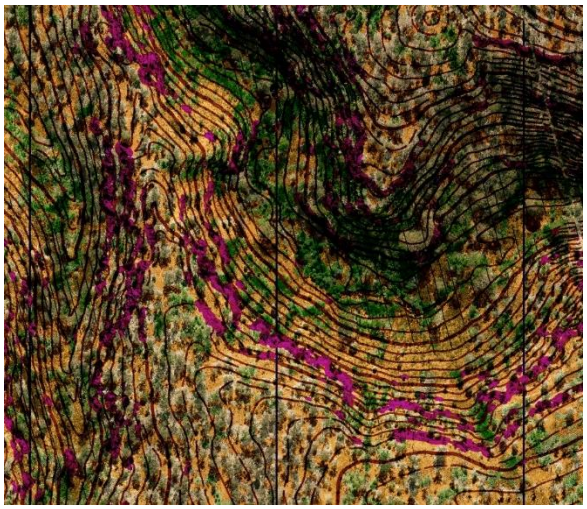
LOVELY BANKS – Fieldwork from LIDAR base

Lovely Banks is a 16.5 sq. km. area and is a remap of the well regarded Sandstone Valleys map between Kempton and Oatlands in Tasmania. It will be competed on over the first two days of Easter 2018. The terrain is about 50% farmland, 35% undulating forest and 15% incised valleys with extensive sandstone detail on the steeper slopes. The forest canopy is open with areas of undergrowth, usually wattle and bracken.

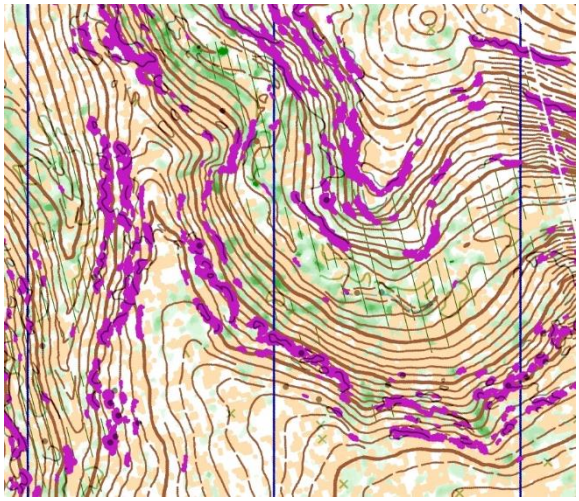


The area was specially flown for LIDAR together with aerial photography at a very large scale. The base map was generated using the default settings distributed with the Pullautin software. These settings are what Jarkko Ryyppo considers to be the most applicable to Finnish terrain. These same settings were used for Transit Flat and except for the identification of boulders were generally acceptable.

The files were huge, well over 20 gigabyte for the LIDAR and over 5 gigabyte for the photos. Georeferencing between the photos and the LIDAR was perfect. Total cost was about $10000 for the LIDAR and $4000 for the photography.

For ease of handling the final Pullautin data was split into three sections and the photos into 66 sections. The final base was the three sections of Pullautin data with an OCAD overlay of information from the photos viewed at a scale of 1:500.

Intensive photo interpretation greatly enhanced the base map. Roads, tracks, fences and water points were man made features that were usually identifiable. Dead trees and fallen logs were very useful both in open and forest areas. Some special trees and bracken boundaries were mapped. In open areas creek lines were obvious on the photos. Farm dams did not appear on the LIDAR but were accurate on the photos. Without the photo interpretation the project would have taken up to 100% longer and with a lesser final result.



At first it was thought that the ideal base would be the lidar superimposed on the photo at the fieldwork scale of 7500 (upper map). Various trial prints showed this to be impractical with an overload of detail. The real value of the photos was their ability to show immense detail at the scale of 1:500. All detail discerned at this scale was transferred to an OCAD file. This file superimposed on the lidar base was printed at the 7500 scale on A4 sheets which were laminated and used as the fieldwork base (lower map).

Other users of Lidar have reported good results using slope lines. A section of map was reviewed using this technique but the result fell well short of our base compiled as above.

The project was managed by Greg Hawthorne (email greg.hawthorne@bigpond.com) who was able to build upon his experience with a LIDAR base from the Transit Flat World Cup event in 2014.

Contours The contour base was from the Pullautin software which showed some extra usable detail (mainly hilltop knolls) to the raw contours produced via OCAD 12. The base was 5 metre contours with 2.5 contours covering all except the steeper areas. Additionally a contours only file was produced from the Pullautin data and after being converted from dxf to Bezier curves was the basis of the drawn up fieldwork.

During fieldwork the contours held up well, like Transit Flat the steeper incised gullies usually needed a ‘v’ rather than a ’u’. Other minor changes were made, but the decision to drop the LIDAR contours into the final map held up.

Splitting the base Lidar file created a problem with using the contour only file directly into the final drawn map. At the edges of each of the splits extra start and end nodes were added to every contour. These were remedied during the final draw.

Rock A strength of Pullautin software is the ability to show rock faces, a weakness is the identification of boulders. The amount of rock on the steeper slopes tested this to the limit. For rock faces, the major vertical cliffs were identified and continuous bands of cliff with only small separation were shown. Passable rock faces on steep slopes were picked up about 50% of the time and there were spots were the only indication of impassable cliffs was the closeness of the contours. Cliff detail on gentler areas was excellent. The thickness of the rock features made for an ugly base but gaps were well marked.

For boulders, larger ones were picked out more consistently than on Transit Flat, either as individual boulders, as a rock face or as a thickened section of a cliff line. A number of boulders of all sizes were reliably identified from the aerial photos usually by the cast of the shadow. Overall about 15% of all boulders were on the base map which is on par with Chris Wilmotts work.

Blue features A feature of the area is very winding watercourses in the valleys. Where these met with a contour they could be identifies from the LIDAR. They were clearly visible on the photos and the plot from the photo virtually went straight to the final map. LIDAR does not recognise water surface easily and a number of dams could only be recognised if the contours picked up the dam wall. The dam and the high water mark were plotted almost directly from the photos.

Yellow vegetation Large parts of the map were farmland with individual trees plotted by LIDAR according to the size of the canopy as white in the yellow. Dead trees in the farmland could occasionally be identified but the size of the white dot could not be seen at the 7500 fieldwork scale. These trees were plotted from the photographs as green crosses. The green crosses were placed at the base of the tree which varied marginally from the white dot which may have beeen calculated from the upper branches. On occasion this showed the tree to be on the wrong side of a fenceline.

Yellow in forest areas when plotted by LIDAR shows extensive minor clearings throughout. I expect this to be a feature of the use of LIDAR in Australia. Larger clearings are mapped but the fieldworker must be aware that all marginal clearings should be checked. This is particularly so as the LIDAR clearings are based on the canopy whereas the orienteer is more likely to assess them from the surrounding tree trunks.

The yellow/white LIDAR boundary was fine between clearings and trees with a higher canopy. There were problems in plotting the boundaries with other vegetation types – see under green vegetation below.

Green vegetation The LIDAR settings for thickness of vegetation are very much dependent on knowledge of the type of vegetation on each map. The green settings for this map picked out thick forest at the canopy level and some areas of bracken. The thick areas of canopy were almost always wattle with a spreading crown, these were easily found in the forest and could be relied on by the fieldworker. They were on the base as both light and medium green and both were useful. Larger areas of bracken were on the base as a stripe. The stripe was too widely spaced for precision and the boundaries that could be picked from the photos were generally more useful.

A problem was a scrubby small tree (Wattle?) which looks like it was regrowth from old clear areas (upper photo). The LIDAR settings did not see it at all even though it was

typically a light to medium green. This vegetation type was common across the map.

There are several areas of impassable vegetation. Thickets of gorse were generally picked up on the base but equally impassable wild rose was marked as yellow (lower photo).

Manmade features As expected virtually no man made features were apparent on the LIDAR base (a couple of earth walls and roadside embankments). An example of the quality of the photos is that in open areas the shadow of a star picket could be seen at the higher magnification. In all the base map ranks as one of the best I have ever worked on.

Colours of base map There is limited ability to change the colour and colour intensity on the LIDAR base. Purple was chosen as the rock/cliff colour as it worked well on Transit Flat. The yellow was too strong in the forest areas and too weak in the open (small white patches for individual trees were difficult to pick). Access to and the ability to utilise Photoshop may resolve this. For ease of fieldworking false colours were used on the base, particularly purple for rock features.

Existing map Orienteering Tasmania had made the decision that the area warranted the expense of a new base. I decided that there must be elements of the old map that were unreliable. I therefore did all my initial fieldwork from the new LIDAR base. As a final check I placed the old map as a background map and checked for anomalies giving me six extra points on the map to revisit.

General comments It seems to me that there is a lot of reinventing the wheel in the developing and use of LIDAR for orienteering maps. My hope for the recent LIDAR Workshop was for greater sharing of things like optimum software settings for different types of terrain and vegetations. I have now fieldworked granite, sandhill and sandstone terrains using a LIDAR base and it seems that the settings used have not been shared to the wider community.

I will circulate this report to known LIDAR practitioners and I hope that anyone producing LIDAR base maps will distribute their settings and experiences widely. Further, I will try and do a similar report to this on each relevant map I am involved in.

Alex Tarr 17/1/2018