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GEOSCIENCE INDEX SYSTEM (version 3.0)

USER GUIDE

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Geoscience index system (v3.0) - User guide

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Summary

The BGS Directorate commissioned the geoscience index as a computer system to improve access to BGS data. It is part of a move to open systems, as recommended by an NCS Visiting Group, and uses a Geographic Information System (Arc/Info) - a fast growing area of NERC computing. The programs were written in Arc Macro Language by K A M Adlam and J R Gibson. The index is still developing rapidly.

The index datasets represent many man-years of effort within many Divisions of BGS. Although limited and incomplete, they include, for Great Britain and the surrounding continental shelf: published and unpublished maps, reports, records, samples, boreholes, and geochemical and geophysical data.

The system is designed for geographically-referenced geoscience data, where the main links between datasets are spatial, and searches are for specific areas. Ease of use is essential, and this user guide does not assume a knowledge of computer methods. The user controls the operation of the index system by pointing and clicking - pointing with a screen cursor by moving a mouse, and selecting items on a map or menu by clicking a mouse button.

In order to familiarise users with the system and its capabilities, a number of guided tours are set out, listing a sequence of user actions and the expected results. They show how areas and data can be selected, and displayed as maps. The maps can be searched and queried interactively, to retrieve information from an associated Oracle database. Retrieved data and maps can be shown on the screen or printed. In limited areas where suitable data are available, the retrieval of scanned documents is illustrated by borehole logs, and it is shown how geological maps can be displayed and related to other data, such as mine-plans and boreholes.

The system is implemented on Sun workstations, which in the regional offices stand alone, but at Keyworth and Edinburgh are linked to Sun database servers. Access is at present available only to BGS staff, through the workstation managers. Details of the menus and specifications of the workstations may be of interest to experienced users, and are listed in the user guide for reference purposes.

In the longer term, users require a comprehensive overview of information available within or from BGS. The system must be widely-available and easy to use, offering rapid and predictable response. The index should provide access to geographically-located data, scanned documents and images, and appropriate backdrops of topographic and geological maps. In-house, it should harmonise with other parts of the information system, including more detailed procedures for computer manipulation and analysis of the data. Future developments will provide better updating facilities, and extend the system to handle world-wide and local datasets, displaying them at an appropriate resolution. Distribution of index data by CDROM is being investigated.

Section 1 - Introduction

1.1 The index system

The primary purpose of the Geoscience Index System is to help users to identify and locate relevant geoscience information. At this early stage of development, the datasets are limited and incomplete, and the system itself is evolving rapidly. It is currently available only to BGS staff.

The index system is a computer system, intended to be easy to use and suitable for occasional and unskilled users, as well as those who routinely answer enquiries. This user guide is intended as a basic introduction, suitable for potential users who may be unfamiliar with computers.

Most geoscience data are geographically referenced, the main links between most datasets are spatial, and searches are generally for a specific area. The system is therefore implemented on a Geographic Information System (Arc/Info) linked to a relational database management system (Oracle). Data are displayed on maps on the screen. The maps can be compiled and the data searched interactively by pointing and clicking at locations on the map and items on menus.

1.2 Indexes available for Great Britain (July 1993)

- Index of boreholes in England and Wales and non-confidential boreholes in Scotland
- Topographic backdrop from Ordnance Survey and Bartholomew's 1:250 000 maps
- Outlines of BGS maps at 1:50 000 and 1:10 000 scale and County Series
- Chronostratigraphic boundaries and areas from BGS 1:250 000 maps
- Geochemical sample locations on land
- BGS offshore samples and geophysical tracks
- Aeromagnetic and gravity data recording stations
- Land Survey records
 - including pallet and borehole samples and waste sites in England and Wales, and site investigations and thin sections in Scotland.

Some limited areas have more detailed Ordnance Survey topography, geological map data, mine plans and scanned borehole logs. Other digital index datasets and a new topographic backdrop are in preparation, and will be added in due course.

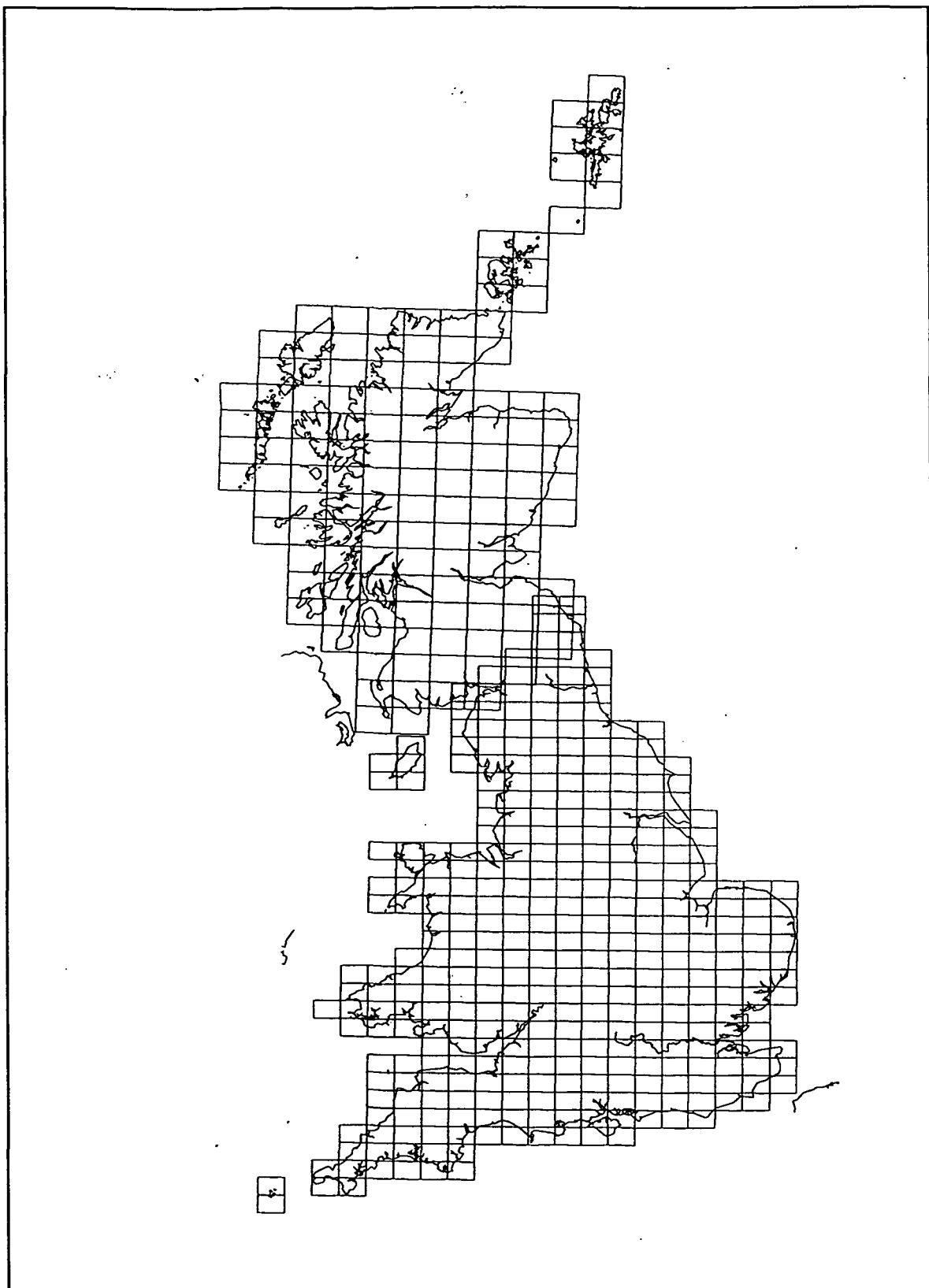


Figure 1: Locations of British 1:50 000 and 1 63 360 geological maps published by BGS, as held in the geoscience index in July 1993.

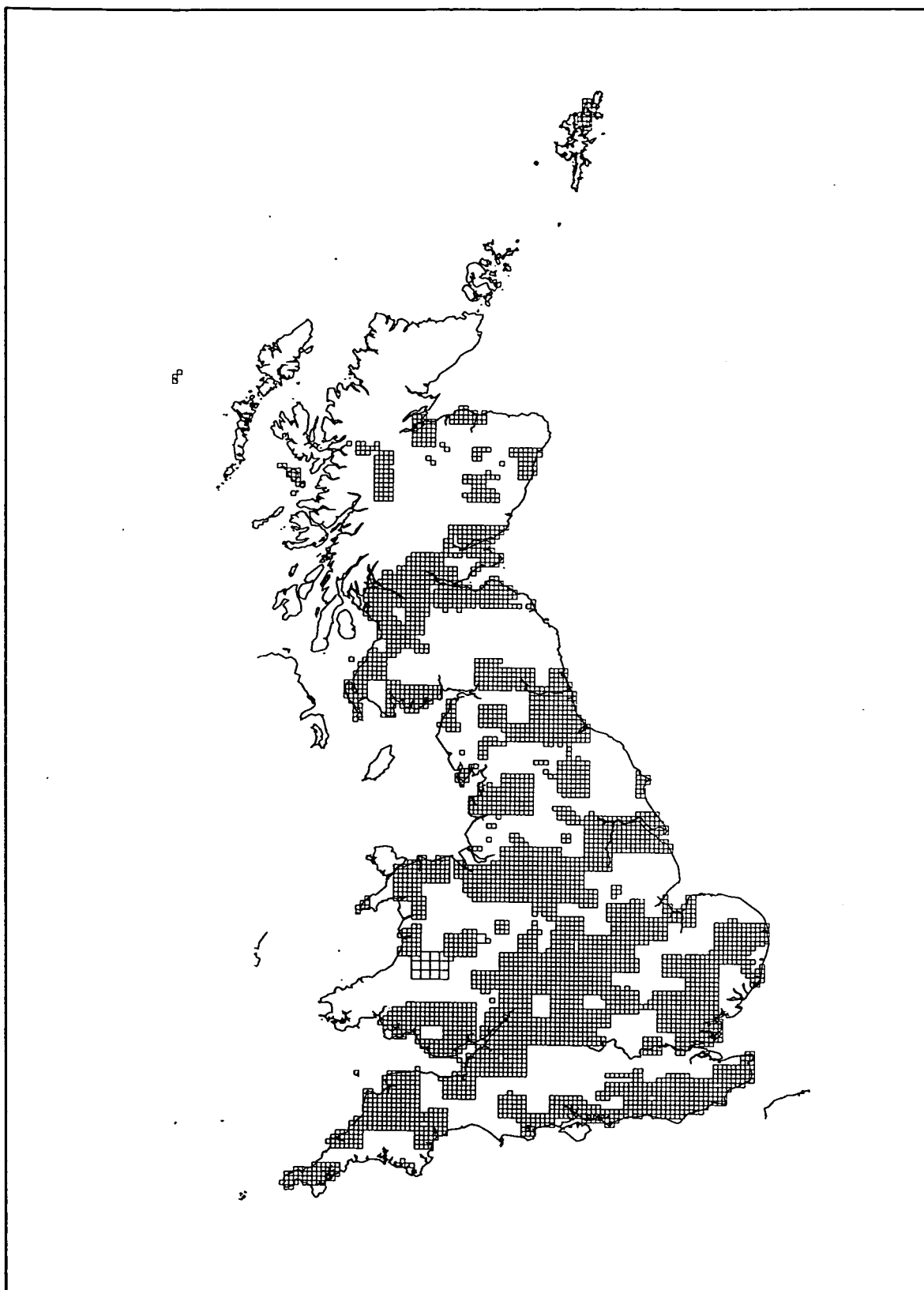


Figure 2: Locations of British 1:10 000 and 1:10 560 National Grid Series geological maps prepared by BGS, and available to the public, as held in the geoscience index in July 1993.

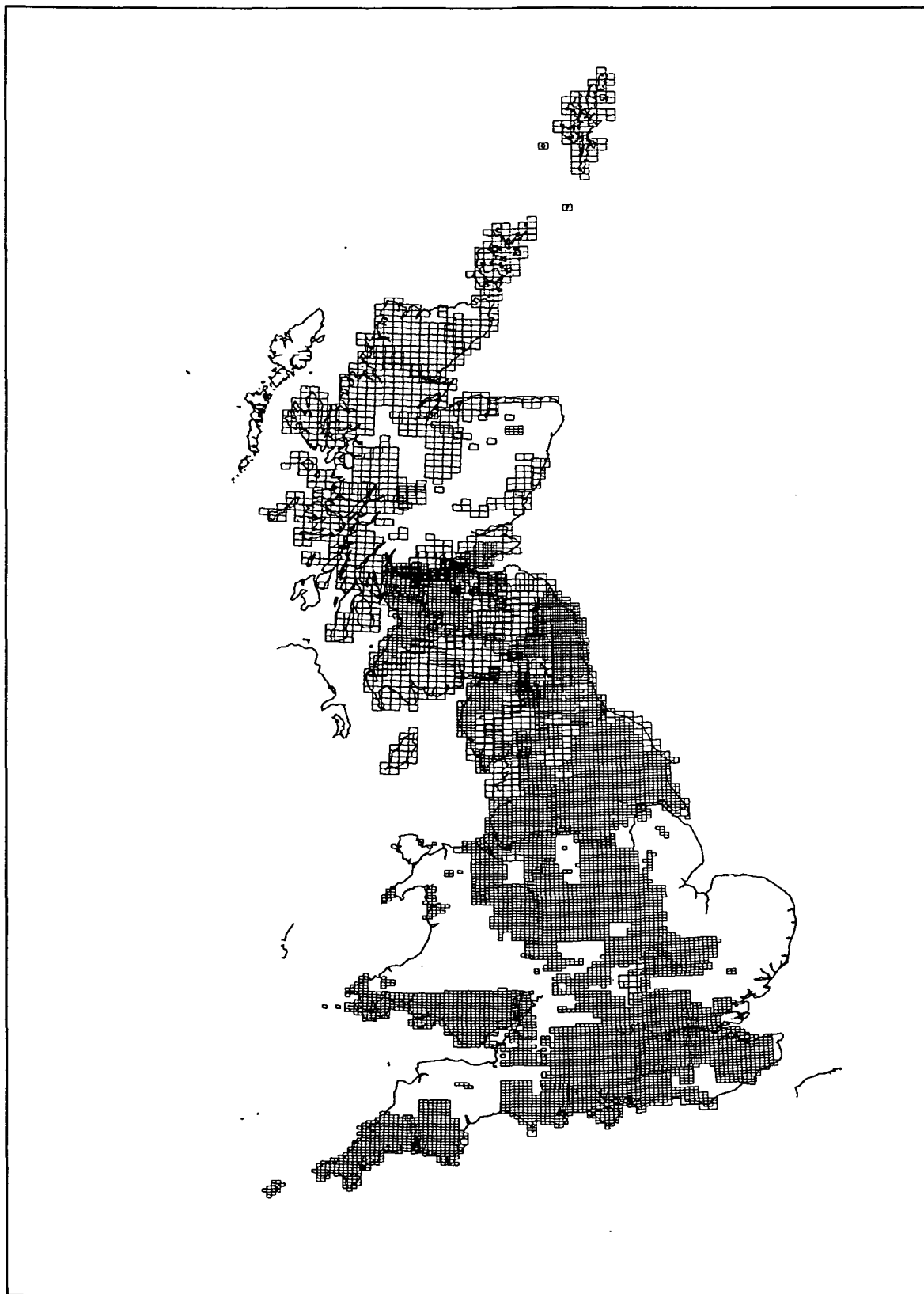


Figure 3: Locations of British 1:10 560 County Series geological maps prepared by BGS, and available to the public, as held in the geoscience index in July 1993.



Figure 4: Locations of the BGS geochemical analyses of stream sediments held in the geoscience index in July 1993.



Figure 5: Locations of the BGS offshore track data held in the geoscience index in July 1993.

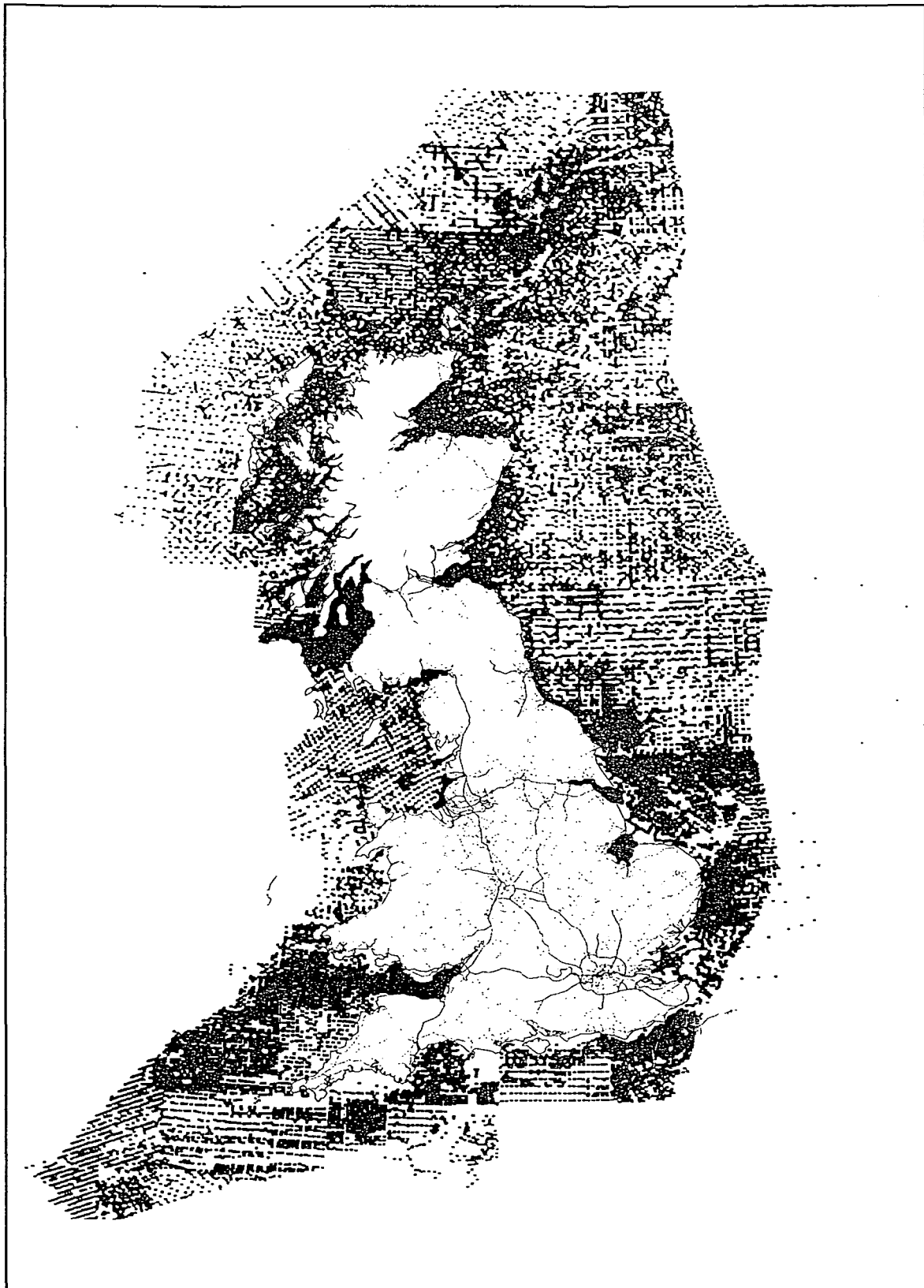


Figure 6: Locations of the BGS offshore sample data held in the geoscience index in July 1993.

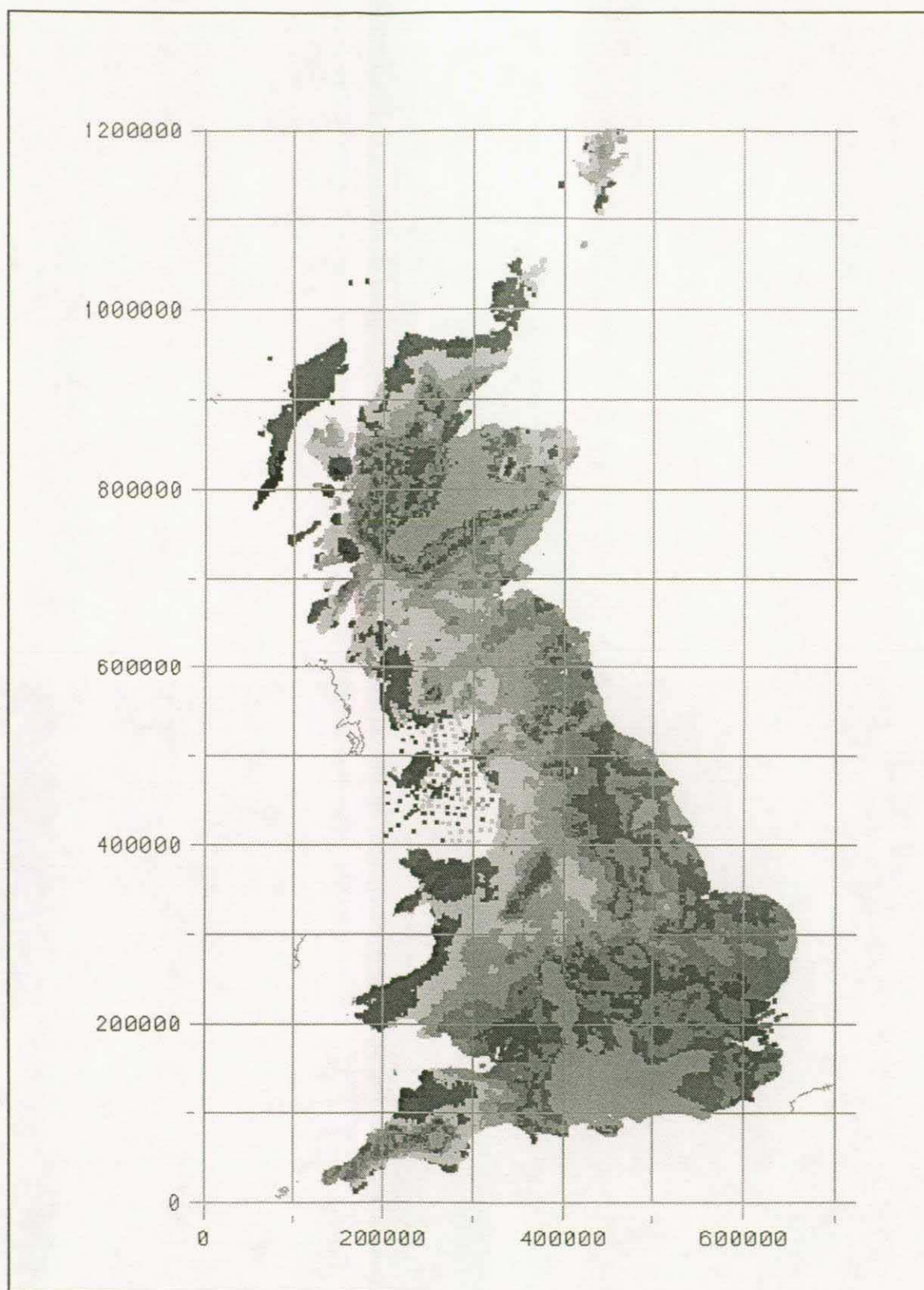


Figure 7: Areas where the locations of BGS gravity measurements are held in the geoscience index in July 1993.

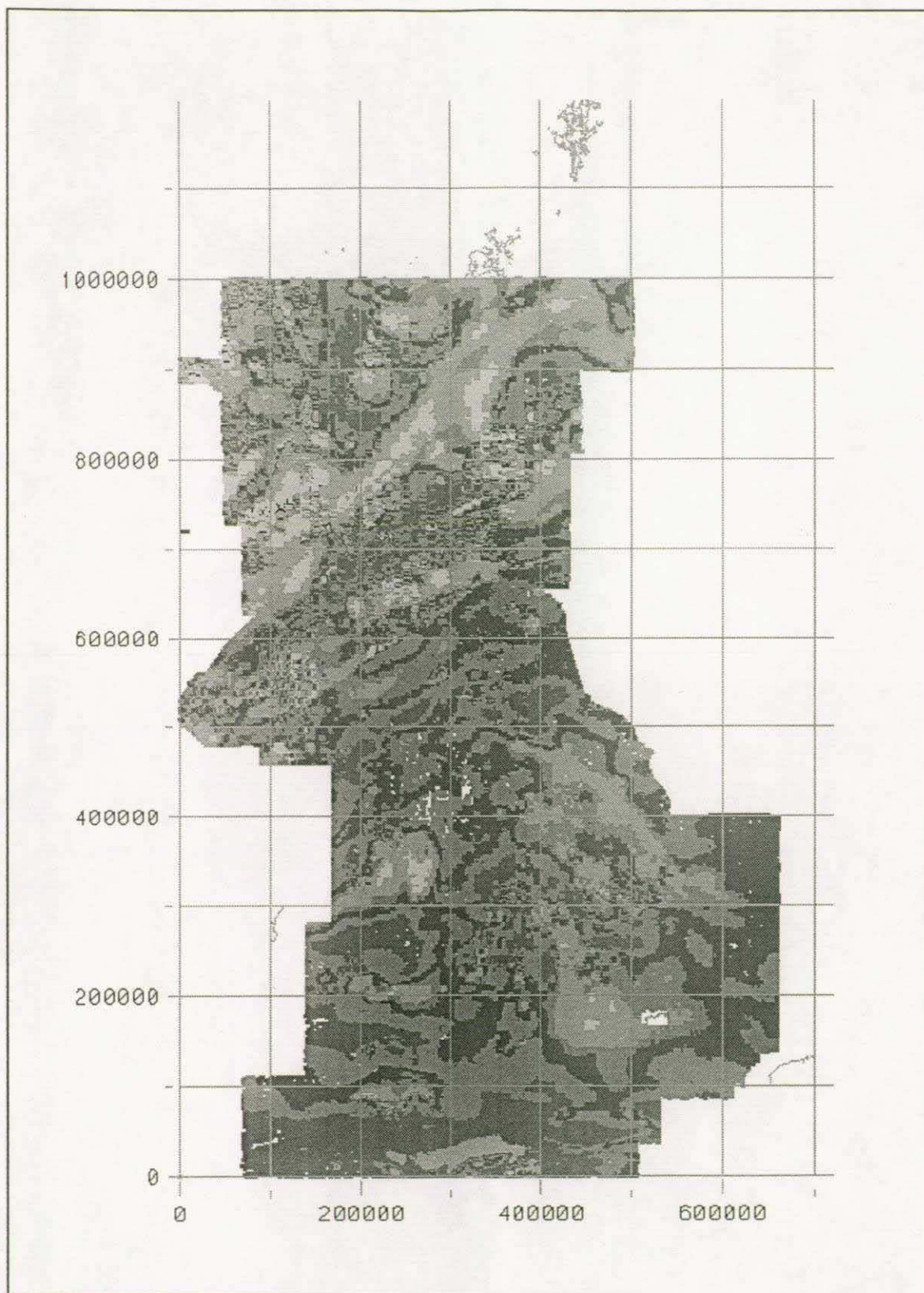


Figure 8: Areas where the locations of BGS aeromagnetic measurements are held in the geoscience index in July 1993.



Figure 9: Areas where borehole locations are held in the geoscience index in July 1993.

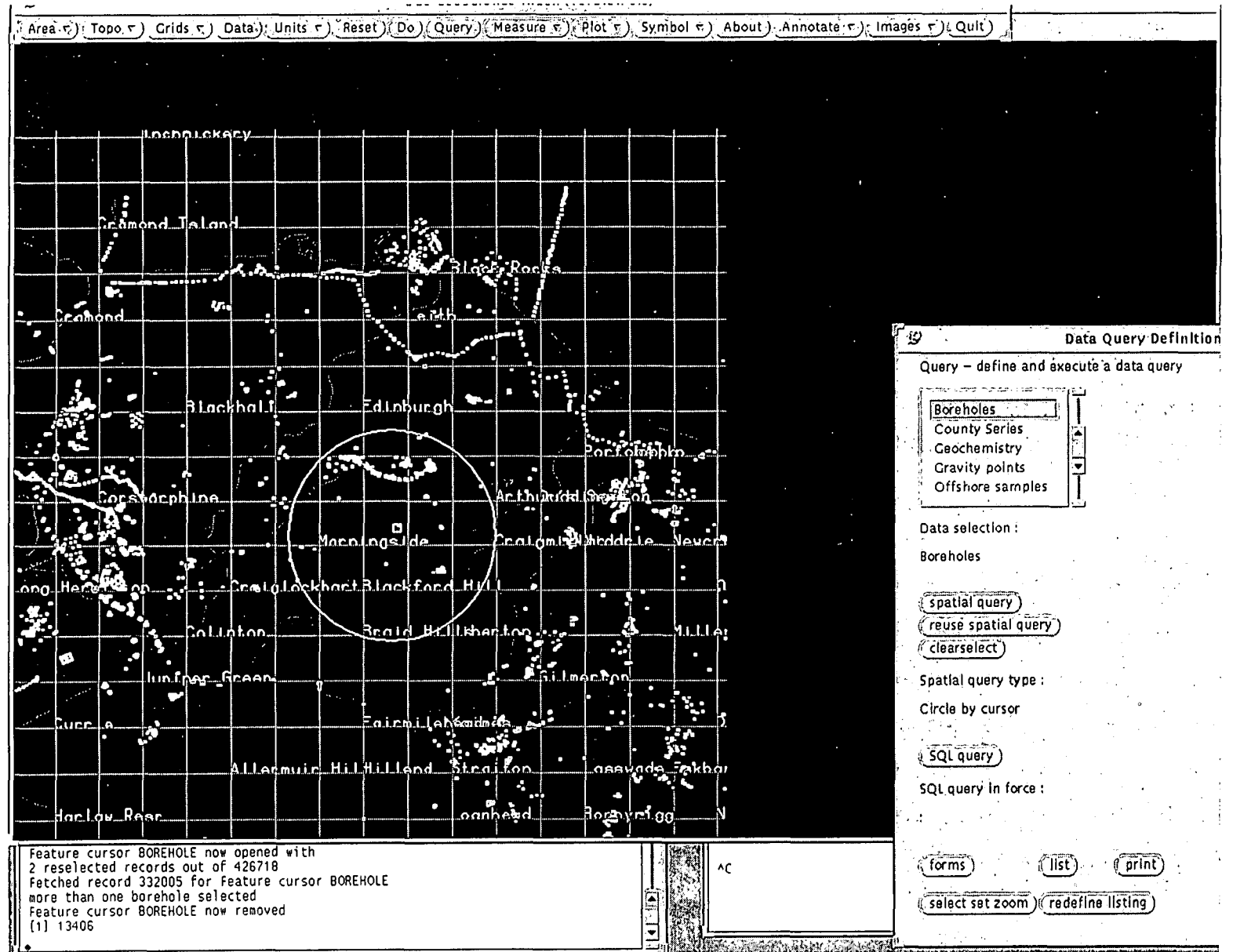


Figure 10: A geoscience index screen showing the location of some boreholes in the Edinburgh area, within a graphic window. Note the main menu bar across the top of the screen, the query window on the right, and the dialogue window at lower left.

1.3 Using the index

The index can be used to browse through the datasets known to the system. On selecting an item in the main menu bar (see figure 10), a detailed menu is displayed. The user specifies the area and topics of interest, by selecting from the Area and Data menus. The system displays an appropriate basemap on which is shown the location and distribution of data. Reselecting from the same menus enables the user to zoom, pan, and change the area and topics displayed.

The index can then be queried, by selecting from the Query menu. A summary of the contents of most datasets is available from the About menu. Individual data items, or those within a selected area, can be chosen through the Query options, and their attributes shown on screen or printed. Further selection can be made on the basis of the attributes, for example, boreholes with total depth over 50m might be retrieved. From the Measure menu, the location of a point in National Grid Coordinates (or latitude and longitude if selected in Units), the length of a line, or the area of a polygon can be determined.

The user can use default options to display the selected information. These will be adequate for many purposes, but alternatives are available. The Topo menu is a means of selecting topographic features to provide adequate background but avoid clutter. Grids overlays an annotated grid of the user's choice. The Symbol menu provides a choice of symbols for point data, and a means of choosing the colours for the background and foreground of the basemap. Annotate contains procedures for annotating data, for example, labelling maps or indicating the total depth of boreholes. Reports can be prepared from data selected by querying, and maps of the data can be printed, using the Plot menu. The Query menu also contains options for printing and plotting selected data. Images gives a choice of displaying scanned images of borehole logs on screen or on paper, for the few boreholes where images are available.

1.4 Familiarisation with the system

In order to appreciate the features of a new system, it may be helpful to watch a formal demonstration. Thereafter, it is advisable to take a predetermined route through the main aspects, before experimenting with variations on known themes. Unstructured experimentation is feasible, but probably inefficient.

Section 2 of the User Guide describes how to access the system, and how to terminate a session. Section 3 describes a set of "guided tours", which can be demonstrated or followed for self-instruction. Section 4 provides a summary of the functions available in the menus. Detailed specifications are available for reference in section 5. Your workstation manager (section 1.5) may be able to help with any difficulties.

1.5 Workstation managers

The geoscience index workstations are located where possible at information points where they are readily available within a group, or in the libraries where they are available to BGS staff generally. Locations and workstation managers are as follows:

Sparcstation 2: F106, Keyworth (Keith Adlam) development machine
F110, Keyworth (John Gibson) development machine. One of these machines can be made available for brief demonstrations elsewhere as a stand-alone device.

Sun IPX: Records (Rod Bowie, Jenny Parnham)
London Information Office (Sylvia Brackell)
Newcastle (Dave Lawrence)
Exeter (Ted Freshney)
Aberystwyth (Derek Woodhall)
Wallingford (Andrew McKenzie)

Sun IPC: Keyworth:
Library, Keyworth (Joan Bird, Jennifer Anderson)
Reception area (Ivan Page)
Regional Geophysics Terminal Room (Konrad Dabek)
H220 Coastal Studies Terminal Room (Tony Crosby)
P006 Geochemistry Terminal Room (Phil Green)
A107 TMOS Land Survey (Jenny Walsby)
B006 TMOS Tectonics (Andy Hulbert)

Edinburgh, Murchison House:
1/7 Marine Operations (Colin Graham)
2/33 Information Systems (Graham Neilson)
3/ Library (Bob McIntosh)
3/ Records enquiries (Ken Lawrie)
4/3 TMOS Terminal Room (Ken Lawrie)

1.6 Acknowledgements and disclaimers

This system is at an early stage of development. It provides only a general indication of some available data known to BGS, and must not be relied upon as a source of detailed information about specific areas.

Topographic backdrops are digital versions of the Ordnance Survey and Bartholomew's 1:250 000 scale map of Great Britain, and are not suitable for precisely locating data. The Geographic Information System is Arc/Info from ESRI. The software and the Bartholomew's data were obtained by NERC through the Combined Higher Education Software Team (CHEST) for research purposes only. The geological data are subject to NERC copyright, the topographic data to Ordnance Survey copyright or Bartholomew's copyright, and the Gazetteer to Ordnance Survey copyright.

Output from this workstation must not be sold, nor copied for commercial use.

Section 2 - How to access the index system

2.1 If you need help

Your local workstation manager (section 1.5) can arrange access to a workstation, and assist with difficulties. If you have significant problems with the system when help is not readily available, just leave and try again some other time. You are most unlikely to have caused any serious harm, but energetic attempts to repair an unfamiliar system can make matters worse. At Keyworth, Keith Adlam (ext 3118) or John Gibson (ext 3589), and at Edinburgh, Vic Loudon (ext 267) or Graham Neilson (ext 210) are available to help or to arrange demonstrations.

DO NOT ATTEMPT TO SWITCH THE WORKSTATION ON OR OFF

2.2 Getting started

If there is a main menu bar near the top of the screen, like the one near the top of the next page, point and click on *Reset*, as described on the next page.

If the screen is black, tap the keyboard space bar.

If the screen is mostly white with a text command, ask the workstation manager to log in.

If only two small windows are visible, headed *cmdtool* and with a message like *bgs_user@xxxx>* in the lower left corner of the screen, point and click in the lower left window, type *index3* and press return. Wait half a minute. Read the warning notice, point and click on its quit button.

2.3 Main menu bar

By following the earlier instructions, you should soon have the following menu bar near the top of the screen:

Area ▾ Topo ▾ Grids ▾ Data Units ▾ Reset Do Query Measure ▾ Plot ▾ Symbol ▾ About Annotate ▾ Images ▾ Quit

2.4 Point and click

The Geoscience Index System is operated largely by pointing and clicking.

Point with the cursor arrow on the screen. You do this by sliding the mouse about on its pad. You point to *windows*, the big boxes on the screen, or to *buttons*, the little boxes with commands like Do or Quit. You will also wish to point to select an item from a list of options (known as a menu), or to indicate an item or a location on a map.

The mouse has buttons too. The two used here are referred to as the LMB and RMB (Left and Right Mouse Button, sometimes labelled the Select and Menu buttons). *Click* by pressing and immediately releasing LMB. *Drag* the cursor by pressing RMB, holding it down as you move the cursor to the selected item, then releasing the button.

In the main menu bar, see above, the items marked ▾ have a sub-menu. To *select* from these items, point, hold down RMB to reveal the sub-menu, drag the cursor to the item you select, and release the button. To *select* from the other items, just point and click with LMB.

Some menus list a set of options with a scrollbar on their right. You can scroll through the options by repeatedly clicking or pressing LMB while pointing to the down or up arrow of the scrollbar. Pop-up menus, which have a pin in the top left corner, can be cleared (unpinned) by clicking on the pin.

Some operations require you to identify items or locations on a map displayed on the screen. For this, the system replaces the cursor with a pair of cross-hairs, and provides instructions in the bottom left window. To select, use the mouse to position the cross-hairs appropriately, and click with LMB.

2.5 Options

Guided tours through the system are suggested in the next section, to illustrate available features. There are many other options which you can explore, and which are largely self-explanatory, or explained on the screen in the bottom left window (the dialogue window).

2.6 Trying again

It would be surprising if you found everything you need at the first attempt. As you try new options, the computer retains your selections for topo and data. Click on *Reset* to return to the default options. *Quit* takes you out of the system. For instructions to restart, see section 2.2. To finish, see section 2.7.

2.7 Leaving the system

If you are finished, do NOT switch off, just leave. You can click on *Reset* and *Area* to clear your work from the screen.

Thank you for your interest. The data and the program are changing rapidly and the price/performance ratio of workstations continues to improve. Immediate decisions are constrained by the available technology, but your input as a user (along with others) will influence longer term developments.

2.8 Your comments

Comments or fault reports on the programs or data will be welcomed by a workstation manager, or Keith Adlam or David Ovadia in Keyworth, or Vic Loudon in Edinburgh. To enter them on a bug list, send a note of the fault by e-mail to E_TVL@UK.AC.NMH.VA (from Keyworth CBS%NMH.VA::E_TVL, from Edinburgh E_TVL). Data errors will then be notified to the data manager responsible.

Section 3 - Guided tours

3.1 Before setting out

One way to become familiar with the usage and capabilities of a system is by a guided tour. It is then easier to explore specific applications. A formal demonstration, possibly based on the scripts which follow, is a good way to get a broad overview of the index. The same scripts can be used for self-instruction, with or without the formal demonstration.

Items to be selected are listed in sequence. Menu items and entries typed by the user are underlined. Normally, the item is in the menu which appeared most recently on the screen. The items in bold are in the main menu bar. Section 2.4 describes the "select" procedure.

The comments in italics point out aspects to which the demonstrator might wish to call attention. As text on the screen is not readily visible to a group of viewers, the demonstrator should also provide a general commentary (rehearsed in advance) on what is going on.

A short demonstration will take about 20 minutes, a full demonstration about one hour. Any or all of the indented sections can be omitted if time is short.

Do not move the mouse unnecessarily, as this tends to take the cursor away from where it will be needed.

One word of warning - the system does not prevent you looking at detailed data for a large area, for example all English boreholes. The results on a small screen are not useful, and displaying 400 000 points will take some hours. Once started, there is no convenient way to interrupt the process. Always match the area to the data. Topography is displayed for areas less than 5km across only where there are large-scale maps available.

Accessing the index system is described in section 2.2. The first message displayed by the index system is a warning and disclaimer. After looking at this, quit the warning notice, and await the appearance of the main menu bar.

The index was commissioned by the BGS Directorate as a tool to improve access to BGS data. It is part of a move to Unix-based open systems, recommended by an NCS Visiting Group, and is based on a Geographic Information System (Arc/Info) - one of the growth areas of NERC computing. The programs were designed and written in Arc Macro Language (AML) by Keith Adlam and John Gibson in BGS at Keyworth. The data represent many man-years of effort within many Divisions of BGS.

3.2 Country-wide data with an English example

The first part of the demonstration gives some examples of the main country-wide data collections. It shows how areas of interest can be selected with the area menu, how data can be selected and displayed with the data menu, and the details of items obtained with the query menu.

(Based on an area in southern England. An alternative version for Central Scotland follows as section 3.3. Similar procedures can be followed for other areas.)

Data. 10k geol maps.

The system is controlled by a point and click procedure (demonstrate the mouse, screen cursor, Left and Right Mouse Buttons). Outlines of published BGS maps are being selected for display. 50k geol maps. OK.

Area. Map

One of the first tasks in an enquiry is to define the area of interest. There are many ways to do this. One way, suitable for browsing, is to select the area from a map. The dialogue window on the bottom left of the screen, has instructions for the user.

Point and click the LMB (select) on the left centre of square SO (within the square), and the right centre of square TV.

The outlines of the BGS 1:10 000 and 1:50 000 geological maps are shown.

Details about an item of information can be obtained by pointing to it.

Query. 10k geol maps. Spatial query. Point. Select a 1:10 000 map (say, in central Southampton). *The selected topic and the spatial query type are indicated in the query window. The number of items selected is shown in the dialogue window. Forms. Page 2. Unpin page 1.*

Some codes can be difficult to decipher, but an explanation may be available.

About. 10k geol maps. Quit.

50k geol maps. Reuse spatial query. List. Quit.

Information can also be queried even if it is not displayed. For example, offshore samples can be queried in a selected area.

Move scrollbar down the alphabetical list of datasets in the query window. Offshore samples. Spatial query. Circle by cursor. Select a point, say, in central Cardiff, move the cursor out about 1 cm to give a circle of that radius, and click again. Forms. Next, Next,...

Samples are highlighted as their data appears.

Unpin Off_samp window.

An individual item can be reselected.

Spatial query. Point.

Select one of the yellow dots within the circle.

List. Quit. Unpin query window.

The location of a sample can be measured from the screen as National Grid Reference, latitude and longitude, etc.

Measure. Position.

Select one of the offshore samples, read the easting and northing (in numeric form). Quit.

Units. Degrees-mins-secs. Measure. Position.

Select the offshore sample again, this time read the lat and long in degrees, minutes and seconds. Quit.

Information can be selected along a line, such as offshore samples along a proposed track-line. A zone, say, 5000m on either side of the line, can be included.

Query. Offshore samples. Spatial query. Line by cursor.

Type in: 5000 OK.

Select about five points along an irregular line south and then west from Bournemouth. End by clicking the RMB.

Similar procedures could be used to find boreholes along, say, a proposed motorway route. List. Continue, Pause.

There is information about the sample and its lithology at each point. Quit.

An irregular area can be studied.

Offshore tracks. Spatial query. Move scrollbar down - Area by cursor. Select about 5 points to define a polygon about 5 cm across, in the sea on the bottom left corner of the display, ending with RMB.

The instructions for selecting points appear in the bottom left window. The BGS shallow seismic lines that cross the selected area are shown. Forms. Next, Next, . .

Individual lines are highlighted as the corresponding data are displayed.

Having selected the items through the query menu, the results can be read using the list command, or a paper copy of the listing can be sent to the local printer by clicking on "print". The variables to be included in the listing can be altered with the "redefine listing" item on the Data Query menu. (Figure 11)

RECNO	YEAR	PROJ	LINE	FIX	SUBFIX	LAT	LON	DEPTH
1	73	7	63	40	0.00	49.6190	-2.7435	68
2	73	7	83	32	0.00	50.4458	-3.1308	52
3	73	7	84	11	0.00	50.5538	-3.0899	34
4	73	7	85	14	0.00	50.6020	-3.0241	32
5	73	7	88	22	0.00	50.2119	-2.9116	65

Figure 11: Listing of offshore tracks on the local printer.

Unpin Off_track window. Unpin Data Query window.

Where recent 1:10 000 map coverage is incomplete, the old County Series maps may be useful, as, for instance, for the 1:50k map sheet east of Southampton.

Query. 50k geol maps. Spatial query. Point. Select a point within the large map east of Southampton. List.

The map sheet number is 316. Quit. Scroll down the datasets in the query window, select County Series. Spatial query. Scroll down. 50k map area. Type in 316.

The 1:10k maps can be labelled. Annotate. 10K geological maps. (Figure 12)

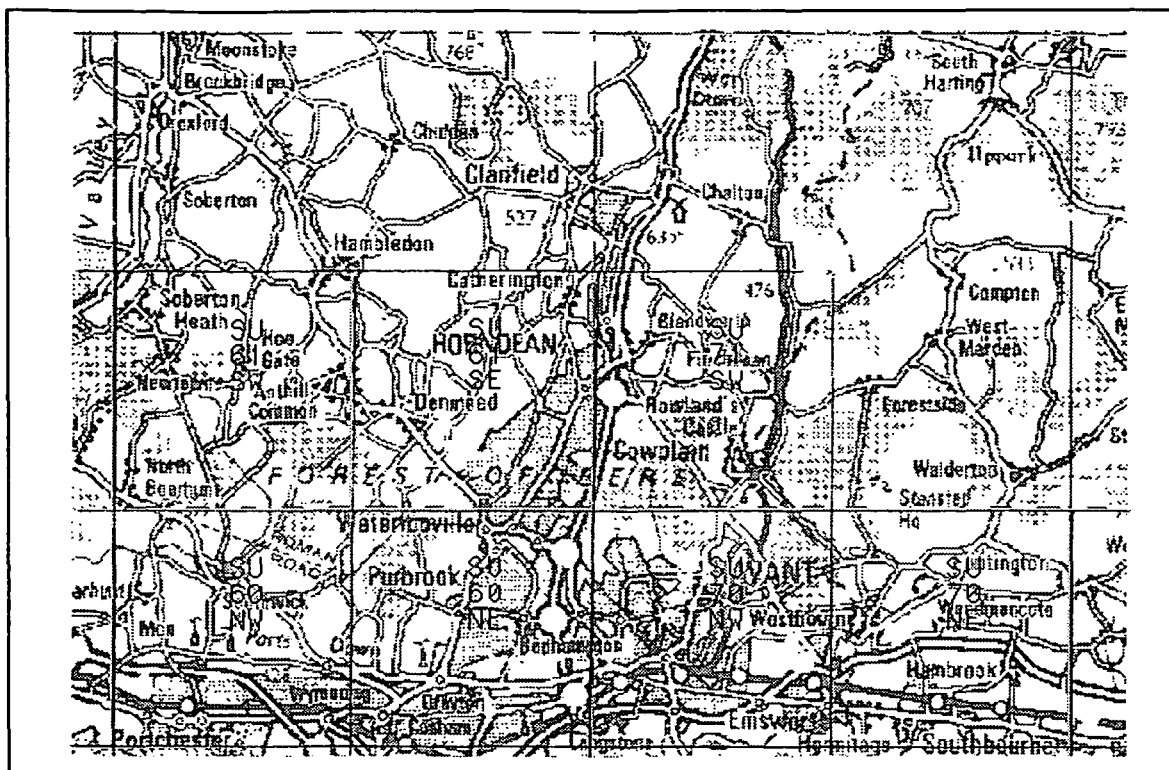


Figure 12: Part of screen showing 1:10 000 map outlines annotated with the sheet numbers.

On the query menu, select County Series, Spatial query. Point. Select a point, for example in the County Series map above SU71SW. Forms. Page 2. Next, next.

There may be several overlapping maps at the selected point. A paper copy of the list of maps can be obtained by selecting the Print option. (Figure 13)

\$RECNO	SHEET	SHEETNUM	SUFFIX	QUARTER	SCALE
1	OSX	33	.	FS	10,560
2	OSX	33	.	NW	10,560
3	OHP	60	.	FS	10,560
4	OHP	60	.	SE	10,560

Figure 13: Printed list of maps retrieved in response to a query.

Unpin the forms window. Unpin the Data Query window.

After selecting the area and the topic, appropriate displays of base-map and data were chosen. When a new theme is begun, the previous options no longer apply, so reset the default options.

Reset.

The new display is not drawn until "Do" is selected, or a new area is chosen. This can be done in many ways, including zooming in to a selected area of the map, or entering coordinates, or selecting a name from the Gazetteer.

Area. Gazetteer. Type in Fawley OK.

Choose the right Fawley. Select the third entry (Fawley HAMP SU4503).

Grids. Default grid.

If the location is not quite correct, the display can be recentred on a selected point, or an adjacent area can be selected. Superimposing National Grid lines makes locating data easier.

Area. Move: North.

Data. Boreholes. OK.

Area. Zoom: in. Select an area more than 5kms across, say from the left centre of the map (441 114) to Swanwick (449 109) in the southeast.

Data, in this case boreholes, can be shown in response to a query, or throughout the selected area. A point, line, circle or area query then provides more information about the selected boreholes.

For many enquiries , it may be necessary to select specific data items. For example, only deeper boreholes may be of interest. The selection described next takes a few minutes.

The rest of this section is not suitable for a short demonstration.

Query. Scroll up - Boreholes. Spatial query. Scroll down - Mapextent. SQL query. Scroll down - Drilled length. >. Type in 100., return. OK.

*The numbers of boreholes selected in the area, and the number over 100m deep, are recorded in the dialogue box on the bottom left of the screen.
10 out of the 800 boreholes (approximately) are selected as over 100m deep.*

Select set zoom. *The map is redrawn for the area containing the selected data. It may be helpful to show different depths in different colours, to see the spatial distribution of deeper holes. Where there is room, the boreholes can be annotated with their total depth. (Figure 14)*

Symbol. Classify symbols. Boreholes. Drilled length. Equal int. (Number of classes) - type in 5 OK.

Annotate. Other data sets. Boreholes. Scroll down - Drilled length. Annotate. Spatial query. Point. Select the deepest borehole (1827m) on the centre left. Forms. Page 2. Unpin page 1. Unpin Data Query window.

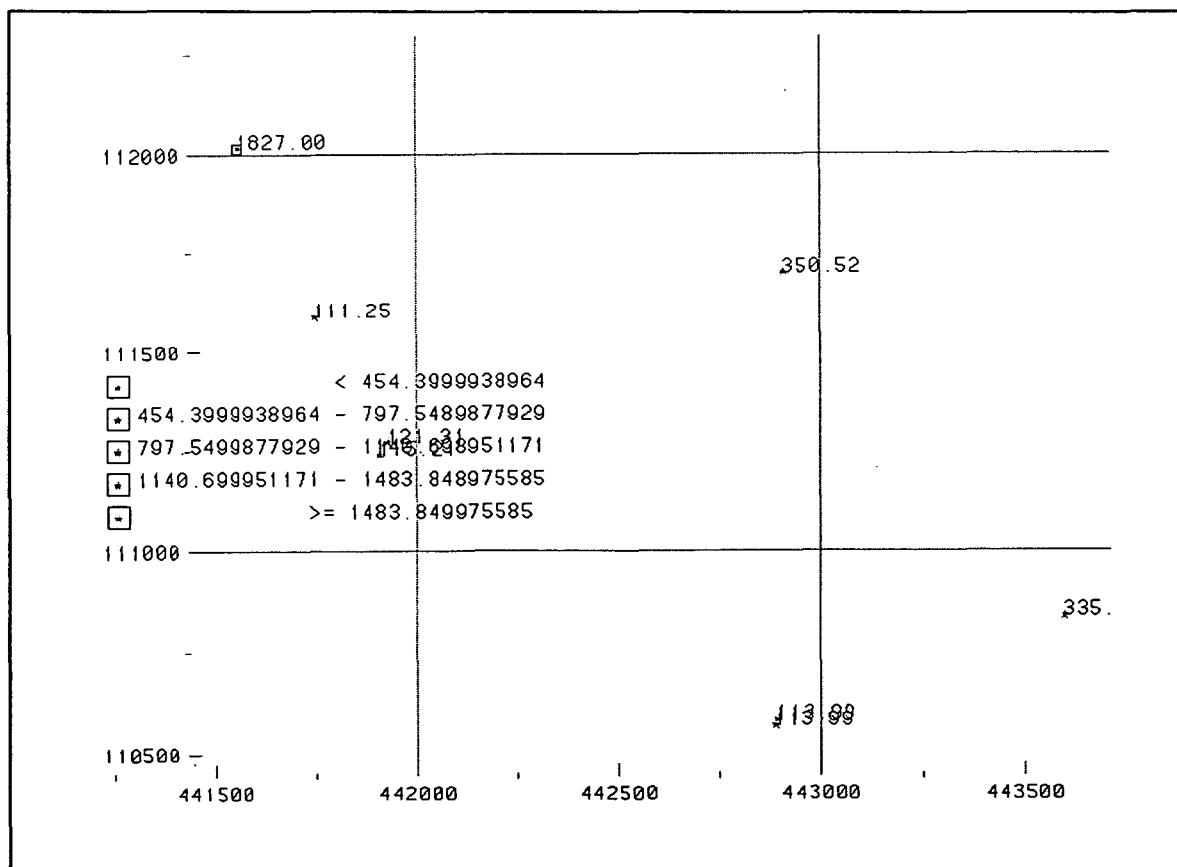


Figure 14: Boreholes annotated with their drilled depth.

An increasing variety of datasets has been indexed, though not all are country-wide.

Reset. Area. Gazetteer. Type in - Keywor. OK. Select the first (Keyworth NOTT SK6130).

Area. Zoom: Out x 5. Data. More. Pallet samples, Borehole samples, Waste sites. OK. Do.

A paper plot of the map can be prepared, although this is not recommended for a formal demonstration, using the Plot menu and then Print Graphic Window. The window on the bottom left indicates the sizes of the datasets as they are displayed.

There are also extensive geochemical datasets from York northwards, and geophysical datasets, such as gravity and aeromagnetic data.

Reset. Data. More. Gravity points. Aeromag data. OK. Do.

This ends the first part of the demonstration. Either Quit at this point, or Reset, and continue to section 3.4.

3.3 Country-wide data

an alternative example from Scotland

The first part of the demonstration gives some examples of the main country-wide data collections. It shows how areas of interest can be selected with the area menu, how data can be selected and displayed with the data menu, and the details of items obtained with the query menu.

(Alternative version of section 3.2, covering the same concepts as the previous example, but with Scottish examples, and some other datasets. Either of the two alternative versions can be used, depending on the areas likely to be of interest, or similar procedures used for other areas.)

Data. 10k geol maps.

The system is controlled by a point and click procedure (demonstrate the mouse, screen cursor, Left and Right Mouse Buttons). Outlines of published BGS maps are being selected for display. More. Scotland 50k. OK. Area. Map

One of the first tasks in an enquiry is to define the area of interest. There are many ways to do this. One way, suitable for browsing, is to select the area from a map. The dialogue window, on the bottom left of the screen, has instructions for the user.

Point and click (select) on the top centre of square NM (within the square), and the bottom right of square NT.

The outlines of the BGS 1:10 000 and 1:50 000 geological maps are shown.

Details about an item of information can be obtained by pointing to it.

Query. 10k geol maps. Spatial query. Point. Select a 1:10 000 map (say, in north central Edinburgh). *The selected topic and the spatial query type are indicated in the query window. The number of items selected is shown in the dialogue window.*
Forms. Page 2. Unpin page 1.

Some codes can be difficult to decipher, but an explanation may be available.

About. 10k geol maps. Quit.

In the query window, scroll down the list of datasets. Scotland 50k. Reuse spatial query. List. Quit.

Information can also be queried even if it is not displayed. An example is offshore samples for a selected area.

Move scrollbar up the alphabetical list of datasets in the query menu. Offshore samples. Spatial query. Circle by cursor. Select a point, say, on Holy Island off the east coast of Arran, move the cursor out about 1 cm to give a circle of that radius, and click again. Forms. Next, Next,...

Samples are highlighted as their data appears.

Unpin Off_samp window.

An individual item can be reselected.

Spatial query. Point.

Select one of the yellow dots within the circle.

List. Quit. Unpin query window.

The location of a sample can be measured from the screen as National Grid Reference, latitude and longitude, etc.

Measure. Position.

Select one of the offshore samples, read the easting and northing (in numeric form). Quit.

Units. Degrees-mins-secs. Measure. Position.

Select the offshore sample again, this time read the lat and long in degrees, minutes and seconds. Quit.

Information can be selected along a line, such as geochemical samples along a traverse across the Highland boundary. A zone, say, 5000m on either side of the line, can be included.

Query. Scroll up list of datasets. Geochemistry. Spatial query. Line by cursor. Type in: 5000 OK.

Select about five points along an irregular line on the left of the screen from the centre of Glasgow northwest for some 7 cm. End by clicking the RMB.

Similar procedures could be used to find boreholes along, say, a proposed motorway route.

List. Continue, Pause. Quit. *There is information about which elements were analysed at each point.* Forms. Page 2. Next, Next. Unpin page 1.

An irregular area can be studied.

In query window, select Offshore tracks. Spatial query. Move scrollbar down - Area by cursor. Select about 5 points to define a polygon about 5cm across, say in the Firth of Clyde north of Arran, ending with RMB.

The instructions for selecting points appear in the bottom left window. The BGS offshore geophysical tracks that cross the selected area are shown. Forms. Next, Next, ...

Individual lines are highlighted as the corresponding data are displayed.

Having selected the items through the query menu, the results can be read using the list button within the query window, or a paper copy can be sent to the local printer by clicking on "print". The variables to be included in the listing can be altered with the "redefine listing" button in the query window.

Unpin the "Off_track" window and the query window.

Where up-to-date map coverage is incomplete, the old County Series may be useful, as, for instance, for the 1:50k Kirkcaldy map sheet, north of Edinburgh.

Area. Zoom: In. Select points just inside two opposite corners of the 1:50k map sheet north of Edinburgh.

The 1:10k maps can be labelled. Annotate. 10K geological maps.

Query. Scroll up - County Series. Spatial query. Scroll down - Mapextent. Spatial query. Point. Select a point, for example at Glenrothes. Forms. Page 2. Next, next. Unpin page 1. Unpin the query window.

After selecting the area and the topic, appropriate displays of base-map and data were chosen. When a new theme is begun, the previous options no longer apply, so reset the default options.

Reset

The new display is not drawn until "Do" is selected, or a new area is chosen. This can be done in many ways, including zooming in to a selected area of the map, or entering coordinates, or selecting a name from a Gazetteer.

Area. **Gazetteer.** Type in **Blackford Hill.** Select **Blackford Hill LOTH NT2570.**

Data, in this case boreholes, can be shown in response to a query, or throughout the selected area. A point, line, circle or area query then provides more information about the selected boreholes.

For many enquiries, it may be necessary to select specific data items. For example, only deeper boreholes may be of interest. The selection procedure described next takes a few minutes.

The rest of this section is not suitable for a short demonstration.

Query. Scroll up - **Boreholes.** **Spatial query.** Scroll down - **Mapextent.** **SQL query.** Scroll down - **Drilled length.** > Type in **50.,** **return.** **OK.** *34 out of the 700 boreholes (approximately) are selected as over 50m deep (see dialogue window).* **Select set zoom.**

It may be helpful to show different depths in different colours, to see the spatial distribution of deeper holes. Where there is room, the boreholes can be annotated with their total depth.

Symbol. **Classify symbols.** **Boreholes.** **Drilled length.** **Equal int.** (Number of classes) - type in **5** **OK.**

Annotate. **Other data sets.** **Boreholes.** Scroll down - **Drilled length.** **Annotate.** **Spatial query.** **Point.** Select deepest borehole (902m near Gilmerton). **Forms.** **Page 2.** Unpin page 1. Unpin the query window.

An increasing variety of datasets is being indexed, though not all are country-wide.

Reset. Area. Gazetteer. Type in - Keywor. OK. Select the first (Keyworth Nott SK6130). *A larger area may make this obscure location more easily identifiable.*

Area. Zoom: Out x 5. Data. More.

Pallet samples. Borehole samples. Waste sites. OK. Do.

The dialogue window on the bottom left indicates the sizes of the datasets as they are displayed.

A paper plot of the map can be prepared (although this is not recommended for a formal demonstration) using the Plot menu and then Print Graphic Window.

There are also extensive geochemical datasets from York northwards, and geophysical datasets, such as gravity and aeromagnetic data. Not all of these are available on the stand-alone workstations in regional offices.

Reset. Data. More. Gravity points. Aeromag data. OK. Do.

This ends the first part of the demonstration. Either Quit at this point, or Reset, and continue to section 3.4.

3.4 Scanned borehole logs in London and Newcastle

The second part of the demonstration gives examples of features of the index which are available only in limited, local areas. The ability to select and display scanned images of documents associated with a particular location, is illustrated with borehole logs.

The next part of the demonstration refers to specific data items, and therefore may require the instructions to be followed precisely.

Reset if already in index3, otherwise Quit, and start with the initial prompt, click in the lower left window, and type index3. Quit disclaimer.

Unlike the first part of the demonstration, where the data is country-wide, the second part illustrates some features which at present are available only for a few, limited, local areas.

Grids. Default grid.

Area. Grid Square. Type in: TQ38SW OK. *The City of London is in the centre of the map, the Thames can be seen near the bottom of the screen. TQ or TQ38 could have been entered to select larger grid squares.*

Area. Zoom: in. Select points marginally inside the top left and lower right corners of the displayed map.

Area. Zoom: in. Select points to cover most of the bottom left grid square, and the left half of the one to its right [that is, include Waterloo Bridge and the Embankment to the north].

Data. Boreholes. OK. Do.

The topographic base has changed from 1:250 000 to 1:50 000 and then to the 1:10 000 Ordnance Survey topographic base. Street names can be read if you are close to the screen. The yellow dots are boreholes, which are densely spaced in the London area. (Figure 15)

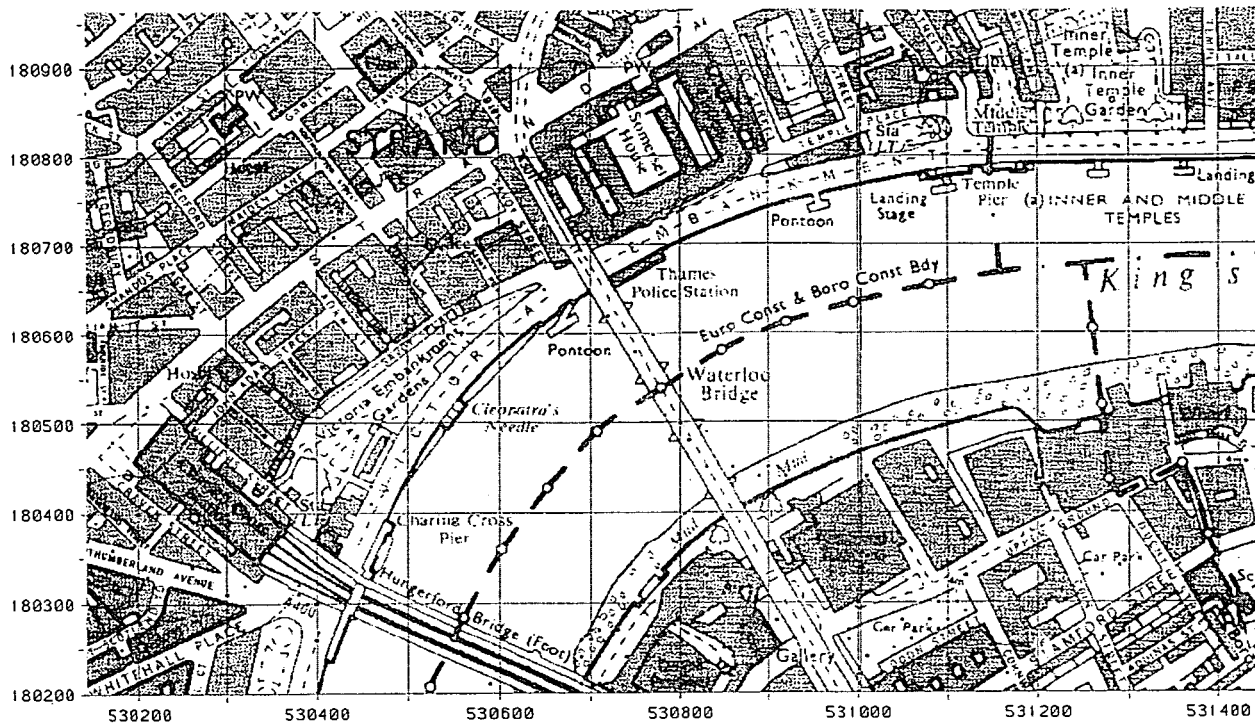


Figure 15: Selected area of London showing borehole locations as black dots.

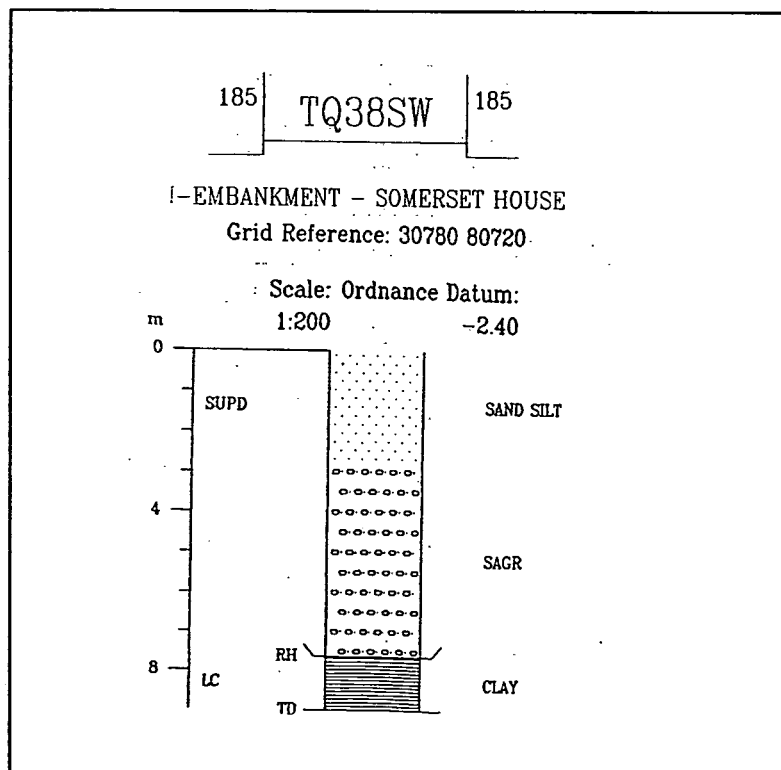


Figure 16: Scanned graphic log from a borehole selected from the above map.

Query. Boreholes. Spatial query. Point. Point to the borehole above the first M in eMbankment. Forms. Page 2. Unpin page 1. Unpin query window.

Images. Borehole images.

Point to the borehole above the first M of eMbankment. Click on the borehole number which should appear in a pop-up menu. (See figure 16).

The graphic log is a scanned document, although the log could be drawn by computer. Click on the pin at the top of the pop-up menu, to release it, and the log should disappear.

Images. Borehole images. Select the borehole to the right of the first N in embaNkment. Click on the borehole number. View the log, then unpin the borehole number.

Under the Images menu, another option is "Borehole image print". If this is chosen, and then the borehole number in the popup window is selected, a paper print of the scanned document is obtained.

The locations of points on the screen, as National Grid Reference or as latitude and longitude, can be determined from the Measure menu.

Measure. Position. Point again to the same borehole. Read the Grid Reference. Quit.

Units. Decimal degrees. Measure. Position. Point to the same borehole. Read the latitude and longitude in degrees and decimal degrees. Quit.

Measure. Length. From the same borehole, click a line of about five steps to, say, Charing Cross Station, click the RMB, read the distance in metres. Quit.
An area can also be measured by outlining the area of interest.

IF TIME IS PRESSING, THE DEMONSTRATION CAN STOP HERE.

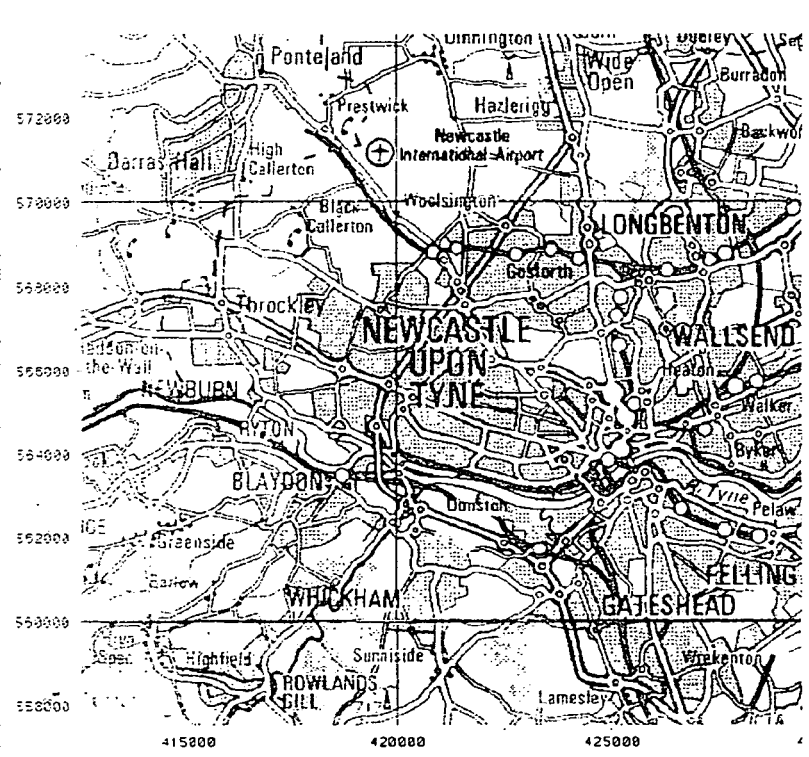
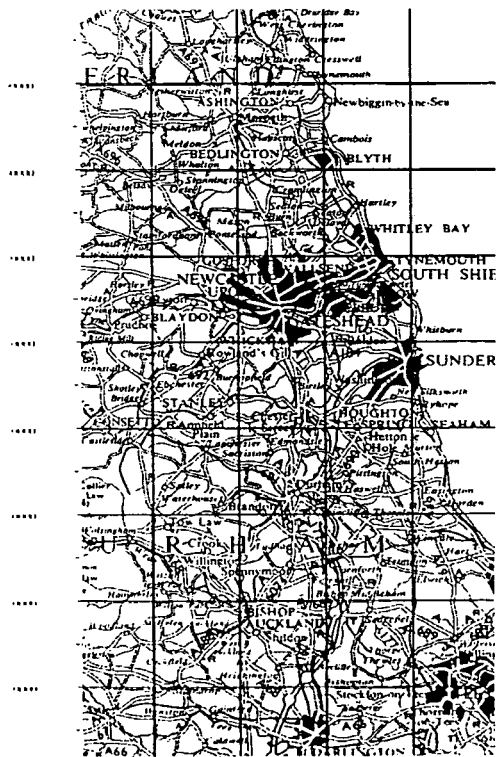
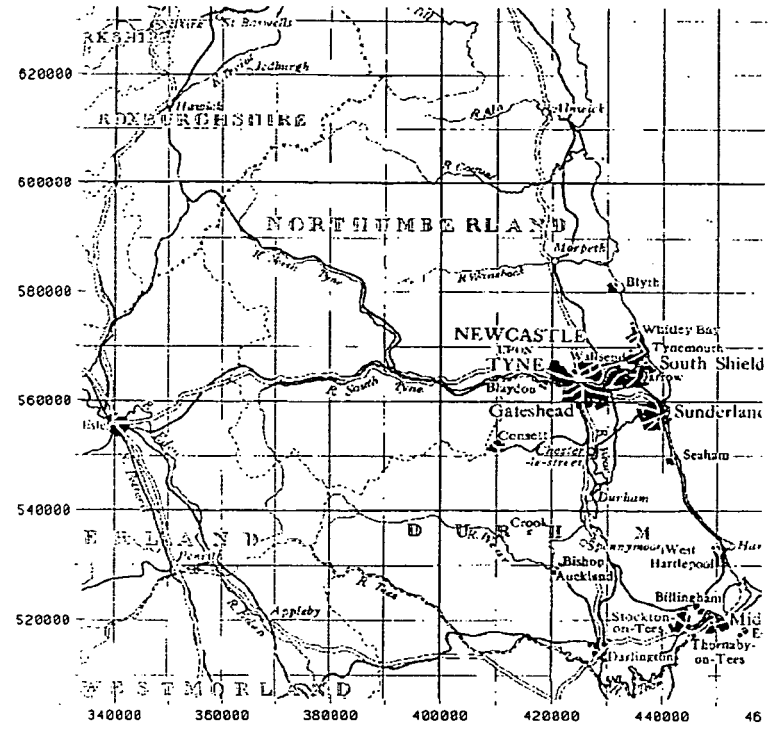
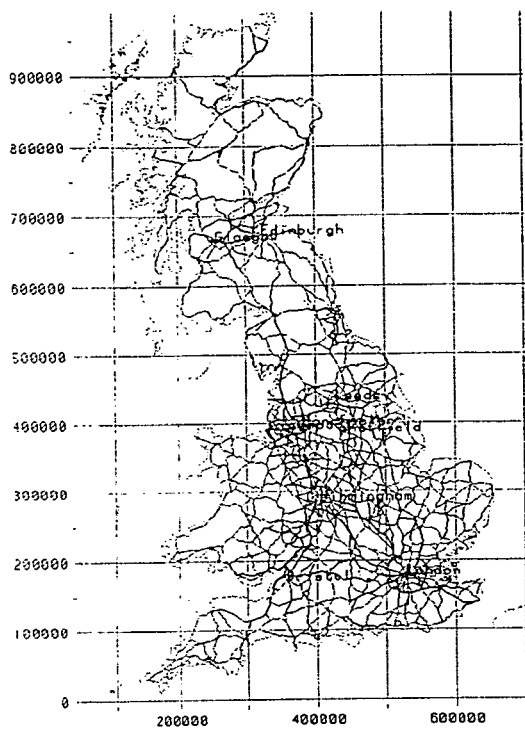


Figure 17: Zooming in to a selected area in Newcastle-upon-Tyne. The scale of the base map changes as a smaller area is selected.

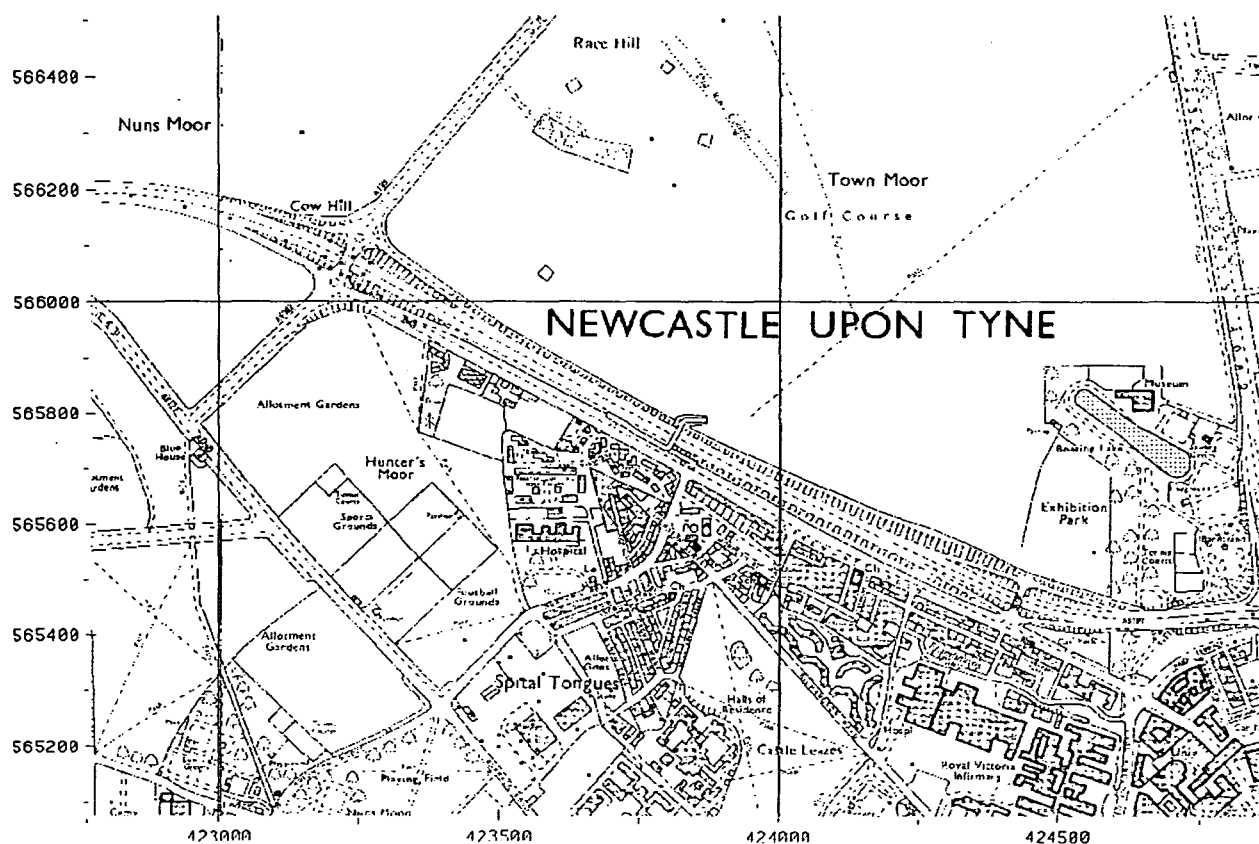
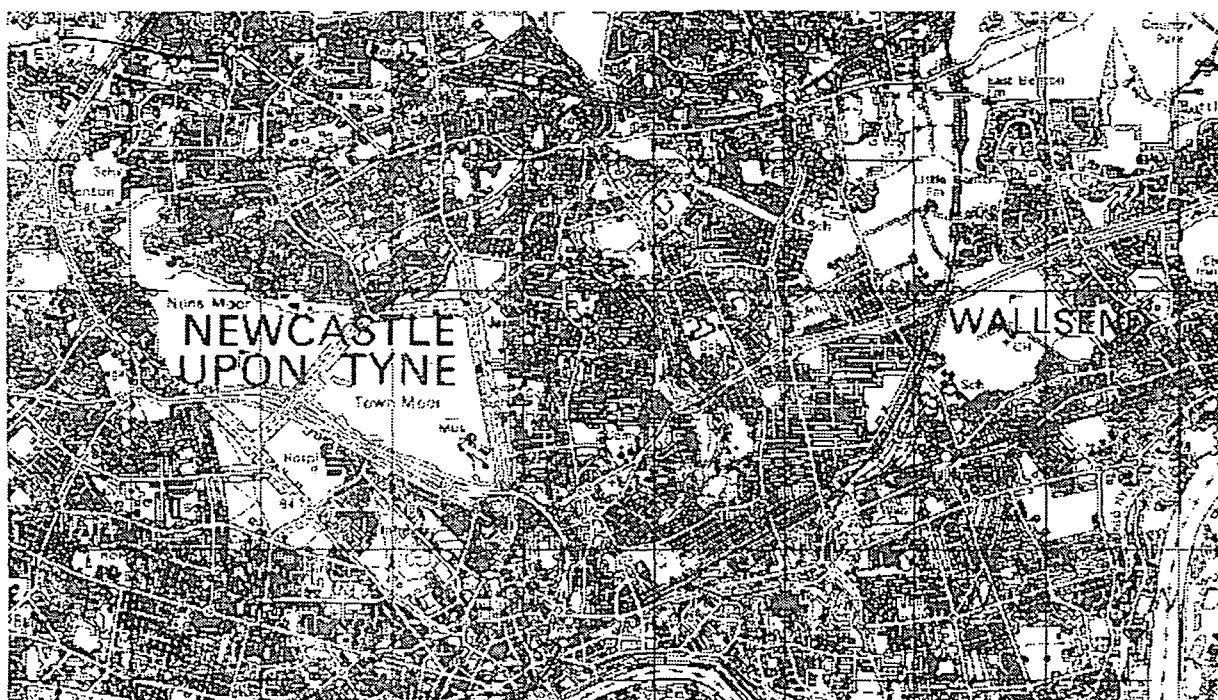


Figure 18: After zooming in to an appropriately small area, the boreholes are displayed (shown on paper as black dots).

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NZ 26 NW / 41
(For Survey use only)

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

Name of Shaft or Bore given by Geological Survey:
TOWN MOOR BORE, 1766

Name and Number given by owner:

For whom made

Town or Village Naxxatle upon Tyne County

Exact site 666 yards NW of the St of Barras Bridge Attach a tracing from a map, or a sketch-map, if possible.

Purpose for which made COAL

Ground Level at ^{shaft}bore relative to O.D. 218 AOD If not ground level give O.D. of beginning of ^{shaft}bore

Made by

Information from B.S. 1444; Wake Don Book 1846. Date of sinking July 1786

Examined by Date received Dec 1959

6-inch Map Registered No.
94 SE/46

Nat. Grid Reference
C 24496551

1" N.S. Map No. 20 1" O.S. Map No. Confidential or not

SPECIMEN NUMBERS AND ADDITIONAL NOTES

In Bell's Volume IX a plan is given of a survey carried out in 1763 one of whose points is a borehole on the Town Moor. Distances and level differences are given from a number of fixed points and it is possible to sit this hole fairly well. There seems little doubt that the present borehole is the one referred to by this survey. Thus the B.S. position and level are in error by some distance. Wiles's log stops short at the floor of the lower main seam. It is likewise only a skeleton log.

According to B.S. & N.C.R. this bore is at C 24726547.

(For Survey use only) GEOLOGICAL CLASSIFICATION	DESCRIPTION OF STRATA	THICKNESS		DEPTH	
		FT	IN.	FT	IN.
ch	Soil and clay	1	6	1	6
	Strong clay	66	-	67	6
	Brown metal		3	67	9
	Brown part with soft partings	5	6	73	3
	Gray and brown sandy metal	1	9	75	-
	Soft black and gray metal	1	6	76	6
	COAL		6	77	-
	Soft gray metal	7	-	84	-
	A thin girdle or lump		6	84	6
	Gray metal	3	-	87	6
	Gray and brown sandy metal	13	6	101	-
	Brown and gray sandy stone with port girdles and sandy partings	4	-	105	-
	Gray part	1	-	106	-
	Blue metal		9	106	9
	Brown and gray sandy part	1	6	108	3
	Gray part with sandy partings & (water)	1	6	109	9
	Soft brown and gray part	13	-	122	9
	Blue metal	1	-	123	9
	COAL		6	124	3
	Black metal with coal		6	124	9
	COAL		4	125	1
	Gray metal with port girdles	8	-	133	1
	Gray part	4	-	137	1
	COAL		4	137	5

Figure 20: Page 2 of the scanned documents contains the descriptive record of the borehole of the previous figure.

Dave Lawrence, in the Newcastle Office, has done a lot of work in scanning borehole records. (See figures 17 to 20).

Reset.

Area. Grid square. Type in: NZ OK.

Grids. Default grid. Area. Zoom: in. Select points marginally inside the top left and lower right corners of the displayed map. **Area. Zoom: in.**

Select points just within the 10 km square around Newcastle, possibly omitting the southern strip to fit the window. *This is the OS 1:50 000 map.*

Area. Zoom: in. Select the area from 423 567 (on the E of Newcastle), to the grid intersection 3 lines right and 2 lines down.

Data. Boreholes. OK. Do.

We can look at one or two of the boreholes along a new route across the city, the base-map is now OS 1:10 000.

Images. Borehole images. Select the centre borehole of the right edge of the cluster of boreholes at the flyover on the centre right of the screen. Click on the borehole number. *The original log may not have been clearly legible.*

Press Ctrl V (hold down the Ctrl key while pressing V, or select from the Pan/Zoom menu), and click on the D of Dark (the first letter of the third entry under strata). Enlarge the window by pointing to its lower right corner, holding the select button down while moving the mouse four inches to the left, then release.

Select the pin on the pop-up menu to release the image.

Images. Borehole images. Follow the road to the right from the flyover, select the next borehole on the road below the X of eXhibition Park. Click on the first entry in the pop-up menu. *This borehole record has three pages.* Select and Quit in turn the second and third items in the pop-up menu.

Use Ctrl V to enlarge the log as necessary, selecting the point to centre the enlarged image, widen the window by dragging the lower right corner, and use Ctrl A to pan the image, selecting the new centre point.

Unpin the pop-up menu.

THE DEMONSTRATION CAN STOP HERE OR CONTINUE TO SECTION 3.5

3.5 Geological maps in Clwyd

The third part of the demonstration gives examples of other features of the index which are available only for limited, local areas. The ability to display and query geological maps is illustrated with data from the Wrexham area of northeast Wales.

Reset. *Another way of selecting an area is by using a gazetteer. For example, we can select an area in northeast Wales which was the subject of a recent thematic mapping study.*

Area. Gazetteer. Type in: WREXHAM OK. *Several names with Wrexham in them are listed. The first (in Clwyd) is the one required.*

Select Wrexham CLWY SJ3350.

Grids. Default grid.

Data. More. Drift 10k. OK. Do.

A map of the Drift geology is drawn. The Solid geology and coal plans could also be shown for this area.

The screen display is more readable if the amount of data shown at one time is reduced.

Data. Boreholes. OK.

Area. Zoom: in.

Select a point near the top of the map, just right and below the grid intersection 332 355, go three grid squares down and four to the right, and select a second point just left and above the grid intersection 336 352.

The boreholes are shown as yellow dots. The nature of the Drift deposits can be found using the query menu.

Query. Drift 10k. Spatial query. Point. Select a point in the dark green area just left of GRESFORD. **List. Quit.**

The names of the Solid formations can also be determined using the query menu, even when they are not displayed.

Query. Solid 10k. Reuse spatial query. List. Read the name of the underlying solid geology formation, point out that the Solid boundary has been drawn. **Quit. Solid 10k. Spatial query. Point.** Select another point across the formation boundary. **List. Quit.** Unpin the query menu.

Reset.

This concludes the formal demonstration. Copies of the sequence of instructions used in the demonstration are in the Geoscience Index User Guide for users who wish to explore the system. The system is available on workstations throughout BGS.

Additional data is being added rapidly, according to priorities set by Divisional Data Coordinators. More information is available from Keith Adlam and John Gibson in Keyworth, and Vic Loudon in Edinburgh, or from your own workstation manager.

END OF DEMONSTRATION.

Section 4 - Using the menu functions

4.1 General Setting

The menus are largely self-explanatory. However, the following additional comments may be helpful for reference purposes. The menus are described as in July 1993, and will inevitably be changed in later versions of the system.

The detailed menus are described here for reference. The inexperienced user may prefer to rely on default options, particularly for Area, Grids, Plot, and Images. This can be done simply by selecting with the LMB from the main menu bar.

An indication of the extent and variety of some datasets that have been indexed is given in figures 1 to 9. The index system enables the user to make detailed searches by area and topic through these and similar datasets. The functions of the system which make this possible can be considered under the headings of browsing, querying and displaying.

Browsing can be seen as the process of searching through available datasets. This is conducted by means of a dialogue between the user, who repeatedly narrows the discourse by specifying areas and topics of interest, and the computer, which responds with more detail within the new constraints, itemising datasets which might meet the user needs, and showing their geographical distribution within the selected area.

When the user has determined the existence of possibly relevant data, the querying facilities are available to find their properties or attributes, and to list identifiers or shelf numbers to make it easier to locate the original records. More detailed selection can be based on attribute values.

The retrieved information can be displayed on the screen, or printed on paper or film. The system provides a means of choosing a suitable base map, and, if need be, altering the displayed symbols or colours.

4.2 Browsing

The main activities in browsing are selecting the area (using the Area menu) and the data of interest (using the Data menu).

The Area menu is a pull-down menu. Drag with the RMB to the selected item. It offers the following options:

Map	Displays an outline map of the UK with 100km grid squares, and invites the user (see dialogue window) to click on two opposite corners of a rectangular area which will then be displayed on the screen. If you change your mind, cancel by pressing the RMB.
Gazetteer	For use if you know the place name, but not its location on a map. When requested, type in the first letters of the required place name. Corresponding names in the gazetteer, if any, will be listed in a popup menu. Scroll down if necessary, and select the required name. A 10km square map centred on that place will be displayed.
Grid Square	When requested, type in the Grid Square in the form TQ38SW. TQ or TQ38 are alternatives if a larger area is required. A map of the chosen square is displayed.
Corners	A popup menu headed <i>Define map corners</i> is displayed, with a request that National Grid Coordinates in metres should be entered for the southwest and northeast corners. Terminate each value by pressing return. Select cancel if you make a mistake or change your mind, or OK when all the correct values are entered. A map of the chosen area is displayed.
50k geol. sheet	Type in the 1:50 000 scale geological map sheet number for England and Wales for the area required, using the Cancel and OK buttons as before.
Offshore quadrant	Type in the offshore quadrant or quadrants required.
Offshore block	Type in the offshore quadrant and blocks required.
Move:	Selecting one of the options (North, South, East, West, Northwest, Southwest, Northeast, Southeast) moves the display, with the same size, shape and content, to an adjoining area in the direction indicated.

Move: Centre	Cross-hairs are provided, which can be moved with the mouse to a location which, when the LMB is clicked, is taken as the centre of a new map of the same size, shape and content as before.
Zoom: in	Cross-hairs are provided, with which two points can be selected (by clicking with the LMB), that form the opposite corners of the new map. See the dialogue window.
Outx2	Doubles the linear size of the map area.
Outx5	Increases the linear size of the map area 5 times.
In/Outxfactor	A factor to change the linear dimensions of the displayed area can be entered from the keyboard, zooming in if less than 1.0, zooming out if more than 1.0.
Show map limits	Indicates, in a popup window, the easting and northing of the boundaries of the map displayed on the screen.
Show map scale	Indicates, in a popup window, the scale of the current map display on the screen.

The Data menu is selected with the LMB. Unlike the Area menu, it is possible to select several data items for simultaneous display. As each item is selected, a tick should appear in the small square on its left. The item can be deleted by selecting it again. At the bottom of the data window, click on More to see another window of options, OK when the selection of all required data items has been satisfactorily completed, or Cancel to return, without selecting data, to the main menu.

The data options are as follows:

250k lithostrat	Lithostratigraphy as depicted on the BGS 1:250 000 geological map, where digital data are available.
10k geol maps	Outlines of publicly available BGS geological maps of the National Grid Series at scales of 1:10 000 and 6 inches to the mile.
50K geol maps	Outlines of the published BGS geological maps at 1:50 000 or 1 inch to the mile for England and Wales (see also Scotland 50k).
County Series	Outlines of publicly available BGS geological maps of the County Series at a scale of 6 inches to the mile.

Survey Records	Locations to which some BGS Land Survey records in Scotland refer. These data are currently being revised.
250k chronostrat	Chronostratigraphy from the BGS 1:250 000 map, where digital data are available.
250k geol lines	Geological boundaries from the BGS 1:250 000 map, where digital data are available.
Boreholes	Locations of boreholes recorded in the BGS borehole index. In Scotland, only non-confidential boreholes are shown.
Geochemistry	Locations of stream sediment samples which have been geochemically analysed for BGS.
Offshore samples	Locations of samples collected for BGS offshore.
Scotland 50k	Outlines of 1:50 000 and related Scottish geological maps published by BGS (see also 50k geol maps).
Pallet samples	Locations of pallet samples, where digital data are available.
Borehole samples	Locations of borehole samples, where digital data are available.
Waste sites	Locations of waste sites, where digital data are available.
Rock slices	Locations of some BGS thin sections of Scottish rocks.
Gravity points	Locations of BGS gravity measurements.
Offshore tracks	Locations of BGS offshore shallow seismic lines, and other BGS offshore geophysical tracks.
Aeromag data	Locations of BGS aeromagnetic measurements.
Solid 10k	Digitized map of Solid geology where data available.
Drift 10k	Digitized map of Drift geology where data available.
Coal plans	Extent of coal plans where digital data available.

When browsing, the map is redrawn when a new area is chosen. If the new map is required at another time, for example, to see a new collection of datasets, the **Do** button should be selected. The **Reset** button cancels the Data selection.

4.3 Querying

General information about the content of a dataset, including its attributes as recorded in the index, and an explanation of any abbreviations used, can be obtained by selecting the *About* item in the main menu bar. A popup window lists the same datasets as the *Data* menu, in alphabetical order. Descriptive information is obtained by selecting the required dataset, but at present information is available only for 10k geol maps; boreholes; geochemistry; offshore samples; and offshore tracks.

The *Query* button can be selected to obtain more detailed querying facilities. The query refers to a particular dataset, selected from the scrollable list within the query window. The selected dataset appears under the heading *Data selection*:. The area to which the query refers must then be defined by selecting the *spatial query* button.

A popup window then offers a choice of methods of defining the area of interest, such as indicating a point by means of the cursor (in this case, crosshairs), or by defining a circle, rectangle, or irregular area with the cursor, or by entering coordinates. If *mapextent* is selected, the query applies to the entire area shown on the screen.

The type of spatial query selected is shown in the query window under the heading *Spatial query type*:.

The data referred to in the query is shown on the screen, whether or not they were selected from the *Data* menu. The attributes of the queried data are available for further investigation. The *list* button at the bottom of the query window provides a list of the attributes of the queried data in a separate window on the screen. Alternatively, the same information can be printed by selecting the *print* button, which directs the output to the appropriate laser printer.

For most datasets, more details can be obtained by selecting the *forms* window. Where a number of queried items are shown in the graphical window, different colours are used to distinguish items currently on display in the forms window, those that have already been displayed, and those that are still to be looked at.

The listing, as it appears in response to the *list* or *print* command, can be modified by selecting the *redefine listing* button. This provides a list of the variables recorded in the index for that dataset, and enables the user to select those which are to appear in the listing.

Subsequent queries may refer to the same area as before, possibly referring to other datasets. Rather than redefining the query, the same one can be used by selecting the *reuse spatial query* button.

A more advanced selection tool is offered with the *SQL query* button. This makes it

possible to select a subset of the queried data by building a simple SQL command from the name of the variable, a symbol to show whether its value within the subset is greater or less than or equal to a value which is entered from the keyboard. The selected subset can be displayed by selecting *select set zoom*.

Another type of query is concerned with the location of a point, length of a line or area of a polygon. These can be carried out by selecting the Measure button, and using the cursor to define the point, line or area. A previous selection of the Units button makes it possible to obtain a location in latitude and longitude rather than National Grid coordinates.

4.4 Displaying

The display functions are dispersed among a number of menus, including the *select set zoom*, *print* and *list* functions described in 4.3.

The Topo menu provides a list of options which can be included in the topographic base map. Any or all of the items can be chosen, following the procedures described in section 4.2 for the Data menu. Most of the items are taken from the Bartholomews' 1:250 000 digital map of Great Britain. It cannot be used for precisely locating data points. Ordnance Survey maps at 1:2 500 000, 1:625 000 and 1:250 000 scale have also been digitised as a backdrop. More detailed maps at 1:50 000 and 1:10 000 are available for local areas. The scale of the map, or the amount of detail in the Bartholomews map, is changed automatically depending on the size of the area selected. At present (July 1993), the changes are made at 100, 10 and 5kms. For an area on the screen less than 5 kms from side to side or top to bottom, no default topography is shown. If items from the Bartholomews topography are selected, they will be shown for any size of map.

Items that can be shown on the base map include:

Coastline

Drainage Rivers, canals.

Place names Names of main settlements, the number depending on the area.

Roads For larger areas, only main roads are shown.

Railways + Ferries

Water areas Standing water, lakes, reservoirs.

- O.S. transparent The default selection, scale depending on area. If the Ordnance Survey base map obscures the data, it may be better to select items of Bartholomews topography.
- O.S. opaque Shows the topography more clearly, but tends to obscure the data.

Although the base map may include a grid, the values are unlikely to be visible. An alternative is to select a grid from the Grids menu. The default grid, which is National Grid lines at a spacing appropriate to the area of the map, is suitable for most areas on land. If preferred, a grid at a spacing of 100km, 10km, 1km, 100m or 10m can be chosen.

In offshore areas, quadrants, blocks, degree lines and 1/10 degree lines can be selected. No grid switches off any grid that has been chosen. This also happens when the Reset button is used.

A plot of the contents of the main graphical window can be obtained as a monochrome A4 plot from the appropriate laser printer, simply by choosing the default option (LMB) on the Plot menu. The use of the other Plot options is more complex, and is best undertaken in consultation with a user who already has experience of producing these plots. They can give higher quality plots, or colour plots on paper or film, or larger plots.

The other plotting options are of more specialised interest. For the few boreholes for which scanned images of associated documents are available, the Images button provides a very straightforward means of showing the borehole image on screen, or obtaining a paper print of the document at the laser printer. After selecting the item on the menu, cross-hairs are provided. Placing these over the borehole, tap the LMB, and when the borehole number appears in a popup window, select the borehole number, or if there is more than one page, select the page required.

The Symbol menu provides a means of altering the colour and size of the symbols by which the data are shown on the map, and of altering the colour of the background. Different symbols can be chosen depending on the value of a selected variable. The Annotate menu makes it possible to display values of a selected variable alongside the data symbol to which they refer.

Reset returns the options other than Area to their default settings. Do redraws the graphical window with the most recent selections. Quit is a means of leaving the index system, and returning to the system prompt on the workstation. Type index3 to reenter the system.

Section 5 - Specifications

5.1 User requirements

The requirement for an index to, and improved information about, BGS data was identified by a BGS study commissioned by the Department of the Environment (Clayton et al, 1987), and by the New Methods Task Force of the BGS Programme Board. The BGS Directorate, Programme Board, various consultants employed by BGS, and BGS Computer User Groups repeatedly expressed the need for improved provision of information, and a more coherent and better documented view of the information system as a whole. In 1989, the BGS Office Automation Strategy Working Group emphasised the need for a more integrated set of computer tools to be available to the user. Their findings are documented in minutes and internal reports. Users within BGS have indicated that they wish not only to access a computer index, but also, having identified relevant data, to retrieve and process the data further within the same system.

Methods of presentation were explored in a demonstrator described by Adlam et al (1988). The user interface illustrated by the demonstrator was welcomed by potential users, but implementation as a production tool was not practicable at that time (Adlam, 1990).

Subsequent cost-reductions and improvements in workstations and software made it possible to introduce a first operational version of the index in April, 1992. User requirements specified the following features for the index system:

1. It should provide a comprehensive overview of information available within or from BGS.
2. It should operate through a graphical user interface, enabling the user to see the spatial distribution of relevant datasets, overlaid on topographic base maps of appropriate accuracy and detail.
3. It should be easy to use, even for infrequent or inexperienced users.
4. It should offer rapid and predictable response.
5. Hard copy output should be conveniently available.
6. The index should be widely available, initially throughout BGS including regional offices.

7. In the medium term, it should be possible to make the index information available outside BGS.

8. In the medium term, the index should be seen as a component of a front-end system, which, within BGS, gives access to a wider range of detailed data.

Following the initial release, it became clear that the geoscience index was an appropriate tool for accessing scanned borehole records. The scanning is being undertaken as a separate project, centred initially on the Newcastle office of BGS. It was also apparent that it could be helpful to display geoscience maps as a backdrop to other indexed data, particularly as an extensive map digitising programme is now under way in BGS. Two other aspects were therefore added to the requirements.

9. The index should give access to scanned documents by selecting their location on the screen.

10. Where available, it should be possible to display geoscience maps as a backdrop to the index data.

Extensive user feedback has been obtained and documented (see, for example, Gibson, 1992), and the system has been extensively modified in the light of user comments.

5.2 Workstation specifications

Sun SPARCstation IPX or IPC with 40-MHz SPARC integrated integer and floating point unit; 16 Mbytes of ECC memory; 207-Mbyte internal SCSI disc; 3.5-inch internal floppy disc; integrated GX graphics accelerator; two 4-Mbyte memory expansion; 1.3 Gbyte SCSI desktop storage module. At main sites, connected to Sun 630 data server.

5.3 Place in the Information System

It has long been the task of librarians and archivists to provide indexes which assist the user to find required information. Indexes also help custodians of the information to identify, acquire, arrange, store, keep track of, and dispose of information in an orderly manner. Conventional indexes assume that there are clearly identifiable documents which can be catalogued. Recent developments of hypertext, seamless maps under constant revision, and computer databases undermine this assumption. The digital methods which cause the problem can also provide a solution. Computer indexes, such as the present one, are essential, not just to give better access to conventional data, but also to provide the means of addressing the finer-grained information and the multiple versions of computer-based systems.

The organisation of the index must reflect the perceived structure of BGS information, such as that represented in the data models or data architecture. It must also recognise that alternative views of the information structure are valid, and in particular, that conventional indexes and cataloguing procedures are not being superseded, but merely extended.

The index should be implemented as one component within the functional architecture of a larger information system. In order to perform the function of an index adequately in a computer environment, the look and feel of the user interface must be consistent with those of other parts of the system which perform other, possibly overlapping, functions. From the user's point of view, the index system must be able to operate together with other applications, and readily exchange data with them in a coherent computer environment.

Driving forces must be in place to reward contributors of information, to encourage measurement and improvement of the quality of the information, and to ensure that users extract maximum benefit from the system. Feedback from users and contributors must be channelled to encourage system development in response to real requirements.

5.4 Future developments

1. As BGS is custodian of information from many countries, the index must be extended to cope with world-wide information.
2. At present, the index deals with a moderate number of country-wide datasets. Much of BGS information is local, and the access procedure must be modified to inform the user of localised data relevant to an area or topic of interest.
3. Data should be shown at appropriate resolution for the area being displayed.
4. A low-cost system for storing and delivering data, particularly outside BGS, is required. Recent developments in the technology of CD-ROMs suggest that they are now an appropriate medium.
5. For in-house use, the index should be embedded in a front-end system which gives the user wider access to BGS data while maintaining the look and feel of the user interface and offering convenient data exchange between programs.
6. An updating mechanism is required to ensure that the user is aware of data recently added to the system, even if they are not immediately consolidated in the GIS or CD-ROMs.

7. There is a continuing need to improve the robustness of the system, and the comprehensiveness and quality of the data. Furthermore, the initial investment must be safeguarded by long-term maintenance and development of the data and delivery system.

6. References

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