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SPECIFICATION FOR MAPPING

at scales between 1:1,000 and 1:10,000

FIRST EDITION

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prepared by a working group of the Royal Institution of Chartered Surveyors and the British Air Survey Association and presented by

J.D. Leatherdale

ABSTRACT

This specification for mapping has been designed for use worldwide as a general specification for contract mapping. Optional and alternative clauses are included to cover most common requirements but individual users may wish to make their own additions and deletions to satisfy their particular needs.

Drafts of this specification have been widely circulated around the world and the many constructive comments received have been used to prepare this edition.

This Specification may be used without acknowledgement and comments for consideration in preparing future editions are welcomed by the R.I.C.S. working group.



The Royal Institution of Chartered Surveyors

12 Great George Street, Parliament Square, London SW1P 3AD

SPECIFICATION FOR MAPPING AT SCALES BETWEEN 1:1,000 AND 1:10,000

INTRODUCTION

This Specification for mapping has been designed for general use in contract mapping around the world at scales between 1:1,000 and 1:10,000.

Where possible this Specification defines the products to be delivered rather than the survey methods to be used. Clients should select the scale, accuracies and content of the mapping to satisfy their requirements, leaving contractors to select the survey methods which will achieve these specifications both reliably and economically. It may be broadly assumed that most mapping within this range of scales is likely to involve some combination of ground and air survey methods. Particular requirements or circumstances may be better suited to ground survey methods, as for instance where high accuracy and limited information are required, or to a maximum use of air survey methods where access, cost or time for work on the ground have to be severely restricted. This Specification enables clients to define precisely what they need, no more and no less, and permits contractors to use the most efficient current techniques available to achieve these requirements.

Clients should be aware that the cost of mapping generally escalates rapidly with increasing scale and increasing accuracy requirements. Higher accuracies and closer contour intervals usually increase the cost of mapping very substantially and clients are well advised to consider carefully what scale, contour interval and accuracies are really necessary to satisfy their requirements.

The following table suggests suitable combinations of map scales, contour intervals and accuracies (given as standard errors or root mean square errors) which are usually economic to produce by air survey methods under normal circumstances:

Map Scale	Contour Interval metres	Spot Height Accuracy r.m.s.e. metres	Planimetric Accuracy r.m.s.e. metres
1:1,000	0.5	+ 0.12	+ 0.3
1:2,000	1	+ 0.25	+ 0.6
1:5,000	2	+ 0.5	+ 1.5
1:10,000	5	+ 1.25	+ 3.0

Closer contour intervals and increased accuracies can be achieved by air survey methods but the cost is likely to increase rapidly. Where much closer contour intervals or much increased accuracies are required for a given mapping scale, ground survey methods may be more appropriate.

Where air survey methods are adopted this Specification provides for ground control to achieve the specified accuracies, plotting of map detail and contours and spot heights as visible on the aerial photography, with the option to add additional information by field completion. The detailed specification for aerial photography may be left to the discretion of the contractor or alternatively the separate "Specification for vertical air photography" issued by the R.I.C.S. may be used.

Where ground survey methods are adopted this Specification remains valid except that the additional information listed in section 10 may be collected at the same time as the planimetry, contours and spot heights listed in sections 7, 8 and 9.

The presentation of the final maps is defined to avoid misunderstanding between client and contractor as to the standard and content which is expected for conventional line mapping, but it is considered neither desirable nor possible to enforce standard styles of presentation throughout the world. It is suggested that clients should either supply a sample map showing the style of presentation required or ask the contractor to submit a sample sheet from a comparable project. Clients requiring photomaps, digital maps, or other products should attach separate specifications for these items and delete the clauses in this Specification which are not required.

This Specification may be used as a contract document for general mapping requirements by adding appendices and deleting clauses which are not applicable, or it may be used more selectively as a guide for writing a specification for mapping projects with more specialised requirements. Most common requirements for contract mapping within this range of scales are accommodated by providing optional and alternative clauses, and spaces for inserting additional requirements or appendices.

OPTIONAL clauses and additional requirements which are only required in special circumstances are printed in italics and should be omitted from the contract except where individual clauses are clearly indicated as being included.

ALTERNATIVE clauses are clearly labelled EITHER/OR to indicate that a choice must be made. The simplest alternative is listed first and the most elaborate, and probably the most expensive, is listed last. The most common or recommended alternative is printed in normal type shall be adopted except where alternative clauses in italics are clearly marked to be included instead.

Earlier drafts of this Specification were prepared by a working group set up by the British Air Survey Association and copies were sent to fifty individuals in eighteen countries for comment. Many valuable suggestions have been received which have been used to amend this edition which has been prepared and issued by the Royal Institution of Chartered Surveyors.

It is hoped that users commissioning mapping projects around the world will find this Specification useful. Comments are welcomed and should be sent to the Mapping Specifications Working Group, The Royal Institution of Chartered Surveyors, 12 Great George Street, London. SW1P 3AD. England.

SPECIFICATION FOR MAPPING

NAME OF PROJECT
CONTRACT REFERENCE
PURPOSE OF PROJECT
.....
.....

1 SCOPE OF WORK

1.1 MAPPING is required at the scale of 1:.....
with contours at a vertical interval of metres/feet.

1.2 MAPPING AREA

The area to be mapped is defined on the map, *diagram, photomosaic or by the list of coordinates*, attached as Appendix measuring square kilometres/hectares/square miles/acres approximately.

1.3 CONTRACTUAL OPERATIONS

The work involves the following operations:
(DELETE ITEMS NOT REQUIRED TO BE PERFORMED BY THE CONTRACTOR).

- aerial photography
- ground control
- permanent marks
- photogrammetric mapping or ground survey
- reproductions of original plots
- additional information
(including field completion of photogrammetric plots)
- cartographic drawing
- reproductions of final map sheets
- lithographic printing*
- additional requirements and products (specified in section 13)*

.....
.....

2 MATERIALS TO BE DELIVERED

All correspondence and materials shall be despatched to the following address:

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

Client's Representative
Telephone Number Telex Number

All materials shall be despatched by post or air freight except where special instructions are given below:

.....
.....

DELIVERIES - DELETE ITEMS NOT REQUIRED

- 2.1 sets of contact prints of the aerial photography.
- 2.2 copies of an index plot *or print laydown* of the photography.
- 2.3 One set of descriptions, coordinates and heights of permanently marked ground survey stations.
- 2.4 One set of descriptions and heights of permanent bench marks.
- 2.5 One set of stable base transparencies of the preliminary plots reproduced in reverse by vacuum frame on diazo or photographic material as specified in clause 11. (b)
- 2.6 *additional paper copies of 2.5.*
- 2.7 Two sets of paper proofs of the master border, diagram of the layout of sheets, and the fair drawn sheets. One set of these proofs shall be returned to the contractor with any corrections which the client requires to be incorporated in the final maps.

2.8 DELIVERIES OF FINAL MAP SHEETS.

..... sets of transparencies printed on stable base material using a vacuum frame shall be reproduced from:

EITHER (a) *original plots as specified in clause 11. (c) by diazo, photographic or photo-mechanical processes as a positive printed on the reverse side ("wrong reading").*

OR (b) *improved original plots as specified in clause 11. (d) by photographic or photo-mechanical processes as a positive printed on the reverse side ("wrong reading").*

OR (c) *final maps of a high cartographic standard as specified in clause 12.(b) by photographic or photo-mechanical processes as a positive on material with matt drawing surfaces on both sides. The border, grid and detail shall be printed in solid black with the contours screened. Spot heights shall be printed EITHER in solid black OR screened as specified in clause 12.5. The image shall be printed EITHER on the reverse side ("wrong reading") OR forward facing.*

OR (d) *final maps of a high cartographic standard as specified in clause 12.(b) to the following specification:*

- positive transparency* OR *negative*
(clear image on opaque background)
- matt* OR *clear film*
- reverse (wrong reading)* OR *forward facing (right reading)*
- combined* OR *.....separations*
border, grid detail, contours and spot heights shall be printed with the following separations, screens and masks:

.....
.....

2.9 DUPLICATE PAPER COPIES

..... *sets of paper diazo copies of the final maps with border, grid, detail, contours and spot heights combined as applicable.*

2.10 LITHOGRAPHIC PRINTING

*One set of plastic colour proofs to be returned to the contractor with any corrections to be incorporated in the final maps.
..... paper copies of each sheet litho printed in colours on
..... weight of paper of type.*

2.11 ADDITIONAL PRODUCTS AND MATERIALS TO BE DELIVERED

List additional items to be delivered as specified in section 13.

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

2.12 WORKING MATERIALS

Original working materials such as ground control results, original photogrammetric instrument plots and original final drawings shall be:

EITHER (a) retained by the contractor for at least 18 months after completion of the contract and may be disposed of thereafter.

OR (b) delivered to the client on acceptance of the final maps.

3 SURVEY METHODS

3.1 The contractor shall use techniques, equipment and materials which are capable of achieving the accuracies and standards specified for the final products.

3.2 The contractor shall employ staff experienced in the various tasks to be performed. Trainees may be employed if properly supervised.

3.3 The client shall be entitled to inspect the work in progress at any time and may request a written description of the techniques, equipment and staff to be employed on the project.

4 AERIAL PHOTOGRAPHY (WHERE APPLICABLE)

EITHER (a) The mapping shall be prepared from existing photography and EITHER the original films OR prints and diapositives shall be supplied to the contractor.

OR (b) The contractor shall fly aerial photography of a scale and quality suitable for the preparation of the maps and other products specified under this contract.

OR (c) The contractor shall fly aerial photography to the specification given in Appendix to obtain stereoscopic coverage of EITHER the mapping area defined in clause 1.2 OR the area defined in Appendix

5 GRID & HEIGHT DATUM

5.1 Ground control and mapping shall be connected to and in terms of:

EITHER (a) the national grid in metres/feet

OR (b) *the Universal Transverse Mercator grid (UTM) in metres*
zone
spheroid
datum

OR (c) *a local plane rectangular grid in metres/feet*

OR (d) *the grid projection specified below in metres/feet:-*
projection
spheroid
datum
coordinates of origin
central meridian/standard parallel
false coordinates of origin
scale factor

5.2 All heights and contours shall be related to the following height

datum in metres/feet
.....
.....

6 GROUND CONTROL

EITHER (a) *Existing control available to the Contractor shall be used.*

OR (b) *The client shall establish ground control to a pattern and accuracy to be agreed with the contractor.*

OR (c) *The contractor shall establish ground control as specified in this section 6 for mapping either by air survey or ground survey methods. The density of control points shall be sufficient to achieve the mapping accuracies specified in clauses 7.1, 8.1, and 9.1.*

6.1 *The client may request a diagram to be submitted for approval showing the planned density and pattern of plan and height control points. The agreed density of points shall not be reduced without the approval of the client.*

6.2 PLAN CONTROL

EITHER (a) New plan control points shall be established to an accuracy throughout the mapping area of better than one part in 10,000 as determined by loop closures or other redundant observations.

Adjacent control points shall be in sympathy with each other to a root mean square error of better than ± 0.1 mm at map scale. (90% of a representative sample of points shall be in sympathy with adjacent points to better than 0.2 mm at map scale).

Where mapping is to be based on existing control of lower accuracy, any new points shall be established and adjusted into sympathy with the existing net to comparable accuracy.

OR (b) *plan control shall be established as specified in Appendix.....*

6.3 HEIGHT CONTROL

EITHER (a) Where new height control points are established, adjacent points shall be in sympathy to better than one tenth of the specified contour interval, and all height points shall be in sympathy with existing bench marks or a reference bench mark to better than one third of the specified contour interval.

Where mapping is to be based on existing bench marks of lower accuracy, height control points shall be established and adjusted into sympathy with the existing bench marks to comparable accuracy.

OR (b) *Height control shall be established as specified in Appendix.....*

6.4 PERMANENT MARKS (MONUMENTS)

EITHER (a) *Ground control stations are not required to be permanently marked on the ground.*

OR (b) Main survey stations, such as traverse stations and bench marks, shall be permanently marked on the ground to the designs specified in Appendix, except where this is impracticable. Photopoints are not required to be permanently marked.

OR (c) *Permanent ground markers (PGMs) shall be constructed to the designs specified in Appendix, except where this is impracticable, and at an approximate density of*
.....
.....

6.4.1 Permanently marked planimetric stations shall be plotted and numbered on the final maps; descriptions, coordinates (and heights) shall be supplied to the client. Descriptions and heights of permanent bench marks shall be supplied to the client.

6.4.2 The contractor may modify the construction of permanent marks to suit local conditions, with the agreement of the client. In unstable ground such as swamps and drifting sand dunes it may not be possible to construct permanent marks.

7 PLANIMETRY

Where mapping is being undertaken using air survey methods, topographical features which are clearly apparent on the air photographs and which can be depicted at publication scale shall be shown on the final maps as specified in this section 7. Only those features listed in Section 10 are required to be completed by ground methods.

Where mapping is being undertaken entirely by ground survey methods, the topographical features specified in this section 7 and the additional features specified in section 10 shall be surveyed and shown on the final maps.

7.1 PLANIMETRIC ACCURACY

7.1.1 Grid lines and control points shall be drawn to an accuracy better than ± 0.2 mm root mean square error. (90% of grid intersections shall be within 0.3 mm).

An additional tolerance for shrinkage of stable base materials shall be permitted. Provided final transparencies are stored carefully at a temperature of around 20°C and a relative humidity of around 50%, stable base materials should remain dimensionally correct within 0.3 mm in one metre.

7.1.2 Well defined points of detail shall be plotted in their true positions at map scale to better than ± 0.3 mm root mean square error, when coordinates are scaled off the map from the nearest grid lines and compared with coordinates determined by precise measurement on the ground from the nearest control point. (90% of a representative sample of well defined points shall be within 0.5 mm).

DETAIL TO BE SHOWN ON THE FINAL MAPS

7.2 BUILDINGS AND STRUCTURES

7.2.1 Permanent buildings larger than 6 square millimetres at map scale shall be shown:

EITHER (a) by roof-lines

OR (b) *by ground-lines (plinths) at scales larger than 1:2000.*

7.2.2 Smaller buildings may be generalised or omitted as appropriate. Ruins, partially demolished buildings, buildings under construction, and other structures shall be shown in outline. Glasshouses larger than 8 square millimetres at map scale shall be distinguished by cross hatching.

7.3 BOUNDARIES

Walls, hedges, fences and similar field boundaries shall generally be shown by single lines representing the centre of the physical boundary as interpreted from the air photographs,

EXCEPT AT SCALES BETWEEN 1:1000 and 1:1250 where walls thicker than one metre shall be shown by double lines and hedges shall be shown by conventionalised canopy symbols.

Administrative boundaries shall not be shown unless specified as a special requirement in Section 13.

7.4 ROADS, TRACKS AND FOOTPATHS

Road edges or kerb lines shall be surveyed except at scales around 1:10,000 where widths may be conventionalised according to the road category.

Tracks shall be shown either with conventionalised widths or surveyed edges where these are clearly defined and wide enough to plot at map scale.

Footpaths shall be shown either by single broken lines, or conventionalised widths or surveyed edges.

Drives, and tracks in private properties shall be shown only where they exceed fifty metres in length.

7.5 RAILWAYS

Railway tracks shall be shown EITHER by the gauge width OR by conventional symbols.

Railway stations, buildings, bridges, and level crossings shall be shown, but other railway installations shall be omitted unless specified as additional features in clauses 7.10 and 10.6.

7.6 TRANSMISSION LINES, PIPELINES, MASTS AND POLES

Pylons and masts shall be shown to scale or by conventional symbols.

Surface pipelines shall be shown by conventional symbols.

Electricity poles which are significant topographical features shall be shown at scales of 1:2500 and larger outside urban areas.

7.7 WATER, DRAINAGE AND COASTAL FEATURES

Rivers, streams, canals and ditches shall be shown by double or single lines as appropriate to their width and scale. Intermittent streams and wadi beds where significant shall be shown by broken lines.

Where rivers and other water features are obscured by trees, the approximate outline shall be shown by broken lines.

Lakes, ponds lagoons and reservoirs shall be shown by the water line at the time of photography or ground survey.

Wells, springs, waterfalls, dams, weirs, sluices, locks and fords shall be surveyed in outline or indicated by symbols or annotations as appropriate.

The sea shoreline shall be shown by

EITHER (a) the water line at the time of photography or ground survey.

OR (b) *the metres/feet contour line.*

OR (c) *the approximate high water mark.*

OR (d) *the water level in metres/feet related to datum.*

Major features such as mud, sand, shingle, boulders, rocks, cliffs, swamps and marshes shall be indicated appropriately by symbols or annotations.

Piers, jetties, slipways, harbour walls, fixed cranes, breakwaters, groynes, and lighthouses shall be surveyed in outline or shown by symbols as appropriate to the scale.

7.8 TERRAIN, VEGETATION AND LAND USE CLASSIFICATIONS

EITHER (a) The representation of major types of terrain, vegetation and land use shall be limited to simple classifications of significant and extensive topographical features. Features shall be shown by symbols or annotations as appropriate.

Terrain features to be shown shall include rock outcrops, cliffs, sand dunes, swamps and marshes.

Vegetation and land use features to be shown shall be limited to major categories of woodland, bush, scrub, cultivation, orchards, and plantations as appropriate.

AT SCALES BETWEEN 1:1000 and 1:1250 ONLY, woodland and large isolated trees shall be shown by the extent of the canopy. Tree trunks are not required to be shown. Orchards and plantations shall be shown by conventionally spaced symbols, or by annotations.

AT 1:2000 AND SMALLER SCALES, woods shall be shown either by the canopy or by conventional symbols. Scattered trees shall be represented by scattered symbols, and only prominent isolated trees shall be shown individually.

Man-made features to be shown shall include open cast mines, quarries, tips, cemeteries, parks and recreation grounds.

OR (b) *As (a) with the following additional classifications:*

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

OR (c) *Terrain, vegetation and land use types shall be classified and represented on the maps as specified in Appendix.....*

NAMES AND ANNOTATIONS

7.9 Names of places, districts, streets and prominent buildings shall be shown

in English or

EITHER (a) taken from existing maps.

OR (b) *Supplied by the client.*

OR (c) *collected on the ground as specified in section 10.*

8 CONTOURS

EITHER (a) *No contours are required,*

OR (b) Contours shall be shown at a vertical interval of metres/feet as specified in this section 8.

8.1 Contours shall be correct to a root mean square error of better than one third of the contour interval where a representative sample of points on contour lines is checked by precise measurement from the nearest control point. (90% of a representative sample shall be correct to better than half the specified contour interval.)

Any contour which can be brought within this vertical tolerance by moving its plotted position in any direction by not more than 0.5 mm or one tenth of the horizontal distance between contours, whichever is the greater at map scale, shall be considered acceptable.

8.2 Where, because of trees, vegetation or other obstructions, the ground is not visible on the air photographs or ground survey is restricted:

EITHER (a) contours shall be shown as broken lines to indicate that the accuracy stated in 8.1 cannot be guaranteed.

OR (b) *contour accuracy stated in 8.1 shall be maintained by height measurement on the ground except in areas of dense trees or vegetation, requiring extensive line clearing before surveying.*

OR (c) *contours in areas of dense trees or vegetation shall be interpolated between lines of height points surveyed on the ground along cleared lines at intervals ofmetres/feet, and the contour accuracy specified in 8.1 shall not apply.*

9 SPOT HEIGHTS

EITHER (a) *No spot heights are required*

OR (b) Spot heights shall be supplied on the final maps as specified in this section 9.

9.1

EITHER (a) Spot heights shall be correct to a root mean square error of better than one quarter of the specified contour interval where a representative sample is checked by precise measurement from the nearest control point. (90% of a representative sample shall be correct to better than two fifths of the specified contour interval.)

OR (b) *Spot heights shall be supplied to an accuracy of \pm metres \sqrt{K} where K is the distance in kilometres from the nearest control point.*

- 9.2 Spot heights shall be shown in the following positions, except where the ground is obscured by vegetation or other obstructions:
- at salient points such as hilltops, bottoms of depressions and saddles.
 - at significant changes of gradient along the centre line of through roads, generally at intervals of between 30 and 120 mm at map scale.
 - in flat areas (where the horizontal distance between contours generally exceeds 50 mm at map scale) at intervals between 50 and 100 mm at map scale.
 - at the locations or densities specified below:

.....

10 ADDITIONAL INFORMATION (INCLUDING FIELD COMPLETION OF PHOTOGRAMMETRIC PLOTS)

The additional information listed in this section 10 shall be collected by ground survey or from reliable sources and shown on the final maps.

EITHER (a) *No additional information is required.*

OR (b) *The client shall plot the additional information listed in this section 10 on copies of the preliminary plots and return these to the contractor to prepare the final maps.*

OR (c) The contractor shall collect the additional information listed in this section 10 and show the information on the final maps. Where air survey methods are being used changes since the date of photography are not required to be shown.

OR (d) *As clause (c) but planimetric detail and additional information to be shown shall be updated to the time of collection of the additional information.*

10.1 The client shall obtain the permissions necessary to enter private property and restricted areas. The work shall be limited to collecting information which can be obtained without entering areas for which authorisation has not been provided.

Field completion shall be carried out without causing damage. The permission, cost and compensation involved in cutting trees, bush and crops to clear survey lines shall be arranged by the client at no cost to the contractor.

10.2 ADDITIONAL INFORMATION TO BE SUPPLIED AT ALL SCALES (DELETE ITEMS NOT REQUIRED)

- Names of districts, towns, villages, rivers, physical features, major roads, public buildings.
- Classification of roads, tracks and visible surface pipelines.
- Simple classification of major types of terrain such as rock, sand dunes and swamp, including the following:

- Simple classification of major types of vegetation and land use such as woodland, scrub, cultivation and orchard, including the following:

- Simple annotation of man-made features such as mines, quarries, tips, cemeteries and parks, including the following:

.....

- Plotting bridges, culverts, distance markers, wells, and other major landmarks including the following:

.....

10.3 ADDITIONAL INFORMATION TO BE SUPPLIED AT 1:2500 AND LARGER SCALES (DELETE ITEMS NOT REQUIRED)

- letter boxes, telephone call boxes, fire hydrants.
- buildings (larger than 6 square millimetres at map scale).
- archways in buildings where more than 3 m in width and visible from a public access.
- Power lines of over 11,000 volts outside urban areas. Individual pylons shall be shown.

10.4 ADDITIONAL INFORMATION TO BE SUPPLIED AT SCALES BETWEEN 1:1250 AND 1:1000 (DELETE ITEMS NOT REQUIRED)

- archways in buildings where more than 2 m in width and visible from a public access.
- gates more than 3 m in width.
- pylons and poles of power lines of over 11,000 volts outside urban areas.
- public taps and standpipes.
- *ground lines (plinths) of buildings shall be shown on the final maps instead of roof-lines only where specified in clause 7.2.1. (b).*

10.5 ADDITIONAL FEATURES TO BE SHOWN

The following additional features shall be surveyed and shown on the final maps:

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

11 REPRODUCTIONS OF ORIGINAL PLOTS

The following reproductions of the original plots prepared either at the photogrammetric instruments or from the ground surveys shall be supplied:

EITHER (a) *No reproductions of the original plots are required.*

OR (b) PRELIMINARY PLOTS.

Where specified in clauses 2.5 and 2.6, sets of reproductions of the original plots shall be delivered as proofs before field completion and preparation of the final drawings. The proofs shall be neat and readable; annotations and values may be hand written, but the style of presentation and sheet layout are not required to conform to the specification for the final maps.

OR (c) FINAL MAPS REPRODUCED FROM ORIGINAL PLOTS.

Where specified in clause 2.8 (a) sets of reproductions of the original plots shall be delivered as the final maps without field completion or final drawing.

Plots shall be completed to a legible standard with the sheet number, scale, date of photography and contour interval shown on each sheet. Names, annotations, grid and height values may be written neatly by hand.

Where contours are specified, thicker index contours shall be shown at multiples of metres/feet, and contour values reading up the slope, shall be neatly written by hand at a density sufficient to identify all contours without ambiguity. On steep slopes intermediate contours may be omitted where they are generally closer than 1 mm apart at map scale.

The size and layout of the final maps shall be selected by the contractor to cover the mapping area with the minimum number of sheets, not exceeding AO size (841 mm x 1189 mm) overall.

The style of presentation, provided the maps are neat and legible, shall be at the discretion of the contractor.

OR (d) FINAL MAPS REPRODUCED FROM IMPROVED ORIGINAL PLOTS.

Where specified in clause 2.8 (b) sets of reproductions of the original plots, completed to a high standard with stencilled or type-set names, annotations, grid and height values, shall be delivered as the final maps without field completion or final drawing.

Contours where specified, shall be drawn in ink or scribed or produced by automated plotter and thicker index contours shall be shown at multiples of metres/feet. Contour values reading up the slope shall be stencilled or type-set at a density sufficient to identify all contours without ambiguity. On steep slopes intermediate contours may be omitted where they are generally closer than 1 mm apart at map scale.

The size and layout of the map sheets shall be agreed with the client to cover the mapping area with a convenient and economical number of sheets, not exceeding AO size (841 mm x 1189 mm) overall, and without duplicating detail in overlaps.

The sheets shall be printed in a border showing the following information:-

- *sheet number*
- *scale*
- *north arrow*
- *grid values*
- *contour interval and height datum*
- *compilation note*
- *client's address*
- *contractors acknowledgement*

The style of presentation shall be at the discretion of the contractor, provided the maps are neat and the transparencies are suitable for the reproduction of diazo paper copies.

12 PRESENTATION OF FINAL MAPS

EITHER (a) *The final maps shall be reproduced direct from the original plots as specified in section 11 and no additional cartographic drawings are required.*

OR (b) *The final maps shall be produced to a high cartographic standard in ink or by scribing or by automated cartography as specified in this section 12.*

12.1 SHEET LAYOUT

EITHER (a) *The size and layout of the final maps shall be selected by the contractor to cover the mapping area with the minimum number of sheets, not exceeding A0 size (841 mm x 1189 mm) overall.*

OR (b) *The final map sheets shall be of generally uniform dimensions, not exceeding A0 size (841 mm x 1189 mm) overall. Oversized sheets, outriggers, and insets may be used only with the approval of the client. Large blocks of sheets shall be aligned parallel to the grid and butt joined with the sheet edges coinciding with round figure grid values.*

For irregular shaped areas and route surveys the sheets may be skew to the grid and where there is a change of orientation between adjoining sheets the joins shall be indicated by cut lines without duplicating detail in overlaps.

OR (c) *The size and layout of the final sheets shall be as specified in Appendix*

12.2 BORDER

The following information shall be shown in the margin of each sheet:

- *sheet number and title*
- *scale bar and representative fraction*
- *north arrow*
- *grid values*
- *contour interval and height datum*
- *compilation note*
- *index to adjacent sheets*
- *client's name*
- *contractor's acknowledgement*
- *a legend if requested*

12.3 GRID

The grid shall be drawn across the face of the maps:

EITHER (a) as continuous lines *or intersections* at 100 mm intervals for 1:1000, 1:2000, 1:5000 and 1:10,000 scales or at 80 mm intervals for 1:1250 and 1:2500 scales.

OR (b) *as specified in Appendix*

12.4 PRESENTATION

EITHER (a) The style of presentation of the final maps, including conventional signs, line widths and styles, type sizes and styles, shall be selected by the contractor to suit the particular circumstances.

All names, annotations and values shall be EITHER typeset OR *stencilled*.

On request the client shall be supplied with a sample legend and sample map sheet of a similar project showing the style of presentation for approval before mapping commences.

OR (b) *The final maps shall be produced to the drawing specification or sample map attached as Appendix*

12.5 CONTOURS AND SPOT HEIGHTS

Contours, where specified, shall be produced to a high cartographic standard. Contour values shall read up the slope, at a density sufficient to identify all contours without ambiguity. Thicker index contours shall be shown at multiples of metres/feet. Slopes shall be shown by contours or by slope or cliff symbols as appropriate.

Depression contours shall be distinguished either by an arrow pointing downhill, or by ticks on the lower side of the bottom contour, or by a spot height value at the lowest point.

Spot heights, where specified, shall be shown EITHER on the detail separations OR *on the contour separations*.

13 SPECIAL REQUIREMENTS

Specifications for additional requirements and products are attached as Appendix

(such items as aerial triangulation results, photomosaics, orthophotomapping, Digital Terrain Models, profiles, digital data, and derivative mapping at smaller scales should be inserted in this section as required).

14 MATERIALS AND ASSISTANCE TO BE PROVIDED BY THE CLIENT

The client shall provide the following assistance, information and materials to the contractor and shall not hold the contractor responsible for any delays in the delivery of the work caused by delays in receiving any of these items:

(LIST OR DELETE ITEMS AS REQUIRED)

- 14.1 Assistance in obtaining flying permits, visas, work permits, access to land, and other permits or authorisations:-
.....
.....
- 14.2 Supplying Information:
All instructions necessary to complete the work:-
.....
.....
- 14.3 Returning proofs of map sheets, sheet layouts and borders with corrections and approval to proceed with the subsequent production stages within two weeks of receipt.
- 14.4 Other items:-
.....

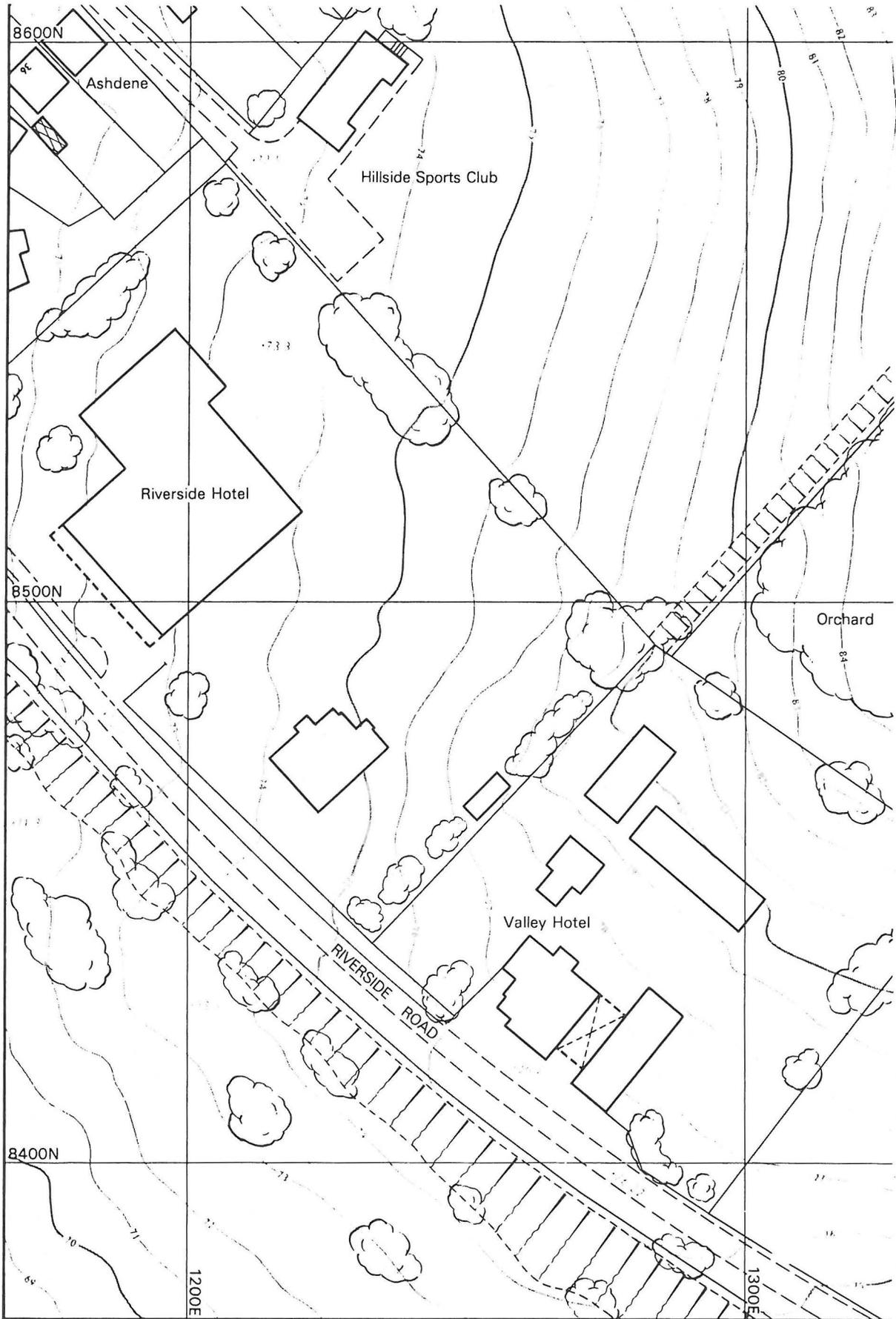
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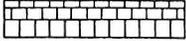
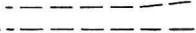
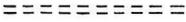
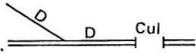
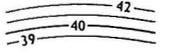
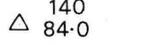
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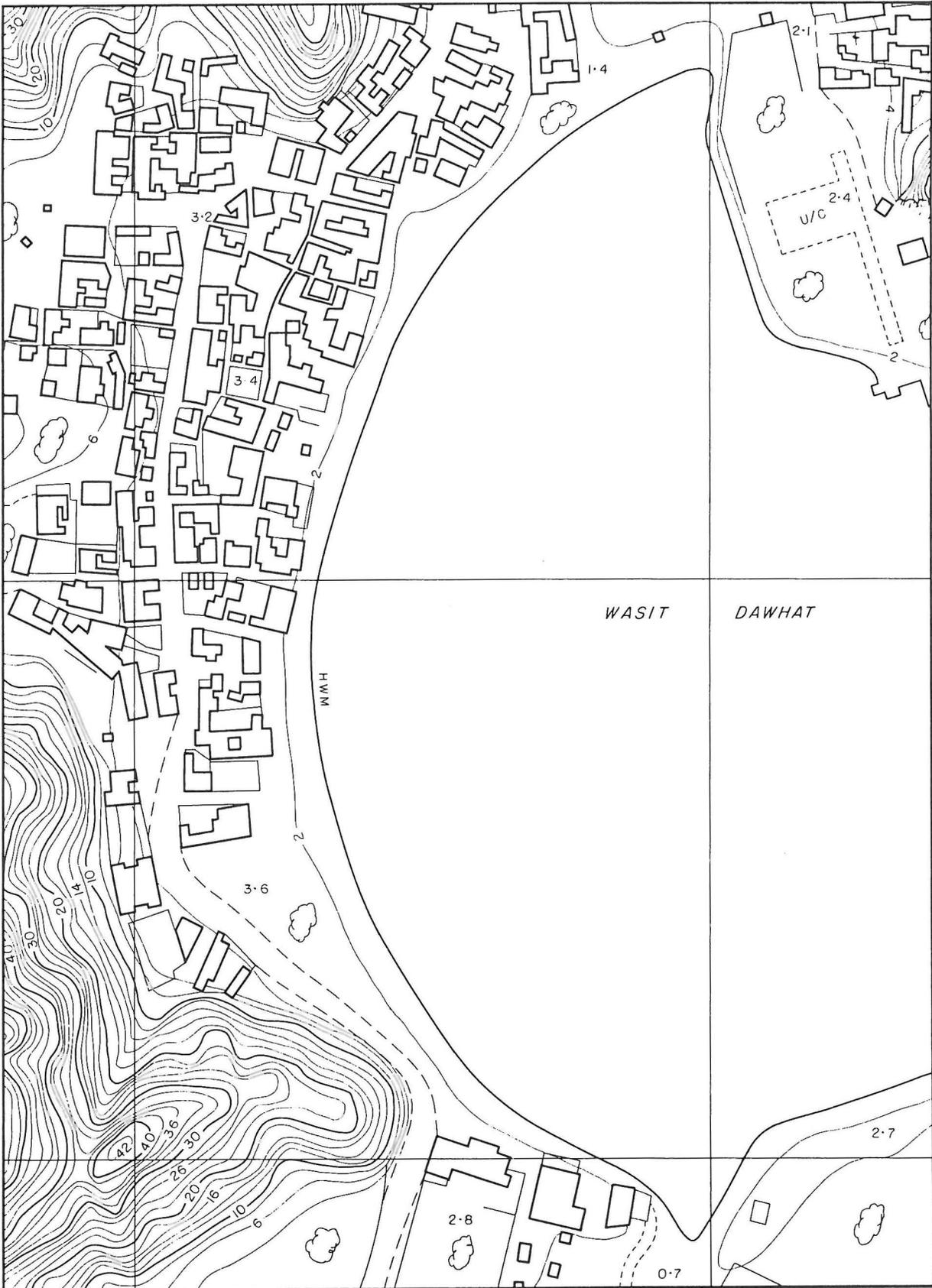
EXAMPLES OF FINAL MAPS

The examples of final maps and legends which follow are included to demonstrate the standard of presentation which may be expected. The content and styles of presentation have been adapted to meet the requirements of individual clients and do not necessarily conform to this Specification in every respect.

Example A	1:5000	scale	Original Plot	South-East Asia.
Example B	1:1,000	scale	High cartographic Standard	United Kingdom.
Example C	1:2,000	scale	High cartographic Standard	Middle East.
Example D	1:5,000	scale	High cartographic Standard	Africa.
Example E	1:10,000	scale	High cartographic Standard	Middle East.



Buildings, Arch	
Glasshouses	
Foundations or Ruins	
Sloping Masonry	
Wall	
Fence, Gate (over 3 metres in width)	
Hedge	
Road :- Kerbed, Unkerbed	
Track	
Footpath	
Railway :- Standard Gauge	
Narrow Gauge	
Water :- River, Stream	
Ditch, Culvert	
Marsh, Pond, Lake	
Slopes, Cliff, Rocks	
Tree, Group of Trees	
Electricity Pylon	
Telephone Call Box, Letterbox	
Fire Hydrant, Public Tap	
Spot Heights Photogrammetric, Field	
Contours	
Control Point	



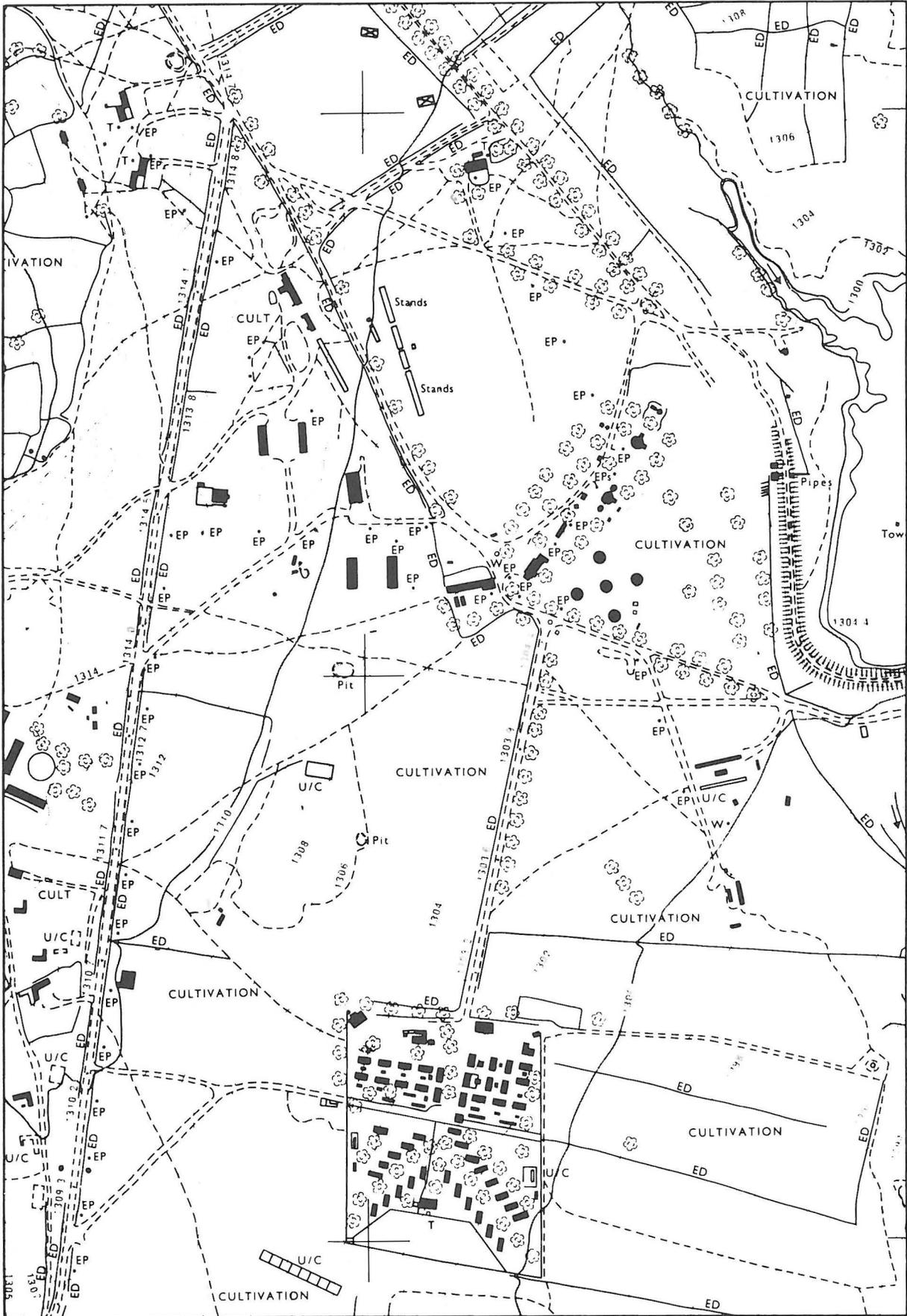
MIDDLE EAST

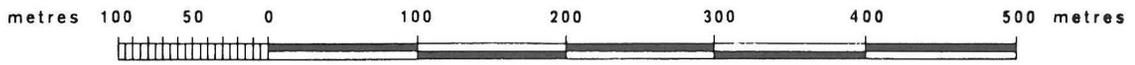
LEGEND

1:2000 SCALE

EXAMPLE C

Building	
Foundations & Ruins	
Under Construction	
Walls/Hedges/Fences	
Metalled & Oiled Roads	
Other Roads	
Tracks & Footpaths	
Cultivation	
Trees/Bushes	
Wadis	
Rivers/Streams/Ditches	
Well	
Bore Hole	
Terracing	
Coastline Detail Waterline	
High Water Mark	
Cliff	
Rock Outcrop	
Boulders	
Permanent Marker	
Spot Heights	
Contours	





LEGEND

CONTROL:

- Traverse Stations: a) Primary..... Δ
- b) Secondary..... ∇
- c) Tertiary..... \odot
- Property Beacons : a) Government \uparrow
- b) Licensed Surveyor... \square
- Bench Mark, Photo Centre... \uparrow 13 259 + 27

CONTOURS:

- Index, Intermediate.....
- Form Lines.....

HEIGHTS:

- Photogrammetric.....
- Ground Survey.....

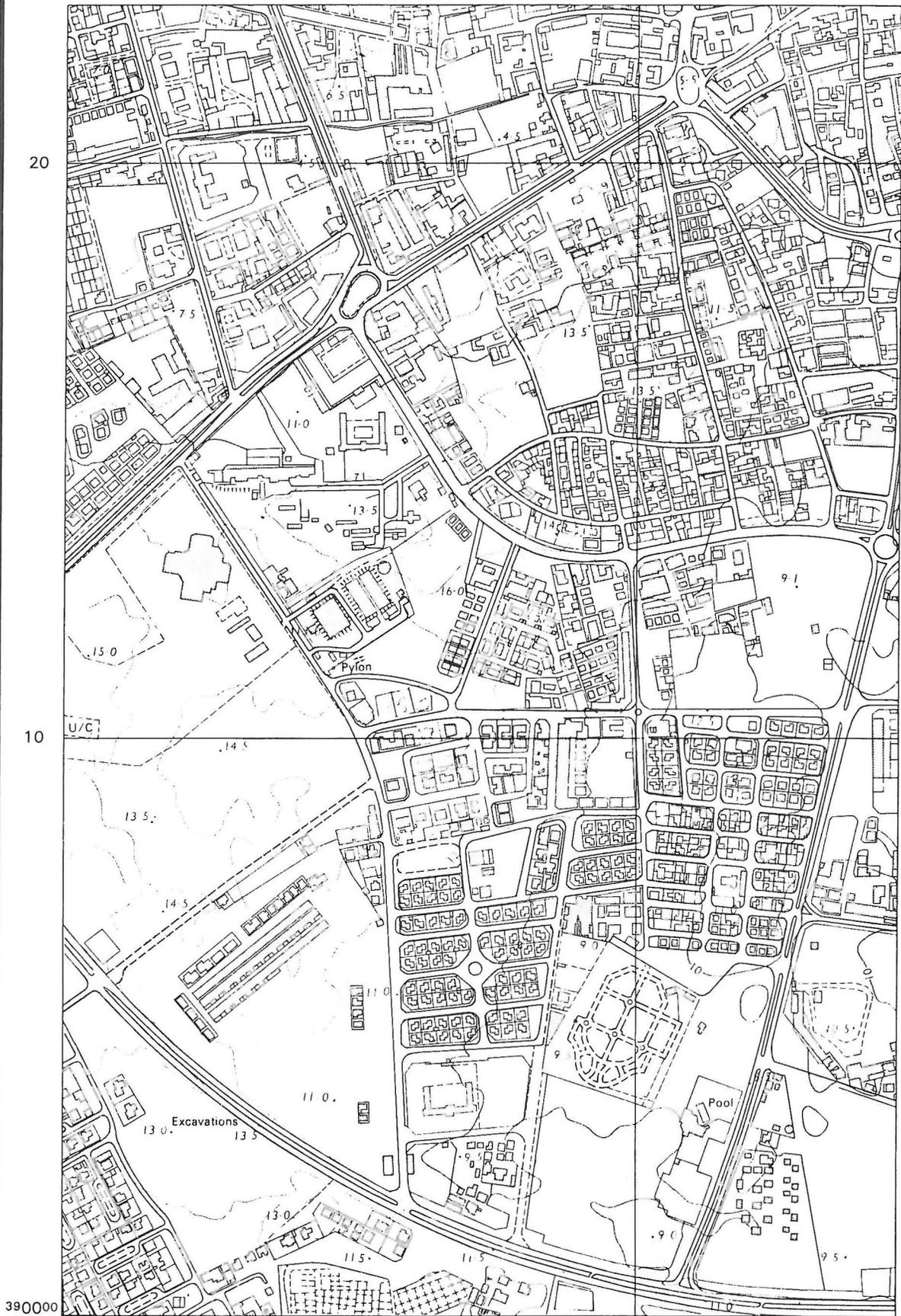
BUILDINGS:

- Completed.....
- Under Construction.....
- Ruin, Antiquities.....

VEGETATION:

- Cultivation
- Trees
- Area Liable to Flood.....
- Marsh.....

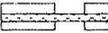
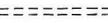
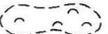
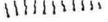
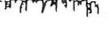
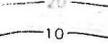
- Road
- Footpath.....
- Railways.....
- Embankment, Cutting.....
- Earth Drain
- Walls, Fences
- Pylon, Transmission Line
- Electric Power.....
- Water Tank
- Well, Borehole.....
- River, Stream.....
- Waterfall, Rapids, Rocks.....
- Pond, Spring.....
- Cliff.....
- Rock Outcrop.....
- Quarry.....
- Sand Dunes.....
- Sand, Gravel, Clay Pit



1:10,000 SCALE

MIDDLE EAST

EXAMPLE E

Buildings		مباني
Covered Bazaar		سوق مسقوف
Building Under Construction	[U/C]	مبنى تحت الإنشاء
Ruin	[Ruin]	خربة
Main Road		طريق رئيسي
Other Road		طريق أخرى
Track		طريق تربي
Wall or Fence		جدار أو سور
District Boundary		حدود التريق
Other Boundaries		حدود أخرى
Graveyard		مقبرة
Well	oW	بئر
Trees		أشجار
Scrub	a a	أعشاب
Slopes		منحدرات
Coastal Sand		رمال ساحلية
High Water Mark		منسوب الماء
Wadi and Wadi Spread		وادي
Cliff		جرف
Rock		صخر
Escarpment		سطح شديد الانحدار
Boundary PostBP	علامة الحدود
Electricity PoleEP	عمود التيار الكهربائي
PostP	عمود
Telegraph PoleTP	عمود تليفراف
Trigonometrical Station	G 31 39-17	نقطة تقيسية
Bench Mark	BM 67 7-39	علامة المنسوب
Spot Height	-21.1	الارتفاع
Contours		كشور

LEGEND

SCALE 1:10,000

المقياس 1:10000

EXAMPLE E