PLANNING FOR PUBLIC TRANSPORTATION USING GIS
CASE STUDY-HYDERABAD

A DISSERTATION

submitted in partial fulfilment of the
requirements for the award of the degree
of
MASTER OF URBAN AND RURAL PLANNING

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Candidate's Declaration

I hereby declare that the work presented in this dissertation entitled **'Planning For Public Transportation Using GIS'** in partial fulfilment of the requirements for the award of the Degree of **Master Of Urban And Rural Planning** submitted in the department of architecture and planning, university of Roorkee, Roorkee, is an authentic record of my own work carried out during the period July 1997 to January 1998 under the guidance of Dr. Agha M. A. Siddiqui, Lecture in the Department of Architecture and Planning, University of Roorkee, Roorkee.

I have not submitted the matter presented in this dissertation for any other degree or diploma.

Dated: 28/1/98

Kavitha

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This is to certify that above statement made by the candidate is correct to the best of my knowledge.

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Place: Roorkee.

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Chapter 1

Introduction

1.1 General

Cities require large-scale movement of persons, which is at present largely based on personalised transport. In developing countries like India, it is easy to increase vehicle ownership, especially of 2-wheelers, but with constrained resources, it is not so easy to develop transport infrastructure. The solution[1] therefore, lies in creating and / or improving the road-based public transport system that supplements the private vehicles and takes over as the main mode of urban transport.

The purpose of urban transport (synonymously used with public transport) is, therefore, to carry as many persons as possible – quickly, reliably, efficiently, conveniently, and comfortably from places of origin to their destination.

Quickness, efficiency, reliability, convenience, and comfort are the important terms, which would make public transportation acceptable and popular. In the days of strangle traffic congestion, environmental pollution and energy shortage, it is time to apply incentives to encourage the use of public transport, alongwith disincentives to discourage the use of private automobiles. Moreover, with that would reduce number of private vehicles on urban road, 2-wheelers in particular.

With this understanding, the ongoing study on planning for public transportation using GIS has been taken up with Hyderabad City as the case study.

1.2 Case Study

Hyderabad (Map 1), the fifth largest city in India is growing at a phenomenal rate. The metropolitan area extends to 1,865 sq. km. Its population as per 1991 census stands at 4.35 million. Nearly 1 million people and 6,000 vehicles are added to this every year. The rapid urbanisation and industrial growth in and around the city pose additional demands on the limitedly available infrastructure, including transport infrastructure. The commuter needs are presently met up mostly by the bus transport system, which is short of capacity to meet the increasing demands.

As on date, there are 300 public transportation routes on which nearly 2200 buses, operate carrying more than five lakh passengers per day. The secondary information reveals that most of the routes in the city converge at a few focal points. This is because of large concentration of offices, schools, colleges etc. at these points. The uneven distribution of the institutions has resulted in overlapping of routes, excessive traffic and overloading of buses, e.g. at Dwarka, Basherbagh, and secretariat, more than 500 buses pass in an hour.

The overloading of buses and their movement on certain routes during peak hours pose large-scale traffic problems. Excessive conurbation's of activities on a few routes and few locations makes them zones of maximum traffic generation and attraction. To mention some locations, Koti has 35 routes, Charminar - 40, Namapally - 30, Mehdipathnam- 14, Secunderabad - 70, Women's college - 10, and Sanat nagar 15 routes.

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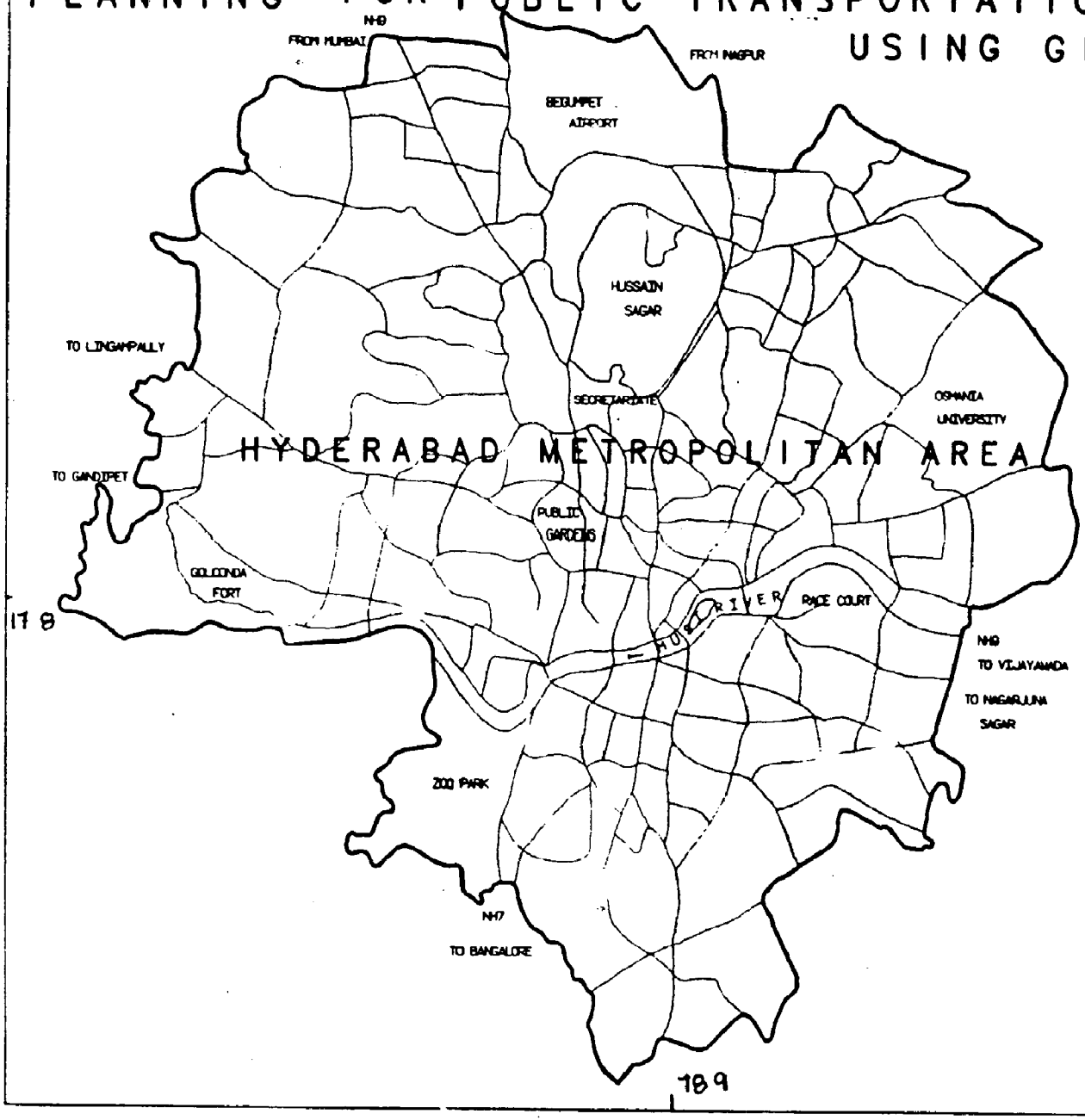

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- MUNICIPAL BOUNDARY
- ROAD NETWORK

MAP NO : 1

CASE STUDY AREA

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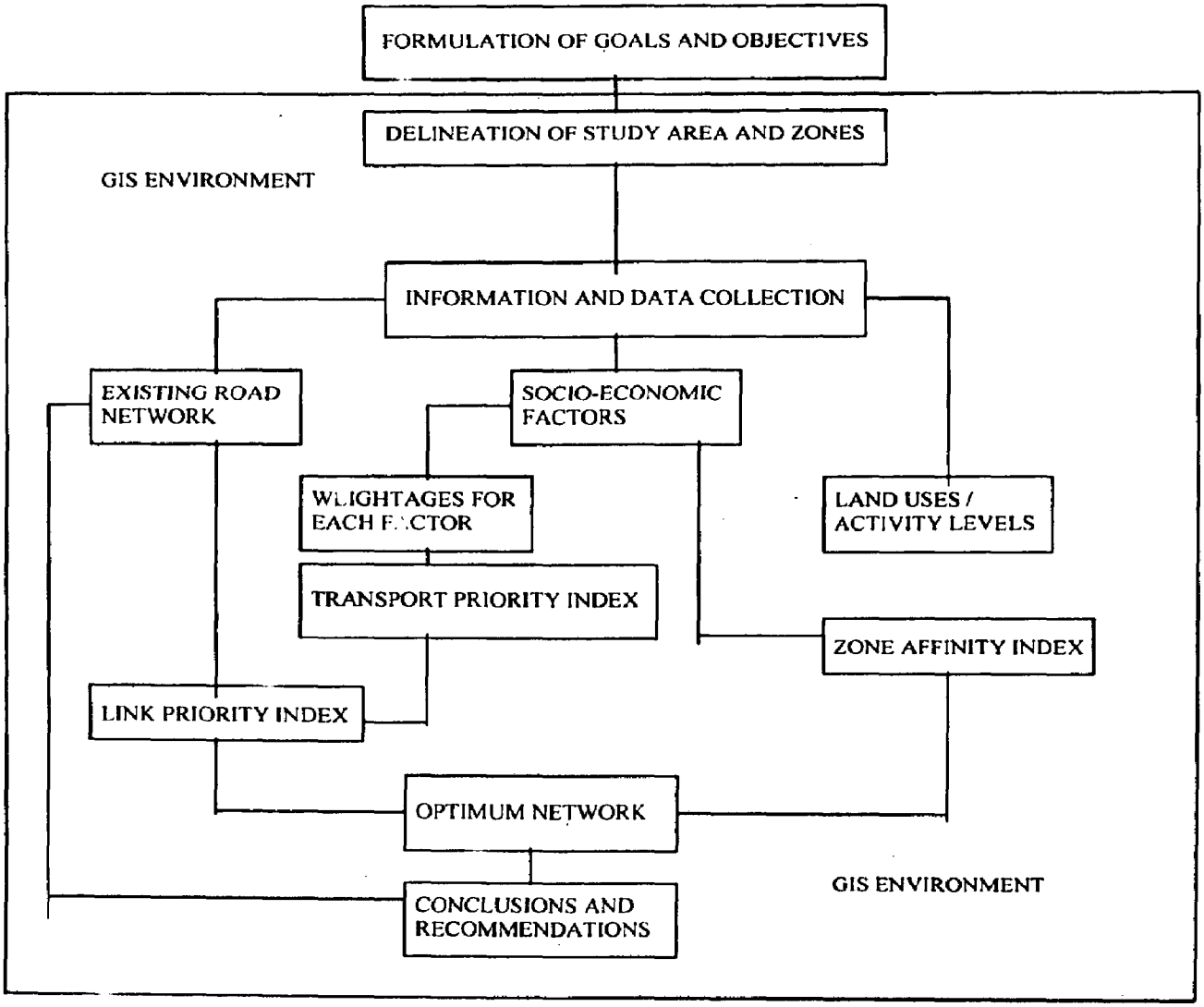
The undesirable and irrational cutting across of routes is largely responsible for so many ill effects including, congestion in the CBD areas. There is, therefore, a need to perform a detailed study into these and suggest an optimum solution (network) for public transportation of appropriate standards and routing / scheduling etc. so that there do not remain any shortfalls and the travel demands of the are fulfilled.

1.3 Aims and Objectives

The study therefore aims at determining priorities of the existing public transport routes and identify further public transport route with missing links. Keeping this in view, following would be the objectives (steps) of the study.

1. Study the socio-economic characteristics in each traffic zone;
2. To study the existing public transportation road network;
3. To study trip-generating zones and trip-attracting zones alongwith traffic volumes;
4. To study activity levels in the each zone; and,
5. Identify potential work places in the city.

1.4 Methodology



1.5 Scope

The study would cover the city of Hyderabad. It would be confined to public transportation only, i.e. trips catering to employment. This limitation is essentially because of time constraint.

Reference

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CHAPTER 2

STUDIES ON PUBLIC TRANSPORTATION

One of the most inevitable aspects of the phenomenon of urbanisation is the continued increase in demand for urban infrastructure and urban services; The demand for transport system is, arguably, the foremost of them all as stressed by the National Commission on Urbanisation[1], "Urban transportation is the single most imported component instrumental in shaping urban development and urban living". It then becomes important to provide an efficient and effective transport system to support and promote rational development. While urban areas, may be viewed, as an engine of growth, urban transport is the wheel of that engine[2].

2.1 The Challenge

Moving about in India cities are becoming a nightmare for the public, and the increasing number and magnitude of problems, a challenge to the town and transport planners. There are several reasons for this. Some are:

1. Increasing encroachment of space by pedestrians, parked vehicles, hawkers and shopkeepers;
2. Poor enforcement of construction and maintenance standards, and traffic regulations; and,

3. Uncontrolled proliferation of the intermediate public transport due to inadequate mass transport[3].

2.2 Urban Transport Demand

Urban transport demand has many dimensions - size, characteristics, technology, finance, fiscal, institutional etc[4]. Hutchinson classifies the urban travel demands as follows:

1. Radial - type travel along corridors focused on the central business district,
2. Circumferential- type travel between activities located in the suburbs of cities;
3. Travel within residential areas where this type of travel night be between local area activities or travel at the beginning or completion of a longer trip within an urban region;
4. Travel within the central business district where this travel might be between activities within the central area or and from the terminals of regional transport facilities focused on the central area; and,
5. Travel to and from major activating concentrations not located within the central area such as airports, universities and recreational areas.

The size of urban travel demand, Ranganthan (1994) argues, is high, and is continuously increasing. He identifies three factors for this. These are:

1. increasing population;
2. increased mobility rate; and,
3. Increased trip length.

Urban travel demands are satisfied in many ways and by many modes. In the absence of an adequate, efficient and satisfying public transport, a large number of private and para-transit modes enter the market to service the travel demand. Such a proliferation of vehicles results in acute congestion, inordinate delays, serious accidents, high-energy consumption (and loss), and intense pollution of environment[6].

2.3 Urban Road Network

In order to perform socio-economic and cultural activities, human beings have to necessarily more from one place to another. Urban transportation network is required to facilitate movement of human beings. This network is necessary for inter-city passenger movement as also for movement of goods. Since city is not an isolated unit, transportation links are also required for regional, national and international linkages. Aim of transportation is to establish a reliable, efficient and attractive multi-mode system both for mass transportation and vehicles meant for individuals. It is also to provide safe pedestrian movement. In Indian context, these roads are to cater to mixed traffic i.e. fast moving vehicles as also cycles and cycle-rickshaws[7].

2.4 Buses For Public Transport

It is a very common practice in India as well as in so many other countries to adopt buses as a made for mass transport even though their cost per passenger km. is higher compared to other modes like Light Rail Transit (LRT) or Mass Rapid Transit System (MRTS). This is because the buses are mass-produced and can use the right-of-way provided by the public authorities which results in low capital intense mode, though with a short service life. The comparatively steady price and uniform availability of oil together with capability of providing a high degree of flexibility to a new or altered service, quick and cheaply (to the operator) turns the buses as the choice mode especially in urban areas of developing countries[8].

The size of buses[9] used for mass transit depends on route characteristics; nevertheless, their overage size has increased over time. Technological advancement in component manufacturing has, *interalia*, effected this increase. Use of large buses on busy routes minimises the labour requirements as more number of passagers can be accommodated per manpower unit.

In any community, there is demand for transport for work, shopping, education, social and leisure activities. The level and nature of the demand depend upon densities of development, spatial distribution of activities, age structures and socio-economic characteristics of an area. The extent to which public transport can satisfy the demand is influenced by all these factors. It is also strongly dependent on the location of this

development in relationship can greatly enhance the efficiency of public transport and hence cost of its provision.

This turn enables public transport to play a more effective role in the community, not only for the benefit of non-car owning households but also for the benefit of those in car owning households who still require public transport for certain trips; such instances are when the car is either not available or not well suited to the particular purpose. If the bus can be an attractive alternative for these trips, it reduces dependence on the private car and results in economic, social, energy and environmental benefits to the community.

The general philosophy of bus operation[10] can be described as:

1. providing direct routes for the buses between points of primary attraction;
2. providing balanced housing densities along such routes within convenient walking distance;
3. providing pedestrian access to stopping places at regular intervals;
4. locating secondary traffic objectives on thel ine of the route between important points, for example, schools, local centres, post offices, or public buildings[10].

The policy and programme thrust should be to encourage public transport systems i.e. high occupancy vehicles with access to public, whether private individuals or public agencies11 owns them.

2.5 Problem Identification

Due to the rapid growth of Hyderabad in terms of population and horizontal expansion, the transport infrastructure has insufficient and has not kept pace with its expansion and increasing demand.

As on date, there are 67 traffic zones (Map 2) and 300 public transportation routes on which nearly 1200 buses, operate carrying more than five lake passengers per day. The secondary information reveals hat most of the routes in the city converge at a few focal points. This is because of large concentration of offices, schools, colleges etc. at these points. The uneven distribution of the institutions has resulted in overlapping of routes, excessive traffic and overloading of buses, e.g. at Dwarka, Basherbagh, and Secretariat, more than 500 buses pass in an hour.

The overloading of buses and their movement on certain routes during peak hours pose large-scale traffic problems. Excessive conurbation's of activities on a few routes and few locations makes them zones of maximum traffic generation and attraction. To mention some locations, Koti has 35 routes, Charminar - 40, Namapally - 30, Mehdipathnam- 14, Secunderabad - 70, Women's college - 10, and Sanat nagar 15 routes.

The undesirable and irrational cutting across of routes is largely responsible for so many ill effects including, congestion in the CBD areas. There is, therefore, a need to

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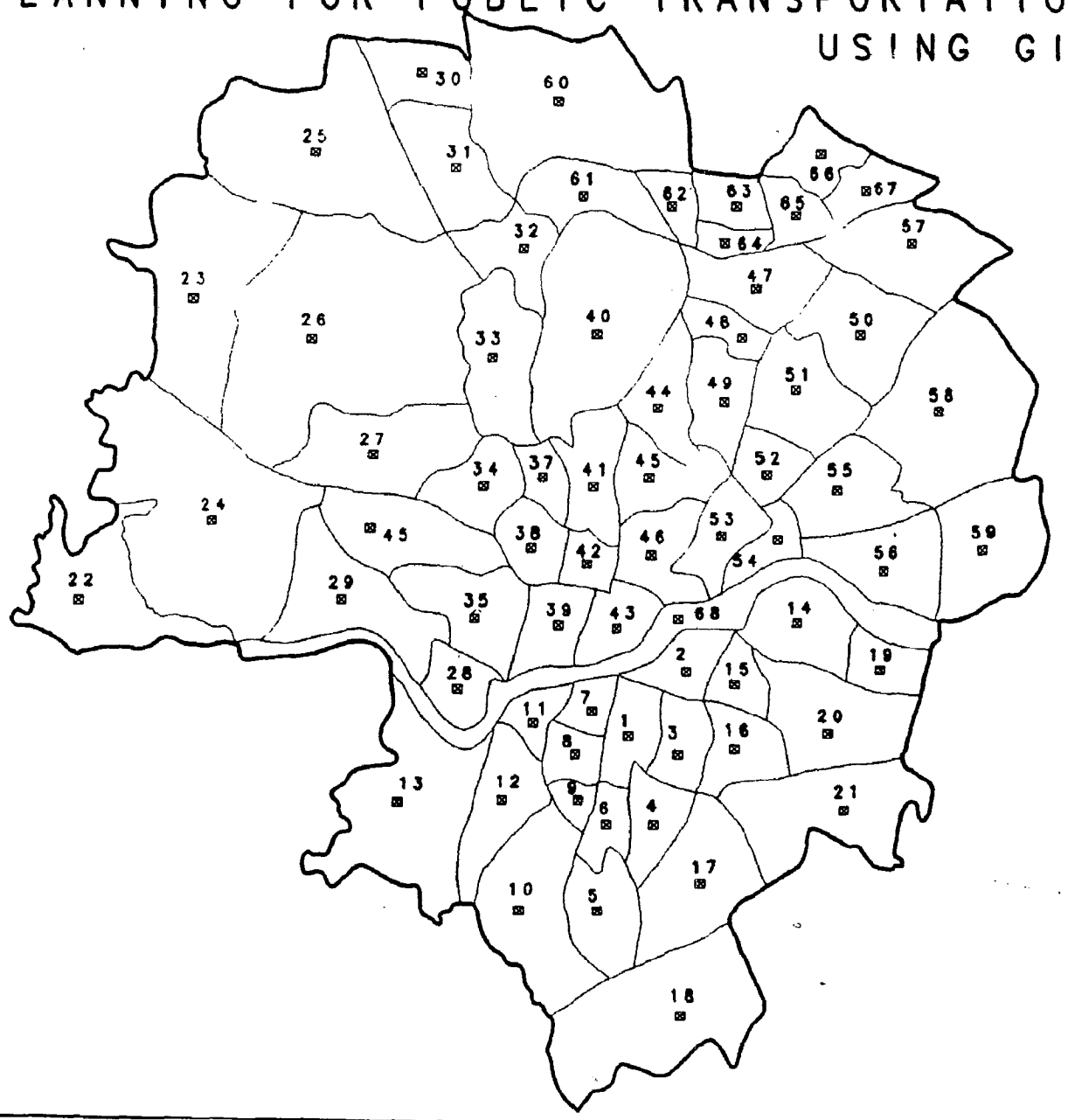

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

TRAFFIC ZONE BOUNDARY

MUNICIPAL BOUNDARY

MAP NO : 2

TRAFFIC ZONES

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perform a detailed study into these and suggest an optimum solution (network) for public transportation of appropriate standards and routing/ Scheduling etc. so that there do not remain any shortfalls and the travel demands of the people, partly related to work trips are fulfilled.

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Chapter 3

GEOGRAPHIC INFORMATION SYSTEMS

This chapter contains a brief information regarding the geographic information systems, their domain, capabilities, applications with specific reference to transport planning, and networking.

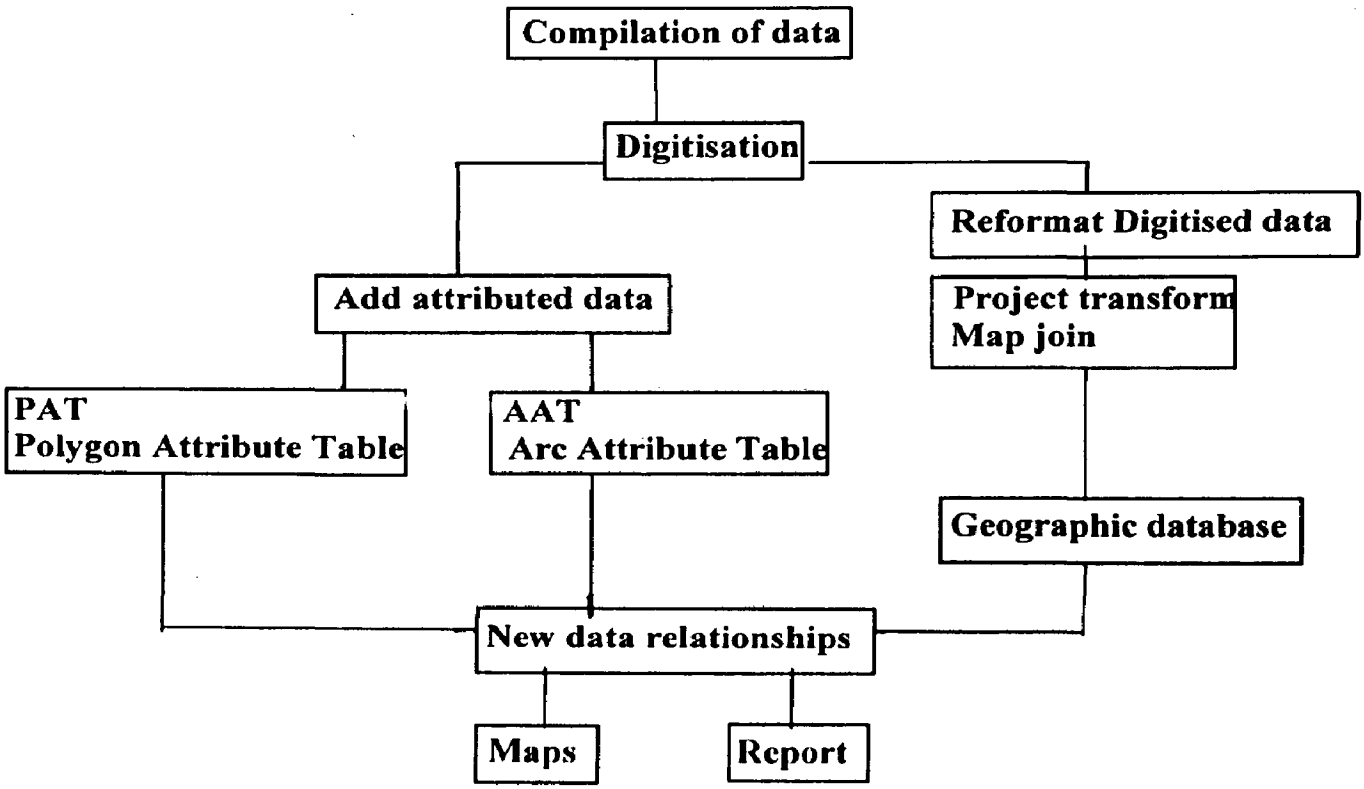
3.1 Introduction

The GIS can be described as 'an organised collection of computer hardware, software, geographic data, and personnel designed to efficiently to capture, store, update, manipulate, analyse and display all forms of geographically referenced information'.

There are two types of Map information –

1. Describing the location and shape of geographic features and their spatial relationships to other features; and,
2. Descriptive information about features.

The various components and steps in a **GIS** project are given below graphically.



3.2 Questions GIS Can Answer

GIS can be described in two ways. These are:

1. Through formal definition ,and
2. Through its ability to carry out spatial operations, linking data sets together using location as the common key. There are five generic questions that a sophisticated GIS can answer.

Location **what is at.....?**

The first of these questions seeks to find out what exists at articulator location can be described in many ways using for example, place name, post or zip code or geographic reference such as latitude.

Condition **where is it.....?**

The second question is the converse of the first and requires spatial analysis to answer. Instead of identifying what exists at a given location, You want to find location where certain conditions are satisfied.

Trends **What Has Changed Since.....?**

The third question might involve both of the first two and seeks to find the difference within an area over time.

Patterns **What Spatial Patterns Exist.....?**

Modelling What If.... ....?

"What if " questions are posed to determine what happens, for example, if a new road is added to a network or if a toxic substance seeps into the local ground water supplies. Answering this type of questions require both geographic and other information.

3.3 Applications of GIS in the Transportation

The Geographical Information Systems (GIS) is a special type of Information system in which data consists of observations on spatially distributed features, activities or events. Most GIS applications involve some form of geographic analysis. It includes land use and natural resources management, property distribution and development policy and teaching.

Transport is concerned with movement of persons or goods for some particular purpose. In highly populated urban industrial areas there are usually dense patterns of transport lines. The features, characteristics and patterns of this transportation net work are capable of investigation and geographers have recently applied analysis and a number of techniques for these purposes.

In the study area the transport net work is very complex due to haphazard growth of the city. The dominance of two national highways bisecting the city is very much prominent in the transport net work. In this study public transport route s have been considered for transport planning.

Transport Priority, Link Choice and Zone Affinity Indices of each traffic zone are calculated with the help of the spatial distribution of the transport net work. The north and northeastern part of the city are most accessible and well connected. These indices have been calculated by using dBase. The distribution and the growth of population is very much related to the availabily of the mass transport network has created an unplanned growth urban centres and population.

3.4 GIS in Road Networking

Because the field of transportation is inherently geographic, GIS poses a technology with considerable potential for achieving dramatic gains in efficiency and productivity for a multitude of traditional transportation application, as well as creating opportunity to develop new applications that so far were considered impossible. Recognising these possibilities. the transportation community has taken a serious look at GIs over the fast five years, and there is a growing body of support for full scale GIs implementation within transportation agencies.

By virtue of the simple fact that transportation systems are geographically distributed, virtually all maintenance functions stand to benefit from basic automated mapping of the transportation infrastructure. The simple ability to see a picture of the system vastly improves the ability to plan its maintenance or improvement. Each piece of roadway must be digitised. The maps for digitisation can be obtained from development departments or photogrammetry, GPS etc.

3.4.1. Associate data with map entities for display

Associating the computer based maps with data describing the attributes of the roadway vastly improves the usefulness of the maps because information can be graphically displayed. As with basic mapping, a GIS that allows the association of data with map entities requires very little investment in software. It requires the digitised roadway segments be linked to the attribute data using a key field such as mile post or node numbers. Sophisticated GIS systems with high levels of accuracy and detail may use longitude-latitude co-ordinates as the linking key. Attribute data tend to change frequently and could be continually updated at a more regular pace than the digitised roadway infrastructure.

3.4.2. Interactive map based query and data entry

Geographic based reporting the capability to interactively query and update geographic roadway data require software that can manage the digitised roadway data as well as the attributed data. Many levels of sophistication of interactive query and data

management capabilities are available. For example, a system which maintenance a record for each roadway segments between each intersection might allow for query and data entry by 'Point and click'. More complex systems might allow for query of roadway segments within a given distance of an intersection query by condition can be extended from simple reporting to analysis and recording of roadway characteristics. Spatial analysis capabilities are particularly useful for identifying exceptions, evaluating their trends, and assessing the condition of the inventory, all of which can be applied to planning the work programme.

3.4.3. Shortest path calculations

The ability to calculate shortest paths between given locations has existed for a long time and is not dependent on graphic or interactive display of the roadway network. It does require computerised representation of the network - a task, which is, made much easier and more accurate with GIS interactive query and update. Also, the results of the shortest path calculations are many times easier to understand when it is visually displayed. The graphic interactive interface with network data makes it feasible to use shortest path routines to schedule the placement of materials and equipment, plan detours, and schedule work crews.

The graphic representations can be simple schematic drawing of the work. The only roadway attribute, which is required, is some measure of impedance. The software

does not require dynamic relational database management capabilities but does require specialised routines for determining path.

3.4.4. Geocoding

Geocoding is the ability to use an address to locate a data item. As with shortest path calculations, geocoding is a specialised capability, which has been available for a long time. However, a graphic interactive interface with network data, geocoding capabilities are now practical for maintenance functions.

To make geocoding possible, the digitised data must contain information about street names and house numbers. As with the shortest path capability, geocoding does not require data of small scale or high levels of accuracy but does require that all roadways be included in the database. The software must be capable of matching on street names.

3.4.5. Real time monitoring

As with many information system, adding real time access greatly expands the functionality. For example adding an interactive shortest path to provide emergency vehicles with least congested, most direct route to the incident would improve response time still further.

Chapter 4

MODEL FOR TRANSPORTATION NETWORK

4.1 Introduction

Activities, housing and transportation are the three important components of a complex urban system. Activities are the places of work, education, shopping, recreation etc. Housing are the places of residence. The interaction between the places of resistance and the different activities is made possible by transportation facilities.

Urban planners are concerned with the most appropriate arrangement of the different sub-systems to yield a well-organised and integrated urban structure. But due to the phenomenon of urbanisation, and the already haphazard & organic development of existing towns / cities pose manifold problems.

There is no dearth of land use transport models as well as of transport network models. Any number of researches and research organisation have been improving the old models and developing new ones. The model that has been used here has three parts and is based on the Graph Theory and the Gravity Model.

4.2 Node Choice

In order to assess the demands and priorities of different nodes in the city, indices in the form of transport priority index (TPI) need to the developed.

The selection (Choice) of zones as nodes in the network should be on the basis of their individual TPI value. A higher TPI value would fetch a zone a higher priority whereas a lower TPI value would fetch it a lower priority. There values are computed by the equation -

$$TPI_j = \sum_{i=1}^{K} V_{ij}.W_i$$

where,

V_{ij} = Value (or number) of ith parameter for jth zone

w_i = Weightage for ith parameter

K = Number of parameters considered

and

TPI_j = Transport Priority index for jth zone.

Determination of TPI values (for node choice) requires a set of parameters and their weightages which can be achieved with the help of an expert survey. The zones with higher TPI values are preferred for consideration of nodes in the transportation network.

4.3 Link Choice

The second stage in planning exercise of urban transportation network planning is determination of links. The technique adopted for this is development of link priority indices (LPI). The selection of links in the network would be on the basis of their individual LPI values. A higher LPI value would fetch a link a higher priority and a lower LPI value, a lower priority. The equation is -

$$LPI = (T. N / L) + 5B$$

where,

T = Max TPI value of the zone served by the road

N = Number of zones benefitted/served by the road.

L = Length of the link

B = 1, if road is used for public transport

B = 0, if otherwise

This analysis helps in identifying the importance attached to links basing on which decision relating to determination of networks can be taken. It's application, however, changes with a given situation. In some cases, it may even not be required.

4.4 Network Choice

Once the node & link choices have been determined, a modified gravity model can be applied to optimize the resultant network. This modified model is in the form of zone affinity indices (ZAI), and is mathematical represented as –

$$ZAI_{ij} = \frac{P_i \cdot P_j \cdot TPI_i \cdot TPI_j}{d^2_{ij}}$$

where

P_i , P_j = Population of zones i & j

TPI_i , TPI_j = Transport priority indices of zones i * j

d^2_{ij} = square of the distance between zones i & j

ZAI_{ij} = Index of affinity between zones i & j

This 3-stage analysis helps in determining the network for urban (public) transport. New links with maximum ZAI values can be chosen for construction.

Provision of additional links alongside strengthening (widening/improving etc.) the existing ones would complete the exercise of planning the optimum urban road network.

Chapter 5

Working Procedure and Results

This chapter details out the working procedure and discusses on the results. The experimental work has been planned as follows:

1. The map attained from Development Authority was digitised in Arc/Info for traffic zones, road network as polygons and arcs respectively;

2. Routes are represented as line segments to obtain precise length and co-ordinates from the GIS by querying;

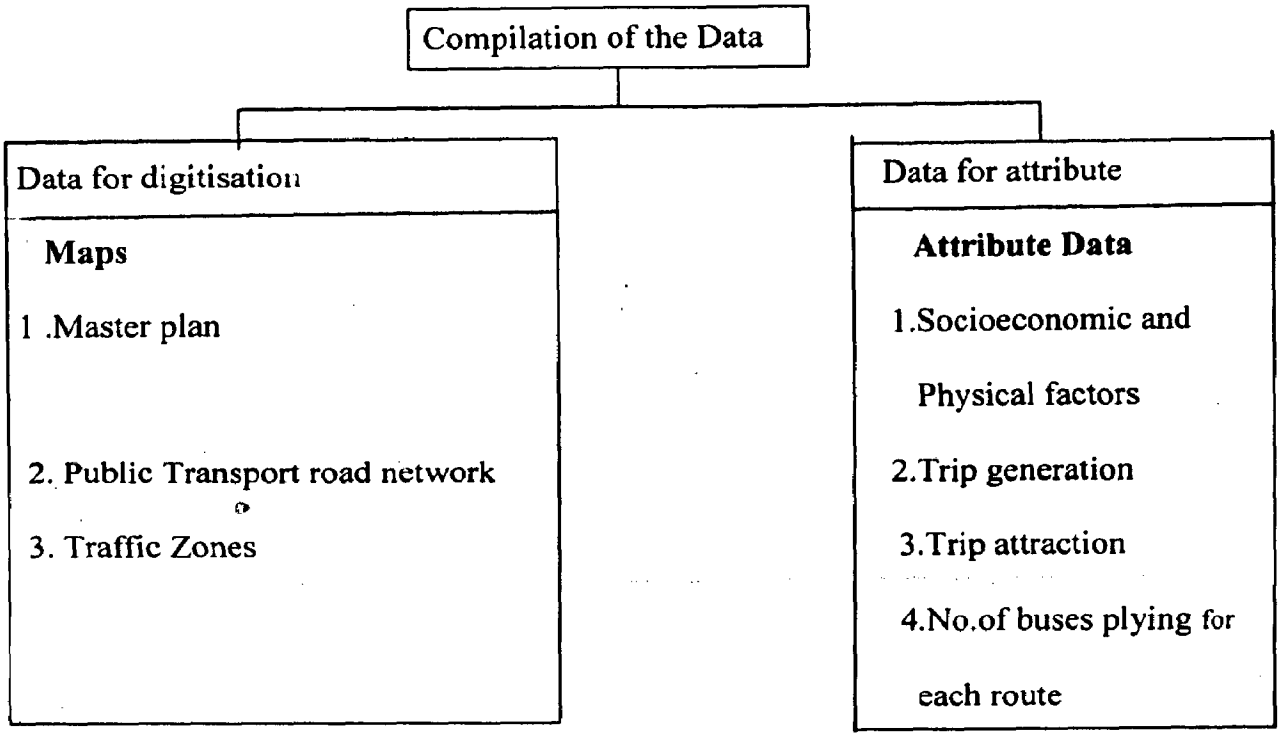
3. The co-ordinates and lengths are exported into text file in the format that comprehensive network choice model requires; and,

4. Socio-economic and physical factors are incorporated in the model and Transport Priority Index, Zone Affinity index is calculated.

The output from the transportation network model has been interfaced with the GIs for generating the output. The entire working procedure and the results for this analysis have been presented in the ongoing chapter in seven sections.

5.1 Information Compilation

Data collected from various sources has been categorised into spatial and non-spatial data. It has been compiled as explained below.



5.2 Getting Spatial Data Into Arc/Info:

The first step in developing digital database is to determine what the contents of the data would be. The contents have ideentified as geographical features and their attributes as follows :

Geographic Feature	Feature	Feature attributes
1. Traffic zones	polygons	socioeconomic data
2. Land uses	polygons	activity levels
3. Public Transport routes	arcs	Number of buses on the route

5.3 Making Spatial Data Usable

The second step after inputting spatial data into Arc/Info is to correct the data if there are any unwanted arcs ,nodes..Etc. and to assign user_id to the each zone to identify each arc and polygon in the coverage.

In the digitised coverage of Traffic zones contains 67 traffic zones and labelling has done according to the zone number assigned for conducting primary survey.

5.4 Getting Attribute Data into Arc/Info:

Each geographic feature in the coverage will have a corresponding record in the feature attribute table. To add additional data for each feature, create a new data file to hold the attributes, add the attribute values to the feature attribute tables for coverage.

5.5 Managing the Database

The next step after inputting both the digitised data and attribute data is to prepare them for spatial as well as non-spatial analysis. In case of spatial data, multiple maps can be joined to make as one single map. Then transform the map units into real world co-ordinates. Following the tic-ids, which were given while digitising, can do this procedure.

5.6 Performing Geographical Analysis

5.6.1. Calculation of Transport Priority Index

It is important to include appropriate parameters/factors in determination of TPI. Therefore, instead of listing out the factors arbitorily, Delphi method as been adopted. A panel of ten (10) experts has been chosen and a format for interviewing those experts designed (appendix 1). The purpose of this summery is twofold: one, to enlist identifies socio-economic and physical factors. Which effect public transport of a place; second to determine the importance/weightages carried each of these factors. The factors thus listed out are considered relevant in deciding TPIs of the traffic zones. They are: population break-up by income, public / semi-public activities, working population, service employment, trip generation, trip attraction, and basic employment. The weightages assigned to those factors by the expert group are as follows:

Table 1
Parameters and Weightages

S. No.	Factors	Weightages
1.	population break-up by income	25
2.	public / semi-public activities	21.5
3.	working population	17.8
4.	service employment	14.3
5.	trip generation	8.9
6.	trip attraction	8.9
7.	basic employment	3.6

Source : Expert survey.

These factors along with their weightages have been used in deterring TPI, in Appendix 2.

5.6.2. Calculation of Zone Affinity Index

Centroid of each zone has been taken as a node and the distance between all other zones calculated by taking x, y co-ordinates of each traffic zone, and the ZAI is calculated by using modified gravity model (Network Choice), given in Chapter 4.

5.6.3. Number of buses plying on each route

Movement of working population has been computed using ZAI of those traffic zones where bus terminals are located. There are four bus terminals in the city in the following traffic zones -

Table 2
Bus terminal and their location

S. No.	Traffic Zones	Bus Terminal
1.	zone no. 1	Charminar
2.	zone no. 28	Mehdipatnam
3.	zone no. 46	Barkatpura
4.	zone no. 65	Secunderabad

Source : Secondary source information.

5.7 Presenting the Results of the Analysis

The analysis and the results have been discussed and have also been presented in the form of classified maps. Map 1 showing the case study are (Hyderabad metropolis) has been given in Chapter 1, as is Map 2 that shows the traffic zones in the metropolis has been given in Chapter 2.

The land use map (Map 3) gives information regarding public and semi-public activities (activity levels) in the metropolis. The central part of the city is dominated by commerce but the activity levels in that area are too high due to more conveniences, and maximum frequency of buses The database (Appendix 4) created for data for all the parameters listed out in table 1.

Map 4 shows the location and / or distribution of working population. The maximum working population is noticed at the following traffic zones:

1. Secretariat
2. Santa nagar
3. Secunderabad station, and,
4. Nampally.

PLANNING FOR PUBLIC TRANSPORTATION USING GIS

CASE STUDY_HYDERABAD

N

SCALE
1 : 8 0 0

LEGEND

- RESIDENTIAL
- PUBLIC & SEMI PUBLIC
- COMMERCIAL
- RECREATIONAL
- INDUSTRIAL
- WATER BODIES

MAP NO : 3

LAND USES

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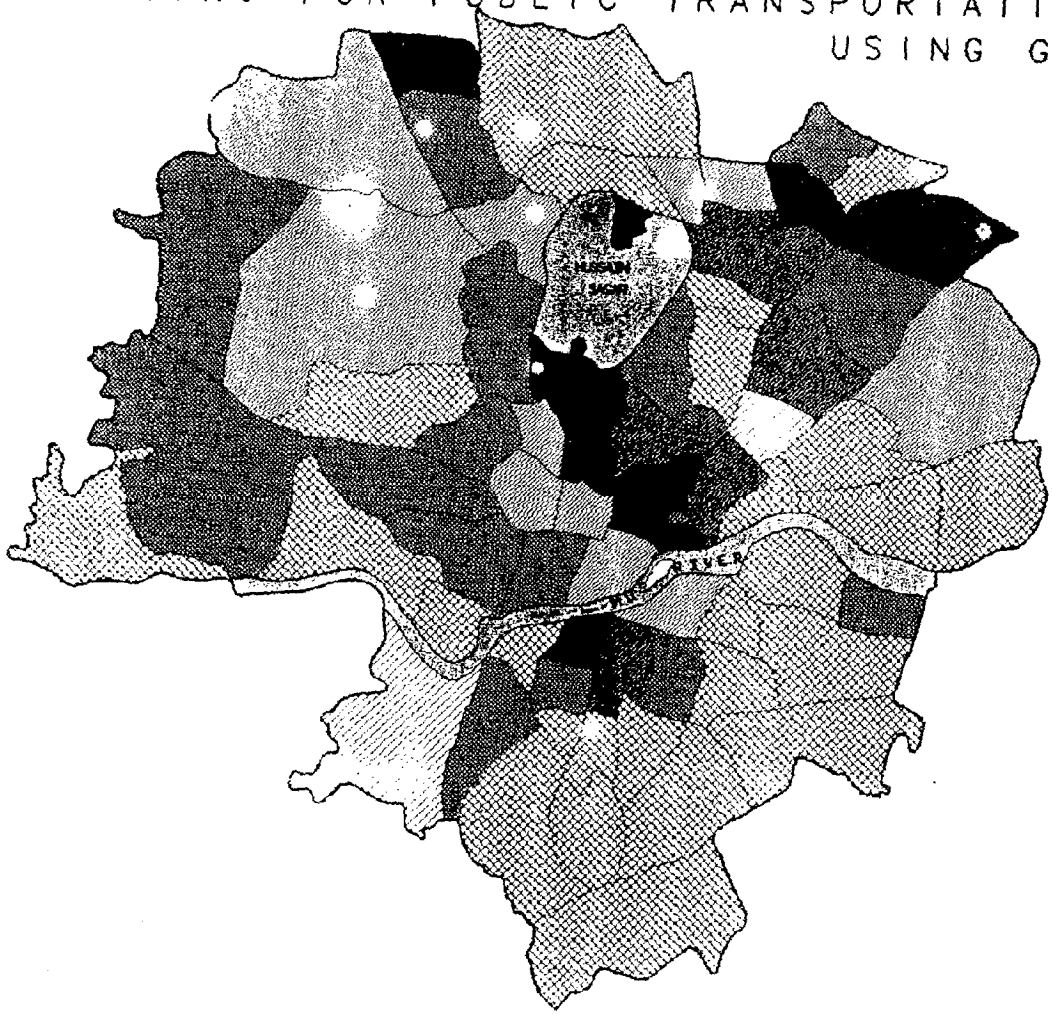
CASE STUDY_HYDERABAD



N

SCALE
1 : 800

LEGEND

MAP NO : 4

WORKING POPULATION

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Map 5 demonstrates zones with levels of public and semi-public activities. Service employment (Map 6) has been taken into consideration due to the reason that the movement of service employment would be more than the basic employment. The zones with maximum service employment would have potential for trip generation. There are several zones where 100% population is engaged in service (employment). These are zones with essentially residential land use.

The analysis shows that zones with a predominant residential land use have maximum trip generation. These zones are located in between Mehdipatnam and Barkatpura depots, and at Secunderabad station.This phenomenon of trip generation is depicted in Map 7. The data has been given in appendix4.The zones, which locate institutions, and working places attract maximum trips. These zones are located near Barkatpura depot (Map 8). The load on buses destined for this terminal is maximum.

The TPIs for all traffic zones in the metropolis have been computed using the Node Choice model given in Chapter 4. These values have been plotted on Map 9. Zone number 2 that have maximum trip generations and attractions, exhibits maximum TPI value. The transport routes connecting this zone need be given foremost priority.

The ZAIs help in determining the requirement of buses (in number) on different routes connecting zones with higher values. This has been done with respect to the four bus terminals (Map 10). The maximum number of buses has been assigned on routes in

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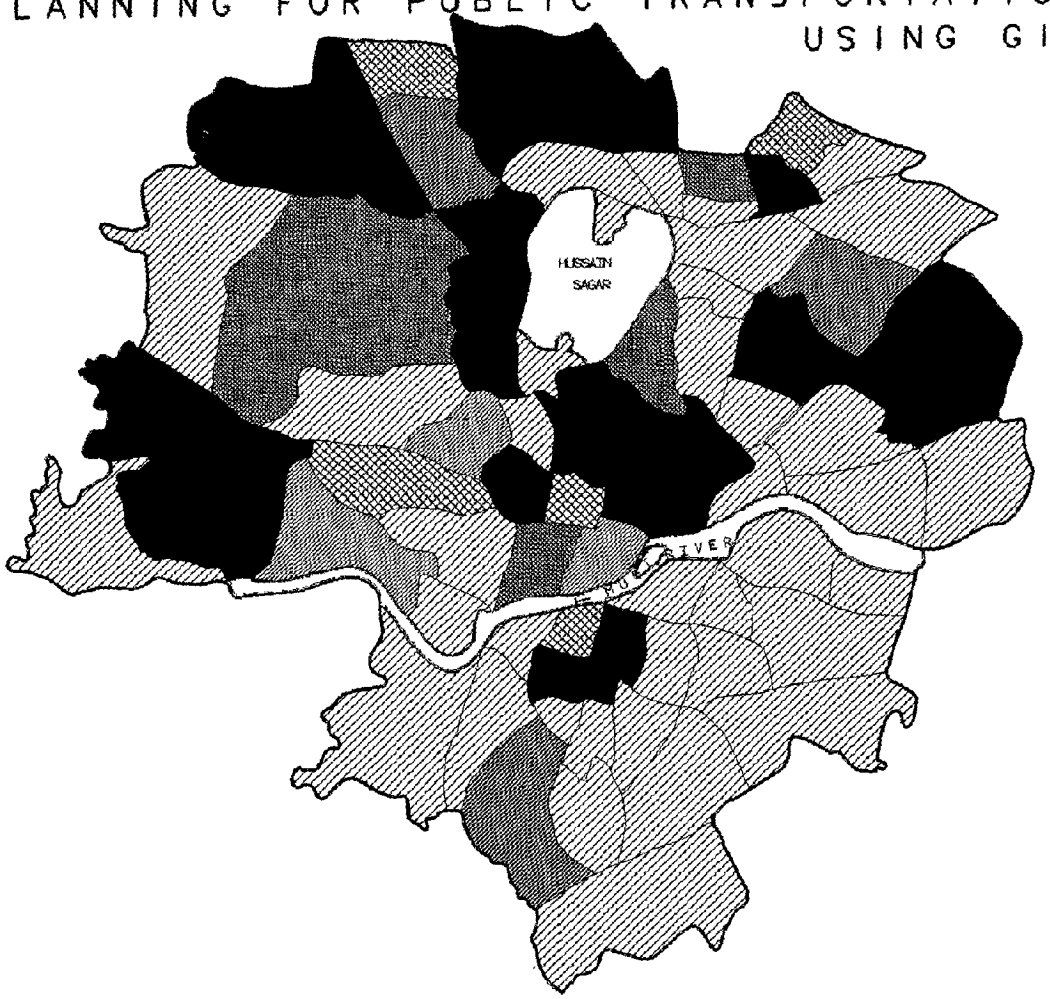

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- 100%
- 100-90%
- 90-80%
- 80-70%
- 70-60%
- 60-50%
- 50-40%
- WATER BODIES

MAP NO : 5

PUBLIC & SEMI PUBLIC ACTIVITIES

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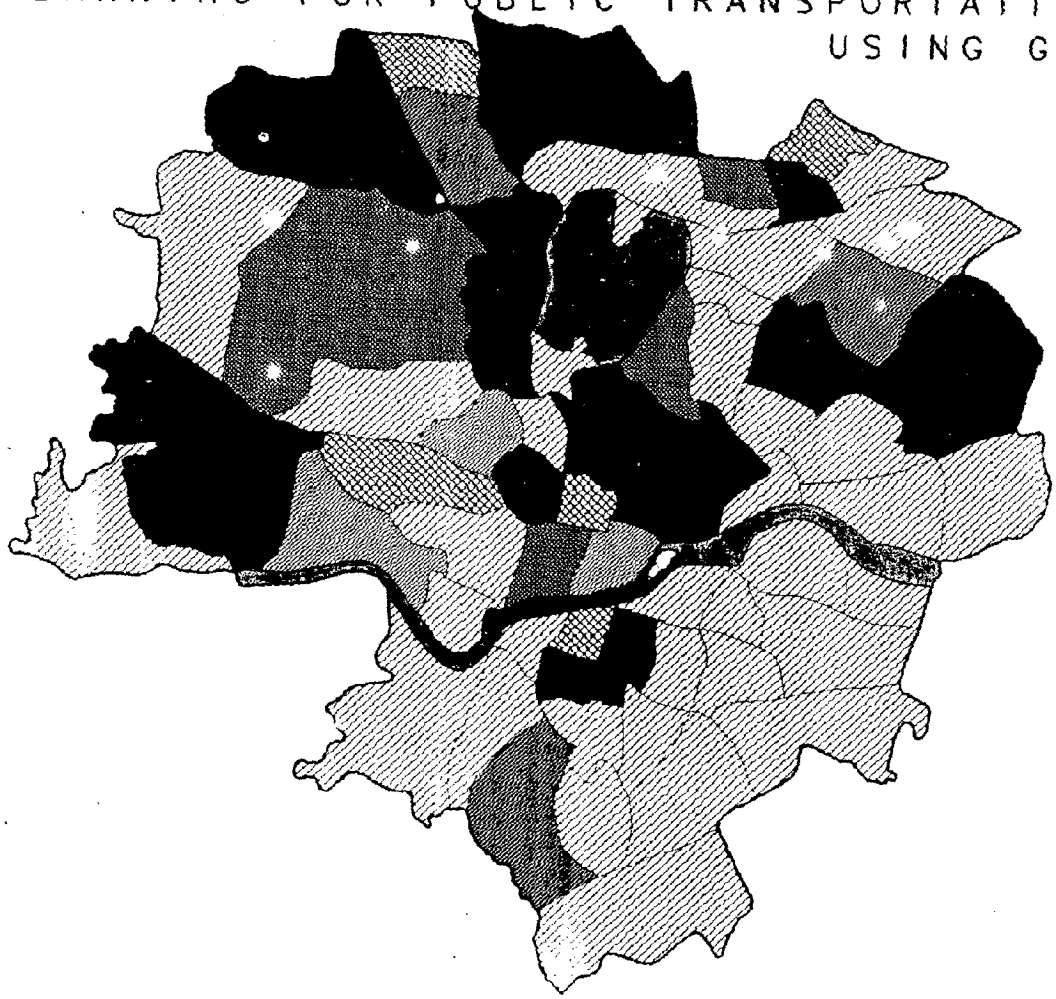
CASE STUDY_HYDERABAD



N

SCALE
1 : 800

LEGEND

MAP NO : 5

PUBLIC & SEMI PUBLIC ACTIVITIES

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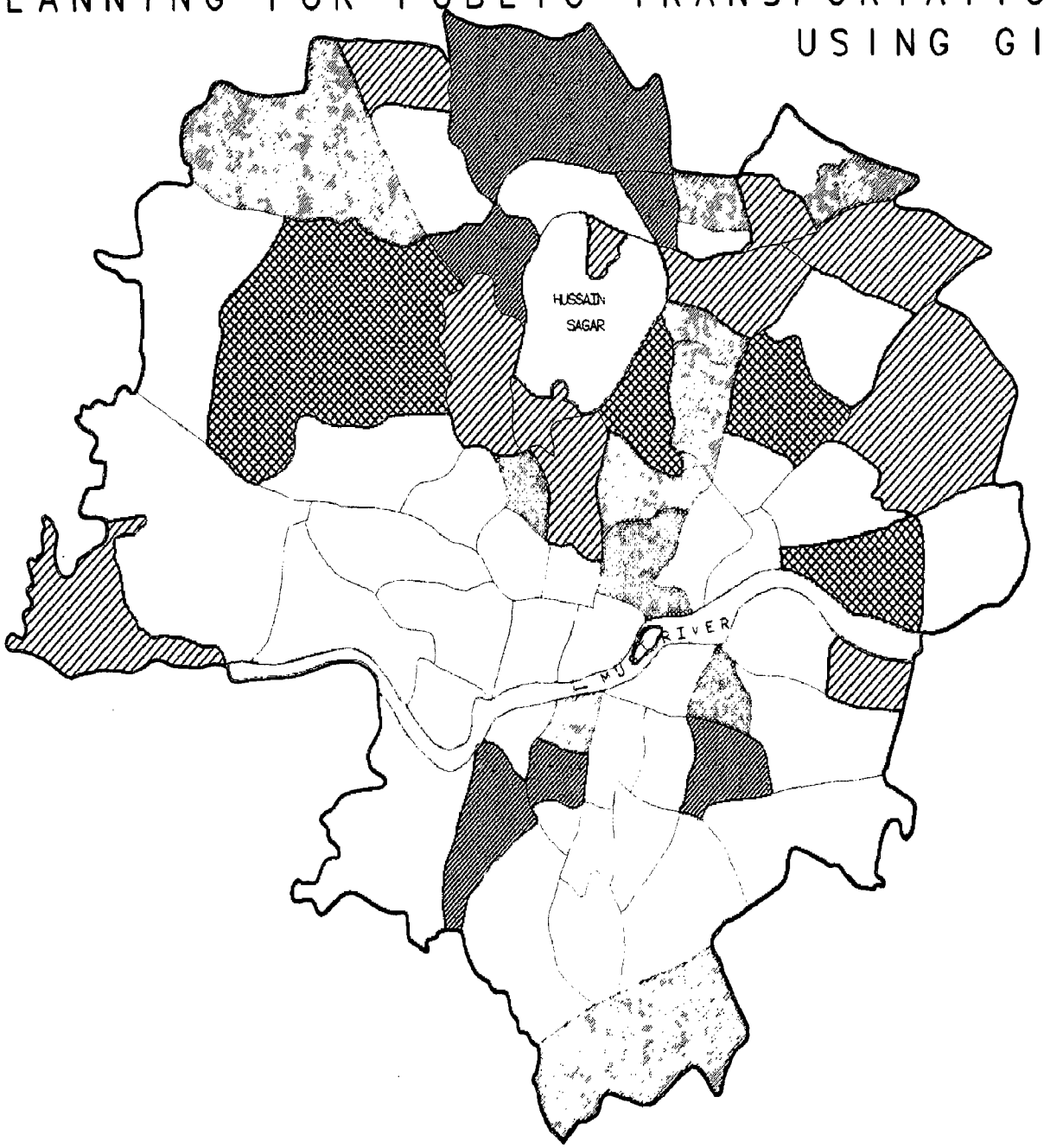

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- 100%
- 100-90%
- 90-80%
- 80-70%
- 70-60%
- 60-50%
- 50-40%
- WATER BODIES

MAP NO : 6

SERVICE EMPLOYMENT

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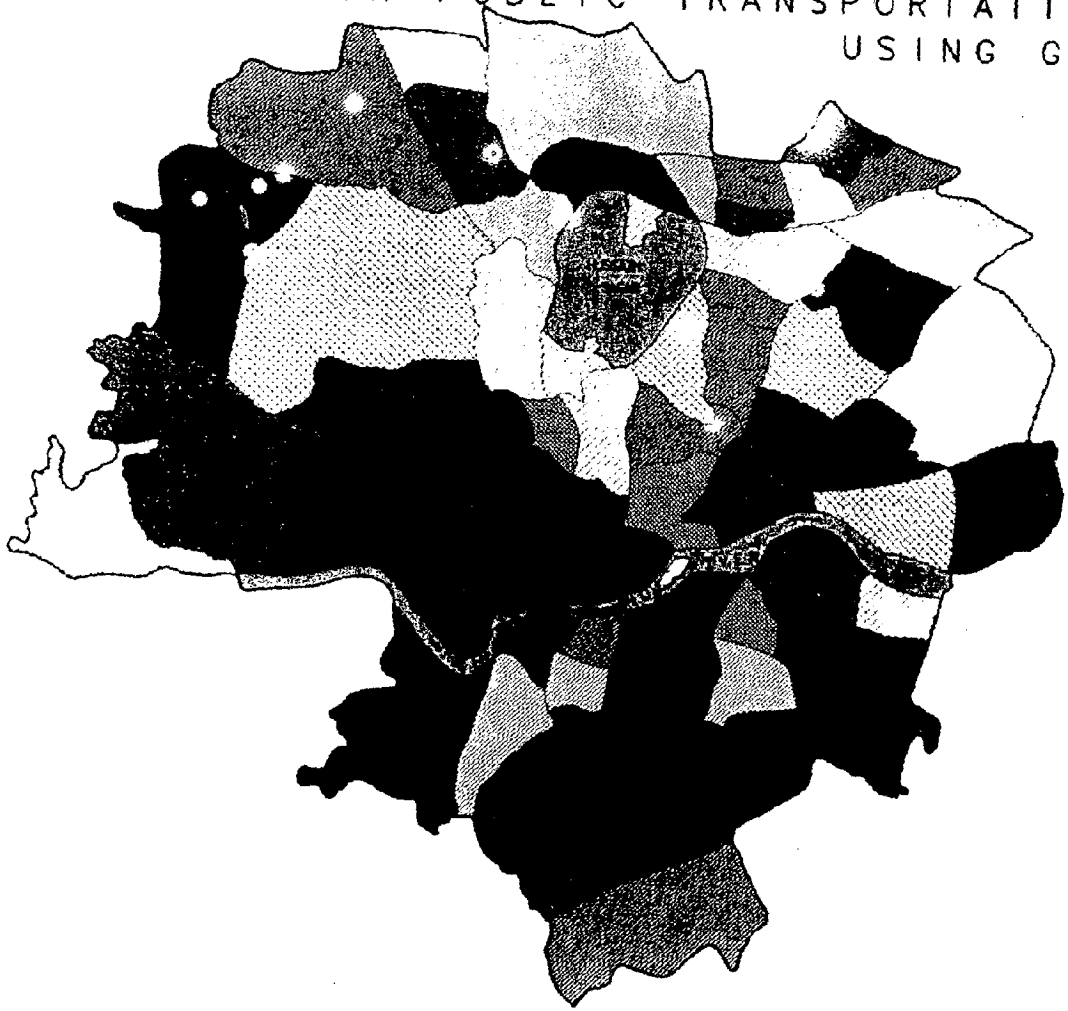
PLANNING FOR PUBLIC TRANSPORTATION USING GIS



CASE STUDY HYDERABAD

N

SCALE
1 : 800

LEGEND

MAP NO : 6

SERVICE EMPLOYMENT

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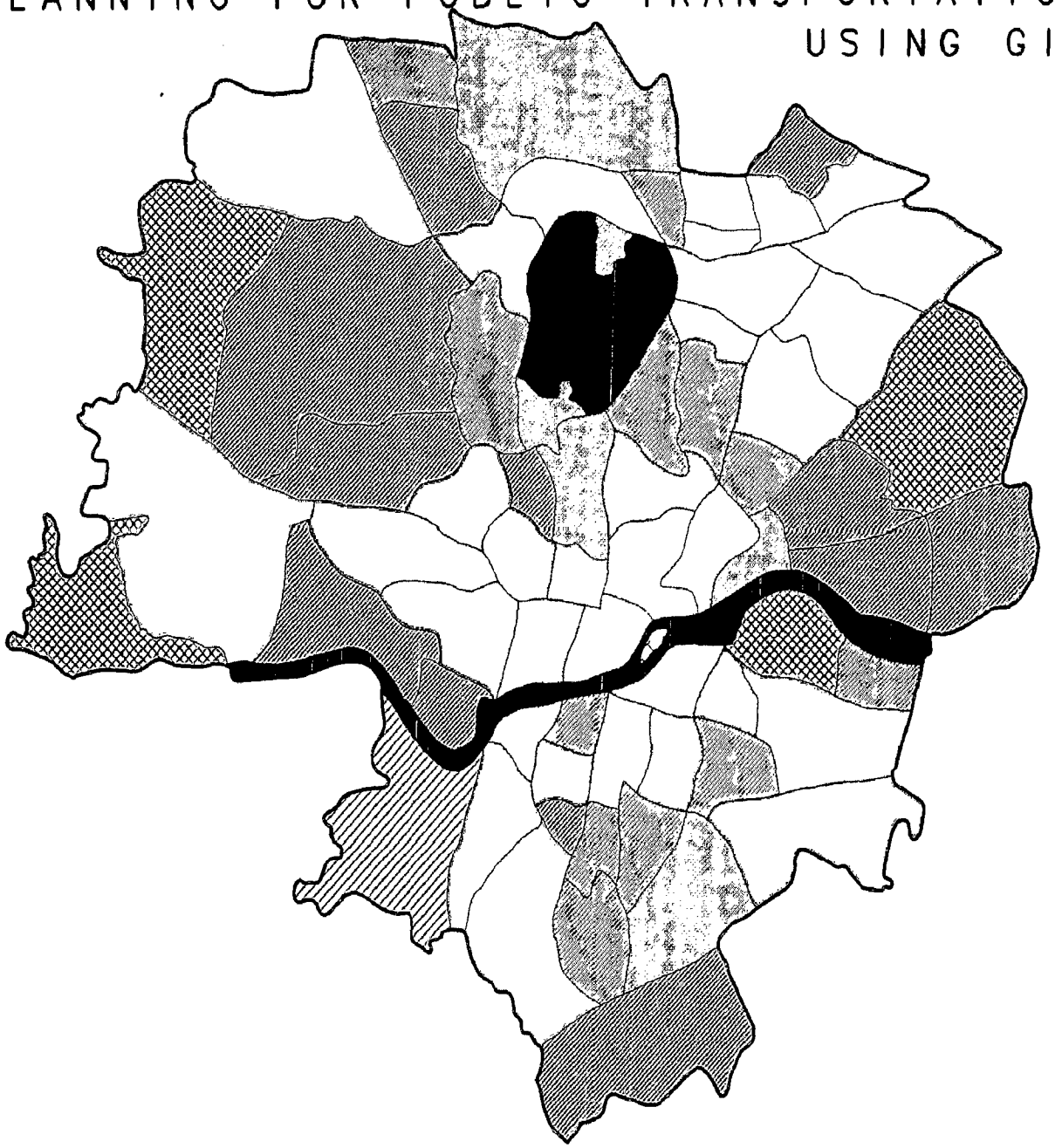

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- >25000
- 25000-15000
- 15000-10000
- 10000-5000
- 5000-2500
- 2500-1000
- 1000-500
- WATER BODIES

MAP NO :7

TRIP GENERATION

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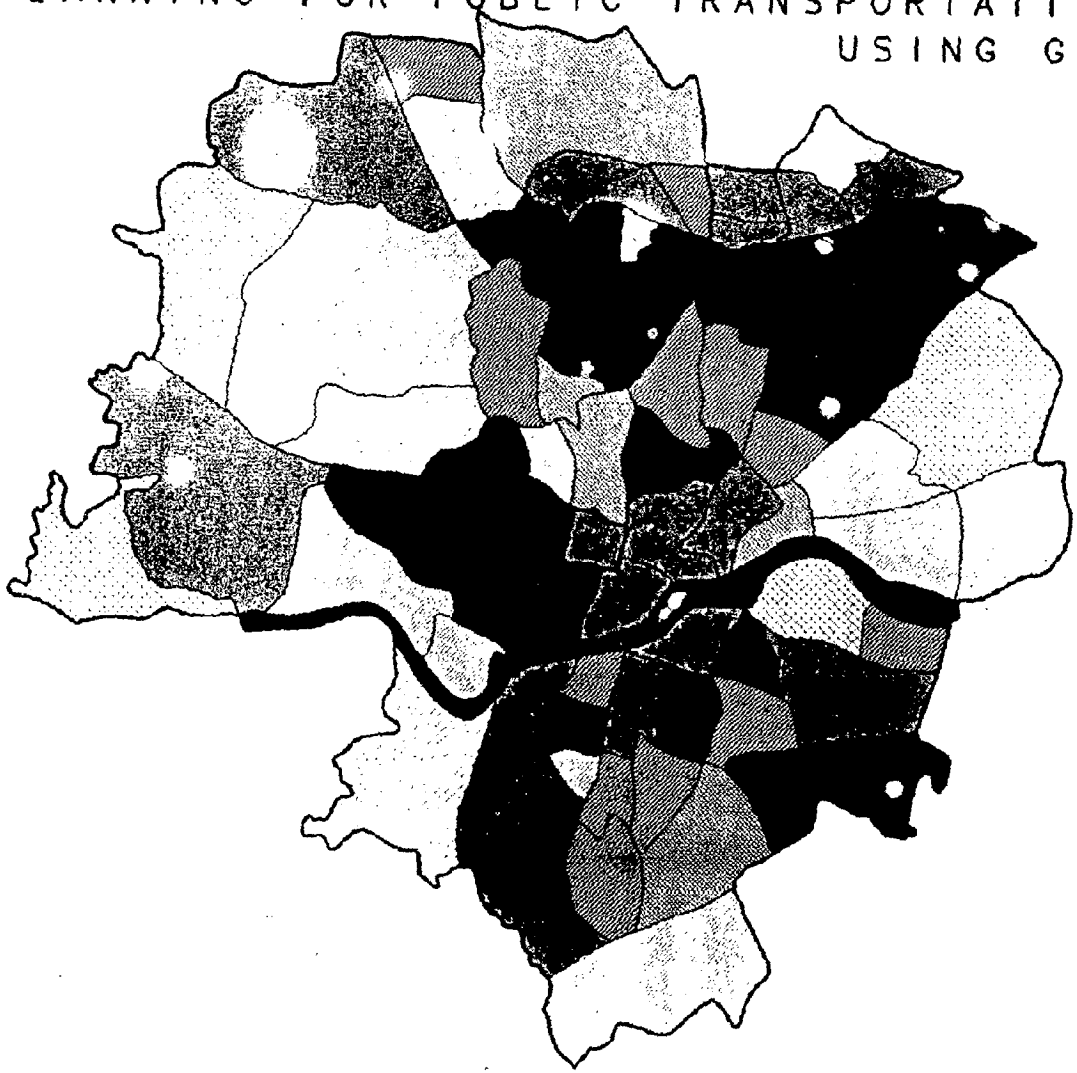

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- >25000
- 25000-15000
- 15000-10000
- 10000-5000
- 5000-2500
- 2500-1000
- 1000-500
- WATER BODIES

MAP NO : 7

TRIP GENERATION

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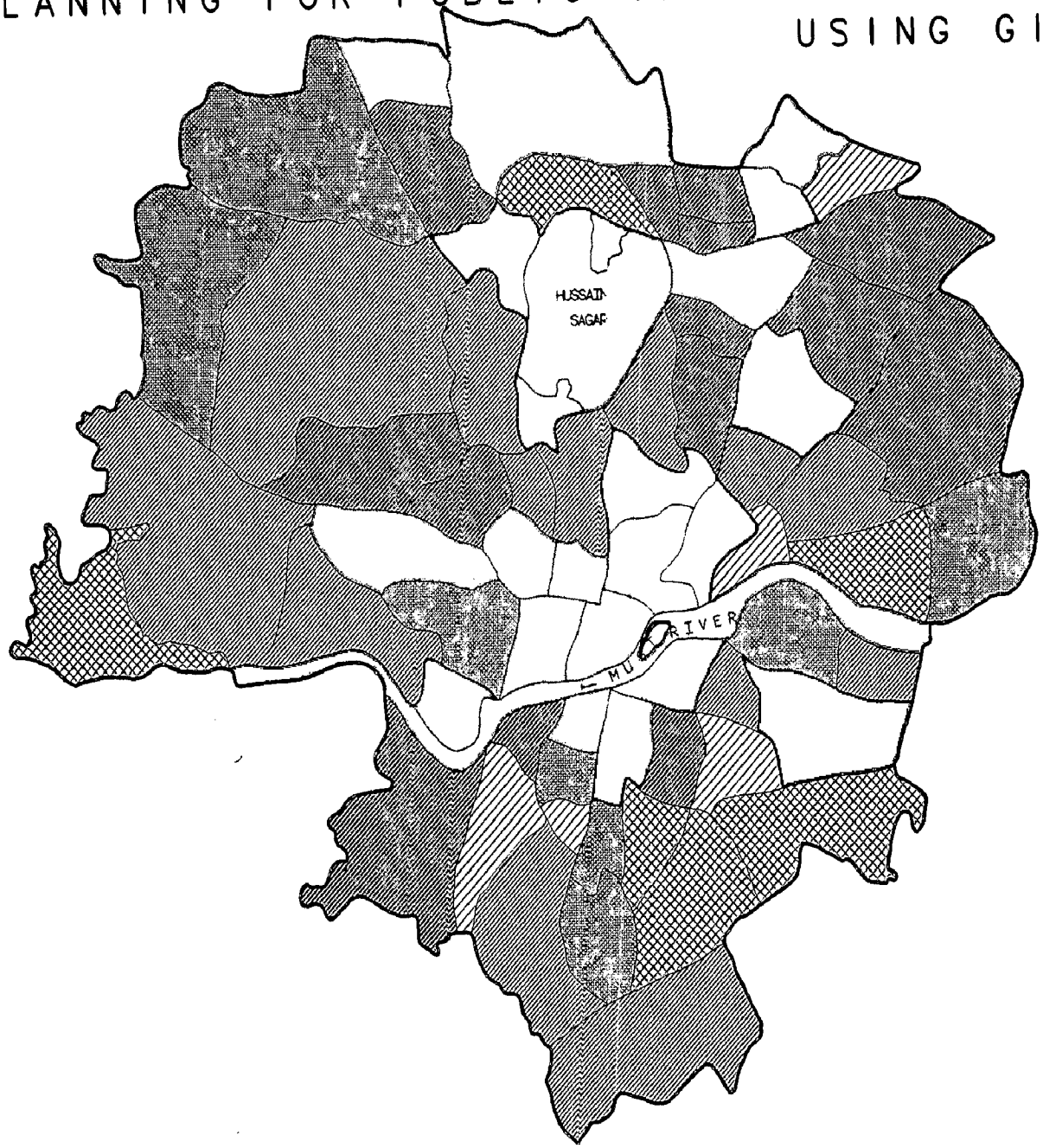

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- >25000
- 25000-15000
- 15000-10000
- 10000-5000
- 5000-2500
- 2500-1000
- 1000-500
- WATER BODIES

MAP NO : 8

TRIP ATTRACTION

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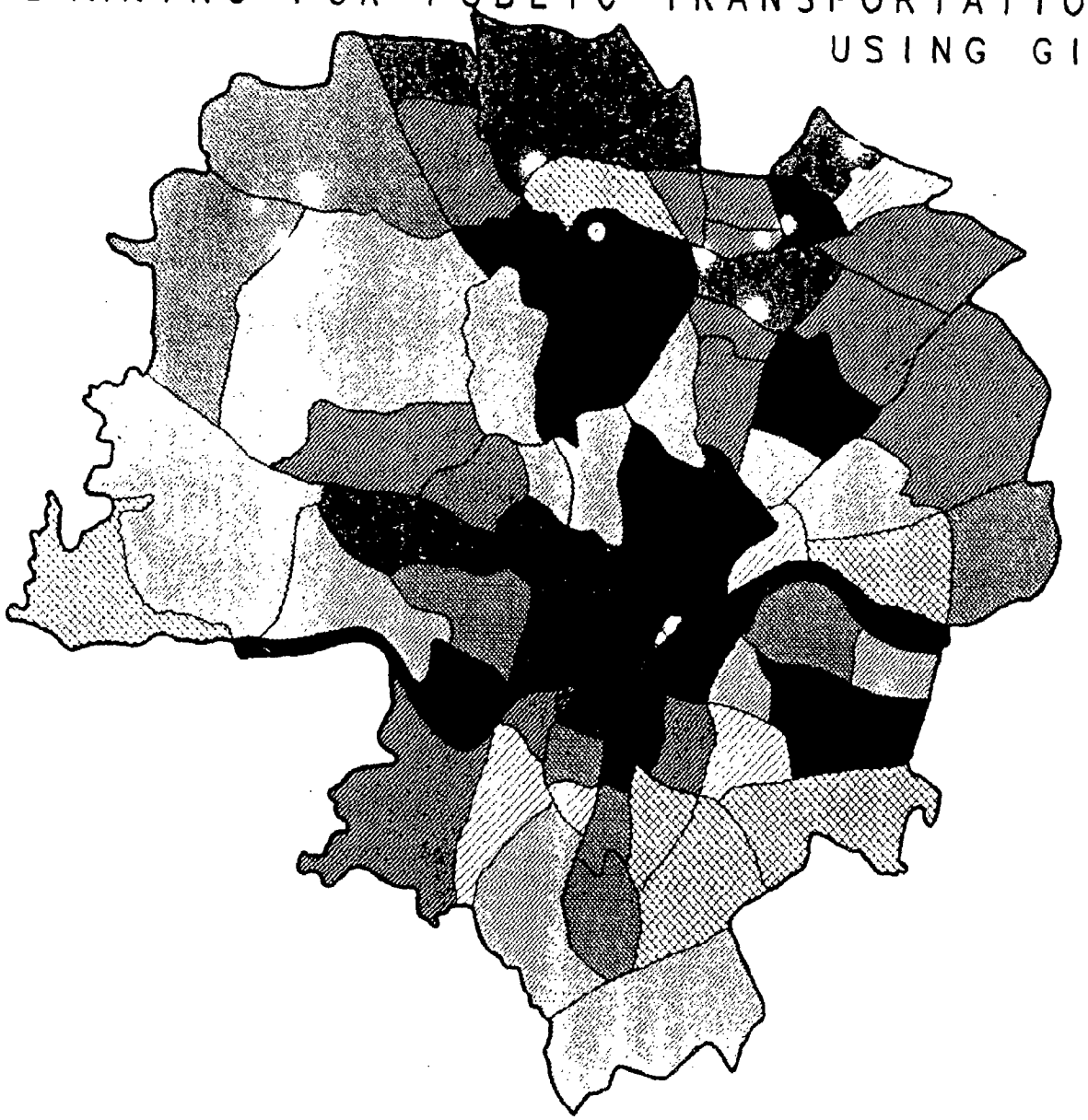

CASE STUDY_HYDERABAD

N

SCALE
1 : 600

LEGEND

- >25000
- 25000-15000
- 15000-10000
- 10000-5000
- 5000-2500
- 2500-1000
- 1000-500
- WATER BODIES

MAP NO : 8

TRIP ATTRACTION

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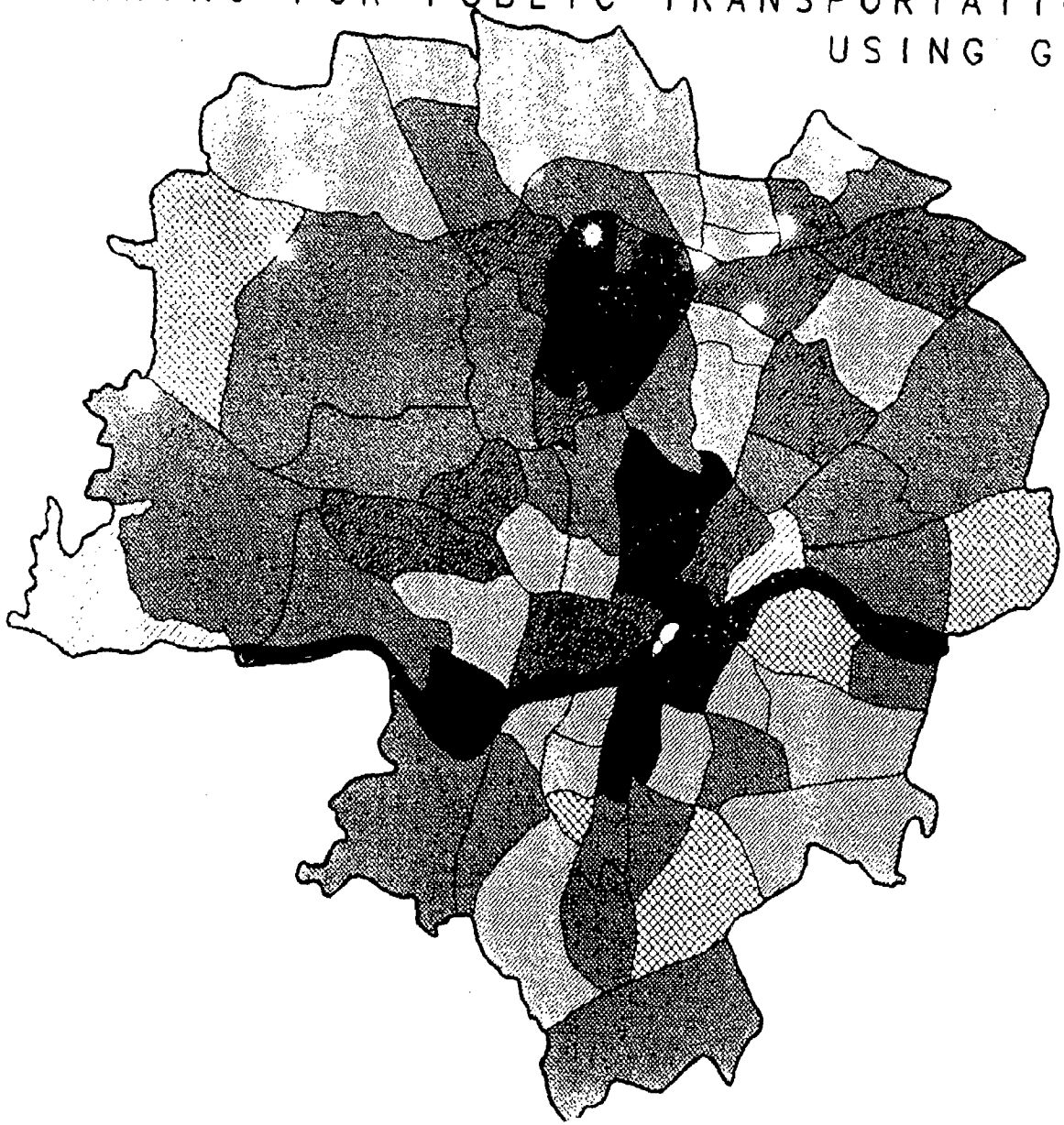
PLANNING FOR PUBLIC TRANSPORTATION USING GIS



CASE STUDY_HYDERABAD

N

SCALE
1 : 8 0 0

LEGEND

MAP NO : 9

TRANSPORT PRIORITY INDEX

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CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- > 300 BUSES
- 300-250 BUSES
- 250-200 BUSES
- 200-150 BUSES
- 150-100 BUSES
- 100-50 BUSES
- < 50 BUSES

MAP NO : 10

NUMBER OF BUSES ON ROADS

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central core of the city and the routes, which connect Hyderabad with Secunderabad, that data given in Appendix 2.

Chapter 6

Recommendations and Conclusions

The basic objective of the present thesis has been to study the public transportation system by making use of GIS (ARC/INFO) for which Hyderabad has been chosen as the case study. The analysis in the GIS environment has helped understand the problem of the metropolis with regard to its public transportation, its magnitude and also the various factors that contribute to it. On the basis of the output, analysis, certain interpretations have been made and presented in the preceding chapter. This Chapter focuses on recommendations and conclusions.

6.1 Recommendations

1. The study and the analysis therein show that people under different income groups have varying choice/tendency for using public transportation. People coming from EWS and LIG categories rely/depend almost entirly on public transportation for their movement (home to work place vice versa).

2. The analysis of the situation shows that the city requires many more buses to carry people to their work places and back home a large number of buses need to be started from all (four) terminals/depots in the city in the following table.

Table 3
New buses from Bus Terminals

Depot/ terminal	No of new buses
Charminar depot	621
Barkatpura depot	1318
Secunderabad depot	1087
Mehdipatnam depot	99

Source : Analysis in GIS environment.

The movement /distribution of these new buses on different routes has been shown graphically in Map no.10, under seven bus ranges viz. More than 300 buses, 300-250, 250-200, 200-150, 250-100, 100-50, and less than 50 buses.

3. A more efficient transport system would result in a considerable reduction of private vehicles. There would be an estimated shift of (2,41,500 people/4025 buses for work trips) personnel and other modes to public transportation. This shift, on one hand reduce private vehicles on the roads on the other, provide enough space for bus movement.

4. It is belived that provision of separate bus lanes eases out traffic and other movement difficulties and confusions. So, it is here by recommended that on

roads/routes carrying (refer map no.10), 200 public transport buses or more there should provided separate buslanes for buses. In such cases, the traffic other than the buses should restrict itself to the non-bus lane(s).

5. It is important that buses for public transport stop at proper places only. To achieve this, it would be desirable to instal stop signs and markboxesof appropriate size on the roads (bus lanes only) for bus stoppages. This would check buses from unwanted places and the passengers from boarding/alighting at intersections etc.

6. The State Public Transportation corporation or any other local authority dealing with public transportation should consider proving incentives like travel passes, monthly tickets, if possible on subsidised rates etcinaddition to overall improvement in the service to public transport usersto attract them in large numbers.

7. There should also be installed mandatory/regulatory, causionery/warning, and informatory road signs on the city streets/roads wherever necessary, as part have overall traffic management in the city.

8. All heavy and medium passenger (goods vehicles and four wheeled light vehicles should be fitted with a speed governer (to check/control the speed of vehicles of rash driving) and the maximum speed should be 40 km/hr for these vehicles. Vehicles with

interstate or national goods permits to exempted for this. They should more only on the specified routes within speed limits. This recommendation is on the lines of Supreme Court judgement.

6.2 Conclusions

The Public transportation study for work trips in Hyderabad city has been depicted using a wide array of figures presented through GIS analysis It would though be difficult to briefly put it in summary form or as genaralised conclusions since the study has been devoted only to work trips due to time constraints, yet an attempt has been made. The conclusions drawn from the study are as follows:

1. A GIS database is developed for the planning of this study. This database can further be utilised in other aspects at city level.

2. With the help of GIS, planning for transportation becomes easy, quick and efficient as well as presentation of the results is enhanced. It is concluded that GIS is capable in handling public transportation data and helps in deriving out useful results for planning purposes. It's use, therefore is recommended for such studies.

6.3 Scope For Further Study

There is great need to consider other aspects alongwith work trips which lead to movement of people in the urban areas. These aspects include educational trips, market-destined trips, recreational trips, and so on. Requirement of buses for these aspects can be overlaid to find out congestion on roads, route diversions, or prioritising the public transportation routes.

Hence, the use of GIS for analysis of spatial coverages is recommended, as the GIS analysis is faster and economical, particularly for a larger data set.

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Appendix 1

DEPARTMENT OF ARCHITECTURE AND PLANNING
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ROORKEE-247667

EXPERT SURVEY PROFORMA

(For academic purpose only)

As part of requirement of MURP course at the University of Roorkee, Roorkee, I have taken Public Transportation Planning problem in the city of Hyderabad which would be handled using GIS software. In the study, certain socio-economic factors are to be used alongwith their weightages (relative importance). It is in this connection that you have been included as an expert in the survey and your opinion would be of paramount importance in this regard.

Name:
Designation:

SOCIO-ECONOMIC FACTORS

	Extremely imp	Very imp	Moderately imp	imp	not relevent
1.Population break-up by income (HIG/MIG/LIG/EWS)	☐	☐	☐	☐	☐
2.Public and semi public activities	☐	☐	☐	☐	☐
3.Working population	☐	☐	☐	☐	☐
4.Basic employment	☐	☐	☐	☐	☐
5.service employment	☐	☐	☐	☐	☐
6.Trip generation.	☐	☐	☐	☐	☐
7.Trip attraction	☐	☐	☐	☐	☐

Thanks for your cooperation

Kavitha Maddula
MURP - II

Appendix 2

Record#	ZONE	RST_ID	POP_B_HIG	PUB_SM_ACT	WORK_POP	SER_EMP
1		0	0	0.00	0	0.00
2	BEGUMPET	60	1549	121.20	2066	79.09
3	ERRAGADDA	25	4364	398.60	5135	82.96
4	S NAGAR	30	53072	54.00	58969	6.57
5	S R NAGAR	31	4169	87.80	4633	97.91
6	NEHRU NAGAR	66	2619	54.40	2910	95.76
7	SUBHASH NAGAR	67	1130	20.40	1330	84.96
8	P NAGAR	61	907	10.80	1463	100.00
9	PATNY	63	7405	61.60	9873	85.27
10	R PET	62	5588	36.60	8597	75.65
11	SEC BAD R S	65	26645	121.00	31347	13.91
12	JUBLEE HILLS	23	1766	14.60	3500	100.00
13	METTUGUDA	57	15555	4.10	17283	4.10
14	PANJAGUTTA	32	5263	138.40	6192	72.34
15	SECRETARIAT	40	29827	18.40	35091	15.36
16	BANJARA HILLS	26	1163	61.40	5500	56.34
17	MONDA MARKET	64	10656	27.40	11840	98.05
18	BHOIGUDA	47	8000	40.40	10667	46.67
19	S P MANDI	50	2295	87.40	2550	100.00
20	ERRAMANZIL	33	7787	183.40	4500	48.80
21	KAVADI GUDA	48	1600	15.00	1778	84.25
22	OSMANIA UNIV	58	7793	500.00	9168	13.10
23	INDIRA PARK	44	2914	65.40	3886	55.67
24	RAM NAGAR	51	8942	120.60	11923	55.55
25	ASHOK NAGAR	49	1607	11.20	1893	81.58
26	GOLCONDA FORT	24	2910	146.80	3234	97.18
27	PUBLIC GARDEN	41	31371	144.20	34857	9.61
28	S D HOSPITAL	27	1298	28.60	1442	100.00
29	HIMAYAT NAGAR	45	11696	144.20	13760	88.96
30	NALLAKUNTA	52	1200	45.50	1001	100.00
31	AMBERPET	55	1202	10.80	1335	100.00
32	V N CLNY	34	1200	78.80	4200	100.00
33	NAMPALLY	37	5432	45.00	5600	63.94
34	KACHIGUDA	53	9325	107.40	10361	94.64
35	R NAGAR	59	1182	30.80	1314	100.00
36	MEHDIPATNAM	28	3184	57.80	3538	100.00
37	MALLEPALLY	38	4950	100.40	5502	90.89
38	K QUARTERS	54	1450	29.40	1638	100.00
39	SULTAN BAZAR	46	17362	235.80	23149	66.62
40	IBRAHIM BAGH	22	774	10.00	1832	49.36
41	GOLNAKA	56	1337	36.70	1783	58.62
42	KARYAN	29	738	78.60	1200	100.00
43	M MARKET	42	6151	52.80	6835	97.56
44	MUSI RIVER	68	0	0.00	0	0.00
45	DHULPET	35	2617	40.00	2908	100.00
46	OLD MALAKPET	14	1865	22.96	2073	97.77
47	AFZALGUNJ	43	5682	72.40	8314	100.00
48	GOSHA MAHAL	39	1144	60.40	2501	100.00
49	M BAGH	19	2662	30.00	3808	43.63
50	DARULSHAFA	2	5590	37.06	6213	100.00
51	C C GUDA	15	1031	20.30	1473	68.04
52	ZIA GUDA	36	1533	22.00	1704	100.00
53	MALAKPET CLNY	20	1827	30.00	2030	100.00
54	HIGH COURT	7	13103	58.72	18719	81.89
55	CHARMINAR	1	11852	103.54	14815	97.10
56	ZOO PARK	13	408	11.40	454	100.00
57	PETLA BURZ	11	4043	22.20	2404	100.00

58	YAKUT PURA	3	3504	8.80	3893	100.00
59	RAIN BAZAR	16	850	30.00	1800	72.00
60	KILWAT PALACE	8	3632	129.88	4274	74.79
61	C BARADARI	12	2557	11.40	2841	77.38
62	INDIRA SADAN	21	1195	40.00	1328	100.00
63	SULTAN SHAHI	4	920	7.40	1021	100.00
64	S A CHABUTRA	9	1698	4.80	1887	100.00
65	SANKAR GUNJ	6	890	26.88	1057	96.33
66	UPPU GUDA	17	1343	10.30	1492	90.49
67	JAHAKUMA	10	1539	83.00	1811	100.00
68	SANKAR GUNJ	5	890	26.88	1057	96.33
69	C GUTTA	18	1627	26.40	1808	87.06

POLYGON ATTRIBUTE TABLE FOR TRAFFIC ZONES:

RST_ID - User _id,

POP_B_HIG - Population break up by income,

POB_SM_ACT - Public and semi public activities,

WORK_POP - Working Population ,

SER_EMP - Service Employment,

TRIP_GEN - Trip generation,

TRIP_ATTN - Trip attraction,

TPI - Transport Prioity Index,

Record#	zone_no	x_cord	y_cord	zone_1	zone_28	zone_46	zone_65
2	60	34.72269	26.86353	96	28	336	771
3	25	29.79418	25.99722	205	97	572	451
4	30	31.87650	27.46535	2100	797	6580	7840
5	31	32.40871	25.86307	177	74	587	609
6	66	38.99056	25.95344	147	25	529	25200
7	67	40.15121	25.46362	50	8	174	3080
8	61	34.81874	25.31836	49	15	195	353
9	63	37.47121	25.33584	615	122	2380	44800
10	62	36.48219	28.29058	310	72	1011	3920
11	65	38.69185	25.11362	1820	322	7420	0
12	23	28.00964	23.97727	32	19	78	45
13	57	40.75260	25.42286	832	121	2660	26600
14	32	33.39156	24.51185	448	196	1680	1400
15	40	35.21014	23.19629	3920	1168	21000	15400
16	26	30.58960	22.96563	75	72	220	102
17	64	37.51356	24.61600	868	165	3780	50400
18	47	37.94342	24.00944	882	149	4060	42000
19	50	39.77217	23.30912	206	26	825	3920
20	33	33.29506	22.72600	88	56	392	157
21	48	37.35568	23.20146	190	32	1060	2240
22	58	41.52874	21.98394	546	54	1680	2660
23	44	36.19867	22.22142	451	89	3500	1400
24	51	38.77607	22.14949	1400	170	7560	9520
25	49	37.28828	22.15849	280	41	1960	1242
26	24	28.16235	19.80040	177	154	351	122
27	41	34.95480	20.78104	7000	1680	82600	5600
28	27	31.30727	21.14927	132	439	386	108
29	45	36.37644	20.67266	5880	723	130200	5740
30	52	38.21442	20.93244	149	14	1034	297
31	55	39.50653	20.44686	171	13	719	313
32	34	33.85455	20.57324	1063	636	6160	670
33	37	34.13503	20.77681	1027	484	7000	745
34	53	37.43756	19.77295	3920	249	47600	2380
35	59	42.26936	19.58630	63	5	155	106
36	28	31.69844	19.80811	653	0	1540	322
37	38	33.89594	19.69151	1960	900	10360	737
38	54	38.24104	19.61858	131	8	791	95
39	46	36.07571	19.51625	22400	1540	0	7420
40	22	26.31159	18.35933	25	12	43	16
41	56	40.23579	19.33347	240	14	700	262
42	29	30.55510	18.76501	96	203	180	41
43	42	34.96937	19.36225	3920	497	49000	1023
44	68	36.97150	18.42027	0	0	0	0
45	35	32.74751	18.68318	1070	974	2240	266
46	14	38.72544	18.27033	440	16	1097	155
47	43	35.49673	18.35926	12600	399	44800	1046
48	39	34.31926	18.33516	1219	111	2520	137
49	19	40.34225	17.65704	639	29	1197	344
50	2	36.62031	17.67065	26600	299	26600	1279
51	15	37.64154	17.35505	1680	28	1820	169
52	36	32.55021	17.31950	1175	293	1344	182
53	20	39.50308	16.72057	718	23	942	200
54	7	34.95125	17.00085	110600	804	21000	1540
55	1	35.75377	16.56538	0	653	22400	1820
56	13	31.61967	15.43229	92	14	85	17
57	11	33.88297	16.82858	3220	140	1680	184
58	3	36.71490	16.40361	19600	84	3360	343
59	16	37.81480	16.26812	1540	21	902	120

58	YAKUT PURA	27131	11703	5
59	RAIN BAZAR	11492	783	14
60	KILWAT PALACE	26189	2891	5
61	C BARADARI	22630	830	14
62	INDIRA SADAN	37548	2217	5
63	SULTAN SHAHI	11477	1076	14
64	S A CHABUTRA	9180	501	15
65	SANKAR GUNJ	13436	4894	14
66	UPPU GUDA	4965	1547	15
67	JAHAKUMA	19414	7846	5
68	SANKAR GUNJ	13436	4894	14
69	C GUTTA	8668	5544	14

POLYGON ATTRIBUTE TABLE FOR TRAFFIC ZONES:

ZONE_1 - Number of people from Charminar depot,

ZONE_28 - Number of people from Mehdipatnam depot,

ZONE_46 - Number of people from Barkatpura depot,

ZONE_65 - Number of people from Secunderabad depot,

REQD_Z1- Number of buses required for Charminar depot,

REQD_Z28- Number of buses required for Mehdipatnam depot,

REQD_Z46- Number of buses required for Barkatpura depot,

REQD_Z65- Number of buses required for Secunderabad depot,

FROM_Z1 - Number of buses from charminar Depot.

FROM Z28 - Number of buses from Mehdi patnam Depot.

FROM Z46 - Number of buses from Barkatpura Depot.

FROM Z65 - Number of buses from Secunderabad Depot.

Record#	from_z1	from_z28	from_z46	from_z65	reqd_z1	reqd_z28	reqd_z46	reqd_z65
2	2	0	6	13	1	0	3	5
3	3	2	10	8	1	0	2	3
4	35	13	110	131	10	4	34	64
5	3	1	10	10	1	0	2	4
6	2	0	9	140	1	0	4	67
7	1	0	3	51	0	0	1	23
8	1	0	3	6	1	0	1	3
9	10	2	40	249	4	1	20	128
10	5	1	17	65	3	0	8	34
11	30	5	124	0	10	3	16	0
12	1	0	1	1	0	0	0	0
13	14	2	44	147	5	0	22	45
14	7	3	28	23	4	1	42	14
15	65	19	116	85	32	14	46	42
16	1	1	4	2	0	0	1	0
17	14	3	63	280	6	1	24	123
18	15	2	68	233	7	0	32	125
19	3	0	14	65	1	0	6	32
20	1	1	7	3	0	0	4	1
21	3	1	18	37	1	0	6	14
22	9	1	28	44	5	1	12	20
23	8	1	58	23	4	1	23	12
24	23	3	126	159	12	1	24	72
25	5	1	33	21	2	0	12	10
26	3	3	6	2	0	1	3	0
27	117	28	0	93	25	12	0	42
28	2	7	6	2	0	4	2	0
29	98	12	0	96	42	4	0	43
30	2	0	17	5	1	0	5	2
31	3	0	12	5	2	0	4	2
32	18	11	103	11	6	5	65	5
33	17	3	117	12	6	4	45	5
34	65	4	264	40	34	3	126	21
35	1	0	3	2	0	0	1	0
36	11	0	26	5	5	0	13	3
37	33	15	173	12	18	4	65	5
38	2	0	13	2	1	0	6	0
39	124	26	0	124	25	12	0	45
40	0	0	1	0	0	0	0	0
41	4	0	12	4	2	0	4	1
42	2	3	3	1	1	0	0	0
43	65	8	272	17	23	6	145	5
44	0	0	0	0	0	0	0	0
45	18	16	37	4	14	4	14	2
46	7	0	18	3	3	0	7	1
47	70	7	249	17	32	2	124	11
48	20	2	42	2	10	0	26	1
49	11	0	20	6	5	0	14	3
50	147	5	147	21	45	2	75	10
51	28	0	30	3	10	0	15	1
52	20	5	22	3	14	2	14	1
53	12	0	16	3	6	0	9	1
54	0	13	116	26	0	4	67	12
55	0	11	124	30	0	0	25	15
56	2	0	1	0	1	0	0	0
57	54	2	28	3	32	0	15	1
58	109	1	56	6	46	1	32	3

59	26	0	15	2	10	0	7	0
60	85	3	49	5	23	2	23	2
61	23	1	12	2	12	0	5	0
62	8	0	8	2	5	0	3	1
63	23	0	6	1	12	0	2	0
64	30	0	8	1	14	0	4	0
65	23	0	6	1	10	0	2	1
66	8	0	4	1	4	0	1	0
67	12	1	7	1	6	0	3	1
68	7	0	3	1	3	0	1	0
69	5	0	4	1	2	0	1	0

POLYGON ATTRIBUTE TABLE FOR TRAFFIC ZONES:

ZONE_1 - Number of people from Charminar depot,

ZONE_28 - Number of people from Mehdipatnam depot,

ZONE_46 - Number of people from Barkatpura depot,

ZONE_65 - Number of people from Secunderabad depot,

REQD_Z1- Number of buses required for Charminar depot,

REQD_Z28- Number of buses required for Mehdipatnam depot,

REQD_Z46- Number of buses required for Barkatpura depot,

REQD_Z65- Number of buses required for Secunderabad depot,

FROM_Z1 - Number of buses from charminar Depot.

FROM Z28 - Number of buses from Mehdi patnam Depot.

FROM Z46 - Number of buses from Barkatpura Depot.

FROM Z65 - Number of buses from Secunderabad Depot.

Appendix 4

Record#	route_no	width	from_z1	from_z28	from_z46	from_z65	totalbuses
1	0	80	0	0	0	0	0
2	9	200	17	12	55	65	149
3	9	100	2	0	6	13	21
4	15	150	17	12	55	65	149
5	15	150	3	2	10	8	23
6	0	80	0	0	0	0	0
7	0	80	0	0	0	0	0
8	0	80	0	0	0	0	0
9	15	150	3	2	10	8	23
10	15	150	2	0	6	13	21
11	0	80	0	0	0	0	0
12	0	80	0	0	0	0	0
13	0	80	0	0	0	0	0
14	0	80	0	0	0	0	0
15	15	150	2	0	6	13	21
16	9	200	3	0	10	10	23
17	9	200	17	12	55	65	149
18	17	60	3	2	10	8	23
19	15	150	3	2	10	8	23
20	17	60	3	2	10	8	23
21	15	150	2	0	6	13	21
22	9	80	3	0	10	10	23
23	9	200	3	0	10	10	23
24	9	200	3	2	10	8	23
25	15	150	2	0	6	13	21
26	0	80	0	0	0	0	0
27	7	200	2	0	6	13	21
28	9	200	3	0	10	10	23
29	17	60	3	2	10	8	23
30	19	100	10	2	20	223	255
31	15	150	5	0	16	32	53
32	0	80	0	0	0	0	0
33	0	80	0	0	0	0	0
34	15	80	2	0	6	13	21
35	15	150	2	0	6	13	21
36	15	150	2	0	6	13	21
37	17	60	3	0	10	10	23
38	9	200	3	0	10	10	23
39	17	60	3	0	10	10	23
40	7	200	10	2	20	223	255
41	15	150	2	0	8	126	136
42	3	200	10	2	20	223	255
43	0	80	0	0	0	0	0
44	0	80	0	0	0	0	0
45	1	150	15	4	62	0	81
46	10	150	5	0	16	32	53
47	0	80	0	0	0	0	0
48	1	150	1	0	2	25	28
49	1	150	2	0	8	126	136
50	15	150	1	0	2	6	9
51	15	150	2	0	6	13	21
52	17	60	3	2	10	8	23
53	17	60	3	2	10	8	23
54	10	150	0	6	0	1	7
55	7	200	10	2	20	223	255
56	10	150	1	0	2	6	9
57	32	150	14	2	22	132	170
58	3	100	10	2	20	223	255

59	3	100	14	2	31	252	299
60	10	80	14	2	22	132	170
61	10	150	14	2	22	132	170
62	10	150	14	2	22	132	170
63	15	150	1	0	2	25	28
64	17	60	3	0	10	10	23
65	10	150	7	2	14	11	34
66	10	150	7	2	14	11	34
67	9	200	3	0	10	10	23
68	0	80	0	0	0	0	0
69	32	150	14	2	22	132	170
70	1	150	15	4	62	0	81
71	32	150	15	2	34	210	261
72	10	150	5	0	16	32	53
73	10	150	1	0	4	2	7
74	1	150	14	2	22	132	170
75	1	80	14	2	22	132	170
76	7	200	14	2	31	252	299
77	10	150	15	2	34	210	261
78	7	200	15	2	34	210	261
79	32	150	15	2	34	210	261
80	32	150	15	2	34	210	261
81	32	150	15	2	34	210	261
82	16	100	15	2	34	210	261
83	3	100	10	2	20	223	255
84	32	150	15	2	34	210	261
85	3	200	10	2	20	223	255
86	10	150	15	2	34	210	261
87	32	150	15	2	34	210	261
88	3	60	14	2	22	132	170
89	10	150	1	0	2	6	9
90	16	100	15	2	34	210	261
91	1	150	15	2	34	210	261
92	16	80	15	2	34	210	261
93	1	80	15	2	34	210	261
94	16	80	15	2	34	210	261
95	17	60	1	0	4	2	7
96	32	100	15	2	34	210	261
97	7	200	15	2	34	210	261
98	8	100	1	0	4	2	7
99	9	200	7	2	14	11	34
100	8	60	1	0	6	3	10
101	9	80	1	0	4	2	7
102	7	200	15	2	34	210	261
103	10	150	15	2	34	210	261
104	7	80	15	2	34	210	261
105	5	100	3	0	14	32	49
106	8	60	1	0	6	3	10
107	8	100	1	0	4	2	7
108	14	80	1	0	4	2	7
109	14	80	1	0	4	2	7
110	7	200	15	2	34	210	261
111	5	100	3	0	18	18	39
112	0	80	0	0	0	0	0
113	15	100	9	0	14	22	45
114	27	150	14	2	22	132	170
115	7	100	3	0	18	18	39
116	5	100	3	0	18	18	39
117	5	100	3	0	18	18	39
118	8	100	1	0	4	2	7

119	12	60	1	0	4	2	7
120	17	60	1	0	4	2	7
121	12	80	0	6	0	1	7
122	7	100	3	0	18	18	39
123	5	100	9	0	14	22	45
124	5	100	14	2	22	132	170
125	12	80	1	0	4	2	7
126	14	80	1	0	4	2	7
127	7	200	3	0	18	18	39
128	16	100	15	2	34	210	261
129	5	100	3	0	18	18	39
130	10	150	32	18	175	128	353
131	10	150	1	0	6	3	10
132	12	80	1	0	4	2	7
133	5	100	3	0	18	18	39
134	5	100	3	0	18	18	39
135	5	100	11	2	63	74	150
136	14	60	1	0	6	3	10
137	14	80	1	0	4	2	7
138	1	150	15	2	34	210	261
139	5	100	3	0	18	18	39
140	5	150	11	2	63	74	150
141	1	100	3	0	18	18	39
142	20	80	0	0	0	0	0
143	7	200	3	0	18	18	39
144	14	60	1	0	6	3	10
145	8	100	1	0	4	2	7
146	3	60	3	0	14	32	49
147	16	100	3	0	18	18	39
148	20	80	0	0	0	0	0
149	16	100	0	0	0	0	0
150	16	100	0	0	0	0	0
151	1	150	11	2	63	74	150
152	1	100	11	2	63	74	150
153	16	100	3	0	18	18	39
154	14	60	1	0	6	3	10
155	12	60	1	0	4	2	7
156	8	100	1	0	6	3	10
157	9	200	1	0	6	3	10
158	0	80	0	0	0	0	0
159	16	100	11	2	63	74	150
160	8	100	1	0	4	2	7
161	20	80	0	0	0	0	0
162	3	60	3	0	14	32	49
163	5	100	8	0	29	11	48
164	5	100	8	0	29	11	48
165	14	60	1	0	6	3	10
166	6	100	9	0	14	22	45
167	14	100	2	6	6	2	16
168	6	100	9	0	14	22	45
169	3	60	3	0	14	32	49
170	6	100	9	0	14	22	45
171	14	100	2	6	6	2	16
172	14	100	2	6	6	2	16
173	7	200	8	0	29	11	48
174	8	100	1	0	4	2	7
175	7	80	8	0	29	11	48
176	5	100	58	14	0	46	118
177	12	100	0	6	0	1	7
178	14	100	2	6	6	2	16

179	8	100	1	0	4	2	7
180	7	200	58	14	0	46	118
181	7	100	8	0	29	11	48
182	1	150	11	2	63	74	150
183	4	80	3	2	6	2	13
184	6	100	9	0	14	22	45
185	12	80	1	0	4	2	7
186	12	100	0	6	0	1	7
187	3	60	9	0	14	22	45
188	14	60	1	0	6	3	10
189	9	200	1	0	6	3	10
190	16	100	11	2	63	74	150
191	20	80	2	0	16	5	23
192	9	200	32	18	175	128	353
193	35	100	1	0	6	3	10
194	9	200	32	18	175	128	353
195	9	200	32	18	175	128	353
196	20	80	0	0	0	0	0
197	20	80	0	0	0	0	0
198	5	100	58	14	0	46	118
199	35	100	1	0	6	3	10
200	5	100	58	14	0	46	118
201	9	200	32	18	175	128	353
202	9	200	58	14	0	46	118
203	9	200	58	14	0	46	118
204	6	100	11	2	63	74	150
205	4	80	3	2	6	2	13
206	0	80	0	0	0	0	0
207	6	100	11	2	63	74	150
208	20	80	2	0	16	5	23
209	7	200	49	12	0	48	109
210	35	100	2	6	6	2	16
211	12	100	1	0	4	2	7
212	22	100	58	14	0	46	118
213	9	200	58	14	0	46	118
214	20	80	0	0	0	0	0
215	22	100	49	12	0	48	109
216	6	100	49	12	0	48	109
217	6	100	49	12	0	48	109
218	4	80	3	2	6	2	13
219	8	100	3	2	6	2	13
220	8	100	2	6	6	2	16
221	8	100	1	0	4	2	7
222	1	150	2	0	16	5	23
223	27	150	2	0	6	13	21
224	9	200	49	12	0	48	109
225	16	100	2	0	16	5	23
226	6	100	2	0	16	5	23
227	7	200	49	12	0	48	109
228	35	100	2	6	6	2	16
229	1	150	2	0	16	5	23
230	6	100	0	0	0	0	0
231	22	100	49	12	0	48	109
232	12	80	2	6	6	2	16
233	12	80	2	6	6	2	16
234	3	60	9	0	14	22	45
235	35	100	18	10	51	11	90
236	23	80	2	6	6	2	16
237	6	100	2	0	16	5	23
238	16	100	2	0	16	5	23

239	16	100	2	0	16	5	23
240	14	60	0	0	0	0	0
241	16	100	18	10	51	11	90
242	16	100	16	14	36	12	78
243	6	100	2	0	16	5	23
244	8	60	18	10	51	11	90
245	23	80	18	10	51	11	90
246	9	200	49	12	0	48	109
247	23	80	7	2	14	11	34
248	16	100	18	10	51	11	90
249	16	100	18	10	51	11	90
250	8	60	11	0	13	5	29
251	8	60	11	0	13	5	29
252	7	200	49	12	0	48	109
253	22	100	17	8	58	12	95
254	1	150	32	4	237	20	293
255	18	80	3	2	6	2	13
256	4	80	3	2	6	2	13
257	8	80	3	2	6	2	13
258	4	80	3	2	6	2	13
259	8	80	3	2	6	2	13
260	22	100	186	13	0	61	260
261	22	100	49	12	0	48	109
262	27	150	1	0	2	2	5
263	6	100	2	0	16	5	23
264	22	80	17	8	58	12	95
265	14	100	16	14	36	12	78
266	6	100	2	0	16	5	23
267	6	100	2	0	16	5	23
268	15	150	4	0	12	4	20
269	3	60	9	0	14	22	45
270	28	80	11	0	13	5	29
271	8	80	0	0	0	0	0
272	0	80	0	0	0	0	0
273	21	60	2	0	12	2	16
274	8	60	11	0	13	5	29
275	21	60	2	0	12	2	16
276	8	60	11	0	13	5	29
277	3	60	1	0	2	2	5
278	3	60	4	0	12	4	20
279	3	100	1	0	2	2	5
280	22	100	186	13	0	61	260
281	22	100	186	13	0	61	260
282	27	150	3	0	12	5	20
283	16	100	18	10	51	11	90
284	23	80	7	2	14	11	34
285	20	80	3	0	12	5	20
286	27	150	4	0	12	4	20
287	4	80	3	2	6	2	13
288	23	80	18	10	51	11	90
289	9	200	17	8	58	12	95
290	22	100	186	13	0	61	260
291	7	200	49	12	0	48	109
292	8	60	58	14	0	46	118
293	14	100	16	14	36	12	78
294	14	60	16	14	36	12	78
295	27	150	4	0	12	4	20
296	3	200	32	8	244	17	301
297	9	200	17	8	58	12	95
298	14	100	32	8	244	17	301

419	29	100	0	0	0	0	0
420	18	60	2	0	6	13	21
421	30	200	12	0	16	3	31
422	21	60	1	0	6	3	10
423	4	80	0	0	0	0	0
424	18	100	12	0	16	3	31
425	18	60	0	0	0	0	0
426	26	200	0	0	0	0	0
427	7	200	0	0	0	0	0
428	7	80	132	4	132	10	278
429	1	100	0	0	0	0	0
430	18	100	128	2	2	24	156
431	18	80	2	0	6	13	21
432	18	60	0	10	186	15	211
433	20	80	11	0	20	6	37
434	30	200	12	0	16	3	31
435	9	100	12	0	16	3	31
436	4	80	0	0	0	0	0
437	23	80	20	2	21	2	45
438	13	60	20	4	11	3	38
439	13	80	0	0	0	0	0
440	4	80	0	0	0	0	0
441	26	200	128	2	2	24	156
442	21	60	0	0	0	0	0
443	29	100	132	4	132	10	278
444	18	60	0	10	186	15	211
445	28	80	20	4	11	3	38
446	4	80	0	0	0	0	0
447	13	60	0	0	0	0	0
448	18	60	13	0	14	2	29
449	2	80	2	0	6	13	21
450	30	200	12	0	16	3	31
451	2	80	132	4	132	10	278
452	18	60	13	0	14	2	29
453	26	200	27	2	14	3	46
454	13	60	0	0	0	0	0
455	23	80	20	4	11	3	38
456	4	80	0	0	0	0	0
457	18	100	12	0	16	3	31
458	18	60	13	0	14	2	29
459	21	60	128	2	2	24	156
460	13	60	27	2	14	3	46
461	13	80	128	2	2	24	156
462	1	150	0	10	186	15	211
463	20	80	12	0	16	3	31
464	26	200	11	0	12	2	25
465	2	80	2	0	6	13	21
466	26	200	11	0	12	2	25
467	29	100	13	0	14	2	29
468	13	60	128	2	2	24	156
469	4	80	0	0	0	0	0
470	18	100	13	0	14	2	29
471	31	60	163	0	28	6	197
472	1	150	0	10	186	15	211
473	13	80	128	2	2	24	156
474	13	100	0	10	186	15	211
475	1	100	128	2	2	24	156
476	13	60	128	2	2	24	156
477	31	60	13	0	14	2	29
478	11	80	13	0	14	2	29

479	2	80	13	0	14	2	29
480	31	60	163	0	28	6	197
481	20	80	12	0	16	3	31
482	31	60	12	0	16	3	31
483	2	100	163	0	28	6	197
484	2	100	13	0	14	2	29
485	29	100	163	0	28	6	197
486	25	60	0	10	186	15	211
487	18	60	2	0	0	0	2
488	2	80	2	0	6	13	21
489	29	100	163	0	28	6	197
490	14	100	163	0	28	6	197
491	21	60	128	2	2	24	156
492	14	80	163	0	28	6	197
493	13	100	11	0	6	1	18
494	2	80	8	0	8	2	18
495	31	60	12	0	16	3	31
496	21	80	128	2	2	24	156
497	2	80	8	0	8	2	18
498	20	80	12	0	16	3	31
499	26	200	11	0	12	2	25
500	25	60	11	0	6	1	18
501	11	60	128	2	2	24	156
502	20	80	8	0	8	2	18
503	18	100	13	0	14	2	29
504	11	60	11	0	12	2	25
505	11	60	15	0	8	1	24
506	11	60	128	2	2	24	156
507	24	150	0	10	186	15	211
508	21	60	128	2	2	24	156
509	11	60	11	0	12	2	25
510	11	60	15	0	8	1	24
511	11	60	15	0	8	1	24
512	11	60	15	0	8	1	24
513	11	60	128	2	2	24	156
514	29	100	11	0	6	1	18
515	29	60	11	0	6	1	18
516	32	80	13	0	14	2	29
517	2	100	13	0	14	2	29
518	25	60	11	0	6	1	18
519	11	60	15	0	8	1	24
520	11	100	15	0	8	1	24
521	20	80	8	0	8	2	18
522	25	60	8	0	4	1	13
523	11	60	12	0	6	1	19
524	0	80	0	0	0	0	0
525	24	150	11	0	6	1	18
526	26	200	11	0	12	2	25
527	31	60	8	0	8	2	18
528	0	80	0	0	0	0	0
529	29	100	11	0	6	1	18
530	25	60	8	0	4	1	13
531	24	150	11	0	6	1	18
532	11	60	15	0	8	1	24
533	29	80	11	0	6	1	18
534	26	200	11	0	12	2	25
535	33	80	8	0	4	1	13
536	29	80	11	0	6	1	18
537	29	80	11	0	6	1	18
538	0	80	0	0	0	0	0

539	141	147	3.023801	13	21	4	150
540	146	149	0.376792	24	6	3	150
541	144	150	0.670439	29	4	0	100
542	152	144	0.391317	29	6	3	80
543	142	148	1.637849	11	10	4	60
544	142	151	0.639392	21	12	3	60
545	142	148	0.028490	11	10	4	100
546	142	151	0.021039	18	12	3	80
547	152	149	1.050045	29	6	3	80
548	148	146	2.440084	21	10	4	60
549	147	1	3.578238	1	0	0	150
550	147	145	1.042037	25	17	2	60
551	150	145	1.014937	33	17	2	80
552	152	150	0.488376	29	4	0	80
553	124	151	1.071018	26	12	3	200
554	151	146	0.617407	11	10	4	60
555	151	1	0.282115	1	0	0	80
556	145	1	0.966558	11	60	4	150
557	124	1	5.584156	1	0	0	80
558	152	145	0.656245	33	17	2	80
559	145	153	0.276016	11	18	3	150
560	145	153	0.991146	11	18	3	150
561	145	153	0.604633	11	18	3	150
562	152	145	0.635265	33	17	2	80
563	146	152	2.381267	24	5	3	150
564	152	154	0.443518	11	18	3	150
565	152	146	0.053362	24	10	4	60
566	146	155	0.026280	11	18	3	100
567	154	153	0.514138	33	18	3	80
568	154	155	0.545073	24	18	3	150
569	146	155	1.263792	11	18	3	150
570	146	1	2.482926	11	60	4	80
571	153	156	1.657860	24	18	3	150
572	155	156	1.113101	33	18	3	80
573	153	1	3.370226	1	0	0	80
574	156	1	1.803225	1	0	0	80
575	155	1	1.208830	1	0	0	80
576	155	1	1.732715	1	0	0	80

ARC ATTRIBUTE TABLE FOR PUBLIC TRANSPORT ROUTES:

LPOLY_ - Left polygon,

RPOLY_ - Right polygon,

LENGTH - Length of the route,

PT1_ID - User _id,

ZONE_NO - Connecting zone,

WIDTH - Width of the route,

ROUTE_NO - Route number.

239	16	100	2	0	16	5	23
240	14	60	0	0	0	0	0
241	16	100	18	10	51	11	90
242	16	100	16	14	36	12	78
243	6	100	2	0	16	5	23
244	8	60	18	10	51	11	90
245	23	80	18	10	51	11	90
246	9	200	49	12	0	48	109
247	23	80	7	2	14	11	34
248	16	100	18	10	51	11	90
249	16	100	18	10	51	11	90
250	8	60	11	0	13	5	29
251	8	60	11	0	13	5	29
252	7	200	49	12	0	48	109
253	22	100	17	8	58	12	95
254	1	150	32	4	237	20	293
255	18	80	3	2	6	2	13
256	4	80	3	2	6	2	13
257	8	80	3	2	6	2	13
258	4	80	3	2	6	2	13
259	8	80	3	2	6	2	13
260	22	100	186	13	0	61	260
261	22	100	49	12	0	48	109
262	27	150	1	0	2	2	5
263	6	100	2	0	16	5	23
264	22	80	17	8	58	12	95
265	14	100	16	14	36	12	78
266	6	100	2	0	16	5	23
267	6	100	2	0	16	5	23
268	15	150	4	0	12	4	20
269	3	60	9	0	14	22	45
270	28	80	11	0	13	5	29
271	8	80	0	0	0	0	0
272	0	80	0	0	0	0	0
273	21	60	2	0	12	2	16
274	8	60	11	0	13	5	29
275	21	60	2	0	12	2	16
276	8	60	11	0	13	5	29
277	3	60	1	0	2	2	5
278	3	60	4	0	12	4	20
279	3	100	1	0	2	2	5
280	22	100	186	13	0	61	260
281	22	100	186	13	0	61	260
282	27	150	3	0	12	5	20
283	16	100	18	10	51	11	90
284	23	80	7	2	14	11	34
285	20	80	3	0	12	5	20
286	27	150	4	0	12	4	20
287	4	80	3	2	6	2	13
288	23	80	18	10	51	11	90
289	9	200	17	8	58	12	95
290	22	100	186	13	0	61	260
291	7	200	49	12	0	48	109
292	9	60	58	14	0	46	118
293	14	100	16	14	36	12	78
294	14	60	16	14	36	12	78
295	27	150	4	0	12	4	20
296	9	200	32	8	244	17	301
297	9	200	17	8	58	12	95
298	14	100	32	8	244	17	301

299	1	150	32	4	237	20	293
300	21	100	186	13	0	61	260
301	21	100	186	13	0	61	260
302	20	80	3	0	12	5	20
303	27	150	4	0	12	4	20
304	7	200	186	13	0	61	260
305	21	100	186	13	0	61	260
306	27	150	3	0	12	5	20
307	27	150	4	0	12	4	20
308	27	80	4	0	12	4	20
309	16	100	32	4	237	20	293
310	21	100	32	4	237	20	293
311	0	80	0	0	0	0	0
312	16	60	16	14	36	12	78
313	23	80	18	10	51	11	90
314	20	80	4	0	12	4	20
315	7	200	186	13	0	61	260
316	21	60	2	0	12	2	16
317	21	100	32	4	237	20	293
318	9	100	186	13	0	61	260
319	7	200	186	13	0	61	260
320	9	200	32	8	244	17	301
321	35	100	11	0	13	5	29
322	28	80	11	0	13	5	29
323	8	60	11	0	13	5	29
324	27	100	4	0	12	4	20
325	1	150	32	4	237	20	293
326	4	80	0	0	0	0	0
327	1	150	32	4	237	20	293
328	23	80	16	14	36	12	78
329	20	80	4	0	12	4	20
330	8	60	18	16	18	4	56
331	8	60	11	0	13	5	29
332	27	80	2	6	6	2	16
333	27	80	4	0	12	4	20
334	1	150	32	4	237	20	293
335	30	200	186	13	0	61	260
336	8	60	18	16	18	4	56
337	30	200	32	4	237	20	293
338	8	60	18	16	18	4	56
339	14	100	32	8	244	17	301
340	26	200	186	13	0	61	260
341	14	100	32	8	244	17	301
342	7	100	105	6	223	17	351
343	8	100	18	16	18	4	56
344	28	80	11	0	13	5	29
345	8	60	32	8	244	17	301
346	23	80	2	2	2	1	7
347	8	60	16	14	36	12	78
348	22	80	16	14	36	12	78
349	8	80	16	14	36	12	78
350	8	1	16	14	36	12	78
351	22	60	32	8	244	17	301
352	1	150	186	13	0	61	260
353	14	100	186	13	0	61	260
354	0	80	0	0	0	0	0
355	21	60	32	8	244	17	301
356	34	80	0	0	0	0	0
357	21	60	2	0	12	2	16
358	0	80	0	0	0	0	0

359	26	200	105	6	223	17	351
360	21	60	32	8	244	17	301
361	0	60	0	0	0	0	0
362	0	80	0	0	0	0	0
363	0	80	0	0	0	0	0
364	34	80	0	0	0	0	0
365	16	100	32	4	237	20	293
366	20	80	4	0	12	4	20
367	34	80	0	0	0	0	0
368	34	80	0	0	0	0	0
369	30	200	32	4	237	20	293
370	26	200	105	6	223	17	351
371	30	200	0	0	0	0	0
372	7	200	105	6	223	17	351
373	34	80	0	0	0	0	0
374	4	100	186	13	0	61	260
375	23	80	20	2	21	2	45
376	23	80	2	2	2	1	7
377	13	60	3	2	6	2	13
378	0	80	0	0	0	0	0
379	35	100	2	2	2	1	7
380	13	60	2	2	2	1	7
381	3	60	1	0	2	2	5
382	34	80	0	0	0	0	0
383	4	80	0	0	0	0	0
384	0	80	0	0	0	0	0
385	20	80	0	0	0	0	0
386	0	80	7	0	18	3	28
387	8	60	18	16	18	4	56
388	30	200	0	0	0	0	0
389	2	80	7	0	18	3	28
390	2	80	7	0	18	3	28
391	30	200	132	4	132	10	278
392	9	200	132	4	132	10	278
393	18	60	7	0	18	3	28
394	1	150	105	6	223	17	351
395	35	100	2	2	2	1	7
396	22	80	20	2	21	2	45
397	23	80	2	2	2	1	7
398	13	60	2	2	2	1	7
399	4	80	0	0	0	0	0
400	29	100	105	6	223	17	351
401	4	80	0	0	0	0	0
402	4	80	3	2	6	2	13
403	4	80	0	0	0	0	0
404	30	200	14	0	15	3	32
405	0	80	0	0	0	0	0
406	28	80	18	16	18	4	56
407	12	80	20	4	11	3	38
408	0	80	0	0	0	0	0
409	0	80	0	0	0	0	0
410	2	80	11	0	20	6	37
411	35	100	0	0	0	0	0
412	1	150	105	6	223	17	351
413	26	200	105	6	223	17	351
414	4	80	0	0	0	0	0
415	4	80	0	0	0	0	0
416	26	200	105	6	223	17	351
417	0	80	0	0	0	0	0
418	18	60	132	4	132	10	278

419	29	100	0	0	0	0	0
420	18	60	2	0	6	13	21
421	30	200	12	0	16	3	31
422	21	60	1	0	6	3	10
423	4	80	0	0	0	0	0
424	18	100	12	0	16	3	31
425	18	60	0	0	0	0	0
426	26	200	0	0	0	0	0
427	7	200	0	0	0	0	0
428	7	80	132	4	132	10	278
429	1	100	0	0	0	0	0
430	18	100	128	2	2	24	156
431	18	80	2	0	6	13	21
432	18	60	0	10	186	15	211
433	20	80	11	0	20	6	37
434	30	200	12	0	16	3	31
435	9	100	12	0	16	3	31
436	4	80	0	0	0	0	0
437	23	80	20	2	21	2	45
438	13	60	20	4	11	3	38
439	13	80	0	0	0	0	0
440	4	80	0	0	0	0	0
441	26	200	128	2	2	24	156
442	21	60	0	0	0	0	0
443	29	100	132	4	132	10	278
444	18	60	0	10	186	15	211
445	28	80	20	4	11	3	38
446	4	80	0	0	0	0	0
447	13	60	0	0	0	0	0
448	18	60	13	0	14	2	29
449	2	80	2	0	6	13	21
450	30	200	12	0	16	3	31
451	2	80	132	4	132	10	278
452	18	60	13	0	14	2	29
453	26	200	27	2	14	3	46
454	13	60	0	0	0	0	0
455	23	80	20	4	11	3	38
456	4	80	0	0	0	0	0
457	18	100	12	0	16	3	31
458	18	60	13	0	14	2	29
459	21	60	128	2	2	24	156
460	13	60	27	2	14	3	46
461	13	80	128	2	2	24	156
462	1	150	0	10	186	15	211
463	20	80	12	0	16	3	31
464	26	200	11	0	12	2	25
465	2	80	2	0	6	13	21
466	26	200	11	0	12	2	25
467	29	100	13	0	14	2	29
468	13	60	128	2	2	24	156
469	4	80	0	0	0	0	0
470	18	100	13	0	14	2	29
471	31	60	163	0	28	6	197
472	1	150	0	10	186	15	211
473	13	80	128	2	2	24	156
474	13	100	0	10	186	15	211
475	1	100	128	2	2	24	156
476	13	60	128	2	2	24	156
477	31	60	13	0	14	2	29
478	11	80	13	0	14	2	29

479	2	80	13	0	14	2	29
480	31	60	163	0	28	6	197
481	20	80	12	0	16	3	31
482	31	60	12	0	16	3	31
483	2	100	163	0	28	6	197
484	2	100	13	0	14	2	29
485	29	100	163	0	28	6	197
486	25	60	0	10	186	15	211
487	18	60	2	0	0	0	2
488	2	80	2	0	6	13	21
489	29	100	163	0	28	6	197
490	14	100	163	0	28	6	197
491	21	60	128	2	2	24	156
492	14	80	163	0	28	6	197
493	13	100	11	0	6	1	18
494	2	80	8	0	8	2	18
495	31	60	12	0	16	3	31
496	21	80	128	2	2	24	156
497	2	80	8	0	8	2	18
498	20	80	12	0	16	3	31
499	26	200	11	0	12	2	25
500	25	60	11	0	6	1	18
501	11	60	128	2	2	24	156
502	20	80	8	0	8	2	18
503	18	100	13	0	14	2	29
504	11	60	11	0	12	2	25
505	11	60	15	0	8	1	24
506	11	60	128	2	2	24	156
507	24	150	0	10	186	15	211
508	21	60	128	2	2	24	156
509	11	60	11	0	12	2	25
510	11	60	15	0	8	1	24
511	11	60	15	0	8	1	24
512	11	60	15	0	8	1	24
513	11	60	128	2	2	24	156
514	29	100	11	0	6	1	18
515	29	60	11	0	6	1	18
516	32	80	13	0	14	2	29
517	2	100	13	0	14	2	29
518	25	60	11	0	6	1	18
519	11	60	15	0	8	1	24
520	11	100	15	0	8	1	24
521	20	80	8	0	8	2	18
522	25	60	8	0	4	1	13
523	11	60	12	0	6	1	19
524	0	80	0	0	0	0	0
525	24	150	11	0	6	1	18
526	26	200	11	0	12	2	25
527	31	60	8	0	8	2	18
528	0	80	0	0	0	0	0
529	29	100	11	0	6	1	18
530	25	60	8	0	4	1	13
531	24	150	11	0	6	1	18
532	11	60	15	0	8	1	24
533	29	80	11	0	6	1	18
534	26	200	11	0	12	2	25
535	33	80	8	0	4	1	13
536	29	80	11	0	6	1	18
537	29	80	11	0	6	1	18
538	0	80	0	0	0	0	0

539	13	150	8	0	8	2	18
540	24	150	11	0	6	1	18
541	29	100	11	0	6	1	18
542	29	80	11	0	6	1	18
543	11	60	12	0	6	1	19
544	21	60	11	0	12	2	25
545	11	100	12	0	6	1	19
546	18	80	11	0	12	2	25
547	29	80	11	0	6	1	18
548	21	60	12	0	6	1	19
549	0	150	0	0	0	0	0
550	25	60	8	0	4	1	13
551	33	80	8	0	4	1	13
552	29	80	11	0	6	1	18
553	26	200	11	0	12	2	25
554	11	60	12	0	6	1	19
555	0	80	0	0	0	0	0
556	11	150	2	0	6	13	21
557	0	80	0	0	0	0	0
558	33	80	8	0	4	1	13
559	11	150	5	0	4	1	10
560	11	150	5	0	4	1	10
561	11	150	5	0	4	1	
562	33	80	8	0	4	1	13
563	24	150	7	0	2	1	10
564	11	150	5	0	4	1	10
565	24	60	12	0	6	1	19
566	11	100	5	0	4	1	10
567	33	80	5	0	4	1	10
568	24	150	5	0	4	1	10
569	11	150	5	0	4	1	10
570	11	80	2	0	6	13	21
571	24	150	5	0	4	1	10
572	33	80	5	0	4	1	10
573	0	80	0	0	0	0	0
574	0	80	0	0	0	0	0
575	0	80	0	0	0	0	0
576	0	80	0	0	0	0	0

Record#	lpoly_	rpoly_	length	pt1_id	zone_no	tpi	width
1	4	1	2.151987	1	0	0	80
2	3	4	0.733189	9	30	4	200
3	4	2	0.370616	9	60	4	100
4	4	5	1.789584	15	30	4	150
5	3	6	0.633107	15	25	4	150
6	3	1	1.339467	1	0	0	80
7	2	1	5.540225	1	0	0	80
8	3	1	0.078214	1	0	0	80
9	3	6	0.472056	15	25	4	150
10	6	1	0.217576	15	60	4	150
11	7	1	0.045884	1	0	0	80
12	7	1	0.004995	1	0	0	80
13	7	6	0.011398	1	0	0	80
14	7	1	0.681044	1	0	0	80
15	5	2	0.484145	15	60	4	150
16	5	8	1.581143	9	31	3	200
17	6	5	0.630614	9	30	4	200
18	6	10	0.522669	17	25	4	60
19	7	6	0.516559	15	25	4	150
20	6	10	0.485404	17	25	4	60
21	8	2	0.327030	15	60	4	150
22	8	12	0.038373	9	31	3	80
23	6	8	0.347213	9	31	3	200
24	6	11	0.590987	9	25	4	200
25	12	2	0.050232	15	60	4	150
26	9	1	0.316888	1	0	0	80
27	2	1	1.458679	7	60	4	200
28	11	8	0.700734	9	31	3	200
29	10	11	1.551240	17	25	4	60
30	2	15	0.083880	19	63	4	100
31	2	16	1.059468	15	62	4	150
32	9	1	2.535664	1	0	0	80
33	7	1	2.475241	1	0	0	80
34	18	1	0.041639	15	60	4	80
35	15	1	0.860520	15	60	4	150
36	18	1	0.299295	15	60	4	150
37	17	8	0.551583	17	31	3	60
38	8	12	0.817961	9	31	3	200
39	17	8	0.313007	17	31	3	60
40	16	15	0.197549	7	63	4	200
41	18	9	0.893674	15	66	4	150
42	15	18	0.277933	3	63	4	200
43	13	1	1.731741	1	0	0	80
44	13	1	0.003833	1	0	0	80
45	18	20	0.066651	50	65	4	150
46	14	16	0.461498	10	62	4	150
47	13	1	0.132069	1	0	0	80
48	9	13	1.380903	50	67	3	150
49	20	9	0.364650	50	66	4	150
50	2	14	2.530695	15	61	3	150
51	12	2	1.426572	15	60	4	150
52	7	10	1.373494	17	25	4	60
53	7	10	0.111929	17	25	4	60
54	7	19	1.866761	10	23	2	150
55	16	15	0.582372	7	63	4	200
56	12	14	0.400345	10	61	3	150
57	13	21	1.447975	32	57	4	150
58	15	18	0.621186	3	63	4	100

59	15	24	0.602004	3	64	4	100
60	13	21	0.032788	10	57	4	80
61	13	25	0.012059	10	57	4	150
62	13	25	0.029504	10	57	4	150
63	20	13	0.611407	15	67	3	150
64	17	12	0.833125	17	31	3	60
65	12	26	0.861023	10	32	4	150
66	17	26	0.205669	10	32	4	150
67	10	17	1.184914	9	31	3	200
68	19	1	1.874556	1	0	0	80
69	20	25	0.642232	32	57	4	150
70	18	20	0.830403	50	65	4	150
71	18	28	0.069202	32	47	4	150
72	14	16	0.973268	10	62	4	150
73	10	23	2.800028	10	26	3	150
74	28	25	0.063068	50	57	4	150
75	28	25	0.005648	50	57	4	80
76	16	24	0.463390	7	64	4	200
77	16	29	0.310163	10	47	4	150
78	24	29	0.049062	7	47	4	200
79	18	28	0.696204	32	47	4	150
80	18	28	0.098735	32	47	4	150
81	18	32	0.039951	32	47	4	150
82	32	28	0.053518	16	47	4	100
83	24	18	0.482539	3	63	4	100
84	18	32	0.591095	32	47	4	150
85	24	18	0.058253	3	63	4	200
86	24	31	0.433063	10	47	4	150
87	18	32	0.061385	32	47	4	150
88	30	25	0.589163	3	57	4	60
89	26	14	0.821190	10	61	3	150
90	33	28	0.532148	16	47	4	100
91	28	30	0.664546	50	47	4	150
92	36	28	0.004604	16	47	4	80
93	36	30	0.003415	50	47	4	80
94	33	36	0.005058	16	47	4	80
95	19	23	1.312174	17	26	3	60
96	31	32	0.570661	32	47	4	100
97	29	31	0.452867	7	47	4	200
98	37	23	0.042602	8	26	3	100
99	23	26	1.031536	9	32	4	200
100	26	35	0.456335	8	33	3	60
101	26	23	0.011499	9	26	3	80
102	29	32	0.249498	7	47	4	200
103	22	29	0.806463	10	47	4	150
104	22	32	0.005799	7	47	4	80
105	30	34	0.576586	5	50	4	100
106	23	40	0.414269	8	33	3	60
107	37	23	1.176174	8	26	3	100
108	39	37	0.294187	14	26	3	80
109	39	37	0.004507	14	26	3	80
110	22	32	0.088433	7	47	4	200
111	32	42	0.006909	5	48	4	100
112	21	1	3.368413	1	0	0	80
113	21	43	0.028336	15	58	3	100
114	21	25	2.594210	27	57	4	150
115	22	42	0.061731	7	48	4	100
116	32	42	0.297231	5	48	4	100
117	22	42	0.008717	5	48	4	100
118	39	23	1.376562	8	26	3	100

119	38	23	1.265137	12	26	3	60
120	19	38	0.566820	17	26	3	60
121	27	19	1.771734	12	23	2	80
122	22	42	0.174657	7	48	4	100
123	25	43	0.391576	5	58	3	100
124	34	25	2.082670	5	57	4	100
125	27	38	0.216054	12	26	3	80
126	39	37	0.587422	14	26	3	80
127	44	42	0.178723	7	48	4	200
128	32	33	1.110676	16	47	4	100
129	32	42	0.843760	5	48	4	100
130	14	22	3.964030	10	40	4	150
131	14	35	1.222015	10	33	3	150
132	27	38	0.162102	12	26	3	80
133	33	46	0.098972	5	48	4	100
134	33	46	0.008751	5	48	4	100
135	30	41	0.766194	5	51	4	100
136	37	40	0.675587	14	33	3	60
137	37	39	1.199061	14	26	3	80
138	33	30	1.002731	50	47	4	150
139	33	46	0.404106	5	48	4	100
140	30	41	0.260594	5	51	4	150
141	30	46	0.034075	50	48	4	100
142	42	47	0.212374	20	49	4	80
143	45	42	0.367306	7	48	4	200
144	39	40	0.200750	14	33	3	60
145	38	39	0.854421	8	26	3	100
146	41	34	0.981410	3	50	4	60
147	42	46	0.658984	16	48	4	100
148	42	47	0.665633	20	49	4	80
149	46	47	0.456969	16	49	4	100
150	46	47	0.027249	16	49	4	100
151	46	41	0.525890	50	51	4	150
152	46	41	0.024580	50	51	4	100
153	47	46	0.084693	16	48	4	100
154	39	40	0.388993	14	33	3	60
155	39	48	2.279217	12	26	3	60
156	22	35	0.969792	8	33	3	100
157	35	40	1.803440	9	33	3	200
158	27	1	3.784433	1	0	0	80
159	49	41	1.113682	16	51	4	100
160	38	48	2.069509	8	26	3	100
161	45	47	1.051119	20	49	4	80
162	41	34	1.232527	3	50	4	60
163	22	44	1.930972	5	44	3	100
164	22	44	0.030934	5	44	3	100
165	48	40	0.722485	14	33	3	60
166	34	43	2.000197	6	58	3	100
167	48	52	0.192102	14	27	3	100
168	34	43	0.020253	6	58	3	100
169	41	34	0.064813	3	50	4	60
170	41	43	0.018727	6	58	3	100
171	48	52	0.945007	14	27	3	100
172	48	52	0.002332	14	27	3	100
173	44	45	1.861647	7	44	3	200
174	38	48	0.247285	8	26	3	100
175	44	45	0.027286	7	44	3	80
176	44	51	0.086947	5	41	3	100
177	50	27	0.805406	12	23	2	100
178	48	52	0.064403	14	27	3	100

179	38	48	0.046206	8	26	3	100
180	45	51	0.152179	7	41	3	200
181	51	45	0.003003	7	44	3	100
182	47	49	1.054553	50	51	4	150
183	50	53	0.551564	4	24	3	80
184	41	43	0.591710	6	58	3	100
185	27	38	1.886984	12	26	3	80
186	53	27	0.782259	12	23	2	100
187	57	43	0.107113	3	58	3	60
188	52	40	0.630827	14	33	3	60
189	22	40	1.057268	9	33	3	200
190	49	41	0.885622	16	51	4	100
191	49	55	0.915244	20	52	3	80
192	61	22	0.169352	9	40	4	200
193	59	40	0.560887	35	33	3	100
194	61	22	0.050968	9	40	4	200
195	40	22	0.095463	9	40	4	200
196	45	47	0.033714	20	49	4	80
197	45	47	0.783840	20	49	4	80
198	22	51	1.344676	5	41	3	100
199	63	40	0.457220	35	33	3	100
200	22	51	0.035131	5	41	3	100
201	60	22	0.496231	9	40	4	200
202	60	51	0.057788	9	41	3	200
203	60	51	0.002834	9	41	3	200
204	57	41	0.524842	6	51	4	100
205	56	50	0.947201	4	24	3	80
206	50	1	2.699015	1	0	0	80
207	57	41	0.250154	6	51	4	100
208	41	62	0.523751	20	52	3	80
209	51	54	0.749581	7	45	6	200
210	59	52	0.541486	35	27	3	100
211	53	38	0.746741	12	26	3	100
212	64	51	0.605311	22	41	3	100
213	60	51	0.306540	9	41	3	200
214	45	47	0.344109	20	49	4	80
215	65	54	0.305445	22	45	6	100
216	45	54	1.472130	6	45	6	100
217	45	54	0.231261	6	45	6	100
218	56	53	0.623364	4	24	3	80
219	53	66	1.664802	8	24	3	100
220	38	52	3.129821	8	27	3	100
221	66	38	0.365048	8	26	3	100
222	47	55	0.839567	50	52	3	150
223	43	1	3.690625	27	60	4	150
224	60	64	0.210549	9	45	6	200
225	55	62	0.628687	16	52	3	100
226	57	62	0.437814	6	52	3	100
227	64	65	0.319577	7	45	6	200
228	67	52	0.706069	35	27	3	100
229	47	55	0.132748	50	52	3	150
230	54	47	0.546574	6	49	4	100
231	65	54	0.653097	22	45	6	100
232	66	52	0.651554	12	27	3	80
233	66	52	0.364602	12	27	3	80
234	58	43	1.404823	3	58	3	60
235	52	68	1.526201	35	34	4	100
236	71	52	0.521488	23	27	3	80
237	70	55	0.440420	6	52	3	100
238	55	62	0.067789	16	52	3	100

239	55	62	0.613559	16	52	3	100
240	59	63	0.927452	14	68	0	60
241	59	73	0.060746	16	34	4	100
242	73	75	0.018870	16	38	4	100
243	57	62	0.471007	6	52	3	100
244	67	68	0.426686	8	34	4	60
245	72	68	1.120187	23	34	4	80
246	60	64	0.403398	9	45	6	200
247	79	67	0.003641	23	32	4	80
248	59	73	1.016129	16	34	4	100
249	67	59	0.647832	16	34	4	100
250	79	72	0.021013	8	28	4	60
251	72	79	0.002004	8	28	4	60
252	64	65	0.409054	7	45	6	200
253	64	78	0.545434	22	37	3	100
254	54	70	0.531678	50	53	4	150
255	80	56	0.007988	13	24	3	80
256	56	66	0.551101	4	24	3	80
257	56	81	0.041647	13	24	3	80
258	81	66	0.003410	4	24	3	80
259	80	81	0.040306	13	24	3	80
260	54	77	0.593005	22	46	7	100
261	65	54	0.355937	22	45	6	100
262	43	69	1.525652	27	59	2	150
263	76	62	0.382550	6	52	3	100
264	63	61	1.039724	22	37	3	80
265	63	75	0.387510	14	38	4	100
266	76	62	0.008292	6	52	3	100
267	74	62	0.307501	6	52	3	100
268	43	82	0.028881	15	56	3	150
269	58	43	0.926747	3	58	3	60
270	66	71	0.353755	28	28	4	80
271	56	80	0.677070	13	22	1	80
272	56	1	1.566611	1	0	0	80
273	74	76	0.050825	21	54	1	60
274	72	79	0.128230	8	28	4	60
275	74	76	0.003520	21	54	1	60
276	72	79	0.006030	8	28	4	60
277	82	69	0.055349	3	59	2	60
278	84	82	0.067191	3	56	3	60
279	84	69	0.004097	3	59	2	100
280	65	77	0.231076	22	46	7	100
281	65	77	0.380070	22	46	7	100
282	76	57	0.362212	27	55	3	150
283	67	73	0.365241	16	34	4	100
284	79	67	0.614554	23	32	4	80
285	57	58	1.442691	20	55	3	80
286	58	84	0.424628	27	56	3	150
287	80	66	0.490059	13	24	3	80
288	79	73	0.245037	23	34	4	80
289	60	78	0.429801	9	37	3	200
290	65	77	0.516274	22	46	7	100
291	78	65	0.399953	7	45	6	200
292	61	60	1.565855	8	41	3	60
293	61	83	0.541938	14	38	4	100
294	60	83	0.086698	14	38	4	60
295	58	86	1.029565	27	56	3	150
296	78	89	0.089829	9	42	4	200
297	60	78	0.085528	9	37	3	200
298	60	88	0.276564	14	42	4	100

299	77	70	0.558080	50	53	4	150
300	77	91	0.577281	21	46	7	100
301	77	91	0.387913	21	46	7	100
302	57	58	0.320518	20	55	3	80
303	58	90	0.541472	27	56	3	150
304	78	77	0.146114	7	46	7	200
305	77	91	0.409308	21	46	7	100
306	76	57	0.405784	27	55	3	150
307	57	90	0.500790	27	56	3	150
308	86	84	0.367884	27	56	3	80
309	70	74	0.904293	16	53	4	100
310	70	92	0.462590	21	53	4	100
311	80	1	0.746422	1	0	0	80
312	73	75	0.902626	16	38	4	60
313	79	73	0.702125	23	34	4	80
314	90	86	0.211630	20	56	3	80
315	78	91	0.138747	7	46	7	200
316	74	76	0.920416	21	54	1	60
317	74	93	0.436687	21	53	4	100
318	91	94	0.023855	9	46	7	100
319	78	91	0.024921	7	46	7	200
320	78	89	0.665007	9	42	4	200
321	71	72	0.951504	35	28	4	100
322	85	71	0.828918	28	28	4	80
323	72	79	0.782538	8	28	4	60
324	76	90	0.333145	27	56	3	100
325	91	92	0.512641	50	53	4	150
326	76	96	0.380441	4	68	0	80
327	91	92	0.130892	50	53	4	150
328	79	75	0.538648	23	38	4	80
329	90	86	0.411341	20	56	3	80
330	79	97	0.238740	8	35	4	60
331	72	79	0.263700	8	28	4	60
332	86	84	0.529574	27	27	3	80
333	86	84	0.957636	27	56	3	80
334	91	92	0.137593	50	53	4	150
335	91	94	1.041186	30	46	7	200
336	79	97	0.140999	8	35	4	60
337	98	92	0.281565	30	53	4	200
338	79	97	1.702396	8	35	4	60
339	88	89	0.857179	14	42	4	100
340	89	94	0.553050	26	46	7	200
341	88	89	0.114377	14	42	4	100
342	88	100	0.020065	7	43	4	100
343	72	97	0.224164	8	35	4	100
344	95	72	0.989283	28	28	4	80
345	83	88	0.916325	8	42	4	60
346	66	85	1.477006	23	29	3	80
347	101	83	0.225009	8	38	4	60
348	75	83	1.291501	22	38	4	80
349	97	75	0.470761	8	38	4	80
350	101	75	0.282873	8	38	4	1
351	101	88	0.703874	22	42	4	60
352	94	98	0.467501	50	46	7	150
353	100	94	0.747823	14	46	7	100
354	69	1	2.586124	1	0	0	80
355	102	88	0.243364	21	42	4	60
356	76	96	1.206533	34	68	0	80
357	93	76	0.927390	21	54	1	60
358	69	1	0.179617	1	0	0	80

359	88	100	0.233807	26	43	4	200
360	21	88	0.024833	21	42	4	60
361	69	1	0.034654	1	0	0	60
362	69	1	0.080762	1	0	0	80
363	69	1	0.055502	1	0	0	80
364	93	96	0.164049	34	68	0	80
365	92	93	0.999615	16	53	4	100
366	90	84	0.522979	20	56	3	80
367	90	96	1.414171	34	68	0	80
368	92	96	0.079706	34	68	0	80
369	98	92	0.697155	30	53	4	200
370	102	100	0.102706	26	43	4	200
371	98	96	0.025755	30	68	0	200
372	102	100	0.003886	7	43	4	200
373	98	105	0.785924	34	68	0	80
374	103	98	0.319584	4	46	7	100
375	97	101	0.359184	23	39	4	80
376	66	85	0.449508	23	29	3	80
377	87	66	3.172174	13	24	3	60
378	69	1	0.532541	1	0	0	80
379	85	95	1.105282	35	29	3	100
380	106	85	0.772408	13	29	3	60
381	84	69	1.820570	3	59	2	60
382	84	104	1.280561	34	68	0	80
383	69	104	0.122643	4	68	0	80
384	69	1	0.613717	1	0	0	80
385	96	104	0.448556	20	68	0	80
386	104	99	0.012477	2	14	2	80
387	97	97	0.911570	8	35	4	60
388	105	96	0.493933	30	68	0	200
389	96	99	2.863572	2	14	2	80
390	96	99	0.048978	2	14	2	80
391	96	109	0.375767	30	2	7	200
392	96	109	0.008983	9	2	7	200
393	99	99	1.007273	18	14	2	60
394	100	103	0.860926	50	43	4	150
395	106	107	0.361062	35	29	3	100
396	101	101	1.010012	22	39	4	80
397	87	106	0.691450	23	29	3	80
398	107	95	1.941991	13	29	3	60
399	103	105	0.811839	4	68	0	80
400	112	103	0.287995	29	43	4	100
401	87	113	0.473744	4	68	0	80
402	80	87	3.577034	4	24	3	80
403	106	113	1.153715	4	68	0	80
404	99	110	0.411322	30	15	4	200
405	80	113	0.028979	1	0	0	80
406	95	97	1.762283	28	35	4	80
407	95	114	0.342900	13	36	6	80
408	113	1	0.032418	1	0	0	80
409	104	1	0.581862	1	0	0	80
410	104	108	1.449416	2	19	3	80
411	113	111	0.239175	35	68	0	100
412	100	112	0.360448	50	43	4	150
413	102	100	0.891790	26	43	4	200
414	112	115	0.429798	4	68	0	80
415	112	115	0.026243	4	68	0	80
416	102	112	0.050267	26	43	4	200
417	80	1	8.596553	1	0	0	80
418	105	109	1.346825	18	2	7	60

419	115	105	0.374154	29	68	0	100
420	113	1	1.806750	18	60	4	60
421	99	116	0.985245	30	20	4	200
422	101	102	1.332434	21	33	3	60
423	102	117	0.785173	4	68	0	80
424	110	116	0.440868	18	20	4	100
425	115	118	0.598722	18	68	0	60
426	117	115	0.312835	26	68	0	200
427	117	118	0.017347	7	68	0	200
428	117	121	0.002990	7	2	7	80
429	121	118	0.002447	50	68	0	100
430	121	122	0.003522	18	8	4	100
431	111	1	1.478179	18	60	4	80
432	118	123	0.019138	18	1	6	60
433	99	108	0.994144	20	19	3	80
434	99	116	0.837028	30	20	4	200
435	108	116	0.021066	9	20	4	100
436	101	119	1.243109	4	68	0	80
437	97	101	1.285477	23	39	4	80
438	97	114	1.190670	13	36	6	60
439	114	119	0.025006	13	68	0	80
440	97	119	0.047702	4	68	0	80
441	117	122	0.825937	26	8	4	200
442	119	117	0.275226	21	68	0	60
443	118	109	0.390300	29	2	7	100
444	118	123	0.568624	18	1	6	60
445	107	114	0.766141	28	36	6	80
446	107	111	2.128589	4	68	0	80
447	111	119	0.091861	13	68	0	60
448	109	127	0.267786	18	16	3	60
449	108	1	0.776456	2	60	4	80
450	108	125	1.384550	20	20	4	200
451	110	109	1.305966	2	2	7	80
452	109	127	0.761650	18	16	3	60
453	119	126	1.158465	26	11	4	200
454	111	119	0.244283	13	68	0	60
455	120	114	1.670876	23	36	6	80
456	114	111	0.585618	4	68	0	80
457	110	116	0.867655	18	20	4	100
458	110	128	1.175121	18	16	3	60
459	126	122	0.736437	21	8	4	60
460	129	126	0.813473	13	11	4	60
461	130	122	0.005549	13	8	4	80
462	122	123	0.812695	50	1	6	150
463	116	125	0.710946	20	20	4	80
464	111	129	0.458343	26	12	3	200
465	125	1	0.579862	2	60	4	80
466	111	129	0.118502	26	12	3	200
467	123	127	0.765832	29	16	3	100
468	122	130	0.455194	13	8	4	60
469	120	111	1.785293	4	68	0	80
470	116	128	0.357841	18	16	3	100
471	127	131	0.436109	31	3	4	60
472	122	123	0.223208	50	1	6	150
473	123	135	0.023928	13	8	4	80
474	135	136	0.024253	13	1	6	100
475	122	135	0.008024	50	8	4	100
476	122	132	0.511510	13	8	4	60
477	128	133	1.233059	31	16	3	60
478	128	133	0.004104	11	16	3	80

479	128	127	0.683059	2	16	3	80
480	127	131	0.946983	31	3	4	60
481	116	125	0.320862	20	20	4	80
482	116	134	0.941532	31	20	4	60
483	133	131	0.025436	2	3	4	100
484	131	133	0.006683	2	16	3	100
485	123	131	0.228499	29	3	4	100
486	123	136	0.537134	25	1	6	60
487	111	124	2.514364	18	13	3	60
488	125	1	0.518804	2	60	4	80
489	136	131	0.283583	29	3	4	100
490	136	139	0.005096	14	3	4	100
491	129	130	0.714422	21	8	4	60
492	139	131	0.006867	14	3	4	80
493	139	140	0.003907	13	4	0	100
494	125	138	0.595096	2	21	4	80
495	125	137	0.788372	31	20	4	60
496	129	130	0.026646	21	8	4	80
497	137	141	0.849069	2	21	4	80
498	134	137	0.490638	20	20	4	80
499	124	129	0.738566	26	12	3	200
500	131	140	0.285202	25	4	0	60
501	130	132	0.755419	11	8	4	60
502	134	141	0.621630	20	21	4	80
503	134	133	0.699992	18	16	3	100
504	129	142	0.647632	11	12	3	60
505	132	143	0.054636	11	9	2	60
506	130	132	0.085475	11	8	4	60
507	132	136	0.788238	24	1	6	150
508	129	130	0.348693	21	8	4	60
509	129	142	0.536243	11	12	3	60
510	130	143	0.296612	11	9	2	60
511	132	143	0.594231	11	9	2	60
512	130	143	0.045882	11	9	2	60
513	142	130	0.066189	11	8	4	60
514	136	140	0.466783	29	4	0	100
515	136	144	0.582010	29	6	3	60
516	131	133	0.879331	32	16	3	80
517	131	133	0.002356	2	16	3	100
518	131	140	0.966254	25	4	0	60
519	142	143	0.142467	11	9	2	60
520	142	143	0.004189	11	9	2	100
521	133	141	1.440744	20	21	4	80
522	133	145	0.394624	25	17	2	60
523	142	146	0.139247	11	10	4	60
524	124	1	3.338377	1	0	0	80
525	143	144	0.489482	24	6	3	150
526	124	142	0.711912	26	12	3	200
527	138	141	1.038333	31	21	4	60
528	138	1	2.120610	1	0	0	80
529	144	140	0.570644	29	4	0	100
530	141	145	0.671488	25	17	2	60
531	143	149	0.389707	24	6	3	150
532	146	143	0.880938	11	9	2	60
533	144	149	0.459726	29	6	3	80
534	124	142	0.482005	26	12	3	200
535	140	145	0.944410	33	17	2	80
536	140	150	0.885354	29	4	0	80
537	144	149	0.213287	29	6	3	80
538	141	1	0.605114	1	0	0	80

539	141	147	3.023801	13	21	4	150
540	146	149	0.376792	24	6	3	150
541	144	150	0.670439	29	4	0	100
542	152	144	0.391317	29	6	3	80
543	142	148	1.637849	11	10	4	60
544	142	151	0.639392	21	12	3	60
545	142	148	0.028490	11	10	4	100
546	142	151	0.021039	18	12	3	80
547	152	149	1.050045	29	6	3	80
548	148	146	2.440084	21	10	4	60
549	147	1	3.578238	1	0	0	150
550	147	145	1.042037	25	17	2	60
551	150	145	1.014937	33	17	2	80
552	152	150	0.488376	29	4	0	80
553	124	151	1.071018	26	12	3	200
554	151	146	0.617407	11	10	4	60
555	151	1	0.282115	1	0	0	80
556	145	1	0.966558	11	60	4	150
557	124	1	5.584156	1	0	0	80
558	152	145	0.656245	33	17	2	80
559	145	153	0.276016	11	18	3	150
560	145	153	0.991146	11	18	3	150
561	145	153	0.604633	11	18	3	150
562	152	145	0.635265	33	17	2	80
563	146	152	2.381267	24	5	3	150
564	152	154	0.443518	11	18	3	150
565	152	146	0.053362	24	10	4	60
566	146	155	0.026280	11	18	3	100
567	154	153	0.514138	33	18	3	80
568	154	155	0.545073	24	18	3	150
569	146	155	1.263792	11	18	3	150
570	146	1	2.482926	11	60	4	80
571	153	156	1.657860	24	18	3	150
572	155	156	1.113101	33	18	3	80
573	153	1	3.370226	1	0	0	80
574	156	1	1.803225	1	0	0	80
575	155	1	1.208830	1	0	0	80
576	155	1	1.732715	1	0	0	80

ARC ATTRIBUTE TABLE FOR PUBLIC TRANSPORT ROUTES:

LPOLY_ - Left polygon,

RPOLY_ - Right polygon,

LENGTH - Length of the route,

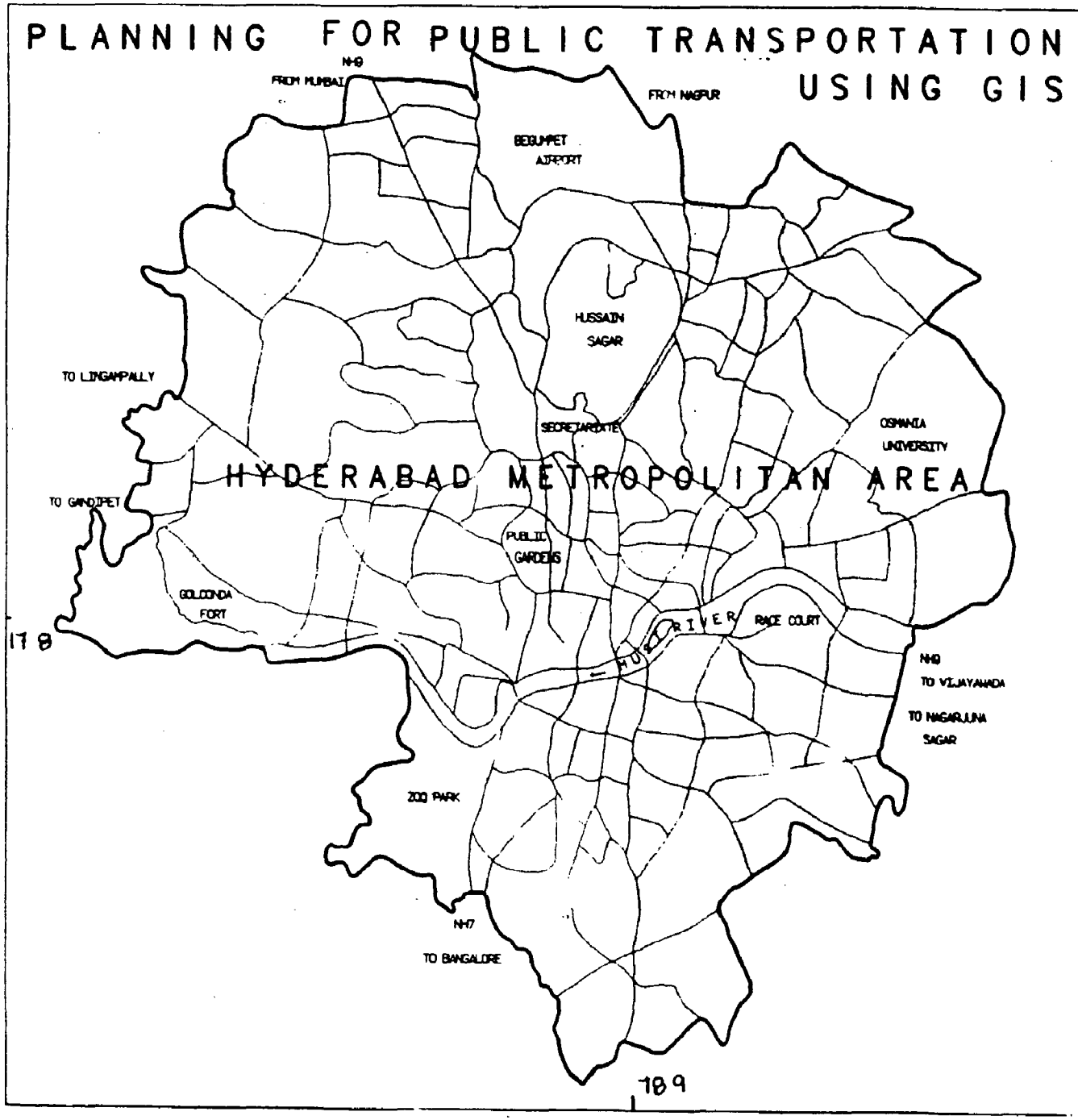
PTI_ID - User _id,

ZONE_NO - Connecting zone,

WIDTH - Width of the route,

ROUTE_NO - Route number.

PLANNING FOR PUBLIC TRANSPORTATION USING GIS



CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- MUNICIPAL BOUNDARY
- ROAD NETWORK

MAP NO : 1

CASE STUDY AREA

KAVITHA MADDULA
M.U.R.P
DEPARTMENT OF ARCHITECTURE
AND
PLANNING
UNIVERSITY OF ROORKEE

PLANNING FOR PUBLIC TRANSPORTATION USING GIS

CASE STUDY_HYDERABAD

N

SCALE
1 : 800

LEGEND

- >25000
- 25000-15000
- 15000-10000
- 10000-5000
- 5000-2500
- 2500-1000
- 1000-500
- WATER BODIES

MAP NO : 4

WORKING POPULATION

KAVITHA MADDULA
M.U.R.P
DEPARTMENT OF ARCHITECTURE
AND
PLANNING
UNIVERSITY OF ROORKEE

Record#	zone_no	x_cord	y_cord	zone_1	zone_28	zone_46	zone_65
2	60	34.72269	26.86353	96	28	336	771
3	25	29.79418	25.99722	205	97	572	451
4	30	31.87650	27.46535	2100	797	6580	7840
5	31	32.40871	25.86307	177	74	587	609
6	66	38.99056	25.95344	147	25	529	25200
7	67	40.15121	25.46362	50	8	174	3080
8	61	34.81874	25.31836	49	15	195	353
9	63	37.47121	25.33584	615	122	2380	44800
10	62	36.48219	28.29058	310	72	1011	3920
11	65	38.69185	25.11362	1820	322	7420	0
12	23	28.00964	23.97727	32	19	78	45
13	57	40.75260	25.42286	832	121	2660	26600
14	32	33.39156	24.51185	448	196	1680	1400
15	40	35.21014	23.19629	3920	1168	21000	15400
16	26	30.58960	22.96563	75	72	220	102
17	64	37.51356	24.61600	868	165	3780	50400
18	47	37.94342	24.00944	882	149	4060	42000
19	50	39.77217	23.30912	206	26	825	3920
20	33	33.29506	22.72600	88	56	392	157
21	48	37.35568	23.20146	190	32	1060	2240
22	58	41.52874	21.98394	546	54	1680	2660
23	44	36.19867	22.22142	451	89	3500	1400
24	51	38.77607	22.14949	1400	170	7560	9520
25	49	37.28828	22.15849	280	41	1960	1242
26	24	28.16235	19.80040	177	154	351	122
27	41	34.95480	20.78104	7000	1680	82600	5600
28	27	31.30727	21.14927	132	439	386	108
29	45	36.37644	20.67266	5880	723	130200	5740
30	52	38.21442	20.93244	149	14	1034	297
31	55	39.50653	20.44686	171	13	719	313
32	34	33.85455	20.57324	1063	636	6160	670
33	37	34.13503	20.77681	1027	484	7000	745
34	53	37.43756	19.77295	3920	249	47600	2380
35	59	42.26936	19.58630	63	5	155	106
36	28	31.69844	19.80811	653	0	1540	322
37	38	33.89594	19.69151	1960	900	10360	737
38	54	38.24104	19.61858	131	8	791	95
39	46	36.07571	19.51625	22400	1540	0	7420
40	22	26.31159	18.35933	25	12	43	16
41	56	40.23579	18.33347	240	14	700	262
42	29	30.55610	18.76501	96	203	180	41
43	42	34.96937	19.36225	3920	497	49000	1023
44	68	36.97150	18.42027	0	0	0	0
45	35	32.74751	18.68318	1070	974	2240	266
46	14	38.72544	18.27033	440	16	1097	155
47	43	35.49673	18.35926	12600	399	44800	1046
48	39	34.31926	18.33516	1219	111	2520	137
49	19	40.34225	17.65704	639	29	1197	344
50	2	36.62031	17.67065	26600	299	26600	1279
51	15	37.64154	17.35505	1680	28	1820	169
52	36	32.55021	17.31950	1175	293	1344	182
53	20	39.50308	16.72057	718	23	942	200
54	7	41.95125	17.00085	110600	804	21000	1540
55	1	35.75377	16.56538	0	653	22400	1820
56	13	31.61967	15.43229	92	14	85	17
57	11	33.88297	16.82858	3220	140	1680	184
58	3	36.71490	16.40361	19600	84	3360	343
59	16	37.81480	16.26812	1540	21	902	120

60	8	34.66268	16.19805	15400	155	2940	314
61	12	33.38391	15.18543	1400	70	744	118
62	21	39.21693	15.47294	501	14	460	100
63	4	36.18893	15.01952	1400	14	343	50
64	9	34.69662	15.41560	1820	26	457	60
65	6	35.28946	14.98400	1400	17	340	49
66	17	37.04679	14.13001	488	10	226	42
67	10	33.70611	13.68673	722	35	415	82
68	5	35.21756	13.58194	429	12	200	38
69	18	36.17698	11.88066	305	13	211	52

Appendix 3

Record#	ZONE	TRIP_GEN	TRIP_ATTN	TPI
1		0	0	0
2	BEGUMPET	4432	21137	5
3	ERRAGADDA	24716	4921	5
4	S NAGAR	13253	21828	5
5	S R NAGAR	5493	10340	14
6	NEHRU NAGAR	6842	20137	5
7	SUBHASH NAGAR	17080	886	14
8	P NAGAR	15807	1315	14
9	PATNY	19620	13767	5
10	R PET	12618	14084	5
11	SEC BAD R S	18929	38396	3
12	JUBLEE HILLS	1621	3996	15
13	METTUGUDA	50469	10126	3
14	PANJAGUTTA	29035	30062	3
15	SECRETARIAT	4784	50326	3
16	BANJARA HILLS	9097	6669	14
17	MONDA MARKET	19620	13767	5
18	BHOIGUDA	28366	21964	3
19	S P MANDI	29086	13956	5
20	ERRAMANZIL	11153	7743	14
21	KAVADI GUDA	34787	10564	5
22	OSMANIA UNIV	1455	12564	14
23	INDIRA PARK	13203	5712	14
24	RAM NAGAR	33402	33002	3
25	ASHOK NAGAR	11115	14000	5
26	GOLCONDA FORT	17292	5720	14
27	PUBLIC GARDEN	3501	9678	14
28	S D HOSPITAL	6544	10853	14
29	HIMAYAT NAGAR	26595	66758	10
30	NALLAKUNTA	11029	8802	14
31	AMBERPET	9450	7636	14
32	V N CLNY	47152	11869	3
33	NAMPALLY	6700	7500	14
34	KACHIGUDA	21491	38158	3
35	R NAGAR	5122	3022	15
36	MEHDIPATNAM	37761	19388	3
37	MALLEPALLY	33020	15896	5
38	K QUARTERS	3343	520	46
39	SULTAN BAZAR	23451	152482	2
40	IBRAHIM BAGH	2090	2400	46
41	GOLNAKA	9133	1866	14
42	KARYAN	8277	5606	14
43	M MARKET	16281	24814	5
44	MUSI RIVER	0	0	0
45	DHULPET	34515	4082	5
46	OLD MALAKPET	1146	4005	15
47	AFZALGUNJ	20074	54544	3
48	GOSHA MAHAL	52276	17496	3
49	M BAGH	11295	9128	14
50	DARULSHAFA	17574	122279	2
51	C C GUDA	27669	5994	5
52	ZIA GUDA	5642	71698	10
53	MALAKPET CLNY	16660	26921	5
54	HIGH COURT	11235	18994	5
55	CHARMINAR	23774	55027	10
56	ZOO PARK	501	12115	14
57	PETLA BURZ	21983	12697	5

				5
58	YAKUT PURA	27131	11703	14
59	RAIN BAZAR	11492	783	5
60	KILWAT PALACE	26189	2891	14
61	C BARADARI	22630	830	5
62	INDIRA SADAN	37548	2217	14
63	SULTAN SHAHI	11477	1076	15
64	S A CHABUTRA	9180	501	14
65	SANKAR GUNJ	13436	4894	15
66	UPPU GUDA	4965	1547	5
67	JAHAKUMA	19414	7846	14
68	SANKAR GUNJ	13436	4894	14
69	C GUTTA	8668	5544	

POLYGON ATTRIBUTE TABLE FOR TRAFFIC ZONES:

ZONE_1 - Number of people from Charminar depot,

ZONE_28 - Number of people from Mehdipatnam depot,

ZONE_46 - Number of people from Barkatpura depot,

ZONE_65 - Number of people from Secunderabad depot,

REQD_Z1- Number of buses required for Charminar depot,

REQD_Z28- Number of buses required for Mehdipatnam depot,

REQD_Z46- Number of buses required for Barkatpura depot,

REQD_Z65- Number of buses required for Secunderabad depot,

FROM_Z1 - Number of buses from Charminar Depot.

FROM Z28 - Number of buses from Mehdi patnam Depot.

FROM Z46 - Number of buses from Barkatpura Depot.

FROM Z65 - Number of buses from Secunderabad Depot.