

Beinn Bhuidhe and Sims (1D)

Report of surveys carried out by Alan Dawson on 2 May 2014

Background

The purpose of these surveys was to measure several summits and cols around Beinn Bhuidhe above Glen Fyne, notably Beinn Bhuidhe East Top, a marginal 900m summit which is shown as 901m on OS maps. Heights were measured using a Leica Geosystems RX 1250 GPS antenna and controller, with subsequent processing using OS Rinex data to obtain precise results. Conditions for the surveys were fair: clear and dry but persistently dull with a cold east wind.

Beinn Chas survey

This hill runs parallel to Glen Fyne, with its steep eastern slopes rising high above the track that leads north from the A83 toward Beinn Bhuidhe. The summit of Beinn Chas has a 680m spot height on the OS 1:50000 map but large-scale maps show three small contour rings in the summit area, so the main purpose of the survey was to identify and measure the highest point. This turned out to be easier than expected, as the hill has an obvious prominent rock on its highest point, topped by a small cairn, located in the smallest of the three 680m contour rings. The col was also easily identified, on a narrow flat area next to a small lochan, exactly as indicated from the map.

Summit feature: Cairn on large rock

Summit survey time: 20 minutes

Antenna height at summit: 0.57m

Margin for error: 0m

Base station data:

<i>Base station:</i>	ARIS	FAUG	GLAS	KILN	LOGG	OBAN
<i>Distance away:</i>	87	92	65	39	47	36
<i>Summit ellip height:</i>	737.455	737.458	737.448	737.448	737.385	737.469
<i>Col ellip height:</i>	653.792	653.868	653.777	653.767	653.747	653.801

Col survey time: 20 minutes

Antenna height at col: 0.88m

Margin for error: 0.04m

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 737.44m

Mean elliptical col height: 653.79m

WGS84 to OSGB36 adjustment: 54.743 for summit, 54.715 for col

Adjustment constant: 0.16m

Result:

Summit: 682.86m
Latitude: 56° 18' 13.79831" N
Longitude: 4° 54' 46.98152" W
Summit gridref: NN 19869 16193
Col: 599.24m
Col gridref: NN 2126 1735
Drop: 83.6m
Outcome: No status change, height increased by almost 3 metres



Beinn Chas summit survey in progress, with Stac a'Chuirn and Beinn Bhuidhe behind

Meall an Daimh survey

This hill lies in an impressive location beneath the steep southern slopes of Beinn Bhuidhe which tower above and dwarf its summit. It does not appear in any hill listing as it appears from OS maps to have a drop of only about 17m. The 753m spot height is in a large 750m contour ring, suggesting a fairly flat summit area, but on the ground the summit is steep and rocky, indicating an obvious discrepancy between the spot height and the contouring. An unanticipated survey was therefore required, as it appeared that the hill must be over 753m high, and altimeter readings suggested a drop of over 20m. The survey times were shorter than usual, with only 15 minutes at summit and col, but the data quality was still good enough to give consistent measurements from six base stations.

Summit feature: Grass

Summit survey time: 15 minutes

Antenna height at summit: 0.60m

Margin for error: 0.02m

Base station data:

<i>Base station:</i>	ARIS	FAUG	GLAS	KILN	LOCG	OBAN
<i>Distance away:</i>	87	92	65	39	47	36
<i>Summit ellip height:</i>	816.456	816.538	816.468	816.431	816.419	816.479
<i>Col ellip height:</i>	792.741	792.675	792.788	792.764	792.771	792.78

Col survey time: 15 minutes

Antenna height at col: 0.66m

Margin for error: 0.06m

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 816.47m

Mean elliptical col height: 792.75m

WGS84 to OSGB36 adjustment: 54.732 for summit, 54.733 for col

Adjustment constant: 0.16m

Result:

Summit: 761.89m

Latitude: 56° 19' 22.54638" N

Longitude: 4° 54' 06.73814" W

Summit gridref: NN 20650 18289

Col: 738.18m

Col gridref: NN 2060 1843

Drop: 23.71m

Outcome: New Subsim - previously unlisted 600m summit with drop over 20m, summit 9m higher than map



Meall an Daimh summit survey in progress, with Stac a'Chuirn behind

Stac a'Chuirn survey

This summit lies at the western end of the long summit ridge of Beinn Bhuidhe. The main reason for the survey was to investigate apparently anomalous mapping, with the 1:50000 map showing an 870m spot height within an 840m contour ring, suggesting an exceptionally sharp summit or a mapping error. The 1:25000 and 1:10000 maps show the 870m spot height to be within a small 850m contour and a tiny 860m contour ring, making the 870m spot height more plausible but still suggesting a rock pinnacle. The name Stac a'Chuirn indicated that the summit might have a sharp rocky summit or stack. On the ground however the summit area is fairly flat and quite unlike that suggested by the mapping, though it does drop away steeply on its southern and western slopes. Altimeter readings suggested a difference of only about 35m between col and summit, compared to the 50m shown on the maps. Unfortunately, satellite coverage was particularly poor for the survey of this hill, with data recording from only 4 or 5 satellites for much of the time, giving a greater variation than usual between base station measurements, increasing the margin for error by about 0.1m at the summit and by up to 0.4m at the col.

The OS map shows an 820m spot height at the col area, but this appeared slightly west of the likely col location. The col is long and gently undulating and there is a slight rise just west of the col, so it is probable that the 820m spot height relates to the top of this rise. Survey time at the col was kept short in order to allow time for subsequent surveys, as the status of the hill was not in question and therefore the survey only need to produce a definite result to the nearest metre.

Summit feature: Cairn

Summit survey time: 30 minutes

Antenna height at summit: 0.80m

Margin for error: 0.02m

Base station data:

<i>Base station:</i>	ARIS	FAUG	GLAS	KILN	LOCG	OBAN
<i>Distance away:</i>	87	92	65	39	47	36
<i>Summit ellip height:</i>	906.961	906.98	907.037	906.853	906.945	907.05
<i>Col ellip height:</i>	872.229	872.24	872.187	872.074	872.713	872.012

Col survey time: 16 minutes

Antenna height at col: 0.81m

Margin for error: 0.06m

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 906.97m

Mean elliptical col height: 872.24m

WGS84 to OSGB36 adjustment: 54.762 for summit, 54.751 for col

Adjustment constant: 0.16m

Result:

Summit: 852.37m

Latitude: 56° 19' 14.03001" N

Longitude: 4° 55' 38.94184" W

Summit gridref: NN 19055 18092

Col: 817.65m

Col gridref: NN 1971 1839

Drop: 34.7m

Outcome: No status change, but height 18m lower than shown on OS map and drop 15m less



Stac a'Chuirn summit survey in progress, with Beinn Bhuidhe behind

This unprecedented result, with a change of 18 metres from OS mapping, together with the changes of 3 metres and 9 metres for the two previous summits, raised the question of whether the survey equipment was functioning correctly, as such results are extremely rare. On the other hand, the main reason for carrying out the survey of Stac a'Chuirn was because of the unconvincing mapping, and the sole reason for the survey of Meall an Daimh was because of the visible discrepancy between the topography of the summit and the mapping. In both cases the survey results did reflect the reality of the summit and col shapes, the surveyed grid references were correct in each case, and the col survey results showed close correlation to the mapping. In the case of Stac a'Chuirn, one possible explanation was that a rock pinnacle did exist in the past but had been destroyed by lightning or long-term weathering. However, there was no apparent evidence for this on the ground.

Fortunately, there was an immediate opportunity to test the validity of these survey results on the summit of Beinn Bhuidhe, which had a trig point on the summit with a known OS height of 948.537m. Although the trig pillar was no longer standing, there seemed no reason why the height reading should be wrong. Assuming that the flush bracket of the trig point had been 25cm above the highest point of the hill, then the summit survey should find a height of between 948.0 and 948.6m. If this turned out to be the case then it would show that the equipment was functioning correctly and that the survey findings for the summits of Meall an Daimh and Stac a'Chuirn were indeed correct, to within about 0.1m.



The flat summit of Stac a'Chuirn, seen from the slopes of Beinn Bhuidhe

Beinn Bhuidhe survey

The base of the trig pillar is still visible at the edge of the summit cairn, with the top half of the destroyed pillar on the other side of the cairn. The survey equipment was set up above the base of the ruined pillar, with the rock beneath the pillar base judged to be the highest natural point of the hill, although it was impossible to know whether this had been moved there when the trig pillar was erected.

Summit feature: Cairn

Summit survey time: 30 minutes

Antenna height at summit: 0.80m

Margin for error: 0.06m

Base station data:

<i>Base station:</i>	ARIS	FAUG	GLAS	KILN	LOCG	OBAN
<i>Distance away:</i>	87	92	65	39	47	36
<i>Summit ellip height:</i>	1003.056	1003.074	1003.095	1003.028	1003.01	1003.046

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 1003.05m

WGS84 to OSGB36 adjustment: 54.738m

Adjustment constant: 0.16m

Result:

Summit: 948.47m
 Latitude: 56° 19' 36.01022" N
 Longitude: 4° 54' 24.14649" W
 Summit gridref: NN 20368 18717
 Col: Not surveyed
 Drop: 592m
 Outcome: No status change, survey finding closely corresponds to OS trig point height

This finding supported the conclusion that the survey equipment was functioning correctly, that the OS summit height for Meall an Daimh was 9 metres too low, and that for Stac a'Chuirn was 18 metres too high.



Beinn Bhuidhe summit survey with destroyed trig pillar and Stac a'Chuirn beyond

Beinn Bhuidhe East Top survey

The original impetus for the day's surveying was to check whether this hill was over 900m. However, the startling findings from Meall an Daimh and Stac a'Chuirn had distracted attention from this primary focus, so it was well into evening by the time of the survey of this hill.

Summit feature: Cairn
 Summit survey time: 30 minutes
 Antenna height at summit: 0.75m
 Margin for error: 0.04m

Base station data:

Base station:	ARIS	FAUG	GLAS	KILN	LOCG	OBAN
Distance away:	87	92	65	39	47	36
Summit ellip height:	957.689	957.697	957.779	957.722	957.441	957.507
Col ellip height:	880.896	880.9	880.881	880.87	880.843	880.892

Col survey time: 20 minutes
 Antenna height at col: 0.92m
 Margin for error: 0.1m

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 957.64
 Mean elliptical col height: 880.88
 WGS84 to OSGB36 adjustment: 54.713 for summit, 54.720 for col
 Adjustment constant: 0.16m

Result:

Summit: 903.09m
 Latitude: 56° 19' 56.22225" N
 Longitude: 4° 53' 30.07566" W
 Summit gridref: NN 21323 19303
 Col: 826.32m
 Col gridref: NN 2111 1914
 Drop: 76.8m
 Outcome: Status unchanged, summit height increased by 2m

This result confirmed the summit as being over 900m, with a relatively modest two metres increase in height. There was however a discrepancy between mapping and survey result in the grid reference for the summit. The OS 1:10000 map shows a 901m spot height at NN 21282 19363, but the survey showed the summit cairn to be almost 100 metres south-east of that point. There is another potential summit a few metres north-west of the summit cairn, but two-way readings with a Leica laser level showed this to be lower than the survey point.



Beinn Bhuidhe East Top summit survey, with Beinn Bhuidhe beyond

Ceann Garbh survey

This hill lies at the north-eastern end of the main Beinn Bhuidhe ridge. It has an 803m summit with a drop of 88m according to OS mapping so there was no compelling reason to survey it, but in view of the findings from other nearby summits a short survey was carried out at col and summit, in order to find out if the OS mapping was reasonably accurate.

Summit feature: Cairn

Summit survey time: 20 minutes

Antenna height at summit: 0.82m

Margin for error: 0.04m

Base station data:

<i>Base station:</i>	ARIS	FAUG	GLAS	KILN	LOCG	OBAN
<i>Distance away:</i>	87	92	65	39	47	36
<i>Summit ellip height:</i>	858.593	858.62	858.456	858.524	858.497	858.572
<i>Col ellip height:</i>	770.516	770.505	770.469	770.369	770.334	770.413

Col survey time: 15 minutes

Antenna height at col: 0.94m

Margin for error: 0.1m

Only the six nearest base stations were used for processing as all others were over 100km away.

Mean elliptical summit height: 858.54m

Mean elliptical col height: 770.43m

WGS84 to OSGB36 adjustment: 54.683 for summit, 54.693 for col

Adjustment constant: 0.16m

Result:

Summit: 804.02m
Latitude: 56° 20' 28.27986" N
Longitude: 4° 52' 40.85481" W
Summit gridref: NN 22210 20258
Col: 715.90m
Col gridref: NN 2195 2007
Drop: 88.1m
Outcome: Status unchanged, summit height increased by 1m



Ceann Garbh col survey in progress, with Ceann Garbh summit behind

Discussion

Six summits were surveyed during the day. The result for one of them, Beinn Bhuidhe, was exactly as expected from OS mapping and trig point database. Four summits were surveyed as higher than shown on OS maps - by 1m, 2m, 3m and 9m. The other summit was surveyed as being 18m lower than shown on OS maps. Five cols were also surveyed. The results for four of them were within one metre of those extrapolated from contouring on OS maps. The other col, for Stac a'Chuirn, was two metres lower, due to the mapped 820m spot height not being quite at the col position.

Survey results giving differences of one or two metres from OS spot heights are to be expected. A difference of three metres is uncommon but is within the expected range of survey results. Differences of 9m and 18m are way beyond all expectation and previous experience. The evidence indicates that the survey equipment was functioning correctly. The most likely explanation therefore is that the summit spot heights of 753m for Meall an Daimh and 870m for Stac a'Chuirn shown on OS maps are wrong. Perhaps the original OS surveyor for this area had bad handwriting and had originally written 763m for Meall an Daimh and 850m for Stac a'Chuirn. Perhaps the cartographer attempted to rectify the anomaly by adding a tiny 860m contour ring. Or perhaps the cartographer was having a bad day.



Ceann Garbh summit survey in fading light, with Beinn Bhuidhe East Top beyond