THE SCHOOL OF MINES AND INDUSTRIES, BALLARAT

MOUNT HELEN CAMPUS DEVELOPMENT PLAN 1970

G. J. HARRISON L. H. VERNON J. B. VERNON

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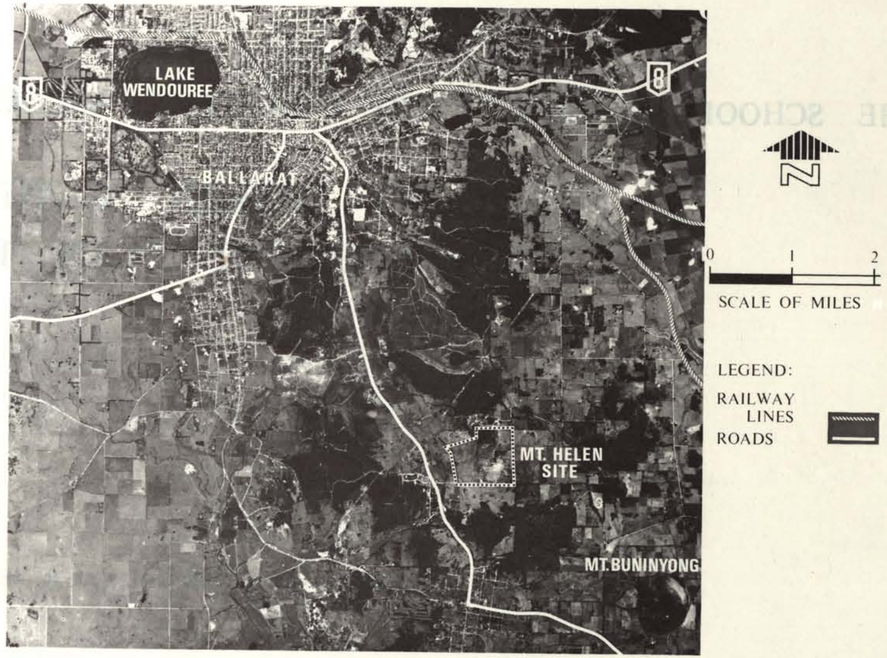

AERIAL PHOTOGRAPH OF THE BALLARAT AREA SHOWING THE MT. HELEN SITE

FOREWORD

Although changing attitudes to education, and growth in demand for it, bring complexities and problems, they also bring challenges and opportunities.

When the School of Mines was first founded the primary objective, presumably, of those seeking a place to start their venture was that it should provide shelter from the elements, be readily accessible and cost as little as possible. They could hardly be blamed for failing to foresee the trends which would make a few steep acres on a city block a liability rather than an asset.

With the affiliation of the tertiary division with the V.I.C. and the increased flow of financial support from the State and Commonwealth authorities, the School of Mines Council found, in 1967, both the necessity and the capability of obtaining a new site for a new start. The purchase of the Mt. Helen site brought together the unique combination of ample space, no obsolete buildings, a new vision — and a hundred years of tradition and experience.

Having a sharpened awareness of the need for long range planning of the new campus, the Council set about the task of defining its objectives and producing a brief to guide the Campus Planners. This required a survey of changing teaching techniques, growing student numbers, widening fields of human knowledge and the kind of environment that is desirable to stimulate educational activities at the tertiary level.

After extended consideration, a brief was produced as a specification of the workings of the new Institute and it became possible to begin planning the physical development to achieve this.

Believing that the best result would be achieved by some workable combination of strong local knowledge and interest and the guidance of one with major experience in other similar exercises, the Council brought together the Joint Site Planners — Messrs. L. H. and J. B. Vernon of Ballarat and G. J. Harrison of Flinders University.

These three principals together with their specialist consultants and the Council and its staff, have worked energetically and enthusiastically to produce the Master Plan presented in the following pages.

My Council and I are confident that the Plan is an admirable one and that it meets our needs. It achieves the desired balance between firm definition of major activity areas, building sizes and relationship, provision for services and communications and the means of cultivating the desired atmosphere — and the scope for flexible and imaginative filling in of details as the shadowy predictions of conditions 20 or 30 years hence come more clearly to light.

The most rewarding stage can now proceed — the buildings can rise, the landscape change, and the people concerned come together for the educational processes — the central purpose of the whole venture.

M. B. JOHN
President of the School Council

ACKNOWLEDGEMENTS

During the preparation of this report and the development plan for the Mount Helen site, generous assistance has been received from the Buninyong Shire Council, The Council of the City of Ballaarat, the Ballarat Water Commissioners and Sewerage Authority, the State Electricity Commission and their officers.

Significant contributions have been made by Professor L. D. Pryor, Professor of Botany at the Australian National University, as landscape design consultant, and by Messrs. Fisher and Jeffreys of Ballarat, Licensed Surveyors, who have prepared detailed information concerning existing site conditions, and Mr. John L. Mansell, Consulting Engineer, has advised on possible heating modes.

The clarity with which the policies of the School have been explained to us by the Principal, Mr. E. J. Barker, and his advice on a wide variety of matters, have been of primary importance in making it possible to prepare our proposals. The constant interest shown in the plan by the Council and its readiness to reach decisions on many difficult questions have been of great assistance and encouragement to us in our task. Without such help it would not have been possible to take into account many factors of great importance.

The authors wish to acknowledge and record their indebtedness to all the bodies and individuals mentioned and to others who have given valued assistance in the preparation of this report.

April, 1970

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ILLUSTRATIONS

1. INTRODUCTION

The School of Mines and Industries at Ballarat has a distinguished record. It is Australia's third oldest tertiary educational institution and was the first founded specifically to offer technical education at tertiary level. Founded in 1870 by a group of local residents to assist the then flourishing gold-mining industry by training personnel at all levels, it has developed and sustained a high academic reputation, and has produced graduates who have made major contributions to industrial development in Australia. Over the years its objectives have evolved gradually, and the training programme has been organised into three distinct groups of courses, at professional, trade and secondary levels. The School now offers professional or tertiary courses in Civil, Electrical, Electronic, Mechanical and Mining Engineering, Geology, Metallurgy, Chemistry, Physics, Accounting, Data Processing, and Art. It also provides training for a wide range of the trades and meets the needs of the central Ballarat area for secondary technical educational facilities.

When it commenced, the School was granted the use of a disused Court House on 1¼ acres of steep land adjoining the Ballarat Gaol and near the city centre. Further land and buildings nearby were acquired gradually, until in 1965 the School held about 8½ acres in three sections intersected by two busy streets, and a motley collection of old buildings converted for teaching use.

In December 1965 the School became affiliated with the newly-established Victoria Institute of Colleges. The School Council recognised the need for major expansion of the institution to provide for extensive development of its professional courses, and in February 1967 purchased 240 acres of land near Mt. Helen, 5 miles from Ballarat, to accommodate new buildings for the tertiary section of the School.

An initial master plan to accommodate up to 2,000 students on the new site was prepared by L. H. Vernon and Associates during 1967, and an initial group of buildings to house Metallurgy, Geology and some of the school's engineering departments has been erected in accordance with this plan. Subsequently, as a result of changes of policy and other factors, and following the visit to Australia of Professor J. D. MacConnell, Professor of Education at Stanford University, and his associates, under the sponsorship of the Federal Government, it became clear that more than 2,000 students should be provided for in the plan for the Mt. Helen campus.

Consequently the School Council decided that a fresh plan for up to 3,000 students should be prepared. In July 1969 arrangements were concluded whereby the authors were appointed as joint planners to prepare the long-range plan for development of the Mt. Helen site for the School's tertiary division which has become known as the Ballarat Institute of Advanced Education.

2. THE SITE

The site is actually located between Mt. Clear and Mt. Helen on the lower western slopes of Green Hill. It is about ½ mile east of the Midland Highway that links Ballarat and Geelong and is approximately 5 miles from the centre of Ballarat. The site and main routes to the city are marked on the frontispiece.

The total area available is about 241 acres. The west, south and east boundaries are adjacent to public roads whilst the north boundary adjoins private property.

Topographically the area may be described as undulating to steeply undulating with well defined gullies and ridges. Over most of the area, slopes are approximately 1 in 10 to 1 in 20. The slopes command northern, southern and western aspects with many excellent views. There are practically no slopes with an eastern aspect. Drainage presents no problem, and no difficulty is anticipated in the construction of foundations for buildings.

The geological structure of the site consists of slates and sandstone of ordovician and silurian periods. Although there are only limited exposures in the area, it may safely be assumed that over the site generally the bedding of the sandstone is steeply dipping with thin greywackes, grading through from gritty mudstones to clay slate. The surface consists mostly of residual material from the weathering of slates and sandstones with a thin crust of humus bearing soil. The area of the spur on which the existing buildings are located is free from any sign of slump or flow structure and there is no indication of any troublesome circumstances due to instability of slopes.

Diagram 1 illustrates the site, its topography, the location of existing trees and other natural features, and development to July 1969. The diagram is based on a detailed survey of the central area and on more approximate survey information and aerial photographs of the remainder of the site.

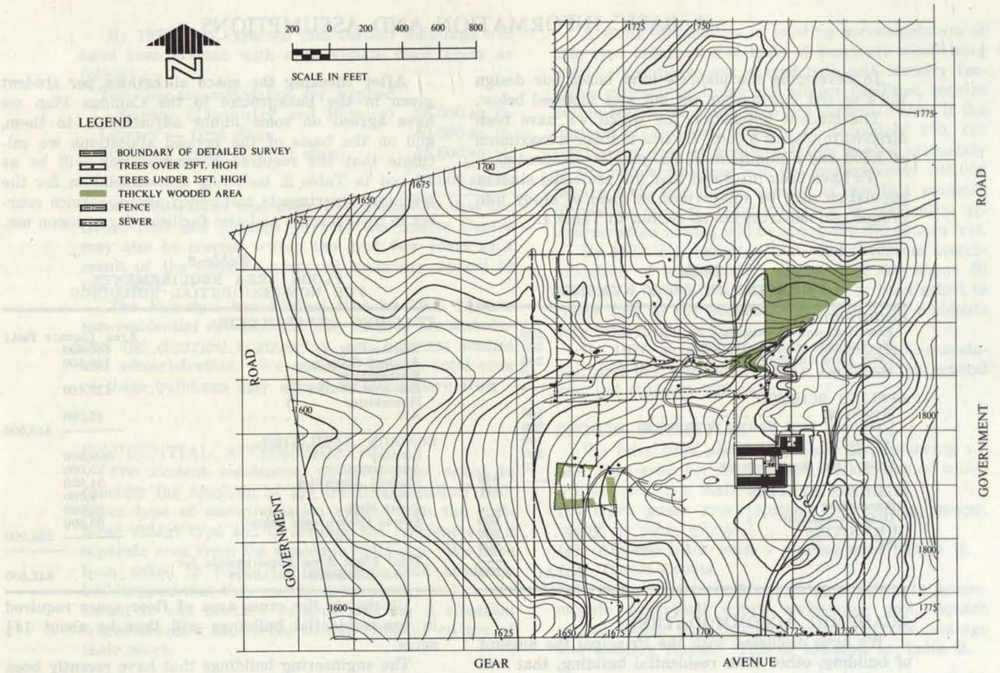

Diagram 1 PLAN OF MT. HELEN SITE, JULY 1969

3. BASIC INFORMATION AND ASSUMPTIONS

In developing the plan we have based our design work on the information set out and assessed below.

The student population for which we have been directed to plan is 3,000. Of this number a maximum of 1,500 and a minimum of 750 may be residential.

We have been informed that the projected student population may be sub-divided by field of study into groups and departments as set out in Table 1.

Table 1
PROJECTED STUDENT NUMBERS

ENGINEERING		
Electrical and Electronic	250	
Mechanical (and Production)	200	
Civil (and Surveying)	240	
Mining	80	
		770
APPLIED SCIENCE		
Metallurgy	160	
Chemistry (and Malting & Brewing)	320	
Geology	100	
Physics	200	
Other (e.g. Architecture)	50	
		830
BUSINESS STUDIES (Accounting, Data Processing)		600
HUMANITIES		500
ART		300
TOTAL		3,000

ACADEMIC ACCOMMODATION

We have discussed with the Principal the amount of building, other than residential building, that will be necessary to accommodate the projected student population.

After checking the space allocations per student given in the Background to the Campus Plan we have agreed on some minor adjustments to them, and on the basis of the revised allocations we calculate that the required accommodation will be as set out in Table 2, including accommodation for the teaching departments mentioned above, service courses in mathematics and also facilities for common use.

Table 2
FLOOR AREA REQUIREMENTS
FOR NON-RESIDENTIAL BUILDINGS

	Area (square feet)	
TEACHING DEPARTMENTS		
Engineering	100,600	
Applied Science	140,500	
Mathematics, Business Studies, Humanities	123,400	
Art	46,000	
		410,500
COMMON FACILITIES		
Library	100,000	
Administration	20,000	
Student Amenities	54,000	
Shops	6,000	
Great Hall	25,000	
Sports Centre (see below)	30,000	
		235,000
Total Floor Area Requirements for Non-Residential Buildings		645,500

Ultimately the gross area of floor space required in non-residential buildings will thus be about 14½ acres.

The engineering buildings that have recently been erected on the site provide some 53,000 gross square feet of accommodation.

By 1972, it is expected that further buildings will have been erected with approximate floor areas as follows :—

Teaching accommodation for Applied Science (Chemistry and Physics)	35,000 sq. ft.
Library — first stage	40,000 sq. ft.
Student's Union — first stage	15,000 sq. ft.
	90,000 sq. ft.

We understand that there is a possibility that the Great Hall and perhaps part of the Sports Centre may also be erected within the next few years as a result of the School's proposed centenary appeal to the public.

The Principal has advised that by 1975 further non-residential development may include accommodation for electrical engineering, art, business studies and administration. We assume that the total area of these buildings may exceed 90,000 square feet.

RESIDENTIAL ACCOMMODATION

For student residences, we have been asked to consider the adoption of the traditional hall of residence type of accommodation rather than the scattered village type and to arrange the residences in a separate area from the academic buildings. We have been asked to relate the residences and academic buildings so that they may be conveniently and closely linked to one another without creating a situation where students are forced to live virtually on top of their work.

A study of facilities in existing accommodation of this type indicates that halls of residence comprising single study bedrooms, shared bath and laundry facilities, recreation, dining and kitchen facilities, require 300 to 350 sq. ft. gross area per student. Thus if the number of resident students is ultimately 750, the total gross area of accommodation needed ultimately in the residential area will be approximately 245,000 square feet, and if the number of resident students ultimately rises to 1,500, the area of residential accommodation needed will be about 490,000 square feet.

By 1972 it is expected that study-bedroom accommodation of some 20,000 square feet for about 80 students will be provided, and we have been asked to relate this to the students' union so that residents may take meals in the union.

By 1975 it is anticipated residential accommodation and the associated dining facilities for several hundred students will exist.

SPORTS FACILITIES

We have been asked to include the following :—

(a) Two ovals for football and cricket, one of which will be used as a main oval.

(b) Open grass areas suitable for hockey, soccer, rugby, or other games.

(c) Athletic track with a playing area within it.

(d) Tennis Courts.

(e) Indoor sports centre with gymnasium to accommodate basketball court, swimming pool, squash courts, locker and changing rooms, offices, storage and meeting rooms. This is included in Table 2.

4. BASIC SITE PLANNING

On the basis of the information provided by the School and the assumptions described in detail in the foregoing paragraphs, basic site planning considerations have been investigated and certain principles have been established.

First of all, we have sought to establish the amounts of land that should be reserved for the various types of development that are foreseen. Two important principles have been adopted which affect our decisions.

The first is that the campus should be designed for pedestrian circulation. The separation of pedestrians and vehicles is of prime importance in the interests of convenience and safety and will enable the campus to develop in a pleasant and logical manner as a satisfactory environment for tertiary education. In this way the campus will follow the distinguished example of universities such as Cambridge, Harvard and Berkeley.

The second principle is that separate zones or precincts should be established for academic, residential and sporting activities. We believe the grouping of facilities for each of these activities is the most efficient arrangement from all points of view.

With these principles in mind, we have studied building densities. In the case of academic buildings, we have adopted a density of $\frac{3}{4}$ acre of building floor area per acre of site, i.e. a plot ratio of 0.75. Assuming buildings averaging 2-3 storeys in height and provision for major car parks outside the academic area, development at this density will permit easy pedestrian movement between all academic buildings, the efficient distribution of the engineering services, and a satisfactory degree of integration of the School's activities. At the same time this plot ratio is low enough to allow the development of pleasant landscaped areas between buildings and to avoid the need for multi-storey structures which would be both unnecessarily costly and difficult of access for large groups of students. This overall density is about $2\frac{1}{4}$ times that adopted in the 1967 plan, and is similar to the density suggested by Professor MacConnell's colleague, Mr. Hugh Mitchell, in 1968, but it is considerably lower than that used in a number of recent plans for institutions on rural sites in other parts of the world. We should like to stress that we believe the density we propose is the minimum that should be adopted in the future for academic buildings. It is suggested as an average for the academic area. In the case of the library, we would expect a much higher density to be achieved, and this might balance a slightly lower density in other specific academic functions.

For residential development we propose a lower density of building to allow the inclusion of car parking facilities for residents within the developments. We have adopted a plot ratio of 0.5. This is equivalent to approximately 60 persons per acre, and we consider it will enable the provision of economical halls of residence of domestic scale in an environment that can be developed attractively and maintained without waste of resources incorporating parking space for 1 car to every 2 residents. In the Ballarat climate, we think it important to avoid excessive

dispersion of the residences. We think the density proposed will permit students to live within easy walking distance of shared dining facilities, the students' union, library, academic buildings, gymnasium and sports fields. The availability of all necessary facilities close at hand may reduce the need for resident students to maintain their own cars at Mt. Helen.

On the basis of the proposals described above, the areas of land required for academic and residential areas are set out in Table 3.

Table 3

BUILDING SITE REQUIREMENTS

Zone	Gross Floor Area sq. ft	Acres	Plot Ratio	Land Req'd. Acres
Academic	645,500	14.8	0.75	19.7
Residential (including associated parking):				
750 students	260,000	6.0	0.5	12.0
1500 students	520,000	12.0	0.5	24.0

The sporting facilities listed in Chapter 3 will require substantial areas of land. Each oval will cover about 6 acres, and a similar area will be needed for the athletic track. We believe these areas and the other playing fields can be accommodated within an area of about 30 acres of sports fields. This area would represent a total of 10 acres per 1,000 students, which is a figure commonly used and will provide space for the active participation of a large proportion of students in sporting activities.

Car parking facilities will be needed for almost all staff and, we believe, for up to 75% of non-resident students. As mentioned above, resident students will be catered for in the residential areas.

We estimate that when the institution is fully operative the total number of staff, including academic, administrative, technical, secretarial and maintenance staff, will be approximately one fifth of the number of students. At the 3,000 student level, this gives a figure of 600 staff. We estimate that 90% of staff will require car parking facilities. A substantial number of parking places should also be provided for visitors to the campus during normal working hours — we suggest 60 places; for visitors attending evening functions and sporting events we would expect some of the student and staff parking places to be available also.

On these bases we have calculated the amount of land required for car parking. Our conclusions are summarised in Table 4.

Table 4

PARKING AREA REQUIREMENTS

Users	No. persons		No. park. places		Land Req'd. Acres	
Staff	600		540		4.5	
Visitors	—		60		0.5	
Non-Resident students	1500a	2250b	1130a	1690b	9.5a	14.0b
Residents	1500	750	750	380	*	*
	3000	3000	1880	2070	14.5	19.0

* Parking space provided within the residential area.

Figures marked a and b are alternatives representing estimated extremes.

Having determined the ultimate size of the areas of land needed for various campus functions, we next considered how these areas should be related to one another.

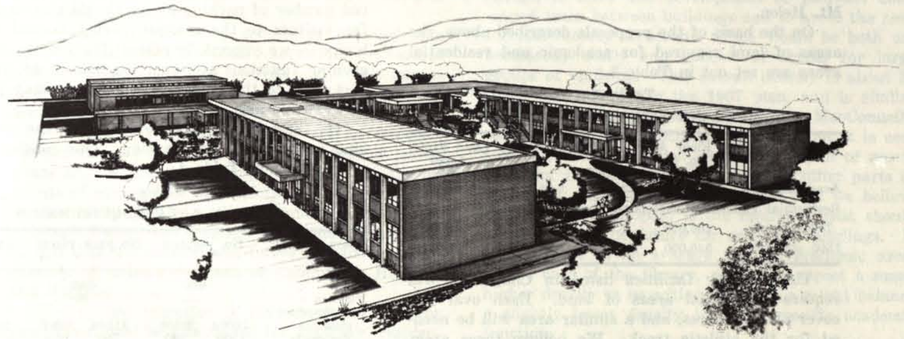

Diagram 2 PERSPECTIVE VIEW OF EXISTING BUILDINGS

As the percentage of students that will be resident and the relative rate of development of academic and residential facilities is uncertain, and in view of the pattern of campus life in Australia, we readily adopted the Council's suggestion mentioned in Chapter 3 that we should plan separate academic and residential areas.

In the academic area, we concluded that only a small proportion of the total number of cars can be accommodated at surface level without sacrificing pedestrian convenience which is an essential characteristic of an academic building.

Consequently we see the need for four main zones: academic, residential, sporting and commuter parking.

In locating the zones on the site, it is clear that primary consideration should be given to the academic zone. This will require a fairly central location with good accessibility. It should be suitable topographically and geologically for substantial buildings, and have a sunny aspect and a pleasant outlook.

The residential zone needs to be close to the academic area and reasonably close to the sports fields, but because individual buildings will be of domestic scale, steeper and more broken sites can be utilised and may in fact help to produce an interesting type of environment. For sports fields, land which is reasonably flat or can be terraced at reasonable cost is essential, and for some activities shelter from wind is needed; the fields need to be accessible to students and to the public, and should be reasonably close to the building and parking zones. Areas for commuter parking should be carefully related to the academic zone and will need adequate connections to the road system of the district, particularly to roads leading to Ballarat. They do not need to be on prime sites.

We have accepted the existing development, including the recent development of Gear Avenue, the newly completed group of engineering buildings, existing services and the existing landscape as making a suitable starting point. The existing building development is illustrated in Diagram 2.

A number of alternative zoning patterns have been examined in relation to the above and other relevant factors, and we have concluded that the best pattern of land use is that illustrated in Diagram 3.

Having established the general disposition of facilities on the site, the next stage in our planning was to study several elements in depth, and more or less in parallel. These included the academic and residential building groups and their possible staging, the vehicular circulation system and its relationship to public roads, the pedestrian circulation system, the reticulation system for engineering services, and the landscape pattern.

The formulation of the design concept for the development of the site followed, and as the scheme emerged it was necessary to make adjustments in the academic, residential and sporting areas and to modify the circulation systems in detail. In the chapters that follow, we report first on our detailed studies, and subsequently on the development plan as a whole.

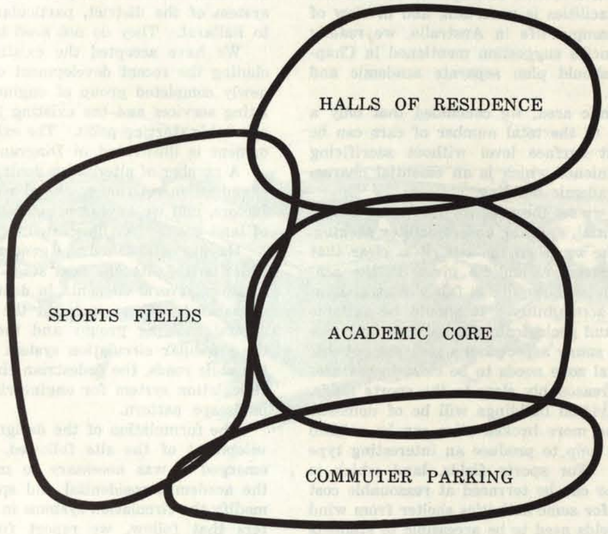

Diagram 3 PATTERN OF LAND USE

5. THE ACADEMIC AREA

The academic zone will include areas for the Great Hall and administration, the library and student union, and teaching buildings for engineering, applied science and humanities. For reasons described later we propose that the indoor sports centre also be included in the academic zone. The functional relationship between these and other major areas has been analysed and appears to us to be as indicated in diagram 4. As indicated in Chapter 3, the total floor area of the buildings is expected ultimately to be about 639,000 square feet.

The Great Hall requires a prominent site, easily accessible to both the public and the academic population, and the administrative building has similar access requirements.

The Library will probably be the most important individual facility on the site and needs a central location, readily accessible from the students' union, halls of residence and all departmental buildings. Library facilities are expected to be particularly important for students in the humanities. We also anticipate that public use of the library may increase in the future, and think good public access should be available. A pleasant outlook from the library is most desirable.

To provide economical access within the library building, it is desirable to enter it at an intermediate level from which reading areas on both upper and lower floors may be reached with minimum movement. The library is expected to grow to almost three times its initial size and staged development of the building must be provided for.

The Students' Union should be given a central location, and should have access to outdoor terraces and landscaped areas for passive recreation; in addition ready access from the residential area is necessary, particularly in the early stages of development when the union will provide meals for residents. The rate and direction of growth of student facilities in the Union is difficult to predict accurately; it appears that a relatively low and informal type of building is called for, to which alterations and additions may be made as the need arises.

The departmental buildings fall into three broad groups; one for engineering, one for applied science and one for other departments — mathematics, business studies, humanities and art. Each group will expand gradually, and should be able to accommodate future change. It appears to us that a series of two or three storey wings connected by covered ways is called for, and that the wings should be suitable for internal modification and for gradual development as required. We think these buildings should be simple and functional, and should provide a background against which key buildings such as the Great Hall and Library may be set. Within each group of departmental buildings, there will be requirements for specialised accommodation, but we anticipate that these will be provided within one type of structure for each group, so that space allocations to individual departments may be varied to suit changing demands. As science and engineering normally require a high proportion of large rooms — laboratories, drawing offices and lecture rooms — we think building wings

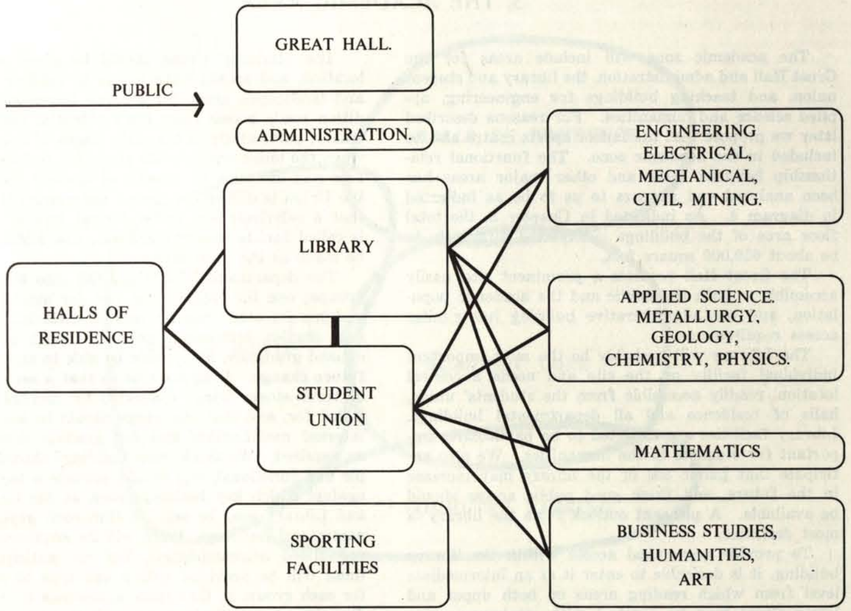

Diagram 4 FUNCTIONAL RELATIONSHIP

about 50' thick may be needed, with windows mainly facing north or south. In most other departments, where the space allocation per student is relatively low, small rooms will predominate; we think wings 35' or 40' wide may be economical in these cases.

The administrative building is envisaged as relatively straightforward office accommodation, which may be developed in one or two stages. Suitable provision should be included for the Council of the School, possibly with a separate Council Chamber.

The site for the sports centre needs to be close to the academic and residential areas to encourage physical activity by students during breaks in their studies, but also needs to be related to outdoor sporting facilities. We believe the changing, locker and equipment storage facilities in the centre can also be used by students using the playing fields.

The spaces between the buildings in the academic area will be of great importance. By careful planning we believe it will be possible to produce a series of partly enclosed courtyards complementary to the buildings, with interesting changes of level, paving and landscape treatment which will provide a pleasant, convenient and sheltered environment in which students and staff may move from building to building, and which will also be pleasant to look out into from the buildings. It will be necessary to complete the construction, paving and landscaping of these spaces as the buildings are erected so as to avoid unnecessary interruption and disturbance in the future. By making suitable budgetary provision for finishing off around buildings in this way, a complete academic environment can be made to exist at every stage.

6. RESIDENTIAL AREA

Four separate residential complexes for 350-400 students may be needed if the ultimate proportion of residents is high. On the other hand, fewer or less densely populated complexes may suffice.

We have allocated a residential zone capable of meeting the maximum demand. We propose that the first site be developed in the traditional manner to accommodate 350 students, and have indicated a suitable pattern of development. It is not necessary to determine the density or type of residential development for the other areas at this stage so we have not made detailed suggestions about them.

We think it desirable to leave open a large number of options in the residential area. The development plan described in Chapter 12 can accommodate rapid or slow growth of residential facilities, and the facilities may be added to by small or large amounts without affecting the development frame-work. The residential plan should be generally independent of other facilities and of their rate of development, although there may be advantages at certain times in relating residential facilities to those elsewhere, e.g. in relating the initial study-bedroom accommodation to the union dining-room and kitchen.

7. SPORTING FACILITIES

The extent to which various types of sporting facilities will be needed to meet the demands of students and staff is not altogether clear, and student preferences are unlikely to become clear until the campus has been functioning for several years, but we believe the existence of good facilities on the new site will generate interest in sport. We think as many students as possible should be encouraged to participate in physical activities on the campus, and that in a relatively short time the School may be fielding teams in district competitions.

We have assumed that interest in various sports may fluctuate from time to time. Consequently we propose most of the sports area be developed as a series of grassed terraces which may be marked out as required for the games that are popular in a given season.

As with the residential area, the rate of growth of sports fields may be independent of other development. It can be determined from time to time in relation to the demand for recreational facilities, which will depend on student numbers and interest.

8. ROADS AND PARKING

As indicated in Chapter 3, the Mt. Helen campus will ultimately have a total day-time population of about 3,600 persons including 750 to 1,500 residents and 2,100 to 2,850 commuters. Vehicle ownership among this population will be high and the problems of providing adequate parking facilities and dealing with high vehicle flow rates at peak periods will be very considerable.

Significant capital and recurrent resources will have to be devoted to demands associated with vehicles at every stage of development, and it will probably be desirable to examine economic alternatives to the free use of private transport, both initially and as growth progresses, such as encouragement of public transport between the campus and the city.

In studying the requirements for roads and parking, we have assumed widespread use of private motor transport by both staff and students, and we have assessed probable parking demands as shown in Table 4.

It should be pointed out that alternative sets of complementary figures are given for parking demand by residents and non-resident students; if the residential population reaches 1,500 students and their cars are parked in the residential area, a relatively small amount of parking space will be needed in the academic area; if the residential population is as low as 750, the ultimate requirements for parking for commuters nears the academic are will be increased substantially.

In the academic area itself we think it reasonable to limit the number of parking spaces to about 600 which may be reserved for staff and visitors in order that they may park close to their destinations. As explained in Chapter 4 the great bulk of commuter parking should be provided in areas on the periphery of the academic zone. The valley and filled land immediately south of the academic campus offers an ideal location for extensive car parking and we suggest it be developed for this purpose to keep pace with requirements. Much of the work of constructing and finishing the car parks can be left until the demand arises, but the initial developmental work in this area should be undertaken at an early stage. This will include earthworks (which are most economical if done in bulk) and landscaping. Once the layout and rough levels are established on the ground it will be possible to plant large numbers of tree seedlings at very small expense; five or ten year's growth may be gained before some of the car parks come into use, and the vehicles will be effectively screened and shaded that much sooner.

We have shown the parking area extending to the sporting zone to the west and up the valley to the east. The former extension has the advantage of providing ample parking space close to the sports fields; the latter is necessary to accommodate maximum commuter demand, but both extensions may be superfluous if the number of students in residence approaches the maximum assessment.

The main car parks will be used primarily by day students, but may also be used at off-peak periods to accommodate large influxes of visitors to the campus, e.g., for ceremonies in the Great Hall, week-end conferences, or extension courses in the evenings.

The staging of construction of the parking facilities can be arranged to keep ahead of demand. In order to predict demand a few years ahead, it will be desirable to make regular checks of actual vehicle numbers in relation to resident, day-student, staff and visitor numbers. Within this framework it will be important to consider parking requirements when priorities for capital development are being determined.

The road pattern necesary to carry large numbers of vehicles to and from the campus at peak periods has received careful attention. Assuming a maximum flow rate of about 500 vehicles per lane per hour, we consider four outlets from the site at diverse points will be essential ultimately. We presume that Gear Avenue and its intersection with the Midland Highway will be upgraded (probably to four lanes) in the course of time, that the government roads on both the eastern and western boundaries of the site will be developed within the next decade or so and that highway connections from these three roads to the city will also be developed.

We recommend that discussions with the Buninyong Shire Council and the Ballarat and District Town Planning Committee be instituted on a continuing basis so that the influence of the campus on transport planning and many other aspects of development resulting from the changing pattern of land use in the campus area may be taken into account.

Within the site, we propose two main roads linking the Gear Avenue entrances to the additional entrances on the western and eastern boundaries repectively, with the residential and academic zones and major car parks between them. These roads will be linked by a road on the northern side of the valley

between the academic and residential zones, and also by a loop road to the north of the residences.

The present entrance from the eastern end of Gear Avenue will become one of the secondary approaches. The main approach to the Great Hall and administration will be first from the entrance farther west on Gear Avenue, and then from the entrance on the western boundary of the site, to which a direct road connection from Ballarat is envisaged.

Access to the pedestrian precincts for academic and residential buildings will be from the perimeter roads described above via several short spur roads. The main buildings will be served by such a spur which will terminate in a turning area of sufficient size to accommodate public transport vehicles (100 ft. turning circle). The other spurs will give access to local car parks and to service points adjacent to the various academic and residential buildings. These points will be enclosed by buildings and/or screen walls as a series of service yards, and their dimensions will permit three-point turns by medium-sized trucks. We believe larger yards may tend to become cluttered with refuse and tradesmen's cars, and so might be wasted.

The system of roads and the location of parking areas we propose is illustrated in Diagram 5.

It will be some years before the complete road system is required. We suggest that by 1972 it will be necessary to complete the loop around the academic area from Gear Avenue, together with spurs to the Great Hall/Administration (the main approach), the Library/Union and the initial residences; and extension of the spur north of the existing engineering buildings to the eastern end of the initial applied science building. By 1975 we suggest completion of the main drive from the western boundary, a service spur from the main car park to Humanities/Applied Science, and, if resident students exceed 350 in number, portion of the northern loop road.

It may be of interest to refer to the total length of roads within the site with those shown on the 1967 plan, as this is one of the points we have been asked to check. The total length of major roads in the present plan for 3,000 students (excluding car park access roadways and minor spur roads) is 10,400 feet, compared with approximately 16,000 feet for 2,000 students in the 1967 plan, largely as a result of the increased building density now proposed.

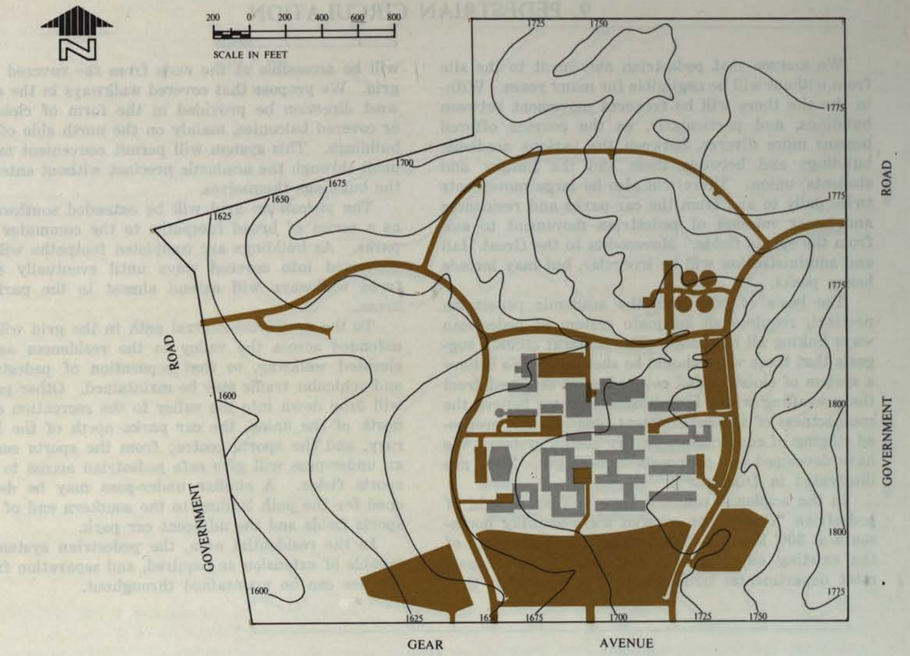

Diagram 5 ROADS AND PARKING

9. PEDESTRIAN CIRCULATION

We assume that pedestrian movement to the site from without will be negligible for many years. Within the site there will be frequent movement between buildings, and particularly, as the courses offered become more diverse, between the various academic buildings and between them and the library and students' union. There will also be large movements twice daily to and from the car parks and residences and lesser volumes of pedestrian movement to and from the sports fields. Movements to the Great Hall and administration will be irregular, but may include heavy peaks.

The basis of our plan, the academic pedestrian precinct, requires an adequate system of pedestrian ways linking all buildings. The Ballarat climate suggests that these ways should be sheltered. We believe a system of cloisters and covered ways screened from the prevailing winds is indicated, and we believe the compactness of the development plan and the proposed staging of construction justify such a system. We have developed our proposals accordingly. They are illustrated in Diagram 6.

In the academic zone we have laid out a grid of pedestrian "streets" or covered ways running north-south at 300' intervals, starting at the western end of the existing engineering buildings. As we expect most departmental buildings to run east-west, they will be accessible at the ends from the covered way grid. We propose that covered walkways in the east-west direction be provided in the form of cloisters or covered balconies, mainly on the north side of the buildings. This system will permit convenient movement through the academic precinct without entering the buildings themselves.

The pedestrian grid will be extended southwards as a series of broad footpaths to the commuter car parks. As buildings are completed footpaths will be converted into covered ways until eventually sheltered walkways will extend almost to the parking areas.

To the north, the central path in the grid will be extended across the valley to the residences as an elevated walkway, so that separation of pedestrian and vehicular traffic may be maintained. Other paths will drop down into the valley to the recreation area north of the union, the car parks north of the Library, and the sports centre; from the sports centre an under-pass will give safe pedestrian access to the sports fields. A similar under-pass may be developed for the path leading to the southern end of the sports fields and the adjacent car park.

In the residential area, the pedestrian system is capable of extension as required, and separation from vehicles can be maintained throughout.

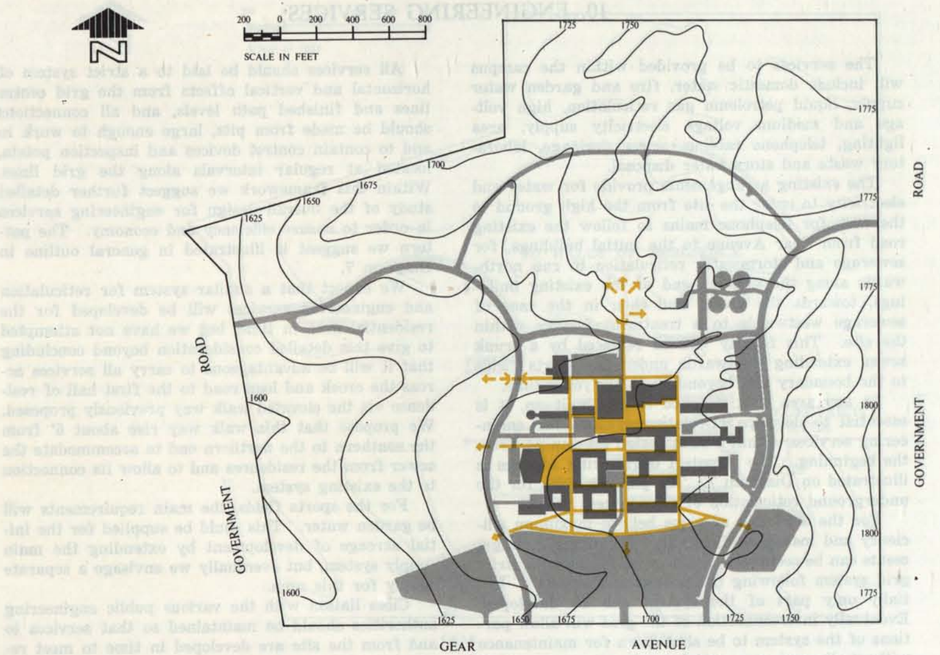

Diagram 6 PEDESTRIAN CIRCULATION

10. ENGINEERING SERVICES

The services to be provided within the campus will include domestic water, fire and garden water supply, liquid petroleum gas reticulation, high voltage and medium voltage electricity supply, area lighting, telephone cabling, sewer drainage, laboratory waste and stormwater disposal.

The existing arrangements provide for water and electricity to enter the site from the high ground to the east, for telephone mains to follow the existing road from Gear Avenue to the initial buildings, for sewerage and stormwater reticulation to run northwards along the western end of the existing buildings, towards the creek, and then in the case of sewerage westwards to a treatment facility within the site. This facility will be replaced by a trunk sewer extending westwards under the sports fields to the boundary and beyond in a few years time.

In any area that is to be closely built up, it is essential to develop reticulation systems for engineering services within a firm design framework from the beginning. The layout of engineering services is illustrated on Diagram 7. The plan provides for the underground reticulation of all services.

For the academic area we believe maximum efficiency and maximum flexibility of building arrangements can be secured by locating all mains on a strict grid system following the pedestrian "streets". Initially only part of the system will be developed. Eventually interconnection of the grid will allow portions of the system to be shut down for maintenance without disrupting essential services to any part of the campus.

All services should be laid to a strict system of horizontal and vertical offsets from the grid centre lines and finished path levels, and all connections should be made from pits, large enough to work in and to contain control devices and inspection points, located at regular intervals along the grid lines. Within this framework we suggest further detailed study of the overall design for engineering services in order to ensure efficiency and economy. The pattern we suggest is illustrated in general outline in Diagram 7.

We expect that a similar system for reticulation and engineering services will be developed for the residential area in time, but we have not attempted to give this detailed consideration beyond concluding that it will be advantageous to carry all services across the creek and loop road to the first hall of residence via the elevated walk way previously proposed. We propose that this walk way rise about 5' from the southern to the northern end to accommodate the sewer from the residences and to allow its connection to the existing system.

For the sports fields, the main requirements will be garden water. This could be supplied for the initial acreage of development by extending the main supply system, but eventually we envisage a separate supply for this area.

Close liaison with the various public engineering authorities should be maintained so that services to and from the site are developed in time to meet requirements, and so that services within the site are co-ordinated with the external facilities.

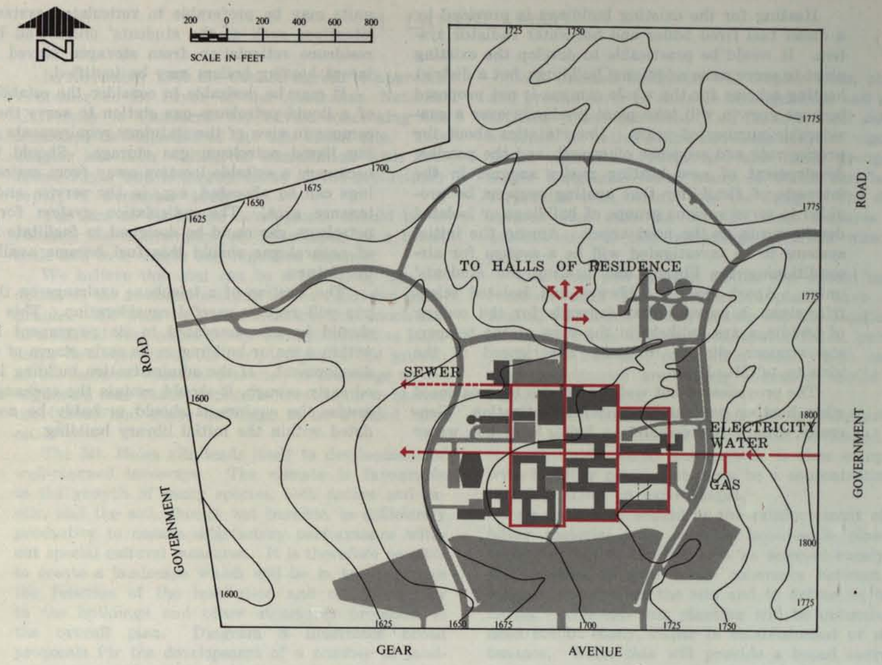

Diagram 7 ENGINEERING SERVICES

Heating for the existing buildings is provided by a diesel fuel fired boiler and hot-water radiator system. It would be practicable to develop the existing plant to serve some additional buildings, but a district heating scheme for the whole campus is not proposed because growth will take place gradually over a considerable number of years. Uncertainties about the precise rate and sequence of growth and the possible development of new heating modes suggest in the interests of flexibility that heating systems be provided to serve various groups of buildings or isolated developments as the need arises. Among the initial systems to be investigated will be a system for air-conditioning the library and heating the students' union. Apart from the library and isolated scientific areas it appears that demands for the cooling of buildings are unlikely in the view of the temperate summer climate normally experienced in the vicinity of Mt. Helen.

The provision of hot water may also be considered when heating systems are under investigation. Generally, where the demand is light, local hot water units may be preferable to reticulated systems. In situations such as the students' union and halls of residence reticulation from storages served by adjacent heating boilers may be justified.

It may be desirable to consider the establishment of a liquid petroleum gas station to serve the whole campus in view of the statutory requirements governing liquid petroleum gas storage. Should this be necessary a suitable location away from major buildings can be allocated, e.g., in the service and maintenance area. The reticulation system for liquid petroleum gas could be designed to facilitate the use of natural gas should this fuel become available in the future.

The location of a telephone exchange on the campus will require careful consideration. This facility should be accommodated in its permanent location within a major building in its early stages of campus development. If the administration building is erected early enough, it should contain the exchange; otherwise the equipment should probably be accommodated within the initial library building.

11. LANDSCAPING

In November 1969 the Council agreed to approach Professor L. D. Pryor of the Australian National University in Canberra, for advice concerning the landscape development of the Mt. Helen site. This chapter has been written in consultation with Professor Pryor and is largely based on his preliminary report of December 1969.

The aim of landscape development should be to enhance the environment of the campus on a broad scale and in a simple and dignified manner.

We believe this aim can be achieved by the adoption of the recommendations in the following paragraphs. We wish to stress the view that much can be achieved very economically through effective landscape development in the early stages of the growth of the campus. Careful attention to plantings at the beginning may enable expensive treatments to shelter courtyards and shade buildings to be avoided later on.

The Mt. Helen site lends itself to development of well-planned landscape. The climate is favourable to the growth of many species, both native and exotic, and the soil, though not basaltic, is sufficiently productive to ensure satisfactory performance without special cultural measures. It is therefore possible to create a landscape which will be in keeping with the function of the institution and complementary to the buildings and other structures proposed in the overall plan. Diagram 8 illustrates broad proposals for the development of a number of landscape zones of varying character to meet varying functional requirements.

Well-planned landscape will employ trees, shrubs and ground-cover in suitable arrangements and proportions. There are already on the site small patches or copses of native forest and some areas of vigorous forest regrowth. There are also lines, groups or single indigenous trees, many of which can be incorporated with benefit into the design. The development plan attempts to take these features into account and to take advantage of them wherever possible.

The trees now present on the site should not be removed until the development plans have been studied in further detail, setting out the location of buildings, roads and services, sports fields, parking areas and the like; only when those which cannot then be retained are clearly indicated should any removal take place.

The total landscape development is necessarily a rather long-term project which must be staged, but it is desirable, since tree growth is slow compared with building rates, that there be a concentration of planting effort in early stages.

An early step should be the reinforcement of existing material with suitable broad-scale planting, mainly of native species, such as selected eucalyptus and wattles, to give broad coherence between the various elements on the site and to define its boundaries. Although this planting will be extensive, it need not be costly, either in establishment or maintenance. While this will provide a broad surround to the area, giving overall general shelter and pleasant outlook from both inside and outside the campus,

it should not be a complete ring of planting isolating the site entirely from the surrounding countryside. There are places where openings or lower or thinner planted zones can be arranged so that distant vistas can be incorporated into the scene.

In the zone to be developed for playing fields there will necessarily be an interim period during which construction is staged and in which maintenance of the areas yet to be constructed will be satisfactorily achieved by making meadow hay. Indeed, in view of the climate of Ballarat it will be appropriate to keep some open grassy areas maintained indefinitely by extensive mowing instead of establishing formal lawn. In the more intimate areas, especially those associated with the academic buildings and in the immediate vicinity of halls of residence, attention must be given to the needs of users, and both shelter and shade as well as aesthetic appeal will play a major part in determining detailed design. Shade, and its complement of sunny outlook in winter, will be met by the use of some deciduous trees and a limited selection of species especially suitable for use in these areas can be made from the wide range of species which thrive in the district.

Harmony in design in the academic area will result from development and planting according to an integrated landscape plan which will provide a matrix within which the separate buildings will lie and which will help to bring them together as part of a single whole. At a more extensive scale, a similar union of the residential college area and sports fields with the academic zone into a single whole can be achieved without precluding the development of a degree of interest from diversity which is desirable in a landscape as extensive as the campus. As development proceeds, each separate major zone on the campus and each building or structure within such zones will need individual consideration in landscape planning but strictly within the overall framework.

Areas of specific interest, such as the small valley to the north of the students' union should be developed to provide places of seasonal interest for those who like to enjoy in their natural surround plants and animals natural to the area.

To achieve these various ends, a detailed landscape plan must be developed with a phased construction programme, suitably financed and supported by adequate maintenance resources, using the best available methods appropriate to present and future needs. A small ground staff will be necessary, with adequate equipment and other facilities. A continuing policy based on an initial well-conceived plan is essential for a satisfactory outcome in the long term.

Diagram 8 LANDSCAPING

12. THE DEVELOPMENT PLAN

In formulating our proposals, we have had in mind that the campus will develop gradually. We are aware that an inflexible master plan, though prepared in great detail, approved, and implemented in some small part, is likely to be passed over when after a time a situation arises that is not provided for. Since in a rapidly developing institution the academic emphasis may shift markedly during the main period of growth, we think it is particularly important that our proposals for the Mt. Helen campus should lend themselves to modification to meet changing requirements.

The plans presented here are for the long as well as short term. They aim to provide for needs that can now be predicted within a framework that is firm enough to produce an obvious sense of order on the site and to permit rational, economical and coherent development at each stage. At the same time the framework is designed to be flexible, so that it will encompass developments in the future that cannot be predicted at present.

The long-term development plan is not intended to be followed in all details. Though we have indicated locations for certain facilities, we have not attempted to specify locations for all the minor facilities that might be required, partly because the detailed requirements for future projects cannot be known to us but mainly because of the rigidity which such specification would impart to the plan. Instead, we have concerned ourselves primarily with systems and patterns of development.

Our proposals are illustrated on Diagram 9.

The paragraphs that follow describe the main features of the plan in each of the four zones referred to in Chapter 4, and their relationship one to another.

The basic circulation and service systems are determined primarily by practical considerations such as functions and topography. The routes for main roads, footways and service mains have to be established at the beginning, and consequently these have been studied in detail, but the precise locations of minor routes and service branches are matters for the future.

The main approaches to the campus can be made very attractive. From Gear Avenue at the south-west corner of the site the Great Hall will dominate the academic ridge and will be viewed across the southern end of the sports terraces; the car parks in the foreground will be screened by heavy planting. Within a few years the principal approach to the campus will be via the entrance on the west boundary of the site. This approach will be dramatic. From this entrance the road will sweep up and around the ridge of high ground in the north-western part of the site and then, with the buildings revealed in the distance and the playing fields in the foreground and on terraces to the south, the road will follow the curving contour line and swing south across the valley on a causeway as it rises to approach the main buildings. Crossing the academic ridge below the existing windbreak plantation the road will carry on to the commuter car parks and Gear Avenue.

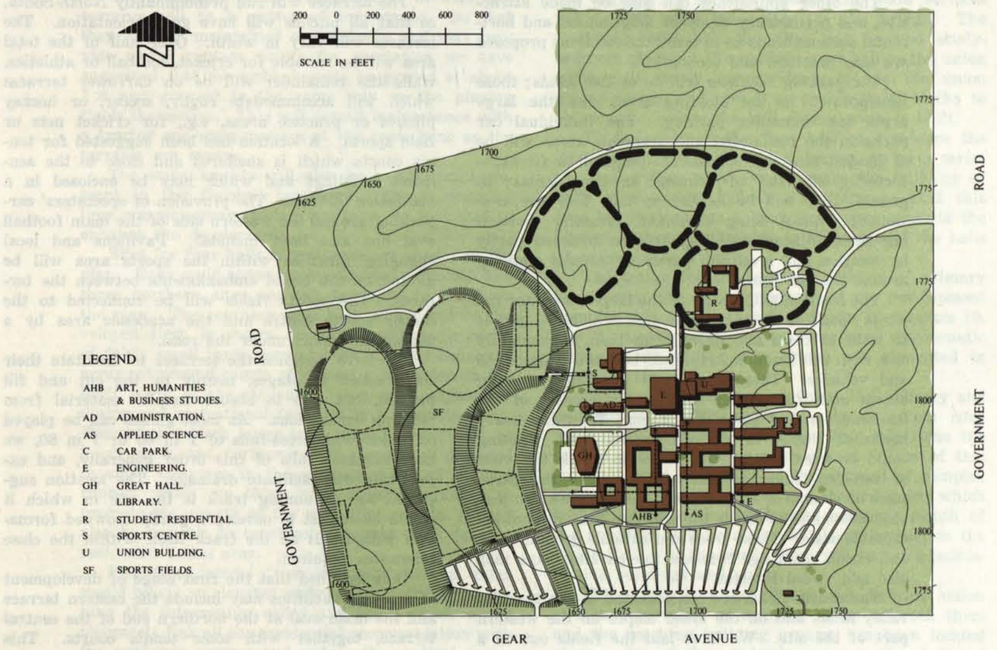

Diagram 9 THE DEVELOPMENT PLAN

The other approaches can also be made attractive, and preliminary study of longitudinal and horizontal sections leads us to think the locations proposed are also practical and economical.

Car parking facilities will be of two kinds; those incorporated in the building areas and the large areas for commuter parking. The individual car parks in the residential and academic areas will be of modest size and so can be designed to fit satisfactorily into the environment in these areas; in general they will be located so that they are convenient without being dominant elements. Screening from adjacent buildings will be achieved partly by location and level and partly by careful planting around the car parks.

The location and design of the large commuter car parks south of the academic area will allow people to walk to them and drive from them conveniently and with minimum interference between pedestrians and vehicles. These areas will be many acres in extent and will require careful development of the landscape around and within them. We think heavy banks of shrubs or mounds covered with planting could be used around the parks to break the view of vehicles from adjacent areas; within the parks rows or clumps of large trees should be grown to provide shade and to divide the areas up into units of acceptable scale. These trees and suitable ground cover and shrub plantings between the parking bays may also add visual interest.

The sports fields are concentrated in the two flat valley areas and on the lower slopes on the western part of the site. We have laid the fields out on a series of broad terraces; a typical arrangement of pitches is indicated by dotted lines on the plan.

The terraces will run predominantly North-South, so that all pitches will have good orientation. The terraces will vary in width. Over half of the total area will be suitable for cricket, football or athletics, while the remainder will be on narrower terraces which will accommodate rugby, soccer, or hockey pitches or practice areas, e.g., for cricket nets or field sports. A location has been suggested for tennis courts which is sheltered and close to the academic buildings and which may be enclosed in a plantation of trees. The provision of spectators' car-parking around the western side of the main football oval has also been included. Pavilions and local changing facilities within the sports area will be located on the broad embankments between the terraces. The sports fields will be connected to the indoor sports centre and the academic area by a pedestrian tunnel under the road.

We have designed the terraces to facilitate their construction in stages, mainly by the cut and fill method, but also to absorb surplus material from building excavations. As most games can be played on fields with cross-falls of 1 in 60 or 1 in 80, we have assumed falls of this order generally, and expect this will facilitate drainage. The location suggested for a running track is the one in which it would be easiest to develop a gently crowned formation with levels on the track itself within the close tolerances required.

It is assumed that the first stage of development of sporting facilities may include the eastern terrace and the main oval at the northern end of the central terrace, together with some tennis courts. This would provide basic facilities for all the main competitive games at an early date.

The treatment of the embankments between the terraces will be a matter of importance. So that they may be maintained economically and may provide useful vantage points for spectators we have suggested that the embankments be graded at about 1:6 and grassed in the same way as the playing fields themselves. This will permit maintenance with a tractor and gang-mowers at the same time as the terraces are mown.

The embankments will also be a significant element in the finished landscape. Broad sweeping lines complementary to the landform are proposed to enhance the development.

Sites for four halls of residence are shown on the plan. Each could accommodate 350-400 persons. The three northern sites are not developed in detail on the plan. The southern-most hall, which will be developed first, is shown diagramatically as a series of fairly small three-storey blocks of study-bedrooms arranged around courts of domestic character on the bluff north of the students' union, with supporting dining and recreational facilities in a separate block. East of this block lower land could be developed as a car park, and further parking could be provided in small clearings in the existing stand of natural timber, which we think may require thinning to promote the growth of the trees that remain. It may also be possible to construct a tennis court for the residents in this area.

Pedestrian access from the halls to the union would be via an elevated walkway or footbridge spanning the intervening valley and road, which would ultimately link all the residential accommodation with the academic campus and reduce the vertical movement involved, and which also forms a key part of the engineering services system; all main services will be run over the valley via the bridge. The footbridge will link the first one or two study-bedroom blocks of the southernmost hall to the union sufficiently closely for residents to use the union dining rooms, and will thus enable these blocks to be occupied before the hall dining room is built.

To the west of the first hall of residence the land slopes irregularly and is broken up by a series of small gullies which would make the building of halls of residence difficult. We propose that this area be developed as a landscaped area opposite the library, and made available to occupants of the halls of residence as a park.

The design for the academic area is of primary importance, and an enlargement of the development plan for this area is therefore shown in diagram 10. For the same reason, we have prepared diagramatic cross-sections of the area which are presented in Diagram 11.

The "public" buildings — Great Hall, library and administrative offices have a common access road which will accommodate buses. This will form the main approach to the academic area. East of this approach road there will be a courtyard of complex shape leading to the library and student union which will be at the centre of campus activity. South of the approach will be a formal plazza leading to the Great Hall. To the north there will be the administrative buildings and shops.

The campus core, the library and students' union and the courtyard of complex shape between them and the teaching building groups, has been located at one edge of the academic area, on the sheltered lower part of the northern slope, close to both resi-

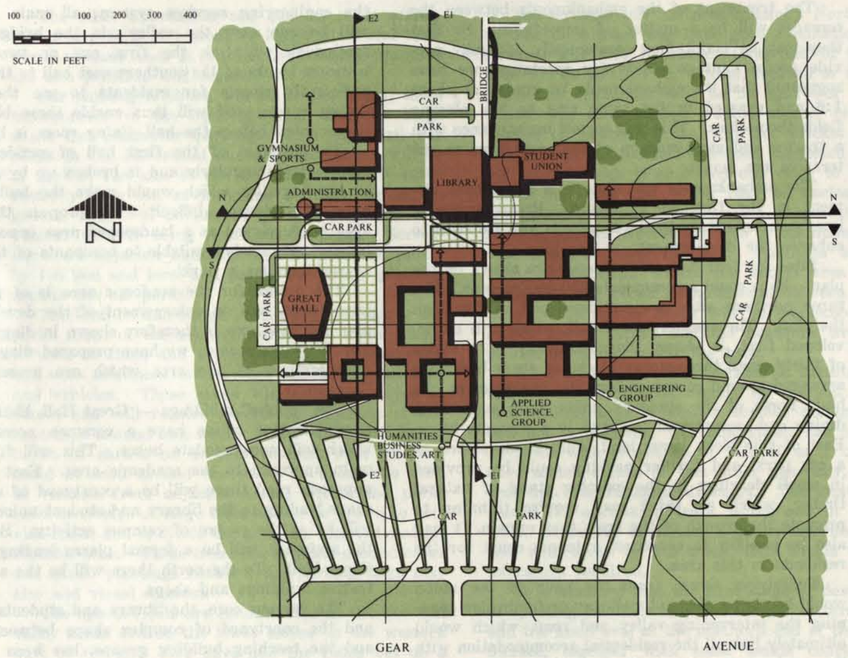

Diagram 10 PLAN OF ACADEMIC AREA

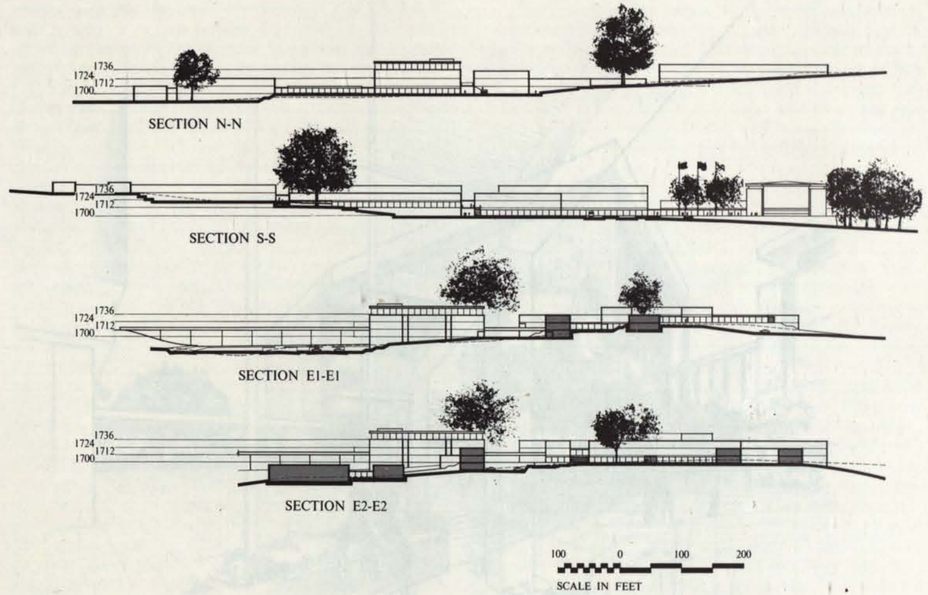

Diagram 11 SECTIONS THROUGH ACADEMIC AREA

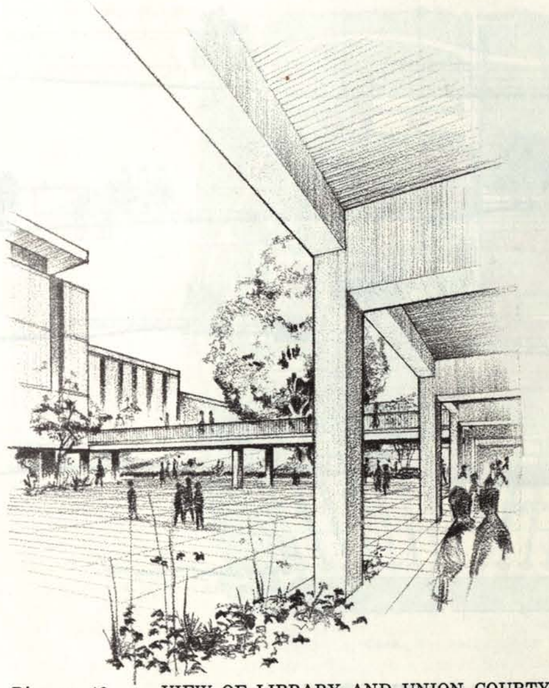

Diagram 12 VIEW OF LIBRARY AND UNION COURTYARDS

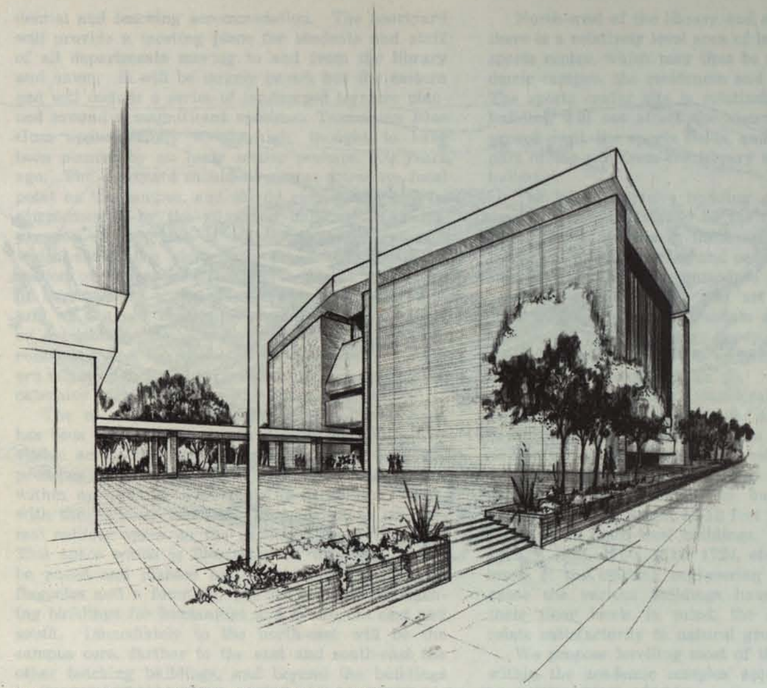

Diagram 13 VIEW OF GREAT HALL

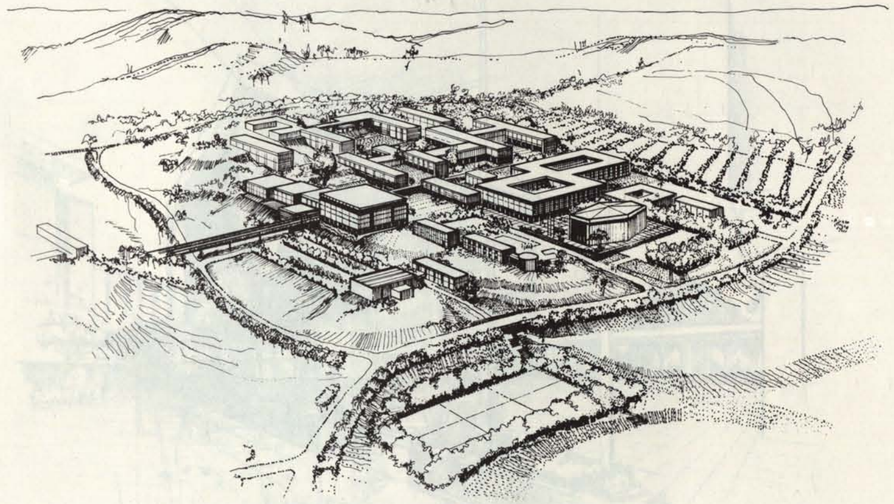

Diagram 14 BIRD'S EYE VIEW OF ACADEMIC AREA FROM THE NORTH-WEST

dential and teaching accommodation. The courtyard will provide a meeting place for students and staff of all departments moving to and from the library and union. It will be largely paved, but the eastern end will include a series of landscaped terraces planned around a magnificent specimen Tasmanian Blue Gum approximately 90 ft. high, thought to have been planted by an early settler perhaps 100 years ago. The courtyard should be a most attractive focal point on the campus, and should complement and be complemented by the adjoining buildings. An impression of this area is illustrated in diagram 12, which shows the view from the south-west. The section of valley and creek north of the union can be developed as a pleasant park, which might contain an outdoor theatre; views of the park would be available from the refectories, the bridge to the residences, and the initial residential blocks. Northern windows in the library would also command more extensive views to the north-west.

The most prominent site in the academic area has been reserved for the Great Hall, which will be visible across the playing fields from the main approaches to the site. The Great Hall will be set within an existing windbreak of eucalyptus, which with the building itself will give shelter to the formal outdoor space on the eastern side of the Hall. This space which is illustrated on diagram 13 will be paved and planted and may be furnished with flagpoles and a fountain, will be bounded by teaching buildings for humanities and art to the east and south. Immediately to the north-east will be the campus core, farther to the east and south-east the other teaching buildings, and beyond the buildings to the south the main car parks.

North-west of the library and administration sites there is a relatively level area of land suitable for the sports centre, which may thus be sited near the academic campus, the residences and the playing fields. The sports center site is relatively low, so that the building will not affect the views out over the approach road, the sports fields, and the north-western part of the site from the library and administration building.

The most extensive building groups in the academic area will naturally be the departmental buildings. These will be in three sections separated by major north-south service and pedestrian routes. The western group will accommodate mathematics, business studies, humanities and art departments; the central group will accommodate applied science departments; and the eastern group, which will include the existing buildings, will accommodate the various engineering departments.

As the site slopes considerably, the academic buildings will occur at a number of levels. We think it essential that a common system of levels be adopted for all academic buildings, related to the levels for pedestrian circulation, so that floor levels will be continuous from building to building. We have adopted a storey height of 12 feet in the development plan for all multi-level buildings. The levels chosen (R.L.'s 1688, 1700, 1712, 1724, etc.) tie in with the levels of the existing engineering buildings and, because the various buildings have been sited with their floor levels in mind, the levels chosen also relate satisfactorily to natural ground levels.

We propose levelling most of the courtyard areas within the academic complex approximately to one or another of the levels mentioned; this will entail

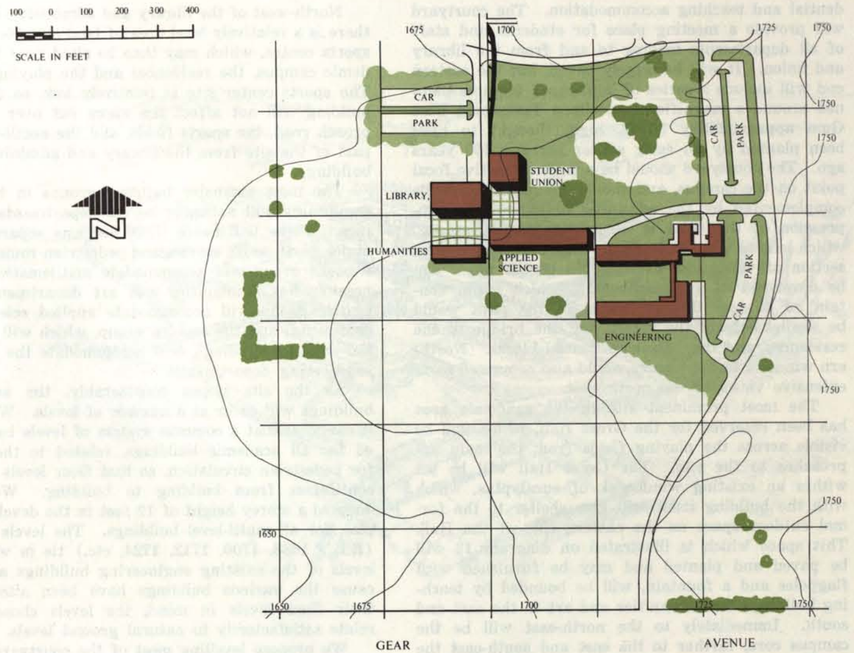

Diagram 15 ACADEMIC AREA DEVELOPMENT STAGE 1

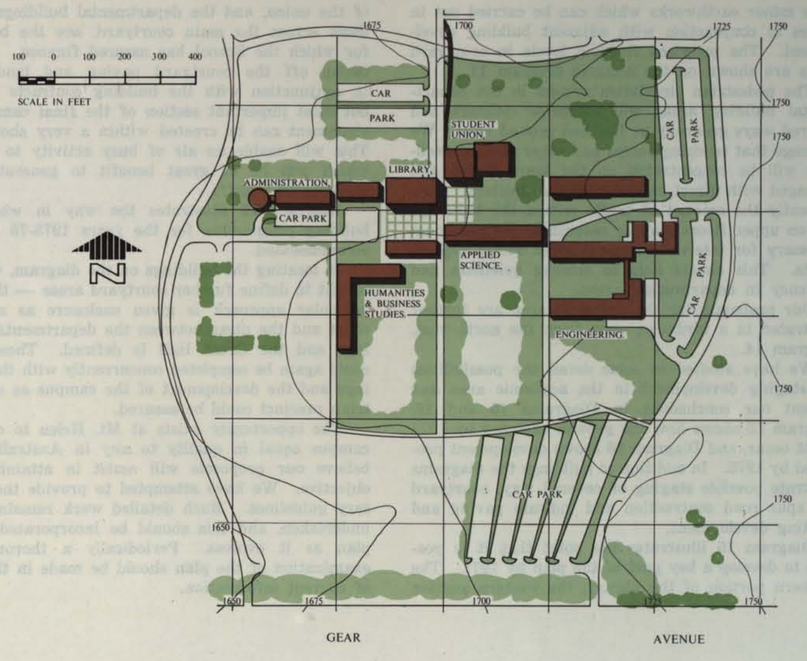

Diagram 16 ACADEMIC AREA DEVELOPMENT STAGE 2

some minor earthworks which can be carried out in stages in conjunction with adjacent building development. The proposed finished levels in courtyard areas are shown on the sections diagram 11.

The pedestrian circulation system in the departmental building areas will comprise cloisters and covered ways generally at finished ground level. We envisage that teaching rooms and other student facilities will be concentrated on the lower floors and arranged with direct access from the cloisters. Consequently the amount of traffic within the buildings and on upper floors may be reduced to the minimum necessary for internal communication within departments. This should help to achieve quietness and efficiency in departmental areas.

Our proposals for the academic area are further illustrated in a birds-eye view from the north-west, Diagram 14.

We have studied in some detail the possibilities for staging development in the academic area and present our conclusions in Diagrams 15 and 16. Diagram 15 shows how the growth expected by 1972 might occur, and Diagram 16 shows development projected by 1975. In addition to buildings the diagrams illustrate possible staging of covered way, courtyard and spur road contruction and indicate paving and planting development.

Diagram 15 illustrates the point that it is possible to develop a key part of the plan by 1972. The southern portion of the library, the western portion of the union, and the departmental buildings facing them across the main courtyard, are the buildings for which the School has assured finance. By finishing off the courtyard paving and landscaping in conjunction with the building contracts a small but most important section of the final campus environment can be created within a very short time. This will enable an air of busy activity to develop which will be of great benefit to generations of students and staff.

Diagram 16 illustrates the way in which the building programme for the years 1973-75 may be accommodated.

In locating the buildings on the diagram, we have sought to define further courtyard areas — the main vehicular approach is given enclosure as a motor court and the plaza between the departmental buildings and the Great Hall is defined. These areas could again be completed concurrently with the buildings and the development of the campus as a pedestrian precinct could be assured.

The opportunity exists at Mt. Helen to create a campus equal in quality to any in Australia. We believe our proposals will assist in attaining this objective. We have attempted to provide the necessary guidelines. Much detailed work remains to be undertaken, and this should be incorporated in the plan as it evolves. Periodically a thorough re-examination of the plan should be made in the light of current information.

Waller & Chester, Printers, Ballarat