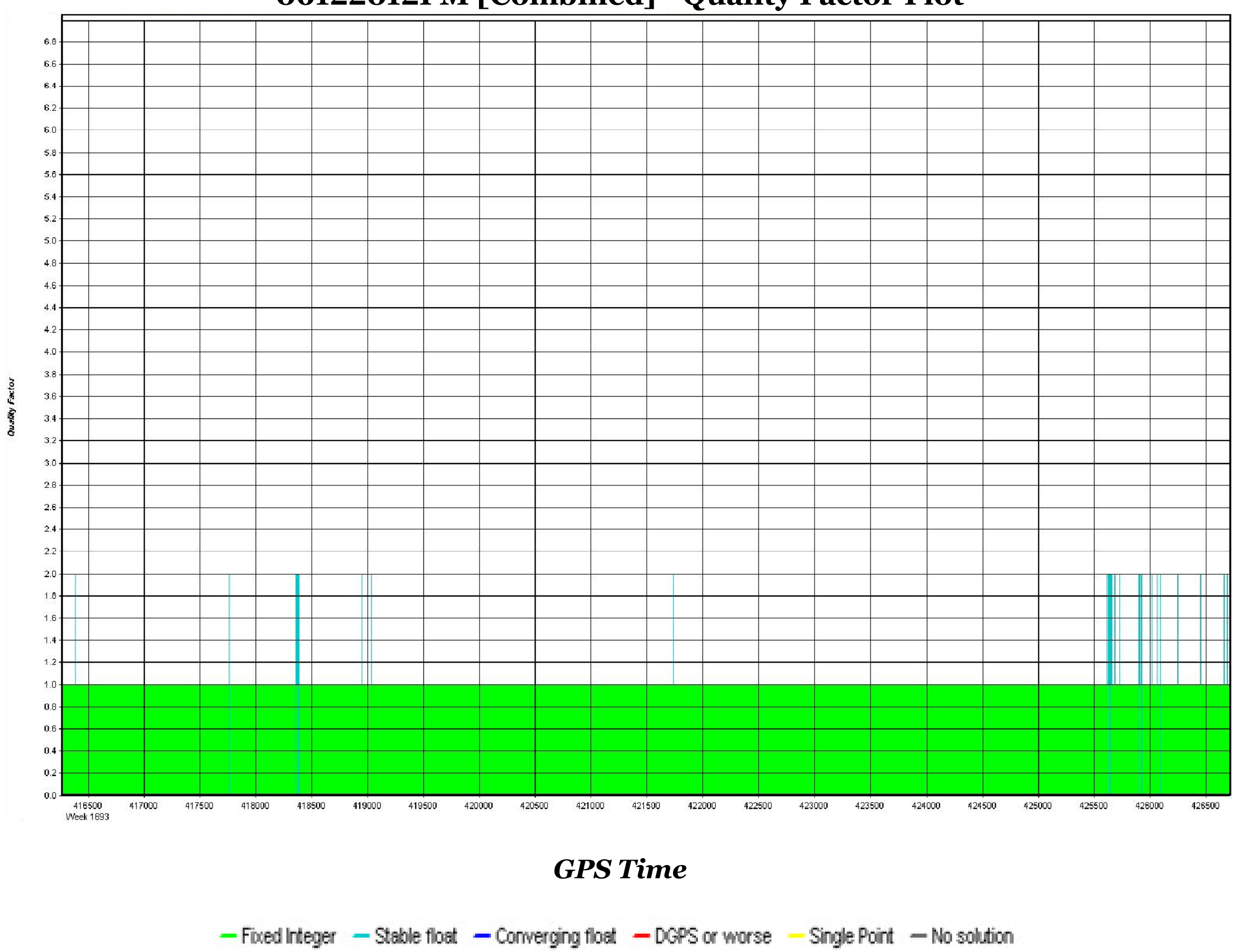
POSPAC Version 4.31

Combined - Map



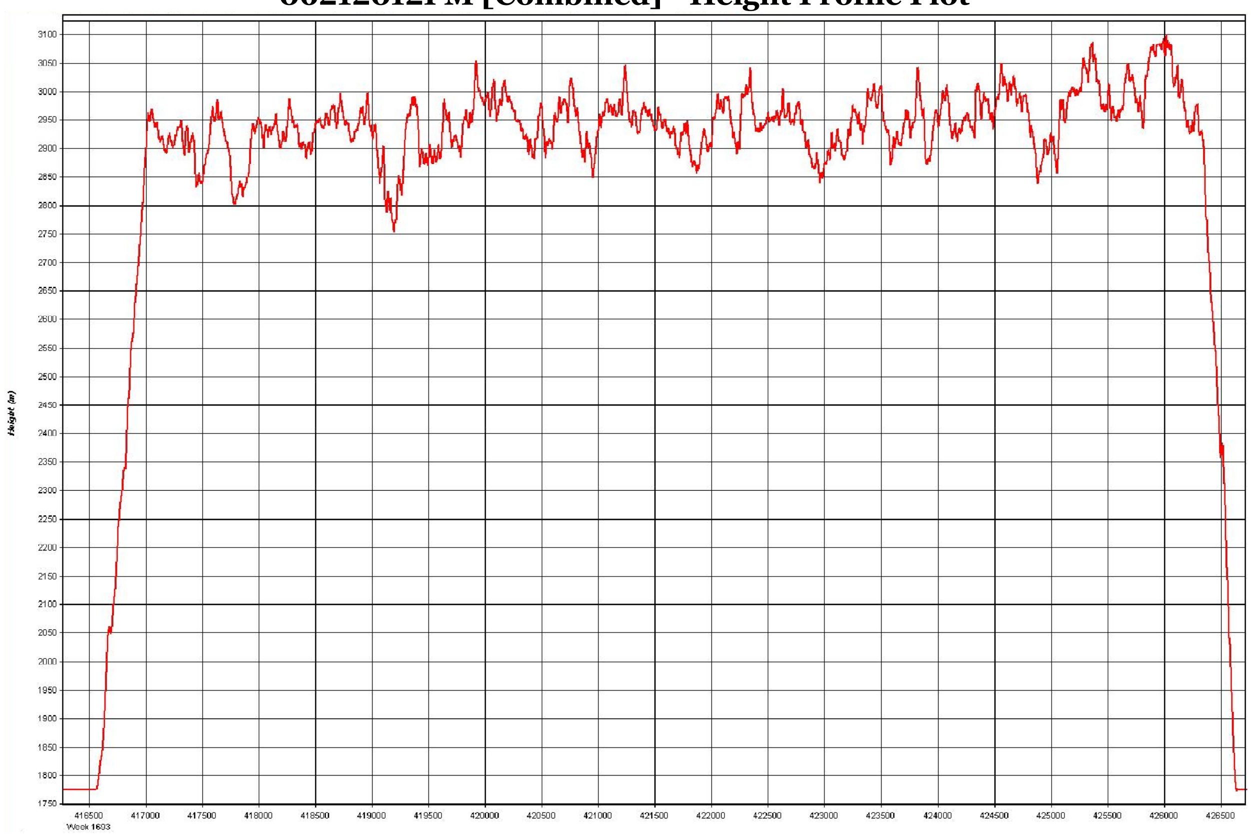
Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06122012PM [Combined] - Quality Factor Plot



Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - Height Profile Plot

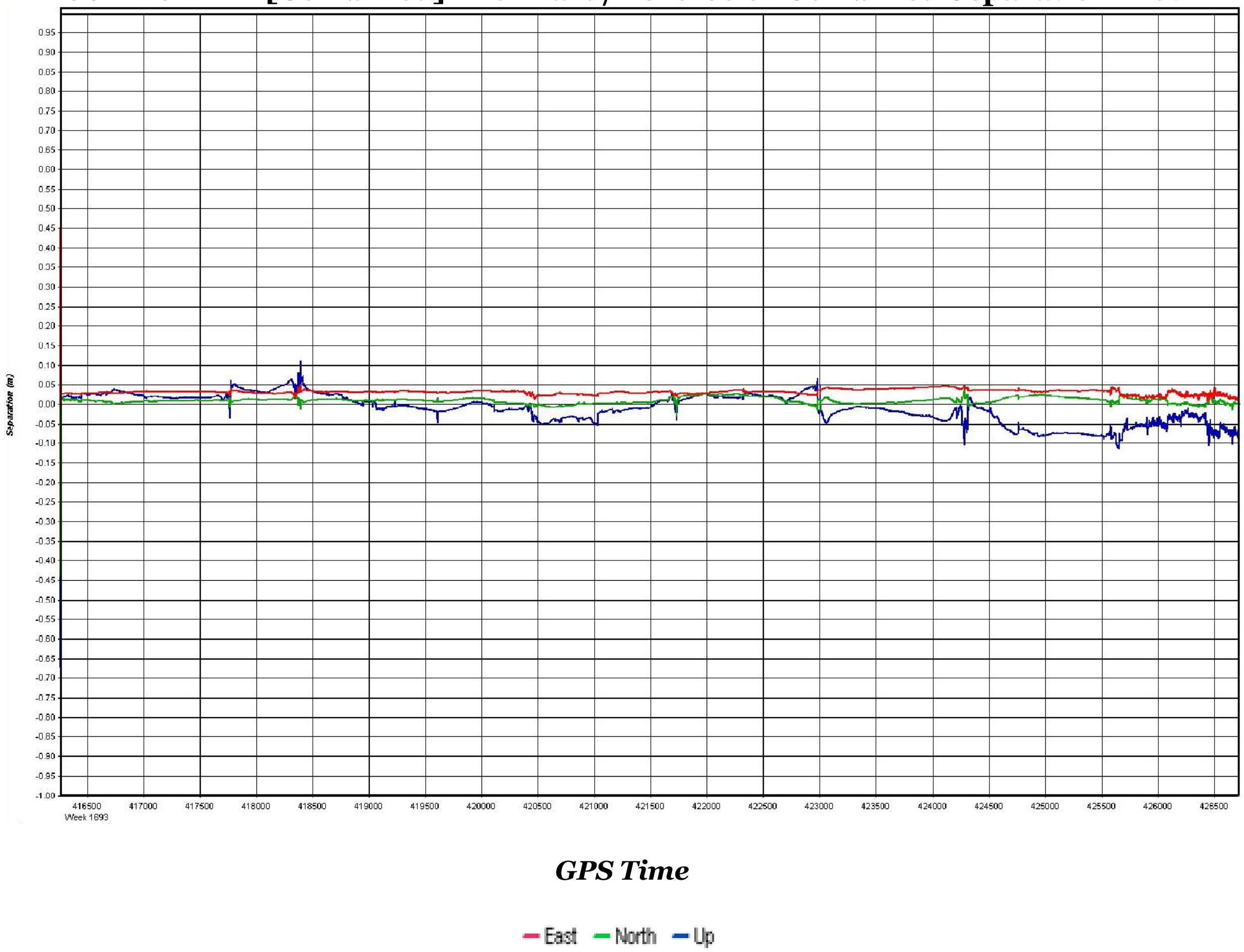


GPS Time

Height

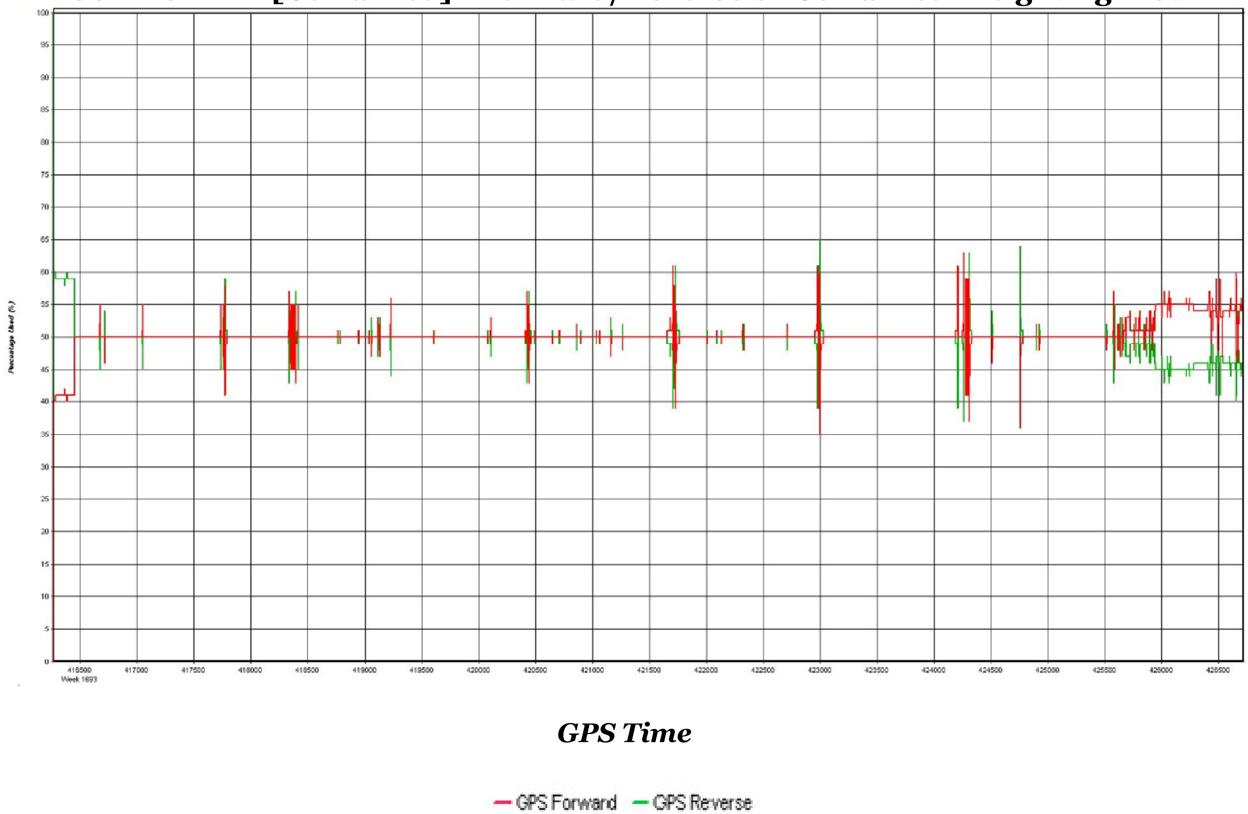
Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - Forward/Reverse or Combined Separation Plot



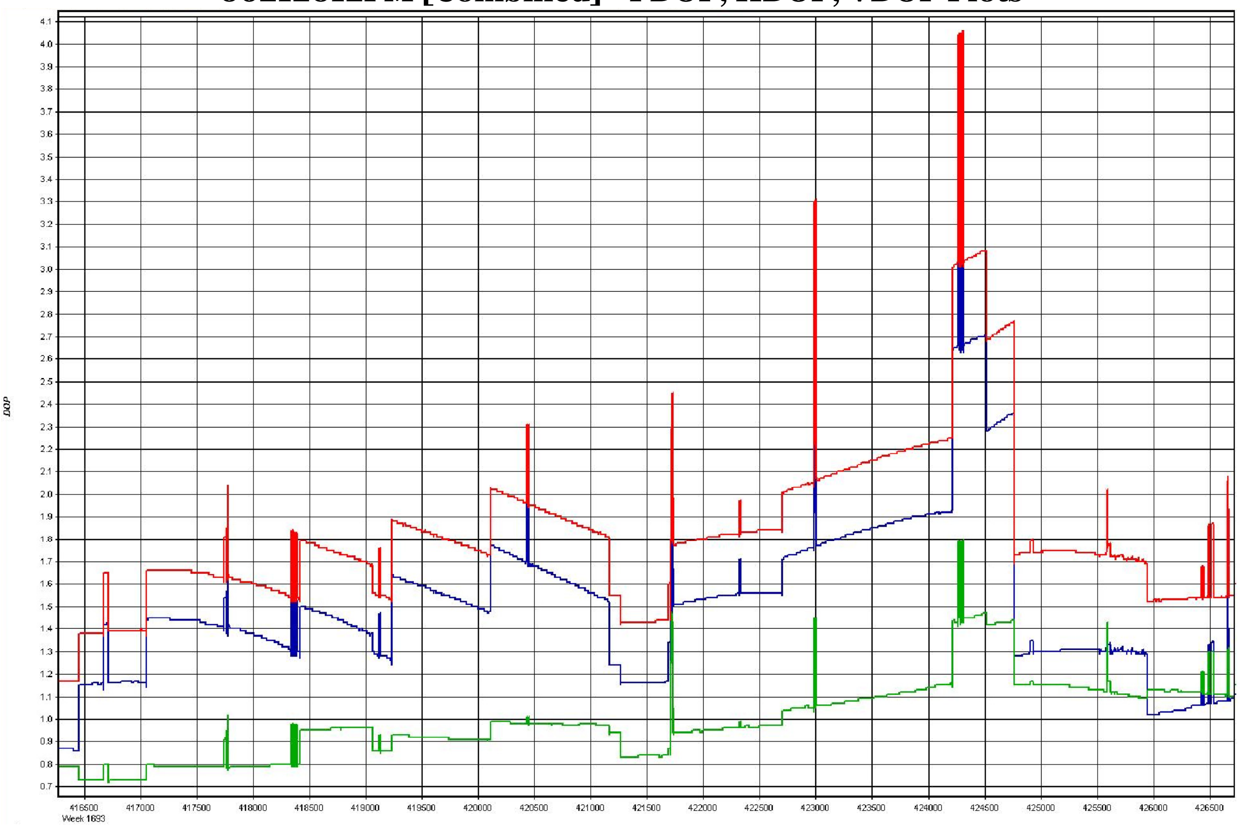
Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06122012PM [Combined] - Forward/Reverse or Combined Weighting Plot



Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - PDOP, HDOP, VDOP Plots

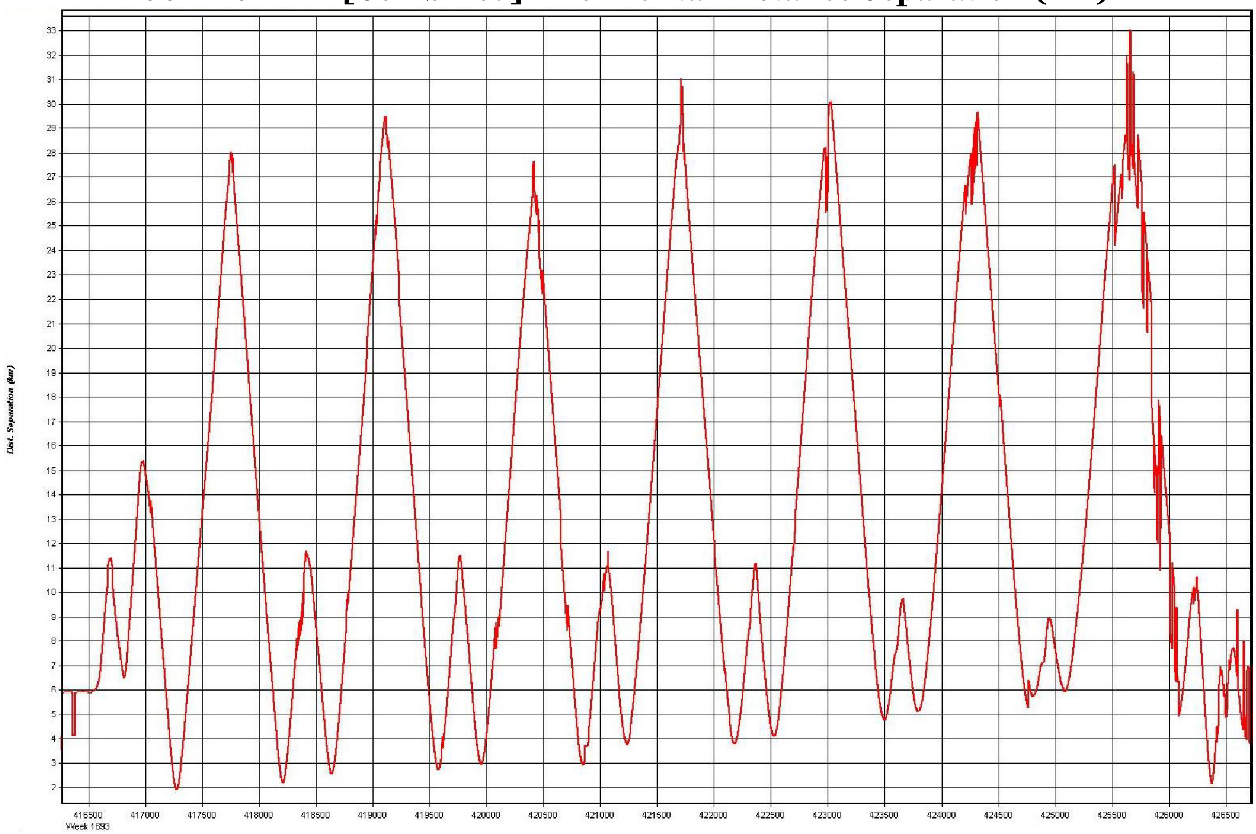


GPS Time

— PDOP — HDOP — VDOP

Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - Horizontal Distance Separation (km)

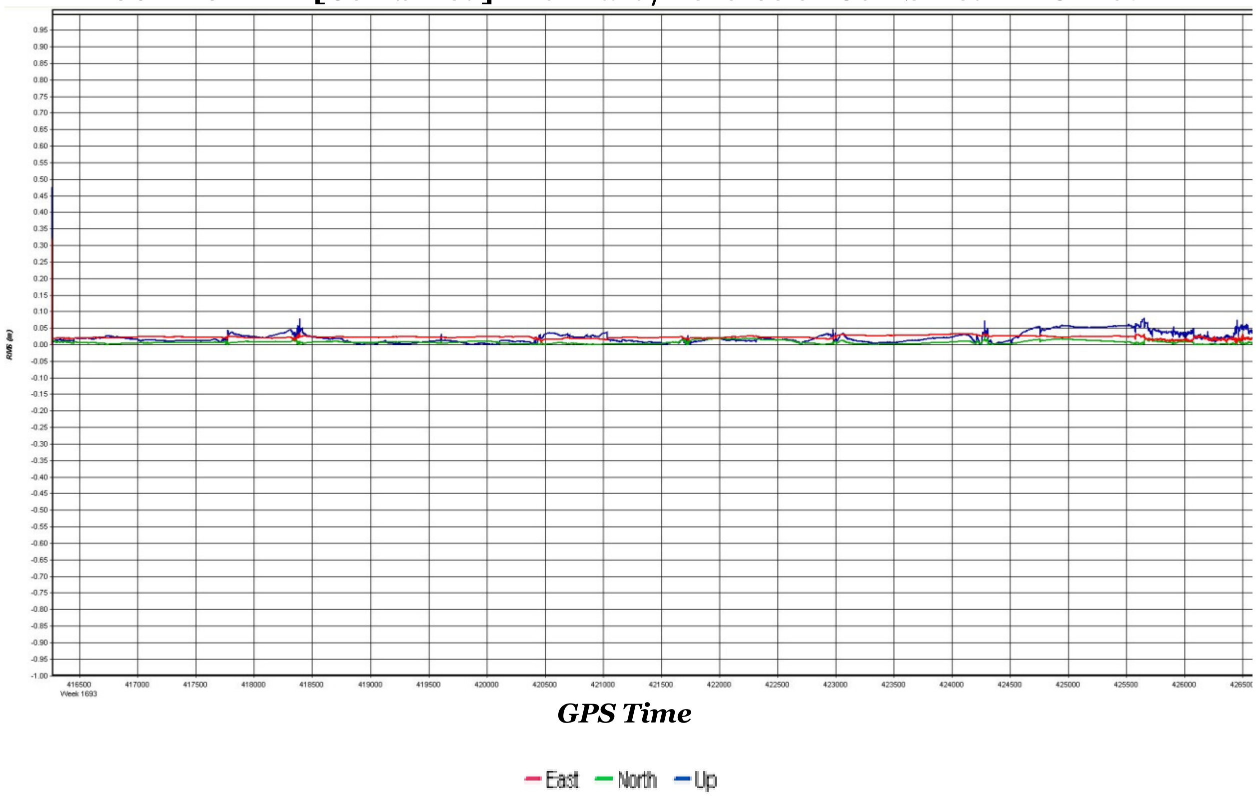


GPS Time

Distance

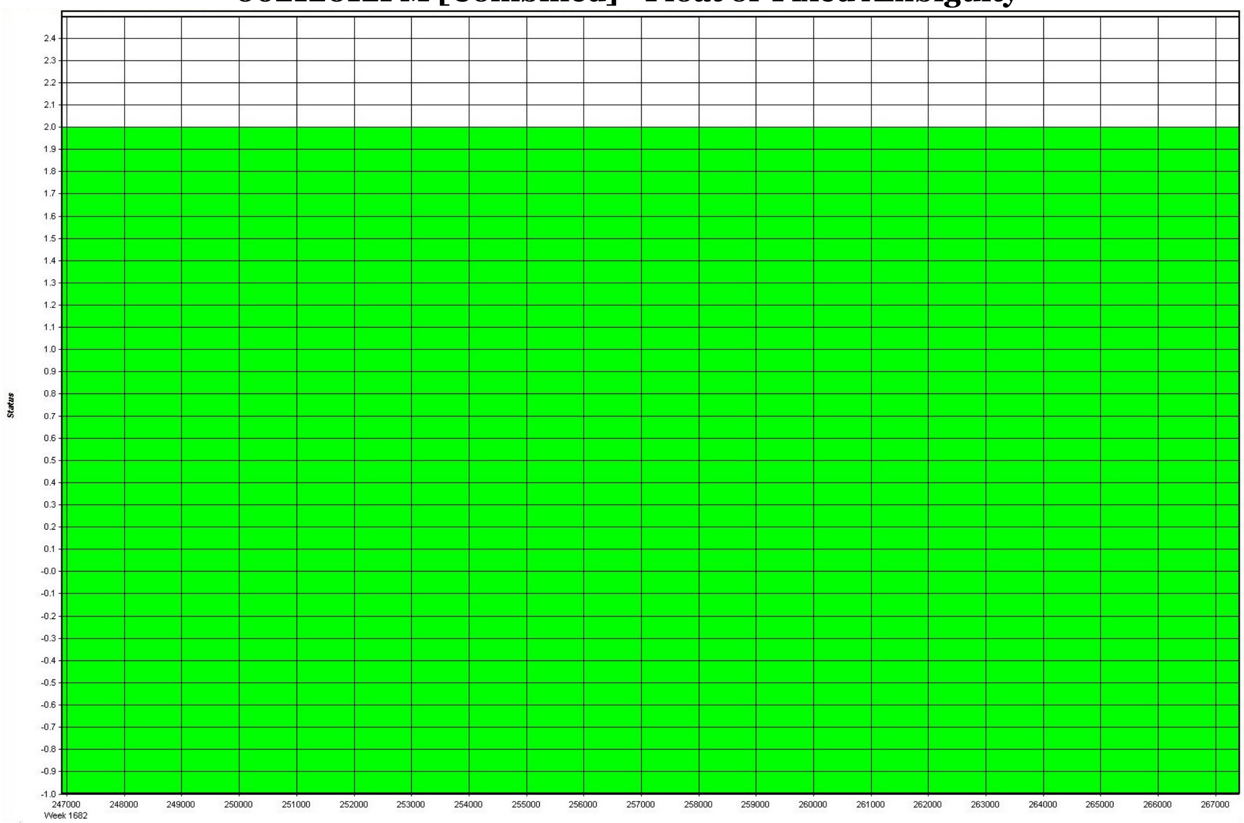
Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - Forward/Reverse or Combined RMS Plot



Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

06212012PM [Combined] - Float or Fixed Ambiguity



GPS Time

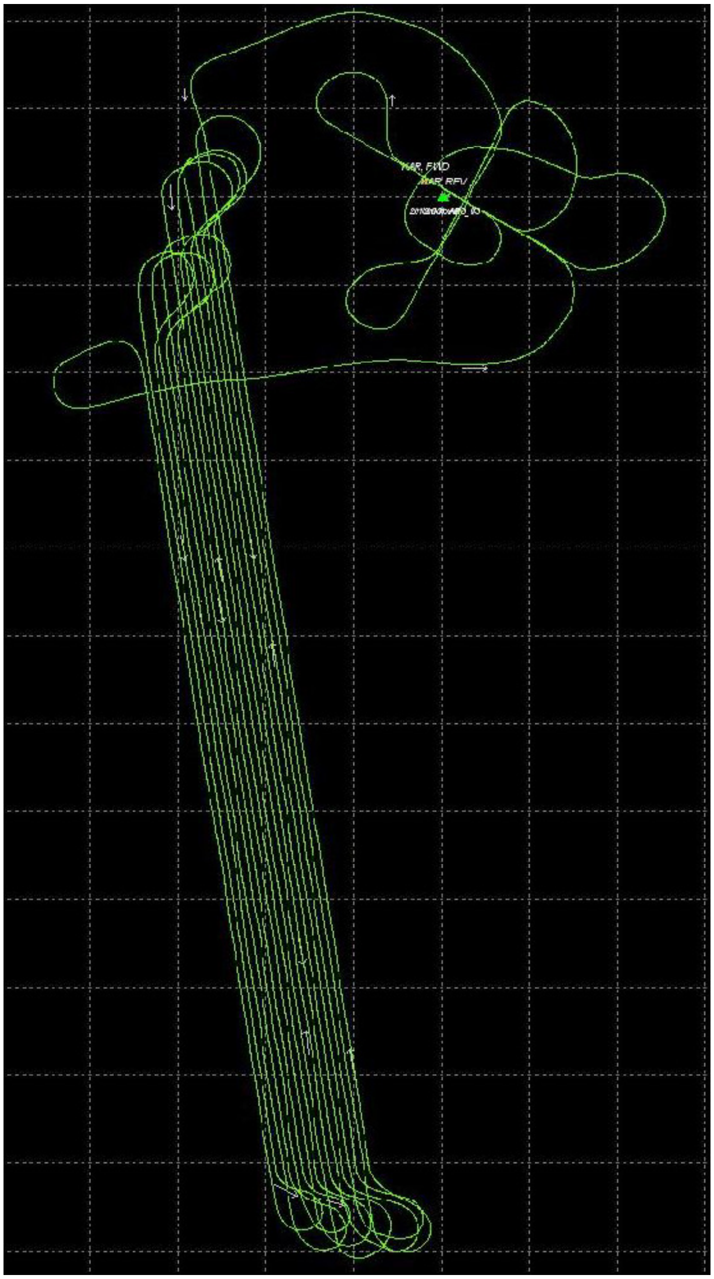
Float — Fixed (1 baseline) — Fixed (2 or more)

Process	Run (15)	by Unknown	on 06/21/2012	at 12:45

Output Results for 06272012

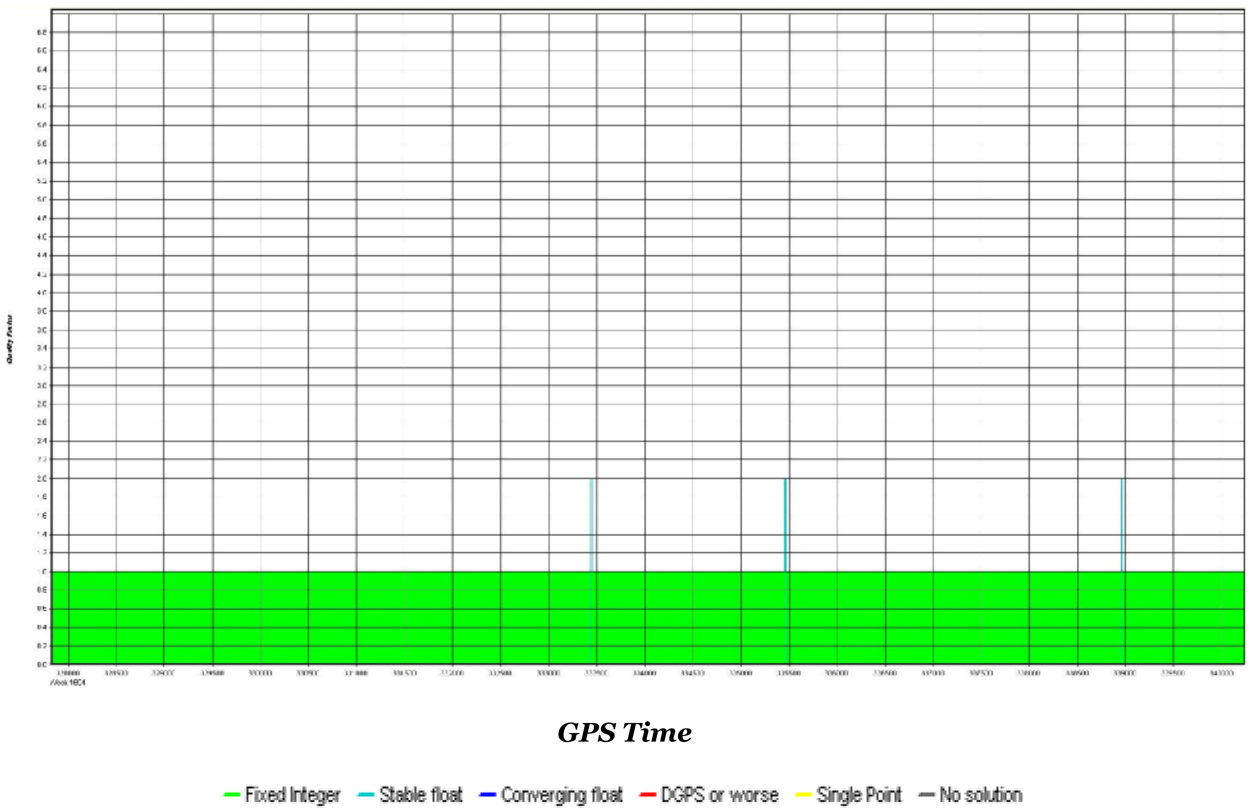
POSPAC Version 4.31

Combined – Map



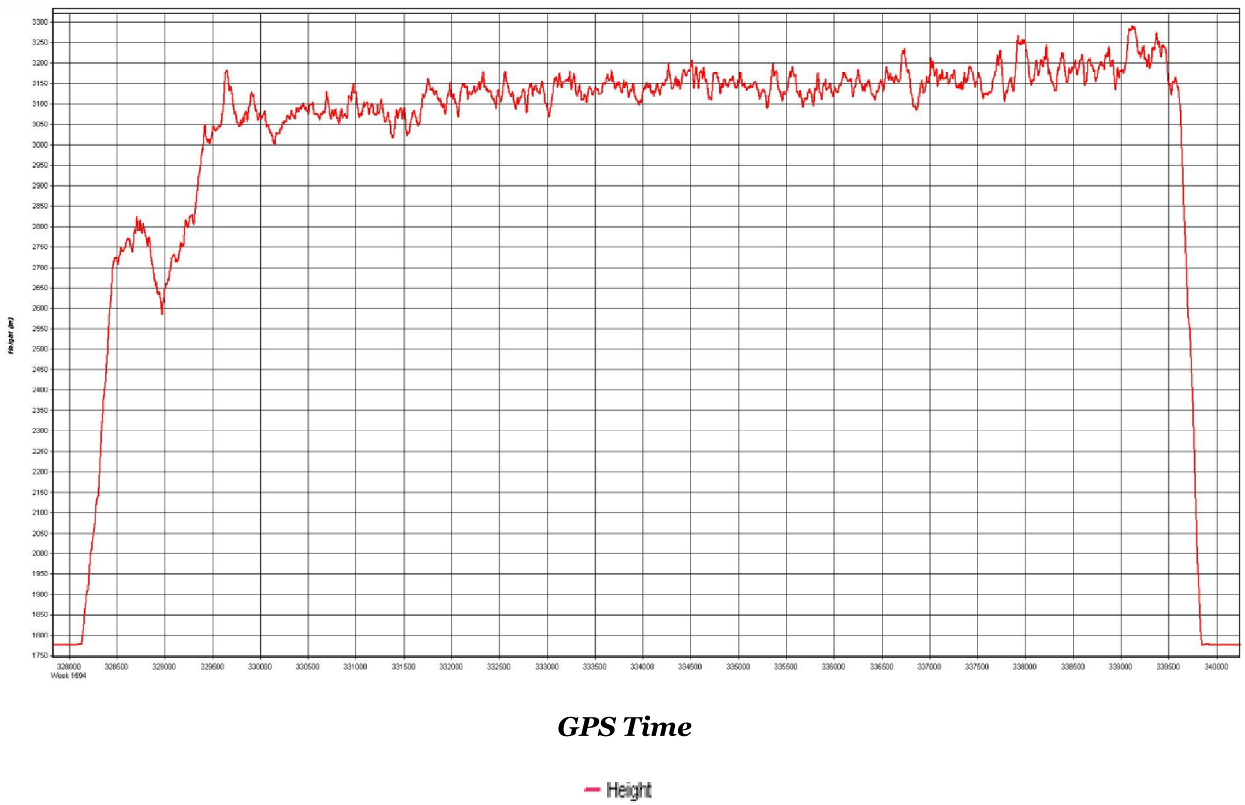
Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – Quality Factor Plot



Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

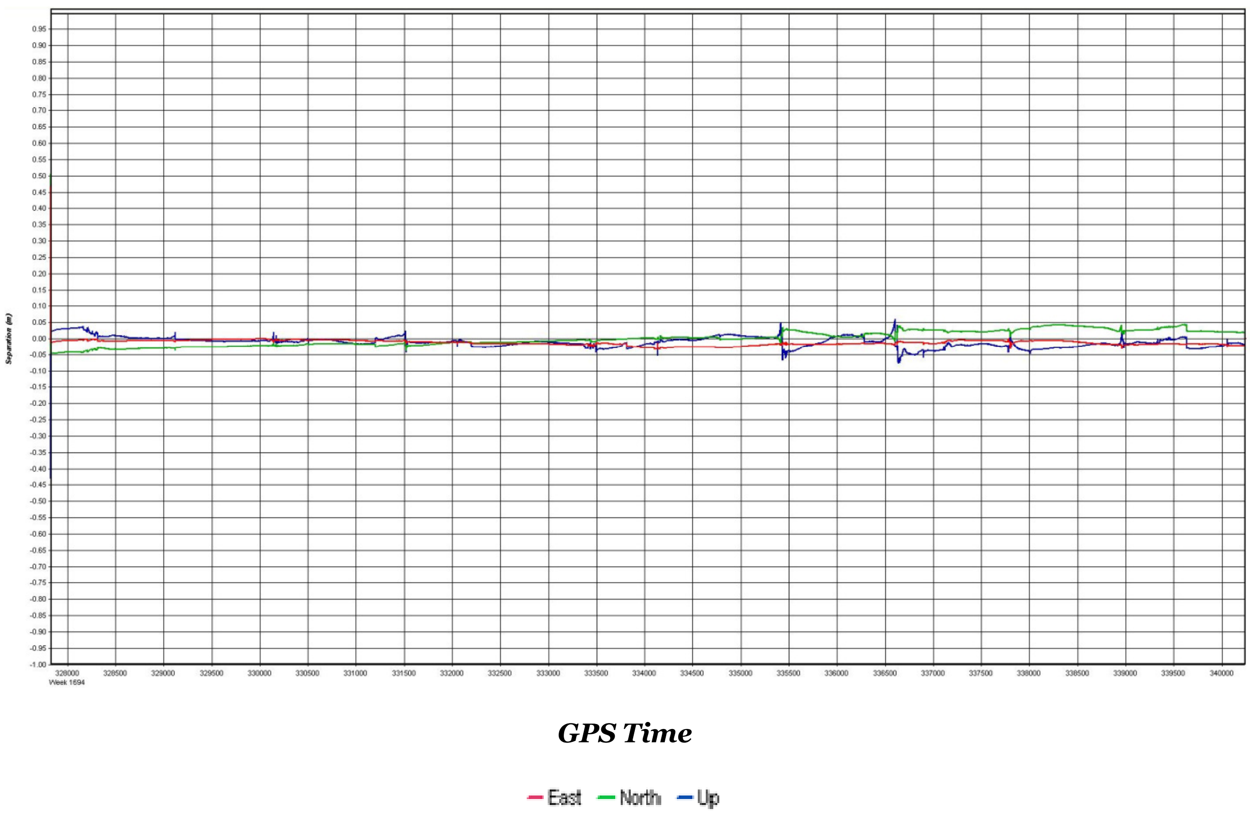
06272012 [combined] – Height Profile Plot



GPS Time

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

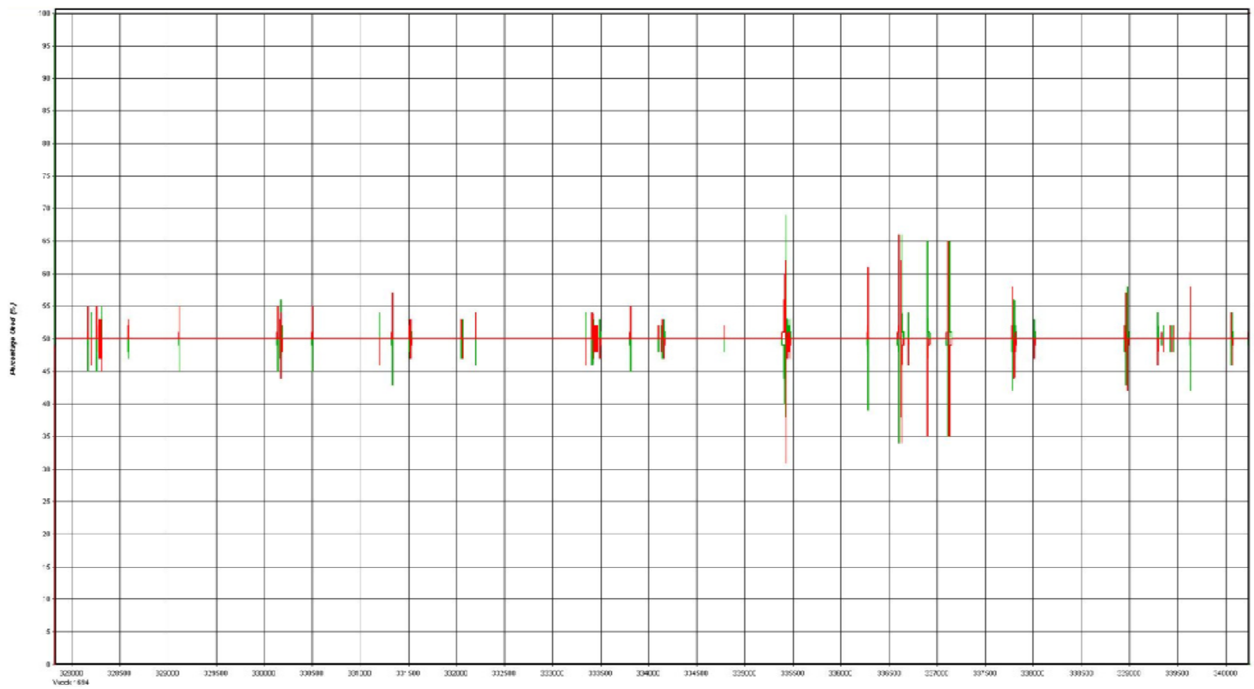
06272012 [combined] – Forward/Reverse or Combined Separation Plot



GPS Time

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – Forward/Reverse or Combined Weighted Plot

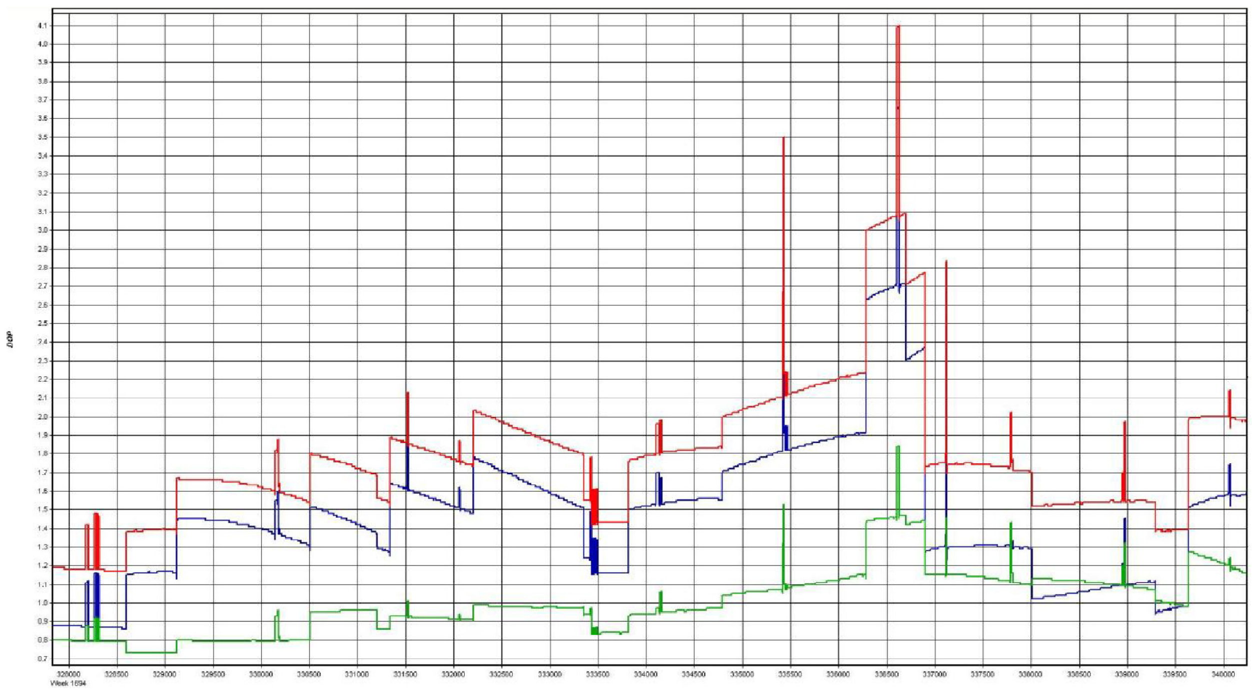


GPS Time

— GPS Forward — GPS Reverse

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – PDOP, HDOP, VDOP Plots

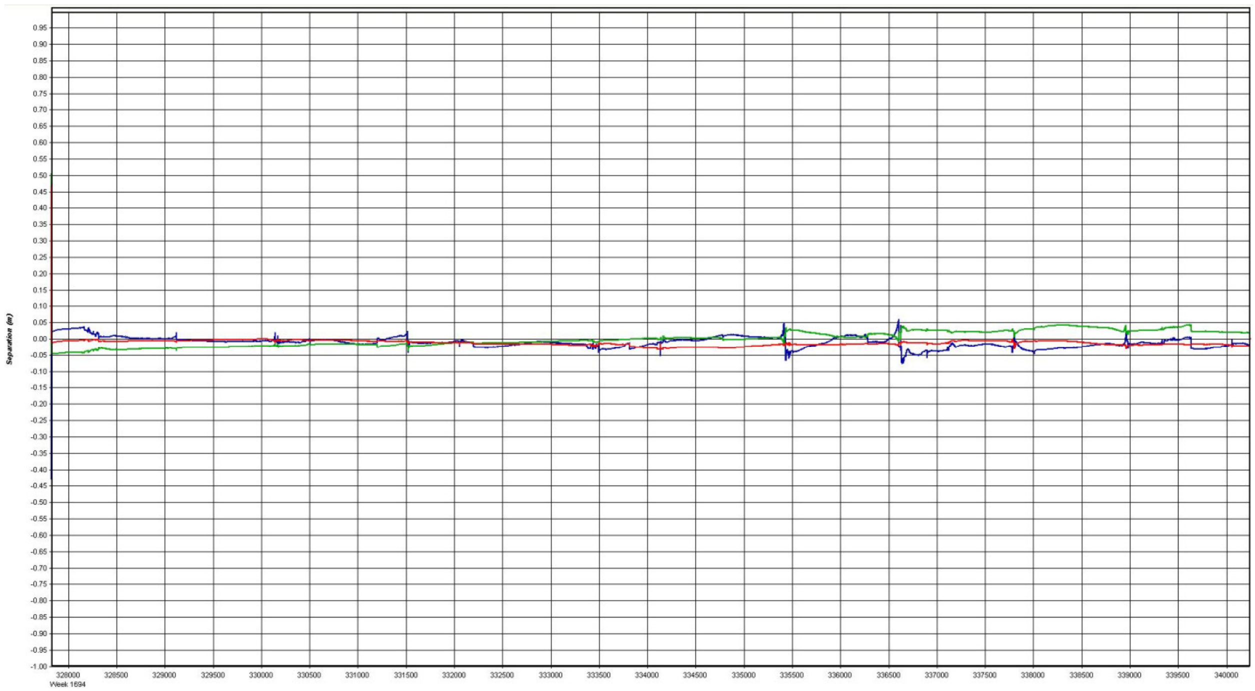


GPS Time

— PDOP — HDOP — VDOP

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – Horizontal Distance Separation (km)

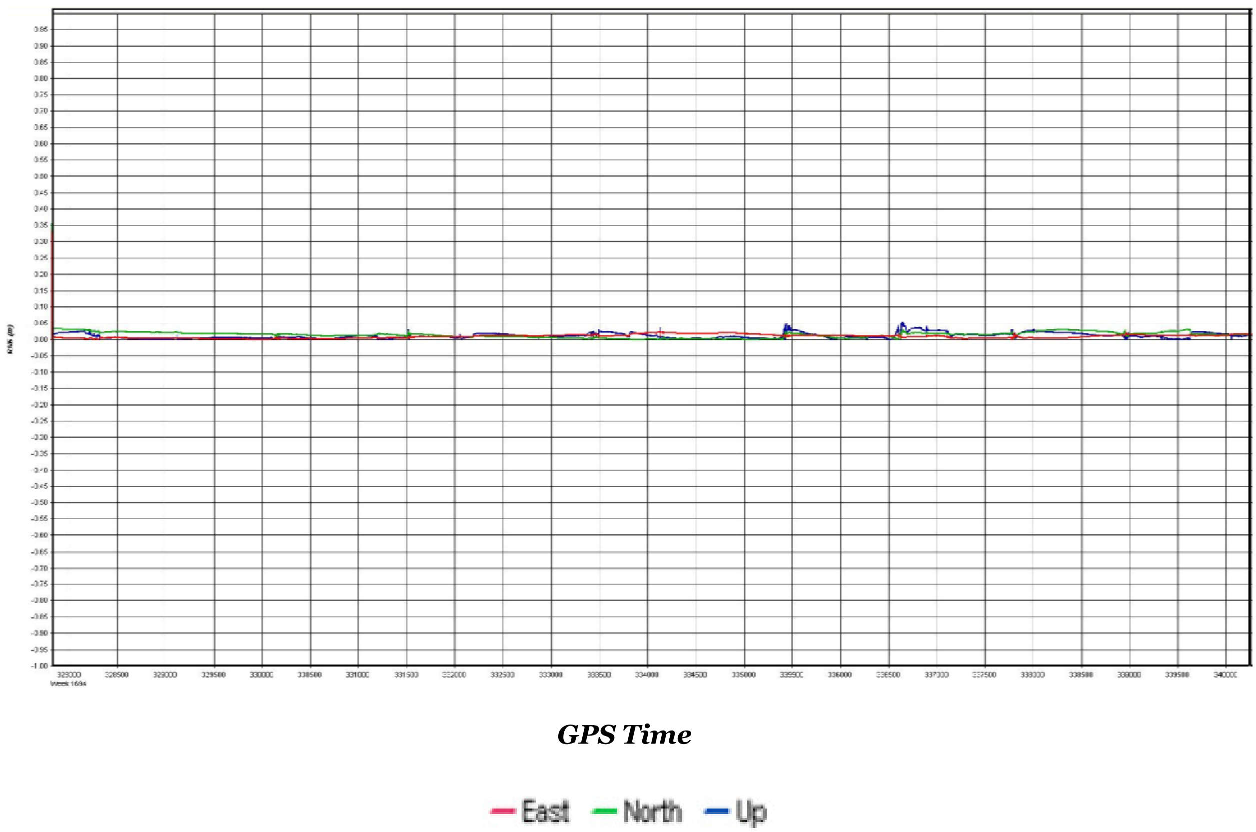


GPS Time

Distance

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – Forward/Reverse or Combined RMS Plot



Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

06272012 [Combined] – Float or Fixed Ambiguity

GPS Time

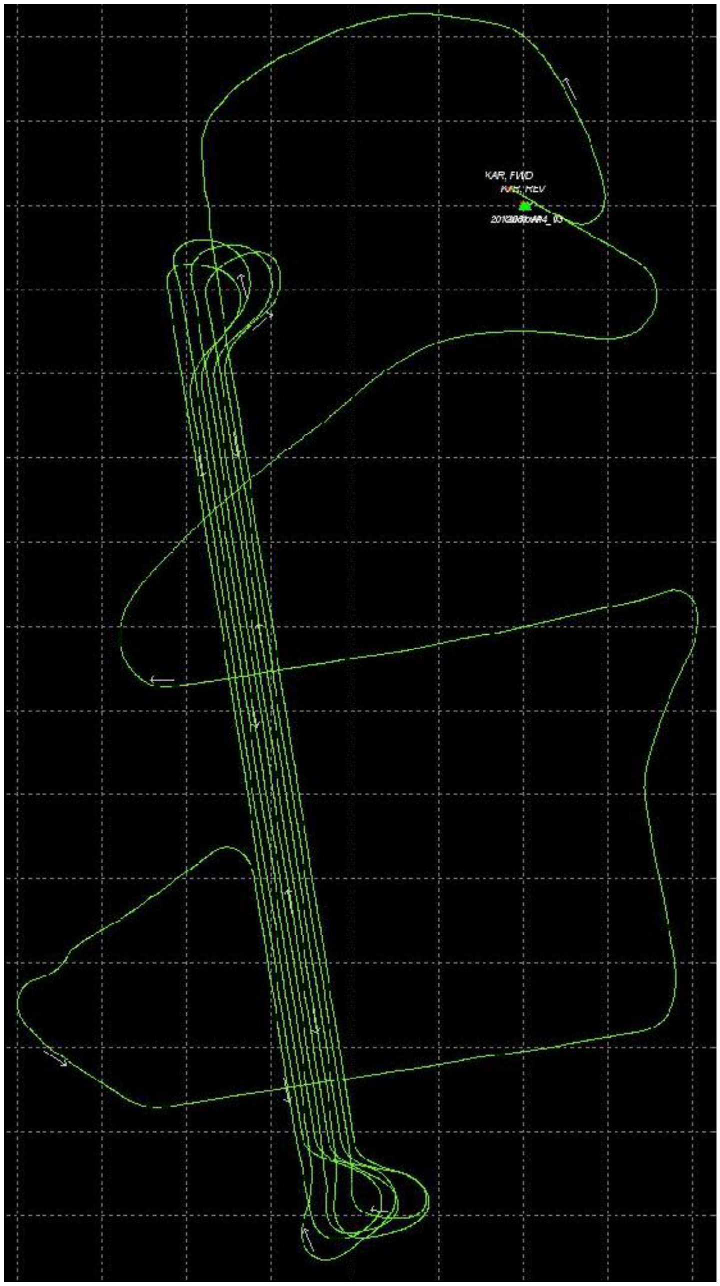
Float — Fixed (1 baseline) — Fixed (2 or more)

Process	Run (17)	by Unknown	on 06/27/2012	at 12:30

Output Results for 06282012

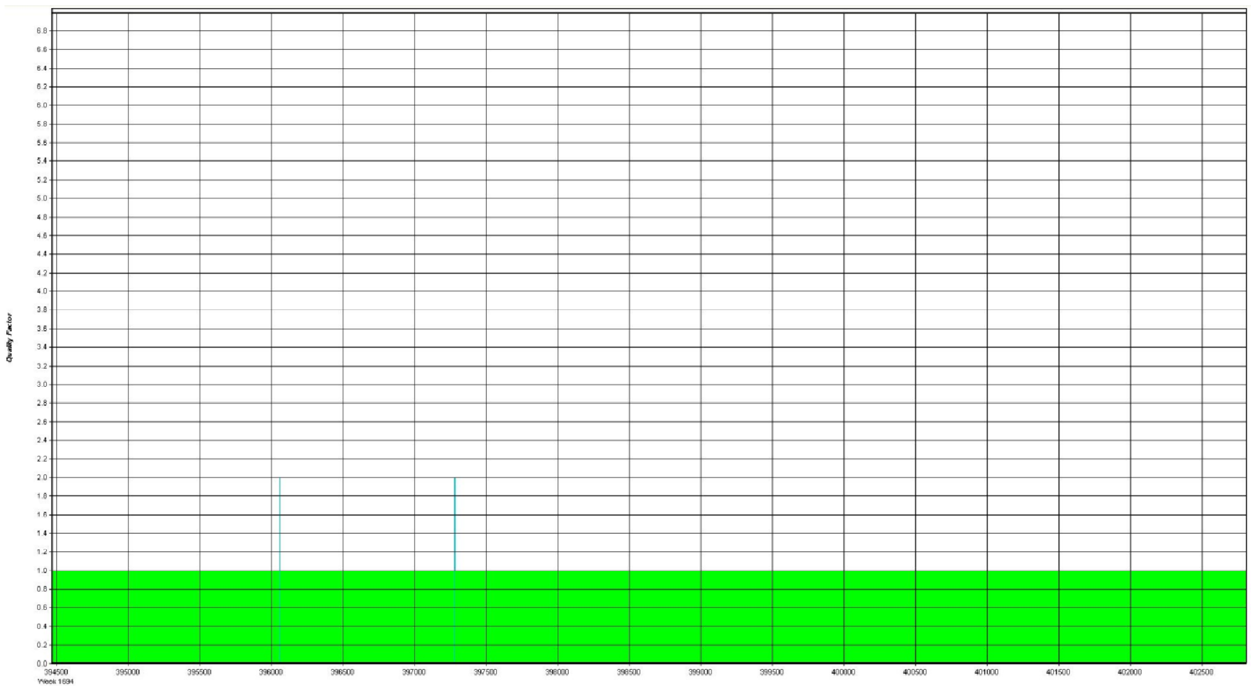
POSPAC Version 4.31

Combined – Map



Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Quality Factor Plot

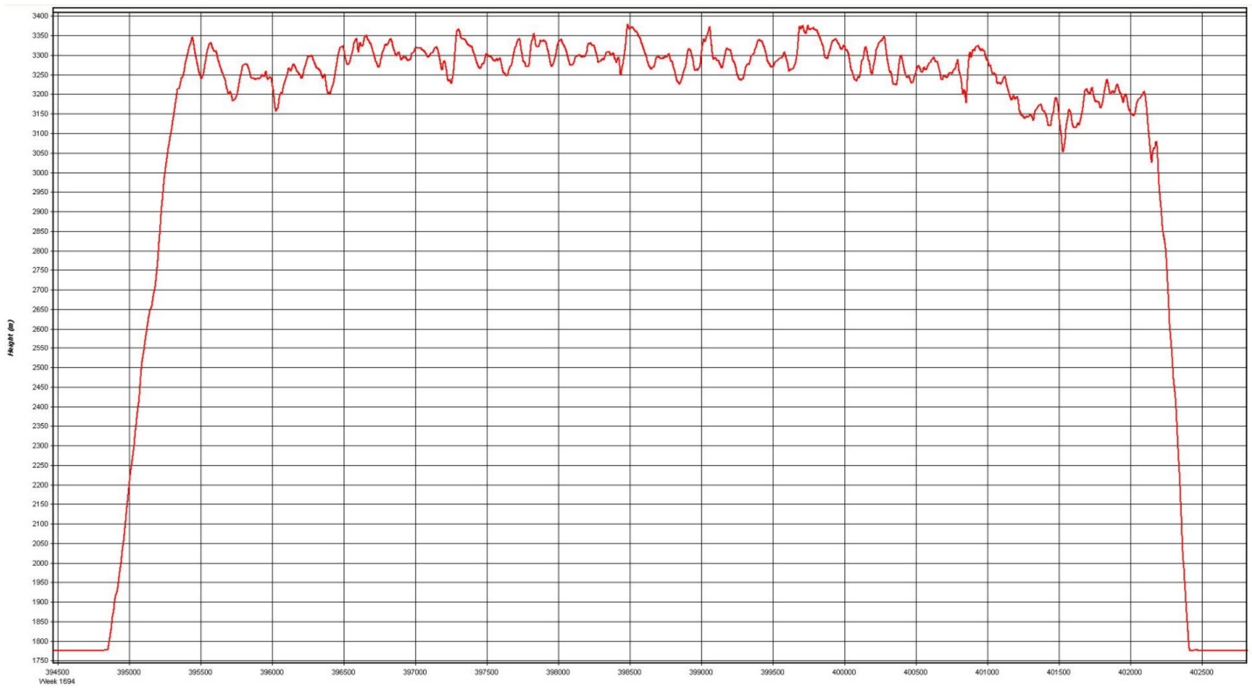


GPS Time

Fixed Integer · Stable float · Converging float · DGPS or worse · Single Point · No solution

Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Height Profile Plot

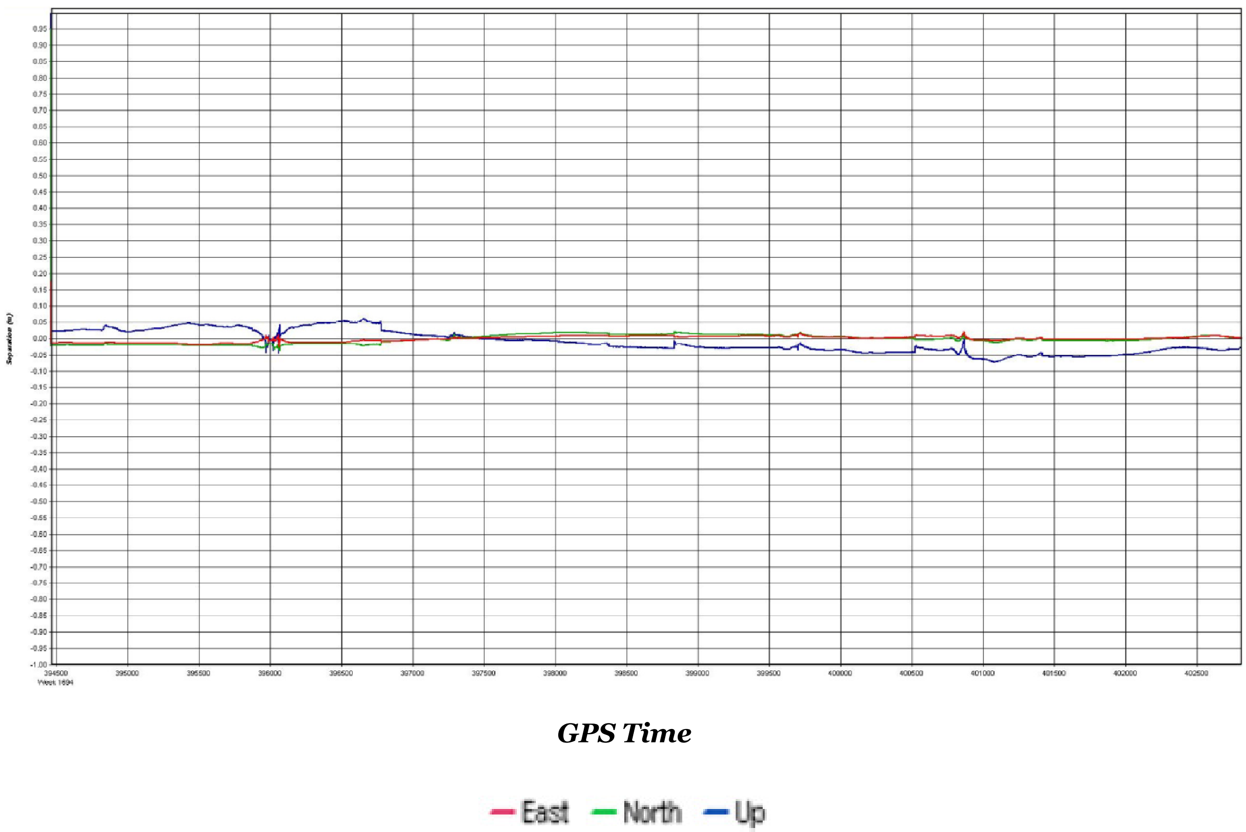


GPS Time

— Height

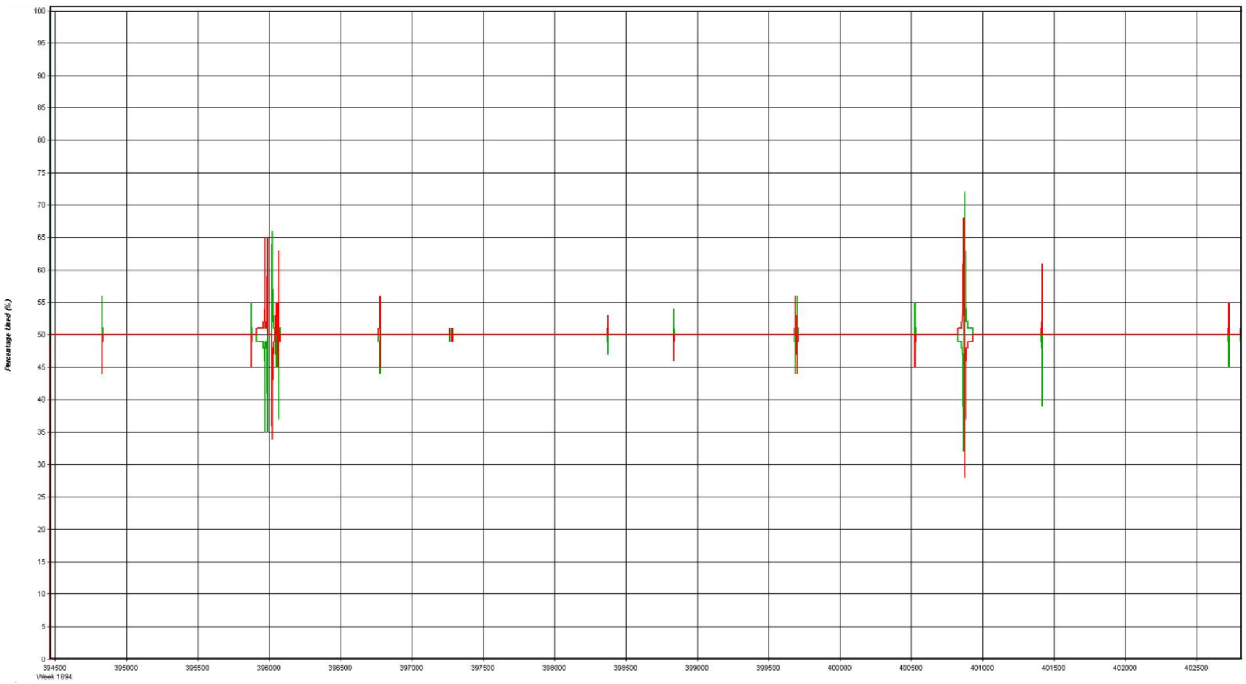
Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Forward/Reverse or Combined Separation Plot



Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Forward/Reverse or Combined Weighting Plot

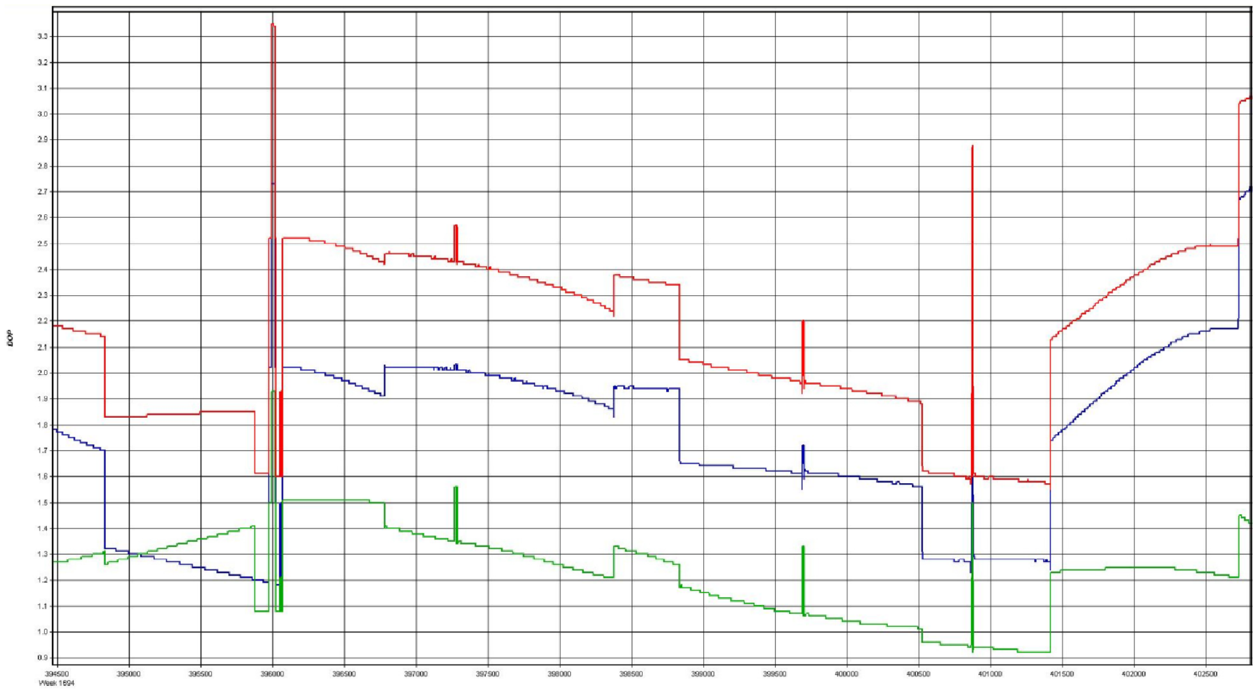


GPS Time

GPS Forward GPS Reverse

Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

0628212 [Combined] – PDOP, HDOP, VDOP Plots

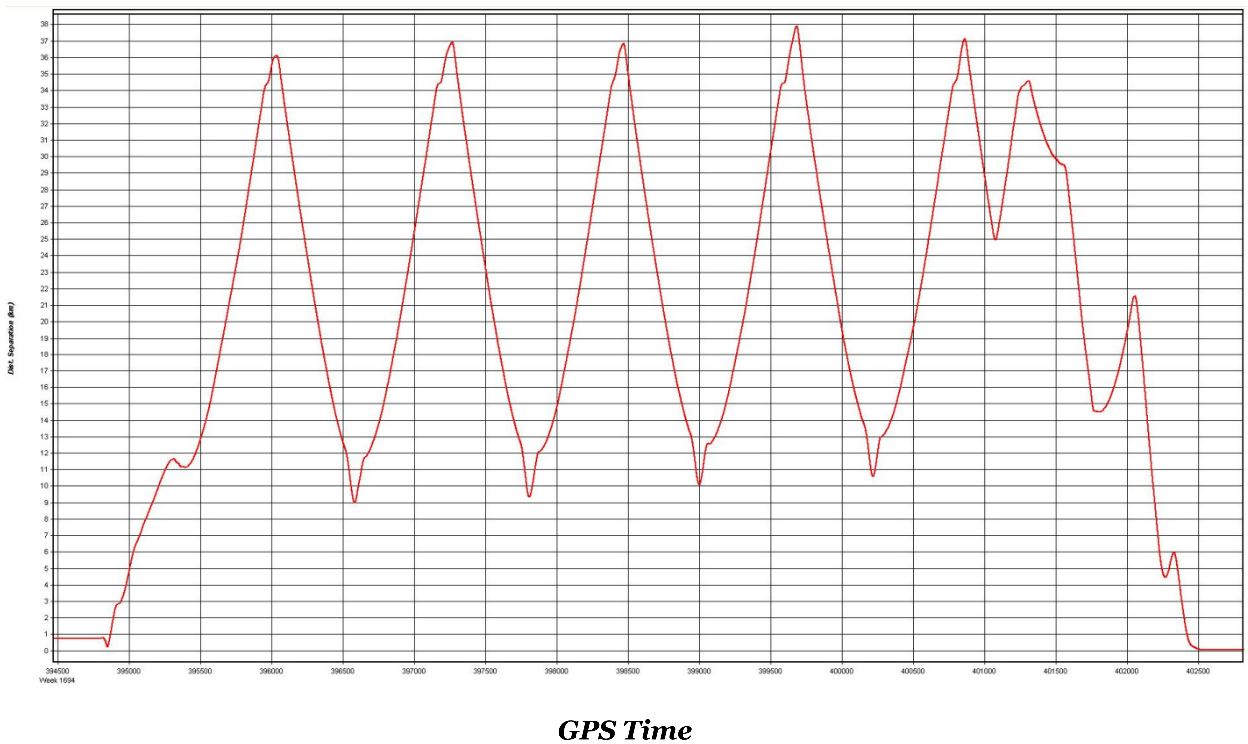


GPS Time

— PDOP — HDOP — VDOP

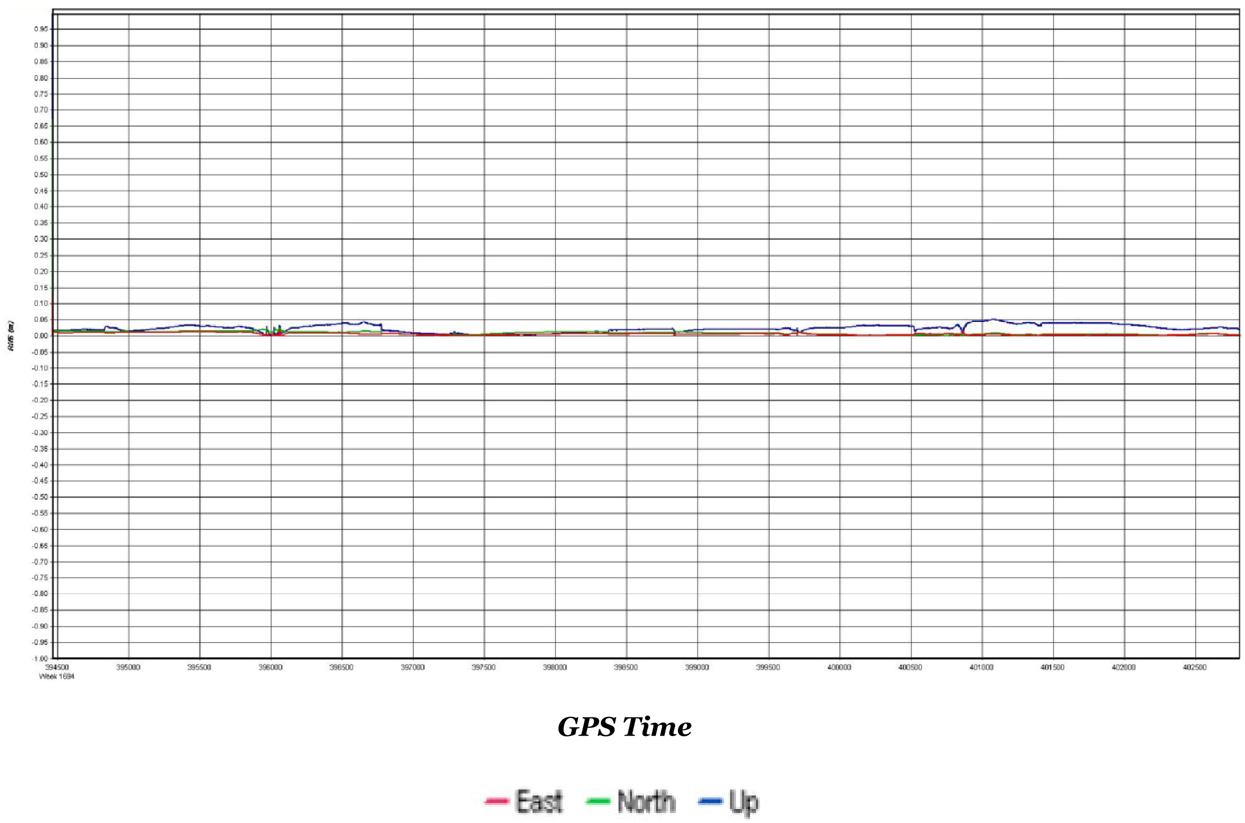
Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Horizontal Distance Separation (km)



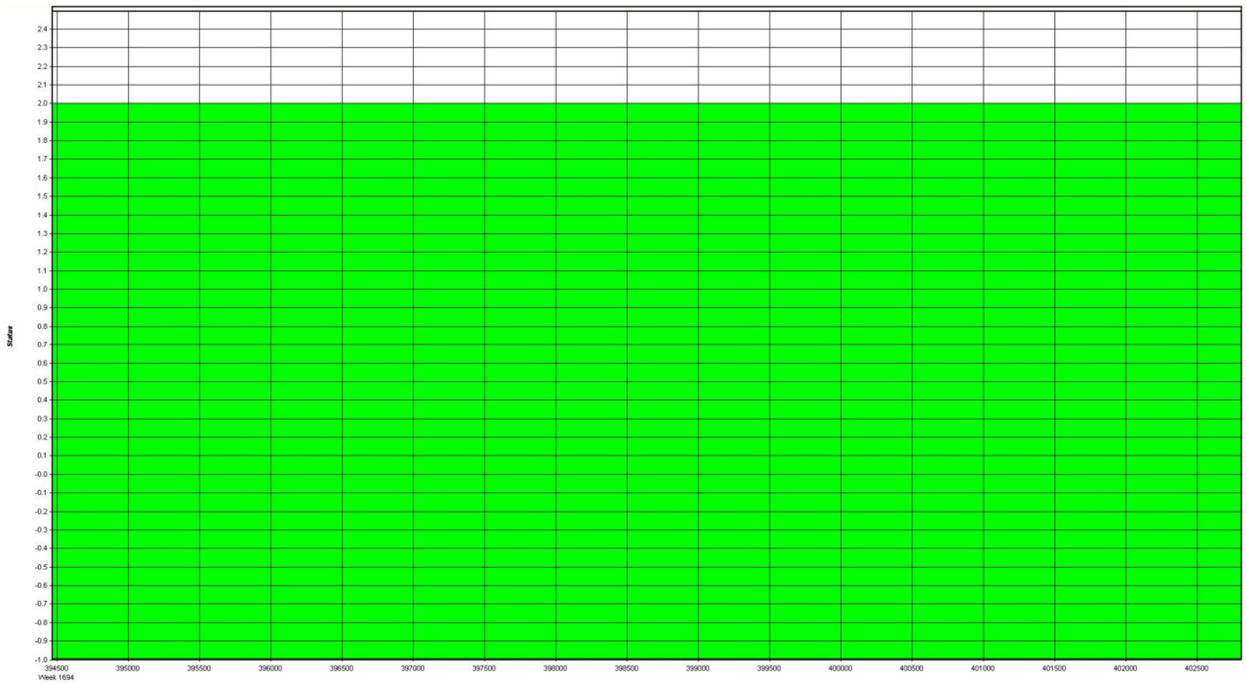
Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012 [Combined] – Forward/Reverse or combined RMS Plot



Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

06282012[Combined] – Float or fixed Ambiguity



GPS Time

— Float — Fixed (1 baseline) — Fixed (2 or more)

Process	Run (12)	by Unknown	on 06/28/2012	at 06:30

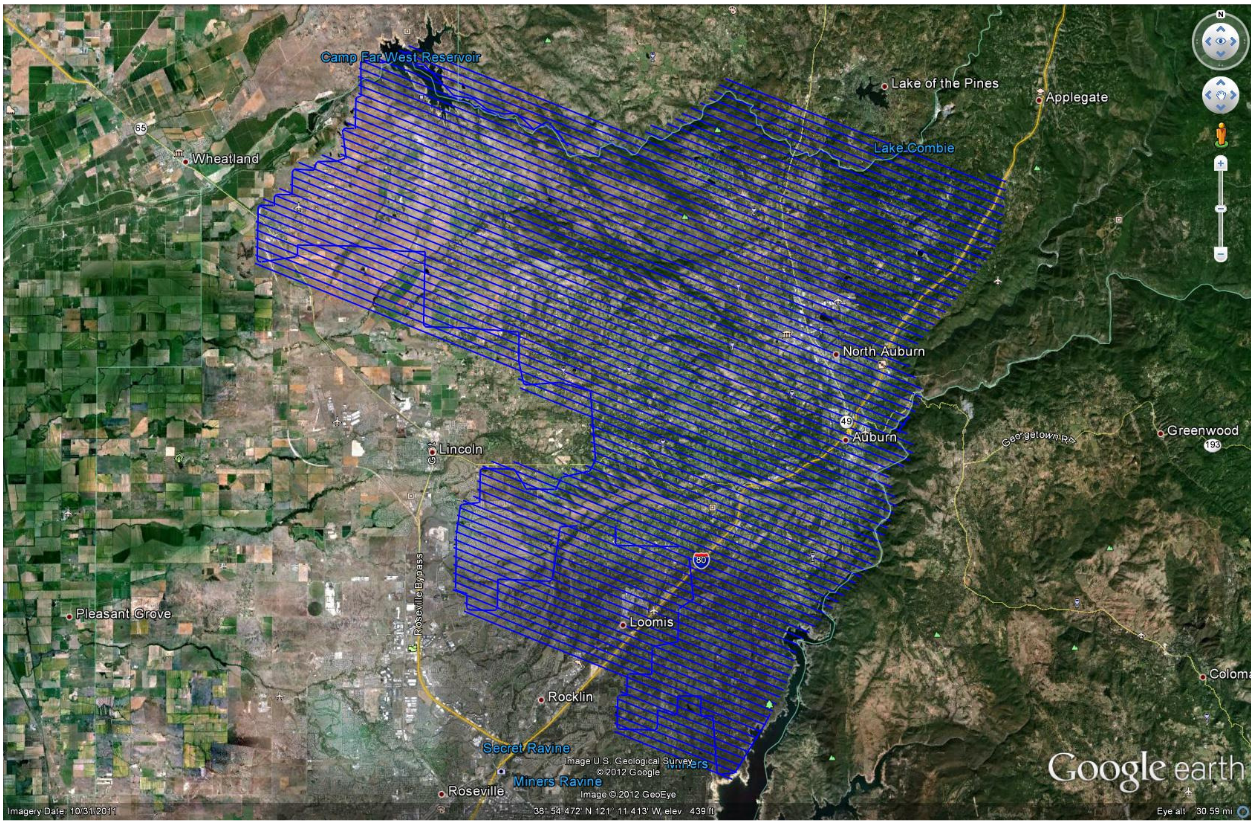
EAST PLACER CONTROL POINTS

Number	Easting	Northing	Known Z	Laser Z	DZ
D1	223163.921	4351385.949	1809.132	1809.220	+0.088
D3	224298.095	4341397.289	1889.832	1889.900	+0.068
D2	238454.189	4348174.181	1922.237	1922.270	+0.033
10	228124.484	4337977.699	1926.507	1926.507	+0.023
2	226959.966	4356535.182	1825.880	1825.890	+0.010
1	220064.541	4352725.159	2243.051	2243.060	+0.009
4	240084.540	4349777.482	2139.395	2139.400	+0.005
D5	234955.620	4350209.365	2191.694	2191.690	-0.004
6	234069.418	4347324.719	1921.939	1921.930	-0.009
11	223620.904	4333507.941	1946.974	1946.960	-0.014
D4	226600.813	4330898.842	1901.816	1901.800	-0.016
9	232857.083	4341985.681	1921.418	1921.400	-0.018
14	229864.332	4327823.764	1930.844	1930.820	-0.024
7	240763.036	4346369.858	1953.209	1953.180	-0.029
5	223584.523	4346319.601	1848.559	1848.520	-0.039
8	220252.494	4339939.342	2108.595	2108.530	-0.065

Average DZ	+0.001
Minimum DZ	-0.065
Maximum DZ	+0.088
Average Magnitude	+0.028
Root Mean Square	+0.037
Std Deviation	+0.038

WEST PLACER ACQUISITION LOG

DMI acquired LiDAR data over an Area of Interest (AOI) covering all or portions of West of Placer County, California. The acquisition plan entailed a nominal point spacing of 2.08 points per meter square and a side lap of 40% between flight lines. The AOI covers 189 square miles.



Flight plan

LiDAR ACQUISITION DETAILS

Collections (Lifts): 3

Collection Dates: 2012 April 2, 3

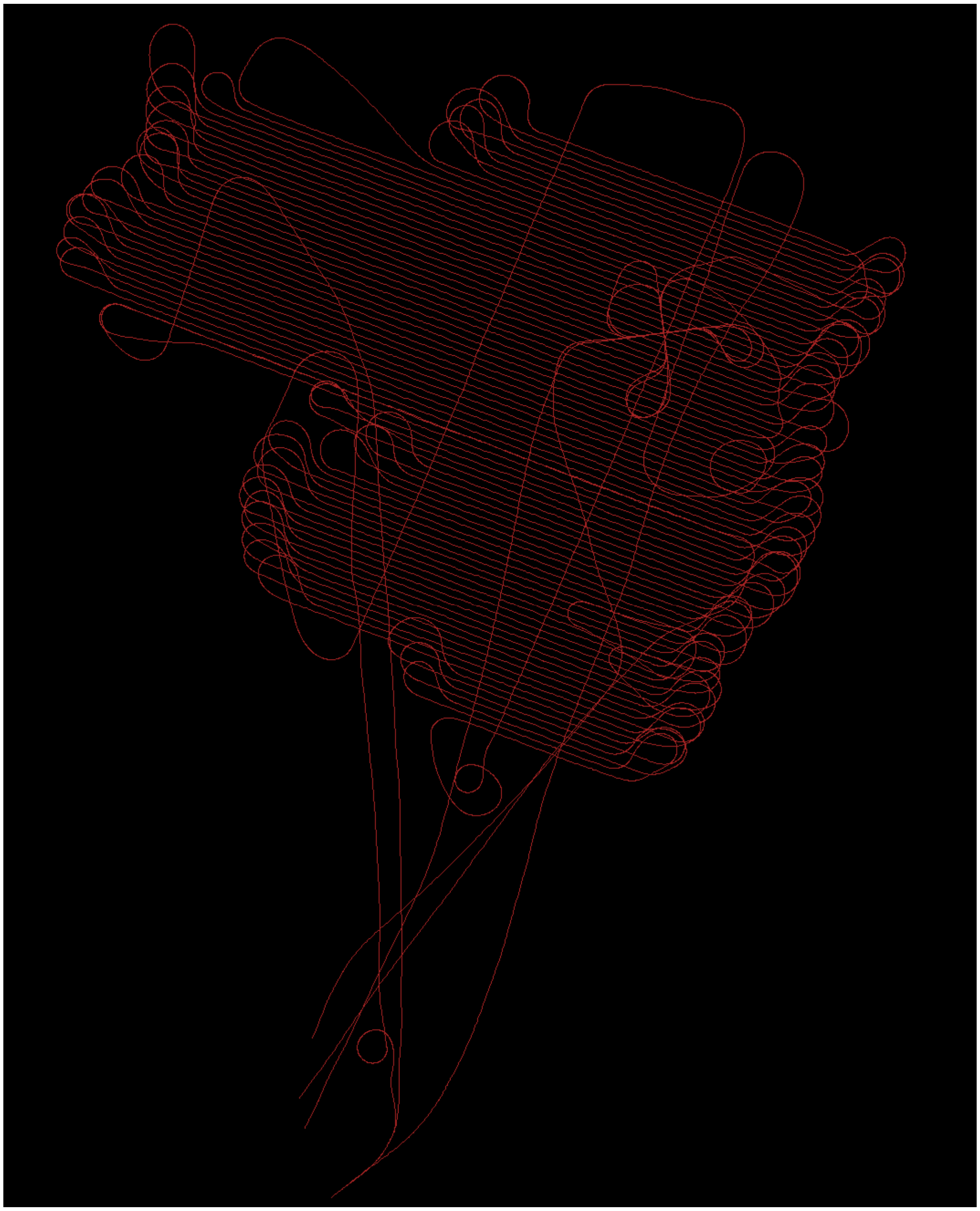
Field of View (FOV): 18 degrees

Average Point Density (planned): 0.69 m

Flight Level(s): 914 / 3000 m/ft

Sensor Type: Optech Gemini **Sensor Serial Number(s):** 07SEN204

All acquired LiDAR data was initially quality controlled after every mission for coverage and further verified for content and adherence to flight plan at DMI production facilities Huntington Beach, CA. All data was accepted for processing.

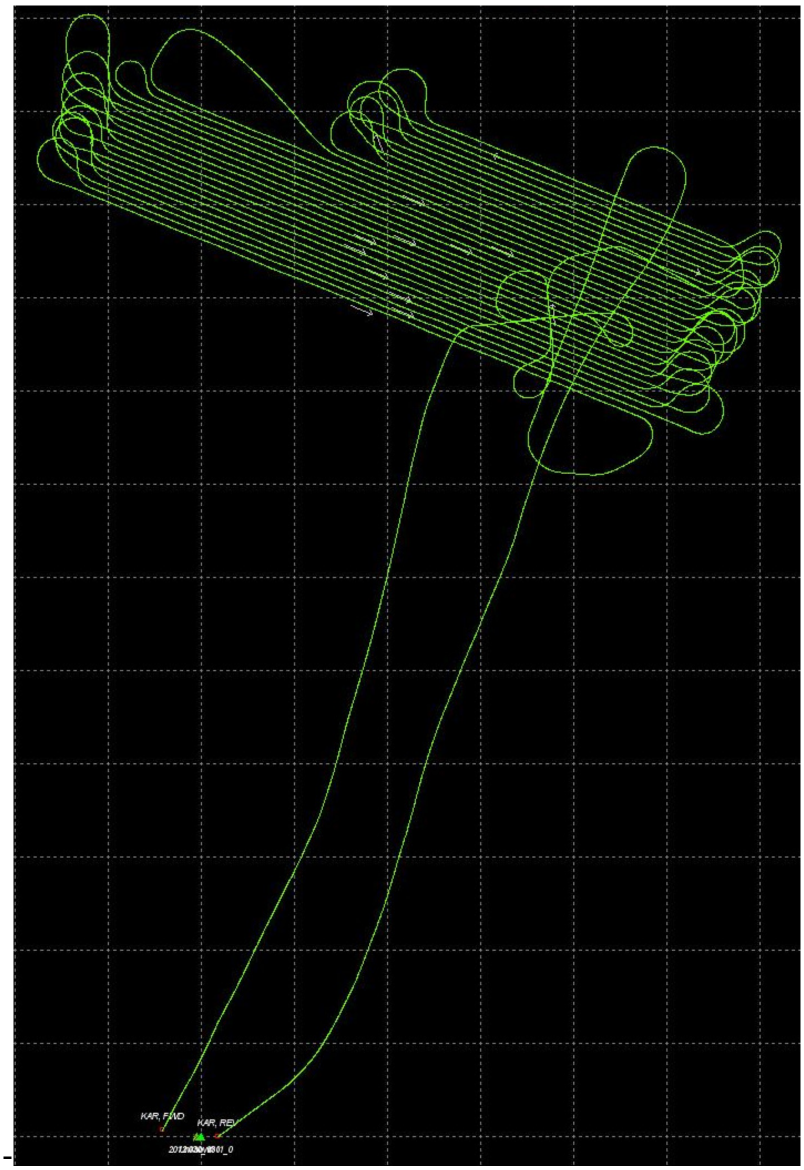


West of Placer AOI Flight Trajectories

Output Results for 04022012AM

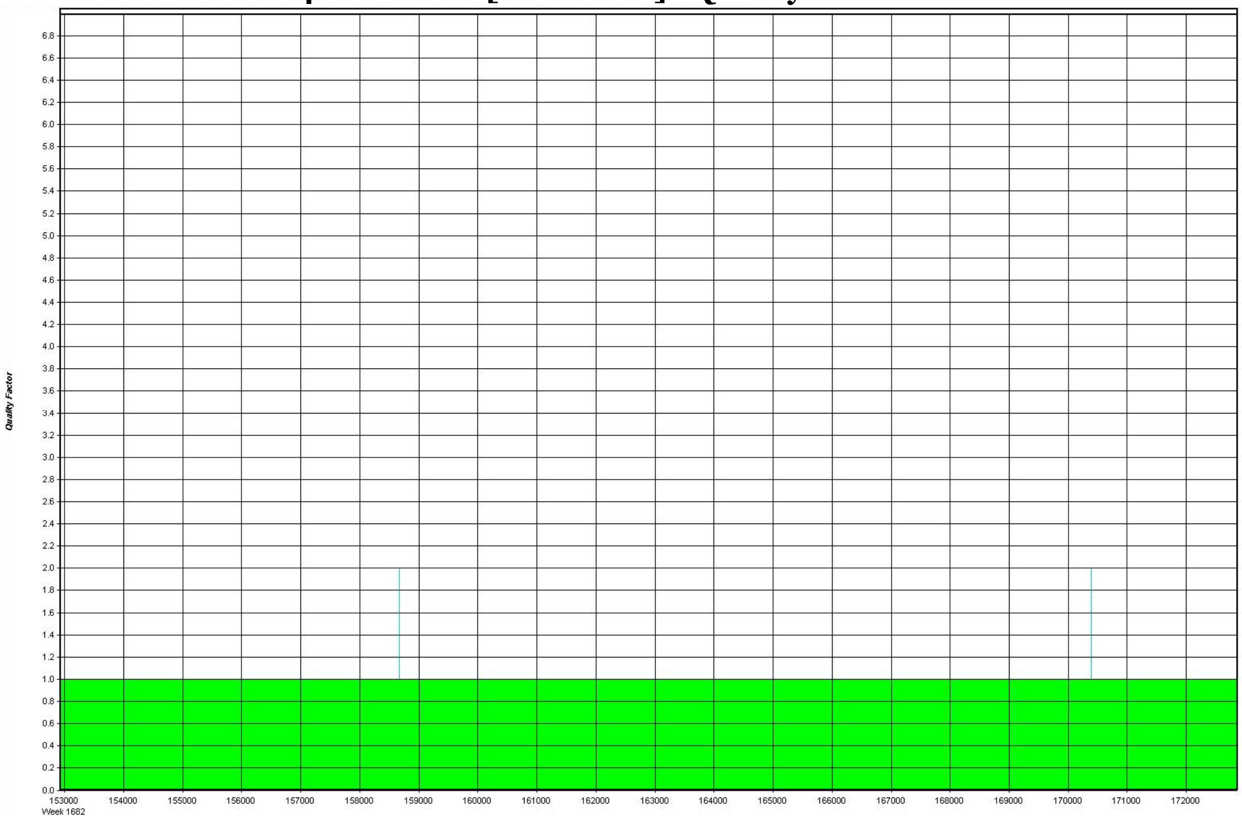
POSPAC Version 4.31

Combined



Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

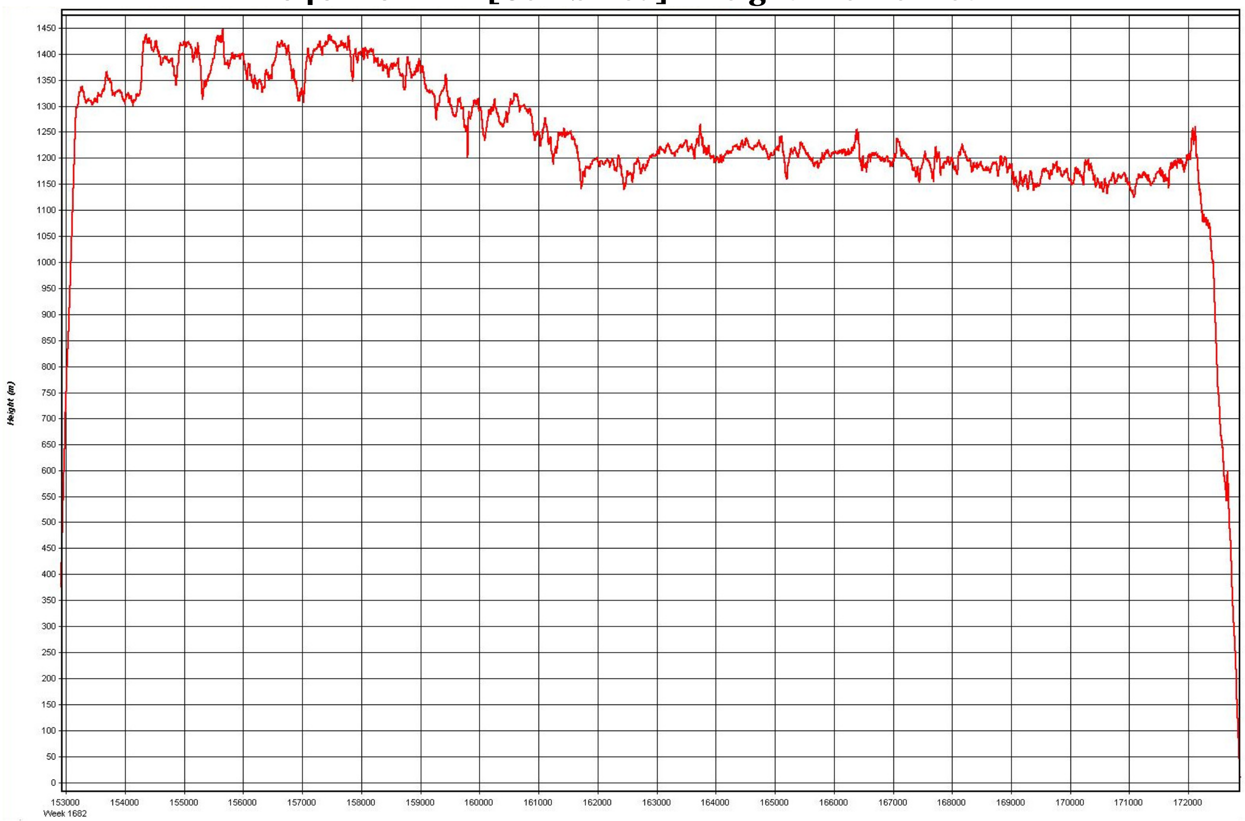
04022012AM [Combined] - Quality Factor Plot



GPS Time [UTM, NAD83]

Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012AM [Combined] - Height Profile Plot

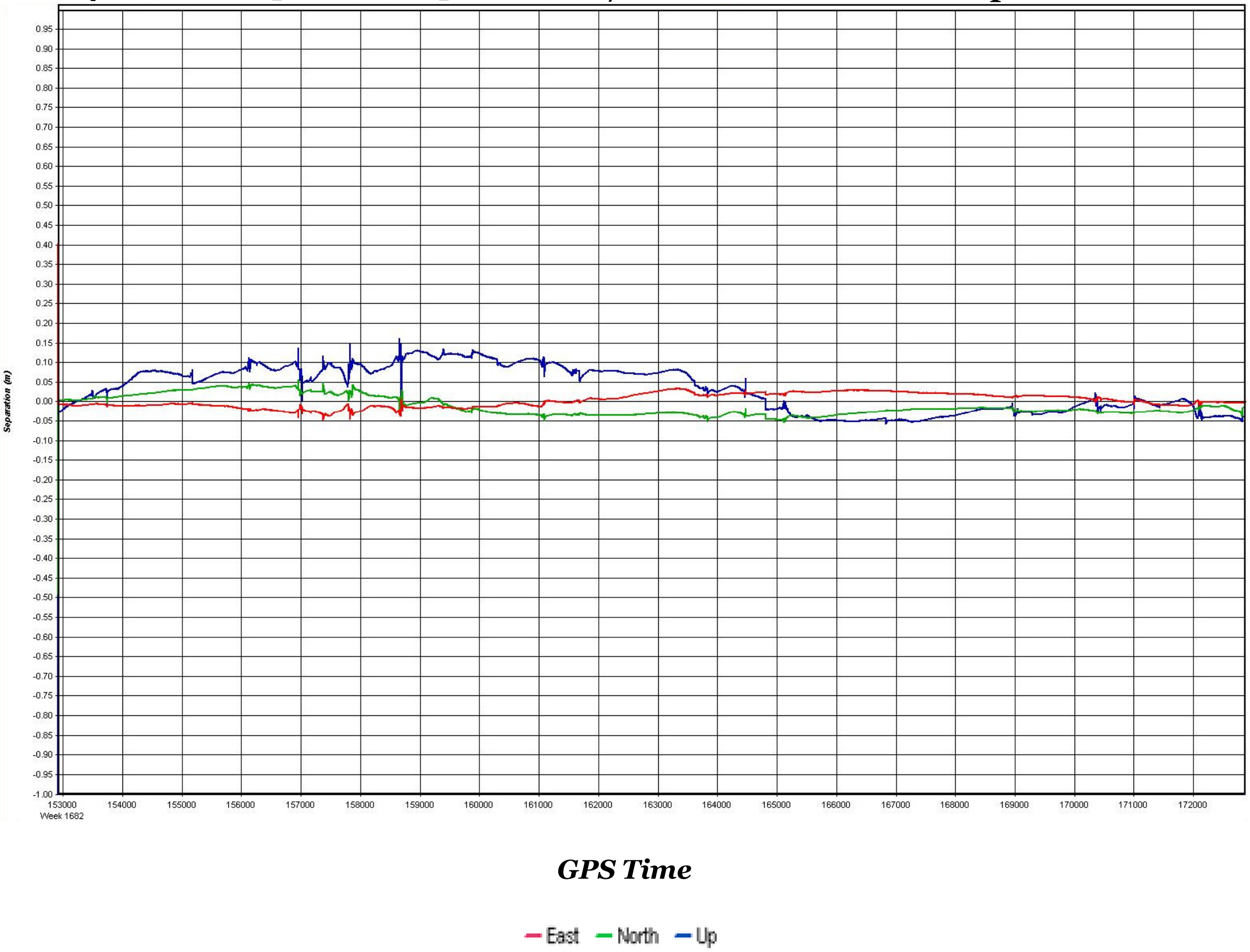


GPS Time

— Height

Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012AM [Combined] - Forward/Reverse or Combined Separation Plot

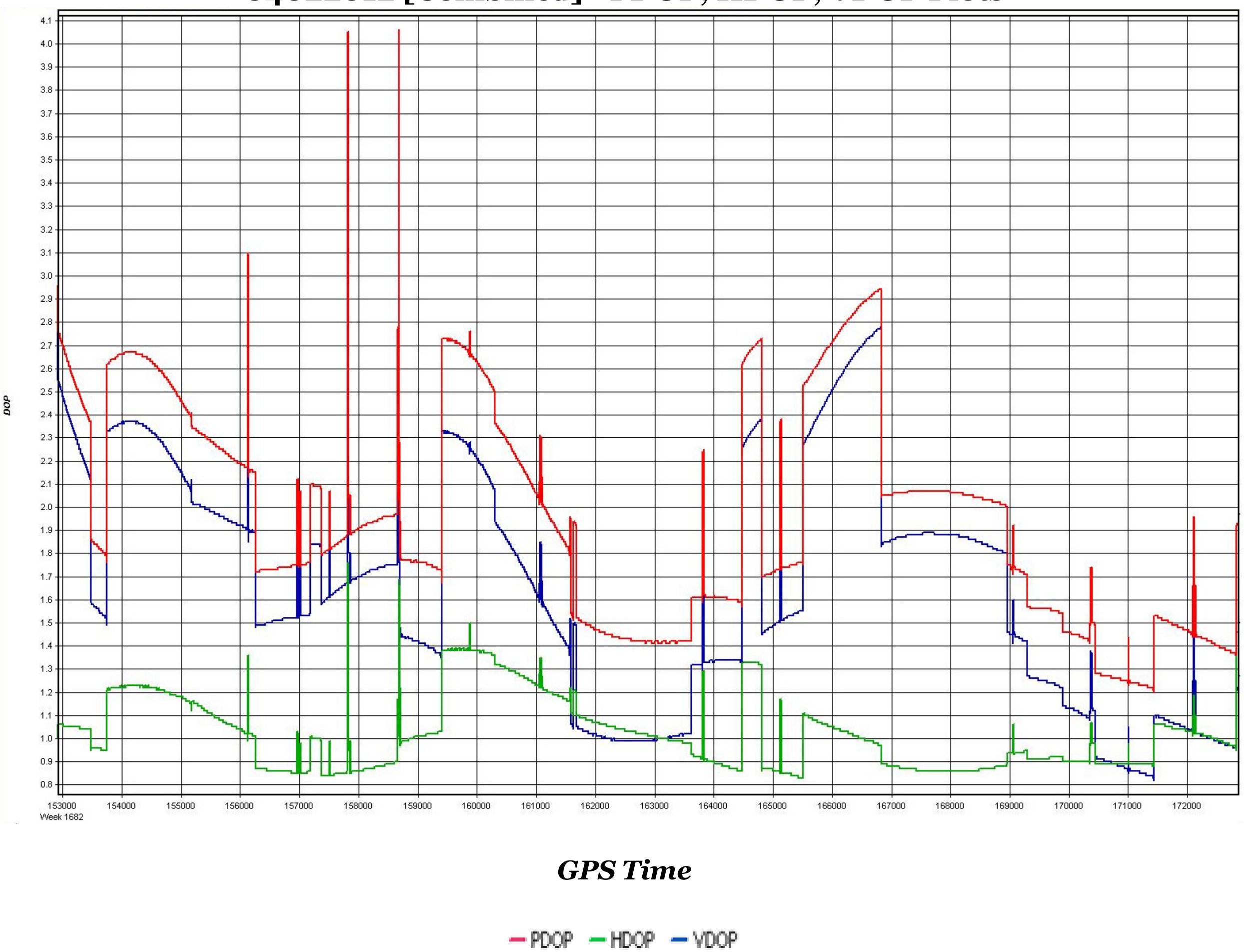


Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012AM [Combined] - Forward/Reverse or Combined Weighting Plot

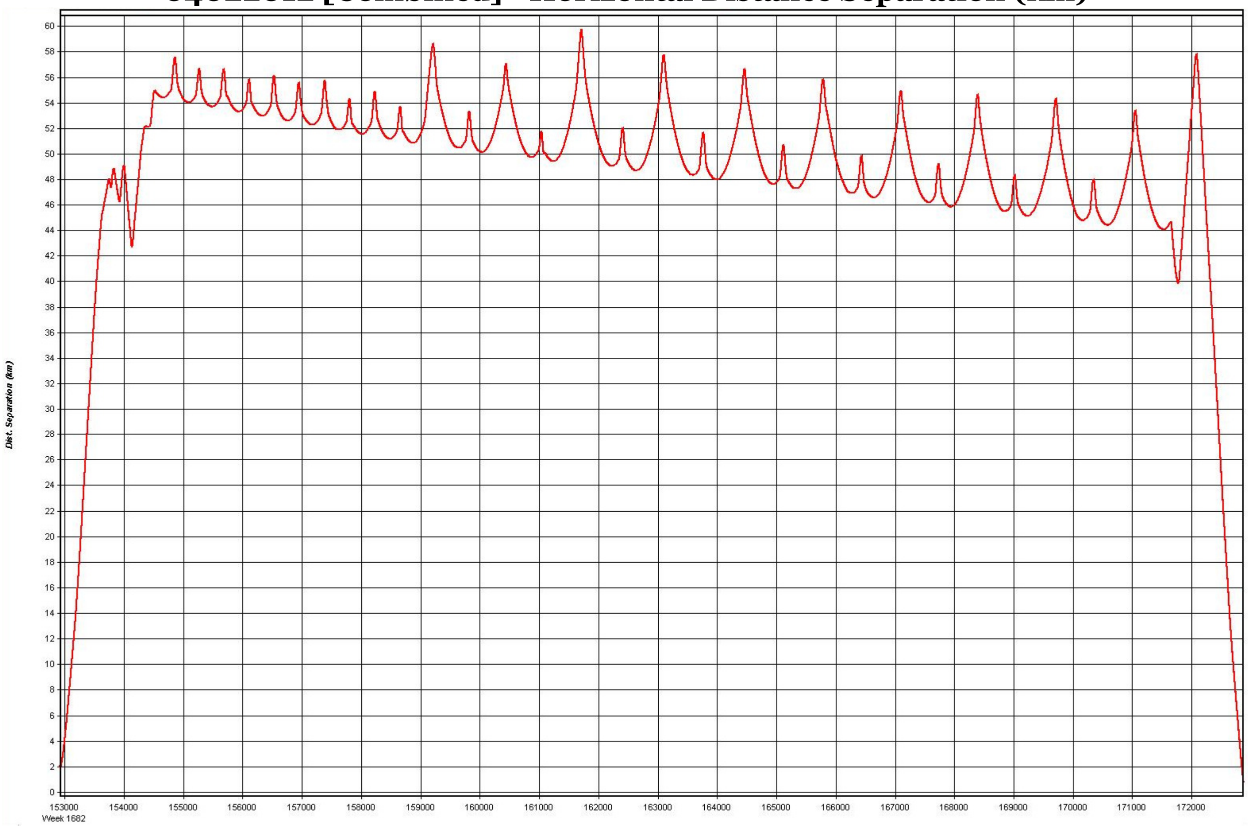
Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012 [Combined] - PDOP, HDOP, VDOP Plots



Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012 [Combined] - Horizontal Distance Separation (km)



GPS Time

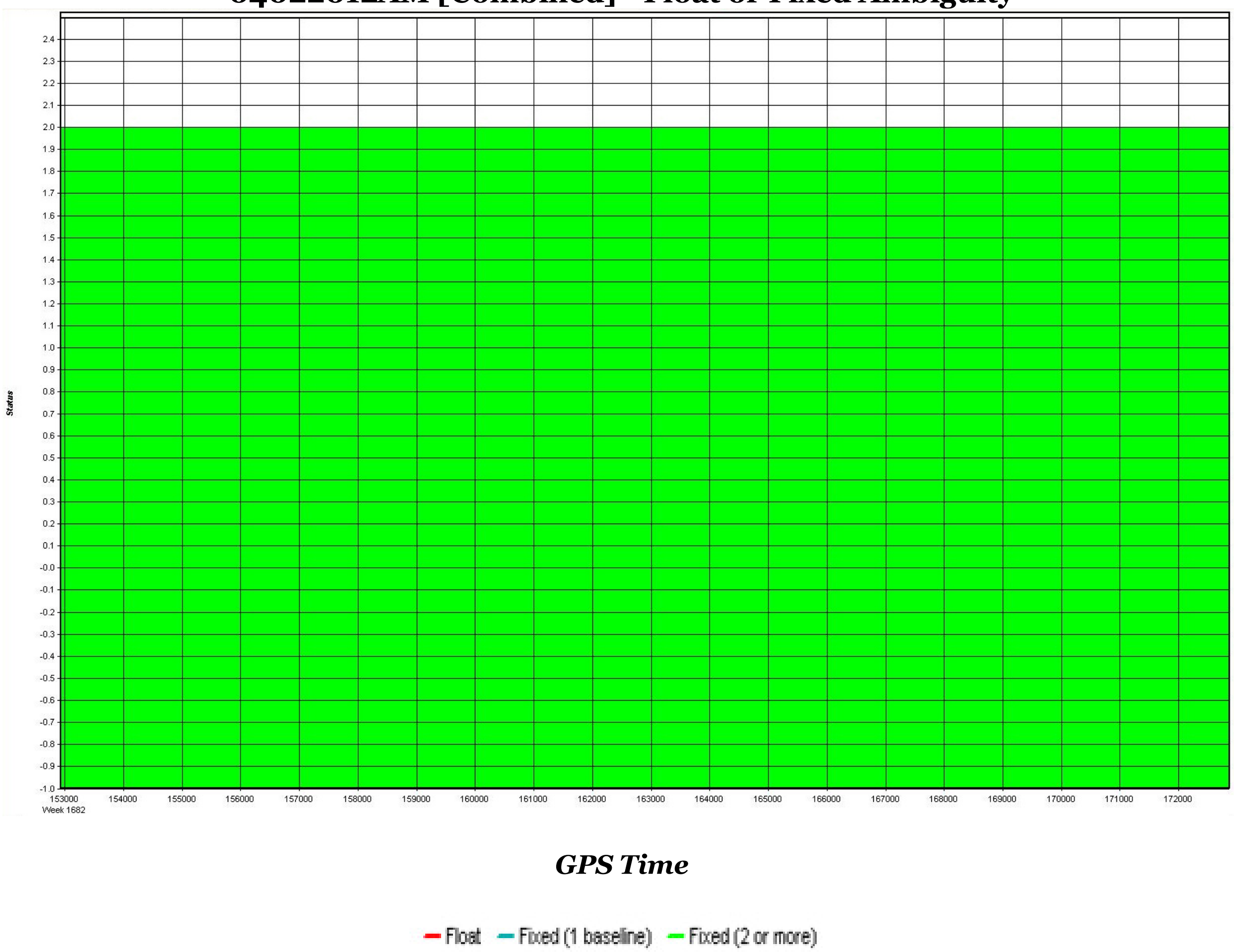
— Distance

Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012AM [Combined] - Forward/Reverse or Combined RMS Plot

Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

04022012AM [Combined] - Float or Fixed Ambiguity



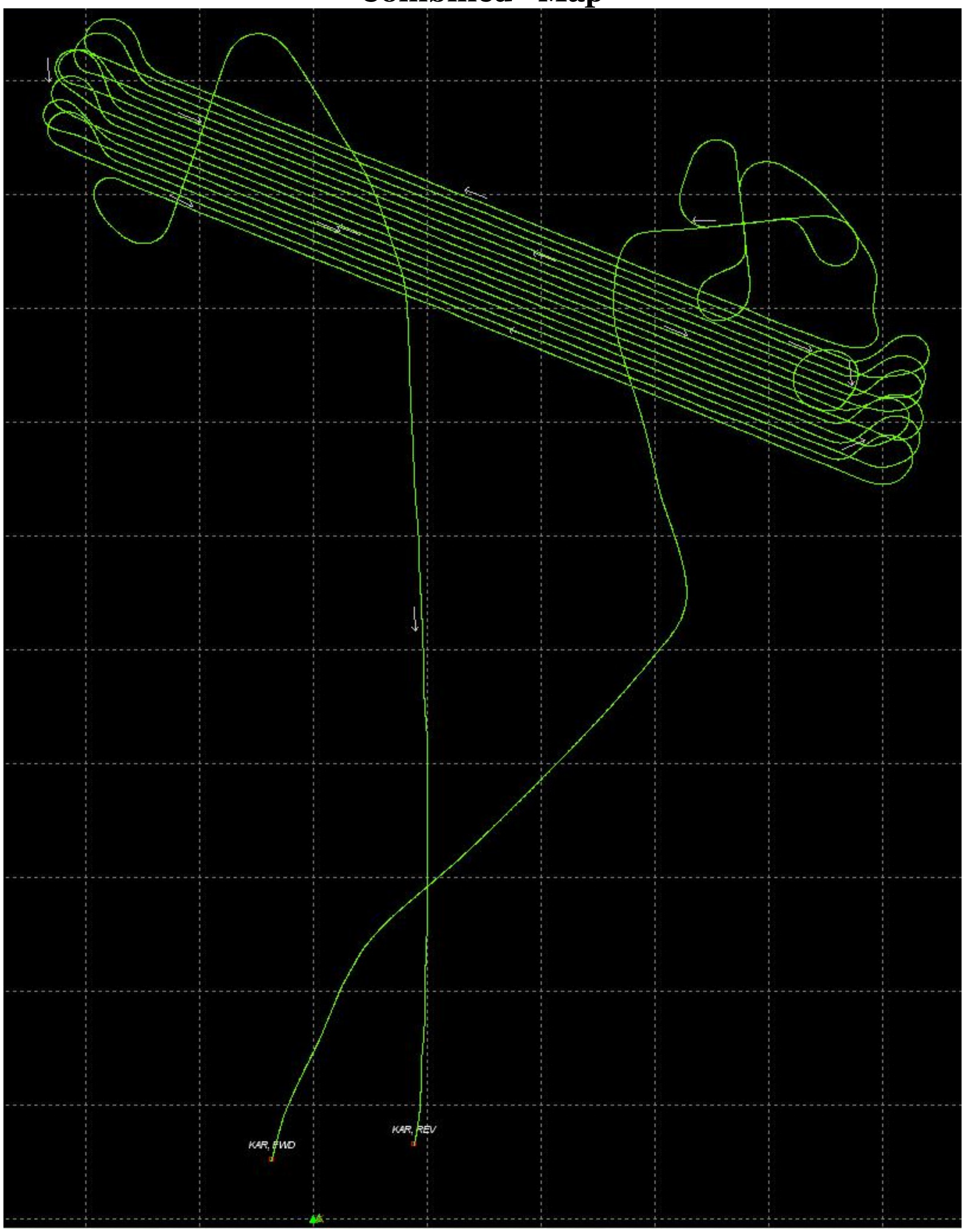
GPS Time

Process	Run (30)	by Unknown	on 04/02/2012	at 11:20

Output Results for 04032012AM

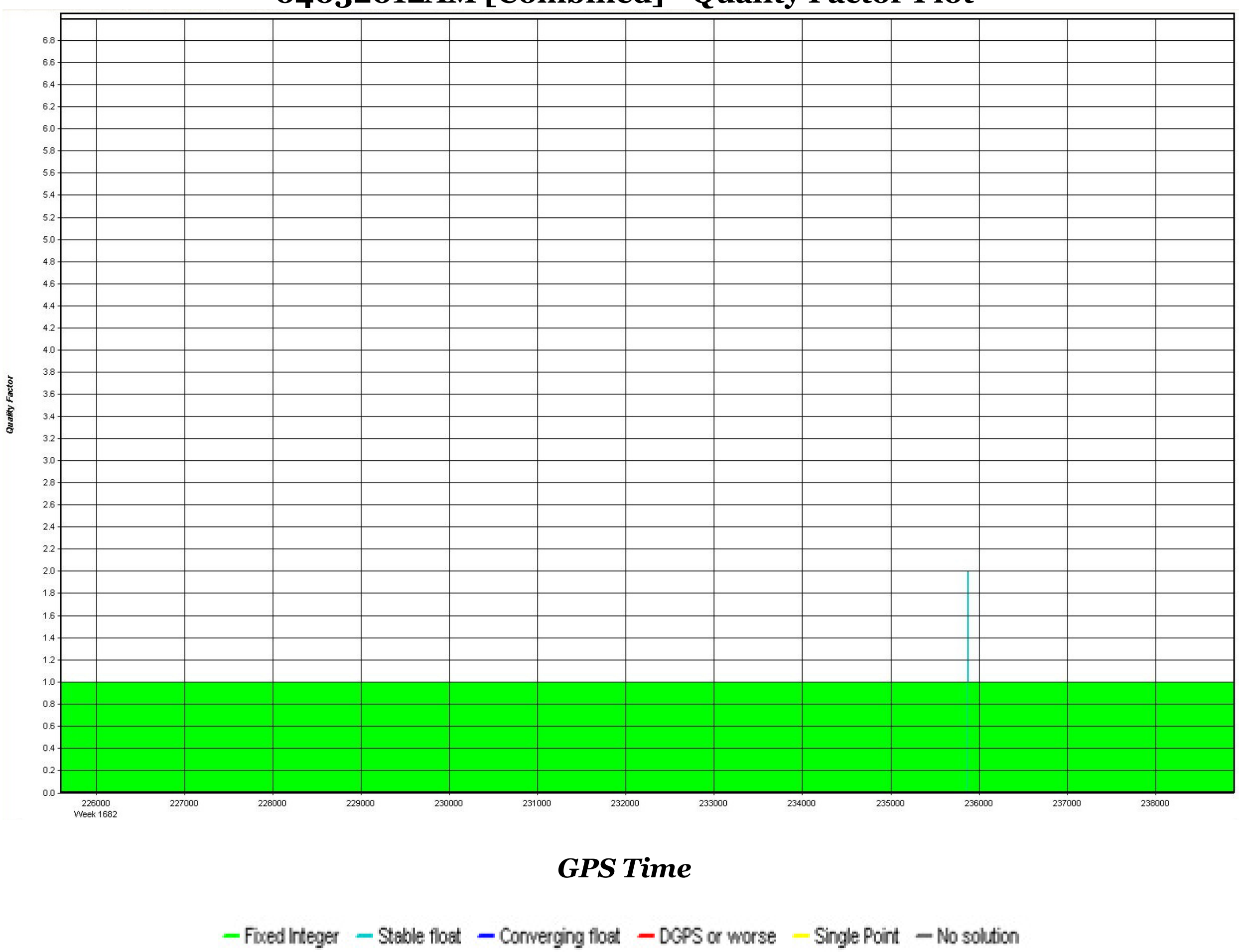
POSPAC Version 4.31

Combined - Map



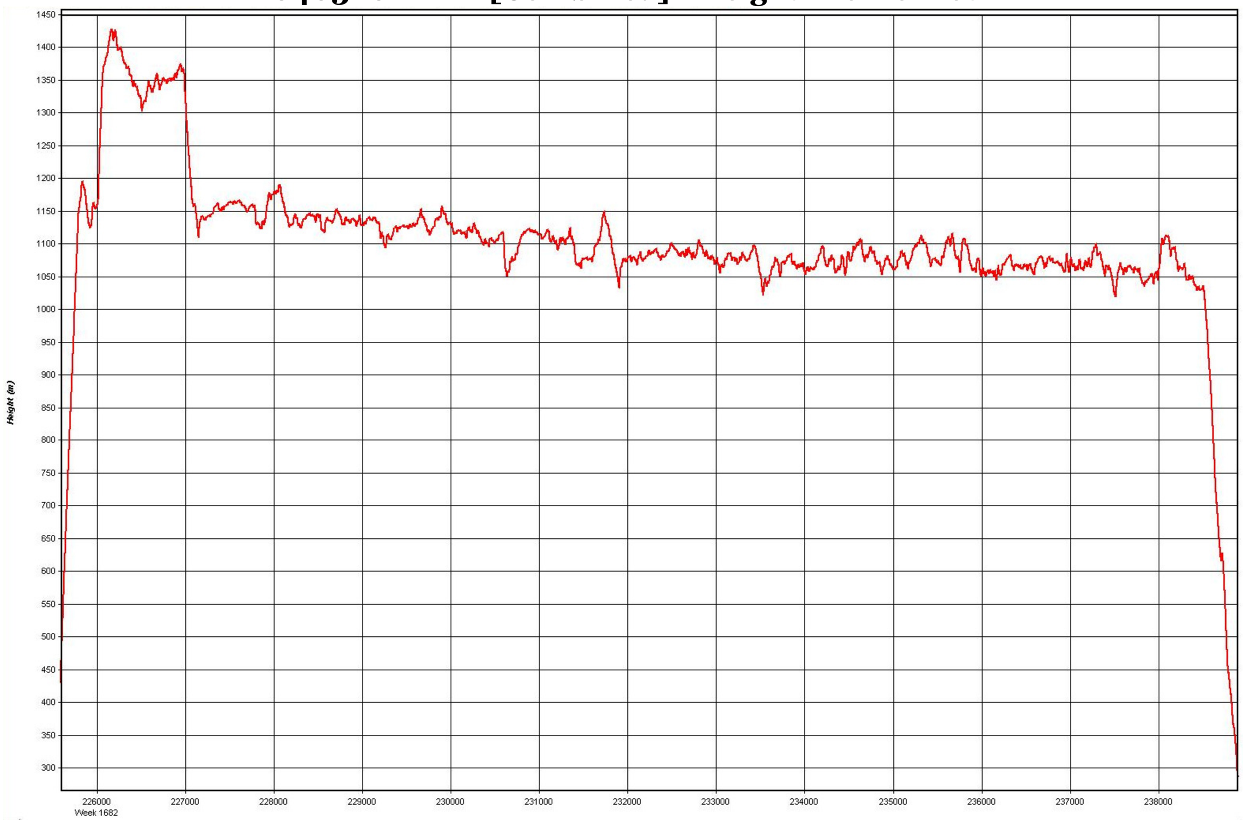
Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012AM [Combined] - Quality Factor Plot



Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Height Profile Plot

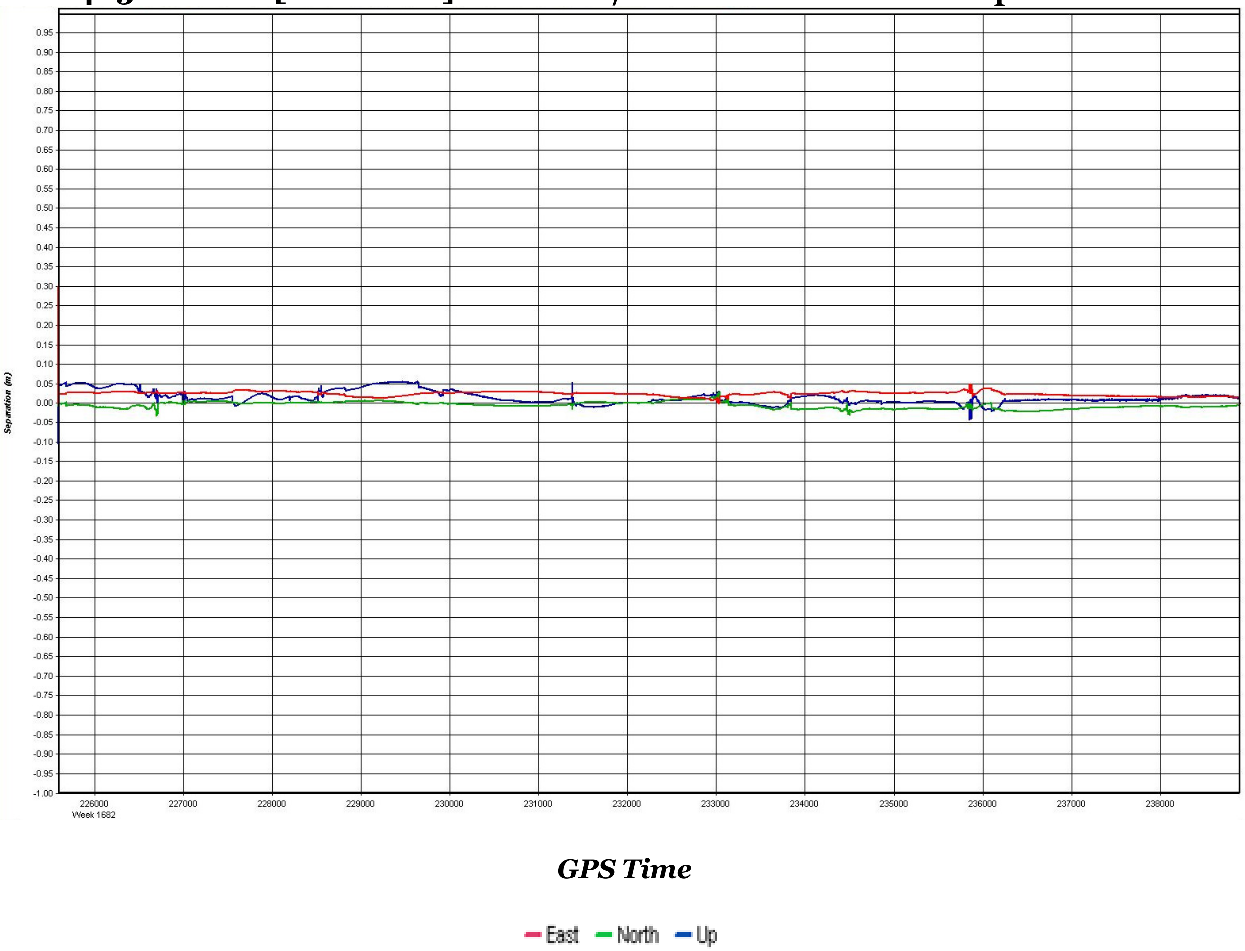


GPS Time

Height

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Forward/Reverse or Combined Separation Plot



Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Forward/Reverse or Combined Weighting Plot

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

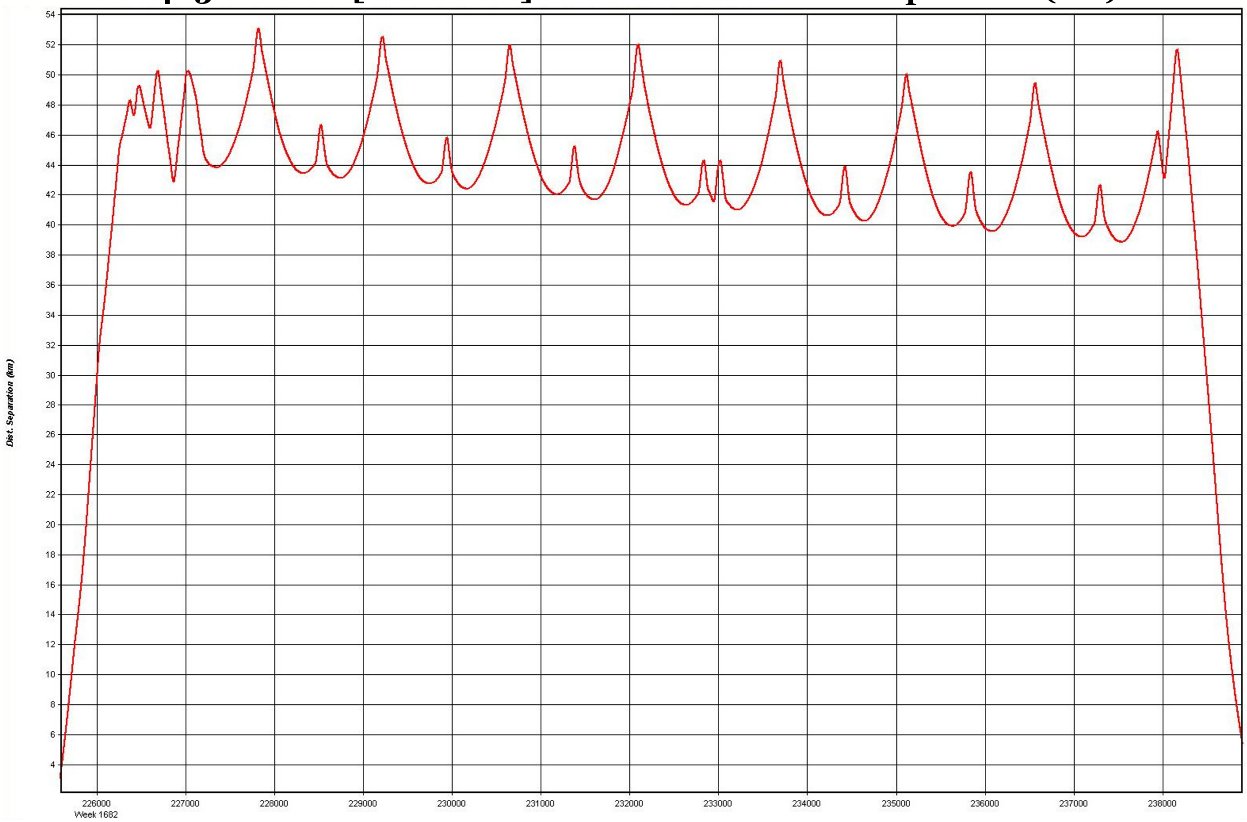
04032012 AM [Combined] - PDOP, HDOP, VDOP Plots

GPS Time

PDOP HDOP VDOP

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Horizontal Distance Separation (km)



GPS Time

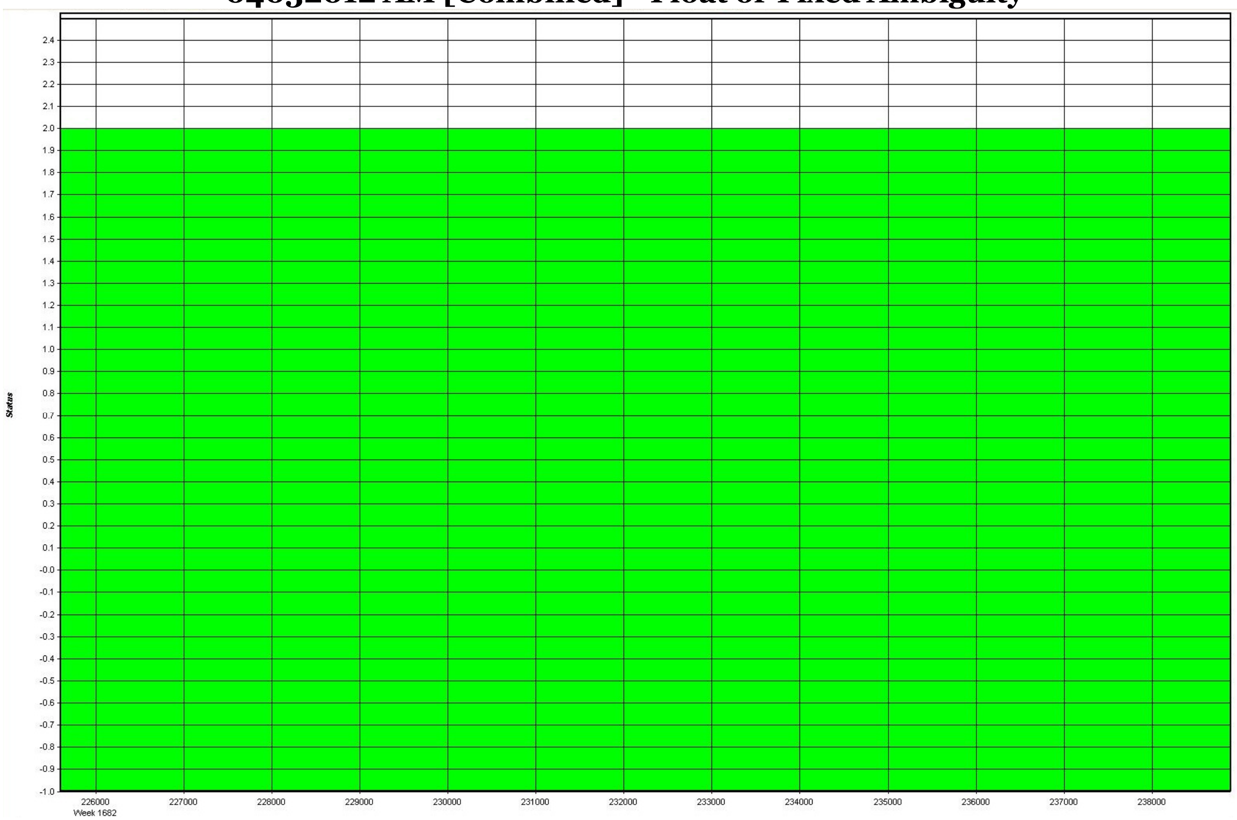
Distance

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Forward/Reverse or Combined RMS Plot

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

04032012 AM [Combined] - Float or Fixed Ambiguity



GPS Time

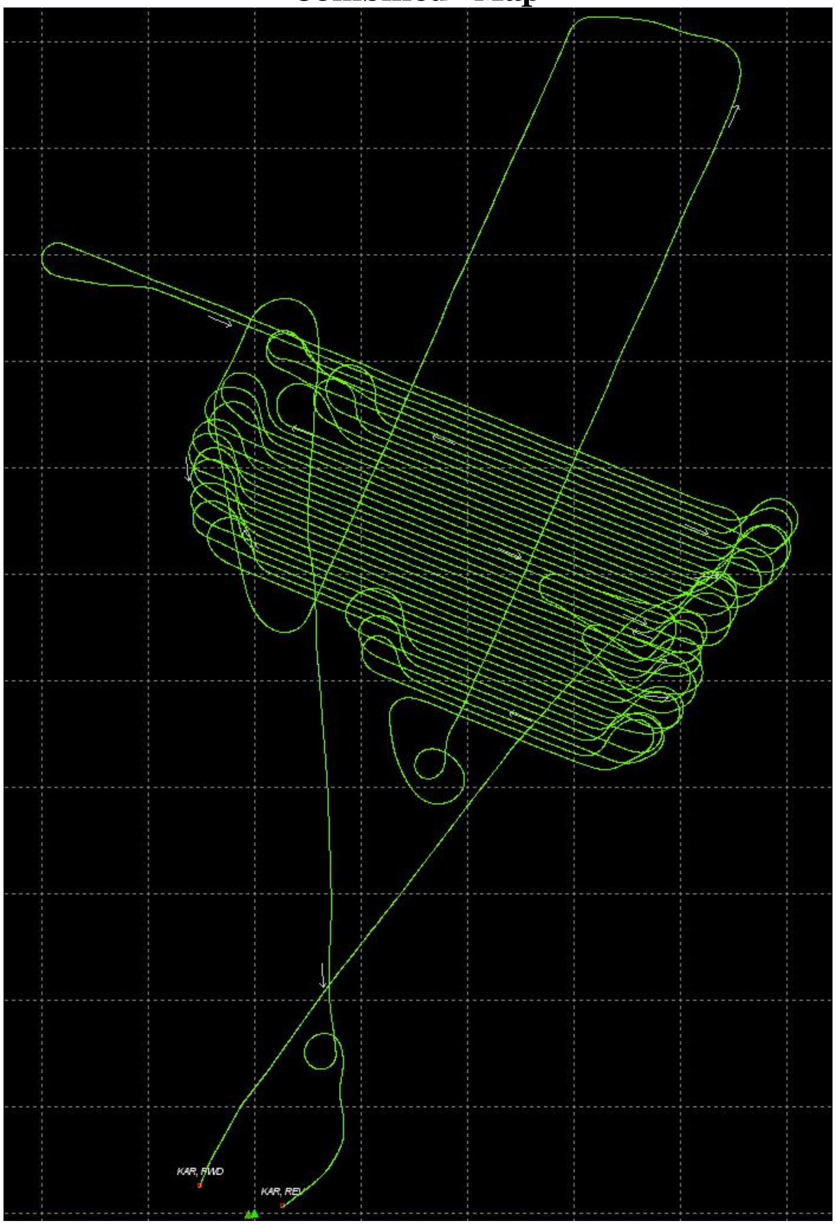
Float Fixed (1 baseline) Fixed (2 or more)

Process	Run (15)	by Unknown	on 04/03/2012	at 07:50

Output Results for 04032012PM

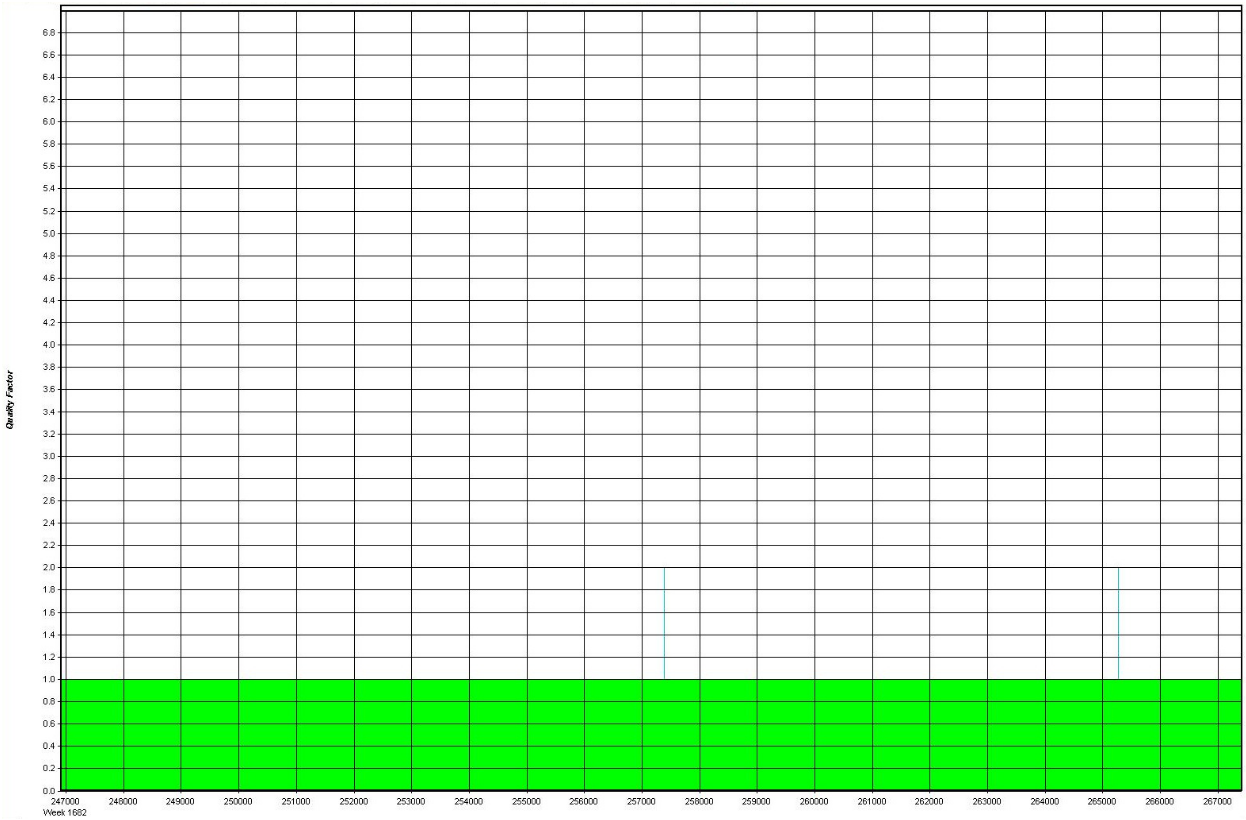
POSPAC Version 4.31

Combined - Map



Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Quality Factor Plot

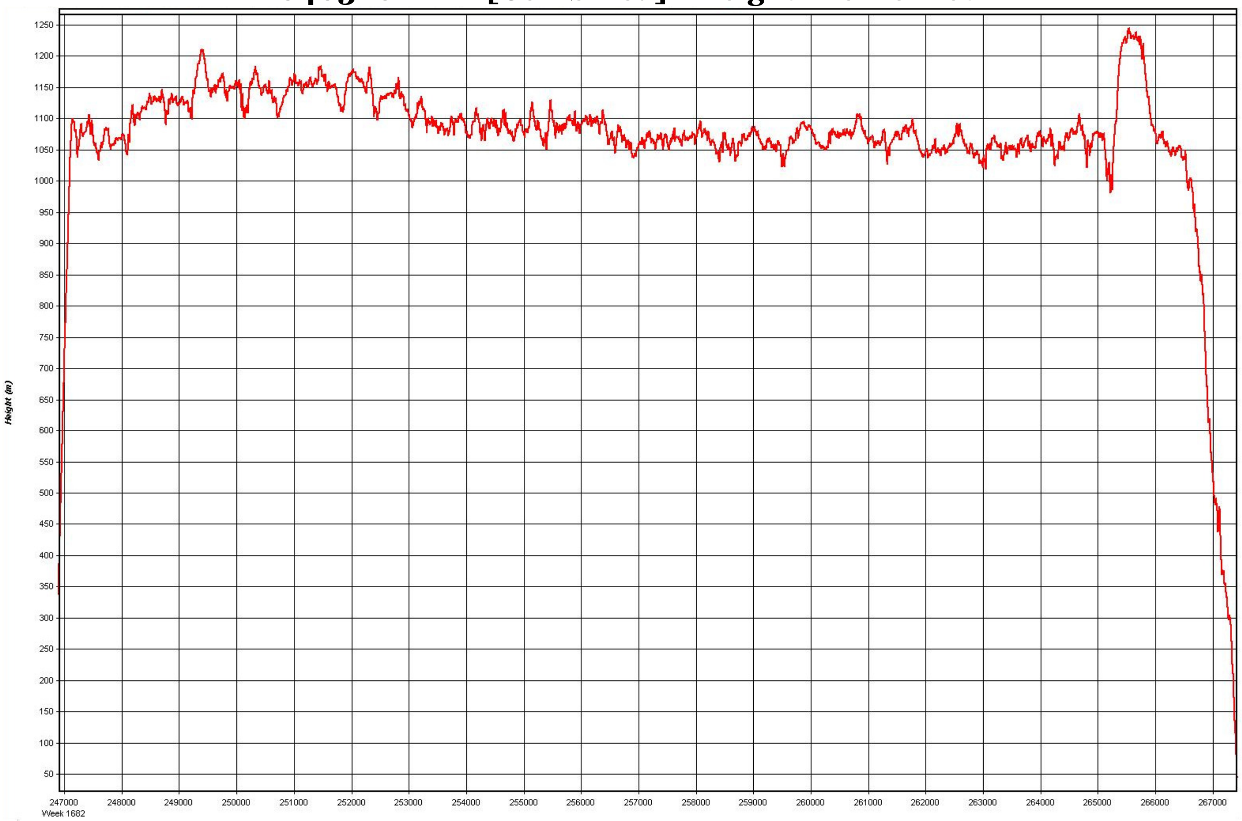


GPS Time

Fixed Integer — Stable float — Converging float — DGPS or worse — Single Point — No solution

Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Height Profile Plot

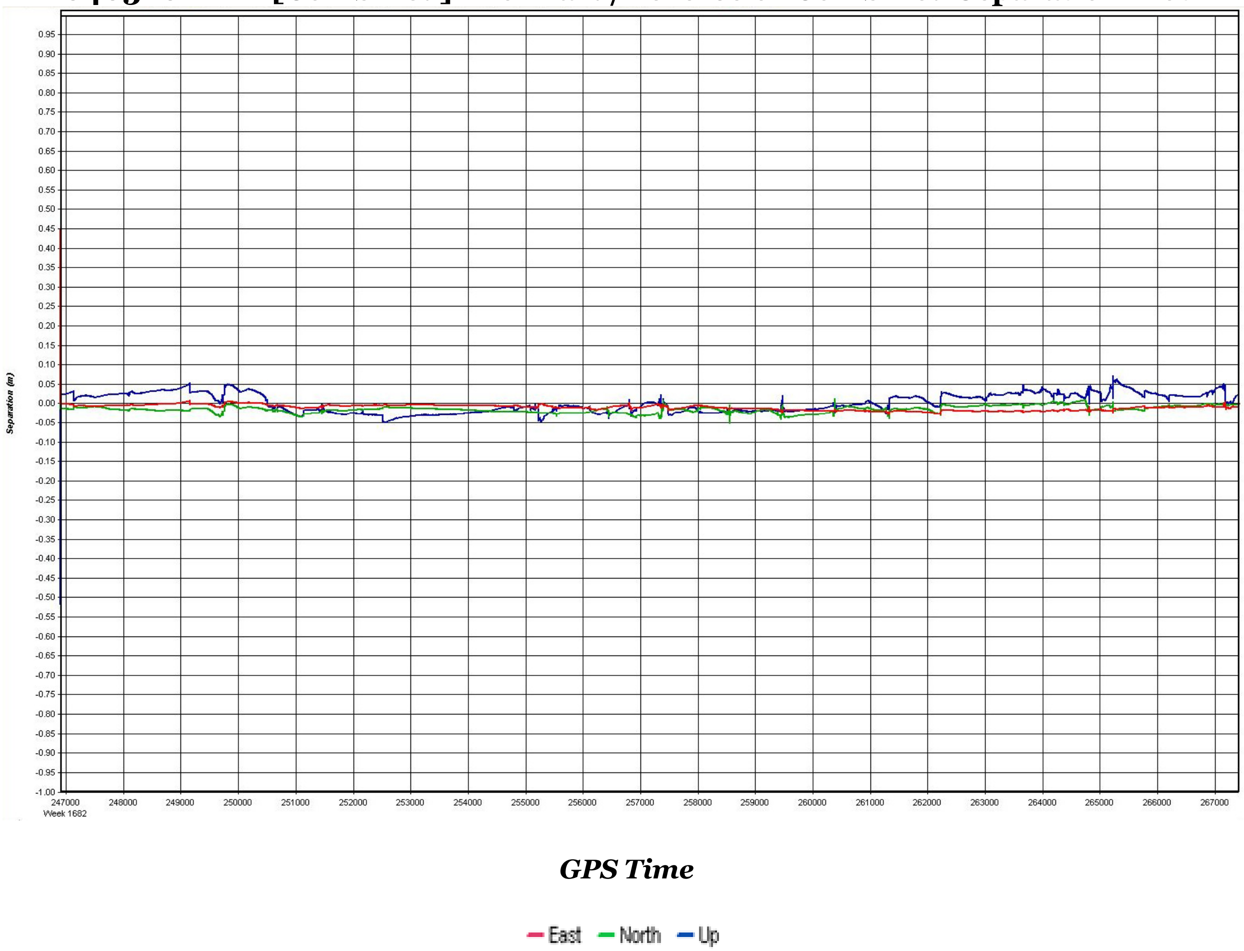


GPS Time

— Height

Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Forward/Reverse or Combined Separation Plot

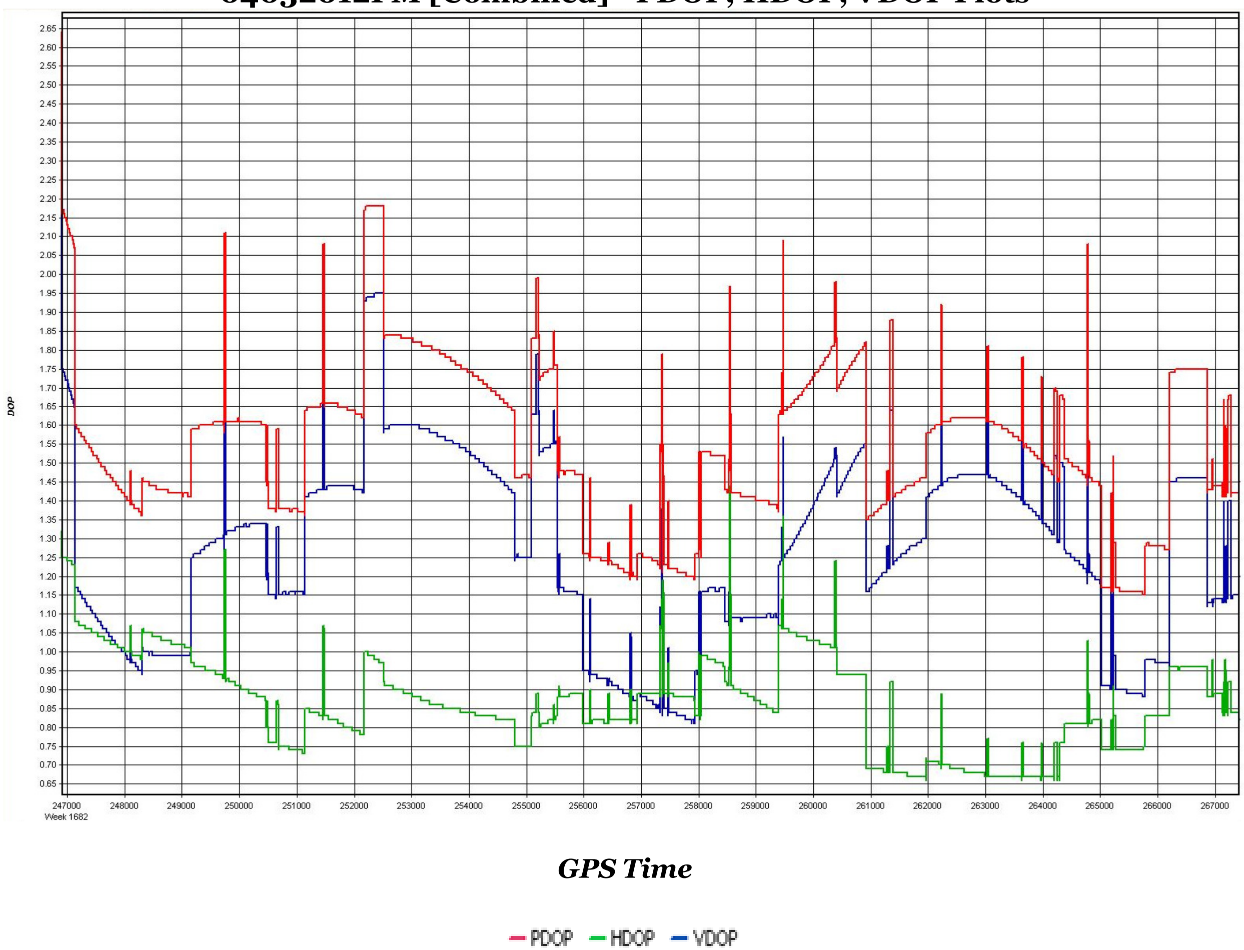


Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Forward/Reverse or Combined Weighting Plot

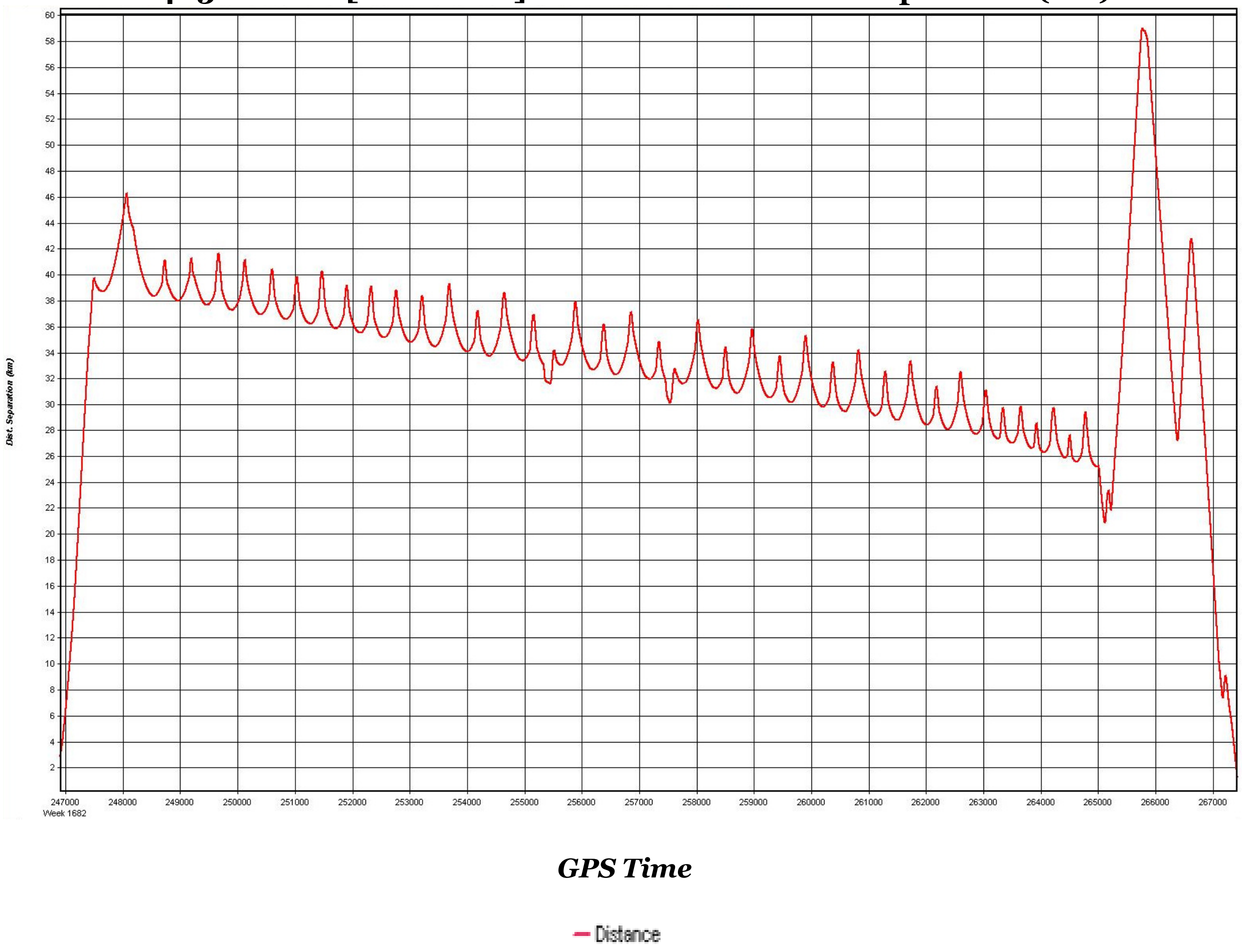
Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - PDOP, HDOP, VDOP Plots



Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Horizontal Distance Separation (km)



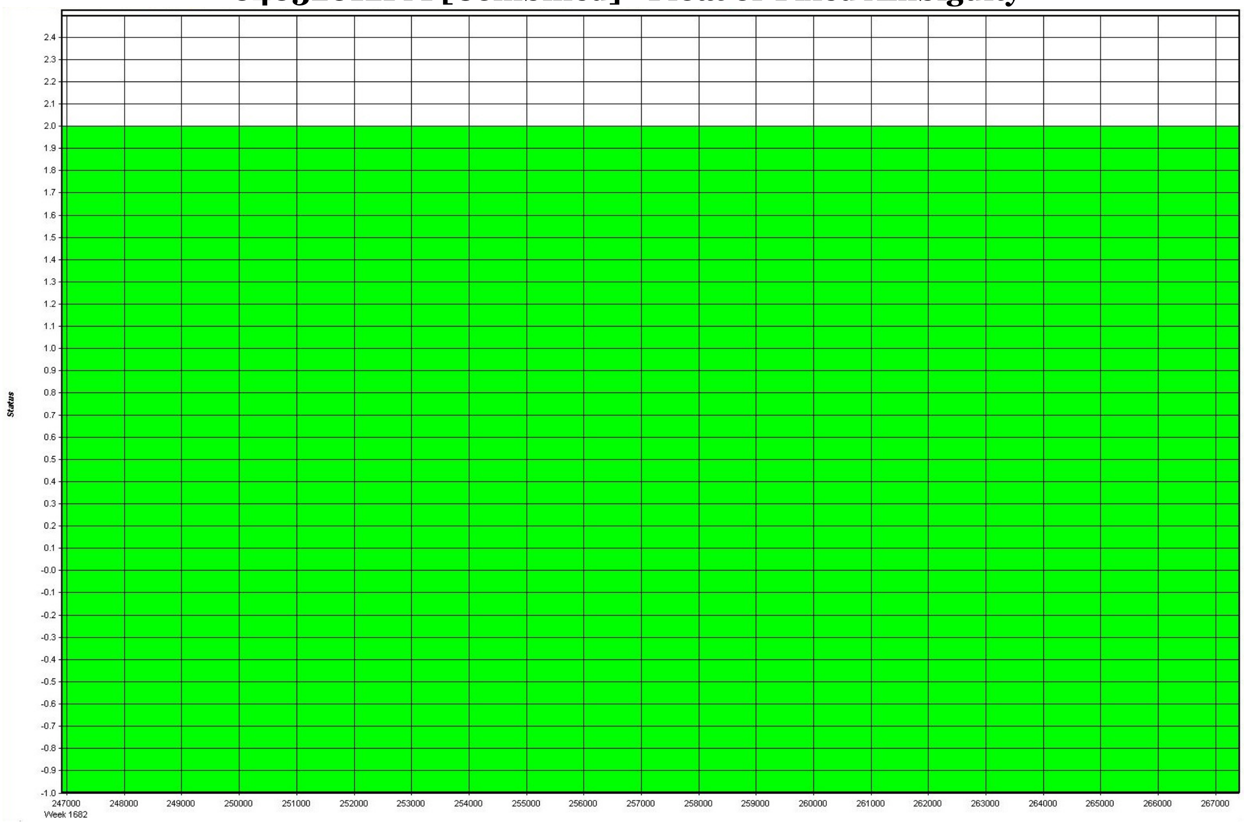
GPS Time

Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Forward/Reverse or Combined RMS Plot

Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

04032012PM [Combined] - Float or Fixed Ambiguity



GPS Time

Float   Fixed (1 baseline)   Fixed (2 or more)

Process	Run (39)	by Unknown	on 04/03/2012	at 13:30

WEST PLACER CONTROL POINTS

Number	Easting	Northing	Known Z	Laser Z	DZ
17	650115.733	4299712.818	90.676	90.810	+0.134
5	658788.915	4317380.301	452.104	452.230	+0.126
16	661279.305	4301648.219	206.243	206.320	+0.077
18	657028.261	4294478.232	114.098	114.170	+0.072
19	661302.555	4292313.145	147.788	147.850	+0.062
11	667297.264	4303783.524	378.445	378.500	+0.055
9	647892.448	4312229.695	62.340	62.380	+0.040
15	651226.651	4305619.994	71.108	71.140	+0.032
12	640576.817	4315000.805	33.411	33.430	+0.019
4	655102.444	4317469.745	212.869	212.880	+0.011
7	649121.587	4315657.100	60.346	60.340	-0.006
3	645802.515	4323495.364	98.777	98.750	-0.027
1	673343.038	4317849.337	600.229	600.200	-0.029
13	643723.646	4318980.880	56.494	56.460	-0.034
10	660048.084	4308678.773	214.927	214.870	-0.057
6	666100.088	4313090.027	451.499	451.430	-0.069
8	650560.497	4320947.520	186.783	186.660	-0.123
2	661361.054	4321743.771	396.296	396.150	-0.146
14	655228.297	4308561.637	108.608	108.410	-0.198

Average DZ	-0.003
Minimum DZ	-0.198
Maximum DZ	+0.134
Average Magnitude	+0.069
Root Mean Square	+0.086
Std Deviation	+0.088