A NATIONAL SPECIFICATION

FOR TACTUAL AND LOW VISION

TOWN MAPS

FIRST EDITION 1985
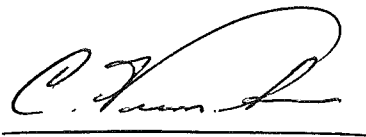
FOREWORD

At its forty-third meeting, held in Adelaide in October 1985, the National Mapping Council, noting representations from the Australian Institute of Cartographers regarding specifications for tactual mapping, and recognising that maps of urban areas produced for visually handicapped people should be uniform throughout Australia, resolved to adopt and publish the National Specification for Tactual and Low Vision Town Maps prepared by the Institute as a National Standard for such maps (Resolution 427).

This specification was prepared on behalf of the Australian Institute of Cartographers by Mr B.E. Goodrick MBE, FAIC, Chairman of the Institute's Tactual Mapping Working Group.

The Council commends this publication to all who are engaged in the production of tactual and low vision maps of urban areas.

Canberra
December 1985

(C. Veenstra)
Chairman
National Mapping Council

A NATIONAL SPECIFICATION FOR TACTUAL AND LOW VISION TOWN MAPS

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A NATIONAL SPECIFICATION FOR TACTUAL AND LOW VISION TOWN MAPS

1. INTRODUCTION

The aim of these specifications is to ensure that town maps produced for blind and partially sighted people are uniform throughout the country.

Although certain principles set out in the specification may be applicable to tactual and low vision maps made for other purposes, the specification applies only to town maps.

Map reading and interpretation by congenitally blind people is very much more difficult than for map users with normal vision. Fingers are blunt instruments of sensory perception when compared with eyes, and the building of a mental image of the mapped area can only be achieved with patience and a retentive memory.

Uniformity of approach, scale and symbolisation are more important than for traditional maps and the specification therefore contains aspects not usually found in specifications for maps used by people with normal vision. A number of important questions are therefore addressed in the form of guidelines, i.e. simplification of detail, amount of detail to be shown, maps as part of a system, etc.

The specifications will apply equally to maps produced by any method involving reproduction from an original drawing. They will not necessarily apply to multi-level tactuals as used in Europe for town maps, but fit in well with current methods used by Australian mapping organisations.

'Swell' paper and screen printing using 'puff' ink are techniques ideally suited for copies on demand or small run multiple copies of single level tactuals. The swell paper technique has the added advantage of easy amendment of original drawings so necessary for updating and for proof copies. It is at these two methods that the specifications are more especially directed.

For bold print maps, electrostatic printing is suitable for 'one off' and small numbers of copies, and lithographic printing is most suitable for longer print runs.

It is unlikely that any map specification will provide a solution to every problem which is likely to arise in the course of map production over widely spaced areas during long periods of time. Problems will be solved using common sense in applying the guidelines set out in the specification. However, experience has shown that effective maps will only be produced with the help of blind user advice and testing, and every organisation should ensure that it creates a mechanism to have this facility available.

2. AREAS TO BE MAPPED

In general the needs of the visually impaired in the community should be met by maps of high use areas such as shopping complexes, health centres, rail, bus and air terminals, teaching institutions plus simple overall maps of cities and towns which provide a picture of the suburbs or local government areas and town centres relative to one another. Major physical features such as lakes and even major roads may be included but the map must be kept simple.

Small scale maps related to education and learning require different treatment and are not covered by this specification.

Existing organisations serving the visually handicapped, and particularly those related to mobility training, can be very helpful in determining needs and assessing where subtle distinctions occur. For instance, while it is appropriate to map a high usage shopping area, both overall and in detail, the same need not apply to a university, where an overall map is useful but detailed plans of a building can be learned quickly with the help of a mobility instructor. In the latter case, production of a map which may not be needed again is not warranted.

The same could apply to a map of a primary school, where a student quickly learns the school layout and the effort of producing a map may likewise not be warranted. The same may be the case with high use public buildings, such as art galleries and exhibition areas, where blind people are usually accompanied by guides or friends with normal vision.

While cost and economy of effort are major considerations, it should be remembered that the main aim is to increase the mobility of blind people and thereby their independence. Generally the maps will be tactual and low vision versions of some of an organisation's own products.

3. A SYSTEM FOR TOWN MAPS

The difficulty for blind map users in establishing a mental picture of a mapped area has already been mentioned, but cannot be overemphasised. It is compounded by what researchers believe are fairly severe limits in the ability of blind people to relate the position of objects (map detail) when sensed by both hands, spaced any more than a handspan or two apart.

To lead users from a mental picture of the whole to a more detailed picture of the parts, the following is recommended.

. Provide a simple small scale map of a whole town or city to enable users to get a mental image of the relationship of major topographic features, districts or municipalities, parts of which may be mapped in more detail at larger scales.

. Produce maps of high usage areas at larger scales to show individual streets, street names and buildings. These maps provide users with a mental picture of particular high usage areas such as shopping complexes, etc. and access to them via public transport.

. Prepare still larger scale maps of the separate city blocks which go to make up high usage complexes. These maps should show individual shops and businesses to enable users to locate public buildings and gain access to the businesses or facilities of their choice.

By adopting this approach to town mapping, users can first gain an overall mental picture then be guided through more detail at increasingly larger scales.

It is also necessary to provide a system of references which will lead users from the general to the more detailed information. This is achieved by numbering features on the maps, with the numbers providing a key to more detailed information in list form.

In this way a small scale map of a whole town or city will provide the key to the existence and location of the major features which go to make up the whole and perhaps to larger scale maps of high usage areas. Such larger scale maps in turn provide keys to even larger scale maps showing individual businesses and facilities. Users are thus provided with an overview of their environment, access to separate high usage areas from public transport, and the location of individual shops and businesses.

Sample tactual and low vision maps of high usage areas and of separate city blocks are shown at Annexes 1, 2, 3 and 4.

4. MAP SCALES

One of the major differences between tactual and conventional maps is that type is replaced by braille. Braille is a standard height and the letters are constructed from six dots in a standard configuration. It therefore does not have the flexibility of size, shape and style which type provides. (See Annex 6).

It is the size of braille which tends to dictate the amount of detail which can be shown and the scale at which tactual maps can be produced. Quite apart from the fact that there may be insufficient space to include braille names, the 3 mm spacing of braille dots has been found to be an optimum spacing for tactual perception and recognition. The width between the two sides of a street which includes a street name is therefore the height of the braille plus 3 mm either side. The scale of a map in which most streets and names are shown in this manner is about 1:2500. Likewise the scale of more detailed maps showing individual businesses is also dictated by braille size. With each establishment numbered as an index to more detailed information in text form, minimum scale will be about 1:500.

Overall city maps require a much more flexible approach to scale, which will be dictated by the size of the area to be mapped and the degree of detail chosen. As a general guide, local government areas of the largest Australian cities can be depicted by outline and designated by number at 1:200 000 scale. Enlargements of inner city areas are necessary at this scale. Smaller cities can be mapped showing the same information at larger scales consistent with their size.

Bearing in mind the difficulty of relating the positions of different features by touch, overall maps of cities, town centre maps and maps of individual business areas made at the above scales will result in map-sheet sizes which blind people find convenient to use.

Three hand spans has been found to be a useful limit for tactual map-sheet size. If an area to be mapped cannot be contained within this limit, rather than reduce scale it is better to use more than one sheet with notes about adjoining map-sheets shown on each.

The scale should be shown on the face of the map using a simple bar scale as illustrated on the sample maps in Annexes 1-5.

5. MAP LAYOUT AND CONTENT

Visually impaired users will be helped considerably if all maps they encounter have standard layouts. The following guidelines should be followed in designing tactual maps.

- As far as is practicable, titles, scales, etc. should appear on the face of all maps. Positioning should be at the top edge regardless of sheet dimensions.

- All maps, particularly those subject to frequent revision, should include a note 'Map detail correct to (date)' in association with the title.

- North points should appear at the top of the map and as far as possible in a constant position. However, a north point need not be included on the largest scale city block maps, where street names surrounding the area are adequate for orientation.

- On city block maps correct orientation is not essential. If the maps are given a generally north orientation, better use can often be made of limited space. The sample maps at Annexes 2 and 4 are examples of approximate orientation.

- Map names and numbers should appear in both braille and Roman alphabet letters to facilitate filing. In the event that a blind user seeks assistance from a sighted person, it is desirable for some names to appear in Roman lettering. This, however, creates a problem with swell paper copies as the raised Roman names have been found to be confusing to blind users. Their use should thus be minimised, and positioning carefully considered.

- When an area is covered by more than one map, adjoining map names and numbers should appear close to and parallel to the joining edges.

- Lettering on low vision maps and braille are best placed horizontally. Braille may be sloped, though this should be avoided except in the case of street names, and it should never be curved. In difficult situations names can be arrowed in.

- Although it is in conflict with the practice adopted for education, in the interests of simplicity and to save space symbols for capitals used in braille writing will not be used for feature names and text on town maps.

- Linework prepared for tactual maps can also be used for bold type maps, with braille replaced by 18 point sans serif medium weight type of which there are many suitable faces available. Type size can be reduced to 16 point where space is a problem.

- Braille names should be kept clear of street intersections otherwise braille cells of the street name in one direction will likely be mistaken as part of a name in the cross street.

.   Reference numbers. In order to ensure clarity of numbers
    in braille, use the constriction for 'number' in association
    with numbers 0 to 9. The two cells in two digit numbers
    on their own will ensure clarity and, with the constriction
    omitted, all numbers will likely be restricted to two cells
    for space saving.

.   Legends are best shown on the face of the map. However, if
    a map is one of a series, provision of a separate legend
    sheet has the advantage of conserving space on individual
    maps. Abbreviations in either braille or bold type can be
    explained on the face of the map or on a separate legend
    sheet as applicable.

.   Overall city or town maps will generally need to show major
    topographic features such as rivers, lakes, shore lines, etc.
    Such maps will have many users and, in order to show the
    minimum detail, will likely exceed in size the swell paper
    normally available for use with electrostatic printing.
    Screen printing with puff ink and offset printing will
    therefore be the best method of reproduction.

.   Maps of high usage areas such as town centres require frequent
    updating and often only single copies or small numbers will be
    needed at any one time. Under these circumstances copying on
    demand is the most suitable means of production. For multiple
    copies swell paper and electrostatic printing offer the best
    reproduction processes. The maximum available size of swell
    paper (A3) will dictate the format. Such a size restriction
    is acceptable because little is known about blind people's
    ability to establish spatial relationships between map detail
    which is widely separated.

    The content of street maps of high usage areas should be such
    that users can not only identify blocks of buildings and the
    streets surrounding them but also navigate their way from public
    transport terminals or stops to shopping blocks and public
    buildings or facilities. In order to do this users will need to
    be aware of traffic lights, pedestrian crossings and the location
    of public telephones, toilets and other facilities.

    As far as is practicable, the numbered index to individual
    buildings or blocks of buildings should be included on the
    face of the map. If this is not possible, however, separate
    lists are acceptable.

.   Large scale plans of city blocks or separate buildings are
    essential to the location and access to individual shops and
    businesses. The existence of such maps should be referred to
    on indexes appearing on smaller scale overall maps of town
    centres. Like town centre maps, they need frequent updating
    and copies are best provided on demand using electrostatic
    printing and swell paper. Format will therefore be the same.

Such large scale maps should show street names, pedestrian crossings, traffic lights and public facilities. It is important to show door access to buildings and businesses, using standard symbols, as well as stairways, escalators, elevator and ramp locations. Obstacles and features constituting hazards to movement should likewise be depicted using the appropriate symbols. Indexes to shops and businesses should if possible appear on the face of the map. For sample maps and layouts see Annexes 1 - 5.

6. SIMPLIFICATION

For cartographers with experience confined to conventional map making it is difficult to grasp the extent to which detail must be generated in order to produce successful tactual maps.

A person with normal vision gains an overall mental picture of a mapped area at a glance and is then at liberty to examine specific areas in more detail. Tactual perception on the other hand can be described as the equivalent of viewing a map through a tube with a diameter equal to a finger tip. Viewing a map in this way would be a worthwhile exercise for any cartographer embarking on tactual map making for the first time in order to comprehend how a mental image has to be built bit by bit with great concentration and a retentive memory.

Furthermore, for successful tactual perception the following points should be borne in mind:

- Lines and braille must be clearly separated by at least 3 mm (3 mm is the distance between braille dots).

- Small changes in line direction go undetected.

- Only marked differences in line weights can be perceived. (1:2 is recommended).

- It is impossible to detect differences in shape between small symbols (hence the recommended sizes).

- Intricate changes in line direction, such as those exhibited when depicting meandering streams, merge together and disappear.

- Only the most radically different tactual patterns can be distinguished, and some dot patterns can easily be confused with braille.

All of the above points relate to simplification of map features themselves but the 'selection' aspect of generalisation is equally important.

Braille size will often be a deciding factor in the amount of information to be included but, more importantly, any detail which is not essential to the map function is superfluous and will only tend to confuse.

If the object of the map is to guide a blind person around a shopping centre, anything which is not essential to that purpose should be eliminated. Even then there may be features which the cartographer considers essential, such as kerbs and gutters, but of which blind people are likely to be conscious at all times. Consult blind map users and/or the local mobility instructor on these aspects.

Map scale is less important in tactual maps than clarity of perception, so scale can be distorted locally to ensure that symbols are clearly separated one from the other.

Most cartographers begin by making tactual versions of existing maps. Such maps may be quite simple for people with normal vision but will likely be confusing to an extent which will discourage blind people from using them.

For anyone accustomed to making conventional maps, the degree of simplification and selection necessary for effective tactuals can be difficult to conceive. The tactual result may appear almost diagrammatic, but if its purpose is fulfilled and the user is unconfused then it is a success.

The following are examples of desirable simplification.
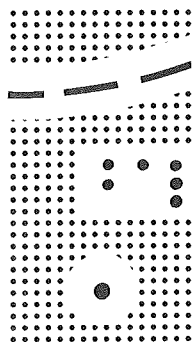
Path cleared of pattern by 3 mm.

Braille cleared of pattern.

Obstruction cleared of pattern.
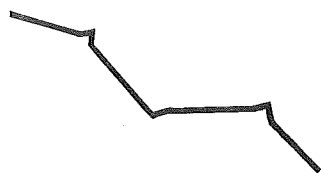
If retention of small directional changes is desired, exaggeration of corners is permissible.

Content and internal scale distorted in the interests of clarity.
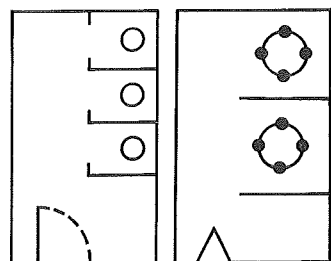
True to scale   Simplified

Street with footpaths true to scale.

Footpaths eliminated and if necessary
street widened in interests of clarity
and to accommodate braille.
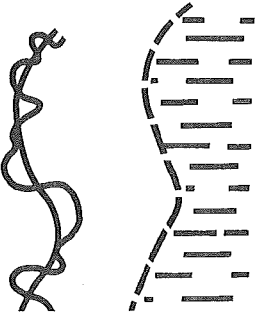
Stream and shoreline shapes very
much simplified.

7. MAP SYMBOLS

A set of map symbols developed in the 1950s at the University of Nottingham
(U.K.) for mobility maps has gained wide international acceptance. It makes
sense to adopt well researched mobility map symbols for town maps. The
following symbols, with some minor changes and additions to suit new
requirements and techniques, are therefore an adaptation of the Nottingham
symbols and should be used for town maps at the recommended scales.

It should be noted that for a blind person map features may have a different
connotation to that of a person with normal vision. For instance, to the
sighted person with a conventional mental plan view, a tree with its crown
occupying a considerable area may be the picture, but for a blind person
only the trunk represents an obstacle and that is where a blind person's
interest lies.

Similarly, small drops or steps may be considered to be self-evident by a
sighted person and are often not included on maps but they can be severe
hazards to a blind person.

To produce effective tactuals, the cartographer should constantly try to
place himself in the position of a person without sight.

SYMBOLS FOR TOWN MAPS

Please note that the symbols shown below are included as a guide. Symbol sizes and lineweights are not specified and may be varied slightly to suit particular circumstances. Lineweight should, however, not be less than 0.35 mm and preferably about 0.5 mm. The sizes of symbols shown have proven effective and should not be varied unless there is good reason to do so.
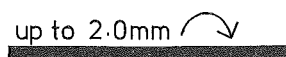
ROADS, STREETS AND ASSOCIATED FEATURES

	1:500	1:1250	Small Scale City Maps
Street defined by buildings			
The existence of footpaths is assumed. Minimum width for inclusion of names is 9 mm. At 1:500 scale footpaths may be indicated by use of discouragement lines (see page 12) for kerbs.		✓	
Street not defined by buildings	✓	✓	
Major roads (small scale maps) up to 2.0mm			✓
Footpaths and walkways in open spaces 7.0 3.0 0.5	✓	✓	
Traffic lights at intersection	✓	✓	
Traffic lights – pedestrian only	✓	✓	
Pedestrian crossing without lights	✓	✓	
Pedestrian underpass 5.0	✓	✓	
Pedestrian overpass	✓	✓	
Footbridge (minimum length 7 mm or draw to scale) 7.0 3.0	✓	✓	
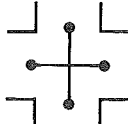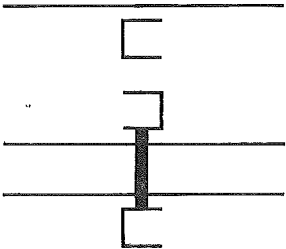
	1:500	1:1250	Small Scale City Maps

BUILDING AND ASSOCIATED FEATURES

Building with entrance (small
scale town centre map)

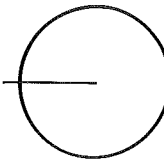| | | ✓ | ✓ |

At 1:500 scale show outline
with entrances thus

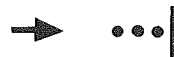| ✓ | | |
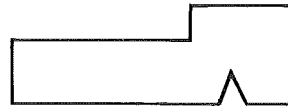
Building or city block
identification number
or letter

Buildings used for specific
purposes will be labelled
church, school, town hall,
etc. if possible on the
face of the map

Two braille cells

Stairs (up in direction
of arrow)

| ✓ | ✓ | |

Escalator (up in direction
of arrow)

| ✓ | ✓ | |

Ramp (up in direction of
arrow)

| ✓ | ✓ | |

Telepone box

| ✓ | ✓ | |

Pillar

| ✓ | | |

Toilets –

    Female

| ✓ | ✓ | |

    Male

| ✓ | ✓ | |

    Unisex

| ✓ | ✓ | |

Obstruction (unspecified)

| ✓ | ✓ | |

WATER FEATURES

Feature		1:500	1:1250	Small Scale City Maps
Small streams (lineweight variable)		✓	✓	✓
Large streams (lineweight 0.35 mm)		✓	✓	✓
Water areas with shoreline (sea, lakes, etc.) Shorelines 0.7 mm		✓	✓	✓
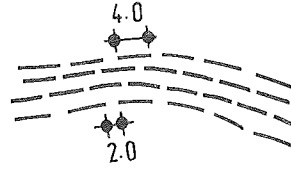
AREA FEATURES
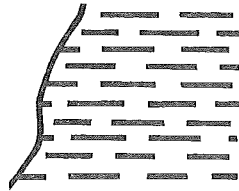
Feature		1:500	1:1250	Small Scale City Maps
Parks or recreation areas with prepared grass (Letraset 907)		✓	✓	
Open areas, carparks. golf courses, etc. Label as appropriate		✓	✓	
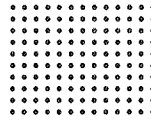
TRANSPORT

Feature		1:500	1:1250	Small Scale City Maps
Railways (lineweight 1.0 mm) Modification will be required for use at small scales		✓	✓	✓
Tramways (lineweight 0.5 mm)		✓	✓	✓
Bus or tram stops		✓	✓	
Railway stations (large scale) – show buildings and platforms to scale		✓	✓	
Railway stations (small scale)				✓

MISCELLANEOUS SYMBOLS

12
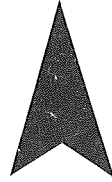
	1:500	1:1250	Small Scale City Maps
North point		✓	✓
Direction arrows (use also for traffic direction, etc.)	✓	✓	✓
Location marks	✓	✓	✓
Boundaries (May be used for local government or other administrative boundaries by labelling or legend description)	✓	✓	✓
Discouragement lines (An important symbol; use for small drops and other such features which represent possible hazards to visually impaired users)	✓	✓	✓

ADDITIONAL SYMBOLS

In the event that additional symbols are needed some well established conditions relating to the use of maps by visually impaired people should be observed.

Line Symbols

While the eye can distinguish fine differences in line widths, marked differences are necessary for tactual perception. If it is necessary to create additional symbols, a logarithmic progression in line thickness has been found to provide satisfactory distinction.

For example, if three lineweights are necessary on one map, the following widths will likely be successful:

0.35 mm

0.7 mm

1.4 mm

Likewise, in choosing line symbols similar rules apply. Not only should the
lineweight be doubled but the length of dash and break should also be
doubled as follows:
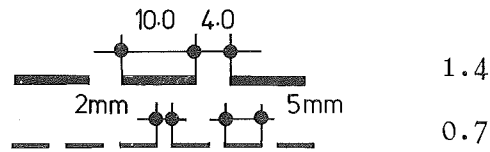
The interposition of other shapes such as dots or triangles can also be
effective. It should be borne in mind, however, that the shapes interposed
need to conform to the rules laid down for point symbols, i.e. the size must
be capable of tactual recognition, and confusion with other map symbols must
be avoided.
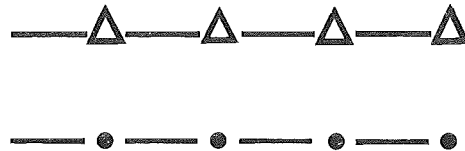
Point Symbols

Apart from those standard symbols already described, it may also be
necessary to devise additional symbols for other features.

The following symbols (actual size) will be found effective:
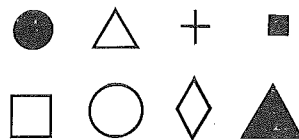
It is worth noting that open shapes are usually easier to distinguish than
solid shapes.

If the same shape must be used in both open and solid form then the size
difference should be in a ratio of at least 1:2. For easy recognition,
point symbols need to be clear of other details by 3 mm.

The use of small solid symbols of any shape should be avoided to ensure that
there is no confusion with braille dots.

Patterns

Situations may also arise in which additional patterns may be needed to depict areas other than those included in the standard symbols.

A great deal of testing has been done on pattern recognition by blind people and the following sample patterns have been found to be readily distinguishable one from the other.

LT 959

LT 64
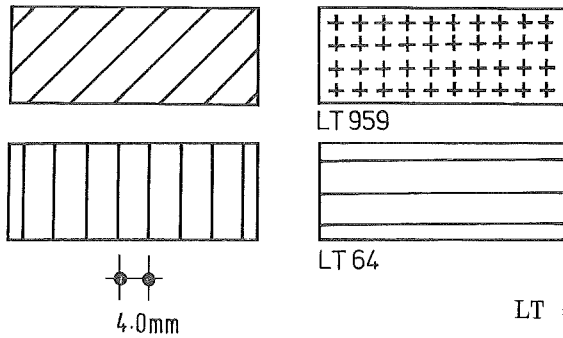
LT = Letraset Catalogue Number

4.0mm

The above patterns are actual size with lines 0.35 mm width; 0.7 line width is equally effective and width between lines can be reduced to 3 mm.

Dot patterns are not recommended because of the likely confusion with braille.

8. MAP REFERENCE SYSTEMS

There are a number of difficulties for blind map users if the reference system adopted for town maps is one in which the coordinates on the largest and intermediate scale maps are part of a system covering a whole city or State.

Such a system will likely be unduly complicated, the overall concept difficult to grasp and unnecessarily cumbersome for a blind person to use.

A reference system is, of course, essential in order to locate points of interest and for this purpose a grid for each map, shown by ticks around the edge and lettered one way and numbered the other, will be adequate.

Grid lines crossing the map tend to conflict with other map detail and create confusion.

It is not easy to maintain eastings and northings parallel across the map and for this reason ticks should be spaced about 4 x braille height (36 mm) apart. Grid ticks which are too closely spaced may result in mistaken identifications.
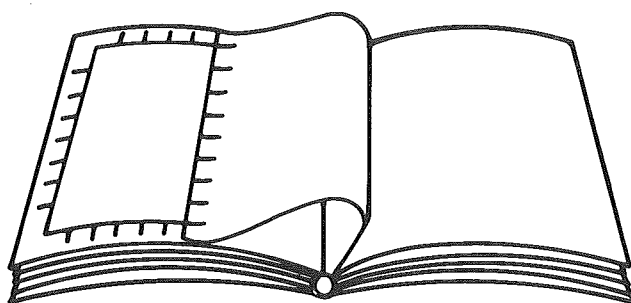
Annexes 1, 3 and 5 show suggested treatments.

It should be noted that a reference grid is not included on 1:500 scale maps of shopping blocks as sequenced numbering of individual businesses is considered adequate for reference from a list.

The use of list references is especially useful in tactual and low vision mapping, where the size of braille and bold type create problems with space.

At all three scales, points of interest, areas mapped at larger scales and individual features can be identified by number and or letter, and described using lists.

Ideally, of course, the lists should appear with the map on the same sheet of material, as illustrated in Annexes 2 and 4, but this is not always possible and separate lists, identified with the map name and or number, though not as effective, can be adequate.

An effective means of facilitating reading of grid references on tactual maps, especially for atlas maps or sets of maps in folders, is by printing grid ticks and numbers on the reverse side of the sheet down the right hand edge. When the right hand sheet edge is folded inwards, as illustrated in the diagram below, the sheet edge becomes a north-south scale for accurate location of features. This is of course only practicable when back to back printing is contemplated.
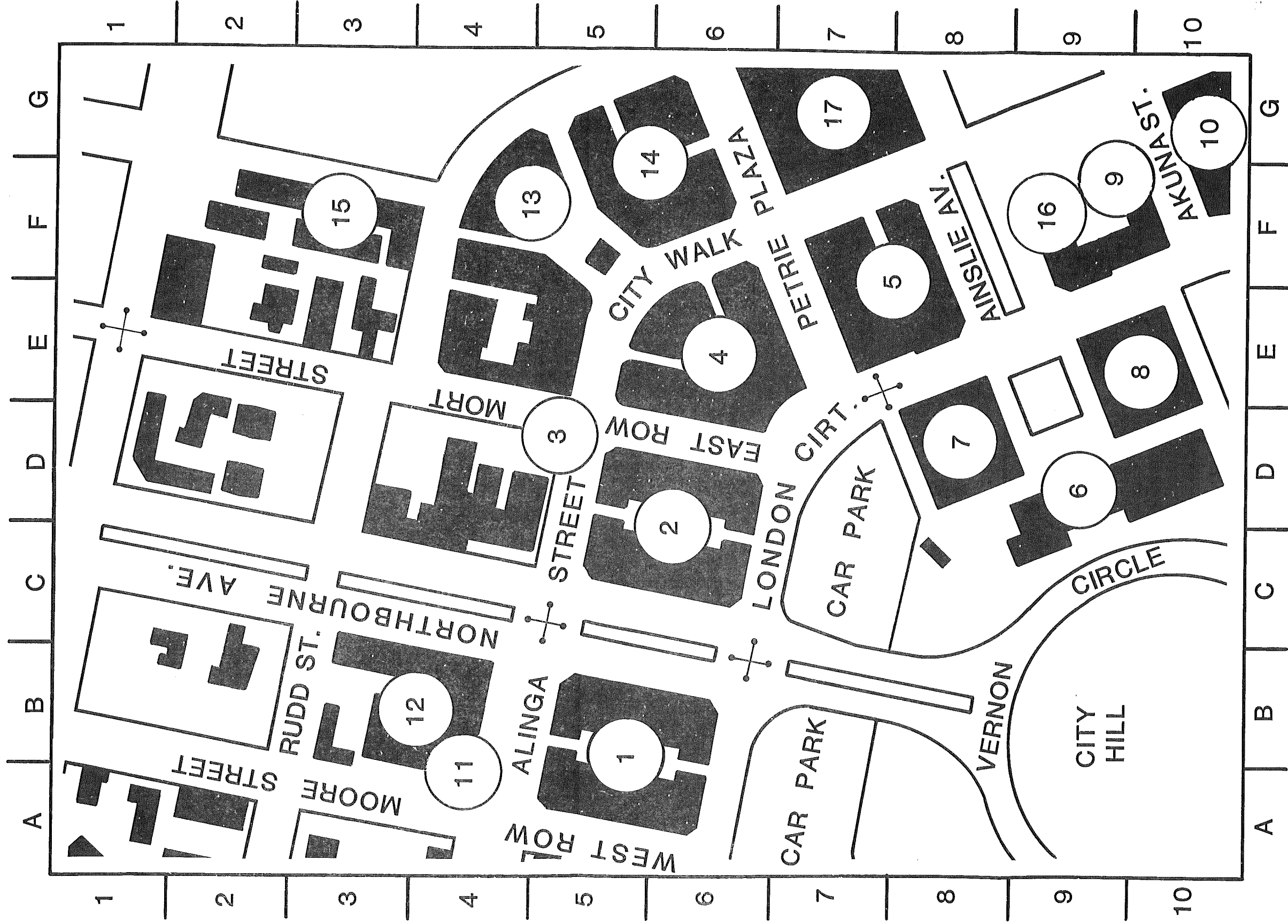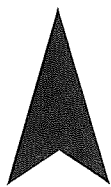
ANNEX 2

CANBERRA CIVIC CENTRE
DECEMBER 1980

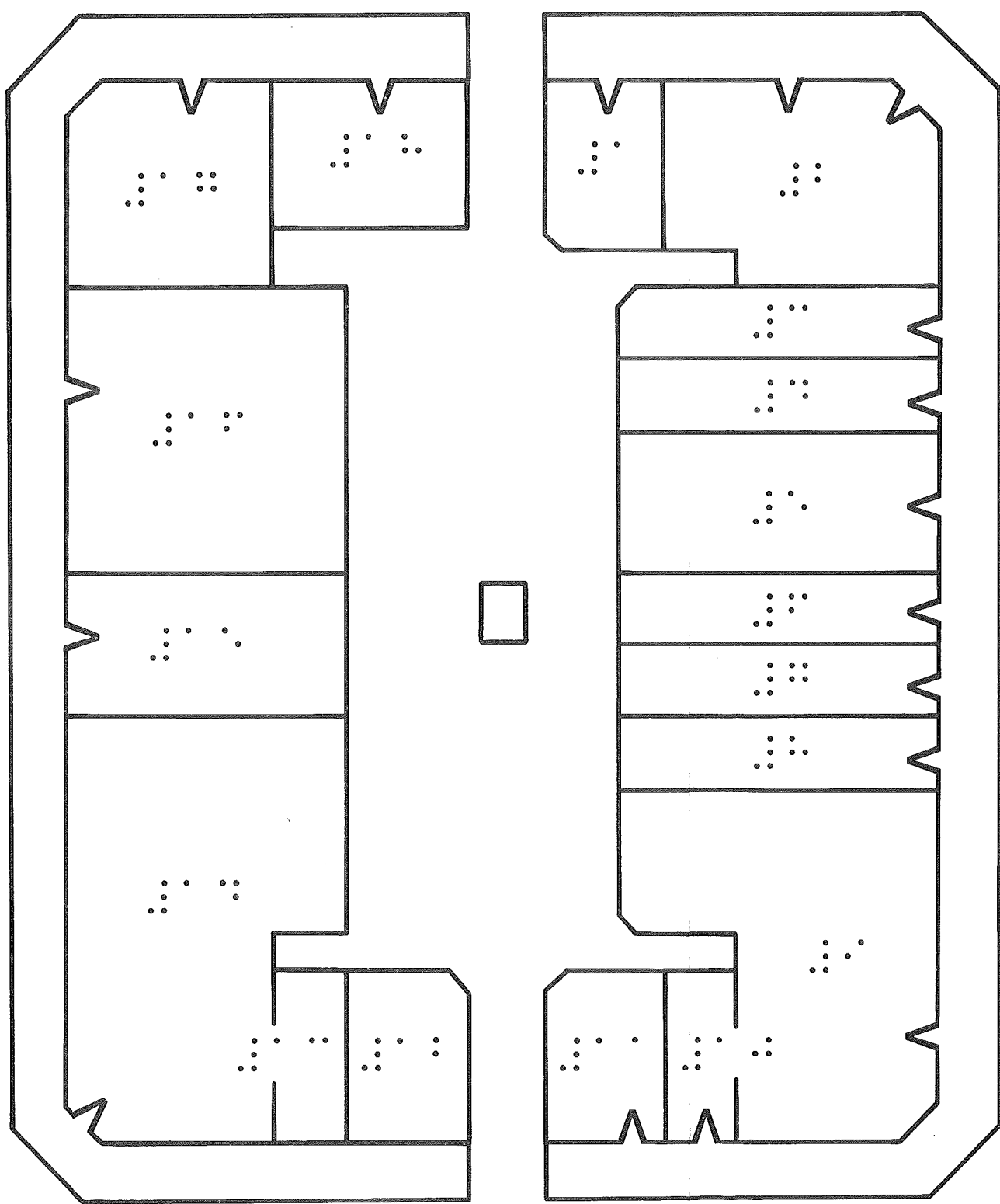MAP 1 OF 2 MAPS

SCALE 0   150 METRES

N

CITY WALK
CITY WALK PLAZA
PETRIE
AINSLIE AV.
AKUNA ST.
MORT STREET
EAST ROW
LONDON CIRT.
CAR PARK
STREET
NORTHBOURNE AVE.
RUDD ST.
MOORE STREET
ALINGA
WEST ROW
CAR PARK
VERNON CIRCLE
CITY HILL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

LARGE SCALE MAP 1
CIVIC CENTRE
MELBOURNE BUILDING
DECEMBER 1980

N

SCALE 0 |___|___|___|___|___| 50 METRES

LEGEND

1 PHONES

2 POST OFFICE

3 GROCERY SHOP

4 ARTS & CRAFT

5 NEWSAGENCY

6 CHEMIST

7 SNACK BAR

8 REAL ESTATE

9 COMMONWEATH BANK

10 REAL ESTATE

11 SOUTH BRITISH UNITED INSURANCE

12 MALAYSIAN RESTAURANT

13 CHARCOAL RESTAURANT

14 A.C.T. GOVT. TOURIST BUREAU

15 PASSPORT OFFICE

16 TAXATION OFFICE

17 TAA

18 A.G.P.S.
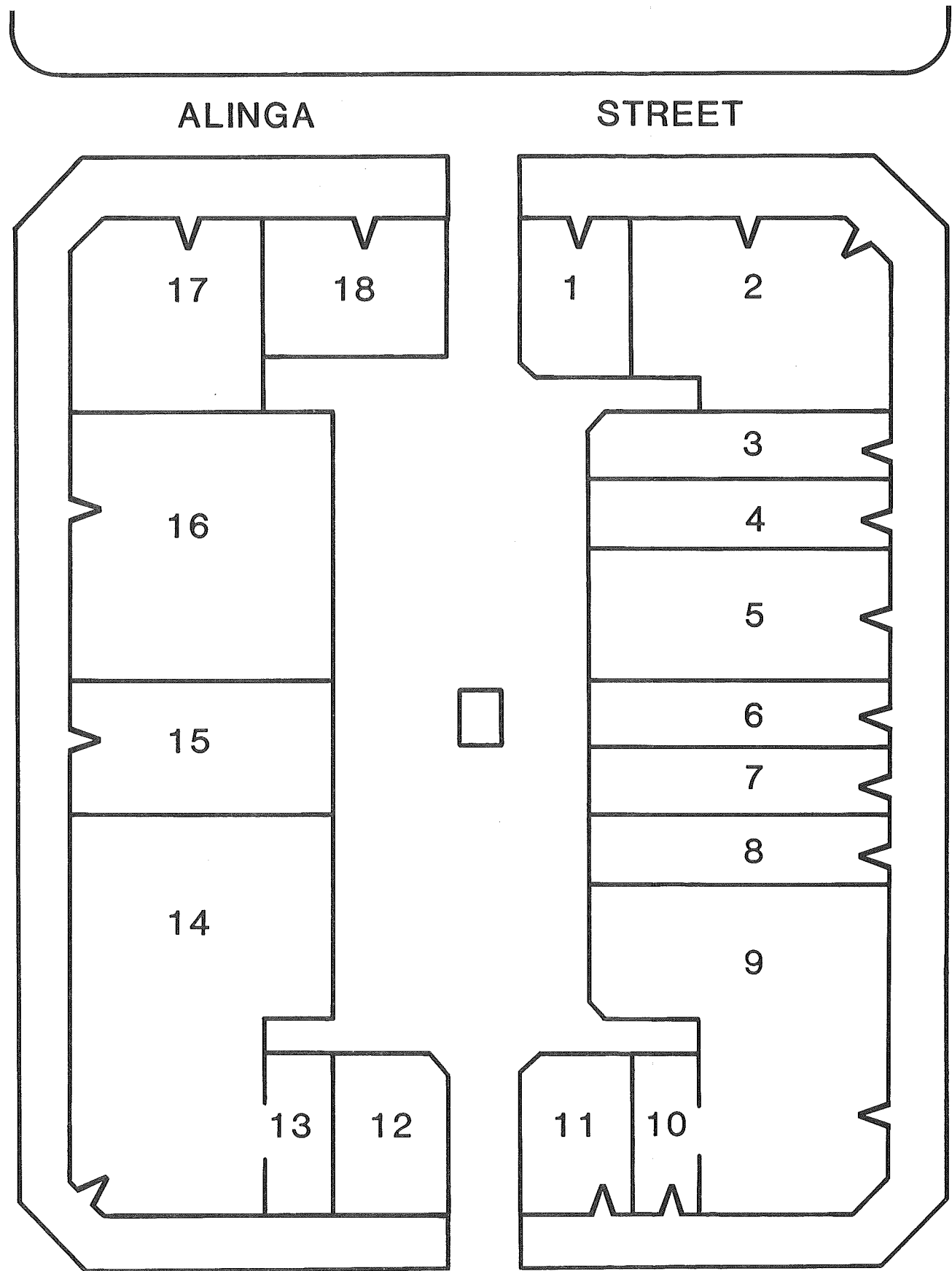
ALINGA STREET

NORTHBOURNE AVE.

WEST ROW

LONDON CIRCUIT

17 18 1 2
16 3
    4
    5
15 6
    7
    8
14 9
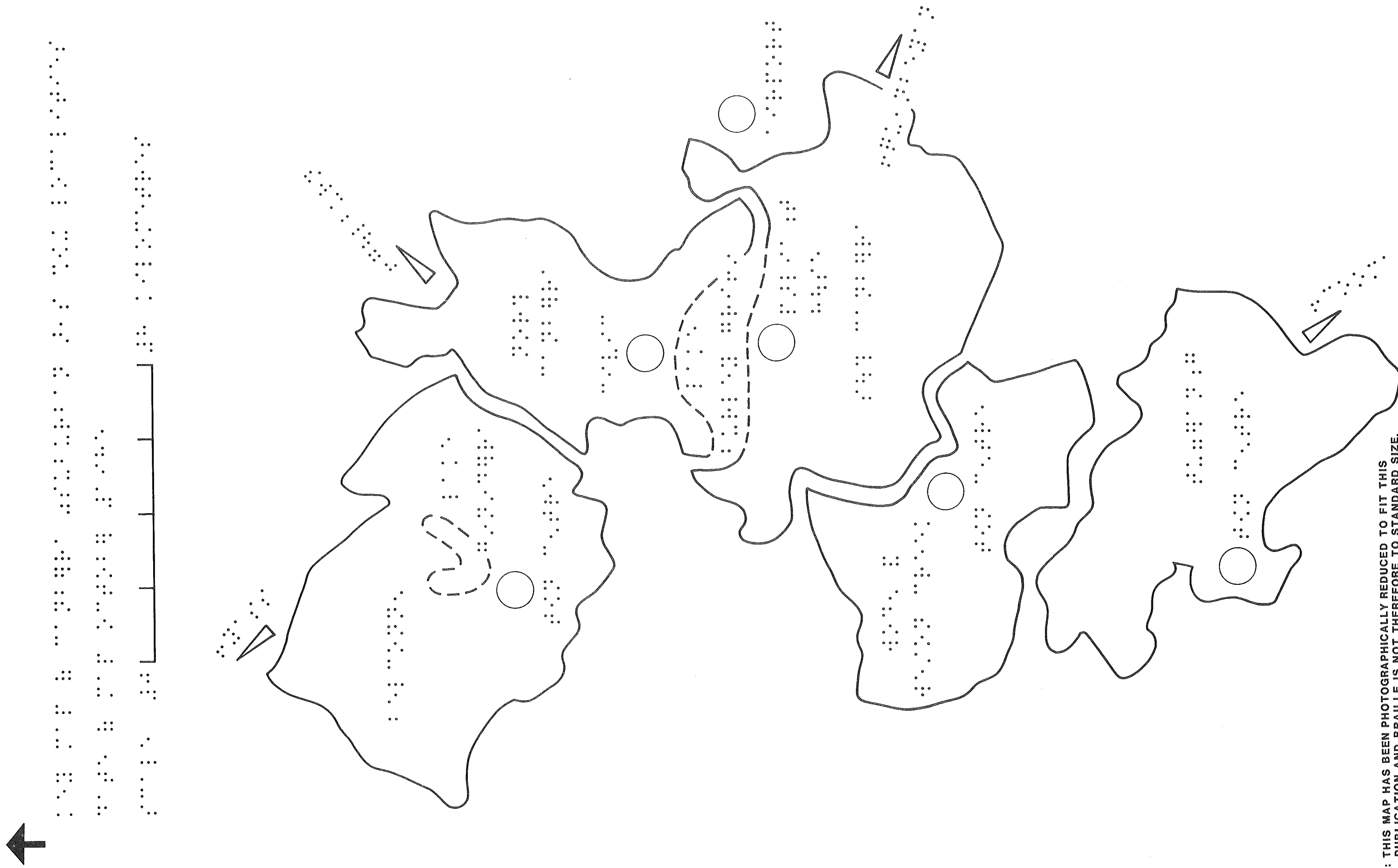13 12 11 10

NOTE: THIS MAP HAS BEEN PHOTOGRAPHICALLY REDUCED TO FIT THIS PUBLICATION AND BRAILLE IS NOT THEREFORE TO STANDARD SIZE.

USEFUL EXTRACT FROM THE "STANDARD ENGLISH BRAILLE"

The Alphabet

⠿ The letter symbol, this symbol immediately preceding braille indicates that the braille is letters, (we don't usually use this, as where possible we assume braille to be letters unless told otherwise).

A B C D E F G H I J

K L M N O P Q R S T

U V W X Y Z

⠿ The number symbol

Numbers

1 2 3 4 5 6 7 8 9 0

Some Punctuation

( ) "? " , ; : . - !

E.G

Nº 1ˢᵀ ST . J A N U AR Y   Nº 1 9 8 5

In writing braille on maps you will encounter "Contractions" ('AR' as in Janu**ar**y, above). The following are some of the more common ones, there are many more.

-ANCE AND AR -ATION BUT BY CC CH DAY DD EA ED

EN -ENCE ER FOR IN ING ITY -MENT NAME -NESS OF

OU OW SH -SION ST TH THE -TION TO WORLD

+ - X ÷ = DASH ✶