Urban Goods Movement in Sydney

Occasional Paper

Transport planning and research has placed considerable emphasis on the movement of people but comparatively little on the movement of goods. Such neglect prompted the Commonwealth Bureau of Roads to sponsor a Workshop on Urban Goods Movement in January 1975 as a means of gaining an insight into the topic.

Subject
Series
Date
A to Z
Search
Results
Print
Exit
GO BACK

BUREAU OF TRANSPORT ECONOMICS

URBAN GOODS MOVEMENT IN SYDNEY

P.J. Rimmer

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE
CANBERRA 1978

Printed by Watson Ferguson and Co., Brisbane

FOREWORD

In January 1975, a two-day workshop on urban goods transport was held at the Commonwealth Bureau of Roads (Melbourne). It was considered that the study of urban freight had been a generally neglected field, belying both its importance and its complexity. The workshop addressed itself to several questions of fundamental significance and the proceedings published by the Bureau of Roads provide a wide review of the current state-of-the-art. In addition, the workshop indicated the need for an empirical investigation of urban goods movement on nominated issues, the general feeling being that much could be gained by focusing attention on Sydney.

Following the workshop, the then Bureau of Roads implemented a work programme into urban goods movement which provided the basis for recommendations in the Report on Roads in Australia, 1975. A study-design was developed and an empirical investigation of urban goods movement issues in Sydney was commenced. This occasional paper presents the results of that investigation within the framework for the examination of the urban goods movement process. Deficiencies in the system and policy options available for their resolution are identified.

The report was written by Dr. Peter Rimmer of the Department of Human Geography, Research School of Pacific Studies, the Australian National University in conjunction with Bureau of Roads staff. Work carried out for the Bureau of Roads by W.D. Scott and Co. Pty. Ltd., and A.H. Meyburg and P.R. Stopher was utilised in preparing this report and their contributions are acknowledged. Diagrams, unless otherwise shown, were drawn by M.U. Pancino of the Department of Human Geography, Research School of Pacific Studies, Australian National University.

The work is published under the aegis of the new Bureau of Transport Economics (formed in June 1977) by the amalgamation of the then Bureau of Roads and the then Bureau of Transport Economics) as it represents some of the more significant exploratory work on urban freight research undertaken in this country.

(G.R. CARR)
Acting Assistant Director
Transport Planning Branch

Bureau of Transport Economics
Canberra
February 1978

CONTENTS

FIGURES

TABLES

CHAPTER 1 - INTRODUCTION

Transport planning and research has placed considerable emphasis on the movement of people but comparatively little on the movement of goods. Such neglect prompted the Commonwealth Bureau of Roads to sponsor a Worshop on Urban Goods Movement in January 1975 as a means of gaining an insight into the topic. The Workshop was attended by shippers, freight forwarders, vehicle owners, terminal operators, highway authority representatives, academics and members of Commonwealth and State Government departments and instrumentalities, and the Workshop proceedings, edited by Ogden and Hicks, contain the position papers and other notes together with suggestions as to the direction of future research[1].

Following the Workshop the Bureau of Roads implemented a work programme into urban goods movement. A major component of the work programme was the creation of a study-design, as participants at the Workshop, chastened by experience with data-consuming transportation studies, emphasised the need to develop a study-design before rushing into data collection. A discussion of the study-design that was subsequently developed is included as an Appendix to the present document.

Another aspect of the work programme stemming from the Workshop was an empirical investigation of urban goods movements issues in Sydney. The results from the investigation are discussed in this report.

Before the results are examined, a general framework is established which puts the urban goods issue in a national context (Chapter 2). Within the framework an examination is made of the reasons for the general neglect of the urban goods movement topic, and the need

---

(1) Ogden, K.W. and Hicks, S.K. (eds.), Goods Movement and Goods Vehicles in Urban Areas, Commonwealth Bureau of Roads, Melbourne, 1975.

for greater involvement by the Bureau. Past Australian studies on urban goods movement are reviewed, highlighting the pressing need in Australia to understand the nature of the urban goods movement process - the task of comprehending why goods move in space and over time (Chapter 3). As it is difficult, given the present state of the art, to make recommendations on major changes to plant, equipment and technology in the urban goods movement process, an incremental planning approach is adopted that grades projects in terms of their certainty of "success" (Chapter 4).

Within the context of the incremental planning approach the dimensions of Sydney's urban goods movement task is indicated (Chapter 5). This general survey is preparatory to the identification and location of deficiencies in Sydney's urban goods movement system (Chapter 6). The shortcomings are classed as either operational deficiencies, spot network deficiencies, or major network deficiencies. Strategies for resolving each of these sets of deficiencies are outlined as a series of "very certain" policies that accord with the incremental planning approach adopted (Chapter 7). The final chapter provides a summary of the Report's contents, including conclusions on method and approach.

CHAPTER 2 - THE NATIONAL CONTEXT

Australian urban areas depend for their existence on a massive flow of people and goods into, out of, and through them. While considerable emphasis has been given to facilitating the movement of people little attention has been given to the movement of goods. This neglect prompts an examination of the need to study urban goods movements in Australia. Such an examination is necessarily preparatory to outlining why the Commonwealth Government should be involved in urban goods movement and indicating what research has been undertaken on the topic in Australia.

THE DISREGARD OF URBAN GOODS MOVEMENT

The comparative neglect of urban goods movement in Australia is attributed to the pronounced passenger bias in transport planning and research. The bias stems partly from the practice of simplifying assumptions concerning urban goods movement in planning highway networks and partly as a response to electoral, and subsequently governmental, demands for speedy solutions to conspicuous passenger transport problems.

Truck operators have been unable to counter the emphasis on passenger transport because they have had to rely on lobbying via carrier associations rather than electoral pressure. The truck operator's cause has not been assisted by the dearth of information on urban goods movement. Unlike public transport, which indicates when, where, how and why the passengers are being moved, the commercial vehicle operators are reticent about disclosing such information on goods movements.

A widespread belief that the urban goods topic is a non-issue has compounded the neglect introduced by the passenger bias and dearth of information. It is often argued that truck operators moving consignments of goods between origin and destination see solutions rather than problems; a congested major arterial road in the vicinity of a transport depot, for instance, can quickly be

circumvented by the truck operator deviating via a residential street. While the solution may be acceptable to the truck operator it may be unacceptable to the transport planner who may react to the former's behaviour either by restricting access to residential streets or questioning whether the vehicle depot is in the right location. The differing perception of vehicle operator and transport planner to the same phenomenon highlights the need to consider urban goods movement from several viewpoints before declaring it a non-issue; the views of the shipper, commercial vehicle operator, highway authority, residents, different levels of Government and transport planner should, at least, be canvassed in this regard[1].

A distillation of these viewpoints invariably reveals that the urban goods movement topic is worth studying because it, at least, promises to reduce generalised social costs (a composite figure which, according to Hicks[2], incorporates transport operation costs, external costs, community costs and urban structure costs).

A reduction in transport operation costs, which are essentially private costs incurred in either consolidating or distributing goods, can be realised through the lowering of either running costs or overheads (which affect the "price" to the user), the lessening of other distribution costs such as packaging, storing and insuring goods for transport, and the abating of "quality" costs (or non-"quality" costs) incurred due to goods being lost, damaged or delayed in transit. The reduction of transport operation costs may be achieved through investigating whether a more efficient use can be made of such existing resources as terminals, road space and vehicles, particular attention being given to the selection of more appropriate vehicle types, the consolidation of

---

(1) See Rimmer, P.J., "A Conceptual Framework for examining Urban Goods Movements, in K.W. Ogden and S.K. Hicks (eds.) (1975), ibid..

(2) Hicks, S.K., "Urban Goods Movement: A Political Economist's Viewpoint", in K.W. Ogden and S.K. Hicks (eds.) (1975), o p cit..

shipments and routes, the management of modal interchanges and the organisation of passenger-goods interfaces. Such an investigation is warranted because a principal share of benefits in most major road investments is obtained by goods vehicles. Whether the high value placed on commercial vehicle time (usually the driver's wage plus an additional amount) should continue to be applied across all organisations, on the assumption that they can capture all possible marginal productivity gains, must be questioned.

If the aim is to reduce generalised social costs the questioning must go beyond the private costs incurred in transport costs and encompass a set of external costs. These costs include noise, air pollution and vibration stemming from the actions and characteristics of trucks[1]. There are, in addition, delays caused by trucks to other vehicles and pedestrians, personal and property damage occasioned by road accidents and psycho-social disturbances triggered by individuals through the close proximity of trucks. While the quantification of such indirect external costs is difficult compared with direct transport operation costs any strategy designed to reduce generalised social costs must endeavour to encompass the task.

The strategy must also include community costs incurred by governments and their agencies in assuming responsibility for urban goods activities that are best performed by public authorities. These costs to the community are related to the provision and administration of rail and road facilities, the provision and operation of terminal facilities such as seaports and airports, the operation of government goods services such as waste disposal and post office mail services, and the functioning of regulatory and planning bodies. The list is not exhaustive but covers the most important community costs that have to be examined in reducing generalised social costs; these community costs are relatively easy to identify compared with urban structure costs.

(1) See Organisation for Economic Co-operation and Development, The Urban Movement of Goods, Proceedings of the Third Technology Assessment Review, Paris, 1970.

Just as urban structure influences the nature of urban goods movement the converse also holds in that the costs of moving goods influences urban structure. The latter is reflected in the powerful effect transport costs have on location as reflected in the siting of factories adjacent to major arterial roads in the outer suburbs of cities; a phenomenon that may attract or repel residential development. Although our knowledge of the relationship between transport costs and urban structure is not very great the attempts to alter the nature of such costs by varying the range of urban structures does promise to reduce generalised social costs, as illustrated in the Land Use and Transport System Alternatives for New Cities (LUTSANC) Study[1].

Whilst the isolation of transport operation costs, external costs, community costs, and urban structure costs assists in revealing the character of generalised social costs such components overlap and are interrelated. The system effects of the urban goods movement process are such that considerable care has to be undertaken to ensure, for instance, that a reduction in transport operation costs in one part of the system is not counteracted by an increase in another part. A consolidation terminal in the Central Business District (CBD) may, for example, make more efficient use of available truck capacity but may also necessitate shippers having larger warehouse space to offset less frequent deliveries. Such complex interrelationships prompt caution but should not divert us from the challenge of discovering and implementing measures which reduce the total generalised cost of urban goods movement to the lowest possible level. The possibility of reducing the total amount of resources devoted to the urban goods task indicates that the past neglect of the topic is unwarranted. Whether the Commonwealth Government should be involved in overcoming the neglect of urban goods movement is the next question to be answered.

---

(1) Maunsell and Partners Pty Ltd., New Structures for Australian Cities: Main Report, Cities Commission, Canberra 1975.

COMMONWEALTH GOVERNMENT INVOLVEMENT

The Bureau of Roads saw a need to become involved with urban goods movement because of the expressed desire of the Commonwealth Government, irrespective of party, to promote efficiency as a strategy for ensuring that economic growth will secure rising living standards[1]. A knowledge of urban goods movment would assist the Commonwealth Government in determining whether the economic health of individual firms is best served by improving the location of establishments for access to factors of productions and markets and/or by improving transport. The general absence of information on urban goods movement in Australia makes it difficult to decide between transport and/or non-transport solutions, a situation reinforcing the need for the Bureau to become involved in urban goods movement.

A greater involvement by the Bureau in urban goods movement is also prompted by the fact that many existing practices within urban areas are inconsistent with national policies aimed at achieving operative efficiency within agreed social constraints. Such inconsistencies stem from, amongst other reasons, the division of legal and executive responsibility over transport between the Commonwealth Government and the State Governments under the Australian Constitution. While the Commonwealth Government has control over transport to, from and within the Territories and over interstate and overseas transport the State Governments are each responsible for the regulation of transport within their own borders. The State Governments have delegated some of their responsibilites to Local Government including control over local roads and some, but not total, power to regulate commercial vehicle movements. Goods movement has therefore, become a local council issue. Where local councils have not ignored the issue they have invariably become enmeshed in the question of regulating truck movements.

(1) See King, R.J., "An Approach to Social Evaluation in Transport Planning", in Metropolitan Transport: The Way Ahead?, The National Committee on Transportation of the Institution of Engineers (Australia), Sydney, 1975.

The unfortunate corollory of the allocation of government responsibility is that Local Governments are less likely, with their limited financial and manpower sources, to examine the urban goods movement issue in detail or research it. Even if Local Government were prepared to research the topic their fragmented responsibility over only parts of the urban area precludes an assessment of goods movement at a metropolitan scale. There is a need for the Commonwealth Government to become actively involved with State Governments and Local Government to develop national policies geared to promoting efficiency in urban goods movement. This would extend the concern with urban transport problems already expressed by the Commonwealth Government in grants of financial assistance to the State Governments under the Transport (Planning and Research) Act 1974.

A REVIEW OF PAST AUSTRALIAN STUDIES ON URBAN GOODS MOVEMENT

The prospect of greater Commonwealth Government involvement in urban goods movement through the Bureau prompts a review of previous work in Australia on the topic. Relatively little work has been found, presumably because of the respective roles played by each of the State Governments and Local Government in transport planning and research. Within urban areas each of the State Governments has been preoccupied with passenger movements, particularly involving journeys to work; urban-based Local Government has also exhibitied a passenger-orientation by passing regulations to facilitate movements of people generally at the expense of movement of goods.

The main source of information on urban goods movements has emerged as a by-product of metropolitan transportation planning. A prime concern of such studies has been to examine the origin and destination of truck trips disaggregated by heavy and light types of vehicles. The Melbourne Transportation Study produced by the

Metropolitan Transportation Committee[1] proved to be an exception as it supplied details of commodity consignments originating and terminating within the metropolitan area during 1964. An analysis of these consignments by Ogden[2] provides useful, though dated, information on commodity flows by land use, shipment size, length of haul and area. Regrettably, the transportation studies undertaken subsequent to the Melbourne Transportation Study have neglected to collect such commodity data.

There have been, however, more detailed analyses of commercial vehicle movements than is usual in transportation studies in the Newcastle and Wollongong Regions. These studies have been undertaken by the Urban Transport Study Group of New South Wales, a State Government organisation established to conduct transportation studies of Newcastle and Wollongong as well as further work in the Sydney Region as a follow up to the Sydney Area Transportation Study (1974). The main thrust of the Urban Transport Study Group's research has been to identify and model commercial vehicle movements, abandon a thirty year planning horizon in favour of a shorter period, develop industry-related growth estimates and establish inter-regional and conurbational flows involving urban goods movement within and between Sydney, Newcastle and Wollongong[3].

When the Commonwealth Bureau of Roads sponsored an Urban Goods Workshop in January 1975 as a means of gaining some insight into the urban goods issue, the research by Ogden[4] and the Urban Transport Study Group supplied the main empirical contributions on the topic. Such a finding prompted the addition of a substantial

---

(1) The Metropolitan Transportation Committee, The Melbourne Transportation Study, (3 vols.), Melbourne, 1969.

(2) Ogden,,K.W., "An Analysis of Urban Commodity Consignments" in Metropolitan Transport: The Way Ahead?, the National Committee on Transportation of the Institution of Engineers (Australia), Sydney, 1975.

(3) Carvan, C. "Freight Studies in the Newcastle and Wollongong Regions", in K.W. Ogden and S.K. Hicks (eds.). (1975), op. cit., pp 101-105.

(4) Ogden, K.W. (1975), op. cit..

bibliography to this study which describes the nature and scope of research overseas. It also highlighted the need for the empirical investigation of urban goods movement in Sydney on nominated issues. Before focusing attention on Sydney, however, it is necessary to outline the nature of the urban goods issue and explain the adoption of an incremental planning approach.

CHAPTER 3 - THE URBAN GOODS MOVEMENT PROCESS

The review of previous research on urban goods movement in Australia indicates that data is not only scarce but conveys little information on either the purpose of urban goods movement or the conditions under which goods move. This situation is aggravated by a preoccupation with modelling the aggregate behaviour of commercial vehicle movements within the traditional transportation study framework. Data collection in transportation studies is invariably subjugated to the requirements of a pre-existing model which purports to be an abstraction of the real world. While the modelling approach is informative, in that it provides the spatial pattern of commercial vehicles, it does not supply the reasons as to why goods move.

UNDERSTANDING WHY GOODS MOVE

The key issue of this study is the need for an understanding of the urban goods movement process[1]. In fulfilling this objective attention is directed on the one hand to ensuring that the data collected reflects the essential nature of the urban goods movement process and on the other hand to ensuring that our comprehension of the real world is mirrored in the model. This model is not intended as the fulfilment of our endeavours because it is necessary to feedback its results for reviewing in terms of an understanding of the urban goods movement process; a task that may necessitate either adjustments to the model or further data collection. An emphasis of understanding the urban goods movement process is critical because our modelling procedures can only handle relatively trivial problems associated with urban goods movement.

An understanding of the logistic chain between producer and ultimate consumer or user provides the key to our comprehension of

(1) See Rimmer, P.J., Urban Goods Movement: A Review of the Magnitude of the Urban Freight Issue, Recommendations on Very Certain Policy Options, and the Way Ahead, Report to the Commonwealth Bureau of Roads, Melbourne, 1975.

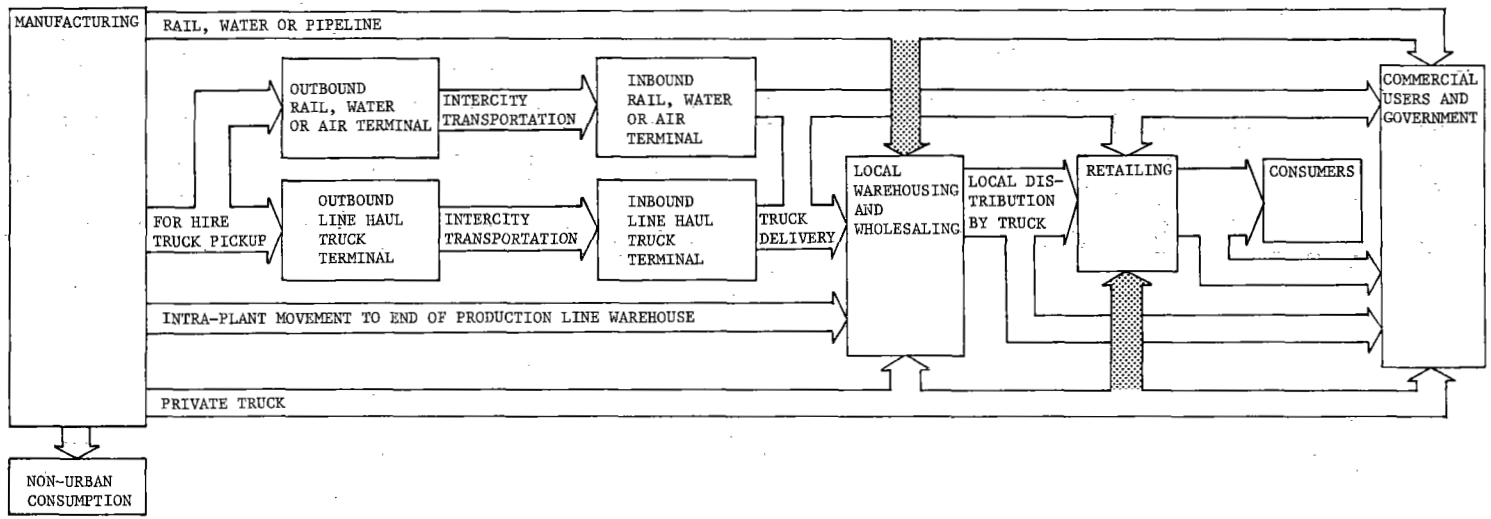


Figure 1 - GENERALISED STRUCTURE OF LOGISTICS SYSTEM

the urban goods movement process. Our attention, in particular, is directed to the flow of goods between manufacturer, wholesaler, retailer and ultimate consumer (or absorption in another production process) that occurs within Australia's urban areas, because the movements between economic units reflects the demand for urban goods transport.

Any analysis of the pattern of demand should be based on the individual consignment. The voluminous number of consignments moving within urban areas necessitates their classification into groups with similar characteristics (mass, volume, shape, value, origin, destination, shipping and insurance costs, time and date of despatch and commodity type). As the resulting groups are product related it is assumed that each group of consignments is either consolidated or distributed in the same manner. While each group of consignments follows its own particular channel between producer and ultimate consumer or user there are many common inter-group characteristics that permit generalisation. Such commonalities enabled Kearney and Voorhees[1] to provide a generalised structure of the logistics system (Figure 1) which encompasses the various permutations of channels used by shippers in moving goods between producer and ultimate consumer or user. As indicated in Figure 1 shippers can use direct line haul services either on a door-to-door basis or in combination with pick up and delivery services to and from terminus, manufacturing plants, warehouses and retail outlets. The particular combination employed reflects the shipper's effort to be price competitive by seeking cost-effective methods of distribution which provide a level of service and yet keep costs to a minimum; a task which involves trading - off relative economies of scale in production against the cost of transport, inventory carrying and warehousing[2].

---

(1) Kearney: Management Consultants in association with Voorhees, A.M. and Associates, Inc., Urban Goods Movement Demonstration Project Design: Final Report on Phases I and II - A Primer on Urban Goods Movement, unpublished report to Urban Mass Transportation Administration, U.S. Department of Transportation, Washington, 1975.

(2) Kearney and Voorhees (1975), ibid..

Once the demand pattern is known for each consignment group it should be possible to estimate the supply requirements. Assessments can be made of the number of pick ups and deliveries which require local and line haul vehicles and the number of trips that are likely to be generated. Such information provides a measure of the performance required in terms of number of vehicles, kilometres travelled, driving time consumed and tonnes moved.

These performance measures are critical because, given a certain volume of commodities to be moved, the possibilities for directly reducing the demand for urban truck movement[1] are, according to Hicks[2], principally limited to using passenger vehicles to collect goods instead of delivering them, using freight substitutes (such as electricity in place of coal) and by changing city structures to lessen the distance travelled. Apart from these possibilities in the generalised social cost of urban goods movement most usually come from the supply side; the efficient use of vehicles, road space and terminals is crucial to this regard.

---

(1) The volume of truck movement can, of course, be altered by changing generalised costs; the means of altering generalised cost have already been noted.

(2) Hicks, S.K., "Urban Goods Movement: A Political Economist's Viewpoint", in K.W. Ogden and S.K. Hicks (eds.) (1975), op cit..

CHAPTER 4 - THE INCREMENTAL PLANNING APPROACH

As it is difficult, given the present state of knowledge, to unravel the complexity of urban goods movement in Sydney we adopted a planning framework that investigates the issue incrementally by building from limited knowledge in a suboptimisation process. The incremental planning approach is usually conceived as being preoccupied with the search for realisable, short range and low capital projects as an alternative to high capital cost long-term options generated by transportation studies[1]. Our particular version of the incremental planning approach developed by Hensher[2] avoids the short-term/long term dichotomy and, once the nature of the deficiencies in Sydney's urban goods movement system are identified, it assesses policy options in terms of their relative certainty of implementation.

Under the proposed planning approach options are graded from the relatively certain, non-capital, flexible, short implementation period projects through to the relatively uncertain, capital-intensive, inflexible, long gestation period projects. This grading system permits the adoption of a planning approach which begins at the certain end of the certainty-uncertainty continuum and works towards more general projects involving greater uncertainty. As a result, incremental planning in a state of uncertainty emphasises realisable projects which make more efficient use of existing technologies and promise early improvements rather than major capital investments in plant, equipment or technology that have occasionally generated more severe problems than they were intended to solve. Incremental planning is particularly apposite for allowing on-going modification in accordance with the changing needs of urban goods movement in Sydney. The high level of uncertainty associated with the difficulty of

(1) Etzioni, D.A., "Mixed-scanning: A "Third" Approach to Decision-Making", in A. Faludi (ed.), A Reader in Planning Theory, Oxford, 1975.

(2) Hensher, D.A., "Incremental Planning and Uncertainty", in K.W. Ogden and S.K. Hicks (eds.) (1975), op. cit..

obtaining information in advance of changing needs makes the allocation of resources to improvements on the basis of hazy planning and implementation horizons a riskly undertaking. The information problem is highlighted by the relative paucity of data for examining the magnitude of urban goods movment in Sydney at one point in time and understanding the pattern of changing needs over time as part of the determination of long-term planning objectives.

CHAPTER 5 - SYDNEY'S URBAN GOODS MOVEMENT TASK

Sydney has the largest goods movement task of any metropolitan area in Australia. As Table 1 indicates Sydney accounts for almost 38 per cent of freight tonne-kilometres performed in metropolitan areas; it is also responsible for 30 per cent of freight tonne-kilometres performed in New South Wales.

DIMENSIONS OF THE TASK

Despite Sydney's perceived urban goods movement "problem" there has been no published analysis of consignment data which describes shipment, mass, volume, shape, origin, destination, time and data of despatch, and commodity type for the metropolitan area. Only the general characteristics of consignment movements can be deduced from surveys of freight transport systems and commercial vehicle systems undertaken by the Sydney Area Transportation Study (SATS).

The SATS study of freight transport systems concentrated on externally-oriented commodity movements by all modes. Its results in Table 2 indicate that 43 million tonnes were received or despatched from the Sydney region in 1971. Over 65 per cent of this mass was inwards freight carried largely by road, rail and sea from domestic and overseas origins. As the total contribution of air transport is negligible in terms of mass the same three modes predominated in moving the remaining 14.9 million tonnes outwards from Sydney to domestic and overseas destinations. As these externally-oriented flows were related to their zones of origin and destination they provide a useful basis for discussing freight terminal location. The major drawback of the study, however, was that it failed to quantify internal freight movements. The figure indicated in Table 2 is an estimate. As a result recourse has to be made to the commercial vehicle movement survey to determine the nature of internal freight movement.

TABLE 1 - ROAD FREIGHT MOVEMENT WITHIN STATES AND TERRITORIES 1971[a]

(million freight tonne-kms)

State of Vehicle Registration	Metropolitan	Provincial Urban	Other	Total
N.S.W.	2,886	909	5,691	9,486
VIC.	2,114	307	4,377	6,798
QLD.	676	244	2,039	2,959
S.A.	729	-	2,559	3,288
W.A.	852	-	2,343	3,195
TAS.	124	54	507	685
N.T.	44	-	533	577
A.C.T.	194	-	-	194
TOTAL	7,619	1,514	18,049	27,182

(a) The original figures have been amended to obtain concurrence of row and column totals.

Source: Commonwealth Bureau of Roads, "Review of Australian Road Transport", Vol 1, Bureau Paper No. 29 (Part 2), Melbourne 1975.

TABLE 2 - FREIGHT FLOWS INTO, WITHIN, AND OUT OF THE SYDNEY REGION, 1971

(thousands of tonnes)

Mode	Destination						
	In Bound		Out Bound		Total	Within	TOTAL
	Domestic[a]	Overseas	Domestic	Overseas			
Rail	10574	-	3000	-	13574	-	13574
Road	3578	-	3535	-	7293	107600[b]	114893
Sea	7132	6592	2072	6226	22021	-	22021
Air	18	16	31	10	76	-	76
TOTAL	21482	6608	8638	6236	42965	107600[b]	150563

(a) Original figures have been amended because they include intra-metropolitan movements of building materials.

(b) Estimated.

Source: Commonwealth Bureau of Roads, (1975), ibid., 117.

Internal commercial vehicle movements are an important component of aggregate traffic flows within Sydney (Table 3). They not only dwarfed external movements but accounted for 27 per cent of the 3.4 million daily trips by all types of vehicles in 1971. As the average trip length performed by commercial vehicles was longer than that by passenger vehicles the former were responsible for 36 per cent of the 34,022,000 vehicle kilometres travelled daily. In terms of total vehicle operating costs the proportion attributable to commercial vehicles was even greater. As 24 per cent of the commercial vehicle trips were carried out by heavy vehicles travelling longer distances it is estimated that they incurred, exclusive of wages to drivers and helpers, at least half of the total vehicle operating costs in Sydney. If labour costs are included, the total annual costs of running commercial vehicles operating on 250 days a year was an estimated $790 million. These figures take no account of the costs attributable to terminal operation, road construction and maintenance, traffic congestion, noise and pollution, and the effect of transport on the nature of urban structure.

TABLE 3 - DAILY COMMERCIAL VEHICLE TRIPS BY AREA OF OPERATION, LENGTH AND DURATION, 1971

Vehicle type	External total trips (no.)	Total trips (no.)	Median Internal length of trip (km)	Median duration of trip (minutes)
Light	4,900[a]	708,000[b]	4.2	10
Heavy	8,400[c]	223,000[d]	5.3	17

(a) Includes 1,300 station sedans, cars, and taxis, and 3,500 utilities and panel vans.
(b) Includes 276,000 station sedans, 166,000 utilities and 226,000 panel vans.
(c) Not available by vehicle type.
(d) Includes 186,000 2/3 axle trucks, 10,000 combination trucks, and 27,000 other vehicles.

Source: Sydney Area Transportation Study, SATS: Volume 1 - Base Year (1971) Data Report Systems, Sydney, 1974, pp. VI-40 to VI-46.

If the generalised social cost was calculable it is anticipated that its dimensions would be of such a magnitude to prompt the identification and evaluation of alternatives for improving goods movements in Sydney. While the necessary data for undertaking such a task are not available it is possible to describe the structural features of the urban goods system in Sydney and identify existing deficiencies in the flow of consignments to, from, and within the region.

As the SATS freight survey omitted internal goods movements, the commercial vehicle has to be used as a surrogate for urban goods movement. Although analyses of externally-oriented commodity flows produced by SATS and vehicle data derived from the Australian Roads Survey supply supporting evidence, the translation of vehicle movement to goods movement is not always satisfactory. While the type of truck can be used as a substitute for types of goods, their composition, origin and destination, the relationship between trucks and goods may be obscured by mixed loads bearing little reference to truck size. Such reservations must be borne in mind in breaking down commercial goods movements to indicate major areas of operation.

The CBD/non-CBD distinction used by SATS in Table 4 to describe commercial vehicle movements reflects a passenger bias in discussing urban goods movement. Sydney CBD accounted for less than 10 per cent of all commercial vehicle trips in 1971 and its share of heavy vehicle movement was only 8 per cent. Such figures suggest that the CBD/non-CBD distinction should not be overemphasised because it is less critical in commercial vehicle movements where many centres are involved in generating and attracting traffic.

TABLE 4 - DAILY INTERNAL AND EXTERNAL COMMERCIAL VEHICLE TRIPS IN SYDNEY REGION BY AREA OF OPERATION AND VEHICLE TYPE, 1971

(number of trips)

	Internal		External
	Light no.	Heavy no.	All Types no.
CBD[(a)]	75,000	18,000	400
Non CBD	663,000	205,000	12,500
Through	-	-	400
TOTAL	708,000	223,000	13,300

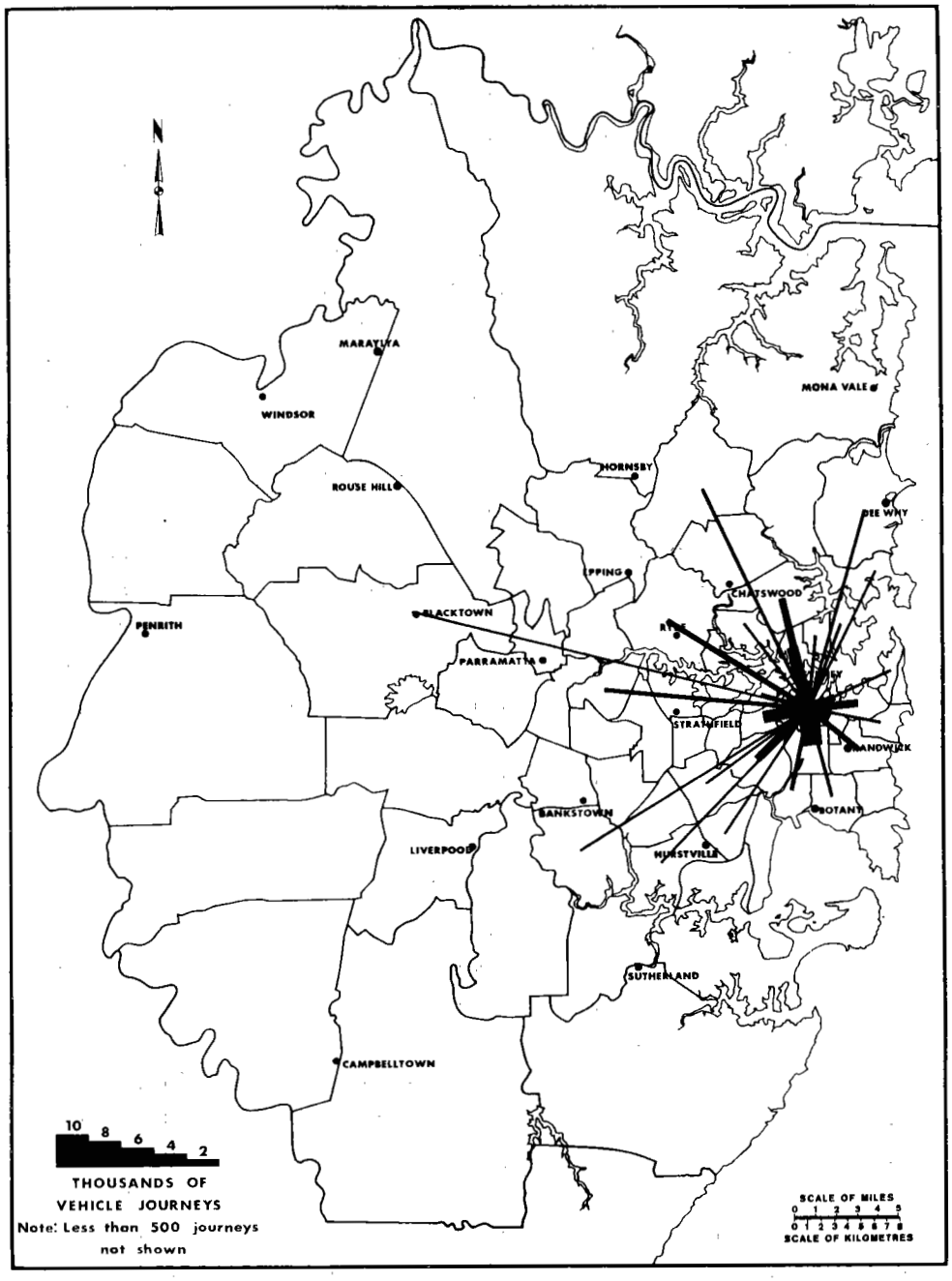
(a) CBD indicates that at least one trip-end was in the Central Business District.

Source: Sydney Area Transportation Study, (1974), ibid., VI-40 to V1-46.

Unlike the pattern for private motor vehicles in the morning peak, commercial vehicle movements to the CBD are concentrated and are dominated by journeys from adjacent road traffic districts (Fig.2). In some respects it would be preferable to see the CBD-oriented commercial vehicle movements superimposed on non-CBD interdistrict vehicle movements (Fig. 3). Such a composite pattern not only puts the CBD movements into perspective but emphasises the failure of many peripheral districts to attract 500 commercial vehicles per day. The other significant features are the strong north-south axis in flows north of Sydney Harbour; and, above all, the overall importance of the Central Peninsula. As the Central Peninsula, encompassing the area south of the Harbour, north of Georges River, and east of Parramatta is so critical in urban goods movement it is singled out, together with its possible extensions towards Campbelltown and Penrith, for more detailed attention. The emphasis on the Central Peninsula, however is designed to illustrate the range of problems in urban goods movement rather than to suggest that commercial vehicles do not experience problems in areas north of the Harbour (e.g. North Sydney and West Ryde) or south of Georges River (e.g. Sutherland).

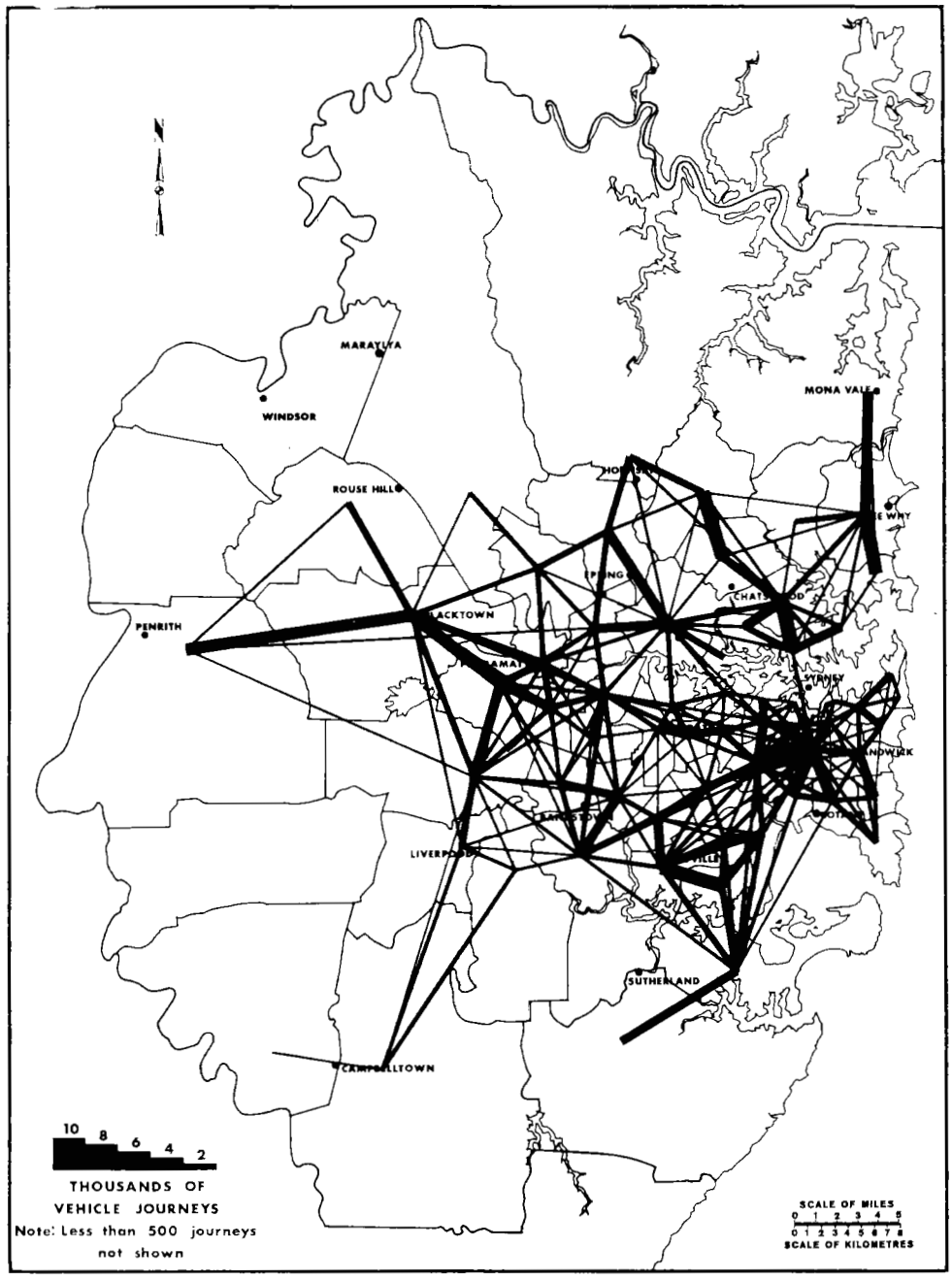
THE CENTRAL PENINSULA

The standing of the Central Peninsula in commercial vehicle movements is derived from three main regions of freight generation and attraction which in turn can be subdivided into major freight areas (see Fig 4). Movements are most heavily concentrated in the older established eastern region of the Central Peninsula. Three main centres of activity in the eastern region can be distinguished: (1) the Port of Sydney terminals at Mort Bay, White Bay, Glebe Island, Rozelle, Pyrmont, Darling Harbour, Walsh Bay, and Woolloomooloo and the ain intrastate rail terminal at Darling Harbour which is adjacent to the CBD; (2) an industrial-transport terminal complex at St Peters, Alexandria, Marrickville, and Mascot which is contiguous with Sydney Airport; and (3) the industrial area of Botany which is the site for Sydney's second



Source: Sydney Area Transportation Study, (1974a) Figure 6.36

Figure 2 Interdistrict Movement by Commercial Vehicles: CBD and Internal Districts - 1971.



Source: Sydney Area Transportation Study, (1974a), Figure 6.37

Figure 3 Interdistrict Movement by Commercial Vehicles: Non-Central Business District - 1971.

port. These areas in the eastern region of the Central Peninsula are separated by residential buffer zones from the second concentration of commercial vehicle movements in mid-peninsula.

The mid-peninsula region comprises the industrial area of Bankstown which includes the Milperra road haulage terminals, the rail terminals in the Enfiled-Chullora area, the industrial areas of Auburn, Silverwater, Clyde, and Homebush Bay-Flemington which is not only the site of the new city markets but an area earmarked for future transport terminals. Another residential buffer zone separates these areas in mid-peninsula from the third series of concentrated commercial vehicle movements located in the western region of the Central Peninsula.

Commercial vehicle movments in the west are focused on growing industrial areas at Blacktown, Wetherill Park-Smithfield-Fairfield and Liverpool, which have already attracted rail and road terminals. As industrial growth and redevelopment occur in the inner areas of the Central Peninsula it is anticipated that the western region and its outliers at St. Marys and Campbelltown will attract an increasing share of commercial vehicle movements.

Already there are detectable shifts of activities within the eastern region. The changing industrial character of the CBD and adjacent terminal areas has resulted in the up-rooting of some activities and their relocation in the St Peters-Alexandria-Marrickville-Mascot-Sydney Airport area and Botany. There is also some leap-frogging of activities from the eastern region to the mid and western regions of the Central Peninsula. Such changes have important effects on the nature and composition of urban goods generation and attraction and in turn on commercial vehicle movements. These locational shifts have also to be borne in mind when assessing deficiencies in the existing system of urban goods movement with Sydney.

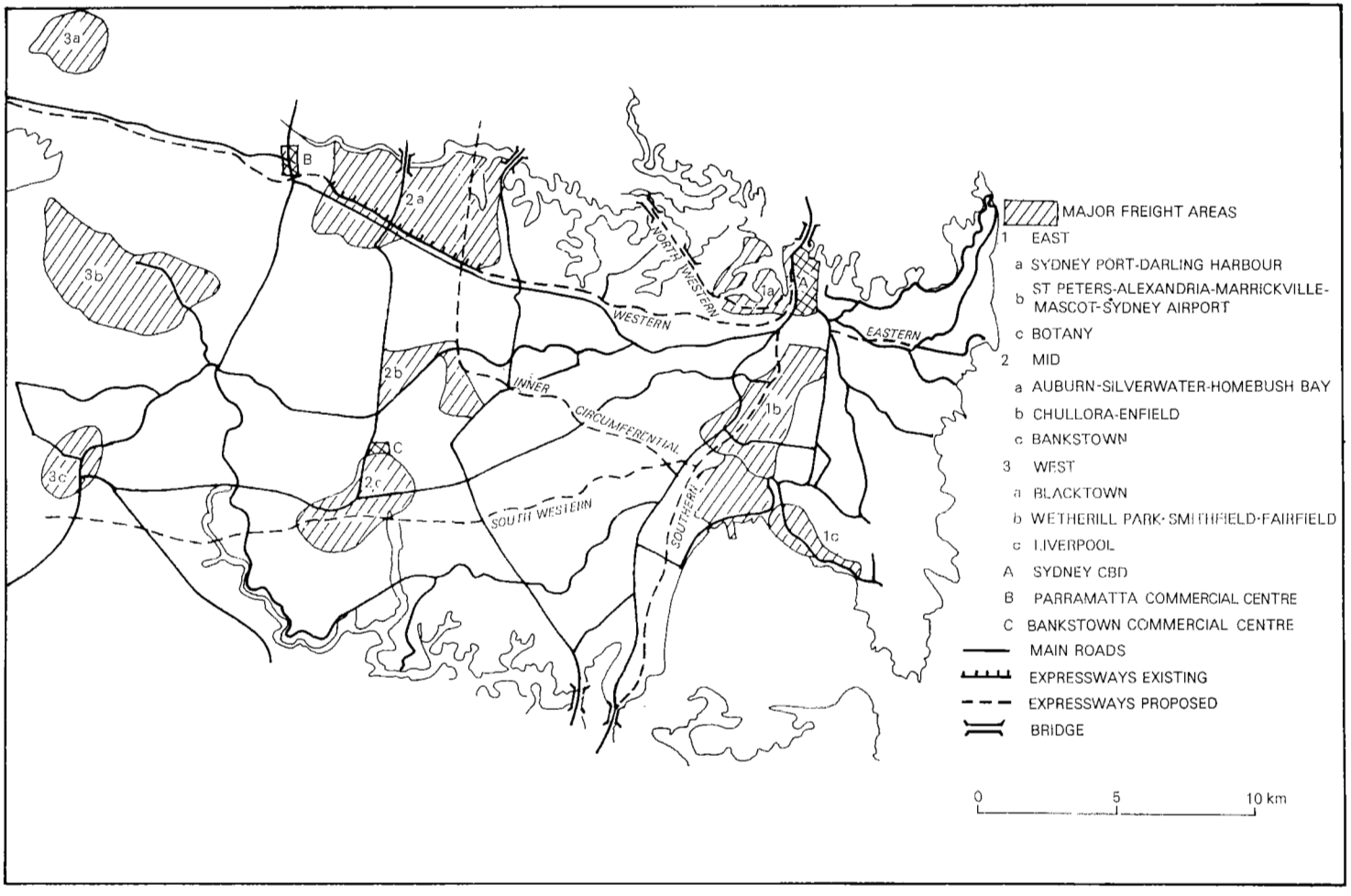


Figure 4 Major Freight Areas and Main Roads in the Central Peninsula of Sydney, 1975.

CHAPTER 6 - IDENTIFICATION OF SYSTEM DEFICIENCIES

A survey of the urban goods movement process to identify shortcomings in the existing system was undertaken in CBD and Surburban locations in the Central Peninsula by W.D. Scott and Co. Pty Ltd[1].

The survey's activities included:

(a) examining a range of specific operational issues suggested by the Workshop on urban goods movement sponsored by the Commonwealth Bureau of Roads in January, 1975, which involve the use of such policy instruments as building codes, pick up and delivery times, consolidation, traffic control and regulation[2];

(b) identifying minor and local road deficiencies;

(c) considering major road investment strategies in relation to urban goods movement.

Detailed information on the system deficiencies documented by the survey is given in Appendix B. Here the shortcomings are considered in general terms by examining each of the three topics in turn in the Sydney context.

OPERATIONAL DEFICIENCIES

In considering what was happening, the feasibility of proposed solutions, and the nature of institutional responsibility, the study of nominated operational issues revealed the depth of the

---

(1) Scott, W.D. and Co Pty Ltd, Empirical Investigation of Issues Arising from Goods Workshop (2 vols.), unpublished report to the Commonwealth Bureau of Roads, Melbourne, 1975.
(2) Ogden, K.W. and Hicks, S.K., (1975), op. cit.

deficiencies in the urban goods movement process. As these inadequacies occasion costly delays, compound traffic congestion, and aggravate noise and pollution problems, the main deficiencies are given in some detail.

Receipt and despatch facilities: Inadequate facilities were noted in many buildings particularly those constructed before the Second World War. However, new inner city buildings are required to incorporate bridging systems for minimising conflict with pedestrians and to supply off-street delivery access with adequate provision for turning and exiting. In suburban locations the prescriptions on new buildings are liberally interpreted in the absence of a standard Local Government building code specifying minimum requirements for loading and unloading docks. There are also many instances where adequate receipt and despatch facilities have not been provided in high-rise residential and office buildings and in industrial parks.

Pick up and delivery: Inefficiencies stem from restricted and variable receipt times and institutional rigidities (e.g. all transport drivers must begin and end work between specified hours in Sydney or penalty rates apply). While the introduction of night deliveries could mitigate delays, this is, as yet, only a feasible economic proposition for special categories of operation such as petroleum, some grocery chains, and some building contractors.(1)

Vehicle scheduling: Without detailed knowledge of vehicle operations a prima facie case could be made that trucks are too lightly loaded and travel too many kilometres compared with their delivery schedules. These apparent inefficiencies have prompted the call to consolidate consignments and vehicle routes. As these inefficiencies seem to be most evident in the Sydney CBD there has been a suggestion that all goods originating and terminating there should pass through a single consolidation terminal.

(1) McGrath, J., "Urban Goods Transport: An Ancilliary Operator's Viewpoint" in K.W. Ogden and S.K. Hicks (eds.) (1975), pp. 93-97.

Road capacity constraints: The passage of commercial vehicles along many urban arterials outside designated clearway hours is hindered by the reduction of road capacity occasioned by parked, double parked and abandoned vehicles. This problem is particularly severe in strip shopping centres where inadequate provision has been made for off-street parking for customers and rear access for delivery vans.

Designated loading zones: Inadequacies in commercial goods operation are compounded by the refusal of Local Councils to either designate loading zones, provide them in sufficient numbers, or require off-street access. The loading problem is aggravated by the encroachment of private station wagons on designated zones to avoid parking fees.

Apparent solutions to this set of operational deficiencies are known but before these policy instruments are evaluated it is pertinent to indicate deficiencies in the current road network in relation to commercial vehicle movements. As there are marked differences in the scale of deficiencies, minor and local shortcomings affecting the commercial vehicle industry are considered separately from major inadequacies.

SPOT DEFICIENCIES

A wide range of spot deficiencies create hazards for commercial vehicles. These deficiencies include:

(a) narrow lane widths resulting in damage to external truck mirrors;

(b) local roads, heavily trafficked by commercial vehicles, which have been allowed to deteriorate because these minor commercial roads do not attract finance for their special upkeep unlike designated residential roads;

(c) the long period of exposure to on-coming traffic experienced by articulated vehicles in making a right hand turn from a major road into a distributor road, due to the absence of right hand turn bays;

(d) difficulties experienced by semi-trailers in tracking when a right hand turn is immediately followed by a left hand turn and vice versa (the dog-leg turn);

(e) the absence of a radius of turn at road intersections to prevent the outswing of semi-trailers in making a left hand turn from a kerbside lane;

(f) congestion and poor road geometry that create hazards at narrow railway bridges, railway underpasses, and level crossings;

(g) the effect of road camber which poses problems for high level and high density loads when off the crown of the road;

(h) a range of minor irritants such as poor signposting, multiple traffic lights, the lack of sychronised traffic lights, obstructions provided by shop awnings, power poles and hydrants, the absence of lane markings, the lack of kerb-to-kerb street paving, stop signs where give-way signs are adequate, the positioning of bus stops at intersections, and the designation of 'light roads' by Local Councils to exclude trucks over specified limits.

Many of these minor difficulties can be resolved by relatively small investments, unlike the major network deficiencies.

MAJOR NETWORK DEFICIENCIES

Major deficiencies in the existing system are exposed by comparing commercial vehicle movements within and between the three major freight areas in the Central Peninsula with the location and

capacity of the network (see Figs 1, 2, & 3). Data on commercial vehicle use of individual routes has been derived for various dates from the Australian Roads Survey supplemented by screenline counts from SATS. Table 5 summarises the information from SATS. Some basic data from the Australian Roads Survey is given in Table 6.

TABLE 5 - COMPOSITION OF TRAFFIC AT SELECTED LOCATIONS

(6am - 10pm)

Location	Percentage of vehicle composition				Total number of vehicles
	Panel vans	2 and 3 axle trucks	Semi and full trailers	Other vehicles	
Bridge Complex					
Sydney	4.9	2.3	0.3	92.5	130,396
Gladesville	6.5	6.2	0.9	86.4	68,687
Ryde	6.6	6.1	0.9	86.4	41,001
Silverwater	6.8	8.7	1.2	83.3	32,077
Other Locations					
Parramatta Road, Homebush (Telopea/ Birne Sts)	6.9	11.4	2.2	79.5	48,927
Parramatta Road, Duck River, Clyde	6.5	9.4	2.5	81.6	28,395
Liverpool Road, Bankstown (Boronia/ Stacey Sts)	5.8	6.7	1.8	85.7	40,192
Canterbury Road, Punchbowl (West Punchbowl Road)	6.7	8.9	2.1	82.3	39,671
Victoria St, West Ryde	6.4	7.9	1.3	84.4	44,537

Source: Sydney Area Transportation Study, (1974), op.cit., Table III-29.

TABLE 6 - COMPOSITION OF ROAD TRAFFIC AT SELECTED LOCATIONS FOR VARIOUS DATES

Location	Date	Percentage of Vehicle Composition		AADT (c)
		Light vehicles (a)	Heavy vehicles (b)	
EASTERN REGION				
York St, City	1972	90	10	19,550
George St, City	1972	86	14	36,930
Regent St, City	1968	80	20	28,000
Botany Rd/Bourke St, Zetland	1968	85	15	18,270
Sth Dowling St, Zetland	1971	92	8	31,290
O'Riordan St, Mascot	1971	94	6	24,460
King St, Newtown	1971	92	8	28,660
Princes Hwy/Canal St, St Peters	1971	85	15	50,270
Princes Hwy, Tempe	1971	88	12	49,270
Bay St, Rockdale	1971	95	5	20,500
General Holmes Dr, Kyeemagh	1971	95	5	47,550
Botany Rd, Mascot	1971	80	20	20,930
Botany Rd, Banksmeadow	1971	80	20	21,470
Marrickville Rd/Victoria St, Marrickville	1971	65	35	16,600
Railway Pde, Marrickville	1971	88	12	16,600
King/Enmore St, Newtown	1971	90	10	24,450
MID-REGION				
Concord Rd (Brays Av/ Homedale Av)	1971	93	7	26,780
Concord Rd/Parramatta Rd Homebush	1972	85	15	45,800
Silverwater Rd/Parramatta Rd, Auburn	1972	92	8	36,210
Pemberton Rd, Strathfield W	1972	95	5	11,340
Liverpool Rd/Roberts Rd, Strathfield	1972	80	20	44,770
Roberts Rd/Juna Pde, Greenacre	1972	95	5	3,390
Roberts Rd/Wattle St, Wiley Pk	1972	95	5	20,760
Parramatta Rd/Rawson Rd, Clyde	1971	92	8	14,400
Olympic Dr, Lidcombe	1968	95	5	22,540

TABLE 6 (cont)

WESTERN REGION				
Western Hwy/Blacktown Rd, Prospect	1968	92	8	51,620
Centenary Rd, Merrylands	1969	96	4	14,090
Warren Rd	1971	93	7	12,500
Smithfield Rd (Polding St/ Orphan Ck)	1972	70	30	7,750
Elizabeth St, Fairfield	1971	96	4	13,070
Woodville Rd, Granville	1968	94	6	34,220
Woodville Rd, Leightonfield	1968	93	7	32,090

(a) Includes passenger cars, taxis, utilities, panel vans, etc.
(b) Includes 2 and 3 axle trucks and semi and full trailers.
(c) Average Annual Daily Traffic.
Source: Australian Roads Survey 1974.

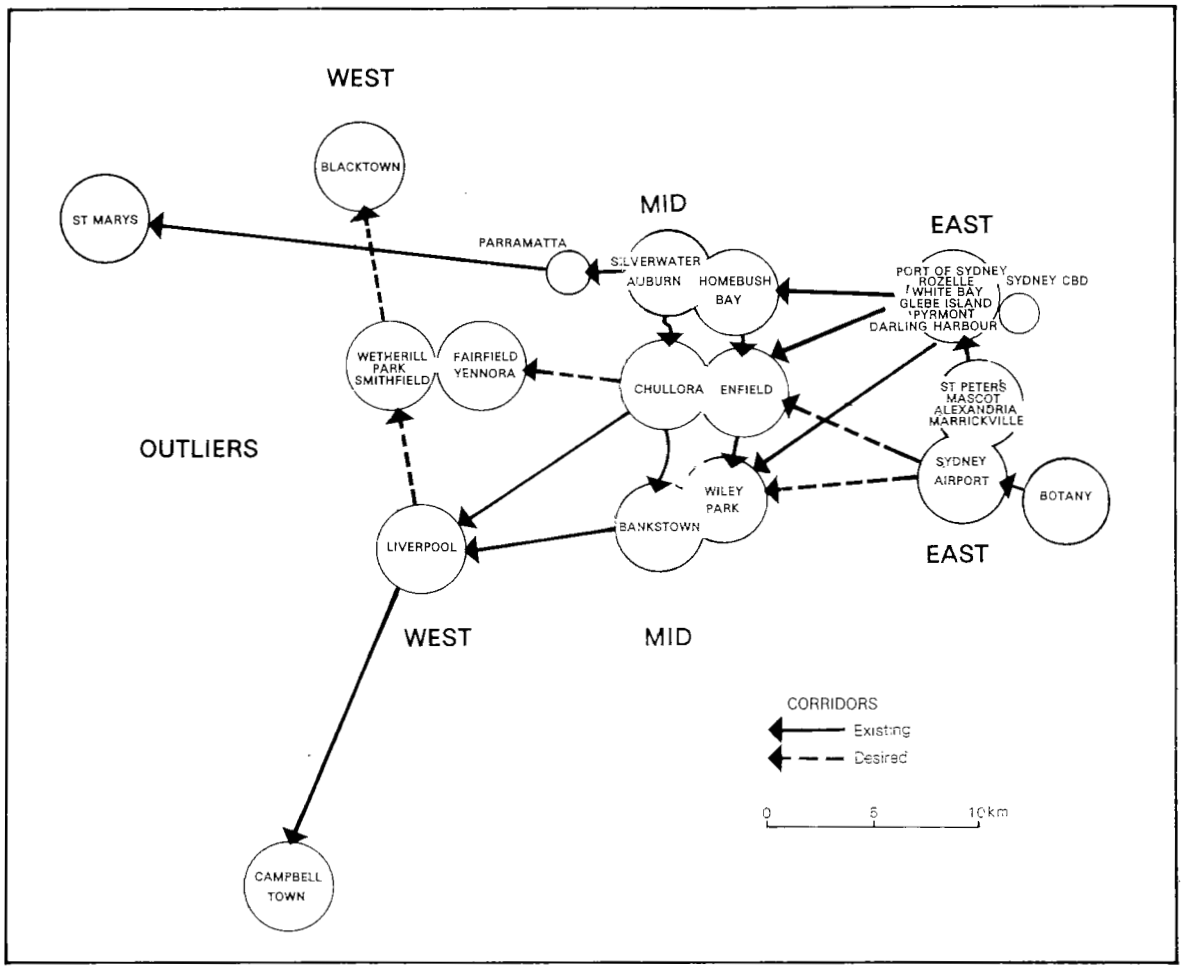


Figure 5 Schematic Diagram of Major Freight Areas and Commercial Corridors in the Central Peninsula of Sydney.

In considering this data the deficiencies in north-south links within the eastern, mid, and western regions of the Central Peninsula are examined first, then the east-west links between the three regions (see Fig. 5).

North-south links:

The general nature of deficiencies in north-south links highlighted in separate analyses of the eastern mid, and western regions of the Central Peninsula are derived from field observations which pinpoint the specific locations requiring attention.

East: North-south links and internal connections within major freight areas pose problems to light and heavy commercial vehicles in the eastern region because of its intensely developed urban character. Movements out of terminals in the inner city cause problems of congestion in the absence of a complete inter-terminal route specifically designed for commercial vehicles. North-south links between the port complex and St Peters, characterised by narrow and poorly-aligned routes with inadequate rail crossings, pose problems of extreme congestion and conflict with local vehicles and pedestrians. Internal connections for commercial vehicles within the St Peters-Sydney Airport area are also distinguished by limited road capacity, poorly-designed roads, extreme congestion and intense vehicle conflict in the vicinity of terminals. The links between the St Peters-Sydney Airport area and Botany are similarly deficient and inadequate to cope with the anticipated traffic from Sydney's second major port at Botany Bay.

Mid: The north-south link Wiley Park-Enfield-Homebush Bay Corridor does not follow a direct route and has instances of bad road geometry. A parallel connection Bankstown-Chullora-Silverwater forces commercial traffic through Bankstown shopping centre and Lidcombe as intended bypasses have not been completed.

West: The Liverpool-Wetherill Park-Blacktown north-south link is incomplete and at its northern end leads into a residential area and streets of low capacity; an alternative route is not yet available.

East-West links:

The deficiencies in links between the eastern and mid regions and the mid and western regions of the Central Peninsula and their respective major freight areas are examined separately because existing connections differ markedly in density and direction.

East-Mid: The east-west trending links are best considered in terms of interconnections between areas in particular regions. The port complex-Homebush Bay link is currently served by a section of Parramatta Road which does not follow a direct route. This link epitomises almost the entire range of minor network deficiencies in relation to commercial vehicle traffic - congestion, conflict with local traffic and pedestrians in shopping areas, narrow lane widths, large numbers of traffic lights, and difficult right hand turns. Similar difficulties are experienced on the northeast-southwest connections linking the port complex to Enfield and Bankstown (i.e. Hume Highway and Canterbury Road). The major deficiencies occur, however, in the absence of routes cutting across the established northeast-southwest network in a northwest-southeast direction linking St Peters and Enfield and in an east-west direction from St Peters-Banksotwn. These deficiencies result in commercial vehicles having to negotiate residential areas.

Mid-West: The major existing link between Homebush Bay and Parramatta is another section of Parramatta Road which presents a similar set of problems to commercial vehicles as in the previous section. No direct route exists for commercial vehicles between Chullora and Fairfield-Wetherill Park but connections are available between Bankstown and Liverpool.

CHAPTER 7 - VERY CERTAIN POLICY OPTIONS

Following the adoption of an incremental planning approach the policy priorities for facilitating urban goods movement are based on their certainty of success. The task, therefore, is to specify a set of policy options having high certainty of success for resolving each set of operational deficiencies, spot network deficiencies and major network deficiencies.

Operational Strategies

Changes in the rules under which the urban goods system operates, excluding those governing investment which are considered later, offer a range of possibilities for resolving operational deficiencies. The opportunities include alterations in:

(a) building codes for new and existing buildings to facilitate receipt and despatch;
(b) shipping and receiving facility operation;
(c) pick up and delivery times to minimise delays and congestion;
(d) consolidation practices, with or without a union terminal for the CBD consignments, to reduce the number of trips;
(e) traffic control regulations to make more effective use of existing road space;
(f) parking zone regulations to speed truck deliveries;
(g) intermodal terminal location and facilities through which goods pass to and from urban areas;
(h) packaging;
(i) truck design;
(j) new transport modes;
(k) rearrangements in land use.

Methods of improvement are rated in terms of possible implementation by various participants in the urban goods movement process, on the basis of surveys conducted by the Commonwealth Bureau of Roads, a review of the literature, and communication with those

working on the subject. The rating system in Table 7 emphasises the need for industry action on its own behalf and encouragement an co-operation by the Commonwealth, State, and Local Governments in addition to regulation.

Of the range of instruments available to governments, it is considered that traffic control measures offer the most effective operational means available for improving commercial goods movement. These measures need to be seen as part of area transport management schemes within designated regions or corridors. As a first step, the provision of clearways could be extended in time and space on nominated urban arterials carrying heavy volumes of commercial traffic.

Strip shopping centres could initially be excluded from this requirement. Where there is conflict between commercial vehicles, local traffic and pedestrians in strip shopping centres, special measures may be necessary. Before these measures are specified a range of alternatives could be examined including either the bypassing of centres and the declaration of pedestrian precincts or banning on-street parking and encouragement of provision of customer parking, rear access to shops, pedestrian facilities and measures for containing the speed of commercial trucks in shopping centres. A series of demonstration projects could be undertaken for selected shopping strips to monitor the effects of the alternatives on safety, business, and the local social and physical environment.

Associated demonstration projects that could be incorporated in area transport management schemes are the use of truck only lanes, truckways, and truck parks. The schemes could also consider truck parking zones for loading and unloading. Regulations governing these parking zones should be changed to ensure that non-commercial station wagons, panel vans, and utilities do not use them.

TABLE 7 - POSSIBILITIES OF REALISING IMPROVEMENTS IN URBAN GOODS MOVEMENT SYSTEMS

Candidate Improvements	Possible Actions													
	Government										Industry			
	Build	Regulate					Encourage				Cooperation			User
		Code	Zone	Control	Licence	Price	Tax	Legislate	Research	Demonstrate	R&D	Standardise	Price	
1. Improve receiving and despatch structures.		X	X	X			X	X	X	X	X	X		X
2. Improve receiving and despatch facility operation									X	X	X	X	X	X
3. Extend pick up & delivery times											X	X	X	X
4a. Consolidating pick up and delivery (w/o CBD terminal)				X		X			X	X	X		X	X
4b. Consolidating pick up and delivery (with CBD terminal)	X				X			X	X	X	X		X	X
5. Extend clearways in space and time				X					X	X				
6. Improve commercial parking arrangements				X	X					X				
7a. Improve intermodal terminal operation									X	X	X			
7b. Improve intermodal terminal location			X					X	X	X	X			
8. Improve packaging						X		X	X	X	X	X	X	X
9. Improve truck design							X	X	X		X	X		X
10. New transport modes	X								X	X	X			
11. Rearrange land use	X		X			X	X	X	X	X			X	

Source: Adapted from N.D. Lea et al., "Canadian Studies of Urban Goods Movements - Status Report", Transportation Research Record, No. 496, 1974, page 96.

Other instruments available for facilitating urban goods movement are less amenable to use by government. Changes in building codes are difficult to specify. The Commonwealth Government could investigate the feasibility of producing a set of minimal requirements for receipt and despatch facilities which could be adopted as part of a standard building code for industrial structures by Local Government[1]. The same inquiry could examine the feasibility of requiring new tenants to upgrade existing buildings, including the practicality of such suggestions as the condemnation and restructuring of the ground floors of existing buildings in narrow streets to facilitate pick up and delivery.

The degree of feasible government action on shipping and receiving facility operation, pick up and delivery times, intermodal terminal location and facilities, packaging, truck design, and new transport modes is limited. Action could focus on research and development and the promotion of forums for the interchange of views and ideas by shippers and receivers, unions, carriers, freight forwarders, and terminal operators. Similar action applies to the consolidation of consignments in standard sized sealed modules and the consolidation of routes to minimise the number of trips. There may however, be scope for more direct government action in consolidating non-bulk building materials destined for CBD sites at a location outside the CBD. In all of these matters industry has to trade off the costs and benefits from making a change in its current physical distribution management practices.

The case for the establishment of a consolidation terminal for CBD consignments seems questionable. While such a suggestion may seem apposite for New York (and its garment centre in particular) its

---

(1) Industry representatives suggest that the minimum requirement for loading bays are height 4.57m, width 3.66m, double width 6.10m, and dock height 0.9m-1.4m.

practices should not prove the guide for action in Australia[1]. Movements in Australian CBD's are not of the same magnitude. Admittedly, the vision of less-than-truck-load operations consolidated at a union terminal, pick up and delivery services performed by a single carrier in a defined zone, and strict control of entry is appealing and appears to offer tangible benefits. These potential benefits may be offset by a capital-intensive terminal, a decreased frequency of pick up and delivery service, increased dock holding space to handle larger loads, costly inter-terminal transfers, and management problems in controlling such a complex operation[2].

Spot Network Strategies

As minor and local road improvements offer positive benefits from relatively low cost and short implementation period projects with a large degree of certainty, they have to be accorded a high priority rating in any incremental approach. Local roads of non-residential character that are heavily trafficked by commercial vehicles could be designated as local commercial roads and finance appropriated to prevent their deterioration. Some Commonwealth Government assistance might be warranted in some areas as indicated in the Report on Roads in Australia 1975 (para. 7.69). Although the cost may not be low, provision could also be made for improving road geometry at specific locations where intensive commercial vehicle use creates traffic hazards. Such locations include problem intersections without right hand bays, narrow railway bridges, railway underpasses, level crossings, extremely narrow lane widths and narrow streets.

---

(1) cf. Arrow, M.M., et.al., "Environmental Impact of Goods Movement Activity in New York City", Transportation Research Record, No. 496, 1974, pp 80-92; and Mohr, E., "Some Fallacies in Urban Goods Movement", Transportation Research Record, No. 496, 1974, pp 105-108.

(2) Hicks, S.K. (1975), op. cit.

Major Network Strategies

The existing state of knowledge on urban goods movement makes it difficult to obtain the advance information on changing needs that is necessary for evaluating the commercial benefits of corridor level network investments. As it is risky in these circumstances to allocate major capital investments on the basis of hazy planning and uncertain implementation horizons, the preferred strategy is to rank route corridors in terms of their investigation priorities. The corridor projects can then be subjected in sequence to studies designed to elicit their costs, feasibility (economic, financial, technical and institutional) and social and environmental impacts. A project stemming from a corridor study with an attendant emphasis on consignments delivered and shipped from internal and external sources to economic units (e.g. manufacturer, wholesaler, retailer, institution, and household) should be monitored as a before and after study. In this way research and development will contribute to a deeper understanding of the pattern of changing needs in urban goods movement over time as part of the transport planning process that determines long term objectives. The monitoring of projects is envisaged as an integral unit of a general research strategy which is designed to understand the longer term changes in urban goods movement that result from complex interactions of changes within the transport system and other variables. Our on-going work is establishing a framework for such monitoring.

It is pertinent to illustrate the designation of investigation priorities for corridors with major commercial benefits by reference to Sydney's Central Peninsula. Priority ratings are given to these commercial corridors within and between the eastern, mid, and western regions of the Central Peninsula.

Rating Investigation Priorities: A tentative rating system is used to indicate investigation priorities on the basis of needs within a five year time span (1975-80). The subscripts are explained for individual projects but the needs rating is as follows:

(a) corridor requiring a project to cater for existing and anticipated high commercial traffic volumes in areas of intense industrial, institutional, and residential development.

(b) corridor with smaller commercial traffic volumes in which progressive improvements are possible in areas of less dense urban development to cater for projected industrial and institutional needs for the next five years.

(c) corridor with relatively small commercial traffic volumes and without major deficiencies in next five years but in which inadequacies are anticipated on the basis of projected industrial growth.

A subscript is attached to the alphabetical rating system to distinguish whether the project has a high (1), medium (2), or low (3) level of feasibility.

When the assessment system is applied to north-south corridors and east-west trending corridors of the Central Peninsula, it highlights the problem of accommodating the second port at Botany within the existing road network. While some of the congestion problems of the Port of Sydney and the CBD are alleviated by the diffusion of activities within the eastern region and to locations in the mid and western regions, the Botany Bay Port will recreate the congestion problems (see Fig. 6).

(a) North-south corridors: Internal corridors within the eastern region are all in the highest needs category. The Sydney port complex-St Peters corridor is accorded a low feasibility rating as major and continuous road construction in the corridor would be expensive and disruptive (A3). A higher feasibility rating is given to the St Peters-Botany Bay link because the second port location is potentially disruptive in an already congested area (A1). The two mid-region corridors, Wiley Park-Enfield-Homebush Bay and Bankstown-Chullora-Silverwater, are ranked in the second needs category

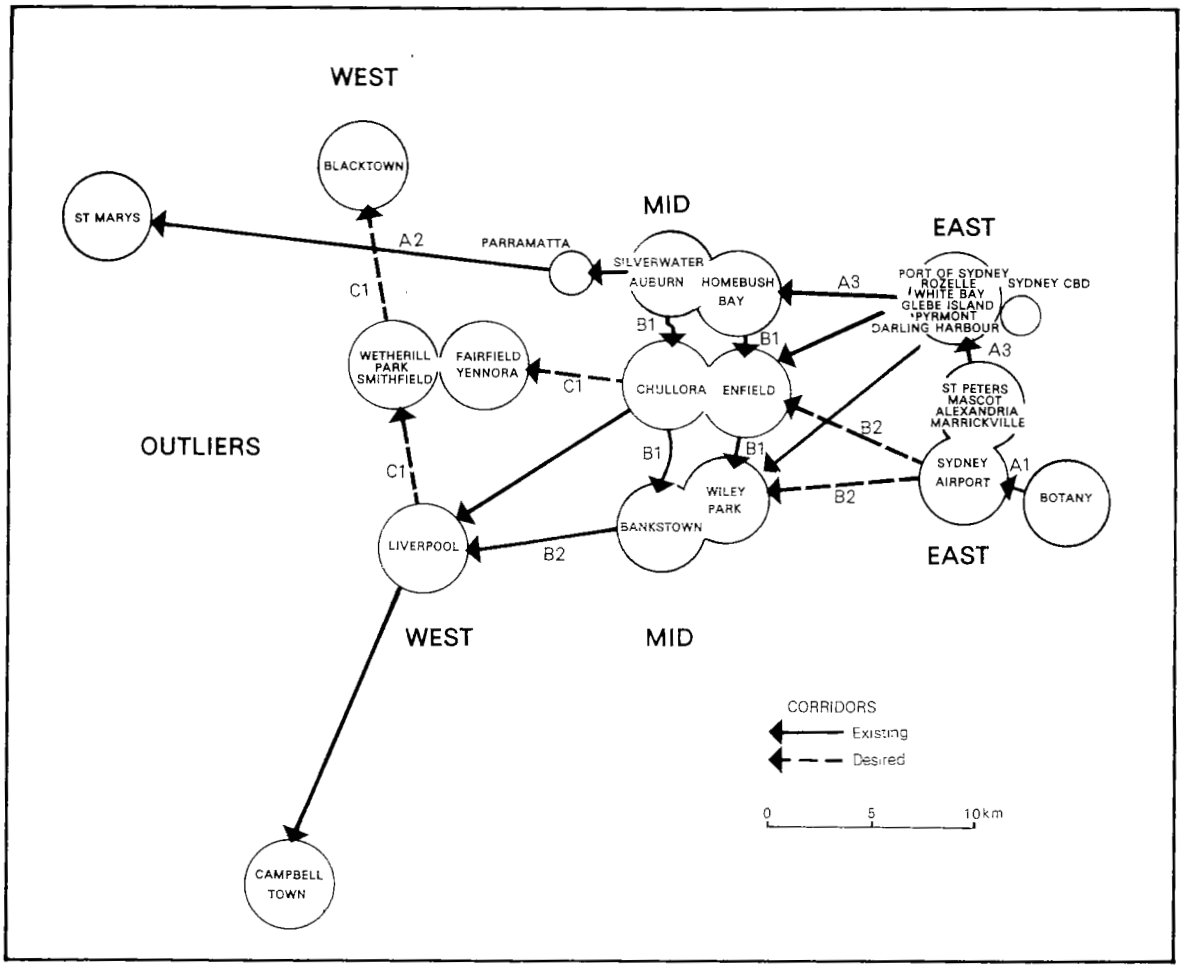


Figure 6 Priority Ratings for Investigating Commercial Corridors in the Central Peninsula of Sydney (see text for explanation of ratings).

but they receive the highest feasibility rating because the projects can be undertken with less disruption (B1). In the western region the Liverpool-Weatherill Park-Blacktown corridor has a low rating in terms of needs but there is an opportunity to upgrade existing links and complete other sections (C1).

(b) East-west corridors in eastern-mid peninsula: A high priority needs rating is accorded the corridor linking the Sydney port complex and Homebush Bay but as the proposed major link is potentially disruptive in an area of intense development it has a low feasibility rating (A3). The relatively high needs rating of the St Peters-Enfiled corridor is heightened by the Botany Bay port decision but there is the problem of selecting a suitable route corridor is necessary between St Peters and Enfield but it could not be built within the five year time span (B2)[1]. A similar investigation priority rating is given St Peters-Bankstown route (B2).

(c) East-west corridors in mid-western peninsula: The Homebush-Parramatta corridor has the highest needs rating but difficulties in by-passing bad sections of the existing route reduce its feasibility rating (A2). The Chullora-Wetherill Park route has a low needs rating within the five-year time span although improvements are feasible (C1); a higher rating is applicable to the Bankstown-Liverpool corridor because it connects with the Bankstown-St Peters route (B2).

While this analysis is suggestive rather than definitive in character it is sufficient to emphasise that needs and feasibility are not closely related. Such a finding indicates that a series of investigations is possible.

---

(1) The Kyeemagh-Chullora link proposed by the Urban Transport Advisory Committee, New South Wales (1976) would satisfy this need.

Major impact studies are warranted of the Botany-St Peters-Sydney Airport area and the following corridors: St Peters-Enfield, St Peters-Bankstown-Liverpool, the two mid-peninsula corridors, and Homebush Bay-Parramatta. If major projects are not feasible in highly developed urban corridors, such as Sydney port complex-St Peters and Sydney port complex-Homebush Bay, a scanning survey is needed to detect the possibilities for minor improvements. In the remaining corridors there is a need for an opportunity survey to see that the prospects for major commercial routes are not foreclosed. Such investigations would provide information for outlining a road program and recommendations leading to the designation of major commercial roads and export roads under the National Roads Act 1974.

Major Commercial Roads and Export Roads (National Commercial Roads): The corridors of marked commercial significance linking major freight areas in Sydney can be seen as the basis for defining major commercial roads tailored to the needs of heavy vehicles - heavy duty pavement with attention to the geometry of turns, drainage and camber, signposting and high quality lighting, location of stop and give-way signs to give priority to commercial traffic, and provision for out-of-dimension vehicles carrying such freight as transformers and large pressure cylinders. While it can be argued that the designation of major commercial roads should be restricted to corridors interfacing with the terminals of interstate and overseas trade (rail, road and sea), there is some value in identifying a wider set of commercial corridors similar to the national highway system which can be progressively upgraded to meet a minimal set of standards for heavy commercial vehicles. Hopefully, such measures will not only keep heavy trucks from residential streets but may permit the lowering of residential street design standards - a change that may involve some change in the vehicles used for the collection of refuse.

If such a broad definition of major commercial roads is accepted the term export road could be restricted in urban areas to such

roads as portways linking domestic and international seaport and airport terminals within a designated urban area. A portway linking Walsh Bay, Darling Harbour and Pyrmont in the Port of Sydney could be investigated. Investigations could also be undertaken at Botany Bay, Sydney Airport, and similar locations in other urban areas. Such roads could be linked to the designated major commercial road network with preference to the access of commercial vehicles. These roads would have the advantage of discouraging private vehicles except on export business and attract commercial vehicles from the existing narrow access roads to port areas (see Figure 7).

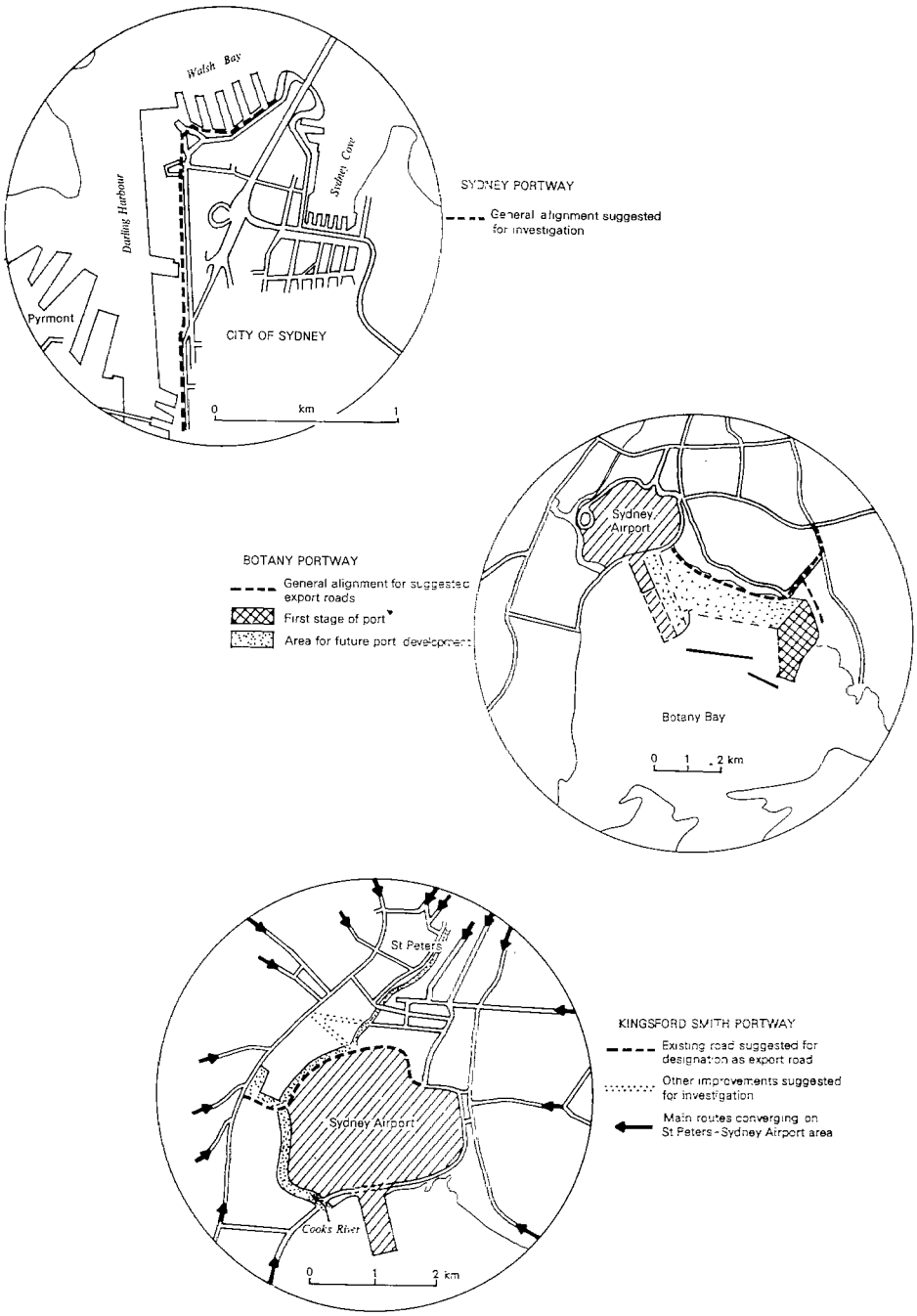


Figure 7 General alignment of export roads suggested for investigation in Sydney.

CHAPTER 8 - SUMMARY AND CONCLUSIONS

RESUME

This study has highlighed that urban goods movement too often has been disregarded in transport planning and policy formulation within Australia. Such neglect is unwarranted and there is a strong case on efficiency gounds for the Bureau and others to research the topic. Much of the neglect stems from an over-emphasis in transport planning and research on the morning and evening passenger peak. As a result there is little information available on which to base a case for reducing the generalised social cost of urban goods movement. While this composite figure can be separated into costs associated with transport operation, externalities, the community and urban structure, we lack knowledge on these cost components and how they interact with each other in a system setting. These inadequacies prompted this study to focus on an understanding of the urban goods process as its prime objective; they also suggested the adoption of an incremental planning approach as its context.

Within this general framework the Sydney case study is directed to identifying and locating the urban goods movement system's deficiencies, after a preliminary assessment of the magnitude of the task in terms of commercial vehicle trips. These shortcomings are separated into operational, spot network and major network deficiencies and a matching set of strategies are developed including projects that can be implemented with certainty of success - an emphasis that results in most of the suggestions being characterised by flexibility and low cost positive benefits.

CONTRIBUTIONS

The research effort involved in identifying system deficiencies and producing strategies that match has assisted transport planning and policy formulation in several ways.

1. The concept of an urban goods workshop at which representatives of shippers, freight forwarders, vehicle owners, terminal operators, highway authority representatives, academics and members of Government instrumentalities interchanged ideas; an idea that could be extended by getting participants to enunciate their problems propound possible solutions for reaction by other participants.

2. The use of open-ended questionnaires by Scott[1] to elicit from participants in the urban goods movement process their perception of deficiencies in the system and their needs.

3. The emphasis of field observation as a means of understanding the urban goods movement process - an antidote to studies that begin by collecting data to satisfy the needs of a pre-packaged model.

4. The designation of a scheme for rating investigation priorities for major network improvements that envisages a series of studies -major network, scanning and opportunity surveys - that are tailored to the needs of different types of commercial corridor.

STRATEGIES

The following planning strategies in this paper are worthy of further investigation:

1. the extension of clearway hours on nominated urban arterial roads which carry heavy commercial traffic, excluding designated strip shopping centres;
2. the establishment of a range of demonstration projects as part of an area transport scheme to monitor transport experiments involving

---

(1) Scott, W.D. and Co. Pty Ltd., (1975), op. cit.

a) strip shopping centres,
b) truck only lanes,
c) truckways,
d) truckparks,
e) consolidating some CBD building materials at non-CBD sites;

3. the investigation of minimal requirements of receipt and despatch facilities and the feasibility of upgrading existing buildings to facilitate pick-up and delivery;

4. the sponsoring of research and development into shipping and receiving facility operations, pick-up and delivery times, intermodal terminal location and facilities, packaging, truck design, and new transport modes, encouragement could also be given to the continued interchange of views and ideas by users and operators on physical distribution management;

5. detailed studies into possible major network strategies serving goods movement to indicate the existence of corridors of major commercial significance, and establishment of a priority rating for investigating these corridors on the basis of need and feasibility of implementation; and

6. the provision of Commonwealth Government financial assistance for

   a) isolated road improvements to facilitate urban goods movement,
   b) major road improvements required to increase the capacity of routes raised for the movement of overseas and inter-state freight,
   c) major commercial roads as part of the urban arterial programme.

APPENDIX A
A PROPOSED STUDY-DESIGN

The study design in the Appendix provides an operational framework within which the deficiencies and options recognised in Sydney's urban goods movement system could be investigated empirically. Before allocating resources to data collection it is important to develop a prototypical study design which directs attention to the key issue of urban goods movement system and to indicate the detailed steps required in undertaking such studies. With these thoughts in mind the Bureau of Roads commissioned Dr Meyburg and Dr Stopher of the United States to develop a prototypical study-design[1]. The main features of the resulting study-design are indicated here.

RANKING AND GROUPING OF CANDIDATE IMPROVEMENTS

Meyburg and Stopher recognised at the outset that the identification and importance of candidate improvements in the search for safe, cheap, and efficient movement of goods with urban areas depends very much on the size of the geographical area under consideration (i.e. federal, state or local) and on the viewpoint from which the objectives are identified. Defining urban goods movement 'as the movement of any non-person item that is carried in a non-passenger vehicle, or is not accompanying a passenger in a vehicle, and which takes place in an urban area' and focusing attention on the consignment as the accounting unit, Meyburg and Stopher[2] identified thirteen candidate improvements requiring research and development. These included improvements to the efficiency of movement, congestion, demand forecasting, loading and unloading facilities types of freight vehicle used, development

---

(1) Meyburg, A.H. and Stopher, P.R., Urban Goods Movement - A Study Design for General Application in Metropolitan Areas, unpublished report to the Commonwealth Bureau of Roads, Melbourne, 1975.

(2) Meyburg, A.H. and Stopher, R.R. (1975), ibid., 2-10.

of planning procedures, distribution of freight generating land uses, air and noise pollution, institutional and regulatory issues, interface with interurban and international modes, applicability of new technology, consolidation, and standardisation of shipping units.

The next step, was to suggest a rationale for grouping the candidate improvements. As Table 8 indicates five different sets of criteria can be used to demonstrate the range of different grouping schemes. First, a generic and technological grouping criterion highlighted candidate improvements related to capacity, regulation and planning, efficiency, and impact issue. Second, the degree of capital involved resulted in candidate improvements being classed as having either low-capital cost, high capital cost, or unspecified capital cost; a scheme that is related to the incremental planning approach outlined. Third, the candidate improvements were ordered according to their feasibility of implementation in terms of either the regulatory role of government or the availability of capital to private enterprise. Fourth, the issues were ranked in terms of their potential to have long-term effects on urban goods movement activities. Finally, the candidate improvements were assessed in terms of potential government involvement.

The grouping and ranking of the candidate improvements emphasised that there is no unique classification because the particular categorisation depends on the specific viewpoint from which the ordering scheme is developed. If our intention is to understand urban goods movement there is a need to examine the varying perception of shipper/receiver, truck operator, terminal operator, highway authority, Government and impactee (see Table 9). Once these viewpoints are known we are then in a position to examine the suggested study-design - its elements, structure and products.

TABLE 8 - GROUPING OF CANDIDATE IMPROVEMENTS

Candidate Improvements	Generic and Technological Grouping				Capital Cost			Feasibility of Implementation	
	Capacity related issues	Regulatory and planning issues	Efficiency issues	Impact issues	Low capital cost	High capital cost	Upspecified capital cost	Role of Government	Availability of capital to private enterprise
1. Efficiency of movement			X		X	X		)	)
2. Congestion	X				X	X		)	)
3. Demand forecasting		X					X	)	)
4. Loading and unloading facilities	X		X		X	X		)	)
5. Types of freight vehicles used	X					X		)	)
6. Development of planning procedure		X					X	)Dependent	)Dependent
7. Distribution of freight-generating land uses		X		X		X		)on locale	)on locale
8. Air and noise pollution				X		X		)	)
9. Institutional and regulatory issues		X					X	)	)
10. Interface with interurban and international modes			X			X		)	)
11. Applicability of new techniques			X	X	X	X		)	)
12. Consolidation		X	X		X[a]	X[(c)]		)	)
13. Standardisation of shipping units		X	X		X			)	)

	Long-term effects on urban goods movement	Government Involvement							
		Regulation and prices of carriers	Planning and provision of right-of-way	Regulation of loading	Land-use controls and unloading facilities	Regulation and control of urban	Interaction with trade unions impacts	Operation of shipping	Funding of technology development
1. Efficiency of movement			X				X		X
2. Congestion			X						
3. Demand forecasting	X		X						
4. Loading and unloading facilities				X					
5. Types of freight vehicles used		X				X			X
6. Development of planning procedure		X	X						
7. Distribution of freight - generating land uses	X				X	X			
8. Air and noise pollution						X			
9. Institutional and regulatory issues	X	X		X			X	X	
10. Interface with interurban and international modes			X X				X		X
11. Applicability of new techniques			X						X
12. Consolidation		X[(a)]		X[(b)]		X[(b)(c)]		X	
13. Standardisation of shipping units		X							

(a) Shipments (b) Terminals (c) Warehouses

Source: Based on data from Meyburg and Stopher (1975).

TABLE 9 - ROLES IN THE URBAN GOODS MOVEMENT PROCESS

	Shipper	Receiver	Vehicle owner	Terminal operator	Highway authority	Impactee	Activist	Government
Variants	Long haul Short haul	Long haul Short haul	Ancillary Hire and reward Owner driver	Government Private	Australian State, Local Governments			Australian State, Local Governments
Objectives	Minimise perceived costs	Minimise perceived costs	Maximise vehicle earnings	Maximise throughput	Maximise net social benefits	Minimise disruption/ maximise benefits	Minimise undesirable proximate activity/ maximise accessibility	Resource allocation at each level Operational norms
Constraints	Labour relations	Labour relations	Spatial/ temporal access	Terminal congestion	Capacity	Noise	Political ideology	Urban structure (land use)
	Loading facilities	Unloading facilities	Terminal congestion	Terminal site	Design of infra-structure	Air pollution	Instrument-alities (ie. protest institutionalised)	Equity (e.g. rural v urban, motor vehicle v rest)
	Vehicle suitability	Vehicle suitability	Highway congestion	Terminal location	Location	Property severance		Voters (power)
	Access problems	Access problems	Vehicle use			Community disruption		
	Handling equipment	Handling equipment	Security			Safety		
			Documentation					
			Regulation					
Options	Improvements in situ	Improvements in situ	Vehicle scheduling and routing	Scheduling vehicle arrival	Change control signals	Adjustment in situ (eg. modify perception; insulation)	Appeals lobbying	Regulation
	Relocation	Relocation	Size and type of fleet	Re-siting or re-location of buildings	Widen roads		Publicity	Taxes
				New and different sized buildings	Construct new roads	Migration	Appeals to unions (eg BLF)	Subsidies
								Public ownership

Source: Rimmer, P.J., "A Conceptual Framework for Examining Urban Goods Movements," in Ogden, K.W. and Hicks, S.K. (eds.)(1075), op. cit.

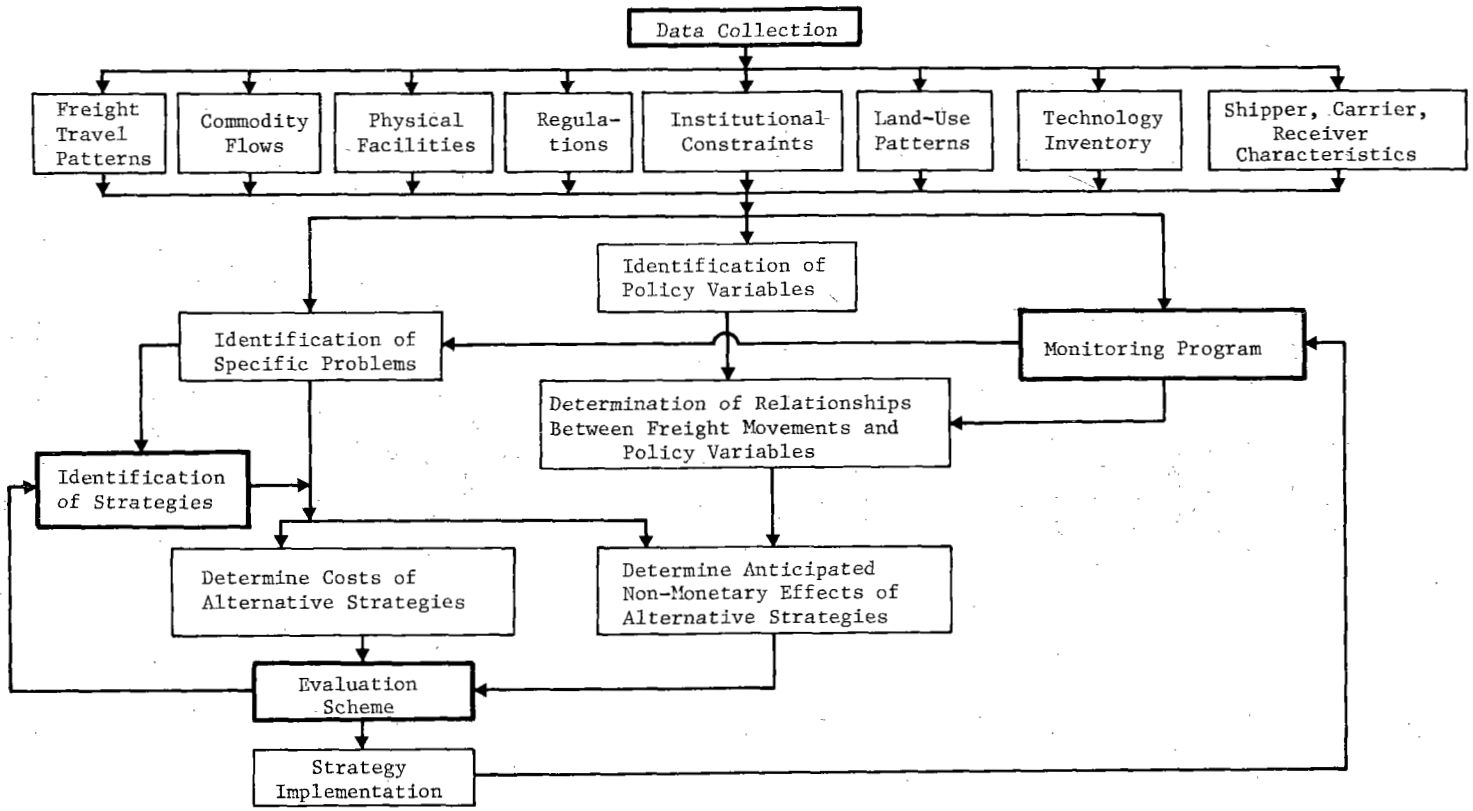
STUDY DESIGN ELEMENTS

As indicated in Table 10 the study-design incorporated four primary elements. There is a data collection element which ensures details are gathered on urban goods movement under eight principal information group headings. A monitoring programme is also included which gauges how urban goods movement changes in response to various forms of intervention. This programme necessitates before and after studies and strong connections with participants in the transport industry. Such a programme provides the basis for investigating urban goods movement elasticities in relation to a range of policy and investment options. Strategy identification, the third element of the study-design, involves the enumeration of alternative options for tackling urban goods movement problems; these are grouped into either short and long-term options or low cost and capital intensive options. The final element incorporates an evaluation scheme that will assess the effectiveness of alternative strategies; the initial stages of evaluation will necessarily be crude until analytical and forecasting techniques are improved.

STUDY-DESIGN STRUCTURE

These four elements are incorporated in the study-design framework in Figure 8. The initial data collection phase is intended (i) to generate data on candidate improvements for the identification of strategies, (ii) to provide inputs to the monitoring programme, and (iii) to help identify policy variables. Once the policy variables are recognised they can be used as the basis for testing relationships with specific attributes of urban goods movement as part of the evaluation scheme's development. The other inputs to the evaluation scheme include the identification of specific problems and strategies and the estimation of the costs of each option.

In its initial stages it is expected that the evaluation scheme will consist of flow diagrams and a simple balance sheet recording



Source: Meyburg and Stopher (1975).

Figure 8 - Elements of a Study Design

negative and positive impacts. As an understanding of the urban goods system develops it is anticipated that simple quantitive relationships will be established such as those between different trip rates and land use a step towards a cost-effectiveness or cost-benefit approach. Ultimately, the coarse associative relationships may be replaced by behaviourally-based forecasting relationships.

Once the alternatives have been evaluated within an incremental planning framework the selected strategies are implemented as demonstration projects. Such projects provide feedback to the monitoring programme for testing relationships; the feedback also helps refine the process of identifying suitable strategies.

STUDY-DESIGN PRODUCTS

The products of the study design implicit in the discussion of structure are made explicit in Figure 9. Two sets of products emerge from the process of submitting such initial inputs as the identification of primary variables, primary data collection and monitoring to a battery of analytical techniques. Whereas, the items in the first set of products can be developed immediately to resolve existing problems, the second set of products requires extensive research and development.

The first set of products comprises seven short-run items which consist of the generation of trip rate relationships, vehicle and facility capacity utilization measures, the identification of freight routes, the regulatory scenarios, the identification of alternative modes, the recognition of peaking patterns and the congestion effects of goods movements. These items are subsumed in the final short-run product which describes the regulatory scenario that can be produced in varying stages by altering the core elements. Different scenarios, for example, could encompass a map of the location and type of road-based restrictions on the movement or loading and unloading of freight vehicles and an inventory of rule-making powers.

TABLE 10 - COMPONENTS OF THE STUDY DESIGN

Strategy identification		Main topics	Details
Principal potential alternative strategies	Details	A. Aim	The development of an evaluation scheme that will permit the determination of the effectiveness of alternative strategies for dealing with specific problems.
A. Short and long-term options	Rate and regulatory options Technological options (e.g. containerisation, break-bulk warehousing etc.) Land use controls.	B. Requirements	The scheme needs to identify a set of objectives and criteria for defining effectiveness, where these may be derived from the key issues and from data collection.
B. Low cost and capital intensive alternatives.	After hours delivery Banning freight vehicles from certain streets or neighbourhoods. Provision of more off-street loading docks. Land use and regulatory controls to effect different types of consolidation (e.g. warehouses for supplying grocery chains or supermarkets). Consolidation of distribution-collection shippers, congestion pricing in metropolitan area.	C. Refinements	The various strategies and technological alternatives must be able to be fitted into the scheme for assessment against various specific urban-area problems. Initially, the analytical procedure will be crude since an acceptable forecasting procedure is unavailable. As data are analysed and changes monitored the evaluation procedure can be gradually refined, with the addition of further criteria, and the development of quantitative procedure for estimating the various strategies on urban goods movement.

Source: Based on data from Meyburg and Stopher (1975), op. cit.

TABLE 10 - COMPONENTS OF THE STUDY DESIGN

Data Collection		Monitoring programme	
Principal information groups	Details	Main topics	Details
A. Freight travel pattern	Origins, destinations and other characteristics of consignments within urban area (including components of intercity consignment movements); mode should be specified.	A. Aim	To determine how freight movements change in response to various forms of intervention such as changes in hours of delivery, changes in restrictions on loading and unloading, rate changes, equipment changes by shippers.
B. Commodity flows	Broad attraction and generation rates of commodity flows by land-use type.		
C. Physical facility inventory	Warehouses, terminals, modal interfaces (e.g. container depots), garages, vehicles and travelled way available for freight movement and their capacities.	B. First alternative procedure before and after study	Develop continuing monitoring programme of the metropolitan area which will provide times-series data spanning any changes.
D. Regulations	Loading and unloading restrictions, rate structures, vehicle-size units, any restrictions on use of streets.	C. Second alternative procedure communications with participants in urban goods movement	Develop strong lines of communications with all agencies, institutions, and firms involved in freight movement and its regulation, to be able to gain prior warning of changes far enough in advance to establish the before-survey.
E. Institutional constraints	Trade union rules, monopolistic controls and government intervention.		
F. Land use patterns	Propensity of land-use types to attract or generate freight trips.	D. Primary data required from monitoring programme as basis for further investigations into freight movement elasticities with respect to a wide range of policy and investment options.	Nature and extent of changes on freight movement patterns at level of consignment in terms of origin, destination, quantity, time-of-day, consignment type, vehicle type, mode, number and warehousing operations and modal interchanges per consignment etc
G. Inventory of technological options ranging from alternative uses of existing technologies to potentials of new and proposed technologies	Pneumatic tube delivery systems, conveyor systems, use of public transport for freight movement outside passenger service hours or in redesigned vehicles, air cushion vehicles etc.		
H. Inventory of shipper, receiver and carrier characteristics	Size and characteristics that relate to the type and location of industry, size and types of merchandise shipped received and carried, types of vehicles used etc.		

The second set of products encompasses four long-run items derived from the short-run products. They are the development of demand models for commodities, the generation of efficiency measures for urban goods movement, the specification of regulatory models to determine system reactions to different options, and the creation of land use models specifically for urban goods movement. These items are incorporated in the final long-run product - a set of regulatory models that will permit the planner to determine the probable system reactions to various regulatory strategies. It is likely that the set of models will devolve upon a simulation procedure using data produced by the monitoring programme.

Such has been the paucity of research into urban goods movement that Meyburg and Stopher emphasised that few of the products of the first set exist for any specific location and none of the products of the second set has been developed. In time, however, it is anticipated that improved long-run products will supplant and augment short-run products in planning urban goods movement. The critical role of the long-term products is to gauge the impact of alternative strategies.

STUDY-DESIGN ASSESSMENT

While the elements, structure and products this study-design provide a comprehensive and flexible superstructure for pigeon-holing individual studies so that they contribute to the sum total of knowledge on urban goods movement, it is not exhaustive and there are opportunities for varying its scope and emphasis. The study-design could be based on corridor or sub-area studies rather than thirteen candidate improvements which would have the advantage of emphasising the systems nature of urban goods movement - an improvement in one area triggering positive or negative impacts elsewhere in the system. There is also scope for emphasising linkages between people and goods movement. Such qualifications emphasise that the Meyburg-Stopher study-design is only one

approach to urban goods movement and is intended for discussion rather than for acceptance or rejection at this stage in our understanding of urban goods movement.

APPENDIX B

ROAD DEFICIENCIES ASSOCIATED WITH GOODS MOVEMENT IN SYDNEY 1975

LOCATION	UBD MAP NO.	SPECIFIC PROBLEM DESCRIBED
1 ASHFIELD	83B9-84B1	Liverpool Road section requires clearway
	83B10-82E9	Liverpool Road requires 12 hr clearway up to Homebush Road
	83B9	Bottleneck at I/S of Hercules Street and Liverpool Road which although light controlled has heavy RT while parkers block other lane - 12 hour clearway is required.
		RT at Holden Street and bus stop between Hercules and Holden Streets on Liverpool Road causes congestion.
2 AUBURN	63G6	Hillier's Road should have more "No Standing" restrictions
	63E8	Wetherill Street, Silverwater has on street loading problems
	63G4	Rawson Street traffic encounters traffic from railway overpass north of Auburn Station causing congestion
	63L7	Subway at Lincoln Street is a bottle-neck
	63H5-64M10	Route along Queen Street-Railway Parade-underpass-Church Street-Arthur Street-Broughton Street has poor alignment and difficult railway crossings especially underpass at Arthur Street (causing illegal entry into Rookwood Cemetry).
3 BALMAIN	5N9-D10	Route along Robert Street, Mullens Street, Rowntree Street is unsatis-factory since it runs through a residential area.
	6E2	Container berths at Cameron Street heavy traffic through residential streets e.g. Mort Street, Darling Street.
	8D5	Container depot Forsyth Street, Glebe, generates heavy traffic through streets.
4 BANKSTOWN	81M3-90G3	Edgar Street needs rebuilding at expense of Chapel Road (81L8-90F7) as this through the Shopping Centre (90A8)

		96B10	Alfords Pt. Bridge ends abruptly at Clancy Street - need feeder system to be built here.
		9101-90F9	Davies/Fairford Roads need rebuilding.
		81D8	Railway Bridge at Joseph Street, Regents Park needs widening
		80G6	Waiting area in Miller Street is now employee's car park and as a result semi-trailers (up to 100) queue in Miller Street.
5	BASS HILL	80K8	Chester Hill Road should not be designated as "Light Traffic Only"
6	BEVERLY HILLS	92J1	Shopping area along Georges Road (Ring Road '3') is a bottleneck.
7	BEXLEY	93J4	Railway underpass at Harrow Head tight U-bend to south - bad geometry
		93G2	Congestion due to close spacing of traffic lights (presumably unsynchronized) and shopping area at I/S of Forest and Bexley Roads and Forest with Stoney Creek Road and Kinsland Road. Camber on Forest Road through Bexley unacceptable for heavy goods vehicles.
		93C7-G1) 92G10-HI) 91H10-F1 90E10-G1	Dissatisfaction expressed with route from Alexandria and St Peters to (and thence to Melbourne) from the Princes Highway along Forest Road, Stoney Creek Road, King Georges Road, Canterbury Road, and Milperra Road because roads are regarded as residential roads and the route is indirect.
8	BLAKEHURST	99J2	3 Lane bridge at Tom Ugly's Pt. joining Blakehurst to Sylvania is a bottleneck in peak hour.
9	BOTANY	75C9	Botany Road congested in shopping areas - needs clearways Botany Road inadequate for industrial usage Botany Road congested east of airport
		85N7-N8	Major bottleneck in General Holmes Drive/Level Crossing/Botany Road/ Wentworth Avenue/Mill Pond Drive complex
		85M6	Underpass in O'Riordon Street needs widening.
10	BURWOOD	65N3	Burwood Road thru shopping area is congested.

11 CONCORD	64C9	Nullawarra Avenue needs rebuilding
12 CROYDON	65K3-L8	Narrow lane widths on Parramatta Road between Burwood Road and Great North Road
	65K3-J1	Parking bans along Parramatta Road from Concord to Burwood (where there is heavy RT) would relieve congestion
	65	Parramatta Road - worst section is from Croydon to City with narrow lanes and RT vehicles holding up flow
13 ENFIELD	82C1-K8	Chullora and Enfield Railway properties hinder use of Ring Road '3' and other arallel N-S routings
	82E8	I/S of Homebush Road (Water Street) and Dean Street not safe (geometry?)
	82D5	I/S Roberts Rd with Hume Highway - geometry problem
	82N6	I/S Roberts Road/Wiley Avenue/Park Avenue/Punchbowl Road - geometry problems
14 ENMORE	9C1	Low level railway underpass, LNS but probably at Liberty Street
15 EPPING	39K3	Bad geometry at Epping Bridge I/S incl. dog-leg turns and narrowing of lane width
16 ERMINGTON	53J7	Access from Silverwater Road northwards through Dundas Valley to Carlingford and West P_nnant Hills is by circuitous routes involving many tight turns
17 GRANVILLE	62C7	Narrow lane widths on Parramatta Rd due to pylon in middle of road at rail bridge near Duke Street I/S
	62C9	No lane markings on Parramatta Road at level crossing near Marsh Street I/S. Parramatta Road congested through Granville
	62N5	Bad geometry at I/S of Woodville and Rawson Roads
	62N9	Bad geometry at I/S of Rawson Road and Ferndell Street
	62D8	Low pedestrian overpass across Railway Parade at Granville Station
	63C1	Parramatta Road congested between Rawson Street and Woodville Road due to heavy RT at Berry Street. Sign posting off Parramatta Road to Camellia is ill-defined

	62B7	I/S of Parramatta Road with Woodville Road and Church Street is a bottleneck due to bad geometry.
18 HOMEBUSH	64K8	Bottleneck near George Street intersection due to narrow lane width on Parramatta Road where 3 lanes merge into 2. Bridge Road to Concord Rd section is congested. RT at Knight Street and Station Street should be banned (as is RT from Subway Lane)
	64J5	Give way signs at I/S of Bedford Rd and Parramatta Road cause long queues and delays to meat wagons
	64J4-K8	Traffic congestion on Parramatta Rd from Homebush to Flemington due to narrow lane width - (3 lanes merge into 2)
	LNS	Other reference to congestion on Parramatta Road due to narrow lane widths. Western F/W built from Parramatta to Darling Harbour would alleviate this problem
	LNS	Synchronization of lights along Parramatta Road is needed
	64J4-J5	Present widening on Parramatta Rd to provide RT lane into Farm Produce Market may cause further congestion in this area
	64M8	Light control needed at I/S of Brahton Road and Homebush Road
19 HORNSBY	27C3	I/S of Pacific Highway and College Crescent has bad geometry. This causes frequent breach of traffic regulations here as well. (Accident-prone location for Petrol Tankers).
20 HURSTVILLE	92N8	Low level rail bridge at Hurstville Station
21 KILLARA WEST	40J6-J9	Because Lady Game Drive is designated "Light Traffic Only" unnecessarily long detour along Ryde Road, Pacific Highway and Fiddon's Wharf Road has to be used to get from 'J6' to 'J9'
22 LEICHHARDT	7L4	I/S of Marion Street and Balmain Rd unsafe for goods vehicles to negotiate
	7A4-N4	Balmain Road through Leichhardt and Lilyfield urgently needs rebuilding
23 LIVERPOOL	88H3	Liverpool Bridge is a bottleneck during evening perak period

	6405	Barker Road is overloaded with traffic
24 MARRICKVILLE	85G3	Campbell Street needs widening and reconstruction
	85F2	May Street/Campbell Street/Bedwin Road/Unwins Bridge Road is below drainage system - should be raised 3 ft
	84C5	LT from West Street into Railway Terrace is difficult - geometry problem
	84E6	Sydenham Road needs widening between Park Road and Malakoff St
	84C10	Liberty Street at Stanmore Road I/S needs widening to simplify LT
	85B3	King Street, Newtown needs massive off street parking and 24 hour clear ways or a bypass built
	84H10	Sydneham Station Bridge is a bottleneck
	84H8	Marrickville shopping centre at I/S of Marrickville and Victoria Roads is congested - needs parking bans
	84F4	Dulwich Hill shopping centre needs parking bans
25 MASCOT	85J6	Church Avenue one-way eastbound at present - OK. If flow reversed queuing problems and congestion would arise due to proximity of warehouse entrance to busy O'Riordan Street
	85N6-D9	O'Riordan Street is congested between Mascot and Zetland
	85N7	I/S of Mill Pond Drive and General Holmes Drive is a bottleneck - General Holmes Drive is saturated during peak hours
26 MOSMAN	58E4	Clearway on Military Road needs to be extended
27 NEWTOWN	9D4	Newtown Bridge - RT banned Australia Street into King Street. LT physically impossible due to geometry of I/S. Heavy RT into Wilson Street and LT into Bedford Street cause congestion. I/S as a whole incl. Erskinville Road requires renewal. Car parking on King St causes congestion
	8L3-06	Traffic congestion on Missendon Rd from Newtown to Camperdown. Shopping area on King Street needs off street parking for 900 cars (70 spaces available now).

28 PARRAMATTA	52M4	Low level rail underpass at Pitt St
	51E2-E6	Wentworth Ave and Fitzwilliam Rd, Toongabbie, require reconstruction and some widening
	62N6	Rawson Road, Guildford needs stengthening
	62M9-E9	Clyde Street needs strengthening
	62E8	William Street, Granville, needs stengthening
	52L3	Park Parade, Westmead, needs widening to four lanes and I/S with Pitt and Hawkesbury Roads are very bad
29 PETERSHAM	70l-N5	12 hour clearway needed on Parramatta Road between Elswick Street and Balmain Road
	7N4	Traffic congestion on Parramatta Road between Norton and Catherine St, especially at Balmain Rd I/S
	84B5	Bad geometry at I/S of Parramatta Road and West Street
30 REDFERN	3M4	Congestion on Regent St (which becomes Botany Road) due to double set of lights at I/S with Lawson and Redfern Streets - need synchronization of lights
31 REGENTS PARK	81F8-L8	Rookwood Road is in urgent need of rebuilding
32 ROCKDALE	93G5	I/S of Bay Street with Princes Highway including shopping area either side is congested
	93H4	Low level rail bridge at Harrow Rd
33 ROZELLE	5G1-010, 60l-N6	Victoria Rd heavily congested between Iron Cove Bridge and Glebe Island Bridge due to heavy traffic and cross streets like The Crescent, Lilyfield Road, Robert Street, Darling Street and freight terminals in area.
34 ST PETERS	85G4-G2	Campbell Road too narrow - I/S geometry is bad at Unwins Bridge Rd/ May Street/Bedwin Road - improvement to light control at I/S with Princes Highway is necessary
35 STRATHFIELD	64H8	RT from Queen Street into Pomeroy Street is hazardous since Pomeroy Street traffic has ROW but is not visible from Queen Street
	82D5	Entering Liverpool Road from Pemberton Street is a problem due to lack of light control

	64M10	Underpass at Strathfield Station is via circuitous route (many dog-leg turns)
36 SYDENHAM	85K1	LT from Princes Highway into Bellevue Street causes outswing into adjacent traffic lane. Light control required to cater for heavy LT and RT movements. Better or alternative access to Cook's River Goods Yard is required.
	84H10	Low level railway bridge at Sydenham Station
	85J4	Alexandra Canal Bridge is bottleneck due to 6 lanes merging into 4 heavy RT from Ricketty Street into Burrows Road and heavy RT from Burrows Road into Canal Road
	85H2	I/S of Princes Highway and Canal Road requires improvement to light control to allow smooth eastbound flow along Canal Road.
37 SYDNEY	4G1	Fitzroy Street needs widening from Dowling Street to Bourke Street including new geometry at I/S with Bourke Street.
	3G6-K7	Elizabeth Street south of Central Station needs rebuilding to Cleveland Street
	3K1-4L2	Cleveland Street needs widening
	IH4	RT from Grosvenor Street into Gloucester Street is hazardous due to inadequate sight distance of oncoming traffic entering from York Street
	IJ3	Access to Harbour Bridge through Kent and Bridge Streets is problem at peak periods - Kent Street between Napoleon and Market Street is problem
	IN1	Pyrmont Bridge is bottleneck when open to let shipping through
	1010	I/S of William Street with Palmer and Bourke Streets should be Grade separated
	3M3	Lawson Street over bridge needs widening
	3M2	I/S of Lawson Street and Abercrombie Street requires improvements to geometry
	9H7	Coulson Street underpass is narrow and low
38 TEMPE	84K8-J10	Unwins Bridge Road congested through to Railway Road (narrow section)

39	THE SPIT	43M4	The Spit Bridge is a bottleneck when opened to let shipping through
40	WEST PENNANT HILLS	38D4	Detour along Pennant Hills Road around busy Thompson's Corner into Castle Hill Road used because Victoria Road is designated at "Light Traffic Only"
41	WEST RYDE	54G7-G4	Westbound along Victoria Road from Heritage Street to Adelaide Street is congested due to heavy RT at Chatham Road
		54L9	Ryde Bridge (3 lane) is a bottleneck in peak hours
42	WORONORA	101D3	Bottleneck on Bridge at Menai Road
43	YAGOONA	8IM6	Shopping Centre on Hume Highway causes congestion - needs clearway and removal of pedestrian crossings
44	COOKS RIVER VALLEY ROUTE	LNS	Route needs developing from Mascot/ St Peters to Homebush/Silverwater. Route to Tempe with connections to Mascot and Botany is needed
45	WOLLI CREEK VALLEY ROUTE	92,84,85	Route from Beverley Hills through Tempe to St Peters needs to be developed
46	SHOPPING AREAS	LNS	On arterials at Ashfield, Bexley, Campsie, Parramatta, Fairfield, Liverpool (even with bypass), Hurstville, Merrylands, Guildford, Strathfield, Burwood, Beverley Hills - are a problem
47	ROAD SURFACE	LNS	Substandard on main and local roads in Granville, Fairfield and Smithfield
48	LIGHT TRAFFIC ONLY	LNS	Problem in Canterbury and Bankstown LGA's, where too many roads are so designated
49	RING ROADS	Main Connecting Roads	'3' is ill-defined and inadequately sign posted as to suburb locations particularly at North Strathfield - Ring Road '1' is a misnomer - '5' should be redesignated - busy cross roads such as Parramatta Road, Liverpool Road, Canterbury Road plus many dog-leg turns impede flow along Ring Road '3' and other parallel N-S routings
50	12 HOUR CLEARWAYS	LNS	Advocated on Parramatta Road, Victoria Road, Liverpool Road, Canterbury Road, Pacific Highway,

		Princes Highway, Eastern Valley Way, Pennant Hills Road, all Ring Roads, King Georges Road, Hume Highway and Marrickville Road, Silverwater Road and Victoria Road route from Regents Park to Sydney wharves gives better travel times than Parramatta Road, which is more direct. 12 hour clearways effect deliveries to on street shops (especially Canterbury Rd meat shops)
51 WHARVES	2K1	Heavily laden vehicles use Sir John Young Crescent rather than Bourke Street to avoid steeper descent
	6D2	Access through Balmain to terminal (ANL) is problem
	1	Walsh Bay wharves inadequate for semi trailers
	1	Darling Harbour has good facilities but getting out of area is problem, i.e. Via Kent Street - Napoleon St (J2.3) to Market Street (N4)
	1-O2	South Darling Harbour Wharves are virtually useless
	6M4	Glebe Island - queues along the Crescent as far as Johnston Street (7C,D9)
	6J4	White Bay - Congestion at Villawood (Leightonfield) and, queue along Miller Road to Princes Highway (80F6-K6)
	6D3	Mort Bay - narrow winding street access through residential areas of Balmain and hill climb from waterfront.

Source: Scott (1975)

Notation:
- Stn - Station
- I/S - Intersection
- RT - Right turn
- LT - Left turn
- LNS - Exact Location Not Stated
- ROW - Right of Way

SELECTED REFERENCES

1. Bibliographies and Literature Reviews

Bolger, F.J. and Bruck, H.W. (1973), An Overview of Urban Goods Movement Projects and Data Sources. Washington D.C., Department of Transportation.

Smith, K.J.G. (1976), 'Urban Retail Deliveries and the Problem of Heavy Goods Vehicles in Towns', Transport Operations Research Group Working Paper No. 12. Newcastle upon Tyne, University of Newcastle upon Tyne, Department of Civil Engineering.

Watson, P.L. (1972), An Annotated Bibliography on Urban Goods Movement. Illinois, Northwestern University.

Wheeler, J.O. (1976), A Bibliography of Recent Studies of Urban Commodity Flows. Monticello (Illinois), Council of Planning Librarians Exchange Bibliography.

2. Urban Goods

Atkins Planning (1975), 'Swindon Freight Study: Collection of Data and Construction of Computer Model', Transport and Road Research Laboratory Supplementary Report 158 UC. London, Department of the Environment.

Battilana, J.A. and Hawthorne, I.H. (1976), 'Design and Cost of a Transhipment Depot to Serve Swindon Town Centre', Transport and Road Research Laboratory Report 741. Crowthorne: Transport and Road Research Laboratory.

Bettison, G.E. (1976), 'The Financial Stability of the Road Haulage Industry in Western Australia', Policy Research Paper. Perth, Director General of Transport, Western Australia.

Cundhill, M.A. and McCarthy, S.P. (1976), 'Swindon Freight Study: Models for Assessing Environmental and Congestion Changes', Department of Environment TRRL Supplementary Report 226 UC. Crowthorne: Road Research Laboratory.

Fisher, G.P. (ed.) (1976), Goods Transportation in Urban Areas: Proceedings of the Engineering Foundation Conference September 7-12 1975. Washington D.C. Department of Transportation.

Goettee, D. and Cadotte, E.R. (1977), 'Freight Movement: A Crucial Component of Transportation System Management', in Transportation Research Board, Transportation System Management Special Report 172, Washington D.C., National Academy of Sciences: 37-43.

Habib, P.A. and Crowley, K.W. (1976a), 'Economic Approach to Allocating Curb Space for Urban Goods Movement', Transportation Research Record No. 591, pp. 18-24.

Habib, P.A. and Crowley, K.W. (1976b), 'Economic Rationale for Establishing Off-Street Loading Requirements in City Center', Transportation Research Record No. 591, pp. 25-31.

Harlow, G.R. (1973), 'The Effect of Heavy Vehicles in Residential Areas', Journal of Institute of Municipal Engineers, Vol. 100: 297-302.

Kelly, R.W. and Holder, R.W. (1977), 'Efforts to Improve Goods Movement in Dallas', in Mexico City Institute of Transportation Engineers, Compendium of Technical Papers from 47th Annual Meeting IV Congreso Mundial de Ingenieria des Transpertes 2-6 October 1977. Mexico City, Institute of Transportation Engineers.

Levinson, H.S. (1977), 'Innovations in Urban Goods Movement', in Mexico City Institute of Transportation Engineers, Compendium of Technical Papers from 47th Annual Meeting IV Congreso Mundial de Ingenieria des Transpertes 2-6 October 1977. Mexico City, Institute of Transportation Engineers.

Loebl, S.A. (1976), 'Aspects of Demand for Urban Goods Movement in City Centers', Transportation Research Record No. 591, pp. 38-40.

Meyburg, A.H. and Stopher, P.R. (1974), 'A Framework for the Analysis of Demand for Urban Goods Movements', Transportation Research Record No. 496, pp. 68-79.

Ogden, K.W. (1977a), Urban Goods Movement. Melbourne, Department of Civil Engineering, Monash University.

Ogden, K.W. (1977b), 'Modelling Urban Freight Generation', Traffic Engineering and Control, March 1977 : 106-9, 117.

Ogden, K.W. (1977c), 'An Analysis of Urban Commodity Flow', Transportation Planning and Technology, Vol. 4:1-9.

Rimmer, P.J. (1976), 'Urban Goods and Commercial Vehicle Movements in Sydney', unpublished paper delivered at the Seminar on Future Transport Strategies for Metropolitan Sydney, School of Transport and Traffic Engineering, The University of New South Wales 15-16 June, 1976.

Rimmer, P.J. and Hicks, S.K. (1977), 'Urban Goods Movement: Process, Planning Approach and Policy', in D.A. Hensher and P.R. Stopher (eds), Proceedings Third International Conference on Behavioural Travel Modelling (in press).

Rimmer, P.J. and Hooper, P. (1977), Launceston Area Urban Freight Study: A Reconnaissance Report. Melbourne, Commonwealth Bureau of Roads.

Rosman, P.F. (1976), 'Alternative Sizes of Lorry: Two Investigations into Public Preferences', Department of Environment TRRL Supplementary Report 210. Crowthorne, Transport Road Research Laboratory.

W.D. Scott and Co. Pty. Ltd. (1975), Empirical Investigation of Issues Arising from Urban Goods Workshop (2 vols), unpublished report to the Commonwealth Bureau of Roads, Melbourne.

Slavin, H.L. (1976), 'Demand for Urban Goods Vehicle Trips', Transportation Research Record No. 591, pp. 32-7.

Smith, K.J.G. (1976a), 'Constraints Affecting the Use of a Public Transshipment Depot', Transport Operations Research Group Working Paper No. 19. Newcastle upon Tyne, University of Newcastle upon Tyne, Department of Civil Engineering.

Smith, K.J.G. (1976b), 'Analysis of Goods Deliveries to a Semi-Pedestrianised Shopping Street', Transport Operations Research Group Working Paper No. 22. Newcastle upon Tyne, University of Newcastle upon Tyne, Department of Civil Engineering.

Starkie, D.N.M. (1970), 'Commercial Vehicles in Urban Transportation', Journal of the Institution of Highway Engineers, Vol. 17: 19-25.

Transportation Research Board (n.d.), Transportation Planning for Small Areas, National Co-operative Highway Research Program Report 167. Washington D.C., National Research Council.

Watson, P.L. (1975), Urban Goods Movement: A Disaggregate Approach. Lexington, Lexington Books.

Wigan, M.R. (1977), 'Indicators for Urban Commodity Movements', Australian Road Research Board Internal Report AIR000-59. Melbourne.

Zavattero, D.A. (1976), 'Suggested Approaches to Urban Goods Movement and Transportation Planning', Transportation Research Record No. 591, pp. 41-3.