FORMULATION AND ANALYSIS
OF AN ENVIRONMENTAL
. RANCH/RETREAT
BY
JAMES G. SHEPARD

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TERRANATUS

an environmental retreat



FORMULATION AND ANALYSIS OF AN ENVIRONMENTAL RANCH/RETREAT

by

JAMES G. SHEPARD

A thesis submitted to the School of Architecture
in partial fulfillment of the requirements for the
degree of

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My wife, Becky, for her support and endurance on this time-consuming project. Her patient understanding and loving help has relieved me of the many worrisome details of day-to-day living thus allowing me to concentrate on this thesis.

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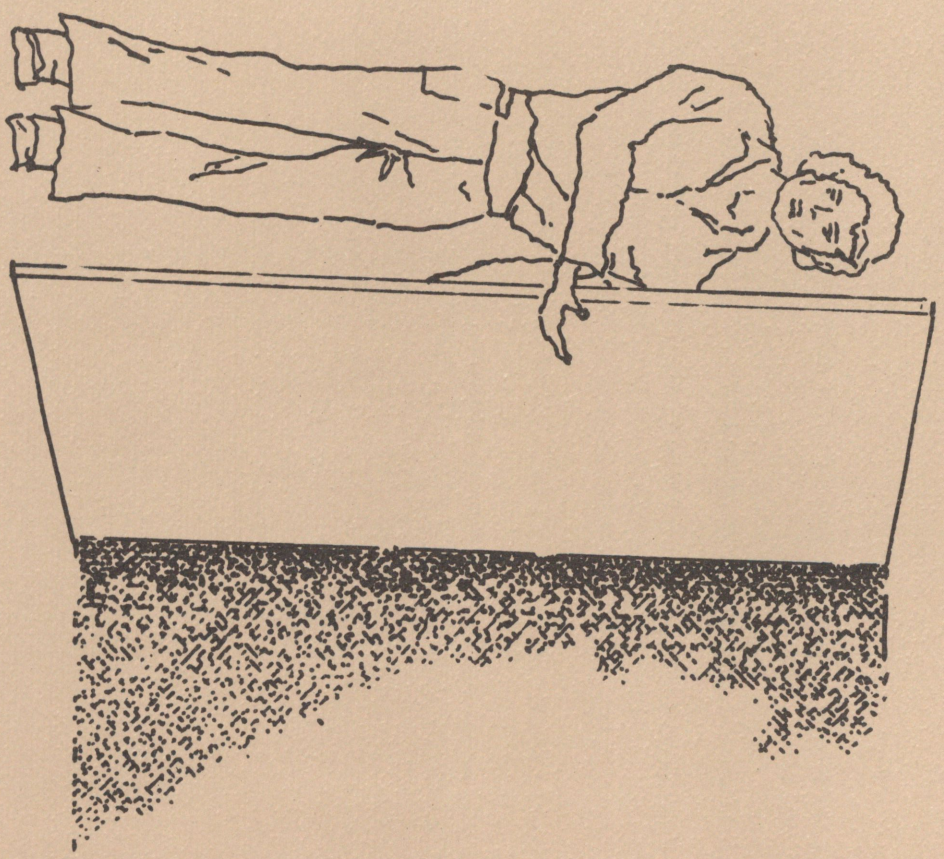
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INTRODUCTION

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong we may begin to use it with love and respect."

-Aldo Leopold

"In ten years between 1960 and 1970, the United States consumed as much petroleum as in previous history."

-Wilson Clark

"Not blind opposition to progress, but opposition to blind progress."

-Motto of the Sierra Club

"We affirm finally that any deliberate attempt to reach a rational and enduring state of equilibrium by planned measures, rather than by chance or catastrophe, must ultimately be founded on a basic change of values and goals at individual, national, and world levels."

-Limits to Growth

"Towards what ultimate point is society tending by its industrial progress? When the progress ceases, in what condition are we to expect that it will leave mankind?"

-John Stuart Mill, 1857

"Even West Germany, a country whose per capita GNP exceeded that of the United States in 1973, has a per capita level of energy consumption less than half that of the United States. The world's energy reserves would not last long if other countries were as gluttonous in their use of energy and other key resources as the United States. Is this consumption morally justified?"

-Wilson Clark

"We cannot command nature except by obeying her."

-Francis Bacon

"We have met the enemy and he is us."

-Walt Kelly

That statement by the creator of the "Pogo" cartoon strip is a comment on mankind that rings true now more than at any time in previous history. Worldwide, the human race is increasing at an alarming rate; in many places like a cancer. Keeping pace with this population growth is an exponential growth of industrialization causing rapidly increasing amounts of pollution and rapidly

decreasing amounts of food-producing land and nonrenewable resources.

This exponential growth of population and industrialization causes an exponential growth in the rate of consumption of nonrenewable resources such as fossil fuels, metals, etc. The sobering aspect of exponential growth is the rapidity with which it can approach a fixed limit. The following French riddle best illustrates this point:

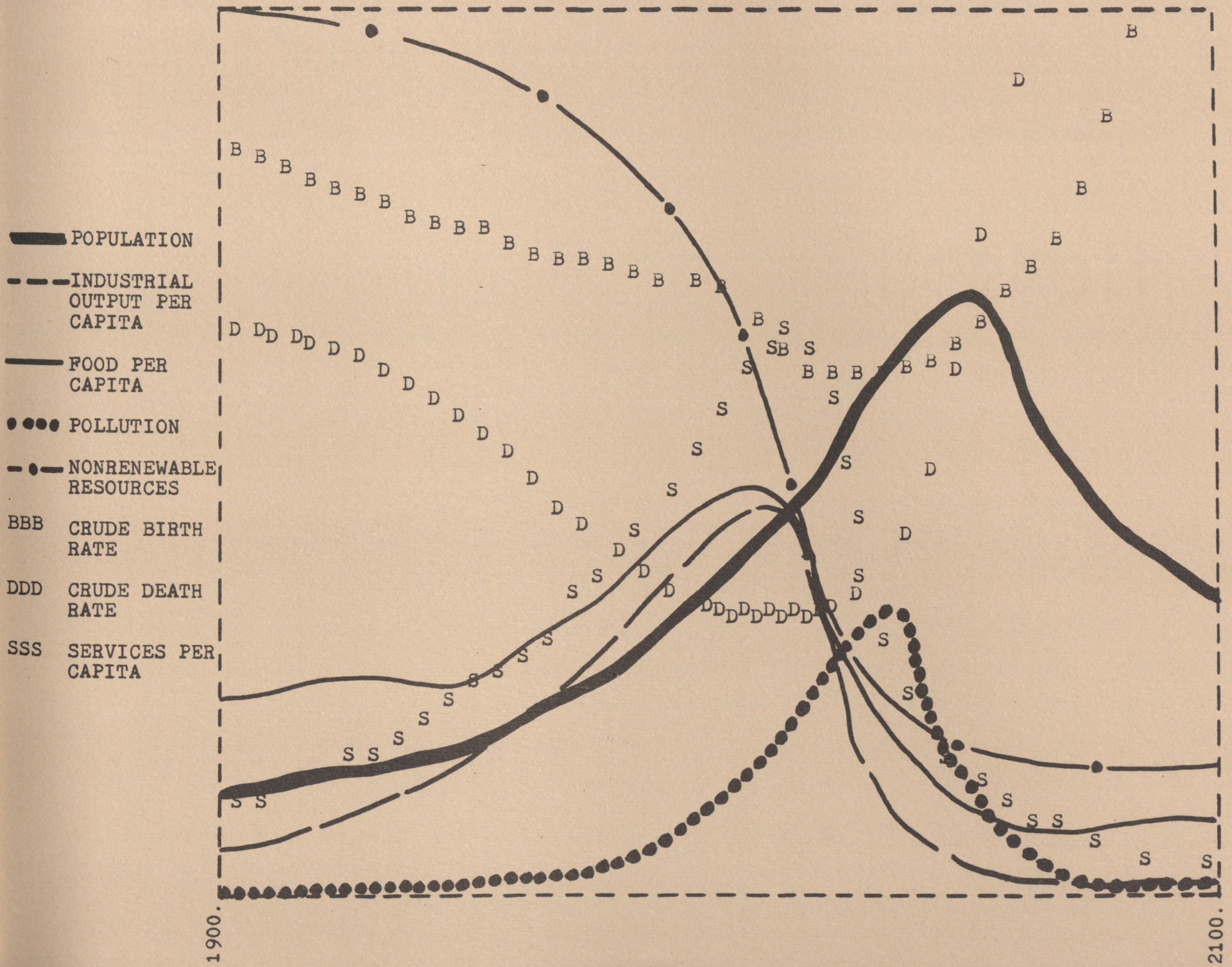
> A farmer owns a pond on which a water lily is growing. The lily plant doubles in size each day. If the lily is allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. The farmer is not too worried by the lily plant, and decides to wait until the plant has covered one-half the pond before he cuts back the lily. What day will he have to cut the plant?
>
> On the 29th day, leaving him only one day to save his pond.

Equally disturbing as exponential growth is the slow turn-around time for change when such large quantities are involved. For example, the pesticide DDT can take up to eleven years to deteriorate to harmless levels. Also, its harmful effects were not noticed for many years since it took time for the DDT to work up the food chain from insect to fish to larger fish to man. It is hard to imagine how much damage has been done by the massive use of DDT in the past years. What is especially disturbing is that it takes eleven years for the pesticide to become harmless, even if its use is discontinued immediately!!

Throughout most of recorded history, the earth as seemed infinite, largely due to the relative minuteness of the human race. However, due to exponential growth of the population, mankind has grown very large, very quickly. The human race now consumes enormous quantities of the earth's resources and it is now becoming painfully evident that the earth is, indeed, finite.

The following illustration is a computer output regarding the world situation if present trends continue unchecked. As can be seen, resources are used up fairly rapidly, yet population and pollution continue to increase for some time after the peak of industrialization due to natural delay time. A collapse of the various systems is indicated in the not-too-distant future.

WORLD MODEL STANDARD RUN (Taken from the "Limits to Growth")



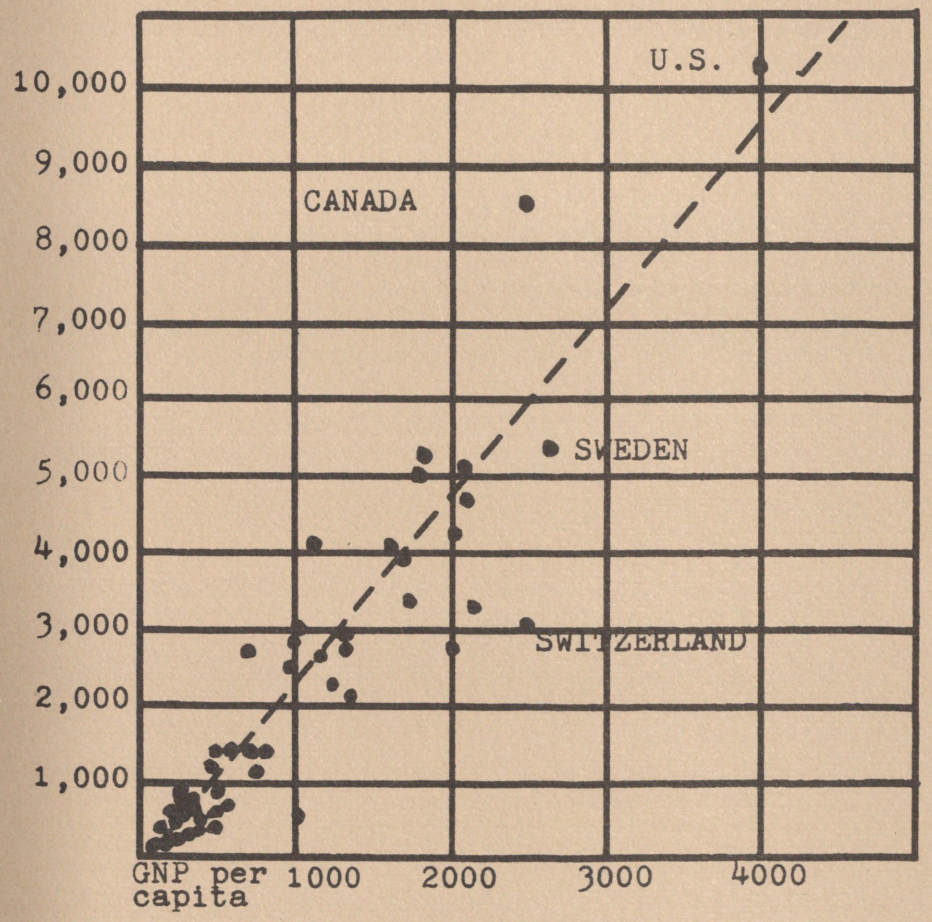
The importance of the preceding illustration is not the fact that it predicts a collapse in the future, but the fact that it represents that collapse as being in the near future. My intention is not to be a doomsday prophet, but to recognize that mankind is rapidly using up those things that keep our civilizations at their present, comfortable levels. Logic dictates that there are fixed, finite limits to most of the natural resources we consume daily. Logic also dictates that exponential growth is drawing mankind rapidly closer to those fixed limits.

The United States of America has consistently been a leader in the world since its inception in 1776. Unfortunately, America is also the leader in energy consumption and resource usage. As the following illustrations indicate, this distance by which America leads the rest of the world in resource exploitation is not a small one. We Americans are the megaconsumers and megapolluters of the world, consuming more energy per person than any other country in the world. It should not be surprising that the greatest country on earth uses more resources than any other country, but it is distressing that we use so much more. Our present-day use of resources is neither wise or efficient.

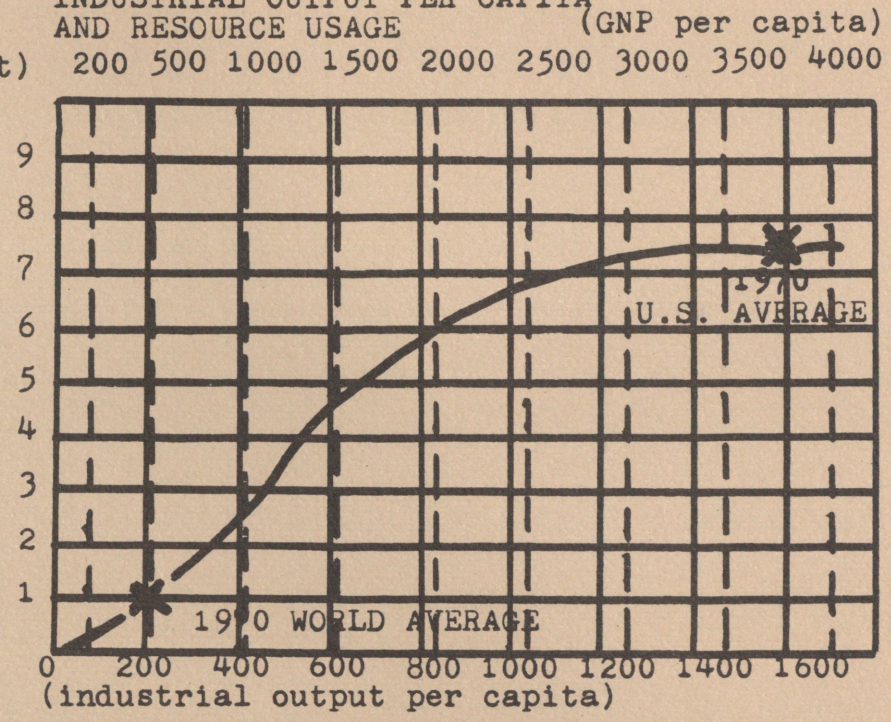
I feel as an American, and secondly as a designer, that the present-day disproportionate use of natural resources by our country is not justified, either morally or economically. I do not feel the quality of life increases drastically as resource usage increases, but I do feel the quality of life will drastically decrease when those nonrenewable resources are used up.

Architects, as the designers of the built environment, can and should affect the current trends of exploitation of the natural resources and the environment. The built environment

ENERGY CONSUMPTION AND GNP PER CAPITA



INDUSTRIAL OUTPUT PER CAPITA AND RESOURCE USAGE



Note: both illustrations taken from the book "Limits to Growth"

has tremendous physical impact on the natural environment but its very presence. Equally important, the built environment requires tremendous amounts of natural resources for construction and operation during its lifetime. More importantly, environment shapes and modifies peoples' attitudes and values. As creators of environment, architects have the potential and the obligation to produce the best environments they know how to produce while keeping the users' best interests at heart.

As a designer, I feel the best environment I can build today is one which relates to nature not only in the immediate physical sense, but in a long-range sense of minimal use of nonrenewable resources. In other words, I feel a re-examination and re-evaluation of the relationship between architecture and nature is in order.

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THESIS STATEMENT

"Civilizations have risen and fallen without apparently perceiving the full import of their relations with the earth."

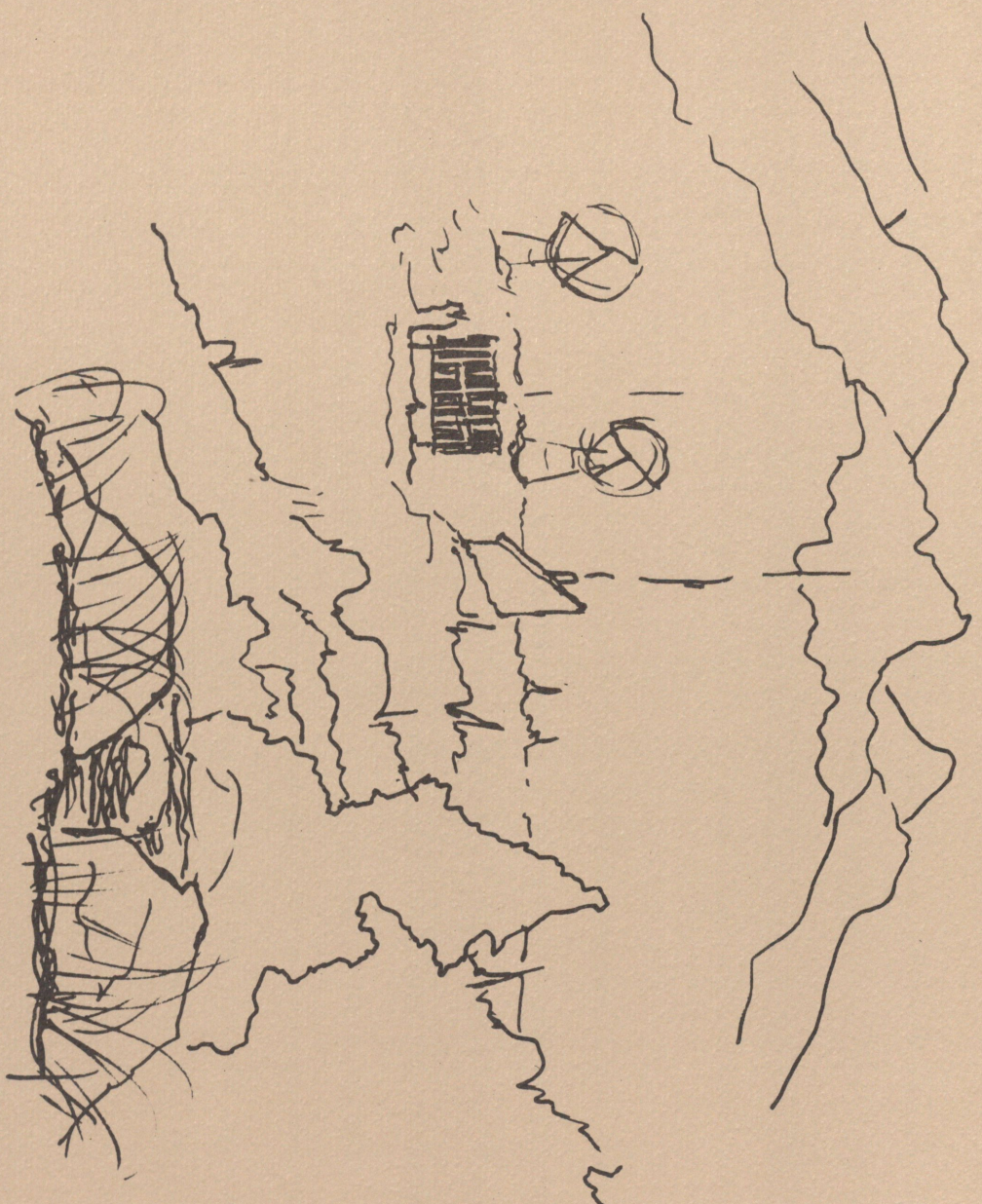
-Lewis Mumford

Apparently today's civilization has not perceived the significance of its relationship with the natural environment.

A product of civilization, the built environment, increasingly serves as the means thru which man relates to the natural environment.

As a creator of the built environment, the designer's role is to interpret man's relationship with Nature thru the built environment.

A design which reflects this relationship is necessarily a better design.



THE RETREAT

Terranatus will be a secluded ranch/retreat devoted to the education of, and enjoyment by, its guests. Within the framework of a working ranch, this vacation retreat will strive to offer its guests a unique learning and living experience characterized by power derived from Nature's renewable resources, by an increased reliance on human power, and by a minimal usage of motor vehicles.

Terranatus will be a multi-use facility in that it will offer several levels of experiences to its guests. The existing use where Terranatus will be built is that of a working ranch with cattle and tourism as the main income. The ranch will continue to raise cattle and the vacationing guests will come to the new complex which will serve as a vacation retreat, as a place for recreation, and as an educational center.

The very existence of Terranatus will be to provide vacationing Americans with an alternate lifestyle where renewable resources are emphasized and concern for the environment is primary. For this reason, the retreat location will be secluded from heavily-inhabited areas. This privacy and seclusion is necessary so that the guests can truly feel they are in "another world" during their stay. In this way, the guests will totally experience the alternate lifestyle at Terranatus. After a stay of approximately one week, the guests will return home carrying with them memories of their experience at the retreat. The guest will then have a basis to compare his present lifestyle with that of Terranatus. The guest will then be able to formulate his own opinions and values regarding his own, individual lifestyle.

At the retreat, three relationships involving Man are recognized and will be given varying degrees of emphasis and attention:

MAN-ENVIRONMENT

This relationship is the foundation on which the retreat is built. Primary emphasis will be given to the relationship between Man and Nature not only in environmental classes, which form the core of the curriculum, but in research exploring the many implications that Man's existence has on natural eco-systems. Results from this research will be published so that the general public may benefit from the existence of Terranatus, as well as the guests who stay there. Probably the most effective illustration of the retreat's philosophy on the relationship between man and the environment will be the retreat itselt. The buildings comprising the retreat will serve as practical applications involving the utilization of Nature's renewable resources and will illustrate the possibility for a harmonious relationship between architecture and nature. In this way, the retreat will not only be a place where teaching occurs, it will be what it teaches.

MAN-MAN

In an energy-intensive society, such as our own, people tend to become more self-reliant and have less contact with other people. This is primarily due to machines. People do not need to gather together to build a barn, or bring in a crop since machines can accomplish those things quicker and easier.

However, at the retreat the lifestyle will be a "working ranch" atmosphere where each and every guest is expected to contribute some labor to keep the community going. Also energy conservation and minimal environmental impact will dictate a sharing of some spaces by the guests. In this labor-intensive society, the guests will be eating, working, playing, and living together much of every day. This means social interaction will be frequent between the guests and will be an inescapable fact in the Terranatus lifestyle.

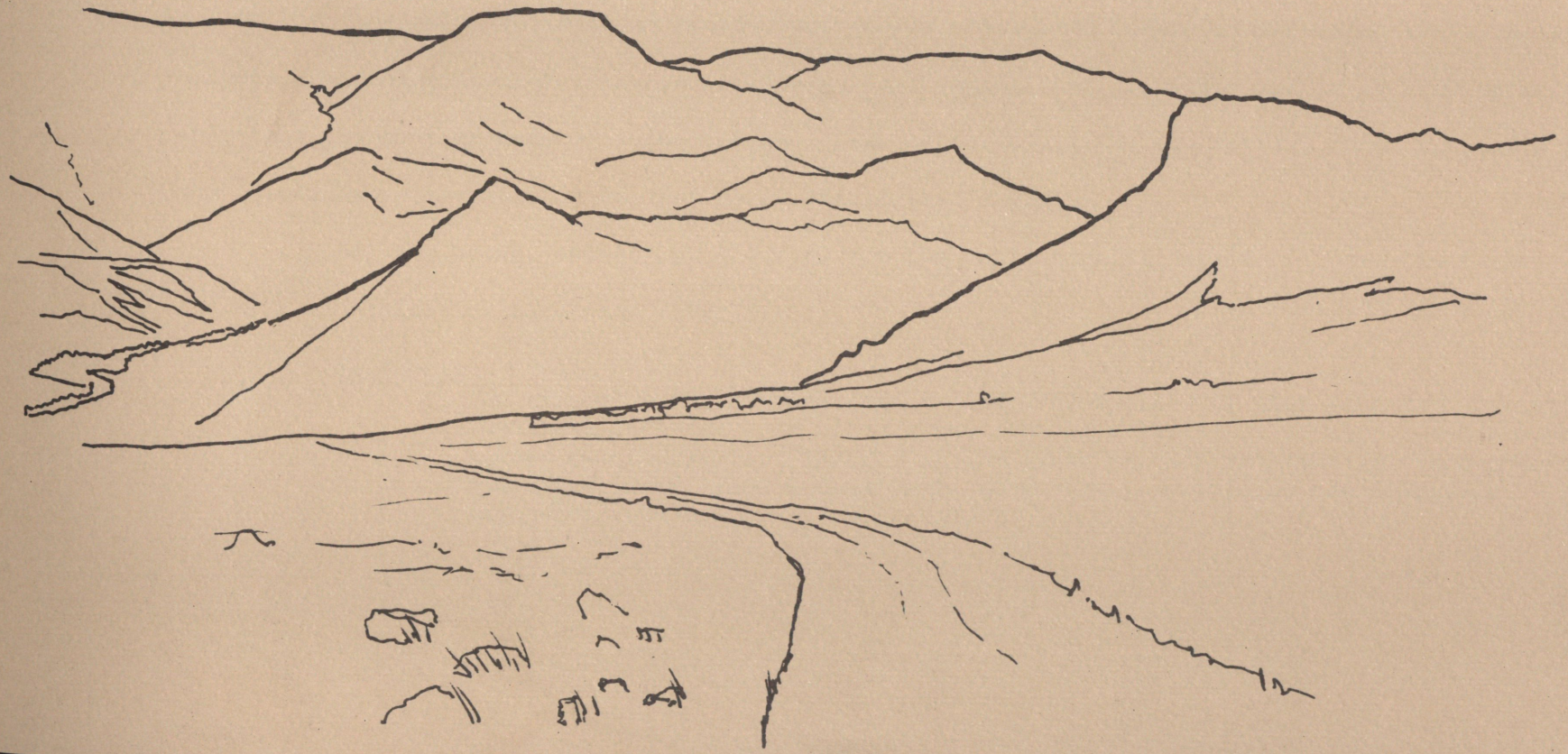
MAN-HIMSELF

A respect for nature has already been expressed as the primary philosophy at Terranatus. In keeping with that philosophy, man must respect all forms of life since they are indispensable parts of nature. This indicates a respect not only for other human, but a respect for one's self.

In keeping with this philosophy, the curriculum at the retreat endeavors to encourage its guests to participate in creative arts classes. The ability to create and think abstractly is solely unique to man among nature's many forms. To accentuate these abilities, the retreat will offer creative art classes to promote individual expression and creativity feeling that they are important elements in development of the human psyche.

"Therefore, let us build houses that restore to man the life-giving, life-enhancing elements of nature. This means an architecture that begins with the nature of the site. Which means taking the first great step toward assuring a worthy architecture, for in the rightness of a house on the land we sense a fitness we call beauty."

-Frank Lloyd Wright



THE SITE

The environmental retreat I have described could, conceivably, be located anywhere in the United States. There is no doubt that solar applications would be more effective in the Southwestern United States due to the abundance of sunshine there. Likewise, hydro-electric applications would probably be most effective in the Northwest due to the abundance of flowing water. However, I have chosen to select a site within a 150-200 mile radius of Bozeman for several reasons.

Obviously, the closer the site is to Bozeman, the easier it will be to analyze and investigate. This availability is a critical factor in my ability to do a comprehensive job of site analysis.

Most importantly, I feel the Montana-Wyoming area of the Rocky Mountain West is especially appropriate for this retreat due to the abundance of untouched, natural beauty in the region, and due to the increasing reliance on energy sources from this area. Much of this country is in its original natural state yet pressure for energy is changing that condition and it is this relationship that the retreat endeavors to explore. What better place for the retreat than in an area where the relationship between Man and Nature is changing so rapidly?

For the actual selection of a site for the environmental retreat, I used the following criteria in evaluating each particular site:

Seclusion

The retreat must be reasonably secluded from areas of high activity. It is important that the site offer areas that have little or no visual and acoustical access to discernible elements of civilization such as highways, campgrounds, buildings, etc. This seclusion is necessary to reinforce the "separate existence" philosophy of the retreat.

Scenic Value/Imagery

The site must be one of great natural beauty and little evidence of environmental destruction such as clear-cutting, strip mining, etc. This natural, untouched environment is necessary to present nature at her best. In this way the site will act as a stimulating atmosphere for the creative activities and as an ideal to strive for in the environmental education. To maintain an image of protection, security, and oneness with nature, I feel forested areas on the site are desirable.

Access

Although not as vital as the first two categories, it is important that the site have access to a transportation source such as a highway or railroad. It is preferable that the site have access to a highway for transportation of guests and materials.

Private Land

It is preferable that the site be land that is privately owned. The retreat is to be a private business enterprise and the site must be purchasable land free from most controls that accompany federal or state-owned lands.

On-Site Inspection

This category relates to the nearness of the site to Bozeman and the relative ease of site inspection. As stated before the acceptable distance is to be within a 200 mile radius of Bozeman.

Flowing Water Nearby

Flowing water could be a potential power source as well as offering a source of water supply and recreational activity. A stream or river on the site itself would be most preferred.

Solar Orientation

This is an important factor since the sun is a renewable power source that could meet a large portion of the retreat's needs. A site with south-facing slopes or areas free from winter shadows cast by near-by mountains is preferred.

Acreage

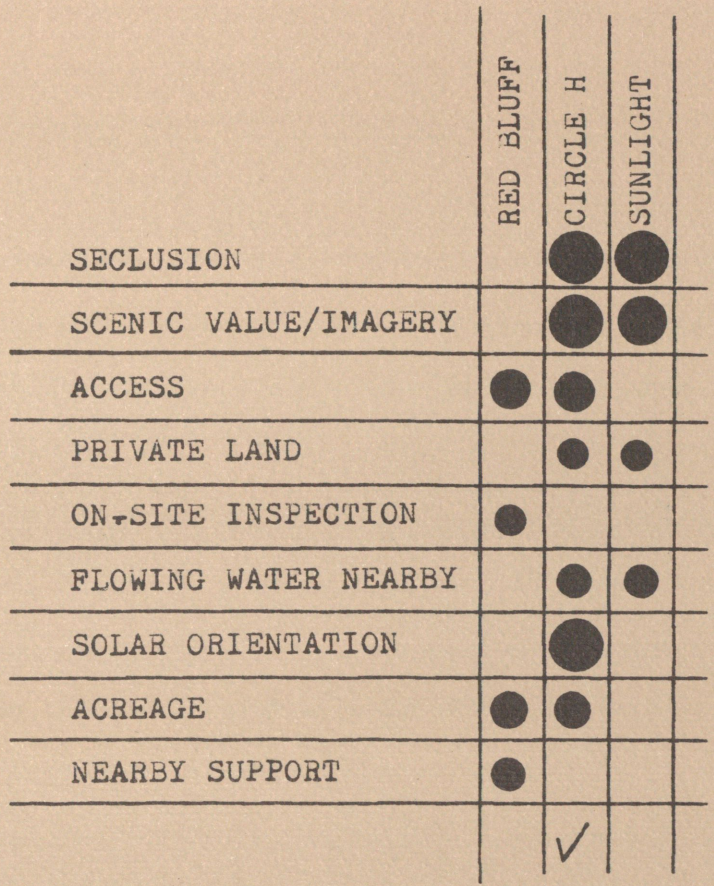
The retreat will have a guest capacity similar in size to a small village. For purposes of self-sufficiency, seclusion, and freedom from encroachment, the site should be fairly large; preferably 1,000 acres or more.

Nearby Support

The site should be within 30-40 minutes, by car or plane (if possible), from a town or city with adequate medical facilities. Plane, bus, and train connections are important in this consideration.

My site selection process included the mental evaluation of many sites using the previous criteria. I eventually reduced the possible sites to three likely sites. The first site is the Red Bluff Ranch owned by Montana State University and it is located 25 miles west of Bozeman on the road to Norris. The other two sites are located near Cody, Wyoming. The Circle H is located west of Cody and the Sunlight site is located northwest of Cody. These last two sites are on private land.

My final selection was the Circle H Ranch site because it fulfilled more of the necessary criteria than the other two sites. Using my criteria, the Circle H Ranch site is the best possible site for the retreat among the many sites that I considered.



Note: The relative size of the circles indicates their importance in my site selection process.

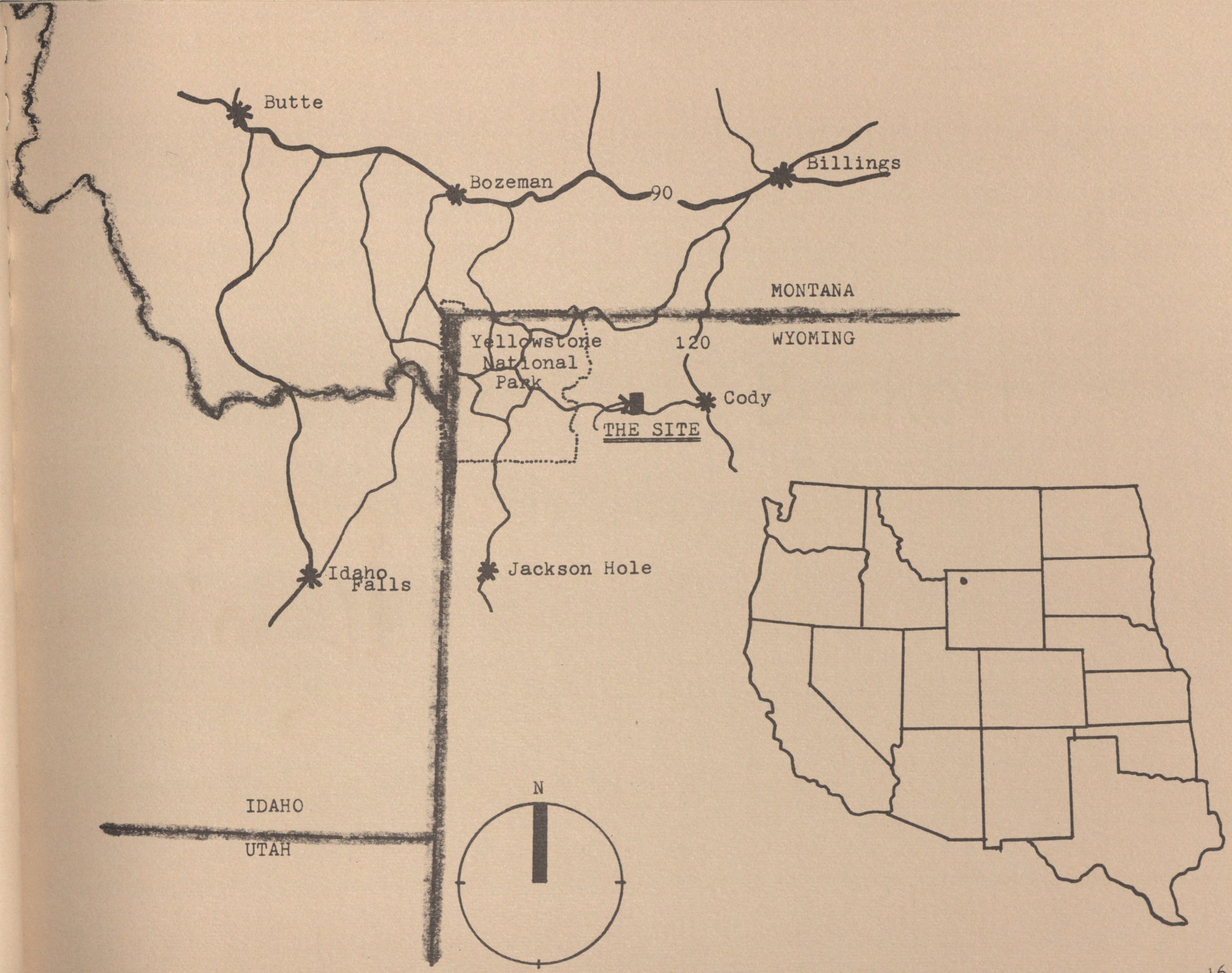
The Circle H Ranch, hereafter referred to as the site, is located 25 to 30 miles west of Cody, Wyoming on U.S. Highway 14-16-20 leading to the East Entrance of Yellowstone National Park. Cody will be the support town for the retreat by serving as the supply point for food and building supplies while also serving as the transportation center for the guests.

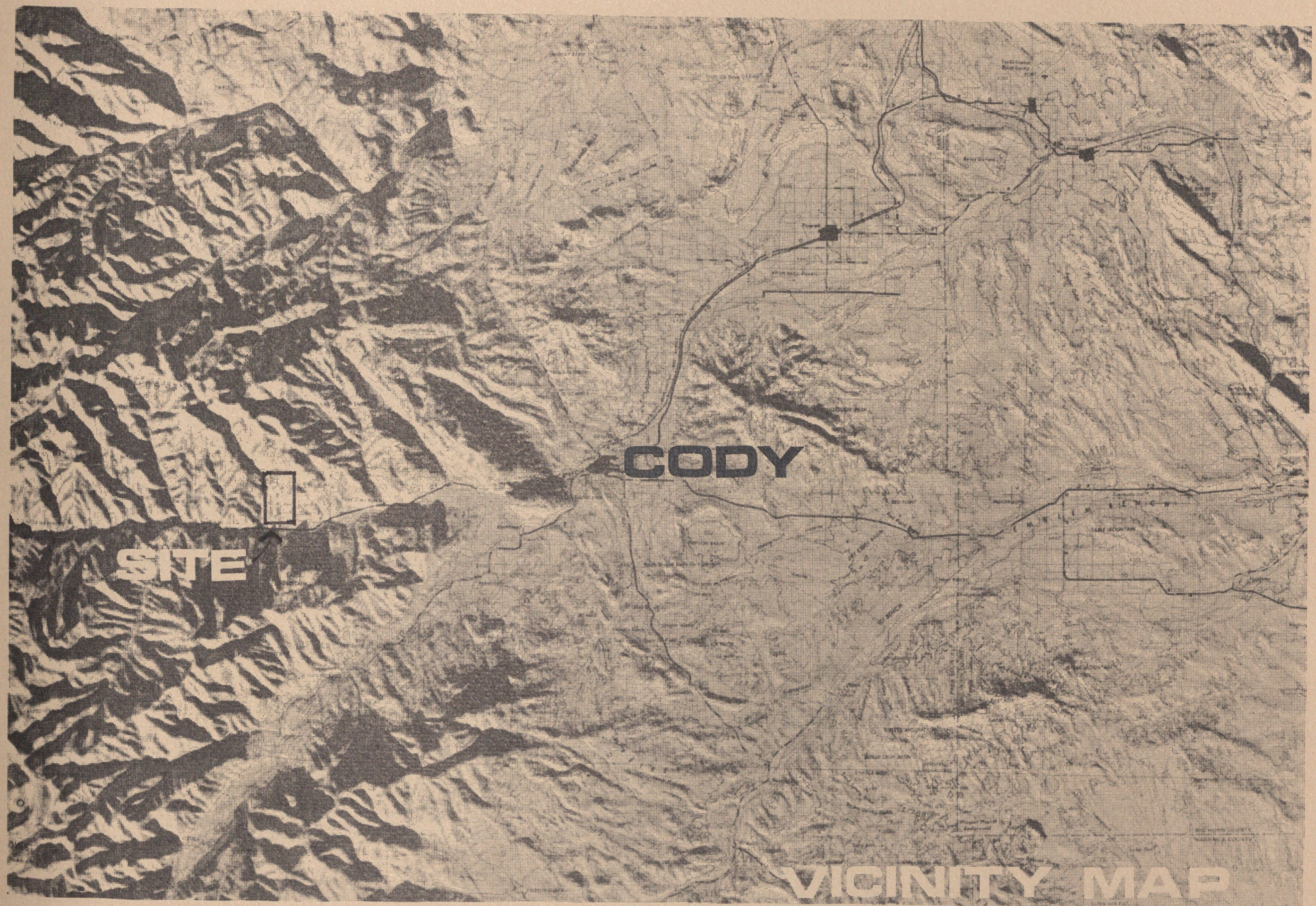
Cody, Wyoming was founded by Colonel William F. "Buffalo Bill" Cody and several other entrepreneurs. They arrived at the present town site in the mid 1890's and in 1902 the town was incorporated.

Cody today has a permanent population of about 7,000 people. The town's main sources of income are the Husky Oil Refinery, tourism, and ranching. The town has a 50-bed medical facility, two large supermarkets, and a large number of clothing stores and motels. There is daily bus-and-air-service to Billings, Montana, which is only 120 miles away by car. Billings has daily air, bus, and train connections to most parts of the United States.

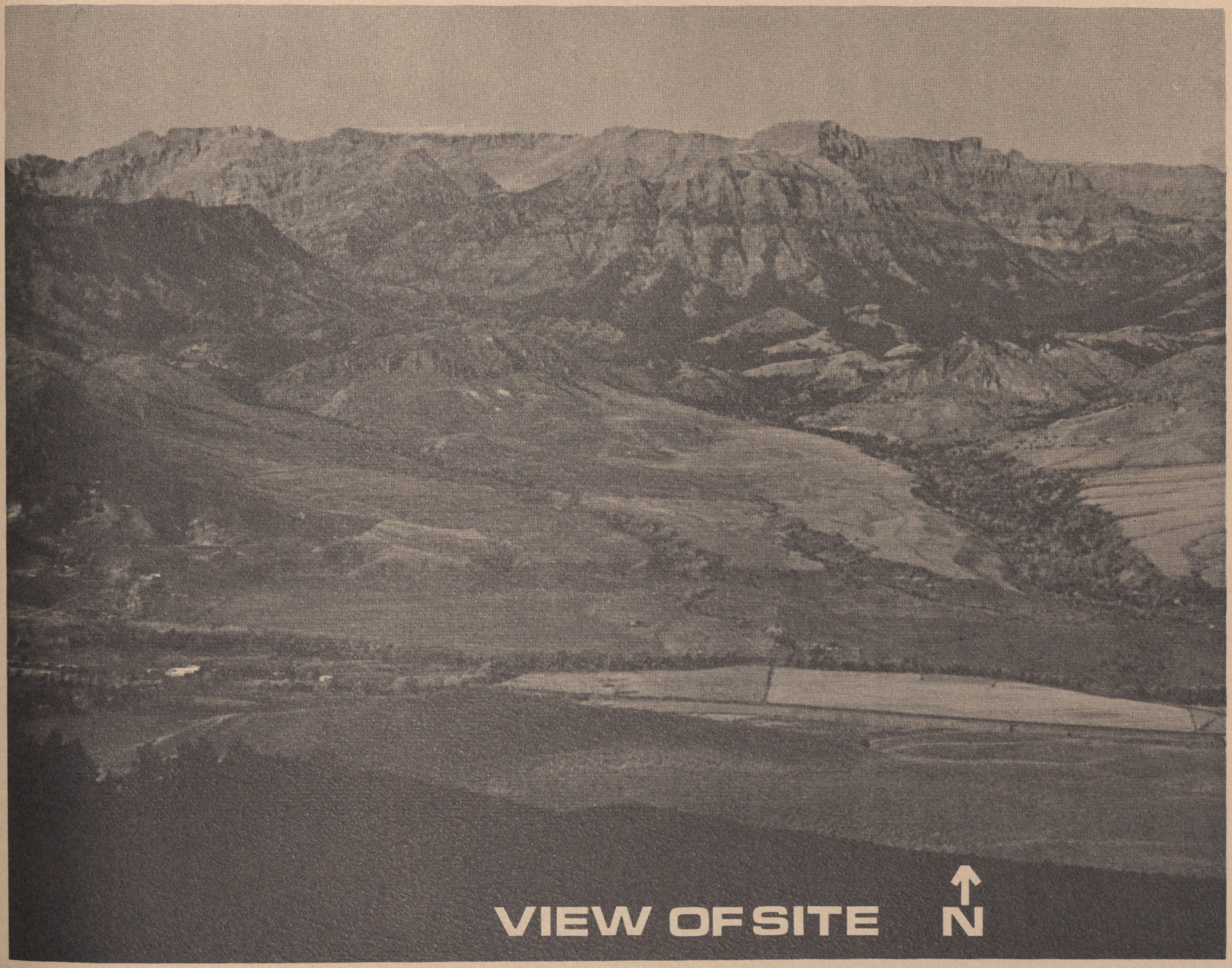
A unique feature of Cody is the Buffalo Bill Historical Center. This center includes the Buffalo Bill Museum, which is a collection of that frontier celebrity's memorabilia. The center also includes the Whitney Gallery of Western Art, which is one of the finest such collections in America. Also included is a fine Plains Indian Museum and a Winchester Museum presenting a wide collection of frontier firearms.

At present, the site is a working ranch owned by Bud and Cella Hall. In addition there is a foreman, Harry VanWagner, and his family residing on the ranch. Basically the two men do all the work on the ranch. The main sources of income are from cattle and guests that stay from late spring to early fall, including some hunters.


Butte
Bozeman
90
Billings
MONTANA
WYOMING
120
Yellowstone
National
Park
Cody
THE SITE
Idaho
Falls
Jackson Hole
IDAHO
UTAH
N



VICINITY MAP

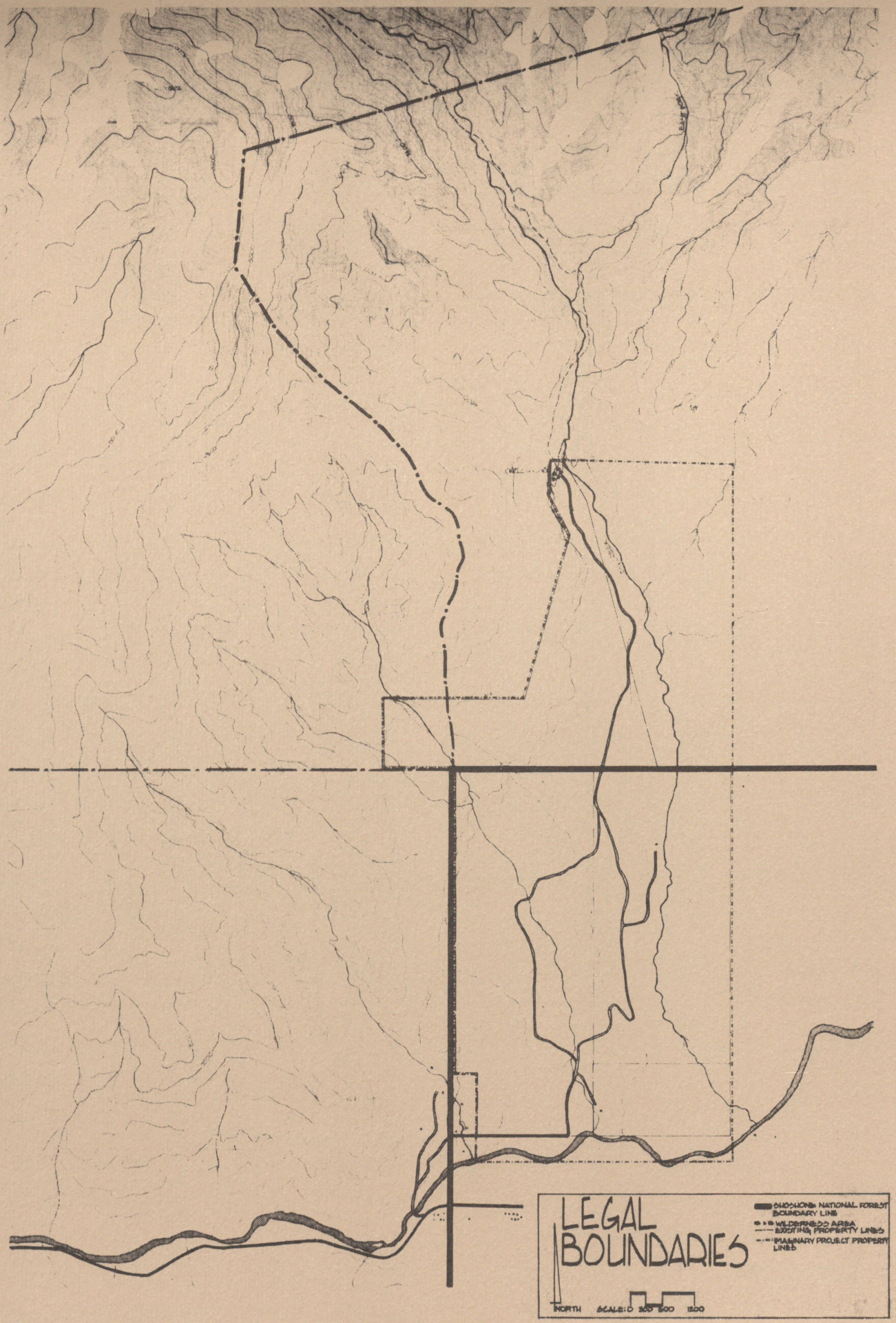

VIEW OF SITE
N

The site is bordered on the south side by the North Fork of the Shoshone River as it flows down toward Cody thru Wapiti Valley. The site is also bordered on the west and north sides by the Shoshone National Forest. The northern end of the site is actually within the boundaries of the forest, including a designated wilderness area, however the site was homesteaded as private land before the formation of Shoshone National Forest. Thus, the site remains private land. The Legal Boundaries Map illustrates these descriptions.

On the Hydrography Map it can be seen that the site has adequate flowing water. The Shoshone River flows throughout the year, as do two streams that flow from north to south across the site. The most easterly stream, Big Creek, is approximately 6-8 feet in width and one foot in depth. These dimensions represent the stream at its smallest size during the year. Further west, Spring Creek flows throughout the year although it is much smaller being only 2-3 feet in width. All other drainages on the site are intermittant and carry minimal amounts of water only during spring runoff.

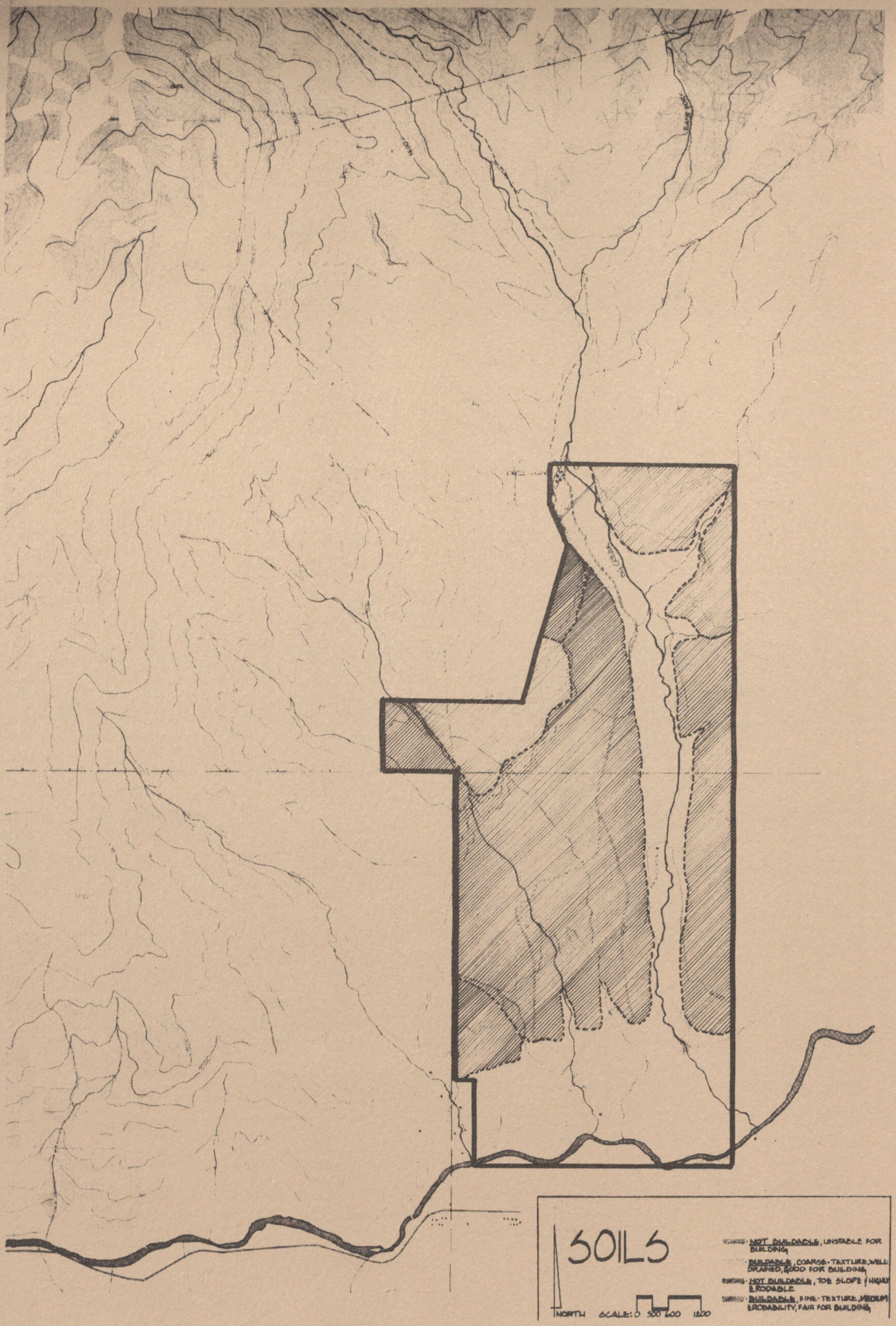
The Slopes Map indicates five categories of slope throughout the site. I considered those slopes of 20% and below to good for building. Slopes over 20% are feasible for building, but considered unbuildable due to the difficulties involved.

There had been no investigations on the site relating to soils information, so I obtained the help of Mr. Kellog, a soils specialist for Shoshone National Forest. By examining aerial photographs, he was able to classify areas of the site according to soils type. These areas are designated on the Soils Map.


LEGAL
BOUNDARIES
SHOSHONE NATIONAL FOREST BOUNDARY LINE
WILDERNESS AREA
EXISTING PROPERTY LINES
IMAGINARY PROJECT PROPERTY LINES
NORTH
SCALE: 0 300 600 1200

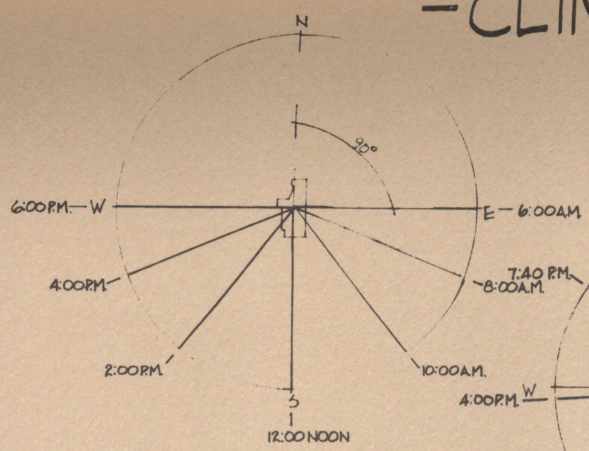

HYDROGRAPHY
SHOSHONE RIVER
YEAR-ROUND STREAMS
INTERMITTENT
NORTH
SCALE: 0 500 600 1200

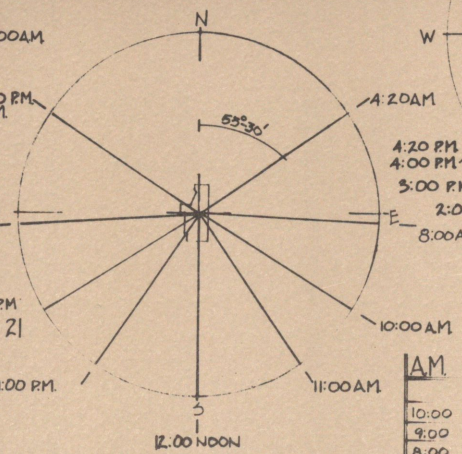

SLOPE
0-5% GOOD FOR BLDG. SITE
5-10% GOOD
10-20% FAIR
20%-40% DIFFICULT
40% & OVER NO BLDGS.
NORTH SCALE: 0 300 600 1200

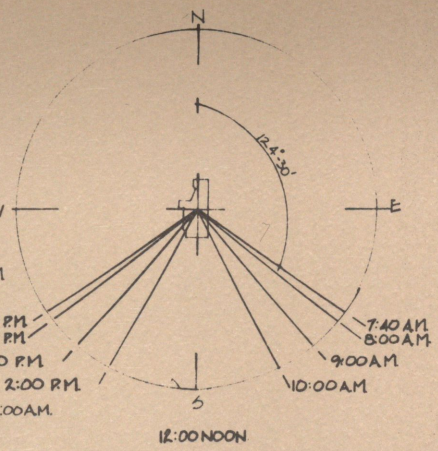

SOILS
NOT BUILDABLE, UNSTABLE FOR BUILDING
BUILDABLE, COARSE-TEXTURE, WELL DRAINED, GOOD FOR BUILDING
NOT BUILDABLE, TOO SLOPE / HIGHLY ERODABLE
BUILDABLE, FINE-TEXTURE, MODERATE ERODABILITY, FAIR FOR BUILDING
NORTH
SCALE: 0 300 600 1200

-CLIMATE-

SOLAR







FALL SEPT 23

A.M.	P.M.	AZIMUTH	ALTITUDE
NOON		180°	45°
10:00	2:00	141°	38°
8:00	4:00	112°	26°-30'
6:00	6:00	90°	0

SPRING 2:00 P.M. MARCH 21

A.M.	P.M.	AZIMUTH	ALTITUDE
NOON		180°	21°-30'
10:00	2:00	151°-30'	16°
9:00	3:00	139°-0'	10°
8:00	4:00	127°-30'	2°-30'
7:40	4:20	124°-30'	0°-0'

WINTER DEC. 22

A.M.	P.M.	AZIMUTH	ALTITUDE
NOON		180°	68°-30'
1:00	1:00	145°-30'	65°-30'
10:00	2:00	121°-30'	57°-30'
8:00	4:00	93°	51°-30'
4:20	7:40	55°-30'	0

SUMMER JUNE 22

A.M.	P.M.	AZIMUTH	ALTITUDE
NOON		180°	68°-30'
11:00	1:00	145°-30'	65°-30'
10:00	2:00	121°-30'	57°-30'
8:00	4:00	93°	51°-30'
4:20	7:40	55°-30'	0

TEMPERATURE

NEAR SITE	JAN.		FEB.		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPT.		OCT.		NOV.		DEC.	
HIGHEST	54	58	58	56	64	63	66	81	87	76	95	83	98	83	93	82	84	79	80	69	70	54	56	44
LOWEST	-18	-10	-8	10	18	-1	14	18	25	25	38	33	46	36	40	33	32	26	24	25	0	14	-12	-2
AVERAGE HIGH	32	42	46	44	48	47	48	56	67	63	78	72	83	76.5	81	69	69	63.5	64.5	57	44.5	42	37	32
AVERAGE LOW	10	27	20	24	24	24	21	32	38	35.5	49.5	41	53	46	50.5	42	42.5	35	37	33	27	28.5	17.5	18
YEARS RECORDED	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974	1973	1974

	HIGHEST TEMP.	LOWEST TEMP.	FIRST FREEZING	LAST FREEZING
1973	98	-18	SEPT 15	MAY 12
1974	83	-10	SEPT 3	MAY 14

CODY (30 YEARS)	JAN.	F.E.B.	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCT.	NOV.	DEC.
AVERAGE HIGH	37.5	40.3	47	58	67.7	75.5	85.7	83.6	73.6	63	47.5	41.1
AVERAGE LOW	11.9	14.3	20.6	30.8	39.9	47.1	54.1	51.8	42.8	34.3	22.1	16.5
HIGHEST	68	75	79	87	94	98	105	102	97	87	74	67
LOWEST	-33	-46	-22	-18	15	25	33	29	16	3	-24	-28
AVERAGE DEGREE-DAYS	1249	1056	967	618	357	168	23	47	240	512	906	1122
CLIMATIC ATLAS DEGREE-DAYS	1600	1400	1200	900	600	400	100	200	400	800	1200	1400

WIND

IN CODY: WINTER WINDS = 10-12 M.P.H. AVERAGE
SUMMER WINDS = 6-8 M.P.H. AVERAGE
PREVAILING WESTERLIES

SUMMARY

ESTIMATED CONDITIONS AT SITE:

WINTER WIND - ± 12 M.P.H. AVERAGE
SUMMER WIND - ±8 M.P.H. AVERAGE

DEGREE DAYS - 9000 YEARLY

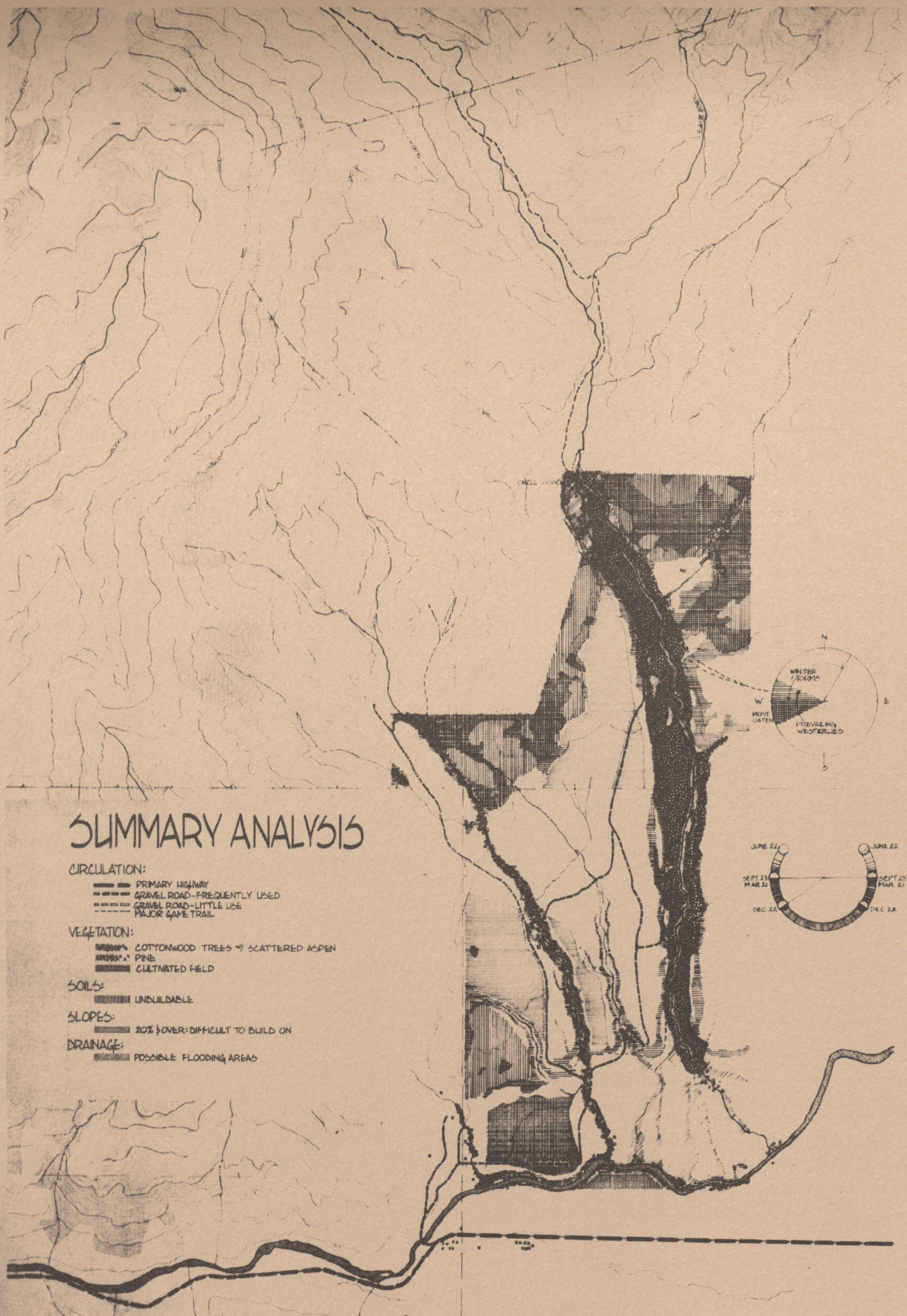
AVERAGE POSSIBLE SUNSHINE - WINTER = ±55%
AVERAGE POSSIBLE SUNSHINE - SUMMER = ± 75%
MEDIAN SEASONAL SNOWFALL = ±32"
AVERAGE GROWING SEASON = ± 103 DAYS

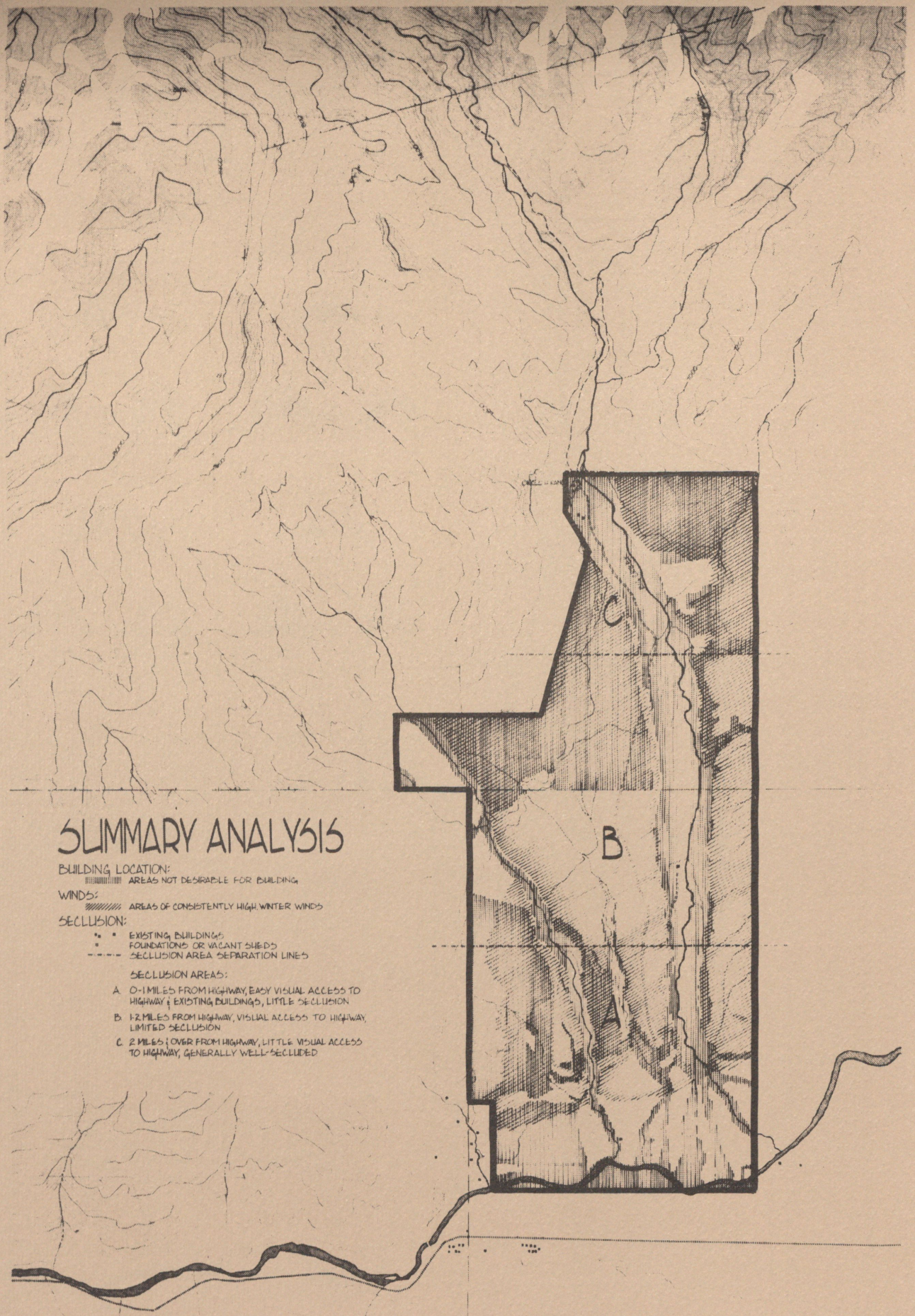
The climate of the site is generally cool and dry. Temperatures during the summer average mid-seventies during the day and mid-forties at night. In the winter, daytime temperatures average from 30°-35° F and from 15°-20° F at night. Sub-zero temperatures are common from November thru March. Freezing weather is possible until late May or early June and returns in early or mid-September making for a short growing season. The prevailing westerlies are strongest in fall, winter, and early spring. Sunshine is fairly abundant and averages at 65% throughout the year. Heating will be the primary concern since the site has a high degree-day rating of 9,000 degree-days annually.

In the first Summary Analysis Map all the preceding data has been incorporated into the map.Vegetation and circulation paths have also been added to present a composite of information. In this way, vast areas of the site can be blocked off as being unbuildable due to soil conditions, excessive slopes, dense vegetation, etc.

The second Summary Analysis Map represents the areas previously discarded as being unbuildable. In addition, high wind areas are blocked off since high wind fosters excessive heat loss due to infiltration. The areas that are left untouched by lines indicate possible building sites. The site itself is broken into three areas relating to the relative seclusion on the site. Area A is the least secluded due to its proximity to the highway and existing buildings. Area C is the most secluded.

On the last Summary Analysis Map, the dark-colored areas represent the possible building sites. They are numbered from one to five and are evaluated relative to each other regarding


SUMMARY ANALYSIS
CIRCULATION:
PRIMARY HIGHWAY
GRAVEL ROAD-FREQUENTLY USED
GRAVEL ROAD-LITTLE USE
MAJOR GAME TRAIL
VEGETATION:
COTTONWOOD TREES W/ SCATTERED ASPEN
PINE
CULTIVATED FIELD
SOILS:
UNBUILDABLE
SLOPES:
20% & OVER: DIFFICULT TO BUILD ON
DRAINAGE:
POSSIBLE FLOODING AREAS
N
E
W
S
WINTER STORMS
MOIST OCEAN
PREVAILING WESTERLIES
JUNE 22
JUNE 22
SEPT 23 MAR 22
SEPT 23 MAR 21
DEC 22
DEC 22



SUMMARY ANALYSIS

BUILDING LOCATION:
AREAS NOT DESIRABLE FOR BUILDING

WINDS:
AREAS OF CONSISTENTLY HIGH WINTER WINDS

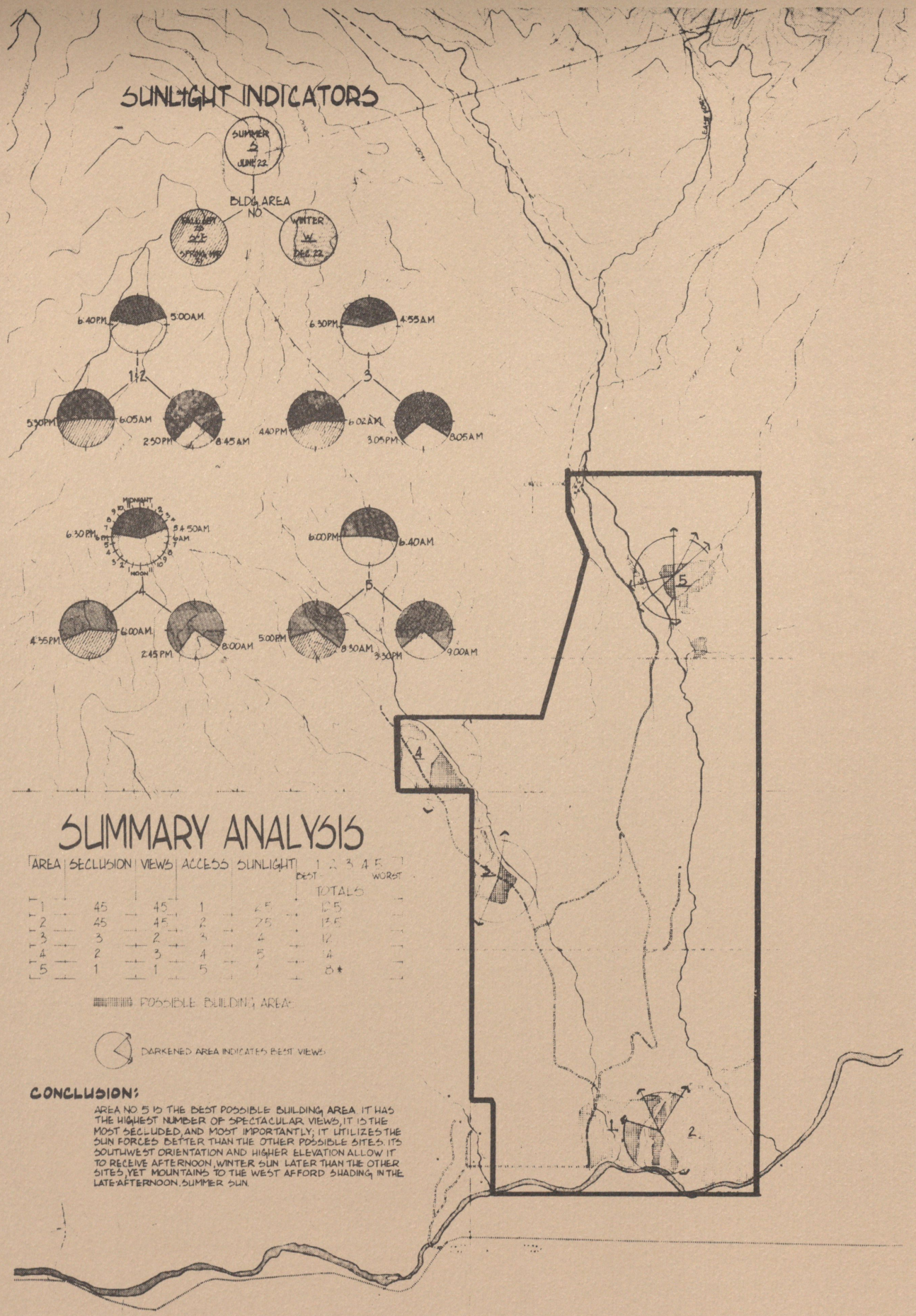
SECLUSION:
EXISTING BUILDINGS
FOUNDATIONS OR VACANT SHEDS
SECLUSION AREA SEPARATION LINES

SECLUSION AREAS:

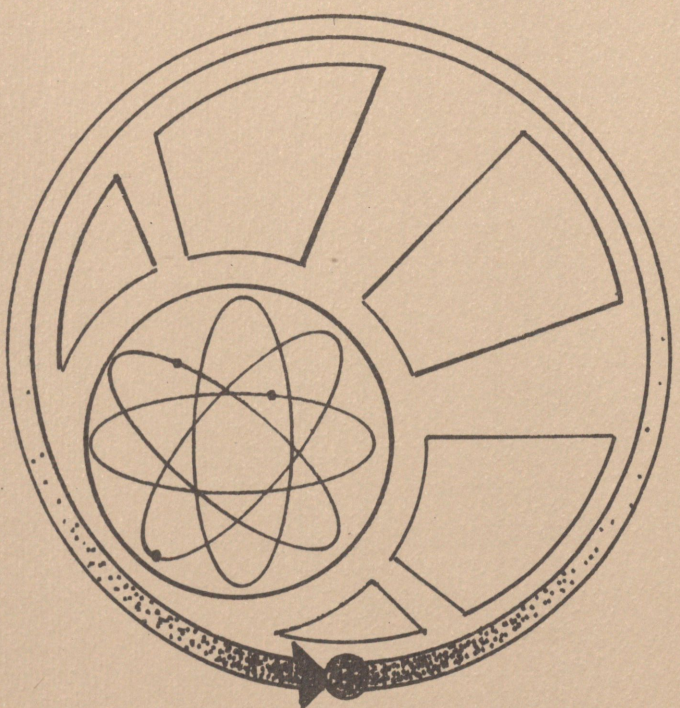
A. 0-1 MILES FROM HIGHWAY, EASY VISUAL ACCESS TO HIGHWAY & EXISTING BUILDINGS, LITTLE SECLUSION

B. 1-2 MILES FROM HIGHWAY, VISUAL ACCESS TO HIGHWAY, LIMITED SECLUSION

C. 2 MILES & OVER FROM HIGHWAY, LITTLE VISUAL ACCESS TO HIGHWAY, GENERALLY WELL-SECLUDED


SUNLIGHT INDICATORS
SUMMER
JUNE 22
BLDG AREA
NO
WINTER
DEC. 22
6:40PM
5:00AM
1½
5:30PM
6:05AM
2:50PM
8:45AM
6:30PM
4:55AM
3
4:40PM
6:02AM
3:05PM
8:05AM
MIDNIGHT
NOON
6:30PM
5:50AM
4:35PM
6:00AM
2:45PM
8:00AM
6:00PM
6:40AM
5
5:00PM
8:30AM
3:30PM
9:00AM
SUMMARY ANALYSIS
AREA | SECLUSION | VIEWS | ACCESS | SUNLIGHT | 1 2 3 4 5 BEST WORST | TOTALS
1 | 45 | 45 | 1 | 25 | 125
2 | 45 | 45 | 2 | 25 | 135
3 | 3 | 2 | 3 | 4 | 12
4 | 2 | 3 | 4 | 5 | 4
5 | 1 | 1 | 5 | 1 | 8*
POSSIBLE BUILDING AREA
DARKENED AREA INDICATES BEST VIEWS
CONCLUSION:
AREA NO 5 IS THE BEST POSSIBLE BUILDING AREA. IT HAS THE HIGHEST NUMBER OF SPECTACULAR VIEWS, IT IS THE MOST SECLUDED, AND MOST IMPORTANTLY; IT UTILIZES THE SUN FORCES BETTER THAN THE OTHER POSSIBLE SITES. ITS SOUTHWEST ORIENTATION AND HIGHER ELEVATION ALLOW IT TO RECEIVE AFTERNOON, WINTER SUN LATER THAN THE OTHER SITES, YET MOUNTAINS TO THE WEST AFFORD SHADING IN THE LATE AFTERNOON, SUMMER SUN.

possible sunlight, quality and quantity of views, potential for seclusion, and ease of access. The lowest number indicates the best in each category and area No. 5 is definitely the best possible building site for Terranatus.



ENERGY & RECYCLING

Nature is cyclic; always continuing from one phase to another phase to another and back to start all over again. The water we use daily is constantly in a cycle of evaporation and condensation. Our very lives operate on a 24 hour cycle and our activities vary as nature changes from Fall to Winter to Spring to Summer over and over again. In this context, I feel the built environment must understand these cycles and strive to disrupt these cycles as little as possible.

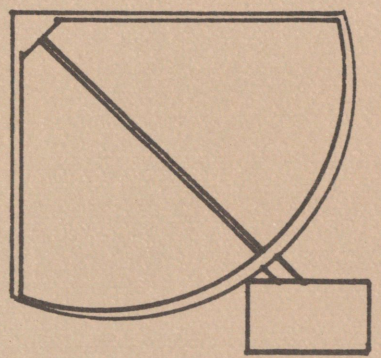
The majority of present-day buildings do little, if any, in the way of utilizing either renewable resources or recycling resources. The grossest neglect has been in respect to energy. Energy is the key to our existence since virtually all our activities spring directly, or indirectly, from it. At present, virtually all of our energy is derived from nonrenewable resources such as coal, oil, gas, etc. Energy will remain the key to our existence, but it will be the renewable forms of energy that comprise that key. To do otherwise and continue emphasis on the fossil fuels will be to lock the door on ourselves.

I feel the other large area of gross neglect is in waste-handling systems. Presently, great quantities of water are used to siphon off a valuable resource. The result is excessive pollution and loss of a recyclable resource.

The following section is devoted to systems and solutions which enable the built environment to utilize natural cycles and resources with a lesser impact than conventional means.

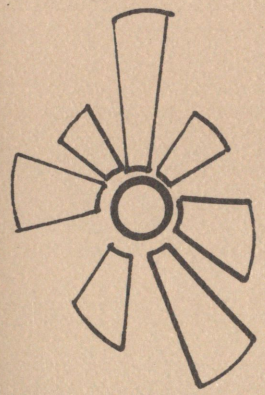
-SOLAR-

FOCUSING COLLECTOR-



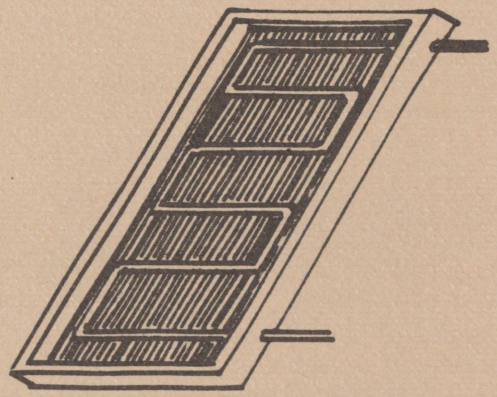
THESE COLLECTORS CAN PRODUCE EXTREMELY HIGH TEMPERATURES FROM 300°F-1000°F. THESE TEMPERATURES ARE CONCENTRATED ON A SMALL AREA AT THE FOCAL POINT OF THE COLLECTOR. TO BE EFFECTIVE, THESE UNITS MUST HAVE SOME AUTOMATIC DRIVE MECHANISM TO TRACK THE SUN ON ITS DAILY ARC.

DUE TO THE HIGH TEMPERATURES, FOCUSING COLLECTORS MAKE IDEAL SOLAR COOKERS. THEY CAN ALSO BE USED FOR HOT WATER SUPPLY AND SPACE HEATING. RECENTLY, THEY HAVE BEEN DEVELOPED FOR ELECTRICITY GENERATION. WATER IS TURNED TO STEAM AT THE FOCAL POINT BY THE HIGH TEMPERATURES. THIS STEAM TURNS A TURBO-GENERATOR WHICH PRODUCES ELECTRICITY FOR IMMEDIATE USAGE OR STORAGE IN BATTERIES. THESE COLLECTORS ARE 50% EFFECTIVE, OR SLIGHTLY MORE. FOCUSING COLLECTORS ARE INEFFECTIVE ON CLOUDY DAYS.



FLAT-PLATE COLLECTOR-

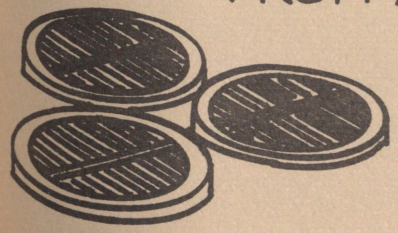
THESE COLLECTORS PRODUCE TEMPERATURES GENERALLY AROUND 140° F. THESE COLLECTORS ARE STATIONARY, AND CAN BECOME AN INTEGRAL PART OF THE BUILDING DESIGN. THEY ARE MANUFACTURED BY QUITE A FEW COMPANIES AND ARE RELATIVELY INEXPENSIVE. THESE COLLECTORS COLLECT FROM 40%-70% OF THE SUN'S INCIDENT ENERGY. THEY CAN OPERATE EFFECTIVELY WITH DIFFUSE RADIATION ON CLOUDY OR HAZY DAYS. SOME OF THE NEWLY-DEVELOPED PANELS ARE RATED TO BE CAPABLE OF DELIVERED TEMPERATURES IN EXCESS OF 250° F.



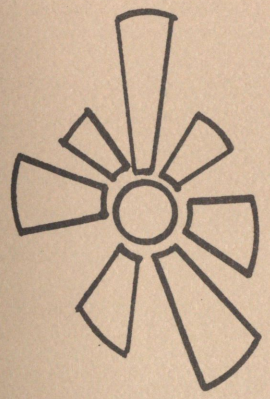
THESE COLLECTORS CAN BE UTILIZED FOR HOT WATER SUPPLY AND SPACE HEATING & COOLING.

SOLAR CELLS-

THESE CELLS, GENERALLY OF SILICON, CONVERT HEAT FROM THE SUN DIRECTLY INTO ELECTRICITY.



THESE CELLS RANGE FROM 14%-20% EFFICIENCY AND THEY ARE QUITE EXPENSIVE. IMPROVEMENTS IN THIS AREA ARE QUITE RAPID, SO EFFICIENCY WILL GO UP AND EXPENSES WILL GO DOWN. THESE CELLS COME IN MODULAR PANELS OR RIBBON STRIPS. STORAGE IN BATTERIES.

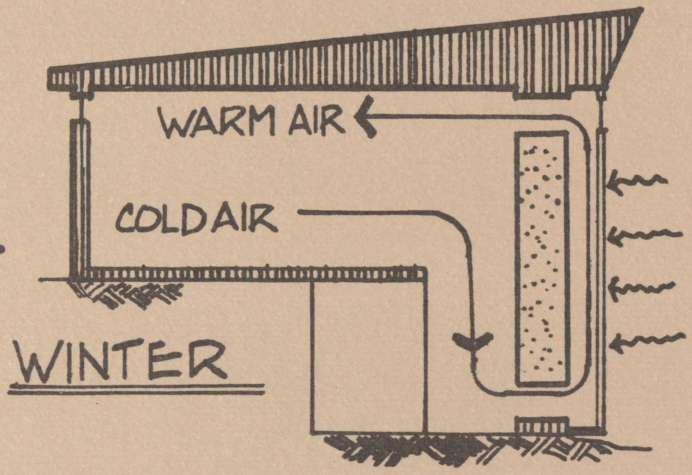


TROMBE-MICHEL WALL-

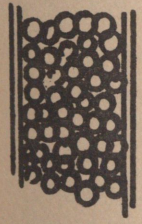
THIS INTEGRATED SYSTEM SERVES AS STRUCTURE, COLLECTOR, AND STORAGE RECEPTACLE. THE SYSTEM CONSISTS OF A MASSIVE, SOUTH-FACING, CONCRETE WALL PAINTED BLACK. A "GREENHOUSE" EFFECT IS ACCOMPLISHED BY A COVER SHEET OF GLASS OR PLASTIC. SINCE CONCRETE HAS A THERMAL CAPACITY 60% THAT OF WATER, IT DOES A GOOD JOB OF STORING HEAT.

THE SUN HEATS THE AIR BETWEEN THE GLASS AND THE WALL CAUSING IT TO RISE DISPLACED BY COLDER AIR. THUS, A NATURAL CIRCULATION IS SET UP AND THE ROOM IS HEATED BY CONVECTION. AT NIGHT, THE CONCRETE WALL RADIATES HEAT INTO THE ROOM.

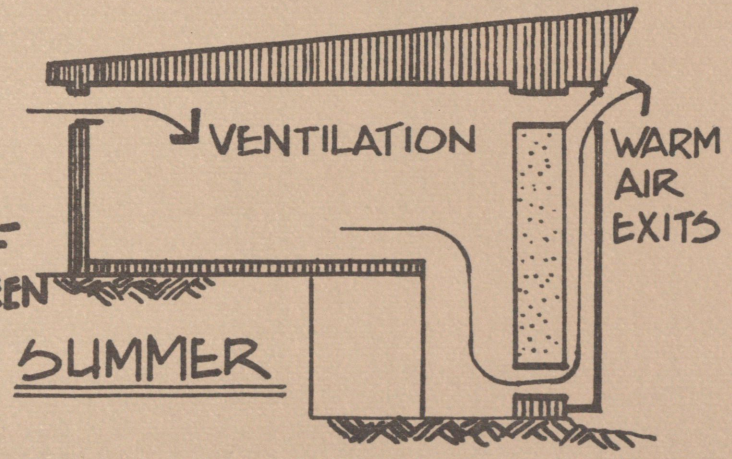
THESE SYSTEMS WORK BEST WITH INSULATION APPLIED OVER THE COVER GLASS AT NIGHT TO PREVENT HEAT LOSS AND DURING SUMMER TO PREVENT HEAT GAIN.



BEADWALL-



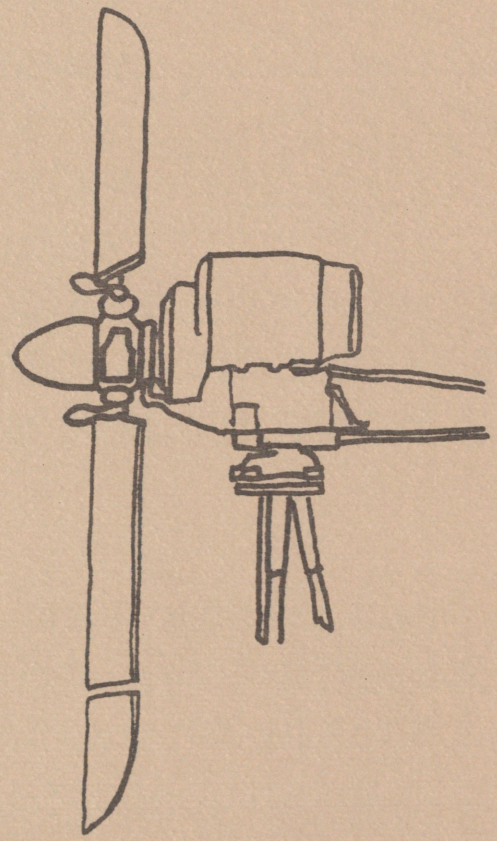
THIS SYSTEM CONSISTS OF A BLOWER PUSHING THOUSANDS OF PLASTIC INSULATING BEADS INTO THE AIRSPACE BETWEEN PANES OF GLASS TO ACT AS INSULATION. COULD BE USED ON WINDOWS, COLLECTORS, AND THE TROMBE-MICHEL WALL.



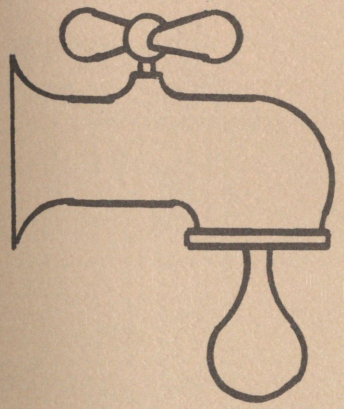


-WIND-

WIND GENERATOR-

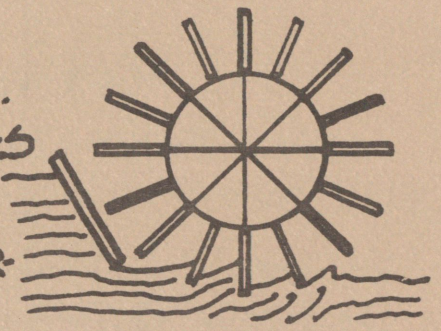


THE THEORETICAL MAXIMUM POWER THAT CAN BE CONVERTED FROM WIND POWER TO ELECTRICITY IS 59.3%. THE BEST WIND GENERATORS WILL LOSE 30% OF THAT IN THE ROTOR, 10% IN THE GEARING, AND 20% IN THE GENERATOR. THIS MEANS WIND GENERATORS ARE 30% EFFICIENT IN TRANSFORMING WIND POWER TO ELECTRICAL POWER. THE MOST DESIRABLE FEATURE OF WIND POWER IS THAT POWER INCREASES AS THE SQUARE OF THE PROP DIAMETER AND AS THE CUBE OF THE WIND VELOCITY. THIS MEANS IF THE PROP DIAMETER IS DOUBLED, THE POWER IS INCREASED 4 TIMES. IF WIND SPEED IS DOUBLED, POWER OUTPUT INCREASES BY 8!



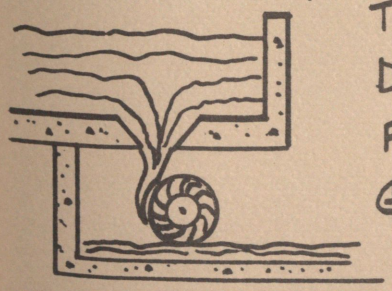
-WATER-

WATERWHEEL-



THIS IS A "LOW TECHNOLOGY" FORM OF SUPPLYING POWER. THE WHEEL CAN BE GEARED TO TURN LOW-SPEED MACHINES SUCH AS SAWS, LATHES, ETC. BY MEANS OF BELTS & PULLEYS, THE SLOW-TURNING WHEEL CAN BE COUPLED TO A FASTER-TURNING GENERATOR TO PRODUCE ELECTRICITY. WATER-WHEELS RANGE FROM 30%-85% EFFICIENCY IN THIS CONVERSION. THEY DO REQUIRE SMALL DAMS TO PRODUCE HEAD PRESSURES FROM 3-10 FEET. WATERWHEELS ARE LITTLE AFFECTED BY VARIANCE IN FLOW RATES AND SILT OR SAND WILL NOT DAMAGE THE WHEEL.

TURBINES-



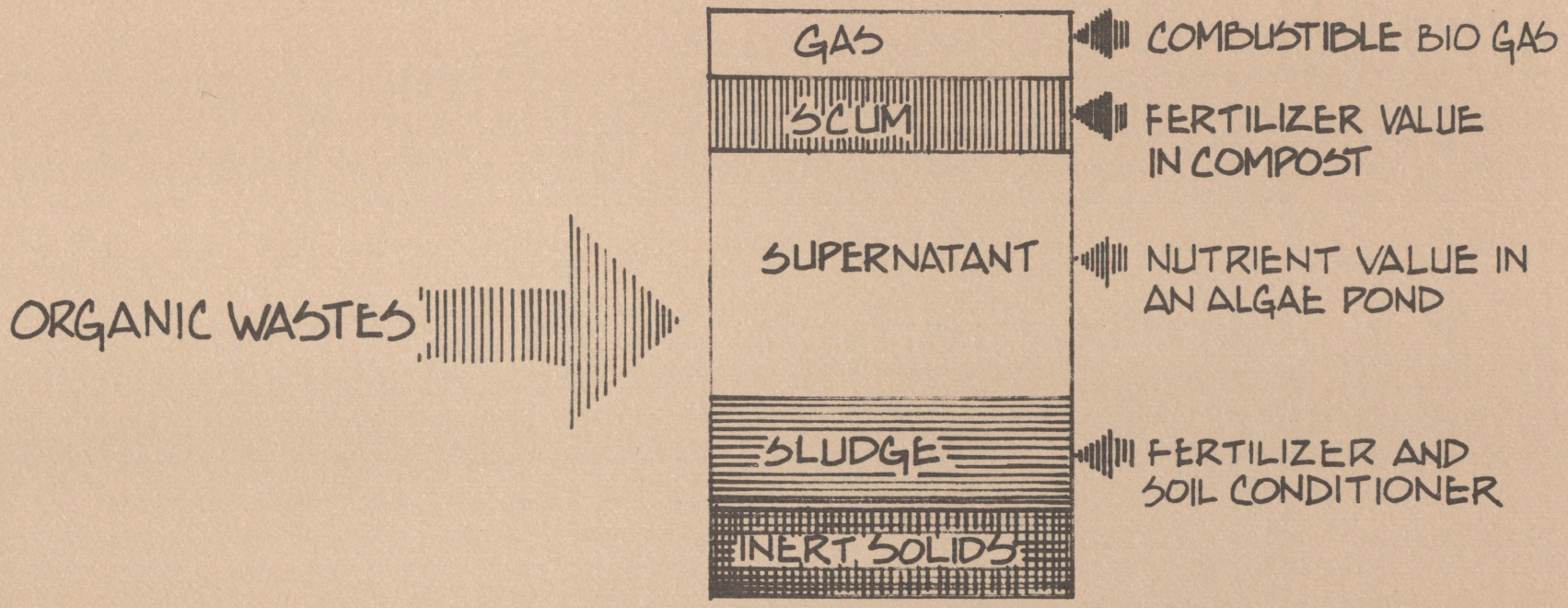
THESE ELECTRICITY GENERATORS ARE "HIGH TECHNOLOGY" DEVICES AND REQUIRE GREAT CARE IN INSTALLATION. THEY ARE FROM 80%-90% EFFICIENT AND WELL-SUITED TO ELECTRICAL GENERATION. HOWEVER SILT CAN DAMAGE THEM AND THEY REQUIRE FROM 3 TO 26 FEET OF HEAD.



-BIO-GAS-

METHANE DIGESTER-

THIS DIGESTER IS PART OF A WASTE-HANDLING SYSTEM. AS ORGANIC WASTES DECOMPOSE IN AN OXYGEN-FREE ATMOSPHERE BIO-GAS IS GIVEN OFF. THIS BIO-GAS IS BASICALLY TWO PARTS METHANE TO ONE PART CARBON DIOXIDE AND HAS ROUGHLY 2/3 THE HEAT VALUE OF METHANE. IT CAN BE USED IN GAS STOVES AND GAS-FIRED WATER HEATERS. THIS SYSTEM REQUIRES SOME FREQUENT ATTENTION, BUT PRODUCES A RENEWABLE FORM OF ENERGY AND BY-PRODUCTS OF VALUE SUCH AS SOIL CONDITIONERS AND FERTILIZERS BESIDES DISPOSING OF ORGANIC WASTES.

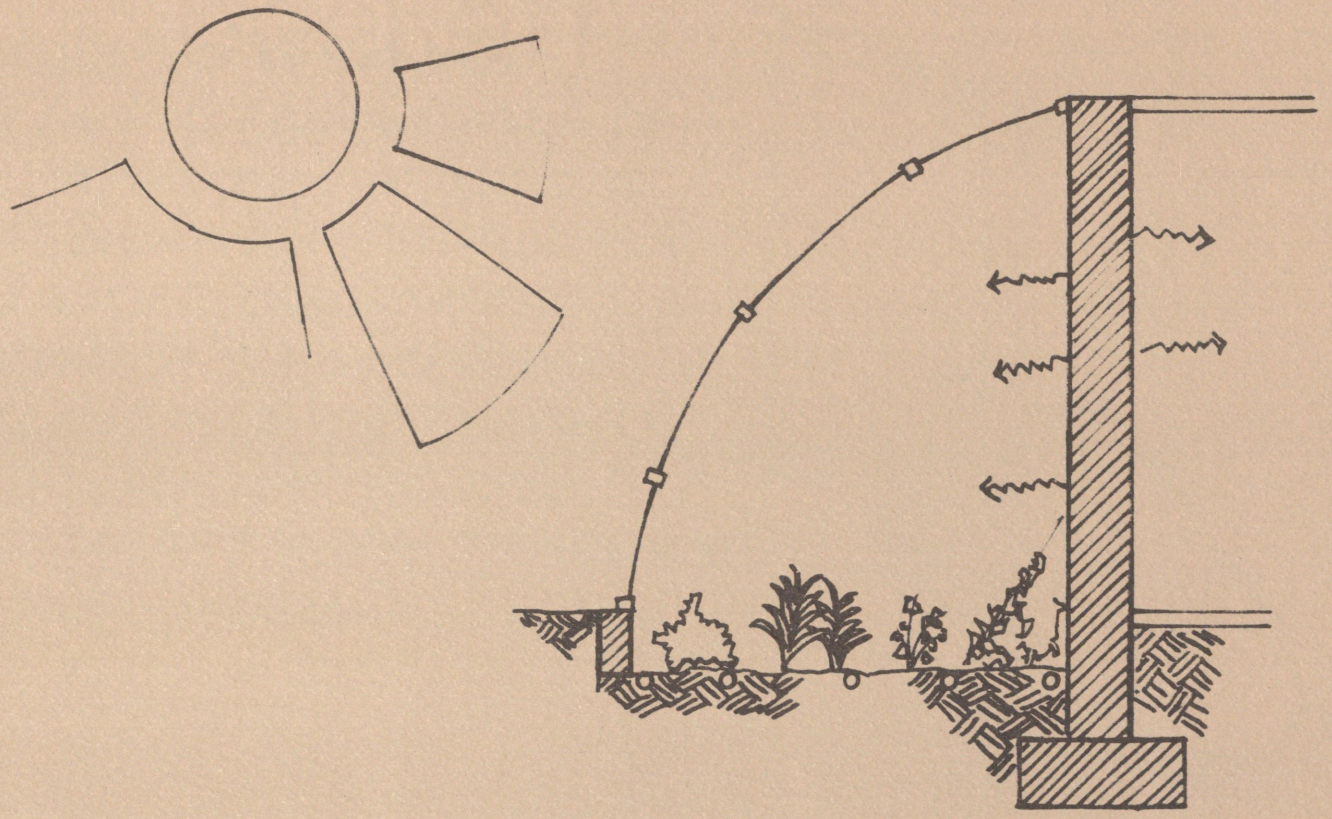


METHANE DIGESTER-

TAKES ORGANICALLY PRODUCED WASTES AND RECYCLES THEM INTO RESOURCES. ORGANIC WASTES CONSIST OF HORSE MANURE, COW MANURE, HUMAN EXCRETA, VEGETABLE WASTES, ETC. BIO-GAS CAN BE USED FOR HEATING WATER, COOKING, AND RUNNING COMBUSTION ENGINES. SCUM AND SLUDGE HAVE VALUE AS SOIL CONDITIONERS AND FERTILIZERS. HEAT ADDS GREATLY TO THE SPEED AND EFFICIENCY OF THIS PROCESS. THIS IS AN ANAEROBIC PROCESS.

COMPOSTING-

IN THIS PROCESS ORGANIC WASTES, GENERALLY VEGETABLE AND KITCHEN WASTES, ARE MIXED WITH SOIL IN A LARGE PILE. HIGH TEMPERATURES ARE GENERATED CAUSING DECOMPOSITION INTO PLANT NUTRIENTS.

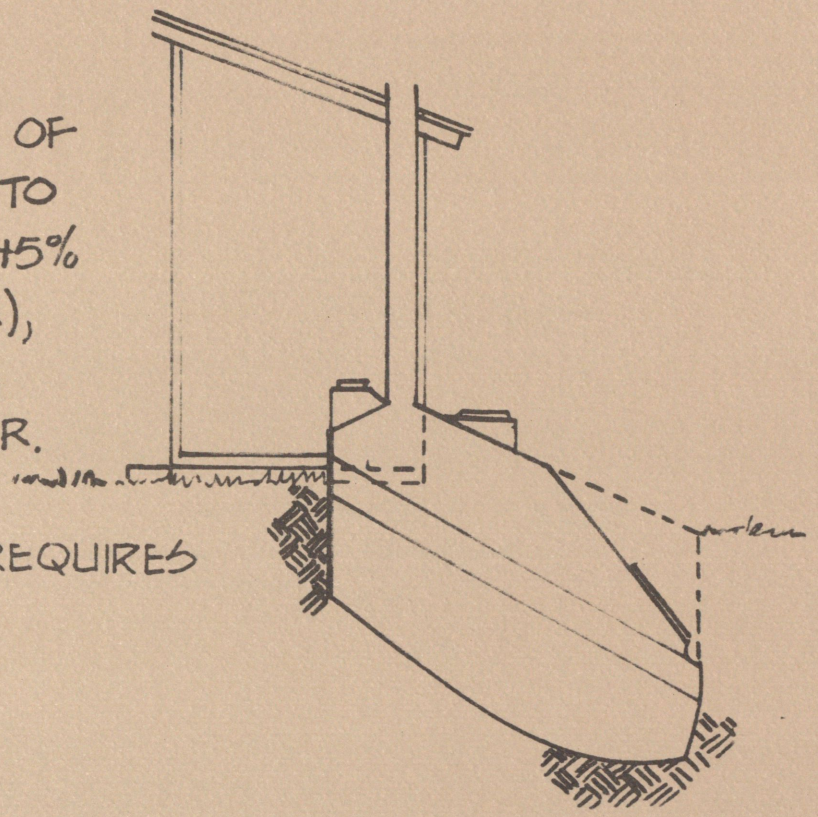


BIOSPHERE-

A MINI-GREENHOUSE FACING SOUTH. IT OPERATES MUCH LIKE A TROMBE-MICHEL WALL BY STORING HEAT DURING THE DAY AND RADIATING THIS HEAT DURING THE NIGHT. HEAT FROM THE SUN IS ALSO ABSORBED BY THE PLANTS AND THE GROUND AND TUBES OF WATER HALF-BURIED IN GROUND. EXCESS HEAT CAN BE VENTED INTO INTERIOR SPACES.

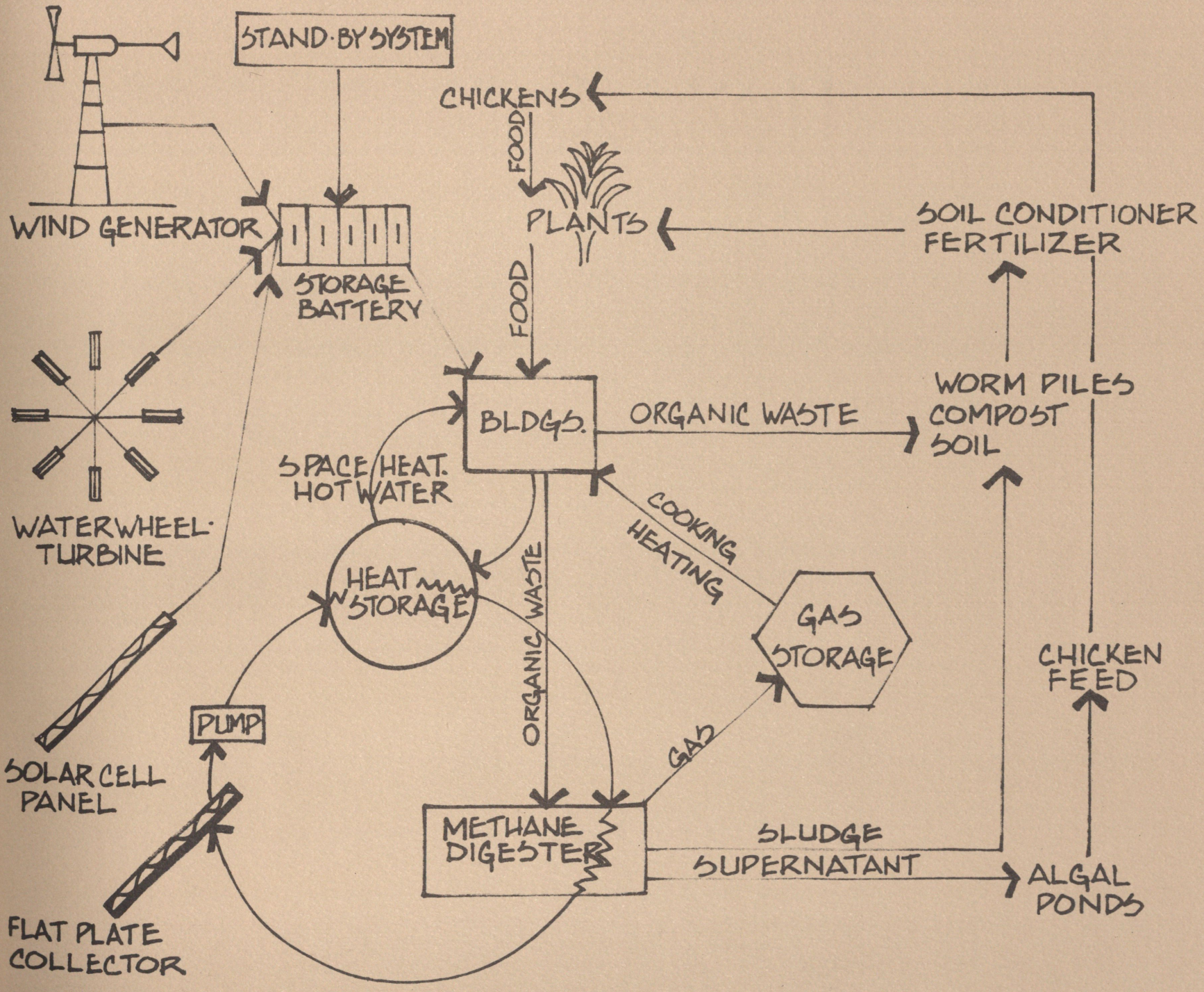
CLIVUS MULTRUM-

THIS SYSTEM ORIGINATED IN SWEDEN ABOUT 20 YEARS AGO. THE ADVANTAGES OF THIS SYSTEM ARE: NO WATER REQUIRED TO CARRY AWAY WASTES (CAN ACCOUNT FOR 45% OF A HOUSEHOLD'S WATER CONSUMPTION), IT KEEPS WASTES OUT OF THE WATERWAYS, AND PRODUCES A GOOD SOIL CONDITIONER. UNFORTUNATELY, THIS AEROBIC PROCESS CAN PRODUCE UNPLEASANT ODORS AND REQUIRES SOME HEAT IN COLDER CLIMATES.



WORM PILES-

WORMS LIKE ENVIRONMENTS OF MANURE, SOIL AND ORGANIC WASTES. THEY WILL CONSUME THESE WASTES LEAVING THEIR OWN EXCREMENT, CALLED "CASTINGS." THESE CASTINGS MAKE AN EXCELLENT FERTILIZER. DUE TO THEIR FAST RATE OF REPRODUCTION, WORMS CAN REDUCE LARGE PILES OF ORGANIC WASTES, SUCH AS VEGETABLE WASTES, RAGS, AND PAPER TO A FERTILIZER MUCH SMALLER IN VOLUME THAN THE ORIGINAL PILE. THE SURPLUS OF WORMS CAN BE USED AS A FOOD SOURCE, OR SOLD AS BAIT.


STAND-BY SYSTEM
CHICKENS
FOOD
WIND GENERATOR
PLANTS
SOIL CONDITIONER
FERTILIZER
STORAGE
BATTERY
FOOD
WORM PILES
COMPOST
SOIL
BLDGS.
ORGANIC WASTE
SPACE HEAT.
HOT WATER
WATERWHEEL
TURBINE
COOKING
HEATING
HEAT
STORAGE
ORGANIC WASTE
GAS
STORAGE
CHICKEN
FEED
PUMP
SOLAR CELL
PANEL
GAS
METHANE
DIGESTER
SLUDGE
SUPERNATANT
ALGAL
PONDS
FLAT PLATE
COLLECTOR

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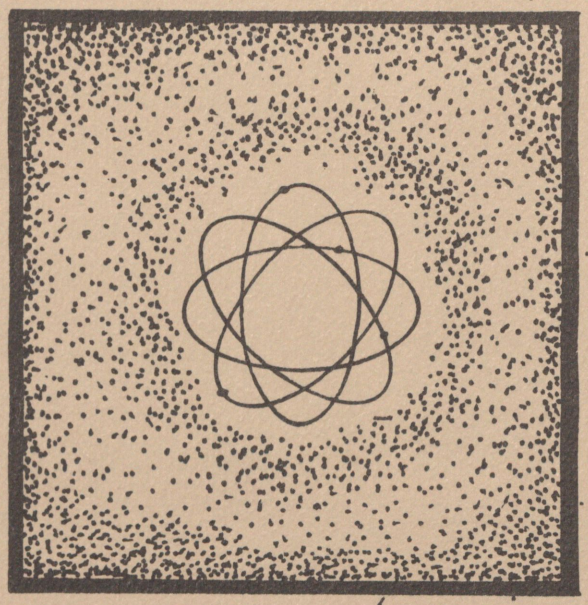
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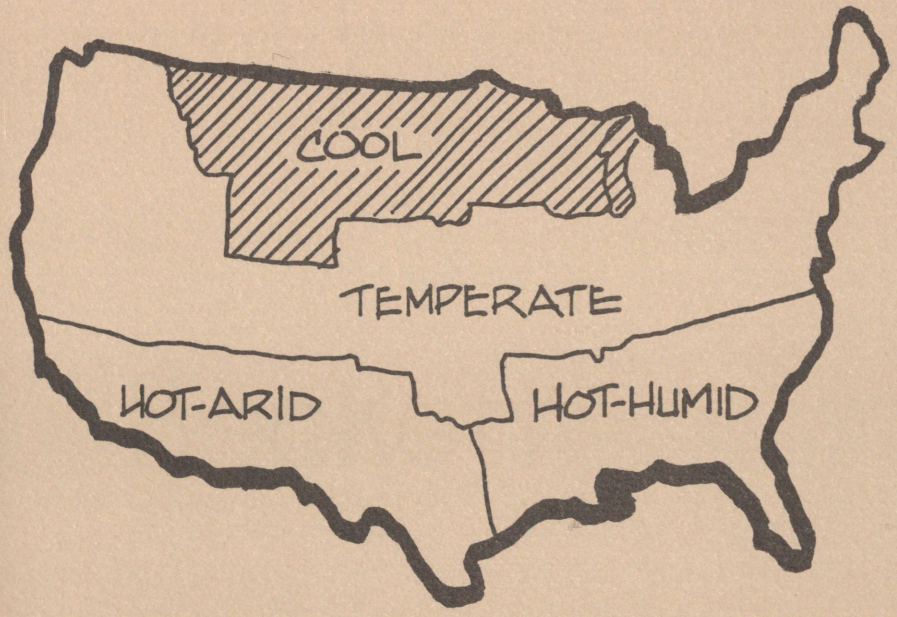
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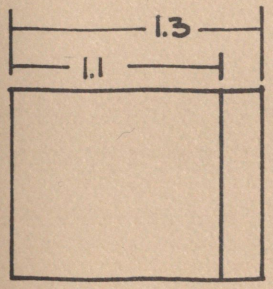


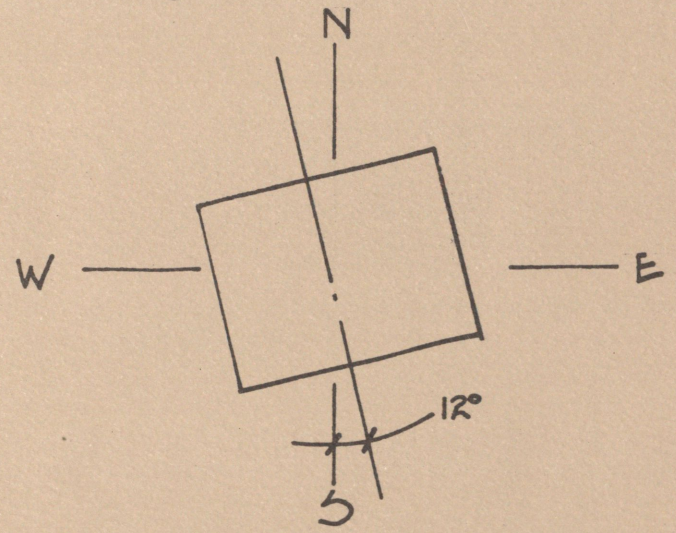
ENERGY CONSERVATION

In order for the renewable forms of energy to be most effective, it is essential that the energy is utilized efficiently and waste is minimized. Basically this means a building should maximize its use of incoming energy and should minimize the outflow of energy that has not been used efficiently. In other words, energy conservation is as important in building design as the forms of energy themselves.

There are many ways to conserve energy in the design of a building. In the following section, I have illustrated some of these methods that may have particular relevance to the design of the retreat.

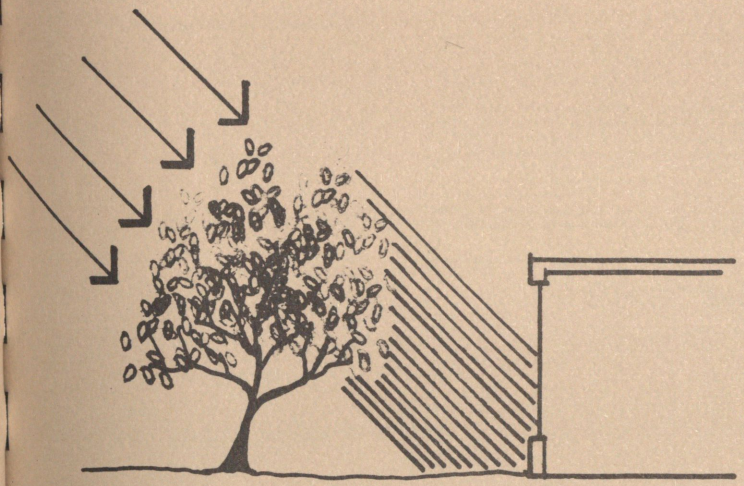




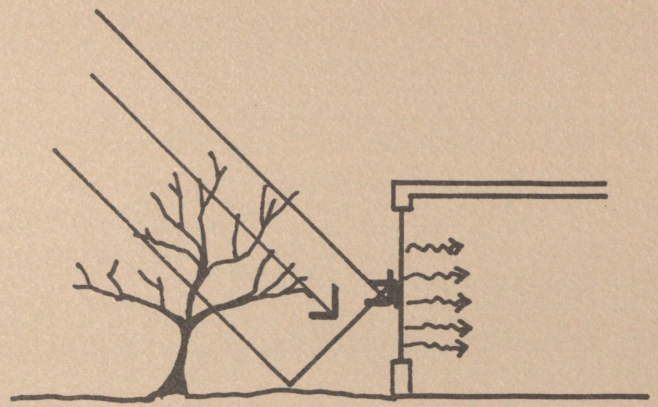


THE CLIMATIC REGION FOR THE SITE IS DESIGNATED AS COOL. ACCORDING TO OLGYAY THE OPTIMUM SHAPE FOR A BALANCED CONDITION IS LONGER ON THE EAST-WEST AXIS. IT FACES 12° EAST OF SOUTH.*

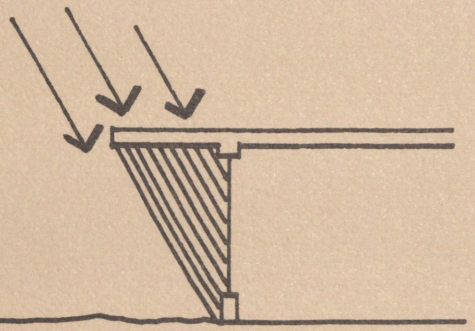
* TAKEN FROM "DESIGN WITH CLIMATE" BY VICTOR OLGYAY



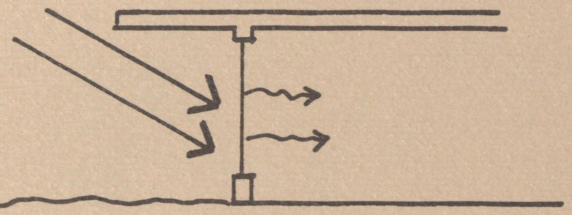
SUMMER



WINTER

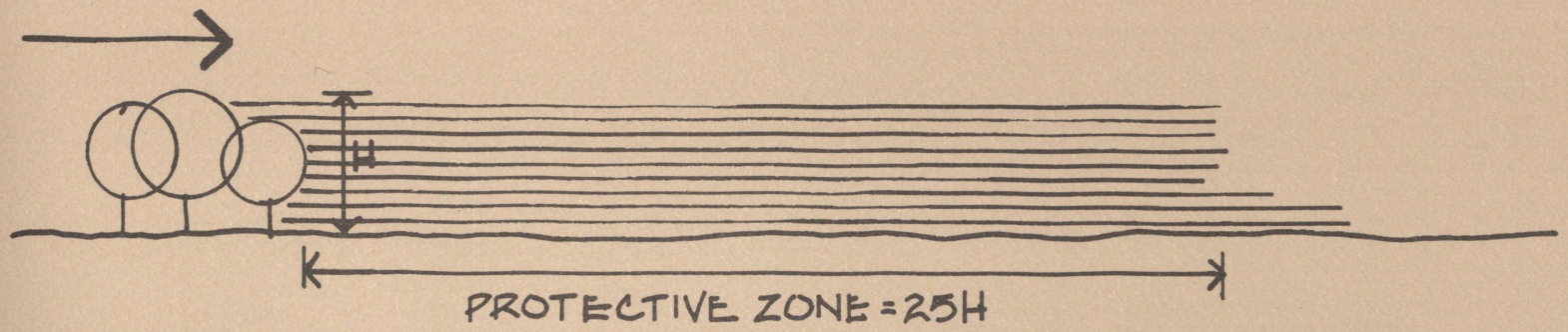


SUMMER

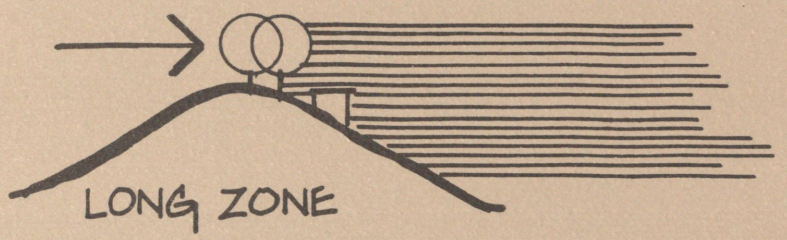


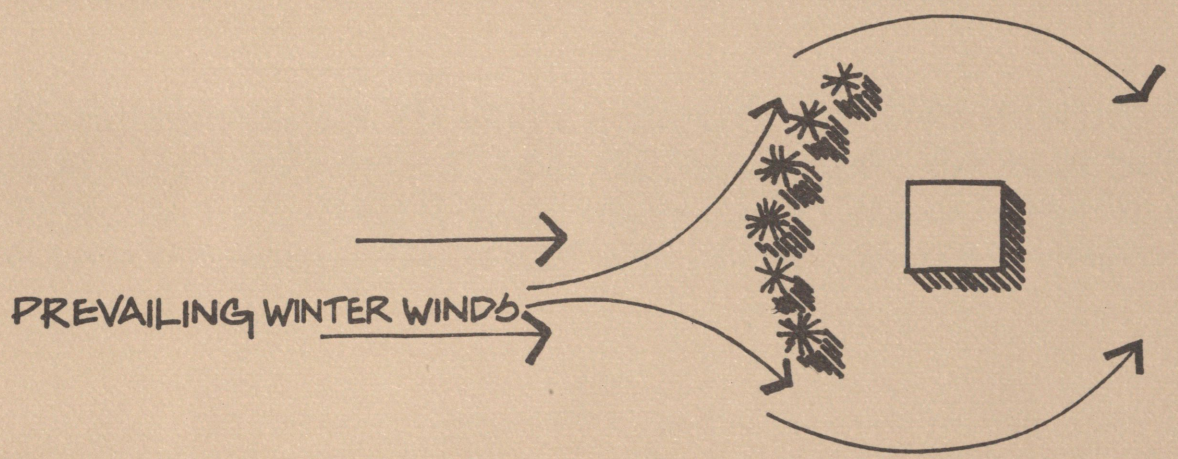
WINTER

SHADING - THE USE OF DECIDUOUS TREES OR OVERHANGS CAN LESSEN HEAT GAIN IN SUMMER WITH LITTLE ADVERSE EFFECT ON WINTER HEAT GAIN.

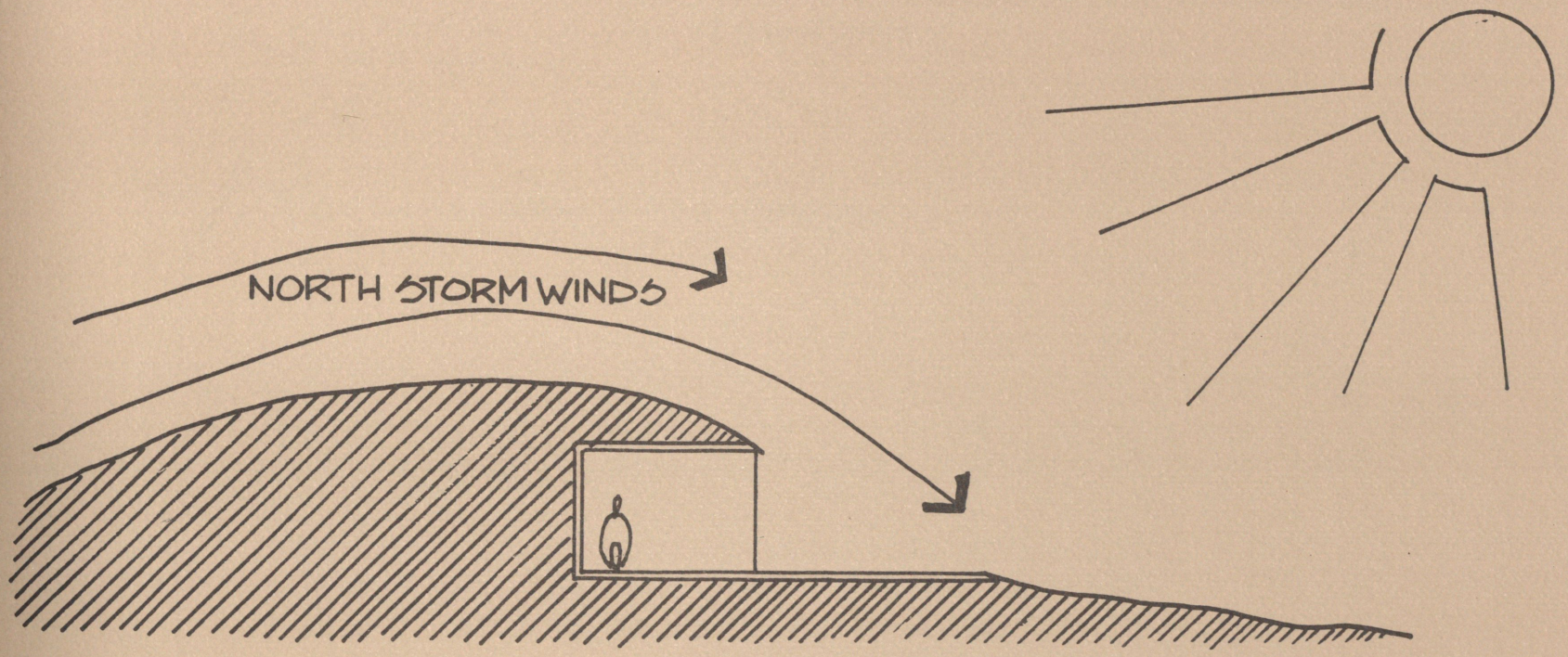




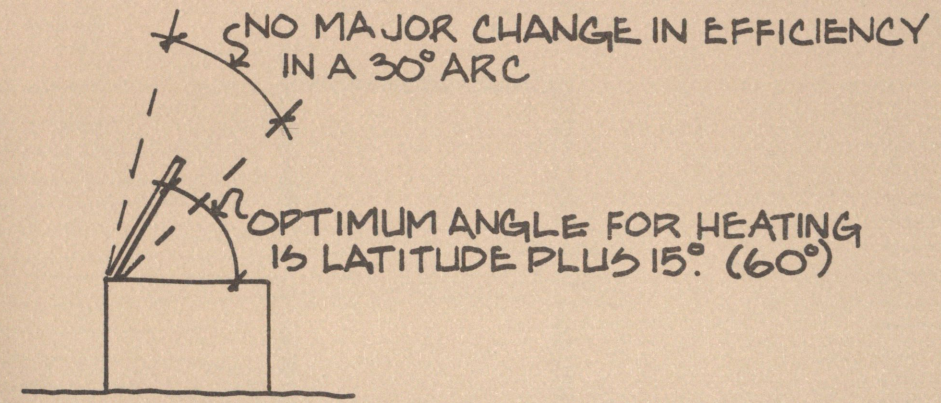


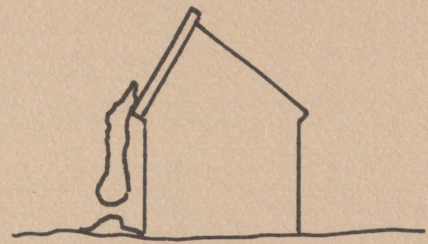


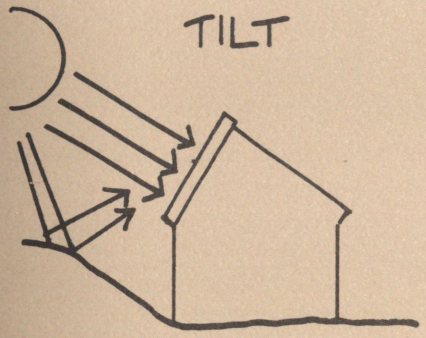
WIND - TREES CAN BE EFFECTIVE IN REDUCING WIND VELOCITY THUS REDUCING HEAT LOSS. CONIFERS ARE DENSER SO THEY MAKE GOOD WINDBREAKS AGAINST WINTER WINDS.

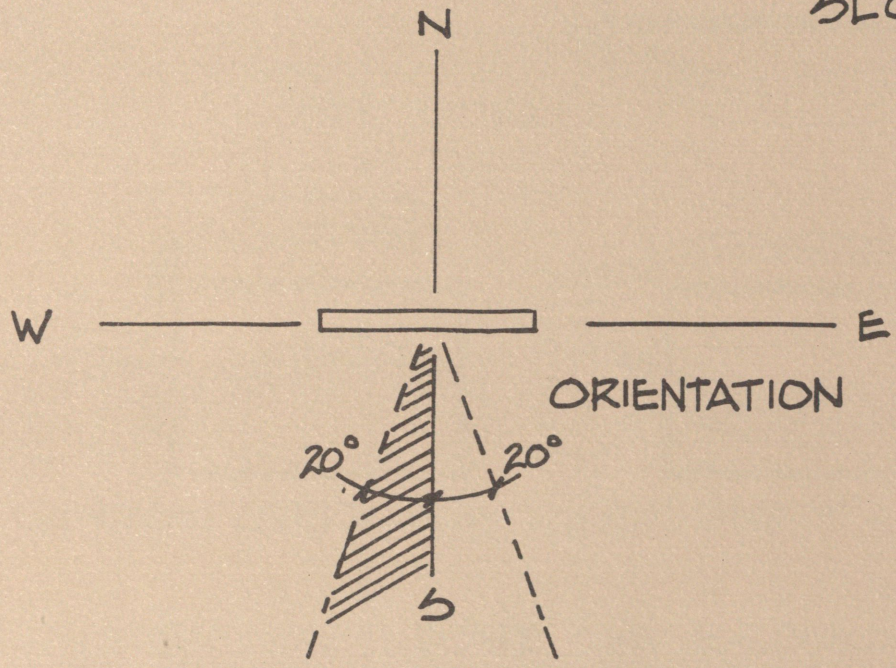


BERM - BERMING OR BURYING PARTS OF THE STRUCTURE CAN REDUCE HEAT LOSS IN WINTER AND REDUCE HEAT GAIN IN SUMMER. PENETRATION IN THE SOUTH-FACING SLOPE WILL MAXIMIZE WINTER HEAT GAIN AND PROVIDE PROTECTION FROM STORM WINDS.

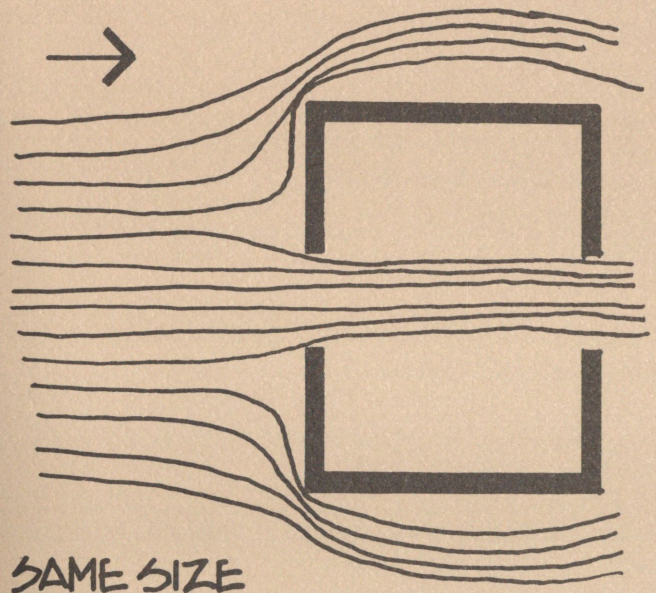




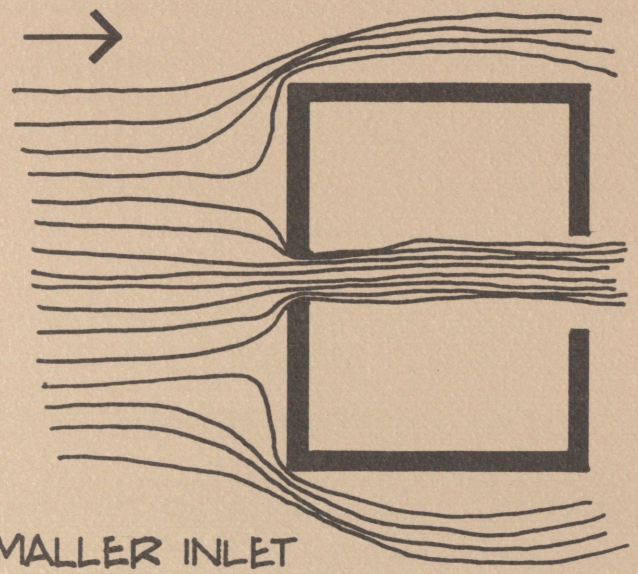




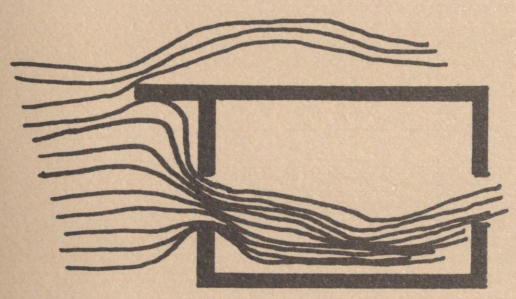
COLLECTORS - STEEP COLLECTORS SHED SNOW, RAIN, AND DIRT EASILY. THEY ALSO CAN BE MORE EFFECTIVE DUE TO REFLECTANCE OFF OF SNOW. COLLECTORS ARE EFFECTIVE UP TO 20° EITHER SIDE OF SOUTH. I FAVOR WEST OF SOUTH DUE TO HIGHER AMBIENT TEMPERATURES IN THE AFTERNOON.



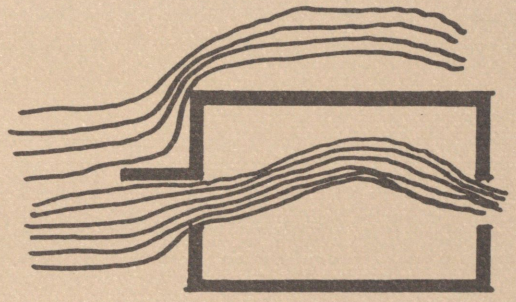
SAME SIZE



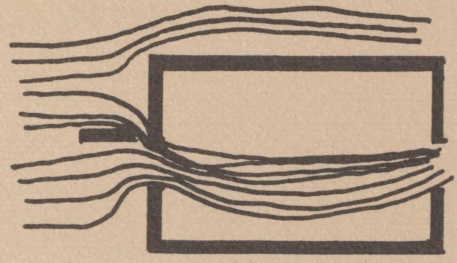
SMALLER INLET



ROOF OVERHANG



WINDOW OVERHANG



OVERHANG w/ SLOT

VENTILATION - IN THE COOL CLIMATE, SPACE COOLING IS MINIMAL AND NATURAL VENTILATION IS SUFFICIENT TO MAKE SPACES COMFORTABLE. DUE TO THE VENTURI EFFECT, AN INLET SHOULD BE SMALLER THAN THE OUTLET TO INCREASE SPEED OF AIR FLOW. THE POSITION OF THE INLET DETERMINES THE PATH OF AIR FLOW. IF THE INLET IS HIGH, FLOW IS HIGH AND IF THE INLET IS LOW, FLOW IS LOW. THE POSITION OF THE OUTLET HAS LITTLE EFFECT. AS SHOWN, OVERHANGS CAN AFFECT THE FLOW PATH UP OR DOWN.*

* TAKEN FROM "DESIGN WITH CLIMATE" BY OLGYAY

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PROGRAMMING

In the development of my thesis project I have felt very strongly that the programming of the project was a vitally important element in the design process. For that reason I conceived an idea I felt was worth developing and have struggled to bring that idea into focus from my first vague notions. The definition of spaces, functions, and activities of the retreat has proven to be a demanding, involved process that I was ill prepared for. In school, we have always been given prepared programs and formats to design within and the freedom that thesis offers in that area can truly become the most difficult part of the design process.

I envision Terranatus as a combination of many existing facilities to produce a complex which is unique as an existing entity. In that frame of thinking, I have developed the program of the retreat using criteria from various building types and my own personal viewpoint. In this process I used "Time-Save Standards for Building Types" and "Architectural Graphic Standards" quite extensively as references.

In developing this thesis project, I have found that some limitations must be defined or the project will suffer. To this end, I have adopted some working assumptions for this particular project that will limit the scope of the thesis investigation. These assumptions are idealistic, but by their adoption I feel the solution will be of higher quality, if not of quantity. Granted, the solution may be an ideal, but to fall short of that ideal in reality is still an attempt to question that which now exists, and try to better it.

WORKING ASSUMPTIONS

-MONEY IS NO OBJECT

The operation of the retreat would take more money than the retreat would make from the guest fees so it is assumed that manufacturers of solar collectors, wind generators, etc., would make payments to the retreat for the privilege of displaying their products at the retreat and using it as an experimental testing station.

It is true that the proposed energy and recycling systems are presently fairly expensive items. However the life-cycling costs of such items over the entire life of a building indicate that such systems would actually cost less money in the long run. Besides, all the money in the world will not purchase a pound of coal or a gallon of oil when these nonrenewable resources have been used up.

-OPTIMAL ZONING AND CODES

Zoning ordinances and building codes are intended to maximize property values, establish minimum standards, and protect the safety of the users of a building. However, many codes and zoning laws are restrictive to new and innovative ideas and are based on specific criteria rather than on a performance basis. In order to further my understanding of codes by questioning them rather than simply accepting them, I have assumed that the retreat is located in an area of optimal conditions for my retreat.

-GUESTS ARE COUPLES

In order to maximize the effectiveness of the experience in learning and living at the retreat, I have assumed the guests will generally be couples. By this, I mean the program at the retreat would probably appeal to a certain segment in American society. Specifically, younger people from 18-35 will be most attracted to the retreat lifestyle. However, age is not a vital factor above age 15. Children below that age would find little interest in the curriculum at the retreat and they would require enormous supervision while their parents attended retreat functions. For that reason, I am assuming guests at the retreat will be 15 or older and can be divided into couples. These couples can be two men, two women, a man and a woman, or parents and their children over 15 divided into twos. The division into twos allows for the greatest capacity of guests with the greatest flexibility.

-MASS TRANSPORTATION TO SITE - WEEKLY TURNOVER

It is assumed that the guests will arrive in Cody on or before a predetermined date for their vacation at the retreat. A parking lot will be available in Cody for them to leave their cars during their stay if they drove. A bus will then transport the guests out to the retreat for their stay. This means of transportation is more efficient than cars in terms of energy consumption and eliminates excessive on-site parking. This parking is more in keeping with the urban fabric of Cody.

The guests will arrange to stay at the retreat on a reservation basis. The minimum stay will be one week so that the guests have ample time to truly experience the unique lifestyle at the retreat. Maximum stays will be no longer than three weeks so that turnover allows a greater number of people to experience the retreat.

PROGRAM DEVELOPMENT

BUILDING TYPES:

-Living-

-Residences-maximum privacy, inefficient use of space and energy.

-Apartments-moderate privacy, moderate use of space and moderately efficient use of energy due to common walls. Usually a shared laundry.

-Youth Hostels-little privacy, but maximum social interaction and excellent energy conservation. Common sleeping areas and common dining/lounging areas produce a large multi-use space.

-Communes-little or no privacy, but extremely good energy conservation due to sharing of space and equipment.

-Hotel/Motel-common lobby, lounge, and eating areas. Private sleeping and bathroom facilities. Often a swimming pool and usually daily laundry service by maids.

-Guest Ranch-often seperate, detached guest accommodations. Usually common lounge and dining areas. At most, the guests are part of a "family" and help in the operation of the ranch by working.

-Educational-

-Schools-most schools have "passive" learning areas such as the library and classrooms. The "active" learning areas consist of labs, shops, and studios, etc. The library may become a resource center which provides not only books, but audio-visual equipment and other information aids. Most schools have a multi-purpose room which serves as a gym, an assembly hall, and as a cafeteria. Usually schools have a physical center containing a swimming pool and a gymnasium.

RETREAT APPLICATION:

There should be an emphasis on sharing of spaces for energy conservation and social interaction.

Sleeping areas to be private with shared bathrooms between groups of twenty or so guests.

Possibility of groups of guests sharing lounge areas in guest units containing approximately 10 bedrooms.

Guests to be encouraged to "look after themselves". They will serve themselves while at the retreat.

Cafeteria-style eating and a centralized laundry service. Each guest unit to have a small linen supply from which guests make their own beds.

The retreat should contain classrooms, work shops, craft areas, and an information/resource center.

The dining area should function as an assembly hall and possible recreation room.

A small swimming pool and mini-gym are possible facilities.

BUILDING TYPES:

-Leisure/Recreation-

-General-tennis clubs, golf clubs, health resorts, health spas, Y.M.C.A., etc. are all leisure and recreational facilities. Most of the facilities contain swimming pools, saunas, large multi-purpose rooms, etc. They all try to keep maintenance to a minimum and staff to a minimum that is still effective.

-Personal-I feel outdoor sports and activities are a necessary ingredient for physical well-being and that they promote the closeness of man to nature.

-Camps-are mainly for young people in their teens, but they contain some unique features in relating to the outdoors. Semi-permanent tent structures permit a mixing of indoor/outdoor. Outdoor showers and assembly areas encourage the use of outside space.

-Miscellaneous-

-Greenhouse-can be a strong tie to nature providing a source of food besides being a possible educational device and a place to relax.

RETREAT APPLICATION:

A sauna would be an activity well-suited to the retreat for its emphasis on the human body and the relaxation it provides.

Any physical activities should require minimal staff supervision and maintenance.

Outdoor showers, assembly areas, and barbecue are possible outside spaces for the retreat.

The determination of recreational activities offered at the retreat will be determined by several factors as shown on the matrix (p. 53) devoted to the evaluation of the various activities that could be offered in that particular climatic region. In this evaluation I considered the impact on the environment by the particular activity, the amount of energy it required to function, ease of maintenance, the amount of supervision necessary, and the ease of storage. In this way, I obtained recreational activities that would require little professional input and would respect the environment. Motorized sports failed the evaluation very badly as snowmobiling indicates on the matrix. However, snowmobiles would be possible as emergency vehicles in the winter, but only as emergency vehicles.

■ MAXIMAL
▲ MEDIUM
● MINIMAL

	ENVIRONMENTAL IMPACT	ENERGY USAGE	MAINTENANCE	SUPERVISION	STORAGE
HIKING	●	●	●	●	●
BICYCLING	▲	●	▲	●	▲
FISHING	●	●	●	●	●
CROSS-COUNTRY SKIING	●	●	●	▲	▲
SNOWSHOEING	●	●	●	▲	●
SLEDDING	●	●	●	●	▲
CAMPING	●	●	▲	■	▲
SOFTBALL	●	●	●	●	●
VOLLEYBALL	●	●	●	●	●
CANOEING	●	▲	▲	■	■
HORSESHOES	●	●	●	●	●
ICE SKATING	●	●	▲	●	●
TENNIS	▲	●	▲	●	●
BADMINTON	●	●	●	●	●
BASKETBALL	▲	●	▲	●	●
PICNICKING	●	●	●	●	●
HORSEBACK RIDING	●	●	▲	■	■
RUBBER RAFTING	●	▲	●	■	▲
GOLF	■	▲	■	●	■
SNOWMOBILING	■	■	▲	■	■

In the following two small sections devoted to the program and space requirements, I wish to emphasize that neither is inviolate and free from change. These findings are from the first quarter of thesis and further research and thought may well change some of these findings in the final design solution. A program should be a guide, but not a restraint and since I am functioning as owner/designer these changes would only benefit the final project since usually the owner has defined the program for his needs.

THE PROGRAM

This environmental retreat will accommodate 100 guests. The number of 100 is a result of earlier research and thought which produced a buildable area that is relatively small. Since over-population is itself an affront to the environment, the numbers at the retreat are kept small to produce quality rather than quantity. The number 100 allows for a diversity of programs yet retains the character of a small community or village which is essential to the effectiveness of the overall experience.

EDUCATIONAL:

- 4-Small size classrooms (ability to combine two of the small-size into one large classroom)
- 1-Wood working shop
- 1-Metal working shop
- 1-Painting/drawing studio
- 1-Ceramic/sculpture studio
- 1-Crafts room
- 1-Information/resource center
- Instructors' offices

RECREATIONAL:

- Equipment storage and maintenance
- Swim/Sauna area
- Mini-gym/Physical center

LIVING:

Guest Area (20 guests to a unit)

- 10 bedrooms.....private at 2 per room
- 2 bathrooms.....shared by 20
- 1 lounge.....shared by 20

RECREATIONAL ACTIVITIES:

Hiking	Camping
Bicycling	Fishing
Snowshoeing	Sledding
Volleyball	Softball (space permitted)
Horseshoes	Badminton
Picnicking	Rafting
Cross-country skiing	

PUBLIC:

- Reception/Lobby
- Dining/Assembly
- Relaxation/Conversation areas

Staff Area

Manager & Family	Staff Units
3 bedrooms	1 bedroom
1 living room	1 bed/lounge area
1 bathroom	2 bathrooms-shared
storage	1 large lounge-shared
1 kitchen	

SPACE REQUIREMENTS (continued)

LIVING: BUILDING TYPE:

Guest Units

Living/Loung area

3'-4" minimum traffic land between furniture

6'-0" maximum distance for conversation

For 20 people a minimum common room is 300 square feet.....Youth Hostel

Staff Units

Staff Quarters

1 bedroom 9'-0" x 9'-0" minimum.....Residential

1 bedroom/lounge 12'-0" x 16'-0" minimum.....Hotel

Shared bathrooms (same criteria as guest units)

EDUCATION:

Classrooms

Standard size - 30 places @ 25'-0" x 32'-0"

Small size - 10 to 15 places @ 24'-0" x 26'-0".....School

Arts & Crafts

Shops - 25'-0" x 32'-0"

Studios - 24'-0" x 26'-0".....School

Resource Center

1800 books - 9'-0" x 15'-0" @ 3'-0" aisles

Approximate size of center - 25'-0" x 32'-0".....School

RECREATION:

Swim/Sauna

Small pool - 20'-0" x 40'-0" with 10'-0" terrace around the pool for circulation.....Swimming Hall

Sauna - 50 ft.^{2} for 30 bathers = 1500 ft.^{2}.....Sauna

Physical center 50'-0" x 80'-0" accommodates regulation volleyball, mini-basketball, and 8 table tennis.....Gymnasium

PUBLIC:

Reception/Lobby = 15'-0" x 30'-0" minimum.....Hotel

Dining/Assembly = 12 to 15 ft.^{2} per person.....School

Relaxation/Conversation areas = approximately 600 ft.^{2} each.....Personal judgement

SUPPORT:

Kitchen/Food preparation
Main storage
Laundry/Maintenance
Greenhouse

OUTDOOR SPACE:

Barbecue area
Outdoor assembly/lecture area

MISCELLANEOUS:

Manager/secretary
Mechanical room
Store/Display

STAFF:

Manager.....1
Environmental Ed.....5
Shop instructors.....2
Studio instructors.....2
Crafts.....1
Mental Center.....1
Physical Center.....1
Basic maintenance.....2
Working ranch.....2 (live at existing ranch)
Kitchen.....2
Linen/kitchen.....2
Store.....1
Receptionist.....1
23
(21 at the retreat itself)

SPACE REQUIREMENTS

LIVING:

BUILDING TYPE:

Guest Units (20 guests per unit)

-Bedrooms

	Width	
Twin beds-2 night tables	9'-4" to 12'-2".....	
Double bed-2 night tables	6'-10" to 9'-2".....	Residential
Bed plus passage length	8'-10".....	
6'-0" x 10'-0" per bunk.....		Youth Hostel
Most Hotel rooms = 200 Square feet or more.....		Hotel

-Bathrooms

10 Men = 1 W.C., 1 Urinal, 1 sink, 1 shower
10 Women = 2 W.C., 2 sinks, 2 showers.....Youth Hostel

SPACE REQUIREMENTS (continued)

LIVING: BUILDING TYPE:

Support

Kitchen/Food prep.....School and Hotel
- Food prep. = 640 ft.^{2}
- Serving = 310 ft.^{2}
- Storage = 250 ft.^{2}

Recreation Equipment Storage = approximately 1000 ft.^{2}.....Gymnasium & Camp facility

Main Storage = approximately 800 ft.^{2} .....Personal judgement

Laundry/Maintenance = 300 ft.^{2} minimum .....Residential/Hotel

Mechanical = approximately 1000 ft.^{2} .....Personal judgement

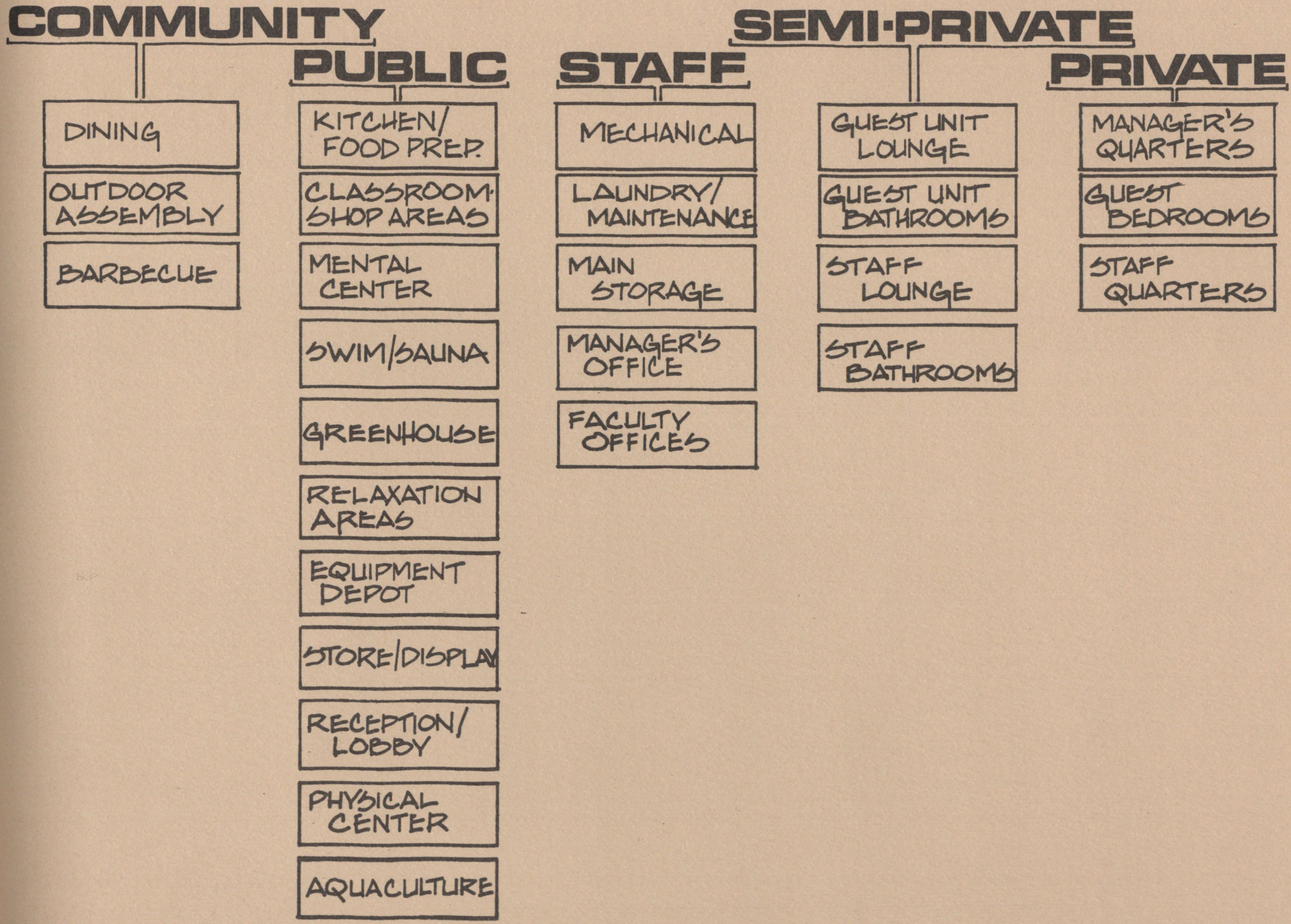
Greenhouse = 1000 ft.^{2} .....School/Commercial greenhouse

Miscellaneous
- Manager/Receptionist = 100 ft.^{2} minimum apiece .....Personal judgement
- Store/Display = 400 ft.^{2} minimum.....Small store

Outdoor Spaces
- Assembly/Lecture = a hemisphere of 600 ft.^{2} minimum.....Camp facility
- Barbecue Area = 600 ft.^{2} .....Personal judgement
- Outdoor Showers = 400 ft.^{2} .....Camp facility

ROUGH TOTALS:

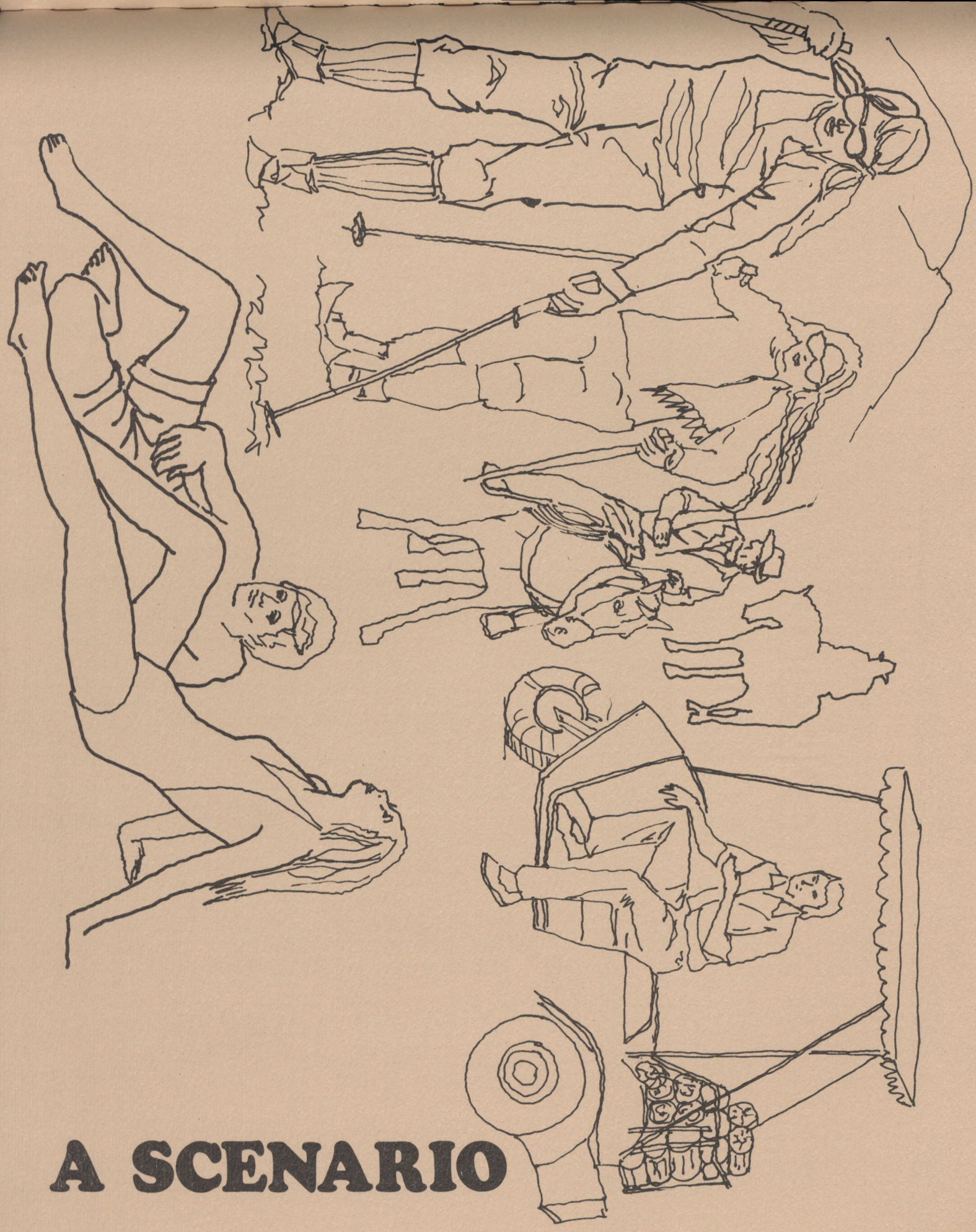
	Ft.^{2}		Ft.^{2}
Guest Units (5 units).....	2600	Educational area.....	7500
Staff unit.....	4000	Swim/Sauna.....	4400
Manager's Quarters		Physical center.....	4000
Kitchen, 3 bedrooms, storage, and 1 bathroom.....	1100	Reception/Lobby.....	450
Relaxation Areas.....	1200	Kitchen/Dining.....	3000
Greenhouse.....	1000	Mechanical.....	1000
Equipment Depot.....	1000	Main Storage.....	800
Store/Display.....	600	Laundry/Maintenance.....	500
		Managerial Offices.....	200


COMMUNITY
PUBLIC
DINING
OUTDOOR ASSEMBLY
BARBECUE
KITCHEN/ FOOD PREP.
CLASSROOM/ SHOP AREAS
MENTAL CENTER
SWIM/SAUNA
GREENHOUSE
RELAXATION AREAS
EQUIPMENT DEPOT
STORE/DISPLAY
RECEPTION/ LOBBY
PHYSICAL CENTER
AQUACULTURE
SEMI-PRIVATE
STAFF
MECHANICAL
LAUNDRY/ MAINTENANCE
MAIN STORAGE
MANAGER'S OFFICE
FACULTY OFFICES
GUEST UNIT LOUNGE
GUEST UNIT BATHROOMS
STAFF LOUNGE
STAFF BATHROOMS
PRIVATE
MANAGER'S QUARTERS
GUEST BEDROOMS
STAFF QUARTERS

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A SCENARIO

The following first-person narrative is intended to convey some idea of the goals and purposes of my project. Hopefully, an indication of the imagery begins to emerge.

A DAY IN THE LIFE OF A GUEST

Why I awakened I don't know, but I think it was the lack of noise. By that I mean car horns weren't blaring, television sets and radios weren't blasting, mixers weren't grinding...there just wasn't any noise. I did hear sounds, but they were pleasant sounds of nature. The birds were chirping outside the open window to our bedroom while a gentle morning breeze ruffled the summer leaves of the nearby cottonwood trees. I could hear the fresh mountain water in Big Creek splashing and swirling along its rocky path as it tumbled past the retreat on its way to join the North Fork of the Shoshone River in the bottom of the Wapiti Valley.

I arose and crossed the bedroom to open the door to our room. The scenery visible thru the south-facing windows of the guest unit was unbelievably breath-taking. Since none of the other guests were up and about, I crossed the lounge area and leaned against the double-paned thermal glass to drink in the scene in front of me. I could feel the warmth of the sun thru the glass and marveled at this natural energy source. Just then, a movement to my left attracted my attention and I turned just in time to see the Skylid insulated louver system over the stair-well swinging open. On this louver system are two tubes filled with freon. When the sun warms the outside tube the freon evaporates and transfers to the inside tube where the cooler temperatures cause the freon to condense. This shift of weight causes the louvers to open and admit the heat and light from the sun. Later on, when the sun is low, the heat coming thru the skylight is diminished and the inside temperatures are higher so the freon reverses its cycle and the louvers swing shut to trap the solar heat inside the living areas.

I also knew that that same sun would be heating the black surfaces of the solar collectors above me on the roof. Yesterday I had learned in a retreat class that when the collectors have heated to a temperature slightly higher than the water temperature in the storage tank, thermostats would be triggered and circulation would begin. I remembered my instructor had said utilizing power from the sun made sense because the sun is a constant source of power, and solar power is clean and free from pollutants. I knew the sun was an unlimited source of power and felt that tapping its power offered an attractive future for mankind. At least here at the retreat they are trying to make that future possible.

I shifted my gaze, upwards, to the snow-capped monolith confronting me across the green valley. Mountainous scenery literally surrounded the retreat, but the vista before me eclipsed all the other views. Ptarmigan Mountain, looming over 12,000 feet in altitude, captivated my thoughts as it struck home the feeling that we humans are puny when compared to nature. As Francis Bacon said many years ago; "We cannot command nature except by obeying her."

I returned to our room to find my wife, Marilyn, already awake. We dressed and then stripped the sheets from our bed so we could drop them in the downstairs laundry closet on our way to breakfast in the main lodge. At the retreat, the guests were expected to look after themselves and participate in some chores to help run the retreat. A linen closet was located in each guest unit containing a receptacle for soiled linen and shelves of fresh linen. In this way, the guests could change their linen and towels when they felt they needed clean replacements. This policy meant doing some tasks which we would not be expected to do at Holiday Inn, but the work was minimal

when divided among the 100 guests. More importantly, we met people much quicker when working beside them and our bill was much less than comparable vacation spots. The retreat could operate with less staff meaning less overhead since we guests help run the place. This reduction meant reduced rates for us, and to a young couple, like Marilyn and myself, that made the difference between a three-day vacation and a seven-day vacation.

On our way to the main lodge we were passed by one of the adapted golf carts they use at the retreat. These carts run on rechargable batteries supplying electrical current to the drive mechanisms. This meant the carts made very little noise and could be recharged from the electricity produced at the retreat by the wind generators and water turbines. These carts are used to carry linen and firewood to the guest unit or ferry supplies up to the educational center.

We continued on to the main lodge and proceeded to the dining room, the largest room at the retreat, to eat the buffet-style breakfast. We sat with a young couple from Minnesota that lived in our guest unit. At the retreat there are five guest units containing twenty guests in ten rooms. These twenty people share a common living area and bathroom facilities so we meet the people in our guest unit fairly quickly. This couple consisted of a man and wife and most of the couples at the retreat were married. However there were many single people such as two college students sharing a room, or two bachelors interested in the environment, two secretaries on vacation, etc. There were also several older families consisting of the parents and their children of high school age. It was a policy of the retreat that guests be age 15 or older since younger children would require a great deal of supervision and effectively destroy the advantages the retreat could offer with the policy.

After breakfast, the four of us sauntered down to the lobby area to check on the day's activities and our own, individual schedules. My wife had scheduled for a class on gardening and canning and I had opted to work on fabricating a solar collector in the metal shop. I was helping another guest build his own flat-plate collector under the guidance of the retreat's instructor. This other guest had purchased the raw materials from the retreat and would use his own labor to build the device. I had elected to help him so that someday I could build my own collectors. My wife and I said goodbye to our friends from Minnesota then headed off to our classes after agreeing to meet at 10:30 A.M. for the nature hike.

I finished early in the shop so I decided to browse through the store in the main lodge while waiting for the group to gather for the nature hike. While browsing, I found a book on methane digesters that particularly interested me and mentally made a note to buy it later. I glanced at my watch and realized I was late for the hike so I rushed down the stairs toward the front of the lodge. As I flew out of the store I caught a glimpse of the display area and saw an experimental heat pump that looked particularly fascinating, but told myself that would have to wait.

I arrived just as the guide was heading up the trail with about 50 guests behind. I found my wife, received an icy stare for being late, and fell into step with the group. The guide was a professor of botany from a nearby university and he explained that he had spent several summers at the retreat. Since his room and board were free and he was paid a fee it was virtually a vacation for him. As we walked, he explained the various flora and fauna of the region and man's effect on them. His information was extremely interesting and the panorama of the Rocky Mountains made an incomparable classroom. Around eleven, we stopped for a rest and I stepped away from the

group to look back down on the Big Creek Drainage which comprised the retreat's property. Along the creek were several guests fly fishing while near the main lodge I could see several games of horseshoes in progress. Within the educational building I knew several classes were in progress while some guests were probably swimming in the physical center. At the retreat, a guest was encouraged to plan his days as he wanted them, allowing a great freedom to do the things that interest him. I turned from the view and walked back to the group as we continued on our way.

We arrived back at the retreat about noon and, as we drew close to the main lodge, the smell of sizzling hamburgers and baked potatoes assaulted our noses. The cooks had set up some solar cookers about an hour before and were barbecuing using the sun! Guests were streaming in from all parts of the retreat property to line up for lunch so Marilyn and I scurried over to get in line. We loaded our plates and sat on the patio admiring the view and the food.

The afternoon was filled with classes that Marilyn and I had scheduled. We had decided to take advantage of the expertise at the retreat by learning as much as we could during our stay. However, since we were on vacation, we had also elected to spend the next day relaxing and taking a long leisurely stroll and picnic.

Dinner was a veritable feast with beef raised on the retreat, vegetables grown in the gardens and greenhouses, prawns from the aquaculture section, honey for the dinner rolls, and homemade ice cream made from the milk supplied by the dairy cows. I know that much of this food had gathered nutrients from organic wastes of the retreat. Garden and kitchen wastes were ground up and used to feed the fish, or composted and used on the gardens. Even human wastes were recycled using methane digesters or Clivus Multrums to produce excellent humus and fertilizer.

A methane digester would not only produce good fertilizers to grow food but also bio-gas to cook the food.

After dinner we joined other guests in the relaxing lounges as we waited for the dining hall to empty. We then helped clear the dining room and set up chairs transforming the dining room into an assembly hall for the guest lecturer that was to speak later that night.

The speaker that night was a nucleur scientist and he gave a very stimulating talk on nucleur energy for the future. The talk ended with a lively question-and-answer session about the suitability of nucleur power for long-term use. Many guests were still discussing the matter among themselves when the lecture broke up. I grabbed Marilyn and we walked down to the lobby to check the sauna schedule.

The schedule was broken into three parts where men only could sauna, or women only, or mixed sauna bathing. Marilyn and I enjoyed taking a sauna together so we checked to see when mixed bathing would occur. We were pleased to find the sauna would be open for mixed bathing in ten minutes so we headed for our room to get some gear and then headed for the physical center.

The experience of a sauna is truly envigorating if done in the correct way as the Finnish, originators of the sauna, intended it to be done. This consists of alternating stays in the dry heat of the hot-room, cold plunges in the plunge pools, showers, and relaxing. The sauna at the retreat had resting cubicles for relaxing between cycles, and a relaxation room with a fantastic view of Ptarmigan Mountain and a deck for sunbathing. The sauna really makes a person aware of his body and, for that reason, sauna bathing is best experienced without the confinement of clothing. However nudity does have some social stigmas that affect some people so the sauna area

is designated as being an optional area for clothing. The pool area is designated for clothing such as swim suits. This policy allows for nudity only in the sauna area where both clothed and unclothed guests can enjoy the sauna and its obvious physical benefits.

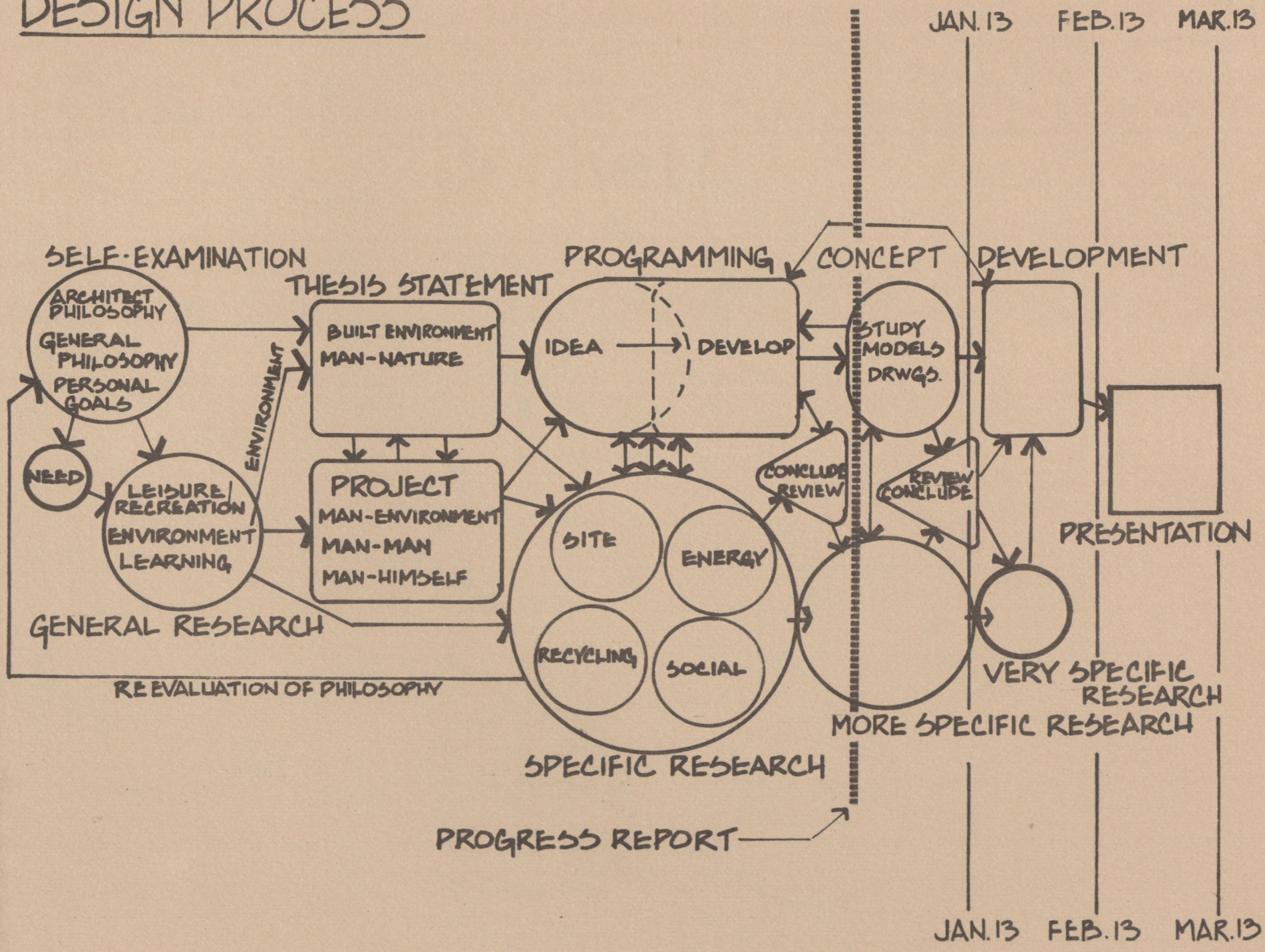
As Marilyn and I strolled towards our unit from the physical center, I thought how totally relaxed and natural I felt. Looking up at the stars, which I rarely see at home, I reflected on how unnatural the lack of noise and pollution had seemed when we had arrived at the retreat. It now seemed unnatural that we would be returning to that environment we had created for ourselves. I thought how annoyed I had been when our host at the retreat had made us walk the last one-half mile to the retreat. He had said that human power was used extensively at the retreat and that we would have to get used to looking after ourselves without the add of machines. He had told us how the life-style at the retreat would not be easy and would often be inconvenient. He had said we would probably find that the retreat seemed primitive in some ways and we would at first want to get home quickly. He told us that, before we left, we would probably change our attitudes regarding what convenience really is, and what a price we pay for it.

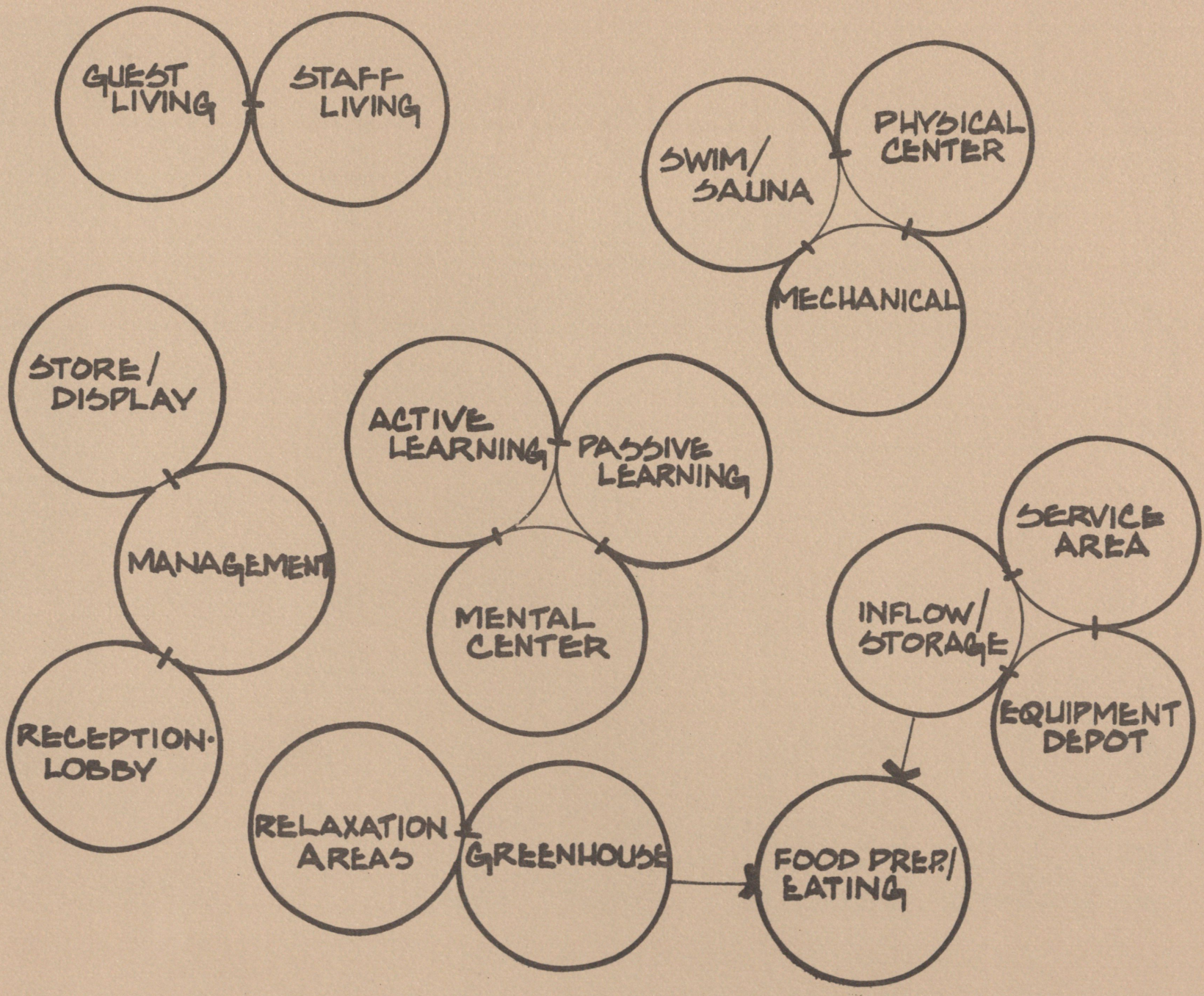
I had changed my mind while at the retreat. I knew that the lifestyle exemplified at the retreat put more emphasis on human power and made people more responsible for their own impact on the environment, but I honestly feel the quality of life here is as good or better than that I have at home. I feel better due to the additional exercise I receive by using my human power to do tasks I let machines do for me before. I use much less energy than I do ordinarily and I receive as much for it. I feel I am a better human being.

As we went inside the guest unit, I thought how the phrase we had first heard on our arrival at the retreat had taken on a good deal more meaning. We had just stepped from the bus that ferries guests from Cody, Wyoming to the retreat when the host waved his hand behind him. Indicating the beautiful scene behind him he said, "This is ours to live in harmony with and enjoy, or to destroy. As Walt Kelly, the cartoonist for Pogo, has related in his cartoon: We have met the enemy and he is us."

THE DESIGN

DESIGN PROCESS




GUEST LIVING
STAFF LIVING
SWIM/ SAUNA
PHYSICAL CENTER
MECHANICAL
STORE/ DISPLAY
MANAGEMENT
RECEPTION- LOBBY
ACTIVE LEARNING
PASSIVE LEARNING
MENTAL CENTER
SERVICE AREA
INFLOW/ STORAGE
EQUIPMENT DEPOT
RELAXATION AREAS
GREENHOUSE
FOOD PREP/ EATING

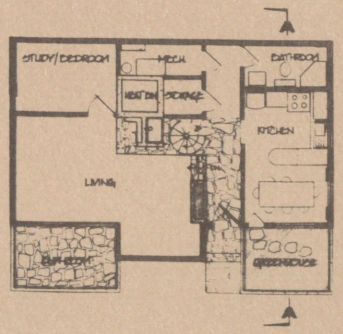


OVERALL SITE

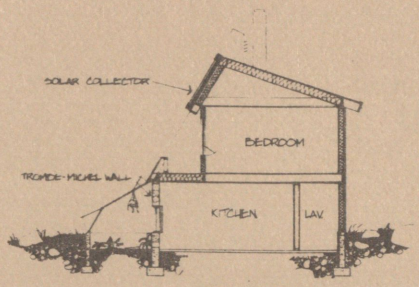
SITE PLAN

GUEST UNIT
4
5
1
2
3
STAFF
MANAGER
SWIM/SAUNA
EDUCATIONAL CENTER
0 10 30 100
SCALE
NORTH
W
E
S

MANAGER / MAIN LODGE



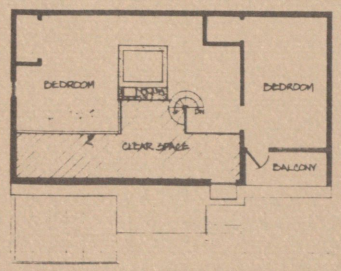
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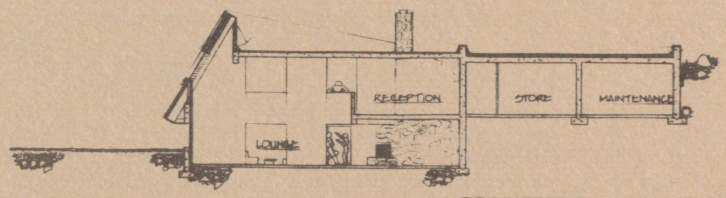
SECTION AA



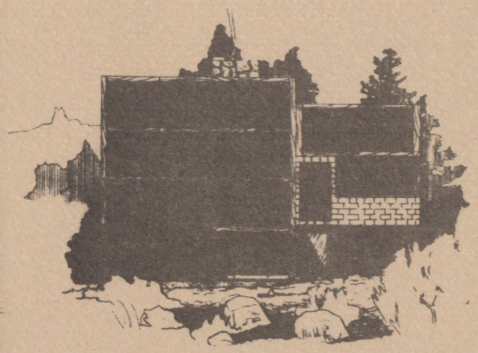
EAST ELEVATION



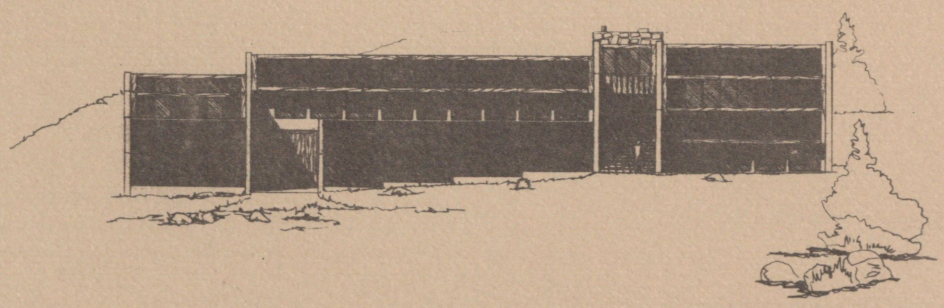
UPPER LEVEL



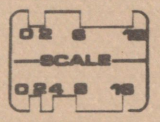
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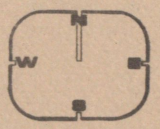


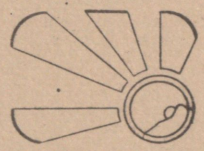
SOUTH ELEVATION



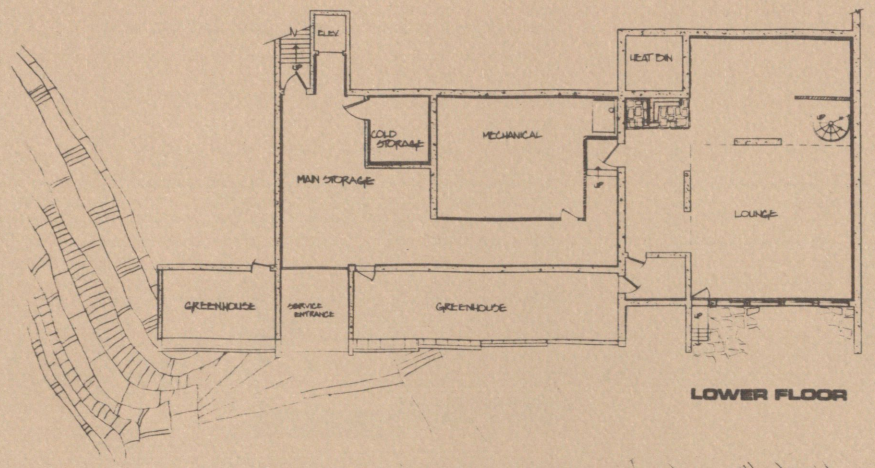
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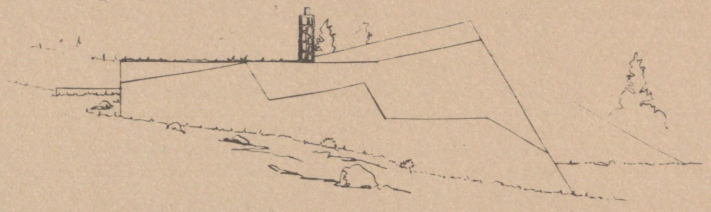




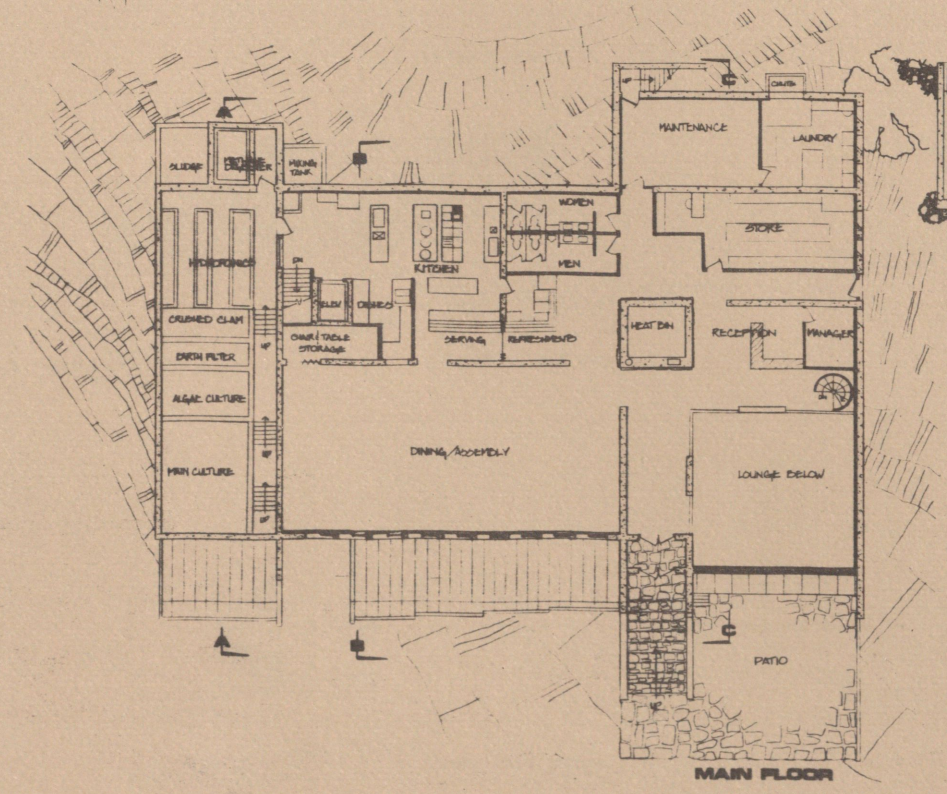
MAIN LODGE



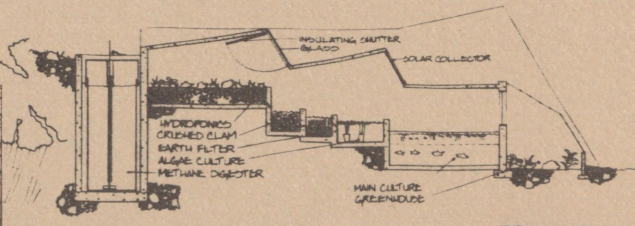
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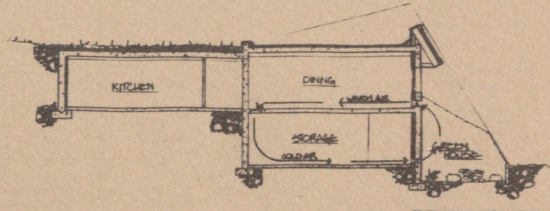
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MAIN FLOOR

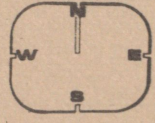


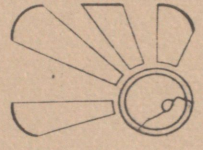
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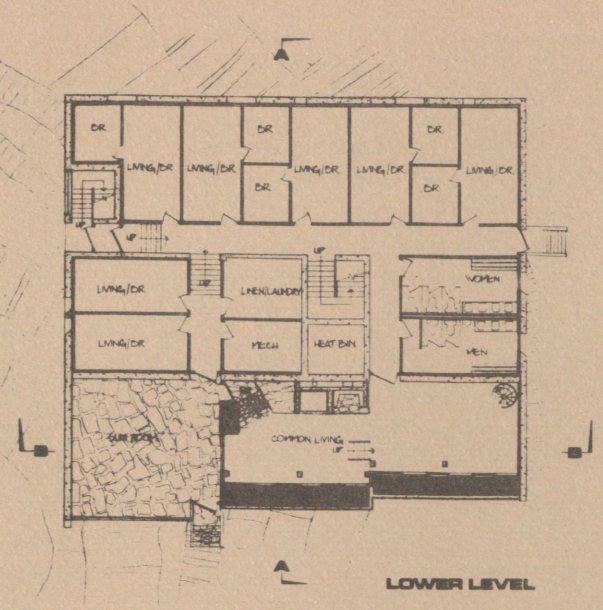
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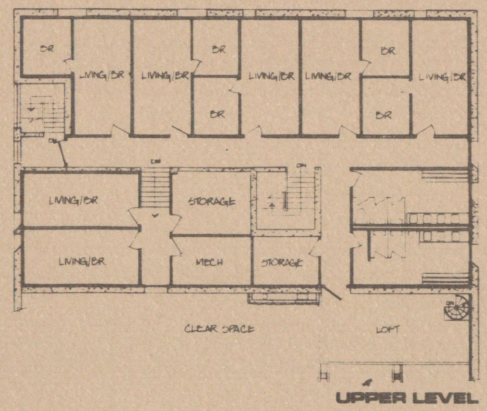




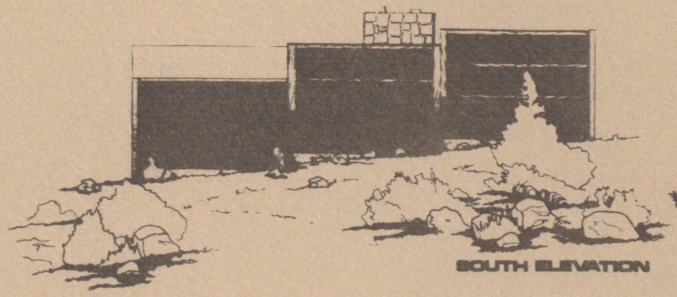
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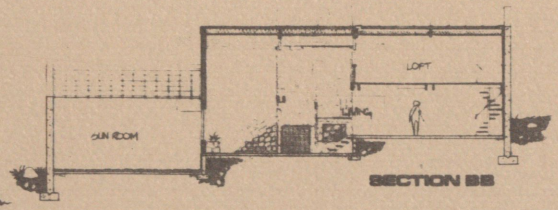
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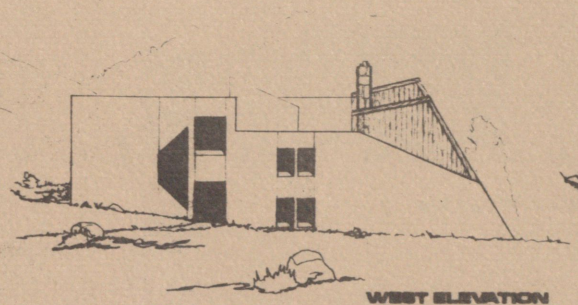
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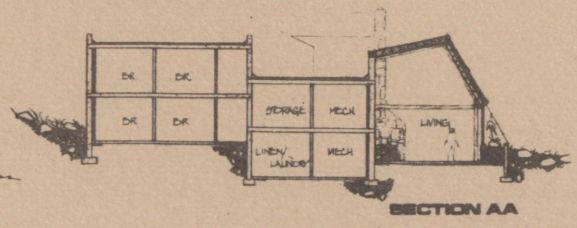
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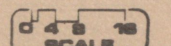
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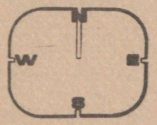


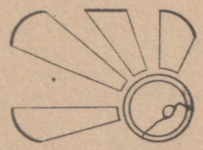
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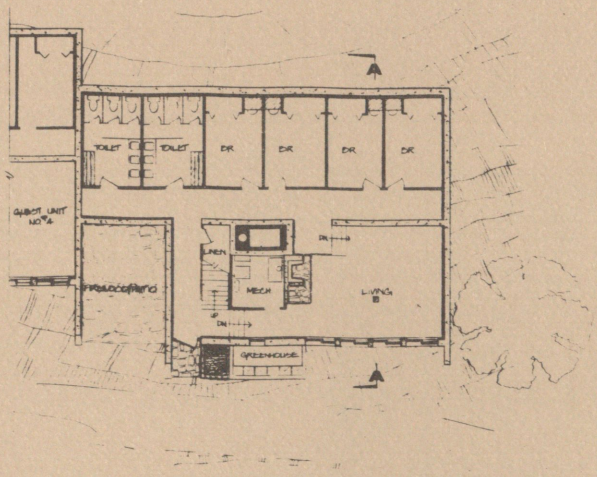
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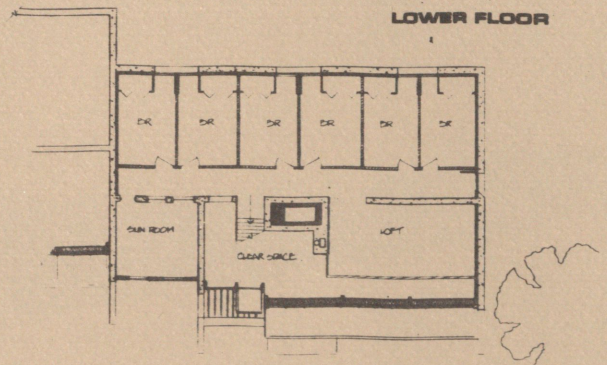




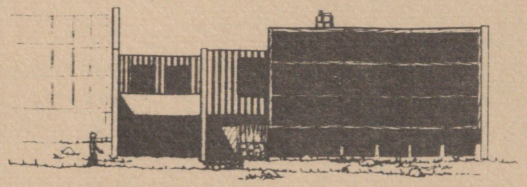
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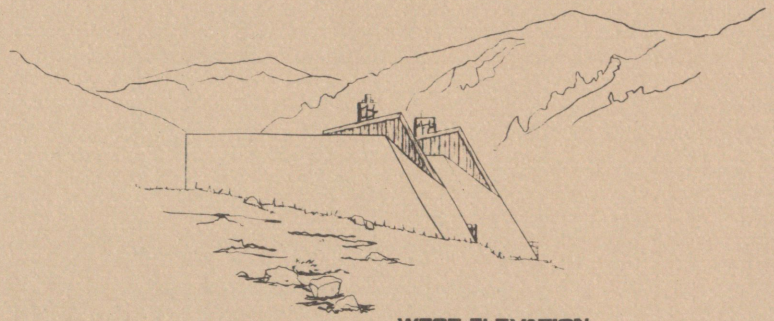
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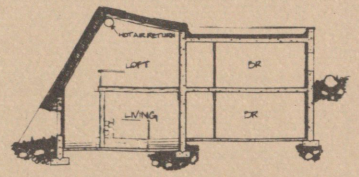
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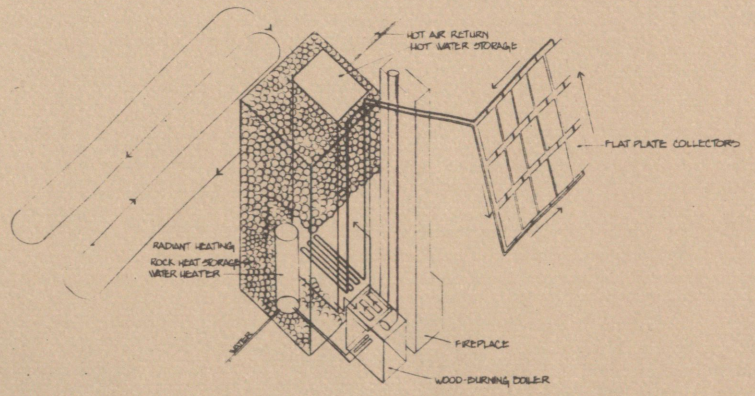
SOUTH ELEVATION



WEST ELEVATION



SECTION AA

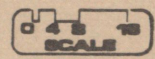


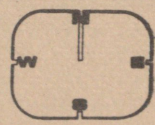
HEAT CORE

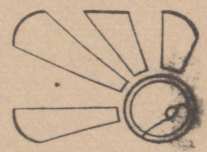
THE HEAT CORE CONSISTS OF A FIREPLACE, A WOOD-BURNING BOILER, AND A HEAT STORAGE BIN CONTAINING A DOMESTIC WATER HEATER AND A LARGE WATER TANK FOR SPACE HEATING.

AS HOT AIR RISES TO THE APEX OF THE ROOF, IT IS COLLECTED AND RETURNED TO THE BIN WHERE THE ROCKS ABSORB THE HEAT AND KEEP THE WATER TANKS HOT.

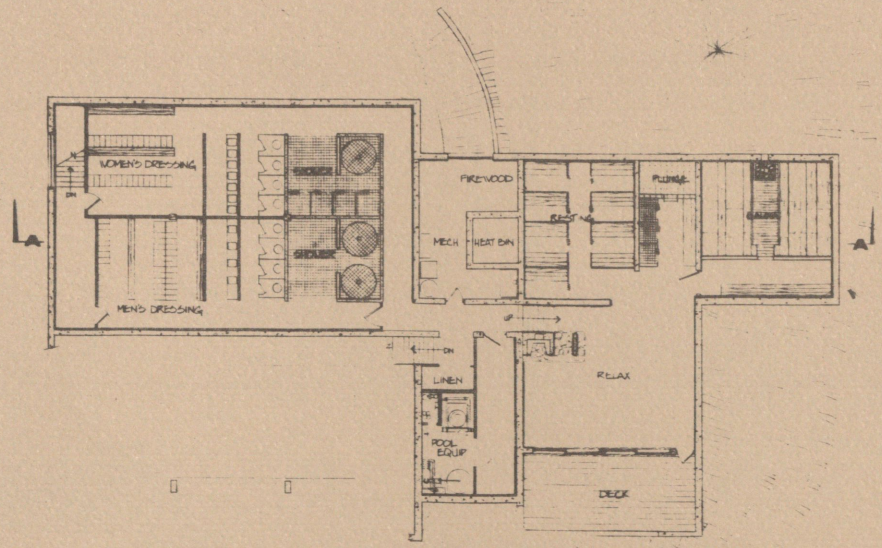
THE WOOD BURNING BOILER IS USED AS A BACK-UP SYSTEM WHEN SOLAR HEATING IS INSUFFICIENT.



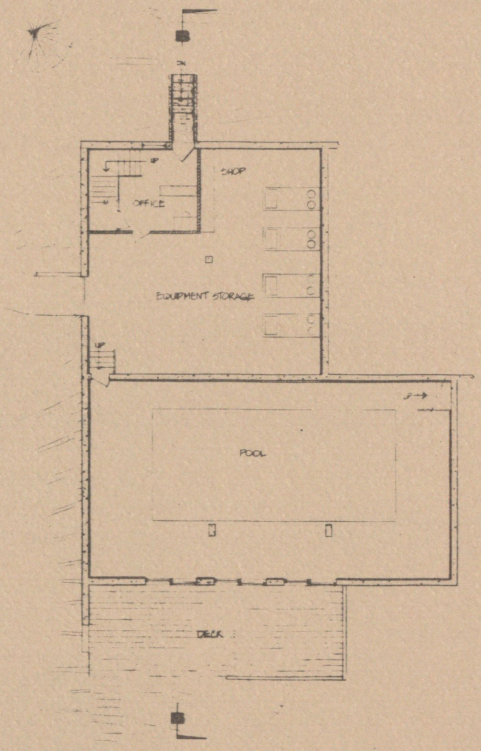




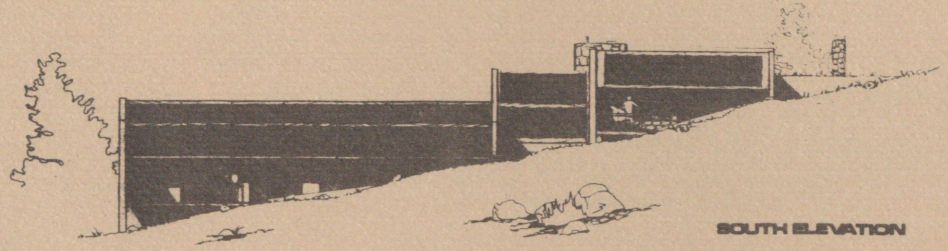
SWIM / SAUNA



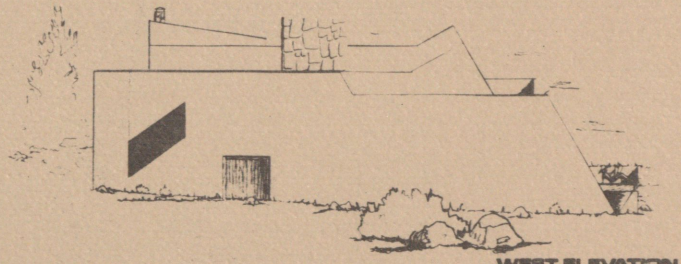
UPPER LEVEL



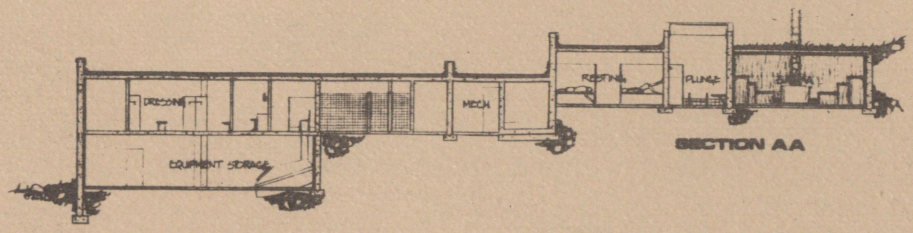
LOWER LEVEL



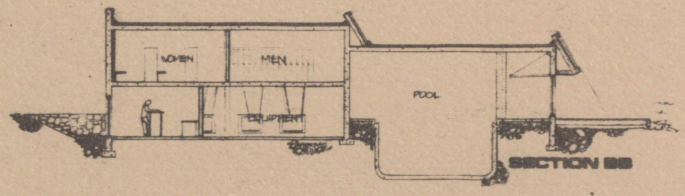
SOUTH ELEVATION



WEST ELEVATION

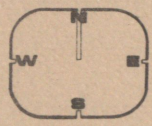


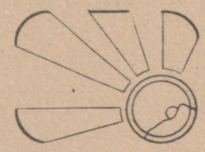
SECTION AA



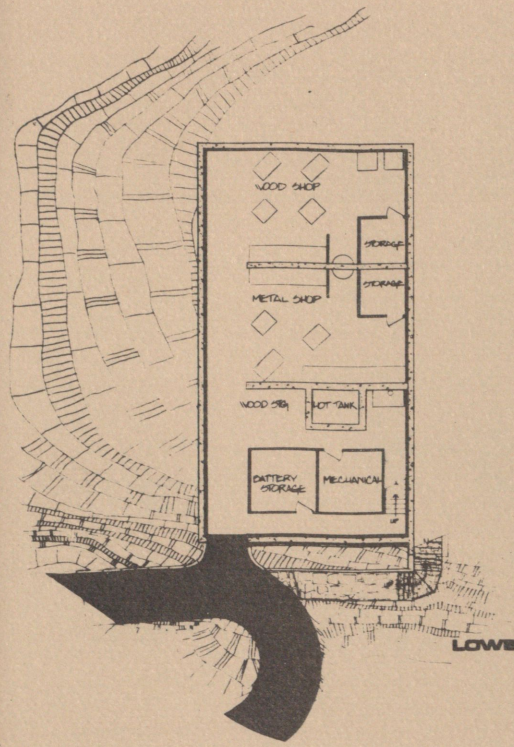
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SCALE

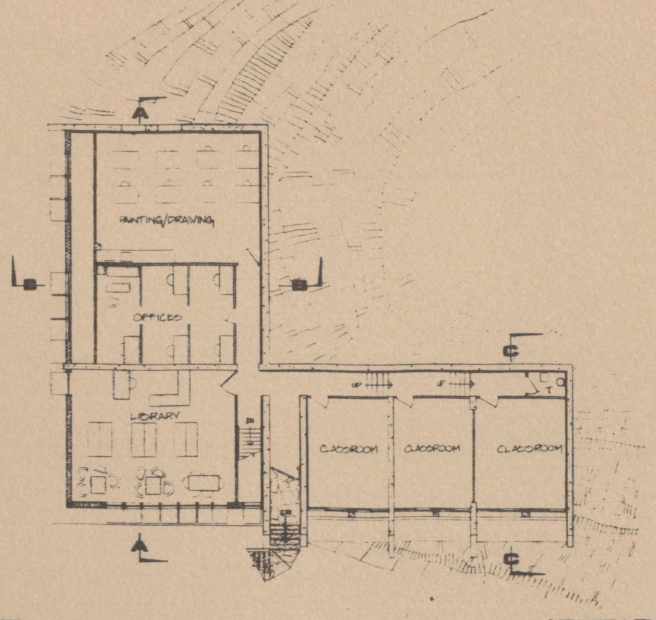




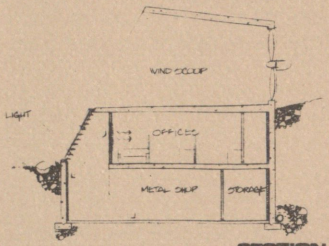
EDUCATIONAL CENTER



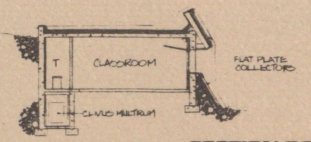
LOWER LEVEL



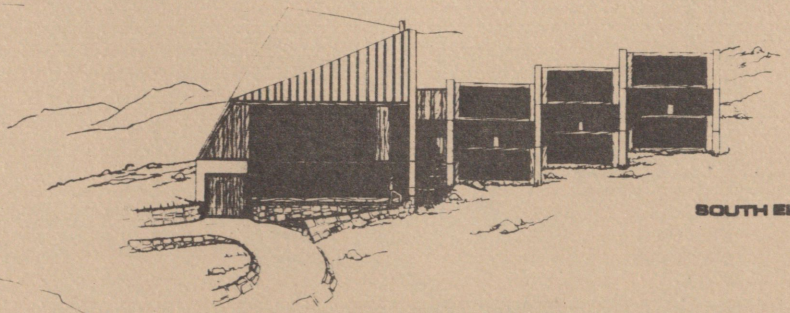
UPPER LEVEL



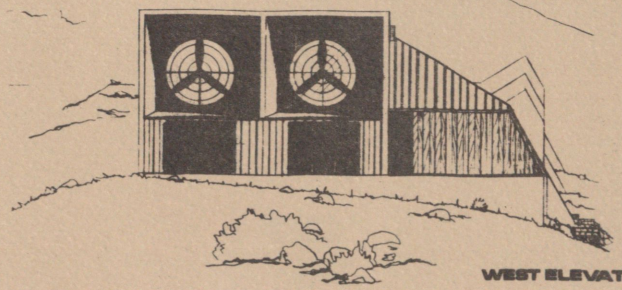
SECTION BB



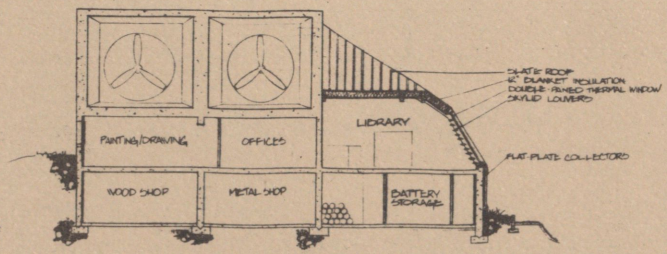
SECTION CC



SOUTH ELEVATION



WEST ELEVATION

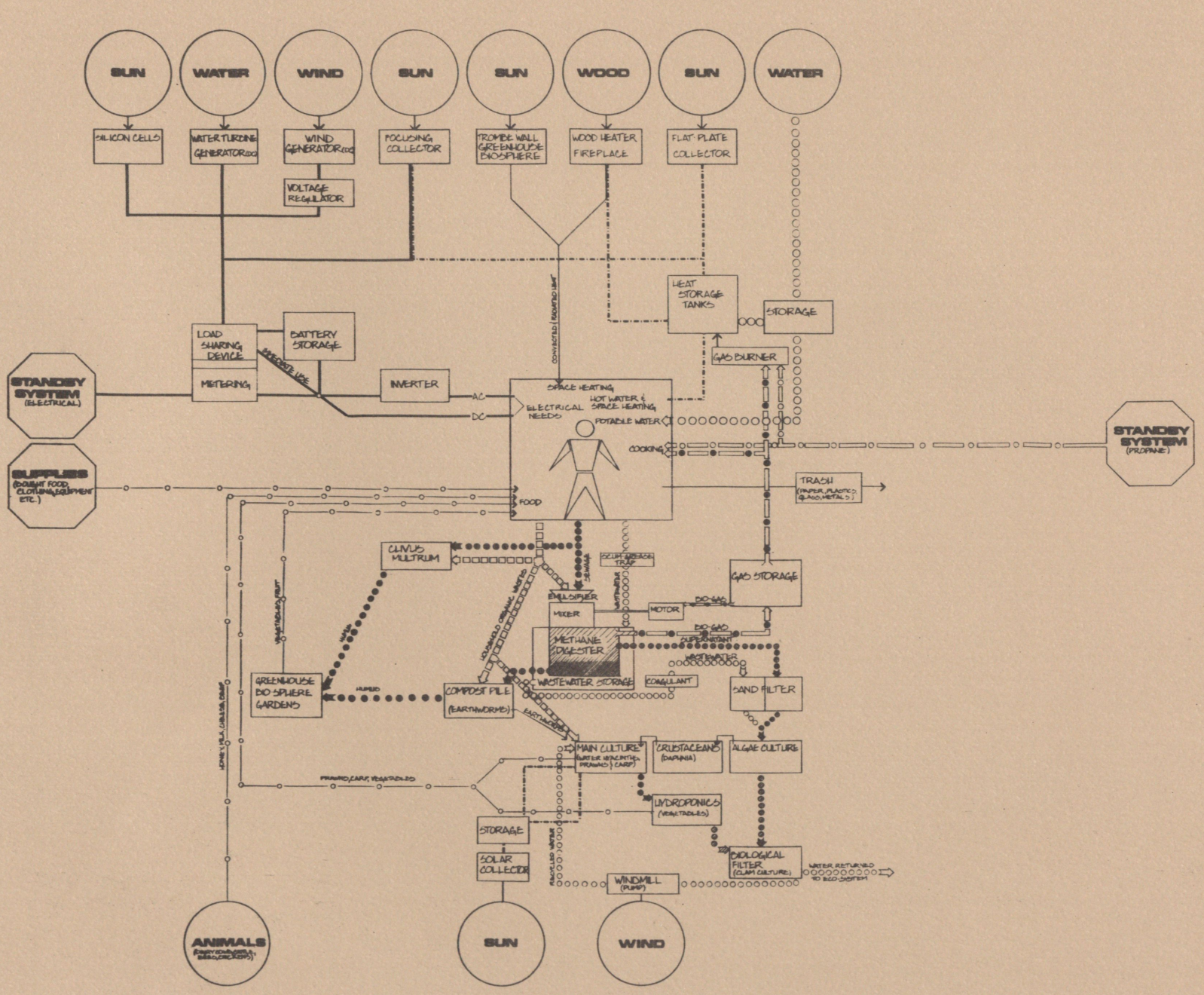


SECTION AA

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SYSTEM FLOW CHART



SUMMARY

-Philosophy

I began this thesis with the philosophy that a better architecture is the architecture that relates to the natural environment. In the last six months I have not discovered any information to contradict that original philosophy. If anything, my research has strengthened my belief that architecture is , indeed, better when it relates to nature.

The relationship between a building and nature is a complex one and must be evaluated on many different levels. It is not enough to merely say a building relates to its site by its physical form or that the building is in visual harmony with the site. I feel that building must be evaluated in terms of its usage of nature's resources.

A building uses energy and materials during construction and operation over the lifetime of the building. These factors also affect the natural environment since the materials and energy come from some part of the natural eco-system whether they come from the site itself, or from across the country. In the final result, I feel the building must be considered for its resource usage equally as much as for its esthetic value. When both elements of the relationship have been considered, then the building does truly begin to "relate" to nature.

-Process

During the first quarter of thesis I delineated a process chart depicting how I felt my designing would proceed. That chart was basically a linear flow chart with a clear cut beginning and a clear cut ending. I now feel that chart is misleading since I have evaluated how I actually designed. To me, the design process is like a circle with no clear cut end. Instead, I feel that as the designer gains new information and insight he retraces old ground and corrects decisions he made earlier and forges ahead with the latest correct information trying to break new ground. As time progresses, fewer and fewer decisions have to be made until ,at some point in time, the designer feels he is close enough to the correct solution and goes with what he's got. To me the closest thing the design process can be compared to is a mathmatical function with a limit approaching zero. Each time through the formula, the answer moves closer to zero and can become infinitely close to zero. In the same way, I felt I would go

through my process and each time I would be closer to the correct design solution, but still not entirely correct. The limiting factor on the process is time. More time allows for more cycles and a more nearly correct solution so I feel the designer must acknowledge this condition and allow himself adequate time to produce a good design.

-Systems

For the particular site I was dealing with in this cold northern climate, I determined that some systems for energy collection were not advisable while other systems that I had only vaguely considered were very appropriate. Basically, I concluded that flat-plate solar collectors in conjunction with wood-burning boilers could give 100% space heating. The minimized glazing on the buildings and south orientation also help this a great deal.

Due to the available wind and always-flowing water, I concluded the electricity would have to be generated from these sources since silicon cell solar panels require large surfaces to generate appreciable amounts of electricity. Electricity will have to be backed up by conventional means of electricity due to the possibility of little or no wind due to abnormal weather conditions.

The recycling systems offer fairly good advantages with little or no maintenance. Basically, the Clivus Multrum is the best system due to its minimal maintenance, no sewer lines, and no usage of water. The methane digester is basically a good system, but at the retreat it will supply only partial amounts of the gas needed for cooking. This supply of gas could be increased by addition of the large amounts of cow manure generated on the site, but I felt this would require too much maintenance and too much energy for the extra amounts of gas it would produce.

In retrospect, I feel the areas that every architect and designer can deal with, and should deal with, are passive means of heating a house and energy conservation. With effective energy conservation techniques and incorporation of passive systems into the design, the building will require only minimal amounts of extra energy from conventional or alternate energy systems. I feel passive systems and energy conservation techniques are much less restrictive on the design vocabulary than solar collectors,etc.

-Design

Having worked with alternate energy systems for six months and trying to incorporate them into building designs, I have mixed emotions about their effect on the design. They definitely have a great impact on the building form and a great impact on the perception of that building. In other words, they impose another set of restrictions on the designer in addition to site, function,program requirements,etc. To me, this extra set of restrictions was often difficult to deal with, but they can be dealt with. I feel these extra restrictions prolong design time and make a good solution difficult to find. However, I also believe that a good solution under these restrictions will be a better solution overall.

In my project, I allowed the energy conservation and solar orientation to produce common living areas to the south of the buildings. Public or semi-public spaces were predominant while privacy was minimized. Definitely this affects the social structure as we are used to it, however I designed this to be a vacation retreat with weekly turnover and not to be permanent housing where privacy is essential. In other words, I determined the public spaces should be maximized for more reasons than just the fact I was using alternate energy. I feel the solar collectors can be adapted to various living situations, but the flexibility is limited when compared to other existing systems of heating. In many cases I had to ask myself should convenience rule or effecient energy use. I usually opted for the effecient energy use.

-General

I feel this thesis has been successful for me when considered as a total experience. I feel thesis is truly an individual learning experience which no one can truly evaluate but the thesis student himself. I feel I have learned a great deal in a great many areas and have many interests which sprung from my research which I will explore in the future. The many disciplines and ideas the thesis student must explore make thesis a very positive experience. I can now see why a thesis is the culmination of the training we receive here in school.

My only regret on this thesis is that I selected a large complex to work with. It was frustrating for me to carry my buildings to a certain level of design and not be able to go further due to the time involved. I feel good about my project, but feel it could be a nine month endeavor to really

do justice to the buildings. I have made a great many decisions and resolved many difficulties arising from the design of this retreat, but I also realize the retreat would have to be carried to a much finer level of design to truly function as I envision it could. I would urge other students to truly consider their own motivations when doing a thesis and make sure they are doing a project that can be given sufficient attention in a six-month period.

Finally, I believe a place like Terranatus could, and should, exist. I feel the concept of such a facility is a good one and that my attempts to bring that concept to reality were worthwhile. I feel my design solution was adequate, but not the ideal I had hoped for. Much more time and thought would be required to produce a design worthy of the ideals the retreat stands for. All in all, I feel it has been a worthy effort and an encouragement to continue learning.

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