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Part 2

PN-AAJ-790

FEASIBILITY STUDY FOR EXPANSION
of
THE COOPERATIVE COLLEGE OF KENYA
ARCHITECTURAL ENGINEERING REPORT

Report Prepared by

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Submitted to:

The Ministry of Cooperative Development
Government of Kenya

Agricultural Cooperative Development International

U.S.A.I.D. Mission to Kenya

Study III Part 2

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I. INTRODUCTION

The preceding analysis recommending the academic expansion of the College, referred to as Study 3, Part 1, is the basis for developing the total building program for the expanded campus.

The purpose of this Architectural - Engineering Report is to reflect physical building and other allied needs. The building study carried out so far is the development of architectural engineering aspects between 13th November, 1980 and 8th December, 1980. This study is broad but sufficient in depth and experience to pinpoint building spaces and their allied infrastructures and also to relate buildings, functions, phasing and environment. We have also addressed engineering requirements, existing problems, recommendations on operations, maintenance and rehabilitation of facilities and equipment. We have considered only one land use plan, but for the final design, further alternates are recommended for consideration.

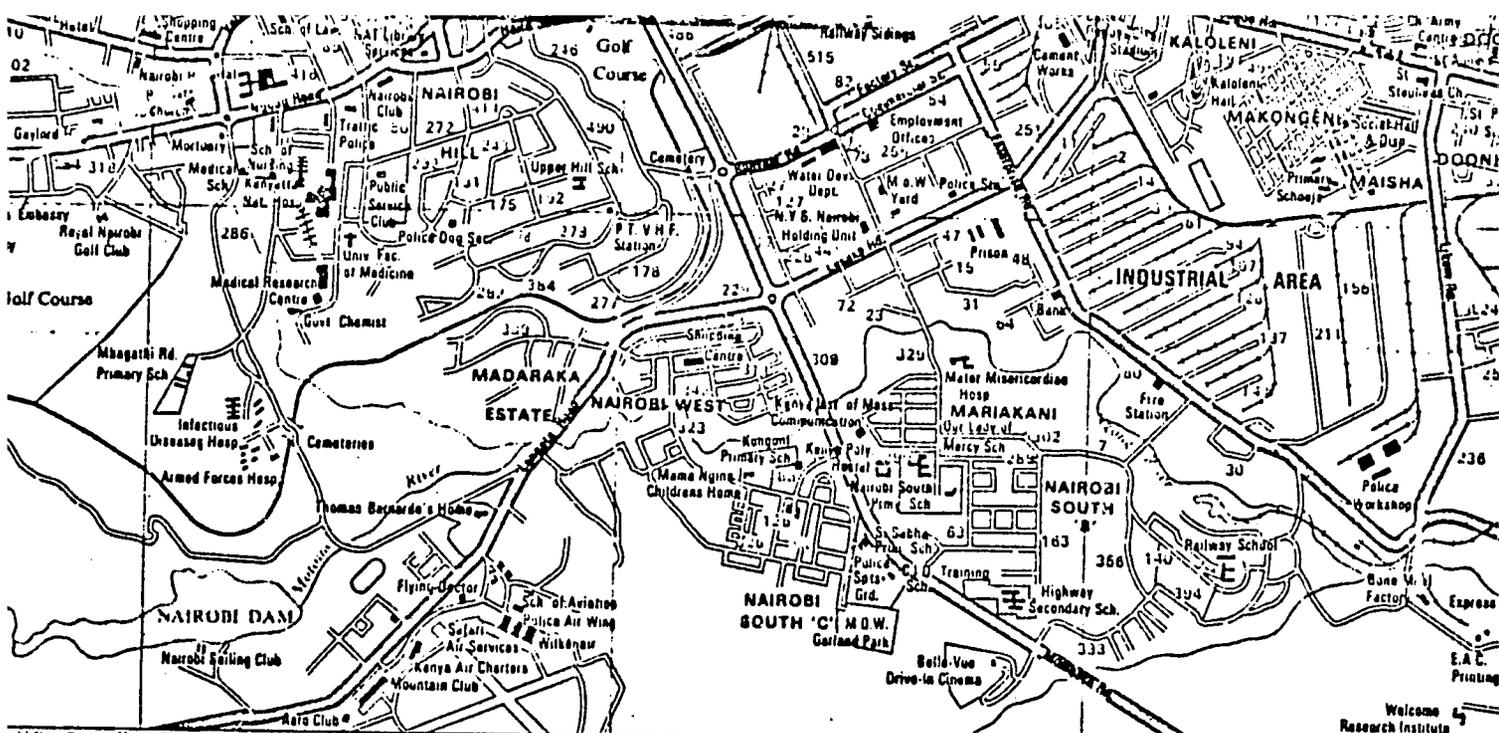
Study 3 concludes that an enlarged campus be provided with building spaces for 500 full-time students (from the present 220) and for 160 student attending short-term courses for Continuing Education.

The building and infrastructure program broadly results as follows:

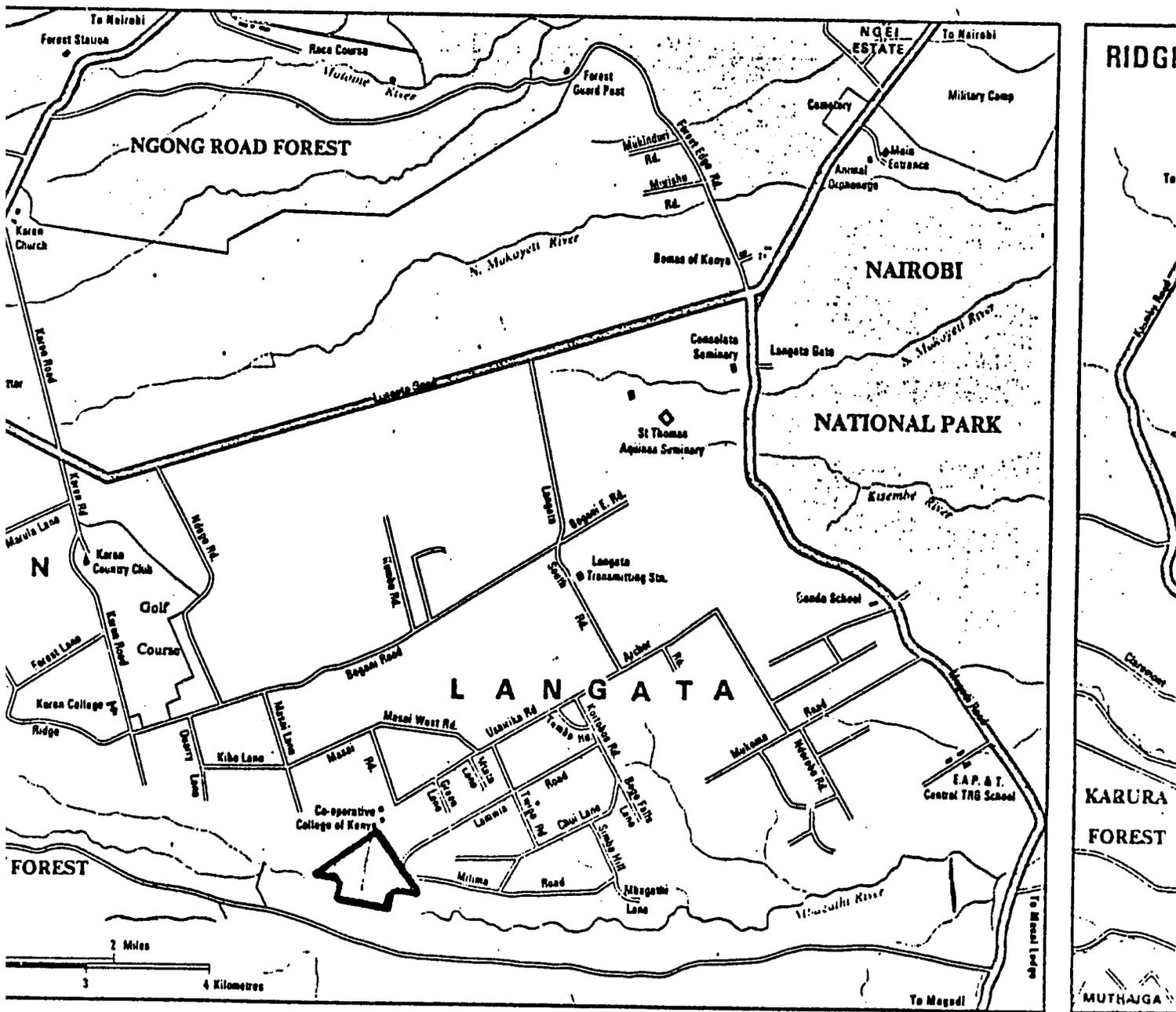
1. new faculty, instructional and administration areas in addition to those existing;
2. additional halls of residence and kitchen/dining;
3. a Learning Resource Center;
4. for Continuing Education Students, new dormitories, instructional areas and kitchen/dining;
5. housing for staff and subordinate workers;
6. outdoor recreation, indoor activity centers, swimming pool and a multi-purpose auditorium;
7. ancillary support buildings such as day care center, dispensary, laundromat, maintenance shops.

The architectural program outlines each building or group of buildings by function and the space program for each has been developed based on certain assumptions and criteria which are stated for each. The aggregate of space areas is then multiplied by a factor which accounts for walls and circulation areas. This multiplier is based on historic data for building type related to function.

A cost estimate of the proposed buildings assessed from recent projects is included with this report.



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A. Further Sequences

For the purposes of planning, we have assumed an average design time of nine months from concepts to the completion of contract documents. With a detailed Bills of Quantities, a tender period of two months would be reasonable, i.e., construction can commence eleven months from the date of initial approvals.

The development of architectural design is anticipated by the following stages:

1. Approval by user agencies of master plan study;
2. Revisions, if any;
3. Topographic survey and sub-surface investigation;
4. Development of concepts and schematics after alternate land-use studies.
5. Detailed cost estimates for funding approvals;
6. Detailed design and contract documents;
7. Final approvals;
8. Out to tender; tender period;
9. Commence construction.

B. Development Phasing

Ideally, the new construction should be in one phase to avoid a hiatus in funding and to minimise the impact of inflation. However, to meet the educational needs of the campus some phasing may be necessary so that the expansion can occur without disruptive effects of a large building program. We see that to reflect educational philosophy, economic constraints, internal change and environmental needs, some phasing may be considered.

The current student population needs recreation urgently and for this end the outdoor recreation and the Activity Center should be addressed first.

Also an initial emphasis on construction would be to develop a cluster of buildings on the following schedule:

1. Learning Resource Center;
2. Kitchen/Dining;
3. Student Dormitories;
4. Classroom Space/Faculty Offices.

Staff Housing could begin almost immediately in a staged development along with the Day Care Center and the Dispensary.

Once the initial phase of new Kitchen/Dining and Faculty areas are complete, the remodelling of the existing classroom space into offices and of refurbishing the existing kitchen/dining can follow.

The construction of the less critical areas such as the Multi-purpose Auditorium, Co-Op Laundromat/Store, Maintenance Facilities, Swimming Pool and the outdoor track can remain last.

C. Design and Planning Philosophy

1. Objectives and Assumptions

The following objectives and assumptions have guided the planning process:

- a. The Cooperative College should be planned as a self-sustaining community and should express itself as an entity by means of a compact and coherent layout.
- b. Space needs of the College must conform to the educational philosophy of maximizing interdisciplinary contact and encouragement of maximum communication possibilities between its constituent elements.
- c. An enrollment of 660 students is expected: 500 regular students and 160 Continuing Education Students.
- d. Major design efforts should be focused on establishing a rational set of building types, the creation of as large a vehicle-free campus as possible, and as economical a solution as possible. (All vehicular traffic would enter and exit at the front gate.)
- e. Establish a building pattern which will lend itself to a logical phasing of construction.
- f. Housing for the staff members on the campus will be maximised
- g. Covered all-weather pedestrian routes should link all academic and dormitory structures.
- h. Maintain the scale and character of existing College, if possible.
- i. The number of exterior building materials should be minimized and should be compatible with those existing. The use of existing stone walls and pitched red tile roofs should be encouraged.
- j. The Campus environment must be sensitive and visually pleasing as well as invigorating and intellectually stimulating.
- k. The new design should be threaded through the existing buildings to provide a unified expression of the campus development.
- l. The use of the natural, given personality of the site demands that each building contribute to the special quality of the whole. The entire site should be used to create a continuous learning and teaching environment.

m. Exploit the natural fall of the land and the view of the valley below.

n. Where possible, valuable woods should be maintained.

o. The use of passive natural energy to control not only air movement and temperature, but the physical and architectural building forms as well.

p. Discourage the use of an architecture that will impose obligations or limitations on the future development potentials of the campus.

2. Climatic Guidelines

a. Avoid exposed ridges. Select N.NE.E slopes as these receive greatest insulation during cooler months and cooler times of day.

NOTE: Winds are also NE.E. Construction on steep slopes provides cost and stormwater runoff problems.

b. Use linked groupings to reduce heat loss by minimizing external walls in relation to party walls; also to provide wind protection.

NOTE: Linked units are expensive on slopes. Use planting to protect from winds but not to shade.

c. Use compact square plans. Maximum area covered for minimum floor area.

d. Use double banking. Cross-ventilation should be avoided. Minimum amount of external wall for room.

e. Main rooms and the long facades should be on east and west for maximum insulation.

f. rooms with less requirement for solar heating (kitchen, bathrooms, stores), could be on north sides.

g. Living rooms on east to catch sun earlier. Bedrooms on west catch sun later.

h. Kitchens built into units to maximize cooking heat source.

NOTE: Woodsmoke and grime.

i. Avoid major openings on south west. This direction receives maximum insulation during hottest hours in hottest months.

- j. Locate fireplace in center for maximum heat gain. If not possible, locate on west for maximum storage of west sun.
- k. Sufficient overhang for rainwater protection but not too much for solar protection.
 - l. Aprons or open drains to protect ground.
 - m. Massive walls and roof (stone and tiles) for maximum thermal capacity. Minimum window openings.
 - n. Low air movement not required. Therefore sill heights governed by views and privacy.
 - o. Permanent vents very important.
 - p. Unshaded but sheltered outside sitting spaces important.

II. RECOMMENDATIONS

The physical plan for the Cooperative College derives its form from an educational philosophy and a set of curriculum requirements already touched upon in an earlier portion of this study. The translation of this philosophy and these requirements into an architectural Building Space Program and a set of planning conclusions and recommendations may be summarized as follows:

A. Architectural Recommendations

1. Academic Facilities

Logically speaking, the space immediately adjacent to the existing instructional areas seemed most fitting for the academic facilities. By locating all of the academic and instructional spaces here, we can centralize the academic zone and provide a rational link with the remainder of the campus. The Learning Resource Center, as befits the importance it must play in the overall curriculum development should be the dominant building on the campus, not only by its central location, but by its size and architectural treatment. All other academic structures should extend outward from the Learning Resource Center and be linked together and penetrated by continuous covered pedestrian and service corridors.

2. Student Housing

To avoid a split between instruction and social activities, the student housing has been pulled in as close as possible to the academic area, with facilities for leisure time pursuits integrated with and forming a buffer between the academic buildings and the student housing. Three dormitory buildings are proposed, each with three stories and each housing 96 students in two-man rooms. In an attempt to encourage a sense of belonging to the larger overall

student body and yet at the same time allowing for a smaller more intimate association, each floor of 32 students each has been personalized with its own lounge and laundry facilities. The dormitories have been opened up as much as possible to allow for the natural ventilation required in this type of climate.

3. Continuing Education In-Service Program

The Continuing Education area has been designed as a total entity in itself with its own Instructional Space, Hostel and Lounge/Dining Facility. The entire service will be housed adjacent to and linked to the existing Kitchen and Dining Facility which will be remodeled to accommodate the 160 Continuing Education participants.

The Continuing Education instructional area has been programmed to permit flexibility to accommodate the many varying type of curricula, and revisions as the program expands. The Hostels have been programmed to accommodate an older, more mature participant in single rooms. Four single rooms are then clustered around common toilet facilities and a living space. Special V.I.P. suites can thus be formed as required, and accommodations for groups of female participants can be provided on the same floor as the male participants. Five two-story hostels have been planned with each hostel accommodating 32 participants.

4. Physical Plant Facilities

The physical plant functions will be housed adjacent to the existing storage and shop areas. These will consist of central storage, and vehicle and building maintenance facilities.

5. Parking

Since the majority of staff lives on Campus and is within walking distance, it is anticipated that 40 additional visitors parking spaces may be required and these would be located adjacent to high-use areas such as the Multi-Purpose Auditorium and the Continuing Education In-Service Area.

6. Athletic Fields

The only sizable piece of relatively flat land is the Mbagathi River bottom land. A small soccer field is presently located here. It is anticipated that this field be reoriented on the North-South axis and a 400-meter running track encircle it. A 500 seat bleacher area would also be required.

7. Recreation Area

The only other sizable piece of flat land is in the north-east corner of the Campus, just adjacent to the Student Dormitories, the proposed Multi-Purpose Auditorium and the Student Activity Center. This area will provide the logical extension of the leisure and recreational activities already associated with the adjoining buildings. This area would accommodate two tennis courts, two multi-purpose courts for basketball, volleyball, netball and badminton as well as a swimming pool and bath-house. Due to site limitations, the proposed Field Hockey area will probably not be provided.

Closely associated with the recreation area we have both an Activity Center and a Multi-Purpose Auditorium. The Activity Center is intended to provide the students with space for leisure and recreational activities. It provides for student lounge, games, radio/TV and reading areas. It is situated adjacent to the Student Dormitories and serves as a buffer between the academic zone and the recreational area. The Multi-Purpose Auditorium, although its main function is academic and performance related, can also accommodate a full range of indoor sports activities and can seat up to 1,000 people.

8. Staff Housing

On the assumption that all staff must be housed on Campus, 303 housing units must be provided. Of this number there are 65 existing units which will continue to be utilized, thus requiring a total of 262 new housing units to be constructed. The Staff Housing will be of three types. Single family detached homes, two-story four-plex units and two-story townhouses or three-story six-plex units.

Of the 262 new units required, 10 will be single family units; 51 families will be housed in four-plex units and 242 families will be housed in townhouses or six-plex units. Servants quarters will be provided for the senior staff and lecturers.

The use of housing clusters has been stressed, with the housing units themselves forming a common outdoor open space for use by the residents of each small cluster. Children's play areas, landscaping and some parking is then interwoven into the fabric of the living area. It is hoped that by clustering we can create an environment which will encourage a sense of belonging to the larger housing community, while at the same time fostering an attachment to a smaller and more comprehensive segment of the housing population.

The housing for the most part has been situated to the west-end of the site, with the subordinate housing stepping down the hill and neatly nestled into the slope and overlooking the river bottom below.

There are some inherent problems associated with building on the slope, the least of which are increased cost and problems posed by soil erosion. These problems, however, are manageable and can be handled by economical design and proper landscaping and maintenance.

The demand for housing will undoubtedly put a tremendous drain on the available land bank of the College. The only way to respond to this was to increase the density and go up with two and three story housing units. The question that must be answered by the Ministry is whether this is the most desirable type of housing for the subordinate staff, or should the requirement for housing all the staff on campus and alternate housing types be provided. This is not to say that the units that have been proposed would encourage the formation of ghettos, but it is a situation that must be sensitively handled. It is, however, the only feasible way to accommodate this number of people in the space available, subject to approval by local authorities.

A home-ownership incentive program may be required to encourage staff to buy their own homes and to live off campus and thus reduce the density. The key to the success housing is the maintenance of not only the units but the grounds as well.

In light of the recent governmental changes in the areas of housing, additional study may be required before a firm policy on heights and density in the staff housing area can be established. The proposed units will, however, provide a structure for the future development of housing and for the preparation of preliminary costing.

9. Dispensary

A small Dispensary has been included to provide for the daily medical services of the students and staff, as well as staff dependents. A small ward for overnight observation as well as minor emergency care capabilities is provided. The facility is located proximate to the Student Dormitories and the Staff Housing areas.

10. Day Care School

A small Day Care School will provide services for staff family children from nursery age to age six and it has been centrally located within the Staff Housing area. The facility will accommodate 90 children at any one time.

11. Co-op Laundromat/Store

A Co-op Laundromat/Store has been provided as a teaching aid for the consumer management courses and will also provide the students, the staff and their families with self-service laundry service and minor daily food requirements. It has been situated proximate and accessible to both the Staff Housing and Student Dormitories.

Directly across the street is located the Activity Center, the Multi-Purpose Auditorium and the Student Dormitories with the recreational areas positioned just adjacent to them on one of the flatter areas of the site. On the west side of the site, provision has been made for the location of the Continuing Education Instructional area, Hostels and Dining and Lounge. The site is beautifully landscaped and steep in sections. Following the natural slope of the remainder of the site, the staff housing has been set into the hillside overlooking the valley below; the soccer field and track have been positioned on the flatter bottom land.

B. Engineering and Environmental Recommendations

1. Existing Problems

To ensure that the existing facility and support equipment does not deteriorate further, the following needs of the College community must be attended to as a matter of priority.

- a. Repair or replace the existing boiler to bring the main kitchen to normalcy and to supply hot water.
- b. Bring reliable power source to the water pumping station near the Mbagathi River.
- c. Rehabilitate the existing waste water oxidation pond.
- d. Alter the method for supplying water for fire demand. Instead of using pumps from an existing low level storage tank, the supply for fire demand should be from an elevated storage tank.
- e. Attend to items of building maintenance.

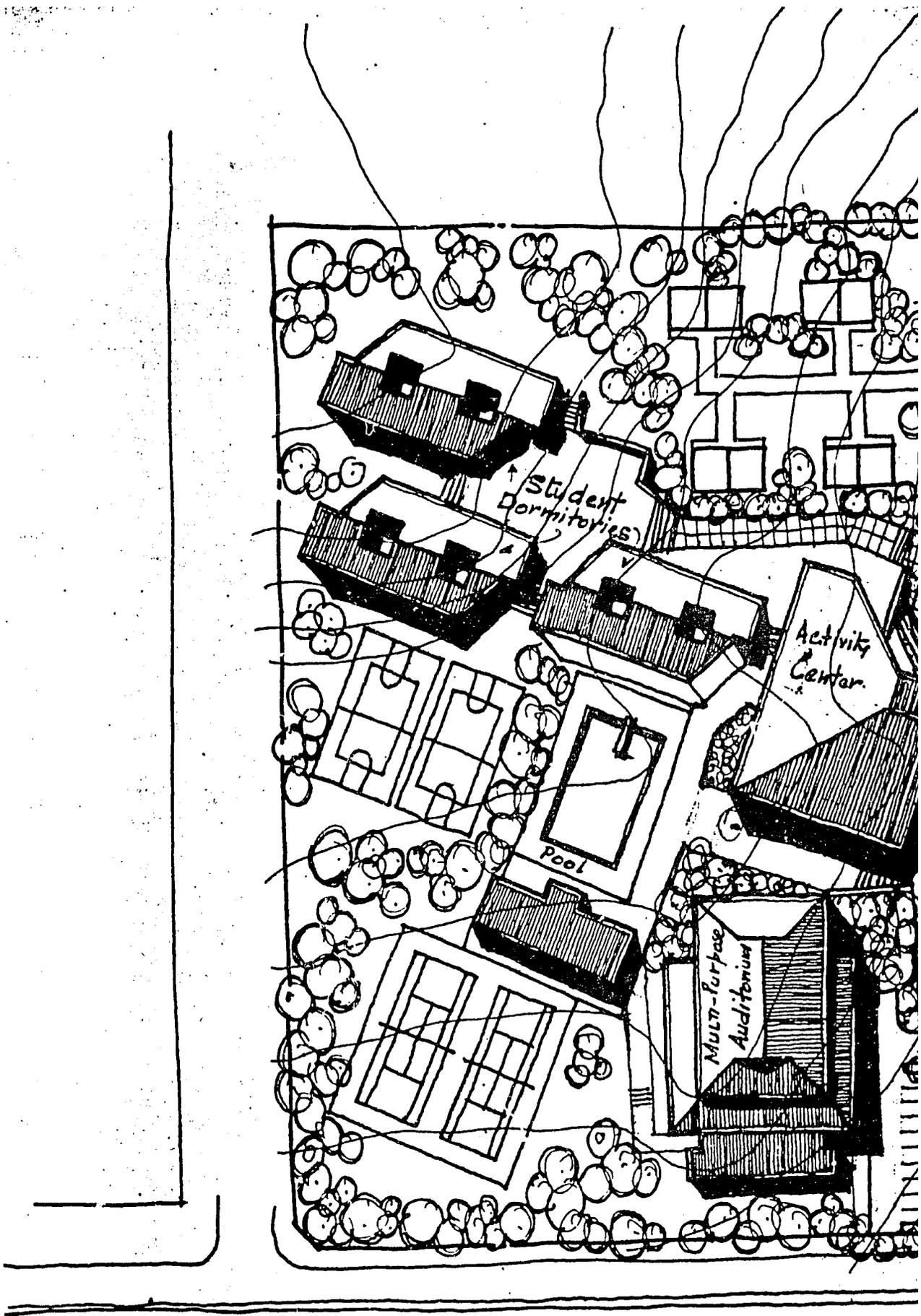
2. Topographical Survey

A full topographical survey of all the physical features is required for feasibility of all architectural and engineering design intents to support the needs of the planned community.

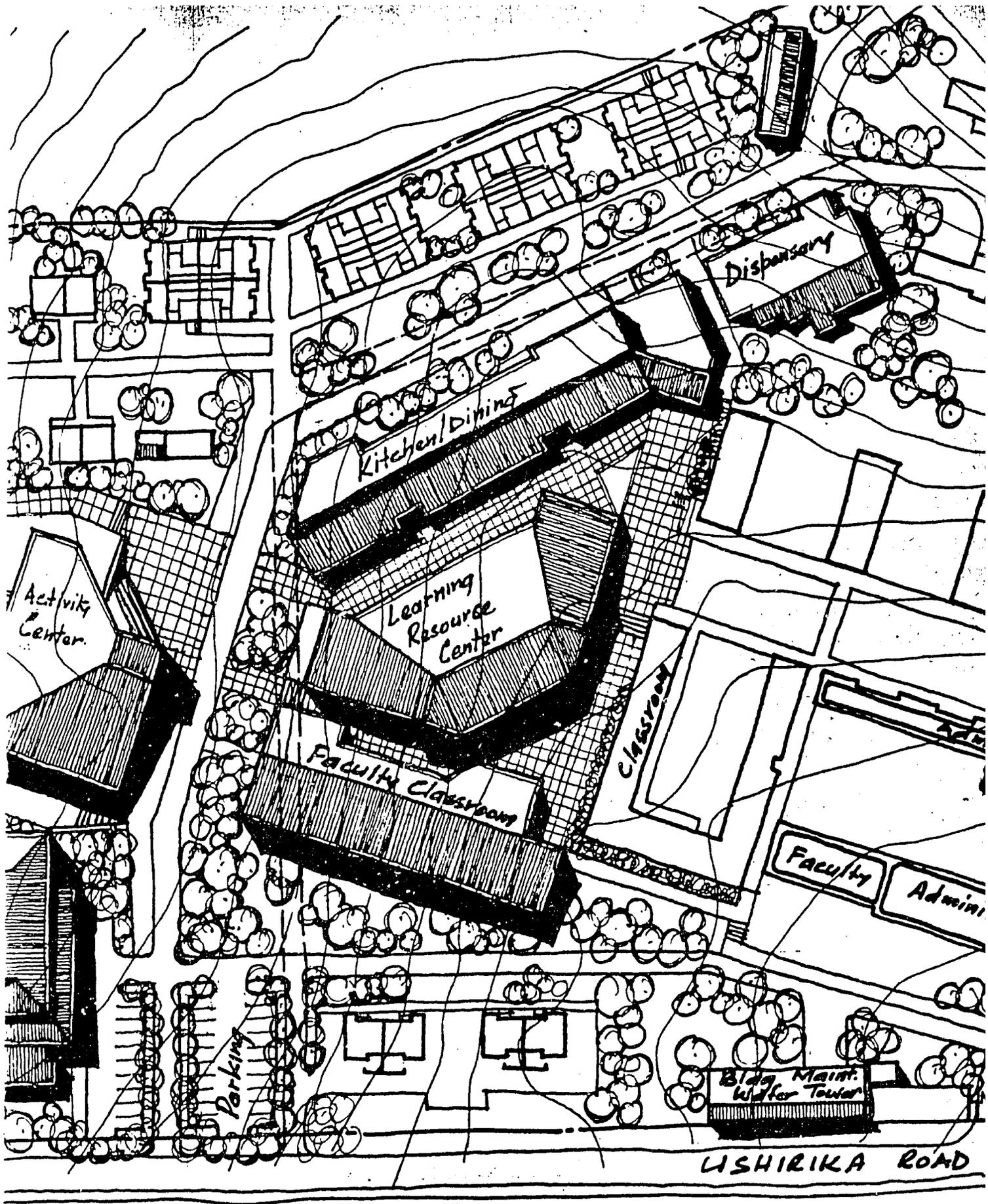
3. Water

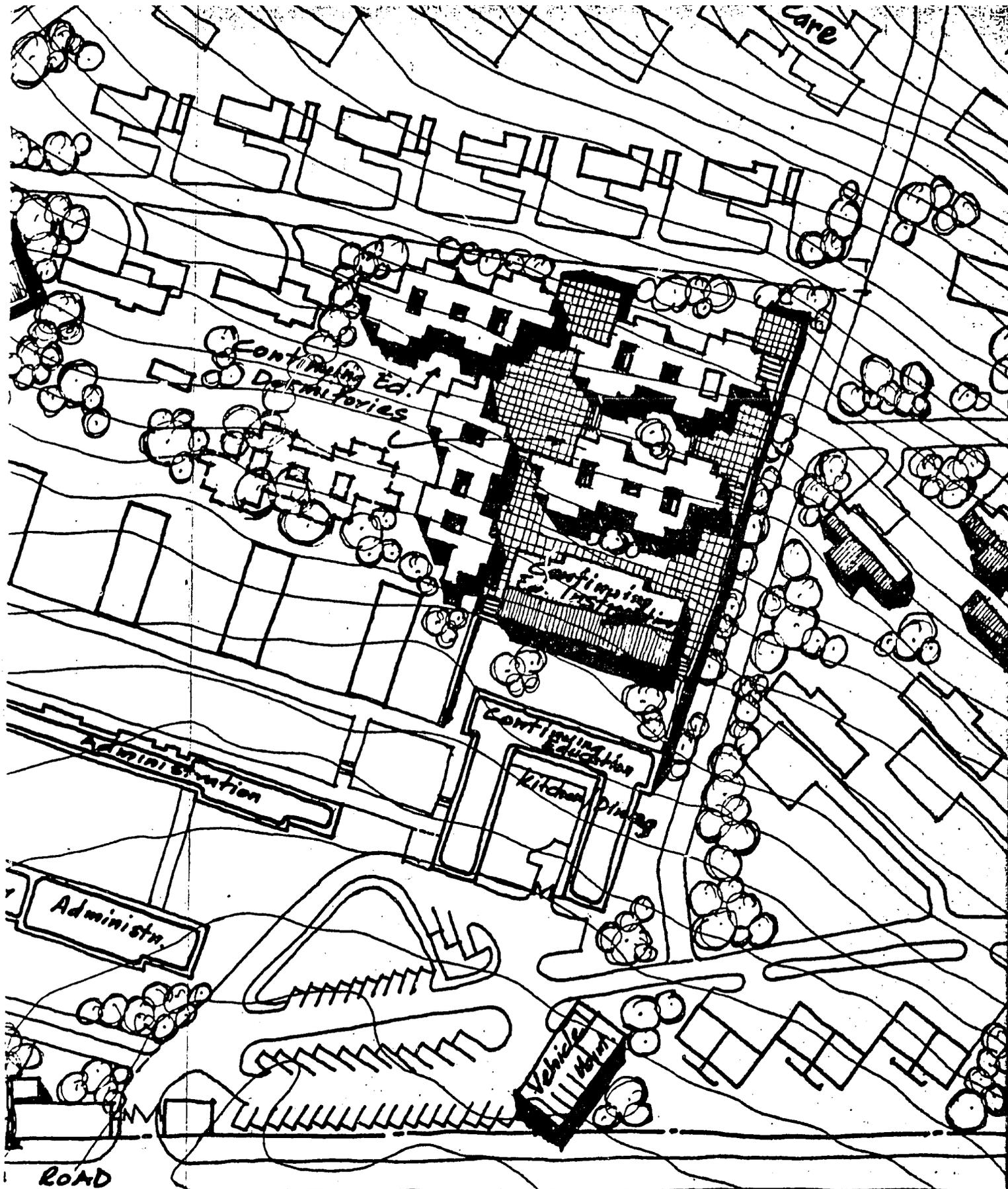
Supply will be inadequate for the College expansion from the existing source. Mbagathi River is overdrawn and presently the College has limited drawing rights. Augmentation will have to be from boreholes and future adequacy will have to be ensured by conservation policies.

Removal of excess fluorides in water is necessary by reverse osmosis or de-ionizing equipment. Additional elevated water storage capacity is required.



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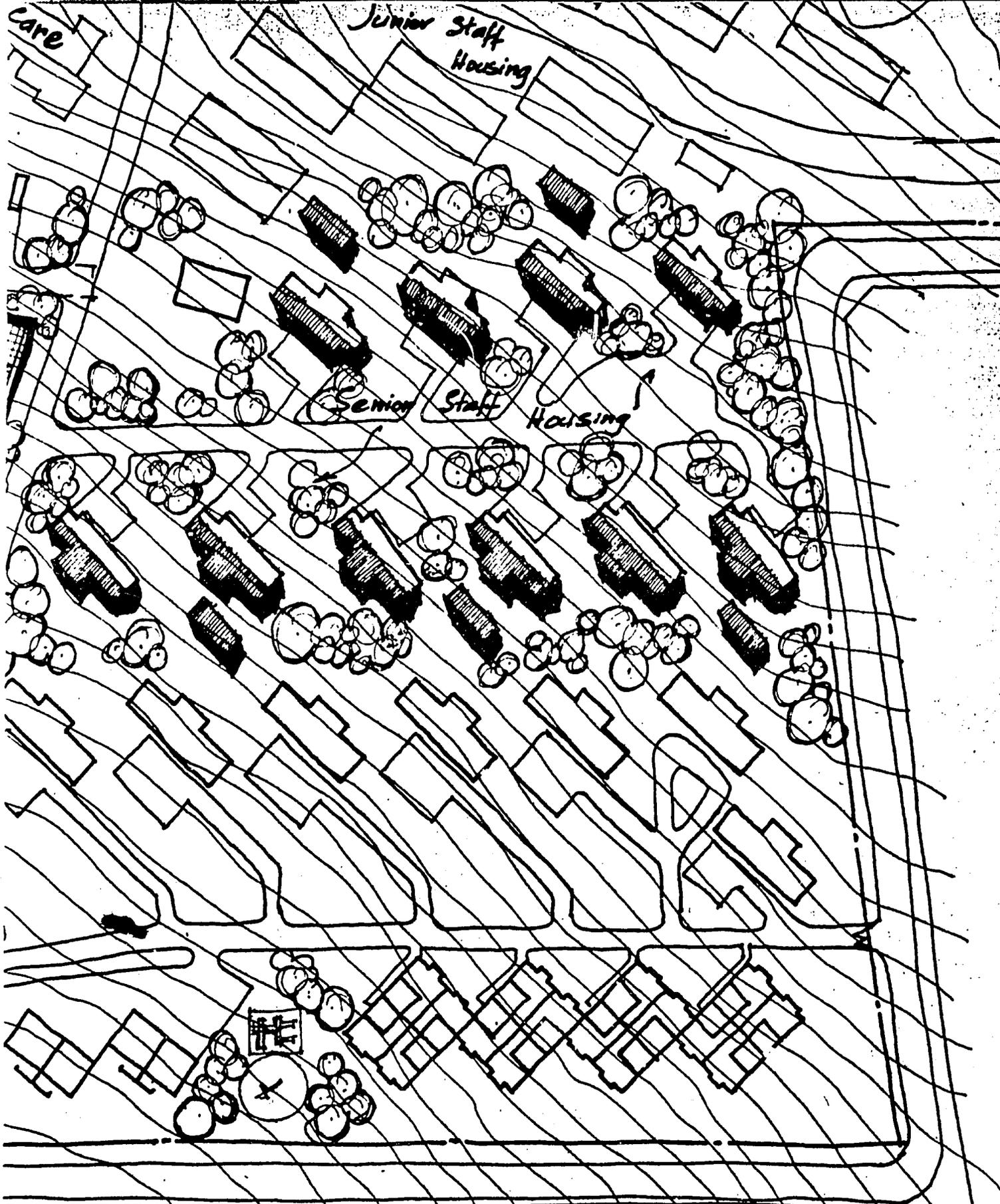




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Co-operative College of Kenya
Leo A Daly Omaha Nebraska

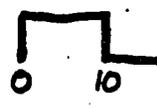
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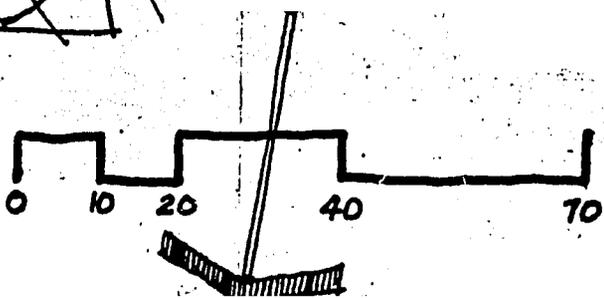
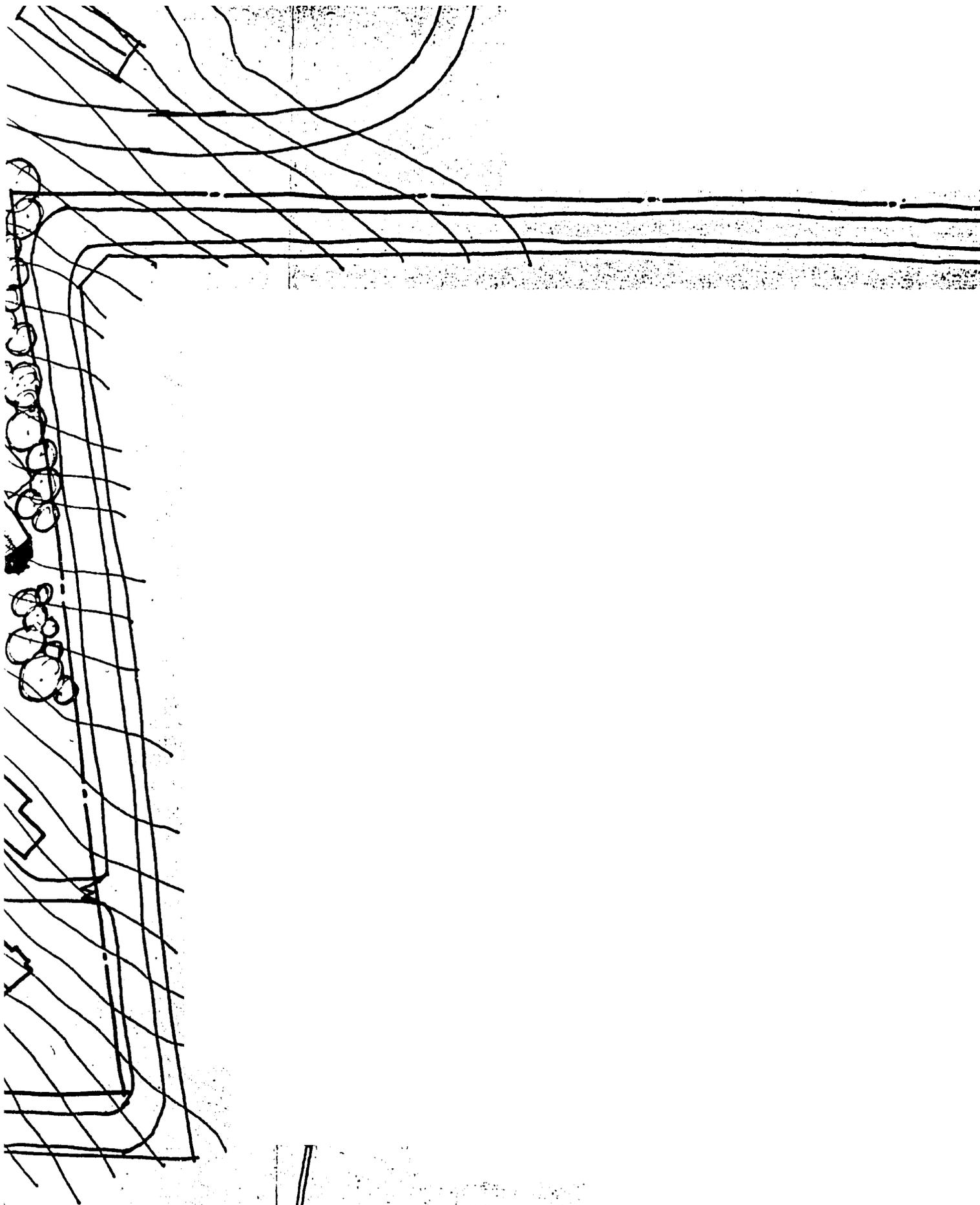
ED MASTER PLAN

College of Kenya.
Nairobi, Nebraska

Dec 1980

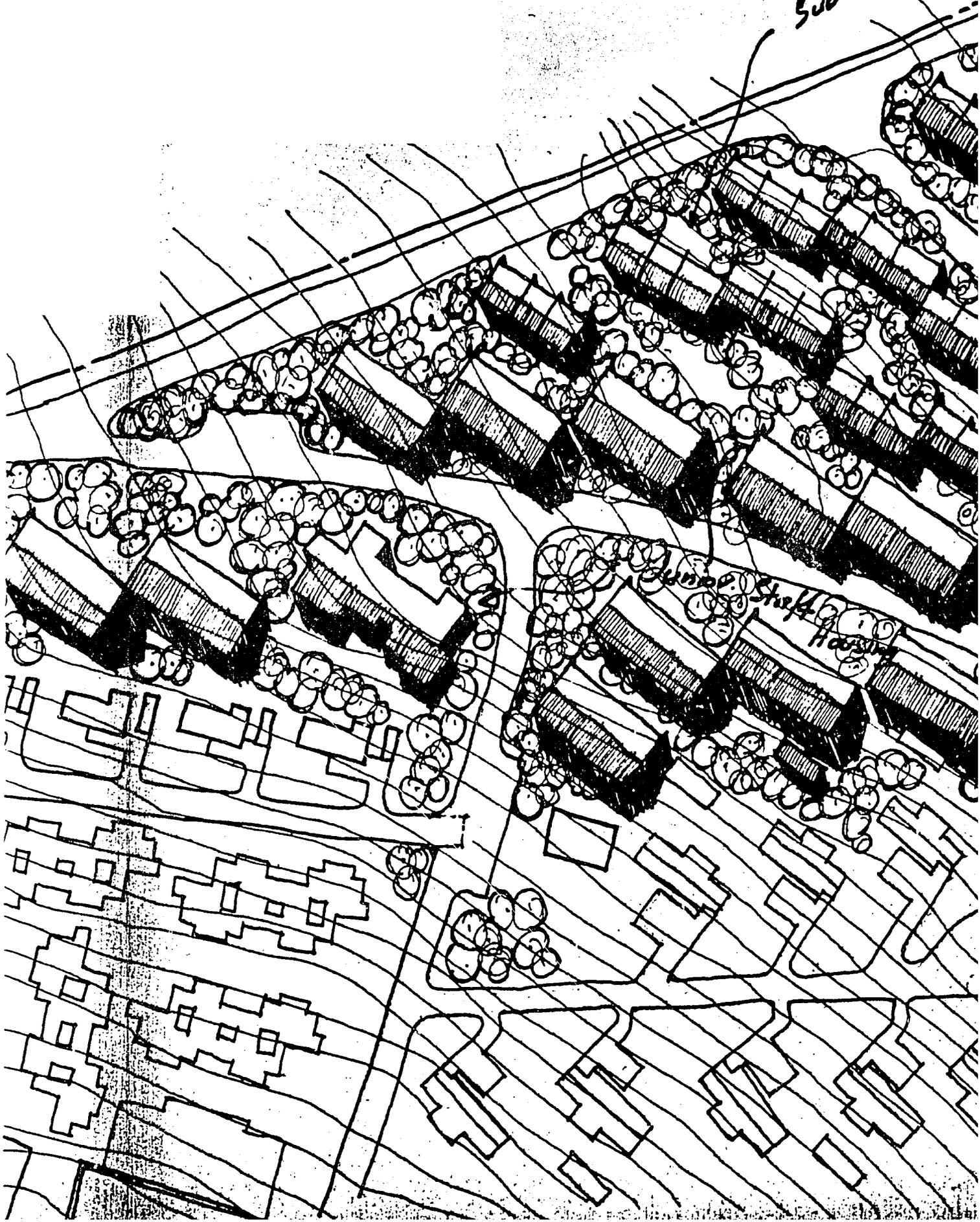


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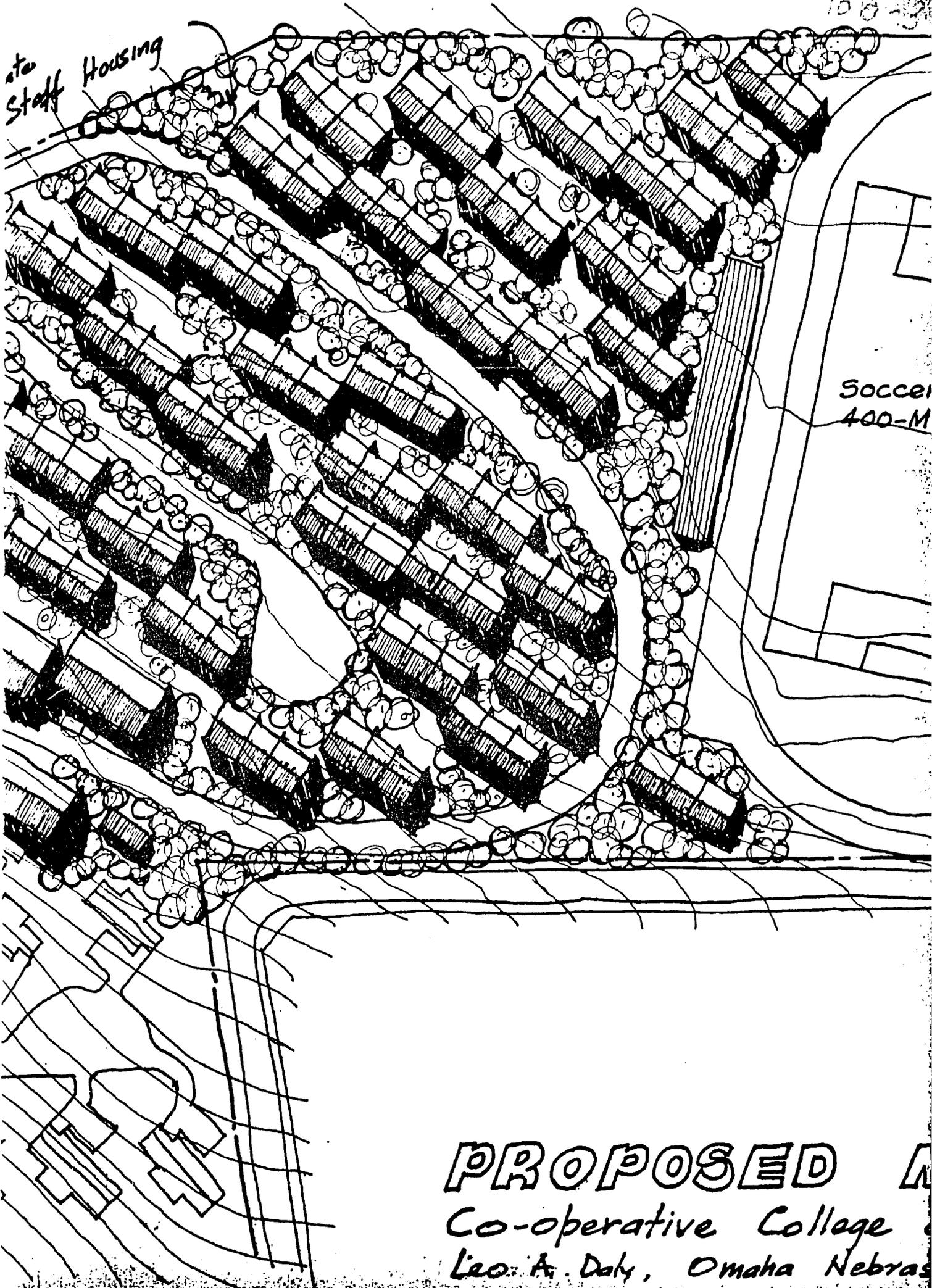




Sub-ordinate Staff



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Staff Housing



Soccer
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PROPOSED
Co-operative College
Leo. A. Daly, Omaha Nebraska

Mbagati

Occer Field/
100-Meter Track

Proposed Soakage

Existing Soakage

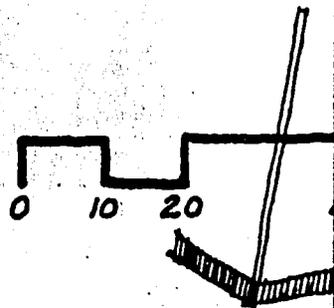
Proposed Oxidation Pond

Existing Oxidation Pond

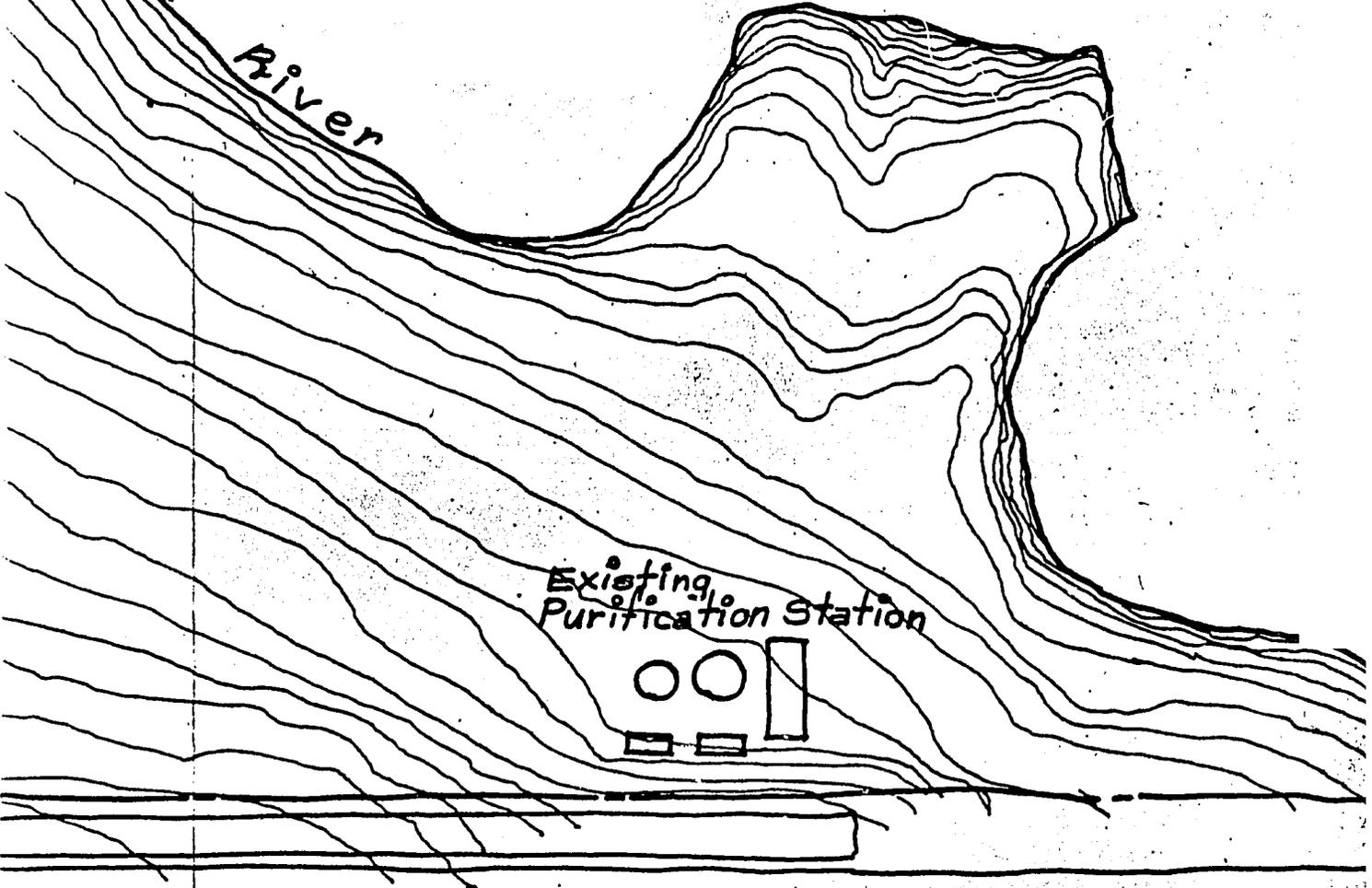
MASTER PLAN

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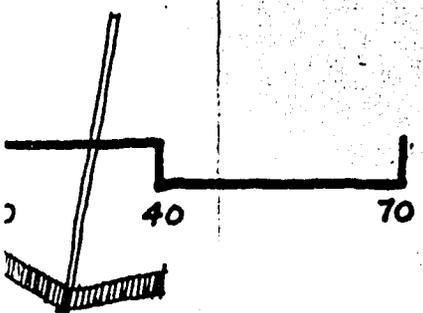
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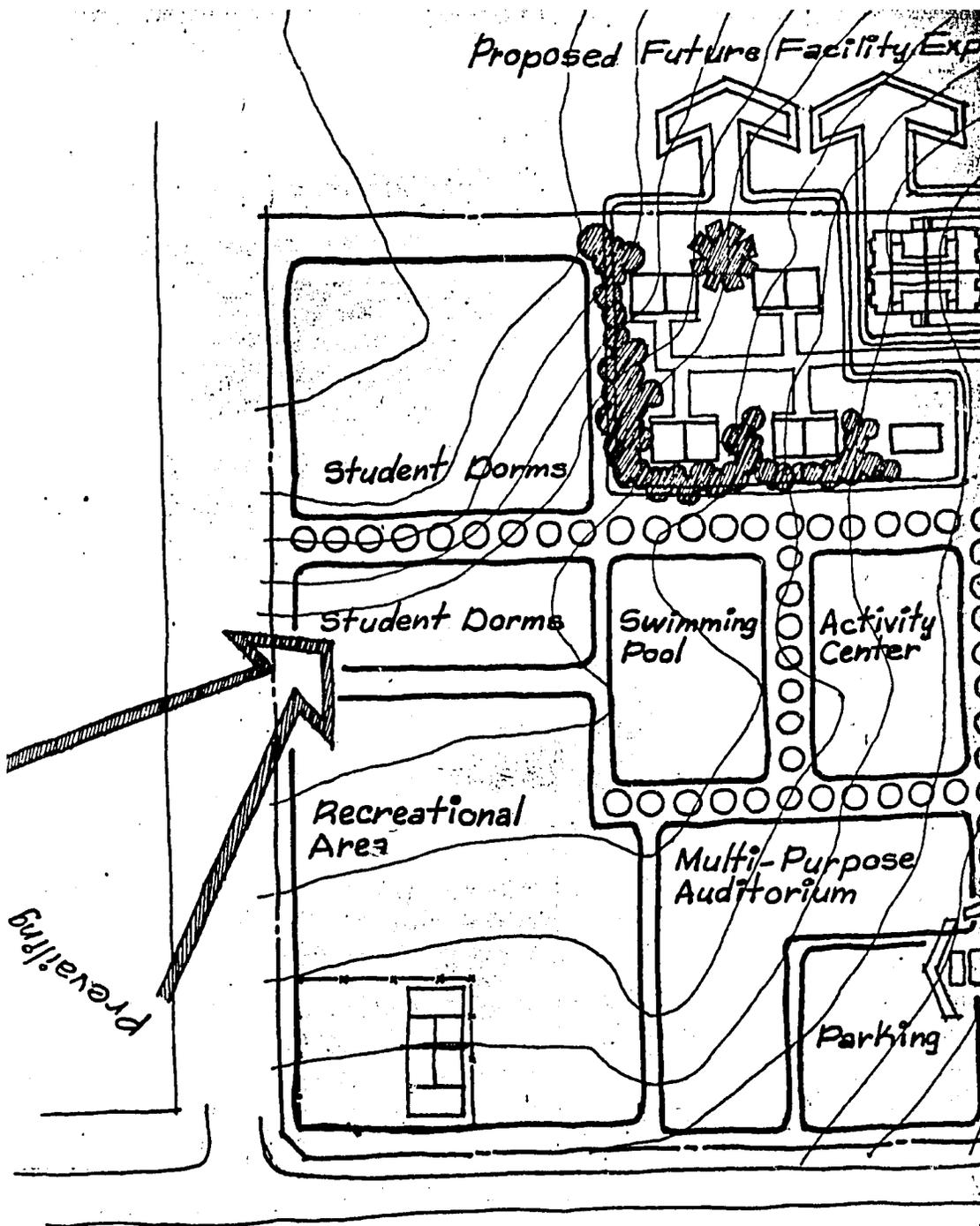
Mbagathi River

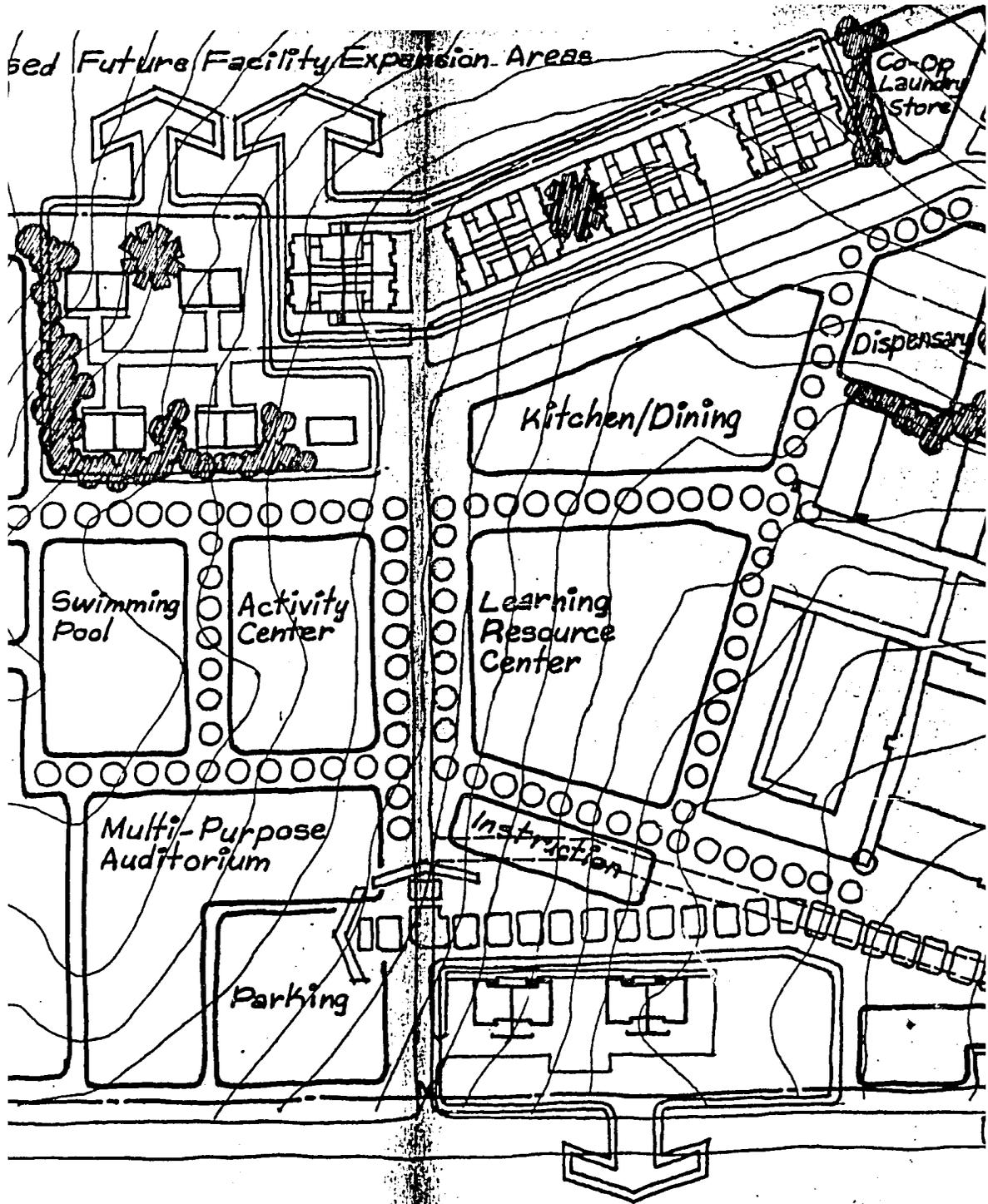


Existing Purification Station



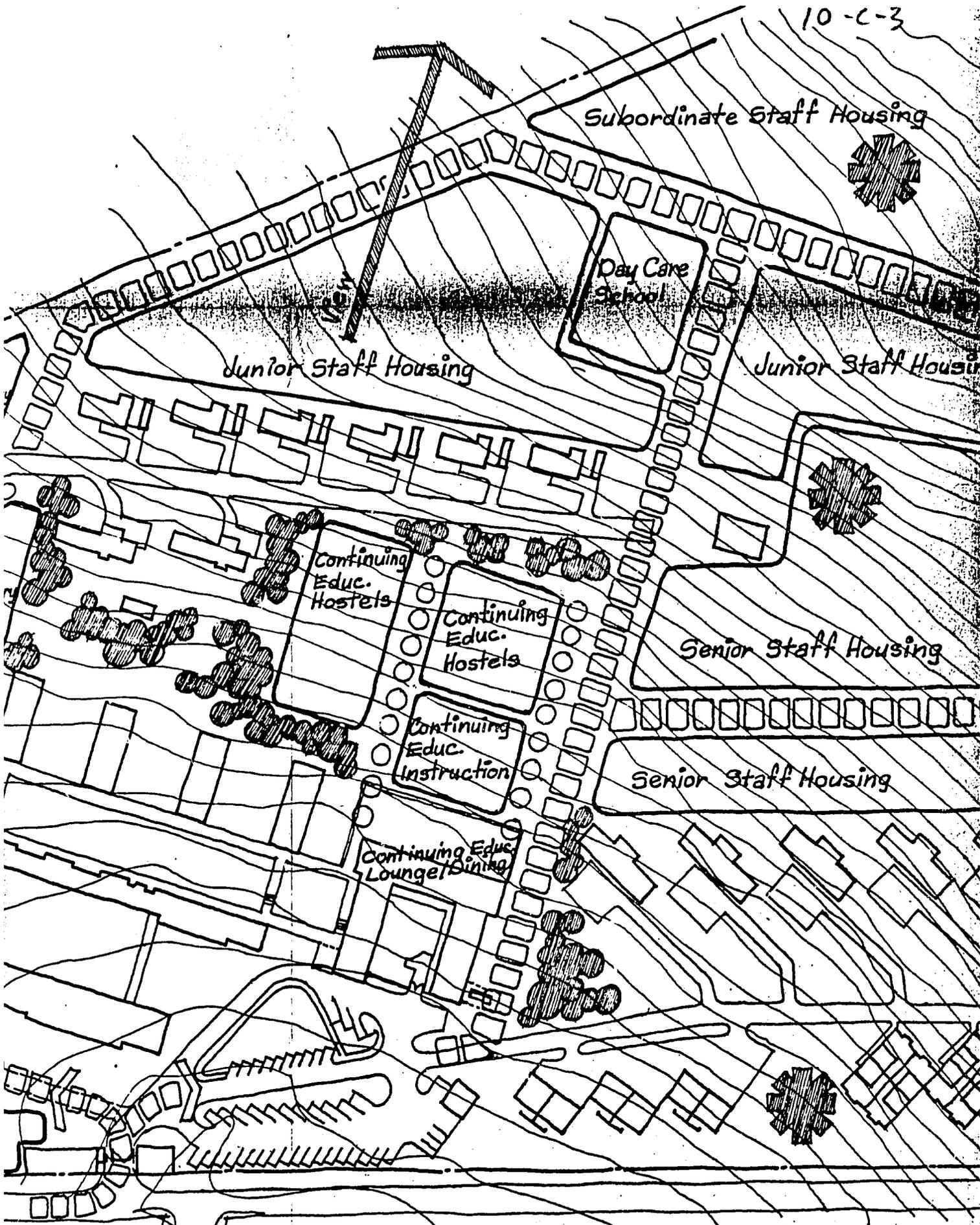
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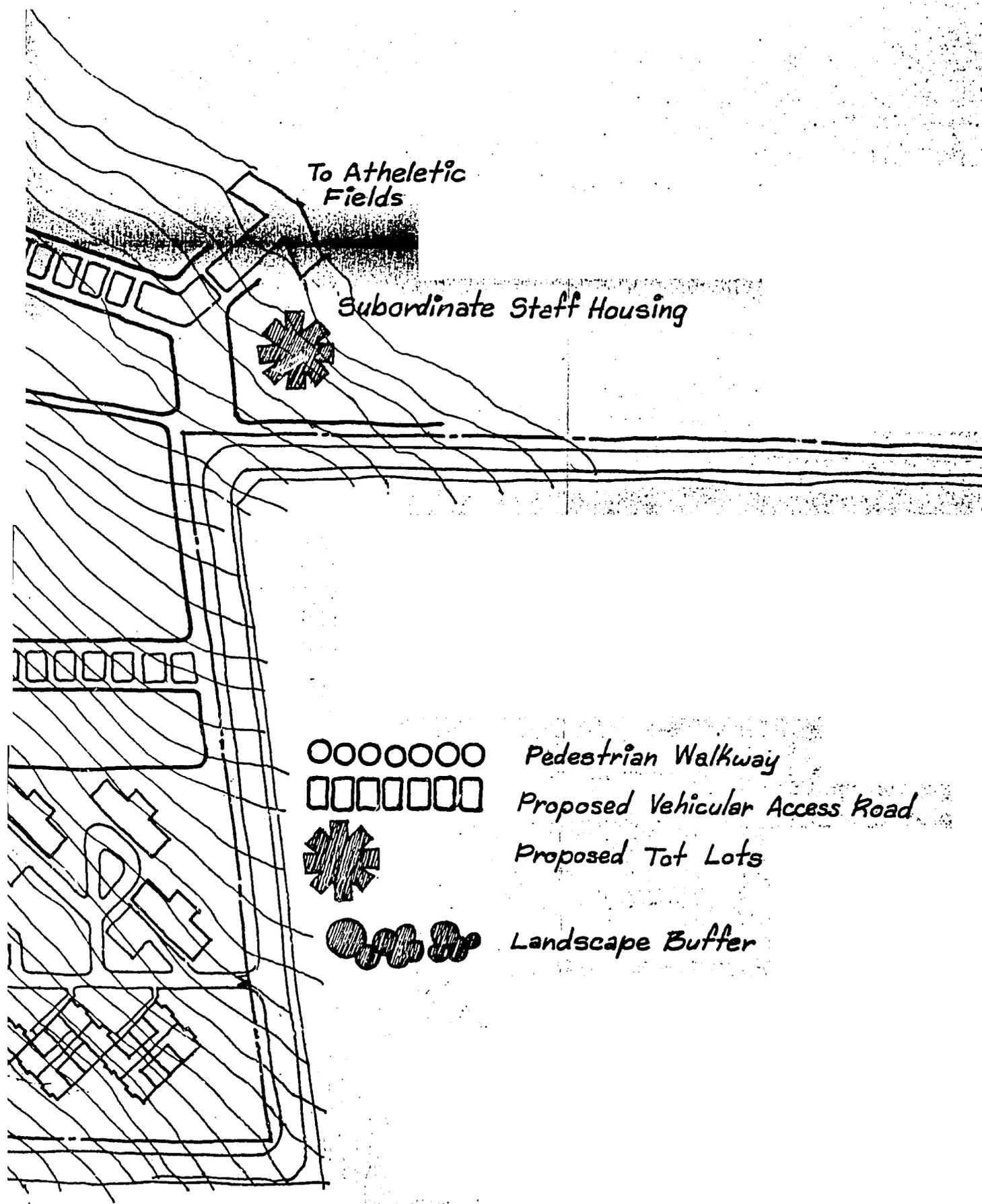


Proposed Future Facility Expansion Areas

Proposed Future Expansion Area



DEVELOPMENT CONCEPT
 Co-operative College of Kenya.



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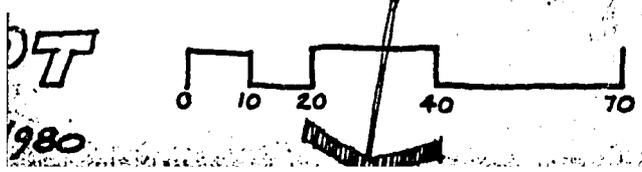
Pedestrian Walkway

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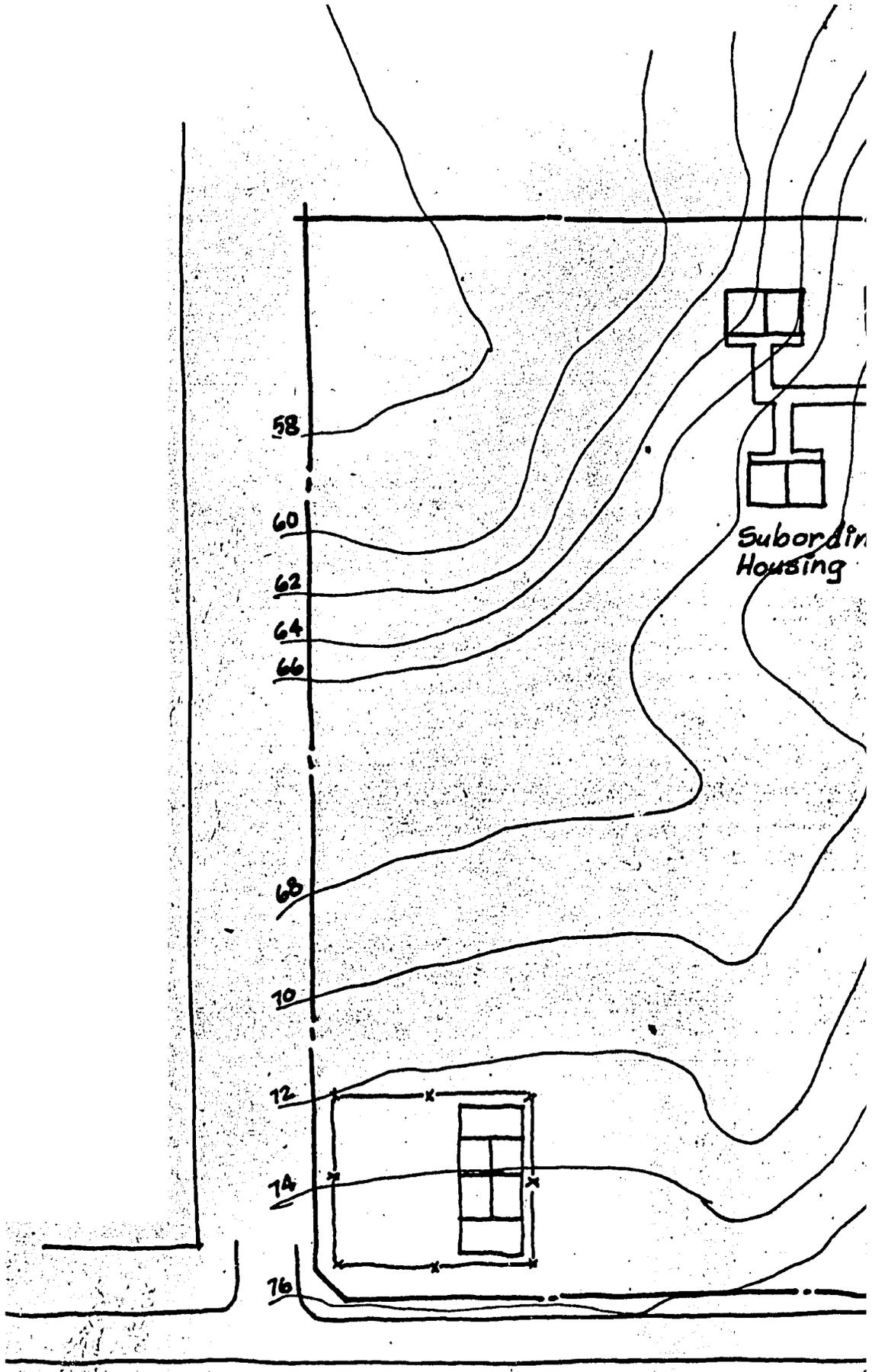
Proposed Vehicular Access Road

Proposed Tot Lots

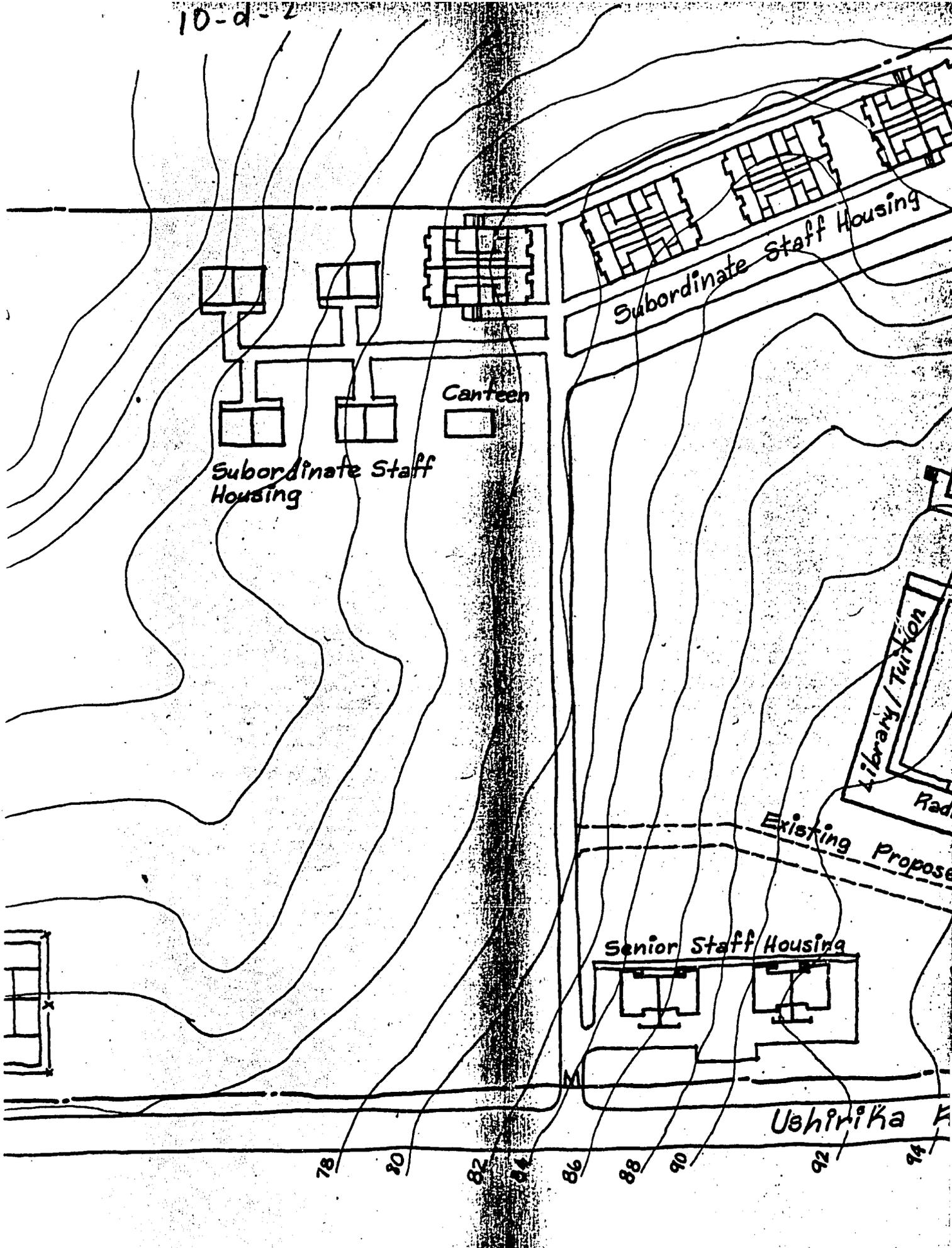
Landscape Buffer



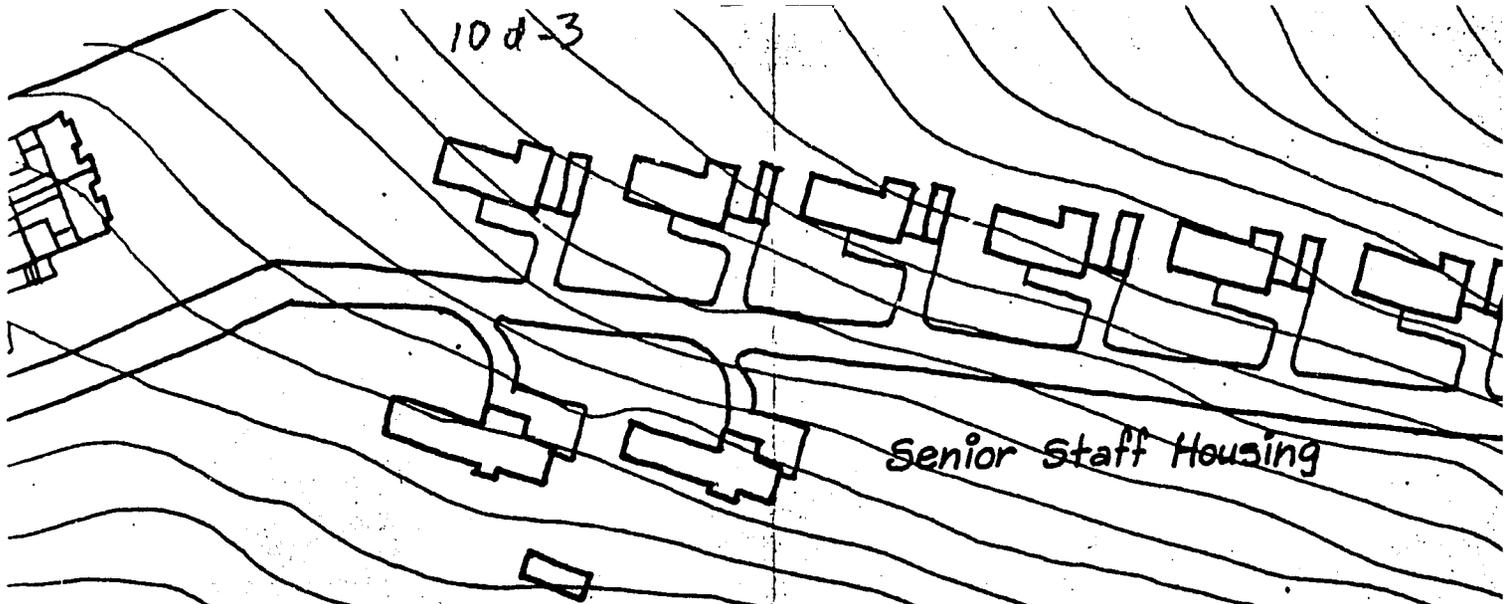
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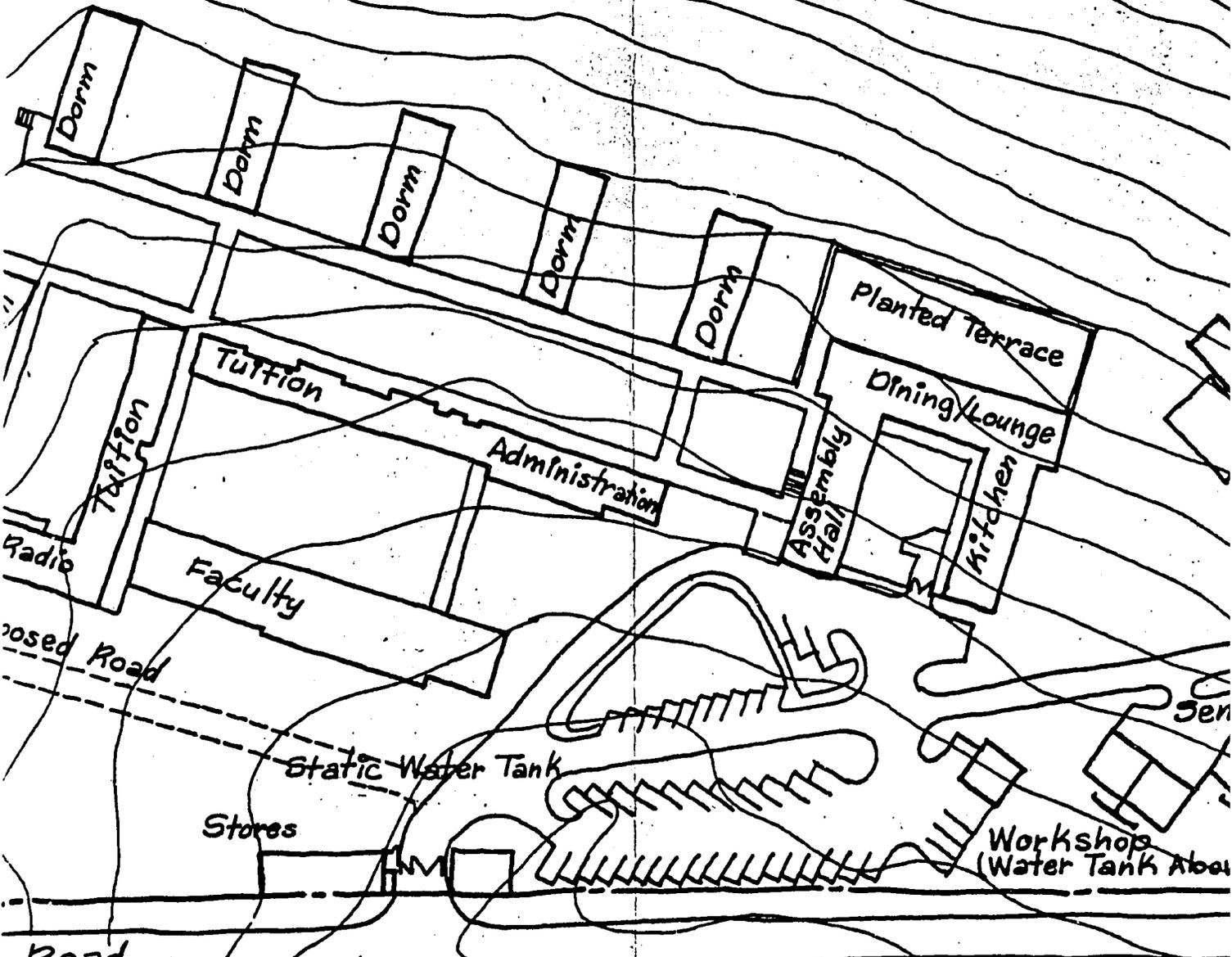
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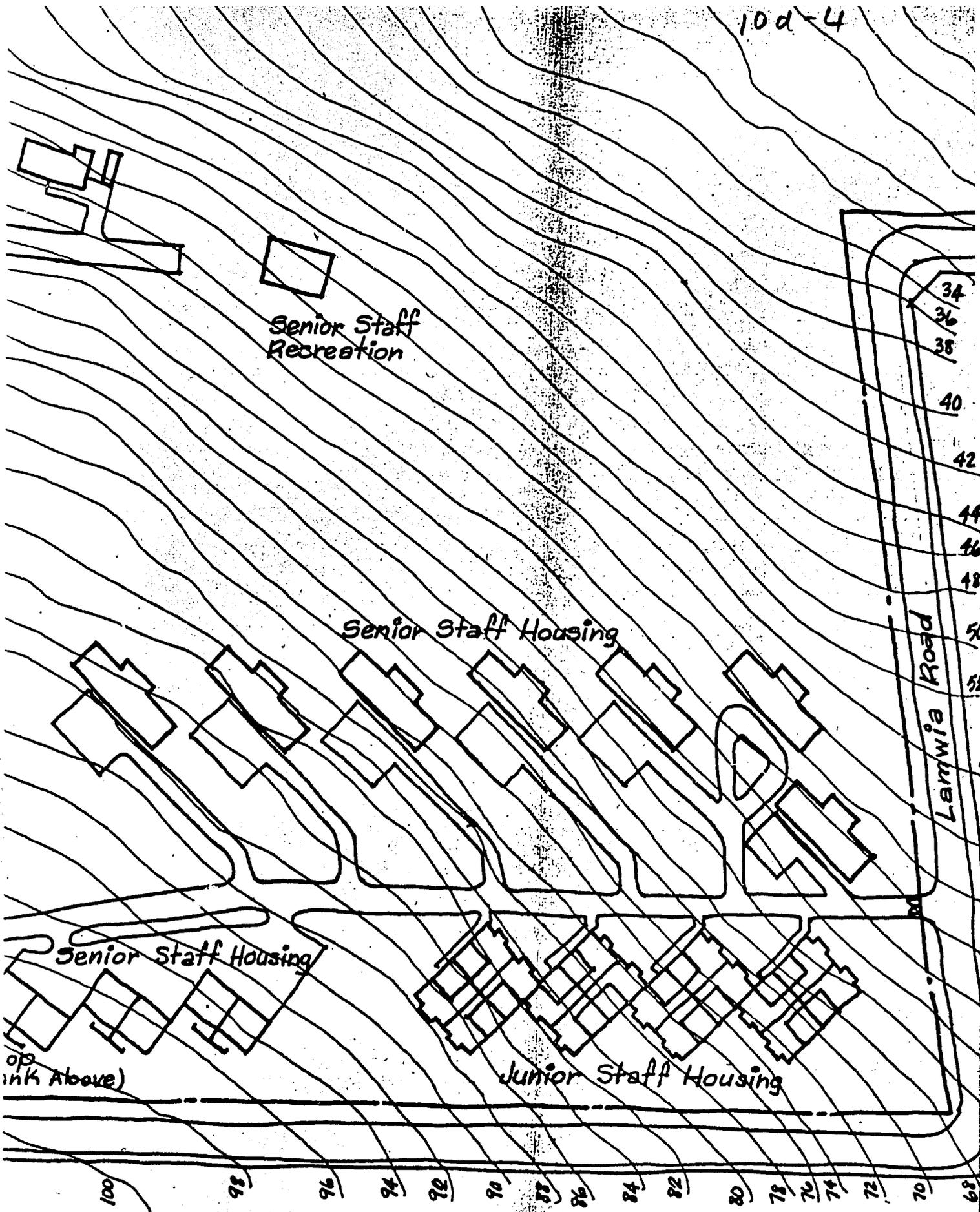


Senior Staff Housing



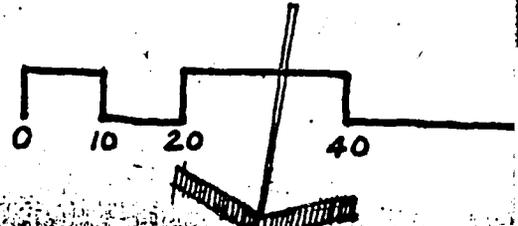
EXISTING &
 Co-operative College
 Leo A. Dale, Omaha

10d-4

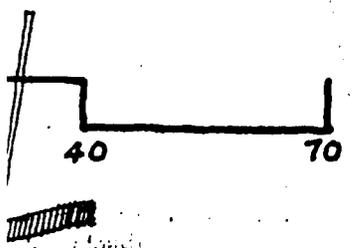
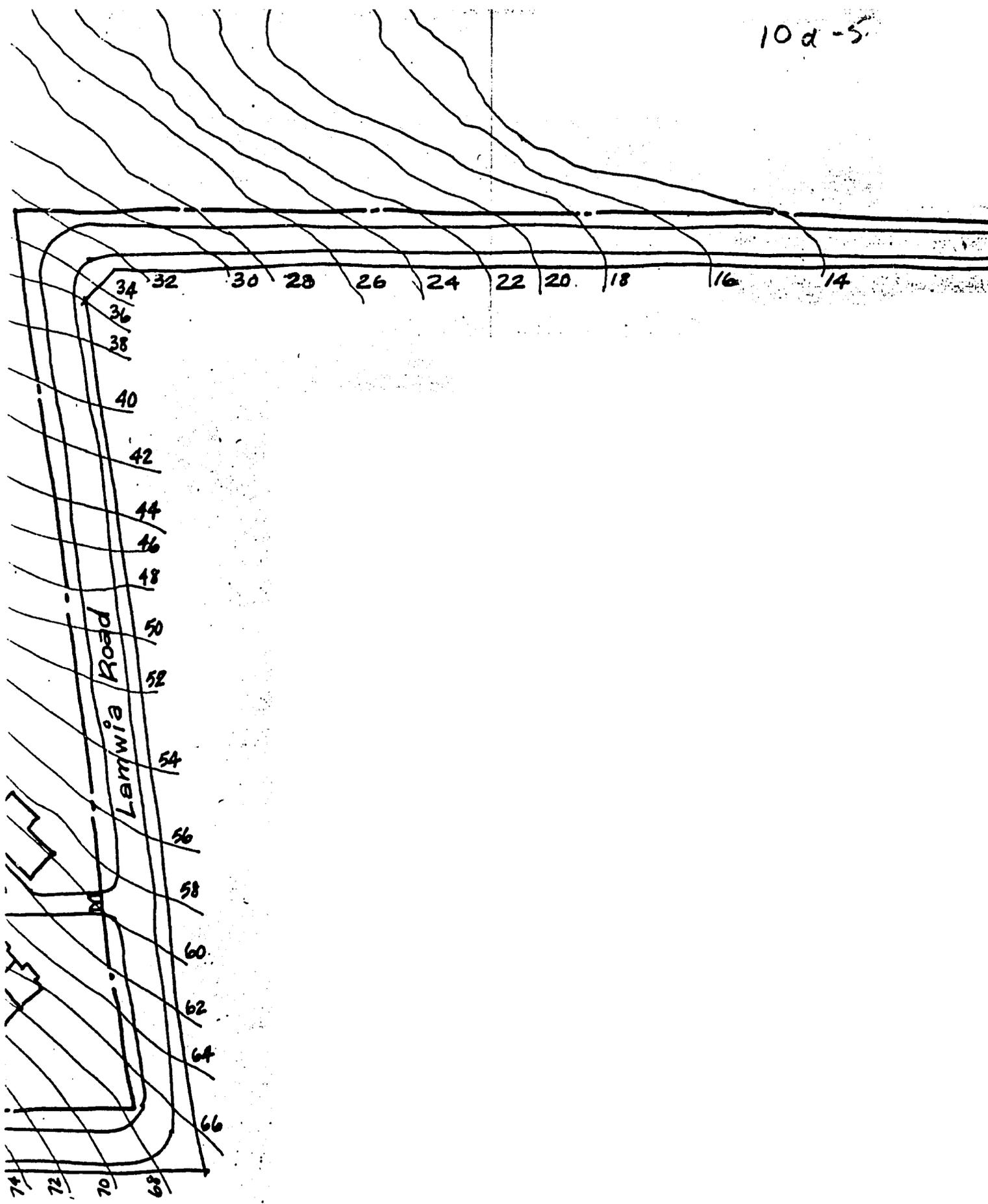


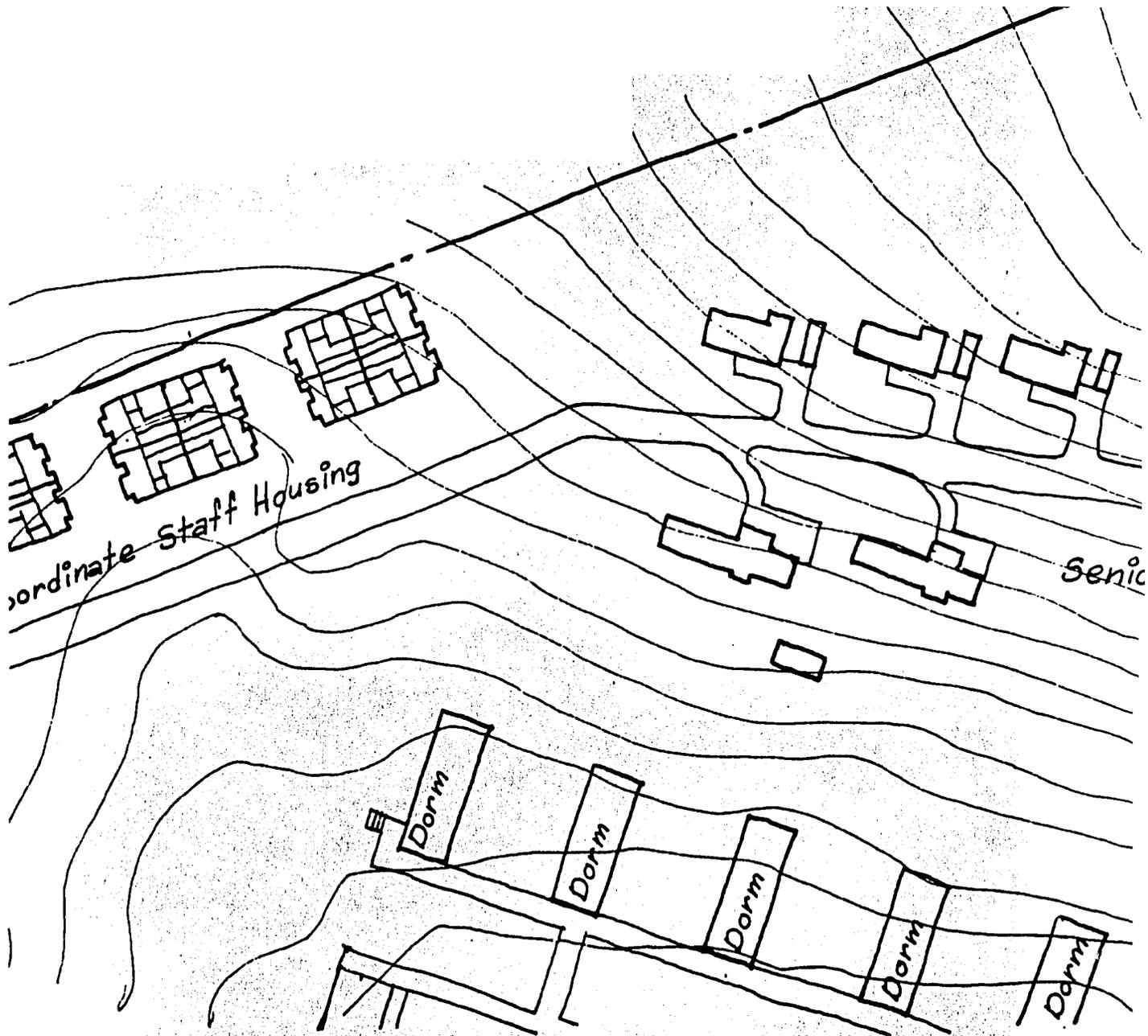
SITE PLAN

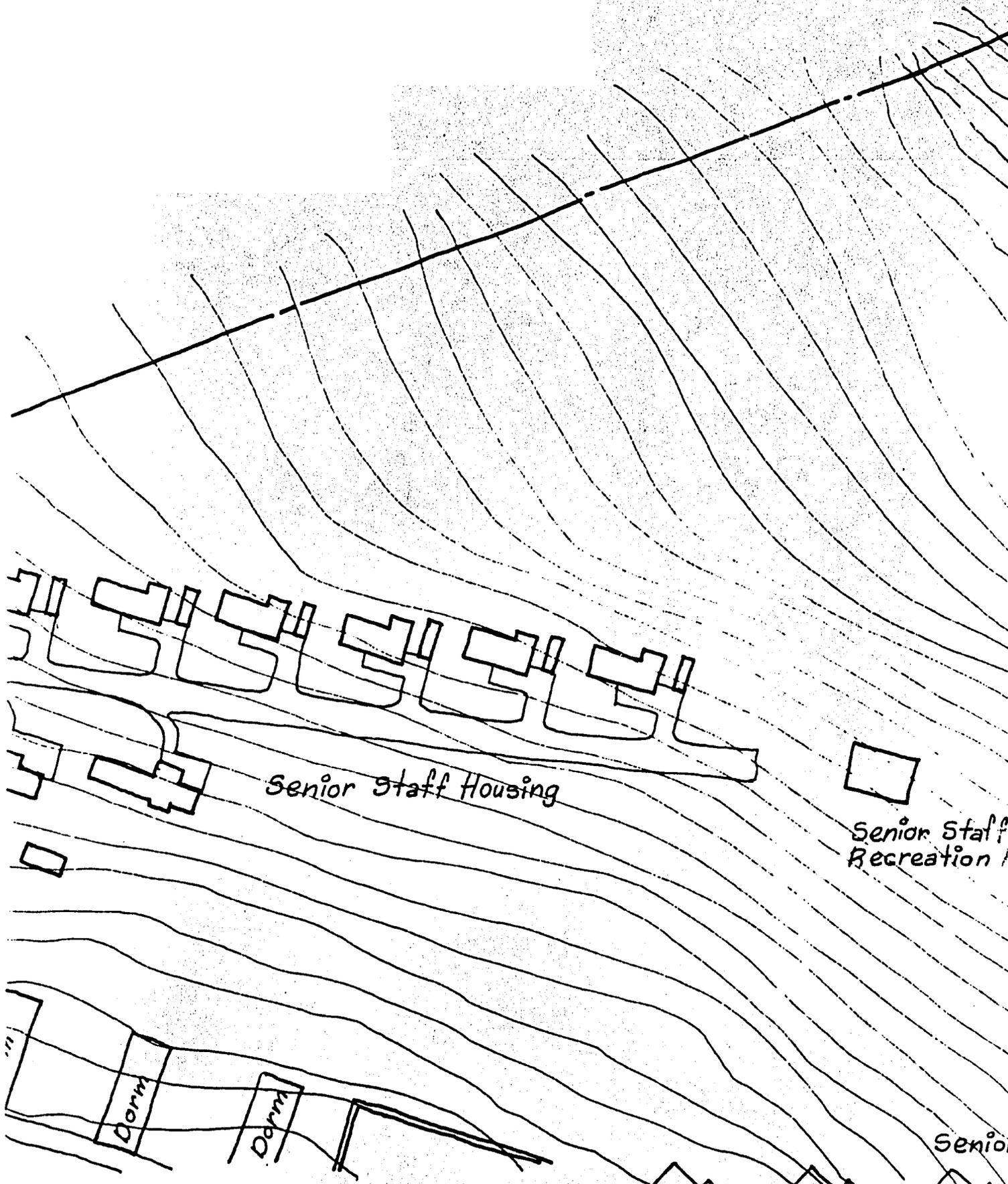
College of Kenya Dec 80



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Senior Staff Housing

Senior Staff Recreation

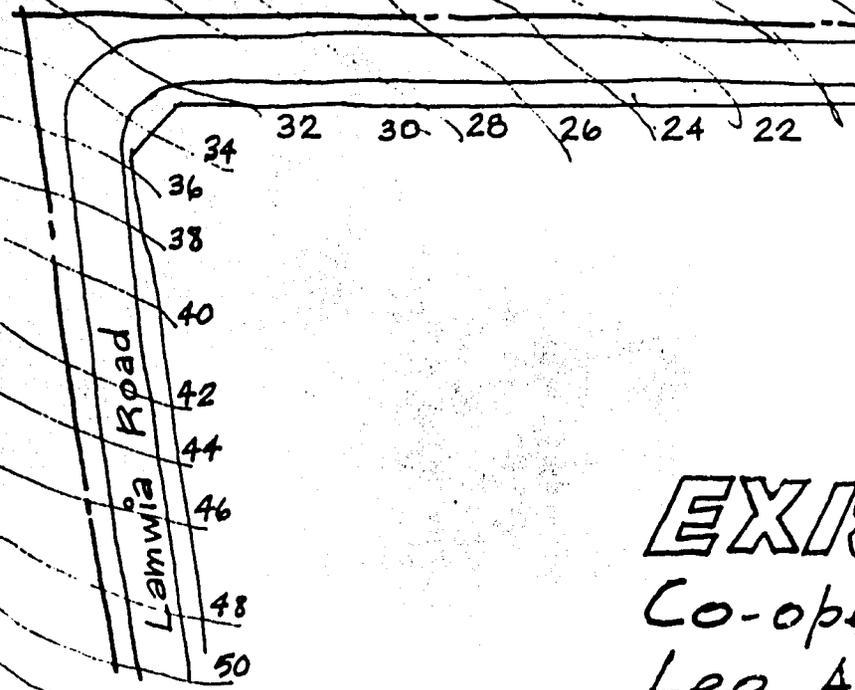
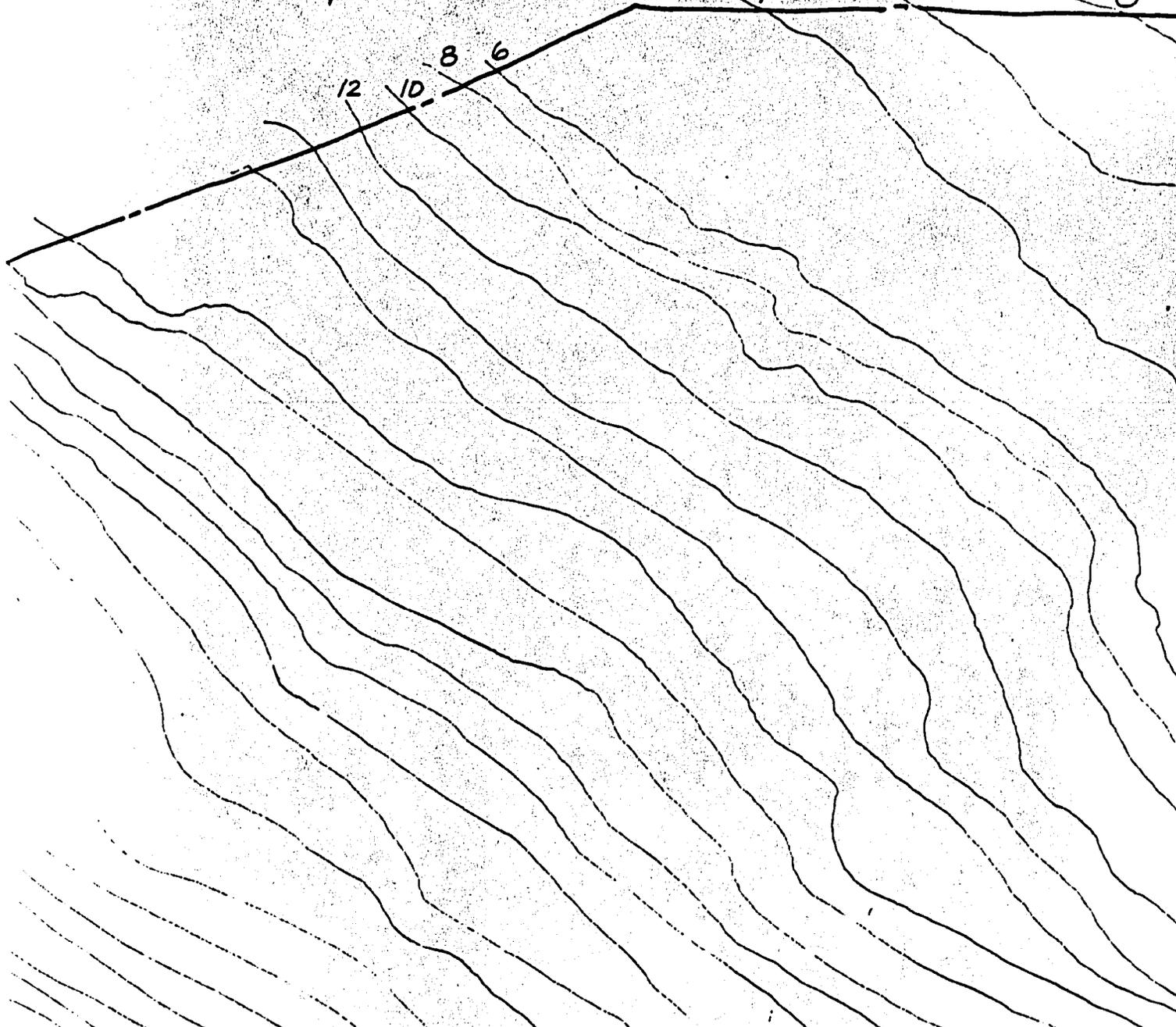
Dorm

Dorm

Senior

10c-3

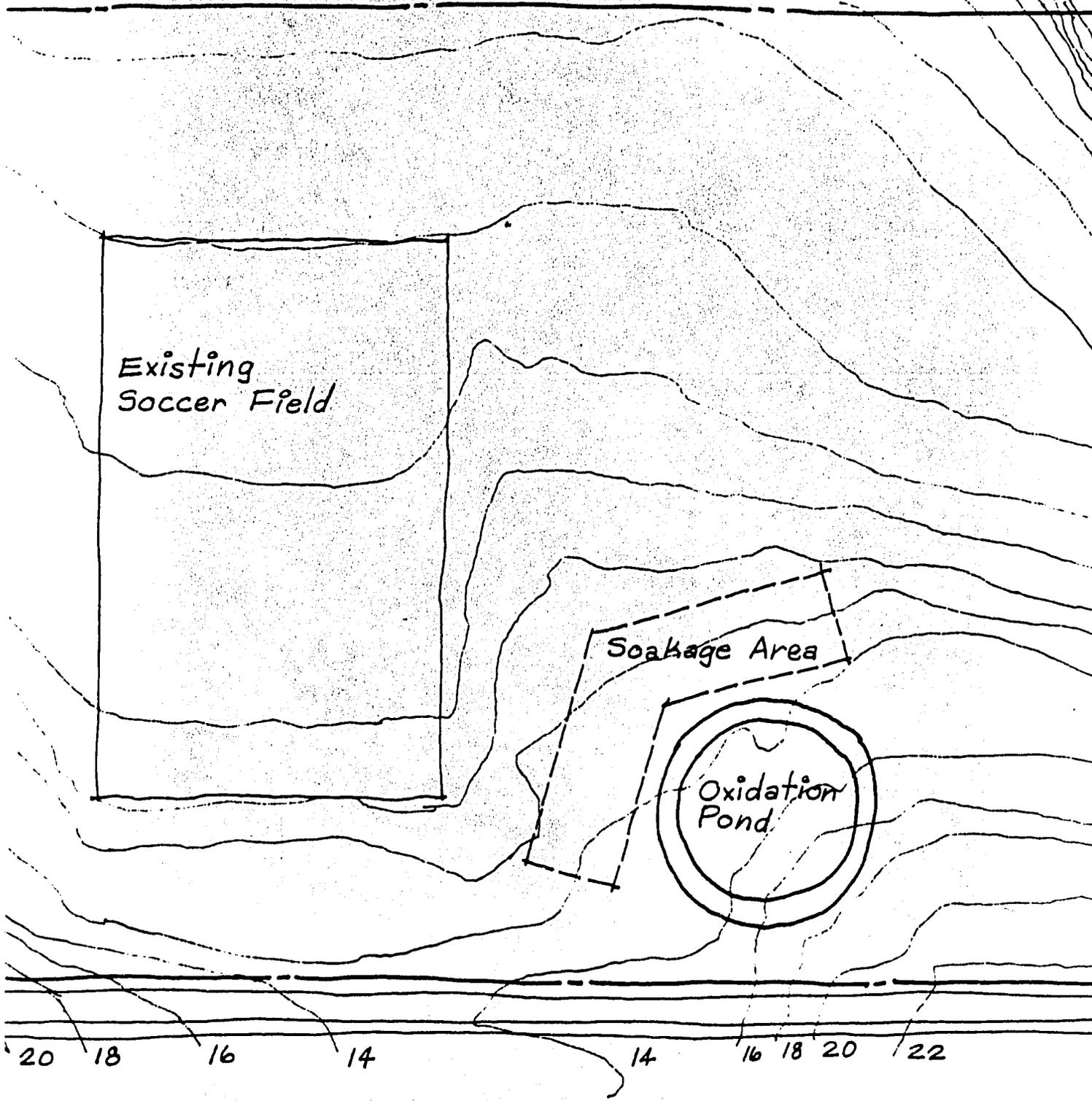
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Hall

Staff Housing

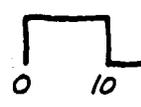
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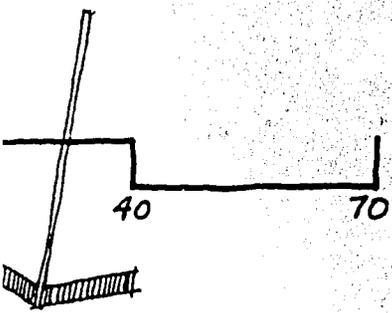


EXISTING SITE PLAN

operative College of Kenya.
A Daly, Omaha, Nebraska

Dec 1980





4. Waste Water

Existing oxidation pond treating water needs thorough overhaul. For the expansion, the treatment system needs to be doubled in capacity with a ground allowance made for future expansion.

5. Electrical

For the expansion, the current needs will be trebled, based on a per capita consumption rate being maintained, with some additional requirement for pumping and water purification.

6. Operations and Maintenance

For a continuing normalcy of all facilities a systemized approach to operations and maintenance is recommended for which a separate building and staffing requirement are outlined in the architectural program.

7. Solar Energy

Solar Energy should be utilized for heating of water for the existing halls of residence and for the expansion.

8. Building Systems

It is anticipated that architectural design of new buildings will be sympathetic to the existing buildings which are in exposed load-bearing textured local stone. The roofs are pitched and in red clay tile. The same structural and architectural systems are expected for the expansion. Intermediate floors of buildings of more than one story will be in reinforced concretes. Buildings requiring long clear spaces (e.g., library, auditorium, etc.) will be spanned with steel trusses with the roof tile carried of a structural metal deck.

III. DETAILED SPACE PROGRAM

This Space Program outlines the areas required by the Cooperative College to meet the proposed curriculum requirements as detailed in the first part of this study. Each of the functions listed herein is explained in the Detailed Space Program which follows this Summary.

Summary of Area Required

Administration	1275
Faculty Office Area	1275
Learning Resource Center	3205
Instructional Area	1585
Student Dormitories (3-96 man Three-story units)	6555
Kitchen/Dining Facility	2610
Activity Center	880
Bath House (At the Swimming Pool)	345
Multi-Purpose Auditorium	1815
Continuing Education In-Service Instructional Space	775
Continuing Education In-Service Hostel (5-32 man Two-Story Units)	4500
Continuing Education Dining/Lounge	1700
Dispensary	695
Day Care School	585
Cooperative Laundromat/Store	265
Staff Housing	
Type "C" Single Family Units (10 Three Bedroom Units)	1150
Servants Quarters (10 units)	240
Type "D" Four-Ples Units (51 Three Bedroom Units)	5253
Servants Quarters (30 Units)	720
Type "E" Townhouses (242 2-bedroom units @ 16,940 m ²)	
Type "E" Alternate (242 2 bedroom units at 18,150 m ²)	18150
Vehicles and Equipment Maintenance Shop	275
Building Maintenance Shops	405
Laundry Hold/Housekeeping Storage	105
Entrance Gatehouse/Campus Security Office	48
TOTAL GROSS SPACE PROGRAM REQUIREMENT	54,381 Sq. Meters

NOTE: A portion of the total square meterage will be accommodated in existing remodeled facilities.

Parking (visitor)	1280 gsm
Outdoor Recreational Areas Land Take	29697 gsm

A. Administration

1. Description

The Administration Area has the responsibility for development and coordination of all administrative functions of the College.

2. Relationships

The Administration Area should be prominently situated, highly visible and easily accessible to both the students and the public.

3. Assumptions

It is anticipated that this function will be accommodated in existing facilities.

4. Functional Criteria

Student Affairs, Accounts and Business areas should be easily accessible and inviting to the students.

5. Space Criteria

Office space is based on the following criteria:

Principal at 25 nsm;*

Vice Principals, Executive Officers at 20 nsm;

Division Heads, Directors at 15 nsm;

Faculty at 12 nsm;

Staff offices at 10 nsm;

Clerical work stations at 6.5 nsm.

Conference room size is based on the following criteria

Conference room size is based on the following criteria:

Large Conference at 36 nsm;

Medium Conference at 24 nsm;

Small Conference at 12 nsm.

6. Administration - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby	40.0
Public Toilets (2 at 10m ²)	20.0

* nsm = Net Square Meters

Offices Areas

Office of the Principal

Principals's Office	25.0
Administrative Secretary	15.0
Shorthand Typist	10.0
Copy Typist	6.5
Clerical Officers (2 at 6.5m ²)	13.0
Toilet	6.0
Committee/Board Room (25 at 2.4m ²)	60.0

Vice Principal - Academic	20.0
Shorthand Typist	10.0
Copy Typists (2 at 6.5m ²)	13.0
Clerical Officers (2 at 6.5m ²)	13.0

Vice Principal - Student Affairs	20.0
Shorthand Typist	10.0
Copy Typists (2 at 6.5m ²)	13.0
Clerical Officers (3 at 6.5m ²)	19.0

Vice Principal - Administration	20.0
Shorthand Typist	10.0
Copy Typists (2 at 6.5m ²)	6.5
Clerical Officers (2 at 6.5m ²)	13.0

Executive Officer	20.0
Shorthand Typist	10.0
Copy Typists	6.5
Clerical Officers (2 at 6.5m ²)	13.0

Student Records and Counseling

Director	15.0
Shorthand Typist	10.0
Copy Typist	6.5

Bursary Office	12.0
Counseling Offices (2 at 12m ²)	24.0
Copy Typist	6.5
Clerical Officers (2 at 6.5m ²)	13.0
Waiting	10.0

Student Records/Admission Registrar	12.0
Copy Typist (2 at 6.5m ²)	13.0
Clerical Officers	6.5
Waiting	10.0

Purchasing

Head	12.0
Copy Typist	6.5
Clerical Officers (2 at 6.5m ²)	13.0

Accounts and Business	
Head	12.0
Accountant	10.0
Cashiers (2 at 6.5m ²)	13.0
Copy Typist	6.5
Clerical Officers (2 at 6.5m ²)	13.0
Hostel Director	
Hostel Director	15.0
Copy Typist (share with Recreational Director)	6.5
Clerical Officer (2 at 6.5m ²) share with Recreational Director	13.0
Student Recreational Director	15.0
Clerical Head	
Clerical Head	15.0
Senior Clerical Officer	10.0
Meeting Room	
Meeting Room	24.0
Reception	
Receptionists (2 at 8.0m ²)	16.0
PBX	14.0
Waiting Room	40.0
Office Support Areas	
Records/Vault	19.0
File Storage/Central Records	24.0
Office Supply	20.0
Mail Room	14.0
Reproduction/Work Room	20.0
Employees Areas	
Lockers and Toilets (.5m ² x 50)	25.0
Employee Lounge	24.0
Staff Toilet (2 at 8m ²)	16.0
Maintenance	
Receiving	10.0
Janitors' Room	15.0
<hr/>	
Net Building Area	981.0
Gross Conversion Factor	x 1.3
	1275.3
Gross Building Area	say 1275.0

Janitor
15m²

Rec'g.
10m²

Employee
Lockers/
Toilets
25m²

Employee
Lounge
24m²

File
Storage/
Central
Records
24m²

Office
Supply
20m²

Repro./
Work Rm.
20m²

Mail Rm.
14m²

Staff
T.
8m²

Staff
T.
8m²

Wait

Short-
hand
Typ.

Copy
Typ.

Snr.
Cler.
10m²

Clerical
Head
15m²

Cler.
Off.
13m²

Student
Rec. Dir.
15m²

Copy
Typ.
6.5m²

Hostel
Director
15m²

Cler.
Off.
6.5m²

Copy Typ.
13m²

Wait
10m²

Registrar
12m²

Copy
Typ.
13m²

Bursary
12m²

Wait
10m²

Counselor
12m²

Cler. Off.
6.5m²

Counselor
12m²

Copy
Typ.
6.5m²

Head
Accts./Bus.
12m²

Cashiers
13m²

Account.
10m²

Cler.
Off.

Vault

ADMINISTRATION

Shorth'd Typ. 10m² Copy Typ. 6.5m²

Dir. Student Records / Counseling 15m²

Meeting Rm. 24m²

Clerical Off. 19.5m²

Copy Typ. 13m²

Shorth'd Typ. 10m²

Vice-Prin. Student Affairs 20m²

Cler. Off. 13m²

Shorth'd Typ. 10m² Copy Typ. 6.5m²

Exec. Officer 20m²

Committee / Board Rm. 60m²

Cler. Off. 13m²

Vault 19m²

Cler. Off. 13m²

Copy Typ. 6.5m²

Purchas'g. Head 12m²

Cler. Off. 13m²

Shorth'd Typ. 10m²

Copy Typ. 6.5m²

Vice-Prin. Admin. 20m²

Cler. Off. 13m²

Shorth'd Typ. 10m²

Copy Typ. 13m²

Vice-Prin. Academic 20m²

T. 6m²

Principal 25m²

Shorth'd Typ. 10m²

Cler. Off. 13m²

Admin. Sec. 15m²

Recept. 16m²

PBX 14m²

Waiting 40m²

Lobby 40m²

T. 10m²

T. 10m²

ADMINISTRATION

B. Faculty Office Area

1. Description

The Faculty Office Area provides office facilities for all lecturers by Department or discipline.

2. Relationships

The Faculty Office Area should be located proximate to the classroom and instructional spaces as well as the administrative areas. A location proximate to the Learning Resource Center is desirable but not an absolute necessity.

3. Assumptions

a. Student:Faculty ratio of 12 to 1.

b. Thus, with 660 606al students, approximately 55.

c. Department Heads receive a private office; all other faculty are housed in 2-man offices.

d. It is anticipated that this function will in part be accommodated in existing facilities.

4. Space Criteria

Office space is based on the following criteria:

Division Heads, Coordinators, Directors at 15 nsm;

Faculty at 12 nsm;

Two-man office at 20 nsm;

Staff office at 10 nsm;

Copy typist and clerical officers at 6.5 nsm.

4. Faculty Area - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Public Toilets (2 at 6m ²)	12.0
<u>Office Areas</u>	
Head of Management	15.0
Shorthand Typist	8.0
Copy Typist (2 at 6.5m ²)	13.0
Clerical Officer (2 at 6.5m ²)	13.0
Files	8.0
Faculty Offices (12 at 20m ²)	240.0
Waiting/Reception	10.0

Head of Accounting	15.0
Shorthand Typist	8.0
Copy Typist (2 at 6.5m ²)	13.0
Clerical Officers (2 at 6.5m ²)	13.0
Files	8.0
Faculty Offices (10 at 20m ²)	200.0
Waiting/Reception	12.0
Head of Law	15.0
Shorthand Typist	8.0
Copy typist	6.5
Clerical Officers (2 at 6.5m ²)	13.0
Files	8.0
Faculty Offices (5 at 20m ²)	100.0
Waiting/Reception	12.0
<u>Office Support Areas</u>	
Instructional Conference Rooms (4 at 24m ²)	96.0
Work Room/Reproduction	15.0
Faculty Lounge/Kitchenette	30.0
Employee Lounge	15.0
Employee Lockers and Toilets	20.0
Storage	20.0
Faculty Toilets (3 at 8m ²)	24.0
<u>Maintenance</u>	
Janitors' Room	8.0
<hr/>	
Net Building Area	980.5
Gross Conversion Factor	<u>x 1.3</u>
	1274.0
Gross Building Area	say 1275.0

Management Faculty

employee areas

storage jan.

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Instruct. Conf

[Empty box]

Faculty Lounge

Instruct. Conf.

Head Mgmtg.

Head Acctg.

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Instruct. Conf

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Head Law

Office Support

Instruct. Conf

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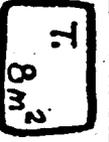
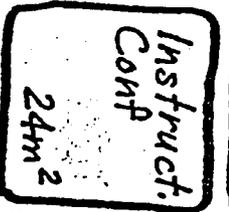
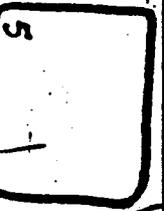
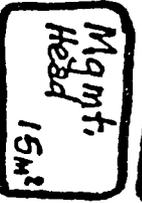
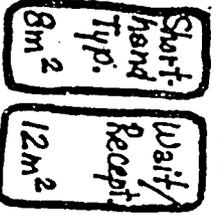
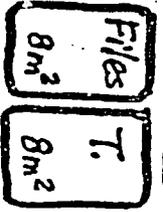
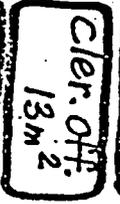
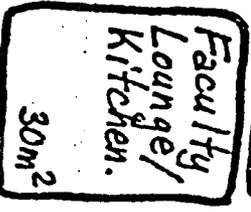
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Law Faculty



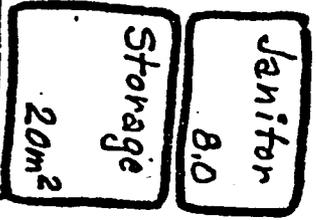
FACULTY OFFICES

Faculty Offices

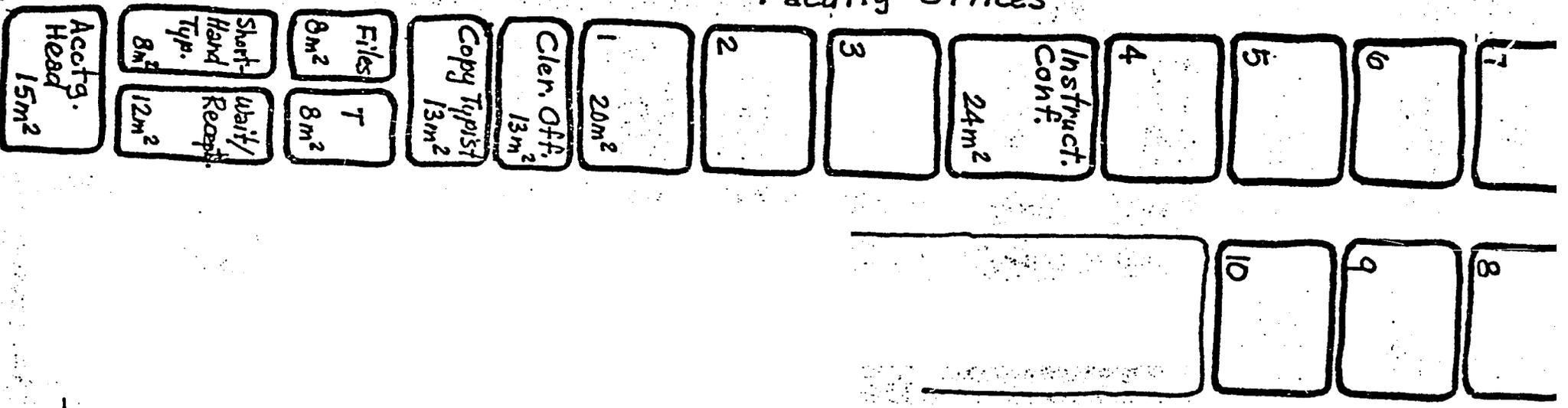


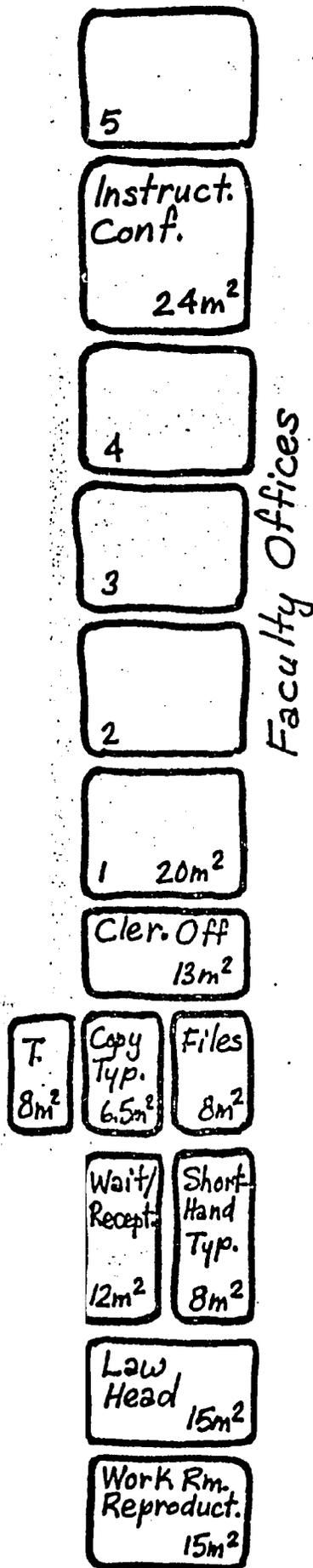
Faculty Offices

MANAGEMENT OFFICES



Faculty Offices





LAW OFFICES

C. Learning Resource Center

1. Description

The Learning Resource Center is intended to provide for the educational and cultural resource needs of the student body and staff. This facility will house the Library and all Education Media Support areas such as Production, Correspondence, Recording and Audio-Visual.

A software library will also be available, including tapes, records, cassettes and other audio-visual materials. These materials will be made available for use either in the Library or on a "check-out" basis.

2. Relationships

For maximum usage, the Learning Resource Center should be centrally located and immediately adjacent to both the dormitories and the instructional areas.

3. Assumptions

a. Twenty-five percent of the student body will utilize the Library at any one time.

b. User capacity - 200.

c. An extensive audio-visual collection will be maintained to augment the classroom lecture material.

4. Functional Criteria

a. The Library is sized to conform to criteria and standards recommended by the American Library Association.

b. The types of library space required will include General Reading, Individual Carrels, Reference, Periodicals and Typing.

c. Noise levels must be controlled.

d. The library should be carpeted in spaces such as receiving work, storage and toilets.

e. A display area is required in the Main Lobby for historical evolution of the Cooperative Movement.

f. The Learning Resource Center planning and design must allow for future expansion.

<u>Distribution of Seating by Type</u>		<u>Student Seating Distribution Criteria</u>	
Carrel Seating	45%	Carrels	90
Table Seating	45%	Tables	90
Lounge Seating	7%	Lounge	14
Typing Rooms	3%	Typing Rooms	6
	100%		200

5. Collection Criteria

Main Collection = 40,000 volumes for the first 600 students, plus 10,000 volumes for each additional 200 students at approximately .01m² per volume.

NOTE: In view of the limited scope of course offerings, and after review of the number of volumes provided at other local and area libraries such as:

- Egerton college, Njoro, Kenya, designed for 50,000 volumes and projected 1650 students and ultimately 3000,

- National Central Library, Nairobi, Kenya, 45,000 volumes,

this number has been considerably reduced from U.S. standards.

6. Space Criteria

2.3 nsm per person per conference area;

1.85 nsm per study carrel;

2.8 nsm per person per reading area;

Stack area: 23 volumes per lineal meter of shelving, standard bookshelving units; six shelves, adjustable 90 cm x 25 cm x 204 cm;

Stack area: a range of 110-160 volumes per square meter is recommended. Use 130 volumes/m²;

Office space:

Division Heads, Directors at 15 nsm;

Faculty at 12 nsm;

Staff office at 10 nsm;

Shorthand Typist at 8 nsm;

Clerical work stations at 6.5 nsm.

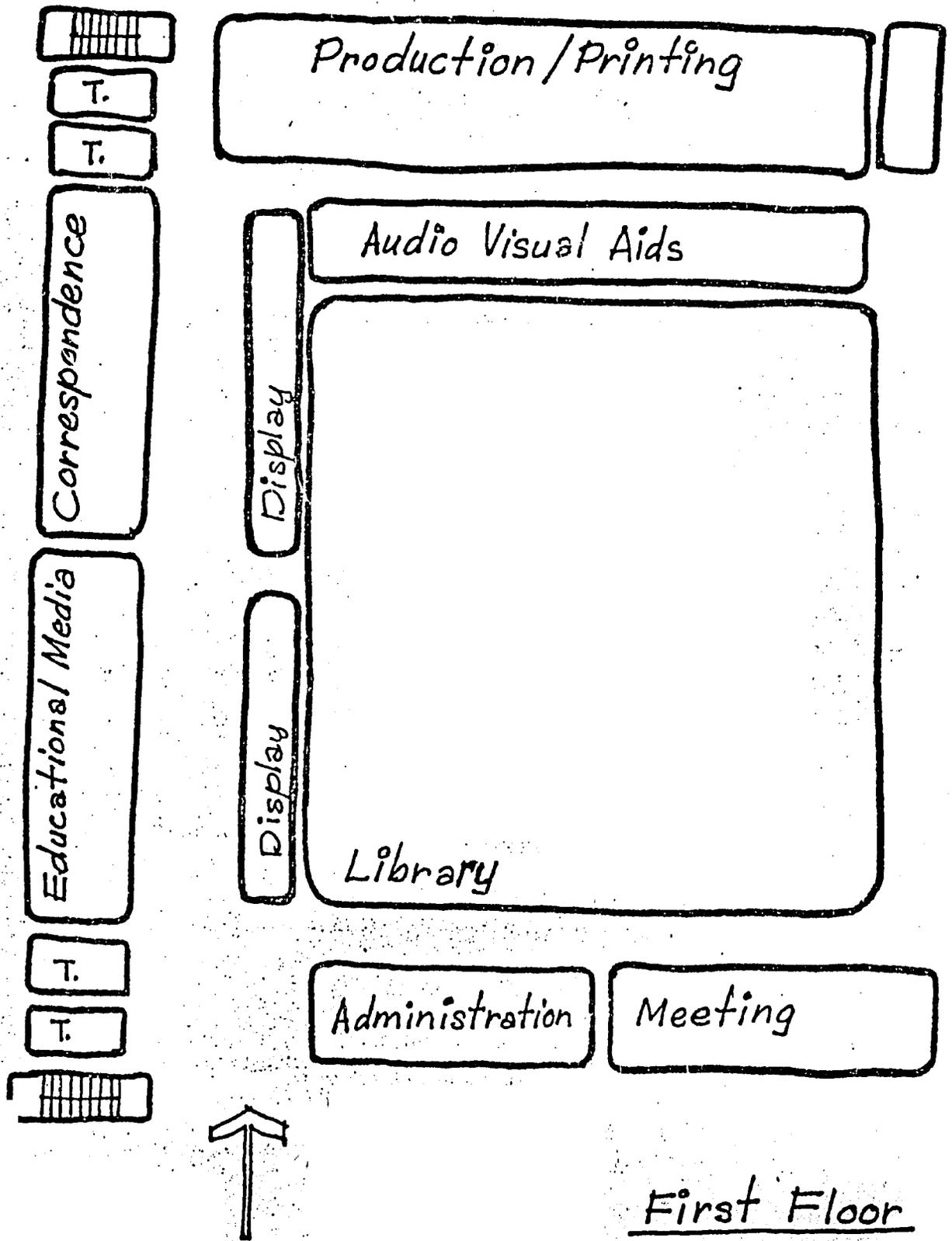
7. Learning Resource Center - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby/Display	150.0
Public Toilets	26.0

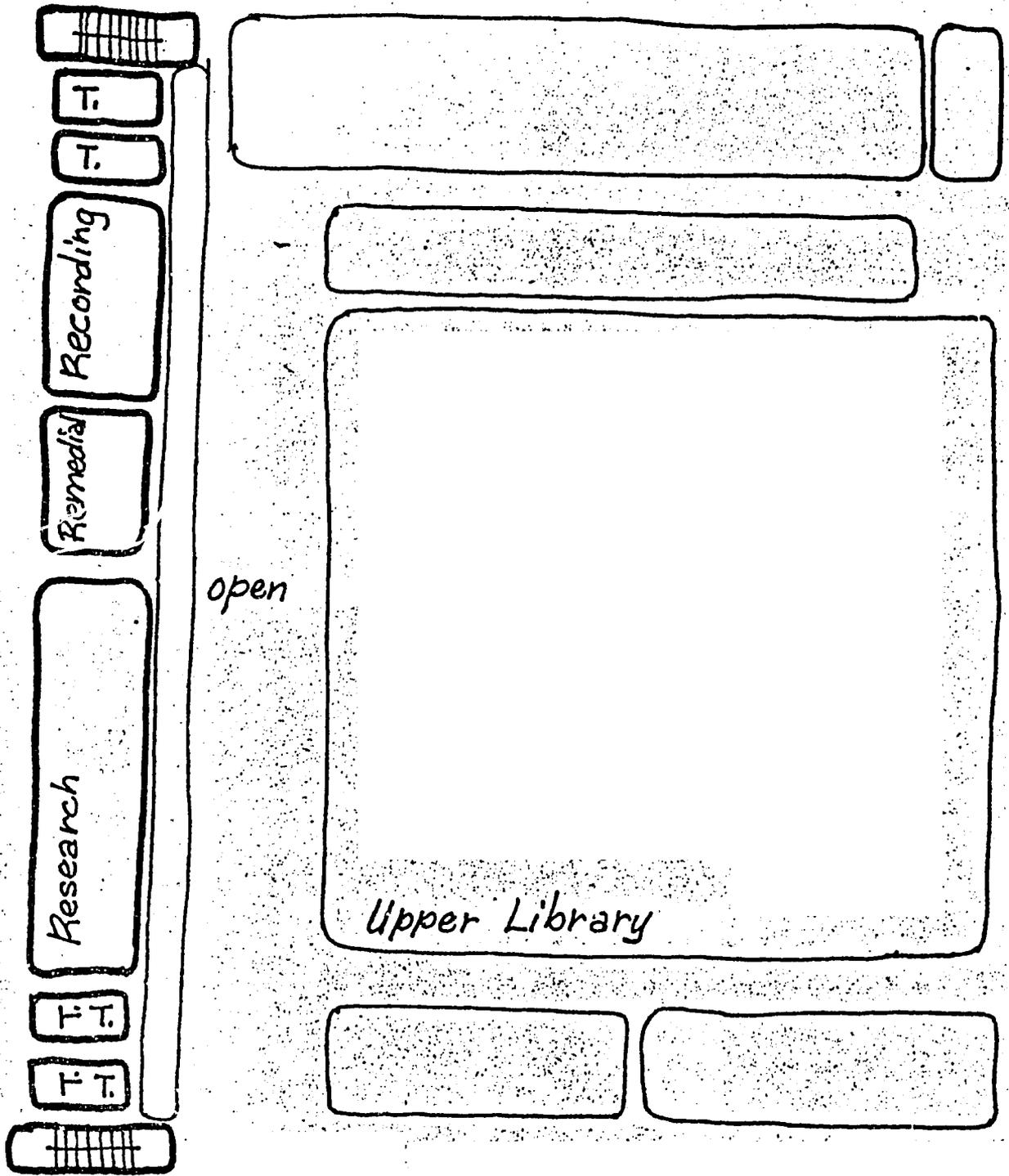
Office Areas

Director-Learning Resource Center	15.0
Shorthand Typist	8.0
Clerical Officers	6.5
Educational Service Unit	
Research Unit Coordinator	12.0
Research Coordinator Technicians (3@ 10.0m ²)	30.0
Copy Typist	6.5
Clerical Officer (2 at 6.5m ²)	13.0
Correspondence Coordinator	12.0
Correspondence Lecturers-Developers (2 @ 10m ²)	20.0
Copy Typists (2 at 6.5m ²)	13.0
Clerical Officer (3 at 6.5m ²)	19.5
Remedial Specialist Lecturer	12.0
Educational Media Center	
Director-Educational Design	15.0
Copy Typist	6.5
Audio-Visual Aids	
Coordinator	12.0
AV Lecturer (2 at 12m ²)	24.0
Technicians (2 at 10m ²)	20.0
Copy Typists	6.5
Clerical Officers (2 at 6.5m ²)	13.0
Audio-Visual Viewing and Listening Rooms	13.0
Audio-Visual Storage and Distribution	30.0
Production/Printing	
Director	12.0
Assistant	10.0
Graphic Artist	10.0
Copy Typist	6.5
Production/Printing Area	80.0
Storage	25.0
Workroom with sink	15.0
Dark Room	15.0
Graphics Work Room	40.0
Recording	
Audio Studio	20.0
Audio Control	10.0
Technicians (2 at 10m ²)	20.0
Library	
Librarian	15.0
Assistant Librarian	12.0
Copy Typists (2 at 6.5m ²)	13.0
Clerical Officers (3 at 6.5m ²)	19.5

Main Entrance	20.0
Control and Circulation	27.0
Card Catalog	17.0
Seating	
Students (190 seats at 3m ²)	570.0
Faculty (10 seats at 5m ²)	50.0
<u>Collections</u>	
Main Collection 40,000 vol.	400.0
Reserve Collection 660 vol.	6.6
Reference Collection 2,000 vol.	20.0
Bound Periodicals 2,000 vol.	20.0
Current Periodicals 66 vol.	.7
Typing cubicles (6 at 2m ²)	12.0
<u>Office Support Areas</u>	
Conference Rooms (2 at 20.0m ²)	40.0
Group Meeting Rooms	35.0
<u>Technical Processes Areas</u>	
Acquisition/Catalog Processing	40.0
Receiving Area	20.0
Workroom	40.0
Storage	50.0
<u>Employee Areas</u>	
Employee Lounge/Tea Kitchen	30.0
Toilets	32.0
<u>Maintenance</u>	
Janitors' Room	15.0
Trash	10.0
<hr/>	
Net Building Total	2288.8
Gross Conversion Factor	<u>x 1.4</u>
	3204.3
Gross Building Area	say 3205.0
<hr/>	
Exterior Program Elements	
Service Area	50.0

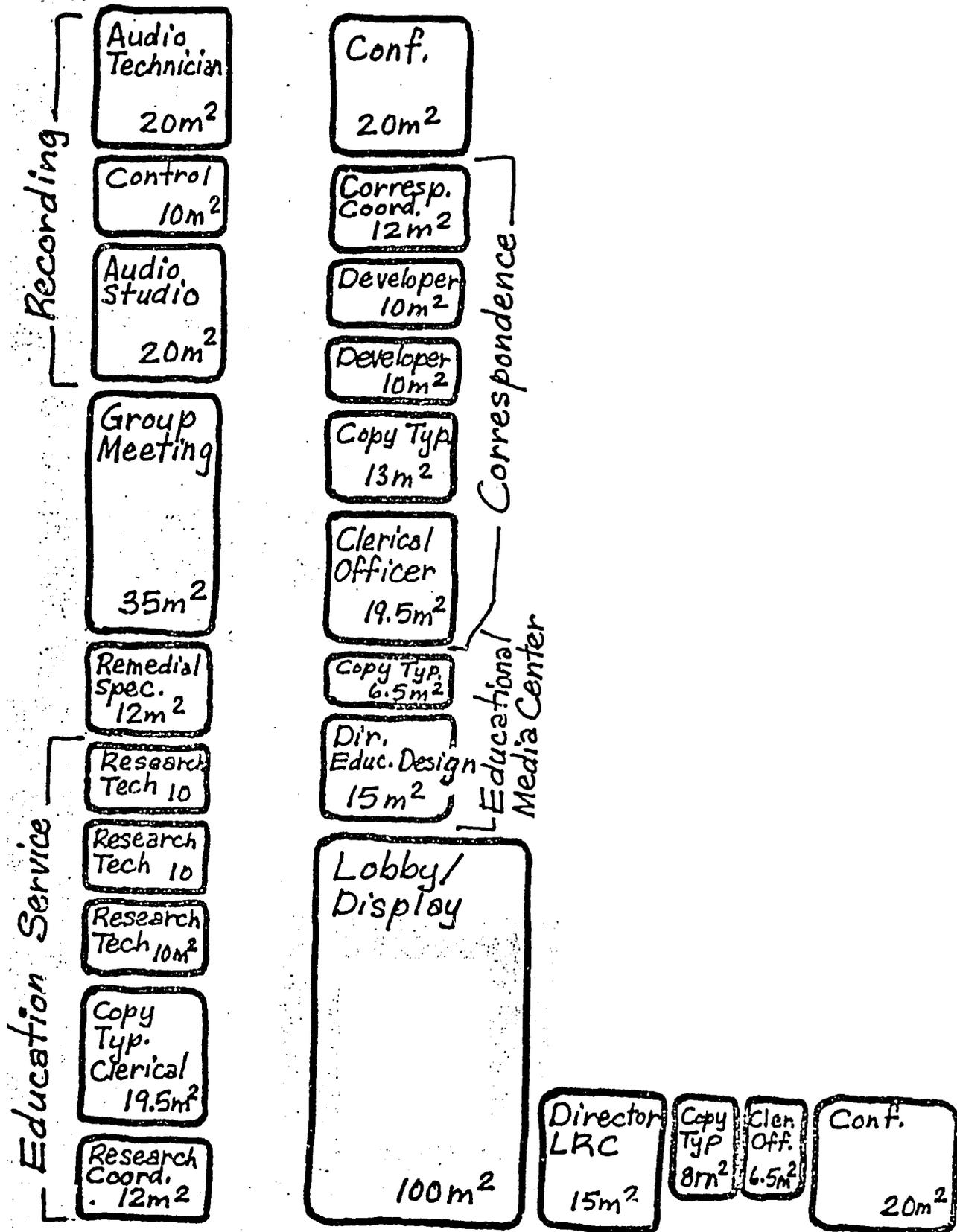


LEARNING RESOURCE CENTER

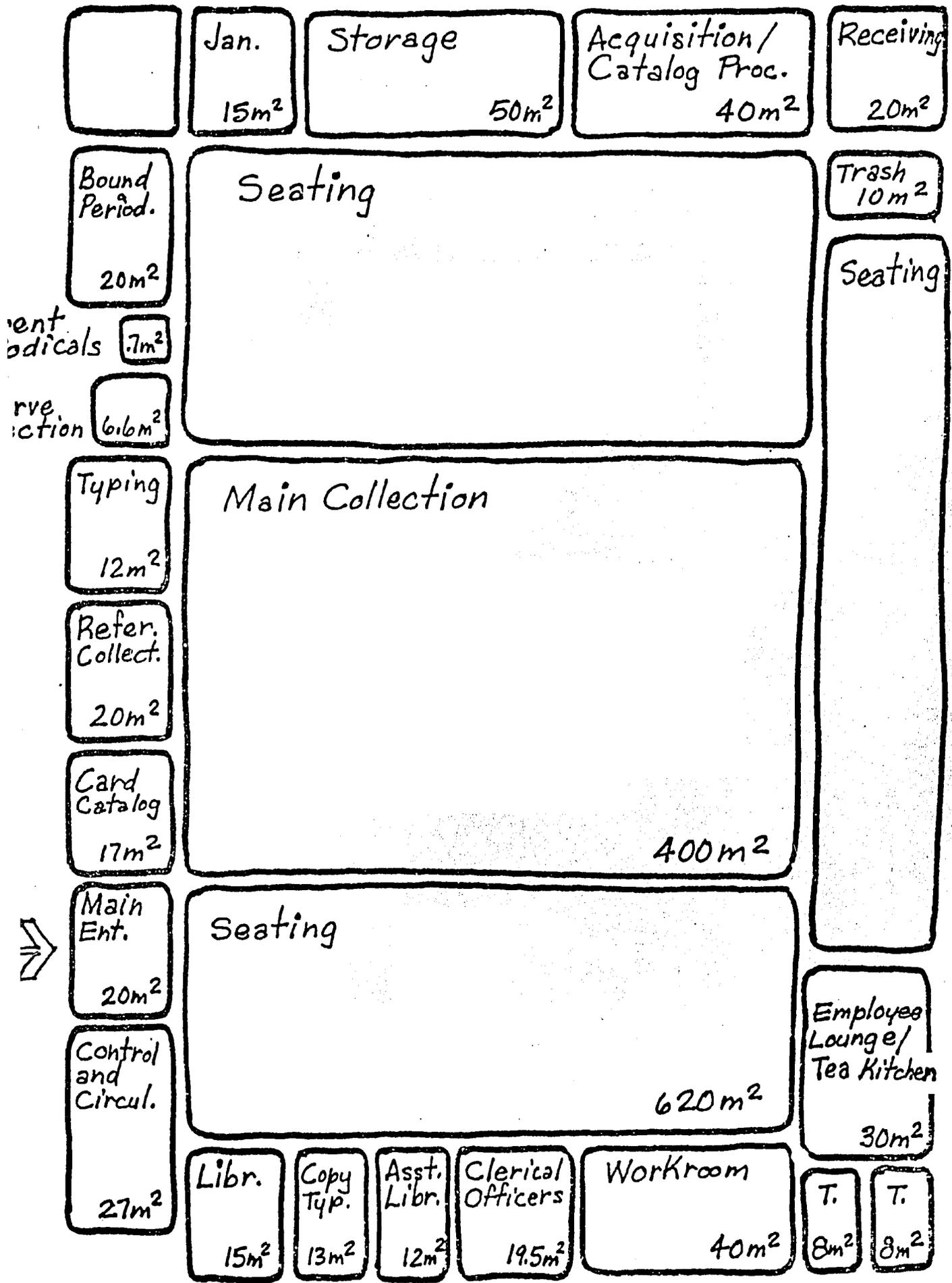


Second Floor

LEARNING RESOURCE CENTER

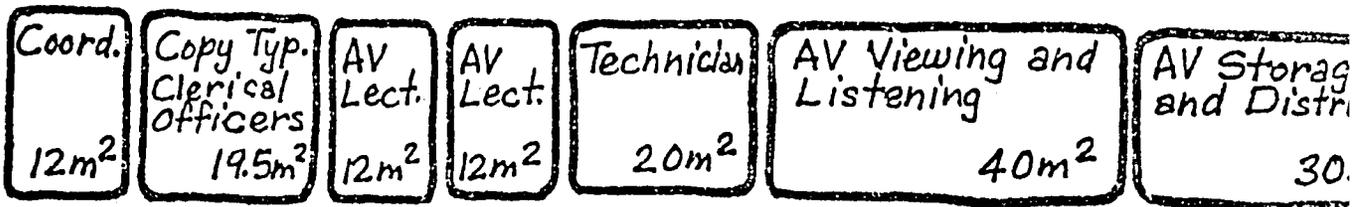
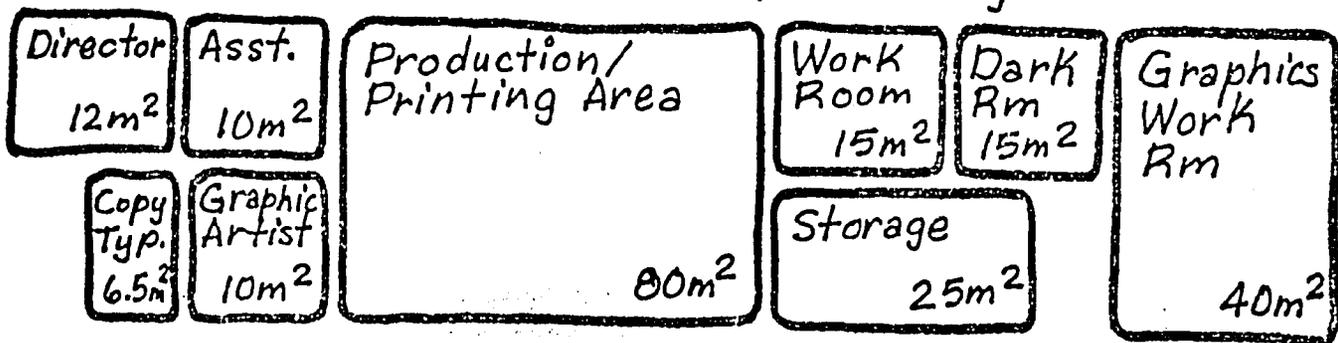


LEARNING RESOURCE CENTER



LIBRARY

Production/Printing



Audio Visual Aids

AUDIO VISUAL and PRODUCTION PRINT

D. Instructional Area

1. Description

The Instructional Area is intended to provide for all student instructional activities.

2. Relationships

The Instructional Area should be proximate to the Learning Resource Center, the Dormitories and the Faculty Office area.

3. Assumptions

a. Existing classroom space will in part continue to be utilized for instruction.

b. Existing Cooperative Banking Mock-up will be relocated into a larger classroom.

4. Functional Criteria

a. Instructional space organization facilities should be grouped by space type to permit future change in departmental organization and composition.

b. Classrooms are set up for 30-student capacity.

c. Two classrooms are to be set up so that they can be combined into one large classroom for 60 students.

d. Three classrooms are to be set up for 30 students plus an operational mock-up; these include:

Cooperative Banking Model
Farm Supply Store Model
Savings and Credit Model

e. Lockable Storage Cabinets should be provided in all classrooms.

5. Space Criteria

Classroom size will be based on the following criteria:

Large Classroom 120 nsm;
Medium Classroom 80 nsm;
Small Classroom 60 nsm.

6. Instructional Area - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby/Commons	20.0
Toilets	48.0
<u>Instructional Areas</u>	
General Classrooms (12 at 60m ²)	780.0
Classroom/Mock-ups (3 at 120m ²)	360.0
<u>Maintenance</u>	
Janitors' Room	10.0
<hr/>	
Net Building Area	1218.0
Gross Conversion	<u>x 1.3</u>
	1583.4
Gross Building Area say	1585.0

Stair/Jan.

Classroom 1

60m²

Classroom/Mock-up 1

120m²

Classroom 2

60m²

Classroom 7

60m²

Classroom 3

60m²

Toilet
12m²

Classroom 4

60m²

Lobby/
Common

20m²

Toilet
12m²

Classroom 5

60m²

Classroom 8

60m²

Classroom 6

60m²

Classroom Mock-up 2

- 35 -

120m²

Stair

First Floor

INSTRUCTIONAL AREA

Stair / Jan

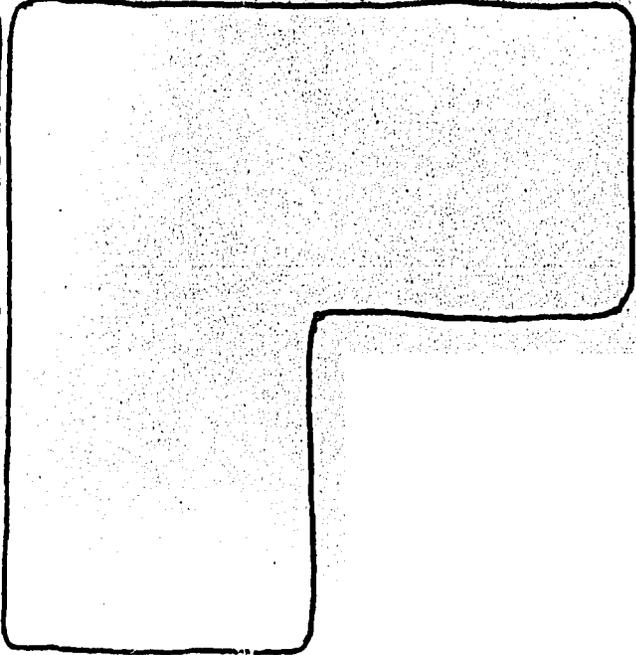
Classroom 9
60m²

Classroom 10
60m²

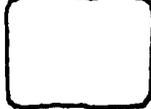
Classroom /
Mock-up
120m²

Classroom 11
60m²

Classroom 12
60m²



Toilet
12m²



Classroom 13
60m²

Toilet
12m²



Second Floor

Stair

INSTRUCTIONAL AREA

E. Student Dormitories

1. Description

The Student Dormitories are intended to provide double room accommodations for the student population. The dormitories are to be coeducational with male and female students on alternate floors.

2. Relationships.

The Student Dormitories should be located proximate to the Learning Resource Center, the Instructional Area, the Kitchen/Dining Facility, the Activity Center, as well as the Outdoor Recreational Facilities.

3. Assumptions

216 students will remain housed in existing dormitories.

4. Functional Criteria

- a. Provide accommodation for 288 students;
- b. Natural ventilation must be maximized;
- c. Hand launcry facilities should be provided, as well as clothes lines;
- d. Provide for in-room study accommodations
- e. Provide one-room deep 3 or 4 story structures;
3 stories of 16 double rooms each or 4 stories of 12 double rooms each.

5. Space Criteria

Study-Bedrooms (double rooms) at 14.0 nsm per person;

Lounge at 1.5 nsm per person;

Luggage storage at 0.2 nsm per person;

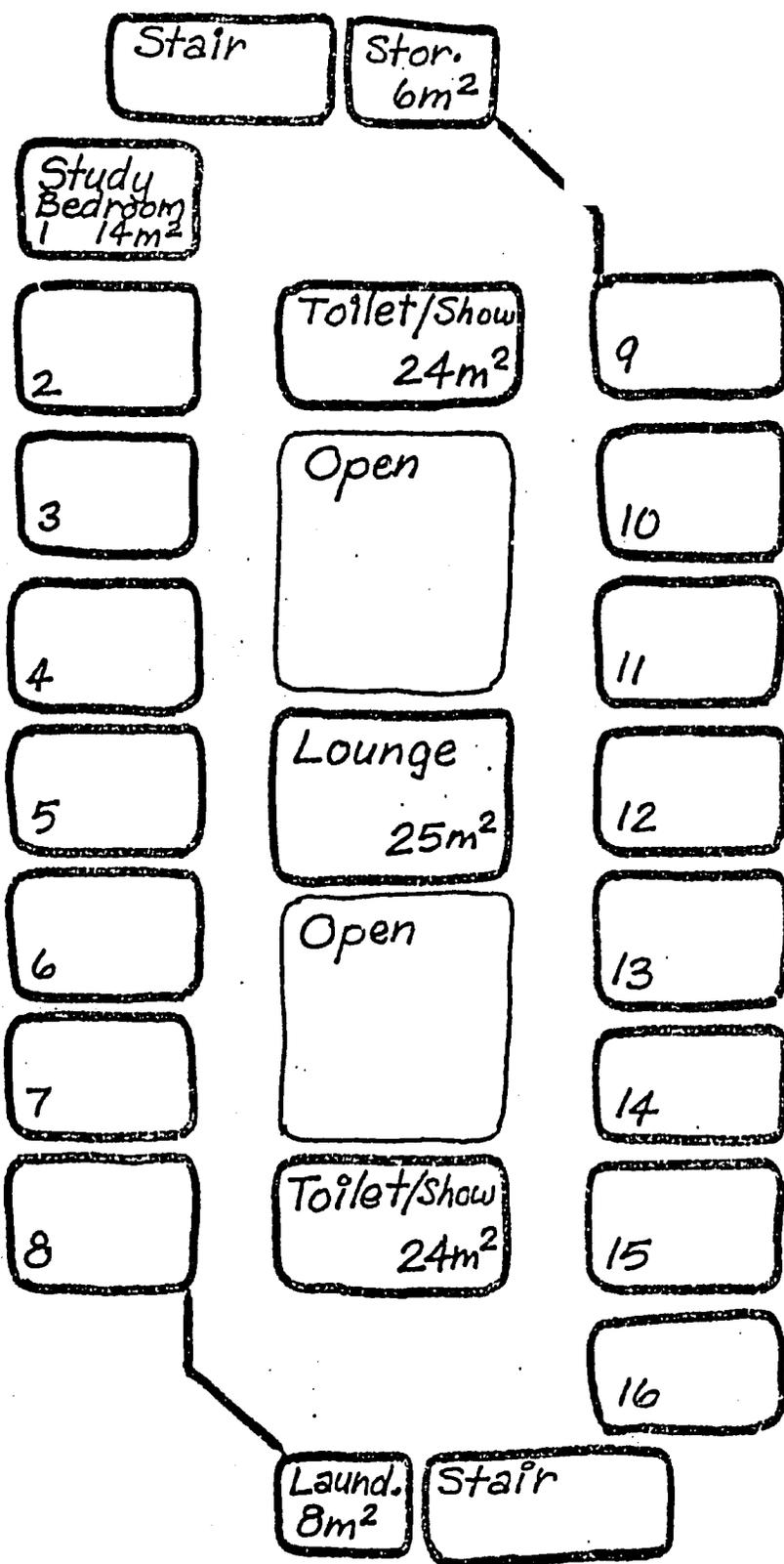
Toilets--Water Closets - 1 per 4 people at 2.5 nsm per fixture;

 Showers - 1 per 4 people at 2.5 nsm per fixture;

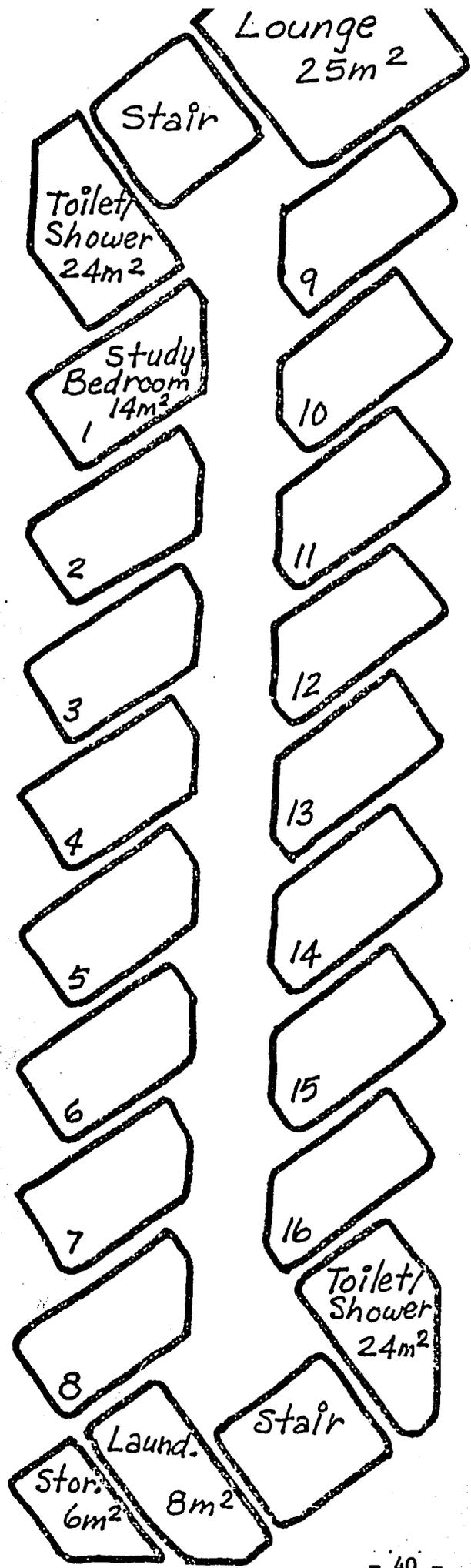
 Lavatory - 1 per 3 people at 2.5 nsm per fixture.

6. Student Dormitories - Building Space Program -

Space	Area (m ²)
Study-Bedroom (96 at 14.0 m ²)	1344.0
Toilet/Shower (6 at 24.0 m ²)	144.0
Lounge (3 at 25.0 m ²)	75.0
Laundry (3 at 8.0 m ²)	24.0
Storage (3 at 6.0 m ²)	18.0
Linen Storage	
Covered, Open corridors and galleries @ ½ area	200.0
<hr/>	
Net Building Area	1819.0
Gross Conversion Factor	<u>x 1.2</u>
	2182.8
Gross Building Area	say 2185.0
Total Gross Dormitory Building Area (3 at 2185 m ²)	6555.0



STUDENT DORMITORIES



ALT. STUDENT DORMITORIES

F. Kitchen/Dining Facility

1. Description

The Kitchen/Dining Facility is provided to accommodate all of the students simultaneously during meals.

2. Relationships

The Kitchen/Dining facility should be centrally located and proximate to the classroom and student dormitory areas.

3. Assumptions

a. User capacity 560 with dining facilities for Continuing Education participants being located separately. (Utilization of seating is assumed to be 90%, requiring a total seating capacity of 500 students \div .90 = 555.6 (use 560) using 10 seats per table.)

b. As the College student enrollment increases beyond the design capacity, staggered lunch periods will be employed.

4. Functional Criteria

a. Staff toilets should not open into the kitchen area, but rather to the outside.

b. Kitchen and Related Area Space Factors

<u>Area Name</u>	<u>Factor</u>
Receiving	.029
Checking	.034
Control Office	.025
Bulk Food Stores	.104
Non-Food Stores	.040
Broken Case Stores	.029
Meat Cold Room	.032
Vegetable Cold Room	.060
Dairy Cold Room	.025
Meat Freezer	.018
Kitchen	.484
Dishwashing	.120
	<u>1.000</u>

5. Space Criteria

2.5 nsm per person in Dining Area

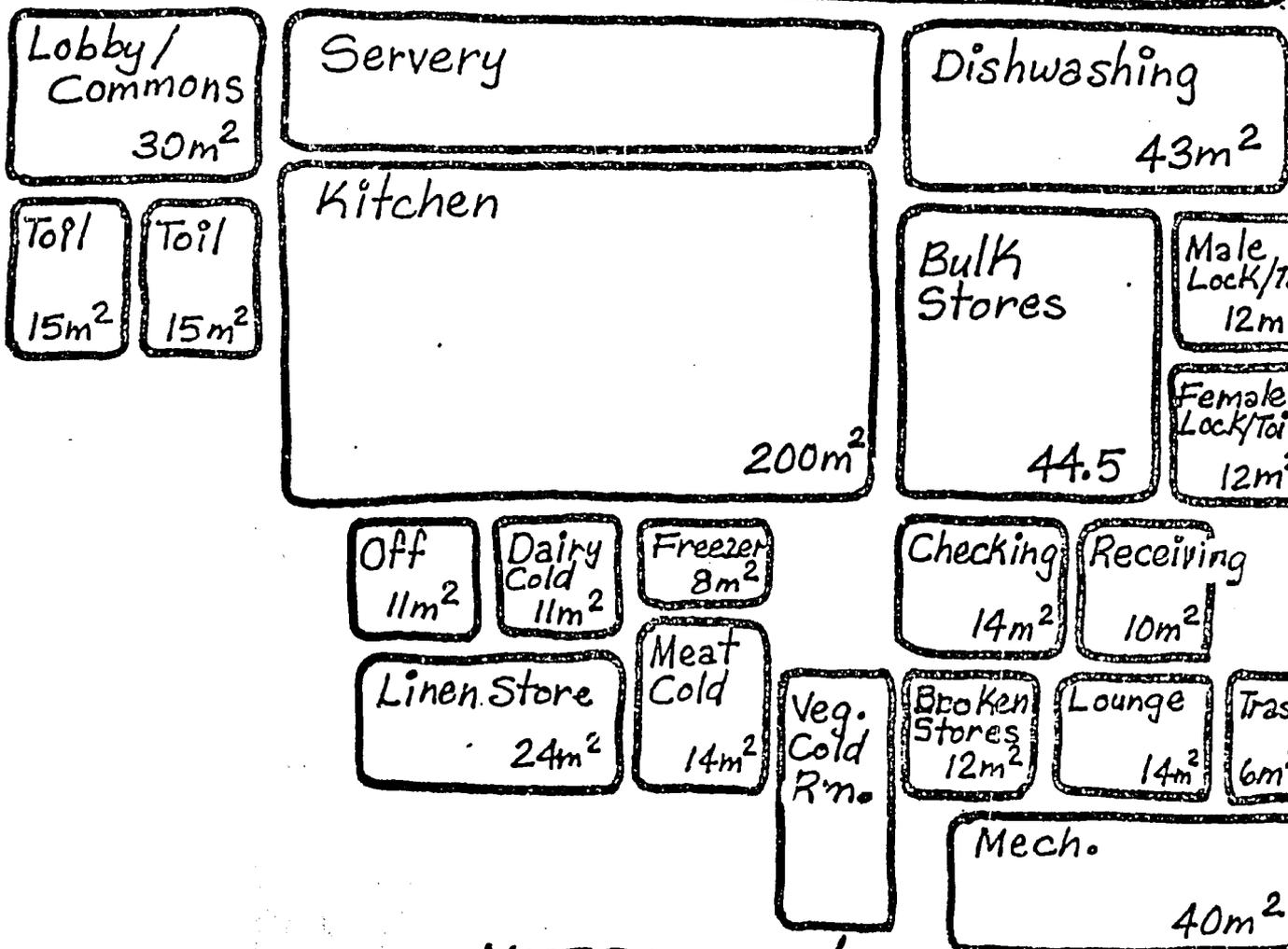
Kitchen should be sized at .75 nsm per meal served

6. Kitchen/Dining Area - Building Space Program

Space	Area (m ²)
<u>Public Areas</u>	
Lobby/Commons	30.0
Student Toilets (2 at 15m ²)	30.0
Dining Room (560 sets at 2.5m ²)	1400.0
<u>Production Areas</u>	
Control Office	11.0
Bulk Food Stores	44.0
Non-Food Stores	17.0
Broken Case Stores	12.0
Meat Cold Room	14.0
Vegetable Cold Room	24.0
Dairy Cold Room	11.0
Meat Freezer	8.0
Kitchen	200.0
Dishwashing	43.0
<u>Staff Areas</u>	
Staff Lockers/Toilets (2 at 12m ²)	24.0
Staff Dining/Lounge	14.0
<u>Maintenance and Mechanical Areas</u>	
Receiving	10.0
Linen Storage	24.0
Checking	14.0
Janitors' Room	6.0
Mechanical	40.0
Trash and Garbage Storage	6.0
Fuel Storage (open covered area ½ area)	25.0
<hr/>	
Net Building Area	2007.5
	<u>x 1.3</u>
	2609.75
Gross Building Area	say 2610.0
<hr/>	
<u>Exterior Program Elements</u>	
Service Area	200.0

Dining

1400m²



KITCHEN/ DINING

G. Activity Center

1. Description

The Activity Center provides the students with space for various leisure and recreational activities.

2. Relationships

The Activity Center should be located proximate to the Dormitory areas if site limitations permit adjacent the outdoor recreational areas such as the swimming pool.

3. Functional Criteria

a. To determine the capacity of the Center, space for 25 percent of the total number of students is used.

b. Total accommodations should include allowance for outdoor (terrace) seating areas.

c. If a swimming pool is provided in conjunction with this facility, it should be located in such a way as to satisfy both the users and the audience.

4. Space Criteria

Total capacity = 125

Provide space for activity areas according to the following criteria:

Lounge at $4.0m^2$ per person and 20% of total capacity;

Games at $6.9m^2$ per person and 35% of total capacity;

Radio-TV area at $2.0m^2$ per person and 22% of total capacity;

Reading at $2.8m^2$ per person and 8% of total capacity;

Snack Bar at $1.5m^2$ per person and 15% of total capacity;

Table Tennis at $48m^2$ per table;

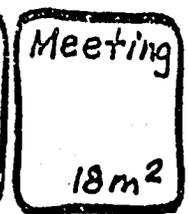
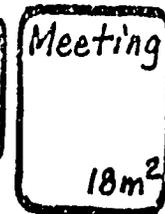
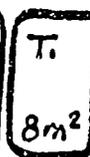
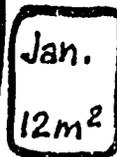
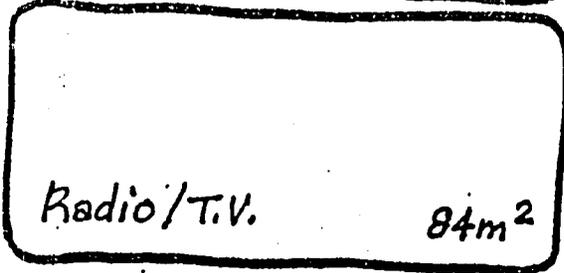
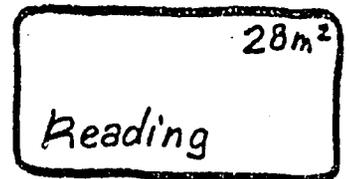
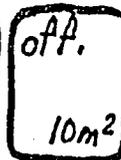
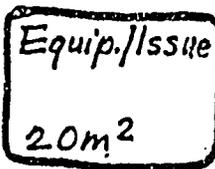
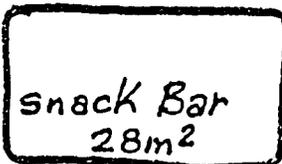
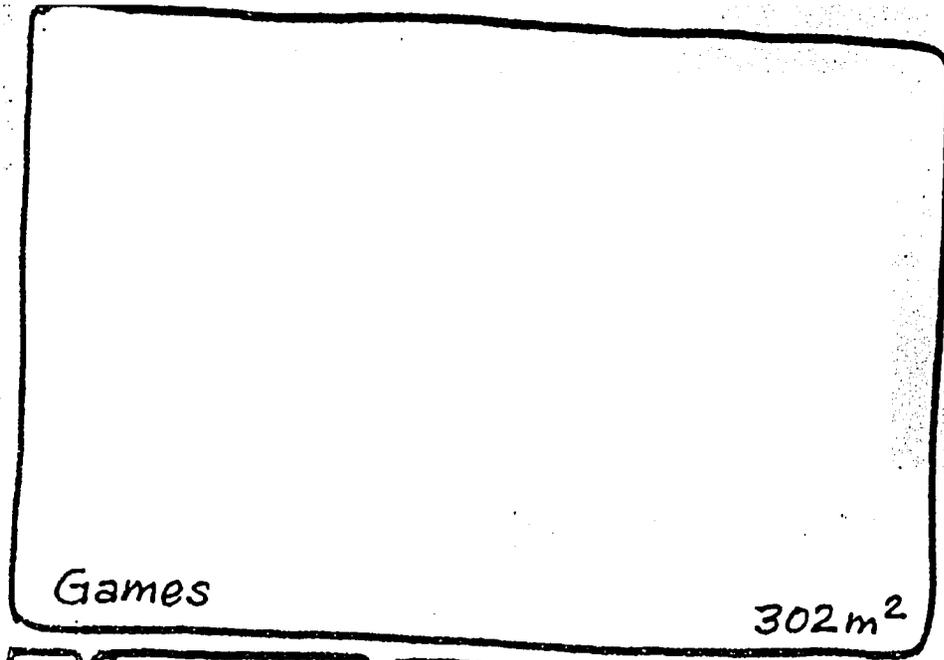
Billiard Table at $42m^2$ per table;

Area card table at $9m^2$ per table;

Provide 3 table tennis, 3 billiard tables and 4 card tables in Games area.

5. Activity Center - Building Space Program

Space	Area (m ²)
Public Areas	
Lobby/Commons	10.0
Toilets	16.0
Activity Areas	
Lounge (25 at 4.0m ²)	100.0
Games (43.75 at 6.9m ²)	302.0
Radio-TV Area (28 at 3.0m ²)	84.0
Reading (10 at 2.8m ²)	28.0
Snack Bar (18.75 at 1.5m ²)	28.0
Meeting Rooms (2 at 18m ²)	36.0
Equipment Storage/Issue	20.0
Office	10.0
Maintenance	
Storage	20.0
Janitors' Room	12.0
Trash	8.0
<hr/>	
Net Building Area	674.0
Gross Conversion Factor	<u>x 1.3</u>
	876.2
Gross Building Area	say 880.0



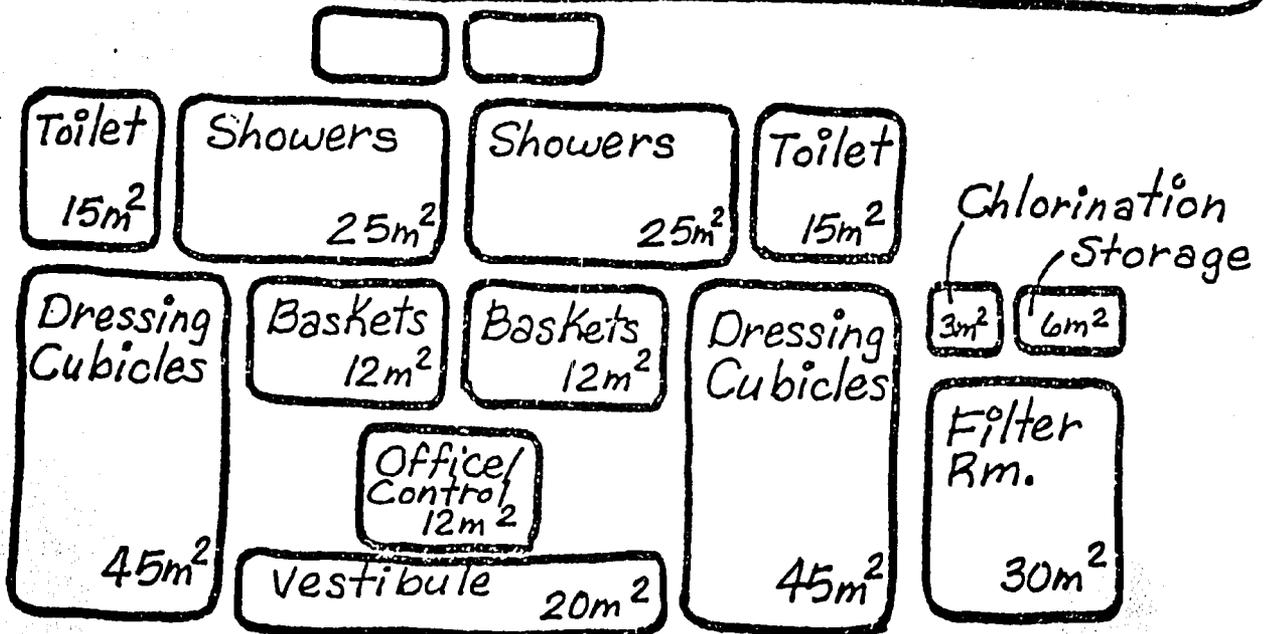
ACTIVITY CENTER

Deck

Outdoor Pool

375m²

375m²



BATH HOUSE AND POOL

H. Multi-Purpose Auditorium

1. Description

The Multi-purpose auditorium will provide student assembly spaces suitable for a wide variety of performances and related functions. These include, but are not limited to lecturers, panel discussions, exhibitions and dramatic, musical and other performances. In addition to this more formal functions, the Multi-purpose facility can serve as a meeting place for informal discussions and socializing by students, staff and the community as well. The facility can also accommodate a full range of indoor sports activities such as volleyball, tennis, gymnastics, and wrestling.

2. Relationships

The Multi-purpose Auditorium should be centrally located to students and Continuing Education participants. It should also be situated to allow for accessibility for the outside public and yet to the Campus security, and have the ability to be locked off from the remainder of the Campus. It should be located away from the academic or instructional area and yet still be accessible to the academic area and parking facilities.

3. Functional Criteria

- a. Seating Capacity -- 1000 maximum
- b. The Auditorium should accommodate movable seating and portable sports equipment and storage.
- c. Locker rooms sized for 25 people each.
- d. The Auditorium should have the capability of being subdivided into smaller activity modules by folding partitions.
- e. Showers/drying sized for 10 each.

4. Space Criteria

Auditorium Seating at .74 nsm;
Multi-purpose gymnasium (includes basketball, volleyball, and seating (bleachers) at 882m²).

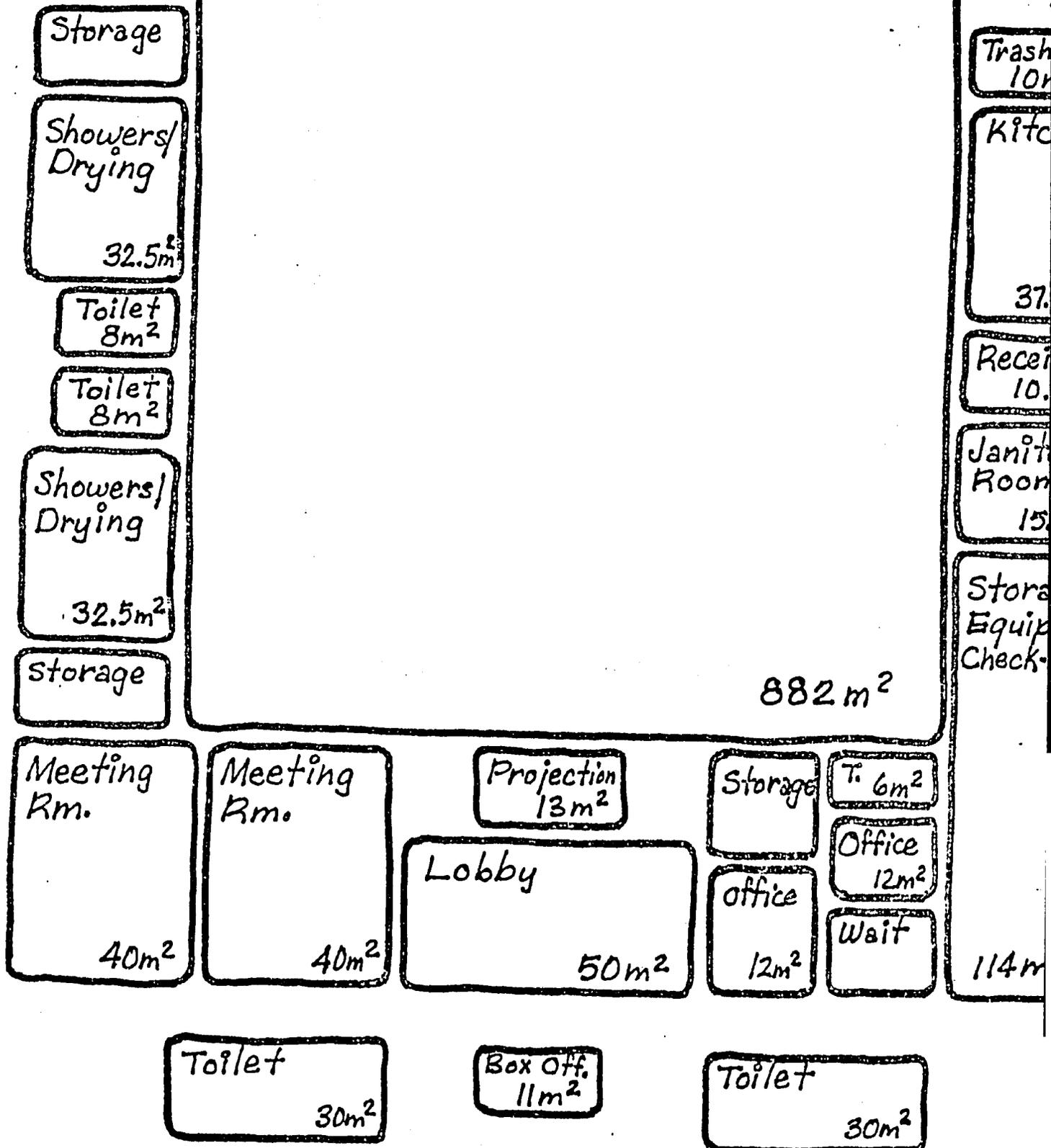
Gross Area Requirements for Basketball

<u>Play Area</u>	<u>Gross Dimensions</u>	<u>Total Area Reqmt (m²)</u>
Minimum 12.8 x 22.5	18.8 x 28.5	536
Standard 14 x 26	20 x 32	640
Maximum 15.2 x 28.6	21.2 x 34.6	734

5. Multi-Purpose Auditorium - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby	50.0
Box Office (Ticket Booth)	11.0
Public Toilets (2 at 30m ²)	60.0
<u>Office Areas</u>	
Administration Offices (2 at 12.0m ²)	24.0
<u>Multi-Purpose Area</u>	
Auditorium	882.0
Equipment Check-out and Storage	114.0
Lockers (2 at 37m ²)	74.0
Showers/Drying (2 at 32.5m ²)	65.0
Toilets (2 at 8m ²)	16.0
Kitchen	37.5
Meeting Rooms (2 at 40m ²)	80.0
Projection Room	13.0
<u>Maintenance Areas</u>	
Receiving	10.0
Janitors' Room	15.0
Trash and Garbage	10.0
<hr/>	
Net Building Area	1393.5
	x 1.3
	<u>1811.55</u>
Gross Building Area	1815.0
	say
<hr/>	
<u>Exterior Program Elements</u>	
Visitors drop-off and Service Area	150.0

Multi-Purpose Auditorium



MULTI-PURPOSE AUDITORIUM

I. Continuing Education In-Service Instructional Space

1. Description

The Continuing Education In-Service Instructional Space is provided to accommodate specific short course workshops and seminars.

2. Relationships

The Continuing Education In-Service Instruction Space should be located proximate to the Continuing Education Hostels, Kitchen/Dining facilities, and if possible, the Learning Resource Center

3. Functional Criteria

Space is to be provided to accommodate 160 students or 25 percent of the total College training capacity.

a. Although the Continuing Education In-Service compound is an integral part of the campus, it should function as a total self-sustaining entity in itself, with all of its facilities clustered or grouped accordingly.

b. Maximum flexibility in instructional space arrangement must be maintained in order to meet the wide diversity of educational program needs.

c. Instructional space should be set up in conference room settings of tables and comfortable chairs.

d. Rooms should be set up so that two or more of the seminar/conference rooms can be opened up to accommodate 40 participants.

e. Storage modules should be built into each room.

4. Space Criteria

2.3 nsm per person per conference area.

5. Continuing Education In-Service Instructional Space

<u>Building Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby	30.0
Toilets	20.0
<u>Office Areas</u>	
Coordinator Continuing Education	12.0
Shorthand Typist	8.0
Clerical Officers (2 at 6.5m ²)	13.0
Files/Storage	10.0
Waiting	8.0
Toilet	6.0
<u>Instructional Areas</u>	
Seminar/Conference Rooms (8 at 60m ²)	480.0
<u>Maintenance</u>	
Janitors' Room	8.0
<hr/>	
Net Building Area	595.0
Gross Conversion Factor	<u>x 1.3</u>
	773.5
Gross Building Area	say 775.0

Seminar/
Conference
1 60m²

Seminar/
Conference
2 60m²

Seminar/
Conference
3 60m²

Wait
8m²

Coord.
Cont. Ed.
12m²

Clerical
13m²

Toil.
6m²

Files/
stor.
10m²

Short-
hand Typ.
8m²

Seminar/
Conference
4 60m²

Lobby/
Commons
30m²

Toilet
10m²

Jan 8m²

Toilet
10m²

Seminar/
Conference
5 60m²

Seminar/
Conference
8 60m²

Seminar/
Conference
6 60m²

Seminar/
Conference
7 60m²

CONTINUING EDUC. INSTRUCTION

J. Continuing Education In-Service Hostel

1. Description

The Continuing Education In-Service Hostels are intended to provide single-room coeducational accommodations for 160 Continuing Education participants.

2. Relationships

The continuing Education In-Service Hostels should be located proximate to the Continuing Education Instructional Space and Dining and Lounge Facilities. Proximity to the Learning Resource Center is also very desirable.

3. Assumptions

Since it is impossible to forecast the number of male or female participants for any one given seminar course, and it seems impractical to allocate a single floor or for that matter, a whole building for females, it is assumed that both male and female participants will be accommodated on the same floors.

4. Functional Criteria

- a. Room arrangements should allow for clustering or forming of suites around common shower and toilet facilities. This is particularly advantageous for not only providing semi-private facilities for the female participants but it also allows for the formation of V.I.P. suites for any senior executive officials that may attend.
- b. Maximizing flexibility of spaces and yet not minimizing the interaction and contact between participants.
- c. Natural ventilation must be maximized.
- d. Hand laundry facilities should be provided as well as clothes lines.
- e. The view towards the Mbagathi River should be maximized.
- f. Since it is anticipated that many of the participants will be middle-aged and older, it was felt that a participant should never have to walk more than one full flight of stairs either way to get to his individual accommodations.
- g. No more than four participants share a living room.
- h. Provide for lavatories in each study-bedroom.
- i. Provide for in-room study accommodations.

5. Space Criteria

Study-Bedrooms at 12.0m²

Lounge at 1.4 nsm per person

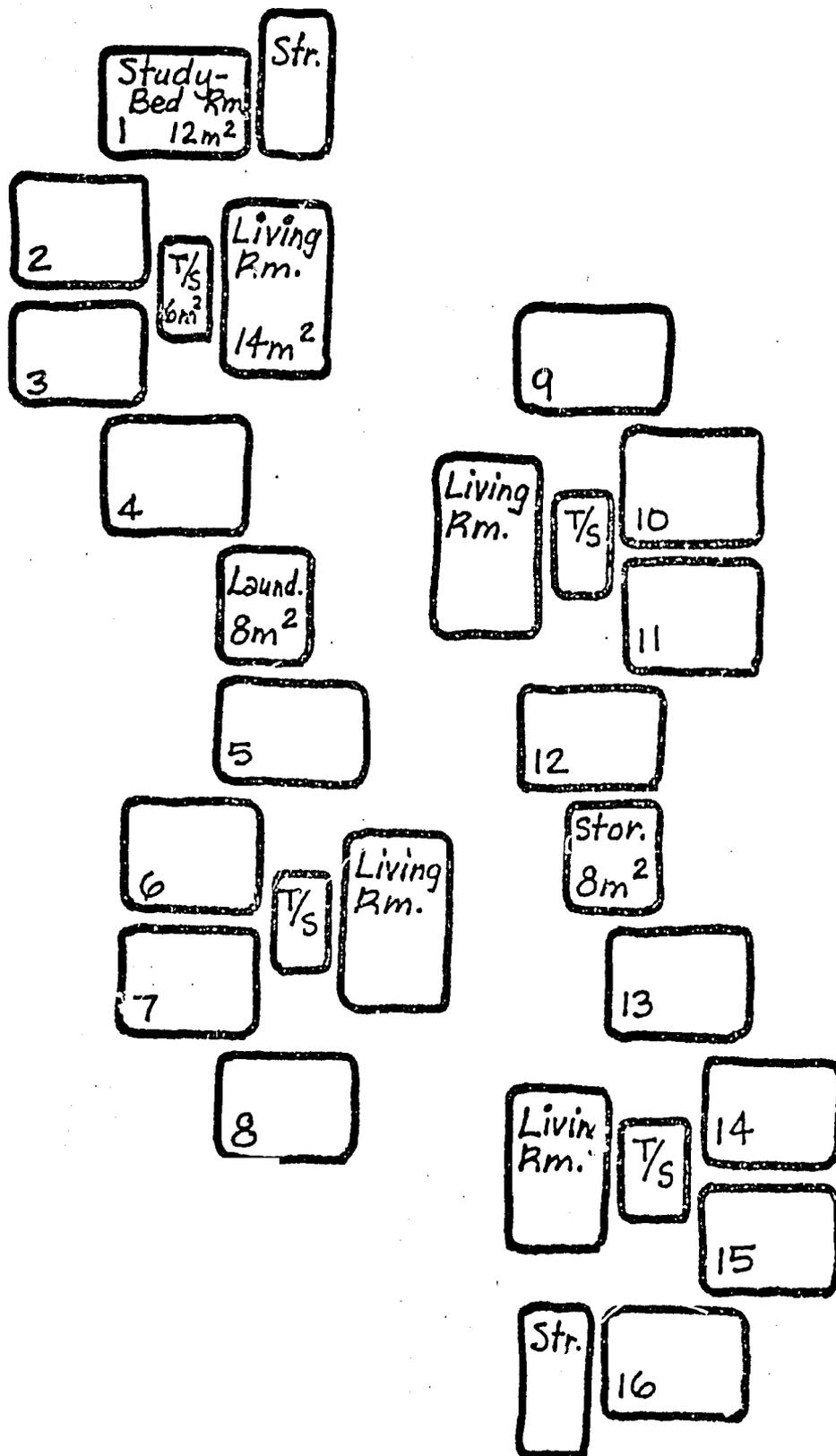
Luggage storage at 0.2 nsm per person

Toilets: Water Closets - 1 per 4 people at 2.5 nsm per fixture.

Showers - 1 per 4 people at 2.5 nsm per fixture.

6. Continuing Education In-Service Hostel - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Study-Bedroom (32 at 12.0m ²)	384.0
Water closet/shower rooms (8.0 at 8m ²)	64.0
Living Rooms (8 at 14.0m ²)	112.0
Laundry Room (2 at 8.0m ²)	16.0
Storage (2 at 8.0m ²)	16.0
Linen Storage	10.0
Covered Open Corridors and Galleries @ ½ area	150.0
<hr/>	
Net Building Area	752.0
	<u>x 1.2</u>
	902.4
Gross Building Area	say 900.0
Total Gross Hostel Building Areas (5 at 900m ²)	4500.0



CONTINUING EDUCATION HOSTEL

K. Dispensary

1. Description

The Dispensary is intended to provide for the daily medical services of the students, staff and their dependents. A small ward for holding or overnight observation of patients as well as minor emergency capabilities will be included.

2. Relationships

The Dispensary should be centrally located for easy accessibility for both the students and the staff and dependents. Road access is also an important consideration.

3. Assumptions

a. Total service population - 2160

b. With the availability of specialized health care nearby at Kenyatta National Hospital, it is assumed that this facility is only a limited outpatient unit and that any medical or surgical cases requiring extensive care will be transferred there for treatment and care.

c. The ward is to be utilized for patients requiring isolation, observation or short-stay limited care.

d. The Dispensary will be staffed by one full-time nurse with a physician and dentist or dental hygienist and a pharmacist on a part-time basis. A small support staff will also be required. "Mid-wives" will also be available for assistance.

4. Functional Criteria

The projected volume of outpatient visits and workloads as well as area parameters are derived from U.S. Military Hospital Planning Guidelines supplemented by data derived from experience with health care facilities in the United States and throughout the world.

Outpatient Visits/Year

Students	660 x 12 OPV/yr	7920
Staff	300 x 12	3600
Children	1200 x 12	14400
		<u>25,920</u> OPV/Yr.

Pharmacy Prescriptions

3.0 pres./O.V.Y.
x 25,920
77,760 prescriptions

Emergency Visits

8% of total O.V.Y. = 2,073.6 emergency visits

Of these, only 20% are expected

to be true emergencies = 414 True

Emergency Visits
per year

Dental Clinic

Planning Guidelines for dental services recommend a dentist-to-population ratio for 1 dentist to 2000-3000 population. In anticipation of difficulty in staffing, the higher ratio of 1 per 3000 will be adopted, thus indicating no full-time dentist is required. Use of dental hygienist or dental hygiene technician is, however, indicated with the support of a part-time dentist.

5. Clinic - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby	8.0
Waiting	20.0
Toilets (2 at 6m ²)	12.0
<u>Office Area</u>	
Office (2 at 15m ²)	30.0
Reception/Medical Records	15.0
<u>Outpatient Area</u>	
Exam/Treatment Rooms (2 at 12m ²)	24.0
Dental ORs (2 at 10m ²)	20.0
Dental Lab	8.0
Pharmacy	15.0
<u>Emergency Area</u>	
Emergency Wait	10.0
Emergency Room	33.0
Patient Toilet	6.0
Storage	5.0
<u>Observation Ward</u>	
Nurses' Station	10.0
Nourishment Station/Medicine Prep	5.0
Isolation Room (2 at 16m ²)	32.0
Observation Cubicles (4 at 15m ²)	60.0
Toilet/Shower	10.0
<u>Central Services</u>	
Central Stores	24.0
Clean Utility	10.0
Clean Linen	10.0
Soiled Utility	10.0
Clean-up and Sterilizing	15.0

Maintenance and Mechanical Areas

Janitors' Room	6.0
Mechanical	30.0
Trash Room	4.0

Net Building Area 432.0

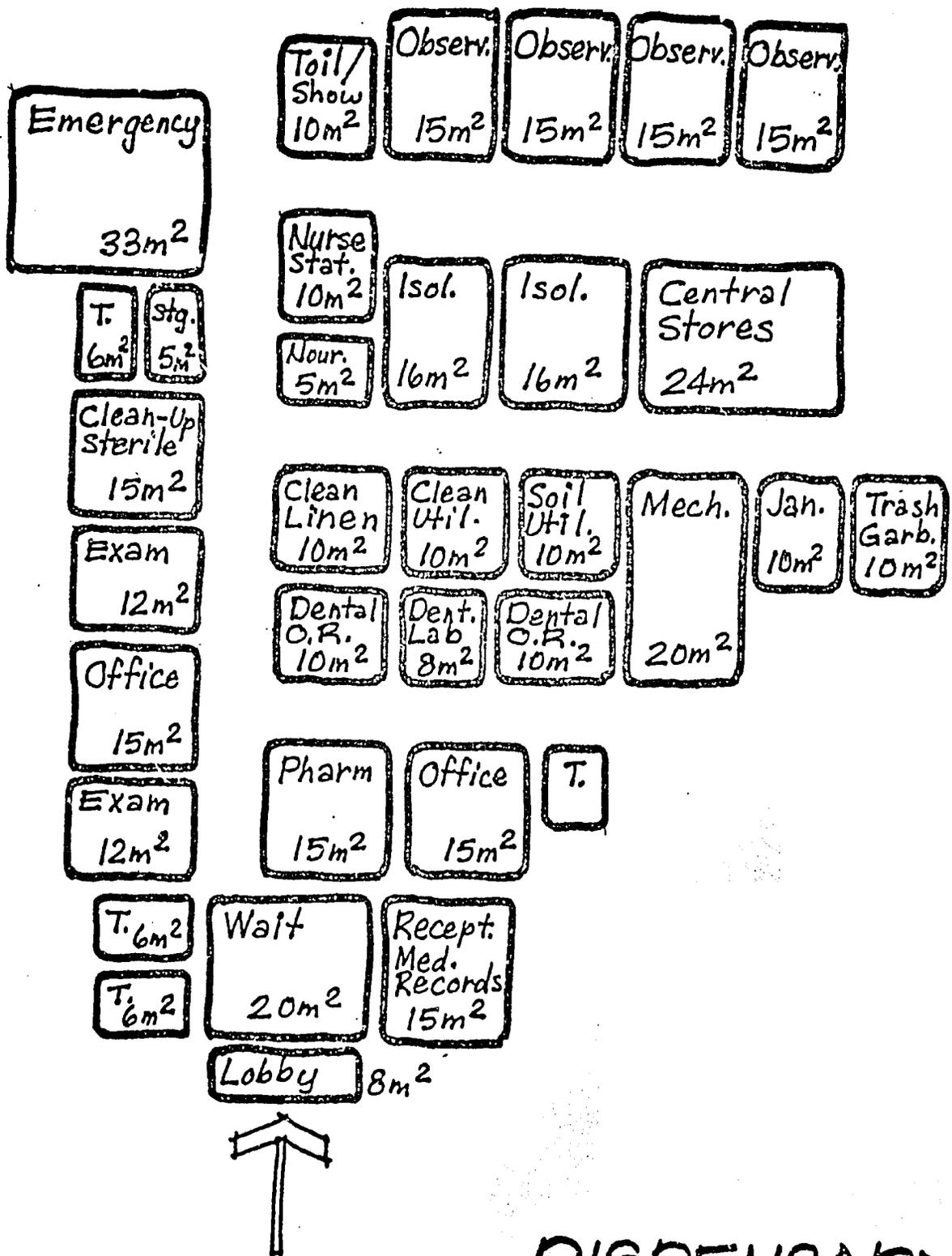
x 1.5

691.2

Gross Building Area say 695

Exterior Program Elements

Emergency access drive 50.0



DISPENSARY

L. Day Care School

1. Description

The Day Care School is intended to house the preschool age children of the campus staff members. This will include children from nursery age to age six.

2. Relationships

The Day care School must be located proximate to the staff housing areas.

3. Assumptions

- a. There will be 368 staff members on campus.
- b. There is an average of two children per staff member.
- c. 38 percent of total staff children ages 0 - 18 will be in preschool.
- d. Lunches will be served to all children.

4. Functional Criteria

- a. Classrooms are to be sized for 25 - 30 children.
- b. The Nursery area, designed for 30 children from five months to two years old, has a kitchen of its own and functions independently of the remainder of the school.
- c. Each classroom should have its own open-air play area.

5. Space Criteria

Pupil to teacher ratio of 15 to 1.
6.97 nsm per student.

6. Day Care School - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Public Areas</u>	
Lobby/Waiting	20.0
Toilets (2 at 8m ²)	16.0
<u>Administration</u>	
Director's office	12.0
Office/Conference Room	12.0
Storage/Workroom	14.0
<u>Nursery</u>	
Mothers' Room	12.0
Milk Kitchen	8.0
Bathing/Changing	10.0
Nursery (2 at 30m ²)	60.0
<u>Classrooms</u>	
Classroom (age 4 through 6)	60.0
Toilets	18.0
Classroom (age 2 through 3)	60.0
Toilets	10.0
Isolation	10.0
<u>Support Areas</u>	
Multi-Purpose Commons	37.5
Staff Room	19.0
Staff Toilet	6.0
Kitchen	15.0
Trash Room	6.0
Janitor	6.0
Covered open play area (3 at 25m ²) at 50%	37.5
<hr/>	
Net Building Area	449.0
Gross Conversion Factor	<u>x 1.3</u>
	583.7
Gross Building Area	585.0
	say

M. Cooperative Laundromat/Store

1. Description

This Co-op Laundromat/Store will provide the students, the staff and their dependents a self-service laundry service as well as a canteen area programmed to meet minor daily food demands. The Canteen will sell such items as candy, newspapers, magazines, toiletries, school supplies and limited grocery commodities and will be operated as a Co-op Laboratory teaching area for the appropriate related courses. The facility will be used as a teaching aid for the consumer management courses and will be operated by the students under faculty advisement.

2. Relationship

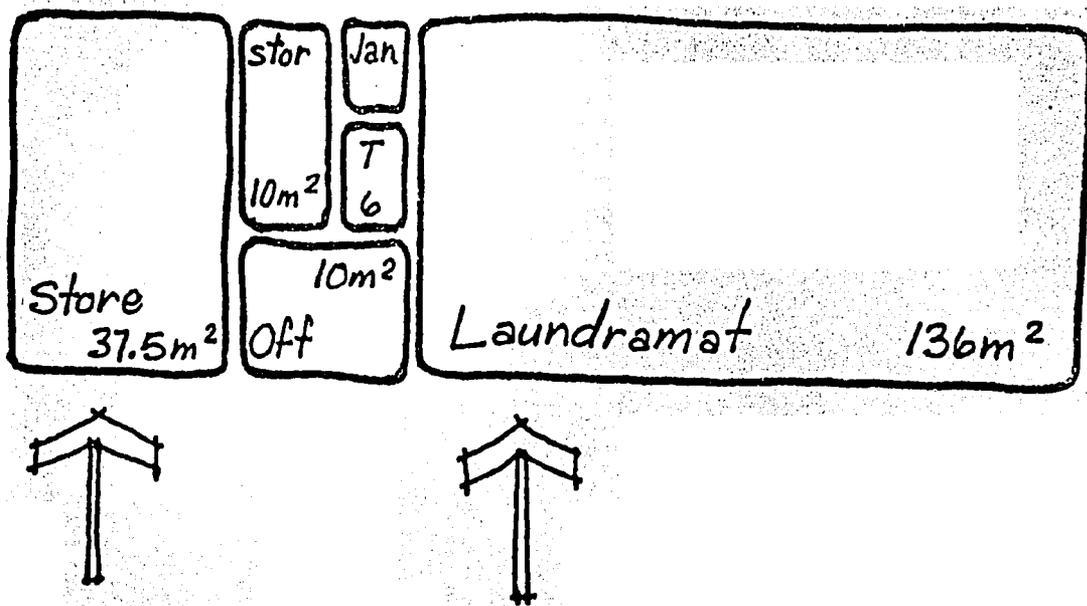
The Co-op Laundromat/Store should be located for easy accessibility by both the students and the staff, as well as their dependents.

3. Functional Criteria

Since this is a teaching as well as an operational facility, the floor area may need to be slightly higher.

4. Co-op Laundromat/Store - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Laundry Area (15 washers and dryers)	136.0
Office Laundry and Canteen	10.0
Canteen	
Cashier's Counter	3.0
Magazines	4.5
Toiletries/drugs/school supplies	10.0
Grocery Shelving	20.0
Storage	10.0
Toilet	6.0
Janitor	4.0
<hr/>	
Net Building Area	203.5
Gross Conversion Factor	<u>x 1.3</u>
	264.55
Gross Building Area	say 265.0



CO-OP LAUNDRAMAT / STORE

N. Staff Housing

1. Description

The Staff Housing is intended to provide on campus living accommodations for 303 staff members and their dependents. This Housing will be of three general types: single family detached homes; two story 4-plex units; and two story townhouses or maisonettes.

2. Relationships

The Staff Housing should be proximate to the existing units on the periphery of the campus and away from any future expansion avenues. The Staff Housing should also be proximate to the Dispensary, the Day School and the Co-op Laundromat/Canteen.

3. Assumptions

a. In light of the recent governmental changes in the area of housing, additional study will be required. This proposal will provide sufficient data for preliminary costing.

b. Approximately 3 percent of the spouses in Government housing in Grades C and D are also staff members.

c. Approximately 1.5 percent of the staff in grades C and D will live off campus.

d. Additional housing will be provided for the 46 families now doubling and tripling in the existing one-family units.

e. The following Government Grade Housing is to be provided: Grade C to include Principals, Departments Heads, Senior Teaching Staff. (Servants' quarters will be provided for the new housing provided this group.) Grade D to include Junior Teaching Staff and Clerical. (Servants' quarters will be provided for 20 staff members in this group). Grade E to include Technicians, Senior Drivers and Subordinate Staff.

f. There will be a total reallocation of existing units to accommodate the new government housing categories, e.g., the existing 3-bedroom and 4-plexes, now housing subordinate staff, might be remodeled and used to house Junior or even Senior Staff members.

g. Assume 20 percent of Junior Staff will own automobiles.

h. A future consideration may be the demolition or conversion of the 2 duplex units off of Ushirika Road north west of the existing Library block as well as the demolition of the 4 duplex units at the north east corner of the site. The demolition of these units would provide future expansion avenues.

4. Functional Criteria

a. Servants' quarters consist of 2 12-square meter rooms or a total gross of 24m² each.

b. The use of housing clusters is strongly recommended to define common outdoor space.

c. The housing units must be sympathetic to the social and cultural life styles of its future residents.

d. Land should be set aside for garden plots for staff. (Possibly bottom land.)

e. Provide 100 gallon water storage tank above each housing unit. (450 liter tank)

Functional Criteria

Number of Housing Units By Government Housing Category

Government Housing Categories	No. of Existing Units by Category	Approx.No. of Additional Staff Members	Additional Housing Requirements
C	25	15	10
D	16	51	51
E	24	196	242*
Totals	65	262	303

* Includes the provision of 46 new units for existing staff members and dependents presently doubling and tripling up in single family units

MINIMUM SIZES FOR GOVERNMENT HOUSING UNITS BY CATEGORY

	Government Category	C	D	E
		(3 Bedroom Unit)	(3 Bedroom Unit)	(2 Bedroom Unit)
AREAS	Living Room	24.0	22.0	13.73
	Vestibule	10.3	10.3	6.2
	Kitchen	7.62	7.62	5.72
	Storage	1.71	1.71	1.71
	Bedroom 1	11.1	10.2	10.84
	Bedroom 2	10.1	8.24	9.43
	Bedroom 3	10.0	8.16	-
	Bath	3.7	3.7	2.5
	Water Closet	1.71	1.71	1.71
	Closets Walls and Circulation	18.29	17.36	14.49
SPECIAL UNITS	Total Minimum Government Standard sizes (gsm)	98.53	90.0	66.32
	Yard (paved and screened)	9.9	9.9	5.93
	Total Unit Plinth (m ²)	108.43	99.9	72.25

note: These numbers were arrived at from the standard minimum sized Government Housing Plans, Ministry of Works Building Department, Republic of Kenya.

EXISTING STAFF HOUSING SPACE ALLOCATION

CATEGORY	SENIOR STAFF						JUNIOR STAFF	SUBORDINATE STAFF	
	3-Bdrm Single family (2 units)	3-Bdrm Single family (2 units)	3-Bdrm Single family (6 units)	3-Bdrm Single family (5 units)	3-Bdrm Duplex (4 family units)	2-Bdrm Duplex (6 family units)	1-Bdrm 4-plex (16 Family units)	3-Bdrm 4-plex (16 family units)*	1-Bdrm Duplex (8 Family Units)
Living Room	33.46	24.85	25.0	33.46	19.52	19.52	16.21		13.64
Entry	4.46	1.63	6.35	4.46					
Dining Room	14.4	15.76	9.76	10.22					4.99
Kitchen	8.36	7.54	10.00	8.29	7.25	6.04	5.67	5.67	3.74
B.R. I	13.29	11.38	14.52	13.29	12.55	11.15	20.4	10.07	9.54
B.R. II	10.22	9.6	11.84	10.22	7.9	10.85		10.07	
B.R. III	8.52	9.5	8.99	8.52	7.9			10.07	
Hallway	5.42	2.68	4.45	5.42	3.08	3.58			1.95
Bath	4.74	3.55	5.03	4.74	4.13				
Guest Bath	2.5		1.39	2.5					
Shower						2.2	1.67	1.67	1.95
W.C.		1.64				2.0	1.67	1.67	1.67
Storage	3.28		15.69	3.28			1.67	4.66	.55
Closets	3.16	3.22	2.84	3.16	1.86	2.98	1.3	1.95	.55
Add 12% Wall thickness	13.42	10.96	13.90	12.92	7.70	7.00	5.83	5.50	4.63
Unit Size	125.23	102.31	129.76	120.55	64.19	65.32	54.42	51.33	43.21
Carpport	19.98			19.98					
Veranda (covered)		5.60			9.18	3.72	9.0	15.54	3.35
Veranda/Yard (paved & screened)	18.91			14.31	14.31	15.61	24.22	21.36	15.24
Terrace	13.38								
Total Plinth Areas	177.50	107.91	160.08	154.84	87.68	84.65	87.64	88.23	61.8

15
69

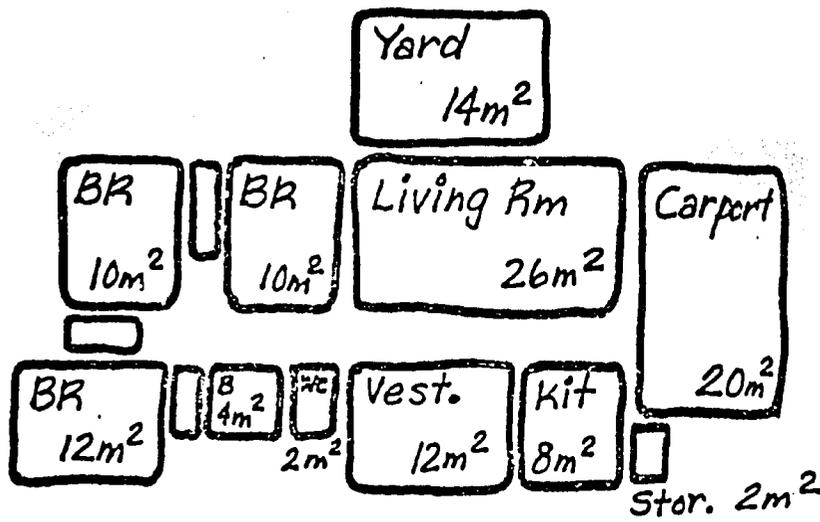
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5. Staff Housing - Building Space Program

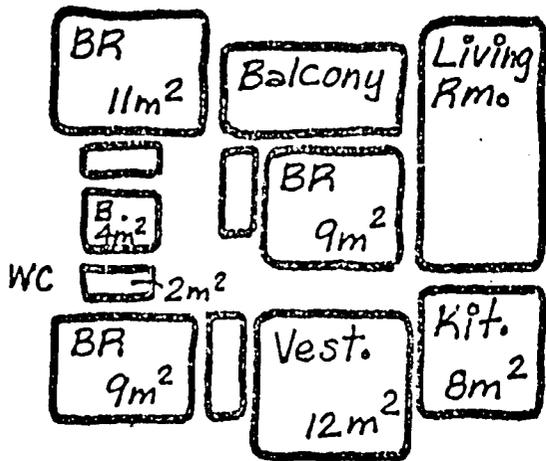
Space	Area (m ²)
Type "C" Single Family Units - 3 Bedroom	
Living Room	26.0
Vestibule	12.0
Kitchen	8.0
Storage	2.0
Bedroom 1	12.0
Bedroom 2	10.0
Bedroom 3	10.0
Bath	4.0
Water Closet	2.0
Carport at 50%	10.0
<hr/>	
Net Building Area	96.0
Gross Conversion Factor	<u>x 1.2</u>
	115.2
Gross Building Area	say 115.0
<hr/>	
Exterior Program Elements	
Paved and Screened Yard	14.0
Driveway (will vary with each unit location)	40.0
Total Gross Building Area (10 units at 115m ²)	1150.0
Total Gross Building Area for Servants' Quarters (10 units at 24m ²)	240.0

Space	Area (m ²)
Type "D" 4-plex units - 3 Bedroom	
Living Room	24.0
Vestibule	12.0
Kitchen	8.0
Storage	2.0
Bedroom 1	11.0
Bedroom 2	9.0
Bedroom 3	9.0
Bath	4.0
Water Closet	2.0
<hr/>	
Net Building Area	81.0
Gross Conversion Factor	<u>x 1.2</u>
	97.2
Balcony at 50%	<u>6.0</u>
	103.2
Gross Building Area	say 103.0
<hr/>	
Exterior Program Elements	
Parking area (15 at 32m ² parking)	480.0
Total Gross Building Area	
51 Units at 103.0m ²	5253.0
Total Gross Building Area for Servants' Quarters (30 units at 240m ²)	720.0

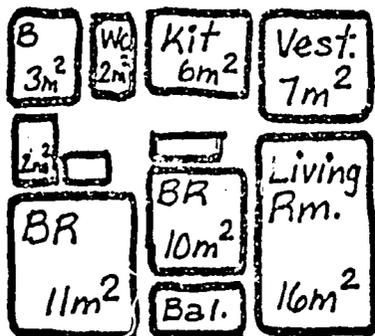
Space	Area (m ²)
<u>Type "E" Townhouses - 2 bedroom</u>	
Living Room	16.0
Vestibule	7.0
Kitchen	6.0
Storage	2.0
Bedroom 1	11.0
Bedroom 2	10.0
Bath	3.0
Water Closet	2.0
<hr/>	
Net Building Area	57.0
Gross Conversion Factor	<u>x 1.2</u>
	68.4
Gross Building Area	say 70.0
<hr/>	
Exterior Program Elements	
Paved and Screened Yard	7.0
Total Gross Building Area 242 Units at 70.0m ²	<u>16,940.0</u>
<hr/>	
<u>Type "E" Townhouses - 2 Bedroom 6-Plex</u>	
Living Room	16.0
Kitchen	6.0
Storage	2.0
Bedroom 1	11.0
Bedroom 2	10.0
Bath	3.0
Water Closet	2.0
<hr/>	
Net Building Area	50.0
	<u>x 1.2</u>
	60.0
Balcony at 50%	<u>7.0</u>
Gross Building Area	67.0
Common Area (Stairs, Deck, Covered Walkway, etc., at 50%)	<u>9.0</u>
	76.0
Total Gross Building (242 at 76m ²)	18,150.0



Type "C" Single Family Units - 3 Bedroom



Type "D" 4-plex Units - 3 Bedroom



Type "E" Townhouse / 6-plex Units - 2 Bedroom

STAFF HOUSING

0. Vehicle and Equipment Maintenance Shop

1. Description

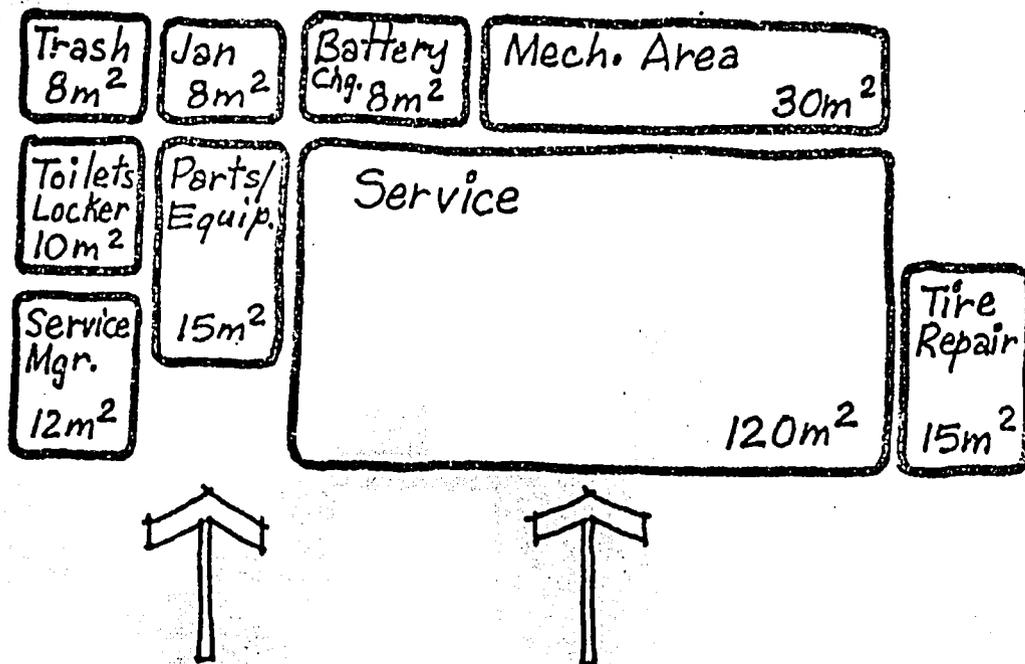
The Vehicle and Equipment Maintenance Shop will provide facilities for the maintenance and repair of campus vehicles and equipment. Parking and exterior repairs space is also to be included in conjunction with this facility.

2. Relationships

The Vehicle and Equipment Maintenance Shop should be located with other support facilities and somewhat isolated from mainstream of daily campus life. Still the facility should be accessible from the network of roads.

3. Vehicle and Equipment Maintenance Shop - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Office Areas	
Service Manager's Office	12.0
Work Areas	
Service (2 bays at 60m ²)	120.0
Parts and Equipment Stores Tire Repair	15.0
Battery Charge	8.0
Maintenance and Mechanical Areas	
Janitors' room	8.0
Toilets and Lockers	10.0
Mechanical Area (i.e., machine rooms)	30.0
Trash Room	8.0
<hr/>	
Net Building Area	211.0
Gross Conversion Factor	<u>x 1.3</u>
	274.3
Gross Building Area	say 275.0
<hr/>	
Exterior Program Elements	
Covered Parking (and working) area	
for 3 busses at 53.7m ²	161.0
for 4 4-seaters (cars) at 32m ²	128.0
for 2 Land Rovers at 36m ²	72.0
for 2 mini-busses at 36m ²	<u>72.0</u>
	433.0



VEHICLE AND EQUIPMENT MAINTENANCE

P. Building Maintenance Shops

1. Description

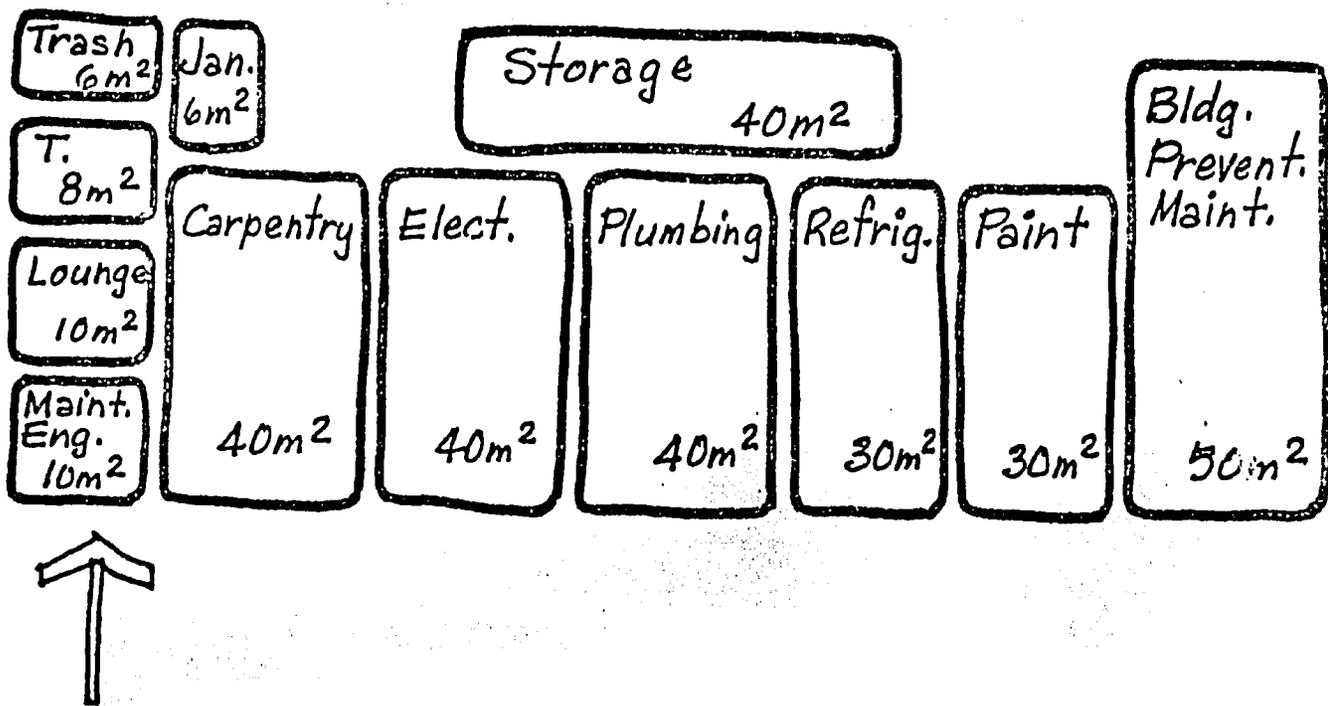
Building Maintenance Shops will provide building-related repair services such as furniture repair, woodworking, plumbing and electrical supplies and services, and some small machinery repair.

2. Relationships

The Building Maintenance Shops should be located with other support facilities and out of the view of the maintenance of daily campus life. Still the facility should be accessible from the network of roads and have direct truck access.

3. Building Maintenance Shop - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Office Areas	
Maintenance Engineer	10.0
Workshop Areas	
Carpentry	40.0
Building Preventive Maintenance and Custodial	50.0
Paint Shop	30.0
Electrical Shop	40.0
Refrigeration Shop	30.0
Plumbing	40.0
Employee Areas	
Employee Toilets	8.0
Employee Lounge/Tea Kitchen	10.0
Maintenance Areas	
Janitors' Room	6.0
Storage	40.0
Trash and Garbage	6.0
Net Building Area	310.0
Gross Conversion Factor	<u>x 1.3</u>
	403.0
Gross Building Area	say 405.0
Exterior Program Elements	
Service Area	100.0



BUILDING MAINTENANCE SHOP

Q. Entrance Gatehouse/Campus Security Office

1. Description

The Entrance Gatehouse and Campus Security Office is intended to control access to the Campus as well as to be the office for the Campus Security.

2. Relationships

The Entrance Gatehouse and Campus Security Office should be located at the existing main gate to the Campus.

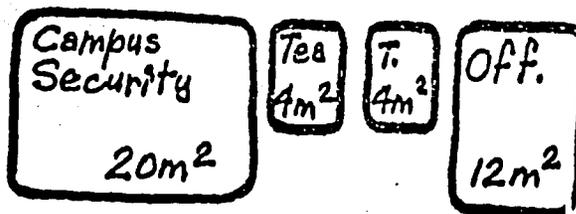
3. Assumptions

a. The gatehouse will be manned on a 24-hour basis.

b. We anticipate that this function will be housed at the existing storage area and will thus replace the existing Sentry Box.

4. Entrance Gatehouse/Campus Security Office - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Office	12.0
Campus Security Staff Office	20.0
Toilet	4.0
Tea Room	4.0
<hr/>	
Net Building Area	40.0
Gross Conversion Factor	x 1.2
Gross Building Area	48.0



ENTRANCE GATEHOUSE / SECURITY

R. Laundry Hold/Housekeeping Storage

1. Description

The Laundry Hold is intended to provide an area for the receiving, storage and dispersal of clean linens for dormitory, hostel, and general campus use.

The area also serves as a receiving area for soiled articles as well. The Housekeeping storage is intended to provide space for general storage of housekeeping supplies and cleaning materials.

2. Relationships

The Laundry should be centrally located between the Dormitories and the Hostels. It should be immediately accessible to the roads and located out of sight of the main campus circulation.

3. Assumptions

a. Laundry will continue to be contracted out to a commercial laundry.

b. Laundry will continue to be delivered twice a week and will be distributed to the individual linen storage units in the Dormitories, the Kitchen/Dining Area, the Multi-Purpose Auditorium and the Dispensary.

c. Staff will continue to collect the soiled laundry and hold it for collection.

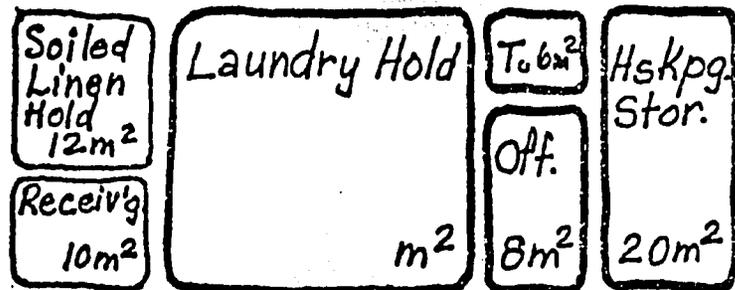
d. A centralized collection and dispersal is preferred over several points.

4. Functional Criteria

The service yard for the Laundry pick-up and delivery should be screened from view.

5. Laundry Store - Building Space Program

Space	Area (m ²)
Laundry Store	40.0
Housekeeping	20.0
Office	8.0
Toilet	6.0
Receiving	10.0
Soiled Linen Holding	12.0
<hr/>	
Net Building Area	96.0
Gross Conversion Factor	<u>x 1.1</u>
	105.6
Gross Building Area	say 105.0
<hr/>	
Exterior Program Elements	
Service Area	50.0



LAUNDRY HOLD/HOUSEKEEPING
STORAGE

S. Outdoor Recreation Facilities

1. Description

The Outdoor Recreational Facilities are intended to provide a full range of physical exercise activities such as track, soccer, hockey, basketball, volleyball, netball, badminton, tennis and swimming.

2. Relationships

The Outdoor Recreational Facilities should be located proximate to the Activity Center and the dormitory areas and yet buffered from the Learning Resource Center and Instructional Areas.

3. Assumptions

a. All students will be encouraged to participate in team sports in the form of intramural activity.

b. A solar application may be a future consideration for heating the swimming pool, the main concern here being the fact that due to the shortness of daylight hours, the water in the pools generally does not have sufficient time to heat up.

4. Functional Criteria

a. The orientation of outdoor playing fields such as hockey, basketball, volleyball, badminton and tennis must be with the long axis of each play area north/south (with an allowable deviation of 15°).

b. Within the Staff Housing areas, a variety of tot lots and play lots should be provided for both formal and informal play activity.

c. A minimum of 10 meters should be provided for player and spectator circulation, seating and buffer areas between activity areas and circulation/spectator areas.

d. Pool capacity is based on a safety standard of 1.85m^2 of combined pool plus deck area per user.

5. Space Criteria

Soccer field: 64 meters x 100 meters = 6,400 nsm/8260 gms;
Track (400 meter): 90.08 meters x 174.47 meters around the soccer field 18,462 gsm;
Tennis courts: 260.76 nsm/670 gsm;
Pool (15 meters x 25 meters) 375 m^2

Pool (15 meters x 25 meters)	375 m ²
Deck (area equal to pool)	375 m ²
Mechanical Equipment area	25 m ²
	<hr/>
	775 m ²

Volleyball: 9 meters x 18 meters = 162nsm/312 gsm;*
Basketball: 14 meters x 26 meters - 364nsm/640 gsm
Badminton
 Single: 5.18 meters x 13.40 meters = 69.4 nsm/125 gsm
 Double: 6.10 meters x 13.40 meters - 81.74 nsm/140 gsm

6. Outdoor Recreation Facilities - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
<u>Bath House and Pool</u>	
Outdoor Pool (15 x 25)	375.0
Deck	375.0
Bath House	
Filter Room	30.0
Chlorination	3.0
Storage	6.0
Baskets (2 at 12m ²)	24.0
Showers (2 at 25m ²)	50.0
Toilets (2 at 15m ²)	30.0
Dressing Cubicles (2 at 45m ²)	90.0
Vestibule	20.0
Office/Control	12.0
<hr/>	
Net Building Area (Bath House Only)	265.0
Gross Conversion Factor	<u>x 1.3</u>
	345.0
Gross Building Area say	345.0
Tennis Courts (. 2 at 670 gsm)	1340.0
Multi-purpose Courts (with Basketball, Volley- ball, netball and Badminton (2 at 650 gsm)	1300.0
Track (400 meter around a soccer field)	18,462.0
Bleacher area (500 at .67m ²)	335.0
Field Hockey	8260.0
<hr/>	
Land Take	27,697.0

Note: Space Programmed reflects only specific activity areas and does not take into account leisure open space building grounds, etc.

*gsm = gross square meters

T. Parking Spaces

1. Description

Parking Spaces are intended primarily to accommodate the visitors and are of the shared parking category. Another category of parking, although limited in scope, must also be accommodated: that is the "off-peak" category or spaces required at facilities such as assembly halls where demand occurs on a scheduled or off-peak basis.

2. Relationships

Parking spaces should be provided proximate to the administration area, the control gate entries, and the Multi-Purpose Auditorium.

3. Assumptions

a. Car ownership (based on 1970 study)

Cars/person	0.09
0 Percentage	76.0
1 Car Owning	19.0
2+ Households	5.0

b. Since the majority of all faculty and staff live on campus, parking spaces for those with cars will be provided them at their place of residence.

c. It is assumed that the faculty and staff and students will continue to walk to and from work and class.

d. District centers will be predominantly accessible by bus.

e. Parking and service areas will be provided for adjacent to those buildings requiring such.

f. The Continuing Education participants are more likely to own cars and require parking spaces.

g. Parking requirements for Continuing Education based on:

0.19 x participants - minimum

0.40 x participants - maximum

0.29 x participants

Thirty-seven existing use parking spaces provided, 7 of which are used for Campus vehicles.

h. The visitor parking provided will not, therefore, need to be at the same high standard established in the district centers.

4. Space Criteria

34m² per car.

5. Parking Spaces - Building Space Program

<u>Space</u>	<u>Area (m²)</u>
Parking (40 Shared Spaces at 32m ²)	1280.0

IV. REALLOCATION OF EXISTING SPACE

In an effort to retain as much of the existing order of the campus, and still remain sympathetic to the overall masterplan, several existing functions had to be reallocated into other new or existing structures. This provided not only the cost benefits inherent in the renovation and reuse of the existing structures, but it also provided a more consistent and logical grouping of like functions.

Among the existing spaces being reallocated are the following:

- existing kitchen/dining /lounge area would be remodeled to accommodate the continuing education program, while a new kitchen/dining/lounge area would be constructed to accommodate the remainder of the student body;

- a portion of the administration function would be housed in the existing print shop and faculty office area. The print shop would then be accommodated in the proposed learning resource center, while a portion of the faculty offices would be relocated and housed in the new faculty office/classroom facility. In addition, the tuition wing across from the existing dorms would also be utilized to accommodate a portion of the administrative functions as well;

- The existing library and recording areas would then be reallocated to tuition or classroom space.

In the area of staff housing, there were several possible options for reallocation. Among these were: the two senior staff duplex units along Ushirika Road could be converted to an office function or be demolished to provide an avenue for future expansion; the four subordinate staff duplex units on the eastern portion of the site could in the future be demolished to provide an avenue of future expansion as well; the four subordinate staff four-plex units could be renovated and reallocated to senior staff; the four junior staff four-plex units along Ushirika Road could be renovated and reallocated to senior staff, or if need be, be demolished to provide another avenue for future expansion.

The above provides a reallocation of housing with all senior staff members being now housed on the upper portion of the site and the junior and subordinate staff on the lower portion.

A. 1. SCHEDULE OF EXISTING ACCOMMODATION

1.1	DORMITORIES (HALLS OF RESIDENCE)	S.M.
	SPACE PER DORMITORY	
	ROOMS	224
	CORRIDOR & STAIRS	75
	KITCHEN	17
	LAUNDRY ROOM	10
	TOILETS	<u>34</u>
	NETT AREA PER UNIT	360
	5 UNITS, THUS TOTAL FOR DORMS	1800 S.M.
1.2	MAIN ADMINISTRATION	
	OFFICES	95
	CONFERENCE ROOM	33
	RECEPTION	24
	TOILETS	8
	HALL	<u>88</u>
		248 S.M.
1.3	CLASSROOM BLOCK I	
	CLASSROOMS 3 x 57	171
	CLASSROOMS 3 x 22	88
	TOILETS	44
	CLEANERS ROOM	<u>5</u>
		308 S.M.
1.4	FACULTY PLUS ADMINISTRATION BLOCK	
	FACULTY OFFICES	194
	FACULTY LOUNGE	40
	CORRESPONDENCE STUDY & OFFICES	75
	PRINT SHOP	74
	STOREROOM	11
	CLERICAL	111
	CORRIDOR & CIRCULATION	<u>148</u>
		653 S.M.

1.5 "NEW" CLASSROOM BLOCK II

CLASSROOMS 4 x 58	232
CLASSROOM	55
CLASSROOM	88
CLASSROOM	84
LANGUAGE LAB	40
LIBRARY	153
RADIO/RECORDING	42
TOILETS	46
STORE	<u>11</u>

751 S.M.

1.6 WALKWAYS:

ENTRANCE CANOPY

1223 S.M.

73 S.M.

1.7 KITCHEN/DINING

DINING ROOM

221

LOUNGE

201

KITCHEN:

COOKING 134

SERVERY 16

OFFICE 6

COOLER 30

STORAGE 55

CIRCULATION 22

263

685

1.8 AUDITORIUM

MEETING HALL

167

LOBBY

45

212 S.M.

1.9 HOUSING

SENIOR STAFF - 3 BR SINGLE FAMILY UNITS 15 No.

JUNIOR STAFF - 3 BR SINGLE FAMILY IN DUPLEX UNITS 4 NO.

JUNIOR STAFF - 2 BR SINGLE FAMILY IN DUPLEX UNITS 6 NO.

JUNIOR STAFF - 1 BR " " " 4-FLEX UNITS 15 NO.

SUBORDINATE STAFF - 3 BR SINGLE FAMILY IN 4-FLEX UNITS 16 NO.

SUBORDINATE STAFF - 1 BR " " " DUPLEX UNITS 8 NO.

- 86 -

TOTAL:

65 UNITS

B. Existing Problems

The existing College buildings and services are suffering from several problems relating to building maintenance and operation of equipment. The following is a brief summary of the major ineffectualities. Remedial actions for each of these are addressed under their respective functional heading. The general maintenance for the campus appears to be good, especially of the grounds, which are kept neat. It is strongly recommended that similar high quality attention be given to the operation of mechanical, electrical and architectural fixtures on a continuous basis and we outline the methodology for this under "Operation and Maintenance." A recent annual report of the College indicates that annual expenditures on spares, tools and maintenance was \$8400, which is not really adequate for such a facility.

1. Existing Kitchen

The boiler for supplying energy to the kitchen and hot water for halls of residence has been out of action for some months for lack of some spare parts. Either a replacement should be provided or effective repairs should be carried out to restore normalcy for the functioning of the kitchen.

2. Water Supply

The pumping of water for domestic use from the Mbagathi River is powered by diesel engines which break down frequently and there is practically no standby capacity. The College feels that this entire operation should be improved and brought up to standard for a continuous operation.

3. Waste Water (sewage)

The pond for treating waste water from the campus is in a state of disrepair and needs immediate cleaning out and repair measures.

4. Building Maintenance

There are several items of building repair which should be carried out by the maintenance personnel or by minor outside contractors. These items consist of regular painting, replacement of broken glass to windows, re-puttying of windows, door hardware repair and replacement, plaster repair and patch-up, tile repair, replacement of pre-cast concrete covers to utility trenches in courtyards, replacement or restoration of curtain (drapery) tracks, replacement of gutters and downspouts, etc. Additionally, the dormitory toilets need improved ventilation which can be done by installing exhaust fans. The existing offices in the faculty areas need improved acoustical qualities and this can be done by installing acoustical tile ceilings.

C. Site Considerations

1. General Site Considerations

The existing property housing the campus of the Cooperative College of Kenya is situated in the Langata-Karen suburban area of Nairobi. The campus property is located in a scenic setting on the north side of Mbagathi River facing the Ngong Hills.

The property is distinctly divided by fencing into two parcels of land.

The first portion comprises an almost fully developed 30.4 acres on which the existing College buildings and staff housing were dedicated in 1972. (Land Registration No. 5955/1). This area is almost rectangular with the Ushirika Road (known previously as Legion Park Road) forming its northern property boundary and its rough east-west axis.

The second parcel of land comprising 35 acres approximately (Land Registration No. 2327/2) is on the south and west of the first portion. It is trapezoidal in shape with Mbagathi River forming its western boundary. The attached sketch in this section indicates the perimeters of the total land area, copies of which were obtained from the Director of Land Surveys.

The second area of land is almost unimproved. At present, it has the waste water treatment pond, a soccer field and water treatment structures near the gorge of the River.

The site generally slopes from the north-east to south-west at a rate of ten percent up to within 50 meters of the river, when the land falls sharply into the valley of the Mbagathi River.

2. Facilities of the Expanded Campus

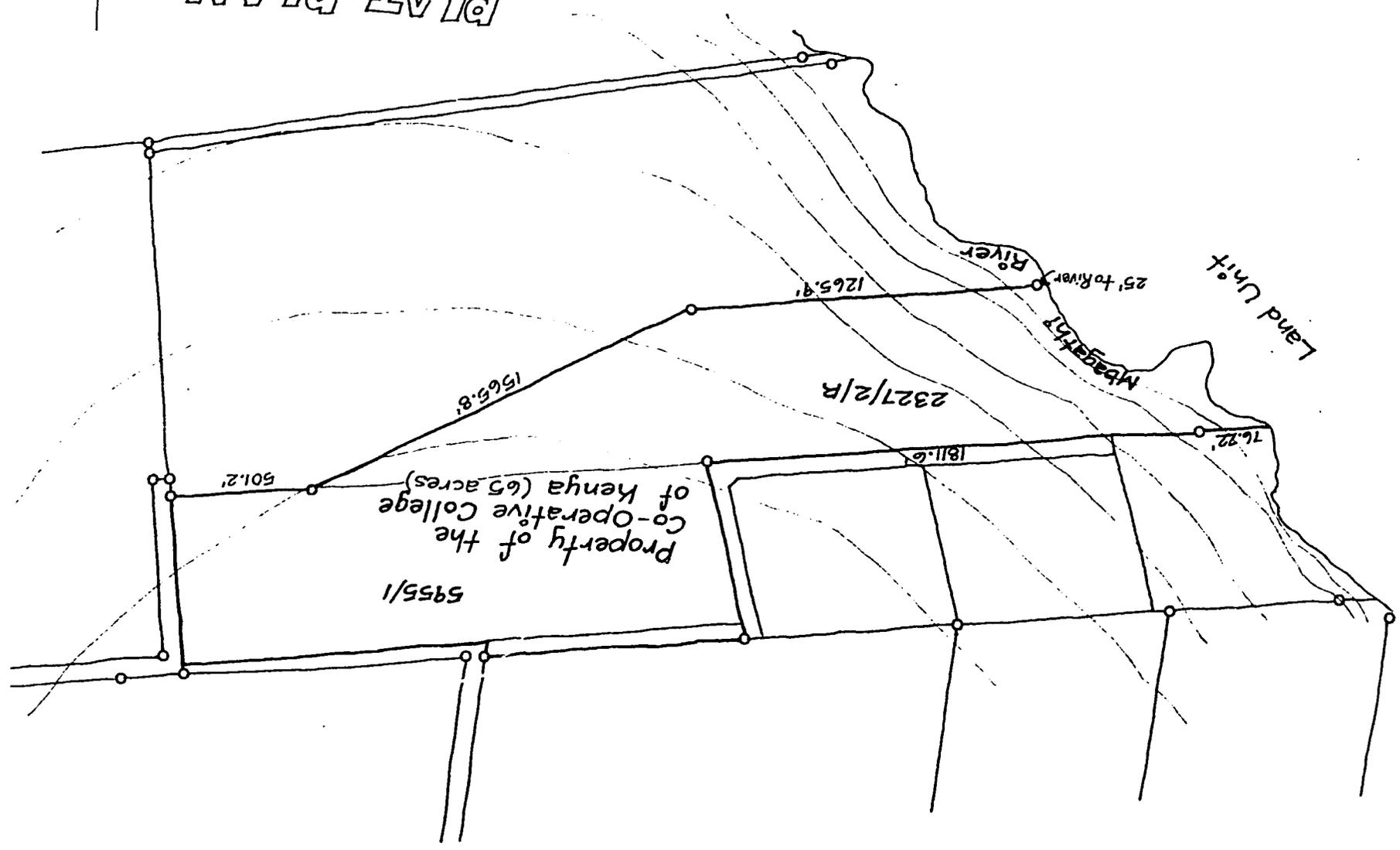
The College buildings and the campus site under this study, in the expanded state results in the following facilities:

Buildings

Administration
Faculty Office Area
Learning Resource Center
Instructional Area
3 Student Dormitories (96 man 3-story units)
Kitchen/Dining Facility
Activity Center
Swimming Pool with Bath House
Multi-purpose Auditorium



PLAT PLAN
Scale: 1/85000



5955/1
Property of the
Co-Operative College
of Kenya (65 acres)

2327/2/R

Land Unit

Mbagathi River

501.2'

1565.8'

1265.9'

1811.6'

76.22'

25' to River

Continuing Education In-Service Instructional Space
Continuing Education Dining/Lounge
Continuing Education In-Service Hostel (5 32 man 2-story units)
Dispensary
Day Care School
Co-op Laundromat/Store
Staff Housing
 Type "C" - 10 3 BR Units
 Type "D" - 51 3 BR Units
 Type "E" - 242 2 BR Units

Vehicle and Equipment Maintenance Shop
Building Maintenance Shops
Laundry Hold/Housekeeping Storage
Entrance Gatehouse/Campus Security Office
Outdoor Recreation
Parking, covered walkways
Site: Roads, Utilities, Landscaping, Additional water supply,
 Boreholes and storages, Additional Sewage Treatment.

3. Limitation of Master Plan Study

Overall, the expansion results in almost total development of the available land area except those areas not feasible due to steep terrain near the river. The required housing and other relating infrastructure for the new housing will take up the majority of the economically developable land area. This study considers only one land use plan and no detailed architectural design of the buildings have been developed to study aspects of environmental impact. For final economically constructable feasibility of locating buildings on the lower unimproved areas of the property, a complete topographical survey is essential.

D. Site Utilities

1. Water

a. Water Supply Source

The existing campus community gets its domestic water from the Mbagathi River which forms the south-east property line of the campus. The records at the Water Apportionment Board of the Ministry of Water Development show that the College has permission to draw water at 0.2035 cusecs at peak flows. This is equal to 510 cubic meters per day. No specific conditions are attached during dry weather flows. It is believed that the College pumps as need arises and the existing storage tank with a capacity of 386 cubic meters, (103,000 US Gallons) ensures current needs without continuous pumping. We were told the pumping station is manned on a 24-hour basis.

Raw water and purified water pump rooms, purification structures and other appurtenances are located just above the river gorge. The purified water after chlorination is pumped to a main storage tank; approximate height for pumping is 280 feet. The pumps for raw water and the purified water both have a capacity of 1800 gallons per hour. The pumps are powered by diesel engines with limited and unreliable standby capacity.

b. Existing Problems

The College authorities experience equipment failures frequently at the pumping stations and they feel that this method is more expensive at current prices. It is recommended that for water supply without interruption, the pumps should be powered by electricity from the E.A.P. & L. supply lines which are fairly close. New diesel engines should be installed as stand-by sources of power.

The type of water purification plant as built on this site is common in Kenya. There are some minor improvements recommended such as providing the operators with better water testing methods to determine accurate dosages of purification chemicals.

c. Expansion

For this masterplan study, water demand estimates are computed as follows using per capita demands from other sources (e.g., Egerton College, Jubail, etc.).

Population:

Full-time students in residence	500
Part-time students (Cont. Ed.)	160
Faculty, office and Administration	102
Sub-ordinate staff	266
Additional over and above in housing	1764

Water Demand (liters per day)

Full-time students	500 x 95 L/d	= 47,500
Part-time students	(160 x 95) 75%	= 11,400
Offices	102 x 57	= 5,800
Sub-ordinate staff	266 x 30	= 8,000
Housing	1,764 x 157	= <u>276,900</u>
		349,600 L
		say 350 cubic meters

A new storage tank of say 500 cubic meters capacity can be designed to serve the new housing separately for a demand of 174 cubic meters allowing in each case three days reserve for emergencies.

The existing pumping at the river station therefore needs no augmenting to fulfill any additional demands

A typical water analysis of a borehole within the Ngong-Karen area (see Exhibit 1) indicates inordinate amounts of fluorides at 7.2 mg/L which is much higher than the acceptable 1.5 mg/L which is the W.H.O. norm. This water will have to be treated to reduce fluoride contents and this is ideally done by de-ionising process equipment which is available in Kenya. Estimated cost for such an installation is \$30,000 per 100 cubic meters per day purification capacity.

In the long term, the College faces water supply problems as increasing demand is placed on the Mbagathi River and underground sources. The College will have to implement and administer water conservation policies and also consider recycling of waste water for irrigation and other non-domestic uses.

EXHIBIT - 1

TYPICAL ANALYSIS OF BORE-HOLE WATER KAREN-NGONG AREA.

(Parts per million)mg/l

Electrical Conductivity at 25°C	370
pH	7.2
Turbidity	Nil
Bicarbonate (H CO ₃)	173
Carbonate (CO ₃)	17
Chloride (Cl)	23
Sulphate (SO ₄)	9
Nitrate	Nil
Nitrite	Nil
Flouride	7.2
<hr/>	
Sodium	100
Potassium	13
Calcium	7
Magnesium (Mn)	2.5
Iron (Fe)	0.1
HARDNESS (Ca CO ₃)	28
Total Dissolved solids	320

INTERNATIONAL WATER DRINKING STANDARDS. W.H.O. 1971

	ACCEPTABLE CONCENTRATION	MAX. ALLOWABLE CONCENTRATION
Total solids	500 mg/l	1500 mg/l
Color	5 units	50 units
Turbidity	5 units	25 units
Iron (Fe)	0.1 mg/l	1.0 mg/l
Manganese (Mn)	0.05 mg/l	0.5 "
Copper (Cu)	0.05 "	1.5 "
Zinc (Zn)	5.0 "	15 "
Calcium (Ca)	75	200
Magnesium (Mg)	30	150
Sulphate (SO ₄)	200	400
Chloride (Cl)	200	600
Total Hardness (Ca CO ₃)	100	500
Phenolic substances	0.001	0.002

Toxic Substances

Maximum allowable concentration	mg/l
Lead	0.1
Arsenic	0.05
Selenium	0.01
Chromium	0.05
Cyanide	0.05
Cadmium	0.01
Mercury	0.001

Recommended Control Limits for Flourides in Drinking Water

Average Annual Daily TEMP °C	Control limits for flourides mg/l	
	Lower	Upper
10 - 12	0.9	1.7
12 - 14.6	0.8	1.5
14.7 - 17.6	0.8	1.3
17.7 - 21.4	0.7	1.2
21.5 - 26.2	0.7	1.0
26.3 - 32.6	0.6	0.8

SUMMARY OF RECOMMENDATIONS FOR WATER SUPPLY DURING CAMPUS EXPANSION

1. Apply for permits for boreholes
2. Install new pumps, stand-by power and alter power for pumps from Diesel to Electrical at Mbagathi River stations
3. Install boreholes and pumps for expansion of College
4. Install purification measures to remove excessive flourides from domestic water.
5. Construct additional storage tanks.

d. Waste Water Treatment

Existing: The existing treatment works for sewage waste at the Cooperative College site were designed in 1969 and consist of an oxidation pond, soakage area and a screen with humus tank for screening debris. See sketch. This type of operation is common in Kenya for sewage treatment and disposal in a community of this size.

The main design features of the treatment works are:

Design Polulation	:	650
Estimated flow	:	39 cubic meters/day
Volume of pond	:	1340 cubic meters
Soakage Area	:	420 linear meters of trench in an overall area of 22 x 70 meters.

The pond is circular with a mid-depth diameter of 40.800 meters with a depth of 1.07 meters. The waste water enters the pond via a screen and a board at the inlet withholds scum. The outlet is in the center of the pond in the form of a box. The fluid enters a concrete pipe beneath the pond via the box and thence to an outlet chamber. From the chamber, the water is conveyed to the Soakage Area.*

The embankment of the pond has a slope of 1:2.5 within the designed "wet" depth and a slope of 1:2 above the "wet" depth. The embankment is paved with pre-cast concrete slabs to prevent erosion and growth of vegetation.

Inspection: A recent inspection by engineers of COWI Consult revealed that the pond and the ancilliary structures are in a poor state of rapair and maintenance.

Due to lack of maintenance the vegetation and weeds have propagated into the pond, particularly on the Western side. The debris screen is full and needs immediate removal of debris. The outlet pipe beneath the pond has been blocked, it is believed, for the past three years and consequently no water has entered the Soakage Area. The pond is therefore, emptied occasionally in the vicinity on vacant ground through a valve chamber on the eastern side. It is doubtful if the soakage area functions because the channels in the manholes are full of soil and vegetation.

e. Expansion

For the total expanded facility and for an estimated population of 2132, the amount of wastewater anticipated amounts to 2132 x 60 liters/day. This is approximately 128 cubic meters of flow. The

*The facts relating to the existing treatment system have been furnished by Messrs. COWI Consult to whom we acknowledge our thanks for the help and courtesy.

existing pond is designed for 30 cubic meters at a rate of 60 liters per day per person. This means that the facility requires two additional ponds of the same size or one additional one to handle 89 cubic meters. Additional soakage area required is approximately 4800 square meters with 1400 linear meters of soakage trenching. It is felt that with growth in living standards of an urban community this phase of expansion should allow space for one additional pond and an equivalent soakage for a capacity of 100 cubic meters.*

The site has good natural slope of approximately 10 percent towards the Mbagathi River. With minimum trenching depth, the waste water collection can have gravity flow terminating at the existing and/or new oxidation ponds. The ponds are fairly remote from the existing or future housing developments and are adequately fenced.

f. Storm Water Drainage

Most of the existing roads and open walkways are drained by open concrete lined gutters and the system is apparently well designed. No incidents of flooding are reported. For future expansion the same methods should be adopted and with increased amount of developed land, the rain run-off should be channelled properly.

2. Electrical Power Supply

a. Existing

The campus is at present supplied from an overhead line from Ushirika Road which is on the northern side of the campus. An overhead transformer is the main connector for the campus and its capacity details are:

kVA	200
High Voltage	11,000
Low Voltage	433-250

The main feed to the campus is via an underground armored cable beneath Ushirika Road and connects to a closet located on the south side of the Water Tank building. The supply and metering of electricity is separated by blocks of buildings e.g., hostels, kitchen and Assembly Hall, street and security lighting, housing blocks, etc.

b. Expansion

If the percapita use of power remains approximately the same during expansion, the existing power supply needs to be increased

*The existing design of the pond treats at 60 liters of flow per day per person. Our knowledge of flow data in similar communities averages 110 liters/d/p.

by 200 percent. The College administration is economical in use of electrical power and if some standards of conservation prevail in the future, only the connector loads need be at theoretical higher levels. The exact kVA ratings cannot be determined at this stage until all buildings, facilities and community services are scoped with detail design during Preliminary Design stage.

The electrical needs of the campus are mainly for residential, classroom and office uses with some requirements for water pumping and water purification.

3. Air Conditioning, Heating and Ventilation

No air conditioning is envisioned for any of the buildings but some measures may be taken in special areas in the Learning Resource Center for special materials sensitive to humidity and temperature.

All buildings are designed to facilitate natural ventilation but exhaust fans are recommended in toilet areas.

At this stage, heating of any of the buildings is not anticipated.

4. Solar Energy

Currently the student population has no adequate hot water for personal hygiene or laundry due to equipment failures at the main boiler plant. For a more reliable and economical source for heating water the College should install solar collection panels at the existing dormitories and for the future expansion.

This type of application is increasingly being used in Kenya for residential, commercial and institutional buildings. Technology for such installations is simple and is readily available in Kenya. Operating and Maintenance costs of such installations are minimal.

The solar panels and the supporting appurtenances can be installed within the building envelopes. Estimated cost for such an installation per pupil housed is approximately \$350 per student at 1980 prices. Energy savings per student can be between \$40 to \$50 per year based on K.shs.1/-per HwH electricity charges. Undoubtedly cost benefits are substantial without even taking into account finance charges, inflation, etc.

Within the Nairobi region, it is believed that solar index is sufficiently high for 290-300 days of the year to ensure water temperatures at 50°C (120°F). For the remainder of the days some nominal boosting from other energy sources will be required.

5. Operations and Maintenance (O & M)

O & M is a management and systems approach to operate and maintain items of equipment, fixtures and fittings. This type of approach is designed to keep a facility of this type with a minimum of interruption to normalcy for the populations' needs and comforts. For this end, a Building Maintenance Shop is provided in the building program and this effort should be headed by a professional Buildings Engineer.

The Operations and Maintenance Systems are achieved by obtaining during the construction phase from the construction contractor Operating Manuals of all mechanical and electrical items. The Operation Manuals provide detailed installation, operating, greasing, special tooling, trouble shooting and maintenance procedures. These manuals list all required spare parts which are required up to one to three years of operating life and are stocked at the time of purchase. It is commonly specified that the suppliers or manufacturers be in-country or reasonably responsive for spare parts supply and services. Long distance or overseas manufactured items without supply organizing abilities should be discouraged by writing tight specifications. Manufacturers of more sophisticated equipments should be made to train operating personnel.

Operations and Maintenance philosophy will ensure operating efficiency and minimise breakdowns and is therefore strongly recommended. The additional costs incurred are cost beneficial in the long run.

Language for Operations and Maintenance manuals is usually very simple and should be obtained in parallel bi-lingual form.

V.

COOPERATIVE COLLEGE OF KENYA, NAIROBI

MASTER PLAN STUDY -- COST ESTIMATES (Dec. 1980)

Daly Project 050280

	Program Area	Unit Rate Per S.M.	Kenya Shs. Thousands	US Dollars Thousands	
A	Campus Building				
B.	Staff Housing Type "C" (10 No)	24,659	2,860	70,500	9,400
	Type "D" (51 No)	1,150	2,340	2,700	359
	Type "E" (242 No)	5,253	1,800	9,450	1,260
	Sub-total for Housing KShs: 40.4M US\$: 5.4M	18,150	1,560	28,300	3,780
C	Remodelling Existing Buildings	4,400	L.S.	3,000	400
D.	Outdoor Recreation w/Swimming Pool at \$60,000 subtotal	29,000	20	4,800	640
E	Add 18% for Infrastructure of (A+B)			118,750	15,839
F.	Add 10% for equipment of (A+C)			20,000	2,661
				7,500	1,000
G	Architectural-Engineering Fees 11% Sub-total			145,250	19,500
				16,000	2,100
H	Surveying & Sub-surface investigation			161,250	21,600
I	Operations & Maintenance Manuals Compilation			450	060
	Total at Dec. 1980 Prices			300	040
K.	Escalation at Mid-Point Construction (at 1% per month 18%)			KShs162 Million	US\$21.7 Million
				29,000	3,900
	TOTAL			KShs191 Million	US\$25,600 Million
	Contingencies 7½%				

COST ESTIMATES

A. SPACE PROGRAM, CAMPUS BUILDING	Sq. Meters	Building Cost* Overall US\$
Administration	1275	700,000
Faculty Office Area	1275	700,000
Library/Learning Resource Center	3275	1,800,000
Instructional Area	1585	900,000
New Student Dormitories	6555	3,600,000
Kitchen/Dining Facility	2610	1,450,000
Activity Center	880	400,000
Bathhouse (at swimming pool)	345	190,000
Multi-purpose Auditorium	1815	1,000,000
Continuing Education: In-service Instruction	775	430,000
Hostel	4500	2,440,000
Dining/Lounge	1700	940,000
Dispensary	695	400,000
Day Care School	385	250,000
Laundromat/Store	265	150,000
Vehicle/Equipment Shop	275	150,000
Building Maintenance Shop	405	200,000
Laundry/Housekeeping	105	60,000
Gate House	48	27,000
	29,068	
Deduct Existing space to be remodeled	4,409	
New Building Space	24,659 Sq. M.	

*Cost overall inclusive of infrastructure, equipment, A-E Fees.

- B. Housing Types to Ministry of Works Standards for Space Requirements.
- C. Existing Building Spaces (Excluding Existing Hall of Residences) to be remodeled
- D. Outdoor Recreation: Soccer Field w/440 meter track surrounding
Two tennis courts
Bleachers
Two Multi-purpose playing courts (Basketball etc.)
- E. Infrastructure:

Site Grading	Street Lighting
Foul Drainage	Waste Water Treatment
Storm Drainage	Water Treatment, Storage Tank
Site Electrical Distribution	Roads
Landscaping	
- F. Equipment:

Classroom Furniture	Library Equipment, Excl. books
Office Furniture	Athlete Equip., indoor & outdoor
Kitchen Equipment	
- G. Architectural-Engineering Consultant fees to Kenya by-law norms.

- H. Surveying and Soils Investigation - A rough Lump sum estimate
- J. Operations and Maintenance Manuals compilation by specialists consultant

Cost per House
Incl Infra-structure fees

Type "C" 419 s.m.	\$48,000	KShs 360,000
Type "D" 326 s.m.	33,600	252,000
Type "E" 279 s.m.	19,500	146,000