

# Surveying Carnedd y Ci

15 December 2007

John Barnard, Graham Jackson and Myrddyn Phillips.

## **1) Introduction**

Carnedd y Ci (Section 30E, Grid Ref SJ062341, spot height 648m, OS 1:25000 Explorer Sheet 255) is possibly a hill that should be included in John and Anne Nuttalls' list of English and Welsh Hills. With a summit spot height marked at 648m and the contours for the bwlch to the east indicating it to be between 630 and 640m, this hill could have 15m of ascent from bwlch to summit, thereby satisfying the Nuttall ascent criterion.

Myrddyn Phillips had previously surveyed this hill using his own levelling technique and found the ascent to be 45 feet (13.7m). However, bearing in mind the measurement error of this method (about +/- 2m for this terrain), plus the difficulty in accurately locating the position of the bwlch, we decided to carry out an accurate survey to measure the ascent from bwlch to summit.

## **2) Conditions for Survey and Instruments used.**

Although the weather for the day looked very promising as it was clear but very cold, on the hill conditions were so bad that it was not possible to carry out the line survey. On the summit the wind was so strong that it was difficult to stand upright, and because of the wind-chill factor with sub zero temperatures, our plans had to be drastically reduced.

Grid references for the summit and bwlch were recorded on Garmin Etrex and Map60CSx, and Magellan Explorist 100 handheld GPS units. Angles were measured using Abney levels.

## **3) The Survey**

### **3.1) Location of the Summit**

The highest point was on grass not far from the cairn.

The 10 figure Grid References for this summit were:-

Garmin Etrex	SJ 06194 34076	Accuracy 5m	Height = 650m
Garmin Map60CSx	SJ 06197 34078	Accuracy 3m	Height = 650m
Magellan Explorist 100	SJ 06194 34076	Accuracy 5m	Height = 653m
Mean of three readings	SJ 06195 34077		Height = 651m

### **3.2) Location of the Bwlch**

The position of the bwlch was located using trekking poles and an Abney level. Although we recognise that this method was not totally systematic, it was accurate enough for this survey.

The 10 figure Grid References for the bwlch were:-

Garmin Etrex	SJ 06306 34005	Accuracy 5m	Height = 638m
Garmin Map60CSx	SJ 06307 34005	Accuracy 3m	Height = 637m
Magellan Explorist 100	SJ 06304 34005	Accuracy 5m	Height = 637m
Mean of three readings	SJ 06306 34005		Height = 637m

### **3.3) Angle Measurement and Height difference from Bwlch to Summit**

Using the Abney levels, we measured the angle from the bwlch to the summit position. The same angle was recorded on both instruments.

Elevation angle from bwlch to summit = 5.5 degrees

Distance from bwlch to summit =  $\text{SQRT}((06306-06195)^2 + (34077-34005)^2) = 132\text{m}$

**Height from bwlch to summit =  $132 \times \tan(5.5) = 12.7\text{m}$**

### **4) Discussion of Errors**

We believe the largest error in this survey to be in the measurement of the angle of elevation of the bwlch to the summit. Although we measured it to be 5.5 degrees on two separate instruments, we estimate the angle limits to be 5.0 and 6.0 degrees. Feeding these angles into the height calculation gives the ascent from bwlch to summit as lying between 11.4 to 13.7m.

The height difference as calculated from the mean of the GPS measurement is 13.7m.

### **6) Summary and Conclusions**

The measurements taken in this survey are not accurate enough to be taken as definitive. However, they confirm Myrddyn's previous survey that there is unlikely to be 15m of ascent from bwlch to summit on Carnedd y Ci.

The hill will be line surveyed subsequently under better weather conditions.

John Barnard, Graham Jackson and Myrddyn Phillips, 16 December 2007.