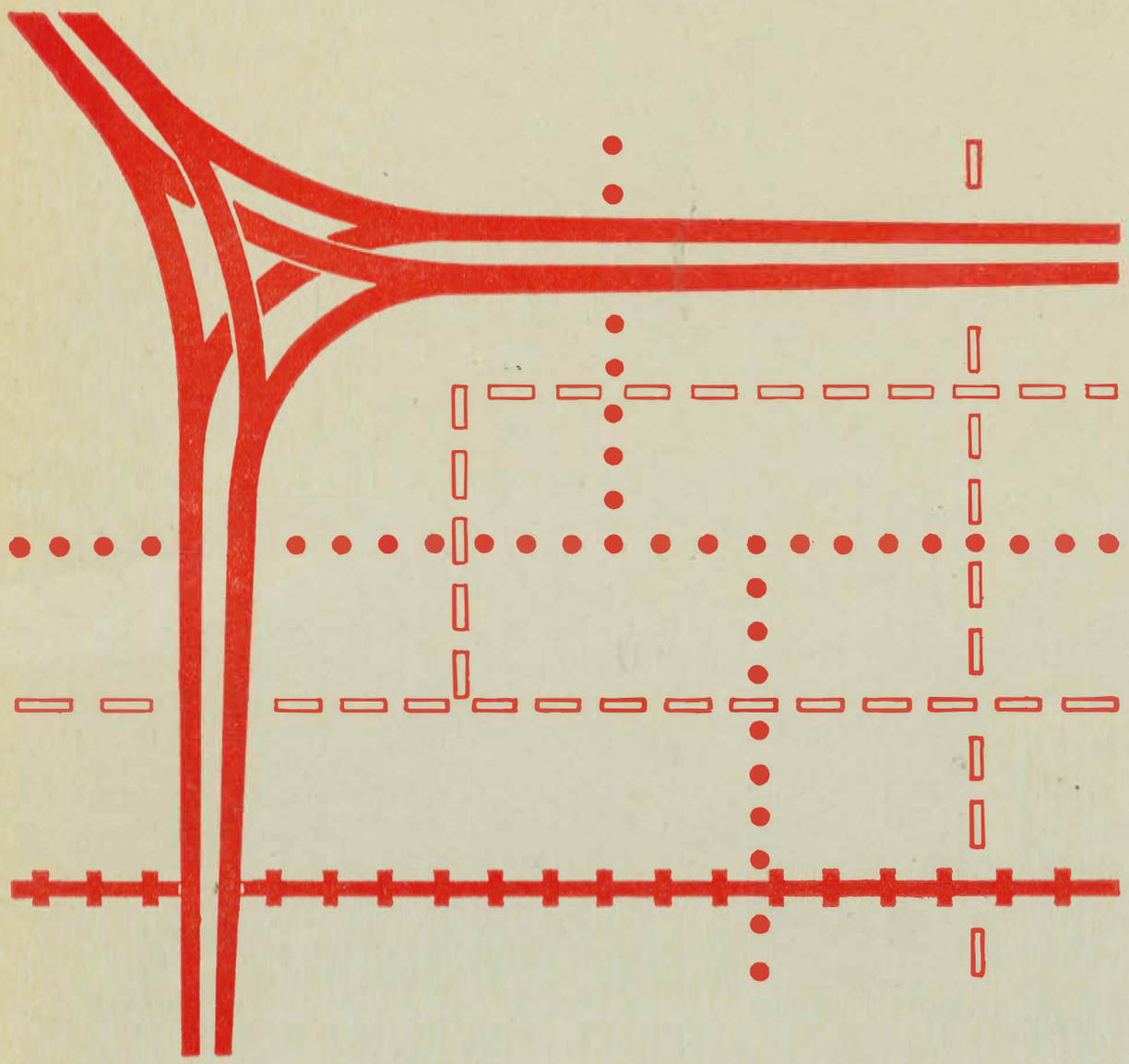
E. J. Waldron

PRIMARY HIGHWAY PLAN



traffic in Nottingham

1965-2005



TRAFFIC IN NOTTINGHAM
1965 to 2005

A Traffic Plan
for the City

F. M. Little
City Engineer and
Planning Officer

Nottingham
1966

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Nottingham

Foreword

By Alderman C. A. Butler
Chairman of the
City of Nottingham Planning Committee

During recent years the Planning Committee have devoted much time to consideration of how best to replan Nottingham to meet the needs of the future, whilst retaining those characteristics that give the city its individuality.

This is largely a problem of obtaining patterns of redevelopment that are visually pleasing and that function satisfactorily, but the latter aim cannot be achieved unless the right solution is found for traffic. This is a most urgent task because as individuals and as a community we rely more and more on the motor vehicle, yet this could, unless we provide for it in the right way, make our cities a bedlam.

The Planning Committee have approved the proposals produced by the City Engineer and Planning Officer, which are described in this Report. We consider that these provide a soundly conceived element in the replanning of the city, and we commend them to the public of Nottingham.

C. A. BUTLER

Nottingham
1966

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Plans, Diagrams and Perspectives

Map of the Primary Highway Network

Section I Introduction, Scope and Background

1 Since there will be frequent reference made in this Report to certain terms, brief descriptions of them are given:—

Primary Routes are those major highways linking regional main roads with the subsidiary **District and Local Distributor routes.**

The traffic system is, in descending order of priority use for the vehicle, or ascending order for the pedestrian:—

Regional Routes — Motorways; Other regional highways

Primary Routes

Routes in the Contained Areas — District distributors; Local distributors; Pedestrian ways or areas

The system of primary routes is a **Network,** the lines of which form the boundaries of **Contained Areas of Development,** within which the subsidiary distributors will lie.

Each Contained Area may comprise one or several **Environmental Areas,** each requiring a standard of treatment to secure good urban conditions appropriate to it. One form of such treatment is **Comprehensive Development** in which the pattern of building groups and of local traffic movement is reshaped to a unified plan, as distinct from the piecemeal development of individual ownerships, which 'freezes' the existing patterns.

The Background of the Traffic Plan

2 The Report is the first of several that will deal with different aspects of the city's planning. It is the Traffic Plan, with special emphasis on the Primary Highway Network, and it is a part only of the Development Plan, into which it will be integrated. Its proposals have been formulated against a town-planning background, which is described in general terms, the traffic principles of the general planning and related matters being dealt with to the extent that they are relevant to and influence the planning of the Primary Network.

3 All planning, if it is to be soundly done, must involve a recognition that the planner's task is not to mould people to his wishes, but to provide for the needs of people as a civilised community of human beings. This is not the same thing as an aggregation of people's demands. There are innumerable demands, and points of view, even conflicting and changing needs of the same individual, and there is the estimation of future needs. It is the planner's task to weigh up in a 'balance' of care and thoughtfulness, and if possible of wisdom, how far these demands can be met and translated into needs, how far they can be reconciled, in what form they should be assimilated into the overall plan, in a way also in which they can be best achieved. These matters involve not just a balance of quantities, but judgment values as well.

4 All the elements of the overall plan exert mutual influences of action and interaction, and therefore call for a balanced solution, that does not give undue or predetermined priority to any single demand. As has been indicated, the Traffic Plan is one part only in the Review of the city's Development Plan, which is at present in course of preparation. No one part of the latter can be or has been treated in isolation, and in its preparation the correlation between each element has been constantly borne in mind.

5 The two principal elements of the Development Plan will be those dealing with **Land Use** and with **Traffic.**

Land Use

6 The proposals for Land Use will deal with the allocation and planning of areas for public and private needs to serve all the activities of the community: housing, industry, production, commerce, public services, health, education, culture, leisure and transport. This provision will be in relation to the city's present and future population, in amount and distribution, and to the urban requirements of the city as the centre of the region it serves.

Design Structure

7 The form that these land uses will take when translated by the operations of development into actuality is part of the **'design structure'** of planning. Throughout this process regard must be paid to the comprehensive, and the visual and three-dimensional aspects of planning, to give an integration of the forms of building groups, their surroundings and open spaces, with the practical needs of activities, leisure and communications.

8 It is convenient to refer here to another aspect of the urban design process, the enhancement of visual satisfaction in the townscape or street scene by the help of natural elements: trees, shrubs, lawns, flowers, water, and the natural configuration of ground, interfusing them into the man-made elements to identify these with and implant them in their setting, and to increase the sense of proximity between the human being and the town around him. It is a triple process, of deliberate provision, of conservation and of inter-relation.

Section II The Principles of the Traffic Plan

An Appraisal of the Urban Traffic Problem

10 The community and the individual directly and indirectly depend on the motor vehicle and wish to use it more and more. The motor vehicle is a bad master but a good and necessary servant, and its potentialities can be wisely and fully used by approaching the problems it produces, in a positive and not a negative way, not by 'spoiling' it but by guiding it.

11 Traffic if uncontrolled exercises a massive invasive pressure on towns, a pressure that, unless the right action is taken, will disrupt all urban activities including traffic itself. The problems produced by traffic can best be studied where they are most acute, i.e., where there is congestion. In a few words they may be described as:—

> Too many vehicles, with more to come, standing and moving on too little road space, that is laid out to an imperfect pattern, and that is also traversed by pedestrians, with consequent danger, inefficiency, delay, noise, fumes and frustration.

12 Most of the roads in existing towns have to do several jobs at the same time. They have to serve pedestrians, standing vehicles both parking and collecting or delivering goods, local traffic and often longer distance traffic as well. These groups jostle and compete with each other. The result is that the typical busy town street is a jack of all trades and a master of none.

13 The town street system is largely to a pattern that evolved on a very local basis in days when people and goods relied much less on road vehicles for their transport and when people travelled shorter distances to their work. On most major routes junctions and cross streets are too frequent for efficient traffic flow and this is especially so in and near town centres.

14 Since it is mainly the activities carried on in buildings that need transportation and generate traffic, traffic is greatest where buildings are most concentrated, i.e., in and converging on town centres. The problems created by traffic affect all areas, but are most intractable in the former. It is a desirable planning objective to relieve all areas of as much extraneous traffic as possible: it is especially urgent to accomplish this in a central area.

15 With growing urbanisation, increasing population and increasing use of private cars, a solution to the traffic problem is urgent. The solution that commends itself is one that sorts out the conflicting groups of traffic and makes proper, adequate and where possible separated provision for each. This can be achieved by a two-pronged and concurrent attack, by replanning the pattern of building groups and replanning the pattern of highways.

16 The factor that makes the problem so difficult is the use of the private car, because both when travelling and standing this takes up much more space per person than do other forms of transport, and will require still more space in total in the future because of its rapidly growing numbers.

17 Since the habits of employment produce traffic concentrations at the peak periods, the problem largely stems from the car-commuter. If therefore the peak commuter problem can be solved, the solution will generally take care of the lesser though growing demands during the present off-peak periods.

18 One cannot shut one's eyes or say "if we don't provide for traffic it need not or won't come", because transportation is important to a city, and if one's own city does not provide it, then trade and people may go to another place that does. The effects of traffic are already present and there is little sign of its pressures abating. Unless provision is made for it it will clog in the existing roads, and make itself felt more and more in areas that may now be relatively free from its effects.

19 To give paramount priority to and accept the fullest traffic increases of the future, containing an unrestrained increase of commuter cars, is scarcely practicable in an established city. The highway system needed and the amount of parking that would be required in or near the central area, would demand a massive reconstruction of most city centres and their fringes, so great as to be unattainable within the period by which it would be needed, would be inordinately costly, and would involve great problems of rehabilitation from displaced properties. It would at any rate be undesirable since it would completely alter the character of the city centre.

20 It might be said that the more positive approach is that of the Americans, of a full acceptance of the car and its needs, but this argument does not take into account their much greater dependence on the car, small amount of public transport, longer distances of commuter travel, widely spread suburban belts and ample land resources. It is not accepted that their argument is valid or desirable for established cities in this country. To take one point alone, our cities are generally fortunate in having well-used local public road transport services, and it would be short-sighted to neglect this asset.

21 It is the total of activities in a central area that determines the number of people that have to be transported there, and fundamentally the transportation needs are for the movement of this number of people, rather than of any given number of vehicles. This is to say that providing the modes of travel are acceptable to those who in the future will frequent the city, then it becomes possible to consider a highway system that fully provides for future transportation needs by making more effective use of road space. This is the policy that would best suit the needs of Nottingham.

22 Subject to the considerations discussed earlier of the design processes of planning, two of the related aims of the city's plan will be a proper provision in the right places for the settled urban activities, and a proper provision in the right places for traffic, and this would be to the advantage of both needs.

23 These tasks can be best accomplished by making separated provisions of major highway, local highway, service area, and footway or precinct. Thus each group of traffic, through and local, standing vehicle and pedestrian, would have an efficient and safe single-purpose 'track' instead of the typical general-purpose ones existent to-day.

24 This solution is, therefore, a two-fold one of *sorting out* traffic and *deflecting* it, of replanning the contained areas and of providing the primary routes. If good environmental conditions and good facilities for traffic are both to be attained the two tasks that are necessary are:—

To improve localised conditions by creating more comprehensive patterns of development, which best give the opportunity for the spatial separation of traffic groups.

To improve general conditions by removing from contained areas the whole of their extraneous traffic: that which has no occasion to be in them but at present passes through of necessity. For this purpose to provide the primary routes to a design that, by giving a high traffic capacity and standard, will attract as much traffic as possible away from the contained areas.

25 The Traffic Plan was selected as the first subject of the city's replanning to be presented, because traffic is the major urban planning problem that must be solved most urgently, and whose solution will make other planning objectives easier to attain.

26 This order of treatment does not imply that traffic demands are to be given priority over all other considerations. It is a recognition of certain facts, which are:—

(*a*) The rate of provision for this country's towns of efficient and adequate communications in the form of highways, safe for the vehicle and the pedestrian, has for many years lagged far behind the increase in the number of motor vehicles and in traffic.

(*b*) The motor vehicle is more and more becoming the major mode of transport, catering either directly or indirectly for the activities of the individual as a person or as a member of the community.

(*c*) As long as there is an increasing manufactured output of new vehicles, the pressure from more persons and organisations to use more vehicles will continue, and it is in towns and cities that this pressure will be most felt.

(*d*) The advantages and convenience of motor vehicles bring with them, when vehicles are collected together as traffic, a harmful impact which unless it be controlled, can frustrate its own purpose and can conflict with or even destroy, by congestion, danger, noise and disturbance, the everyday life of the individual centred on home, school, place of employment, or leisure occasions.

(*e*) These harmful impacts are building up at a faster rate than they are being relieved, and are among the principal agents tending to destroy towns as urban centres of work and congregation.

(*f*) This process is particularly serious in large established towns, and correspondingly difficult to relieve, and its relief must therefore be a primary task in these towns if they are to be made efficient, safe and pleasant to live and to work in.

(*g*) Almost all existing properties possess the common feature that they are contiguous to or are dependent on highways, and therefore highway proposals are a major factor affecting them and their redevelopment.

(*h*) The adoption of a highway plan, which to be effective must be a radical one, is also urgent, because if deferred, every new building that is constructed or reconstructed on land that might be required for, or is affected by a future highway, could make the latter more difficult to achieve.

(*i*) Efficiency of transportation is a desirable aim, and road vehicles cannot operate efficiently in congested traffic conditions. The highways should be made at least as efficient as the road vehicles that use them.

(*j*) Major highways are schemes which have to be authorised in local and central government programmes, well in advance of their need becoming imminent. To obtain this authorisation they must be shewn in their context (the place they fit into in the jigsaw), and their need must be established.

27 The major subject of the present Report is the Primary Highway Network, but the traffic basis of this is derived from and is a part of the general overall intentions for transportation or traffic in the city, i.e., the full Traffic Plan.

28 The transportation needs of a city embrace all methods by which people, and also goods, move or are moved from place to place, that is to say by mechanical transport and pedestrian movement.

29 The assumptions to be made regarding the extents to which different forms of transport are likely to be utilised have a direct bearing on the principles, design and scale of the primary network itself.

30 Leaving aside the transport of goods, because the solution for human transport can in its process solve this, mechanical road transport of people is of two kinds: (*a*) Personal or Individual, and (*b*) Collective or Mass, the principal examples of each group being the car and the bus. These can be supplemented by other forms of mass transport that do not use the highway, and these are discussed in Section V of this Report entitled 'The Role of Public Transport'. The word 'supplemented' is used advisedly, because for reasons which will be fully discussed in that section, the use of forms of mass transport that do not use the highway could at the most only marginally reduce Nottingham's highway needs. To *rely* on their introduction and sufficient use in the future would be to build on unsound assumptions, and to miss the opportunity of providing, within the time needed, any realistic solution for traffic.

31 The present Report deals primarily with major traffic movement, but all traffic originates and has destinations in areas of development. The specific proposals for local traffic circulation within these Contained Areas, by systems of subsidiary distributor routes, will be dealt with in the detailed planning of these areas.

32 One principle of 'balance' should however be mentioned, and it is the need, consistent with safety and amenity, for a reasonable accessibility to be given to certain local traffic to its points of origin and call. This is one aspect of what may be termed 'Controlled Penetration', and is of importance in the city centre and to public transport. It will therefore be further discussed in the sections dealing with these subjects.

33 There is likely to be increasing use in the future of air travel, for long and shorter distances, by plane or helicopter, but this is not discussed in the present Report which deals essentially with traffic traversing Nottingham and with local daily traffic. Even a much extended use of air travel could only have marginal effects on the sum total of the needs for daily travel of the major proportion of the population.

The Pedestrian

34 It has been stressed that an essential task is to 'sort out' and make separate provision for the different categories of traffic. By traffic one generally thinks of vehicles, but the pedestrian is also an element of traffic, and one that justifies equal consideration and separated facilities. In the selection of the routes for the primary network care has been taken to locate these routes as far as possible on lines that do not bisect major pedestrian flows, and where this is not possible 'second level' pedestrian ways such as footbridges or subways are desirable.

35 Apart from this, the principal help to pedestrians will come from the deflection of major traffic volumes on to the primary routes, thus taking much of the traffic out of the contained areas, and by the replanning of the latter so that pedestrians do not have to cross trafficked routes, e.g., to local shops and to local schools. The detailed proposals for pedestrian routings, and for traffic-free areas are, as with the proposals for local traffic circulation, matters to be appropriately dealt with in the detailed planning of the contained areas.

The Contained Areas

36 The planning and the design structure of the Contained Areas will be the subject of subsequent reports, and it will here suffice to discuss the general traffic principles applicable.

37 The areas that are bounded by the network lines of the primary routes have been called in this report Contained Areas, partly because of this containment, but also for a deeper reason, because they ought ideally to be self-contained for their local needs. These are the ones which should, for example in a residential area, be within walking distances for people, and for which they should not have to cross heavily trafficked roads: local shops, schools for the younger children, the local open spaces, play areas, clinics, libraries, etc. In the same way there should not in an area be such facilities as would bring an 'invasion' of traffic from other areas. In this sense the older notation for these areas, of district and neighbourhood, reflected this aim of proximity.

38 In the locational planning of the Contained Areas there are two related operations, the sorting out of uses that is involved in the above process, and the sorting out of traffic into its categories, which will be more fully discussed later. An objective of both is to secure safe and convenient proximity for pedestrians, and better facilities for vehicles.

39 Existing patterns of local streets and boundaries of individual ownerships restrict and often prevent the attainment of these aims. On the other hand, the 'marriage' of ownerships and the reform of the street pattern, mainly an unplanned one as existing, can facilitate this, and this process of obtaining a unified and well arranged pattern over a wider area is termed Comprehensive Development. It widens the scope for obtaining the spatial separation of the conflicts between pedestrians and the groups of vehicular traffic, local, longer distance and standing vehicles, by the use of unified layouts over larger areas, of for example variations of the Radburn principle in residential development, and by the use of more than one level, i.e., by vertical as well as horizontal segregation.

40 The process of 'sorting out' traffic in the contained areas will be achieved principally by reshaping these to new patterns of development, that will include a rationalised local traffic system of subsidiary distributors. Traffic originating in the areas will be gathered to the local distributors, and thence to the district distributors. The latter will connect to the primary routes at a limited number of junctions, or pass below or above these routes to give local traffic an access to adjacent areas.

41 In proportion to the total extent of a city (as distinct from that of its centre) only a relatively small amount is at any one time 'ripe' for or capable of redevelopment. In other areas the buildings may have very many years of useful life ahead or be too substantial, there may be little need or opportunity to change the pattern, or it may be wished to preserve the local characteristics, streets, buildings, or groups of buildings.

42 In such areas the process of redevelopment is not available to reform the patterns of local traffic, and whilst the provision of the primary routes can reduce the traffic volumes in these areas, the only way in which they can be further relieved is by the use of certain traffic management methods, which will be discussed more fully later.

43 An aspect of the Contained Areas that may be conveniently referred to here is the planning of the principal **Suburban Centres.** Here in these locally busy areas there is a need to improve traffic and environmental conditions, to segregate the movements of vehicles and pedestrians, and to provide increased public car parking facilities. These objectives are exemplified in Fig. 32, which shows the principles of the proposed pattern of redevelopment for the centre of Bulwell, an old-established township, to serve ultimately a population of 15,000.

The City Centre

44 An important part of the Development Plan will be that containing the planning proposals for the City's Central Area, which may properly be regarded as the most important of the Contained Areas. It is not the purpose of this Report to deal with these proposals except in the context of traffic. But since city centres largely have the worst problems of urban traffic, greatly influence the solutions for traffic, and are so important to their cities, it is worthwhile to consider their general characteristics and function, because these must be taken fully into account in formulating any proposals for their redevelopment or their traffic.

45 The centre is a place of congregation, the focal point of a city, where many of the threads of the city's activities are gathered, and it presents to most visitors the public image of the city.

46 The unique purpose of a city centre is that it can and should provide, on a scale and range commensurate with the population it serves, for the desired urban activities that are most conveniently located there, that is to say for public services, work, business, shopping, entertainment, culture, public resort and amenities, relaxation, even for just sharing in the busy urban scene. It should have most of its facilities conveniently near and accessible to each other and it should be an active place, even though it should also have its oases of quietness. It should have its own recognisable character, life and vigour, and well-being in its people. These are some of the things that a city can enhance for its citizens, a sense of pride and of urban satisfaction in its city centre, its continuity, life and activities.

47 Traffic is a part of a city's proper activity, but excess of traffic, by congestion with danger, noise and fumes, is not. This excess distracts urban life both in a practical and ideal sense, separating and disturbing essential proximity, and imposing conditions that take away from the effective vitality of a city. It is not wrong that a city centre should be busy, for that is inherent in its function and can be pleasurable. But whilst 'busyness' and urban facilities are two companions that get on well together, congestion is the third that jostles in to change company into crowd.

48 A city centre is usually the greatest single grouping of the city's communal activities, and is therefore its vital heart. It is generally the part of the city which is the most substantial and valuable, and the one in which the pattern of streets and buildings is the most firmly established. It is usually the part where traffic pressures are the most intense and complex, because here the buildings and their activities are thickest on the ground, and the street pattern is the least planned for the motor age. It is the part that is most vulnerable to traffic impact, yet where the problems of relief are the most difficult and urgent.

49 All these considerations then must be borne in mind in working out a solution for traffic for the centre of an established city. The solution that might be right for a 'new town' is not thereby right for a city centre that is a living organism. An entirely new start of revolution and upheaval should not at any rate be contemplated, for long before it could be effective the pressures of traffic would have overwhelmed the centre. Here a new pattern must be a skilful amalgam of conservation and renewal, and be a process of speedy evolution that is both well planned and well executed.

50 These then are the needs and problems of city centres, and the manner in which traffic impacts on the city centre of Nottingham can be relieved and provided for will be outlined in Section IV.

Regional Population Needs

51 Apart from increased vehicle ownership and usage, two other aspects of traffic growth influence Nottingham's highway requirements, firstly the growing importance of the city as a regional capital, and secondly the future increase of population in the city, in the adjacent districts, and beyond these in the region.

52 Nottingham has always been a regional centre, and if it is to sustain and enlarge this role, with rising population in its 'traffic catchment area', the 'draw' and activities of the city centre will increase.

53 The area the city at present serves can be considered in terms of this total catchment, which comprises firstly the city and districts outside this, being its bus catchment area, and a wider area including and extending beyond this, its car catchment area.

54 The latter can be taken to be the area shown hatched in Fig. 6, being that from which 95% of Nottingham's traffic originates. It covers 350 square miles, extending to between 7 and 17 miles from the city centre. This is not of course exclusively the 'province' of Nottingham, as it is overlapped by and includes within it the catchment areas of other towns. It is also the area found from other surveys to be its car catchment area for city centre shopping. Thus it is important to the city centre's future to attract as much as it can of the potential trade from this area, and good highways, carparking and public transport are means to this end.

55 The projections of increased population in the zones contributing to Nottingham's traffic have been taken into account in assessing future traffic. It is of interest to note that the population of Nottingham and the adjacent county districts is expected by 1981 to increase from the present figure of about 500,000 to between 550,000 and 600,000.

Traffic Management

56 The application of methods of Traffic Management has a useful albeit limited value in partially resolving the impacts of traffic in certain areas, and an outline of its potentialities is therefore given.

57 The growth of vehicular traffic, and the conflicts that arise between competing groups of traffic, e.g., different traffic streams and pedestrians, caused by the inevitable multi-purpose function that most existing roads have to perform, produced a need to apply 'first-aid' methods that could relatively quickly improve the efficiency and safety of these roads, until such time as redevelopment and sufficient provision of 'single purpose' routes could give a permanent remedy, by Space Segregation, i.e. the provision of separate places for each conflicting group of traffic, including that of pedestrians.

58 Such methods constitute Traffic Management or Traffic Engineering, which is the application to existing roads of operational techniques, not involving major structural work, for the purpose of improving their traffic characteristics.

59 The most generally used of these techniques are primarily directed towards Control, i.e., to securing the safe and orderly movements of traffic and pedestrians. In this function they are frequently using 'time segregation' i.e., reducing the conflicts by allotting separate periods of time to each traffic group, and the most common examples are traffic signals and pedestrian crossings.

60 With the growth of traffic, the techniques were further developed, with a particular objective of increasing the traffic capacity and efficiency of traffic routes. In this role the aim is, simply, to get more traffic flowing more easily along a traffic route, so far as this can be done with due regard for safety. Such methods include one-way operation, the prohibition of right-turns, the control of street parking, the use of linked signal systems, and the use of lane-marking to channelise traffic.

61 Traffic management methods also have an application in combination with limited parts of longer-term highway schemes, to constitute a first phase of these, and this process will be used in certain early schemes in Nottingham, an example being shown in Fig. 30.

62 A so far lesser used but important function of traffic management is that referred to in para. 42, the improvement of environmental conditions, and in this role it may be restrictive on vehicular traffic. Examples of this use are the preventing of through traffic from short-cutting through a residential area, and the reduction of traffic noise in say a hospital area.

63 An extension of this role has a useful application in those parts of the city centre or in other busy areas where a partial segregation is the most that can be achieved. For example, in a particular street it may be desirable to give a priority but not an exclusive use to pedestrians, and in this case the traffic management policy would be directed towards that end.

64 The primary objective in each of the roles of Traffic Management requires a decision as to whether traffic or environmental conditions shall have priority in any particular case, for in the existing patterns of roads and development the two aims can run counter to each other.

65 The roles have a common aim of channelling traffic into the better places for it, and so long as thought is given to ensuring that undesirable side-effects are not created, the application of traffic management is of value. It has its limitations, for it can only reduce in a degree the inefficiencies or faults inherent in the existing street pattern. It does not after all claim to be a cure for traffic ills but only a way of relief.

66 Developments in traffic management that are likely to be increasingly used in the future are those that will give new modes of communication between 'controller' and driver, with the mutual aims of raising the efficiency and safety of traffic flows and of helping the driver. There are two ways in which this can be done. The first is in road signing, where at present a multiplicity of signs, directional, mandatory and informatory, neither helps the town street-scene nor best aids the vehicle driver. Here there is a continuing need for a system that by design and location is more easily seen and quickly comprehended by drivers, especially in heavy traffic. The second is in the application of the techniques that are available in other fields, such as closed circuit television and computer, for the centralised control of traffic in busy areas. This could be used also to notify to potential users the amount and location of carparking available at any particular time in an area, a service that will become increasingly desirable with growing numbers of vehicles coming into towns.

Section III The Primary Highway Network

The Selection of Routes for the Primary Network

68 The extent and location of the primary routes are derived from a traffic need, assessed and measured, being that for certain volumes of traffic to travel between terminal areas of origin, transmission and destination, thereby establishing that a route of given capacity must be provided somewhere within the tract of land joining the terminal areas.

69 A choice of more exact location for the route has then to be made, and pays regard to:—

(*a*) Relation to existing routes, and characteristics of these.

(*b*) Configuration of ground, and presence of natural or man-made barriers such as rivers, railways and substantial buildings.

(*c*) Comparative practicability of implementation at the time when the need will become imminent, as affected by prospects of redevelopment.

(*d*) Comparative costs, for engineering work and for property.

(*e*) Particular problems that narrow the choice of location are the space required for the large intersections and the distances required between these to give the route maximum and safe traffic capacity.

70 All the above factors may be termed those of engineering and traffic, which affect any major highway scheme, but regard has also to be paid to town-planning considerations. These concern the improvement of the environmental conditions in the areas on either side of the routes, i.e. aimed at achieving self-containment in them and at removing extraneous traffic from them. Broadly, the former influence the selection of the line of route and the latter the case for the establishing of a route. The extent of the primary network is governed by the need to accommodate a given amount of traffic and to channel from the Contained Areas as much of the traffic as possible and desirable. Thus the omission of a particular segment of the primary network could leave in its adjacent areas an excessive amount of extraneous traffic.

71 The outcome of the various considerations leads in practice to a series of decisions, in part to utilise existing roads, with the necessary widening, improvement, and satisfactory junctions, and in part to establish new routes.

The General Traffic Basis of the Primary Network

72 The final and completed Traffic Plan must be one that is capable of being brought into being progressively, starting from the existing highway pattern but not fettered by this, and leading to a wholly satisfactory highway pattern.

73 Throughout these phases there must be the aim of separating through from local traffic, and both of these from pedestrians, so that vehicular and pedestrian facilities are each more efficient, safer and more pleasant for their own purposes.

74 The statements made in para. 19 regarding the unacceptability of providing for a completely unrestrained increase in private car use, apply to Nottingham, and are based on an examination made of a trial primary network that would take the resulting traffic volumes, of the parking facilities that would be required, particularly in the central area, and of the amount of redevelopment that would be necessary. Nevertheless, it will be possible to provide for the whole of Nottingham's transportation needs, and the policy that is advocated, and the basis of the proposals now made, can be termed planning for a **Balanced Traffic Need,** as distinct from traffic demand. It relies on a rearrangement of a part of these future needs in a manner that will give a better use of road space in the future highway system. It will still require a radically improved highway provision, of rational pattern and high design standards, accompanied by new patterns of development, but it would not bring with it the ill-consequences of providing for unrestrained traffic demand; it would be less costly, and it would be attainable.

75 The rearrangement spoken of is one of travel habits, and relates to only a small proportion of the total daily traffic within the city's boundaries, being primarily to a portion of the peak-time travel to the central area. It affects the remainder of the peak traffic in the city only fractionally, and the off-peak traffic not at all. It involves one process which the local authority can influence, being the greater use of public transport by means of a co-ordinated car parking policy, and other trends which it can encourage, which will be discussed later.

The subjects of Public Transport, and of Car Parking for the Central Area, are of sufficient importance to warrant a separate discussion, and are therefore dealt with in detail in Sections V and VI of this Report.

76 The scales of the proposed primary highway network, and the amount of parking to be provided in the central area, are therefore based firstly on securing a redistribution in the proportions of modes of travel to the central area, i.e. of the vehicle types used for this purpose in the peak period traffic stream, that will produce a better use of road space and give in the central area an acceptable degree of traffic. In technical words, this redistribution is termed a variation in the 'modal split'. In simple words it means encouraging some people to come by bus who would otherwise use their cars if there were ample parking for them and at acceptable charges.

77 The objective described aims at preventing an excessive increase beyond what the highway system of its time will take, in the number of commuter cars, by a policy co-ordinating on the one hand the amount of parking that is provided and the charges made for this, and on the other hand the encouragement of a greater use of public transport. The corollary is that the continuance of a satisfactory public transport service must be ensured throughout the future.

78 There has in recent years been discussion and examination of other methods of restraining car entry into towns, but under present circumstances and legislation the policy of applying a restraint by using parking policy would appear to be the most effective. It has a special advantage where, as is usual, the same authority controls and provides highways and the major proportions of public carparking and of public transport.

79 Although it is convenient to refer to the above policy as one of restraint, it is not in fact a new, alarming or very restrictive one. Restraints on unfettered car use already exist, and in the form proposed the full needs of the future can be met. Indeed the network proposed will provide for over twice the present-day number of journeys to the central area, a considerable increase in parking facilities is proposed, and allowance is made for increases both in the numbers of people travelling by car and by bus to the city centre.

In fact the traffic proposals allow for the greater employment, shopping and commercial potential that the redevelopment of the central area will provide, and that will be stimulated by increase in population in the area for which Nottingham is the natural centre.

80 So far the subject of discussion has been the constitution of the main traffic streams, but now considers the routing to vehicle destinations. A principal purpose of the primary routes is to channel traffic around the Contained Areas, letting into these only their locally needed traffic. A particular example is the central area, where one half of all the vehicles in it at peak times are only passing through, and these will be deflected on to the primary routes around it.

81 To provide for the traffic growth envisaged the most effective single contribution is the primary highway network, the provision of which will also be a major help in removing extraneous traffic from the Contained Areas and in particular from the city centre.

82 Quantitatively the proposals have been derived from the very detailed surveys that have been made in the city during recent years, of existing transportation, traffic volumes and movements. These have been analysed to ascertain the trends and needs, and projected into the future, taking account of increasing vehicle ownership and use, increasing population and changes in the development of land, i.e. new development, changes from one type to another, or changes in density, each generating altered volumes and distribution of traffic.

83 The investigations show that compared with the present day the traffic in Nottingham can be expected to be more than double by 1980, and almost treble by the turn of the century, that by 1980 nearly 80% of the ultimate maximum will have been reached, and by 1985 nearly 90%.

84 Three important points arise from the expectations that there will be a considerable increase in traffic and that most of this will occur in a relatively short period of years. The first concerns making a start and the second looking to the end. Firstly the sound remedy is surely to embark on the provision of the kind of facilities that are capable of being put into use with progressive and early effect, that is to say on highways suitable for the motor vehicle. Major highways have to be authorised in programmes some years before their construction is started, years in which traffic is building up.

85 Secondly, the validity of the Plan does not *depend* on a proposition that the motor vehicle, substantially as we know it or with developed improvements in it, will still be the principal mode of local transport in forty years' time. It notes the very substantial growth of traffic that there will be long before this, and it cannot but be sound to judge that the motor vehicle will still be the major provider of local transport in the period in which almost all of the traffic growth occurs.

86 This leads to the third point, which is that it is an important concept of the Plan for the primary network that it would safeguard for the future and provide **routes or channels of communication** of adequate scale, capable of being used by road transport, or by a combination of this with other forms of transportation that might be evolved.

87 The quantitative traffic basis of the network contains a series of factors which in the nature of things may each exert in practice degrees of influence different from those that have been taken. These are the rates of traffic growth and car ownership, changes in population, the redistribution of modes and habits of local travel actually accepted by people, and the degree of efficiency of road use provided by technical developments of vehicle and highway. The effects were therefore examined of reasonable variations from the factors taken materialising in the future. A number of them tended to balance out on probability, and it must be noted that the land requirements of the network largely arise from the 'geometry' of the road layout, and that highway capacities fall into broad ranges according to their number of carriageway lanes. Although it is inevitable that some judgment decisions entered into this analysis, the conclusion was reached that the designs and proposals now presented are soundly based.

The Quantitative Traffic Basis of the Primary Network

88 In order to understand better the complex distribution of traffic in Nottingham the general pattern of traffic movement may be described. It is composed of:—

(*a*) A major flow converging on the city centre.

(*b*) Lesser flows converging on other areas of employment. These areas are roughly comparable to an inverted tee, with an east-west band to the north side of the Trent, and a north-south band along the Leen Valley, each continuing beyond the city.

(*c*) The regional flows, following principally a north-south line, together with a pull towards the west and a lesser pull towards the north-west. These result from the concentrations of population and industry in the West Midlands, Lancashire, and South Yorkshire, and the relatively very thinly populated areas to the east of the Nottingham district.

These flows, as expanded to the future, are shown in conventionalised form in Fig. 12.

A feature that emerges from the pattern is the amount of traffic crossing the Trent in the general Nottingham area.

89 The processes of derivation of the finally selected primary network and its future traffic basis are shown graphically in Fig. 1 and were in brief:—

(*a*) Existing volumes of traffic, origins and destinations, method and purpose of journeys were measured. Many surveys were taken from 1961 to 1964, and comprised volumetric counts, both manual and automatic, throughout the city, direct interview of drivers in traffic streams at inner and outer cordons and check points, aerial and ground surveys of street parking, sample censuses of car occupancy, parking purpose and bus passengers, and data of public transport passengers. Present 'desire-lines' of traffic are shown in Figs. 9, 10 and 11. Computer analysis was used for the existing traffic movements and their future projections.

(*b*) The city and the county areas contributing traffic were finally divided into 29 zones (Fig. 7) for each of which existing car ownership was obtained.

(*c*) Future projections (Fig. 8) were made by giving each zone an overall 'Growth Factor' which is a compound of three constituent factors:—

Increase in car ownership per head.

Future development or redevelopment (changes in land use).

Changes in population.

(*d*) Further allowances were included for regional redistribution of traffic (new highways, etc.), frustrated journeys (i.e. those not made because of lack of parking, etc.), possible changes in the timing and destinations of journeys, and for the use of public transport.

Appendix A gives a more technical and detailed description of the processes used for the traffic surveys, their analysis, future projection and application in the derivation of the primary network.

90 As regards vehicle ownership nationally, the Road Research Laboratory's analysis of present ownership and forecasts of future change in this, were adopted, their research being based on the best national and international experience available, particularly from those countries where there is already a much higher car ownership than in Britain. Their conclusions are shown by graph in Fig. 2 and are summarised in the following table:—

Average Number of Vehicles per head

Year	*Cars & Motor cycles only*	*Other Vehicles*	*All Vehicles*
1950	.07	.02	.09
1960	.15	.03	.18
1965	.21	.05	.26
1970	.27	.06	.33
1980	.38	.07	.45
1990	.44	.07	.51
2000	.45	.08	.53
2010	.46	.09	.55

91 It will be noted that the present Nottingham figure is only slightly below the national average, that nationally 'other vehicles' (mainly commercial) are expected nearly to double in number, and that the increase predicted for cars rises from one car per five persons at present to over one car per three persons by 1980 (or almost double the present scale of ownership), and then increases at a lesser rate until a 'saturation' of ownership is reached.

92 It must be recognised that this form of assessment is based on certain patterns of expenditure of household and other income on consumer and capital goods, particularly of that spent on cars and car use as compared with other goods and services, and that variations from these patterns will correspondingly modify the growth rates taken.

93 The total effect of the various growth factors relevant to Nottingham is shown in Fig. 8 which gives the present and future daily journeys in all zones. In brief the 1965 total of 300,000 journeys could be expected to rise to over 800,000, i.e. to nearly three times the present traffic volumes, based on present habits and modes of travel.

94 These are total journeys in a day, and the next step is to decide the peak hour flows for which the highways should be designed. The relation between peak hour and total daily flow varies with different routes, but on average for the whole city a peak hour flow is about 10% of the 16-hour flow.

95 It might be suggested that it is extravagant to design roads for the flow during a very short peak period, but to design for less would increase the period of congestion, and on many roads there are already very high off-peak flows. Nevertheless there is already some evidence of peak flows extending in duration, and this is a trend that should be encouraged, for example by a staggering of working hours. It is also conceivable that future development of personal communication by telephone, radio and television might give facilities that could result in a spreading of peak travel times.

96 In the design of the primary network, a spread of the peak flow over a period of two hours has been taken. A further allowance has also been made for an expected increase in the number of persons per car at peak periods (car occupancy rate).

97 Other trends that would also give better 'road occupancy', such as smaller size of cars for town travel and methods of safely reducing the 'headway' between travelling vehicles, are worthy of encouragement by taxation policy and technical development.

98 At this point the adjustments for restraint discussed earlier must be brought in, requiring an examination of the composition of the traffic within the city's boundaries. This can be considered as being of three different categories (see Fig. 14):—

(i) Traversing Nottingham on its way elsewhere (about 10% at present of the total);

(ii) Travelling to or between different parts of the city other than the central area (about 53% at present);

(iii) Travelling to destinations in the central area (about 37% at present).

99 The network is designed on the basis of no restraint being applied to the first group, which will be limited only by the facilities for parking available at its origins and destinations, a 10% restraint on the second group, and a larger restraint on the third group, these restraints being only applicable to peak period journeys.

100 The degree of restraint on the last group is one applied to 60% of all ultimate car commuter journeys. There is never a clear-cut distinction between the commuter and the business user who travels by car at peak times, but the effect is approximately equal to one on 40% of all peak period car journeys to central area destinations. Note that this does not imply a drastic or sudden restraint; it means that in each future year it may be necessary that up to 2% of potential car commuters must be encouraged to use public transport instead. The overall effect on travel habits of this policy is also less severe than might appear, for it results in a network that provides capacity for 84% of the total future peak time journeys in their present form and 16% in modified form, the last being indeed only 3% of the total 16 hour flow. However, its application is essential in order to reduce unrestrained car commuter travel at peak periods.

Description of the Network

101 The outcome of all the various considerations described was the selection of the proposed primary network, of which Figs. 24 to 27 show various aspects: the designed traffic flows, the use of existing and new roads, the widths, and the estimated phasings. The correlation of the routes with the present and future highway systems of county and region will be noted in these figures and Fig. 6.

102 The class of road is related to traffic capacity thus:—

Passenger car units/hour (one direction)		
Below 2,500	..	Dual 2-lane carriageway
2,500—3,500	..	,, 3-lane ,,
3,500—4,500	..	,, 3-lane ,, of urban motorway design standard

103 The main features of the network are:—

An Inner Motorway

The Outer Ring (trunk) Road

Twelve radial and orbital routes, including three links between Nottingham and the M.1 Motorway and four routes crossing the Trent.

104 Its extent (including trunk road sections) is:—

	Improved Existing Road (*miles*)	*Road on New Line* (*miles*)	*Total* (*miles*)
Dual two-lane	8.8	3.7	12.5
Dual three-lane ..	11.3	5.5	16.8
Dual three-lane (urban motorway) ..	2.7	2.0	4.7
	22.8	11.2	34.0 miles

105 The folded map at the end of this Report shows the network to a larger scale. This, together with the phasing plans, should be read in the context of the sub-sections dealing with the further stages of design (para. 111) and with phasing (para. 124).

106 The traffic requirements of a primary route involve high standards of alignment and junction design, and restriction of access. Where new primary routes are constructed, these needs should be provided for initially as far as this is possible. Where existing roads are utilised they can only be secured over a longer period.

107 Primary routes cannot function to full efficiency unless or until all uncontrolled right-turns, vehicular access points to individual properties, and junctions with minor roads, are removed from them. This can be done by the provision of service roads, or by altered layout of the building groups, thus collecting and re-routing the traffic, that would otherwise feed directly at a large number of points on to the primary route, on to it at a strictly limited number of accesses, in fact those with the district distributor roads. Thus there is a need for a progressive reduction in the number of accesses, preferably by redevelopment of the bands of property along either side of the primary routes.

The most heavily trafficked segments of the network will ultimately have to be of urban motorway design standard, the remainder requiring a high but less exacting standard.

108 The types of **intersections** will vary according to the traffic flows they have to take, in descending order of capacity as follows:—

Multi-level (Three or two levels)	Direct Interchange	All traffic streams physically separated.
	Grade-Separated	Main streams physically separated, but with weaving or controlled cross-movement for minor streams by gyratory system or signals.
Single-level (ground)		All traffic streams handled by gyratory system or signals.

109 The main intersections are likely to fall into one of the two multi-level groups in their ultimate form, with a phased progression towards this as traffic increases. The junctions of primary with district distributors are likely to be mainly of the single-level group. The location of the latter junctions will be dealt with in the planning of the Contained Areas, but generally these junctions will have to be placed well clear of the main primary intersections.

110 A number of perspectives of the proposed primary routes are included at the end of this Report. Particular features that may be noted are the integration of buildings with the highway in the underpass scheme which forms part of the eastern sector of the Inner Motorway, and the manner in which certain district distributors pass over or under the primary routes.

Further Stages of the Primary Network design

111 As stated in para. 105 the map at the end of this Report shows the proposed primary network for Nottingham, but in reading it regard should be paid to phasing (para. 124) and to the following matters: The development of the design of the primary routes is in three stages, each of progressively closer definition, which may be termed those of (*a*) general planning, (*b*) detailed planning, and lastly (*c*) of engineering design, i.e. when a scheme comes into early prospect of being carried out. The proposals now presented constitute the first stage and comprise a series of routes, their approximate lines, the volumes of traffic they are designed to take, the width categories of roads that would be needed, and the likely types of intersections.

The plan does not purport to lay down exact boundary lines for the primary routes or for their intersections. These matters can only be more closely defined at the second stage of design when more detailed examinations are made. Similarly, the need to redevelop frontages on the primary routes may affect properties, or parts of these, that lie outside the finally defined boundaries of the highway. *Therefore at this stage it is not possible to state with exactness what properties will or will not be affected by the proposals.*

112 It may not, in all cases where an existing road is proposed to be widened to form a primary route, prove necessary to carry out this widening in the conventional way, disturbing property possibly on both sides. For example, part of the width of the existing road might be used as a local or service road, with the primary highway placed parallel to this. This is one of the matters that would be examined in the second stage of design.

Aesthetic Considerations in the Design

113 The proposals for the highway network inevitably stem from a utility purpose, but regard has been paid to the attainment of other satisfactions, of amenity and aesthetics. The visual impact of a highway on a townscape may be considered as seen by the traveller in a vehicle, the pedestrian, and the occupants of nearby buildings.

114 Harmony with the urban scale requires that any massive obtrusiveness of road structure, of accessories to this, and of vehicles, should be guarded against by thoughtful design. Glare of light and traffic noise too must be remembered, and careful design can help to reduce and confine these.

115 Against this background a merit of the policy of providing for a major proportion of urban traffic by a relatively limited number and length of high-capacity routes, is that it justifies in these the application of the highest standards of visual design, in the engineering works themselves and also in their setting. Configuration of ground produces problems but it also creates opportunities, and it can be used as an ally in this task. An example of this is the western length (Park Way) of the Inner Motorway. This is designed to be incut into the slope of the escarpment, by carrying the northbound carriageway under the southbound one, in a pair of semi-open tunnels.

116 Landscaping, and open park areas can, without extravagant cost, be provided alongside much of the highway. Residual fringe areas that are awkward or unsuitable for development can be similarly treated. For example, the road proposed parallel to Castle Boulevard near the canal offers good opportunities for landscaping, and there will be the possibility of extending the open space of the General Cemetery towards the Inner Motorway.

117 What is perhaps an outstanding feature of the proposals is that the traveller on the Inner Motorway will from Wilford Road to Mansfield Road have a sequence of open views. First he will see the Castle, then on his left glimpses of The Park in its valley setting, before he enters the tunnel under Canning Circus. Emerging from this he will see on his right the green space of the present cemetery, and on the whole of the next length as far as Mansfield Road there will be an uninterrupted prospect southwards over the town, with the Arboretum in the foreground, and beyond this the future buildings of the Civic Centre and Victoria Station.

The Cost of the Primary Highways

118 The overall cost, at present-day rates, of the primary network proposed is of the order of £68 million at present-day prices for the engineering works and the acquisition of properties. This figure excludes those portions of the network which are or will be trunk roads, which are the financial responsibility of the Ministry of Transport. On the present basis of Ministry grants the cost falling on the corporation would be £17 million, with £51 million borne by the Exchequer.

119 These are large costs but should be considered in their full perspective, and the following points are relevant:—

(*a*) The expenditure will be spread over a period of about 40 years.

(*b*) The adverse effects on the city's economic life of not embarking on the implementation of a fully satisfactory highway system.

(*c*) The expected increase of population and development in the area for which Nottingham acts as a natural centre, and the corresponding increasing importance of the city as a regional capital.

(*d*) The regional context of the network, and the relation of the capital costs of the latter to the economic potential of the traffic it will serve, with the possibility of national financial contributions reflecting this as an additional source of the capital monies required.

120 Cost-benefit studies have been carried out for those segments of the network that will be needed in the near future, and it is clear from these that the community should derive great benefits from such schemes.

121 It must be stressed that the primary routes (either new routes or improved existing ones) are not the only highways that will be required, for systems of subsidiary distributor routes will also be necessary in the Contained Areas of development. Many of the classified and other main roads in the city that are not absorbed into the primary system will become district distributors, and these will still require improvements, especially at their junctions, and they will in places have to pass under or over the primary routes. Nevertheless the progressive provision of the primary network should reduce the need there would otherwise be for major improvement of these subsidiary routes.

122 There will, however, be a continuing necessity to obtain an increased capacity on existing major roads, which will become more heavily trafficked until such time as sufficient of the primary network is in being. Part of this improvement can be provided by the application of 'traffic management' and 'traffic engineering' techniques and minor works.

123 Studies of comparative cost were made as already indicated between possible alternative routings of the network, and an overall study made of the costs of providing a network for different future volumes of traffic. The conclusions of the latter study are shown by graph in Fig. 31. It will be seen that the cost of a network of lesser capacity fell by a relatively small amount, but for a network of greater capacity the cost rose by a disproportionately greater amount. Thus the selected design gives financially the best return for money spent.

The Phasing of the Primary Network Programme

124 In the past, statutory Development Plans have covered a period of twenty years, but this is not now sufficient having regard to the growth of traffic and the life-span of buildings, and the Ministry of Transport now requires that traffic plans should look forward over a much longer period. Forty years has been adopted as a suitable basis for a comprehensive highway plan, because vehicle ownership and use are expected to continue to rise during most of this period, and population is expected to increase during these years.

125 The full pattern of the Primary Network is capable of taking, in the redistributed proportions described in para. 100, the ultimately expected maximum of traffic that will use such routes, and that is expected to be progressively reached within the next forty years. Therefore the needs, for different parts of the network to be constructed, will be reached at varying dates within this period, but the greater part of the total need will come within the first twenty-five years.

126 The network has been so designed that its segments, their full extents of widening and improvement, and the full provision of the intersections, can be dissected into phases that can be constructed at the times they are needed. In their earlier stages a length of dual three-lane route may be constructed as dual two-lane, and a two-level intersection be at ground-level only. Since junctions on a route tend to be bottlenecks, the improvement of these may precede the construction of the converging routes.

127 The estimated general phasing in ten-year periods is shown on Fig. 27. This phasing is the best assessment that can be made at the present day, and may well require amendment in the light of future circumstances. It is, however, possible to make a closer forecast of the schemes that are likely to be required in the early years, and whilst this must still be regarded as provisional, those where a start may be made in the period to 1978 are shown in Fig. 28.

Section IV

The Traffic Proposals for Nottingham's City Centre

129 The functions of a city centre and the resolving of its traffic problems have been discussed earlier. The more specific manner of this resolution, as applied to the city centre of Nottingham, is now described and can best be followed by reference to Fig. 29. The principles are those of removal of extraneous traffic, of controlled penetration by necessary traffic, and of separation of the routings of the conflicting traffic groups.

130 The traffic proposals comprise:—

(*a*) A major deflection of traversing traffic on to the primary routes, the one principally relieving the city centre being the proposed Inner Motorway.

(*b*) A more localised deflection by a system of subsidiary distributors (of which the Inner Ring Road is one), the more important ones being shown in the figure.

Thus by these instruments for deflecting and channelling traffic, each area of the city centre obtains a reduction of the traffic within it.

(*c*) Areas of comprehensive development, where traffic-free conditions for pedestrians can be secured, and calling vehicles (parking and loading/unloading of goods) separated from passing traffic.

(*d*) The application of Traffic Management methods to relieve traffic conditions in other areas, and to establish priority routes for pedestrians or for local or servicing traffic.

131 Other features that may be noted are:—

The passage of certain subsidiary distributor routes either above or below the Inner Motorway, giving a direct access for local calling traffic and in particular public transport.

The curtailment or diversion of many of the streets that at present give a direct traffic route into the city, at the Inner Ring Road, so that ultimately there would be only about ten streets connecting to the latter on its inner side.

132 There are likely to be at least three major areas of future comprehensive development in the city centre: at Broad Marsh, Victoria Station and the Civic Centre, all in early prospect, and covering in total about 60 acres, and large parts of these will be traffic-free. Both at Broad Marsh and Victoria Station systems of vertical segregation will be used; in the former calling vehicles being provided for at 'first floor' level, and in the latter at underground level.

133 The provisions for public transport will include three permanent covered bus stations; at Victoria Station, replacing the present Huntingdon Street Station; at Mount Street, and at Broad Marsh, replacing the two existing open stations. Separate and convenient pedestrian routes are planned, to link the stations with the main shopping areas.

134 Approximate positions of the present and some of the future public car parks are shown. The amounts and distribution of public carparking facilities are discussed in Section VI.

135 The Inner Motorway will form an outer protecting ring around what may be called the wider central area, and its location required careful examination. Its distance out has to be neither too far, for if so it would leave too much traffic within this area, nor too close in, for it would then plough a wide swathe through the centre and require the clearance of very many substantial buildings on its route and at its large intersections.

136 Further localised reductions of traffic in this wider central area will be made possible by establishing a rational pattern of district and local distributors. The most important of the district distributors is the Inner Ring Road, which contains within its line most of the inner core of the central area. This is roughly half a mile by two-thirds of a mile in extent, and an area of this size is too big to be reasonably considered as one for pedestrians only, as has sometimes been suggested. The justified aims for it are: the deflection of extraneous traffic from it or from its parts, the controlled penetration into it by public transport and by those vehicles that need to call there for business, shopping, the handling of goods, indeed for all appropriate central area purposes, and the securing of traffic-free areas and of 'pedestrian priority' routes.

137 Reference to Figures 22 and 23 will best show the categories of vehicle-journeys in the wider central area at peak period, the effects of the proposed degrees of restraint, and of the deflection on to the primary routes. The salient features are:—

	At Present		*In 40 years' time*		
			In Centre		*Not in Centre*
Vehicles only passing through, and therefore deflectable ..	11,200				29,700 (deflected)
Business etc. journeys other than commuter	4,400	11,200	9,900	17,800	
Work journeys	6,800		7,900		11,900 (restrained from entry)
	22,400		17,800		41,600
				59,400	

138 Thus, whilst total traffic will have grown from 22,400 journeys to a hypothetical 59,400 or 2.65 times the present figure, the traffic within the wider central area will have diminished from 22,400 to 17,800 journeys. Notwithstanding this overall reduction there is, however, an increase provided for of business and commuter journeys from 11,200 to 17,800.

139 In terms of people the proposals allow (approximately, since a slightly different area of survey was taken):—

	At Present	*In forty years' time*	
Travelling by bus	29,800	32,000	(63%)
car	8,600	11,200	(22%)
other modes ..	7,900	7,800	(15%)
	46,300	51,000	

Section V The Role of Public Transport

141 Since the greater part of the urban traffic problem arises from the car-commuter, because of the amount of road space he occupies, some consideration should be given to examining the degree to which forms of mass or collective passenger transport, that do not occupy road space, or occupy it more efficiently, can be used.

142 Before doing this it is important to remember that this subject is one where the solutions proposed for every individual city will differ widely, because each city has a transportation problem of different characteristics, proportions, numbers, present modes of travel, and potentialities.

143 But most cities face two changes in common, the desire of more and more people to use their cars, and the expectation that much of the future growth of traffic will occur in the next decade or so. Therefore, each essential element of any proposed solution must pay regard to this pressure and its early impact.

144 The right solution for transportation to Nottingham's central area must pay regard to the numbers and 'modes of travel' of those who come each day into the city centre to work. There are expected to be 51,000 in the future but at present there are about 46,000, whose modes of travel are:—

On foot and on two-wheels ..	5,000	or	11%
By car	8,600		19%
By bus	29,800		64%
By rail	2,900		6%

145 Thus in considering other forms of mass transportation, it is pertinent to consider how much these would be utilised and how far they would be merely taking over, or attempting to do so, from existing forms of mass transport.

146 The principal form of collective transport that does not use the roads is rail travel, either by trains of conventional type or rail-motor. The number of persons travelling by local train into Nottingham to work has steadily diminished as services and routes have been reduced. Whilst regrettable, this is an example of a general trend and it would be unwise to rely on its being halted or reversed. Nor can the retention of services be relied on, although this is not to say that reasonable steps should not be taken to obtain the fullest benefits that rail passenger services give. But even so, the fact that only 6% of Nottingham commuters come by rail shows that it would require a very comprehensive return to rail travel to give any useful relief to the roads.

147 Underground railway systems have been suggested, but study of these, and of their initial and operating costs, shows that they can only be usefully considered for very large cities and where they already exist in part and can be extended as development expands into outer areas.

148 A system sometimes advocated for urban mass transport is the Monorail. Whilst this requires major changes in redevelopment particularly at the stopping places in the central area, which must be frequent, some bigger questions must be asked and considered before it can be considered as a solution.

149 Mass transport systems of non-road type are mainly appropriate and viable where there is a linear pattern of development along their routes, of high density and total amount, that is to say with ample passenger potential adjacent to their stations.

150 They cannot in an existing town be utilised by more than a fraction of those who at present use buses, which also have the advantage of flexibility in being able, with different local services, to 'wander' from the direct lines of route.

151 When it is remembered that two-thirds of the people coming into the centre of Nottingham already travel by an established mass transport system, the bus, it will also be seen that any new form would only give a fractional benefit, and could only draw on those adjacent to its route.

152 But it is not necessary that these new systems should be completely rejected, for the planning of adequate modern highways would itself leave open the possibility of using these both for orthodox and unorthodox systems in the future.

153 A modern highway system is at any rate necessary for the future, and cannot be avoided by the use of new transportation systems, and the outcome of this discussion is that it would be unwise to *rely* on such systems coming into being and being sufficiently used, and it would be preferable to rely on methods that are within the field of the local authority.

154 At very much less financial cost than that of establishing new forms of urban transportation, it would be possible to sustain and also to develop the existing established forms of urban transport, and to ensure the maximum use of public road transport commensurate with the growth of the city's activities.

155 It is of interest that the main reductions in passengers carried by the city's transport in the last decade have been in the off-peak and inter-suburban services, and that there has been relatively little fall in the numbers of passengers to and from the central area at peak times. Yet an imbalance between peak and off-peak operation clearly has an effect on the running costs of a transport undertaking. But a general further reduction in peak and off-peak travel could hazard the efficiency of an undertaking. It is a reasonable assumption that the nearer that public parking charges are to their economic price, the better would public transport be able to retain its passengers. It is not the province of this Report to consider the financial policies either of public transport or of local authority parking, but the relationship between these is evident, and the policy on both has a bearing on the prosperity of the city.

156 On the basis of a controlled redistribution of modes of travel, attainable by a co-ordinated parking and transport policy, it is expected that notwithstanding the increased use of cars there will be a greater number of persons travelling to the city centre by bus than there are at present.

157 To be able to rely on public transport to the extent needed, it is necessary to improve general traffic conditions, since this will in itself help bus travel. Conversely the facilitation of bus movement, and attention to halts, will assist general traffic flow. There are many minor ways in which this can be done, and in some cases modifications to highway layout to provide this would be justified.

158 It is the essence of local public transport that it can provide conveniently short walking distances for its users. For this reason, whilst buses would be able to use the primary routes wherever this suits the undertaking, the planning proposals provide for bus routes along the subsidiary distributors in the contained areas of development. Thus the bus services will be able to penetrate the zones where people live, work and shop, to a planned degree consistent with safety and amenity considerations, and will be able to travel direct from one zone to another by convenient routes. This policy should also help to keep 'dead mileage' to a minimum.

159 This principle of convenient **Controlled Penetration** by public transport, on a scale that is consistent with the provision of major areas free from traffic or with reduced traffic in them, is one that is specially important in the city centre.

Localised Transport

160 A form of more local collective transport should be mentioned, because there can be increasing scope for its application. This is the development of the escalator known as the travellator, being a horizontally moving platform on which pedestrians can travel. Its most likely application is in or between large scale developments such as shopping centres and car parks, for example between the Victoria Station scheme and the Lacemarket area.

161 Escalators of normal type have of course a widening application, and it is possible to consider their use as a communication between the lower level of the town say at Broad Marsh and the upper level at High Pavement.

162 Lastly, reference will be made in the section of this Report dealing with Car Parking to the possibilities of using mini-buses between carparks on the periphery of the central area, and the city centre itself.

Section VI Car Parking for the Central Area

164 It is necessary to consider the policy for and provision of carparking because, as has been indicated, this has a function in the Traffic Plan and a bearing on the proportions of vehicle categories in the total traffic on which the primary network is based. The transportation needs are governed by the total of development and activities generating these. The uncontrolled amount of car use in this total has to be adjusted downwards to balance with the acceptable traffic flows. This adjustment necessitates a reliance on public transport, and an unco-ordinated provision of carparking would upset the necessary balance.

In simple terms, too lavish or too cheap a provision of parking would draw away users of buses, thus reducing the economic ability of public transport to fill its necessary role. Too small a provision would be insufficient for the activities of the city centre. Therefore the policy decisions to be made in the future, regarding public carparking and public transport are mutually related and important. The total of parking to be aimed at must be neither too much nor too little, but much more than there now is will be required.

165 The need for a much increased provision of off-street public carparking for the central area arises from:—

(*a*) The very great increase in car ownership and use that will come about, with a consequent pressure and demand by individuals to use their cars to a maximum degree.

(*b*) Increased development, which generates a greater demand for parking.

(*c*) Reductions in street parking for traffic and environmental reasons, and by the absorption of streets into areas of redevelopment.

(*d*) Increase of employment in the central area.

(*e*) The growth of the regional population centred on Nottingham.

(*f*) The importance to the city of a prosperous city centre, attractive to commerce and all who frequent it.

Duration of Parking

166 The demand for parking space makes it generally desirable that where parking is permitted in streets, this should only be for short periods, and that drivers requiring longer period parking should be provided for off the street.

167 The latter category falls mainly into two groups, (*a*) all-day parking (mainly the commuter but also business use); (*b*) medium-period parking (for business, shopping etc.).

Apart from overlaps between these groups, it is a proportion of the commuter group who cannot in the future all be catered for, since their travel times are at peak traffic periods.

Places of Parking

Parking is of four kinds:—

(*a*)	Street parking	(public use)
(*b*)	Temporary off-street parks	(public and private use)
(*c*)	Parking within or associated with buildings	(private use)
(*d*)	Permanent off-street parks	(public and private use)

168 The need to facilitate traffic flow is, with growing traffic, likely to reduce the amount of street parking that can be permitted. The amount of temporary off-street parking is of course constantly changing with clearance and redevelopment of sites.

169 Under town planning control new buildings are required to contain parking facilities, to an appropriate scale, but this is not intended to, nor is it in every case desirable that it should, provide for all who may frequent the buildings.

The Amount of Parking for the Central Area

170 The ultimate target figure for parking provision for the central area is based on an equation arising from the Balanced Need, being:—

ACCEPTABLE DEMAND = PARKING PROVISION = HIGHWAY PROVISION

The Balanced Need is derived from the sum of demands of the central area, as generated by its buildings and various activities, and then adjusted, in accordance with the necessary redistribution in the proportions of modes of travel. The Acceptable Demand is part of the Balanced Need, and is the number of commuter and essential cars with central area destinations, requiring parking at any particular period and time of day. The Parking Provision is the total required of off-street and on-street spaces, both public and private, for varied periods of stay. The Highway Provision is that part of the traffic capacity of primary and subsidiary distributor routes, that is available for car-users.

171 At present there are about 3,800 car spaces on-street and 4,900 off-street, both public and private, or 8,700 in all. It is estimated that ultimately the parking provision for the central area should be 3,000 spaces on the street, and 15,300 in off-street carparks, or 18,300 in all.

172 Thus there is a need to provide in the future about 10/11,000 more car spaces than at present, or roughly at least 300 car spaces per year.

Distribution of Parking for the Central Area

173 Drivers will always wish to use their cars to get them as near their destinations as possible. It is undesirable, however, that more than a minor amount of the total carparking should be right in the heart of the city, as otherwise too much traffic would be attracted there. On the other hand there is little prospect, in a city of Nottingham's size, that carparks situated any considerable distance from the centre would be acceptable to car-users.

174 Analysis of their journey distances shows that 75% of all Nottingham's car commuters travel less than five miles from home to work in the central area, and 50% travel less than three miles (see Fig. 15). Thus for most car-users the parking should preferably be within walking distance of their destinations.

175 The pattern that has been chosen therefore for the location of carparks is:—

(*a*) A small proportion, only about 10% of the total, will be in the centre core of the city.

(*b*) About 65% will be adjacent to the Inner Ring Road, i.e., distributed along a ring, from 300 to 600 yards from the mid-point.

These two groups could therefore be termed 'Park and Walk', a general aim being that a motorist should have no more than about 300 yards to walk from his parking place to any destination in the city centre.

(*c*) The third group, comprising the remaining 25% of the total, should be no further out than the fringe of the central area, say from 600 yards to a little over half a mile from the mid-point. These are only likely to be well used, when the maximum provision of the 'park and walk' carparks has been made. They require probably to be of sufficient size to justify the operation of a minibus type of shuttle service at short frequency so that users do not have to depend on the normal bus services which at these points would already be crowded. They can be termed 'park and short ride'.

The Characteristics of Town Carparks

176 Carparks, especially at peak periods, can create local traffic concentrations, and their size, layout and accesses therefore require careful study. The city's off-street parking requirements are much greater than can be provided by surface carparks. Because of the difficulties of finding sites, land values, problems of levels, ground conditions and costs, most central area carparks will be likely to be of the multi-level type, generally above ground.

177 The lines of Corporation policy in providing permanent public parking are already established, and are:—

(*a*) The provision of a number of carparks each with a capacity in the general range of from 200 to 600 cars. Of these there are already four, and three more are in early prospect. Some of this group will be solely carparks, others will be combined with other development in composite schemes.

(*b*) The provision of a few very large public carparks, in big comprehensive development schemes such as Broad Marsh and Victoria Station.

178 Whilst taking advantage of the special opportunities afforded by large schemes, the general aim, to provide a frequent distribution of smaller carparks, which is a policy convenient to their users, is one that makes the provision of carparks easier. This is an important consideration when a continuing programme of carpark provision is essential.

179 Two subsidiary ways in which public carparking might be given an added facility may be mentioned. One is in the advance signing of parking availability that has been referred to in para. 66. The other possibility is by the introduction of a parcels collection service at carparks similar to that provided by bus undertakings.

180 Appendix B describes in detail the manner in which the amounts of future carparking needed for the central area were arrived at, and the relationship of these amounts to highway capacity, employment, trading and other needs in the central area.

Section VII Conclusion

181 Every practitioner in the fields of town-planning, traffic and highways, owes a debt to the Buchanan Report, for its thoroughness of analysis and the clarity it brought to the problem of traffic in towns. That Report stressed fundamental principles of solution that are valid in all towns, and depicted the ranges of solution that might be achieved.

182 All towns have a common general problem, but every town has different physical and traffic characteristics and size, and the traffic solution for each town must therefore, inevitably and properly, differ.

183 The Traffic Plan for Nottingham now presented is the outcome of research that has been undertaken during the last four years, and of development of design that has extended over more than two years. This development had to follow many lines of approach each requiring concurrent cross-checks and reconciliations. The Plan as described is only a minute fraction of the total work involved. Many apparent solutions were prepared, examined, rejected or modified before a final choice was made.

184 The aim that has been constantly borne in mind in working out the proposals of the Traffic Plan, is that it should be soundly based and balanced in all respects, and be capable of sustained and progressive attainment. Its preparation has not been undertaken lightly nor prematurely completed, for a scheme brought too quickly to birth is likely to be still-born, and to remain on paper during years in which traffic congestion and invasion continue to grow. The time spent in its preparation has been well used. It has allowed thorough and searching tests to be applied, and has given the opportunity for thinking, rethinking and review in a full perspective. It has enabled fresh looks to be given at different aspects, to recognise an impact and reach a better solution.

185 One sometimes speaks of traffic arteries, and this reflects a truth, for like life-blood, traffic and its communications sustain industry, commerce and indeed almost all urban activities. If increase of national and local productivity is worth aiming at in industry and commerce, then the attainment of safety, efficiency and adequacy by a re-organisation on modern lines of the highway system which feeds these should equally be an essential task.

186 If Nottingham provides, resolutely and progressively, the traffic facilities that are in keeping with the city's future, and reshapes its central area and its city to the human needs of its people and all who now and in the future would frequent it, then it will hold and advance its place among provincial cities. If it does not then well-being and prosperity will move elsewhere to those towns, existing and new, that find themselves ready and able in greater measure to re-organise their patterns to meet the needs of tomorrow.

187 Many of the city's past achievements in highways, such as the construction of London Road, Lower Parliament Street, Castle Boulevard, and the inner ring of Lenton, Radford, and Gregory Boulevards, the outer ring from Valley Road by Western, Middleton, and Clifton Boulevards, and the construction of Clifton Bridge, were for their time most far-sighted actions. Without these routes Nottingham's traffic would long before now have been in a sorry plight, and the city's prosperity would have suffered.

188 But the pressures and needs of traffic are increasing, and the timely evolution of a modern highway system, based on the principles advocated in this Report, would well serve the future needs of the city, and would help to attain many other planning objectives.

F. M. LITTLE
City Engineer and Planning Officer

Guildhall
Nottingham

End-Note

My gratitude is due to all those of my staff who have shared in the production of the Traffic Plan, for their unfailing co-operation and thoroughness. My thanks are due also to my fellow chief officers for their help, and to the members of the city's Planning Committee and other Committees concerned in various aspects of the subject, for the interest they have shown.

I am conscious of the responsibility that rests on me personally in presenting proposals that must have some influence on the future of Nottingham. I believe that the Plan is well founded. I know that it has been thoroughly thought out, and I have given every part of it mature and critical appraisal and judgment throughout its development.

F.M.L.

Details of Traffic Survey, Analysis and Assignment

I EXISTING TRAFFIC VOLUMES AND DISTRIBUTION

190 Data of past trends and volumes of traffic in the city were first studied, and showed annual growth rates varying from nil (due to saturation having been reached) on certain routes to 12% on routes that had spare capacity, with an average of about 6%. Fig. 4 shows the increase of vehicle registrations in the city and county during recent years. Figs. 3 and 5 show respectively annual variations in traffic volumes on Valley Road, and daily variations on Trent Bridge and Clifton Bridge.

191 In April 1962 a survey of traffic movements at all major road junctions was undertaken. This was followed up by an Origin and Destination Survey which was carried out in August and September 1962 by direct interview at points along a series of circumferential cordons and screen lines. The outermost cordon encompassed most of the city. The inner cordons and screen lines recorded all major journeys within the city, while the outer cordon recorded the external journeys to and through the city.

192 At two check points continuous volumetric counts were carried out during the period of the survey to correct for the variation in traffic flow on the different days of the main survey.

193 The planning of the surveys, selection of interview points, questionnaire forms etc. were undertaken by the City Engineer's Department in consultation with the Ministry of Transport prior to the issue of grant aid for survey.

194 The basic information collected related to vehicular movements and in particular to:—

(*a*) Origin and Destination of all vehicle journeys in an eight-hour period (7 - 10 a.m., 12 - 2 p.m. and 4 - 7 p.m.).

(*b*) Travel purpose of occupants (work, business or other purpose).

(*c*) Travel mode (car, motor cycle, goods vehicle).

(*d*) Number of occupants, including the driver.
Local buses were not stopped as their movements could be determined from the timetables. Longer distance buses were stopped to obtain the O. & D. information and travel purpose only.

195 The field sheets were summarised and an initial grouping of O. & D. volumes was carried out by an IBM computer which produced 16-hour flows (6 a.m.-10 p.m., scaled up from the 8-hour sample) for 200 origins and destinations. To facilitate computer work these 200 origins and destinations were manually reduced to 80.

196 To check the O. & D. results an assignment to the existing road network of the recorded movements between the 80 origins and destinations was carried out by an ICT computer. Resulting flows were compared with the volumetric counts obtained in the April survey (corrected to August). The assigned flows showed that the O. & D. survey results were substantially correct.

197 The boundaries of the 80 traffic zones were selected to fit existing land use and were subsequently consolidated to the 29 zones shown in Fig. 7, to facilitate interpretation of desire lines.

198 The basic information of traffic movements at the survey date 1962 provided a picture of the existing movement between the 29 zones related to:—

(*a*) Central area journeys.

(*b*) Through or by-passable traffic.

(*c*) External (outside city)—internal (inside city), excluding central area journeys.

(*d*) Local journeys in the city (between suburbs).

199 The appropriate desire line diagrams for moves (*a*) (*b*) and (*c*) are shown on Figs. 9, 10 and 11. The diagram for local journeys (*d*) has been omitted as no varying pattern was apparent.

200 In addition to the major surveys mentioned above, several other surveys were carried out and used to provide additional information. These were:—

(*a*) **Central Area O. & D. Survey (1961)**
Used to assess the traffic movements (origin, destination, purpose and method of travel) within the city centre. This has been the basis for analysis and projection of central area traffic flows on the Inner Ring Road and other distributors, and of central area parking.

(*b*) **Central Area Parking Surveys (1961 and 1964)**
Aerial photograph and ground surveys, used to assess existing parking demand, density and turnover.

(*c*) **Public Transport Surveys (1963 and 1964)**
Data related to volumes and frequency of all city bus services was extracted from service timetables. Numbers of bus passengers entering and leaving the central area at peak periods were obtained from surveys made by the City Transport Department. Supplemented by direct interview and postcard surveys, these were used to assess the principal bus-priority routes and the general movement of bus passengers throughout the city and their detailed movement in the central area. Figs. 16 to 21 illustrate the data gathered.

(*d*) **Pedestrian Surveys (1962 and 1964)**
Used to assess in the central area the principal flows, and the pedestrian movements of bus passengers to and from bus stations.

(*e*) **Employment Survey (1964)**
Used to assess the distribution of employment and numbers employed throughout the city, and in particular to relate these factors to the use and extent of floor space in the central area.

(*f*) **Land Use Survey (1964)**
Used to assess in amount, type and distribution, existing land-use in the traffic zones throughout the city, and in more detail the floor areas of development in the central area.

(*g*) **Land Use and Traffic Generation**
In order to determine the relationship between certain main land uses and the traffic generated by them, a survey by home interview and similar means was carried out by students of the Department of Civil Engineering of Nottingham University on behalf of the City Engineer's Department.

This information was obtained for selected residential, industrial, and shopping areas within the city. The result of the residential area study provided basic facts on car ownership, travel purpose, and method of travel related to family structure, and socio-economic groupings. Information on the generation of commercial and employees' traffic was obtained for certain industrial areas, and this relation was also determined for commercial and shoppers' traffic at sample shopping districts.

II FUTURE GROWTH OF TRAFFIC

201 Having established and checked the pattern of existing movements the next step was an assessment of the future growth in traffic for each zone-to-zone movement, based on changes in vehicle ownership, population and land-use.

Growth factors, taking the 1962 figures as unity, were derived for each of these three elements giving a combined growth factor for each zone.

(*a*) Changes in Vehicle Ownership (vehicles per head)

202 For those of the 80 zones that are wholly within the city, the existing population was determined from the 1961 National Census. The existing number of vehicles registered for each zone was obtained from the Local Taxation Office.

In those zones that were principally residential the existing vehicle ownership (vehicles per head) was derived by dividing the total number of cars and motor cycles registered in the zones by the population of the zone.

In those zones that were principally industrial and also in the central area, the ownership rate is more complex, as these zones accept journeys from all other zones. A growth factor based on the city average was taken, i.e., the total number of vehicles registered in the city divided by the total population of the city.

For zones partly or wholly outside the city, principally the adjoining county districts, which contribute substantially to the city traffic flows, the existing ownership was assumed to be the same as similar areas in the city.

For areas beyond these districts that contribute to the city traffic flows, the national average vehicle ownership was taken. A summary of existing vehicle ownership was thus obtained for all the 80 traffic zones.

203 The growth of vehicle ownership up to the year 2010 was assessed by using the Road Research Laboratory curve (Fig. 2). From the present ownership in each zone the future ownership for each of the years 1970, 1980, 1990 and 2000 was obtained from this curve.

204 The ratio of future to present-day ownership gave growth factors of ownership for each zone, which were used in the calculation of the growth of traffic for the zone.

205 Theoretical growths for residential areas were adjusted to allow for variations in family income, size and structure, rateable values, social habits, and parking availability.

(*b*) Changes in Population

206 Estimates of future population for each zone in the city were made, and major changes in population in the county districts were obtained from the County Planning Officer. The principal ones are shown in Fig. 13.

207 The ratio of future to existing population was taken as a measure of the increase in traffic due to the increase in population. This factor was used in conjunction with the growth factor for vehicle ownership for the appropriate zones.

(*c*) Changes in Land Use

208 Changes in land use have been included in the growth factor calculations. For example, the Lenton Lane industrial site was studied for traffic generation. Movement to all other zones was simulated by the Furness gravity method (flow inversely proportional to distance squared, and directly proportional to population).

209 All the above information was processed by an ICT computer to predict future zone-to-zone moves for the 80 zones. These flows were then consolidated to 29 zones to facilitate manual assignment (Fig. 7). A summary of the growth factors, taking account of all the above-mentioned considerations, is shown in Fig. 8.

III ASSIGNMENT OF FUTURE FLOWS

210 In assigning flows the following assumptions were made:—

(*i*) Traffic between adjacent zones would not use the primary network.

(*ii*) Where new primary routes were provided parallel to existing routes, public service vehicles and commercial traffic to and from the areas adjoining the existing roads were assigned to existing routes.

211 The unrestrained flows estimated for the year 2010, as governed by future desire lines, were assigned, on a basis of minimum journey time and distance, to a draft network, and successive variations in the form of this were examined and adjusted as found necessary. The heavy flows resulting from the thus selected assignment of unrestrained flow, and the scales of network and parking that would have been needed, made it necessary, as described in the Report, to apply some degree of restraint to future peak period journeys.

212 After studying the effects of a series of trial adjustments for this, it was found that a solution, balanced in relation to highway and parking provision, development, land-use and amenity considerations, could be obtained by applying the restraint and road-occupancy factors adopted in the final design.

Road Occupancy

213 A 'passenger car unit' (p.c.u.) can be loosely defined as the comparative road space taken up by different types of vehicles when travelling, taking the average car as unity. The accepted values are, for urban streets:—

	On Street	*At Roundabouts*	*At Signals*
Cars and light vans	1.0	1.0	1.0
Commercial vehicles (medium)	1.75	2.8	1.75
(heavy)	2.5		
Buses and coaches	3.0*	2.8	2.25
Motor cycles	.75	.75	.33
Pedal cycles	.33	.5	.2

**Can vary in practice according to the proportion of buses in and the density of the traffic stream.*

Car Occupancy

214 Sample surveys in Nottingham showed that car-occupancy (number of persons per car including the driver) averaged 1.2, in and near the central area, reaching 1.4 at journey to work times near large works outside the centre. For example, therefore, 36 persons travelling in 30 cars occupy ten times as much road space as 36 passengers travelling in one bus (i.e., 30 p.c.u's. and 3 p.c.u's. respectively).

Appendix B

Detailed Analysis of Carparking Provision for the Central Area

I BASIC CALCULATION OF DEMAND

216 The demand, when vehicle growth reaches saturation, for on-street and off-street parking in the central area contained within the Inner Motorway, has been derived as follows:—

Short Term Parking

217 From O. & D. surveys and projections, the total trips to the central area are expected to be 130,000 trips in 16 hours.

However, in order to determine the demand for short-term parking the period from 9 a.m. to 5 p.m. has been considered. The number of trips in this period will be the above figure divided by 1.95, i.e. .. .. 67,000 trips

For trips requiring short-term parking, the following trips during the 8-hour period of 9 a.m. to 5 p.m. should be deducted:—

Bus	2,600
Motor cycle	3,100
Not requiring parking—5% of 67,000	3,300
By commuters (provided with long-term parking)	4,500
By central area residents (provided with long-term parking) ..	1,000
Deduct: ..	14,500 trips

∴ Potential trips requiring short-term parking 67,000 — 14,500 = 52,500 trips

∴ Taking the present central area average turnover which is 6 uses per car space in 8 hours, the short-term parking required = $\frac{52,500}{6}$ = 8,800 spaces

218 The above figures were checked by considering the likely turnover from different categories of short-term parking spaces:

Off-street	*Turnover*	*Spaces*	*Trips in 8 hours*
2-hour spaces	3	5,300	15,900
1-hour spaces	7	500	3,500
On-street			
1-hour spaces	7	1,000	7,000
30-minute spaces	13	2,000	26,000
		8,800	52,400

The parking provision allowed above takes account of persons who park more than once in a day.

Commuter Parking

219 From the O. & D. surveys and projections, the unrestrained number of commuter cars would be 20,000 cars.

On the basis taken that 60% are restrained, the commuter parking required is:—

20,000 x .4 = ... 8,000 spaces

Residential Parking

220 From expected future central area residential accommodation the following number of car spaces is required:—

Residential	2,400
Hotels	750
	3,150
From this can be deducted an allowance for residential spaces which will be shared with short-term parkers, say	—1,650
Nett requirements for residential parking	1,500 spaces

Summary

221

Short term parking		8,800
Commuter parking		8,000
Residential parking (nett)		1,500
	Total	18,300 spaces

This will be provided as follows:

Off-street		15,300
On-street		3,000
		18,300 spaces

II DEMAND BASED ON FLOOR SPACE AND WORKING POPULATION

222 A survey was made of existing floor space in the central area, present trends examined, and a forecast made of possible changes during the design period. From these figures, and from an assessment of the present working population, projections of future numbers of persons employed were made (see Table I, at end of this Appendix).

223 Using future floor areas and appropriate ratios of car space to floor area for each use-category, non-commuter carparking spaces were calculated, giving a figure of 10,300 (i.e., 8,800 short term, plus 1,500 nett residential). Similarly, ratios of employed persons per car space were used to calculate commuter car spaces, totalling 8,000. These calculations are shown on Table II of this Appendix.

III PARKING LOAD ON CENTRAL AREA DISTRICT DISTRIBUTORS

224 The traffic volumes for the peak hour of 5 p.m. to 6 p.m. generated by the above parking provision were assessed, and the capacity of district distributors carrying this load examined, as follows:

225 **From Off-street Car Parks**

		Evacuation	*Outbound Trips*
Commuters	8,000	65%	5,200
Residential	1,500	5%	80
2-hour spaces	5,300	35%	1,850
1-hour spaces	500	33%	170
From street parking and service areas	3,000	33%	1,000
Non-parking vehicles	$5\% \times \frac{130,000}{10}$		650
Buses 10% of 6,000			600
Motor cycles			600
Total vehicles/hour	=		10,150

Capacity of District Distributors

226 The district distributors within the Inner Motorway must have in total a capacity sufficient to accommodate their peak flows, including those generated by the carparks.

227 The following district distributors are those which serve as main feeders to and from the central area. Their peak hour capacities and predicted flows are noted for one direction (outgoing 5 p.m.—6 p.m.). Conditions during the evening peak period are taken, because of the overlap that then occurs of long term and short term parkers (mainly business plus shopping).

Distributor	*Outbound Capacity (Vehicle/hour) One-Way*	*Approximate Outbound Flow (5 p.m. to 6 p.m.)*
Derby Road	2,500	1,400
Lenton Road	500	100
Castle Boulevard	1,000	700
Carrington Street	1,200	1,100
London Road	2,200	2,300
Barker Gate	1,500	1,800
St. Ann's Well Road	900	900
Mansfield Road	1,500	1,400
Waverley Street	600	500
	11,900	10,200

228 These calculations confirm that the parking spaces to be provided are properly balanced with the highway capacity.

IV PERSONS TRAVELLING BY CAR TO WORK IN CENTRAL AREA

229 By examination of the present and future distribution of modes of travel into the central area allowed by the highway capacity, the following data were noted:

	Persons
Present number of persons coming to work in cars	8,600
Total future spaces for acceptable number of commuter cars = 8,000	
So, assuming 1.4 persons per car, the future number of persons travelling to work in central area by car = 8,000 x 1.4 =	11,200

230 The commuter parking provision proposed therefore allows for an increase of 11,200—8,600 = 2,600 or 30% in the number of persons travelling to work in the central area by car, which is in conformity with the land-use calculations allowing for redevelopment.

CENTRAL AREA FLOOR AREAS AND EMPLOYMENT **Table I**

	(1) *1964 Floor Area*	(2) *Estimated Increases*	(3) *Additional Areas (1) x (2)*	(4) *Deductions (Highways and Parking Garages)*	(5) *Future Floor Area (1)+(3)—(4)*	(6) *1964 No. of Persons Employed*	(7) *Persons Employed per 1,000 sq. ft. (6)÷(1)*	(8) *Future No. of Persons Employed (5) x (7)*
Shops ..	3,590,000	30%	1,070,000	100,000	4,560,000	8,100	2.27	10,400
Offices ..	4,240,000	20%	840,000	100,000	4,980,000	13,600	3.22	16,000
Industry ..	3,350,000	5%	170,000	400,000	3,120,000	15,700	4.70	14,600
Wholesale Warehouses	2,460,000	20%	490,000	400,000	2,550,000	2,100	0.86	2,200
Education ..	240,000	10%	20,000	—	260,000	470	1.97	500
Hotels ..	500,000	20%	100,000	—	600,000	990	1.97	1,200
Other ..	2,560,000	30%	770,000	400,000	2,930,000	5,040	1.97	5,700
	16,940,000				19,000,000	46,000		50,600

Estimated increases in floor area = 12%
Estimated increases in employment = 10%

CITY CENTRE PARKING REQUIREMENTS **Table II**

	Future Floor Area in sq. ft.	*"Non-Commuter" Floor Area per car space*	*No. of Parking spaces for "Non-Commuter" Parking*	*Persons Employed*	*Employed Persons per car space*	*No. of Parking Spaces for Commuters*	*Total No. of Spaces*	*Floor Area per Car Space*
Shopping	4,560,000	800	5,700	10,400	15	700	6,400	710
Offices ..	4,980,000	3,000	1,660	16,000	4	4,000	5,660	880
Industry ..	3,120,000	5,000	620	14,600	8	1,820	2,440	1,300
Wholesale W'houses	2,550,000	20,000	130	2,200	4	550	680	3,700
Education	260,000	1,000	260	500	5	100	360	720
Other ..	2,930,000	7,000	430	5,700	8	710	1,140	2,600
Hotels ..	600,000	800	750	1,200	10	120	870	690
Residential	2,400,000	1,000	750†	—	—	—	750	1,000*
			10,300‡	50,600		8,000	18,300	

†Requirement 2,400 but assume 1,650 spaces are vacated during business hours and used for short-term parking.

‡This comprises 8,800 short-term spaces and 1,500 residential and hotel spaces.

*Part of provision is shared with short-term parkers.

Appendix C

Summary of Locations of the Primary Routes

233 The Primary Network having been described in general terms, the following is a more detailed note on the location of its segments.

The numbers in brackets after each one are shown in Figs. 26 and 27, and are the points of intersections and of crossing the city boundaries.

234 **The Inner Motorway (1–4–5–6–7)**

The Eastern Segment (1–4) named Sheriff's Way, will start at the Mansfield Road/Huntingdon Street junction (1), run between Glasshouse Street and Huntingdon Street, thence via Cranbrook Street to the London Road/Canal Street junction, thence via London Road to a point south of the London Road/Waterway Street junction (4). At point (1) it receives the northern link of the Eastern By-pass.

The Southern Segment (4–5) named Meadows Way, runs by a new road to a point west of Wilford Road on land now occupied by railway sidings. This segment is roughly 500 yards south of and parallel to Canal Street.

The Western Segment (5–6), named Park Way, runs northwards by a route on the eastern fringe of The Park to a tunnelled length at Canning Circus (6).

The North-West (6–7) and Northern (7–1) Segments (named Forest Way) connect Canning Circus to the Mansfield Road/Huntingdon Street point (1) by a route cutting the corner of the General Cemetery, running to near the Waverley Street/Raleigh Street junction (7), thence along the northern edge of the Arboretum.

235 **The Outer Ring (Trunk) Road (23–9–10–11–12–14–15–16)**

Follows the general line of Clifton, Middleton and Western Boulevards and Valley Road to about the junction of Edwards Lane. The continuing trunk road length (16–18) will run northwards between the two parts of the Bestwood Park estate.

The Radial and Orbital Routes

236 The **northern radial** (1–16–17) follows Mansfield Road and thence Hucknall Road to Hucknall Lane.

The **Carlton Road** primary (2–19) runs outwards from the line of the Eastern By-Pass, passing under this.

London Road (4–21) runs from the Inner Motorway southwards across Trent Bridge.

The **Fourth Trent Crossing** (5–8–22) will run southward from the Inner Motorway, crossing the Trent at Wilford to join the County's proposed Loughborough Road by-pass.

The Eastern By-Pass and Third Trent Crossing (1–2–3–20) will run from Lady Bay in the county, northwards by a new river bridge, thence to the north-eastern junction (1) of the Inner Motorway.

Link Road (3–4) will connect the south-eastern junction (4) of the Inner Motorway to the Eastern By-pass.

Queen's Drive Primary (8–10) follows the length of Queen's Drive from near Wilford Road to Clifton Boulevard on the Outer Ring (trunk) Road.

The Clifton Lane and Barton Lane Primary (9–24) follows generally Clifton Lane and Barton Lane to link with the M1 Motorway, and give good access to the East Midlands Airport at Castle Donington.

The Castle Boulevard Parallel and University Boulevard (5–11–25) will run from the Inner Motorway by a new route roughly parallel with Castle Boulevard near the canal, thence continuing along University Boulevard.

The Derby Road Primary (6–13–12–26) runs from the Inner Motorway at Canning Circus generally along the line of Derby Road, and thence linking with the M1 Motorway.

The Ilkeston Road Primary (13–14–27) runs from the Derby Road primary near Canning Circus using new and existing routes, via Ilkeston Road and Wollaton Road connecting with the Outer Ring Road near the present junction, thence running by a new route near the canal and swinging back to Trowell Road.

The North-West Primary (7–15–28) runs from the Inner Motorway at its junction near Waverley Street/Raleigh Street, by a new route lying between Alfreton Road and Radford Road, to the Outer Ring Road, thence via Nuthall Road to connect to the M1 Motorway.

Appendix D

List and Description of Plans and Diagrams

Figure 1 Survey and Analysis Programme

Show the stages of quantitative derivation of the network, from land-use and traffic considerations. These require 'balancing' with town planning and qualitative considerations.

Figure 2 Future Prediction of Vehicle Growth

This graph is based on the Road Research Laboratory predictions of future vehicle growth. The expected ownership in vehicles per head of population is plotted against the year.

The present-day figures for sample areas at Mapperley and Clifton have been plotted for 1965 to show the relation between these and the national average. Ownership over the city as a whole amounts at present to about 0.21 vehicles of all types per head of population.

Figure 3 Valley Road Continuous Traffic Census

A continuous record of daily flows at a point on Valley Road has been kept since 1956. The pattern is fairly regular in terms of seasonal change. The rate of growth at 12% p.a. (compound) is higher than the national average.

Figure 4 Vehicle Registration Growth 1950-1964

This diagram illustrates the rate at which vehicle registrations in the City and County have increased since 1956. The City growth follows the national average.

Figure 5 Traffic Flows—Trent Bridge and Clifton Boulevard

Quarter-hour interval counts by automatic counter taken at Trent Bridge and Clifton Boulevard have been plotted to show the build-up of traffic throughout the 16-hour day. On Trent Bridge 11% of the 16-hour flow occurs between 5 p.m. and 6 p.m. and on Clifton Boulevard this proportion is 13.3%.

Both graphs illustrate the effect of taking 10% of the 16-hour traffic to represent the peak proportion.

Figure 6 Main Highway Plan and Regional Setting

Shows the principal existing highways of Nottingham and the region, and includes the M1 Motorway as it will be on completion. The "catchment area" shaded shows the limits within which 95% of all traffic in the City originates.

Figure 7 Traffic Zones

Shows the 29 traffic zones within and beyond the City boundaries, used for origin and destination surveys and land-use changes.

Figure 8 Growth of Traffic (1962-2010)

Shows tabulated the phased growth of traffic which is expected to originate in each of the 29 zones between 1962 and the year 2010. The growth factors are composite figures which take account of population changes, land use changes, and changes in vehicle ownership for each year.

The figures are of the 'unrestrained demand', in terms of one-way journeys in a 16-hour day (i.e., an outward and return journey = 2 journeys).

These figures have subsequently been reduced by restraining factors as described in Section III, to give the basis of network design and carparking provision.

Figure 9 Desire Line Diagram: Into City Centre

This 'desire line' diagram based on the 1962 Origin and Destination survey, shows the central area journeys from the 29 zones within and beyond the City boundaries. The flows are in one direction and represent vehicle trips over a period of 16 hours. The widths of the black bands between the zones represent to scale the flows, marked alongside the band.

Figure 10 Desire Line Diagram: Through Traffic

This desire line diagram shows through-traffic movements, i.e., those that do not stop in those traffic zones that are wholly within the City boundaries. The predominance of the north/south moves will be noted.

Figure 11 Desire Line Diagram: External/Internal, excluding City Centre

From the same survey, this diagram shows external and internal moves between the 29 traffic zones other than those to and from the City centre. As in Fig. 9, the flows recorded are in one direction only and represent the volume over a 16-hour period.

Figure 12 Main Desire Lines (year 2010)

Shows in simplified form the principal future desire lines of local and longer distance traffic.

Figure 13 Major Population Growths

Changes in population for all areas contributing to the City traffic have been included in the calculations for growth factors. Those listed in Fig. 13 are some of the major changes.

Figure 14 Distribution of Main Journeys

Shows in diagrammatic form a summary of major traffic movements over a 16-hour period. It illustrates the point that 37% of all City traffic is to and from the central area in terms of vehicle trips.

Figure 15 Distances of Journeys by Car to City Centre Destinations in the Peak Period (1965)

Shows the 'crow fly' distances travelled from home to the city centre by commuter and business cars in the peak period.

Figures 16 and 17 Bus Passenger Journey Purpose Modes of Travel to Work in City Centre

These two figures show by table and diagram, the journey purpose in the City centre of mid-week peak hour bus passengers, and the modes of travel of all who travel in the peak period to work in the city centre. The lower tables and diagrams show the 'modal split' and the noteworthy features are that of all who travel to work in the city centre, 64% use buses and 19% use cars.

Figures 18 and 19 Public Transport (Private Undertakings)

These show the frequencies of mid-week services, from the region to the city central area.

Figure 20 Public Transport (Nottingham Corporation)

Shows the frequencies of corporation mid-week bus services.

Figure 21 Public Transport Peak Time Travel

Shows the numbers of persons travelling into and out of the central area by corporation bus on different routes during the morning and evening peak periods.

Figure 22 Central Area Journeys (in peak period, present and future)

Illustrates the application of 'restraint' and deflection, being the present and future proportions and numbers of journeys at peak periods travelling (*a*) to destinations in the central area, and (*b*) passing through the central area.

Figure 23 Central Area Journeys (in peak period, present and future)

This graph amplifies the information shown on Fig. 22, and shows the progressive rates of increase in numbers of journeys.

Figure 24 The Primary Highway Network: Ultimate Traffic Flows

Shows the network in outline and the ultimate peak-hour traffic flows on each segment. The figures are in passenger-car units (p.c.u's.) per hour in one direction, after applying restraining factors.

Figure 25 The Primary Routes: Use of New and Existing Roads

Shows by chain line the lengths of new primary routes, and by full line those where existing roads, substantially improved, will be utilised. Of the 34 miles of primary highway, about 23 miles will be on the line of existing roads.

Figure 26 The Primary Routes: Design Standard

Shows the proposed width-categories of the primary routes, and also shows the principal district distributors.

Figure 27 The Primary Highway Network: Phasing

Shows the estimated broad phasing for the construction of the segments of the network, in the following periods:—

(*a*) Up to 1975, (*b*) from 1975 to 1985, and (*c*) after 1985. Several main junctions are likely to require improvement in advance of their associated routes.

Figure 28 The Primary Highway Network: Early Phases

Whilst still a provisional estimation, the parts of the network that are likely to be constructed between now and 1978 are shown in this figure, in respect of classified road schemes. Trunk road improvements during this period are not shown but are likely to include the dualling of Clifton Bridge and a grade-separated junction at Queen's Drive, north of the bridge, by the provision of a flyover across the roundabout. The junction improvement marked on the plan is at Canning Circus, and will comprise a tunnelled road system, being the first phase of the ultimately needed junction.

Figure 29 The Central Area Traffic Plan

Shows the 'wider central area' contained by the proposed Inner Motorway. This figure is described in Section IV.

The rationalisation of the street pattern within the Inner Ring Road, by concentrating traffic as far as possible on to certain roads, the district and local distributors, will enlarge the scope for retaining the local character or 'street picture' of various other streets, for example in the Lacemarket area.

The avoidance of direct routes for through traffic into the central area will be noted. Examples of this are at Chapel Bar, which it is intended to close off at its upper end, to vehicles that at present enter the central area that way, an indirect route being provided via Mount Street; at Greyfriar Gate, and Carrington Street (north of Canal Street). This busy shopping street will thus be relieved of much of its traffic as a first stage. The construction of the road shown on the plan, running north from the point marked Broad Marsh will then enable traffic to be removed from that length of Carrington Street.

This will then form a pedestrian shopping precinct as part of the Broad Marsh redevelopment scheme.

Figure 30 Eastern Segment of Inner Motorway and Inner Ring Road

The mid-length of this segment of the Motorway is also the eastern segment of the Inner Ring Road. This figure shows the construction in three phases:—

(i) Using mainly existing streets, with short lengths of new road, and utilising one-way operation (this can be called an 'expanded traffic-engineering' phase—see para. 61).

(ii) Construction of the underpass length of the Motorway primary route (see perspectives). This is the first stage in grade-separation of the primary and subsidiary routes.

(iii) Continuation southward of the primary route, including the addition of a flyover to the southern gyratory system.

Figure 31 Relative Costs of a Primary Network for different Traffic Capacities

Shows by graph, a cost-comparison of trial networks to take different traffic volumes. The network chosen is in the range of capacity below which the cost falls slowly and above which it rises steeply (see para. 123).

Figure 32 The Bulwell Town Centre

Shows the separations of traffic groups (pedestrian areas, parked and calling vehicles, and passing traffic) on a scale appropriate to a suburban shopping centre.

Perspectives

The perspectives which then follow illustrate:—

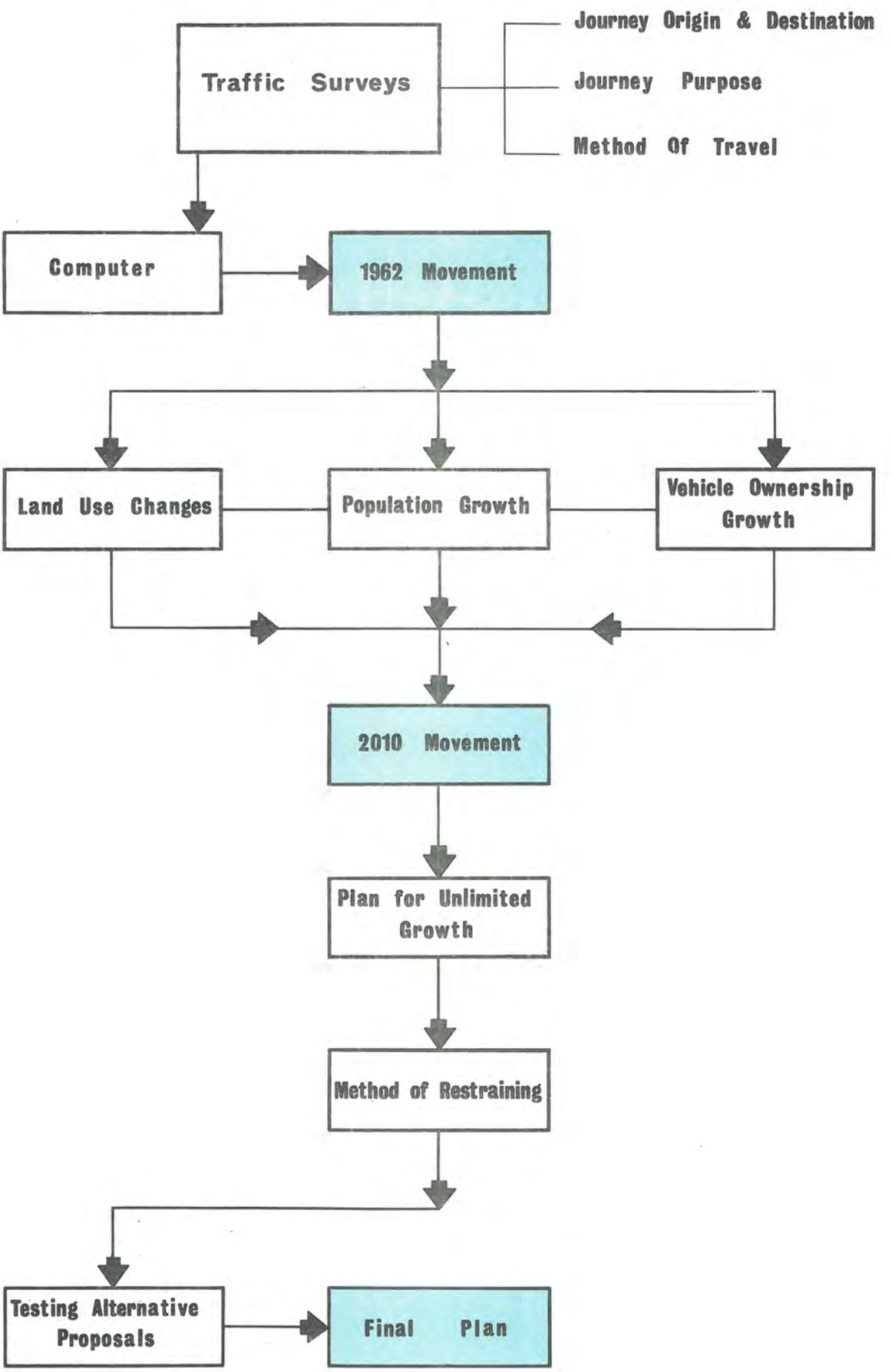
The Inner Motorway	Sheriff's Way looking north	Aerial view
Do.	Do.	Driver's view
Do.	The Park Way: Two-level Section looking towards Canning Circus Tunnels	
Do.	Forest Way, with Waverley Street below (looking southwards)	
The Eastern By-Pass and third Trent Crossing (looking north-eastwards)		

Map showing the Primary Network

The enlarged plan of the network is folded at the back of the Report. It must be read in the context of paras. 111-112 and 124-127.

Figure 1

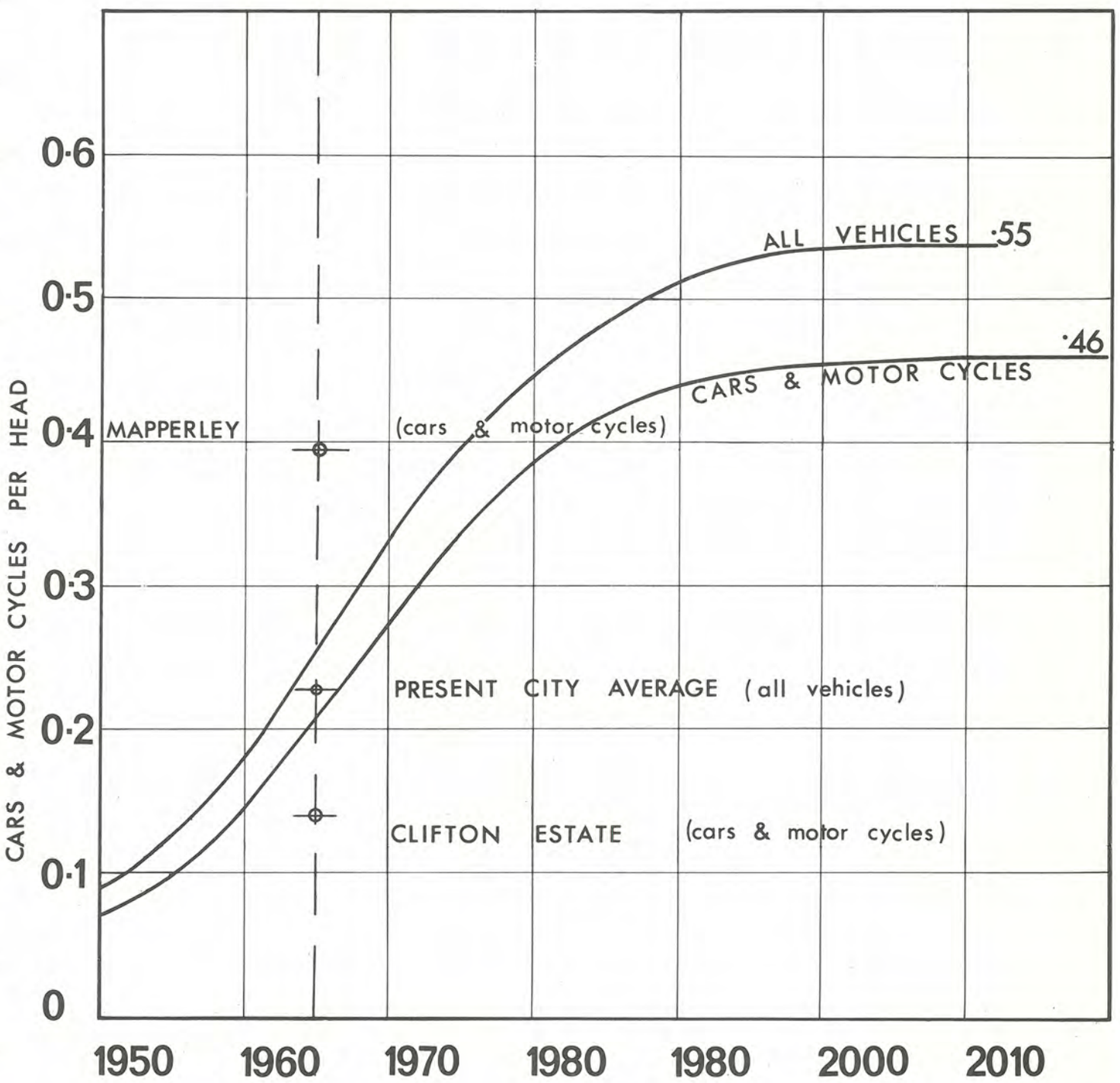
City of Nottingham



Survey & Analysis Programme

Figure 2

City of Nottingham



Future Prediction Of Vehicle Growth

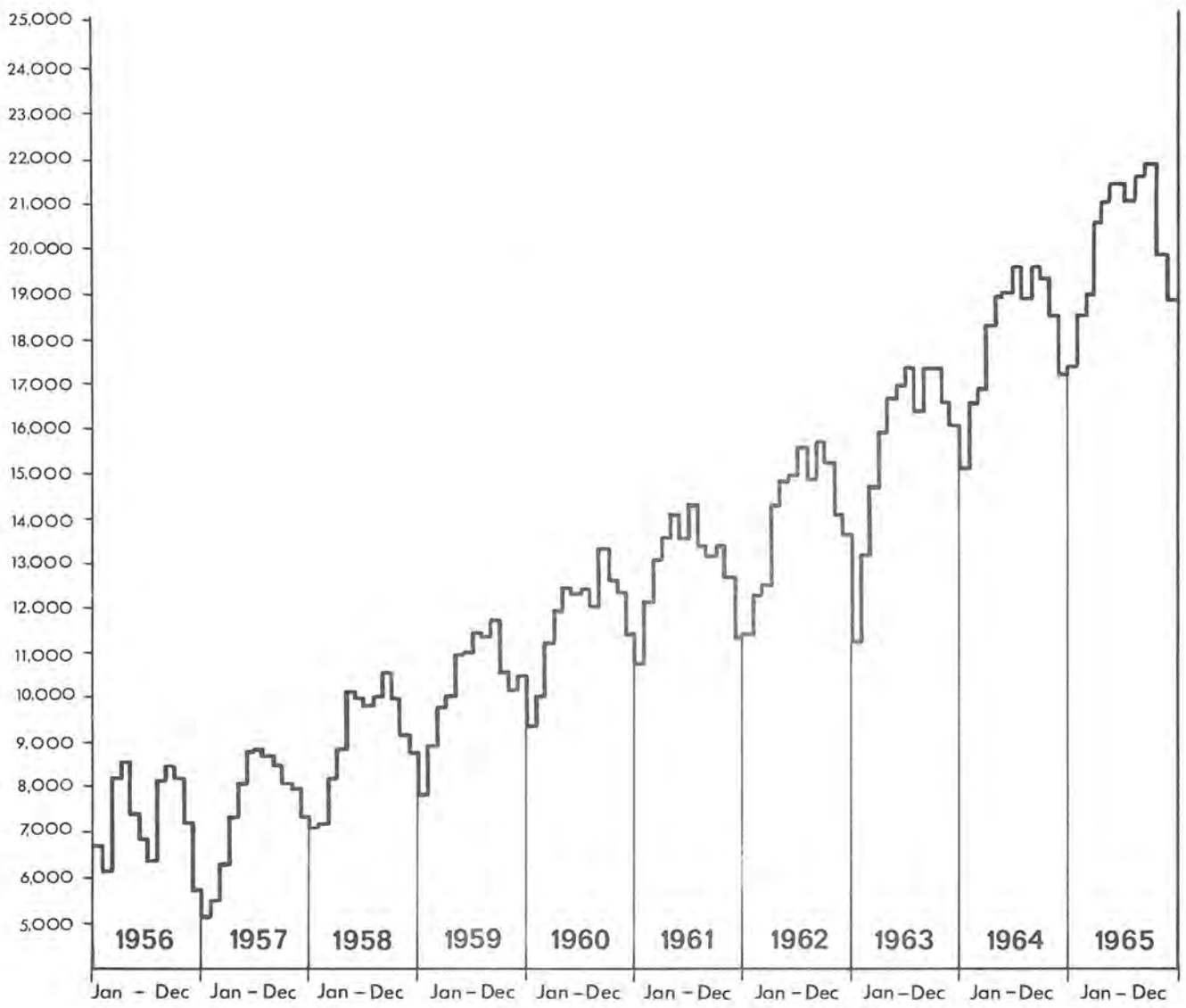
(Road Research Laboratory)

Figure 3

City of Nottingham

Average Annual Growth (all vehicles)

1956 – 1965 12 % per annum



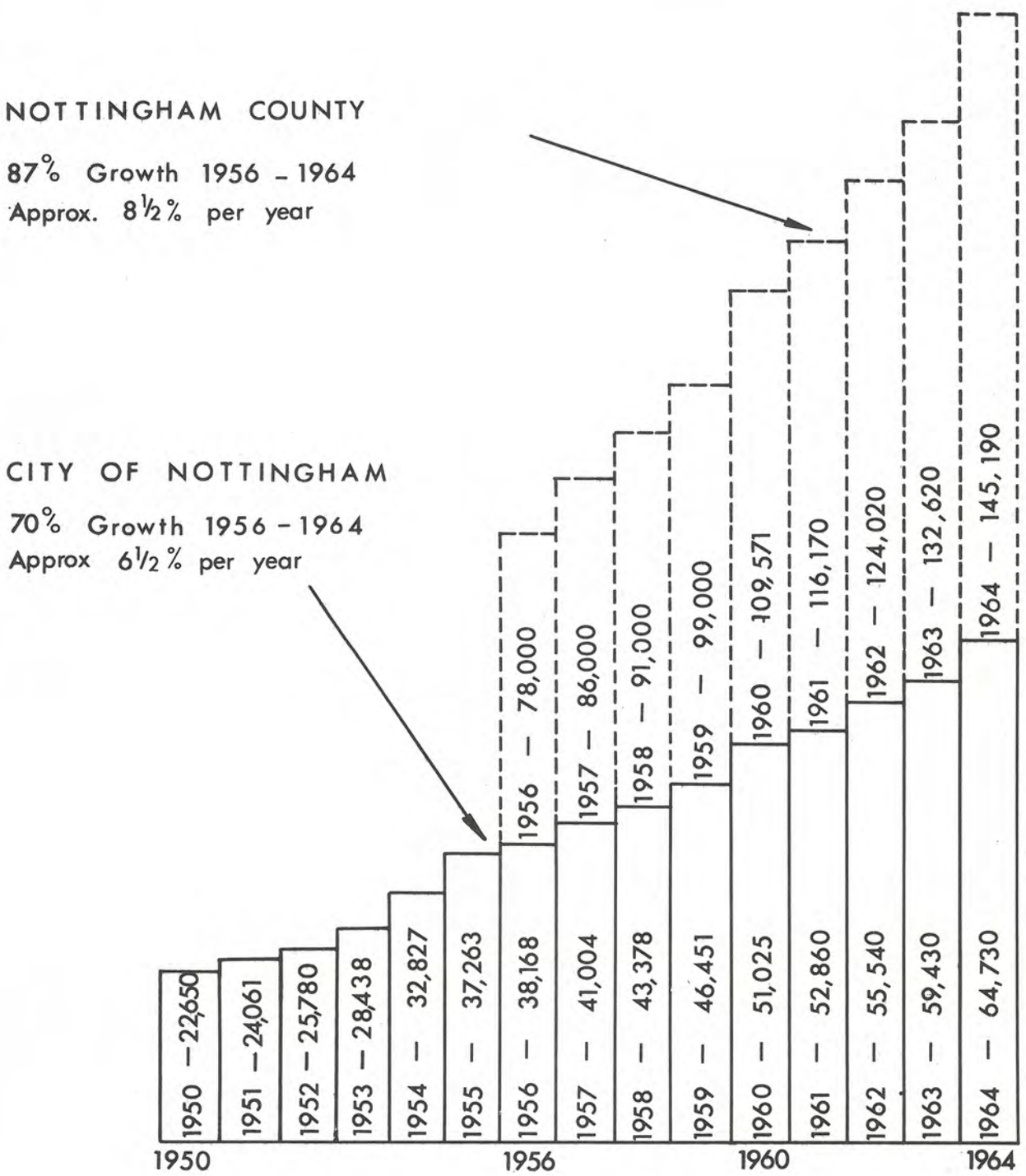
Valley Road Continuous Traffic Census

(site 26 – A614)

Average daily total in two directions

Figure 4

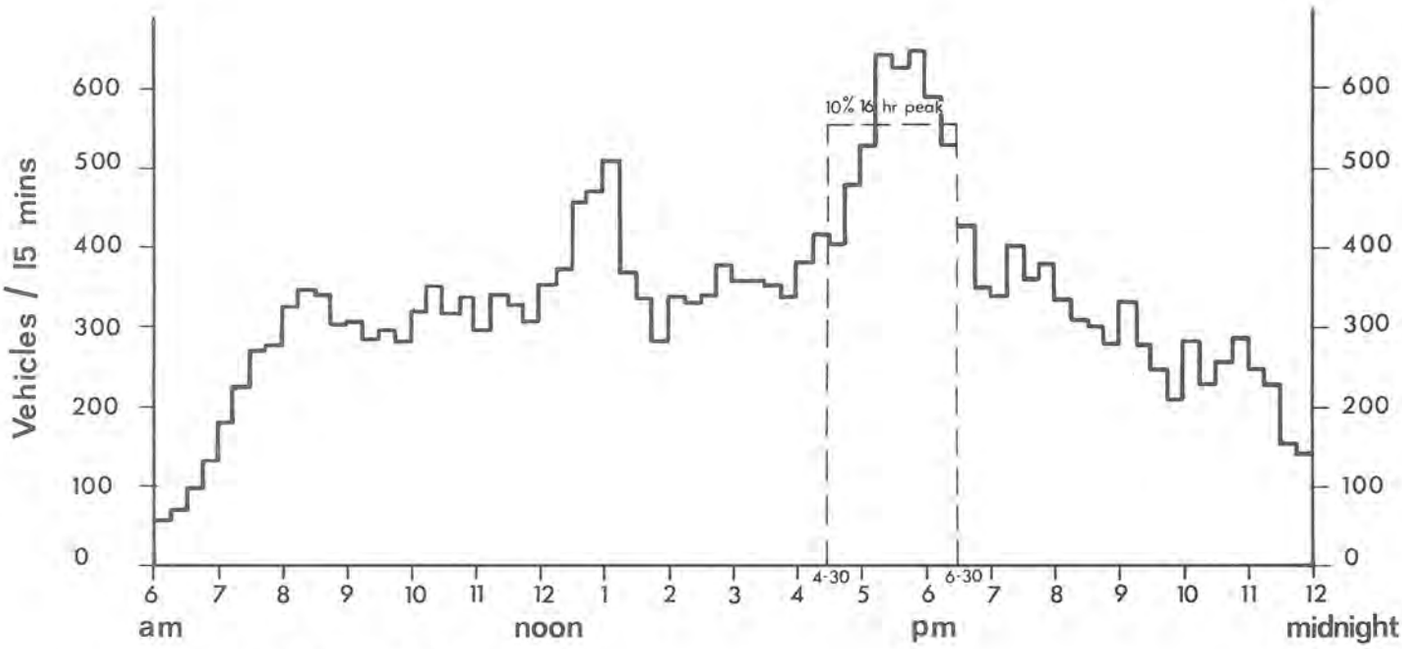
City of Nottingham



Vehicle Registration Growth 1950 - 1964

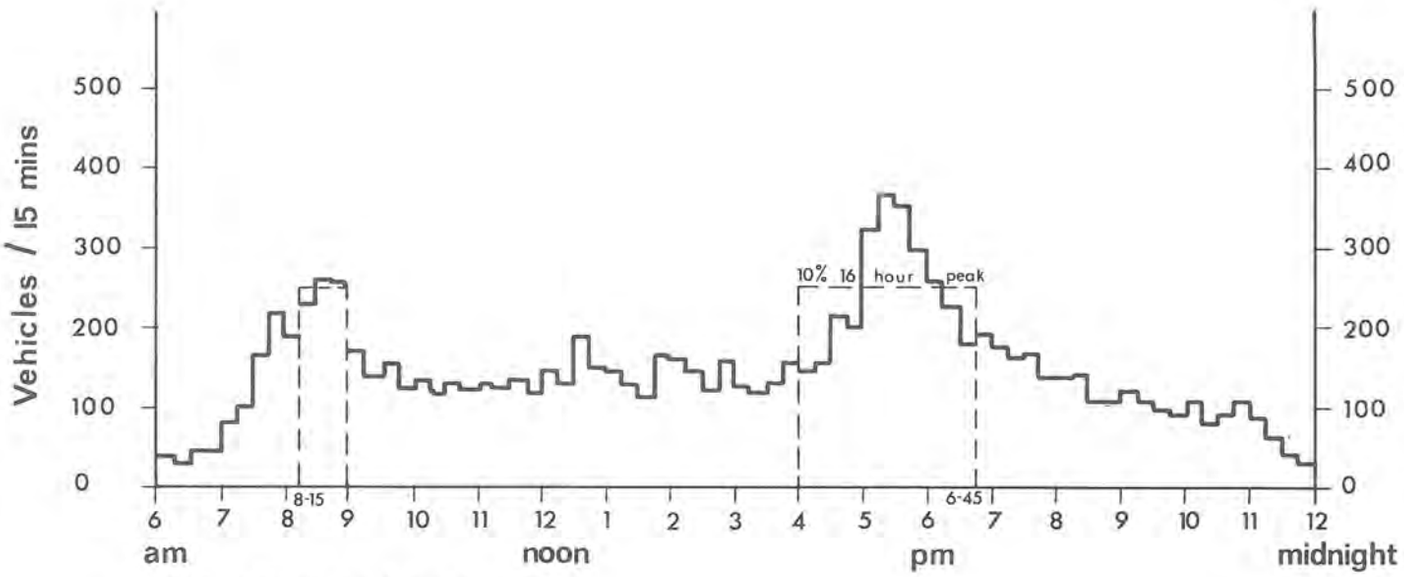
Figure 5

City of Nottingham



Peak 2425 vehs. (5-6 p.m.)
Peak / 16 hrs. 11%

Traffic Flows Trent Bridge
Southbound-April 1964

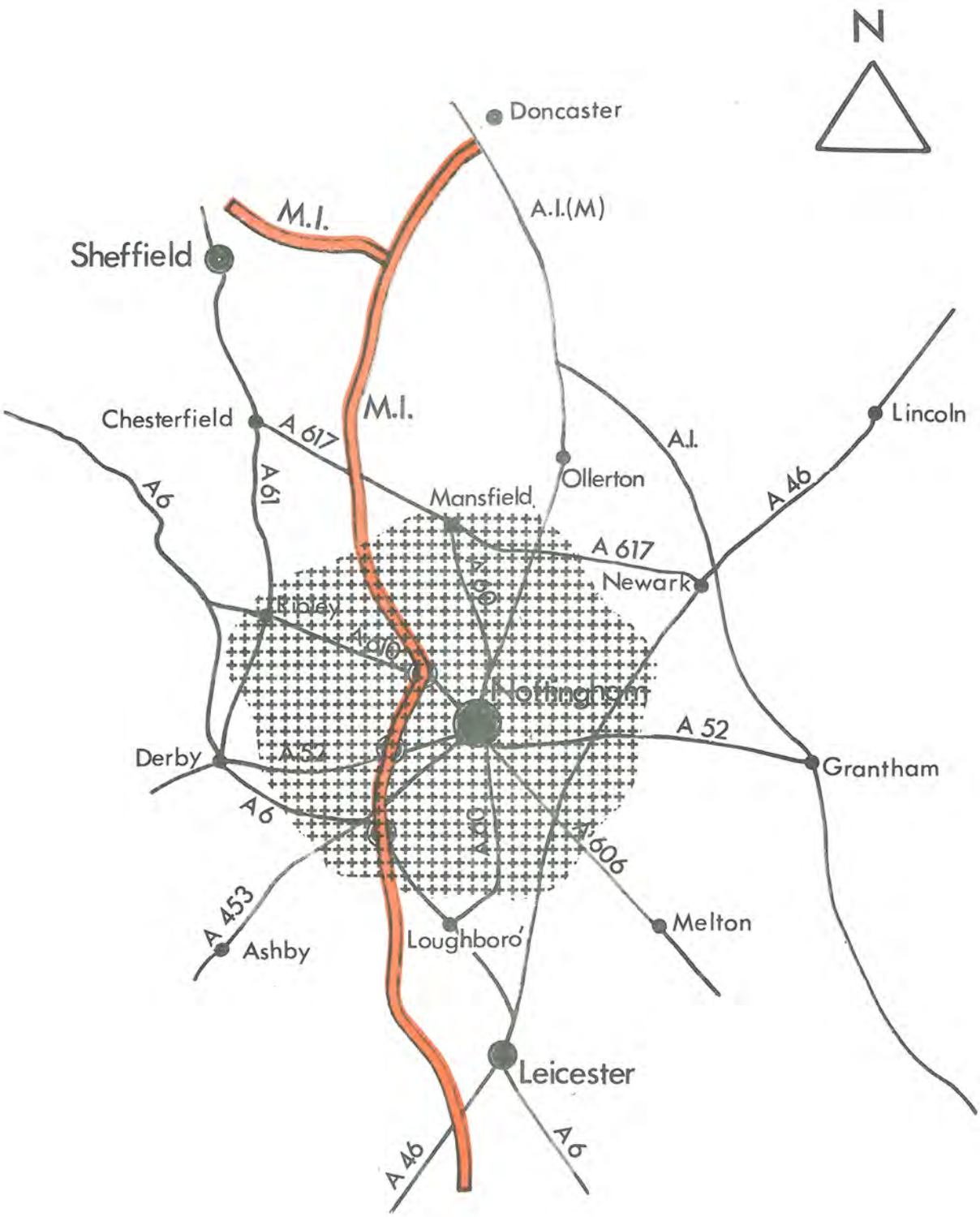


Peak 1330 vehs. (5-6 p.m.)
Peak / 16 hrs. 13·3 %

Traffic Flows Clifton Blvd - Lenton Lane - Queens Drive
Southbound June 1964

Figure 6

City of Nottingham



Scale (miles)

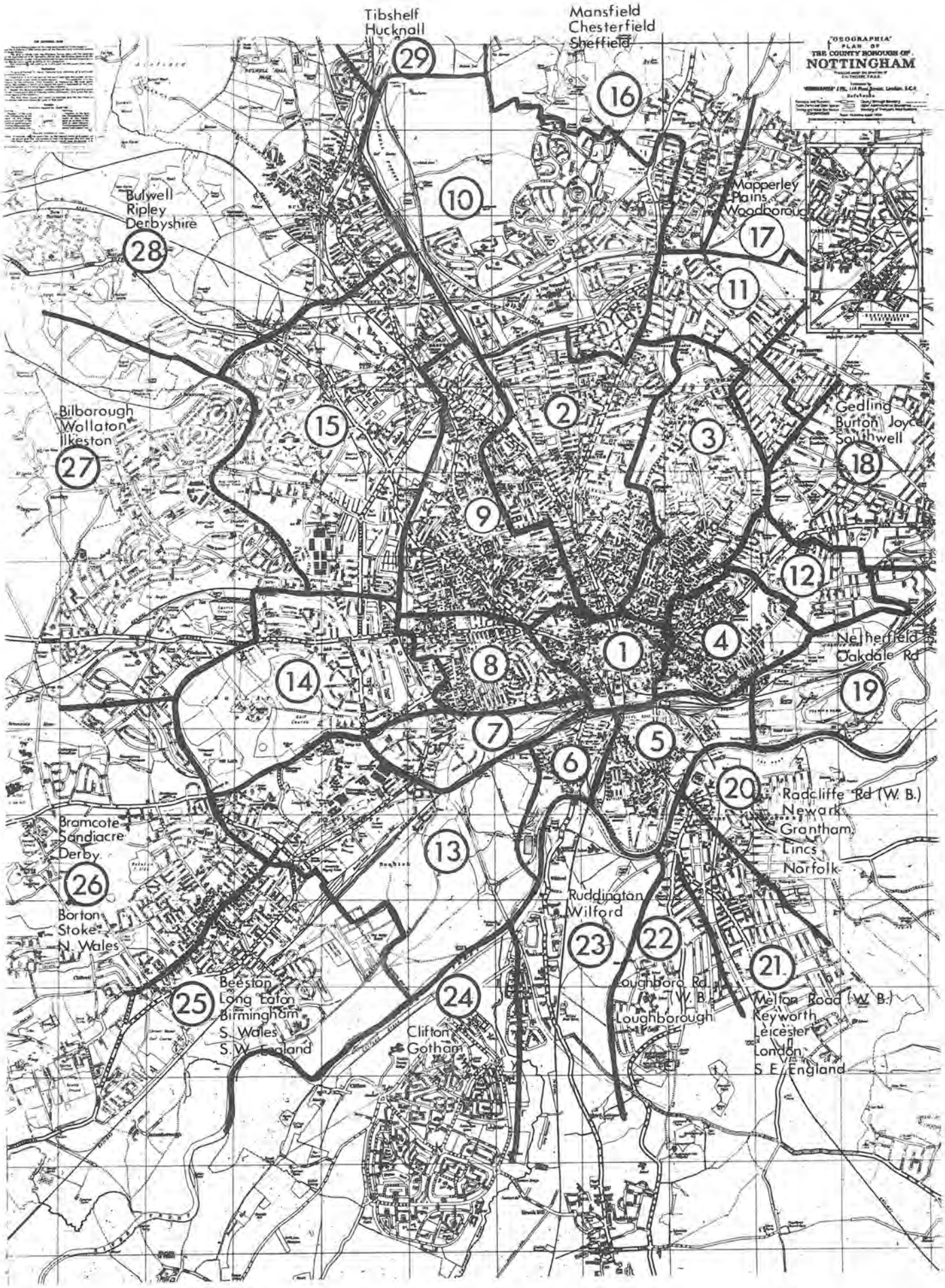
0 10 20

Area from which 95% of city traffic originates

Main Highway Plan & The Regional Setting

Figure 7

City of Nottingham



Traffic Zones

Figure 8

City of Nottingham

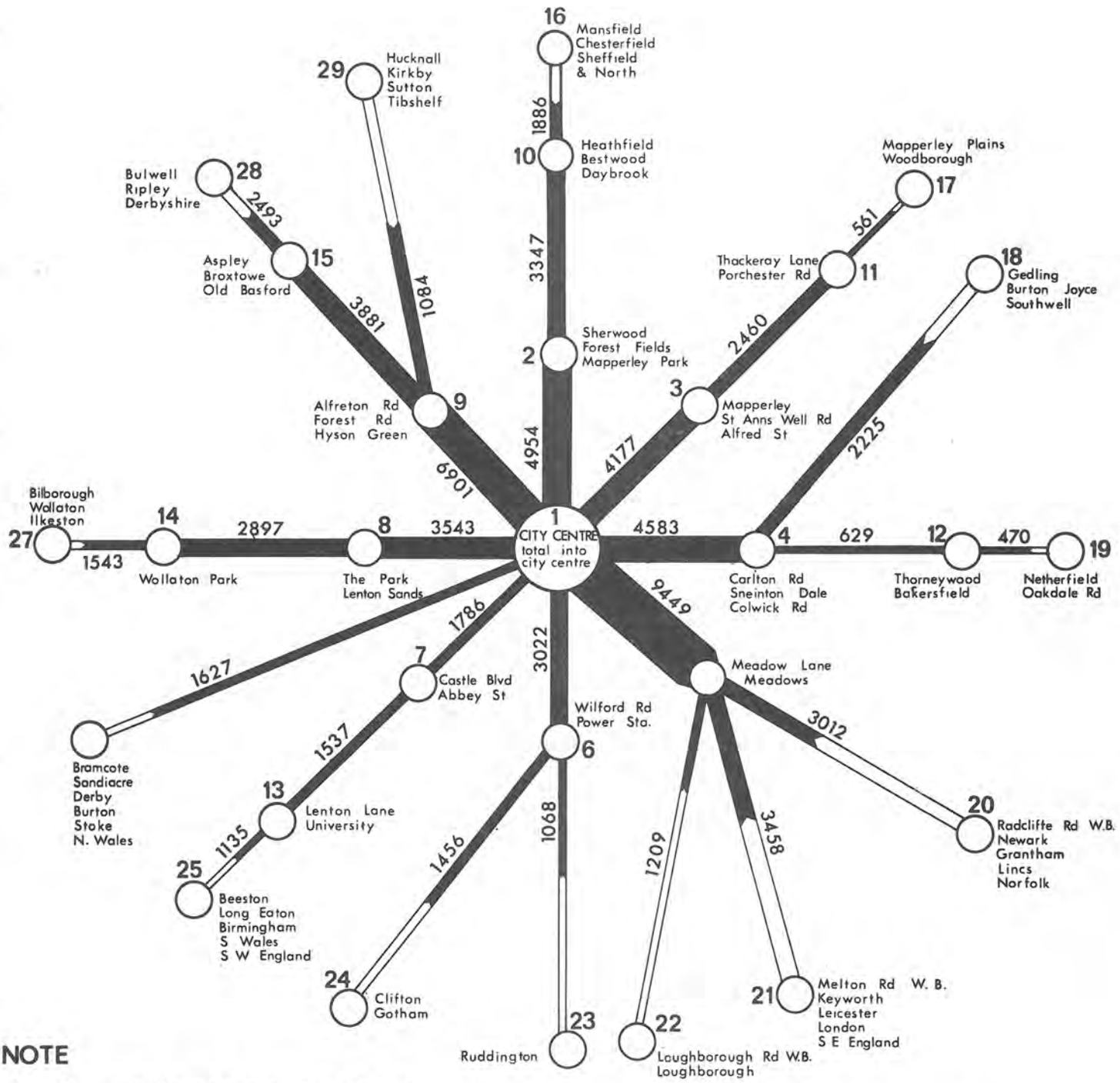
AREA NUMBER	TRAFFIC to AREA 1962	GROWTH 1962-1970	GROWTH 1962 - 1980	GROWTH 1962 - 1990	GROWTH 1962 - 2000	TOTAL TRAFFIC 2010	GROWTH 1962 - 2010	NOTES
1	40749	1 · 7	2 · 3	2 · 7	2 · 8	118172	2 · 9	City Centre
2	12791	1 · 7	2 · 4	2 · 7	2 · 8	36309	2 · 8	
3	8932	1 · 6	2 · 2	2 · 8	3 · 0	26991	3 · 0	
4	4448	1 · 2	2 · 0	2 · 7	2 · 9	13075	3 · 0	
5	11259	1 · 5	2 · 3	2 · 8	3 · 0	35181	3 · 1	
6	4226	1 · 1	1 · 9	2 · 4	2 · 6	11305	2 · 7	
7	4824	1 · 6	2 · 2	2 · 5	2 · 6	12763	2 · 7	
8	5924	1 · 6	2 · 3	2 · 6	2 · 7	16027	2 · 7	
9	14360	1 · 4	2 · 3	3 · 0	3 · 1	46659	3 · 3	
10	6427	2 · 1	3 · 3	3 · 8	4 · 0	25851	4 · 0	Bestwood
11	5655	1 · 9	2 · 5	2 · 6	2 · 7	15540	2 · 8	
12	1170	1 · 3	1 · 7	1 · 9	2 · 1	2397	2 · 1	
13	3053	2 · 9	11 · 5	13 · 4	13 · 8	43586	14 · 2	Lenton Lane
14	7691	1 · 6	2 · 2	2 · 4	2 · 5	19598	2 · 6	
15	10585	1 · 6	2 · 2	2 · 5	2 · 6	27811	2 · 6	
16	6724	1 9	2 · 7	3 · 2	3 · 3	22767	3 · 4	
17	2667	1 · 5	2 · 0	2 · 3	2 · 4	6401	2 · 4	
18	7543	1 · 9	3 · 0	3 · 5	3 · 6	27909	3 · 7	
19	2880	1 · 6	2 · 1	2 · 4	2 · 5	7294	2 · 5	
20	9501	2 · 6	4 · 6	5 · 4	5 · 6	55106	5 · 8	Radcliffe Rd
21	8384	1 · 9	2 · 7	3 · 2	3 · 3	29344	3 · 5	
22	3974	2 · 2	3 · 2	3 · 6	3 · 8	14900	3 · 8	Loughboro' Rd
23	4041	2 · 3	3 · 5	4 · 2	4 · 6	18400	4 · 6	Wilford & Ruddington
24	7331	2 · 2	2 · 8	3 · 2	3 · 4	25659	3 · 5	
25	7480	2 · 0	2 · 6	3 · 0	3 · 2	24444	3 · 3	
26	10760	2 · 0	3 · 1	3 · 7	3 · 8	41447	3 · 9	
27	8219	1 · 9	2 · 6	3 · 0	3 · 0	24347	3 · 0	
28	16995	2 · 0	3 · 1	3 · 7	3 · 8	66792	3 · 9	Bulwell
29	5355	1 · 9	2 · 6	3 · 1	3 · 2	17622	3 · 3	
Total	253,948	Proportional Average 1 · 7	2 · 6	3 · 1	3 · 2	833,697	3 · 3	

Growth Of Traffic (1962 — 2010)

Figure 9

City of Nottingham

External Cordon O & D Survey 1962



NOTE

The flows indicated are for 16 hrs total vehicles & are uni-directional. All flows under 200 are omitted.

scale

Total vehicles in 16 hrs (one way)

0 10000

Desire Line Diagram Into City Centre

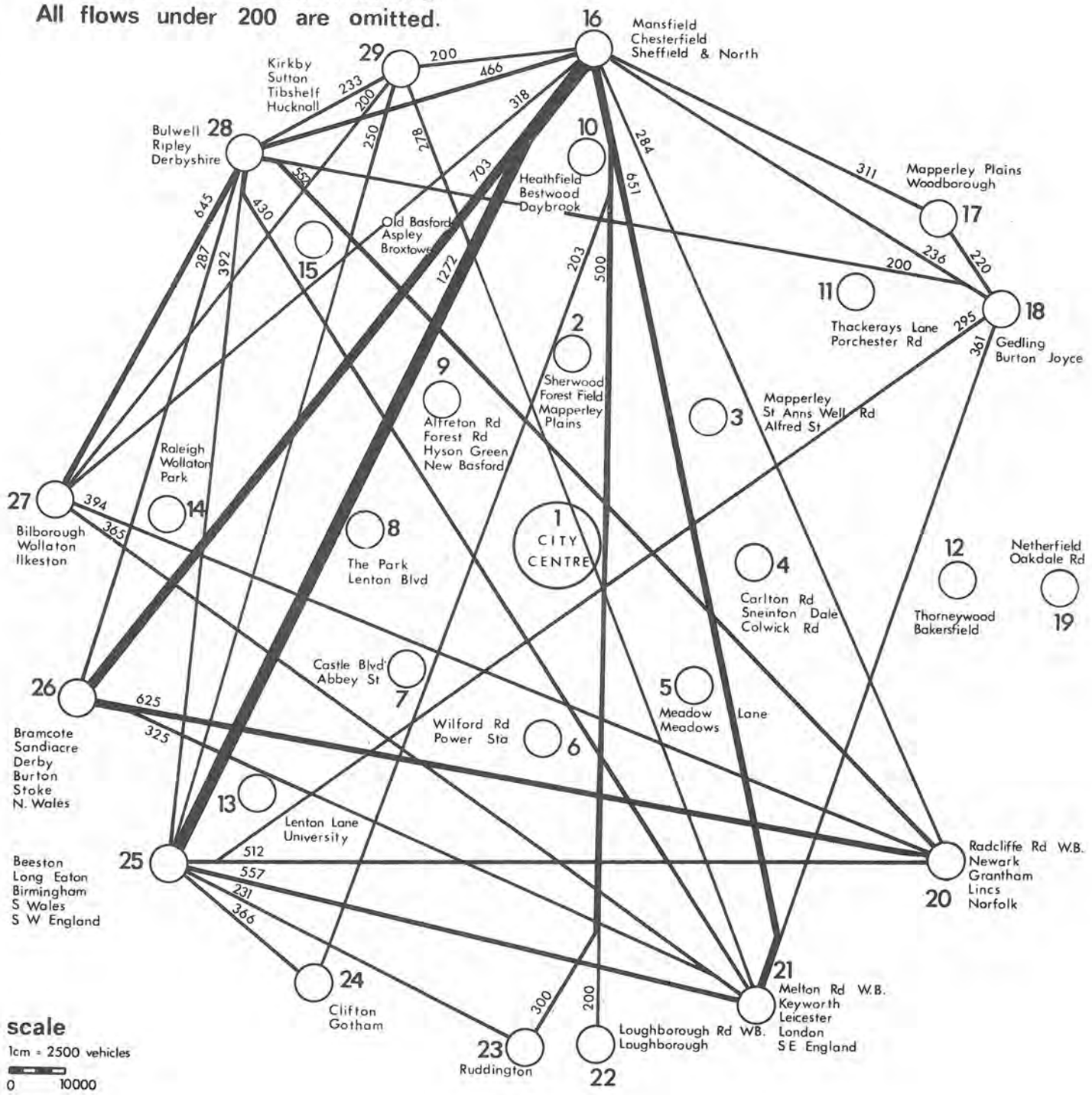
Figure 10

City of Nottingham

External Cordon O & D Survey 1962

NOTE

The flows indicated are for 16 hrs total vehicles & are uni-directional. All flows under 200 are omitted.



Desire Line Diagram

Through Traffic

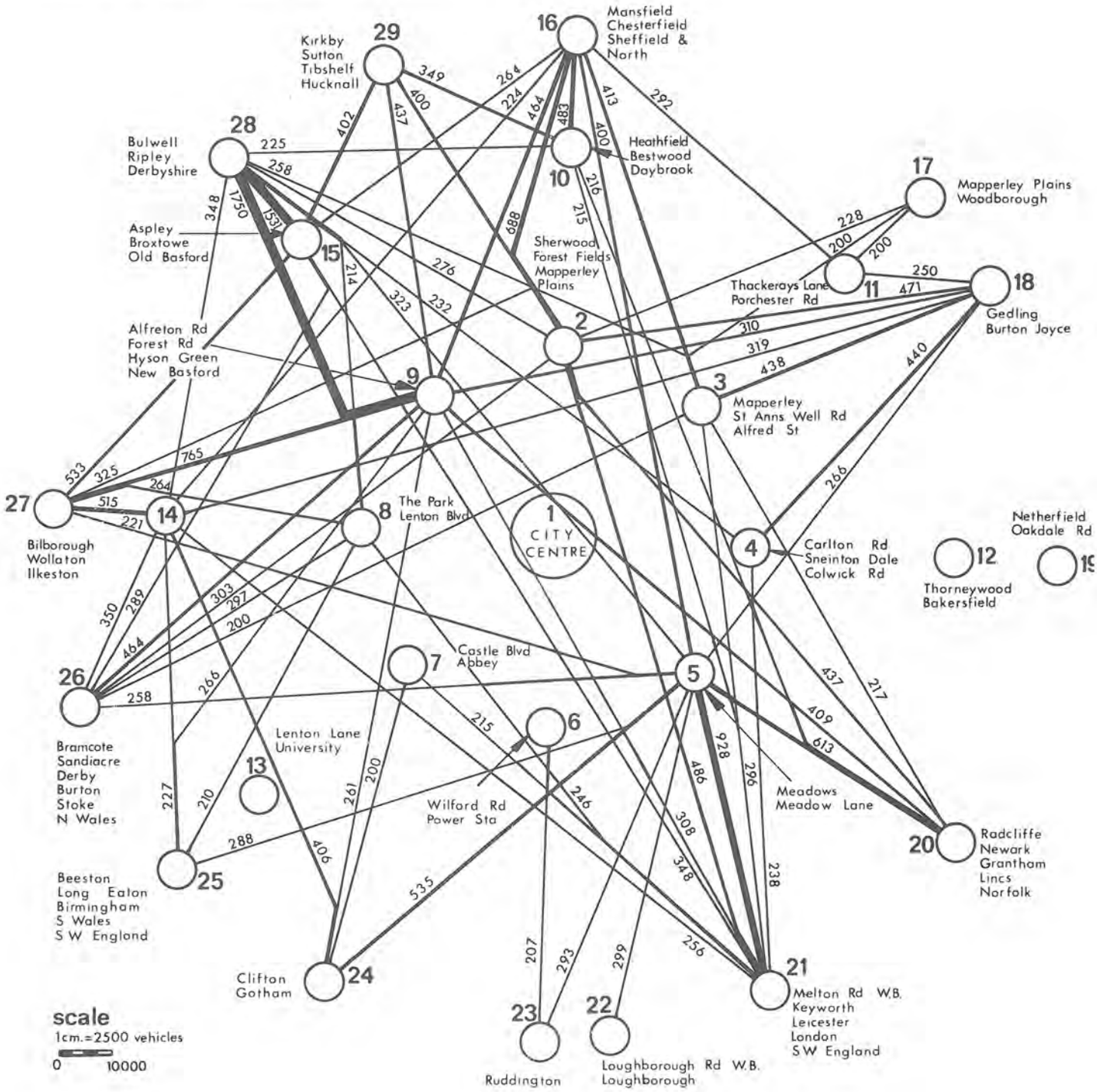
Figure 11

City of Nottingham

External Cordon O & D Survey 1962

NOTE

The flows indicated are for 16 hrs total vehicles & are uni directional. All flows under 200 are omitted.

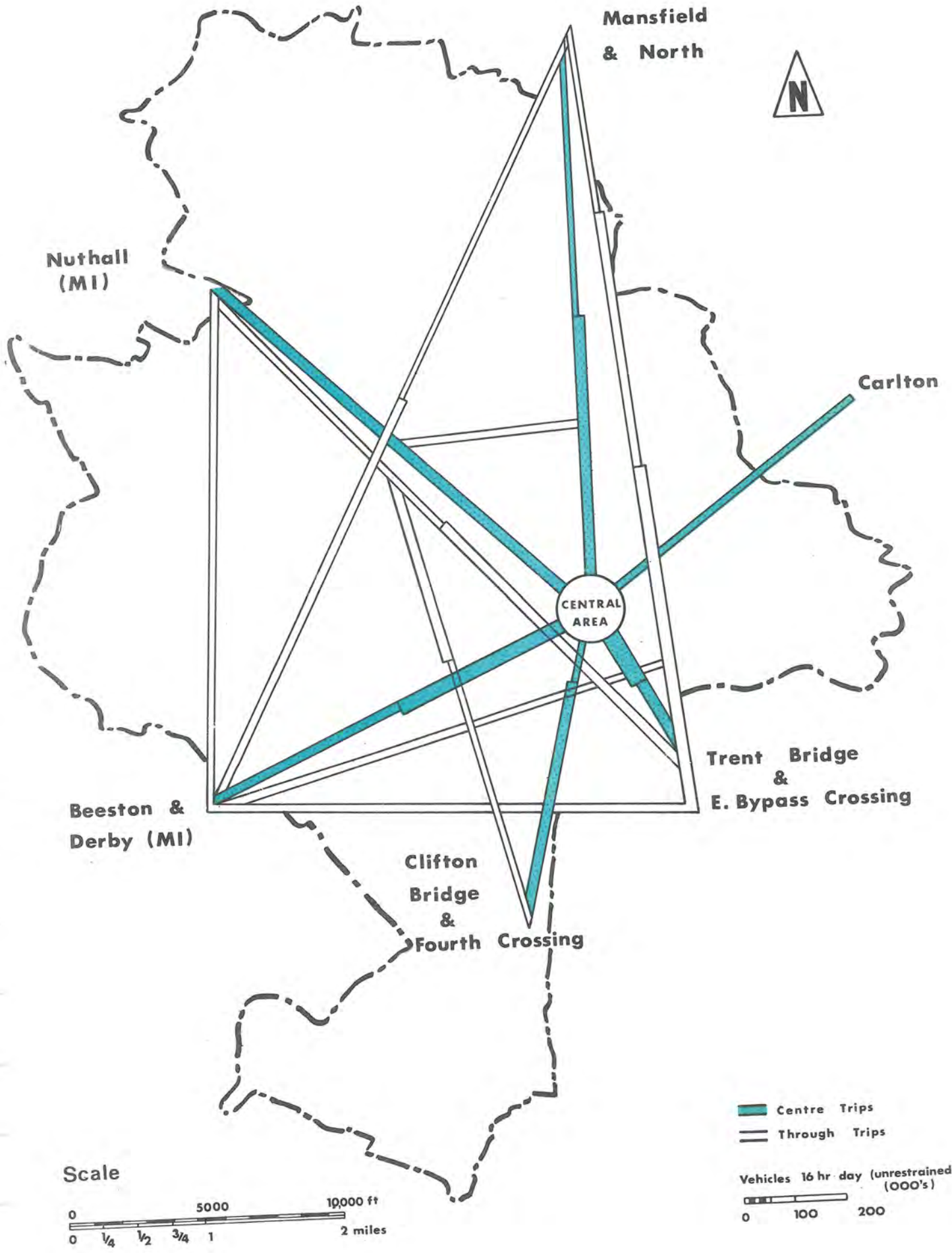


Desire Line Diagram

External – Internal Traffic Excluding City Centre Zones

Figure 12

City of Nottingham



Main Desire Lines (2010)

Figure 13

City of Nottingham

District	1961 Census	1981 Estimate	Estimated Increase	% Increase
Bulwell	18,186	28,000	9,814	54
Bestwood Park	6,544	10, 600	3,956	60
Bestwood	4,950	12,000	7,050	142
Clifton	29,542	38,000	8,458	23

CITY

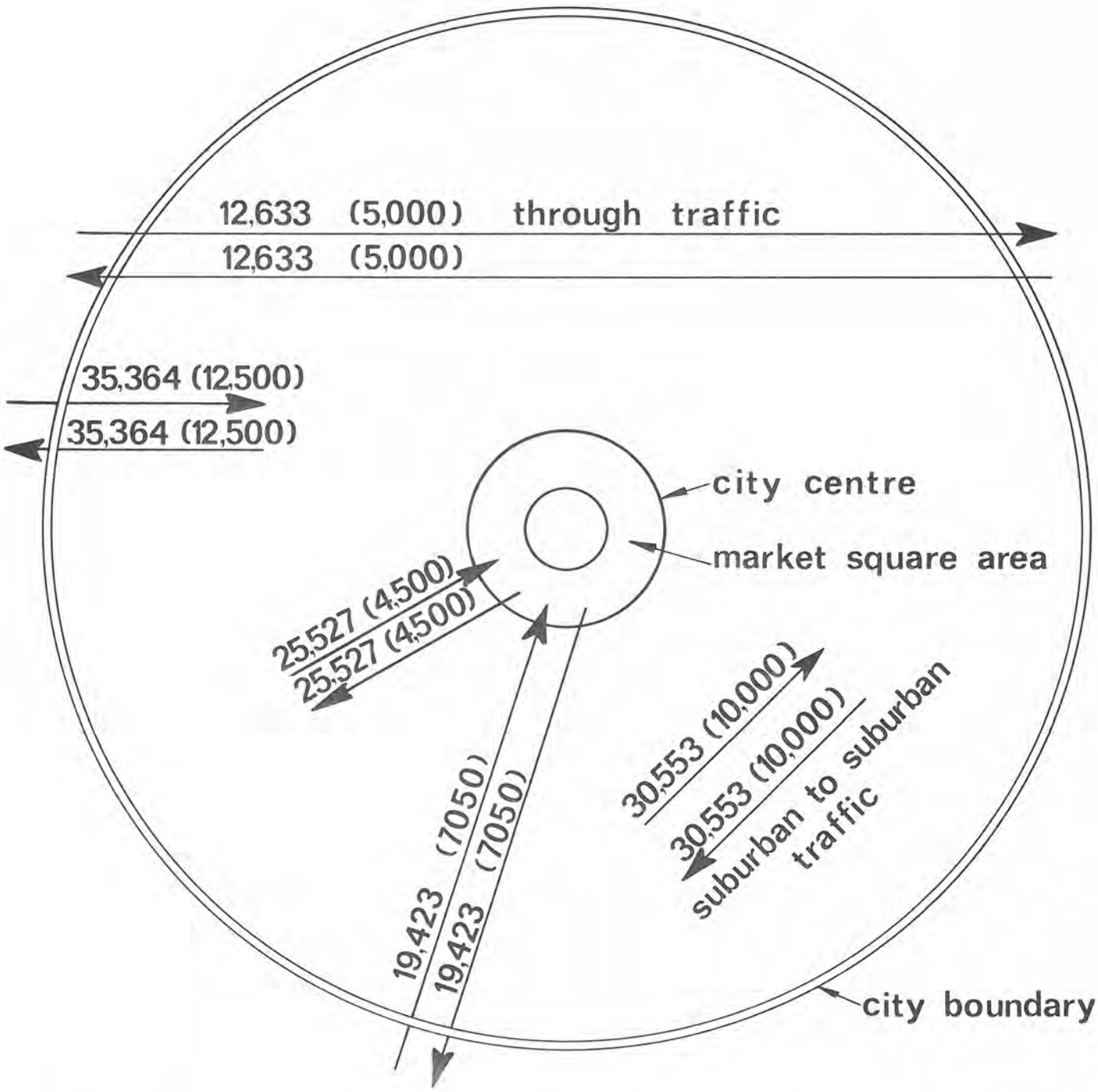
District	1961 Census	1981 Estimate	Estimated Increase	% Increase
Carlton	38,815	43,000	4,185	11
W. Bridgford	26,973	33,500	6,527	24
Arnold	26,829	38,000	11,171	42
Beeston	55,995	71,000	15,005	27
Hucknall	23,269	30,700	7,431	32
Radcliffe	16,259	23,600	7,341	45

COUNTY DISTRICTS

Major Population Growths

Figure 14

City of Nottingham



Total trips (both directions) 247,000 vehicle trips in 16 hours

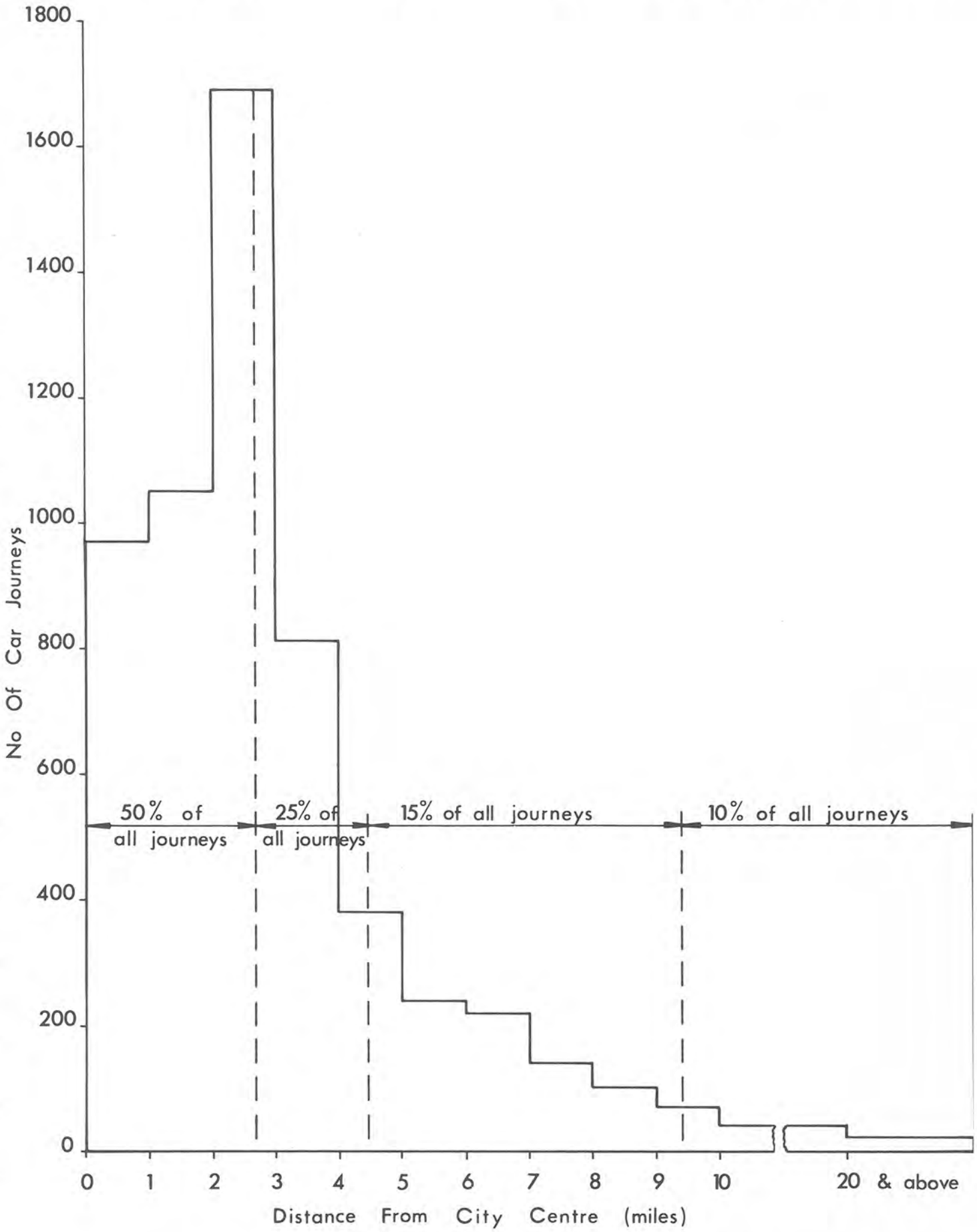
Through trips	= 12,633 in each direction	=	10% total
City centre trips	= 44,950 in each direction	=	37% total
Market square trips	= 11,550 in each direction	=	10% total
Other trips	= 65,917 in each direction	=	53% total

Figures in brackets refer to flows to & from the market square zone

Distribution Of Main Journeys

Figure 15

City of Nottingham



Distances Of Journeys By Car To City Centre Destinations In The Peak Period - (1965)

City of Nottingham

Bus Station	Trip Purpose						Total Cards	Sampling Factor	Total Passengers
	work	business	pleasure	shopping	school	others			
Mount St	80%	2%	3%	11%	3%	1%	882	25%	3,577
Huntingdon St	90%	3%	3%	1%	2%	1%	497	17%	2,882
Broad Marsh	90%	4%	1%	1%	3%	1%	412	16%	2,622
Total	85%	3%	2%	6%	3%	1%	1,791	20%	9,081

Bus Passenger Survey 1964 — 5-6 p.m.)
Out Of Town Buses (Outbound)

Vehicle Class	Total vehicles in city centre at 9·30 a.m.	Total number of persons in city centre at 9·30 a.m.	% Of Total Persons	Mode Of Travel
Pedestrians	Walking to work & living in central area	3,000 + 500 } 3,500	8	Walking
Pedal Cycles	930	930	2	Private Transport
Motor Cycles	565	565	1 } 22	
Cars	6,160	8,600	19	
Vans	170			
Goods	285			
Buses		29,800	64	Public Transport
Rail		2,900	6 } 70	
TOTAL	8,110	46,295 say 46,000	100	

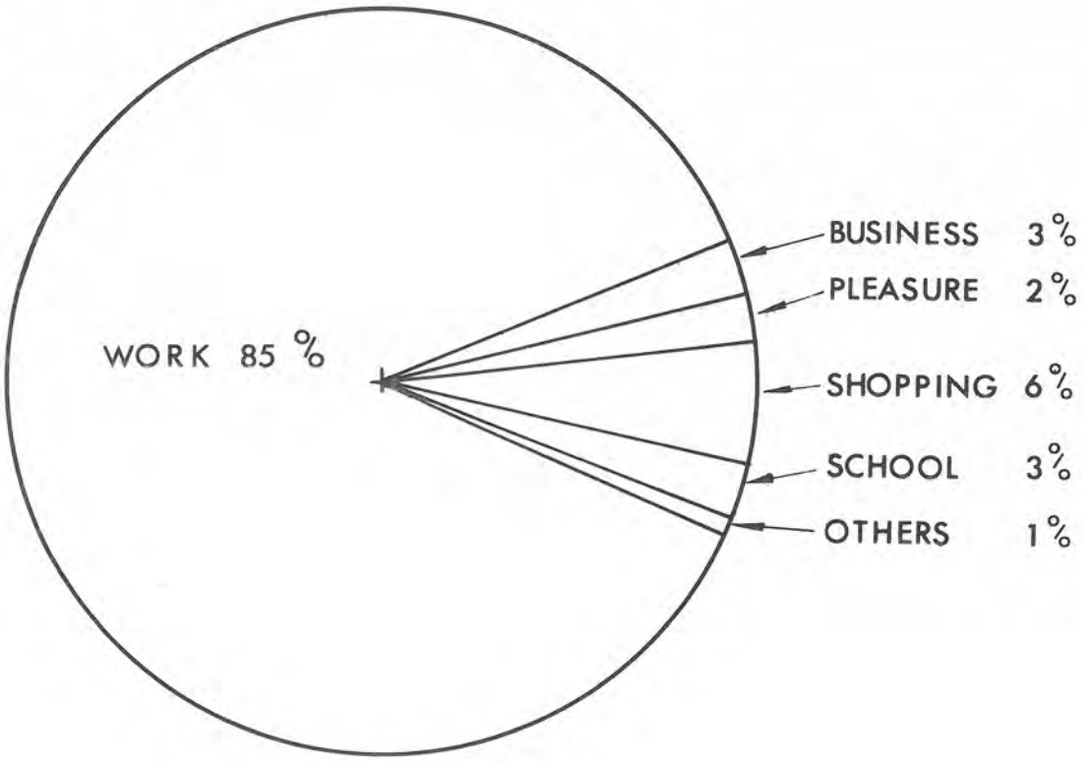
Travel To Work In City Centre – All Modes
7-30 a.m. — 9-30 a.m. 1963

City of Nottingham

CENTRAL AREA MOVEMENT

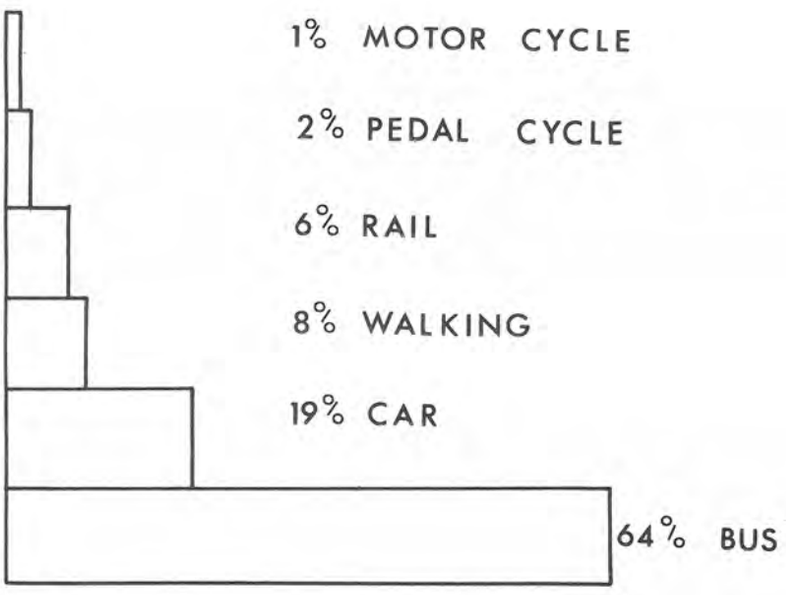
OUT OF TOWN PASSENGER SERVICE

5 p.m. – 6 p.m.
MARCH 1964



Summary Diagram
Bus Passenger Journey Purpose

7 a.m. – 9 30 a.m.
1963

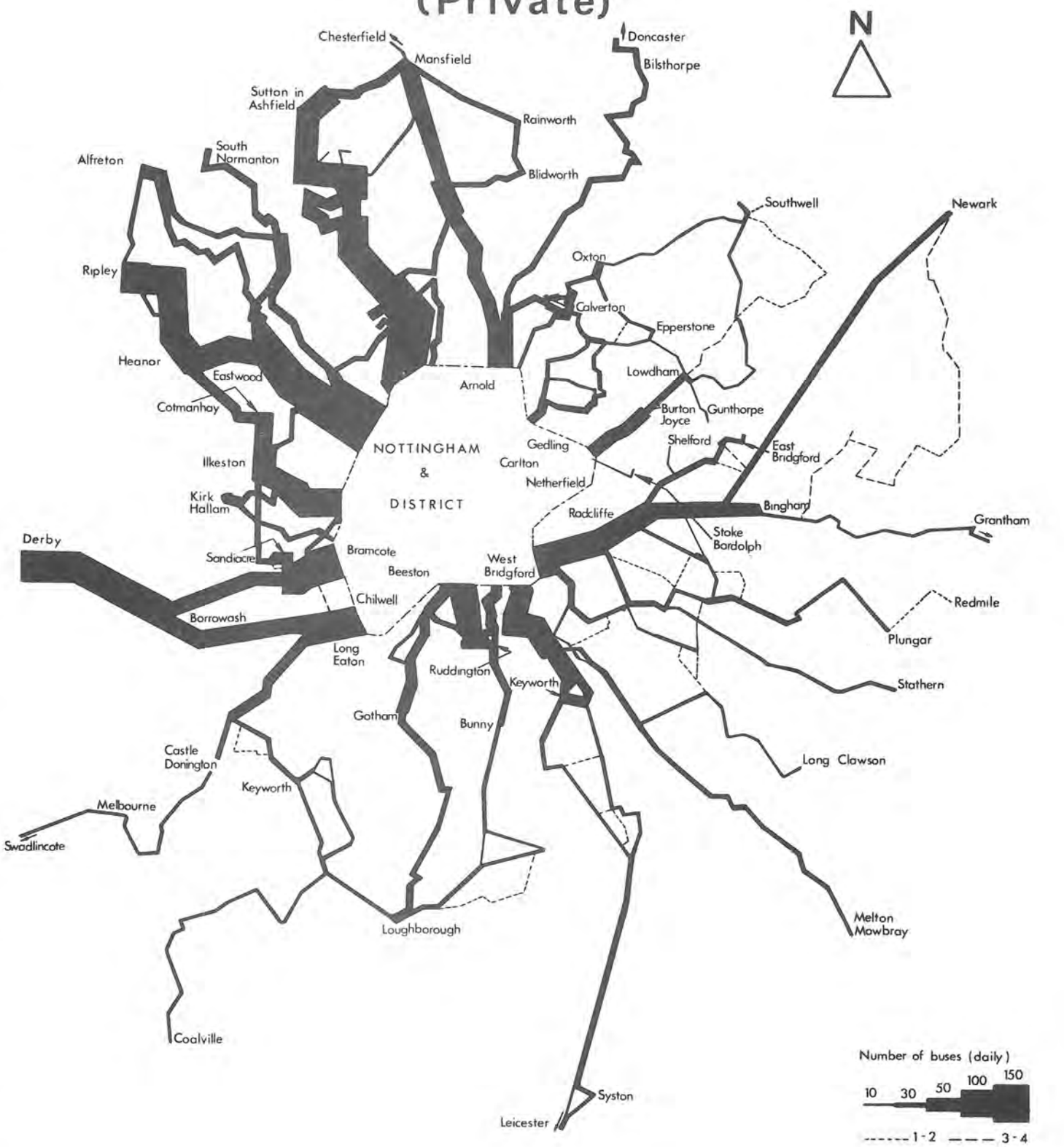


Summary Diagram
Modes Of Travel To Work In City Centre

Figure 18

City of Nottingham

Public Transport Service (Private)



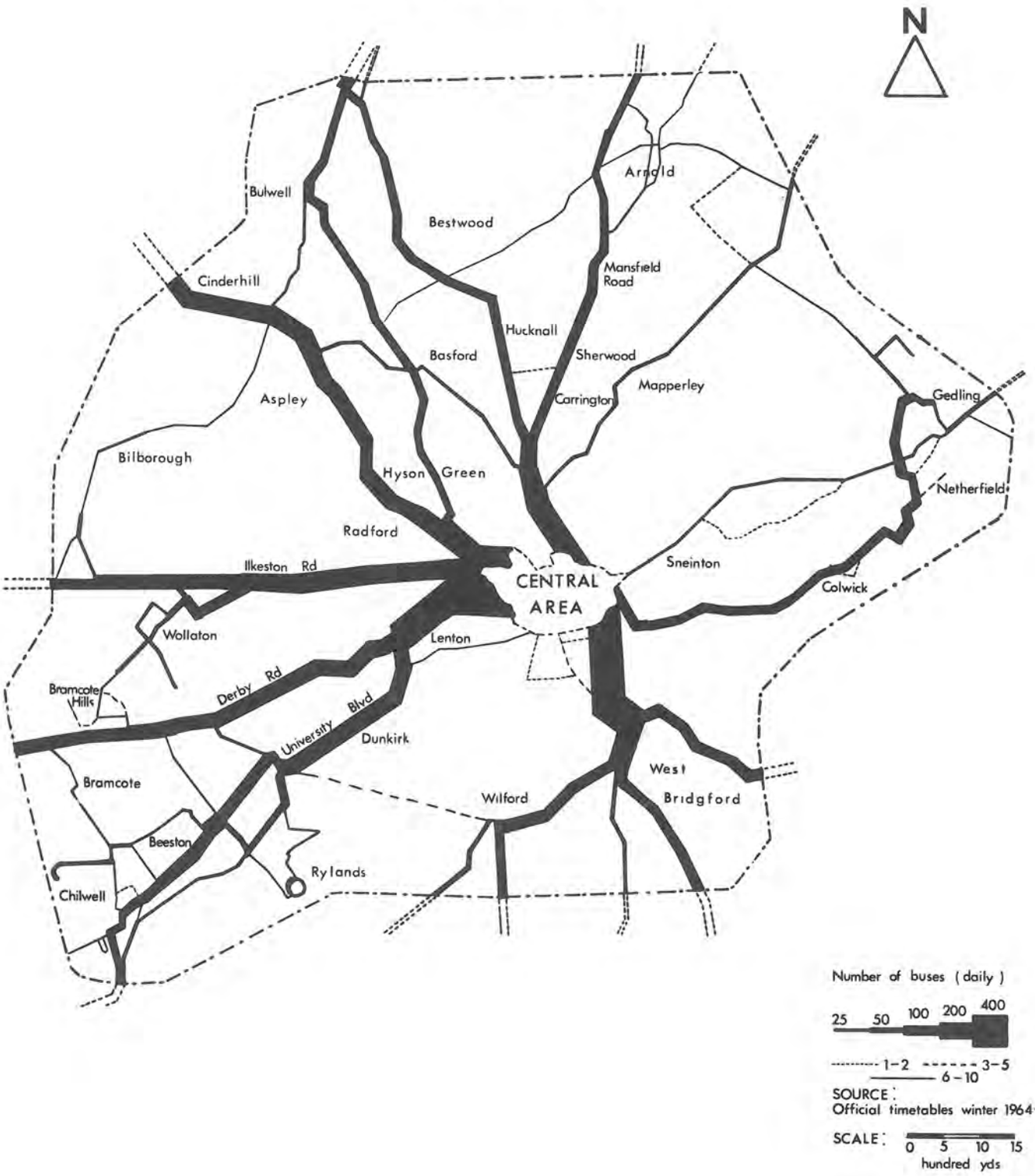
Nottingham

Frequency of Wednesday stage service

Figure 19

City of Nottingham

Public Transport Service (Private)



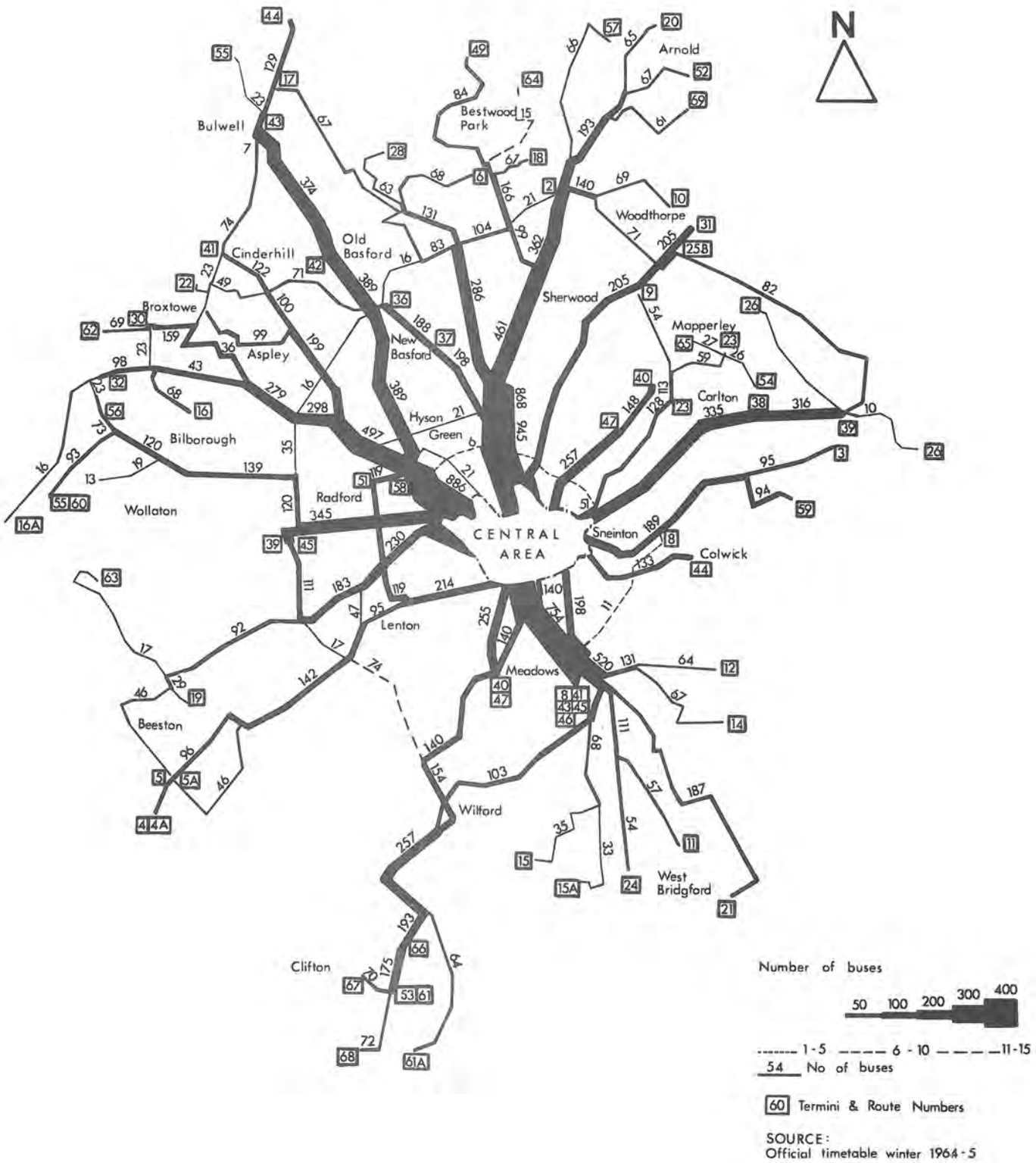
Nottingham and District

Frequency of Wednesday stage services to the central area boundary

Figure 20

City of Nottingham

Public Transport Service (Corporation)

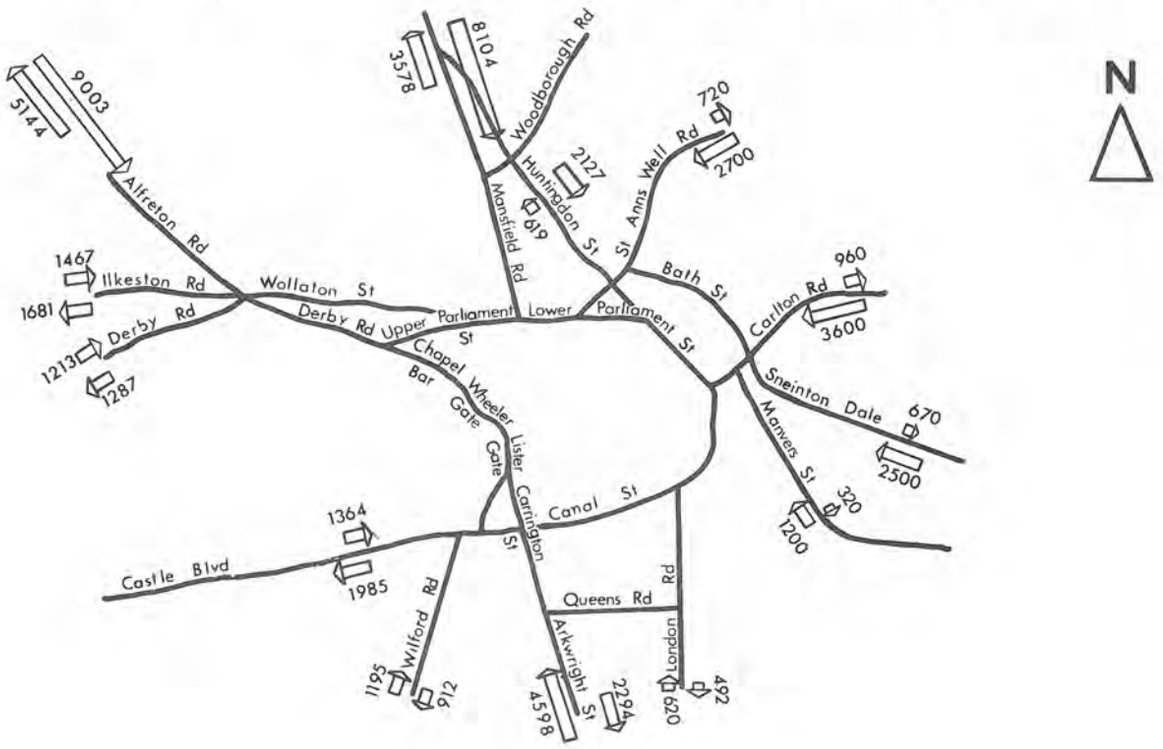


Nottingham City Transport

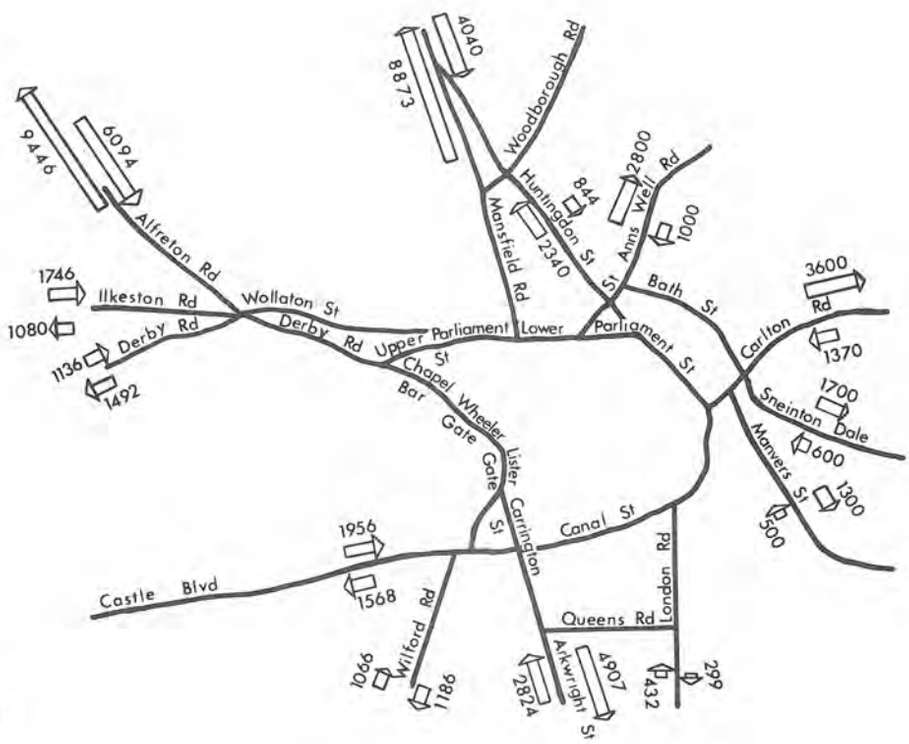
Frequency of Wednesday services in outward direction only

Figure 21

City of Nottingham



Morning Peak
7·00 a.m.–9·00 a.m.



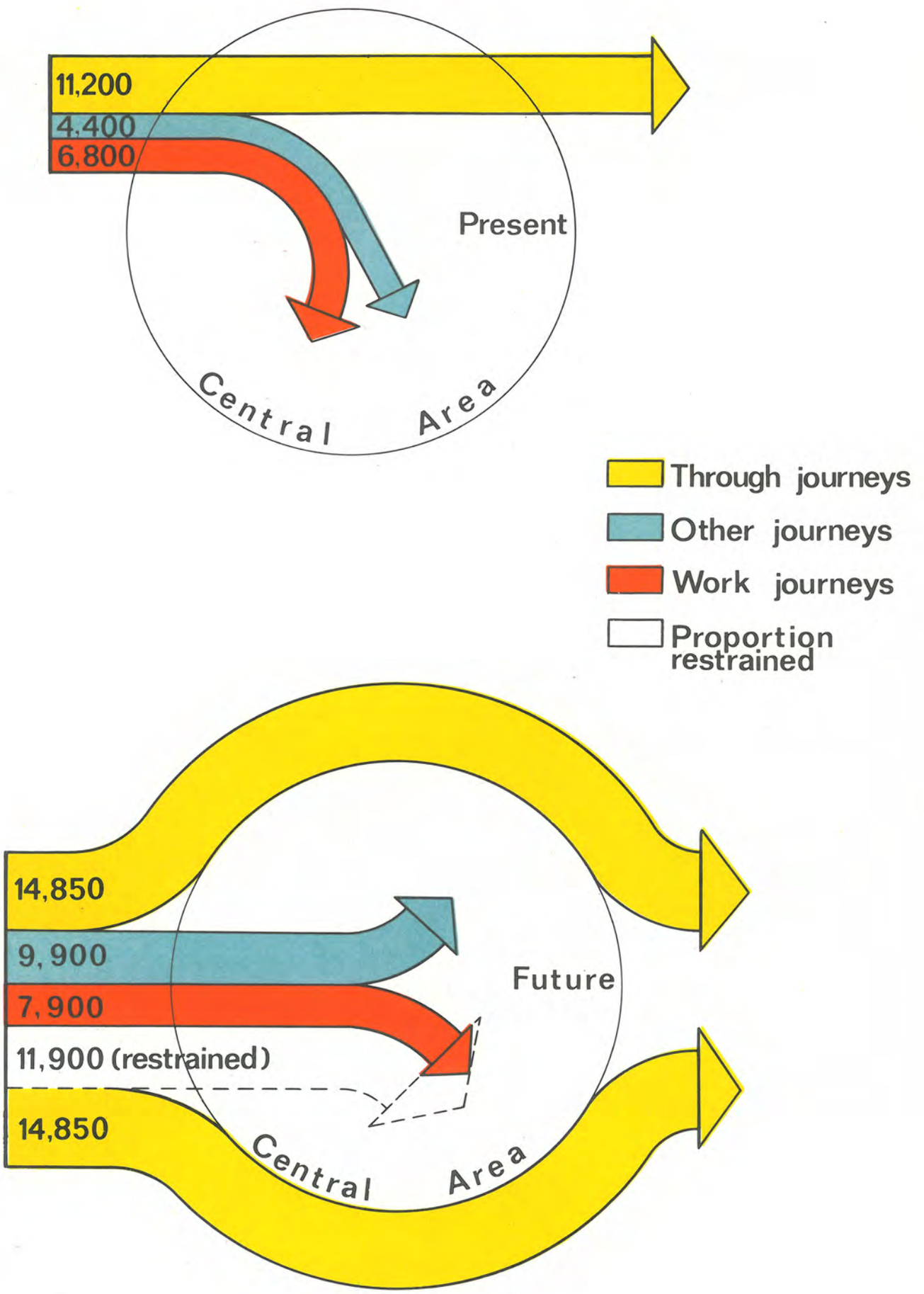
scale
0 4000
passengers

Evening Peak
4·30 p.m. – 6·30 p.m.

Corporation Bus Passengers Entering & Leaving Central Area At Peak Periods

Figure 22

City of Nottingham

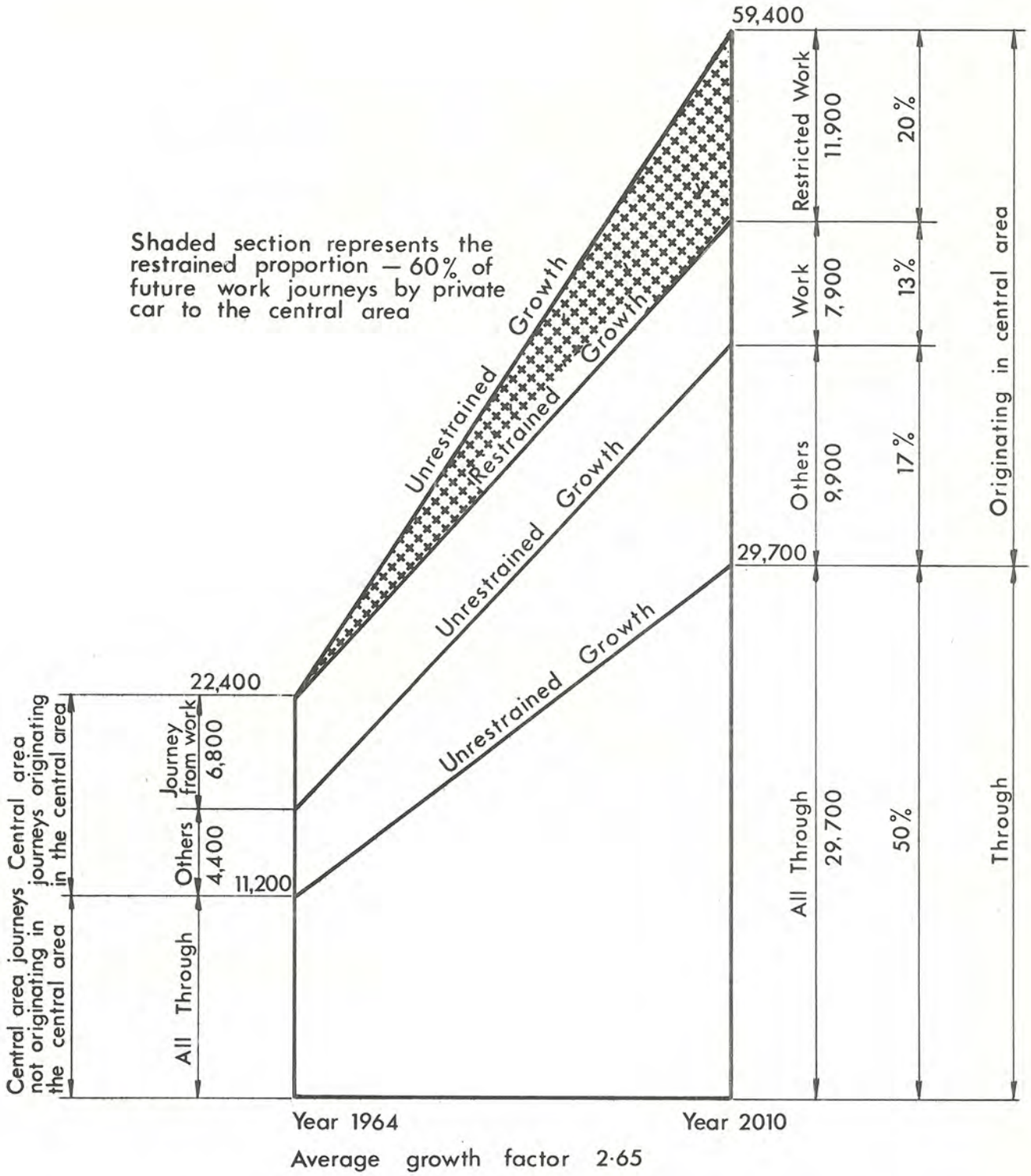


Central Area Journeys

(peak period)

Figure 23

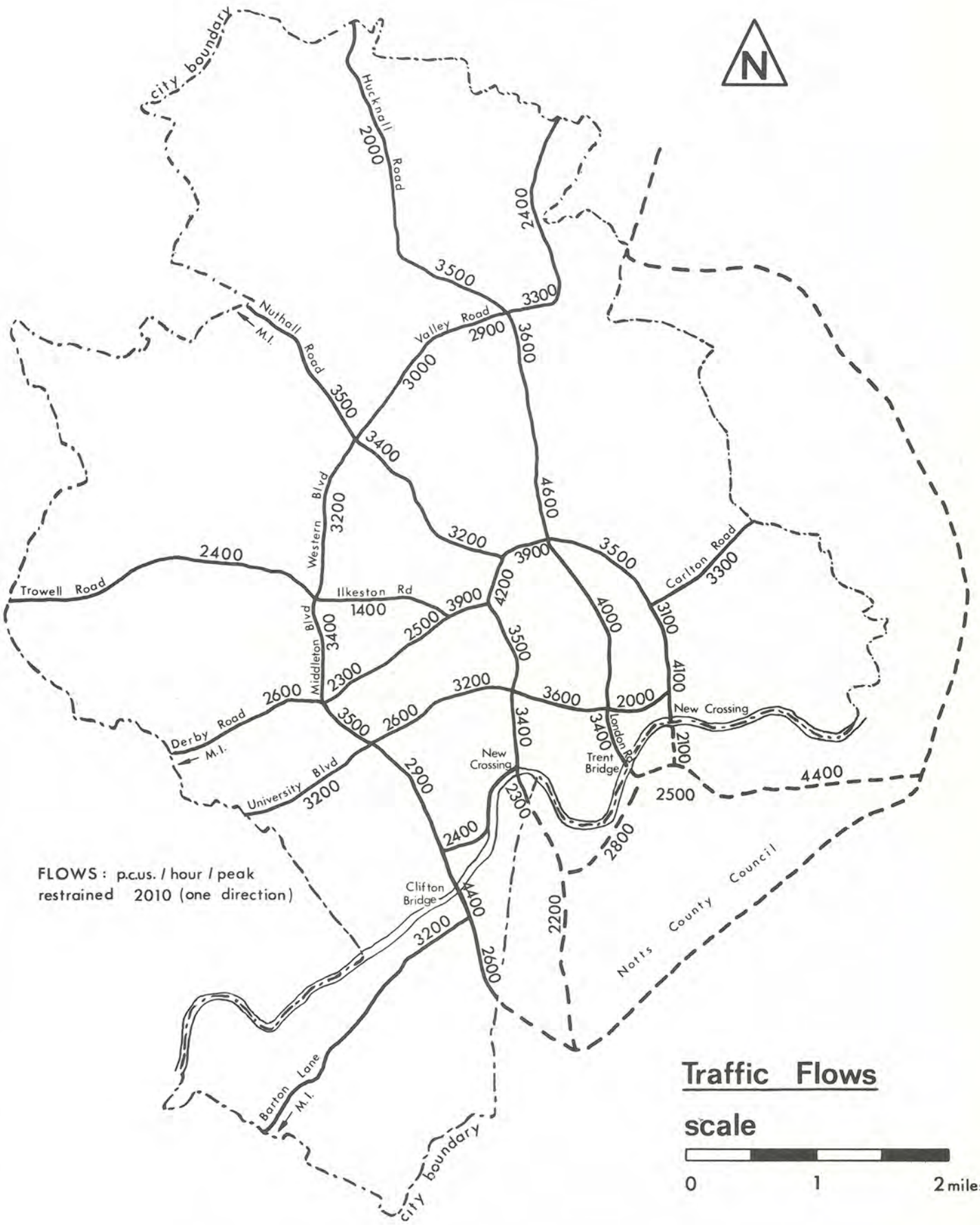
City of Nottingham



Graph Showing Restrained Proportion Of Future Journeys From Or Through Central Area Between 4-30 p.m. & 6-30 p.m.

Figure 24

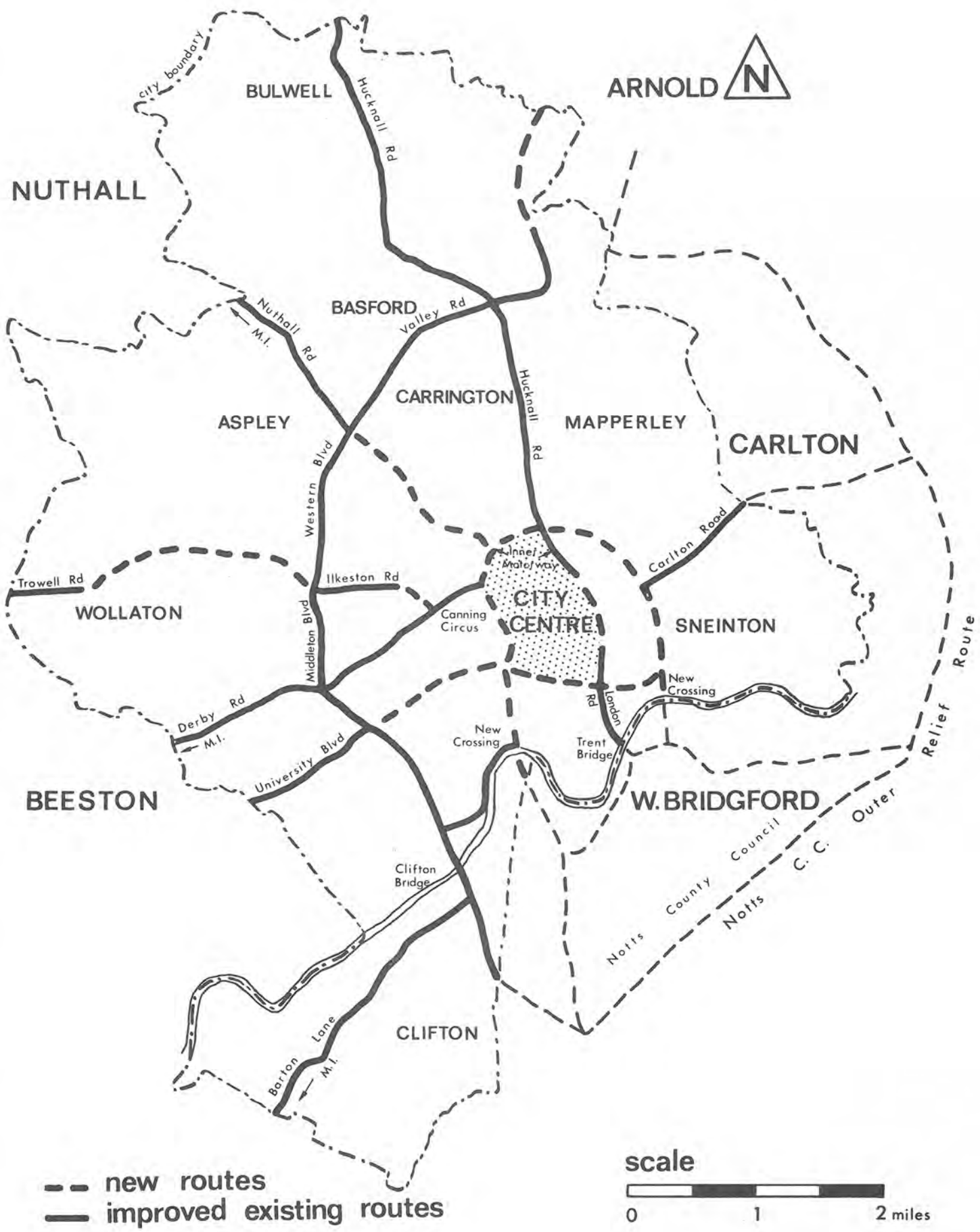
City of Nottingham



Primary Highway Plan

Figure 25

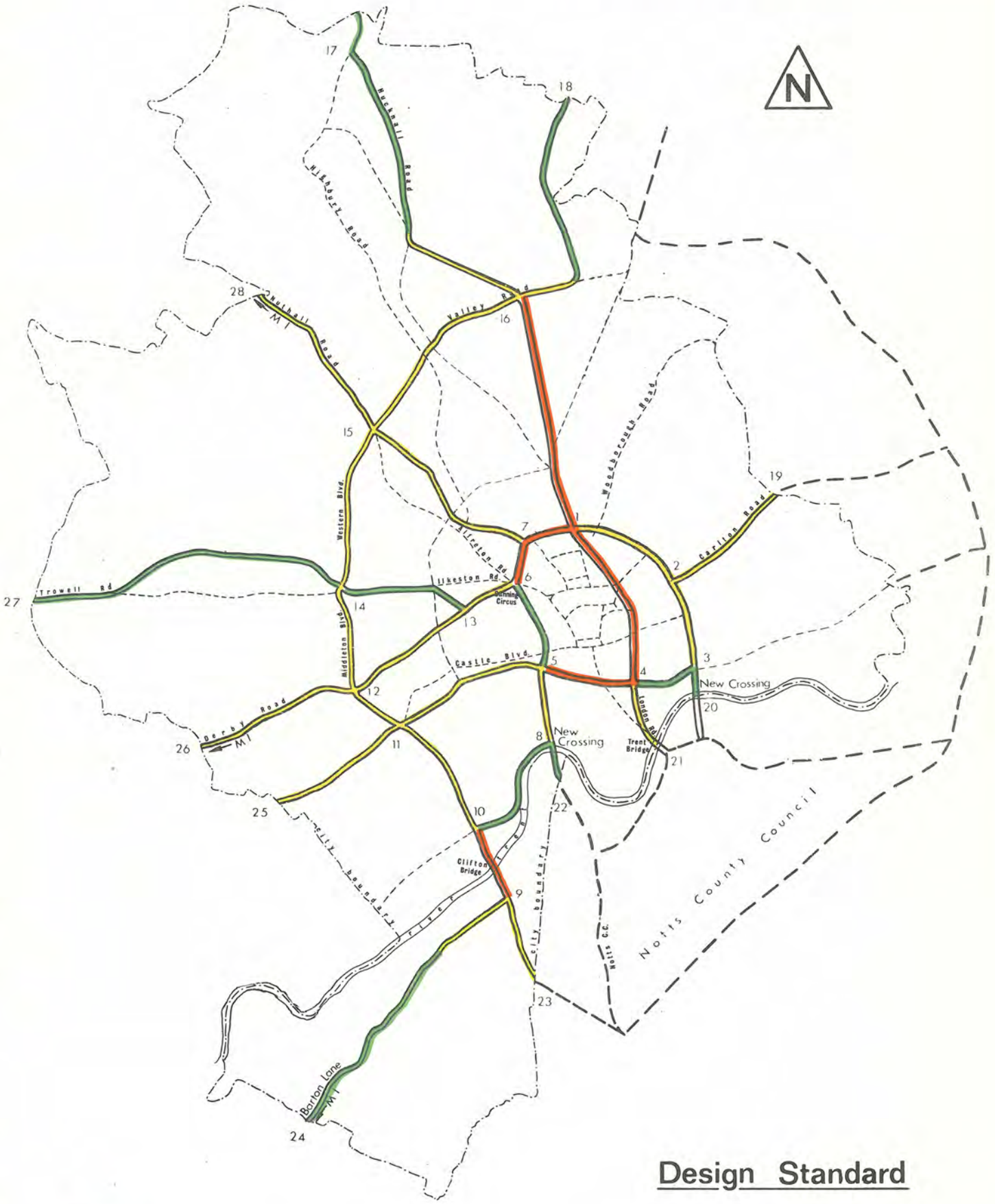
City of Nottingham



Primary Highway Plan

Figure 26

City of Nottingham



Design Standard

key

- Dual 3 lane (m'way)
- Dual 3 lane
- Dual 2 lane

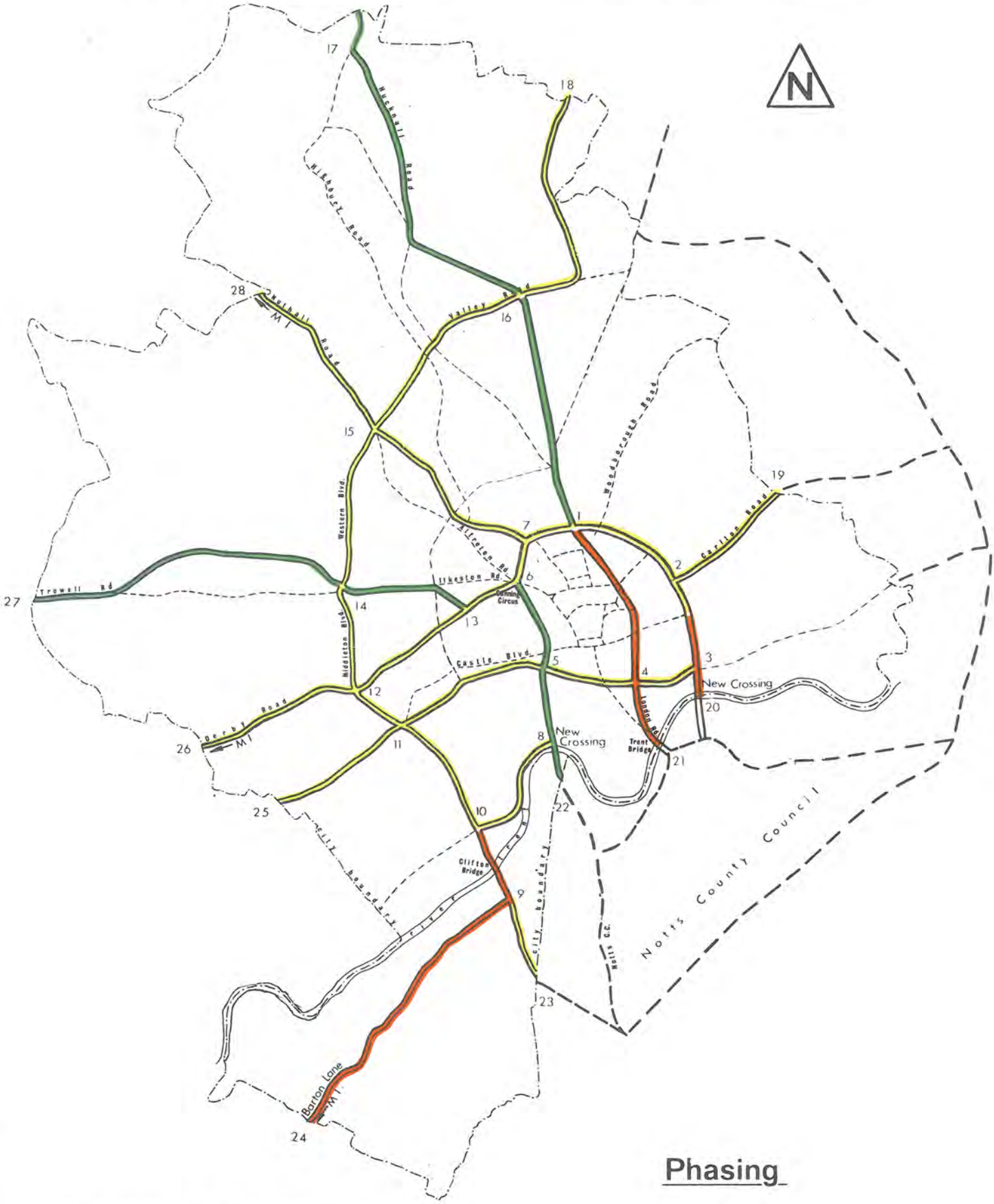
scale

0 1 2 miles

Primary Highway Plan

Figure 27

City of Nottingham



Phasing

provisional phasing

- 0 10 years
- 10 20 years
- Beyond 20 years

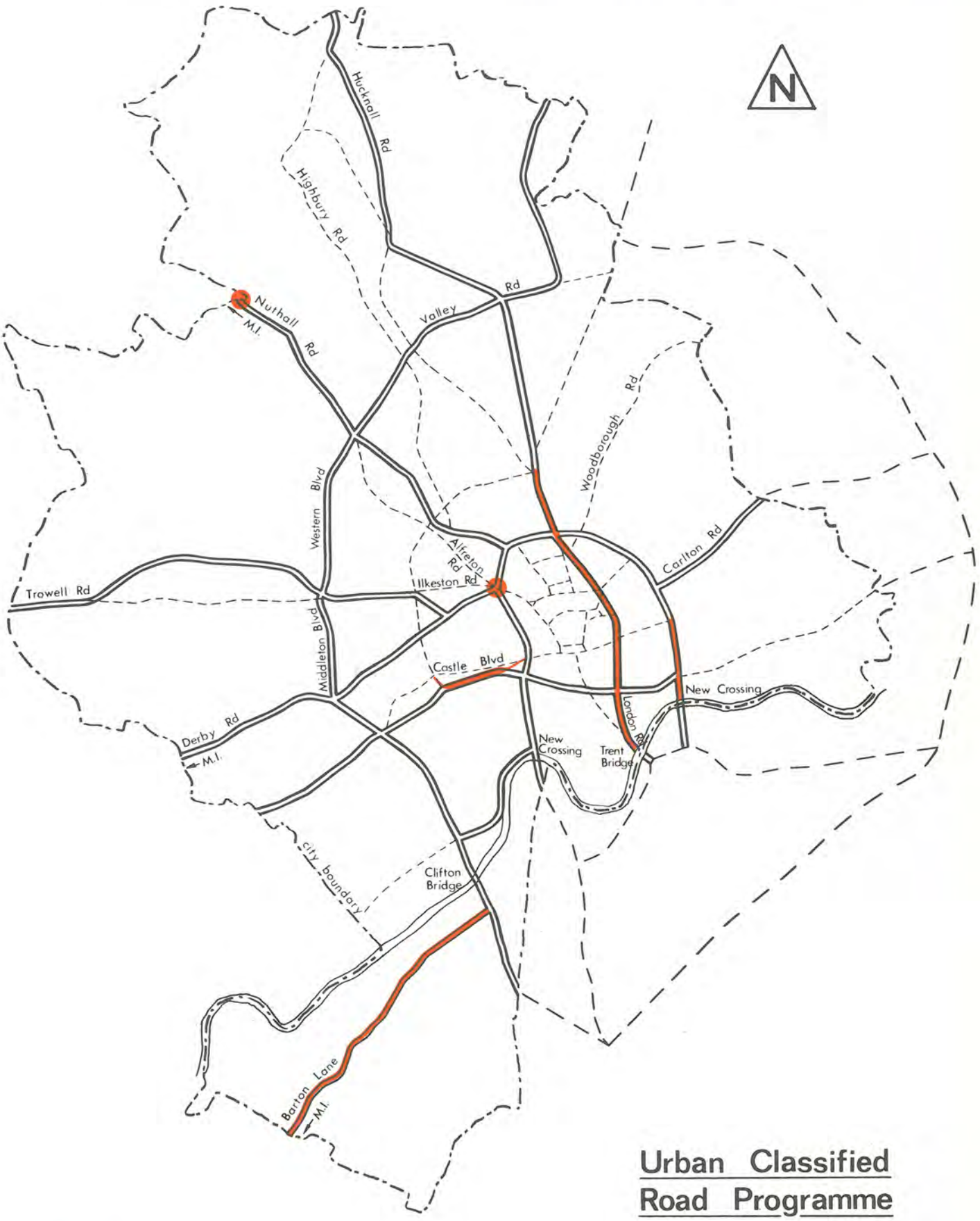
scale

0 1 2 miles

Primary Highway Plan

Figure 28

City of Nottingham



Urban Classified Road Programme

key

classified schemes up to 1978

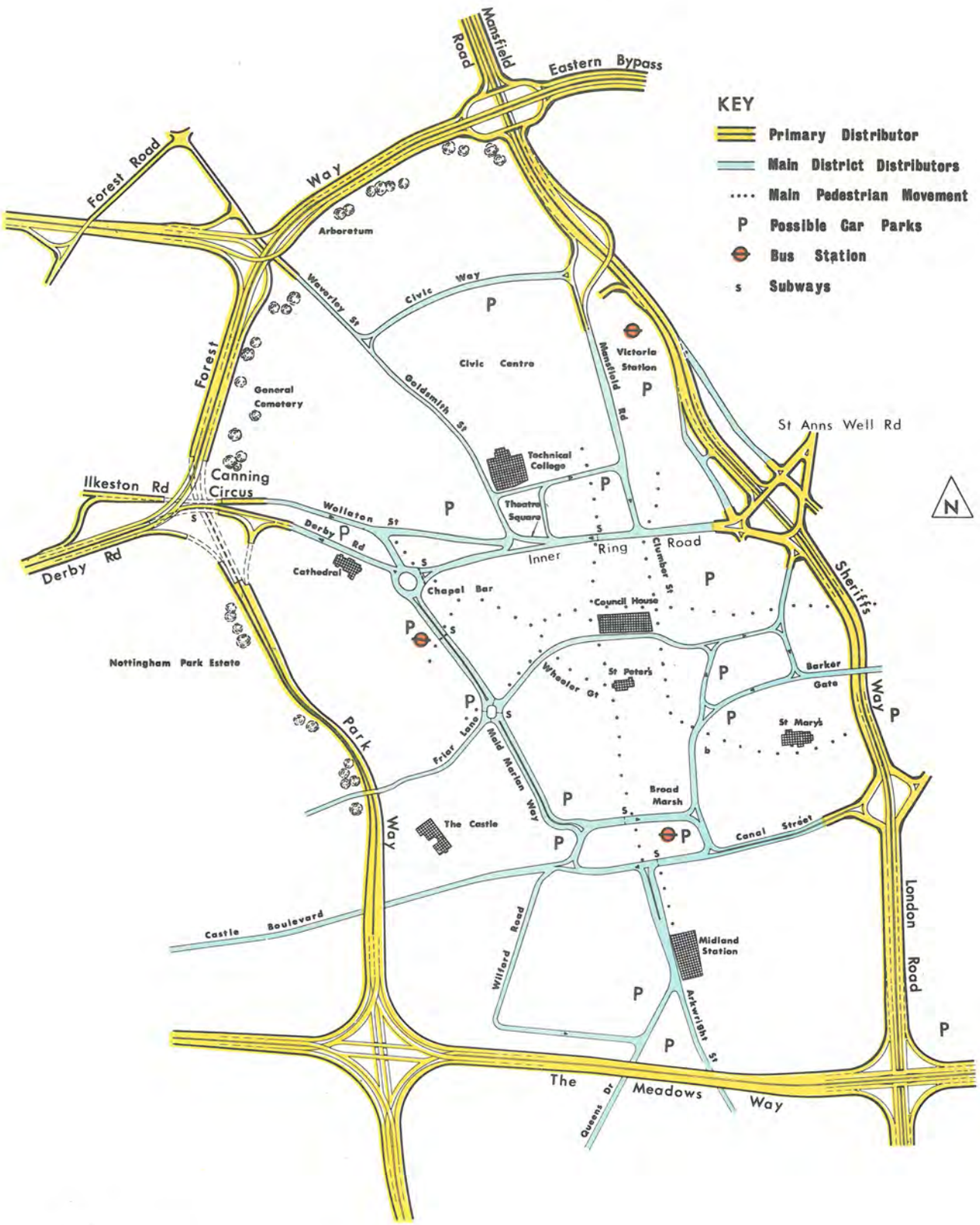
scale

0 1 2 miles

Primary Highway Plan

Figure 29

City of Nottingham



scale

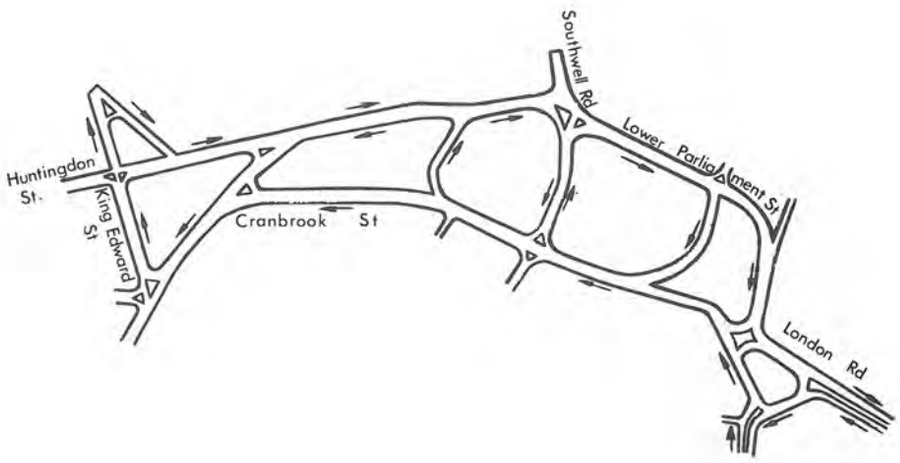
0 1000 2000 ft

0 1/4 mile 1/2 mile

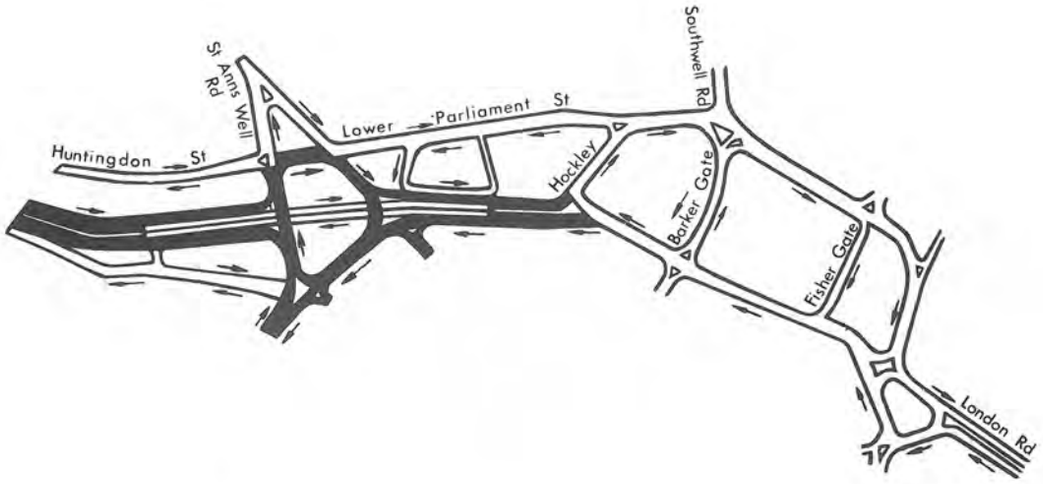
Central Area Traffic Plan

Figure 30

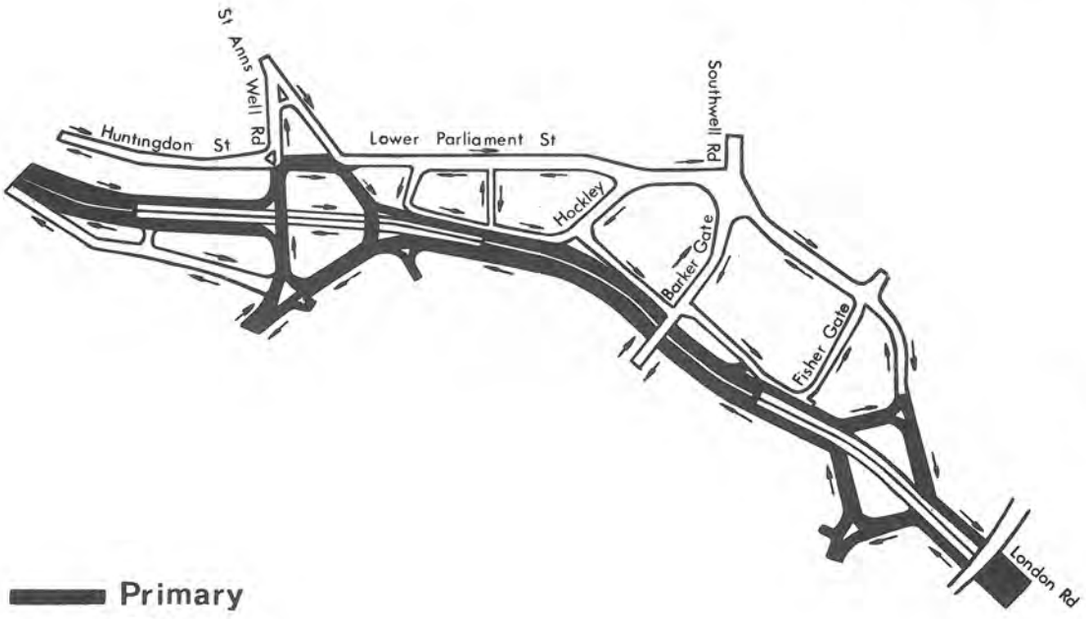
City of Nottingham



Phase 1



Phase 2



Phase 3

Primary
District

scale
0 500 1000 ft

Part Of Eastern Sector Showing A Scheme In Which Early Traffic Engineering Works Form Part Of The Ultimate

Figure 31

City of Nottingham

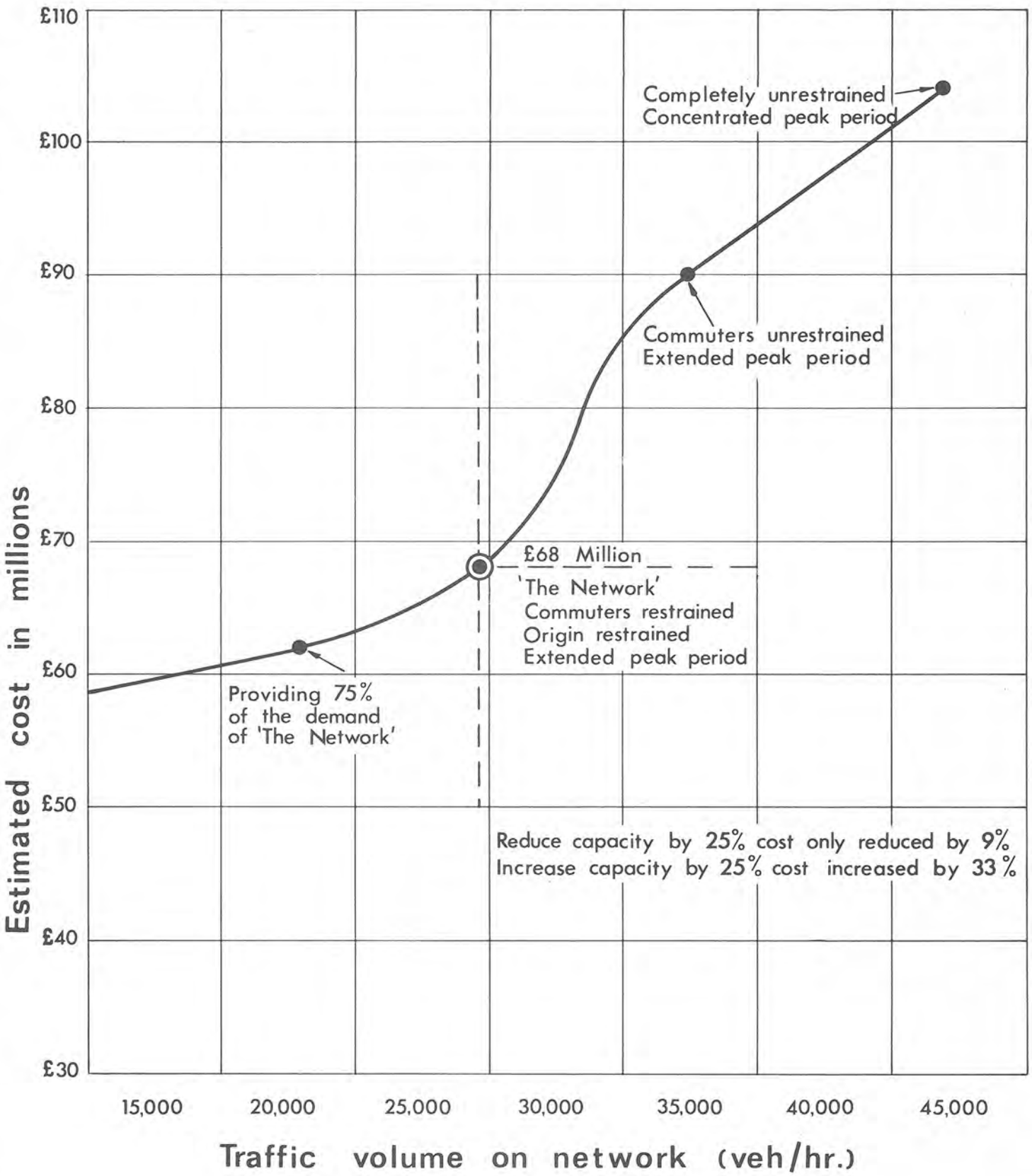
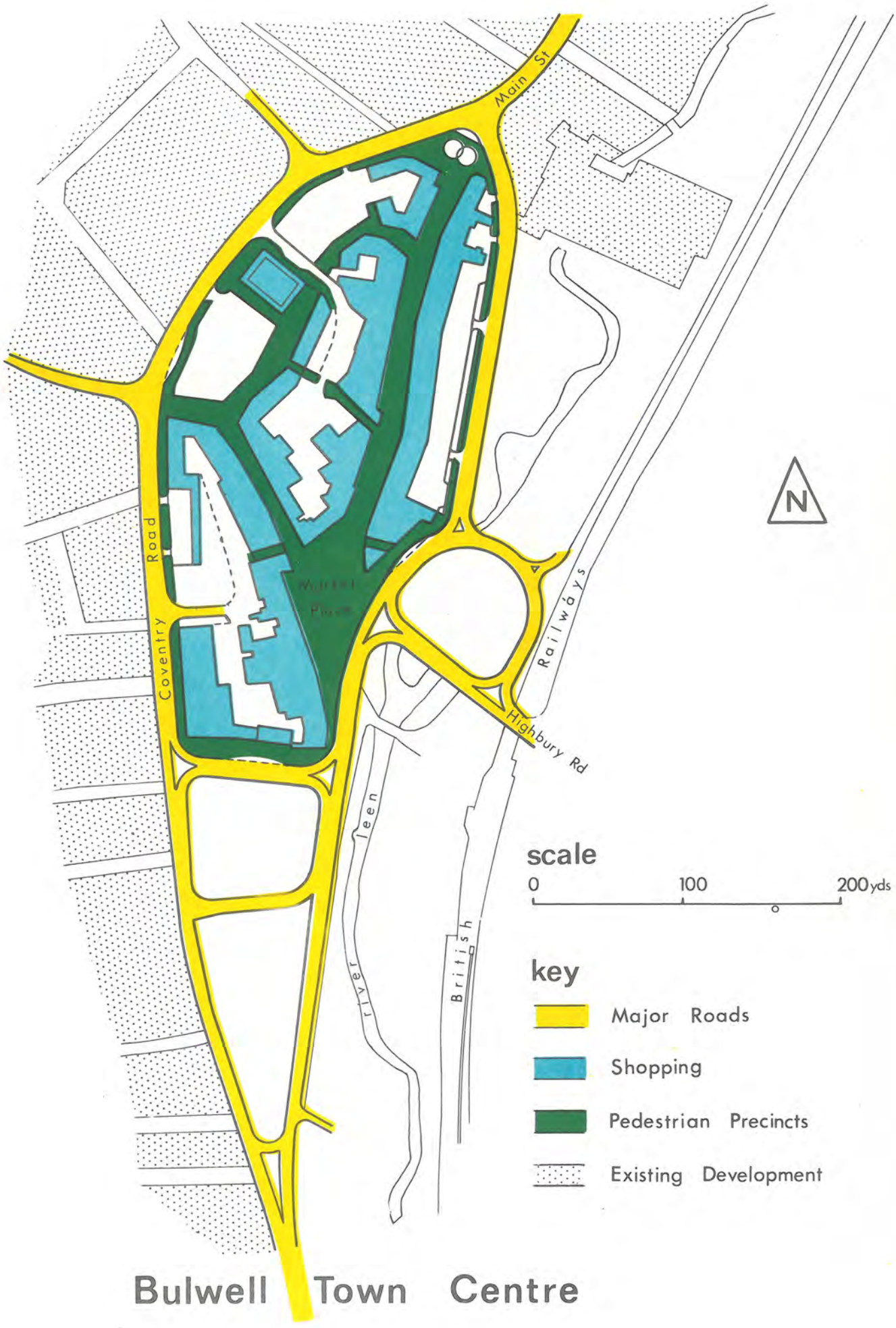


Chart Showing Cost Of Network For Various Traffic Volumes

Figure 32

City of Nottingham



Bulwell Town Centre

CITY OF NOTTINGHAM

NOTE

This plan does not purport to shew exact containing lines for the primary routes and their intersections. These can only be defined when more detailed examinations have been made.

N

KEY

Primary Distributors

Main District Distributors
[Including Bus Routes]

Scale

5000 10,000 ft

1/4 1/2 3/4 1 2 miles

F M LITTLE
CITY ENGINEER & PLANNING OFFICER