



INTERGOVERNMENTAL
OCEANOGRAPHIC
COMMISSION

INTERNATIONAL
HYDROGRAPHIC
ORGANIZATION



GENERAL BATHYMETRIC CHART OF THE OCEANS

**SUPPORTING VOLUME
TO THE
GEBCO DIGITAL ATLAS**

NATURAL ENVIRONMENT RESEARCH COUNCIL

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***THE GEBCO DIGITAL ATLAS IS NOT TO BE USED
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TO THE
GEBCO DIGITAL ATLAS**

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British Oceanographic Data Centre

This volume accompanies a CD-ROM containing the data sets of the GEBCO Digital Atlas (GDA) and a floppy disk containing the GDA Software Interface. It describes the activities of GEBCO and includes a User Guide to the GDA Software Interface.

The GDA Software Interface provides a powerful and user friendly tool kit which includes facilities for selecting, interrogating, visualizing, overlaying and exporting data from the GDA. It has a very low learning overhead and has been designed for use on an IBM PC (or compatible) with a VGA colour display.

March 1994

NATURAL ENVIRONMENT RESEARCH COUNCIL

Preface by the Chairman GEBCO

I am delighted to introduce the first digitized edition of GEBCO, otherwise known as the GEBCO Digital Atlas (GDA). The CD-ROM which accompanies this booklet contains the digitized contours of the Fifth Edition of GEBCO which was published as a complete set in 1984, comprising eighteen charts and a world summary chart. In two areas, the central south Atlantic and the seas around Japan, the GDA contains contours which have been updated from the Fifth Edition using much more recent data.

Now that GEBCO is available in digital form, the user will be able to manipulate its contents as fits the need without the constraints of sheet boundaries, scale or projection.

In addition to the contours, the package contains the tracklines on which the contours are based, the World Vector Shoreline (of the US Defense Mapping Agency), a computerised Gazetteer of the geographic names of undersea features maintained by the IHB, the digitized bathymetric chart of the Mediterranean, carried out as an IOC Regional Ocean Mapping Project, and a copy of the trackline inventory of the holdings of the IHO Data Centre for Digital Bathymetry.

It is the intention of the GEBCO community to update the GDA as and when significant new data become available, taking advantage of the benefits of a digitized data base. When the overall revisions become substantial, a new series of printed charts will be published, directly from the GDA, to provide for those who prefer the conventional paper charts.

I would like to take this opportunity to thank those numerous people who have devoted so much of their time and effort, often on a voluntary basis, to making the GEBCO Project such a success. Although the ongoing support of the IOC and IHO has been crucial to the continuance of the project, it is the dedication of rather a few individuals which has kept the momentum going. It would not be appropriate to acknowledge here all of those who have taken part but I would particularly like to mention three who have carried substantial burdens and made great contributions.

Meirion Jones chairs the Sub-Committee on Digital Bathymetry and has driven ahead the movement to bring GEBCO into the digital age. Bob Fisher, who chairs the Sub-Committee on Undersea Feature Names, has meticulously examined new names that have been proposed and brought considerable erudition to ensuring their historical and literary accuracy.

But especially I would like to thank Desmond Scott, as Permanent Secretary of GEBCO, and representative of IOC, who has maintained the long and complex discussions and negotiations between our formal meetings, has solved problems that seemed intractable, has ensured that progress continues through all difficulties and who has kept comprehensive records of our activities in the minutes.

Without the goodwill and enthusiasm of the GEBCO community, this CD-ROM of the GEBCO Digital Atlas could never have been completed.

Sir Anthony Laughton
Chairman of the Joint IOC/IHO Guiding Committee for GEBCO

Acknowledgements

The GEBCO Digital Atlas was produced under the auspices of the Intergovernmental Oceanographic Commission of UNESCO and the International Hydrographic Organization. The project was overseen by the Joint IOC/IHO Guiding Committee for GEBCO, and technical advice and guidance was provided by the GEBCO Sub-Committee on Digital Bathymetry. The British Oceanographic Data Centre was responsible for co-ordinating the technical aspects of the project and for assembling, quality controlling and preparing the contents of the GEBCO Digital Atlas for publication. This work was funded by the Marine and Atmospheric Sciences Directorate of the UK Natural Environment Research Council.

The production of the GEBCO Digital Atlas would not have been possible without the untiring efforts of the countless marine scientists and hydrographers who have collected echo-sounding measurements across the world's oceans over the past fifty years and more. Likewise, it has also depended on the efforts of the many hydrographic offices, marine laboratories, government agencies and university departments who have assembled, maintained and made these data available for use by GEBCO. The first release of the GEBCO Digital Atlas, being based primarily on the Fifth Edition of GEBCO, owes a great deal to the work of the scientific co-ordinators (as listed below) responsible for compiling these data into the bathymetric contour sheets of the Fifth Edition:

David Monahan: Canadian Hydrographic Service, Ottawa, Canada

Lawrence W. Sobczak: Department of Energy, Mines and Resources, Ottawa, Canada

Jean-René Vanney: Université Pierre et Marie Curie, Paris, France

Johannes Ulrich: Institut für Meereskunde an der Universität Kiel, Germany

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Robin K.H. Falconer & Jane Handley: GeoResearch Associates, Waikanae, New Zealand

Gisle Grønlie: University of Oslo, Norway

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Norman Z. Cherkis: Naval Research Laboratory, Washington, USA

G. Leonard Johnson: Office of Naval Research, Arlington, USA

Robert L. Fisher, Jacqueline Mammerickx, Isabel Taylor & Stuart Smith: Scripps Institution of Oceanography, La Jolla, USA

A special debt is owed to the Dominion Hydrographer and staff of the Canadian Hydrographic Service, Ottawa, who undertook the cartography and publication of the GEBCO Fifth Edition and prepared stable base transparencies of the bathymetric contours, coastlines and trackline control from the masters of the printed sheets for use in the digitization programme. Their kind permission for the use of this material in the GEBCO Digital Atlas is gratefully acknowledged.

A number of laboratories collaborated with BODC in the digitization of the GEBCO Fifth Edition sheets and grateful appreciation is expressed to:

The Bureau Gravimétrique International, Toulouse, for digitizing the bathymetric contours from 11 of the 18 Fifth Edition sheets and the Institut Géographique National (France) for funding this work.

The NERC Unit for Thematic Information Systems, Reading, for digitizing the bathymetric contours for 4 of the Fifth Edition sheets.

The Head Department of Navigation and Oceanography, St. Petersburg, for digitizing the bathymetric contours for one of the Fifth Edition sheets and the trackline control for 3 other sheets.

The Alfred-Wegener-Institut, Bremerhaven, for digitizing the trackline control for 2 of the Fifth Edition sheets.

The Japan Oceanographic Data Center, Tokyo, for making available the digitized bathymetric contours and tracklines for a major part of one of the Fifth Edition sheets.

Finally, special mention should be made of the generosity shown by the following organizations in making their products available for use in the GEBCO Digital Atlas:

The U.S. Defense Mapping Agency for the World Vector Shoreline.

The Head Department of Navigation and Oceanography, St. Petersburg, for the First Edition of the International Bathymetric Chart of the Mediterranean.

The International Hydrographic Bureau, Monaco, for the digital version of the IHO/IOC Gazetteer of Geographic Names of Undersea Features.

The U.S. National Geophysical Data Center, Boulder, for the GEODAS trackline inventory of data available at the IHO Data Centre for Digital Bathymetry.

The UK Hydrographic Office for the Third Edition of the Echo-Sounding Correction Tables.

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The copying of the GEBCO Digital Atlas in digital form for dissemination to third parties is prohibited without prior written permission from the British Oceanographic Data Centre - the price of the GEBCO Digital Atlas has been set at a low level so as to encourage users to obtain their copies directly from the BODC.

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The legal copyright of the main components of the GEBCO Digital Atlas is held by the UK Natural Environment Research Council on behalf of the Intergovernmental Oceanographic Commission (of UNESCO) and the International Hydrographic Organization, through the Joint IOC/IHO Guiding Committee for GEBCO.

The legal copyright of certain components is however held separately:

The US Defense Mapping Agency for the World Vector Shoreline (WVS);

The Head Department of Navigation and Oceanography, St. Petersburg, for the First Edition of the International Bathymetric Chart of the Mediterranean;

The International Hydrographic Bureau, Monaco, for the IHO/IOC Gazetteer of Geographic Names of Undersea Features;

The UK Hydrographic Office for the Third Edition Echo-Sounding Correction Tables;

The US National Geophysical Data Center for the GEODAS trackline inventory of echo-sounding data held at the IHO Data Centre for Digital Bathymetry.

Any material reproduced from the GEBCO Digital Atlas should be accompanied by appropriate attribution to the source of the material. For non-GEBCO material, such as the World Vector Shoreline, acknowledgement should include reference to the original source (the US Defense Mapping Agency).

If the GEBCO bathymetry is being downgraded or is being reproduced over a large area covering many sheets then the source should be acknowledged as 'The GEBCO Digital Atlas published by the British Oceanographic Data Centre on behalf of IOC and IHO, 1994'.

If the bathymetry is being reproduced in its original form for a specific region then the acknowledgement should include reference to the scientific co-ordinators responsible for compiling the original contours, for example: 'The bathymetry is reproduced from GEBCO sheets 5.04 and 5.08, compiled by A.S. Laughton, D. Monahan, R.C. Searle, and G.L. Johnson, and made available through the GEBCO Digital Atlas published by the British Oceanographic Data Centre on behalf of the IOC and IHO, 1994'.

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SECTION 1

The General Bathymetric Chart of the Oceans (GEBCO)

1.1 HISTORICAL BACKGROUND

First Edition

GEBCO was initiated at the turn of the century by HSH Prince Albert I of Monaco. It traces its origins to discussions held during the Seventh International Geographic Congress in Berlin in 1899 which resulted in a Commission being set up to study the naming of ocean relief features and to draw up plans for a general chart of the oceans. The Commission was composed of ten leading geographers and scientists of the day: HSH Prince Albert I of Monaco, Professor O. Krummel, Admiral S.O. Makarow, Dr. H.R. Mill, Sir John Murray, Dr. Fridtjof Nansen, Professor O. Petersson, Baron Richtofen, Professor A. Supan and Professor J. Thoulet.

The Commission met in Wiesbaden in April 1903 under the chairmanship of Prince Albert and gratefully accepted the Prince's offer to organise and finance the production of a new series to be designated "The General Bathymetric Chart of the Oceans (GEBCO)". The series, on a scale of 1:10 million, was to be composed of 16 sheets on Mercator projection, together with 8 sheets on gnomonic projection covering the polar regions.

Work on the First Edition of GEBCO began in June 1903 with a team of seven draughtsmen under the direction of Lieutenant Ch. Sauerwein. Extremely rapid progress was made and the series was completed in a period of 7 months. The lithographed charts were presented to the Paris Academy of Sciences in January 1904, and later in the year to the Eighth International Geographical Congress in Washington, D.C. In making the presentation, Professor Thoulet remarked ".....Here then is everything that is known about the relief of the ocean floor. For many years to come, mariners, telegraphists, engineers, oceanographers and scientists will continue their soundings, for now we must proceed to fill in the details; no point of any sea on the globe will escape our investigations....."

The First Edition contained over 18,000 soundings selected mainly from British Admiralty Charts with additional data incorporated from soundings obtained by cable-laying vessels. Depth contours were shown at 200m, 500m, 1000m and at 1000m intervals thereafter.

Second Edition

At the opening of the Oceanographic Museum at Monaco in 1910, Prince Albert called together an international committee of experts to discuss the production of a Second Edition of GEBCO. The first sheets of the Second Edition were published in 1912 but the last did not appear until 1930. World War I broke out when only a part of the series had

been printed and Prince Albert died in 1922. Dr. Jules Richard, Director of the Oceanographic Museum, supervised the production of the remaining sheets of the series according to the wishes expressed in the Prince's will.

For the Second Edition the number of soundings had increased to 30,000. Dr. Richard, writing in 1930 remarked "The second edition (1912-1930) is much more complete than the first.....The assembled coloured sheets form a magnificent chart of unique type. It is particularly interesting as an ensemble; it shows up in a striking fashion the gaps in our knowledge of the relief of the sea bottom. It shows us clearly what has yet to be done to fill these gaps.....the present chart must be retained; it must be completed little by little and thus brought to perfection.....The gaps are enormous, some of them are several hundreds of thousands of square kilometres in extent. In these days echo-sounding will make it easier to fill them up than in the past, for a vessel can take soundings while underway....."

Almost up to World War II, all soundings in the deep ocean were discrete wire soundings, obtained laboriously by a very small number of ships that could spare the time to stop on station for lengthy periods of time for the sole purpose of obtaining one spot ocean depth. As a result, the few deep ocean soundings obtained each year could be published in the form of lists, by certain national Hydrographic Offices; the major sources of data were the "Lists of Oceanic Depths" published regularly by the British Admiralty since 1888, the French "Annales Hydrographiques" and the German "Annalen der Hydrographie". However, with the advent of the echo-sounder, this approach soon became impractical.

Third Edition

There was a major change in organisation for the production of the Third Edition of GEBCO. Following the death of Prince Albert, his scientific team was disbanded and the Government of Monaco invited the International Hydrographic Bureau (now the International Hydrographic Organization) to take over the project. In 1929, the Bureau was entrusted with the task of keeping the series up-to-date and of collating all data outside the continental shelf.

Data for the Third Edition were compiled by the IHB staff, and hydrographic offices of the IHO Member States were requested to supply all available oceanic soundings. These took the form of lists of depths together with the 'exact' geographical position and details of sounding apparatus, sea temperatures, velocity of sound in seawater etc. To collate the soundings, the IHB established a series of 1001 plotting sheets on Mercator projection at a scale of 1:1 million projection. From these plotting sheets the contour lines were compiled and soundings for inclusion on the GEBCO 1:10 million series were selected.

Publication began in 1932 but work on the Third Edition progressed slowly and was never completed; the effect of World War II and the rising flood of new data were contributing factors but the main reason was the lack of financial support which restricted deployment of resources to a single draughtsman.

Fourth Edition

The VIth International Hydrographic Conference, 1952, saw the need for a Fourth Edition of GEBCO and, with the amount of bathymetric data continuing to increase rapidly, decided that the sheets should be updated on a 5-year cycle. Consequently, the Fourth Edition was started in 1958 before the Third Edition had been completed. The 2 sheets published in 1958 and 1961 were the last to be based on compilations prepared by the IHB. To produce further sheets from the great wealth of new data becoming available was clearly beyond the resources of the Bureau alone and, accordingly, a new organisational structure was evolved.

The responsibility for maintaining the 1:1 million plotting sheets was taken over by 18 volunteering Hydrographic Offices of IHO Member States, each responsible for a specific area of the world's oceans. The IHB co-ordinated the scheme, ensuring the flow of bathymetric soundings to the appropriate Hydrographic Office.

In 1965, an agreement was reached between the IHB and the French Institut Géographique National (IGN) for the production of the GEBCO Fourth Edition. Responsibility for the cartographic compilation, publication and sales of GEBCO was taken over by IGN, with IHB acting as the co-ordinator for the whole activity. The volunteering Hydrographic Offices supplied IGN with updated copies of their 1:1 million collected soundings sheets for use in compiling the GEBCO sheets. The IGN was responsible for drawing the contours and selecting the soundings, with the French Hydrographic Office verifying this work. The project was overseen by the GEBCO Committee - a consultative body with membership drawn from national Hydrographic Offices, the Scientific Committee on Oceanic Research (SCOR) and the International Association for the Physical Sciences of the Oceans (IAPSO). An Editorial Board of the Committee was responsible for the verification and correction of geomorphological details.

With the new arrangements, 7 GEBCO sheets, 4 of the Fourth Edition and 3 of the Third Edition, were published between 1966 and 1973. However, under this system there were a number of drawbacks, principally the lack of scientific input in the compilation of the various sheets. These inadequacies were highlighted by the SCOR Working Group on "Morphological Mapping of the Ocean Floor".

Even to the present day, the sounding coverage of the world's oceans is very patchy and often concentrated on isolated tracklines with large gaps in between. When the earlier editions of GEBCO were produced there was no adequate understanding of the nature and scale of processes which first create and then modify the variety of morphological features of the ocean floor. Only when the theory of Plate Tectonics was developed in the late 1960s did it become possible to understand the processes involved in shaping the ocean floor. The knowledge base developed from the geological and geophysical research of the period enabled scientists, cautiously but with increasing confidence, to infer major linear trends and thus to interpolate between sounding lines in order to produce more meaningful bathymetric charts. This scientific approach to bathymetric mapping was to become one of the key features of the preparation of the Fifth Edition of GEBCO.

1.2 THE FIFTH EDITION OF GEBCO

In 1972, realising the need for a modernised GEBCO series, the IHO and the IOC decided to co-sponsor an entirely new edition of the GEBCO, to be compiled by marine scientists employing the best available geological and geophysical knowledge of the sea floor.

Production of the series was supervised by a Joint IOC-IHO Guiding Committee for the GEBCO composed of ten members, five nominated by the IHO and five by the IOC. The IHO experts were selected from volunteering Hydrographic Offices in their Member States, whereas the IOC experts, who were nominated after consultation with the Scientific Committee on Oceanic Research (SCOR), the International Association for the Physical Sciences of the Ocean (IAPSO), and the Commission for Marine Geology (CMG), were eminent marine geologists and geophysicists.

The IHO retained responsibility for maintaining the 655 collected soundings sheets on a scale of 1:1 million, and for providing cartographic advice on, and supervision over, the final product. On the other hand, the IOC, in conjunction with SCOR, IAPSO and CMG, was responsible for all scientific input, including contouring of the bathymetric data and compilation of the final waterwork for each sheet.

The collected soundings sheets provided by the volunteering Hydrographic Offices formed a unique data base on which to compile the Fifth Edition. However, by virtue of the fact that these sheets had been compiled over a period of thirty to forty years, the data recorded thereon varied considerably in accuracy, both in depth and position, depending on the sounding apparatus fitted in, and the navigational methods employed by, the numerous ships which had contributed data.

Improved methods of sounding by Precision Depth Recorder using a crystal controlled time base, and navigation using such systems as Omega and the Satellite Navigator, clearly demonstrated the errors to which earlier data were liable. However, in the absence of improved modern data, these data continue to be all that are available in many areas. Although certain areas of the deep sea may be of sufficient commercial, military or scientific importance to be examined closely by saturated surveys, for the greater part of the deep oceans bathymetric charts can only be compiled from random track data of variable quality. The interpretation of such data relies on the expert understanding of marine geologists and geophysicists of the processes shaping the ocean floor.

A major problem facing the preparation of the Fifth Edition was the chronic lack of finance available for GEBCO and the recognition that sales clearly could not begin to cover production costs, at least until the complete world cover was available and the series had been given wide publicity. The breakthrough came when, with remarkable foresight, the Canadian Government agreed to scribe, print and provide sales outlets initially for the first 4 sheets of the series, but later for the full 18 sheets. This agreement was honoured by the Canadian Hydrographic Service, which over the period 1975 to 1982 was responsible for bringing to publication the complete series of 18 Fifth Edition charts. Indeed, at the completion of the project, the CHS also published a World Sheet with global coverage at a scale of 1:35 million.

With this agreement in hand, the Guiding Committee was able to offer marine geoscientists in many countries of the world the possibility of publishing their work, with full acknowledgements, in a prestigious chart series of high quality and thus gain strong support from the leaders of the world marine geoscientific community. However, it could not assist them with project funding and it is a measure of the high regard in which the GEBCO is held that so many eminent marine geoscientists were willing to give their time and energy to the preparation of one or more sheets of the series, and to obtain institutional or national funding for their in-house work.

For each of the Fifth Edition sheets, one or more Scientific Co-ordinators were appointed who were responsible for co-ordinating and compiling the best possible contour plots for the area of the sheet. They were also responsible for working closely with the Scientific Co-ordinators of adjacent sheets to ensure continuity at borders and on overlaps. An independent review procedure was also set up, through which all sheets had to pass before being cleared for publication.

For the Fifth Edition, the world cover between 72°N and 72°S was, as with earlier editions, on Mercator projection at a scale of 1:10 million at the equator. This required 16 sheets, some of which were given overlap strips so as to ensure that prominent morphological features were shown in their entirety on one sheet and were not cut by an arbitrary geographical border. For the same reason, limits of sheets in the southern hemisphere were shifted by 20° to the east in order to give more satisfactory cover to the main ocean basins.

The polar regions were covered by 2 sheets only (as opposed to 8 in the earlier editions). These were on Polar Stereographic projection at a scale of 1:6 million at 75° latitude, and reached to 64° N and S, thus having a considerable overlap with the Mercator sheets.

The area and limits of each of the published sheets is shown in Figure 1, while a full list of the Scientific Co-ordinators responsible for each sheet is given in Table 1. The land topography and coastlines for the Fifth Edition were taken from the *Carte Générale du Monde*, by permission of the Institut Géographique National, Paris, France. The Antarctic continent was taken from maps supplied by the Scott Polar Research Institute in Cambridge, England, while the Arctic shoreline was taken from the American Geographical Society Map of the Arctic Region. Each of the sheets depicted contoured bathymetry at standard depths of 200m, 500m and at 500m intervals thereafter, although the actual contours displayed varied slightly as some sheets also included contours at depths intermediate to the standard levels.

So as to ensure the standardization and general acceptance of the geographical names and the nomenclature used for ocean bottom features in the Fifth Edition, each sheet was carefully scrutinised by the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features. In conformance with the system used by the IHO for its International Nautical Chart series, national versions of geographic names were used for land features (transliterated to the Roman alphabet where appropriate) and English names were used at sea.

An important innovation with the Fifth Edition was the inclusion of sounding control on the face of each sheet. Discrete soundings appear as grey dots and echo-sounding tracks as grey lines in the background to the contours. Saturated areas and areas of high quality surveys are shown in boxes and cross referenced to a note in the border of the sheet. This has enabled far fewer spot depths to be shown (in figures); indeed, these are now virtually confined to maximum and minimum depths of significant features. An even greater advantage is that the chart user can assess the contour reliability as a reliable indication of the amount and spacing of the original data from which the contours were drawn is presented.

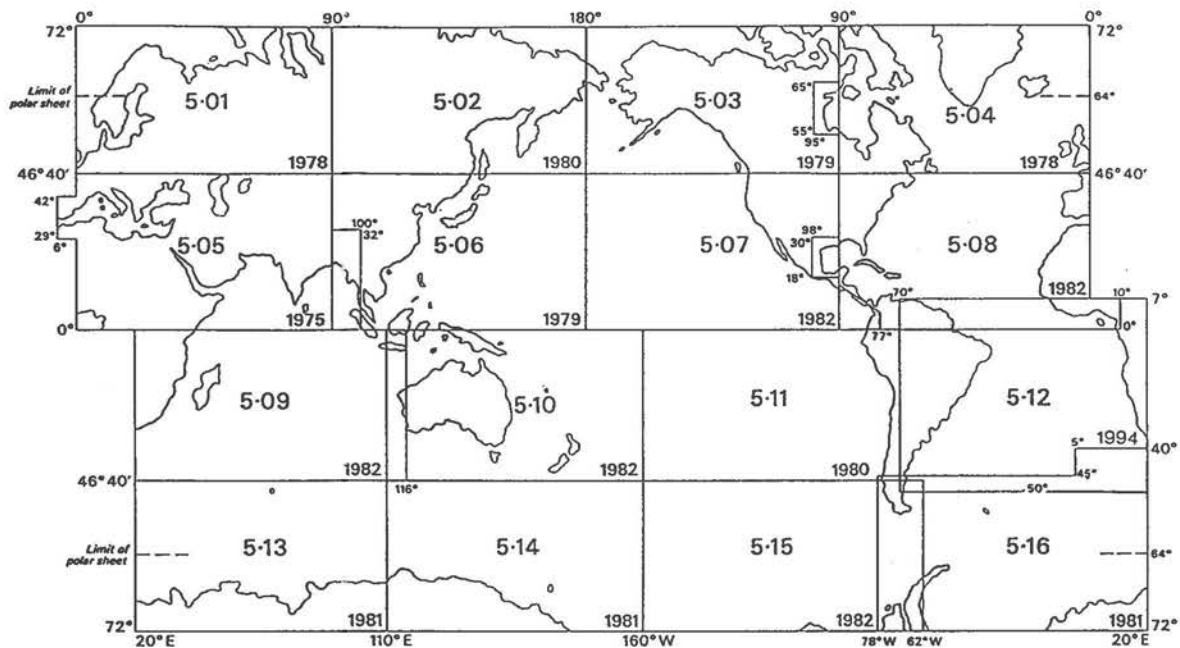
Copies of the Fifth Edition sheets (either flat or as a boxed set of folded sheets with supporting volume) can be obtained direct from:

The Hydrographic Chart Distribution Office
Department of Fisheries and Oceans
1675 Russell Road
P.O. Box 8080
Ottawa
Ontario K1G 3H6
Canada
Fax: 1 (613) 998 1217

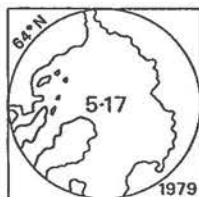
or

Ocean Mapping (IOC)
Cumbers
Mill Lane
Sidlesham
Chichester
West Sussex PO20 7LX
United Kingdom
Fax: 44 (428) 685637

It should be noted that a revision of sheet 5.12 in the South Atlantic is currently in production. The GEBCO Guiding Committee decided in 1987 that, as the original version of 5.12 printed in 1978 had been based on rather sparse data and as substantial amounts of new data had become available in the meantime, it would be in order to commission the preparation of a revised version. The compilation and assembly of the contours for the revised sheet was completed in 1993 and it is due to be published by the Canadian Hydrographic Service in 1994.



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Sheets 5.01 to 5.16 were published on Mercator Projection at a Scale of 1:10 million at the equator. The two polar sheets 5.17 and 5.18 were published on Polar Stereographic Projection at a scale of 1:6 million at 75° latitude.

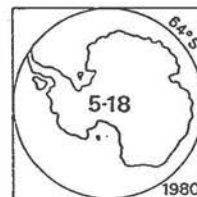


FIGURE 1. Geographic coverage of the published sheets of the GEBCO Fifth Edition

TABLE 1: Scientific Co-ordinators responsible for compiling the bathymetry on the sheets of the GEBCO Fifth Edition

Sheet No.	Scientific Co-ordinator	Affiliation
5.01	Johannes Ulrich	Institut für Meereskunde an der Universität Kiel, Germany
5.02	Gleb B. Udintsev	Vernadsky Institute of Geochemistry, Moscow, Russia
5.03	G. Leonard Johnson	Office of Naval Research, Arlington, USA
	David Monahan	Canadian Hydrographic Service, Ottawa, Canada
5.04	Anthony S. Laughton	IOS Deacon Laboratory, Wormley, UK
	David Monahan	Canadian Hydrographic Service, Ottawa, Canada
5.05	Anthony S. Laughton	IOS Deacon Laboratory, Wormley, UK
5.06	Yoshio Iwabuchi	Hydrographic Department, MSA, Tokyo, Japan
5.07	Jacqueline Mammerickx & Stuart M. Smith	Scripps Institution of Oceanography, La Jolla, USA
5.08	Roger C. Searle	IOS Deacon Laboratory, Wormley, UK
	David Monahan	Canadian Hydrographic Service, Ottawa, Canada
	G. Leonard Johnson	Office of Naval Research, Arlington, USA
5.09	Robert L. Fisher	Scripps Institution of Oceanography, La Jolla, USA
5.10	David Monahan	Canadian Hydrographic Service, Ottawa, Canada
	Robin K.H. Falconer	Bedford Institute of Oceanography, Dartmouth, Canada & New Zealand Oceanographic Institute, Wellington, New Zealand
	Marie Tharp	Lamont-Doherty Geological Observatory, New York, USA
5.11	Jacqueline Mammerickx & Stuart M. Smith	Scripps Institution of Oceanography, La Jolla, USA

TABLE 1 (continued)

Sheet No.	Scientific Co-ordinator	Affiliation
5.12	Peter Hunter	IOS Deacon Laboratory, Wormley, UK
	Norman Cherkis	Naval Research Laboratory, Washington, USA
	Carl Brenner	Lamont-Doherty Geological Observatory, New York, USA
	Gleb B. Udintsev	Vernadsky Institute of Geochemistry, Moscow, Russia
	Robin Falconer & Jane Handley	GeoResearch Associates, Waikanae, New Zealand
5.13	Dennis E. Hayes & Michael Vogel	Lamont-Doherty Geological Observatory, New York, USA
5.14	Robin K.H. Falconer	Bedford Institute of Oceanography, Dartmouth, Canada & New Zealand Oceanographic Institute, Wellington, New Zealand
	Marie Tharp	Lamont-Doherty Geological Observatory, New York, USA
5.15	Jacqueline Mammerickx & Isabel Taylor	Scripps Institution of Oceanography, La Jolla, USA
	Steven Cande	Lamont-Doherty Geological Observatory, New York, USA
5.16	John LaBrecque, Philip D. Rabinowitz & Carl Brenner	Lamont-Doherty Geological Observatory, New York, USA
5.17	G. Leonard Johnson	Office of Naval Research, Arlington, USA
	David Monahan	Canadian Hydrographic Service, Ottawa, Canada
	Gisle Grønlie	University of Oslo, Norway
	Lawrence W. Sobczak	Department of Energy, Mines and Resources, Ottawa, Canada
5.18	G. Leonard Johnson	Office of Naval Research, Arlington, USA
	Jean-René Vanney	Université Pierre et Marie Curie, Paris, France

1.3 DIGITIZATION OF THE FIFTH EDITION OF GEBCO

Publication of the Fifth-Edition of GEBCO was a goal with a time limit for its achievement but the overall task will continue well into the foreseeable future. More data are being collected daily in all parts of the world's oceans. It has become inevitable that modern methods of data storage and retrieval need to be introduced if GEBCO is to be kept properly updated. Furthermore, users are becoming more sophisticated in their requirements and digital data sets are required to exploit the opportunities provided by modern computing technology.

In 1983, the GEBCO Guiding Committee set up a Sub-Committee on Digital Bathymetry to look into this problem and, in particular, to provide guidance on:

- a) digitizing the GEBCO Fifth Edition and
- b) establishing an international system for maintaining and updating the data stored on the IHO collected soundings sheets using automated digital techniques.

Both these tasks have now been completed (see also section 1.4).

Digitization of the Fifth Edition proved a major task and took the best part of ten years to complete (1984-1993). As usual, funding was a major problem and the provision of resources for the work was dependent on the foresight and goodwill of national agencies. The successful completion of the task was dependent on the generous cooperation of two organisations in particular; the French Institut Géographique National through support given to the Bureau Gravimétrique International in Toulouse; and the Marine and Atmospheric Sciences Directorate of the UK's Natural Environment Research Council (NERC) through support given to the NERC Unit for Thematic Information Systems and the British Oceanographic Data Centre.

The digitization of the bathymetric contours and coastlines of the Fifth Edition was carried out, on a sheet by sheet basis, at four laboratories:

- * Bureau Gravimétrique International, Toulouse, France - 11 sheets
- * NERC Unit for Thematic Information Systems, Reading, UK - 4 sheets
- * Head Department of Navigation and Oceanography, St. Petersburg, Russia - 1 sheet
- * British Oceanographic Data Centre, Bidston, UK - 2 sheets

Quality control, final editing and reformatting of these data into a uniform data set was carried out by the British Oceanographic Data Centre (BODC).

Stable base transparencies of the master bathymetric contour plates of the published sheets were used as the source material for digitizing, except for sheets 5.06 and 5.12. These

transparencies were provided by the Canadian Hydrographic Service at the same scale and projection as the published sheets. At each of the participating laboratories the transparencies were raster scanned using laser scanning equipment. The raster output, typically on a 20 dot/mm binary matrix, was converted into unlabelled contour vector streams which were then exhaustively checked and edited using an interactive graphics display terminal. Gaps in contours, caused by contour labels on the published charts, were filled in digitally from the terminal. Each digitized contour stream was then manually assigned an appropriate bathymetric depth by cross reference to the contours on the printed sheets.

On occasions where it was difficult to identify contour values without ambiguity, reference was made back to the Scientific Co-ordinator(s) for the sheet, the IHO collected soundings sheets or the digital sounding data held at the National Geophysical Data Center, Boulder, USA.

Prior to their final release, the digitized contours for each sheet were reviewed in detail at BODC. This review involved plotting out the contour vectors, on the same scale and projection as the published sheet, and checking out in detail the registration and labelling of each vector - no mean feat considering that the 18 Fifth Edition sheets produced some 95,000 contour segments. BODC's checks on the digitized sheets confirmed that the techniques adopted at the participating laboratories were able to reproduce the Fifth Edition contours to an accuracy comparable with the line thickness of the contours on the published sheets.

As already mentioned, the digitization was carried out on a sheet by sheet basis. Where the published sheets overlap in geographic coverage, only one version of the overlapping area was digitized i.e. that shown on the most recently compiled sheet. Edge matching was carried out across the sheets to ensure the digitized data provide a seamless bathymetry across the globe. Thus, digitized contours at sheet boundaries may not always accord with those on the printed sheets, although any adjustments made were carried out taking due account of the underlying trackline control information.

The two polar sheets (5.17 and 5.18) were only digitized to the 72° latitude i.e. they were not digitized where they overlapped adjacent Mercator sheets. Details showing the digitized area contributed by each of the 18 sheets is shown in Figure 2.

For sheet 5.06 in the Western Pacific, the digital contours and coastline for the area from 100°E to 180°E were taken directly from a digital data base maintained by the Japan Oceanographic Data Center, Tokyo. An earlier version of this data base had in fact formed the basis for the published sheet.

Rather than digitize the outdated version of 5.12, BODC collaborated in the production of the revised version of this sheet. The revised contouring of various sections of the sheet was carried out by scientists in the USA, Russia, New Zealand and the UK and, following review by two nominated GEBCO experts, their hand drawn contours were sent to BODC for digitizing and for compiling into a single seamless sheet. The contents of

the digitized file are being used as the base from which the revised sheet will be published by the Canadian Hydrographic Service in 1994.

Recognising that the digitized contours would be of limited value without corresponding information on the distribution of soundings used in their original compilation, it was decided that the trackline control should also be digitized from the Fifth Edition sheets. Using almost identical techniques and procedures to those used in digitizing the bathymetric contours and coastlines, the tracklines from the Fifth Edition were digitized on a sheet by sheet basis by three organisations in Russia, Germany and the UK thus:

- * British Oceanographic Data Centre, Bidston, UK - 13 sheets
- * Head Department of Navigation and Oceanography, St. Petersburg, Russia - 3 sheets
- * Alfred-Wegener-Institut, Bremerhaven, Germany - 2 sheets

Quality control, final editing and reformatting of these data into a uniform data set was again performed at BODC, with the work being carried out over a 3 year period between 1990 and 1993. The Canadian Hydrographic Service kindly collaborated again by providing stable base transparencies of the master, trackline control plates of the published Fifth Edition sheets for use in digitizing. As before, raster scanning techniques using laser scanning equipment provided the basis for the digitization, with the final output being in the form of trackline vectors.

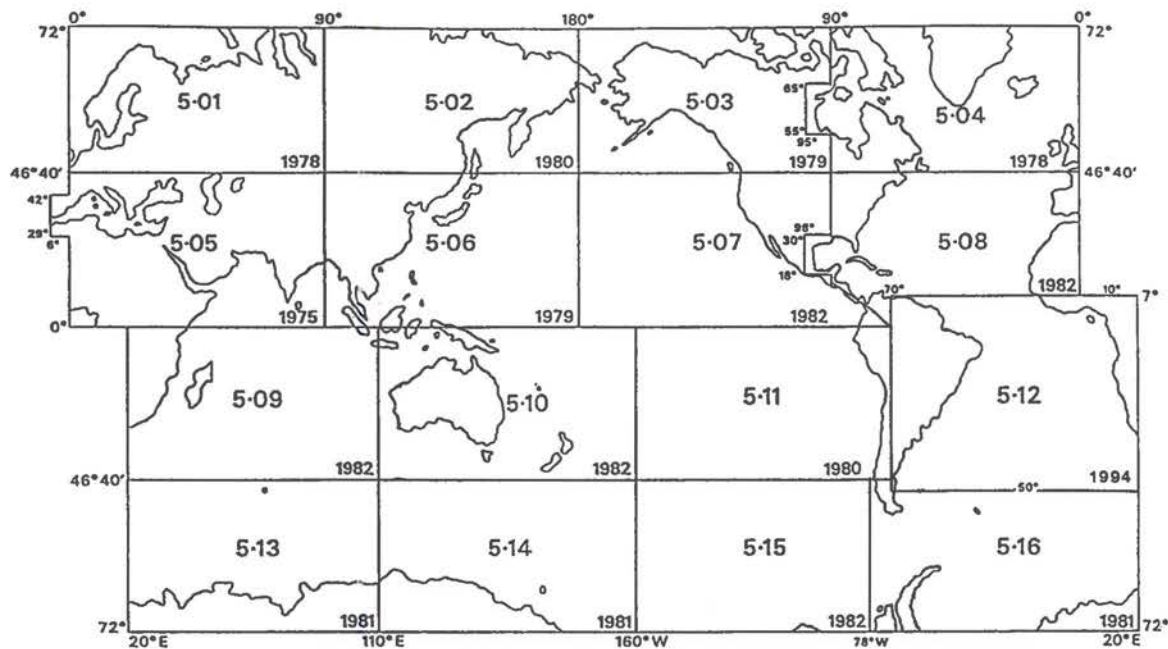
The outlines of survey boxes (together with their supporting text) were digitized as well as the individual ship tracklines. In areas where sheets overlapped, the tracklines were only digitized on the sheet from which the bathymetric contours had been digitized. For the area of sheet 5.06 between 100°E and 180°E, the tracklines were digitized from transparencies taken from the trackline plates used to produce the 1:1 million scale atlas published by the Japan Oceanographic Data Center, which complemented the digital data set of bathymetric contours and coastlines already supplied to BODC for that area. Likewise, for the area of sheet 5.12, the tracklines were digitized from source material provided by the compilers of the revised bathymetry for the new version of the sheet.

The complete data set of the digital contours, coastlines and tracklines for the GEBCO Fifth Edition was finalised in June 1993 thereby providing a high quality digital base from which future editions of GEBCO might evolve.

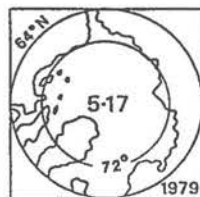
1.4 ROLE OF THE IHO AS THE WORLD DATA CENTRE FOR BATHYMETRY

The first international system for compiling sounding data on a worldwide basis was established in 1903 by Prince Albert I of Monaco. Following his death in 1922, the Government of Monaco invited the International Hydrographic Bureau (now the International Hydrographic Organization) to take over the scheme. In 1929, the Bureau was entrusted with this task by the International Hydrographic Conference, and a world series of plotting sheets was established, at a scale of 1:1 million on Mercator projection,

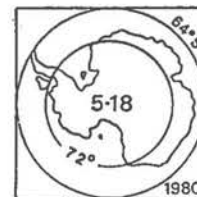
FIGURE 2. Geographic coverage of the sheet areas digitized from the GEBCO Fifth Edition



- 13 -



In those areas where the published sheets overlapped, the contours were digitized only from the most recently published sheet. The polar sheets were digitized only to 72° latitude, i.e. not including their area of overlap with adjacent Mercator sheets.



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on which to record and publish all sounding data outside the continental shelf. Up until World War II, the data was comparatively sparse and could be handled by the small staff at the disposal of the Bureau.

By the mid-1950s, a great wealth of modern data became available and it was clearly beyond the resources of the Bureau alone to maintain the soundings data bank. Consequently, in order to ensure that the 1:1 million plotting sheets could be kept up to date, a network was established involving the services of volunteering Hydrographic Offices in 18 IHO Member States. Each of the Volunteering Hydrographic Offices (VHOs) accepted responsibility for compiling bathymetric data in specific geographic areas and for periodically updating the 1:1 million collected soundings sheets in their area of responsibility.

Individual Hydrographic Offices were charged with ensuring the regular supply of bathymetric data to the appropriate VHO, and the IHB in Monaco maintained a co-ordinating role in this scheme, issuing information on the status of the various sheets from time to time. Copies of the soundings sheets were available to the user community on direct application to the appropriate VHO - a nominal charge was usually made to cover the cost of copying. When the ICSU World Data Centre (WDC) system was established following the International Geophysical Year in the late 1950s, the IHO became recognised as the World Data Centre for Bathymetry.

The collected soundings sheets formed the base from which much of the contouring of the GEBCO Fifth Edition was compiled. However, during the preparation of the Fifth Edition in the early 1980s, it became apparent that a number of the GEBCO Scientific Co-ordinators had at their disposal considerably more data than appeared on the 1:1 million sheets maintained by the VHOs. The shortfall in data submission to the VHOs appeared closely related to the introduction of computer techniques for the handling of bathymetric data, particularly in the geoscience community. Since the late 1960s, geoscientists had been finding it far more convenient to store their data in computer compatible form and to plot out data automatically as and when the need arose. Computer techniques also enabled far greater volumes (and densities) of data to be handled than could be readily hand scribed onto plotting sheets.

The GEBCO Sub-Committee on Digital Bathymetry reviewed this situation in 1986, recognising that a major part of the missing data might well be found in the underway marine geophysics database maintained by the US National Geophysical Data Center (NGDC) in Boulder. At that time, the Boulder centre held some 2000 cruises of bathymetric, magnetic and gravity data, primarily from US laboratories but also with significant contributions from Japan, France, the former USSR, UK, New Zealand, Canada, South Africa and China. The database already included over 7 million nautical miles of digital bathymetric data and had clearly demonstrated the value of computing techniques for managing bathymetric data. The Sub-Committee advised that, in pursuing its goal of maintaining a global collection of sounding data for the deep ocean, the IHO should seek to collaborate with the US NGDC in creating a digital database for sounding data.

In 1987, the US Government submitted a proposal to the XIIIth International Hydrographic Conference for the establishment of an IHO Data Centre for Digital Bathymetry (DCDB) to be operated by the US NGDC on behalf of IHO. This proposal was viewed favourably by the IHO Member States and on 1st June 1990 the IHO DCDB was duly established at US NGDC in Boulder.

The IHO database of digital, single beam echo-sounding data is co-held within NGDC's GEODAS database of worldwide underway geophysics data. In its first three and a half years of operation, up to the end of December 1993, the IHO DCDB has assimilated over 8 million echo-soundings covering over 2 million nautical miles of track from 900 cruise legs into the GEODAS database. The total GEODAS database now contains over 28 million echo-sounding values covering 12 million nautical miles of track from over 3600 cruise legs. The distribution of these data is shown in Figure 3. It will be readily noticed that, although the international collection of sounding data has come a long way since 1904 when the First Edition of GEBCO was published based on a total of 18,000 soundings, for many areas of the globe there are still large gaps in the data coverage.

The use of computing techniques has revolutionised user access to the worldwide collection of echo-sounding data. In March 1993, the NGDC released a two volume CD-ROM version of its complete GEODAS data holding. It contains all data assimilated up to the end of 1992 and is accompanied by a user friendly software interface providing the user with direct access to over 4 gigabytes of marine geophysical trackline data, including the complete holding of single beam echo-sounding data. (An updated CD-ROM encompassing data assimilated up to the end of 1993 is due to be released in early 1994). The complete package is available from:

National Geophysical Data Center
NOAA E/GC4, Dept. 915
325 Broadway
Boulder CO 80303-3328
U.S.A.

Fax: 1 (303) 497 6513
Internet: rrw@mail.ngdc.noaa.gov

For some time, the IHO DCDB will exist in parallel with the VHO system of 1:1 million collected soundings sheets, at least until the data from these sheets can be made available in digital form - much of the older data is only to be found on these sheets and is invaluable for those areas not covered by modern data. In 1992, an IHO Working Group on Oceanic Plotting Sheets concluded that the system for maintaining hard copy 'collected soundings sheets' should be phased out in favour of the digitally based system at the IHO DCDB. It is envisaged that the VHOs will continue to play a major role in searching out and quality controlling sounding data in their geographic area of interest and in ensuring their submission in digital form to the IHO DCDB. The VHOs will also be encouraged to collaborate with the IHO DCDB in the digitization of the soundings on their plotting sheets, taking care to avoid duplication with data already available in digital form.

In addition to single beam echo-sounding data, the IHO DCDB is also investigating the possibility of extending its database to accommodate multibeam data. As an initial step,

FIGURE 3. Distribution of single beam echo-sounding data held in digital form at the IHO Data Centre for Digital Bathymetry (as of 31/12/93)

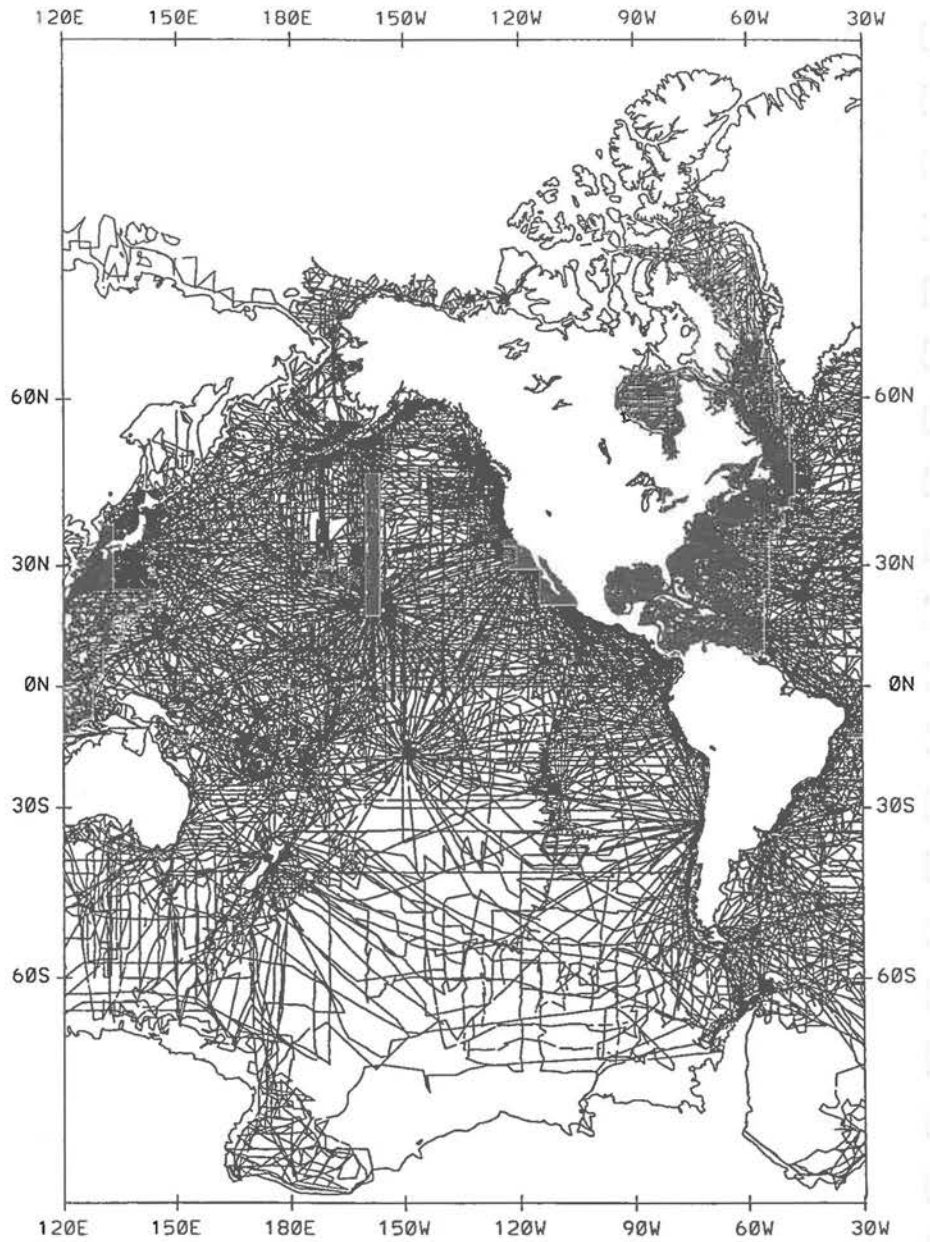
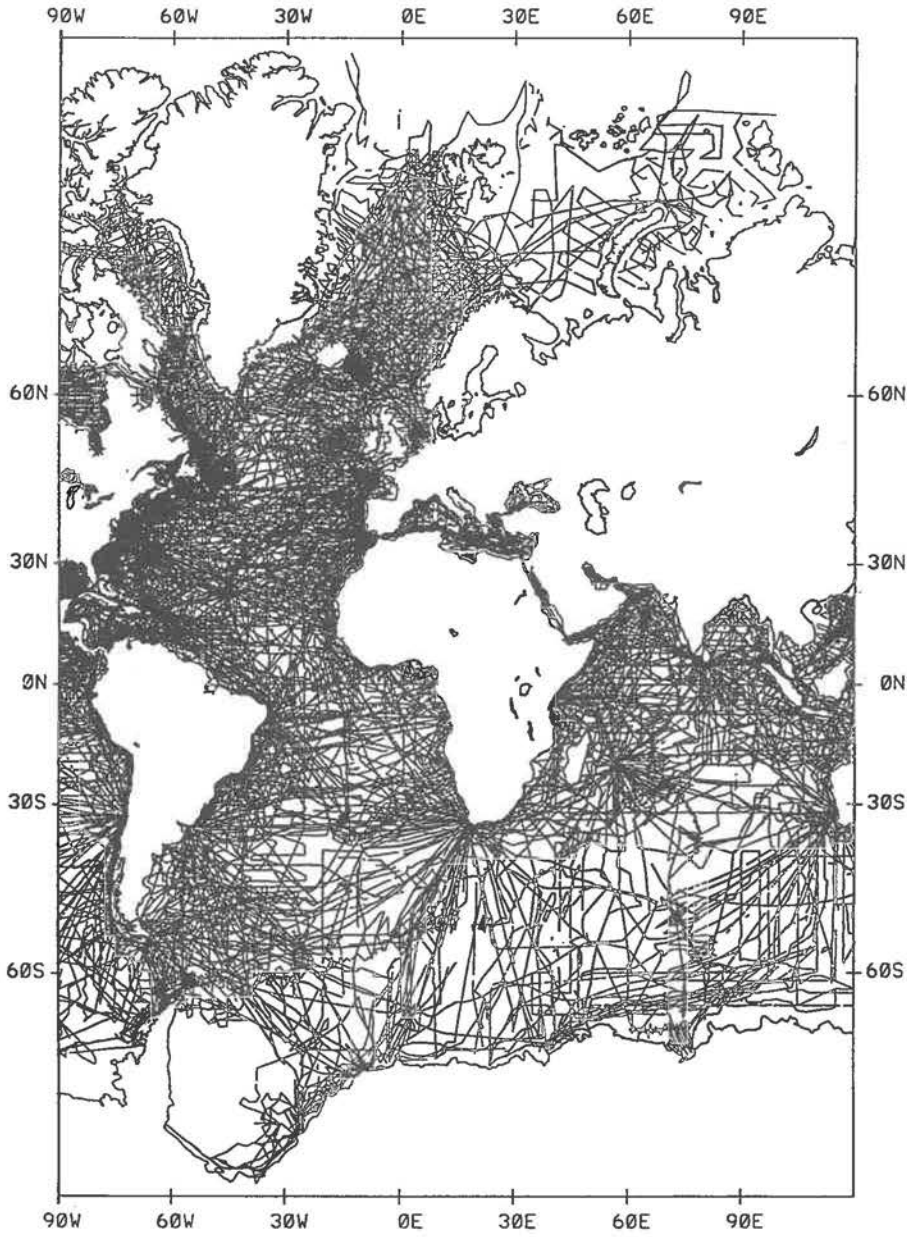


FIGURE 3 (continued)



vertical beam data are being extracted from such datasets for storage in the GEODAS database and for providing an inventory of multibeam data coverage. Work has already started in soliciting multibeam data and in developing data structures for their storage and exchange.

The IHO has also played the lead role in promoting the use of standard tables for correcting echo-sounding depths for the velocity of sound in seawater. The first such standard was set in 1929 with the publication of the First Edition of Matthews Tables. In 1939, a Second Edition of Matthews Tables was published by the British Admiralty Hydrographic Department and these tables remained in use until the early 1980s. In 1980, a Third Edition of Echo-Sounding Correction Tables (Carter's Tables) was produced, incorporating vastly increased volumes of temperature and salinity data than were available in 1939 and using an improved formula for the velocity of sound in seawater (see 'Echo-Sounding Correction Tables (Third Edition) in Publication N.P.139 of the UK Hydrographic Department). In 1982, the XIIth International Hydrographic Conference at Monaco decided to adopt the Third Edition Tables in place of Matthews Tables.

1.5 UNDERSEA FEATURE NAMES

Since its inception at the turn of the century, GEBCO has been intimately concerned with the nomenclature and terminology used for the naming of undersea features. It plays an international role in the naming of undersea features falling entirely or mainly (more than 50%) outside territorial waters.

In 1974, the GEBCO Guiding Committee established a Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features (renamed in 1993, the GEBCO Sub-Committee on Undersea Feature Names) with the main objective of advising on names and nomenclature to be used on the GEBCO charts. The Sub-Committee developed a list of definitions for undersea feature terms, which were subsequently discussed with the Working Group on Maritime and Undersea Features of the United Nations Group of Experts on Geographical Names. As a result of these discussions a set of joint guidelines, together with principles and procedures for naming features, a name proposal form, and a list of terms and definitions, was worked out in accordance with the provisions of appropriate resolutions of United Nations Conferences on Geographical Names. The resulting document entitled "Standardization of Undersea Feature Names" was published by the IHB as IHO-IOC Publication BP-0006 (now B-6) and is reproduced in Annex I.

The Sub-Committee played a key role in ensuring the standardization of the geographical names and nomenclature used for ocean bottom features on the sheets of the GEBCO Fifth Edition. During the Ninth Session of the GEBCO Guiding Committee in 1983, the IHB was requested to prepare a Gazetteer of the geographical names of undersea features shown on the GEBCO Fifth Edition and on the IHO Small-Scale INTERNATIONAL Chart Series (1:2.25 million and smaller), so that they could be used on other chart series and assist in the standardization of feature names. The IHB accepted the task, particularly since the small-scale INT charts, produced by IHO Member States, were increasingly showing more detailed ocean morphology with more geographical names.

The first edition of the Gazetteer was published by the IHB in November 1988 as IHO-IOC Publication BP-0008 (now B-8). It included the geographical names shown on the GEBCO Fifth Edition and on the small-scale INT charts published up to February 1988, as well as the new geographical names approved by the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features at its meeting in April 1987. The Gazetteer is kept updated by the IHB using a computer based system and new names are added as and when they are approved by the Sub-Committee. A special supplement of the Gazetteer covering the names of undersea features in the Mediterranean was published by the IHB in 1990. A second edition of the Gazetteer is planned for publication by the IHB in 1994, in digital form only.

In 1987, the parent bodies of GEBCO i.e. the IHO and the IOC, both adopted similar motions aimed at improving the standardization of naming undersea features in an effort to curb the indiscriminate and unregulated naming of undersea features in articles submitted to professional journals, or on ocean charts or maps. New names were appearing without any close scrutiny being made concerning their suitability, or even whether the feature had already been discovered and named. The motions strongly encouraged marine scientists and other persons in Member States wishing to name undersea features to:

"check their proposals with published Gazetteers of Undersea Feature Names, taking into account the guidelines contained in the IHO/IOC publication 'Standardization of Undersea Feature Names' (including the use of the 'Undersea Feature Name Proposal Form contained therein), to submit all proposed new names for clearance, either to their national authority or, where no such national authority exists, to the IOC or IHB, for consideration by the 'GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features', which may advise on any potential confusing duplication of names." It is now generally understood that proposals for the naming of undersea features located in international waters should be sent directly to the IHB or the IOC (see Annex D).

The motions also called on Member States "to invite publishers of ocean maps, and editors of scientific journals, in their country, to require compilers and authors to provide written evidence of such clearance before accepting for publication any maps or scientific articles containing new names for undersea features."

1.6 IOC REGIONAL OCEAN MAPPING PROJECTS

The primary aim of the IOC Regional Ocean Mapping Projects is to produce high quality bathymetric charts at a scale of 1:1 million for specific regional areas of the world's oceans. The projects are organised so as to be complementary to the work of GEBCO and, at the present time, there are five such projects:

- * International Bathymetric Chart of the Mediterranean and its Geological-Geophysical series (IBCM)

- * International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IBCCA)
- * International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)
- * International Bathymetric Chart of the Western Indian Ocean (IBCWIO)
- * International Bathymetric Chart of the Western Pacific (IBCWP)

Within each project, IOC provides the framework for the establishment of an Editorial Board responsible for organising the compilation and publication of the bathymetric charts. The charts are prepared to common specifications compatible with GEBCO and it is intended that they will be incorporated within the GEBCO Digital Atlas in due course. As with GEBCO, the funding of the work is often problematical and each project is dependent on the voluntary efforts of national laboratories and experts. The IBCWIO and IBCWP projects, in particular, are beset by resource problems. However, the IBCM project, which was the forerunner of the IOC regional ocean mapping programme, is well established and is already planning a Second Edition of its series of 10 sheets. The work of IBCCA is also well advanced, with one sheet already published and with a further 4 sheets of its 17 sheet series due for publication in 1993 and 1994. The work of IBCEA is also well underway.

1.6.1 International Bathymetric Chart of the Mediterranean (IBCM)

The IBCM project was conceived in 1972 by participants in the joint IOC/ICSEM/FAO Programme of Co-operative Investigations in the Mediterranean (CIM) and was co-ordinated by the IOC/ICSEM/FAO Operational Unit for CIM in Monaco. The work was progressed from 1974 to 1978 under the guidance of an 'Ad-hoc Group of Experts on Bathymetric Charts of the Mediterranean'. This group was subsequently reshaped into the 'IOC Editorial Board for the IBCM'. The technical specifications established for the IBCM formed the basis for the 'Specifications for international bathymetric charts produced under the IOC regional mapping projects.'

One of the principles adopted in the preparation of IBCM was to accept only precision soundings, with accurate navigation by satellite or comparable techniques, read from echo-sounder records corrected for the speed of sound. Most of the data selected were navigated using Loran C, with the positional accuracy varying from +/-100m in central areas (e.g. the Tyrrhenian Sea) to +/-600m in peripheral areas. The soundings were compiled on 1:250,000 British Admiralty plotting sheets for oceanic soundings, and the contours were drawn directly on these sheets before being reduced to 1:1 million. The contours were drawn by scientists specialised in morphology and charting of the sea floor.

The bulk of the data available for the IBCM First Edition was collected on marine geophysical surveys undertaken by three institutions. Between 1961 and 1965, 112,000 km of track were surveyed by the Osservatorio Geofisico Sperimentale (OGS) of Trieste in co-operation with the Saclant ASW Research Centre in La Spezia. Then, between 1965 and 1972, the OGS acquired another 217,500 km of track, primarily in the western and central Mediterranean but also including a reconnaissance of the eastern Mediterranean.

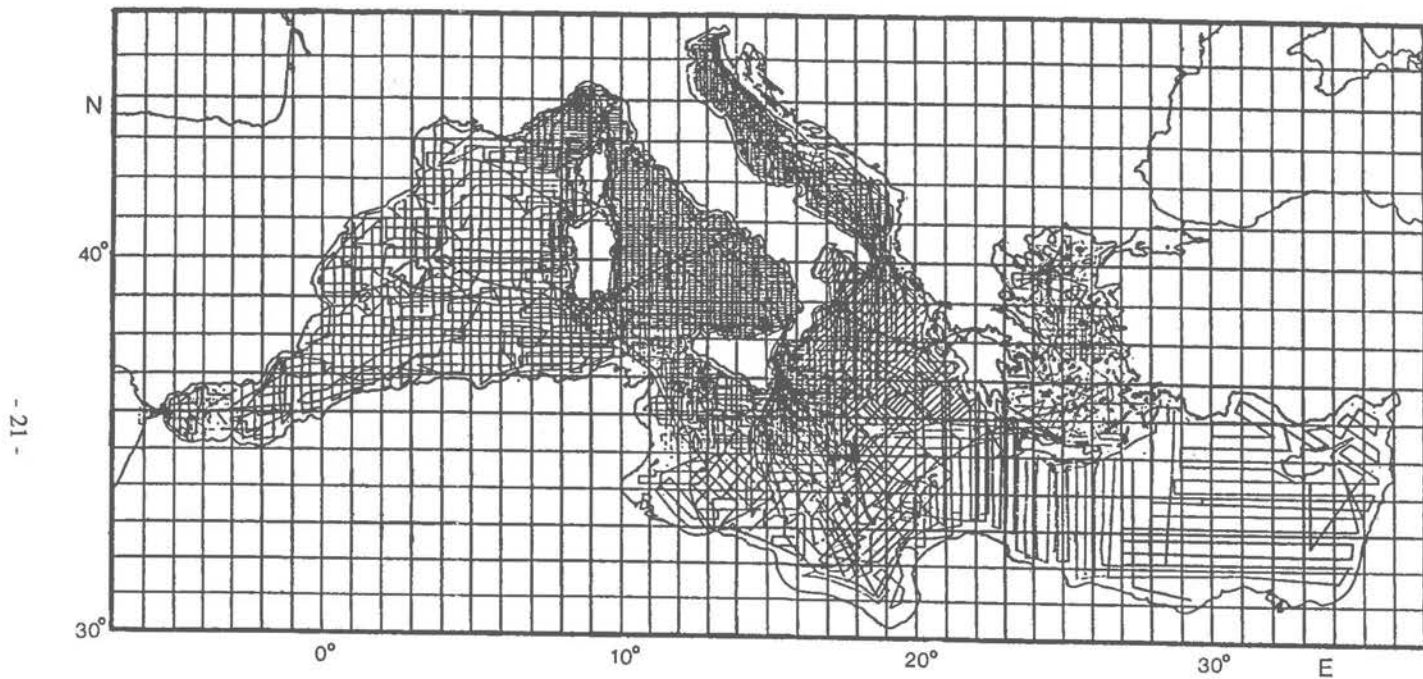


FIGURE 4. Distribution of echo-sounding data collected by Osservatorio Geofisico Sperimentale, Trieste; Saclant ASW Research Centre, La Spezia; and the Department of Geodesy and Geophysics, Cambridge University. This 550,000 km of track comprises 80% of all data available for compiling the IBCM First Edition.

In the eastern Mediterranean, east of 20°E, the Department of Geodesy and Geophysics of Cambridge University carried out a regional bathymetric survey with another 220,000 km of track. Figure 4 shows the location of this 550,000 km of track, which comprises 80% of all the data available for the First Edition of the IBCM.

The cartography of the First Edition of IBCM was carried out by the Head Department of Navigation and Oceanography, St. Petersburg, and they published the complete series in 1981 under the auspices of the IOC. It consists of 10 sheets (see Figure 5) on Mercator projection at a scale of 1:1 million (at 38°N) and covers an area 30°N to 46°N; 6°W to 36.5°E. The Black Sea is included at a scale of 1:2 million for the area 40°N to 47.5°N; 26.5°E to 42.5°E. Most sheets depict contoured bathymetry at 0m (coastline), 20m, 50m, 100m, and 200m, and at 200m intervals thereafter, although the actual contours displayed vary slightly from sheet to sheet. The published sheets also include land contours as well as sounding control showing the position of echo-sounding tracks and areas of detailed surveys.

The geographic names of undersea features shown on the published charts were adopted by the IBCM Editorial Board in collaboration with the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features. The full list is included in the computerised IHB Gazetteer and was also published by IHB in 1990 in hard copy form (Pubn. BP-0008 Supplement No. 1).

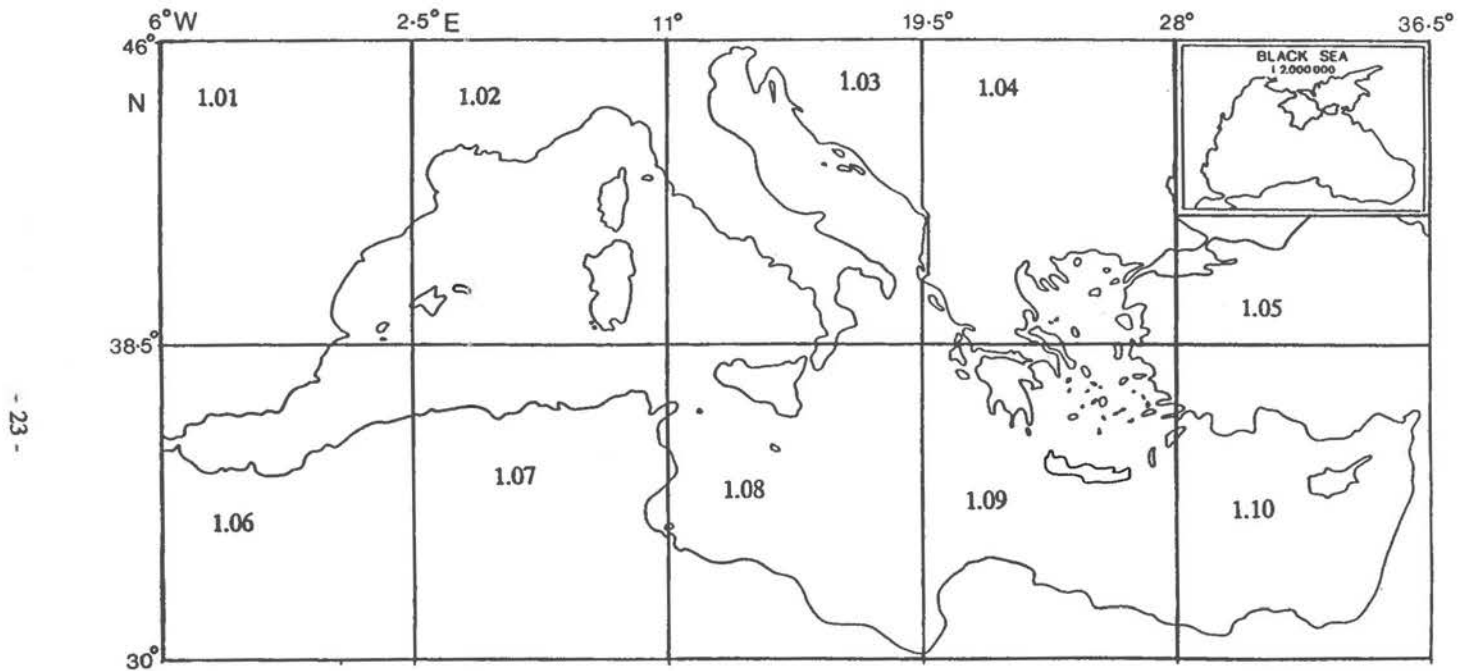
The IBCM coastline was taken from the original bathymetric plotting sheets, except for Corsica, Sardinia and the area of Alexandria, where the coastline shown on the plotting sheets differed significantly from that on the nautical charts and topographic charts available at the time IBCM was in preparation. The coastline was taken from the latter for these areas.

The IBCM (English version) can be purchased from:

Ocean Mapping (IOC)
Cumbers
Mill Lane
Sidlesham, Chichester
West Sussex PO20 7LX
United Kingdom
Fax: 44 (428) 685637

The IBCM (Russian version) can be ordered from:

V/O Soyuzkarta
45 Volgogradsky Prospekt
109125 Moscow, Russia
Telex: 411942 REN SU



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The series is accompanied by a composite sheet with the full set of sheets reduced to a scale of 1:5,000,000.

Similarly to GEBCO, in order to ensure that the IBCM 1:250,000 plotting sheets for soundings can be kept up to date, a network has been established involving the services of Volunteering Hydrographic Offices (VHOs) in 7 IHO Member States. Each of the VHOs has accepted responsibility for compiling bathymetric data in specific geographic areas and for periodically updating the 1:250,000 collected soundings sheets in their area of responsibility. Individual Hydrographic Offices are charged with ensuring the regular supply of bathymetric data to the appropriate VHO and the IHB in Monaco maintains a co-ordinating role in this scheme.

In 1983, the bathymetric contours and coastlines depicted on the IBCM First Edition were digitized by a commercial company from polyester transparencies of the ten 1:1 million master sheets. The digitization was carried out by manual curve following on a digitizing table, according to the specification that a) ninety percent of the digitized points should fall within 0.3mm of their position on the source map, with no point to exceed 1.0mm from that position and b) the maximum distance between successive digitized points should be 1.0mm.

In 1988, a detailed review and editing of the digitized data was carried out by the British Oceanographic Data Centre on behalf of the IOC. After removal of some minor digitizing errors, the review confirmed that, in general, the digitization accuracy was within the line thickness (0.3mm) of the plotted out digitized contours. The standard of digitization of the 1:2 million chart of the Black Sea was found to be slightly inferior to that of the other sheets, although still within 1 chart mm. The digitized data set does not include the land contours or the underlying track control information.

The work of the IBCM Editorial Board also includes the development of five series of geological/geophysical charts of the Mediterranean. Bouguer Gravity Anomalies, Seismicity and Plio-Quaternary Sediments series were published in 1989, 1991 and 1994 respectively on the same scales and sheet limits as the Bathymetry series. An Unconsolidated Bottom Surface Sediments series is planned for publication in 1995, while a Magnetic Anomalies series is tentatively scheduled for publication in 1996. Once these series have been completed, attention will be paid to the creation of a Second Edition of the bathymetric sheets.

1.6.2 International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IBCCA)

The IBCCA will be produced as a series of seventeen sheets presented on Mercator projection at a scale of 1:1 million at 15°N as shown in Figure 6. Although the series is still some way from completion, considerable progress has been made in gathering together all available sounding data in the region and in the compilation of the contoured sheets. The Editorial Board is well established and the work is being carried out by participants from Mexico, Cuba, Costa Rica, Venezuela, Colombia and the USA. The data

FIGURE 6. Geographic coverage of the sheets of the IBCCA
 (To be published on Mercator Projection at a scale of 1:1 million at 15°N)

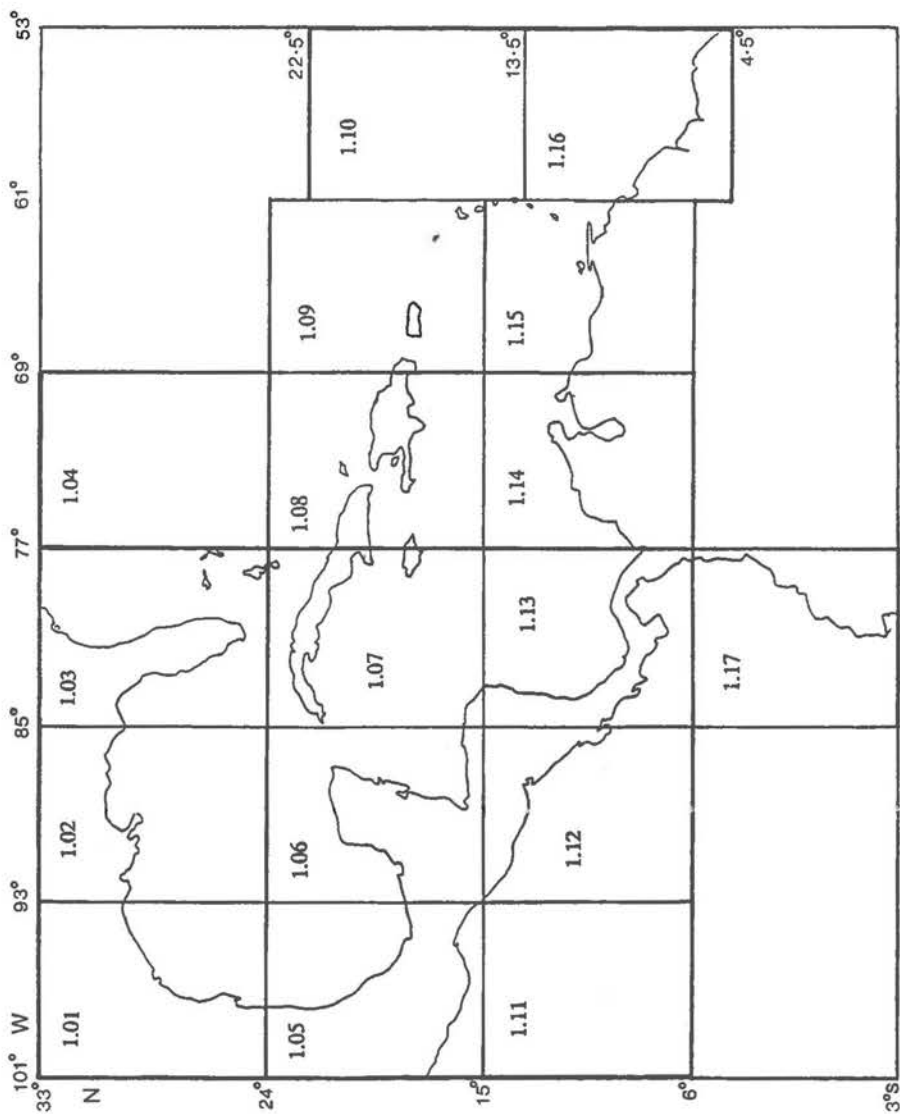
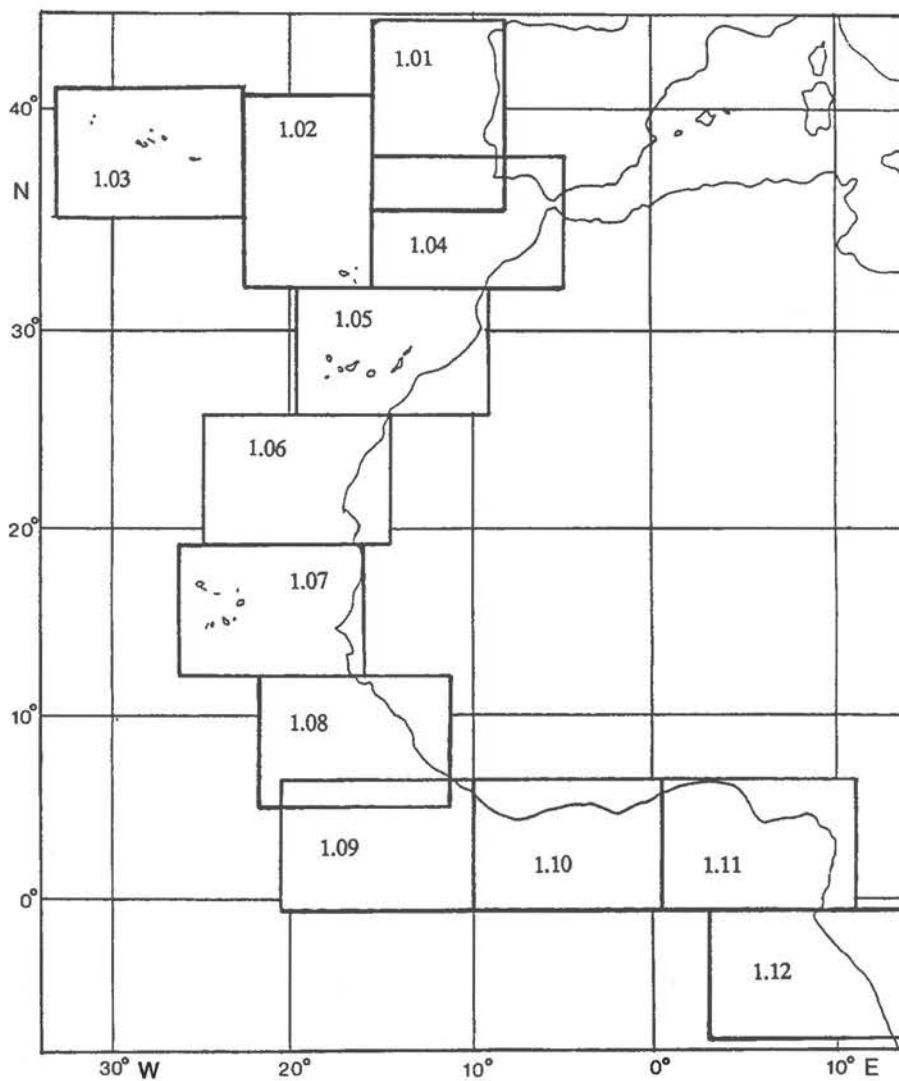


FIGURE 7. Geographic coverage of the sheets of the IBCEA
(To be published on Mercator Projection at a scale of 1:1 million at 20°N)



are being assembled and contoured on plotting sheets at a scale of 1:250,000 except in areas where the data coverage does not justify use of this scale, in which case the data are worked at 1:500,000.

The first sheet of the series (sheet 1.09) was published in November 1992 and it is planned that a further four sheets (sheets 1.04, 1.06, 1.07 and 1.08) will be published in late 1993 to early 1994. Compilation work is in hand for sheets 1.01, 1.02, 1.03, 1.05, 1.12, 1.13, 1.14 and 1.15, while soundings sheets are being prepared for the remainder of the region. In due course it is planned that the contours on the published sheets will be digitized and incorporated into the GEBCO Digital Atlas.

1.6.3 International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)

The IBCEA will be published as a series of twelve sheets on Mercator projection at a scale of 1:1 million at 20°N as shown in Figure 7. During the 3rd Conference of the Eastern Atlantic Hydrographic Commission held in Lagos, Nigeria, in March 1991, Spain, Portugal and France agreed to produce sheets as follows:

- Portugal : 1.01, 1.02, 1.03 and 1.07
- Spain : 1.04 and 1.05
- France : 1.06, 1.08, 1.09, 1.10 and 1.12

It is planned that sheets 1.01, 1.08 and 1.09 will be printed in 1994 and that the contours from the published sheets will be digitized for incorporating into the GEBCO Digital Atlas.

1.7 THE GEBCO DIGITAL ATLAS AND THE FUTURE DEVELOPMENT OF GEBCO

1.7.1 The GEBCO Digital Atlas

Since its First Edition was published in 1904, the traditional approach of GEBCO has been towards the publication of printed charts covering the globe at a scale of 1:10 million. This approach would, if continued, greatly inhibit the future development of GEBCO. By its very nature, the printed chart sets constraints on the scale, projection and resolution of the information it portrays. Furthermore, the costs and resources necessary to maintain GEBCO regularly updated using traditional cartographic techniques are prohibitive. Chart production is expensive and cartographic preparation is time consuming. Perhaps one of the greatest drawbacks is the inability to incorporate updated sections of revised bathymetry without incurring the expense of reprinting whole sheets.

Fortunately, with the rapid development of computing technology, these problems can be readily overcome using digital techniques. It is now possible to maintain GEBCO in a digital form without in any way compromising the high standards of quality to which

GEBCO has always aspired. Not only does it provide flexibility in the manner in which bathymetry may be displayed and manipulated by the user, but charts need no longer be constrained to a scale of 1:10 million and updating on a regular basis becomes a practical proposition.

The digitization of the GEBCO Fifth Edition has set a foundation for the future development of GEBCO and has focused the attention of the GEBCO Guiding Committee on the concept of a GEBCO Digital Atlas (GDA). The GDA will form the focus around which GEBCO will be updated and, in its initial form, it has been assembled and published on CD-ROM by the British Oceanographic Data Centre containing:

- a) the digitized bathymetric contours and coastlines of the GEBCO Fifth Edition
- b) the digitized trackline control of the GEBCO Fifth Edition (including references to the sources of survey boxes)
- c) the existing digitized bathymetric charts from the IOC Regional Ocean Mapping Projects - at present this comprises solely the IBCM
- d) a copy of the computerised Gazetteer of geographic names of undersea features as maintained by the IHB
- e) a standard world coastline i.e. the US Defense Mapping Agency's World Vector Shoreline
- f) a copy of the trackline inventory maintained by the IHO Data Centre for Digital Bathymetry showing the distribution of its holdings of digital sounding data

These products comprise the First Release of the GEBCO Digital Atlas.

1.7.2 A Standard World Coastline for GEBCO

Having been transferred into digital form, the GEBCO bathymetry is no longer constrained by scale and it is anticipated that, in future, it may well be updated in certain regions at scales of up to 1:500,000 (or even 1:250,000 in isolated cases). However, by its very nature, the GEBCO Fifth Edition coastline, based primarily on the Carte Générale du Monde of the Institut Géographique National, Paris, France, is suited only for use at scales of the order of 1:10 million.

In 1989, a search was instigated by the GEBCO Sub-Committee on Digital Bathymetry for an alternative coastline satisfying the criteria that it should be a) digital, b) suitable for use at scales up to 1:250,000, c) global in coverage and d) of consistent accuracy across the globe. It was fortunate that, just at that time, the US Defense Mapping Agency (DMA) released its World Vector Shoreline (WVS) - the only coastline able to approach the GEBCO criteria. Acting on the advice of its Sub-Committee, the GEBCO Guiding Committee has agreed that WVS should be adopted as the standard coastline for future use in GEBCO, and the DMA has generously given GEBCO permission to use WVS in the GEBCO Digital Atlas. The WVS has also been adopted as the standard coastline for future use in IOC's Regional Ocean Mapping Projects.

A description of the WVS may be found in the January 1990 edition of the International Hydrographic Review. The WVS was developed by the DMA as a digital data file, at a nominal scale of 1:250,000. Worldwide coverage of the data set was completed in July 1989, working to a specification that 90% of all identifiable shoreline features should be located within 500 metres (i.e. 2mm at 1:250,000) of their true geographic position with respect to the World Geodetic System (WGS-84) datum.

The main source material for the WVS was DMA's Digital Landmass Blanking (DLMB) database which was derived primarily from the Joint Operations Graphics and coastal nautical charts produced by DMA. The DLMB data consisted of a land/water flag file on a 3 by 3 arc-second interval geographic grid. This raster database was converted into vector form to create WVS and explains the 3 arc-second stepping interval apparent in the coastline when plotted out at high scale. For areas of the world not covered by the DLMB database, the shoreline was taken from the best available hard copy sources at a preferred scale of 1:250,000.

The WVS is a truly impressive product but some uncertainty remains in that the accuracy specification (500m -see above) for 90% of WVS gives no indication of the accuracy for the remaining 10% of the world or where the areas of lesser accuracy occur. It is anticipated that the main area of reduced accuracy occurs around Antarctica and preliminary tests tend to confirm this. Fortunately, a high quality mapping of Antarctica is currently underway under the auspices of the Scientific Committee on Antarctic Research (SCAR) and it is anticipated that this will produce an accurate Antarctic coastline suitable for use in GEBCO in due course.

As yet, the WVS has not been matched to the GEBCO Fifth Edition bathymetric contours and isolated occurrences may arise where WVS appears in conflict with the bathymetry e.g. around oceanic islands and where the shoreline abuts a submarine scarp. Such mismatch is mainly a consequence of the different scale and resolution of the two data sets. It is planned that the WVS will be phased in with the GEBCO bathymetry as and when the bathymetry is updated with new data. This has already occurred for the area of sheet 5.12, where WVS was used as the source of the coastline for the revised version of the sheet currently in press.

1.7.3 Updating the GEBCO Digital Atlas

The GEBCO Digital Atlas (GDA) will form the base from which future printed editions of GEBCO will be generated. However, rather than being geared towards the printing schedules of such future editions, the updating of the GEBCO through the GDA will be a continual process. Without the scale constraints of the printed chart, it is envisaged that improved bathymetric compilations will be merged into GEBCO at scales ranging from 1:10 million up to 1:500,000 (or larger scales in isolated cases). This will be achieved by 'stitching in' so as to maintain the seamless nature of the data set. Use of larger scale material for any given area will be dependent on there being an adequate density of sounding data therein to justify its inclusion.

In order to maintain the high quality and global nature of GEBCO, it will be necessary to set standards on the new material used for its updating. Prior to their inclusion in the GDA, new updated bathymetric compilations in any given area will need to conform to the following principles:

- a) contours should be expressed in corrected metres.
- b) as a minimum, the GEBCO basic contours of 200m, 500m, 1000m and at 500m intervals thereafter should be included. Where appropriate, the inclusion of contours at 20m, 50m and 100m is to be encouraged. Where additional intermediate contours are included an interval of 100m is recommended.
- c) the GEBCO basic contours should be continuous within the compilation area.
- d) contours cutting the edges of the compilation area should be 'stitched in' to those in the surrounding area of the GDA - in general the 'stitching in' should be from outside the compilation area rather than from inside.
- e) in coastal zones and around islands, the contours should be compatible with the World Vector Shoreline.
- f) compilations submitted should be accompanied by the ship tracks and survey boxes (annotated with their source) used in compiling the contours.
- g) the updating material should normally be in digital form - if submitted in hard copy form, sufficient graticule points should be included within and at the edges of the map to enable potential distortions to be checked through subsequent digitizing and if necessary corrected.
- h) compilation methods should be fully described in supporting documentation, including details of the projection, ellipsoid and scale used, as well as information on any additional support material that might have been used e.g. magnetic surveys, sonar images, satellite altimetry, proprietary compilations; the names and affiliation of the authors of the map; the data sources used; and the date the map was compiled.
- i) in international waters, the names of newly named undersea features should be submitted for approval to the GEBCO Sub-Committee on Undersea Feature Names, or to the appropriate national authority where they fall within territorial waters.
- j) updated compilations and supporting material will be submitted for review by a GEBCO approval panel which will comprise the compiler and two experts from outside the region to act as referees.

Adherence to the above principles should ensure that, at any given time, a high quality, seamless global bathymetric chart of GEBCO basic contours can be output from the GDA. In general, it is envisaged that the geographic coverage of newly inserted

compilations will normally (but not exclusively) be in excess of a minimum size of 5° by 5°, or its equivalent area. It is anticipated that compilations at the larger scales will include progressively increased numbers of intermediate contours, possibly with intervals as small as 20m at the largest scale. The contour interval will, in general, be governed by the sounding density and the smoothness of the topography. The use of digital techniques will enable seafloor relief to be stored at high resolution where appropriate, without compromising the facility to produce smaller scale seamless charts of the GEBCO basic contours. It is planned that the generalisation of larger scale compilations being input into the GDA will be kept to minimum so as to avoid loss of information.

It is envisaged that updating material for GEBCO will come from one of three sources:

a) IOC Regional Ocean Mapping Projects (see section 1.6)

As the specifications used by these projects for bathymetric mapping are closely compatible to GEBCO, it is anticipated that they will produce 1:1 million scale updates that can be readily incorporated into the GDA.

b) Other International, National or Laboratory-based Mapping Projects

The compilers of revised bathymetry within these projects are encouraged, where practicable, to follow the GEBCO principles listed above. However, it is expected that some (if not most) of these projects will not adhere to these principles e.g. on the use of corrected metres or basic contour values and intervals. In such cases it will be the responsibility of GEBCO to find the necessary resources to undertake the conversion of these compilations into a form compatible with the GDA.

c) GEBCO-initiated Compilations of Revised Bathymetry

The GEBCO Guiding Committee has recently established a global Network of Regional Reviewers covering all oceanic areas. Each Reviewer will be required to maintain a continuing review of all new bathymetric data that has become available within his geographic area of responsibility since compilation of the relevant GEBCO Fifth Edition sheets, and to advise the GEBCO Guiding Committee when sufficient new data have been collected to justify a block revision of the contours within a significant part of his area. It will then be the responsibility of the Guiding Committee to find and work with a suitably qualified geoscientist on a new compilation satisfying GEBCO principles which, when complete, can be incorporated into the GDA as a block update.

As in the past, the future resourcing of GEBCO will be dependant on the voluntary contributions of individuals and national agencies. At the present time, the UK Natural Environment Research Council is supporting GEBCO by funding the posts of GEBCO Bathymetric Editor and GEBCO Digital Atlas Manager at the IOS Deacon Laboratory, Wormley, and the British Oceanographic Data Centre, Bidston, respectively.

The GEBCO Bathymetric Editor is responsible for maintaining a supervisory role over the flow of data relevant to GEBCO by searching out new data sources; by liaising with

national and international organisations involved in ocean mapping and with academic and agency geoscientists and hydrographic services researching the geomorphology of the world's oceans; by receiving and assessing recommendations from the Regional Reviewers for upgrading the GDA; and by identifying, and subsequently liaising with, compilers for revised blocks of contours.

The GEBCO Digital Atlas Manager is responsible for maintaining and periodically updating the GDA by the integration (and 'stitching in' as necessary) of new blocks of data when supplied through the GEBCO Bathymetric Editor and digitizing incoming material where necessary. It is planned that updated versions of the GDA will be published from time to time as and when significant upgrades have taken place.

For the time being, it is planned that the bathymetry of the world's oceans will be maintained in the GEBCO Digital Atlas in the form of contour vectors, and will be made available to users on CD-ROM. However, it is recognised that there is an increasing requirement, particularly amongst ocean modellers, for it to be made available in the form of a gridded data set and it is intended that such a product will be developed as soon as resources allow.

1.7.4 The Organisation of the GEBCO System

The present organisational framework, that has evolved to support the future development of GEBCO, is summarised in Figure 8 which illustrates the relationships between the system's various components.

The Joint IOC-IHO Guiding Committee for GEBCO continues to have overall responsibility for guiding the GEBCO project and for determining the policy for the preparation and dissemination of the GEBCO charts and the GEBCO Digital Atlas (GDA). It acts on behalf of the two parent organizations which each nominate five members to the Committee.

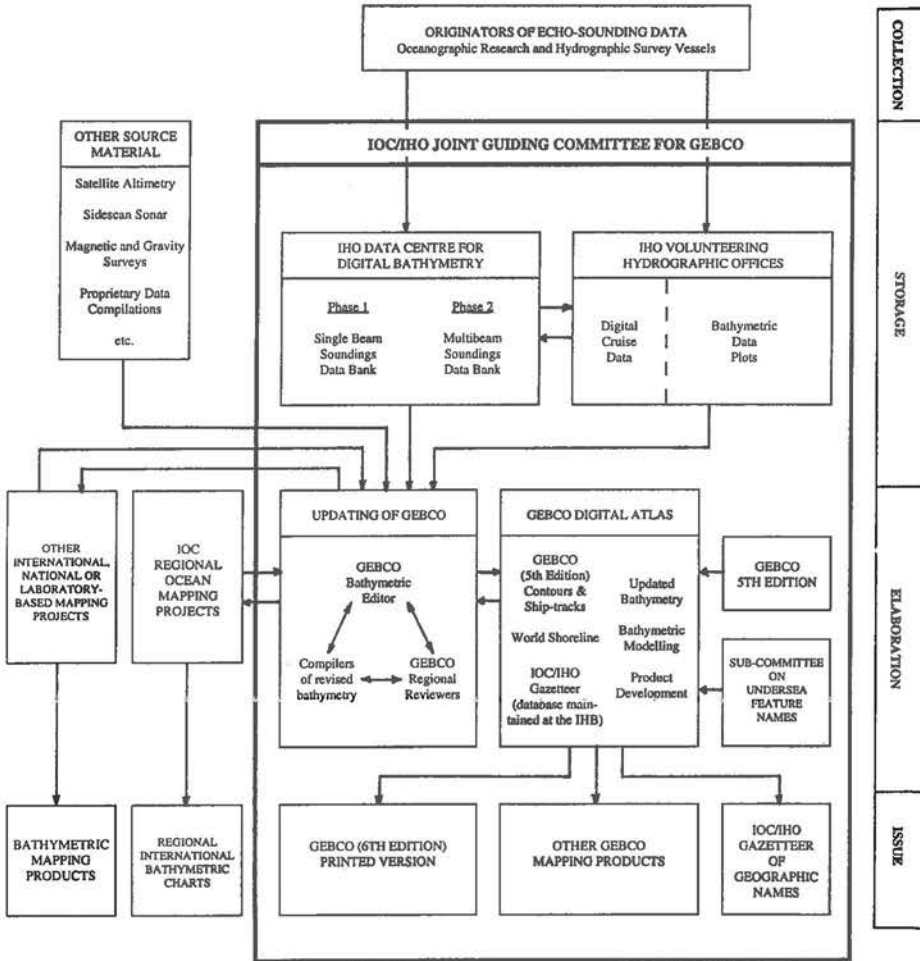
The Guiding Committee is supported in its work by two Sub-Committees:

The GEBCO Sub-Committee on Undersea Feature Names (formerly the Sub-Committee on Geographical Names) which recommends to the Guiding Committee the names to be included in the charts and the GDA. These are also published in the IHO-IOC Gazetteer of Geographical Names of Undersea Features which is maintained in database form at the IHB, Monaco.

The GEBCO Sub-Committee on Digital Bathymetry which advises the Guiding Committee on procedures for maintaining and upgrading both the GDA and its products and the worldwide collection of sounding data.

Original sounding data are assembled and maintained for GEBCO by the IHO Data Centre for Digital Bathymetry, Boulder, in collaboration with the IHO Volunteering Hydrographic Offices (see section 1.4). These data are made freely available for the

FIGURE 8. Structural Diagram of GEBCO Activities



updating of bathymetric compilations destined for GEBCO. The continued success of the IHO in assembling global data is dependent on the continued collaboration of marine scientists and hydrographers in submitting their data.

The updating of GEBCO (see section 1.7.3) is primarily focused on the work of the GEBCO Bathymetric Editor, the Regional Reviewers, those geoscientists volunteering to compile revised blocks of bathymetric contours and the GDA Manager. This work is carried out in collaboration with the IOC Regional Ocean Mapping Projects and other international, national and laboratory based mapping projects.

The GDA will be continually updated to reflect the best available bathymetry and will be accompanied by a standard world shoreline and the IHO/IOC Gazetteer. Data products will be developed according to the needs of scientists and hydrographers worldwide and updated versions of the GDA will be regularly published, initially through the medium of a software supported CD-ROM package.

Once the GDA has been significantly upgraded, consideration will be given to its further dissemination through the publication of the printed Sixth Edition of GEBCO at a scale of 1:10 million.

Details concerning the procedures, standards and organisation of the GEBCO system are kept updated, on behalf of the IOC and the IHO, by the IHB through its publication B-7 'Guidelines for GEBCO' obtainable from:

International Hydrographic Bureau	
7, avenue Président J.F. Kennedy	
B.P. 445 - MC 98011 MONACO Cédex	Telex: 479 164 MC -INHORG
Principality of Monaco	Telefax: (33) 93 25 20 03

SECTION 2

Contents of the GEBCO Digital Atlas (GDA)

2.1 INTRODUCTION

The First Release of the GEBCO Digital Atlas (GDA) consists of three components: a CD-ROM containing the Atlas data sets; a floppy disk containing the GDA Software Interface; and a Supporting Volume (this volume).

The package has been designed as a dual-purpose system. On the one hand, it offers a wide range of facilities for displaying the contents of the CD-ROM on the user's own computer screen through the GDA Software Interface. On the other hand, it also enables the user to extract data for further processing on his own system - this can be achieved either through the GDA Software Interface or by direct access to the files on the CD-ROM.

The following Atlas data sets are included on the CD-ROM:

- a) the digitized bathymetric contours, coastlines, and trackline control from the GEBCO Fifth Edition
- b) the digitized bathymetric contours and coastlines from the IBCM First Edition
- c) a set of digital global coastlines from the World Vector Shoreline at a range of scales from 1:43 million up to 1:250,000
- d) a trackline inventory of the digital echo-sounding data held at the IHO Data Centre for Digital Bathymetry up to December 1993
- e) a digital set of geographically referenced feature names including the IHO/IOC Gazetteer of Geographical Names of Undersea Features, a list of the ports/cities and Antarctic islands portrayed on the printed sheets of the GEBCO Fifth Edition, a list of Antarctic stations and a specially prepared list of oceanic islands.
- f) a digital version of the Third Edition of the Echo-Sounding Correction Tables
- g) a set of supporting documents describing each of the data sets included on the CD-ROM

2.2 MAIN FEATURES OF THE GDA SOFTWARE INTERFACE

The GDA Software Interface provides the user with facilities both for displaying the Atlas charts on his own screen and for extracting data from the Atlas into his own files. It has been developed to run on IBM compatible PCs and is controlled by a system of 'pull down' menus, backed up by a context-sensitive help system. This provides a very

'user-friendly' interface and requires the minimum of computing expertise on the part of the user. The low learning overhead afforded by this system ensures that the novice user is able to operate the Atlas system to good effect almost immediately, without the need for special training or for extensive reading of reference manuals.

The user is offered a choice of two bathymetric chart series: the GEBCO Fifth Edition and the IBCM First Edition. In both cases, there is a choice of coastlines i.e. either the coastline used in the chart series or the World Vector Shoreline. If required, the coastline can be accessed independently of the bathymetry.

Initial geographic area selection is made by chart number, by geographic latitude and longitude limits or by a user controlled zoom box. Within the selected area, the user then has full control to zoom in and out of his particular area of interest and to pan across to adjacent areas as required. The system also incorporates a backtracking facility and a 'where am I' facility for highlighting the user's chosen area of interest within a broader geographic context.

If the World Vector Shoreline is being displayed, the user may either select which scale version is to be used or allow the system to choose the appropriate scale automatically depending on the areal extent of the selected area on the screen. Thus, in the latter case, if the user progressively zooms into an area, the system will automatically switch to higher resolution versions of the Shoreline as the scale of the viewed area increases.

The system informs the user of the depths of the contours available within any chosen area, with facilities for selecting which ones should be displayed and for assigning colours to them.

A cursor controlled querying facility is available for displaying the value of any displayed contour.

There is a choice of five projections for displaying charts: Equidistant Cylindrical, Mercator, Miller Cylindrical, Lambert Cylindrical Equal-Area and Peters Equal-Area.

A geographic grid can be overlaid for reference on the area being viewed - the interval between grid lines being set automatically depending on the field of view.

The current cursor position is constantly displayed in geographic coordinates. In addition, the echo-sounding correction (see section 2.11) at the cursor position can also be displayed.

A multi-point distance measuring option is available with distance displayed in miles, nautical miles and kilometres.

When accessing the GEBCO series, the display area can be overlaid with the GEBCO Fifth Edition trackline control information (ship's tracks and survey boxes). A cursor initiated query within any survey box present in the viewing area will result in the details of the survey being displayed on the screen.

Alternatively, the display area can be overlaid with tracklines indicating the echo-sounding data currently available from the IHO Data Centre for Digital Bathymetry. It should be noted that not all of these data were available when the contours of the GEBCO Fifth Edition were compiled.

The display area can also be overlaid with symbols showing the locations of undersea features, oceanic islands, ports/cities and Antarctic islands and stations. A cursor controlled querying facility is available for displaying the names of these features on the screen.

The system keeps track of the source charts contributing to the display on the user's screen and the supporting documentation for these charts can be listed out on demand.

The facilities available for selecting data for display on the user's screen can also be used for selecting data to be exported into the user's own files, either in the DXF format or in a simple flat ASCII format (see also section 2.3).

Maps and text from the current screen display can be copied to a printer (IBM or Epson 8-pin, HP Laserjet or HP Paintjet). The current screen display can also be stored as a PCX or GEM image for use in desktop publishing or wordprocessing software.

A facility is available for saving screen displays as 'slides' for viewing outside the Atlas system using the 'Slideshow' program provided.

In addition to the above mentioned features, the system provides flexibility in the choice of colour palettes, in the assignment of colours and in the positioning of all overlaid windows. Context sensitive help is available at all times and default settings exist for virtually all options - if desired the user can change the defaults, many of which can be saved for future use.

Further details concerning the GDA Software Interface may be found in the User Guide presented herein in Section 3.

2.3 EXTRACTING DATA FROM THE GDA

Most of the data are stored on the CD-ROM in two forms:

- a) as a set of binary formatted files and indices designed for direct input to the GDA Software Interface and optimised for speed of processing and display. These formats need not concern the user.
- b) as a set of simple flat ASCII files directly accessible to the user. These include:
 - 18 files of the GEBCO Fifth Edition bathymetric contours and coastlines with one GEBCO sheet per file - the geographic coverage of each sheet is as shown in Figure 2 (page 13).

18 files of the GEBCO Fifth Edition trackline control (including the outlines of survey boxes) with one GEBCO sheet per file - these complement the above files of bathymetric contours.

10 files of the IBCM First Edition bathymetric contours and coastlines with one IBCM sheet per file - the geographic coverage of each sheet is as shown in Figure 5 (page 23).

8 files of GEODAS (March 1993) bathymetric tracklines showing the coverage of data held at the IHO Data Centre for Digital Bathymetry with one file per geographic octant.

Each of the directly accessible files is built up as a series of vector streams relating either to bathymetric contours or coastlines or to tracklines or the outlines of survey boxes. Each file is formatted in the same flat ASCII format as described in Table 2 (page 39).

In copying files directly from the CD-ROM, the user is constrained to accepting the geographic coverage of the file and all the contour levels contained therein. A more flexible approach is provided through the GDA Software Interface, which allows the user to define precisely his geographic area of interest, irrespective of sheet boundaries. It also allows the user to specify which contour levels are to be selected and also to merge trackline vectors in the same file as the bathymetric contours and coastlines.

When vector streams are exported through the GDA Software Interface, the user is offered a choice of formats. The vectors can either be exported in the simple flat ASCII format described in Table 2 or in the DXF format. The DXF originated as a proprietary format in the commercially available 'AUTOCAD' package, but is now a standard input format for many other commercially available software packages. With this option the user is able to avail himself of the presentational and manipulative capabilities of such packages for displaying the vector information in the GDA. In DXF the vector streams are expressed as polylines in geographic co-ordinates with each contour depth assigned to a separate layer and a separate logical colour. Each of the layers is labelled according to the same feature code system as given in Table 2.

The GDA Software Interface provides the only mechanism whereby the user can copy the World Vector Shoreline (WVS), or parts thereof, into his own files. The user can specify his geographic area of interest and the scale version of WVS to be exported. When output, the WVS can be merged in the same file as the bathymetric contours and tracklines as required. If WVS is selected prior to contour export, then it will replace the existing coastline in the GEBCO or IBCM charts.

X

TABLE 2. A simple flat ASCII format for GDA vector streams

Within this format, files are built up as a series of labelled vector streams relating to bathymetric contours, coastlines, tracklines or the outlines of survey boxes. A new vector stream is started for each contour segment, coastline segment, trackline or survey box.

Each vector stream is preceded by a header record containing a feature code 'ICODE' for the vector and a count 'ICOUNT' of the number of succeeding co-ordinate pairs making up the vector. Each co-ordinate pair is stored in a record with a geographic latitude 'ALAT' and longitude 'ALONG', each expressed in decimal degrees.

By default, latitude is stored in the range -90° to $+90^{\circ}$ with north positive and south negative; with longitude stored in the range -180° to $+180^{\circ}$ with east positive and west negative. However, it is possible for the user to specify that longitude should be stored in the range 0° to 360° . A further option enables the longitude to be expressed in a 360° range within the band 0° to $+540^{\circ}$ although this option will only be used in exceptional cases for maintaining a contiguous geographic area.

Each record is made up of 20 bytes as follows:

Header record: ICODE, ICOUNT in format (2I6,6X),CR,LF

Co-ordinate pair record: ALAT, ALONG in format (F8.4,F10.4),CR,LF

The feature code of each vector contains:

'0' for coastlines

'depth in corrected metres' for bathymetric contours

'22222' for tracklines

'22223' for outlines of survey boxes, special compilations or areas of dense sounding coverage

Within each file, the vector streams are stored in ascending order of their feature code value 'ICODE' - thus all coastline vectors will appear before the bathymetric contour vectors which, in turn, will be arranged in ascending order of their depths. If present, the tracklines will follow the bathymetric contours and then be followed by the outlines of survey boxes.

2.4 GEBCO FIFTH EDITION BATHYMETRIC CONTOURS AND COASTLINES

This data set was digitized from stable base transparencies of the masters of the eighteen printed sheets of the GEBCO Fifth Edition and all data are stored in geographic coordinates. The series comprises 16 sheets on Mercator projection at a scale of 1:10 million (at the equator) in the region 72°S to 72°N and two polar sheets on polar stereographic projection at a scale of 1:6 million at 75° latitude. These sheets were based on the international 1924 (Hayford) ellipsoid. The polar sheets were only digitized to 72° latitude i.e. to the limits of the Mercator sheets. The sheet areas digitized are shown in Figure 2 (page 13).

Where sheets overlapped, the overlap area was only digitized from the most recently published sheet. It is estimated that, in general, the digitized bathymetric contours lie well within 0.5mm of their positions on the printed sheets. At the completion of digitization, a detailed edgematching of contours was carried out across sheet boundaries so as to provide a seamless global bathymetry - thus digitized contours at sheet boundaries may not always accord with those on the printed sheets although any adjustments made were carried out taking due account of the underlying trackline control information.

All bathymetric contours present on the published sheets were digitized, including the basic GEBCO contours of 200m, 500m, and 500m intervals thereafter. The actual contours depicted vary considerably from sheet to sheet and intermediate contours are often included to better define the bathymetry in certain regions. However, all sheets include, as a minimum, the basic GEBCO contours and these were digitized as closed contours without open ends. All contour levels are expressed in corrected metres i.e. based on echo-soundings corrected for the speed of sound according to the Echo-Sounding Correction Tables (see section 2.11).

The bathymetric contours were digitized from the published GEBCO Fifth Edition sheets except in two regions:

- a) 50°S to 7°N; 70°W to 20°E where they were digitized from the approved and edited pre-publication compilation sheets for revised GEBCO sheet 5.12. In general, these sheets were compiled and digitized on Mercator projection at a scale of 1:5,737,447 at the equator, except in the area 0°S to 3°S where they were prepared at a scale of 1:2,500,000. The area 0° to 7°N, 20°W to 20°E was taken from the digitized version of GEBCO sheet 5.08.
- b) 0°N to 46°40'N; 100°E to 180°E, where the contours were provided in digital form by the Japan Oceanographic Data Center from their standard 1:1 million bathymetric charts of the region. These were subsequently reduced in volume by 89% using the Douglas-Peucker algorithm with a lateral tolerance of 0.08mm.

The digital coastline included in this data set is essentially that portrayed on the GEBCO Fifth Edition sheets i.e. based on the Carte Générale du Monde of the Institut Géographique National in Paris, France, and, for the Antarctic continent, on maps

provided by the Scott Polar Research Institute in Cambridge, England. However, there are two exceptions:

- a) for the region 50°S to 7°N; 70°W to 20°E of revised GEBCO sheet 5.12, the digital coastline has been taken from the high resolution World Vector Shoreline digital data set reduced in volume by 84% using the Douglas-Peucker algorithm with a lateral tolerance of 0.04mm at a scale of 1:5,737,447.
- b) for the region 0°N to 46°40'N; 100°E to 180°E, the coastline was provided in digital form by the Japan Oceanographic Data Center based on their standard 1:1 million bathymetric charts of the region. The volume of this data set was reduced by 89% using the Douglas-Peucker algorithm with a lateral tolerance of 0.08mm.

This data set appears in two forms on the CD-ROM; one tailored for access and display through the GDA Software Interface, while the other is directly accessible to the user with one file per GEBCO sheet, formatted according to the specification given in Table 2 (page 39).

2.5 GEBCO FIFTH EDITION TRACKLINES AND SURVEY BOXES

This data set was digitized from stable base transparencies of the masters of the eighteen printed sheets of the GEBCO Fifth Edition and complements the data set of bathymetric contours and coastlines described in section 2.4. The track control was digitized from sheets of the same scale and projection as used in digitizing the corresponding bathymetry. In areas where sheets overlapped, the tracklines were only digitized on the sheet from which the bathymetric contours had been digitized. All data are stored in geographic coordinates. The data set includes the digitized outlines of areas of high quality surveys and saturated sounding coverage as well as the individual ship tracklines. The locations of isolated spot soundings were not digitized.

For the area of GEBCO sheet 5.12 (50°S to 7°N; 70°W to 20°E), the tracklines were digitized from source material provided by the compilers of the revised bathymetry for the new version of the sheet.

For the area 0°N to 46°40'N; 120°E to 180°E, the tracklines were digitized from transparencies taken from the trackline plates used to produce the 1:1 million scale atlas published by the Japan Oceanographic Data Center, which complemented the digital data set of bathymetric contours and coastlines used in the GDA for this area. Tracklines for the remainder of GEBCO sheet 5.06 were taken from the published GEBCO sheet.

This data set appears in two forms on the CD-ROM; one tailored for access and display through the GDA Software Interface, while the other is directly accessible to the user with one file per GEBCO sheet, formatted according to the specification given in Table 2 (page 39).

On the printed GEBCO sheets, the areas of saturated soundings and of high quality surveys are cross-referenced to an information note in the border of the sheet. This

information has been stored on the CD-ROM and is available to the user through the GDA Software Interface by setting the cursor in query mode within the area of the survey box on the user's display screen.

2.6 INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN (FIRST EDITION)

For the Mediterranean Sea area, the CD-ROM also contains the digitized coastlines and bathymetric contours from the 1:1 million published sheets of the IBCM First Edition, in addition to the 1:10 million digitized bathymetry from the GEBCO Fifth Edition. However, the digital data set does not include the trackline control or the land contours published on the IBCM First Edition printed sheets.

The IBCM covers 10 sheets in the area 30°N to 46°N; 6°W to 36.5°E each published at a scale of 1:1 million (at 38°N) on Mercator Projection (see Figure 5 on page 23). The Black Sea is included at 1:2 million in the area 40°N to 47.5°N; 26.5°E to 42.5°E. The ellipsoid used was $e=0.081813$, $a=6,378,245$. The contours were digitized from these sheets with the criteria that 90% of digitized points should lie within 0.3mm of their position on the original charts and that, along each contour, the maximum distance between successive digitized points should not exceed 1mm. The digital data are expressed in geographic co-ordinates.

All bathymetric contours and coastlines present on the published sheets are included in the digital data set. Most sheets include contoured bathymetry at 0m (coastline), 20m, 50m, 100m, 200m and at 200m intervals thereafter, although the actual contours depicted vary slightly from sheet to sheet. All contour levels are expressed in corrected metres i.e. based on echo-soundings corrected for the speed of sound according to the Echo-Sounding Correction Tables (see section 2.11). The coastline used on IBCM was based on that depicted on the 1:250,000 British Admiralty plotting sheets for oceanic soundings, except for Corsica, Sardinia and the area of Alexandria where it was extracted from other nautical charts and topographic charts available in the early 1980s. The IBCM coastline is included in the data set.

This data set appears in two forms on the CD-ROM; one tailored for access and display through the GDA Software Interface, while the other is directly accessible to the user with one file per IBCM sheet, formatted according to the specification given in Table 2 (page 39).

2.7 WORLD VECTOR SHORELINE

As an alternative to the coastline used in the GEBCO Fifth Edition, the CD-ROM also includes a copy of the World Vector Shoreline (WVS) at several resolutions corresponding to scales of 1 to 43 million; 1 to 12 million; 1 to 3 million; 1 to 1 million; 1 to 250,000; and 'full resolution' (about 1:125,000). This product is referenced to the World Geodetic System (WGS-84) datum and was created to an accuracy specification

that 90 percent of all identifiable shoreline features should be located within 500 metres (i.e. 2.0mm at 1:250,000) of their true geographic position with respect to WGS-84. The accuracy of WVS is known to be somewhat suspect around the Antarctic continent.

The basic WVS product was created at a scale of 1:250,000 (or up to 1:125,000 where the source data allowed) and the lower resolution data sets are simplified versions of the basic product obtained by filtering out points using the Douglas-Peucker algorithm so as to produce a lower data volume. In its original form the WVS was organized in one degree square units, and shoreline continuity was ensured by including the co-ordinates of all shoreline crossovers with whole degree latitude and longitude lines. These points appear to have been retained at each step during the simplification process with the result that, for the 1:43 million scale shoreline, they appear to have a disproportionate influence on the simplified shoreline. However, this effect is only noticeable if the simplified shoreline is viewed at scales larger than 1:43 million and serves to illustrate that the simplified shorelines should only be used at scales smaller than or equal to their nominal scales.

The WVS data set has not yet been matched to the GEBCO Fifth Edition bathymetric contours and isolated occurrences may arise where the shoreline appears in conflict with the depth contours e.g. around small oceanic islands or where the shoreline abuts a submarine scarp. It should be noted that WVS was used in the production of the revised GEBCO sheet 5.12 and is therefore compatible with the GEBCO bathymetry in this area.

The WVS, at each of its scales, is stored on the CD-ROM in a binary format suitable for display and/or export using the GDA Software Interface. Unlike the GEBCO and IBCM data sets, a simple ASCII version of WVS is not available on the CD-ROM for direct copying i.e. user files of WVS data can only be created through the GDA Software Interface. Because the data are organised in one degree square units, WVS vectors are output in separate segments for each degree.

2.8 GEODAS TRACKLINE INVENTORY OF DATA HELD AT THE IHO DATA CENTRE FOR DIGITAL BATHYMETRY

The CD-ROM includes a trackline inventory of the single beam echo-sounding data held in digital form at the IHO Data Centre for Digital Bathymetry. The IHO DCDB is co-located with the U.S. National Geophysical Data Center and its digital holdings of single beam echo-sounding data are co-held within NGDC's GEODAS database of worldwide underway geophysics data - a major international database of underway bathymetry, magnetics, gravity and seismic shot-point data.

In March 1993, all data contained in the GEODAS database up to the end of 1992 were published by NGDC on a pair of CD-ROMs, complete with supporting access software. (An updated CD-ROM including data assimilated up to the end of 1993 will be released by NGDC in early 1994). Incorporated within the search and retrieval facility of the package is a trackline inventory comprising a simplified navigation file for each cruise leg contributing data to the database. Sufficient navigation points are included in the

inventory to replicate the trackline coverage of echo-sounding data lodged in the database. The staff at NGDC kindly provided BODC with a pre-release copy of the inventory covering data assimilated to the end of 1993 and software was written at BODC to convert it for use within the GDA.

This data set, encompassing data assimilated up to the end of 1993, appears in two forms on the CD-ROM; one tailored for access and display through the GDA Software Interface, while the other is directly accessible to the user with one file per octant of the globe, formatted according to the specification given in Table 2 (page 39).

2.9 GEOGRAPHIC NAMES

Included on the CD-ROM are geographically referenced lists of the names of undersea features, oceanic islands, Antarctic islands, Antarctic stations, ports and cities. This information is available to the user via queryable feature symbols that can be overlain on the map area of charts displayed on the user's screen through the GDA Software Interface. The feature's name is revealed on the screen when the cursor is positioned in query mode on the symbol. In the case of undersea features, extended information is displayed covering relevant details on the naming of the feature as stored in the IHO/IOC Gazetteer (section 2.9.1). Separate symbols are used for undersea features, islands and place names on land.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardization of names on nautical and bathymetric charts.

2.9.1 IHO/IOC Gazetteer of Geographical Names of Undersea Features

The IHO/IOC Gazetteer of Geographical Names of Undersea Features is maintained at the IHB in Monaco on a computerised database system. The Gazetteer was populated initially with the names of undersea features shown on the GEBCO Fifth Edition and on the IHO International Charts at Small Scales (1:2,250,000 and smaller), and later supplemented by the names shown on the IBCM First Edition. It is kept regularly updated with new geographical names as and when they are approved by the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features (SCGN) - renamed in 1993, the Sub-Committee on Undersea Feature Names (SCUFN).

A copy of the IHB database was used as the source material for the undersea feature names stored on the CD-ROM and it includes all names approved by the GEBCO SCGN up to and including its Tenth Meeting held at the Scripps Institution of Oceanography, La Jolla, 29 April - 3 May 1993. Information extracted from the Gazetteer for each undersea feature, and which may be viewed on the user's screen when the feature is queried through the GDA Software Interface, includes:

- a) the geographical name of the feature and the generic term used to define the nature of the feature.
- b) the geographical position of the feature - this is only an approximate position and is used solely to identify the feature, rather than to define its precise location. Where the feature is extensive, a second position may also be given to indicate its extent. For linear features, such as ridges and fracture zones, further positions may have been added by BODC to delineate the feature.
- c) a reference to the GEBCO sheets, IHO Small-Scale International Charts (using the prefix 'INT') and IBCM sheets on which the geographical name and the undersea feature are shown or might be added to future editions.
- d) information on whether the geographical name and generic term are also recognised by the 'Advisory Committee on Undersea Features of the U.S. Board on Geographic Names (ACUF/BGN)'. A 'yes' or 'no' indicates whether the geographical name and its generic term are shown in the 'Gazetteer of Undersea Features - Names approved by the United States Board on Geographical Names' published by the Defense Mapping Agency, Washington, D.C., Third Edition, December 1981. If a date is given it means that the name has been adopted subsequent to the publication of the Third Edition of the U.S. Gazetteer and indicates the date of the meeting of the ACUF/BGN which adopted the name. Information is also given where the geographical name, the generic term, or the geographic positions differ from those shown in the IHO/IOC Gazetteer.
- e) other information relevant to the naming of the feature, for example, any variations or changes in the name. The abbreviation 'GEBCO/SCGN/..' means that the name has been recently approved by the GEBCO SCGN during one of its meetings, or by correspondence.

2.9.2 Oceanic islands and Antarctic islands

A geographically referenced list of about 400 oceanic islands was specially prepared by BODC to complement the GDA. The list is not intended to be comprehensive in any way nor are the names given to the individual islands intended to be definitive. The list focuses primarily on small islands in the open ocean and excludes islands in the Mediterranean, the Gulf of Mexico, the Caribbean Sea (except for the Windward and Leeward Islands) and the inner seas of South-east Asia. It also excludes islands on the continental shelves in close proximity to land and all continental shelf islands in the Arctic Circle.

An initial list of islands was prepared using the names printed on the sheets of the GEBCO Fifth Edition, but this was then extended by reference to the Comprehensive Edition of 'The Times' Atlas of the World, particularly in the areas of Micronesia, Melanesia and Polynesia in the Pacific Ocean. In general, an attempt was made to identify all isolated islands but in island groups only a few key islands were identified. The name of the island group is included in parenthesis after the island name where appropriate.

Island names were taken either from the GEBCO Fifth Edition sheets or from 'The Times' Atlas of the World and follow the naming and language conventions adopted by these two sources. Inevitably, the list contains a mixture of anglicised and local language names. For the First Release of the GDA, the list is intended to be representative rather than authoritative and it is hoped that a more comprehensive and standardized list can be identified for inclusion in future releases of the GDA. The geographic co-ordinates of each island were determined by reference to the World Vector Shoreline. Using the GDA Software Interface, each island was zoomed into in turn on a PC screen and the screen cursor was set within its confines - the geographic co-ordinates of the cursor were then read off the automatic cursor co-ordinates display.

The CD-ROM also includes a geographically referenced list of the Antarctic islands named on the GEBCO Fifth Edition sheets. The island names were taken directly from these sheets and the geographic co-ordinates of islands close to the ice shelf were determined by reference to the digitized coastline of the GEBCO Fifth Edition, using the GDA Software Interface in a similar manner to that outlined above for oceanic islands. Many of the Antarctic islands close to the ice shelf are not clearly defined on the World Vector Shoreline.

2.9.3 Ports/cities and Antarctic stations

The CD-ROM includes a geographically referenced list of all ports and cities annotated on the sheets of the GEBCO Fifth Edition. Their names are taken directly from these sheets and their geographical co-ordinates were taken from the Gazetteer in the Comprehensive Edition of 'The Times' Atlas of the World. These co-ordinates were checked relative to the digitized version of the GEBCO Fifth Edition coastline viewed through the GDA Software Interface.

The CD-ROM also includes a geographically referenced list of scientific stations operating in Antarctica south of 60°S during the Antarctic winter of 1991. The list covers stations occupied by the member nations of the ICSU Scientific Committee on Antarctic Research and was reproduced from SCAR Bulletin, No 103 (October 1991).

2.10 DATA SET DOCUMENTATION

Supporting documentation is provided for each of the data sets stored on the CD-ROM. These documents are stored in separate files which can either be viewed through the GDA Software Interface or listed off to accompany any data exported from the GDA. The descriptive texts covering the GEBCO Fifth Edition, the IBCM First Edition, the World Vector Shoreline and the IHO/IOC Gazetteer are virtually the same as those given in Sections 1 and 2 of this volume. However, more extensive documentation is provided for each of the individual GEBCO Fifth Edition sheets. This additional material covers not only author credits and details concerning the compilation and digitization of the sheet, but also includes a full list of the source material used in the compilation of the sheet's bathymetry e.g. literature references, sources of unpublished survey data and special

compilations, sources of sounding data and published maps. Documentation is also provided covering the contents and use of the data files and software for the Third Edition Echo-Sounding Correction Tables.

2.11 ECHO-SOUNDING CORRECTION TABLES

Measurements of seafloor depths using echo-sounding techniques depend on knowledge of the mean velocity of sound in the water column between the echo-sounding device and the seafloor. This in turn is dependent on the temperature and salinity down the water column and these characteristics vary across the world's oceans. Most modern echo-sounders assume a sound speed of 1500 m/s while some earlier versions assume 800 fm/s (1463 m/s). Since 1929, when the First Edition of Matthews Tables was published, standard correction tables have been used to correct for the true speed of sound in seawater - for this purpose the world's oceans are divided into discrete areas linking regions with common sound velocity profiles, and a table is constructed for each area with the depth correction to be applied at various depths down the water column.

In 1939, a Second Edition of Matthews Tables was published and these tables remained in common use until the early 1980s (Matthews, D.J., 1939. Tables of the velocity of sound in pure water and sea water for use in echo-sounding and sound ranging (Second edition). British Admiralty Hydrographic Department, Publication H.D. 282, London, 52p).

In 1980, a Third Edition of the Echo-Sounding Correction Tables was published by the U.K. Hydrographic Department to replace Matthews Tables. The tables were extensively revised to incorporate the large number of temperature and salinity measurements obtained since 1939 and used an improved formula for the dependence of sound velocity on temperature and salinity. Computations for the revised tables were carried out by D.J.T. Carter of the Institute of Oceanographic Sciences, Wormley, England, using oceanographic station data provided by the U.S. National Oceanographic Data Center, Washington. The revised tables, together with a detailed description of their preparation may be found in 'Echo-Sounding Correction Tables (Third Edition) in Publication N.P.139 of the U.K. Hydrographic Department. In 1982, the XIIth International Hydrographic Conference at Monaco adopted the Third Edition Tables to replace Matthews Tables (Second Edition).

The Third Edition Tables are applicable for use throughout the world in water depths greater than 200 metres, and cover depth to the sea bed in each of 85 echo-sounding areas. The tables are in metres and cater for echo-sounders calibrated to 1500 m/s, a conversion table for 1463 m/s being provided. As the boundaries between echo-sounding correction areas lie along exact degrees of latitude and longitude, the tables are particularly suited for computerised use.

The CD-ROM contains a directly accessible set of files to enable the user to set up his own system for computing the echo-sounding correction, according to the Third Edition

Tables, given the ship position and the uncorrected depth reading. The files include the echo-sounding correction area definitions and correction tables, together with the necessary computer routines and documentation for installing the system. In addition, the GDA Software Interface also provides a facility for automatically computing the echo-sounding correction at the geographic position of the cursor on the user's display screen - the user simply supplies the uncorrected depth reading and the system returns the echo-sounding correction area identifier and the corrected depth value or vice versa.

SECTION 3

User Guide to the GDA Software Interface

3.1 SYSTEM REQUIREMENTS

The software requires an IBM PC (or compatible) with 640k RAM (500k free), a VGA display, a CD-ROM drive, and a hard disk with at least one Megabyte of free space in which to install and run the Atlas software. A numeric co-processor will be used if it is present. The software is designed to run under DOS 3.0 or later, and with any version of Microsoft DOS Extensions that supports the ISO 9660 standard to permit access to the CD-ROM drive. A mouse (Microsoft compatible) is highly desirable, but not essential. If required, the software may be installed for multi-user operation on a LAN.

Although the interface will run on any IBM compatible PC, it is recommended that a fast 80386, 80486 or Pentium based system, with numeric co-processor if appropriate, is used in order to maximise display speed. Similarly, whilst the software will run under any version of DOS from 3.0 onwards, it is strongly recommended that DOS 6.2 (or later) be used since the SMARTDRV disk cacheing software of that version will also cache read operations from CD-ROM, significantly enhancing data access speeds.

3.2 LOADING THE GDA SOFTWARE INTERFACE ONTO YOUR SYSTEM

To install the GDA Software Interface on your system, place the installation diskette in the A: drive and enter the command:

A:\INSTALL to install in directory GEBCO on the C: drive

or:

A:\INSTALL <directory name> to install in the directory specified by <directory name> on the C: drive

or:

A:\INSTALL <directory name> <drive:> to install in the directory specified by <directory name> on the <drive:> drive

For example, the command:

A:\INSTALL GEBATLAS D:

will cause the GDA Software Interface to be installed on the D: drive in directory GEBATLAS.

Note: If the floppy disk drive from which you are installing is not drive 'A:', then you should use the DOS 'SUBST' command to instruct the PC to read from the

correct drive when reference is made to drive 'A:'. For example, to install from drive 'B:', enter the command:

```
SUBST A: B:\
```

before you begin the installation process (you will probably need to insert a disk in the 'B:' drive before issuing the command as DOS performs a check read before performing the substitution).

The command:

```
SUBST A: /D
```

will return your system to normal function once the GDA Software Interface has been installed.

This will cause the GDA Software Interface to be unpacked from the distribution diskette(s) into the specified directory. All necessary subdirectories will be created during the installation (if the destination directory already exists on your system, then it should be cleared and deleted before installing the GDA; if the destination directory is itself a subdirectory, then the directory in which it will reside must exist prior to installation). You will be prompted to insert any further installation diskettes if they are required.

At the end of the installation process, the program SET_DEF automatically runs to permit you to set the default values for your system. A detailed description of this program is given in section 3.5, "Setting GDA system defaults". In order to test the system, however, the only setting that you may need to change is the drive letter of your CD-ROM drive; the program may be re-run later to set printer ports, printer type, etc..

If you are installing the GDA for use on a LAN, please read section 3.10, "Installing the GDA for use on a LAN", for information on system default settings for individual users.

3.3 RUNNING THE GDA SOFTWARE INTERFACE

First ensure that, if available, the mouse driver is installed by running MOUSE.COM. In the following description of how to use the program it will be assumed that a mouse is being used. The use of the keyboard to emulate a mouse is described in section 3.11.

Using the DOS command 'CD', make the directory which contains the Atlas system the current directory, and then start the program with the command:

```
GEBCO
```

This will cause the main title screen of the GDA to appear on the VDU display. Press any key or mouse button to proceed to the next screen, repeating until the Area Selection Screen of the GDA is displayed.

The GDA Software Interface automatically senses whether your PC contains a numeric co-processor, and uses it if one is found.

3.4 QUICK GUIDE TO THE GDA SOFTWARE INTERFACE

The main functional features of the GDA Software Interface have been summarised in sections 2.2 and 2.3. The system has been designed to be intuitive and user-friendly, and requires only minimal computing expertise on the part of the user. The low learning overhead afforded by the system ensures that the novice user may operate it to good effect almost immediately.

It is recommended that you familiarise yourself with the following brief description of the GDA Software Interface before running the software, but thereafter it is probably most effective simply to run the system and explore it (making use of the context-sensitive help messages) rather than to read about it in detail. The software has been designed to be robust and to encourage a 'try it and see' approach to learning, so go ahead - you won't break anything!

3.4.1 Overview

The GDA software interface is functionally divided into two sections between which the user may move freely. The first section, the Area Selection Screen, displays a land/sea map of the entire area covered by the dataset, and from this the user may select the extreme limits of the geographic area for which he/she wishes to view or export data. The second section, the Main Display Screen, displays the detailed bathymetric contour, coastline, trackline and feature data for the specified geographic area; the user is free to zoom and pan within the limits of the selected area, but may not extend the plot outside those limits without returning to the Area Selection Screen and specifying a new area. This 'two tier' display system allows the user rapidly to select his or her area of interest before detailed data are displayed, and hence avoids time delays whilst unwanted information is presented.

Two parallel versions of the Area Selection Screen are available, one for the GEBCO and one for the IBCM, and the user may swap freely between them by activating the appropriate option on the 'Area Select' menu.

The GDA Software Interface offers a number of options for controlling the manner in which information is presented (e.g. colours, linestyles, map projection, the subset of contours to be displayed, whether or not tracklines and/or feature locations should be displayed, the source of the coastline, etc.). All of these options are available from the Main Display Screen, but many of them may, if desired, be pre-selected from the Area Selection Screen before the detail plot is initiated.

The Interface not only permits visualisation of the data on the PC screen, but also serves to select the geographic area and subset of available datasets for export to the user's hard disk (in flat ASCII or DXF formats) for use with other software packages. Data export may be performed either from the Area Selection Screen or from the Main Display Screen as desired by use of the 'Export Data' option on the 'Utilities' menu.

3.4.2 Context sensitive help

Context-sensitive help is available at all times within the package, activated by pressing the <F1> key. This 'quick start' guide provides sufficient information for users to operate the software interface, but for more detailed information on a specific topic you are referred to the context-sensitive help (or to the printed version of the 'Help' messages given in Annexes III and IV).

Help for any menu option may be obtained by placing the cursor on that option (whether it highlights or not) and pressing the <F1> key; if a menu has been pulled down and the cursor is outside that menu, then the help system will offer information about the preceding menu option from which the current menu was called. To exit help, press the <Esc> key or the right hand mouse button.

3.4.3 Selecting options from 'pull down menus' within the GDA Software Interface

Using the mouse cursor, point to the desired keyword at the top of the display (the blue background will change to a red highlight), then press and release the left mouse button to cause the relevant menu to appear on the screen. At times, some keywords will appear in grey text rather than yellow, indicating that they are not currently available for selection (for example, on the Area Selection Screen the 'Plot' keyword will not be active for selection until the area for which data are to be plotted has been specified).

Move the highlight bar to the desired menu option (the bar only appears while you are within the menu area), and select by pressing the left mouse button and releasing.

Repeat the last step (if necessary) to move down the chain of menus until you reach the final selection, at which point the relevant option will be activated.

Notes: Some menus, rather than allowing the user to select an operation to be performed, offer a choice of alternative display styles which will remain in force until changed by the user (e.g. the map projection to be used). These menus have a 'Confirm' box at their foot, and will have the currently selected option highlighted irrespective of the cursor position. Select the desired option by pointing to it with the mouse cursor and pressing the left mouse button, then enter that selection into the system by pointing to the 'Confirm' box and pressing the left mouse button. The effects of changes made from these menus will not be shown until the data are replotted (either by zooming in/out or by selecting the 'Redraw' option).

Items which appear in grey instead of black on the menus cannot be selected. These options will have been temporarily disabled by the software since they are not appropriate to the current situation.

Selection from any menu can be aborted either by pressing the left mouse button whilst the mouse cursor is outside the menu area (this returns you to the previous menu level) or by pressing the right-hand mouse button irrespective of cursor

position (this will cancel the entire menu chain and return you to the main screen).

3.4.4 Repositioning the zoom window, legend, geographic cursor position window or information window

When these options are selected, the dotted outline of the relevant window appears on the screen, with a 'crossed arrows' mouse cursor at its centre. Move this 'ghost outline' to the desired location on the screen without holding down the mouse button, and confirm the new position by pressing the left mouse button. The operation may be aborted at any time by pressing the right-hand mouse button.

3.4.5 Positioning and setting the size of the zoom window

When a zoom-in option is selected, a small 'plus sign' mouse cursor with the subscript 'z' appears. Move the mouse cursor to one corner of the area to be zoomed into, then press and release the left mouse button. The mouse cursor will disappear to be replaced by a 'ghost outline' of the zoom box which will grow outwards from the anchor point according to the mouse movement used (on the Main Display Screen, if 'screen proportions' has been selected as the zoom box shape, then the box will always retain the same height/width proportions as the main display area; otherwise its proportions will be fully user-controlled). Move the free corner of the zoom box so that the desired area is enclosed, then press the left mouse button to cause the zoom to be effected. If an edge of the zoom box is taken outside the current display area, then it will be 'clipped' to the edge of the current display.

The zoom operation can be aborted by pressing the right-hand mouse button.

3.4.6 Querying contours, survey boxes or features

On the Main Display Screen, contours may be queried to determine their depth (in order to resolve any ambiguities caused by 'wraparound' of colours in the legend) at any time; survey boxes and feature locations may only be queried if they have been selected for display. Selection of an option under the 'Query' menu will cause the background of the command to go yellow, indicating that the option is active, and the menu heading will change to indicate the type of data being queried. The cursor will change to a cross with a subscript of 'C', 'S' or 'F' for contours, survey boxes or features respectively. No other options may be selected whilst querying is in progress.

To query items displayed on the screen, point to the selected item with the cursor, and press the left mouse button (pointing does not need to be precise, the nearest item will be selected providing it is within a reasonable radius of the cursor). The line segment, box outline or symbol will flash, and textual information associated with it will be displayed. The information will remain on display until the next symbol is queried (single line text) or the text box is closed by pressing the right-hand mouse button (symbols with multi-line text).

To terminate the query function, press the right-hand mouse button. Any displayed single line information will be removed, and control will return to the main screen options.

3.4.7 Quitting the Main Display Screen

When the 'Quit - Partial' option is selected from the Main Display Screen, control is returned to the Area Selection Screen to permit a new area to be specified. The current area selection is discarded, but user options such as palette selection, whether tracklines should be plotted, etc. are retained and will remain current throughout the GDA session unless subsequently changed or reset by the user..

3.4.8 Printing from within the GDA Software Interface

If the 'Utilities - Print Screen' option or the option to print textual information from within the GDA Software Interface is selected, then the appropriate printer must be connected to the designated output port. Due to the variety of possible print paths that may be selected, it is not possible for the GDA software to check fully for correct connection; the responsibility for ensuring that the printer is ready to receive data when a print operation is performed therefore lies with the user.

When printing textual data, the printer (if it is not an IBM printer) should be used in IBM emulation mode so that any IBM special characters contained in the text are printed correctly.

Screen dump and screen capture options within the GDA Software Interface may, if desired, be activated by a 'hot-key' rather than from a pull-down menu option. In this case, the cursor remains at its current position on the screen (as opposed to becoming 'hidden') and is part of the printed or captured image; the cursor may therefore be used to indicate a point of interest on the display. See the help text for the appropriate options for information on specific 'hot-keys'.

If your printer is not supported directly by the GDA Software Interface but you are running the *Windows* operating environment with a suitable printer driver, screen dumps from the system may be obtained by installing and running the GDA as a DOS application within *Windows* (see section 3.9, "Installing the GDA as a DOS application under *Windows*"). To print a graphics screen, first capture it to the *Windows* clipboard by pressing your computer's 'Print Screen' key, then transfer it to your preferred *Windows* graphics package and print it from there via the correct printer driver.

3.4.9 Free disk space requirement

Since the GDA Software Interface creates some files for its own use whilst running, at least 0.5 Megabytes of free disk space should be available before the software is run (in addition to any space required for files (screen displays, palettes, contour selections, etc.) saved by the user from within the package).

3.5 SETTING GDA SYSTEM DEFAULTS

The system defaults file is used to customise the GDA system to your specific hardware (PC, display and printer) configuration, and the program SET_DEF is provided to permit you to change the defaults file settings. As supplied, the GDA Software Interface will run on any PC with a VGA display, it assumes that the CD-ROM drive will be drive D:, and it is configured for a Hewlett-Packard Laserjet printer on port LPT1: for both text and graphics output. If your system differs from this, then you will need to run program SET_DEF in order to change the relevant settings.

3.5.1 Running program SET_DEF

First make the GDA directory the current directory using the DOS 'CHDIR' or 'CD' command (e.g. 'CD C:\GEBCO'), then enter the command 'SET_DEF' followed by <Enter>.

The program will ask if you wish to make changes to the standard GDA defaults file and you should answer 'Y(es)' to this unless you wish to create or edit additional defaults files (which will usually only be necessary for use on a LAN).

The program will then present an introductory text screen, followed by a menu which lists the six default values that you may change, together with their current settings. To change a default setting, enter the number of that setting, as shown on the menu, and follow the instructions given by the program. On completion of setting each item, you will be returned to the menu screen upon which the changed setting will be displayed. When you have made all the changes that you require, save them to disk by selecting the 'S(ave)' option (or, if you change your mind, you may 'Q(uit)' the program without saving the changes).

3.5.2 Explanation of SET_DEF options

Instructions on how to change default values, and the possible alternatives that may be chosen, are given within the program. The following notes are therefore intended to help you choose which settings are most appropriate for your system.

Option 1. CD-ROM drive letter

Possible alternatives are 'D' to 'Z'.

The default setting is drive 'D'. If your CD-ROM drive has been allocated a different letter, key in the appropriate letter.

Option 2. Text print stream

This option tells the GDA Software Interface where to direct any text printout that you request. Alternatives are PRN:, LPT1:, LPT2:, LPT3:, AUX:, COM1:, COM2:, COM3:, <filename> and NAMED_FILE.

If you select any of PRN: through to COM3:, then text output from the GDA will always be directed to the logical or physical device corresponding to the selected identifier on your system.

Selecting the <filename> option will enable you to enter the name of a disk file to which text output will always be directed from within the GDA Software Interface (this can be useful when you wish to transfer data to another machine before printing, or to import the text into a wordprocessor or DTP package).

If you select the NAMED_FILE option, then no destination for text output will be stored in the defaults file. Instead, the first text print of each GDA session will cause the system to prompt you for the name of the file *or output port* (e.g. PRN: etc.) to which output should be directed for the duration of that session. This option is most useful if you have more than one printer attached to different ports of your PC, or if you wish to alternate between immediate and deferred printing.

Option 3. Image print stream

This option tells the GDA Software Interface where to direct any graphical printout that you request. Alternatives are PRN:, LPT1:, LPT2:, LPT3:, AUX:, COM1:, COM2:, COM3:, <filename> and NAMED_FILE.

The effects of selecting the various options are as described for the text print stream above.

Option 4. Text printer control file

This option allows you to specify the name of a control file which contains various print codes (for 'bold text on/off' etc.) which are specific to your printer. You may select predefined files for Epson 8-pin dot matrix, IBM Proprinter, Hewlett-Packard Laserjet or 'Null printer' (the last being most suitable for use when text is to be saved in a file for import into a wordprocessor). If your printer is not compatible with one of the templates supplied, then you may choose the <filename> option to specify the name of a file containing printer codes that you have set up for it (instructions on how to do this are given in section 3.7, "Customising the printer control file").

Option 5. Workfile directory

This option allows you to specify the directory on your hard disk in which the GDA Software Interface may create (and subsequently delete) workfiles whilst it is running. The directory must be one to which you have write permission.

Workfiles created by the GDA Software Interface all have the extension '.\$\$\$', and the software deletes all files of this type from its workfile directory at the end of each session, so do not choose a workfile directory in which you might create files with the '.\$\$\$' extension that you wish to keep.

For single user 'stand alone' use, then the current directory at run time (i.e. the GDA directory) is a suitable choice.

If you are accessing the software via a LAN, then the current (GDA) directory will not be a suitable choice since it will probably be write-protected. It should be avoided in any case since files created by your session would clash with those of any other user who is using the GDA at the same time. A subdirectory on the hard disk of your own machine is the best choice.

Option 6. Synchronise screen update

When displaying a chart, the GDA Software Interface attempts automatically to disable the mouse cursor momentarily during screen updates which might result in conflict within the system (both the GDA software and the mouse driver software attempting to update different areas of the screen simultaneously). Most mouse driver software will respond correctly, and in that case screen update synchronisation should be left at its "No" setting to obtain maximum speed of update.

A small minority of mouse drivers, however, will not respond to a request to disable, and conflict occurs. This will cause small areas of the screen in the Position Window to become corrupted. If this occurs, then setting synchronisation to "Yes" will cause updates of the Position Window to be synchronised with the frame rate of the display, allowing the mouse cursor to be 'hidden' during updates without causing visible flickering. This solves the problem of conflict, but the Position Window will be updated noticeably more slowly and it will tend to lag slightly behind the movement of the mouse cursor (which will still move at the same speed).

3.5.3 Creating an alternate defaults file

To create an alternate defaults file, make the GDA directory the current directory and then run program SET_DEF with the name of the file that you wish to create as a command line parameter.

For example, to create an alternate defaults file called MYDEFS.DAT in the current directory, enter the command:

```
SET_DEF MYDEFS.DAT
```

The software will inform you that no file of that name exists, and ask if you wish to create a new file of the specified name. Answer 'Y(es)' to this question. The new file will be created, initialised with the standard option settings, and you will then be offered the opportunity to change them in the usual way.

3.5.4 Editing an alternate defaults file

To edit an alternate defaults file, make the GDA directory the current directory and then run program SET_DEF with the name of the file that you wish to edit as a command line parameter.

For example, to edit the alternate defaults file MYDEFS.DAT in the current directory, enter the command:

```
SET_DEF MYDEFS.DAT
```

The program will load the specified file and then permit you to change the option settings in the usual way.

3.5.5 Using an alternate defaults file

In order to use default settings which are stored in an alternate defaults file, you must tell the GDA Software Interface the name of the file that you wish it to use instead of the standard defaults file. This is done by setting the DOS environment string GEBCO_DEFAULTS to contain the name of the alternate file before the GDA software is run.

For example, to use the alternate defaults file MYDEFS.DAT in the GEBCO directory of your C: drive, enter the command:

```
SET GEBCO_DEFAULTS=C:\GEBCO\MYDEFS.DAT
```

When run, the Atlas software will then use default values from the specified file.

To cancel the use of the alternate file, clear the DOS environment string by entering the command:

```
SET GEBCO_DEFAULTS=
```

3.5.6 If your defaults file becomes corrupted

In addition to the options that may be set by means of the SET_DEF program, the defaults file also contains the names of directories in which GDA data sets are stored.

Initially, these directories are all on the CD-ROM, but they may be changed by the more adventurous user as described in section 3.6.5 if data are transferred to the hard disk.

If you accidentally delete or corrupt the defaults file whilst editing it, and you have not kept a backup copy, then you can create a new copy (with all entries set to their default values) by first deleting the corrupt file and then running SET_DEF as described in section 3.5.1. The program will ask if you wish to create a new standard defaults file; answer 'Y(es)', and then edit it to set your preferences in the usual way.

3.6 GETTING THE MOST FROM YOUR SYSTEM

Although the GDA Software Interface will run on any IBM compatible PC which meets the minimum hardware specification, its performance can be optimised by choice of machine and of operating system software, and also by relocating some of the most frequently used files to hard disk. The following hints will assist you to optimise performance on your PC.

3.6.1 Choice of processor

The software will run on an 8088 PC if required - but slowly! An 80386, 80486 or Pentium processor with a high clock speed (preferably 25MHz or above) is highly recommended, and will yield speed increases in line both with increasing clock speed and improved processor architecture higher up the 80x86 'family' of cpu chips.

3.6.2 Numeric co-processor

The GDA Software Interface detects the presence of a numeric co-processor and uses it if available (80486DX and Pentium processors have a built-in numeric co-processor). The presence of a numeric co-processor typically boosts display speed by better than 30%.

3.6.3 Choice of CD-ROM drive

Any CD-ROM drive will work with the GDA Software Interface, but display performance will largely reflect the capabilities of the drive. The GDA contains a large number of files, and the seek time of the drive (i.e. the average time taken to locate the start of a file) is therefore almost as important as its data transfer rate. Ideally, a modern, double-speed (300kbps data transfer rate) drive with an average seek time of less than 300ms should be used.

3.6.4 CD-ROM cacheing

CD-ROM drives are comparatively slow devices, particularly when a large number of files is to be handled. Use of cacheing software (such as the version of SMARTDRV supplied as part of DOS 6.2) will significantly increase performance since it will permit the directory information to be retained in RAM rather than read from CD-ROM for each file accessed. File storage on the CD-ROM has been optimised to minimise seek times between files (the next file needed will usually be the next one on the disk), but this optimisation is destroyed if the drive constantly has to seek directory information from another part of the disk. If you are not using cacheing software, you will notice this as a deterioration in speed when plotting areas just west 180°E (when the data files are furthest from their directory information) compared to those just east of 180°W (where data and directory are closest together).

3.6.5 Transfer of frequently used files to hard disk

Display speed direct from a CD-ROM drive will be perfectly satisfactory on the majority of systems. If you wish to improve performance, however, access and display speed can be increased if you have a large amount of free disk space available (about 22Mb) and you copy the binary GEBCO bathymetric contour data from the CD-ROM drive to your hard disk. Copy the files to a subdirectory on your hard disk, and then use your system editor to modify the appropriate line of the file DEFAULTS.DAT in the MISC subdirectory of your GDA directory (the meaning of each line is indicated by a comment at its end) to point to the new directory instead of the CD-ROM directory. This will give an immediate increase in system performance due to the shorter seek times and higher data transfer rates associated with hard disks; additionally, you may find that you benefit from speed increases associated with disk cacheing, since all versions of SMARTDRV cache the hard disk.

The above principle may be applied to any of the datasets supplied on the CD-ROM if the user feels that the speed increase is worth the disk space occupied. Use the contents of the README.TXT files on the CD-ROM and the comments in the DEFAULTS.DAT file to identify links between datasets and directories.

Do ensure that you specify the hard disk directory correctly in the defaults file. If the GDA Software Interface cannot find a specific data file it assumes that this is because no data are available for that geographic 10° square and it moves on to the next one. So if no data of the relevant type are plotted after you move files to your hard disk, and no error messages are issued by the software, double-check that you have specified the directory correctly.

3.6.6 Planning your GDA session

As you become more familiar with the GDA Software Interface, you will find that you can use it more efficiently by thinking ahead and using the time-saving features that have been incorporated.

At the Area Selection Screen, do not choose a working area that is larger than necessary; this will minimise the time taken for the initial plot on the Main Display Screen.

Having chosen your working area, set your preferences (projection, contour selection, coastline, tracklines, features, etc.) before you proceed to the Main Display Screen. This will save you having to re-draw the display after making the desired changes on the Main Display Screen.

Wherever possible, use 'Zoom - Redefine' or 'Zoom - Reposition' rather than 'Zoom - Out' followed by 'Zoom - In' in order to move around your selected geographic area.

3.7 CUSTOMISING THE PRINTER CONTROL FILE

Information from the printer control file is used by the Atlas system to perform the following tasks:

- a) Reset the printer at the start of a session.
- b) Select 10 characters per inch (fixed pitch) printing.
- c) Select 6 lines per inch printing.
- d) Turn bold text on.
- e) Turn bold text off (i.e. resume normal text printing).

Since all text output from the GDA Software Interface has been designed to be a maximum of 70 characters line length plus a six (blank) character left-hand binding margin the above settings will print a well balanced, A4 width page on all 80-column printers, with key text highlighted by bold print.

Standard printer control files are provided with the GDA Software Interface for Epson 8-pin, IBM Proprinter and Hewlett-Packard Laserjet compatible printers, as well as a 'null printer' control file which inserts no printer control information into the output (for use when printing to disk for transfer to a wordprocessor or DTP package). If your printer is not compatible with any of those listed, then you may need to create your own printer control file.

Even if your printer is compatible with one of the standard control files, you may wish to customise your copy, or create an alternate file, in order to use a particular font, print in landscape mode, use a different size of print, etc..

3.7.1 Creating or editing a printer control file

Printer control files are standard ASCII text files and may be created or edited using any text file editor, such as the standard EDLIN or EDIT in DOS, or by a wordprocessor in text mode (but do be sure to save the edited file as ASCII text and not as a document). It is suggested that you make a copy of the standard printer control file which is closest to your requirements (EPSON.DSC for Epson, IBMPRO.DSC for IBM Proprinter, and HPLASER.DSC for Hewlett-Packard Laserjet; all in the MISC subdirectory of the GDA directory) and then modify the copy to suit your requirements.

Each printer control file consists of six lines:

- Line 1: A free-format title line describing the contents of the file
- Line 2: The printer reset escape sequence(s)
- Line 3: The 10 characters per inch escape sequence
- Line 4: The 6 lines per inch escape sequence
- Line 5: The escape sequence to turn bold printing on
- Line 6: The escape sequence to turn bold printing off

For example, the following is a listing of the Epson printer control file EPSON.DSC:

```
                Escape sequences to control EPSON printer
27 64 255        { Reset printer           }
27 80 18 20 255 { Set 10 characters per inch }
27 50 255        { Set 6 lines per inch      }
27 69 27 71 255 { Bold on                   }
27 70 27 72 255 { Bold off                   }
```

As you see, each of lines 2 to 6 consists of a sequence of decimal numbers (between 0 and 254), each of which represents a single byte value to be sent to the printer, terminated by the value 255. The rest of each line is ignored by the software, and has therefore been used to store a plain-text reminder of the meaning of the code values.

Line 2 of the above listing therefore consists of the sequence 27 (= Escape character) followed by 64 (= '@') and terminated by 255. This would result in the '<Esc>@' control sequence being sent to the printer, and '<Esc>@' is the Epson printer reset code sequence.

You may therefore modify any of the lines in the printer control file to insert the control sequences that you require (consult your printer manual for information on the codes specific to that printer). Each line may be up to 255 characters in length, the sequence must be terminated by the number 255, and the descriptive comment may be omitted if you wish. A line with only the number 255 tells the system that no control sequence is required for that feature.

When you have finished editing your printer control file, use program SET_DEF (as described in section 3.5, "Setting GDA system defaults") to tell the system the name of the new file so that it will be used in subsequent GDA sessions.

Notes

1. Although line two of the control file has been labelled 'Printer reset', it can be used to do more than just a simple reset. For example, if your printer can be set to use the IBM character set by means of an escape sequence then put that sequence on line 2 after the reset code itself. Page orientation, page length, perforation skipover, font selection, etc. may also be set on this line.
2. As supplied, lines 3 and 4 set the character pitch to 10 characters per inch and the line spacing to 6 lines per inch. There is no reason why you should not use different values if you prefer (as long as you allow sufficient space for 76 characters per line of print).
3. Although lines 5 and 6 are labelled 'Bold on' and 'Bold off', they could just as easily be used to switch an alternative text style, such as underlined or italic text, on and off. If you are printing to a file for later import into a wordprocessor, then you could use these lines to insert a code character as a marker which could later be used to identify bold print sections of text (the '~' character is most suitable for this as it has a coded significance within the GDA Software Interface, and should therefore never occur in text printed from it).

3.8 USING THE SLIDESHOW PROGRAM

A simple utility is included with the GDA package which permits the user to display a timed sequence of screen images which have previously been saved from within an Atlas session. The images may be saved as Paintbrush (.PCX) files, GEM image (.IMG) files or as 'slideshow' screen memory dump files (.SLD), and any mixture of these file types may be displayed in a single 'show'.

To use this utility, it is first necessary to run a GDA session and to save the required images onto disk (preferably your hard disk if speed of display is important). The names of the saved image files, together with the length of time for which each should be displayed, are then placed in an ASCII text file which is used to drive the presentation. Images will be displayed in the sequence specified by the order of their filenames within the driver file.

Having performed the above steps, you may initiate the slideshow with the command:

```
<GDA directory>\SLIDESH0 <driver file name>
```

The first image of the sequence will then be displayed on the screen, and the program will pause until a key is pressed to trigger the rest of the slideshow. The show will run automatically, using the display timings specified in the driver file, unless the keyboard is used (as described below) to modify progress through the slides by pausing, stepping, restarting the sequence or quitting the program. On completion of the sequence, the program will normally return to the initial slide, display it, and then pause ready to repeat the slideshow (although a continuous loop display can be selected if desired; see below).

Images stored in PCX or IMG formats are compressed, and will occupy considerably less disk space than SLD files (which contain a simple copy of the video screen memory). However, PCX and IMG files take longer to transfer to the display screen than SLD files do since they must be decompressed at display time. Use of PCX or IMG files will therefore minimise disk storage requirements, but at the expense of a slower display speed; .SLI files will give a really snappy display, but at the expense of greater disk storage requirements. The final choice will probably be determined by the speed capabilities of the machine upon which the slideshow is running.

Please note that whilst PCX and SLD files contain full palette information, and will therefore display with SLIDESH0 identically to when they were captured, the IMG format does not include palette information, and the default VGA palette will be used. It is therefore recommended that the IMG format is avoided for slideshow images.

3.8.1 Slideshow driver file format

The driver file is a simple ASCII text file with one line for each image to be displayed; it may be prepared using any wordprocessor or file editor. On each line, enter the duration of display for this slide (leading spaces will be ignored), followed by a single space, and then the name of the slide file.

An example file might look like that below:

```
10 ATLANTIC.SLD
5 C:\SLIDES\MIDOCEAN.PCX
20 PACIFIC.PCX
```

If this driver file were used, then file ATLANTIC.SLD from the current directory would be displayed for 10 seconds, followed by file MIDOCEAN.PCX from the directory C:\SLIDES for 5 seconds, and finally file PACIFIC.PCX from the current directory for 20 seconds.

3.8.2 Keyboard control of the slideshow program

During the slideshow, the keyboard may be used to control the program, allowing the user to pause the display, step through the slides one by one, restart the sequence, or quit the slideshow. The key definitions are as follows:

- C Pressing the 'C' key places the program in auto-cycle mode. At the end of the sequence it will return to the first slide and continue the display without pausing. Auto-cycle is cancelled by pressing any other key.
- P Pressing the 'P' key causes the program to pause, continuing to display the current slide until any other key is pressed.
- Q Pressing the 'Q' key causes the program to terminate, ending the slideshow, and returning the user to the DOS prompt.
- R Pressing the 'R' key causes the program to re-start the sequence. The first slide will be displayed, and the program will pause until a key is pressed.
- S The 'S' key is used to step manually from slide to slide. When it is first pressed, the sequence will display the next slide in the sequence and then pause. Repeated keypresses will cause the program to display, and pause at, each slide in turn. The program may be returned to timed display mode by pressing any key other than 'S' or 'P'.

3.8.3 Running your slideshow on another PC

If you wish, the slideshow that you have prepared may be transferred to, and run on, a different PC which does not have a copy of the GDA Software Interface on it.

Simply copy your slide files, the driver file (modifying directory paths to suit the target machine if necessary) and the executable file SLIDESHOW.EXE (which you will find in the GDA directory) onto the target PC and then run the program as described above. Because of the large size of slideshow files (particularly .SLD files), you may find the use of a file compression package to be of assistance if the transfer is made *via* floppy disks.

3.9 INSTALLING THE GDA AS A DOS APPLICATION UNDER *WINDOWS*

If desired, the GDA Software Interface may be installed as a DOS application under the *Windows* operating environment. One advantage of this is that the display screen may be captured to the *Windows* clipboard at any time (by pressing the <Print Screen> key), and from there may be transferred to any *Windows* graphics package for printing. This affords access to a much wider variety of printers (via the *Windows* printer drivers) than is supported directly by the GDA Software Interface.

The GDA Software Interface must first be installed under DOS as described in section 3.2 and checked for correct function. When this is complete, start *Windows* and install the GDA as a DOS application as described below. Substitute the name of the directory (including drive letter) in which you installed the GDA Software Interface for any occurrence of '<GDA directory>' in the following instructions.

3.9.1 Set up a suitable Program Group

If you already have a Program Group set up for DOS applications then you may add the GDA to that (skip the rest of this section and go directly to section 3.9.2). If you do not have a DOS applications Program Group, create one as follows:

- a) Pull down the 'File' menu of Program Manager
- b) Select 'New'
- c) Click on 'Program Group' to make it the active selection
- d) Click on 'OK'
- e) Enter 'DOS Applications' in the 'Description' box (leave the 'Group File' box empty; *Windows* will create and name a file for you)
- f) Click on 'OK'

A new Program Group with the title 'DOS Applications' will appear on your desktop, and will be the active group. Resize and position the group as you wish to suit your desktop (but do not minimise it yet).

3.9.2 Add the GDA Program Item to the group

Make the Program Group into which you wish to insert the GDA the active group (i.e. its title bar will be highlighted) and then:

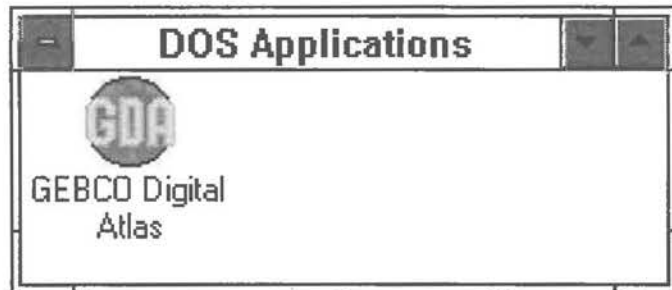
- a) Pull down the 'File' menu of Program Manager
- b) Select 'New'
- c) Click on 'Program Item' to make it the active selection
- d) Click on 'OK'

- e) Enter 'GEBCO Digital Atlas' in the 'Description' box
- f) Enter '<GDA directory>\GEBCO' in the 'Command Line' box
- g) Enter '<GDA directory>' in the 'Working Directory' box
- h) Click on 'Change Icon'
- i) Click on 'Browse'
- j) Select the 'MISC' subdirectory of your GDA directory on the directory tree
- k) Select 'GEBCO.ICO' as the icon file
- l) Click 'OK' (on the 'Browse' window)
- m) Click 'OK' (on the 'Change Icon' window)
- n) Click 'OK' (on the 'Program Item' window)

The GEBCO Digital Atlas icon will then be added to your DOS Applications Program Group.

Note: If the GDA Software Interface runs correctly under DOS, then it should run perfectly under *Windows* using the default PIF (Program Information File), so don't worry that you haven't created one specifically for the GDA.

Your *Windows* desktop should now have upon it a Program Group similar in appearance to that depicted below:



To run the GDA Software Interface, just double-click on the icon in the usual way.

3.10 INSTALLING THE GDA FOR USE ON A LAN

The GDA Software Interface has been designed to run successfully via a Local Area Network (LAN) with multiple concurrent users. It has been tested on an IBM Token Ring LAN, where it supported concurrent access without any problems.

Installation of the software on the LAN server is no different to installing on a single user machine (as described in section 3.2, "Loading the GDA Software Interface onto your system"). Once installed, however, some changes to the system defaults file will be needed in order to permit multiple concurrent access (see section 3.5, "Setting GDA system defaults" for information on how to make these changes).

The LAN manager will need to decide whether all users can use a single defaults file (stored on the LAN server) or whether each user will require an individual defaults file (stored on his local disk). The following points need to be considered when running the software in a LAN environment:

a) **CD-ROM drive letter**

If all users will reference the GDA CD-ROM drive by the same letter, then a single defaults file which specifies that drive letter may be used. If different users reference the CD-ROM drive by a different letter, then each user must have his/her own defaults file specifying the correct drive letter.

b) **Print streams and printer control file**

If all printing on the LAN is *via* a print server, then the default settings for these parameters may be set identically for all users. If different users will be using different printers, however, then user-specific defaults files may be required in order to direct and control printing appropriately.

c) **Workfile directory**

As supplied, the default workfile directory is the current directory at run time (i.e. the GDA directory on the LAN server). In most cases this will need to be changed since users will not have write access to the server. For multi-user concurrent access it will certainly need to be changed so that each user's Atlas session is using a different workfile directory, preferably on the local hard disk of the connected PC.

d) **Synchronise screen update**

Since most networked systems are based around a limited range of PC hardware makes and software versions it is unlikely that different users will require different settings for this parameter. If such a case does arise, however, then the use of user-specific defaults files is advisable.

If all users of the GDA Software Interface can utilise the same default file values, then these may simply be set by the LAN administrator in the standard default file (<GDA directory>MISCDEFAULTS.DAT) on the LAN server.

If individual users require different default file values, then individual default files should be created (either on the LAN server or on the connected PC). In this case, the DOS environment string GEBSCO_DEFAULTS should be set to contain the pathname of the user-specific defaults file before each GDA session is started (as described in section 3.5, "Setting GDA system defaults").

3.11 USING THE PC KEYBOARD TO EMULATE A MOUSE

The keyboard may be used to emulate a mouse. If no mouse driver is detected by the software when the program is started, then it will assume that the keyboard is to be used instead.

Keys have the following function:

Key	Function
Left arrow	Move mouse cursor left
Right arrow	Move mouse cursor right
Up arrow	Move mouse cursor upwards
Down arrow	Move mouse cursor downwards
Home	Move mouse cursor diagonally up and left
Page Up	Move mouse cursor diagonally up and right
End	Move mouse cursor diagonally down and left
Page Down	Move mouse cursor diagonally down and right
Plus sign	Move mouse cursor to top of screen
Minus sign	Move mouse cursor to bottom of screen
Ctrl + Left arrow	Move mouse cursor to extreme left of screen
Ctrl + Right arrow	Move mouse cursor to extreme right of screen
Ctrl + Home	Move mouse cursor to top left corner of screen
Ctrl + Page Up	Move mouse cursor to top right corner of screen
Ctrl + End	Move mouse cursor to bottom left corner of screen
Ctrl + Page Down	Move mouse cursor to bottom right corner of screen
Enter (or Return)	Simulates pressing left mouse button
Esc	Simulates pressing right mouse button

The numeral keys '1' to '9' control the speed at which the mouse cursor moves across the screen (i.e. they set the amount of movement obtained by a single press of a mouse movement key). Pressing the '1' key causes the cursor to move a single pixel for each depression of a mouse movement key, the '2' key 3 pixels, the '3' key 5 pixels, and so on up to 17 pixels per depression for the '9' key. At the start of the program the value defaults to 9 pixels per key depression.

When the GDA Software Interface is expecting alphanumeric input from the user (e.g. when filenames are being keyed in, or depth values for echo-sounding correction) the numeric keys revert to normal function and have no effect on mouse cursor movement.

The 'hot key' combinations to save or print the current screen display (as described in section 3.4.8) function throughout in the same way as when a mouse is being used.

3.12 ERROR CODES ISSUED BY THE SYSTEM

The GDA Software Interface has been designed to trap errors which might reasonably be expected to occur when it is running in a suitable environment (i.e. the host PC has sufficient memory and disk space available, and all of the GDA files are present in the correct directories). When such an error is detected, a plain language message is issued informing the user of the error, together with its possible cause where possible, and the user is offered the opportunity to rectify the situation and try again. This type of error trapping occurs in the following circumstances:

- a) When the GDA Software Interface accesses a data file
- b) When a print operation is attempted
- c) When file saving operations attempted

During its normal operation using its own files, however, the GDA Software Interface makes extensive use of system memory. In order to maximise system performance, the software assumes that adequate memory is available for highly repetitive tasks. It is possible, therefore, if the GDA is run on a PC with inadequate base memory, or if one or more Atlas files has accidentally been corrupted or damaged by the user, that an unchecked program error may occur causing the program to abort.

If the GDA is installed correctly and about 500k of RAM is available, it is extremely unlikely that such unchecked errors will occur. The following list of possible error codes is supplied, however, in order to enable the user to identify and correct the constraint which the PC system is imposing upon the GDA software. In each case, the user will be returned to the DOS prompt and the error message 'Run-time error' followed by a three digit number will be issued. The three digit error numbers which may occur are as follows:

- 002 A file needed by the system cannot be found. This should never occur, since all file accesses are checked for validity within the software, and a more meaningful message (naming the file in question) is issued. If the file has accidentally been deleted, re-install the GDA Software Interface from the distribution diskettes.
- 004 DOS is not permitting the GDA to open a sufficient number of files at the same time. Change the 'FILES=' line in your CONFIG.SYS file to 'FILES=10' or greater (add the line if it is not already there), reboot your PC, and re-run the GDA Software Interface.
- 100 A file needed by the system is shorter than is stated in its header section. This will only occur when a file has been accidentally damaged and truncated. Re-install the Atlas from the distribution diskettes.
- 203 There is insufficient base memory free for the program to run. If the GDA Software Interface is installed on a PC with 640 kilobytes of base memory, then this error will only occur if too many memory-resident SYS files or utilities utilities (such as 'Sidekick', etc.) have been installed, thus reducing the amount of memory available to the GDA. The problem may be solved by re-running the GDA Software Interface after the memory-resident utilities have been reduced

or removed to the point where 500k of RAM is available. (Use the DOS command 'CHKDSK' (or 'MEM' in later versions of DOS) to determine the amount of free base memory available).

If it is not possible to gain sufficient free memory on your PC with its normal configuration, it may be necessary to prepare a boot diskette which does not load non-essential SYS files or utilities.

The majority of users should never encounter the above errors, and it is therefore hoped that the error code information will prove to be superfluous.

If a run-time error code which does not appear on the above list is issued by the system, it indicates that a serious problem has arisen either with the GDA Software Interface or with the user's PC. Should such a situation arise, the user is advised first to re-install the GDA system from the distribution diskette(s) and try re-running the system. If the error persists, it may indicate a potential fault (or incompatibility problem) on the user's PC, and further information on the meaning of the error number may be obtained from:

GEBCO Help Desk,
British Oceanographic Data Centre,
Proudman Oceanographic Laboratory,
Bidston Observatory,
Birkenhead,
Merseyside L43 7RA

Telefax: 44 (51) 652 3950
Internet: BODCMail@UA.NBI.AC.UK

Please use a copy of the Problem Report Sheet supplied with this Supporting Volume to notify BODC if you encounter any difficulties when running the software on your PC system. If you have mislaid the Problem Report Sheet, please notify BODC of your problem in writing (either on paper or by electronic means), and provide the following information:

Make and model of PC (specify processor chip and clock speed).
Make and version number of operating system (e.g. MSDOS 6.2).
Make and model of video board (if not standard motherboard VGA system).
Free base memory on PC before running the GDA Software Interface.
Make and model of mouse.
Make, model and emulation mode of printer.
GDA Software Interface version number and release date.
Any system customisation that you have performed.
Your name, address and telephone, fax and/or Internet address.
The nature of the problem.

Your cooperation in reporting such error situations, should they occur, will be appreciated by the GDA team, and may permit the situation to be avoided in subsequent releases of the software.

ANNEXES

ANNEX I

Standardization of Undersea Feature Names

Note: These guidelines, the name proposal form and the list of terms and definitions have been worked out through collaboration between the Joint IOC-IHO Guiding Committee for GEBCO and the Working Group on Maritime and Undersea Features of the United Nations Group of Experts on Geographical Names, in accordance with provisions of appropriate resolutions of United Nations Conferences on Geographical Names. They have also been published by the IHB as IHO-IOC Publication B-6 (formerly BP-0006).

- I. General guidelines
- II. Principles for naming features
- III. Procedures for naming features
- IV. Terminology
- V. Terms and definitions
- VI. Proposal Form

I. GENERAL GUIDELINES

- A. International concern for naming undersea features is limited to those features entirely or mainly (more than 50%) outside waters under the jurisdiction of states.
- B. "Undersea feature" is a part of the ocean floor or seabed that has measurable relief or is delimited by relief.
- C. Names used for many years may be accepted even though they do not conform to normal principles of nomenclature.
- D. Names approved by national names authorities in waters beyond national limits (i.e., international waters) should be accepted by other states if the names have been applied in conformance with internationally accepted principles. Names applied within the territorial limits of a state should be recognised by other states.
- E. In the event of a conflict, the persons and agencies most directly involved should resolve the matter. Where two names have been applied to the same feature, the older name generally should be accepted. Where a single name has been applied to two different features, the feature named first generally should retain the name.

- F. Names not in the writing system of the country applying the names on maps or other documents should be transliterated according to the system adopted by the national authority applying the names.
- G. In international programmes, it should be the policy to use forms of names applied by national authorities having responsibility for the pertinent area.
- H. States may utilise their preferred versions of exonyms.

II. PRINCIPLES FOR NAMING FEATURES

A. Specific terms

1. Short and simple terms (or names) are preferable.
2. The principal concern in naming is to provide effective, conveniently usable and appropriate reference; commemoration of persons or ships is a secondary consideration.
3. The first choice of a specific term, where feasible, should be one associated with a geographical feature; e.g.: Aleutian ridge, Aleutian trench, Peru-Chile trench, Barrow canyon.
4. Specific terms for other features can be used to commemorate ships or other vehicles, expeditions, or scientific institutes involved in the discovery of the feature, or to honour the memory of famous persons. Where a ship name is used, it should be that of the discovering ship, or if that has been previously used for a similar feature, it should be the name of the ship verifying the feature; e.g.: San Pablo seamount, Atlantis II seamounts.
5. If names of living persons are used (surnames are preferable), they should be limited to those who have made an outstanding or fundamental contribution to ocean sciences.
6. Groups of like features may be named collectively for specific categories of historical persons, mythical features, stars, constellations, fish, birds, animals, etc. Examples are as follows:

Musicians seamounts:

Bach seamount
Brahms seamount
Schubert seamount

Electricians seamounts:

Volta seamount
Ampere seamount
Galvani seamount

Ursa Minor ridge and trough province:

Suhail ridge
Kochab ridge
Polaris trough

7. Descriptive names are acceptable, particularly when they refer to distinguishing characteristics (i.e. Hook ridge, Horseshoe seamount).
8. Names of well-known or large features that are applied to other features should have the same spelling.
9. Specific elements of names should not be translated from the language of the nation providing the accepted name.

B. Generic terms

1. Generic terms should be selected from the following list of definitions (see part V.) to reflect physiographic descriptions of features.
2. Generic terms applied to features appearing on charts or other products should be in the language of the nation issuing the products. In those cases where terms have achieved international currency in a national form, that form should be retained.
3. It should be recognised that as ocean mapping continues, features will be discovered for which existing terminology is not adequate. New terms required to describe those features should conform to these guidelines.

III. PROCEDURES FOR NAMING FEATURES

- A. Individuals and agencies applying names to unnamed features in international waters should adhere to internationally accepted principles and procedures.
- B. The form given in part VI. is recommended as a model for new proposals. This form is also available in: Arabic, French, Greek, Italian, Portuguese, Russian and Spanish.
- C. Prior to the naming of a feature, its character, extent and position shall have been established sufficiently for identification. Positions should be given in terms of geographic co-ordinates. If it is necessary to refer to a feature before such a full identifiability has been established, it is suggested that the reference be by geographic co-ordinates and generic term with the addition of (PA) - position approximate - after the co-ordinates if the position is not adequately established and (?) after the generic term if the nature of the feature is in some doubt.

- D. New names should be approved by the appropriate national authorities before being published. Where no such authority exists, clearance should be sought through either IHB or IOC, as indicated on the "Proposal Form" in part VI.
- E. If a national authority has reason to change the name of a feature it named originally, information explaining the change should be circulated to other authorities. If there is opposition to a name change, the involved authorities should communicate with each other to resolve the question.
- F. National authorities approving names of features should regularly publicise their names decisions.
- G. National authorities naming features within their territorial jurisdiction should conform to the principles and procedures stated above.

IV. TERMINOLOGY

The list which follows in part V. is comprised of terms that are defined as closely as possible to correspond to their usage in the cited references taken from literature of ocean science, hydrography and exploration. In developing the definitions, it was realised that modern investigations at sea have the advantage of using very advanced instrumentation and technology that enables a more precise description of certain features than was previously possible. There has also been an attempt to limit the usage of precise physical dimensions in the definition of features. In preference, words that indicate relative sizes such as extensive, large, limited and small have been used. The definitions are based almost exclusively on a geomorphological description of the features themselves and must not be construed as having any legal or political connotation whatsoever. Nor do they necessarily conform to the hydrographic/navigational usage as appearing in the Hydrographic Directory (IHO Special Publication No. 32).

It is realised that many names features, such as "cap", "deep" and "swell" have widely accepted historical usage. No attempt has been made to define them since the description of these particular features is included among the present definitions.

Contained in the list of definitions, and enclosed in parenthesis, are a number of synonymous and descriptive terms commonly used in literature. The underlined terms are defined and suggested for depiction on maps. It is noted that many of the terms will appear on maps or charts prefixed by appropriate geographic names.

V. TERMS AND DEFINITIONS

Note that the "references" cited in the following list have been taken from the GEBCO list and do not appear in the agreed United Nations listing.

ABYSSAL HILLS: A tract of small elevations on the seafloor

Ref.: Menard, H.W., 1964. *Marine Geology of the Pacific*, McGraw-Hill, New York, 271p.

ABYSSAL PLAIN (PLAIN): An extensive, flat, gently sloping or nearly level region at abyssal depths.

e.g.: Biscay Abyssal Plain.

Ref.: Heezen, Bruce C., and A.S. Laughton, 1963. "Abyssal Plains" in M.N. Hill (ed.), *The Sea*, Vol. 3, p. 312-364.

APRON: A gently dipping featureless surface, underlain primarily by sediment, at the base of any steeper slope.

ARCHIPELAGIC APRON: A gentle slope with a generally smooth surface of the seafloor, particularly found around groups of islands or seamounts.

e.g.: Marquesas Archipelagic Apron.

Ref.: Menard, H.W., 1956. "Archipelagic Aprons" *Bull. Am. Assoc. Petroleum Geol.*, Vol. 40, p. 2195-2210.

BANK: An elevation over which the depth of water is relatively shallow, but normally sufficient for safe surface navigation.

e.g.: Georges Bank.

Ref.: See Shoal.

BASIN: A depression more or less equidimensional in plan and of variable extent.

e.g.: Brazil Basin.

Ref.: Maury, M.F., 1854. *Bathymetrical Map of the North Atlantic Basin*, with contour lines drawn in at 1000, 2000, 3000 and 4000 fathoms.
This term (in French) appears in the first edition of GEBCO.

BORDERLAND (CONTINENTAL BORDERLAND): A region adjacent to a continent, normally occupied by or bordering a shelf, that is highly irregular with depths well in excess of those typical of a shelf.

e.g. California Borderland

ref.: Shepard, F.P., and K.O. Emery, 1941. Submarine Topography off the California Coast: Canyons and Tectonic Interpretations, Geol. Soc. Am. Spec. Pap. 31, 171p.

CANYON (SUBMARINE CANYON): A relatively narrow, deep depression with steep sides, the bottom of which generally has a continuous slope, developed characteristically on some continental slopes.

e.g.: Hudson Canyon.

Ref.: Shepard, Francis P., and Robert F. Dill, 1966. Submarine Canyons and other Sea Valleys, Rand McNally and Co. Chicago, 381p.

CONTINENTAL MARGIN: The zone, generally consisting of shelf, slope and rise, separating the continent from the abyssal plain or deep sea bottom.

CONTINENTAL RISE: A gentle slope rising from the oceanic depths towards the foot of a continental slope.

Ref.: Heezen, B.C., M. Tharp and M. Ewing, 1959. The Floors of the Oceans, 1, The North Atlantic, Geol. Soc. Am. Spec. Pap. 65, 113p.

ESCARPMENT or SCARP: An elongated and comparatively steep slope separating flat or gently sloping areas.

e.g.: Mendocino Escarpment.

Ref.: Menard, Henry W., and Robert S. Dietz, 1952. "Mendocino Submarine Escarpment", J. Geol., Vol. 60, p. 266-278.

FAN or CONE (DEEP SEA FAN, DEEP SEA CONE, SUBMARINE FAN, SUBMARINE CONE): A relatively smooth, fan-like, depositional feature normally sloping away from the outer termination of a canyon or canyon system.

e.g.: Delgada Fan, Ganges Cone.

Ref.: Ericson, D.B., M. Ewing and B.C. Heezen, 1951. "Deep Sea Sands and Submarine Canyons", Bull. Geol. Soc. Am., Vol. 62, p. 961-966.

FRACTURE ZONE: An extensive linear zone of irregular topography of the seafloor, characterised by steep-sided or asymmetrical ridges, troughs or escarpments.

e.g.: Murray Fracture Zone.

Ref.: Menard, H.W., 1964, op. cit.

GAP (ABYSSAL GAP): A narrow break in a ridge or a rise.

e.g.: Theta Gap.

Ref.: Heezen, B.C., M. Tharp and M. Ewing, 1959, op. cit.

GUYOT or TABLEMOUNT: A seamount having a comparatively smooth flat top.

e.g.: Welker Guyot.

Ref.: Hess, H.H. (1946). Drowned ancient islands of the Pacific Basin, Am. Jour. Sci., Vol. 244, pp. 772-791.

Hamilton, E.L. (1956). Sunken Islands of the Mid-Pacific Mountains, G.S.A., Memoir No. 64.

HILL: A small isolated elevation (see also Abyssal Hills).

HOLE: A small depression of the seafloor.

KNOLL: A relatively small isolated elevation of a rounded shape.

e.g.: Cantabria Knoll.

Ref.: Menard, H.W., 1964, op. cit.

LEVEE: A depositional embankment bordering a canyon, valley or deep-sea channel.

Ref.: Buffington, Edwin C., 1952. "Submarine Natural Levees", J. Geol., Vol. 60, p. 473-479.

MEDIAN VALLEY (RIFT, RIFT VALLEY): The axial depression of the mid-oceanic ridge system.

Ref.: Wiseman, J.D.H. and R.B.S. Sewell, 1937. "The Floor of the Arabian Sea", The Geological Magazine, Vol. 74, p. 219-230.

MOAT (SEA MOAT): An annular depression that may not be continuous, located at the base of many seamounts, islands and other isolated elevations.

Ref.: Vening Meinesz, F.A., 1948. Gravity Expeditions at Sea, Vol. 4, Netherlands Geod. Comm., Delft.

MOUNTAINS: A large and complex grouping of ridges and seamounts.

PEAK: A prominent elevation either pointed or of a very limited extent across the summit.

e.g.: Confederation Peak.

PINNACLE: Any high tower or spire-shaped pillar of rock, or coral, alone or cresting a summit.

PLATEAU: A flat or nearly flat area of considerable extent, dropping off abruptly on one or more sides.

e.g.: Blake Plateau.

Ref.: Agassiz, Alexander, 1888. Three Cruises of the Blake, Bull. Museum Comp. Zool., Harvard Univ., Vol. 14 and 15. (Note however, that Agassiz called what is now the "Blake Plateau" the "Pourtales Plateau").

PROVINCE: A region identifiable by a group of similar physiographic features whose characteristics are markedly in contrast with surrounding areas.

Ref.: Heezen, B.C., M. Tharp and M. Ewing, 1959, *op. cit.*

REEF: Rock lying at or near the sea surface that may constitute a hazard to surface navigation.

Ref.: Darwin, Charles, 1842. The Structure and Distribution of Coral Reefs, Smith, Elder and Company, London, 214 pp.

RIDGE (The word RIDGE has several meanings)

(a) A long, narrow elevation with steep sides.

e.g.: The Wyville Thomson Ridge (Roberts 1975).

Ref.: The term appears on the bathymetrical maps by Sir John Murray which accompany the Challenger Report. Summary of Results, Part I, published in 1895.

(b) A long, narrow elevation often separating ocean basins.

e.g.: Walvis Ridge.

Ref.: Schott, G., 1942, *Geographie des Atlantischen Ozeans*, Hamburg, C. Boysen, 438 pp.

(c) The major oceanic mountain systems of global extent.

e.g.: Mid-Atlantic Ridge.

RISE: A broad elevation that rises gently and generally smoothly from the sea floor.

e.g.: Argentine Rise.

Ref.: Maury (op. cit.) mapped the "Dolphin Rise", which later was found by Challenger to be the Mid-Atlantic Ridge.

A synonym for RIDGE definition (c).

e.g.: East Pacific Rise.

Ref.: Menard, H.W., 1960. "East Pacific Rise", *Science*, Vol. 132, p. 1737-1746.

SADDLE: A broad pass resembling in shape a riding saddle, in a ridge or between contiguous seamounts.

e.g.: Hawke Saddle (Labrador Shelf).

SEACHANNEL (CHANNEL): A continuously sloping, elongated depression commonly found in fans or abyssal plains and customarily bordered by levees on one or both sides.

SEAMOUNT: A large isolated elevation characteristically of conical form.

Ref.: Murray, H.W., 1941. "Submarine Mountains in the Gulf of Alaska", *Bull. Geol. Soc. Am.*, Vol. 52, p. 333-362.

Sir John Murray (op. cit., 1899) makes reference to "numerous volcanic cones" on the seafloor.

SEAMOUNT CHAIN or SEAMOUNTS: Several seamounts in a line.

e.g.: Kelvin Seamounts; Emperor Seamounts.

Ref.: Northrop, J. and R.A. Frosch, 1954. "Seamounts in the North American Basin", *Deep Sea Research*, Vol. 1, p. 252-257.

Dietz, R.S., 1954. "Marine Geology of the Northwestern Pacific: Description of the Japanese Bathymetric chart 6901", *Bull. Geol. Soc. Am.*, Vol. 65, p. 1199-1224.

SHELF (CONTINENTAL SHELF, ISLAND SHELF, INSULAR SHELF): A zone adjacent to a continent (or around an island) and extending from the low water line to a depth at which there is usually a marked increase of slope towards oceanic depths.

e.g.: Scotian Shelf.

Ref.: Murray, Sir John, and J. Hjort, 1912. *The Depths of the Ocean*, Macmillan, London.

Murray uses the term earlier than this, however. See Murray, Sir John, 1899. *Present Condition of the Floor of the Ocean; Evolution of the Continental and Oceanic Areas*, Rep. Brit. Assoc. Adv. Sci., 1899, p. 789-802.

SHELF-EDGE (SHELF BREAK): A narrow zone at the outer margin of a shelf along which there is a marked increase of slope.

Ref.: Murray and Hjort, 1912, *op. cit.*

SHOAL: An offshore hazard to surface navigation composed of unconsolidated material.

e.g.: Georges Shoal.

Ref.: "... that but this blow, Might be the be-all and end-all here, But here, upon this bank and shoal of time, We'd jump the life to come". Shakespeare, W., 1608. *Macbeth*, I, vii, i.

SILL: A submarine ridge of relatively shallow depth separating basins.

Ref.: Sverdrup, H.U., Johnson, M.W. and Fleming, R.H., 1946. *The Oceans*, Prentice-Hall, New York, 1987 pp.

SLOPE (CONTINENTAL SLOPE, ISLAND SLOPE): The slope seaward from the shelf edge to the beginning of a continental rise or the point where there is a general reduction in slope.

Ref.: Same as Shelf.

SPUR: A subordinate elevation, ridge or rise projecting outward from a larger feature.

TERRACE or BENCH (DEEP SEA TERRACE): A relatively flat horizontal or gently inclined surface, sometimes long and narrow, which is bounded by a steeper ascending slope on one side and by a steeper descending slope on the opposite side.

e.g.: Meriadzek Terrace.

Ref.: Day, Alan A., 1959. "The Continental Margin between Brittany and Ireland, Deep Sea Research", Vol. 5, p. 249-265.

TRENCH: A long, narrow, characteristically very deep and asymmetrical depression of the seafloor, with relatively steep sides.

e.g.: Marianas Trench, Tonga Trench.

Ref.: Fisher, R.L. and R. Revelle, 1955. "Trenches of the Pacific". Sci. Am., Vol. 193, p. 36-41.

Fisher, R.L. and H.H. Hess, 1963. "Trenches" in M.N. Hill (ed.), The Sea, Vol. 3, p. 411-436, John Wiley, New York.

TROUGH: A long depression of the seafloor characteristically flat bottomed and steep sided and normally shallower than a trench.

e.g.: Rockall Trough.

VALLEY or SUBMARINE VALLEY or SEA VALLEY: A relatively shallow, wide depression, the bottom of which usually has a continuous gradient. This term is generally not used for features that have canyon-like characteristics for a significant portion of their extent.

e.g.: Natal Valley.

Ref.: Shepard, Francis, P. and Robert F. Dill, 1966. Submarine Canyons and other Sea Valleys, Rand McNally, Chicago, 381pp.

VI. PROPOSAL FORM (see overleaf)

UNDERSEA FEATURE NAME PROPOSAL

Name proposed:

Ocean or Sea:

Coordinates: A - of midpoint or summit: Lat., Long.

..... kilometres in direction from

and/or B - extremities (if linear feature):

Lat. to Lat.

Long. Long.

Description (kind of feature):

Identifying or categorizing characteristics (shape, dimensions, total relief, least depth, steepness, etc.):

.....
.....
.....

Associated features:

.....
.....

Chart reference:

Shown with name on chart No.

Shown but not named on chart No.

Not shown but within area covered by chart No.

Reason for choice of name (if a person, state how associated with the feature to be named):

.....
.....

Discovery facts:

Date by (individuals or ship)

By means of (equipment):

Navigation used:

Estimated positional accuracy in nautical miles:

Description of survey (track spacing, line crossing, grid network, etc.):

.....
.....

Nature and repository of other survey activities (dredge samples, cores, magnetics, gravity, photographs, etc.):

.....
.....

Supporting material: enclose, if possible, a sketch map of the survey area, profiles of the features, etc., with reference to prior publication, if any:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

continued overleaf

Submitted by:

Date:

Address:

.....

.....

Concurred in by (if applicable):

Address:

.....

.....

National Authority (if any):

Address:

.....

.....

NOTE: This form should be forwarded, when completed:

a) if the undersea feature is located in territorial waters:-

to your "National Authority for Approval of Undersea Feature Names" or, if this does not exist or is not known, either to the International Hydrographic Bureau or to the Intergovernmental Oceanographic Commission (see addresses below);

b) if the undersea feature is located in international waters:-

to the International Hydrographic Bureau or to the Intergovernmental Oceanographic Commission, at the following addresses:

International Hydrographic Bureau
7, Avenue Président J.F. Kennedy
B.P. 445
MC 98011 MONACO CEDEX
Principality of MONACO

Intergovernmental Oceanographic Commission
UNESCO
Place de Fontenoy
75700 PARIS
FRANCE

ANNEX II

Menu Options Available in the GDA Software Interface

OVERVIEW

The GDA software interface is functionally divided into two sections between which the user may move freely. The first section, the Area Selection Screen, displays a land/sea map of the entire area covered by the dataset, and from this the user may select the extreme limits of the geographic area for which he/she wishes to view or export data. The second section, the Main Display Screen, displays the detailed bathymetric contour, coastline, trackline and feature data for the specified geographic area; the user is free to zoom and pan within the limits of the selected area, but may not extend the plot outside those limits without returning to the Area Selection Screen and specifying a new area. This 'two tier' display system allows the user rapidly to select his or her area of interest before detailed data are displayed, and hence avoids time delays whilst unwanted information is presented.

Two parallel versions of the Area Selection Screen are available, one for the GEBCO and one for the IBCM, and the user may swap freely between them by activating the appropriate option on the 'Area Select' menu.

The GDA Software Interface offers a number of options for controlling the manner in which information is presented (e.g. colours, linestyles, map projection, the subset of contours to be displayed, whether or not tracklines and/or feature locations should be displayed, the source of the coastline, etc.). All of these options are available from the Main Display Screen, but many of them may, if desired, be pre-selected from the Area Selection Screen before the detail plot is initiated.

The Interface not only permits visualisation of the data on the PC screen, but also serves to select the geographic area and subset of available datasets for export to the user's hard disk (in flat ASCII or DXF formats) for use with other software packages. Data export may be performed either from the Area Selection Screen or from the Main Display Screen as desired by use of the 'Export Data' option on the 'Utilities' menu.

AREA SELECTION SCREEN MENU BAR HEADINGS

The function of menu options to be found under each of the menu bar headings on the Area Selection Screen is summarised below:

Area Select

The Area Select menu options permit the user to specify the absolute limits of the area for which contour data are to be displayed and/or exported. These area limits will be used

by the system to determine certain data parameters (for example, only contour depths known to be present within the area will be offered to the user for selection), but the user will have full flexibility to zoom and pan within the selected area once a plot has been initiated.

The working area may be selected by use of a 'zoom box', by specifying precise geographic coordinates, or by specifying an individual chart from the original printed series, and the user may then request a display of the edge coordinates of the selected area.

An option is also provided for the user to switch between the Area Selection Screen for the GEBCO digital dataset (the default) and that for the IBCM.

Display

The Display menu offers options to control the appearance of the Area Selection Screen display. Options are offered to:

- * Toggle the display of chart outlines on or off
- * Toggle the display of a geographic grid on or off
- * Move or hide the position window and select its display format

Options

The Options menu, which is not available for selection until a data area has been specified by the use of the 'Area Select' menu, offers options that permit the user to specify data selections and display preferences before the data are actually plotted (all of the options available under this menu are duplicated within the Main Display Screen, permitting the plot content to be amended at any time).

Data selections made under this menu will also apply to data exported directly from the Area Selection Screen by means of the 'Utilities - Export Data' menu option.

The following functions are offered:

- * Specify the map projection to be used for plotting
- * Select which of the available contours should be plotted
- * Assign colours to the selected contours
- * Save the current contour selection to disk
- * Load a previously saved contour selection from disk
- * Toggle display of tracklines on or off
- * Select the source of trackline data (GEBCO or IHO DCDB)
- * Select the coastline source (GEBCO/IBCM or WVS)
- * Toggle display of feature locations, islands and place names on or off
- * Assign symbol colours to feature locations, islands and place names
- * Display a summary of the current data selection

Plot

The Plot menu is not available for selection until a data area has been specified by the use of the 'Area Select' menu.

When selected, the option takes immediate effect, causing the area selection process to be terminated and initiating a plot of the combination of contours, coastlines, tracklines and feature locations that has been specified by the user. Control is transferred to the Main Display Screen, where the user may view the selected data.

Once in the Main Display Screen, the user may not move outside the geographic area specified from the Area Selection Screen, but is free to zoom in to view sub-areas at larger scale, to respecify the combination of contours, coastlines, tracklines and feature locations that is to be displayed, to control the style of display (colours, projection, etc.), to query items on the display, to make hard copy or image file copies of the display, and to export selected data for all or part of the specified area.

Utilities

The Utilities menus offer the user facilities to perform the following functions:

- * Save the screen display to disk
- * Dump the screen display to a printer
- * Reset the Area Selection Screen system defaults
- * Measure distances on the chart
- * Perform Carter's Tables echo-sounding depth corrections
- * Export data for the currently selected area to disk file
- * Display the current Atlas version number and release date

Info.

This option permits the user either to view descriptive text for the currently selected datasets on the display screen, or to direct a copy of the text to a printer or print file. When the Area Selection Screen is first entered, descriptive text for all datasets contained in the Atlas is offered for viewing. When a data area has been selected, however, information is offered only for those datasets which are both currently selected and are relevant to the selected area.

Quit

This option causes the system to terminate the GEBCO Digital Atlas session, and to return the user to the DOS prompt.

MAIN DISPLAY SCREEN MENU BAR HEADINGS

The function of menu options to be found under each of the menu bar headings on the Main Display Screen is summarised below:

Display

The Display menu options permit the user to control the manner in which the selected data are depicted upon the display screen.

Facilities are provided to:

- * Control the colours in which coastlines, contours and tracklines are displayed.
- * Select the geographic projection to be used.
- * Superimpose or remove a geographic grid.
- * Set the vertical and horizontal justification of the plot within the Main Display Screen.
- * Control the height and position of the window used to display textual information.
- * Control the visibility, position and format of the box in which the current cursor position is displayed.
- * Control the visibility, position and format of the legend window.

Content

Options under this menu heading permit the user to select the combination of contours, tracklines and features to be displayed by the system, to select which data source should be used (where alternatives are provided), and to allocate colours from the current palette to individual contour depth levels and to the different feature types.

Zoom

Menus under this option permit the user to zoom in to a selected area of the current display, and subsequently to reposition the 'zoom window' or to zoom back out. Facilities are also offered to show the location and extent of the current zoom window in the context of the overall dataset area, and to specify whether the area selected during each zoom operation should be fully under user control or should have its height to width ratio adjusted automatically in order to fill the display screen with the resultant plot.

A ten level 'zoom memory' is incorporated, which stores 'Zoom - In' commands as they are issued. This permits the user to 'backtrack' to an earlier zoom level without returning to the full area display.

Redraw

This option causes the screen display to be erased and then redrawn. It permits changes (to the selection of contours, coastlines, tracklines, features, projection or colours) made under the 'Display' menus to be incorporated into the current display, without the need to perform an action under the 'Zoom' menu which would result in a change in the geographic area plotted.

Query

This option permits the user to query individual contours, features or survey boxes on the Main Display Screen in order to obtain additional information about them.

Utilities

The Utilities menus offer the user facilities to perform the following functions:

- * Save the screen display to disk
- * Dump the screen display to a printer
- * Reset the Main Display Screen system defaults

- * Measure distances on the chart
- * Perform Carter's Tables echo-sounding depth corrections
- * Export data for the currently selected area to disk file
- * Display the current Atlas version number and release date

Info.

This option permits the user either to view descriptive text for the currently selected datasets on the display screen, or to direct a copy of the text to a printer or print file. Information is offered only for those datasets which are both currently selected and are relevant to the selected area.

Quit

Options under this menu cause the system to terminate plotting, and to return the user either to the Area Selection Screen or to the DOS prompt.

MENU OPTIONS COMMON TO BOTH SCREENS, BUT WITH SCOPE LIMITED TO THE CURRENT SCREEN

The following list itemises menu options that are to be found on the menus of both the Area Selection Screen and the Main Display Screen, but which are executed immediately within the current screen when selected, and have no effect upon the other screen (e.g. changing the format in which the cursor position is displayed on the Area Selection Screen will not change the format in which it is displayed on the Main Display Screen):

- * Geographic Grid On/Off
- * Position Window Hide/Show, Reposition and Specify Format
- * Save Screen as PCX, IMG or Slideshow
- * Print Screen to Epson/IBM, HP Laserjet or HP Paintjet printer
- * Reset System
- * Measure Distances
- * Echo-sounding depth correction using Carter's Tables
- * Export Data as ASCII stream or DXF
- * Display GDA version number and release date
- * View or print information text for the relevant datasets
- * Display geographic limits of the currently selected area

MENU OPTIONS COMMON TO BOTH SCREENS AND HAVING EFFECT UPON BOTH

The following list itemises menu options that are to be found on the menus of both the Area Selection Screen and the Main Display Screen, and which set options common to both screens (e.g. if a specific coastline is selected on the Area Selection Screen, then that outline would be the one included in any data export from the Area Selection Screen, and will also be the one used for display or export when control subsequently passes to the Main Display Screen):

- * Select contours (or load previously saved settings)
- * Trackline source and selection status
- * Coastline source

MENU OPTIONS COMMON TO BOTH SCREENS, BUT ONLY AFFECTING THE MAIN DISPLAY SCREEN

The following list itemises menu options that are to be found on the menus of both the Area Selection Screen and the Main Display Screen, but which only affect the appearance of data displayed upon the Main Display Screen (e.g. the choice of geographic projection will only be relevant when the data are actually displayed):

- * Choice of geographic projection
- * Assignment of colours to individual depth contours
- * Selection of feature types and assignment of their colours

MENU TREE STRUCTURE FOR THE AREA SELECTION SCREEN

Area Select

By Zoom Box

By Geographic Coordinates

(Edge coordinate input boxes)

(Confirm)

By GEBCO Chart Number (or By IBCM Chart Number)

GEBCO Sheet 5.01 (IBCM Sheet 1)

GEBCO Sheet 5.02 (IBCM Sheet 2)

GEBCO Sheet 5.03 (IBCM Sheet 3)

GEBCO Sheet 5.04 (IBCM Sheet 4)

GEBCO Sheet 5.05 (IBCM Sheet 5)

GEBCO Sheet 5.06 (IBCM Sheet 6)

GEBCO Sheet 5.07 (IBCM Sheet 7)

GEBCO Sheet 5.08 (IBCM Sheet 8)

GEBCO Sheet 5.09 (IBCM Sheet 9)

GEBCO Sheet 5.10 (IBCM Sheet 10)

GEBCO Sheet 5.11

GEBCO Sheet 5.12

GEBCO Sheet 5.13

GEBCO Sheet 5.14

GEBCO Sheet 5.15

GEBCO Sheet 5.16

GEBCO Sheet 5.17

GEBCO Sheet 5.18

IBCM Chart Series (or GEBCO Chart Series)

Display Edge Coordinates

(Table of edge coordinates of current selection area)

Display

- Chart Outlines On/Off (*Off = default*)
- Geographic Grid On/Off (*Off = default*)
- Position Window
 - Hide/Show (*Show = default*)
 - Reposition
 - Specify Format
 - Degrees, Minutes, Seconds (*default*)
 - Decimal Degrees
 - (*Confirm*)

Options

- Projection
 - Equidistant Cylindrical
 - Mercator (*default*)
 - Miller Cylindrical
 - Lambert Cylindrical Equal-Area
 - Peters Equal-Area
 - (*Confirm*)
- Contours
 - Select Contours
 - (*Table of available contours*)
 - (*Confirm*)
 - Assign Colours
 - Cyclic Colours Only
 - Cyclic Colours and Styles
 - Cyclic Colour 500s, Others Grey
 - Save Current Settings
 - (*Directory listing*)
 - (*Confirm*)
 - Load User Settings
 - (*Directory listing*)
 - (*Confirm*)
- Tracklines
 - Status
 - Selected
 - Not Selected (*default*)
 - (*Confirm*)
 - Source of Tracklines
 - GEBCO (*default for GEBCO*)
 - IHO DCDB (*default for IBCM*)
 - (*Confirm*)
- Land Outline
 - GEBCO 1:10,000,000 (*or IBCM 1:1,000,000*) (*default*)
 - WVS Auto Resolution
 - WVS Full Resolution
 - WVS 1:250,000
 - WVS 1:1,000,000

WVS 1:3,000,000

WVS 1:12,000,000

WVS 1:43,000,000

(Confirm)

Show Content

(Table of current settings)

Features

Select Feature Types

Undersea Features

Islands

Place Names

(Confirm)

Assign Colours

Undersea Features

(Colour chart)

(Confirm)

Islands

(Colour chart)

(Confirm)

Place Names

(Colour chart)

(Confirm)

Plot

(Transfers control to the Main Display Screen)

Utilities

Save Screen

PCX File

(Filename input box)

GEM Image

(Filename input box)

Slideshow

(Filename input box)

Print Screen

Epson / IBM

HP Laserjet

HP Paintjet

Reset System

Distance

Carter's Tables

Export Data

(Filename input box)

Version

Info.

Display

(List of relevant info. topics)

(View or Print)

Quit

Confirm

MENU TREE STRUCTURE FOR THE MAIN DISPLAY SCREEN

Display

Colours

- Select Standard Palette
 - Red Palette
 - Green Palette
 - Blue Palette (*default*)
 - Rainbow Palette
 - (*Confirm*)
- Set Contour Colours
 - (*Colour chart + colour controls*)
 - (*Confirm*)
- Set Coastline Colour
 - (*Colour control*)
 - (*Confirm*)
- Set Trackline Colour
 - (*Colour control*)
 - (*Confirm*)
- Save Current Palette
 - (*Directory listing*)
 - (*Confirm*)
- Load User Palette
 - (*Directory listing*)
 - (*Confirm*)

Projection

- Equidistant Cylindrical
- Mercator (*default*)
- Miller Cylindrical
- Lambert Cylindrical Equal-Area
- Peters Equal-Area
- (*Confirm*)

Geo. Grid On/Off

Main Window

- Vertical Position
 - Top
 - Centre (*default*)
 - Bottom
 - (*Confirm*)
- Horizontal Position
 - Left (*default*)
 - Centre
 - Right
 - (*Confirm*)

Info. Window

- Height
- Reposition

Pos. Window

Hide/Show (*Show = default*)

Reposition

Specify Format

Degrees, Minutes, Seconds (*default*)

Decimal Degrees

(*Confirm*)

Legend Window

Hide/Show (*Show = default*)

Reposition

Specify Format

Auto 1, 2 or 3 Columns (*default*)

2 Columns

3 Columns

4 Columns

5 Columns

6 Columns

7 Columns

8 Columns

(*Confirm*)

Content

Contours

Select Contours

(*Table of available contours*)

(*Confirm*)

Assign Colours

Cyclic Colours Only

Cyclic Colours and Styles

Cyclic Colour 500s, Others Grey

Specific Colours and Styles

(*Contour colours & styles table*)

(*Confirm*)

Save Current Settings

(*Directory listing*)

(*Confirm*)

Load User Settings

(*Directory listing*)

(*Confirm*)

Tracklines

Status

Selected

Not Selected (*default*)

(*Confirm*)

Source of Tracklines

GEBCO (*default for GEBCO*)

IHO DCDB (*default for IBCM*)

(*Confirm*)

Land Outline

GEBCO 1:10,000,000 (or IBCM 1:1,000,000) (default)

WVS Auto Resolution

WVS Full Resolution

WVS 1:250,000

WVS 1:1,000,000

WVS 1:3,000,000

WVS 1:12,000,000

WVS 1:43,000,000

(Confirm)

Features

Select Feature Types

Undersea Features

Islands

Place Names

(Confirm)

Assign Colours

Undersea Features

(Colour chart)

(Confirm)

Islands

(Colour chart)

(Confirm)

Place Names

(Colour chart)

(Confirm)

Show Content

(Table of current settings)

Zoom

In

Out

Backtrack

Reposition

Redefine

Precisely

(Edge coordinates input boxes)

(Confirm)

Where Am I?

Box Shape

Defined During Zoom (default)

Screen Proportions

(Confirm)

Show Limits

(Table of edge coordinates of current screen)

Redraw

(Immediately redraws current display to reflect any change in settings)

Query

Contours
Features
Survey Boxes

Utilities

Save Screen
 PCX File
 (Filename input box)
 GEM Image
 (Filename input box)
 Slideshow
 (Filename input box)
Print Screen
 Epson / IBM
 HP Laserjet
 HP Paintjet
Reset System
Distance
Carter's Tables
Export Data
 (Filename input box)
Version

Info.

Display
 (List of relevant info. topics)
 (View or Print)

Quit

Partial
To DOS

ANNEX III

Detailed Description of Menu Options on the Area Selection Screen

Please Note

The descriptions of individual menu options presented in this annex are direct copies of the messages displayed by the context-sensitive help system which are available at all times within the Atlas software. It is neither necessary nor desirable to read this section before using the Atlas. When some experience has been gained with the software, these option descriptions will be of assistance as reference material.

As described in Annex II, some menu options are common to both the Area Selection Screen and the Main Display Screen. These options may be divided into three categories:

- a) Options that are functionally identical on both screens, but whose scope is limited to the current screen only. These options are indicated by a dotted vertical bar in the right-hand margin next to their description below.
- b) Options that may be selected from either screen, and have an effect on both. These options are indicated by a dashed vertical bar in the right-hand margin next to their description below.
- c) Options which only have effect in the Main Display Screen, even though they may be selected from either screen. These options are indicated by a solid vertical bar in the right-hand margin next to their description below.

The description of any option marked with a vertical bar may safely be skipped if you have already read the description of its counterpart given in Annex IV.

Area Selection Screen

The Area Selection Screen permits the user to specify the absolute limits of the area for which data are to be displayed and/or exported. A schematic chart showing the total extent of the current dataset (GEBCO or IBCM) is displayed in a fixed window within

the display area, and the current cursor position in geographic coordinates is continuously displayed in a smaller window which may be repositioned or hidden by the user.

Along the top of the screen is a menu bar displaying major headings by which the user may activate pull-down menus of options which control the Atlas. A pull-down menu is activated by pointing to the appropriate heading using the mouse cursor (the heading background colour will change from blue to red) and pressing (and then releasing) the left-hand mouse button. Selection of items from the pull-down menu is made in a similar manner, and will result either in the action being carried out or in the appearance of a further menu offering additional options. Some menu actions have no immediately apparent effect upon the display, but will be implemented when the contour data are actually plotted (allowing preselection of a number of display options).

Whilst a chain of pull-down menus is active, the user may return one level up the chain (without making a selection) by pressing the left-hand mouse button at any time when the cursor is outside the currently active menu. Pressing the right-hand mouse button or the <Escape> key (irrespective of the cursor position) causes the entire menu chain to be abandoned, returning the user to the area selection screen.

The 'Options' and 'Plot' headings are only applicable once the working area has been selected. Until that time, these two headings will be displayed in grey instead of yellow, and they will not be available for selection.

Menu items which are printed in black on the pull-down menus are selectable by the user. Items which appear in grey are inappropriate to the present situation (e.g. data cannot be exported before an area has been selected) and they will not be available for selection.

Help text is available for each menu item individually, and may be summoned by pointing to the appropriate entry and then pressing the <F1> key.

Area Select

The Area Select menu options permit the user to specify the absolute limits of the area for which contour data are to be displayed and/or exported. These area limits will be used by the system to determine certain data parameters (for example, only contour depths known to be present within the area will be offered to the user for selection), but the user will have full flexibility to zoom and pan within the selected area once a plot has been initiated.

The working area may be selected by use of a 'zoom box', by specifying precise geographic coordinates, or by specifying an individual chart from the original printed series, and the user may then request a display of the edge coordinates of the selected area.

An option is also provided for the user to switch between the Area Selection Screen for the GEBCO digital dataset (the default) and that for the IBCM.

Area Select - By Zoom Box

This option permits the user to position a box outline around an area of the chart, and thereby to select data lying within that geographic area.

When the option is activated, control is returned to the Area Selection Window, upon which the cursor appears as a cross with the subscript 'z'. One corner of the desired zoom box may be specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now disappear to be replaced by a 'ghost outline' of the zoom box, one corner of which is 'anchored' to the specified corner point. Movements of the mouse will move the diagonally opposite corner of the box, causing it to change in size. When the zoom box encloses the desired zoom area, it may be fixed by pressing the left-hand mouse button, at which point the selected area will be indicated by a flashing box outline, and control will be returned to the main Area Selection Screen.

If an area of IBCM data is being selected and the cursor is taken outside the Area Selection Window during the zoom process, then the zoom box will be clipped to the edge of that window. If GEBCO data are being selected, however, only the latitude limits of the box will be clipped, whilst in longitude the box will 'wrap around' to permit selection of an area which spans the eastern and western limits of the display. In the latter case, the maximum longitude range permitted is 360° (any attempt to exceed this will cause the box to reset to zero width).

If an attempt is made to select an area which contains no contour lines or coastlines (in the centre of a continent, for example) a warning message is issued and the selection process is aborted.

Upon successful selection of an area, the 'Options' and 'Plot' menu bar options will become active.

The zoom process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Area Select - By Geographic Coordinates

This option permits the user to specify precisely the geographic limits of the area for which data are to be displayed and/or exported.

The appropriate latitude and longitude limits may be keyed in directly from the keyboard, the <Tab> or <Enter> key being used to move on to the next input box in the sequence. Initially, active input boxes are available for degrees, minutes, seconds and hemisphere for each coordinate value. Boxes which are 'skipped' will be evaluated as zeros by the system. If a decimal point is keyed in as part of the degrees entry, then the minutes and seconds boxes for that coordinate will no longer be available for entry - the decimal degrees value being used instead.

Permissible values for latitude range from 90°S to 90°N, whilst those for longitude range from 360°W to 360°E. The extended longitude range permits the user to select areas which span the 180° meridian, but the total longitude range of the area selected must not exceed 360°.

Coordinate entry may be aborted at any time by moving the cursor to the 'Cancel' box and pressing the left-hand mouse button.

When entry of the coordinates is complete, the designated area may be selected by highlighting the 'Confirm' box and pressing the left-hand mouse button. Control will then return to the main Area Selection Screen, upon which the selected area will be indicated by a flashing box outline.

If an attempt is made to select an area which contains no contour lines or coastlines (in the centre of a continent, for example) a warning message is issued and the selection process is aborted.

Upon successful selection of an area, the 'Options' and 'Plot' menu bar options will become active.

Area Select - By IBCM Chart Number

This option permits the user to specify the area for which data are to be selected for display and/or export by reference to the number of the original IBCM printed chart from which the data were digitised. A plot of the outlines of the charts may be superimposed upon the Area Selection Screen by use of the 'Display - Chart Outlines On' menu item. The menu consists of a complete list of charts. The required chart area may be selected by pointing to the appropriate menu entry with the cursor and then pressing the left-hand mouse button.

Control will then return to the main Area Selection Screen, upon which the selected area will be indicated by a flashing box outline.

Upon successful selection of an area, the 'Options' and 'Plot' menu bar options will become active.

Area Select - By GEBCO Chart Number

This option permits the user to specify the area for which data are to be selected for display and/or export by reference to the number of the original GEBCO printed chart from which the data were digitised. A plot of the outlines of the charts may be superimposed upon the Area Selection Screen by use of the 'Display - Chart Outlines On' menu item.

The menu consists of a complete list of charts. The required chart area may be selected by pointing to the appropriate menu entry with the cursor and then pressing the left-hand mouse button.

Control will then return to the main Area Selection Screen, upon which the selected area will be indicated by a flashing box outline. Please note that the area selected will contain all data originating from the designated chart, but may also include areas from adjacent charts where the printed map area is irregular in outline.

Upon successful selection of an area, the 'Options' and 'Plot' menu bar options will become active.

Area Select - GEBCO Chart Series

This option, which is only visible when the current Area Selection Screen is displaying the IBCM area, causes data selection to switch to the GEBCO chart series. The Area Selection Screen is redrawn to display a map of the World, and data subsequently selected will be taken from the GEBCO dataset.

Area Select - IBCM Chart Series

This option, which is only visible when the current Area Selection Screen is displaying the World map, causes data selection to switch to the IBCM chart series. The Area Selection Screen is redrawn to display a map of the Mediterranean, and data subsequently selected will be taken from the IBCM dataset.

Area Select - Display Edge Coordinates

Selection of this option causes the system to display the geographic limits of the currently specified data selection area. The option will not be available for selection until an area has been selected by use of one of the other options on the 'Area Select' menu.

The edge coordinates display may be closed by pressing either mouse button.

Display

The Display menu offers options to control the appearance of the Area Selection Screen display. Options are offered to:

- * Toggle the display of chart outlines on or off
- * Toggle the display of a geographic grid on or off
- * Move or hide the position window and select its display format

Display - Chart Outlines On

Activation of this option causes a plot of the outlines of the original printed charts from which the data were digitised to be superimposed on the current display. Each area is labelled at its centre with the reference number of the printed chart to which it corresponds.

Display - Chart Outlines Off

Activation of this option cancels the superimposition of a chart outlines plot upon the current display.

Display - Geographic Grid On

Activation of this option causes a geographic grid to be superimposed on the current display.

Display - Geographic Grid Off

Activation of this option cancels the superimposition of a geographic grid upon the current display.

Display - Position Window

Menus under this option permit the user to control the position, status (visible or hidden) and numerical format (degrees, minutes and seconds or decimal degrees) of the Position Window on the current display. The Position Window is used to display the current position of the cursor in geographical coordinates.

All options take immediate effect when selected.

Display - Position Window - Hide

This option causes the Position Window to be hidden (i.e. removed from the display). The window will remain hidden until the user restores it by use of the 'Display - Position Window - Show' option.

Display - Position Window - Show

This option causes the Position Window to be restored to the display, following its removal by use of the 'Display - Position Window - Hide' option.

Display - Position Window - Reposition

This option permits the user to control the position in which the Position Window is located within the display area.

On activation of this option the system returns immediately to the main display, upon which the current position of the Position Window is shown by a dashed 'ghost outline' with a 'crossed arrows' cursor at its centre. Movements of the mouse will cause the outline to be moved around the display; when it is located in the desired new position for the Position Window it may be 'fixed' by pressing the left-hand mouse button, upon which the geographic position display will be transferred to the area bounded by the outline.

If the Position Window was hidden prior to repositioning, then it will be restored to the screen and will remain visible after the process is complete.

The repositioning process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Display - Position Window - Specify Format

This option controls the way in which the current cursor location is displayed within the Position Window. The user may select between geographic notation (degrees, minutes and seconds) or decimal degrees.

Display - Position Window - Specify Format - Degrees, Minutes, Seconds

This option selects geographic notation (degrees, minutes and seconds) for the cursor position display.

Display - Position Window - Specify Format - Decimal Degrees

This option selects decimal degrees notation (to two decimal places) for the cursor position display.

Options

The Options menu, which is not available for selection until a data area has been specified by the use of the 'Area Select' menu, offers options that permit the user to specify data selections and display preferences before the data are actually plotted (all of the options available under this menu are duplicated within the Main Display Screen, permitting the plot content to be amended at any time).

Data selections made under this menu will also apply to data exported directly from the Area Selection Screen by means of the 'Utilities - Export Data' menu option.

The following functions are offered:

- * Specify the map projection to be used for plotting
- * Select which of the available contours should be plotted
- * Assign colours to the selected contours
- * Save the current contour selection to disk
- * Load a previously saved contour selection from disk
- * Toggle display of tracklines on or off
- * Select the source of trackline data (GEBCO or IHO DCDB)
- * Select the coastline source (GEBCO/IBCM or WVS)
- * Toggle display of feature locations, islands and place names on or off
- * Assign symbol colours to feature locations, islands and place names
- * Display a summary of the current data selection

Options - Projection

This menu option permits the user to specify which of five available map projections should be used when the selected data are plotted. The projections are:

Equidistant Cylindrical
Mercator (default)
Miller Cylindrical
Lambert Cylindrical Equal-Area
Peters Equal-Area

The map projections used within the GEBCO Digital Atlas Software Interface are a very close approximation to the stated projections. In order to maximise speed of display, latitude scaling is linear within each degree of latitude, the scaling factor being appropriate to the stated projection at the mid-point of that degree of latitude. In practical

terms, this approximation is transparent to the user under most circumstances, the only exception being the extreme case of a Mercator projection beyond 89° North or South where, instead of tending to infinity, the scaling factor is constant (being the scaling factor appropriate to 89.5°). A practical advantage of this is that datasets which extend to 90° North or South can be plotted on a Mercator projection without generating a program error.

Data exported from the system are independent of any cartographic projection, and retain the full resolution and spatial accuracy at which they were digitised.

Options - Projection - Equidistant Cylindrical

This option causes the data, when plotted, to be displayed using the Equidistant Cylindrical projection. The projection will be used for all data plots during the current session unless an alternative projection is selected by the user.

The projection is a regular, rectangular grid, with a 1:1 scaling ratio between latitude and longitude (i.e. a square grid).

Options - Projection - Mercator

This option causes the data, when plotted, to be displayed using the Mercator projection. The projection will be used for all data plots during the current session unless an alternative projection is selected by the user. The Mercator projection is the default, and will be used if no alternative is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $1.0 / \cos(\text{latitude})$.

Options - Projection - Miller Cylindrical

This option causes the data, when plotted, to be displayed using the Miller Cylindrical projection. The projection will be used for all data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $1.0 / \cos(0.8 * \text{latitude})$.

Options - Projection - Lambert Cylindrical Equal-Area

This option causes the data, when plotted, to be displayed using the Lambert Cylindrical Equal-Area projection. The projection will be used for all data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $\cos(\text{latitude})$.

Options - Projection - Peters Equal-Area

This option causes the data, when plotted, to be displayed using the Peters Equal-Area projection. The projection will be used for all data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $2.0 * \cos(\text{latitude})$.

Options - Contours

Items under this menu heading permit the user to specify which of the available bathymetric depth contours should be displayed when the data are plotted, and to allocate line colours and line styles to them.

The subset of contours currently selected for display will also be the subset that will be included in any data exported from the GDA.

Options - Contours - Select Contours

This option permits the user to specify which of the available bathymetric depth contours should be displayed when the data are plotted, or included in any data export from the GDA.

A table showing the depths of all contours available within the presently selected geographic area is displayed, with those currently selected for plotting highlighted by a red background bar (by default, the system initially selects the 200m contour and all contours at 500m intervals from 500m downwards; the coastline is permanently selected, and is not available for deselection).

Contours may be added to, or deleted from, the selection by pointing to the appropriate table entry with the cursor and then pressing the left-hand mouse button which causes that contour entry to toggle between selected and deselected.

The 'Select All' and 'Deselect All' and 'Select 500s' boxes at the foot of the table may be used to fill the selection, clear it or select all contours at 500m intervals from 500m downwards. Following any of these operations, the table remains active to permit further selections or deselections by the user.

When the selection is complete, it must be activated by pointing to the 'Confirm' box with the cursor and pressing the left-hand mouse button.

The selection process may be aborted at any time by pressing the <Escape> key or the right-hand mouse button, or by pressing the left-hand mouse button whilst the cursor is outside the table area. If a selection is abandoned in this way, then the contour selection current when the table was opened remains in force.

Options - Contours - Assign Colours

This option permits the user to specify what combination of colours and linestyles should be used to display the currently selected contours. The contours should always be selected before colours and styles are assigned.

By using this menu item, the user may apply one of three predefined, cyclic colour and linestyle schemes to the selected contours. Within the Main Display Screen, a further

facility will be found which permits the user to assign specific colours and styles to individual contours if desired, and also options for selection and modification of colour palettes.

Options - Contours - Assign Colours - Cyclic Colours Only

Activation of this option causes the eight available colours in the contour palette to be applied cyclically to the selected contours (i.e. colours will be assigned in sequence with increasing depth, cycling back to the first colour at the ninth contour depth, and so on). A solid line will be used for all.

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

Options - Contours - Assign Colours - Cyclic Colours and Styles

Activation of this option causes the eight available colours in the contour palette and the three available linestyles (solid, dashed and dotted) to be applied cyclically to the selected contours (i.e. colours and styles will be assigned in sequence with increasing depth, cycling back to the first colour and style at the twenty-fifth contour depth, and so on).

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

Options - Contours - Assign Colours - Cyclic Colour 500s, Others Grey

Activation of this option causes the eight available colours in the contour palette to be applied cyclically to those selected contours that are at 500m depth multiples (i.e. colours will be assigned in sequence with increasing depth, cycling back to the first colour at the ninth 500m multiple contour depth, and so on); all other contours will be set to light grey. A solid line will be used for all.

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

Options - Contours - Save Current Settings

This option permits the user to save the current contour selection and its colour/linestyle assignments to a disk file. Since selections saved in this way may be re-loaded at a later date, the user may store his or her personal preferences for recall during subsequent GDA sessions (although care should be taken to ensure that the saved preferences will be applicable to the contours available when the settings are re-loaded, particularly if the geographical area, and hence the range of contours available, is different).

When the option is activated, a display window is opened which shows the current directory's parent directory ('..'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .SET (the extension

used for settings files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file in which the settings are to be saved may be entered directly from the keyboard (the extension .SET is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are saved by clicking on the 'Confirm' box.

Options - Contours - Load User Settings

This option permits the user to load previously saved contour selection and colour/linestyle assignments from a disk file. Care must be taken to ensure that the saved settings are applicable to the contours available when the settings are re-loaded, particularly if the geographical area, and hence the range of contours available, is different.

When the option is activated, a display window is opened which shows the current directory's parent directory ('.\'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .SET (the extension used for settings files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file from which the settings are to be loaded may be entered directly from the keyboard (the extension .SET is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are loaded by clicking on the 'Confirm' box.

Options - Tracklines

This menu option offers the user to select whether or not tracklines should be superimposed upon the bathymetric contour plot, and to specify the source of the trackline information.

The trackline status and source settings are also used by the GDA Software Interface to determine whether or not trackline information should be included in any data export from the GDA, and from which source the tracklines should be exported.

Options - Tracklines - Status

This menu option allows the user to select whether or not tracklines should be superimposed upon the bathymetric contour plot and included in any data export from the GDA. The default is for no tracklines to be plotted or exported.

Options - Tracklines - Status - Selected

If this menu option is selected, tracklines (from the source specified using the 'Options - Tracklines - Source' menu) will be superimposed upon the bathymetric contour plot and included in any data export from the GDA. This will apply to all plots performed during the current session, unless trackline plotting is subsequently de-selected by the user.

Options - Tracklines - Status - Not Selected

When this option is selected, trackline plotting is cancelled and no further trackline information will be displayed or exported unless subsequently re-selected by the user. This is the default option.

Options - Tracklines - Source of Tracklines

This option permits the user to specify the source of trackline information to be superimposed upon the bathymetric contour plots or included in any export from the GDA.

When GEBCO bathymetric contour data are to be plotted, the user may select GEBCO tracklines (the default) or IHO DCDB tracklines. When IBCM bathymetric contour data are to be plotted, only IHO DCDB tracklines may be selected, and the option to select GEBCO tracklines is suppressed.

Warning

The IHO DCDB trackline information is supplied solely for the purpose of indicating the coverage of digital bathymetric data available from that source. The IHO DCDB data were not used in the compilation of either of the bathymetric contour datasets supplied (GEBCO or IBCM), and should not, therefore, be used as any indication of the confidence that may be placed in contours for a given area.

The GEBCO tracklines represent the data coverage available for the compilation of the bathymetric contours of the GEBCO 5th Edition charts. No digital trackline control is available for the IBCM dataset.

Options - Tracklines - Source of Tracklines - GEBCO

Selection of this menu option causes the GEBCO trackline information to be used for any subsequent trackline plots or data exports. This option is the default when GEBCO contours are being plotted, but is not available for selection if IBCM contours are being plotted.

Options - Tracklines - Source of Tracklines - IHO DCDB

Selection of this menu option causes the trackline information from the International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) to be used for any subsequent trackline plots or data exports. This option is the alternate option when GEBCO contours are being plotted, but is the default when IBCM contours are being plotted.

Warning

The IHO DCDB trackline information is supplied solely for the purpose of indicating the coverage of digital bathymetric data available from that source. The IHO DCDB data were not used in the compilation of either of the bathymetric contour datasets supplied (GEBCO or IBCM), and should not, therefore, be used as any indication of the confidence that may be placed in contours for a given area.

The GEBCO tracklines represent the data coverage available for the compilation of the bathymetric contours of the GEBCO 5th Edition charts. No digital trackline control is available for the IBCM dataset.

Options - Coastline

This menu option permits the user to specify the source of the coastline to be plotted in conjunction with the bathymetric contours or included in any data export from the GDA.

The default option is for coastline information to be taken from the same source as the contour information (i.e. GEBCO or IBCM), and at the same scale. As an alternative, however, the World Vector Shoreline (WVS) may be specified as the coastline source, either at a specified scale or at 'Auto Resolution' in which the display system automatically selects the source scale most appropriate to the current screen display scale, adjusting its selection as necessary as the user zooms the display in or out.

Options - Coastline - IBCM 1:1,000,000

Selection of this option (the default option for IBCM contour data) causes subsequent contour plots or data exports to include the coastline digitised from the corresponding IBCM charts at 1:1,000,000 scale.

This option is not available when GEBCO contour data are being plotted or exported.

Options - Coastline - GEBCO 1:10,000,000

Selection of this option (the default option for GEBCO contour data) causes subsequent contour plots or data exports to include the coastline digitised from the corresponding GEBCO charts at 1:10,000,000 scale.

This option is not available when IBCM contour data are being plotted or exported.

Options - Coastline - WVS Auto Resolution

Selection of this option causes subsequent contour plots to include an appropriate scale of coastline from the World Vector Shoreline (WVS) dataset.

The display system automatically selects the source scale (full resolution, 1:250,000, 1:1 million, 1:3 million, 1:12 million or 1:43 million) most appropriate to the current screen display scale. The selection is adjusted as necessary as the user zooms the display in or out.

Data export is not permitted with this option active. The user must specify the required data source scale explicitly.

Options - Coastline - WVS Full Resolution

Selection of this option causes subsequent contour plots or data exports to include the full resolution coastline from the World Vector Shoreline (WVS) dataset (nominally 1:250,000 but with some areas included at a larger scale).

Options - Coastline - WVS 1:250,000

Selection of this option causes subsequent contour plots or data exports to include the 1:250,000 scale coastline from the World Vector Shoreline (WVS) dataset.

Options - Coastline - WVS 1:1,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:1 million scale coastline from the World Vector Shoreline (WVS) dataset.

Options - Coastline - WVS 1:3,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:3 million scale coastline from the World Vector Shoreline (WVS) dataset.

Options - Coastline - WVS 1:12,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:12 million scale coastline from the World Vector Shoreline (WVS) dataset.

Options - Coastline - WVS 1:43,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:43 million scale coastline from the World Vector Shoreline (WVS) dataset.

Options - Features

This menu option permits the user to specify which groups of geographic features (undersea features, islands and/or place names) should be displayed upon subsequent contour plots as queryable symbols at the appropriate geographic locations. The colour assigned to symbols denoting features of each type may also be specified.

Options - Features - Select Feature Types

This menu option permits the user to specify which groups of geographic features (undersea features, islands and/or place names) should be displayed upon subsequent contour plots as queryable symbols at the appropriate geographic locations.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Options - Features - Select Feature Types - Undersea Features

Activation of this menu option (which acts as an on/off toggle) will cause the nominal locations of undersea features (as referenced in the IHO/IOC Gazetteer of Geographical Names of Undersea Features) to be displayed upon subsequent contour plots as circular, queryable symbols at the appropriate geographic locations.

Linear features will be displayed as two or more symbols joined by a line which approximates the course of the feature.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Options - Features - Select Feature Types - Islands

Activation of this menu option (which acts as an on/off toggle) will cause the locations of oceanic and Antarctic islands to be displayed upon subsequent contour plots as triangular, queryable symbols at the appropriate geographic locations.

Please note that, in order to maximise positional accuracy, the symbol locations have been determined by reference to the World Vector Shoreline at its highest resolution. When viewed in conjunction with a coastline of lower source resolution (e.g. the 1:10,000,000 coastline digitised from the GEBCO charts) a slight discrepancy may be noticed between the location symbols and the coastline of some of the smaller islands that they denote.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Options - Features - Select Feature Types - Place Names

Activation of this menu option (which acts as an on/off toggle) will cause the locations of ports/cities (as portrayed on the GEBCO 5th Edition sheets) and Antarctic stations to be displayed upon subsequent contour plots as square, queryable symbols at the appropriate geographic locations.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Options - Features - Assign Colours

This option permits the user to change the colour in which the symbols denoting different geographic features are plotted. Due to palette limitations imposed by the VGA display, only the colours blue, yellow, grey, red and white are available.

Options - Features - Assign Colours - Undersea Features

This option permits the user to change the colour in which the symbols denoting the location of undersea features are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for undersea feature symbols is white.

Options - Features - Assign Colours - Islands

This option permits the user to change the colour in which the symbols denoting the location of oceanic and Antarctic islands are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for island symbols is yellow.

Options - Features - Assign Colours - Place Names

This option permits the user to change the colour in which the symbols denoting the location of ports/cities and Antarctic stations are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for place name symbols is red.

Options - Show Content

Activation of this option causes a text window containing a summary of the currently selected options to be opened on the display screen. Information is presented on the number of contour levels selected for display, the visibility status and source of trackline data, the source of coastline information, and the visibility status and display colour for each type of geographic feature.

The summary window is closed by pressing either mouse button.

Plot

The Plot menu is not available for selection until a data area has been specified by the use of the 'Area Select' menu.

When selected, the option takes immediate effect, causing the area selection process to be terminated and initiating a plot of the combination of contours, coastlines, tracklines and feature locations that has been specified by the user. Control is transferred to the Main Display Screen, where the user may view the selected data.

Once in the Main Display Screen, the user may not move outside the geographic area specified from the Area Selection Screen, but is free to zoom in to view sub-areas at larger scale, to respecify the combination of contours, coastlines, tracklines and feature locations that is to be displayed, to control the style of display (colours, projection, etc.), to query items on the display, to make hard copy or image file copies of the display, and to export selected data for all or part of the specified area.

Utilities

The Utilities menus offer the user facilities to perform the following functions:

- * Save the screen display to disk
- * Dump the screen display to a printer
- * Reset the Area Selection Screen system defaults
- * Measure distances on the chart
- * Perform Carter's Tables echo-sounding depth corrections
- * Export data for the currently selected area to disk file
- * Display the current Atlas version number and release date

Utilities - Save Screen

This option permits the user to save the current screen display to a disk file either for later re-display outside the Atlas or for manipulation within a drawing or desktop publishing package.

Utilities - Save Screen - PCX File

This option causes the current display screen to be saved to disk in 16-colour PCX image (.PCX) file format, which is compatible with most drawing or desktop publishing packages. A slideshow display program which is compatible with this storage format is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.PCX' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

During the saving process, a countdown of the number of pixel rows yet to be processed appears in the top right-hand corner of the screen.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the PCX File save option may alternatively be activated at any time by pressing the key combination <Alt> + <F4>; this will cause the screen to be saved exactly as seen.

Utilities - Save Screen - GEM Image

This option causes the current display screen to be saved to disk in colour GEM image (.IMG) file format, which is compatible with many drawing or desktop publishing packages. A slideshow display program which is compatible with this storage format is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.IMG' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

During the saving process, a countdown of the number of pixel rows yet to be processed appears in the top right-hand corner of the screen.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the GEM Image save option may alternatively be activated at any time by pressing the key combination <Alt> + <F5>; this will cause the screen to be saved exactly as seen.

Utilities - Save Screen - Slideshow

This option causes the current display screen to be saved to disk as a graphics RAM dump. This is more rapid than saving as a PCX file or GEM image, but is less versatile outside the Atlas, and has a higher storage overhead. A slideshow display program which is compatible with this storage format (and also with the .PCX and .IMG formats) is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.SLD' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the slideshow save option may alternatively be activated at any time by pressing the key combination <Alt> + <F6>; this will cause the screen to be saved exactly as seen.

Utilities - Print Screen

This option permits the user to dump the current screen display to a printer or to a disk file for subsequent copying to a printer. The printer port or disk file to which output is

directed will be the one specified in the system defaults file, and may be changed by the user by means of the setup program.

Utilities - Print Screen - Epson / IBM

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a monochrome image suitable for printing on an Epson or IBM compatible dot-matrix printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen black is dumped as white, and all other colours are printed as black.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the Epson / IBM screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F1>; this will cause the screen to be dumped exactly as seen.

Utilities - Print Screen - HP Laserjet

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a greyscale image suitable for printing on an HP Laserjet compatible laser printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen black is dumped as white, and all other colours are printed as shades of grey through to black.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the HP Laserjet screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F2>; this will cause the screen to be dumped exactly as seen.

Utilities - Print Screen - HP Paintjet

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a colour image suitable for printing on an HP Paintjet compatible inkjet printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen colours are dumped as displayed.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the HP Paintjet screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F3>; this will cause the screen to be dumped exactly as seen.

Utilities - Reset System

This option restores the display system to its default settings and colours (i.e. those normally set by the system at the start of a GEBCO Digital Atlas session). Items reset include:

- * Coastline source, resolution and colour
- * Contour selection, colours and display styles
- * Tracklines source, visibility and colour
- * Features selection and colours
- * Information Window height and position
- * Position Window visibility, position and format
- * Chart outlines on/off
- * Geographic grid on/off
- * Geographic projection

If a geographic area had been selected prior to the reset, then that area selection will be cancelled.

Utilities - Distance

This option permits the user to measure the cumulative distance along a multi-segment line on the displayed chart, the distance being expressed in terms of miles, nautical miles and kilometres. All distances are computed as the 'great circle' distance between turning points in the line (i.e. the shortest distance between those points on the surface of a sphere).

The user must ensure that no single line segment between turning points exceeds 180° of arc in length, otherwise the distance computed for that segment will not correspond to the track as displayed (e.g. if a segment of 200° of arc is drawn, then the shortest distance between its endpoints is along the remaining 160° of arc around the Earth's sphere, rather than along the line itself).

When the option is activated, control is returned to the Main Window, upon which the cursor appears as a cross with the subscript 'D'. The starting point for distance measurement is specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now disappear to be replaced by a 'rubber band' line, one end of which is 'anchored' to the specified starting point. Movements of the mouse will move the other end of the line, whilst the current 'on the ground' distance between the present position and the anchor point is continually displayed at the top of the display.

Turning points may be added to the line by pressing the left-hand mouse button whilst the line-end is at the desired location. The line is terminated by pressing the right-hand mouse button whilst the line-end is at the desired location; the distance display will then become fixed and the cursor will reappear.

Pressing the left-hand mouse button after a line has been terminated will cause the previous line to be removed from the display, and a new measurement line will begin from the current cursor position.

To end distance measurement and return to the normal display, press the right-hand mouse button at any time when the cursor is displayed; this will also cause the current measurement line (if any) to be removed from the display.

Utilities - Carter's Tables

This option permits the user to perform echo-sounding depth correction for a specified location using the Third Edition of the Echo-Sounding Correction Tables ("Carter's Tables").

When the option is activated, control is returned to the Area Selection Screen, upon which the cursor appears as a cross with the subscript 'E'. The location for echo-sounding depth correction is specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now become fixed at that location, and the number of the relevant depth correction area will be displayed at the top right-hand corner of the screen.

Once the cursor position has been fixed, the user may key in an observed depth in uncorrected metres; when the <Enter> key is pressed, the corrected depth is displayed alongside. A series of depth values may be entered in sequence for the same location, entry of the first digit of a new depth causing the numeric displays to clear.

Alternatively, corrected depths may be keyed in and the system will compute the corresponding uncorrected depth. The <Tab> key toggles between the two entry modes, with the current entry field being indicated by the location of the flashing numeric cursor.

Correction of depths for the current location is terminated by pressing the right-hand mouse button or the <Escape> key. The user may then reposition the cursor as above to make depth corrections for a new location, or may terminate depth correction and return to the Area Selection Screen by pressing the right-hand mouse button or the <Escape> key.

Utilities - Export Data

This option permits the user to export to hard or floppy disk a copy of the presently selected data for the current geographic area. The exported dataset will consist of:

- Coastlines from the currently selected source
- The currently selected bathymetric contour levels
- If 'selected', tracklines from the currently specified source

The system first performs a prescan of the data in order to determine the size of the export dataset, and then informs the user of the disk space requirement for either ASCII or DXF export formats (see the relevant information text under the 'Info.' menu for a description of the two formats), and offers the options to select an export format or to abort the export process.

If you elect to proceed with the export, then the system asks for the name of the disk file into which you wish the information to be exported (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.ASC' for an ASCII format file or '.DXF' for a DXF format file (if you enter a filename with an extension other than these, then the extension will be changed). The filename is checked for validity before export begins; if it is not valid then an error message is issued and you will be offered the option to re-enter the filename. A warning is issued if the specified file already exists, or if the specified disk drive does not have sufficient free space.

During the export process, the percentage completion is displayed as an indication of progress.

Utilities - Version

This option displays the version number and release date of the Atlas software. The latest version of both software and CD-ROM data files is always available from:

**GEBCO Help Desk,
British Oceanographic Data Centre,
Proudman Oceanographic Laboratory,
Bidston Observatory,
Birkenhead,
Merseyside L43 7RA**

Telefax: 44 (51) 652 3950 Internet: **BODCMail@UA.NBLAC.UK**

The version number and release date display may be closed by pressing either mouse button.

Info.

This option permits the user either to view descriptive text for the currently selected datasets on the display screen, or to direct a copy of the text to a printer or print file. When the Area Selection Screen is first entered, descriptive text for all datasets contained in the Atlas is offered for viewing. When a data area has been selected, however, information is offered only for those datasets which are both currently selected and are relevant to the selected area.

When the option is activated, a box containing a list of available information topics, one per line, opens upon the display area. The user may specify the text to be viewed or printed by first pointing to the appropriate line with the mouse cursor and pressing the left-hand mouse button to highlight it, and then selecting the 'View' or 'Print' options from the foot of the selection box.

If the 'View' option is selected, the text will be displayed in the Information Window. If the amount of text exceeds the capacity of that window, it will be displayed in 'pages'; in this case the word 'More' will appear at the bottom right-hand side of the Information Window, and the user may cause the next 'page' of text to be displayed by pointing to the 'More' box with the cursor and pressing the left-hand mouse button. The information display for a specific topic may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button while the 'More' box is not highlighted.

The 'Print' option permits the user to direct the descriptive text for the current dataset to a printer connected to the serial or parallel ports, or to a file for printing at a later time (the print destination being defined in the System Defaults file; see your User Guide for more information on the System Defaults file).

As far as possible, the descriptive text has been written in a manner which permits it to be listed on any printer which is capable of printing 80 characters per line (line length within the descriptive text is a maximum of 70 characters, and a left-hand 'binding margin' is added to the printout). In some instances, however, it has been necessary to use special characters from the IBM character set in order to include symbols in the text. It is therefore recommended that the printer (if it is not an IBM) be run in IBM Proprietary compatibility mode in order to reproduce these characters correctly.

When text viewing or printing is complete, select the 'Cancel' button to return to the Area Selection Screen.

Quit

This option causes the system to terminate the GEBCO Digital Atlas session, and to return the user to the DOS prompt.

The user is asked to confirm selection of this option by placing the cursor on the 'Confirm' box and pressing the left-hand mouse button.

The Quit option may be aborted by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button whilst the 'Confirm' box is not highlighted.

Quit - Confirm

This option requests user confirmation that the system should terminate the GEBCO Digital Atlas session and return the user to the DOS prompt.

The Quit option may be aborted by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button whilst the 'Confirm' box is not highlighted.

ANNEX IV

Detailed Description of Menu Options on the Main Display Screen

Please Note

The descriptions of individual menu options presented in this annex are direct copies of the messages displayed by the context-sensitive help system which are available at all times within the Atlas software. It is neither necessary nor desirable to read this section before using the Atlas. When some experience has been gained with the software, these option descriptions will be of assistance as reference material.

As described in Annex II, some menu options are common to both the Area Selection Screen and the Main Display Screen. These options may be divided into three categories:

- a) Options that are functionally identical on both screens, but whose scope is limited to the current screen only. These options are indicated by a dotted vertical bar in the right-hand margin next to their description below.
- b) Options that may be selected from either screen, and have an effect on both. These options are indicated by a dashed vertical bar in the right-hand margin next to their description below.
- c) Options which only have effect in the Main Display Screen, even though they may be selected from either screen. These options are indicated by a solid vertical bar in the right-hand margin next to their description below.

The description of any option marked with a vertical bar may safely be skipped if you have already read the description of its counterpart given in Annex III.

Main Display Screen

The Main Display Screen permits the user to view coastline, bathymetric contour, trackline and feature data for the currently selected geographic area. Facilities provided include the ability to zoom or pan within the selected area, to change data selections and

screen attributes, to perform screen capture or dump to printer, and to export the selected data for the currently displayed geographic area.

The data plot is scaled to fill the display screen, whilst the legend and a continuous display of the current cursor position in geographic coordinates are shown in smaller, overlain windows which may be repositioned or hidden by the user.

Along the top of the screen is a menu bar displaying major headings by which the user may activate pull-down menus of options which control the Atlas. A pull-down menu is activated by pointing to the appropriate heading using the mouse cursor (the heading background colour will change from blue to red) and pressing (and then releasing) the left-hand mouse button. Selection of items from the pull-down menu is made in a similar manner, and will result either in the action being carried out or in the appearance of a further menu offering additional options. Some menu actions have no immediately apparent effect upon the display, but will be implemented when the contour data are next plotted (via the 'Zoom' or 'Redraw' options), thus allowing a number of display options to be changed at one time.

Whilst a chain of pull-down menus is active, the user may return one level up the chain (without making a selection) by pressing the left-hand mouse button at any time when the cursor is outside the currently active menu. Pressing the right-hand mouse button or the <Escape> key (irrespective of the cursor position) causes the entire menu chain to be abandoned, returning the user to the area selection screen.

Menu items which are printed in black on the pull-down menus are selectable by the user. Items which appear in grey are inappropriate to the present situation (e.g. features cannot be queried before they have been selected for display) and they will not be available for selection.

Help text is available for each menu item individually, and may be summoned by pointing to the appropriate entry and then pressing the <F1> key.

Display

The Display menu options permit the user to control the manner in which the selected data are depicted upon the display screen.

Facilities are provided to:

- * Control the colours in which coastlines, contours and tracklines are displayed.
- * Select the geographic projection to be used.
- * Superimpose or remove a geographic grid.
- * Set the vertical and horizontal justification of the plot within the Main Display Screen.
- * Control the height and position of the window used to display textual information.
- * Control the visibility, position and format of the box in which the current cursor position is displayed.
- * Control the visibility, position and format of the legend window.

Display - Colours

Options under this menu heading allow the user to select the colours in which coastlines, contours and tracklines are to be displayed, to save the current colour palette for restoration at a later date, and to load a previously saved palette as the current palette.

Display - Colours - Select Standard Palette

This option permits the user to select one of the four standard contour colour palettes, predefined within the GEBCO Digital Atlas, as the current palette. The colours used to plot coastlines and tracklines remain unchanged (and may be selected separately by other options under the 'Display - Colours' menu heading).

Display - Colours - Select Standard Palette - Red Palette

Selection of this option changes the current palette of colours used to display contours to one consisting of eight graded shades of red. The colours used to plot coastlines and tracklines remain unchanged (and may be selected separately by other options under the 'Display - Colours' menu heading).

Display - Colours - Select Standard Palette - Green Palette

Selection of this option changes the current palette of colours used to display contours to one consisting of eight graded shades of green. The colours used to plot coastlines and tracklines remain unchanged (and may be selected separately by other options under the 'Display - Colours' menu heading).

Display - Colours - Select Standard Palette - Blue Palette

Selection of this option changes the current palette of colours used to display contours to one consisting of eight graded shades of blue. The colours used to plot coastlines and tracklines remain unchanged (and may be selected separately by other options under the 'Display - Colours' menu heading).

Display - Colours - Select Standard Palette - Rainbow Palette

Selection of this option changes the current palette of colours used to display contours to one consisting of eight colours arranged in a 'rainbow' sequence (Red, Orange, Yellow, Light Green, Dark Green, Light Blue, Dark Blue and Purple). The colours used to plot coastlines and tracklines remain unchanged (and may be selected separately by other options under the 'Display - Colours' menu heading).

Display - Colours - Set Contour Colours

This option permits the user to control precisely each of the eight colours of the palette used to display contours.

When the option is activated, a colour chart is displayed which depicts the eight colours of the palette as presently defined. To modify the palette, first select the colour to be changed by pointing to it with the mouse cursor and then pressing the left-hand mouse button; this will cause a colour change box to be opened in which a sample bar of the relevant colour is displayed, together with 'Up' and 'Down' arrow buttons for each of the Red, Green and Blue (RGB) components of that colour. Use the up and down arrows to

change the RGB values (between 0 and 63) in order to obtain the desired colour (any contour lines that appear in the relevant colour on the background display will change colour simultaneously). If you are happy with the modified colour, point to the 'Confirm' bar with the mouse cursor and then press the left-hand mouse button in order to make the change permanent. If you decide that you do not wish to make a change to the original colour, press the left-hand mouse button whilst the cursor is outside the colour change box; this will close the colour change box, and the colour will revert to its initial setting.

When you have made all the palette colour changes that you require, close the colour chart window by pressing the left-hand mouse button whilst the cursor is outside the chart (or press the right-hand mouse button to close the entire menu string).

Display - Colours - Set Coastline Colour

This option permits the user to control precisely the colour in which coastlines are displayed.

When the option is activated, a colour change box is opened in which a sample bar of the coastline colour is displayed, together with 'Up' and 'Down' arrow buttons for each of the Red, Green and Blue (RGB) components of that colour. Use the up and down arrows to change the RGB values (between 0 and 63) in order to obtain the desired colour (any coastlines that appear on the background display will change colour simultaneously). If you are happy with the modified colour, point to the 'Confirm' bar with the mouse cursor and then press the left-hand mouse button in order to make the change permanent. If you decide that you do not wish to make a change to the original colour, press the left-hand mouse button whilst the cursor is outside the colour change box; this will close the colour change box, and the colour will revert to its initial setting.

Display - Colours - Set Trackline Colour

This option permits the user to control precisely the colour in which tracklines are displayed.

When the option is activated, a colour change box is opened in which a sample bar of the trackline colour is displayed, together with 'Up' and 'Down' arrow buttons for each of the Red, Green and Blue (RGB) components of that colour. Use the up and down arrows to change the RGB values (between 0 and 63) in order to obtain the desired colour (any tracklines that appear on the background display will change colour simultaneously). If you are happy with the modified colour, point to the 'Confirm' bar with the mouse cursor and then press the left-hand mouse button in order to make the change permanent. If you decide that you do not wish to make a change to the original colour, press the left-hand mouse button whilst the cursor is outside the colour change box; this will close the colour change box, and the colour will revert to its initial setting.

Display - Colours - Save Current Palette

This option permits the user to save the current colour palette (i.e. the colours currently being used to display coastlines, contours and tracklines) to a disk file. Since palettes saved in this way may be re-loaded at a later date, the user may store his or her personal preferences for recall during subsequent GDA sessions.

When the option is activated, a display window is opened which shows the current directory's parent directory ('..'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .PAL (the extension used for palette files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file in which the palette is to be saved may be entered directly from the keyboard (the extension .PAL is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are saved by clicking on the 'Confirm' box.

Display - Colours - Load User Palette

This option permits the user to load a previously saved colour palette from a disk file.

When the option is activated, a display window is opened which shows the current directory's parent directory ('..'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .PAL (the extension used for palette files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file from which the palette is to be loaded may be entered directly from the keyboard (the extension .PAL is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are loaded by clicking on the 'Confirm' box.

Display - Projection

This menu option permits the user to specify which of five available map projections should be used when the selected data are plotted. The projections are:

- Equidistant Cylindrical
- Mercator (default)

Miller Cylindrical
Lambert Cylindrical Equal-Area
Peters Equal-Area

The map projections used within the GEBCO Digital Atlas Software Interface are a very close approximation to the stated projections. In order to maximise speed of display, latitude scaling is linear within each degree of latitude, the scaling factor being appropriate to the stated projection at the mid-point of that degree of latitude. In practical terms, this approximation is transparent to the user under most circumstances, the only exception being the extreme case of a Mercator projection beyond 89° North or South where, instead of tending to infinity, the scaling factor is constant (being the scaling factor appropriate to 89.5°). A practical advantage of this is that datasets which extend to 90° North or South can be plotted on a Mercator projection without generating a program error.

Data exported from the system are independent of any cartographic projection, and retain the full resolution and spatial accuracy at which they were digitised.

When the current projection is changed by use of this option, the chart display is immediately redrawn.

Display - Projection - Equidistant Cylindrical

This option causes the data, when plotted, to be displayed using the Equidistant Cylindrical projection. The projection will be used for all subsequent data plots during the current session unless an alternative projection is selected by the user.

The projection is a regular, rectangular grid, with a 1:1 scaling ratio between latitude and longitude (i.e. a square grid).

Display - Projection - Mercator

This option causes the data, when plotted, to be displayed using the Mercator projection. The projection will be used for all subsequent data plots during the current session unless an alternative projection is selected by the user. The Mercator projection is the default, and will be used if no alternative is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $1.0 / \cos(\text{latitude})$.

Display - Projection - Miller Cylindrical

This option causes the data, when plotted, to be displayed using the Miller Cylindrical projection. The projection will be used for all subsequent data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $1.0 / \cos(0.8 * \text{latitude})$.

Display - Projection - Lambert Cylindrical Equal-Area

This option causes the data, when plotted, to be displayed using the Lambert Cylindrical Equal-Area projection. The projection will be used for all subsequent data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $\cos(\text{latitude})$.

Display - Projection - Peters Equal-Area

This option causes the data, when plotted, to be displayed using the Peters Equal-Area projection. The projection will be used for all subsequent data plots during the current session unless an alternative projection is selected by the user.

Longitude scaling is uniform throughout. Assuming a longitude scaling factor of 1.0, then the latitude scaling factor for a given latitude is $2.0 * \cos(\text{latitude})$.

Display - Geo. Grid On

Activation of this option causes a geographic grid to be superimposed on the current display. The grid spacing will be such that between two and eight grid lines, spaced at 'round number' multiples of degrees, minutes and seconds, will be plotted on each axis. Each grid line will be annotated in geographic units unless it is too close to the edge of the Main Window for the annotation to be plotted in full. The precision used for the annotation will vary to suit the requirements of the current plot scale.

When selected, this option takes immediate effect, and a geographic grid will be superimposed upon all subsequent plots until it is cancelled by the user (by means of Display - Geo. Grid Off).

Display - Geo. Grid Off

Activation of this option cancels the superimposition of a geographic grid upon the current display.

When selected, this option takes immediate effect.

Display - Main Window

Menus under this option permit the user to specify the vertical (top, centre, bottom) and horizontal (left, centre, right) alignment of the Main Window within the display area.

If a change is made, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Vertical Position

This option permits the user to specify the vertical alignment (top, centre, bottom) of the Main Window within the display area.

If a change is made, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Vertical Position - Top

This option causes the top edge of the Main Window to be aligned with the top of the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the Main Window, this will only be apparent if the Main Window has a lower height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Vertical Position - Centre

This option causes the Main Window to be vertically centred within the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the Main Window, this will only be apparent if the Main Window has a lower height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Vertical Position - Bottom

This option causes the bottom edge of the Main Window to be aligned with the bottom of the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the Main Window, this will only be apparent if the Main Window has a lower height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Horizontal Position

This option permits the user to specify the horizontal alignment (left, centre, right) of the Main Window within the display area.

If a change is made, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Horizontal Position - Left

This option causes the left-hand edge of the Main Window to be aligned with the left-hand side of the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the Main Window, this will only be apparent if the Main Window has a higher height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Horizontal Position - Centre

This option causes the Main Window to be horizontally centred within the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the

Main Window, this will only be apparent if the Main Window has a higher height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Main Window - Horizontal Position - Right

This option causes the right-hand edge of the Main Window to be aligned with the right-hand side of the display area on all subsequent plots. Since the Atlas software tries to fill the display area with the Main Window, this will only be apparent if the Main Window has a higher height to width ratio than the display area.

If this option is selected, the effect will not be apparent until the next time that the screen display is redrawn.

Display - Info. Window

Menus under this option permit the user to specify the height and position of the Information Window within the display area.

The Information Window is used for display of descriptive text for the currently selected dataset(s) (activated by 'View' under the 'Info.' menu bar option). It is also used to display information presented in response to query of a survey box or undersea feature, and is being used for the display of this Help text.

Display - Info. Window - Height

This option permits the user to specify the height of the Information Window. The height is expressed in terms of the number of lines of text that it can contain at any one time.

On activation of this option the system returns immediately to the main display. The current position of the Information Window is shown by a dashed 'ghost outline' with a 'vertical arrows' cursor in the middle of its lower edge, and the number of text lines that it can contain is shown in its bottom left-hand corner. Movements of the mouse will cause the lower edge of the window outline to be raised or lowered, in increments of one line of text, and the 'lines' count is updated accordingly. When the window is the desired height it may be 'fixed' by pressing the left-hand mouse button; this causes the ghost outline to disappear, and the user is returned to the main display.

The resizing process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Display - Info. Window - Reposition

This option permits the user to determine the position in which the Information Window is located within the display area.

On activation of this option the system returns immediately to the main display, upon which the current position of the Information Window is shown by a dashed 'ghost

outline' with a 'crossed arrows' cursor at its centre. Movements of the mouse will cause the outline to be moved around the display; when it is located in the desired new position for the Information Window it may be 'fixed' by pressing the left-hand mouse button. The ghost outline will disappear, and the user is returned to the main display.

The repositioning process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Display - Pos. Window

Menus under this option permit the user to control the position, status (visible or hidden) and numerical format (degrees, minutes and seconds or decimal degrees) of the Position Window on the current display. The Position Window is used to display the current position of the cursor in geographical coordinates.

All options take immediate effect when selected.

Display - Pos. Window - Hide

This option causes the Position Window to be hidden (i.e. removed from the display). The window will remain hidden until the user restores it by use of the 'Display - Position Window - Show' or 'Display - Position Window - Reposition' options.

Display - Pos. Window - Show

This option causes the Position Window to be restored to the display, following its removal by use of the 'Display - Position Window - Hide' option.

Display - Pos. Window - Reposition

This option permits the user to control the position in which the Position Window is located within the display area.

On activation of this option the system returns immediately to the main display, upon which the current position of the Position Window is shown by a dashed 'ghost outline' with a 'crossed arrows' cursor at its centre. Movements of the mouse will cause the outline to be moved around the display; when it is located in the desired new position for the Position Window it may be 'fixed' by pressing the left-hand mouse button, upon which the geographic position display will be transferred to the area bounded by the outline.

If the Position Window was hidden prior to repositioning, then it will be restored to the screen and will remain visible after the process is complete.

The repositioning process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Display - Pos. Window - Specify Format

This option controls the way in which the current cursor location is displayed within the Position Window. The user may select between geographic notation (degrees, minutes and seconds) or decimal degrees.

Display - Pos. Window - Specify Format - Degrees, Minutes, Seconds

This option selects geographic notation (degrees, minutes and seconds) for the cursor position display. At small scales the position is expressed to the nearest second of arc, but at larger scales the resolution is increased to the nearest hundredth of a second of arc.

Display - Pos. Window - Specify Format - Decimal Degrees

This option selects decimal degrees notation for the cursor position display. At small scales the position is expressed in degrees of arc to two decimal places, but as the scale increases the resolution also increases to a maximum of six decimal places.

Display - Legend Window

Menus under this option permit the user to control the position, status (visible or hidden) and format of the legend window which contains the key for the contour depths showing the colour and linestyle in which each is depicted upon the display.

All options take immediate effect when selected.

Display - Legend Window Hide

This option causes the legend window to be hidden (i.e. removed from the display). The legend window will remain hidden until either the user restores it by use of the 'Display - Legend Window - Show' or 'Display - Legend Window - Reposition' options.

Display - Legend Window - Show

This option causes the legend window to be restored to the display, following its removal by use of the 'Display - Legend Window - Hide' option.

Display - Legend Window - Reposition

This option permits the user to determine the position in which the legend window is located within the display area.

On activation of this option the system returns immediately to the main display, upon which the current position of the legend window is shown by a dashed 'ghost outline' with a 'crossed arrows' cursor at its centre. Movements of the mouse will cause the outline to be moved around the display; when it is located in the desired new position for the legend window it may be 'fixed' by pressing the left-hand mouse button, upon which the legend window will be transferred to the area bounded by the outline.

If the legend window was hidden prior to repositioning, then it will be restored to the screen and will remain visible after the process is complete.

The repositioning process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Display - Legend Window - Specify Format

This option permits the user to specify the number of columns to be used to display information within the legend window, and hence the shape of that window. The default

option is for the minimum number of columns to be used (1, 2 or 3, depending upon the number of contour depth levels selected).

Display - Legend Window - Specify Format - Auto 1, 2 or 3 Columns

If this option is selected then the legend window will contain the minimum number of columns (1, 2 or 3) necessary to display the currently selected number of contour depth levels.

Display - Legend Window - Specify Format - 2 Columns

If this option is selected then the legend window will contain two columns of information, providing that the currently selected number of contour depth levels can be displayed without extending outside the limits of the plot area. If the number of depth levels is too great, then the system will automatically increase the number of columns to three. The height of the window is adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 3 Columns

If this option is selected then the legend window will always contain three columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 4 Columns

If this option is selected then the legend window will always contain four columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 5 Columns

If this option is selected then the legend window will always contain five columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 6 Columns

If this option is selected then the legend window will always contain six columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 7 Columns

If this option is selected then the legend window will always contain seven columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Display - Legend Window - Specify Format - 8 Columns

If this option is selected then the legend window will always contain eight columns of information, the height of the window being adjusted automatically to the minimum necessary for all information to be displayed.

Content

Options under this menu heading permit the user to select the combination of contours, tracklines and features to be displayed by the system, to select which data source should be used (where alternatives are provided), and to allocate colours from the current palette to individual contour depth levels and to the different feature types.

Content - Contours

Items under this menu heading permit the user to specify which of the available bathymetric depth contours should be displayed, and to allocate line colours and line styles to them.

The subset of contours currently selected for display will also be the subset that will be included in any data exported from the GDA.

Content - Contours - Select Contours

This option permits the user to specify which of the available bathymetric depth contours should be displayed or be included in any data export from the GDA.

A table showing the depths of all contours available within the presently selected geographic area is displayed, with those currently selected for plotting highlighted by a red background bar (by default, the system initially selects the 200m contour and all contours at 500m intervals from 500m downwards; the coastline is permanently selected, and is not available for deselection).

Contours may be added to, or deleted from, the selection by pointing to the appropriate table entry with the cursor and then pressing the left-hand mouse button which causes that contour entry to toggle between selected and deselected.

The 'Select All' and 'Deselect All' and 'Select 500s' boxes at the foot of the table may be used to fill the selection, clear it or select all contours at 500m intervals from 500m downwards. Following any of these operations, the table remains active to permit further selections or deselections by the user.

When the selection is complete, it **must** be activated by pointing to the 'Confirm' box with the cursor and pressing the left-hand mouse button.

The selection process may be aborted at any time by pressing the <Escape> key or the right-hand mouse button, or by pressing the left-hand mouse button whilst the cursor is outside the table area. If a selection is abandoned in this way, then the contour selection current when the table was opened remains in force.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Contours - Assign Colours

This option permits the user to specify what combination of colours and linestyles should be used to display the currently selected contours. The contours should always be selected before colours and styles are assigned.

By using this menu item, the user may apply one of three predefined, cyclic colour and linestyle schemes to the selected contours, or may assign specific colours and styles to individual contours if desired.

Content - Contours - Assign Colours - Cyclic Colours Only

Activation of this option causes the eight available colours in the contour palette to be applied cyclically to the selected contours (i.e. colours will be assigned in sequence with increasing depth, cycling back to the first colour at the ninth contour depth, and so on). A solid line will be used for all.

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Contours - Assign Colours - Cyclic Colours and Styles

Activation of this option causes the eight available colours in the contour palette and the three available linestyles (solid, dashed and dotted) to be applied cyclically to the selected contours (i.e. colours and styles will be assigned in sequence with increasing depth, cycling back to the first colour and style at the twenty-fifth contour depth, and so on).

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Contours - Assign Colours - Cyclic Colour 500s, Others Grey

Activation of this option causes the eight available colours in the contour palette to be applied cyclically to those selected contours that are at 500m depth multiples (i.e. colours will be assigned in sequence with increasing depth, cycling back to the first colour at the ninth 500m multiple contour depth, and so on); all other contours will be set to light grey. A solid line will be used for all.

All contours that are not currently selected will be assigned a solid, light grey linestyle (this will be used if they are subsequently selected for plotting without being assigned a colour).

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Contours - Assign Colours - Specific Colours and Styles

This option permits the user to allocate a specific colour (from the current palette) and linestyle (solid, dashed or dotted) to each of the currently selected contour levels.

When the option is activated, a window is opened on the display in which is depicted, for each of the currently selected contours, the depth value in the current colour, plus a sample of the current linestyle.

To change the colour and/or linestyle for a specific contour, select that contour by pointing to it with the mouse cursor and then pressing the left-hand mouse button. This will cause a colour and linestyle chart to be displayed just outside the nearest left/right border of the contour display window. The attributes of the selected contour level may be changed by pointing to the desired colour and/or linestyle on the chart and pressing the left-hand mouse button. The new selection may be made permanent by pointing to the 'Confirm' box on the chart and pressing the left-hand mouse button, or may be abandoned by pressing the left-hand mouse button when the cursor is outside the chart (in which case the original colour/linestyle of the contour level will be restored).

When all desired contour colour/linestyle selections have been made, the changes may be made permanent by pointing to the 'Confirm' box of the contour display and pressing the left-hand mouse button. Alternatively, changes may be abandoned by pressing the left-hand mouse button whilst the cursor is outside the contour display window; this will cause all contour attributes to be reset to those current before the option was selected.

The option may be terminated at any time, and the menu chain closed, by pressing the right-hand mouse button or the <Escape> key. Control will then return to the main display window, with all contour attributes unchanged.

Content - Contours - Save Current Settings

This option permits the user to save the current contour selection and its colour/linestyle assignments to a disk file. Since selections saved in this way may be re-loaded at a later date, the user may store his or her personal preferences for recall during subsequent GDA sessions (although care should be taken to ensure that the saved preferences will be applicable to the contours available when the settings are re-loaded, particularly if the geographical area, and hence the range of contours available, is different).

When the option is activated, a display window is opened which shows the current directory's parent directory ('..'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .SET (the extension used for settings files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file in which the settings are to be saved may be entered directly from the keyboard (the extension .SET is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are saved by clicking on the 'Confirm' box.

Content - Contours - Load User Settings

This option permits the user to load previously saved contour selection and colour/linestyle assignments from a disk file. Care must be taken to ensure that the saved settings are applicable to the contours available when the settings are re-loaded, particularly if the geographical area, and hence the range of contours available, is different.

When the option is activated, a display window is opened which shows the current directory's parent directory ('..'), its subdirectories (identifiable by the backslash character at their end), and an alphabetical listing of all files of type .SET (the extension used for settings files by the GDA). By pointing to a directory with the cursor and pressing the left-hand mouse button the user may shift to that directory, and the display will be refreshed to show the sub-directories and files present there. The full directory path name of the current directory will be displayed at the top of the window.

The name of the file from which the settings are to be loaded may be entered directly from the keyboard (the extension .SET is the only one allowed, and will be added by the system if no extension is specified). Alternatively, an existing file may be specified by pointing to it with the cursor and pressing the left-hand mouse button. Alterations to the filename may be made using the <Backspace> key to delete characters.

The process may be aborted at any time by clicking on the 'Cancel' box.

When the file name has been entered, the settings are loaded by clicking on the 'Confirm' box.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Tracklines

This menu option offers the user to select whether or not tracklines should be superimposed upon the bathymetric contour plot, and to specify the source of the trackline information.

The trackline status and source settings are also used by the GDA Software Interface to determine whether or not trackline information should be included in any data export from the GDA, and from which source the tracklines should be exported.

Content - Tracklines - Status

This menu option allows the user to specify whether or not tracklines should be superimposed upon the bathymetric contour plot and included in any data export from the GDA. The default is for no tracklines to be plotted or exported.

Content - Tracklines - Status - Selected

If this menu option is selected, tracklines (from the source specified using the 'Content - Tracklines - Source' menu) will be superimposed upon the bathymetric contour plot and included in any data export from the GDA. This will apply to all plots performed during the current session, unless trackline plotting is subsequently de-selected by the user.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Tracklines - Status - Not Selected

When this option is selected, trackline plotting is cancelled and no further trackline information will be displayed or exported unless subsequently re-selected by the user. This is the default option.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Tracklines - Source of Tracklines

This option permits the user to specify the source of trackline information to be superimposed upon the bathymetric contour plots or included in any export from the GDA.

When GEBCO bathymetric contour data are to be plotted, the user may select GEBCO tracklines (the default) or IHO DCDB tracklines. When IBCM bathymetric contour data are to be plotted, only IHO DCDB tracklines may be selected, and the option to select GEBCO tracklines is suppressed.

Warning

The IHO DCDB trackline information is supplied solely for the purpose of indicating the coverage of digital bathymetric data available from that source. The IHO DCDB data were not used in the compilation of either of the bathymetric contour datasets supplied (GEBCO or IBCM), and should not, therefore, be used as any indication of the confidence that may be placed in contours for a given area.

The GEBCO tracklines represent the data coverage available for the compilation of the bathymetric contours of the GEBCO 5th Edition charts. No digital trackline control is available for the IBCM dataset.

Content - Tracklines - Source of Tracklines - GEBCO

Selection of this menu option causes the GEBCO trackline information to be used for any subsequent trackline plots or data exports. This option is the default when GEBCO contours are being plotted, but is not available for selection if IBCM contours are being plotted.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Tracklines - Source of Tracklines - IHO DCDB

Selection of this menu option causes the trackline information from the International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) to be used for any subsequent trackline plots or data exports. This option is the alternate option when GEBCO contours are being plotted, but is the default when IBCM contours are being plotted.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Warning

The IHO DCDB trackline information is supplied solely for the purpose of indicating the coverage of digital bathymetric data available from that source. The IHO DCDB data were not used in the compilation of either of the bathymetric contour datasets supplied (GEBCO or IBCM), and should not, therefore, be used as any indication of the confidence that may be placed in contours for a given area.

The GEBCO tracklines represent the data coverage available for the compilation of the bathymetric contours of the GEBCO 5th Edition charts. No digital trackline control is available for the IBCM dataset.

Content - Coastline

This menu option permits the user to specify the source of the coastline to be plotted in conjunction with the bathymetric contours or included in any data export from the GDA.

The default option is for coastline information to be taken from the same source as the contour information (i.e. GEBCO or IBCM), and at the same scale. As an alternative, however, the World Vector Shoreline (WVS) may be specified as the coastline source, either at a specified scale or at 'Auto Resolution' in which the display system automatically selects the source scale most appropriate to the current screen display scale, adjusting its selection as necessary as the user zooms the display in or out.

If changes are made using these options they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Coastline - GEBCO 1:10,000,000

Selection of this option (the default option for GEBCO contour data) causes subsequent contour plots or data exports to include the coastline digitised from the corresponding GEBCO charts at 1:10,000,000 scale.

This option is not available when IBCM contour data are being plotted or exported.

Content - Coastline - IBCM 1:1,000,000

Selection of this option (the default option for IBCM contour data) causes subsequent contour plots or data exports to include the coastline digitised from the corresponding IBCM charts at 1:1,000,000 scale.

This option is not available when GEBCO contour data are being plotted or exported.

Content - Coastline - WVS Auto Resolution

Selection of this option causes subsequent contour plots to include an appropriate scale of coastline from the World Vector Shoreline (WVS) dataset.

The display system automatically selects the source scale (full resolution, 1:250,000, 1:1 million, 1:3 million, 1:12 million or 1:43 million) most appropriate to the current screen display scale. The selection is adjusted as necessary as the user zooms the display in or out.

Data export is not permitted with this option active. The user must specify the required data source scale explicitly.

Content - Coastline - WVS Full Resolution

Selection of this option causes subsequent contour plots or data exports to include the full resolution coastline from the World Vector Shoreline (WVS) dataset (nominally 1:250,000 but with some areas included at a larger scale).

Content - Coastline - WVS 1:250,000

Selection of this option causes subsequent contour plots or data exports to include the 1:250,000 scale coastline from the World Vector Shoreline (WVS) dataset.

Content - Coastline - WVS 1:1,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:1 million scale coastline from the World Vector Shoreline (WVS) dataset.

Content - Coastline - WVS 1:3,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:3 million scale coastline from the World Vector Shoreline (WVS) dataset.

Content - Coastline - WVS 1:12,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:12 million scale coastline from the World Vector Shoreline (WVS) dataset.

Content - Coastline - WVS 1:43,000,000

Selection of this option causes subsequent contour plots or data exports to include the 1:43 million scale coastline from the World Vector Shoreline (WVS) dataset.

Content - Features

This menu option permits the user to specify which groups of geographic features (undersea features, islands and/or place names) should be displayed upon subsequent contour plots as queryable symbols at the appropriate geographic locations. The colour assigned to symbols denoting features of each type may also be specified.

Content - Features - Select Feature Types

This menu option permits the user to specify which groups of geographic features (undersea features, islands and/or place names) should be displayed upon subsequent contour plots as queryable symbols at the appropriate geographic locations.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Features - Select Feature Types - Undersea Features

Activation of this menu option (which acts as an on/off toggle) will cause the nominal locations of undersea features (as referenced in the IHO/IOC Gazetteer of Geographical Names of Undersea Features) to be displayed upon subsequent contour plots as circular, queryable symbols at the appropriate geographic locations.

Linear features will be displayed as two or more symbols joined by a line which approximates the course of the feature.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Content - Features - Select Feature Types - Islands

Activation of this menu option (which acts as an on/off toggle) will cause the locations of oceanic and Antarctic islands to be displayed upon subsequent contour plots as triangular, queryable symbols at the appropriate geographic locations.

Please note that, in order to maximise positional accuracy, the symbol locations have been determined by reference to the World Vector Shoreline at its highest resolution. When viewed in conjunction with a coastline of lower source resolution (e.g. the 1:10,000,000 coastline digitised from the GEBCO charts) a slight discrepancy may be noticed between the location symbols and the coastline of some of the smaller islands that they denote.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Content - Features - Select Feature Types - Place Names

Activation of this menu option (which acts as an on/off toggle) will cause the locations of ports/cities (as portrayed on the GEBCO 5th Edition charts) and Antarctic stations to be displayed upon subsequent contour plots as square, queryable symbols at the appropriate geographic locations.

It should be stressed that the use of geographic names in the GDA must not be construed as having any legal or political connotation whatsoever. They are intended purely for geographic convenience and, in the case of undersea features, for encouraging the standardisation of names on nautical and bathymetric charts.

Content - Features - Assign Colours

This option permits the user to change the colour in which the symbols denoting different geographic features are plotted. Due to palette limitations imposed by the VGA display, only the colours blue, yellow, grey, red and white are available.

If changes are made using this option they will not be reflected in the display until the chart is redrawn by means of the 'Redraw' or 'Zoom' menus; a warning message is displayed until that time. This permits the user to change a number of options at one time without redrawing the screen after each individual change.

Content - Features - Assign Colours - Undersea Features

This option permits the user to change the colour in which the symbols denoting the location of undersea features are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for undersea feature symbols is white.

Content - Features - Assign Colours - Islands

This option permits the user to change the colour in which the symbols denoting the location of oceanic and Antarctic islands are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for island symbols is yellow.

Content - Features - Assign Colours - Place Names

This option permits the user to change the colour in which the symbols denoting the location of ports/cities and Antarctic stations are plotted on the display.

When the option is activated, a colour chart which displays the five available colours appears next to the menu item. The desired colour is selected by highlighting the appropriate entry on the colour chart and then clicking on the 'Confirm' box.

The default colour for place name symbols is red.

Content - Show Content

Activation of this option causes a text window containing a summary of the currently selected options to be opened on the display screen. Information is presented on the number of contour levels selected for display, the visibility status and source of trackline data, the source of coastline information, and the visibility status and display colour for each type of geographic feature.

The summary window is closed by pressing either mouse button.

Zoom

Menus under this option permit the user to zoom in to a selected area of the current display, and subsequently to reposition the 'zoom window' or to zoom back out. Facilities

are also offered to show the location and extent of the current zoom window in the context of the overall dataset area, and to specify whether the area selected during each zoom operation should be fully under user control or should have its height to width ratio adjusted automatically in order to fill the display screen with the resultant plot.

A ten level 'zoom memory' is incorporated, which stores 'Zoom - In' commands as they are issued. This permits the user to 'backtrack' to an earlier zoom level without returning to the full area display. The memory is wiped by the 'Zoom - Out' command.

Whenever a first level 'Zoom - In' command is executed, a copy is made of the full area screen before zooming. This is then used to provide a 'Zoom - Where Am I?' facility, which shows the limits of the current zoom window superimposed upon the full area chart, and as a base chart for the 'Zoom -Redefine' option which permits the selection of a new sub-area without the need to 'Zoom - Out'. If contour, coastline, trackline, feature, or projection selections are changed during the course of a session then the saved screen will display a different selection to that which is current; parity may be restored, if desired, by performing a 'Zoom - Out' operation to reset the stored screen to incorporate the currently selected settings.

Zoom - In

This option permits the user to zoom in to a selected area of the chart (i.e. to select an area of the current display which will then be enlarged to fill the available display area).

When the option is activated, control is returned to the Main Window, upon which the cursor appears as a cross with the subscript 'z'. One corner of the desired zoom box may be specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now disappear to be replaced by a 'ghost outline' of the zoom box, one corner of which is 'anchored' to the specified corner point. Movements of the mouse will move the diagonally opposite corner of the box, causing it to change in size. When the zoom box encloses the desired zoom area, it may be fixed by pressing the left-hand mouse button, upon which the display will immediately be redrawn with the selected area enlarged to fill the Main Window.

If the cursor is taken outside the Main Window during the zoom process, then the zoom box will be clipped to the edge of the currently displayed geographic area.

If the 'Zoom - Box Shape - Screen Proportions' option is active, then the user will have control over the size of the zoom box, but it will always retain a height to width ratio identical to that of the display area so that the resulting zoomed plot will fill the VDU screen.

When the first zoom after an initial plot of a dataset or after execution of the 'Zoom - Out' or 'Zoom - Maximum Out' commands is performed, the user may experience a slight delay as a copy of the full data area is made on disk for use by the 'Zoom - Where Am I?' option at a later time.

The zoom process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Zoom - Out

Selection of this option will cause the display immediately to zoom out to the maximum limits for the current dataset (i.e. the limits selected from the Area Selection Screen).

This option will not be available if the display area is currently set to the maximum geographic limits for the current dataset.

Zoom - Backtrack

Selection of this option will cause the display immediately to zoom out to the limits of the preceding zoom level. Up to 9 preceding zoom levels may be backtracked in this way.

This option will not be available if there is no preceding zoom level (i.e. if no 'Zoom - In' has been executed after an initial plot of a dataset or after execution of the 'Zoom - Out' command).

Zoom - Reposition

This option permits the user to reposition the zoom box within the area covered by the dataset without changing its size. Repositioning by up to 50% of the height and/or width of the current display area is permitted (providing that this would not take the zoom area outside the limits of the dataset).

On activation of this option the system returns immediately to the main display, upon which the current position of the zoom window is shown by a dashed 'ghost outline' with a 'crossed arrows' cursor at its centre (at this stage the ghost outline will be coincident with the borders of the Main Window). Movements of the mouse will cause the outline to be moved around the display; when it is located in the desired new position for the zoom window it may be 'fixed' by pressing the left-hand mouse button, upon which the display will immediately be redrawn to show the new zoom area.

This option will not be available if there is no current zoom level (i.e. if no 'Zoom - In' has been executed after an initial plot of a dataset or after execution of the 'Zoom - Out' command).

The repositioning process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Zoom - Redefine

This option permits the user to move to a new sub-area of the current dataset (i.e. to 'Zoom - In' to an area of the current dataset which may lie completely outside the current zoom area, without the need first to 'Zoom - Out').

When the option is activated, the current display is replaced by a copy of the initial (unzoomed) data area, with the limits of the current zoom area indicated by a flashing

rectangle. When the rectangle stops flashing (to be replaced by a fixed, grey outline) the cursor appears as a cross with the subscript 'z'. One corner of the redefined zoom box may be specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now disappear to be replaced by a 'ghost outline' of the zoom box, one corner of which is 'anchored' to the specified corner point. Movements of the mouse will move the diagonally opposite corner of the box, causing it to change in size. When the zoom box encloses the desired zoom area, it may be fixed by pressing the left-hand mouse button, upon which the display will immediately be redrawn with the selected area enlarged to fill the Main Display Window.

If the cursor is taken outside the Main Window during the zoom process, then the zoom box will be clipped to the edge of the currently displayed geographic area.

If the 'Zoom - Box Shape - Screen Proportions' option is active, then the user will have control over the size of the zoom box, but it will always retain a height to width ratio identical to that of the display area so that the resulting zoomed plot will fill the VDU screen. Please note that the proportions will be calculated according to the currently selected projection, and may therefore appear to be incorrect during zooming if the projection current when the base screen was saved differs from the current one.

The zoom process may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key.

Zoom - Precisely

This option permits the user to specify precisely the geographic limits of the zoom area for which data are to be displayed. The specified limits must lie within the base area selected from the Area Selection Screen.

The appropriate latitude and longitude limits may be keyed in directly from the keyboard, the <Tab> or <Enter> key being used to move on to the next input box in the sequence. Initially, active input boxes are available for degrees, minutes, seconds and hemisphere for each coordinate value. Boxes which are 'skipped' will be evaluated as zeros by the system. If a decimal point is keyed in as part of the degrees entry, then the minutes and seconds boxes for that coordinate will no longer be available for entry - the decimal degrees value being used instead.

Permissible values for latitude range from 90°S to 90°N, whilst those for longitude range from 360°W to 360°E. The extended longitude range permits the user to select areas which span the 180° meridian.

Coordinate entry may be aborted at any time by moving the cursor to the 'Cancel' box and pressing the left-hand mouse button.

When entry of the coordinates is complete, the designated area may be selected by highlighting the 'Confirm' box and pressing the left-hand mouse button. Control will then return to the main display screen, which will be redrawn to display data for the specified area.

If the 'Zoom - Box Shape - Screen Proportions' option is active, then it will be overridden by the coordinates entered under this option.

Zoom - Where Am I?

This option permits the user to establish the location of the current zoom window upon the overall data area selected from the Area Selection Screen. When the option is activated, the current display is replaced by a copy of the initial (unzoomed) data area, with the limits of the current zoom area indicated by a flashing rectangle.

If the user has selected new options for contours, coastlines, tracklines, features or projection whilst zoomed in, then the dataset shown on the 'Zoom - Where Am I?' screen will be that which was current at the time of the initial 'Zoom - In' command. [By zooming in only a minute amount and then changing options whilst maintaining the zoom level, this can offer a useful way of visually comparing two different selections by allowing them alternately to be displayed rapidly without the need to reselect and redraw the screen.]

This option will not be available if there is no current zoom level (i.e. if no 'Zoom - In' has been executed after an initial plot of a dataset or after execution of the 'Zoom - Out' command).

Zoom - Box Shape

This option offers the user a choice between full control of the shape and size of the zoom window during 'Zoom - In' or 'Zoom - Redefine' commands and control of size only, the software automatically adjusting the height to width ratio of the zoom box such that the resulting plot will completely fill the display area.

The selected option will become active the next time a 'Zoom - In' or 'Zoom -Redefine' command is executed.

Zoom - Box Shape - Defined During Zoom

Selection of this option causes the shape of zoom area selected during subsequent 'Zoom - In' or 'Zoom - Redefine' commands to be fully under user control (i.e. the user will be able, if desired, to select a 'tall thin' or 'short fat' zoom area which will only partially fill the display area when plotted).

If selected, this option will become active the next time a 'Zoom - In' or 'Zoom - Redefine' command is executed.

Zoom - Box Shape - Screen Proportions

Selection of this option causes the shape of zoom area selected during subsequent 'Zoom - In' or 'Zoom - Redefine' commands to be constrained to the same height to width ratio as the display area, so that the resulting plot will completely fill the display area. The size of the zoom box will remain under user control.

If selected, this option will become active the next time a 'Zoom - In' or 'Zoom - Redefine' command is executed.

Zoom - Show Limits

Selection of this option causes the system to display the geographic limits of the currently displayed geographic area.

The limits display may be closed by pressing either mouse button.

Redraw

This option causes the screen display to be erased and then redrawn. It permits changes (to the selection of contours, coastlines, tracklines, features, projection or colours) made under the 'Display' menus to be incorporated into the current display, without the need to perform an action under the 'Zoom' menu which would result in a change in the geographic area plotted.

Query

This option permits the user to query individual items within the current dataset in order to obtain additional information.

When an option under this menu heading is activated, the background to the menu heading changes from blue (or red when highlighted) to yellow, indicating that the system is currently in query mode, and the name of the type of display item selected for query is displayed there ('Contour?', 'Feature?' or 'Survey?').

Query - Contours

This option permits the user to query individual contour lines within the current dataset in order to determine their precise depth value. The option is particularly useful when a large number of depth levels is being displayed, since it permits the user to resolve potential ambiguities arising from the limited number of line colours/styles available (which necessarily means that the same display colour/style combination must be allocated to more than one depth level).

When the option is activated, the background to the 'Query' menu heading changes to yellow, indicating that the system is currently in query mode, and the heading 'Query' is replaced by the heading 'Contour?'. The mouse cursor appears as a cross with the subscript 'C'.

In order to query a contour line, the cursor is placed on (or near to) the line and the left-hand mouse button is pressed. The system will identify the nearest contour line to the cursor, a segment of the line will flash to confirm its selection, and the depth level associated with that contour will be displayed alongside.

The query mode is terminated by pressing the right-hand mouse button or the <Escape> key. Termination is indicated by the background to the menu heading changing from yellow to blue, with the heading 'Query' being restored.

Query - Features

This option permits the user to query individual features within the current dataset in order to obtain further information about them. The option is only available if at least one

feature type (Undersea Features, Islands or Place Names) is currently being displayed, and only those types of feature currently displayed will be scanned during the query process.

When the option is activated, the background to the 'Query' menu heading changes to yellow, indicating that the system is currently in query mode, and the heading 'Query' is replaced by the heading 'Feature?'. The mouse cursor appears as a cross with the subscript 'F'.

In order to query a feature, the cursor is placed on (or near to) the feature and the left-hand mouse button is pressed. The system will identify the nearest feature to the cursor, the symbol representing that feature will flash to confirm its selection, and the information relating to that feature will be displayed.

Islands and Place Names will respond to query with their name, and this will appear in a display window alongside the relevant symbol. For Undersea Features, however, a larger volume of information is offered, and this is presented in the Information Window; in this case the user may control the height of the window and its position within the display area by use of the commands under the 'Display - Info. Window' menu.

The query mode is terminated by pressing the right-hand mouse button or the <Escape> key. Termination is indicated by the background to the menu heading changing from yellow to blue, with the heading 'Query' being restored.

Query - Survey Boxes

This option permits the user to query survey boxes within the current dataset in order to determine their source reference.

When the option is activated, the background to the 'Query' menu heading changes to yellow, indicating that the system is currently in query mode, and the heading 'Query' is replaced by the heading 'Survey?'. The mouse cursor appears as a cross with the subscript 'S'.

In order to query a survey box, the cursor is placed within the box outline and the left-hand mouse button is pressed. The system will identify the box containing the cursor, the box outline will flash to confirm its selection, and the source reference(s) for that survey box will be displayed. The textual material is presented in the Information Window, and the user may control the height of the window and its position within the display area by use of the commands under the 'Display - Info. Window' menu.

The query mode is terminated by pressing the right-hand mouse button or the <Escape> key. Termination is indicated by the background to the menu heading changing from yellow to blue, with the heading 'Query' being restored.

Utilities

The Utilities menus offer the user facilities to perform the following functions:

- * Save the screen display to disk
- * Dump the screen display to a printer
- * Reset the Main Display Screen system defaults
- * Measure distances on the chart
- * Perform Carter's Tables echo-sounding depth corrections
- * Export data for the currently selected area to disk file
- * Display the current Atlas version number and release date

Utilities - Save Screen

This option permits the user to save the current screen display to a disk file either for later re-display outside the Atlas or for manipulation within a drawing or desktop publishing package.

Utilities - Save Screen - PCX File

This option causes the current display screen to be saved to disk in 16-colour PCX image (.PCX) file format, which is compatible with most drawing or desktop publishing packages. A slideshow display program which is compatible with this storage format is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.PCX' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

During the saving process, a countdown of the number of pixel rows yet to be processed appears in the top right-hand corner of the screen.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the PCX File save option may alternatively be activated at any time by pressing the key combination <Alt> + <F4>; this will cause the screen to be saved exactly as seen.

Utilities - Save Screen - GEM Image

This option causes the current display screen to be saved to disk in colour GEM image (.IMG) file format, which is compatible with many drawing or desktop publishing packages. A slideshow display program which is compatible with this storage format is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.IMG' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

During the saving process, a countdown of the number of pixel rows yet to be processed appears in the top right-hand corner of the screen.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the GEM Image save option may alternatively be activated at any time by pressing the key combination <Alt> + <F5>; this will cause the screen to be saved exactly as seen.

Utilities - Save Screen - Slideshow

This option causes the current display screen to be saved to disk as a graphics RAM dump. This is more rapid than saving as a PCX file or GEM image, but is less versatile outside the Atlas, and has a higher storage overhead. A slideshow display program which is compatible with this storage format (and also with the .PCX and .IMG formats) is supplied as part of the Atlas package, and permits a series of saved screens to be displayed in sequence, the display duration for each screen being set by the user.

You will be asked to supply the name of the disk file into which you wish the information to be stored (by supplying a full catalogue/ filestring you may specify any disk drive or directory). The file will always have the extension '.SLD' (if you enter a filename with an extension other than this, then the extension will be changed). The filename is checked for validity before saving begins; if it is not valid then an error message is issued and the save is aborted.

All pull-down menus and the mouse cursor are removed from the screen whilst the save is in progress. If you wish to save a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the slideshow save option may alternatively be activated at any time by pressing the key combination <Alt> + <F6>; this will cause the screen to be saved exactly as seen.

Utilities - Print Screen

This option permits the user to dump the current screen display to a printer or to a disk file for subsequent copying to a printer. The printer port or disk file to which output is directed will be the one specified in the system defaults file, and may be changed by the user by means of the setup program.

Utilities - Print Screen - Epson / IBM

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a monochrome image suitable for printing on an

Epson or IBM compatible dot-matrix printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen black is dumped as white, and all other colours are printed as black.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the Epson / IBM screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F1>; this will cause the screen to be dumped exactly as seen.

Utilities - Print Screen - HP Laserjet

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a greyscale image suitable for printing on an HP Laserjet compatible laser printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen black is dumped as white, and all other colours are printed as shades of grey through to black.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the HP Laserjet screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F2>; this will cause the screen to be dumped exactly as seen.

Utilities - Print Screen - HP Paintjet

This option causes the current display screen to be dumped to a printer (or to a disk file for subsequent copying to a printer) as a colour image suitable for printing on an HP Paintjet compatible inkjet printer. The printer port or disk file to which output is directed will be the one specified in the System Defaults file, and may be changed by the user by

means of the setup program. The printed image is orientated with its long axis running down the printed page ('landscape' orientation). Screen colours are dumped as displayed.

A check is made before printing to ensure that the destination device is ready to accept output; if this check fails, an error message is issued and the dump is aborted.

During printing, a countdown of the number of screen pixel rows yet to be processed appears in the top right-hand corner of the screen. The dump may be aborted at any time by pressing the <Escape> key.

All pull-down menus and the mouse cursor are removed from the screen whilst the dump is in progress. If you wish to dump a screen which has menus displayed, or has a feature of interest pointed to by the cursor, then the HP Paintjet screen dump option may alternatively be activated at any time by pressing the key combination <Alt> + <F3>; this will cause the screen to be dumped exactly as seen.

Utilities - Reset System

This option restores the display system to its default settings and colours (i.e. those normally set by the system at the start of a GEBCO Digital Atlas session). Items reset include:

- * Coastline source, resolution and colour
- * Contour selection, colours and display styles
- * Tracklines source, visibility and colour
- * Features selection and colours
- * Zoom level and box shape
- * Palette colours
- * Main window justification
- * Information Window height and position
- * Position Window visibility, position and format
- * Legend window visibility, position and format
- * Geographic grid on/off
- * Geographic projection

Utilities - Distance

This option permits the user to measure the cumulative distance along a multi-segment line on the displayed chart, the distance being expressed in terms of miles, nautical miles and kilometres. All distances are computed as the 'great circle' distance between turning points in the line (i.e. the shortest distance between those points on the surface of a sphere).

The user must ensure that no single line segment between turning points exceeds 180° of arc in length, otherwise the distance computed for that segment will not correspond to the track as displayed (e.g. if a segment of 200° of arc is drawn, then the shortest distance between its endpoints is along the remaining 160° of arc around the Earth's sphere, rather than along the line itself).

When the option is activated, control is returned to the Main Window, upon which the cursor appears as a cross with the subscript 'D'. The starting point for distance measurement is specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now disappear to be replaced by a 'rubber band' line, one end of which is 'anchored' to the specified starting point. Movements of the mouse will move the other end of the line, whilst the current 'on the ground' distance between the present position and the anchor point is continually displayed at the top of the display.

Turning points may be added to the line by pressing the left-hand mouse button whilst the line-end is at the desired location. The line is terminated by pressing the right-hand mouse button whilst the line-end is at the desired location; the distance display will then become fixed and the cursor will reappear.

Pressing the left-hand mouse button after a line has been terminated will cause the previous line to be removed from the display, and a new measurement line will begin from the current cursor position.

To end distance measurement and return to the normal display, press the right-hand mouse button at any time when the cursor is displayed; this will also cause the current measurement line (if any) to be removed from the display.

Utilities - Carter's Tables

This option permits the user to perform echo-sounding depth correction for a specified location using the Third Edition of the Echo-Sounding Correction Tables ("Carter's Tables").

When the option is activated, control is returned to the Area Selection Screen, upon which the cursor appears as a cross with the subscript 'E'. The location for echo-sounding depth correction is specified by positioning the cursor at the required location and then pressing and releasing the left-hand mouse button. The cursor will now become fixed at that location, and the number of the relevant depth correction area will be displayed at the top right-hand corner of the screen.

Once the cursor position has been fixed, the user may key in an observed depth in uncorrected metres; when the <Enter> key is pressed, the corrected depth is displayed alongside. A series of depth values may be entered in sequence for the same location, entry of the first digit of a new depth causing the numeric displays to clear.

Alternatively, corrected depths may be keyed in and the system will compute the corresponding uncorrected depth. The <Tab> key toggles between the two entry modes, with the current entry field being indicated by the location of the flashing numeric cursor.

Correction of depths for the current location is terminated by pressing the right-hand mouse button or the <Escape> key. The user may then reposition the cursor as above to make depth corrections for a new location, or may terminate depth correction and return to the Area Selection Screen by pressing the right-hand mouse button or the <Escape> key.

Utilities - Export

This option permits the user to export to hard or floppy disk a copy of the presently selected data for the current geographic area. The exported dataset will consist of:

- Coastlines from the currently selected source
- The currently selected bathymetric contour levels
- If 'selected', tracklines from the currently specified source

The system first performs a prescan of the data in order to determine the size of the export dataset, and then informs the user of the disk space requirement for either ASCII or DXF export formats (see the relevant information text under the 'Info.' menu for a description of the two formats), and offers the options to select an export format or to abort the export process.

If you elect to proceed with the export, then the system asks for the name of the disk file into which you wish the information to be exported (by supplying a full catalogue/filestring you may specify any disk drive or directory). The file will always have the extension '.ASC' for an ASCII format file or '.DXF' for a DXF format file (if you enter a filename with an extension other than these, then the extension will be changed). The filename is checked for validity before export begins; if it is not valid then an error message is issued and you will be offered the option to re-enter the filename. A warning is issued if the specified file already exists, or if the specified disk drive does not have sufficient free space.

During the export process, the percentage completion is displayed as an indication of progress.

Utilities - Version

This option displays the version number and release date of the Atlas software. The latest version of both software and CD-ROM data files is always available from:

**GEBCO Help Desk,
British Oceanographic Data Centre,
Proudman Oceanographic Laboratory,
Bidston Observatory,
Birkenhead,
Merseyside L43 7RA**

Telefax: 44 (51) 652 3950 Internet: BODCMail@UA.NBL.AC.UK

The version number and release date display may be closed by pressing either mouse button.

Info.

This option permits the user either to view descriptive text for the currently selected datasets on the display screen, or to direct a copy of the text to a printer or print file.

Information is offered only for those datasets which are both currently selected and are relevant to the selected area.

When the option is activated, a box containing a list of available information topics, one per line, opens upon the display area. The user may specify the text to be viewed or printed by first pointing to the appropriate line with the mouse cursor and pressing the left-hand mouse button to highlight it, and then selecting the 'View' or 'Print' options from the foot of the selection box.

If the 'View' option is selected, the text will be displayed in the Information Window. If the amount of text exceeds the capacity of that window, it will be displayed in 'pages'; in this case the word 'More' will appear at the bottom right-hand side of the Information Window, and the user may cause the next 'page' of text to be displayed by pointing to the 'More' box with the cursor and pressing the left-hand mouse button. The information display for a specific topic may be abandoned at any time by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button while the 'More' box is not highlighted.

The 'Print' option permits the user to direct the descriptive text for the current dataset to a printer connected to the serial or parallel ports, or to a file for printing at a later time (the print destination being defined in the System Defaults file; see your User Guide for more information on the System Defaults file).

As far as possible, the descriptive text has been written in a manner which permits it to be listed on any printer which is capable of printing 80 characters per line (line length within the descriptive text is a maximum of 70 characters, and a left-hand 'binding margin' is added to the printout). In some instances, however, it has been necessary to use special characters from the IBM character set in order to include symbols in the text. It is therefore recommended that the printer (if it is not an IBM) be run in IBM Proprinter compatibility mode in order to reproduce these characters correctly.

When text viewing or printing is complete, select the 'Cancel' button to return to the Main Display Screen.

Quit

Options under this menu cause the system to terminate plotting, and to return the user either to the Area Selection Screen or to the DOS prompt.

The Quit option may be aborted by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button whilst outside the menu.

Quit - Partial

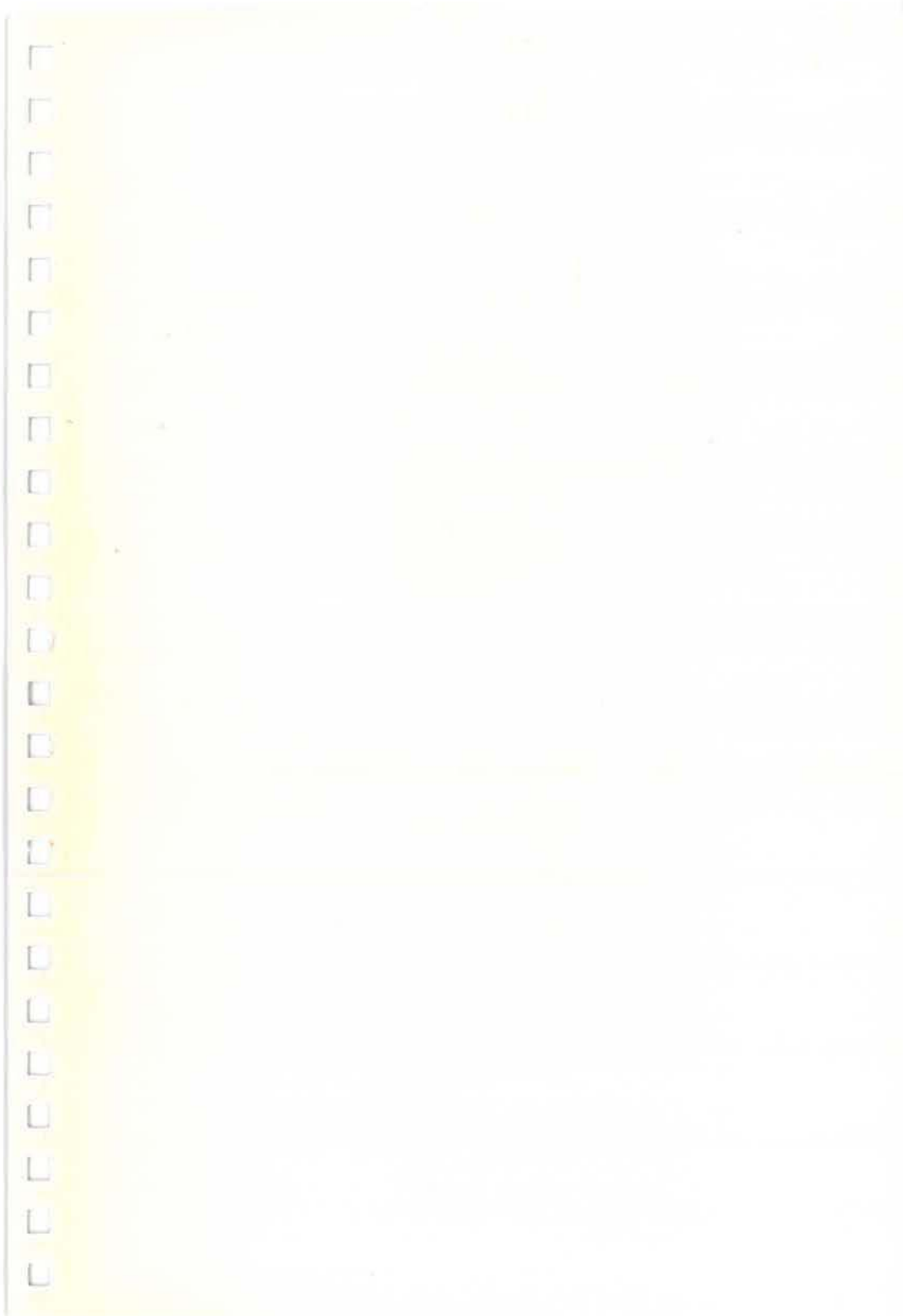
Activation of this option causes the system to terminate plotting, and to return the user to the Area Selection Screen so that a new geographic base area may be selected.

The option may be aborted by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button whilst outside the menu.

Quit - To DOS

Activation of this option causes the GEBCO Digital Atlas session to terminate, and to return the user to the DOS prompt.

The option may be aborted by pressing the right-hand mouse button or the <Escape> key, or by pressing the left-hand mouse button whilst outside the menu.





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