PLANNING FOR THE LAYOUT OF SUB ZONE OF ZONE L, DELHI

A DISSERTATION

Submitted in partial fulfillment of the requirements for the award of the degree of

MASTER OF URBAN AND RURAL PLANNING

By

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CANDIDATE'S DECLARATION

I hereby declare that the work which has been presented in this dissertation entitled as **'PLANNING FOR THE LAYOUT OF SUB-ZONE OF ZONE L, DELHI'** in partial fulfillment of the requirement for the award of the postgraduate degree of **MASTER OF URBAN AND RURAL PLANNING**, submitted in the Department of Architecture and planning, Indian Institute of Technology, Roorkee, is an authentic record of my own work carried out by me during the period from August 2010 to June 2011 under the supervision and guidance of Dr. R.K. Jain.

The matter embodied in this dissertation has not been submitted by me anywhere else for the award of any other degree elsewhere.

Date: 30th, June.2011

Place: Roorkee

Saurabh

(Saurabh Jindal)

CERTIFICATE

This is to certify that the above statement made by the candidate **Saurabh Jindal** is correct to the best of my knowledge and belief.

Date: 30th, June. 2011

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Date: 30th, June. 2011
Place: Roorkee

Saurabh
(Saurabh Jindal)

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CHAPTER 1 INTRODUCTION

1.1. Identification of problem

Delhi as the National Capital has a distinct and unique character. It is a growing and expanding magnet of attraction for people from all across the country and also a hub for the region surrounding it.

The present National Capital Region (NCR) comprises of a total area of 33,578 sq. km. including areas of:-

- Delhi (1483 sq. kms.),
- Haryana (13413 sq. kms.),
- Uttar Pradesh (10853 sq. kms.)
- Rajasthan (7829 sq. kms.)

The Central NCR as defined in the Regional Plan - 2021, comprises of the notified areas of the neighbouring towns of Ghaziabad - Loni, NOIDA, Gurgaon-Manesar, Faridabad-Ballabhgarh, Bahadurgarh and Sonepat-Kundli, and the extension of the ridge in Haryana, having an area of about 2000 Sq.kms.

It has been suggested in MPD-2021 that the opportunities presented by the CNCR should be maximized to enable it to compete effectively with the NCT of Delhi, offering comparable employment, economic activities, comprehensive transport system, housing, social infrastructure and quality of life and environment.

The NCT of Delhi has been divided into 15 Zones from A to H and J to P, of which 8 Zones are in the urban area, one in Riverbed and remaining 6 in the rural area.

- The zone wise area is as follows:-

Zone	Name of zone	Area (Ha)
A	Old City	1159
B	City Extn. (Karol Bagh)	2304
C	Civil Line	3959
D	New Delhi	6855
E	Trans Yamuna	8797
F	South Delhi-I	11958
G	West Delhi-I	11865
H	North West Delhi-I	5677
J	South Delhi-II	15178
K	KI West Delhi-II	5782
	KII Dwarka	6408
L	West Delhi-III	22840
M	North West Delhi-II	5073
N	North West Delhi-III	13975
O	River Yamuna / River Front	8070
P	PI Narela	9866
	PII North Delhi	8534

Table 1 Zone wise area of Delhi city

- The above areas are approximate
- Source :- Master plan Delhi - 2021

- Availability of Urbanisable Land in NCT-Delhi for 2021 is as follows:-

S.No.	Land Use	Area (Ha.)	% to Total Area (Ha.)
1	Total Geographical Area - NCT Delhi	148300	100
2	Built -up Area (As per IRS IC LISS III Satellite data 1999)	70162	47.31
3	Natural Features (Forest, Wild Life Sanctuary, Ridge, River Yamuna and Other Water Bodies / Drains)	19509.10	13.16
4	Sub- Total (Built-Up + Natural Features)	89671.10	60.47
5	Balanced land available in NCT – Delhi (1-4)	58628.90	39.53
6	Land to be kept reserved for: (i) Disposal of Solid Waste generated up to 2051 (sanitary landfill & statutory green belts)	10000	6.74
	(ii) Metro Services / Utilities e.g. power plant, grid station water and sewerage treatment plant, etc.	10000	6.74
	(iii) Agriculture zone in NCT Delhi including dairy farming, horticulture, greenbelts etc.	11000	7.42
7	Sub Total - 6	31000	20.90
8	Proposed/Actual Land available for urbanization (5-7)	27628.90*	18.63
9	Total Urbanisable area 2021 (including built up area 1999) (2+8)	97790.90	65.94
10	Population which can be accommodated in 97790.90 ha. @ 225 PPH = 220 lakh		

Table 2 Availability of Urbanisable Land in NCT-Delhi for 2021

- *This included unplanned and built up area
- Source :- Master plan Delhi - 2021

- Zonewise Estimated Holding Capacity of Existing Urban Area is as follows:-

Zone	Holding capacity MPD2021 (in lakhs)	Existing population 2001 (in lakhs)	Holding capacity 2021 (in lakhs)
A	4.20	5.70	5.70
B	6.30	6.24	6.30
C	7.51	6.79	7.88
D	7.55	5.87	8.13
E	17.89	27.98	28.00
F	12.78	17.17	19.75
G	14.90	16.29	19.55
H	18.65	12.26	18.65
Sub Total	**89.78**	**98.30**	**114.00**
Dwaraka		5.97	13.00
Rohini III		0.96	1.60
Rohini IV & V		1.98	8.20
Narela		1.70	16.20
Sub Total	**32.22**	**10.70**	**39.00**
Grand Total	**122**	**109**	**153**

Table 3 Zonewise Estimated Holding Capacity of Existing Urban Area

- Note: Population figures are only broad planning guidelines.
- The remaining population for the year 2021 will have to be accommodated in the planned new urban extensions.
- Source :- Master plan Delhi - 2021

Delhi urban area -2021

- In 2001, about 702 sq. kms. of area was estimated to have been built up, accommodating about 138 lakh population.
- NCT Delhi is highly urbanized with 93.18% of its population living in urban areas as against the national average of 27.81%.
- During 1991-2001, the urban population of Delhi increased at 3.87% annual growth rate.
- To accommodate the projected population of 230 lakh by the year 2021, a three-pronged strategy is recommended in MPD 2021:
  - To encourage the population to deflect in the NCR towns.
  - To increase the population holding capacity of the area within existing urban limits through redevelopment;
  - Extension of the present urban limits to the extent necessary.

Urban extension

- Out of the remaining 77 lakh (230-153 lakh) population, 29 lakh already exists in villages, census towns, unauthorised colonies and JJ clusters in the present rural areas.
- Therefore about 48 lakh additional population is to be accommodated in the future urban extensions
- To accommodate the projected additional population @ 250-300 pph average city level density, the requirement for urban extension would be 20,000-22,000 ha. of land in development time frame of 15 -16 yrs.
- The immediate urban extension could be in the zones of J to L, N & P (I & II).
- The land required for urban extension, will have to be assembled for planned development.

1.2. Introduction of problem

1.2.1 Location

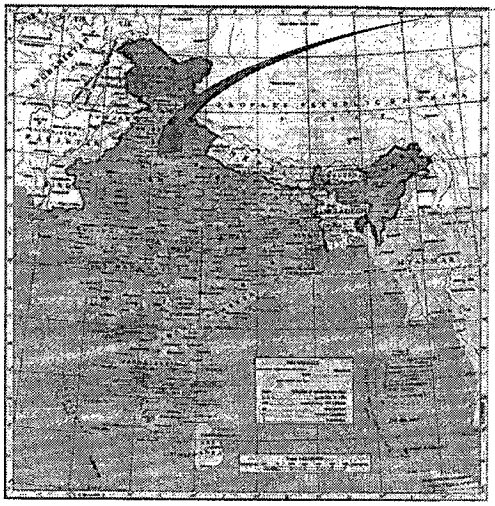


Figure 1Map of India

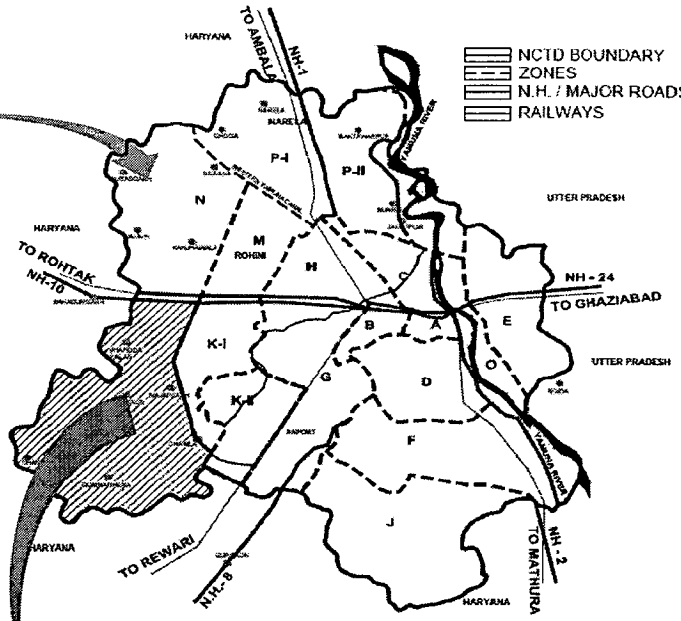


Figure 2Location of zone 'L' on the map of Delhi

- The zone (L) covers an area of 21933 ha as per zonal development plan. which is bounded by thefollowing:
  - Delhi Rohtak Railway line in the North
  - Existing H T line and Zone 'K ' mainly comprising of Dwarka Sub- City , in the East and
  - The National Capital Territory of Delhi boundary on it's southern and western sides.

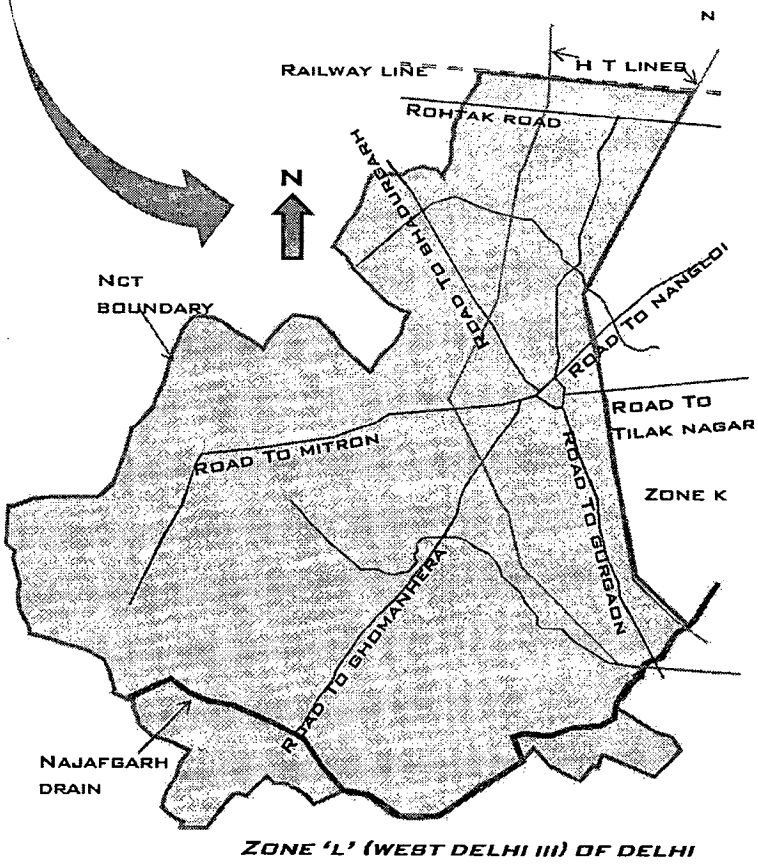


Figure 3 Map of Zone 'L' of Delhi

1.2.2 Characteristics of zone 'L'

- The zone is the largest of 15 zones of Delhi and is predominantly rural in character.
- The topography of the zone depicts gentle slope from the North to South.
- The Najafgarh drain originates from NajafgarhJheel in the South west Delhi- Haryana border.
- The capacity of the drain is about 3000-8000 cusec in different segments, with very gentle gradient.
- As per the information received from the Forest Deptt. Of GNCTD, the zone has 2 protected forests.
- Three major institutional campuses related to police / para-military forces are existing in the zone.

1.2.3 Existing state of zone

- In the zone there are 58 villages, and one Census Town known as Najafgarh.
- There are about 154 unauthorised colonies which are listed in regulrisation list of NCTD.
- Built up area of Najafgarh town is about 780 ha as per zonal development plan.
- Approximately built up area of villages and unauthorized colonies is 1380 ha.
- Total built up area comes to 2023 ha as per zonal development plan.
- Area of land for govt. use in this zone as per zonal development plan = 333 ha

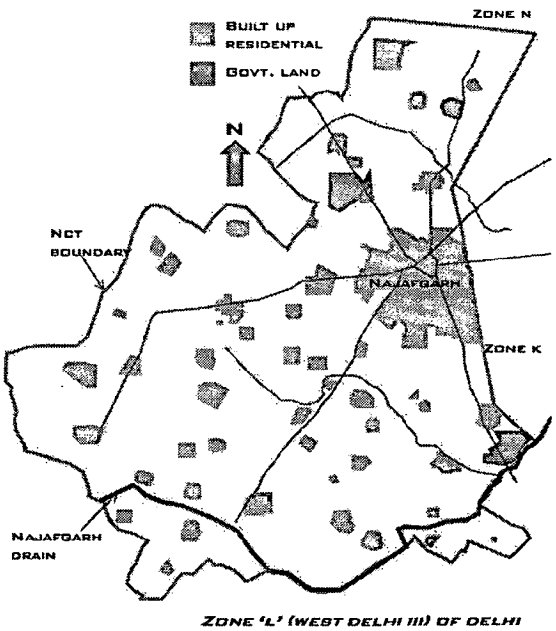


Figure 4Existing state of zone 'L'

- Population of all the settlements in this zone as per census 2001 = 9,02,696

1.2.4 Green belt proposal in MPD -2021

- Area of villages falling in green belt in this zone as per zonal development plan = 10322 ha
- Built – up area of villages in this zone falling in green belt = 643 ha
- Area of land to be newly planned in this zone = 21933-2023-333-10322+643= 9898 ha

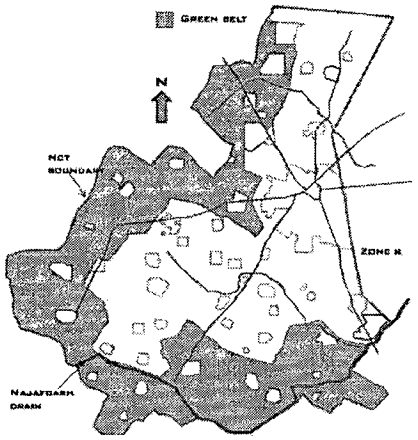


Figure 5Map of Zone 'L' showing Green belt

1.2.5 Area to be newly planned

- Area of land proposed for industrial use other than coming in facility corridor in this zone as per zonal development plan = 400 ha
- Area of land proposed for commercial use other than coming in facility corridor in this zone as per zonal development plan= 120 ha
- Finally area to accommodate about 20 lakh population in this zone = 9898-400-120 = 9378 ha

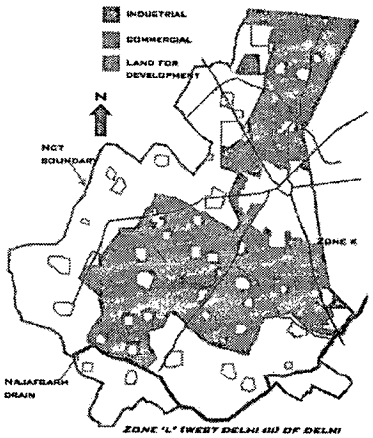


Figure 6 Map of Zone 'L' showing Area to be newly planned

S.No.	Use	Area in ha	%
1	Residential	4159	44.35
2	Commercial	480	5.12
3	Industrial	160	1.71
4	Public / semipublic	1703	18.16
5	Govt. (use undetermined)	325	3.47
6	Recreational	1492	15.9
7	Transports	930	9.91
8	Utilities	129	1.38
	total	9378	100

Table 4 Area to be newly planned – land uses as per zonal development plan

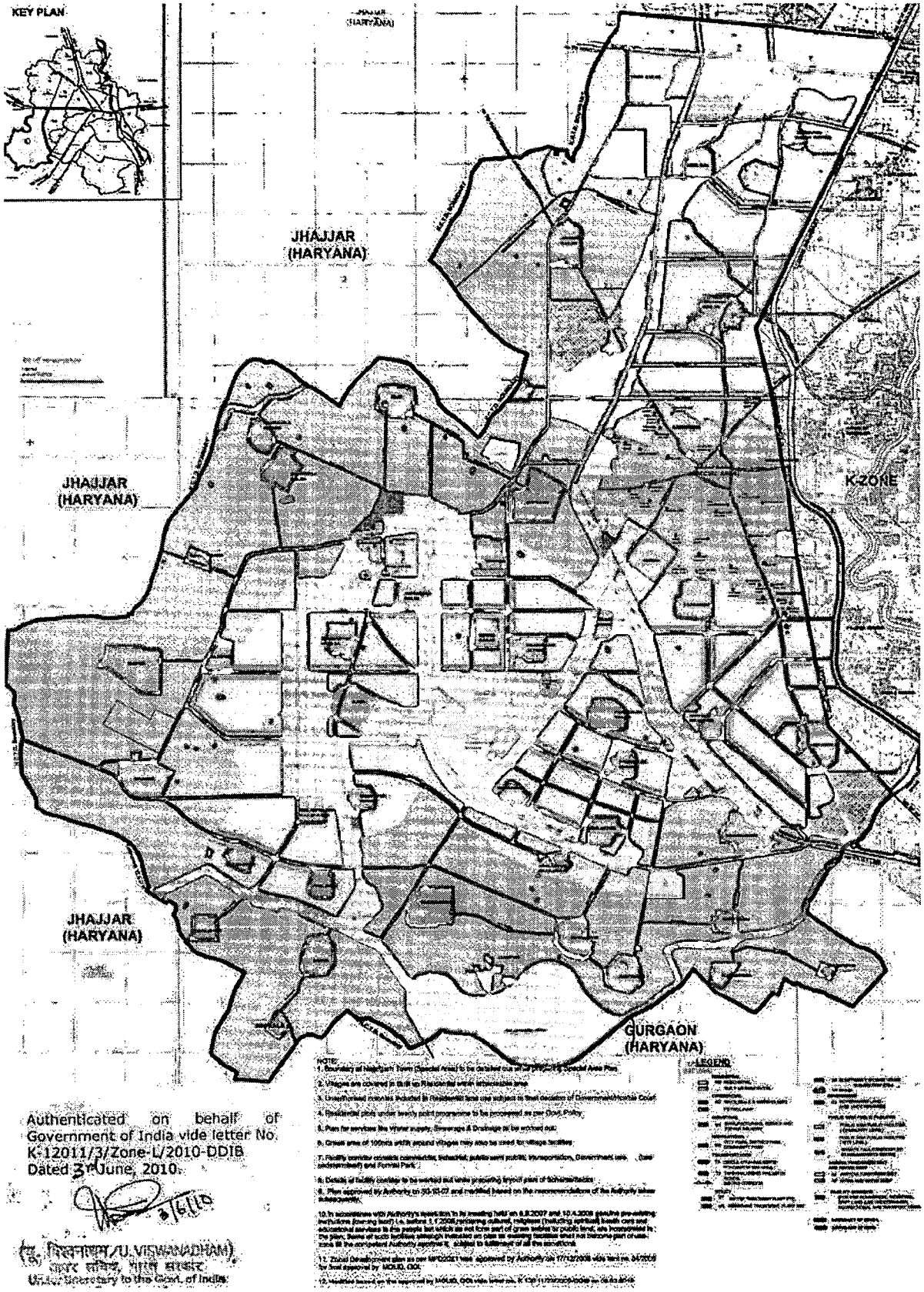


Figure 7 Landuse map of zone 'L' proposed in zonal development plan

1.2.6 Proposals for Sub –Zones

- SUB ZONE 1 – 1570 HA
- SUB ZONE 2 – 2370 HA
- SUB ZONE 3 – 3093 HA
- SUB ZONE 4 – 2345 HA

*areas excluding existing built up residential

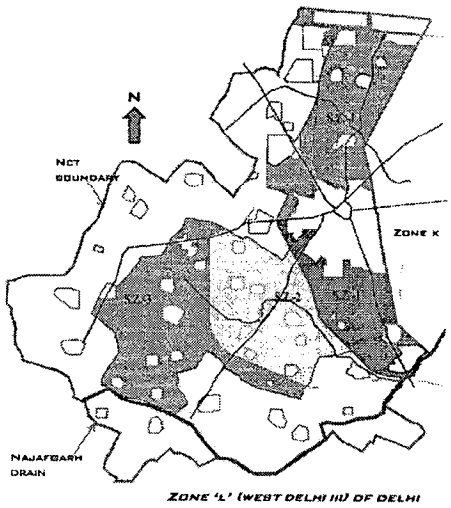


Figure 8 Map of Zone 'L' showing Sub zones

- Area for study = SZ 1 + 260 ha land of zone k
- Thus, the study area will be surrounded by the boundary of najafgarh census town on northern side and metro corridor on western side, najafgarh drain on southern side and metro corridor on the eastern side in zone K1.
- Hence, the layout will be proposed for the area = 1570 + 260 = 1830 ha of land in zone L of Delhi

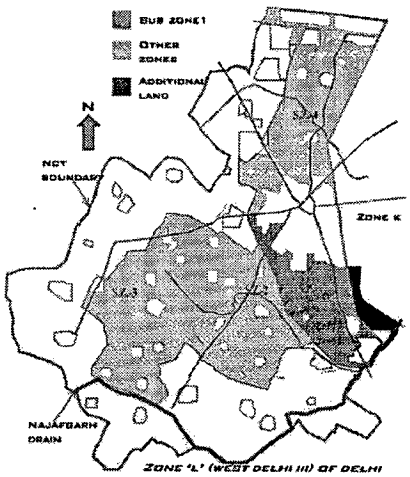


Figure 9 Map of Zone 'L' showing additional land for Sub zone 1

- Now after a combination of new area to 'SZ1' the area will be 9638 ha in the following divisions:
  - Sub zone 1 – 1830 ha = 19%
  - Sub zone 2 – 2370 ha = 24.6%
  - Sub zone 3 – 3093 ha = 32.1%
  - Sub zone 4 – 2345 ha = 24.3%

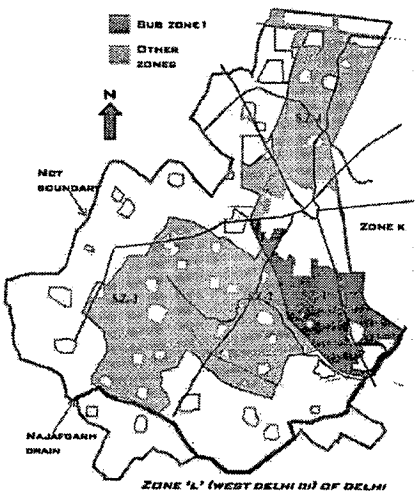


Figure 10 Map of Zone 'L' highlighting Sub zone 1

- Assuming the similar distribution of population in all the sub-zones the population to be accommodated in 'SZ1' is as follows:-
    - Area to accommodate about 20 lakh population in this zone = 9638 ha
    - Thus population to be accommodated in area of 1830 ha will be = (2000000/9638) * 1830 = 3,79,746

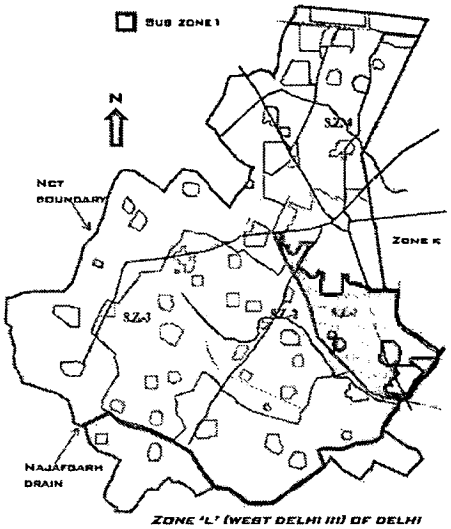


Figure 11 Map of Zone 'L' showing Sub zone 1

- Now modified land uses as per previous calculations

S.No.	Use	%	Area in ha
1	Residential	44.35	4275
2	Commercial	5.12	494
3	Industrial	1.71	164
4	Public / semipublic	18.16	1750
5	Govt. (use undetermined)	3.47	333
6	Recreational	15.9	1532
7	Transports	9.91	956
8	Utilities	1.38	134
	total	100	9638

Table 5 land use break up for Sub zones

- Assuming the similar land uses in all the sub-zones the new division for land use in 'SZ1' is as follows:-

S.No.	Use	Area in ha	Area in ha for 'sz1' (19%)
1	Residential	4275	812
2	Commercial	494	94
3	Industrial	164	31
4	Public / semipublic	1750	332
5	Govt. (use undetermined)	333	63
6	Recreational	1532	291
7	Transports	956	182
8	Utilities	134	25
	total	9638	1830

Table 6 Land use break up for SZ1

1.3. Need for study

Zonal Development Plan means a plan for one of the zones (divisions) of the National Capital Territory of Delhi containing detailed information regarding provision of social infrastructure, parks and open spaces, circulation system, etc. and this act as a link between the layout plan and master plan.

As the zonal development plan for zone 'L' of Delhi was published on 25, June 2010 by Delhi development authority. Hence there is a need for layout plan of the Use zones including residential, facility corridor consisting public / semi-public uses, and recreational etc.

1.4. Aim

Preparation of layout plan for the upcoming sub-zone 1 at zone L of NCT, Delhi.

1.5. Objectives

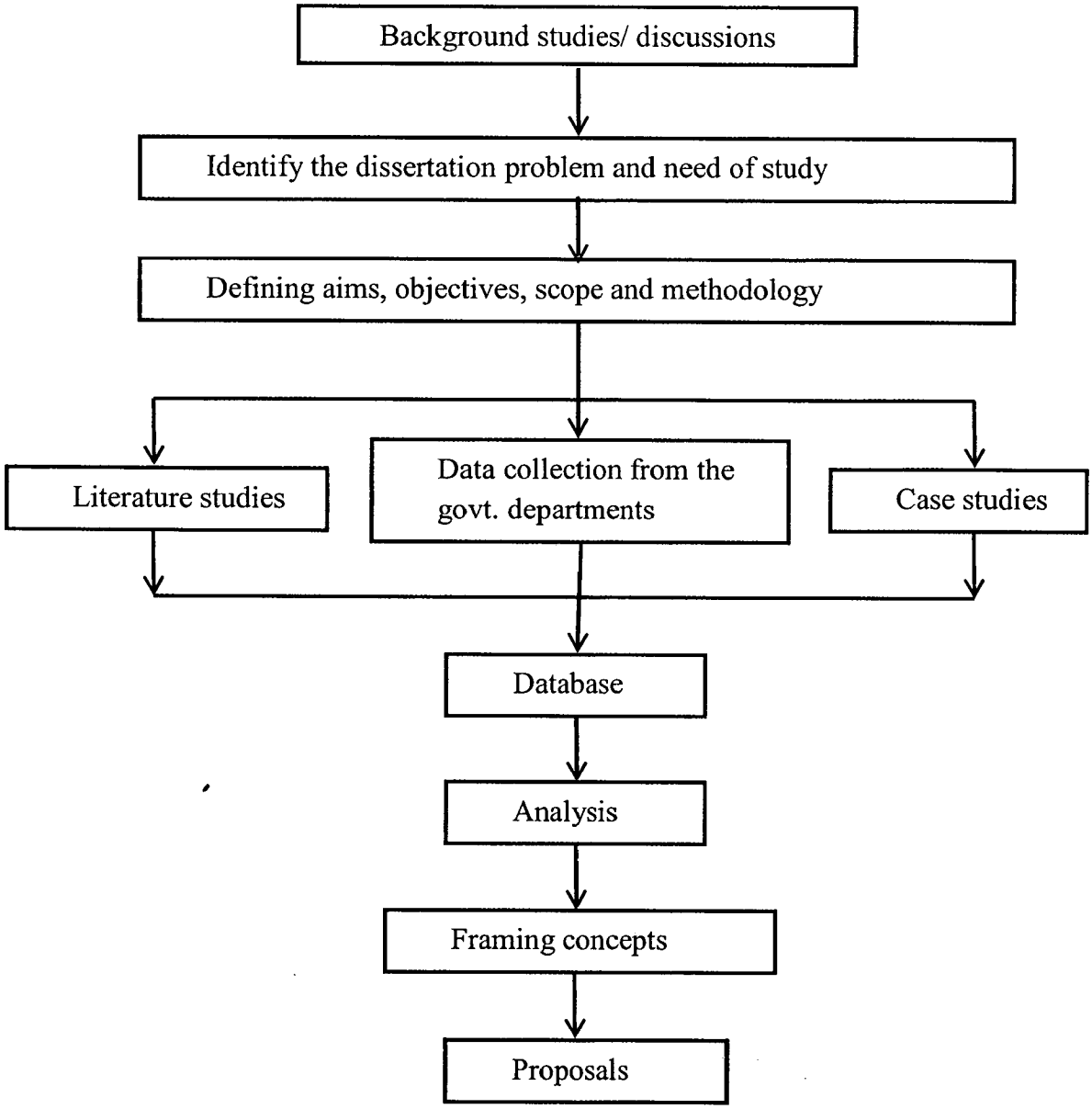
- To provide adequate shelter along with physical & social infrastructure for assigned population.
- To redevelop existing built up area with the objectives to improve the environment by development of proper road width, parking facilities.
- To integrate transport network with the other parts of the city in a framework of sustainable development.
- To create a healthy living and working environment.
- To plan the layout considering climatic conditions.

1.6. Scope and limitations

The scope is limited to layout plan which will indicate the following:

- Use zones,
- Location of all proposed roads with their widths,
- Plots along with building lines and setbacks,
- Public facilities and services etc.
- Statement indicating the total area of the site, area under roads, open spaces for parks, playground, recreational spaces and other public places.
- The requirements and hierarchy of urban development for layout proposals will be based on the guidelines of MPD-2021.
- As the zonal development plan for zone 'L' of Delhi was published on 25, June 2010 & the actual survey of the zone is not there and also not much studies had done on it, thus several assumptions had made.

1.7 Methodology



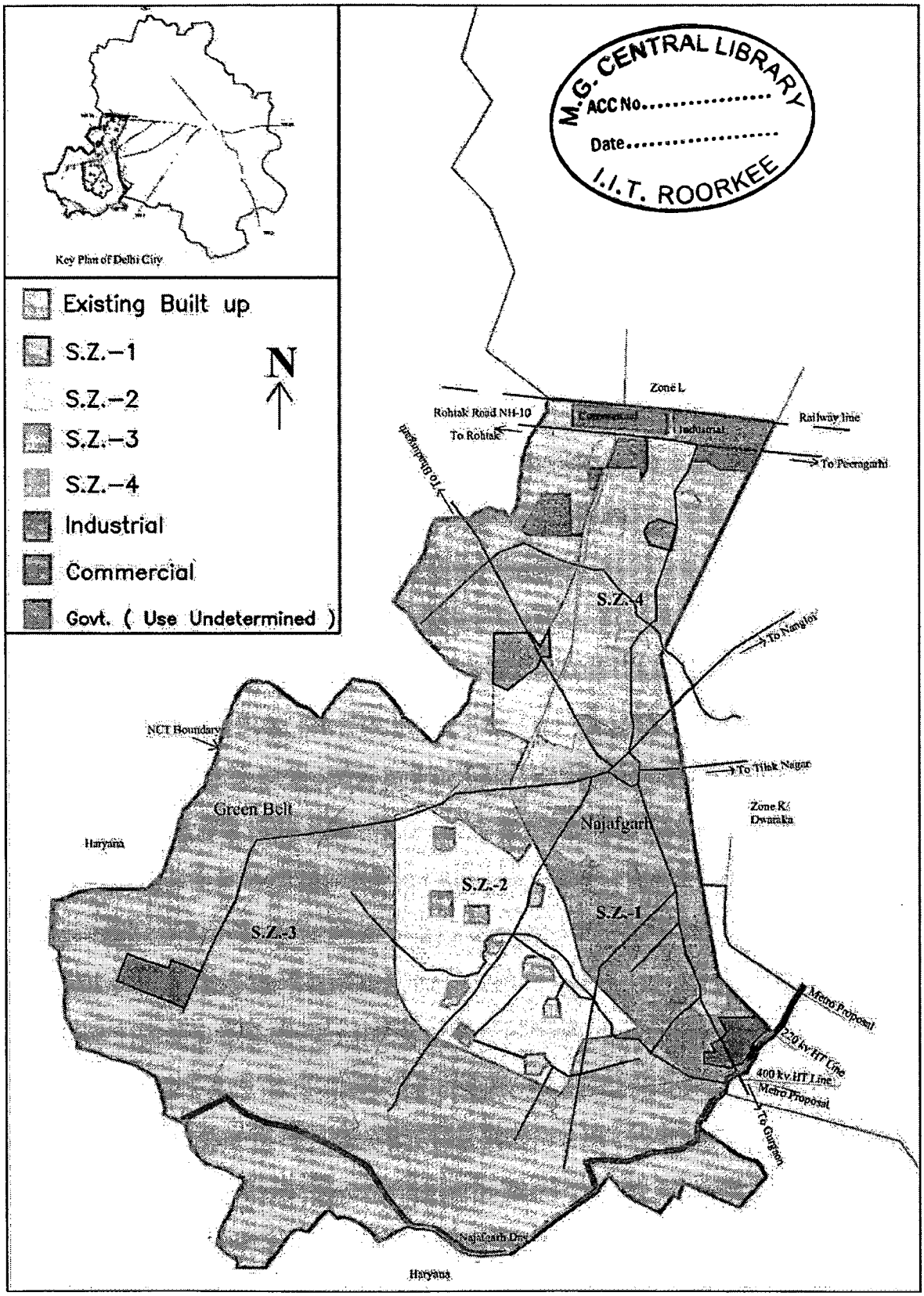


Figure 12 Map of Zone L

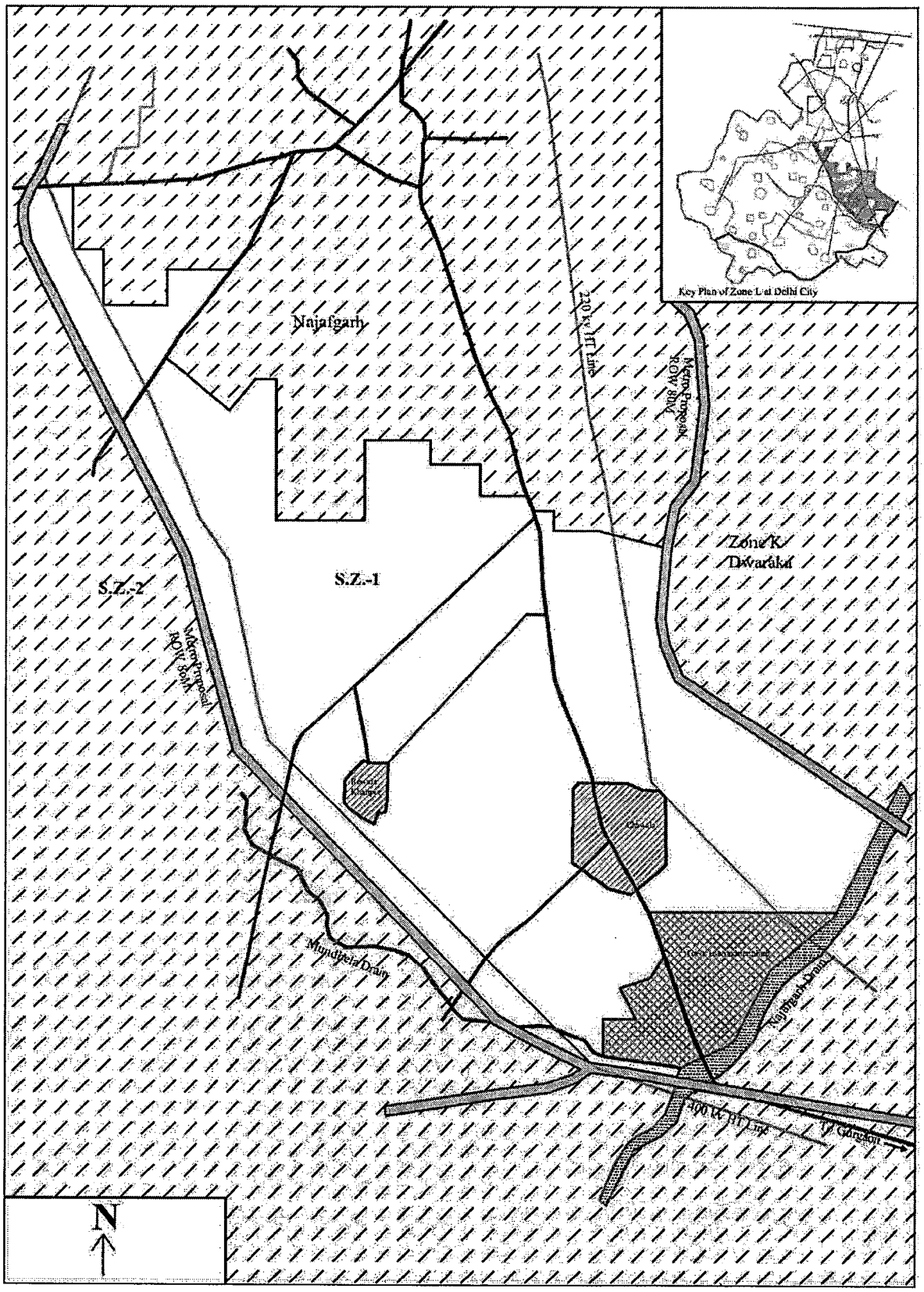


Figure 13 Map of Sub Zone 1

CHAPTER 2 LITERATURE REVIEWS

2.1. "Master Plan for Delhi 2021" by D.D.A., 2007

2.1.1 Hierarchy of urban development

- A planned city for an environment of convenience should have a hierarchical cellular structure; with nuclei to contain essential facilities and services at different levels.
- The pattern of a community module is conceived as residential area containing a 'neighbourhood' with senior secondary school and shopping facilities for day-to-day needs.
- The higher level of additional facilities is to be provided at Community, District and Zonal/sub-city levels.

S.No.	Level	Population
1	Housing Area	5,000
2	Neighborhood	10,000
3	Community	1,00,000
4	District	5,00,000
5	Zonal/ Sub City	10,00,000

Table 7 Hierarchy of Urban Deevelopment

2.1.2 Housing

- The following density norms, with corresponding category of dwelling unit (DU) sizes are proposed:
  - Slum/EWS housing (upto 30 sq.m)-600 DUs/Ha
  - Category I (above30-upto40sq.m.)-500 DUs/ Ha
  - Category II (above40-upto80sq.m.)-250 DUs/ Ha
  - Category III (above80sqm) - 175 DUs/Ha
- Planned areas:
  - Residential Plot-Plotted Housing
  - Residential Plot -Group Housing
  - Cluster Court Housing

2.1.3 Commercial areas

Commercial centers	Population	Area (hac)
CBD	City & sub city level	
District center	5 lakh	44
Community center	1 lakh	5.4
Local shopping center	15,000	0.46
Convenience shopping center	5,000	0.11

Table 8 Five tier system of commercial area

- District Centres and Community Centres could be developed wherever possible, in a linear form as commercial cum facility corridors along major transport networks.
- Such corridors will have non-residential uses like Commercial, Recreational, Public and Semi-public, Utilities, Service and Repair, etc. with detailed Urban Design and landscape schemes.
- The proposed MRTS stations and bus terminals, as the case may be, shall be integrated within these facility corridors.
- Guidelines for Informal trade & Service markets.

2.1.4 Planning Norms and Development Controls

- Master Plan of Delhi provides planning Norms and Development Controls for:
  - Recreational
  - Parking
  - Health
  - Education
  - Sports
  - Security
  - Safety
  - Distributive facilities
  - Community facilities
  - Public & semi-public facilities

2.1.5 Physical Infrastructure

- Guidelines for the efficient
  - Water supply,
  - Sewerage,
  - Drainage,
  - Power &
  - Solid waste management

2.1.6 Land use plans

- Classifications of 37 use zones in nine categories namely:

Residential, commercial, industrial, recreational, transportation, utility, government, public and semi-public, water body.

2.1.7 Mixed land use

- Special regulations for central/ old built up areas
- Permitting non – residential activities on ground floor and residential activities on floor above.

2.1.8 Zonal plans

- Zonal plans detail out the policies of master plan and act as a link between the layout plan and master plan

2.2. "Zonal Development Plan, Planning Zone- L" by D.D.A., 2010

2.2.1 Location and area

- The zone (L) covers an area of 21933 ha. which is bounded by the following:
- Delhi Rohtak Railway line in the North
- Existing H T line and Zone 'K ' mainly comprising of Dwarka Sub- City , in the East and
- The NCT of Delhi boundary on its southern and western sides.
- In the zone there are 58 villages, and one Census Town known as Najafgarh.

2.2.2 Characteristics of the Zone

- The zone is the largest of 15 zones of Delhi and is predominantly rural in character.
- Most of the area of Zone 'L' forms part of the Najafgarh drainage basin.
- The topography of the zone depicts gentle slope from the North to South.

2.2.3 Najafgarh Drain

- It is one of the very old drains which emanates from Rajasthan / Haryana as a rivulets, where phased improvements have been carried out over the years.
- The capacity of the drain is about 3000-8000 cusec in different segments, with very gentle gradient.
- The Najafgarh drain originates from NajafgarhJheel in the South west Delhi- Haryana border and traverse a length of about 51 kms before meeting in River Yamuna.

2.2.4 Zonal Plan Proposals

S.No.	Land Use	Area in Ha.	%
1	Residential	5539	47.70
2	Commercial	600	5.17
3	Industrial	560	4.82
4	Public / Semi Public Facilities	1703	14.67
5	Govt.(Use undetermined)	658	5.67
6	Recreational	1492	12.85
7	Transport	930	8.01
8	Utilities	129	1.11
	Total	11611	100.00

Table 9 Proposed Land use break up for zone L

- Total area of Facility corridor is 2643 ha.
- This facility corridor will be consisting uses under category of Industrial, Commercial, Govt. (Use undetermined) Public - Semi Public facilities, Recreational.
- The specified uses of facility corridors should be detailed out in the layout plans, which will include the following activities:
    - 480 ha. of Commercial Use.
    - 160 ha. of Industrial Use.
    - 325 ha. of Govt. Land (Use undetermined).
    - 75 ha. of Recreational Use.

2.2.5 Residential

- A Neighborhood module of 20-25 ha. shall accommodate about 10,000 population as per density norms of Master Plan.
- About 5 ha. of land in each module shall be provided for neighbourhood facilities such as Sr. Secondary School, Park & Playground etc.
- In any residential sub division plan the minimum area served for social infrastructure shall be about 7 sq.m. per person.

2.2.6 Commercial

- In this zone one wholesale market of food grains in Najafgarh and one wholesale fodder market in village TikriKalan are existing.
- Five District centres, 20 community centers shall be located in new facility corridors, 200 Local shopping centers and convenience shopping centers shall be detailed out as per layout plan within Residential Use zone.
- Service Markets: Service Market and organized informal bazaars have to be planned at appropriate locations.

2.2.7 Industry

- In the zone about 500 ha land is proposed under the industrial use zone.

- New industrial area measuring 160 ha shall be identified in the facility corridor or in its continuity.

2.2.8 Planning Norms and Development Controls

- Zonal plan provides planning Norms and Development Controls for:
  - Public and Semi Public Facilities which include: Health, Education, Sports, Security, Safety & Community facilities
  - Recreational
  - Hierarchy of roads
  - Information regarding Physical infrastructure which includes Catchment area of najafgarh basin, location of sewerage treatment plant, compost plant for solid waste & power grid station sites

2.3. Kenneth B. Hall. "Community by Design", McGraw-Hill, 2001"

2.3.1 Definition of Community Design

A design-based approach is encouraged to create communities that promote a sense of place, have integrated street networks with transit-oriented development, effectively integrate natural and heritage resources and include walkable neighbourhoods with interesting streetscapes, focal points and destinations.

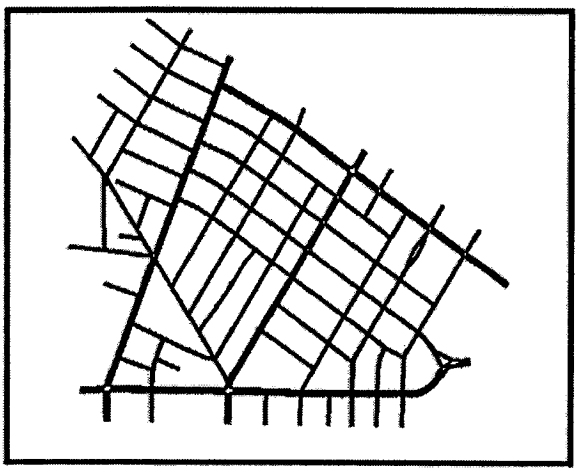


Figure 14 A grid street pattern with transit supportive development

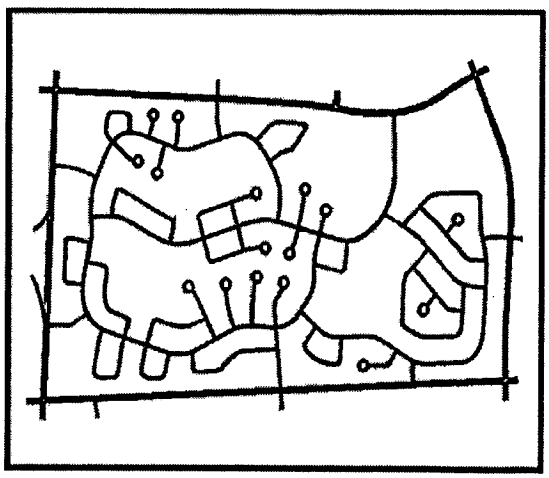


Figure 15 A conventional street pattern with a segregated land use pattern

2.3.2 Community Structure

- Create a community of identifiable and walkable neighbourhoods.
- Design urban areas to allow for direct and convenient access to major destinations and focal points.
- Provide a variety of focal points at prominent, accessible locations.
- Incorporate transit supportive development along planned transit routes.

2.3.3 Street Network

- Design streets for various modes of travel with emphasis on pedestrian use, comfort and aesthetics.
- A highly connected street network for appropriate traffic distribution, safe pedestrian and cycling conditions, barrier free access and efficient public transit.
- Hierarchy of streets to accommodate different functions with emphasis on nonmotorized travel.
- The local street network must be easy to navigate and is well integrated with the arterial road network.

2.3.4 Parks & Open Spaces

- Interconnected open space system with a variety of park spaces located within walking distance to most homes.
- District and community scale parks as primary focal points which are easily accessible from surrounding neighbourhoods and contain a variety of activities and amenities for all residents.
- Plazas or urban squares in key commercial areas, which are well lit and well integrated into the immediate area.

2.3.5 Built Form

- Design buildings at a height and scale which is compatible with the surrounding area.

- Maintain a human scale of development through a comfortable street enclosure which is created through appropriate building massing in relationship to the street width.
- Encourage taller buildings along wider streets.

2.4. Pascaline Gaborit. "Key principles about Sustainable New Towns", ENTP Newsletter, Oct. 2010

Key Principles

- Locate future new settlements as a strategic place well deserved in public transport as transportation is a key element for the new town to attract new inhabitants, businesses and investments.
- Promote multi-functional and holistic approach as places for living gathering all cities functions.
- Use flexible planning so as to integrate the changes in terms of lifestyles.
- Foster social cohesion by providing public services, shopping, sport and cultural facilities.
- Promote environmental construction and renewable energy.
- Consider a long-term and sustainable development vision.
- Better provision of services and amenities.
- Build new housing estates in a more flexible process.
- Strengthen the image and attractiveness of the newly created community.

CHAPTER 3 CASE STUDIES

3.1. Dwarka Sub City, Delhi

3.1.1 Location

- Dwarka is a sub city, located in the South West Delhi district of the National Capital Territory of Delhi.
- The sub-city is located in southwest Delhi in the vicinity of International and Domestic airports.
- It is bounded by Najafgarh road, Pankha road, Rewari railway line, and Najafgarh drain.

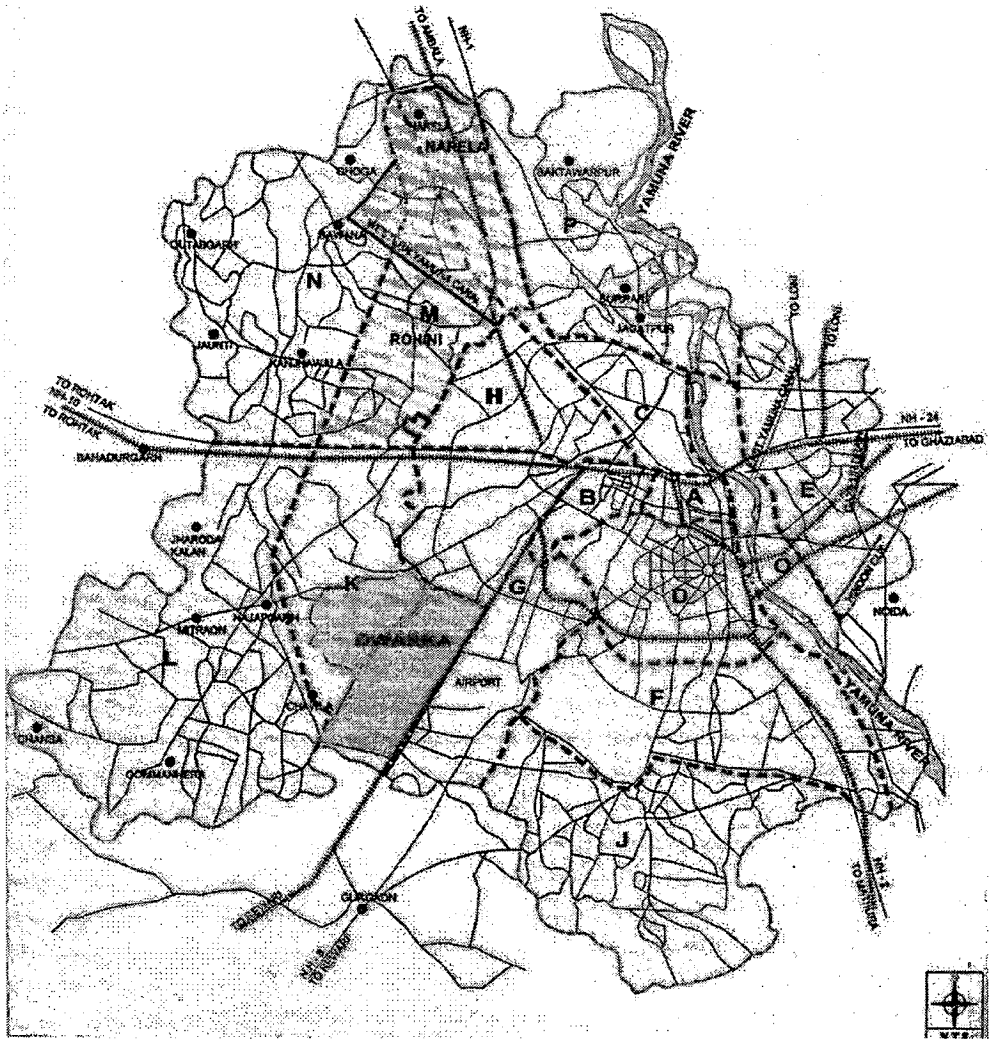


Figure 16 Location plan of Dwarka

3.1.2 Population and area

- Population – 11,00,000
- Total area - 5648 ha.
- Area (Phase - I) - 1964 ha.
- Area (Phase - II) - 1996 ha.
- Existing built up - 1688 ha.
- Dwarka project is planned with 29 sectors.

3.1.3 Land Use plan

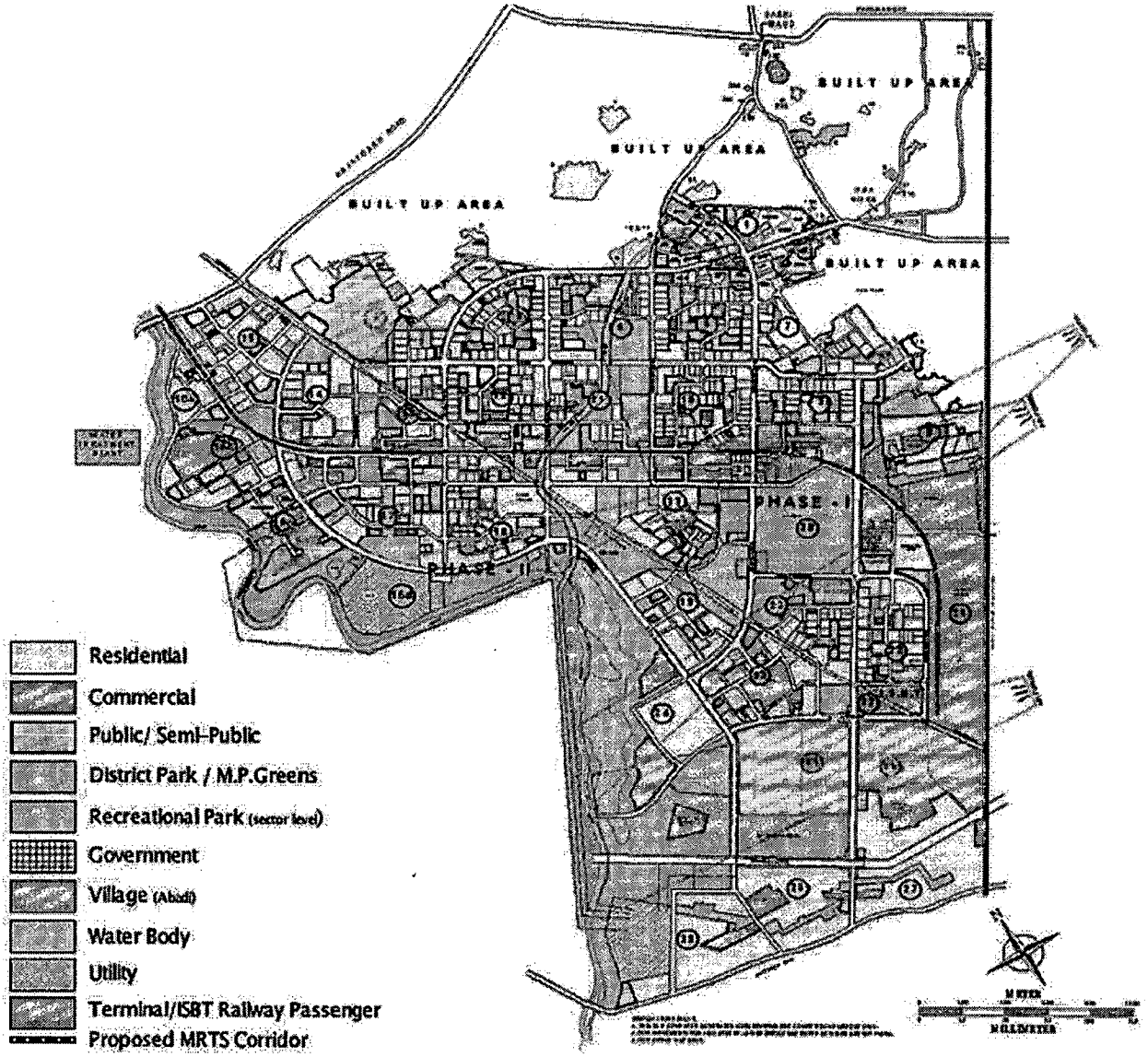


Figure 17 Land Use plan of Dwarka

The landuse distribution is as under:

Residential	48.54%
Commercial	7.05%
Government	0.94%
Public / Semi-Public	6.20%
Recreational	19.94%
Transport	14.33%
Utilities	3.00%

3.1.4 Residential sector

- Each of the residential sectors has been envisaged to be self-contained communities and has been designed for a population of about 30,000 each.
- Area of each sector is about 81 ha. (900 m x 900 m)
- Each sector is bounded on all sides by arterial roads of 45 m and 60 m.wide
- From arterial roads only 4 entries have been taken into the sector at a minimum distance of 450 m.

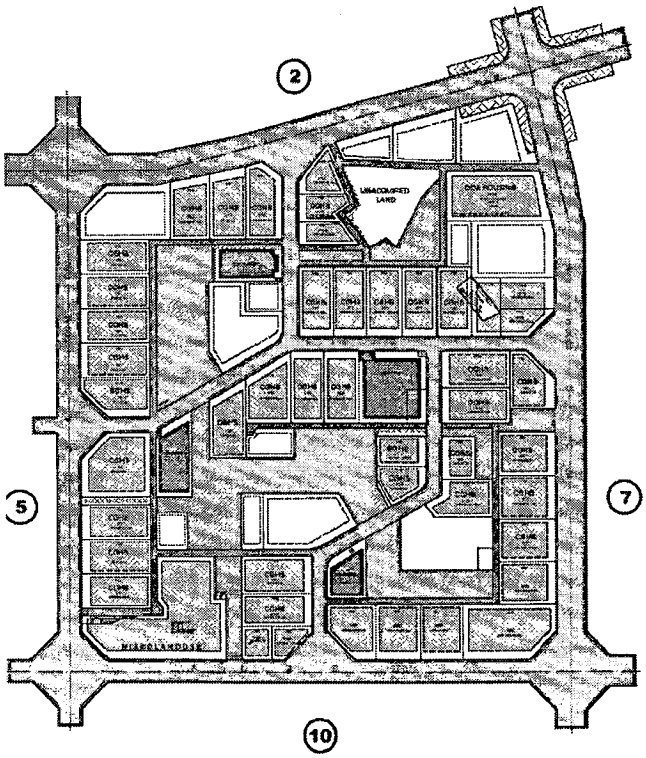


Figure 18 Layout plan of sector 6, Dwarka

3.1.5 Commercial

- The commercial hub of the city will be developed along the proposed Metro Railway line (MRTS) in a linear form.
- Until recently the commercial zone in Dwarka consists of two major markets in sector 6 and 10. Newer markets like Ashirwad chowk - which is the juncture of sectors 12, 11, 4 & 5 have recently come up.
- The first mall of Dwarka is being built in Sector- 14, next to the metro station and the National Law University, Delhi.
- The entire commercial spine is connected to different sectors of Dwarka by 60 m and 45 m roads
- Shopping plazas have also come up in Sector 22, 23

3.1.6 Transport

- 10 Metro stations in the Dwarka sub-city.
- Bus based public transport system will also be the primary mode of transportation of the people in Dwarka.
- Inter-state-bus terminal (I.S.B.T) has been planned near Sector 23.
- The basic road network has been planned both to supplement and compliment the metro based system.
- Two new DTC Bus Depot in Sector 2 and Sector 8 are now open and fully operational.

The hierarchies of road systems adopted in Dwarka sub-city are as under:

(i) Primary Arterial Roads -100 m ROW. & 80 m ROW

(ii) Other Primary Arterial Roads – 60 m ROW & 45 m ROW

(iii) Primary Sub-Arterial (Collector) – 30 mts

(iv) Secondary Sub-Arterial (Collector) - 18 mts.

Up to Sector 21 is connected by the MRTS corridor of Noida- Dwaraka line.

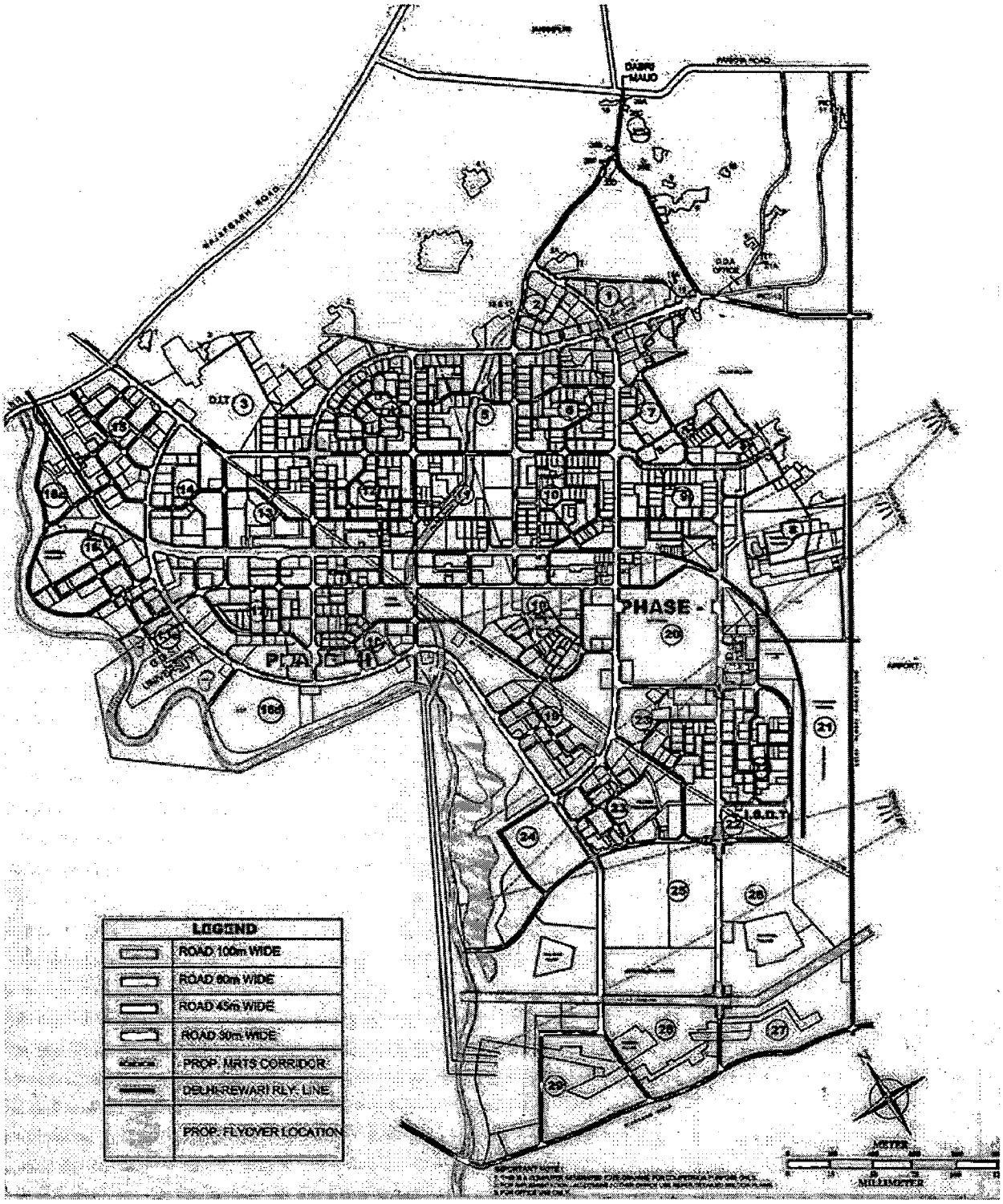


Figure 19 Circulation plan, Dwarka

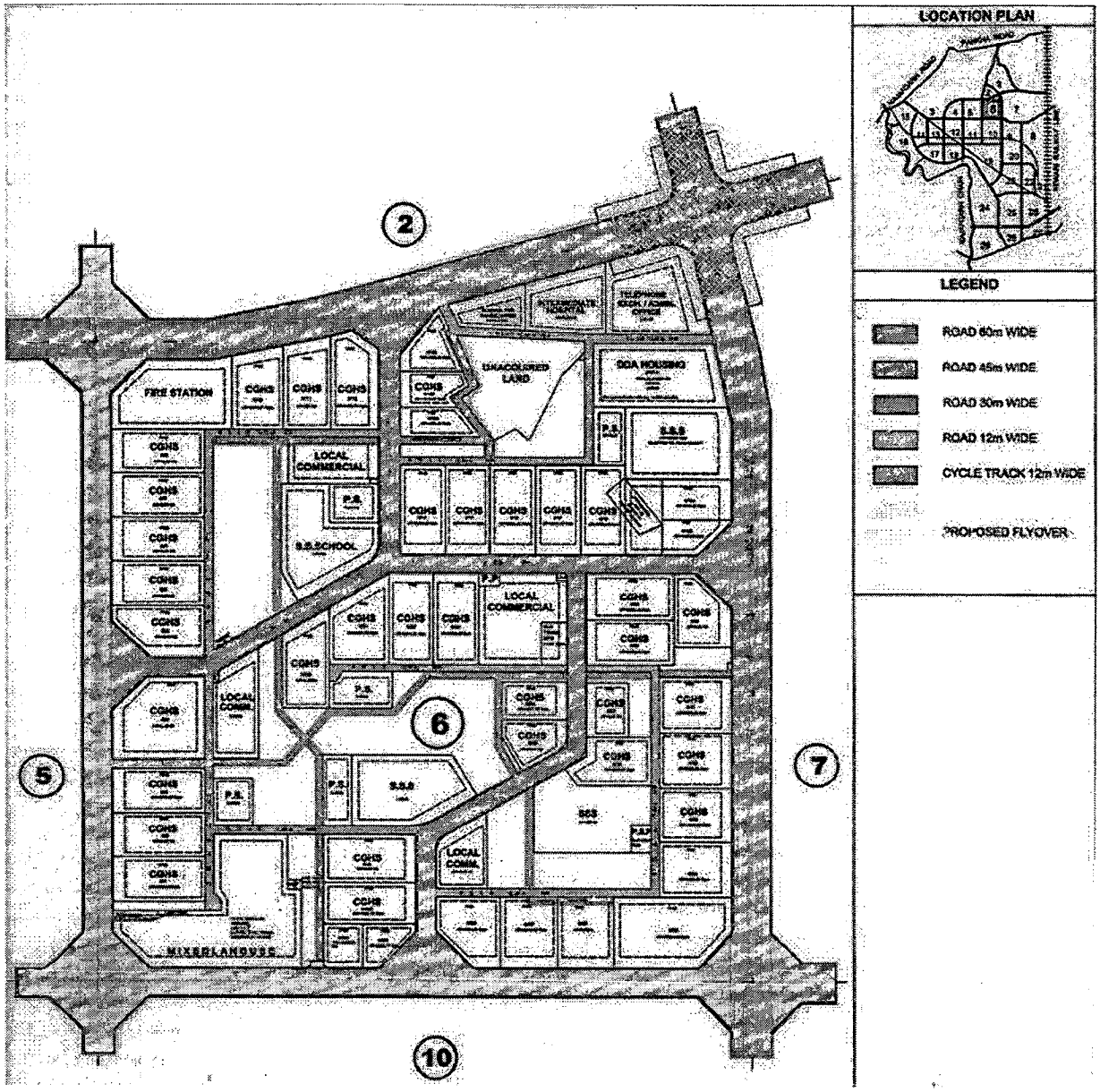


Figure 20 Circulation plan of sector 6, Dwarka

3.1.7 Sewer plan

The STP is located adjoining Najafgarh drain which will carry treated discharge for disposal.

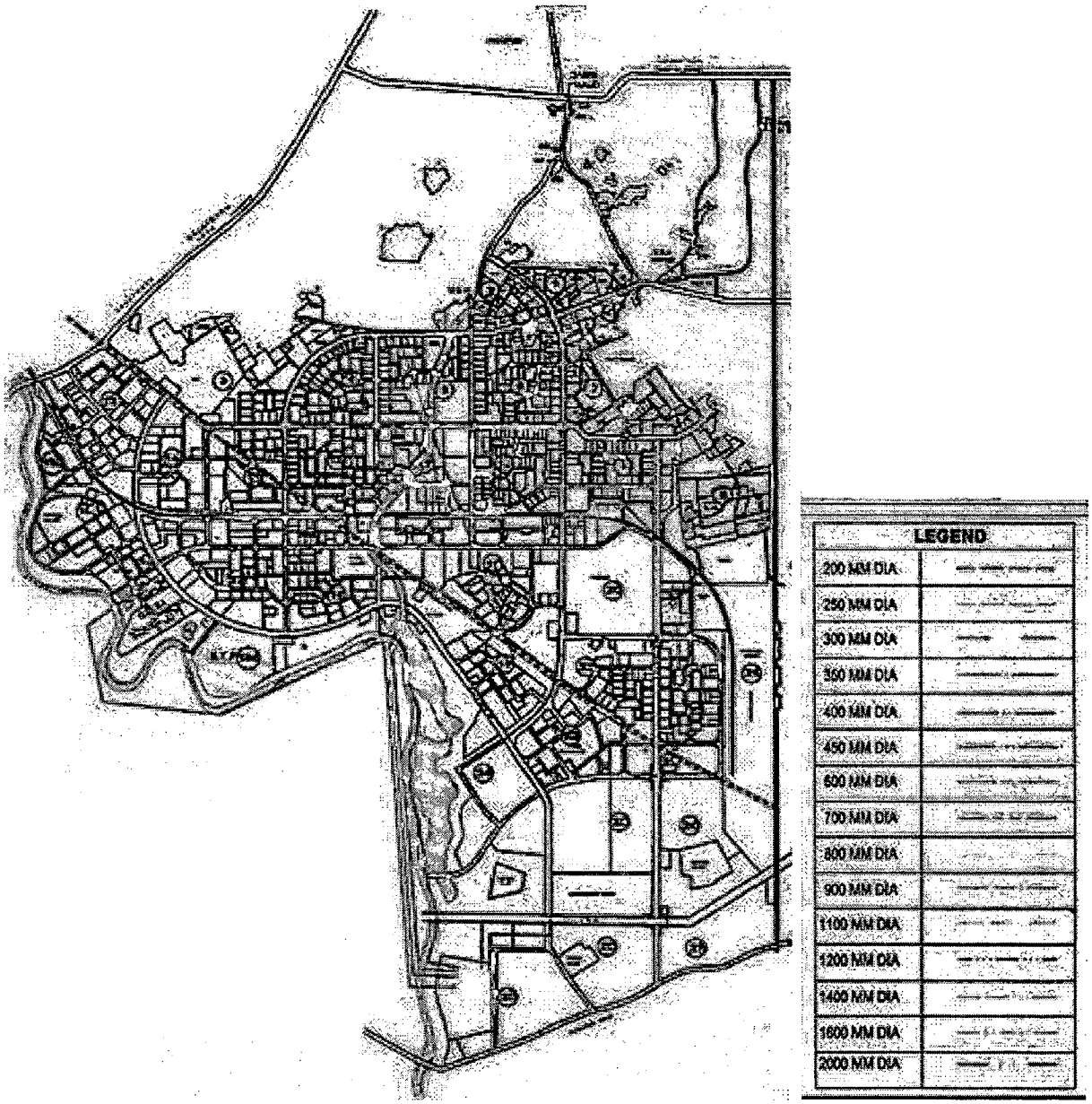


Figure 21 Sewer Pipeline distribution plan, Dwarka

3.1.8 Power plan

- The total power requirement for Dwarka Sub-city is 500 Mega Watt.
- A grid station has been set up which will receive 400 KV power supply from overhead feeder and transforming to 220 KV grid stations.
- These will be further transformed to eleven 66 KV grid station and finally to 11 KV grid station.

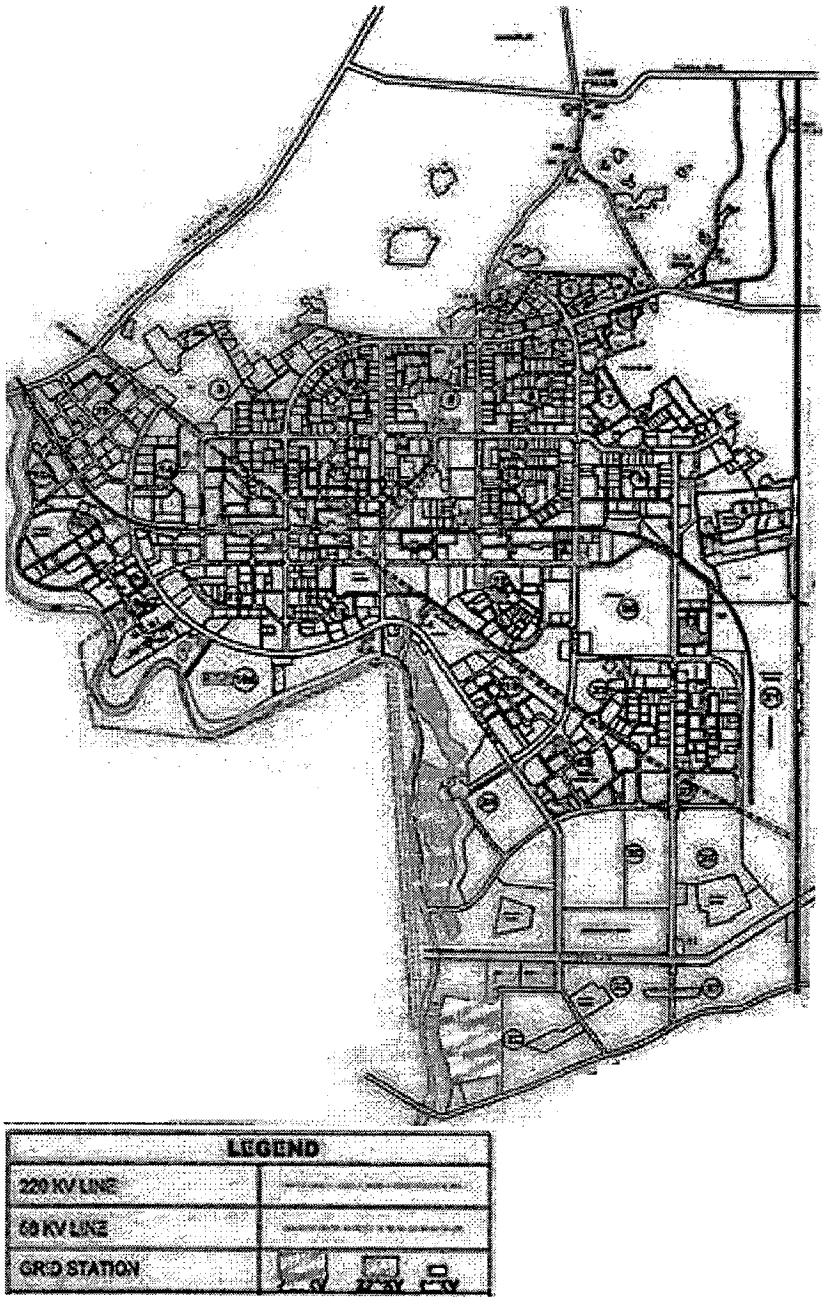


Figure 22 Power distribution plan, Dwarka

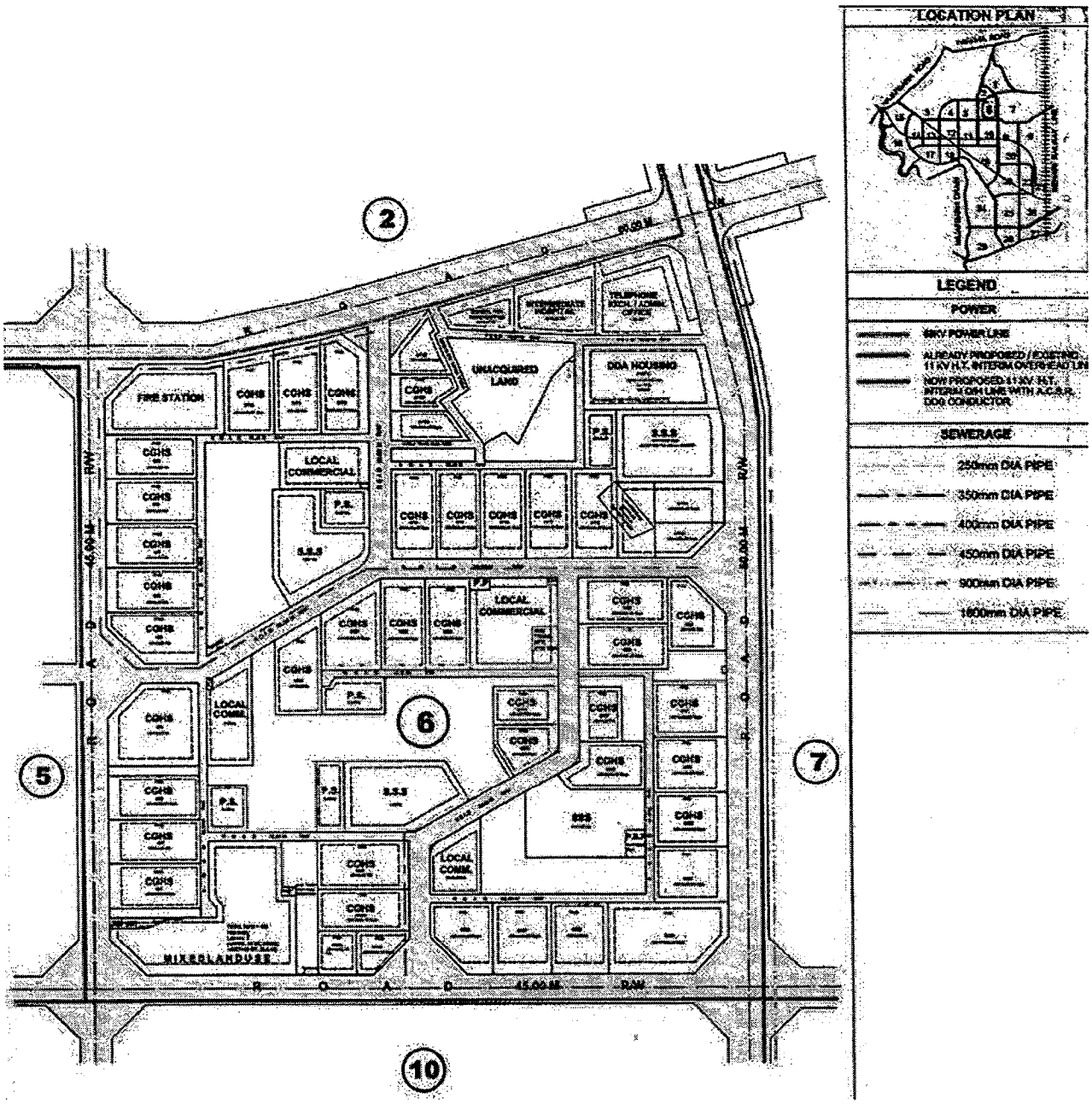


Figure 23 Sewage & Power plan of A sector 6, Dwarka

3.1.9 Water plan

- Water supply demand for Dwarka is 60 MGD.
- The water supply system will consist of underground reservoirs/ command tanks (one command tank to serve 1.5 to 2.0 lakhs population) are inter-connected.

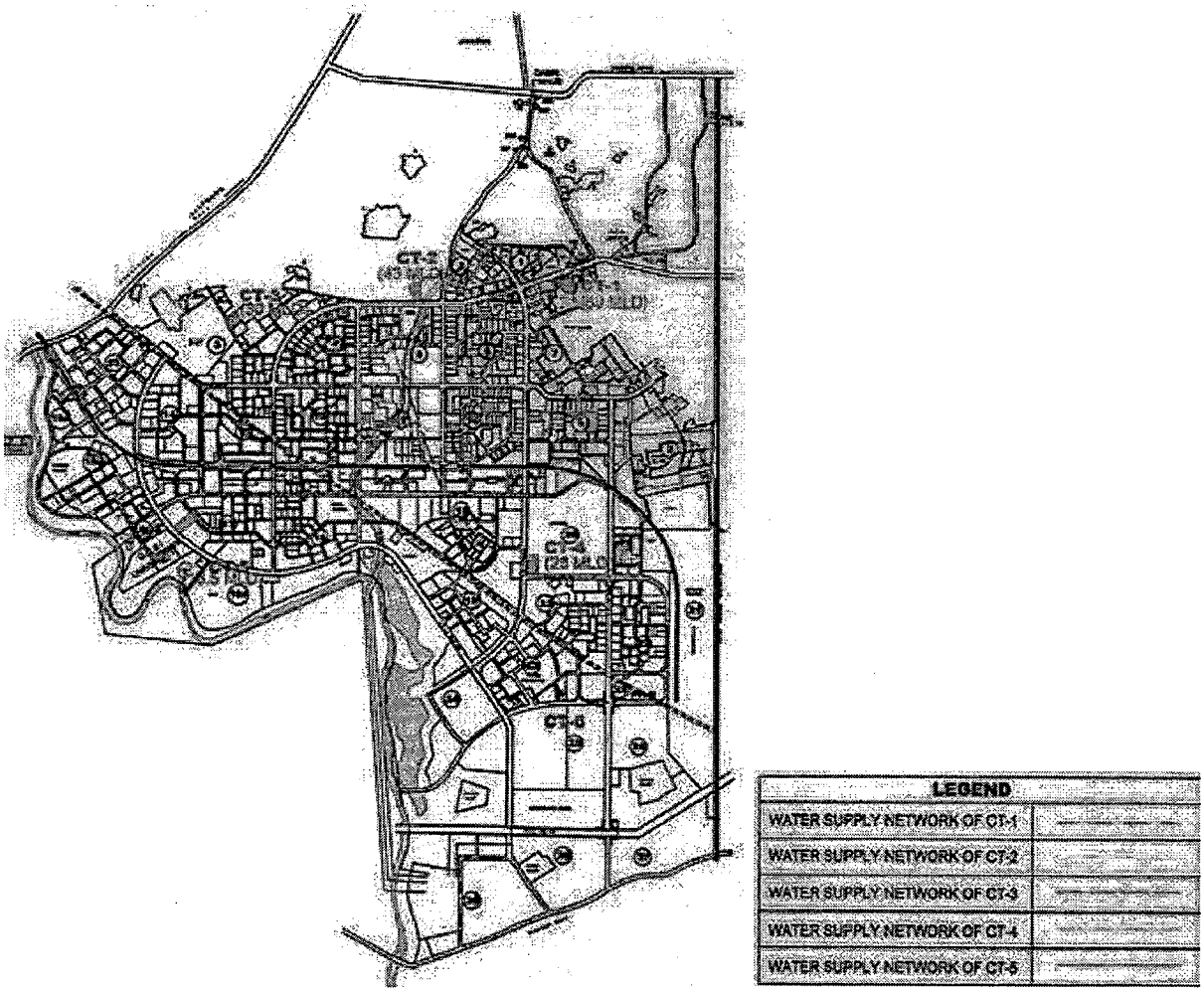


Figure 24 Water pipeline distribution plan, Dwarka

3.1.10 Drainage plan

- The drainage system has been designed for a total catchments area of entire Dwarka Project on the basis of storm intensities and 70% average run off.
- The existing natural gradient towards Najafgarh drain side makes it vastly economical and eminently sensible to use the natural slope to its advantage for working out a proper drainage system.

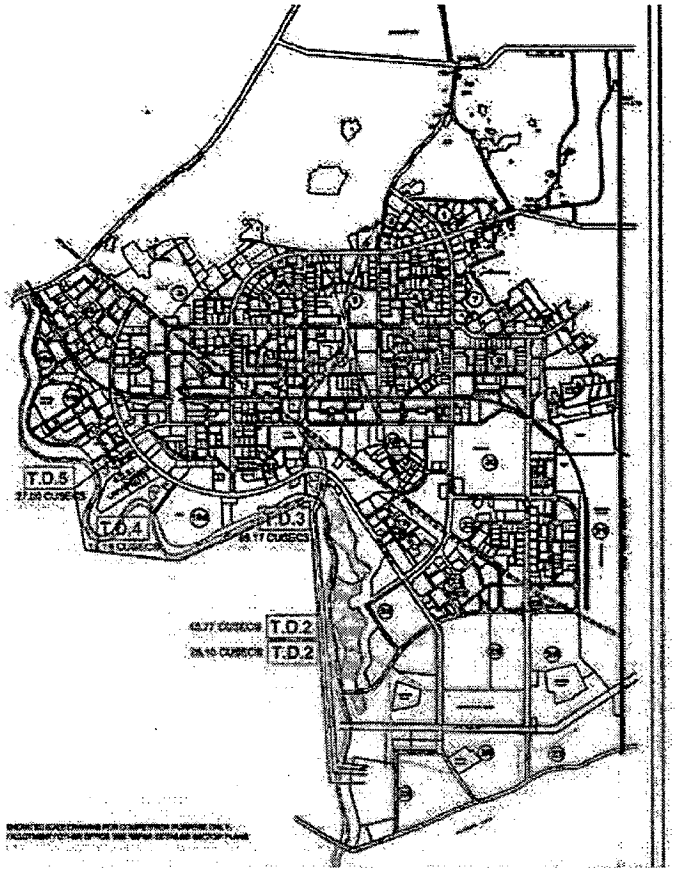


Figure 25 Drainage distribution plan, Dwarka

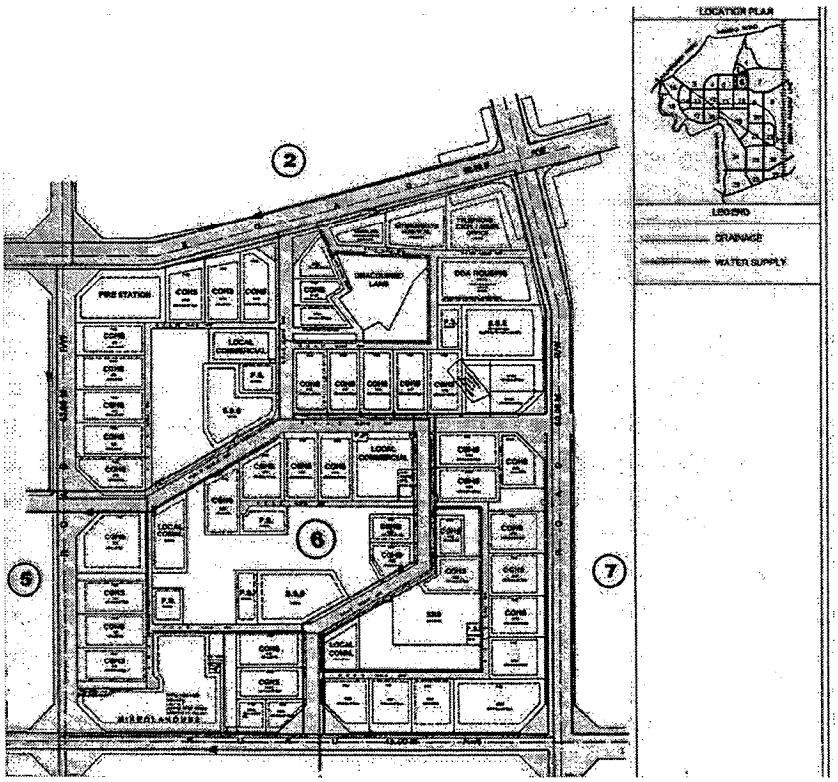


Figure 26 Water & Drainage plan of sector 6, Dwarka

3.2. The North Burnet/Gateway, Austin, Texas

3.2.1 Location

- **Austin** is the capital of the U.S. state of Texas. Situated in Central Texas and part of the American Southwest, it is the fourth-largest city in Texas and the 16th-largest in the United States of America.
- The North Burnet/Gateway is located in north central Austin near the intersection of US 183 and Loop 1/MoPac.
- The edge of the North Burnet/ Gateway planning area is located approximately 8 miles from Downtown Austin.

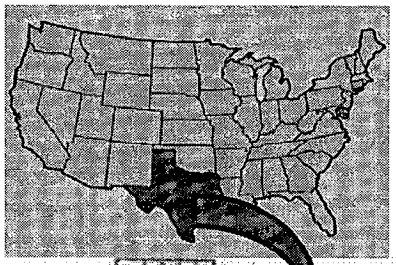


Figure 28 Location of Texas in U.S.

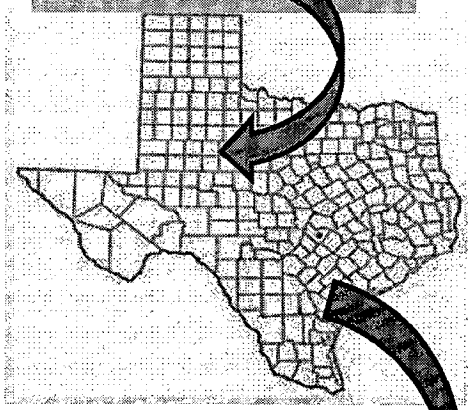


Figure 27 Location of Austin in Texas

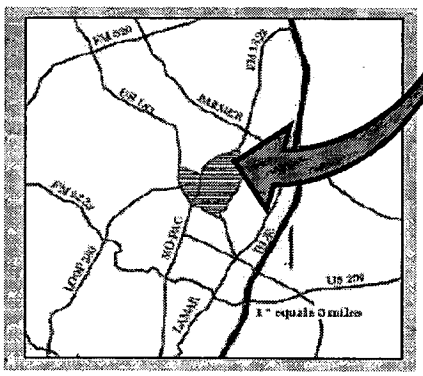


Figure 29 Location of North Burnet/Gateway

3.2.2 Site Profile

- Area: 950 Ha
- DU all types: 41,158
- Two railway lines, which are less than a mile apart from each other, pass through this area. Additionally, the area is readily accessible via existing highways and arterial roadways.
- Two planned rapid bus routes
- One would travel north- south and connect from Burnet Road to Downtown Austin &other would travel east-west in North Austin

Figure 30 Site profile of North Burnet/Gateway

3.2.3 Three broad themes

One: Mixed-use neighbourhood that is more pedestrian- and transit-friendly and can accommodate a significant number of new residents.

- Close proximity to transit and reduce reliance on the automobiles.
- Balances of jobs, houses, retail, open space and community facilities.
- Opportunities to live, work, and play within the same area.
- The plan encourages housing to be developed in close proximity to potential jobsites.

TWO: Increase mobility both within the North Burnet/Gateway area and to surrounding areas by improving connectivity

- More compact, denser development clustered in activity centers to encourage a greater percentage of travel accomplished by walking, biking, and transit.
- A built environment, streetscape and street design that is safe and enjoyable for pedestrians and cyclists.
- Efficient network of streets resulting in greater connectivity and dispersed traffic.

THREE: Sensitivity to the surrounding context and the natural environment.

- Appropriate transitions and buffers for residential uses in adjacent neighbourhoods.
- Public open space in close proximity to residential development.
- Green building practices
- All streets should be well landscaped and shaded with regular street tree plantings to provide shade and help reduce the urbanheat island effect.

3.2.4 Land Use Plan

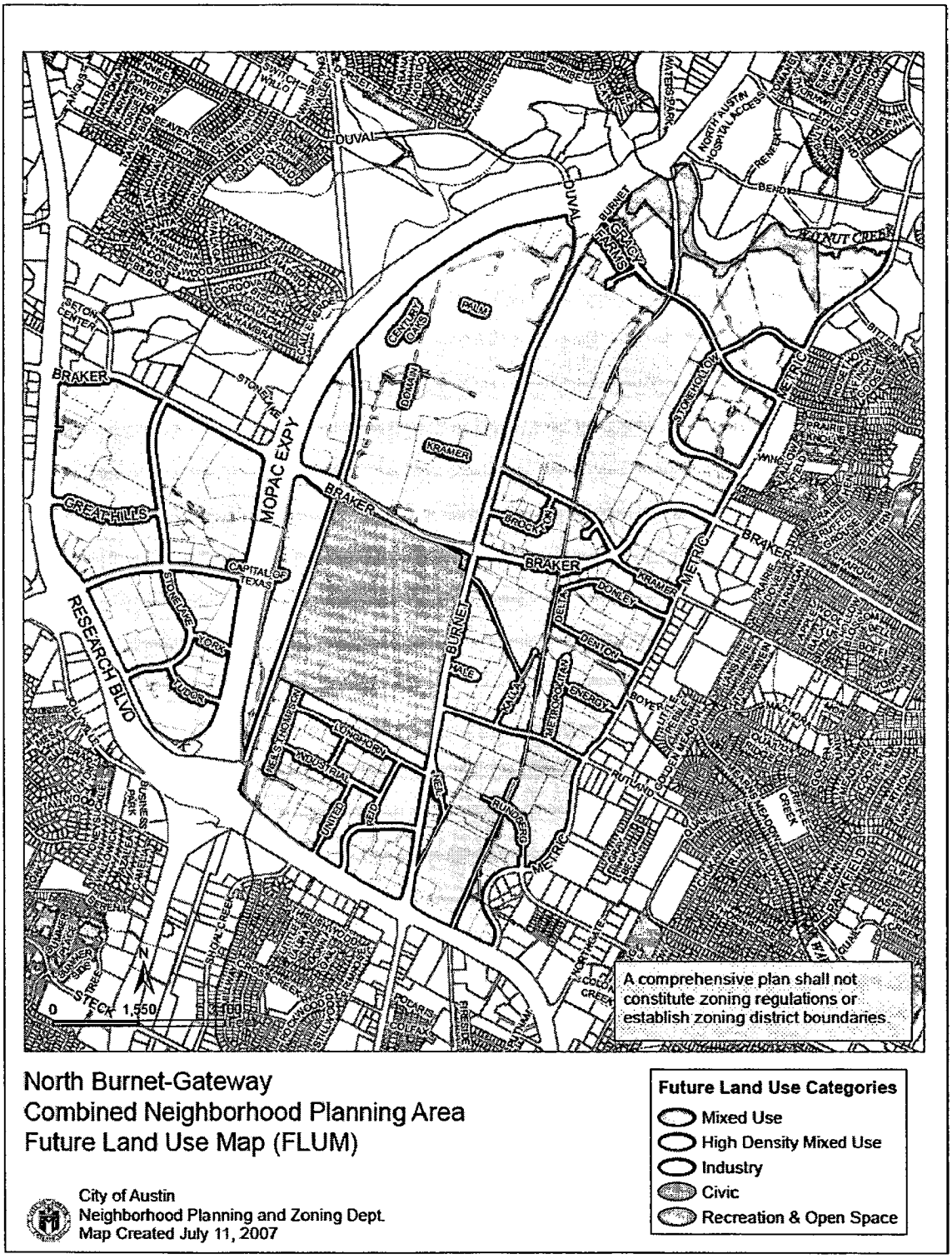


Figure 31 Land Use Plan, NBG

3.2.5 Street Hierarchy

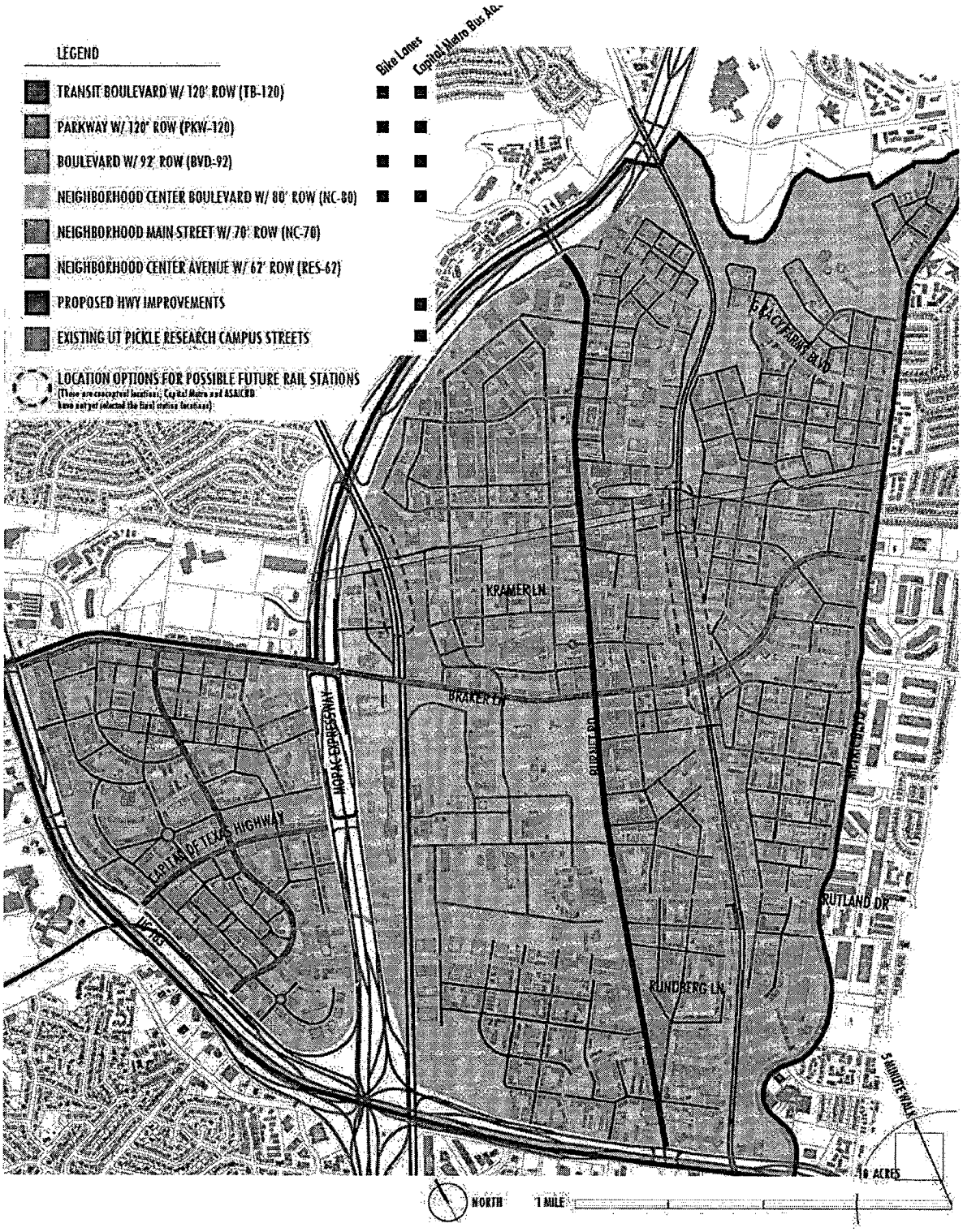


Figure 32 Circulation plan, NBG

3.2.6 Transit connections

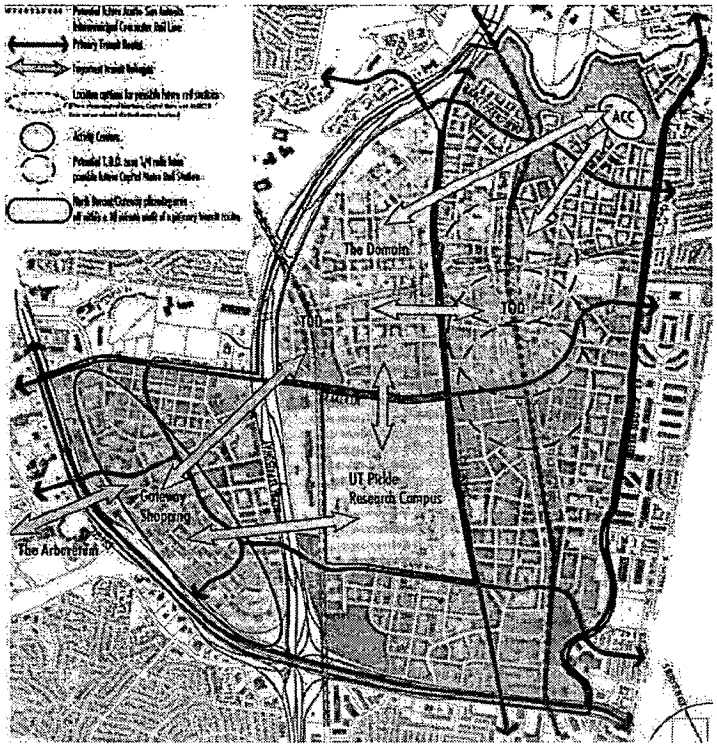


Figure 33 Transit connection plan, NBG

3.2.7 Bicycle corridor and open spaces

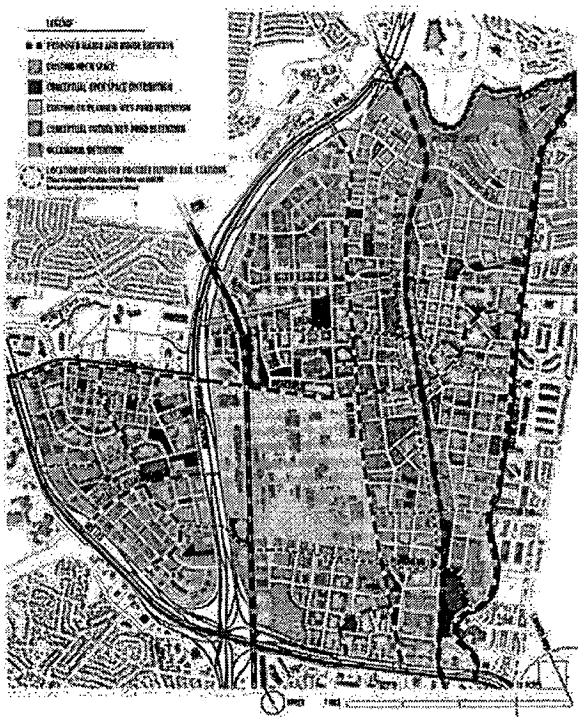


Figure 34 Bicycle corridor and open spaces plan, NBG

3.2.8 Subdistricts

Following are descriptions of the various subdistricts

COMMERCIAL MIXED-USE (CMU):-

- High densities
- Industrial, detached residential and auto-oriented retail are among the prohibited uses in the subdistrict.

WAREHOUSE MIXED-USE (WMU)

- Warehouse Mixed-Use is a transition subdistrict used to accommodate existing industrial uses and enable adaptive reuse of the existing development to include residential and local retail uses.

NEIGHBORHOOD MIXED USE (NMU)

- It is intended to be primarily mid-rise residential with neighbourhood-oriented retail and smaller employers.
- Commercial streets lined with small local businesses, restaurants, & offices, with residential above.

NEIGHBORHOOD RESIDENTIAL

- Denser and more urban form of housing.
- This sub-district would allow up to 5 stories in height.
- Housing types here have a narrow street frontage

COMMERCIAL INDUSTRIAL (CI)

- Commercial Industrial is the subdistrict intended to accommodate existing indus- trial uses while enabling diversification.
- Prohibited uses are residential, destination retail and hospitality.

Figure 35 Subdistrict plan, NBG

3.2.9 Diagrammatic intent of Building standards

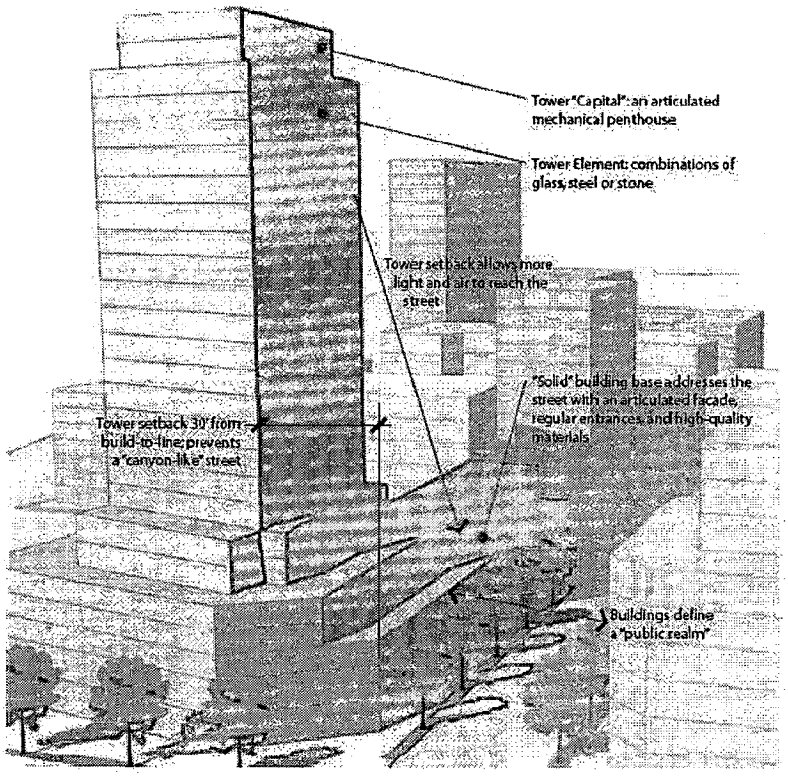


Figure 37 Diagramatic intent of architectural standards,

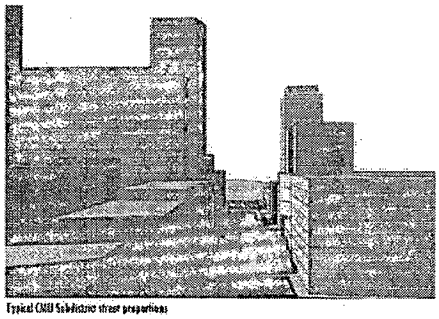
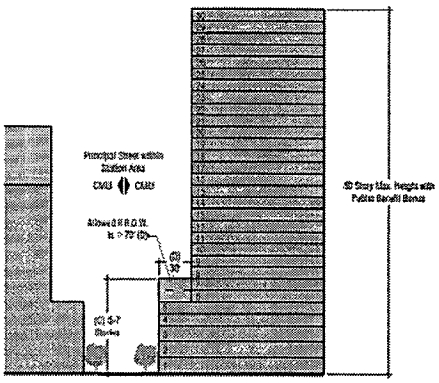


Figure 36 NBG Typical CMU Subdistrict building and street proportions, NBG



3.2.10 Transit Corridors

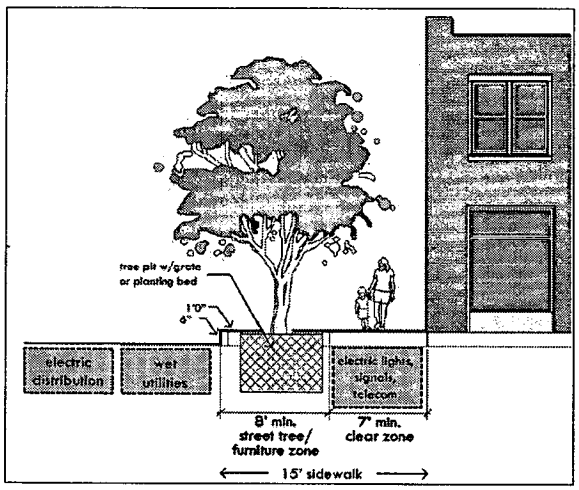


Figure 3-6: NBG Core Transit Corridor with underground utilities.

Figure 39 NBG Core transit corridor with overhead utilities

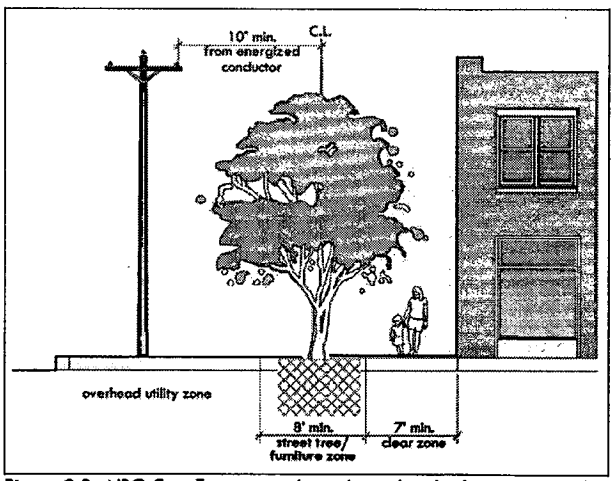


Figure 3-8: NBG Core Transit corridor with overhead utility zone at curb

Figure 38 NBG Core Transit corridor with underground utilities

CHAPTER 4 PROJECT AREA PROFILE

4.1 Introduction

- 'L' zone of Delhi is one of the zones where urban limit is to be extended.
- Area = 21933hac as per zonal development plan
- The green belt = 10322hac as per zonal development plan
- Urbanisable area = 11611hac

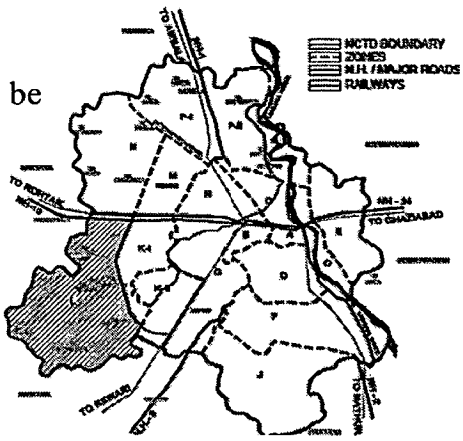


Figure 40 Location map of Zone L

4.2 Percentage Breakup of land uses as per ZDP

S.No.	Land Use	Area in Ha.	%
1	Residential	5539	47.70
2	Commercial	600	5.17
3	Industrial	560	4.82
4	Public / Semi Public	1703	14.67
5	Govt.(Use undetermined)	658	5.67
6	Recreational	1492	12.85
7	Transport	930	8.01
8	Utilities	129	1.11
	Total	11611	100.00

Table 10 Percentage Breakup of land uses as per ZDP

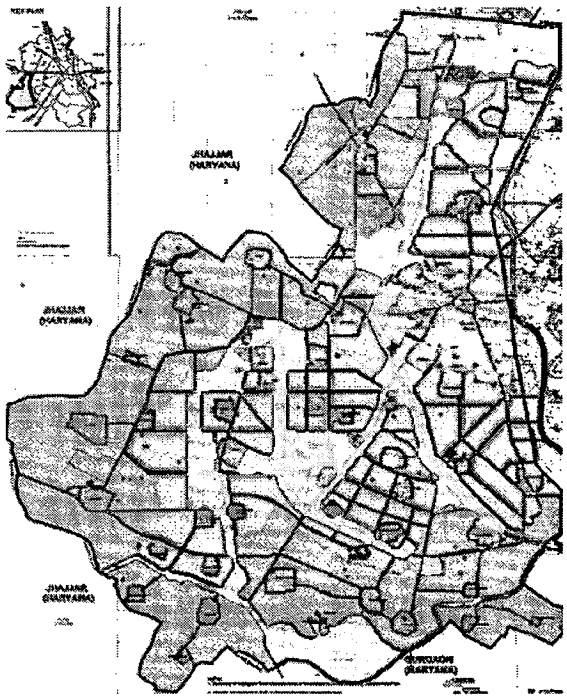


Figure 41 Proposed Zonal Plan of zone

- Existing population = 9lakh as per ZDP
- Zone to be planned for additional 20lakh population.

4.3 Division of Zone L into Sub-Zones

- Sub zone 1
- Sub zone 2
- Sub zone 3
- Sub zone 4

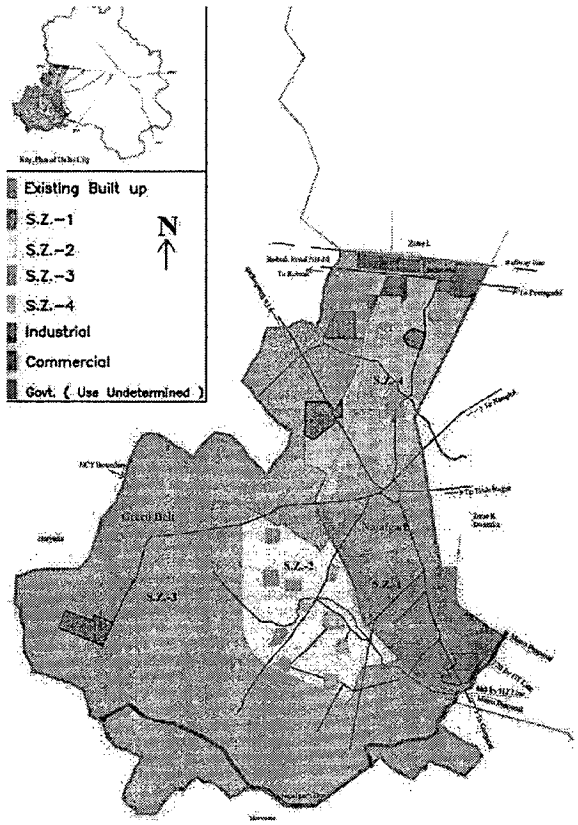


Figure 42 Division of Zone L into sub zones

4.4 Percentage Breakup of land uses for New Development

S.No.	Use	%
1	Residential	44.35
2	Commercial	5.12
3	Industrial	1.71
4	Public / semipublic	18.16
5	Govt. (use undetermined)	3.47
6	Recreational	15.9
7	Transports	9.91
8	Utilities	1.38
	Total	100

Table 11 Percentage Breakup of land uses for New Development

4.5 Project Area – S.Z.1

- Najafgarh Census Town at Northern edge
- Najafgarh Drain about 100m wide at Southern edge
- Proposal of 80m wide metro corridor at eastern and

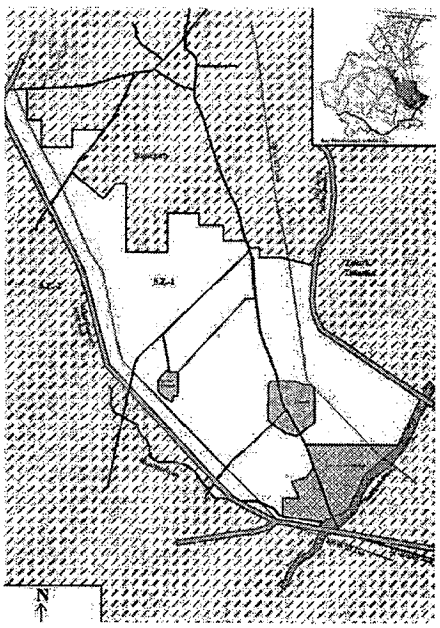


Figure 43 S.Z. 1 Plan

western edge which will connect NH 10 to South Delhi & Gurgaon resp.

- Two villages Rewala khanpur & Chawala and CRPF land inside S.Z.1
- 14m wide Mehrauli Najafgarh road passing through zone, other roads are 10m wide connecting villages
- Two electric lines of 220kv and 400kv are passing through S.Z.1
- Present land use is agricultural

4.6 Distribution of Land uses

- Net area = 1700 Ha (approx.)
- Density = 250 Persons / Ha. As per ZDP
- Population= 4,25,000 (approx.)

S.No.	Use	%	Area in ha
1	Residential	44.35	754
2	Commercial	5.12	87
3	Industrial	1.71	29
4	Public / semipublic	18.16	308
5	Govt. (use undetermined)	3.47	59
6	Recreational	15.9	270
7	Transports	9.91	169
8	Utilities	1.38	24
	Total	100	1700

Table 12 Land use distribution of S.Z. 1

- Location & Area of Commercial activities, Industries and utility area like Water Treatment Plant, Sewerage Treatment Plant, Compost plant for Solid Waste and Grid Station Sites are mentioned in Zonal Development Plant and none of these sites comes under SZ-1.

- So, the area for commercial, Industrial and Utilities i.e. 140 Ha. will be adjusted accordingly.

Residential Area = 754 ha.

Population = 4,25,000

Neighbourhood population = 8,000 - 10,000 Persons

No. of neighbourhoods in a Sector = 4

Population of sector = 32,000 - 40,000 Persons

Number of sectors = 11 – 14 sectors

Area of a Sector = 54Ha – 68 Ha

Social Infrastructure

A. Educational, Health Care and Socio-Cultural Facilities					
	Types of building	**Requirements**	**Total nos.**	**Area required (ha)**	
				Per Unit	**Total**
Primary to Secondary Education	Primary school / Middle school	1 for 5000 pop.	85	0.2	17
	Sr. Secondary School	1 for 10,000 pop.	42	0.6	25.2
	School for Mentally / Physically challenged	1 for 1,00,000 pop.	4	0.2	0.8
Higher Education	General College	1 for 5 lakh pop.	1		
Technical Education	Vocational Training Centre	1 for 5 lakh pop.	1	0.4	0.4
Professional Education	Engineering college	1 for 5 lakh pop.	1		
Health Care Facilities	Hospital A (501 beds & above)	1 for 5, 00,000 pop.	1	4.5	4.5
	Hospital B (201 beds to 500 beds)	1 for 2, 50,000 pop.	2	2.5	5
	Hospital C (101 beds to 200 beds)	1 for 1, 00,000 pop.	4	1	4
	Hospital D (Upto 100 beds)	1 for 1, 00,000 pop.	4	0.5	2
	a. i) Maternity Home (Upto 50 beds) ii) Nursing Home/ Polyclinic/ Dispensary (Upto 50 beds)	1 for50,000 pop.	8	0.2	4
	b. i) Family Welfare Centre ii) Pediatric Centre	1 for50,000 pop.	8	0.08	0.64

	iii) Geriatric Centre iv) Diagnostic Centre.				
	Dispensary for pet animals andbirds	1 for 1, 00,000 pop.	4	.03	0.12
Socio-Cultural Facilities	Multipurpose Community Hall which may include provision for marriages, small public gathering, function, eating joint, and library etc	1 for 10,000 pop.	42	0.2	8.4
	Banquet Hall	1 for 1, 00, 000 pop.	4	0.08	0.32
	Recreational club	1 for 1, 00, 000 pop.	4	0.2	0.8
	Music, dance & spiritual center	1 for 1, 00, 000 pop.	4	0.1	0.4
Other community facilities	a) Old Age Home b) Care Centre for Physically-Mentally challenged c) Working women- men hostel d) Night Shelter e) Adult Education Centre f) Orphanage/ Children's centre. (one each)	1 for 5, 00, 000 pop.	1	0.1	0.6
	Religious	1 for 5,000 pop.	85	0.04	34

B. Distribution Services

Types of services	Requirements	Total nos. required	Area required (ha)	
			Per service	Total
Petrol pump	1 per 150 ha of gross residential area	5	0.05	0.25
	1 per 40 ha of gross industrial area	1	0.1	0.1
	1 in each community center	4	0.03	0.12
Milk distribution	1 booth for 5000 pop.	85	0.005	0.43
LPG Godowns	3 for 1 lakh pop.	13	0.05	.065

Police, Fire & Other services				
Types of services	**Requirements**	**Total nos. required**	**Area required (ha)**	
			Per service	**Total**
Police post	1 for 1 lakh pop.	4	0.1	0.4
Police station	1 for 2.5 lakh pop.	2	0.5	1
Fire station / sub fire station	5 to 7 km radius	2	1	2
Post office	1 for 15,000 pop.	29	0.01	0.29
Auto/ Taxi stand	1 for 15,000 pop.	29	0.05	1.45
Bus terminal	1 for 1 lakh pop.	4	0.4	1.6
District sports centre	1 for 5 lakh pop.	1	10	10
Community Sports Centre	1 for 1 lakh pop.	4	3	12
Recreational Facilities				
Types of services	**Requirements**	**Total nos. required**	**Area required (ha)**	
			Per unit	**Total**
Distric Park	1 for 5 lakh pop.	1	25	25
Community Park	1 for 1 lakh pop.	4	5	20
Neighbourhood Park	1 for 10,000 pop.	42	1	42
Housing Area Park	1 for 5,000 pop.	85	0.5	42.5
District Multipurpose Park	1 for 5lakh pop.	1	4	4
Community Multipurpose Park	1 for 1 lakh pop.	4	2	8
Commercial Activities				
Commercial centers	**Population**	**Total nos. required**	**Area required (ha)**	
			Per unit	**Total**
District center	1 for 5 lakh pop.	1	44	44
Community center	1 for 1 lakh pop.	4	5.4	21.6
Local shopping center	1 for 15,000 pop.	29	0.46	13.34
Convenience shopping center	1 for 5,000 pop.	85	0.11	9.35

Table 13 Requirements of infrastructure services

Transportation

The space standards (ROW) for different categories of roads are :-

Arterial - 45m, 60m, 80m

Sub-Arterial - 30m,45m

Local Street - 12m – 20 m (pedestrian & bicycle friendly)

Electricity

Rule 80 of The Indian Electricity Rules says that The horizontal clearance between the nearest conductor and any part of such building shall, on the basis of maximum deflection due to wind pressure, be not less than- 2.0 metres plus 0.3 metre for every additional 33,000 volts for part thereof

Therefore for 220kv HT line the clearence distance would be = 2+ .3x220/33 = 4m

And for 400kv HT line the clearence distance would be = 2+ .3x400/33 = 5.6m

Building Norms and Development Controls are provided by MPD-2021.

CHAPTER 5 STUDIES & FINDINGS

5.1. Town Planning in Ancient India

5.1.1 Characteristics of Indo Aryan town plan

1. **River**

- Trade Route & Transportation
- Good Sanitation
- Defense
- Agriculture

2. Markets

- Working upon Local Material
- Art & Crafts
- Economy

3. Pleasure Gardens

- Recreation
- Reserve Special Sites for trees

4. Temple

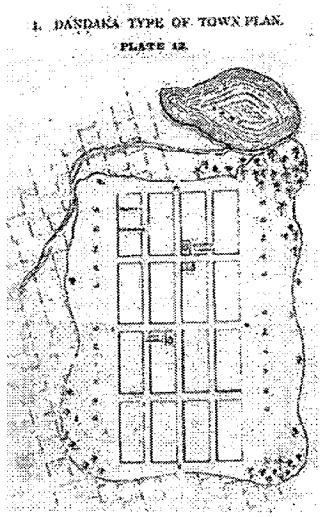
- Temple throughout a city round about it
- Purity, Healthy & Sacred Surroundings
- Learning Centre
- Hermitage

5. Layout

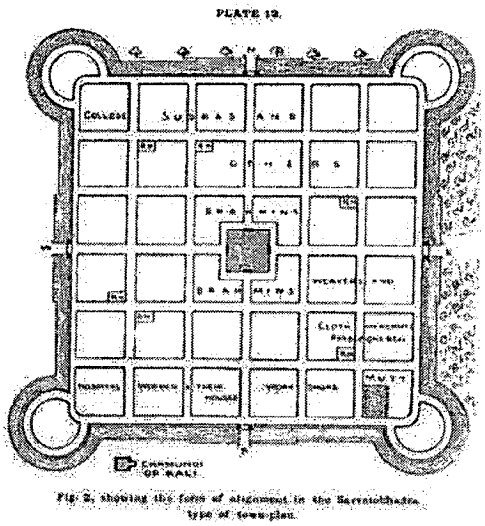
- Division of the ground into wards by a chess board system of road.
- Distribution of land to people according to their profession & social status
- Community gathering under the shade of mighty tree
- Orientation according to natural lighting and ventilation

5.1.2 Forms of town planning Layout

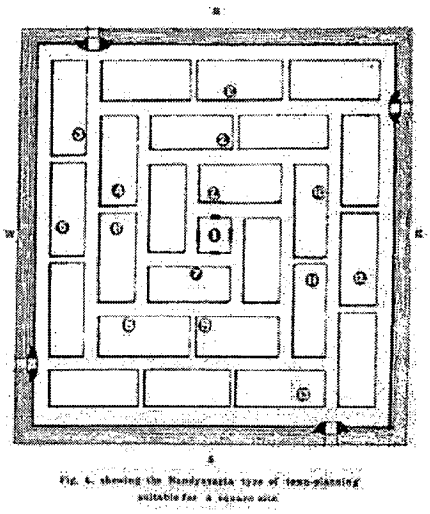
There are eight kind of town planning discussed in manasara's ninth and tenth chapter:-



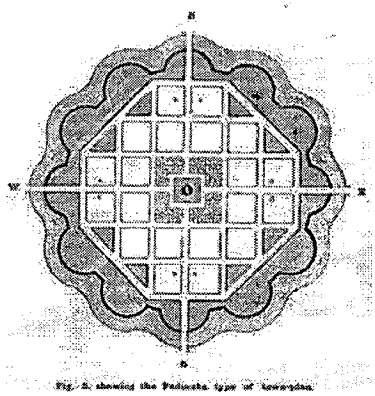
Dandaka



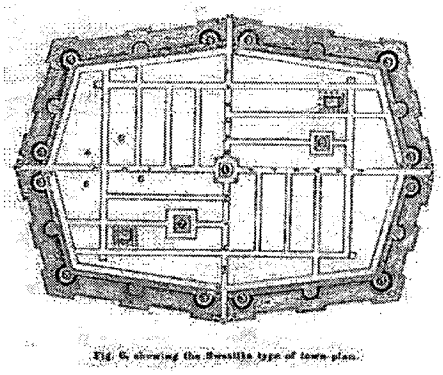
sarvatobhadra



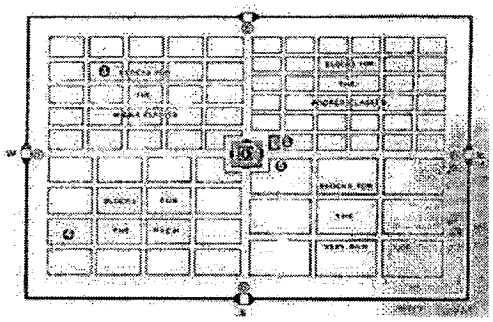
nandyavarta



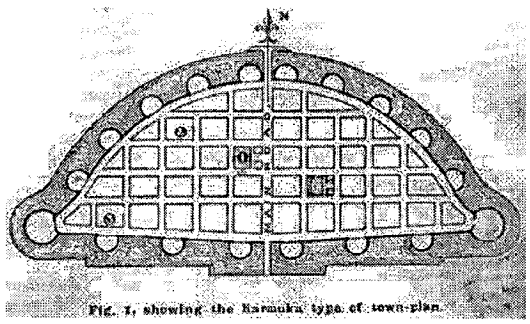
Padmaka



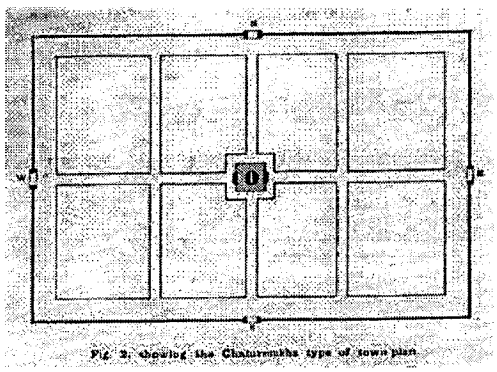
swastika



prastara



Karmuka



chaturmukha

Figure 44 Town Planning forms as discuss in Mansara

5.1.3 Indus Valley Civilization 3000 B.C.

- Mohenjo-Daro and Harappa, the large Indus capitals, were among the first cities to use grid plans, drainage, flush toilets, urban sanitation systems, and sewage systems.
- Mohenjo-Daro is planned in two parts: a citadel with public buildings and a lower city with residences along a grid of streets.
- At Mohenjo-Daro 12 orthogonal city blocks measuring 1200 x 800 feet were formed by three 30-foot-wide avenues oriented toward the north-south direction.
- Two streets about half the width of the main streets, oriented towards east-west crossing them at right angles.
- These very large blocks were subdivided by alleys up to 10 feet wide, onto which many of the houses opened.

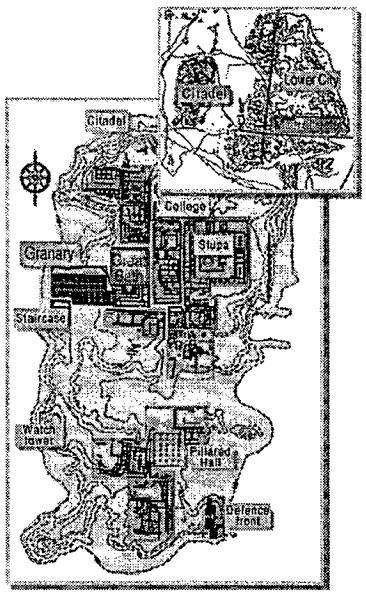


Figure 46 Plan of Mohenjodaro

Figure 45 View of exacavated site of Mohenjodaro

5.1.4 Madurai 550 B.C.

- The plan of Madurai with the temple in the centre and the city all around it.
- There is some notion of the grid but it is broken to fit the town on the existing settlement and topography.

Figure 47 Plan of Madurai city

5.1.5 Jaipur 18th cent.

- Five miles to amber lies the open plain land bounded on by hills on north-west and east.
- The north-south road that connected the amber with the sangner.

  Second road (east-west) that connected the mughal cities (agra) with Ajmer, so this communicating line would help to the economic success.

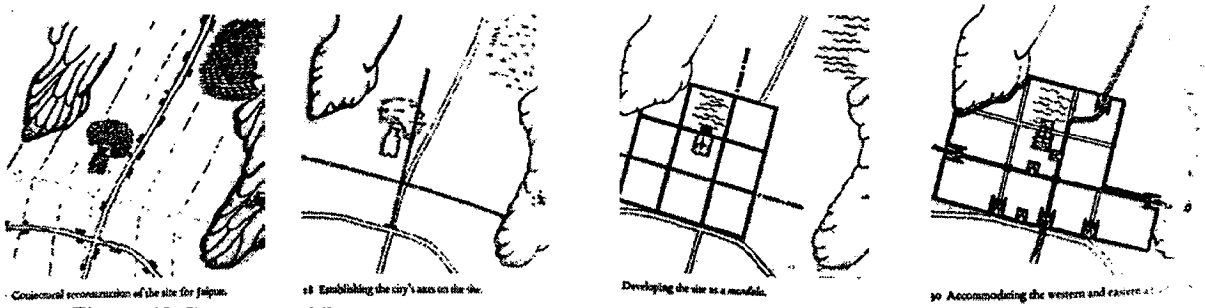


Figure 48 Geometry of Jaipur city

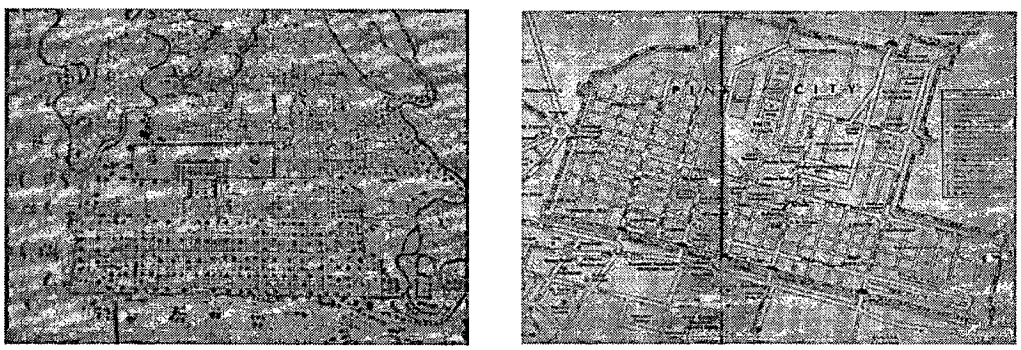


Figure 49 Plan of Jaipur City

5.1.6 Findings

- Layout of Ancient Towns in India were based on rectangular geometry planned according to Vastu shastras.
- Natural features like rivers also worked as a means of Transportation which is a key for economic development.
- Importance were given to Vegetation, trees, sun, prevailing winds, water tanks & rain which we are neglecting today.
- Role of orientation & axis in layout of city
- Urban form based on Social tradition.
- Temple as a supreme power was the starting point of city and central point for social interaction and gave a identity to city but today cutural centre lost this importance.
- Hierarchy of street according to its uses.
- Role of town boundary for defence as well as to give identity to town.

5.2. Town Planning in Ancient Greece & Rome

5.2.1 Priene 450 B.C.

- The whole covered an area of about 2250 x 1500 ft.
- Central movement system
- Geometrically defined spaces
- Temple is placed at the top
- Market was given as central space
- Importance also given to sports & cultural activities

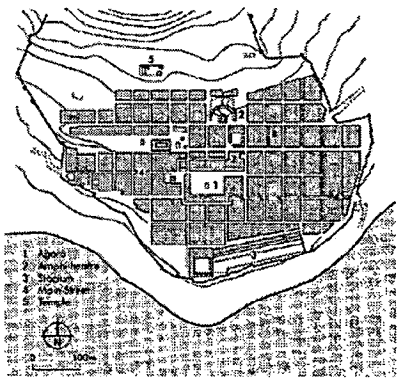


Figure 50 Plan of Priene

5.2.2 Timgad 2nd cent.

- A unitary plan with large square blocks, strong grid lines and the forum placed beside the crossing of two major axes.
- The grid consists of 4 parts of 36 blocks each, 144 blocks in all, of which 11 are taken up by the forum, 6

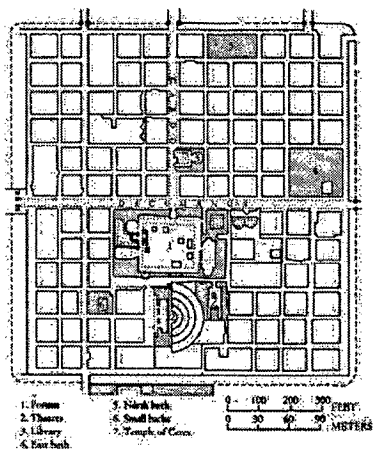


Figure 51 Plan of Timgad

by the theatre and 8 by the baths.

- When new public buildings were needed, they were developed outside the grid.

5.2.3 Findings

- Indian urban culture had an impact upon the deliberate design of cities in ancient Greece
- The adherence to an orthogonal street pattern
- Romans achieved a rational order by the fragmentation of functions into separate units
- Importance given to the role of market place and sports centre
- The plan lacks open spaces within the town

5.3 Neighborhood planning

5.3.1 Concepts

- A *pedestrian pattern* totally separated from vehicular networks
- Social & organizational *identity* in the form of neighborhood
- Neighborhood is not only to provide housing and minor services but it is the area within which residents may all share the common services, social activities and facilities required in the *vicinity* of the dwelling.
- It is a *sociophysical* aggregate that forms its own characteristic unity.
- ½ km. is generally considered *desirable distance* to walk comfortably between the boundaries of a neighborhood. This sets the diameter of neighborhood at about 1sq.km. beyond which a resident have to rely on a vehicle.

5.3.2 Variables

- Territorial Integrity
- Local public utilities, services & facility
- Local Delivery of Social Services

- Local employment
- Population Composition

Variable 1 – **Territorial Integrity**

- Housing cluster
- Proximity of land uses
- Green belts and open spaces
- Local transport network
- Local pedestrian intersections
- Interaction spaces
- Shopping centre
- Aesthetic quality
- Unique physical features or Landmark

Variable 2 – **Local public utilities, services & facility**

- Water supply, sewage & other infrastructure
- Safety & security
- Police
- Fire Services
- Government services
- Education & Training
- Library
- Health
- Sports facilities

Variable 3 – **Local Delivery of Social Services**

- Child care
- Senior Citizen services
- Clubs / Community centre
- Park & Recreation

- Religious
- Playground

Variable 4 – **Local employment**

- Utilities
- Transportation
- Maintenance
- Self trades
- Vendors
- Employment
- Technicians
- Educational institutes
- Medical services
- Manufacturing
- Repairing

Variable 5 – **Population Composition**

- Age groups
- Sex Groups
- Economic Groups
- Religious Groups
- Racial Groups

5.3.3 Social aspect of town planning

- Provision of social infrastructure
- Availability of job opportunities
- Accessibility
- Townscape design
- Safety & Security
- Pride/Sense of Place

- Social Interaction
- Community Stability
- Quality of society

5.3.4 Grid Patterns

- Radial system is particularly appropriate where flows have common origin, interchange or destination.
- Triangular grid gives straight travel in three directions but at a small scale tends to produce awkward sites.
- Rectangular grids are simple, clear, and easy to flow and have good orientation.

5.3.5 Chandigarh 1951

- Chandigarh planning was done in an manner that everything was easily clear about the routes and sectors
- The city consisting of 47 sectors. Each sector is 1200x800 mts.
- All the houses open up inside
- 7 v's road system is used. The roads are classified as v1 ,v2 ,v3.....v7

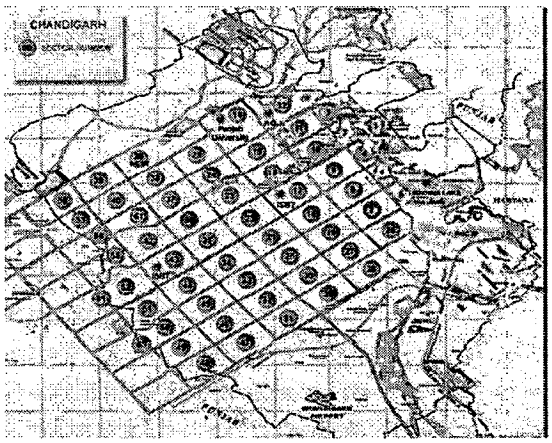


Figure 52 Plan of Chandigarh

- Grid iron pattern, which is easy to set out & easy to dispose of to developers.
- City park along the drain follows the line of the principal axis to cut through the blocks passed through town centre.
- Road junctions are roundabouts.

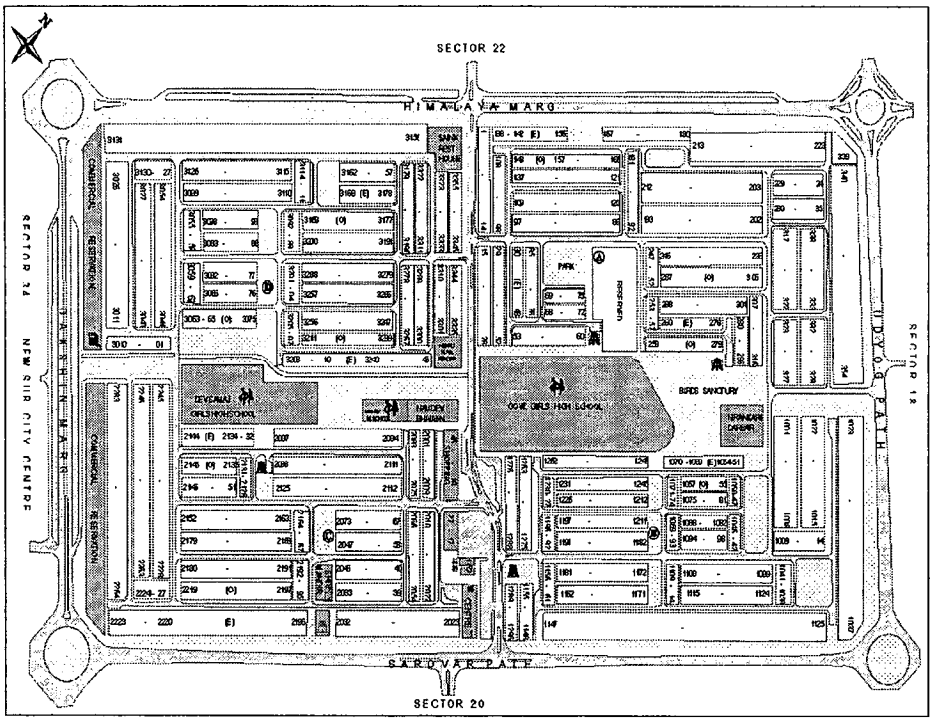


Figure 53 Plan of Sector 21, Chandigarh

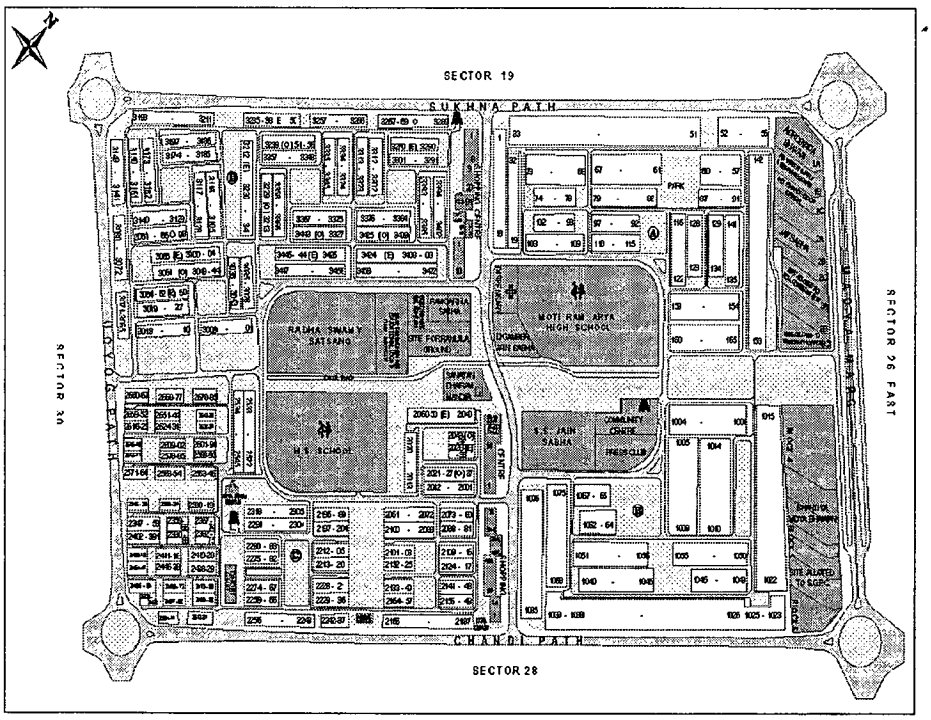


Figure 54 Plan of Sector 27, Chandigarh

5.3.6 Islamabad 1960

- Hierarchy of residential communities, of the related functions
- Transport system are apparent in the segregation of the various categories of movements (i.e. high/low speed Road Traffic, Public Transport, Bicycles, Pedestrians, etc.)
- The whole metropolitan area is sub-divided into sectors of 800x800 mts., called Communities Class V, each for about 20,000-40,000 people and each according to the income group it will serve.
- Each sector (Community Class V) of Islamabad is selfcontained and self-supported with respect to everyday life.
- It is sub-divided into three or four smaller Communities (Class IV) by income groups of occupants.
- In the centre of the sector is the civic centre, containing all types of shopping, business and civic activities.
- Each Class IV Community is subdivided into several Communities Class III, which are further subdivided into Communities Class II.

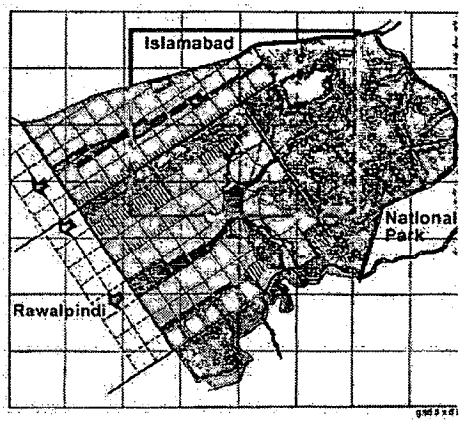


Figure 55 Plan of Islamabad

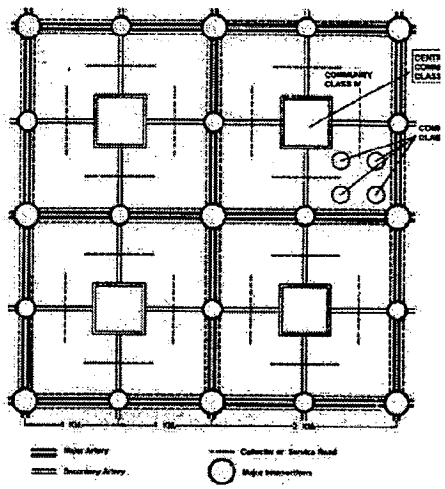


Figure 56 Plan of a Community, Islamabad

5.3.7 Dwarka

- Dwarka project is planned with 29 sectors
- Variations in the size & shape of sectors.
- Sizes of grids are 900X900 and 900x1500.
- Each sector is bounded on all sides by arterial roads of 45 m and 60m wide and the 30m wide inside.
- Higher density of about 200p/ha accommodated in high rise apartments so that to provide more open space on ground.

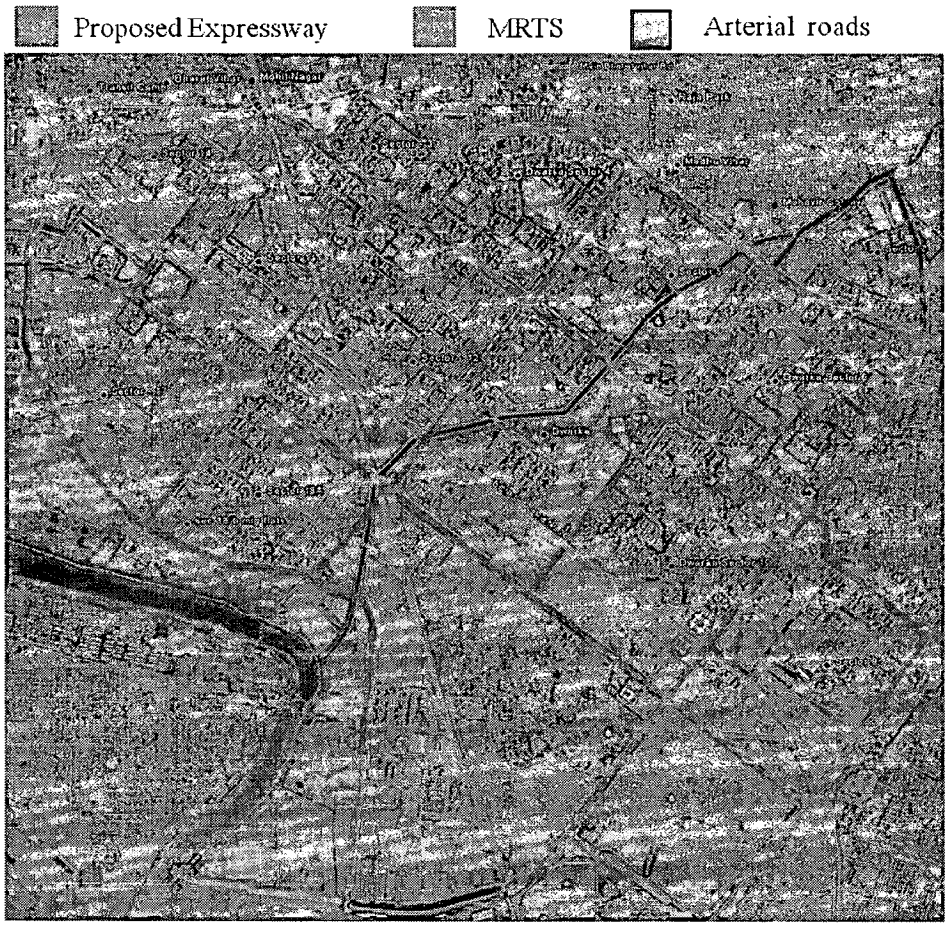


Figure 57 Plan of Dwarka

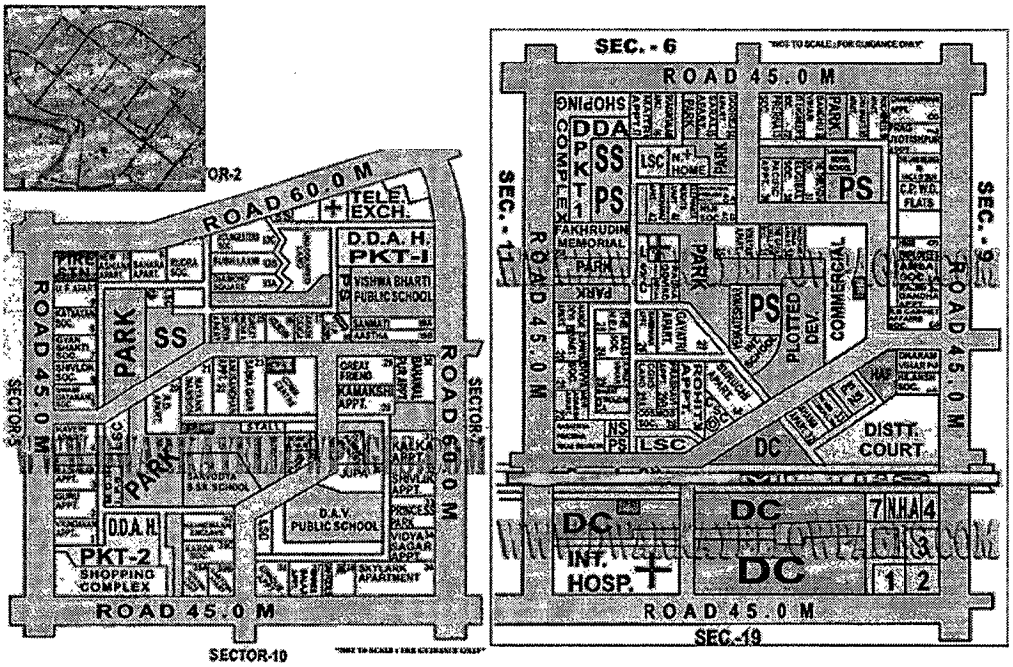


Figure 58 Plan of Sector 6 & Sector 10, Dwarka

5.3.8 Findings

- Geometry of city makes its identity.
- Basic concept of neighborhood planning is the accessibility to all activity areas within a walking distance those it decides the size of a sector.
- Social aspects gives the life to a neighborhood.
- Hierarchy of roads and activity areas from cluster level to neighborhood level to sector level and then to city level.
- Transport network & green spaces gives the form to a city.
- Safety of a city depends upon the pedestrian friendly corridors.
- Activities area which are frequently used like shopping complex, offices and public/ semipublic facilities along the MRTS corridor are easy to accessible & save spaces such as parking, traffic.

5.4. Town Planning in Social Context

- Planning of social services with regard to particular communities.
- Planning to reduce social inequality and improves quality of life.

5.4.1 Factors for Social Planning

1. Provision of social infrastructure

- Public facilities such as schools and medical centers cater for the basic needs of the citizens while others like sports facilities and community centers offer venues for holding different leisure activities.
- Special provisions to look after vulnerable groups such as disabled, elderly and children within a community.
- Open spaces and green areas provide buffer zones in crowded areas to facilitate social gathering and public interaction.
- Provision of accommodations for different socioeconomic groups.

2. **Availability of job opportunities**

- Employment provides incomes to the individuals and the working area offers a place for social contact and interaction.

3. **Accessibility**

- The people would like to be housed in areas with employment opportunities and facilities to participate in leisure and cultural activities for different family members in the proximity.
- The built environment – for example, the key services and facilities, the public transport routes, the provision for walking and cycling – can have an impact on the extent and nature of accessibility in a given place.

4. **Townscape design**

- Pedestrian- oriented streetscapes could encourage outdoor interaction among the citizens.
- Visual images of street furniture and pavement, and interconnectivity of street layouts have impacts on social sustainability of places.
- The citizens are more satisfied when the visual appearance is nice and building configurations in terms of density, height, mass and layout are properly designed.
- Local environmental quality

5. **Safety & Security**

- People prefer to stay in a safe and security place where thieves, burglars or vandals are absent.
- Heavy traffic provides danger for pedestrians and cyclists, as their presence increases the possibility of pedestrian-automobile collisions.

6. **Social equity**

- The concept of social equity has its foundations in social justice, distributive justice or 'fairness in the apportionment of resources', and equality of condition.

- The aspects of everyday life to which residents and users need equitable access. These include education and training, decent housing, public services, (social) infrastructure, green space, culture and recreation.
- Services and facilities most frequently used when locally provided are as follows:
    - Doctor
    - Post office
    - Chemist
    - Supermarket
    - Bank
    - Corner shop
    - Primary school
    - Restaurant/café
    - Library
    - Sports/recreation facility
    - Community centre
    - Facility for children
    - Public open/green space

7. Social Interaction

- Without social interaction, people living in a given area can only be described as a group of individuals living separate lives, with little sense of community or sense of pride or place attachment.
- Relationships between the urban form and social interaction relate to the density, layout and extent of mixed land uses in a street or neighbourhood.
- Economic or social activities such as shops, transportation and educational and religious facilities can be a meeting place for various age groups.
- High-density mixed-use streets with overlooking (flatted) residences are claimed to facilitate social interaction because of the increased range of people (and motivations) using the street over wholly residential ones.

8. Community Stability

- Alongside aims of supporting social capital (e.g. through good educational and community facilities) it is suggested by theorists and policy makers that a community requires well established, long-term residents in order to be described as sustainable.
- Resident mobility may be a symptom of the failure of a neighbourhood or community, exacerbated by low social cohesion or reduced feelings of attachment.

9. Pride/Sense of Place

- Sense of place can be achieved through carefully designing spaces and buildings and, for example, the retention of landmarks.
- A positive sense of attachment to a place is considered a dimension of social sustainability because it is an integral component of people's enjoyment of the neighbourhood in which they live.
- Pride/sense of place is closely related to the built environment, since it is claimed that such feelings can be affected by the perceived quality of a place. For example, if a place has high levels of litter and vandalism, this is likely to affect people's sense of attachment to somewhere that does not feel looked after.

10. Quality of society

- Adequate mass transport
- An attractive natural environment
- A variety of entertainment for all age groups
- Diversified, integrated land use patterns

5.4.2 Thematic areas of social sustainability

Dimension	Key theme area
Social	Access to resources
	Cultural promotion

	Education
	Elderly and aging
	Enabling knowledge management (including access to E-knowledge)
	Freedom
	Gender equity
	Happiness
	Health
	Identity of the community/civic pride
	Integration of newcomers (especially foreign in-migrants) and residents
	Justice and equality
	Leisure and sport facilities
	Quality of Life
	Security
	Skills development
	Social diversity and multiculturalism
	Well being
Socio-economic	Economic security
	Employment
	Informal activities/economy
Socio-environmental	Inclusive design
	Infrastructures
	Environmental Health
	Housing (quality and tenure mix)
	Transport
	Spatial/environmental inequalities

Table 14Thematic areas of social sustainability

5.4.3 Relationship of Social Planning with Urban form

- Urban form may be defined in terms of a number of distinct elements, including:
  - Size of city, city region or settlement, conventionally measured by population
  - Structural form within this region, whether monocentric, polycentric or linear

- The distribution of residential and job densities within this structure, in terms of the degree of concentration versus uniformity
- The density of residential development, which may be measured in various currencies including dwellings, rooms, floorspace or population per unit of area, with the a distinction between 'gross' and 'net' densities
- The configuration of local road networks
- The layout of housing units and blocks
- The predominant type of residential or other buildings, and in particular whether single or multifamily units and the typical height of buildings
- The mix of land uses, including the extent to which economic activities are separate from or intermixed with residential and the size and distribution of public open spaces, both green and paved.

5.4.4 Built Environment

Dimension	Definition
Density and intensity	Amount of activity in a given area
Land use mix	Promixity of different land uses
Street connectivity	Directness and availability of alternative routes through the network, Average block length
Street scale	Three-dimensional space along a street as bounded by buildings
Aesthetic qualities	Attractiveness and appeal of a place

Table 15 Relationship of Built Environment with social sustainability

CHAPTER 6 PROPOSAL FOR LAYOUT OF S.Z.1

6.1 Concepts

Context 1

- Najafgarh Census towards North, which is highly dense due to unplanned growth.
- This has to be integrate with new development but it should not be able to encroach the planned development

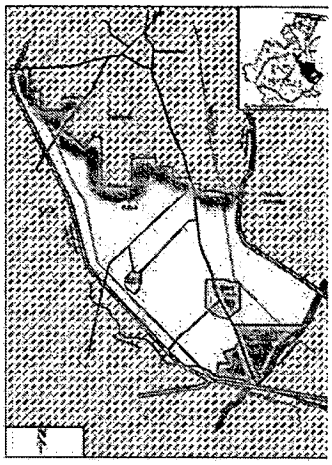


Figure 59 Context 1 for S.Z.1

Concept 1

- The integration is possible with the provision of social amenities, offices and green open spaces.
- Along the northern edge which is linear, a mixed high rise development is preferable.

Context 2

- CRPF land with training centers towards south bounded by about 120m wide najafgarh drain.
- The new development should not be planned so as to disturb the serenity of this area. Continuity of this area must be enjoyed by the urban system also.

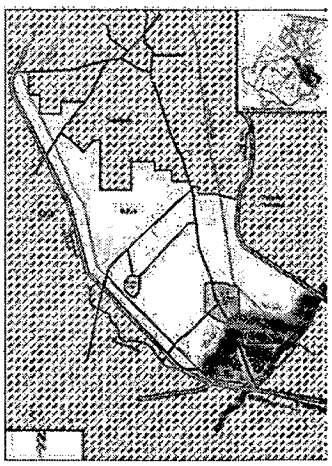


Figure 60 Context 2 for S.Z.1

Concept 2

- Educational institutions, stadium and sport complex are preferred around CRPF land so as to be in harmony with it.
- The land around drain can be conserved with biodiversity, this also act as a buffer space between new development and drain.

Context 3

- Two villages within the boundary of site surrounded by agriculture land which lack parks and social amenities.
- Character and sense of pride of villages should be maintained with the possibility of interaction between them & new development.

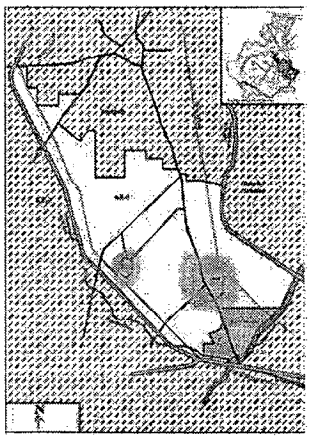


Figure 61 Context 3 for S.Z.1

Concept 3

- Provision of cultural spaces such as religious, galleries, museums, library, thematic gardens and parks give possibility of interaction and a character to town.
- Spaces surrounding to village can be utilized for providing social amenities and open spaces to recreate.

Context 4

- MRTS corridors with 80m row on the Eastern & Western edges, which are connecting NH10 to Gurgaon and South Delhi resp.
- Maximize the access to public transport, reducing the automobile dependency & hence better environmental quality.

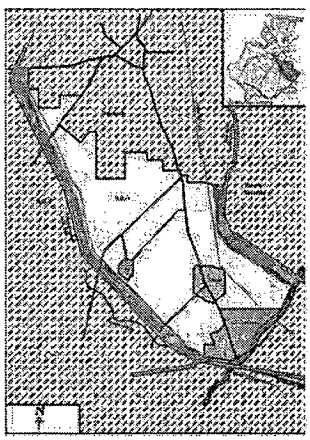


Figure 62 Context 4 for S.Z.1

Concept 4

- To encourage transit ridership & overcome the problem of dead space for parking, a high rise commercial mixed development is preferred along the MRTS corridor.
- Thus it gives more open spaces towards centre & this also gives variety of housing types.
- Two corridors must be connected within site for better permeability.

Context 5

- Existing roads which are passing through site are 7-12m wide connecting villages and najafgarh to gurgaon.
- New development has a provision of 30m, 45m & 60m wide roads.

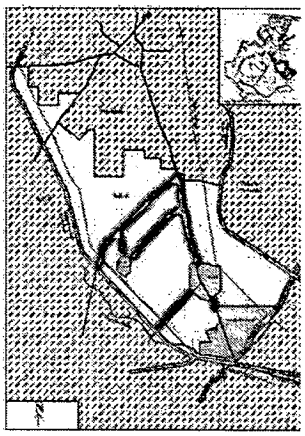


Figure 63 Context 5 for S.Z.1

Concept 5

- If development will be done in a new way then the roads should also be planned according to that. Thus, there will be wastage of resources in widening the existing roads & planning according to that. Example: Ropad road was vanished while planning the chandigarh.
- The roads should be provided to connect the routes to MRTS corridor which also encourage the use of public transport.

6.2 Conceptual Sketch

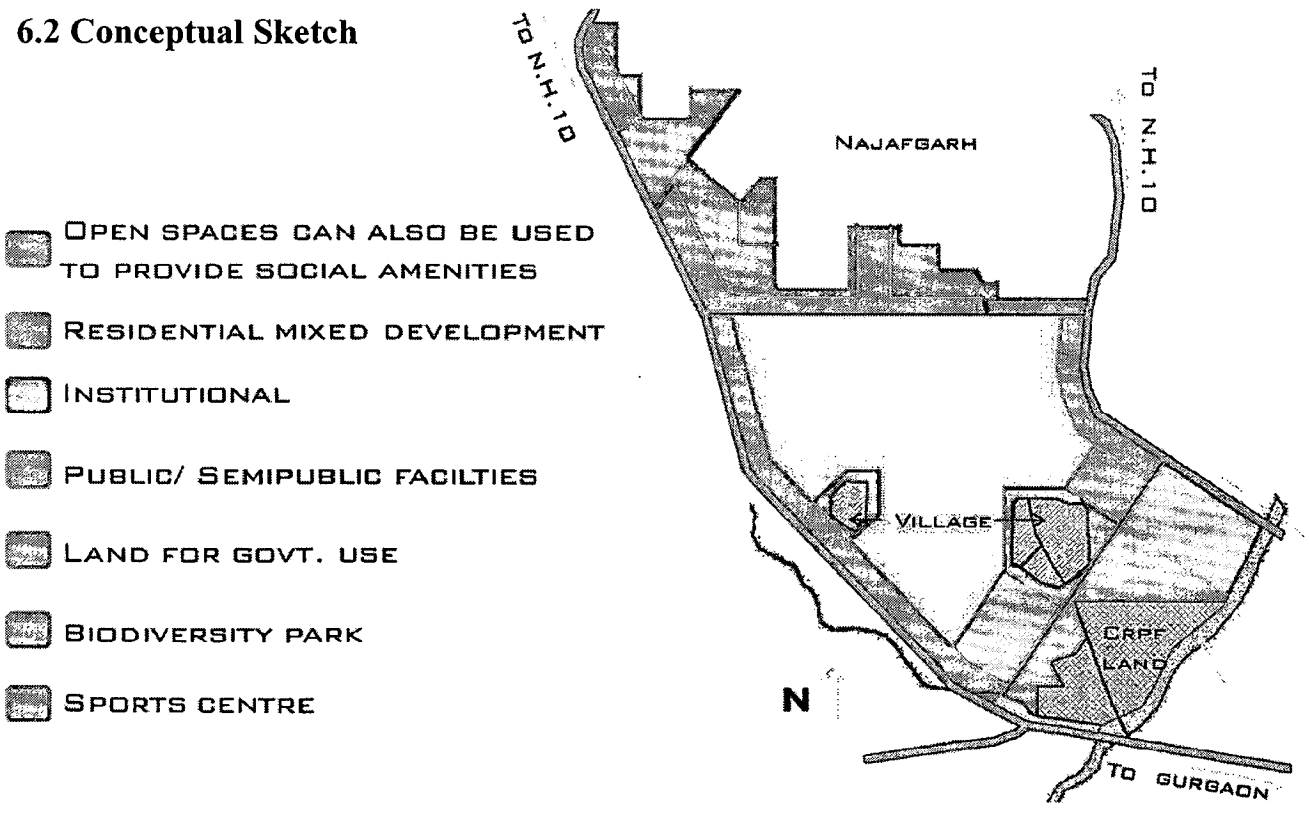


Figure 64 Conceptual sketch for S.Z.1

6.3 Evolution of Grids in S.Z.1

As 500m is the comfortable travel distance for pedestrian, thus here the size of grid is taken as 800m x 800m. The area is divided into 10 residential blocks and arranged in a pattern for a simple traffic circulation.

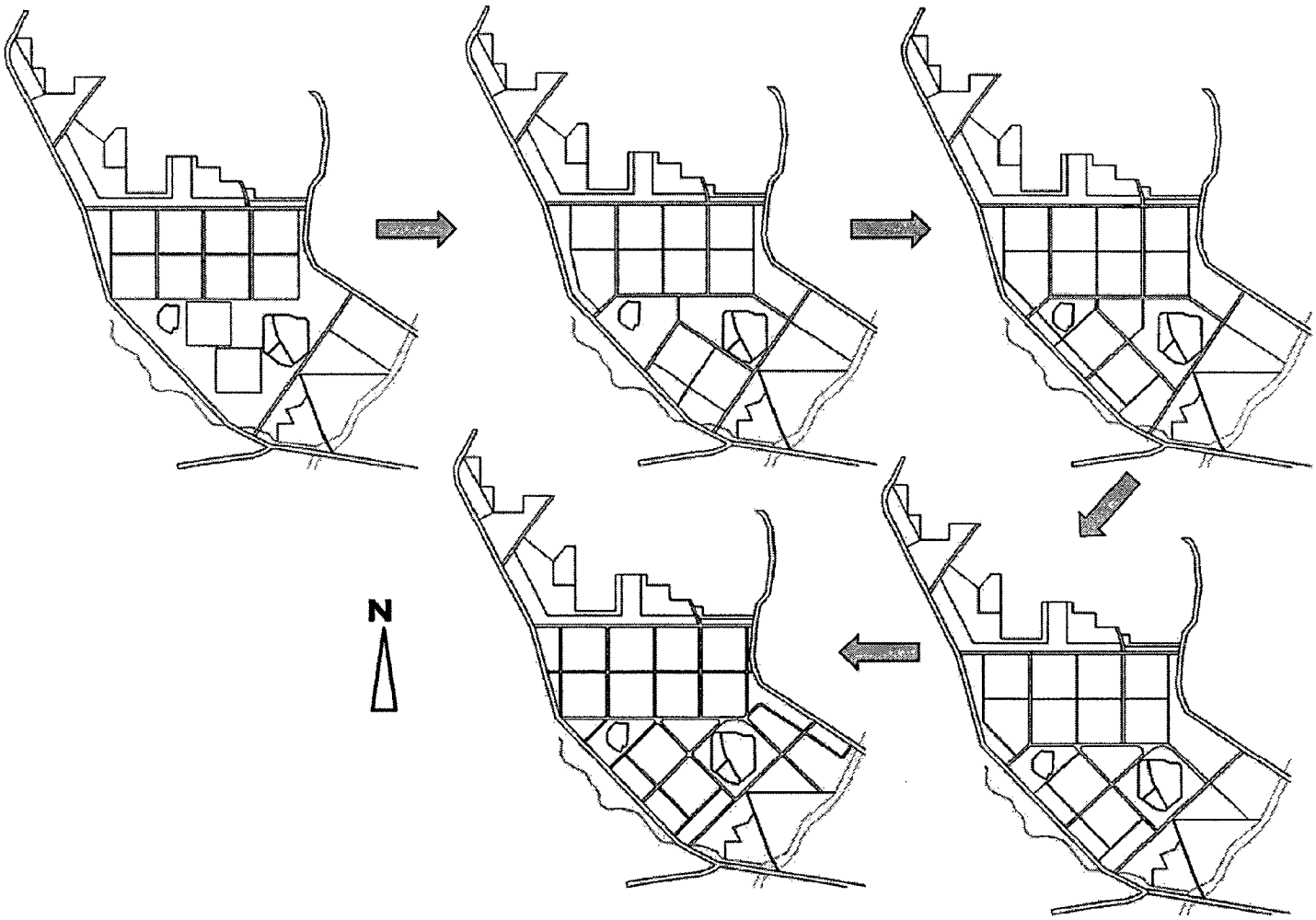


Figure 65 Evolution of grid pattern in S.Z.1

6.4 Layout of Use Zones in S.Z.1

On the basis of concepts evolved earlier, the layout of S.Z. 1 is proposed for the population of about 4,25,000 on a land of 1700 Ha.

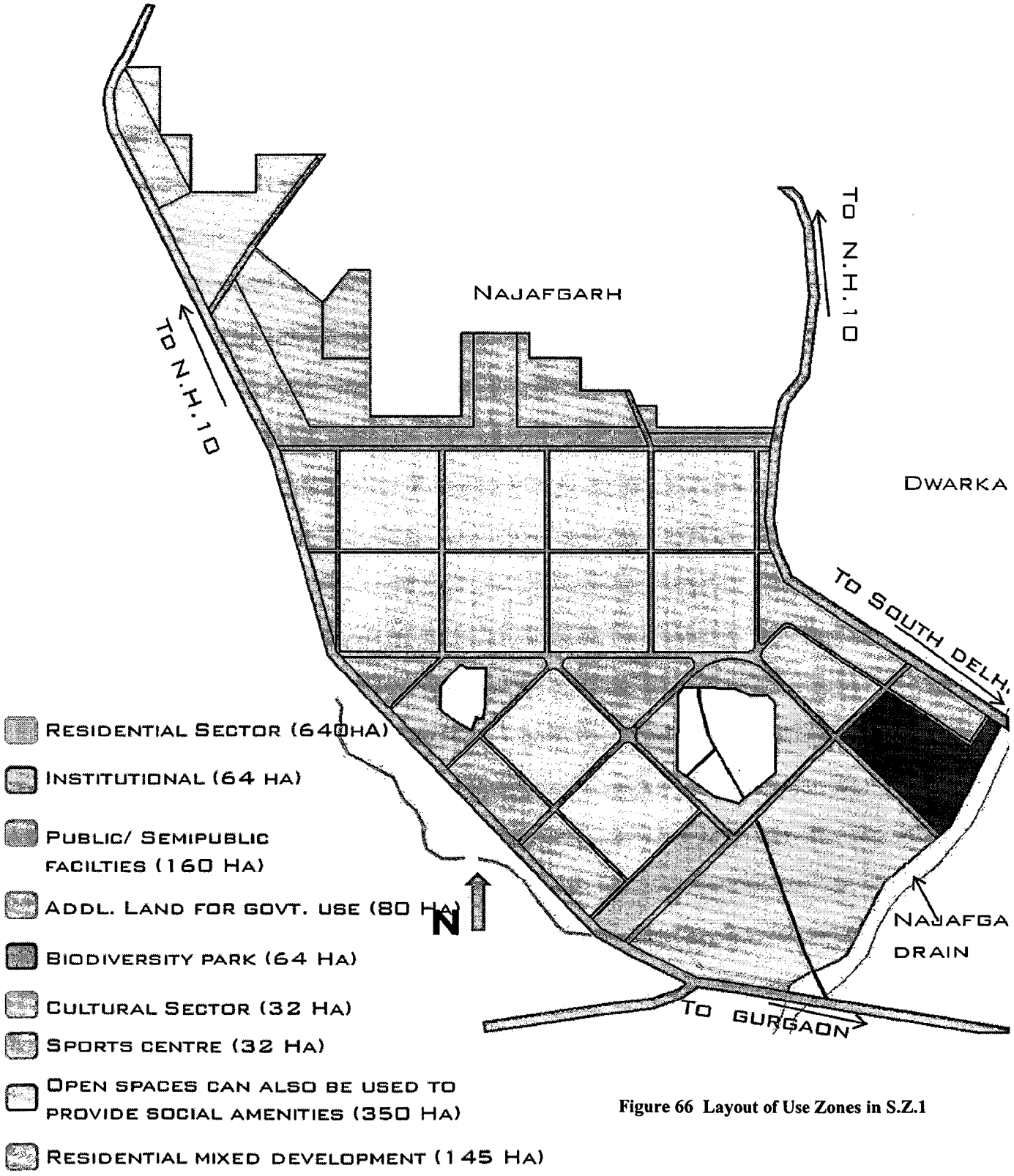


Figure 66 Layout of Use Zones in S.Z.1

CHAPTER 7 PROPOSAL OF LAYOUT ON THE BASIS OF ZONAL PLAN

7.1 Zonal Plan Proposals for S.Z.1

Area of SZ1---- 1700 Ha (approx.)

Gross Density --- 250 PPHa. (ZDP)

Population---- 4,25,000 (approx.)

Residential Area--- 1040 Ha (approx.)

Resi. Density --- 425000/1040 = 409 PPHa

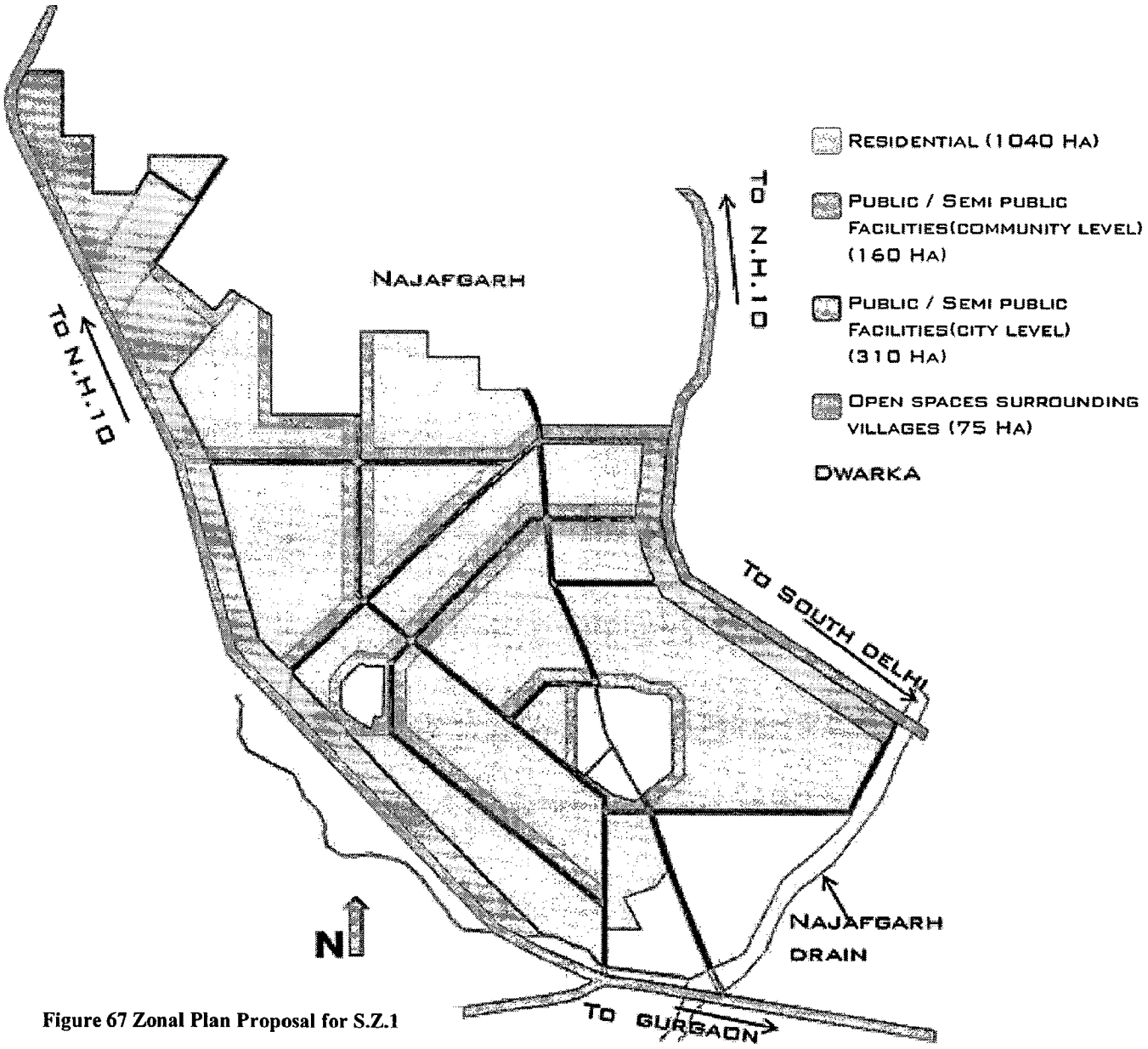


Figure 67 Zonal Plan Proposal for S.Z.1

7.2 Project Area

Residential Density --- 409 PPHa

Residential Area --- 160 Ha

Popuation--- 409x160 = 65,440

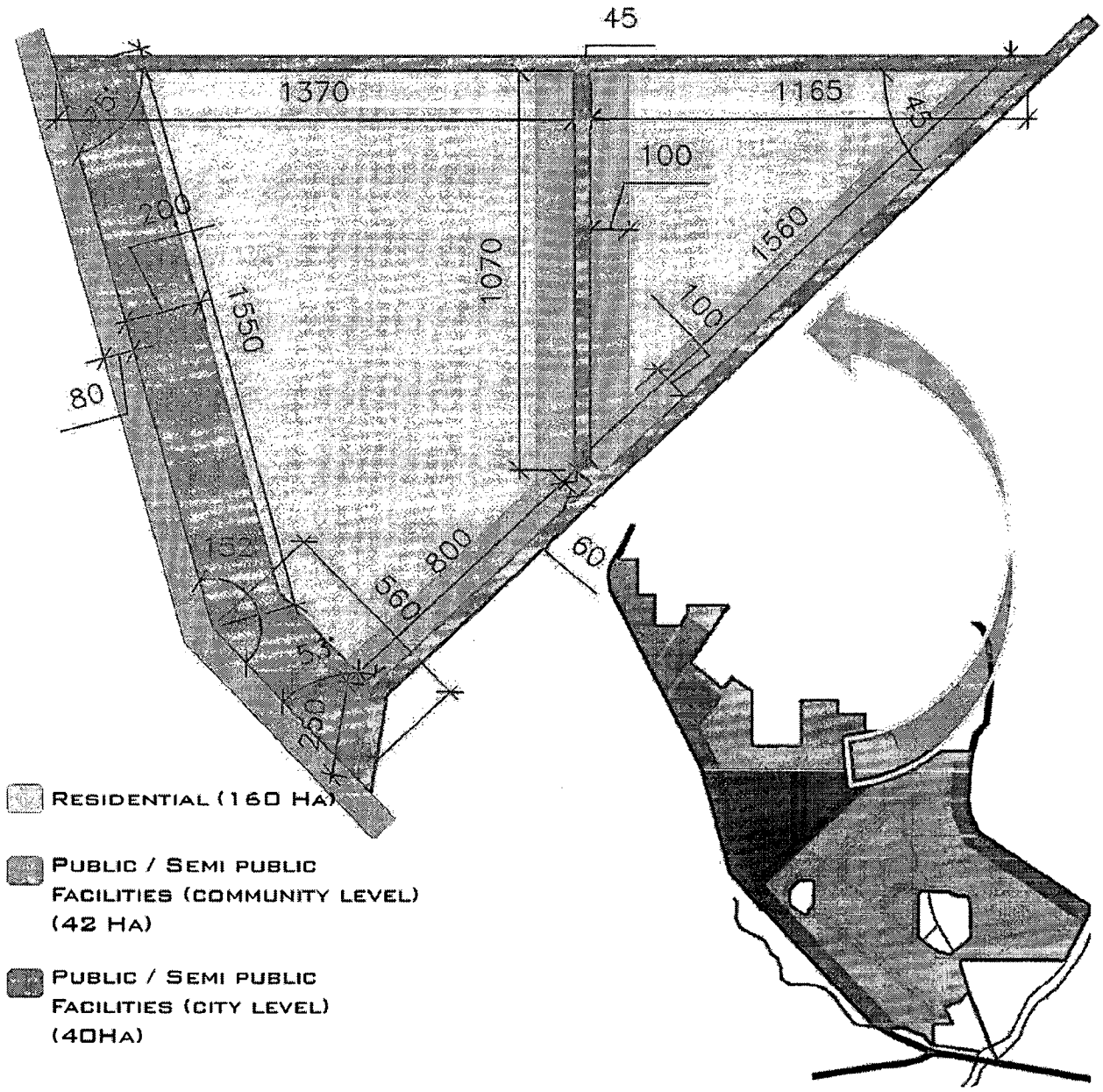


Figure 68 Project Area

7.3 Requirement of Housing in Project Area

- Population = 65,400 Persons
- Avg. Size of D.U. = 4.5Persons
- No. of D.U. = 65400/4.5 = 14,535 D.U.
- Housing types – Plotted Housing
  Group Housing
  Mixed Housing
- Housing (MPD 2021) – 35% D.U. of Group Housing for EWS and 50 % with avg. plinth area of 25sq.m. to 40sq.m.

- **Plotted Housing**

S.No.	Area of Plot(sq. m)	Max. G.C.%	FAR	No. of DUs	Front Setback	Height
1	Below 50	90	350	3	0	15m
2	Above 50 to100	90	350	4	0	15m
3	Above 100 to250	90	300	4	3m	15m

Table 16 Norms for Plotted Housing as per MPD 2021

- **Group Housing**

- Minimum size of plot ---- 3000 sq. m.
- Maximum Ground Coverage---- 33.3%
- Maximum FAR --- 167
- Height---- N.R.
- Parking --- 2.0 ECS/100sq.m. floor area

S.No.	Area of D.U. (sq. m)	Density (DU/Ha)
1	Below 30 (EWS housing)	600
2	Above 30 to 40	500
3	Above 40 to 80	250
4	Above 80	175

Table 17 Norms for Group Housing as per MPD 2021

- **Mixed Housing**
- Retail Shops on Ground Floor
- Public / Semipublic activities facing minimum 13.5m ROW.

7.4 Planning Standards for residential facilities as per MPD 2021

Level	Facilities/Utilities	Area in sq.m			Accessibility limit
		No	Per Unit	Total	
Housing cluster population up to 5000	1.Convenience shopping	1	1000	1000	200m.
	3. Tot lots	20	125	2500	150m.
	4.Housing Area Park	1	5000	5000	200m.
	5. Anganwari	1	250	250	200m.
	6.Milk Booth	5	15	75	200m.
Level	Facilities/ Utilities	Area in sq.m			Accessibility limit
		No	Per unit	Total	
Neighborhood Population-10,000	1.Primary school	1	2000	2000	250m.
	2.Senior secondary school	1	6000	6000	400m.
	3.Dispensary	1	1000	1000	400m.

	4.Religious Buildings	2	400	800	300m.
	5.Electric sub station	1	1200	1200	400m.
	6.Community Center	1	1000	1000	400m.
	7.Local Shopping	1	3000	3000	400m.
	8.Service Market	1	2000	2000	400m.
	9. Informal Market	1	1000	1000	400m.
	10.Auto/ Taxi stand	1	400	400	400m.
	11. U.G. water tank	1	2000	2000	400m.
	12. Sewage pump station	1	500	500	400m.
	13. Dalao	1	200	200	400m.
	14.Neighborhood park	1	5000	5000	400m.
	15. Neighborhood play ground	1	5000	5000	400m.
Level	Facilities	Area in sq.m.			Accessibility limit
		No	Per unit	Total	
Sector Population- 30,000 to 50,000	1.Junior College	1	15000	15000	800m.
	2.Special school	1	10000	10000	500m.
	3.Nusing home	1	2000	2000	400m.
	4.Religious building	2	2500	5000	300m.
	5.Electric sub station	1	2500	2500	400m.
	6.Banquet hall	1	2000	2000	400m.
	7.Public/Govt. Buildings	1	5000	5000	400m.

	8.Recreational Club	1	2500	2500	400m.
	9.Sector shoping	1	10000	10000	400m.
	10.Service Market	1	5000	5000	400m.
	11.Informal Market		5000	5000	400m.
	12.Rikshaw Stand	1	1000	1000	400m.
	13.Bore well/U.G. tank	1	2000	2000	400m.
	14.Sewage pump station	1	10000	10000	400m.
	15. site of vermi compost	1	1000	1000	400m.
	16.Sector park	1	20000	20000	400m.
	17.Sector play ground	1	10000	10000	400m.

Table 18 Planning standards for residential facilities as per MPD 2021

7.5 Area calculations for Residences

- For Neighborhood of 9,000 Population the area needed for facilities = 20,000 sq.m.
- For Sector of 35,000 Population the area needed for facilities = 80,000 sq.m.
- Thus, Maximum area requirement for facilities for 65,500 population would be

  = (7x20000) + (2x80000) = 3,00,000 sq.m. = 30 Ha.
- This gives the net residential area including roads = 160-30 = 130 ha.
- Net residential area including roads = 130 ha.
- Net residential density = 65500/130 = 504 ha.
- Population = 65,500 Persons
- Avg. Size of D.U. = 4.5Persons
- No. of D.U. = 65500/4.5 = 14,556 D.U.

7.5.1 Calculations for Finding Net Residential Density

- Assuming 75% Group housing and 25% Plotted housing gives
  - No. of D.U. for Group housing = 0.75 x 14556 = 10917 D.U.

- And the no. of D.U. for Plotted housing=14556 - 10917 = 3639 D.U.

Area calculations for Group Housing

- 35% of Group housing would be for EWS housing = 35% of 10917 = .35 x 10917 = 3821
- Assuming 20% of Group housing for Above 30 to 40 sq.m., 25% for Above 40 to 80 sq.m.of House and 20% of Group housing for Above 80 sq.m.of House.
- No. of Total D.U. for Group Housing = 10917

S.No.	Area of D.U. (sq. m)	(A) Density (DU/Ha)	(B) Percentage of Housing	(C=B of 10917) No. of D.U.	(D=C/A) Area (Ha.)
1	Below 30 (EWS housing)	600	35 %	3821	6.4
2	Above 30 to 40	500	20 %	2183	4.4
3	Above 40 to 80	250	25 %	2730	10.9
4	Above 80	175	20%	2183	12.5
Total			100 %	10917	**34.2**

Table 19 Area calculations for Group Housing

- **Maximum F.A.R.** = 167

  (Total Floor Area / Area of land) x100 = 167

  Total floor Area = 34.2 Ha (From D)

  Thus, Area of Land for Group Housing = (34.2 / 167) x 100 = 20.5 Ha.

  20.5 Ha of land is needed for 10917 D.U. in Group Housing

  This gives the net residential density for Group Housing = 10917 / 20.5

  = 533 D.U./Ha. = **2400 PPHa**

- **Parking** ---2.0 ECS/100sq.m. floor area

  Total floor area = 34.2 Ha. = 3,42,000 sq.m.

  Parking reqd. = 342000 x 2 / 100 = 6840 ECS

1 E.C.S. reqd. 32sq.m. of area as per NBC norms

Thus, the area for parking =32 x 6840 = 22 Ha

Area calculations for plotted Development

- No. of D.U. for Plotted housing=14556 - 10917 = 3639 D.U.
- Assuming 50% of plots for Below 40 sq.m. of D.U., 40% for Above 40 to100 sq.m. of DU and 10% for above 100 sq.m. to 250 sq.m. of D.U.

Area of Plot (sq. m)	(A) No. of DU per plot	(B) Percentage of plots	(C = B% of 3639) Total No. of DU	(D=C/A) Total no. of Plots reqd.	(E) Avg. Area of Plot (Sq.m.)	(F=DxE) Area reqd. for plots (Ha)
Below 40	3	50%	1820	607	30	1.8
Above 40 to 100	4	40%	1456	364	70	2.6
Above 100 to 250	4	10%	363	91	175	1.6
Total			3639	1062		**6**

Table 20 Area calculations for Plotted Development

So, 6 Ha. plot area needed for 3639 D.U. i,e. for 3639 x 4.5 = 16375 persons

This will give 4 housing clusters

Area of one cluster excluding roads & housing is 8000 sq.m. (as per MPD 2021)

Area of 4 clusters excluding roads & housing = 8000 x 4 = 32000 sq.m. = 3.2 Ha.

So, Area of 3639 DU for plotted housing excluding roads = 6 +3.2 = 9.2 Ha.

Keeping 15 % area for circulation within residential cluster

Thus, Area of a residential cluster for 3639 D.U. = 9.2 + 1.4 = 10.6 Ha.

Say, 12 Ha. of land needed for 3639 D.U in plotted housing

This gives the net residential density for Plotted Housing = 3639 / 12 = 303 DU/Ha = **1400 PPHa**

7.5.2 Area calculations for finding Residential Density

- For the total no. of D.U. = 14,556
- Net Residential area

  Group Housing = 20.5 Ha.

  Plotted Development = 12 Ha.

  Total = 32.5 Ha.

Study 1- Considering Rohini as a study plan for finding the area requirement of residential area than the land use distribution for residential area is as follows:

Distribution of residential area	Percentage
Net Residential Pocket	54.78
Commercial	6.30
Educational	8.76
Parks	16.52
Circulation	13.64
Total	100

Table 21 Land Use distribution in Residential area of Rohini

This gives about 55% of net residential pocket in a residential area.

Study 2 – Considering Dwarka sector 6 as a study plan for finding the area requirement than the land use distribution for sector 6 is as follows:

Sector level Land Use	Area (Ha.)
Net residential	41.10
Commercial	1.56
Public/Semi public	11.63
Utility	0.54
Recreation	12.51
Transportation	10.27
Total	77.61

Table 22 Land Use distribution in Residential area of Dwarka

This gives about 53% of net residential pocket in a residential area

7.5.3 Finding

- The study shows that the net residential pocket is sharing an area of about 53%-55% of residential area.
- Now considering 54% of net residential pocket in a residential area gives an area of residential when the area of net residential pocket would be 32.5 Ha= 32.5/54 x 100 = 60.2 Ha
  - Hence, the study shows that to accommodate 14,556 D.U. the residential area needed 60.2 Ha.
  - This gives the residential density = 14556/60.2 = 241.8 D.U / Ha.
    = 1088 PPHa. say **1000 PPHa.**
  - So, for the project area where 160Ha is residential area the density would be 1000 PPHa
  - Hence, this area will accommodate = 1000 x 160 = 1,60,000 population.

7.6 Calculations for size of Residential Sector

- Keeping Size of Residential sector = 32000 – 40000 persons
- Gives no. of Residential sectors = 160000/32000 to 160000/40000 = 5 to 4
- Thus, no. of Residential sectors = 4
- Size of a Residential sector = 160000/4 =40000 persons
- No. of Neighbourhoods in Residential sector = 4
- Size of Neighbourhood = 38000/4 = 9500 persons

7.7 Final Data

- Therefore, the actual calculations would be according to this data:-
  - Residential Area = 160 Ha.
  - Population = 1,60,000
  - Residential Density = 1000 PPHa.
  - Net Residential density for Group housing = 2400 PPHa.
  - Net Residential density for plotted housing = 1400 PPHa.
  - Number of residential sectors = 4
  - Size of a residential sector = 40000 persons

7.8 Requirement of Infrastructure for layout of project area

A. **Educational & Health Care Facilities**					
Primary to Secondary Education	**Types of building**	**Requirements**	**Total nos.**	**Area required (ha)**	
				Per Unit	**Total**
	Primary school / Middle school	1 for 5000 pop.	32	0.2	6.4
	Sr. Secondary School	1 for 10,000 pop.	16	0.6	9.6
	School for Mentally / Physically challenged	1 for 1,00,000 pop.	2	0.2	0.4
Technical Education	Vocational Training Centre	1 for 5 lakh pop.	1	0.4	0.4
Health Care Facilities	Hospital B (201 beds to 500 beds)	1 for 2,50,000 pop.	1	2.5	2.5
	Hospital C (101 beds to 200 beds)	1 for 1,00,000 pop.	2	1	2
	Hospital D (Upto 100 beds)	1 for 1,00,000 pop.	2	0.5	1
	a. i) Maternity Home (Upto 50 beds) ii) Nursing Home/ Polyclinic/ Dispensary (Upto 50 beds)	1 for50,000 pop.	3	0.2	0.6
Health Care Facilities	b. i) Family Welfare Centre ii) Pediatric Centre iii) Geriatric Centre iv) Diagnostic Centre.	1 for50,000 pop.	3	0.08	0.24
	Dispensary for pet animals and birds	1 for 1, 00,000 pop.	2	0.03	0.06

B. Socio - Cultural Facilities				
Types of services	**Requirements**	**Total nos.**	**Area required (ha)**	
			Per facility	**Total**
Multipurpose Community Hall	1 for 10,000 pop.	16	0.2	3.2
Banquet Hall	1 for 1, 00, 000 pop.	2	0.08	0.16
Recreational club	1 for 1, 00, 000 pop.	2	0.2	0.4
Music, dance & spiritual center	1 for 1, 00, 000 pop.	2	0.1	0.2
Religious	1 for 5,000 pop.	32	0.04	1.28
C. Distribution Services				
Types of services	**Requirements**	**Total nos.**	**Area required (ha)**	
			Per service	**Total**
Petrol pump	1 per 150 ha of gross residential area	1	0.05	.05
	1 in each community center	2	0.03	0.06
Milk distribution	1 booth for 5000 pop.	32	0.005	0.16
LPG Godowns	3 for 1 lakh pop	5	0.05	0.25
D. Police & Other services				
Types of services	**Requirements**	**Total nos.**	**Area required (ha)**	
			Per service	**Total**
Police post	1 for 1 lakh pop.	2	0.1	0.2
Post office	1 for 15,000 pop.	10	0.01	0.1

Auto/ Taxi stand	1 for 15,000 pop.	10	0.05	0.5
Bus terminal	1 for 1 lakh pop.	1	0.4	0.4
E. Recreational Facilities				
Types	**Requirements**	**Total nos.**	**Area required (ha)**	
			Per unit	**Total**
Community Park	1 for 1 lakh pop.	1	5	5
Neighbourhood Park	1 for 10,000 pop.	16	1	16
Housing Area Park	1 for 5,000 pop.	32	0.5	16
Community Multipurpose Ground	1 for 1 lakh pop.	1	2	2
Community Sports Centre	1 for 1 lakh pop.	1	3	3
F. Commercial Facilities				
Commercial centers	**Requirements**	**Total nos.**	**Area required (ha)**	
			Per unit	**Total**
Community center	1 for 1 lakh pop.	2	5.4	10.8
Local shopping center	1 for 15,000 pop.	10	0.46	4.6
Convenience shopping center	1 for 5,000 pop.	32	0.11	3.52
Total	92.08			

Table 23 Requirement of Infrastructure for layout of project area

7.9 Division of Facilities according to Land Uses as per ZDP of Zone L

1. **Public & Semi public facility corridor (city level)**
    - Vocational Training Centre
    - Hospital B (201 beds to 500 beds)
    - Petrol pump
    - Bus terminal
    - Community Sports Center
    - Community Park
    - Community Multipurpose Ground
    - Car Parking
    - Community center
        - Banks & offices
        - Shopping mall cum multiplex
        - Showrooms
        - Retail shopping
        - Thematic shopping
        - Fast food centers
        - Restaurants
        - Hotels
        - Open air theatre
        - Museum / Art Gallery
        - Residences

2. **Public & Semi public facility corridor (community level)**
    - Sr. Secondary School
    - School for Mentally / Physically challenged
    - Hospital C (101 beds to 200 beds)
    - Hospital D (Upto 100 beds)
    - Maternity Home, nursing home & other Health Care Facilities

- Veterinary dispensary
- Banquet Hall
- Recreational club
- Art, Dance, Music & Yoga Centers
- Library
- LPG Godown
- Police post
- Post office
- Auto/ Taxi stand
- Parks
- Nursery
- Sports facilities
- Shopping center
- Showrooms
- Informal market
- Banks & Offices
- Religious building
- Guest House
- ~~Residences~~
- Parking

3. Residential

- Primary school
- Sr. Secondary school
- Dispensary
- Community hall
- Religious building
- Parks
- Sports facilities
- Local shopping

- Informal market
- Service market
- Infrastructure Services
- Residences
- Parkings

7.10 Suggested Guidelines for the layout

- **Building Design**
  - Building should be universally accessible.
  - Energy efficiency of building should be based on the understanding of local climate, solar path, wind direction and vegetation so that there would be the provision of proper day lighting, natural ventilation for comfortable & healthy living.
  - Provision of courtyards & open spaces for plants and users within site.
  - Intelligent building systems, Green building or any innovative building technology can be used.
  - Building material & technology should not harm the environment.
  - Building should be structurally safe to be able to with stand with disaster.
  - Effective fire safety should be provided within premise.
  - Provision of adequate parking within site for users.
  - Drainage system of building should ecological by providing rain water harvesting or water runoff to plants & vegetation.
  - Assessment of life cycle cost of building including cost of site, project development, construction, maintenance & energy requirements.
  - Assessment of building's life time impact on the environment including consumption of energy for production of building materials used, disposal, waste generation, energy requirement and regeneration & recycle of energy by building.

- **Urban Design**
  - Boundary treatment of new development with existing should be a secured edge and an integrated public space through provision of public amenities, green urban spaces and roads.
  - New development should respond to the existing character of the surrounding building through its form, scale and massing.
  - Layout of streets within neighbourhood should be permeable, legible & safe.
  - Taller building should not overshadow the south elevation.
  - Creation of visual connections through axial movement and focal points that can make identity to the society.
  - Human scale of development should be maintained through a comfortable street enclosure.
  - Control of traffic speed through street layout rather than by speed humps.

- **Transport**
  - Safe, comfortable & enjoyable routes for pedestrians & cyclist at neighbourhood & at public spaces.
  - Access to all facilities should be within a walking distance.
  - New transport connections should integrate with the existing roads.
  - Encouraging sustainable mode of transport through High density / compact settlement pattern along public transport routes that also supports walking & cycling and reduce reliance on car.
  - Time travel should be reduced by providing commercial, employment & community facility within close proximity.

- **Energy**
  - Impact of urban runoff should be reduced through sustainable urban drainage system.
  - Water management should be planned so that used water is recycled & reused as many times as possible.

- Provision of trees along buildings & streets which act as buffer, sun trappers and protect from cold winter.

- **Social sustainability**
  - Neighbourhood should inclusive for variety of people, facilities, amenities & housings for balanced & sustainable community.
  - Diverse public spaces should be provided so that every member of society can use them.
  - Layout should clearly distinct the public, communal & private spaces by providing inevitable access to public spaces and preventing to enter at communal or private spaces.
  - Recognizable features like landmarks, public buildings or a landscape space which feels attachment to people should be provided so as to help easily locate the place also.
  - Outdoor elements like foot paths, streets, parks & public spaces should provide opportunities to improve integration between different places, spaces and buildings.

7.11 Concept and criteria for Layout

Concept 1
Design to the maximum holding capacity provided with open spaces.
Criteria 1
Accommodate more population into group housing

Concept 2
Relationship of Geometry of community with sectors
Criteria 2
Division of triangular site into triangular sectors so that circulation follows axis

Concept 3
Pedestrian friendly community

Criteria 3

Provision of 6m wide cycle, rickshaw & non motorised vehicle track with 2 m wide belt for trees on both sides of 80m & 45m wide roads.

Concept 4

Reduce dependency on cars & traffic movement

Criteria 4

Bus terminal, community centres and community level facilities along 80m wide MRTS corridor, so that people have car in their house and come to their workplace & shopping centres through public transport.

Concept 5

Connection of Residences to MRTS with shortest route.

Criteria 5

Provision of 30m wide sub arterial road connecting triangular sectors by crossing thorough it and have alternative shortest routes, which makes sectors more permeable.

Denser sites near to MRTS corridor.

Concept 6

Minimum circulation within sector

Criteria 6

Group housings along the 45m wide sector roads and internal spaces for neighbourhood facilities & plotted housing.

As the perimeter of triangle is more and less area. Thus more number of group housing can be accommodated along road.

Concept 7

Walkable neighbourhood

Criteria 7

Provision of sector facilities along the edges as well as within the sector in such a way to have maximum walkable distance would be 400m and people have more choices within close proximity.

Concept 8

Pedestrian safety within neighbourhood

Criteria 8

Provision of parks or pedestrian routes along housing.

Concept 9

Efficient use of street space

Criteria 9

Provision of adequate mixed along street & informal market on 20 m wide street.

Concept 10

Enjoyable and economically viable commercial complex

Criteria 10

Provision of commercial complex around triangular junction with traffic movement through underpass so that space would become an enclosed piazza and parks on the other side of complex thus it attract more number of people.

Concept 11

Visual connectivity and accessibility

Criteria 11

Connection of sectors with arterial as well as sub arterial road and also visual connection within sector through streets, green & open spaces.

Concept 12

Legibility of streets

Criteria 12

Specific streets for its use as provision of group housing along arterial streets, commercial complex around junctions, 30m wide roads passes through mixed housing & neighbourhood facilities with openings for some group housing, 20m wide street for informal market & mixed housings and connection of housings, parks & neighbourhood facilities with 8 to 12 m wide street.

Concept 13

Provision for proper utilities

Criteria 13

Same slope with same route towards MRTS for sewerage & drainage having no major connections on junctions.

7.12 Area statement for layout proposed

S.No.	Use Premises	Area (Ha)	Size of D.U.	Density (PPHa)	No. of D.U.	Population
Sector 1						
1	ISBT	1.1				
2	Parking	2.8				
3	Community Centre	9.3				
4	Petrol Pump	0.04				
5	Community Park	5				
6	Sports Centre	2.9				
7	Hospital C	1				
8	Group Housing 1	1.2	4.5	2400	640	2880
9	Group Housing 2	3.75	4.5	2400	2000	9000
10	Group Housing 3	2.5	4.5	2400	1333	6000
11	Group Housing 4	3.75	4.5	2400	2000	9000
12	Group Housing 5	1.9	4.5	2400	1013	4560
13	Group Housing 6	1.9	4.5	2400	1013	4560
14	Group Housing 7	2.3	4.5	2400	1227	5520
15	Group Housing 8	2.3	4.5	2400	1227	5520
16	Group Housing 9	2.3	4.5	2400	1227	5520
17	Plotted Housing	1.35	4.5		900	4050
18	Sr. Sec. School	3.5				
19	Primary School	1.2				
20	Institutions	1				
21	Local Shopping Centre	1.1				
22	Infrastructre Services	0.5				
23	Parks	7.2				
24	Roads	10.01				
	Total	**70**				**56610**

Sector 2						
25	Group Housing 10	2.8	4.5	2400	1493	6720
26	Group Housing 11	1.4	4.5	2400	747	3360
27	Group Housing 12	1.2	4.5	2400	640	2880
28	Group Housing 13	1.3	4.5	2400	693	3120
29	Group Housing 14	2.1	4.5	2400	1120	5040
30	Group Housing 15	0.9	4.5	2400	480	2160
31	Group Housing 16	2	4.5	2400	1067	4800
32	Group Housing 17	0.9	4.5	2400	480	2160
33	Group Housing 18	1.4	4.5	2400	747	3360
34	Group Housing 19	1.1	4.5	2400	587	2640
35	Group Housing 20	1	4.5	2400	480	2160
36	Plotted Housing	1.5	4.5		1000	4500
37	Sr. Sec. School	2.7				
38	Primary School	1.3				
39	Institutions	1				
40	Local Shopping Centre	1.1				
41	Commercial Complex	1.1				
42	Infrastructure Services	0.7				
43	Parks	7.5				
44	Roads	7				
	Total	**40**				**42900**
Sector 3						
45	Hospital D	0.7				
46	Special School	0.25				
47	Group Housing 21	4.5	4.5	2400	2400	10800
48	Group Housing 22	2.9	4.5	2400	1547	6960

49	Group Housing 23	2.9	4.5	2400	1547	6960
50	Group Housing 24	2.9	4.5	2400	1547	6960
51	Group Housing 25	2.9	4.5	2400	1547	6960
52	Group Housing 26	4.9	4.5	2400	2613	11760
53	Group Housing 27	2.9	4.5	2400	1547	6960
54	Group Housing 28	2.9	4.5	2400	1547	6960
55	Plotted Housing	1.7	4.5		1100	4950
56	Sr. Sec. School	3.2				
57	Primary School	1.4				
58	Institutions	0.8				
59	Local Shopping Centre	0.9				
60	Commercial Complex	4.5				
61	Infrastructure Services	0.3				
62	Parks	11				
63	Roads	13.5				
	Total	**65**				**69270**
Sector 4						
64	Hospital B	5				
65	Vocational Training Centre	0.4				
66	Parking	1.6				
67	Community Centre	7.8				
68	Community Multipurpose Ground	3				
69	Hospital C	1.2				
70	Special School	0.35				
71	Group Housing 29	1.85	4.5	2400	987	4440
72	Group Housing 30	4.2	4.5	2400	2240	10080

73	Group Housing 31	2.28	4.5	2400	1216	5472
74	Group Housing 32	2.28	4.5	2400	1216	5472
75	Group Housing 33	2.6	4.5	2400	1387	6240
76	Group Housing 34	1.6	4.5	2400	853	3840
77	Group Housing 35	2.25	4.5	2400	1200	5400
78	Group Housing 36	1	4.5	2400	373	1680
79	Plotted Housing	1.8	4.5		1200	5400
80	Sr. Sec. School	2.8				
81	Primary School	1				
82	Institutions	0.8				
83	Local Shopping Centre	1				
84	Commercial Complex	1.99				
86	Infrastructure Services	0.4				
87	Parks	8.5				
88	Roads	11.3				
	Total	**65**				**48024**
Total		**240**				**2,16,804**

Table 24 Area statement for layout proposed

7.13 Land use breakup for layout proposed

S.No.	Land use	area	Percentage %
1	Residential	90	37
2	Public / Semi-public	70	29
3	open spaces	40	17
4	Circulation	40	17
	Total	240	100

Table 25 Land use breakup for layout proposed

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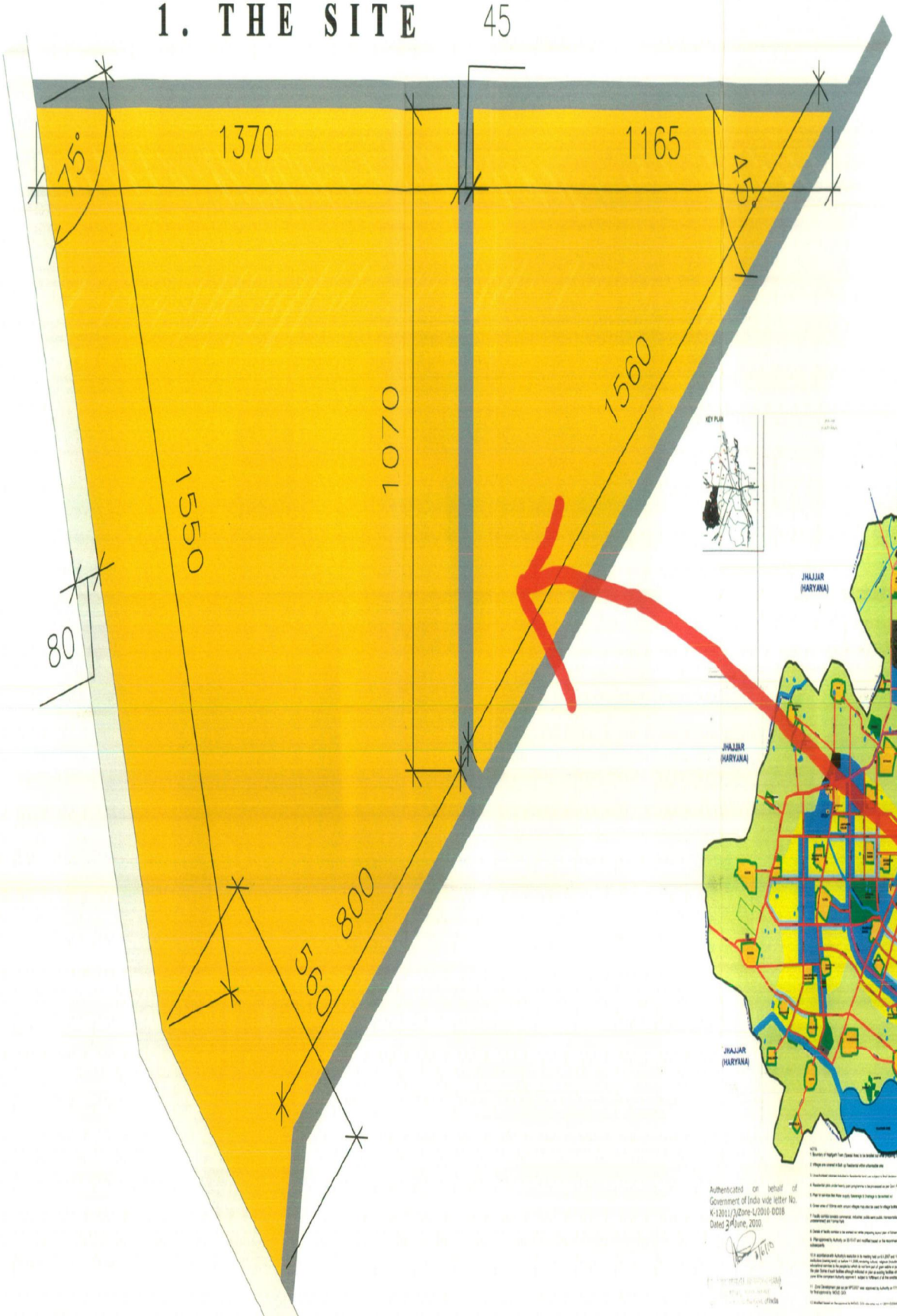
1. THE SITE



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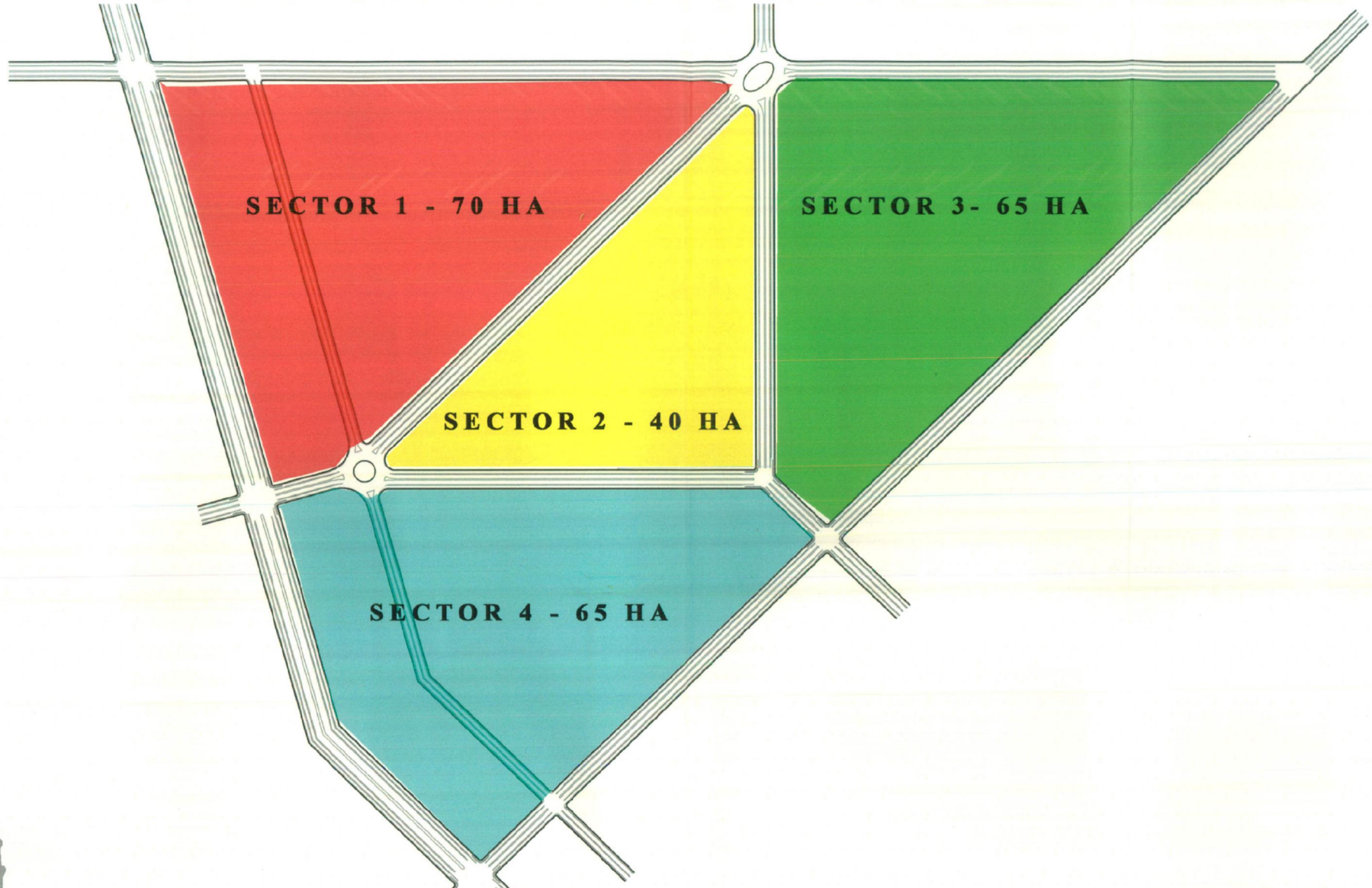
M.U.R.P. DISSERTATION 2010 - 11
LAYOUT PLAN FOR SUB-ZONE OF ZONE 'L' OF DELHI

SCALE
1:10,000

SUBMITTED BY:- SAURABH JINDAL, 9511010
GUIDED BY :- PROF. R.K.JAIN

2. DIVISIONS INTO SECTORS



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SCALE
1:10,000

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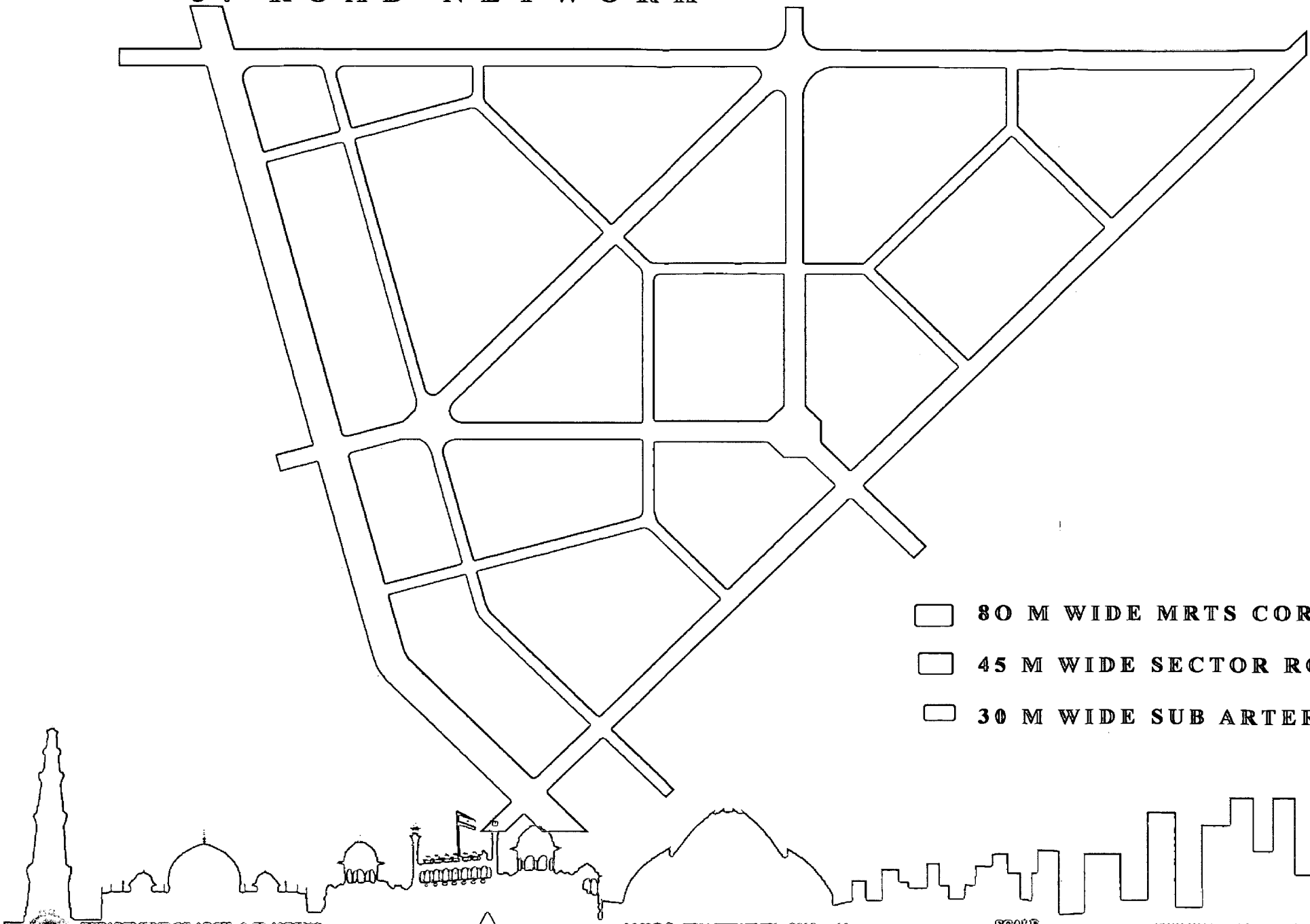
GUIDED BY :- PROF. R.K.JAIN

3. ROAD NETWORK



80 M WIDE MRTS CORRIDOR

45 M WIDE SECTOR ROADS

30 M WIDE SUB ARTERIAL ROA

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SCALE
1:5000

SUBMITTED BY:- SAURABH JINDAL, 9511010
GUIDED BY :- PROF. R.K.JAIN

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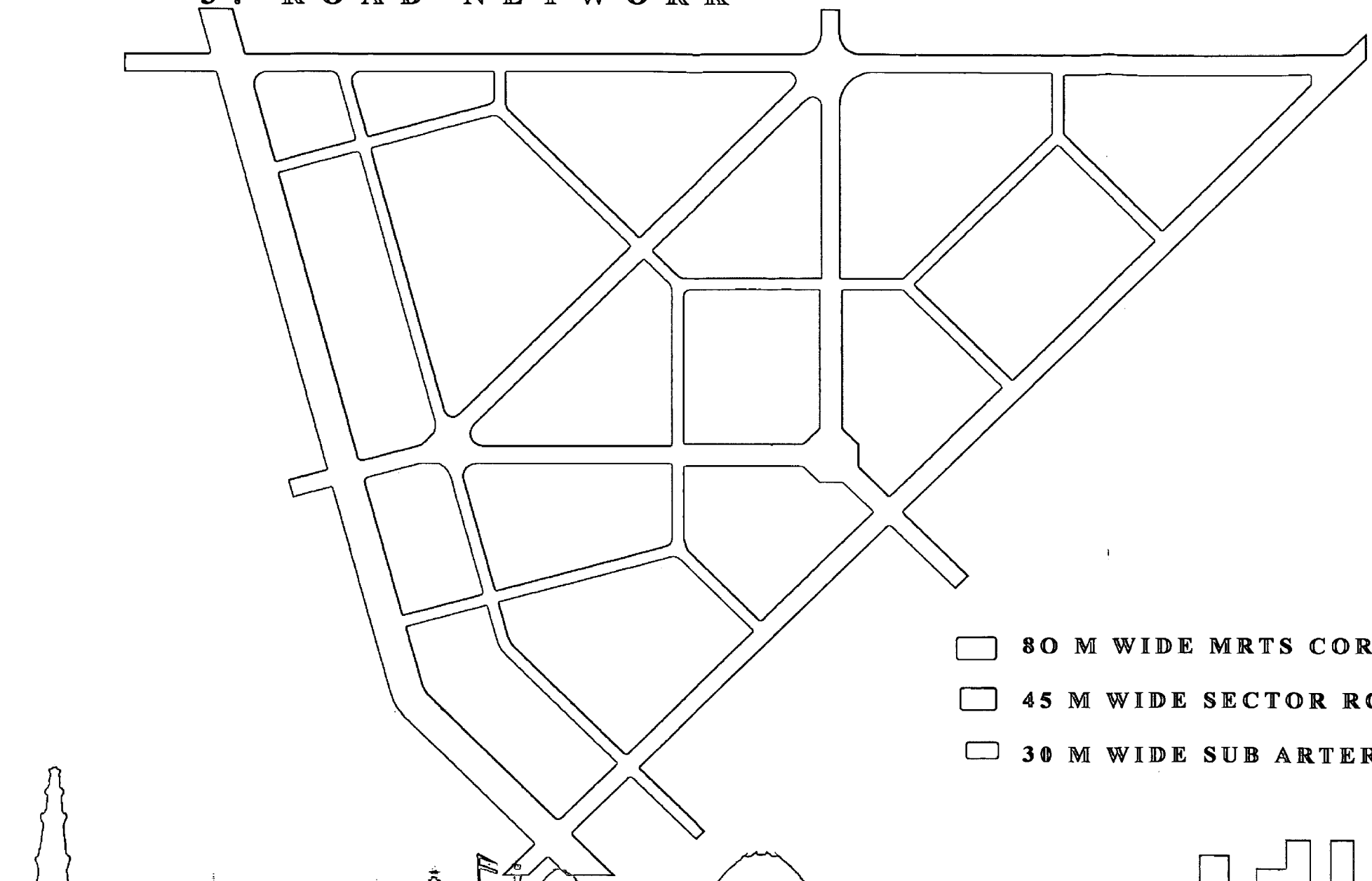

80 M WIDE MRTS CORRIDOR

45 M WIDE SECTOR ROADS

30 M WIDE SUB ARTERIAL ROA

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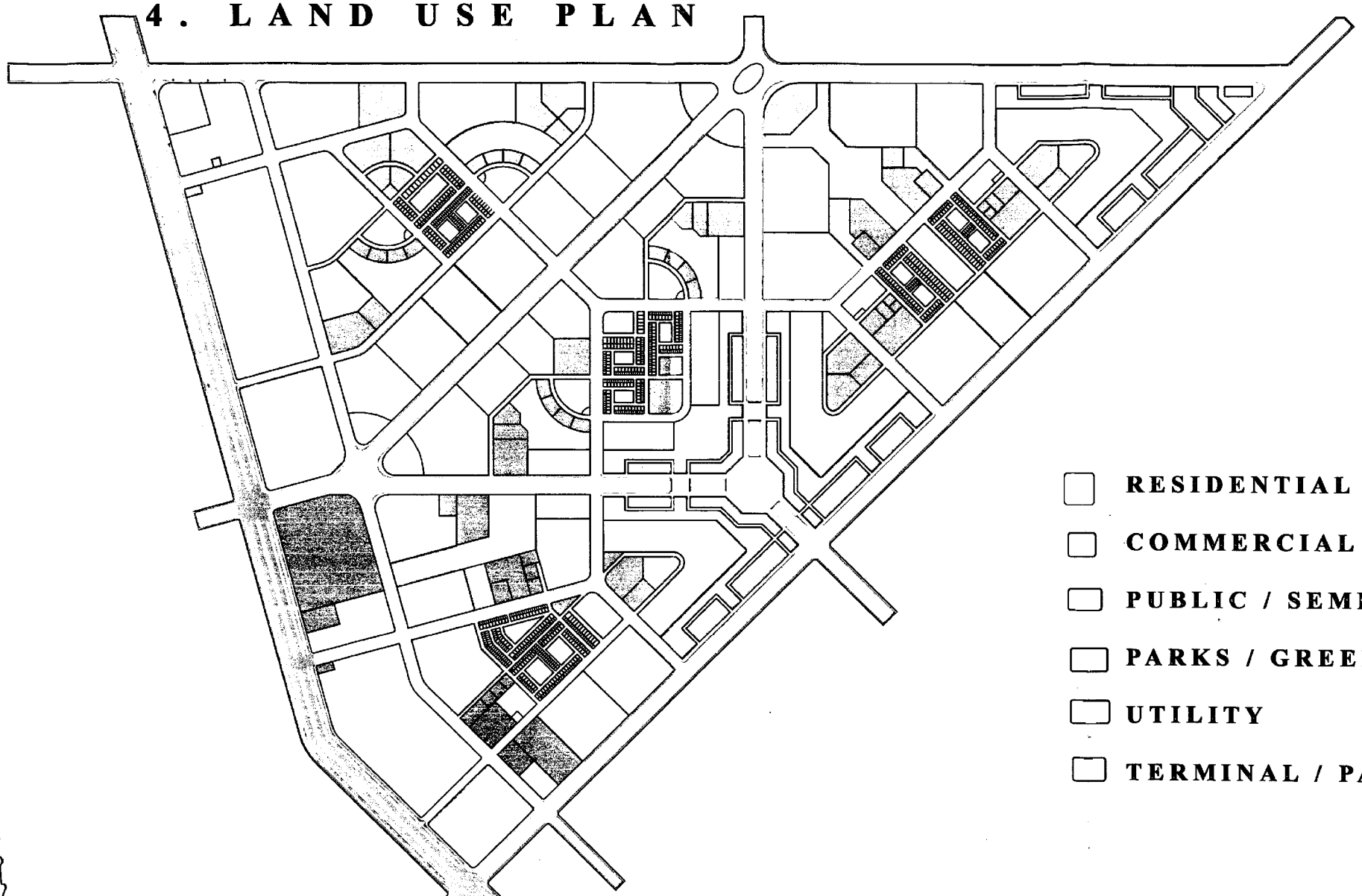
4. LAND USE PLAN



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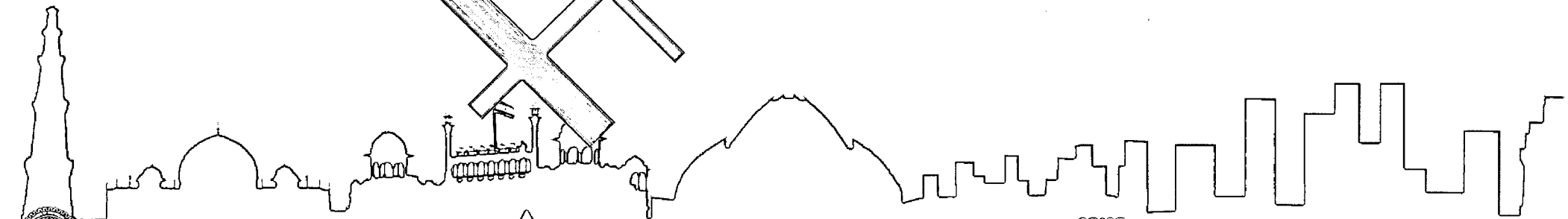
- PUBLIC / SEMI- PUBLI
- PARKS / GREEN
- UTILITY
- TERMINAL / PARKING



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LAYOUT PLAN FOR SUB-ZONE OF ZONE 'I' OF DELHI

SCALE
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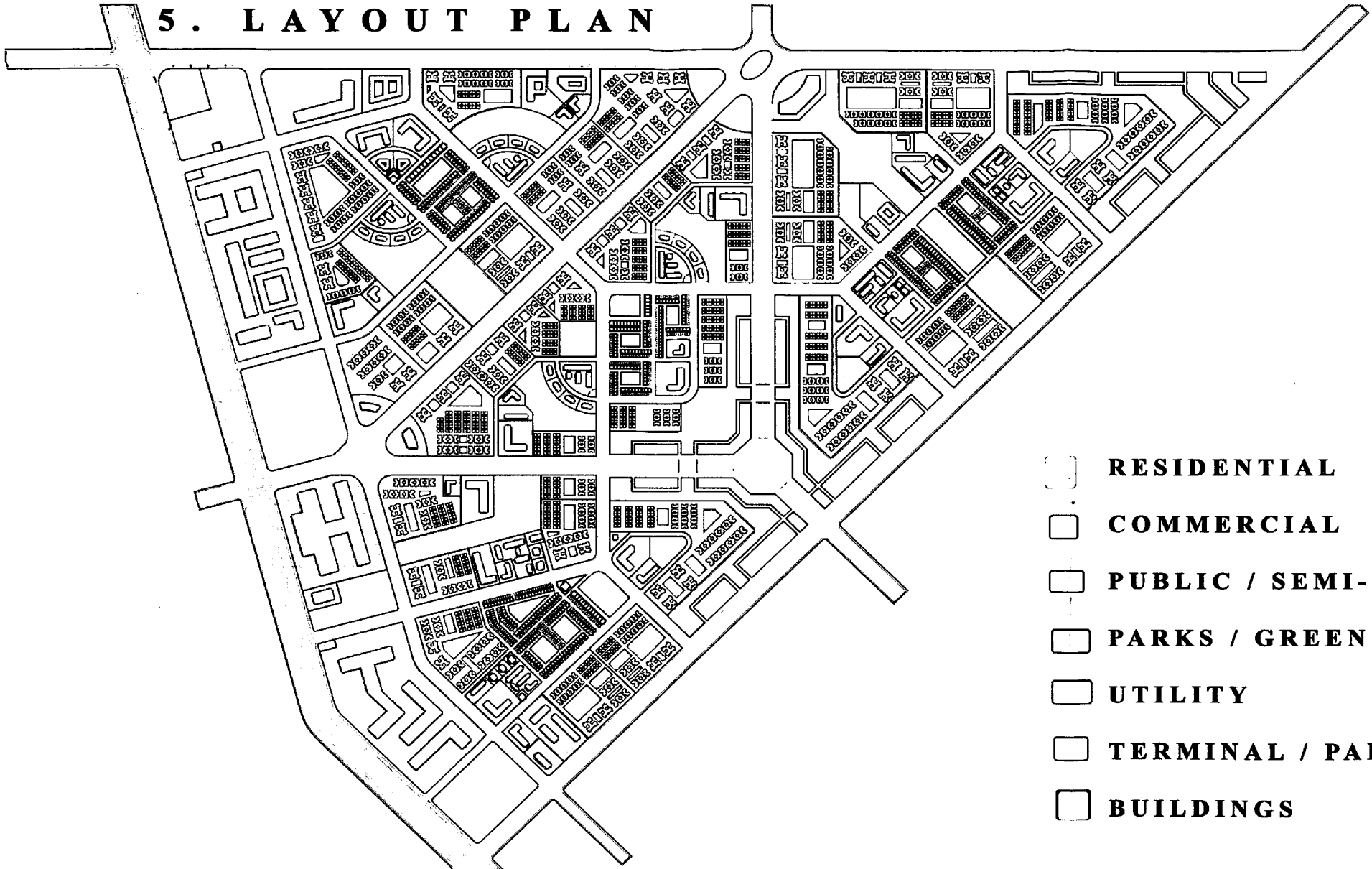
SUBMITTED BY:- SAURABH JINDAL, 95U1010
GUIDED BY :- PROF. R.K.JAIN

5. LAYOUT PLAN



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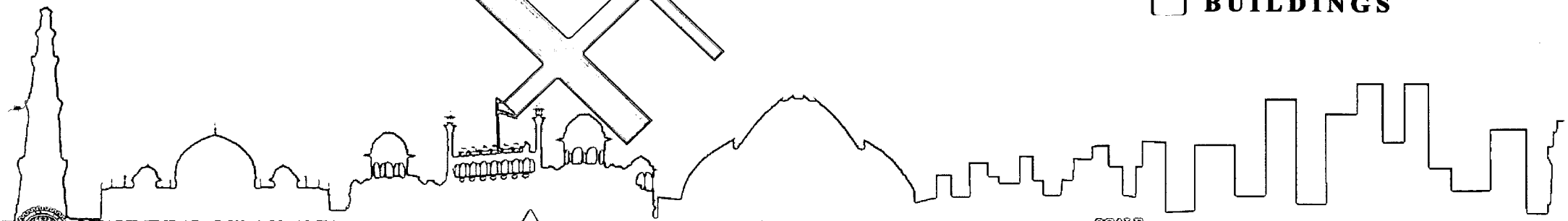
PARKS / GREEN

UTILITY

TERMINAL / PARKINC

BUILDINGS



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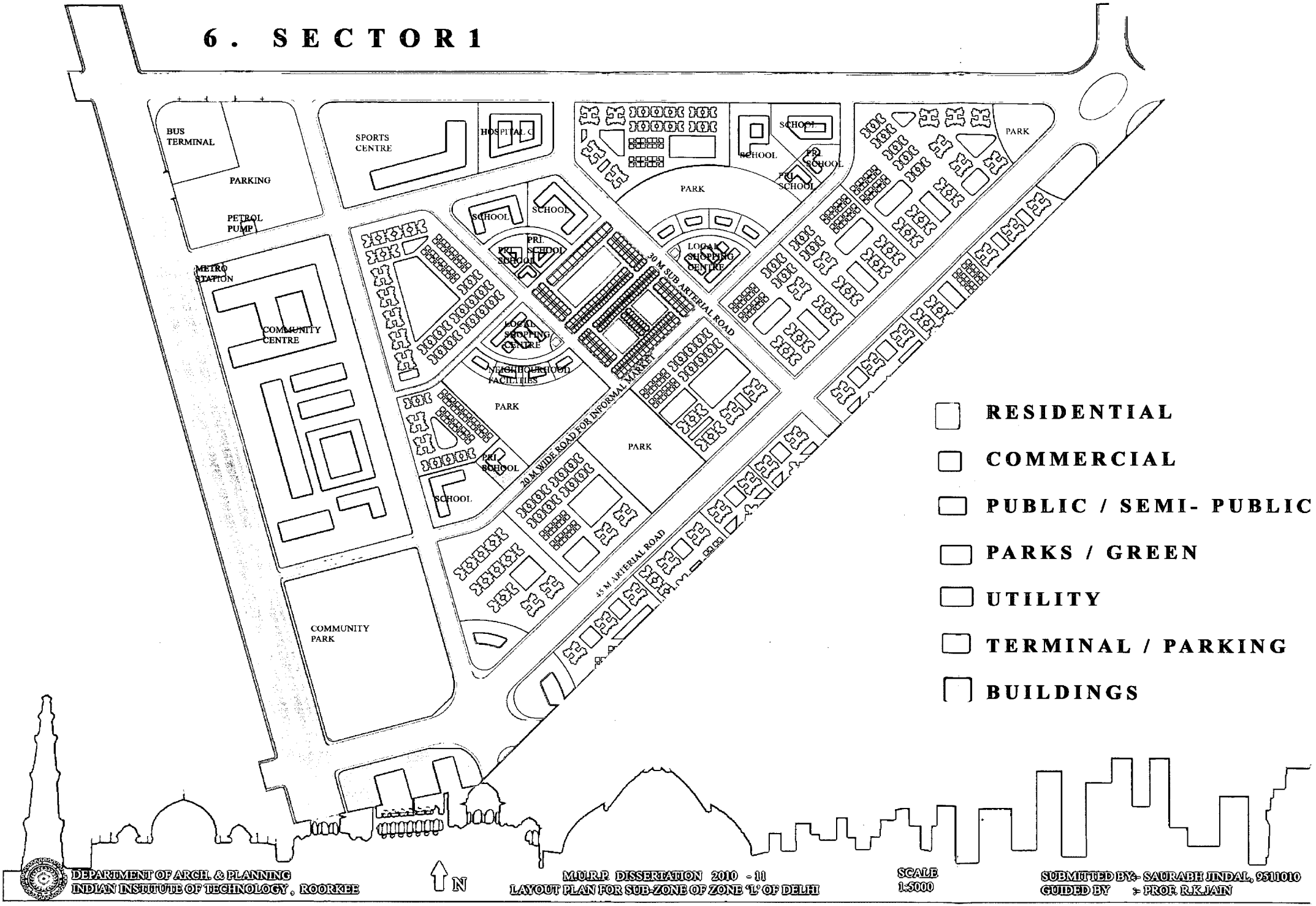
6. SECTOR 1



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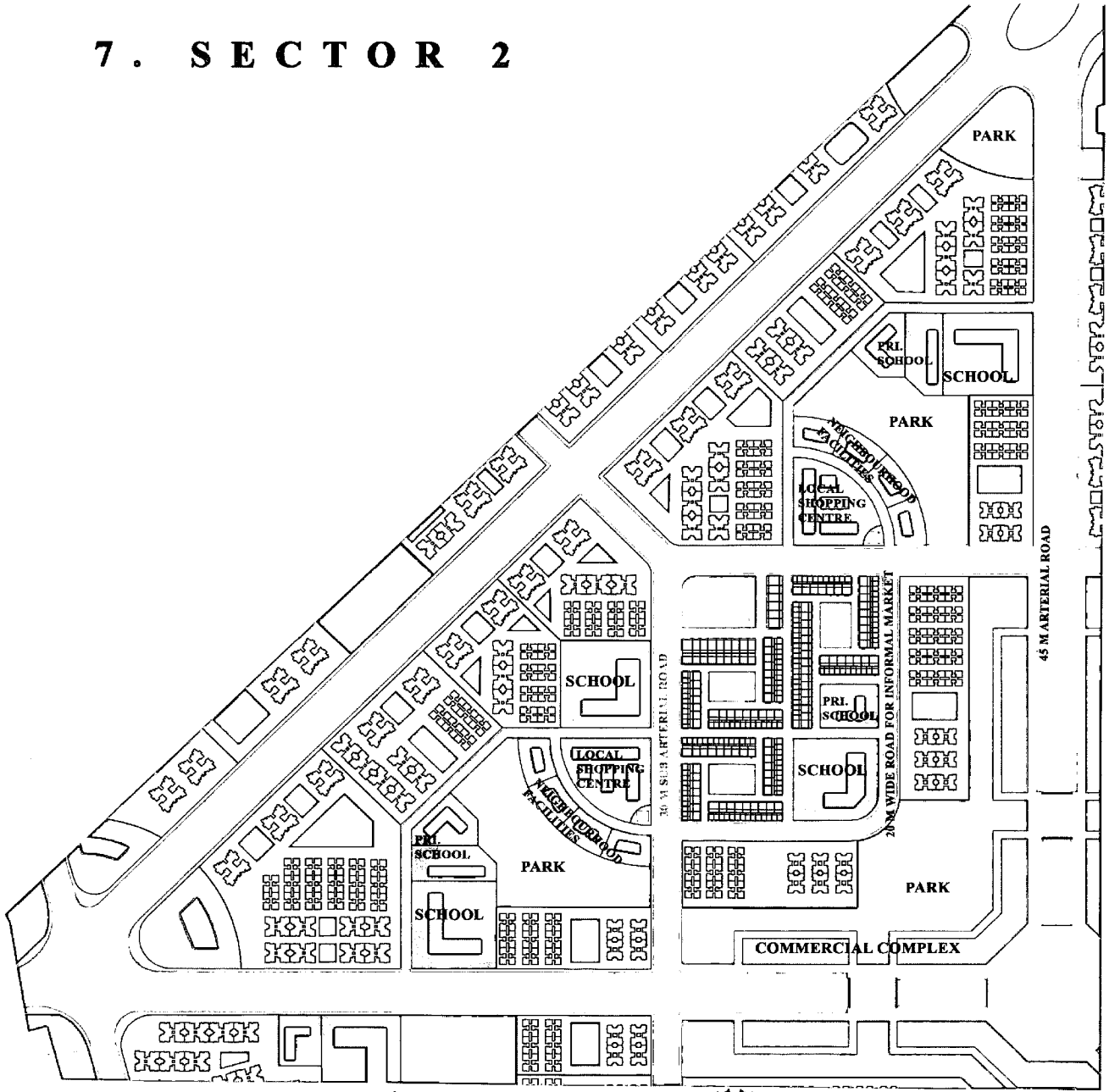
7. SECTOR 2



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8. SECTOR 3

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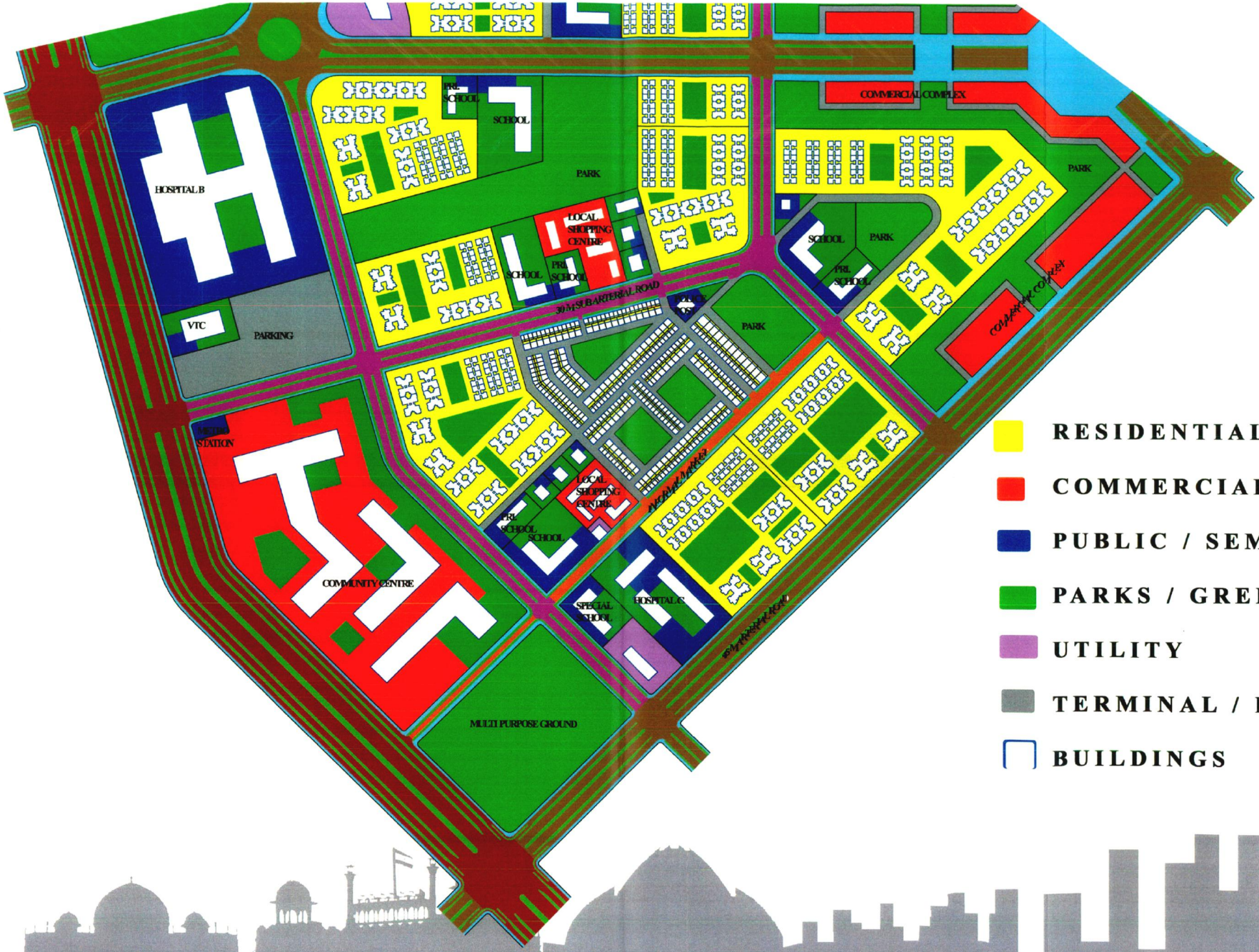
9. SECTOR 4



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SCALE
1:5000

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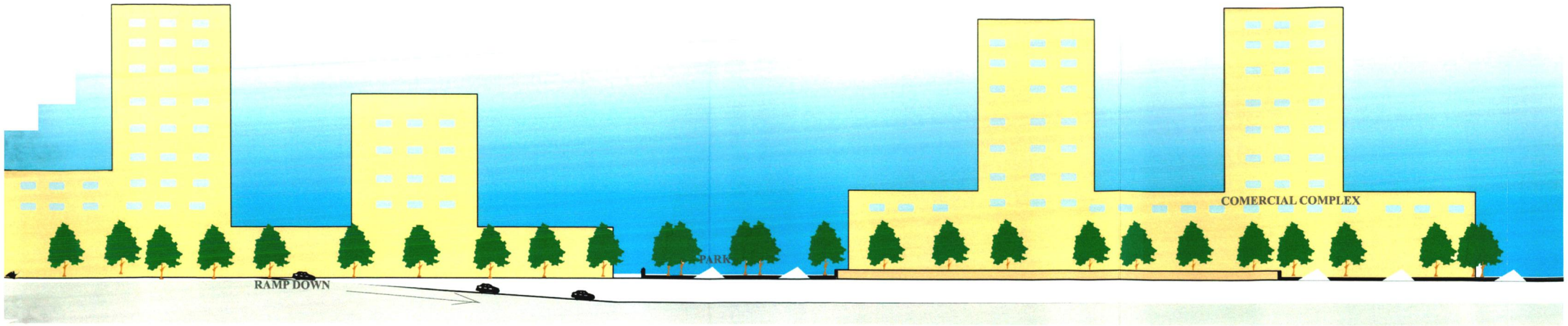
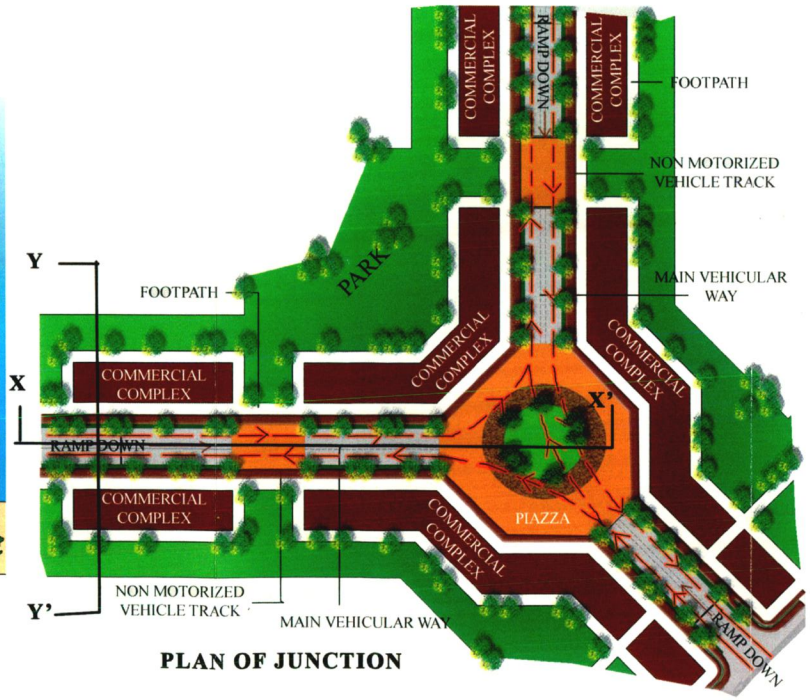
10. JUNCTION AT COMMERCIAL COMPLEX



SECTION XX'

SECTION YY'



PLAN OF JUNCTION

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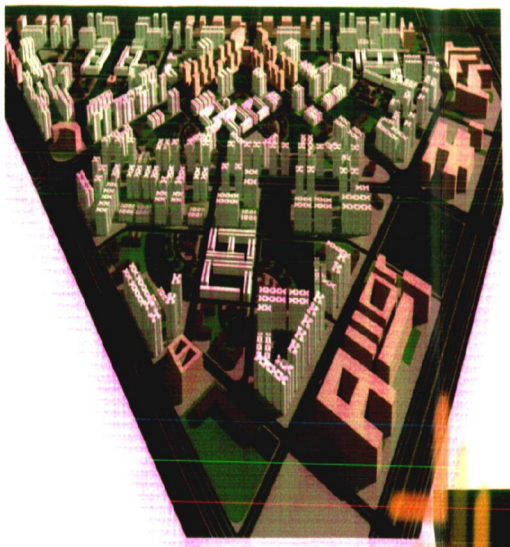

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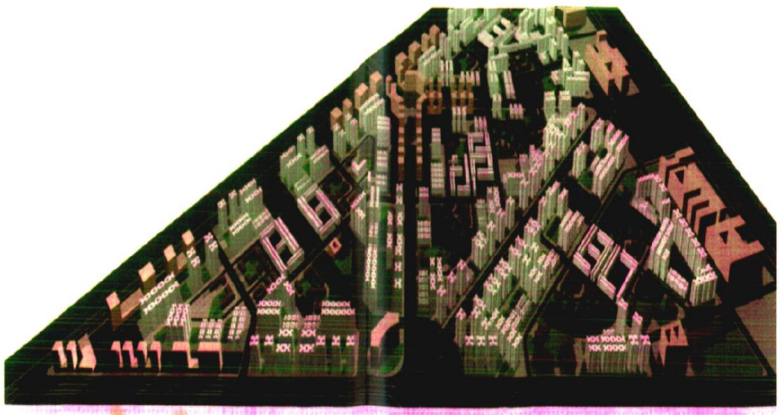

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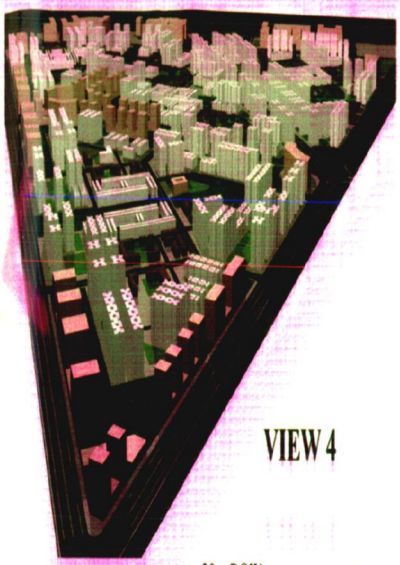

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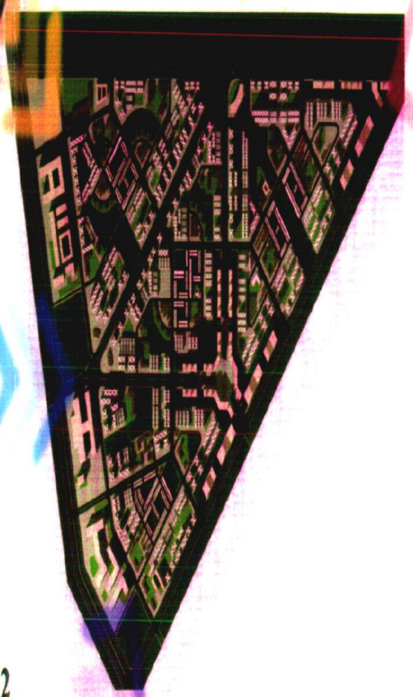

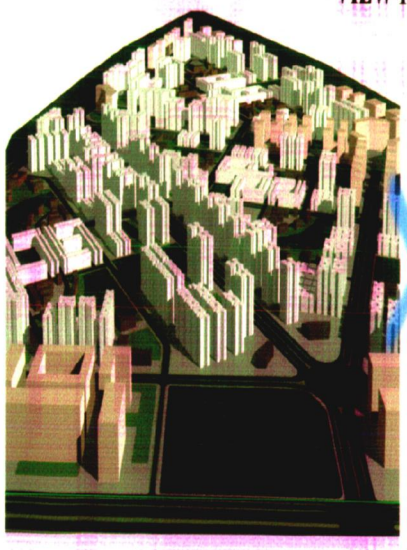

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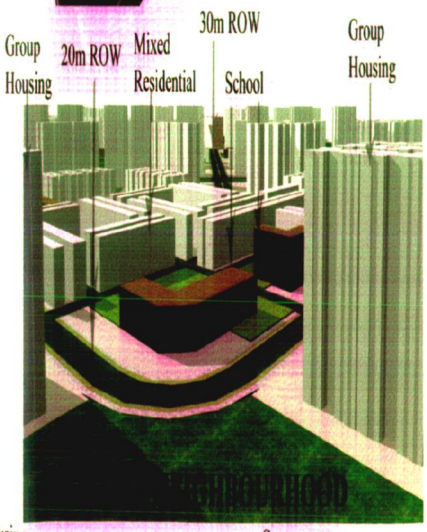

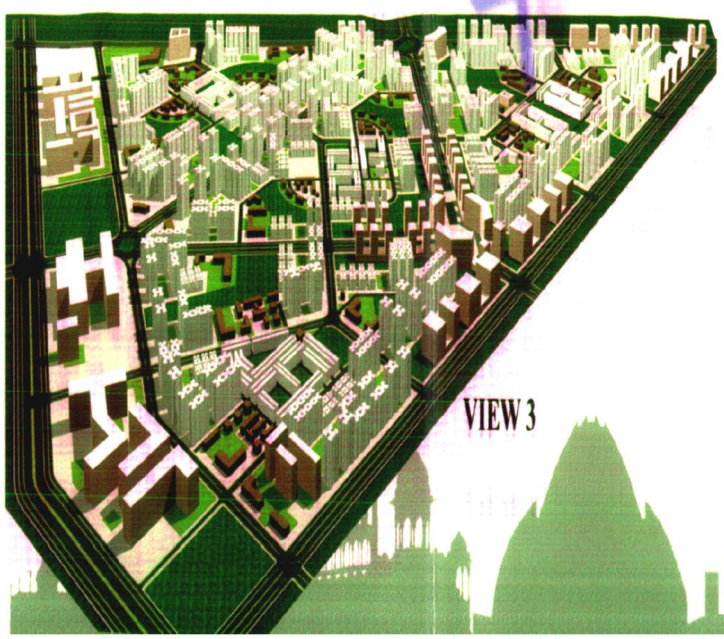

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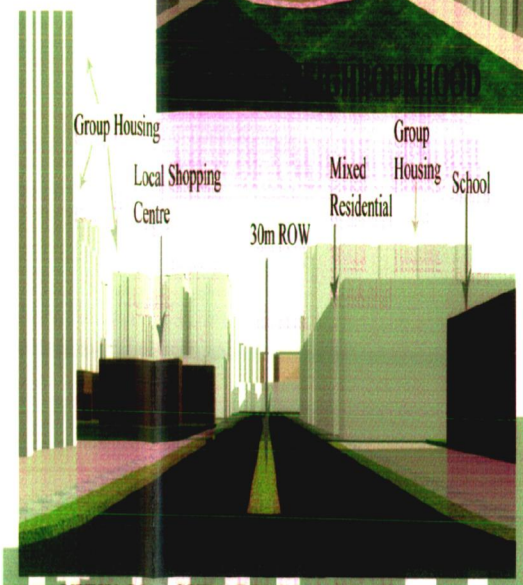

VIEW OF A SUB ARTERIAL ROAD