DESIGN OF A COLLEGE CAMPUS AT HIDDEN LAKE, LENAWEE COUNTY, MICHIGAN

Thesis for the Degree of M. L. A.

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Martin Richard Van Valkenburg

1963

DESIGN OF A COLLEGE CAMPUS AT

HIDDEN LAKE, LENAWEE COUNTY, MICHIGAN

By

MARTIN RICHARD VAN VALKENBURG

A COMPREHENSIVE PROBLEM REPORT

Submitted to the School of Urban Planning and Landscape
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I. Introduction

This comprehensive problem is based on the hypothesis that the property known as Hidden Lake Gardens, endowed in 1945 by Mr. Harry A. Fee along with the sum of $646,612.31 to Michigan State University has been turned over to the State of Michigan for the express purpose of creating and establishing a college campus to service the area of Hillsdale, Jackson and Lenawee Counties. As a Landscape Architect, I have been commissioned by the State of Michigan to develop a unique and functional design for this college.

This problem is unique in the sense that it affords the opportunity to correlate the knowledge acquired in the undergraduate program into one vast project, beginning with the actual need and culminating in the final design with specific details. In addition to this, it affords the landscape architect the opportunity to design for the functional utilization of space for people as well as the aesthetic qualities within the landscape which would be lacking, generally, if done by another profession.

It is understood that it would be a very rare occasion that the State of Michigan would accept a parcel of land with such a stipulation as this, due to future encumbrances which it would most probably generate. Ordinarily the land would be turned over by transfer of deed to the Department of Administration with the Administrative Board accepting all further control. At this point local interest groups would pressure their legislative representative to introduce a bill for the creation of a new college. The bill would probably be tabled for a short period while an appointed legislative committee studies the recommendations. After the findings of this committee are presented to the legislature, the bill will either pass or fail to pass.

Assuming the bill has passed, the legislature will appoint a Board of Trustees, Regents or Governors, depending upon the administrative

framework which has been set up, and the controlling duties will be turned over to the State Board of Education. The actual construction of the college would be controlled by the Building Division unless otherwise stipulated by legislative action, with financing coming from the original endowment and from monies received through legislative appropriation.

TABLE I:

REGIONAL LOCATION

TABLE II:

SITE LOCATION IN RELATIONSHIP TO OTHER STATE SUPPORTED COLLEGES AND UNIVERSITIES

II. Site Analysis

A. General Location

The 407-acre Hidden Lake site is located near the northern boundary of Lenawee County in Franklin Township, T5S, R3E, in the section known as Irish Hills, two miles west of Tipton, Michigan, north of and adjoining Michigan Highway 50 and directly west of and adjoining Nortley Highway.

Of the 407 acres in Hidden Lake proper, 120 acres lie between M-50 and Munger Road to the north, while the remaining 287 acres lie north of Munger Road. (See Table V.)

B. Geology

The soils of the site have developed entirely from drift of the Late Wisconsin (Cary) glaciation which occurred some 12,000 to 13,000 years ago. The unweathered glacial material is a limy, unconsolidated, heterogeneous mixture of silt, clay, sand, gravel and fragments of rock deposited as a moraine.

C. Topography

Approximately 50 percent of the land is open, low and rolling, while the remainder is heavily to sparsely wooded and steeply sloped. There is a difference of 128 feet from the "low point" to the "high point" on the property.

Nestled in the steep wooded slopes of the 287 acre tract is Hidden Lake, the focal point of the entire property. The Lake is spring fed at its northern end and covers 5.7 acres. Approximately 700 feet south of the lake is a small artificial pond which covers .42 acres, whose water level is controlled by pumping, with an overflow into the lake through a small drainage ditch. (See Table VI.)

D. Climate

Lenawee County has a humid temperature climate. It is in a latitude of 42° north. The waters of the Great Lakes have slight effect on the summer temperatures. The temperatures are fairly uniform and precipitation is distributed uniformly throughout the county.

The average temperature in winter is 25.8°F., but winter temperatures range from a high of 69°F. to a low of 26° below zero. Periods in which temperatures are continually below freezing normally last less than two weeks. As a rule, the soil is frozen to a depth of several inches to one foot from one to three months each year, depending on the soil type.

Temperatures in summer range from a maximum of 108°F. to 33°F. The average frost-free season is 105 days, or from May 5 to October 10.

Average annual precipitation is 33.93 inches and about half of this falls during the growing season. There is an average of 110 days each year with 0.01 to 0.25 inch of rain, and 30 days with 0.26 to 1 inch.

E. Soils

The soils in this area range from the Fox Sandy Loams of 12-25 percent to several low areas of Houghton Muck at 0-3 percent slope.

The Fox soil of the Grey-Brown Podzolic great soil group is moderately coarse to coarse textured. In most places they consist of a 1-3 inch layer of humus and leaf mold, 18-42 inches of Sandy Loam with the substratum being porus sand and gravel. These soils, being well drained have a sub-soil which is enriched by clay washed down from the overlying horizons. These 'B' Horizons are finer textured than either the overlying or underlying horizons of the profile. This soil is moderately

low to low in moisture holding capacity and fertility with shallow frost penetration. This gives the soil excellent "buildable" qualities but may require special erosion control where subsurface "cuts" are made.

The Houghton soil is a bog (organic) soil ranging to 14 feet in depth on the site. The soil is very poorly drained and holds water in the Spring. It is composed of unidentifiable plant remains and is a dark brown to black granular soil. Approximately 5 percent of the site is composed of this soil type.

Because of the composition of this soil and the deep frost resulting from its high water-holding capabilities, this soil should be considered unbuildable for all practical purposes.

As the climate varies little within the county, there are few local soil differences due to differences in climate; however, the climate of this area has been responsible for the formation of the soils. The cool, humid climate has leached out the easily soluable constituents from the upper horizons of most of the soils and therefore they have a slightly acid to strongly acid surface soil.

The water supply for the Hidden Lake property will be by well, driven into the unconsolidated drift. Wells in this area are driven to depths ranging from 25 feet to 150 feet. Water in the sandy and gravelly drift is plentiful, with springs and artesian wells located in this area.

F. Vegetation

The vegetation on the 287 acre tract to the north of the property is comprised mainly of two ecological associations. On the steep slopes and more rugged terrain we find the Oak-Hickory Association, while the lower rolling portion is comprised mainly of the Northern Hardwood-Conifer Association.

The tract of land to the south of Munger Road contains primarily the Abandoned Fields Association.

About 5 percent of the total land belongs to the Bog Association.

This definite division in plant associations or types of plant materials is due mainly to the subsurface drainage characteristics of the corresponding soils and the previous land use, if any. (See Table IV.)

G. Summary

From this site analysis I find the property of Hidden Lake contains a variety of different characteristics, all of which will have some effect upon the final design.

Considering topography, the only limitation to building would be on the very steep slopes surrounding the lake. It is not that these slopes are unbuildable, but rather that there would have to be too great a disturbance of the soil, in most cases, for proper circulation, service and parking.

Also from this data, I can assume that the soils of the entire property, with the exception of the Houghton Muck, will have the load bearing qualities and correct frost potential to support the building of a structure.

The climate of the area will also have an effect on the location of structures. I believe those areas of the site with a South-East, South or South-West exposure to be best, in order to utilize the sun's light and heat during the winter months.

Still another factor is the vegetation. I feel it important to disturb as little as possible of the heavily wooded slopes, as this is one of the things which make this site unique. Instead, I would try to utilize the more open and sparsely wooded areas for my buildings, circulation and parking, thus safeguarding the natural beauty of the site.

Due to the character of the topography and vegetation, the wind should not be considered as a primary factor in the building layout. However, the fact that snow drifting will occur on North-South circulation routes and East-facing slopes must be taken into consideration.

The water supply on the site should be no problem, except that the cost would be greater in the higher areas as the wells would probably have to be drilled deeper.

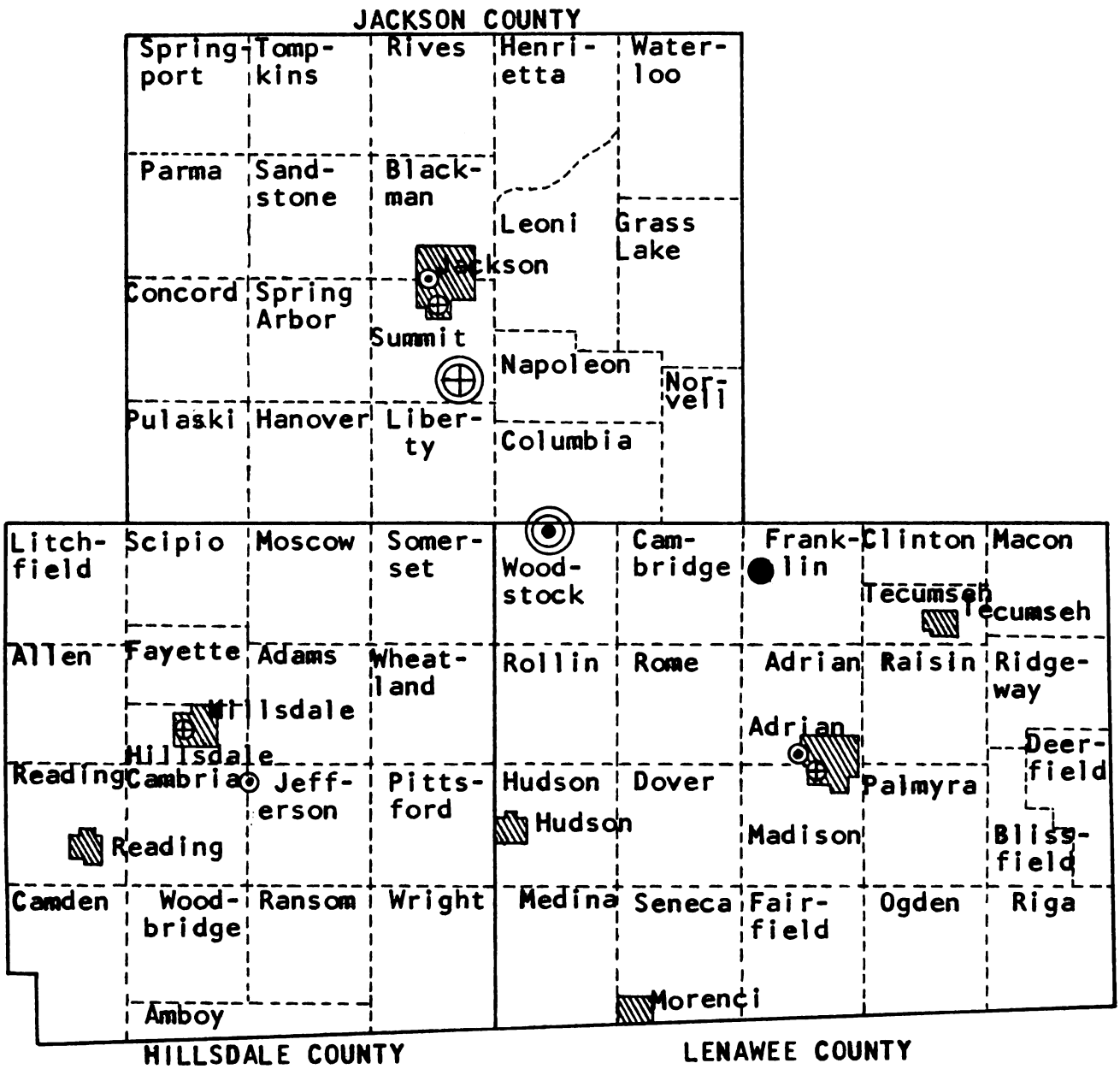
The lake is, and I feel should remain, the focal point, or point of reference within the site.

Views within the site are excellent, but views off the site, over the surrounding farmland, are good also and should not be ignored.

TABLE III:

POPULATION AND GEOGRAPHIC CENTERS OF THE THREE COUNTY AREA: HILLSDALE, JACKSON, LENAWEE

Source: J. F. Thaden and Burton Brackney, Institute for Community Development and Services, Continuing Education Service, Michigan State University



⊕ POPULATION CENTER OF THREE COUNTY AREA

⊙ GEOGRAPHIC CENTER OF THREE COUNTY AREA

⊕ POPULATION CENTER OF COUNTY

⊙ GEOGRAPHIC CENTER OF COUNTY

TABLE IV:

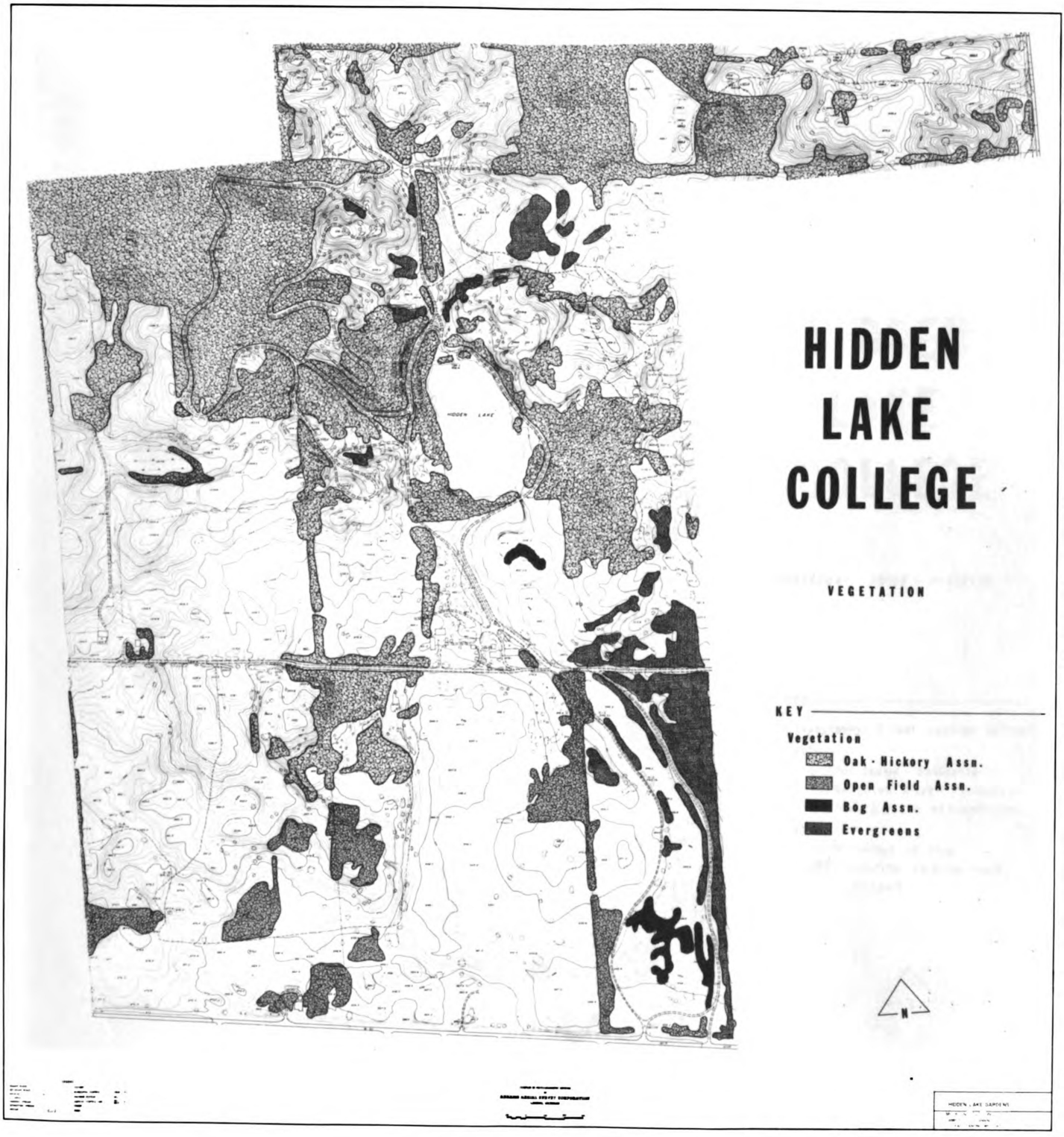

HIDDEN LAKE COLLEGE
VEGETATION
KEY
Vegetation
Oak - Hickory Assn.
Open Field Assn.
Bog Assn.
Evergreens
N

TABLE V:

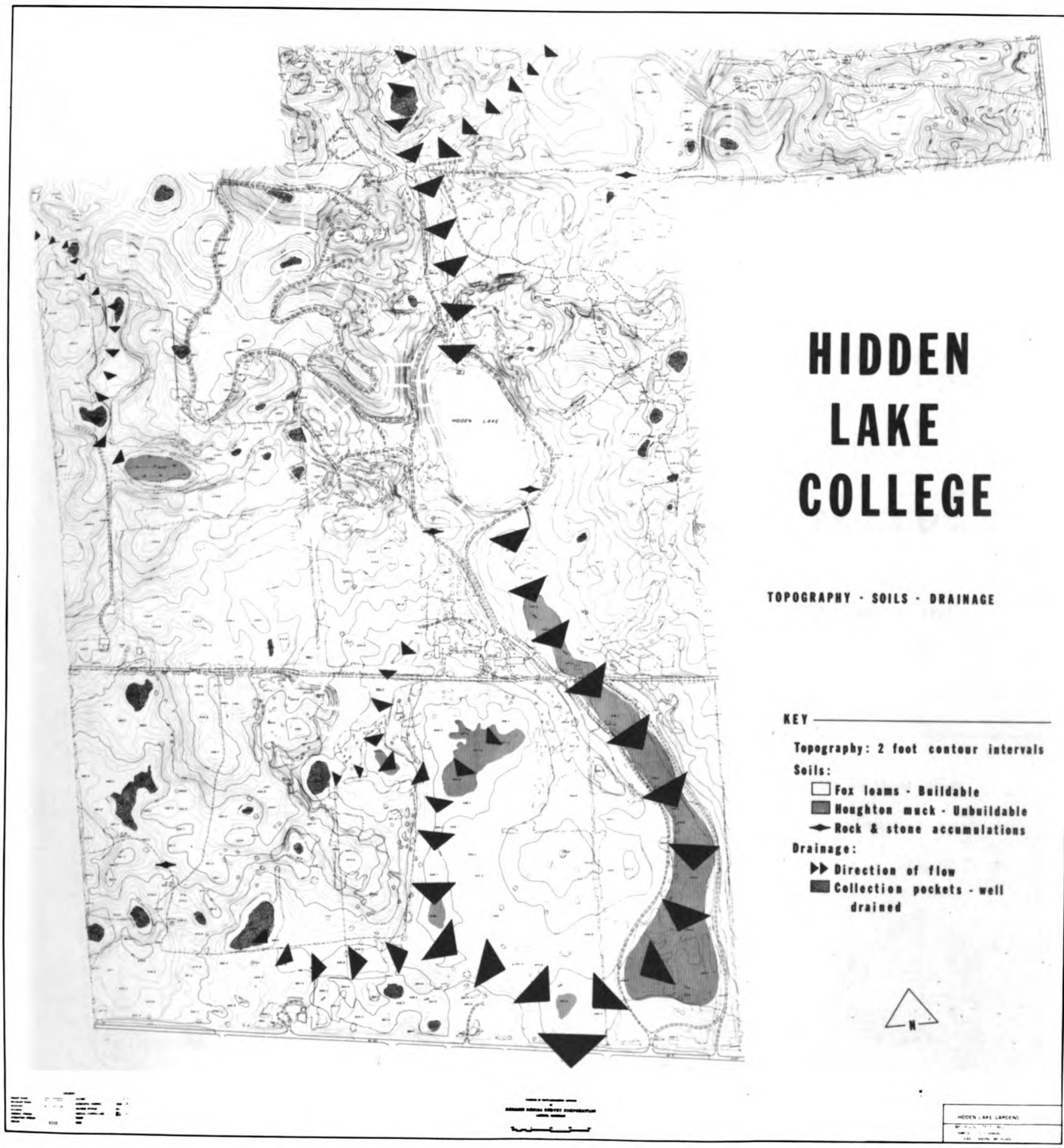
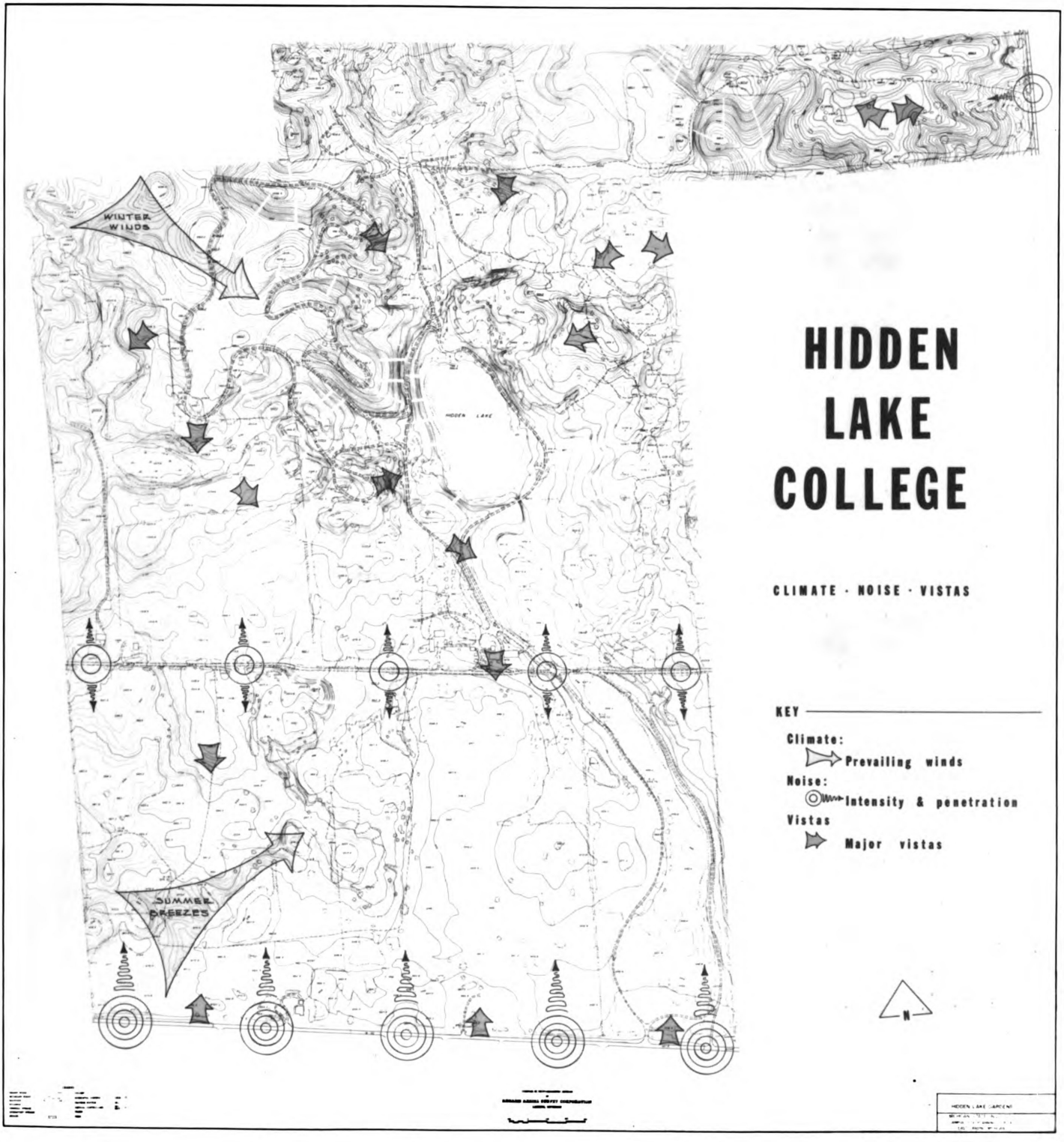

HIDDEN LAKE COLLEGE
TOPOGRAPHY - SOILS - DRAINAGE
KEY
Topography: 2 foot contour intervals
Soils:
Fox loams - Buildable
Houghton muck - Unbuildable
Rock & stone accumulations
Drainage:
Direction of flow
Collection pockets - well drained
N

TABLE VI:


WINTER WINDS
SUMMER BREEZES
HIDDEN LAKE
HIDDEN LAKE COLLEGE
CLIMATE · NOISE · VISTAS
KEY
Climate:
Prevailing winds
Noise:
Intensity & penetration
Vistas
Major vistas
N

III. Justification

Under the hypothesis that the State of Michigan has accepted this Hidden Lake property from Michigan State University for the express purpose of creating a 4-year, degree-granting college, the need arises for a justification of such an action by the State.

The first fact is that neither Hillsdale nor Lenawee County has a public institution of learning nor does it seem practical in terms of finance and population for them to establish their own. Jackson County has, at present, a 2-year community college but it is not degree granting and therefore all advanced study must be done elsewhere. This fact is emphasized to an even greater degree when it is pointed out that the majority of college-age students in a 4-year program, from each of these three counties, attend Michigan State University.[1]

Therefore the burden of educating these people falls squarely on existing state institutions and private colleges. Because of the great increase each year in our state population, and in the percentage of college-age youth attending, (See IV. Enrollment), the existing facilities have become overburdened and in some cases expansion is physically impossible. Because of this, tighter admission restrictions are continually being enforced with a greater number of students being turned away.

This process is in direct opposition to the keen concern on the part of the American public in the past, that higher education should not be restricted by social and economic levels of the individual seeking such education. This concern for the provision of educational opportunity to the largest possible proportions of our population is stimulated by our response to our own social needs, and has been particularly manifest within the past century in the tremendous growth of our colleges and universities. How, then, can we not neglect this public concern?

Another fact is that the need in the three county area has been realized by the people of these counties and already an Executive Advisory Board has been set up by the County Boards of Education to study such needs.

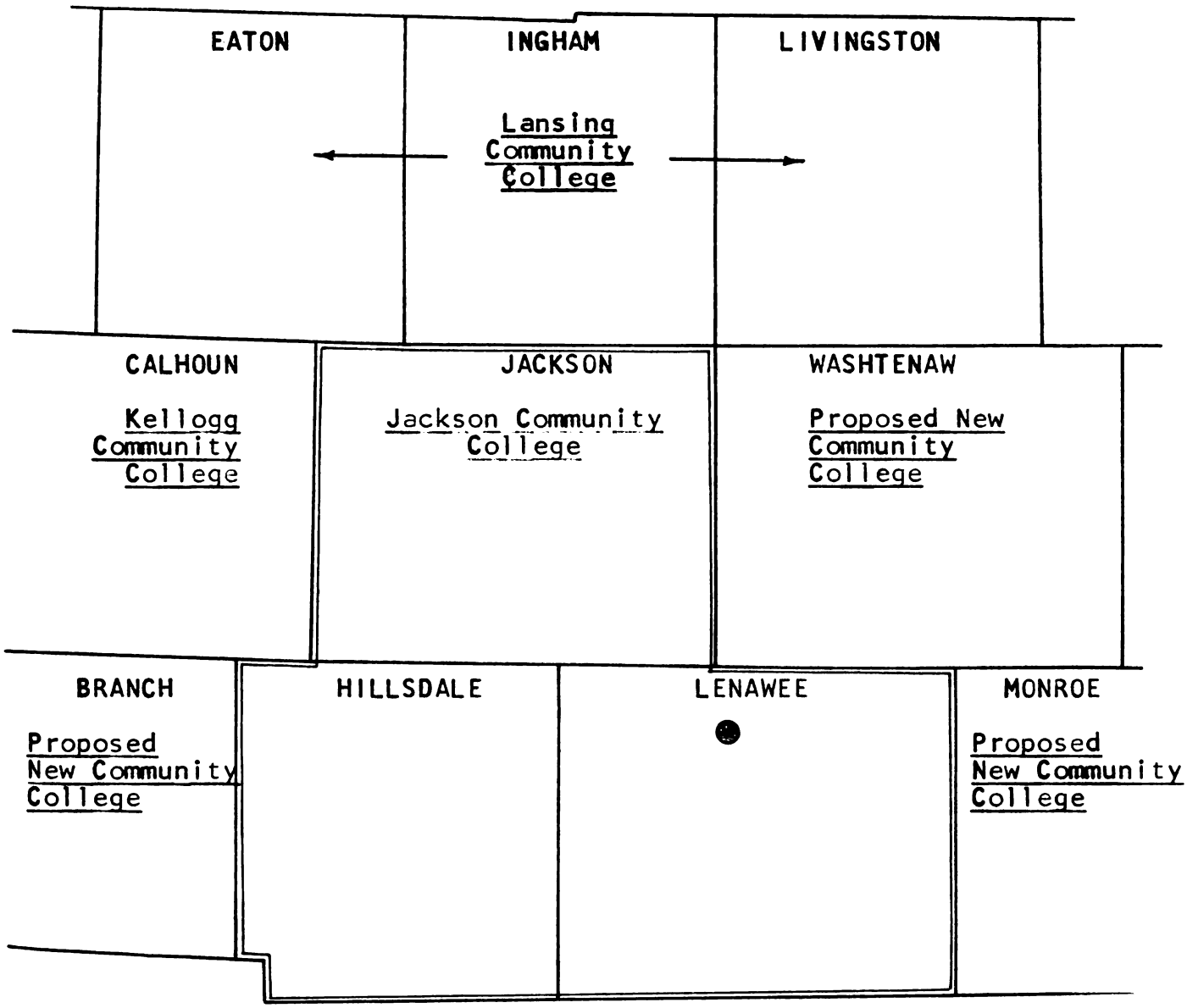
Their study results indicate that the number of college youths in the three county area will go from 4,037 in 1960 to an expected 5,770 by 1970.

It is also pointed out in their study that the combination of Jackson, Hillsdale, and Lenawee Counties as a service area for education is not unreasonable. Three surrounding counties, Branch, Monroe and Washtenaw, have proposed community colleges. Two other counties, Calhoun and Ingham, have existing community colleges. Ingham and Washtenaw have large state supported universities. Of these two, Michigan State University in Ingham County led all state supported colleges by drawing the most students from 30 Michigan counties. Central Michigan University in Mount Pleasant followed with 18. The other, the University of Michigan in Washtenaw County, was sixth in the standings with only 3 counties.[2] This shows that Michigan State is carrying the State's educational burden while the University of Michigan draws heavily from out-of-state.

There is then a definite need for additional state supported schools to relieve this burden of educating our Michigan students. To this end, a new State college is being created in Ottawa county on the Western side of the state and preliminary investigations have been carried out for another state college in the Bay County area to the East.

TABLE VII:

THREE COUNTY SERVICE AREA
AND SURROUNDINGS



JACKSON-HILLSDALE-LENAWEE
COMMUNITY COLLEGE DISTRICT

In Table X are given data summarizing college-age and college enrollment figures for the State of Michigan.[6] The actual figures for the years 1940, 1950, 1955 and 1957 indicate a definite increase in the percentage of college-age youth in Michigan who attend higher educational institutions. The most recent computation, for 1957, would indicate that college enrollments are almost 40 percent of the college age youth of Michigan. So, not only are college enrollments increasing numerically, but there has been a definite increase in the percentage of college age youth attending colleges and universities in the State of Michigan.

With these figures for the number of 18-21 year olds in the three county area (Table VIII) and using the 1957 percentage of college age in college (Table X) as a base for our "low" along with the projected percent of 45.0 for 1970* (Table X) as our "high," we can calculate the number of college-age youth in the three county area who will be enrolled in college in 1970. Table XI.

These figures show a possible increase over the 1960 enrollment for the three county area to be approximately 3500 to 3900 students. With the addition of those students from outside the three county area and from out of state who might attend if such a facility were provided, it seems reasonable to plan for an enrollment of 5,000 students in 1970.

*Based on a very conservative gain of .5 percent per year. See Table XI.

TABLE VIII:

PROJECTIONS OF 18-21 YEAR OLDS IN THE THREE COUNTY AREA FOR 1970

	1960	Constant Percent 1970	Survival Rates 1970
Michigan	7,823,194[2]	9,600,000[2]	9,600,000[2]
Number of 18-21 Year Olds in Michigan	376,699[4]	624,995[1]	595,222[1]
Percent of State Population	4.81	6.51	6.20
Three County Population	244,525[2]	291,513*	291,513*
Number of 18-21 Year Olds in Three County Area	11,762	18,977	18,074

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* Totals taken from an average of three figures calculated by natural increase-migration method; ratio trends and rate of growth trends (2) pp. 41-47.

TABLE IX:

PROJECTION OF COLLEGE-AGE YOUTH IN MICHIGAN FOR 1970

Age	Number in 1952	Number of 18-21 Year Olds in 1970
4	152,337	150,032
3	151,546	149,274
2	149,867	148,049
1	154,493	147,867
Total:	608,243	595,222

PROJECTION OF COLLEGE AGE YOUTH IN MICHIGAN FOR 1975

Age	Number in 1957	Number of 18-21 Year Olds in 1975
4	178,612	175,678
3	183,609	175,979
2	186,508	183,564
1	182,037	174,038
Total:	730,766	709,259

TABLE X:

COLLEGE ENROLLMENTS AND PROJECTIONS OF COLLEGE ENROLLEES FOR MICHIGAN (AS PERCENTAGES OF COLLEGE-AGE)

	1940	1950	1955	1957	1965(1) (a)	1965(1) (b)	1965(2) (c)	1965(2) (d)
College Age in Michigan	339,441	351,356	329,135	347,882	494,476	494,476	520,705	520,705
College Enrollments in Mich.Colleges & Universities	52,815	94,723	119,833	137,504	194,824	217,075	205,157	228,589
Per Cent of College-Age	15.6	27.0	36.4	39.4	39.4	43.9	39.4	43.9

	1970(1) (a)	1970(1) (b)	1970(2) (c)	1970(2) (d)	1975(1) (a)	1975(2) (b)
College Age in Michigan	624,995	624,995	595,222	595,222	709,300	709,300
College Enrollments in Mich. Colleges & Universities	246,232	281,247	234,517	267,849	279,464	319,185
Per Cent of College-Age	39.4	45.0	39.4	45.0	39.4	45.0

(1) The lower of two college-age estimates
(2) The higher of two college-age estimates

TABLE XI:

PROPORTION OF COLLEGE AGE ENROLLED

FOR THREE COUNTY AREA

	1960		1970(1)		1970(2)	
College Age in Michigan	376,699	376,699	624,995	624,995	595,222	595,222
College Age in Three Counties	11,762	11,762	18,977	18,977	18,074	18,074
Percent of College Age in College	39.4	40.9	39.4	45.0	39.4	45.0
College Age Enrolled for Three County Area	4,634	4,811	7,477	8,540	7,121	8,133

(1) The higher of two college estimates

This is a realistic estimate, when according to the Elmo Roper Survey of the Ford Foundation a possible 69 percent would go to college. This figure was reached by interviewing 5,000 households in the United States containing some 6,295 children under 18 years of age. Of this total, 29 percent stated they would definitely go to college while an additional 40 percent were probabilities.

(2) The lower of two college estimates

V. Curriculum

In any normal situation, the curriculum for such an institution and the actual space required for teaching this curriculum would be worked out jointly by the board of directors of the new college and the architect. In any case, before the design process can be inaugurated these two studies must be completed.

The goal which I have set for Hidden Lake College is that it be a 4-year, degree granting institution.

Because the needs of the area and the state should be reflected in the curriculum, the conclusion was reached that this should be a sound and meaningful liberal arts or general education program. This conclusion is based on the fact that our large state universities already have specialized courses in agriculture, veterinary medicine, horticulture, engineering, law, architecture, physics, medicine, etc. Duplicating these specialties in a new college also means duplicating costly equipment and facilities, plus acquiring a faculty who has the special training to teach these courses.

To develop the proposed curriculum, assistance was received from Dr. John X. Jamrich, Assistant Dean of Administrative Services at Michigan State University.

In order to set up the curriculum, a small liberal arts college, Calvin College in Grand Rapids, Michigan, was used as a base. Their curriculum with the exception of three small changes has been used for this purpose.

The changes in the Calvin curriculum came mainly in language courses where Spanish was substituted for Dutch, and Russian substituted for Greek. Because Calvin in a church related college, much emphasis was placed on courses in religion. The majority of these credits in Religion were distributed between Home Economics, which was not offered in the Calvin curriculum, and Geography, which seemed to be lacking in comparison to the other subjects.

TABLE XII:

CURRICULUM AND SUBJECTS

Art

- Art for Elementary Teachers
- Handicraft
- Penmanship
- Art History

Religion

- Old Testament
- General Church History
- American Church History
- New Testament

Biology

- Personal Hygiene
- Human Anatomy and Physiology
- Principles of Microbiology
- General Biology
- Invertebrate Zoology
- General Botany
- Genetics
- Comparative Anatomy of Vertebrates
- Teaching Biology
- Natural History
- Introduction to Embryology
- Nutrition
- Microscopic Technique
- Biological Problems

Chemistry

- Chemistry for Nurses
- General Chemistry
- Qualitative Analysis
- Quantitative Analysis
- Organic Chemistry
- Organo-Biochemistry
- Qualitative Organic Chemistry
- Physical Chemistry
- Chemistry Research
- Pharmacology for Nurses

Spanish

- Elementary Spanish
- Intermediate Spanish
- Advanced Spanish

Economics

- Principles of Economics
- Money and Banking
- Essentials of Accounting
- Business Law: Contracts
- Economic History (U.S.)

TABLE XII - 2

Economics, cont.
- Financial Principles
- Labor Problems and Trade Unionism
- Cost Accounting
- Principles of Marketing

Education
- History of American Education
- Childrens' Literature
- Principles of Education
- School Administration
- Principles of Teaching in Secondary Schools
- Principles of Teaching in Elementary Schools
- Principles of Teaching Kindergarten - Primary Grades
- Teaching Reading in Elementary Schools
- Directed Teaching (Elementary)
- Directed Teaching (Secondary)
- Teaching Arithmetic in Elementary Schools
- Teaching Geography in Elementary Schools
- Teaching History in Elementary Schools

Engineering
- Mechanical Drawing
- Engineering Materials and Processes
- Surveying
- Statics
- Mechanism and Sketching
- Strength and Elasticity of Materials
- Dynamics

English
- Freshman English
- Remedial English
- American Literature
- English Literature I
- English Literature II
- Literature of Romantic Period
- Contemporary English Poetry
- Literature of the Elizabethan Period
- The English Novel
- Methods of Teaching English
- Poetry of the Victorian Period
- Contemporary Fiction
- Advanced Composition
- Literature of the Eighteenth Century

French
- Elementary French
- Intermediate French
- Literature of the Nineteenth Century
- Contemporary French Literature

German
- Elementary German
- Intermediate German
- Romanticism
- Realism

TABLE XII - 3

Geography
- Geography of World Trade
- World Regional Geography
- Geography of North America
- Geography of the Caribbean Area
- Geography of South America
- Physical Geography - Climate and Biotic Resources
- Economic Geography

Russian
- Elementary Russian
- Second Year Russian
- Scientific Russian
- Introduction to Russian Literature
- Advanced Composition and Conversation
- Russian Phonetics

History
- Growth of Western Civilization
- English History to 1600
- Modern and Contemporary European History
- American History of Elementary Teachers
- American History
- Latin American History
- Medieval History
- Greek History
- English History 1600 - 1950
- Roman History

Home Economics
- Food Preparation
- Meal Management
- Home Management
- Family Finance
- Child Study
- Design in Clothing
- Principles of Clothing Construction
- Textiles
- Housing and Home Furnishings
- Clothing for the Family

Latin
- Elementary Latin
- Intermediate Latin
- Cicero's Philosophical Essays
- Selections from Lactantius
- Readings in Latin Prose and Poetry
- Readings in the Church Fathers

Mathematics
- Advanced Algebra
- Plane Trigonometry
- College Algebra and Plane and Analytical Geometry
- Business Mathematics
- Calculus
- Differential Equations
- Statistics
- Theory of Equations
- Teachers Course

TABLE XII - 4

Music
- Theory and Harmony
- Theory and Harmony Advanced
- Introduction to Music Literature
- Church Music
- Elements of Music (Education)
- History of Music
- Form
- Symphonic Literature
- Arranging
- Junior High School Music
- Teaching of Instrumental Music
- Elementary School Music
- Senior High School Music

Philosophy
- Logic
- Perspectives of Philosophy
- History of Philosophy: Ancient
- History of Philosophy: Medieval
- Philosophy of Science
- Aesthetics
- Kant
- History of Philosophy: Modern
- Ethics
- The Philosophy of Thomas Aquinas

Physical Education
- Community Recreation
- Coaching of Basketball
- Individual Sports for Women
- Teaching Physical Education in Elementary Schools
- History and Principles of Physical Education
- Coaching of Spring Sports

Physical Science
- Introduction to Physical Science I
- Introduction to Physical Science II

Physics
- General Physics I
- General Physics II

Political Science
- Government of Modern States
- American National Government

Psychology
- General Psychology
- Educational Psychology
- Mental Hygiene
- Social Psychology
- Psychology of Abnormal People
- Theories of Learning
- Child Psychology
- Advanced General Psychology

TABLE XII - 5

Sociology
- Principles of Sociology
- Social Problems
- The Fields of Social Work
- Criminology and Delinquency
- Social Anthropology
- Proseminar on Sociological Research
- Methods of Teaching Social Problems
- Rural and Urban Community
- The Family
- Introduction to Social Work
- History of Sociology

Speech
- Fundamentals of Speech I
- Fundamentals of Speech II
- Parliamentary Procedure
- Principles of Speech Correction
- Principles of Dramatic Productions
- Advanced Speech
- Interpretive Reading
- Advanced Interpretation
- Diction for the Foreign Student
- Ancient Orators and Theories of Speech
- Advanced Speech Composition
- Introduction to Speech Based on Great Books
- Thespians Productions

VI. Space Requirements

From interviews with Dr. Jamrich, a formula was derived to calculate the area in square feet for any subject in the curriculum. The formula states: Department area in square feet = Number of student credit hours x Number of square feet per student station ÷ Average number of hours each student station is used per week. The key to this formula is the determination of the number of "student credit hours" for each department, for a college of 5000 students.

By taking the average total "student credit hours" for two semesters and the average enrollment for those same two semesters, a direct proportion could be set up on the basis of an enrollment of 5000 students to determine the total number of "student credit hours" required for the Hidden Lake curriculum.

To find how many "student credit hours" were needed for each department based on the calculated total, percentages were used.

First, each of the two semesters' "student credit hours" from the Calvin curriculum were totaled and each department calculated as to percent of that total. From these two figures an average percent of total "student credit hours" was calculated. Those departments having labs were further divided so that an average percent was calculated for both laboratory and lecture. These percentage figures were then multiplied by the total of "student credit hours" needed for a college of 5000 and the number of "student credit hours" per department was derived.

The second item in the formula is the "square feet per student station." This number will vary due to the type of lecture or lab space to be provided with adjustments being made for space requirements of instructional material. Figures for each type of space requirement were derived from conversations with Dr. John X. Jamrich, Assistant Dean of Administrative Services; Dr. Harold L. Dahnke, Director of Space Utilization at

Michigan State University; Messrs. Danielson and Rider, State of Michigan, Department of Administration, Building Division; Mr. Robert Trojanck, Michigan State University, Physical Plant Planning; and Mr. Robert Siefert, Michigan State University, Assistant University Architect.

The divisor in the formula, or "average number of hours each student station is to be used per week" is based on a maximum of 44 hours per week. This means that each student station (seat, desk, bench, etc.) would be occupied every hour of a five-day week plus four hours on Saturday morning. The figure used here in the case of Hidden Lake is 25 hours. This means that each student station will be in use five of the eight hours for the five-day week with no Saturday classes (or any other combination totaling 25 hours.) This figure was chosen because it would provide a little more than half-use for each student station. In addition, it would not create any extravagant amounts of original area needed and it afforded, theoretically, the opportunity to expand with future enrollments about 43 percent, to maximum, without new construction. This figure and the reasoning behind it was substantiated by Dr. Jamrich.

Using these figures, the net square footage of instructional area needed for each department at Hidden Lake was calculated. (Table XIII)

To determine the gross area for each department, according to the figures supplied by Dr. Jamrich, an additional 100 percent must be added for library, faculty office, restrooms, utility, research and storage space. At this point our calculated area is still only 60 percent of the total space needed due to circulation, i.e. stairs, halls, lobbys, etc.

Space requirements for non-academic buildings such as athletic buildings, medical center, auditorium, library, union, chapel, administrative buildings, maintenance buildings, dormitories and married housing are not standardized and gross area is determined by actual needs in each of these facilities.

TABLE XIII:

CALCULATION OF SPACE REQUIREMENTS
CALCULATED FROM STATISTICS OF CALVIN COLLEGE 1955-1956

	SEMESTER I			SEMESTER II											
Curriculum	Credits	S. C. H.	Percent of Total	Credits	S.C.H.	Percent of Total	Total Both Percents	Average Percent of Total	X 76,341	S.C.H. for 5000 Students	Sq.'/Stu. Station	÷25=	Net Square Feet	Net Square Feet Doubled	Total Gross Area +40%
Art	9	207*	.8707	10	333	1.4771	2.3478	1.1739		896	65		2,329.6	4,659.2	7,765.3
Religion	63	565**	2.3766	61	509**	2.2578	4.6344	2.3172		1,769	15		1,061.4	2,122.8	3,538.0
Biology	66	2,609	10.9744	71	2,273	10.0828	21.0572	10.5286	Lab 3.1351	2,394	45		4,309.2	8,618.4	14,364.0
									Lec 7.3935	5,644	15		3,386.4	6,772.8	11,288.0
Chemistry	40	1,200	5.0476	36	756	3.3535	8.4011	4.2005	Lab 1.1654	890	45		1,602.0	3,204.0	5,340.0
									Lec 3.0351	2,317	15		1,390.2	2,780.4	4,634.0
Dutch (Spanish)	24	578	2.4312	24	499	2.2135	4.6447	2.3223		1,773	15		1,063.8	2,127.6	3,546.0
Economics	22	726	3.0538	27	900	3.9923	7.0461	3.5230		2,689	15		1,613.4	3,226.8	5,378.0
Education	51	1,210	5.0897	51	1,389	6.1614	11.2511	5.6255		4,295	15		2,577.0	5,154.0	8,590.0
Engineering	17	331	1.3923	15	255	1.1311	2.5234	1.2617	Lab. .6514	497	50		994.0	1,988.0	3,313.3
									Lec. .6103	466	15		279.6	559.2	932.0
English	101	2,948	12.4004	99	3,006	13.3343	25.7347	12.8673		9,823	15		5,893.8	11,787.6	19,646.0
French	18	531	2.2335	18	361	1.6013	3.8348	1.9174		1,464	15		878.4	1,756.8	2,928.0
German	36	1,011	4.2526	36	822	3.6463	7.8989	3.9494		3,015	15		1,809.0	3,618.0	6,030.0
Geography	6	766*	3.2221	--	509**	2.2579	5.4800	2.7400		2,092	17		1,427.4	2,854.8	4,757.9
Greek (Russian)	31	583	2.4523	31	491	2.1780	4.6303	2.3151		1,767	15		1,060.2	2,120.4	3,534.0
History	63	2,298	9.6663	66	2,256	10.0073	19.6736	9.8368		7,510	15		4,506.4	9,012.8	15,021.3
Home Economics		1,132*	4.7617		1,019**	4.5201	9.2818	4.6409		3,543	30		4,251.0	8,502.0	14,170.0
Latin	38	1,109	4.6648	38	953	4.2274	8.8922	4.4461		3,394	15		2,036.4	4,072.8	6,788.0
Mathematics	43	1,061	4.4629	35	904	4.0100	8.4729	4.2364		3,234	15		1,940.4	3,880.8	6,468.0
Music	30	445	1.8718	30	420	1.8630	3.7348	1.8674		1,426	20		1,140.8	2,281.6	3,802.6
Philosophy	33	759	3.1926	30	1,047	4.6443	7.8369	3.9185		2,991	15		1,794.9	3,589.7	5,982.8
Physical Education	9	77	.3238	7	93	.4125	.7363	.3681		281	15		168.6	337.2	562.0
Physical Science	12	339	1.4259	12	294	1.3041	2.7300	1.3650		1,042	17		708.6	1,417.2	2,362.0
Physics	10	320	1.3460	10	276	1.2243	2.5703	1.2851	Lab .2738	209	45		376.2	752.4	1,254.0
									Lec 1.0113	772	15		463.2	926.4	1,544.0
Political Science	6	210	.8833	6	186	.8250	1.7083	.8541		652	15		391.2	782.4	1,304.0
Psychology	35	1,316	5.5356	26	1,246	5.5271	11.0627	5.5313		4,223	15		2,533.8	5,067.6	8,446.0
Sociology	28	760	3.1968	25	946	4.1963	7.3931	3.6965		2,822	15		1,693.2	3,386.4	5,644.0
Speech	41	682	2.8687	46	800	3.5487	6.4174	3.2087		2,450	20		1,960.0	3,920.0	6,533.3
Total	832	23,773		810	22,543					76,340					

*Adjusted from: Religion 2262, Geography 201, Home Economics --.
**Adjusted from: Religion 2037, Geography -- , Home Economics --.

TABLE XIII

Curric[illegible]	[illegible]	+25=	[illegible]	[illegible]	[illegible]
Art	65		[illegible]	[illegible]	[illegible]
Religion	15		[illegible]	[illegible]	[illegible]
Biology	45		[illegible]	[illegible]	[illegible]
	15		[illegible]	[illegible]	[illegible]
Chemistry	45		[illegible]	[illegible]	[illegible]
	15		[illegible]	[illegible]	[illegible]
Dutch (S[illegible]	15		[illegible]	[illegible]	[illegible]
Economics	15		[illegible]	[illegible]	[illegible]
Education	15		[illegible]	[illegible]	[illegible]
Engineeri[illegible]	50		[illegible]	[illegible]	[illegible]
	15		[illegible]	[illegible]	[illegible]
English	15		[illegible]	[illegible]	[illegible]
French	15		[illegible]	[illegible]	[illegible]
German	15		[illegible]	[illegible]	[illegible]
Geography	17		[illegible]	[illegible]	[illegible]
Greek (Ru[illegible]	15		[illegible]	[illegible]	[illegible]
History	15		[illegible]	[illegible]	[illegible]
Home Econ[illegible]	30		[illegible]	[illegible]	[illegible]
Latin	15		[illegible]	[illegible]	[illegible]
Mathemati[illegible]	15		[illegible]	[illegible]	[illegible]
Music	20		[illegible]	[illegible]	[illegible]
Philosoph[illegible]	15		[illegible]	[illegible]	[illegible]
Physical [illegible]	15		[illegible]	[illegible]	[illegible]
Physical [illegible]	17		[illegible]	[illegible]	[illegible]
Physics	45		[illegible]	[illegible]	[illegible]
	15		[illegible]	[illegible]	[illegible]
Political	15		[illegible]	[illegible]	[illegible]
Psycholog[illegible]	15		[illegible]	[illegible]	[illegible]
Sociology	15		[illegible]	[illegible]	[illegible]
Speech	20		[illegible]	[illegible]	[illegible]
Total					

*Adjust[illegible]

**Adjust[illegible]

TABLE XIV:

NON-ACADEMIC SPACE REQUIREMENTS
(Gross Area in Square Feet
for Enrollment of 5,000*)

	SQ.FT.
Athletic Building	60,000
Medical Center (300 sq. ft. per bed X 50)	15,000
Auditorium (10 sq. ft. per seat X 3,000)	30,000
Library (20 sq. ft. per student X 5,000)	10,000
Union	30,000
Chapel (10 sq. ft. per seat X 200)	2,000
Administrative Complex	14,000
Maintenance and Power Plant	38,900
Faculty Housing (656 sq.ft. per apt. X 200)	131,200
Dormitories (300 sq. ft. per student X 3,000)	900,000
Parking (300 sq. ft. per car X 2800)**	840,000

** 40% X 3,000 = 1200
Faculty Housing 200
70% X 2,000 = 1400
2800

* Audio-Visual--Limited space for central dispersion of equipment is located in the basement of the library.

NOTES

[1]Michigan State University Alumni Magazine, Department of Information Services, October 1962, p.10

[2]Ibid

[3]Russell, John Dale, Staff Study #2 (Following Reports of the Survey of Higher Education in Michigan, J. F. Thaden, 1958), p.12

[4]Jamrich, John X., A New College, A Report to the Legislative and Citizens Committees on the Eight County Study of Higher Education Needs, Michigan State University, December 1959, p.42.

[5]Thaden, J. F., Population of Michigan Counties Projections to 1970, Tech. Bulletin B-24, Institute of Community Development, Continuing Education Service, Kellogg Center, M.S.U., March 1962, pp.32-33,40-47.

[6]Jamrich, John X., A New College, A Report to the Legislative and Citizens Committees on the Eight County Study of Higher Education Needs, Michigan State University, December 1959, p. 51.

DESIGN

DESIGN

The Master Plan for Hidden Lake College is based on an ultimate enrollment of 5,000 students. Actual design and construction is based on the first phase, an enrollment of 2,500 students.

This affects only the number of living units required and the supporting service roads and parking facilities.

CONTENTS

DESIGN CONCEPT

I. Basic Zoning Types

The zoning types for consideration in application to the Hidden Lake College site are as follows:

Radial Zone: This zoning type is circular in form with the core usually consisting of the administrative complex and/or the library. The non-academic and academic zones radiate outward from this hub with those facilities which can be classified as neither academic nor non-academic in transition zones between these wedges. Those facilities which might be considered as transitional in character are: Auditorium, administration, maintenance, medical facilities, parking and athletic facilities such as a field house, intermural building, etc. Future expansion in this situation is orientated outward from the core. (See Table XV, Figure 1.)

Linear Zone: This pattern is generally considered best on flat or nearly flat sites. It is a "through-site" pattern with the bands varying in width according to the designated use. Future expansion is outward from the center along the band in both directions. (See Table XV, Figure 2.)

Nucleated Zone: This pattern is one which works well on very large sites. Here the total university is broken down into smaller units, each one becoming an individual entity. This division can be accomplished by separation of the individual colleges such as Business, Social Science, Natural Science, etc., or, by using a broader division such as professional schools, residential schools, research centers, conference centers, etc. Growth in each case would be outward from each grouping into the surrounding natural landscape. (See Table XV, Figure 3.)

TABLE XV:

BASIC ZONING TYPES

Figure 1 - Radial Zone

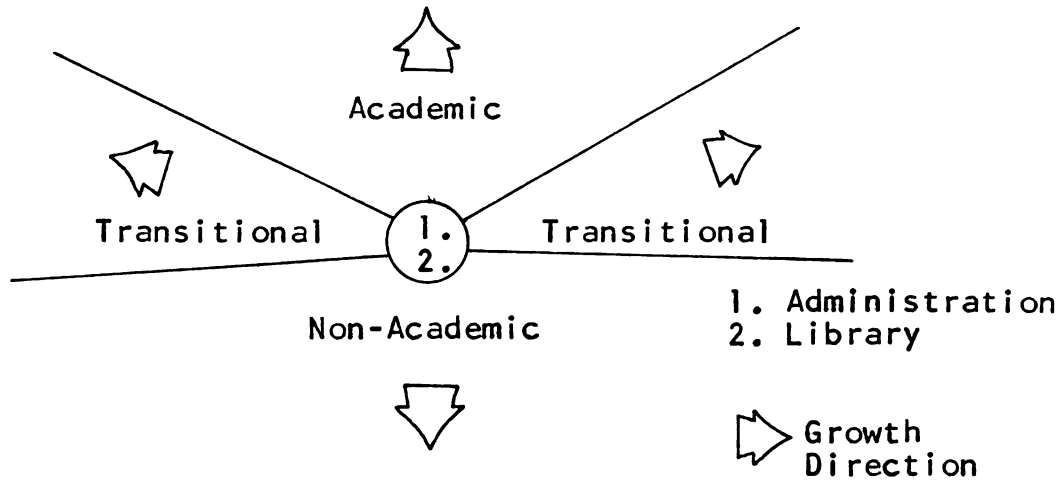


Figure 2 - Linear Zone

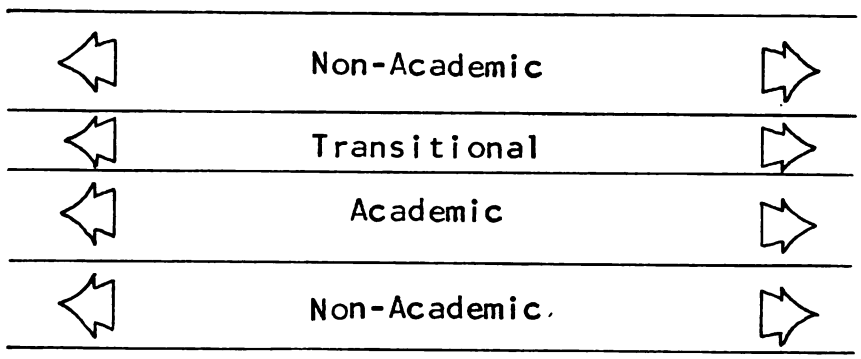
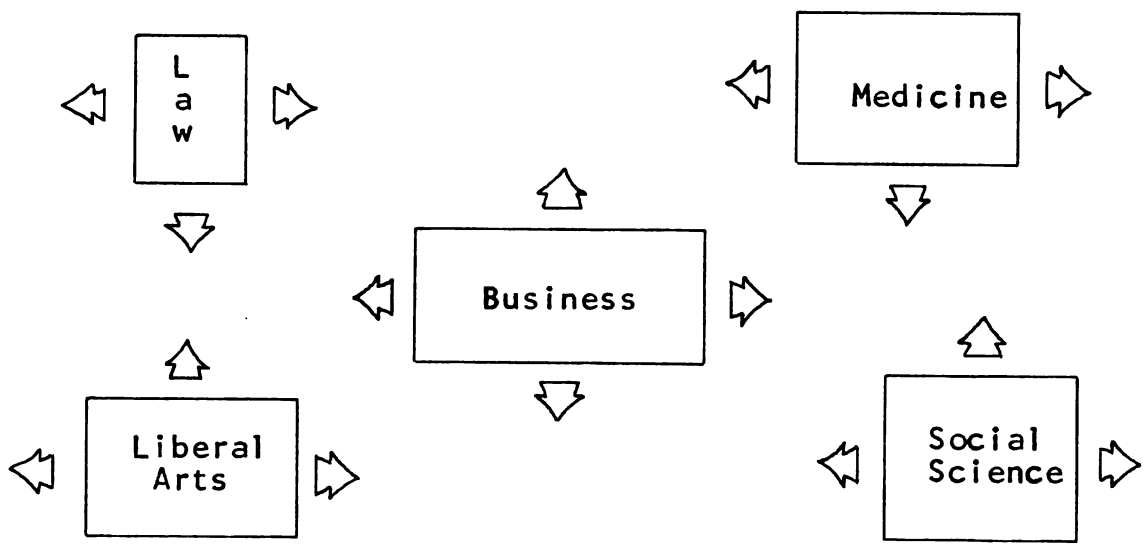


Figure 3 - Nucleated Zone



II. Zoning of the Site

Because of the limitations of the Hidden Lake site due to shape and topography, where steep slopes dictate circulation routes, a purely geometric zoning of the campus is nearly impossible as well as highly impractical in terms of design. Therefore, a configuration of one or more of the patterns would seem to be more applicable.

In the situation of Hidden Lake College I have used a linear pattern set on a radial framework configured to the existing topography. With this pattern, major buildable areas can be designated a land use with natural features of the terrain acting as boundaries. This land use pattern is set up with the transition zone falling between the academic and non-academic zones.

One limitation to this pattern is in future expansion. Several ways to compensate for this limitation would be: to design for a fixed enrollment, the construction of additional stories on existing buildings, or the utilization of marginal or natural unzoned land.

In this problem I have fixed an ultimate enrollment of 5,000 students and have enough buildable land within each zone to double this figure if the need should ever arise.

On the Hidden Lake site I have zoned the majority of that land between M-50 and the county road as non-academic. As the greater percentage of all unbuildable land is located here, I feel I can utilize this area for recreational use. This non-academic area would also serve as the location of my dormitory complex. By locating here, easy access is established from my major circulation routes to these dormitories.

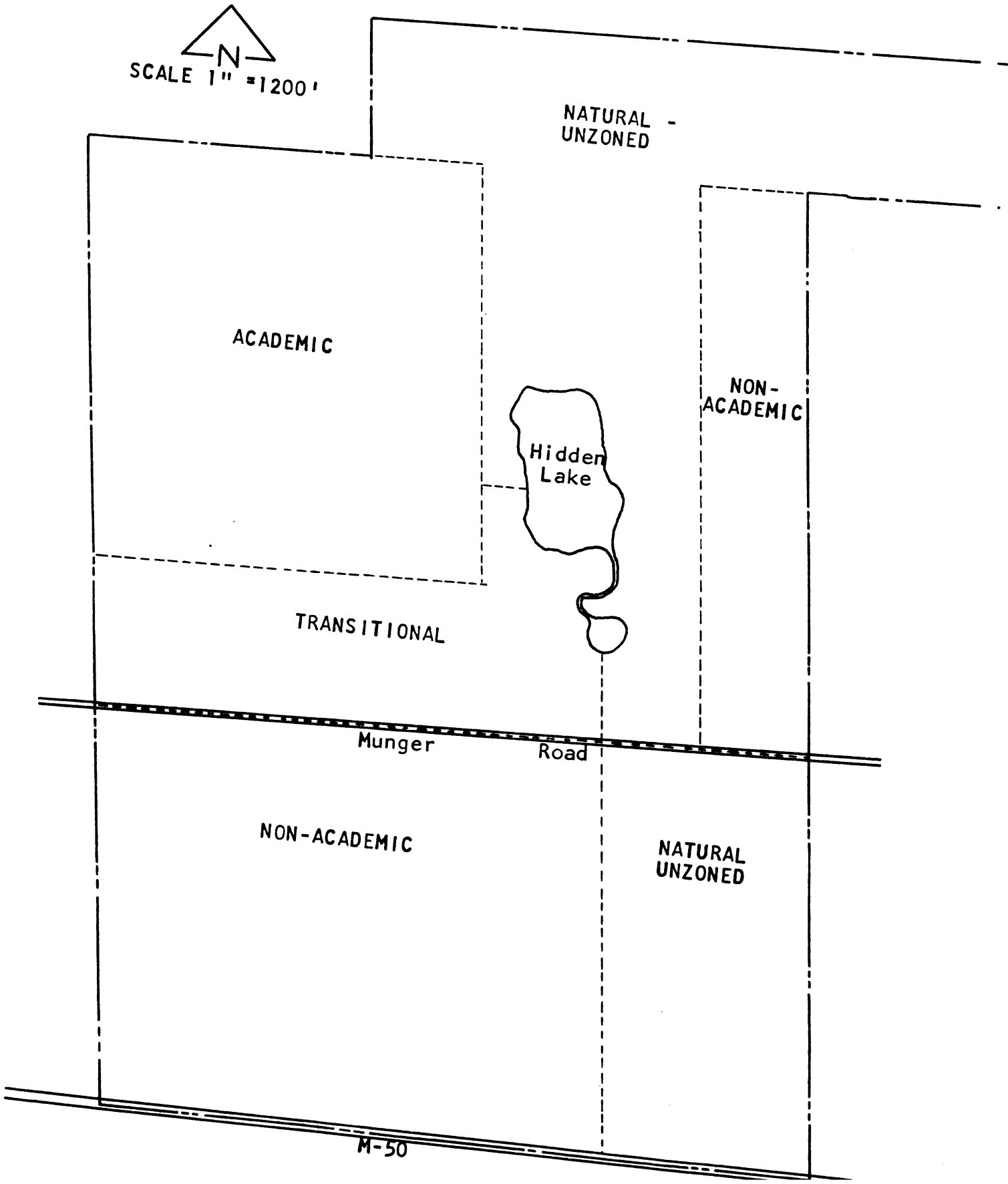
The zone of transition is located north of and adjacent to the county road, again giving easy access to the major circulation routes for the commuter parking,athletic and cultural events.

Faculty housing is located along the east boundary of the property, north of the county road, utilizing topography and vegetation as a natural buffer from the intensive use areas.

The academic zone is located in the northwest section of that property north of the county road as the land lends itself better to buildings of smaller floor areas. I feel this zone which is natural and quiet, being away from major circulation routes, is the best for furnishing the required learning atmosphere. (See Table XVI.)

TABLE XVI:

ZONING OF THE SITE



III. Justification

I have used the county road as the major division line between the academic and transitional and non-academic zones. This was done because a number of factors dictated this division.

First, the general character of the site differs greatly from north of the county road to south of the county road. Where the topography is steeply sloped to the north, it is gently sloped to flat to the south. Where there is a concentration of vegetation of the oak-hickory association to the north, the vegetation to the south is of the open-field and bog association.

Second, views from M-50 terminate at the county road because of the aforementioned physical characteristics, thus this line becomes a visual barrier.

Third, the county road is a thru, secondary, east-west circulation route and therefore is a physical division.

Fourth, there is more natural buildable land south of the county road which lends itself better to buildings of large floor areas, namely dormitories, than there is to the north. The actual need for housing is 900,000 square feet as opposed to 202,000 square feet for the academic facilities, or nearly five times as much area.

IV. Building Sites

A. Dormitories

The dormitory complex will be located on the gently rolling slopes to the west of non-academic area. By using the side-slopes for my building sites I can integrate the buildings into the land and orientate them outwardly toward common open spaces. Service to these dormitories will be from the higher side of all buildings, connected by a common drive to the county road.

B. Faculty Housing

As previously mentioned, this housing is along the east boundary of the property, north of the county road. Here, small units will utilize both steep slope and crests to form the faculty village. Access to these apartments is from a "private" road of low traffic volume.

C. Parking

The major area of parking is located off the county road at the western edge of the property. In this manner peak traffic in the morning and evening and at special events can be parked immediately upon entering the campus and thus reducing congestion on campus roads. Whereas dormitory storage parking is located in one place adjacent to the dormitories, the commuter parking is separated so as to utilize the night use of these structures for the aforementioned special events. The one area of commuter parking which is apart from this main parking group is located on the entrance road just north of the county road and services the student union and field house.

D. Academic

The academic complex of four buildings is located along both sides of a deep oval ravine giving unity to the complex, again utilizing the side slopes of this ravine to better integrate the buildings into this rugged site. Buildings are orientated inwardly toward the ravine with periferal service.

1. General College

The building site is located to the south of the ravine and the nearest of all buildings in the complex to the dormitory area and the commuter parking. This location was selected because of the heavy use-load this building will take, as it houses the classrooms for the basic college.

2. Arts, Speech and Music

This building site is also located along the south rim of the ravine, as many of the functions in which these classes participate will take place in the auditorium.

3. Natural Science

This site is located on the north rim of the ravine with easy access to natural wooded areas for outdoor study.

4. Specialties Building

This building, housing Education, Engineering and Home Economics, is located on the north rim of the ravine in close proximity to both the General College and the library.

E. Library

The site of the library is at the most eastern end of and terminates the academic ravine. This site is at the top of a constant slope up from the lake, giving exceptional views. Service is from the main entrance road.

F. Administration

As the administration and the academic are closely related, the site for administration is incorporated within the academic ravine complex and is easily reached from either direction on the main entrance road.

G. Auditorium

The auditorium site is located between the academic and dormitory area

because of its dual use nature in serving both classroom and cultural events. It is accessible and serviced from the county road with one commuter parking structure servicing that need.

H. Medical Center

This site is located between the academic and dormitory area again because of its dual use nature. Service and access is from the county road.

I. Athletic Field House

This site is located on the main entrance road just north of the county road. The site is within easy walking distance from the academic area for physical education classes and is located adjacent to the unbuildable flat land which will be utilized for recreational purposes. Service is from the county road.

J. Student Union

The site for the student union is on the edge of Hidden Lake giving exceptional views to the students in their leisure hours. It is located near the library and within easy walking distance to the dormitories, yet because of its placement related to the other sites, no interference due to lively activity is anticipated. Access and service is from the main entrance road.

K. Chapel

The site for the chapel is a small triangular promontory on the east side of the lake within the quiet, natural zoned area. This point is a focal point for several vistas from the adjacent hills. Access to the chapel would be by a foot-path-road combination which would be open to vehicular traffic only on special occasions such as weddings.

L. Maintenance and Power Plant

Although a site to the east of the property seemed to be in order here due to

prevailing winds, the ease, efficiency and cost of transporting the various utilities to the building complexes of the campus dictated its position in a central location on the western edge of the property. Because of the technological advances made in modern power plant systems, I anticipate no problems due to noise, smell, smoke or steam. As there are no rail lines within miles of the college site, trucking or piping in of fuel will be required. Access is off the county road.

V. Materials of Construction

The basic building materials to be used in the construction of the physical plant will be steel, concrete, brick and glass.

The steel will be used primarily for structural support and reinforcing while the concrete, brick and glass will be used as components of the facade. I hope through the use of these materials to achieve a naturalistic yet modern structure type.

Concrete was chosen as one of the materials because of the abundance of sand and gravel in this area. The use of brick was dictated, as opposed to natural stone, because one of the largest manufacturers of buff clay brick in the midwest is located in central Ohio.

The use of wood as a structural member or as siding has been eliminated due to its high maintenance cost and limited structural capabilities in multi-storied structures.

By carrying the same materials and design details into all of the structures, a sense of unity is achieved; a coherence which is greatly needed on this site due to the topographical situation.

VI. Character of the Buildings

All buildings will be constructed on appropriate modular units with emphasis on the horizontal line to visually reduce the height of the structures--blending them into the site rather than having them contrasting in character.

This emphasis of the horizontal can be done by the use of deep roof overhangs, heavy sills and copings and horizontal bands of materials.

The roof structures of all buildings, except for faculty housing, will be hip with jerkinhead with a uniform two and one-half foot overhang. The faculty housing will have flat roofs with the same overhang due to their "stacked" arrangement.

The first floor and exposed lower floors of all large buildings will be constructed predominantly of glass to give an airy, transparent sensation. This will help reduce the bulk of the buildings visually.

VII. Buildings

A. Dormitories

Because of the great amount of floor space needed for dormitories and the fact that the area for building is somewhat limited if the site is to be kept as natural as possible, I am recommending that these structures be five stories in height. This will keep the structures within tree height so as not to detract from the site as well as concentrate the student population in close proximity to the academic core. By going to five stories I can also cut the initial building costs per student as well as the cost of utilities.

The form of the buildings will vary from a spread "V" to a spread "U" shape to follow the existing contours and create definite spaces.

Vertical circulation within the building will be by elevator and stairs.

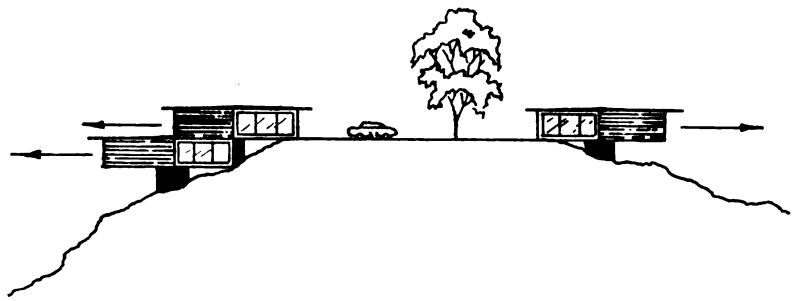
Lower floors will be exposed on the low side only. Space opposite this can be used for kitchens, storage, laundry, maintenance, heating and circulation.

Only one-half (3) of these structures will be constructed in the first stage of development.

B. Faculty Housing

Faculty housing is composed of single and double units of a four-family modular unit. Along the crests of the hills the units will be singular and on the steep slopes they will become two-story "step down." These structures will be supported by a single pillar in the center of the module. Exposure of the rear apartments will be outward from the sides while the front apartments will have a front exposure.

Only one-half (25) of these structures will be constructed in the first stage of development.



C. Parking

On the site of Hidden Lake College, parking is a major problem. The total parking need for the facilities here is 19.28 acres which does not include walks, buffer strips or tree wells. The ideal topography for such an amount of parking would be flat to gently rolling land where grading would be kept to a minimum. Because this type of topography is scarce, and that which does exist must be utilized for recreation and building, I have incorporated three parking structures into the college master plan.

These structures also help bring the related campus areas into closer proximity through their concentration of parking and does away with a terraced type parking which cuts up the land, hinders pedestrian circulation, decentralizes parking from the active use areas and adds cost due to excess roads, retaining walls and utilities.

The two structures north of the county road designated as commuter parking, which also serve a night use to special events, will be constructed in the first phase. The structure south of the county road for dormitory storage parking will be constructed when the enrollment exceeds the 2,500 mark.

The structure will be five stories high, three stories above ground and two below.

D. General College

This building will take a spread "V" shape with a wing at the apex as the main entrance. The lower floor will be exposed to the back side, overlooking the grassy bowl of the ravine. Total height of the structure is three floors. Interior vertical circulation is by steps only.

E. Arts, Speech, Music

This is a small rectangular building of one floor. Main exposure here is also toward the ravine.

F. Natural Science

This structure will take the form of a spread "V" with the apex being the main entrance. Again, the lower floor will be exposed toward the grassy ravine. Total height of the structure is three floors with interior vertical circulation by steps.

G. Specialties Building

A two-story building with an exposed lower floor only to the rear. The form of this building is a spread "U". Interior vertical circulation is by steps.

H. Library

A two-story hexagonal structure with vertical circulation, offices and stacks in the core. This building will be designed to allow the maximum use of natural light in the reading area around the perifery of the building. The basement of the building will house the equipment for audio-visual services.

I. Administration

A two-story structure with a spread "V" form with the main entrance into a wing extending from the apex. The lower floor will be exposed to the rear only. Interior vertical circulation will be by steps.

J. Auditorium

A two-story structure plus basement. The main floor of the auditorium proper will be the first floor and will have a balcony on three sides. The basement will have a smaller drama theatre, storage, maintenance and heating facilities.

K. Medical Center

This fifty-bed center will be rectangular in shape and one story high. A basement will be included for storage, maintenance and laboratories.

L. Athletic Field House

Rectangular in shape, this structure will be two stories high. Where the full height is not needed for gymnasiums and pool, a second floor will be designed to service balconys and provide office and classroom space.

M. Student Union

This building will take a spread "V" form with a wing at the apex. The lower floor of this two-story structure is exposed only on one side, the side facing the lake. The upper floor will feature a cantilevered balcony for viewing and eating. Interior vertical circulation is by steps.

N. Chapel

A small hexagonal structure, one story in height. This building reflects the form and construction of the library on a smaller scale.

O. Maintenance, Power Plant and Telephone Center

The buildings in this complex are generally rectangular in form with the maintenance building and telephone center being one story in height and the power plant two stories.

In addition to these facilities, the campus police and fire equipment will also be located here.

VIII. Circulation

A. Vehicular

The main entrance to the campus is on M-50 near the center of the property. As one means of diminishing the effect the county road has as a division line, I am carrying the vehicular traffic over the county road and leading it directly in toward the academic area. After coming into contact with the core facilities, that is, the library and administration building, vehicular traffic is then led back to the county road.

By using broad horizontal curves near the entrance and progressing downward to sharper curves at the core, a feeling of "reaching a destination" can be achieved on this through road.

The county road running east and west through the property is the alternate entrance to the site. This is the most direct route into the campus and will function as the primary entrance points for the commuter students. I am proposing that this road be paved, straightened, leveled and widened along its entire length.

In addition to these roads, there are six service drives on the campus.

The first service drive is off the main entrance road giving vehicular access to the natural science and specialties building. From the terminal circle there is a connector road leading to an existing loop with turnout to be used as a scenic drive.

The second drive is an existing loop with turnout just south of the library, giving excellent views of the lake and adjacent slopes.

The third service drive is a drive-walk combination and serves the chapel from the main entrance road. This is to be used only on special occasions when the need exists.

The fourth drive is a loop road off the county road servicing the auditorium and medical center.

The fifth drive is off the county road and services the faculty housing facilities. This road has a series of loops for turnarounds and terminates in a cul-de-sac.

The sixth service drive is that which gives access to the dormitory complex. It is connected to the county road and terminates in two cul-de-sacs.

In addition to these drives open for normal traffic, there are four access points onto the walk system. These would be used only for maintenance of the property and snow removal.

B. Pedestrian

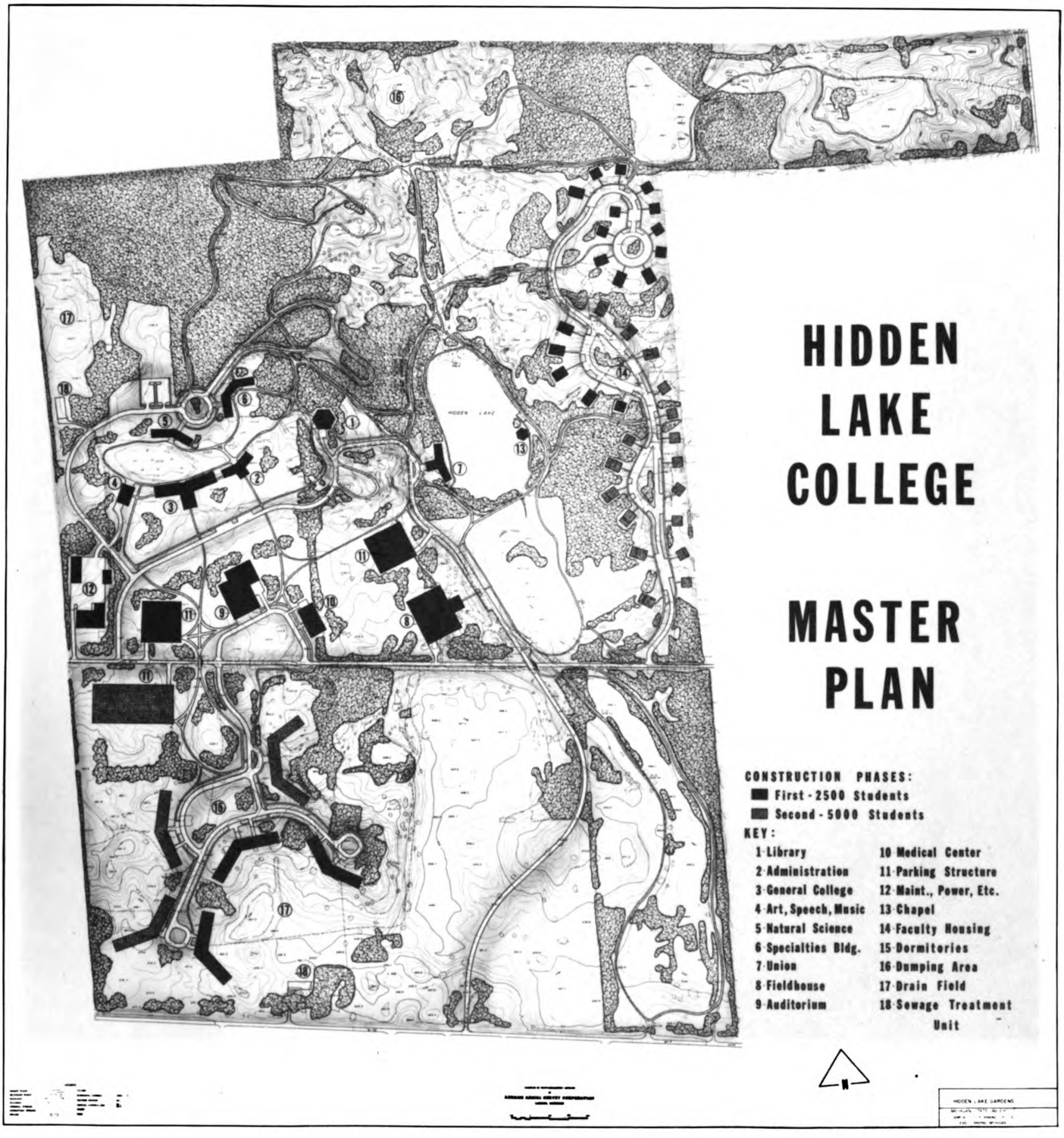
The main circulation route begins in the dormitory complex, overpasses the county road and divides with one leg directed toward the student union and library and the other toward the academic grouping.

Within the academic grouping there is a walk which connects the buildings, following the contours of the ravine, making a complete circuit.

The majority of the existing eight-foot roads will be converted to walks and be used mainly as scenic paths. The rest will be eliminated entirely or used as service drives to proposed buildings.

In general, both the road system and walk system are informal in design with the number of friction points between the two reduced by overpasses and underpasses.

TABLE XVII


HIDDEN
LAKE
COLLEGE
MASTER
PLAN
CONSTRUCTION PHASES:
First - 2500 Students
Second - 5000 Students
KEY:
1 Library
2 Administration
3 General College
4 Art, Speech, Music
5 Natural Science
6 Specialties Bldg.
7 Union
8 Fieldhouse
9 Auditorium
10 Medical Center
11 Parking Structure
12 Maint., Power, Etc.
13 Chapel
14 Faculty Housing
15 Dormitories
16 Dumping Area
17 Drain Field
18 Sewage Treatment Unit
N
HIDDEN LAKE GARDENS

ENGINEERING

CONTENTS

TABLE XVIII:

CONVERSION FROM LATITUDE AND LONGITUDE TO THE MICHIGAN GRID SYSTEM

State - Michigan Zone - East Cent.Mer.$83^{\circ}40'00"$

Station - Intersection M-50 and T-Rd. South Between Sections 19 and 20 (Pt.A). Approximately 650 feet East of the Property

Latitude	$42^{\circ}01'18.6"$ *
Longitude λ	$84^{\circ}06'12.2"$ *
$\Delta\lambda$ = Cent.Mer. - λ	$-0^{\circ}26'12.2"$
$\Delta\lambda"$	-1,572.2
$(\frac{\Delta\lambda}{100})^2$	247.181
H	75.478 096**
V	1.225 003**
a b	-.844 +.1.190**
$X' = H \cdot \Delta\lambda \pm ab$	-118,665.659
$V (\frac{\Delta\lambda}{100})^2 \pm C$	302.744
Tabular Y	190,141.28
X	E 381,334.34
Y	N 190,444.02

$Y = TAB\ Y + V (\frac{\Delta\lambda}{100})^2 \pm C$

$X = X' + 500,000$

$C = -.053$**

* Michigan Primary Traverse Manchester Quadrangle

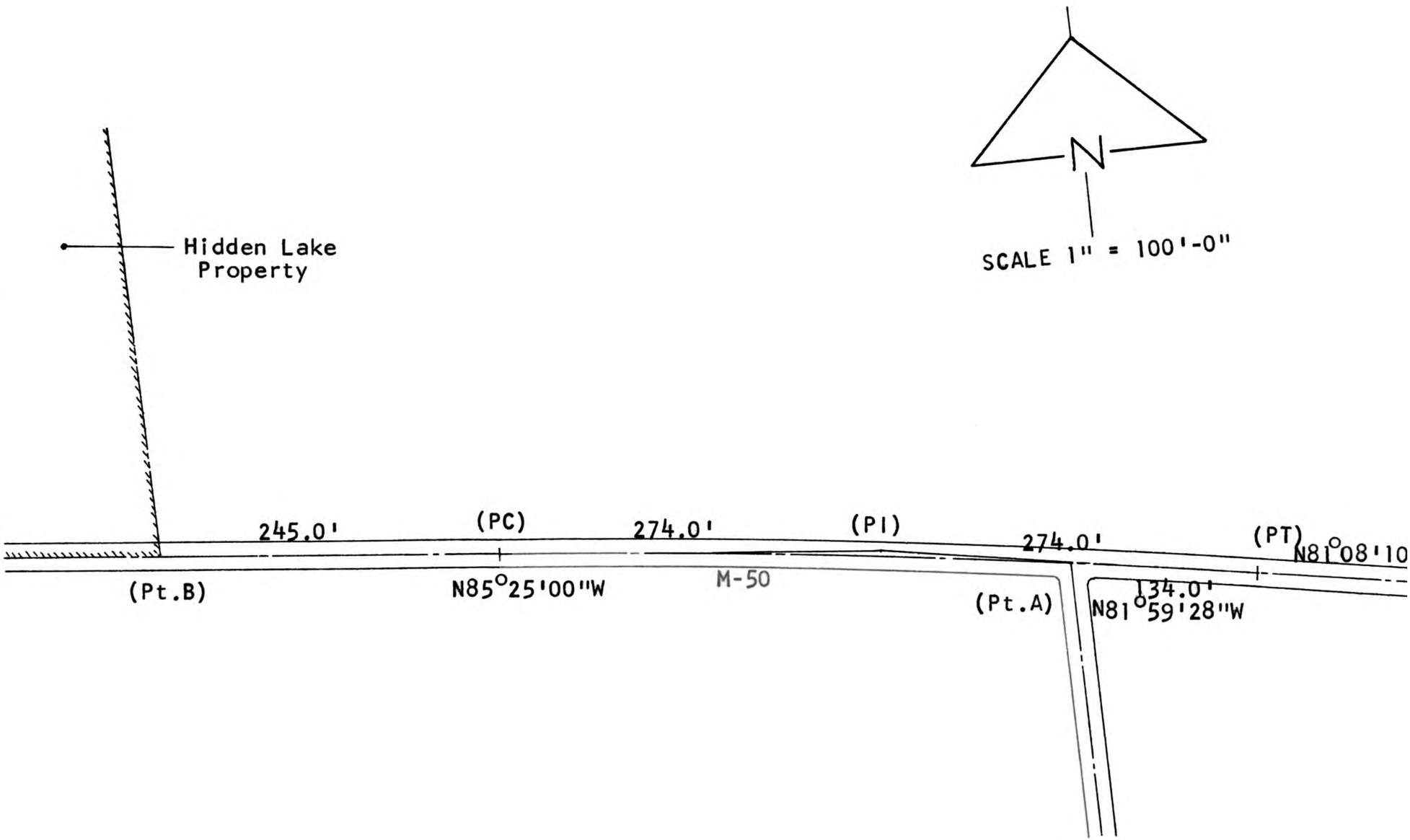
** Figures from Plane Coordinate Projection Tables, Special Pub. 313, U.S.Dept. of Commerce, Coast and Geodetic Survey

TABLE XIX:

PROPERTY COORDINATE CALCULATIONS					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
A									190444.02	381334.3
A-PT	134.00	S81 59 28E	.99024646	.139326729		132.693	18.669		190311.33	381353.0
PT-PI	274.00	N81 08 10W	.98805717	.154087686	270.727			42.220	190582.06	381310.7
PI-B	519.00	N85 25 00W	.99680216	.079908969	517.340			41.472	191099.40	381269.3

TABLE XX:

PROPERTY COORDINATE CALCULATIONS
SUPPORTING DIAGRAM



II. Water Supply

Water will be supplied from wells driven into the glacial drift and pumped into one or more reservoirs equalling one million gallons capacity. This will allow for a standard of one hundred gallons per day per student enrolled to be used with an ample supply left in the reservoir for fire protection, heating "make-up" water and air conditioning of the laboratories.

Irrigation water will be pumped directly from the spring-fed lake into the distribution system.

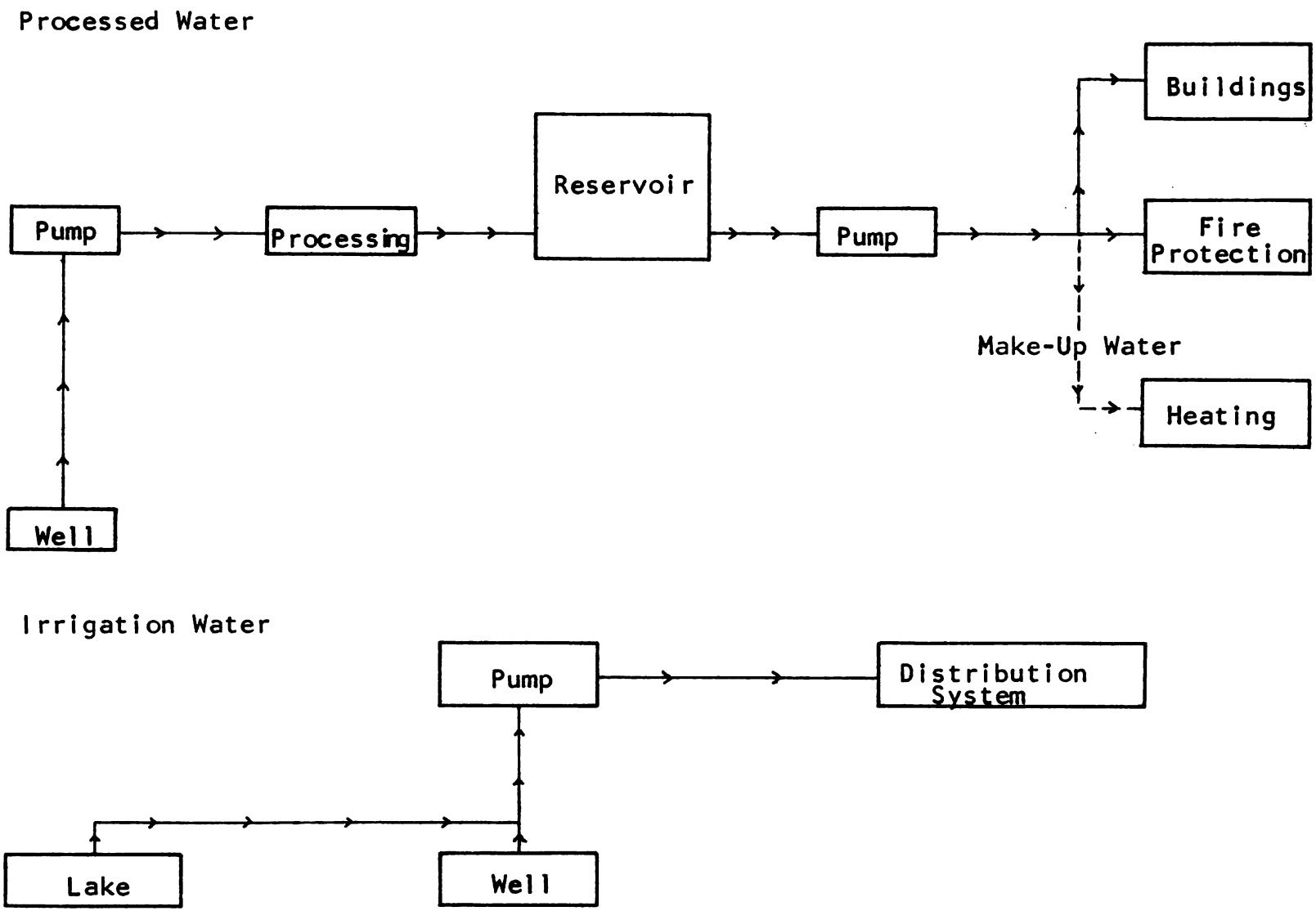
All water lines will run a minimum of four and one-half feet below the surface of the ground and follow the contours of the slope. All pipe junctions will be equipped with access vaults.

Fire plugs will be located on all roads with the maximum distance apart being five hundred feet.

Distilled water for laboratory use will be run through a triple steam still and be transported through tin-lined pipes within the buildings requiring this water. (See Table XXI.)

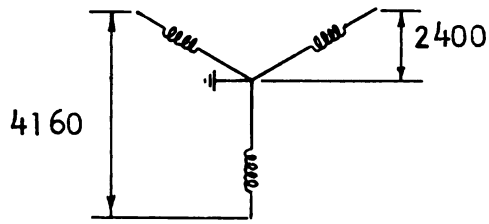
TABLE XXI:

WATER SUPPLY DIAGRAM



III. Electrical Supply

Electricity will be produced at Hidden Lake College in two steam driven generators. Because my total consumption will be substantially below the 10,000 kw. limit, I will use a three phase, 4 wire, "Y" connection distribution system having a voltage of 4160 from phase to phase and 2400 from phase to ground. Wiring will be in series.



Electrical distribution will take place through 500 M.C.M. (Circular Mill Cable) in a fibre duct encased in concrete.

One or more transformers in each building will step the voltage down to the specific use; 120/208 volts for incandescent lights and plugs and 480 volts for fan motors and heavier equipment. In case of large loads from banks of florescent lights, the voltage will be stepped up at the power source from 4160 to 13,200 volts and then stepped down at the building to 277/480 volts. By so doing, a greater efficiency can be obtained. This wiring will be parallel in nature.

A "tie" between the college system bus line and an outside power source will be maintained in case of emergencies. (See Table XXII.)

A. Telephone

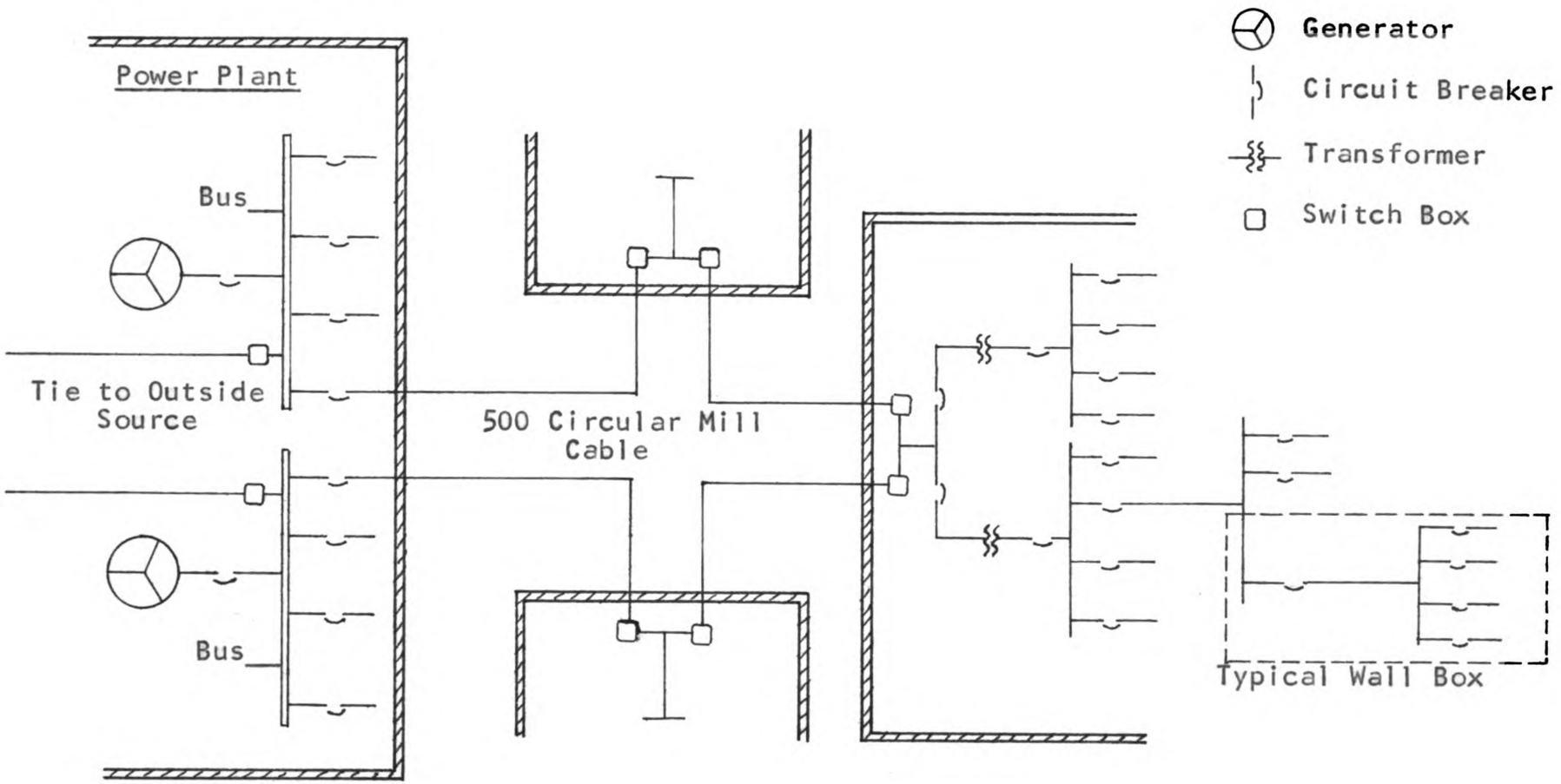
The telephone system control switchboard will be located in the telephone building in the maintenance complex.

Telephone cables will be in fibre ducts encased in concrete and run just above the electrical lines wherever applicable for ease of maintenance and to reduce the initial cost.

Depth of electrical and telephone lines will be two-ft. minimum with vaults located at all junctions for ease of maintenance.

TABLE XXII:

ELECTRICAL CIRCUIT DIAGRAM

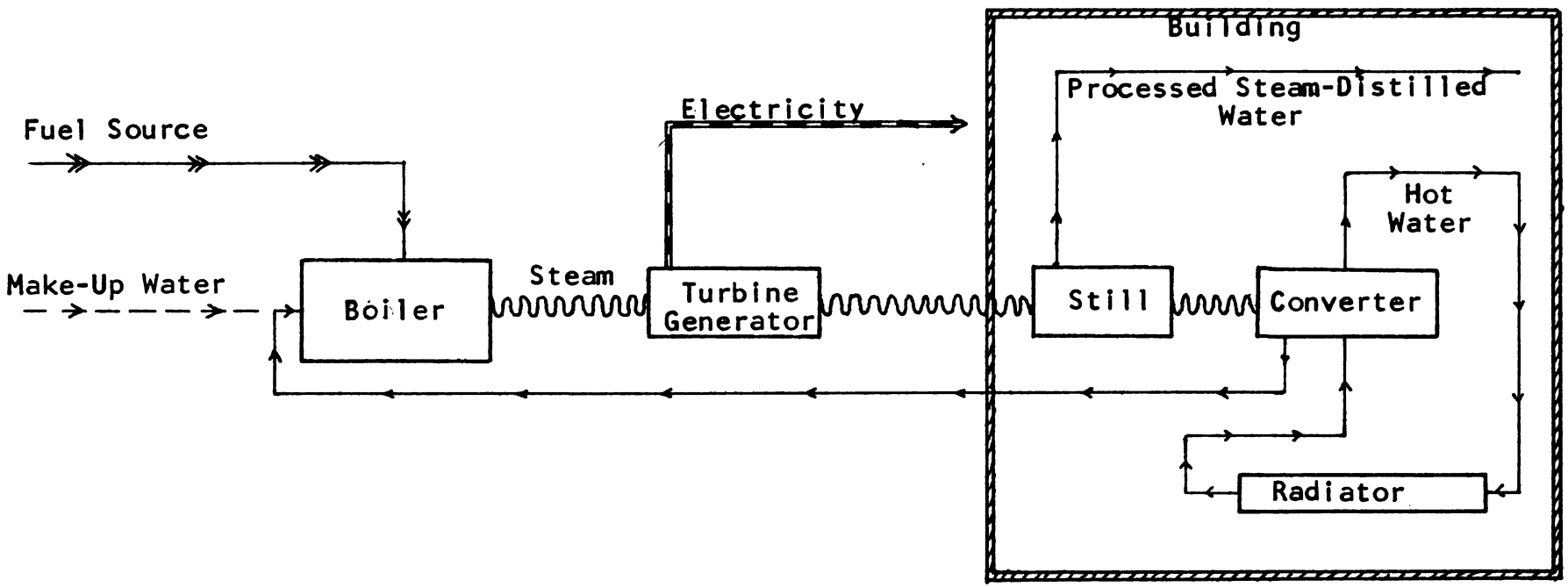


IV. Steam Supply

Steam will be generated in gas fired boilers and after being used to drive the turbines for generating electricity, will be distributed to the buildings through insulated pipes. The minimum depth of these pipes is 30 inches. All main steam lines will be housed in ducts which will allow for easy maintenance. Each building will be equipped with a converter to heat the circulating hot water system. (See Table XXIII.)

TABLE XXIII:

STEAM, HEAT AND ELECTRICAL SUPPLY DIAGRAM



V. Fuel Supply

For fuel at Hidden Lake College I have chosen natural gas. At present, Consumers Power Company has an existing gas main seven miles west of Tipton, approximately five miles west of Hidden Lake property; and this could be made available upon request at no cost to the college. This gas is under pressure and would require no pumping.

This gas would be used for the heating of buildings, as fuel for the boilers for the main campus and individual heating units of the faculty housing, for appliances, laboratory use, and incineration.

My reasons for selecting gas as the basic fuel is based on the comparative costs of available fuels. If the college were buying coal in great quantities and were there rail lines on the property, the cost of this coal would be approximately .33 cents per million B.T.U.s, the least expensive of all fuels. As there are no rail lines or spurs within eight miles, Tecumseh being the closest, the cost of trucking the coal in could easily double this amount.

Natural gas based on a consumption of one million cubic feet per month would run .60 cents per million B.T.U.s. Oil, at the present cost of $7.12 per gallon runs .86 cents per million B.T.U.s. Electricity, at the current rate of 1.5 cents per kilowatt comes to $4.40 per million B.T.U.s.

VI. Storm Water Disposal

All storm water collected from hand surface areas and lawn drains will be emptied into the small pond at the south end of the lake. This will act as a settling pond for any material held in suspension and the clear water will then flow into the lake by way of drainage ditch.

VII. Sewage Disposal

Sewage from the dormitory complex will be collected in a sewer main after flowing through individual grease traps at the building. It will then flow to the sewage disposal unit at the south end of the property, adjacent to the dormitories--the unit composed of bar screen and sedimentation tank (Imhoff). Effluent will be dosed through the use of a battery of inverted siphons and flow through a distribution box and into the drain field.

Sewage from the faculty housing will be treated in individual septic tanks and drain fields adjacent to the housing unit.

Sewage from all other sources will flow by gravity or be collected and pumped to a sewage disposal unit similar to that of the dormitories along the northwest edge of the property. Only that sewage from the union will be required to flow through a grease trap. Effluent will be distributed to the drain field adjacent to this disposal unit.

VIII. Trash and Garbage Disposal

All burnable trash and garbage will be disposed of by gas fired incineration units in all buildings except the chapel and parking structures. All non-burnable trash and ash will be collected and trucked to a dumping area at the northern edge of the site.

STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
X									191099.40	381269.3
X-A	1410.00	N85 25 00W	.99680216	.07990896	112.67			1405.49	191212.07	379863.8
A-B	565.00	N 4 35 00E	.07990896	.99680216	563.19		45.15		191775.26	379908.9
B-C	1020.53	N48 59 03E	.75452825	.65626756	669.74		770.02		192445.00	380679.0
C-D	799.59	N30 20 57W	.50526833	.86296228	690.00			404.00	193135.00	380275.0
D-E	750.00	N30 20 57W	.50526833	.86296228	647.22			378.95	193782.22	379896.0
E-F	265.92	N53 36 19W	.80494845	.59334474	157.78			214.05	193940.00	379682.0
F-G	427.05	N 0 16 06W	.00468328	.99998903	427.00			2.00	194367.00	379680.0
G-H	387.86	S83 02 17W	.99262687	.12121007		47.00		385.00	194320.00	379295.0
H-I	320.17	S 1 58 08W	.03435683	.99940962		320.00		11.00	194000.00	379284.0
I-J	312.44	N84 29 24W	.99537945	.09601948	30.00			311.00	194030.00	378973.0
J-K	914.19	S66 16 06W	.91544030	.40245379		367.92		836.89	193662.08	378136.1
K-L	435.00	S 2 27 16W	.04282503	.99908258		434.60		18.63	193227.48	378117.4
L-M	525.00	S87 32 44E	.99908258	.04282503		22.48	524.52		193205.00	378642.0
M-N	450.00	S87 32 44E	.99908258	.04282503		19.27	449.59		193185.73	379091.5
M-D	1635.00	S87 32 44E	.99908258	.04282503		70.00	1633.00		193135.00	380275.0

TABLE XXIV-2

MAIN ENTRANCE ROAD (PC & PT)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
B									191775.26	3799089
B-PC	306.08	S 4 35 00W	.07990896	.99680216		305.10		24.46	191470.16	3798845
B-PT	306.08	N48 59 03E	.75452825	.65626756	200.87		230.95		191976.13	3801399
C									192445.00	3806790
C-PC	414.62	S48 59 03W	.75452825	.65626756		272.10		312.84	192172.90	3803661
C-PT	414.62	N30 20 57W	.50526833	.86296228	357.80			209.49	192802.80	3804695
E									193782.22	3798960
E-PC	82.31	S30 20 57E	.50526833	.86296228		71.03	41.59		193711.19	3799376
E-PT	82.31	N53 36 19W	.80494845	.59334474	48.84			66.26	193831.06	3798297
F									193940.00	3796820
F-PC	100.45	S53 36 19E	.80494845	.59334474		59.60	80.86		1938840	3797628
F-PT	100.45	N 0 16 06W	.00468328	.99998903	100.45			0.47	194040.45	3796815
G									194367.00	3796800
G-PC	112.42	S 0 16 06E	.00468328	.99998903		112.42	0.53		194254.58	3796805
G-PT	112.42	S83 02 17W	.99262687	.12121007		13.63		111.59	194353.37	3795684
H									194320.00	3792950
H-PC	64.13	N83 02 17E	.99262687	.12121007	7.77		63.66		194327.77	3793586
H-PT	64.13	S 1 58 08W	.03435683	.99940962		64.09		2.20	194255.91	3792928
I									194000.00	3792840
I-PC	186.16	N 1 58 08E	.03435683	.99940962	186.05		6.40		194186.05	3792904
I-PT	186.16	N84 29 24W	.99537945	.09601948	17.87			185.30	194017.87	3790987
J									194030.00	3789730
J-PC	65.22	S84 29 24E	.99537945	.09601948		6.26	64.92		194023.74	3790379
J-PT	65.22	S66 16 06W	.91544030	.40245379		26.25		59.71	194003.75	3789132
K									193662.08	3781361
K-PC	200.00	N66 16 06E	.91544030	.40245379	80.49		183.09		193742.57	3783192
K-PT	200.00	S 2 27 16W	.04282503	.99908258		199.82		8.57	193462.26	3781275

TABLE XXIV-3

ACADEMIC SERVICE ROAD (P.I.)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
15									193681.51	378227.3
15-16	787.47	N38 14 15W	.61892260	.78545197	618.49			487.36	194300.00	377740.0
16-17	507.99	N61 09 52E	.87600755	.48229738	245.00		445.00		194545.00	378185.0
17-18	390.13	N88 31 53E	.99967151	.02562929	10.00		390.00		194555.00	378575.0
18-19	453.02	N37 22 33E	.60704071	.79467073	360.00		275.00		194915.00	378850.0
19-20	254.80	S74 03 17E	.96152451	.27471914		70.00	245.00		194845.00	379095.0
20-21	95.13	N86 59 14E	.99861783	.05255866	5.00		95.00		194850.00	379190.0
19									194915.00	378850.0
19-22	237.17	N55 18 17E	.82219095	.56921176	135.00		195.00		195050.00	379045.0

STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
16									194300.00	377740.0
16-PC	353.76	S38 14 15E	.61892260	.78545197		277.86	218.95		194022.14	377958.9
16-PT	353.76	N61 09 52E	.87600755	.48229738	170.62		309.90		194470.62	378049.9
17									194545.00	378185.0
17-PC	60.87	S61 09 52W	.87600755	.48229738		29.36		53.32	194515.64	378131.6
17-PT	60.87	N88 31 53E	.99967151	.02562929	1.56		60.85		194546.56	378245.8
19									194915.00	378850.0
19-PC	119.31	S37 22 33W	.60704071	.79467073		94.81		72.43	194820.19	378777.5
19-PT	119.31	S74 03 17E	.96152451	.27471914		32.78	114.72		194882.22	378964.7
20									194845.00	379095.0
20-PC	25.05	N74 03 17W	.96152451	.27471914	6.88			24.09	194851.88	379070.9
20-PT	25.05	N86 59 14E	.99861783	.05255866	1.32		25.02		194846.32	379120.0
19									194915.00	378850.0
19-PC	119.31	S37 22 33W	.60704071	.79467073		94.81		72.43	194820.19	378777.5
19-PT	119.31	N55 18 17E	.82219095	.56921176	67.91		98.10		194982.91	378948.1

TABLE XXIV-5

DORMITORY ROAD (P.I.)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
M									193205.00	378642.0
M-4	160.00	S 2 27 16W	.04282503	.99908258		159.85		6.85	193045.15	378635.1
4-5	244.61	S40 48 21E	.65349767	.75692852		185.15	159.85		192860.00	378795.0
5-6	255.23	S 2 32 41W	.04439918	.99901387		225.00		10.00	192635.00	378785.0
6-7	236.48	S13 26 55E	.23257314	.97257890		230.00	55.00		192405.00	378840.0
7-8	175.00	N76 33 05E	.97257890	.23257314	40.70		170.20		192445.70	379010.2
8-9	414.03	S44 25 21E	.69994385	.71419786		295.70	289.80		192150.00	379300.0
7									192405.00	378840.0
7-10	245.00	S76 33 05W	.97257890	.23257314		56.98		238.28	192348.02	378601.7
10-11	656.54	s25 24 37W	.42909716	.90325833		593.02		281.72	191755.00	378320.0
10									192348.02	378601.7
10-12	165.00	S25 24 37W	.42909716	.90325833		149.04		70.80	192198.98	378530.9
12-13	465.00	N64 35 23W	.90325833	.42909716	199.53			420.02	192398.51	378110.9
13-14	715.06	N71 43 44E	.94958367	.31351370	224.18		679.01		192622.69	378789.9

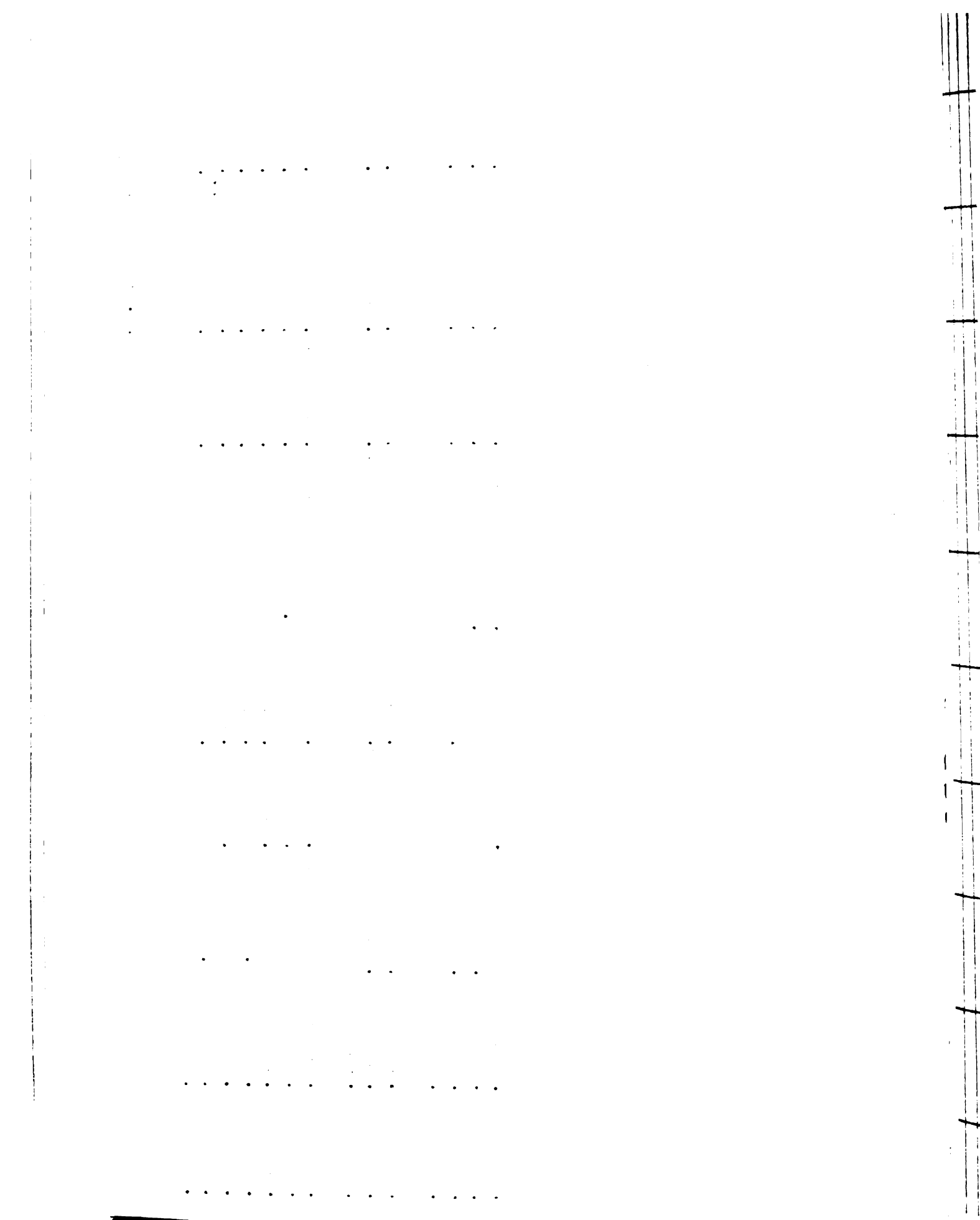


TABLE XXIV-6

DORMITORY ROAD (PC & PT)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
4									193045.15	378635.1
4-PC	99.13	N02 27 16E	.04282503	.99908258	99.04		4.25		193144.19	378639.4
4-PT	99.13	S40 48 21E	.65349767	.75692852		75.03	64.78		192970.12	378699.9
5									192860.00	378795.0
5-PC	79.49	N40 48 21W	.65349767	.75692852	60.17			51.95	192920.17	378743.0
5-PT	79.49	S02 32 41W	.04439918	.99901387		76.41		2.53	192783.59	378792.4
6									192635.00	378785.0
6-PC	50.00	N 2 32 41E	.04439918	.99901387	49.95		2.22		192684.95	378787.2
6-PT	50.00	S13 26 55E	.23257314	.97257890		48.63	11.63		192586.37	378796.6
8									192445.70	379010.2
8-PC	141.52	S76 33 05W	.97257314	.97257890		32.91		137.64	192412.79	378872.5
8-PT	141.52	S44 25 21E	.69994385	.71419786		101.07	99.06		192344.63	379109.2
10									192348.02	378601.7
10-PC	119.62	N76 33 05E	.97257890	.23257314	27.82		116.34		192375.84	378718.0
10-PT	119.62	S25 24 37W	.42909716	.90325833		108.05		51.33	192239.97	378550.3
13									192398.51	378110.9
13-PC	461.59	S64 35 23E	.90325833	.42909716		198.07	416.94		192200.44	378527.8
13-PT	461.59	N71 43 44E	.94958367	.31351370	144.71		438.32		192543.22	378549.2

TABLE XXIV-7

FACULTY ROAD (P.I.)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
D									193135.00	380275.0
D-O	615.00	S87 32 44E	.99908258	.04282503		26.34	614.44		193108.66	380889.4
O-P	94.34	N 2 27 16E	.04282503	.99908258	73.65		4.04		193182.31	380893.3
P-Q	194.42	N48 56 52E	.75411130	.65674663	127.69		146.62		193310.00	381040.0
Q-R	477.63	N10 15 04W	.17796262	.98403724	470.00			85.00	193780.00	380955.0
R-S	898.24	N 1 05 04E	.01892599	.99982088	898.00		17.00		194678.00	380972.0
S-T	835.24	N50 52 47W	.77582315	.63095042	527.00			648.00	195205.00	380324.0
T-U	387.24	N53 55 45E	.80828971	.58878497	228.00		313.00		195433.00	380637.0
U-V	612.37	N27 44 12E	.46540856	.88509596	542.00		285.00		195975.00	380922.0
V-W	635.52	S 3 58 12W	.06923414	.99760043		634.00		44.00	195341.00	380878.0

TABLE XXIV-8

FACULTY ROAD (PC & PT)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
P									193182.31	380893.3
P-PC	32.22	S 2 27 16W	.04282503	.99908258		32.19		1.38	193150.12	380892.0
P-PT	32.22	N48 56 52E	.75411130	.65674663	21.16		24.30		193203.47	380917.6
Q									193310.00	381040.0
Q-PC	142.02	S48 56 52W	.75411130	.65674663		93.27		107.10	193216.73	380932.9
Q-PT	142.02	N10 15 04W	.17796262	.98403724	139.75			25.27	193449.75	381014.7
R									193780.00	380955.0
R-PC	24.81	S10 15 04E	.17796262	.98403724		24.41	4.42		193755.59	380959.4
R-PT	24.81	N 1 05 04E	.01892599	.99982088	24.80		0.47		193804.80	380955.4
S									194678.00	380972.0
S-PC	389.88	S 1 05 04W	.01892599	.99982088		389.81		7.37	194288.19	380964.6
S-PT	389.88	N50 52 47W	.77582315	.63095042	245.99			302.48	194923.99	380669.5
T									195205.00	380324.0
T-PC	324.68	S50 52 47E	.77582315	.63095042		204.86	251.89		195000.14	380575.8
T-PT	324.68	N53 55 45E	.80828971	.58878497	191.17		262.44		195396.17	380586.4
U									195433.00	380637.0
U-PC	58.16	S53 55 45W	.80828971	.58878497		34.24		47.01	195398.76	380589.9
U-PT	58.16	N27 44 12E	.46540856	.88509596	51.48		27.07		195484.48	380664.0
V									195975.00	380922.0
V-PC	475.22	S27 44 12W	.46540856	.88509596		420.62		221.17	195554.38	380700.8
V-PT	475.22	S 3 58 12W	.06923414	.99760043		474.08		32.90	195500.92	380889.1

TABLE XXIV-9

AUDITORIUM LOOP ROAD (P.I.)					LATITUDES		DEPARTURES		COORDINATES	
STATION	DISTANCE	BEARING	COSINE	SINE	NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
M									193205.00	378642.0
M-1	140.00	N2 27 16E	.04282503	.99908258	139.87		6.00		193344.87	378648.0
1-2	370.99	N65 16 56E	.90837847	.41814894	155.13		337.00		193500.00	378985.0
2-3	262.66	S24 43 04E	.41814894	.90837847		238.58	109.83		193261.42	379094.8
3-N	75.74	S 2 27 16W	.04282503	.99908258		75.69		3.24	193185.73	379091.5

TABLE XXIV-10

AUDITORIUM ROAD (PC & PT)

STATION	DISTANCE	BEARING	COSINE	SINE	LATITUDES		DEPARTURES		COORDINATES	
					NORTH +	SOUTH −	EAST +	WEST −	NORTH	EAST
1									193344.87	378648.00
1-PC	45.81	S 2 27 16W	.04282503	.99908258		45.77		1.96		
1-PT	45.81	N65 16 56E	.90837847	.41814894	19.16		41.61		193299.10	378646.04
2									193364.03	378689.61
2-PC	75.00	S65 16 56W	.90837847	.41814894		31.36		68.13	193500.00	378985.00
2-PT	75.00	S24 43 04E	.41814891	.90837847		68.13	31.36		193468.64	378916.87
3									193431.87	379016.36
3-PC	24.17	N24 43 04W	.41814894	.90837847	21.96				193261.42	379094.83
3-PT	24.17	S 2 27 16W	.04282503	.99908258		24.15		10.11	193283.38	379084.72
								1.04	193237.27	379093.79

MICHIGAN STATE UNIVERSITY
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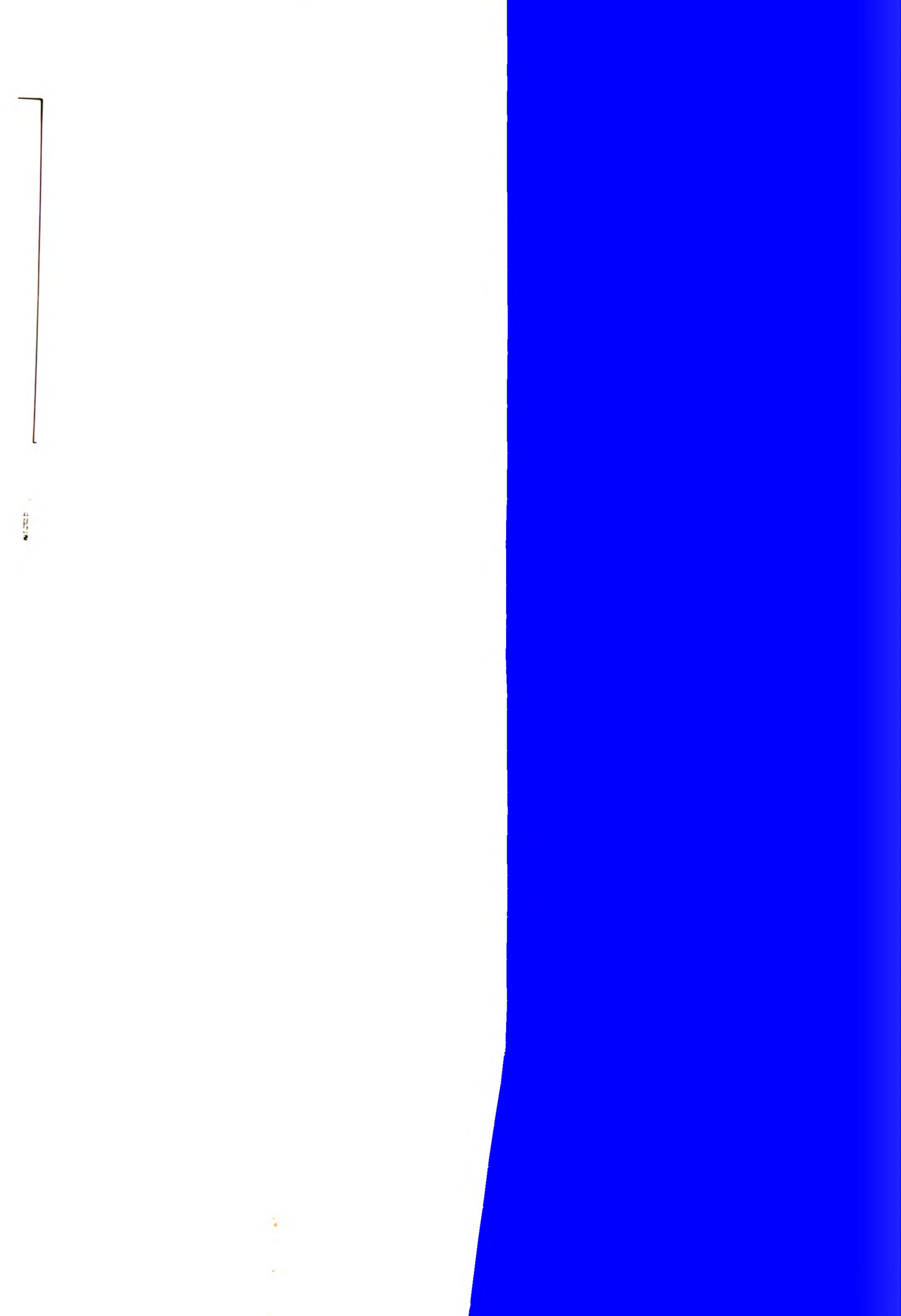
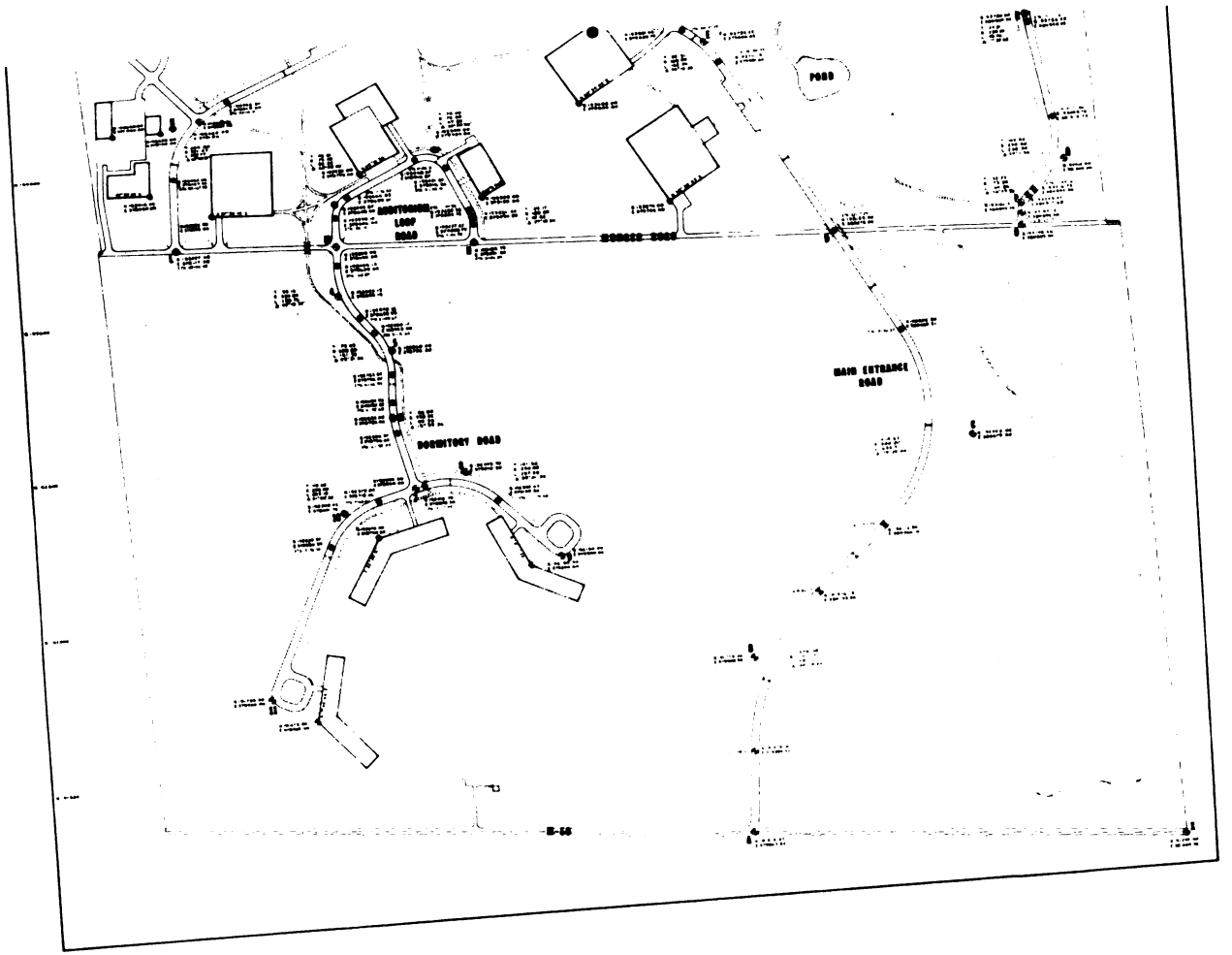
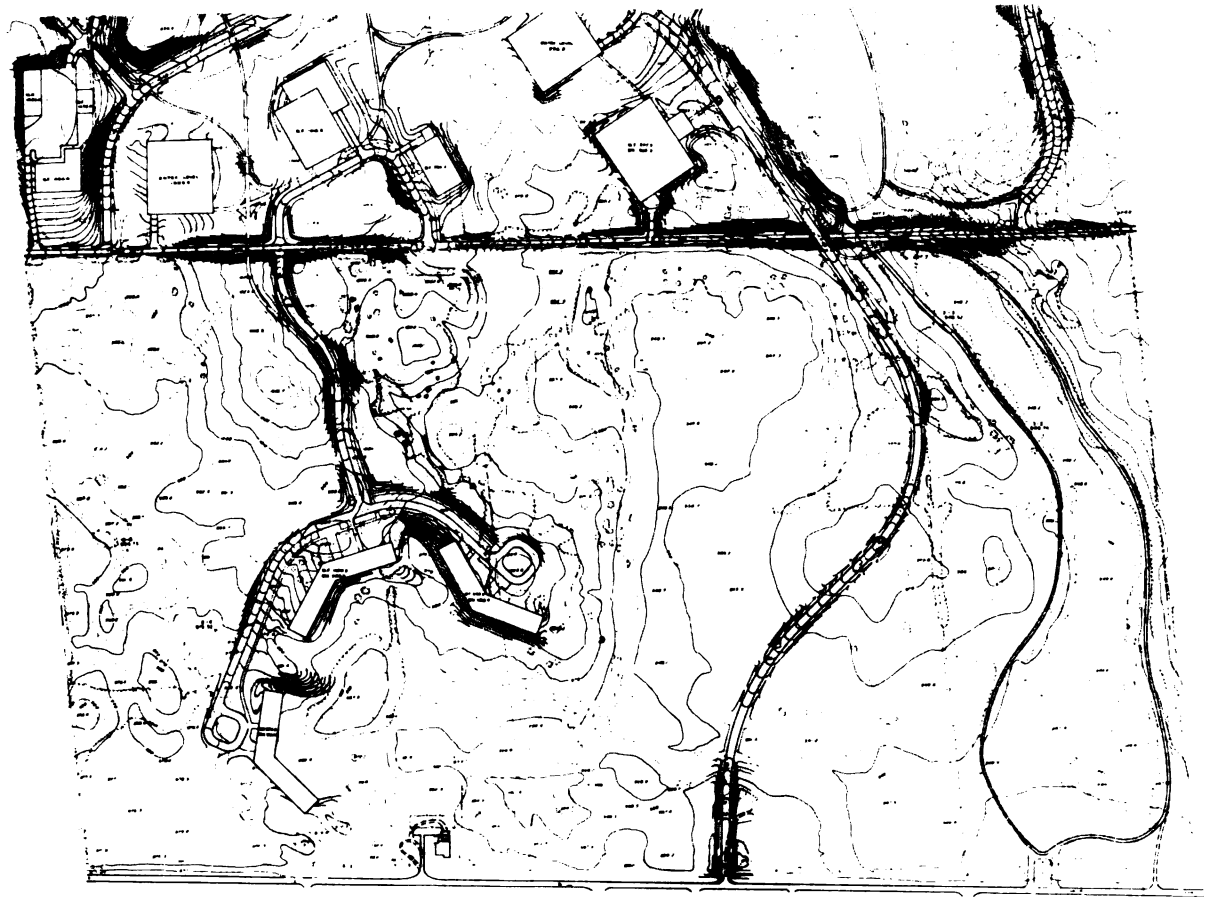
EAST LANSING, MICHIGAN




POND
DORMITORY ROAD
MAIN ENTRANCE ROAD

HIDDEN LAKE COLLEGE

GRADING SHEET



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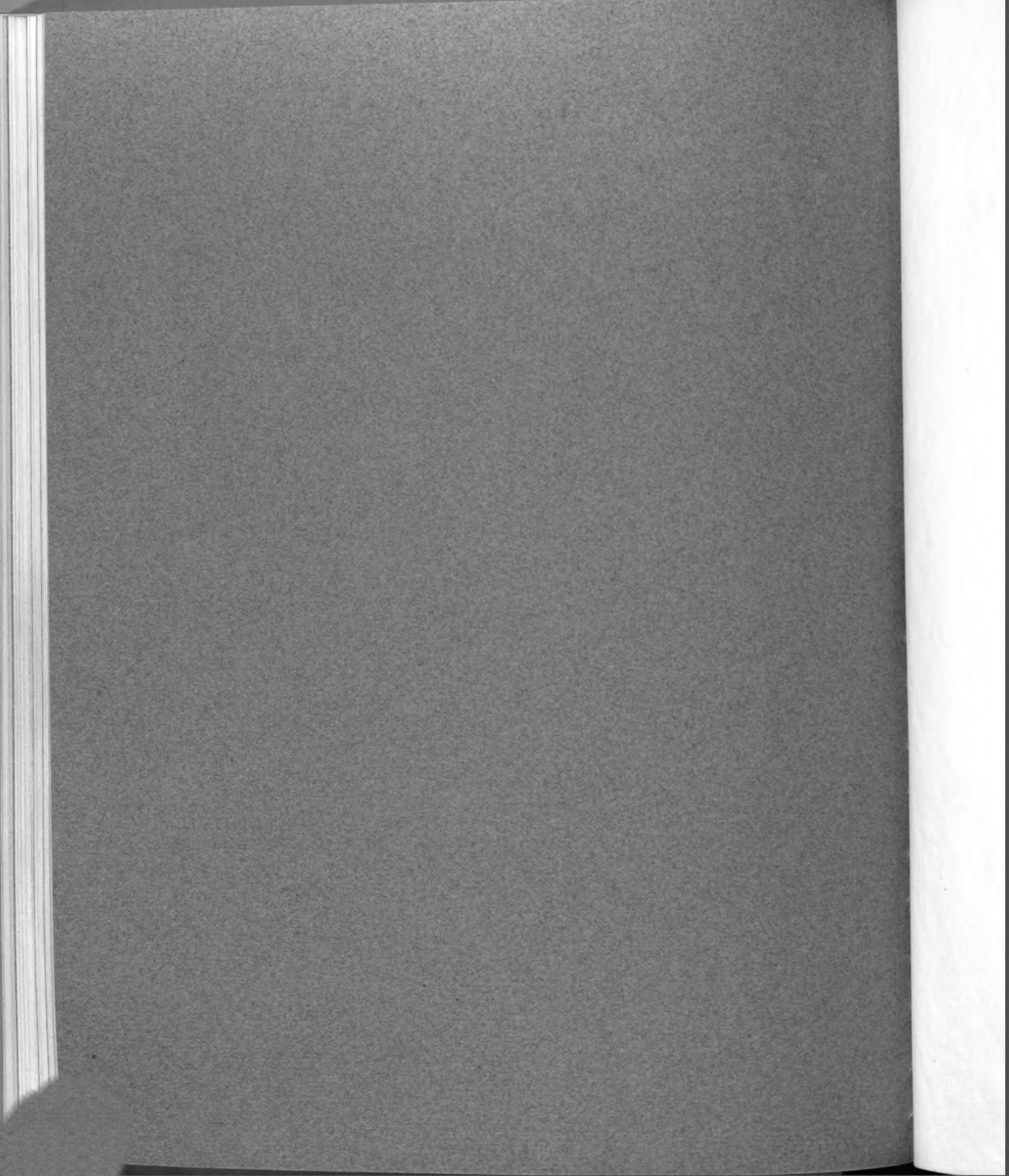

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