Centre for Ecology and Hydrology

Integrated Hydrological Digital Terrain Model (IHDTM)

Data Description

The IHDTM consists of five square grids of data: surface type, ground elevation, outflow direction, inflow pattern and cumulative catchment area. Grid interval is 50 m, with grid points lying on integer multiples of 50. This gives 400 grid points per square km.

Figure 1 shows the location of the grid points in a kilometre square.

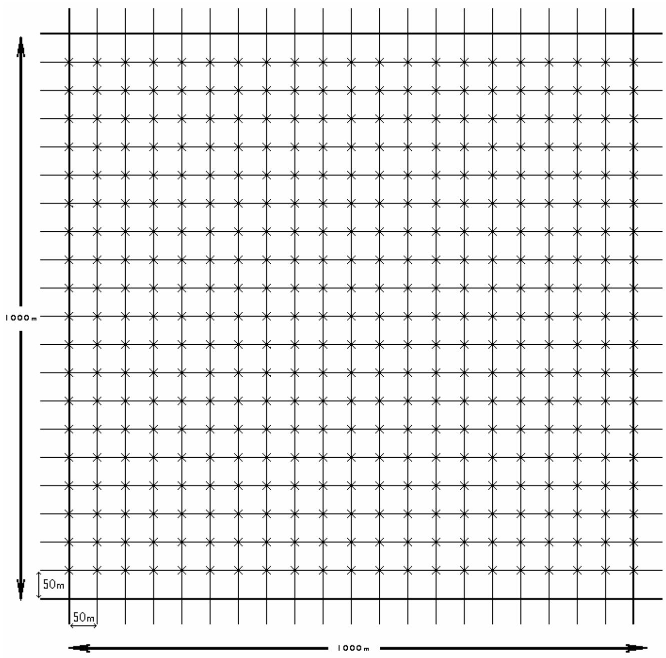

Figure 1 *Location of grid points in a 1 km square*

Note that the 400 points for the square only extend 950 m in each direction, as the column at 1000 m is the first column of the next square east and the row at 1000 m is the first of the next square N.

The data types will now be described, using as an example the 1 km × 1 km square of SW corner 299000, 507000 on the Cumbrian coast.

Figure 2 displays the vector data (from OS 1:50000 maps) from which the IHDTM was generated. Slight discrepancies between the rivers and contours are due to them having been digitised on different occasions and (in the case of north west NRA region only) the rivers being taken from the 1st series maps. As the following example shows, such small discrepancies are overcome by the IHDTM generation process.

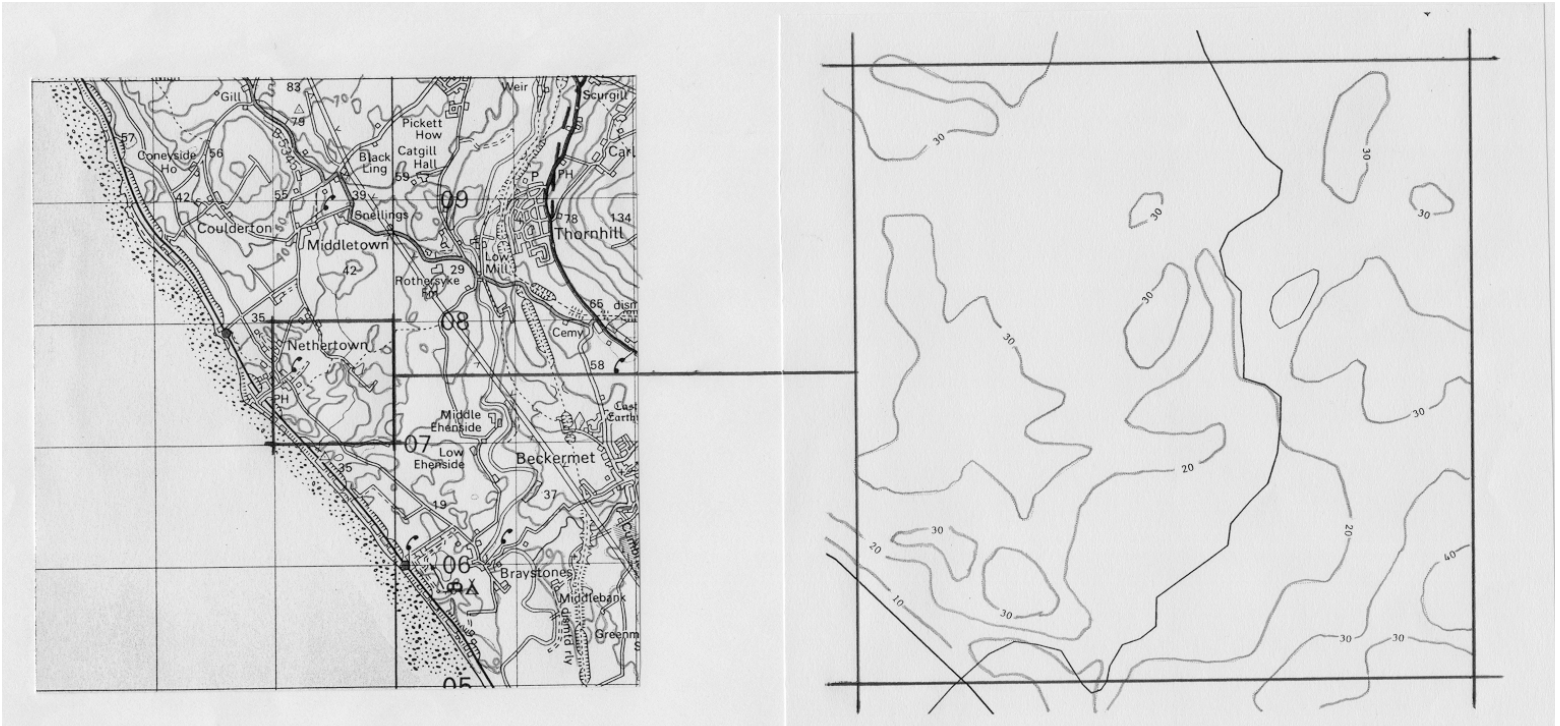

Figure 2 *OS Source map (1:50000 Landranger) and digital vector data (Crown Copyright)*
[N.B. for this region, rivers have been digitised from 1:50000 1st series maps]

Surface type data

Figure 3 displays the surface type data. This is coded as:

-1	undefined
0	sea
1	intertidal
2	land
3	lake
4	river

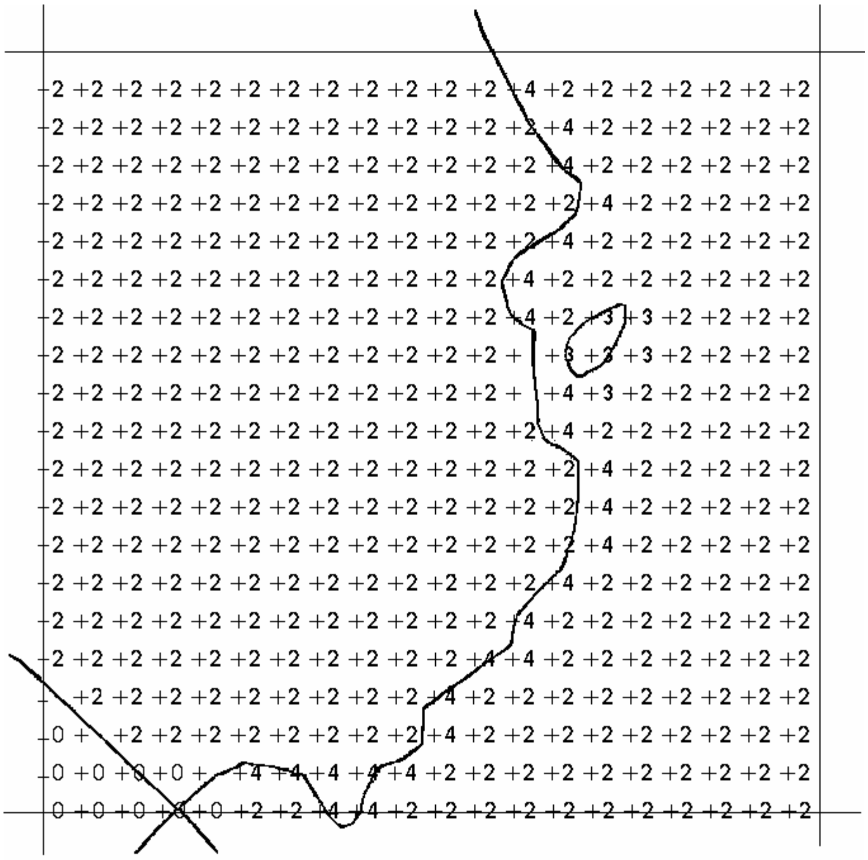

Figure 3 *Surface type grid*

Currently, type 1 (intertidal) is not in use because only the high water mark has been digitised, so intertidal areas are coded as sea. Note that surface type is defined not as the surface type at the grid point, but as the most significant type existing in the 50 m square centred on the grid point, where the types rated in increasing order of significance are: land, river, lake, intertidal, sea. This avoids the fragmentation of important hydrological features such as narrow estuaries and lakes and ensures that rivers are represented as a continuous sequence. It has the disadvantage of exaggerating slightly the area of lake and sea and can cause the loss of narrow coastal features (improvements are being planned which will minimise this effect).

Elevation data

Figure 4 displays the elevation data for the square in units of 100 mm. Note that sea is coded as -1000 (but is displayed as 'sea'). The path of the river may be discerned as a distinct low point within any cross section through the valley.

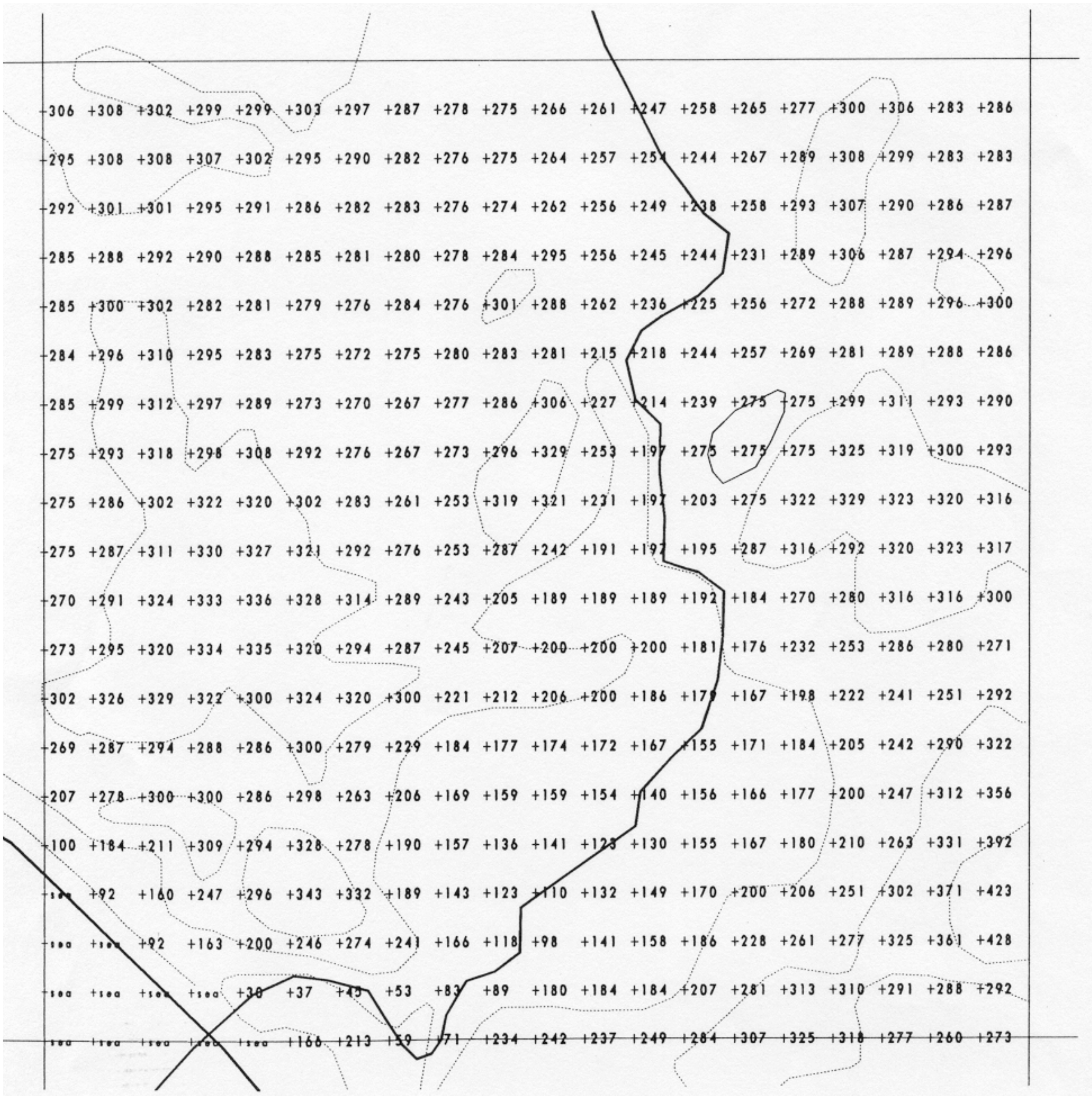

Figure 4 *Elevation grid (m/10)*

Outflow drainage direction data

Figure 5 displays the outflow data for the square. This is defined for each point according to

7	8	9
4	·	6
1	2	3

Sea is coded as -2, (but is displayed as 'sea').

Values greater than 10 are used for special cases, but in all cases the direction is represented in the same way by the final digit, e.g. 2, 12, 22, 32 etc. all represent southerly flow. Values 11 to 19 indicate uphill flow (necessary to maintain a continuous network where depressions exist in the height grid); note that where these exist in this example – two values of 14 in the south west – they are due to the fact that no grid points are located in the floor of the valley leading from these points. Values 21 to 29 indicate lakes, 31 to 39 rivers.

(Codes 41-49 exist in parts of Great Britain where rivers are "locked" into the DTM, notably Scotland, but some other areas too. Flow paths using these codes may not lead all the way to the sea (perhaps ending in a canal.) These codes were created for technical reasons to avoid circular flow paths. Such flow path may be fragmented or incomplete. It is intended to remove them in future development/ maintenance work.)

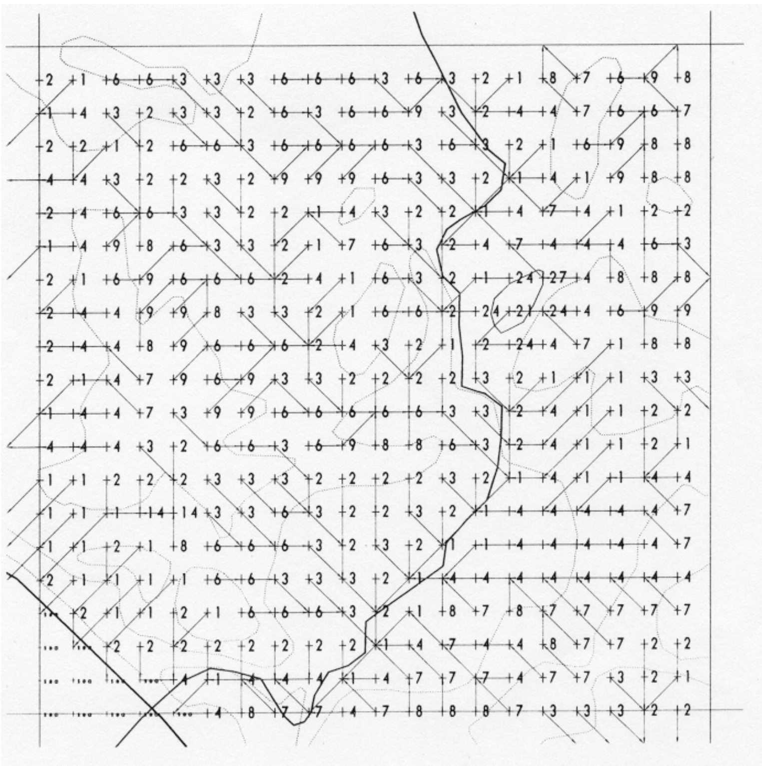

Figure 5 *Outflow direction grid*

Inflow drainage pattern data

Figure 6 displays the inflow pattern data for the square. It has been obtained directly from the outflow data and is stored in order to accelerate some applications, in particular catchment boundary definition. It has been calculated by summing for each point those numbers from the sequence 1, 2, 4 … 128 according to the existence of inward draining neighbours as shown below.

.32	.64	.128
.8	⊙	.16
.1	.2	.4

Values 0 to 254 cover all possible combinations. (It is not possible for all eight neighbours to be inflowing)

e.g. Inflow code = 2
(the other seven neighbours flow elsewhere)

⊙
↑
2

e.g. Inflow code = 136
(the other six neighbours flow elsewhere)

128
·
↙
8 · →⊙

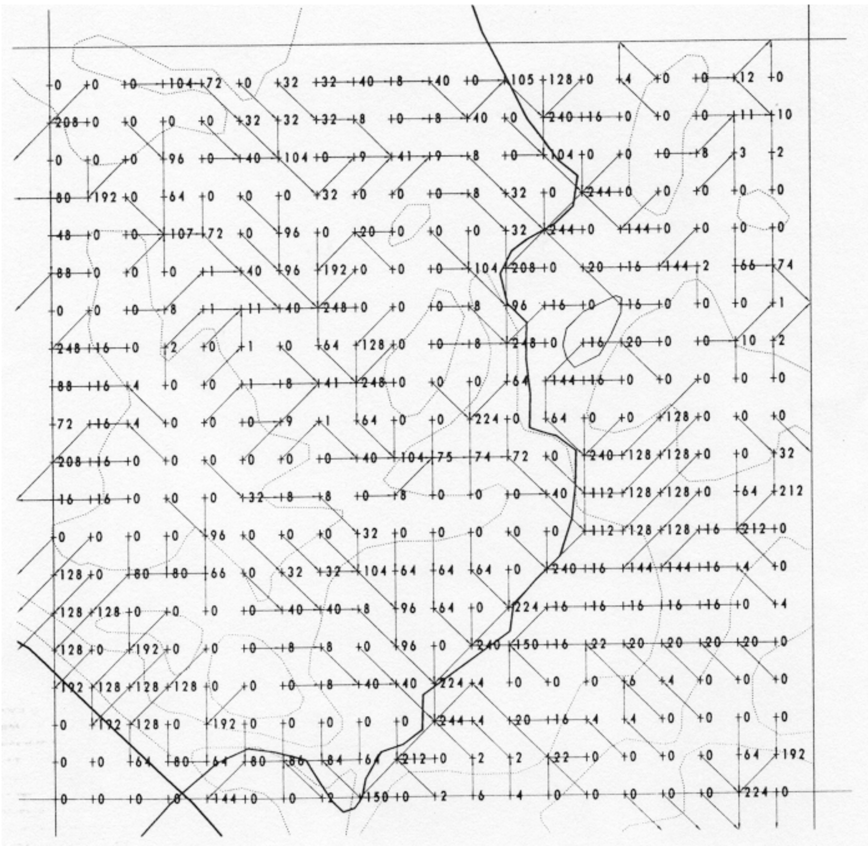

Figure 6 *Inflow pattern grid*

Cumulative catchment area data

Figure 7 displays the cumulative catchment area data for the square. Each number indicates the number of grid points draining through the point (including the point itself). Thus a value of 1 indicates a source and a value of 400 indicates a catchment of 1 km^2. Sea points are coded as -99999999 (but are displayed as 'sea'), except for those receiving outflow from the land which are coded as 0-A where A is the inflowing area.

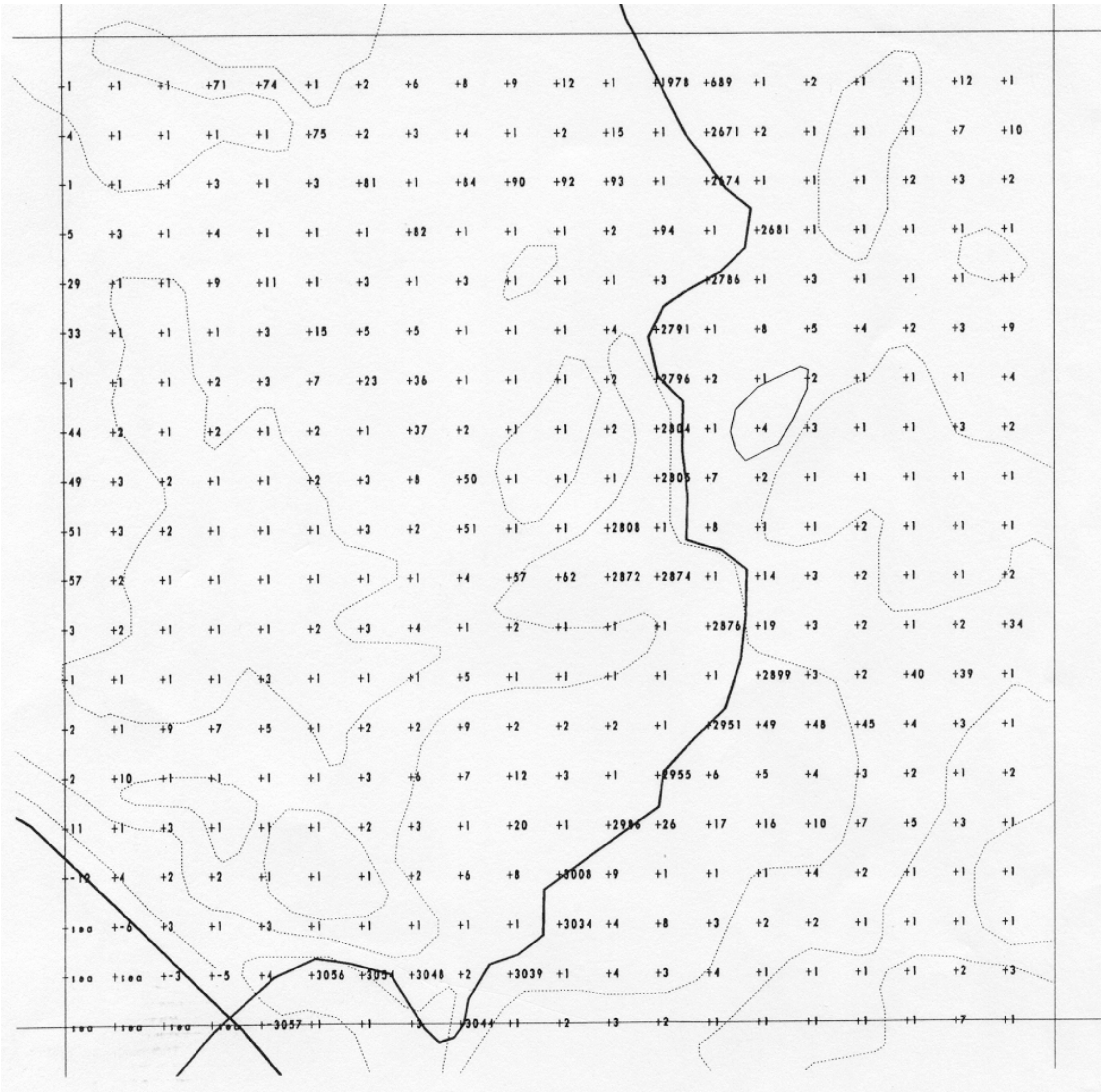

Figure 7 *Cumulative catchment area grid (km^2/400)*