Montana State University Library, Bozeman



THE
LM PISHKUN
TERPRETIVE CENTER

P378
.G878

MONTANA STATE UNIVERSITY
LIBRARY

NA
2540
G878
P378
G878

THE ULM PISHKUN
MUSEUM/INTERPRETIVE CENTER
ULM, MONTANA

BY

DAVID R. GRIGSBY

A

THESIS PAPER

PRESENTED TO THE SCHOOL OF ARCHITECTURE

MONTANA STATE UNIVERSITY

BOZEMAN, MONTANA

3/15/91

IN

PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

OF

BACHELOR OF ARCHITECTURE

PROFESSOR RALPH JOHNSON, ADVISOR

PROFESSOR GEORGE McCLURE, ADVISOR

STATEMENT OF PERMISSION TO COPY

In presenting this thesis as partial fulfillment of the requirements for an advanced degree at Montana State University, I agree that the library shall make it freely available for inspection. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by my major professors, or in their absence, by the Director of Libraries. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature [signature]

Date 6/14/91

[signature]

THESIS ADVISOR

Thomas R. Wood

-DIRECTOR

ACKNOWLEDGMENTS

Reaching the end of five years of Architectural studies, is a particularly special time for me. Having first enrolled in the School of Architecture in 1970 and dropping out after two quarters, it is hard to express the joy and pride I feel at being so close to a life-long goal. Time has a way of slipping by unnoticed, old dreams get tucked neatly away, unfulfilled goals fade, or are lost in the tangles of daily life. Thank God, I got a second chance! The dreams are still there, the goals within reach!

I would like to thank the faculty of the School of Architecture, for their guidance, and the sincere commitment with which they teach. I would also like to thank Janie and Linda from the front office, for their many hours of record keeping and my countless interruptions. I would like to thank the past Director of the School of Architecture, Bob Utzinger and Professor George McClure, for their support and encouragement in my return to school.

I would also like to thank Professor Ralph Johnson for his continuing interest and guidance in this thesis project.

Lastly, I would like to thank archaeologist Stephen Aaberg for his assistance in arranging meetings with the Cascade County Historical Society, and the Montana State Department of Fish, Wildlife and Parks; and for the use of his archaeological research materials on the Ulm Pishkun site. And, a special thanks to Dr. Tom Roll for his enthusiastic help and advice on the archaeological concerns of this thesis project.

David R. Grigsby

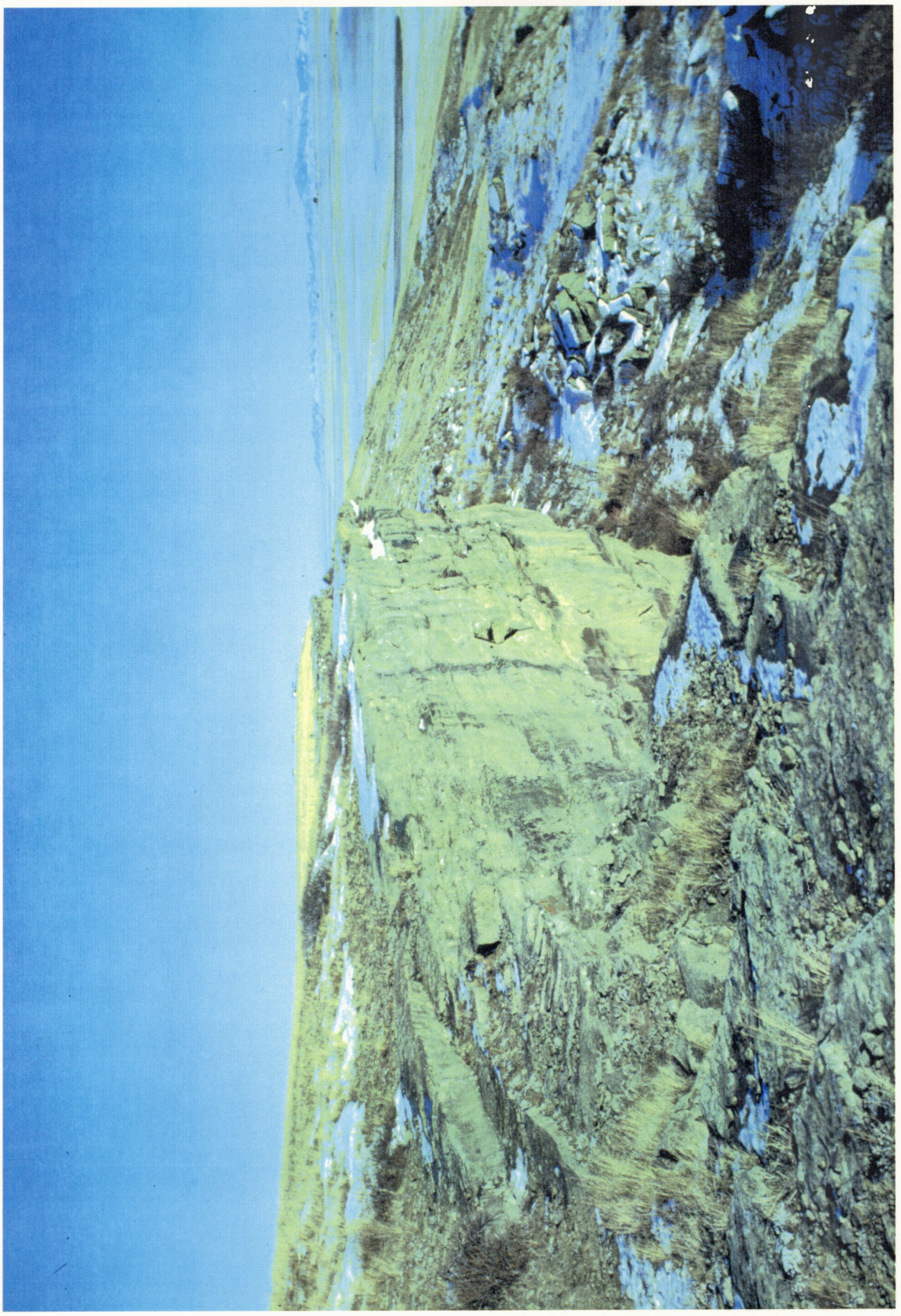


TABLE OF CONTENTS

	Page
STATEMENT OF PERMISSION TO COPY	i
ACKNOWLEDGMENTS	ii
PHOTO OF THE ULM PISHKUN	iii
Chapter 1 - INTRODUCTION	1
MAN AND NATURE	2
STATEMENT OF THESIS	3
PROCESS DESCRIPTION	6
HISTORY	9
History Of Buffalo Jumps	10
Commercial Mining Of Buffalo Jumps	12
Site History	14
Summary	17
PRECEDENT STUDIES	19
TABLE 1 (Precedents)	26
Chapter 2 - SITE ANALYSIS	27
SITE LOCATION	28
Regional Map	30
Location Map	31
Site Boundaries	32
Roads and Trails	33
LAND FORMS	34
Geologic Formations and Soil Classifications	35
Contours/Geology	37

Soils 38
Surface Drainage 39
SENSORY/CLIMATE 40
Sensory Issues 41
Solar Exposure/Average Temp 42
Wind/Precipitation 43
Views to Site 44
Views from Site 45
NATURE 46
Plant Communities 47
TABLE 2 (Plants) 48
Vegetation 51
Fauna 52
ARCHAEOLOGICAL FEATURES 55
Archaeology 56
Cultural Features 57
Site Features 58
Possible Building Sites 59
Chapter 3 - PROGRAM DEVELOPMENT 60
CONCLUSIONS 61
Program Issues 62
The Site 64
Building Site Options 66
The User 67
Building Functions and Relationships 68
Space Adjacency 69
Circulation Types 70

Proposed Circulation 71
Functional/SQ.FT. Relationships 72
3-D/Massing Relationships 73
CONCEPTS 74
INTERIOR CONCEPTS 75
Typical Entry Experience 76
Typical Educational Exhibit Area 77
Typical Cultural Exhibit 78
Typical Archaeological Exhibit 79
EXTERIOR CONCEPTS 80
Typical Entry (Site 1) 81
Typical Entry (Site 2) 82
Typical Rear Elevation 83
REFERENCES CITED 84
BIBLIOGRAPHY 85
THESIS PROJECT SLIDES 86

1 INTRO.

-INTRODUCTION-

(MAN, NATURE, AND THE ULM PISHKUN)

For most of the history of mankind, man has lived with, not apart from nature. The struggles of daily life were intertwined with the natural environment. Man depended on the gifts and forces of nature for his existence, and depended upon the spirit world to sustain him in it. Man took what he needed to survive and left what he didn't need. His possessions were borrowed from his surroundings, re-shaped to meet his needs, and returned to nature when misplaced or no longer needed. The universe was his home, the Great Spirit his guide.

The Ulm Pishkun is such a place. Early man was here, his mark left in subtle ways, a few flat stones that may have once held down the bottom edge of a rawhide tipi cover, a drawing etched in stone of a long forgotten spirit, or a scattering of bison bones and stone tools.

It is the subtleness of his passing that fills this place with mystic. He lived, he used, he worshiped, and he built upon without destroying. Truly, man tread lightly here.

THESIS

STATEMENT OF THESIS

The thesis project is intended to allow the student to explore areas of architectural interest in a simulated professional manner, to make use of architectural methods in research and design, and to be a continuation of the learning experience. My interests in architecture lie heavily in the areas of historic preservation, environmental research (with an emphasis on solar heating and lighting), and earth shelter design. I also have strong interests in geology, archaeology, and anthropology (Plains Indian cultures), which I research and study as time permits.

It was through Dr. Tom Roll of the Montana State University Sociology Department, that I first learned of the Ulm Pishkun and the interests of the Cascade County Historical Society. After conversations with Dr. Roll and conferring with my architectural advisors, I chose the Ulm Pishkun as my thesis project. One of the first steps undertaken in this project was to contact the Cascade County Historical Society to arrange a meeting and to visit the Ulm Pishkun site. Three archaeologists from MSU (Dr. Tom Roll, Dr. John Fisher, Jr, and Mr. Steve Aaberg), and myself visited the site and met with the Cascade County Historical Society's Ulm Pishkun group in January of this year. During this meeting the Ulm Pishkun group and the archaeologists explained their concerns and goals, and of the major role of the Montana State Department of Fish, Wildlife and Parks

in this endeavor. It was through this meeting and visiting the site, that the issues and goals of my thesis project were determined. I will attempt to address them as follows:

1- To research, investigate, and analyze the Ulm Pishkun Site, from it's historical, geological, archaeological, climate, cultural and site characteristics.

2- To help establish long range goals and plans for the site, including a visitor/museum/research center, as an example of potential use.

3- To demonstrate that the site can be utilized and enhanced by a multi-purpose facility that could increase state tourism, protect and help interpret the site's cultural artifacts and history, be exciting to visit, yet maintain a low impact on historic site features.

4- To produce a booklet comprised of the above mentioned Ulm Pishkun research and analysis, research on comparable facilities, and program proposals.

5- To produce a scale model and drawings of the proposed facility and site.

6- To make available all of the above to the Cascade County Historical Society, the State of Montana, and any groups interested in the promotion of the Ulm Pishkun Buffalo Jump.

PROCESS

PROCESS DESCRIPTION

The process that I have used in this thesis project, has been a combination of intuitive reasoning, analytical research, and drawing upon my personal experiences in architecture, nature and anthropological pursuits. For several years, I had previously toyed with the idea of a museum or visitor's center at the Madison Buffalo Jump, which I had visited several times. I believe Montana has been missing a wonderful opportunity to increase tourist trade, by not investing in its un-surpassed archaeological, and historical resources. Thus, I jumped at the chance to show what I believe could be done with The Ulm Pishkun site.

Understanding the delicate nature of archaeological sites, I began by studying the history of the Ulm Pishkun, and sought to understand the archaeological implications that the site posed. I sought to understand archaeological and interpretive museums through precedent research. The information gained through precedent research and conversations with parties interested in the Ulm Pishkun project, helped me establish the types and sizes of spaces that would be necessary for a museum/interpretive center of this kind.

A visit to the site re-enforced the notion of nature, place, and timeless quality. Through a careful site analysis, I was able to locate possible building areas, and through thoughtful study, was able to determine the most suitable building sites. The final site will be chosen taking into consideration all of the elements of site analysis,

museum needs, and intuitive responses. Architectural form here should not impose itself, but rather, it should reinforce and enhance the natural surroundings.

The generation of a building program comes from a combination of all of the above, meeting the needs of the museum, its staff, and its visitors, while remaining sensitive to the natural, spiritual and archaeological features of the site.

HISTORY

HISTORY OF BUFFALO JUMPS

At some time in the distant past, early Plains Indians discovered ways of luring and driving herds of buffalo (bison), into impoundments or over cliffs. Once corralled, or driven over the cliffs, the bison were slaughtered, often in large numbers by the waiting Indians. The result was an effective means of obtaining the necessary food supplies to support groups of early plains peoples. (Malouf and Conner 1962)

The first use of buffalo jumps appears to have developed on the plains of Saskatchewan, and spread into the plains of Alberta and Montana, where most of the jumps have been found. The earliest use of the jumps predates the introduction of the bow and arrow, and appears to have ended with the introduction of the horse. The jumps were particularly well suited for use by the pedestrian oriented Plains Indians, as large amounts of food could be obtained with a minimum expenditure of effort (as opposed to other hunting techniques). The Blackfoot Indian term for the site is Piskun, or Pishkun, which means "deep blood kettle", perhaps a reference to the slaughter and processing of the bison. (Malouf and Conner 1962)

Buffalo jumps tend to have at least five key elements. First, there is usually a nearby grazing area where bison congregated and Indian hunters began the drive. Second, were the driving lanes, formed by long lines of evenly spaced piles of rocks, that begin in the grazing area and continue to the cliff edge. The lanes are formed by at least one line of rock piles and either another line of rock

piles, or a natural feature, such as a steep bank or gully that forms the other side of the lane. The lane is wide at the beginning, then narrows to converge near the edge of the cliff. Bison were driven between these converging lines and eventually stampeded over the cliff. The third part of the jump was the cliff. The cliff varied in height. High cliffs appear to have killed bison outright, but lower cliffs or steep slopes often had catch pens at their bases where wounded or injured bison were confined and dispatched by waiting hunters. (Malouf and Conner 1962)

The fourth element of the jump occurs at the base of the cliff where excavations expose deposits of bones from the slaughtered bison. Artifacts made of stone or bone, such as knives, hammers, chisels and projectile points are often found in these deposits. Multiple intervals of use of the site can often be evidenced by the layering of bone deposits separated by layers of overburden at the base of the jump. The site of these bone deposits, is where the buffalo were slain, their carcasses dis-membered, and the edible portions removed. (Malouf and Conner 1962)

The fifth element of the site is the camp and processing area. It is usually located near the slaughter site, but normally out of view from the slopes above, and leading to the jump. Here is where the meat was dried, bones crushed and marrow removed, and hides scraped and dried. Excavations in this area, often reveal fire rings and pit ovens. Tipi rings and stone tools are often located at the site. (Malouf and Conner 1962)

COMMERCIAL MINING OF BUFFALO JUMPS

Mining of bison kill sites for fertilizer began in the late 1800's, but was not done on a large scale until the era of the two World Wars. The late 1930's thru the 1950's saw most of the commercial exploitation of large bone deposits, and Montana's buffalo jumps were widely sought after. (Davis and Wilson 1978)

While some small scale firms mined bison bone throughout the state, most large scale bone removal appears to have been the work of the Frost Fertilizer Company, a Montana based firm. The company is credited with mining 156 bison kills in Montana, 5 in Wyoming, 3 in South Dakota, and 1 in Alberta. The company mined bison kill sites from 1939 thru 1957 and used field processing units located close to the bone deposit sites and near railway shipment points. The Frost Fertilizer Company actively sought out the bison kill sites and once found would then lease the mining rights from the site owners. (Davis and Wilson 1978)

The Frost Fertilizer Company advertized as "The Pioneer Producer of Buffalo Compost, A dehydrated and milled fertilizer containing all of the buffalo carcass". The company had bone delivery points at Browning, Blackfoot, Ethridge, Kevin, Great Falls, Highwood and Livingston in Montana, and Gleichen in Alberta. (Davis and Wilson 1978)

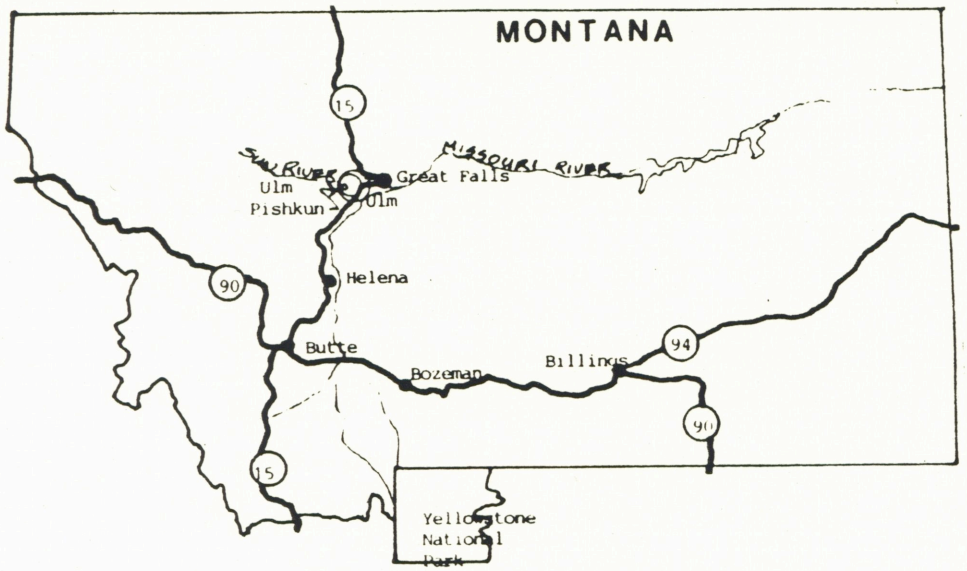
Bison remains were dug from the sites with bulldozers, and moved

by truck to the milling plants, where the bone and compost was separated from the rock and sediment debris. The materials were then dried and crushed to produce the final product. The compost was then sacked in 100 lb. sacks and shipped by rail to Seattle and the West Coast, where it was sold as fertilizer or mixed with livestock feeds. The final bison bone compost contained approximately 17% phosphate, 1.5% nitrate, and 1% potash. Company records show that the material sold for about $28.00 per ton at the mine. (Davis and Wilson 1978)

The total amount of the archaeological record destroyed thru the mining of the kill sites is not known, but is certainly a significant loss in the understanding of many prehistoric sites. Most of the sites are now protected by national historic preservation laws, although illegal artifact hunters still damage sites. (Roll 1990)

THE ULM PISHKUN
(A SITE HISTORY)

Originally known as the Taft Hill jump, the Ulm buffalo jump site is located four miles northwest of Ulm, three miles south of Vaughn, in Cascade County, and about 12 miles west of Great Falls, Montana (Hurt 1964).

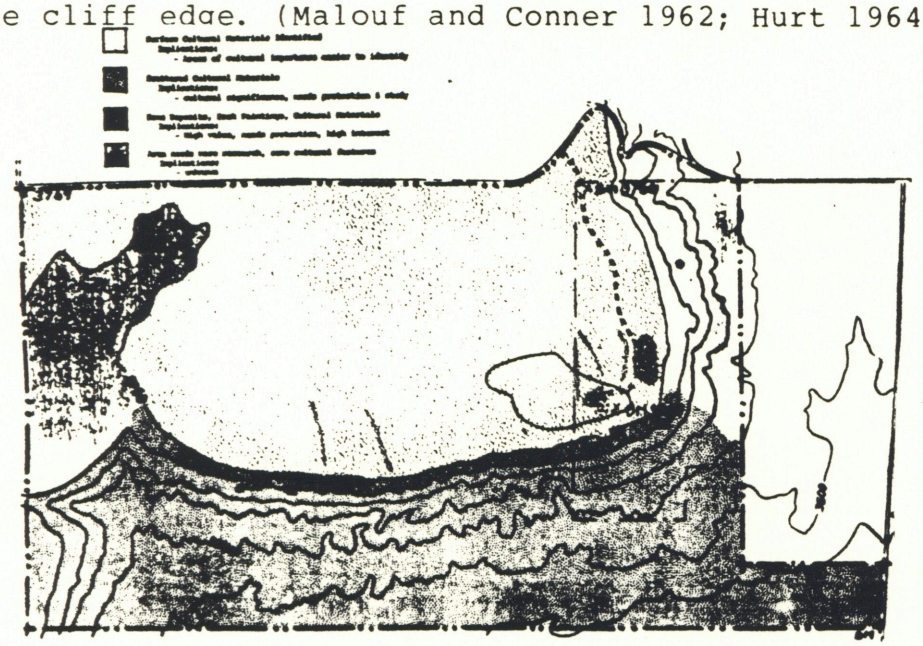


The northern half of the site is owned by the State of Montana, while the southern half of the site is privately owned by three neighboring land owners. The Montana Department of Fish and Game is currently negotiating with the three adjoining land owners, for the purchase of their portion of the site (Meyer 1991).

The site is located on the south rim of a high plateau, midway between the Sun and Missouri rivers that are about 8 miles apart at that point. The jump itself, is located on the south face of a high promontory overlooking a wide expanse of grassland. A rimrock extends for at least a half mile, with its cliff face varying in height from ten to thirty feet. At the base of this cliff is a steep talus slope

that drops twenty to thirty feet in length ending on a ledge that is fifty to one hundred feet wide (Hurt 1964). Below this ledge another steep incline drops to the valley floor below.

On the plateau at the top of the cliff, a broad shallow coulee runs in an east-west direction, intersecting the cliff site at right angles. On the south side of the swale is an alignment of stones about a hundred yards long and about twenty feet apart. A similar stone alignment lies to the west for about forty yards. The coulee and the stone lines were used as drive lanes, directing the stampeding bison to the cliff edge. (Malouf and Conner 1962; Hurt 1964)



On the south side of the coulee lies a group of tipi rings about seventy-five yards back from the rimrock. Another group of tipi rings are located on the north side of the coulee, and to the west, near the stone alignment is yet another group of rings (Malouf and Conner 1962; Hurt 1964). The tipi rings are helpful in determining areas of early human occupation.

Indian hunters, perhaps as long ago as 5,000 years, gathered bison into groups on the plateau above the site and drove them towards

the coulee drive lane (Roll 1991). Once in the drive lane the frightened bison were stampeded to and over the cliff edge. Upon landing on the talus slope, they tumbled down, being killed or at least severely injured. Wounded and injured bison were then dispatched by waiting hunters. Almost all of the bison bone deposits appear in the talus slope above the ledge, indicating that few bison survived the initial fall from the cliff and tumble down the talus slope (Malouf and Conner 1962). The slaughtered animals were then processed, the meat cooked or dried, bones cracked and boiled, and hides scraped (Roll 1991).

The site once had extensive bone deposits twelve to fifteen feet in depth (Shumate 1967:12; Davis 1978), and was probably used periodically until the introduction of the horse, about 1600 AD, when most use of bison jumps was abandoned.

Mining of bison kill sites for "bison compost", was widespread in the 1930´s thru the 1950´s, and few large buffalo jumps escaped commercial exploitation. The large bone deposits of the Ulm site, having survived perhaps thousands of years, were indiscriminately mined for a year and a half in 1946-7 (Davis 1978: 254-286). Large portions of the bone deposits were removed, dehydrated and milled. Sacked in one hundred pound bags, most of the "fertilizer" was then shipped to Seattle, Washington, for use as fertilizer or to be mixed with livestock feeds. Over 150 tons of bone and carcass meal were extracted from the site (Shumate 1967:12; Davis 1978).

Just how much of the site´s archaeological record has been destroyed, remains to be seen. While the site still has extensive bone deposits remaining, they can only hint at, not reveal what has been lost (Roll 1991).

SUMMARY

Since the use of buffalo jumps in America predate our written historic record of early plains people, the preservation of, and scientific study of these jumps should be addressed. These jumps usually include evidence of early habitation sites, and contain many different cultural artifacts, that when properly excavated and studied, might provide untold insights into early human life on the plains. In addition, the bone deposits of the slaughtered bison contain not only cultural artifacts, but also evidence of early bison populations and changes in weather patterns. (Roll 1990)

Surface artifacts, such as tipi rings and drive lines, vary in location with each individual buffalo jump. Soil depths above the rocky cliff edges are generally shallow with little deposition, leaving surface features and artifacts relatively exposed and easily identified. Talus slopes at the bases of the cliffs have heavy deposition of over-burden material from cliff weathering and topsoil erosion, making the identification of archaeological features difficult without excavation. At the same time, these deposits help protect and preserve buried cultural artifacts and bison remains. Most of the information to be learned from the buffalo jumps lies buried in these materials and needs to be protected for future studies. (Roll 1991)

Any future altering of the jump sites by road work, utilities, or

building construction should seriously consider and avoid the disturbance of both the surface artifacts and the buried archaeological deposits. (Roll 1991; Meyer 1991)

PRECEDENTS

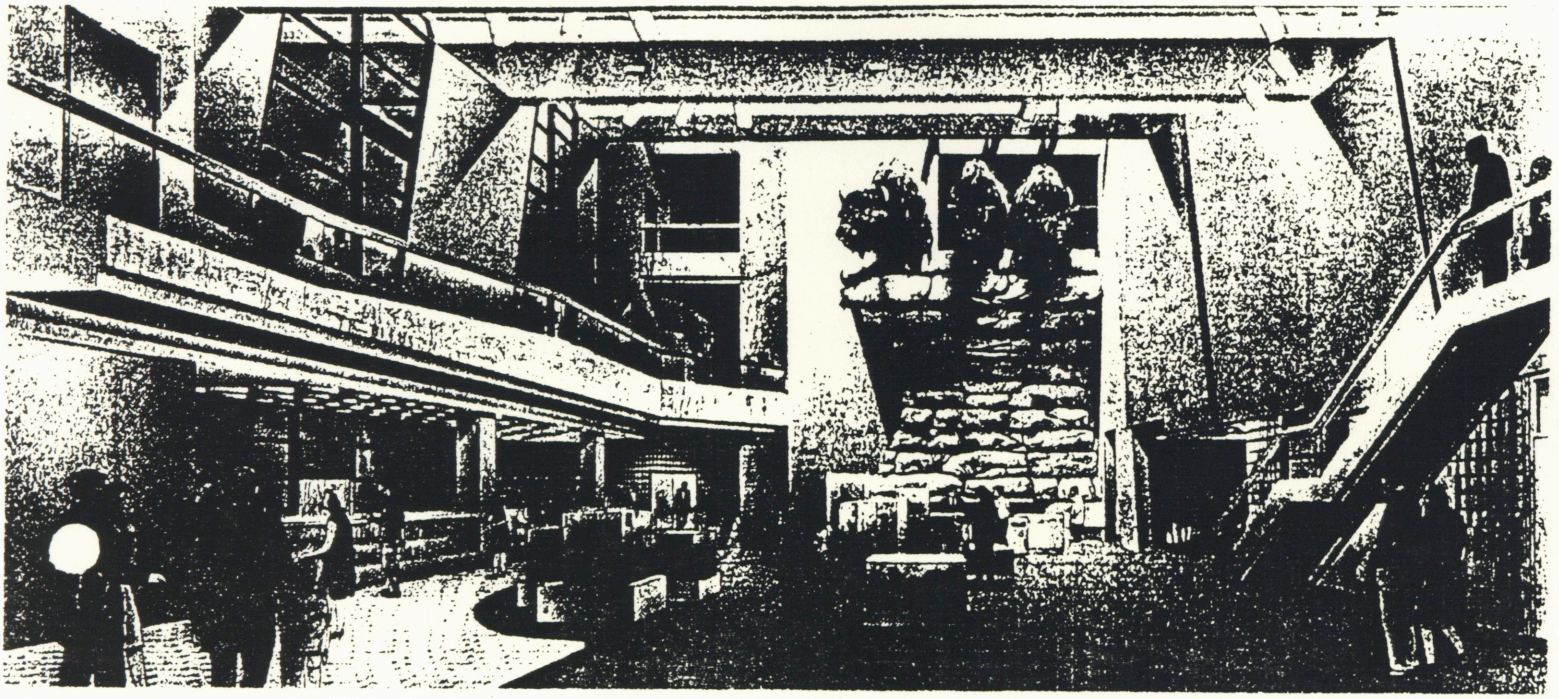
PRECEDENT STUDIES

The following examples of interpretive centers and museums were chosen as being representative works that addressed successfully several needs, concerns and goals that can also be found in the Ulm Pishkun project. These examples tend to reinforce the success of interpretive centers as visitor and tourist destinations. An interpretive center at the Ulm Pishkun could probably be expected to have at least as many visitors as the Head-Smashed In Buffalo Jump Interpretive Centre (located in Alberta), that number over 300,000 per year! The financial income generated by large numbers of tourists drawn to the Ulm Pishkun, could have postive effects on local and area economies.

Most of these examples also address the issue of earth-berming and try to minimize negative site impacts, a major goal of this thesis.

1- Head-Smashed-In Buffalo Jump Interpretive Centre, 18 km NW of Fort Macleod, Alberta, Canada.

The Head-Smashed-In facility has a floor area of 2,400 sq.m. (25,824 sq.ft.), of which approximately 554 sq.m. (5,961 sq.ft.) are administration and services, 1,296 sq.m. (13,945 sq.ft.) are public areas, and 568 sq.m. (6,111.68 sq.ft.) are display areas. The facility houses an 80 seat theater, a 60 seat cafeteria, and a gift shop. Parking includes 30 RV/trailer stalls, 6 bus stalls, and 120 car stalls. There are over 2 km of outdoor interpretive trails on the 1,470 acre site. The complex is handicapped accessible, including two sets of elevators and stairs. The cost was $9.82 million, for a cost of $380.27 per square foot. It might be noted here that most museums today, can be built for $150.00 per square foot. The high cost of the Head-Smashed-In complex might be attributed in part, to the large amount of excavation and earthwork necessary to build, and bury the building into the cliff. The museum was designed by architect Robert LeBlond. The jump was designated as a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO), in 1981. The designation provides protection for the site in the form of a permanent legal, administrative and financial framework.



The Head-Smashed-In facility features guided tours of the Centre, the cliff top and archaeological digs. Exhibits help explain the ecology, geography, climate and vegetation of the prehistoric plains and native accounts of the origins of man. Tipis and travois reconstructions as well as artifacts using a visitor hand´s-on approach, help provide an overview of the Plain´s peoples lifestyle. A topographical model of the jump site, gathering basin, and drive lanes helps interpret the use of the buffalo jump. There are also exhibits that explain the consequences of European contact and trade goods, including the horse and the gun, and how their influence altered the native culture. An archaeology lab, and film presentation, introduce the visitor to the archaeology program at the complex. The Head-Smashed-In Complex since it´s opening in 1987, has averaged over 300,000 visitors a year, more than double the original estimates.

Significant Points :

(positive)
- located on an archaeological site
- museum and research center
- earth shelter form, structure buried in cliff
- handicap accessible
- government financial support of project

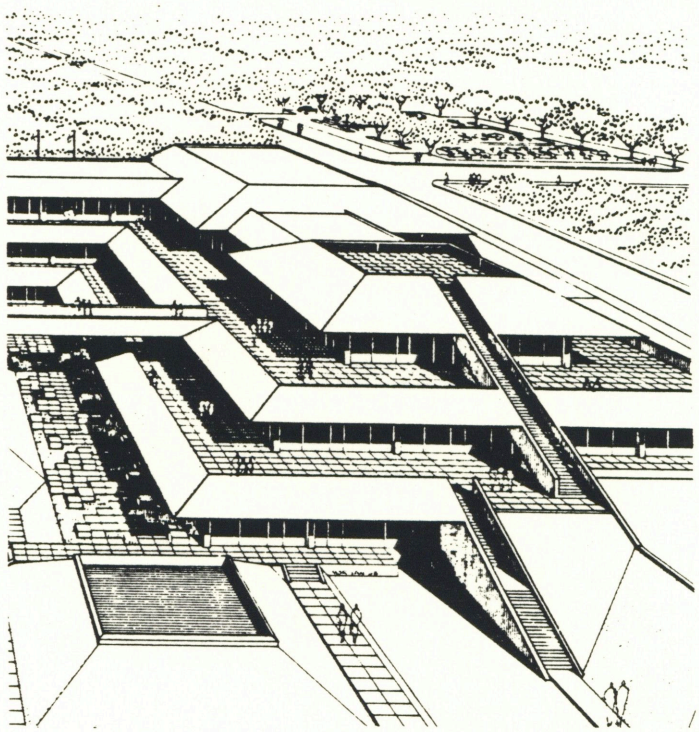
(negative)
- exhibit spaces not integrated into design
- entry access to/from parking area is difficult during peak use
- high cost of construction

2- Florida State Museum, Florida State University, Gainesville, Florida.

Built in the early 1970's the Florida State Museum was designed to house and display a large natural history collection and archaeological exhibits. Research laboratories and university classrooms for the study of the natural and social sciences are also included in this building. The building is seated into an existing hillside, and is of an earth shelter type design. Protected by the earth burming on three sides, the museum is left exposed to the south. Daylighted through the south facing windows, the museum is said to be extremly efficient in terms of energy conservation. The museum complex is a two level facility with a daylighted basement area. Loading docks and receiving areas at both levels allow for the cleaning, sorting, fumigating and catelogueing of newly acquired materials. Mueseum and research storage areas are located on each level, with the main storage being in the basement level. Administration and staff offices are located in the two main levels, with the main entry to the reception and exhibit area being accessed from the top of the hill at the upper level. An exterior courtyard and sculpture garden compliment the structure.

Designed by architect William Morgan, construction costs for this museum were funded by the Florida Board of Regents, private donors and the National Science Foundation.

Significant Points :
(positive)
- earth shelter structure
- use of daylighting for interiors
- integrated exhibit spaces
- handicap accessible
- diversified form of funding



3- American Heritage Center and Art Museum, University of Wyoming, Laramie, Wyoming

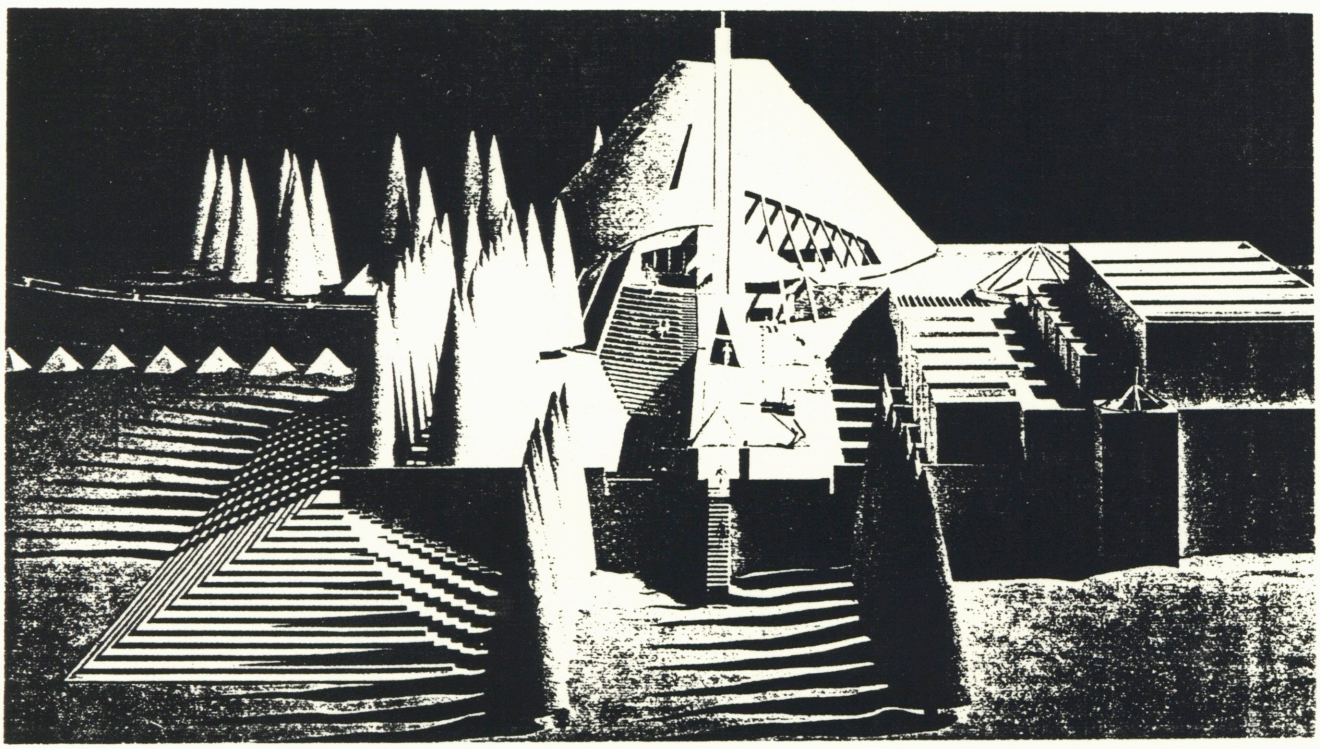
This 136,755 sf. facility, will house and exhibit the regions cultural aspects and museum artifacts, including manuscripts and works of art. The building will include exhibit spaces, galleries, research areas, archives and space for future functions, such as kitchen and dining, archives, auditorium, and extra museum storage and service areas. The center is capped by a large dome structure inspired by the native American tipi, the mountains, and expressing the monumentality of the pyramids. The whole facility sits in and upon a man-made messa of earth-bermed forms and structures.

The architect is Antoine Predock of Albuquerque, New Mexico.

Significant Points :

(positive)

- use of sunlight to define spaces
- use of earth burming and relationship to mountainous region
- inclusion of space for future use and expansion



5- Aillwee Cave Visitors´ Centre, County Claire, Ireland

Built between 1977-1979 this center was designed to protect and control access to underground limestone caverns once used by denning prehistoric bears. The circular, spiraling form of the complex is designed to blend and merge with the surrounding limestone cliff face. The organic form is constructed of concrete and veneered with broken limestone from the area. This facility while relatively small, includes an area for exhibits, administration and reception, a gift shop, a small cafeteria and restrooms.

The architect was A. & D. Wejchert. The centre was designed for and funded by a private client (Aillwee Cave Co. Ltd.).

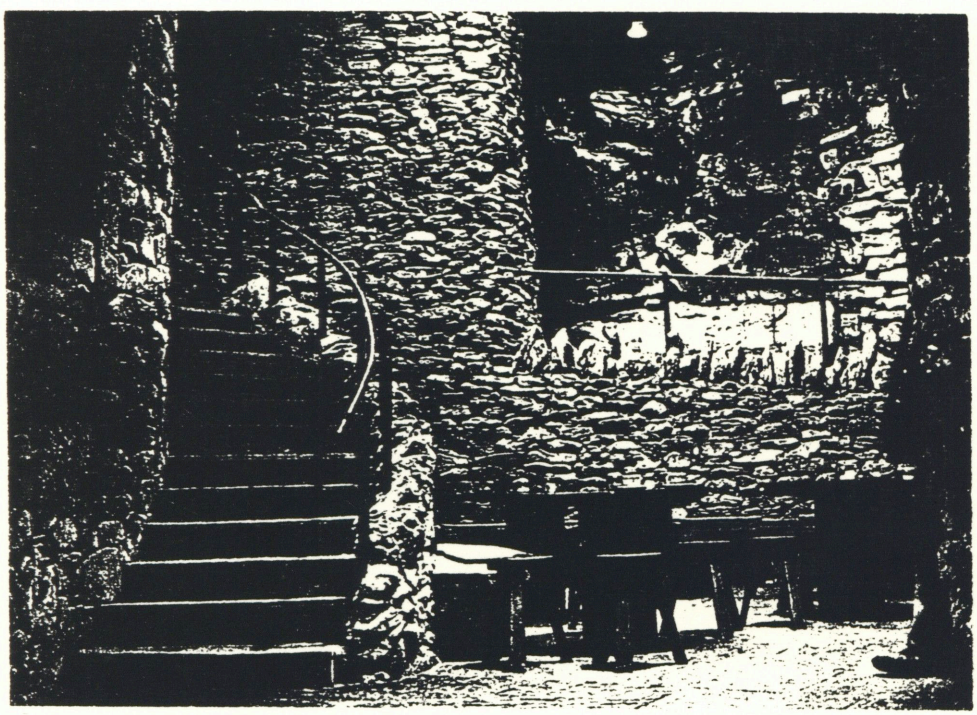
Significant Points :

(positive)

- organic form of structure integrated into cliff face
- although small square footage, includes many features of larger facilities
- "timeless" quality
- privately funded

(negative)

- depends on artificial lighting of spaces
- not capable of handling large numbers of visitors at a time



6- Rio Grande Nature Center and Preserve, Albuquerque, New Mexico

Built in 1983-1984, this center was built to help insure the protection of a natural wetland habitat, and to increase public awareness and understanding of our ecosystem. This building has approximately 5,000 square feet of floor area that includes classroom space, exhibits, a small library and work spaces. The facility is built into a low hill bordering a lake. Entry is made through the hill via a concrete tunnel. Views from the building look across the water and surrounding marsh lands. Guided tours lead guests on outdoor nature trails around the site.

The architect was Antoine Predock of Albuquerque, New Mexico.

Significant Points :

(positive)

- earth shelter design
- entry through hillside
- passive solar applications
- smaller size

TABLE #1 PRECEDENT STUDY

	HEAD-SMASHED-IN, ALBERTA	FLORIDA STATE MUSEUM,	AMERICAN HERITAGE MUSEUM, WYOMING	TYRRELL MUSEUM, ALBERTA	AILLWEE CAVE VIS/CNTR, IRELAND	RIO GRANDE NATURE CENTER, NEW MEXICO
TOTAL SQ/FT	25,824		136,755		1,900	5,000
EXHIBIT (INT) % SQ/FT	23 %	19 %	12 %		13 %	26 %
EXHIBIT (EXT) % SQ/FT	TRAILS	CRT/YD	CRT/YD		TRAILS	TRAILS
ADMIN/OFFICE % SQ/FT	6 %	7 %	14 %		6 %	4 %
RESTROOMS % SQ/FT		.9 %	.8 %			
CLASS/THEATER % SQ/FT	6 %	33 %	3.5 %			12 %
PROJECTION RM % SQ/FT	1.5 %		.4 %			
INFORMATION % SQ/FT	9 %	3 %	3.5 %		3.5 %	2 %
GIFT SHOP % SQ/FT	1.5 %				20 %	
CAFETERIA % SQ/FT	4.5 %		3 %		12 %	
KITCHEN % SQ/FT	1.5 %		.4 %		4.5 %	4 %
GALLERY % SQ/FT			4 %			
LAB/RESEARCH % SQ/FT	4 %	15 %	3.5 %			10 %
STORAGE (GEN) % SQ/FT	8.5 %	4 %	3.5 %		2 %	12 %
(ARTIFACTS) % SQ/FT	7 %	9 %	32 %			
MECHANICAL % SQ/ FT	4.5 %	2 %	2 %			2 %
CIRCULATION % SQ/FT	20 %	4 %	8.4 %		33 %	20 %
PUBLIC REST/RM % SQ/FT	3 %	3 %	2 %		6 %	8 %
PARKING SPCS	AUTO 120 RV 30 B 6	AUTO 16 UNIV PRK	UNIV PRK		AUTO/RV 60	U.N.

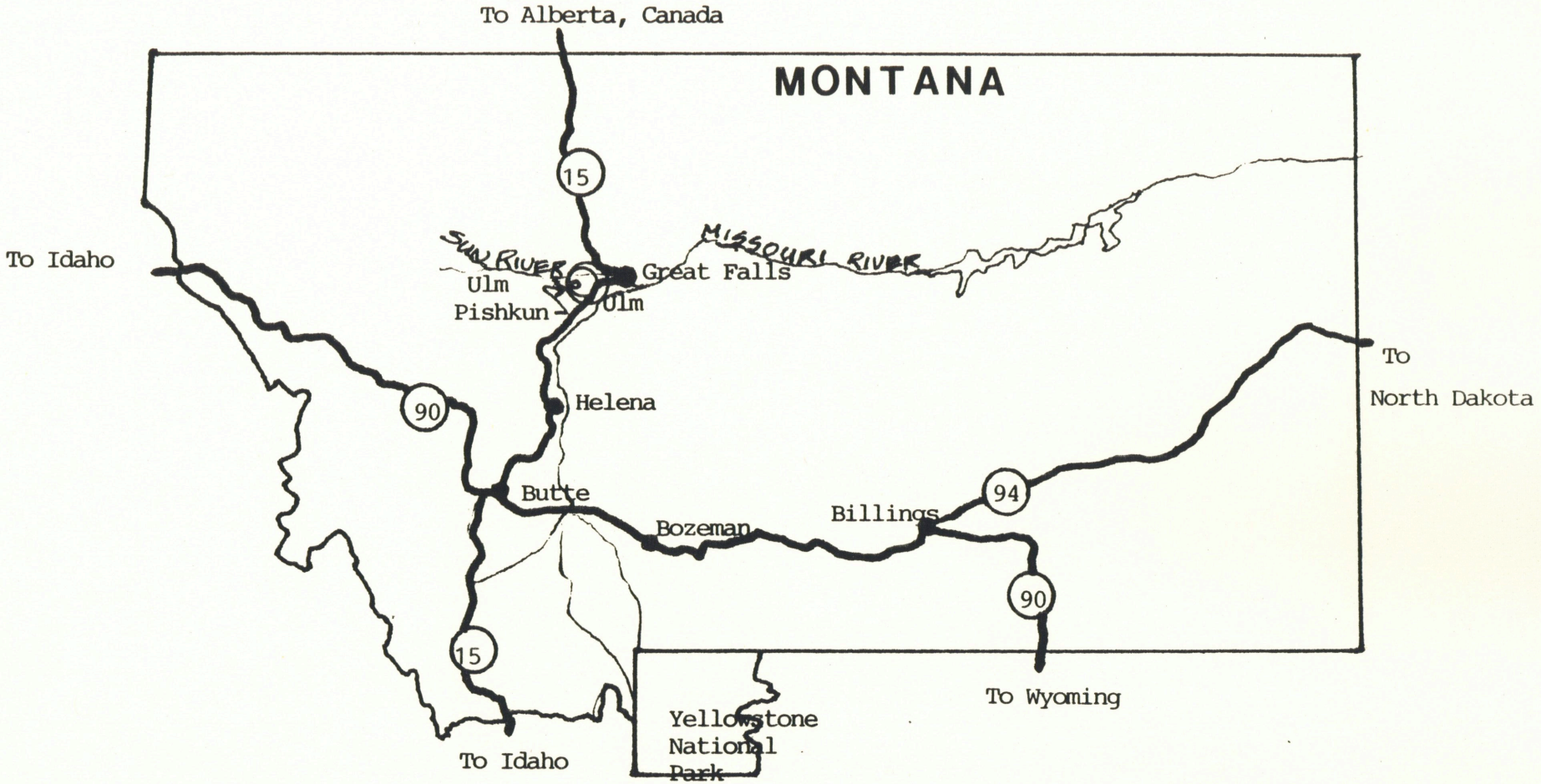
2 ANALYSIS

LOCATION

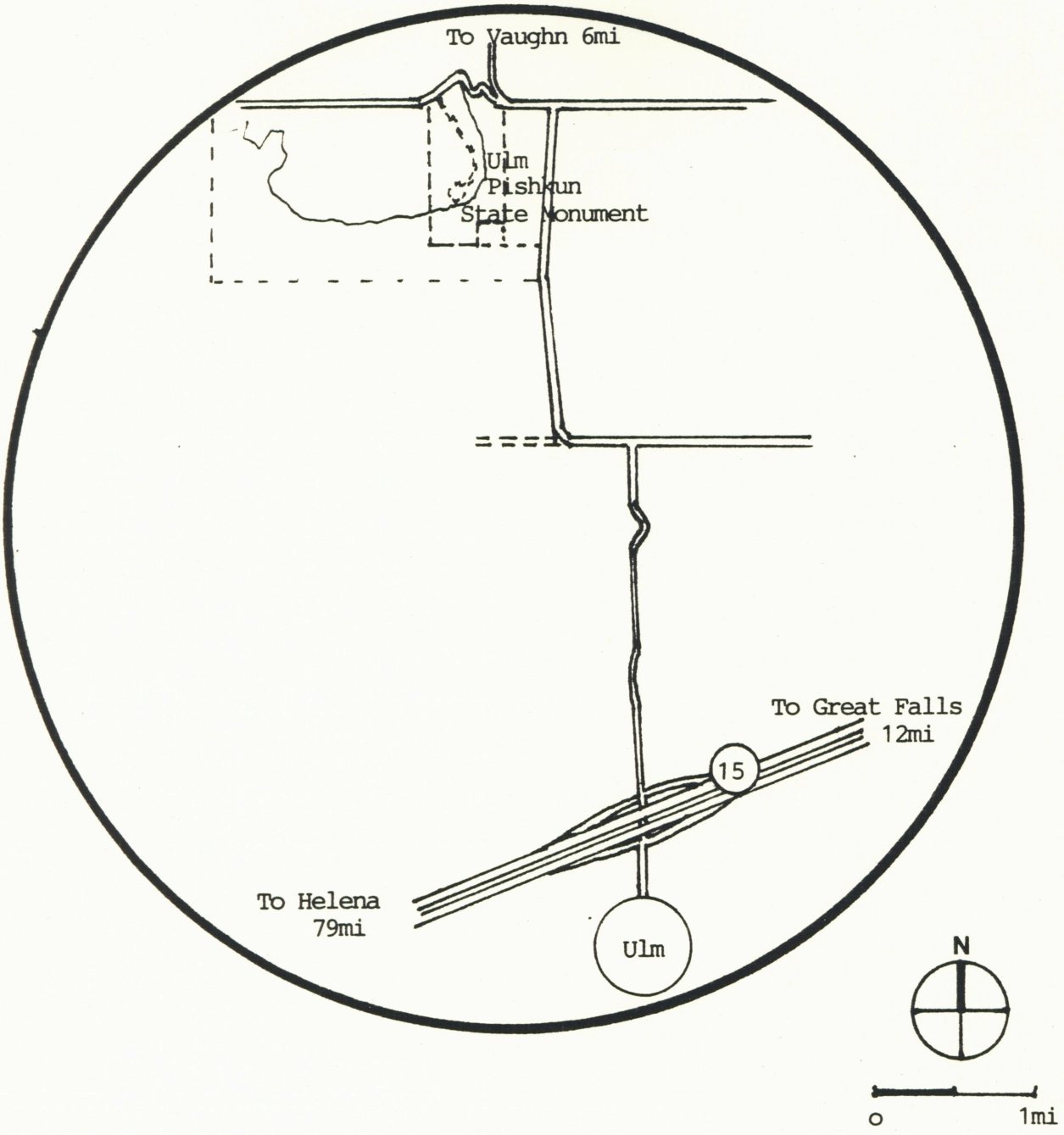
SITE LOCATION

Located on Interstate 15 approximately twelve miles south-west of Great Falls and seventy-nine miles north of Helena, the Ulm Pishkun site offers easy access to both vacationers, school groups, and Montana's public. The site is four miles west of the small town of Ulm, Montana, on Taft Hill (24 Cascade Sections 13 & 18, T20N-R1 & R2E: U.S.G.S.)

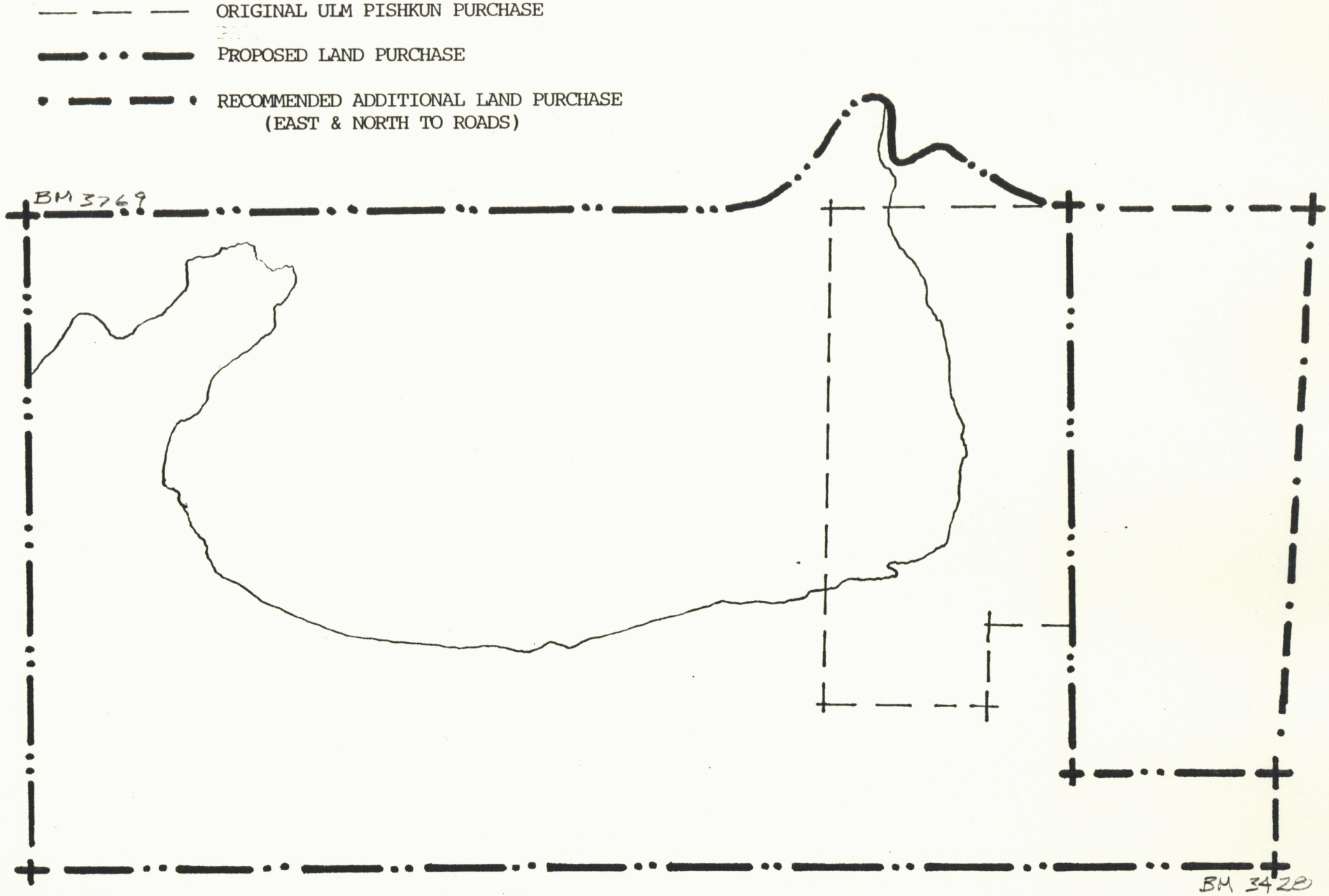
Access to the site from Ulm and Interstate 15 is by an improved gravel road. A small gravel road leads on to the site property from the top and ends in a turn around at an interpretive area near the cliff. Foot trails lead from there along the cliff edge and down to the terrace at the cliff base.


To Alberta, Canada
MONTANA
15
To Idaho
SUN RIVER
MISSOURI RIVER
Ulm
Pishkun
Great Falls
Ulm
90
Helena
To
North Dakota
Butte
94
Billings
Bozeman
90
15
To Wyoming
Yellowstone
National
Park
To Idaho
N

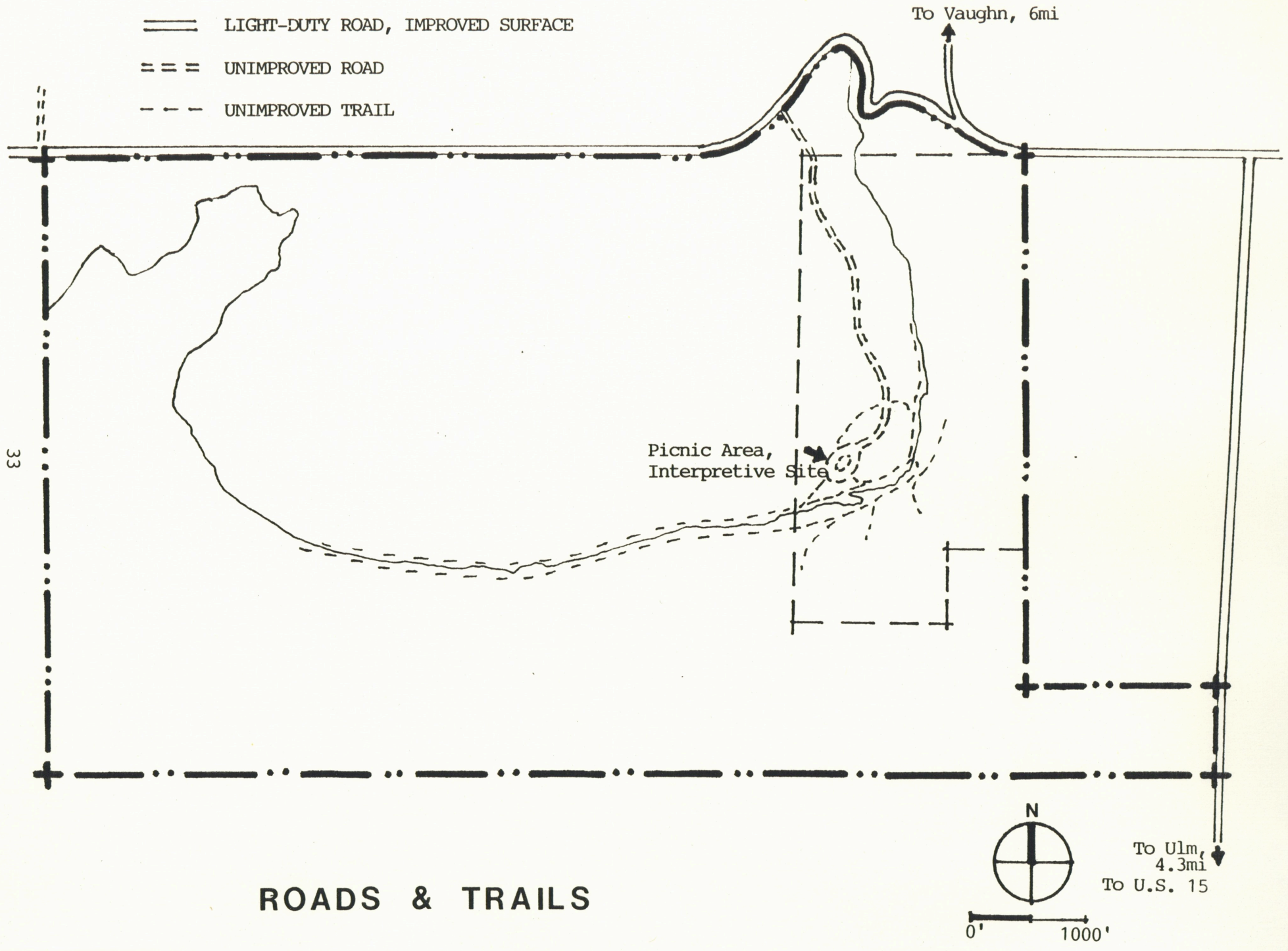
REGIONAL


To Vaughn 6mi
Ulm
Pishkun
State Monument
To Great Falls
12mi
15
To Helena
79mi
Ulm
N
o
1mi

LOCATION



SITE BOUNDARIES



ROADS & TRAILS

LAND

GEOLOGIC FORMATIONS AND SOIL CLASSIFICATIONS

The Ulm Pishkun Buffalo Jump Site is comprised of three geologic formations. They are the Bootlegger Member, the Taft Hill - Vaughn Member, and an alluvium component.

The Bootlegger Member is identified as having interbedded block shale, greenish bentonite, brownish sandstone, and chert pebble conglomerate. Soils covering this formation include the Marmarth, Tanna and Ernem Series that range from shallow to moderate depths (up to 40 inches) including sub layers of clayish loam. While consisting of well drained soils, septic tank absorption fields would face moderate to severe conditions and would probably require built-up drain fields. This formation would have stable soils and provide a relatively sound building base.

The Taft Hill - Vaughn Member is identified as having an undifferentiated upper part, interbedded bentonitic sandstone and siltstone forming badland topography. The lower part consists of alternating greenish glauconitic sandstone and shale. The soils in this member include the Lisam and Abor series. Septic tank absorption fields in these soils would also face severe conditions, including slow perculation. This area could have serious building implications, such as erosion and soil expansion, as well as poor strength conditions.

The alluvium component of the lower site also contains the Arbor

Series of soil at moderate depths, up to 40 inches. This soil has a sandy, clayish composition that has severe shrink-swell characteristics. Septic tank absorption fields in this area would also face severe conditions and poor perculation problems. This area may be high in bentonitic sands and clays, and is part of the drainage that collects the run-off moisture from the slopes above. Drainage and soil expansion could be severe building hazards in this area.

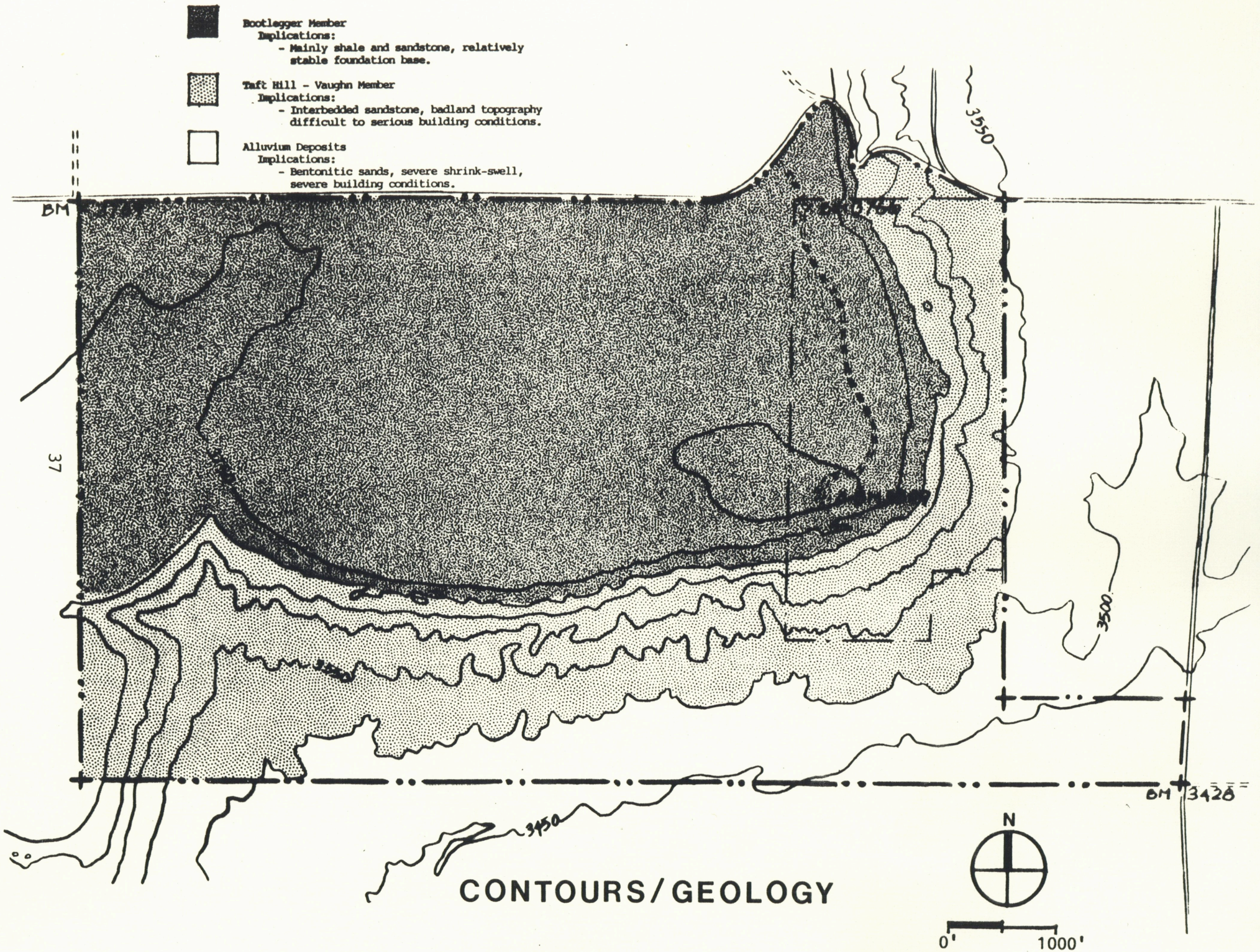
Implications:

Of the geologic formations and soil conditions mentioned above, the Bootlegger Member and its associated soils would appear to have the greatest potential conditions for building purposes. These soils also have the least severe conditions for septic tank drain fields, although they are probably still unsuitable for that purpose without some modification. This area also has the least shrink-swell characteristics and would be more suitable for building and parking area needs.

Sources:

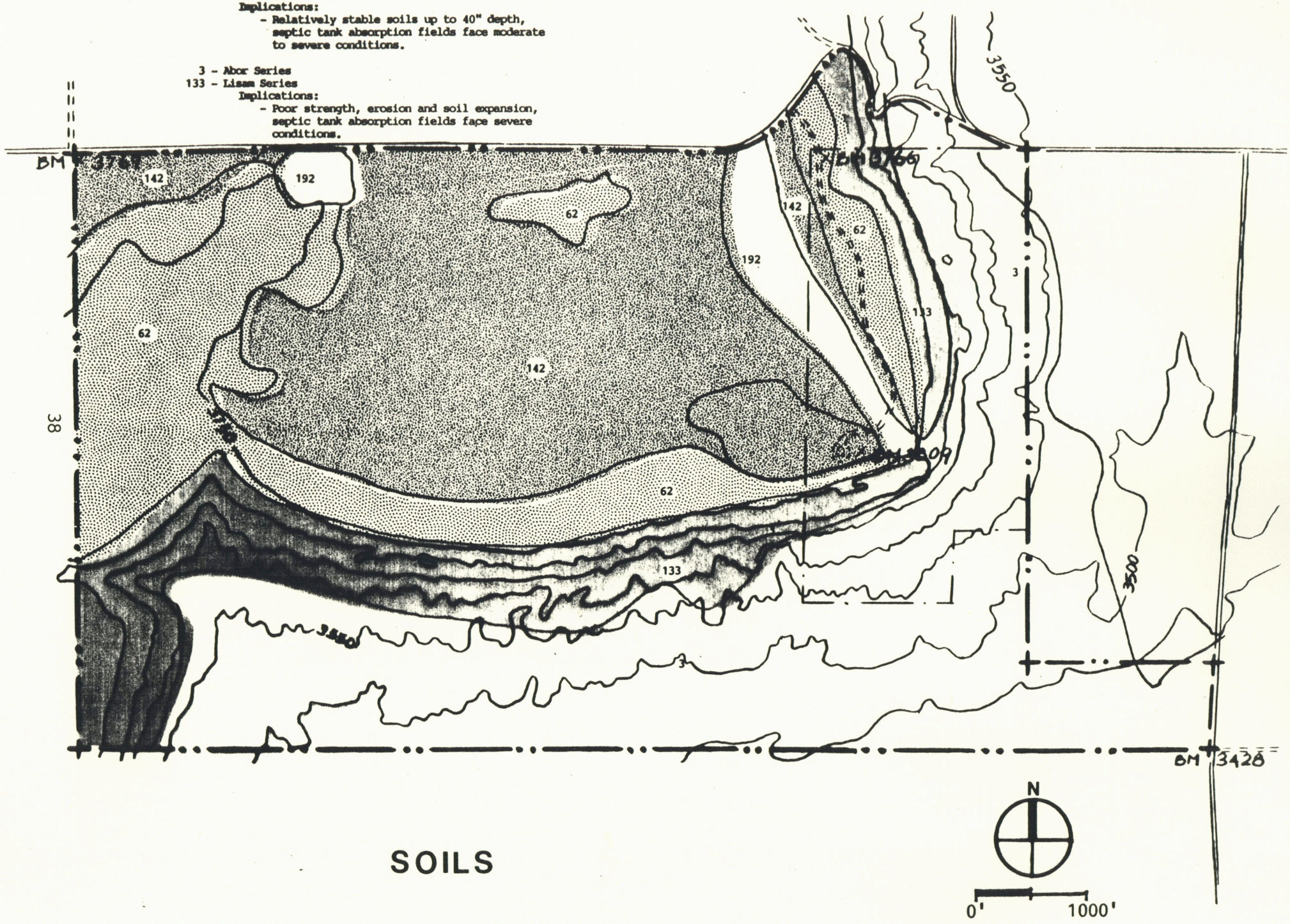
1) Plant & Soils Department, Montana State University, National Cooperative Soil Survey, U.S.A., 6/74-5/81

2) U.S.G.S., Montana Highway Department, Geology Bulletin #52, Plate #1, (note: formations taken from partial bulletin covering area and Ulm site. Date of publication unknown)


Bootlegger Member
Implications:
- Mainly shale and sandstone, relatively stable foundation base.
Taft Hill - Vaughn Member
Implications:
- Interbedded sandstone, badland topography difficult to serious building conditions.
Alluvium Deposits
Implications:
- Bentonitic sands, severe shrink-swell, severe building conditions.
BM
3550
3500
3450
BM 3428
37
N
0'
1000'
CONTOURS/GEOLOGY

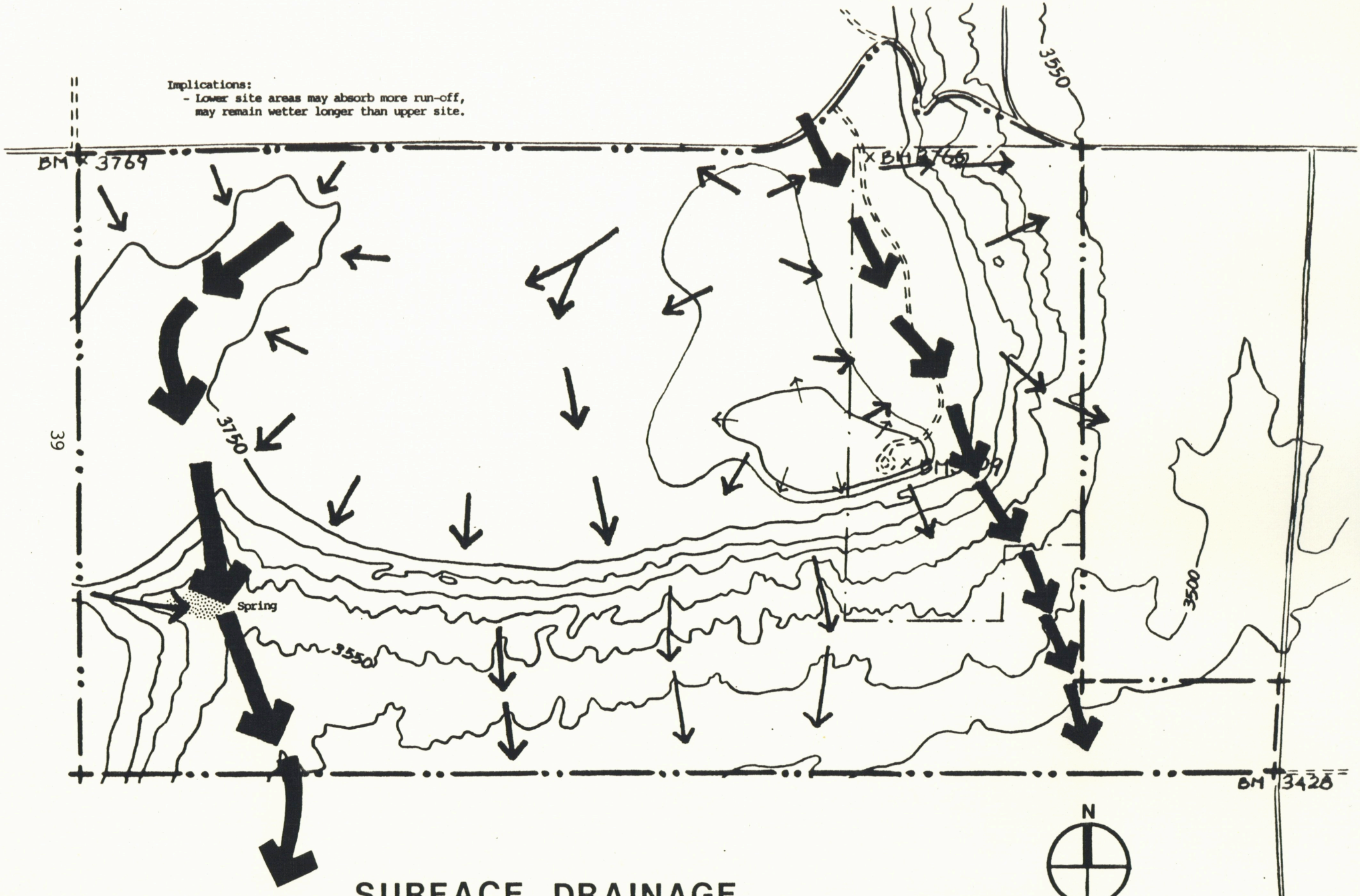
62 - Ennam Series
142 - Marmarth Series
192 - Tanna Series
Implications:
- Relatively stable soils up to 40" depth, septic tank absorption fields face moderate to severe conditions.

3 - Abor Series
133 - Lisam Series
Implications:
- Poor strength, erosion and soil expansion, septic tank absorption fields face severe conditions.



38

SOILS



SURFACE DRAINAGE

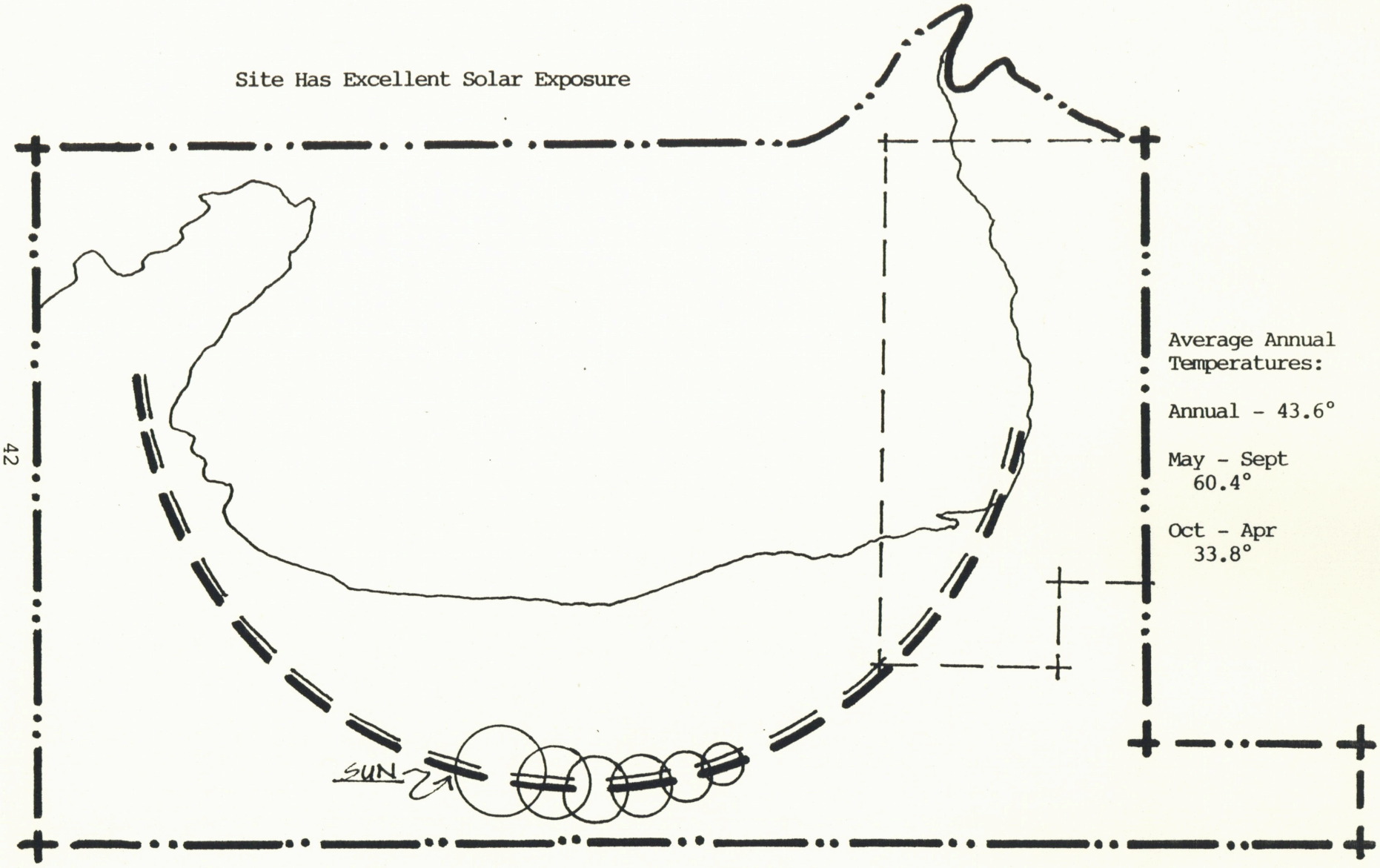
SENSORY

SENSORY ISSUES

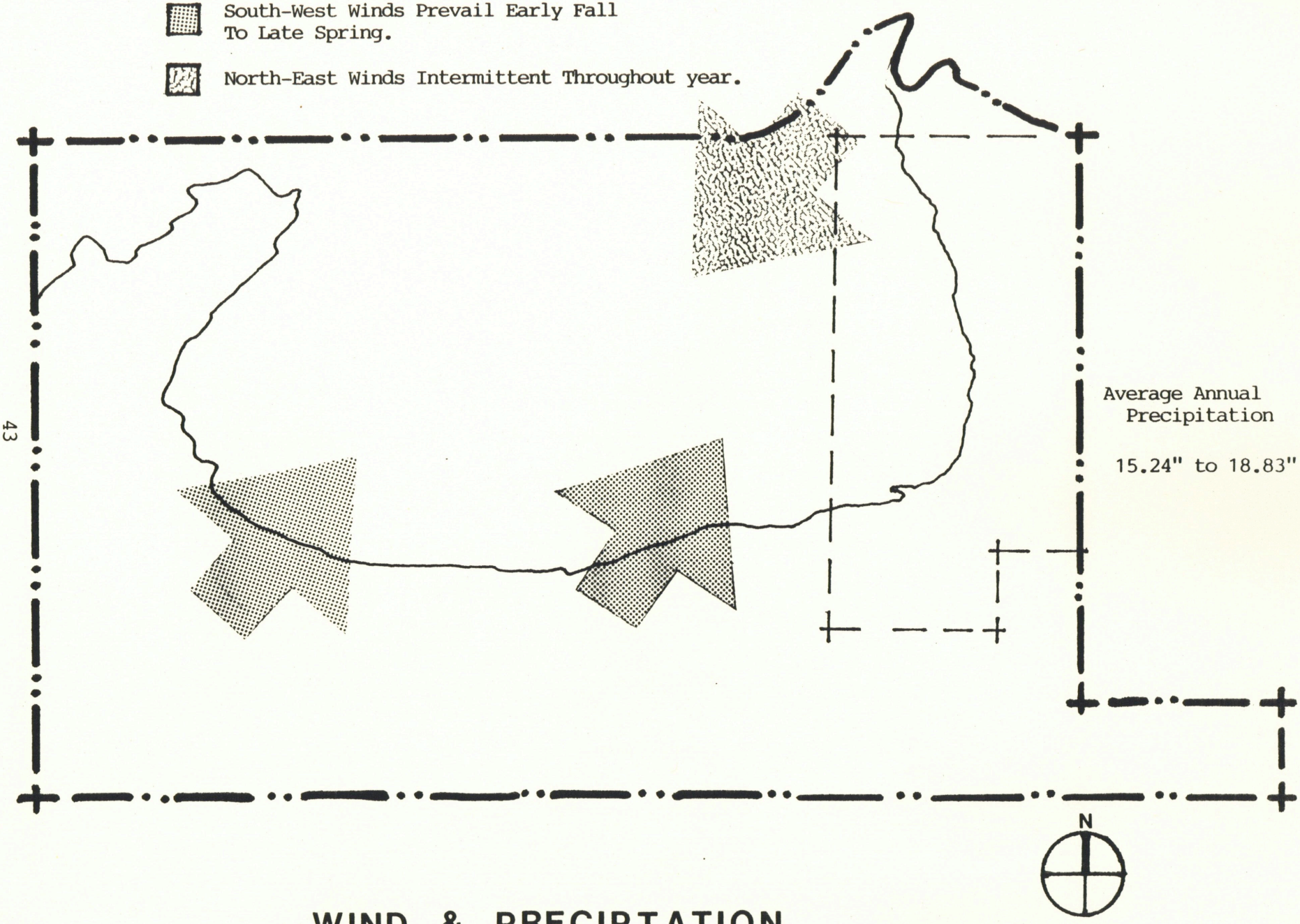
The Ulm Pishkun site is located on a high bluff, overlooking the Missouri River drainage, has sweeping views of the plains to the south and east, and the surrounding mountain ranges. The cliff faces to the south and the site is in the sun through most of the day. Temperatures average 60.4 degrees May-Sept, and 33.8 degrees Oct-Apr. The south-west winds blows regularly from early fall to late spring, and blow intermittently from the north-east throughout the year.

The high plateau that the site is located on can be seen for many miles to the north-east, the west, and the south. The best views towards the jump site, can be seen from the access road to the site from Ulm.

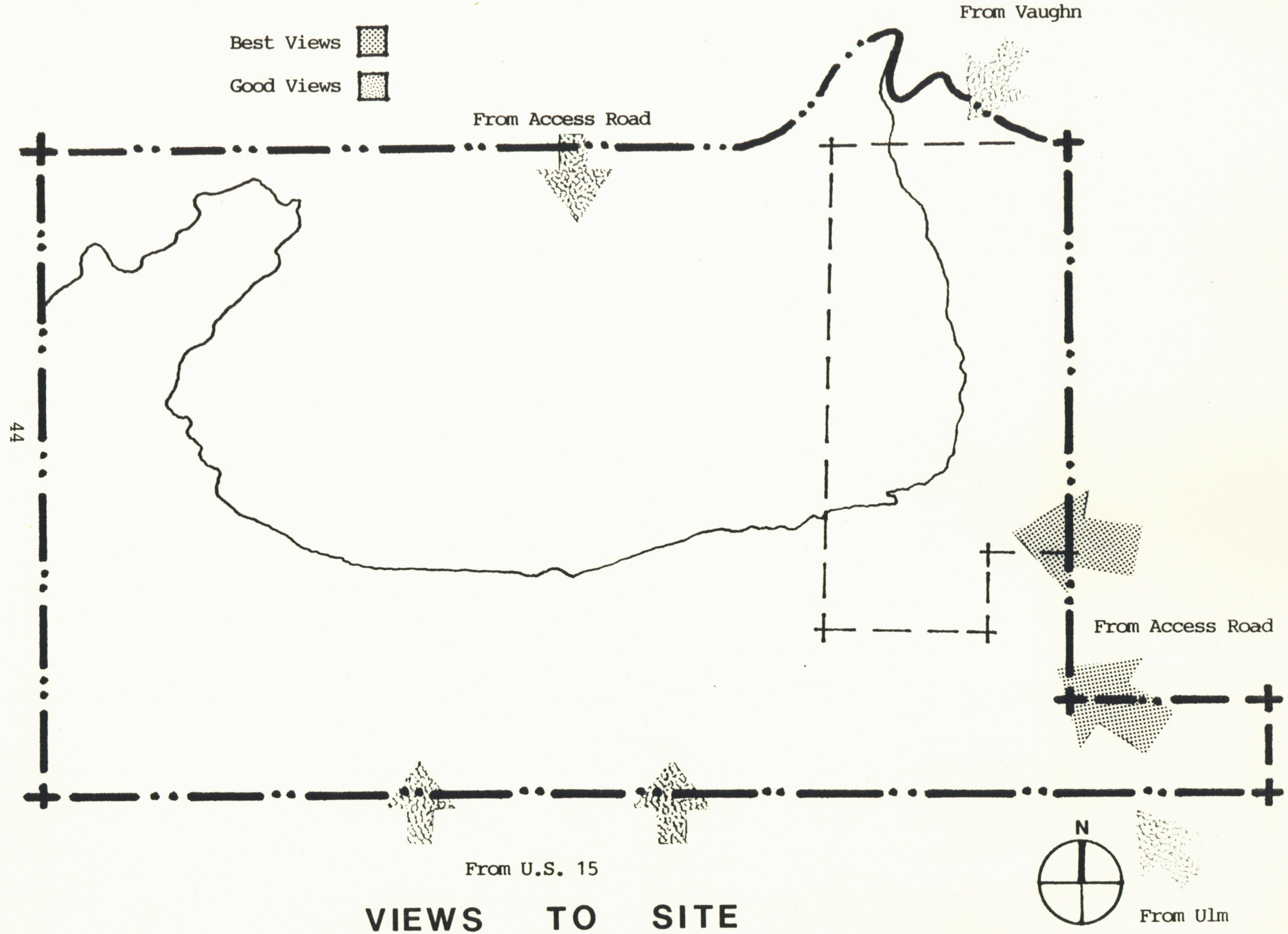
There is one sensory issue at the Ulm Pishkun which cannot be mapped, but must be experienced. It is the spiritual issue that surrounds the place, and can be found only by being there and partaking in the sensual experience of sun, wind, height, sweeping vistas, and the knowledge that early man once also stood there.



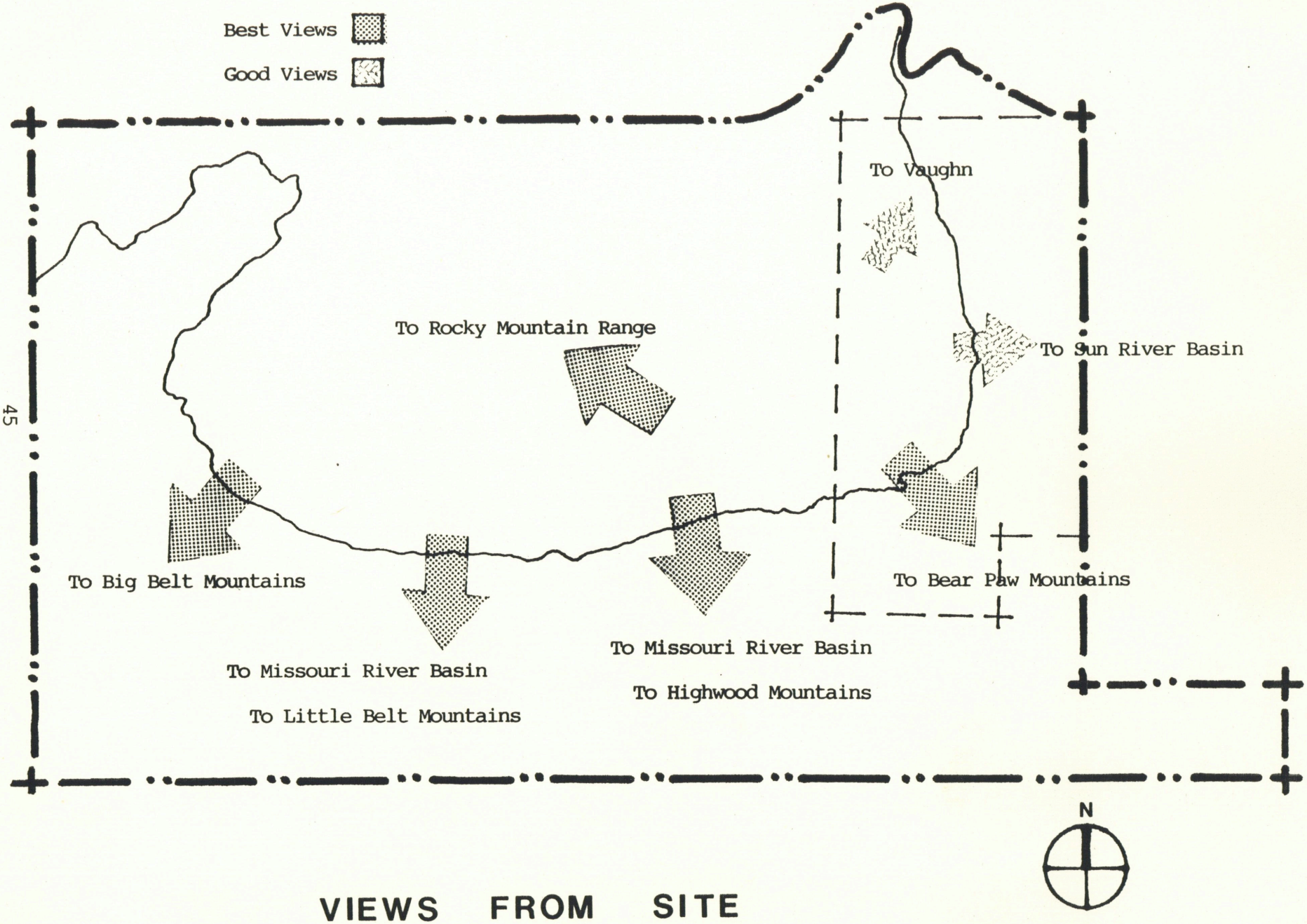
SOLAR EXPOSURE



WIND & PRECIPTATION



VIEWS TO SITE



VIEWS FROM SITE

NATURE

PLANT COMMUNITIES OF THE ULM PISHKUN

The various plant communities common to the Ulm Pishkun, and identified in the following table, are indicative of the Northern Plains eco systems. Most are frequently associated with poor soil, overgrazing or drought-like conditions. Several plant species found on the site, were utilized by Northern Plains Indian cultures and are listed at the end of the following table. No known threatened or endangered plant species have been located on the site, and development of the site would have little adverse effect on the common resident plant species.

TABLE 2 - (Plant Communities Of The Ulm Pishkun)

Community Type: Agsp - Agropyron spicatum
Bogr - Bouteloua gracilis

Grasses -	Forbs -	Browse -
Bluebunch wheatgrass	Hood's phlox	Broom snakeweed
Blue grama	Fringed sagewort	(half-shrub)
Prairie junegrass	Cudweed sagewort	
Western wheatgrass	Hairy golden aster	
Japanese chess	Prairie goldenn pea	
Needle-and-thread		

Community Type: Arfr - Artemisia frigida
PLA spp. - Plantago species
Sede - Selaginella densa

Grasses -	Forbs -	Browse -
Blue grama	Fringed sagewort	Broom snakeweed
Western wheatgrass	Spiny indianwheat	
	Woolly indianwheat	
	Clubmoss	

Community Type: Rice - Ribe cereum
Elci - Elymus cinereus

Grasses -	Forbs -	Browse -
Inland giant wildrye	Fringed sagewort	Squaw current
Western wheatgrass	Three-leaved milkvetch	Skunkbush
Needle-and-thread	Common dandelion	Wood's rose
Prairie junegrass	Hairy golden aster	
Blue grama		

Community Type: Bogr - Bouteloua gracilis
Chna - Chrysothamnus nauseosus

Grasses -	Forbs -	Browse -
Blue grama	Fringed sagewort	Rubber rabbitbrush
Western wheatgrass		Broom snakeweed
Prairie junegrass		
Needle-and-thread		

TABLE 1 - (Plant Communities Cont.)

Community Type: Bogr - Bouteloua gracilis
Stco - Stipa comata

Grasses and Grass-like Plants -	Browse -
Blue grama	Broom snakeweed
Needle-and-thread	
Prairie junegrass	
Western wheatgrass	
Needleleaf sedge	
Pricklypear cactus	
Fringed sagewort	
Hood's phlox	
Hairy golden aster	
Prairie golden pea	

Lichens:

Lecanora melanophthalama -	Green with dark green apothecia (discs)
Lecanora muralis -	Green with tan apothecia
Lecanora alpina -	White with black apothecia (sunken)
Dermatocarpon hepaticum -	Brown
Candelariella rosulans -	Small gold, rock edges
Rhizocarpon disporum -	Gray with black discs

TABLE 3 - (Plants Utilized By Early Plains Peoples)

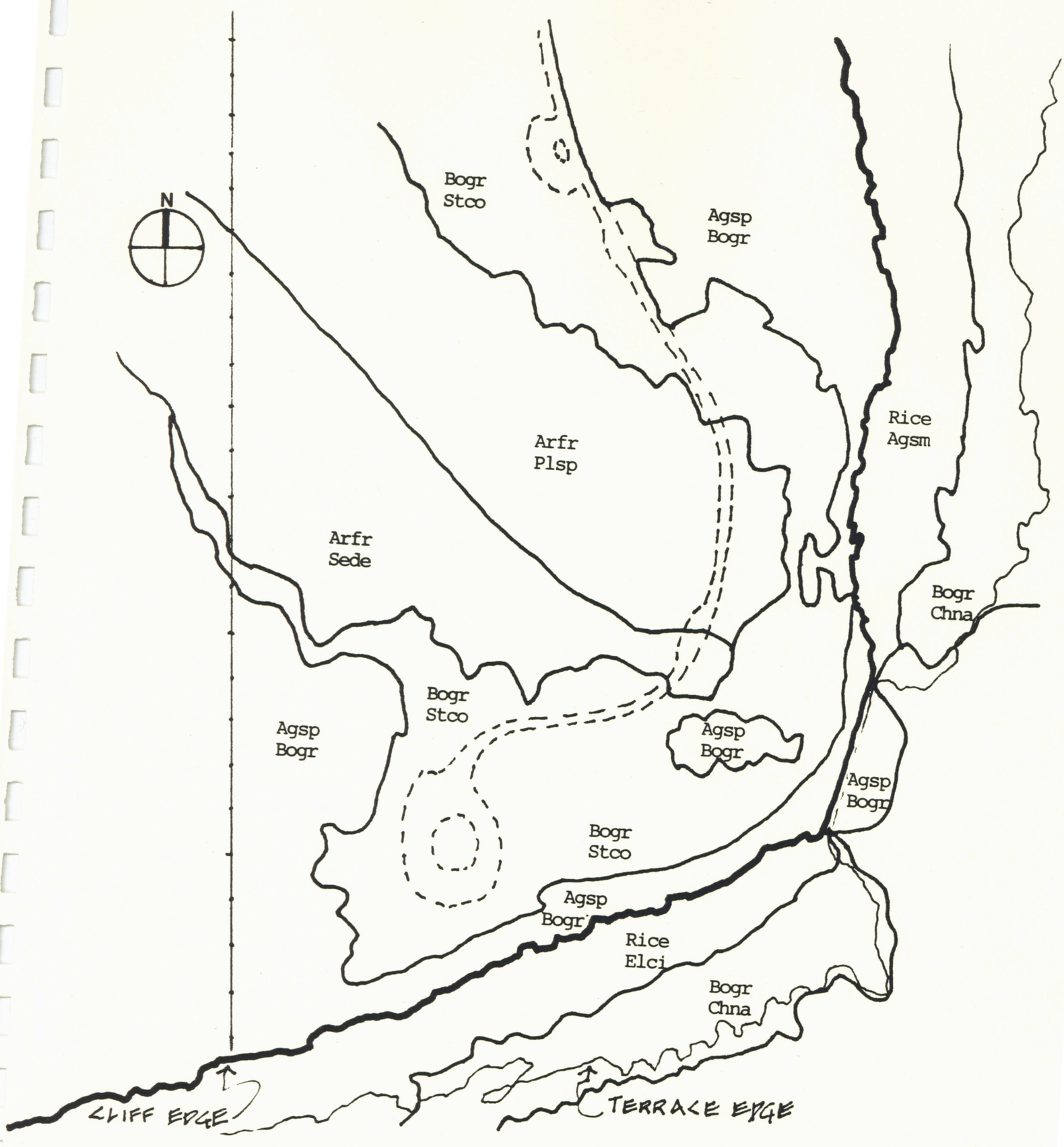
Plants:	Use:
Pricklypear cactus -	Stems and fruits collected in early summer, eaten raw.
Three - leaved milkvetch -	Roots dug in spring, eaten raw.
Squaw current -	Berries gathered in summer, eaten raw.
Wood´s rose -	Rose hips collected in fall and winter, eaten raw, dried or pounded into pemmican.
Cudweed sagewort -	Used for medicinal and religious purposes and ceremonies.
Skunkbush -	Roots dug and used for basket weaving, fruits collected, dried and mixed in lotion for treatment of small-pox.

Sources:

1) Plants of South Dakota Grasslands, A Photographic Study, Bulletin 566, Agriculture Experiment Station, South Dakota State University, Brookings.

2) Deaver, Ken. The Subsistence Strategy, appendices, The Bootlegger Trail Site, A Late Prehistoric Spring Bison Kill, by Tom E. Roll and Ken Deaver. 1978

3) Aaberg, Steve. Plant Species of the Ulm Pishkun, Personal files on the Ulm Pishkun. 1990


N
Bogr
Stco
Agsp
Bogr
Arfr
Plsp
Rice
Agsm
Arfr
Sede
Bogr
Chna
Bogr
Stco
Agsp
Bogr
Agsp
Bogr
Agsp
Bogr
Bogr
Stco
Agsp
Bogr
Rice
Elci
Bogr
Chna
CLIFF EDGE
TERRACE EDGE

VEGETATION

FAUNA OF THE ULM PISHKUN

At the present the Ulm Pishkun site appears to have no resident big game or large animal species. However, the area surrounding the site does support deer and pronghorn antelope. The site has resident populations of Cottontail Rabbits and Black-tailed Prairie Dogs. Golden Eagles, Foxes, and Coyotes in search of food, occasionally visit the site and prey on the Cottontails, Prairie Dogs and small rodents (such as mice).

Black-tailed Prairie Dog

Black-tailed Prairie Dogs live communally in underground burrows or "towns". The entrances to their burrows are located in built up mounds of earth extracted from tunnel burrowing, that help prevent surface ground water from flooding living quarters. Prairie Dog adults weigh about three pounds and are about a foot long. They typically do not hibernate all winter, but may sleep through extreme weather and surface during warmer periods. Prairie Dog pups in litters of four to six, are born in underground dens in the spring and venture to the surface about four weeks later, usually in June. Their life span, when they survive predation, is seven to eight years. Prairie Dogs feed on surrounding grasses and will eat grasshoppers when infestations occur. Their shrill chirping calls can be heard as

when infestations occur. Their shrill chirping calls can be heard as they scamper for cover at the first sign of danger. Prairie Dogs were nearly wiped out during this century from poisoning by farmers and ranchers, concerned over crop and pasture losses. Education and protective measures have helped restore stable populations, and their towns are popular with sight-seers and wildlife watchers.

Site Implications:
- The Ulm Pishkun presents a unique opportunity for public education and viewing of these popular little creatures.

Cottontail Rabbit

Cottontail Rabbits occur in large numbers on the site. They are typically found near clumps of grass and brush amongst the boulder strewn terrace at the cliff base. Cottontails do not hibernate in the winter, but remain active, feeding on area grasses and brush. They are an important winter time food source for larger preditors, such as fox, coyote, hawks and eagles.

Cottontails have as many as four litters, of up to six babies, each season. Born in grass and fur lined nests, hidden in grass or brushy areas, the tiny youngsters begin to venture out at about fourteen days. Easily run down and captured, Cottontails were often eaten by North American Plains Indians.

Implications:
- Cottontail Rabbits are found scattered across the site and are fun to watch and appreciated by sight-seers and wildlife watchers. Being a food source, they also attract preditors, such as the Golden Eagle and Coyote.

Golden Eagle

The Golden Eagle is an occasional visitor to the site. Having wingspans of up to ninety inches, their soaring forms can be seen coursing the skies, searching the area for small mammals. Golden Eagles typically feed on rabbits, birds, or rodents (such as mice and prairie dogs), or carrion. But, they have been known to take larger species such as newborn deer and antelope fawns.

Golden Eagles can often be seen hunting in pairs, their piercing shrieks echoing off the terrain. Eagle pairs mate for life and usually one to two eggs are laid high in tree top or cliff side nests. Young are cared for by the parents until they are able to fly from the nest, and have been taught to hunt. Having a rather long life span, Golden Eagles have been known to live to over forty years.

Implications:

- Golden Eagles are a truly magnificent bird, and a joy to view. No nests were observed on or near the site, and hopefully the birds will not be overly disturbed by site activities.

Sources:

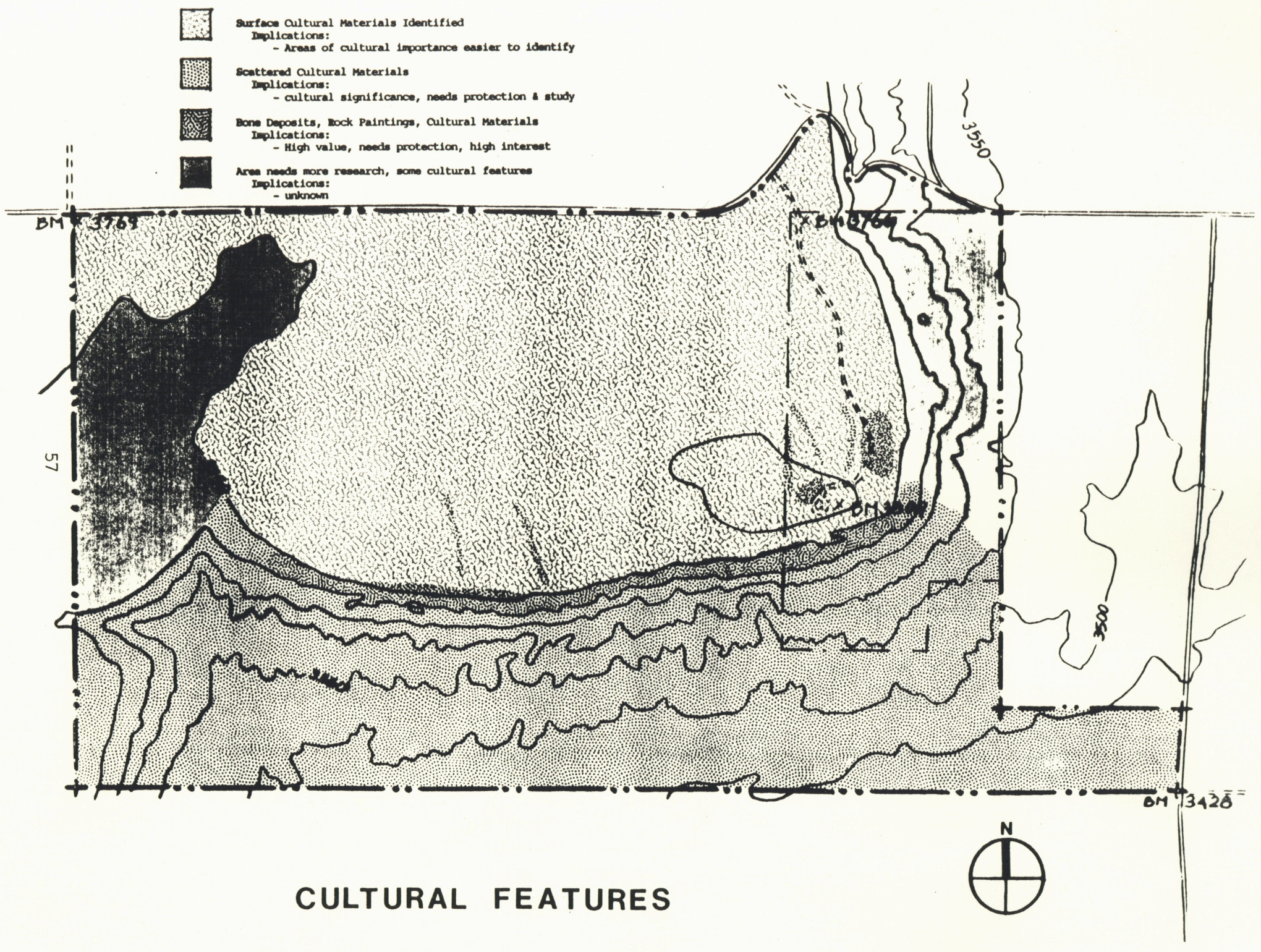
1) Drimmer, Fredrick (Editor)
The Illustrated Encyclopedia Of Animal Life.
Greystone Press, New York. Vols. 2,3,8

ARCHAEOLOGICAL FEATURES

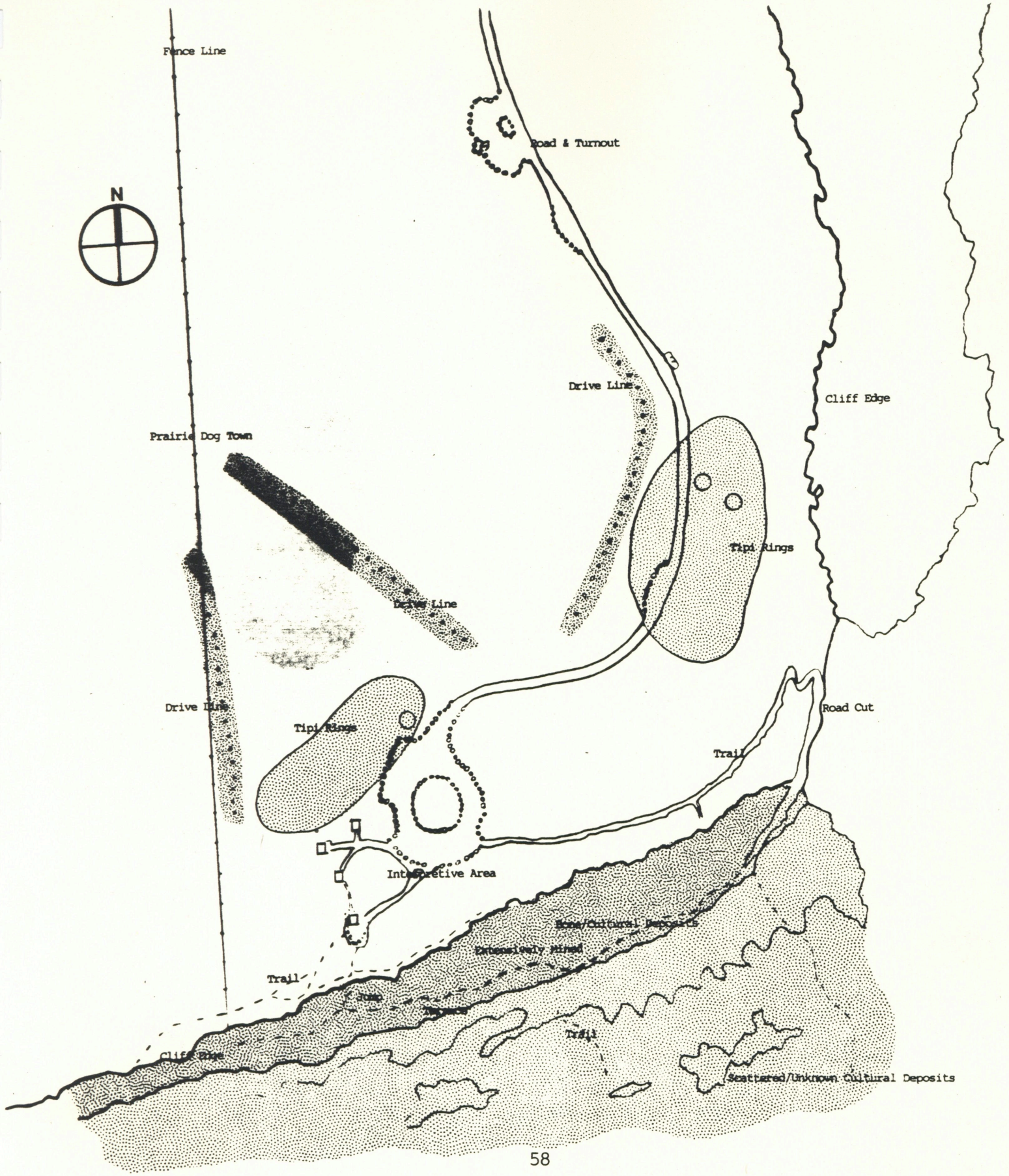
ARCHAEOLOGY

The Ulm Pishkun has a number of archaeological features that appear on the plateau above the cliff, on the terrace and talus slopes below the cliff, and on the flat areas at the bottom of the talus slopes. These known features consist of tipi rings and drive lines and a historic age building stone quarry above the cliff; tipi rings, fire pits, bison bone deposits, stone tools and projectile points on the terrace; and tipi rings at the base of the talus slopes.

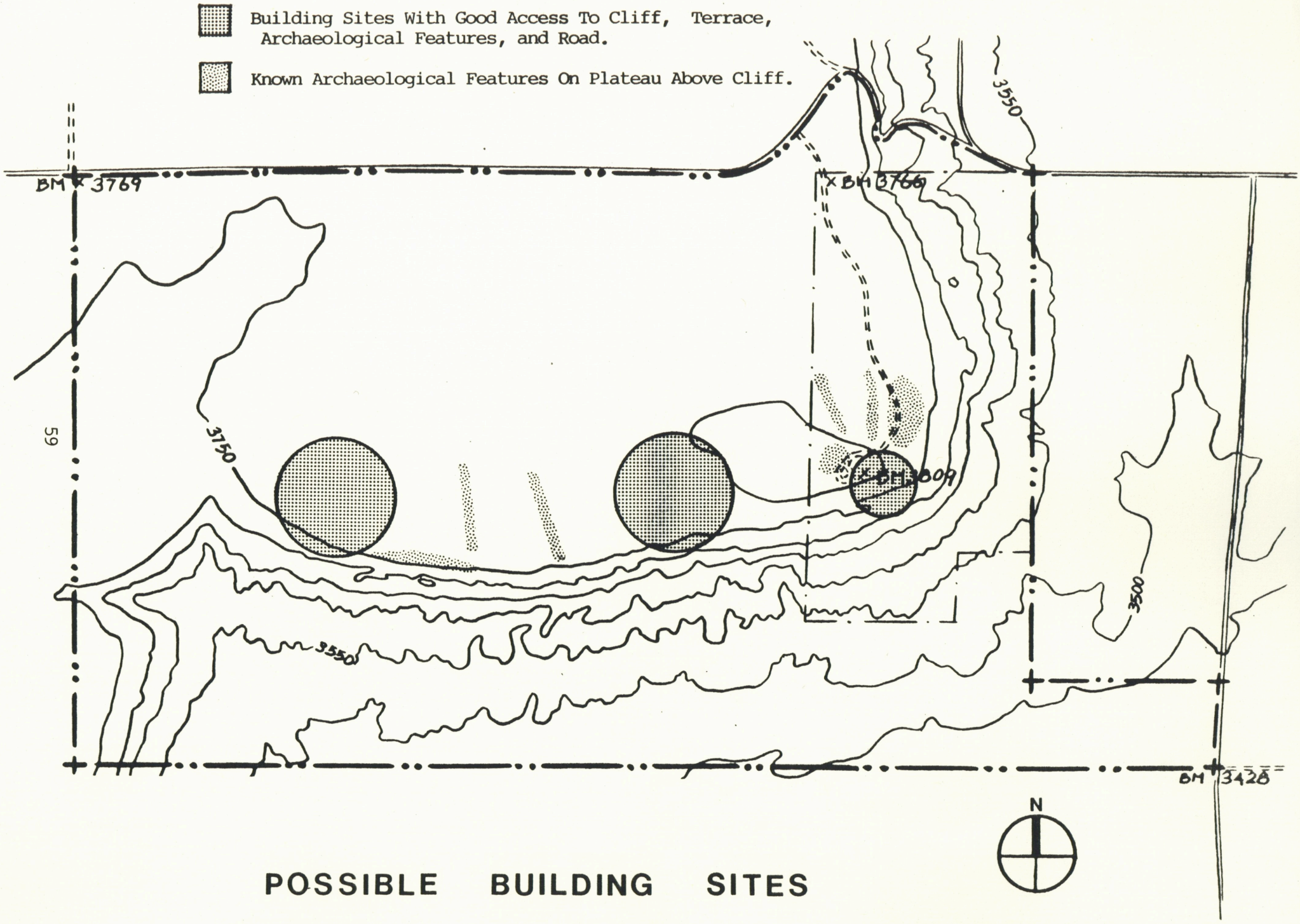
Possible building sites were identified on the basis of soil conditions and areas least likely to damage archaeological sites, with considerations made for archaeological exhibits, area fauna, and interpretive trails.



CULTURAL FEATURES



SITE FEATURES



POSSIBLE BUILDING SITES

3 PROGRAM

CONCLUSIONS

PROGRAM ISSUES

In the development of a program for the Ulm Pishkun, it was first necessary to identify how the site could best be utilized. Through conversations with the Cascade County Historical Society (Ulm Piskun group), anthropologists and archaeologists Dr. Tom E. Roll, and Dr. John W. Fisher, Jr., and archaeologist Stephen Aaberg; and conversations with Design Bureau Chief Dick Meyer and Cultural Resource Coordinator Paul Valley, both with the Montana State Department Of Fish, Wildlife And Parks, a set of program issues were developed.

The first and most important issue discussed, was the protection of archaeological features on the site. It was agreed by all that any building to be built on the site, should avoid if possible, the disturbance of the site's archaeological features. Building over a portion of the terrace was discussed, and it was felt this could be a viable approach, since the terrace had previously been disturbed in several places by commercial bone mining. It was also mentioned that the state was making efforts to acquire the portion of the cliff that is currently in private ownership, and that for the purpose of this study can be assumed to be a part of the site.

Next was the protection of the cliff. It was felt that any structure built on or near the jump, should be located in such a way as to minimize the negative visual impact on the cliff. Parking should be located away from the cliff edge, and preferably hidden from the views below.

It was agreed that the site should function as an interpretive area and museum complex, with an emphasis on the area´s geology, and it´s natural history; plus a focus on archaeological research and the site´s cultural features.

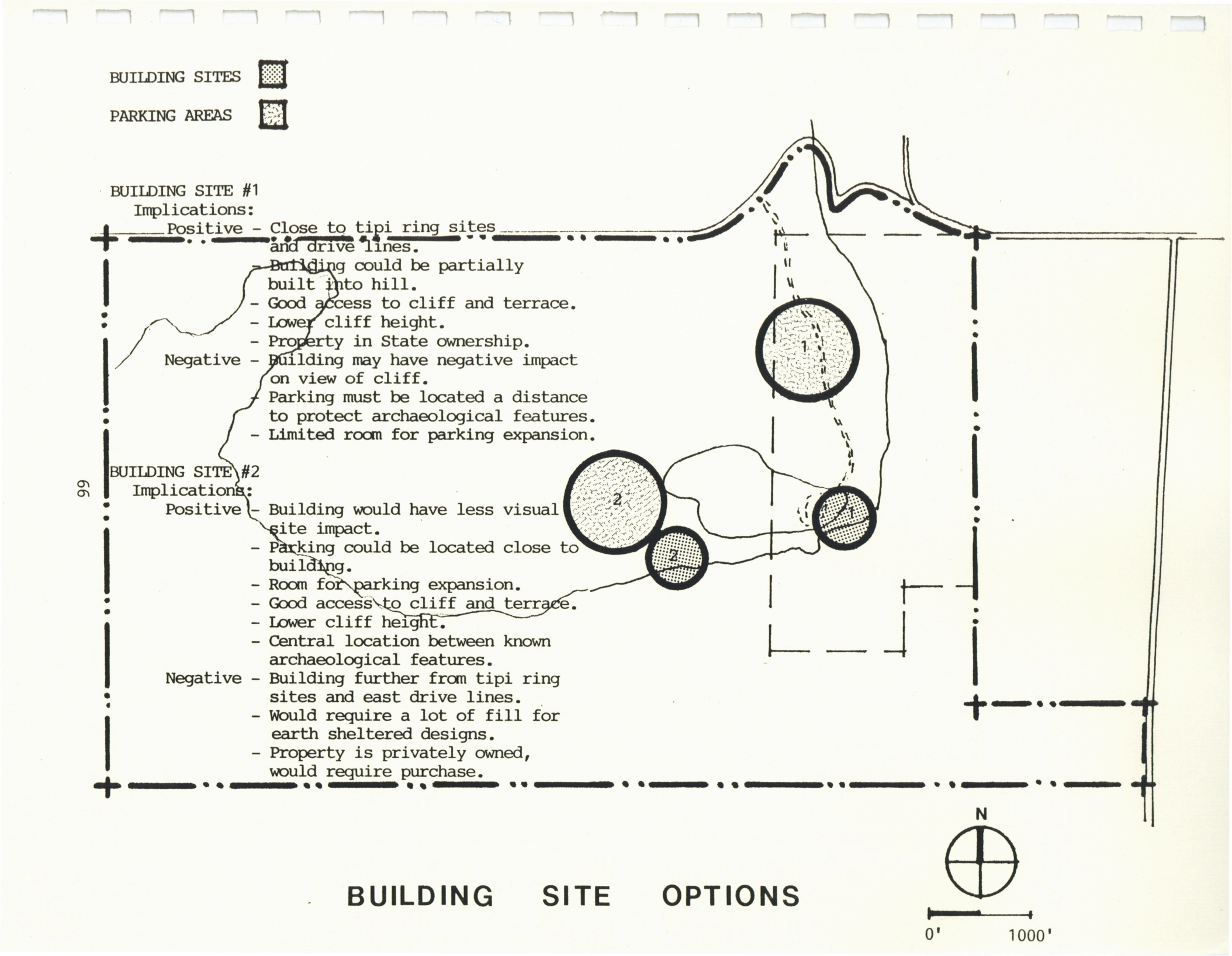
THE SITE

Two building sites were identified using the criteria listed in the last section and also considered other issues of site analysis, such as sun, wind, and soil conditions. One site, which for the purpose of this study shall be identified as site number one, is located on the portion of the Ulm Pishkun already in state ownership. The other site (number 2) is located along the cliff further to the west, on the privately owned portion of the proposed site.

Site number 1 is located on the eastern edge of the jump, where access to the terrace is good, and the hillside above could provide for an earth sheltered type design. Access to this site would lead the visitor from a parking area further back, through an area bounded by archaeological features (drive lines and tipi rings). Care would need to be taken in building here. One drawback could be that the building might block a portion of the cliff from views below on the road. The building on the end of (or beginning of) the cliff, might tend to act somewhat like a period on the end of a sentence, or an explanation point. Either identity would need to be thoughtfully avoided in a design solution.

Site number 2, located further west in a depression along the cliff also has good access to the terrace, could have good potential for an earth sheltered design, and is located in the middle, between known cliff top archaeological features and trails. Parking could be placed closer to the building here, and there is plenty of room for

any future expansion of the facility. There would be less chance of disturbing archaeological features while building here. One of this site´s greatest assets is that its location in the depression in the center of the cliff, might allow a design that could enhance views from below, while allowing full views of the cliff. This is the prefered site, and my proposal will be based on its use.



99

BUILDING SITE OPTIONS

THE USER

The complex would be used for archaeological digs and studies, for educational purposes (such as school sponsored field trips), and for the general enjoyment of visitors and tourists. All of the museum and the site interpretive trails, would be designed to be handicapped accessible. Allowances for safety along cliff top trails would be incorporated into site planning.

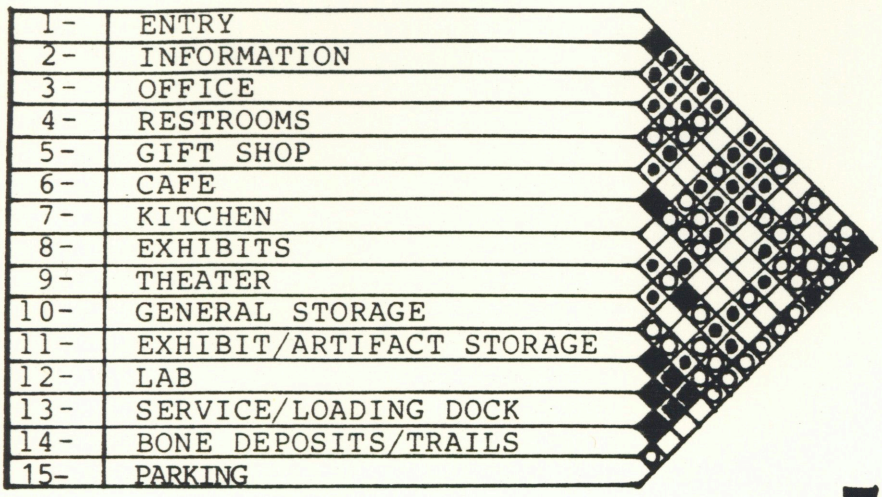
The building would need to have areas to meet the needs of the administrators and staff, an area for archaeological research, an area for large groups and guest speakers (a theater or classroom), as well as exhibit spaces and storage areas.

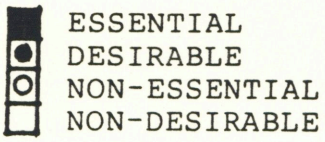
The space would have to accommodate the flow of visitors through the museum and onto terrace trails and back. It would also have to handle the storage of archaeological materials and supplies, as well as meeting the needs of the site archaeologist and his team of excavators.

BUILDING FUNCTIONS AND RELATIONSHIPS

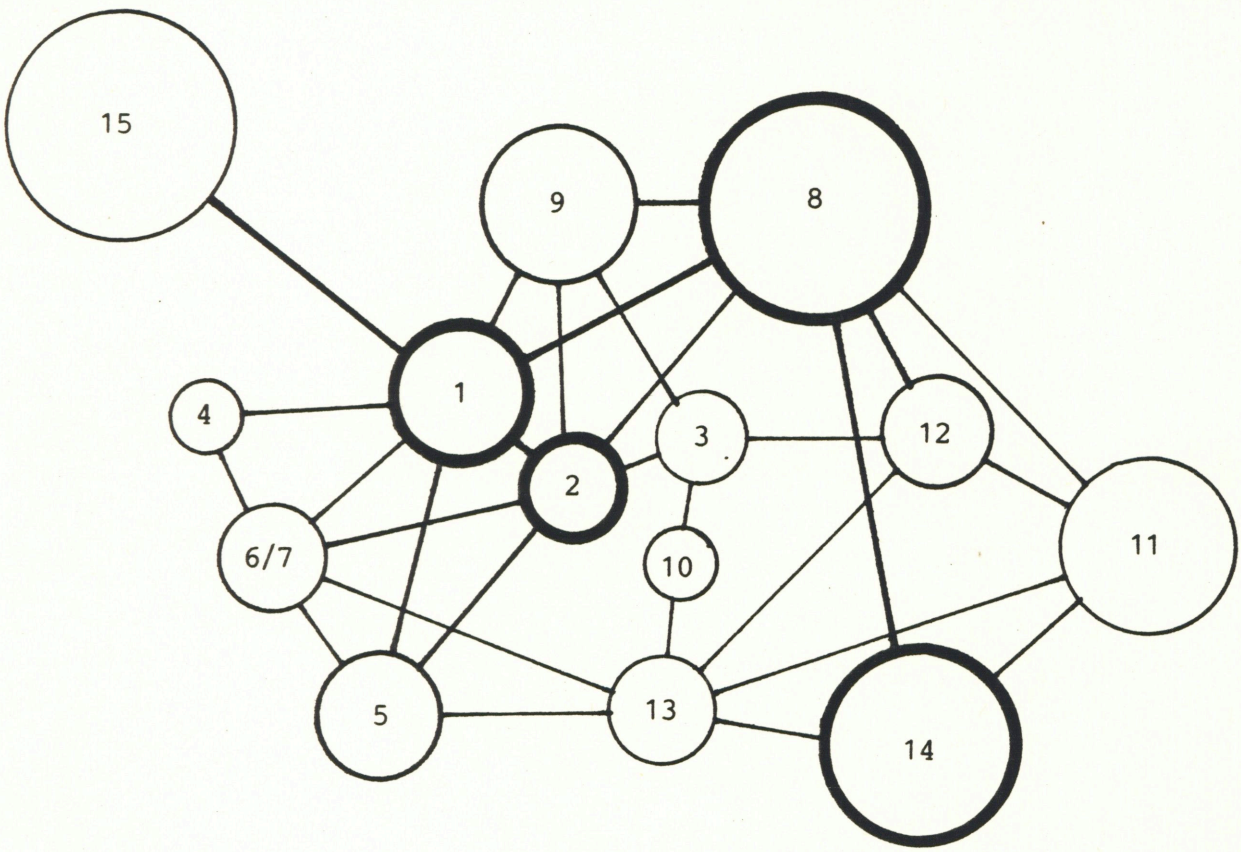
Precedent studies helped in the development of building functions and relationships. The space required for the building functions was determined through the precedent studies, through site analysis (what the site can reasonably handle), and checked for feasibility by Dr. Tom E. Roll, whom has had considerable experience with museum operations.

Space adjacencies and circulation types were also investigated through precedent research, and final relationships identified that would best meet the needs of the facility. A circular type of circulation was chosen to lead the visitor through a series of staged exhibits. Exhibits would occur in four stages, Geology, Natural Sciences, Nomadic Life (a Native American cultural exhibit), and Archaeology. The staging of the exhibits would help in the interpretation of the site in a logical procession.

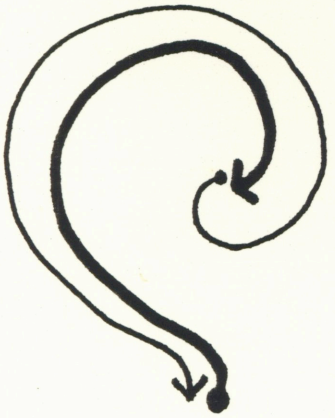




SPATIAL MATRIX



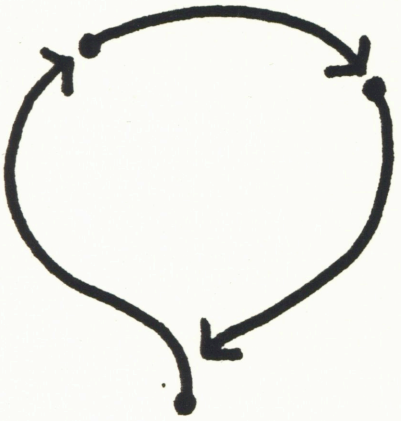
SPACE ADJACENCY



DEAD END

IMPLICATIONS:

- Pedestrian movement impeded
- Staging of events confused by pedestrian flow
- Controlled flow
- Less desirable

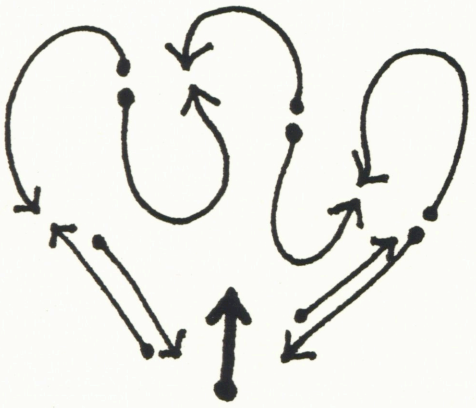


CIRCULAR

IMPLICATIONS:

- Controlled Flow
- Pedestrian movement un-impeded
- Staging of events easily accomplished

*More desirable

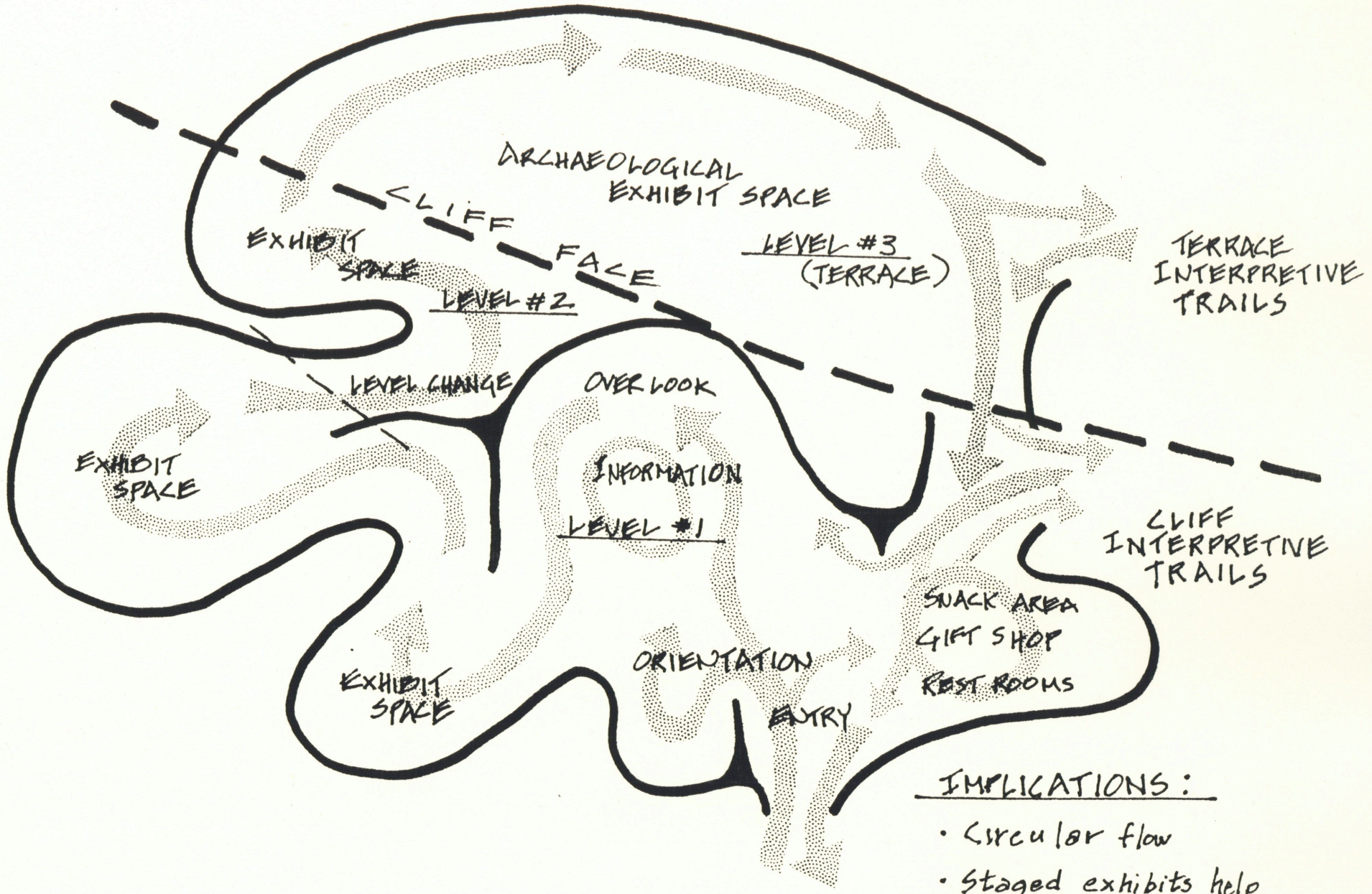


RANDOM

IMPLICATIONS:

- Un-controlled Flow
- Pedestrian movement confused
- Staging of events difficult to accomplish
- Less desirable

CIRCULATION TYPES

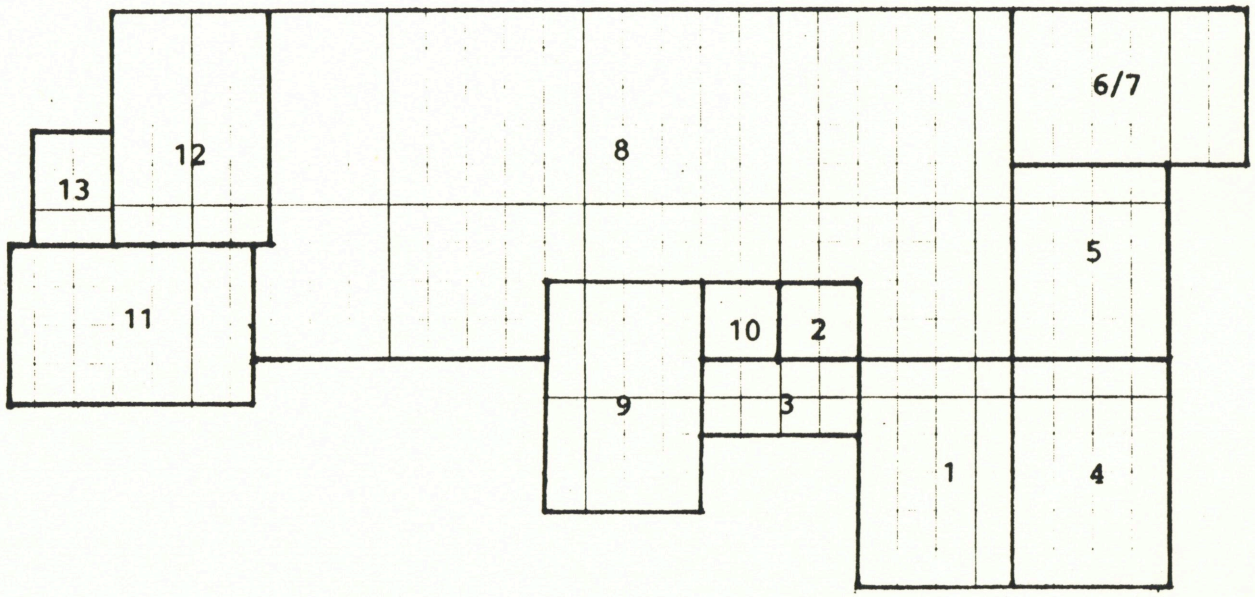


IMPLICATIONS:

- Circular flow
- Staged exhibits help interpret site
- Level changes allow for both cliff top + terrace access

PROPOSED CIRCULATION

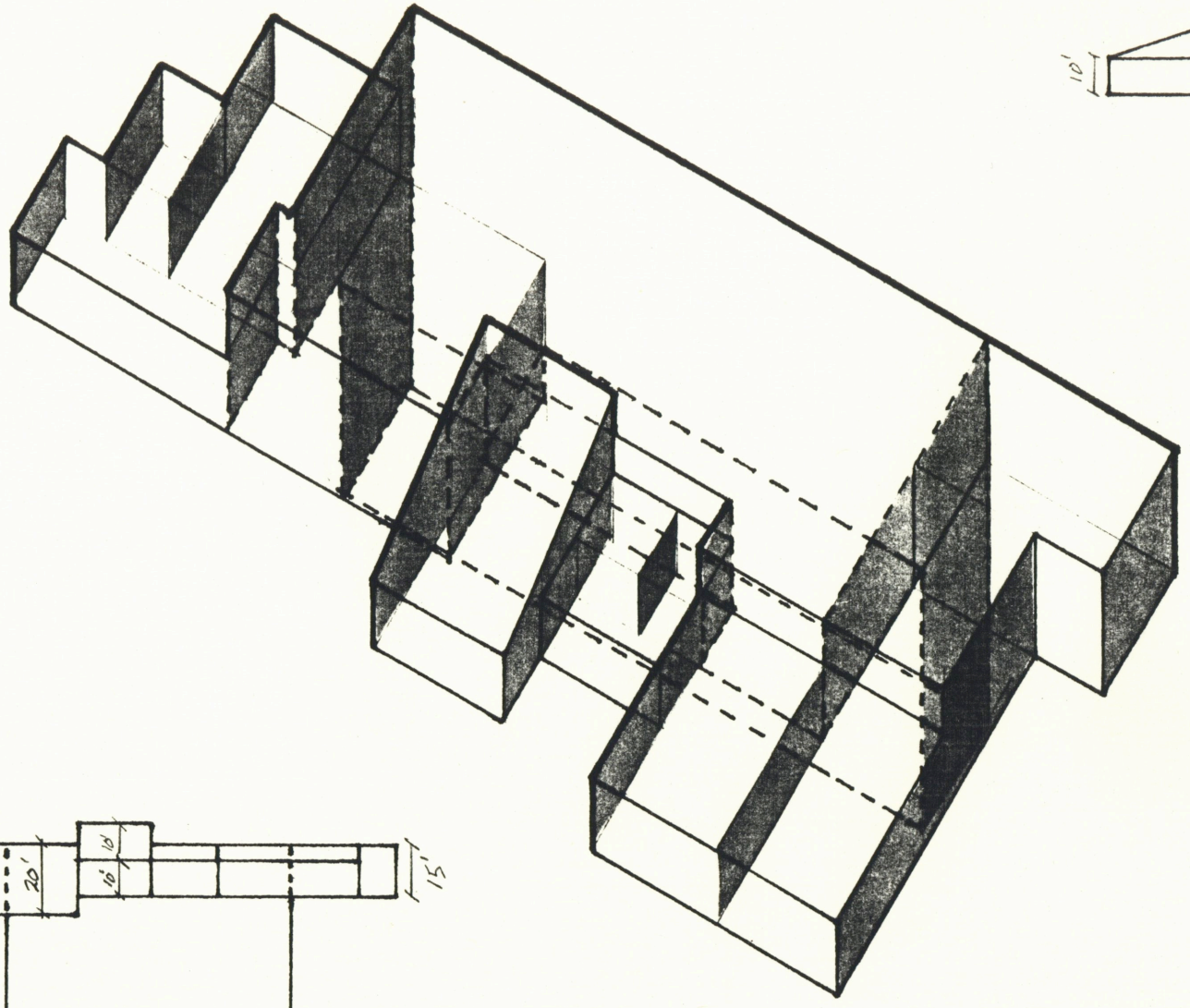
	NET (MIN) SQ/FT	NET (MAX) SQ/FT
1- ENTRY	600	900
2- INFORMATION	200	250
3- OFFICE	250	300
4- RESTROOMS	700	750
5- GIFT SHOP	600	700
6- CAFE	600	900
7- KITCHEN	200	300
8- EXHIBITS	4500	9500
9- THEATER	750	850
10- GENERAL STORAGE	200	300
11- EXHIBIT/ARTIFACT STORAGE	600	950
12- LAB	600	1200
13- SERVICE/LOADING DOCK	150	200
14- MECH.&CIRC.	2175	3500
TOTAL	12,125	20,600

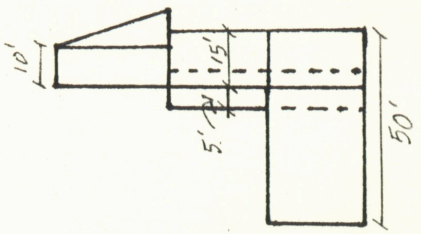


PARKING @ 140 AUTO
30 RV
6 BUS
72,600 SQ/FT

= 100 SQ/FT

FUNCTIONAL / SQ.FT. RELATIONSHIPS





SIDE

NET DIM.

FRONT

3-D / MASSING RELATIONSHIPS

CONCEPTS

INTERIORS



CAPTURE
- FEELING OF ORGANIC MAT.
- CLIFF
- OVERLOOK
- ROCK ART
- VIEWS
- SCULPTURE

TYPICAL ENTRY EXPERIENCE



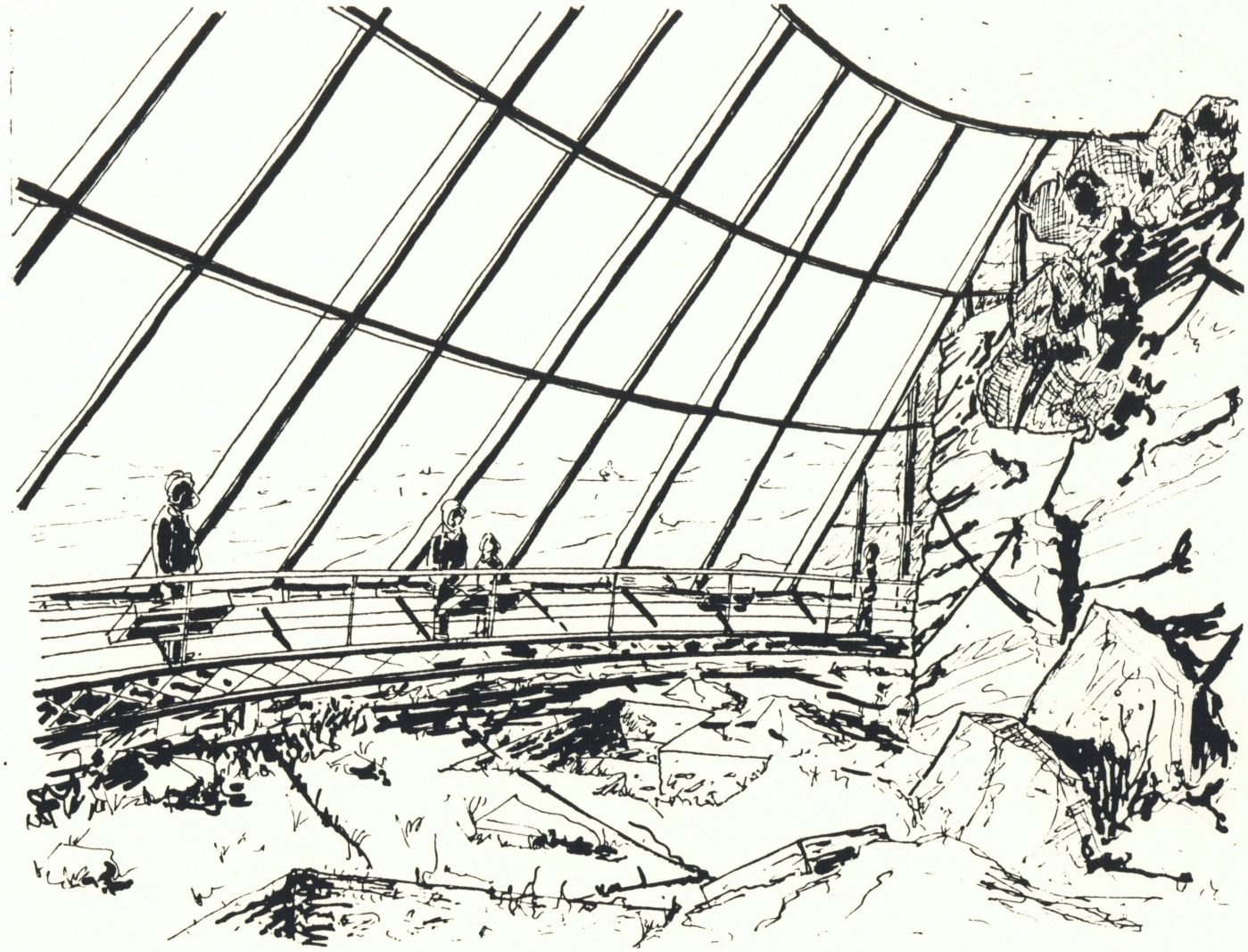
- CAPTURE
- HANDS-ON EXHIBITS
- VIDEO
- TAPED SOUNDS
- ORGANIC FLOW

TYPICAL EDUCATIONAL EXHIBIT



TYPICAL CULTURAL EXHIBIT

~CAPTURE
• WALK-AROU
• SPLIT-LEVEL
• HANDS-ON



- ~~CAPTURE~~
- CLIFF
- SCULPTURE
- ARCH. DIGS
- VIEWS

TYPICAL ARCHAEOLOGY EXHIBIT

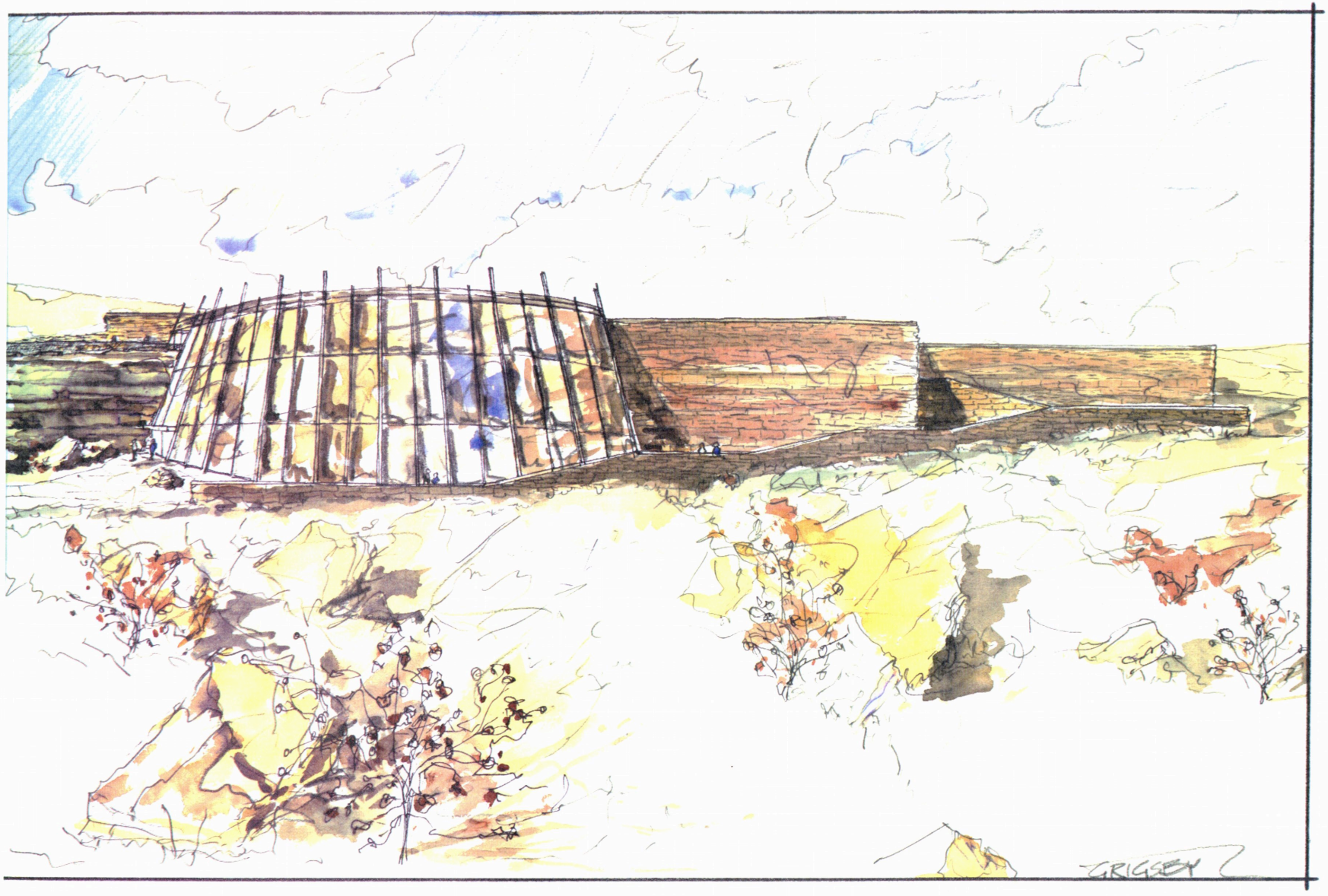
EXTERIORS



SITE #1 ENTRY



SITE #2 ENTRY



REAR ELEVATION

REFERENCES CITED

Agriculture Experiment Station
1989 Plants Of South Dakota Grasslands, A Photographic Study, Bulletin 566, South Dakota State University, Brookings.

Davis, Leslie B., and Wilson, Michael, editors
1978 The 20th-Century Commercial Mining Of Northern Plains Bison Kills, Memoir 14, Bison Procurement And Utilization: A Symposium, Journal Of The Plains Conference, Plains Anthropologist, Vol 23, Number 82, Nov.

Deaver, Ken
1978 The Subsistence Strategy, The Bootlegger Trail Site, A Late Prehistoric Spring Bison Kill, by Tom E. Roll, Appendices.

Hurt, Wesley R.
1964 Bison Jumps Of The High Plains, National Survey of Historic Sites and Buildings.

Malouf, Carling and Conner,Stuart editors
1962 Symposium on Buffalo Jumps, Montana Archaeological Society, Memoir No.1, May.

Meyer, Richard and Valley, Paul
1991 From conversations at a meeting with the Montana State Department of Fish, Wildlife and Parks, in Helena 2/21.

Roll, Dr. Tom E.
1991 From conversations on this thesis project.

U.S.G.S.
Montana Highway Department, Geology Bulletin #52, Plate #1

BIBLIOGRAPHY

Agriculture Experiment Station
1989 Plants Of South Dakota Grasslands, A Photographic Study, Bulletin 566, South Dakota State University, Brookings.

Alberta Culture and Multiculturalism
1990 Promotional Materials on the Head-Smashed-In Interpretive Centre, Historic Resources and Historic Sites Service, Alberta, Canada.

Brawne, Michael
1965 The New Museum Architecture and Display, Frederick A. Praeger, Publishers, New York.

Davis, Leslie B., and Wilson, Michael, editors
1978 The 20th-Century Commercial Mining Of Northern Plains Bison Kills, Memoir 14, Bison Procurement And Utilization: A Symposium, Journal Of The Plains Conference, Plains Anthropologist, Vol 23, Number 82, Nov.

Deaver, Ken
1983 Archaeological Investigations On The Northern Border Pipeline, Montana Segment, Vol.3, Mar.
1978 The Subsistence Strategy, The Bootlegger Trail Site, A Late Prehistoric Spring Bison Kill, by Tom E. Roll, Appendices.

Drimmer, Fredrick, editor
The Illustrated Encyclopedia Of Animal Life, Greystone Press, New York, Vols 2,3,8.

Hurt, Wesley R.
1964 Bison Jumps Of The High Plains, National Survey of Historic Sites and Buildings.

Johns, Barry
1988 Critique: Head-Smashed-In Buffalo Jump Interpretive Centre, The Canadian Architect, p 19-28, Nov.

Klotz, Heinrich and Krase, Waltraud
1985 New Museum Buildings in the Federal Republic of Germany, Rizzoli International Publications, Inc, New York.

LeBlond, The Partnership
1985 Centre Offers Spiritual Message, The Canadian Architect, p 32-34, vol. 30. no.2, Feb.

Malouf, Carling and Conner,Stuart editors
1962 Symposium on Buffalo Jumps, Montana Archaeological Society, Memoir No.1, May.

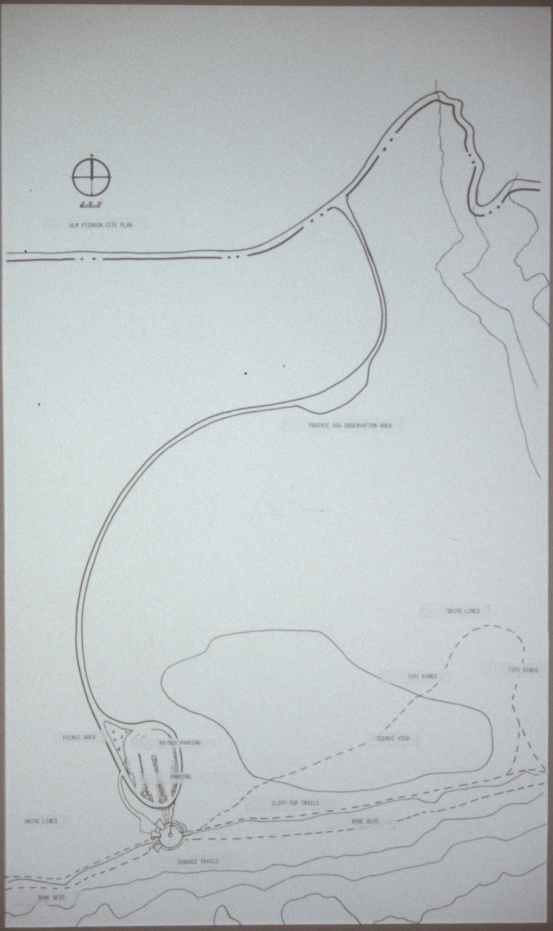
McHarg, Ian L.
1971 Design With Nature, Doubleday/Natural History Press, Doubleday & Company, Inc. Garden City, New York.

Miles, R.S. in collaboration with Alt, M.B.; Gosling, D.C., Lewis, B.N. and Tout, A.F.
1988 The Design of Educational Exhibits, 2nd ed., British Museum (Natural History), London.

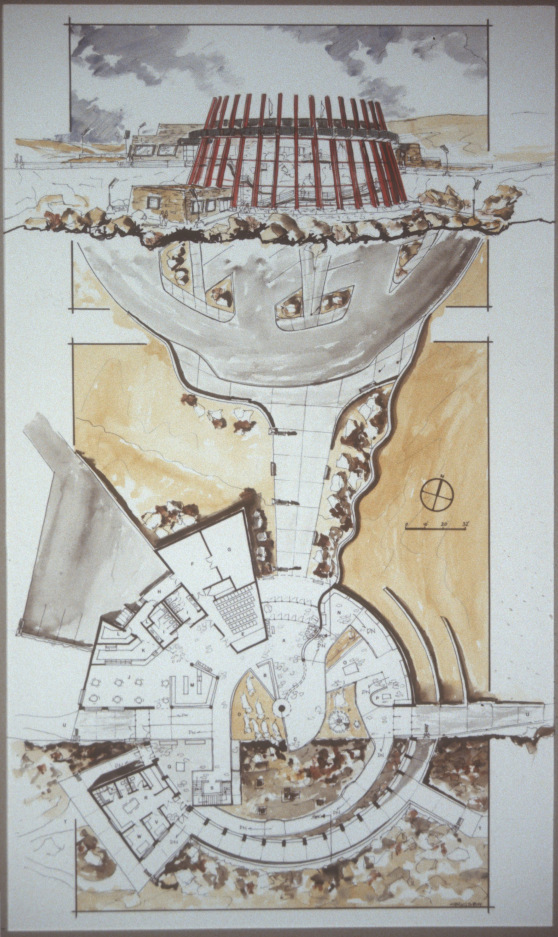
Montaner, Josep and Oliveras, Jordi
1986 The Museums of the Last Generation, Editions, London / St. Martin's Press, New York.

U.S.G.S.
Montana Highway Department, Geology Bulletin #52, Plate #1

White, Edward T.
1983 Site Analysis, Diagramming Information For Architectural Design, Architectural Media, Ltd.


GLR PISHKUN SITE PLAN
PRAIRIE DOG OBSERVATION AREA
SKYLINE
TIPI RINGS
TIPI RINGS
PICNIC AREA
SCENIC VIEW
CLIFF-TOP TRAILS
SKYLINE
BONE BEDS
TERRACE TRAILS
BONE BEDS







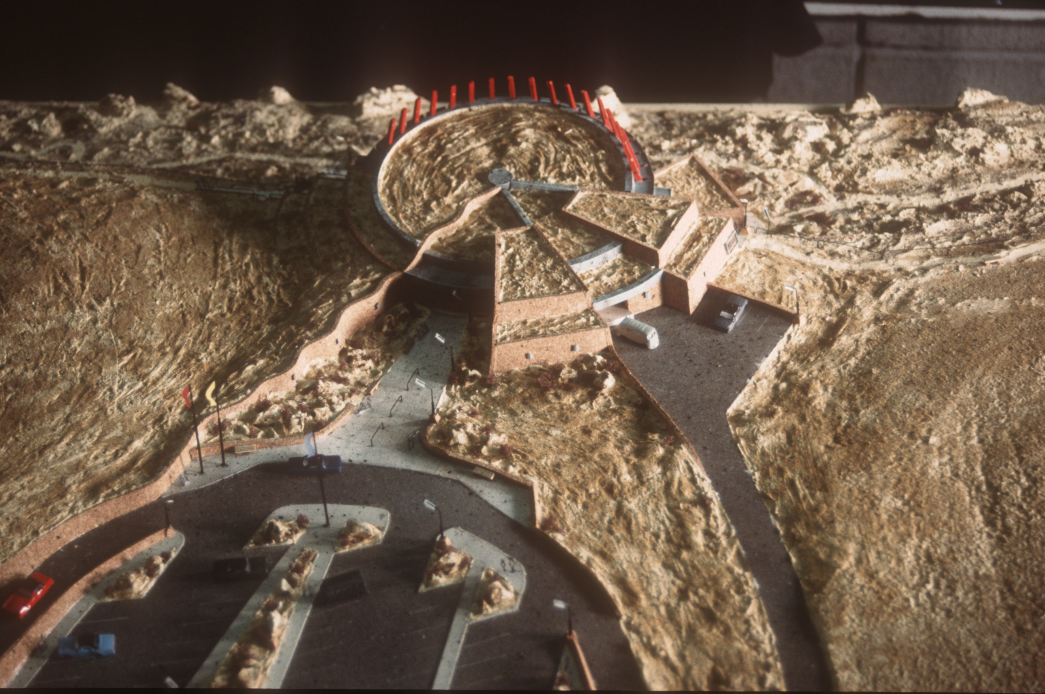






THE SIOUX INDIAN
INTERPRETIVE CENTER

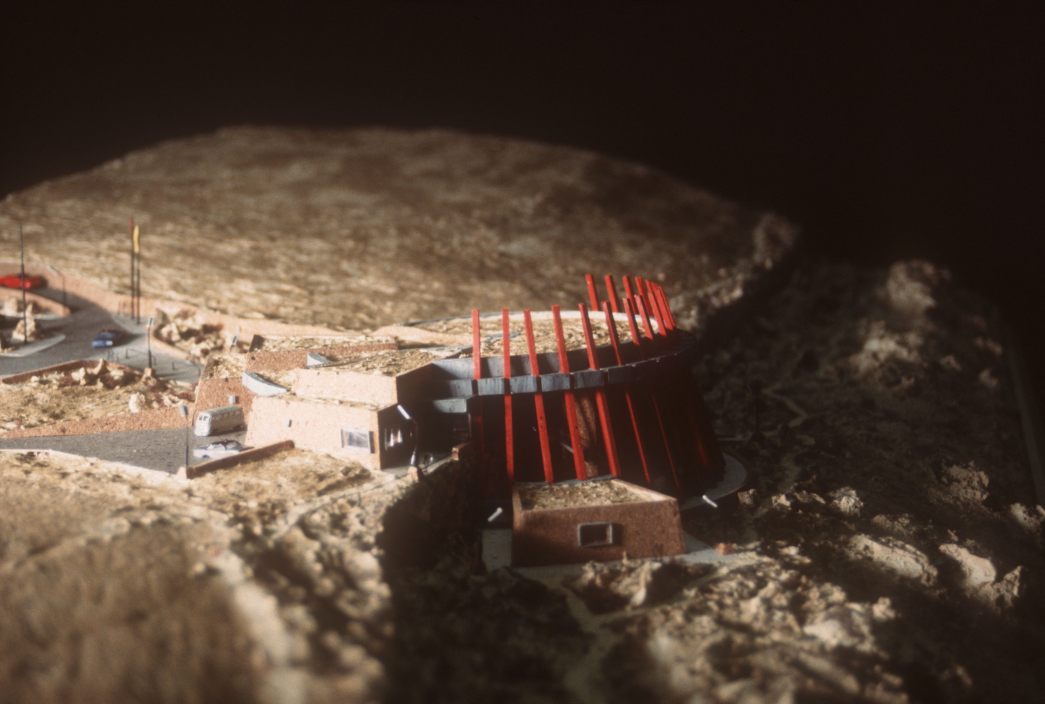
Tyree Bollinger, Inc.
Architects
Denver, Colorado

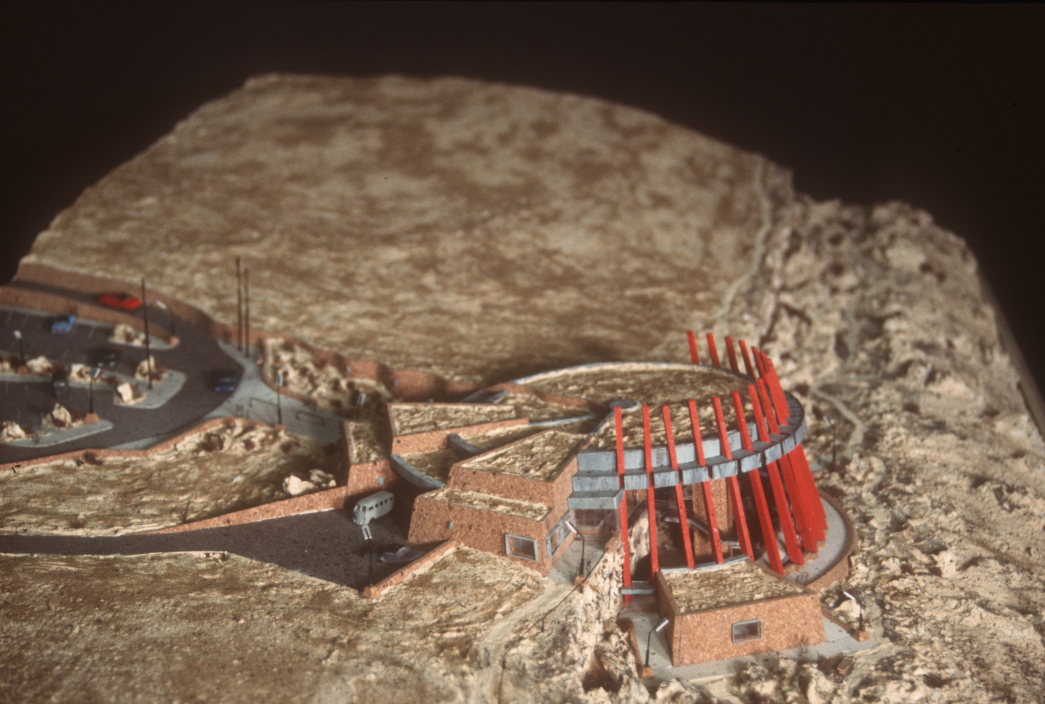


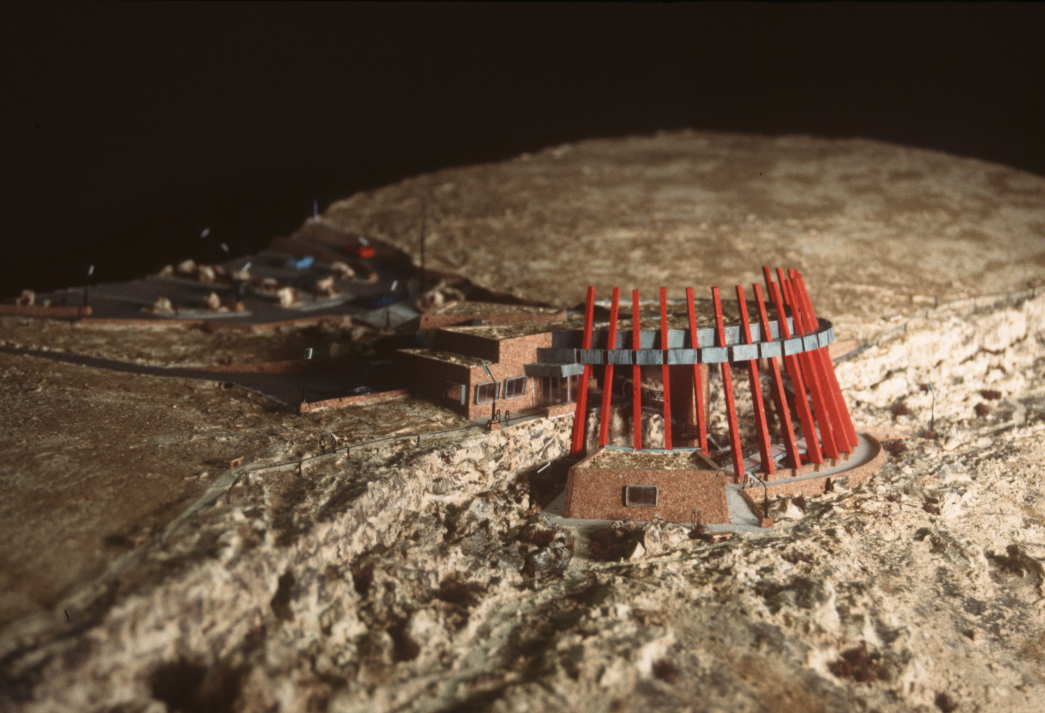






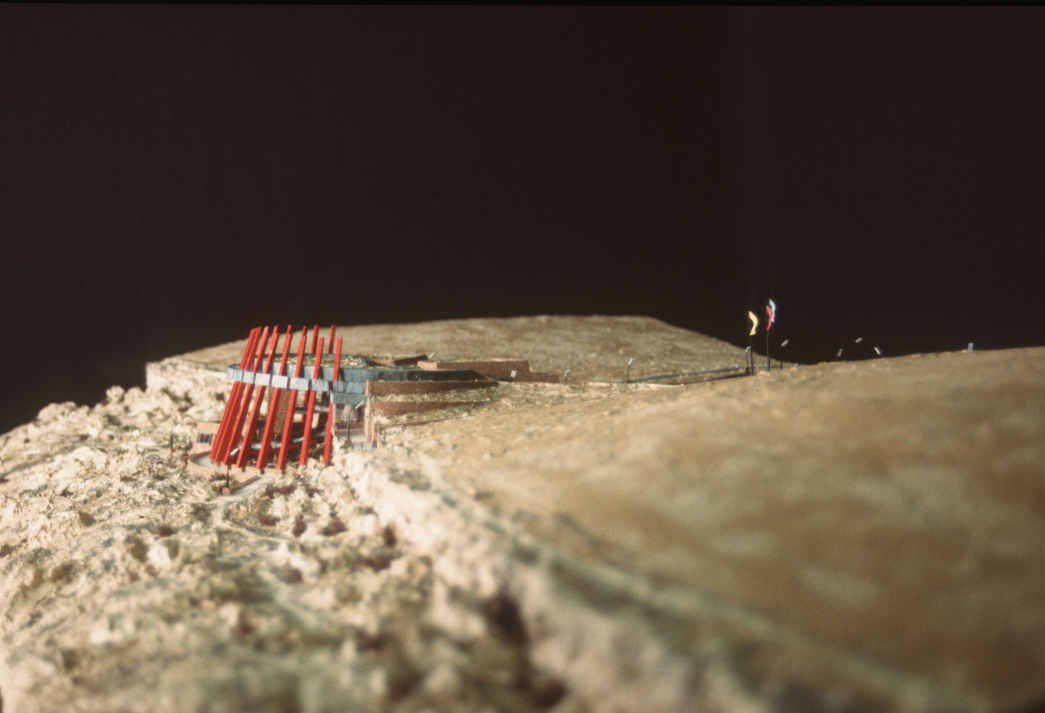
















MONTANA STATE UNIVERSITY LIBRARIES
3 1762 10094303 2