

# Survey of Banwell Hill

21 June 2018

The Team: Graham Jackson & Janet Jackson

## 1) Introduction

Banwell Hill (Hill Number 18255, Section 41, OS 1:50000 Map 182, OS 1:25000 Map 153, Grid Ref. ST388587) is listed as a Tump (Thirty and Upward Metre Prominence) in the Database of British and Irish Hills. Several visitors to the hill have recorded ten-figure grid references for the summit, but all of these are for different locations along the summit ridge. To add to the confusion, a study of LIDAR data for Banwell Hill shows three areas of similar height and two of these are for locations different from those recorded by visitors. The third marks the position of a 15m stone tower built on a large mound. Whether this tower is built over the natural summit is not recorded. Consequently, a survey of Banwell Hill was considered desirable in order to answer this question and, if the natural summit lies elsewhere, determine its position.

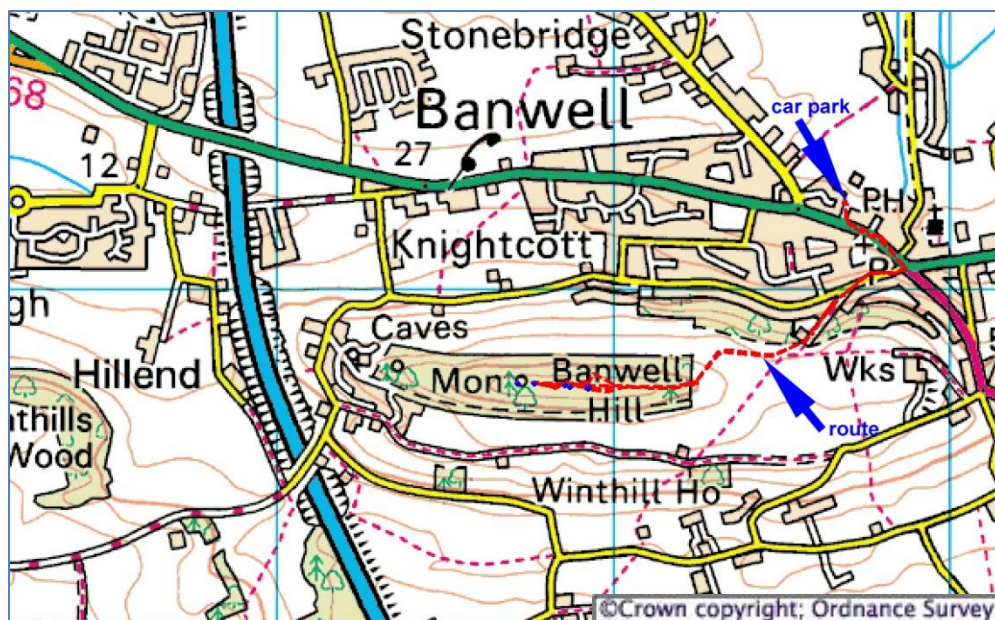
## 2) Equipment used and Conditions for Survey

A Leica NA730 Professional Automatic level (X30 telescopic system)/tripod system and a “1m” E-staff extendable to 5m were used to determine positions and height differences of features in the summit area.

Conditions for the survey, which took place between 12.00hr and 17.00hr BST, were good. There were clear skies and sunshine all day with only an occasional breeze and the temperature was 23 degrees Celsius.

## 3) Character of Hill

Banwell Hill lies just South of the village of Banwell. Immediately to its West is the M5 motorway and to its South is the large expanse of the Somerset Levels. The 1:25k OS map has a 118m spot height on its summit ridge and shows the hill to be extensively covered in trees. A monument at the West end of the ridge is also shown on OS maps. Previous visitors advise parking in the village car park (free) that is situated opposite the local primary school and from there walking East along the



main road (West Street) to its junction with High Street. After walking about 150m distance along High Street a narrow single track road, aptly named Hillpath, is taken steeply up-hill. This road terminates at a house but continues as a footpath and gives access to open land. The East end of the wooded summit of Banwell Hill is seen from here and about half-way along the boundary and near the skyline is a gate. This gate, which is securely fastened to the wall, gives access to the wooded summit. Note that this is private land. From the gate a narrow path winds through the trees to the tower, keeping close to the summit ridge as it does so.

#### 4) **LIDAR Analysis**

The Digital Terrain Model (DTM) plots for the summit of the hill are given in three separate plots in Appendix 2. These go from west, where the tower mound is visible (brown shading), to east where the DTM plot shows two more high points in plots 2 and 3. The grid references from contributors and recorded during the survey are also shown (see Section 5). These plots were submitted courtesy D Marshall and showed other potential high points that required investigation.

#### 5) **Survey of the Summit**

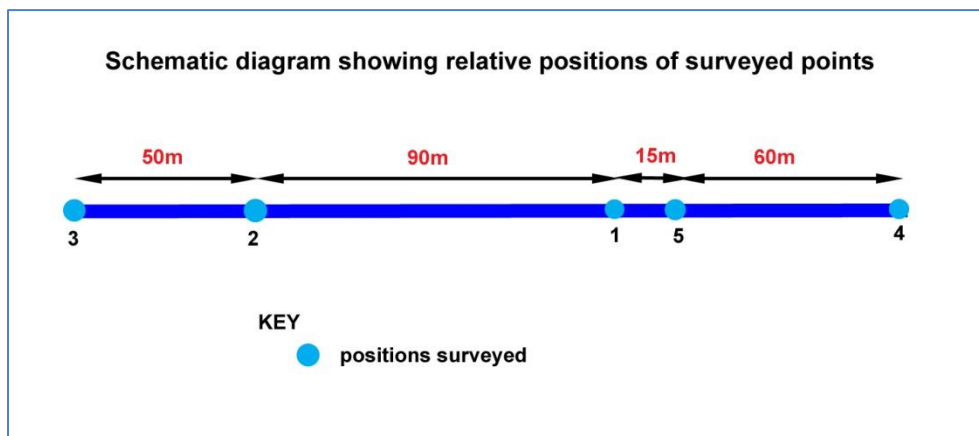
##### 5.1) **Preliminary Survey**

The first task was to carry out a reconnoitre of the summit ridge. We noted that the path closely followed the highest ground with land falling gently on its North and South sides. In some areas the ridge was broader with ground on each side of the path being level for 10m or so before falling away. The tree cover was quite open and the understorey comprised mainly Dog's Mercury which stands 10cm – 20cm high and is growing through leaf-litter.

Our second observation, after walking the length of the ridge to the tower, was how level the ridge appeared to be which is in contrast to the DTM plot from LIDAR that shows 1-2m differences in height over distances of but a few metres. It was also clear from a cursory inspection that the ground at the very western end of the ridge fell towards the mound and tower.

Next, the summit positions recorded by previous visitors and LIDAR were located using a Garmin Oregon 450 GPS receiver and these positions were marked with flags. These were:

Position 1	no feature	ST 38873 58713 Garmin (ST 38871 58708 OSTN15)
Position 2	no feature	ST 38783 58721 Garmin (ST 38781 58716 OSTN15)
Position 3	tower mound	ST 38732 58720 Garmin (ST 38730 58715 OSTN15)
Position 4	LIDAR east summit	ST 38942 58704 (OSTN15)



Photographs of these positions are shown in Appendix 1.

Note that the accuracy of hand-held GNSS receivers is compromised by the tree-cover and will therefore be poorer than the 7-8m expected for more open locations. Their approximate relative positions together with position 5 described below are shown in the diagram.

Work with an Abney level indicated that position 1 was higher than position 4 and that the ground falls by at least half a metre from position 2 to the highest ground separating the tower mound, position 3, from position 2. Beyond the tower in a westerly direction the ground continued to fall. Consequently it was considered highly unlikely that the tower was built over the natural summit.

### **5.2) Survey with Level and Staff**

Next a more detailed survey was undertaken with the Leica NA730 level and staff. First, the level was set up between position 4 (LIDAR E summit) and position 1 in order to determine the height difference between them. Then the ground between the two positions was investigated to check for higher ground. A higher point (position 5) was identified. Regrettably, there was no line of sight between positions 1 or 5 and position 2, a consequence of a break in the tree-cover at an intervening point resulting in a more luxuriant growth of grasses and herbage. Fortunately, it was possible to set up the level at a position on the southern edge of the herbage that did allow a view of position 2 and position 1, thus allowing a height difference to be determined.

No attempt was made to investigate higher positions off the path as time did not allow. However, we believe that no ground higher than circa 15cm would be found as a result of a more detailed survey and consequently such a finding would not change significantly the location of the summit.

### **6) Results**

The staff readings and recorded ten-figure grid references for the different positions were:

First placement position of Leica NA730

Position 4 (LIDAR East summit) = 1.191m ST 38941 58712

Position 1 (no feature) = 0.919m ST 38873 58715

Position 5 (intermediate position) = 0.710m ST 38886 58712

Position 1 is higher than position 4 by  $1.191 - 0.919 = 0.272\text{m}$

Position 5 is higher than position 1 by  $0.919 - 0.710 = 0.209\text{m}$

Second placement position of Leica NA730

Position 1 (no feature) = 0.798m

Position 2 (no feature) = 0.040m ST 38783 58721

Position 2 is higher than position 1 by  $0.798 - 0.040 = 0.754\text{m}$

Position 2 is higher than position 5 by  $0.794 - 0.209 = 0.585\text{m}$

Note that the lower the staff reading then the higher the feature.

The DTM plots from LIDAR indicate that position 4 is about 3m higher than positions 1 and 2. No such height difference exists on the ground either at position 4 or anywhere between position 4 and position 1 and 2.

## **7) Discussion**

Of all the potential summit features the highest natural ground is that about 50m East of the tower (position 2). The tower itself is very unlikely to cover the natural summit since the terrain is falling westwards from near position 2. Position 2 is 0.6m higher than the next highest ground located east along the ridge, namely position 5.

## **8) Summary and Conclusions**

The highest point of Banwell Hill is ground (no summit feature) about 50m East of the tower at ST 38783 58721.

## **9) Acknowledgements**

We would like to thank Jonathan Glew, Richard McLellan and Rob Woodall for their submissions of ten figure grid references and their observations of the summit ridge of Banwell Hill. Without their contribution this survey would have taken much longer to carry out.

\* NB hand-held Garmin GPS grid references are quoted throughout the report unless indicated otherwise.

Graham Jackson, 12 July 2018



## Appendix 1



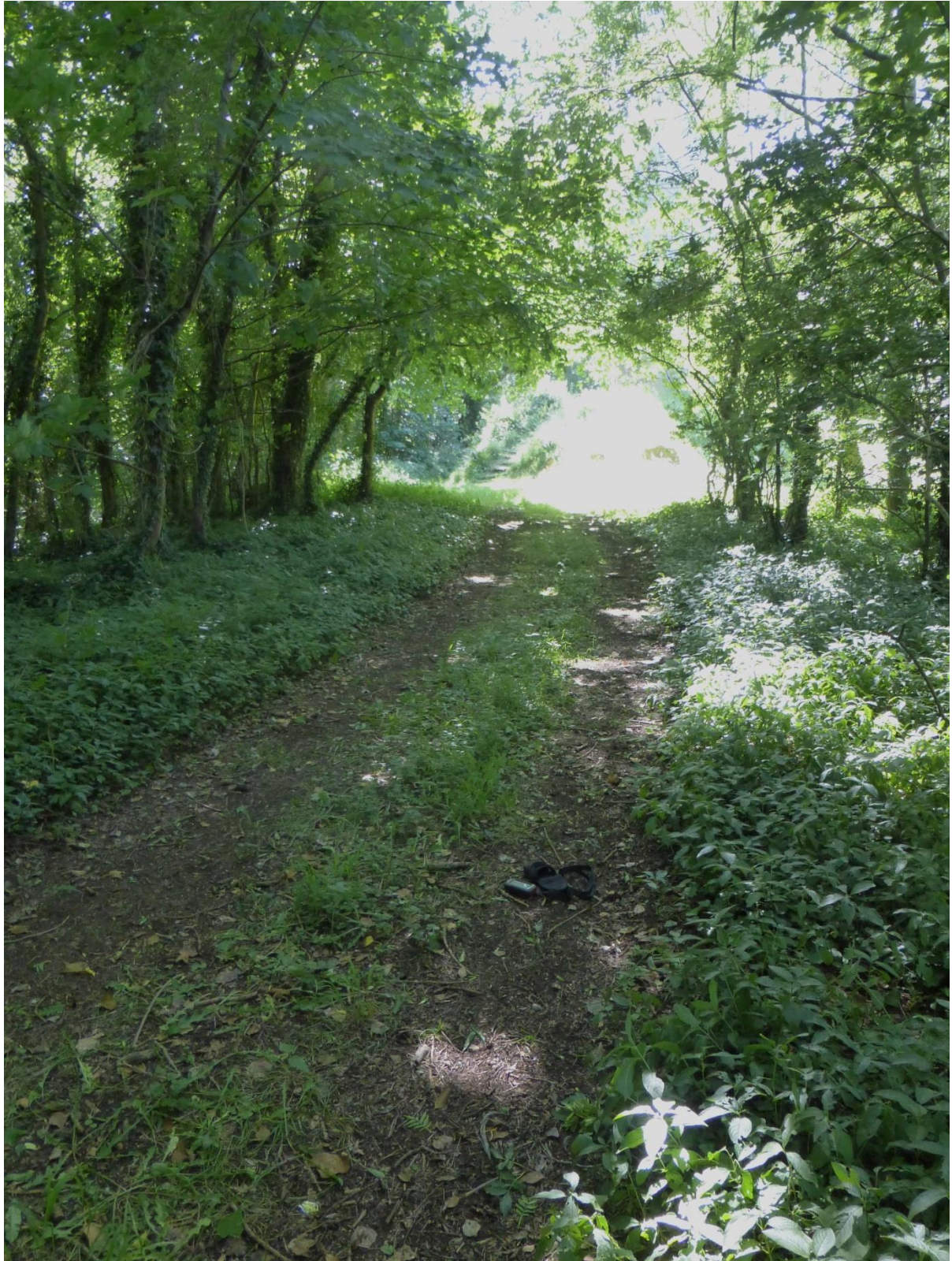
**Tower on Banwell Hill standing on earthen mound; low point between tower and ridge to East is just in the front of the picture**





**The steps leading to the tower are shown on the right of the photograph; the ground falls gently from the camera position to the steps and more steeply beyond**



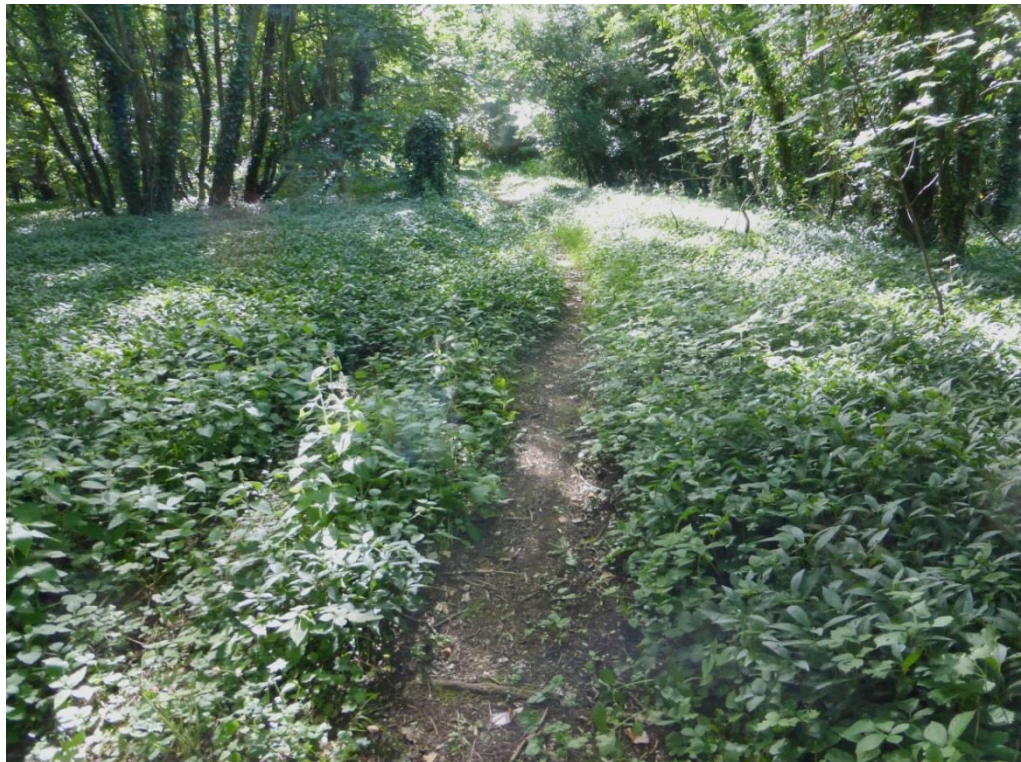


**View from Position 2 looking towards the mound and tower with strong sunlight falling on the mound**





**White flag marking position 1; arrows mark positions 4 & 5**

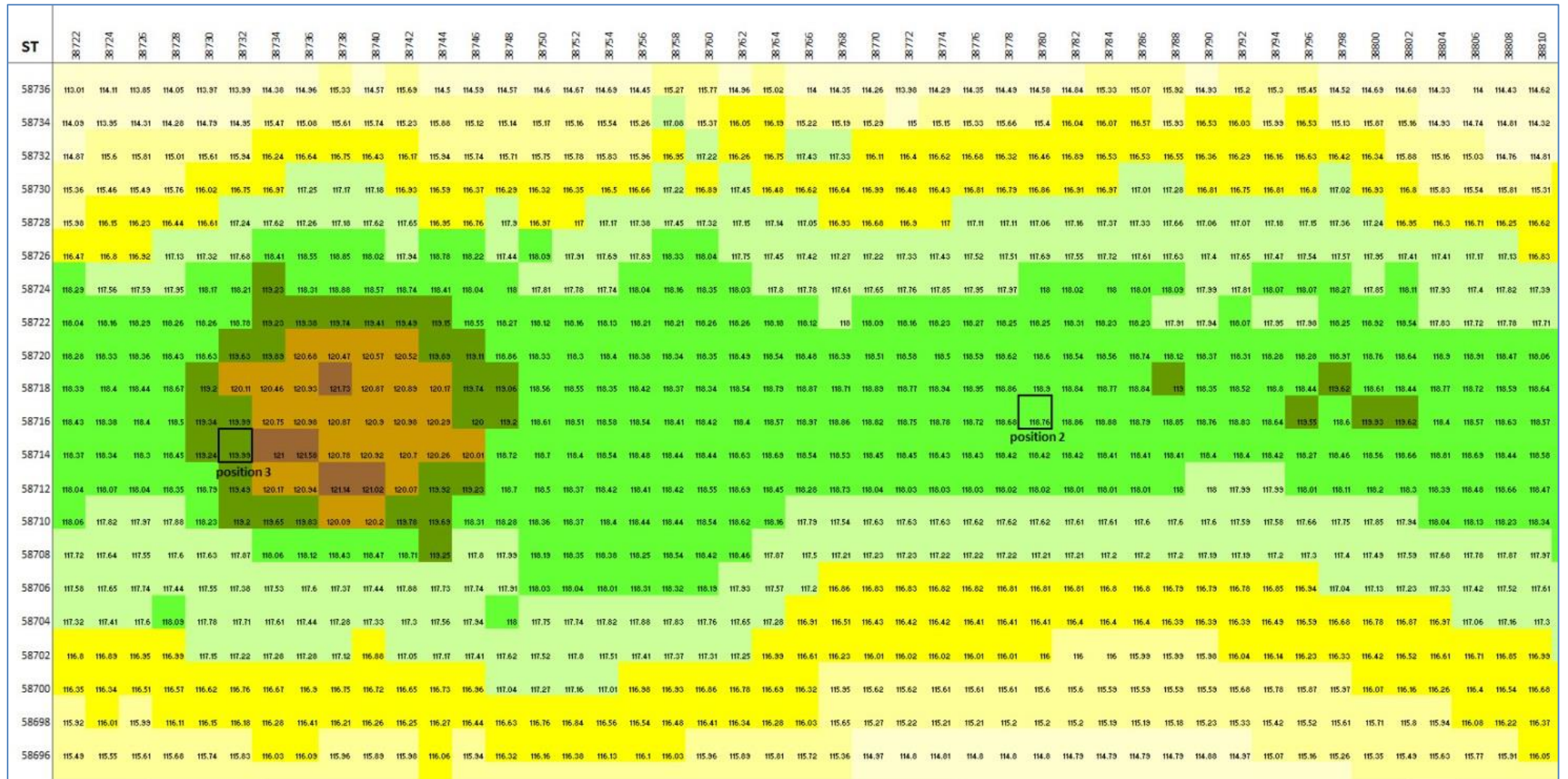


**Looking back from position 4 to positions 5 and 1**



## Appendix 2

colour key: dark brown >121m; light brown 120m; olive 119m; green 118m; light green 117m; yellow 116m

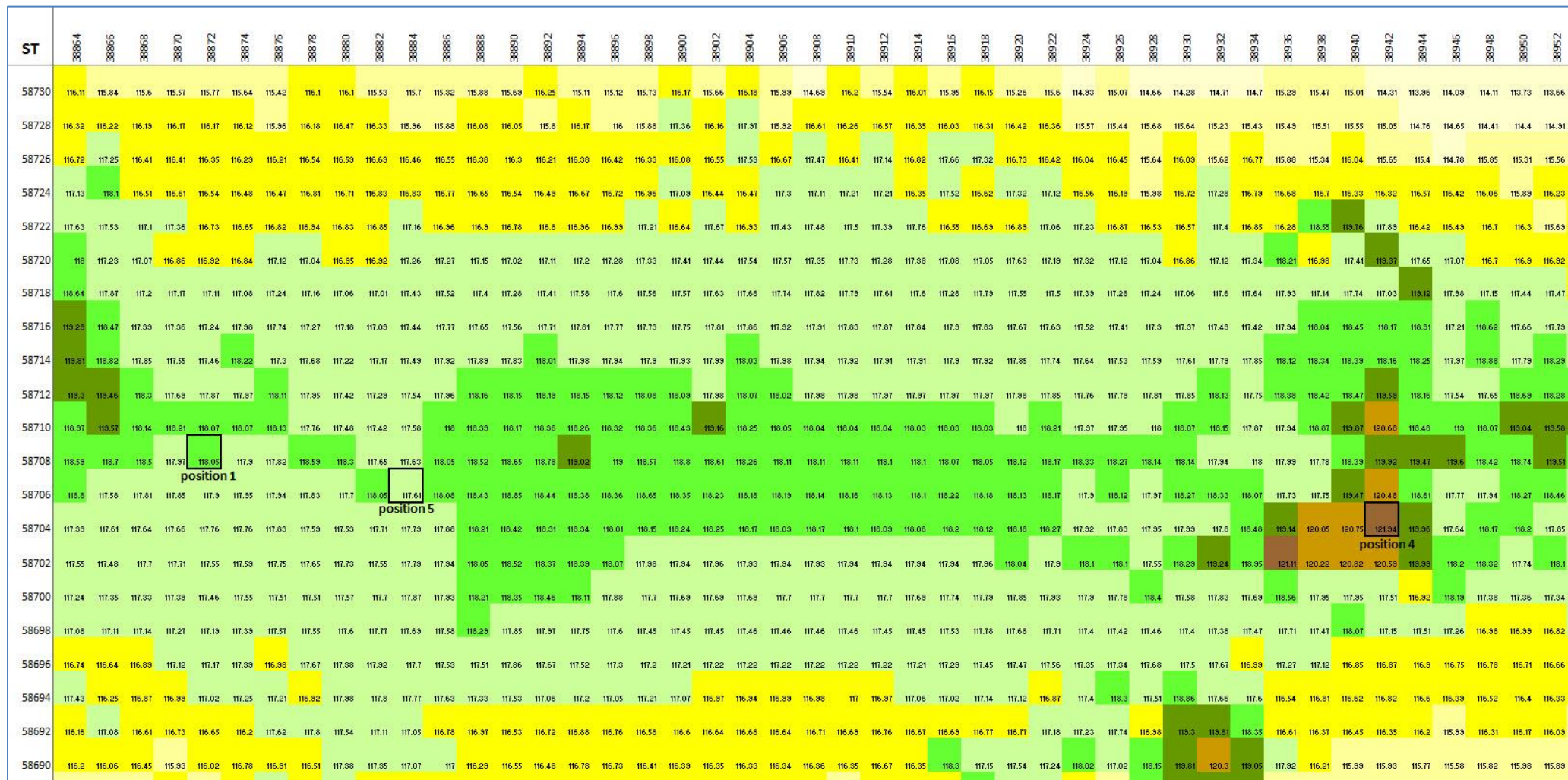


LIDAR plot showing position 2 & 3 with mound (brown shading) clearly shown

ST	38788	38790	38792	38794	38796	38798	38800	38802	38804	38806	38808	38810	38812	38814	38816	38818	38820	38822	38824	38826	38828	38830	38832	38834	38836	38838	38840	38842	38844	38846	38848	38850	38852	38854	38856	38858	38860	38862	38864	38866	38868	38870	38872	38874	38876
58736	115.92	114.93	115.2	115.3	115.45	114.52	114.69	114.68	114.33	114	114.43	114.62	113.88	113.77	113.46	113.39	113.65	113.34	115.03	114.18	114.22	114.01	114.04	114.1	113.72	113.68	113.81	114.45	113.7	113.59	113.53	114.01	114.27	114.38	114.7	114.06	114.11	113.96	113.94	113.84	113.95	113.84	113.61	113.68	113.48
58734	115.93	116.53	116.03	115.93	116.53	115.13	115.87	115.16	114.93	114.74	114.81	114.32	114.4	114.33	114	114.15	114.19	114.1	114.52	114.61	114.53	114.59	115.48	115.08	115.36	114.58	114.37	114.6	114.62	114.43	114.33	114.79	114.2	115.42	115.35	115.6	114.86	114.87	114.84	114.7	114.56	114.2	114.08	114.93	114.66
58732	116.55	116.36	116.29	116.16	116.63	116.42	116.34	115.88	115.16	115.03	114.76	114.81	114.88	115.19	115.01	114.49	114.64	115.31	115.29	115.46	115.49	116.33	115.72	116.37	116.28	115.19	115.13	115.18	115.23	115.28	115.51	115.38	115.37	115.34	115.2	115.63	115.55	115.59	115.41	115.28	115.03	116.16	116.12	114.81	115.81
58730	117.28	116.81	116.75	116.81	116.8	117.02	116.93	116.8	115.83	115.54	115.81	115.31	116.15	115.07	115.84	115.91	115.53	115.62	115.49	115.91	115.81	116.03	116.46	116.74	116.33	116.15	115.89	115.93	116.01	115.94	116.4	116.53	116.14	115.84	115.96	116.22	116.17	116.3	116.11	115.84	115.6	115.57	115.77	115.64	115.42
58728	117.66	117.06	117.07	117.18	117.15	117.36	117.24	116.95	116.3	116.71	116.25	116.62	116.26	116.05	116.35	116.16	116.43	116.11	116.57	116.32	116.5	116.5	116.52	117.22	116.76	116.85	116.56	116.47	116.31	116.34	116.37	116.37	116.63	116.3	116.6	116.54	116.97	116.22	116.32	116.22	116.19	116.17	116.17	116.12	115.96
58726	117.63	117.4	117.65	117.47	117.54	117.57	117.95	117.41	117.41	117.17	117.13	116.83	116.61	116.53	116.62	116.75	116.83	116.83	116.81	116.78	116.85	116.94	116.95	117	117.53	117.43	117.29	117.07	116.98	116.92	116.83	117.42	117.46	117.68	116.92	117.63	117.71	117.29	116.72	117.25	116.41	116.41	116.35	116.29	116.21
58724	118.09	117.99	117.81	118.07	118.07	118.27	117.85	118.11	117.93	117.4	117.82	117.39	117.16	117.13	116.93	117.03	117.07	117.15	117.07	117.09	117.25	117.05	117.25	117.23	117.54	117.13	117.66	117.38	117.29	117.13	117.09	117.35	117.71	117.47	118.26	118.15	117.27	117.84	117.13	118.1	116.51	116.61	116.54	116.48	116.47
58722	117.91	117.94	118.07	117.95	117.98	118.25	118.92	118.54	117.83	117.72	117.78	117.71	117.82	117.74	117.52	117.33	117.43	117.46	117.49	117.45	117.53	117.38	117.44	117.52	117.64	117.48	117.51	117.59	117.51	117.44	117.34	117.4	117.4	117.88	117.48	118.96	118.11	118.18	117.63	117.53	117.1	117.36	116.73	116.65	116.82
58720	118.12	118.37	118.31	118.28	118.28	118.37	118.76	118.64	118.9	118.91	118.47	118.06	118.26	118.12	118.01	117.94	117.73	117.74	117.78	117.72	117.65	117.83	117.85	117.83	118.02	117.89	117.83	117.79	117.74	117.79	117.75	117.69	118.1	118.4	119.45	118.94	120.24	117.84	118	117.23	117.07	116.86	116.92	116.84	117.12
58718	119	118.35	118.52	118.8	118.44	119.62	118.61	118.44	118.77	118.72	118.59	118.64	118.29	118.26	118.32	118.18	118.12	118.04	118	118.12	118.07	118.08	118.12	118.24	118.24	118.15	118.04	117.94	117.88	117.96	117.9	117.81	118.42	118.59	118.42	120.83	120.76	119.3	118.64	117.87	117.2	117.17	117.11	117.08	117.24
58716	118.85	118.76	118.83	118.64	119.35	118.6	119.93	119.62	118.4	118.57	118.63	118.57	118.46	118.38	118.28	118.18	118.13	118.29	118.24	118.27	118.39	118.23	118.33	118.62	118.66	118.33	118.02	117.96	117.93	118	118.62	118.78	119.08	119.89	121.1	121.71	121.44	120.12	119.28	118.47	117.39	117.36	117.24	117.98	117.74
58714	118.41	118.4	118.4	118.42	118.27	118.46	118.56	118.66	118.81	118.63	118.44	118.58	118.47	118.38	118.28	118.22	118.21	118.45	118.41	118.45	118.4	118.42	118.53	118.52	118.56	118.51	118.19	117.98	117.97	117.99	118.14	118.48	119.53	120.53	120.7	121.81	121.3	120.51	119.81	118.82	117.85	117.55	117.46	118.22	117.3
58712	118	118	117.99	117.99	118.01	118.11	118.2	118.3	118.39	118.48	118.66	118.47	118.47	118.45	118.32	118.36	118.62	118.48	118.35	118.66	118.48	118.91	118.38	118.45	118.42	118.41	118.38	118.06	118	118.05	118.29	118.53	118.99	118.89	120.37	119.71	119.32	120.56	119.3	119.46	118.3	117.69	117.87	117.97	118.11
58710	117.6	117.6	117.59	117.58	117.66	117.75	117.85	117.94	118.04	118.13	118.23	118.34	118.43	118.33	118.37	118.4	118.61	118.24	118.24	118.4	118.48	118.59	118.21	118.38	118.41	118.35	118.3	118.24	118.01	118.1	118.4	118.46	118.79	118.24	118.38	118.56	119.16	120.24	118.97	119.57	118.14	118.21	118.07	118.07	118.13
58708	117.2	117.19	117.19	117.2	117.3	117.4	117.43	117.59	117.68	117.78	117.87	117.97	118.06	118.16	118.41	118.15	118.08	118.13	118.04	118.14	118.25	118.52	118.12	117.97	118.33	118.14	118.1	118.22	117.98	118.42	118.04	118.05	117.87	118.42	119.44	118.79	119.02	118.01	118.59	118.7	118.5	117.97	118.05	117.3	117.82
58706	116.79	116.79	116.78	116.85	116.94	117.04	117.13	117.23	117.33	117.42	117.52	117.61	117.75	117.87	118.14	118.06	117.96	118.13	117.92	118.09	118.22	118.12	118.2	117.94	117.91	117.65	118.03	118.04	118.07	118.1	117.93	117.85	117.55	117.92	118.08	118.06	118.38	118.31	118.8	117.58	117.81	117.85	117.9	117.95	117.94
58704	116.39	116.39	116.39	116.49	116.59	116.68	116.78	116.87	116.97	117.06	117.16	117.3	117.44	117.58	117.65	118.18	117.82	117.83	117.89	117.99	118.41	118.24	117.64	117.61	117.6	117.79	117.76	117.92	118.18	117.8	117.68	117.61	117.66	118.13	117.85	117.97	117.97	118.7	117.39	117.61	117.64	117.66	117.76	117.76	117.83
58702	115.99	115.98	116.04	116.14	116.23	116.33	116.42	116.52	116.61	116.71	116.85	116.99	117.13	117.27	117.4	117.76	117.65	117.85	117.8	117.88	117.92	117.78	117.44	117.37	117.42	117.43	117.31	117.83	117.68	117.47	117.51	117.46	117.31	117.55	118.77	117.47	117.78	117.55	117.48	117.7	117.71	117.55	117.59	117.75	
58700	115.59	115.59	115.68	115.78	115.87	115.97	116.07	116.16	116.26	116.4	116.54	116.68	116.82	116.96	117.1	117.19	117.58	117.23	117.07	117.49	117.41	117.4	117.26	117.35	117.25	117.26	117.3	117.33	117.33	117.35	117.37	117.25	117.33	117.16	118.24	117	117.19	117.27	117.24	117.35	117.33	117.39	117.46	117.55	117.51
58698	115.18	115.23	115.33	115.42	115.52	115.61	115.71	115.8	115.94	116.08	116.22	116.37	116.51	116.65	116.73	117.22	117.03	117.27	117.21	117.14	117	117.03	116.98	116.91	116.98	117.01	117.06	117.09	117.12	117.16	117.35	117.04	117.22	117.09	117.36	116.86	116.96	117	117.08	117.11	117.14	117.27	117.19	117.39	117.57
58696	114.79	114.88	114.97	115.07	115.16	115.26	115.35	115.49	115.63	115.77	115.91	116.05	116.19	116.35	116.44	116.49	116.45	116.49	116.71	116.61	116.56	116.52	116.47	116.38	116.45	116.57	116.52	116.67	116.7	116.75	116.85	117.37	116.66	116.89	117.13	116.99	116.63	116.72	116.74	116.64	116.89	117.12	117.17	117.39	116.98

LIDAR plot showing position1 (position 2 is just to the left of the plot)





LIDAR plot showing positions 1, 5 & 4