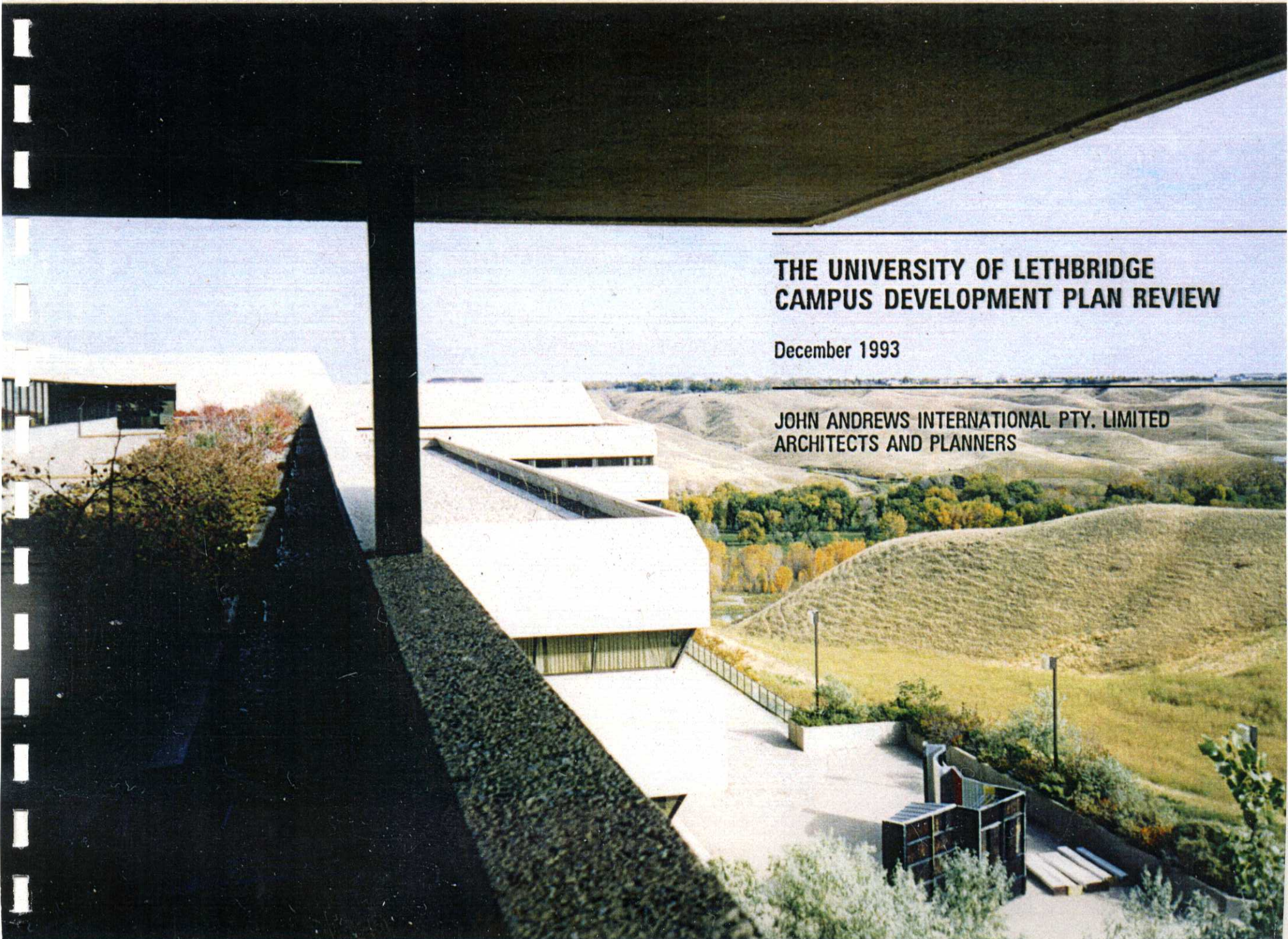


THE UNIVERSITY OF LETHBRIDGE
CAMPUS DEVELOPMENT PLAN REVIEW

December 1993

JOHN ANDREWS INTERNATIONAL PTY. LIMITED
ARCHITECTS AND PLANNERS

CONTENTS PAGE

INTRODUCTION 1

DEVELOPMENT GUIDELINES EXECUTIVE SUMMARY 2

SECTION 1 : CAMPUS DEVELOPMENT 1969 - 1993

1:1 THE ERICKSON / MASSEY PLAN, 1969 3

1:2 SUBSEQUENT DEVELOPMENT 4

SECTION 2 : CURRENT ISSUES

2:1 EFFECT OF WALKING DISTANCE 6

2:2 ACCESS TO THEATRES 6

2:3 PARKING AND ROADS 7

2:4 STRUCTURAL FOUNDATION PROBLEMS 8

2:5 PLANTS / LANDSCAPE 9

SECTION 3 : STRATEGY FOR FUTURE DEVELOPMENT

3:1 CAMPUS DEVELOPMENT PRINCIPLES 10

3:2 LIBRARY 11

3:3 SCIENCE 11

CONTENTS - continued PAGE

3:4 KITCHEN/DINING FACILITIES 12

3:5 PHYSICAL EDUCATION 12

3:6 SERVICES BUILDING 12

3:7 BOTANICAL GARDENS 13

SECTION 4 : GUIDELINES FOR RECOMMENDED DEVELOPMENT SITES

4:1 POTENTIAL DEVELOPMENT SITES 14

4:2 SITE A : SOUTH COULEE 16

4:3 SITE B : WEST RIDGE 18

4:4 SITE C : NORTH UNIVERSITY HALL 22

4:5 UNIVERSITY HALL - EXISTING LIBRARY SPACE 22

4:6 ATRIUM TERRACE, ETC. 22

APPENDIX A : Excerpts from the Development Plan
University of Lethbridge
Erickson/Massey, March 1969

APPENDIX B : Climatic Data from Summaries
DH Smith, March 1969

CONTENTS - continued PAGE

APPENDIX C : Preliminary Subsoil Investigation
University of Lethbridge, Alberta
Ripley, Klohn, Leonoff and Brooker Ltd, March 1969

APPENDIX D : Excerpts from Geotechnical Report:
Proposed Library and Entrance Rotunda,
EBA, July 1992

INTRODUCTION :

In planning for a new Library / Information Centre Building, the University has taken the opportunity to review its long term campus development plan, originally conceived by Erickson / Massey in 1969. The University requested that I undertake a study, in consultation with the Board of Governors Design Review Panel, Doug Gilmor and Dick Strong, of four major areas:

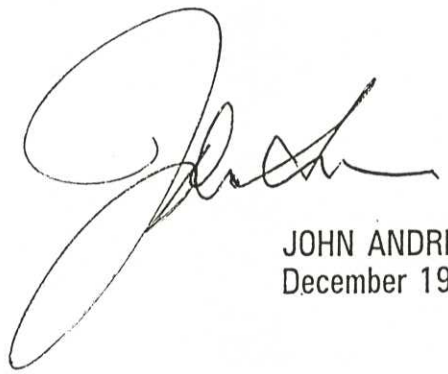
1. Review of the campus plan;

2. Identify campus planning issues for institutional decision;

3. Provide site options for institutional decision;

4. Provide design guidelines as advice to the University.

Following a review of University planning documents, a site visit and meetings with University representatives, we offer the following report as guidance in the further development of the campus.



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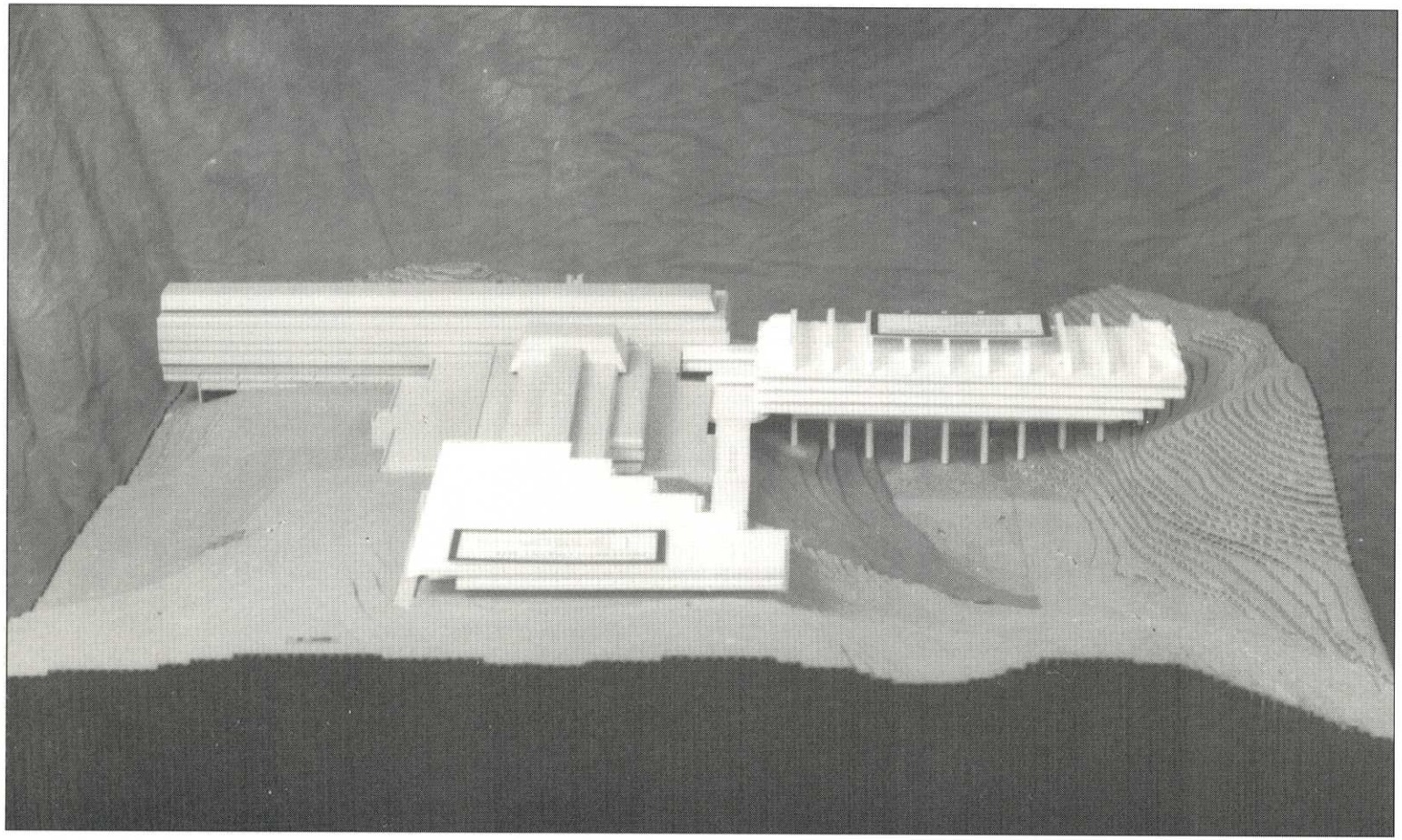
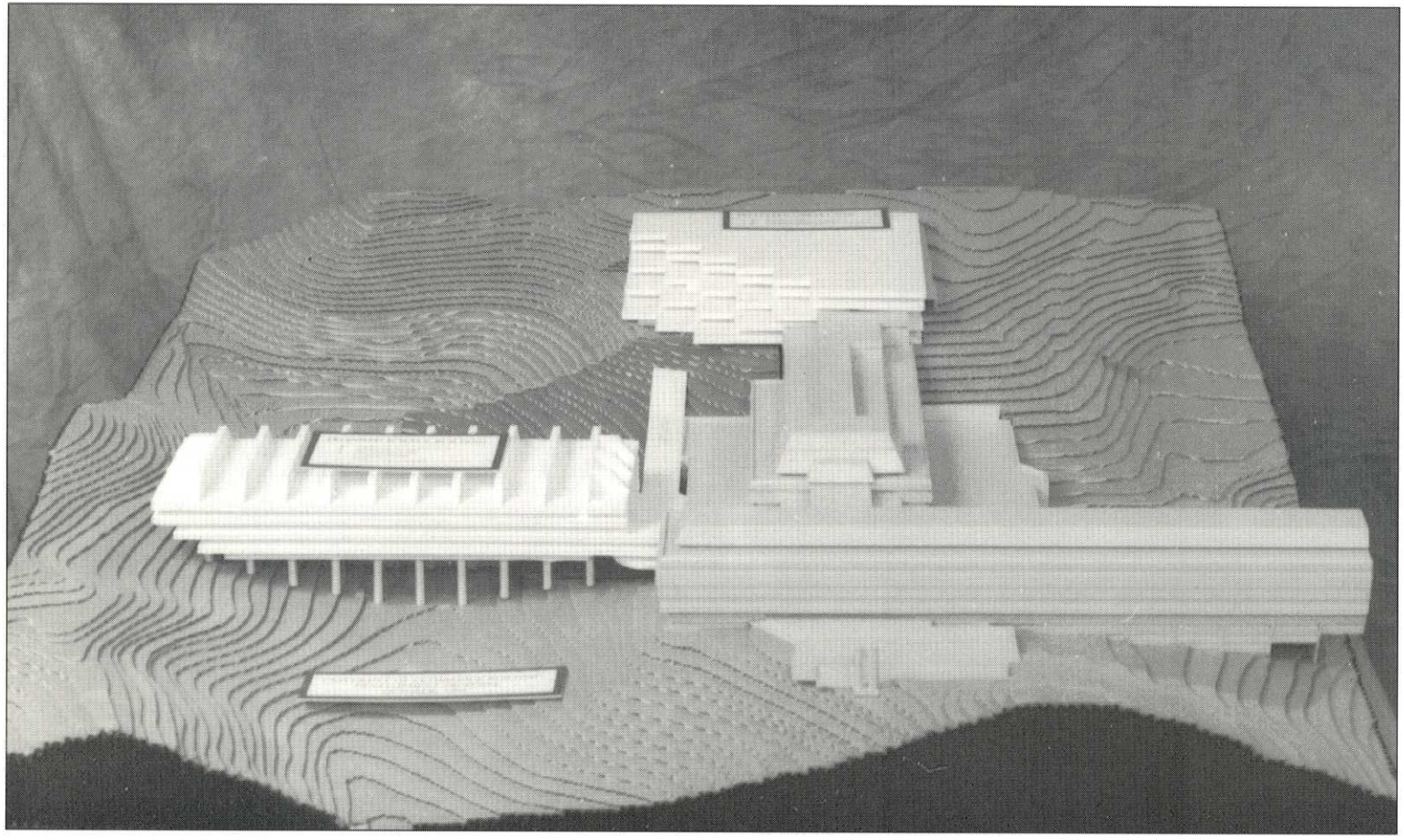


VIEW FROM THE WEST



VIEW FROM THE EAST

DEVELOPMENT GUIDELINES EXECUTIVE SUMMARY :

1. That West Ridge Site be developed for the Library and future proposed associated functions such as conference facility/central kitchens;

2. That the Library incorporate an identifiable appropriately scaled entrance to the University;

3. That excavations on this ridge be very carefully controlled due to the unique soil characteristics;

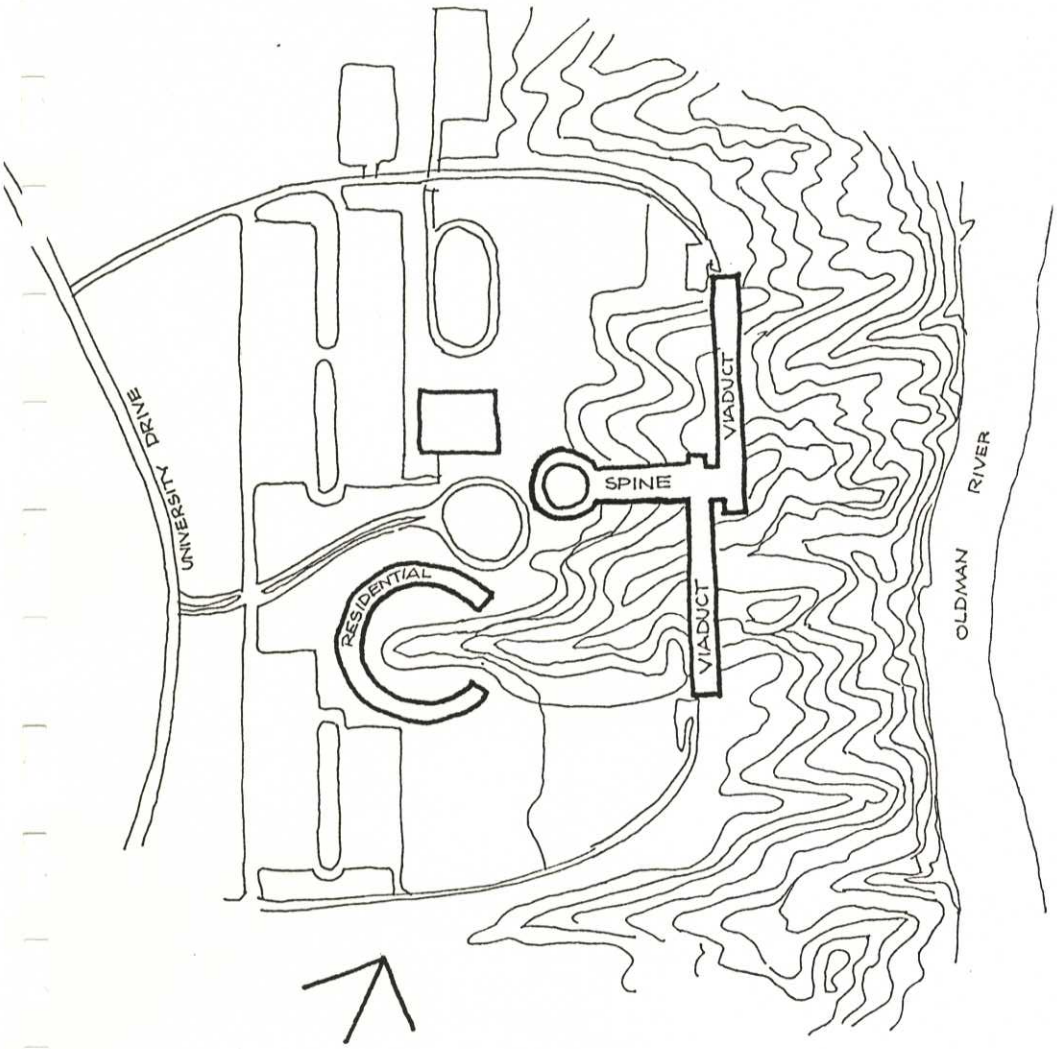
4. That South Coulee site be reserved for Science expansion;

5. That prior to or simultaneous with Science expansion, a parking structure be incorporated with an appropriate drop point and entrance directly into the Theatre Lobby at Level 5;

6. That the north extensions of University Hall not be considered at this time;

7. That an east-west component at the north end of University Hall not be considered at all;

8. That the west campus boundary zone be held in reserve and not developed for botanical uses at this time



SECTION 1 : CAMPUS DEVELOPMENT 1969 - 1993

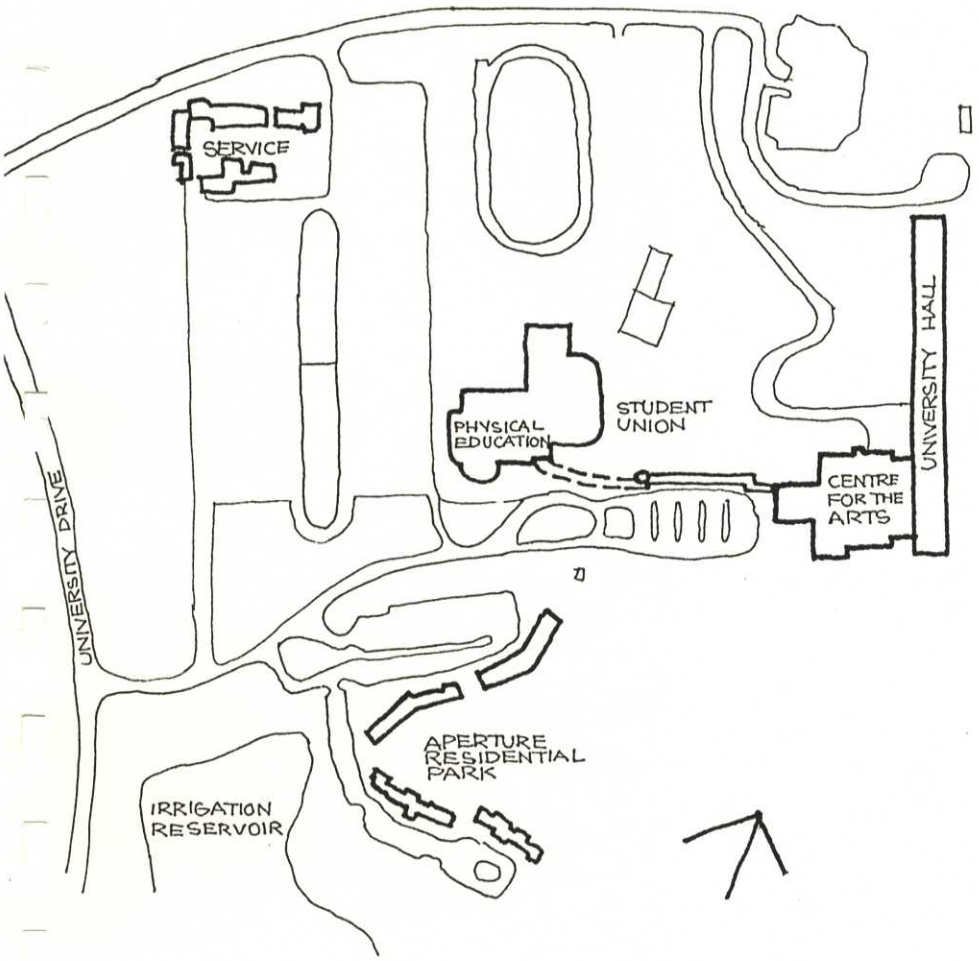
1:1 THE ERICKSON / MASSEY PLAN, 1969

The University of Lethbridge site is located on the west bank of the Oldman River. The plateau area at its approaches from University Drive falls to the river in a distinctive landscape of undulating and denuded coulees.

The Erickson / Massey Plan of 1969 located parking areas, playing fields and ovals and associated indoor facilities in the western plateau area with central facilities (library, student union building and administration) extending from the arrival plateau down a ridge between two coulee formations to north and south wings of academic facilities (arts, science, etc.) which bridged across the coulees in viaduct form at the bottom of the central facilities spine. The north wing was to accommodate Social Sciences and Humanities and the south, Physical and Life Sciences.

Student residences were formed in a crescent on the plateau at the head of one of the coulee formations and additional housing was integrated underneath the viaducts of academic facilities bridging across the lower slopes of the coulees. (see Appendix A)

University Hall, the northern "viaduct" of academic and residential facilities, parking areas and sporting facilities are the only elements of the University which have closely followed the very formal 1969 Campus Plan.



1:2 SUBSEQUENT DEVELOPMENT

Nevertheless, the 1969 Plan has provided a framework to the subsequent development of the University while accommodating a number of departures:-

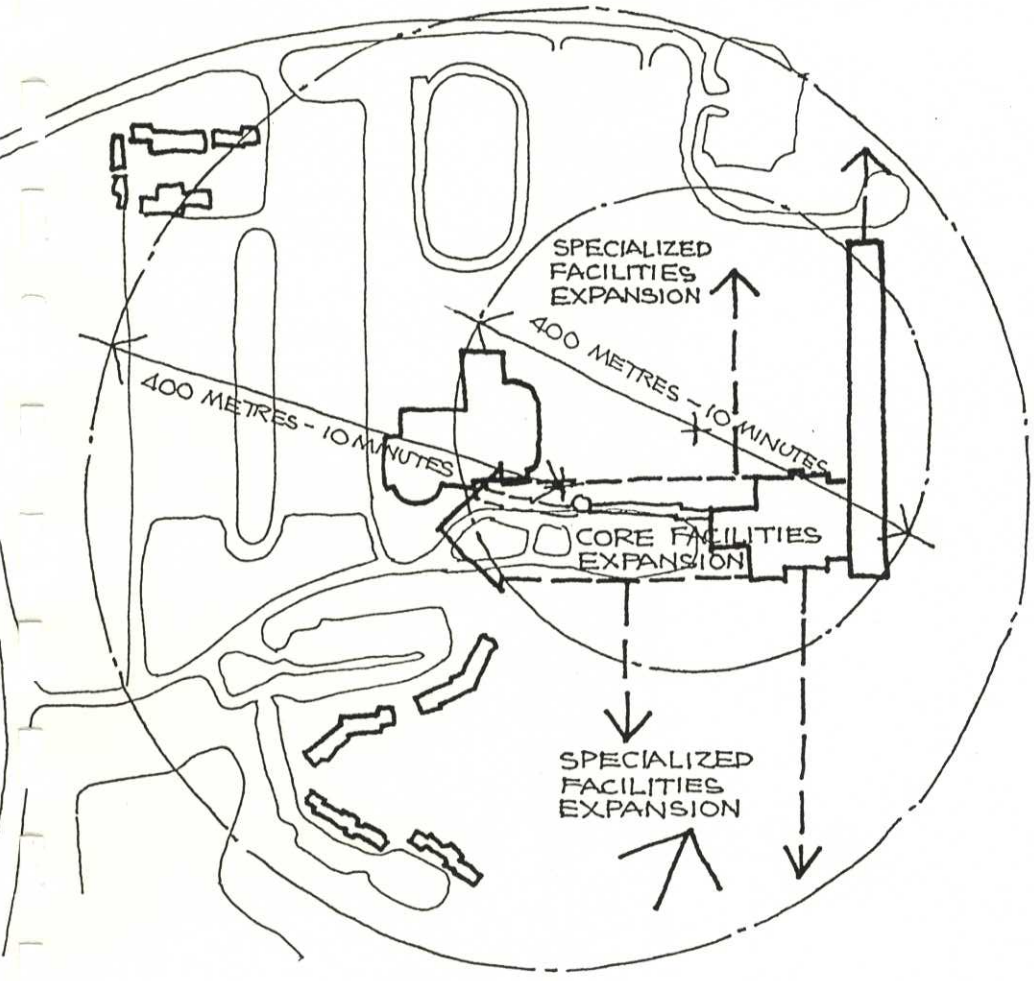
1. The residential complex at the head of the southern coulee has been constructed as four informally grouped buildings with individual carparks.

2. The service buildings have been located in the north-western carpark area rather than on the north side of Valley Road.

3. A large irrigation reservoir has been constructed to the south-west of the residential complex in an area initially planned for carparking.

4. Central and academic facilities have been staged, the 1969 concept of a spinal building complex with north and south viaduct wings being incomplete. This has resulted in the University having no main front entrance at the present time and inconsistency in location of common and specialist functions in both "spine" and "viaduct" areas. For instance, central facilities such as the Library are located in the only completed viaduct wing, University Hall, which was constructed as Stage 1 of the University, as well as Social Sciences, Humanities, and Physical and Life Sciences. The subsequent spinal addition to University Hall accommodates Fine Arts in addition to central facilities such as a theatre complex around a major auditorium with stage facilities.

The facilities of the University of Lethbridge are thus not organised in a coherent central spinal and academic wing grouping. The inadequacies of the structure of completed buildings on the coulee areas of the campus also necessitate that a reassessment of constructional approach as well as location of facilities is imperative in future development of the University of Lethbridge.



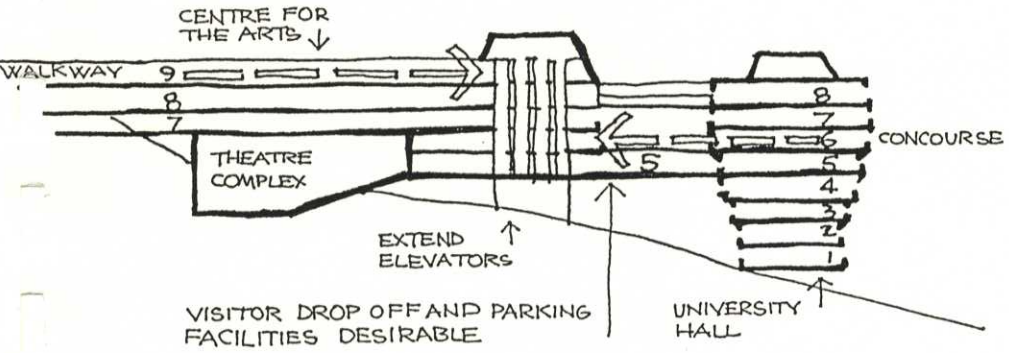
SECTION 2 : CURRENT ISSUES

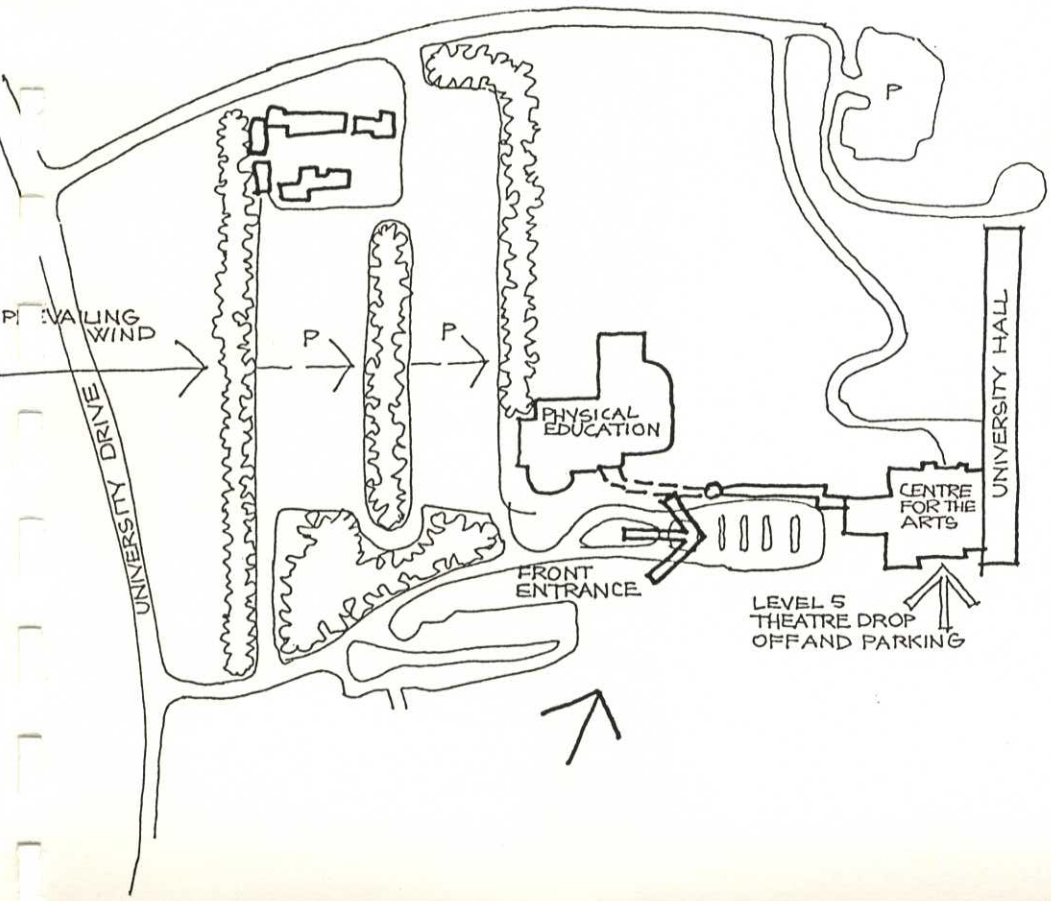
2:1 EFFECT OF WALKING DISTANCE

Generally, university facilities should be organized so that a maximum walking time of 10 minutes for students between lectures and research in common facilities (such as libraries and lecture theatres) and specialized academic areas (such as laboratories, tutorial rooms and studios) is not exceeded. The 10 minutes walking time relates to 1/4 mile or approximately 400 metres. University Hall, the Centre for the Arts, the Student Union and the Regional Aquatic Centre are located within a diameter of this length and considerable opportunity exists for expansion of facilities within this limitation, particularly if common facilities are consolidated as a central spine. Should this occur, scope exists for the extension of common facilities to the west. The Aperture Residential Park to the south-west, parking areas to the west and athletic fields to the north-west would all be located within 10 minutes walking time to the core of common facilities of the campus.

2:2 ACCESS TO THEATRES

Teaching and research facilities of the University are organized around pedestrian circulation spines established at Level 9 (a tunnel from the Student Union Building linking with the Centre for the Arts) and at Level 6 (University Hall). These connect within the Centre for the Arts by stairs and by one hydraulic elevator which continue to the Level 5 foyer of the Theatre Complex. However, two adjoining elevators and an unused elevator shaft terminate at Level 8, all of





which could serve the Level 9 walkway by extending the lift shafts by one storey and relocating the elevator motor room above.

Access to the Theatre Complex, being located well within a 400 metre / 10 minutes walking time from all areas of University Hall, the Centre for the Arts, the Student Union and Physical Education Buildings, would be greatly improved by such increased elevator service at comparatively small cost.

2:3 PARKING AND ROADS

Major deficiencies of existing roads and parking facilities are the lack of an obvious front entrance for visitors and no provision for drop-off and parking adjacent to the Theatre Complex. Due to site gradients, the latter can only be addressed by an elevated structure at Level 5, directly to the south of the foyer at that level (see 4:2). The former needs to be resolved in any future consolidation of the common facilities spine between the Centre for the Arts and the Student Union Building (see 4:3).

Provision of parking structures will have to be considered as student numbers increase from current projections since all available western plateau area within reasonable walking distance has already been utilized.

A problem of the existing western carparks is their exposure to prevailing west south-westerly winds which can be mitigated by further planting of canopy trees in buffers between rows of parked cars.

2:4 STRUCTURAL FOUNDATION PROBLEMS

The entire campus of the University of Lethbridge is situated on very porous soil, the coulee areas towards the Oldman River being also very elastic. Any stormwater or irrigation seepage that enters building foundations could affect the bearing capacity of the soil, diminishing the degree of friction required to support piled foundations.

It is understood that the structural problems which have developed with University Hall are mainly as a result of the extensive cut and fill that was required on the site during construction which as affected the elastic substratum of the coulee formation over which the building has been built.

With respect to the Centre of the Arts which is constructed on a ridge between coulees rather than across coulees as in the case of University Hall, foundation instability is understood to be attributable to extensive excavation into the ridge which, like the adjacent coulees, is also very elastic as a building foundation. (see Appendices C & D)

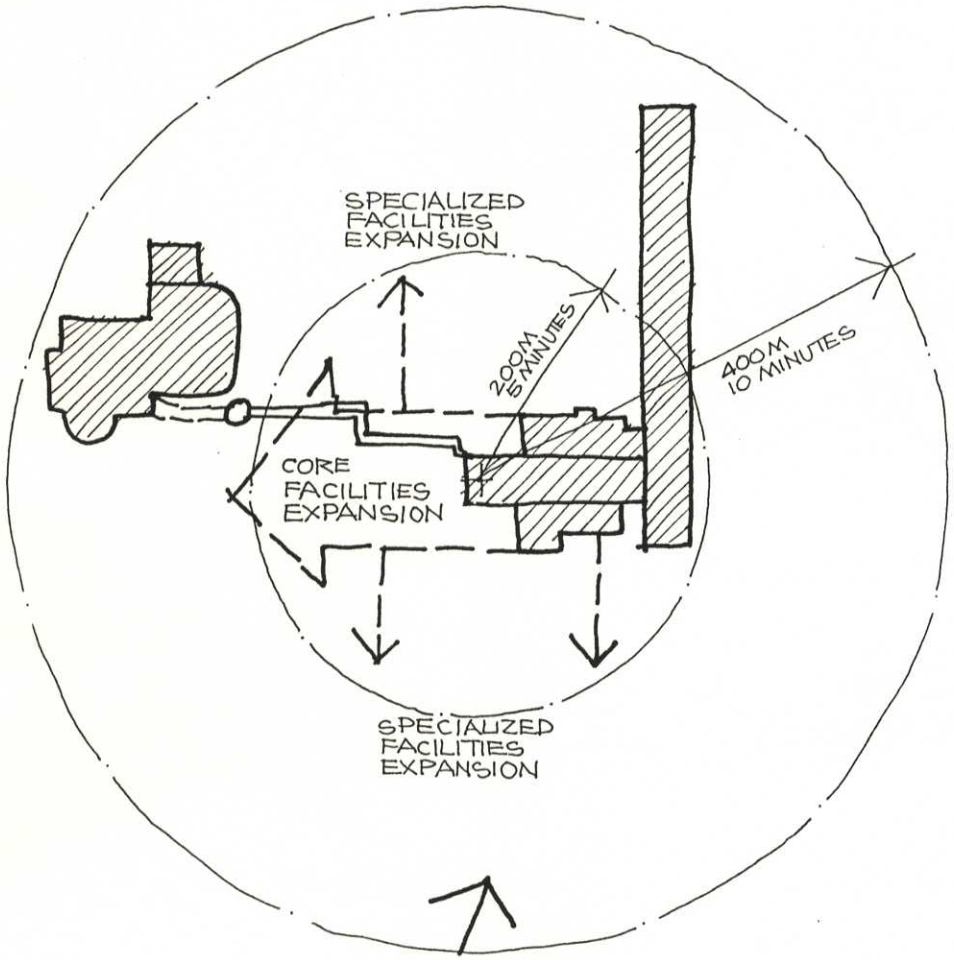
To avoid similar problems occurring in future development of the campus, geotechnical investigations of potential expansion sites should be completed. Stormwater runoff from the western plateau carparks and athletic fields needs to be diverted from the coulee area below. Further investigations of possible downhill seepage from the irrigation lake and the irrigation of the Devonian Park area needs to be undertaken. With new buildings, excavation into the flanks of coulees needs to be minimized together with piled foundations into

the coulee gullies.

2:5 PLANTS / LANDSCAPE

The outdoor safety of students has become a campus issue, particularly with the planting of shrubs which provide concealment of undesirable behaviour. Replanting of garden areas around the Aperture Residential Park and Devonian Park with indigenous low groundcovers and canopy trees such as cottonwoods is recommended.

The denuded coulee landscape of the University of Lethbridge is highly distinctive and any further planting in areas requiring wind or erosion control should be confined to indigenous species which do not require irrigation.



SECTION 3 : STRATEGY FOR FUTURE DEVELOPMENT

3:1 CAMPUS DEVELOPMENT PRINCIPLES

Great scope exists for the future expansion of the University of Lethbridge to occur from the existing lined buildings and maintain the principle of compactness and a continuously linked campus. Other development principles include:-

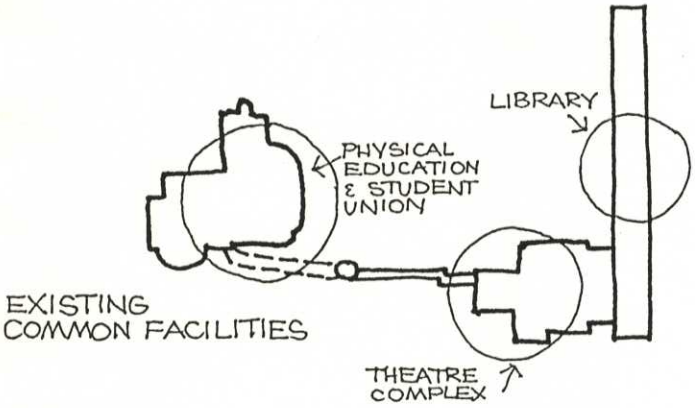
1. Easy access from the established pedestrian walkways at Level 9 (Student Union and Centre for the Arts) and Level 6 (University Hall and Centre for the Arts).

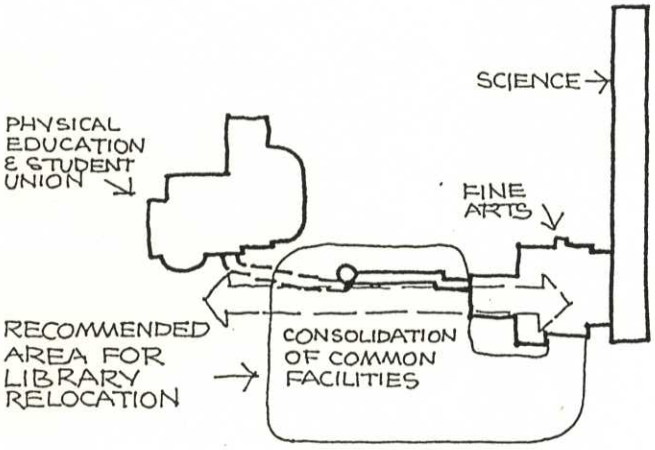
2. Consolidation of core facilities on the ridge location and development of specialized academic facilities as adjuncts to the common core.

3. Sensitivity to the scale and character of adjoining buildings on a highly distinctive landscape.

4. Responsiveness to climatic effects (i.e. sunlight and shade, prevailing winds, winter snow, etc.). (see Appendix A.)

5. Minimumization of piled foundations into coulee gullies and excavation into ridges between coulees. (see Appendices C & D)





3:2 LIBRARY

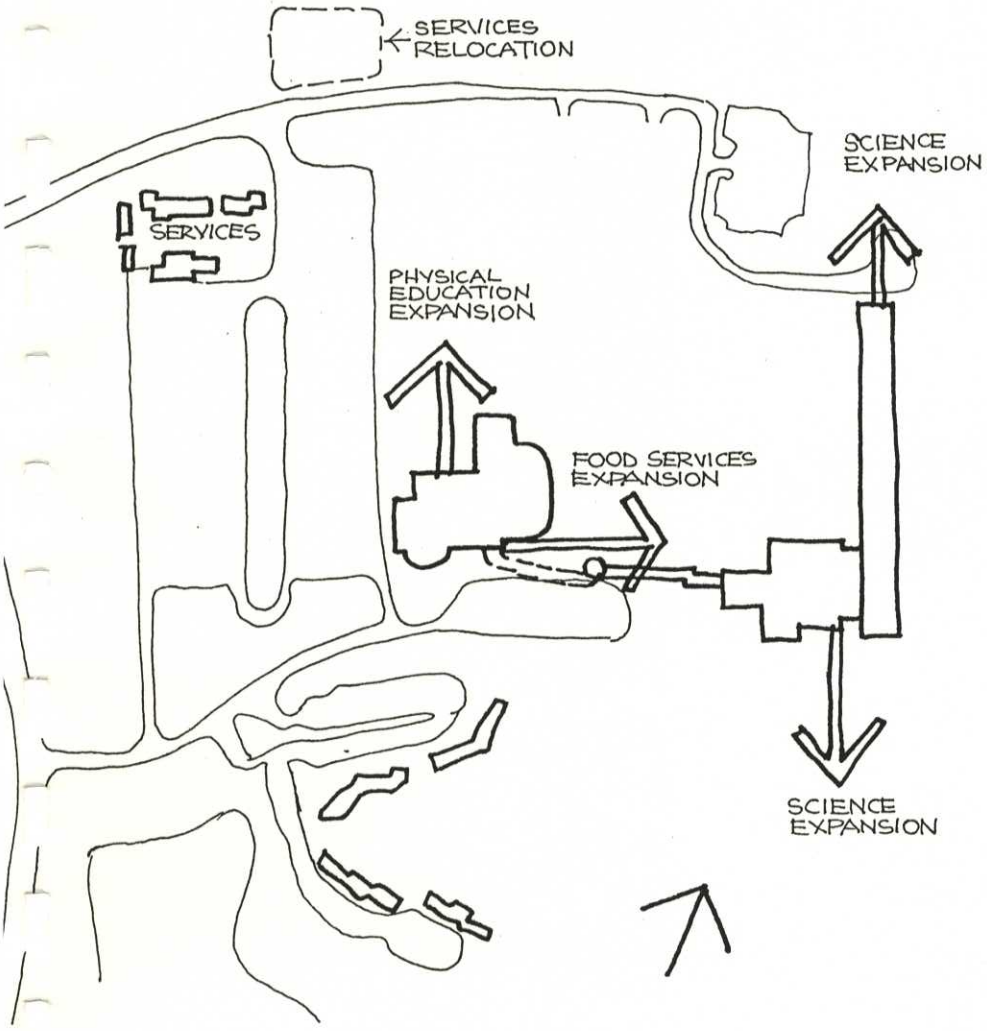
At the present time, the Library is located in University Hall. The structural limitations which have developed in this building do not permit normal bookshelf loading. Furthermore, should the Library be expanded in its current location to meet projected requirements by either relocation of adjoining facilities within University Hall or by a new extension from the existing facility, the common facilities of library and theatres would be consolidated remote from others (e.g. Student Union) with adverse effect on student walking time between campus facilities.

We recommend that an enlarged new library be located between University Hall and the Student Union Building to consolidate common facilities in this area. A new library facility can be organized with an entrance off the existing pedestrian walkways and functional requirements for bookshelf loading and optimum organization over 3 levels can be met. At the same time, space vacated in University Hall can be utilized for specialized academic expansion.

A number of siting options are available for a relocated library in this area, each with intrinsic requirements derived from the specific site (see Section 4).

3:3 SCIENCE

Being a specialized academic area, the location of science facilities is less constrained than the location of core facilities such as the Library. Science is currently located in University Hall and its future needs can be met by expansion into space vacated by the Library,



northwards expansion of University Hall and/or southwards expansion from the Centre for the Arts.

In view of potential chemical pollution damage to adjoining buildings, the location of Science in a westward expansion from the Centre for the Arts in conjunction with core university facilities at pedestrian walkway level is not recommended since the prevailing north-west winds would blow fumes over the Centre for the Arts and the expansion area to its south.

3:4 KITCHEN / DINING FACILITIES

These are core facilities currently located in Levels 4 and 6 of University Hall as well as in the Student Union Building. In addition to expansion of existing facilities, new kitchen and dining areas could be located to the north of the Level 9 tunnel connecting the Student Union and Physical Education Building with the Centre for the Arts, possibly in conjunction with a convention facility for the University.

3:5 PHYSICAL EDUCATION

Further facilities can be provided in the area immediately to the north of the Physical Education Building.

3:6 SERVICES BUILDING

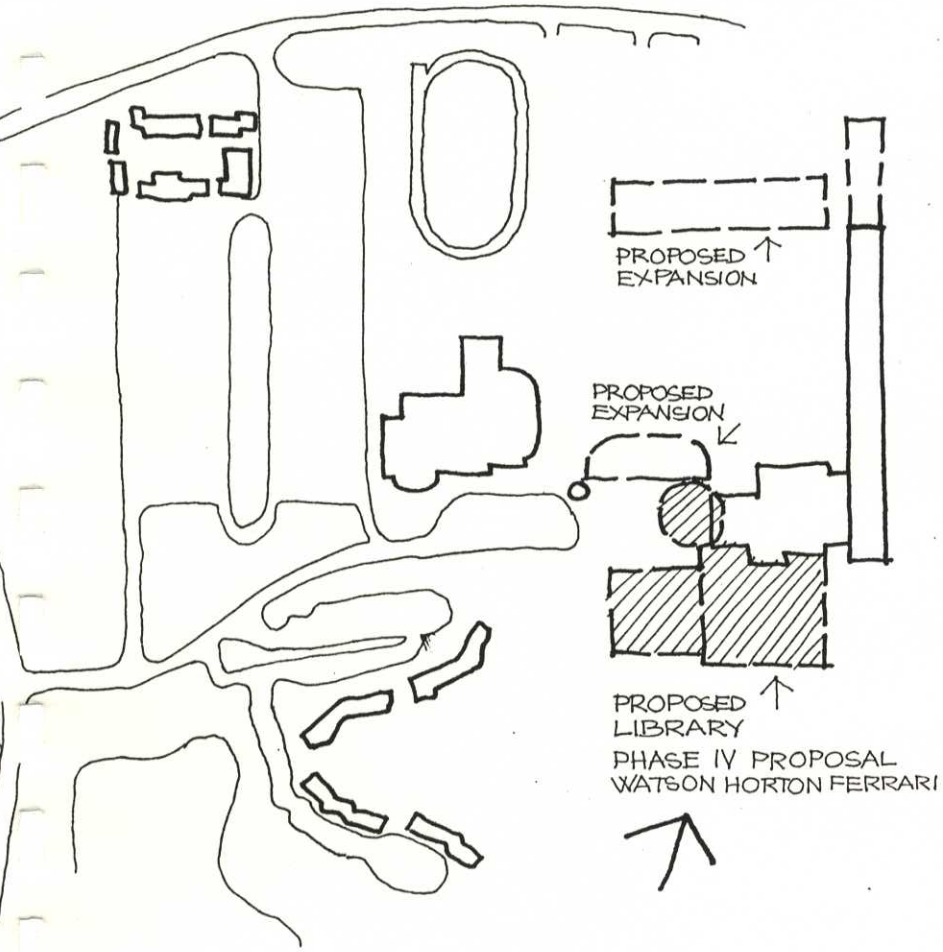
The location of the Service Building complex in the north-west carpark area is convenient for visitors and for access to current campus facilities. Should the University grow to accommodate more than 6000 students, relocation could be necessary to permit

academic expansion in the western carpark area.

The site to the north of Valley Road has locational advantages over possible sites to the south of the Aperture Residential Park such as closer proximity to the academic buildings for shipping, receiving and maintenance and greater visibility as a public information depot. However, relocation of city utility easements would be necessary.

3:7 BOTANICAL GARDENS

We recommend against the proposal to establish a botanical gardens area within the campus in view of undefined future campus requirements at this juncture and the highly sensitive nature of the site in terms of porosity, stormwater disposal and the unique and distinctive quality of the existing landscape. Public access, transport and parking will be problematic and the site is too valuable for other potential low impact uses to relinquish at this time.



SECTION 4 : DESIGN GUIDELINES FOR RECOMMENDED DEVELOPMENT SITES

4:1 POTENTIAL DEVELOPMENT SITES

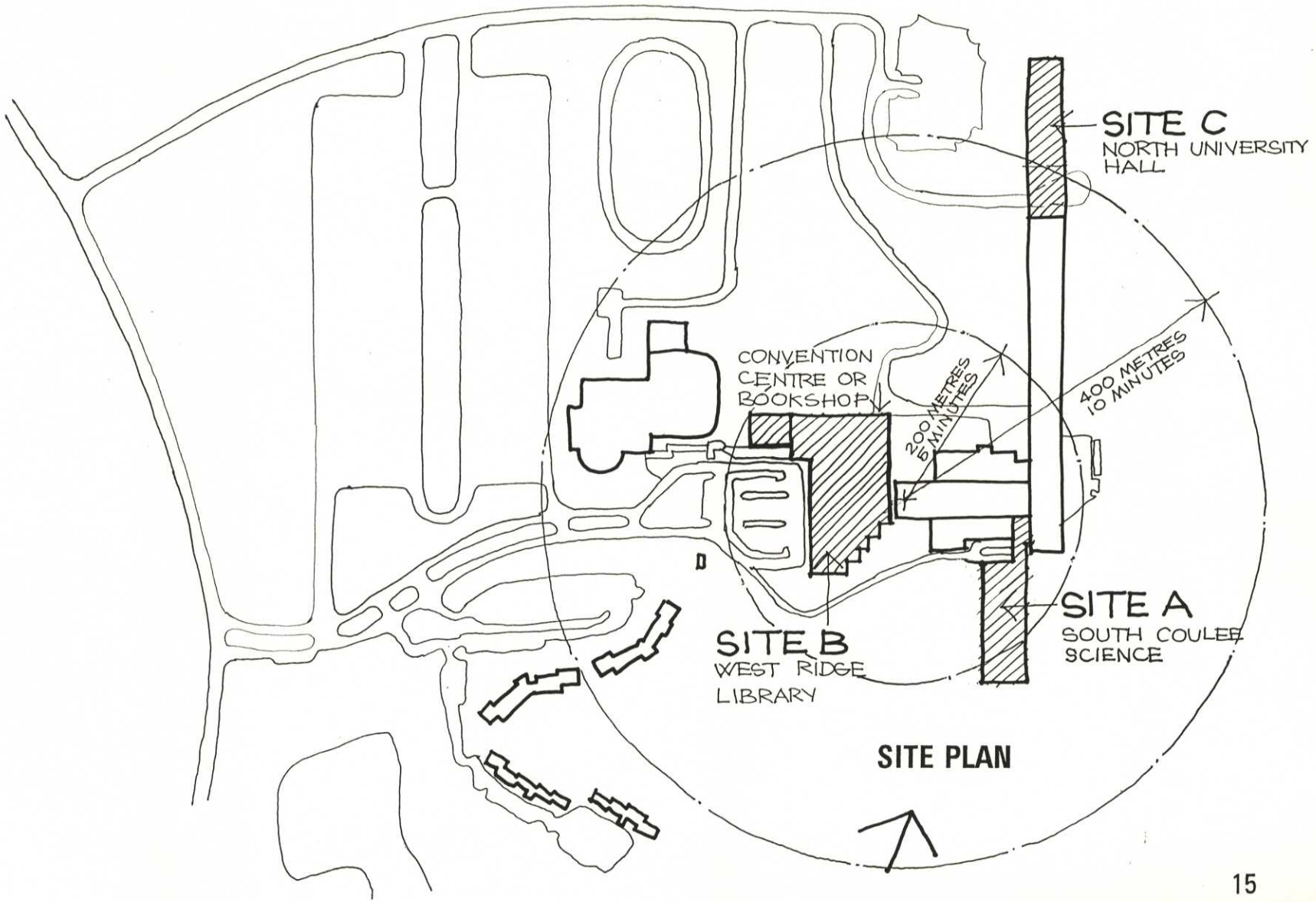
The Conceptual Planning Phase IV Report prepared by Watson Horton Ferrari outlined a number of potential development sites with a recommendation for a Phase IV project accommodating a 17,000 sq. metre (nett) Library, administrative space and a parking structure abutting the south and west of the Centre for the Arts. The proposal involved extensive excavation into the south side of the ridge between the coulees and while a new main entrance was provided, visitor access to the Theatre Complex was indirect, the Library was planned over four levels, the southern outlook from the Centre for the Arts was curtailed and its sculpture terrace was absorbed into an internal pedestrian concourse.

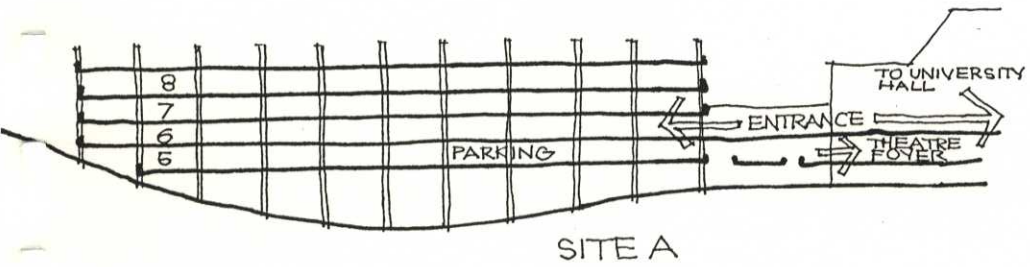
In view of new projections for a 15,000 sq. metre (nett) Library, 10,000 sq. metre (nett) Science expansion and the possible inclusion of a convention facility, we defined 3 potential development sites:-

1. Site 1 - South Coulee
2. Site B - West Ridge
3. Site C - North University Hall

In addition, the University described development priorities as follows:

1. The first short term priority is the Library/entrance facility;


SITE C
NORTH UNIVERSITY HALL
CONVENTION CENTRE OR BOOKSHOP
200 METRES 5 MINUTES
400 METRES 10 MINUTES
SITE A
SOUTH COULEE SCIENCE
SITE B
WEST RIDGE LIBRARY
SITE PLAN



SITE A

2. A second and longer term priority is expansion of the Science Department;

3. A third and longer term priority is a conference facility with an associated central kitchen.

4:2 SITE A : SOUTH COULEE

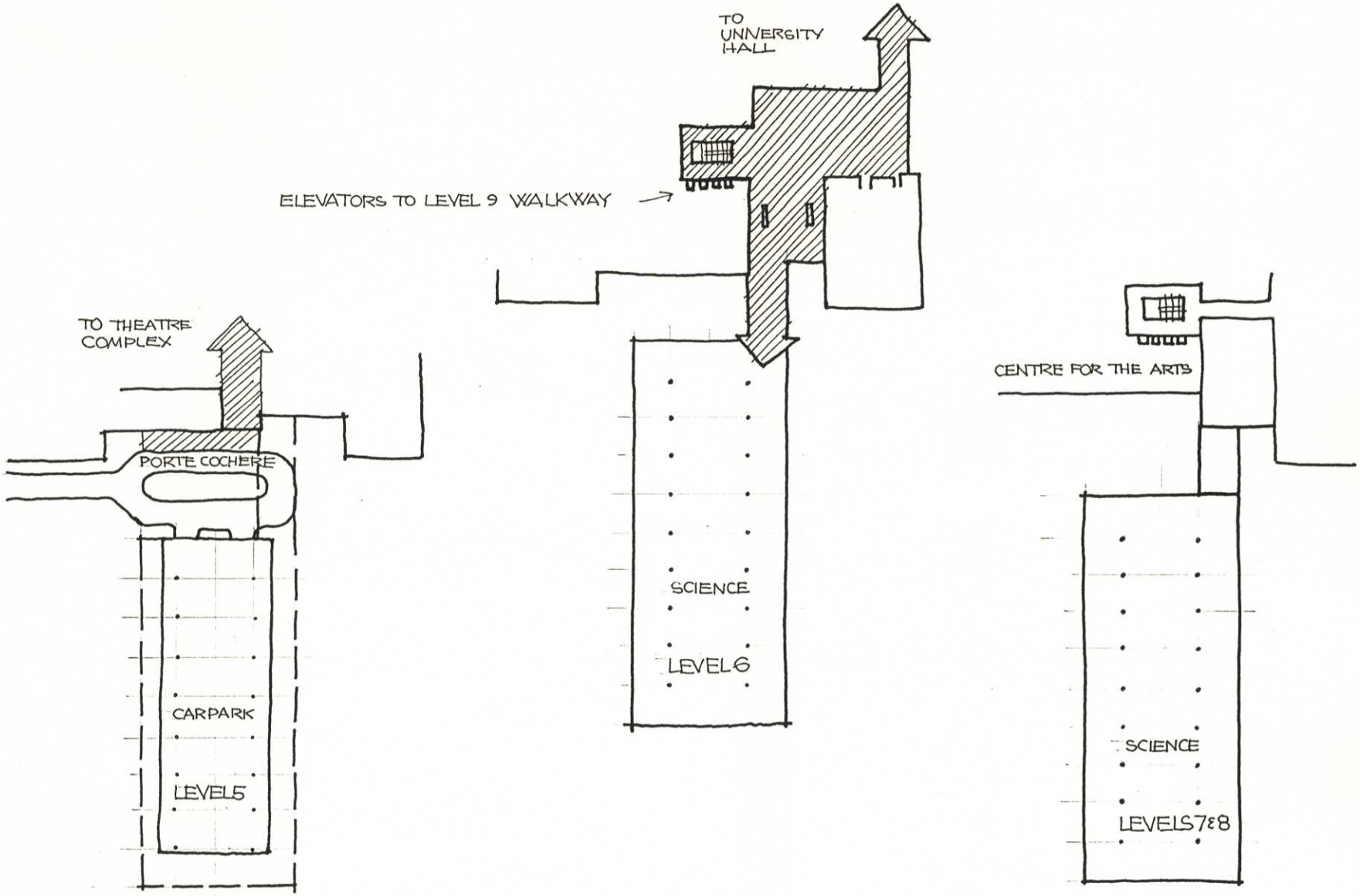
Our recommendations for this site is that it be developed for Science expansion in a wing building extending across the south coulee gully. The building would provide three levels of academic space connected through Level 6 to the adjoining atrium in University Hall and to a drop off and parking area for approximately 80 cars at Level 5 adjacent to the foyer area of the Theatre Complex of the centre for the Arts.

The location is recommended for Science for a number of reasons:

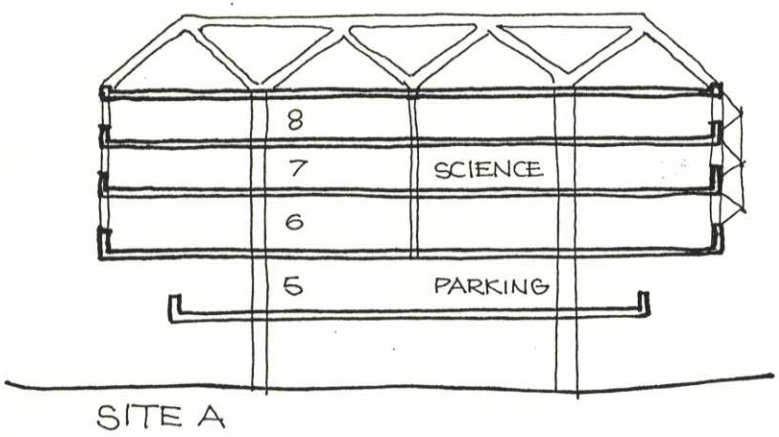
1. The student/faculty group is immediately adjacent to the atrium between University Hall and the Centre for the Arts.

2. This is an optional location for prevailing winds to move laboratory fumes with minimal impact on the rest of the campus.

3. This site locates the Science Department closer to potential future Research Park facilities which may be developed on the recently acquired land south of the current University boundary.



SITE A: SOUTH COULEE
POSSIBLE 3 FLOOR SCIENCE CONFIGURATION



SITE A

4. A new wing in this location reinforces the original Erickson/Massey plan.

In order to minimize foundations into the coulee below, one solution would be a structure hung from rows of exterior columns at 10 metre centres, the intermediate columns on a 10 metre transverse grid being supported from rooftop trusses between the exterior columns to support the exterior of the building.

Should construction on this site not proceed in the immediate future, we would recommend that the drop-off facility at Level 5 extending from Aperture Drive be implemented together with valet parking for Theatre Complex visitors' cars in existing carparks.

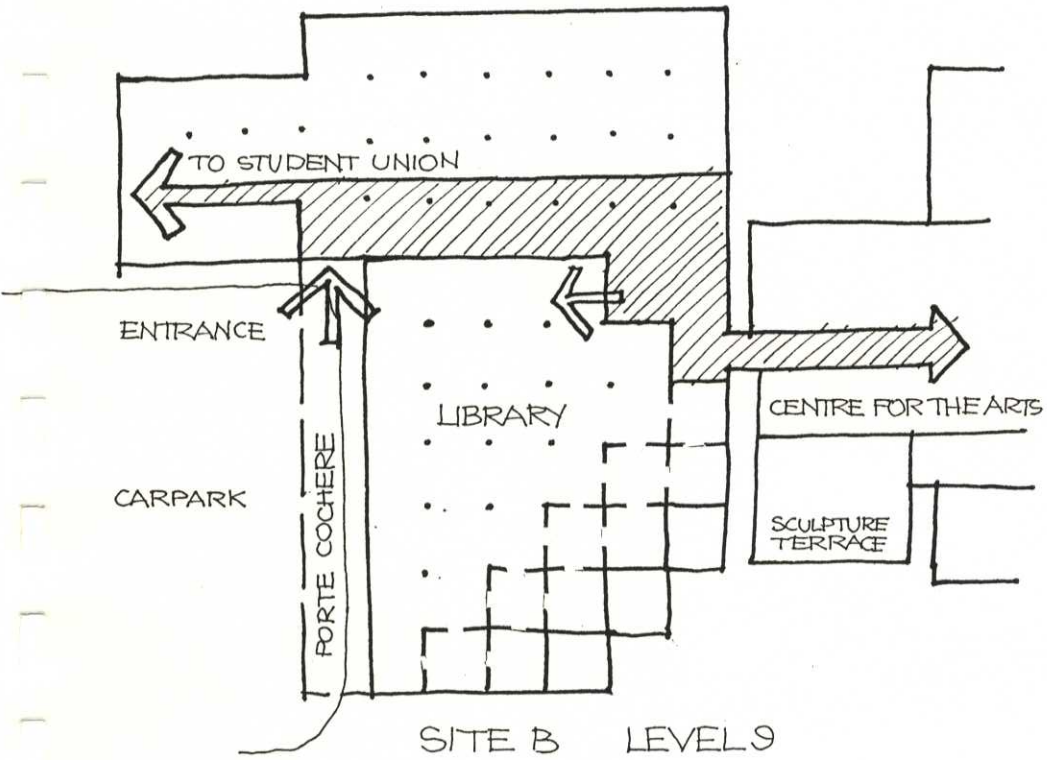
4:3 SITE B : WEST RIDGE

We recommend this location for siting the Library facility since it answers a number of associated program requirements:-

1. A well defined, properly scaled and identifiable entrance to the campus can be developed in conjunction with the Library building.

2. A small but well controlled gallery can be incorporated for display of the renowned University collection.

3. An orientation/information/security point can be incorporated within the entrance area.



4. A future conference facility with associated kitchen space (priority 3) can be located adjacent to the general entrance area.

5. A protected arrival area can be incorporated for passenger drop and pick up.

6. The differential in slope works well for a service entry below.

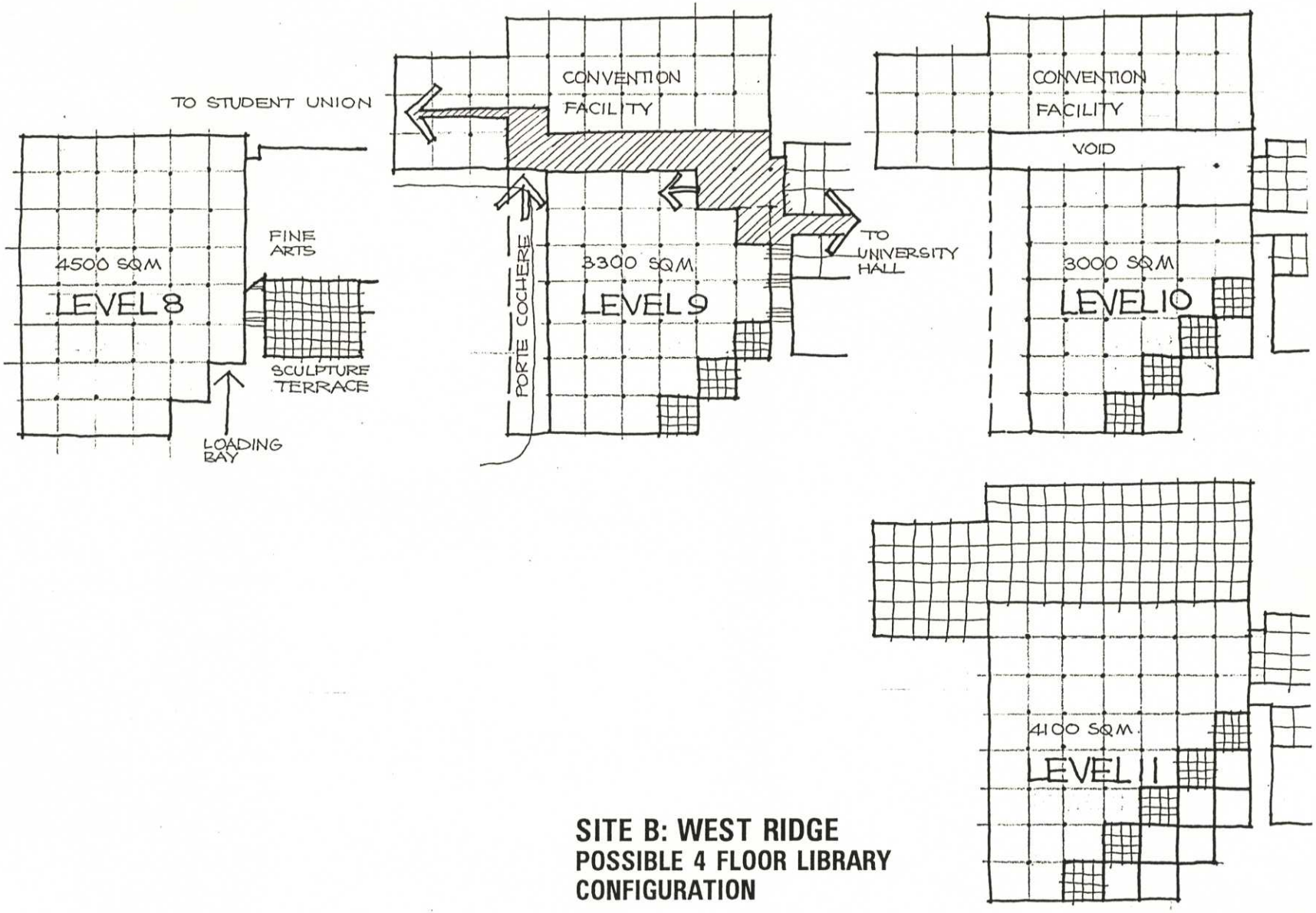
Issues associated with this site:

(A) A 6 metre drop in elevation occurs from the Student Union plaza to the existing entrance. The new entry point, some 70 metres to the west, will be approximately 2 metres higher requiring interior stairs and/or ramping to the Level 9 walkway.

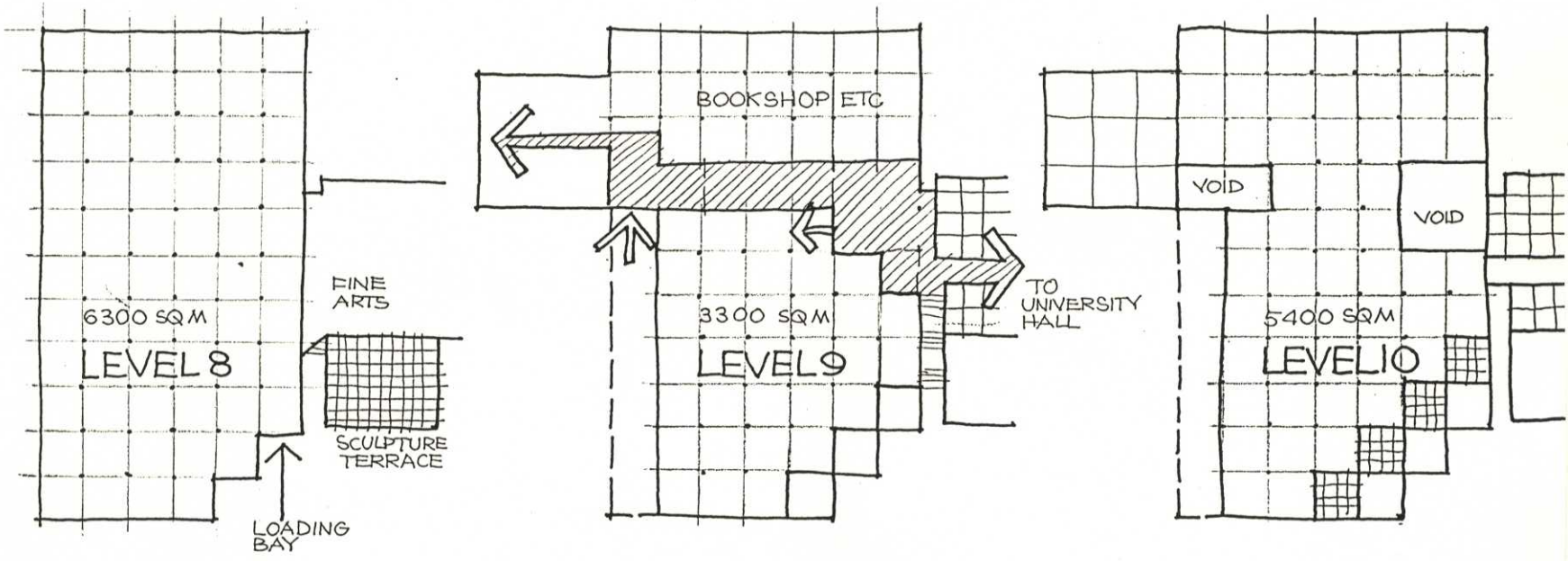
(B) Protection from prevailing west south-westerly winds will also be necessary at the new entrance to the campus.

(C) Minimal excavations of the ridge should be investigated for reasons described in the geo-technical report, the Library being accommodated in either a three or four floor configuration.

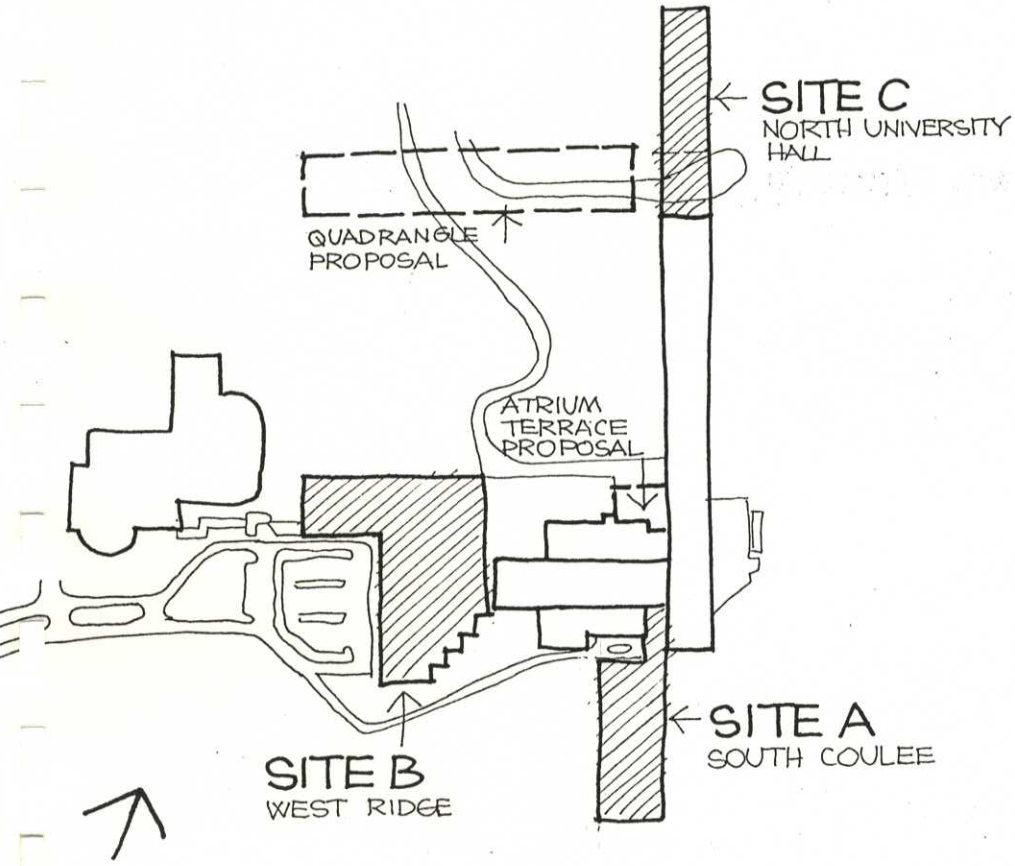
(D) The wind protected and sunny south east edge of this site could be utilized as terraces for library staff, users etc.



SITE B: WEST RIDGE
POSSIBLE 4 FLOOR LIBRARY CONFIGURATION



SITE B: WEST RIDGE
POSSIBLE 3 FLOOR LIBRARY CONFIGURATION



4:4 SITE C : NORTH UNIVERSITY HALL

The north extension of University Hall for Science expansion is not recommended at this time. Although such an extension is within the spirit of the Erickson / Massey plan in its linearity, it moves the Science facility and students even further from the atrium and access to the core facilities.

The addition of an east-west component at the north end of University Hall to form a 'quadrangle' as recommended by the Conceptual Planning Phase IV Report prepared by Watson Horton Ferrari is not recommended. The quadrangle tradition is not relevant or appropriate to the uniqueness of this place, the dimensions of the open space so created are too large to give any sense of enclosure and the dramatic drop in elevation from west to east further dispels any sense of quadrangle.

4:5 UNIVERSITY HALL - EXISTING LIBRARY SPACE

The use of space in University Hall which will be vacated by the Library will be determined by internal decisions of the University community. However, appropriate uses which might be considered would be lightly serviced academic space and special core uses such as a Visual Arts study centre.

4:6 ATRIUM TERRACE, ETC.

Development of the north patio space outside the 6th Floor atrium as a Visual Arts study centre is not recommended. The junction between the Centre for the Arts and University Hall is less than

successful and further additions would only confuse an already unhappy connection.

APPENDIX A

EXCERPTS FROM THE DEVELOPMENT PLAN UNIVERSITY OF LETHBRIDGE

Erickson/Massey, March 1969

V. OBJECTIVES OF THE PLAN

1. External

A. The university plan should encourage.direct communication between the university and the adjacent residential community as well as the university and the city centre of Lethbridge.

B. Attractive pedestrian walkways, linking directly the green areas of the community and the university, should provide a continuity of green space and parkland from the community through the university to the river valley.

C. A simple and clear organization of the university is needed to produce simple explicit forms for the university that in every way possible will represent the most suitable plan and building form for the prairies.

D. The most important view of the university will be from the east of the Oldman River, and the massing and disposition of the buildings from this prospect must be particularly effective.

E. The buildings should be arranged to take particular advantage of the views of the river, coulee, bridge and city.

F. The buildings should be sited so that the retention and use of the coulees, as protected landscaped areas, is encouraged.

2. Internal

A. Reflection of Academic Philosophy:

The University of Lethbridge, in view of the great changes taking place in the educational policy of today, in view of legitimate student discontent, in view of the portending technological advance in electronic teaching and recording methods, and in view of the philosophy and attitudes already expressed by its faculty and administration, should take a significant step to demonstrate in its layout and physical plant its participation in the evolution of the modern university.

B. Relationship of Disciplines:

Concomitant with this goal, the plan should reflect the earnest intent of the university to obtain as much value as possible from the interaction between various disciplines, within the limits of the academic objectives of each specific discipline. To facilitate this, the plan should concentrate on the juxtaposition of facilities so as to benefit from cross-fertilization.

C. Flexibility and Expansion:

The plan should accommodate rapid and slow change in various disciplines either by the easy expansion of one department into another space, or by providing for suitable increments for building expansion.

D. Centralization of Common Space:

Experimentation with learning situations should be encouraged, which takes the teaching space out of the classroom into a common space which can be changed easily in size and character to accommodate specific devices or experiments in teaching methods. The potential of all spaces within the university should be analysed with the intention of maximizing the exchange of knowledge and ideas.

E. Circulation:

Wherever possible the pedestrian circulation should be simple, direct and under cover, so that all parts of the university are reached without having to venture outside. At the same time, it should be attractive to traverse the university by outside routes.

VI. THE DEVELOPMENT PLAN

1. Land Use

A. Parkland:

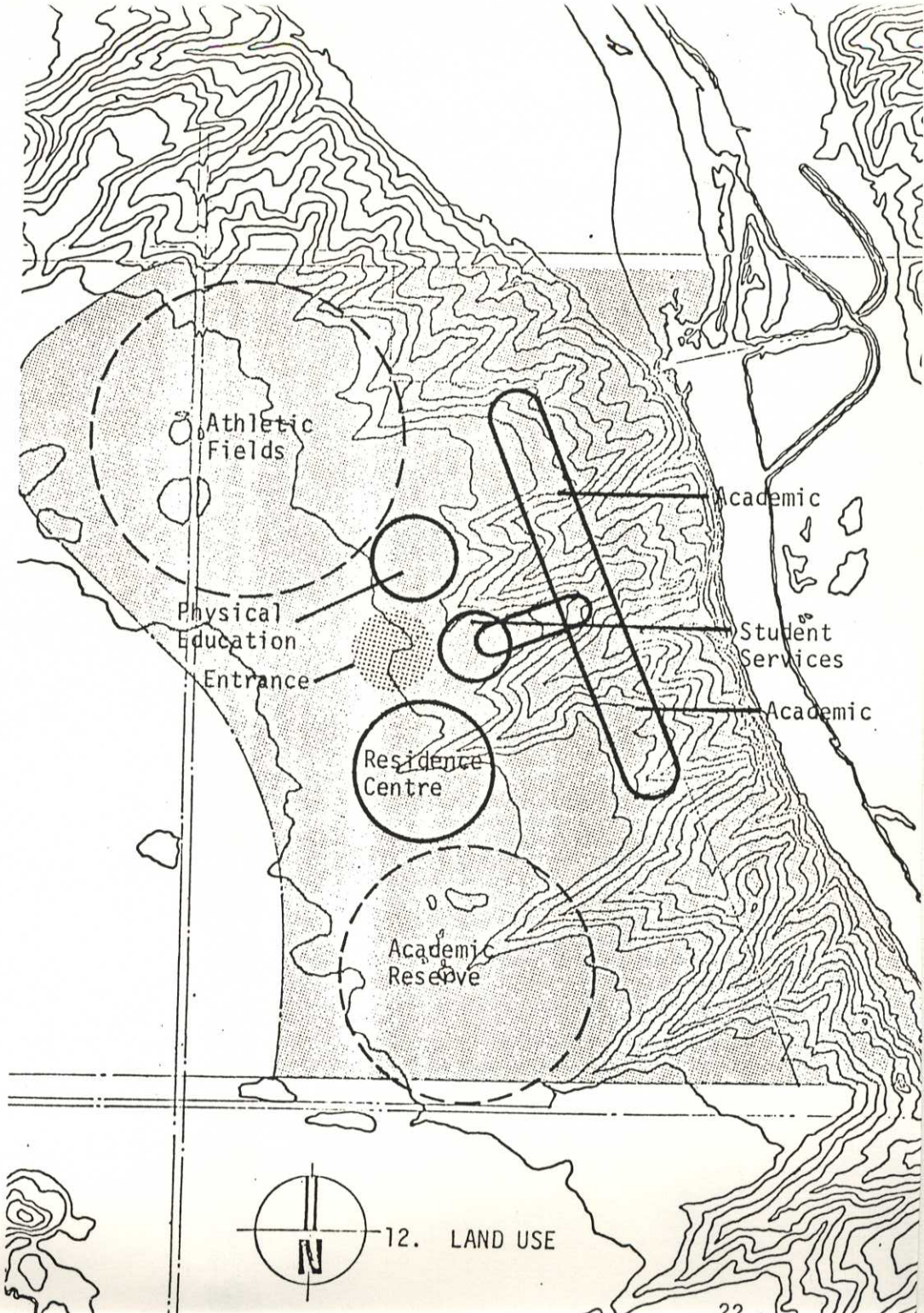
The river parkland and green space extends up the coulees.

B. Academic Area:

The academic area is located where it can best take advantage of the views up and down the river and into the coulees. Rather than placing the academic area where it could only have a removed view of the city and river, it is placed in intimate contact with them and direct contact with all levels of the coulee. This frees the open flat areas of the site for use as athletic fields, parking and expansion, connects the long indentations of the coulees and makes the upper flatland more useful.

C. Academic Reserve:

Academic expansion is to the north and south, with a large academic reserve to the south for the location of related institutions which are expected in the future development of the University.



12. LAND USE

D. Student Residences:

Student residences in the initial stages take the form of minimal rooms, arranged around common lounge and study space. Sheltered in the bottom of the coulees, they look out and have access to the landscaped coulees. Situated below the academic area, they have direct access to the central university space, so that all areas of the university become extensions of the private living space of the student.

E. The Entrance:

At the entrance to the university, the university facilities which are frequented by the community are placed around an entrance court.

F. The University Centre:

The student services are at the main entrance to the university. Here are collected, in one building, the student newspaper and club offices, meeting and games rooms usually associated with a student centre, as well as counselling, health and employment services, the bursar and registrar. At the entrance are also lounges, eating facilities, perhaps a pub, the main theatre and meeting spaces for the university. The restaurant and lounges look down into the outdoor theatre in one coulee and the garden in the other.

G. Recreation Complex:

A recreation facility at the entrance to the university contains the athletic facilities: the women's and men's gyms, exercise rooms, classrooms and swimming pool, that are needed at the university. The gymnasium has direct access to the playing fields and the bleachers on the earth banks west of the main field.

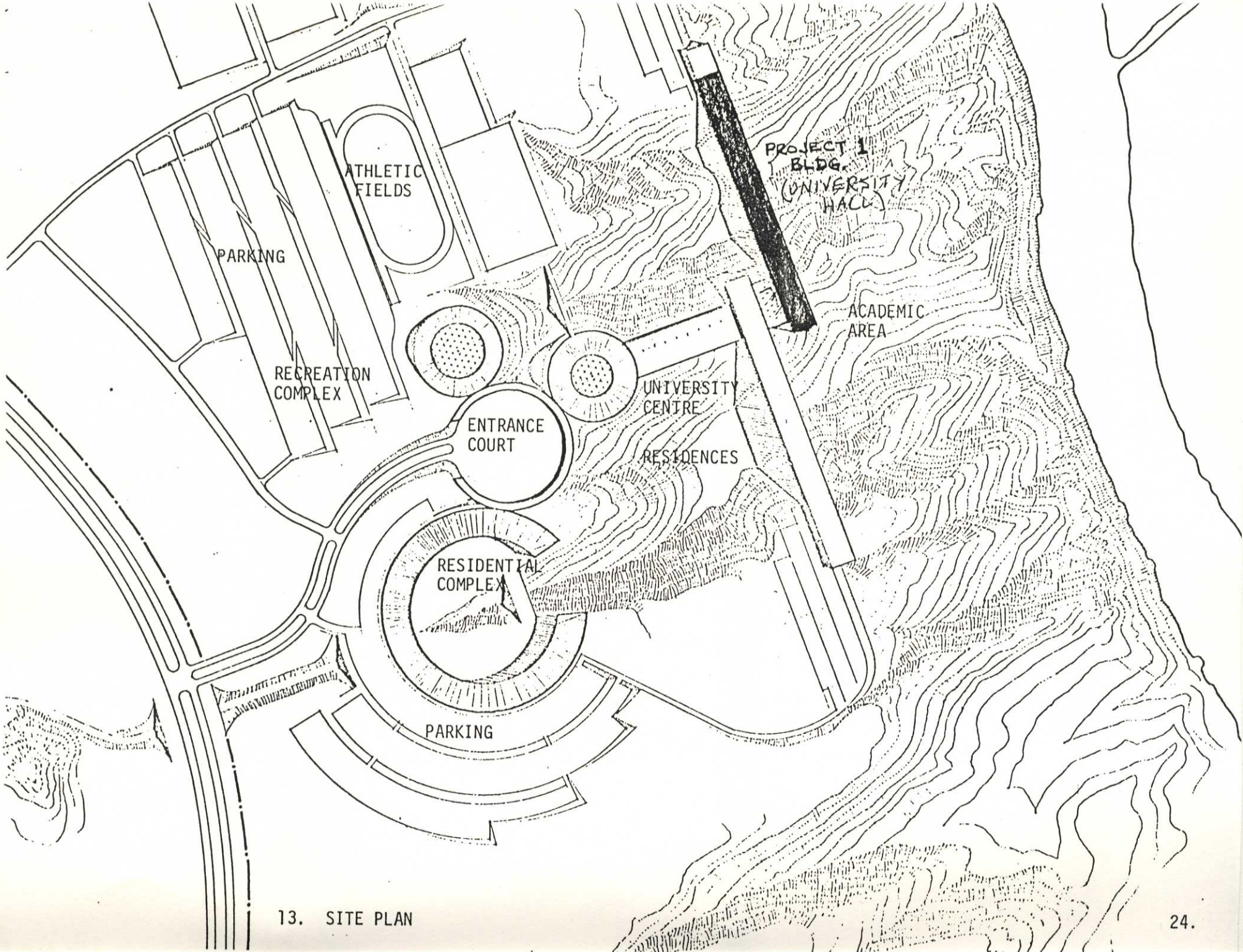
H. Residential Complex:

In keeping with the university's stated desire of providing a variety of student residential space, a Residential Complex containing apartment accommodation for students is located at the entrance court. Within this complex would be found various commercial facilities associated with any university, such as a bank, post office, bookstore, barber, pharmacist, as well as possibly a restaurant or coffee house.

The university needs certain facilities early in its growth that would provide services for its own population. It is not intended that these services should be extensive nor competitive with the central business development of the city or shopping areas in the west when these are required by an expanding population. The residential centre is intended as part of a unique facility at the entrance to the university, available to the community, but primarily a residential and service space for students.

I. Athletic Fields:

Between the university and the site of the proposed Battle Park along the edge of the coulee, an area is designated for athletic fields. Thus the green space-parkland is extended from the north into the site.


ATHLETIC FIELDS
PARKING
RECREATION COMPLEX
ENTRANCE COURT
PROJECT 1 BLDG. (UNIVERSITY HALL)
ACADEMIC AREA
UNIVERSITY CENTRE
RESIDENCES
RESIDENTIAL COMPLEX
PARKING

13. SITE PLAN

2. Circulation

A. Entrance Court:

The arrival point of the University is between the University Centre, Residential Complex and Recreation Complex. Buses and vehicles would load or discharge passengers here and would proceed through the activity sections of the university to the academic core.

B. Vehicular Movement and Parking:

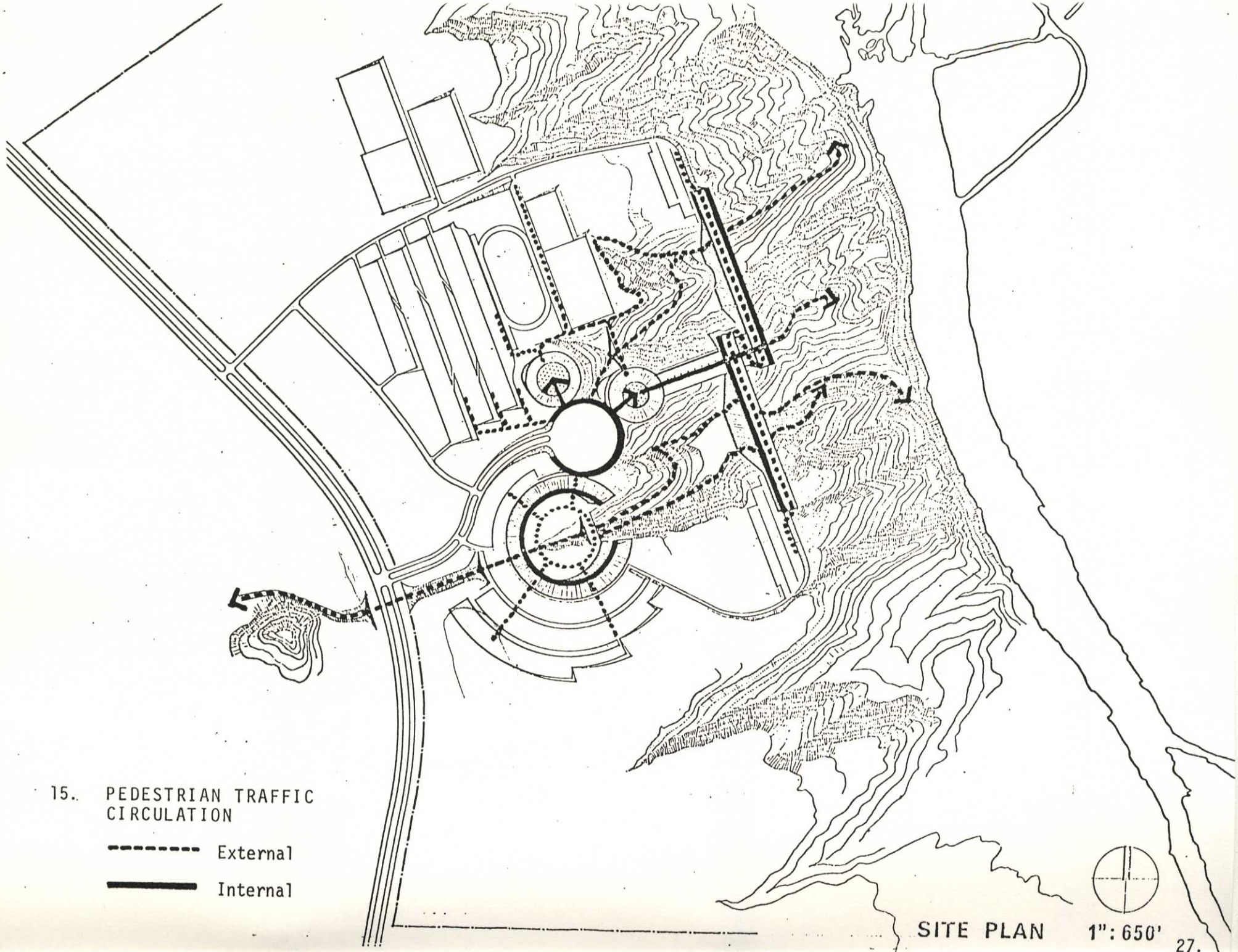
On approaching the university, one would enter by a divided boulevard circling the Residential Centre to the entrance circle, discharge passengers and enter a main parking lot behind the Recreation Complex. The main parking area is directly accessible from a second entrance to the north. If the destination were the Residential Complex, one would enter its parking directly off the entrance road.

Further parking associated directly with the north and south blocks of the academic area would be reached by the service roads at the east and south ends of the campus. Service and emergency access to the academic buildings is at north and south and via access road along the west wing to the centre of the academic area.

C. Pedestrian Circulation:

External access is possible to all parts of the campus by means of walks and walkways around the edge of or down through the coulees, or over the roofs of the academic buildings. Thus a great variety of alternate routes with differing aspects and views are available.

The pedestrian also has complete covered and indoor access to all parts of the university through a main concourse level, varying only by two floors throughout the university. This concourse level gives access up or down one storey to all academic facilities except for the library, which is multi-storey.


15. PEDESTRIAN TRAFFIC CIRCULATION
External
Internal
SITE PLAN 1": 650'

3. Form and Massing

A. Academic Space:

The academic space is contained in a linear multi-storey building crossing the two coulees that penetrate the central campus. The multi-storey space is built into the coulees rather than up, so that the building mass remains low on the landscape.

The primary objective is the achievement of an uninterrupted roof line, a strong horizontal, which by its very flatness contrasts with, and enhances the richness of contour of the coulees.

Since a great variety of spaces will probably be reflected in the facade of this structure, the strong horizontal of the roof parapet is needed to express the boldness demanded by the open site.

B. The Residences:

Residences are domestic in nature and should achieve a certain intimacy of scale in contrast with the academic space. The first of these, placed at the base of the building, look into and step down the coulee, to achieve this intimacy of outlook and scale.

C. University Centre:

As a collecting point in the university and the centre of student life, the University Centre has been massed into a single concentric building. The conical form reflects the angle of slope of the coulees, and suggests mass as against the linear aspect of the academic building.

D. Recreation Complex:

The Recreation Complex was contained within a similar form, since it was found that these forms were harmonious to one another and the landscape. More elaborate and less geometric forms disturb the quiet counterbalance between the land and the buildings.

E. Residential Complex:

The task is to contain a variety of functions within a single building complex that relates to the existing forms of the campus. The conical form was adopted, but opened to the coulee which ran into its centre space. It becomes another earth mass, at the head of a coulee, and inside a protected courtyard containing part of the coulee is surrounded by shops and apartments.

4. Landscape

To maintain the concept of the prairie landscape, the upper levels of the university are left in a natural open field-like landscape treatment. Playing fields will be terraced, and parking lots both terraced and bermed, so that the automobile is kept out of sight and wind and drifting snow are controlled. The coulees adjacent to the academic area, however, will be planted to provide shelter and shaded relief from the exposure of the open fields.

5. The Academic Area

A. Space Relationships:

i. Space Relationships Defined by Function:

The provision of spaces in as great a variety and flexibility possible is a prime objective of the Lethbridge plan. These spaces can be divided into a number of basic types:

a. The spaces where privacy and isolation for individual work can be found such as one's room, private study space or an office.

b. The spaces where intimate exchange of ideas could occur, such as one's room, an office, a table, a corner somewhere.

c. The spaces where a small group could exchange ideas in conversation or seminar.

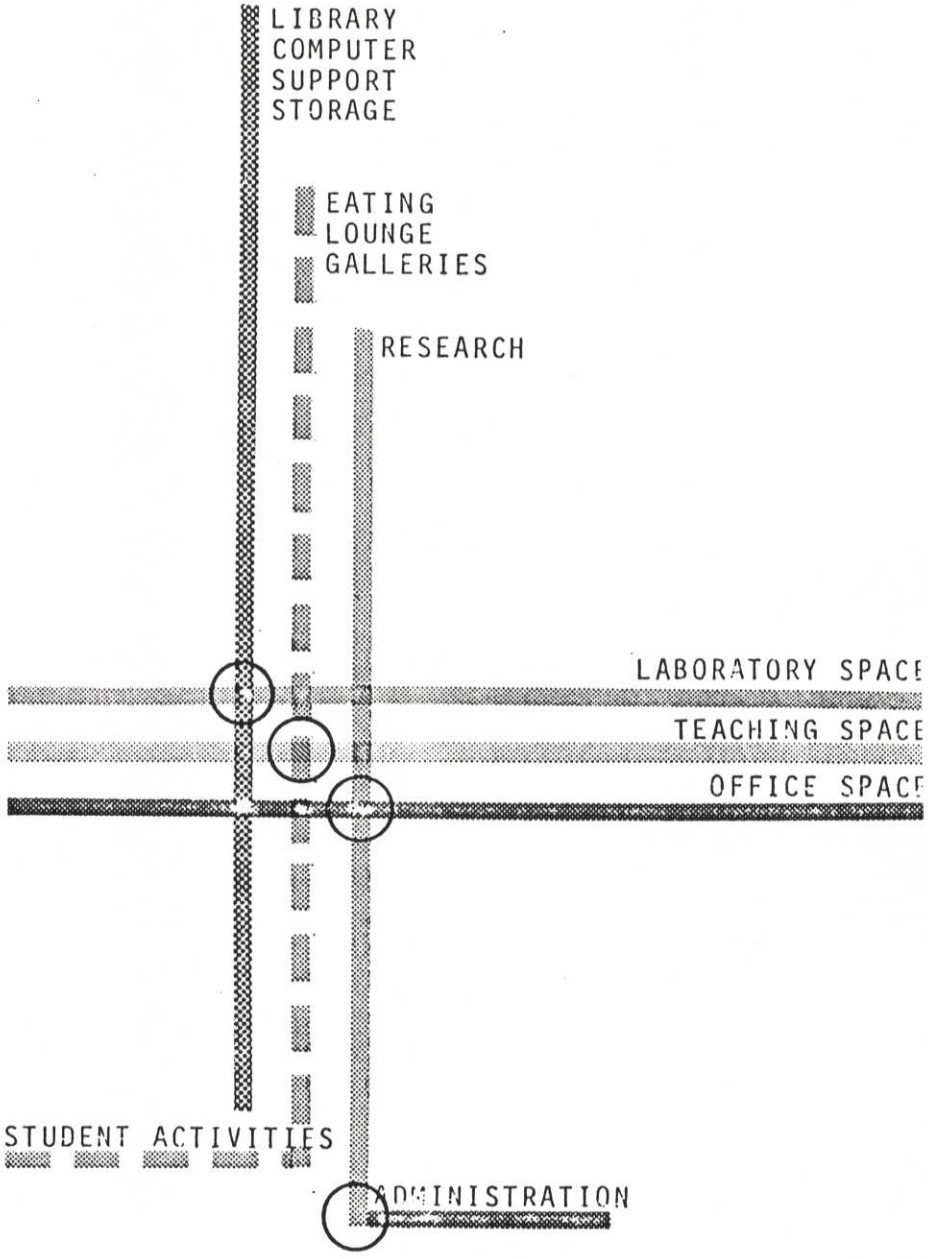
d. The larger spaces where an audience/speaker relationship exists.

e. The spaces designed for specific work and study tasks such as laboratories, both large and small.

f. The spaces where ideas are stimulated by the activity of the surroundings such as the cafeterias, pub, etc.

g. The major meeting spaces involving many hundreds, where exchange is minimal and public.

Of these various types of space within the University community, an interrelated system can be defined. Private work, study and research spaces share common needs. Instructional and discussion areas share common use with lounges and other meeting spaces. Special laboratory, instructional laboratory and support space can also be linked together.



SPACE DEFINITION

ii. Space Relationship Defined by Discipline:

Table I (in Appendix G) records the primary (O) and secondary (X) inter-disciplinary relationships between faculties and departments gathered during discussion with the University faculty.

iii. Breakdown of Spaces by Discipline and Function:

Using data prepared by the University (Users' Report), the estimated spaces required by each discipline for each use (special instructional, instructional, laboratory, office, research, support and service) have been tabulated for the 2,200 and 5,500 student university populations (see Tables II-VII, Appendix G). These totals of space, both by discipline and use, have formed the basis for the preliminary planning.

iv. Space Relationship Defined by Service Requirements:

When needs for services and supply systems are common, spaces would also be grouped. Examples of this would be class laboratories in science, which would be stacked vertically or extend horizontally.

v. Open Space:

An examination of all of the space types reveals that only certain spaces require acoustic or visual isolation. To illustrate, speaker/audience spaces require enclosure for acoustic reasons. Other spaces, however, can be left open to be shaped to the purposes of the user. A general open space, therefore, by means of sound baffles or visual barriers as simple as furniture or plants, can serve for seminars, group discussions and teaching sessions of many types, as well as study, lounge and lunchroom space.

vi. Space Relationships Within Disciplines:

From data gathered in discussions with the university, certain basic relationships of space have been clarified within each of the departments, suggesting three basic associations of space.

a. Instructional-Office

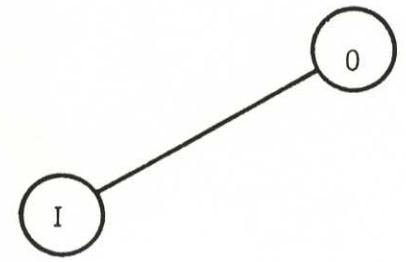
Humanities (e.g. philosophy, English, economics, history) where research is carried out in space similar to office space.

b. Instructional-office-laboratory

Social Sciences (e.g. psychology, geography) where research largely occurs in spaces similar to class laboratory areas.

c. Instruction-office-laboratory-research

Physical and Life Sciences (e.g. physics, chemistry, biology) where office and research and class laboratories are separate spaces.



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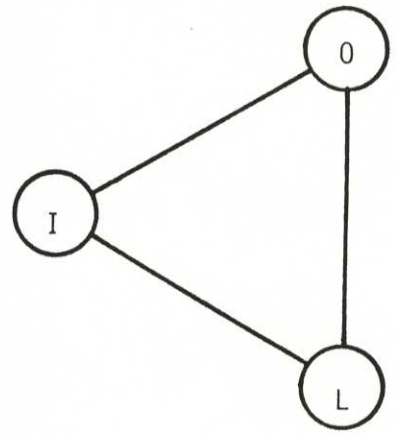

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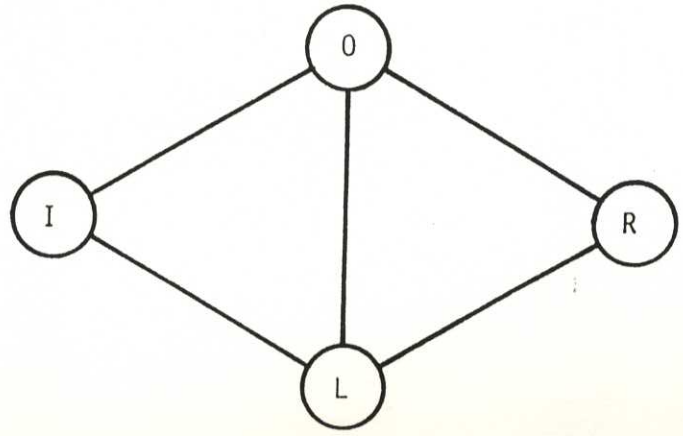


c.

17. SPACE RELATIONSHIPS WITHIN DISCIPLINES

B. Organization of Space:

i. Functional Organization:

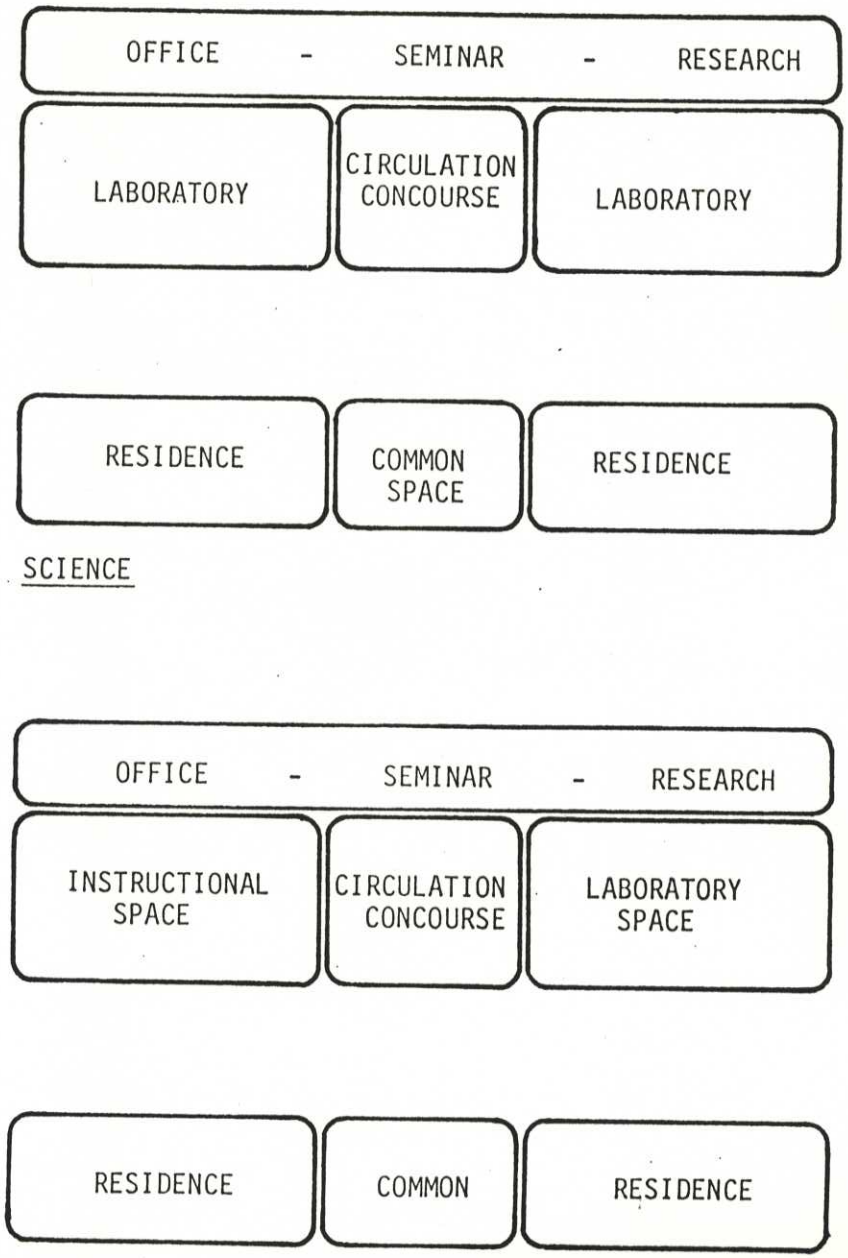
Assuming that all disciplines require discussion, study and office space, and that each discipline occupies a section of building, these facilities should occur in the required proportion in that building section.

Although disciplines may have slightly different requirements, by grouping disciplines with similar requirements, they benefit from proximity and can expand simply by exchanging spaces or moving to other locations.

The suggested cross-sectional organization of spaces of the university would incorporate these potential combinations, by zoning the space, as in the diagram, with office, instructional and research-laboratory-support space in three sectors allowing for possible overlapping of functions where this is required.

ii. Discipline:

Specific arrangements for discipline centres along the horizontal pedestrian pathway will be continuously examined as the university grows. The intention is not to define specific faculty or departmental centres, but allow space assignment to vary as growth and expansion within disciplines occurs. Since the precise development of the university at the 5,500 student level cannot be predicted, this approach is necessary if the university is to contend with changing needs.



18. CROSS-SECTION
ORGANIZATION OF SPACE BY FUNCTION

iii. Open Space Principle:

A flexible, changeable, open space contiguous to offices and class laboratories, continuous through the length of the university, is substituted for classroom space.

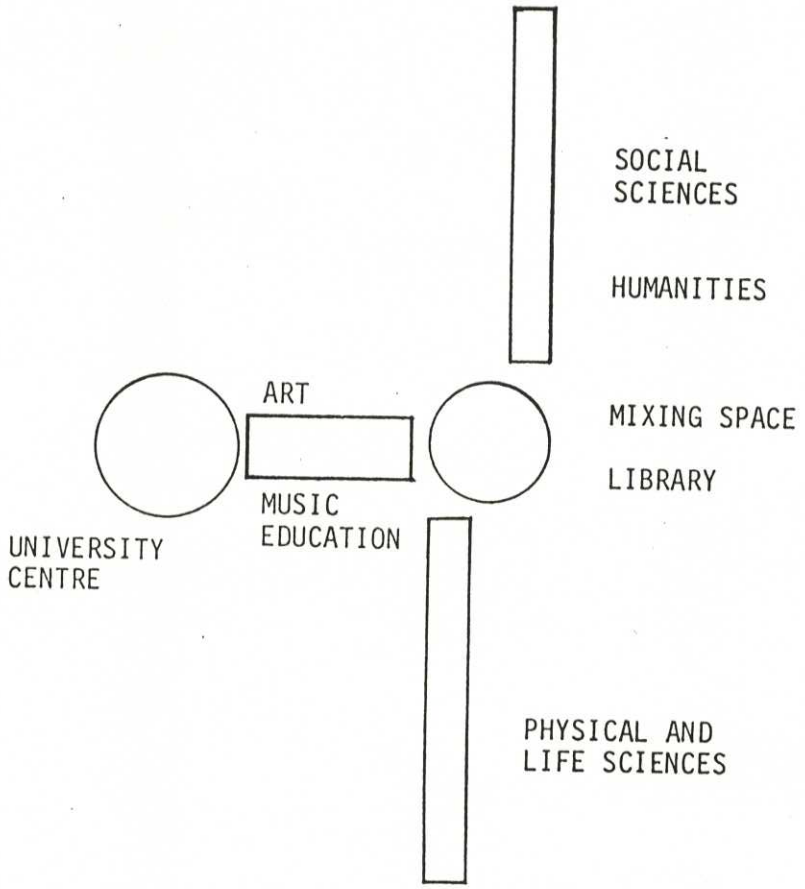
iv. Flexibility:

A repetitive modular structure is essential to provide both simplicity of structure and interchangeability of space, so that necessary variations of space can be provided along its length.

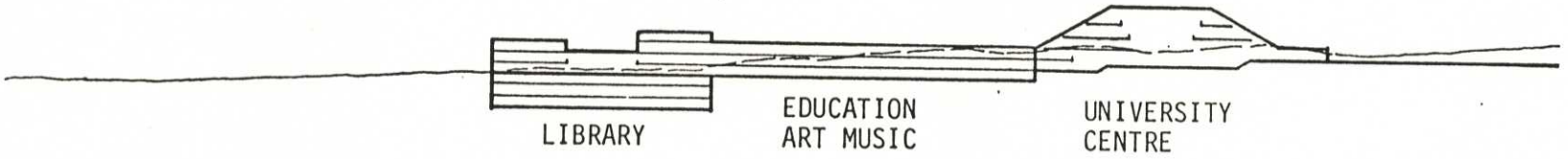
C. Plan for the Academic Area:

After assessing all of the various relationship requirements, a plan has evolved in which the overall academic area is divided into three sectors: the social sciences and humanities in the north; the physical sciences in the south; and education, art, drama and music (with exhibition space, recital hall and theatre) to the west. The west sector serves as the main concourse connecting to the university centre.

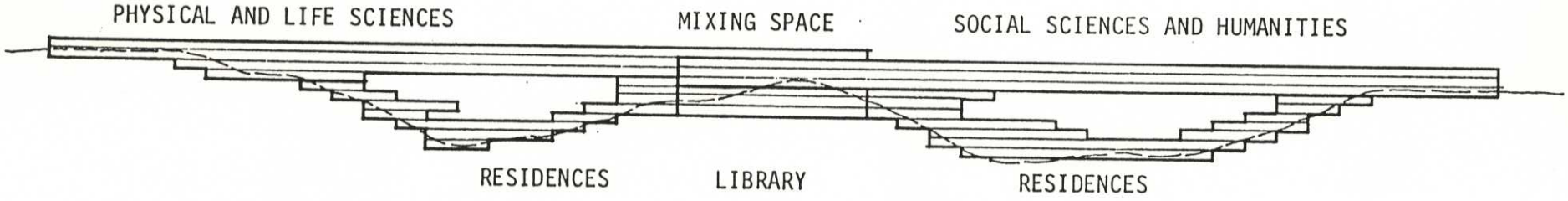
The library is at the centre of the three sectors connecting directly to the concourse-lounge-teaching space. All paths converge on the central mingling space over the library. This is visualized as a large skylit space - a huge lobby to the University off which are lounge areas, central eating area, main lecture theatres, library and senior academic administration.



19. ACADEMIC AREA



EAST-WEST SECTION



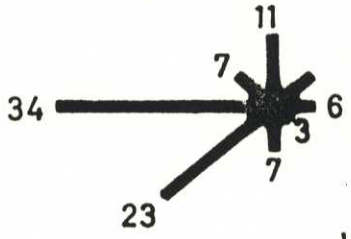
NORTH-SOUTH SECTION

20. ACADEMIC AREA
LONGITUDINAL SECTIONS

APPENDIX B

CLIMATIC DATA FROM SUMMARIES

DH Smith, March 1969



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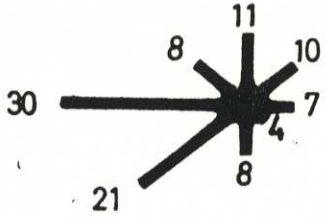

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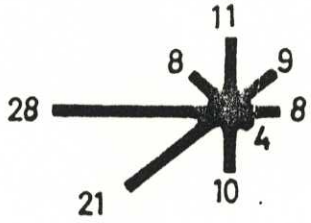

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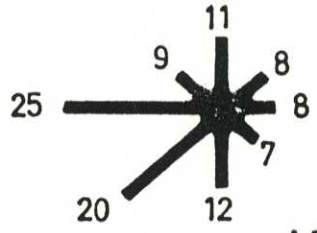

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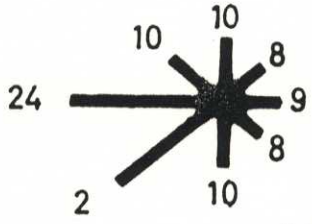

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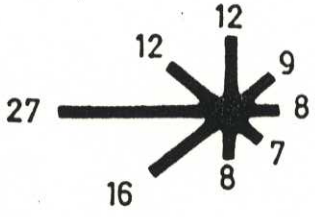

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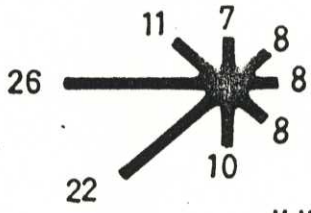

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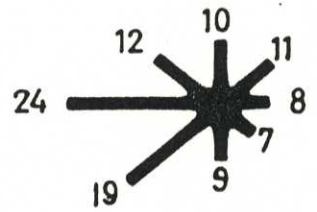

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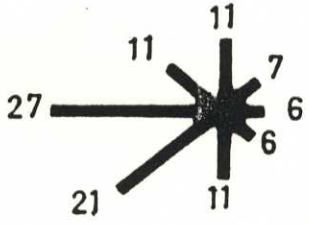

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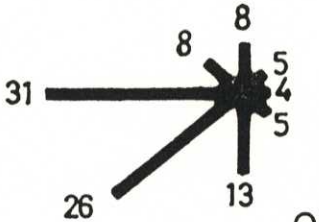

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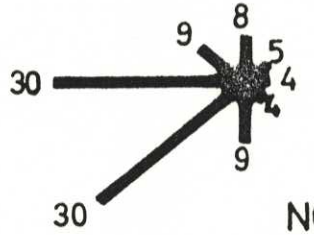

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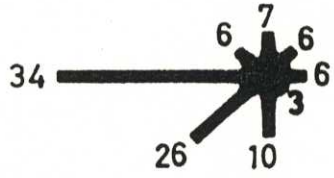

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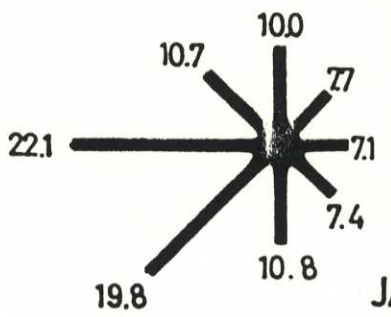

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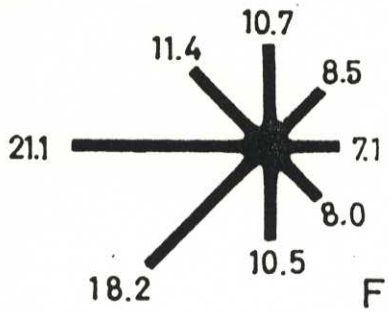

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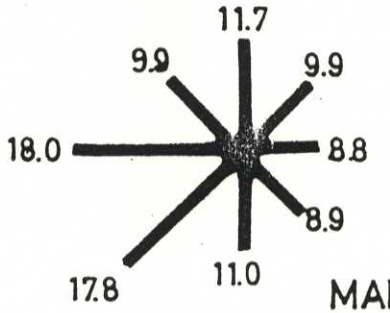

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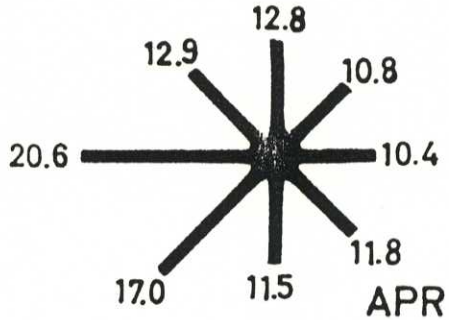

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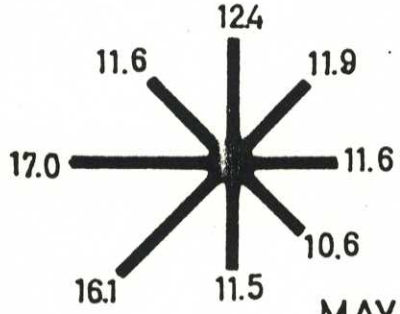

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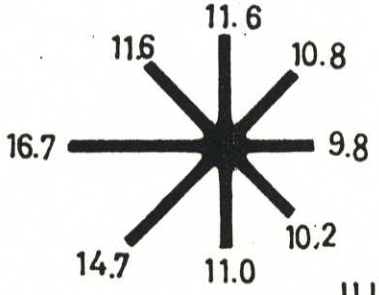

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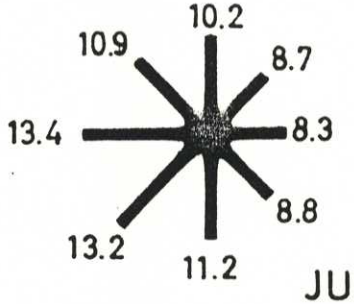

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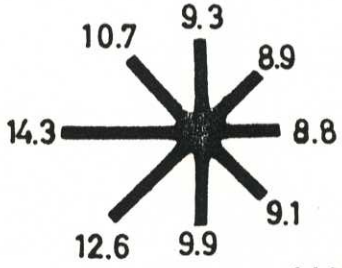

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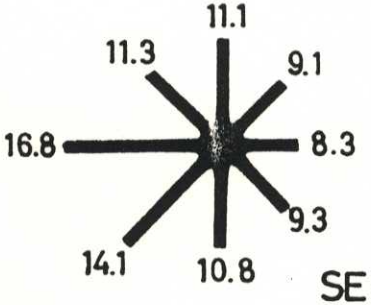

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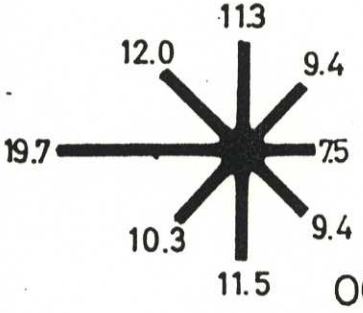

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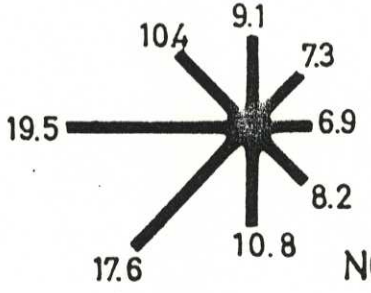

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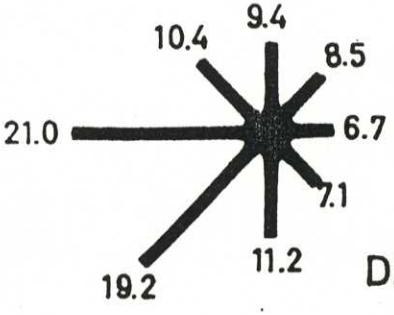
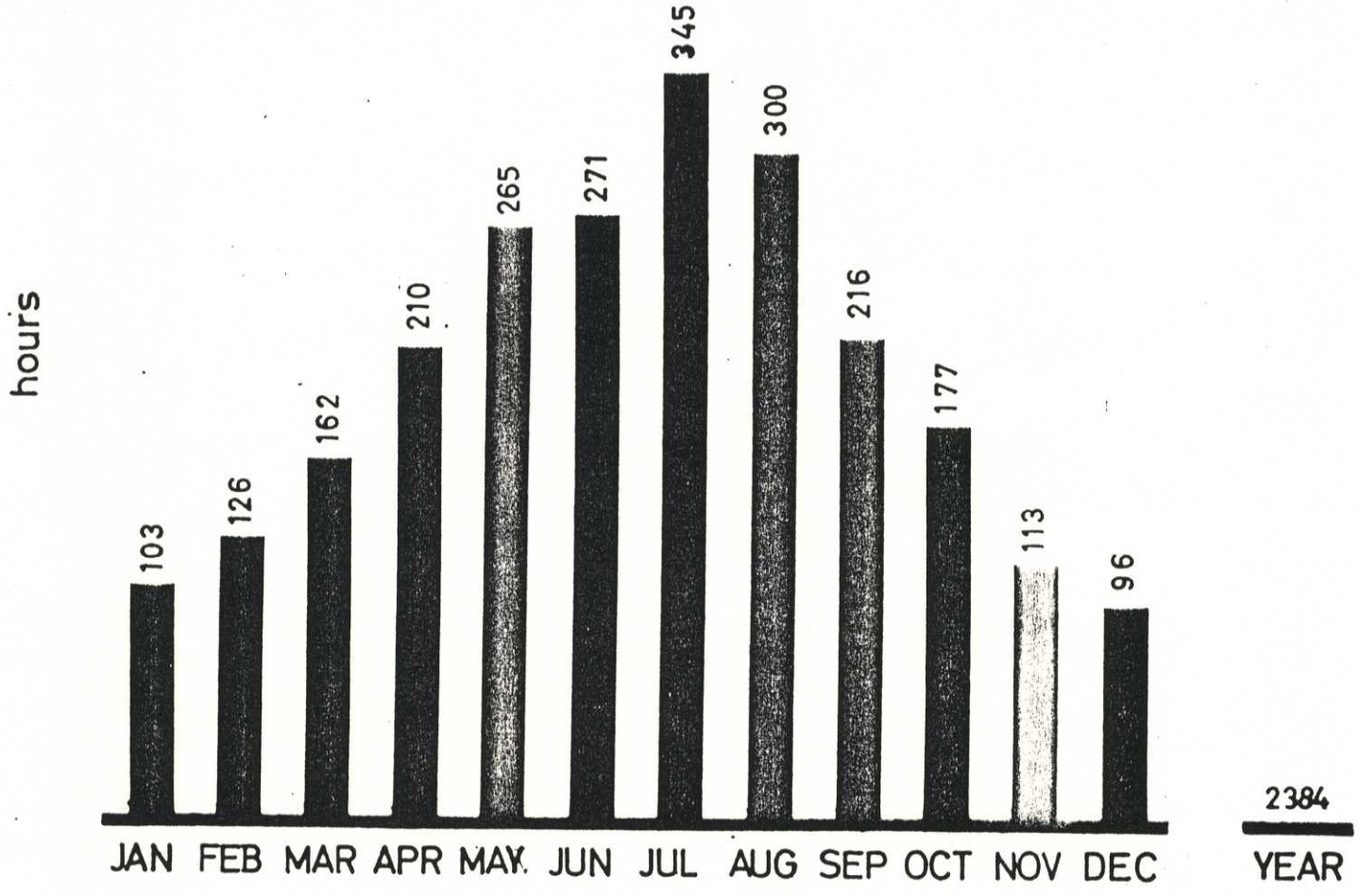
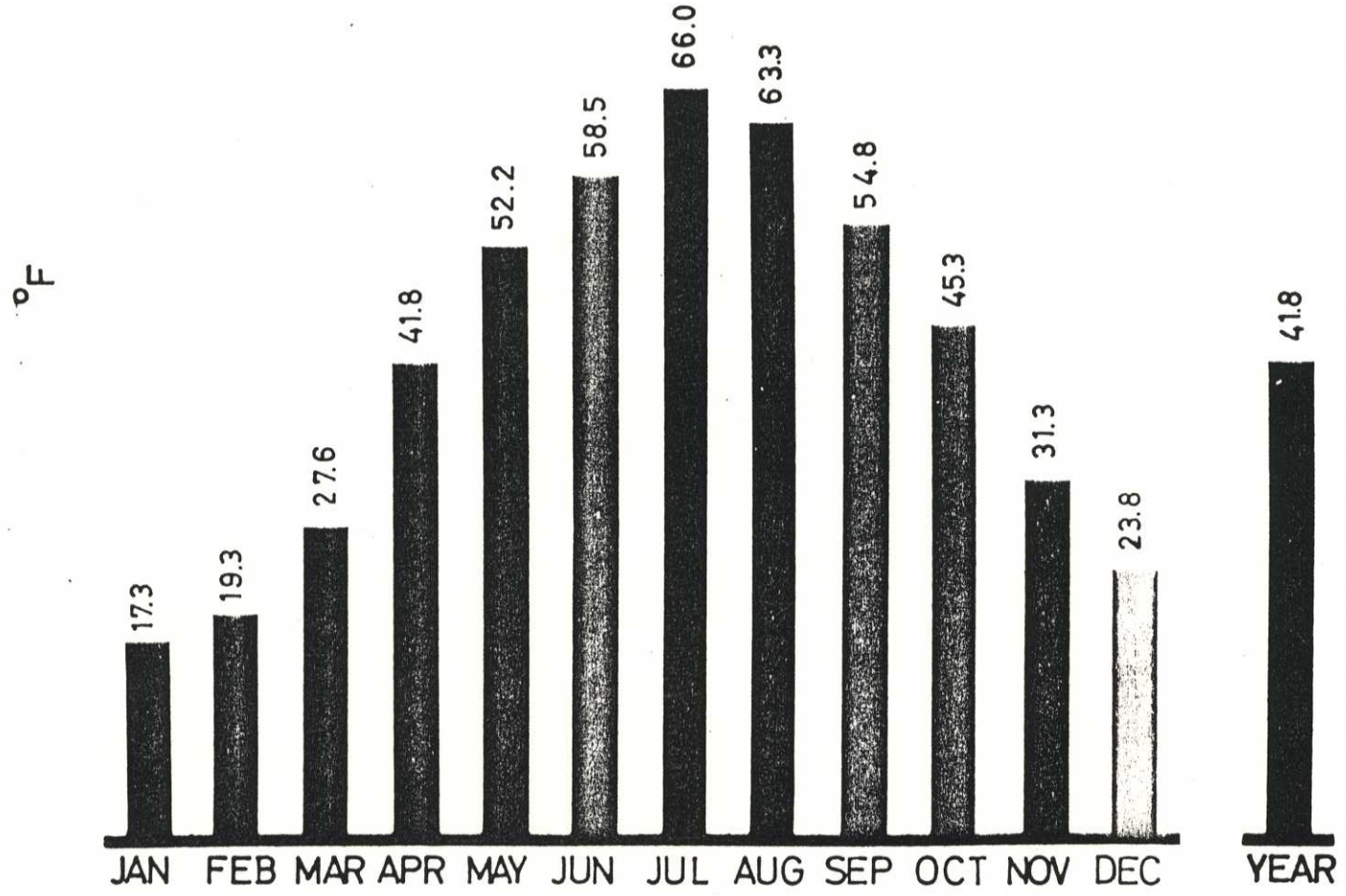


DEC

MONTHLY WIND VELOCITY (MPH)



MEAN MONTHLY & ANNUAL NUMBER OF HOURS OF BRIGHT SUNSHINE



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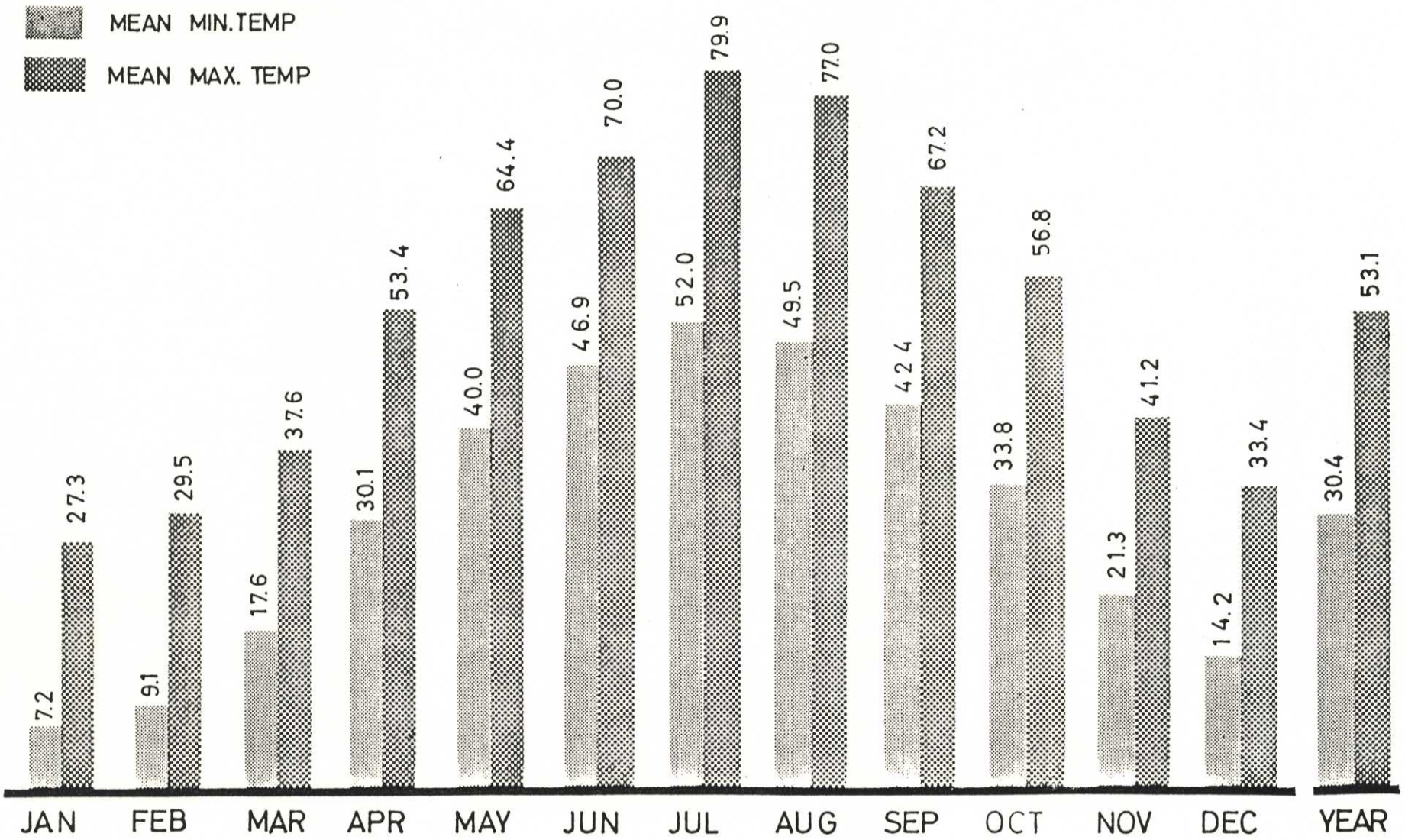

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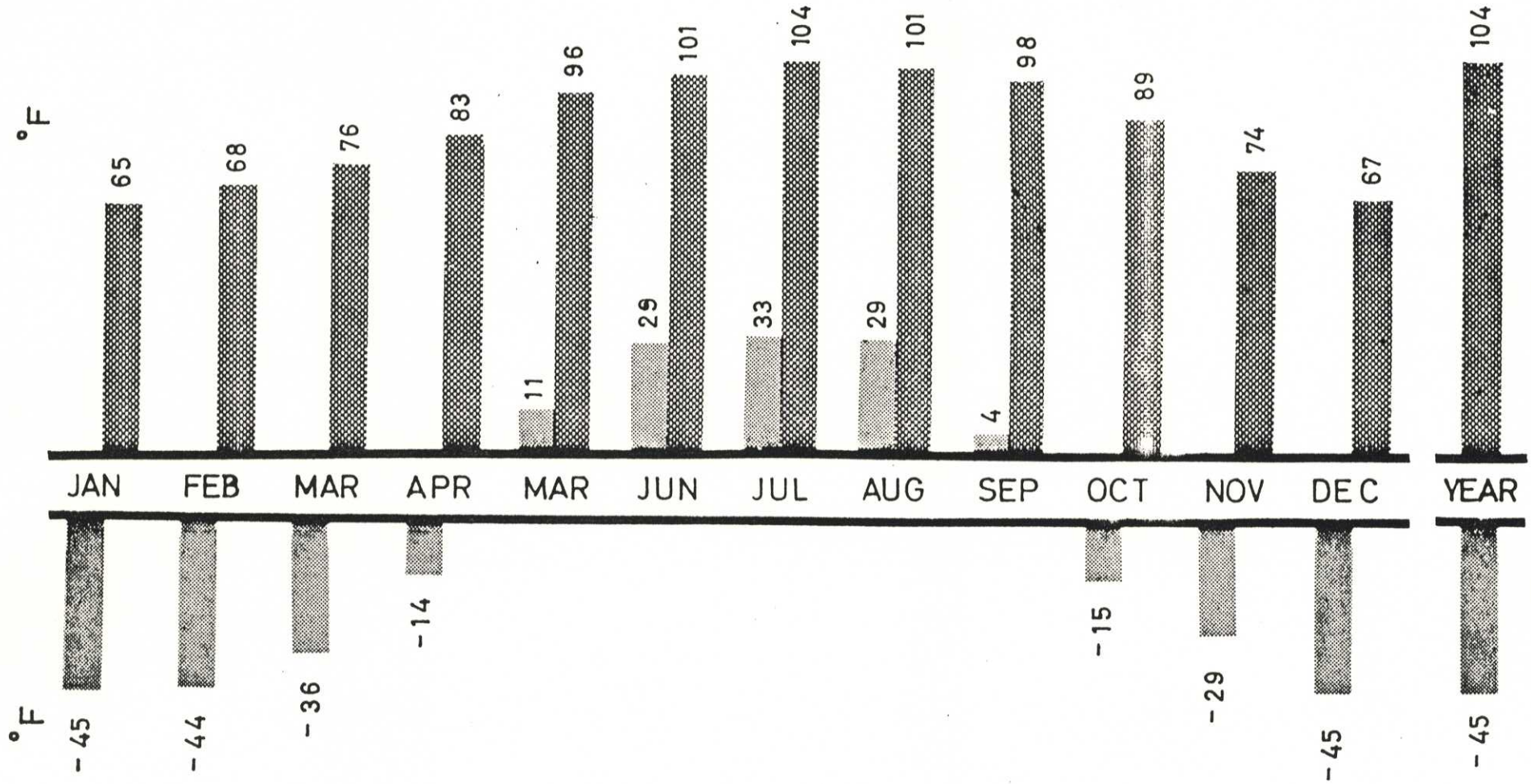

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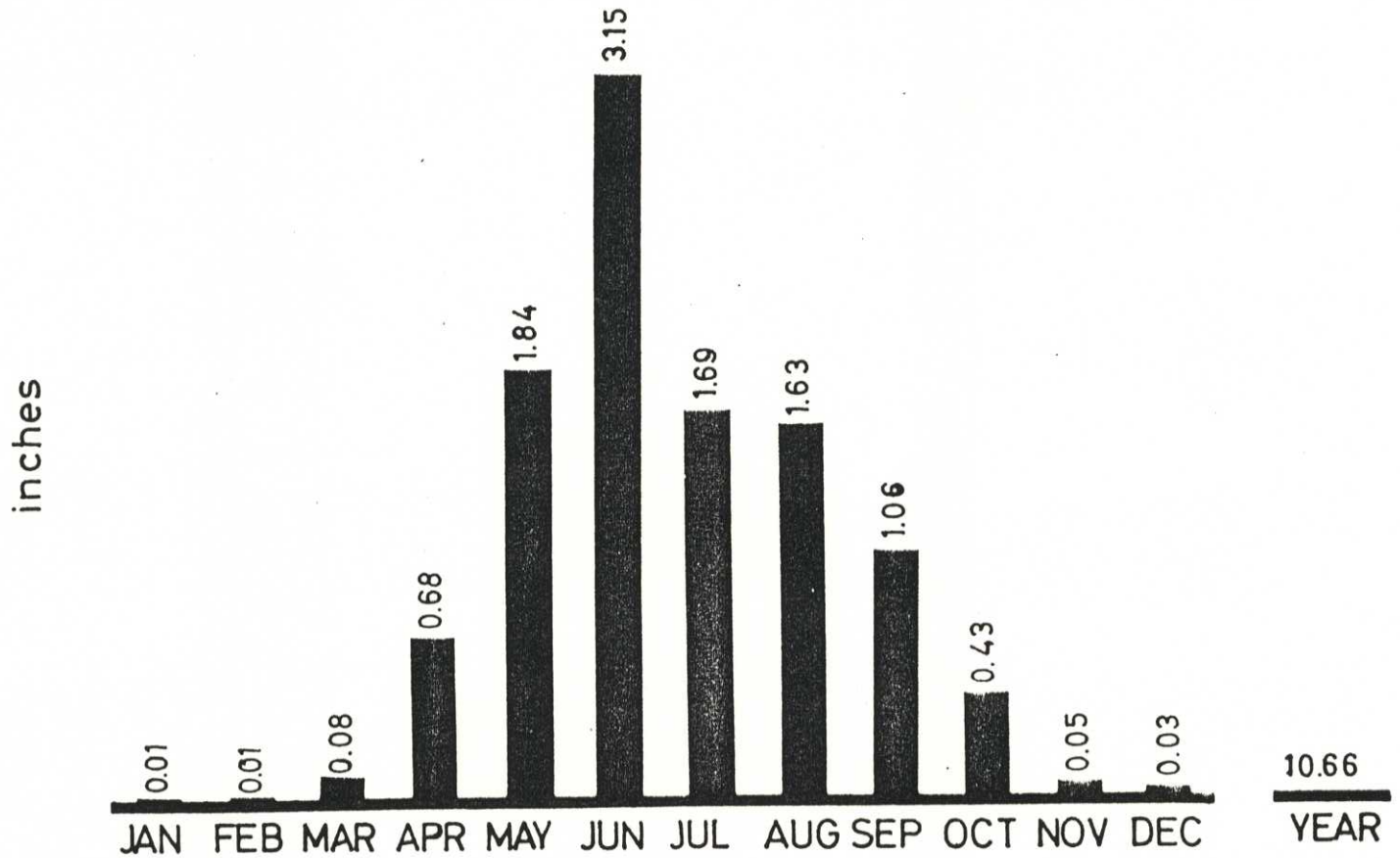
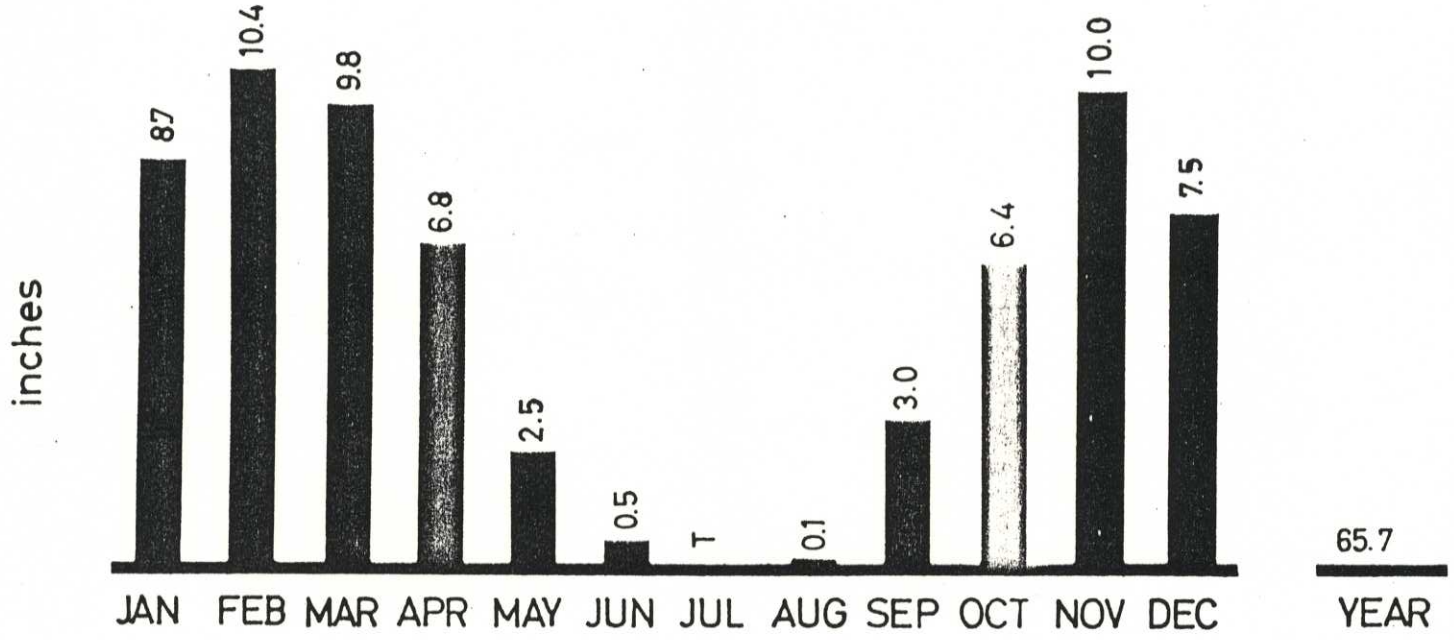


MONTHLY & ANNUAL PRECIPITATION IN INCHES

RAIN



MONTHLY & ANNUAL PRECIPITATION IN INCHES

SNOW

APPENDIX C

PRELIMINARY SUBSOIL INVESTIGATION
UNIVERSITY OF LETHBRIDGE, ALBERTA
Ripley, Klohn, Leonoff and Brooker Ltd, March 1969

PRELIMINARY SUBSOIL INVESTIGATION
UNIVERSITY OF LETHBRIDGE
LETHBRIDGE, ALBERTA

Prepared by:
RIPLEY, KLOHN, LEONOFF & BROOKER LTD.

I. INTRODUCTION

This report presents the results of our preliminary subsoil investigation at the site of the proposed University of Lethbridge, together with analyses of data and general recommendations concerning foundation support for structure and stability of slopes.

At the time of writing, the type and location of the proposed structures had not been finalized; however, the architects have indications for the initial structures. The field investigation was, therefore, carried out within these areas.

II. CONCLUSIONS AND RECOMMENDATIONS

A. Assessment of Subsoil Conditions

In general, subsoil conditions across the proposed University site are good. On the basis of the information available to date, the foundation conditions within Sections 24 and 25 are essentially the same.

The subsoils consist of lacustrine deposits of layered sands, silts and clays overlying stiff glacial till soils. The soils are badly weathered and desiccated to a depth of approximately 15 feet below ground surface.

The lacustrine deposits are more predominent towards the west half of Section 25 and were not encountered in test holes drilled on Section 24. However, we expect that the lacustrine soils will be located in isolated patches throughout the area. We estimate that the thickness of the lacustrine materials will not exceed approximately 15 feet below ground surface.

The glacial till underlying the entire site consists of stiff to very stiff, silty clay containing gravel and coal particles. Pockets and layers of sand are located within the glacial till deposit. The till is relatively incompressible, has a low swelling potential and exhibits high shear strength. Wherever possible, foundation support for structures should be located within undisturbed glacial till soils.

The long term static ground water table at the site is located at depth. Test results indicate that the soil deposits are only partially saturated to depths in excess of 50 feet; however, temporary perched water tables may be encountered across the site as a result of leakage from water storage facilities and irrigation canals and movement of runoff downslope towards the adjacent river valley.

The natural slopes of the erosion gullies on the east side of the proposed University site range from 2.0 horizontal to 1 vertical to 3.5 horizontal to 1 vertical. There is evidence of surface creep movement and shallow slump movements along the gullies in both Section 24 and Section 25.

B. Support of Structures Not Adjacent to Gully Slopes

Either spread footings or augered, cast-in-place concrete piles may be employed for foundation support for structures located on glacial till subsoils. The final choice of the method of foundation support will depend upon the relative economics of the two foundation types, design loads, basement requirements, the depth to glacial till, etc.

Allowable footing pressures for the glacial till subsoils will vary across the site due to the natural variability of the till soils and the presence of perched water tables. As a preliminary estimate, we expect that the allowable net bearing pressures for spread footings located within the glacial till soils will fall between the following values:

square or
rectangular footing.....5500-7500 psf

continuous or
strip footing.....4000-6000 psf

Augered, cast-in-place, concrete piles can be successfully installed in the glacial till soil at this site. However, at locations where perched groundwater tables are encountered, casing or sleeving may be required to maintain open pile holes during placement of foundation concrete. We expect that pile bases can be belled without difficulty in the glacial till. The following range of skin friction and end-bearing values are to be expected for augered, cast-in-place concrete piles in glacial till soil:

skin friction (neglect
upper 6 feet of soil).....500-750 psf

allowable end-bearing
(will depend upon depth and
diameter of pile base).....6000-12000 psf

Relatively light structures, such as small buildings, roadways, parking lots, etc., may be founded directly on the lacustrine soils. However, these soils are variable and load-settlement characteristics will vary from location to location. In addition, isolated patches of highly plastic clay soils having relatively high swelling potentials may be encountered. Thus, recommendations concerning allowable footing pressures for foundation on the lacustrine soil deposits cannot be made at this time and must be based on field investigations carried out at individual structure locations.

C. Support of Structures Adjacent to Gully Slopes

Our field observations and slope stability analyses indicate that gully slopes having a gradient of 2 horizontal to 1 vertical, or flatter, are generally stable. Buildings can be constructed adjacent to the upper edges of the stable gully slopes. These structures will probably require deep foundations, design provisions for disposal of runoff water and minimum disturbance of native vegatative cover adjacent to the structures. Specific recommendations will be dependent upon proposed building loads, structure locations and building configuration. Water and sewer lines must not leak to avoid increases in subsoil moisture on the gully slopes.

D. Control of Erosion

Runoff from roof drains and from paved areas should be disposed of into storm sewers. The runoff should not be allowed to discharge into the gullies. The existing native vegetation at the bottom of the gullies should be left undisturbed. Consideration should be given to the establishment of additional drought-resistant vegetation within the gullies.

E. Depth of Footings and Services

To ensure that footings and service lines will be unaffected by frost, we recommend that all footings should be located at a minimum depth of four feet below finished outside grade. Service lines such as water and sewer should be located at a minimum depth of six feet below ground surface.

F. Soil Sulphates

Analyses of the soluble sulphate content of the soils at the proposed University site indicates that a relatively high concentration of soluble sulphate is present. For the concentrations indicated, normal practice is to utlize sulphate resistance cement in all concrete in contact with the native soil. However, the groundwater conditions at this location are not adverse and it may be possible to utilize normal Portland Cement in foundation concrete provided migration of groundwater through the concrete does not occur.

III. CLIMATE AND GEOLOGY

The City of Lethbridge is located in the southerly portion of the Province of Alberta within a climate area which may be classified as semi-arid, characterized by relatively low annual precipitation and hot dry winds in summertime. The approximate mean annual temperature for the area is 40°F. The National Building Code of Canada lists the mean annual precipitation as 17 inches. Droughts in the area are frequent and evaporation is fairly high. Maximum recorded 15-minute and one-day rainfalls are 0.5 inches and 3.5 inches, respectively. Heavy snowfalls followed by relatively rapid melting and runoff are not uncommon. The depth of frost penetration into the ground is variable and depends upon surface vegetation, snow cover, soil type, groundwater conditions, etc.; however, the average depth of frost penetration is less than that experienced in the Calgary or Edmonton areas.

The sequence of the deposits in order of increasing depth is summarized as follows:

Material	Approximate Thickness (feet)
Lacustrine	0 - 25
Glacial Till	150 - 250
Saskatchewan Sand & Gravel	10 - 25
Bedrock	-

The bedrock in the Lethbridge area consists of Cretacious sandstones, siltstones, coal seams and shale beds.

Geological reports indicate that the area has been subjected to several stages of glaciation during the Pleistocene period. It has been estimated that the

maximum thickness of the glaciers that covered the area is of the order of 2200 feet. Prior to glaciation, the area was crossed by a drainage system of rivers and streams. The preglacial valleys were infilled with deposits of sand and gravel (Saskatchewan Sands and Gravels) that were subsequently buried beneath the more recent glacial deposits. East of the University site, the Oldman River channel intersects a preglacial valley, and the Saskatchewan Sand and Gravel deposits are exposed on the valley walls. Where these gravels outcrop, they are dry, suggesting that the general migration of water from precipitation and irrigation is downward through the surficial deposits into the pervious gravels.

Geologic investigations have shown that at least four till sheets mantle the Saskatchewan Sands and Gravels. The total thickness of the glacial till deposits ranges from 150 to 25 feet. During the last glacial advance, the ice thickness has been estimated at 2000 feet. Thus, the till deposits have been quite heavily preloaded.

The surface soils consist of lacustrine silts and clays containing pockets of pervious sand. The lacustrine sediments have been laid down on the surface of a hummocky moraine.

Irrigation of farmland in the Lethbridge area is carried on extensively. Irrigation canals, ditches and surface storage reservoirs and "dug-outs" are located throughout the area. The long term, static groundwater table is located well below ground surface. However, infiltration of water from rainfall, snow melt and leakage from the irrigation system may result in temporary perched water tables located at relatively shallow depth below ground surface. Within the City of Lethbridge, problems have been encountered with groundwater seepage into basement excavations and augered foundation pile holes. It is extremely difficult to predict those locations where groundwater seepage may prove troublesome as this will depend upon the random scattering of sand pockets within the upper lacustrine soil and within the till deposits.

IV. FIELD AND LABORATORY INVESTIGATION

Fifteen test holes were drilled using a rotary drilling machine. All but one of the test holes were dry-augered; drilling water was not utilized to advance the test holes. The field drilling program extended over the period June 3 to June 10, inclusive. A total of approximately 600 feet of drilling was completed in this time. Disturbed and undisturbed samples of soil were obtained from all test holes for the purpose of classifying the soils encountered. Standard penetration tests were performed at selected depths in each test hole. Slotted galvanized metal standpipes were installed in four test holes across the site to permit periodic observation of groundwater levels.

All samples were visually examined and classified in our laboratory. Water content determinations were carried out on each sample. Atterburg Limit tests were performed on selected samples in order to assist in the classification of the soils. The unconfined compressive strength of 14 samples was determined using standard laboratory shear strength testing techniques. In addition, the unconfined compressive strengths of both shelby tubes and split tube samples were obtained using a calibrated penetration device. Four consolidation tests were run on representative undisturbed soil samples to determine the load-settlement and

swelling characteristics of the native subsoils. Consolidated-quick triaxial tests with pore pressure measurements were carried out to determine the effective stress parameters of the glacial till soil. In addition, direct shear tests were performed to determine the residual strength parameters of the clay till.

V. DESCRIPTION OF SITE AND SUBSOIL CONDITIONS

The major topographic features at the site are the Oldman River Valley with its numerous tributary erosion gullies that extend 1500 to 3000 feet westward from the river channel. The gullies are separated by spur-like extensions of the upland area.

The ground surface west of the tributary gullies slopes in an easterly direction towards the Oldman River. The difference in elevation between the highland and the Oldman River Channel is approximately 300 feet. On this highland or prairie level, the ground surface is gently undulating and is presently utilized as cultivated cereal crop farmland. This farmland has been irrigated in the past and small water reservoirs have been created by damming natural runoff channels at several locations on Section 24 and Section 25. The approximate location of the major irrigation canal in the area is shown on Drawing No. A-59-1.

Approximately 15 feet of lacustrine silt and clay are present in a roadcut in the northwest corner of Section 25. A previous investigation carried out in 1963 indicated that silt materials were located along the north-south road bounding the west side of Section 25. In the majority of the test holes drilled during the present investigation, lacustrine silts or clays were not encountered and glacial till soils were present at ground surface. This indicates that, at the eastern part of the site, the surface lacustrine soils have been removed by erosion.

The glacial till consists of a low to medium plastic sandy clay containing gravel and salt accumulations. The till has been badly weathered to a depth of approximately 15 feet, through seasonal and long-term moisture content changes. Drying or desiccation of the soils has resulted in the formulation of a nuggety soil structure and development of vertical fissures. The fissures are infilled with deposits of salt and sodium sulphate (gypsum) and the fissure faces are coated with oxides. Below a depth of approximately 15 feet, weathering and fissuring is less pronounced; however, examination of the soil samples in all test holes shows that the soil has been weathered and oxidized to a depth of at least 50 feet.

Some seepage water was encountered in test holes 1004 and 1009; however, the measured water levels in these test holes do not reflect the long-term static groundwater level in the area, but are a result of seepage of water from surface storage reservoirs, the irrigation canal west of the site and from migration of precipitation downslope towards the river.

Test holes on cultivated ground generally exhibited higher soil water contents near the ground surface than did those test holes located on uncultivated pasture or meadow areas. This difference in moisture content in the upper soil between cultivated and uncultivated areas is a result of topography, irrigation and land use. In the immediate vicinity of irrigation canals and water storage reservoirs, "perched" water tables resulting from leakage will occur. The resulting

increased soil moisture content will lead to softer soil conditions than occur in adjacent weathered or desiccated soils.

VI. SLOPE STABILITY

The architects have indicated that the proposed University development will probably be located close to the east side of the site. Thus, a major consideration in the design of the structures, access roadways, service lines, etc., is the short-term and long-term stability of the river banks in the vicinity.

As part of this preliminary investigation, slopes on both the east and west sides of the Oldman River near the proposed University site were critically examined by the writer. A number of landslides were observed. These landslides may be classified into two general types:

(a) deep-seated, rotational slides within the glacial till, involving many thousands of cubic yards of soil moving towards the Oldman River;

(b) relatively shallow, slump-type slides with movement on slip surfaces parallel to ground surface, occurring on the sides of tributary erosion gullies.

Two deep-seated rotational-type slides were observed. The unstable areas are along the Oldman River, north of the proposed University site at a location where the river flow impinges on the bank. The most northerly slide encompasses the west abutment of the Canadian Pacific Railway trestle which apparently has experienced some movement and has required repairs.

An abandoned coal mine is located on Section 35, Township 8, Range 22, W4M. According to information received from Mr. M.S. Mitchell, of Robins, Mitchell and Watson, the mined area extends to approximately the south boundary of Section 35, where mining of the coal was discontinued when difficulties were encountered in maintaining roof support for the mine tunnels. We suspect that the deep-seated movement observed within Section 35 is associated with subsidence of the overburden materials into the old mine working and with river erosion at the toe of the slopes. Mr. Mitchell indicated that he had conducted a survey of the mine operators in the area and learned that the coal mine located on Section 35 is the nearest known area of mining to the proposed University site. Serious subsidence and resulting damage to structures founded above previously-mined areas are common. A double check of available records should be made to assure that mining has not been carried out beneath the surface of the proposed University site.

The second type of slope failures observed in the bround survey are relatively shallow, surface slumps, occurring in a direction perpendicular to the main axes of the tributary erosion gullies. Examination of a number of these slides indicates that they are caused by saturation of the weathered and fissured surface soils during periods of heavy rainfall or following periods of rapid snow melt and runoff. The surface layer of soil to a depth of 10 or, perhaps, 15 feet becomes saturated and the fissures become filled with water. The increase in soil pore water pressure and hydrostatic pressures due to water in the fissures causes slumping and downhill movement.

Slope stability analyses were carried out, based on the results of triaxial tests and probable groundwater conditions at the time of slope failure. The analyses indicate that gully slopes of 2 horizontal to 1 vertical, or flatter, will remain stable, provided that adequate slope drainage is provided and toe erosion is not allowed to occur.

In addition to the two types of slides mentioned above, a third type of slope failure was also observed on the east side of the Oldman River in two tributary gullies into which storm sewer water was discharged. Discharge from the storm sewers has resulted in deep erosion cuts in the base of the gullies. In places, the erosion cuts have proceeded through the overlying till, the Saskatchewan Sands and Gravels, and into bedrock. Vertical erosion faces in excess of 30 feet in height have been left standing in the base of the gullies. These vertical slopes disintegrate through drying and development of hydrostatic water pressures in vertical fissures, resulting in triangular wedges of soil being carried into the base of the gully.

These photographs point out the necessity of preventing excess flow down the gullies and show that the native glacial till and lacustrine soils are extremely susceptible to erosion.

To summarize, it would appear that the process of valley widening and downcutting along the east side of the Oldman River follows the following sequence: the tributary gullies are deepened and lengthened by headward erosion resulting from runoff discharging down the gully. As the base of the gully is eroded, movement of soil as blocks or chunks occurs perpendicular to the axis of the gully. The gully is then progressively widened by downslope creep movements and localized shallow slump movements.

We expect that deep-seated slope movements at the heads of spurs between gullies will not occur on the east side of the proposed University site on Sections 24 and 25. However, slow creep movements involving a relatively shallow depth of soil are to be expected along the gullies and localized shallow, planar, slump movements may also occur. The possibility of occurrance of these shallow slope movements will be increased if precautions are not taken to prevent erosion at the base of the gullies caused by discharge of surplus runoff down the gullies.

Under the present conditions of topography and vegetative cover, a delicate state of balance exists. Present runoff conditions have produced active erosion at isolated locations at the bottom of the existing gullies.

The development of roofed and paved areas adjacent to the upper edges of gully slopes will greatly increase the amount of runoff available from the upland areas. Runoff from roof drains and paved areas must be disposed of by means of storm drains. If the runoff were to be discharged into the gullies, rapid erosion would occur at the bottom of the gullies. The development of a deep erosion notch in the bottom of a gully would lead to creep movements and instability of the side slopes.

APPENDIX D

Excerpts from Geotechnical Report :
PROPOSED LIBRARY & ENTRANCE ROTUNDA,
WATSON HORTON FERRARI
E.B.A., July 1992

Foundation Material

The till in the area, with the exception of the surficial ablation till, has been heavily preconsolidated under the weight of glacial ice. Geological reports indicated that the area has been subjected to several stages of glaciation during the Pleistocene period, and estimate that the maximum thickness of the ice may have reached 670 metres. As the laciers retreated, the Oldman River Valley was created by melt water cutting into the till and the underlying bedrock strata. Moisture contents measured in the till material are near the Atterberg plastic limit which is consistent with a highly preconsolidated deposit.

Field and Laboratory Work

Site work was carried out between 1992 May 05 and 13. The rig was a Becker hammer equipped with 143mm (5 5/8") diameter casing. Four testholes were drilled to depths ranging between 21.0m and 39.2m below existing ground surface. Testhole positions, selected on the basis of the proposed building site and access for the drill rig, were set out by EBA prior to drilling.

Disturbed bulk soil samples and split-spoon samples were recovered at regular intervals. Standard Penetration Resistance Values (N) were obtained at approximately 3.0m intervals and undisturbed 'Shelby tube' samples were recovered at selected intervals.

Discussion and Recommendations and Considerations

The geotechnical engineering issues of primary importance at this site are considered to be:

(a) The approximately 27m depth of excavation into the west slope of the Oldman River valley required to construct the west wall of the proposed library building;

(b) Construction of foundation and soil retaining systems for the proposed library addition while maintaining the integrity of the foundation elements in the adjoining Centre for The Arts and University Hall buildings;

(c) The innately variable nature of glacial till deposits and conditions which may be anticipated during design so that pre-planned options will be available during construction to deal with difficult conditions such as deposits of dry running sand or pockets of saturated sand and gravel within the till.

Following an evaluation of available information, EBA considers for several reasons that the University should proceed with caution in developing the proposed Option 1 alternative.

First, the depth and extent of excavation proposed for the building extends beyond the envelope of experience developed by precedent in the Lethbridge area. Of construction projects undertaken locally, the most similar to the proposed library building was the construction of the existing University Hall. The University Hall was constructed in clay till materials and notched into the valley wall as proposed for the library building. However, the maximum depth of excavation for the main Hall, which occurred near the south end of the building, was 16m. The increase in depth of excavation to approximately 27m, as proposed for the Option 1 alternative, significantly increases the degree of complexity associated with both design and construction of soil retaining systems and foundation systems for the building.

The effect of soil pre-consolidation and valley cutting discussed in Section 3.0, have likely resulted in high lateral earth pressures being "locked in" to the till deposit in addition to the vertical stresses to which the mass has been subjected. Excavation of a significant depth of material as proposed in the Option 1 concept will permit vertical and horizontal rebound to occur. As rebound occurs strains within the soil will lead to a decrease in soil strength over time. This loss of strength may result in a major failure unless strains are essentially prevented. Even with control of rebound related strains to prevent destabilization of the slope, time dependent swelling of the clay till underlying the building will occur as a result of unloading the deposit through excavation. Soil strains associated with soil rebound during excavation of the library building would have to be properly controlled to ensure that they did not trigger movements under adjacent buildings. If such movements occurred, it could potentially result in extensive damage to the neighbouring structures.

Careful detailed consideration of all aspects of design and construction related to the building excavation, retaining walls, and foundation will be required to provide a stable structure that will not put the integrity of adjacent facilities at risk.