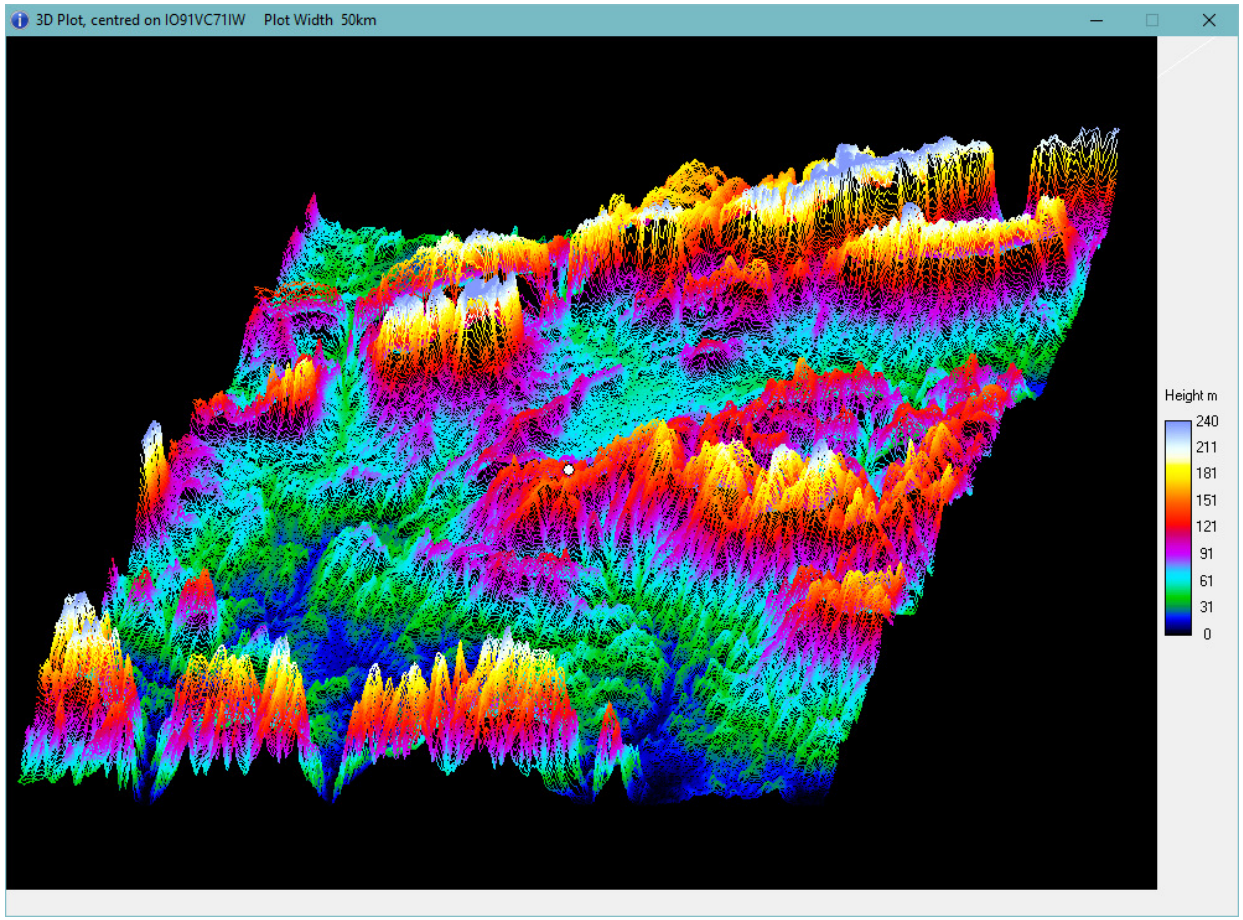
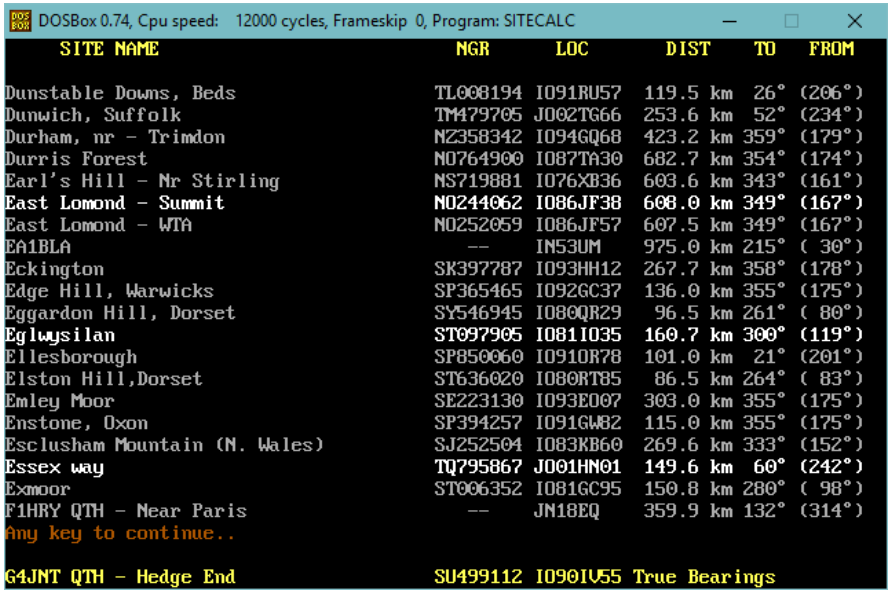
Sites, Heights and Locators
Andy Talbot G4JNT

A suite of programmes for converting Lat/Long, Locators, NGRs, all with Site database lookup; calculating distance and bearing and looking at terrain and heights and profile plots



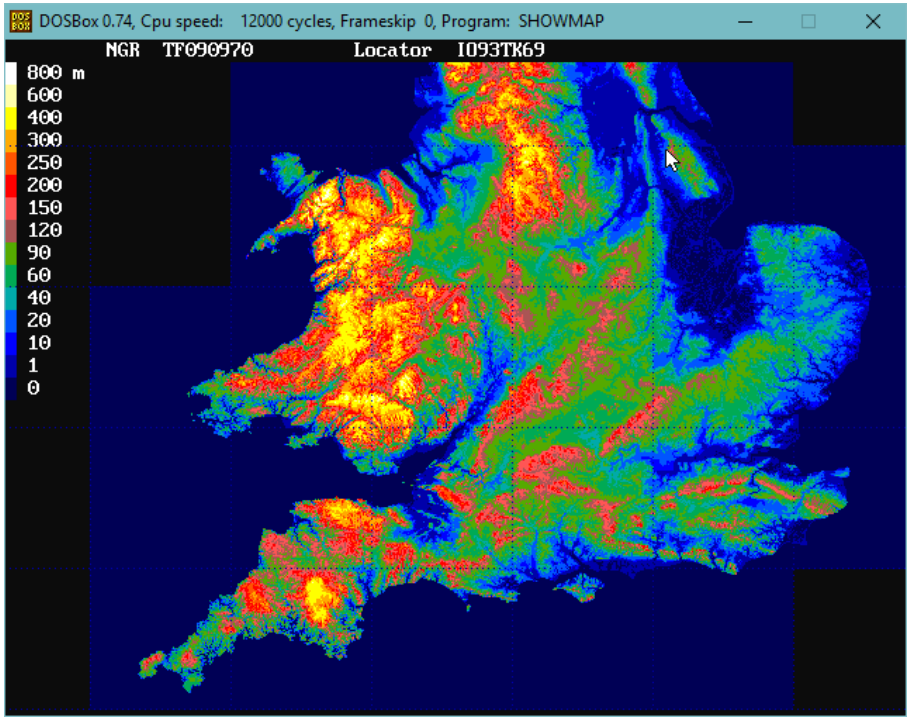
µWave Bearing and Distance - A Bit of History

- 1980s - 90s Sites Database put together by G3YGF, G4ELM, G3PHO and others. BBC Basic (?)
- Distance and Bearing Calculations
  - Pythagoras on NGRs – handheld calculators
  - Good enough in those days
- 1991 DOS version, included NGR-Locator conversion
  - 'Hacked' height database for the UK and wrote terrain plotting and display software. Database lookup
  - Printed output
  - Learnt a lot of programming and display techniques
  - Height database only had 500m spatial resolution and was based on NGR



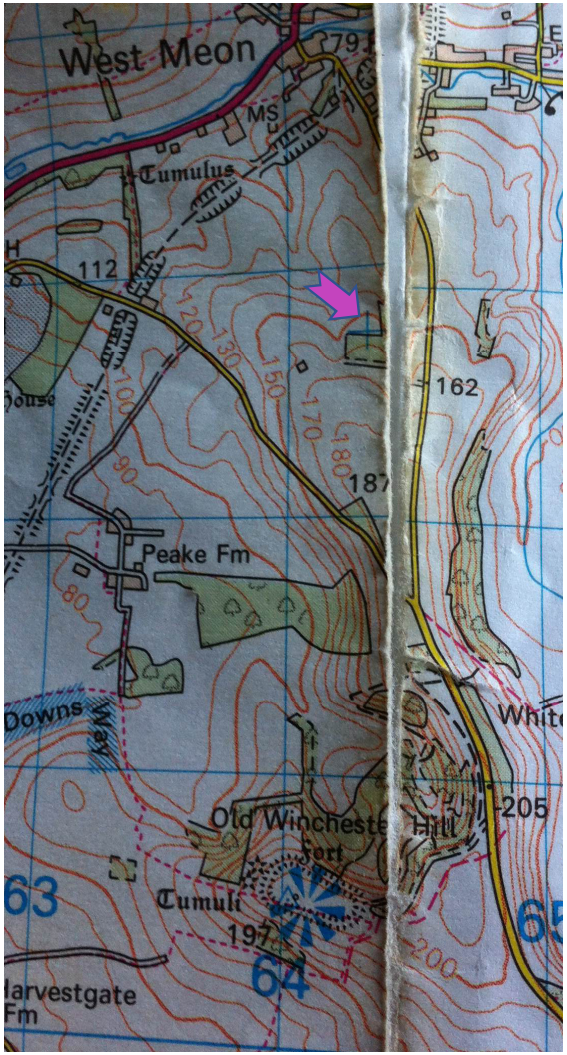
'*GEOG2*' Suite

- Popular in the 1990s, distributed on two floppy discs.
- WINDOWS made it all a bit inelegant
- Mike G0MJW developed 'Profile' with complete RF propagation tools
  - Better Height resolution, SRTM Data, 90m spatial and whole World
- From Win-7 onwards *GEOG2* needed a DOS emulator
  - Wouldn't work with higher resolution NGRs and retro mods were near-impossible, so it all got shoved to one side.
- Decade later – in an idle moment, thought I'd have a go at rewriting GEOG2 progs using SRTM data.

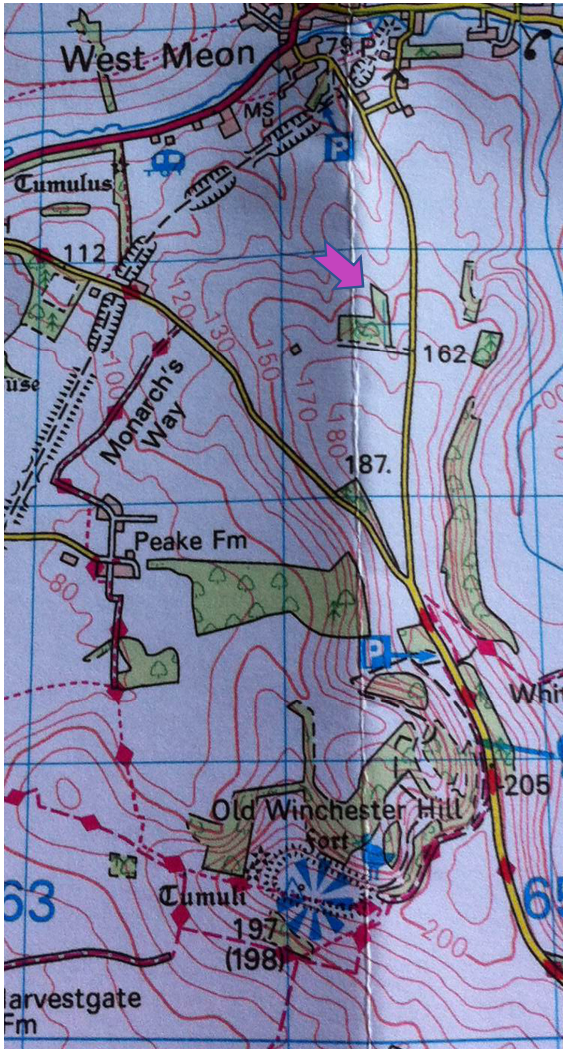


Sites.dat internal structure

- Brown Clee, Salop~SO594865
- Bulbarrow, Dorset~ST780058 Tilde ~ is the field separator
- Burbage Moor~SK275814
- Bursledon (microwave tower, M27 J7)~SU473130
- Burton Dassett, WKS~SP395523
- Bury Down~SU478840
- Bushey Heath, Herts~TQ146945
- Butser (Trig Point), Hants~SU715203~p originally had 2nd field option
- Butser Triangle~SU71051975 but not used any more
- Butts Brow~TQ578025
- Cairngorm~NJ006041
- Cairn o' Mounth~IO86RW Locator or NGRs can be used



1995 OSGB36



2016 WGS84

ONE PROBLEM!

Lat /Long in the UK has moved –

70 - 150m depending where you are

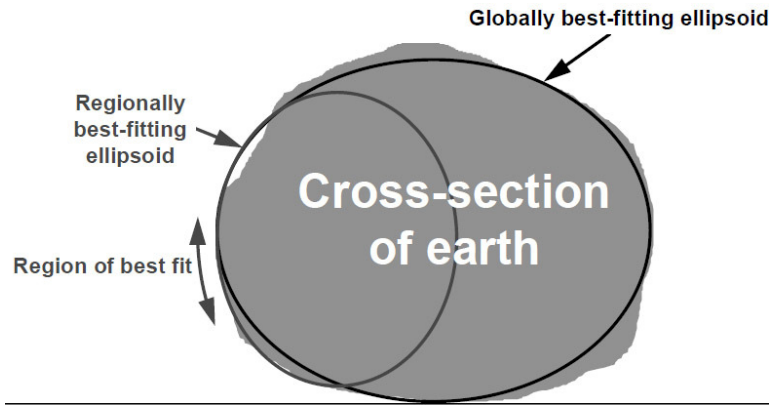
Not a lot, but enough - blame GPS

(… and it will continue to move)

Marker at 51°00’ N 1°05’ W SU6442 2269

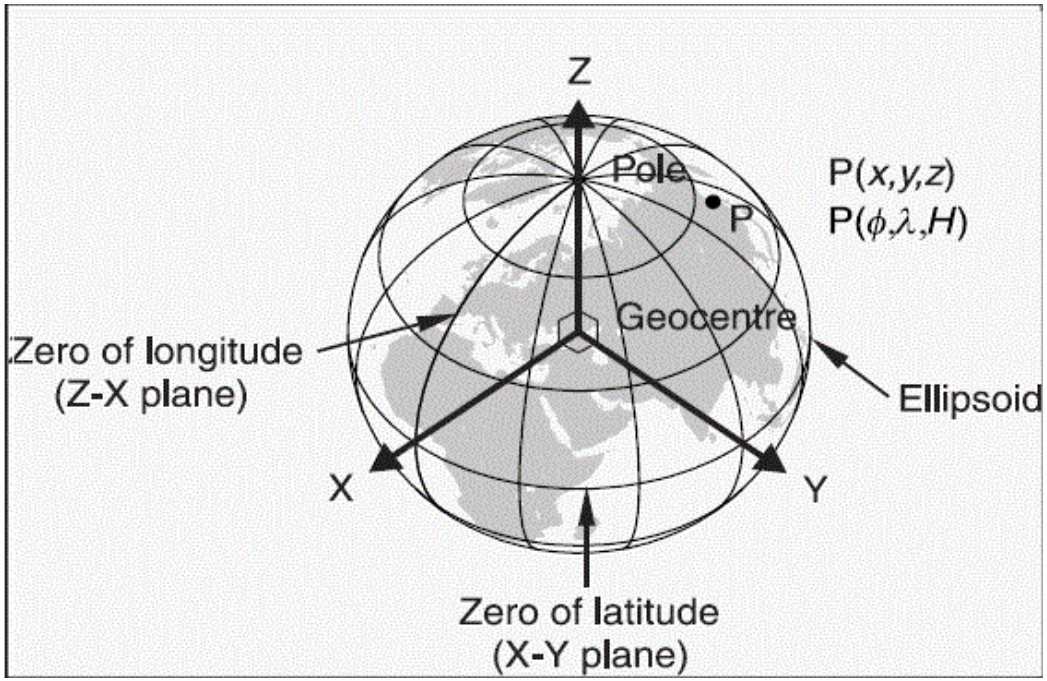
The NGR – Lat/Long Problem

- Most sites stored as NGR but SRTM data needs Lat/Long
  - Pre-GPS, the old NGR conversion used the OS mapping, OSGB36 and the Airy spheroid which locked **UK** Lat / Long to the NGR – exactly. Heights determined by levelling from Newlyn.



- Now Locators, SRTM data and all positioning use the Worldwide WGS84 mapping
- So Lat/Long is slightly different for the two systems – typically around 100 metres error. Different spheroids
- Not good enough for height database.

- Proper conversion is available.
- Published by Ordnance Survey
- G0MJW used it in *Profile*
  - NGR / WGS84 Lat Long conversion accurate to 3m
  - Converts L/L in one spheroid to Cartesian coordinates; then back again into the other.



..\geog\SpheroidConversion.EXE

An Aside .....

The ellipsoid used in the OSGB36 datum is that defined by Sir George Airy in 1830 (later Astronomer Royal. It is not geocentric but is designed to lie close to the Geoid beneath the British Isles. Hence only a tiny fraction of the surface of the ellipsoid has ever been used – the part lying beneath Britain. The rest is not useful. So, the Airy ellipsoid differs from[the worldwide one] in size, shape, position and orientation, and this is generally true of any pair of geodetic ellipsoids.

Before the 1950s, the coordinate system contained many angle measurements but very few distance measurements. This is because angles could be measured relatively easily between hilltop primary control stations with a theodolite, but distance measurement was very difficult. A consequence of this was that the shape of the Terrestrial Reference Frame was well known, but its size (scale) was poorly known. The distance between primary control stations was established by measuring just one or two such distances, then propagating these through the network of angles by trigonometry (hence the name 'trig pillars').

When the OSGB36 triangulation TRF was established, no new distance measurements were used. Instead, the overall size of the network was made to agree with that of the old 18th century Principal Triangulation using the old coordinates of the 11 control stations. Hence the overall scale of the TRF still used for British mapping came to be derived from the measurement of a single distance between two stations on Hounslow Heath in 1784 using eighteen-foot glass rods! The error thus incurred in OSGB36 is surprisingly low – only about 20 metres in the length of the country (which is approx. 20ppm).

High Resolution and Calibration

- 8 Char Loc. Like IO90IV58 came to microwaving in 1990's – needed sometimes for accurate bearing calcs. About 400m accuracy
- GPS came along and we now routinely refer to 10 char locs
  - Eg IO90IV58AK , accurate to about 20m
- 10m and 1m NGR SU49901254 or SU49902 125376 *(The space helps)*
- GPS on smartphones, typically 5 metre accuracy (with good sat view)
  - Check with Trig points. List available from OS as a CSV file
  - 60000 spots, but quite a lot lost or destroyed
  - Check on Google Earth image
  - Result can be impressive! *Especially if you carry a list of trig points and demo to others*

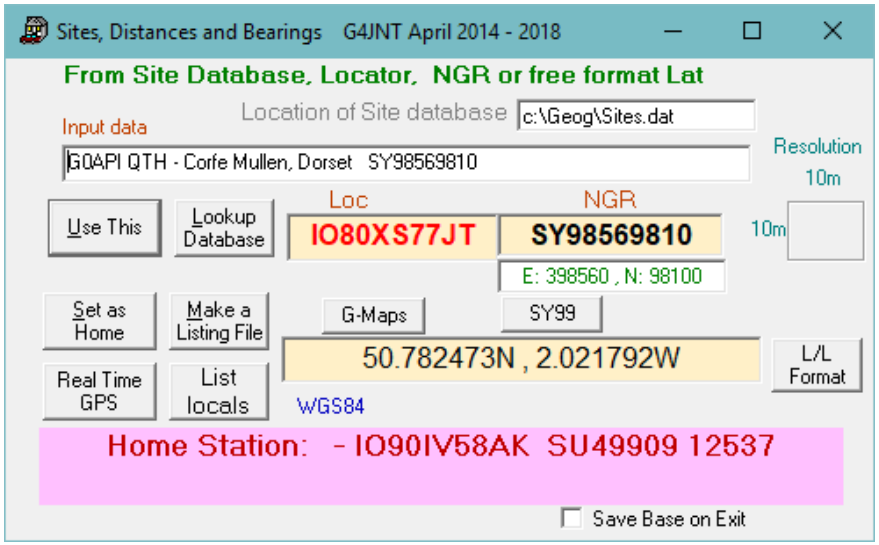
Prog to read OS Database

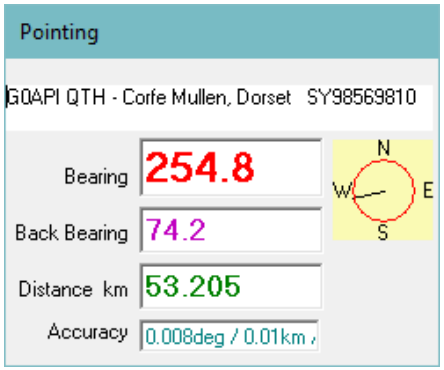
- LOCAL OS BENCHMARKS
- Base NGR SU499126 Max Distance 5.0 km (and this does use Pythagoras !)

4.7 km	Allington Railway Bridge	SU47757 16734	0m	BOLT	
4.7 km	Bitterne Ch Sp	SU45204 12925	0m	SPIRE	
2.6 km	Braxells Farm	SU50566 15095	0m	BURIED BLK	
2.9 km	Dumbleton`S Towers	SU47075 11895	0m	DISC	
1.3 km	Hedge End Ch Sp	SU48658 12384	0m	SPIRE	
3.0 km	Hightown Towers	SU47095 11601	0m	DISC	
0.9 km	Kings Copse	SU49965 11690	0m	BURIED BLK	
3.1 km	Lydgate Road Flats	SU46920 11753	0m	RIVET	
2.5 km	Netley Common	SU47572 11770	72m	BURIED BLK	Replaces pillar 05/86
2.5 km	Netley Common	SU47572 11770	72m	PILLAR	Replaced by buried block 05/86
3.9 km	Sarisbury Ch Twr	SU50246 08702	0m	BOLT	
3.9 km	Sarisbury Ch Twr	SU50245 08702	0m	FLAGSTAFF	

SITECALCWin

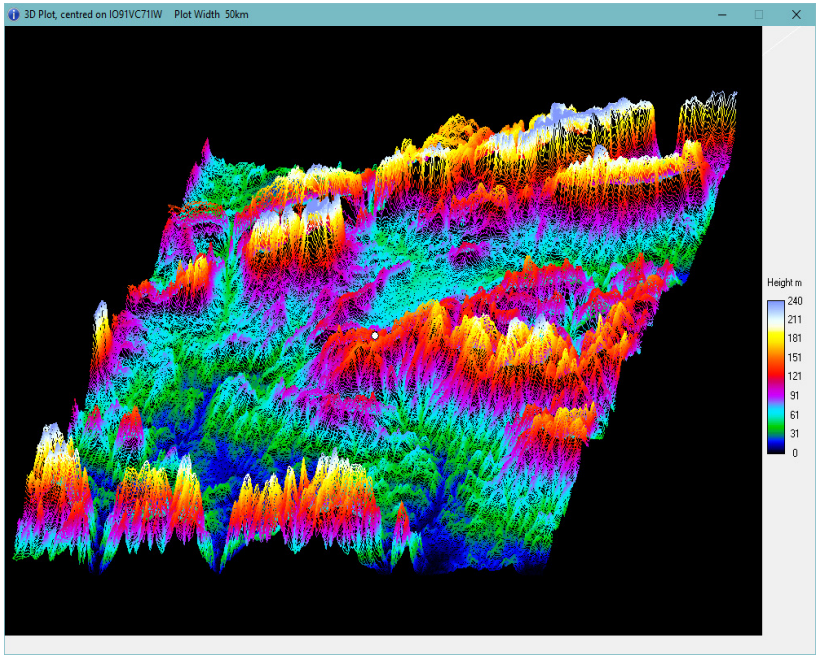
- Proper Windows version of the old DOS *Calcsite* prog. Written some time ago (2006 or thereabouts) in VB6
- Conversion for Lat/Long, Locator and NGR, distance / bearing calc
- Site database lookup or location format recognised automatically
  - But no height information and, until recently, had the OSGB36 error
  - Single button link to Google Earth (via Internet)
  - GPS NMEA Input on RS232 – GPRMC sentence
- Writing in VB6 is tedious, and a bit flaky on Win-7 .
- Latest stuff used PB Console Compiler – which is Windows compatible, but NOT Windows software – so no GUI. *..\geog\SiteCalcWin.exe*





GEOGWin

- Adapting the old progs (conversion from 16 bit DOS to Windows-compatible Powerbasic)
  - ProfileJ
  - Localmap2
  - ViewWin
  - 3DMapWin
  - HorizonPlot
  - Sites_Heights (text only)
  - NearestTrig (" ")
  - Less mouse readout support than true Windows – but sufficient.
  - *..\geog\LocalMap2.EXE* *..\geog\ViewWin.EXE* *..\geog\ProfileJ.EXE* *..\geog\HorizonPlot.EXE* *..\geog\3DMAPwin.EXE*



http://www.g4jnt.com/GeogWinSoftware.pdf