GL008860

PART IV SECTION M

ATTACHMENT J

REGIONAL AND SITE CHARACTERIZATION DATA

15 July 1980

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ATTACHMENT J

REGIONAL AND SITE CHARACTERIZATION DATA

1.0 INTRODUCTION

This document provides MX deployment area and site characterization data in the areas of topology, geology, hydrology, climatology and seismology. The site characterizations include definitions and graphic descriptions of the baseline shelter, cluster and operating bases.

2.0 REGIONAL CHARACTERIZATION

2.1 GENERIC TOPOGRAPHY/GEOLOGY/HYDROLOGY

The MX deployment sites are located in an area denoted as the Great Basin which extends from the Wasatch Range of Utah to the Sierra Nevada Range of Nevada and California. Despite its name, the basin is not a single cup-shaped depression surrounded by mountains but a series of more than 90 basins separated from each other by over 160 mountain ranges. Tectonic activity produced these ranges, which generally run north and south and vary in length from 30 to 100 miles. MX deployment sites will be placed in selected valleys in the states of Nevada and Utah (see Figures 1, 2 and 3).

2.1.1 Topography/Terrain Conditions

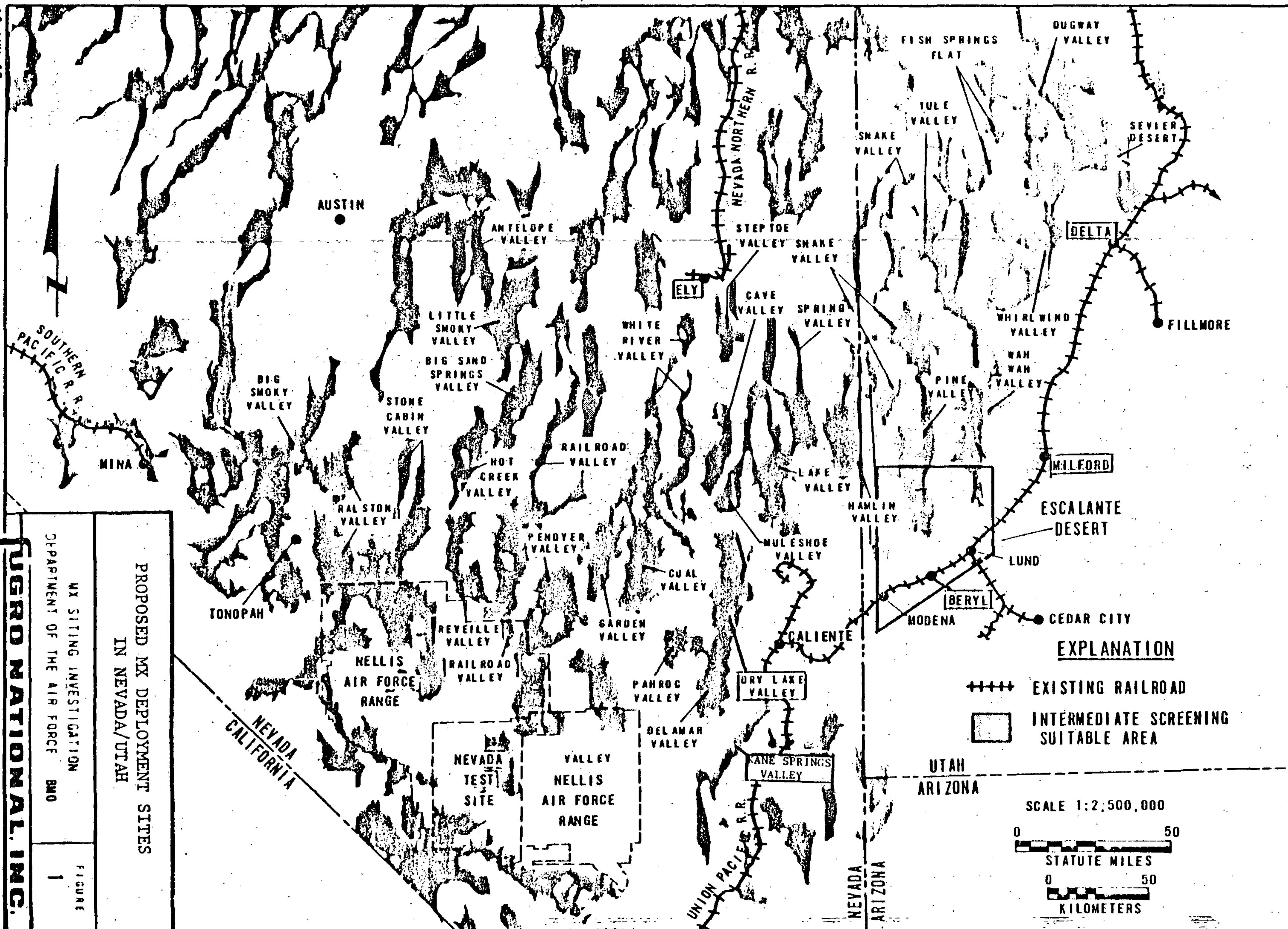
All of the valleys in the MX deployment area exhibit classic basin and range topography. This is typified by a central, relatively flat floored valley with basin-fill deposits, which is generally separated from surrounding mountain ranges by high-angle, north-trending normal faults. Relief in the valleys varies, but is generally on the order of 3000 to 5000 feet. Elevations for the operating base sites and for the shelter/cluster deployment sites are presented in Tables 1 and 2, respectively.

Table 1

AVERAGE AND EXTREME ELEVATIONS OF POTENTIAL OPERATING BASE SITES
(Feet Above Mean Sea Level)

Base Location	Predominant Elevation	Elevation Range
Beryl, UT (Operating Base #1)*	5240	5190-5400
Ely, NV (Operating Base #2)*	6680	6570-6880
Kane Springs, NV	2500	2340-2860
Milford, UT	5080	5000-5280
Delta, UT	4730	4650-4770

*Site Locations for this RFP



PROPOSED MX DEPLOYMENT SITES IN NEVADA/UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE 1

FUGRO NATIONAL, INC.

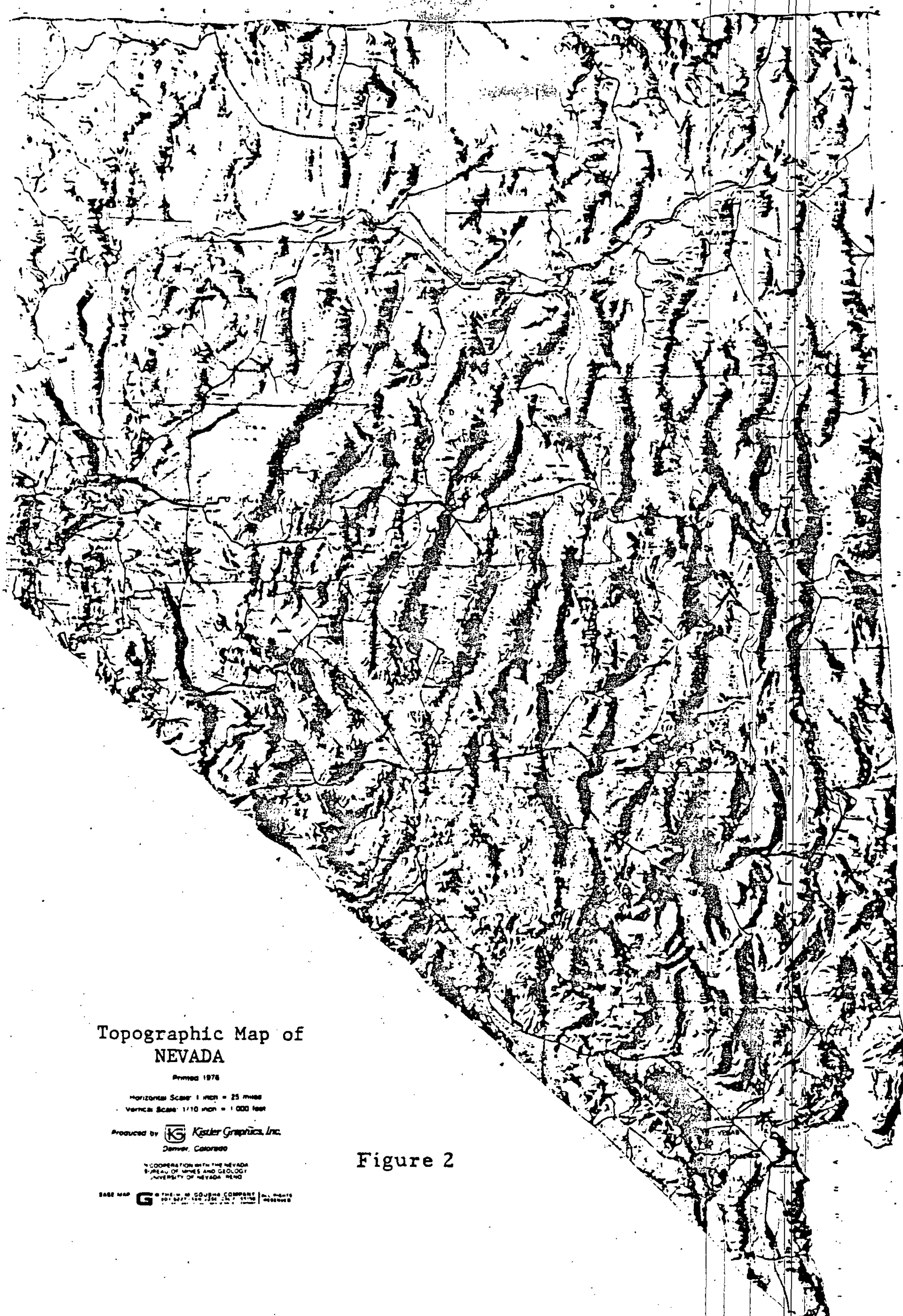

Topographic Map of
NEVADA
Printed 1976
Horizontal Scale 1 inch = 25 miles
Vertical Scale 1/10 inch = 1 000 feet
Produced by Kistler Graphics, Inc.
Denver, Colorado
IN COOPERATION WITH THE NEVADA
BUREAU OF MINES AND GEOLOGY
UNIVERSITY OF NEVADA RENO

Figure 2

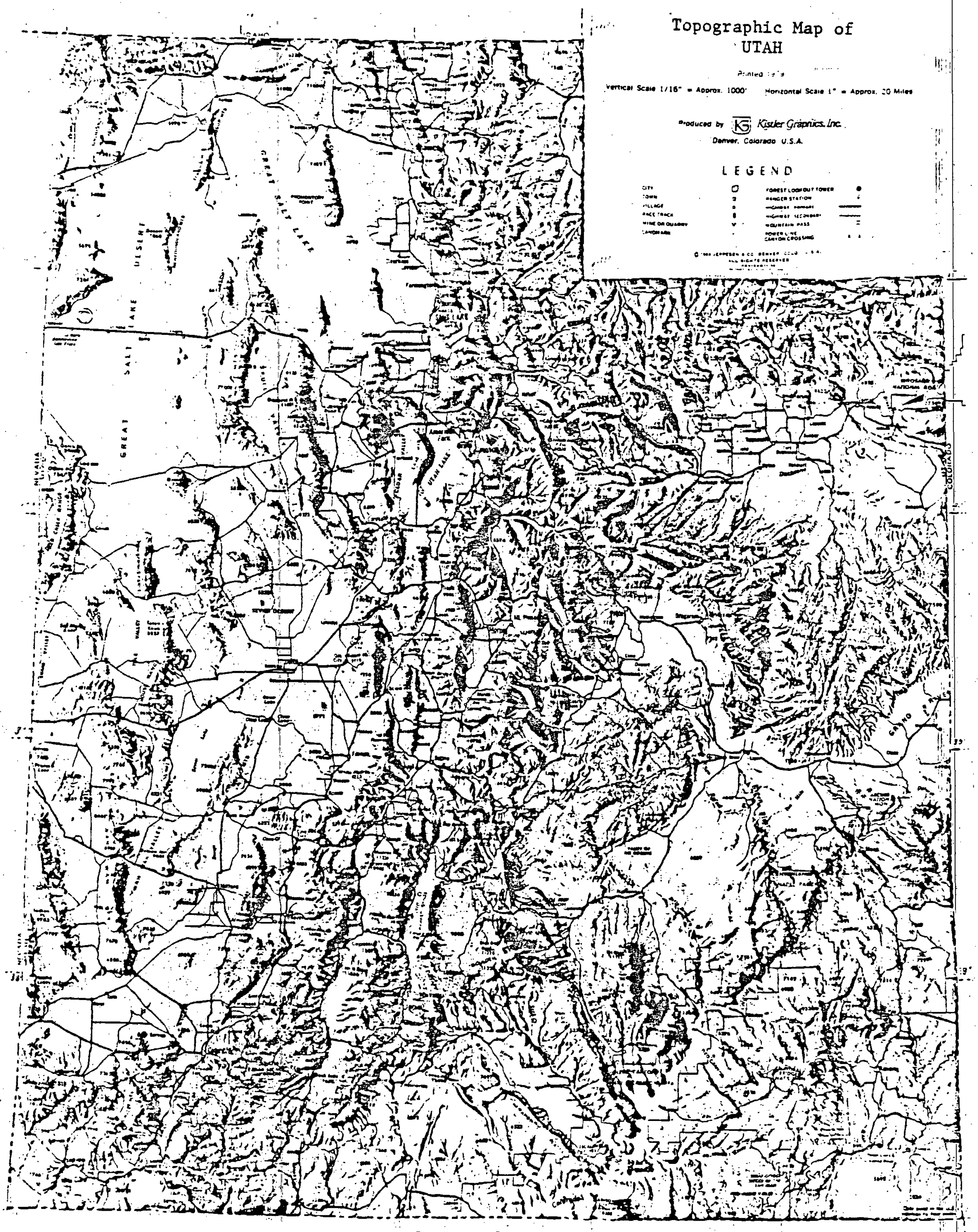

Topographic Map of
UTAH
Vertical Scale 1/16" = Approx. 1000'
Horizontal Scale 1" = Approx. 20 Miles
Produced by Kistler Graphics, Inc.
Denver, Colorado U.S.A.
LEGEND
GREAT SALT LAKE
GREAT SALT LAKE DESERT
UTAH LAKE
COLORADO
NEVADA

Figure 3

Table 2

ELEVATIONS WITHIN SUITABLE VALLEY AREAS
(Feet Above Mean Sea Level)

Valley	Highest Elevation	Lowest Elevation	Predominant Elevation	Number of Clusters
UTAH				
Whirlwind	5600	4600	4800	12
Fish Springs	5000	4300	4500	3
Tule	5900	4500	4800	13
Wah Wah	6000	4600	5000	7
Pine	7000	5200	5500	7
Snake	6200	4700	5200	17
NEVADA				
Hamlin	6400	5400	5700	10
Spring	6400	5800	6000	6
Lake	6600	5900	6000	9
Cave	6600	6000	6300	3
Muleshoe	6400	5400	5700	2
* Dry Lake	6000	4600	4800	10
Delamar	5800	4300	4900	4
Pahroc	5200	4300	4600	1
White River	6600	5200	5400	10
Coal	5800	4900	5100	6
Garden	6200	5200	5500	7
Penoyer	6200	4700	5000	5
Railroad	6200	4800	5200	23
Antelope	7400	6100	6400	8
Little Smoky	7200	6100	6300	3
Big Sand Springs	7000	5900	6200	4
Hot Creek	6600	5200	5300	5
Reveille	6400	5200	5900	5
Stone Cabin	6400	5300	5600	11
Ralston	7000	5200	5900	9
				200

Notes:

*1. Site Location for this RFP.

2. The data presented in this table were derived from 1:250,000 scale topographic maps.

Within this general scheme, however, there can be considerable variation. For example, topographic and terrain conditions in Dry Lake and Pine valleys are quite dissimilar. With Dry Lake Valley, less than one percent of the valley is considered to have adverse terrain conditions. There are few deep drainages and very little area with greater than 10 percent slope. This contrasts with Pine Valley, the southern end of which is characterized by hummocky terrain. Pine Valley has several deep east-northeasterly trending washes which drain into a deeply incised major north trending wash. The washes correspond to areas of greater than 10 percent slope. Additionally, the eastern mountain fronts are characterized by slopes greater than 10 percent. Average drainage incision for alluvial deposits close to the mountain fronts range from 6 to 15 ft in Dry Lake Valley and 3 to 8 ft in Pine Valley. Incisions in valley-ward alluvial deposits range from 0 to 6 ft in Dry Lake Valley and average 3 ft in Pine Valley. Drainage incision depths are comparable to these ranges throughout the MX deployment area. The valleys that contained Pleistocene lakes generally have playas on the valley floor which are fed or drained by streams of highly variable widths and depths.

In summary, Dry Lake and Pine valleys generally reflect the range of conditions within the study area, i.e., Dry Lake Valley has little area affected by deep washes and steep slopes, and Pine Valley has greater amounts of area (probably up to 15 percent) designated as adverse terrain.

2.1.2 Geologic/Soil Conditions

A wide range of sedimentary and volcanic rock types characterize the mountain ranges in the MX deployment area. Carbonate rocks and extrusive volcanic rocks are the most common.

The carbonate rocks are characterized by steep mountain fronts while the volcanic rocks are easily eroded and form shallow shelves and knobs at a distance from the mountain fronts. The presence of the softer volcanics is generally indicative of shallow rock. The occurrence of carbonate and volcanic bedrock is common throughout the study area, although locally the proportion of the two may vary. There may also be minor percentages of other sedimentary rocks such as phyllite and sandstone.

Soils in the basin-fill units are predominantly (90 percent) coarse-grained consisting of sands and gravels. Approximately 10 percent of the deposits contain fine-grained soils such as silts and clays. Gravelly soils are generally dense to very dense below depths of approximately 10 feet, exhibit low compressibility and possess moderate to high shear strengths.

2.1.3 Hydrologic Characteristics

All of the valleys in the Nevada-Utah siting area except White River Valley lie within the Great Basin physiographic province which is characterized by an internal surface drainage system. Individual valleys may have open or closed surface drainage. Stream flow is minimal, being controlled by the arid climate (8 in. mean annual precipitation), and as a result, few perennial streams exist and little data are available on stream flow. Surface runoff is also limited due to high infiltration rates. The sparse surface water is largely appropriated and/or utilized.

The perennial yield compared with current groundwater use generally defines water availability, although additional groundwater may be physically obtainable from the aquifers. However, in many valleys, present and proposed demand for water may amount to more than the consumptive use estimates listed in Table 3 and may approach the perennial yield in some valleys. Perennial yield is the volume of water that can be withdrawn annually from the groundwater basin without causing undesirable results. Estimates of perennial yield which have been made for both Nevada and Utah are based on average annual withdrawal, or natural discharge, and natural or artificial recharge.

Groundwater is present in confined and unconfined valley fill and bedrock aquifers underlying valleys which may be drained or undrained (i.e., not discharged by underflow to adjacent valleys). The groundwater (1) should supply MX construction and operations without exceeding perennial yield, except in a few valleys, and (2) would be replenished through normal hydrologic processes, even in these few valleys, following construction. The total MX water requirements as of October 1979 are shown in Figure 4. These values do not include MX-RES requirements.

The variation in the amount of water present, quality of water, depth to suitable aquifers, regulatory concern about MX usage (e.g., designated valleys, overdraft conditions) and extent of the existing data base is significant for the valleys under consideration as MX deployment sites.

2.1.3.1 Groundwater Availability

Table 3 summarizes the groundwater availability for 34 valleys in and around the Nevada-Utah siting area. "Designated" valleys (see Table 3) are those for which the Nevada State Engineers office has assigned a critical groundwater basin status. "Overdraft" areas have withdrawals which significantly exceed perennial yield.

In general, there appears to be enough water available for MX construction needs. In a few valleys, MX groundwater withdrawals may exceed the perrenial yield.

2.1.3.2 Water Quality

Groundwater suitable for drinking and construction is likely to be present throughout the siting area. Locally, groundwater quality may exceed established drinking standards.

2.1.3.3 Water Temperature

Very little groundwater temperature data have been gathered. However, spring discharge temperatures over 100°F have been measured in some valleys.

2.1.3.4 General Comments

The data presented in the previous sections have been summarized from existing Fugro National reports. A high degree of engineering judgment should be applied if an attempt is made to extrapolate these data.

VALLEY NAME	PERENNIAL YIELD (THOUSANDS OF ACRE-FEET PER YEAR)	CURRENT USE (THOUSANDS OF ACRE-FEET PER YEAR)	COMMENTS
1 BIG SMOKY	9	1	DESIGNATED
2 WHITE RIVER	37	26*	
3 HAMLIN	**	**	
4 SNAKE	32, 80	14*	
5 TULE	< 5	0.035	
6 DRY LAKE *	3	M	
7 WHIRLWIND	5-25[1]	M	
8 FISH SPRINGS	25-50	M	
9 DUGWAY	5-25[1]	M	
10 ESCALANTE DESERT	25-50	65	OVERDRAFT IN IRRIGATED AREAS
11 SEVIER DESERT	100[1]	39	OVERDRAFT IN IRRIGATED AREAS
12 SPRING	70-100	UNK	
13 FERGUSON DESERT	**	**	
14 PINE	< 5[1]	.005	
15 WAH WAH	< 5	M	
16 TIKABOO	1	M	
17 COAL	6	M	
18 CAVE	2	M	
19 LAKE	17	2*	DESIGNATED
20 DELAMAR	3	M	
21 PAHROC	21	M	
22 REVIELLE	UNK	M	
23 RAILROAD	75	17*	
24 HOT CREEK	6	UNK	
25 BIG SAND SPRING	1	UNK	
26 PENOYER	5	M	DESIGNATED
27 GARDEN	6	M	
28 LITTLE SMOKY	5	UNK	
29 ANTELOPE	4	M	
30 RALSTON	6	UNK	DESIGNATED
31 STONE CABIN	2	M	DESIGNATED
32 STONEWALL FLAT	M	M	
33 STEPTOE	70	53	DESIGNATED
34 BLACK ROCK DESERT	***	***	

EXPLANATION

* ESTIMATED BY FUGRO NATIONAL
** INCLUDED IN SNAKE VALLEY
*** INCLUDED IN SEVIER DESERT
M-MINOR, LESS THAN 1000 ACRE FEET PER YEAR
UNK-UNKNOWN

(1) SYSTEM YIELDS ESTIMATES: DEFINED AS THE MAXIMUM AMOUNT OF SURFACE AND GROUND WATER THAT CAN ANNUALLY BE OBTAINED FOR AN INDEFINITE PERIOD OF TIME (EAKIN, PRICE, AND HARRILL 1976)

*(2) SITE LOCATION FOR THIS RFP

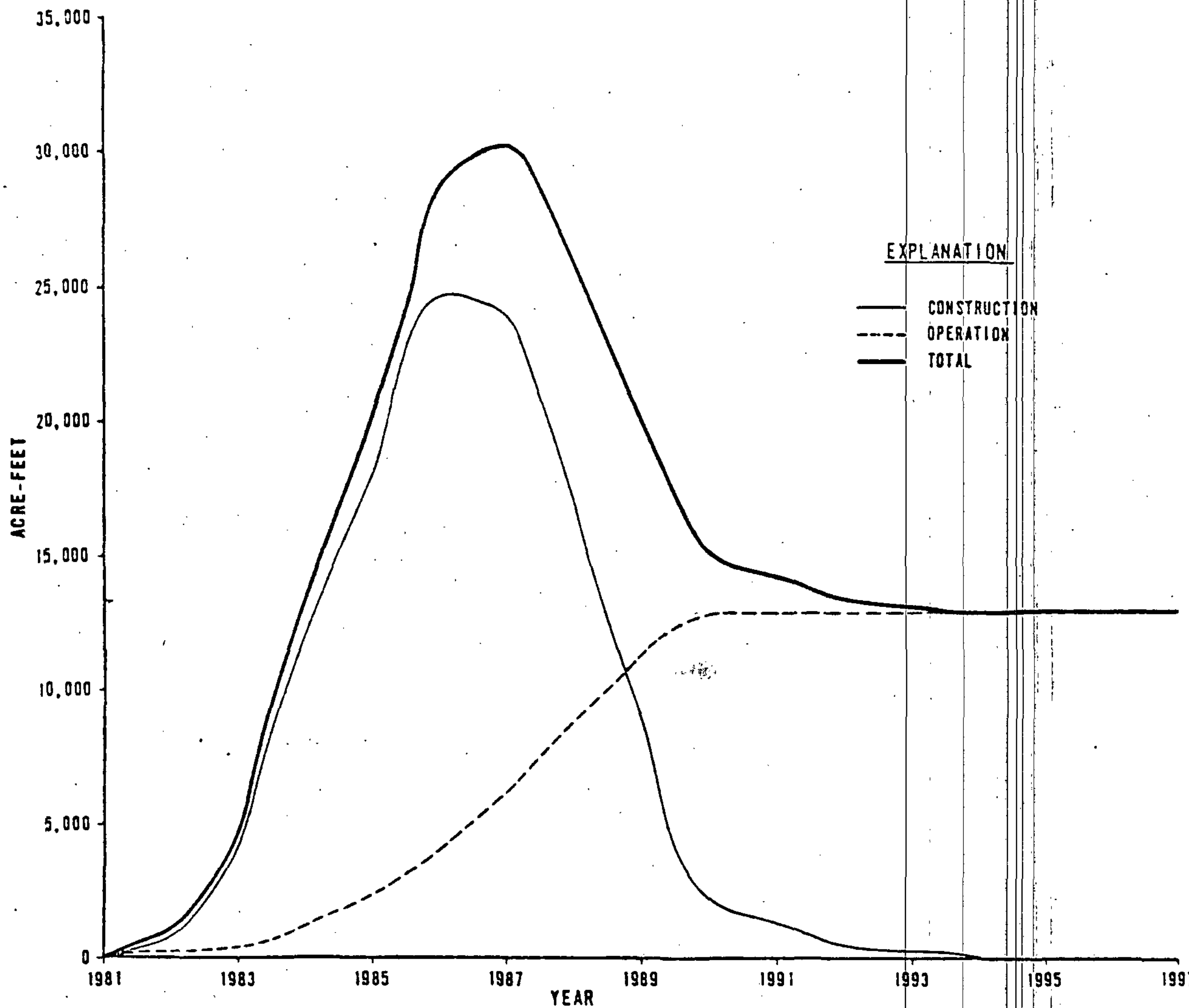
NOTE: PERENNIAL YIELD ESTIMATES ARE FROM VARIOUS STATE AND FEDERAL AGENCIES. WATER RIGHTS HAVE BEEN NEARLY OR TOTALLY APPROPRIATED IN DESIGNATED VALLEYS, EVEN THOUGH CURRENT-USE ESTIMATES MAY BE MUCH LOWER THAN THE ESTIMATED PERENNIAL YIELD.

SUMMARY OF GROUND WATER AVAILABILITY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE 3

FUGRO NATIONAL, INC.



PROJECTED MX WATER REQUIREMENTS
OCT. 1979

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE 4

FUGRO NATIONAL, INC.

2.2 CLIMATOLOGY OVERVIEW

The Great Basin offers extremes of weather and climate not normally found in other states. Figure 5 qualitatively illustrates this variation in climate. The region is one of the driest in the continental United States, lying in the shadow of the Sierras and Cascade Mountains, with an average elevation, greater than 5000 ft. Because the Great Basin lies within the zone of interaction of tropical and polar air masses, the region also has marked seasonal and day-to-day temperature contrasts, typical of the middle latitudes. However, great elevation differences provide a much wider variety of climates than might be expected of this geographic location.

A detailed description of the Great Basin weather can be found in Reference 4.1.

2.3 EXTREME WINDS

An evaluation of the extreme wind environment for the Nevada Test Site is presented in Reference 4.2. The data summarized in Table 4 are applicable for the entire MX-system deployment region.

Table 4

EXTREME WIND SPEEDS IN MPH AT 30 FEET ABOVE GROUND

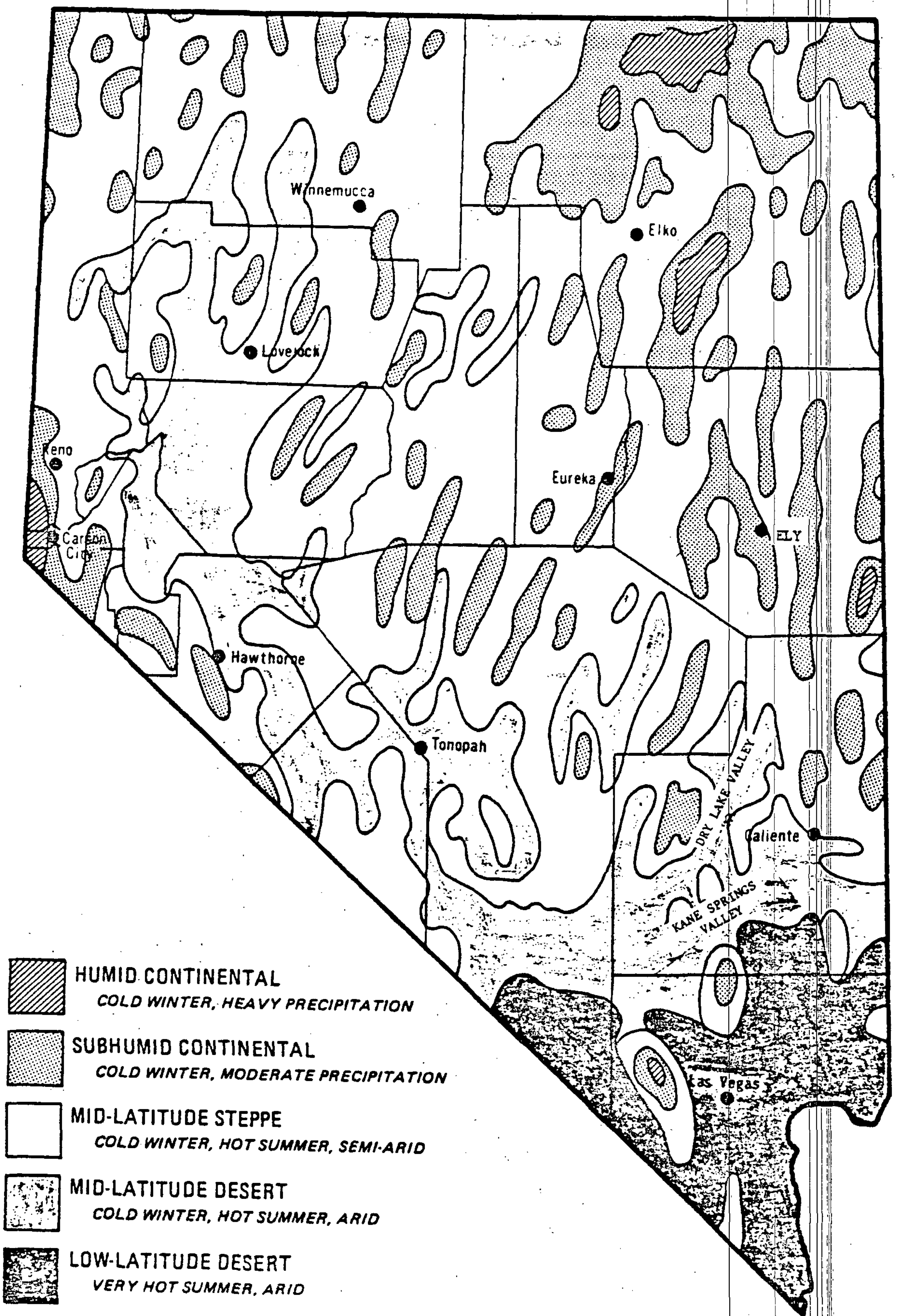
Return Period (Year)	Fastest Mile	Gust
2	48	62
5	55	72
10	61	79
50	75	97
100	82	107

Notation:

Return Period is defined as periodicity, e.g., a 62 mph gust can be expected at two year intervals.

2.4 SEISMIC ACTIVITY

The area in which MX will be deployed has had a low level of seismicity during historic time as compared to other portions of Nevada and Utah. Two zones of high seismic activity border the siting region on the east and west, respectively. The eastern zone is the Intermountain Seismic Belt region which extends northward from Arizona through central Utah. The western zone is the Dixie Valley-Fairview Peak region which corresponds to a north-south alignment of earthquake activity in western Nevada.



Distribution of Climates in Nevada

Figure 5

The Dixie Valley-Fairview Peak zone (see Figure 6) bears many of the same geologic and tectonic characteristics as the areas to the east and can be used in a general way to assess earthquake hazards for the siting region. The largest historical earthquake in this zone (1915) had a probable magnitude of 7.5 with up to 18 feet of fault displacement. The zone has had seven earthquakes with magnitudes greater than 6.0 since 1900.

Evidence of both Holocene and Quaternary faulting has been found in the MX deployment area. Nearly all Holocene faults occur in Utah (see Figure 6A) where they displace 12,000 year old shorelines. Quaternary faults (see Figure 6B) occur throughout the deployment area and are recognized by distinct step-like patterns in alluvium or colluvium. Fault scarps which appear to have resulted from a single event have been found which are up to 30 feet high. Faults in general trend north-south and flank the mountain ranges.

Earthquake hazards include both ground shaking and surface rupture. The greatest hazard of surface rupture is near the base of mountains or high up on the alluvial fans near the bedrock-alluvium contact, since this is where most Quaternary and Holocene faults are now observed.

2.5 UTILITIES

2.5.1 Introduction

This section provides information on the present and planned utility transmission and distribution system within and adjacent to the MX deployment area. As presently projected, the average MX power requirements of 109 MWe is 1 to 5 percent of the existing energy demand in the Utah-Nevada-California power grid. Detailed planning of the utility grid interface with the MX system has not been finalized; however, for proposal purposes, it can be assumed that the proposed MX Ring Bus will be available for transmission and distribution of power.

2.5.2 Existing Grids

Figure 7 shows the location of existing and proposed utility grids as well as the MX Ring Bus and MX substations.

The main existing transmission system in the vicinity of the MX deployment area is a 230 KV line from Sigurd, Utah, which passes through the eastern section of the deployment area and then north of the western section to Ft. Churchill, Nevada. This line connects to a 345 KV loop on the east end of the deployment area in Utah and terminates at a 120 KV network on the west side of the deployment area in Nevada. Also, the Sigurd transmission line extends to Cedar City in southern Utah. The Reid Gardner Plant in Nevada is a 230 KV system passing south of the deployment area through Las Vegas and into the high voltage network near Hoover Dam.

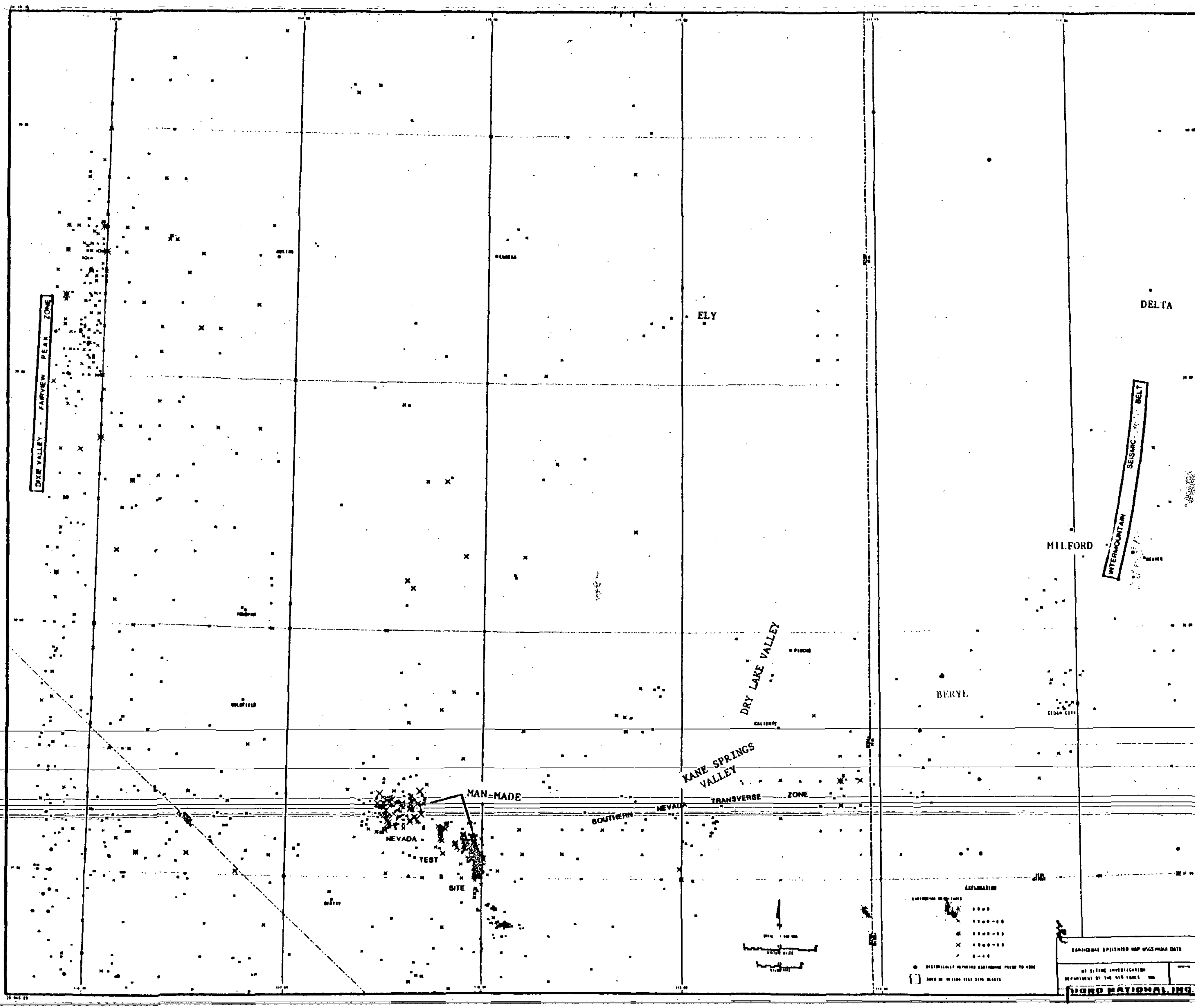
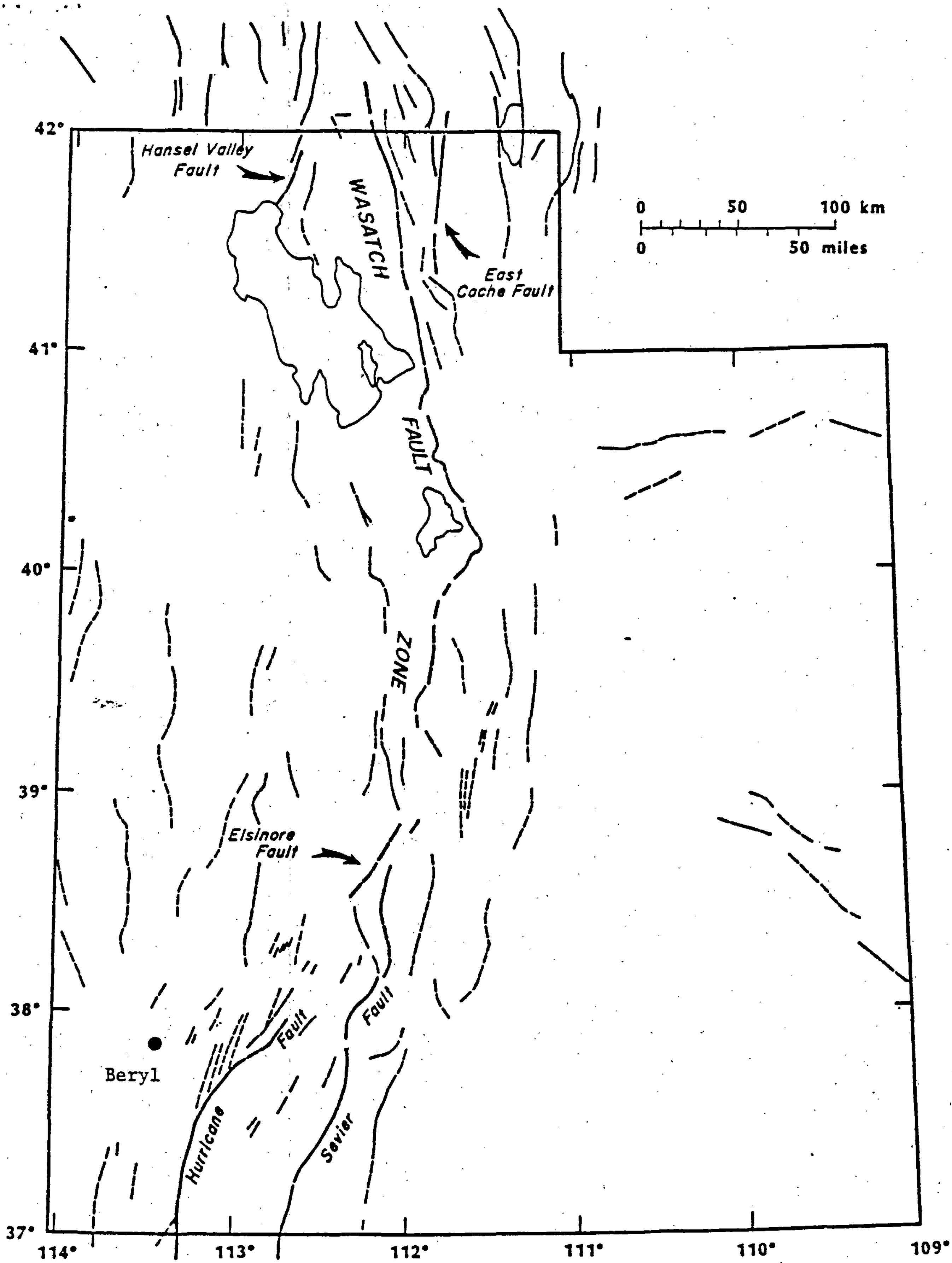

DIXIE VALLEY - FAIRVIEW PEAK ZONE
ELY
DELTA
INTERMOUNTAIN SEISMIC BELT
MILFORD
DRY LAKE VALLEY
BERYL
KANE SPRINGS VALLEY
MAN-MADE
SOUTHERN NEVADA TRANSVERSE ZONE
NEVADA TEST SITE

Figure 6



GENERALIZED MAP OF YOUNG FAULTS IN UTAH

Figure 6 A

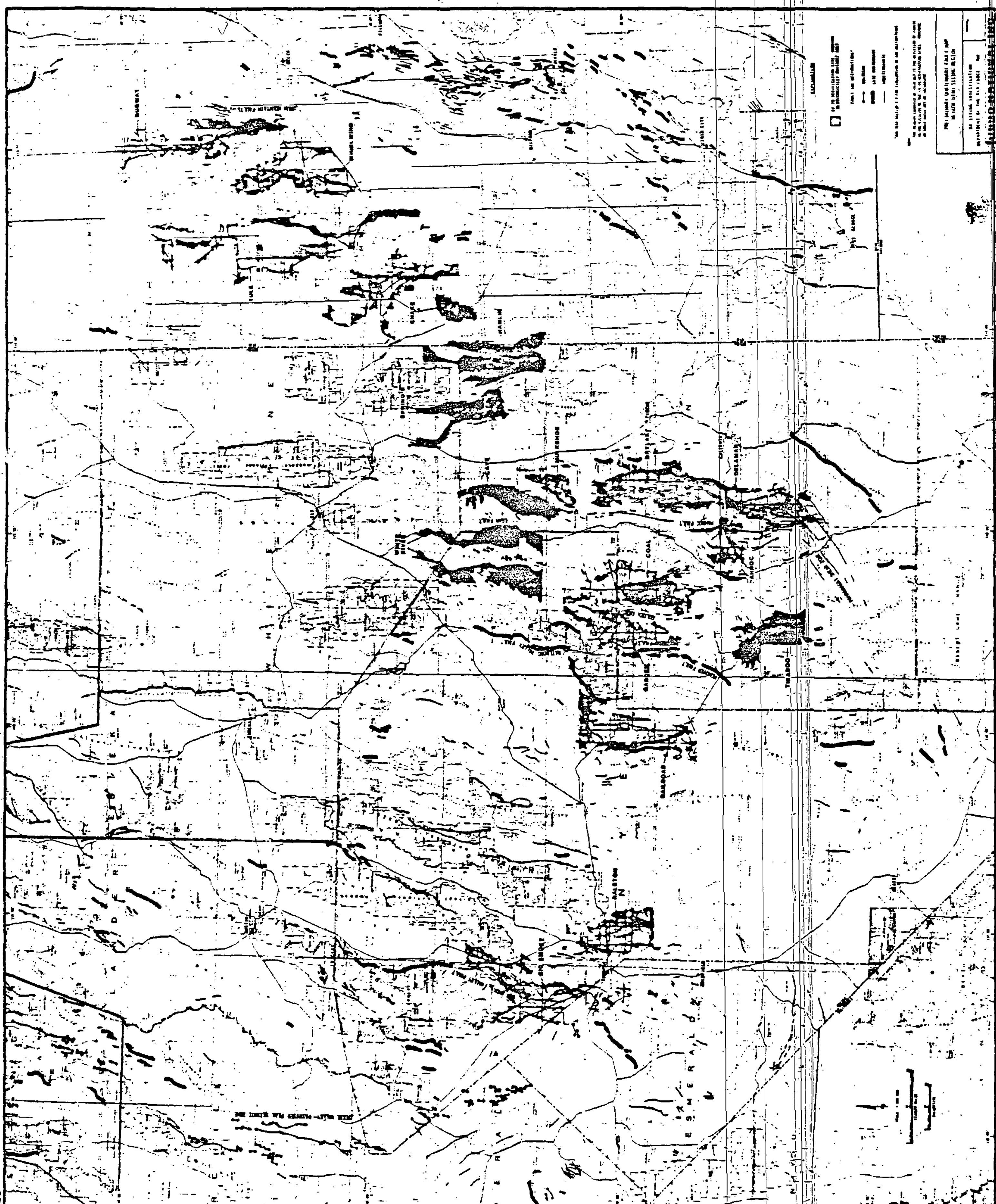
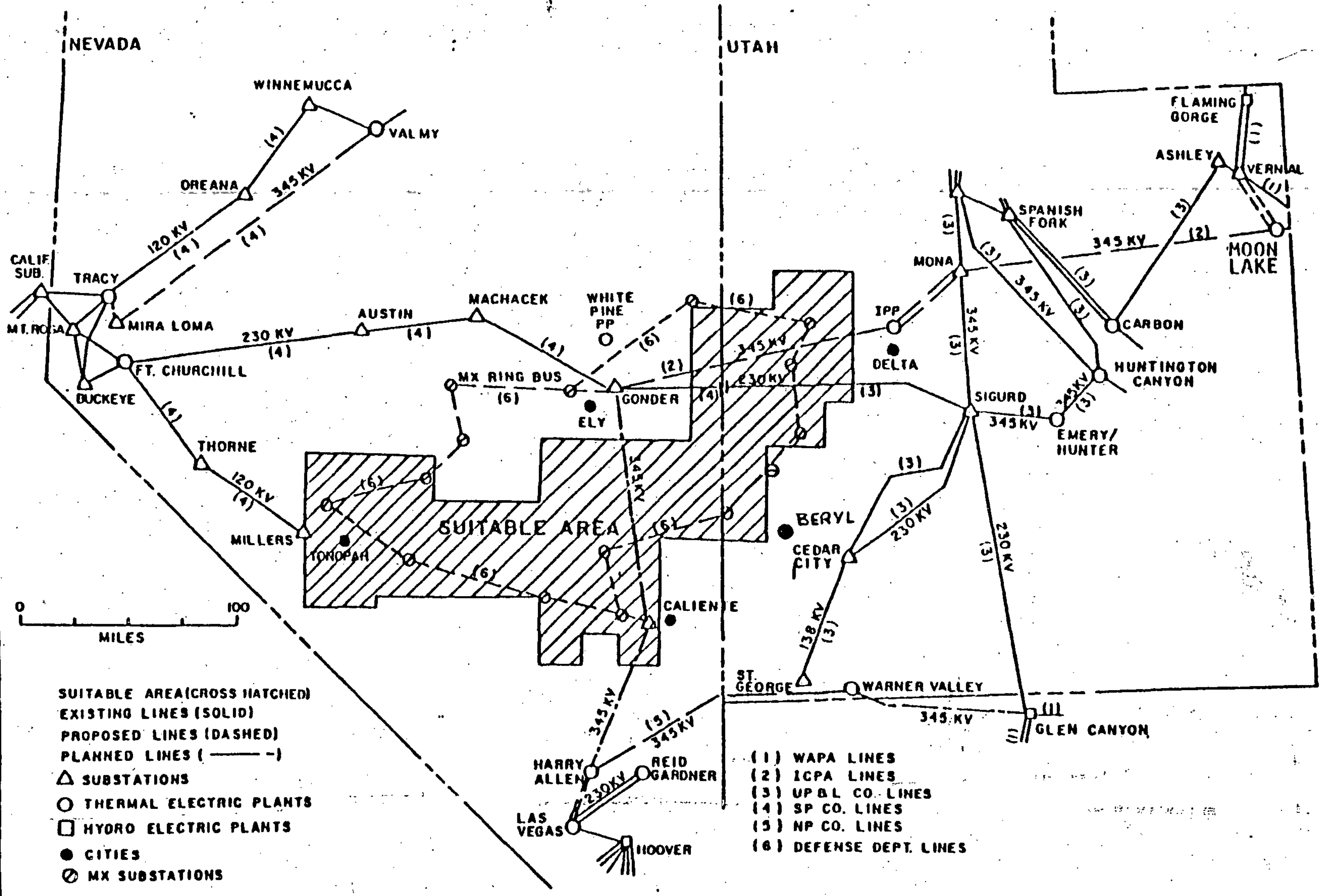


Figure 6B



ELECTRICAL GENERATION AND TRANSMISSION FACILITIES

MX ALTERNATIVE ENERGY SOURCES STUDY - DEPARTMENT OF THE AIR FORCE - BMO

FIGURE 7

FUGRO NATIONAL, INC.

2.5.3 Utility Companies

The primary power companies having direct contact with the MX deployment area are:

1. Utah Power & Light
2. Lincoln County Power District
3. Mount Wheeler Power Company
4. Nevada Power Company
5. Sierra Pacific Power

3.0 SITE CHARACTERIZATIONS

3.1 SHELTER/CLUSTER

The data in this section shall be used in conjunction with Attachment H, MX and MX-RES System Power Characteristics and Requirements, for purposes of defining shelter, cluster and operating base "point designs." For adaptations of the "point designs" to other locations and/or sizes, also use the data in the preceding section. Exceptions shall be clearly identified.

3.1.1 General Topography/Geology/Hydrology

For proposal purposes, the baseline shelter/cluster location will be Dry Lake Valley, Nevada. Details of the geotechnical, climatological and hydrological characterizations are provided in the following sections.

3.1.1.1 Location/Layout

Figure 8 provides a layout of Dry Lake Valley with 10 clusters of 23 shelters per cluster. Figures 8A and 8B provide photographic views of Dry Lake Valley. Figure 9 and 10 (MX Weapon System - Verifiable Horizontal MPS layout and artist concept, respectively) detail the layout of the MX shelter within a 2.5 acre fenced site. This is the current MX configuration. The clear area of Figure 9, which has been designated as a Restricted Zone for this RFP, is that area within the perimeter fence which must be kept free of construction, e.g., MX-RES hardware. The Restricted Zone allows a 20-foot work area on each side of the ROSEE and shelter (see Figure 9). In addition, one side of the shelter (either side) is restricted in order to provide access for MX service vehicles and for placement of MX ancillary equipment. The exact locations of the service road and ancillary equipment are not known at this time. For purposes of this proposal, the cross-hatched area of Figure 9 has been designated as usable area within the shelter fence confines. The centerline of the shelter will be randomly oriented relative to true North. For purposes of this proposal, the centerline of the shelter has been oriented 45° to true North.

3.1.1.2 Topographical Description

Dry Lake Valley, located approximately 15 miles west of Caliente, Nevada, is a north-south trending valley approximately 37 miles long and 12 miles wide which contains an intermittent playa (i.e., closed drainage basin) at its relatively flat bottomed center. The central valley alluvium is downdropped relative to the surrounding bedrock mountain peaks (which extend 4000 feet above the valley floor) by high angle normal faults. Transverse east-trending faults, oriented at high angles to the normal faults, may offset the valley axis. A north trending escarpment within the younger alluvium parallels the main fault system on the eastern side of the valley.

In general, one percent or less area of Dry Lake Valley contains slopes greater than 10 percent grade or has drainage incision depths greater than 10 feet occurring less than 1000 feet apart. There are no areas of complex, highly variable terrain such as dunes or hummocky area.

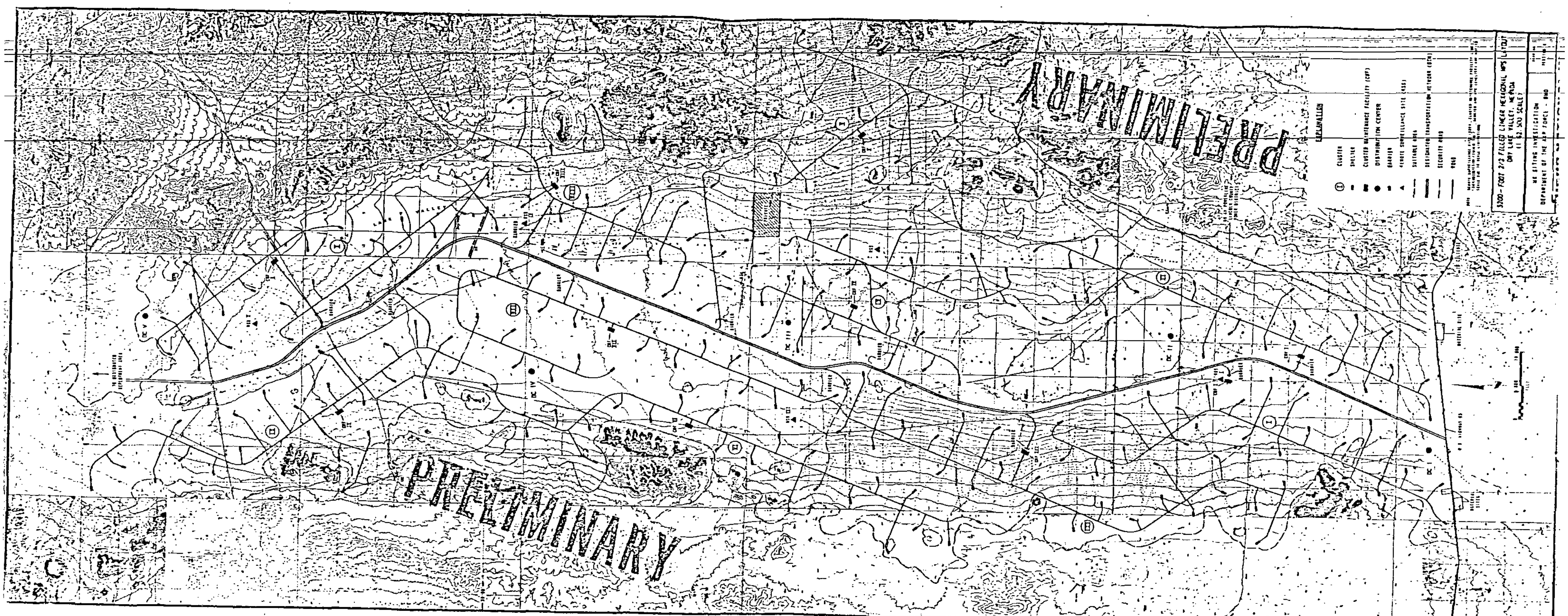


Figure 8

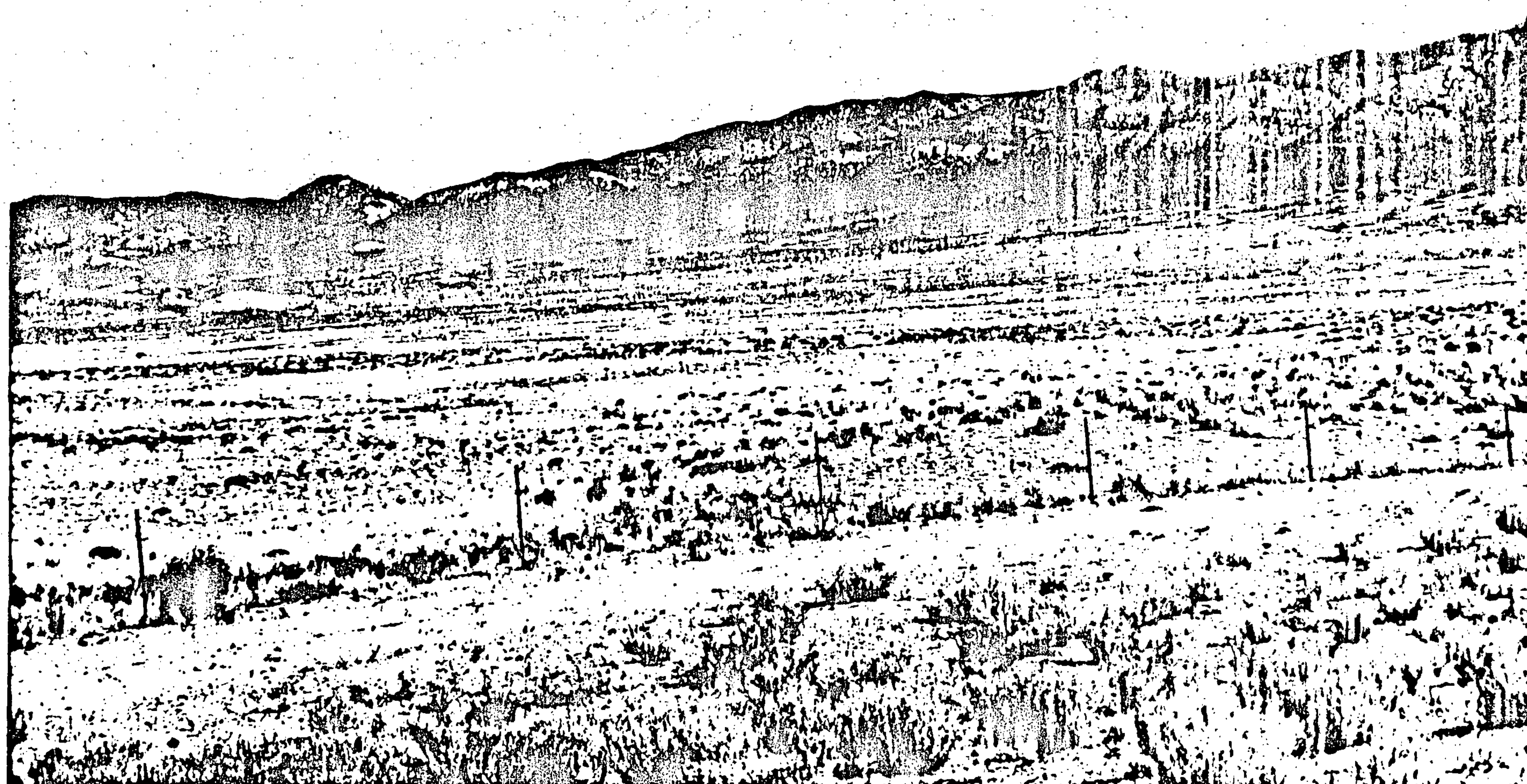


Figure 8A **DRY LAKE VALLEY**

View NE along fault scarp

DRY LAKE VALLEY

Figure 8B Southern end of fissure beginning in stream channel

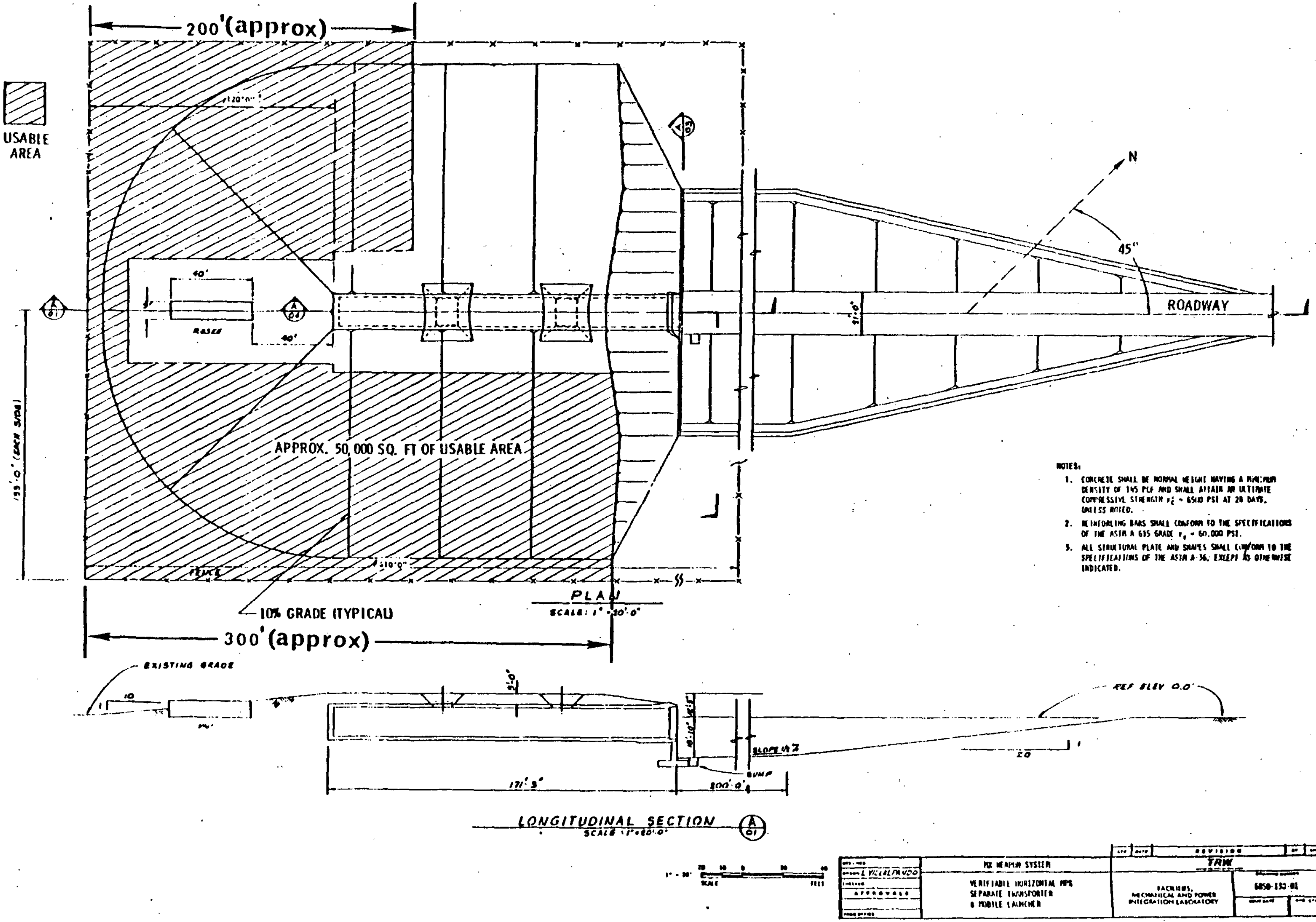
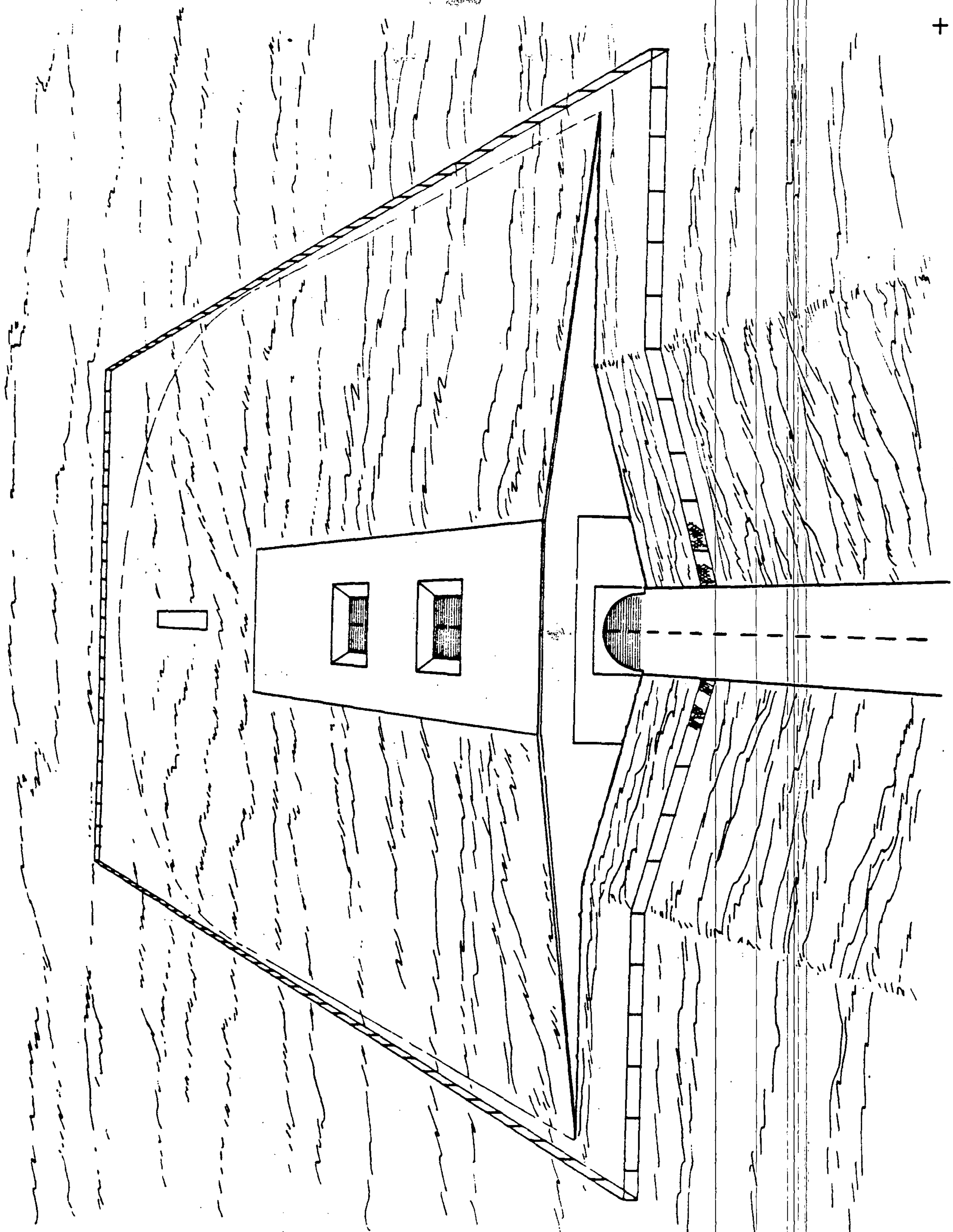

200'(approx)
USABLE AREA
ROADWAY
N
45°
APPROX. 50,000 SQ. FT OF USABLE AREA
FENCE
10% GRADE (TYPICAL)
PLAN
300'(approx)
EXISTING GRADE
REF ELEV 0.0
SLOPE
SUMP
171' 3"
LONGITUDINAL SECTION
NOTES:
1. CONCRETE SHALL BE NORMAL WEIGHT HAVING A MAXIMUM DENSITY OF 145 PCF AND SHALL ATTAIN AN ULTIMATE COMPRESSIVE STRENGTH f'c = 6500 PSI AT 28 DAYS, UNLESS NOTED.
2. REINFORCING BARS SHALL CONFORM TO THE SPECIFICATIONS OF THE ASTM A 615 GRADE fy = 60,000 PSI.
3. ALL STRUCTURAL PLATE AND SHAPES SHALL CONFORM TO THE SPECIFICATIONS OF THE ASTM A-36, EXCEPT AS OTHERWISE INDICATED.
MX WEAPON SYSTEM
VERIFIABLE HORIZONTAL MPS
SEPARATE TRANSPORTER
& MOBILE LAUNCHER
TRW
FACILITIES,
MECHANICAL AND POWER
INTEGRATION LABORATORY
6050-132-01

Figure 9



ARTIST CONCEPT - VERIFIABLE HORIZONTAL MPS
FIGURE 10

AEROSPACE FORM NO. 4651-80

The alluvial fans near the mountain fronts exhibit incision depths ranging from 6 to 15 feet and are randomly spaced. Alluvial fans on the flanks of the playa have incisions of 0 to 6 feet. Older fluvial deposits have incisions varying from 3 to 5 feet. Fine grained deposits in the center of the valley have incisions ranging from 0 to 3 feet. Coyote Wash, located along the valley axis at its northern end, is over 2000 feet wide and 50 feet deep. Flat, wide terrace deposits border the wash for 6.5 miles of its northern length. As it drains southward, the wash opens up and merges with the flat valley floor.

3.1.1.3 Geological Description

The mountain ranges to the west of Dry Lake Valley consist of ash flow tuffs with minor amounts of carbonate rocks; those to the east contain carbonate rocks and minor ash flow tuffs.

The valley-fill deposits are greater than 1000 feet thick in some areas. Alluvial fan deposits account for the majority of the valley-fill, ranging from sandy gravel near the mountain fronts to sandy silt near the center of the valley. The physical characteristics of these units are dependent on age and grain size, but generally the coarser/older units are more cemented and indurated than the finer-grained, younger units toward the center of the valley. Silts and clays from a local Pleistocene lake have been eroded and redeposited by more recent lacustrine and active playa processes in the central portion of the valley. Small sand bars mark the highest lake level. The soil within the shelter will be compacted after construction is complete.

3.1.1.4 Hydrological Description

A general hydrological description of the Nevada/Utah area under consideration for MX deployment is given in Section 2.1.3. Presume that water is available for use, however, actual water requirements for the proposed system shall be identified by the Offerer.

3.1.2 Climatological Data

3.1.2.1 General

The climatological data (See Appendix A) for Caliente, Nevada*, as provided by the National Climatic Center (NCC), is the baseline reference material in regard to temperature and precipitation for the deployment site of Dry Lake Valley, Nevada.** Other design data included in this NCC summary may be used as required.

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*Caliente, Nevada Met-site is located at: Latitude N37°37', Longitude W114°31'; Elevation: 4400 feet

**Dry Lake Valley, Nevada is located at: Latitude N37°50', Longitude W114°47'; Elevation: 4800 feet

3.1.2.2 Humidity

Humidity data for Dry Lake Valley is obtained from Reference 4.1 and summarized in Table 5.

Table 5
RELATIVE HUMIDITY, PERCENT
FOR DRY LAKE VALLEY, NEVADA

MONTH	HOUR 0400	HOUR 1000	HOUR 1600	HOUR 2200
	(Local Time)			
JAN	71	60	55	70
FEB	75	59	52	72
MAR	72	48	41	65
APR	68	40	34	57
MAY	64	33	30	52
JUNE	58	28	24	43
JULY	51	23	21	38
AUG	55	26	22	41
SEPT	56	29	22	43
OCT	65	39	31	55
NOV	72	52	46	68
DEC	73	60	56	72
YEAR MEAN	65	41	36	56

3.1.3 Extreme Winds

The extreme wind environment given in Section 2.3 are applicable to Dry Lake Valley MX deployment site.

3.1.4 Seismic Activity

The specific seismic hazard for Dry Lake Valley is defined in Reference 4.3. Dry Lake Valley is located in Zone 2 as indicated on the map of Reference 4.3. The seismic hazard design standard for this zone is defined as a 5.75 magnitude on the Richter Scale.

3.1.5 Utilities

Detailed planning of the Utility grid interface with the clusters has not been finalized, however, for proposal purposes, it can be assumed that the proposed MX Ring Bus will be available for transmission and distribution of power. Utility availability is defined for the clusters in Attachment H, paragraph 4.3.

3.2 OPERATING BASES

3.2.1 General Topography/Geology/Hydrology

3.2.1.1 Preferred Locations/Layouts

Five sites are presently being considered for the MX system operating bases (see Table 1). For purposes of this proposal, it will be assumed that Operating Base #1 and Operating Base #2 are Beryl, Utah and Ely, Nevada, respectively. Figures 11 and 12 show the layouts for bases located at these two sites.

3.2.1.2 Topographic Descriptions

3.2.1.2.1 Beryl, Utah (Escalante Desert)

Beryl is located in the southern end of the Escalante Desert (Figure 11). The Escalante Desert is an irregularly shaped valley, generally trending northeast-southwest, located in southwestern Utah (Figure 1). It is approximately 88 miles long and 32 miles wide at the widest point. This portion of the Escalante Desert is a relatively flat alluvial basin which is almost completely surrounded by low-lying mountain ranges (6500 to 7500 feet). The basin proper is rimmed by alluvial fans and contains lacustrine deposits in its center.

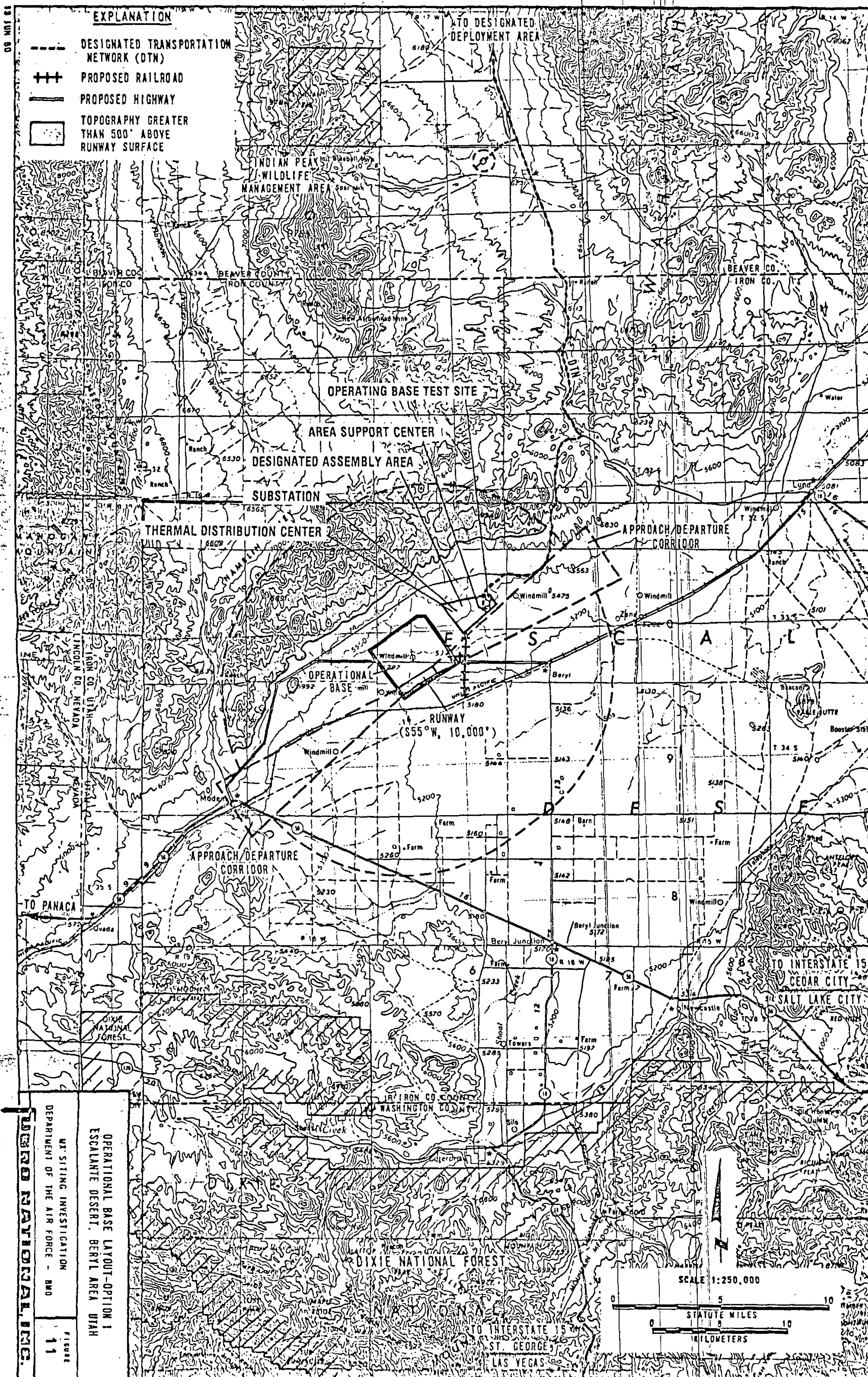
The alluvial fans are generally gently sloping (zero to five percent), although fans with slopes exceeding 10 percent do occur high on the mountain flanks. Lacustrine deposits are almost flat (zero to one percent slopes). Several areas around the periphery of the valley have been identified as having adverse terrain conditions.

These areas are near the southern end of the Wah Wah Mountains and the northern end of the Antelope Range.

The valley floor, between the Union Pacific Railroad and Highway 56, contains some fairly broad and widespread eolian deposits. The topography in portions of these areas is irregular and hummocky.

3.2.1.2.2 Ely, Nevada (Steptoe Valley)

Ely is located in Steptoe Valley which is an elongated narrow valley located in central-eastern Nevada (Figure 1). It is approximately 150 miles long and generally trends north-south and extends northward from the southern end of White Pine County. The valley is bounded by the Schell Creek and Duck Creek ranges on the east with the Egan Range forming the western boundary (Figure 12). The crests of these ranges average 3000 to 4000 feet above the valley floor.



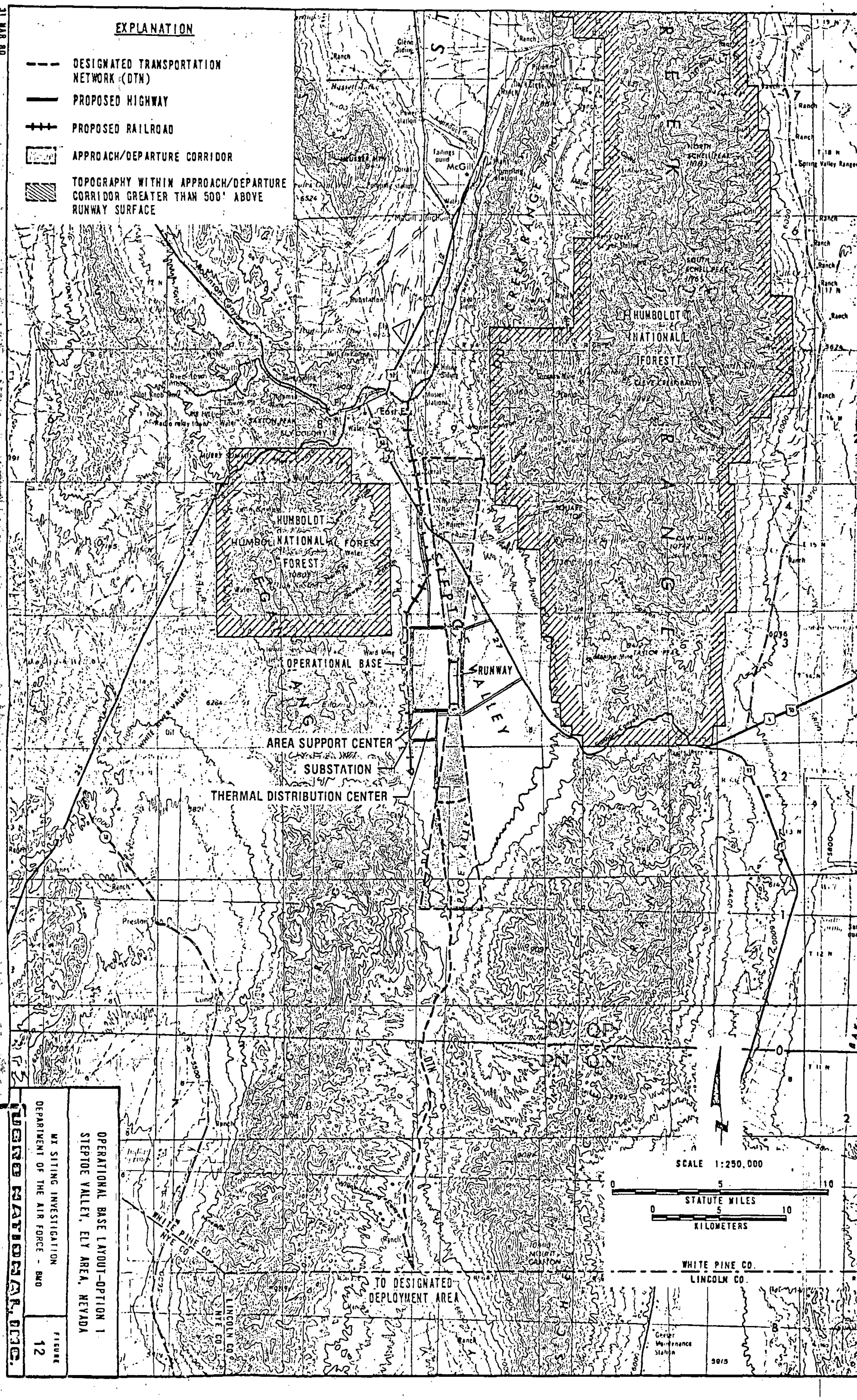
OPERATIONAL BASE LAYOUT-OPTION 1
ESCALANTE DESERT, BERYL AREA UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE 11

FUGRO NATIONAL, INC.

31 MAR 80



MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

OPERATIONAL BASE LAYOUT-OPTION 1
STEPTOE VALLEY, ELY AREA, NEVADA

FIGURE 12

FUGRO NATIONAL, INC.

The valley can generally be divided into three physiographic areas: the valley lowland, alluvial apron, and mountains. The valley lowland, within the study area, has an average northward gradient of about 22 feet per mile. The lowland ranges in width from less than one-quarter mile in the area south of Ely to greater than 9 miles wide just north of McGill, Nevada.

The alluvial fans are intermediate in slope between the mountains and valley lowland and have gradients that average 300 to 400 feet per mile. Alluvial fans along the eastern margin of the valley are relatively more incised than fans along the western margin. Most of the fans along the eastern margin of the valley, south of Ely, would be excluded from MX shelter deployment based on the incision depth and drainage spacing criteria. Only small areas of adverse terrain exist along the western margin of the valley.

3.2.1.3 Hydrological Description

A general hydrological description of the Nevada/Utah area under consideration for MX deployment is given in Section 2.1.3. The following hydrological data are specific to the Beryl, Utah and Ely, Nevada proposed operational base sites. Presume that water is available for use, however, actual water requirements for the proposed system shall be identified by the Offerer.

3.2.1.3.1 Beryl, Utah

Groundwater in the Beryl area is either fresh or slightly saline with the best quality groundwater located in the southern part of the area. The poorest quality water occurs 1 to 3 miles south of Beryl where pumping capability is the highest.

The existing withdrawals of groundwater in the Beryl area greatly exceed the estimated perennial yield. Most of the groundwater withdrawal and the corresponding water level decline occurs in the southern portion of the Escalante Desert Valley. Areas of significant decline, however, comprise less than one-fourth of the valley.

If additional groundwater is developed for an operational base, it is likely that the current rate of water level declines would be accelerated. It may be possible, however, to obtain an operational base water supply through the purchase or lease of existing groundwater rights. This would avoid a significant increase in water level declines.

3.2.1.3.2 Ely, Nevada

The water quality is variable depending on the location relative to recharge areas and depth to the water table. In general, the water quality in Steptoe Valley is good.

Locally, groundwater may be hard, i.e., containing greater than 150 mg/liter calcium carbonate. The calcium carbonate concentration in groundwater samples ranges from 136 to 218 mg/liter for wells, and from 142 to 412 mg/liter for springs.

The existing withdrawal of groundwater does not exceed the estimated perennial yield in Steptoe Valley. However, proposed development will exceed the perennial yield. If additional groundwater is developed for an operating base, it is likely that water levels would decline. Accordingly, over development coupled with a loss of head in the aquifers could locally reduce some spring discharge.

The designation of Steptoe Valley as a critical water basin largely precludes development of groundwater from the shallow aquifer system beyond the estimated perennial yield. This designation, however, is due to the appropriation of groundwater by the White Pine Power Project, the future activities of which are uncertain. Thus, the basin has not, as yet, been developed to its perennial yield. If that application is approved, water from the operating base could come from either the purchase of existing water rights, or the possible development of groundwater from the deep carbonate aquifer, or a combination of both.

3.2.2 Climatological Data

The climatological summaries for the operating base locations are given in Appendices B and C. The NCC summary data for Cedar City, Utah will be used for the Beryl operating base while the Ely NCC summary data will be used for the Ely operating base. Appendices D and E are included in order to provide the Offerer with additional data concerning heating and cooling days for the operating bases.

3.2.3 Extreme Winds

The extreme wind environment given in Section 2.3 are applicable to both the Beryl, Utah and Ely, Nevada operating base locations.

3.2.4 Seismic Activity

3.2.4.1 Beryl, Utah

Beryl, Utah is located in Zone 2 as defined in Refernce 4.3. The seismic hazard design standard for this zone is defined as a 5.75 magnitude on the Richter Scale.

3.2.4.2 Ely, Nevada

Ely, Nevada is located in Zone 2 as defined in Reference 4.3. The seismic hazard design standard for this zone is defined as a 5.75 magnitude on the Richter Scale.

3.2.5 Utilities

Detailed planning of the Utility grid interface with the operating bases has not been finalized, however, for proposal purposes it can be assumed that a transmission and distribution system will be available. Utility availability is defined for the operating bases in Attachment H, paragraph 4.3.

4.0 REFERENCES

4.1 "Nevada's Weather and Climate", J.G. Houghton, et al, Special Publi cation 2, Nevada Bureau of Mines and Geology, Reno, Nevada.

4.2 "Climatological Data, Nevada Test Site and Nuclear Rocket Development Station", R.F. Quiring, ESSA Research Laboratories, Tech. Memo ARL-7.

4.3 "Seismic Design for Buildings," AFM 88-3, Chapter 13, Departments of the Army, the Navy, and the Air Force, April, 1973.

APPENDIX A

CLIMATE OF CALIENTE, NEVADA

(Representative for Dry Lake Valley, Nevada)

CLIMATOLOGICAL SUMMARY

LATITUDE N37 37 | CALIENTE, NV

LONGITUDE W114 31 | ELEVATION 4402

MEANS AND EXTREMES FOR PERIOD 1951-1973

TEMPERATURE (°F)

MONTH	Means: Daily Maximum	Means: Daily Minimum	Means: Monthly	Extremes: Record Highest	Year	Day	Extremes: Record Lowest	Year	Day	Mean Number of Days: Max. 90° and Above	Max. 32° and Below	Min. 32° and Below	Min. 0° and Below
JAN	47.9	17.4	32.7	69	71	31	-10+	63	13	0	2	29	2
FEB	54.2	23.2	38.7	76	63	6	-1	56	17	0	1	25	0
MAR	60.4	26.5	43.4	90	71	30	2	58	9	0	0	26	0
APR	68.8	33.4	51.1	88+	54	17	16	66	20	0	0	14	0
MAY	78.7	41.7	60.2	98	51	26	24	67	1	3	0	3	0
JUN	88.9	49.4	69.2	109	54	22	33+	71	1	15	0	0	0
JULY	95.9	56.6	76.3	107+	60	17	40	58	18	29	0	0	0
AUG	93.3	56.0	74.6	105+	60	7	38	57	31	23	0	0	0
SEPT	86.3	45.5	65.9	102+	59	6	27+	65	20	10	0	1	0
OCT	76.6	35.0	56.8	94	63	1	14+	71	30	1	0	11	0
NOV	59.3	25.4	42.4	80	62	2	0	56	20	0	0	25	0
DEC	49.0	18.8	33.9	69+	58	5	-13	67	21	0	1	29	1
YEAR	71.4	35.7	53.6	109	JUN 54	22	-13	DEC 67	21	81	4	163	3

PRECIPITATION TOTALS (INCHES)

MONTH	Mean	Greatest Monthly	Year	Greatest Daily	Year	Day	Snow, Sleet: Mean	Maximum Monthly	Year	Greatest Depth	Year	Day	Mean Number of Days: .10 or More	.50 or More	1.00 or More
JAN	.71	2.50	69	.90	52	18	2.4	10.0	55	8.0	67	22	2	0	0
FEB	.68	2.83	69	.85	69	25	.9	8.8	59	4.0	51	27	2	0	0
MAR	.78	3.08	73	1.07	52	16	.7	8.0	51	6.0	52	16	2	0	0
APR	.74	3.05	65	1.15	65	26	.0						2	0	0
MAY	.49	1.91	57	.80	58	11	.0						2	0	0
JUN	.32	.99	56	.99	56	30	.0						1	0	0
JULY	.91	2.23	68	1.00	52	30	.0						3	0	0
AUG	.95	3.35	71	1.04	73	5	.0						3	0	0
SEPT	.62	2.82	67	1.56	66	19	.1	2.0	71				1	0	0
OCT	.77	3.26	72	2.10	72	10	.0						2	0	0
NOV	.81	3.08	60	1.80	60	6	.7	5.5	57	4.0	57	3	2	1	0
DEC	.66	1.89	66	.89	66	7	2.3	9.8	70	6.0	67	21	2	0	0
YEAR	8.44	3.35	AUG 71	2.10	OCT 72	10	7.1	10.0	JAN 55	8.0	JAN 67	22	24	1	0

+ ALSO ON EARLIER DATES

Notes:

1) The above table was extracted from the National Oceanic and Atmospheric Administration document titled "Climatography of the United States No. 20, Climate of Caliente, Nevada," dated April 1978.

2) For hail and snow information, see Reference 4.1.

   a) Hail generally is small in size but 1/2-1 inch hailstorms have been observed.

   b) Snow fall ranges from 10-80 inches depending on altitude

APPENDIX B

CLIMATE OF ELY, NEVADA

CLIMATOLOGY SUMMARY

Meteorological Data For The Current Year

Station: ELY, NEVADA YELLAND FIELD Standard time used: PACIFIC Latitude: 39 17 N Longitude: 114 51 W Elevation (ground): 6253 feet Year: 1975

Month	Temp. °F Avg. Daily maximum	Daily minimum	Monthly	Extremes Highest	Date	Lowest	Date	Degree days Base 65 °F Heating	Cooling	Precip. Water equivalent Total	Greatest in 24 hrs.	Date	Snow, Ice pellets Total	Greatest in 24 hrs.	Date	Relative humidity pct. 04	10	16	22	Wind Resultant Direction	Resultant Speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Date	Percent of possible sunshine	Average sky cover tenths, sunrise to sunset	Sunrise to sunset Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility 1/4 mile or less	Temp. Maximum 90° and above	32° and below	Minimum 32° and below	0° and below	Average station pressure mb. Elev. 6262 feet m.s.l.
JAN	40.9	7.6	24.1	59	25	-10	1	1262	0	0.74	0.27	6-7	10.0	2.9	6-7	74	64	57	74	20	3.6	9.1	30	N	10	77	5.7	11	7	13	11	5	1	0	0	10	31	9	809.3
FEB !	41.9	15.3	28.6	62	28	-8	8	1021	0	0.76	0.28	16	9.0	2.0	16	77	64	61	76	21	3.8	10.4	30	SE	2	75	7.0	3	7	18	8	4	0	1	0	3	28	4	807.3
MAR	43.6	20.0	31.8	60	1	-2	17	1023	0	1.59	0.38	10-11	16.4	3.0	10-11	77	62	58	76	21	3.2	10.9	40	S	7	52	6.2	3	5	23	14	7	0	1	0	3	31	1	803.8
APR	46.6	21.6	34.1	64	24	2	7	921	0	1.20	0.29	23	15.6	3.0	16-17	70	53	40	71	21	2.9	9.7	33	S	8	54	7.3	1	12	17	8	5	1	1	0	3	30	0	803.3
MAY	64.1	30.9	47.5	79	14	10	3	533	0	1.40	0.87	4-5	12.1	8.0	4-5	73	40	36	62	23	1.6	10.6	36	S	4	71	5.6	9	9	13	7	4	2	0	0	0	20	0	807.0
JUN !	75.6	38.7	57.2	87	13	26	26	220	3	0.31	0.21	18-19	T	T	19	64	30	27	47	22	4.1	10.6	56	SE	24	82	4.9	10	10	10	5	0	3	0	0	0	6	0	808.3
JUL	86.5	49.4	68.0	94	27	33	31	19	120	1.04	0.49	4	0.0	0.0		62	31	37	31	20	6.0	10.6	39	S	2		4.1	14	13	4	6	0	5	0	10	0	0	0	811.0
AUG	83.1	44.1	63.6	93	9	33	29	81	46	0.51	0.38	20-21	0.0	0.0		53	26	16	38	20	6.0	10.6	32	SW	19	90	3.4	10	6	6	4	0	5	0	6	0	0	0	811.6
SEP	77.9	37.0	57.3	88	7	26	21	217	0	0.53	0.38	11-12	0.0	0.0		63	30	25	48	21	2.7	6.7	29	SW	1	92	2.6	19	7	4	3	0	3	0	0	0	7	0	813.1
OCT	61.7	27.9	44.8	80	2	8	24	617	0	0.91	0.49	11-12	9.6	3.0	T	60	42	32	57	20	3.7	10.0	34	S	9	78	5.1	12	4	15	7	2	1	0	0	0	24	0	809.7
NOV	49.7	14.4	32.1	73	6	8	29	982	0	0.19	0.17	27-28	4.7	2.8	27-28	70	44	46	67	20	2.6	9.4	28	SE	10	74	5.4	9	13	8	5	2	0	0	0	3	30	1	810.0
DEC	43.6	11.6	28.3	64	9	-9	14	1123	0	0.39	0.10	12-13	6.2	3.9	12-13	80	63	59	76	20	3.4	8.0	44	NW	30	70	8.4	8	13	10	4	2	0	0	0	3	31	4	812.1
YEAR	59.7	26.9	43.1	94	JUL 27	-10	JAN 1	8027	169	9.77	0.87	MAY 4-5	79.4	8.0	MAY 4-5	70	46	41	62	21	3.7	9.9	56	SE	JUN 24	66	5.4	120	108	137	84	31	26	3	16	19	236	19	809.0

! DATA CORRECTED AFTER PUBLICATION OF THE MONTHLY ISSUE.

Normals, Means, And Extremes

Month	Temp. °F Normal Daily maximum	Daily minimum	Monthly	Extremes Record highest	Year	Record lowest	Year	Normal Degree days Base 65 °F Heating	Cooling	Precip. Water equivalent Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Snow, Ice pellets Maximum monthly	Year	Maximum in 24 hrs.	Year	Relative humidity pct. 04	10	16	22	Wind Mean speed m.p.h.	Prevailing direction	Fastest mile Speed m.p.h.	Direction	Year	Pct. of possible sunshine	Mean sky cover tenths, sunrise to sunset	Sunrise to sunset Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility 1/4 mile or less	Temp. Max. 90° and above (b)	32° and below	Min. 32° and below	0° and below	Average station pressure mb. Elev. 6262 feet m.s.l.
(a)				37		37					37		37		37		37		37		23	23	23	23	37	11	32	32		37	32	37	37	37	37	37	37	37	37	37	37	37	3
J	38.0	9.2	23.6	68	1951	-27	1949	1283	0	0.64	1.92	1952	T	1948	0.93	1952	34.0	1967	13.1	1943	71	60	53	70	10.6	S	66	SE	1952	66	6.2	9	7	15	7	2	0	0	0	9	31	6	807.9
F	41.4	14.3	27.9	66	1963	-25	1949	1039	0	0.60	2.19	1969	0.01	1972	1.34	1969	19.9	1959	10.4	1936	73	59	52	72	10.8	S	56	S	1934	64	6.3	7	7	14	7	2	0	0	0	5	28	4	805.8
M	46.6	18.9	32.8	73	1966	-13	1952	998	0	0.89	2.40	1958	0.07	1972	0.86	1936	24.8	1958	10.6	1954	72	48	41	63	10.9	S	59	SE	1931	71	6.3	6	8	15	8	3	0	0	0	3	30	1	803.6
A	56.3	26.2	41.3	78	1962	-9	1965	711	0	1.00	2.77	1944	0.16	1946	1.04	1947	24.5	1963	10.7	1970	60	40	34	57	11.0	S	59	S	1931	67	6.1	8	9	13	8	2	1	0	0	0	25	0	803.8
M	66.4	33.6	50.0	87	1974	7	1930	470	0	0.93	3.05	1947	T	1948	1.42	1953	12.1	1975	8.0	1975	64	35	30	52	10.9	S	74	S	1948	71	5.9	7	12	12	7	1	4	0	0	0	13	0	807.3
J	75.7	39.7	57.7	99	1954	19	1930	241	22	0.93	3.55	1963	T	1974	1.30	1963	5.6	1939	5.6	1939	58	28	24	43	10.7	S	63	SW	1952	79	4.4	13	10	7	5	0	5	0	2	0	4	0	808.9
J	86.3	46.0	67.2	97	1960	30	1968	23	92	0.61	1.81	1970	T	1948	1.22	1952	0.0		0.0		51	23	21	35	10.4	S	90	S	1957	80	4.0	14	12	5	5	0	8	0	9	0	0	0	811.1
A	84.2	44.8	63.5	96	1972	24	1960	62	77	0.36	2.06	1973	T	1962	0.91	1973	0.0		0.0		53	26	22	41	10.6	S	57	S	1934	81	3.8	15	12	4	5	0	8	0	5	0	1	0	810.9
S	76.1	37.3	56.7	93	1950	15	1968	263	16	0.61	2.23	1967	T	1953	1.23	1963	2.2	1971	2.2	1971	56	29	22	43	10.5	S	57	S	1933	83	3.1	18	8	4	4	0	3	0	0	0	0	0	811.6
O	63.6	28.4	46.0	84	1967	-3	1971	589	0	0.60	1.76	1941	0.00	1952	1.09	1968	9.7	1971	7.3	1934	65	30	31	55	10.4	S	63	S	1930	73	4.3	14	9	8	5	1	1	0	0	0	22	0	810.6
N	49.1	15.9	34.0	79	1975	-15	1964	930	0	0.66	1.82	1960	T	1959	1.29	1960	18.3	1946	10.6	1967	72	52	46	68	10.1	S	51	S	1934	66	5.8	10	8	12	5	1	0	0	0	2	28	1	808.9
D	40.6	12.0	26.2	67	1958	-28	1972	1203	0	0.71	2.11	1966	T	1962	1.12	1966	22.3	1968	12.7	1970	73	60	56	72	10.2	S	61	SE	1952	64	6.1	8	9	14	6	3	0	0	0	7	30	3	810.8
YR	60.4	27.0	45.1	99	JUN 1954	-28	DEC 1972	7614	207	8.70	3.55	JUN 1963	0.00	OCT 1952	1.34	FEB 1969	34.0	JAN 1967	13.1	JAN 1943	65	41	36	56	10.6	S	74	S	MAY 1948	73	5.2	131	111	123	73	15	31	1	16	26	218	19	808.7

Notes: 1) The above table was extracted from the National Oceanic and Atmospheric Administration document titled "Local Climatological Data, Annual Summary with Comparative Data, 1975, Ely, Nevada."

2) For hail and snow information, see Reference 4.1.

a) Hail generally is small in size but 1/2-1 inch hailstones have been observed.

b) Snow fall ranges from 10 - 80 inches depending on altitude.

APPENDIX C

CLIMATE OF CEDAR CITY, UTAH

(Representative for Beryl, Utah)

CLIMATOLOGICAL SUMMARY

LATITUDE N37 42
LONGITUDE W113 06

MEANS AND EXTREMES FOR PERIOD 1951-1974

CEDAR CITY FAA AP, UT
ELEVATION 5601

MONTH	TEMPERATURE (°F)												
	MEANS			EXTREMES						MEAN NUMBER OF DAYS			
										MAX.		MIN.	
	DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	RECORD HIGHEST	YEAR	DAY	RECORD LOWEST	YEAR	DAY	90° AND ABOVE	32° AND BELOW	32° AND BELOW	0° AND BELOW
JAN	41.9	16.3	29.1	66+	71	18	-26	51	31	0	5	29	3
FEB	46.1	21.0	33.6	70+	72	28	-22	62	27	0	3	25	1
MAR	52.4	25.5	39.0	77	66	31	-1+	58	9	0	1	25	0
APR	61.0	32.3	46.7	82+	62	18	8	66	20	0	0	16	0
MAY	71.8	41.0	56.5	91+	67	22	23+	68	7	0	0	4	0
JUN	82.8	49.1	66.0	101+	70	26	31+	73	19	7	0	0	0
JULY	89.7	57.7	73.7	101+	60	17	43	55	7	16	0	0	0
AUG	87.0	56.4	71.7	99+	60	12	36	68	23	11	0	0	0
SEPT	79.5	46.7	63.1	95+	55	6	23	65	18	2	0	1	0
OCT	67.2	36.0	51.6	86	59	24	-7	71	30	0	0	10	0
NOV	52.4	25.1	38.7	73	66	2	-7	56	20	0	1	24	1
DEC	42.8	17.5	30.2	67+	59	7	-16+	62	25	0	5	29	2
YEAR	64.6	35.4	50.0	101+	JUL 60	17	-26	JAN 51	31	36	15	163	7

MONTH	PRECIPITATION TOTALS (INCHES)														
							SNOW, SLEET						MEAN NUMBER OF DAYS		
	MEAN	GREATEST MONTHLY	YEAR	GREATEST DAILY	YEAR	DAY	MEAN	MAXIMUM MONTHLY	YEAR	GREATEST DEPTH	YEAR	DAY	.10 or MORE	.50 or MORE	1.00 or MORE
JAN	.53	1.87	74	.68	74	21	6.9	23.8	74	11.0	73	5	2	0	0
FEB	.73	2.19	65	1.60	65	6	7.3	34.2	71	12.0	71	20	2	0	0
MAR	.89	2.93	61	1.28	61	18	7.8	28.1	61	10.0	52	11	3	0	0
APR	1.06	2.37	73	1.07	74	2	5.8	23.7	64	5.0	73	2	3	0	0
MAY	.71	1.52	71	1.11	58	11	.7	6.8	64	2.0	62	21	2	0	0
JUN	.48	1.29	70	1.01	70	7	.0						1	0	0
JULY	1.03	2.96	69	1.48	53	31	.0						3	1	0
AUG	1.25	4.31	63	2.02	63	19	.0						4	0	0
SEPT	.90	4.62	67	2.10	67	24	.1	2.0	65				2	1	0
OCT	.77	3.33	72	.88	53	22	1.3	13.5	71	7.0	71	30	2	0	0
NOV	.94	2.11	70	.93	67	21	4.7	13.7	51	0.0	51	24	3	1	0
DEC	.68	1.75	65	.56	72	28	7.0	23.4	72	13.0	67	19	3	0	0
YEAR	9.97	4.62	SEP 67	2.10	SEP 67	24	41.6	34.2	FEB 71	13.0	DEC 67	19	30	3	0

+ ALSO ON EARLIER DATES

Notes: 1) The above table was extracted from the National Oceanic and Atmospheric Administration document titled "Climatography of the United States No. 20, Climate of Cedar City, Utah," dated June 1977.

2) For hail and snow information, see Reference 4.1.

a) Hail generally is small in size but 1/2-1 inch hailstones have been observed.

b) Snow fall ranges from 10 - 80 inches depending on altitude.

APPENDIX D

HEATING AND COOLING DEGREE DAYS FOR UTAH CITIES

MONTHLY AND ANNUAL HEATING DEGREE DAY NORMALS

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
BEAVER	24	40	183	499	846	1097	1156	932	871	591	349	138	6726
CEDAR CITY FAA AP	0	6	114	424	786	1060	1125	893	825	537	281	85	6137
MILFORD WSB	0	7	120	443	831	1128	1218	941	834	534	274	82	6412

MONTHLY AND ANNUAL COOLING DEGREE DAY NORMALS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
BEAVER	0	0	0	0	0	42	157	120	33	0	0	0	352
CEDAR CITY FAA AP	0	0	0	0	8	86	254	201	60	6	0	0	615
MILFORD WSB	0	0	0	0	10	88	288	242	60	0	0	0	688

Note: This information was extracted from the National Oceanic and Atmospheric Administration document titled "Climatography of the United States No. 81 (By STATE), Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1941-70," dated August 1973.

APPENDIX E

HEATING AND COOLING DEGREE DAYS FOR NEVADA CITIES

MONTHLY AND ANNUAL HEATING DEGREE DAY NORMALS

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
CALIENTE	0	0	59	327	678	964	1039	762	676	405	175	28	5113
ELY WSB	23	62	265	589	930	1203	1283	1039	998	711	470	241	7814
LAS VEGAS WSB	0	0	0	74	357	614	645	451	324	126	10	0	2601
PIBCHE	0	6	99	383	738	992	1048	854	812	525	271	78	5806

MONTHLY AND ANNUAL COOLING DEGREE DAY NORMALS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
CALIENTE	0	0	0	0	30	133	341	285	92	8	0	0	889
ELY WSB	0	0	0	0	0	22	92	77	16	0	0	0	207
LAS VEGAS WSB	0	6	8	90	268	519	763	694	453	139	6	0	2946
PIBCHE	0	0	0	0	13	96	264	207	81	11	0	0	672

Note: This information was extracted from the National Oceanic and Atmospheric Administration document titled "Climatography of the United States No. 81 (By STATE), Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1941-70," dated August 1973.