The development of the major railway trunk routes



BRITISH RAILWAYS BOARD

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THE DEVELOPMENT OF THE MAJOR RAILWAY TRUNK ROUTES

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I – Introduction

The report on ' The Reshaping of British Railways ', published in 1963, emphasised the present and future importance of the railways as providers of mass transport over the trunk routes of the country, and their relative unimportance and unsuitability as providers of transport for light flows of local traffic.

In connection with that report it was pointed out that the railway system could be seen as falling into three parts :—

1 a part which is clearly sound now, and potentially sound under any foreseeable future conditions;

2 a part upon which judgment must be suspended because its future usefulness remains questionable ; and

3 a part which is unsound now and never likely to be sound in future.

It is regrettable, though perhaps not surprising, that public attention has concentrated upon the proposed abandonment of the unsound parts of our railway system. Of much greater importance, however, were constructive proposals for the development of a new railway out of the old one which were made in the Reshaping Report, and other proposals which that report foreshadowed.

Those parts of British Railways' route system which fall in the first of the three categories referred to above are :—

Some of the routes carrying suburban traffics.

Some isolated lengths of route which carry heavy flows of bulk traffic, e.g. from mines to power stations, from ports or ore fields to steel works, etc., but which do not link up to provide heavily loaded through routes.

A considerable proportion of the trunk routes linking main centres of population and industry, together with the feeder lines which serve them. Not all existing trunk routes can be included, however, because of the duplication which has resulted from the competitive building of the past.

The object of the present report is a critical examination of a crucial part of the system—the trunk routes—and it sets out for consideration the information and forecasts necessary to establish how the through route system can best be developed to match the future pattern of rail traffic demand.

To this end, the report looks ahead 20 years—a period which is considered to mark the limit of a realistic and quantitative appraisal. It is confined to the trunk routes and leaves out those parts of the system which can be dealt with as separate or subsidiary issues, namely the commuter services and feeder lines.

It should be recognised that the purpose of this study is to select routes for future intensive use, not to select lines for closure, and many of the lines not placed firmly in category 1 will remain in category 2 until their future prospects are seen more clearly.

The publication of this report is not a prelude to precipitate action on a broad front. It is, rather, the exposure of ideas about the way in which the trunk route system should be shaped, and is made for four important reasons:—

(i) Firstly, so that the selection of trunk routes can be subjected to constructive criticism,

(ii) Secondly, so that the next phase of development expenditure can be well planned,

(iii) Thirdly, so that any future proposals for trunk line closure, or diminutions of line utilisation, can be seen in a broader context,

(iv) Fourthly, so that commercial policies can be properly developed and customers be given a clearer view of the future.

The existing rail network between main centres of population and industry

The existing system of through routes connecting main centres is shown in Map 1. Its complexity is a relic of an age in which the railways of this country were built by many competing interests, often operating over the same territory, and some indication of the extent to which routes are duplicated is made immediately apparent, on Map 2, by the colouring of routes which share the principal traffic flows.

The total route mileage involved is some 7,500 miles, subdivided as follows:—

TABLE 1

Type of Route	Miles
4 Track or more	1,400
2 Track	6,100

In certain instances, routes serve subsidiary purposes as well as their main function. This means that there must be an element of judgment in determining the extent to which duplication exists, but, in the view of the Board, the following Table summarises the position :—

TABLE 2

Total Miles in			
Quadruplicated Routes	Triplicated Routes	Duplicated Routes	Single Routes
700	700	3,700	2,400

Table 3 shows the utilisation of the through route system and compares this with the capacity that is available now.

TABLE 3

Type of Route	Miles	Present* Utilisation	Practical* Available Capacity
4 Track or more	1,400	8½m.	20m.
2 Track	6,100	2½m.	8m.

*Passenger/Ton miles per route mile per annum.

The extent to which the maintenance of this excess capacity influences the cost of handling through traffics is made clear if the following Table,

which shows route cost per passenger/ton mile for various types of route and at various traffic levels, is used in conjunction with the previous one :—

TABLE 4

Route Costs (excluding Interest) per Passenger/Net Ton Mile		
Traffic Density Passenger/Net Ton Miles per annum	Route Costs per Passenger/Net Ton Mile	
	4 Track Route	2 Track Route
Millions	pence	pence
45	·07	–
30	·09	–
20	·13	–
15	·15	–
10	·22	–
8½	·26	–
7½	–	·21
5	–	·30
2½	–	·57

NOTE : The figures quoted are an average, assuming the best and most economical modern equipment and methods.

Studies of road and rail costs indicate that, on the trunk network, route costs should be less than about ⅓d. per ton mile, if railway transport is to be widely competitive. Tables 2, 3 and 4 together show that, over much of the trunk system at present in existence, high costs per ton mile are associated with duplication of routes.

Reasons why route selection appears necessary

It is evident that railway economics are such that the cost per unit carried falls rapidly as the traffic density over a route increases. In addition to the resulting reduction in route cost per unit carried, economies also arise from more effective utilisation of lineside facilities such as yards, maintenance depots, stations, etc., and from more intensive use of motive power and rolling stock. Therefore, if an available flow of traffic, which could be carried by one route, is spread over two or more alternative and under-loaded ones, the costs per unit carried are bound to be inflated.

There can be no doubt that British Railways costs are so inflated at the present time, because there is a gross excess of trunk route capacity in relation to the traffic pattern, and only about one-third of the total through route capacity is used. Moreover, much of the money which is being spent

on the system for the sake of the direct economies which result from modernisation of our equipment and installations, also has the effect of increasing route capacity. This important by-product of sensible renewal and independently justifiable improvement expenditures will result in a very substantial increase in route capacity and, if spread over the through routes as a whole, will considerably increase the disparity between capacity and present traffic levels. Also, changes in the mode of operation of the railways which are already being developed, will have a similar effect. Therefore, unless future traffic levels over the through routes are likely to be many times higher than at present, the expenditure of the very large sums of money necessary for the maintenance, renewal, and improvement of all existing through routes cannot be justified, and the concentration of traffic and of development expenditure upon selected routes is clearly desirable.

The importance of the problem will be better appreciated when it is realised that the level of annual expenditure on through route maintenance, renewal, and improvement, is at present running at a level of around £85 million, and is likely to continue at that same general level for a good many years if the whole through route system is maintained. Substantially lower expenditure, upon a suitable selection of routes, is likely to provide all the capacity required to meet foreseeable future demand.

An outline of the study

In order to match a railway system to the transport requirement which it is expected to meet, it is obviously necessary to know much more than the total demand in terms of ton or passenger miles. The total traffic must be subdivided into categories which can be regarded as reasonably homogeneous from a transport point of view, and the location and density of the main flows of traffic in each category must be established. Only if this is done can route capacity be provided in the right manner.

It was considered that the best way of providing this information for a period of twenty years ahead was to analyse the trunk transport requirement associated with the present state of the economy, and then to forecast how the present pattern of traffic flows might be modified by global changes in transport demand resulting from growth in the economy, by changes in the pattern of industrial production, and by any major changes in the geographical distribution of population and industry. For that reason, this report deals with the general problem which has to be solved in the following stages :—

Examination of the present pattern of trunk transport of freight on rail, in relation to the total national demand for freight transport

between main centres, and of the present inter-city flows of passenger traffic.

Consideration of those changes in the national economy and in the disposition of population and industry which are likely to affect the future demand for public transport, and, in particular, rail transport.

Assessment of the probable pattern of transport demand between main centres by 1984, and of the traffic flows favourable to trunk movement by rail.

Consideration of the potential capacity of rail trunk routes when developed technically and operated in the manner best suited to the types of traffic foreseen.

Selection from existing routes of those which can best be developed to provide the network and capacity required to handle the future trunk traffic demand.

II – The present pattern of traffic between main centres of population and industry

It is obvious that the traffic moving over many sections of existing routes may be compounded of a mixture of flows between quite different pairs of points in the country, and the nature of the mixture may be strongly influenced by the chance characteristics of the existing network. Therefore, measurements of traffic densities along existing routes are of little value for our present purpose.

What it is necessary to know, as a basis for providing the most suitable services and routes of the right capacity, is the volume and nature of the traffic flowing between all pairs of main centres of population and industry.

Freight traffic

For rail traffic, comprehensive surveys were made in connection with the report on 'The Reshaping of British Railways', which defined the flows of the main categories of freight between traffic areas in 1961. To establish the present pattern of rail traffic between main centres of population and industry, the Reshaping Report information was used as a background. This information was modified in the light of special studies undertaken over the interim period, and checked by comparison with regular statistics of the forwarding of each of the principal commodities by traffic areas, now available to the Board.

Rail traffic was first divided into the following categories:—

(i) Coal

(ii) Iron and Steel (raw materials and products)

(iii) Oil

(iv) Other Traffic, including General Merchandise

These main categories were then considered in more detail so that, for example, individual consideration was given to the principal commodities and industries covered by (iv). A number of traffic centres was chosen to cover all the important producing and consuming areas. In total they amounted to about 40 centres which gave a geographical spread over the main areas of population and industry. This enabled the great majority of all freight requiring trunk transport to be identified and analysed.

For the four main freight categories set out above, data about the flows between the 40 centres were collated, analysed, and recorded on large tables or matrices, examples of which are given in Appendix 'C'.

Because of the configuration of the country and the distribution of populous areas, even 40 centres proved to be too many for the purpose of considering trunk flows. Because many of the centres are so close together in relation to trunking distances, there is, inevitably, a grouping of traffic from them for the purpose of trunk haulage. Therefore, for ease of comprehension and presentation, the 40 centres were grouped into 14 areas (see Map 3).

The omission of particular towns does not mean that their traffic potential has been disregarded: adjacent centres such as Southampton and Portsmouth, or Leeds and Bradford, have been grouped together because they can both be served by the same trunk flows.

Maps 4 to 7 show, in diagrammatic form, the rail freight flows between 14 main areas, of coal, iron and steel, oil, and other freight. Map 8 shows the total flows of rail freight.

The trunk flows of coal shown on Map 4 cover the movement of about 45 million tons per annum, and of particular importance is the East and West coal movement in the industrial Midlands. On this same map, heavy local flows have also been indicated because they account for the major part of the total rail tonnage, and their magnitude is indicated by the size of the red circles. In many cases they pass mainly over feeder routes which exist solely to cater for them, and make relatively little use of the main through route network. Even so, the potential of the trunk route system is better appreciated if the place of the railways in handling intense local flows is not lost to sight.

It will also be noted that the iron ore, and other materials and products, of the iron and steel industry have been distinguished in Map 5, because of their greatly differing characteristics from the transport point of view.

For road traffic, the main source of information was the Ministry of Transport 'Survey of Road Goods Transport 1962'. Part I of the Final Results of this Survey has already been published and it was possible to supplement this by advance information drawn from the partially completed analyses of individual commodities and traffic flows. Whilst full analyses may reveal differences of detail, it is not considered that they will be important enough to affect the basic pattern that has emerged. In addition, much detailed information about road traffic was available from the surveys undertaken in connection with the Reshaping Report. Also, in assessing the future availability of liner train traffic, account was taken of detailed market assessments which have recently been completed in relation to the first five routes to be developed.

Road-borne freight between main centres has not been subdivided into commodity categories, as in the case of rail freight, because the majority of long distance traffic falls into the general merchandise category. Thus, although large tonnages of coal are moved by road from the pits, and also during final delivery, nearly all these movements are over the shorter distances, and less than 3 million tons is conveyed by road for more than 100 miles. The position is similar in the case of oil, only about 2 million tons being conveyed over 100 miles. These quantities are small in relation to the total of 70 million tons of freight moved by road on direct trunk hauls over 100 miles. In the case of iron and steel, road traffic between main centres is largely limited to products of the industry and, from a transport point of view, these do not differ from other general merchandise traffics in any significant respect. The flows of all road-borne freight traffics are shown in Map 9.

Coastwise freight amounts to about 50 million tons. It consists largely of coal and oil, with only about 5 million tons of other commodities. For both coal and oil, this method of transport meets a specialised need. For oil, the main purpose is movement from refineries to depots and large consumers located on or near the coast. In the case of coal, most of the traffic flows from the North East to large consumers, such as power stations and gas works, in the South East.

It is estimated that the traffic flows shown in Maps 8 and 9 cover more than 95% of the road and rail-borne traffics moving over distances of more than 100 miles. In the case of road very little traffic conveyed under 100 miles has been included, whilst for rail, some traffic conveyed for distances of somewhat less than 100 miles, notably in the coal and iron and steel categories, have been included.

Passenger traffic

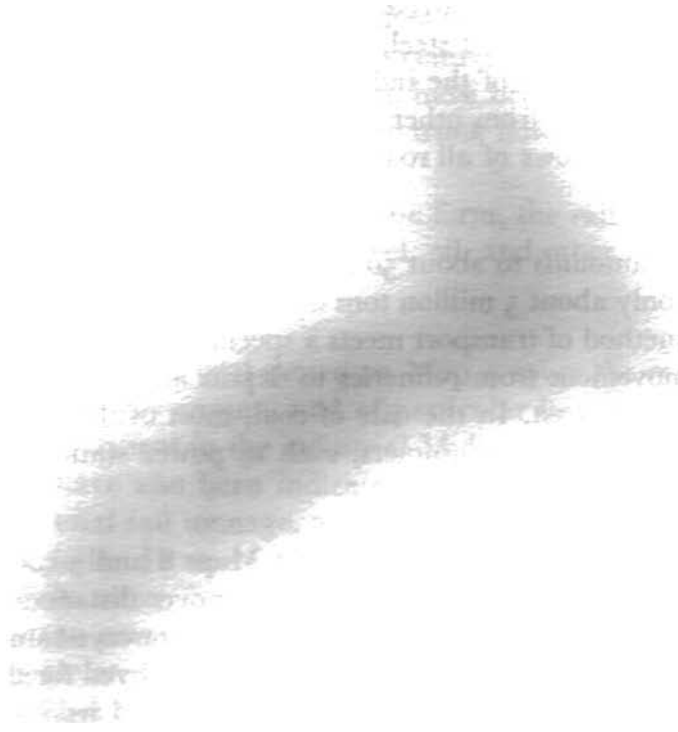
From statistical information available to the Board it was possible to establish the flows of passengers between the main centres. The results of this analysis are shown in Map 10. The dense flows in the South Eastern area, centred on London, have been excluded, together with commuter traffic around other conurbations, and other short distance traffic generally.

A study was made of the movement of passengers on the domestic air routes. Where published traffic figures were available these were used, but in general the flows were derived from an analysis of the scheduled flights by taking into account the types of aircraft used and applying an estimated load factor. The result of this analysis is shown in Map 11.

The long distance coach flows shown in Map 12 were derived in a similar manner. A detailed analysis was made of all the long distance scheduled coach services. From this analysis the flows were estimated by taking into

account the seating capacity of the coaches and the load factor indicated by sample observations. This was then checked against the available published information of road coach traffic.

Reliable and comprehensive information is not available about the inter-city journeys made in private cars.



III – Changes in the economy likely to affect transport over the next twenty years

Any forecast of the probable state of the national economy twenty years hence is bound to be subject to considerable uncertainty, even if the forecast is of a global nature. Moreover, as has already been mentioned, to be useful as a basis for assessing the future transport requirements of the country, the forecast needs to be made in some detail. It must, for example, take account of probable changes in the commodity pattern of industrial production and of changes in the geographical distribution of industry and population, in addition to the assessment of total growth.

This need for resolution of detail within the global picture necessarily adds somewhat to the uncertainty of the conclusions drawn. Moreover, a new Government has taken office during the preparation of the report, whose policies in relation to national and regional planning could affect certain of our assumptions. Nevertheless, because many factors contribute inertia to the economy and limit the rate at which major changes do take place, especially major relocations of industry and population, an attempt to foresee the transport requirements of the nation in twenty years' time is not unrealistic.

Much attention has already been given by economists and others to the next twenty years. Amongst publications which have appeared, some of which deal with developments in specific industries, areas, or aspects of planning, the following are of particular interest:—

'The South East Study 1961–1981', which deals with the growth and distribution of population and industry in the South Eastern Region, was issued last year by the Ministry of Housing and Local Government. One significant feature of this report, and of the White Paper (Cmnd. 2308) which accompanied it, is the evidence which it provides of the strong urge of the Government to damp down the main migrational movement which is apparent at the present time, namely the migration to the South East.

A report by a group under the Chairmanship of Sir Robert Hall, Economic Adviser to the Ministry of Transport, on ' The Transport Needs of Great Britain in the Next Twenty Years ' (H.M.S.O.), was published in 1963. This report deals directly with the problem with which we are concerned, but it is limited to global assessment of the future demand for the main forms of inland transport. It recognises the importance of, but does not attempt, the more detailed examination of traffic flows which is essential for the planning of a transport system.

Nevertheless, the global assessments in this report served as a valuable check on our own conclusions.

Our consideration of the future state of the economy, in the course of which we drew freely upon the work of others, led to a number of assumptions and conclusions which influenced our subsequent consideration of the changes in the present pattern of traffic flows which are likely over the next twenty years. These are outlined below.

It was assumed that the population will continue to grow and the Registrar General's forecasts have been used. These suggest that the total population of the United Kingdom will rise from 54·2 million in 1964 to 62·5 million in 1984 (15%).

An assumption about the rate at which the economy can be expected to grow over the next twenty years presented some difficulty. The growth rate over the last two decades has been only 2·4%, and on this basis the assumption of a 3% rate of growth over the next twenty years would appear rather optimistic. On the other hand, the National Economic Development Council has explored the practicability of a 4% growth rate, but it is, as yet, by no means clear that the national will is strong enough to produce the conditions which must be satisfied if such a growth rate is to be sustained. Therefore, as in the Hall report, the effects of growth rates of 3 and 4% were considered. This was done to determine to what extent the alternative assumptions influenced our conclusions, but, because it would clearly be wrong to set a long term development target for the railways which discounted the work of N.E.D.C., with an associated risk of underestimating the capacity required, weight was given to the more optimistic figure.

Tables 5 and 6, on the following pages, show the estimates which resulted from these assumptions.

Two important assumptions were made about the distribution of population and industry. In relation to population it was assumed that the rate of growth would be comparatively even throughout the country and that no major redistribution would take place. In relation to industry, although some change was foreseen in the commodity pattern of production, the assumption was made that the geographical spread of general industrial activity would remain the same, and that growth would be uniform throughout the country.

These assumptions are clearly of key importance in relation to the planning of a transport system. It cannot be proved that they are sound, but they appear to be justified by the strong and growing tendency towards regional development, and by accompanying governmental efforts to

stabilise the population pattern by damping industrial development where population shows a tendency to grow disproportionately fast, and by inducing it in areas which show a tendency to decline.

The assumptions that the distributions of population and of general industrial activity will remain stable were applied in forecasting the future flows of passenger and of general merchandise traffic. In addition, special studies were made of the future size and location of industries which are large individual users of transport, such as coal, iron and steel, oil, and power generation.

TABLE 5

Assumed Changes in the U.K. Economy
Associated with Growth Rates of 3% and 4%

	1964 (*Estimated*)	*1984* (*Forecast*)	
		3%	*4%*
Population (millions)	54·2	62·5	
Gross Domestic Product (in 1964 £m.)	28,250	51,000	62,000
Industrial Output (in 1964 £m.) (Manufacturing, Quarrying and Construction)	12,250	25,000	31,000
Energy Consumption (m. Tons Coal Equivalent)	290	435	505
Electricity Generation (Thou. m. kWh) (Public Supply)	145	390	450
Steel Production (m. Tons) ..	26	38	41
Car Ownership (m. vehicles) ..	8	19	23

TABLE 6

Assumed Energy Balances in the U.K. Economy
Associated with Growth Rates of 3% and 4%

Sources of Energy (Million tons coal equivalent)

	1964 (*Estimated*)	*1984* (*Forecast*)	
		3%	*4%*
Primary Sources			
Coal	192	140 – 180	160 – 190
Oil and natural gas	93	190 – 230	240 – 270
Nuclear and hydro	5	50 – 80	70 – 100
	290	435	505
Intermediate Sources			
Electricity			
Primary Sources:			
Coal..	69	70 – 110	70 – 110
Oil	11	40 – 70	65 – 95
Nuclear and hydro ..	5	50 – 80	70 – 100
	85	230	265
Gas			
Primary Sources:			
Coal..	21	10	10
Oil or natural gas	7	20	30
	28	30	40

Table 6 continued

Consumption (Million tons coal equivalent)

	1964 (Estimated)	*1984 (Forecast)*	
		3%	*4%*
Total Energy Consumption	290	435	505
Intermediate Energy			
Electricity	85	230	265
Gas (including gas coke) ..	28	30	40
Final Consumers			
Steel (including industry coke ovens)	35	40	50
General industry	85	145	170
Transport	37	55	65
Domestic	82	120	130
All other	51	75	90
Total Final Consumers	290	435	505

Direct Users of Mineral Fuels (Million tons coal equivalent)

	1964 (Estimated)	*1984 (Forecast)*	
		3%	*4%*
Users of Coal			
Electricity	69	70 – 110	70 – 110
Gas	21	10	10
Steel (including industry coke ovens)	21	20	20
General industry	26	10	10
Domestic and other	55	30 – 40	40 – 50
	192	140 – 180	160 – 190
Users of Oil and Natural Gas			
Electricity	11	40 – 70	65 – 95
Gas	7	20	30
Steel	7	10 – 15	10 – 20
General Industry	23	35 – 40	40 – 50
Transport	31	50 – 60	60 – 70
Domestic and other	14	30	35
	93	190 – 230	240 – 270

It cannot immediately be assumed, even if the location of general industrial activity remains unchanged, that the resulting transport demand will grow in direct proportion to the growth of industrial output. A growth of 4% in the gross national product will demand an annual increase of almost 5% in industrial production, because a higher than average growth must be achieved by manufacturing industry to offset the smaller increases likely to be achieved in other sectors of the economy. On the other hand there will be a trend towards the production of goods which are lighter in relation to their value. These two factors tend to influence transport demand in opposite directions and it has been assumed that, overall, the increased movement of manufactured goods will rise at a 4% rate.

It is, however, less clear that the ton mileage of transport demand will grow in the same way, because changes in the relative size of production units, in the need to move intermediate products, and in the distribution of end products to the market areas, may change the average distances over which commodities have to move.

In the case of some industries, the trend towards the integration of production into larger units, which is already apparent, will continue. In so far as this aggregation is for the purpose of vertical integration, it will result in some reduction in the inter-unit transport of intermediate products. At the same time, aggregation into large units with a more extended geographical coverage of the market will increase the average radius of distribution of the finished products. It must be recognised, however, that the policy of taking industry to the population will, to a degree, restrict growth of large units.

On the other hand, growth of the economy, with a corresponding increase in local markets, will enable many manufacturers to subdivide their capacity with advantage, in order to supply markets by local production, because more local markets will become large enough to support a plant of economic size. This will reduce the average radius of distribution of end products and probably increase the transport of raw materials and intermediate products. This trend will be encouraged to some extent by the policy of taking industry to the population.

Changes which may take place in the relationship of transport costs to other costs will affect decisions about the location of plant, particularly where transport is a large element in the final delivery price of the product. While in a short period of years this influence would be small, over a period as long as twenty years it might well have a considerable impact. Indeed, the steps to be taken in improving the railway trunk system will themselves affect the location of population and industry which the system is designed to serve.

The combined effect of these trends is difficult to judge with confidence, but their probable result will be to affect the average distance of movement of intermediate and end products very little.

It was for these reasons that, the main bulk raw materials having been considered separately, it was assumed that the average length of haul of the broad ' general merchandise ' category will not materially change. In other words, it was assumed that the proportions of the total tonnage moving over given distances will remain much the same as at present.

Some may consider that the assumption of a 4% growth rate is unduly optimistic. Also, there may be a tendency for concentration of population and industry in the Midlands and South East contrary to our assumption of a uniform growth throughout the country. Both these factors would tend to reduce transport demand on the trunk routes and thus cause our assessment of demand to indicate the need for more capacity than, in the event, may be needed.

More detailed assumptions

In addition to the foregoing general conclusions and assumptions, there was more detailed examination of particular forms of traffic. The more detailed considerations are referred to in the next section of the report, where the main elements in the future transport demand are considered separately.

IV – The pattern of transport demand between main centres in 1984

As in the case of the 1964 traffic flows described in Chapter II, the 1984 flows of the main categories of traffic were arrived at by considering the probable movements between some 40 centres of population and industry. For the purpose of presentation the movements were then grouped into flows between the 14 main traffic areas. The results are shown in diagrammatic form, and reference is given to the individual maps at appropriate places in the text. Examples of the matrices used are included in Appendices ' B ' and ' C '.

In assessing the role of the various forms of transport, i.e. road, rail, air and coastal shipping, consideration was given to their present characteristics, capacities, and costs. In order to determine their respective future roles a special study was made of the technological and cost changes likely to affect each of them during the next twenty years and an assessment was made of the relativity of their future cost levels.

Separate consideration is now given to the detailed estimates made for the principal categories of traffic, i.e. coal, iron and steel, oil, and other freight. This is followed by the estimate of total future trunk road and rail movement, reference being made to the role of coastal shipping. Finally inter-city passenger movements are considered.

Coal traffic

It was assumed that the total internal consumption of coal would remain fairly steady over the next twenty years, but that it is more likely to decline than to increase. It was also assumed that the Scottish and North Eastern coal fields would decline in importance, and that a greater proportion of production would be concentrated in South Yorkshire and the East Midlands.

The consumption of coal for electricity generation is likely to increase, possibly to 110 million tons per annum, and coking coal consumption for steel production should remain at about the 20 million tons per annum level. It was, on the other hand, assumed that the consumption of coal for other purposes, which require a more widespread distribution of the commodity, would decline to about half the present level.

In the assessment of 1984 coal traffic, provision was made for the main coal-fired generating stations which are at present rail served and for new coal-fired stations known to be contemplated. Provision was also made for the short haul to ports of coal passing to stations which are at present served by coastal shipping. In the main, this resulted in more intensive

coal movements within and from the East Midlands, and a new longer distance flow from Nottinghamshire to the Didcot and Aylesbury areas.

Coal flows to centres of iron and steel production were considered individually, on the basis of forecasts of the probable growth of each centre and of the sources of coal supply to them.

It was assumed that the remainder of the coal consumed in the country will flow to the same consuming areas as at present, although with some change of source.

As will be seen, by comparing Map 4 with Map 13, it is expected that the heavy coal flows which exist at present will persist in 1984, with some changes in their relative intensity, but that the more widespread and lighter flows will diminish substantially.

Changes in the pattern of consumption and in the location of production are expected to cause a continued fall in the average length of haul of rail-borne coal. This, together with the probability of a decline in total production, leads to the expectation that the total demand for rail movement will be about 5,500 million ton-miles, which is in agreement with the Hall Report. The individual flows requiring trunk movement, identified in Map 13, amount to some 3,500 million ton-miles. The remainder will be accounted for by more localised movements.

Iron and steel traffic

Owing to the decided trend towards the use of lighter metals and other substitutes for steel, the development of new steels, and the expected and necessary concentration of British industry upon products of higher technical complexity and less raw material content, steel production is expected to grow at a lower rate than the average for all industries. Production is expected to rise to about 40 million tons by 1984.

Reference has already been made to the coal traffic necessary to support this level of production. Rail traffic arising from the supply of other raw materials to the industry was assessed in a similar manner, by considering the probable growth of each main centre of steel production and the probable sources of ore, limestone and scrap.

There is, at present, a substantial rail movement of intermediate products of the industry, sometimes over considerable distances, some of which are due to imbalances between production stages in individual steel plants. It has been assumed that these flows will decline rather than increase with the growth in total output, since better balancing will be possible as plants develop further.

It has been assumed that the broad geographical pattern of consumption of the finished products of the industry will remain much the same as at present, but, in considering individual flows of these products, account has been taken of the relative growth of sources of supply, and of the location and probable growth or decline of large steel consumers.

In all, the total rail movement associated with the iron and steel industry is estimated at some 4,300 million ton-miles, of which 800 million ton-miles will be on liner trains and about 500 million will be movements of a local nature. The total figure of 4,300 million ton-miles may be compared with a corresponding 1964 figure of 3,300 million, and the expected changes in the flow pattern may readily be seen by comparing Maps 5 and 14.

Oil traffic

A feature of the forecast of the general state of the economy in 1984 is the greatly increased dependence upon oil and natural gas as a primary source of energy and as raw material.

The estimates are necessarily somewhat speculative, because of uncertainty about the development of nuclear power in the second decade, and because there is a margin of uncertainty about the probable use of coal. Another source of uncertainty is the prospect of discovering workable oil or natural gas fields under the North Sea. Also important, from a transport point of view, is uncertainty as to the future relative importance of liquid petroleum and natural gas. Even so, for reasons which will be explained, these uncertainties do not have such a pronounced effect upon the potential rail carriage of oil as might be expected.

About one-quarter to one-third of the 1984 consumption of oil or natural gas is expected to be in power stations. Because the sources are likely to be outside the country, most, if not all, of the generating stations consuming these products will be built on or near the coast, and any not on the coast are likely to have pipe-line connections to a coastal source of supply. Therefore, one of the largest but least quantitatively certain of the potential markets for oil is one which, in any case, cannot be expected to contribute traffic to rail.

A similar argument applies, though perhaps to a lesser degree, in the case of the gas industry.

In the main, therefore, rail-borne oil traffic will be derived from that proportion of the total which is consumed by general industry, by transport, and for domestic heating. Consumption in these fields is expected to be more than 150 million tons coal equivalent by 1984, as compared with 80 million tons at present.

Of the total oil and gas consumption for purposes other than the production of electricity or town gas, about half will be consumed for transport purposes, which means it is virtually certain to be in the form of liquid petroleum products. It is also probable, though less certain, that most of the domestic and general industrial consumption will be liquid fuel, although development of a North Sea gas field might affect the position considerably.

On balance, it seems reasonable to suppose that there will be, in 1984, some 160 to 180 million tons coal equivalent of liquid petroleum products requiring distribution within the country, which means an actual tonnage of 95–110 million. It also seems reasonable to suppose that the geographical pattern of consumption of this oil will broadly match the distribution of population and industry, except that some of the larger individual users of oil will be located near refineries, as they tend to be at present. It is virtually certain that all the refineries supplying the demand will be on the coast, and probable that they will be confined to locations which have already been selected for that purpose. The general magnitude and nature of the oil distribution problem which will exist in 1984 is, therefore, reasonably clear.

What remains to be determined is the manner in which the oil is likely to move.

In this respect, the present position gives less guidance as to the probable future position than is the case with other major categories of freight traffic, because we are just entering a period of rapid change. Pipe-line construction is only just getting under weigh and new methods of rail handling and new contractual arrangements are just beginning to have effect. On the other hand, the potential importance of this traffic to the railways has led to intensive study of the problem, in conjunction with the oil companies, and a fairly good assessment of the probable rail traffic has been made.

By 1984, the very heavy flows (i.e. flows of several million tons per annum between main centres) are likely to be carried by pipe-line, over both short and long distances. The break-even level of flow between rail and pipe-line transport will depend upon the regularity of the flow and the nature of the products handled, but it is likely to be about 2 or 3 million tons per annum.

Final distribution to smaller consumers will, generally, be made by road, either from depots attached to the refineries or from other depots located in the more populous parts of the country. There will, therefore, be little rail transport of small consignments direct to consumers. On the other hand, there will be a great deal of potential rail traffic, in flows ranging from about 10,000 to 3,000,000 tons per annum, from refineries to depots and direct to medium and large consumers.

Within this range, movement in trainload quantities will compete favourably with either road or pipe-line transport, and the railways can expect to attract most of this traffic to inland destinations. In the case of similar flows passing to installations on the coast, the balance of cost advantage between rail and coastal shipping will depend upon local circumstances. In general, however, concentrations of population and industry on the coast are centred on major ports and upon oil refineries. For this reason, movements of oil from one coastal point to another are seen to offer very little potential rail traffic.

The probable 1984 flows of rail-borne oil traffic were assessed in the light of the foregoing considerations and are shown in Map 15. They amount to some 2,000 million ton-miles of traffic, as compared with an existing ton mileage on rail of only 700 million. It is considered that new operating methods and rates recently introduced may, in time, create conditions for an even larger increase in this traffic. In this respect, therefore, our estimate of total freight traffic may be conservative, but the relative effect will be small.

Other freight including general merchandise

This residual category of traffic, which includes commodities of all kinds other than coal, oil, and iron and steel (raw materials and products), has an important place in the present study for several reasons.

Firstly, it is a category which offers very substantial traffic potential at present, and, as mentioned on page 20, this potential is expected to grow roughly in proportion to the growth of the economy. By 1984, it is expected to be about 120% higher than now, if an average growth rate in the gross national product of 4% per annum is achieved.

At present, total railway freight in this category amounts to some 40 million tons, of which about two-thirds is through movement between main centres and one-third local movement. A further 70 million tons or so is trunk hauled by road for distances of 100 miles or more. The way in which this tonnage flows is shown by Maps 7 and 9, and the forecast 1984 position is shown by Maps 16, 17 and 19.

Secondly, as is also shown by the maps, this form of traffic is spread more uniformly between the main centres of population and industry than coal, oil, or iron and steel traffic. It does, therefore, offer traffic potential to a greater part of the railway trunk route system than any of the other three freight categories, and, in this respect, does more to support routes required for inter-city passenger traffic.

Thirdly, this is the category of traffic for which competition between road

and rail is bound to be most vigorous, and where most needs to be done to ensure that each form of transport provides those services for which it is best suited.

An important factor in assessing the roles of the two forms of transport is the extent to which road operators are called upon to cover the cost of the roads which they use. The Board have already expressed the view that, for heavy vehicles on the trunk routes, there is a substantial disparity between system costs and the contribution paid by the operators. Nevertheless, no general increase in road taxation has been assumed for the purpose of making the rail traffic estimates described in the following paragraphs, but some increase has been assumed for the potential use of vehicles heavier and larger than those in general use today.

The Reshaping Report showed that much of the traffic in this category which is carried by the railways at present is unprofitable. The main exceptions are traffic which is carried in trainload quantities and traffic moving between the larger private sidings. Major changes are required both in selection of the kinds of traffic to be catered for and in the nature of the services offered on the railway network, in order that effort may be concentrated on the long distance bulk traffic which they can carry efficiently and economically. They will then be able to take their share of the growth in this category of traffic, instead of carrying a declining volume in a market of growing potential.

Under the plan for regular timetabled container services (' liner ' trains) between the principal traffic centres, it is expected that much of the merchandise movement over the longer distances can be provided for at a cost significantly lower than that of road transport.

At present, some 70 million tons per annum of freight are carried by road in direct trunk hauls for distances over 100 miles, and about 46 million tons per annum are carried more than 150 miles. Only a part of this traffic can be regarded as suitable for movement by liner trains because:—

(*a*) Liner trains will have their greatest advantage only over the longer distances;

(*b*) Liner train services will be operated efficiently only between main centres where they will cater for heavy traffic flows;

(*c*) Certain commodities will require specialised road conveyance.

After taking these three factors into account, it is estimated that some 19 million tons per annum of the existing traffic will be transferred to liner train services, as they build up. Most of this will be traffic moving 150 miles or more, but particular circumstances will enable the railways to attract some traffic moving over somewhat shorter distances.

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Some of the existing rail traffic is also suitable for transfer to liner trains. This will be derived partly from wagon load traffic, but also from the bulking of goods sundries and parcels traffic. The volume of existing traffics suitable for transfer is estimated to be 7 million tons per annum.

Thus, if transport demand were to stay static at its present level, liner train traffic would be expected to grow to a total of about 26 million tons per annum. If, however, total traffic demand grows by 120% by 1984, it is expected that liner train services will take their full share of such growth and that they will then carry some 57 million tons per annum of traffic. The average length of haul for this traffic will be about 200 miles, and the total ton-mileage will be about 12 thousand million.

If the charges for trunk road use were increased for the larger freight vehicles generally, this would tend to augment the long term assessment of liner train potential and, under such circumstances, the 1984 liner train tonnage might reach 80 million. The significance of a change of this magnitude is not apparent at this stage of the report but it can with advantage be stated here that such an increase in train mileage would be absorbed within the spare route capacity provided by the route selection which is described subsequently.

Of the existing rail traffic in the broad category being considered here, about 6 million tons per annum are at present carried in train loads. Potential exists for expansion of this economic form of working, even at the present level of transport demand, and is being realised by increasing operation of company trains carrying chemicals, cement, car bodies, etc. By 1984, because of the combined effects of growth in total traffic and the trend towards concentration of production in larger units, it is estimated that the volume will reach 20 million tons per annum, or about 2,500 million ton-miles per annum.

The remaining wagon load traffic will diminish as suitable flows are converted to train load operation or are transferred to liner services or to road. So will the movement of goods sundries by the wagon load. A residue of profitable traffic will remain, however, composed mainly of freight moving between large private sidings.

The estimates for general merchandise traffic can be summarised as follows:—

TABLE 7

Estimate of Rail Merchandise Traffic

	1964 (Actual)		*Potential (without industrial growth)*		*1984*	
	Tons	*Ton-Miles*	*Tons*	*Ton-Miles*	*Tons*	*Ton-Miles*
	(*Millions*)		(*Millions*)		(*Millions*)	
Wagon Loads	34*	4,800	10	1,500	10	1,500
Train Loads	6	700	9	1,000	20	2,500
Freight Liner Services (including road potential)	—	—	26*	5,500	57†	12,000
Total	40	5,500	45	8,000	87	16,000

* Includes 4 million tons of Goods Sundries and Parcels.

† Includes 5 million tons of Goods Sundries and Parcels.

Total freight

The complete picture of the forecast 1984 trunk rail freight flows between the main centres is shown in Map 18. The flows between the main areas are given in matrix form in Appendix ' B ' and between the traffic centres in Appendix ' C '. Since we are dealing with trunk movement, the traffic shown is mainly confined to flows conveyed more than 100 miles, although some flows of raw materials conveyed for somewhat shorter distances have been included because they will obviously move over the trunk system. The total volume is estimated as 24,500 million ton-miles per annum, compared with 12,000 million ton-miles in 1964.

An assessment has also been made of road freight movement between main centres in 1984, and is portrayed in Map 19. This covers the traffic expected to be hauled over 100 miles, and the estimated total is 17,500 million ton-miles. Traffic moving over shorter distances has been omitted because it is unlikely to be of serious potential value to the railways.

The total volume of trunk movement by rail represents an increase to double the present level. That by road is approximately 60% greater than today. This may seem surprising, but it does not represent the overall position for road and rail traffic, because it is expected that there will be a predominant growth of road traffic over the shorter distances.

The trend of coastwise freight movement will, in the main, depend on the needs of the generating stations situated on or near the coast. Oil movement will increase, both to meet this particular requirement and to meet that part of the general expansion in oil consumption (details of which are given in Table 6) which is best provided for by coastal depots. Where firm plans are known, these have been taken into account, but there is still doubt, in certain instances, as to the extent to which particular generating stations will use coal, oil or nuclear power. Although a substantial volume of coastal coal movement will probably remain, there may be some decline because the flows to consumers, other than the power stations, will fall away. The carriage of other commodities, which at present amounts to some five million tons per annum, is likely to remain a relatively small factor.

Therefore, whilst there may be a substantial margin of error in an assessment of the future volume of freight carried by coastal shipping, the reaction of this uncertainty on rail transport will be relatively small and will certainly not be of sufficient magnitude to affect the conclusions in this report. This is because the uncertainty is about the type of fuel to be used by the generating stations rather than about the method of transport which will be used to convey the fuel.

Passenger traffic

It appears evident that, if the economy continues to grow, and particularly if the growth rate accelerates to the 4% envisaged, there will be an accompanying growth in passenger travel for both business and social purposes. What is less certain is the way in which this growing demand will be split between the various forms of public transport and private personal transport.

For the purpose of considering the effect of the future passenger traffic demand on the railway trunk system we have accepted the unavoidable conclusion that stopping services on trunk routes will decline. Most of them are grossly under-used and hopelessly uneconomic now, and are likely to become more so in future because of road improvement and further growth in car ownership. We have, therefore, restricted our consideration to intercity passenger movements.

Important local services will of course remain, particularly commuter services serving major centres, but these will require special consideration.

The present flows of passengers on scheduled rail, air, and coach services, between main centres are shown in Maps 10, 11 and 12. So far as the railways are concerned, the movement amounts to about 30 million passengers per annum, yielding gross revenue of about £60 million.

A substantial proportion of inter-city passenger traffic arises from business travel, and the industrial expansion described in preceding sections is expected to give rise to an increase in business travel which will be, proportionately, at least as great. Personal contact, personal investigation, and hence personal movement, seem to become even more necessary as the pace and complexity of business and industrial life increase. Therefore, even though the population increase will fall far short of the increase in industrial activity, the proportion of people employed in industrial jobs likely to necessitate travel will increase very considerably.

Growth in the standard of living and in leisure time will generate an increase in personal travel for social purposes which will greatly reinforce the increase which can be expected to arise directly from the 15% growth in the population likely to occur by 1984.

Although it is difficult to assess the total volume of inter-city passenger traffic likely to develop by 1984 with any great precision, it seems reasonable to assume that it will be at least twice as great as it is at present. At the same time, however, it has to be recognised that the railways' share of the total is likely to decline substantially.

For flows between major centres over 200 miles apart, air transport will retain its speed advantage and is likely to take an increasing proportion of the total traffic. This applies particularly to business traffic, which is relatively insensitive to price but much influenced by speed. Here, air competition is likely to be a more potent factor than the private car. Helicopter and vertical take-off and landing aircraft have been taken into account but are not likely to make any appreciable adjustment to the picture as far as can be seen. In both cases there are problems in providing terminals in conurbations.

The effect of air travel on the Anglo-Scottish rail services by day is already very pronounced, and is likely to increase, but the effect on sleeping car services is, and is likely to remain, far less marked.

Over distances below about 100 miles or so, private transport is the main competitor for both business and social passenger traffic, reinforced, in the case of social travel, by coach services. With improvements in roads and growth in car ownership, partially offset by urban road congestion, further erosion of the shorter distance inter-city traffic on rail is likely.

By 1984, three-quarters of all households are likely to own a car, and a minority will have two or more cars. Once the decision to purchase a car has been made, the marginal cost of operating it is fairly low, and it is likely that the cost of operating a car will decline, in real terms, in future. More-

over, a car owner's use of his car is not dominated by economic considerations, but by other real factors such as convenience and by more nebulous ones such as pride of possession. Therefore, despite an often expressed opinion to the contrary, the railways could not expect to retain a great part of this traffic by fare reductions. On the other hand, as a consequence of the economy becoming increasingly car-based, expansion can be expected in the conveyance of accompanied motor cars—whether by day or night services.

The role of the railways will be to concentrate upon the provision of bulk transport over routes of heavy demand, and over medium to long distances. By so doing, they will be able to provide a cheaper alternative to air, on certain longer routes, and provide a faster and more comfortable alternative to road over intermediate and long distances, while leaving shorter distances and cross country journeys to coaches and the private car, which these forms of transport are able to cover more economically. Only by so doing will it be possible for the railways to keep fares at an attractive competitive level, with an optional premium for a luxury standard of accommodation. The services will be frequent, will give a high standard of comfort, and will normally operate at point-to-point speeds of at least 70 miles per hour.

Having regard to all the foregoing considerations, it is estimated that the total volume of demand for inter-city travel on rail will fall slightly from its present level of 5,000 million passenger miles by 1984, but this total seems likely to be concentrated even more heavily into a few main flows. This will be seen from Maps 10 and 20, which show the 1964 and forecast 1984 flows of inter-city passenger traffic on rail.

V – Potential capacity

Assessments having been made of the probable future traffic load on the railways, the next main step was the study of the routes which can best be developed so that, when intensively loaded, they will provide the capacity required.

As a prelude, this section is devoted to a general discussion of the main factors which were taken into account in considering future capacity. It should be emphasised, however, that individual routes differ in important respects. For that reason the capacity estimates presented in this section give no more than a general indication of order of difference between the capacity of double and quadruple track routes under present conditions, and the capacity which they are expected to have under future conditions. In the actual process of route selection, however, route capacities were considered individually.

It is obvious that the capacity of a route in terms of payload carried depends upon:—

(i) the closeness with which trains can be spaced along the route;

(ii) the average speed at which trains move over the route;

(iii) the capacity of the trains;

(iv) the loading of the trains achievable with the type of traffic carried over the route.

The closeness with which trains can be spaced along a route and the average speed at which they move depend upon:—

(*a*) the type of signalling provided;

(*b*) the performance of tractive units;

(*c*) the design of rolling stock—with particular regard to running speeds and braking characteristics;

(*d*) the permanent way—in so far as it affects permitted speeds and the time required for track maintenance;

(*e*) the mix of train speeds, and the effect of train stops;

(*f*) the terminal capacity.

The type of signalling provided is of major importance. Most of the existing routes shown on Map 1 are mechanically signalled and are controlled manually from a large number of signal boxes. These boxes have been sited, in the past, in proximity to stations or level crossings. In consequence they are unevenly spaced and the effect on line capacity has been

determined by a ruling section, i.e. the longest time taken to run between controlling signals.

The aim of modern signalling is to sub-divide a route into portions in such a way that the time taken to pass through each portion is about the same. In this way, the problem of a ruling section which stems from the historical location of signal boxes and governs so much of our present line capacity can be eliminated. Moreover, to realise the full advance in route capacity which can be gained from improved traction and braking, the spacing of the signals must be adjusted to the speed and braking characteristics of the trains which the route carries. Thus, if signalling and rolling stock are modernised in harmony, the effect on route capacity is very substantial. Even so, the potential capacity can only be realised if the train speeds are either high and uniform, or, at next best, if the operating pattern is such that trains in a limited number of speed bands can be grouped into 'flights'.

A random mixing of trains of different speeds creates a situation in which large gaps must be left between fast and slow trains, with a consequent loss in line use. Thus, for example, the number of trains which can pass over a simple up and down line will be less if alternate trains run at 80 and 40 miles per hour than if all of them run at 40 miles per hour. A rationalisation of the speed bands of trains can, therefore, be expected to contribute substantially to the realisation of route potential.

The present and planned future distribution of trains in speed bands are indicated by Tables 8 and 9.

TABLE 8

Average Speed of Trains of Various Types

	Average Speed	
	1964	*1984*
Passenger services on trunk routes	30–60	50 or 70
General Merchandise	20–40	50
Oil	20–30	50
Coal	15–30	35
Iron and Steel—Raw Materials	20–30	35

TABLE 9

Distribution of Total Trains over Speed Bands for Trunk Routes in General

1964		*1984*	
Average Speed	*% of Total Trains*	*Average Speed*	*% of Total Trains*
60	8	70	15
50	19		
40	29	50	70
30	33		
20 or less	11	35	15

It would be wrong to imagine that the average mix of speeds is one which applies on all routes or even that the mix will remain constant over the whole of the day and night on one route. On certain routes, train frequency is likely to be increased during the night hours by the fact that the line will be used only by liner services and sleeping car trains running at similar speeds, or, conversely, the frequency may be reduced as a result of peak demands to run trains of unequal speeds at given times. On some routes it is envisaged that freight only will be moved—and then all at one speed—a feature which means a big increase in potential line capacity above the average.

In practice, too, the working capacity of particular routes is affected by joining or splitting of routes, the nature of the allowances which have to be made for contingencies arising from failure and delay, and the provisions which have to be made for maintenance of the track and signalling, any of which may be peculiar to the route. The scheduling of trains to achieve the best pattern of operation is therefore complex. So much so that plans are well advanced for using computers for this purpose, and this also will contribute towards the greater realisation of potential capacity.

As shown in Table 3, the present average loading of two track trunk routes is only some 2·5 million passenger/ton miles per annum, which, with present levels of train loading, represents about 40 trains per day in each direction—only one train every 36 minutes—whereas the capacity of such routes today lies between 70 and 100 trains per day on each track.

The workable capacity of a modernised two track route, with the pattern of traffic and operation envisaged for the future, is calculated to range from 140 trains per day in each direction up to 200 in favourable circumstances. On four track routes, higher frequencies per track are more easily attainable because additional running lines facilitate the segregation of trains in

different speed bands, and one pair of tracks at least can be used for a single speed band. On four track routes, therefore, the operation of 350 or more trains per day in each direction can safely be allowed for.

Apart from train spacing and the average speed of the whole group of trains using a route, the other factor influencing effective route capacity is train loading.

At present, most train sizes and payloads are small. This is attributable to a multiplicity of causes, most of which are historical but which need not affect the railway of the future.

Tractive power will not be a serious limiting factor, and track improvement and modern rolling stock will permit the operation of much larger trains over the trunk routes. Indeed, a few trains very much larger than the average are operating already.

Apart from the physical ability to run large trains, changes in the future traffic pattern and in the concentration upon services catering for the bulk flows of both freight and passenger traffic will also facilitate better loading of larger trains.

Table 10 shows in terms of passengers (p) and tons (t) the present and expected future loading of trains of various types:—

TABLE 10

Type of Service	*Payload*	
	1964	*1984*
Inter-city passenger	150 p	250 p
Stopping services on trunk routes	60 p	—
General Merchandise	100 t	400 t
Coal	500 t	1,000 t
Iron & Steel—Raw Materials	600 t	1,000 t
Oil	450 t	1,000 t

All the foregoing general considerations affecting capacity were taken into account in making a selection of individual routes, and account was taken of the particular characteristics of each of them.

VI – Selection of trunk routes

As a prelude to the selection of trunk routes to carry the expected traffic flows, the flows of various forms of traffic were converted into trainloads, so as to establish the rail route capacity necessary to handle them. This information is shown in matrix form in Appendix ' D ', which gives particulars of the daily number of trunk trainloads likely to require movement between the traffic centres.

The forecast demand for route capacity was then considered in relation to the potential capacity of the existing through routes, shown in Map 1, in order that the routes which could best provide the required capacity might be chosen. For this purpose, it was necessary to consider the individual characteristics and physical condition of routes in detail, particularly where a choice between alternatives had to be made.

The process of selection involved consideration of the following factors:—

(i) the extent to which existing routes coincide with the principal traffic flows of the future,

(ii) the comparison of the workable capacity of the alternative routes with the number and type of trains expected to arise from the future area to area flows,

(iii) the service of important intermediate centres,

(iv) recent expenditure on route modernisation, such as track improvement, electrification and resignalling projects,

(v) the necessity for large items of future expenditure on trunk routes,

(vi) physical characteristics of the routes: the incidence of bridges, tunnels, viaducts, of ruling gradients, and features likely to restrict speeds permanently,

(vii) ' network ' considerations: the way in which routes selected fit into the future railway trunk network,

(viii) the extent to which changes in the trunk system may result in greater lengths of haul.

The table of area to area flows of trainloads (Appendix ' D ') shows that substantial movements are expected to occur between London and Scotland, London and Manchester/Liverpool, London and Birmingham, as well as movements between the Manchester/Liverpool area and Scotland. The demand for trunk trainload movement amounts to about 240 trains per day in each direction at the southern end near London, decreasing to about 130 trains on the section north of the border.

As will be seen from Map 2, a number of possible routes exist. In the case of traffic from London to Glasgow, three through routes are available:—

(*a*) the East Coast route passing through Peterborough, York, Newcastle and Berwick,

(*b*) the Midland route passing through Leicester, Leeds and Carlisle,

(*c*) the West Coast route passing through (or close to) Birmingham, Liverpool/Manchester, Preston and Carlisle.

For traffic between London and Manchester/Liverpool three possible through routes are available:—

(*a*) the Great Central route passing through Leicester, Nottingham and Sheffield,

(*b*) the West Coast route passing through Rugby and Crewe,

(*c*) the Midland route passing through Leicester, Derby and the Peak Forest line.

Traffic between London and Birmingham has the choice of two existing trunk routes, namely:—

(*a*) the former Great Western route via High Wycombe and Banbury,

(*b*) the West Coast route as far as Rugby, then branching to Birmingham, Wolverhampton and serving the West Midlands area.

In considering the above groups of ' trainload flows ' it was clearly sensible to select the West Coast route as it is able to fulfil the needs of the trunk flows between all the centres discussed. It is also able to cater for the needs of flows from the Manchester/Liverpool area and Scotland. This route connects the five largest cities of the country, London, Birmingham, Liverpool, Manchester and Glasgow, and also gives access to ' the Potteries ', the West Midlands, and Lancashire. The southern section of this route (hereinafter referred to as the West Coast route) is in the process of being electrified between London and Manchester/Liverpool, and will soon be at a point of high operating efficiency. It is sensible, therefore, to select this route as it offers such good scope for the concentration of through traffic over it.

Another flow of traffic which stands out is that passing from London, through the main areas, East Midlands and South Yorkshire, on to the Tyne and Tees area. The daily number of trunk train movements expected will be in excess of 100 at the southern end, with rather less north of York.

In this case Map 2 demonstrates that a choice of four existing routes are available. The routes are:—

(*a*) the East Coast route described above,

(*b*) the line which passes through Cambridge, March, Spalding and Lincoln, joining the East Coast route at Doncaster,

(*c*) the Midland line passing through Leicester and Nottingham,

(*d*) the Great Central line described earlier.

The route selected to cater for the traffic flows in this group is the East Coast route. It serves Sheffield and the West Riding, as well as providing direct through links with the important industrial areas of Tees-side and Tyneside. Also, connecting links exist between this trunk route and Nottingham (via Grantham), the steel producing area of North Lincolnshire, and the Humber ports. It is a fast route with opportunity for a profitable passenger business in the middle-distance range. Scope exists for channelling on to this route freight traffic now passing to the South via the Doncaster—Cambridge—London line, and some from the Midland route. It is needed to serve as a route between London and Newcastle, whilst connecting many of the traffic centres not served by the West Coast route. The data of area to area movement of trainloads of traffic indicate that the route would be less heavily used North of Newcastle, and that through movements to and from Scotland could be provided for by development of the Newcastle—Carlisle line.

The matrix of area to area flows in trunk trainloads (Appendix ' D ') shows substantial future movements between Leeds, Sheffield, Nottingham, Leicester and London. Between Sheffield and Chesterfield the route is expected to carry some 130 trunk trains daily each way. The number of services continuing South from Chesterfield towards Leicester will be of the order of 80 trunk trains per day each way.

These centres represent the heavy industrial belt in the centre of the country, and routes available to cater for this traffic are:—

(*a*) the Midland route passing through Sheffield, Nottingham and Leicester,

(*b*) the Great Central route from Sheffield through Nottingham and Leicester.

The route best equipped to meet the demands is the Midland route, and it is selected as a route for development between Sheffield and Leicester. At the Northern end, the route selected between Leeds and Sheffield is that from Leeds to Moorthorpe and thence from Moorthorpe via the

'Swinton and Knottingley' route into Sheffield. The first part of this route is selected, in any event, as a link between the West Riding and the East Coast route. At the Southern end, the centre section of the Midland route selected for development is connected to the West Coast electrified route at Nuneaton, with the object of achieving a concentration of the available trunk trainloads on that route.

Trunk trainload movement between the London area and the traffic centres in South Wales and the South West is expected to give rise to some 80 trunk trains per day each way.

A number of routes is available to cater for this demand:—

(*a*) the route via Reading and Swindon dividing at Wootton Bassett to serve:—

(i) South Wales via the Severn Tunnel,

(ii) Bristol via Bath,

(*b*) the route passing through Reading, Newbury and Westbury to Taunton and Exeter,

(*c*) the route passing through Basingstoke, Salisbury and Yeovil to Exeter.

The anticipated demand, plus consideration of intermediate centres located on each of the routes described, points to the need to select one route for development. The route via Reading, capable of serving South Wales and the South West (via Bristol and Taunton) provides the best means by which the principal traffic flows can be concentrated whilst, at the same time, connecting all the main centres involved.

The table of area to area movement of trainloads indicates the need to select a route for development which joins the North East and the South West of the country. This movement reaches a peak of about 130 trunk trainload movements per day in the section between Derby and Birmingham.

As illustrated on Maps 1 and 2, a number of possible routes exist. These are:—

(*a*) the route passing through Leeds, Sheffield, Derby, Burton, Birmingham and Gloucester, at which point diverging lines continue into South Wales and to the West Country via Bristol and Exeter,

(*b*) the route passing from Leeds via Manchester and thence South via Crewe, Shrewsbury, Hereford and Pontypool Road into South Wales,

(*c*) the alternative route between Birmingham and Gloucester which passes through Stratford-on-Avon and Honeybourne, joining route (*a*) again at Gloucester.

Route (*a*) is selected in this case. Between Leeds and Chesterfield it is common with the route between Leeds and Leicester described above, and already selected. By its selection the industrial centres in the North East and the West Riding are joined with the Black Country, South Wales, and the South West, in the most direct fashion. All the principal centres of population and industry on the N.E.-S.W. axis of the country are thus served by one route. At different stages, good possibilities exist for the concentration of through traffic flows at present passing on other routes. For example between the South West and Birmingham, the through movement over the routes:—

(*a*) via Barnt Green

(*b*) via Honeybourne

(*c*) via Worcester and Hereford

can be concentrated with advantage on the route selected. Technical improvements, in power, rolling stock and signalling, combine to reduce the restrictive effect of the Lickey incline south of Birmingham, which today inhibits the loading of the route.

The forecast of train movements from East to West across the industrial middle of the country reveals how substantial these movements are expected to be—amounting to some 160 trunk trainloads daily.

Five main routes cross the Central Pennines today:—

(*a*) from Leeds to Manchester via Hebden Bridge,

(*b*) from Leeds to Manchester via Diggle,

(*c*) from Sheffield to Manchester via Woodhead,

(*d*) from Sheffield to Manchester via the Hope Valley,

(*e*) from Derby to Manchester via Peak Forest.

The demand for trunk trainload movement each way is expected to be approximately equal to the future workable capacity of one trans-Pennine route. Nevertheless, because of the shortness of the trunk haul relative to the size of the catchment areas at each end, adoption of one route only would necessitate considerable extra train mileage. For that reason it is prudent to select two routes for long term development.

The routes selected are:—

(*a*) the electrified route between Sheffield and Manchester, passing through Penistone and Woodhead, over which dense flows of freight can be achieved by diverting traffic from alternative routes and by reducing the number of speed bands in which trains operate over it. The route is well sited to cater for most of the flows from the Yorkshire and East Midlands coalfields into Lancashire. The route also gives a good connection to the Liverpool area;

(*b*) the route via Hebden Bridge passing through Bradford, Halifax, Sowerby Bridge and Rochdale, is able to carry the flows from the east side of the Pennines to the North Manchester area and Lancashire, and also provide a through link between the West Riding and the main Anglo-Scottish West Coast route at Preston.

The data of area to area flows indicate the need for through trunk routes between the Humber and the Mersey. At the eastern end, scope exists for concentrating flows between the centres of South Yorkshire and the Humber, viz. traffic flowing east to Hull, Immingham and North Lincolnshire. At the western end, through flows between Manchester and Liverpool call for the selection of one or two routes on which trunk traffic might be concentrated instead of perpetuating the five through trunk routes which exist today. In this, as in all cases, it is necessary to consider the way in which the selected routes fit into the trunk system as a whole. It will be seen (from Map 21) that the trans-Pennine routes selected for development are entirely compatible with the provision of throughout Humber-Mersey trunk routes.

Development in the Hampshire area, the expansion of the port of Southampton, and oil refining developments on the Solent, require the selection of a direct route to the Midlands. The route selected follows the line to Basingstoke, thence via Reading and Didcot to Birmingham. The northern part of this route will form part of the link between the Channel Tunnel Terminal and the Midlands, which will be used to by-pass the London area.

The selection of the West Coast line as the main Anglo-Scottish route permits Glasgow, Perth, Stirling, Edinburgh, Dundee and Aberdeen to be served by one route, thus permitting the maximum concentration of Scottish traffic from the south.

Within Scotland, there is a clear need for one route to be developed between Edinburgh and Glasgow. The route via Falkirk and Polmont is selected for development and will permit the concentration of through traffic now passing over three routes.

The foregoing paragraphs have outlined briefly the main cases in which selection had to be made between alternatives. In Appendix 'A', to exemplify the nature of the processes of choice which were followed in all cases, three areas are dealt with in greater detail. The areas are:—

(i) trans-Pennine routes,

(ii) routes between Manchester and Liverpool,

(iii) routes between Birmingham and the South West.

The object of this appendix is to give an indication of the detailed work undertaken during the process of selection and to illustrate the depth of the survey. From the broad description above it will be gathered that some of the selections were simpler to make than others and involved less background work. Nevertheless, in each case, the investigations were carried to a depth sufficient to establish the conclusions beyond reasonable doubt.

The result of the survey was the selection of some 3,000 route miles. The routes are shown on Map 21, and, when developed, they will be capable of handling the freight and passenger traffic flows between main centres forecast for 1984, with a margin of spare capacity which varies from route to route but which is, in no case, less than 25% of the capacity provided. It is of interest to note that the estimated overall effect of cutting out duplicate routes would be to increase total trunk train mileage by only about 3%.

The conclusion with regard to the adequacy of the capacity provided was established, as mentioned above, by assessing the train movements necessary to carry the 1984 flows of various forms of traffic, and then comparing the total train movement requirements to cover each combined flow, with the assessed capacity of the route selected. In the process of assessment, the general factors referred to in a previous section of the report were considered in relation to the individual characteristics of the particular route. The forecast trunk train flow densities over the selected routes in 1984 is shown on Map 22.

The route selections which comprise the trunk network have been made with particular regard to the flows of imports and exports between inland industrial centres and the ports. The provisions made for trunk connections to the Channel Tunnel development, the Port of London, the Mersey ports, the Humber ports, the South Wales ports, the North East ports, as well as to the docks at Southampton and the Scottish ports, are made evident by Map 21.

Checks were also made to confirm that the selected routes gave a good network of connection between such features as:—

(i) main centres of population,

(ii) large collieries,

(iii) principal iron and steel works,

(iv) electricity generating stations,

(v) oil refining/distributing centres.

The close agreement between the selected network of trunk routes and the particular features mentioned is shown pictorially in Maps 23 to 27.

VII – Conclusion

There is no doubt that, on the assumptions outlined in the report, an expanding market exists for both freight and passenger transport. Nevertheless, the volume of railway traffic has been declining, and it follows that the railway share of the total traffic has been falling even faster. The railways must reshape, and redeploy their assets and service, so as to concentrate on cheap bulk movement, if the decline is to be arrested and reversed. The railways will then play their full part in helping forward the pace of industrial growth itself.

A prime requirement is that the cost of providing the railway track and signalling per unit of traffic passing over it should be reduced to a level which enables services to be provided on a competitive basis. Opportunity exists, specifically, for expansion of the railway carryings of merchandise, oil, and iron and steel, but only if the services are provided in an efficient manner and at a competitive price.

If such changes are made, the railways could increase their carryings of freight, and, even allowing for some decline in the passenger traffic at the shorter distances, **the overall demand for rail transport over the trunk routes could show an appreciable increase in the next twenty years.**

The present network of through routes is under-utilised and, if the railways take advantage of technological progress in signalling and movement, then the disparity between capacity and use will become greater. **It is demonstrably practicable to channel the through movement over a reduced network of lines amounting to some 3,000 route miles rather than the 7,500 miles provided today.**

The overall effect of these changes would be to reduce route costs over the trunk routes, on the basis used in Table 4, to about one-half of their present level. As important, however, is the effect of concentration of through movement on other costs. None of the route costs discussed in the report includes the costs of associated sidings, yards, stations and depots, but greater utilisation will reduce the unit cost of providing and maintaining these assets also. The utilisation of locomotives, train crews, and other staff and equipment will also be substantially improved by working a simplified and intensively used system.

Thus, if the railways concentrate on cheap bulk movement, their prospects as trunk carriers can be revived. The danger is that failure to change, to modernise, and to concentrate, will cause the present decline to continue. **The real choice is between an excessive and increasingly uneconomic system, with a corresponding tendency for the railways**

as a whole to fall into disrepute and decay, or the selective development and intensive utilisation of a more limited trunk route system.

It must be remembered that the survey looked ahead twenty years and that the process of reaching the situation described above is bound to progress by a number of stages. The present report, as a basis for future investment, will have to be reassessed from time to time. The effect on the future extent of the trunk route system will be gradual. As has already been said, this report is not a prelude to closures on a grand scale: it is, rather, a basis for more definitive, stepwise planning of route rationalisation.

The economic and demographic forecasts required for so long term a traffic forecast must be recognised to be subject to wide margins of error. The same applies, in a scarcely lesser degree, to the forecast of technological change in the transport field, on which the future balance of competitive power will depend. Other circumstances, too, over which the railways have no control, for example, freedom of use, cost of use, and availability of roads, may change, and, in changing, alter the market for rail transport.

A system too neatly tailored to the estimated future traffic level might well prove inadequate to carry a substantial part of the profitable traffic on offer. A measure of surplus capacity must therefore be provided for and is, indeed, to some extent inevitable, since traffic potential does not everywhere fit neatly the capacity which can be provided by a railway. In the case of the system indicated this surplus capacity amounts to about one-third.

Other considerations

The relationship between the trunk network and the commuter networks must be established. The largest parts of the London commuter network, on the South and East sides of London, are more or less isolated from the trunk network, but there are other cases, such as the North and West sides of London and, to a less extent, the provincial centres, where future commuter requirements must be provided for when considering line capacity and passenger terminals.

A further factor will be the Channel Tunnel. The trunk system has been designed to accommodate Channel Tunnel traffic, so far as it can be foreseen at present, but this must be re-examined as the Tunnel comes nearer to reality and its traffic patterns can be more clearly foreseen.

This study provides a basis for positive planning. Once the lines most likely to form the trunk rail network during the next twenty years have been determined, the railways will be better able to develop routes, operating methods, and services, to cater for the main traffic flows of the

country at economic prices. **It will also be possible to concentrate railway investment upon the selected trunk routes in the confidence that, on this railway of the future, the essential dense flows of traffic will be maintained.**

For the sake of clarity, it is emphasised that non-selection of lines for intensive development does not necessarily mean that they will be abandoned in the foreseeable future, nor even that money will not be spent upon some of them to improve their suitability for their continuing purpose. It is emphasised that the developed trunk lines will be supported by several thousand miles of freight feeder lines, and that clarification of the position with regard to trunk route development will facilitate decisions about the feeder network. It is also emphasised that the provision of capacity for commuter traffics into the main urban areas is the subject of separate consideration.

Furthermore, it can be seen from the following table that the estimates in this report envisage a substantial increase in trunk railway traffic.

TABLE 11 – RAILWAY TRUNK TRAFFIC
Comparison between 1964 and 1984 Estimate

	1964			1984		
	Tons/ Passengers	*Tons/ Passenger Miles*	*Equivalent Train Miles*	*Tons/ Passengers*	*Tons/ Passenger Miles*	*Equivalent Train Miles*
	Million per Annum		*Per Day*	*Million per Annum*		*Per Day*
Coal	45	4,500	50,000	45	3,500	25,000
Iron and Steel	25	2,500	45,000	30	4,000	40,000
Oil	5	500	5,000	15	2,000	15,000
Other Freight, including General Merchandise	25	4,500	150,000	75	15,000	180,000
Total Freight	100	12,000	250,000	165	24,500	260,000
Passengers	30	5,000	100,000	25	4,500	50,000

VIII – Summary of points

(1) *Through Route System 1964*

About 7,500 route miles.	Map 1, Table 1
One-third single routes, two-thirds duplicated routes.	Map 2, Table 2
Utilisation is low.	Table 3
Route cost per unit of traffic is high and must be substantially reduced for rail to play its part in economic growth.	Table 4

(2) *Railway Freight Traffic 1964*

TABLE 12

	Through Million Ton-Miles per annum	*Local Million Ton-Miles per annum*	*Reference*
Coal	4,500	3,000	Map 4
Iron & Steel	2,500	800	Map 5
Oil	500	200	Map 6
Other	4,500	1,000	Map 7
TOTAL	12,000	5,000	Map 8

(3) *Road Freight Traffic 1964*

On direct trunk hauls over 100 miles amounts to 70 million tons, 11,000 million ton-miles.	Map 9

(4) *Passenger Traffic 1964*

Rail journeys between the main areas total 5,000 million passenger miles.	Map 10
Principal flows of air and road coach traffic are shown.	Maps 11, 12

(5) *Principal Assumptions about 1984* — Tables 5, 6

Population up 15%.

Economic Growth Rate 4% compound.

No major redistribution of population.

Some change in the commodity pattern of industrial production but the geographical distribution of major industrial activity will remain the same and growth will be uniform.

(6) *Railway Traffic 1984*

Coal — Map 13

No increase in total production.

Higher proportion produced in East Midlands and South Yorkshire.

More consumption for electricity generation—remaining users, apart from iron and steel, decline.

Demand for trunk rail transport down 25%.

Iron and Steel — Map 14

Production up to 40 million tons.

No substantial change in production areas.

More integrated works.

Trunk rail carryings up 60%.

Oil — Map 15

Large increase in potential.

Pipe-line competition.

Trainload operating by rail.

Trunk rail carryings up 200%.

Other Freight — Maps 16, 17

Industrial production up 150%, transport demand up 120%. — Table 7

Development of liner trains.

Rail switch to long-distance bulk movement.

Trunk rail carryings up 200%.

TABLE 13

Summary of Rail Freight 1984

	Through	*Local*
	Million Ton-Miles per annum	*Million Ton-Miles per annum*
Coal	3,500	2,000
Iron & Steel	3,000*	500
Oil	2,000	200
Liner Services	12,000	—
Other	4,000	300
TOTAL	24,500	3,000

Map 18

* Excludes traffic carried on liner services

(7) *Road Freight Traffic 1984* Map 19

Flows between main centres shown.
115 million tons, 17,500 million ton-miles.

(8) *Passenger Traffic 1984* Map 20

Increase in total demand for passenger transport.

Competition from air (longer distances) and private car.

Slight fall in level of inter-city passenger traffic on rail, but concentrated more heavily upon fewer routes.

(9) *Potential Capacity of Through Route System*

Taking into account future improvements in the technological and operating fields the potential capacity of the existing through route system is greatly in excess of the likely level of demand for rail transport.

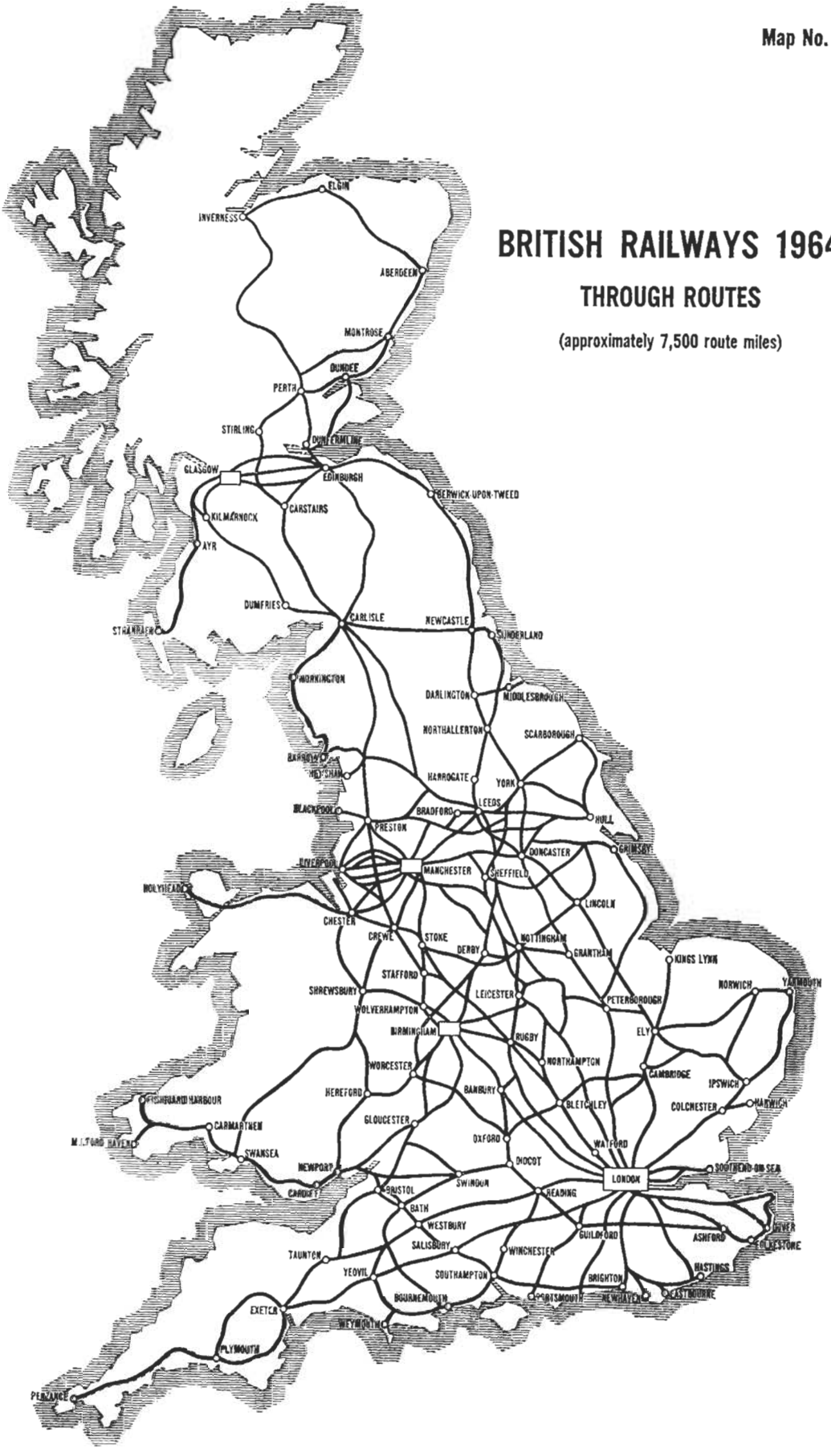
(10) *Selection of Routes*

Selection of the routes most suitable for development leads to network of 3,000 route miles over which through movement could be channelled.	Map 21
Demand for train movement on the through routes shown for 1984.	Map 22 Appendix 'D'
Checks are made against density of population and principal industrial features.	Maps 23 to 27
At no point will there be less than 25% spare capacity in relation to the forecast traffic demand.	

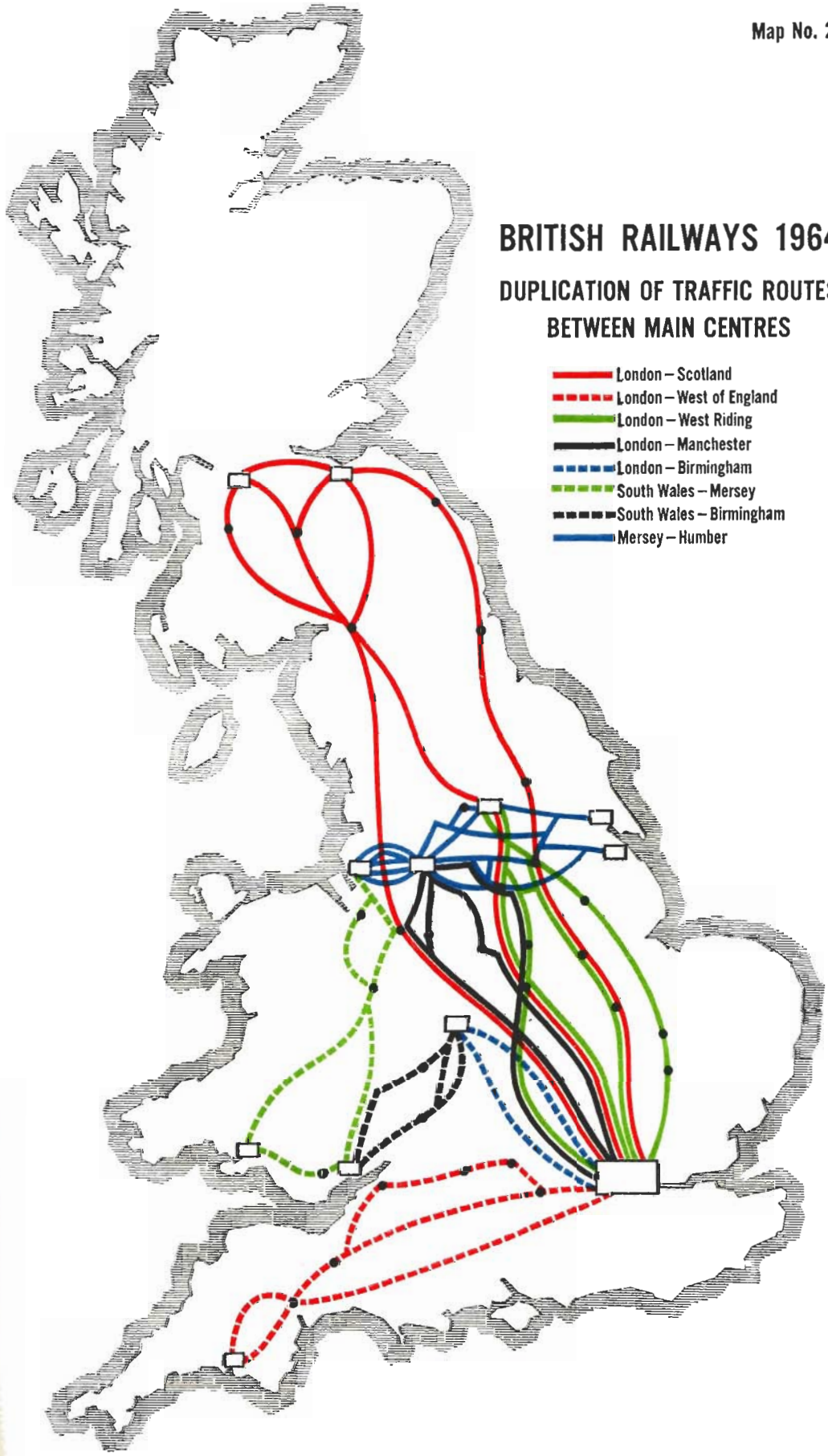
IX – Maps

			No.
1964	Through Routes		1
	Duplication of Traffic Routes Between Main Centres		2
	Key to Traffic Centres and Main Areas (1964 & 1984)		3
	Railway Traffic Flows	Coal	4
		Iron & Steel	5
		Oil	6
		Other Freight	7
		Total Freight	8
	Road Traffic Flows	Total Freight	9
	Railway Traffic Flows	Passenger	10
	Air Traffic Flows	Passenger	11
	Road Coach Traffic	Passenger	12
1984	Railway Traffic Flows	Coal	13
		Iron & Steel	14
		Oil	15
		Merchandise by Liner Service	16
		Other Freight	17
		Total Freight	18
	Road Traffic Flows	Total Freight	19
	Railway Traffic Flows	Passenger	20
	Routes Selected for Development		21
	Through Trains Between Main Centres		22
	Density of Population		23
	Location of Principal Coal Producing Areas		24
	Location of Principal Electricity Generating Stations (Coal Burning)		25
	Location of Principal Iron and Steel Works		26
	Location of Oil Refineries and Population Areas		27

Map No. 1


BRITISH RAILWAYS 1964
THROUGH ROUTES
(approximately 7,500 route miles)
ELGIN
INVERNESS
ABERDEEN
MONTROSE
DUNDEE
PERTH
STIRLING
DUNFERMLINE
GLASGOW
EDINBURGH
BERWICK-UPON-TWEED
KILMARNOCK
CARSTAIRS
AYR
DUMFRIES
CARLISLE
NEWCASTLE
SUNDERLAND
STRANRAER
WORKINGTON
DARLINGTON
MIDDLESBROUGH
NORTHALLERTON
SCARBOROUGH
BARROW
HARROGATE
YORK
LEEDS
BLACKPOOL
BRADFORD
HULL
PRESTON
DONCASTER
GRIMSBY
LIVERPOOL
MANCHESTER
SHEFFIELD
HOLYHEAD
LINCOLN
CHESTER
CREWE
STOKE
DERBY
NOTTINGHAM
GRANTHAM
KINGS LYNN
STAFFORD
NORWICH
YARMOUTH
SHREWSBURY
LEICESTER
PETERBOROUGH
WOLVERHAMPTON
BIRMINGHAM
RUGBY
ELY
NORTHAMPTON
WORCESTER
CAMBRIDGE
IPSWICH
HEREFORD
BANBURY
BLETCHLEY
COLCHESTER
HARWICH
FISHGUARD HARBOUR
CARMARTHEN
GLOUCESTER
OXFORD
WATFORD
MILFORD HAVEN
SWANSEA
DIDCOT
SOUTHEND-ON-SEA
NEWPORT
SWINDON
LONDON
CARDIFF
BRISTOL
READING
BATH
WESTBURY
GUILDFORD
ASHFORD
SALISBURY
WINCHESTER
TAUNTON
YEOVIL
SOUTHAMPTON
BRIGHTON
HASTINGS
BOURNEMOUTH
PORTSMOUTH
NEWHAVEN
EASTBOURNE
EXETER
WEYMOUTH
PLYMOUTH
PENZANCE

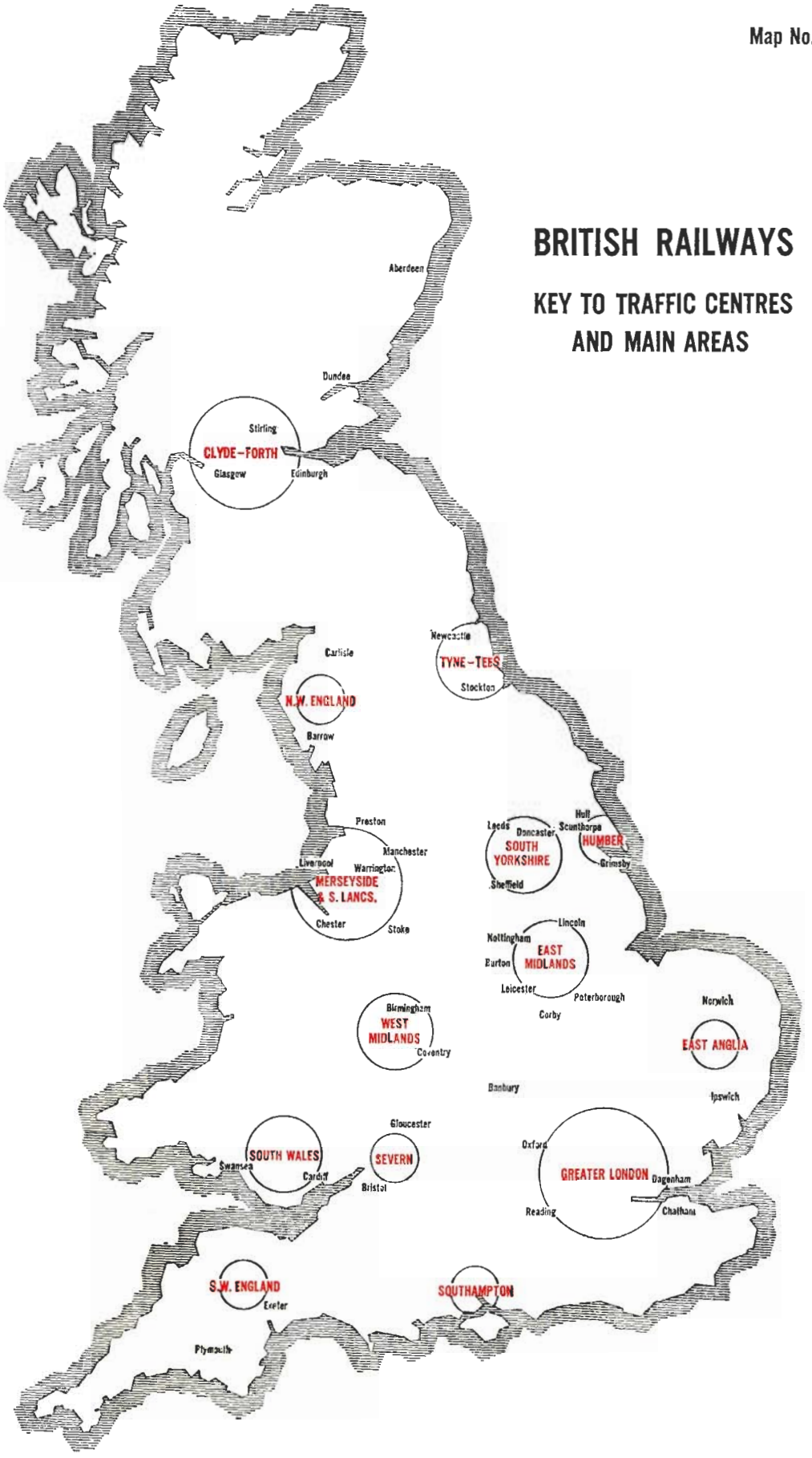
Map No. 2


BRITISH RAILWAYS 1964
DUPLICATION OF TRAFFIC ROUTES
BETWEEN MAIN CENTRES
London – Scotland
London – West of England
London – West Riding
London – Manchester
London – Birmingham
South Wales – Mersey
South Wales – Birmingham
Mersey – Humber

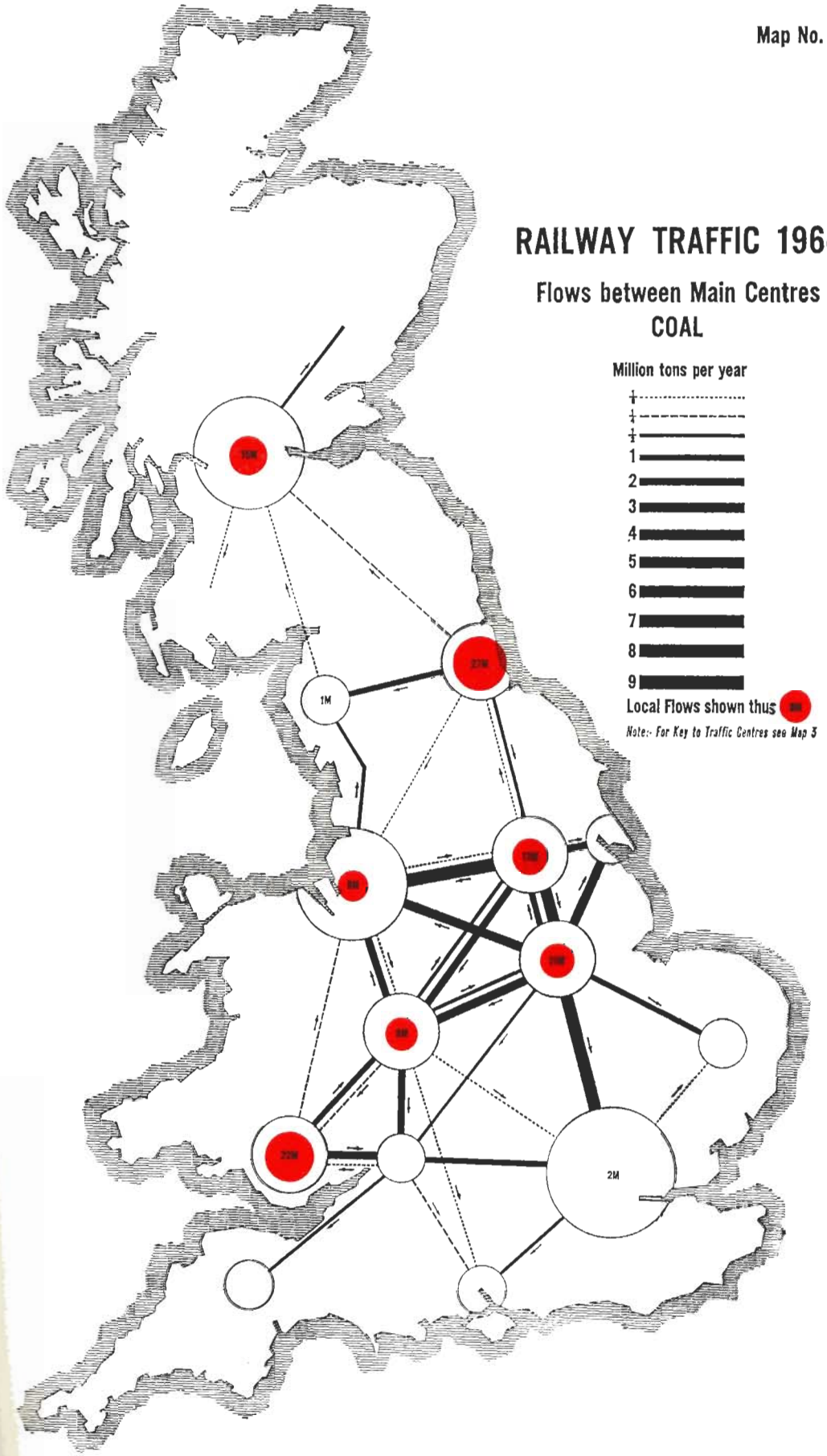
Map No. 3

BRITISH RAILWAYS

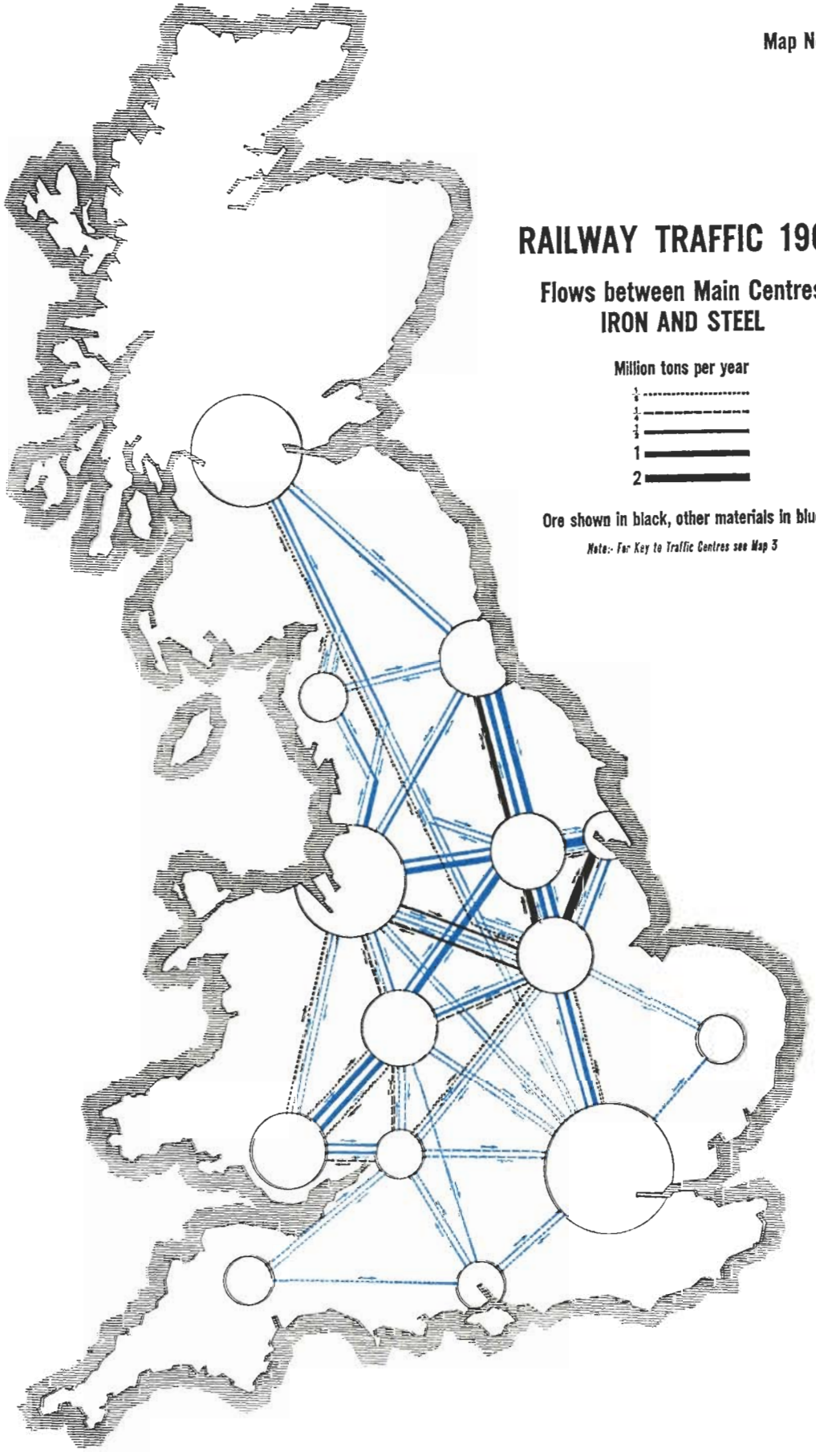
KEY TO TRAFFIC CENTRES AND MAIN AREAS



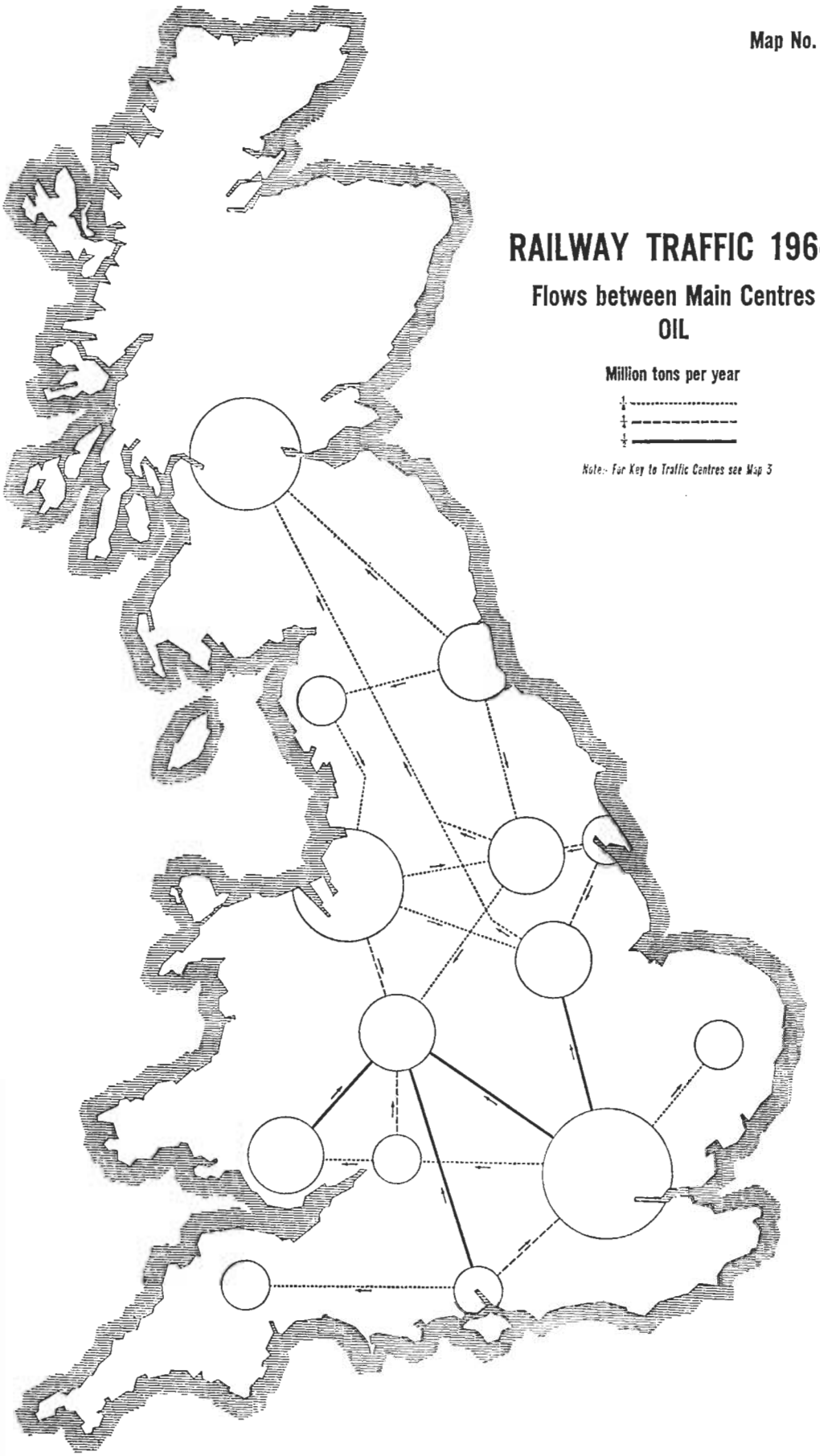
Map No. 4


RAILWAY TRAFFIC 1964
Flows between Main Centres
COAL
Million tons per year
1
2
3
4
5
6
7
8
9
Local Flows shown thus
Note:- For Key to Traffic Centres see Map 3
1M
2M

Map No. 5


RAILWAY TRAFFIC 1964
Flows between Main Centres
IRON AND STEEL
Million tons per year
1
2
Ore shown in black, other materials in blue
Note:- For Key to Traffic Centres see Map 3

Map No. 6



RAILWAY TRAFFIC 1964

Flows between Main Centres

OIL

Million tons per year

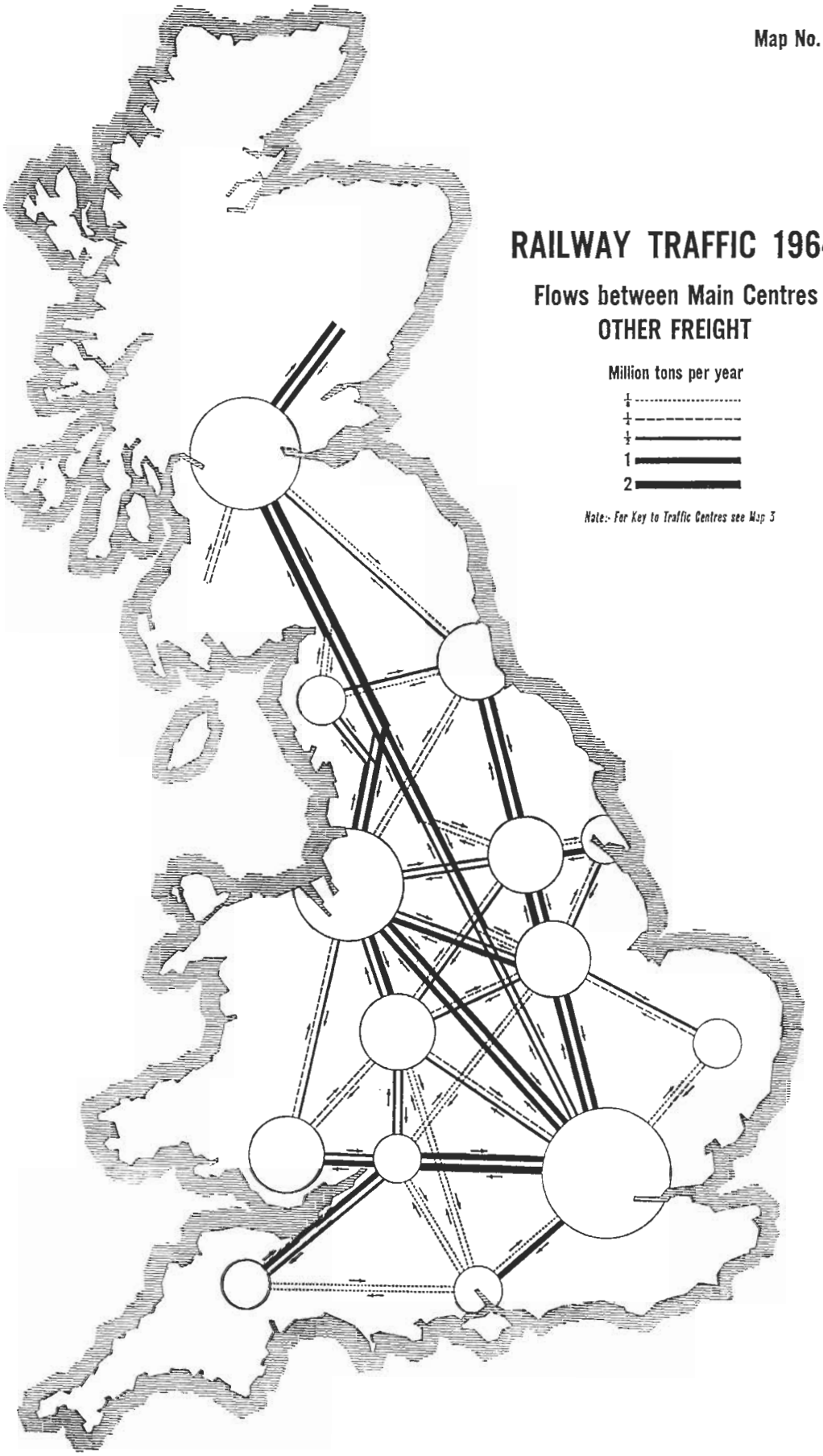
¼ .....

¼ – – – – –

½ ———

Note:- For Key to Traffic Centres see Map 3

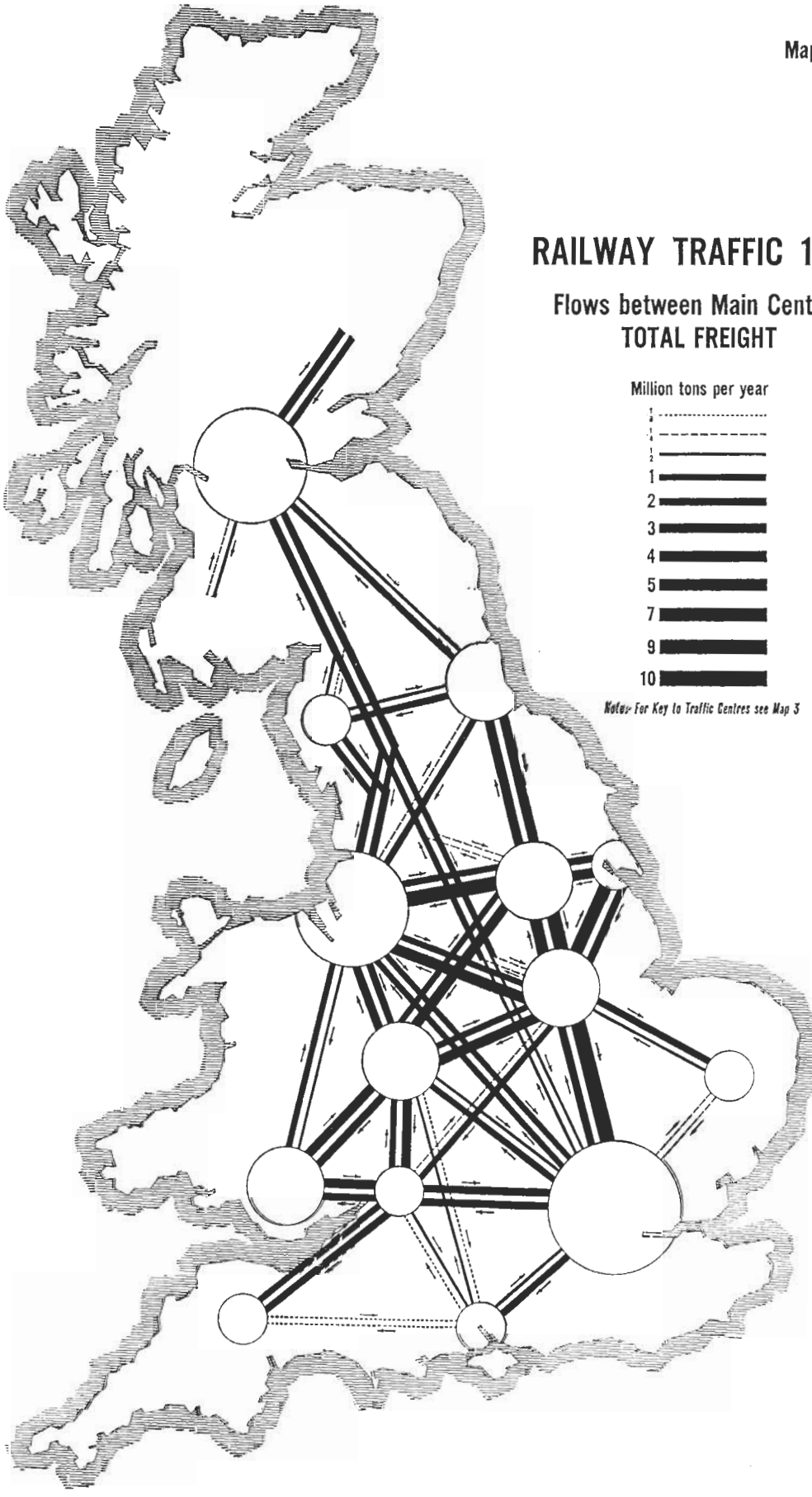
Map No. 7

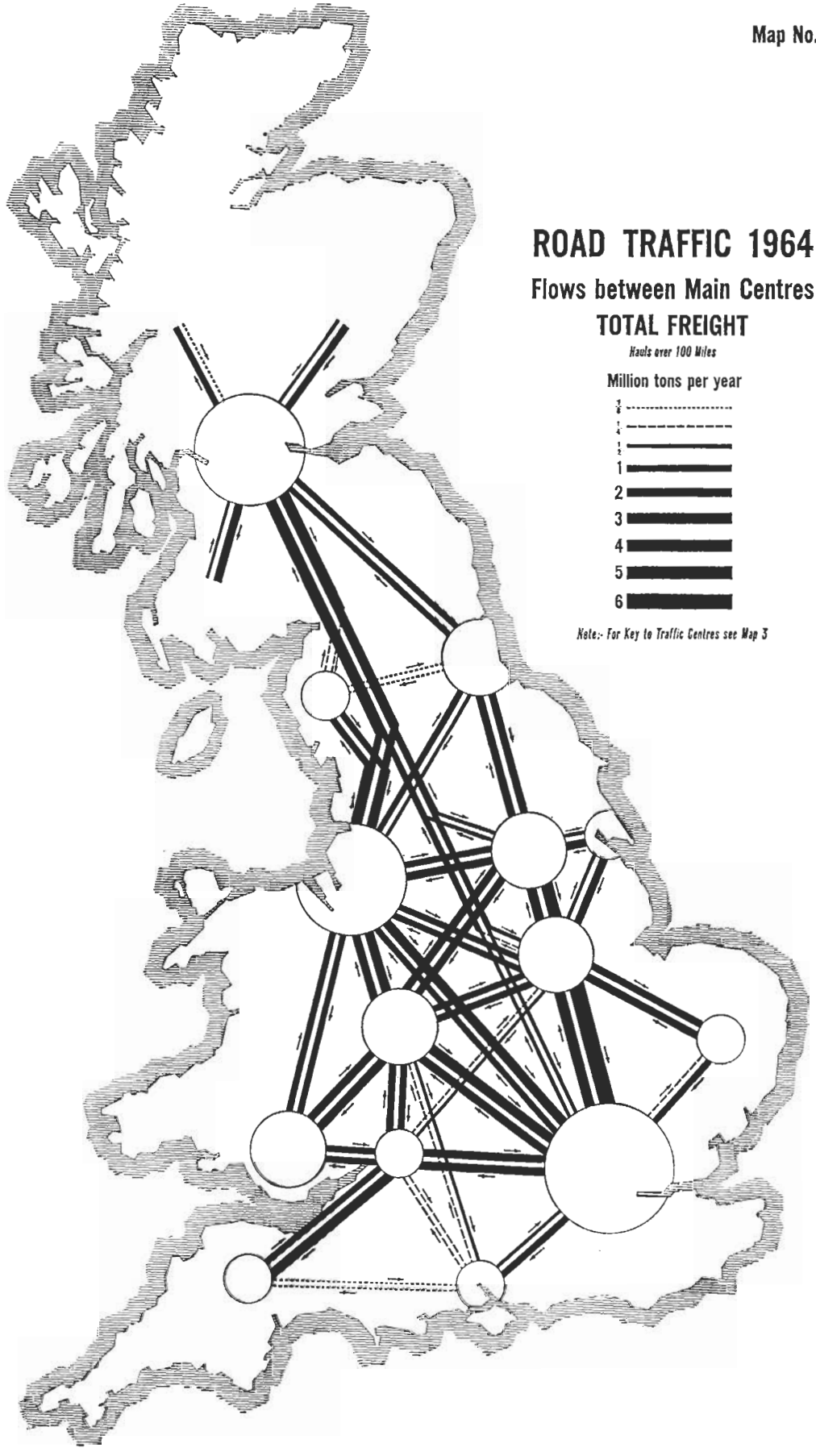

RAILWAY TRAFFIC 1964
Flows between Main Centres
OTHER FREIGHT
Million tons per year
¼
½
1
2
Note:- For Key to Traffic Centres see Map 3

Map No. 8

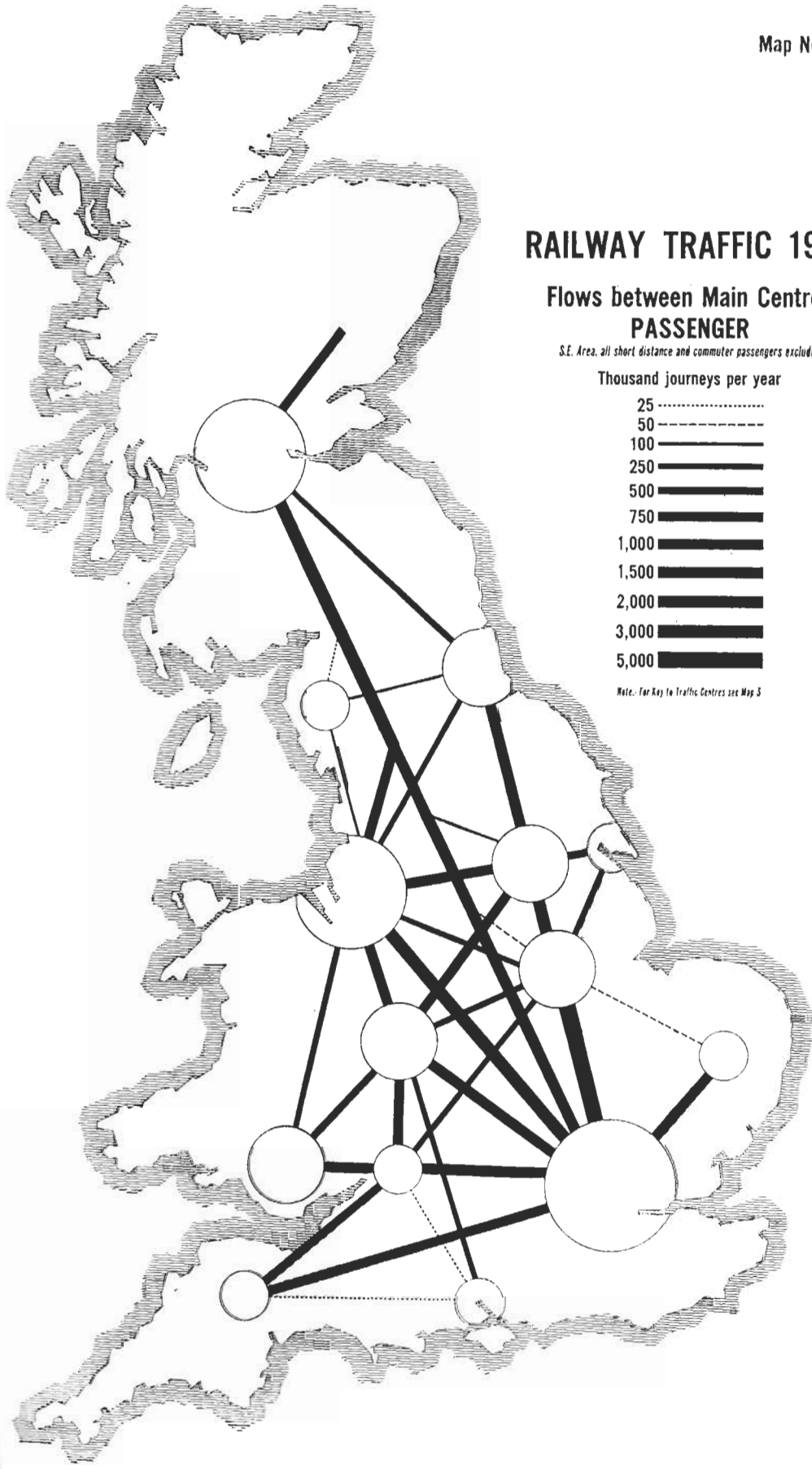
RAILWAY TRAFFIC 1964

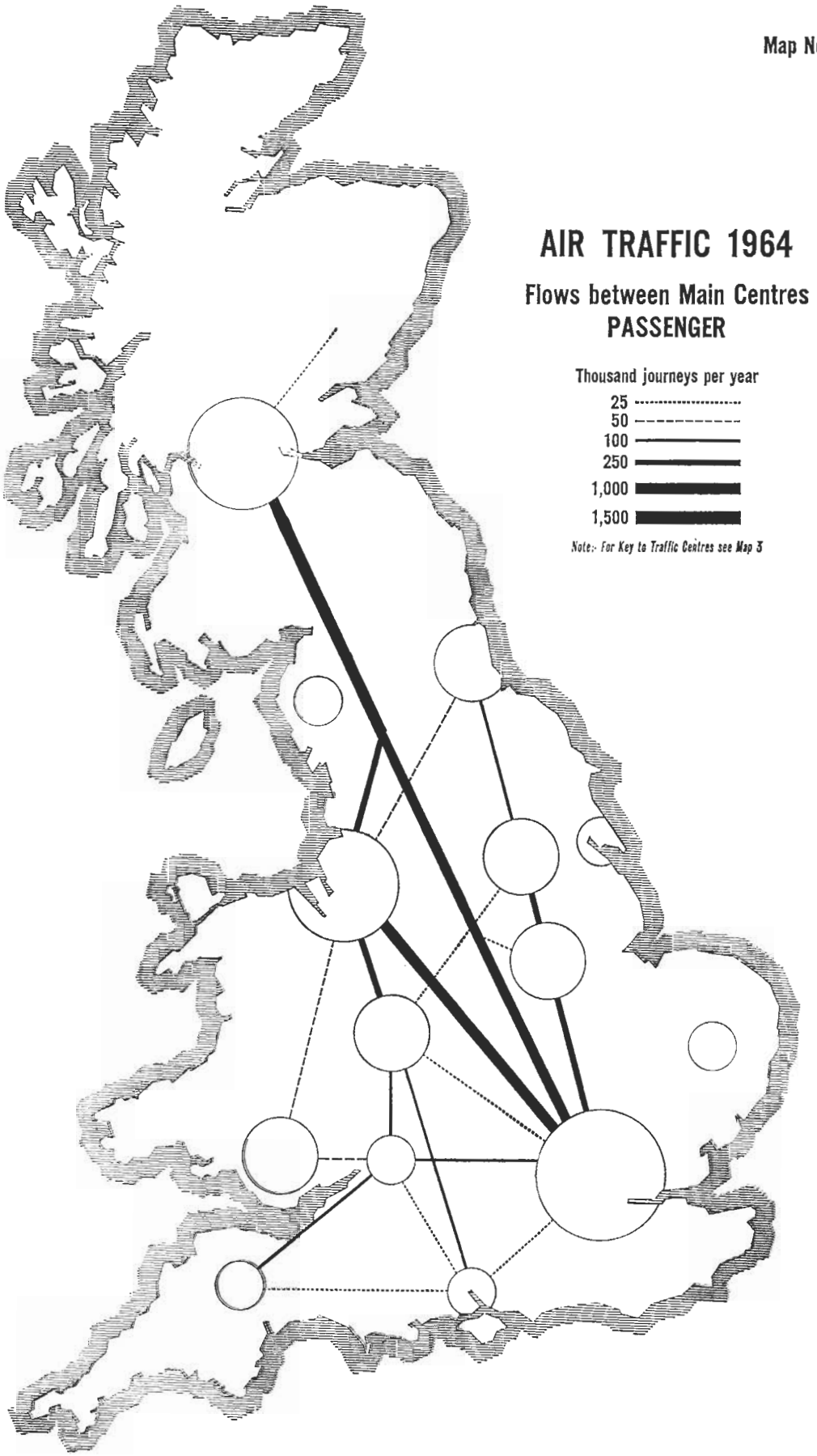
Flows between Main Centres
TOTAL FREIGHT



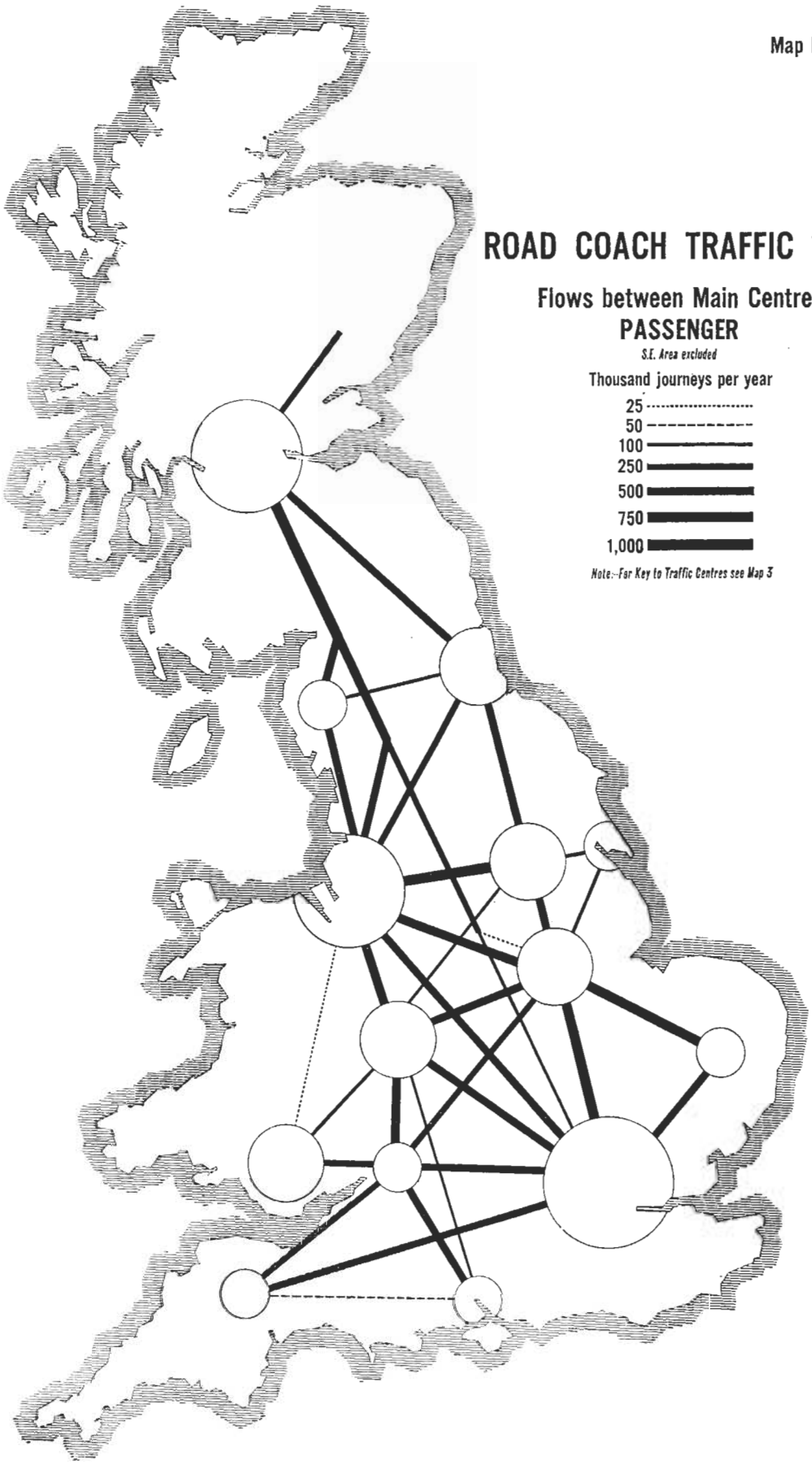

ROAD TRAFFIC 1964
Flows between Main Centres
TOTAL FREIGHT
Hauls over 100 Miles
Million tons per year
¼
½
¾
1
2
3
4
5
6
Note:- For Key to Traffic Centres see Map 3

Map No. 10

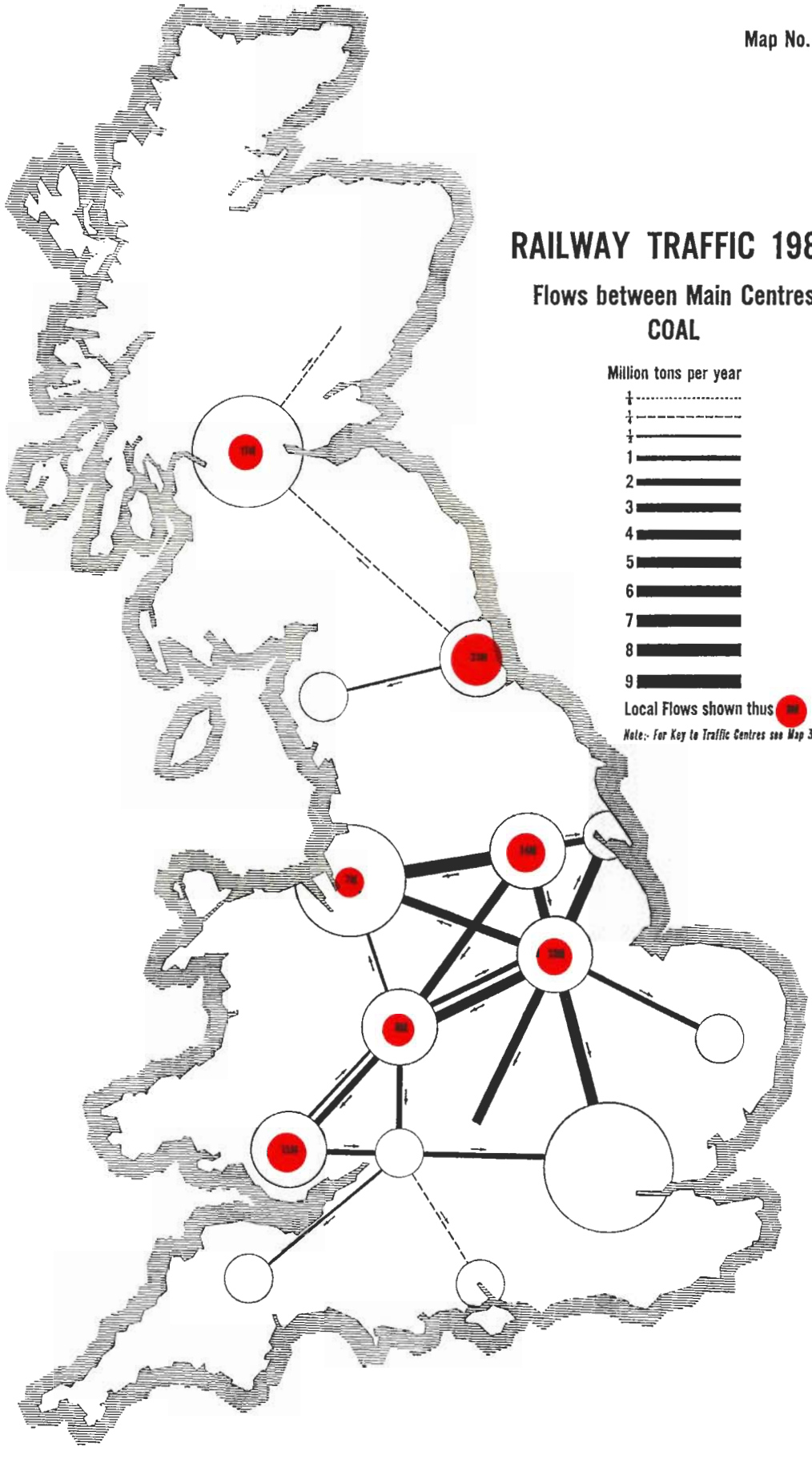

RAILWAY TRAFFIC 1964
Flows between Main Centres
PASSENGER
S.E. Area, all short distance and commuter passengers excluded.
Thousand journeys per year
25
50
100
250
500
750
1,000
1,500
2,000
3,000
5,000
Note.- For Key to Traffic Centres see Map 3


AIR TRAFFIC 1964
Flows between Main Centres
PASSENGER
Thousand journeys per year
25
50
100
250
1,000
1,500
Note:- For Key to Traffic Centres see Map 3

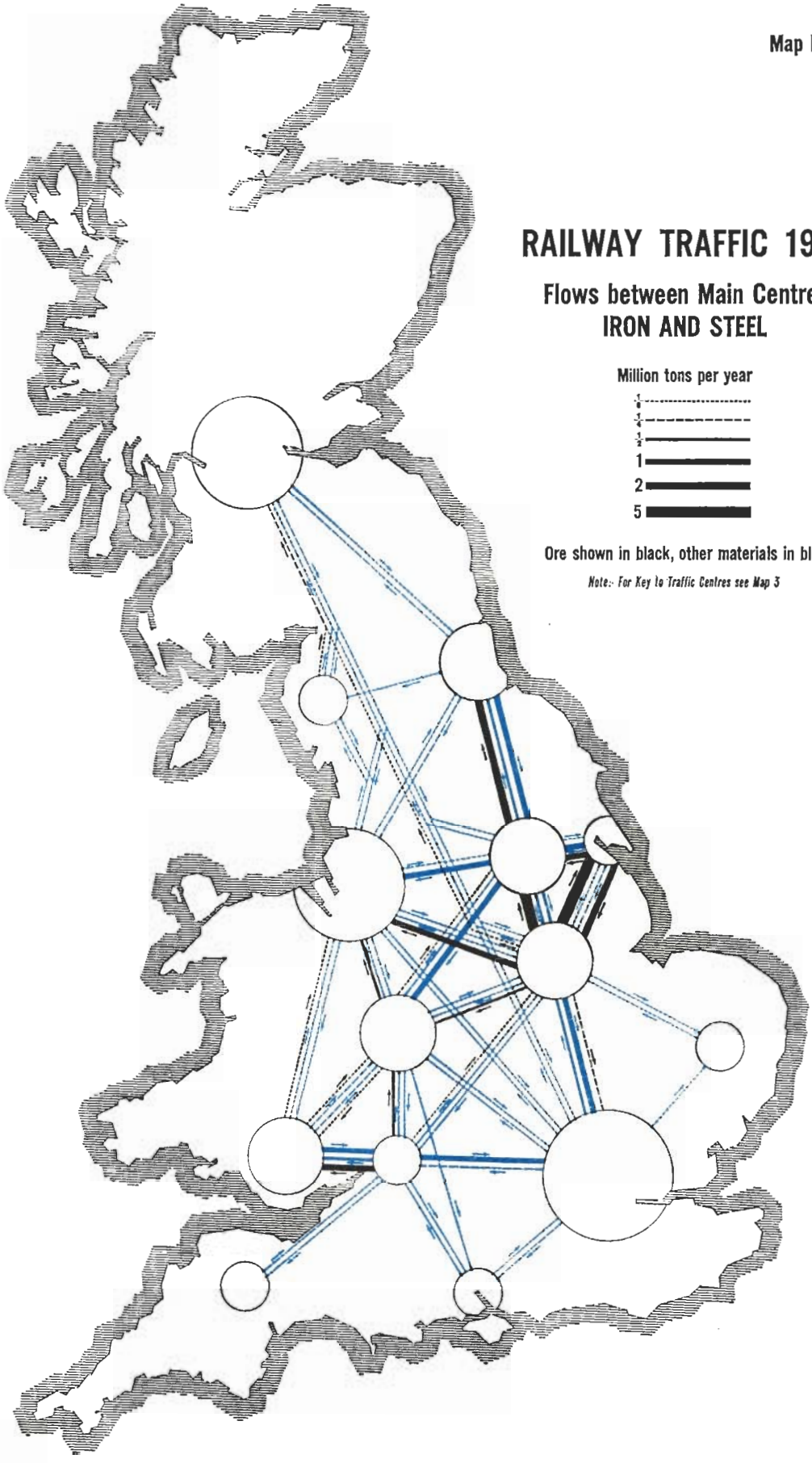
Map No. 12


ROAD COACH TRAFFIC 1964
Flows between Main Centres
PASSENGER
S.E. Area excluded
Thousand journeys per year
25
50
100
250
500
750
1,000
Note:-For Key to Traffic Centres see Map 3

Map No. 13


RAILWAY TRAFFIC 1984
Flows between Main Centres
COAL
Million tons per year
¼
½
¾
1
2
3
4
5
6
7
8
9
Local Flows shown thus
Note:- For Key to Traffic Centres see Map 3

Map No. 14



RAILWAY TRAFFIC 1984

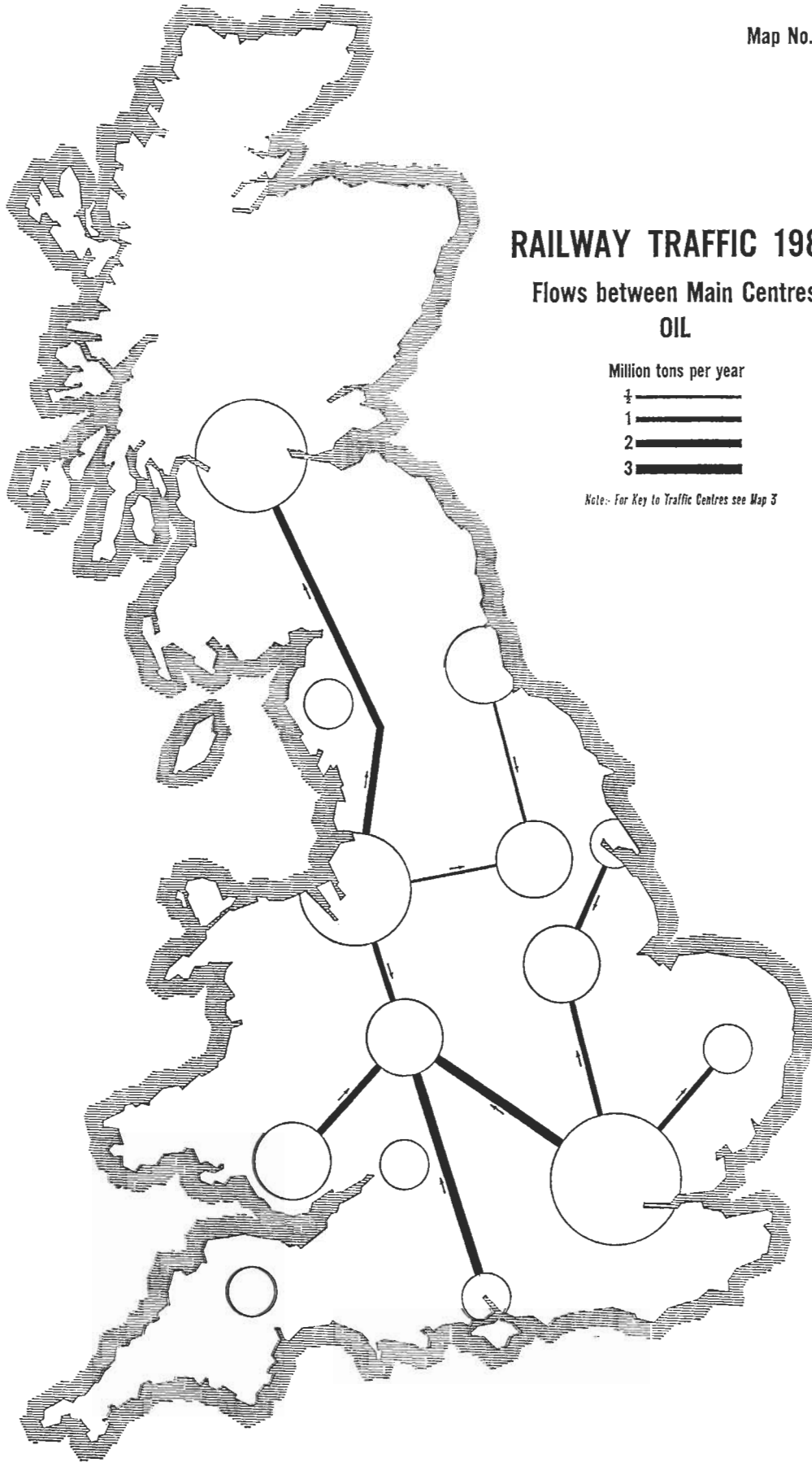
Flows between Main Centres
IRON AND STEEL

Million tons per year

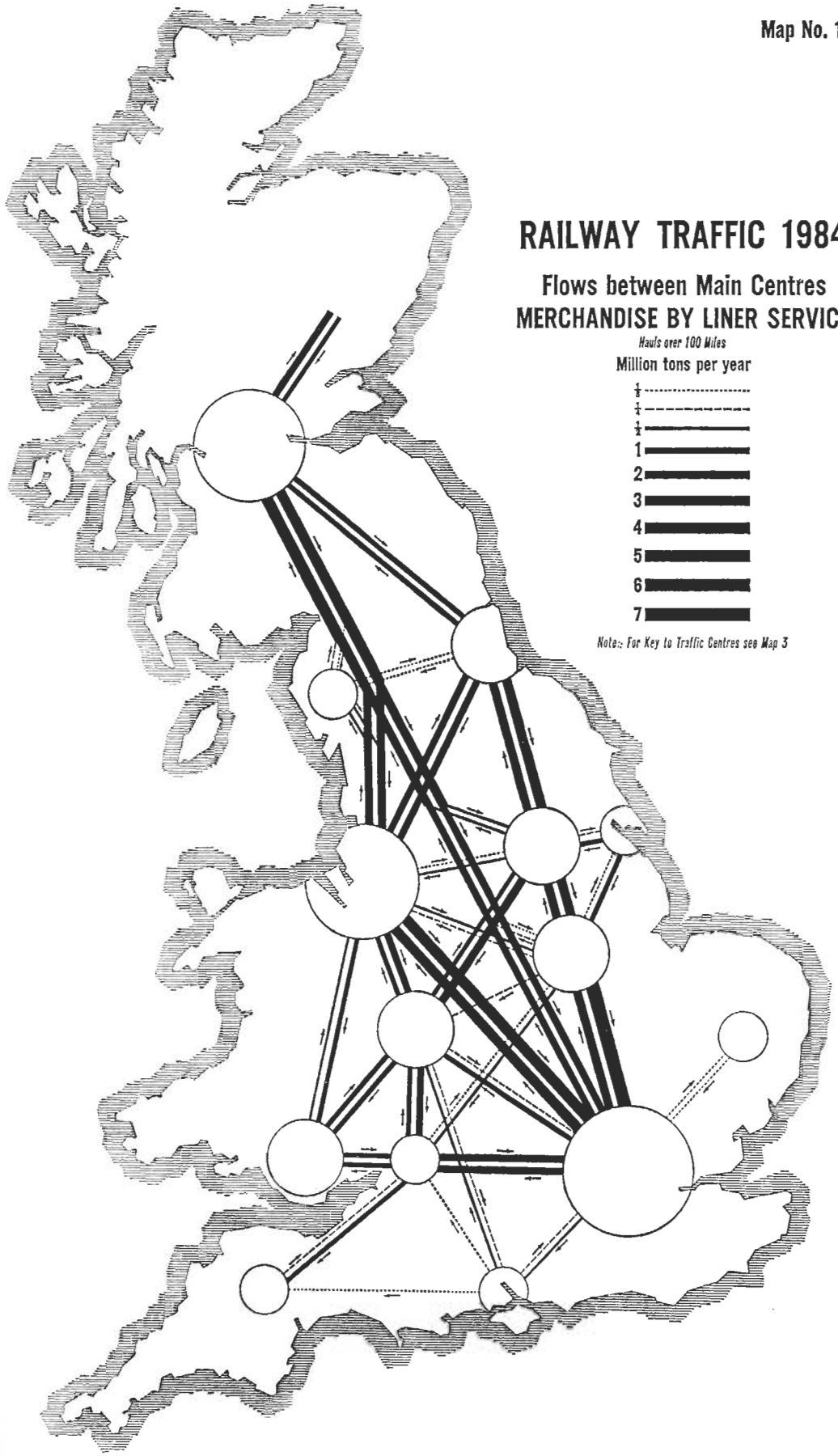
1/8
1/4
1/2
1
2
5

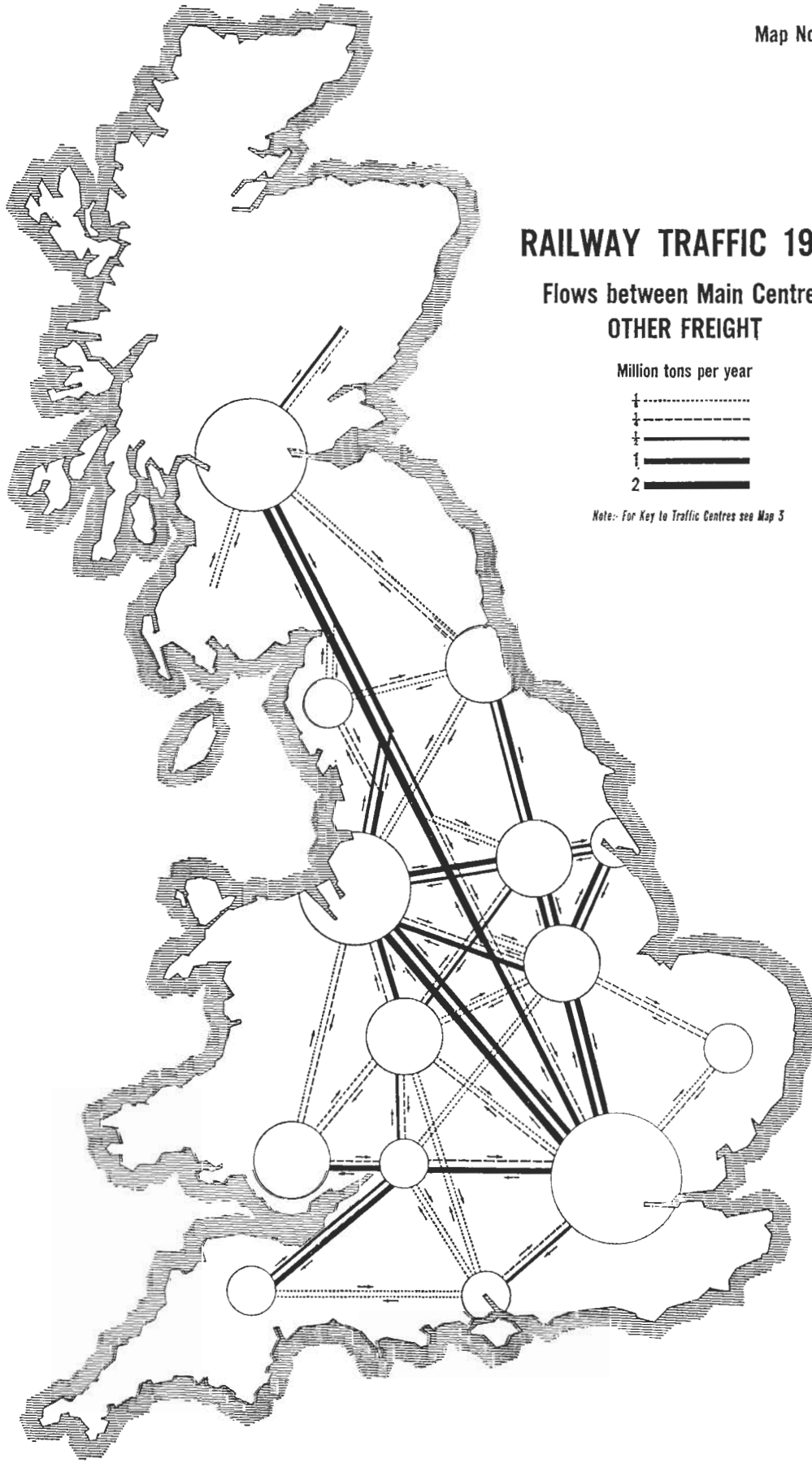
Ore shown in black, other materials in blue

Note:- For Key to Traffic Centres see Map 3

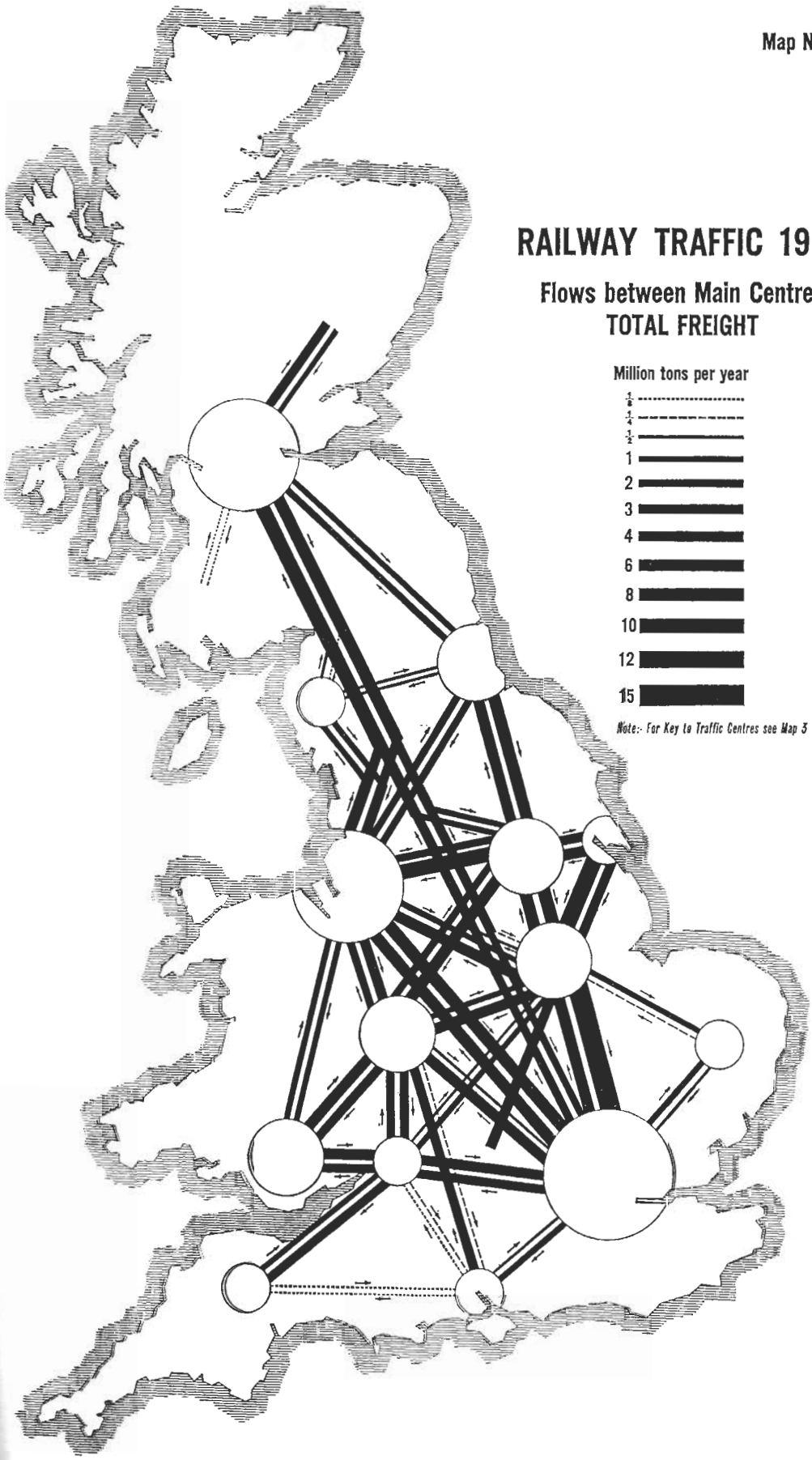

RAILWAY TRAFFIC 1984
Flows between Main Centres
OIL
Million tons per year
½
1
2
3
Note:- For Key to Traffic Centres see Map 3

Map No. 16

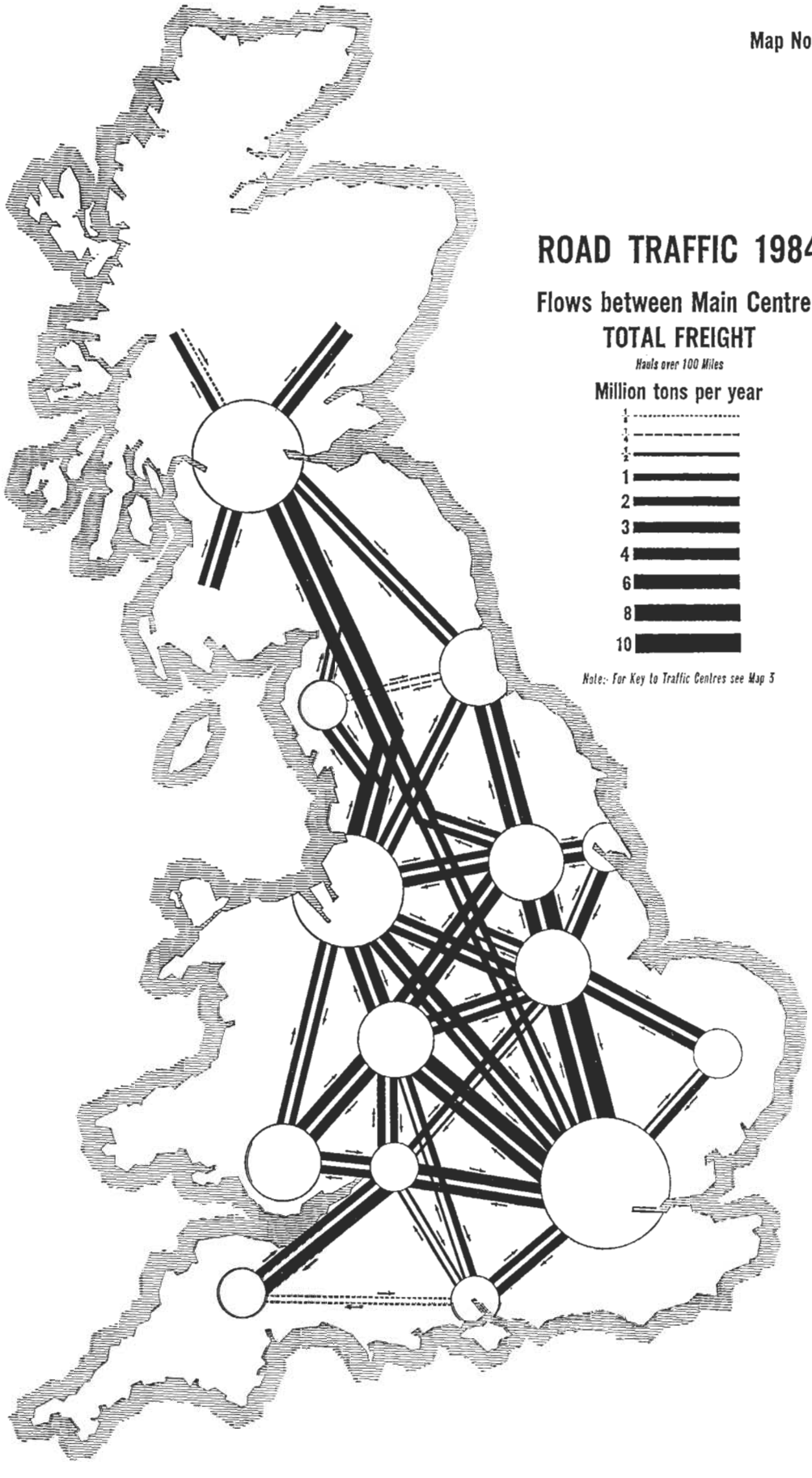

RAILWAY TRAFFIC 1984
Flows between Main Centres
MERCHANDISE BY LINER SERVICE
Hauls over 100 Miles
Million tons per year
¼
½
¾
1
2
3
4
5
6
7
Note:: For Key to Traffic Centres see Map 3


RAILWAY TRAFFIC 1984
Flows between Main Centres
OTHER FREIGHT
Million tons per year
¼
½
1
2
Note:- For Key to Traffic Centres see Map 3

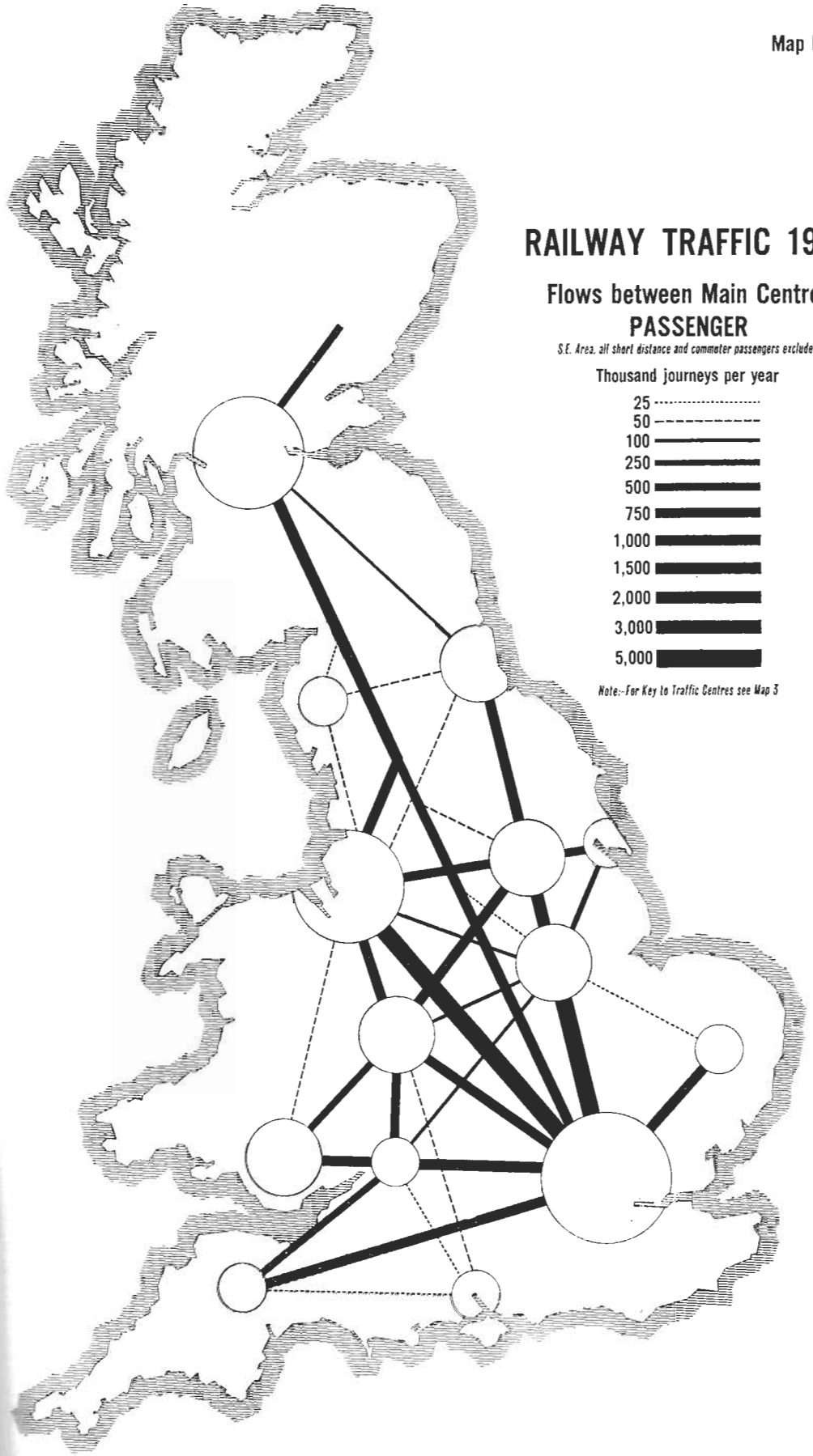
Map No. 18

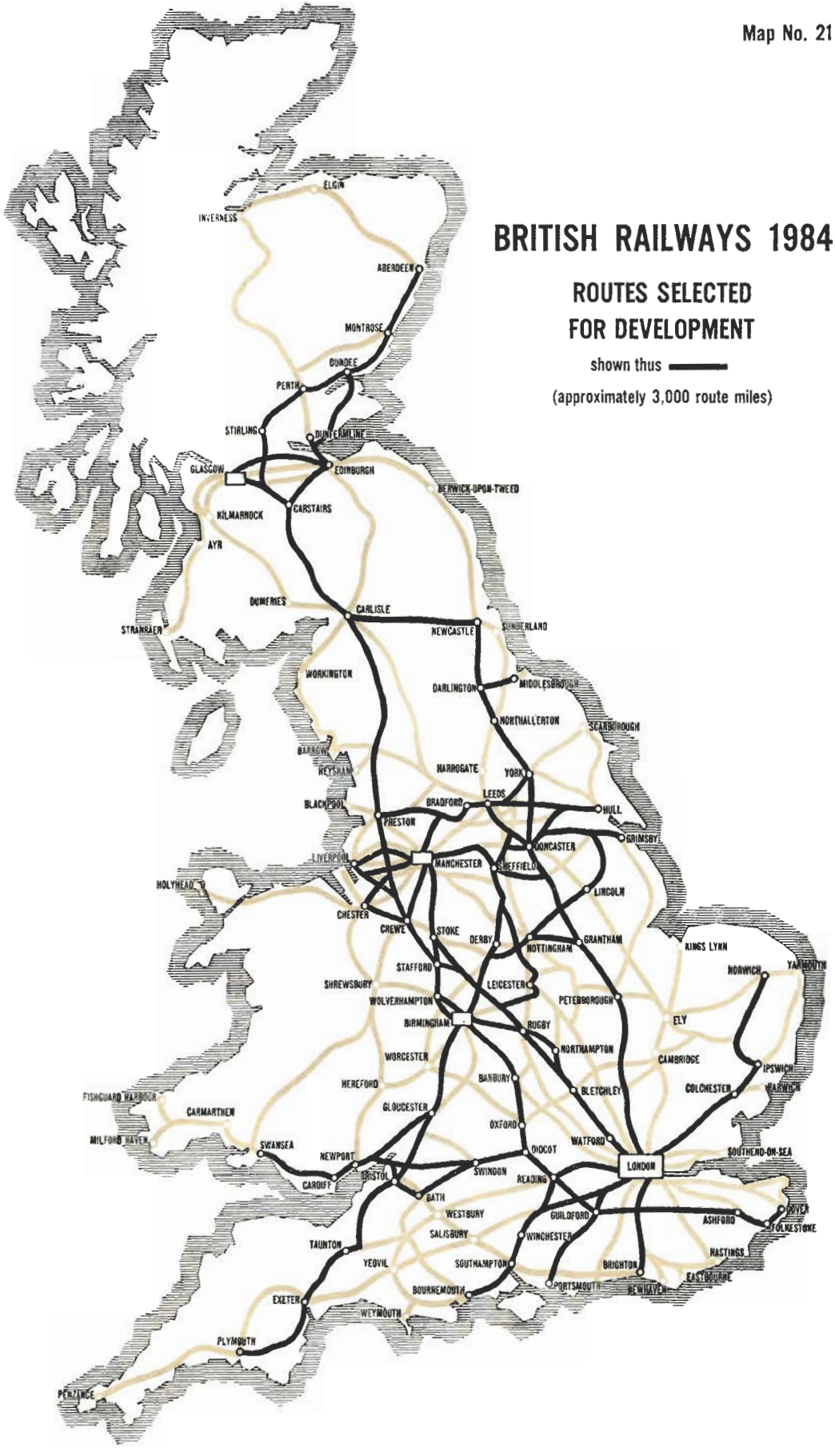

RAILWAY TRAFFIC 1984
Flows between Main Centres
TOTAL FREIGHT
Million tons per year
1/8
1/4
1/2
1
2
3
4
6
8
10
12
15
Note:- For Key to Traffic Centres see Map 3

Map No. 19

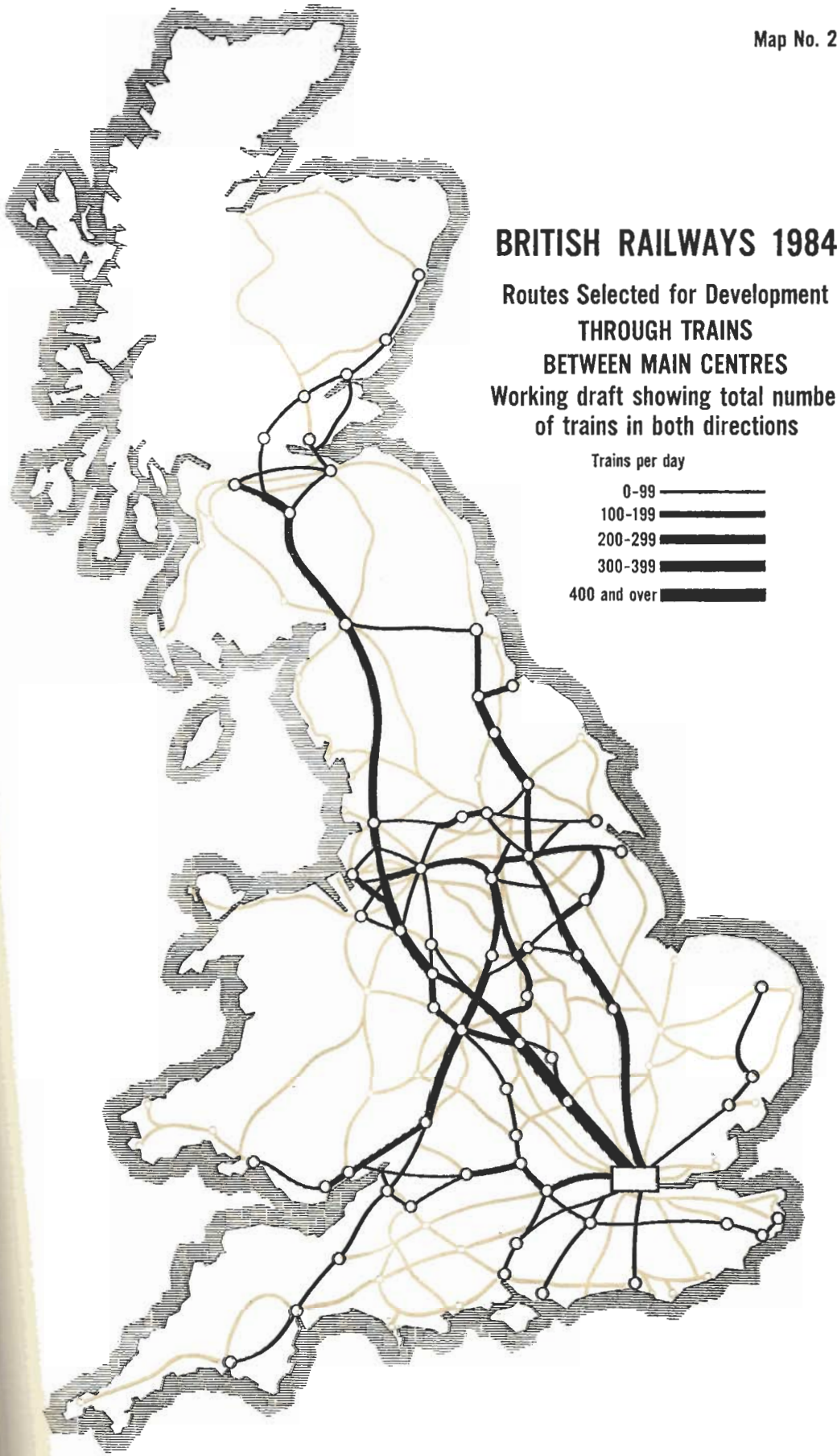

ROAD TRAFFIC 1984
Flows between Main Centres
TOTAL FREIGHT
Hauls over 100 Miles
Million tons per year
¼
¾
½
1
2
3
4
6
8
10
Note:- For Key to Traffic Centres see Map 3

Map No. 20

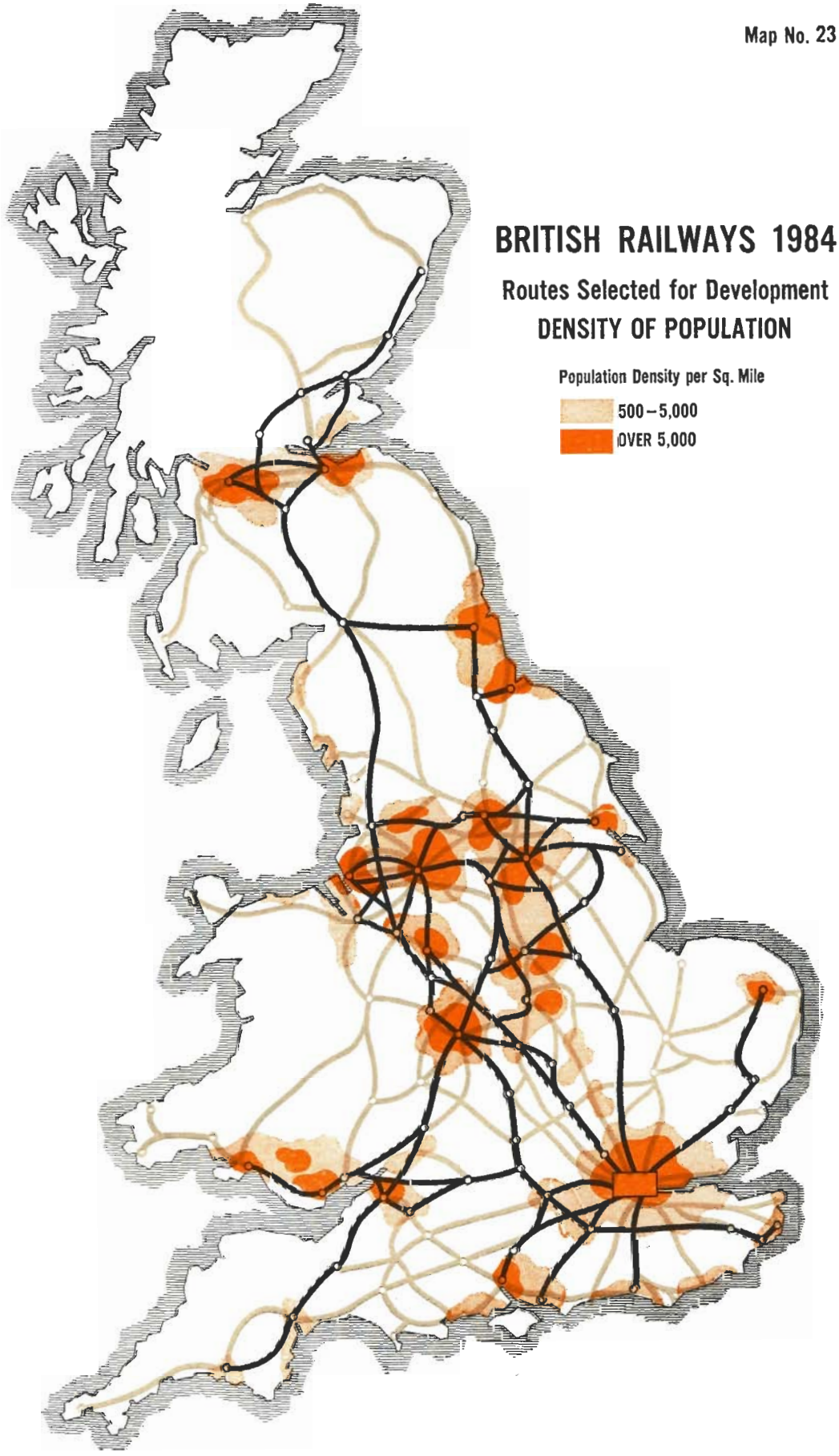

RAILWAY TRAFFIC 1984
Flows between Main Centres
PASSENGER
S.E. Area, all short distance and commuter passengers excluded.
Thousand journeys per year
25
50
100
250
500
750
1,000
1,500
2,000
3,000
5,000
Note:-For Key to Traffic Centres see Map 3


BRITISH RAILWAYS 1984
ROUTES SELECTED FOR DEVELOPMENT
shown thus
(approximately 3,000 route miles)
ELGIN
INVERNESS
ABERDEEN
MONTROSE
DUNDEE
PERTH
STIRLING
DUNFERMLINE
GLASGOW
EDINBURGH
BERWICK-UPON-TWEED
KILMARNOCK
CARSTAIRS
AYR
DUMFRIES
CARLISLE
STRANRAER
NEWCASTLE
SUNDERLAND
WORKINGTON
DARLINGTON
MIDDLESBROUGH
NORTHALLERTON
SCARBOROUGH
HARROGATE
YORK
LEEDS
BRADFORD
HULL
BLACKPOOL
PRESTON
GRIMSBY
DONCASTER
LIVERPOOL
MANCHESTER
SHEFFIELD
HOLYHEAD
LINCOLN
CHESTER
CREWE
STOKE
DERBY
NOTTINGHAM
GRANTHAM
KINGS LYNN
NORWICH
YARMOUTH
STAFFORD
SHREWSBURY
LEICESTER
WOLVERHAMPTON
PETERBOROUGH
BIRMINGHAM
RUGBY
ELY
NORTHAMPTON
WORCESTER
CAMBRIDGE
IPSWICH
HEREFORD
BANBURY
BLETCHLEY
COLCHESTER
HARWICH
FISHGUARD HARBOUR
GLOUCESTER
CARMARTHEN
OXFORD
MILFORD HAVEN
SWANSEA
DIDCOT
WATFORD
SOUTHEND-ON-SEA
NEWPORT
SWINDON
READING
LONDON
CARDIFF
BRISTOL
BATH
WESTBURY
GUILDFORD
ASHFORD
DOVER
FOLKESTONE
SALISBURY
WINCHESTER
TAUNTON
YEOVIL
SOUTHAMPTON
BRIGHTON
HASTINGS
EASTBOURNE
BOURNEMOUTH
PORTSMOUTH
NEWHAVEN
EXETER
WEYMOUTH
PLYMOUTH
PENZANCE

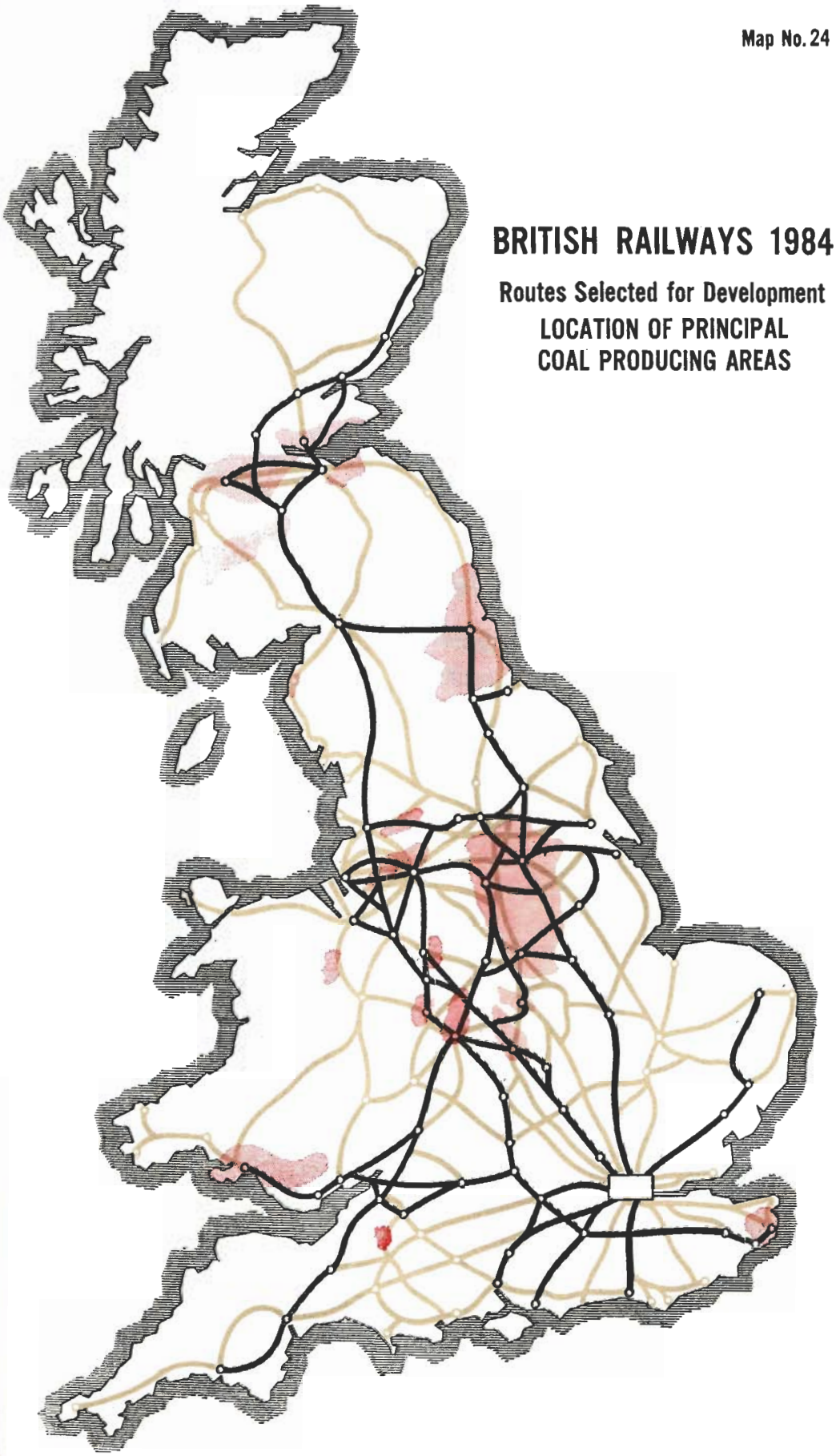
Map No. 22


BRITISH RAILWAYS 1984
Routes Selected for Development
THROUGH TRAINS
BETWEEN MAIN CENTRES
Working draft showing total number of trains in both directions
Trains per day
0-99
100-199
200-299
300-399
400 and over

Map No. 23


BRITISH RAILWAYS 1984
Routes Selected for Development
DENSITY OF POPULATION
Population Density per Sq. Mile
500 – 5,000
OVER 5,000

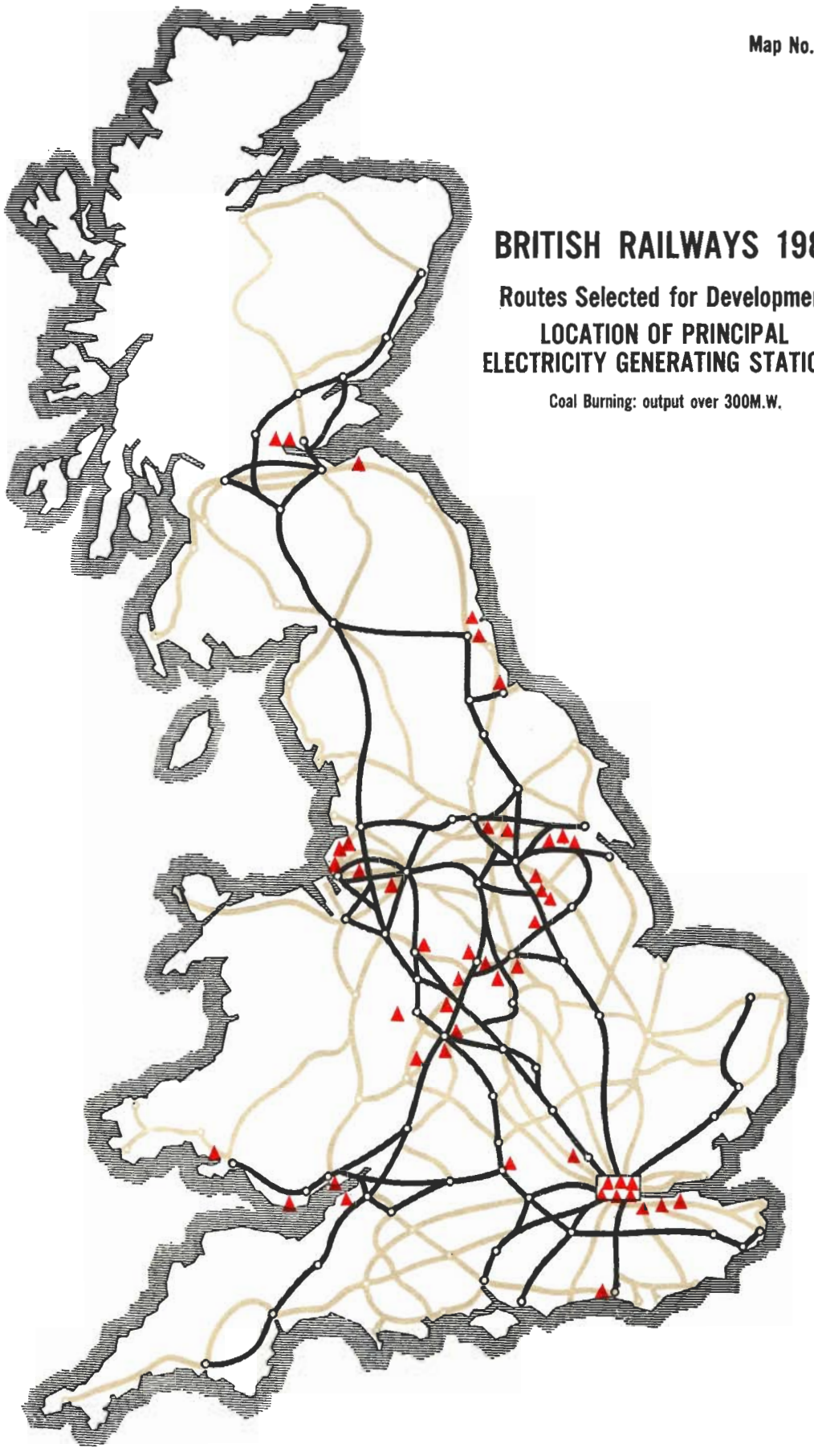
Map No. 24



BRITISH RAILWAYS 1984

Routes Selected for Development
LOCATION OF PRINCIPAL COAL PRODUCING AREAS

Map No. 25



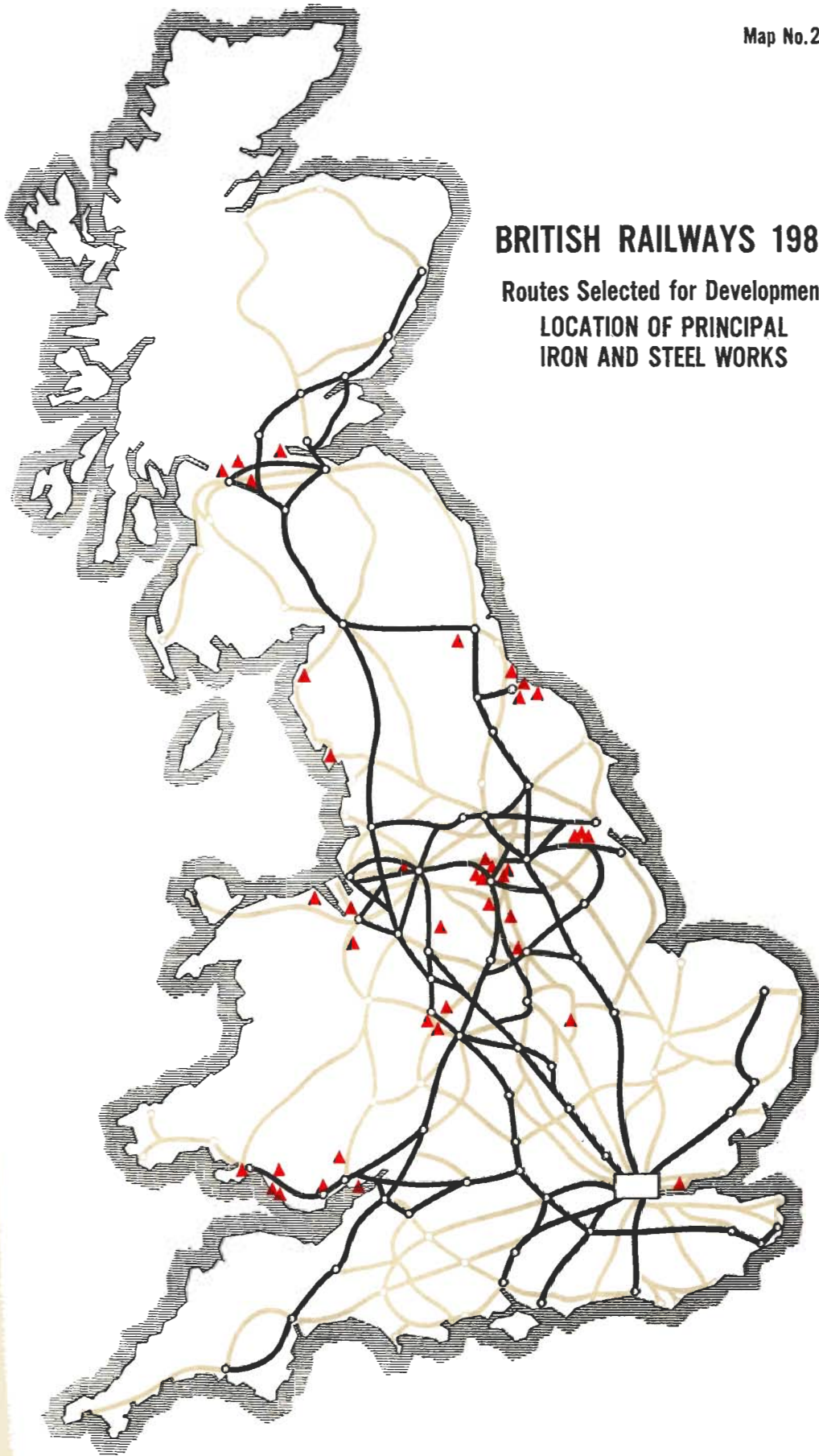
BRITISH RAILWAYS 1984

Routes Selected for Development

LOCATION OF PRINCIPAL ELECTRICITY GENERATING STATIONS

Coal Burning: output over 300M.W.

Map No.26

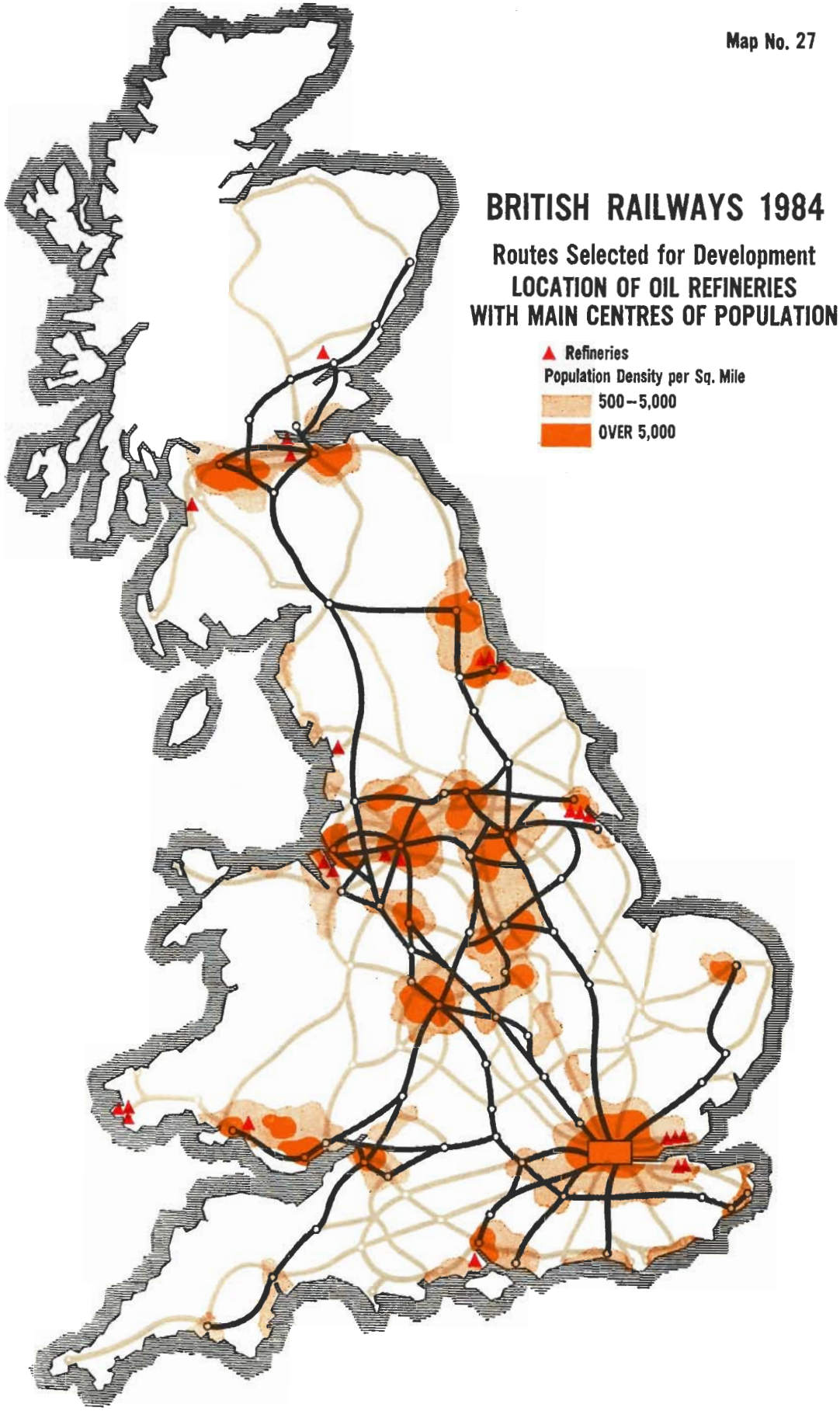


BRITISH RAILWAYS 1984

Routes Selected for Development

LOCATION OF PRINCIPAL IRON AND STEEL WORKS

Map No. 27


BRITISH RAILWAYS 1984
Routes Selected for Development
LOCATION OF OIL REFINERIES
WITH MAIN CENTRES OF POPULATION
Refineries
Population Density per Sq. Mile
500--5,000
OVER 5,000

SUPPLEMENTARY NOTES ON THE SELECTION OF ROUTES FOR DEVELOPMENT

The section of the survey on the selection of routes for development mentions the broad considerations taken into account in reaching conclusions. Much detailed work was undertaken during the process of selection and this appendix deals with some specific examples which illustrate the depth of the survey. It is convenient to deal with these examples under the following headings:—

(1) *General considerations:*

Areas linked by the routes considered.
The future traffic flows between these areas together with the intermediate centres served.

(2) *Physical characteristics:*

Data concerning the numbers of bridges and tunnels, ruling gradients, and features restricting running speeds.

(3) *Traffic levels:*

Levels of traffic at present passing over the routes.

(4) *Alternative routes:*

Summaries of the salient features, the range and mix of speeds expected, and calculated route capacitites.

(5) *'Network' considerations:*

The way in which the routes selected fit into the future railway trunk network.

Example I Trans-Pennine Routes

The routes considered in this example are:—

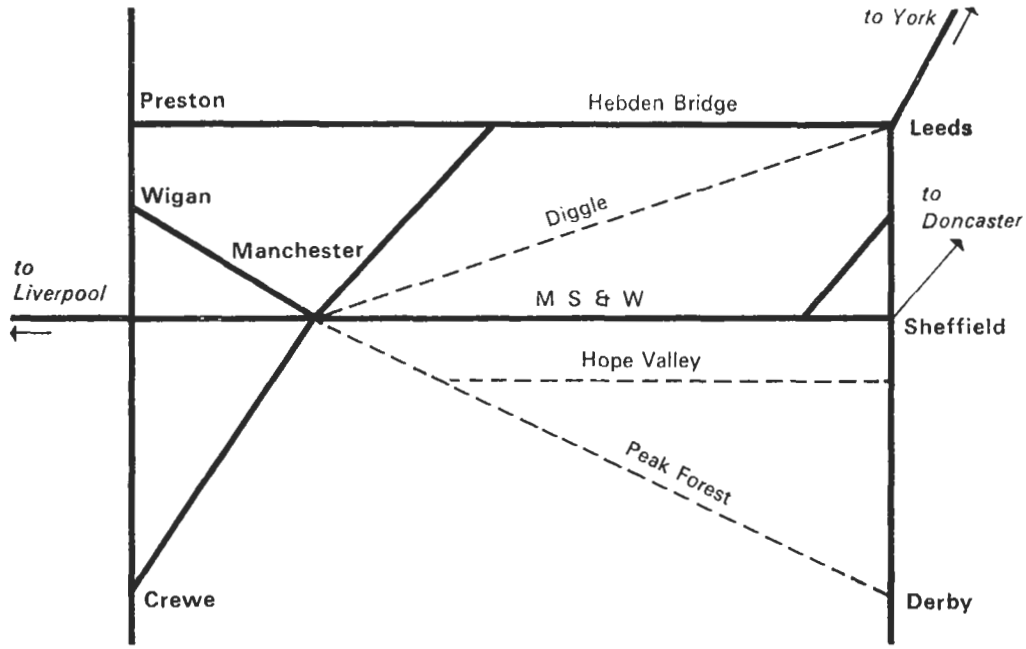
(a) Leeds to Manchester via Hebden Bridge,

(b) Leeds to Manchester via Diggle,

(c) Sheffield to Manchester via the Woodhead Tunnel,

(d) Sheffield to Manchester via the Hope Valley,

(e) Derby to Manchester via Peak Forest.



(1) *General Considerations.*

(a) *Hebden Bridge route.*

This route between Leeds and Manchester links South Yorkshire and the Tyne/Tees and Humber areas with Lancashire. Reference to Maps Nos. 8 and 18 will show that it is well aligned in relation to the present and forecast flows of freight traffic.

Intermediate areas served along the line of this route are :—

Bradford,
Halifax,
Sowerby Bridge,
Todmorden,
Rochdale.

Its most important feature is its ability to fulfil the dual functions of carrying the traffic flows from the East side of the Pennines to the North Manchester area and Lancashire, and that of providing a through link between the West Riding and the main Anglo-Scottish West Coast route at Preston.

(b) *The Diggle route.*

This route, which also connects South Yorkshire and the traffic areas to the East with Manchester, divides near Standedge into two separate lines which rejoin at Stalybridge. It was opened some 8 years later than the Hebden Bridge route, with which it was designed to compete, and now provides a duplicate link for the principal East-West traffic flows. It does not provide a connection between the West Riding and the North, except by a circuitous journey involving greater mileage than the Hebden Bridge route.

The intermediate centres which it serves are Dewsbury, Huddersfield, and a C.E.G.B. power station near Stalybridge.

(c) *The Woodhead route (M. S&W).*

This route provides a link for the principal traffic flows between the southern part of the South Yorkshire area, the East Midlands, and the Manchester/Liverpool industrial complex. At its eastern end, the connecting lines provide a natural 'funnel' for westbound coal from the South Yorkshire/East Midlands coalfields, and they also gather traffic from a very much larger catchment area extending eastwards to the Humber ports.

A particularly important feature of the Woodhead route is that 10 years ago it was electrified, equipped with modern signalling, and re-aligned through a newly bored tunnel between Woodhead and Dunford. This electric system is now being extended to connect with a new mechanised marshalling yard to be opened shortly at Tinsley, north of Sheffield.

At its western end, the route is well located to handle future traffic flows to the Manchester South area. It also provides a through connection, via Godley, with Liverpool and serves important intermediate centres.

(d) *The Hope Valley route.*

This was the last of the trans-Pennine routes to be built in the days of competition, in the hope of attracting some of the traffic passing between Sheffield and Manchester. It covers approximately the same route-mileage as the Woodhead route and provides for the same traffic flows between South Yorkshire, the East Midlands, and the Manchester area. The only intermediate traffic of any importance is provided by a cement works situated midway between Dore and Chinley.

(e) *The Peak Forest route.*

This route connects the traffic centres of the East Midlands with the Manchester area. At its southern end, connecting lines serve the south part of the East Midlands coalfield and the Nottingham area, whilst its northern connections provide links with Stockport and Manchester South. By a branch at Cheadle Heath, a through link is provided to Liverpool, both via Warrington and via the former Cheshire Lines route.

(2) *Physical Characteristics.*

A survey of the five routes under review has revealed that no large items of maintenance expenditure are likely to be incurred during the next 10 years. Although they all embody substantial engineering structures, those on the Woodhead route, in particular, have been renewed in recent years with a consequent reduction in the level of maintenance costs.

The table which follows summarises the main physical features of each route:—

PHYSICAL CHARACTERISTICS OF ROUTES

Route	Route Mileage	Maximum permitted speed mph	Permanent Speed Restrictions* (Distance)				Total cases	Gradients		Tunnels		Bridges		Viaducts	
			0–½ miles	½–2 miles	2–5 miles	over 5 miles		Ruling	Next severest	No. of separate bores	Aggregate length in miles	Over bridge	Under bridge	No.	Aggregate length in miles
Hebden Bridge	49	75	3 cases 1 × 35 mph 1 × 45 mph 1 × 60 mph	1 case 1 × 45 mph	—	—	4	1/47	1/59	19	4·4	72	127	14	1·2
Diggle	43	75	4 cases 1 × 15 mph 1 × 30 mph 1 × 35 mph 1 × 45 mph	1 case 1 × 20 mph	—	2 cases 1 × 50 mph 1 × 55 mph	7	1/47	1/59	13	10·5	91	144	23	1·6
Woodhead	41	60	2 cases 2 × 35 mph	2 cases 2 × 40 mph	—	—	4	1/77	1/97	3	3·7	76	71	8	0·7
Hope Valley	45	80	5 cases 1 × 20 mph 2 × 35 mph 1 × 50 mph 1 × 60 mph	1 case 1 × 45 mph	—	2 cases 1 × 50 mph 1 × 60 mph	8	1/70	1/100	6	8·0	43	195	4	0·3
Peak Forest	61	80	8 cases 1 × 15 mph 2 × 25 mph 1 × 40 mph 1 × 45 mph 2 × 50 mph 1 × 55 mph	6 cases 1 × 20 mph 3 × 50 mph 1 × 55 mph 1 × 60 mph	1 case 1 × 60 mph	1 case 1 × 60 mph	16	1/90	1/100	23	7	153	220	13	1·0

* Restrictions below 65 mph

Attention is drawn to the following points of particular interest:—

(i) Apart from the 1/47 incline at Miles Platting, which is common to both of the 'northern' trans-Pennine routes, in general the gradients via Hebden Bridge are less severe than via Diggle.

On the 'southern' route, all heavy freight trains via Peak Forest require an assisting locomotive for 15 miles between Rowsley and Peak Forest.

(ii) The small number of permanent restrictions on speed over the Woodhead route compares favourably with the large number of such restrictions via Peak Forest.

(iii) The large number of tunnels on the Peak Forest route—23 in all—which affect the maintenance costs for the route.

(3) *Present Traffic Densities.*

It is of interest to note the levels of freight traffic of all classes passing over each of the five routes today, and the following table sets out the present situation:—

Freight traffic carried by trans-Pennine routes : 1964

Route	'000 *Tons per Week*
Hebden Bridge	70
Diggle	40
Woodhead	170
Hope Valley	45
Peak Forest	85

This shows that the Woodhead route carries twice as much freight traffic as any other trans-Pennine route and reference is made later to the scope for increasing its freight train payloads.

(4) *Routes selected for development.*

The conversion of future traffic flows, shown in Maps 18 and 20, into train-loads per day in each direction, using the forecast of future payloads set out in Table 10 of the main report, produces a total demand of rather less than 200 westbound trunk trains (passenger and freight). The volume of eastbound traffic is smaller, as the predominating traffic is the flow of coal from Yorkshire and the East Midlands into Lancashire. These 200 westbound trains per day will just about saturate the future maximum workable capacity of one trans-Pennine route.

The object of the study is to select for development a trunk system which provides for the foreseeable traffic, with an adequate margin of spare capacity. So much the better if this can be provided without route duplication, but, in the case of trans-Pennine traffic, chiefly because of the extra train mileages involved if only one route were selected, it is prudent to select two routes for long-term development. These are one 'northern' route via Hebden Bridge and one 'southern' route via Woodhead.

An important consideration taken into account in selecting the Hebden Bridge route was that of its dual function (mentioned in 1 (*a*) above) of giving access between the West Riding and Manchester, and providing a through connection with the main Anglo-Scottish West Coast route at Preston. The alternative 'northern' route via Diggle is unable adequately to fulfil both these requirements.

Further advantages in favour of the Hebden Bridge route are that in general it has less severe gradients and, moreover, the total population of the intermediate centres served is double that covered by the Diggle route.

Turning now to the 'southern' routes (via Woodhead, Hope Valley and Peak Forest), the most important considerations concerning the route via Woodhead are:—

(i) Its directness for traffic flowing from the East Midlands, and centres to the east and south, to the Merseyside area.

(ii) The favourable rail connections at each end of this route.

(iii) The post-war modernisation of the route, providing electric traction, colour-light signalling, and a new tunnel.

(iv) The scope for increasing the payload of freight trains from 750 tons up to the limit of present coupling strength—about 1,100 tons. The additional power can be provided by adapting the existing electric locomotives to enable two locomotives to operate as one tractive unit.

It was necessary to calculate, in respect of each route, the maximum workable capacity in relation to the total estimated demand for train-load movements. An important feature of this calculation was the way in which trains are expected to operate within the speed bands discussed in the main report (Table 8).

Over the Hebden Bridge route some 30% of the trains are expected to run at an average speed of 35 mph, with the bulk of the remaining 70% averaging 50 mph. Inter-city express passenger services, running at average speeds of 70 mph, will account for about 10% of the total movement. On the Woodhead route the majority of the future trains are expected to be in the heavy freight class, running at an average speed of 35 mph.

The calculations of potential route capacity in the future are summarised below:—

	Woodhead (trunk trains per day/each way)		*Hebden Bridge* (trunk trains per day/each way)	
Theoretical Capacity		320		370
Deductions for:—				
(i) Mixed speeds..	50		100	
(ii) Junction/Terminal confliction	35		50	
(iii) Maintenance & contingencies	35		35	
	—	120	—	185
Workable capacity		200		185

As noted previously, the total traffic demand represents rather less than 200 trunk trains per day in the direction of the heavier flow, so that the selections would provide a substantial margin of spare capacity.

It will be noted (from the table on Page 84) that the effect of selecting two routes for development would be to reduce the trunk route mileage of the trans-Pennine routes from 239 to 90.

The concentration of trunk flows over two routes is likely to give rise to a limited increase in train milcage. This would, however, be compensated by improved utilisation of locomotives and train crews operating over a simplified trunk system. The overall effect of this concentration would be a substantial reduction in the route unit cost (in terms of the cost levels shown in Table 4 of the main report) for trunk traffic compared to the costs which would arise if all five routes were to be retained for trunk movement.

(5) *Network Considerations.*

As in all cases under review, it was necessary to consider the way in which the selected routes would fit into the trunk system as a whole. The main points taken into account in this connection were:—

Hebden Bridge

East End—at Leeds the route feeds in three directions:—

(i) to the north—via the selected Leeds—Church Fenton—York route,

(ii) to the east—via Selby to Hull,

(iii) to the south—via the selected link with the East Coast route at Doncaster.

West End

West of the Pennines the route feeds in three directions:—

(i) to the North—via Preston to the Anglo-Scottish West Coast route,

(ii) to the West—via the selected route to Liverpool,

(iii) to the South—via the newly electrified route to Crewe.

Woodhead

East End

(i) to the North—via the selected Sheffield to Doncaster link on to the East Coast,

(ii) to the East—particularly to Immingham (the port selected for export coal shipment) and the steel centre at Scunthorpe,

(iii) to the South—

(a) via the Sheffield—Retford link on to the East Coast route,

(b) via Sheffield to the selected route serving the East Midlands coalfield area.

West End

The ex-Cheshire Lines route between Manchester and Liverpool has been proposed for development, and this is reached by branching at Godley to provide a through link to the docks at Liverpool, which would also serve the important intermediate industrial centres. This through route by-passes the Manchester complex on its south side and secures many operational advantages by so doing.

A further feature influencing the selection of the Woodhead route is the fact that scope exists for the westward projection of the trans-Pennine electrified system via the Cheshire Lines route to Liverpool; a step which would improve the utilisation of the existing electric locomotives.

Example II Manchester—Liverpool routes

(*a*) Wigan and Kirkby,

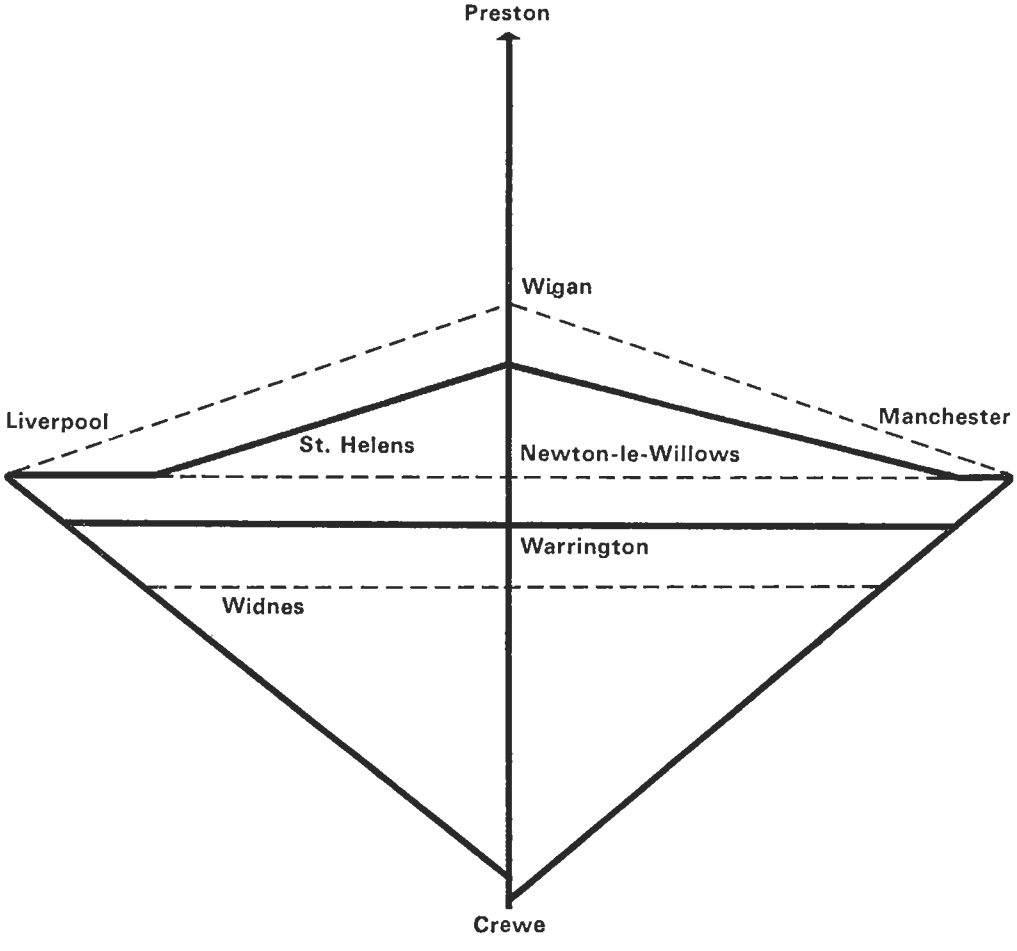
(*b*) Tyldesley and St. Helens,

(*c*) Newton-le-Willows and Earlestown,

(*d*) Irlam and Warrington,

(*e*) Lymm and Widnes.

The routes are shewn diagrammatically in the figure below. The extent of the through route mileage which exists between Manchester and Liverpool reflects the independent and competitive development in the past on the part of the former London & North Western Railway, the Lancashire & Yorkshire Railway, the Cheshire Lines Committee and, to a smaller extent, the Great Central Railway.



(1) *General Considerations*

(*a*) *Route via Wigan*

This route, constructed by the Lancashire & Yorkshire Railway, is one of the less direct of the links between Manchester and Liverpool.

Between Manchester and Liverpool the significant centre of population and industry is Wigan, which can be served by alternative routes.

(*b*) *Route via Newton-le-Willows*

This line has very few industries situated on it. Where they do exist, industrial locations, traffic concentration centres, and the long-life collieries can be conveniently served from other lines.

Junctions to the North provide through links between Manchester and Liverpool and the main Anglo-Scottish trunk route.

(*c*) *Route via St. Helens*

A particular feature of the route is the large number of collieries either located on it or served from it. Many of these collieries have a long life expectancy. The main centre of industry served is St. Helens.

The route is some three miles longer than that via Newton-le-Willows. It also provides a through link with the main Anglo-Scottish West Coast route from the Manchester and Liverpool directions.

(*d*) *Route via Warrington*

This is the former Cheshire Lines route which is two miles longer than the route via Newton-le-Willows. There are several freight centres throughout the length of the route, the most important being at Trafford Park, Irlam, Glazebrook, Warrington and the docks at Herculaneum and Huskisson.

(*e*) *Route via Widnes*

This route, five miles longer than the line via Newton-le-Willows, is less a through link between Manchester and Liverpool than a means of providing a by-pass for Manchester.

Important centres which the route serves are at Arpley (near Warrington), the new C.E.G.B. Power Station at Fiddler's Ferry, Widnes, and the docks at Garston.

Near Widnes the route is joined by the electrified London–Liverpool line.

(2) *Physical Characteristics*

A survey of the five routes under review revealed no large items of maintenance expenditure as likely to be incurred over the next 10 years. The table which follows overleaf summarises the main physical features of each route.

(3) *Present Traffic Densities*

As mentioned in the previous example, whilst selection of routes for development must take account of capacity required for future traffic flows, it is of interest to note the levels of freight traffic passing over each of the routes under review today. The following table sets out the present situation:—

Freight traffic carried over Manchester–Liverpool routes: 1964

Route	*'000 Tons per week*
Via Wigan	25
Via St. Helens	20
Via Newton-le-Willows	20
Via Warrington	30
Via Widnes	35

PHYSICAL CHARACTERISTICS OF ROUTES

Route	Route Mileage	Maximum permitted speed mph	Permanent Speed Restrictions* (Distance)				Total cases	Gradients		Tunnels		Bridges		Viaducts	
			0 – ½ miles	½ – 2 miles	2 – 5 miles	over 5 miles		Ruling	Next Severest	No. of separate bores	Aggregate length in miles	Over Bridge	Under Bridge	No.	Aggregate length in miles
Manchester – Liverpool via Wigan	36	75	1 case 1 × 55 mph	1 case 1 × 35 mph	2 cases 1 × 40 mph 1 × 50 mph	—	4	1/45	1/55	9	1·5	99	93	4	2·5
Manchester – Liverpool via St. Helens	35	60	3 cases 1 × 20 mph 1 × 40 mph 1 × 45 mph	3 cases 1 × 15 mph 1 × 25 mph 1 × 30 mph	—	—	6	1/67	1/100	11	1·6	114	97	3	0·1
Manchester – Liverpool via Newton-le-Willows	32	75	2 cases 1 × 25 mph 1 × 60 mph	1 case 1 × 45 mph	—	—	3	1/69	1/83	11	0·75	81	37	3	1·0
Manchester – Liverpool via Warrington	34	75	3 cases 1 × 25 mph 1 × 40 mph 1 × 50 mph	1 case 1 × 30 mph	—	—	4	1/70	1/100	10	1·75	90	71	8	1·75
Manchester – Liverpool via Widnes	37	40	1 case 1 × 35 mph	2 cases 1 × 20 mph 1 × 25 mph	—	—	3	1/83	1/93	11	0·75	104	75	6	0·25

*Restrictions below 65 mph

(4) *Routes selected for development*

The conversion of future traffic flows into train loads per day in each direction, produces a total demand of some 100 trunk trains (passenger and freight) each way.

The future traffic flows in the area may be grouped as under:—

(i) flows between Manchester and Liverpool,

(ii) flows from Manchester to the north,
Liverpool to the north,

(iii) flows from Manchester to the south,
Liverpool to the south.

It is the first two groups with which we are concerned in considering the routes between Manchester and Liverpool. Flows in category (iii) have already been legislated for, and will pass on to the main Anglo-Scottish route at Crewe or, in the case of Manchester, may pass also via Stoke.

Ideally, it would be preferable if one route could combine the features of:—

(i) serving the majority of important centres of population and industry,

(ii) serving the long-life collieries in the area,

(iii) providing a connecting link from Manchester and Liverpool to the north.

No one route, however, fulfils all requirements. Thus whilst the total trunk flows could be accommodated on one route, it is considered prudent that two routes should be developed:—

(i) a route which serves the majority of the important intermediate centres,

(ii) a route which can provide connections with the collieries in the area and through links to the north.

The two routes which together best fulfil these requirements are the route via Warrington and that via St. Helens.

Further advantages of the route via Warrington are:—

(i) the favourable arrangement of connecting lines at the west end of the route permitting the serving of the docks areas,

(ii) the fact that it lends itself to the diversion of the 'trans-Pennine' diesel service would add to the density of the Warrington route,

(iii) it provides a through route from Liverpool to Sheffield, by connecting with the Woodhead electrified route at Godley.

There are no capacity difficulties for trunk services on the two selected routes. The Warrington route would cover services between Manchester and Liverpool—the route via Wigan would be adequate to cover services to and from the North.

In the case of the route via Warrington, 75% of the services are expected to run at an overall average speed of 50 mph, the remaining 25% are expected to be fairly evenly divided between inter-city passenger expresses and 'heavy' freight services.

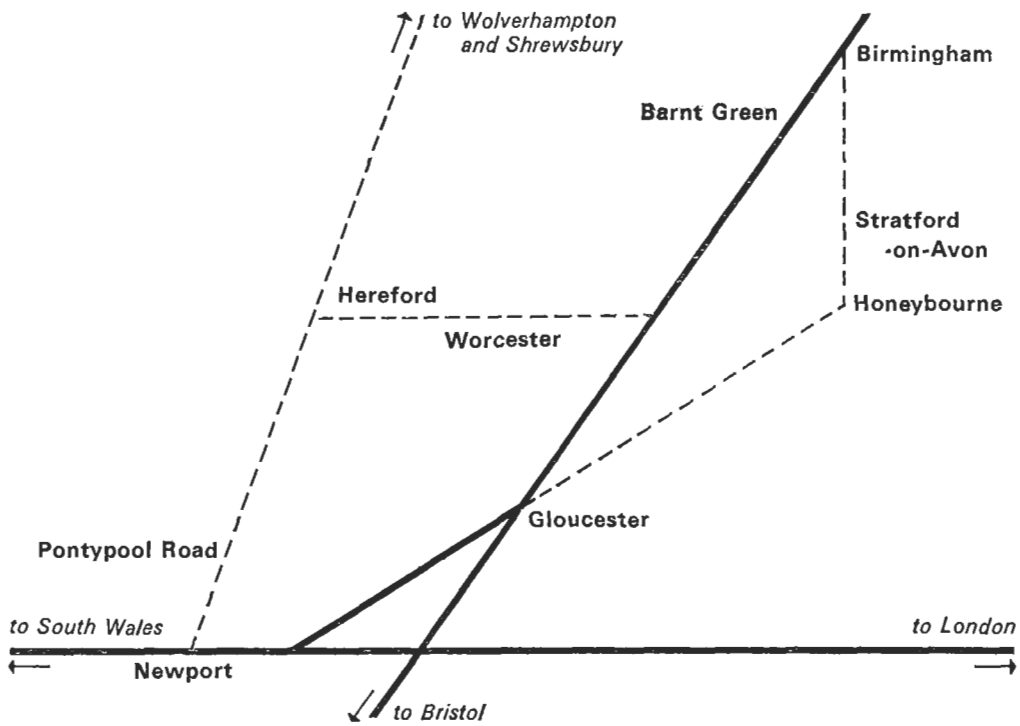
The effect of selecting two routes would be to reduce the route mileage over which trunk traffic is carried from 174 to 69.

Example III Routes between the West Midlands and South Wales/the South West

(*a*) Birmingham to Newport and Bristol, via Barnt Green and Gloucester,

(*b*) Birmingham to Newport, via Worcester and Hereford,

(*c*) Birmingham to Newport and Bristol, via Stratford-on-Avon and Gloucester.



(1) *General Considerations*

(*a*) *Route via Barnt Green*

This route between Birmingham and the South West is the south section of the former Midland Railway Company's route to the West Country.

It is the shortest of the three routes under consideration between Birmingham and Bristol. From Gloucester it connects with the Great Western line via Lydney and Chepstow to Newport.

(*b*) *Route via Worcester and Hereford*

This route provides a link between Birmingham and Newport of approximately the same mileage as route (*a*), and in so doing it serves the centres of Worcester and Hereford. It does not provide a direct connection between Birmingham and Bristol.

(*c*) *Route via Stratford-on-Avon and Gloucester*

This is part of the Great Western route from Birmingham to South Wales. It provides a through route to Bristol by feeding into the Midland route at Gloucester.

There are no major centres of population or industry located on this line.

(2) *Physical Characteristics*

A survey of the three routes under review has revealed no large items of maintenance expenditure likely to be incurred during the next 10 years.

The Table on pages 98 and 99 summarises the main physical features of each route.

The following points are of particular interest:—

(i) The Midland line has a gradient, over a length of 2 miles, of 1/38. This is just south of Barnt Green and is known as the Lickey Incline.

(ii) The Worcester—Hereford—Newport route has gradients steeper than 1/100 for approximately 8 miles of its length with a ruling gradient of 1/45.

(iii) The route via Stratford-on-Avon has 5 miles of gradient steeper than 1/51 and a ruling gradient of 1/41.

(iv) The even spread of permanent speed restrictions over all three routes.

(3) *Present Traffic Densities*

Again the point is made that whilst selection of routes for trunk movement must take account of capacity required for future traffic flows, the levels of freight traffic passing today over each route are not without interest:—

Freight traffic carried over the West Midlands—South Wales and South West Routes: 1964

Route	*'000 Tons per week*
Via Barnt Green and Gloucester	90
Via Worcester and Hereford	70
Via Stratford-on-Avon and Gloucester.. ..	60

The route via Barnt Green shows up as the principal freight route. It is also a good route between Birmingham and Bristol, from the point of view of inter-city passenger services, as it is the shortest link between these two centres. It is also attractive as a link between Birmingham and Newport, with a mileage roughly the same as by the Hereford route.

(4) *Routes selected for development*

The conversion of future traffic flows into train loads per day in each direction produces a total demand of some 45 trunk trains per day between the West Midlands and Bristol, and a similar number between the West Midlands and South Wales.

Of the alternatives, the Barnt Green route, except for the Lickey Incline, is more easily graded and is shorter. The effect of the Lickey Incline will diminish in the future as a result of technical improvement to traction and rolling stock.

Approximately 70% of the trains from the West Midlands to the South West and South Wales will have an average speed of 50 mph, the remaining 30% being divided equally between trains having an average speed of 35 mph and 70 mph.

The practical capacity of the Barnt Green route under these conditions of speed mix is calculated to be about 140 trains per day in each direction. Therefore, with a future load of 90 trains each way, spare capacity will exist even when both Bristol and South Wales trunk trains are routed over the section between Birmingham and Gloucester.

The concentration of trunk flows on to one route between Birmingham, Bristol, and South Wales, will substantially reduce the route unit cost (see Table 4 of main report) for trunk traffic, compared to the costs which would arise if all three existing routes were retained for trunk movement.

(5) *Network Considerations*

At its northern end, the Barnt Green route links naturally with the selected route from Birmingham via Derby to Yorkshire.

By branching at Gloucester, the selected route connects with the main London—South Wales route at Severn Tunnel Junction.

At Bristol it provides a direct connection with the selected route between London and the South West.

It will be appreciated that some of the selections were simpler to make than others and involved less background work. In each case, however, the investigations were carried to a depth sufficient to establish the conclusions beyond reasonable doubt.

PHYSICAL CHARACTERISTICS OF ROUTES

Route	*Route Mileage*	*Maximum permitted speed mph*	*Permanent Speed Restrictions* (Distance)*				*Gradients*		*Tunnels*		*Bridges*		*Viaducts*	
			0–½ *miles*	½–2 *miles*	2–5 *miles*	*over 5 miles*	***Ruling***	*Next severest*	*No. of separate bores*	*Aggregate length in miles*	*Over Bridge*	*Under Bridge*	*No.*	*Aggregate length in miles*
Birmingham/ S.W. via Barnt Green (Midland route) to Gloucester	52	75	3 cases 1 × 15 mph 1 × 30 mph 1 × 35 mph	1 case 1 × 60 mph	1 case 1 × 40 mph	—	**1/38**	1/80	7	0·5	69	71	1	0·125
Birmingham/ S.W. via Stratford-on-Avon to Gloucester.	62	75	3 cases 1 × 20 mph 1 × 25 mph 1 × 35 mph	1 case 1 × 40 mph	—	1 case 1 × 60 mph	1/41	1/47	3	0·5	85	112	4	0·75
Birmingham Worcester Hereford Pontypool Road	96	90	2 cases 1 × 30 mph 1 × 50 mph	2 cases 1 × 10 mph 1 × 40 mph	1 case 1 × 60 mph	—	1/45	1/51	8	2·5	127	203	8	1·0

*Restrictions below 65 mph

Thousand tons per year

RAILWAY TRAFFIC 1984 Flows between main areas (Total Freight)

APPENDIX B

TO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
FROM																
1 CLYDE/FORTH	—	950	800	50	200	—	2,200	50	50	50	250	850	2,050	100	—	7,600
2 TYNE/TEES	1,750	—	950	100	600	50	1,850	200	50	400	300	1,300	1,950	550	—	10,050
3 S. YORKS	800	400	—	2,100	1,950	550	4,350	150	50	150	200	3,600	10,200	200	—	24,700
4 HUMBER	50	500	1,650	—	2,100	50	800	—	—	250	150	600	650	50	—	6,850
5 E. MIDLANDS	500	2,900	2,750	10,850	—	600	7,450	500	300	350	2,150	3,650	5,350	50	4,000	41,400
6 E. ANGLIA	—	50	50	—	100	—	550	—	—	—	—	—	50	—	—	800
7 Greater LONDON	3,100	1,050	1,500	700	2,350	1,200	—	500	750	1,050	1,600	4,900	6,350	100	—	25,150
8 SOUTHAMPTON	150	—	200	—	50	—	250	—	100	—	150	3,950	250	—	—	5,100
9 S.W. ENGLAND	—	50	—	—	50	—	500	—	—	100	100	50	150	—	—	1,000
10 SEVERN AREA	100	50	100	—	350	—	800	50	600	—	1,200	300	850	—	—	4,400
11 S. WALES	150	50	400	50	100	—	2,750	300	250	250	—	3,350	850	—	—	8,500
12 W. MIDLANDS	250	200	250	200	1,350	—	550	100	550	850	200	—	850	—	—	5,350
13 S. LANCS	4,800	2,050	950	600	700	50	6,800	250	250	900	1,100	1,900	—	550	—	20,900
14 N.W. ENGLAND	550	400	100	—	50	—	100	—	—	—	100	50	650	—	—	2,000
15 *Didcot*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	12,200	8,650	9,700	14,650	9,950	2,500	28,950	2,100	2,950	4,350	7,500	24,500	30,200	1,600	4,000	163,800

FROM \ TO	ABERDEEN	BANBURY	BIRMINGHAM	BRISTOL	BURTON	CARDIFF	CARLISLE	CHATHAM	CHESTER	CORBY	COVENTRY	DAGENHAM	DONCASTER	DUNDEE	EDINBURGH	EXETER	GLASGOW	GLOUCESTER	GRIMSBY	HULL	LEEDS	LEICESTER	LINCOLN	LIVERPOOL	LONDON	MANCHESTER	NEWCASTLE	NORWICH	NOTTINGHAM	OXFORD	PETERBOROUGH	PLYMOUTH	PRESTON	READING	SCUNTHORPE	SHEFFIELD	SOUTHAMPTON	STIRLING	STOCKTON	STOKE	SWANSEA	WARRINGTON	TOTAL
ABERDEEN	—	—	150	—	—	—	—	—	—	—	—	—	—	—	100	—	150	—	—	—	—	—	—	—	350	100	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	900
BANBURY	—	—	150	—	—	350	—	—	100	150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	250	550	—	1,600
BIRMINGHAM	—	—	—	800	—	100	—	—	—	750	—	—	50	—	—	500	250	50	—	100	50	50	—	100	500	50	100	—	50	—	500	50	50	—	50	100	100	—	50	—	100	500	5,000
BRISTOL	—	—	100	—	—	100	—	50	50	—	—	—	50	—	—	150	100	—	—	—	50	50	—	50	650	100	50	—	150	—	—	350	—	50	—	—	—	—	50	250	50	2,500
BURTON	—	—	50	—	—	100	50	—	50	—	—	—	—	—	—	50	50	50	50	50	250	—	—	100	700	50	50	—	—	—	—	50	—	—	—	100	50	—	50	50	150	—	2,100
CARDIFF	—	—	600	100	—	—	—	250	—	—	50	—	50	—	—	100	100	50	—	50	100	—	—	150	1,400	200	50	—	100	—	—	100	100	50	—	100	300	—	—	100	—	50	4,150
CARLISLE	50	—	50	—	—	—	—	—	150	—	—	—	50	150	100	—	300	—	—	—	50	50	—	250	100	100	100	—	—	—	—	—	50	—	—	—	—	—	300	50	100	50	2,050
CHATHAM	50	—	3,650	150	—	100	—	—	50	—	50	—	50	100	150	50	300	—	—	—	100	50	—	300	—	350	100	—	1,050	—	—	200	—	—	—	100	—	—	100	—	—	50	7,100
CHESTER	—	—	750	50	50	100	50	—	—	—	250	—	50	50	—	—	1,550	50	—	—	500	—	—	—	650	—	100	—	—	—	—	—	—	—	—	—	50	—	100	—	50	—	4,400
CORBY	—	—	250	—	—	150	—	50	550	—	—	350	50	—	—	—	—	—	—	50	50	—	—	—	600	400	250	—	2,450	—	—	—	—	—	5,450	1,850	250	—	1,850	400	—	—	15,000
COVENTRY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	50	50	—	—	50	50	50	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	350
DAGENHAM	—	—	350	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	500	—	—	—	1,000	—	—	—	—	—	—	—	350	—	—	—	—	—	—	2,200
DONCASTER	—	—	50	—	—	—	—	—	—	—	50	1,250	—	—	—	50	—	—	—	1,000	—	—	—	50	850	—	100	550	100	—	—	—	1,750	—	50	—	50	—	—	—	—	—	—	5,900
DUNDEE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100	—	—	—	100	50	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	350
EDINBURGH	500	—	150	—	—	—	50	—	—	—	—	—	—	100	—	—	—	—	—	—	150	—	—	200	500	250	350	—	—	—	—	—	—	—	—	50	—	—	50	—	—	—	2,350
EXETER	—	—	—	50	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	400	50	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	600
GLASGOW	550	—	600	50	50	250	50	—	100	—	—	—	—	—	—	—	—	—	—	50	300	100	—	350	1,200	850	350	—	100	—	—	50	50	—	—	200	50	—	100	—	—	100	5,500
GLOUCESTER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	50	—	—	—	—	—	—	50	50	50	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	300
GRIMSBY	—	—	150	200	—	50	—	—	50	400	—	—	—	—	—	—	—	—	—	—	—	100	—	200	350	50	150	—	500	—	50	—	—	—	—	450	—	—	100	—	—	—	2,800
HULL	—	—	350	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	50	50	50	350	50	100	—	850	—	—	—	—	—	—	350	—	—	—	—	—	—	2,250
LEEDS	100	—	50	100	—	100	50	—	—	—	—	—	—	50	100	—	300	—	50	1,000	—	50	—	250	1,050	—	—	—	—	—	—	1,500	50	—	—	50	—	—	—	—	—	—	4,850
LEICESTER	—	—	100	50	—	—	—	—	—	—	—	—	—	—	50	50	100	—	50	50	50	—	—	50	250	—	200	50	—	—	—	50	—	—	—	50	150	—	—	—	—	—	1,300
LINCOLN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	50	100	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	250
LIVERPOOL	50	—	500	250	—	300	450	—	—	—	50	—	—	150	—	50	950	150	—	550	150	150	50	—	2,150	—	500	—	200	—	—	50	—	—	—	50	100	—	450	—	400	—	7,700
LONDON	150	—	800	750	150	1,050	100	—	50	50	50	—	200	200	350	200	1,300	150	50	100	850	150	100	1,900	—	1,450	550	200	800	—	—	250	200	—	50	300	100	—	350	450	300	100	13,800
MANCHESTER	—	—	100	150	50	50	—	—	—	—	250	—	50	—	—	—	250	50	—	—	50	50	—	—	1,700	—	400	50	—	—	—	50	—	—	—	50	—	—	50	—	50	—	3,400
NEWCASTLE	100	—	450	150	—	100	550	50	—	—	—	—	50	50	100	—	500	—	—	—	50	50	—	250	550	550	—	—	50	—	—	—	50	50	—	150	100	—	—	50	50	—	4,050
NORWICH	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	50	—	—	550	50	—	—	50	—	—	—	—	—	—	—	—	—	50	—	—	—	800
NOTTINGHAM	—	—	3,000	200	—	1,700	—	1,250	—	—	250	—	250	—	100	50	200	50	—	50	50	—	—	550	4,100	3,050	150	500	—	4,000	—	100	—	50	5,050	50	100	—	—	—	50	—	24,900
OXFORD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	500	—	—	500	—	—	—	500	—	500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,000
PETERBOROUGH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	50	150	50	—	—	—	—	—	—	—	—	—	—	100	—	—	—	400
PLYMOUTH	—	—	50	50	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100	—	50	—	50	—	—	—	—	—	—	—	—	—	—	50	—	—	400
PRESTON	—	—	50	50	—	—	—	—	—	—	—	—	—	—	50	—	1,050	—	—	—	—	—	—	—	400	—	100	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	1,750
READING	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	50	—	150
SCUNTHORPE	—	—	50	50	50	100	50	—	—	—	50	—	—	—	—	—	—	—	—	—	100	—	—	100	100	50	100	50	100	—	—	—	—	—	—	750	—	—	100	—	—	50	1,850
SHEFFIELD	—	—	450	—	1,000	100	150	—	—	750	3,000	—	—	—	50	—	200	50	—	—	—	—	—	900	1,100	3,500	250	—	50	50	—	—	2,250	—	—	50	—	—	—	—	—	—	13,900
SOUTHAMPTON	—	—	3,950	—	50	100	—	—	—	—	—	—	—	—	50	50	100	—	—	—	200	—	—	200	250	50	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	5,050
STIRLING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
STOCKTON	100	—	700	250	100	100	—	250	50	—	150	—	50	50	150	—	500	50	—	50	550	50	150	750	850	200	—	50	200	50	—	50	50	100	—	100	100	100	—	—	100	50	6,050
STOKE	—	—	—	—	—	—	—	—	—	—	—	—	50	—	50	—	—	—	—	—	—	100	—	—	300	—	50	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	600
SWANSEA	—	—	2,650	50	—	—	—	—	50	—	50	250	50	—	—	—	50	50	—	—	50	—	—	100	600	50	—	—	—	250	—	50	—	—	—	50	—	—	—	—	—	50	4,400
WARRINGTON	—	—	—	100	—	150	50	—	—	—	—	—	—	150	150	100	400	50	—	50	—	50	—	—	1,400	—	200	—	—	50	—	50	—	50	—	—	100	—	50	—	50	—	3,200
TOTAL	1,650	—	20,300	3,600	1,500	5,300	1,600	1,900	1,250	2,100	4,250	1,850	1,100	1,050	1,550	1,450	9,350	800	200	3,700	3,900	1,150	350	8,050	24,350	12,300	4,750	2,500	6,900	4,400	550	1,600	6,050	400	10,650	4,850	2,100	100	3,900	1,500	2,250	1,100	168,200

FROM \ TO	ABERDEEN	BANBURY	BIRMINGHAM	BRISTOL	BURTON	CARDIFF	CARLISLE	CHATHAM	CHESTER	CORBY	COVENTRY	DAGENHAM	DONCASTER	DUNDEE	EDINBURGH	EXETER	GLASGOW	GLOUCESTER	GRIMSBY	HULL	LEEDS	LEICESTER	LINCOLN	LIVERPOOL	LONDON	MANCHESTER	NEWCASTLE	NORWICH	NOTTINGHAM	OXFORD	PETERBOROUGH	PLYMOUTH	PRESTON	READING	SCUNTHORPE	SHEFFIELD	SOUTHAMPTON	STIRLING	STOCKTON	STOKE	SWANSEA	WARRINGTON	TOTAL
ABERDEEN	—	—	100	—	—	—	—	—	—	—	—	—	—	—	90	—	160	—	—	—	—	—	—	—	360	100	60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	870
BANBURY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BIRMINGHAM	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	20	180	—	—	90	60	—	—	—	390	—	80	—	—	—	—	40	40	—	—	—	60	—	—	30	—	1,050
BRISTOL	—	—	—	—	—	—	—	—	40	—	—	—	—	—	—	—	80	—	—	—	50	—	—	70	580	40	50	—	160	—	—	220	—	—	—	—	—	—	—	—	—	70	1,360
BURTON	—	—	—	—	—	110	—	—	—	—	—	—	—	—	—	60	—	—	—	20	—	—	—	—	450	—	40	—	—	—	—	30	—	10	—	—	30	—	60	—	30	—	840
CARDIFF	—	—	450	—	—	—	—	—	—	—	50	—	—	—	—	90	50	—	—	—	100	—	—	160	620	160	—	—	—	—	—	90	30	—	—	100	—	—	—	—	—	—	1,900
CARLISLE	40	—	40	—	—	—	—	—	80	—	—	—	—	80	30	—	60	—	—	—	40	60	—	220	80	30	—	—	—	—	—	—	—	—	—	—	—	—	40	10	80	—	890
CHATHAM	50	—	160	140	—	100	—	—	50	—	30	—	—	120	130	60	80	—	—	—	100	—	—	300	—	360	90	—	30	—	—	180	—	—	—	80	—	—	90	—	—	30	2,180
CHESTER	—	—	—	40	—	90	—	—	—	—	—	—	—	50	—	—	180	60	—	20	—	—	—	—	180	—	120	—	—	20	—	—	—	—	—	—	40	—	90	—	40	—	930
CORBY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
COVENTRY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	60	40	—	—	60	—	—	50	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	260
DAGENHAM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
DONCASTER	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	—	—	—	—	310	—	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	360
DUNDEE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	90	50	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	250
EDINBURGH	360	—	80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	130	—	—	180	270	180	280	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,480
EXETER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	260	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	260
GLASGOW	310	—	540	—	—	100	50	—	120	—	—	—	—	—	—	—	—	—	—	—	260	40	—	360	1,170	570	310	—	80	10	—	—	40	10	—	160	50	—	60	—	—	90	4,330
GLOUCESTER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	20	—	—	60	60	60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	230
GRIMSBY	—	—	160	180	—	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	—	220	360	60	90	—	—	—	—	—	—	—	—	—	—	30	—	—	—	1,180
HULL	—	—	280	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	40	300	—	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	730
LEEDS	120	—	60	80	—	100	30	—	—	—	—	—	—	60	100	—	180	—	—	—	—	50	—	—	1,010	—	—	—	—	10	—	—	—	40	—	—	40	—	—	—	—	—	1,880
LEICESTER	10	—	—	60	—	—	—	—	—	—	—	—	—	—	30	40	120	—	—	—	30	—	—	50	260	—	70	—	—	—	—	30	—	—	—	—	160	—	20	—	—	10	890
LINCOLN	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	110	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	160
LIVERPOOL	50	—	—	270	—	160	440	—	—	—	60	—	—	130	—	40	720	150	—	50	—	130	50	—	2,170	—	470	—	190	20	—	40	—	—	—	90	—	440	—	360	—	6,030
LONDON	140	—	820	290	80	600	40	—	60	—	—	—	80	100	310	160	710	130	70	80	730	60	90	1,810	—	1,190	500	130	770	—	—	180	200	—	—	160	—	—	280	470	220	120	10,580
MANCHESTER	—	—	—	110	—	70	—	—	—	—	—	—	—	—	—	—	250	60	—	—	—	—	—	—	1,620	—	270	—	—	—	—	—	—	—	—	—	—	20	—	30	—	2,430
NEWCASTLE	60	—	360	80	—	40	—	—	—	—	—	—	20	—	60	—	160	10	20	20	—	30	—	120	430	440	—	—	40	—	—	—	30	—	—	80	50	—	—	—	30	—	2,080
NORWICH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	190	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	190
NOTTINGHAM	—	—	—	160	—	180	—	—	—	—	—	—	—	—	—	60	180	40	—	—	—	—	—	70	880	—	110	—	—	10	—	30	20	30	—	—	40	—	—	—	50	—	1,860
OXFORD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PETERBOROUGH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	50	160	—	—	—	—	—	—	—	—	—	—	100	—	—	—	340
PLYMOUTH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60
PRESTON	—	—	60	30	—	—	—	—	—	—	—	—	—	—	40	—	60	—	—	—	—	10	—	—	360	—	80	—	30	20	—	—	—	20	—	—	—	10	—	—	—	—	720
READING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SCUNTHORPE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SHEFFIELD	—	—	—	20	—	70	110	—	—	—	—	—	—	—	50	—	180	—	—	—	—	—	—	—	790	—	140	—	—	50	—	—	—	—	—	—	50	—	—	—	—	—	1,460
SOUTHAMPTON	—	—	440	—	—	60	—	—	—	—	—	—	—	—	—	40	120	—	—	—	180	—	—	180	—	60	—	—	—	—	—	60	—	—	—	—	—	—	—	—	20	—	1,160
STIRLING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
STOCKTON	120	—	620	180	—	50	20	180	—	—	90	—	—	—	100	—	270	30	10	—	—	60	—	710	770	130	—	—	160	—	—	—	60	40	—	—	90	—	—	—	30	60	3,780
STOKE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	240	—	30	—	—	—	—	—	—	—	—	—	—	60	—	—	—	330
SWANSEA	—	—	310	—	—	—	—	—	—	—	30	—	—	—	—	—	60	—	—	—	60	—	—	100	310	60	—	—	—	—	—	—	—	—	—	60	—	—	—	—	—	30	1,020
WARRINGTON	—	—	—	110	—	160	—	—	—	—	—	—	—	130	130	80	400	30	—	60	—	30	10	—	1,340	—	190	—	—	50	—	30	—	30	—	—	100	—	40	—	30	—	2,950
TOTAL	1,260	—	4,480	1,750	80	2,010	690	180	350	—	290	—	100	670	1,070	650	4,260	510	100	400	1,850	560	150	4,770	16,020	3,540	3,280	130	1,460	190	—	930	440	180	—	640	800	—	1,340	480	950	460	57,020

FROM \ TO	ABERDEEN	BANBURY	BIRMINGHAM	BRISTOL	BURTON	CARDIFF	CARLISLE	CHATHAM	CHESTER	CORBY	COVENTRY	DAGENHAM	DONCASTER	DUNDEE	EDINBURGH	EXETER	GLASGOW	GLOUCESTER	GRIMSBY	HULL	LEEDS	LEICESTER	LINCOLN	LIVERPOOL	LONDON	MANCHESTER	NEWCASTLE	NORWICH	NOTTINGHAM	OXFORD	PETERBOROUGH	PLYMOUTH	PRESTON	READING	SCUNTHORPE	SHEFFIELD	SOUTHAMPTON	STIRLING	STOCKTON	STOKE	SWANSEA	WARRINGTON	TOTAL
ABERDEEN	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50
BANBURY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BIRMINGHAM	—	—	—	30	—	40	—	—	—	—	—	—	30	—	—	—	20	50	—	—	—	50	—	120	120	—	—	—	20	—	—	—	—	—	30	—	40	—	30	—	—	—	580
BRISTOL	—	—	120	—	—	—	—	50	—	—	—	—	20	—	—	170	—	—	—	—	—	40	—	—	40	30	—	—	—	—	—	120	—	50	—	—	50	—	50	240	—	980
BURTON	—	—	—	—	—	—	50	—	50	—	—	—	—	—	—	—	10	50	50	50	240	—	—	80	240	50	—	—	—	—	—	—	—	—	—	100	—	—	—	—	120	—	1,090
CARDIFF	—	—	—	120	—	—	—	—	—	—	—	—	30	—	—	—	50	—	—	30	—	—	—	—	—	50	10	—	120	—	—	—	50	—	—	30	—	—	—	—	—	—	490
CARLISLE	—	—	—	—	—	—	—	—	50	—	—	—	20	50	50	—	40	—	—	—	—	—	—	50	—	50	120	—	—	—	—	—	—	—	—	—	—	—	240	50	—	50	770
CHATHAM	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	240	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	320
CHESTER	—	—	—	—	30	—	20	—	—	—	—	—	10	—	20	—	360	—	—	—	—	—	—	—	480	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	920
CORBY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
COVENTRY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
DAGENHAM	—	—	360	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	480	—	—	—	—	—	—	—	—	—	—	—	360	—	—	—	—	—	1,200
DONCASTER	—	—	30	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	20	—	40	40	120	—	—	—	—	10	—	40	—	—	—	—	—	—	350
DUNDEE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50
EDINBURGH	120	—	40	—	—	—	40	—	—	—	—	—	—	120	—	—	—	—	—	—	—	—	—	—	240	30	50	—	—	—	—	—	—	—	—	50	—	—	50	—	—	—	740
EXETER	—	—	—	50	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	120	50	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	320
GLASGOW	—	—	—	30	20	120	—	—	—	—	—	—	—	—	—	—	—	—	—	40	30	50	—	—	20	240	—	—	—	—	—	40	—	—	—	—	—	—	40	—	—	—	630
GLOUCESTER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	100
GRIMSBY	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	50	—	100	—	50	—	—	—	—	—	—	50	—	—	—	—	350
HULL	—	—	30	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	50	—	50	40	—	—	120	—	—	—	—	—	—	360	—	—	—	—	—	—	680
LEEDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	120	—	50	—	—	—	—	240	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	460
LEICESTER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	50	—	—	—	—	—	—	120	40	—	—	—	—	—	—	—	50	—	—	—	—	—	—	310
LINCOLN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100
LIVERPOOL	—	—	480	—	—	120	—	—	—	—	—	—	—	—	—	—	240	—	—	480	170	—	—	—	—	—	40	—	—	—	—	—	—	—	—	50	—	—	—	—	30	—	1,610
LONDON	—	—	—	480	—	360	50	—	—	—	10	—	—	120	50	50	540	—	—	—	—	100	—	80	—	240	—	40	10	—	—	50	—	—	20	120	120	—	50	—	—	—	2,490
MANCHESTER	—	—	100	10	50	—	—	—	—	—	240	—	50	—	—	—	—	—	—	—	50	50	—	—	70	—	120	50	—	—	—	50	—	—	—	—	—	—	—	—	—	—	840
NEWCASTLE	20	—	—	10	—	—	30	50	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	120	—	—	—	—	—	—	—	—	50	—	—	—	20	—	—	—	—	—	350
NORWICH	—	—	—	—	—	—	—	—	—	—	—	—	40	—	—	—	—	—	—	—	—	50	—	—	360	50	—	—	40	—	—	—	—	—	—	—	—	20	—	—	—	—	560
NOTTINGHAM	—	—	—	30	—	—	—	—	—	—	240	—	240	—	120	—	—	—	—	50	40	—	—	480	480	—	—	—	—	—	—	50	—	—	30	—	50	—	—	—	—	—	1,810
OXFORD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	480	—	—	480	—	—	—	480	—	480	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,920
PETERBOROUGH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	50
PLYMOUTH	—	—	50	50	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	—	—	40	—	50	—	—	—	—	—	—	—	—	—	50	—	—	—	290
PRESTON	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50
READING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	50	—	100
SCUNTHORPE	—	—	—	30	20	—	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	—	—	—	—	110
SHEFFIELD	—	—	—	—	—	30	40	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	50	—	—	120	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	280
SOUTHAMPTON	—	—	—	—	50	20	—	—	—	—	—	—	—	—	40	—	—	—	—	—	—	—	—	240	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	350
STIRLING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
STOCKTON	—	—	100	50	10	50	—	40	10	—	—	—	20	—	—	—	240	—	—	—	50	—	170	—	—	—	—	10	—	—	—	20	—	50	—	—	—	120	—	—	—	—	940
STOKE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	120	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	170
SWANSEA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	—	70
WARRINGTON	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100
TOTAL	140	—	1,360	890	180	800	310	140	160	—	490	—	490	290	280	320	2,370	170	150	1,180	730	560	220	2,130	2,780	1,310	760	260	590	—	50	460	50	150	90	730	710	120	480	200	440	50	22,590

RAILWAY TRAFFIC 1984 Trunk Trains per day

FROM \ TO	ABERDEEN	BANBURY	BIRMINGHAM	BRISTOL	BURTON	CARDIFF	CARLISLE	CHATHAM	CHESTER	CORBY	COVENTRY	DAGENHAM	DONCASTER	DUNDEE	EDINBURGH	EXETER	GLASGOW	GLOUCESTER	GRIMSBY	HULL	LEEDS	LEICESTER	LINCOLN	LIVERPOOL	LONDON	MANCHESTER	NEWCASTLE	NORWICH	NOTTINGHAM	OXFORD	PETERBOROUGH	PLYMOUTH	PRESTON	READING	SCUNTHORPE	SHEFFIELD	SOUTHAMPTON	STIRLING	STOCKTON	STOKE	SWANSEA	WARRINGTON	TOTAL
ABERDEEN	—	—	1	—	—	—	—	—	—	—	—	—	—	—	6	—	6	—	—	—	—	—	—	—	7	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24
BANBURY	—	—	1	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	7
BIRMINGHAM	—	1	—	13	1	9	—	11	7	4	—	2	9	—	—	2	3	—	1	1	—	—	—	6	18	—	1	—	10	—	2	—	2	—	—	3	13	—	6	—	8	35	168
BRISTOL	—	—	10	—	1	4	—	—	2	—	—	—	—	—	—	3	—	—	1	—	1	—	—	1	19	1	1	—	3	—	—	8	—	—	—	1	1	—	1	—	4	1	63
BURTON	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	7	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	13
CARDIFF	—	2	12	4	—	—	—	1	—	1	—	—	—	—	—	1	2	—	—	—	2	—	—	3	18	2	—	—	1	—	—	1	—	—	—	2	1	—	1	—	—	1	55
CARLISLE	—	—	—	—	—	—	—	—	1	—	—	—	3	1	—	—	13	—	—	1	—	1	—	2	1	—	3	—	—	—	—	—	—	—	—	—	—	—	7	—	1	10	44
CHATHAM	1	—	18	1	—	1	—	—	1	—	—	—	—	1	1	1	3	—	—	—	2	—	—	3	—	4	1	—	9	—	—	2	—	—	—	—	1	—	—	—	—	50
CHESTER	—	—	3	—	—	1	—	—	—	2	1	—	—	1	—	—	10	1	—	—	2	—	—	—	7	—	1	—	—	1	—	—	—	—	—	—	1	—	1	—	—	—	32
CORBY	—	1	1	—	—	1	—	—	3	—	—	1	—	—	—	—	—	—	2	—	—	—	—	—	2	2	1	—	17	—	—	—	—	—	28	10	1	—	9	2	—	—	79
COVENTRY	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	1	—	—	10	—	—	—	1	—	—	—	—	—	—	—	—	—	16
DAGENHAM	—	—	3	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	4	4	—	—	—	—	—	—	3	—	—	—	1	—	20
DONCASTER	—	—	9	—	—	—	3	—	—	—	—	6	—	—	—	—	—	—	—	9	—	—	—	—	12	—	—	3	13	—	—	—	8	—	11	—	—	—	19	—	—	4	97
DUNDEE	—	—	—	—	—	—	2	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	9
EDINBURGH	5	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	3	10	3	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	28
EXETER	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—	—	—	3	—	—	—	—	—	5	—	—	—	—	—	—	18
GLASGOW	10	—	8	—	—	2	13	1	6	—	—	—	—	—	—	—	—	—	—	—	4	—	—	6	22	8	3	—	1	2	—	—	3	—	—	2	1	—	2	—	—	1	95
GLOUCESTER	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	1	4
GRIMSBY	—	—	2	3	—	1	—	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	3	4	—	1	—	2	—	—	—	—	—	—	2	—	—	—	—	—	—	21
HULL	—	—	3	—	—	—	1	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	10	5	—	—	—	8	2	—	—	—	—	—	6	—	—	1	—	—	—	40
LEEDS	1	—	1	2	1	1	—	—	2	—	—	—	—	1	1	—	3	—	—	4	—	—	—	3	16	—	—	—	1	—	—	—	8	—	—	—	1	—	3	—	—	—	49
LEICESTER	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	9	—	2	—	—	—	—	1	—	—	—	2	—	1	1	—	—	20
LINCOLN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	3
LIVERPOOL	1	—	5	3	—	3	4	—	—	—	1	2	—	1	1	1	11	1	—	13	2	2	1	—	29	—	6	—	4	2	—	2	—	—	—	6	1	—	6	—	4	—	112
LONDON	3	—	21	18	2	16	—	—	2	2	—	—	10	2	8	6	20	1	13	7	13	14	1	25	—	20	11	13	39	—	4	5	5	—	2	7	10	2	8	6	8	5	329
MANCHESTER	—	—	—	1	—	—	—	—	—	2	2	—	—	—	1	—	4	1	—	—	—	—	—	—	25	—	4	—	1	2	—	1	—	—	—	20	1	—	—	—	2	—	67
NEWCASTLE	—	—	4	1	—	1	3	—	—	1	—	—	—	—	1	—	2	—	1	—	—	2	—	3	11	6	—	—	—	4	—	—	1	1	—	1	1	—	—	—	—	—	40
NORWICH	—	—	—	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	—	—	—	—	—	—	15	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	23
NOTTINGHAM	—	—	21	1	—	9	—	9	—	9	2	—	14	—	1	2	2	—	2	3	1	—	—	4	37	14	1	3	—	18	—	—	—	—	29	—	—	—	—	—	1	4	187
OXFORD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	4	—	—	—	4	—	4	—	—	12	—	—	—	—	—	—	—	1	—	—	—	1	—	30
PETERBOROUGH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	4
PLYMOUTH	—	—	—	5	4	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	4	1	1	—	—	—	—	—	—	—	—	3	—	—	—	—	—	21
PRESTON	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	9	—	—	—	6	—	1	—	—	—	—	—	—	—	—	9	1	—	—	—	—	31
READING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
SCUNTHORPE	—	—	—	—	—	—	—	—	—	18	—	—	26	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	7	—	—	—	—	—	2	—	—	—	—	—	—	55
SHEFFIELD	—	—	2	—	4	2	1	—	—	10	13	—	—	—	1	1	2	—	2	2	—	—	—	7	14	15	2	—	—	—	—	—	10	1	2	—	—	—	1	—	—	—	92
SOUTHAMPTON	—	—	22	1	—	—	—	—	1	1	—	2	—	—	—	—	2	—	—	—	2	—	—	2	11	2	—	—	1	—	—	—	1	—	—	—	—	—	1	—	1	—	49
STIRLING	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	3
STOCKTON	2	—	7	2	—	1	6	2	—	7	1	—	19	—	1	—	6	—	—	1	2	1	1	8	9	1	—	—	1	—	—	—	—	—	—	—	2	1	—	—	1	3	85
STOKE	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7
SWANSEA	—	2	15	2	1	—	—	—	—	—	1	1	—	—	—	—	1	—	—	—	1	—	—	1	8	2	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	37
WARRINGTON	—	—	11	1	—	2	10	—	—	—	—	—	4	1	2	—	4	—	—	—	—	—	—	—	19	—	2	—	4	—	—	—	—	—	—	2	2	—	3	—	—	—	67
TOTAL	24	7	181	63	14	57	43	24	27	63	22	17	90	9	26	18	103	4	22	46	46	21	3	104	362	89	51	23	156	28	6	22	38	1	70	83	44	3	75	10	35	65	2,195

Note—Includes all classes of freight, empties and passenger services.

