

Appendix D - LiDAR Data Check and Comparison

Introduction

To more accurately assess cut and fill volumes for the proposed Mungo Brush Road upgrade, further investigations into available ground elevation data have been undertaken. RHDHV has purchased available NSW LPI data for the Port Stephens area. The LiDAR data was captured in 2012 as part of the NSW LiDAR Data Forward Program¹². The extents and levels of the LiDAR data used in the study is presented in **Figure D1**. The LPI data includes the raw LiDAR returns allowing selection of ground, vegetation or building returns to be separately investigated.

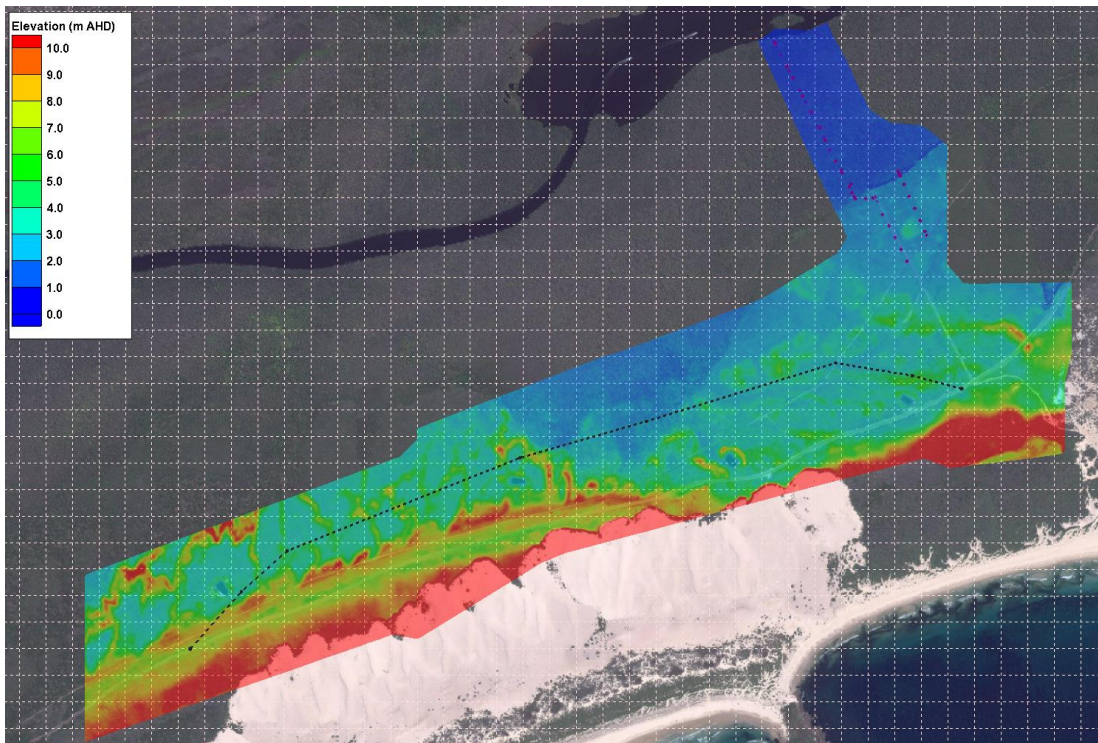


Figure D1: Map Showing: Extracted LiDAR Data Elevations (Colours), Proposed Road Alignment (Black Dashed Line) and Available Ground Survey (Purple Dots)

LiDAR Data Check

The accuracy of the LiDAR data has been assessed by comparing it to ground survey data collected as part of the Lower Myall Flood Study as published in BMT WBM (2015). The location of the available ground survey data is presented in **Figure D1**. The data was collected by Carmen Surveyors using a Total Station along 2 Transects of the Lower Myall Floodplain.

A total of 49 survey points were received and were compared to the LiDAR data. Figure D2 presents data showing the accuracy of the LiDAR data at the 49 locations where ground survey was collected.

¹² Available: http://www.lpi.nsw.gov.au/mapping_and_imagery/imagery_programs

In general the LiDAR data was found to closely match the ground survey data as indicated by the following statistics:

- 45 out of 49 (i.e. 92%) points were +/- 0.3 m (i.e. within 0.3 m of the ground survey level);
- 40 out of 49 (i.e. 81%) points were +/- 0.2 m;
- 28 out of 49 (i.e. 57%) points were +/- 0.1 m.

The location of the -0.6 m error data point is presented in **Figure D3**. This error is due to the ground survey measuring a ground elevation of 1.46 m AHD in an area of steep gradient. From Figure D3 we see in this location the LiDAR data is quite sparse (due to heavy vegetation) and linear interpolation between the LiDAR ground returns has predicted a ground level of 0.85 m AHD.

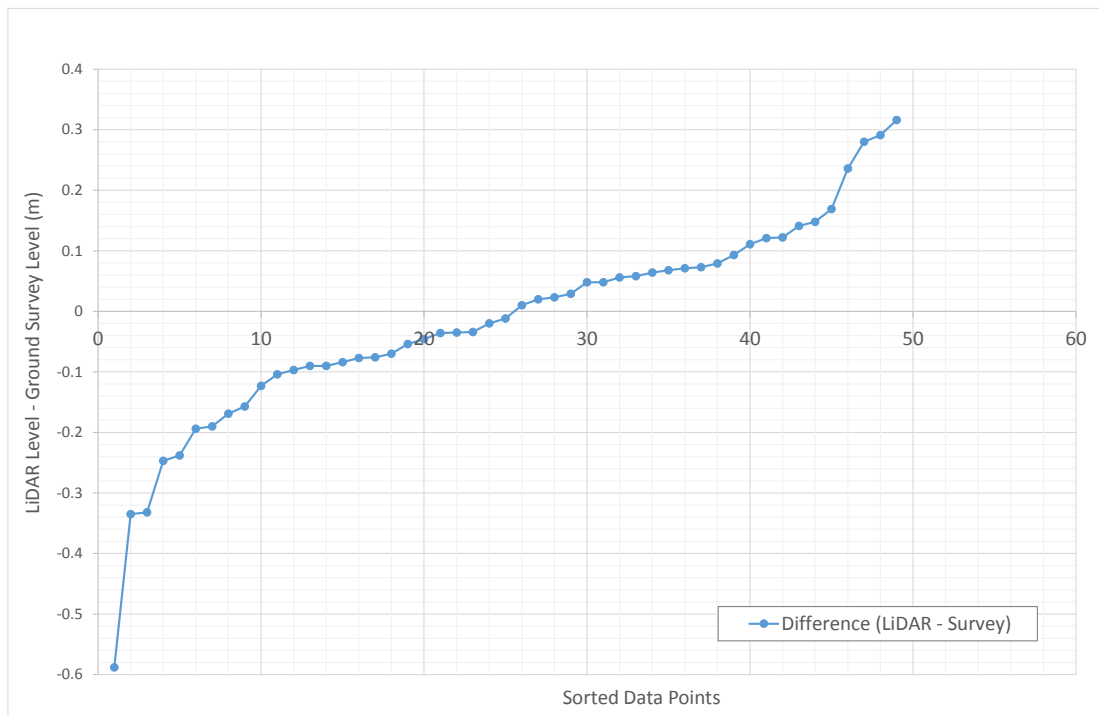


Figure D2: Comparison of Ground Survey to LiDAR Data

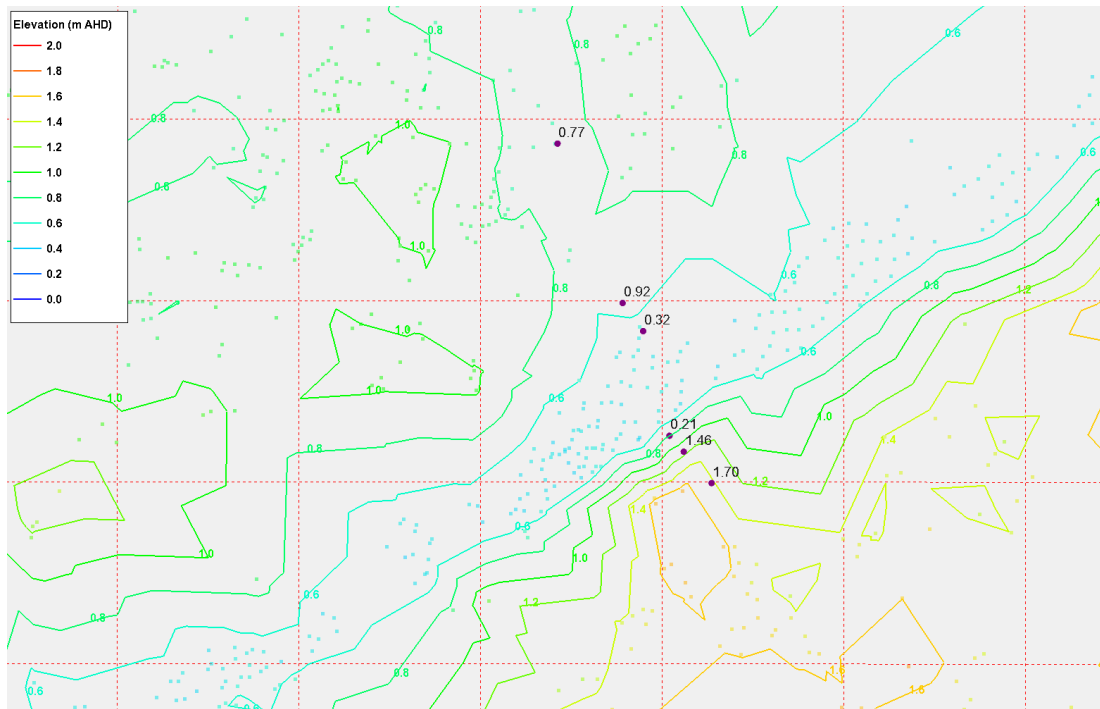


Figure D3: Comparison of Ground Survey to LiDAR Data Detail (Raw LiDAR Data Elevations (Coloured Dots)), Triangulated LiDAR Contours (Coloured Lines) and Available Ground Survey (Purple Dots with black elevation labels). A 10m grid (in red dashed lines) is presented for scale.

LiDAR Data Comparison to Photogrammetry Data

The elevations from the LiDAR data set have been compared to elevations derived using photogrammetric techniques by OEH using data collected in 2013 as presented in **Figure D4**. For the first 1500 m of the proposed road alignment (i.e. Chainage 0 to 1500), the data is closely comparable with differences typically less than 0.5 m. However, between Chainages 1500 and 2000, the photogrammetrical data suggests the ground is 4 to 5 m above the LiDAR ground levels. **Figure D5** shows that this area is heavily vegetated and the LiDAR suggests that this is a lower part of the flood plain. Examination of the vegetation LiDAR returns indicates that this area is heavily vegetated with a top canopy at 15-20 m AHD and a lower canopy at 5-7 m AHD. It is possible that the photogrammetrical analysis has picked up the lower canopy to be the ground surface.

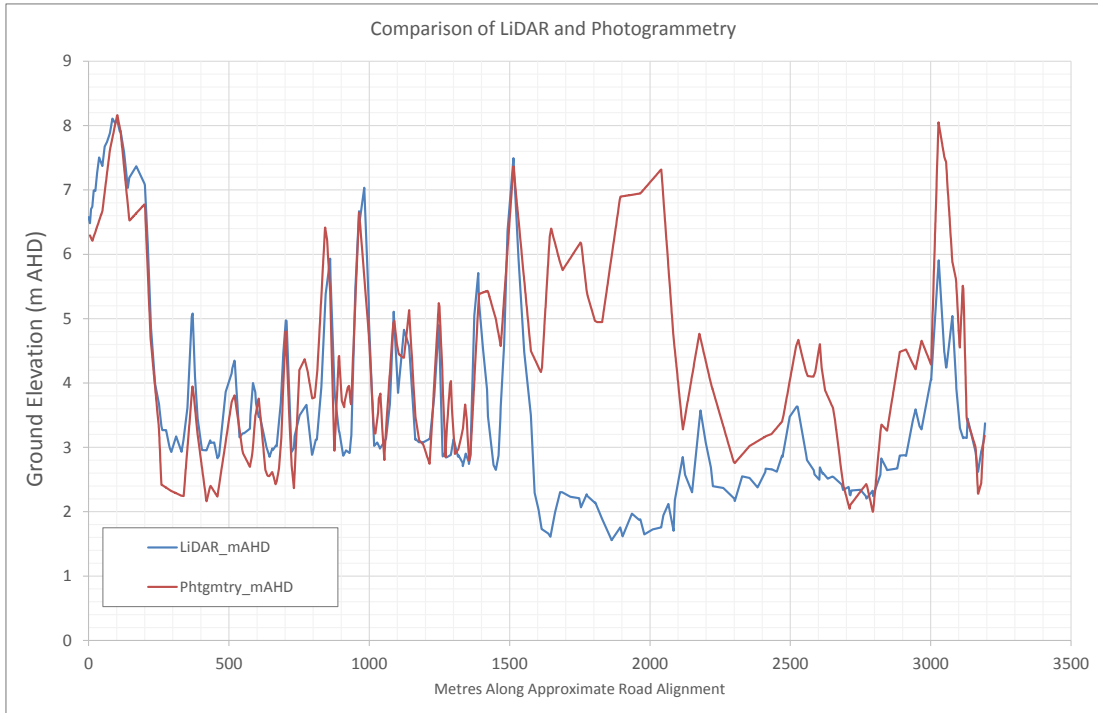


Figure D4: Comparison of LiDAR Data to 2013 Photogrammetry (Supplied by OEH) along proposed road alignment

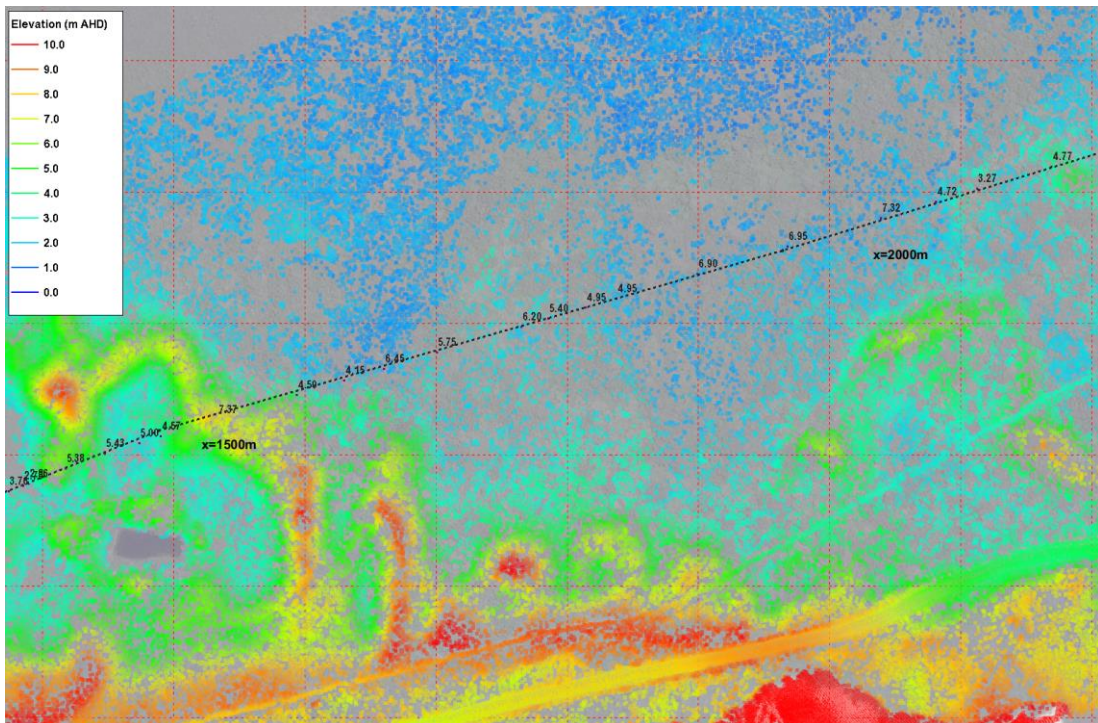


Figure D5: Comparison of LiDAR Data (Raw LiDAR Data Elevations (Colour Dots), to Photogrammetry Data (Black text) along proposed road alignment between Chainages 1500 and 2000. A 100 m grid (in red dashed lines) is presented for scale.

Discussion & Conclusions

A comparison of available LPI LiDAR data along the proposed Mungo Brush Road re-alignment to available ground survey data indicates that over 90% of LiDAR ground points are accurate to within +/- 0.3 m.

A comparison of the LiDAR data to photogrammetry data indicates that in some areas the photogrammetry may have interpreted a dense understory canopy to be the ground surface. It is suggested that the LPI LiDAR data is more suitable for concept design stage, though further checks to ground survey along the final road alignment are suggested prior to detailed design.

References

BMT WBM (2015), *Lower Myall River and Myall Lakes Flood Study*, prepared for Great Lakes Council, June 2015