Data Supply Metadata s5-rev1

Project	5 September 2010 Earthquake	10.130
Sub Area	Christchurch City	
Client	Canterbury Regional Council	
Client Contact	Maurice Wills	

Summary of Data	This dataset is the fifth of a series that NZ Aerial Mapping (NZAM) is producing in response to the recent earthquake in Canterbury. It has been produced from LiDAR and aerial imagery collected over an area of approximately 45 sq km over Kaiapoi town. This data supply includes the following products: • Project extent data • 0.5 m contours • Ground and Non-Ground point cloud Please refer to the report section *Product Generation and Data Supply* for details on these products. More products including ground classified LiDAR point clouds are still in production. This is a revision of the first version of this data that was supplied. There was an error in the field survey work that was used to bring the dataset into the geodetic reference framework. To correct for this error a vertical offset of –0.041m was applied to the data and the products were then regenerated. Please retire any copies of the first version dataset that you have.

Data Acquisition	The project area over Christchurch is included in the ESRI shape file *"100906_AOI"* that accompanies the dataset. A map showing this area of interest is included in Appendix A. LiDAR and digital imagery was collected on 6 September 2010, using NZ Aerial Mapping's Optech ALTM 3100EA LiDAR system and Trimble AIC medium format digital camera. The data was collected flying 1,300 metres above the ground, and using a LiDAR field of view of 38 degrees. The system PRF was set at 70kHZ. The GeoSystems iBase Christchurch was used for the collection of GPS receiver station data during the aerial data acquisition. Independent of this work GNS field surveyed a control site that was used to bring the LiDAR dataset into terms of the post-earthquake geodetic reference system. The details on this work are included in Appendix B.

Data Processing	The LiDAR sensor positioning and orientation (POS) was determined using the collected GPS/IMU datasets and Applanix POSPac software. This work was all undertaken in NZGD2000 coordinate system, and made use of the data collected at the geodetic reference mark for the DGPS processing. Given the magnitude of the earthquake it is likely that the location of the iBase reference mark has changed. However, as no information is available on this yet it had to be assumed that the mark coordinate had not changed. The POS data was combined with the LiDAR range files and used to generate LiDAR point clouds in New Zealand Transverse Mercator (NZTM) map projection but NZGD2000 ellipsoidal heights. This process was completed using Optech DASHMap LiDAR processing software. The subsequent steps were undertaken using TerraSolid LiDAR processing software modules TerraScan, TerraPhoto and TerraModeler. The data was checked for completeness of coverage. The relative fit of data in the overlap between strips was also checked. The point cloud data was then classified into ground, first and, intermediate returns using automated routines tailored to the project landcover and terrain. The data was converted from NZGD2000 ellipsoidal heights into orthometric heights using the LINZ NZGeoid09 and offset separation model. Comprehensive manual editing of the LiDAR point cloud data was undertaken to increase the quality of the automatically classified ground point dataset. This editing involved visually checking over the data and changing the classification of points into and out of the ground point dataset. The Trimble camera orthophotos (see Data Supply Metadata s2 for details) were used as a backdrop when undertaking the manual editing. As part of the manual edit process LiDAR returns from the sea and estuary were removed from the ground point dataset and placed in their own dataset. In the interest of making the dataset available quickly, NZAM's standard practice of adding supplementary points around and along bodies of water to help ensure hydrological flows was not undertaken. The height accuracy of the data has been checked using the check site that GNS surveyed. This was done by calculating height difference statistics between a TIN of the LIDAR ground points and the checkpoints. The standard deviation statistic for the single site is +/-0.05m. To bring the dataset into terms of the best available geodetic reference system definition the dataset was shifted so the average height difference was 0.00m. Due to the small sample size the standard deviation statistic gives an optimistic view of the dataset's vertical accuracy. The positional accuracy of the data has been checked by overlaying GNS surveyed data over the LIDAR data displayed coded by intensity. The data was found to fit well in position.

Product Generation & Data Supply

The supplied products are all in terms of New Zealand Transverse Mercator (NZTM) map projection. The products are in NZTopo50 1:1,000 tiles. The ESRI shape file *"100906_tiles"* that accompanies the dataset contains this tile layout.

The data is loading into a number of folders;

- NZAM CHRISTCHURCH LIDAR
  - Contours
  - Layout
  - PointCloud
    - ASCII
      - Ground
      - NonGround
    - LAS

The folder *Contours* contains 0.5m contour interval contours. The contours were interpolated from a TIN created using the Ground point cloud dataset. The 2.5m interval contours have the TYPE attribute set to INDEX. The rest of the contours are TYPE – Intermediate. This data is provided in ESRI 3D shape file format.

The folder *Layout* contains the product tile layout and project extent files.

The folder *PointCloud* contains the classified LiDAR dataset. This is supplied in two formats; as ASCII files and LAS files.

The folder *ASCII* contains the LiDAR point cloud separated into *Ground* and *NonGround* classes. This data is in ASCII file format mE mN O. The Ground points are the points that have been identified as bare-earth returns. The NonGround points are those points that have been identified as having elevations that sit higher than a TIN created using the Ground point cloud dataset.

The folder *LAS* contains the same points as the ASCII files, but the data is in LiDAR exchange LAS v 1.1 format. The data is stored in the following classes:

Class	Description
2	Ground
14	NonGround

To ease the task of transferring this dataset around the internet the files have been compressed using WinRAR. The data will need to be uncompressed to access it.

If you have requirements for the data in other file formats, map projections please contact NZAM.

Quality Exceptions	No exceptions have been noted to report.

Supplier	NZ Aerial Mapping Ltd
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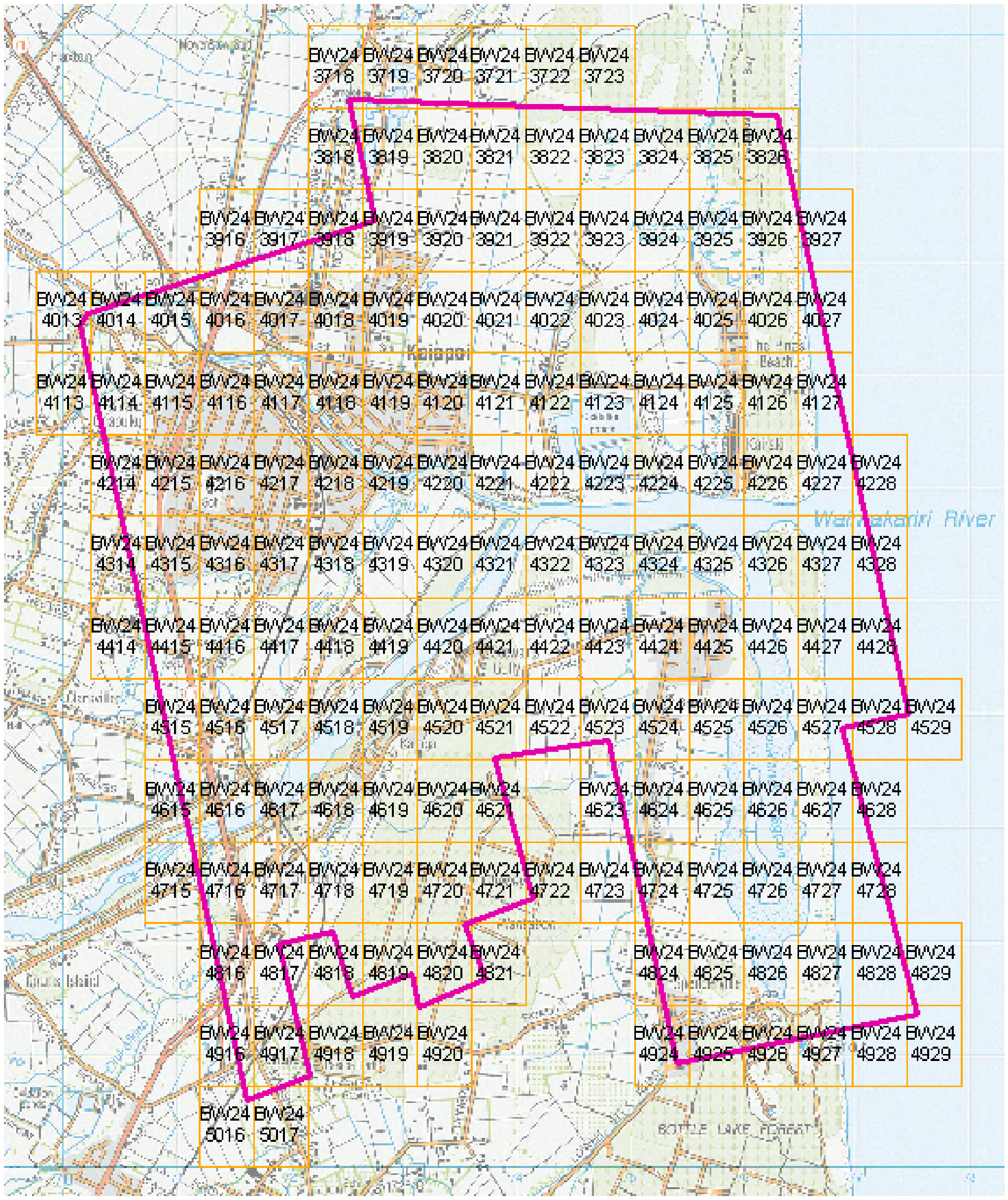
Phone	64-6-873 7550
Supplier Contact	David Napier (david.napier@nzam.com)

Date of Metadata Creation	14 September 2010
Author	Tim Farrier

Appendix A: Project Area and data tile layouts

Areas of interest shown as purple outline.

Kaiapoi
100906



Appendix B: LiDAR Control Survey Report

Lidar Control Survey Report
Post Canterbury Earthquake
September 2010

Survey Date: 10 September 2010

Surveyed By: Neville Palmer

Origin of Coordinates:

LINZ zero order continuous GPS station MQZG (McQueens Valley)

NZGD2000 coordinates (preliminary) as determined by John Beavan of GNS Science for the new position of MQZG after the 04 Septemeber 2010 earthquake.

43° 42' 09.84763" S

172° 39' 16.93179" E

154.707 Ellipsoidal Height

Origin of Heights:

A LINZ high order (vertical 1st or 2nd order and horizontal 2nd or 3rd order) benchmark was identified near to each of the subject Lidar areas to provide survey control. These were observed by GPS occupation and processed relative to the MQZG cGPS station to obtain a post-earthquake ellipsoidal height.

The post-earthquake ellipsoidal height was compared with the pre-earthquake ellipsoidal height published in the LINZ geodetic database. This height difference was then applied to the pre-earthquake orthometric height to obtain a value for the post-earthquake orthometric height.

The derived post-earthquake ellipsoidal and orthometric heights were used as independent height origins for the RTK survey at each subject area.

Point Id	Origin Post EQ NZTM mN (Surveyed)	Origin Post EQ NZTM mE (Surveyed)	Origin Post EQ Ell. Height (Surveyed)		Pre EQ NZTM mN (LINZ DB)	Pre EQ NZTM mE (LINZ DB)	Pre EQ Ell. Height (LINZ DB)	Pre EQ Ortho. Ht. (LINZ DB)
A56N	5182988.771	1569954.979	18.963		5182988.730	1569955.000	19.039	7.306
A576	5172534.235	1564783.232	41.400		5172534.170	1564783.400	41.427	29.785
ACEY	5161949.072	1554623.071	14.511		5161948.890	1554623.410	14.543	3.3309
AG2N	5191426.305	1571625.845	15.743		5191426.260	1571625.810	15.784	4.0092

Point Id	Post-Pre NZTM mN	Post-Pre NZTM mE	Post-Pre Ell. Height		Origin Post EQ Ortho. Ht.
A56N	0.041	-0.021	-0.076		7.230

A576	0.065	-0.168	-0.027		29.758
ACEY	0.182	-0.339	-0.032		3.299
AG2N	0.045	0.035	-0.041		3.968

The apparent vertical motion at each of the control points ranges from 27 to 76 mm. Additional detailed control surveys and analysis would be required to determine whether this is actual movement due to the seismic events or whether it is due to survey accuracy and/or the absolute accuracy of the LINZ coordinates. For the purpose of this survey it has been assumed that this is actual movement.