A NEW URBAN CENTER IN CAMBRIDGE

A thesis offered in partial fulfillment of the
requirements for the degree of Master of Architecture,
Massachusetts Institute of Technology, June 15, 1964

Richard K. Chalmers
Thomas P. Hopper
Masashi Kozima
J. E. Robinson
William B. Rousos
Donald F. Vahrenkamp
Bernard J. Wulff

Signature redacted

.....

Pietro Belluschi
Dean of the School of Architecture and Planning

Signature redacted

.....

Lawrence B. Anderson
Head of the Department of Architecture

Signature redacted

.....

Imre Halasz
Professor of Architecture, Thesis Supervisor

June 15, 1964

Dean Pietro Belluschi
School of Architecture and Planning
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Dean Belluschi,

In partial fulfillment of the requirements for the degree of Master of Architecture, we submit this thesis, "A New Urban Center in Cambridge."

Respectfully,

.....
Richard K. Chalmers
B. Arch., North Carolina State College

.....
Thomas P. Hopper
B. S. in Arch., Rhode Island School of Design

.....
Masashi Kozima
M. Eng., Waseda University

.....
J. E. Robinson
B. Arch., Syracuse University

.....
William B. Rousos
B. Arch., University of Virginia

.....
Donald F. Vahrenkamp
B. Arch., A & M College of Texas

.....
Bernard J. Wulff
B. S. in Arch., University of Cincinnati

(This thesis accepted by Department. Students had left before signing it.)

ABSTRACT: "A NEW URBAN CENTER IN CAMBRIDGE"

Architectural responsibility has expanded in scale. Beyond the manipulation of isolated, highly specialized architectural programs, architects are increasingly being held responsible for bringing order to whole communities of buildings, for finding adaptable structures for change and growth, and for controlling spaces between and around buildings as well as within them.

With this responsibility in mind, the design of a new urban center has been studied. The growth of MIT and the parallel decline and decay of old industrial activities raise the possibility of significant change in the Kendall Square area of Cambridge. The Thesis considers the program requirements for circulation, housing, cultural and commercial activities for an Urban Center in this location. Seven Case Studies explore alternative patterns of land use, circulation, and concepts of design form to accommodate the program.

The Case Studies serve as the first major step in the complex decision-making process of designing a large urban center. The development of an urban theme evolves step by step through experimentation and constant re-

definition of the total concept. The major components to be coordinated are the site, the program, and the impact of the new physical form on the existing and future structure of the surrounding city.

The redevelopment of Kendall Square has become a very real possibility, and is at this time being actively studied by public and private agencies. These Case Studies make a contribution to this effort by testing site, program, and design objectives for this re-development.

CONTRIBUTORS

Pietro Belluschi, Dean, School of Architecture and Planning, MIT

Lawrence B. Anderson, Head, Department of Architecture

Imre Halasz, Assistant Professor of Architecture

O. Robert Simha, Institute Planning Officer

Jerzy Soltan, Professor of Architecture and Urban Design, Harvard

Peter Hornbeck, Assistant Professor of Landscape Architecture, Harvard; Instructor in Landscape Architecture, MIT

Harry M. Horn, Assistant Professor of Civil Engineering

TABLE OF CONTENTS

INTRODUCTION: A NEW URBAN CENTER IN CAMBRIDGE

The eastern end of Cambridge, in which the Massachusetts Institute of Technology is located, has for more than one hundred years supported a considerable portion of the city's commercial and industrial activity. Though some of the city's residential communities have been located here and have persisted over the years, the area is primarily non-residential.

Now, with the decline and decay of the old industrial activities and the corresponding growth of MIT, the possibility of a significant change in this area is suggested. This change is anticipated in part through the completion of the first phases of Technology Square, a research and office center located just north of MIT.

The far-reaching effects of the continued growth of MIT, with its attendant needs for commercial, residential, cultural and recreational facilities, require case studies for development in this part of the city.

THE SITE

Boundaries. The site proposed for this case study is approximately 31 acres or 1,275,000 square feet of land area located in the Kendall Square section of Cambridge. It is bounded on the north by the Broad Canal; on the west by Technology Square; on the south by Main Street, Wadsworth Street and the Charles River; and on the east by the Longfellow Bridge.

It is occupied by a variety of structures and land uses which include industrial buildings, warehouses, automotive service and repair facilities, parking lots, diners, a coal yard and a few residential structures.

To the south of the site is MIT and the Charles River; to the west, two public housing projects and the new Technology Square; to the north, across the Broad canal, an industrial area and the storage facilities of the Cambridge Gas Company.

Topography. This part of Cambridge is in a section described by geologists as the "Boston Lowland." This lowland region extends westward up the valleys of the Neponset, Mystic and Charles Rivers. It is generally less than fifty feet above sea level and consists mainly of marshes and alluvial plains. Of the 7.1 square miles of Cambridge, 0.765 square miles are in water and 6.250 square miles are in land. The latter, which includes the proposed site, has an

average elevation of about twenty-two feet above sea level.

The city engineering department has classified the Cambridge soils into three groups: upper strata clay, upper strata sand, upper strata mud. Mud is found along the banks of the Charles River in the western Cambridge section and in a section of East Cambridge, north of the Broad Canal, and east of the grand junction branch of the Boston & Albany Railroad.

Traffic. Main Street and Broadway are considered primary thoroughfares by the Cambridge Master Plan. Portland Street, 3rd and 6th Streets are classified as secondary thoroughfares, performing as traffic collectors for local and some intercity traffic.

At the present time there are plans to locate an interchange for the proposed interstate Route 695, the inner belt, in the area between Broadway and Hampshire Streets. If this should occur, Broadway would become a more heavily travelled route taking traffic to and from Boston.

The B & A Railroad which separates Technology Square from the rest of the site operates a freight service at grade. Trains run infrequently from 7:00 a.m. until 11:00 p.m. No trains run between 11:00 p.m. and 7:00 a.m.

OLD STREET SYSTEM

THE PROGRAM

There are three important factors which make a case study feasible for a new urban center on the proposed site. First MIT, having a large existing population with no significant community facilities adjacent to its boundaries, is expanding and in search of links to the rest of Cambridge. Second, the project area is an important entrance to the city of Cambridge from Boston. Third, present industrial activity is declining in the area.

The center will provide a new focus of many activities both for MIT and the urban community. Generations of young and active people, including many visitors from foreign lands, will come here, mixing with a more permanent population of varied social complexion. A large population, both transient and permanent, will look for places to live close to other facilities of the center.

The program which has been established for these case studies through the guidance of the MIT planning department assumes a maximum land use. The ratio of constructed floor area to buildable land area is approximately 3.7, including parking. On the following pages is a summary of the determined space needs. These needs will be examined in more detail in the second part of this report and will be used as the basis for the case studies included in the final part of this report.

SUMMARY OF PROGRAM AREA REQUIREMENTS

A.	Commercial		490,000 sq. ft.
B.	Cultural		235,000 sq. ft.
	1. Concert Hall - 2500 seats	130,000	
	2. Theaters - 700 and 200 seats	82,000	
	3. Cinemas - 800 and 400 seats	23,000	
C.	Parking		798,000 sq. ft.
D.	Hotel - 250 room		250,000 sq. ft.
E.	Housing		2,157,000 sq. ft.
	1. MIT married students 400 apts.	220,000	
	2. Transient 1000 apts.	793,000	
	3. Permanent 1000 apts.	1,144,000	
F.	Transportation Center		10,000 sq. ft.
G.	Nursery School		28,000 sq. ft.
	1. Married student	3,000	
	2. Private	25,000	
H.	Offices		250,000 sq. ft.
	TOTAL		4,218,000 sq. ft.

SECTION TWO: DETAILED PROGRAM

A. Commercial: Richard K. Chalmers

B. Cultural: Thomas P. Hopper

C. Parking: Masashi Kozima

D. Hotel: J. E. Robinson

E. Private Housing: William B. Rousos

F. Married Student Housing and Nursery:
Donald F. Vahrenkamp

G. Transportation Center: Bernard J. Wulff

Detailed Program A: COMMERCIAL

Richard K. Chalmers

COMMERCIAL SERVICES

GENERAL PLANNING

1. Estimation of Need and Quantity (based on consumer's dollar)
   - A. What is the total annual income probable in the area after redevelopment?
   - B. What will be the item expenditures in the various shopping centers?
   - C. At which facilities in the shopping center will this income be spent?
   - D. What is the character of those facilities as to rent and areas when considered singly, and as total area when grouped?
2. Functions
   - A. From a physical viewpoint, you must first bring in the goods which are to be offered for sale. This means efficient handling of the incoming freight.
   - B. Bring in the persons to operate the center. (Employee parking.)
   - C. Bring in the customers (walk, bus, car, etc.).
   - D. Get the goods out again. Clearly this should be done in a manner which is pleasant and convenient from the customer's viewpoint if (1) the high cost of home deliveries is to be reduced and (2) customers are to be encouraged to make additional purchases through being relieved of their bundles.

3. Shopping Environment

A. There should be no conflicting or extraneous elements to distract the attention of the customers.

B. There should be a high degree of concentration of interest.

C. There should be an even distribution of pedestrian traffic.

D. There should be an adequate variety of merchandise and services, logically grouped.

E. There should be an inviting festive atmosphere.

4. Division of Merchandise

A. Impulse - Impulse goods are luxuries or suddenly desired merchandise, depending for sale on good display and accessibility.

B. Convenience - convenience goods are staple items of standard quality, use, and popularity.

C. Demand - demand goods are necessities that bring a steady flow of customer traffic.

a. Impulse - perfumes, jewelry, gifts, furs, most mens' furnishings, women's accessories.

b. Convenience - food and drugs.

c. Demand - clothing, furniture, and household equipment.

STORE LOCATIONS

1. Stores should be located to provide an even flow of traffic; in essence, all stores will be located in what might be called prime and equally advantageous locations.
2. Like shops should be grouped; women's shops, men's shops, service shops.
3. Other grouping; department store and supermarket (only if supermarket has bundle holding and pick-up facilities); do not group department stores or junior department stores.
4. Department stores generally prime tenants and referred to as the "puller". They should be located so that all other smaller shops are passed on the way to the department stores.
5. Small service shops should be at entries of main shopping area for impulse buying. These are not necessary to connect to service areas. They receive goods by parcel post or other small bulk deliveries.

VERTICAL SALES TRAFFIC

1. Vertical merchandising

   Street, 1st level - impulse items

   2nd level - convenience items

   3rd level - demand items

Example:

	5	Administration and operation
	4	Customer service, restaurant, auditorium
	3	Furniture and household equipment
	2	Clothing and general merchandise
Street	1	Women's and men's accessories
	B1	Bargain basement
	B2	Service and stock

2. Vertical transportation

   A. Stairs; 2 or 3 levels maximum

   B. Escalators; a flight of escalators, depending upon their width, can take care of 4 to 10 thousand persons per hour. A 4 foot wide escalator, for example, will convey 8 thousand persons per hour.

   C. Elevators; express service, will handle about 400 to 500 people per hour.

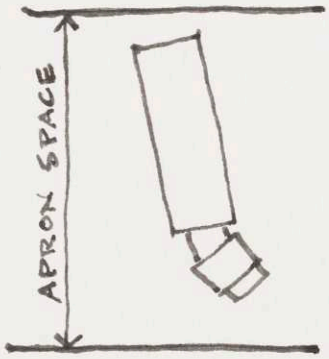
EQUIPMENT

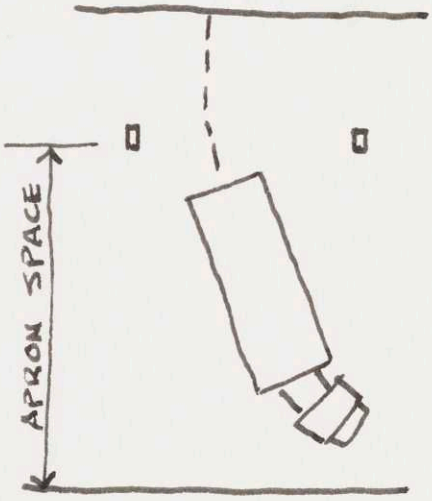
1. Non-Selling Operations

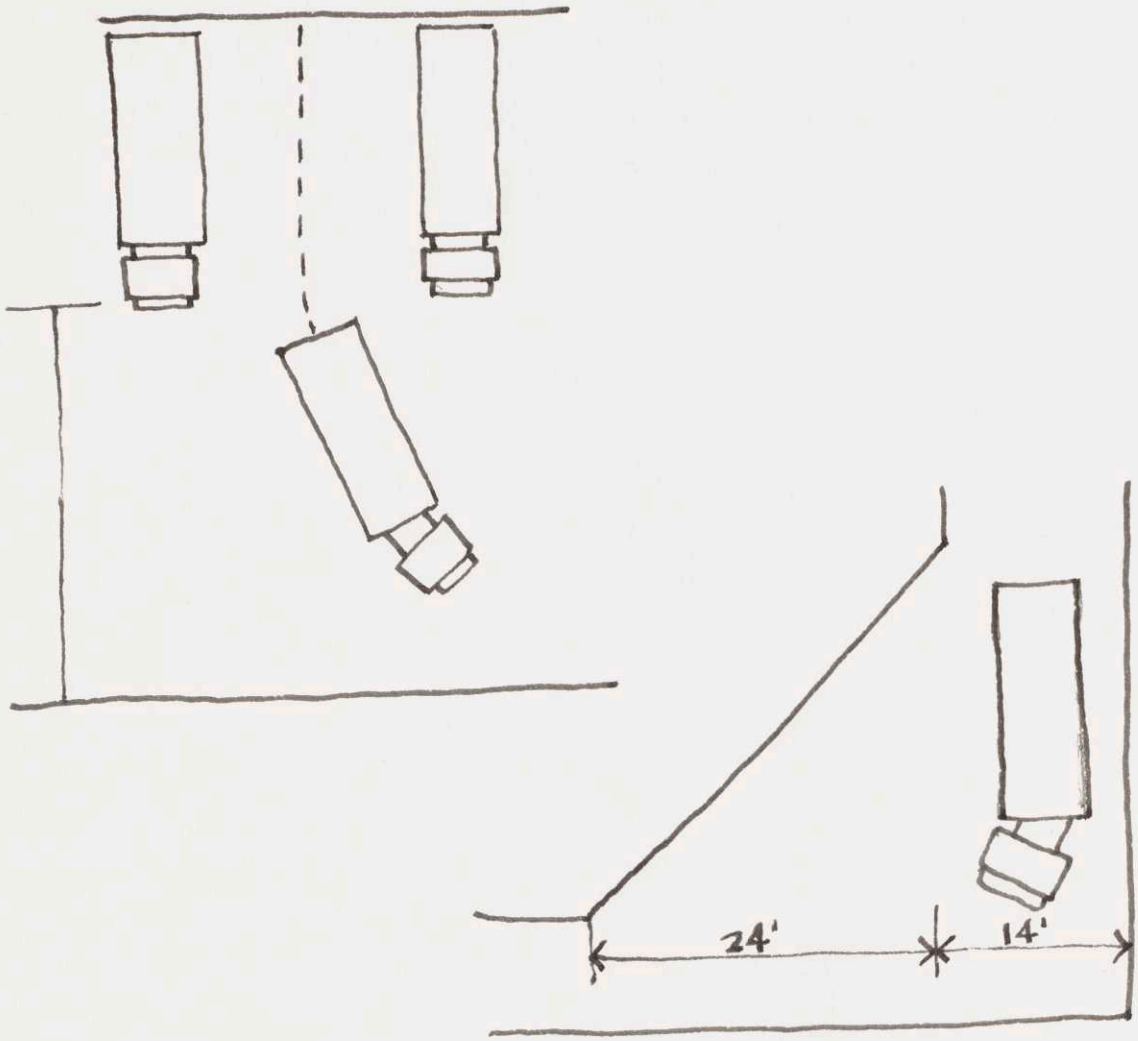
   A. Incoming merchandise is routed from loading platform to sales area; outgoing deliveries leave the store by a similar process. Employees enter, check their belongings; do a day's work, and then leave. In between, they need eating and recreational facilities, toilets, lounges, and sometimes emergency hospitalization. The administrative staff also requires space for working, eating, and relaxation.

B. Storage should not occupy 1st level sales space. Direct service connection to the storage area is prefered, and storage adjacent to the sales space is desired to eliminate complex material handling problems.

C. The table and diagrams show the amount of space which should be allowed for maneuvering tractor-trailers in and out of a loading dock. The amount of apron space will depend on the over-all length of the tractor-trailer, and the width of the opening into which it must back. The apron spaces given are minimum for backing into a dock in one maneuver. The most common height for loading docks is 44 to 50 inches, though light trucks have a lower bed level. Overhead clearance should be 14 ft., for standard trailer range up to 12'6" in height. Maximum width of the standard transport units is 8 ft., so that a minimum clearance should be allowed.







Over-all length of tractor-trailer	Width of opening	Apron space required
35'	10'	46'
	12'	43'
	14'	39'
40'	10'	48'
	12'	44'
	14'	42'
45'	10'	57'
	12'	49'
	14'	48'

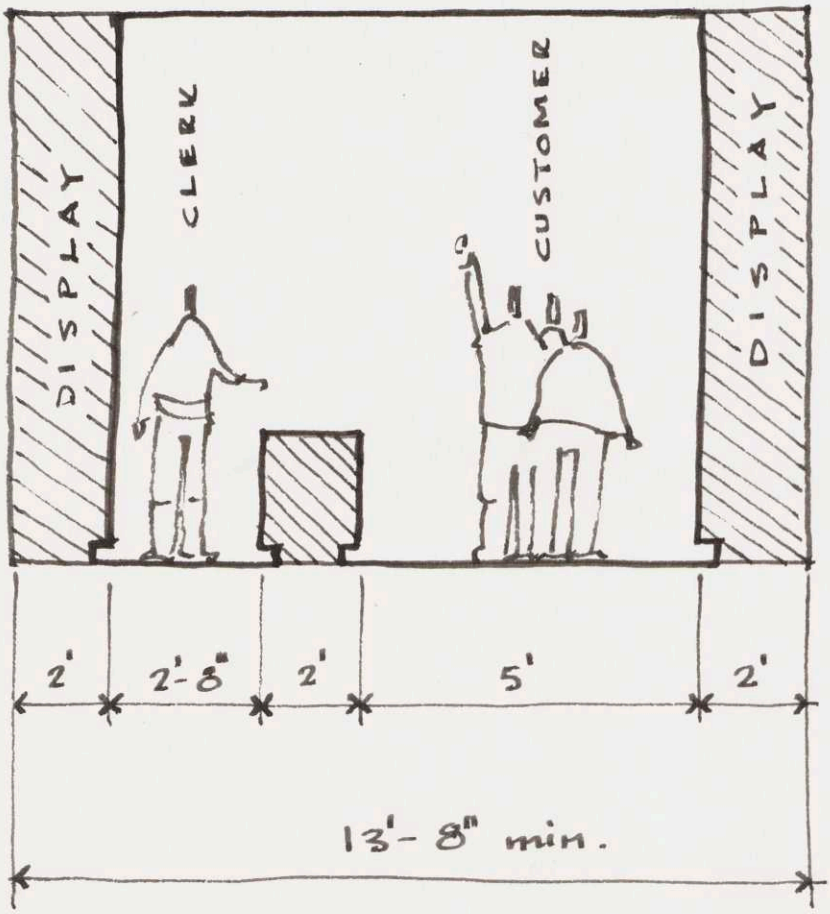
MECHANICAL EQUIPMENT

1. The mechanical equipment that requires the greatest volume, as in most buildings, is the summer and winter air conditioning. In larger stores of multi-levels and few exterior openings a larger ventilating system is required.
2. In general each store will have its own heating and cooling system. In the larger stores it may be necessary or desirable to have several plants and zones.
3. Fire protection is necessary, and methods of ventilating smoke and sprinkler systems are required.
4. The maximum amount of flexibility is desired with all services; lighting, heating, cooling, electrical, communications, etc.

SIZE AND STRUCTURE

Sizes -

1. A basic small store size can be determined by the following dimensions:



A module based on this figure can be used and maintain a certain amount of flexibility with store sizes.

2. Store depths range from 100' to 140' with some self-service drug stores requesting 160'. Heights vary considerably, but seem to have an average range between 12' to 16'.

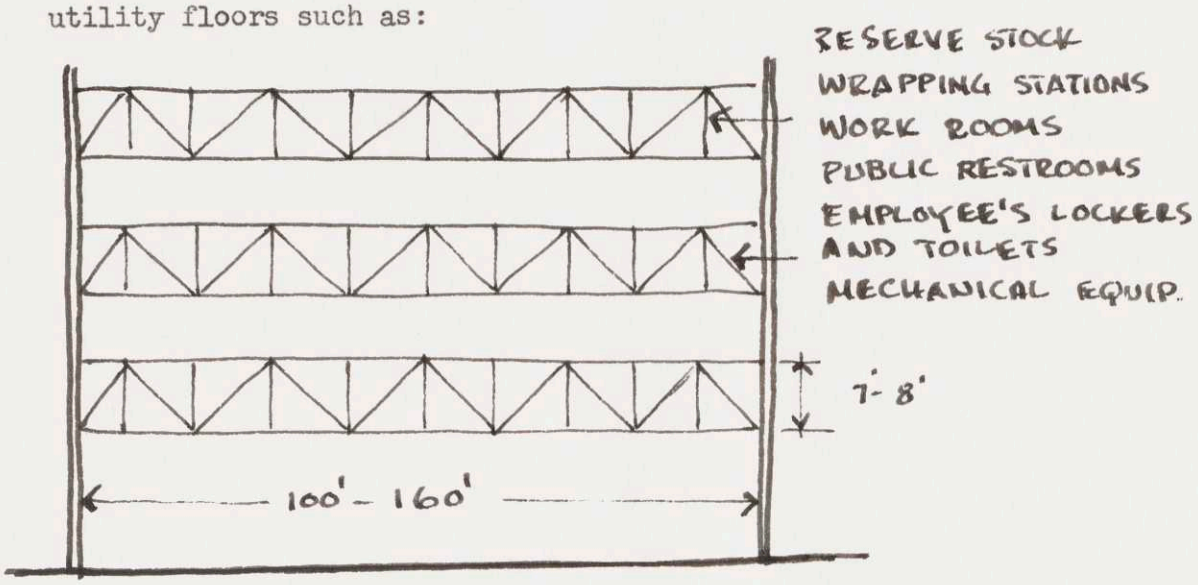
3. Small shops generally request storage area equal to sales area.

4. Optimum size for a supermarket ranges from 18 to 20 thousand sq. ft. of which 80% is sales, 20% is storage and produce. Self-service packaged meats reduce the latter figure 65%.

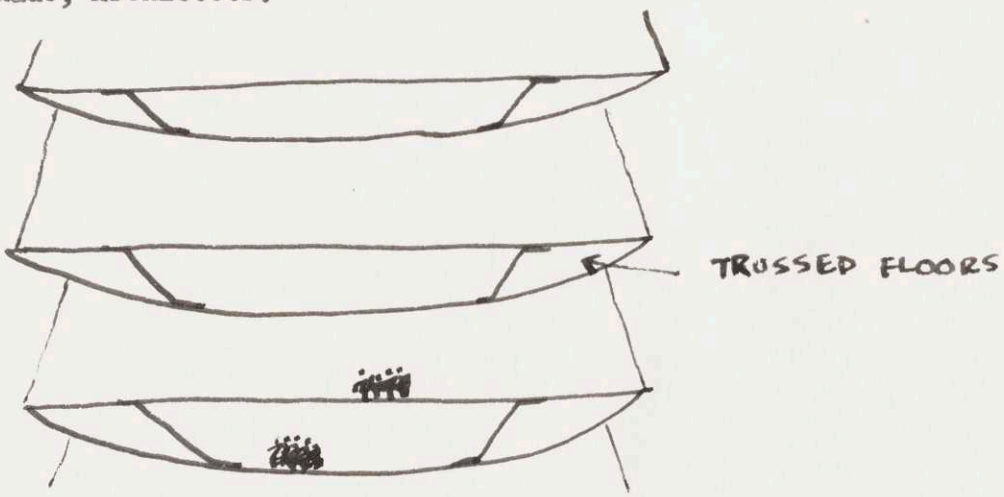
STRUCTURE

1. Ideal requirements would be as follows:
   A. It should be capable of enclosing interior space with the fewest possible fixed points of obstruction on sales floors, service areas, or store front display zones.
   B. It should be adaptable to the flexible installation of circulation elements: stairs, escalators and elevators for public and employees, lifts, conveyors, and elevators for merchandise transportation, pipes, ducts and conduits for electric, plumbing, air conditioning, fire-protection and communication systems.
   C. It should be fireproof or at the very least, slow burning in order to allow people within the building to escape in case of fire.
2. Based on the previous store size of 13'8" the structure module seems to be a bay of 2 times that dimension or plus 28' (Roosevelt Field, L.I., N.Y. by I.M. Pei; bay size of 26' x 32').

3. Larger stores would desire a greater unobstructed area, but this is to be weighed against the economics of the long span construction. Proposals along these lines have been trussed utility floors such as:



Proposed department store by Antonin Raymond and Ladislav L. Rado, Architects.



Proposed department store by Dr. Louis Parnes, Architect.

THE STORE FRONT

Purpose

1. It must catch the eye. Attracting public attention on a street crowded with competition.
2. It must identify the store as to its proprietor and character of merchandise offered.
3. It must display the merchandise as a stage set creating the urge to buy.
4. It should pull the customer into the store. Selling begins on the sidewalk.

TYPICAL SHOPS AND STORES

1. Specialty shop - sells a limited range of related merchandise which will include:
   - A. Men's and women's apparel
   - B. Single service; shoe repair, laundry, travel agency.
   - C. Based on 1. concentrated sales appeal, 2. leisurely shopping conditions, 3. individual attention to each customer.
2. Variety Store -
   - A. In contrast to specialty shops, depend upon diversified sales for their existence. They offer their customers the convenience of shopping from a wide range of merchandise under one management.
   - B. There is a minimum of personal service per customer, a quick turnover, and a greater number of transactions.
   - C. Self-service is typical.

3. Department Store

A. Department stores have the most comprehensive sales program of any retail business.

B. Stocks a complete line of shopping goods; clothes, notions, books, drugs, food, luggage and gifts.

C. Competes with itself by having a "bargain basement".

D. As many as 200 different sales and service sections.

KENDALL SQUARE CAMBRIDGE

Sample Program for Commercial and Related Facilities

FOOD - 70,000 sq. ft.

Supermarket	2@	20,000	40,000
Imported foods	2@	3,300	6,600
Delicatessen	3@	2,600	7,800
Fish & meat mkt.	2@	2,600	5,200
Bakery	2@	2,600	5,200
Candy & ice cream	2@	2,600	5,200
			70,000 sq. ft.

DRUG - 20,000 sq. ft.

Superdrug	1@	4,400	4,400
Variety drug	3@	2,600	7,800
Apothecary	3@	2,600	7,800
			20,000 sq. ft.

CLOTHING - 40,000 sq. ft.

Women's ready-to-wear	1@	11,400	11,400
" " " "	3@	2,600	7,800
Men's ready-to-wear	4@	2,600	10,400
Women's shoes	3@	2,600	7,800
Tailor	1@	2,600	2,600
			40,000 sq. ft.

LIQUOR - 36,000 sq. ft. (25,600) surplus

Liquor	4@	2,600	10,400 sq. ft.

DEPARTMENT STORE - 100,000 sq. ft.

Major	1@	100,000	100,000 sq. ft.

FURNITURE AND HOUSEHOLD - 32,000 sq. ft.

Furniture	1@	5,200	5,200
	1@	2,600	2,600
	1@	3,400	3,400
Appliances	2@	2,600	5,200
Hardware	3@	2,600	7,800
Home furnishings	1@	5,200	5,200
	1@	2,600	2,600
			32,000 sq. ft.

AUTO - 40,000 sq. ft.

Showroom (3-5 cars)	2@	3,000	6,000
Sales office	2@	4,000	8,000
Gas Station	2@	13,000	26,000
			40,000 sq. ft.

SPECIALTY SHOPS (additional)

Music	2@	5,200	10,400
Flowers	2@	2,600	5,200
Jewelry	2@	1,300	2,600
Stationery	2@	2,600	5,200
Art supplies	2@	2,600	5,200
Newspaper - Magazine	2@	300	600
Books	4@	1,000	4,000
Art galleries	4@	1,000	4,000
Cigar	2@	500	1,000
			35,600 sq. ft.

VARIETY STORES - (additional)

5¢ & 10¢	1@	10,000	10,000
Sporting goods	2@	2,600	5,200
Camera	4@	1,000	4,000
Gifts	3@	1,000	3,000
			22,200 sq. ft.

SERVICES

Laundro-mat	2@	1,000	2,000
Laundry	2@	1,000	2,000
Dry cleaning	2@	1,000	2,000
Shoe repair	2@	500	1,000
Barber shop	2@	1,000	2,000
Beauty shop	2@	1,000	2,000
Optometrist	2@	1,000	2,000
Bank	1@	5,000	5,000
Post office	1@	2,600	2,600
Travel agency	2@	500	1,000
			21,600 sq. ft.

RESTAURANTS, NIGHTCLUBS, ETC.

Restaurants - 20,000 sq. ft.

	2@	5,000	10,000
	1@	10,000	10,000
			20,000 sq. ft.

NIGHTCLUBS, BARS, SANDWICH SHOPS - 78,200 sq. ft.

Nightclubs	3@	10,000	30,000
[illegible]	1@	17,600	17,600
Bars	2@	5,000	10,000
	2@	2,600	5,200
Sandwich shops	6@	2,600	15,600
			78,200 sq. ft.

BIBLIOGRAPHY

Shopping Center in Urban Redevelopment, Lillibridge, Robert M. Land Economics, Vol. 24, No. 2, May 1948.

Shopping Districts Washington; De Boer, S.R., American Planning and Civic Association

Shopping Towns U.S.A., Gruen, Victor, Reinhold Pub. Corp., 1960.

The Shopping Center versus Downtown; A Motivation Research on Shopping Habits and Attitudes in Three Cities, Columbus, Bureau of Business Research, College of Commerce and Administration, Ohio State University, 1955.

Downtown and Suburban Shopping Habits Study of Greater Boston; Alevizos, J.P.; Beckwith, A.E., Boston Herald-Traveler Corp., 1954.

Shopping Centers; Design and Operation; Baker, G and Funaro, B; Reinhold, 1951.

Shops and Stores, Ketchum, M.; Reinhold Pub., 1948.

Detailed Program B: CULTURAL

Thomas P. Hopper

A REPERTORY THEATER AND CONCERT HALL

Sponsored by the Massachusetts Institute of Technology

The purpose of the Repertory Theater will be to serve a permanent professional company, visiting companies and the M I T experimental drama group. The purpose of the Concert Hall will be to serve an excellent regional orchestra, visiting orchestras and the M I T orchestra.

The reason for combining the professional and amateur interests will be to facilitate and encourage an exchange of ideas whereby the students will benefit through immediate contact with professional attitudes and techniques; and the profession will benefit by the enthusiasm and curiosity of the students.

PROGRAM

(note: reverberation time 1.3 to 1.5 desirable)

Public or Semi-Public Areas

	sq. ft.
1. Auditorium - 700 seats @ 9 sq. ft./seat. (Continental seating). Provide flexibility for proscenium and apron stage or 3/4 stage.	6,000
2. Experimental theatre for MIT - lectures, workshop, theatre, etc. 200 seats @ 9 sq. ft./seat. (Continental seating). Provide total flexibility.	1,800
3. Library and museum - with small viewing room for study of video tapes.	2,150
4. Conference and lecture rooms - 3 @ 600 sq. ft. (for use by Drama School).	1,800
5. Bar and lounges - includes preparation and service area.	8,000
6. Foyer and lobby area.	4,000
TOTAL	23,750

Management

1. Main office - with space for two secretaries.	400
2. Company manager and assistant - next to main office.	400
3. General manager and assistant - " " " "	400
4. Director and assistant - near main office.	500
5. Box office (close to entrance).	100
6. Stage manager - office off shop and near stage	300
7. Technical director - off shop	300
8. Office for visiting companies	500
TOTAL	2,700

Personnel

1. Dressing rooms - including wardrobes, toilets, and showers for each.	
A. 2 singles @ 200	400
B. 2 doubles @ 300	600
C. 10 quads @ 400	4,000
2. Green Room - for use of actors and crew	900
TOTAL	5,900

Work Space

1. Rehearsals	
A. Large - 2 @ 1,500 sq. ft. for groups	3,000
B. Small - 4 @ 150 sq. ft. for individuals	600
C. Dance or chorus	1,800
2. Main stage and backstage	13,000
3. Experimental stage and backstage	2,000
4. Paint shop - main work area - big to build huge set on wagon - huge doors on to stage.	1,500
5. Special shops - electricity and carpentry (adj. to paint shop)	2,700
6. Laboratory - for experiments with light, staging, photographic effects, etc.	500
7. Design rooms - for sets, costumes, etc.	500
8. Projection and control booth - 5 @ 225	1,125
9. Costume shop	500
TOTAL	27,225

Storage

1. Main Auditorium scenery and props - adjacent to paint shop and service entrance.	4,000
2. Experimental theatre scenery and props - adjacent to experimental theatre or combined with main stage	1,200
3. Costumes shared and adjacent to costume shop and dressing rooms	3,000
TOTAL	8,200

Totals

Public Spaces	23,750
Management	2,700
Personnel	5,900
Work Space	27,225
Storage	8,200
	67,775
20% for structural, mechanical equipment, service, circulation, toilets, check rooms	
TOTAL	81,330

LIMITATIONS FOR SATISFACTORY PLAN AND SECTION*

1. Horizontal angle or polychromatic vision (no eye movement)is approximately 40°.

2. The horizontal angle to the center line at which objects onstage, upstage of the curtain line cease to bear the intended relationship to other objects onstage and to the background is approximately 60°.

3. Judged by the audience's ability to recognize shapes and confirmed by free audience choice of seats, the following is the order of desirability of locations. (A) Front center except when screen is close to front row. (B) Middle center. (C) Middle side (D) Front side. (E) Rear Center. (F) Rear Side.

4. Audiences will not chose locations beyond a line approximately 100° to the curtain and the side of the proscenium.

5. The vertical angle beyond which ability to recognize standard shapes falls off very rapidly is approximately 30°.

* quoted from Harold Burris-Meyer and Edward C. Cole, "Theatres and Auditoriums", Progressive Architecture Library, p. 31.

PROGRAM

Public or Semi-Public Areas

	sq. ft.
1. Auditorium - 2500 seats @ 9 sq. ft./seat (Continental seating).	23,000
2. Chamber music auditorium - 500 seats @ 9 sq. ft./seat (Continental seating).	4,500
3. Music Library and museum	2,500
4. Conference and lecture rooms - 3 @ 600 sq. ft. (for use by music school).	1,800
5. Bar and lounges - includes preparation and service area.	30,000
6. Foyer and lobby area	10,000
TOTAL	71,800

Management

1. Manager's office	300
2. Box office (close to entrance)	400
3. Stage manager - office off shop and near stage	200
4. 2 directors' offices @ 400 sq. ft.	800
5. 2 directors' offices @ 300 sq. ft.	600
6. 2 secretaries offices @ 250 sq. ft.	500
7. conference room	800
8. subscription department	800
9. Press department (critics rooms)	800
TOTAL	5,800

Personnel

1.	Visiting orchestra room	1,200
2.	4 First desk men @ 150 sq. ft.	600
3.	Concert Master	400
4.	4 Soloists @ 150	600
5.	Soloist's reception area	800
6.	Conductor's study and Green Room	800
7.	Three large green rooms @ 1,500	4,500
	TOTAL	8,900

Work Space

1.	Stage for 500 people	
	A. performing area	3,000
	B. Choir area	1,500
2.	Main rehearsal hall	2,500
3.	4 rehearsal rooms @ 400 sq. ft.	1,600
4.	2 rehearsal rooms @ 800 sq. ft.	1,600
5.	30 individual rehearsal rooms @ 100 sq. ft.	3,000
6.	tuning room	600
7.	radio announcer's booth	300
8.	TV, radio, and audio control room	300
9.	Electrician's room	250
10.	Stage-hands room	250
11.	employee's room	250
12.	trunk repair shop	400
13.	trunk storage room	2,000
	TOTAL	17,550

Storage

1.	Percussion instrument storage	200
2.	Large string instrument storage	250
3.	Extra seats for orchestra or table storage	3,000
4.	storage closets 2 @ 150 sq. ft.	300
	TOTAL	3,750

Totals

Public Spaces	71,800
Management	5,800
Personnel	8,900
Work Space	17,550
Storage	3,750
	107,800
20% for structural, mechanical equipment, service, circulation, toilets, check rooms	
TOTAL	129,360

TWO CINEMAS

The purpose of two cinemas will be to provide entertainment of foreign or American art films as well as regular films. In this way it is expected the cinemas will attract people from the M I T community, the new center, and the surrounding area. If a particular film has much attraction both theatres might show the same film but start the show at different times to facilitate overflow crowds or late-comers. This same film after a two week run, for example, might attract a smaller crowd and only one cinema would be used while a new film opens in the other. The cinemas will be of different seating capacities to allow for greater combinations of the above system. This particular notion does not require the cinemas to be adjacent to each other; in fact it is anticipated that they will be separated to allow for other various functions (dancing, skating, bowling, bars, restaurants, etc.) to develop between and around them. It is anticipated that these cinemas will contribute in large part to the night life in the new urban center.

PROGRAM

(note: reverberation time 1.2 or less)

	800 seat Cinema	400 seat Cinema
Public or Semi-Public Areas		
1. Auditorium seats @ 9 sq. ft./seat (Continental seating).	7,200 sq. ft.	3,600 sq. ft.
2. Foyer and Lobby area	3,000	1,500
3. Toilets	800	500
4. Food Concessions	300	150
TOTALS	11,300	5,750
Management		
1. Office	300	300
2. Ticket booth	20	20
TOTALS	320	320
Work Space		
1. Projection room includes toilet, rewinding area, film storage, and power equipment.	800	800
TOTALS	12,420	6,870
20% for structural, mechanical equipment, service, and circulation		
TOTALS	15,000 sq. ft.	8,000 sq. ft.

LIMITATIONS FOR SATISFACTORY PLAN AND SECTION*

1. The horizontal angle to the projection sheet at which distortion on the screen becomes substantially intolerable is 60° measured to the far side of the projected image.

2. The maximum angle of motion picture projection to the horizon is 12°.

* quoted from Harold Burris-Meyer and Edward C. Cole, "Theatres and Auditoriums", Progressive Architecture Library, p. 31.

BIBLIOGRAPHY

Interviews with Prof. Klaus Liepmann, Asst. Prof. Joseph D. Everingham, and Prof. Robert B. Newman.

Harold Burris-Meyer and Edward C. Cole, Theatres and Auditoriums, Progressive Architecture Library, Reinhold, New York, c. 1949.

The Ideal Theater: Eight Concepts, The American Federation of Arts, New York, c. 1962.

Beranek, Leo Leroy, Music Acoustics and Architecture, New York, Wiley, 1962.

Heym, Richard, A Repertory Theatre for the American Theatre Association of Paris, Architectural Thesis, 1961. Used extensively for program requirements.

Hershberger, Howard D., A Large Multi-Purpose Auditorium for Boston, Architectural Thesis, 1962.

Li, Fook Hon, A Motion Picture Theatre in Auburndale, Massachusetts, Architectural Thesis, 1953.

Cromley, Donald Stowe, A Concert Hall for Washington, D.C., Architectural Thesis, 1953.

Keselica, Michael, Jr., A Concert Hall for the New York Philharmonic Symphony Society, Architectural Thesis, 1957. Used extensively for program requirements.

Detailed Program C: PARKING

Masashi Kozima

PARKING FACILITIES

Program: Parking should be provided for the following uses at this center.

Residential 70%	1,750 cars (approx. 525,000 sq. ft.)
Commercial, office and cultural areas	910 cars (approx. 273,000 sq. ft.)
Total	2,660 cars (approx. 798,000 sq. ft.)

The activities of entertainment, business and commercial facilities do not necessarily occur at the same time. Therefore it is possible for parking spaces to serve more than one function by phasing their use. For example parking spaces at Technology Square can be used for the theater or concert hall in the evening.

The program requirements of approximately 3.75 floor area ratio and 2,660 cars make it necessary to have multi-story parking garages on our site.

The Land-acquisition Costs

The land-acquisition cost per space is related to the garage-area per stall and the number of levels. With a multi-level structure, land costs are distributed over a larger number of spaces, thereby reducing the per-space cost for land. Additional levels may be justified since the over-all costs are increased by the actual construction costs.

Land costs average per stall of 18 garages which are located in C. B. D. is $1,597. The minimum land cost of the example is $190 and the maximum of that is $3,600. The costs, however, range between $500 and $1,000 a space for one-half of the facilities.

The Construction Costs

In calculating construction costs, there are normally included: demolition, excavation, concrete and steel, plumbing and heating, electrical equipment, plus architectural, engineering and inspection fees. The average construction cost of the 16 above-ground garages is $1,817 a car space, ranging from $720 to $3,350 a space.

For underground garages, the average construction costs for two facilities was $2,790, or about 50% greater than that of an above-ground open deck facility.

The average cost per square foot of structure was $5.45 ranging from $250 to $7.50.

For four recently constructed self-parking garages, the capacities range from 179 to 605 spaces, demolition costs are relatively minor, averaging only 1.7% of total cost. Basic construction, including excavation, concrete and steel accounts for 68% of the total. With open-deck construction, the plumbing and heating costs are low. The cashier's booth and waiting area are usually heated. These costs average about 3.4% for

the four facilities. Other costs including elevators, ticketing and cashier equipment, and appurtenances, account for about 17% of the total construction cost. Architectural and engineering and inspection fees are about 6% of the total construction cost. The cost per space range from $1,331 to $2,131, and average $1,655 for four facilities.

Relationship between Number of Levels and Cost of Parking Garages

The relationship between the number of levels and the cost of above-ground parking garages is shown at the figure "A". And the relationship between the number of levels and the cost of garages which have both levels above-ground and under-ground are as follows.

Assumption:

the land cost of the project site ---------- $10 per square foot

the construction cost of single story parking garage

---------- $5 per square foot

the construction cost of 2 stories above ground parking garage

---------- $5.25 per square foot

3 ---------- $5.51

4 ---------- $5.79

5 ---------- $6.08

the construction cost of single story under ground parking garage

---------- $7.50 per square foot

2 stories under-ground parking garage

---------- $9.0 per square foot

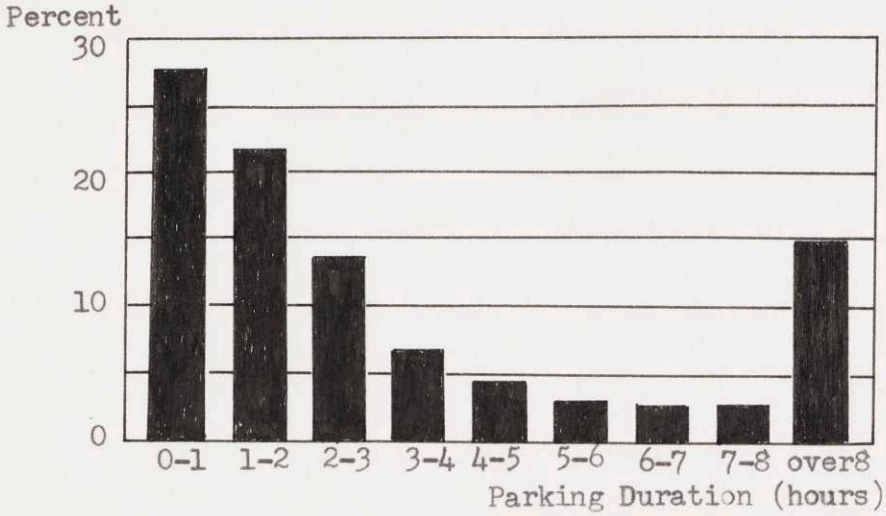
3 ----------$10.80

remark: the construction cost of 2 stories above-ground parking garage is 5% greater than that of single story above-ground garage, and that of 3 stories above-ground parking garage is 5% greater than that of 2 stories above-ground parking garage, and so forth. The construction cost of single story under-ground parking garage is 50% greater than single story above-ground parking garage, and that of 2 stories under-ground parking garage is 20% greater than that of single story under-ground parking garage; and also 3 stories under-ground parking garage is 20% more expensive than 2 stories under-ground parking garage in construction cost per square foot.

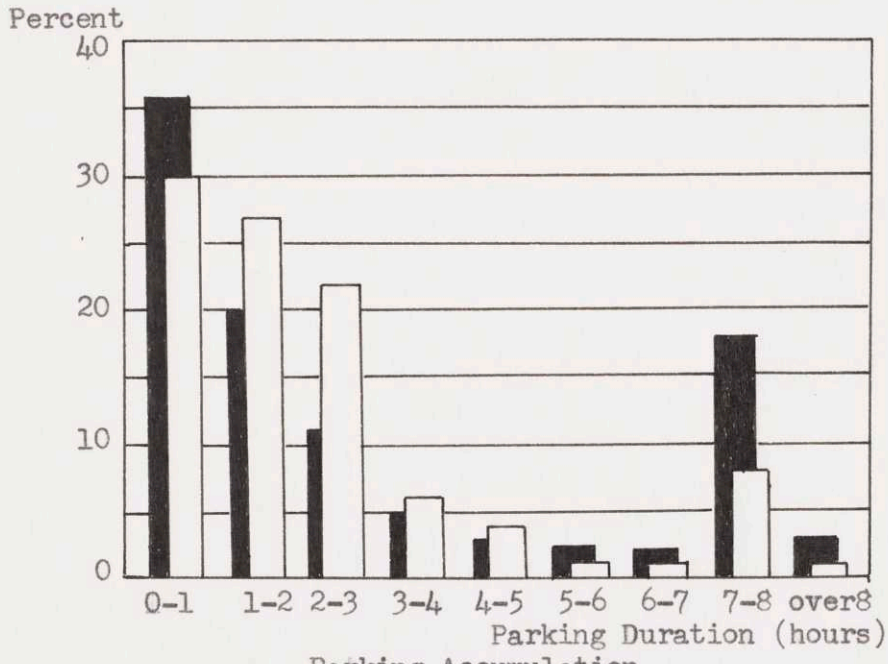
Type of Garage	Land Cost	Construction Cost	Total
1 under-ground plus surface	$5.00/sq. ft.	$7.50/sq. ft.	$12.50/sq. ft.
2 under-ground plus surface	3.33	9.00	12.33
3 under-ground plus surface	2,50	10.80	13.30
1 under-ground	10.00	7.50	17.50
2 do.	5.00	9.00	14.00
3 do.	3.33	10.80	13.33

Type of Garage	Land Cost	Construction Cost	Total
1 under ground 1 above ground plus roof	3.33	6.25	9.58
2 under ground 1 above ground plus roof	2.50	7.67	10.17
3 under ground 1 above ground plus roof	2.00	9.35	11.35
1 under ground 1 above ground	5.00	6.25	11.25
2 under ground 1 above ground	3.33	7.67	11.00
3 under ground 1 above ground	2.50	9.35	11.85
1 under ground 2 above ground plus roof	2.50	5.58	8.08
2 under ground 2 above ground plus roof	2.00	7.13	9.13
3 under ground 2 above ground plus roof	1.67	8.58	10.25
1 under ground 2 above ground	3.33	5.58	8.91
2 under ground 2 above ground	2.50	7.13	9.63
3 under ground 2 above ground	2.00	8.58	10.58

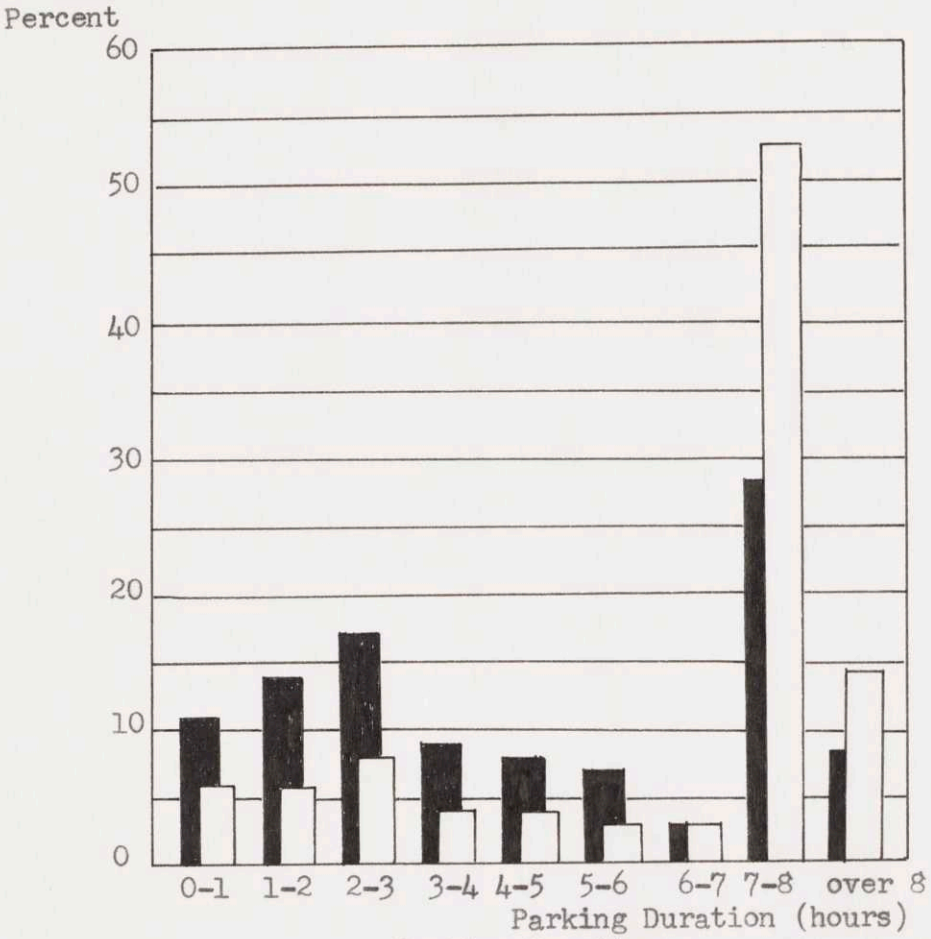
Type of Garage	Land Cost	Construction Cost	Total
1 under ground 3 above ground plus roof	2.00	6.01	8.01
2 under ground 3 above ground plus roof	1.67	6.91	8.58
3 under ground 3 above ground plus roof	1.43	8.16	9.59
1 under ground 3 above ground	2.50	6.01	8.51
2 under ground 3 above ground	2.00	6.91	8.91
3 under ground 3 above ground	1.67	8.16	9.83
1 under ground 4 above ground plus roof	1.67	6.13	7.80
2 under ground 4 above ground plus roof	1.43	6.86	8.29
3 under ground 4 above ground plus roof	1.25	7.94	9.19
1 under ground 4 above ground	2.00	6.13	8.13
2 under ground 4 above ground	1.67	6.86	8.53
3 under ground 4 above ground	1.43	7.94	9.37



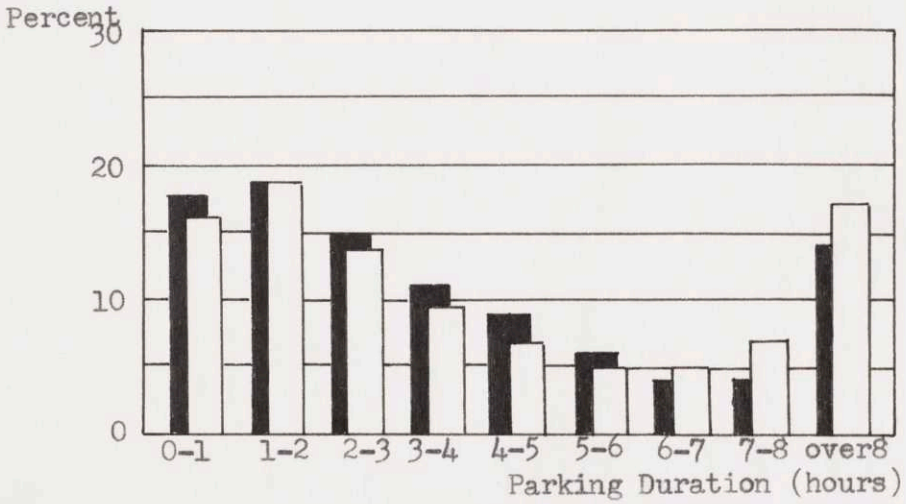
Parking Duration -
Garage Affords Transient Parkers Only



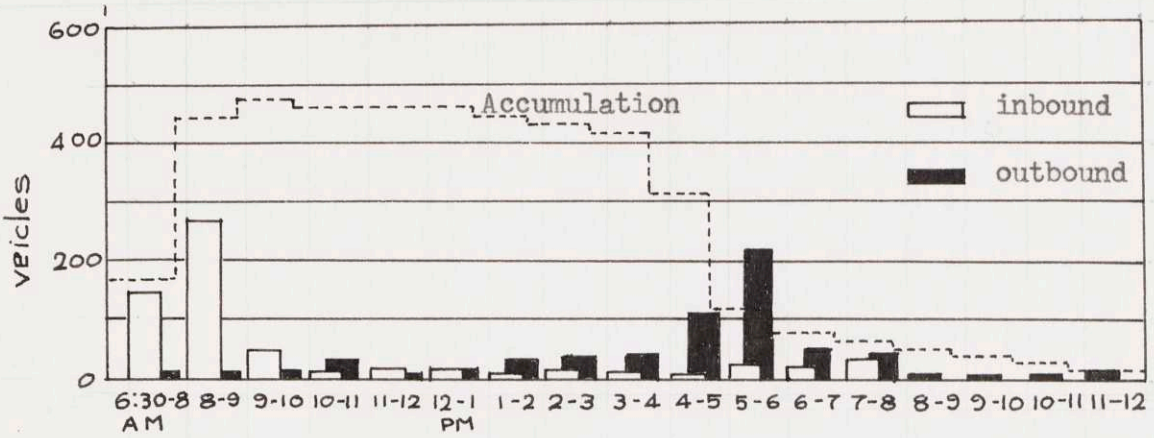
Parking Accumulation -
Two Garages Accommodating Transient and Monthly Parking.



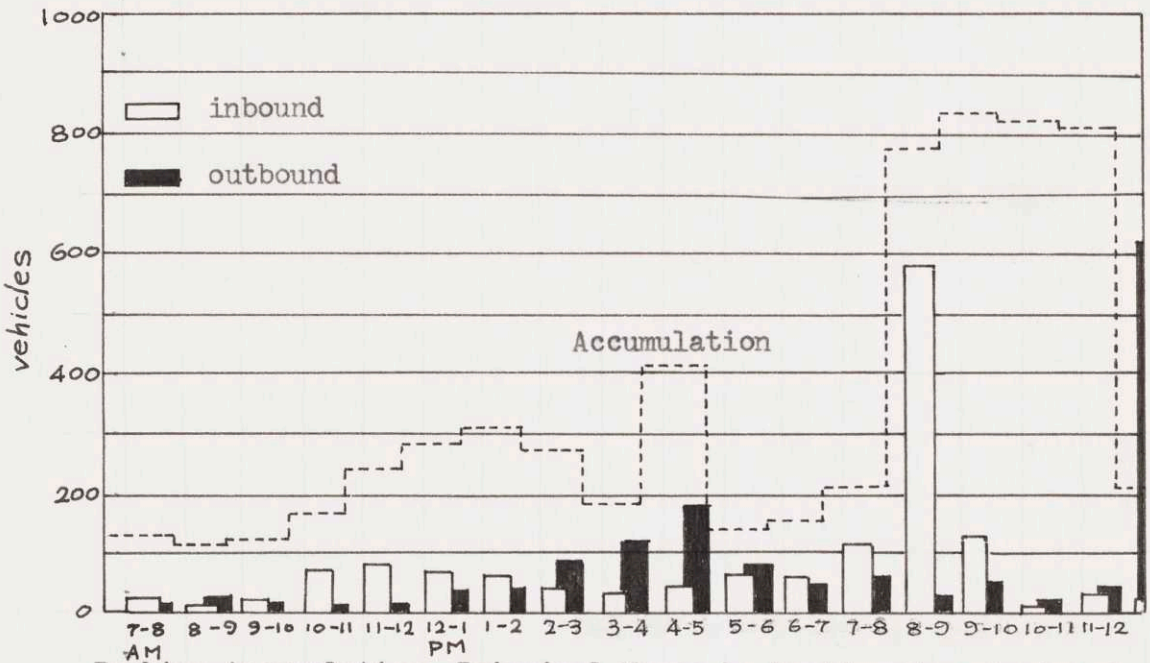
Parking Duration -
Two Garages Accommodating Primarily All-day Parkers



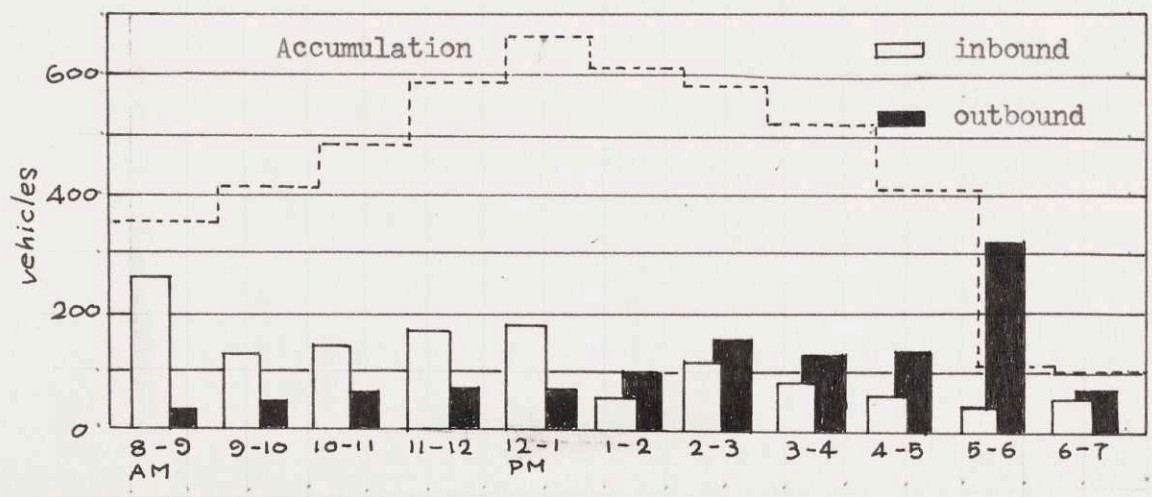
Parking Duration -
Two Garages Located in Same Area of City



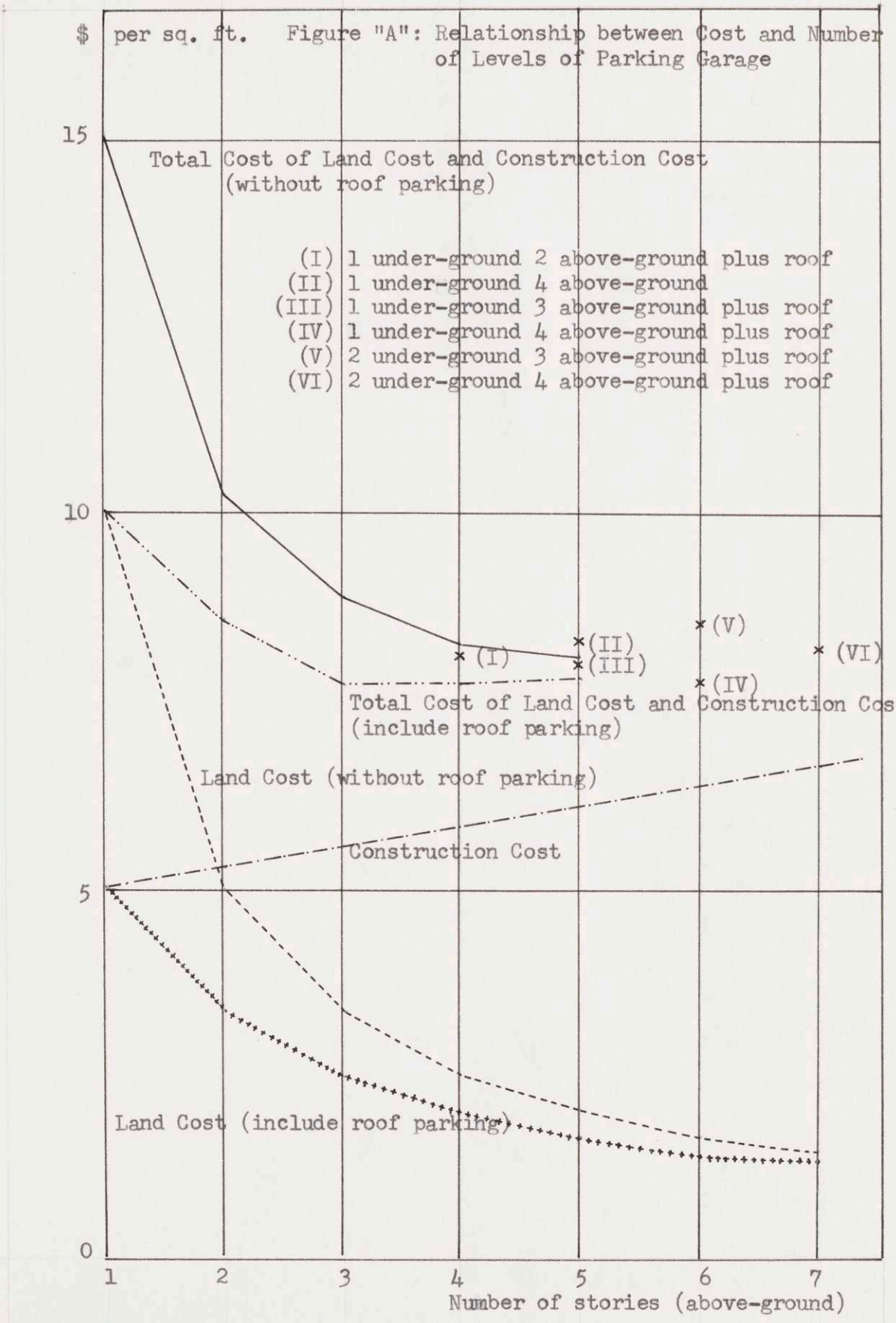
Parking Accumulation--Principal Use by All-Day Parkers



Parking Accumulation--Principal Usage by Daytime Transient and Evening Auditorium Parkers



Parking Accumulation - Usage by Transient Parkers


$ per sq. ft.
Figure "A": Relationship between Cost and Number of Levels of Parking Garage
15
10
5
0
Total Cost of Land Cost and Construction Cost (without roof parking)
(I) 1 under-ground 2 above-ground plus roof
(II) 1 under-ground 4 above-ground
(III) 1 under-ground 3 above-ground plus roof
(IV) 1 under-ground 4 above-ground plus roof
(V) 2 under-ground 3 above-ground plus roof
(VI) 2 under-ground 4 above-ground plus roof
(I)
(II)
(III)
(IV)
(V)
(VI)
Total Cost of Land Cost and Construction Cost (include roof parking)
Land Cost (without roof parking)
Construction Cost
Land Cost (include roof parking)
1
2
3
4
5
6
7
Number of stories (above-ground)

According to this information, the most economical parking garage to build in this area is a four story above-ground type with roof parking or a six story type with one floor under-ground and four above with roof parking.

It is also economically possible to build a few levels of parking under other facilities such as residences and offices.

References

Garages and Service Stations, by Vahlefeld and Jacques, Leonard Hill Books Limited, London, 1960 727-V127

Parking Garage Operation, by Robert E. Whiteside, The Eno Foundation for Highway Traffic Control, Saugatuck, Conn. 1961 727-W594

Autorimesse, by A. Cassi, F. Vallardi, Documenti di Architettura, Composizione e Tecnica Moderna, 1959 727-B29

Parking, by Robert H. Burrge and Edward G. Morgen, The Eno Foundation For Highway Traffic Control, Saugatuck, Conn. 795.8-B94

Vertical Parking Garages, by Charles W. Lerch, Chicago, 1955. VF-795, 81-L56

Detailed Program D: HOTEL

J. E. Robinson

PROGRAM FOR A NEW 250 ROOM HOTEL

for a New Urban Center in Kendall Square, Cambridge

The new hotel will be built to provide:

1. Comfortable quarters for transient visitors of many kinds (businessmen, MIT visitors, convention delegates, tourists);
2. A social center for the Technology Square - MIT - Kendall Square area (with restaurants, lounges, bar, ballroom);
3. A conference and convention center (with meeting rooms and social facilities for groups).

As contrasted with resort, luxury, or residential hotels, this will be a "commercial" hotel. It will recognize, however, that it must provide motel convenience with full hotel facilities and with at least some of the glamour associated with resort and luxury hotels.

Program requirements fall into two major categories: Circulation and Facilities. A hotel is a complex of closely knit but distinct circulation patterns. Its facilities serve two quite separate groups: guests in residence and non-resident visitors.

I. CIRCULATION

A. Access

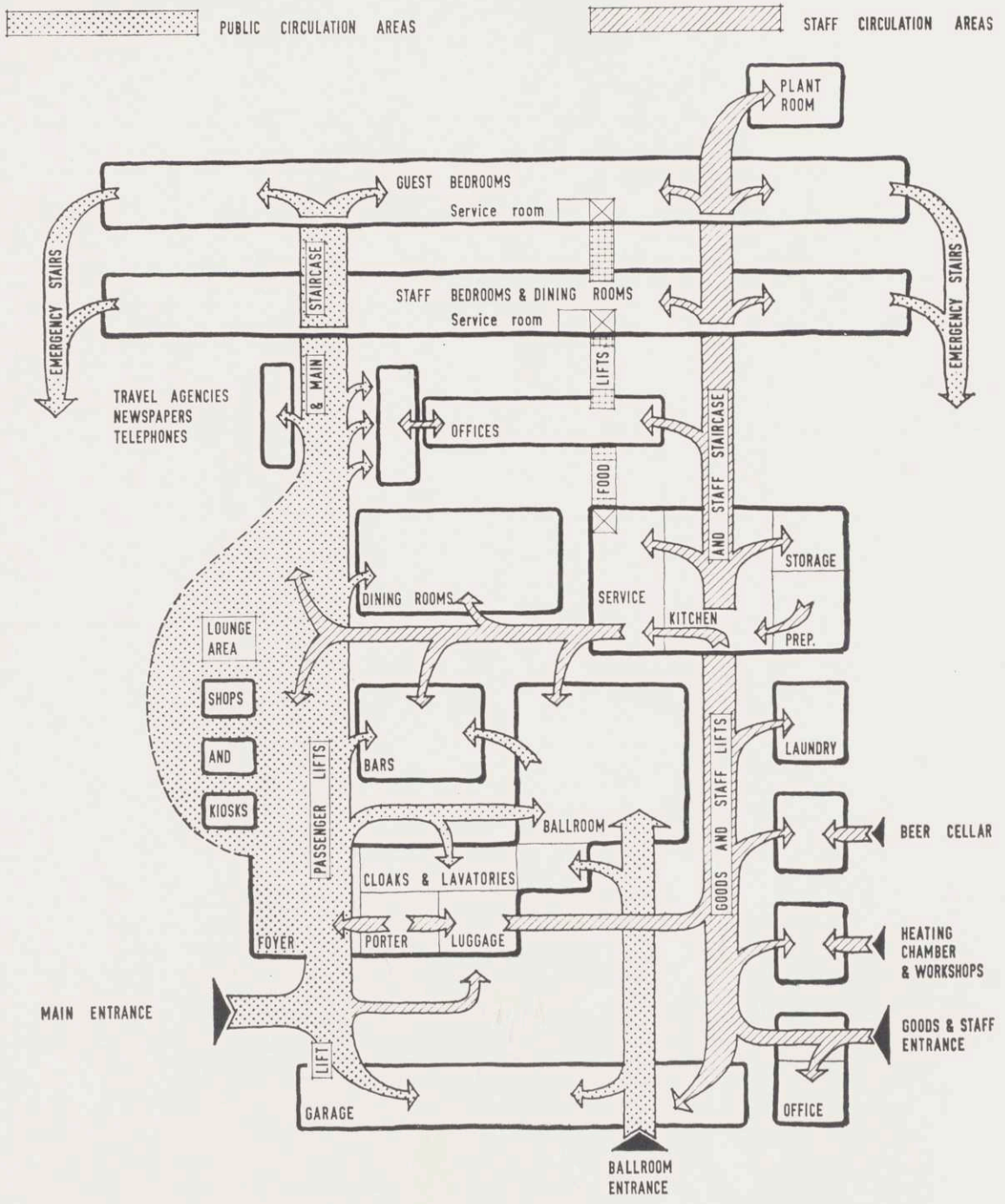
1. Must be easy to find and to get to from metropolitan highways and local streets;
2. Good private car and taxicab entrance;
3. Good public transportation access for vistors to public rooms and for convenience of resident guests.

B. Circulation for guests in residence

1. Protected auto arrival, possibly with drive-in registration;
2. Convenient self-parking (attendant available, but optional);
3. Highly desirable to have some rooms with the motel convenience of parking immediately adjacent to the rooms;
4. Registration desk close to cab and auto entrance, and preferably on the same level;
5. Simple, direct access to all guest rooms, such access protected from intrusions by non-resident visitors to hotel;
6. Easy access from guest rooms to public rooms, function rooms, and swimming pool; and to nearby shopping, entertainment, sports and cultural facilities.

1 HOTELS

THEORETICAL CIRCULATION



C. Circulation for non-resident guests

1. Protected, easy auto arrival and convenient self-parking;
2. Direct access to public and function rooms;
3. Separation from guest rooms and service circulation.

D. Staff circulation

1. Easily controlled staff entrance, separated from guest areas; some parking desirable;
2. Simple, direct service to public and function rooms;
3. Independant service to each subdivision of major function rooms;
4. Service to guest rooms by special service elevator;
5. Clear separation of guest and staff circulation patterns throughout hotel.

E. Supplies

1. One central delivery area capable of holding four trucks at once;
2. Superior access to kitchens for restaurant supplies and waste removal;
3. Access to repair shops, utility areas and storage;
4. Good delivery for displays and exhibitions in connection with conferences and conventions.

II. FACILITIES

A. Guest Rooms

1. Total occupancy 500 persons in 250 rooms;
2. All rooms double occupancy bed-sitting rooms with baths and closet space; 14' - 15' width, 16' - 18' - 20' depth are standard, not including bath and closet space;
3. 6 - 8 suites formed by adding living room between two standard rooms;
4. 20% of rooms connecting;
5. 6 - 8 double sized rooms formed by leaving out partition; second bath space used for kitchenette; used for sample rooms, small functions, or rented to families;
6. Allow 500 gross sq. ft. per room for building size, which includes allowance for corridors, suite living rooms, etc.;
7. Guest rooms need to be well protected from noise of public areas of hotel.

B. Public Rooms

1. Lobby

Small, easy to control; includes registration desk, shops, services, control of access to guest rooms, management offices, porters, telephones; 7,000 - 8,000 sq. ft. allowance for preliminary planning;

2. Coffee Shop - Cafe

125 seats (rule of thumb is half as many seats as there are guest rooms) with one-third of total seating at counter, two thirds at tables; must be easily accessable to resident guests, hotel visitors, and "impulse" customers from sidewalks; 1500 sq. ft. allowance for preliminary planning (does not include main kitchen);

3. Lounge and Bar

About 60 seats at bar and tables; desirable to have food service possible at tables; room used in close conjunction with main dining rooms; needs to be easily accessable for resident and non-resident guests alike; dancing - entertainment area a possibility; allow 1000 sq. ft. for preliminary planning;

4. Main Dining Room

About 100 seats; closely linked to lounge - bar; adjacent outdoor dining area desirable; easily accessable for both resident and non-resident guests; quality of main dining room important in setting tone for entire hotel; allow 2,000 sq. ft. (not including kitchen) for preliminary planning;

5. Pub

Specialty food and drink room to appeal to collegiate community; small, intimate, 40 - 60 seats; must be very well located for ease of access; allow 750 sq. ft. for preliminary planning.

NOTE: sizes of all hotel dining facilities have been kept small in response to the large number of other restaurants and bars close by in the Urban Center.

C. Function Rooms

1. Ballroom to seat 450 at meetings, 300 at banquets, and hold 250 at dances; capable of subdivision into thirds; flexibility and access are keynotes; independant access for guests and for service required for each of the subdivisions;
Can have exterior public access com-

pletely separated from registration desk entrance to hotel, but must also be easily accessable from within the building; sizable foyer required, as well as coat rooms and rest rooms; foyer or other adjacent rooms should be capable of use with the ballroom, as for cocktail parties before banquets, etc.; allow 3,000 sq. ft. for ballroom and 1,000 sq. ft. for foyer and services in preliminary planning;

2. Meeting Rooms and Private Dining Rooms

Two rooms, seating 30 and 50 respectively, able to be used separately or with each other and the ballroom; (double sized guest rooms and living rooms of suites also will be used for smaller meetings and private dining); allow 450 and 750 sq. ft. respectively for the two rooms;

D. Recreation Facilities

Swimming pool is important in attracting tourist and convention trade; tennis courts desirable though not normally heavily used; these, plus health club, putting green, etc. help give resort atmosphere which has great appeal to all visitors. Pool is most important, however; should be out-

doors (if covered, shelter should be completely removable: "people want to swim outdoors in summer."); pool access from guest rooms should be simple and direct; poolside snack bar desirable; pool could be separate from hotel but adjacent to it, as in a club operation;

E. Service Facilities

1. Main Kitchen Complex

Largest of all service elements; can be up to 45 - 50% of total dining areas, although less is preferred whenever possible; must serve all dining areas and function rooms; should be on the same level as the dining and function rooms, with direct service to each; a high price is paid for adding serving kitchens or separate kitchens in other locations (but may be worth it, as to serve a penthouse dining room, for example); allow 4,500 sq. ft. for main kitchen complex in preliminary planning;

2. Services and Maintenance

Laundry, valet, housekeeping facilities, repair and maintenance shops, staff locker rooms etc.; allow 2,000 sq. ft. for these, with 3,000 sq. ft. for utilities and storage areas.

F. Parking

One space for each guest room required, with additional parking nearby for overflow from non-resident guests; staff parking for 10 - 12 cars required (more desirable, but usually cannot afford to provide it); all parking self-parking with attendant available if desired; allow for a minimum of 260 cars (91,000 gross sq. ft. at 350 sq. ft. per car).

SUMMARY OF AREAS REQUIRED:

125,000	guest rooms, baths, closets, corridors
8,000	lobby area
1,500	coffee shop - cafe
1,000	lounge - bar
2,000	main dining room
750	pub
3,000	ballroom
1,000	ballroom foyer area
1,200	meeting rooms - private dining rooms
4,500	main kitchen complex
5,000	service, utilities, storage
91,000	parking for 260 cars
243,950	

Allow 250,000 gross sq. ft. for new hotel.

III. SOURCES

A. Interviews

Meetings with Mr. Robert Shackelton and Mr. Joseph Petrillo, both of the Architectural Department, Sheraton Corporation of America.

B. Economic Analyses

1. "Downtown Boston: Market Studies for Urban Renewal," by Gladstone, May 1963. (Confidential report prepared for the Boston Redevelopment Authority; information on hotel business in metropolitan area and prospects for the next 10 - 15 years; available at the BRA.)

2. "The Market for First Class Hotel Rooms in Downtown Cleveland," by the Real Estate Research Corporation, 1958. (More detailed than the Boston study, with good general points on the hotel business; Rotch Library number 784.3g27.)
C59

C. Books

1. "Hotels and Apartment Hotels," by Root, pp. 96 - 130 in volume 3 of "Forms and Functions of 20th Century Architecture," Hamlin, editor. (General introduction to many types of hotels; Rotch Library number 725.)
H18

2. "Hotels, Restaurants, Bars," by Hatrell and Partners (Reinhold Books), 1962. (British in outlook; reasonably good general survey; some good technical data in appendices; Rotch Library number 727.3.)
H366

3. "Interiors Book of Hotels and Motor Hotels," by Henry End, 1963. (Mainly concerned with interior design, but with a number of detailed case studies of hotel operation plus citation of principles and rules of thumb which are helpful; Rotch Library number NA 7800.)
.E56

4. "Motels, Hotels, Restaurants and Bars," Architectural Record Book, 1960. (Reasonably good general survey; somewhat dated; weak on detailed information and plans; Rotch Library number 727.3.)
Ar 2m

Detailed Program E: PRIVATE HOUSING

William B. Rousos

AN INVESTIGATION OF THE PRIVATE URBAN HOUSING MARKET

I. Definition, organization and management operation of the three common types of urban housing.

A. The Condominium type.

B. The Privately Financed Rental Apartment.

1. Eastgate.

2. Charles River Park.

3. 330 Beacon Street, Boston.

C. The Cooperative type.

II. Financial and Budgeting Analysis.

A. Examination of Lending Institutions, Interest, Mortgage, Amortization and Service Charges.

B. A Monetary Investigation of the three types of common financing.

C. Conclusion.

III. Management and Operation.

A. Yearly operating charges.

B. Yearly maintenance.

IV. A Comparison of the present trends in the design and construction of Urban Housing.

V. The Program.

A. Housing.

B. Nursery School.

VI. Conclusion.

AN INVESTIGATION OF THE PRIVATE URBAN HOUSING MARKET

Note : This study is conducted with the assumption of a 4 room apartment composed of: Kitchen + Bath + Storage = 1 room.
Living and Dining = 1 room.
2 Bedrooms = 2 rooms.

I. A. Condominium is the individual ownership of single units in a multi unit structure, with common ownership of halls, stairs, elevators, lobbies, driveways, etc.

Condominiums may be bought, sold, mortgaged, and are taxed separately as units.

Each owner's property is liable only for his own mortgage debt, another's default does not endanger his interests.

B. The Privately Financed Rental Apartment.

This type apartment is made possible through the investment of capital by an individual or a corporation for the purpose of realizing a profit through their investment.

1. Eastgate.

M. I. T. owns the land and has leased it to New England Mutual for 60 years. (2 1/3 acres).

261 apartments are now renting at $40 - $50 per room.

The gross rental income = $468,000 per year.

(This allows for 7% vacancies at $40 per room.)

Ground rent, taxes, and expenses = $208,000 per year.

Profit = $260,000 per year.

$260,000 per year is 6.9% on a $3,750,000 investment.

Size and type Apartments.

29 - 3 bedroom apartments	=	145 rooms.
108 - 2 bedroom apartments	=	432 rooms.
95 - 1 bedroom apartments	=	285 rooms.
28 - studio apartments	=	55 rooms.
1 - penthouse apartment	=	8 rooms.
261 - apartments	=	926 rooms.

Net to gross area = 55.1%.

240 apartments have balconies, which count as "$\frac{1}{4}$ room". Their size is 6' x 16'. Storage varies, but the minimum is 24 sq. ft.

Construction.

16 foot bays. Wind bracing is important, because the ratio of height to width is over 2.25. Diaphragm walls must carry most of the wind load. The expansion joint is a "saw tooth" connection, which allows movement in the longitudinal direction, but picks up transverse wind shear.

2. Charles River Park.

Site is 48 acres and financed by the John Hancock Insurance Company.

Choice ranges from:

Efficiency	- $125.00 per month.
1 bedroom	- $155.00 per month.
2 bedroom (2 baths)	- $258.00 per month.
3 bedroom (3 baths)	- $292.00 per month.
3 bedroom, town house with garden	- $290.00 per month.

3. 330 Beacon Street, Boston.

78 apartments plus three penthouse units; apartment is 17 stories high and includes a 3 level garage providing 100% parking space.

Bays are 14' x 20'. The plan is a skip corridor system with three centrally located circulation cores. The 1, 2, and 3 bedroom apartments are on one floor, and the 4 bedroom apartments occupy 2 floors.

C. Cooperative.

A cooperative project or apartment building is one in which the tenants buy a percentage of the equity of the buildings and grounds and pay a monthly maintenance charge.

There are several economic and social advantages in this system and some of the most important are:

1. F. H. A. financing - low downpayment.
2. Low monthly payments, since the cooperative is not a money making business venture. (25% - 45% reduction of monthly rentals).
3. Each owner is a shareholder of the property. (may own one residence or many).
4. Low long range operating expenses, because of low turnover in apartment tenants.
5. Choice of neighbors is possible. (not under F. H. A.).

Some disadvantages are:

1. Each tenant is not owner of his part, but owns a percentage of shares. If one shareholder defaults, the others are responsible.
2. Under F. H. A. no owner may sell his share for a profit.

II. FINANCIAL AND BUDGETING ANALYSIS.

A. Examination of Lending Institutions, Interest, Mortgage, Amortization and Service Charges.

1. Methods of Financing.

a. Conventional type F. H. A. insured mortgage.

Maximum 40 years, 97% mortgage.

b. Other Lending Institutions.

Amortization varies, 66 2/3% mortgage.

c. Savings and Loan institutions.

Maximum 20 - 25 years, 80% mortgage.

d. Usually interest is 6¼% - 6½% + 5% of mortgage as a service charge.

B. Monetary Investigation.

1. Investigation of the 80% mortgage.

a. Assume a 4 room $18,000 apartment.

Mortgage (80% of $18,000)	=	$14,400
Difference ($18,000 - $14,400)	=	$ 3,600
Add 5% of $14,000 service charge	=	$ 720
Cost of apartment	=	$18,720
The total downpayment per 4 room apt.	=	$ 4,320

($3,600 + $720 = $4,320).

b. The mortgage carrying charge is:

$14,400 x 6% + 3% amortization = $1,332 per year.

$1,332 ÷ 4 rooms = $ 334 per room per year.

$334 ÷ 12 = $ 27.83 per room per month.

2. Investigation of the 66 2/3% loan.

a. Mortgage 66 2/3% x $18,000 = $12,000

Difference ($18,000 - $12,000) = $ 6,000

Add 5% of $12,000 service charge = $ 600

Cost of apartment = $18,600

Total downpayment per 4 room apartment= $ 6,600

b. The mortgage carrying charge:

$12,000 x 6¼% + 3% amortization = $1,110 per year.

$1,110 ÷ 4 = $ 277.50 per rm. per yr.

$277.50 ÷ 12 = $ 23.13 per rm. per mo.

c. Where the mortgage is higher, the downpayment is lower, but the carrying charge is more.

3. Investigation of the F. H. A. loan.

a. 5¼% interest + ½% for mortgage insurance.

Amortization is 40 years maximum.

On cooperatives and condominiums F. H. A. allows 97% mortgage.

b. Mortgage: (97% of $18,000) = $17,460

Difference ($18,000 - $17,460) = $ 540

Add 8% bank service charge = $ 1,397

Total downpayment per 4 bedroom apt. = $ 1,937

c. Mortgage carrying charge:

5¼% interest + ½% carrying charge.

1½% amortization x $17,600 = $1,266 per year.

$1,266 ÷ 4 = $ 316.50 per rm. per yr.

$316.50 ÷ 12 = $ 26.37 per rm. per mo.

C. Conclusions.

From the above analysis the F. H. A. guaranteed mortgage presents the most attractive method of financing. Although the

66 2/3% mortgage of financing presents the lowest carrying charge, the downpayment makes it impractical. The statutory limitations, as provided by the National Housing Act of 1959, allows for maximum cost per room of $4,800 + 10% for accessory facilities.

III. MANAGEMENT AND OPERATION.

A. Estimated annual operation and fixed charges.

1. Assume an apartment house of 1,000 rms. ÷ 4 rm./apt. = 250 apts.

2. Total operating Expenses:

1,000 rooms at $100 + $25 recreation fee per year = $125,000

Real estate taxes of estimated assessed value of

$2,000,000 at $50 per $1,000 = $100,000

Total = $225,000

3. Annual fixed charges:

Interest at 5¼%	=	$105,000	
Amortization at 1½%	=	$ 21,000	
Mortgage Insurance at ½%	=	$ 10,000	
Total	=	$136,000	= $136,000

Total operating and fixed charges per year = $361,000

B. Estimated Maintenance.

1. Income: Gararge space - 250 spaces at $30 per month.

This is $360 per year x 250 apartments = $90,000 per year.

2. Total rooms = 1,000

- 7% vacancies = 70

930 rooms must support = $361,000

Maintenance per room per year = $\frac{\$361,000}{930}$ = $388 per rm. per yr.

$388 ÷ 12 = $ 32 per rm. per mo.

V. THE PROGRAM.

A. The Housing Program.

1. Since this entire study uses the four room apartment as its basis, the following recommendations are made. The most probable system of financing will be the guaranteed mortgage under the Federal Housing Administration, so that:

at $4,800 per room a 4 room apartment	=	$19,200
If $19,200 is 90% of F. H. A. mortgage,		
then the cost of the apartment	=	$19,200
The downpayment	=	$ 1,200
Total cost	=	$20,400

2. The program:

No. of Apts.	Type	Size	No. of Rooms	Cost
1,200	Efficiency	550 sq. ft.	2 rm. x (4800+10%)	$10,560
1,600	1 bedroom	760 sq. ft.	3 rm. x 5,280	$15,840
700	2 bedroom	920 sq. ft.	4 rm. x 5,280	$21,120
250	3 bedroom	1,180 sq. ft.	5 rm. x 5,280	$26,400
250	4 bedroom	1,440 sq. ft.	6 rm. x 5,280	$31,680

Assumption is that (kitchen + closets + bath) = 1 room.
and the average size of 1 room = 160 sq. ft.

B. The Nursery School and the Apartment.

1. Determination of size.

a. In Cambridge there are 3.59 people per household family and 11 children of ages 3 - 5 in 100 households.
For group A apartments there are 3.30 rooms per apartment. (No. 2 in original program).

For group B apartments there are 4.45 rooms per apartment.

(No. 3 in original program).

The average size apartment = $\frac{3.30 + 4.45}{2}$ = 3.875 rooms.

b. The number of children per household is directly related to the number of bedrooms per apartment, so that:

Efficiency - 0 children

1 bedroom - 1 child

2 bedroom - 2 children

3 bedroom - 3 children

4 bedroom - 4 children

(1). For 3.875 average rooms per apartment, 1.875 are bedrms.

1,000 apartment units x 1.875 bedrooms = 1,875 bedrooms.

1,875 ÷ 100 = 18.75 households.

18.75 x 11 = 206.25 children per 1,000 apts.

Total Number of children = 412.50

(2). Or to calculate it individually:

3.30 rooms per apt. - 2 = 1.30 x 1,000 = 1,300 bedrooms.

1,300 ÷ 100 = 13 households.

13 x 11 = 143 children.

4.45 rooms per apt. - 2 = 2.45 x 1,000 = 24.5 households.

24.5 x 11 = 270 children..

Total number (143 + 270) of children = 413 children.

2. Provide two Nursery schools for 413 pupils each.

V. CONCLUSION.

A. The aspects of our culture that m ake a city liveable can not be realized where personal individuality and choice are absent.

B. The possibility of choice of living conditions within a larger urban environment should be the primary objective of housing.

C. The step by step logical progression of space from PUBLIC to SEMI-PUBLIC to SEMI-PRIVATE to PRIVATE must be maintained for good use of the choices within the urban environment.

BIBLIOGRAPHY

1. Cooperative Apartments. Institute of Real Estate Management, 1961.
2. National Building Code. National Board of Fire Underwriters, 1955.
3. "Apartments", Architectural Record, February, 1949. VF727.3 A.
4. "Boston Builds Balconies", Forum, ,ay, 1951. VF727.3 M.
5. John P. Borgwardt, "The Condominium", Journal of the State Bar of California. September, 1961. VF 722.45 B.
6. Condominium. Associated Homebuilders of the Greater Eastbay, Inc. 1961. 799.45 A849.
7. Charles River Park - pamphlet - Victor Gruen. VF 723 C.
8. Cooperative Apartments. Institute of Real Estate Management, 1956. 799.45 In 7.
9. "Back Bay Center Hall", Architectural Record, March, 1951, pp. 200 - 202.
10. Puerto Rico Condominium. Section 234 of the Federal Housing Administration. VF 799.45 PR.
11. Comparative Housing Study. Harvard University, 1952. Folio 798.4 H26.

Detailed Program F: MARRIED STUDENT HOUSING AND NURSERY

Donald F. Vahrenkamp

DESIGN CRITERIA

The basic function to be satisfied by this building type is to provide efficient housing for the student and his family. It must be within the economic limitations of both occupant and sponsoring institution. It must be designed to meet the normal housekeeping demands of a very young family and be a literal extension of the student's academic environment.

To avoid monotony of population, some consideration should be given to the mixing of family types within a project. Couples with children should be grouped into neighborhoods of clusters, but not in separate projects secluded from couples without children. Separation should be sufficient, however, to prevent children at play from disturbing childless couples, or childless couples from upsetting normal schedules of the very young.

The married student and his family are very young (he and his wife in their early 20's) married less than 3 years.

It can be accurately assumed that a typical student studies both at school and at home, depending upon assignments and family schedule. Because no special provisions have been made for home study, other than perhaps a desk or whatever facilities he has improvised, the student ordinarily works in the bedroom or at the kitchen dining table. He keeps his work hopefully out of child-reach and away from kitchen calamities; but there is really no place where he can safely leave it to return to it later.

Noise and family confusion are his principal problems.

The most obvious annoyance factor is noise--noise from adjacent apartments, from children at outside play, railroad and auto traffic, mechanical equipment, and from maintenance at odd hours.

Other drawbacks include insufficient storage, lack of privacy, and inefficient recreation areas for children.

Advantages of low and high rise housing:

Advantages of high rise apartments:

Use less land, more open areas and more area for other facilities which must be included on the site.

Balconies would be sufficient for much of the outdoor activity of the very young children and would serve for a fair amount of the play for somewhat older children (giving easy supervision) - if adequate open areas are also provided around the building.

The elevators simplify the problem of carrying packages and moving baby carriages (which might be kept in the apartments or on the balconies a great deal of the time).

The nuisance of climbing several flights of stairs is eliminated.

Each family would have complete privacy on their balcony.

There is less maintenance of grounds.

There would be more privacy and less noise than in units closer to the ground and walks.

According to information available on the soil condition, it is unlikely that the foundation costs for one or two high buildings would be any greater than that for a large number of low buildings.

Best suited to childless couples and those having one very young child.

No burden on mothers in carrying their children to their apartment as in low rise of more than 2 stories.

Advantages of low units:

A more personal closer contact with the outdoor play area, even if the units were three stories high.

No problem of elevators for small children. Easier coming and going for their play activities.

The low units could also be provided with balconies, affording the same advantages as for the high.

Closer supervision from windows possible for mothers.

More intimate outdoor spaces, a more human scale, in contrast with the somewhat inhuman scale of the campus areas at the present time.

Eliminates most of the public indoor areas that must be maintained.

Smaller gross area per apartment because of lack of interior circulation, but with comparable net rentable area per apartment.

Greater number of units on the ground floor - with advantages of circulation, but disadvantages of lack of isolation and privacy.

COMPARATIVE STUDY ON WESTGATE (MIT) AND PEABODY TERRACE (HARVARD)

Both Westgate and Peabody Terrace are actual present-day examples in Cambridge, and are newly constructed. (Peabody, at the time of this writing is not fully completed--only 80%)

Amount of Land

Westgate is situated on 120,000 sq. ft. of land or 2.75 acres.

Peabody Terrace is on 251,444 sq. ft., or 5.733 acres.

Population

Westgate has:

90 efficiencies	allowing	0	children	=	0 + 2 adults
60 one-bedroom	"	0-1	"	=	.5 + 2 "
60 two-bedroom	"	1 or more	"	=	1.5 + 2 "

210 units

90 x 2 = 180 people
60 x 2.5 = 150 "
60 x 3.5 = 210 "

540 people in project

$$\frac{540 \text{ people}}{2.75 \text{ acres}} = 196 \text{ people/acre}$$

Peabody Terrace has:

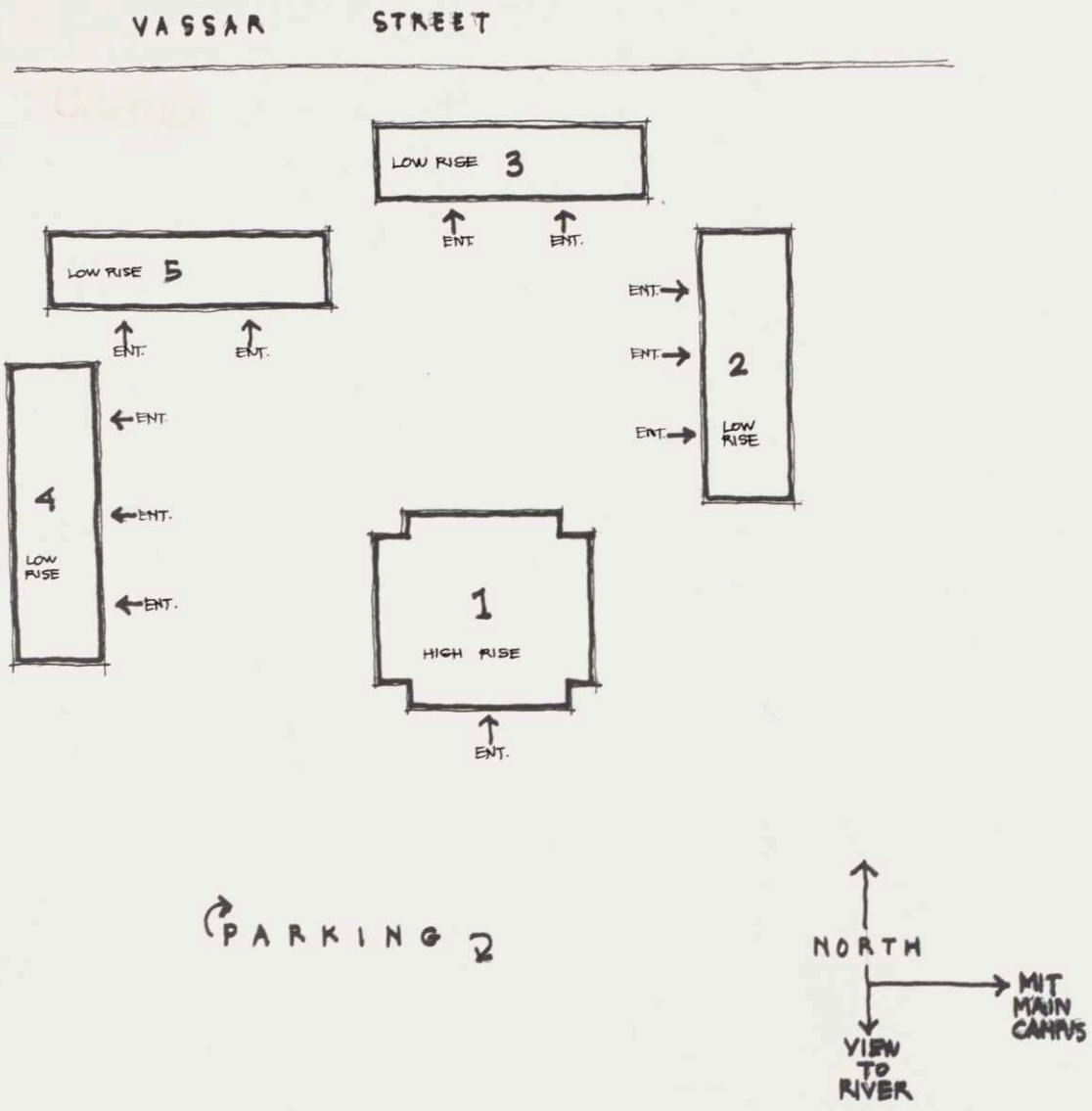
89 efficiencies	allowing	0	children	=	0 + 2 adults
225 one-bedroom	"	1		=	.5 + 2 "
161 two-bedroom	"	1 or more	"	=	1.5 + 2 "
22 three-bedroom	"	1 or more	"	=	2.5 + 2 "

497 units

89 x 2 = 178
225 x 2.5 = 562.5
161 x 3.5 = 563.5
22 x 4.5 = 99

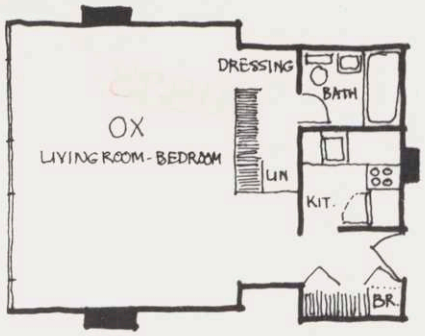
1403.0 people in project

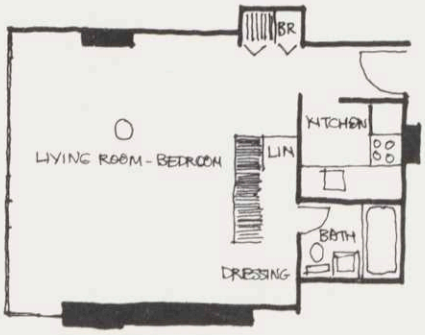
$$\frac{1403 \text{ people}}{5.752 \text{ acres}} = 244 \text{ people/acre}$$

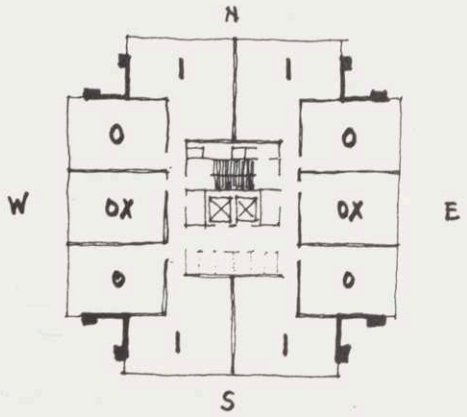


SITE PLAN - WESTGATE

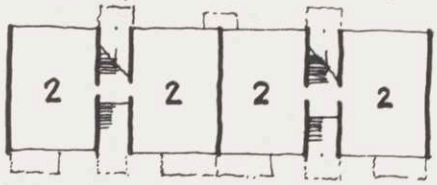
WESTGATE - APARTMENT LAYOUTS



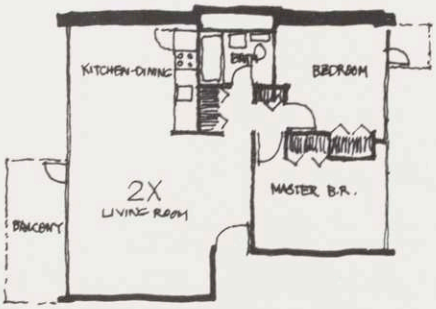


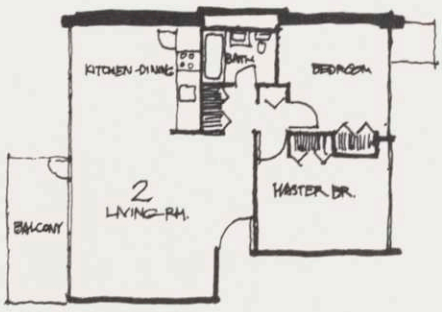


HIGH RISE

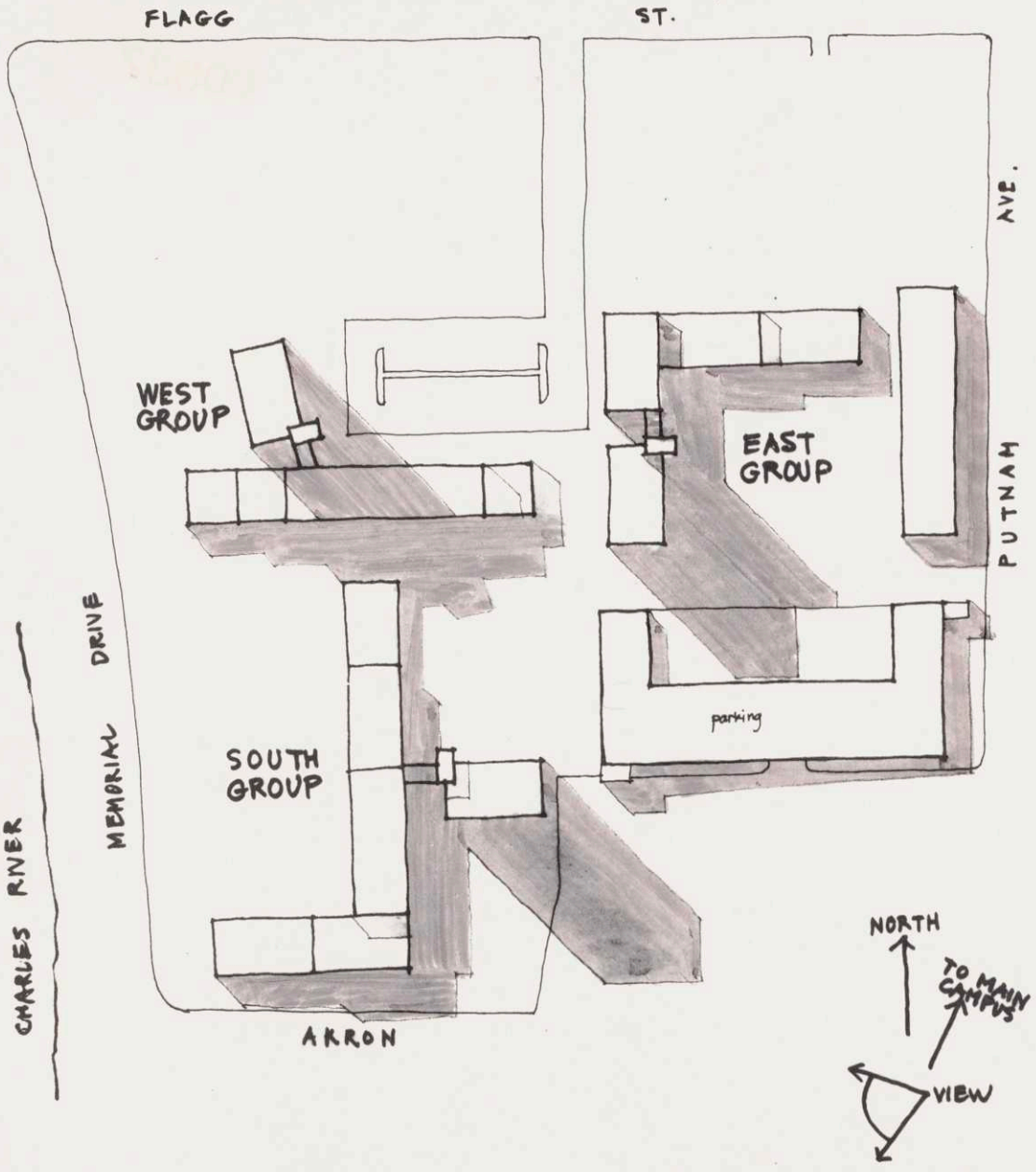


the 2X units on 2nd & 3rd flrs. are slightly larger





LOW RISE



PEABODY TERRACE

Area Breakdown

Westgate has:

Net Area revenue producing space	126,000 sq. ft.	-75%
All other	42,950 sq. ft.	-25%
	168,950 sq. ft.	100%

Bldg. #1 (see site plan)
16 stories and basement

total gross area	115,300 sq. ft.	100%
90 jumbo eff. @ 500 sq. ft.	45,000 sq. ft.	
60 1-bedroom @ 605 sq. ft.	36,300 sq. ft.	
Total revenue producing space	81,300 sq. ft.	70.5%
Total all other space	34,000 sq. ft.	29.5%

Bldg. #2, #4 (see site plan)
3-story apt. bldg.

total gross area of bldg.	16,040 sq. ft.	100%
18 2-br. @ 745 sq. ft.		
total revenue producing space	13,410 sq. ft.	83.6%
Total all other space	2,630 sq. ft.	16.4%

Bldg. #3, #5 (see site plan)
3-story apartment bldg.

total gross area of bldg.	10,935 sq. ft.	100%
12 2-br. units @ 745 sq. ft.		
total revenue producing space	8,940 sq. ft.	81.75%
	1,995 sq. ft.	18.25%

Totals;

gross area in 5 bldgs.	168,950 sq. ft.	100%
90 eff. @ 500 45,000		
60 1-br.@ 605 36,300		
60 2-br.@ 745 44,700		
210 units		
Total revenue producing space	126,000 sq. ft.	75%
Total all other space	42,950 sq. ft.	25%

Peabody Terrace has:

Total area of bldg. 460,758 sq. ft.
(net area not available at this time)

Individual buildings with detailed breakdown on number of apartments is not available at this time.

Size of apartments;

Efficiencies	*Approx.	390 sq. ft.
1-Bedroom	"	530 " "
2-Bedroom	"	740 " "
3-Bedroom	"	890 " "

Floor Area Ratio:

Westgate has:

168,950 sq. ft. of bldg. on 120,000 sq. ft. of land
Floor Area Ratio = 1.5

Peabody Terrace has:

561,372 sq. ft. of bldg. on 251,444 sq. ft. of land
Floor Area Ratio = 2.25

Other Facilities:

Westgate has:

Laundry
Pediatrician's Office
Nursery
Store

Peabody Terrace has:

Laundry
Store
Nursery
Covered Parking

*Peabody Terrace has 4 different efficiencies, 5 different 1-bedrooms, 6 different 2-bedrooms, 2 different 3-bedrooms;
Westgate has 2 plans for eff., 1 plan for 1-bedroom, 2 plans for 2-bedroom.

Parking - 70% is required by the zoning ordinance.

Westgate has:

Space for 154 cars for 210 units.

Peabody Terrace has

Covered
Uncovered — 352 spaces for 497 units

Rent

Westgate's is:

All bills paid

No charge for parking (at present time)

Eff. - $ 95-115
1-br.- $105-125 — per month unfurnished with stove & refrigerator
2-Br.-$137

Peabody Terrace is:

Pay electrical bill

$10 for uncovered parking

$15 for covered "

Eff. $ 90-110
1-Br.$105-140
2-Br.$125-155 — per month unfurnished with stove & refrigerator
3-Br.$170-180

Cost

Westgate:

Bldg. #1	$1,800,000		
" #2	223,500		
" #3	152,800		
" #4	223,500		
" #5	152,800		$2,552,600
Site improvement	40,800		
Utility Connections	11,000		
Equip. (fixed) #1	$53,100		
" " #2	6,600		
" " #3	4,400		
" " #4	6,600		
" " #5	4,400		75,100
Contingencies			118,000
Total const. cost plus architecture and legal services, etc.			202,000
			$ 2,999,500

$\frac{\$2,999,500}{210 \text{ units}} = \$14,200/\text{unit}$

Peabody Terrace:

Gen. Contract			$ 8,822,850
Perf. Bond			48,560
		Total	8,871,410
Arch. & Engineer			
Fee			485,826
B. & G.			221,493
Contingency			335,271
Furnishing			100,000
		Total	$ 10,014,000

$\frac{\$10,014,000}{497 \text{ units}} = \$20,000/\text{unit}$

BIBLIOGRAPHY

Reeves, F. Blair. Housing for Married Students: Problems and Solutions, AIA Journal Sept. 1963 Volume XL, No. 3 pp. 83-90.

Educational Facilities Laboratories. College Students Live Here.

Curtis. Master's Thesis, 1953 MIT.

Program for Married Student Housing-East.
Massachusetts Institute of Technology
Cambridge, Massachusetts

Current Planning Assumptions

Program Requirements - Phase I

Residential Facilities

Service Facilities

Parking and Storage Facilities

Administrative and Maintenance Facilities

Recreation Facilities

Rent Structure

Current Planning Assumptions

The Massachusetts Institute of Technology hopes to provide a balanced grouping of residential facilities at either end of the campus to house approximately 30% of the married student community of 2,400 - 2,500 expected in 1975.

The housing facilities envisioned in this program will both of necessity and of desire be quite urban in character. Its convenient location with regard to Kendall Square and particularly the subway station will make it attractive for those requiring the use of public transport. There will, however, be families with small children and the housing facilities and its immediately surrounding landscape must reflect the needs of the residents as well as achieving a satisfactory integration with Institute academic buildings.

It is proposed to develop, over the next decade, housing on the site for approximately 400 married students.

Program Requirements

The residential and auxiliary facilities required by this program include:

1. Approximately 400 dwelling units for students.
2. Service facilities to support some of the essential residents' needs.
3. Maintenance and general administration spaces.
4. Recreation facilities focused on the needs of the residents.

Residential Facilities

The residential facilities shall be comprised of:

(A) Efficiency apartments - 10% of total dwelling units
(B) 1-bedroom apartments - 80% of total dwelling units
(C) 2-bedroom apartments - 10% of total dwelling units

(A) Efficiency apartments shall include:

1. Full kitchen*
2. Full bath
3. Living room-dining area and sleeping area - with the sleeping area separated from the living room-dining area.
4. Storage space both within and outside of the apt.
5. A minimum area of 400 usable sq. ft. of floor space. (Westgate has 500; Peabody has 390)

(B) 1-bedroom apartments shall include:

1. Full kitchen*
2. Full bath
3. Living room-dining room area
4. Separate sleeping and/or study areas
5. Storage within and outside of the apartment
6. A minimum area of 500 usable sq. ft. of floor space. (Westgate has 605; Peabody has 530)

(C) 2-bedroom apartments shall include:

1. Full kitchen*
2. Full bath
3. Living room-dining area
4. Separate sleeping and/or study areas
5. Storage within and outside of the apartment
6. A minimum area of 600 usable sq. ft. of floor space. (Westgate has 745; Peabody has 740)

*Full kitchen includes a fully enclosed space containing:

1. Full stove (4 burners)
2. Refrigerator (10 cubic feet)
3. Work counters with formica surfaces

4. Steel cabinets with a minimum of 10 linear feet.

5. Stainless steel sink

6. Broom closet (not necessarily in kitchen)

7. Vinyl asbestos flooring

8. Wood rib for the attachment of kitchen accessories.

(A sink-installed disposal is NOT required--garbage will be incinerated in a central facility.)

Service Facilities

The following service facilities shall be provided:

A Convenient Shopping Facility

A small convenient shopping facility of approximately 400 usable sq. ft. for the sale of everyday groceries and a small variety of household needs. This facility should be self-contained and it should NOT be assumed that it will expand. It should be located in the basement or on the first floor reasonably accessible to an elevator and a loading facility.

Laundry

A laundry with facilities for coin-operated washing, drying, and dry cleaning equipment. Space should be provided for 24 washing machines, 12 dryers, and 2 dry cleaning units.

This facility may be located in the basement or on the roof. (Westgate has 15 washers, 6 dryers, and 1 dry cleaning unit for 210 units)

Study and Public Room

A room to be used for studying, meetings, social functions, and a baby clinic should be provided near or at the roof of the building.

Nursery

For 50-60 children at 60 sq. ft./child.

Parking and Storage Facilities

Automobile Parking

Parking space for 70% of the dwelling units will be provided for use by the residents. Parking space should be reasonably convenient and should be based on a 2.1 ratio of compact to standard cars.

Cycle Storage

Storage space for bicycles should be provided on the basis of 1 per dwelling unit. These facilities should be located under cover and be reasonably secure. Access and egress from the cycle storage area should be convenient to the main traffic ways of the Institute as well as to the elevators serving the residential structures.

Baby Carriage Storage

Storage space for approximately 50 baby carriages should be provided close to an elevator in the basement or on the ground floor. Approximately 300 sq. ft. of usable space should be reserved for this purpose. Access to the outside should be provided in conjunction with this facility.

Additional Residential Storage

Storage facilities to supplement storage in apartments should be provided for each dwelling unit to accommodate heavy storage. If outside the apartment this storage area should be in a separate lockable cubicle with a minimum area of 15 to 20 usable sq. ft.

These cubicles may be located in the basement or in the corridor on each residential floor of the building.

Administrative and Maintenance Facilities

Space for administrative facilities should be provided at the public entrance. These facilities should include:

1. A Superintendent's office
2. Mailbox area and Parcel Room adjacent to the superintendent's office.
3. A vestibule adjacent to the main circulation facility
4. Toilets (male and female) for Administrative use.

Space for maintenance facilities should include:

1. Janitor's closets - 1 per floor
2. Incinerator (gas fired) with drop convenient to each apartment
3. A loading facility with access to elevator for handling trash, furniture, etc.
4. Central maintenance area to accommodate work bench for locks, glazing, painting and storage of parts.
5. Toilet for maintenance personnel.

Recreation Facilities

Recreation facilities for pre-school age children and sitting areas for mothers with infants should be provided as part of the general site plan. These facilities should be located in such a manner that they are protected from the surrounding streets and at the same time be part of the overall landscape development.

Rent Structure

It is to be assumed that the gross rental for the apartments in this project are not to exceed an average rental of $130-$135 per month.

Service Requirements

Trash

Fire

Store Service

SUMMARY OF AREA REQUIRED

400 Living Units

10% or 40 units of eff. @ 400 sq. ft.	=	16,000
80% or 320 units of 1-br. @ 500 sq. ft.	=	160,000
10% or 40 units of 2-br. @ 600 sq. ft.	=	24,000
Total		200,000 sq. ft.

Shopping Facility	400
Laundry	1,000
Study and Public Room	7,500 ±
Nursery	3,120
Baby Carriage Storage	300
Residential Storage	6,000
Administrative and Maintenance	1,000 ±
Total	219,320 ± sq. ft.

RESEARCH ON NURSERIES

Planning Requirements

Allow 60 sq. ft./child - (prefer 65 sq. ft.)

1 teacher/15 children (maybe 20)

Large nursery (200 children) 4 acre site size

Avrg. " (40-60 ") 2 " " " Suburban Requirement

Small " (15 ") 1 " " "

Nursery children may ride 20 min. by car or bus

Resulting school area: 0.196 sq. mile.

Walking distance w/o crossing hazards: ¼ mile.

Half-Day Sessions enable greater use--possible double use as game room or meeting room on inclimate days. (trouble with furniture being scaled to youngsters, and demand of health and cleanliness for nursery).

Design Suggestions

Site removed from traffic hazards

Easily accessible to children

Location to protect children from cold, heat, and severe wind.

Playgrounds accessible to classrooms

Avoid long flights of stairs

Single story const. if possible

Specific:

Large low window areas w/wide ledges, but not too much window area that temperature control would be arduous.

Spaces Desired - Interior:

Multipurpose

Assembly

Spaces Desired - Interior: (cont'd.)

Kitchen

Playroom

Sleeping/Rest

Parents

Health

Conf.

Arts & Crafts

Music

Indiv. Counselling & Testing

Library

Special Teaching & Remedial

Science Lab.

Teacher's Wk. Rm.

Audiovisual Rm.

Outside Spaces:

Play Area

Division of Play Area

Adequate Gross Area

Hard surface w/lines for various games

Sheltered play area

Fenced Play ?

Areas for Digging

Water Play

Shade Trees

Outside Spaces: (cont'd.)

Outdoor classrooms, patio, court.

Play apparatus, seesaws, bars, jungle gym, slides, swings,

open tunnel (some located on resilient surfaces)

Typical Schedule:

8:45	Arrival of children. Inspection by nurse. Outdoor play.
9:15	Remove Wraps. Fruit Juice
9:30	Work Period
10:30	Group Activities - Conversation - Music - Games
11:00	Washing - Look at Books
11:15	Story
11:30	Rest - Set Lunch Tables
11:45	LUNCH
12:15	Wraps - Outdoor Play
1:15	Remove Wraps - Preparation for Nap
1:30	Nap
2:30	Crackers & Milk - Play--indoors and outdoors - wraps.
3:45	Leave for Home.

From the Comparative Housing Study Published by Harvard School of Architecture:

1950 Census - 3.59 persons/household

in 100 households in Cambridge

Ages 3-5 (nursery age)

There are 86.72 children in 100 homes of school age

From the Comparative Housing Study Published by Harvard School of Architecture: (cont'd.)

There are 12.9 children of ages 3-5 (or 12.9%)

11.0 in nursery school

1.9 stay at home

If 400 units are taken as the maximum number of living units in the married student housing, and 80% are 1-bedroom and 10% eff. & 2-bedroom, and since no children are allowed in eff., and only one child in 1-br. (based on present rules in Westgate), and we presume 2 children in 2-br., we have a total of 400 children. If we then take the above 12.9% for an estimating figure for amt. of children of nursery age (3-5), we get 51.6 or 52 children.

Summary of Area Required:

Married Student Housing

52 children X 60 sq. ft./child = 3120 sq. ft.

Private Housing

413 children X 60 sq. ft./child = 24,780 sq. ft.

(Both are interior requirements)

BIBLIOGRAPHY

Waechter, Heinrich H. Schools For The Young, Rotsch Libr. # 728.2 W12.

U.S. Dept. of Health, Education And Welfare. Functional Schools For Young Children, Rotsch Libr. # 728.22 T21.

Harvard School of Architecture. Comparative Housing Study, 1958.

Detailed Program G: TRANSPORTATION CENTER

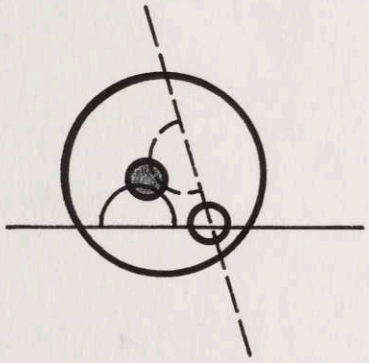
Bernard J. Wulff

THE URBAN TRANSPORTATION CENTER

The city is many destinations tightly grouped. Demanding interconnectedness for existence, these destinations generate complex patterns of many transportation systems which must also be interconnected to facilitate the changes in scale of movement; from one's entering a city to one's entering a building within the city.

A transportation center is not a destination; it is a major transfer point. It is an occurrence in the city where many systems of human conveyance are brought into close, static relationships which permit efficient transformation of passengers into pedestrians and pedestrians into passengers.

On the next page these relationships are diagrammed. Note that, for each transfer from one means of conveyance to another, it is necessary to follow a sequence from passenger to pedestrian to passenger; also, from collection to dispersion to collection.



THE CITY

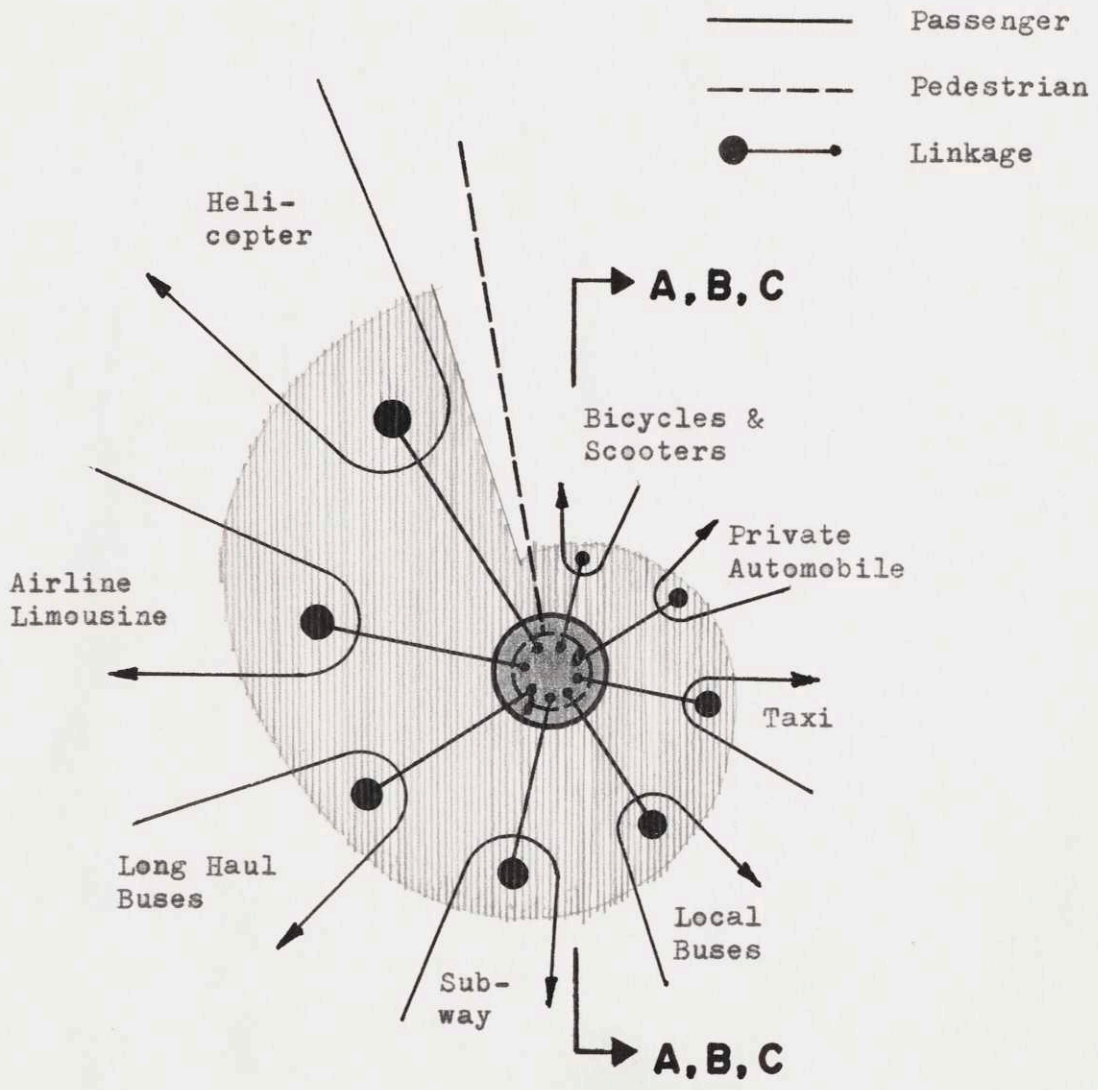
● Point of Transfer - a change in means of conveyance

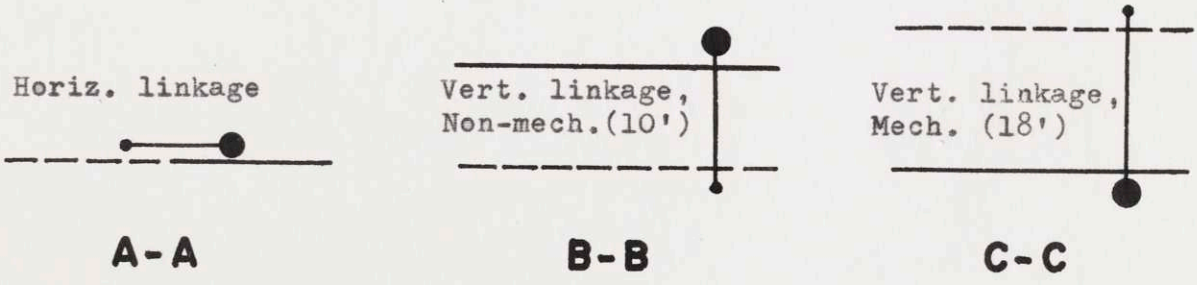
○ Point of Intersection - without change in means of conveyance

– – – Pedestrian - active; slow, random movement

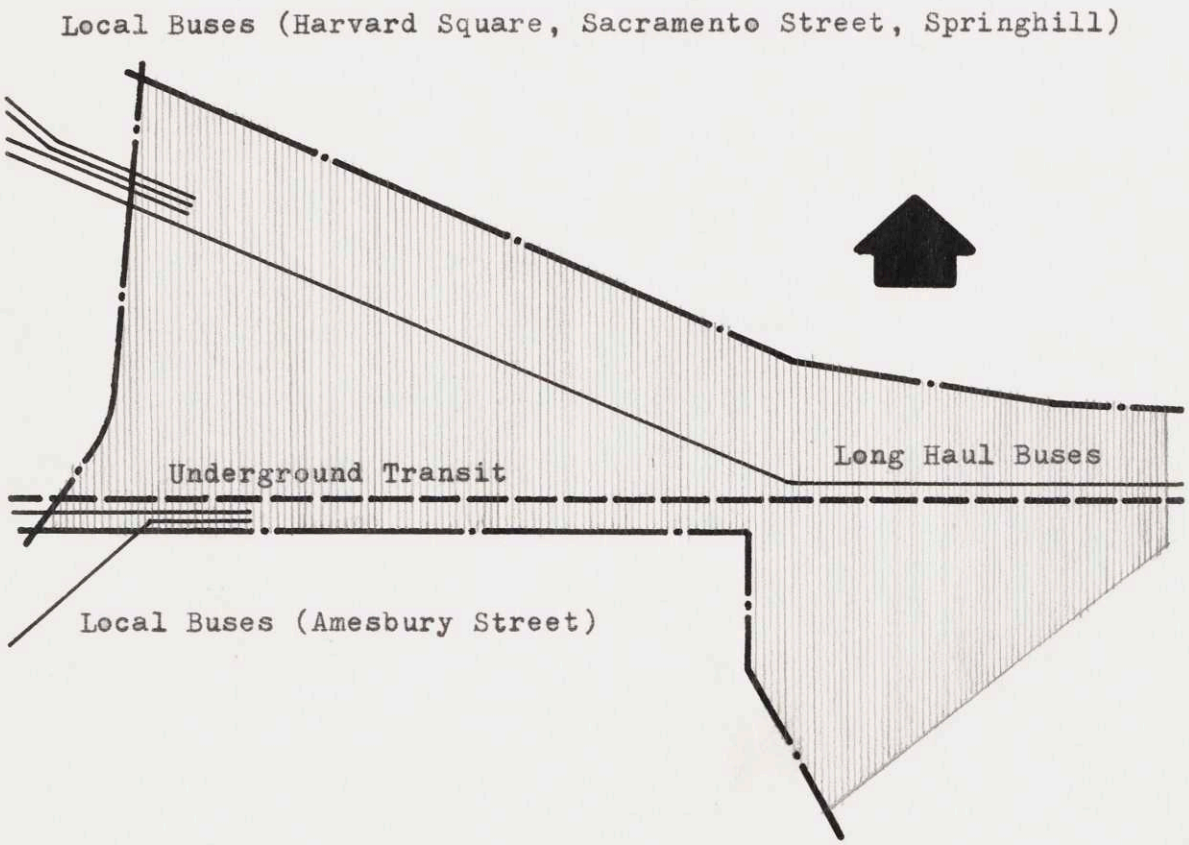
——— Passenger - passive; rapid, channeled movement

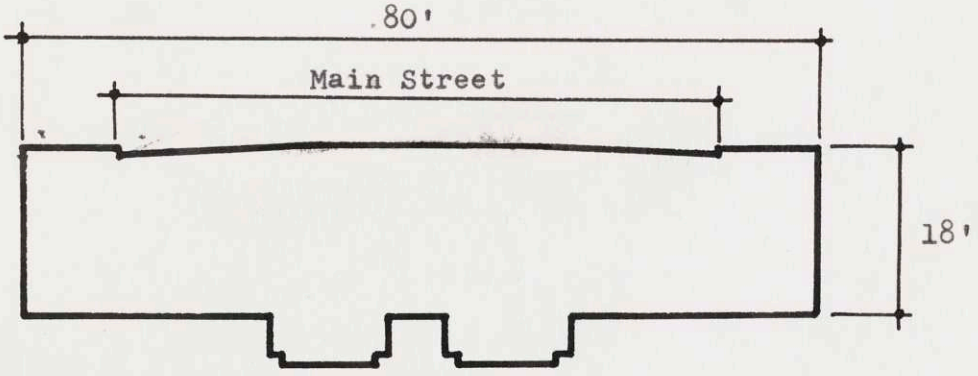
THE TRANSPORTATION CENTER IN THE CITY





PUBLIC TRANSPORTATION ROUTES TO THE SITE





Section Through Subway - Kendall Square Station

BUS TERMINAL DESIGN DATA

Basic Planning Considerations

The basic plan relationships of facilities in a bus terminal are governed by the placement of bus lanes and loading platforms. These elements, brought together, form the transfer point from pedestrian to passenger. Generally, a square site is the most desirable in permitting efficient and economical concourse layout, providing for the loading of buses on two or three sides of the waiting room, and making approaches to all buses equal.

One vehicular entrance and one exit to the site are normally sufficient. The lane width should be at least fourteen feet. Pedestrian access to the loading platforms (concourses) should be through multiple doorways or "gates" so located as to distribute passenger traffic uniformly, without congestion even during the peak load periods.

Related Facilities

Waiting room: Seating may be based on 1/3 passenger of loading docks, assuming 35 to 37 persons per bus. Space allowances range from 15 to 35 square feet per person; 20 to 24 square feet is considered satisfactory. Drinking fountains, trash baskets and ash receptacles are needed. Check lockers are desirable.

1500

Toilets: Convenient access from the waiting room is desirable. A women's lounge may be included.

500

Office: Ticket sales area should provide 50 square feet per selling position. Space should also be provided for the terminal manager and switchboard operations.

300

Drivers' quarters: Provide a lounge and toilet facility accessable from the concourse through a private entrance.

200

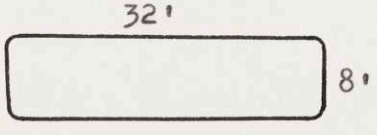
Restaurant: Quick lunch service adjacent to waiting area. (Not operated by the bus company.)

News stand: (Not operated by the bus company.)

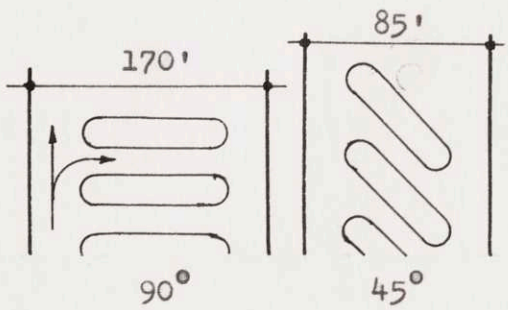
Travel bureau: (Not operated by the bus company.)

Bus parking: Provide paved area for six buses at peak hours. Allow 500 square feet per bus, including space for manuvering in and out of loading position.

3000



Surface Bus (ITR = 27')
OTR = 40'



HELICOPTER TERMINAL DESIGN DATA

Heliport Defined

A "heliport" is defined by the Federal Aviation Agency as "an area of land, water or structure used or intended to be used for the landing and take-off of helicopters."

All heliports can be divided into two general categories: 1) airline or scheduled passenger operations which require baggage and passenger handling facilities as well as a particular type of operational criteria, and 2) all other, or general, types such as used for executive transportation, charter operations, private or industrial helicopter use. The latter is applicable to this case study.

Site Selection

Three major elements to which considerations must be given in the determining of the location of heliports are:

1. Take-off and landing areas.
2. Obstacles adjacent to the site.
3. Flight paths to be used to and from the heliport.

Golf courses, parks, parking lots, undeveloped areas and some rooftops are suitable heliport sites, provided they are level and unobstructed. Large adjacent structures can cause problems of turbulence.

A heliport can be an area not solely dedicated for take-off

and landing of helicopters. Many areas utilized for other purposes can be satisfactorily used for intermittent or occasional helicopter operations. For example, a portion of a waterfront dock area, a roped-off segment of an automobile parking area, or a non-permanent occasional use area can be used for the touchdown and take-off of helicopters and termed a "helistop."

Dimensional Requirements

The touchdown pad or landing gear contact area is the only portion of the heliport which needs to be capable of taking the helicopter landing loads. This area normally comprises the middle half of a minimum size heliport landing area and needs to be only slightly larger than the helicopter's landing gear.

Because of the unique ability of a helicopter to rise and descend vertically, the minimum size of a heliport landing area would be equal to the size of the helicopter, which is primarily the size of the circle swept by its main rotorblades plus a safe margin of clearance. In actual practice, most heliports are at least one and one half to two times the size of the main rotor.

It is recommended that the heliport be fenced-in to keep unauthorized personnel out of the landing area. The fencing should not be so high as to be an obstruction during landing or take-off; three feet is a maximum height. A wind indicator should be placed in a location that is readily visible from the air.

Based on existing helicopter size range, the fenced-in area will be approximately 75 to 100 feet square.

Related Facilities

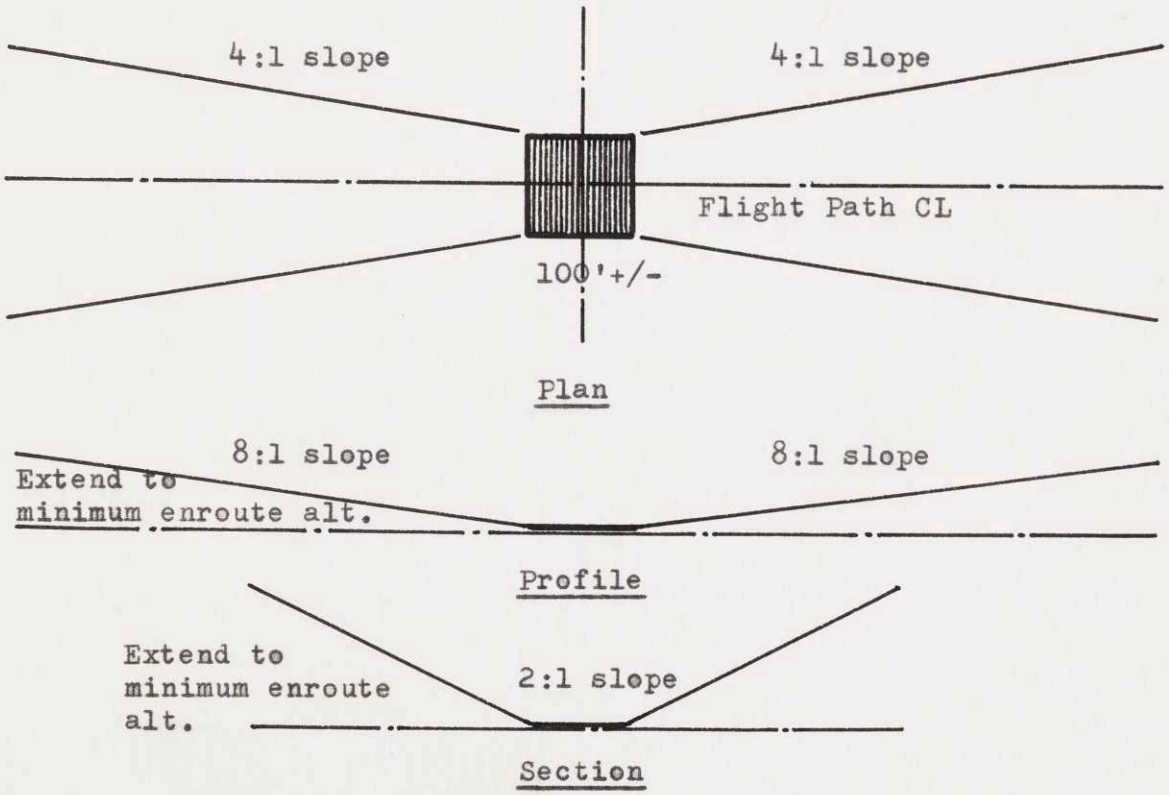
Passenger waiting area: Seating for ten persons will be adequate. Location should be adjacent to the landing area.

150

Ticket counter: Provide one selling position, allowing 50 square feet.

50

Landing Area Requirements



SUMMARY OF AREA REQUIREMENTS

Bus Terminal		
Waiting room	1500	
Toilets	500	
Office	300	
Drivers' quarters	200	
Bus parking (6)	3000	
	5500	5500
Taxi Parking (10)		2500
Limousine Parking (1)		500
Helicopter Terminal (1)		
Waiting room	150	
Ticket counter	50	
Landing area	10000	
	10200	10200
Pedestrian Circulation		1300
	TOTAL:	20000

BIBLIOGRAPHY

For information not included in this report which relates to problems of transportation in context with the given site and program, the following sources may be helpful:

"Over and Under," Architectural Review, May, 1961, pp. 321-36.

"Town and Traffic," RIBA Journal, August, 1962, pp. 290-9.

"Transport," RIBA Journal, December, 1960, pp. 69-74.

Bendtsen, P. H., Town and Traffic, Denmark, 1961.

Cambridge Planning Board, East Cambridge Traffic Study, Cambridge, 1962.

Duff, Robert F., Terminal Facilities for Logan Airport, M. I. T. B. Arch. Thesis, 1962.

Joy, Anthony, A Transportation Facility for Boston, M.I.T. B. Arch. Thesis, 1962.

SECTION THREE: CASE STUDIES

A. Richard K. Chalmers

B. Thomas P. Hopper

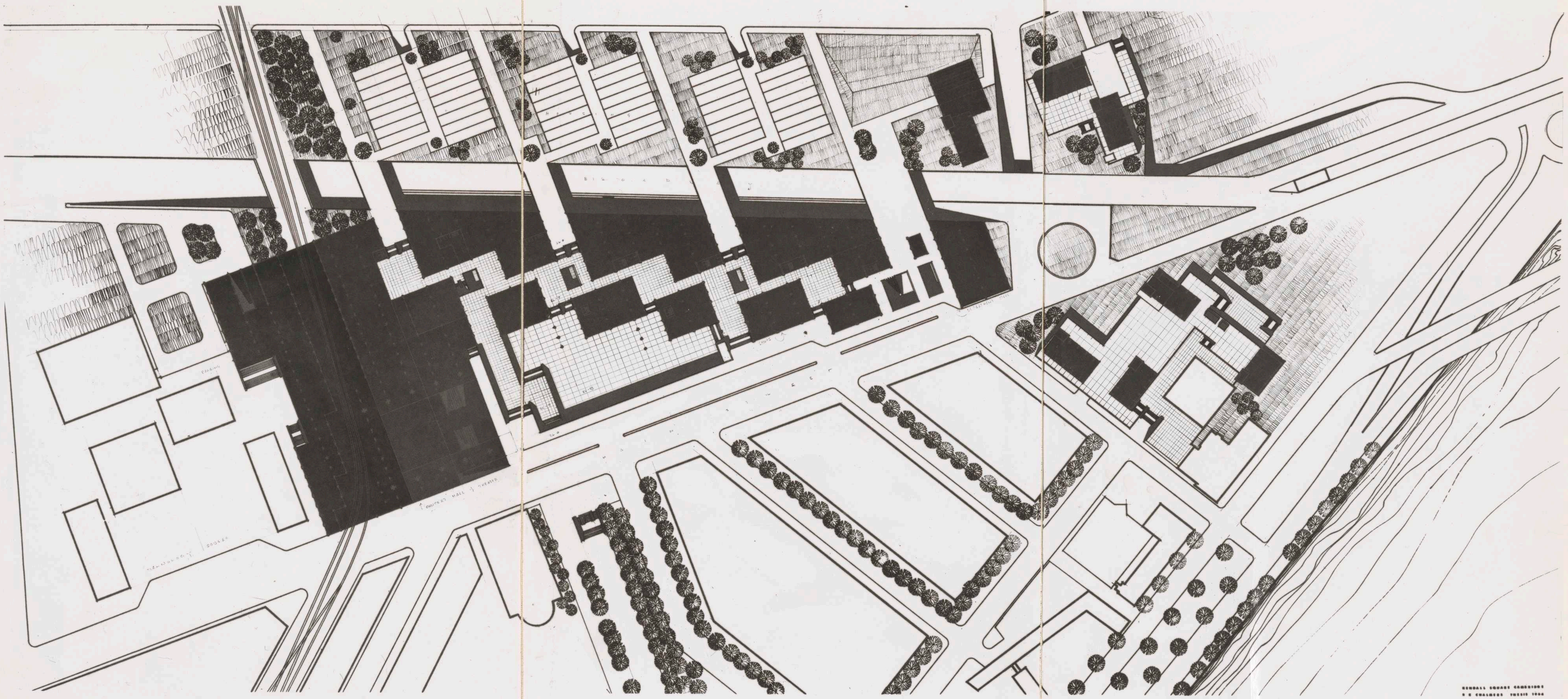
C. Masashi Kozima

D. William B. Rousos

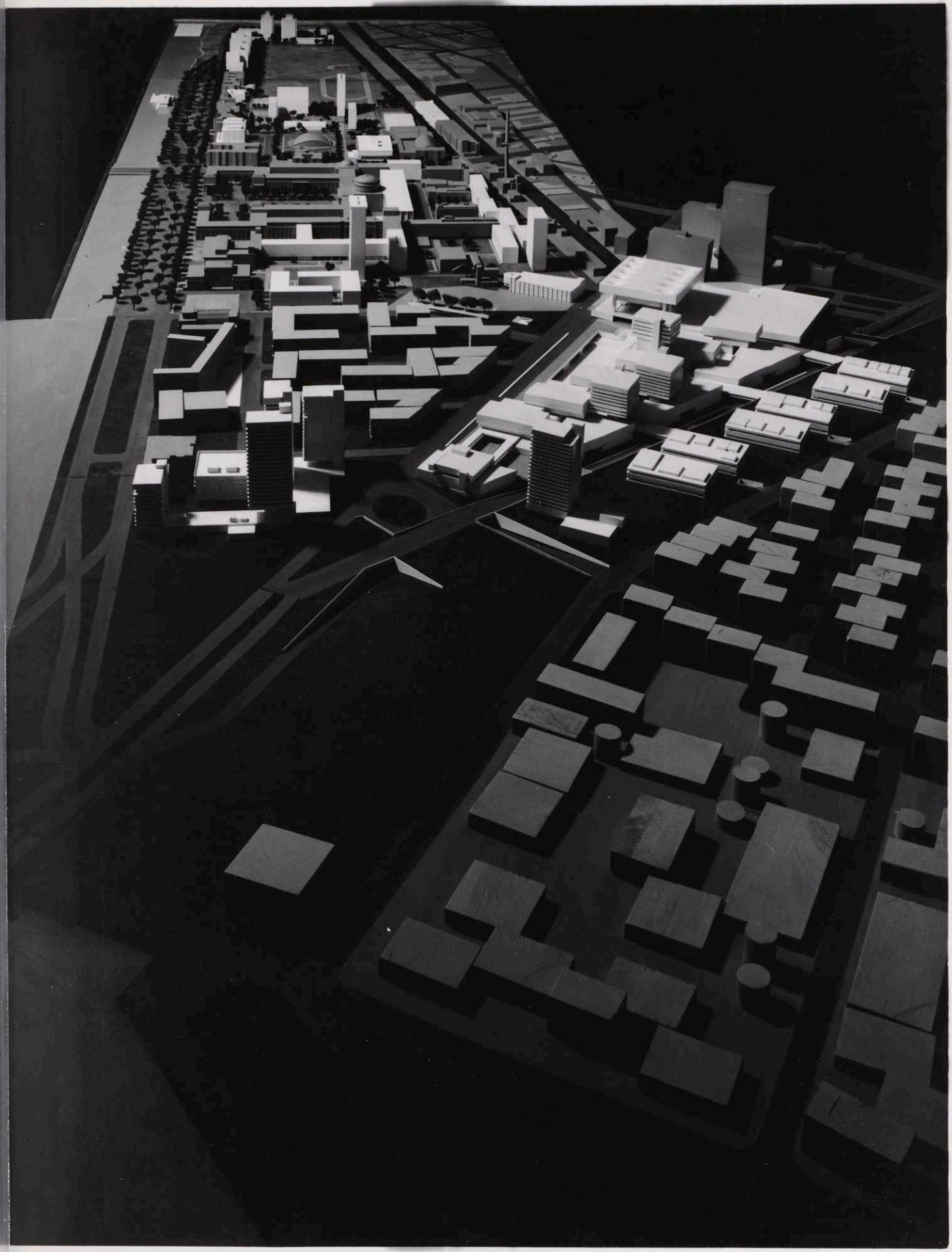
E. Donald F. Vahrenkamp

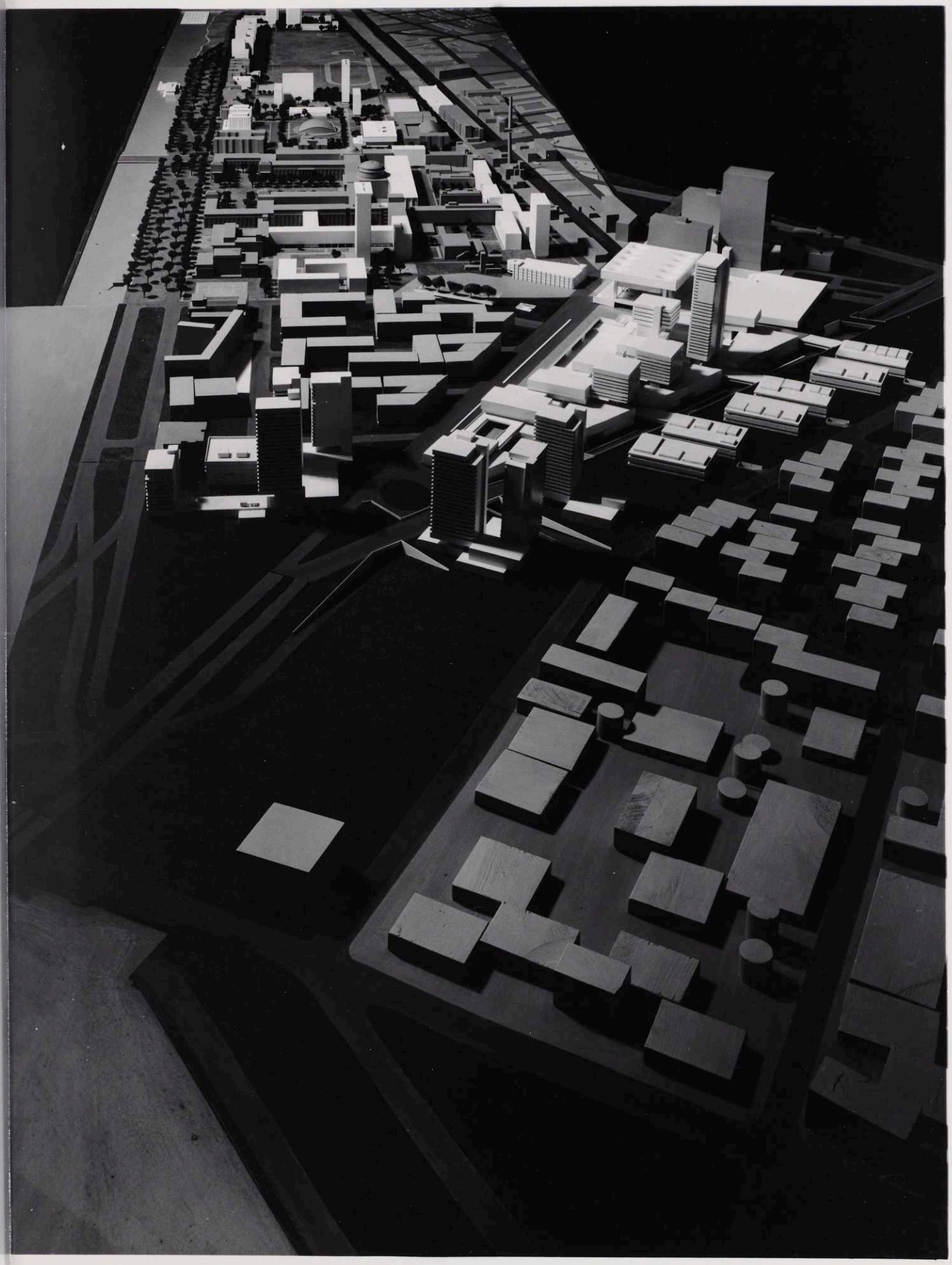
F. Bernard J. Wulff

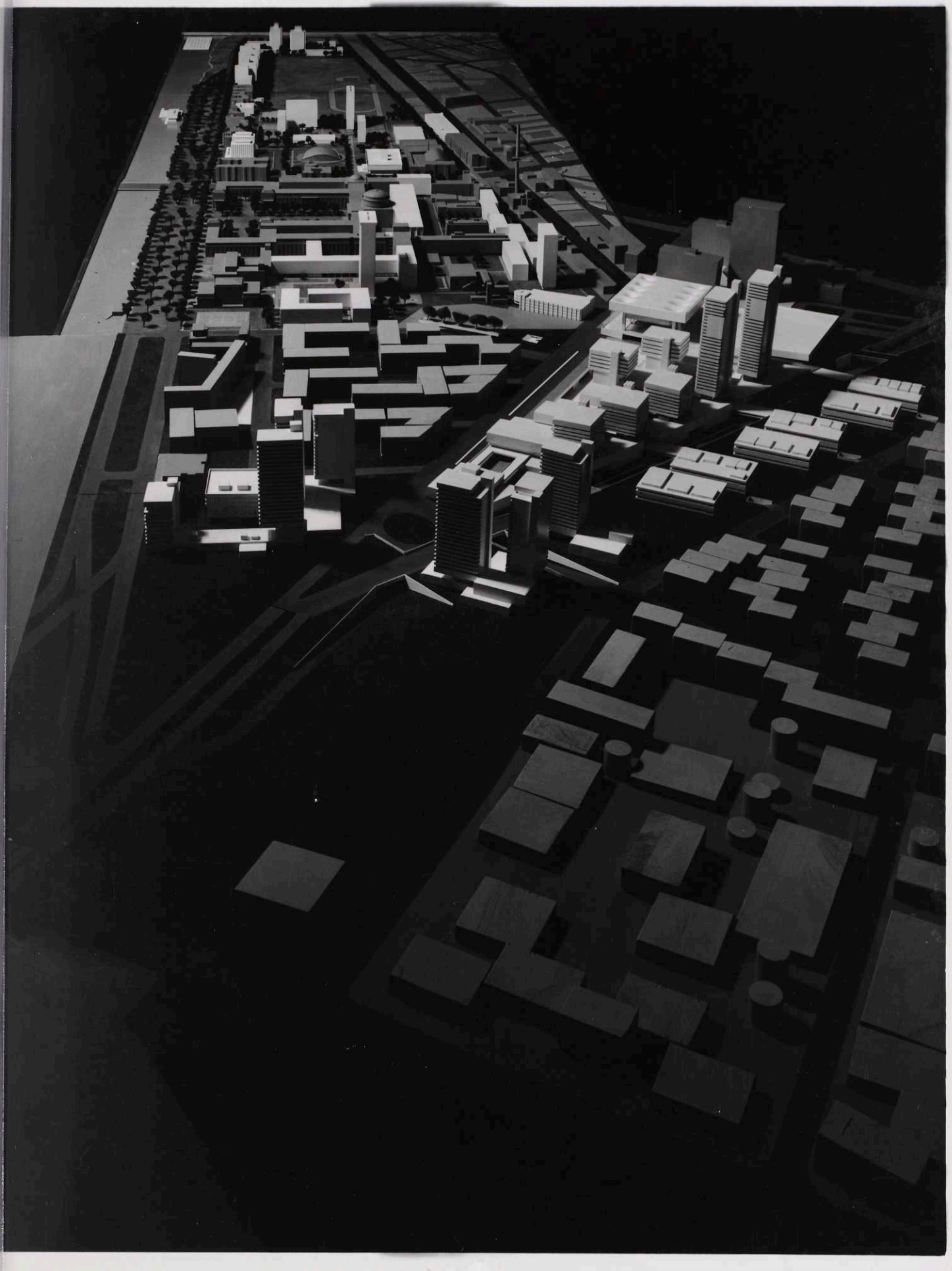
CASE STUDY A: Richard K. Chalmers

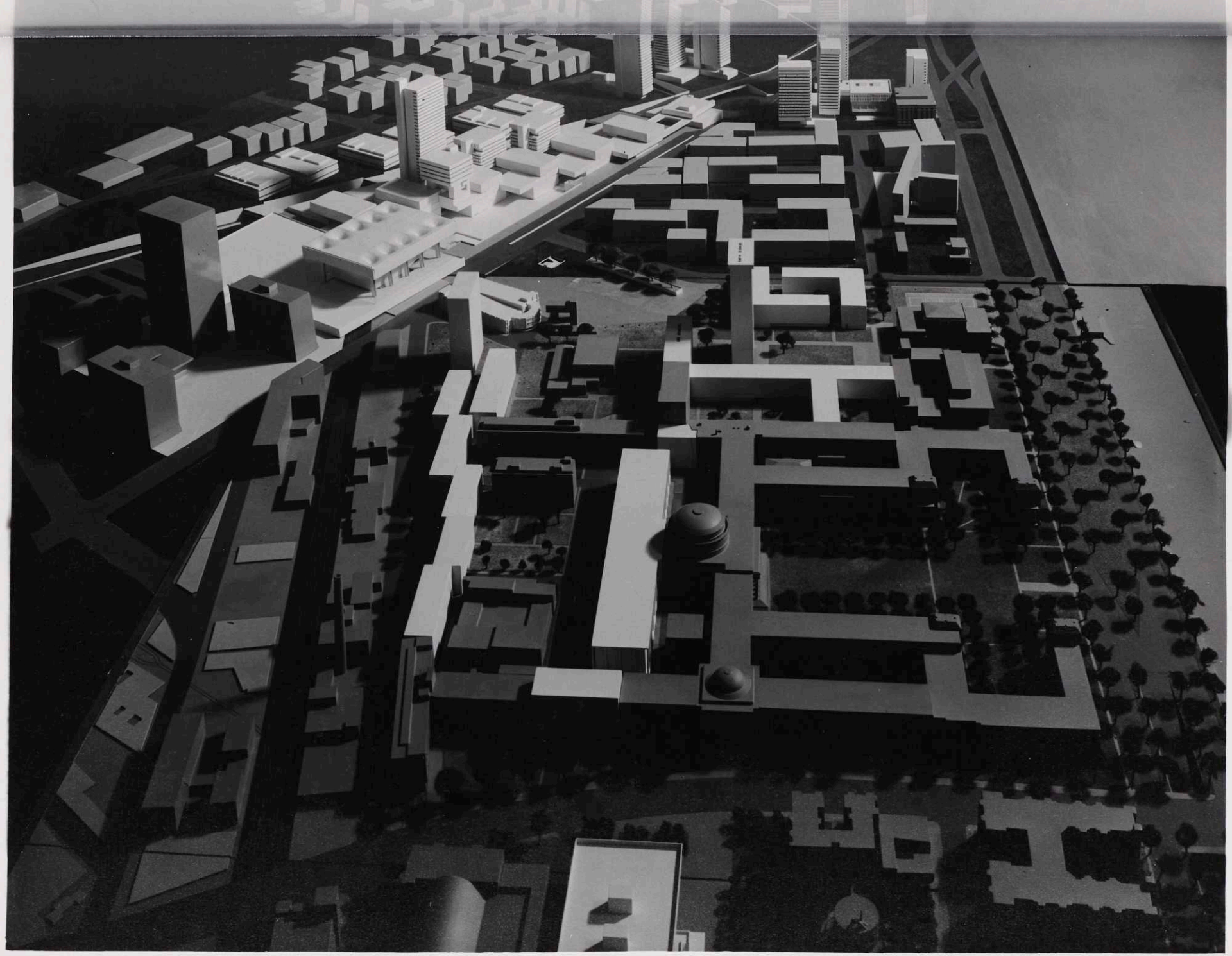


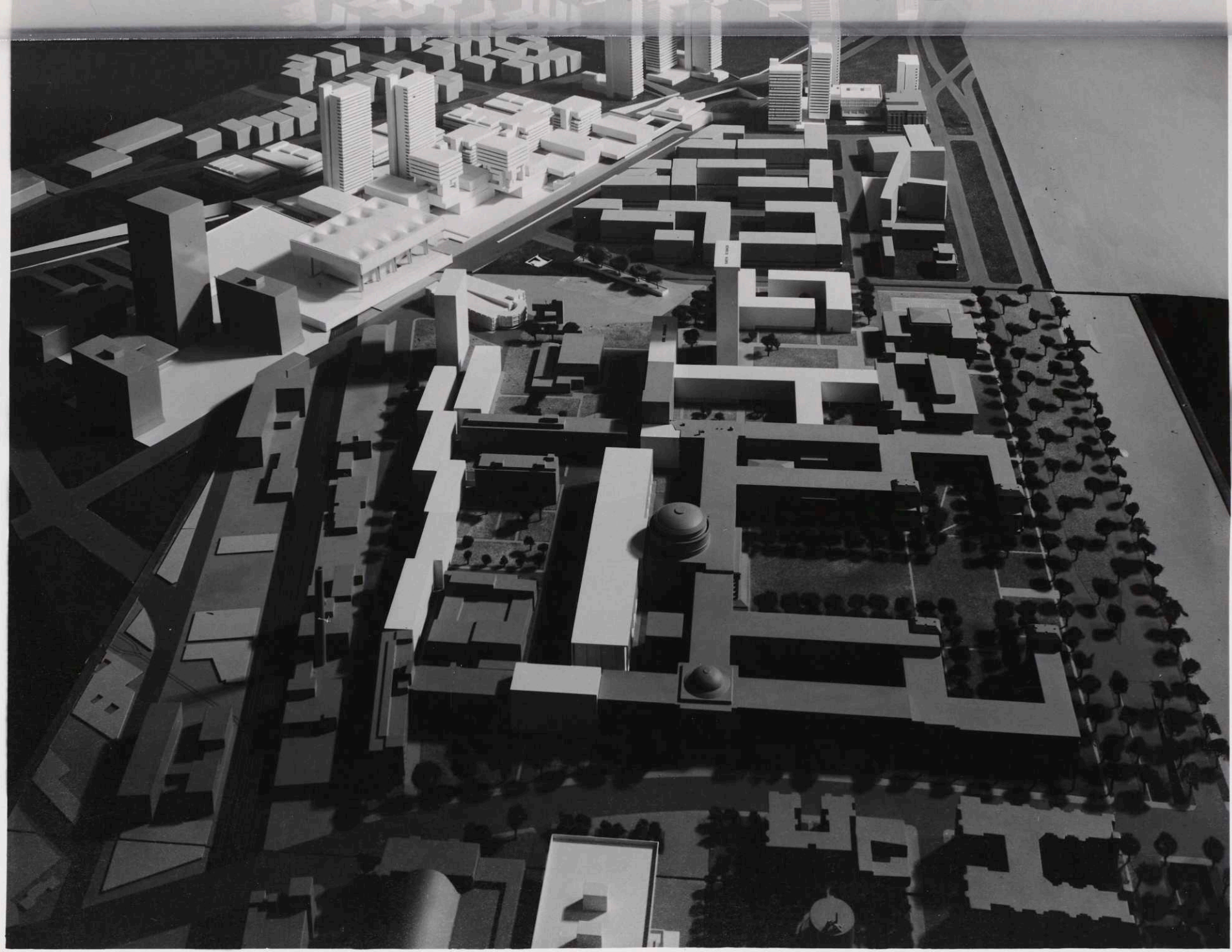
KENDALL SQUARE CAMBRIDGE
R E CHALMERS THESIS 1964

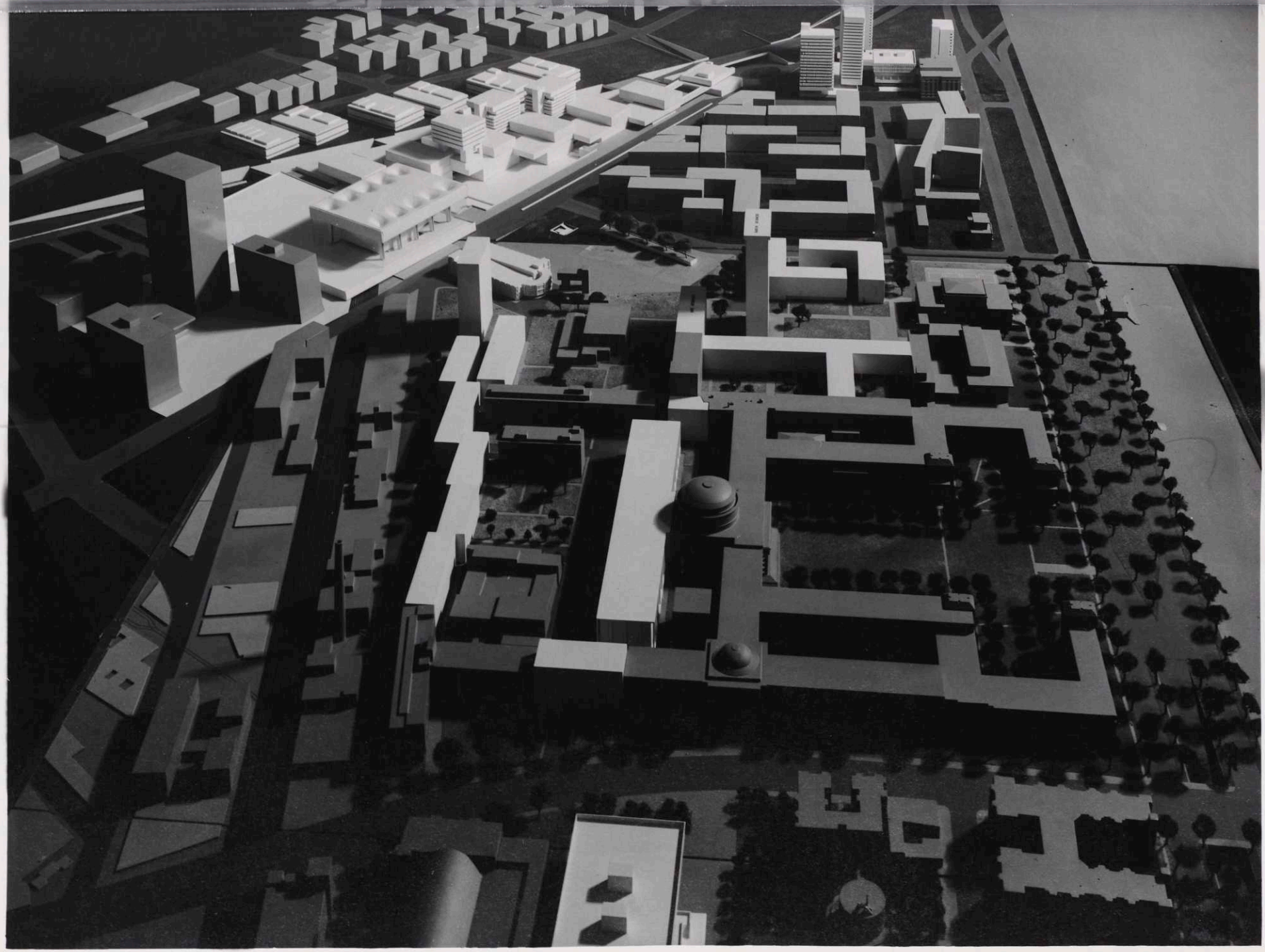










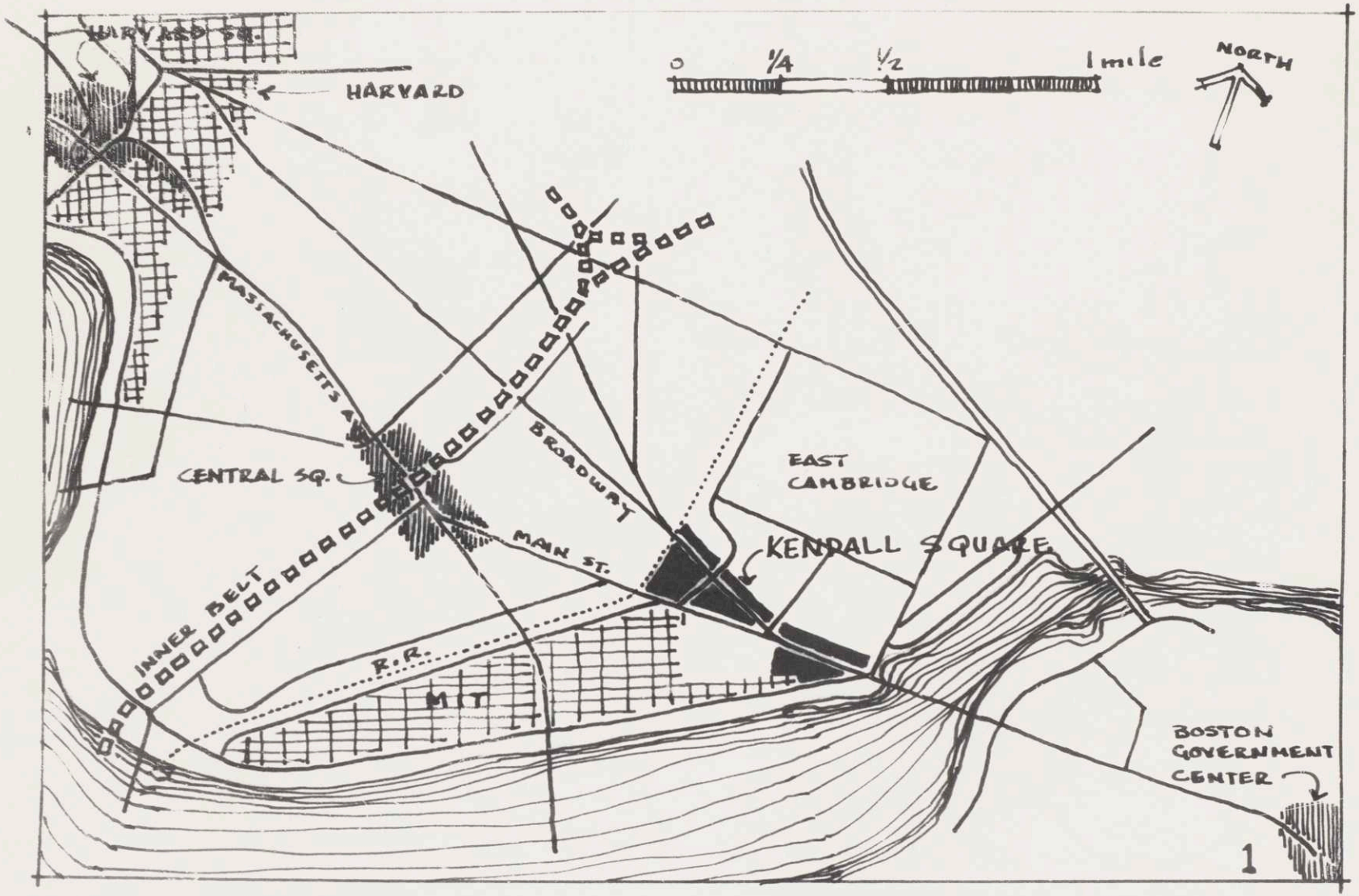


DESIGN OBJECTIVES

1. Kendall Square Cambridge shall be defined as an entity and be comprehensible as a total complex with clear and distinct separation at all edges where there is a major functional change. It shall be comprehensible as a total complex at all of the various speeds related to the center.
2. It shall have a high concentration of mixed uses and there shall be an attempt to promote the following activity characteristics:
   A. Perceptive (visible)
   B. Even distribution (physical)
   C. Even distribution over a period of time (12, 16-24 hrs.)
   D. Distribute activities so that they reinforce each other.
   E. Combine compatible activities to form a new and strongly identifiable activity.
   F. Allow a wide choice of experiences.
3. It shall be so designed to be constructed in stages; each stage being in social and economic balance with its surroundings and be in a complete form at any point of its development.
4. There shall be an attempt to investigate the amount of design control that should be placed on a project of this scale.

DESIGN DESCRIPTION

1. (Design Objective #1) The site has been considered in two basic parts. One being the area bounded by Main Street, Technology Square, and the Broad Canal and the second the area bounded by Memorial Drive, M.I.T. and the Broad Canal which is adjacent to the Longfellow Bridge and cut by Main Street. This second section will be a passive area composed of a large amount of open space (adjacent to the bridge and the Charles River) and multi-story housing (M.I.T. married student housing adjacent to the M.I.T. campus and private units adjacent to East Cambridge). This area is considered primarily as the receptive space for the Longfellow Bridge. The open space (Park and recreation area for the residents and play areas for the nursery schools) is thought of as a base and a positive foot for the Cambridge end of the bridge. The space defined by the housing units is the point of intersection of Main Street and Broadway and is the point of entry or exit of the city. Very little more will be said about this area. The major effort has been placed upon the first area mentioned, that is bounded by Main Street (M.I.T.), Technology Square and the Broad Canal (East Cambridge) which is considered a point of high activity and the beginning of a spine which links Cambridge into an understandable form. Diagram #1 shows how Kendall Square, Cambridge acts as a major activity point along a spine which extends from Boston's government center thru


HARVARD SQ.
HARVARD
0
1/4
1/2
1 mile
NORTH
MASSACHUSETTS AVE.
BROADWAY
CENTRAL SQ.
EAST CAMBRIDGE
KENDALL SQUARE
MAIN ST.
INNER BELT
R.R.
MIT
BOSTON GOVERNMENT CENTER
1

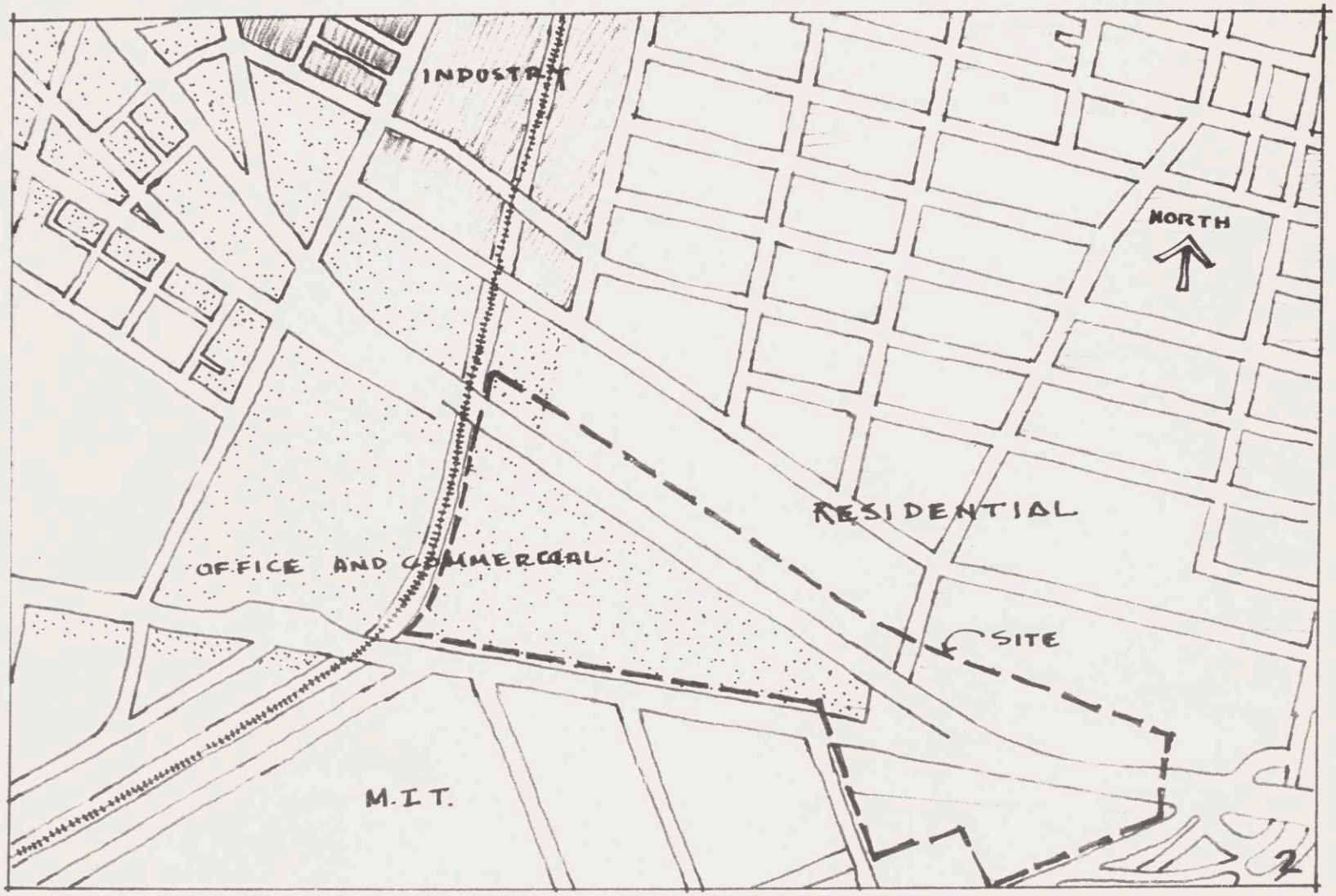
Kendall Square Cambridge to Central Square, Harvard Square and on to Porter Square (which is not shown but is a short distance North of Harvard Sq.) This spine establishes the one major axis which is considered in the geometry of the proposed solution. It also establishes one of the strong and well defined edges of the project. Main Street is the edge that separates M.I.T. and its educational functions from the commercial, entertainment and residential functions of Kendall Square Cambridge. This edge is strengthened by a strong axial view of the Federal and State office towers of the Boston Government Center seen from the intersection of Main St. and Massachusetts Ave. in Central Sq. This would be a completed axis if a similar focus occured at the Central Sq. end. A second means of defining this edge is the depression and opening of a large public area in the designed complex at Kendall Sq. Visual linkages are made along this edge to M.I.T. and the Charles River by straightening three streets which then connect the Charles River and 1. the concert hall and theater complex where there is also the subway station and a pedestrian underpass. 2.The major open space mentioned before and 3. a minor open space which is the orientating space for the bus terminal, department store and supermarket.

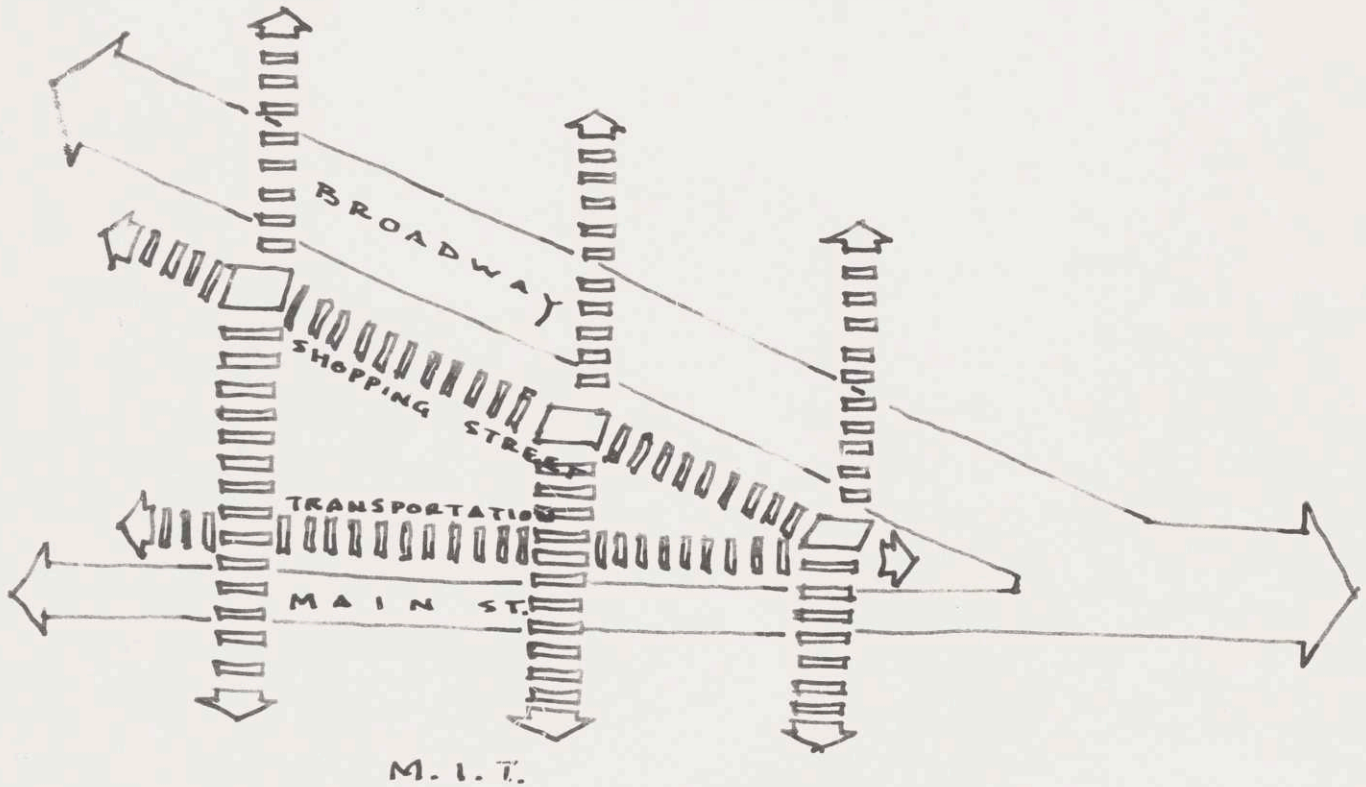
At the Technology Square edge an attempt was made to make Technology Sq. a part of the new complex because of similar functions and the program requirements for the dual use of parking facilities for Technology Sq.(day) and the concert

hall (night). The West edge of the project now becomes Portland St. where a residential area begins.

The linkage between Kendall Sq. and Technology Sq. will be to provide pedestrian ways thru and around the concert hall-theater complex to provide some day-time activity in this area.

The North or East Cambridge edge will be defined by the depression of Broadway which will become a major connection between Boston and the new inner belt interchange, and the massing of the project which builds up to that edge. The linkage at this edge is provided by the 2 - level pedestrian bridges which connect the residential area at grade and parking facilities below grade. The housing and parking units along this edge will provide for future expansion of the commercial facilities. It is proposed to fill the Broad Canal along this edge (see photos and dia.2). The second axis which is used to establish the geometry of the project is the pedestrian axis which is perpendicular to Main Street and goes to and thru the project between East Cambridge and M.I.T. Two secondary axes are one which parallels Broadway and crosses the North - South pedestrian axes and another which parallels Main St. and links the transportation facilities (dia.#3). To be consistant with the speed of movement along these axes the project massing was developed in its long dimension along the high speed axes (subway, Main St. and Broadway).

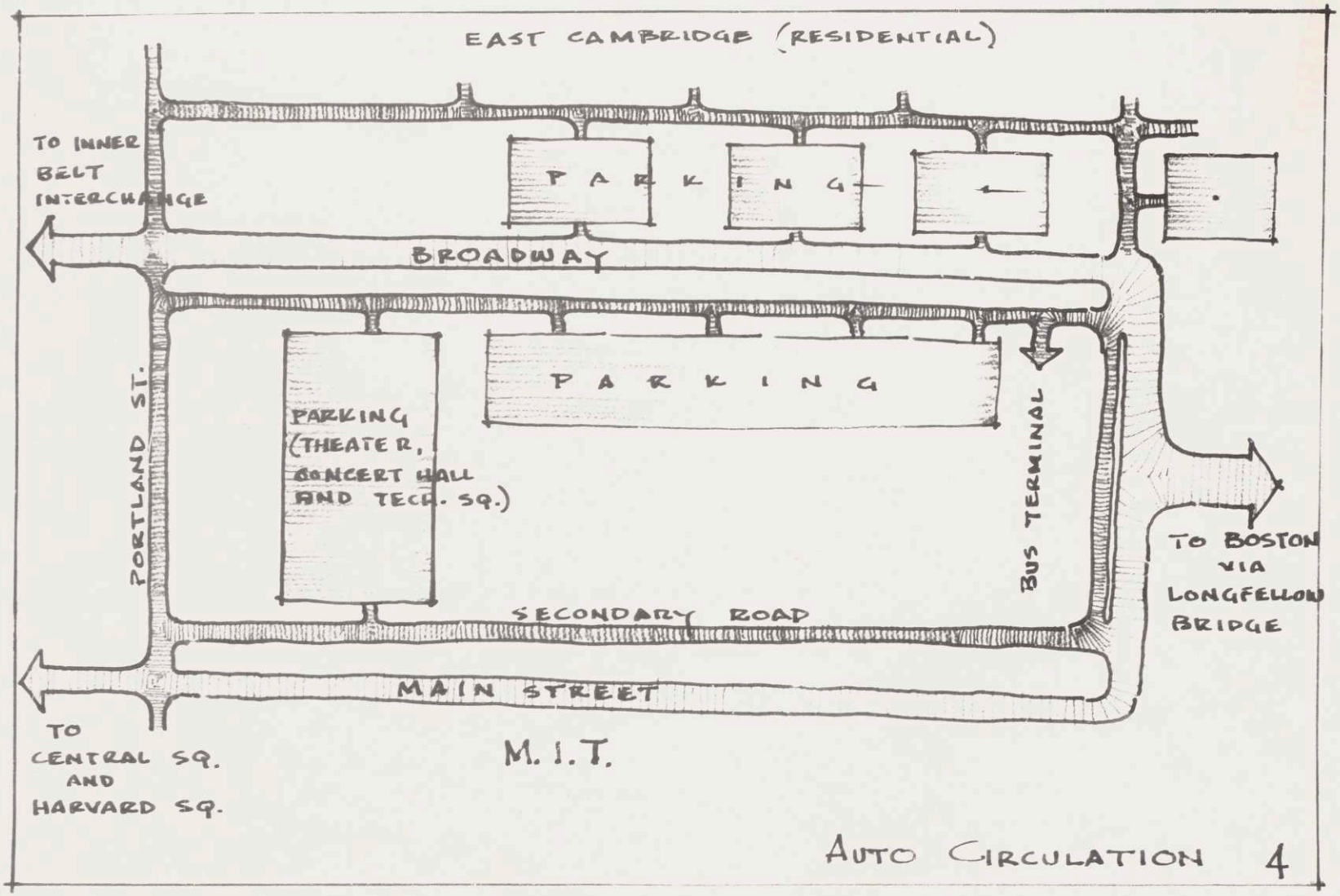

INDUSTRY
NORTH
RESIDENTIAL
OFFICE AND COMMERCIAL
SITE
M.I.T.



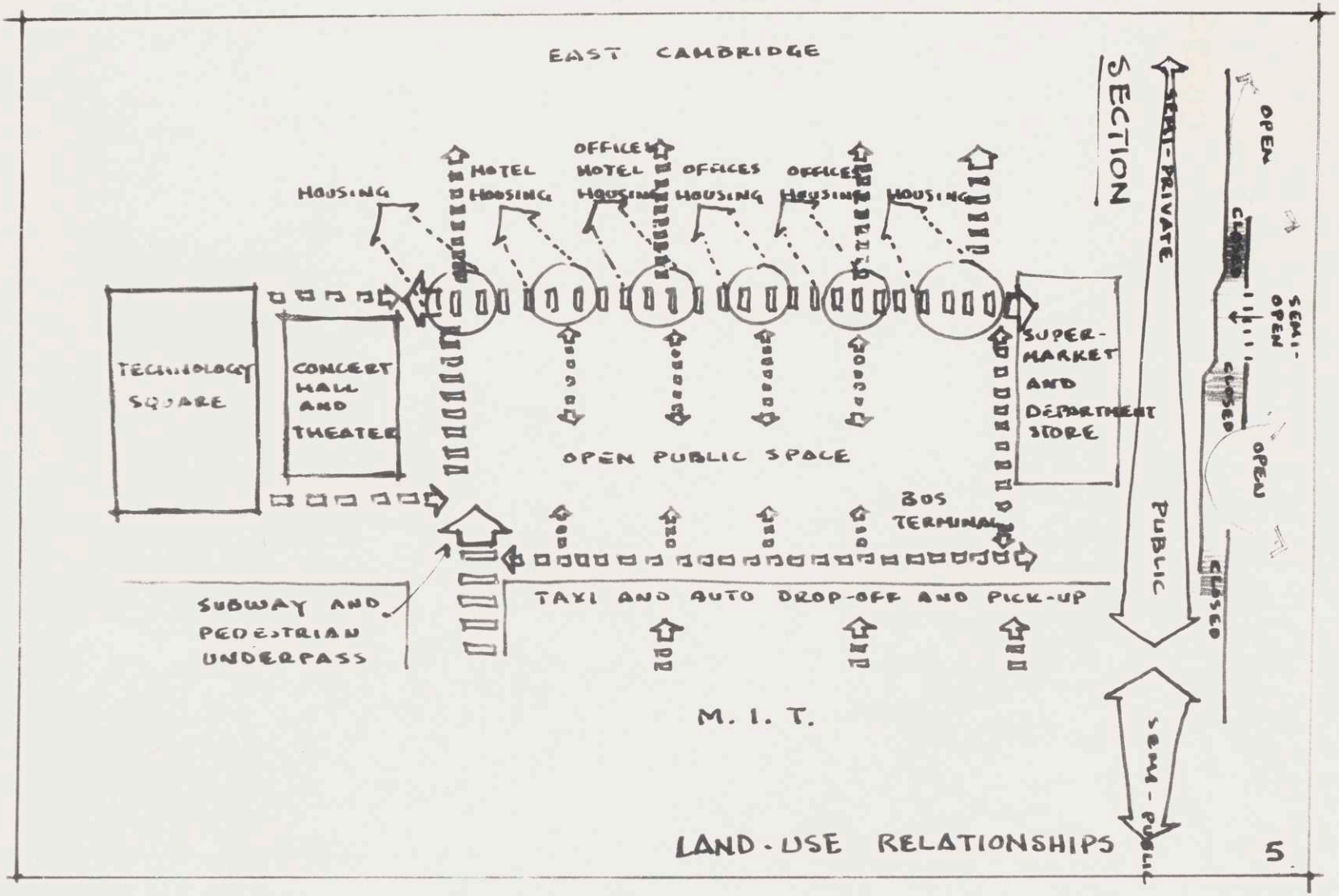
MOVEMENT AXES 3

Diagram #4 shows the auto circulation and parking facilities. As indicated, a secondary road system is provided at all edges of the site which provides the necessary transition area for the change in speeds from auto to pedestrian.

2. (Design objective #2) The commercial facilities of the program where used as the common denominator in the distribution of activities due to their high frequency and constant usage. They form a shopping street which is the pedestrian axis parallel to Broadway. This shopping street is intersected by the North - South pedestrian axis and at these intersections occur secondary reference points within the project; the primary reference point being the large public open area adjacent to Main St. These secondary points receive the circulation cores of the various other functions of the project (hotel, offices, housing and entertainment - dia. #5). The combination of various elements entering these points will by the nature of the combination give the area a character of its own which will be recognizable and serve as a point of orientation within this large complex of structures. The shopping street also acts as one element in a series that forms a screen between the high intensity public activity adjacent to M.I.T. and the more quiet atmosphere of the residential East Cambridge area. This screen is set up by a series of changes of levels, variations in light qualities, changes in scale and inclosure of the spaces.(dia.5 section)

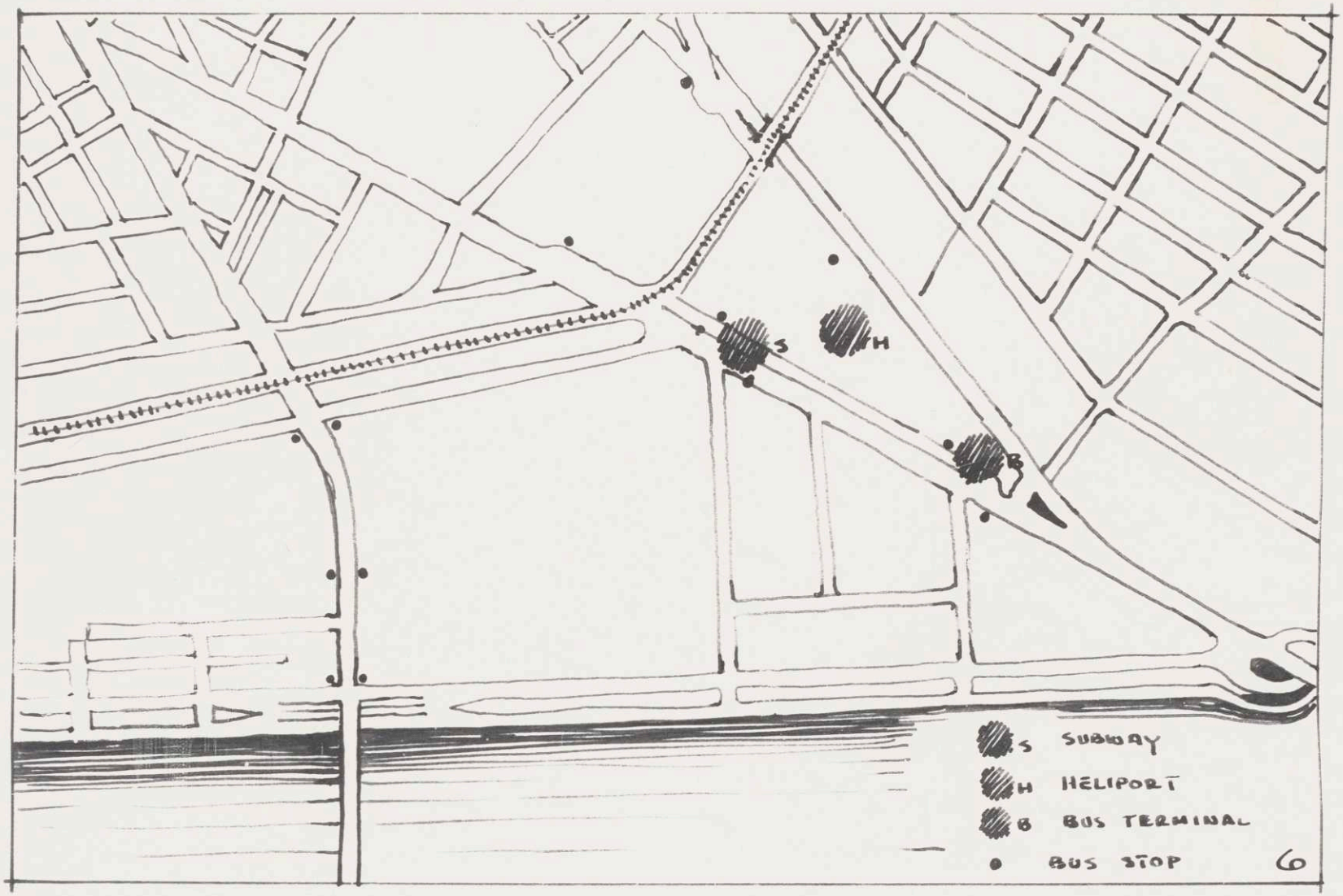


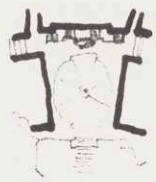
AUTO CIRCULATION 4



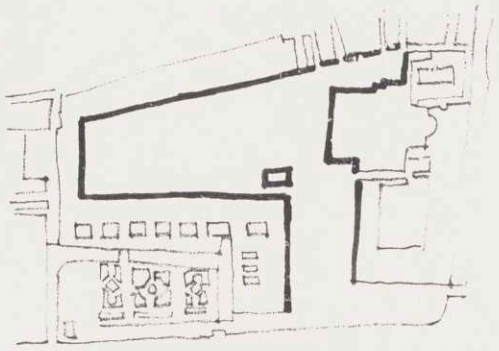
LAND-USE RELATIONSHIPS

(Design objectives #3 & #4) Foundation conditions in this area gave the direction to the staging and also the design control for this project (dia.#8). This condition indicated the use of floating foundations for the low rise structures and piling for all high-rise structures. It is therefore proposed to basically construct a floating foundation platform which will be the parking garages. At particular points which are determined by the initial design, pile foundations are placed for the high-rise structures. In this way the ultimate volumes of the project are predetermined. The functions or rate of growth, however, are not fixed and so may change according to the particular needs. The initial expense of the foundations and parking garages will be quite costly, but these facilities could be considered municipal facilities as parking garages can be, and the foundations subsidized. At this point the design control is limited to land use in very general terms with the major control being in building bulk. The character of the crossing points along the shopping street will be determined by the combination of activities that occur around it, and the commercial activities that will develop in that area will be a result of what happens above or around it.


S
H
B
S SUBWAY
H HELIPORT
B BUS TERMINAL
BUS STOP
6

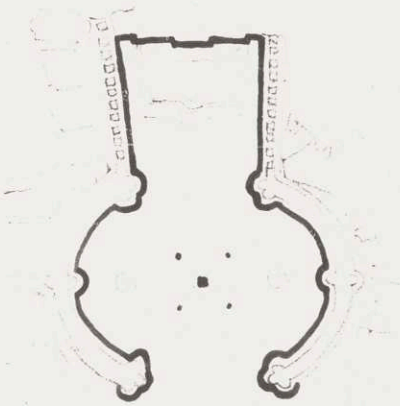


CAMPIDOGLIO, ROME

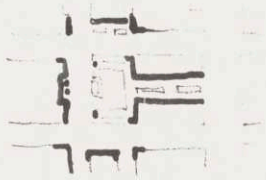


PIAZZA SAN MARCO, VENICE

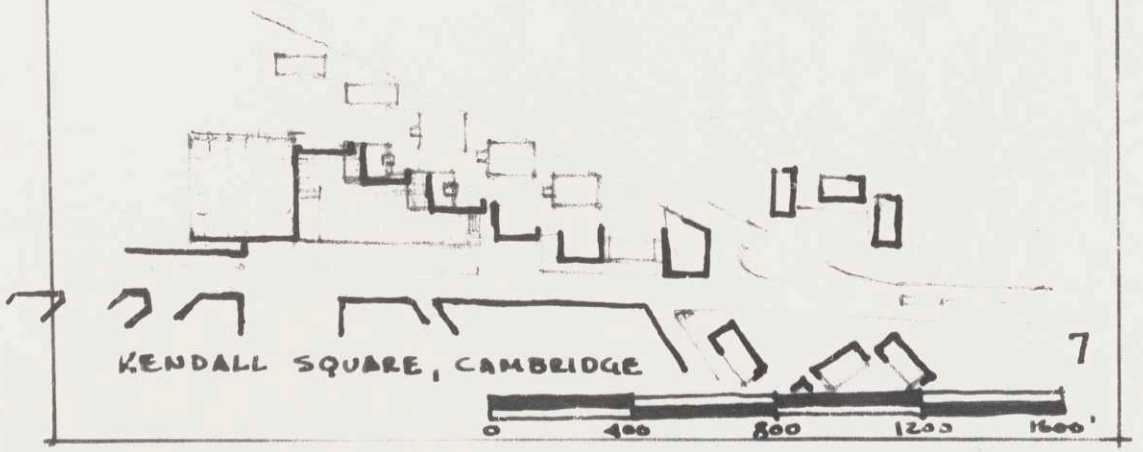
PIAZZA SIGNORIA, FLORENCE



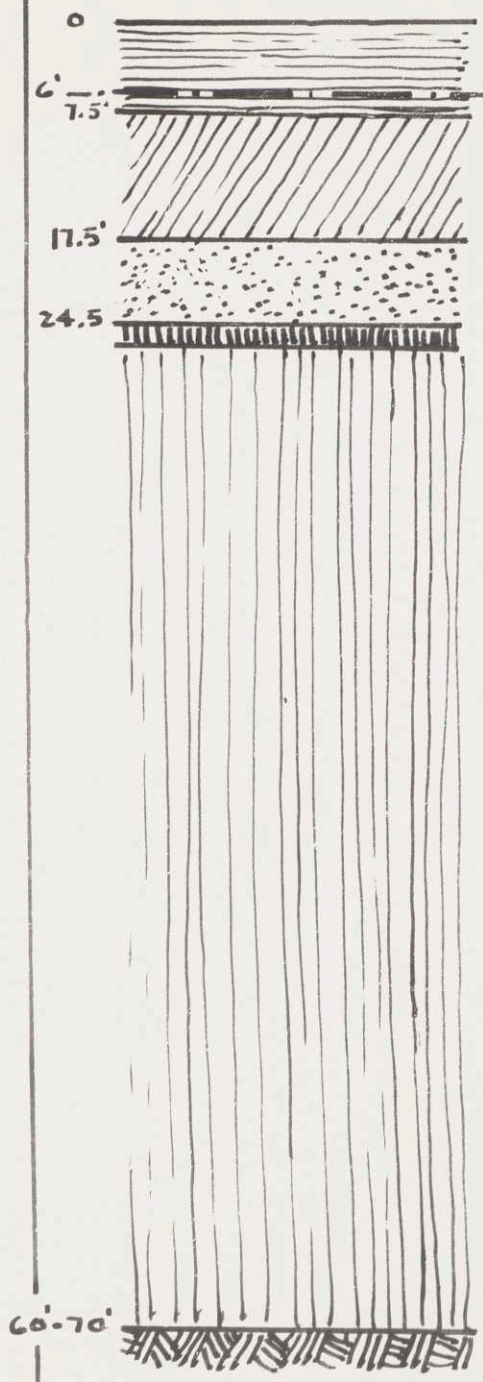
PIAZZA SAN PIETRO, ROME



ROCKEFELLER CENTER, NEW YORK

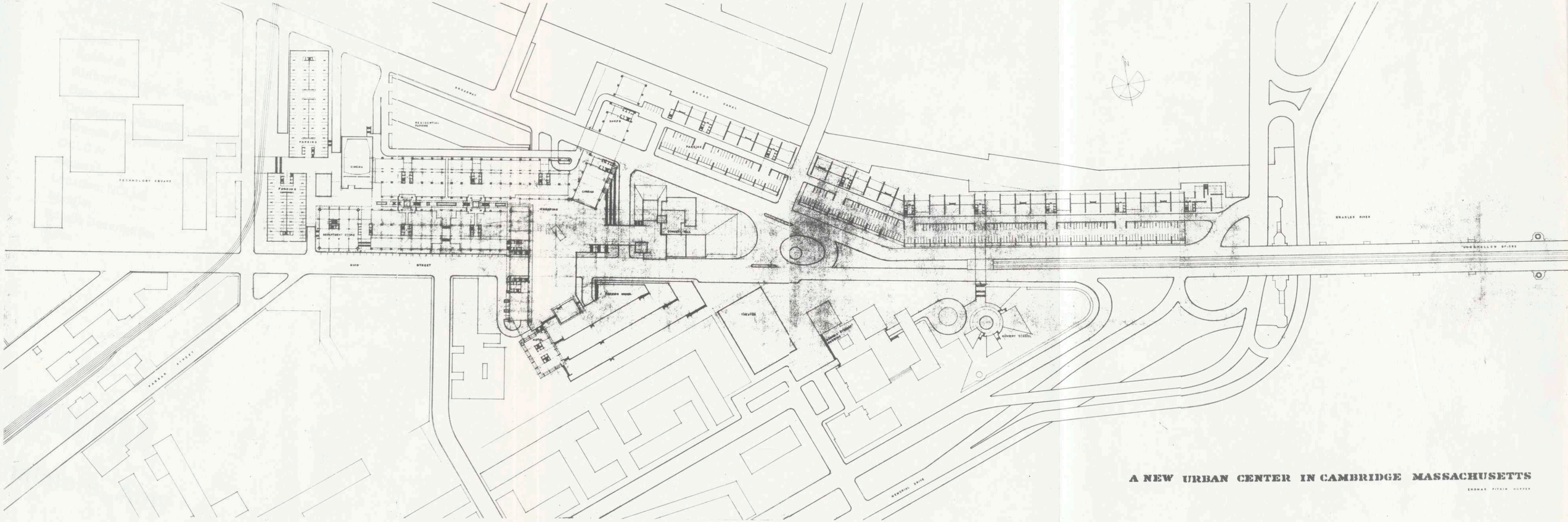


KENDALL SQUARE, CAMBRIDGE



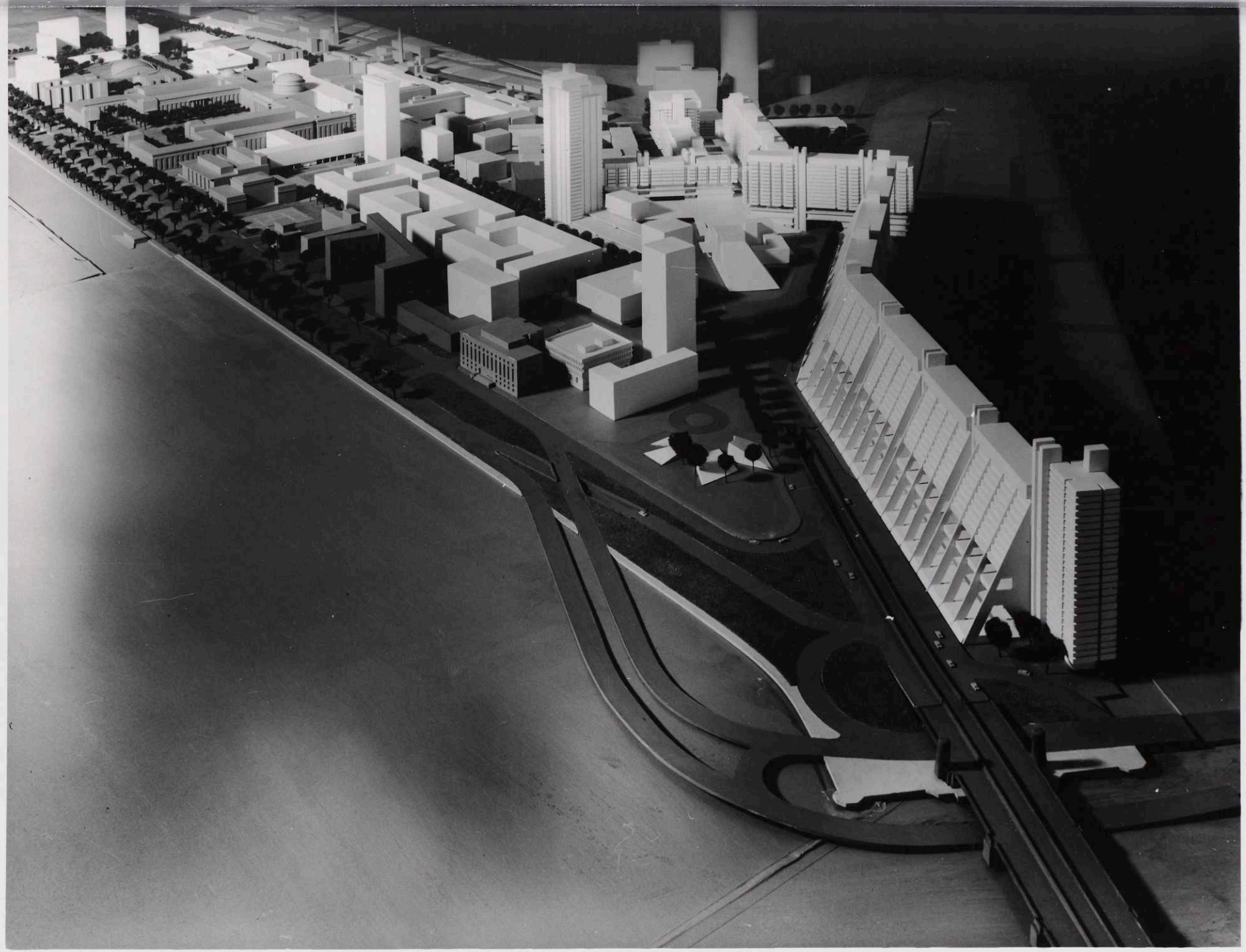
SUBSURFACE CONDITIONS

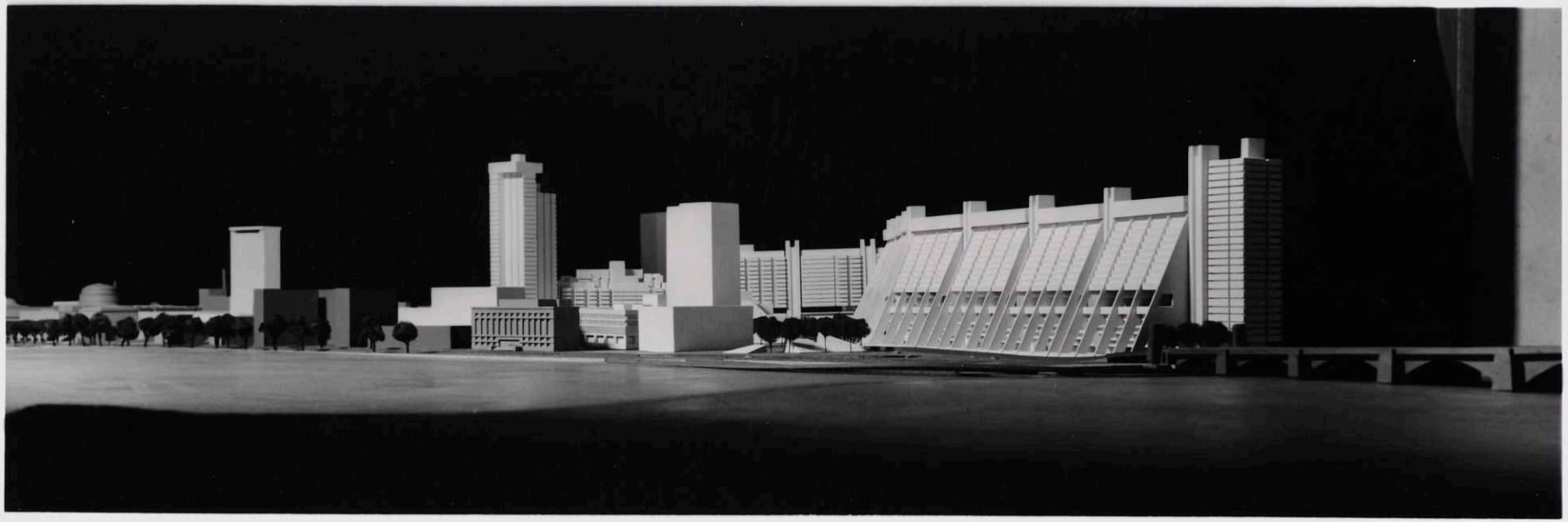
CASE STUDY B: Thomas P. Hopper

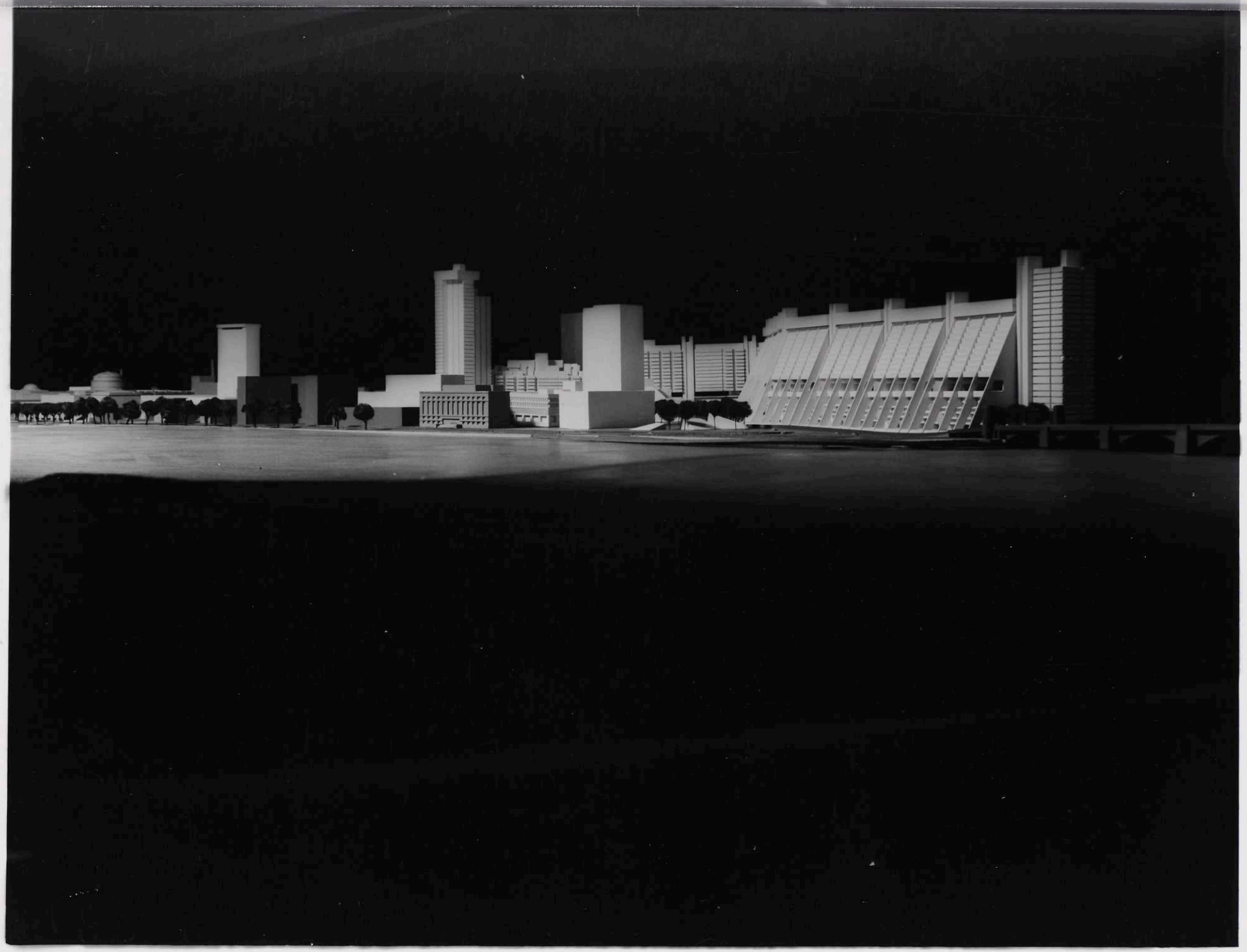


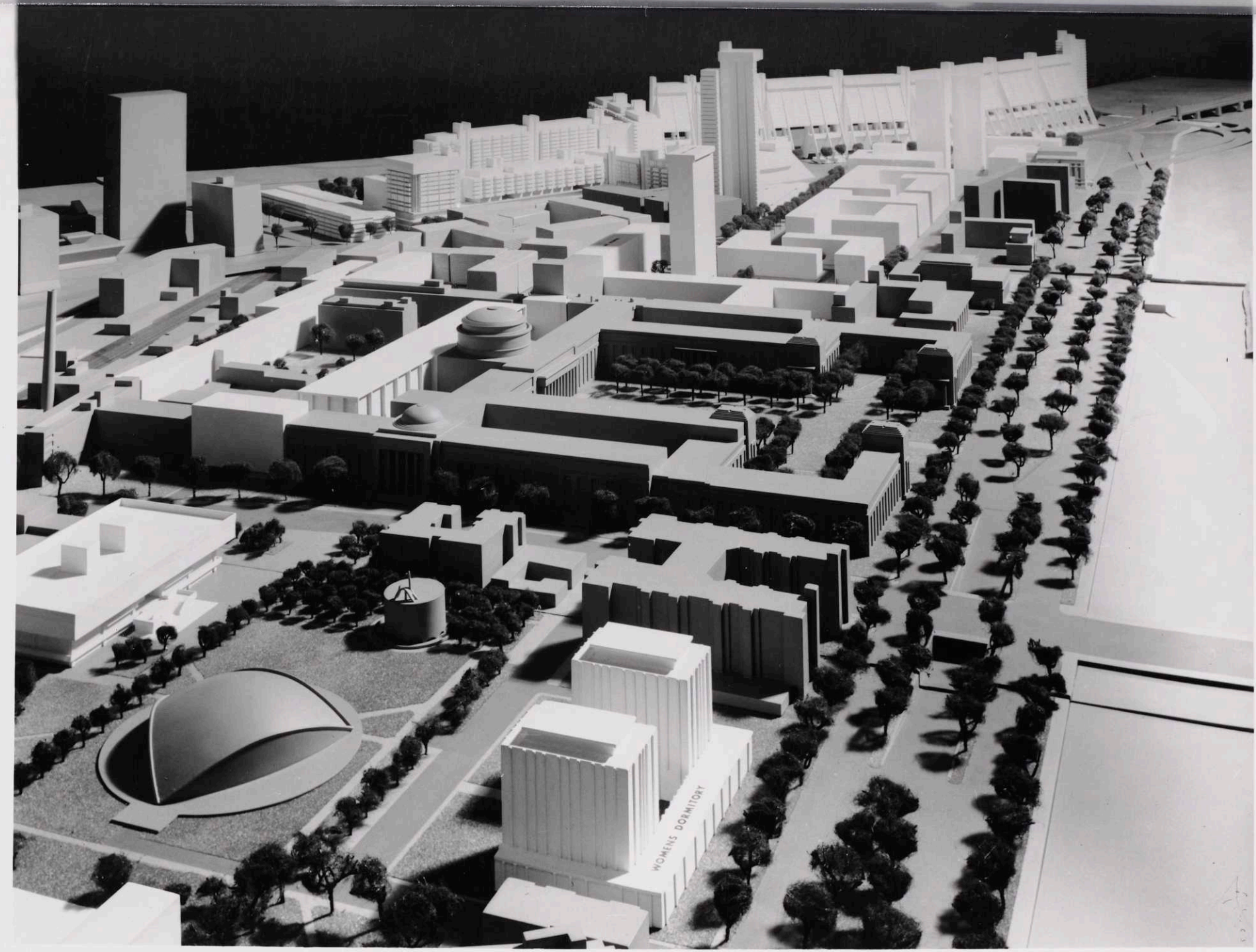
A NEW URBAN CENTER IN CAMBRIDGE MASSACHUSETTS

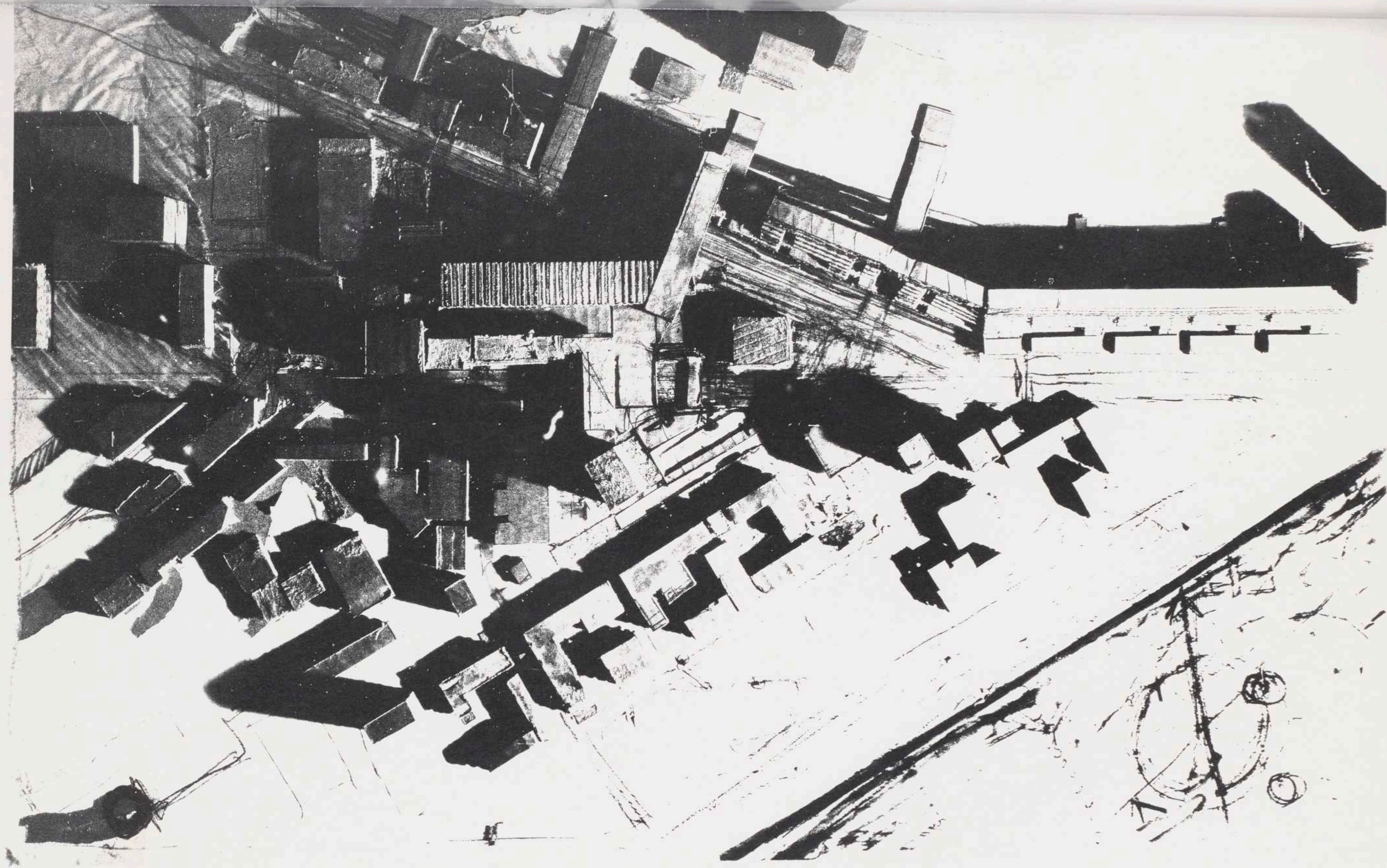
EHRMAN PITKIN HOFFER

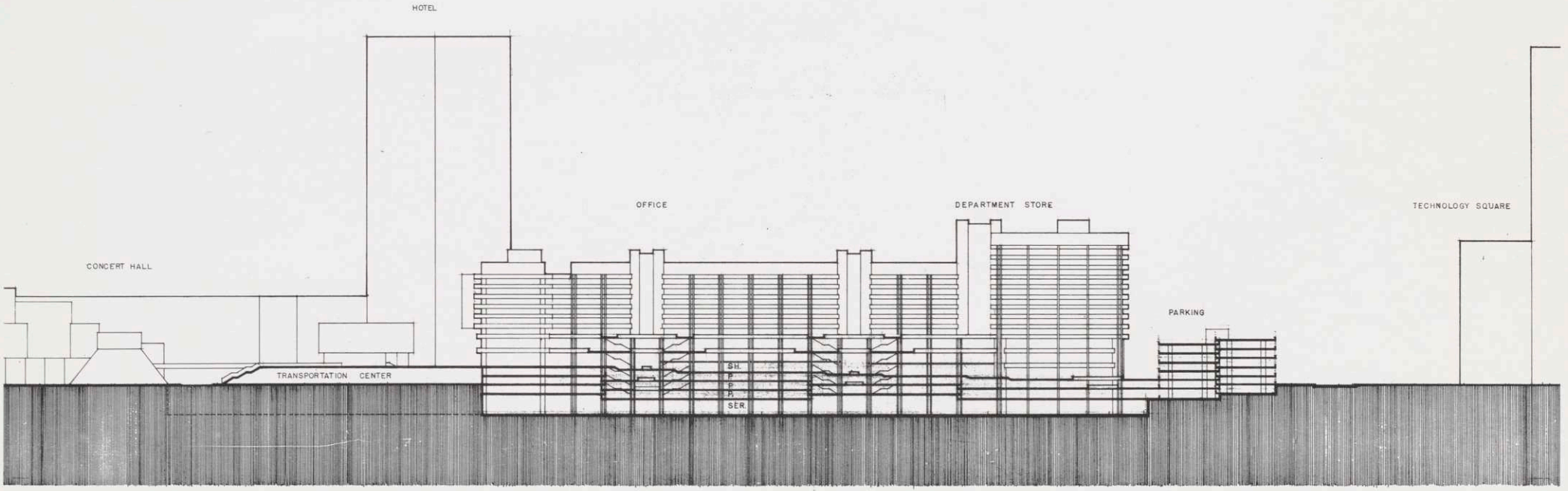






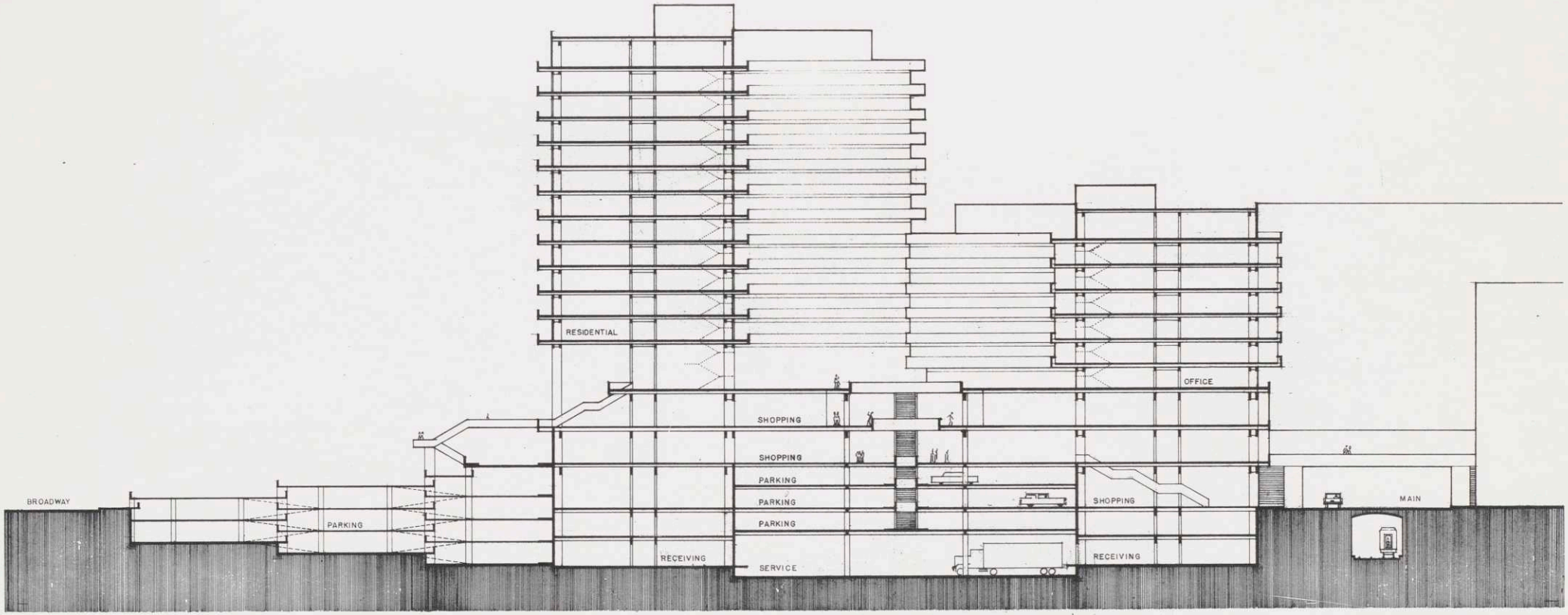

WOMENS DORMITORY





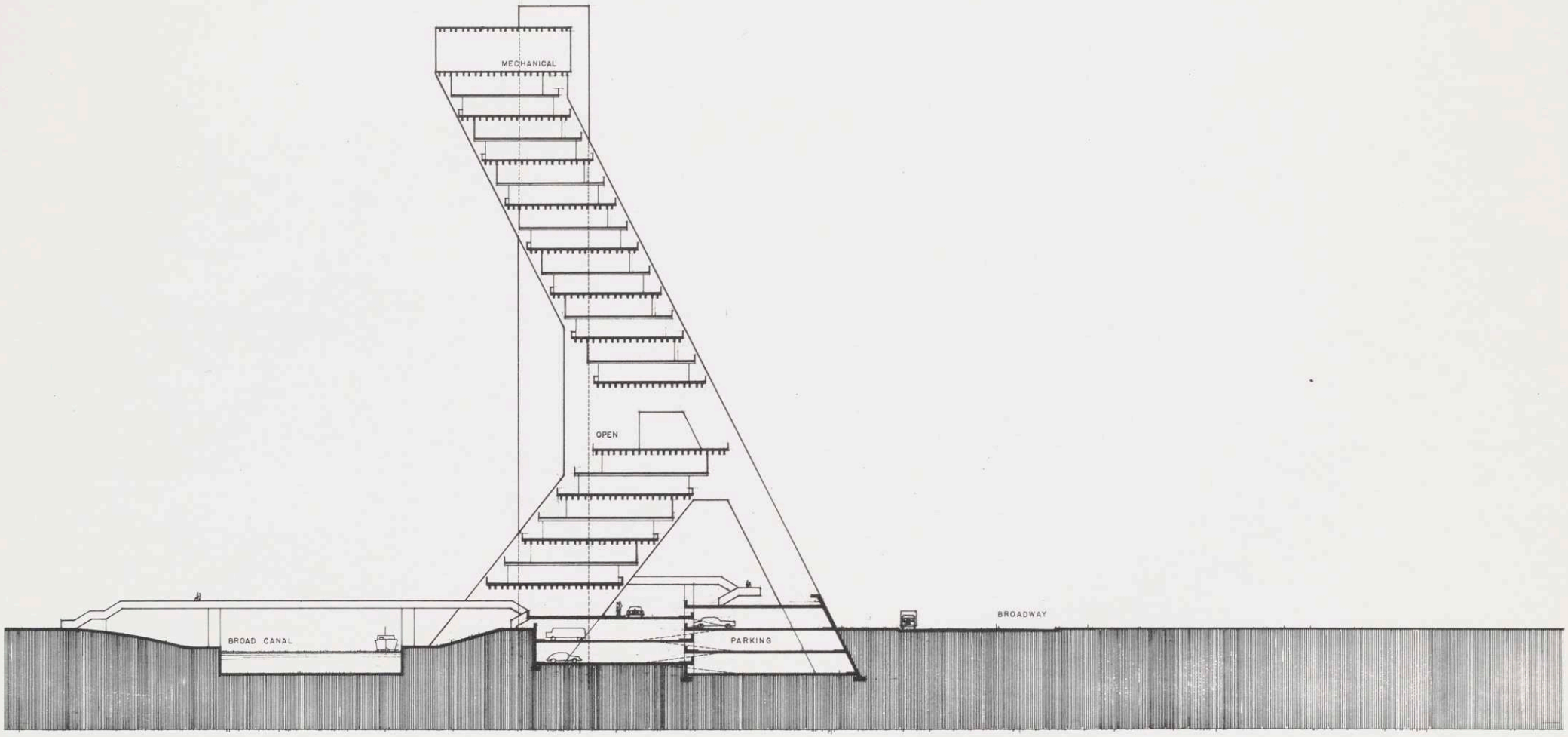
SECTION A—A

0 0 10 20 30 40 50



SECTION B—B

0 0 10 20 30 40 50



SECTION C-C

0 5 10 20 30 40 50

CASE STUDY B: A NEW URBAN CENTER by Thomas P. Hopper

Design Objectives

It was stated in the program that M I T is expanding and in search of links to the rest of Cambridge. My objective is to provide a strong joint between M I T and the new urban center.

It was also stated that the project area is an important entrance to the city of Cambridge from Boston. My objective is to achieve a sense of arrival, a place to come to, a destination. The center should be recognizable and distinguishable from, yet related to, its surrounding environment, and should establish a nucleus of forces that may extend beyond the boundaries of the site.

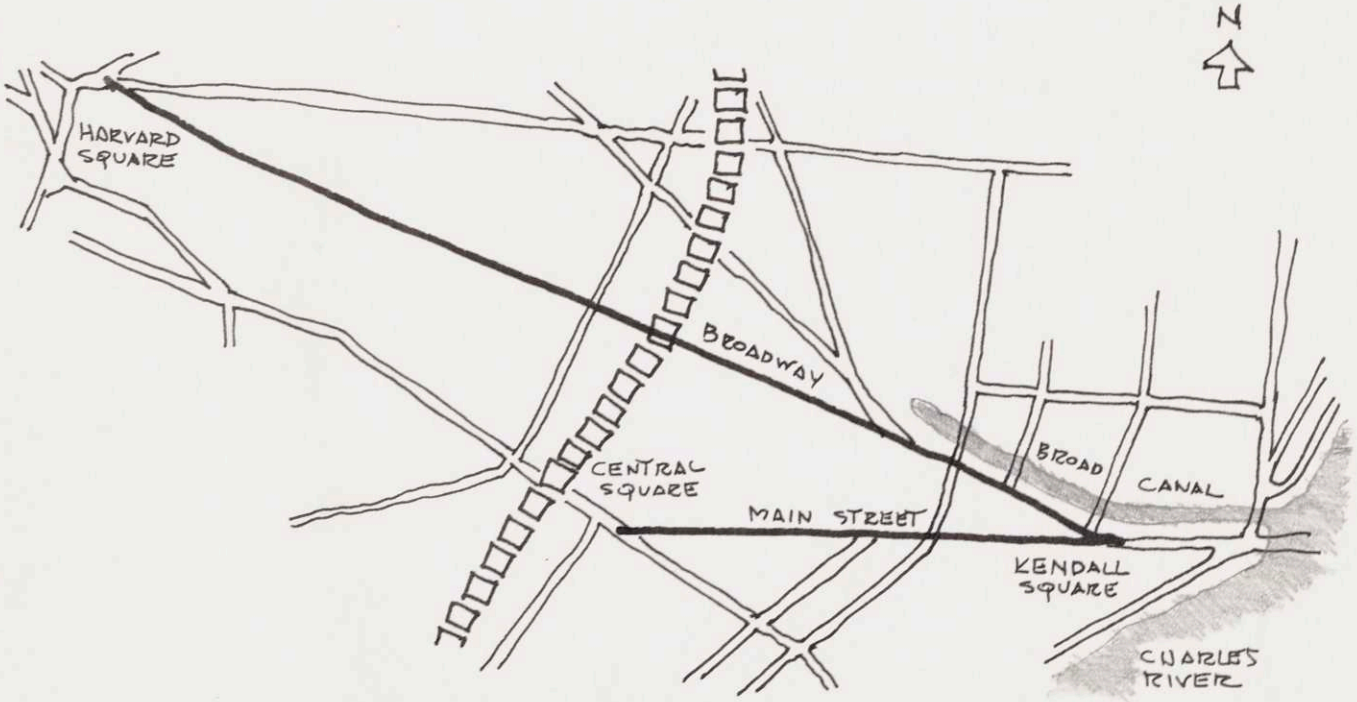
The site has unique geometry and edge conditions and it is my objective to recognize and reinforce these characteristics as an opportunity for a better solution.

It is also my objective to develop a place where there will be maximum interaction, choice, and variety of all functions.

Finally, it is my objective to develop a solution that would have possibilities for phasing its construction and yet at each time achieving an open-endedness to allow for further growth.

General Site Description

The topography and geometry are unique characteristics of the site. Broadway is a diagonal in the street system but is in no way arbitrary. In fact it is essentially straight from Kendall Square to Harvard Square. That is to say it is longer than Main Street which is between Kendall Square and Central Square. The Broad Canal is a diagonal in the system too, and it is parallel to Broadway making the angle a stronger tension force of the geometry.

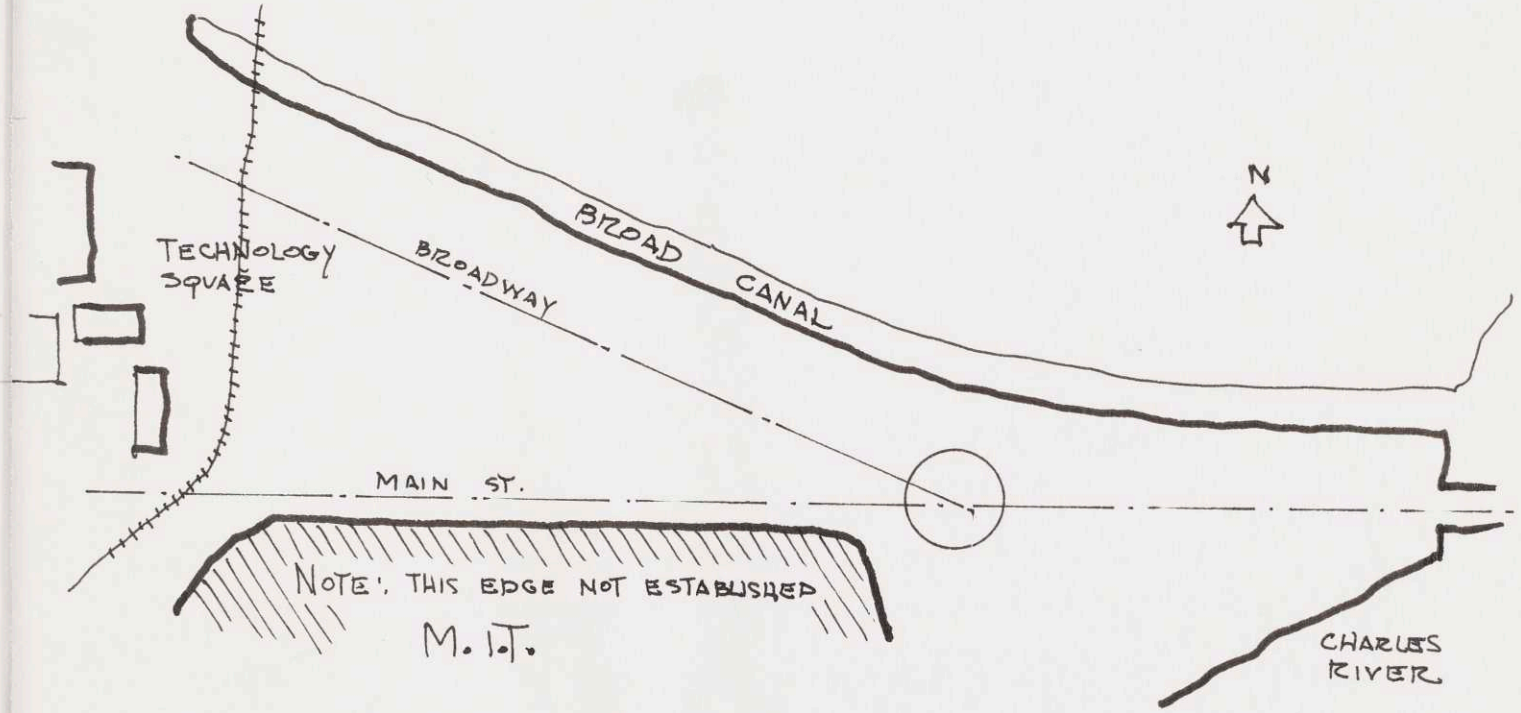


A map reveals that the Cambridge area is made up of many unique geometries. It is important to look upon conditions such as this as opportunities for better solutions. Camilo Sitte stated that "it is the irregular sites that present the most interesting and generally superior possibi-

lities. For the Architect is impelled by them to use ingenuity and to surpass the mere mechanical drawing of straight lines."

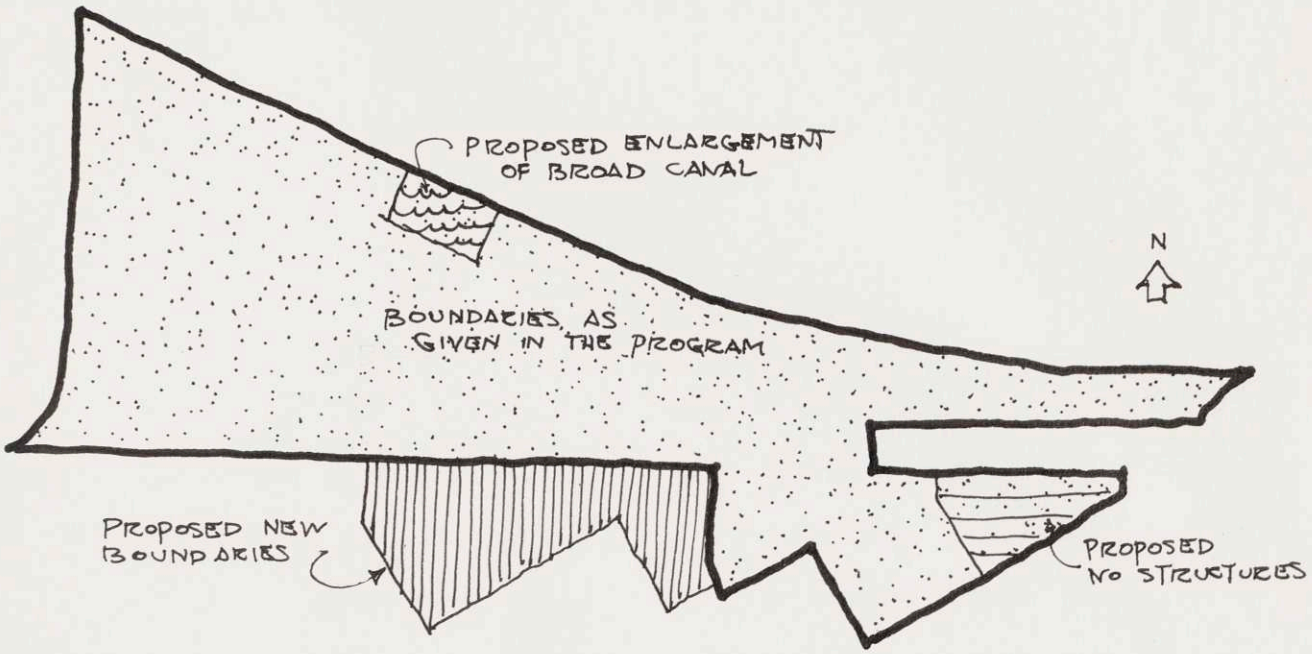
Changing of Site Boundaries

As it has been indicated in the general introduction, the site boundaries were established on the north by the Broad Canal, on the west by Technology Square, on the south by Main Street, Wadsworth Street and the Charles River, and on the east by the Longfellow Bridge. The only edge that is not already established is the south edge or M I T; therefore I feel justified in submitting a proposal for development here.



I intend to change the actual boundaries given, to allow for the strongest joint possible between the new urban center and M I T. To reinforce this further it has become necessary to provide some of the functions of the program on the south side of Main Street. These functions will help to

make a more active pedestrian life adjacent to the M I T campus.



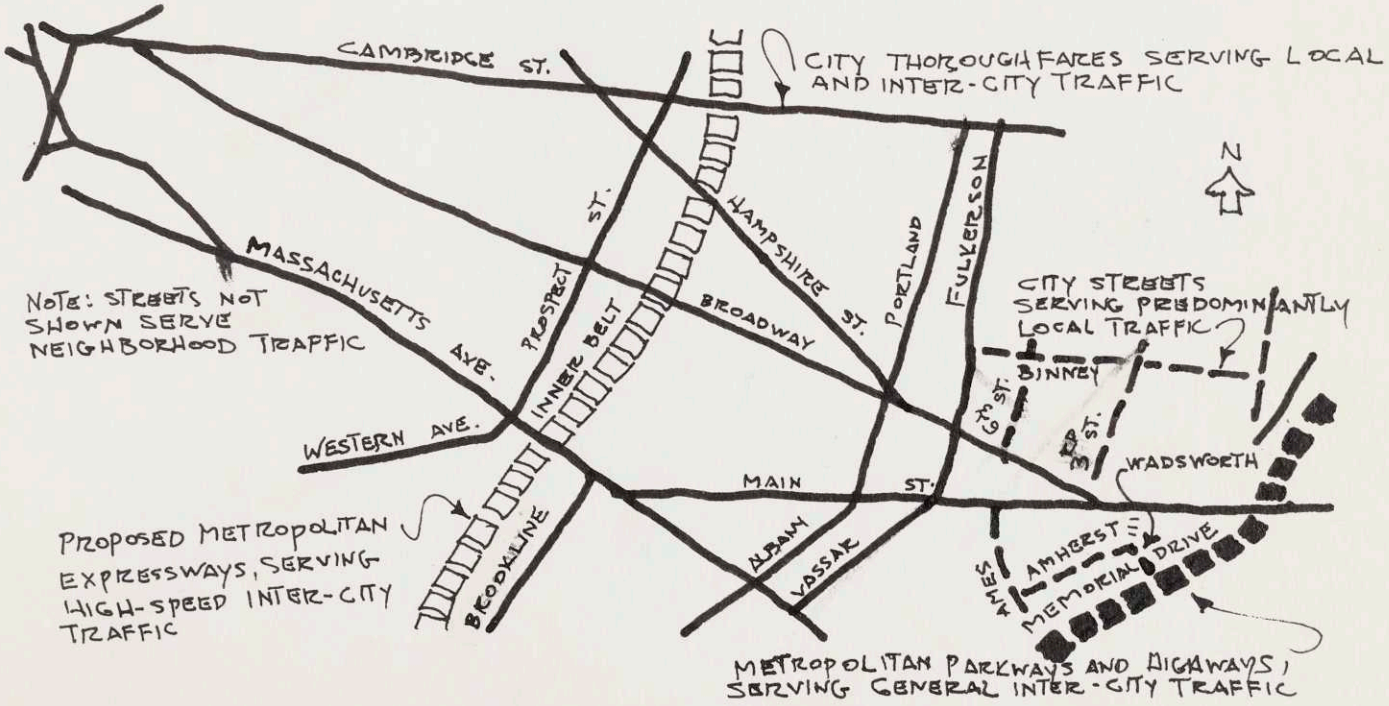
It must be noted that I have not proposed any large quantity of the program on the triangular lot bounded by Main Street, Wadsworth Street and the Charles River except M I T housing and the nursery school. This was done in order to provide a transparent edge at M I T to reveal itself, the river, and Boston beyond. This will be discussed further below.

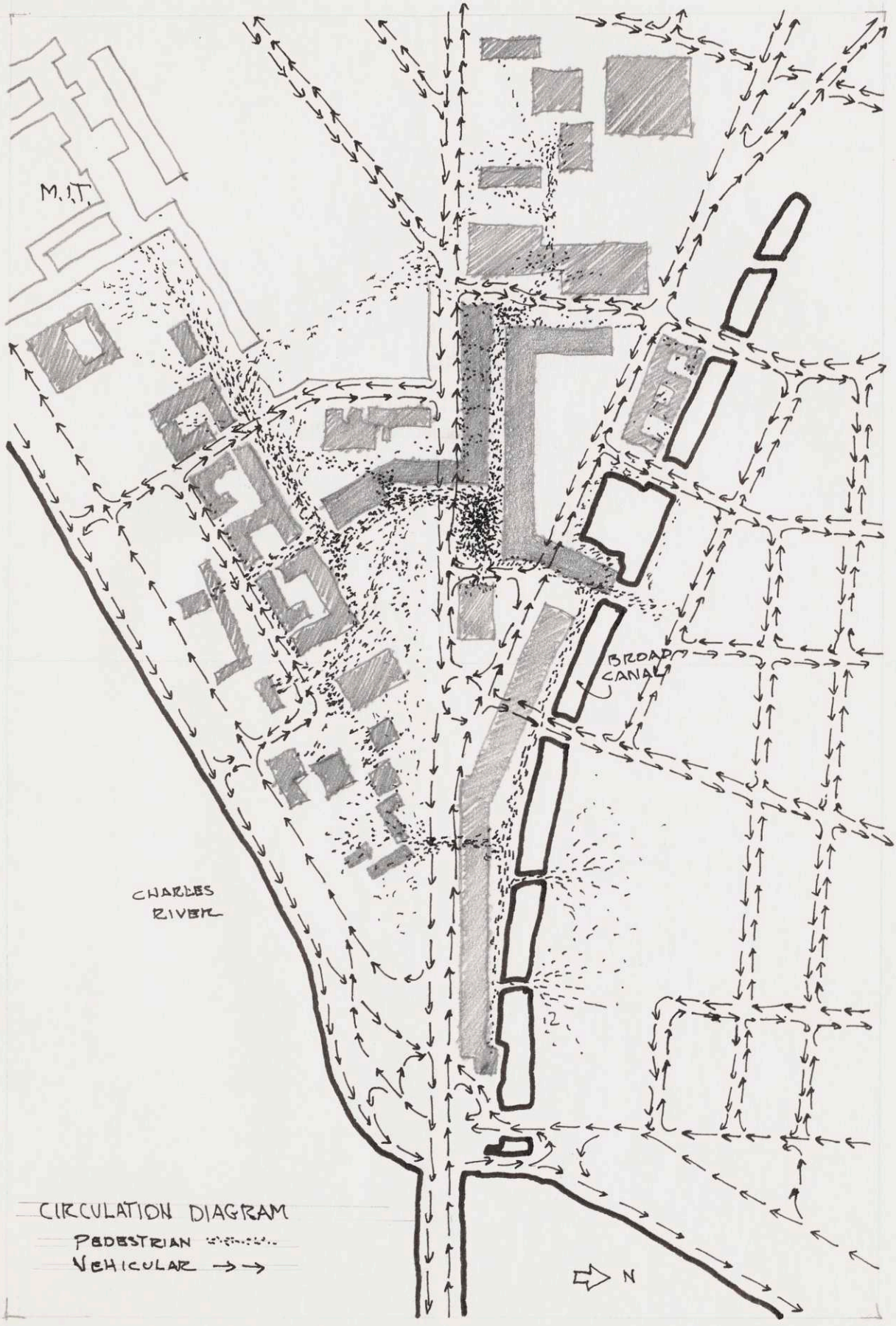
Circulation

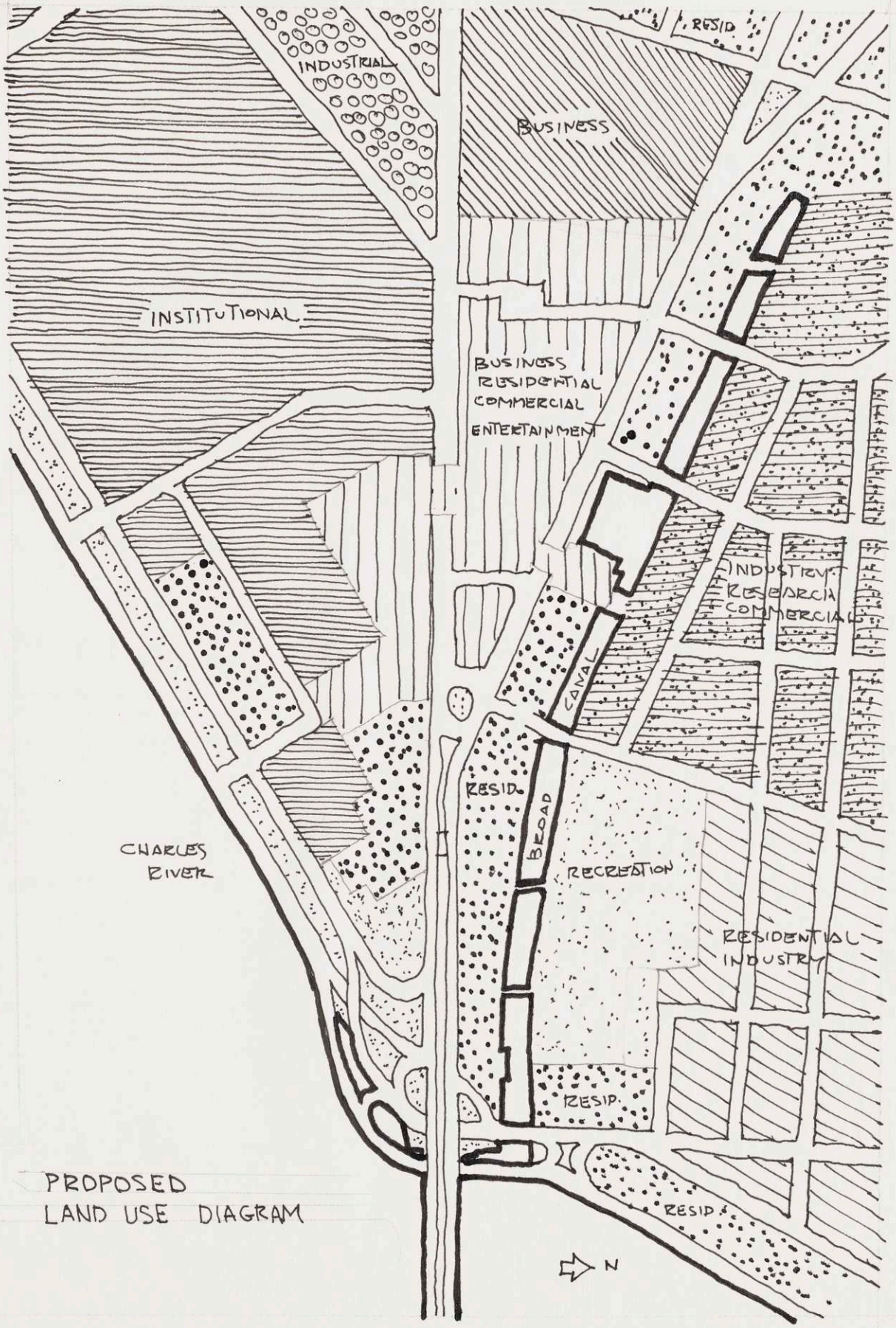
The realms of pedestrian, vehicular and service circulation should have their own scale, structure and character. These circulation systems are separated wherever possible, with specific points of transfer from one realm to the other. The joints between these realms should be places of meaningful experiences. These major exchange points are located at the beginning of the pedestrian areas where parking is also

provided. Those functions that necessitate pedestrian drop-off (from cars, buses, and taxis) are in the same locations.

It is my belief that Broadway will be a through street especially since it connects the inner belt and Longfellow Bridge. Main Street is primarily a destination street joining Central Square and Kendall Square. The extension of Vassar Street into our site and across the Broad Canal will serve as a link to East Cambridge. This extension will also serve as a transfer point at the west end of the site and become a service street for M I T, the new center, and East Cambridge as well. I have decided to eliminate the connection of Wadsworth Street into our site because of the complexity of the junction as it now exists and more important because of the need for people to pass through the center before turning into M I T. Third and Sixth Streets have been stopped at Broadway eliminating any through traffic in the project, but keeping destination traffic to the center possible. It is hoped that through-traffic in these directions would occur along Memorial Drive or the inner belt.




M.I.T.
BROAD CANAL
CHARLES RIVER
CIRCULATION DIAGRAM
PEDESTRIAN
VEHICULAR
N

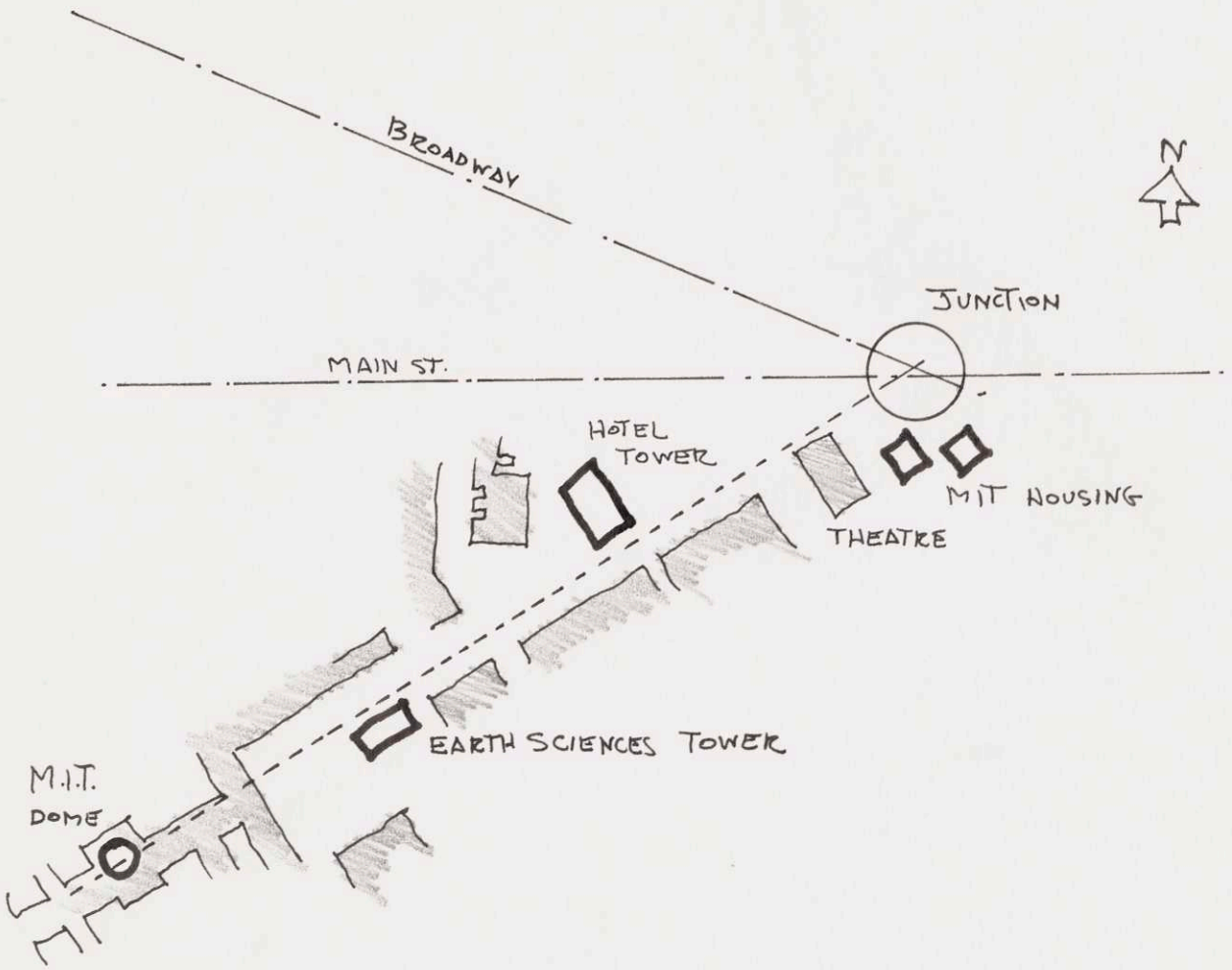


PROPOSED
LAND USE DIAGRAM

Land Use

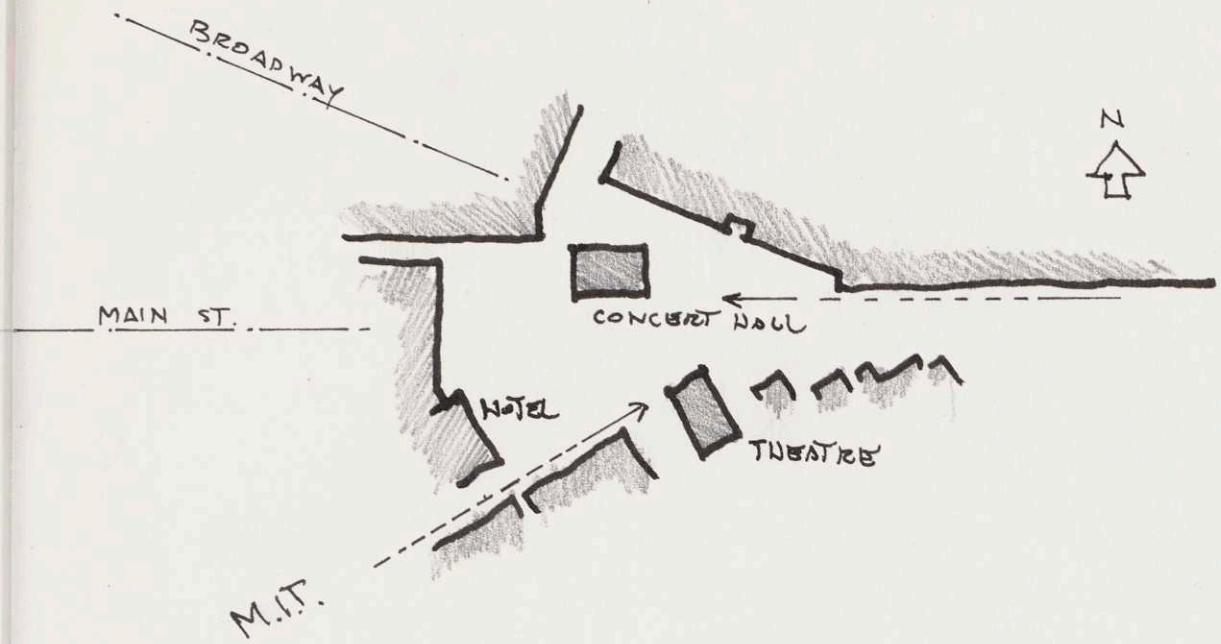
It is important to note that this site is one in a series of important nodes and that arrival from Boston, Harvard Square, Central Square or from any other direction plays significant roles in determining the destination and experiences by vehicle. One of the most important experiences is that of crossing the Longfellow Bridge and coming into our site. It is my intention that people in automobiles should be involved with this center, spacially and visually, so that they become aware of its existence and know that they have arrived. Because Longfellow Bridge is long and straight the scale and speed are such that one does not arrive in Cambridge at the point where the bridge touches ground but well after. The point that I have chosen to be the place of arrival for the sutomobile is at the junction of Broadway and Main Street. Here a space shall be provided for the person in the automobile to make a choice between coming to the center or passing through. At the same time he should become aware of M I T's existence.

I have provided a means of awareness of M I T by extending its geometry up to the edge of this intersection. The visual axis into the campus is reinforced by the relationship of the main dome, the earth sciences tower, and the geometry of M I T.

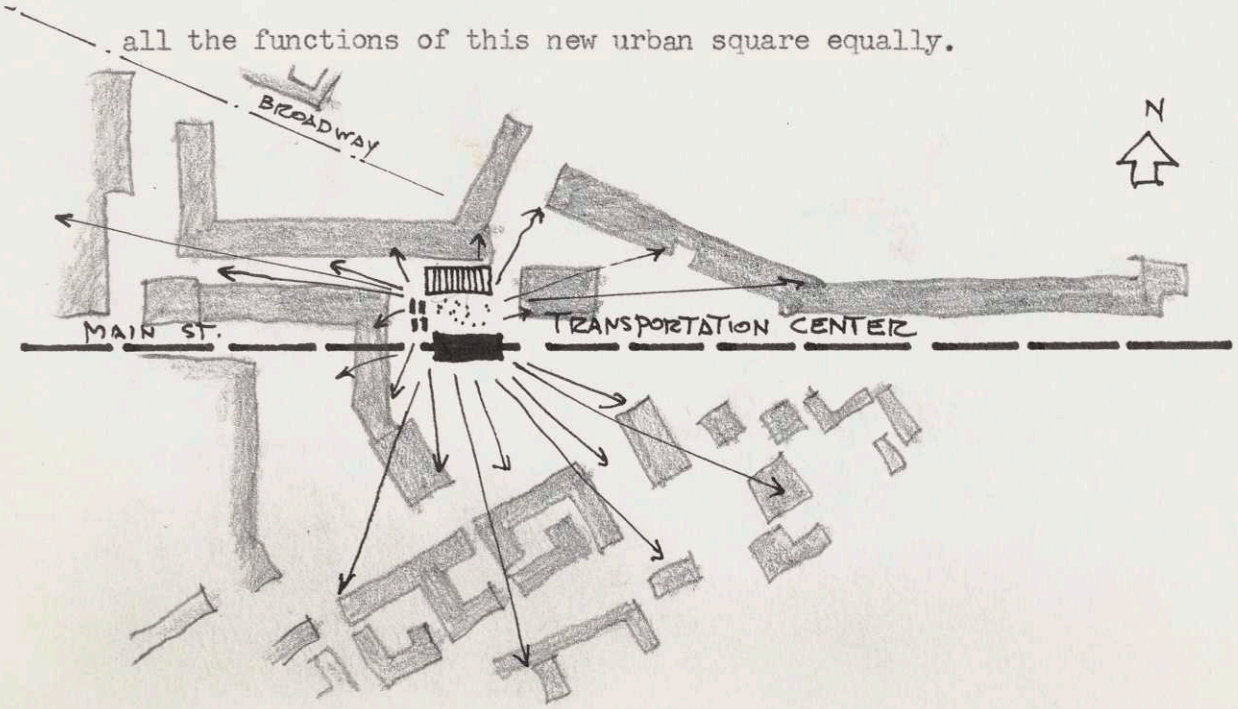


The vitality of this particular point can be increased even further by locating the transportation center adjacent to it. This then provides a further reinforcement of the pedestrian connection to M I T.

A focal element for the new urban square will be the concert hall with its prestige and symbolic content enriching the space by a deserving kind of architecture. The theater serves a similar function in its architecture and is located such that it is a visual focus for the pedestrian axis from M I T.

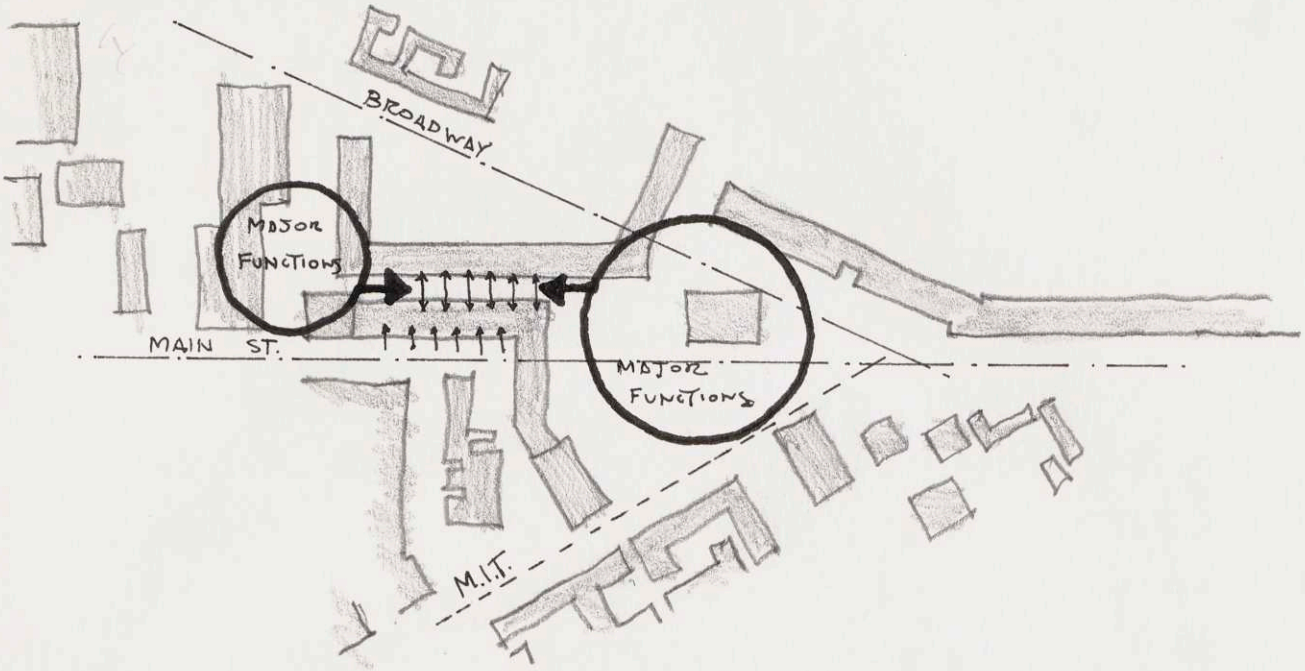


The importance of the intersection of Broadway and Main Streets is further reinforced by locating transitory functions adjacent to it such as the transportation center, hotel, and parking. The hotel tower, which serves as a gateway, has its geometry relating to M I T's geometry and especially the Earth Sciences tower. It plays an important role in making one aware of the pedestrian axis into the campus as well as enriches the pedestrian activity in this area by its function. The transportation center also enriches activity and is centrally located such that it serves all the functions of this new urban square equally.



The transportation center primarily serves the pedestrians using buses, taxies, and subways. It is my intention to provide a natural light source as the means of orientation for people using these services, and this can be achieved for the subway by dropping the grade down to the same level. The bus parking level will look directly to the outside but yet be sheltered by a roof. Pedestrians will be able to pass from one means of circulation to another and be orientated by natural light and yet protected from the weather.

The commercial facilities work best as a two-sided pedestrian street. This allows for the greatest vitality and variety of experience through the maximum interaction of opposing functions. I have placed functions with the greatest attraction as focal points at each end; the department store, 5¢ and 10¢'s, drop-off street, parking facilities, and cinema at the west end; and transportation center, restaurants, specialty shops, concert hall, theater, cinema, hotel, and parking at the east end. These magnets tend to pull people back and forth through the shopping street. It is important to note that the retail shopper should be aware of his position in the context of the total structure and aware of the type of commodities available related to movement through the mall. There should be one major public level in the shopping area where the pedestrian is the primary consideration.



The stores along the edge of Main Street should be accessible from both the Main Street side and from the pedestrian shopping mall. There will be short-term parallel parking along this edge in order to allow for the quick purchase of merchandise in these stores. Business facilities will be located directly over the commercial stores along the edge of Main Street convenient to people on Main Street or in the mall and parking at either end or under the stores themselves. Service for the commercial facilities is a continuous loading platform directly under the mall with vertical circulation at the rear of the stores. It is my belief that the center will become active day and night by the variety of facilities offered in the mall and especially at the ends where the main cultural facilities and cinemas are located.

The commercial facilities serve as a connection between the new Kendall Square and Technology Square. At the west end of the site, I have located parking to serve both Tech. Square and the commercial

facilities. The joint between Tech. Square and our site is hampered by the existence of the railroad tracks. However, their infrequent use will allow pedestrian crossing at grade level. If and when the tracks are removed the space under the parking structures can be used to serve both Tech. Square and/or as expansion for commercial facilities.

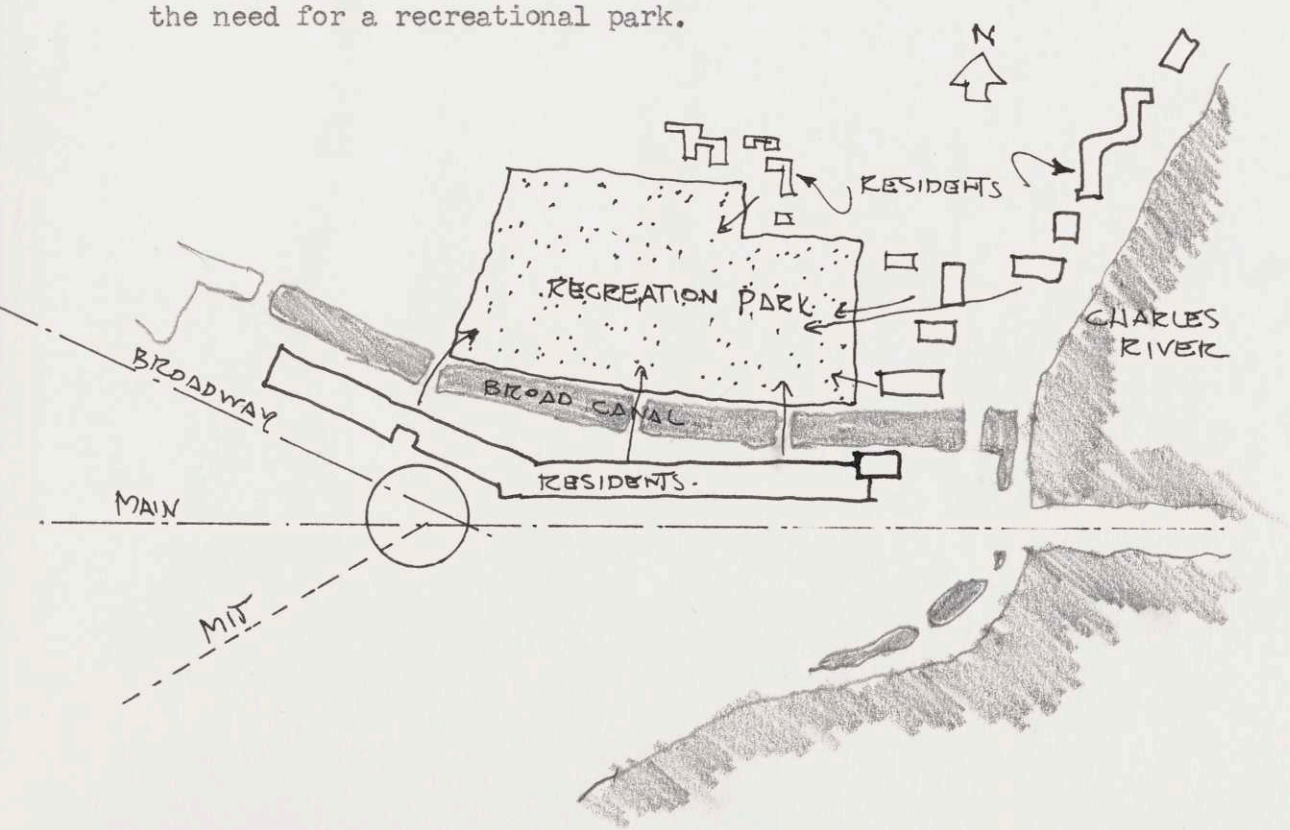
Growth of the center can only occur in the direction of East Cambridge. In order to achieve connection into this area I have extended the commercial facilities across Broadway Street up to the edge of Broad Canal and provided a pedestrian crossing at the canal.

The greatest quantity of parking will occur at the extremities of the commercial facilities. At these points the parking will serve other functions as well, such as the cultural facilities at the east end and Technology Square at the west end. Some parking will occur under the mall for greater convenience and pick-up of merchandise.

Housing

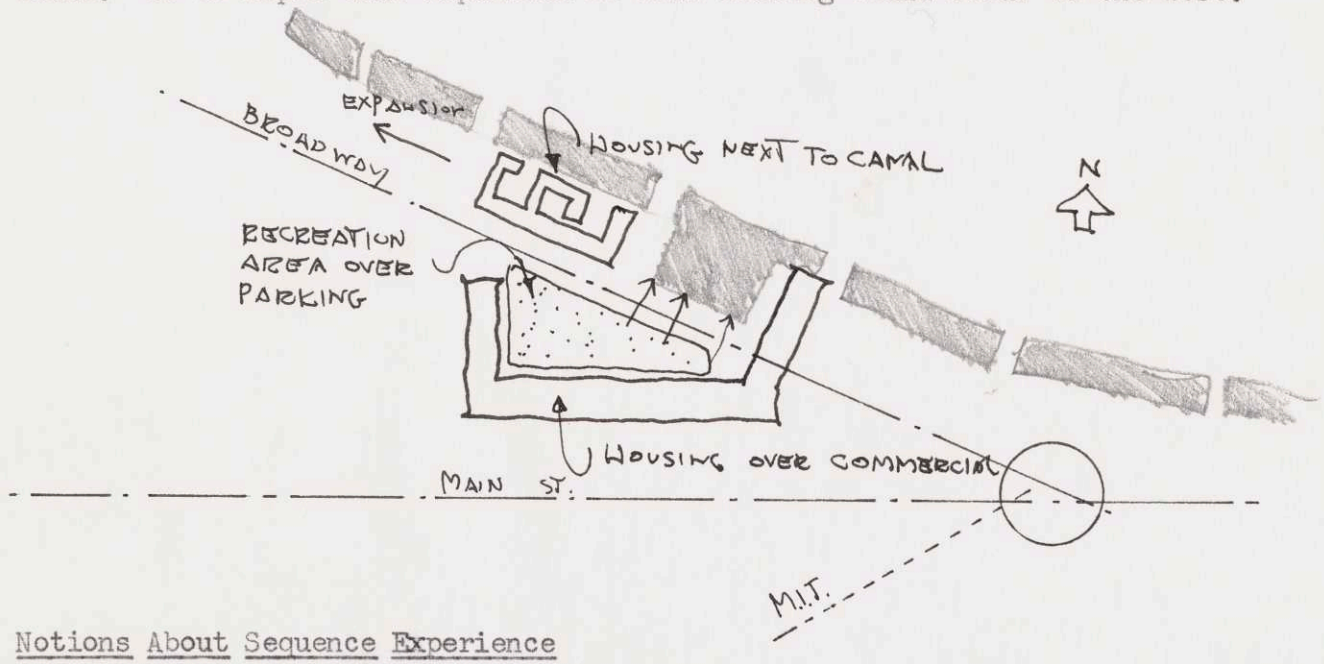
A considerable amount of the housing is located in such a position as to take advantage of the views towards the Charles River and Boston beyond. The strip of land between Broad Canal and Main Street is choice property in terms of view and there should be as much housing as possible in this location. I have developed a continuous edge of housing all along that site into the center. This line of housing is orientated to the south and its scale accomodates the notion of a funneling or directing action into the site and helps to enclose space at the center. The apartments at the base of the structure are orientated away from the sound of the street and towards the canal. Sound is further reduced by

raising the ground level above existing grade. This attains better views for the lower residences and provides parking facilities under the structure. Since there is little land available it is important to replace the ground level with new ground levels and I have achieved this by a raised pedestrian level within the structure. This also allows sunlight to come through the structure to the canal and land beyond. The apartments would be both owned and rented and the intention is to develop a partially flexible system such that apartments can be one and two floors or one and two story spaces by removing non-permanent structure which would occur every other floor. All apartments would be through type except where the corridor occurs which is every third floor. The system of structures could grow in phases by joining at each core. The land behind the canal would ideally become a recreational park to be used by people living in these structures. If housing were to continue development along the Charles River, this would further reinforce the need for a recreational park.



Opposite this housing on the lot bordered by Main Street, Wadsworth Street and the Charles River will be the M I T married student towers which have already been proposed. It would be my intention to provide some low-rise housing here as well. There would also be enough land available for a nursery school to serve the residents. My intentions for this school would be to develop a sculptural and playful array of forms that would be achieved through the molding of earth.

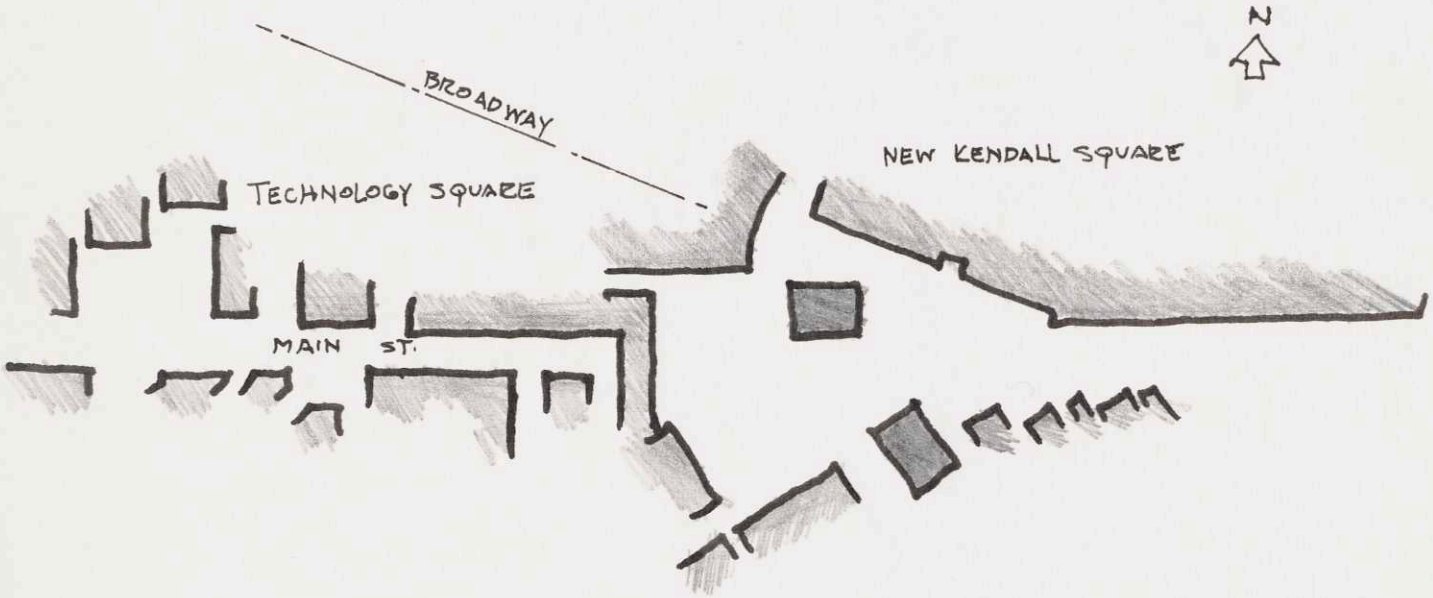
Since the program for housing requires such a large amount, not all of it can be accomodated on the choice property. Therefore I have provided housing over the commercial facilities with its orientation towards the Broad Canal. There would be a semi-private residential level provided for them above the parking spaces. There would also be included some low-rise housing at ground level immediately adjacent to the canal. It is hoped that expansion of this housing would occur to the west.



Notions About Sequence Experience

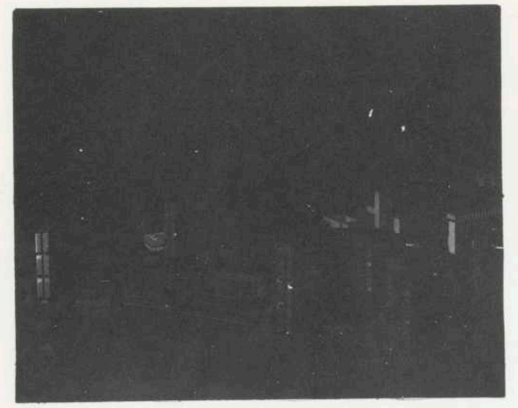
The space made by Technology Square would become significant when the structures along Main Street towards the new urban square form

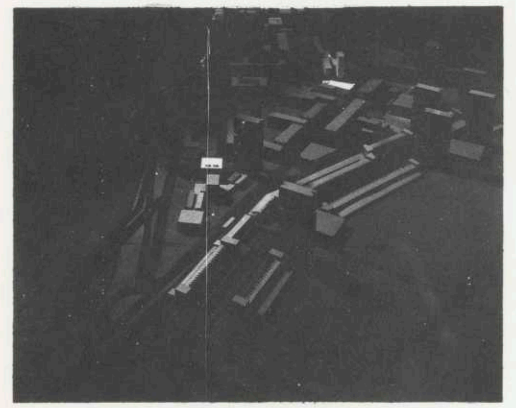
a continuous wall. This same notion applies for the new urban square. The scale as one approaches the site from the Longfellow Bridge is an important consideration because of the speed and straightness of the approach. It is my belief that a hard, continuous edge established here by the housing accomodates the appropriate scale. Since one of my considerations is to reveal M I T as soon as possible I have made its edge broken and transparent such that one can visually penetrate into the campus.

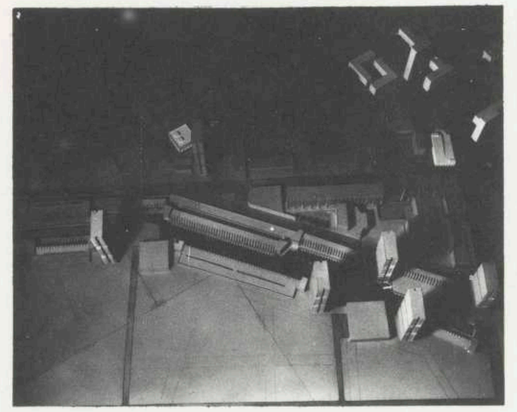


CASE STUDY C: Masashi Kozima

AN URBAN CENTER

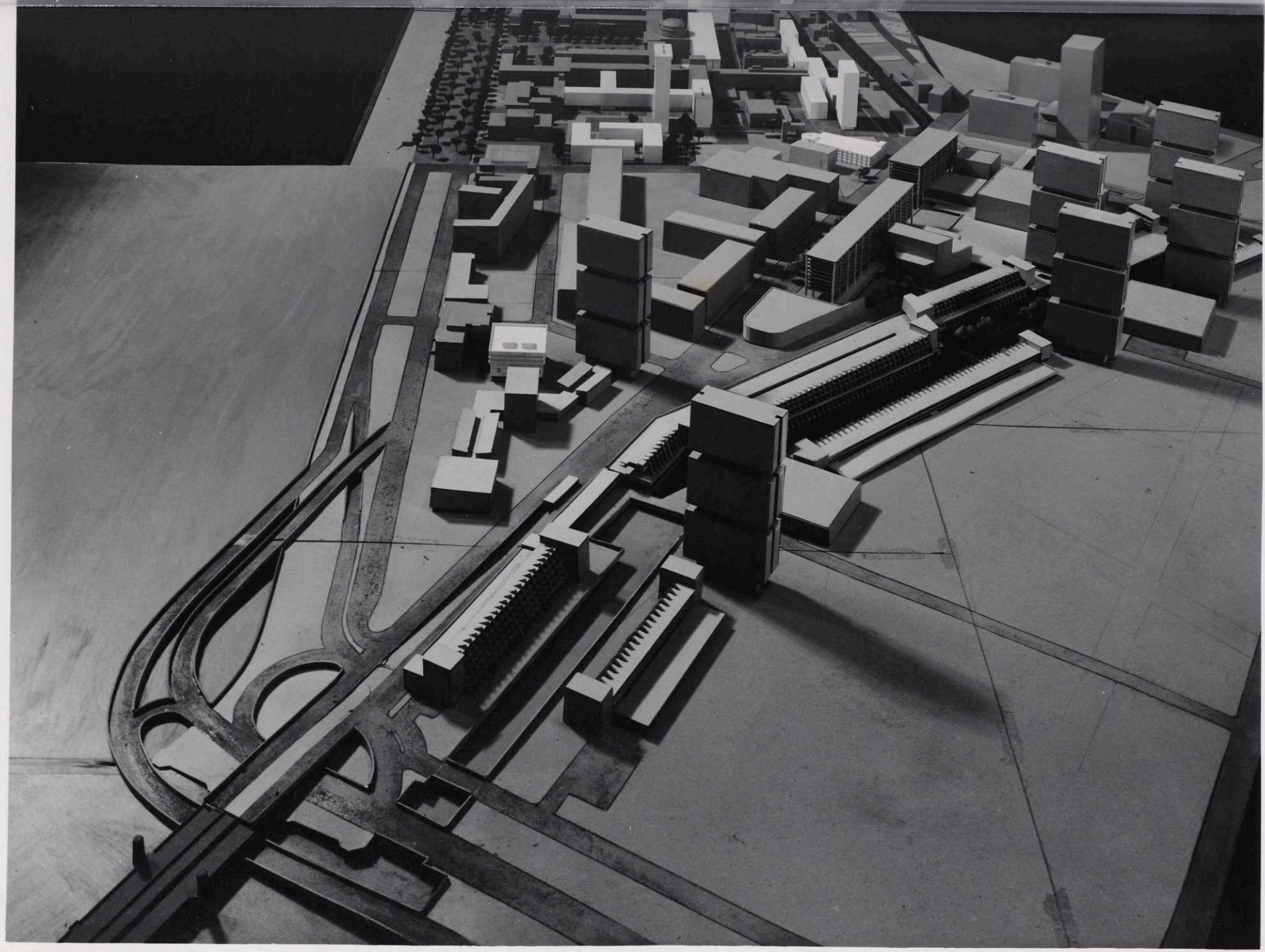


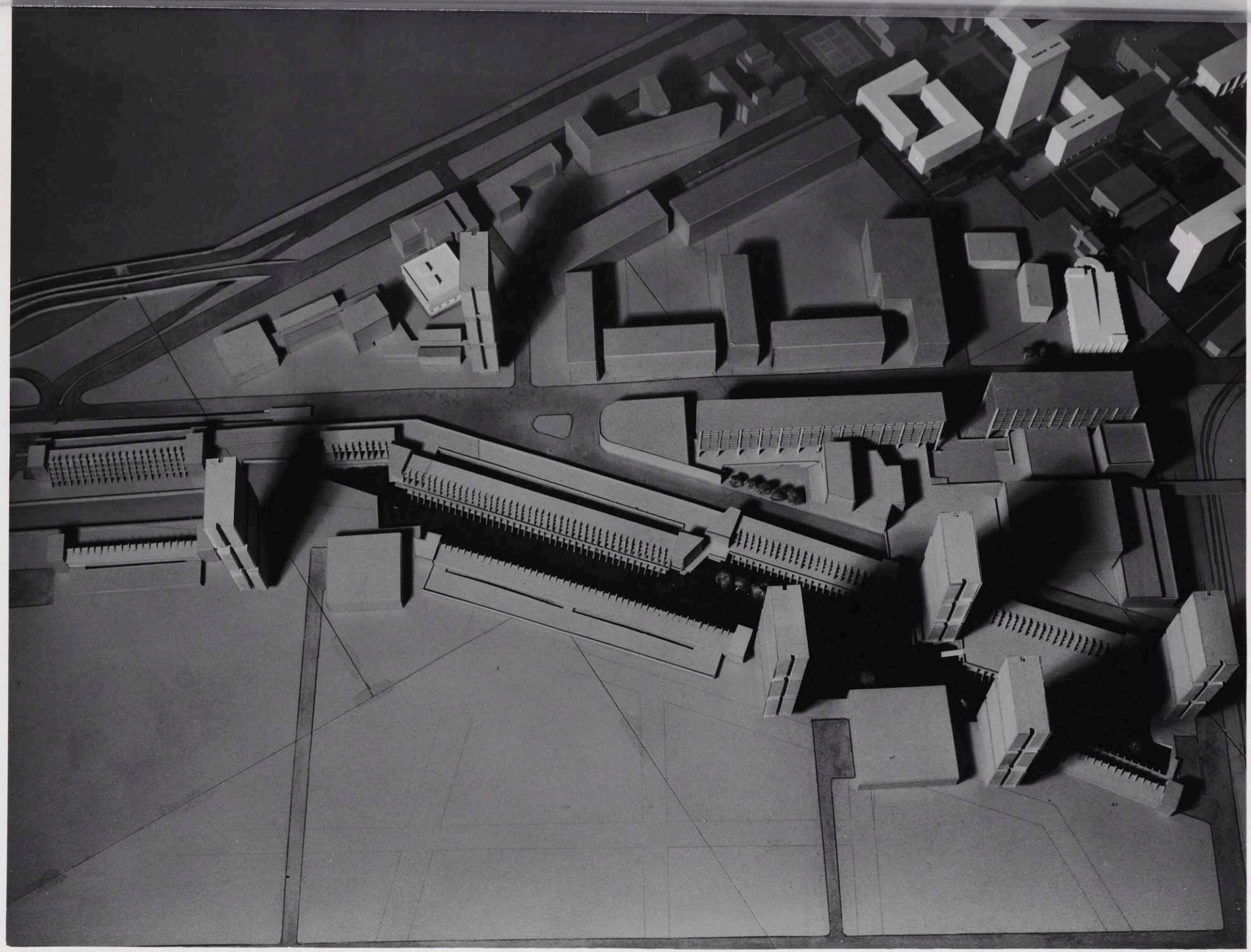


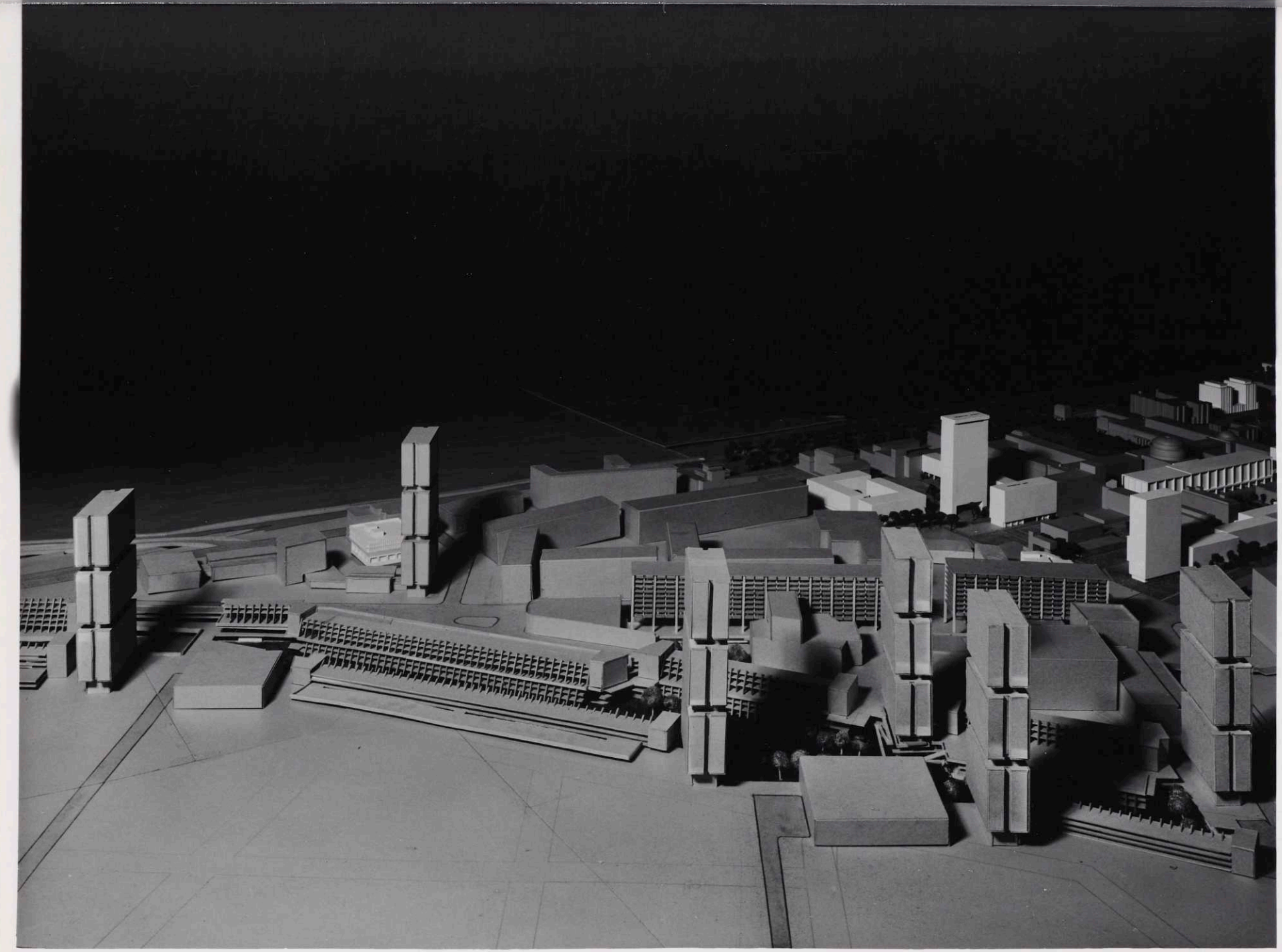


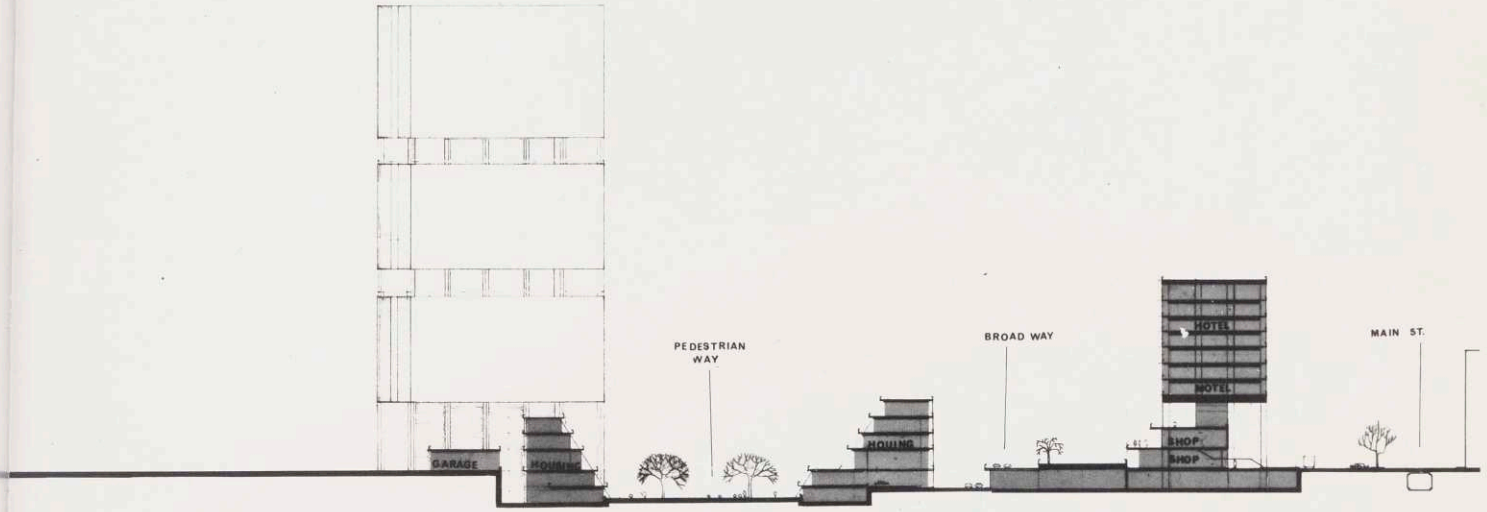
SCALE 1" = 40'

AN URBAN CENTER
MASTER IN ARCHITECTURE THESIS
M.I.T. JUNE 1964
MASASHI KOZIMA

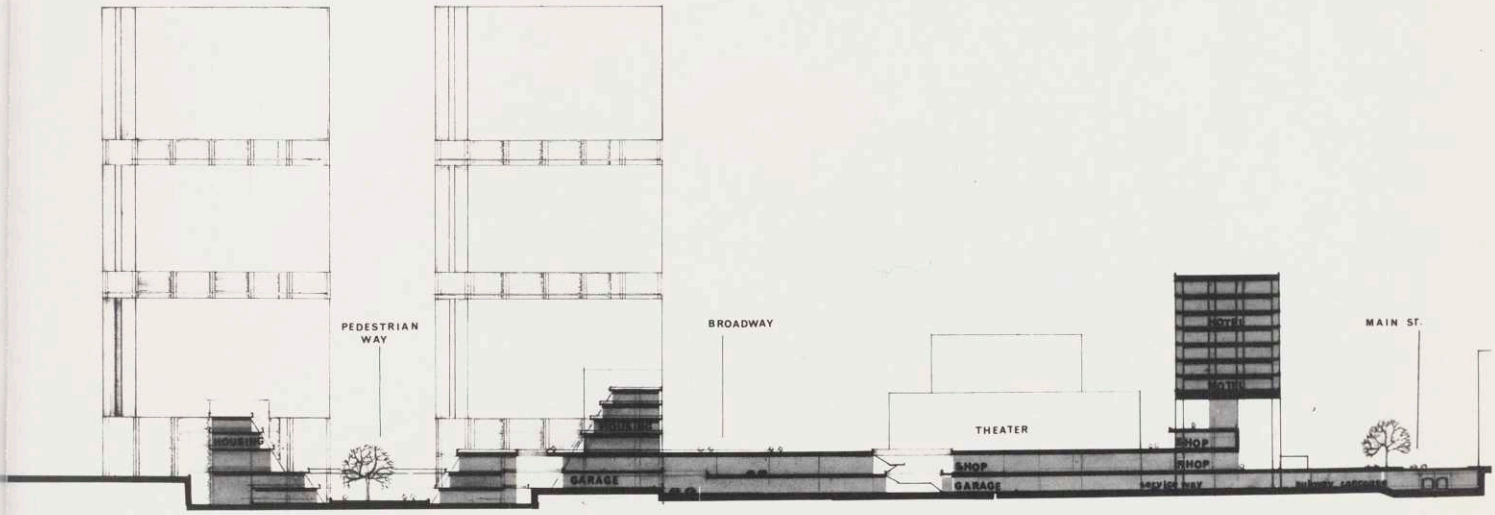








SECTION B — B



SECTION A — A

AN URBAN CENTER
MASTER IN ARCHITECTURE THESIS
M.I.T. JUNE 1964
MASASHI KOZIMA

Design Objectives

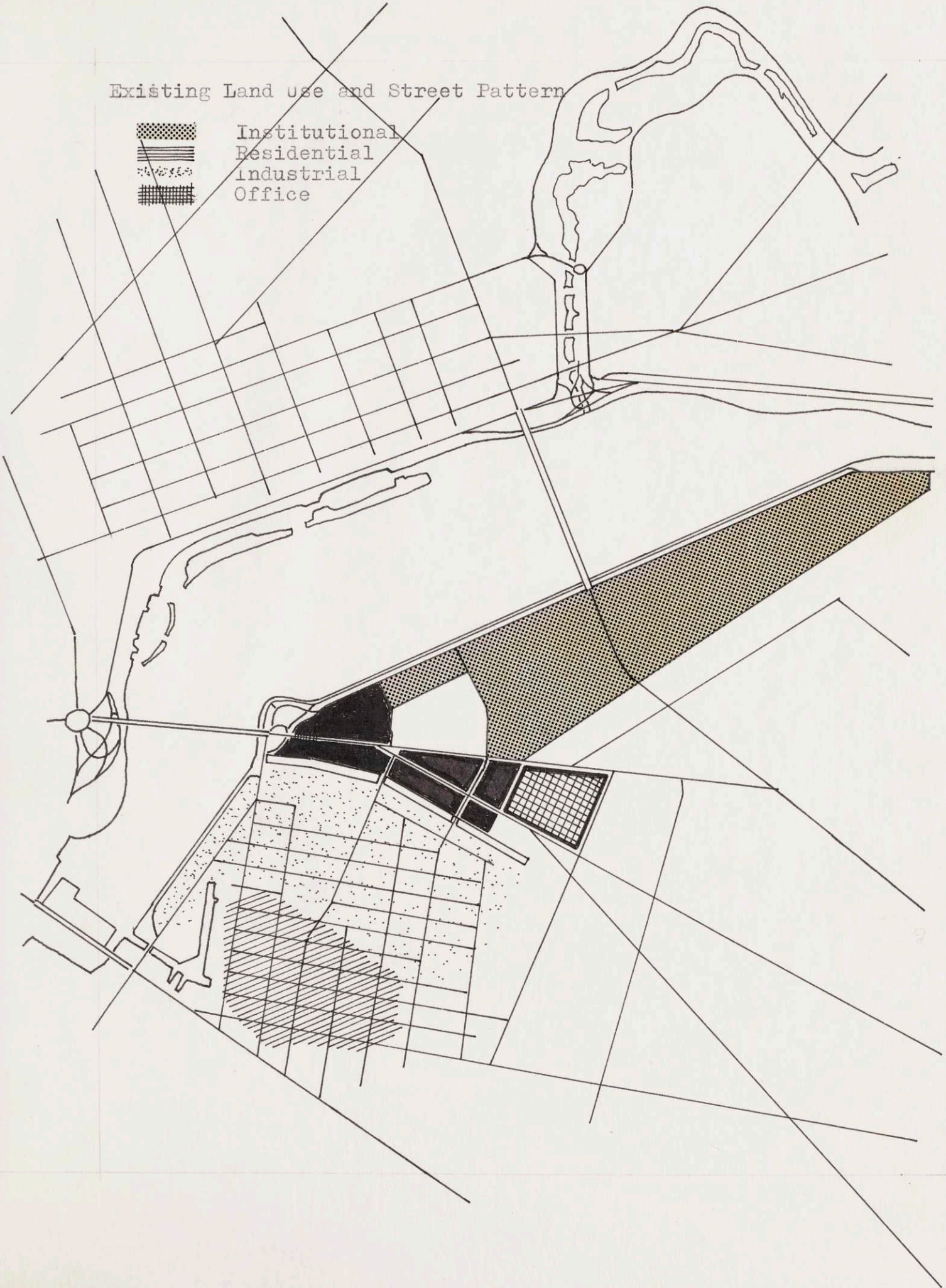
1. As it is the intention of the program that a high density of activities be achieved on the site, the ambition of this solution is to generate a high visual balance by which the mass and composition of the buildings can be comprehended from a considerable distance.

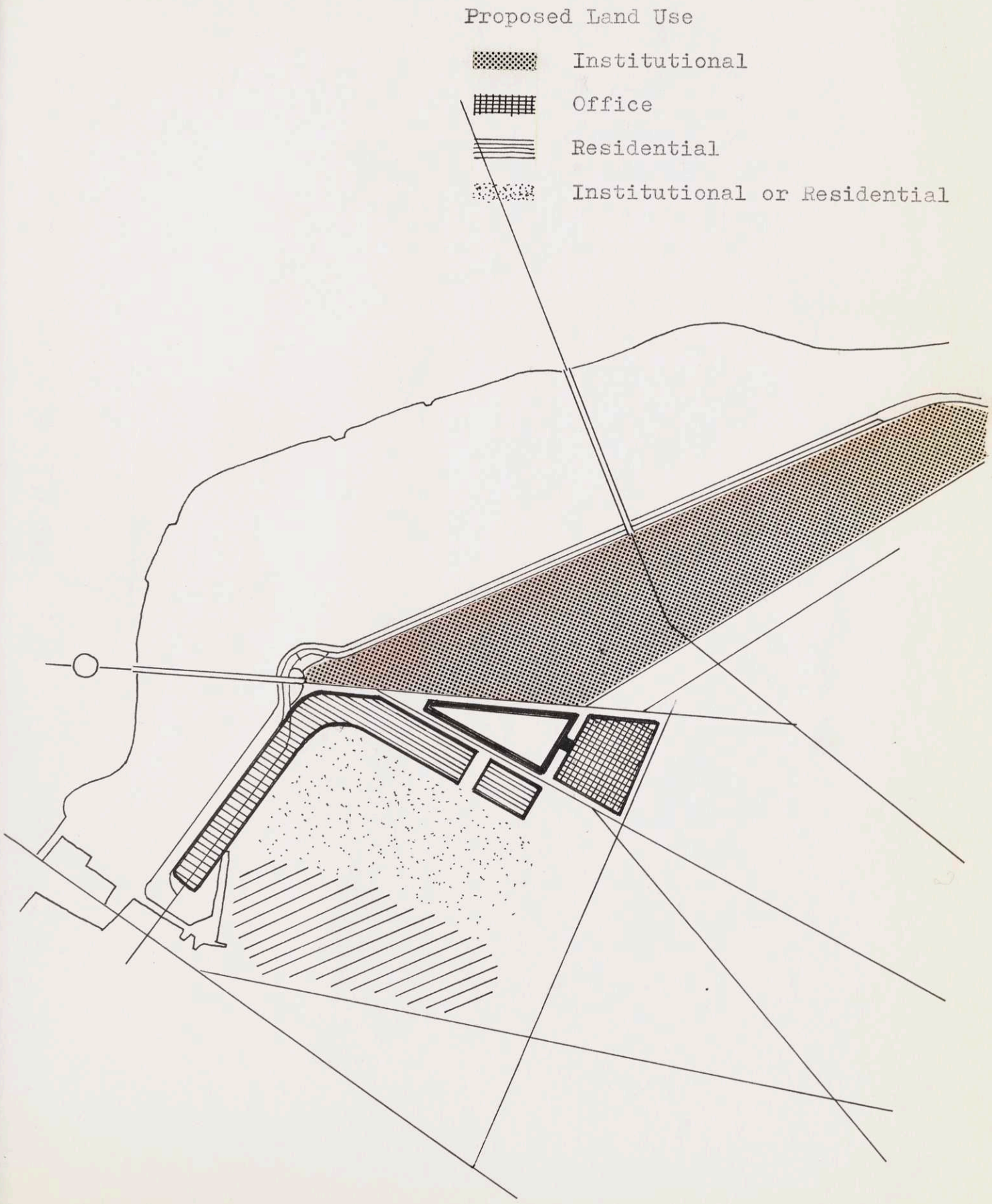
2. Although this design incorporates a variety of elements, residential, cultural, cmmercial, recreational and so forth; the need to organize the scheme in function and space must be recognized. Some of these elements should perform this task of organizing the entire development and making it intelligible. The elements I have chosen to do this I would like to call "generators or organizers", ------Shops and Pedestrian Ways.

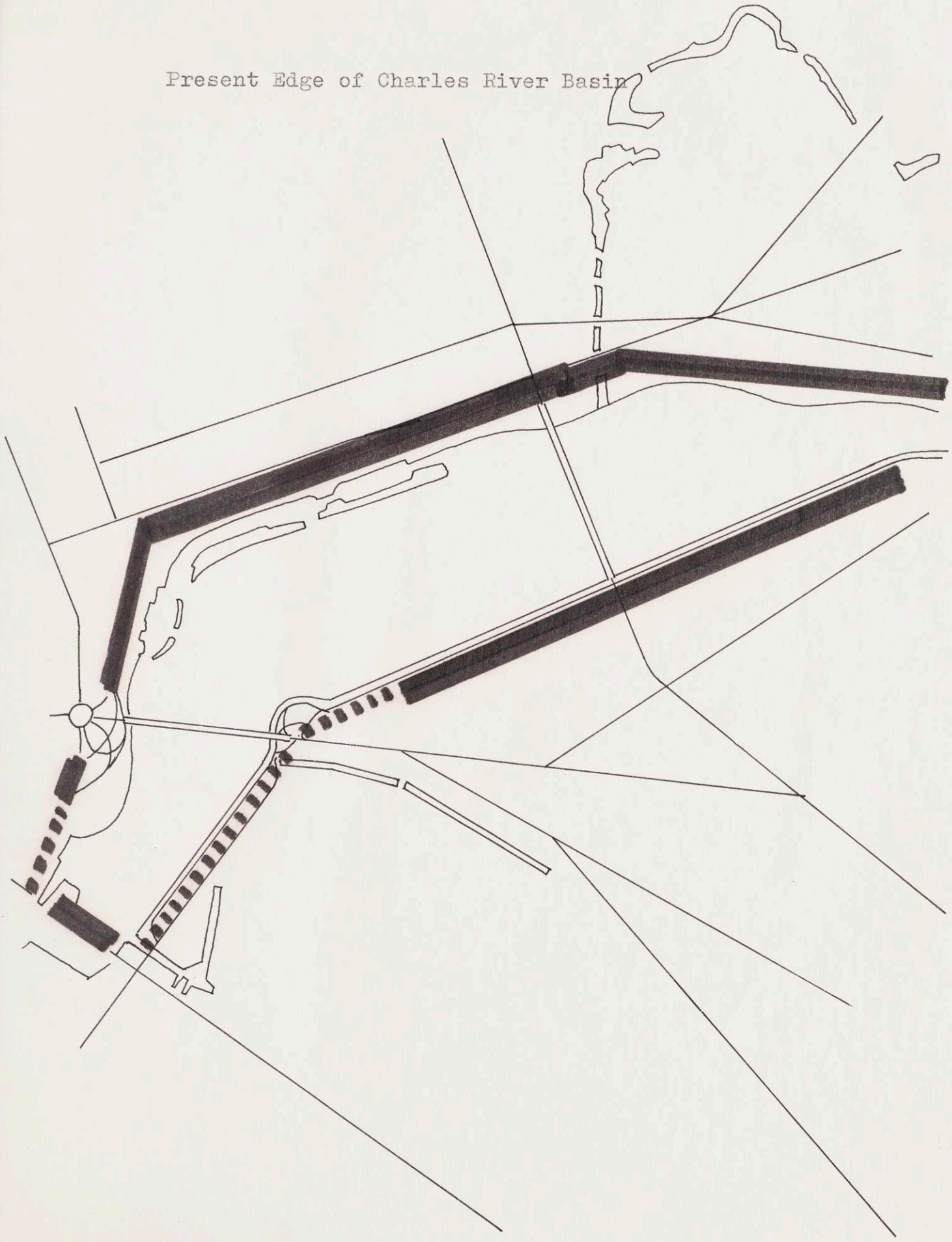
3. The center should comprize various sections, M. I. T., East Cambridge and the new housing provided in this program. Elements in this design which are not generators or organizers but which serve to link these sections as connecting factors I should describe as "connectors".

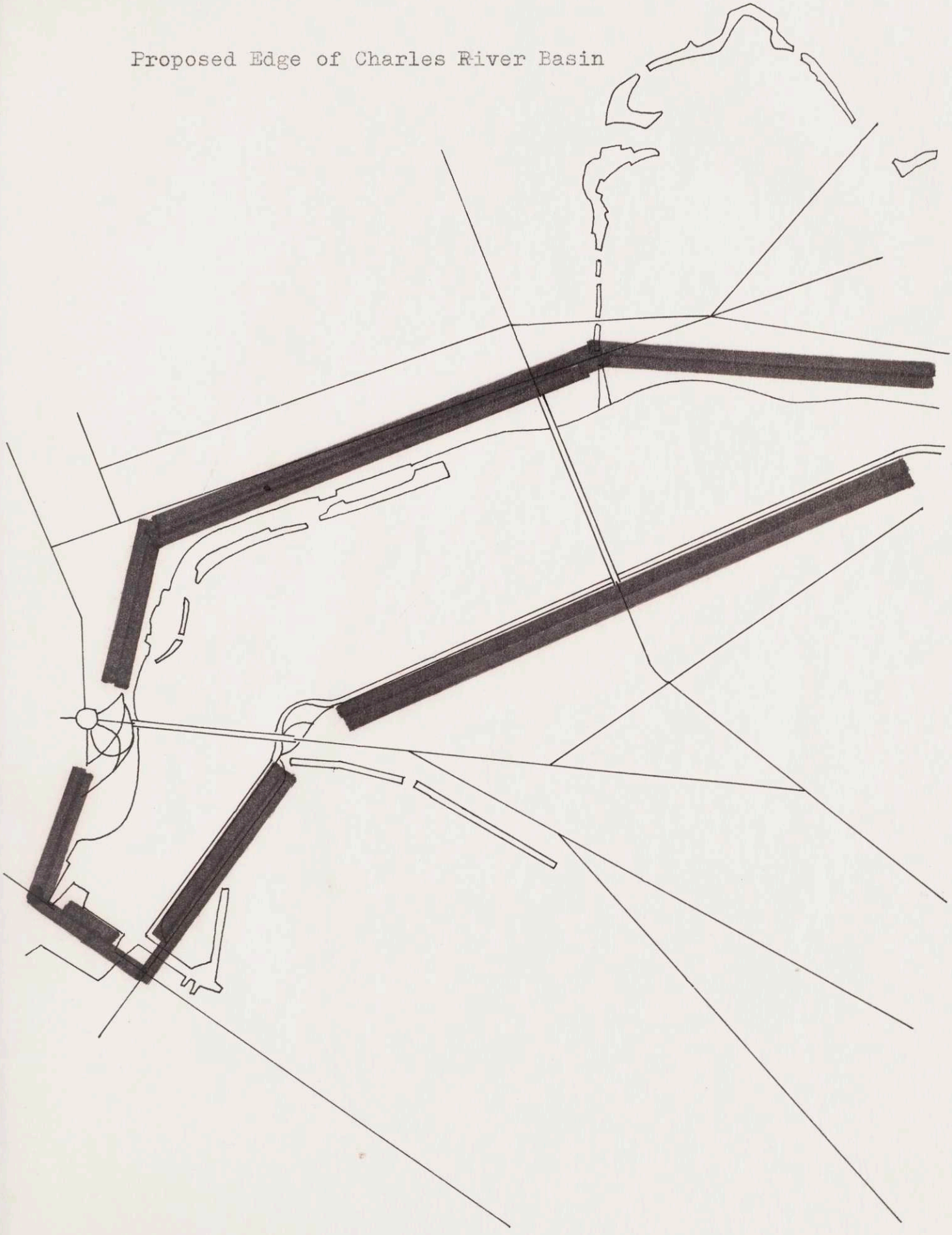
4. In addition the center should furnish some factors to organize the sequence of streets as a new urban spine.

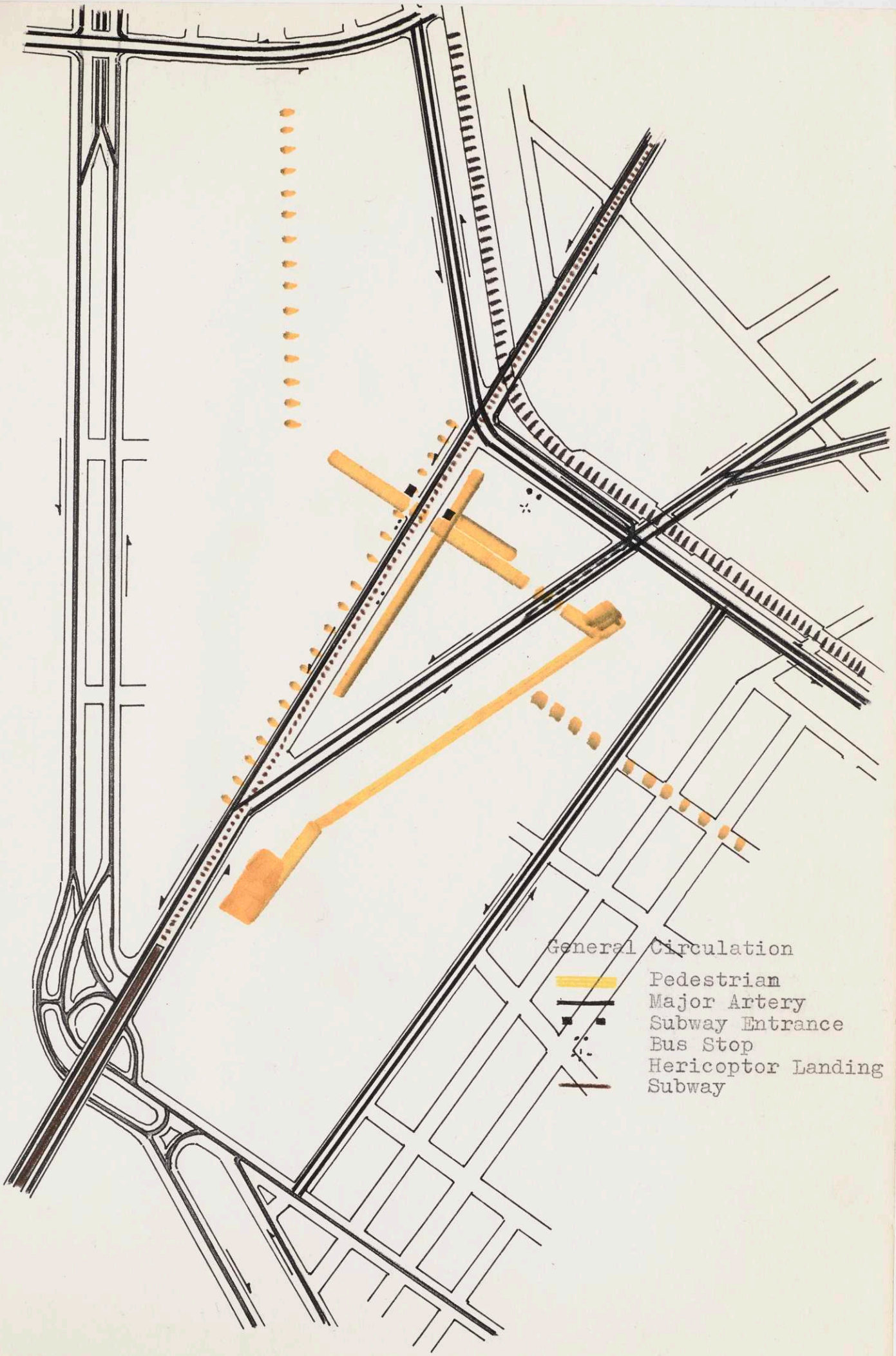
5. The spaces of the design are organized in relation to the interlocking of two major geometries----the one geometry described by the longitudinal axes of the towers (perpendicular to the Main Street); the other geometry by the lower structures defining Broadway.


Existing Land use and Street Pattern
Institutional
Residential
Industrial
Office


Proposed Land Use
Institutional
Office
Residential
Institutional or Residential


Present Edge of Charles River Basin


Proposed Edge of Charles River Basin


General Circulation
Pedestrian
Major Artery
Subway Entrance
Bus Stop
Hericoptor Landing
Subway


Prudential Center
Government Cente
Kedall Sq.
Developping Urban Spine

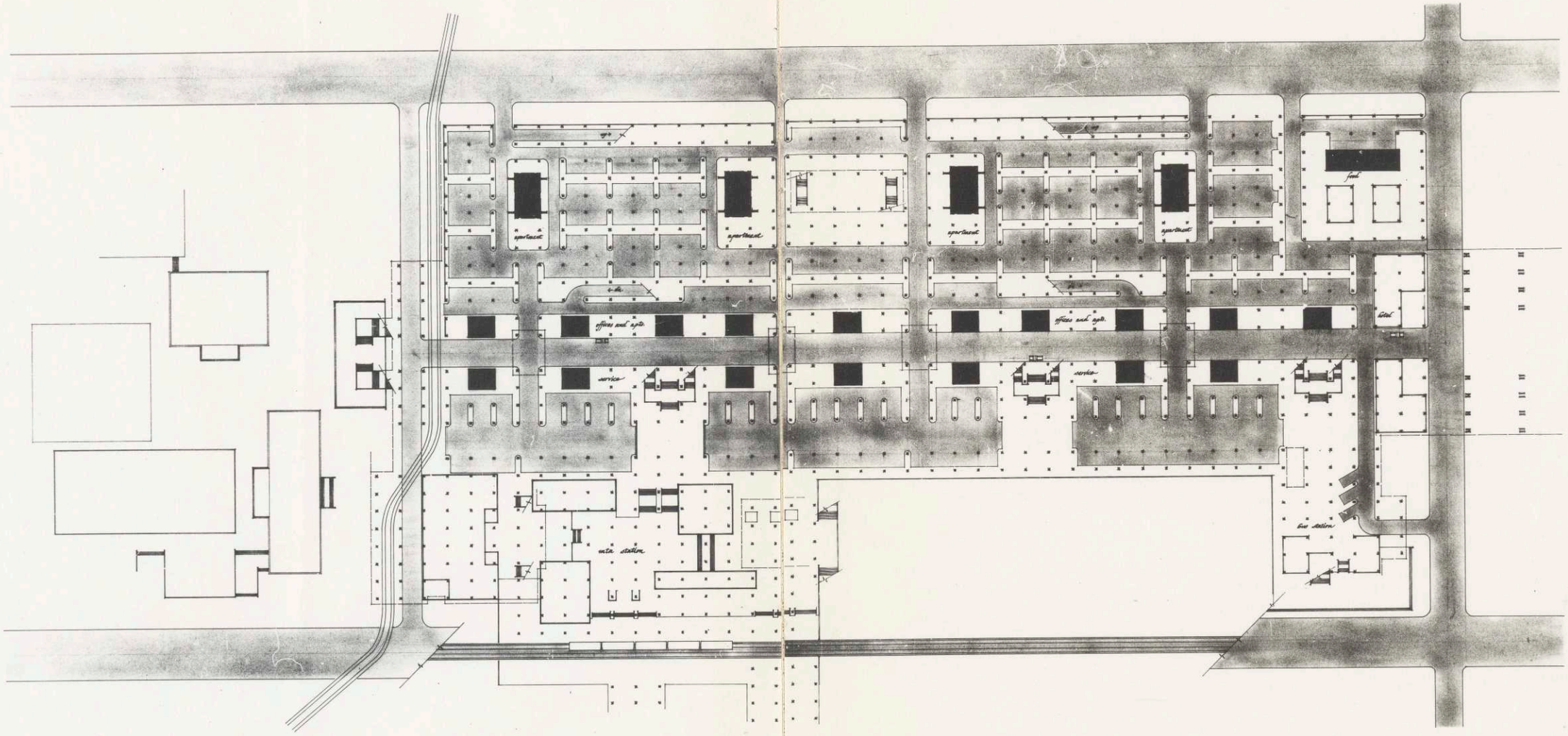
Prudential Center

Government Center

Kendall Sq.

Projected Intensity of Activities along the Spine

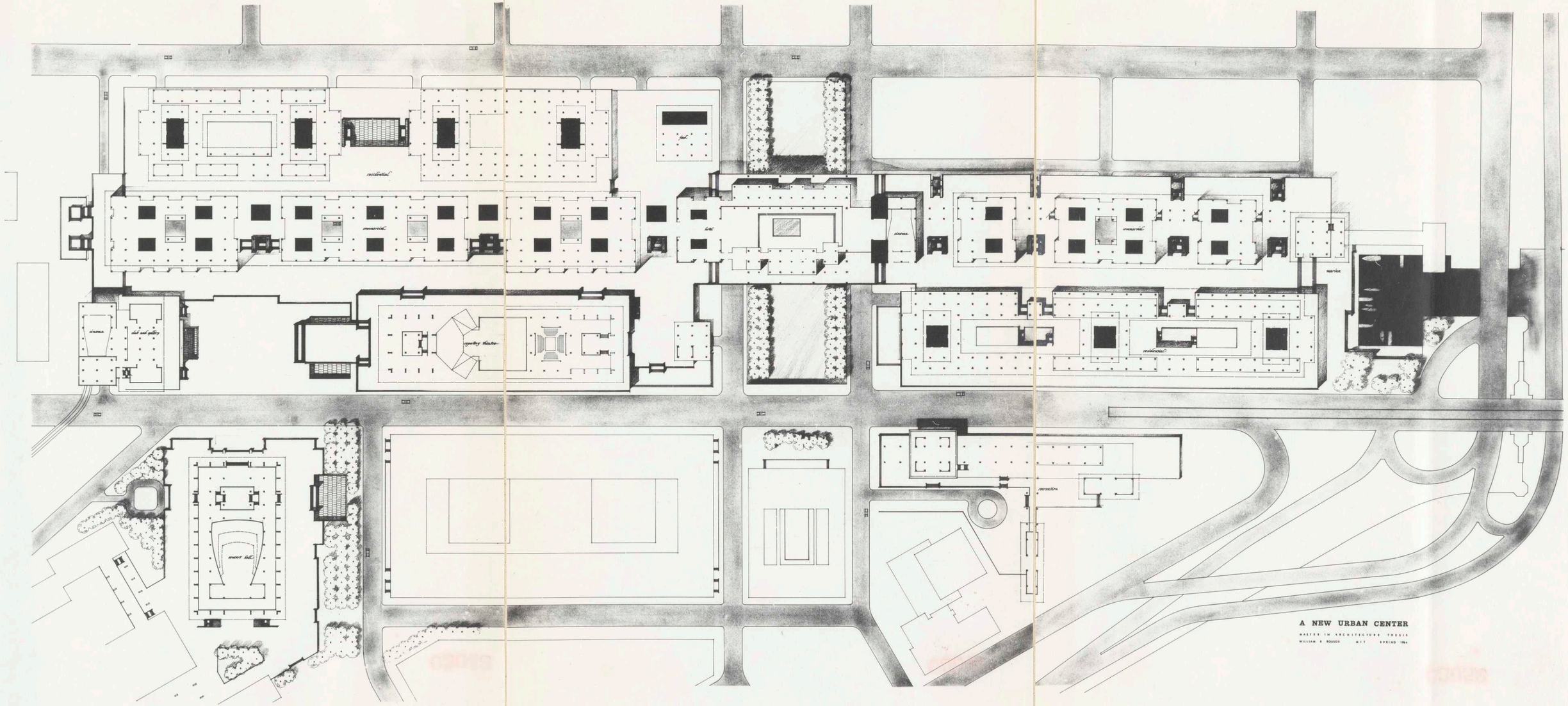
CASE STUDY E: William B. Rousos



SERVICE AND CIRCULATION PLAN

A NEW URBAN CENTER

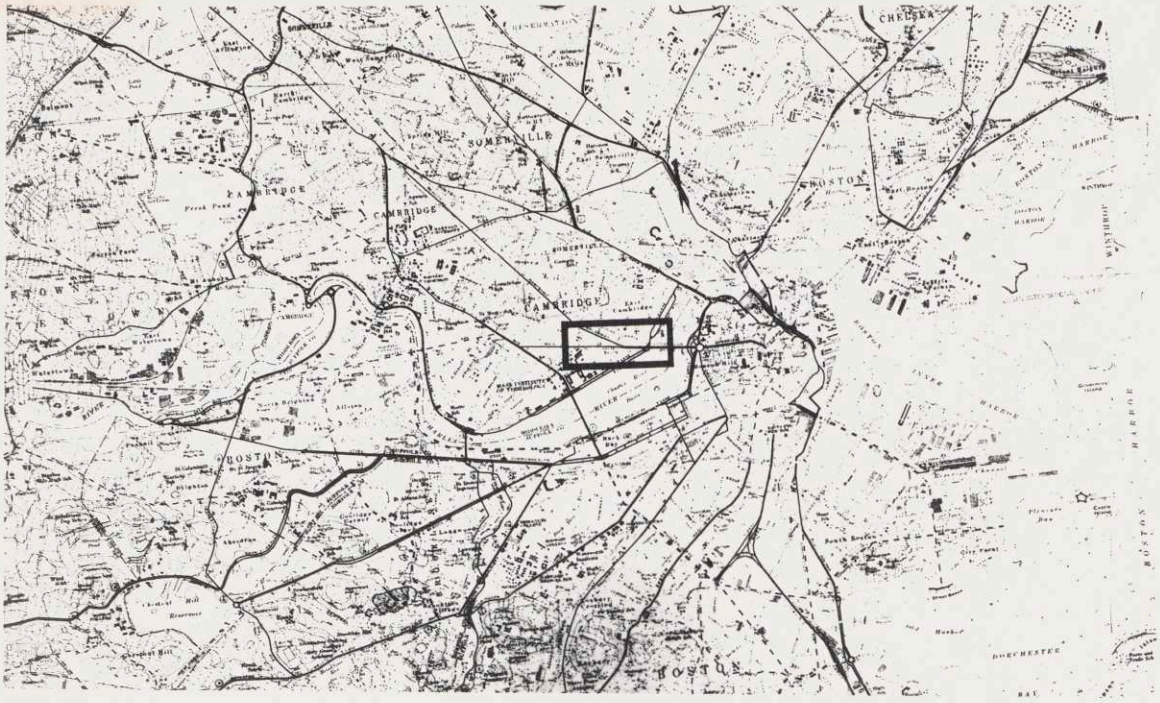
MASTER IN ARCHITECTURE THESIS
WILLIAM E ROUSOS M.I.T SPRING 1964



A NEW URBAN CENTER

MASTER IN ARCHITECTURE THESIS

WILLIAM R ROUSOS MIT SPRING 1964

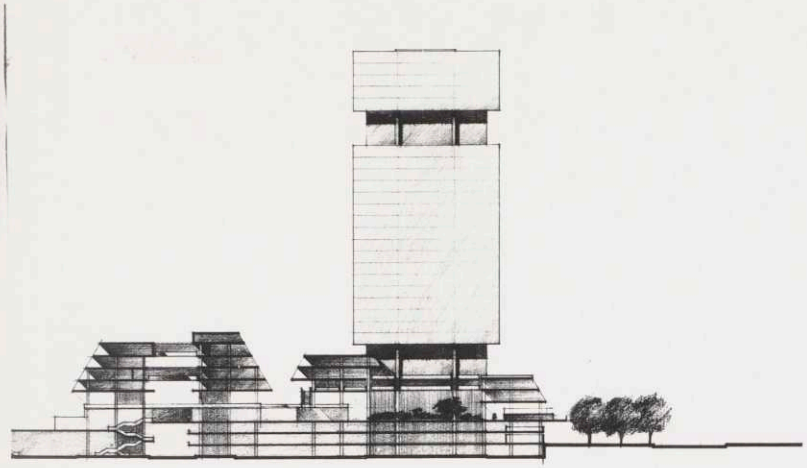


SITE LOCATION

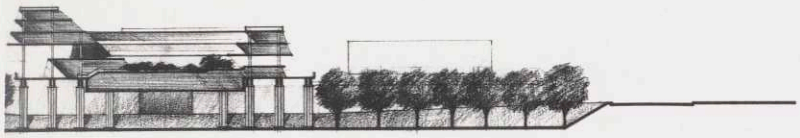
A NEW URBAN CENTER

MASTER IN ARCHITECTURE THESIS

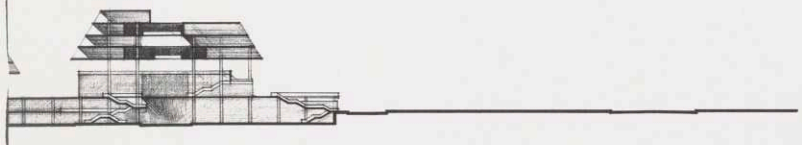
WILLIAM R ROUSOS M I T SPRING 1964



A



B

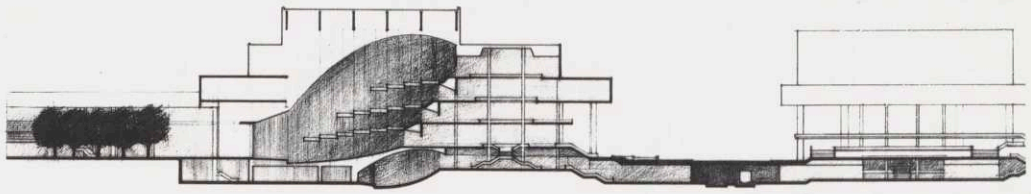


C

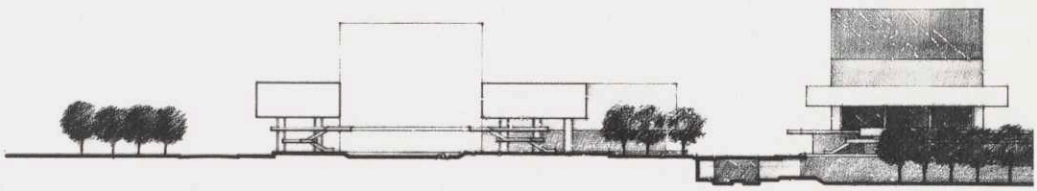
A NEW URBAN CENTER

MASTER IN ARCHITECTURE THESIS

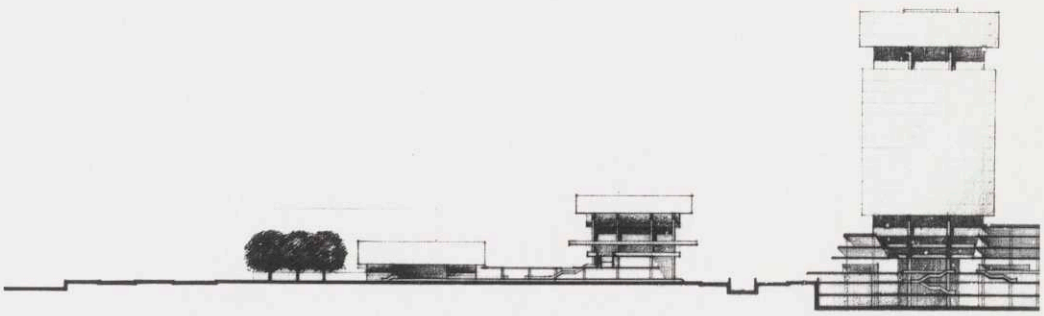
WILLIAM B ROUSOS M.I.T SPRING 1964



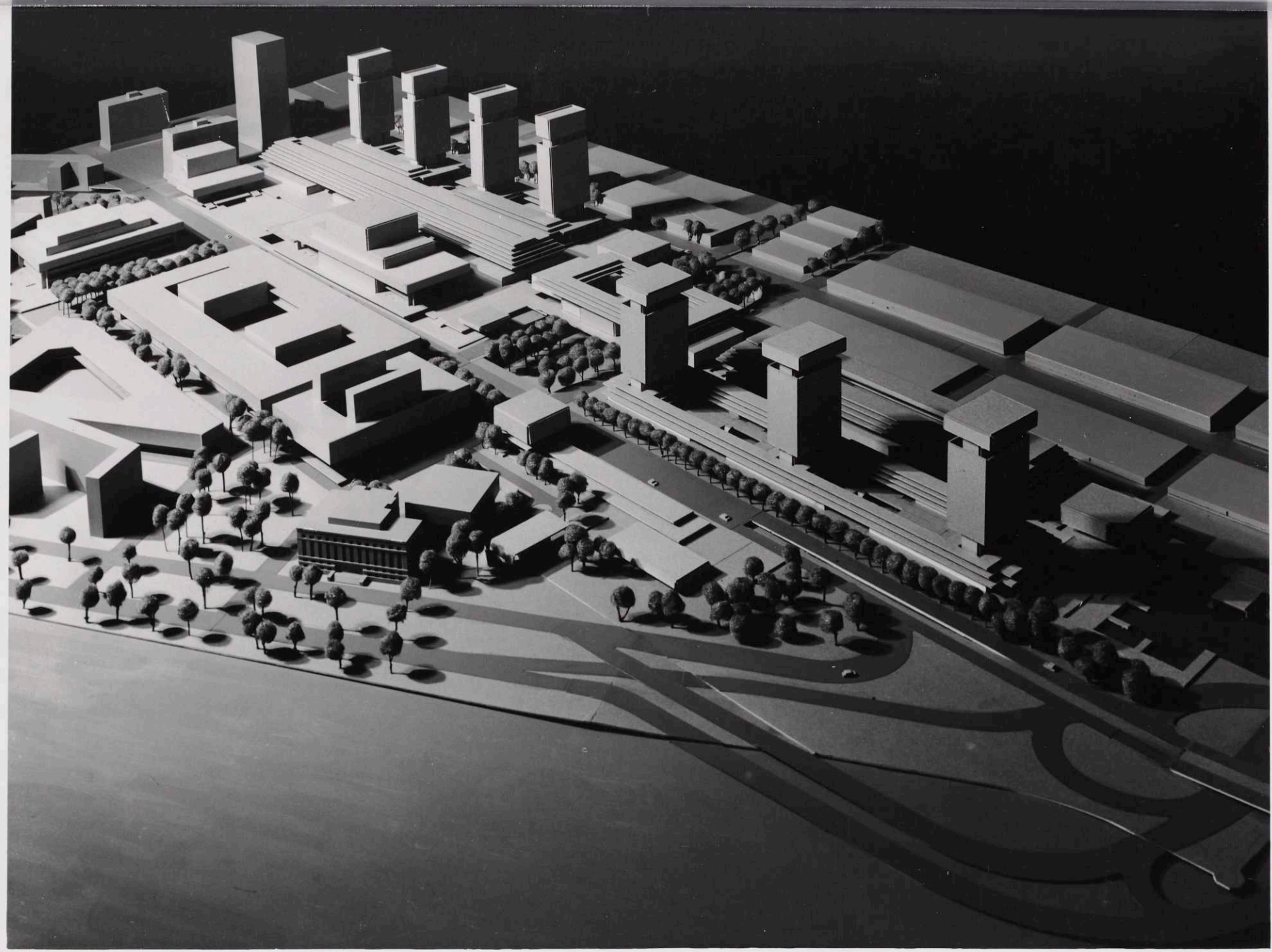
SECTIO

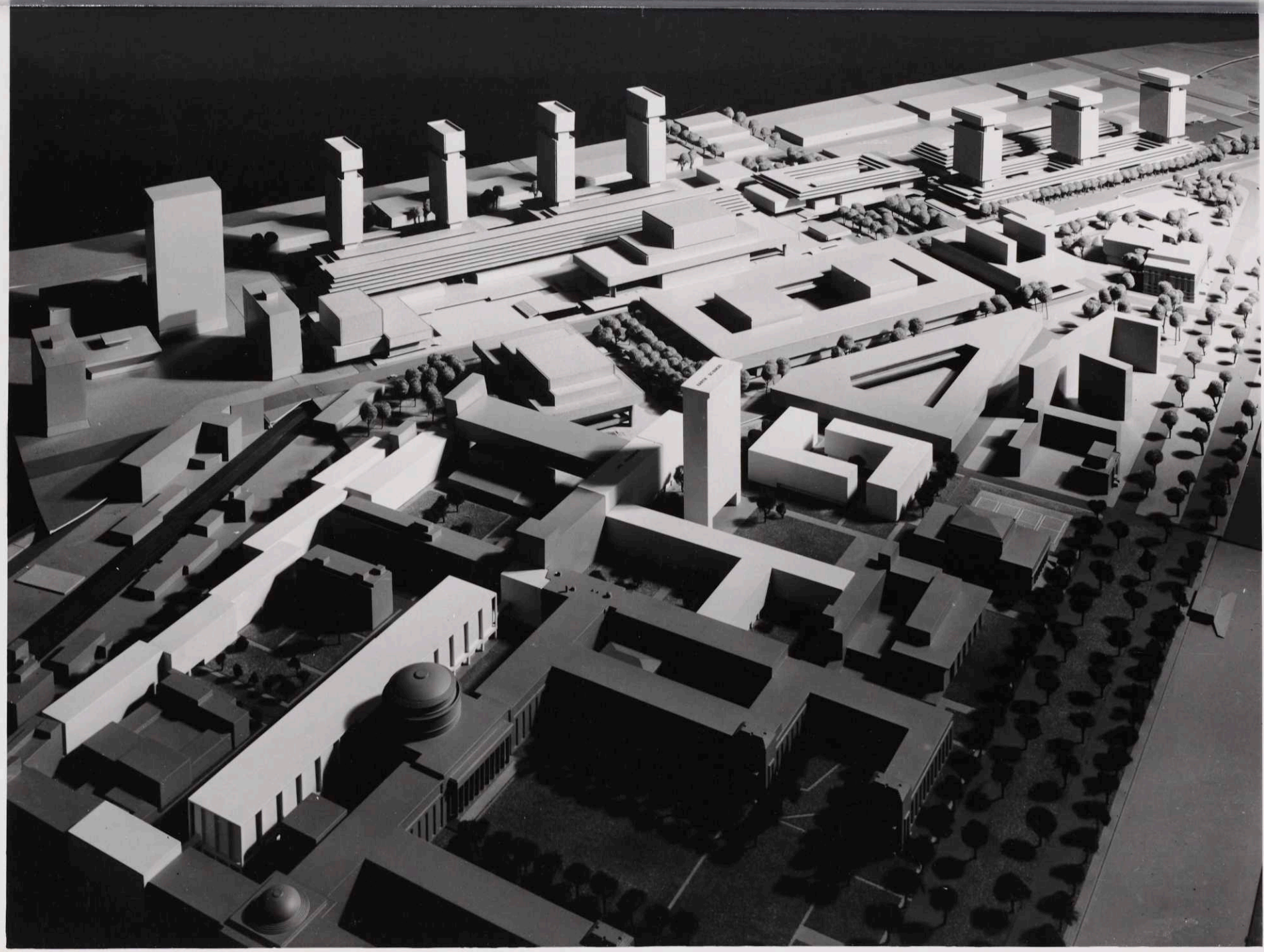


SECTIO



SECTION





DESIGN OBJECTIVES

DESIGN OBJECTIVES

These design objectives originate from my personal feelings concerning the design of the New Urban Center, class discussions, and limitations of the program and the site.

1. The New Urban Center is thought of as a distribution and an arrival point. It is joined to a historical spine that links important landmarks of Boston and Cambridge. This spine is in a process of development, and it includes the Boston Common, the new Government Center complex, Beacon Hill, Kendall Square (our site), Central Square, and Harvard Square.
2. The geometry of its growth should clearly explain traffic routes from the most significant vehicular to the most secondary pedestrian. This traffic should achieve a degree of involvement with the area, but it should also have the choice to proceed and to become further involved, or to completely by-pass the area and leave the center.
3. It should be a collector of many types of activities. These activities should clarify the growth pattern from inside as well as from outside. The character of activities should define the scale and quality of open spaces and interspaces between buildings. These should be continuous and shouldform a sequence linking the major open spaces with the minor.
4. It should provide a leadership of direction and geometry by which it can link its parts, as well as provide methods of joining the seams and edges of the surrounding area, so as to organize it. The new Urban Center should be strongly joined to its

most important neighbors in the following order:

1. M. I. T.
2. East Cambridge.
3. Technology Square.

5. In its final form it should have a strong identity of its own, and it should be easily recognizable as an area within the city. This identity should be possible to achieve through the efforts of one architect or many.

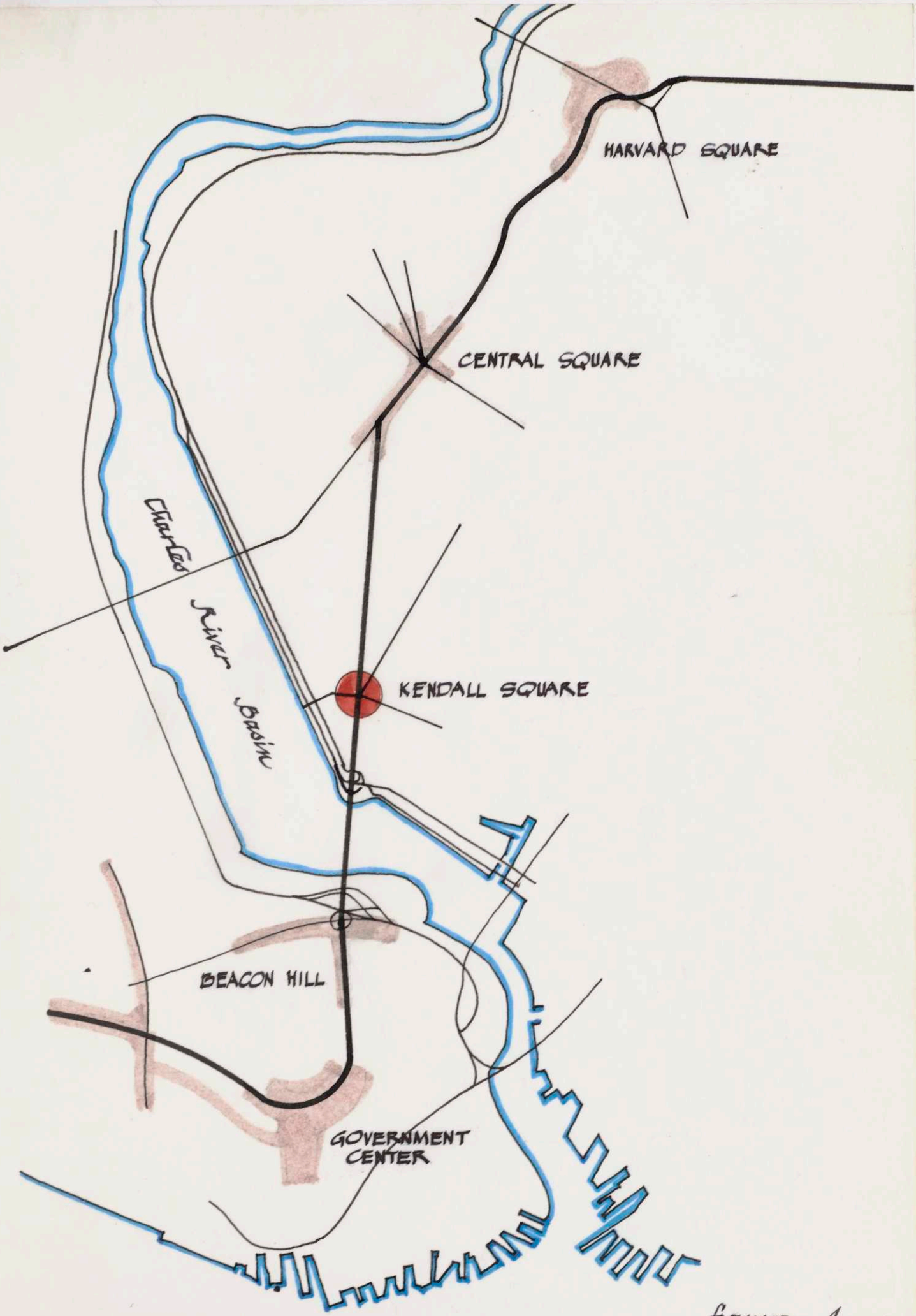

HARVARD SQUARE
CENTRAL SQUARE
Charles River Basin
KENDALL SQUARE
BEACON HILL
GOVERNMENT CENTER

figure .1.

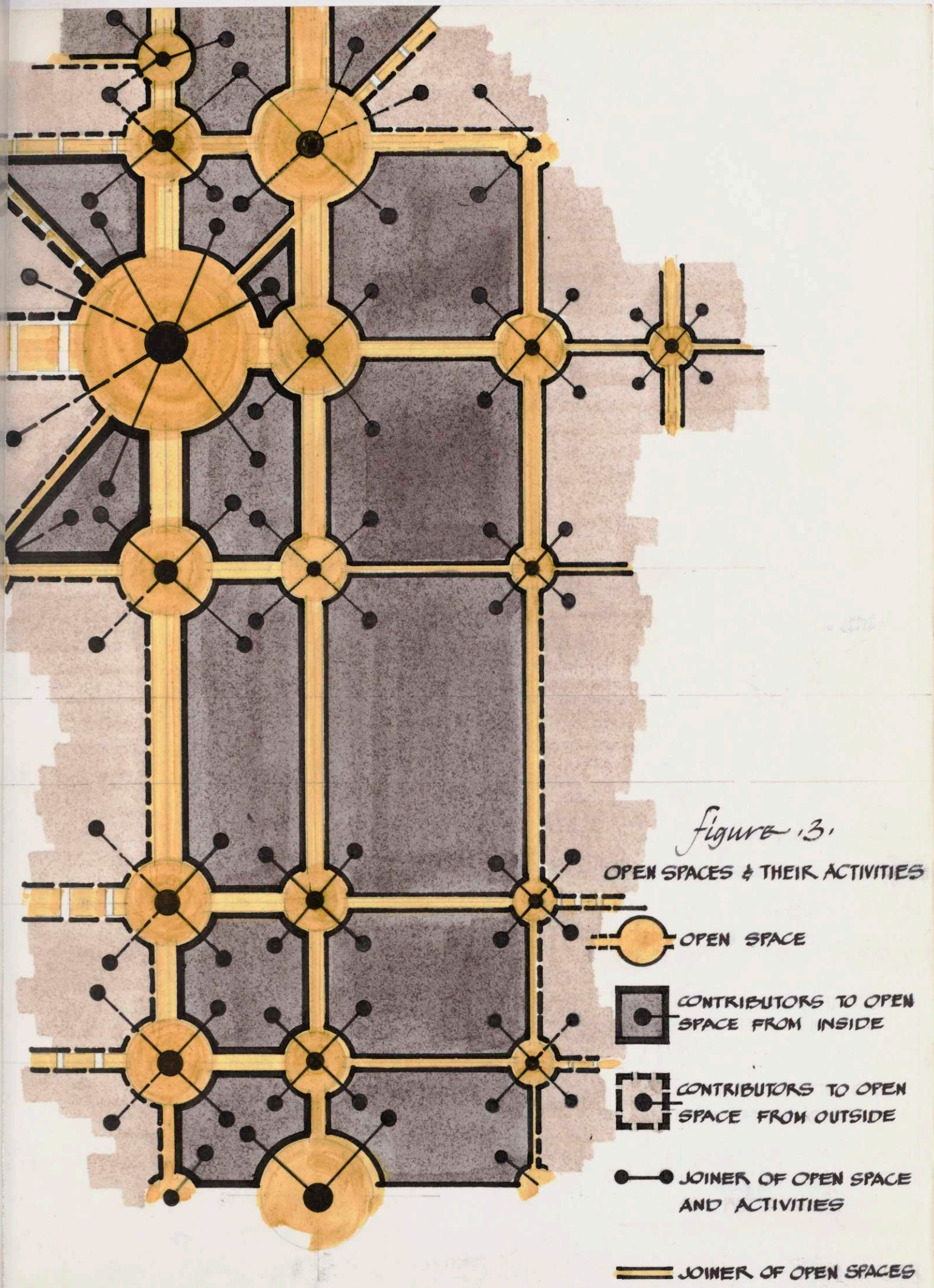
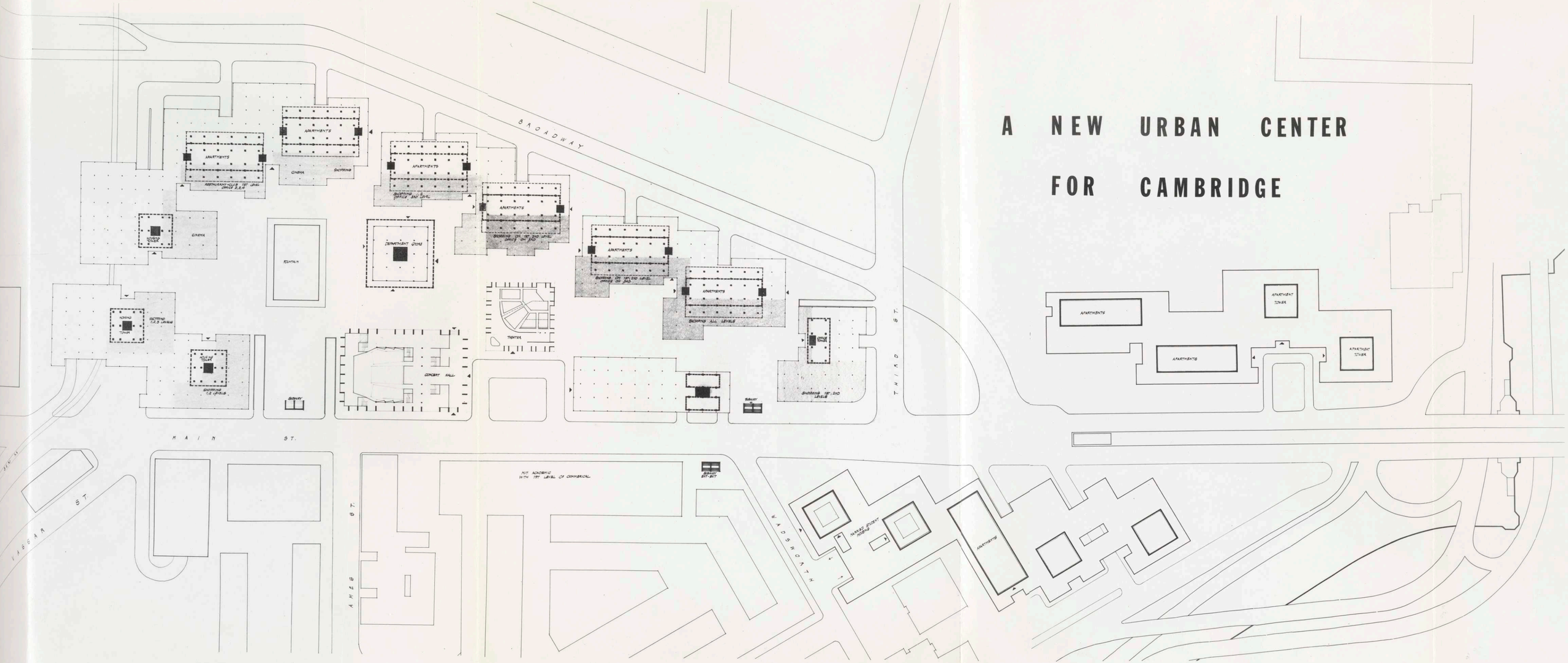
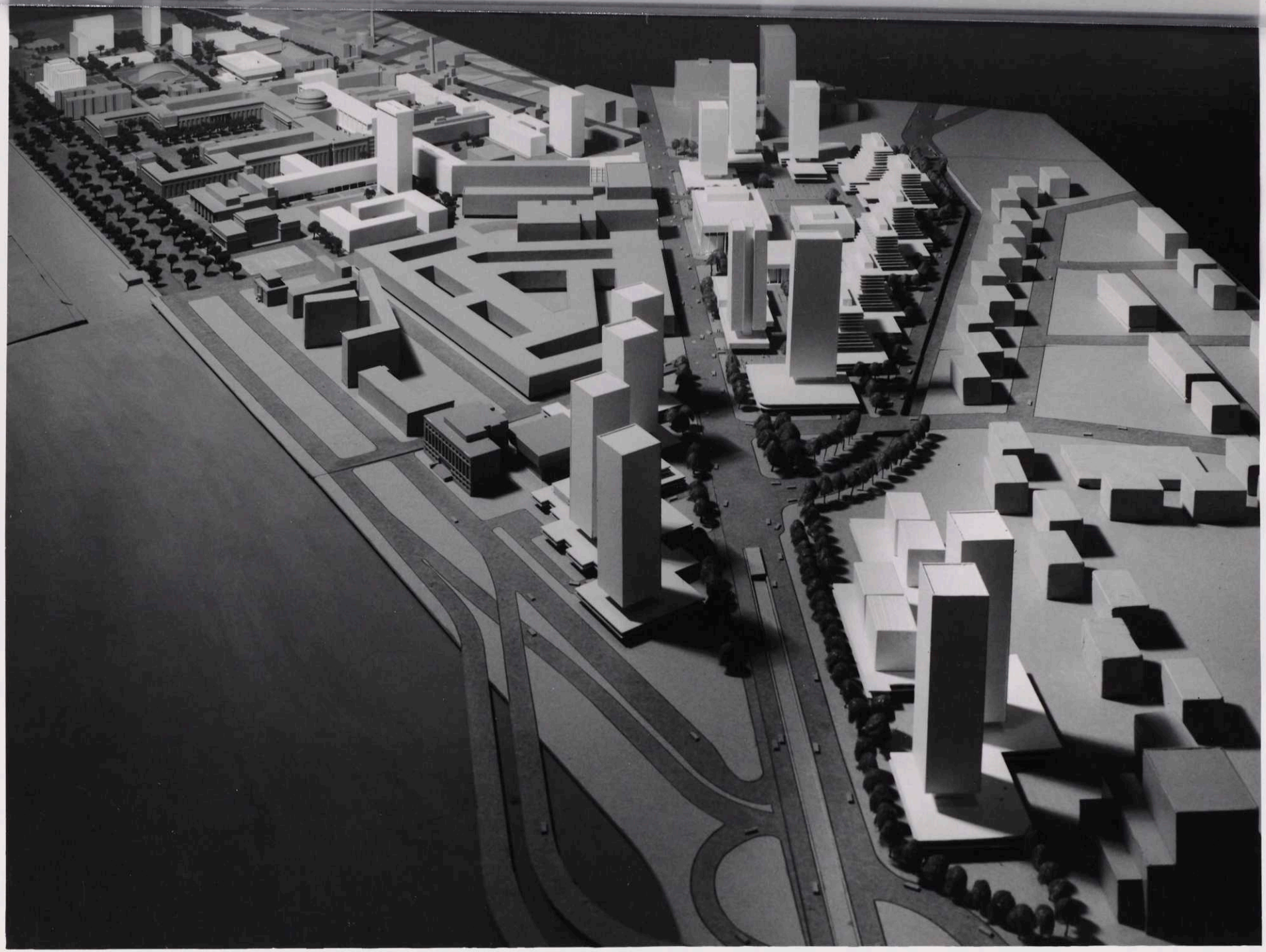

OPEN SPACES & THEIR ACTIVITIES
OPEN SPACE
CONTRIBUTORS TO OPEN SPACE FROM INSIDE
CONTRIBUTORS TO OPEN SPACE FROM OUTSIDE
JOINER OF OPEN SPACE AND ACTIVITIES
JOINER OF OPEN SPACES

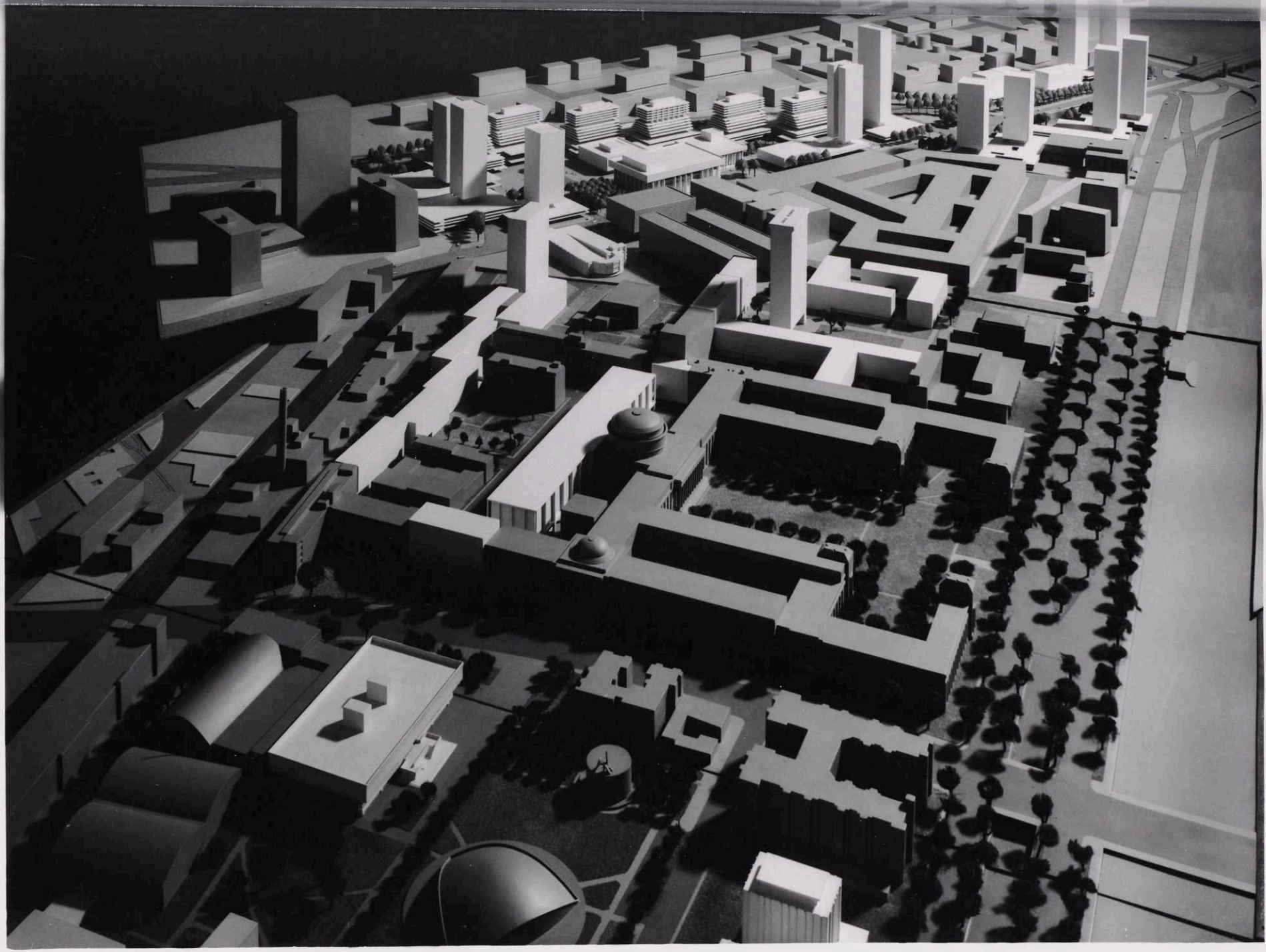
figure 13.

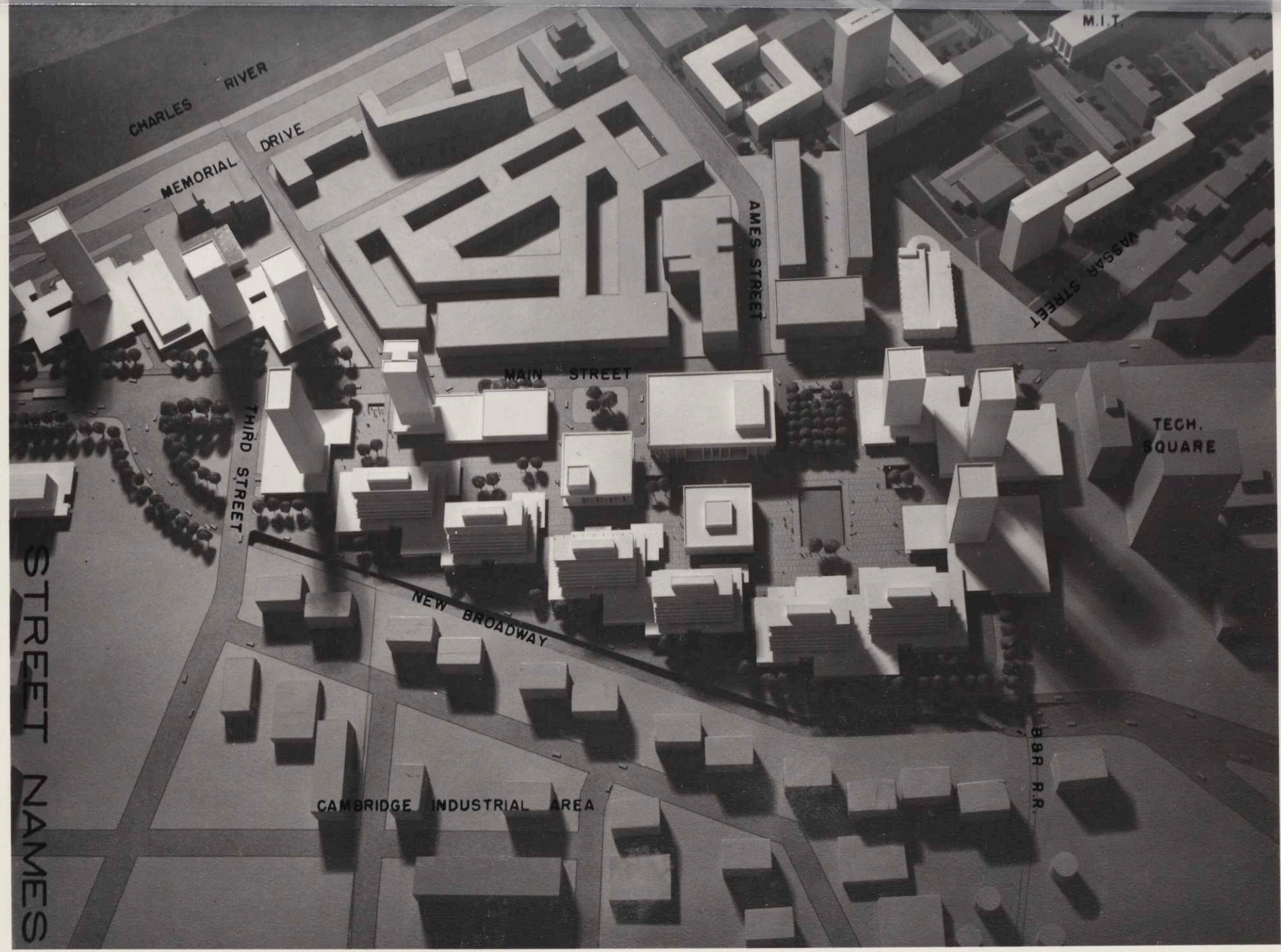
CASE STUDY F: Donald F. Vahrenkamp

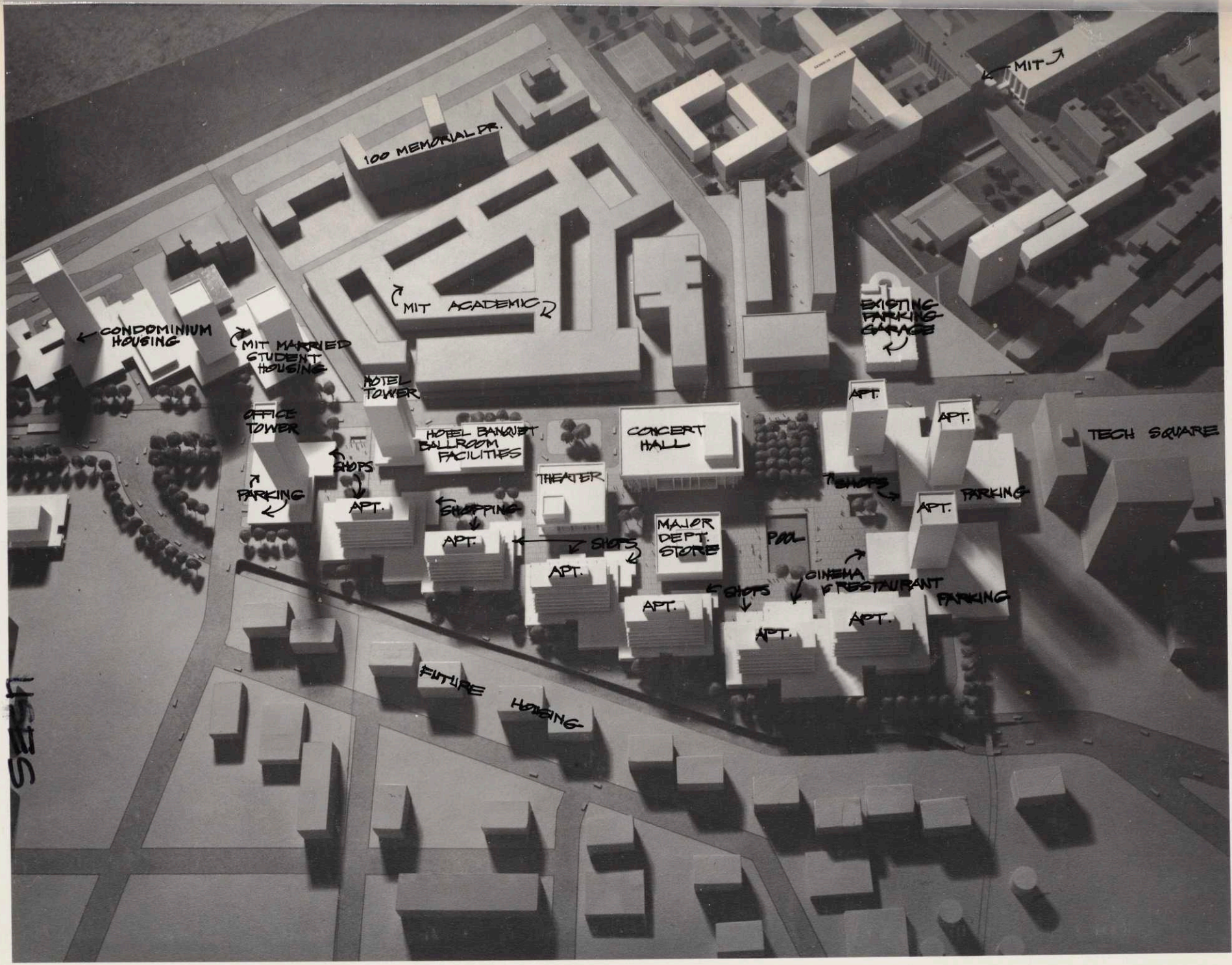
A NEW URBAN CENTER FOR CAMBRIDGE

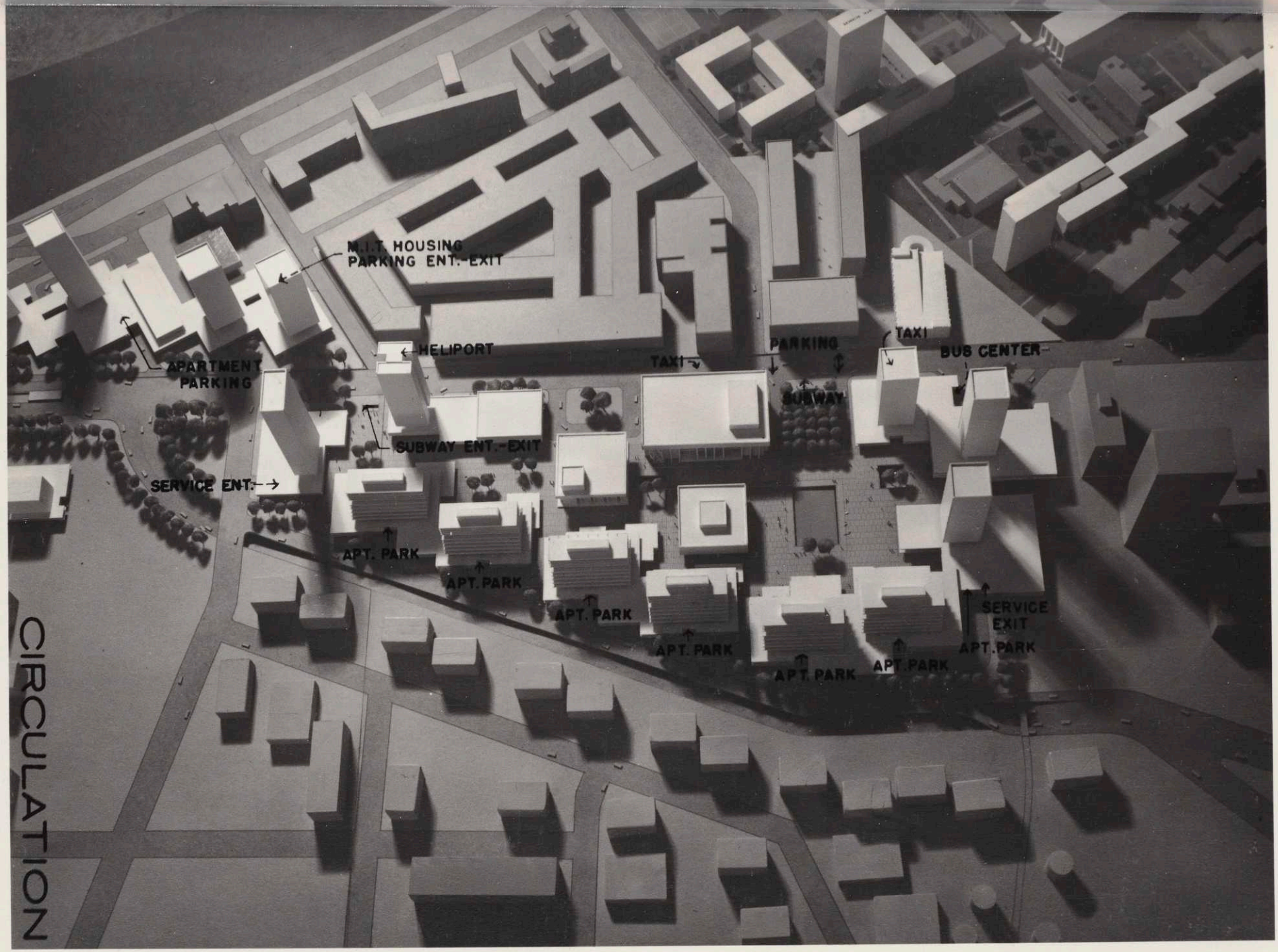






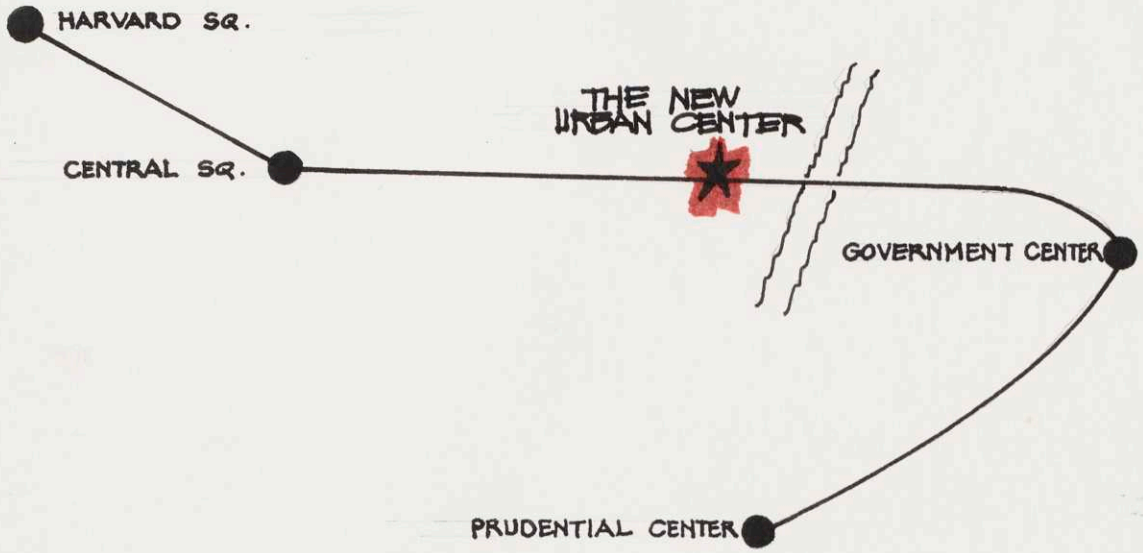

CHARLES RIVER
MEMORIAL DRIVE
M.I.T.
AMES STREET
MASSAR STREET
MAIN STREET
THIRD STREET
TECH. SQUARE
NEW BROADWAY
B&R R.R.
CAMBRIDGE INDUSTRIAL AREA
STREET NAMES


100 MEMORIAL DR.
MIT
MIT ACADEMIC
CONDOMINIUM HOUSING
MIT MARRIED STUDENT HOUSING
EXISTING PARKING GARAGE
HOTEL TOWER
OFFICE TOWER
HOTEL BANQUET BALLROOM FACILITIES
CONCERT HALL
THEATER
APT.
TECH SQUARE
SHOPS
PARKING
MAJOR DEPT. STORE
POOL
CINEMA & RESTAURANT
FUTURE HOUSING
MEMORIAL DRIVE

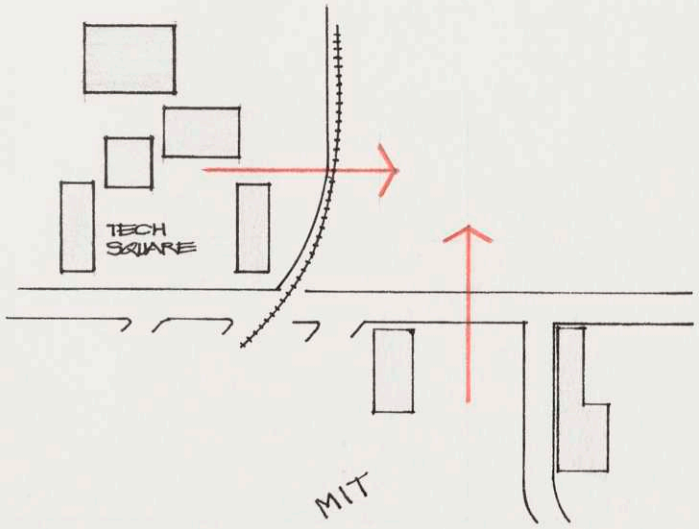

M.I.T. HOUSING
PARKING ENT.-EXIT
HELIPORT
APARTMENT
PARKING
TAXI
PARKING
TAXI
BUS CENTER
SUBWAY
SUBWAY ENT.-EXIT
SERVICE ENT.
APT. PARK
APT. PARK
APT. PARK
APT. PARK
APT. PARK
APT. PARK
SERVICE
EXIT
APT. PARK
CIRCULATION

DESIGN OBJECTIVES

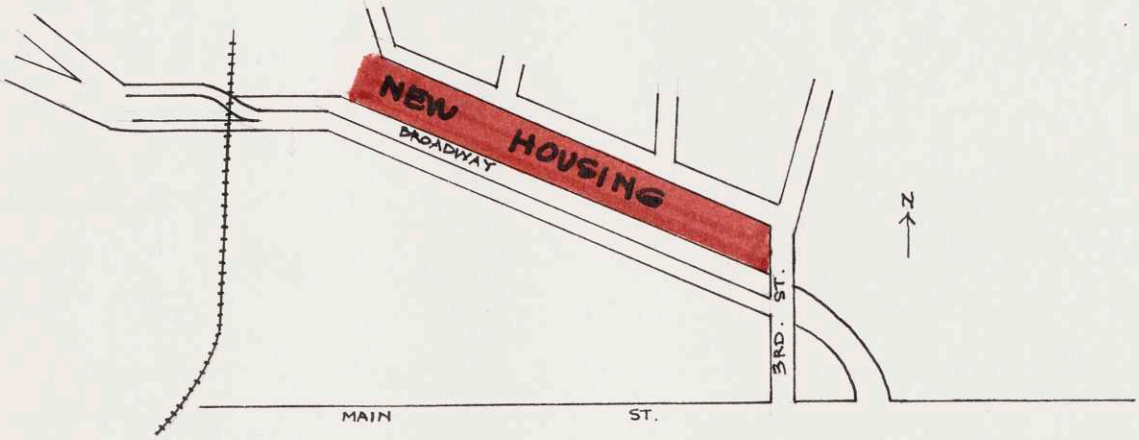
1.) This new urban center should be one of a sequence of major activity nodes that occur along the major routes and rapid transit lines connecting the Prudential and Government Centers onto Central and Harvard Squares in Cambridge. This center should exemplify the entrance qualities that the site location offers as the gateway to Cambridge from Boston via the Longfellow Bridge.



2.) The center should reveal a visible expression of relating the pedestrian activity from MIT and Tech Square.



3.) The industrial area north of the site in East Cambridge seems to be immovable for the next 20 years. Although a refinement of the area would be a reasonable assumption, an effective barrier instead of a link should be the objective in this case. The only expansion adjacent to this area would be a small extension of residential units.



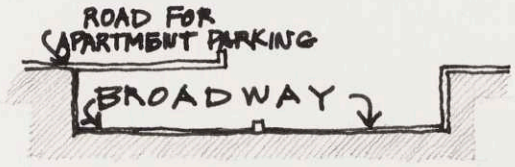
4.) The handling of parking and servicing should be in such a manner so as not to penetrate the ground surface of the main pedestrian activity points in the center. Rapid transit exits and entrances as well as the bus center should be placed so as to distribute activity.

5.) The distribution of day and night activities should be dealt with in such a manner so as to alleviate any dead areas.

CIRCULATION

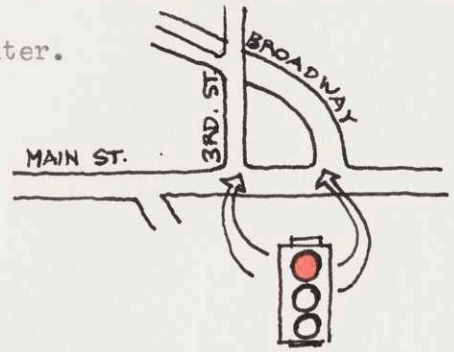
1.) Parking for shopping, hotel, and cultural facilities is off Main Street. There are no direct connections of streets across Main.

2.) Broadway has been brought down to the level of the old Broad Canal, and the distributing street (for apartment parking use) is over it with its connection off 3rd. Street. Broadway will not have direct connection to the center.



3.) Traffic lights will be used at the 3rd. Street-Main and Broadway-Main intersections. These two lights will operate simultaneously.

These traffic lights will also be used for the pedestrian movement to the center from the housing areas to the east and southeast of the center.

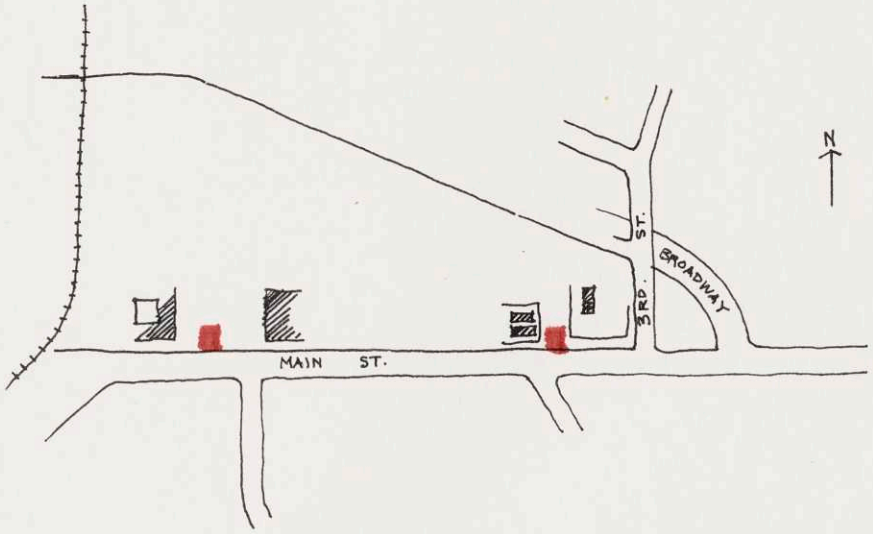


4.) The pedestrian connection from MIT will be by a pedestrian crosswalk light on Main Street, while the connection to Tech Square will be across the railroad tracks.

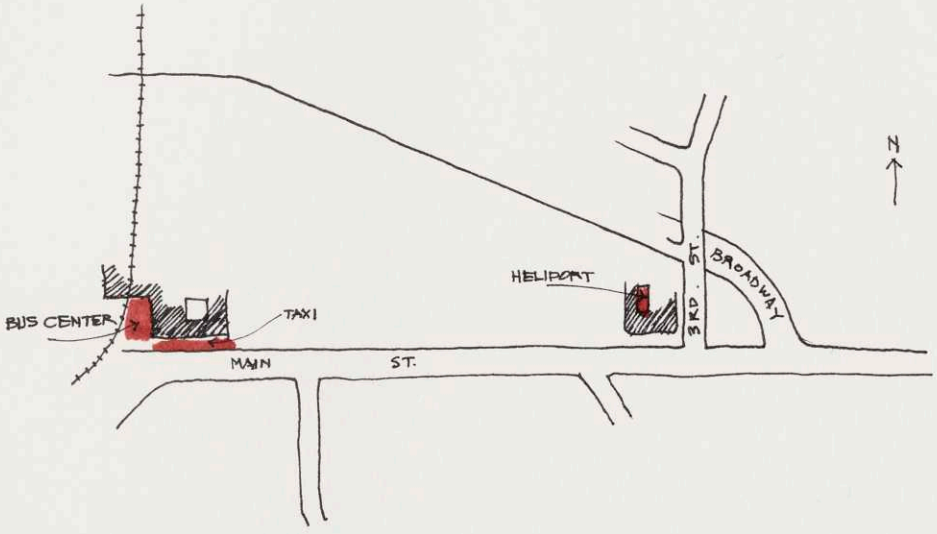
5.) The subway entrance-exit points will be in two locations:

1) At the Hotel-Office Center

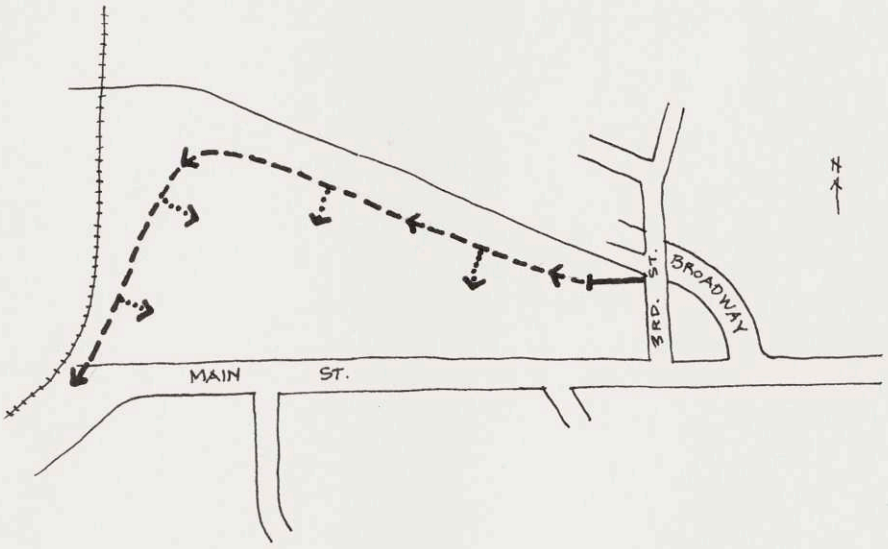
2) At the main pedestrian entrance to the center

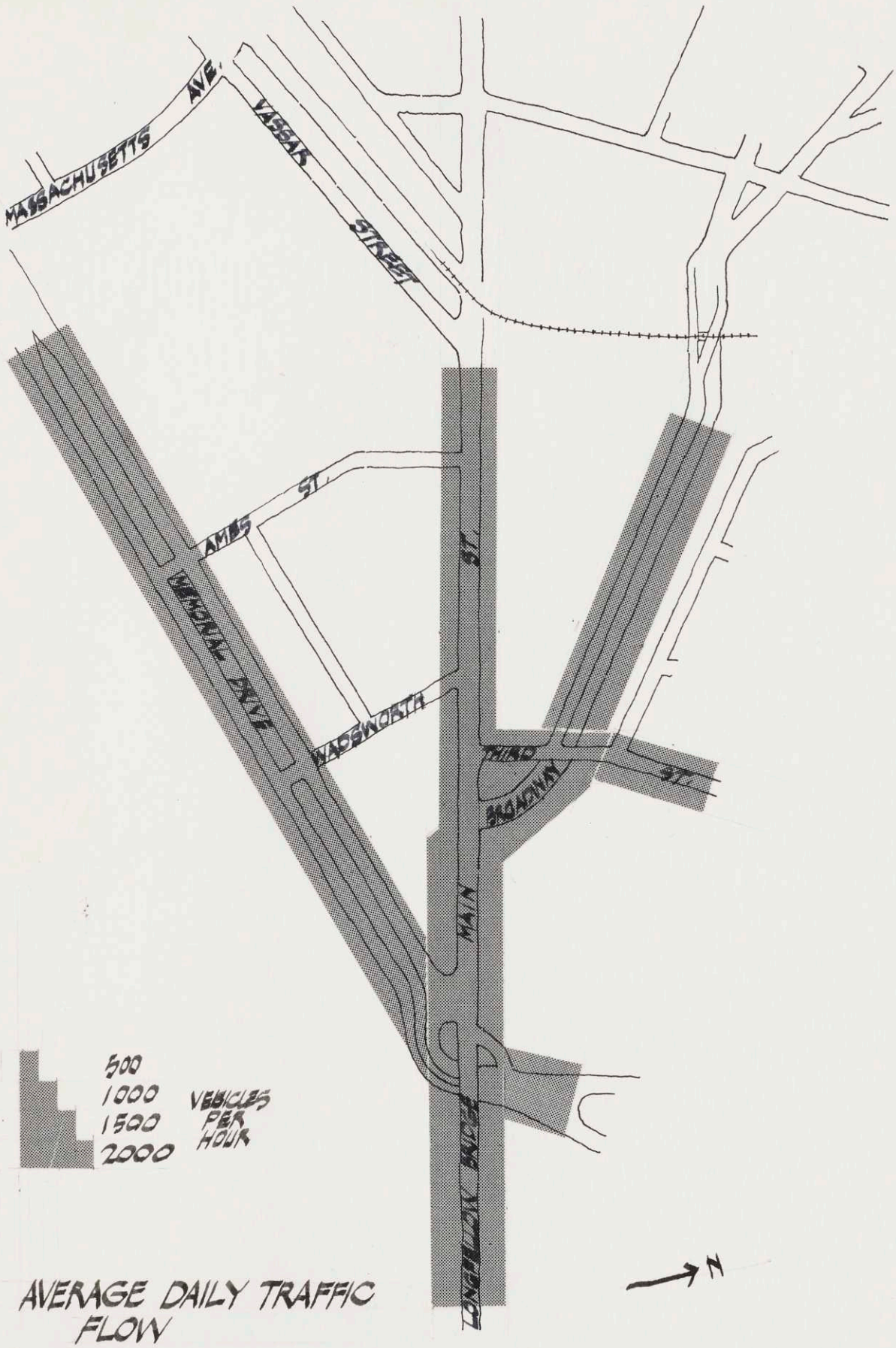


6.) The Bus Center facilities will be at the west end of the center off Main Street. The taxi stand is adjacent to the Bus Center, while the Heliport would be located on top of the office tower.

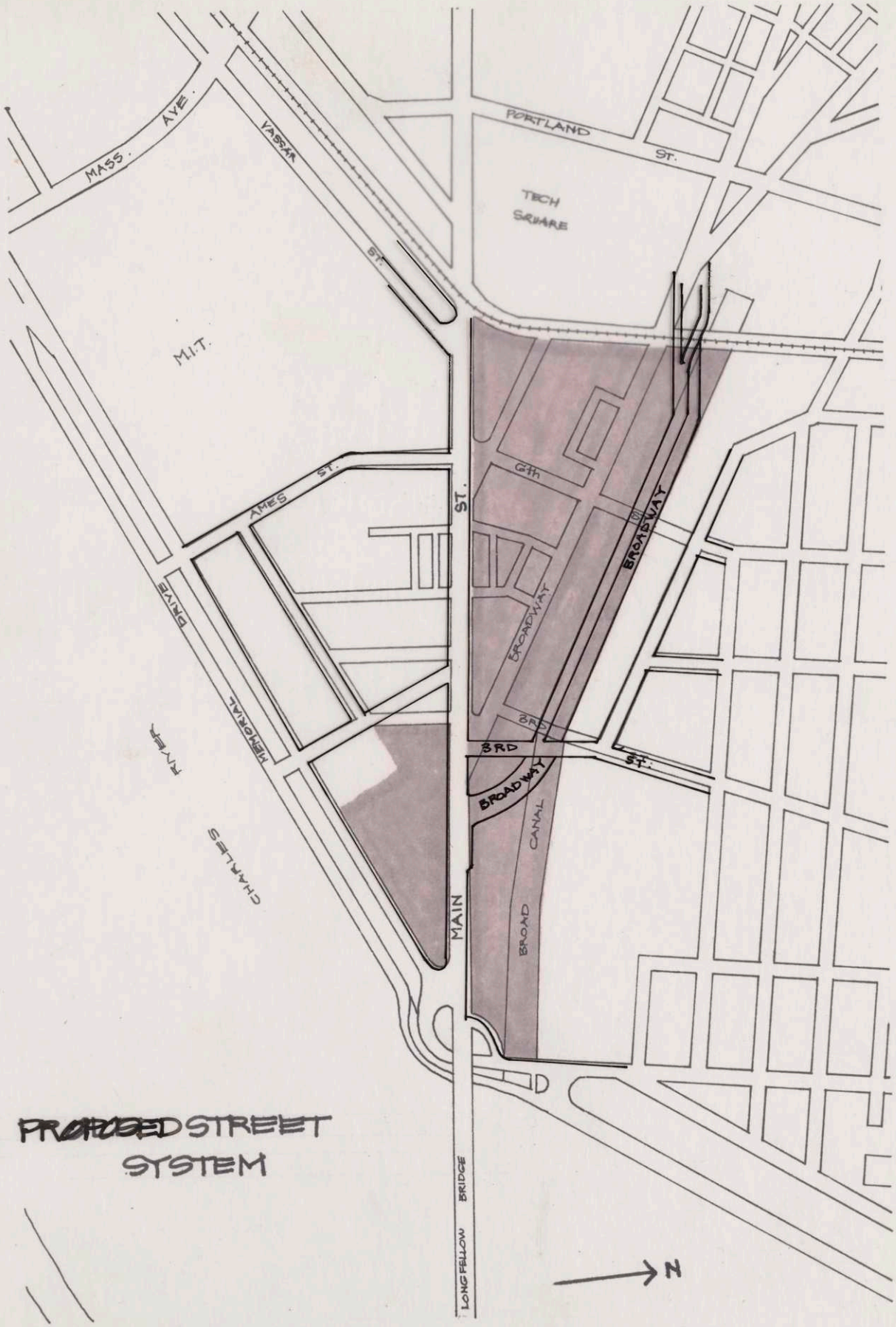


7.) All service to shopping, hotel, and cultural facilities will be from below the ground surface. The entry to this level will be off 3rd. Street in a one-way system to Main Street.



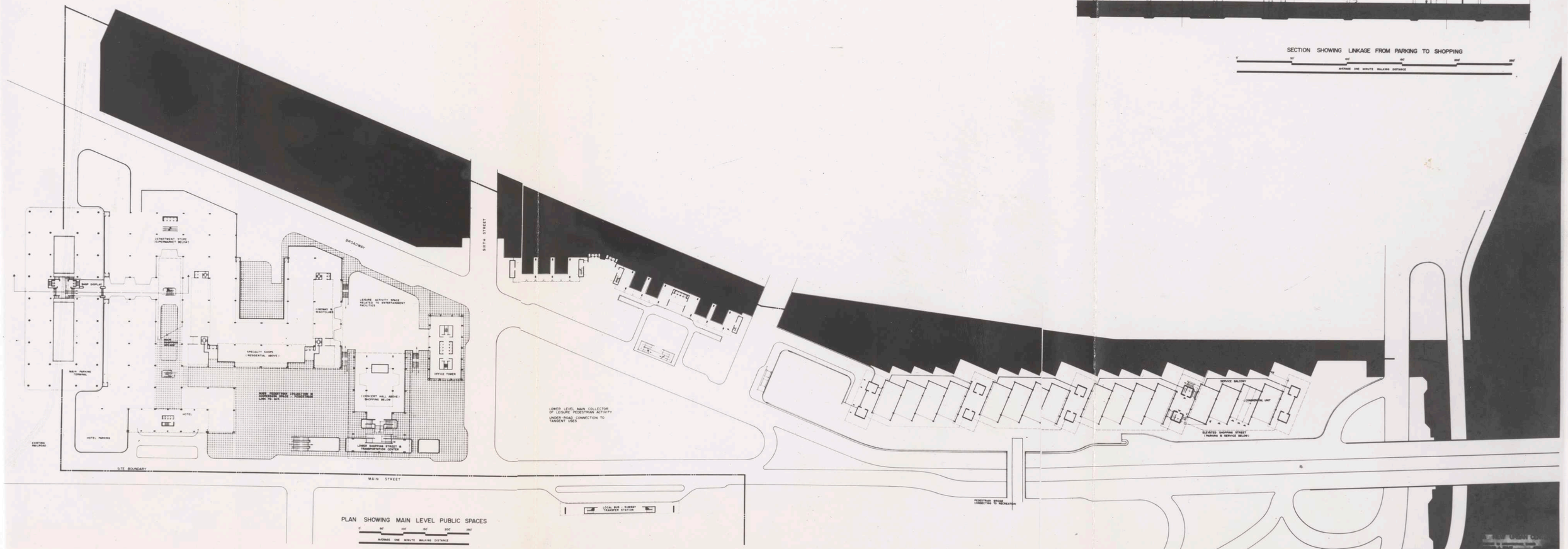


AVERAGE DAILY TRAFFIC FLOW



PROPOSED STREET SYSTEM

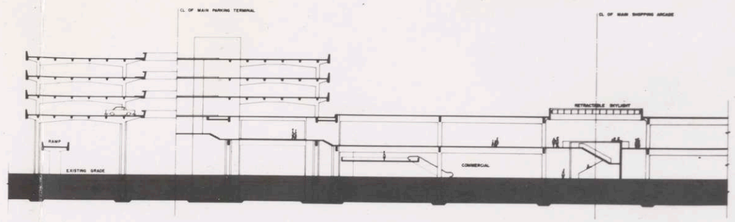
CASE STUDY G: Bernard J. Wulff



PLAN SHOWING MAIN LEVEL PUBLIC SPACES

0' 50' 100' 150' 200' 250'

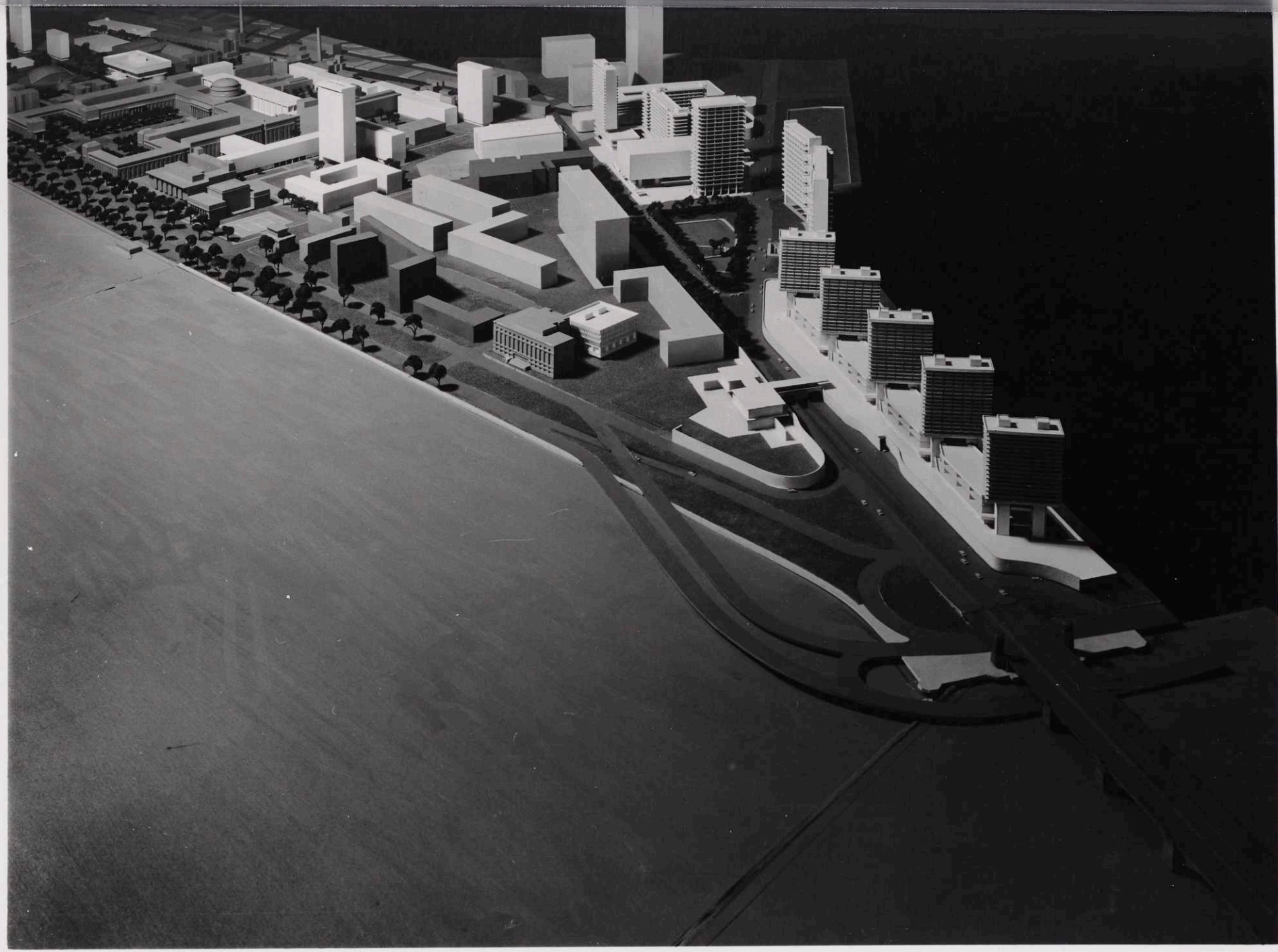
AVERAGE ONE MINUTE WALKING DISTANCE

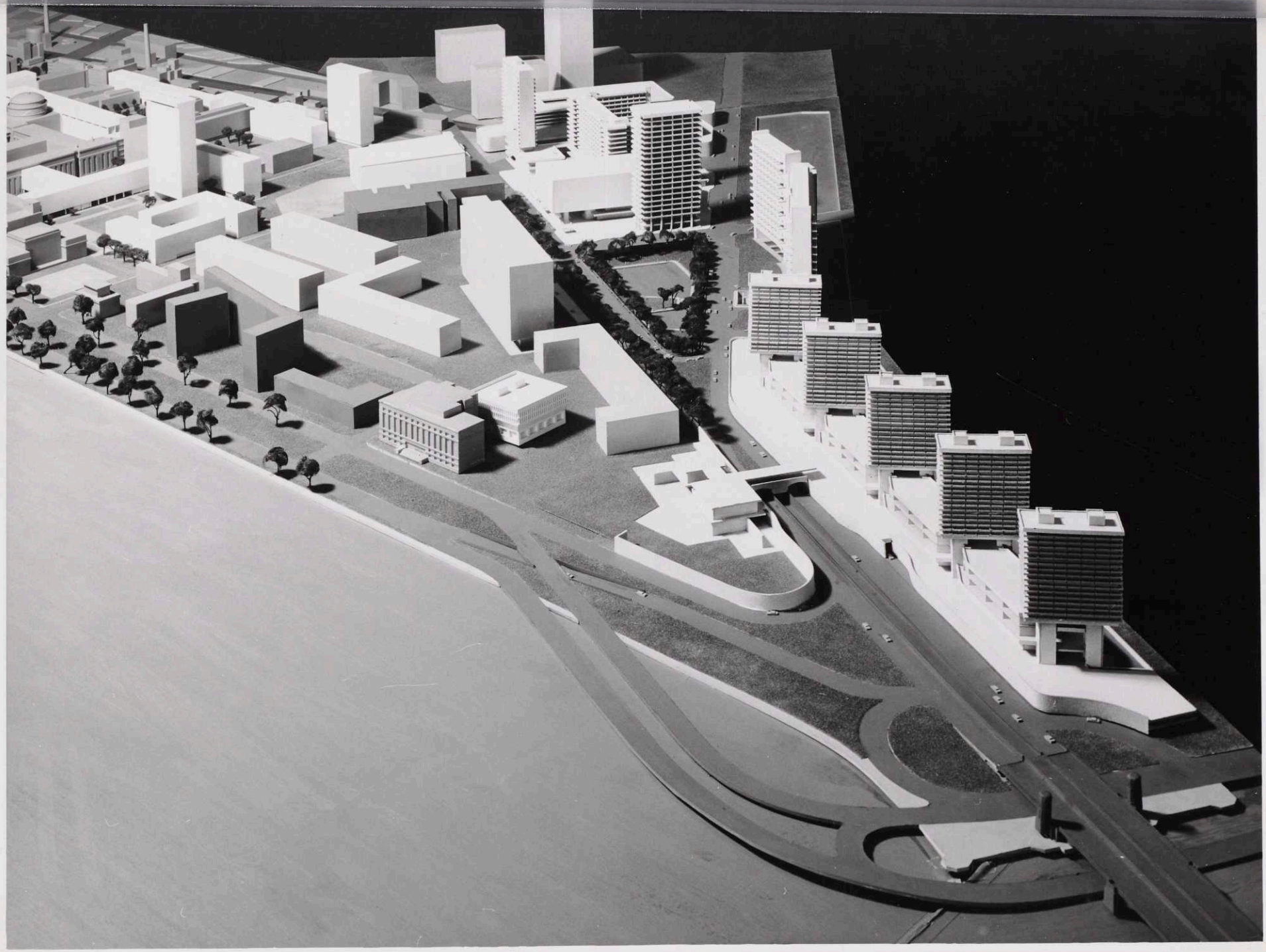


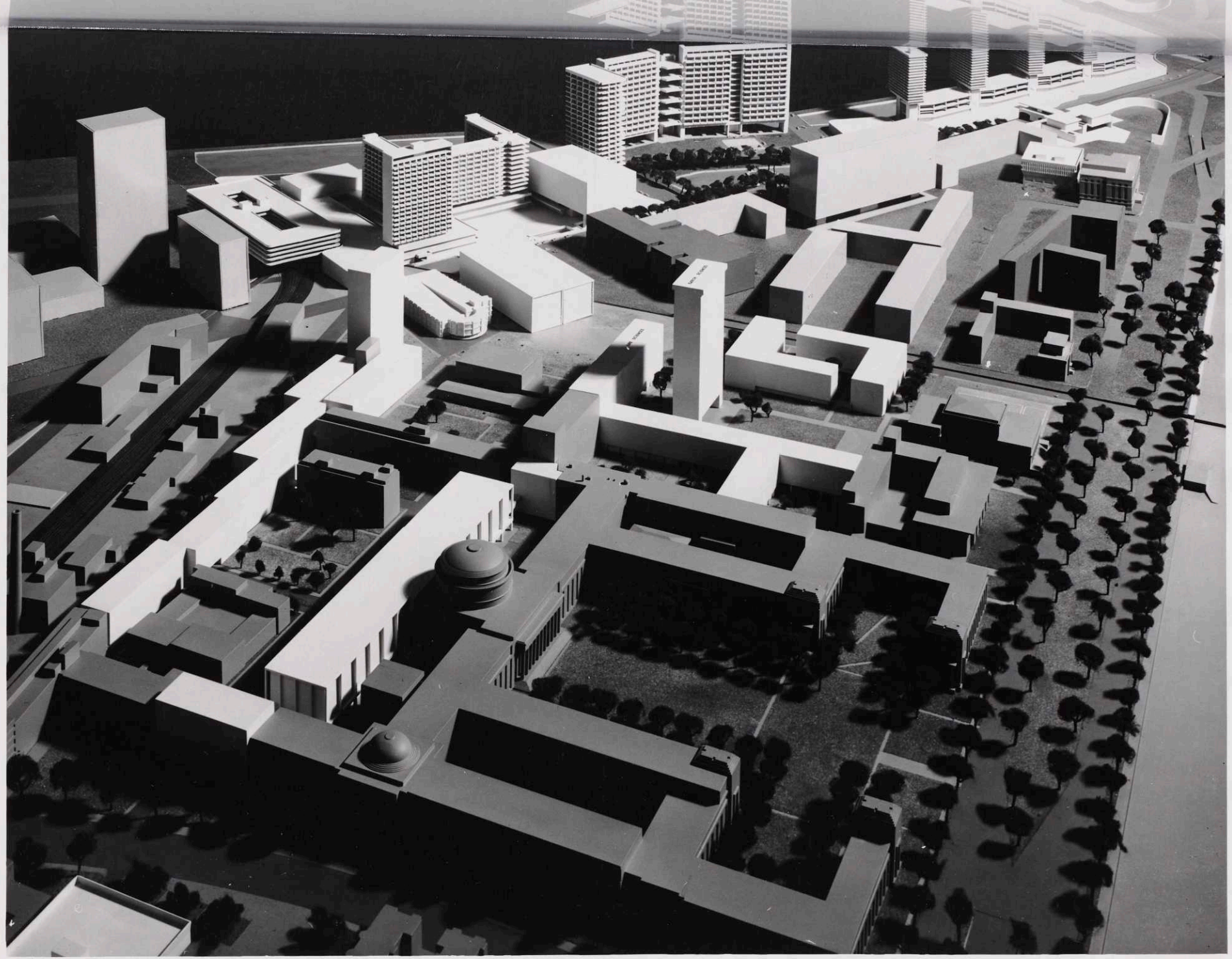
SECTION SHOWING LINKAGE FROM PARKING TO SHOPPING

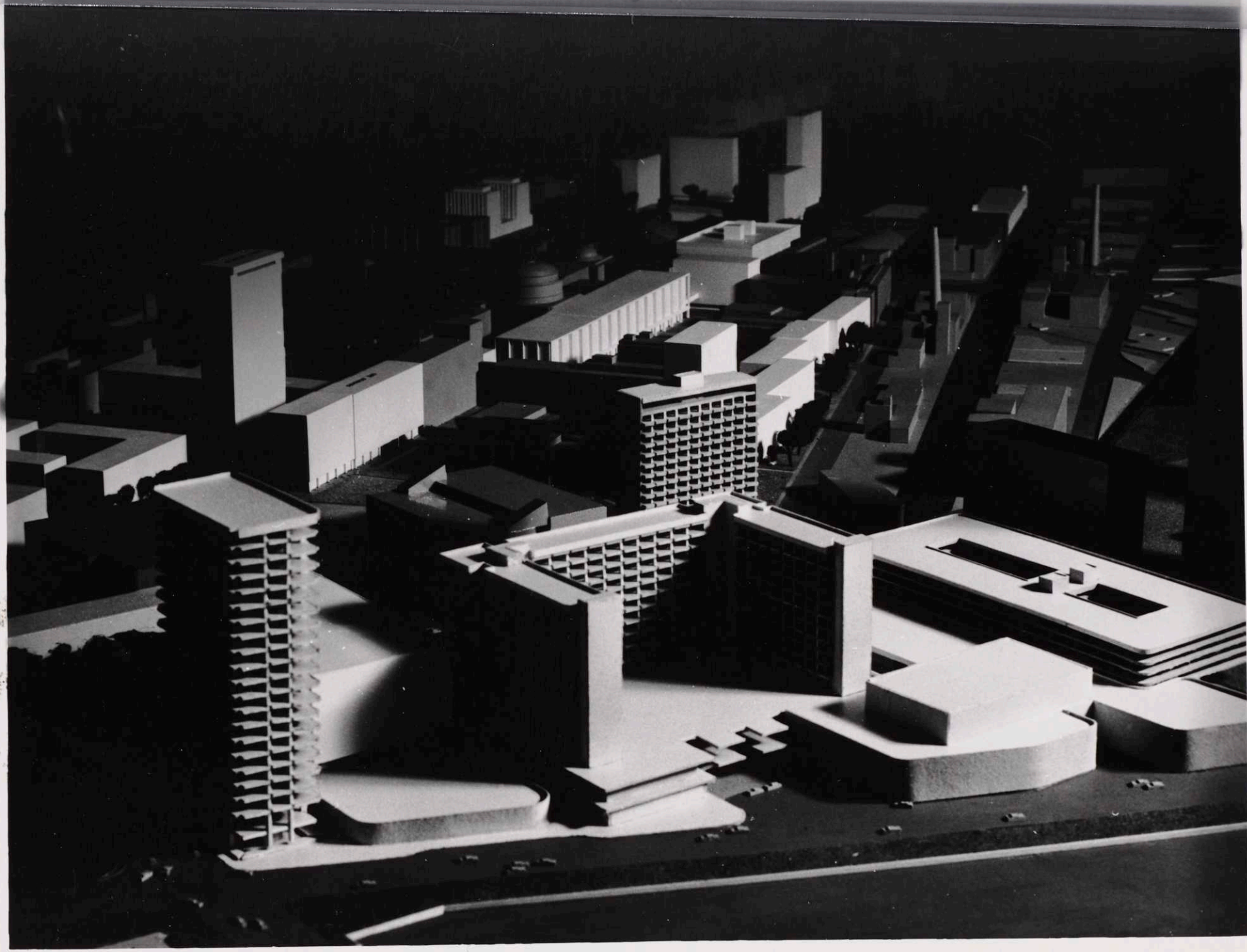
0' 50' 100' 150' 200' 250'

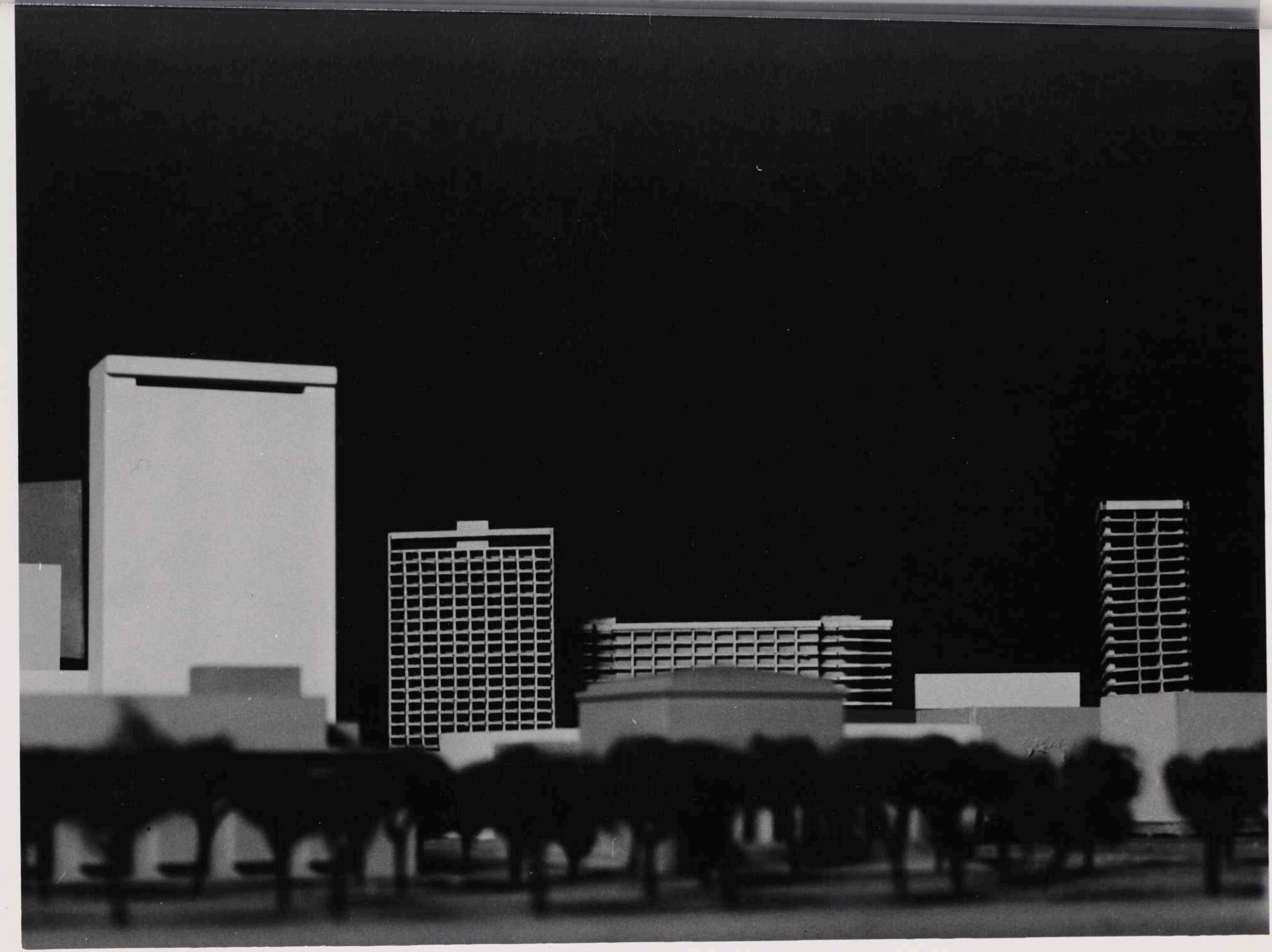
AVERAGE ONE MINUTE WALKING DISTANCE











INTRODUCTION

In this case study, two interests are being served. The first is inherent in the proposal for this study; that MIT wants to become as well linked with the city of Cambridge as Harvard University is presently. The second is a general attitude of the writer toward the problem of designing at the new urban scale; that there is a limit to the development at an initial stage beyond which the benefits of the new system will both disrupt the natural process of change and growth of other parts of the city and cause the new system itself to die on the vine.

"The natural process of change and growth" is a key issue in urban design in general, and in this case study it is the common denominator which links the two interests mentioned above and underlies the design objectives and design descriptions on the following pages.

DESIGN OBJECTIVES

1. To anticipate an activity and population growth process which will begin from within the project area and extend beyond the given edges.

2. To design the seed for growth.

3. To provide in the initial stage a facility which will relate strongly to MIT and which will stimulate further developments at its perimeter, eventually binding MIT to Cambridge in an even flow.

4. To identify and strengthen the nodal quality of the new urban center in relationship with other important centers in the metropolitan area.

DESIGN DESCRIPTION

The Kendall Square site is in many ways an exception to the rule of prime location sites. In spite of its location at the end of an important bridge which leads directly to the heart of Boston and in spite of the inclusion of good public transportation facilities within its boundaries, it is a relative vacuum in terms of intensity of pedestrian usage. The given edge conditions are basically physical phenomena - street, canal, railroad, river - with activity voids beyond.

For MIT, whose interests are being served by this case study, the immediate need is for shopping, recreational, cultural and other leisure time activities which are within desirable walking distance of the large existing institutional population. It follows, then, that a new urban center could conceivably be a self-contained unit having linkage only to MIT. However, as the needs accelerate in future years and adjacent properties are redeveloped, what was at first a good solution will become a problem.

In the best interests of MIT for long range development, a number of observations and assumptions have been made by the designer to guide in the development of potential linkages to a future surrounding activity growth:

1. The industrial zone between East Cambridge and the

Broad Canal will change to residential, stimulated by the new public facilities available in the first design stage of this case study. In the meantime, the Canal will serve as a buffer between activity and inactivity.

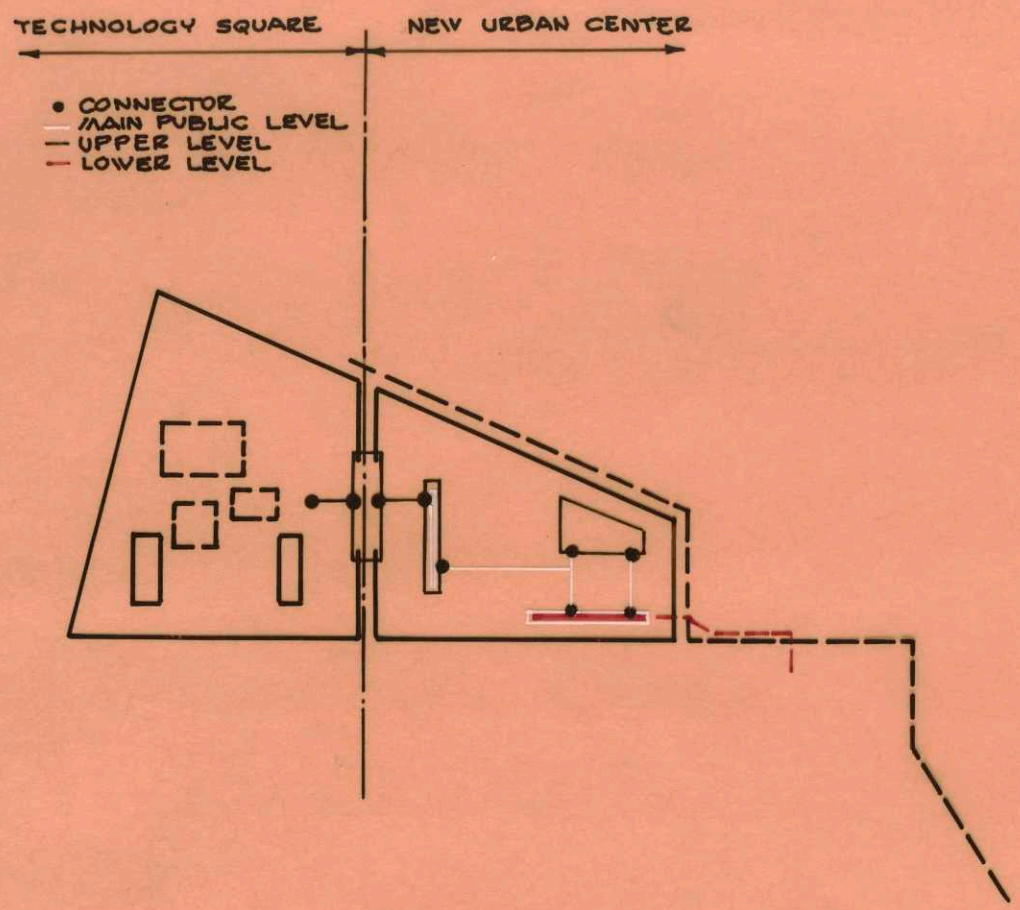
2. The railroad separating Technology Square from the given site is presently inhibiting pedestrian linkage to the only existing promise for a new vitality adjacent to the site.

3. Because MIT is situated on a site which is elongated away from the major dimension of the Kendall Square site, it is important to intercept the internal pedestrian movement at the earliest point with strong, direct linkage to the major pedestrian spaces in the new urban center.

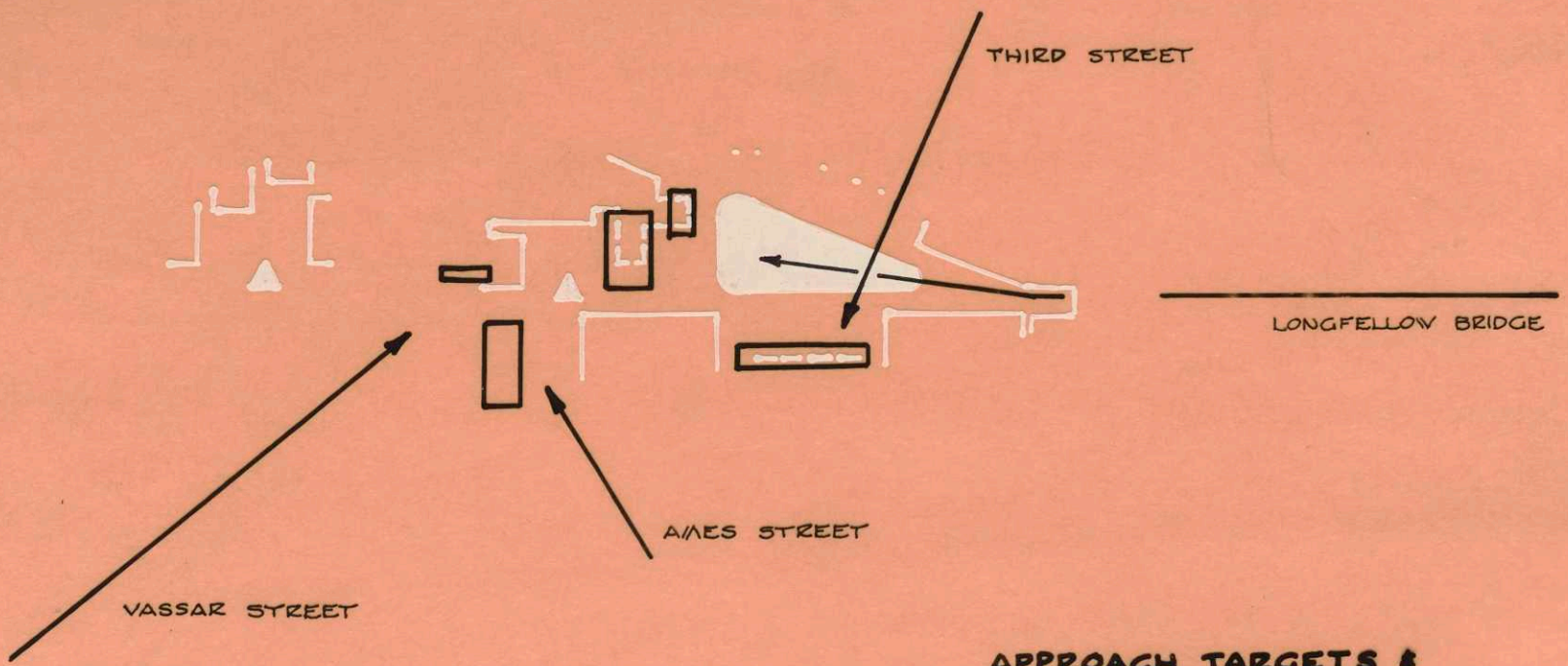
4. The existing population will support a large portion of the programmed public spaces. The proposed residential development will constitute a major portion of the middle and long range development, paralleling the anticipated changes in East Cambridge. This delaying tactic will allow for additional land acquisitions north of the Broad Canal having desirable edge conditions which will enable the designer to develop a more three-dimensional residential environment than is allowed by the given, dissected site.

5. If the new urban center is to become an important point of arrival in the sequence of city spaces, it will be important to intercept the primary linear movement generated by Main Street and Broadway with strong secondary movements of pedestrians and vehicles, all of which are linked to a major public open space. Existing vehicular connectors which provide this opportunity are Third Street and Sixth Street from East Cambridge and Ames Street from MIT.

On the following pages are diagrams which illustrate the primary aspects of the design proposals which stem from these observations. To best understand the development of this solution it is important to study the diagrams in reverse order, beginning with the final drawing.

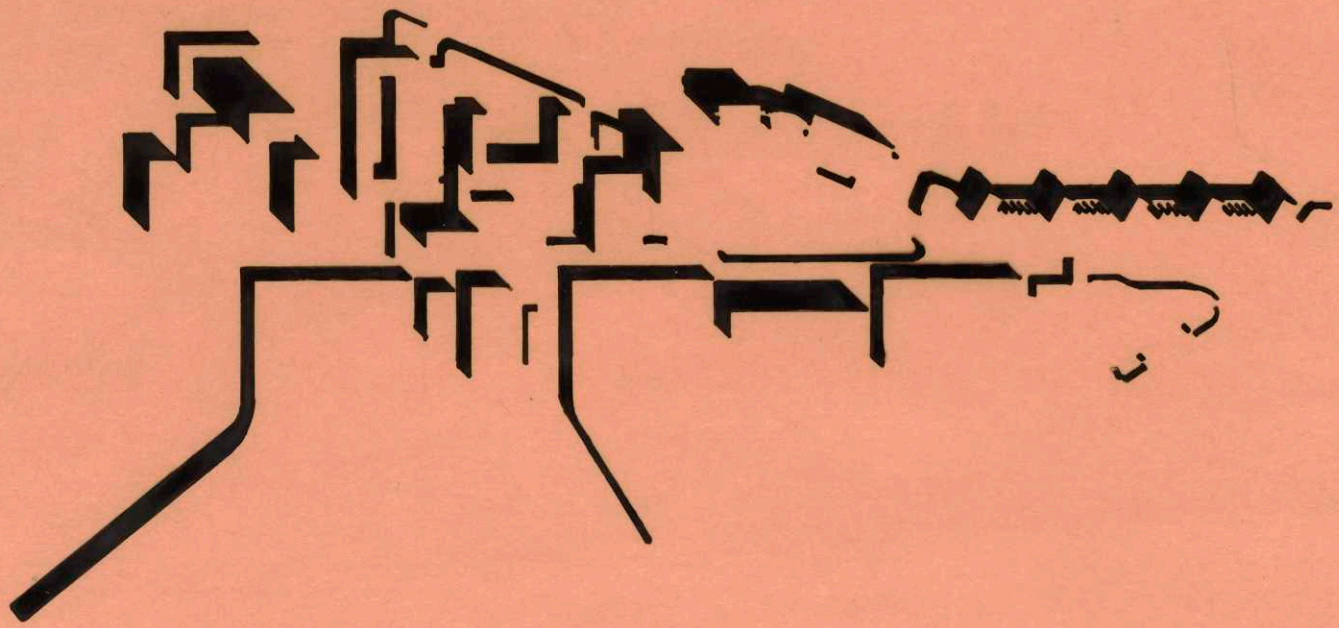


STAGE ONE LINKAGE DIAGRAM

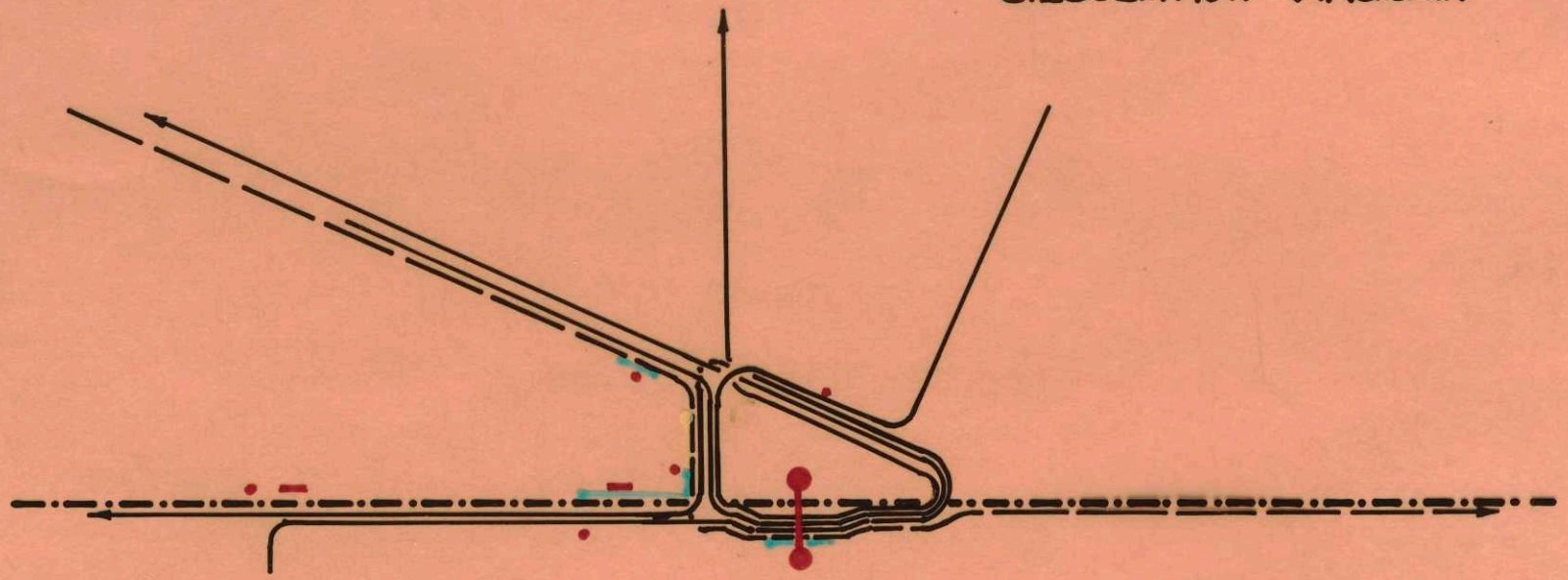


APPROACH TARGETS & ARRIVAL SPACES

THREE-DIMENSIONAL FORM



CIRCULATION DIAGRAM

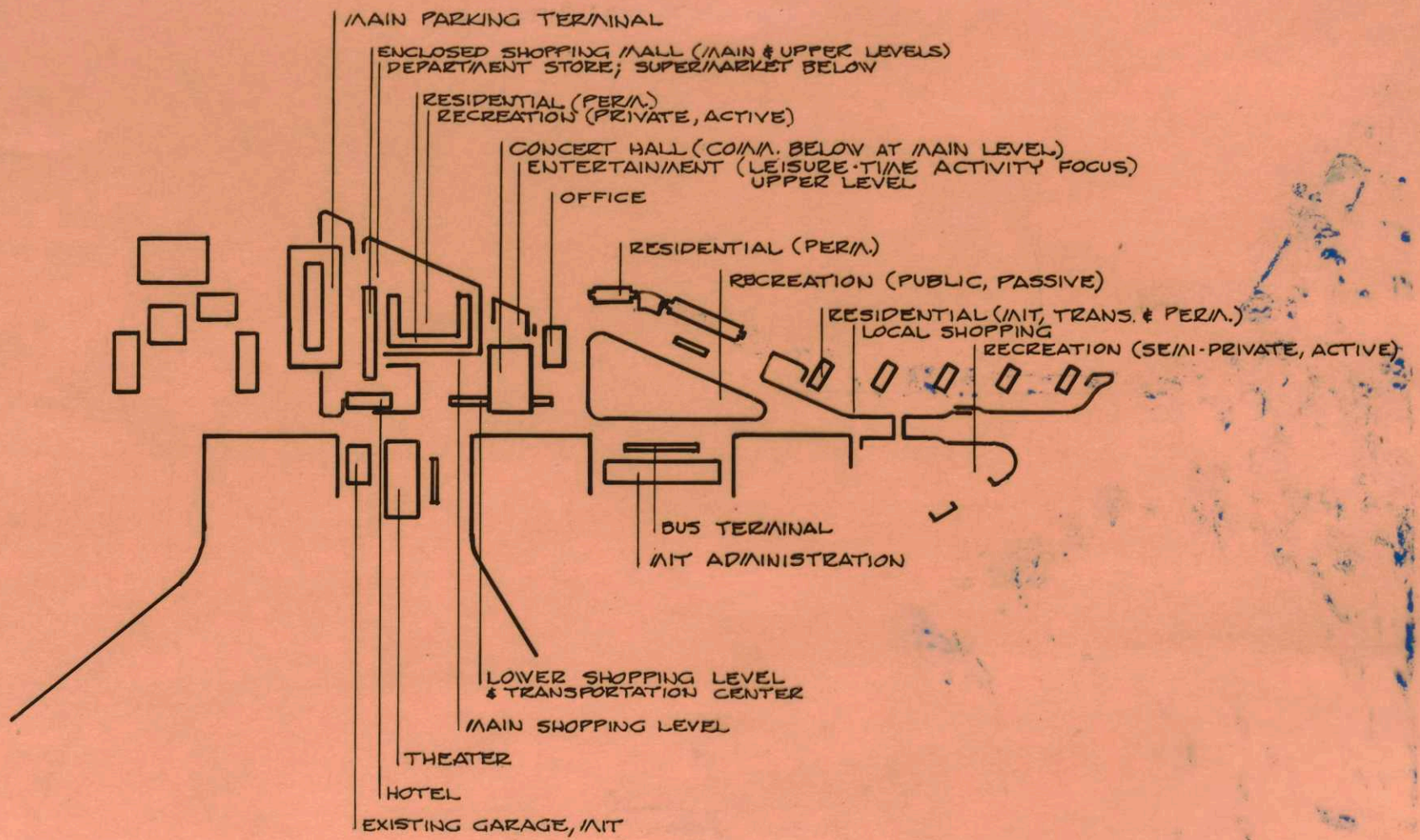


SUBWAY
LONG HAUL BUS
LOCAL BUS
TAXI
HELIPORT

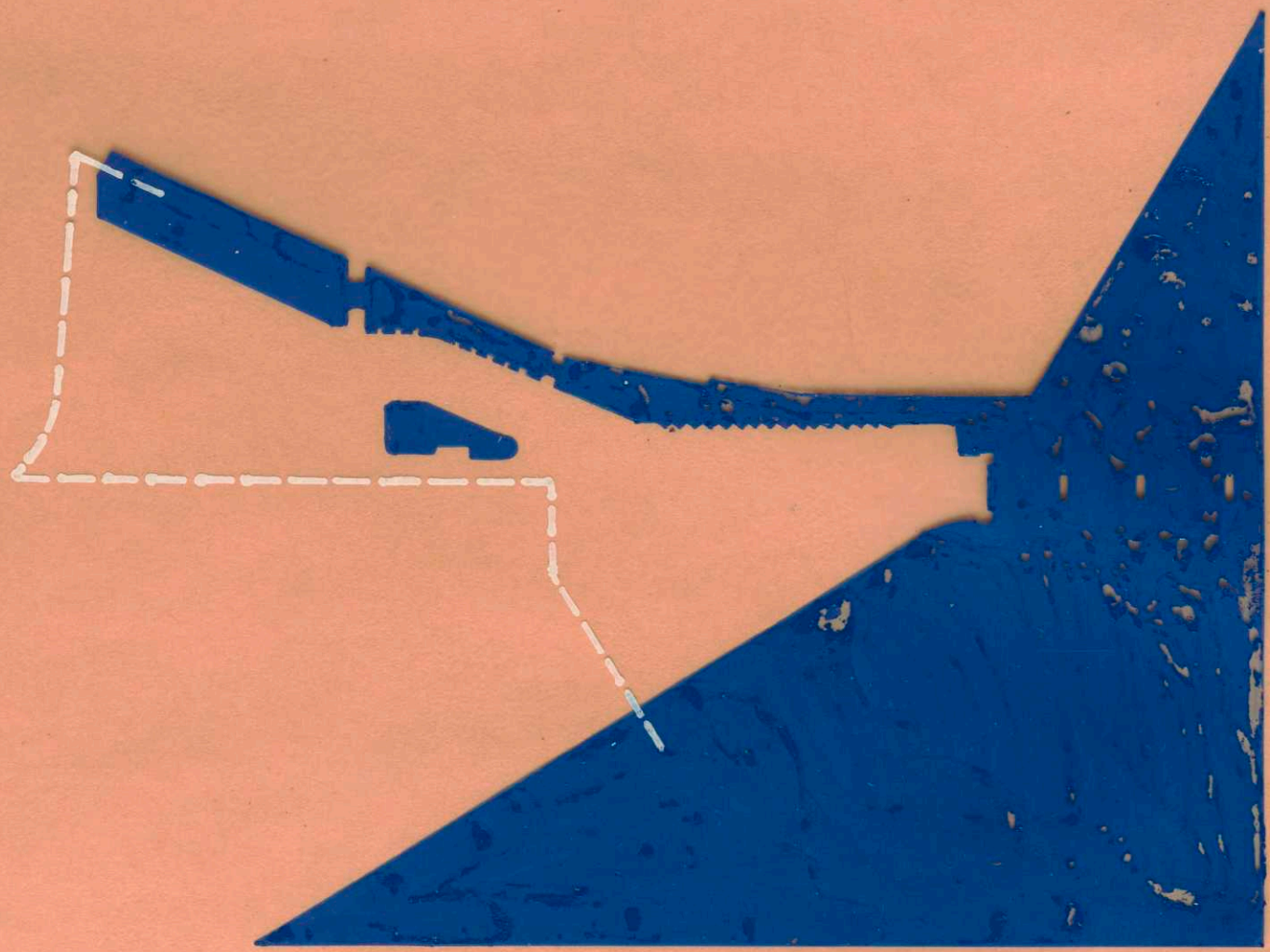
MAIN TRANSFER POINT
(PASS.-PED.-PASS.)

SECONDARY TRANSFER
(PASS.-PED./PED.-PASS.)

LAND USE DIAGRAM

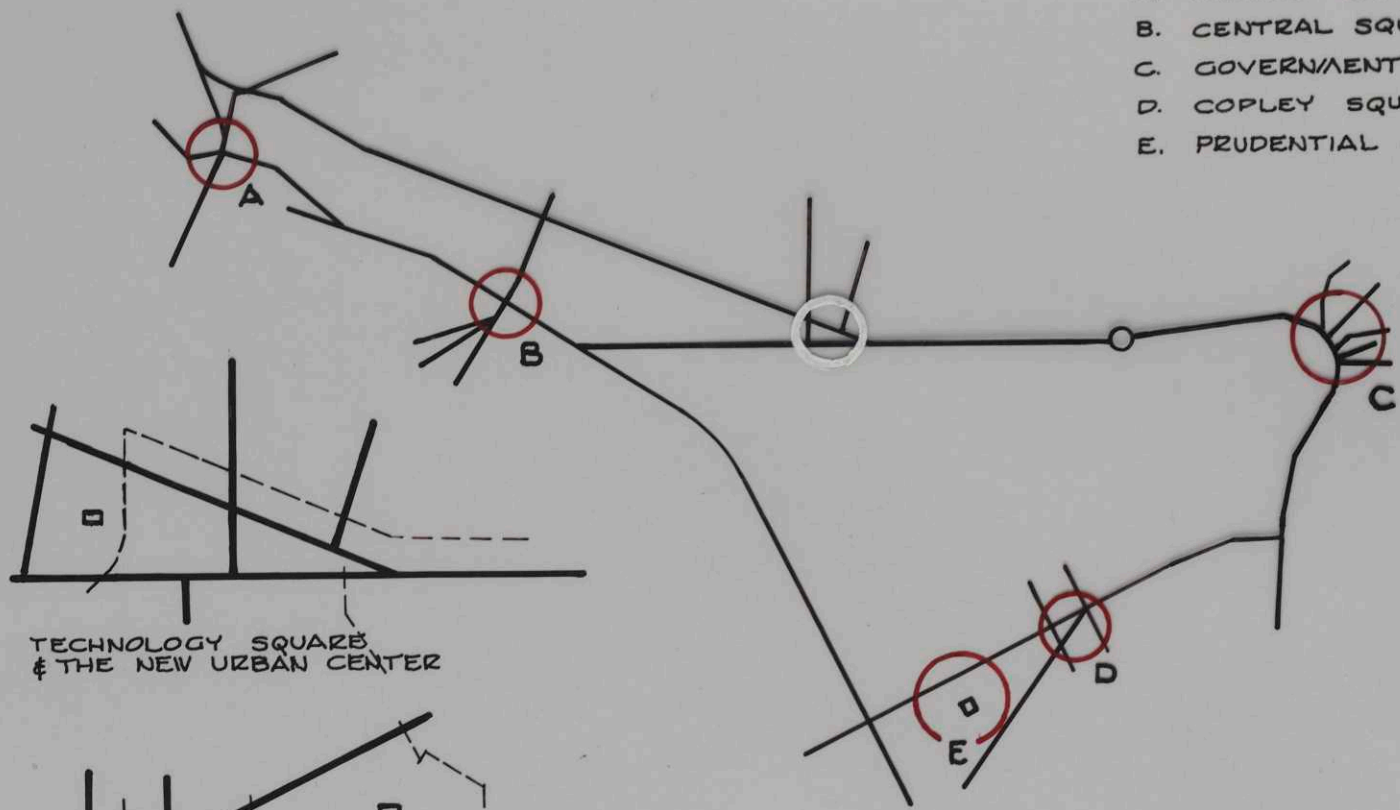


LAND/WATER DIAGRAM

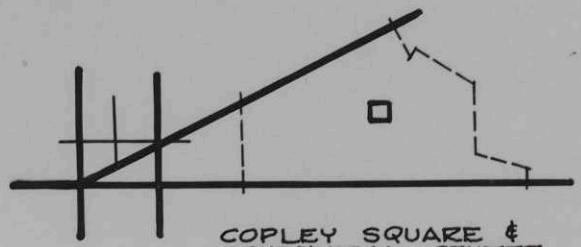


MAJOR EXISTING CENTERS RELATED TO THE SITE

A. HARVARD SQUARE
B. CENTRAL SQUARE
C. GOVERNMENT CENTER
D. COPLEY SQUARE
E. PRUDENTIAL CENTER



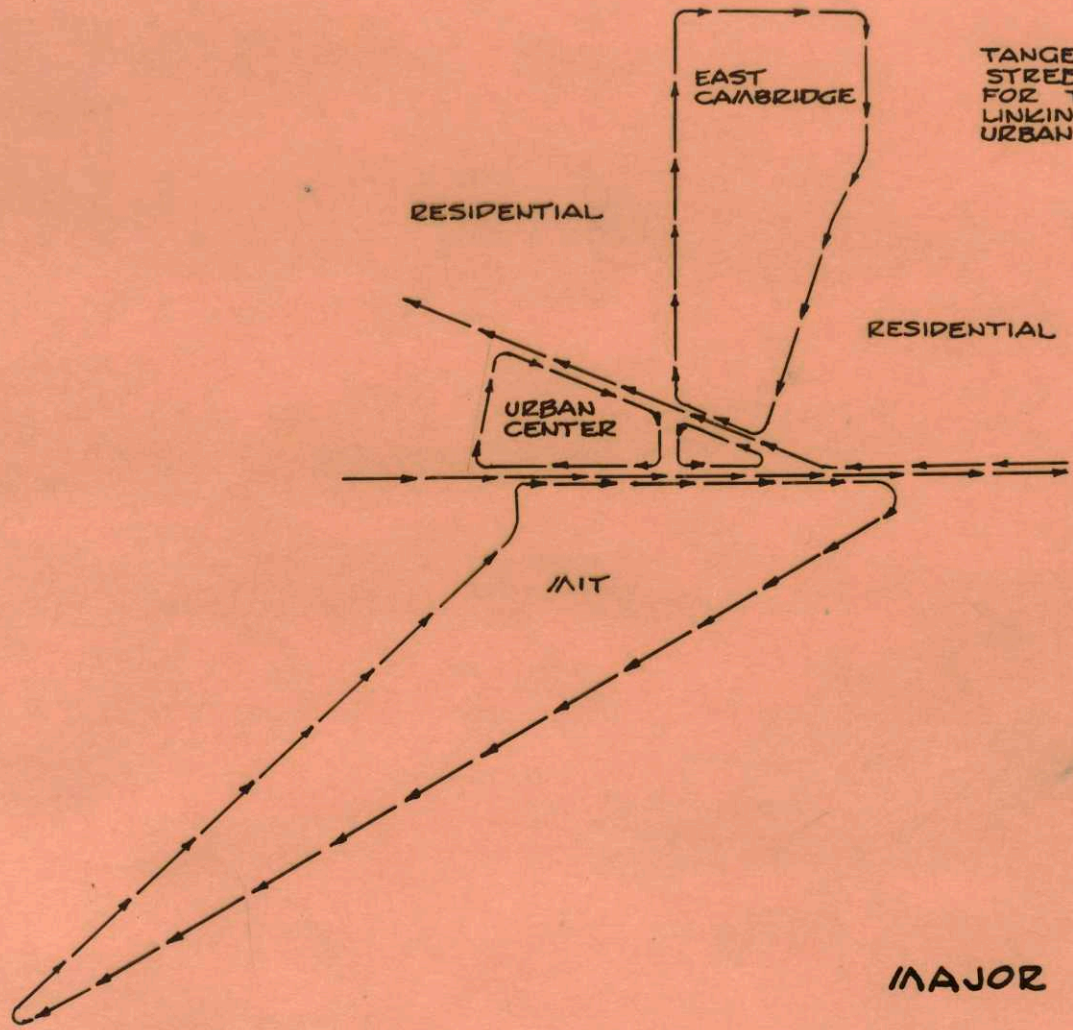
TECHNOLOGY SQUARE & THE NEW URBAN CENTER



COPLEY SQUARE & PRUDENTIAL CENTER

SCALE: 1"=2600'

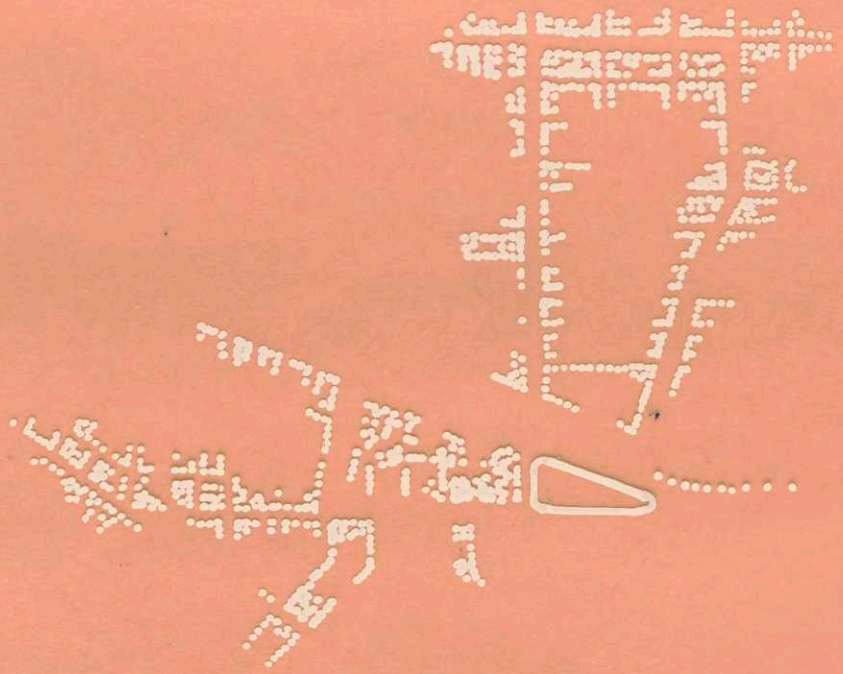
N



TANGENT CIRCUMFERENTIAL STREET SYSTEM, PROPOSED FOR TRAFFIC EFFICIENCY IN LINKING ADJACENT, SELF-CONTAINED URBAN UNITS.

N

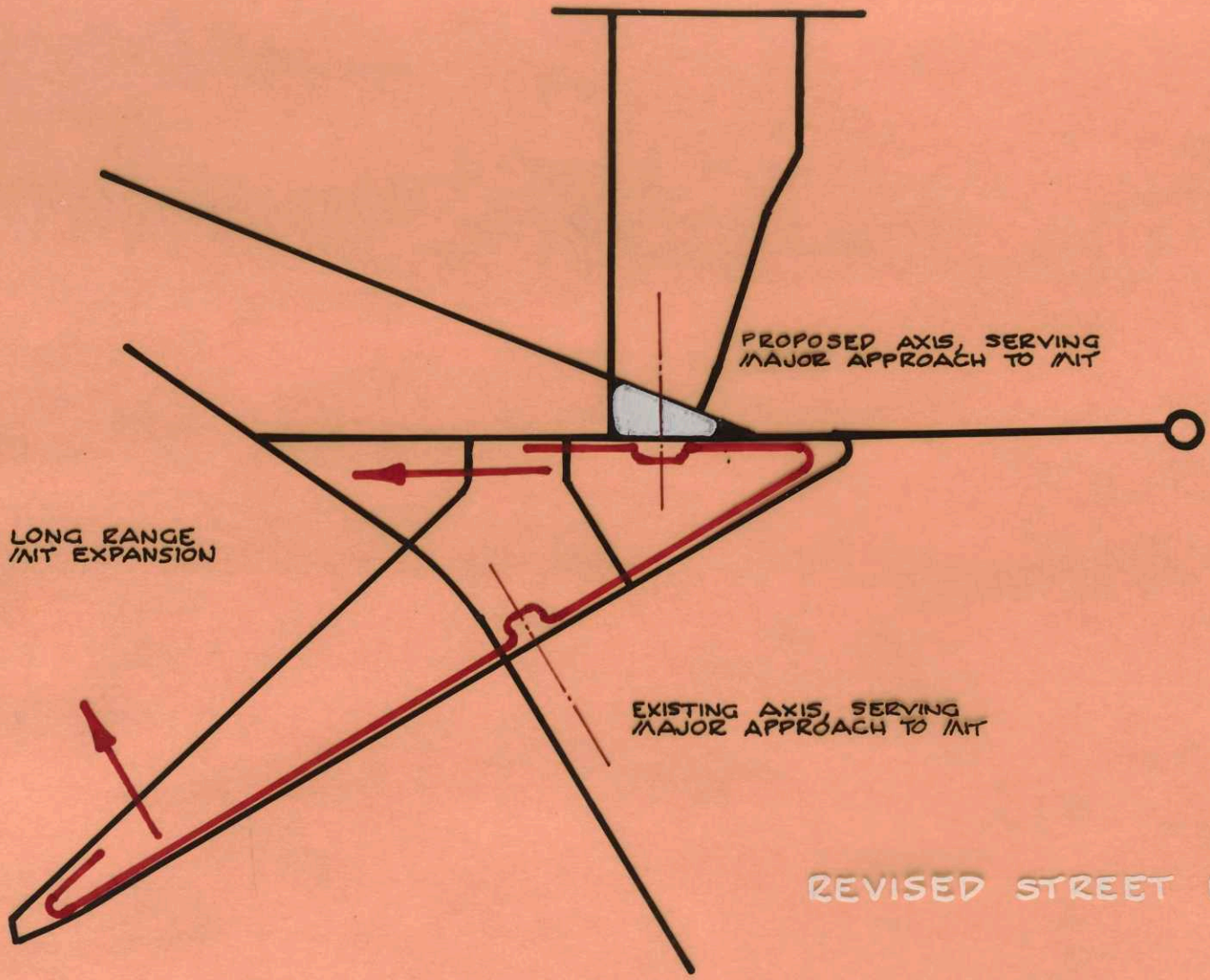
MAJOR TRAFFIC SYSTEM



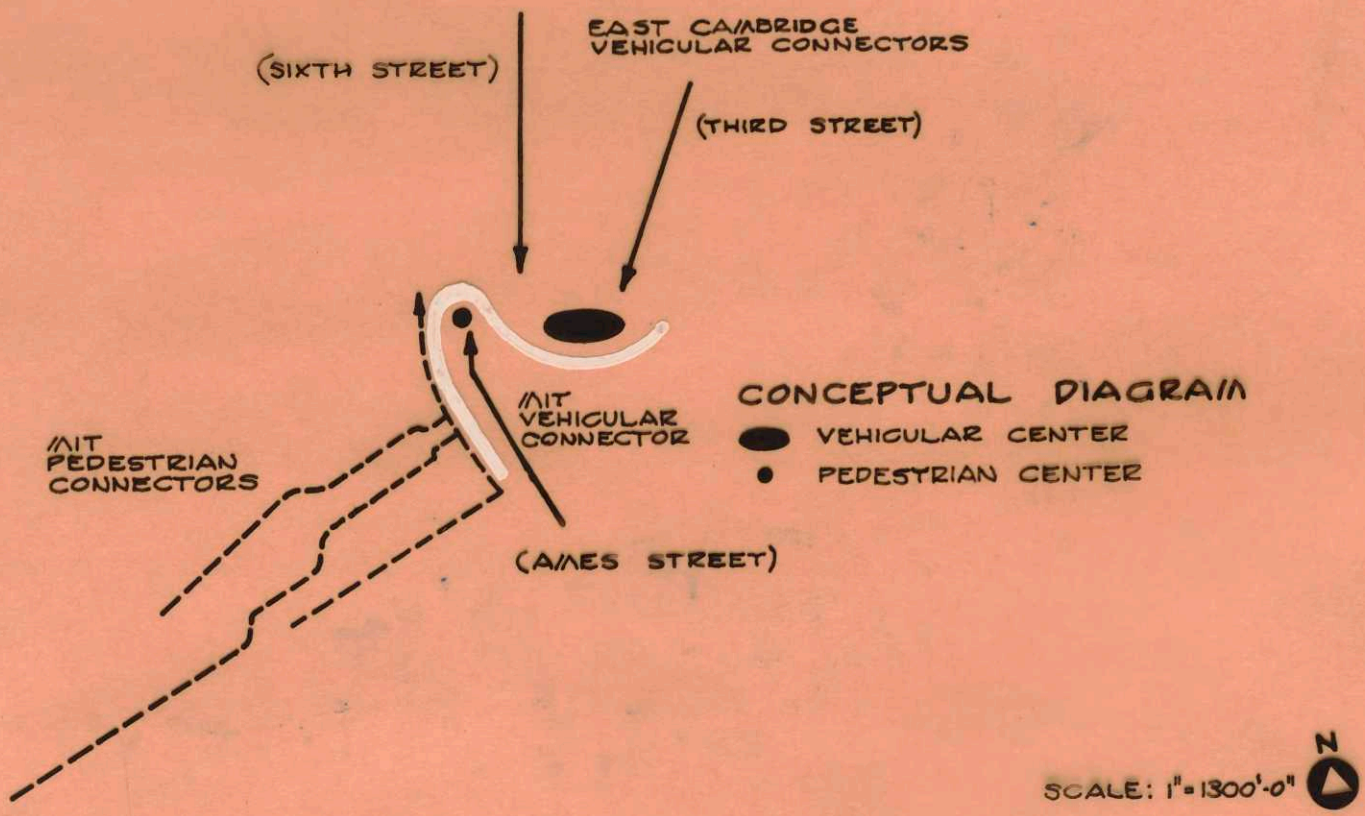
ACTIVITY DIAGRAM

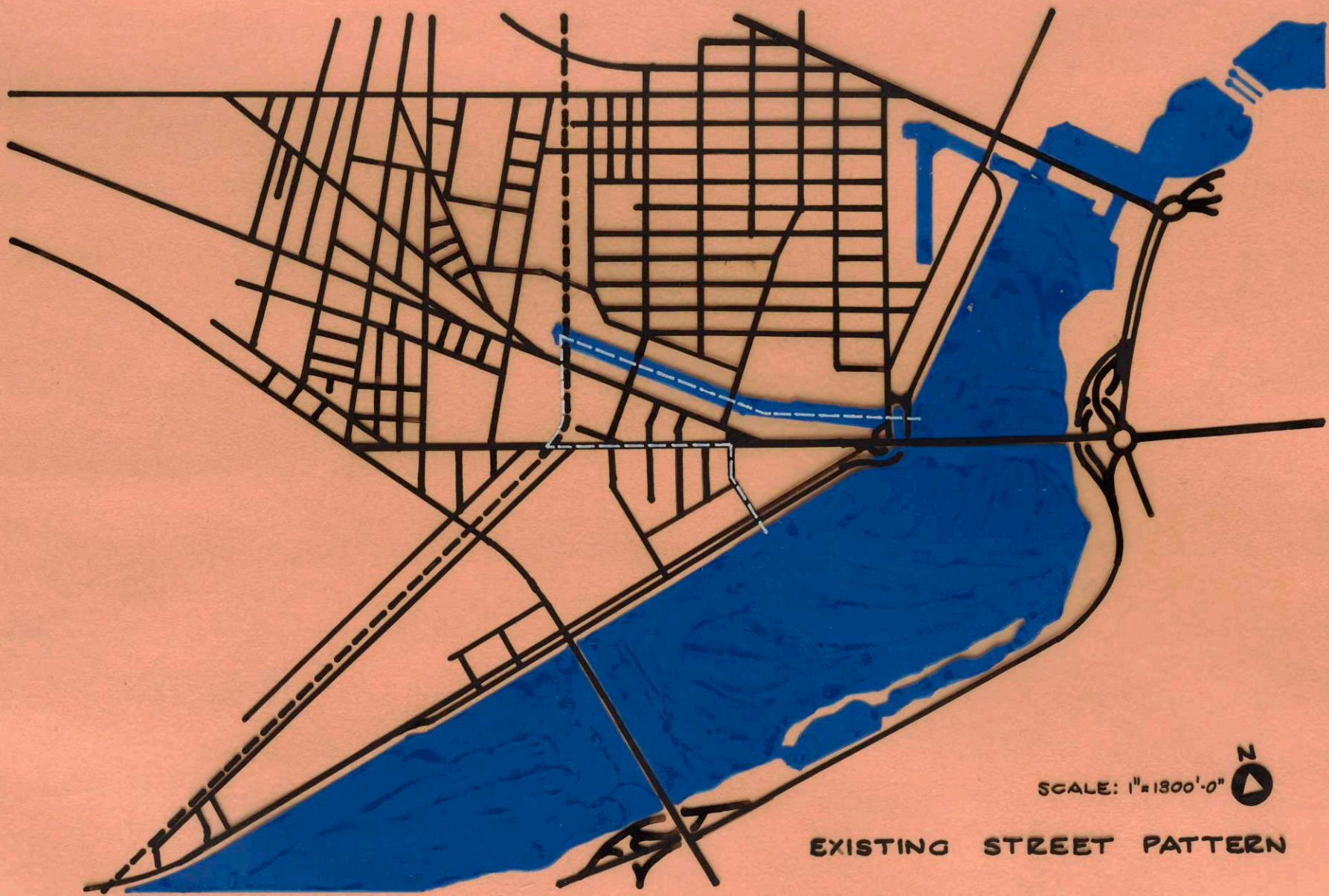
PUBLIC

N



REVISED STREET PATTERN


(SIXTH STREET)
EAST CAMBRIDGE
VEHICULAR CONNECTORS
(THIRD STREET)
MIT
VEHICULAR
CONNECTOR
MIT
PEDESTRIAN
CONNECTORS
(AMES STREET)
CONCEPTUAL DIAGRAM
VEHICULAR CENTER
PEDESTRIAN CENTER
SCALE: 1"=1300'-0"
N



EXISTING STREET PATTERN

CONCLUSION

As stated in the introduction to this case study, large urban redevelopment programs imply staging - not so much for the reasons of technological limitations and available monies - but, rather, to accomodate the natural process of change and growth in a city. This concept is seen to have strong implications in determining the feasibility of using the given site and program to answer the needs of MIT.

In meeting MIT's general need for positive linkage to the city of Cambridge and the greater Boston metropolitan area, the Kendall Square site has several important,long range advantages. With the completion of the new Government Center in Boston and the Charlesbank residential and shopping development which lies between the new Boston Center and the Charles River, the Longfellow Bridge will serve the most direct connection from the city of Cambridge to the heart of Boston. Also, the existing MTA line which passes through the site will become increasingly important to the site in terms of accessibility and imageability as the mounting problem of moving commuters to the revitalized heart of the city leads inevitably to the improvement of the mass transit facilities.

To solve the immediate need for public facilities adjacent to M I T which will serve the existing population - presently stranded in an academic vacuum - the Kendall Square site has one

major disadvantage. It is distal to the existing center of MIT, and it is separated from the closest existing edge of MIT by property which, although earmarked for institutional expansion, is presently occupied by non-institutional and non-public uses.

In order to capitalize on the long range advantages of the site without sacrificing a good solution to the immediate needs of MIT, it may be desirable to establish several linkages to the city, each having an appropriate scale in time, usage, and imageability which is compatible to surrounding conditions. It is proposed that further studies be made on sites adjacent to MIT which serve better the immediate needs of the institute and which can eventually be linked to a large scale development on the Kendall Square site.