OPEN FILE REPORT 83

PRELIMINARY SELECTION OF SITES GEOLOGICALLY SUITABLE

FOR THE

DISPOSAL OF HAZARDOUS WASTES IN NEW MEXICO

Prepared by: Roy Foster, Senior Petroleum Geologist
George Austin, Deputy Director
John Hawley, Environmental Geologist
William Stone, Hydrogeologist

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New Mexico Bureau of Mines & Mineral Resources

At the request of Vernon Arnold of the New Mexico EIA, a preliminary geologic evaluation was made to locate potential sites for the surface disposal of hazardous wastes. Factors considered in site selection were limited to the following:

1. Rock type and permeability: Rock types chosen should have low interstitial permeability. These include shale, gypsum, pumiceous tuff, caliche above low permeability zones, and some soil. Permeable zones may be suitable in areas of insignificant recharge where water table is deep. On site investigations were not conducted for the preliminary study. Detailed geologic investigations of a specific site would include measuring and describing the stratigraphic sequence, nature and spacing of fracture systems, faulting and permeability. Mineralogical composition would be necessary for future studies to determine reaction with different types of waste. This is particularly important for the clay minerals which can attenuate movement of material because of high surface tension and cation exchange capacity.

Shale is exposed over large areas in the northern part of New Mexico. The Cretaceous Lewis and Mancos Shales are widely exposed in the San Juan Basin. The Pierre Shale also of Cretaceous age, crops out in Colfax and Mora Counties. The Triassic Chinle Formation consists mostly of shale and is extensively exposed both north and south of I-40 in eastern New Mexico. Extensive studies have been conducted on the Pierre Shale at the Chem-Nuclear low-level radioactive waste disposal site in Colfax County. Pumiceous tuff beds have high porosity but unless fractured, very low permeability. Included are the Quaternary Bandelier Tuff in the Jemez Mountains and tuffs in the Datil Formation of Tertiary age in Socorro and Catron Counties. The Bandelier Tuff has been used for storage of radioactive waste at Los Alamos. Recent extensive investigations at this site indicate that there has been no transportation of radio nuclides outside the containment area. Caliche-capped surfaces are common although not restricted to the southern part of the state. Where these units overlie strata of generally low permeability there is a good potential for location of a site suitable for long-term hazardous waste disposal.

2. Known aquifers: Where there appeared to be a possibility for contamination of a fresh water aquifer the site was eliminated from consideration. This was true even though detailed studies might indicate areas that would be suitable for disposal. The Pierre Shale is reported to be saturated with water to near the surface in Colfax County. However, permeabilities are so low that very few wells are drilled into this interval even for

stock water. The water is generally high in sulfates and not suitable for domestic use. The Chinle Formation does contain low-yield, shallow fresh-water aquifers. The water is extensively used for domestic and stock purposes and probably occurs in fractures in the shale and interbedded permeable sandstones. Because of this the only sites considered in this interval are where the Chinle underlies a caliche caprock. In areas where pumiceous tuffs occur at the surface the water table is commonly very deep or at least below the tuff beds. This verifies their low permeability. In parts of New Mexico there are thick sequences of valley-fill sediments consisting of alternating beds of sandstone, shale, conglomerate and siltstone. These are commonly capped by a resistant surface of caliche. Although some of these areas may be underlain by fresh-water aquifers, the water table is very deep and there is no recharge from the surface. Water percolates only a short distance into the soils and sediments before evaporating and precipitating the calcium carbonate that forms the caliche cap.

3. Surface Stability: There is limited information available on erosion rates in various parts of the state. Attempts were made to select sites that at least under present conditions are not being eroded at a very rapid rate. Shale beds such as the Pierre could be subject to rapid erosion if there was a change in conditions. The caliche-capped soils and sediments have been stable for a considerable length of time. Barring drastic climatic changes it is expected that erosion rates will continue at a very low rate. The tuff beds, although soft, generally have

low rates of erosion in the present New Mexico climate. These beds commonly form flat-topped mesas surrounded by fairly steep cliffs. Active streams will form deep, steep-sided canyons in geologically short periods of time, but dissection by intermittant tributaries is fairly slow.

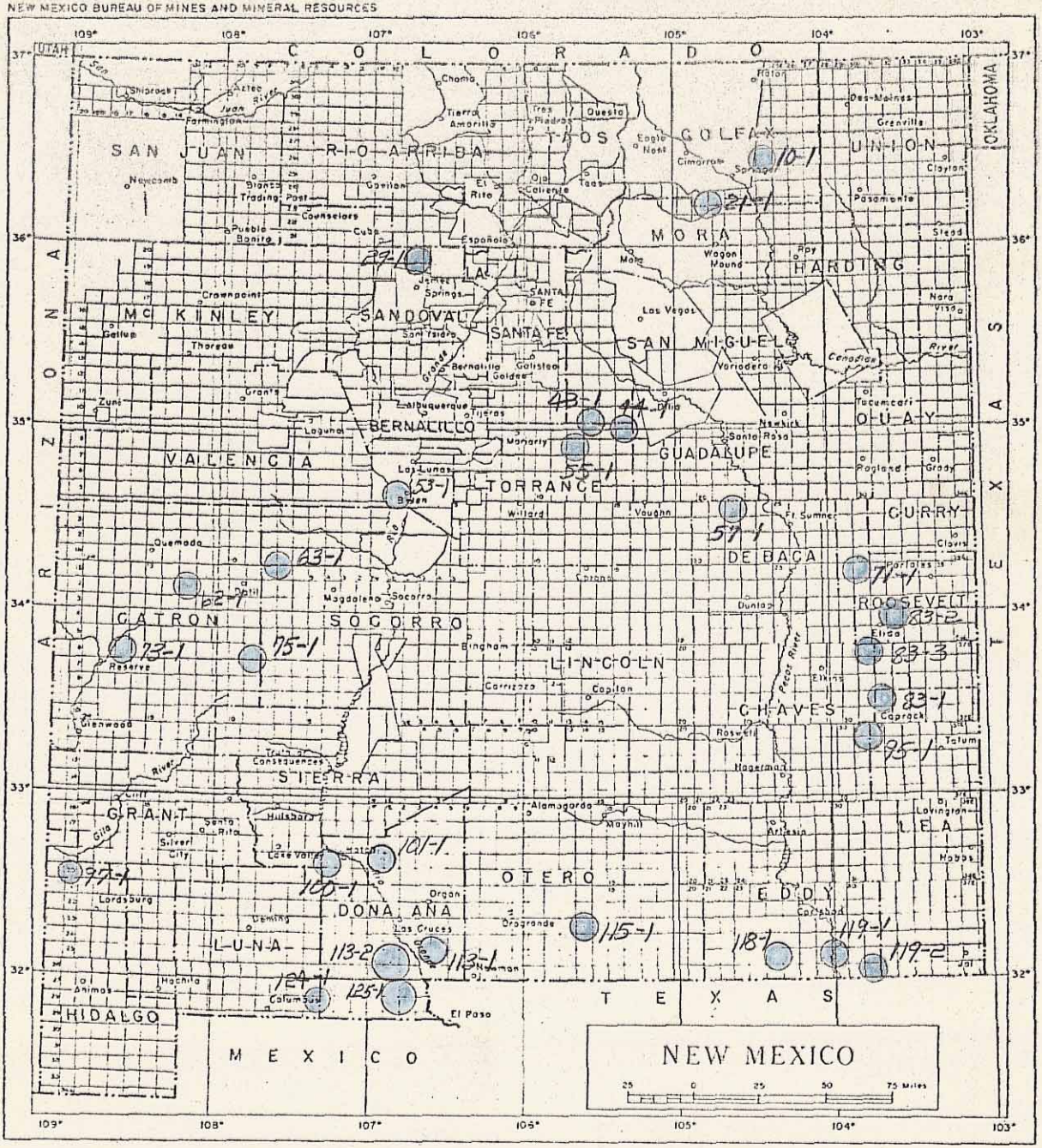
4. Known and Potential Mineral Deposits: Evaluation from this aspect was limited to developed oil and gas producing areas and known and potential sites for the development of coal, potash and uranium resources. This eliminates a considerable portion of southeastern and northwestern New Mexico.

5. Land Status: Land ownership and use was only partly considered in site selection. Indian lands were avoided eliminating large areas in the San Juan Basin. State ownership was considered in some cases. Where the Pierre Shale is exposed in Colfax and Mora Counties, state ownership was used to narrow possibilities to a specific locality. A large contiguous block of state land is present where Torrance, San Miguel and Santa Fe Counties join. Ownership of the localities selected includes private land and lands administered by the State Land Office, Bureau of Land Management, Forest Service, and Department of Defense. State lands are fairly complex. As an example, the state may only administer mineral rights with the surface privately owned. This would have to be determined for each site.

6. Accessibility: Some consideration was given to assessibility although sites were not necessarily eliminated merely because of poor access or distances from potential sources

of hazardous waste. This is an important cost factor. A somewhat different approach for site selection might be to first determine source, type and quantity of hazardous wastes and then look for the nearest and most accessible geologically suitable site.

Summary: Sites were selected based on apparent suitable geologic and hydrologic conditions. Detailed investigation might prove that many or even all of the sites selected in this preliminary process are unsuitable. No consideration was given to possible environmental, ecologic, or demographic factors with the exception of potential contamination of fresh-water aquifers. Many wastes might be better disposed of in the subsurface environment. Types and quantities of these wastes are needed to determine if this approach is practical.



Preliminary Site Selection for Hazardous Waste Disposal in New Mexico

PRELIMINARY SITE

Site Designation: 10-1: Raton

County: Colfax

Location: T.26N., R.24E

Geology: Dark gray shale of Pierre Formation of Cretaceous age.

Water: See site 21-1

Precipitation: 16"/yr.

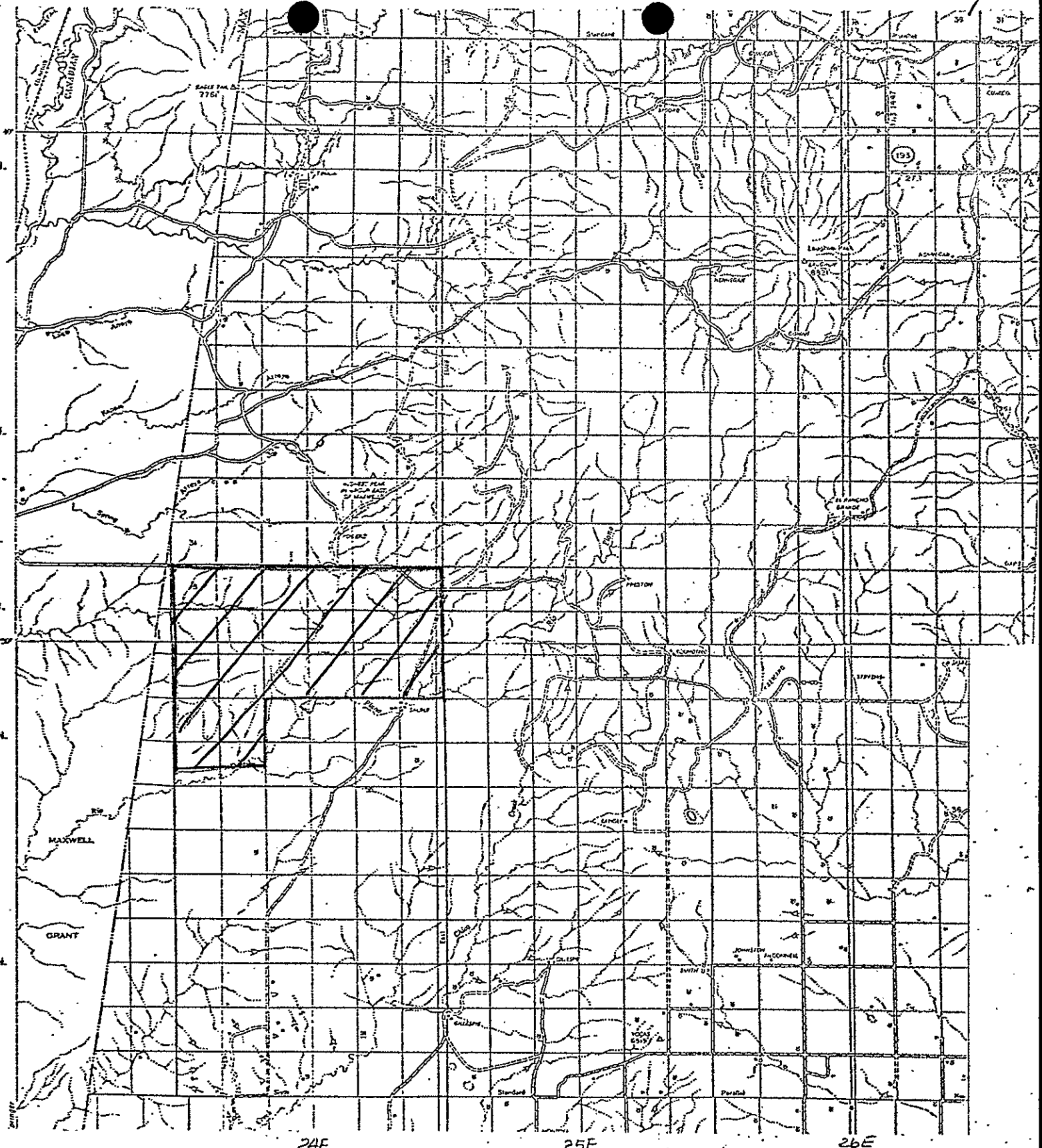
Evaporation: 50-55"/yr.

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: State land. Primary use grazing

Accessibility: 8 miles of gravel, graded, and drained, and graded and drained road north from U.S. 56.

Remarks: This site on the Pierre shale was chosen because it it is mostly state land. For additional comments see Site 21-1.



Site 10-1: Raton

Fig 2

PRELIMINARY SITE

Site Designation: 21-1: Springer

County: Colfax - Mora

Location: T.23N., R.20-21E.; T.22N., R.21E.

Geology: Thick dark gray shale, probably bentonitic, of the Pierre Shale of Cretaceous age.

Water: The Pierre Shale is saturated with water almost to the surface. However permeability is so low no water is yielded to wells. Locally where weathered to below the water table small yields of poor quality water are obtained.

Precipitation: 16"/yr.

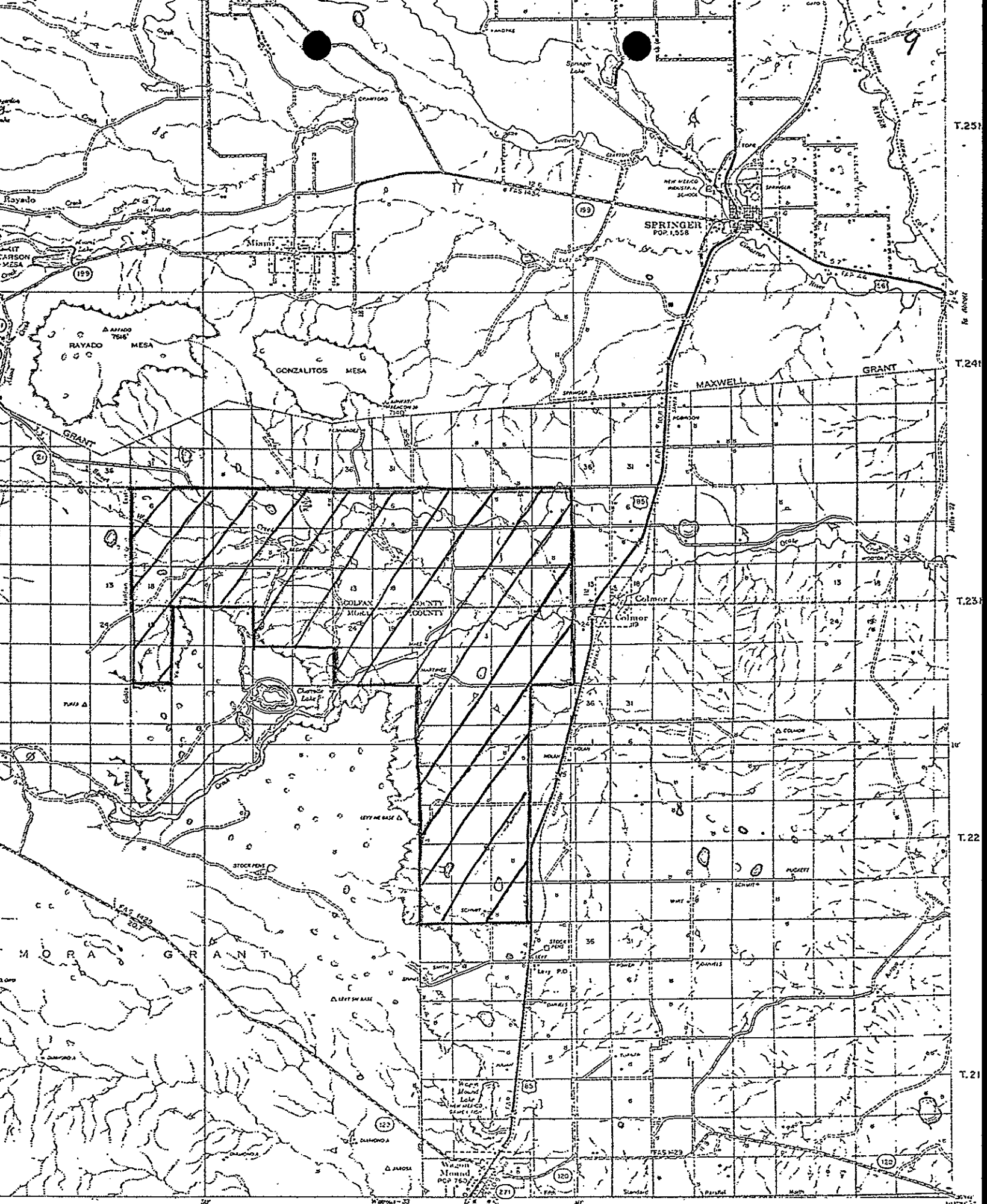
Evaporation: 55"/yr.

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: Private and state land. Primarily grazing

Accessibility: 1-12 miles of graded and drained and unimproved and primitive road west of I-25.

Remarks: This is the same stratigraphic interval proposed by Chem-Nuclear for the disposal of low-level radioactive waste. The work done on the Pierre Shale could be used for selecting a hazardous waste site in Colfax and Mora Counties.



Site 21-1: Springer

Scale 1/190080 or 1 Inch = 3 Miles

DATE OF INVENTORY
COLFAX COUNTY 1958
MORA COUNTY 1960

SPRINGER QUADRANGLE 21

Fig 3

PRELIMINARY SITE

Site Designation: 29-1: Jemez

County: Sandoval

Location: T.18-20N., R.2E.

Geology: Bandelier Tuff of Quaternary age. Mostly nonwelded to welded ash-flow deposits.

Water: Indicated depth to water greater than 500 ft. and yields less than 25 gpm.

Precipitation: 20-25"/yr.

Evaporation: 40-45"/yr.

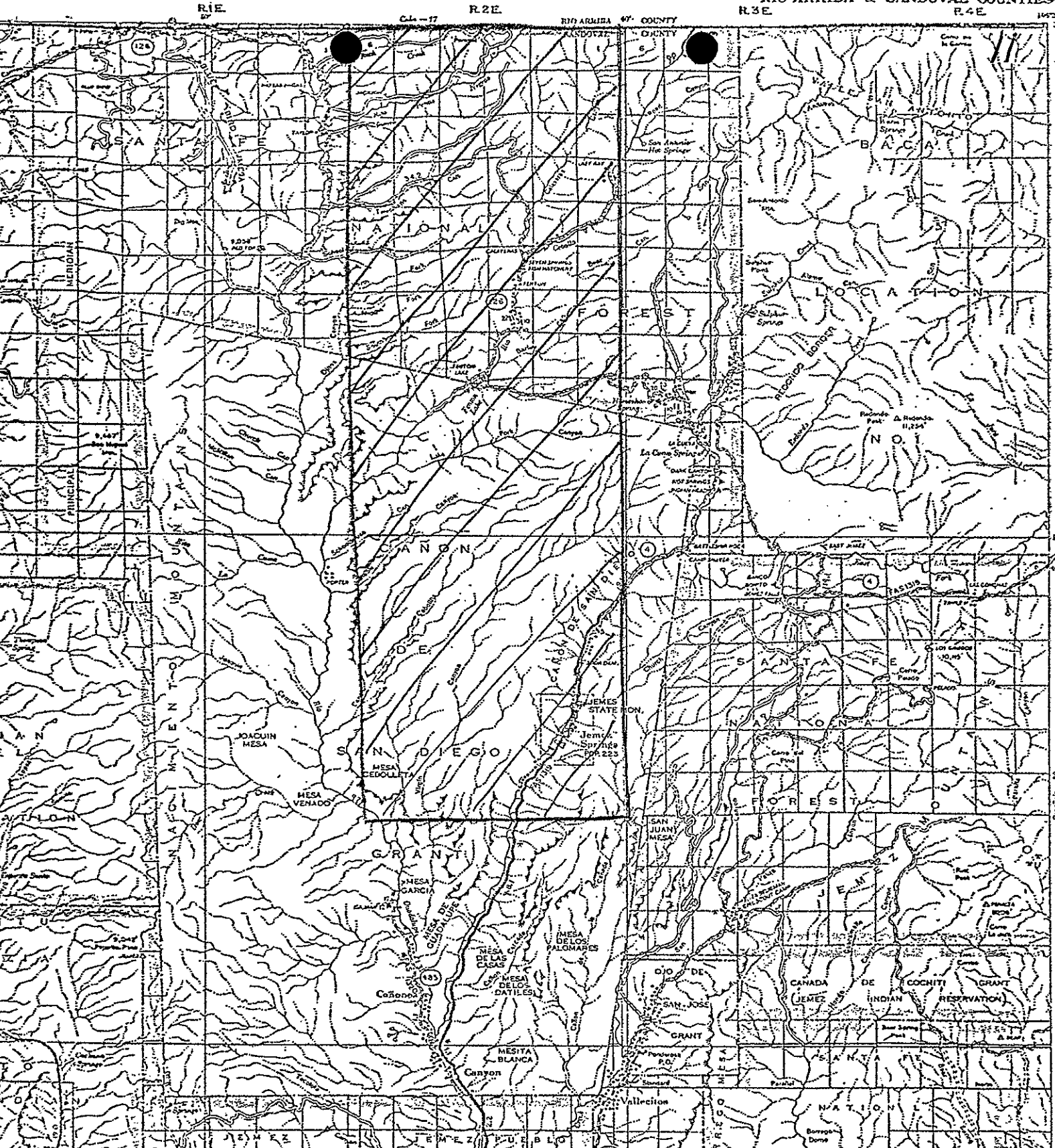
Erosion: Low rate of erosion. Upper surface stable.

Land Status: Forest Service. Primary use timbering - recreation.

Accessibility: NM4 and 126 traverse area.

Soils:

Remarks: Should be an excellent site for long-term integrity. Apparently no radio nuclides have migrated from site at Los Alamos in same stratigraphic interval.



Site 29-1: Jemez

PRELIMINARY SITE

Site Designation: 43-1: Lamy

County: Torrance - San Miguel

Location: T.9-10N., R.13E.

Geology: Yeso Formation of Permian age. Clayey siltstone with minor limestone and gypsum.

Water: Depth on the order of 200->500 ft. although some shallow wells in the Yeso. Water quality generally poor (high sulfates) and yields low.

Precipitation: 14-16"/yr.

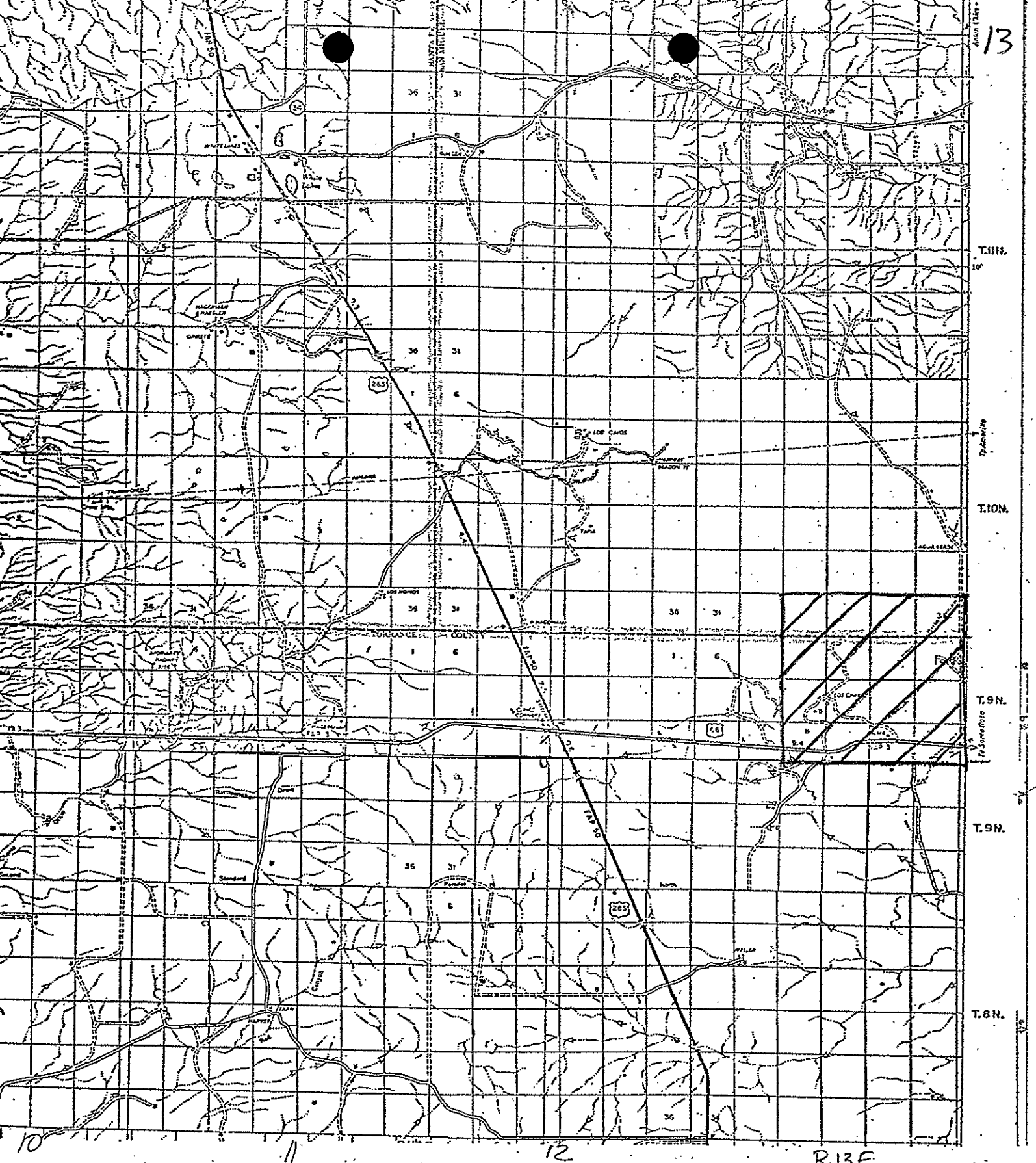
Evaporation: 55"/yr.

Erosion: Area of moderate rates of erosion

Land Status: State. Primary use grazing

Accessibility: Interstate 40 crosses area.

Remarks: Studies would have to be made of infiltration rates and probably coring to determine stratigraphic sequence.



Site 43-1: Lamy

Fig 5

PRELIMINARY SITE

Site Designation: 44-1: Anton Chico

County: Torrance

Location: T.9N., R.15E.

Land Form: Flat to gently rolling.

Geology: Quaternary alluvial deposits

Water: Depth to water 50-150'; shallow aquifer is Triassic Dockum Group. Water quality suitable for domestic use.

Minerals:

Precipitation: 11-13"/yr.

Evaporation: 55-60"/year.

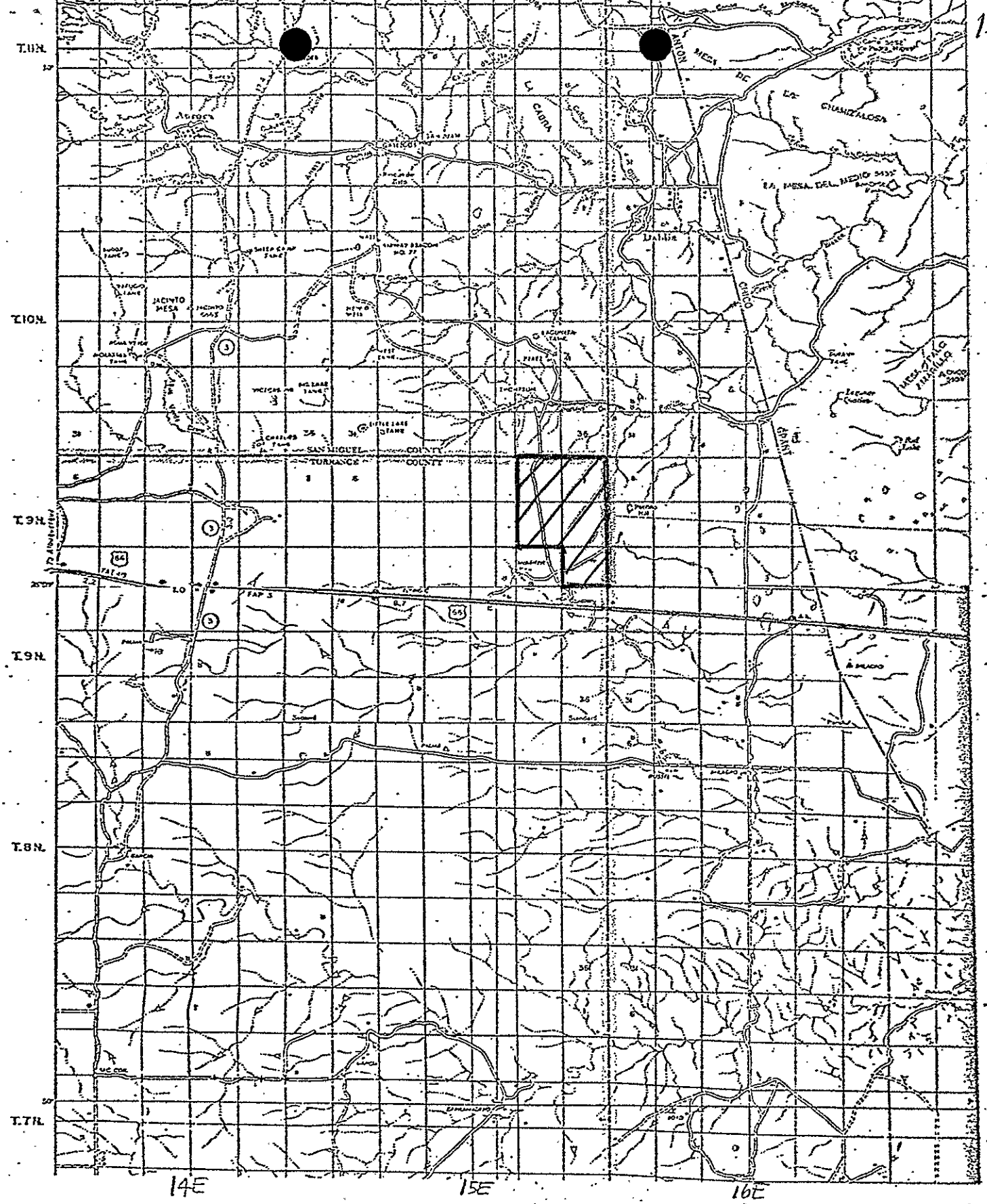
Soils: Clovis Loam, Hagerman fine sandy Loam, Harvey-Dean Loams, Tapia Loam, Tapia-Dean Loam. Caliche or lime zones near surface in all

Erosion: Low

Land Status: State

Accessibility: I-40

Remarks: Shallow fresh water would seem to eliminate this site.



Site 44-1; Anton Chico

PRELIMINARY SITE

Site Designation: 53-1: Belen

County: Valencia

Location: Belen Claim about 2 miles west of Belen; T.5N., R.1E. projected, (see Ground-Water Report 7 NMBM&MR)

Land Form: Table land, level to gently undulating, with shallow undrained depressions.

Geology: Sierra Ladrones (Upper Buff) Formation-Upper Santa Fe Group, ancient river deposits (interbedded sand, loam and clay with nonindurated caliche cap, 2-5 ft. thk). Unit more than 200 ft. thick.

Water: Water table more than 300 feet below land surface; zone of saturation in Santa Fe Group basin fill. No integrated surface drainage system, except overland and shallow channelized flow into elongated closed depressions.

Minerals: unknown

Precipitation: 8" (Los Lunas)

Evaporation: 75" Class A Pan (Los Lunas)

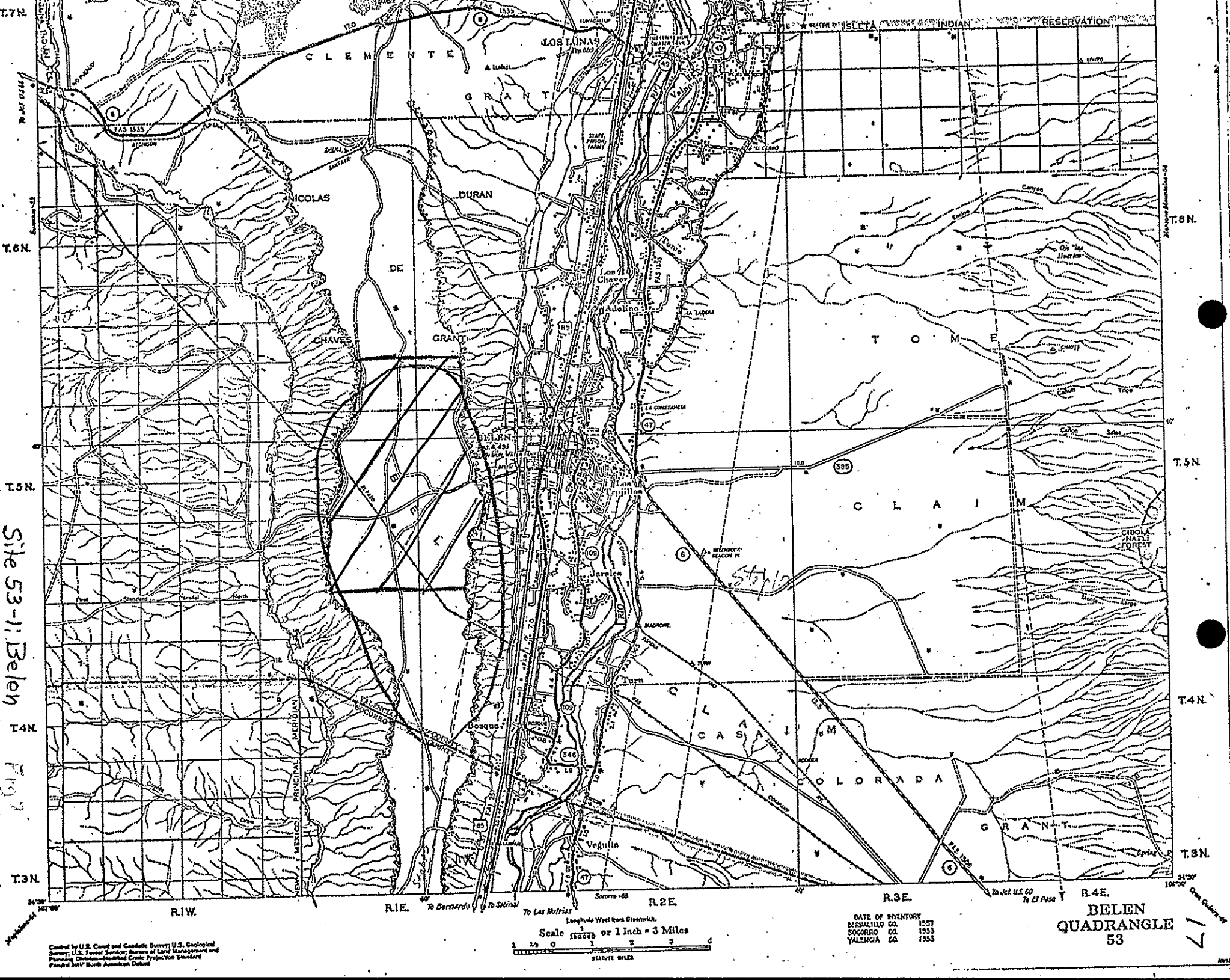
Soils: Aridisols, with strong horizons of clay and/or carbonate accumulation.

Erosion: Water erosion-sedimentation hazard - none to slight

Land Status: Private; Range use.

Accessibility: Good access to I25-NM80, via graded Belen Dump Road (about 2 miles west of Belen)

Remarks: This is a centrally located site close to major metropolitan areas and near geographical center of state.


ISLETA INDIAN RESERVATION
LOS LUNAS
CLEMENTE GRANT
NICOLAS DURAN DE CHAVES GRANT
T O M E
C L A I M
CASA COLORADA GRANT
BELEN
Los Chaves
Adelino
Jarales
Tomé
Bosque
Veguita
Site 53-1: Belen
T.7 N.
T.6 N.
T.5 N.
T.4 N.
T.3 N.
T.8 N.
T.5 N.
T.4 N.
T.3 N.
R.1W.
R.1E.
R.2E.
R.3E.
R.4E.
To Bernardo
To Sitio
To Las Nutrias
To Jct. U.S. 60
To El Paso
Longitude West from Greenwich
Scale 1/190080 or 1 Inch = 3 Miles
STATUTE MILES
DATE OF INVENTORY
BERNALILLO CO. 1957
SOCORRO CO. 1953
VALENCIA CO. 1955
BELEN QUADRANGLE
53

PRELIMINARY SITE

Site Designation: 55-1: Laguna del Perro

County: Torrance

Location: T.8N., R.12E.

Geology: Yeso Formation of Permian age. Sandstone, limestone, shale, and gypsum. May consist mostly of sandstone in this area due to proximity to Pedernal Mountains.

Water: Depth 400-600 ft. yields generally less than 15 gpm. Water is generally unsatisfactory for drinking or domestic use but can be used for stock. Two wells in township indicate suitability for domestic use.

Precipitation: 14"/yr.

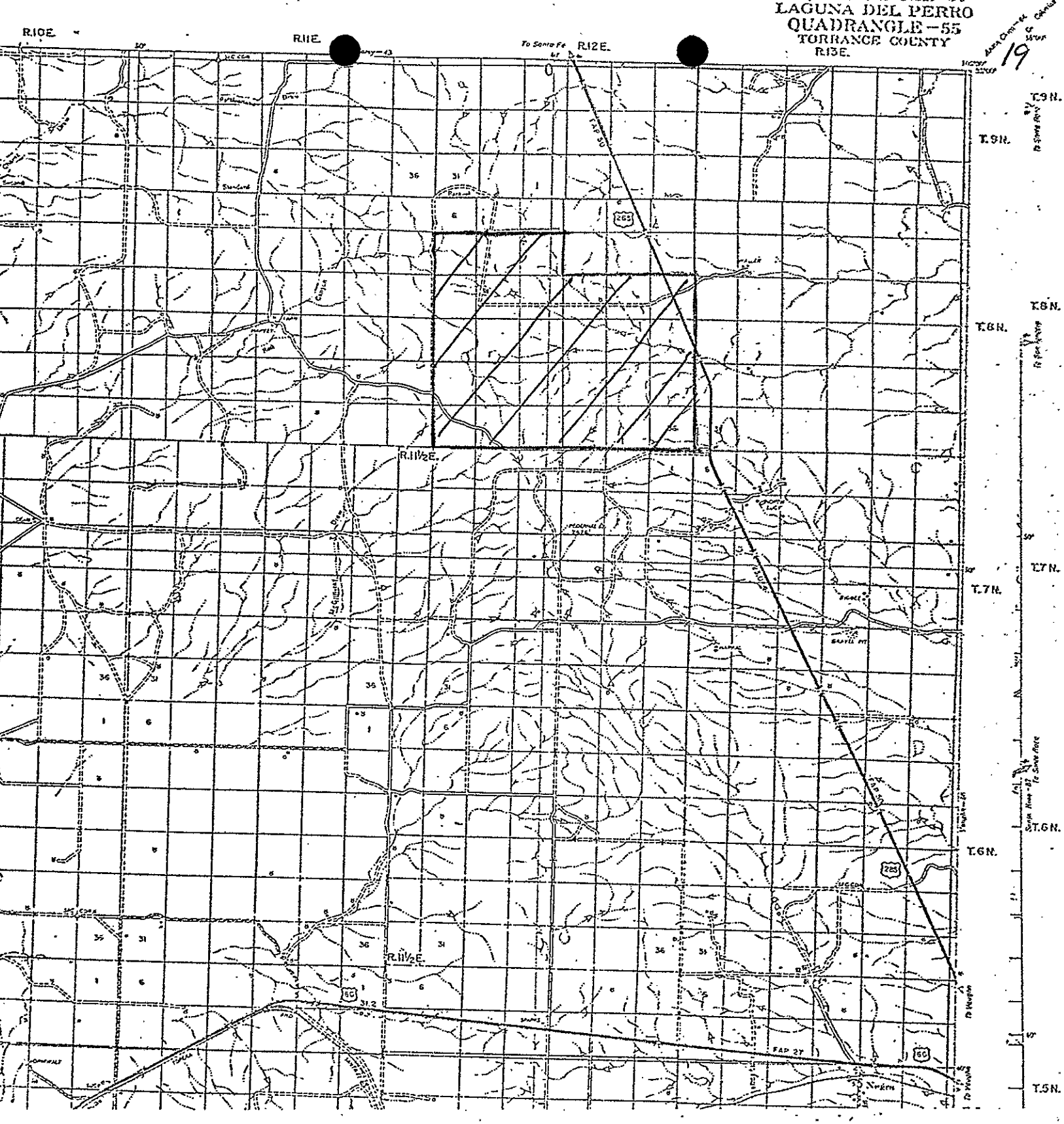
Evaporation: 50-55"/yr.

Erosion: 0.2-1.0 acre ft./sq. mi./yr.

Land Status: State

Accessibility: US 285 crosses northeast corner.

Remarks: This locality is part of what appears to be the largest contiguous block of state land. Stratigraphy of the Yeso is poorly known in this area.



Site 55-1: Laguna del Perro

Fig 8

PRELIMINARY SITE

Site Designation: 57-1: Santa Rosa

County: De Baca

Location: T.4N., R.22E.

Land Form: Mostly gently rolling with interior drainage

Geology: Gravel, silt, sand, clay, and caliche. Pliocene-Pleistocene

Water: 15-300'. Quality generally poor

Minerals:

Precipitation: 10'11"

Evaporation:

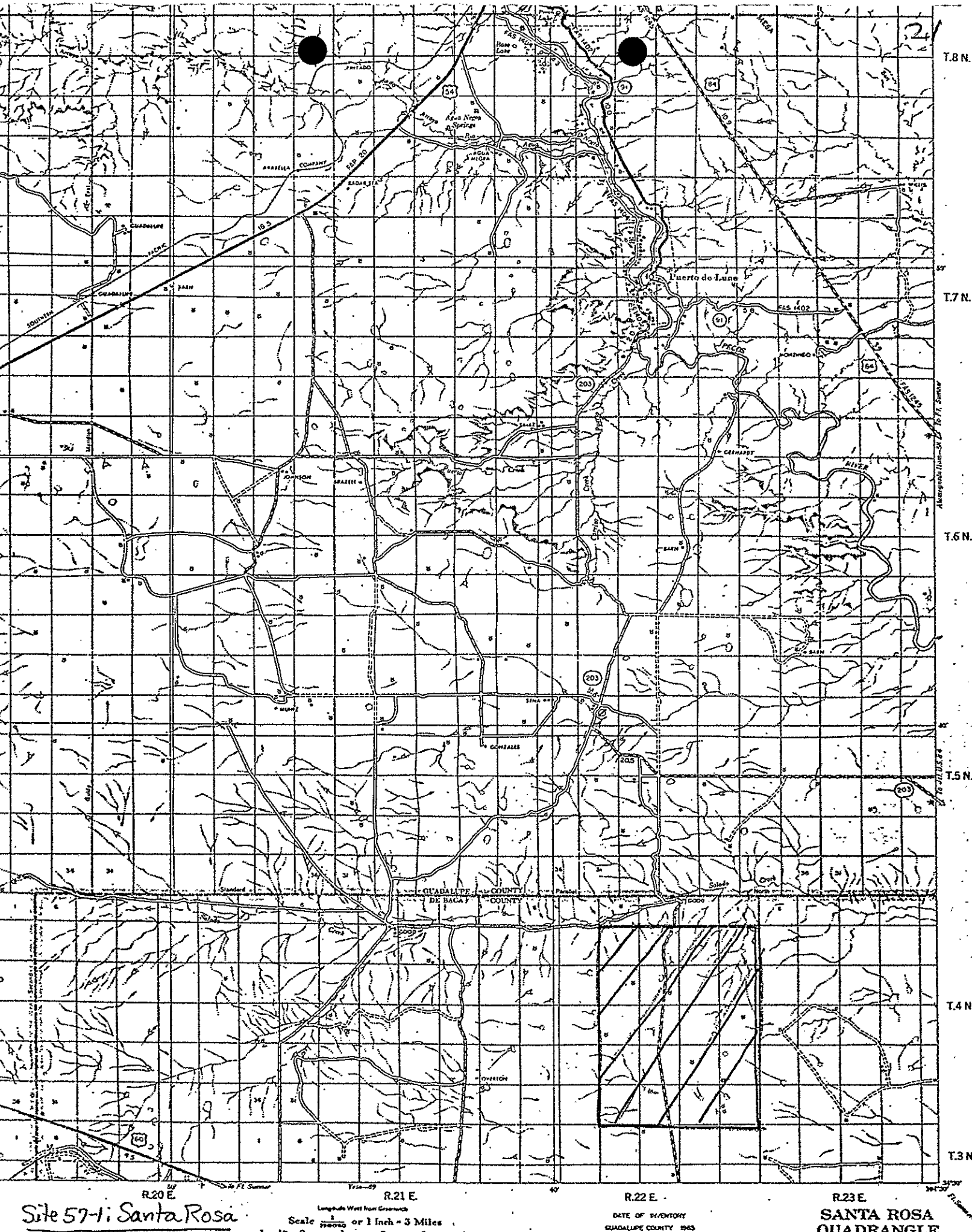
Soils:

Erosion: Very little dissection

Land Status: State - grazing

Accessibility: 4 miles gravel road north from US 60

Remarks:



Site 57-1: Santa Rosa

PRELIMINARY SITE

Site Designation: 62-1: Quemado

County: Catron

Location: T.2S., R.13W.

Geology: Massive pumiceous and crystal tuff and tuff breccia of the Tertiary Datil Formation

Water: Water depth 200-500 ft. fresh water yields from less than 25 gpm to 100 gpm.

Precipitation: 16"/yr.

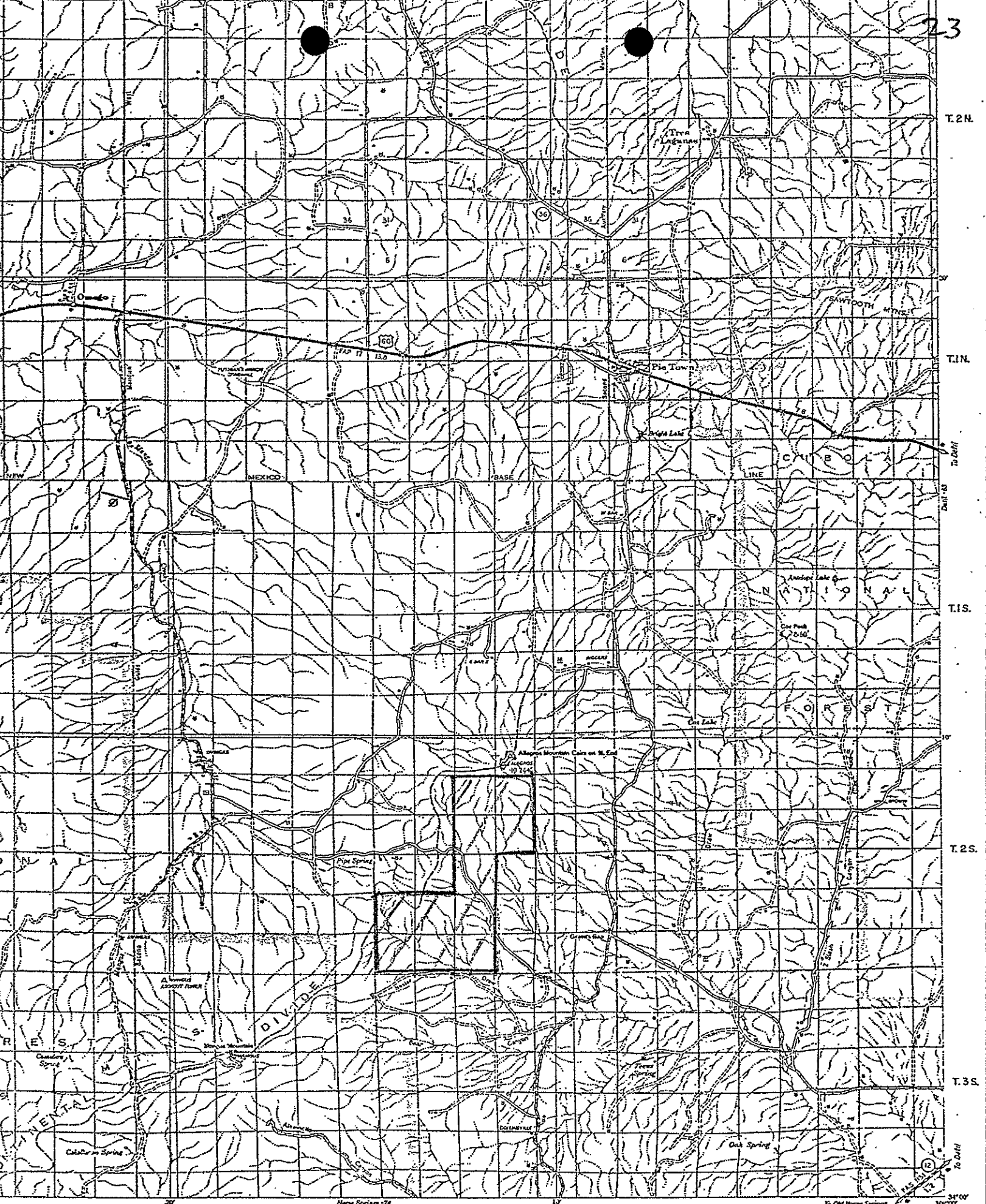
Evaporation: 45"/yr.

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: Private and state land with grazing primary use.

Accessibility: 20 miles of graded-drained and unimproved road south from US 60 at Pietown.

Remarks: Should have very low permeability and minor fracturing.



Site 62-1: Quemado

Fig 10

QUEMADO QUADRANGLE
62

PRELIMINARY SITE

Site Designation: 63-1: Datil

County: Socorro

Location: T.1N., R.7-8W.; T.1S., R.7W.

Geology: Massive pumiceous and crystal tuffs and welded tuffs

Water: Depth from 200 to >500 ft. Fresh water yields of less than 25 gpm. No reported saline water.

Precipitation: 12-16"/yr.

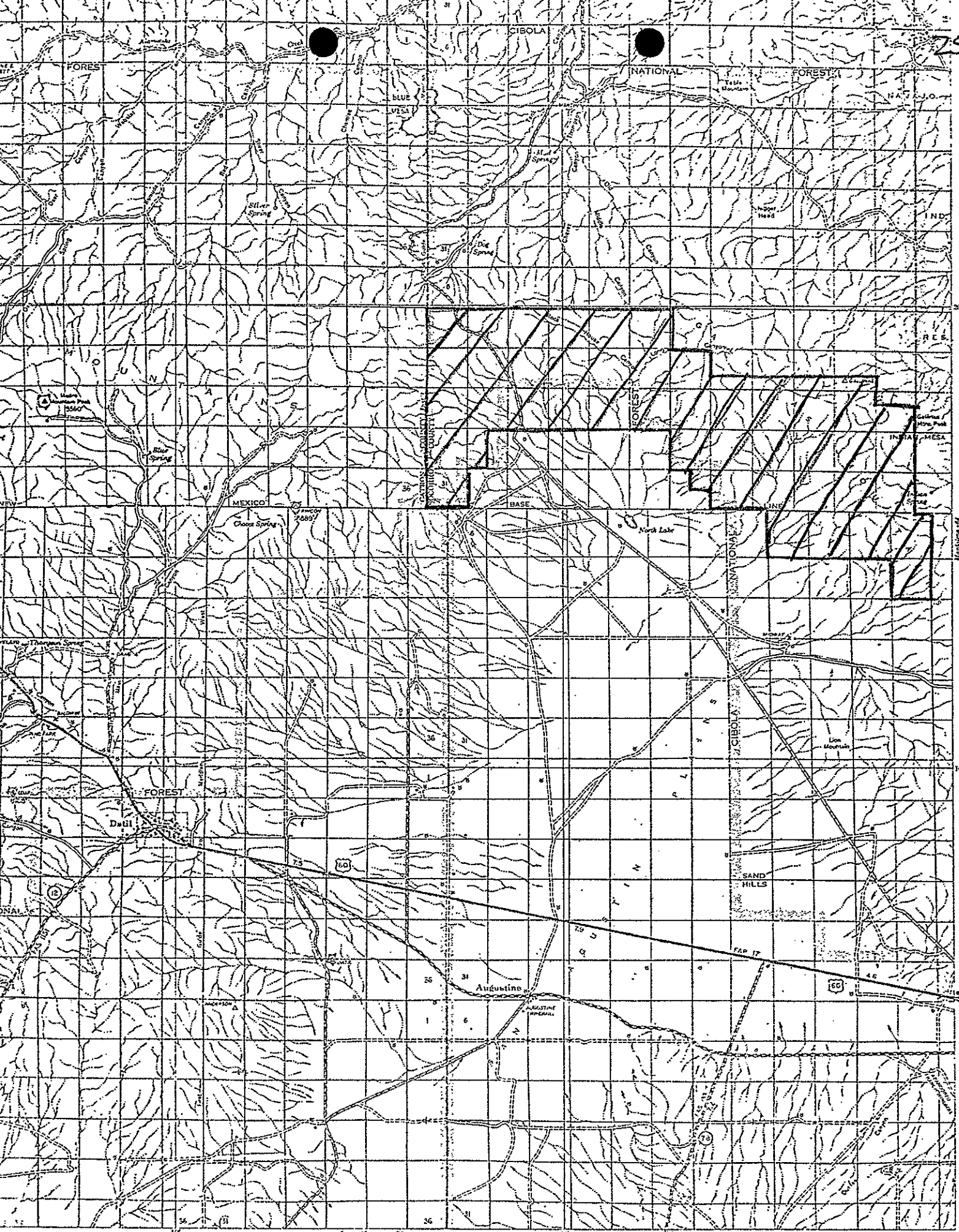
Evaporation: 45-50"/yr.

Erosion: <0.2-0.5 acre ft./sq. mi./yr.

Land Status: Mostly private with minor state. Primary use grazing, possibly some timbering.

Accessibility: 20 miles of graded and drained and gravel, graded and drained road north of US 60

Remarks: Should have low permeability and minor jointing.



Site 63-1: Datil

PRELIMINARY SITE

Site Designation: 71-1: Melrose

County: Roosevelt

Location: T.1S., R. 29-30E.

Land Form: Mesa

Geology: Ogallala Caprock over Triassic sandstone, siltstone and shale

Water: Slightly saline to brine; <200' depth

Minerals: caliche

Precipitation: 14-16"/yr.

Evaporation: 70-75"/yr.

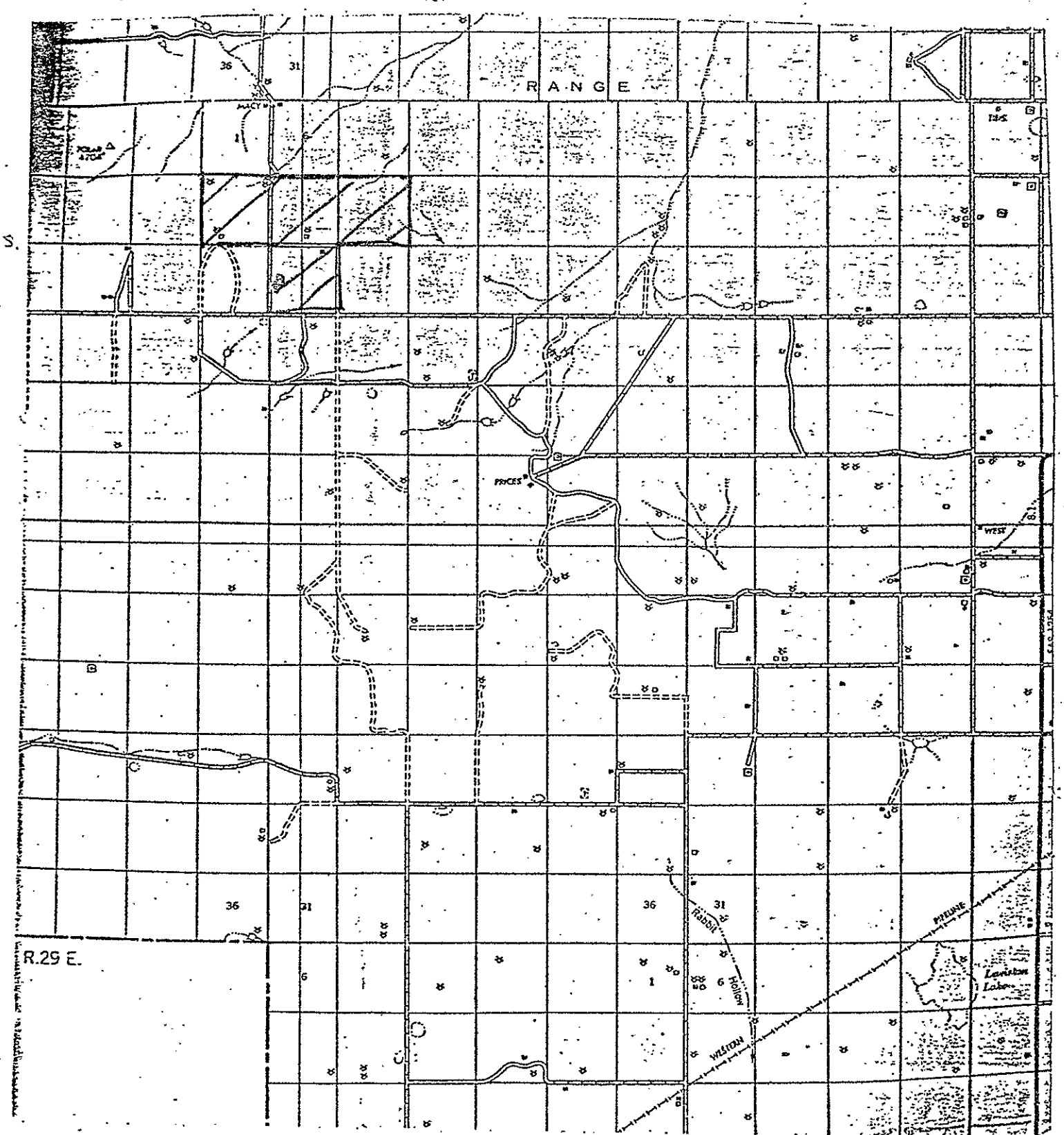
Soils: Gypsiferous & sandy

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: Private (some leased to military) Used for range land & some dry farming.

Accessibility: Good - several improved roads

Remarks:



Site 71-1; Melrose

Fig 12

PRELIMINARY SITE

Site Designation: 73-1: Reserve

County: Catron

Location: T.6S., R.17W.

Geology: Massive pumiceous and crystal tuff and ash with local thin sandstone and conglomeratic sandstone interbeds. Some rhyolite flows and tuff breccias.

Water: Depth from less than 200 ft. to 500 ft. Fresh water yields less than 25 gpm. No saline waters known.

Precipitation: 12-16"/yr.

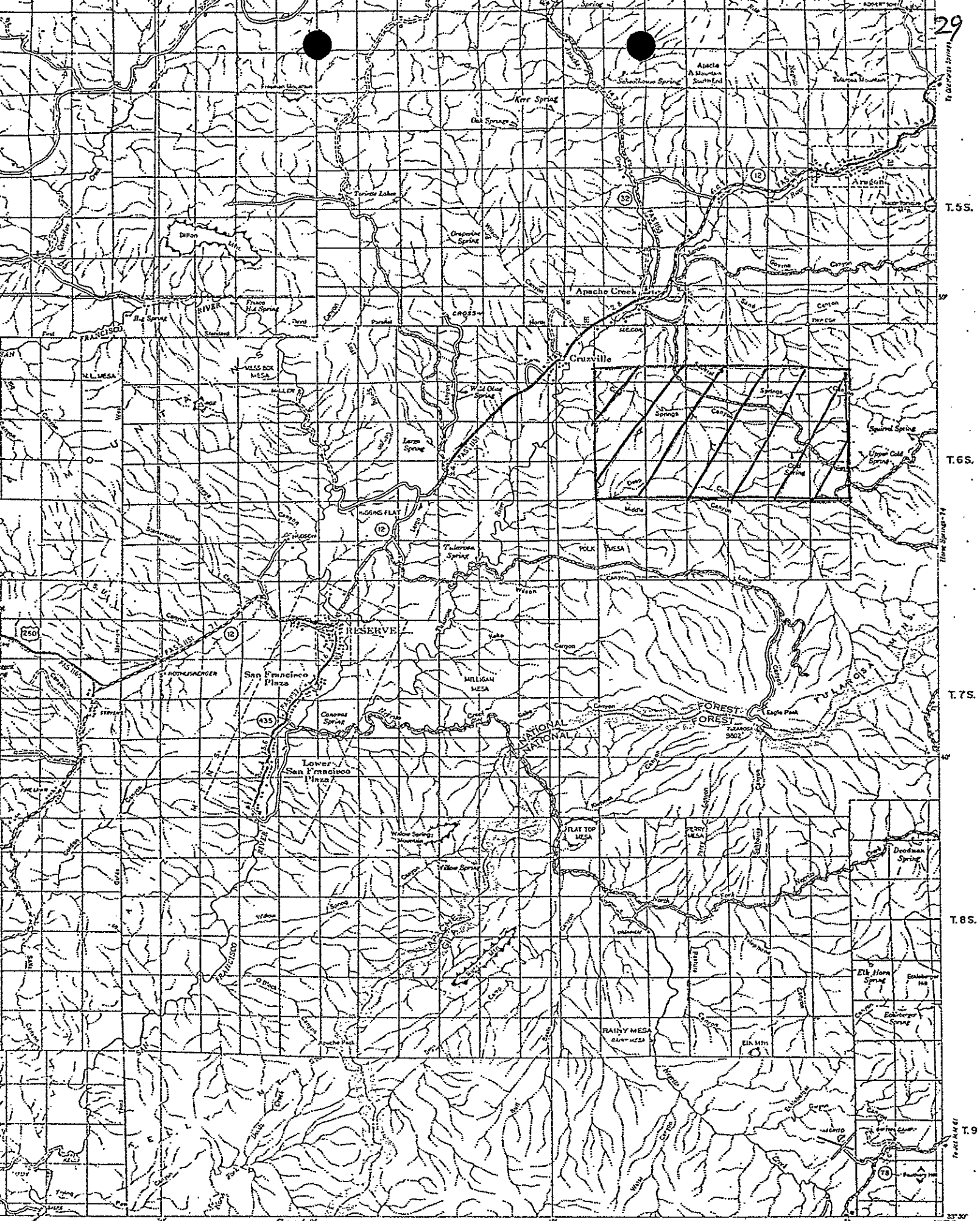
Evaporation: 35-40"/yr.

Erosion: 0.2-0.5 acre ft./sq. mil./yr. Low

Land Status: Forest Service. Primary uses grazing and timber.

Accessibility: 2-3 mi. of gravel, graded, and drained road east of NM 12 from Apache Creek

Remarks: Thickness of massive pumiceous tuff needs to be investigated. Flows and interbedded sandstones may restrict usefullness of site.



Site 73-1: Reserve

RESERVE QUADRANGLE

72

PRELIMINARY SITE

Site Designation: 75-1: Luera Mountains

County: Catron

Location: T.6-7S, R.9W.

Geology: Massive pumiceous and crystal tuff and tuff breccia of the Tertiary Datil Formation.

Water: Ground-water table is at depths of from <200 ft. to >500 ft. Yields of fresh water are less than 25 gpm. in the general area and probably occur in beds below the tuff interval.

Precipitation: 16"/yr.

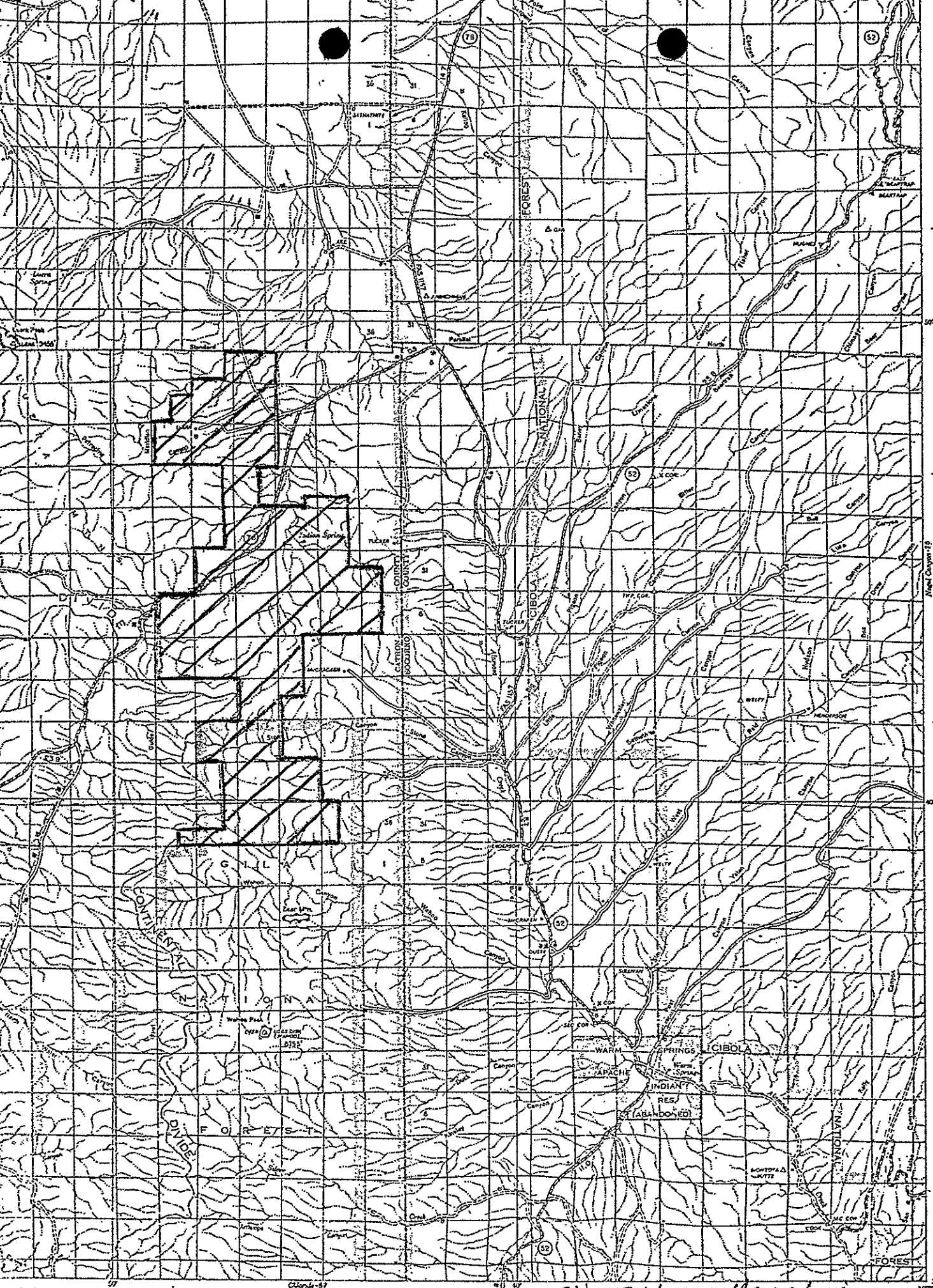
Evaporation: 45"/yr.

Erosion: <0.2-0.5 acre ft./sq. mi./yr.

Land Status: State and BLM land in T.6S.; forest, private, and BLM in T.7S. Primary use is grazing.

Accessibility: 30-40 miles south of US 60 via NM 78 (gravel, graded, and drained).

Remarks: Should have very low permeability and minor fracturing.



31

Fig 4

Site 75-1 Luera Mountains

PRELIMINARY SITE

Site Designation: 83-1: Elida

County: Lea

Location: T.9S., R.32E.

Land Form: Mesa

Geology: Ogallala Caprock over Triassic Dockum. Siltstone, shale and sandstone

Water: Slightly saline to brine; <200 depth

Minerals: caliche

Precipitation: 14-16"/yr.

Evaporation: 70-75"/yr.

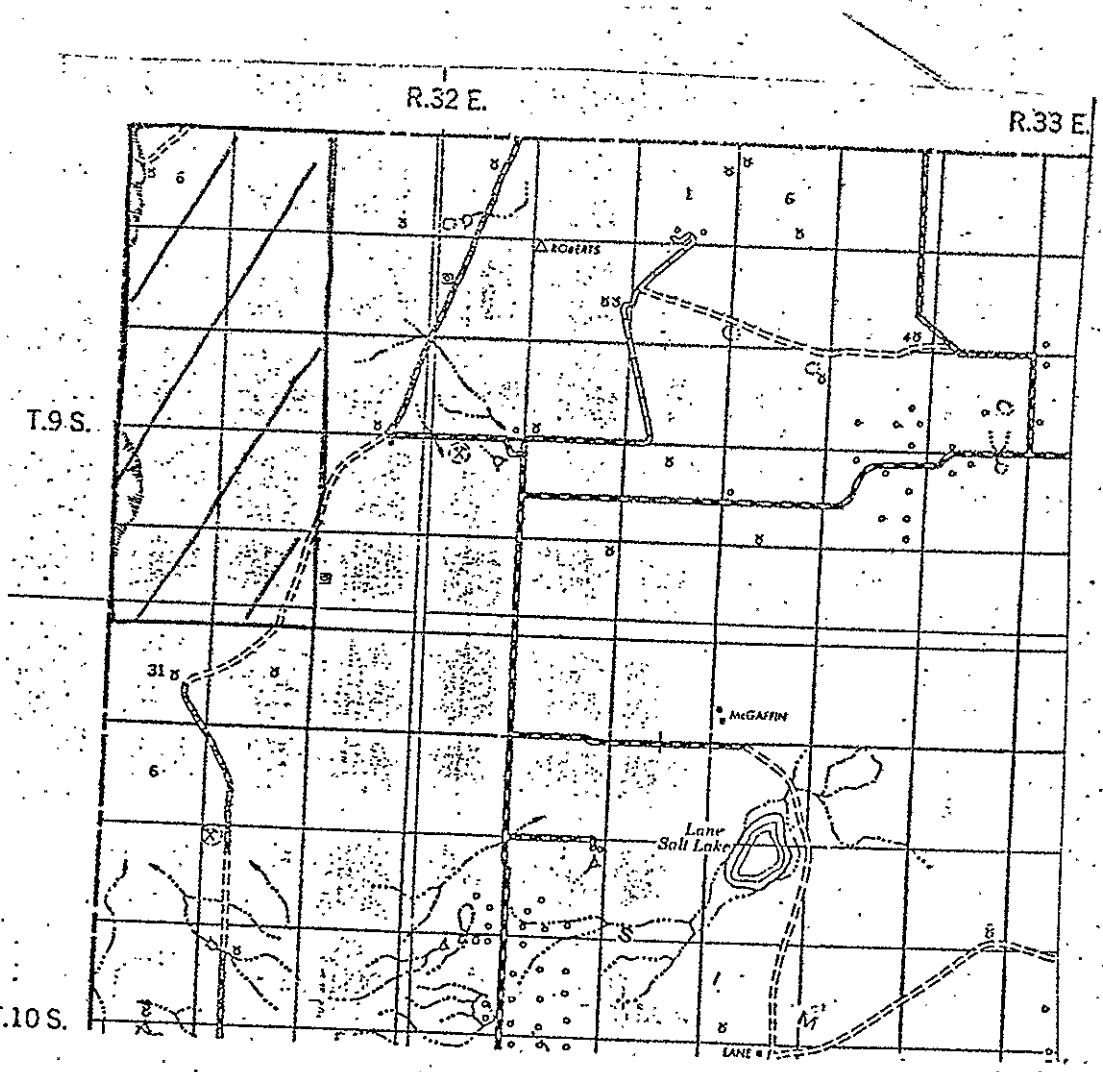
Soils: "Paleustaff - uptipsamments - Paleargids"

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: 7 sq. mi. state, 1½ sq. mi. BLM, 1½ sq. mi. private; used as rangeland

Accessibility: Fair to good; several unimproved roads 2 mi. from good road

Remarks:



Site 83-1 : Elida

Fig 5

PRELIMINARY SITE

Site Designation: 83-2: Elida

County: Roosevelt

Location: T.4S., R.32E

Land Form: Plain

Geology: Ogallala Caprock over Triassic Dockum. Sandstone, shale and siltstone

Water: Slightly saline to brine, <200' depth

Minerals: Caliche

Precipitation: 14-16"/yr.

Evaporation: 70-75"/yr.

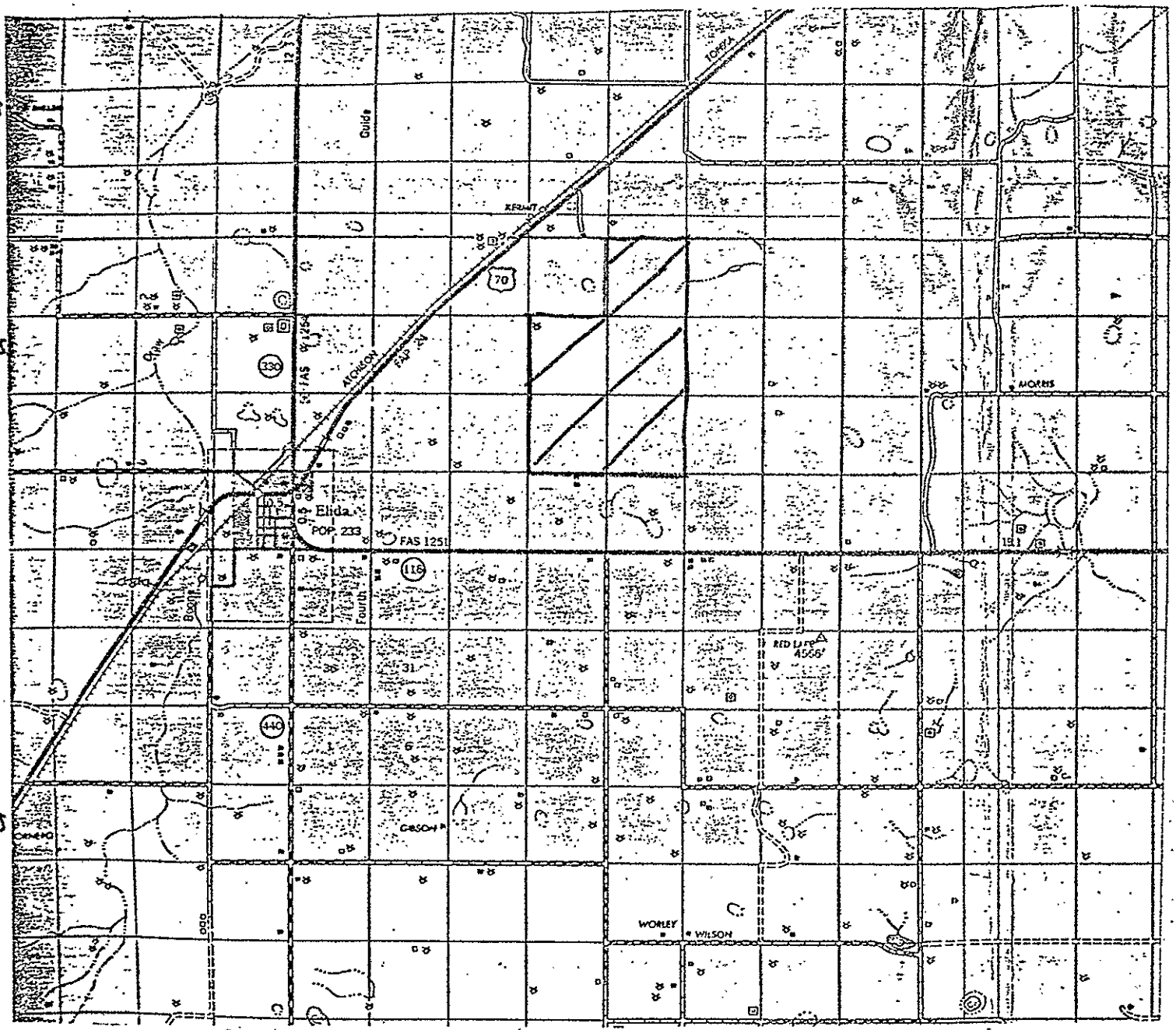
Soils: "Paleustolls"

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: Private; used as rangeland

Accessibility: Good - several unimproved roads and one rail line & hard surface highway within one mile.

Remarks:



Site 83-2; Elida

Fig 16

PRELIMINARY SITE

Site Designation: 83-3: Elida

County: Chavez

Location: T.6S., R.31E.

Land Form: Mesa

Geology: Ogallala Caprock over Triassic Dockum. Sandstone, siltstone and shale

Water: Slightly saline to brine, <200' depth

Minerals: Caliche

Precipitation: 12-14"/yr.

Evaporation: 70-75"/yr.

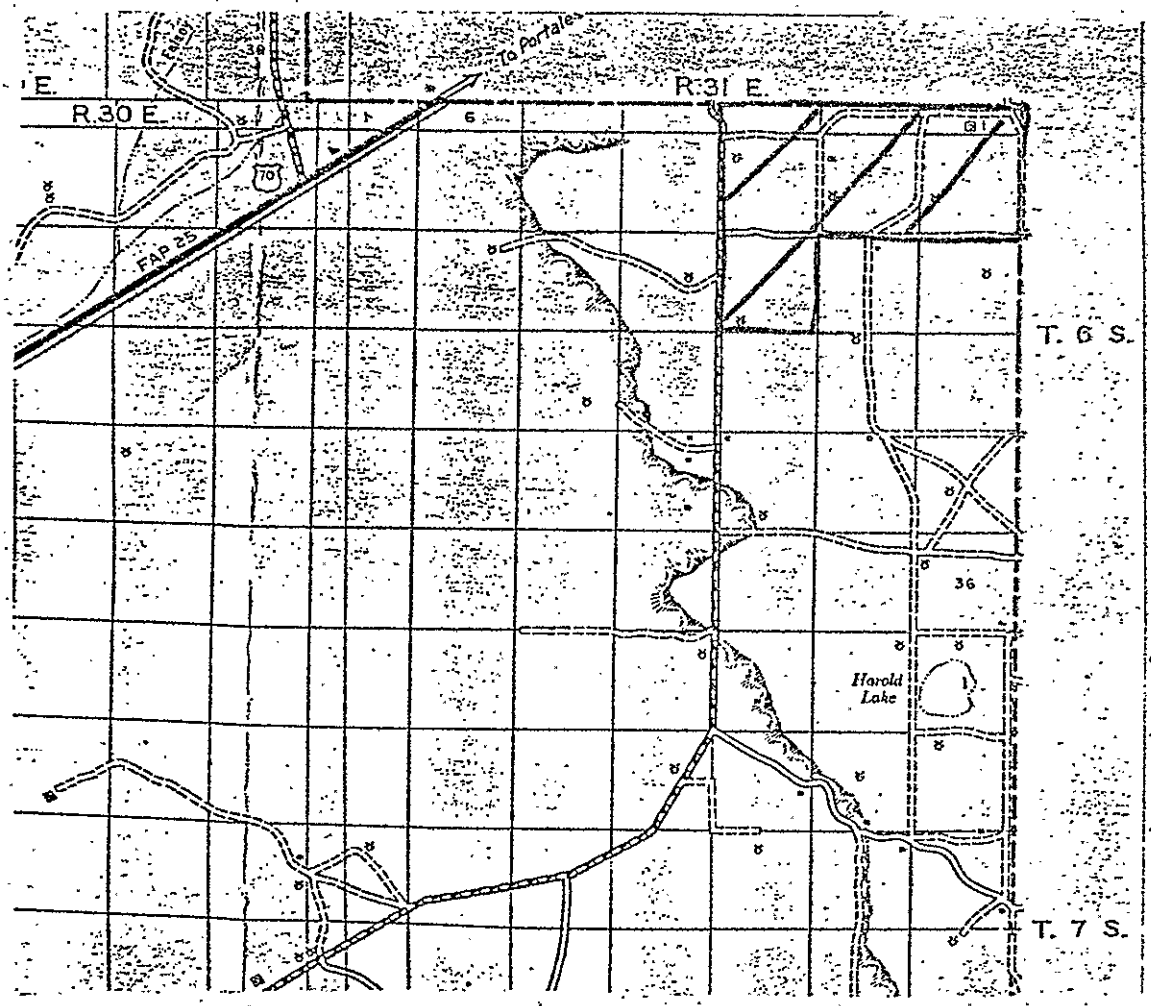
Soils: "Haplargids-ustipsamments"

Erosion: 0.2-0.5 acre ft./ sq. mi./yr.

Land Status: 1/3 state, 1/3 BLM, 1/3 private; rangeland

Accessibility: Good, 2 improved roads, some unimproved ones as well.

Remarks:



Site 83-3; Elida

Fig 17

PRELIMINARY SITE

Site Designation: 95-1: Caprock

County: Chavez

Location: T.11-12S., R.31E.

Land Form: Mesa-cuesta

Geology: Ogallala Caprock over Triassic sandstone, shale and siltstone

Water: Slightly saline to brine, <200' depth

Minerals: Caliche

Precipitation: 14"/yr.

Evaporation: 70"/yr.

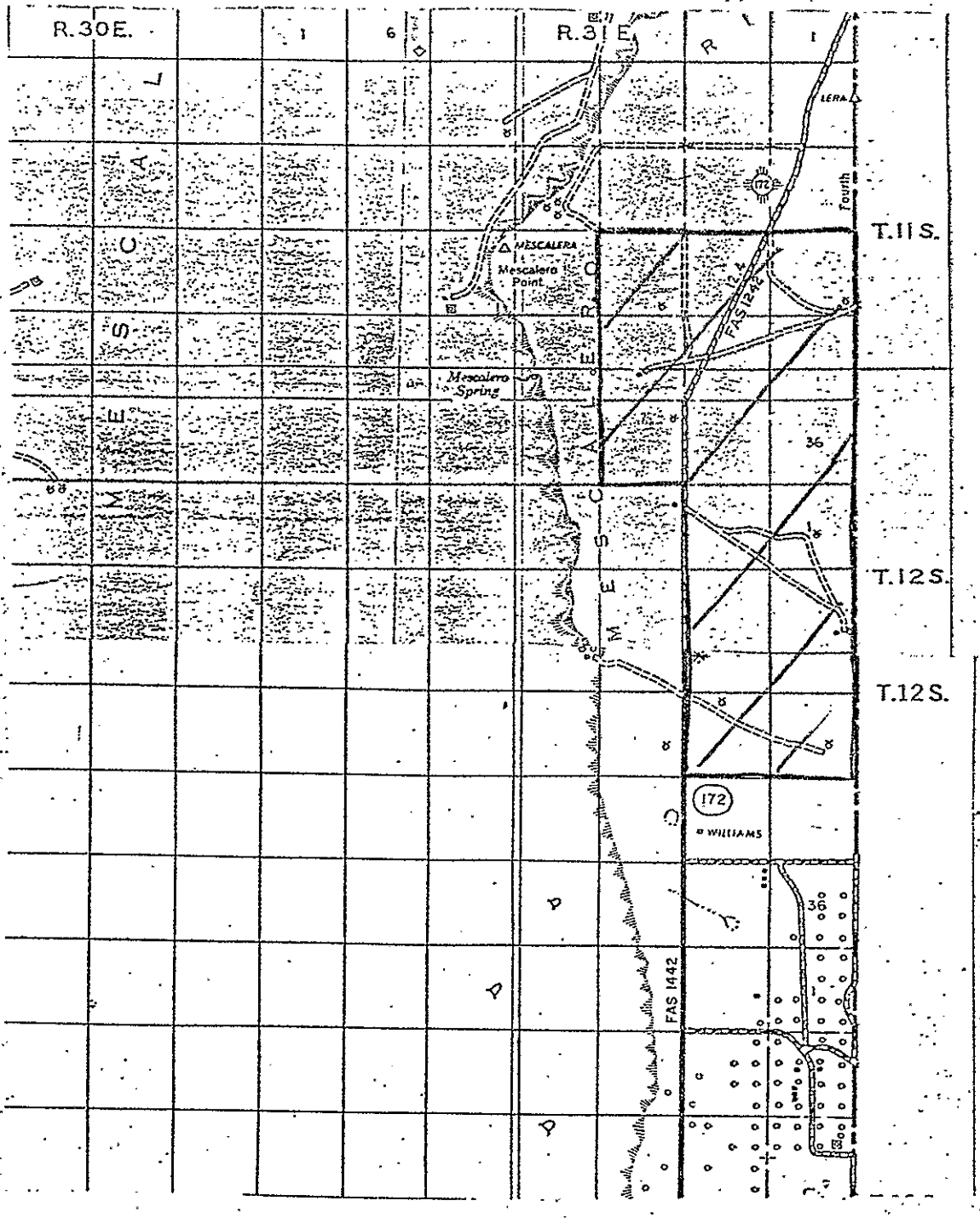
Soils: "Calciustolls"

Erosion: 0.2-0.5 acre ft./sq. mi./yr.

Land Status: 12 sq. mi. state, 1 sq. mi. BLM, 1 sq. mi. private; used as rangeland

Accessibility: Good - improved road through site

Remarks:



Site 95-1: Caprock

Fig 18

PRELIMINARY SITE

Site Designation: 97-1: Virden

County: Hidalgo

Location: T.20S., R.20W.

Land Form: Tableland; level to gently undulating

Geology: Upper Gila Group-ancient river and lake deposits composed of sand and gravel over interbedded silt-clay sand, with local carbonate cemented zones and caliche cap (2-5 ft. thick)

Water: Water table estimated to be more than 200 feet below land surface; zone of saturation in Upper Gila Group basin fill. Surface drainage network poorly developed, with closed depressions

Minerals: Unknown

Precipitation: 9.8" (Lordsburg)

Evaporation: 92" (Lordsburg) Class-A Pan

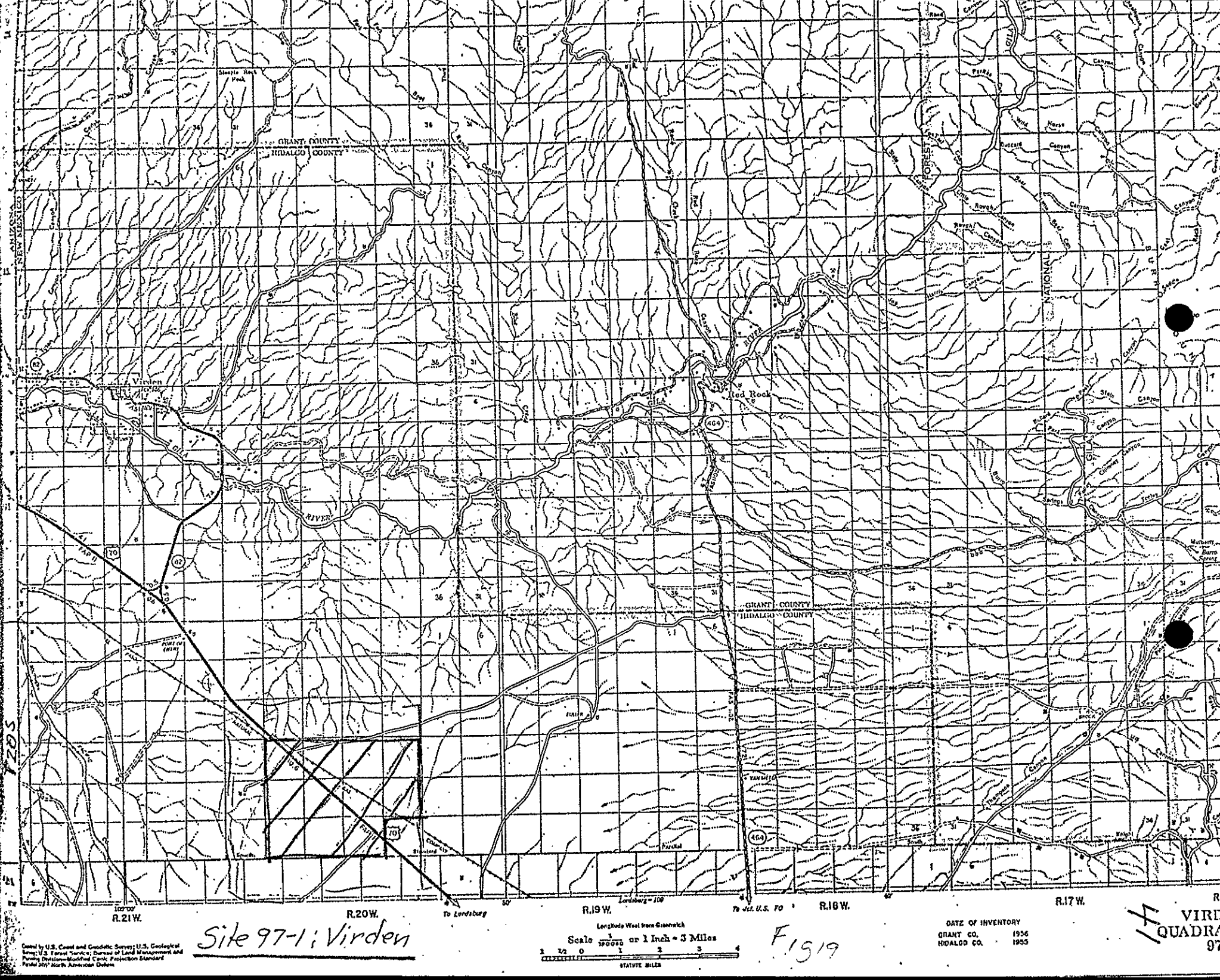
Soils: Aridisols, with strong horizons of clay and carbonate accumulation

Erosion: Water erosion-sedimentation hazard slight to none

Land Status: BLM; range use

Accessibility: Crossed by US Hwy. 70; between Lordsburg and Virden

Remarks:



Site 97-1; Virden

F1919

T20S

PRELIMINARY SITE

Site Designation: 100-1 Hatch (West Mesa)

County: Dona Ana

Location: T.19S., R.4W.

Land Form: Tableland, level to gently undulating, with shallow undrained depressions.

Geology: Camp Rice Formation (Upper Santa Fe Group) ancient river deposits of interbedded sand, clay, and loam, with local carbonate cemented zones and indurated caliche caprock (2-5ft thk). Formation about 250 ft thk.

Water: Water table is more than 200 ft below land surface; zone of saturation at base of Camp Rice Fm (?), and in underlying Lower Santa Fe Group playa facies (Rincon Valley Fm). No integrated surface drainage except flow into small playa depressions.

*Minerals: Unknown; except for bentonite clay production nearby from Upper Camp Rice Formation.

Precipitation: Approx. 9" (Hatch)

Evaporation: Approx. 97" Class A Pan (Las Cruces)

Soils: Aridisols with strong horizons of clay and/or carbonate accumulation.

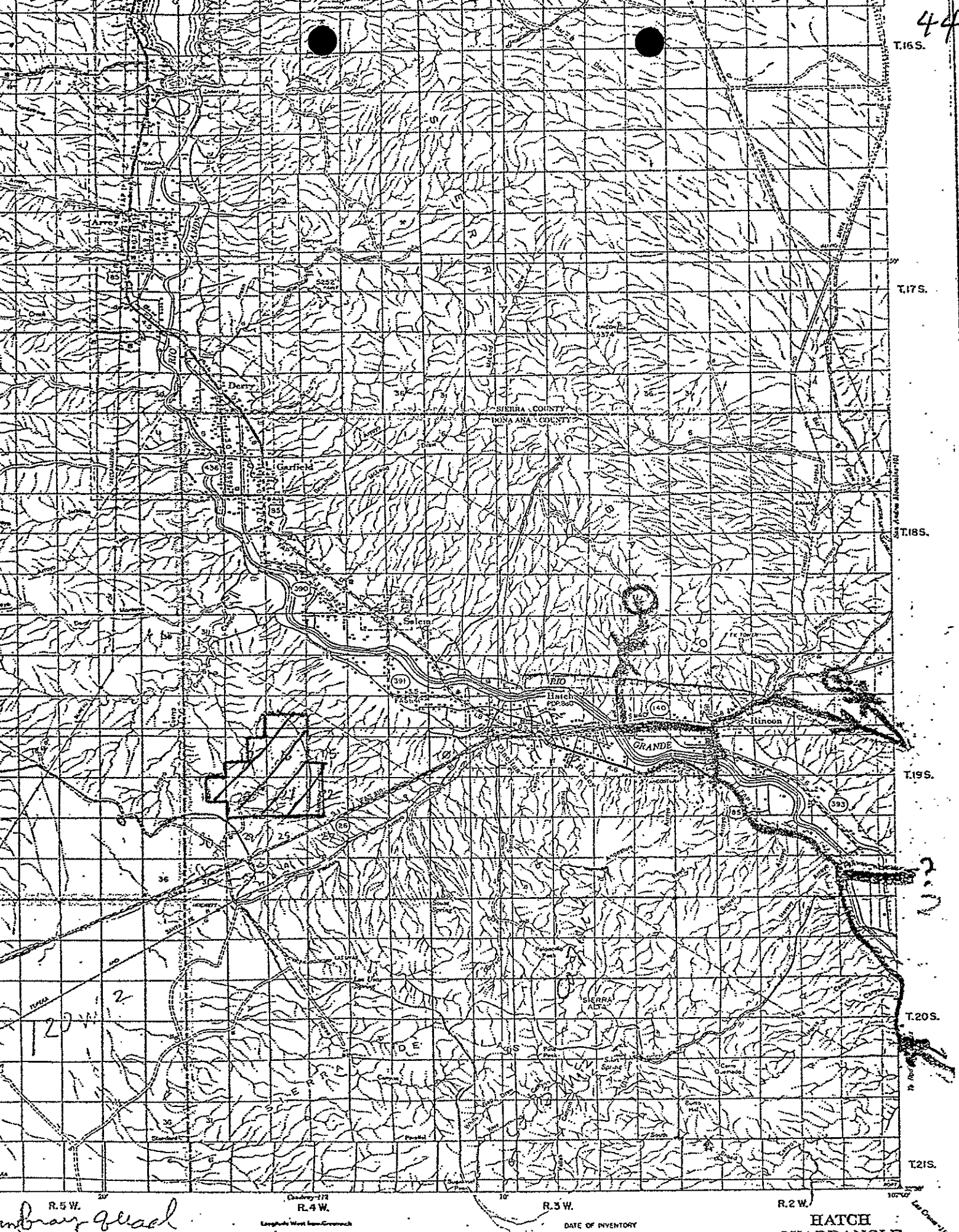
Erosion: Water erosion-sedimentation hazard--none to slight. Local small dune sand deposits stabilized with mesquite vegetation.

Land Status: BLM, state, and private (includes block of 2 state sections). Range use.

*See Bulletin 87, p. 314 for discussion of bentontic clays in Camp Rice.

Accessibility: Good, about 2 miles north of NM 26 (5 miles SW of Hatch Interchange on Interstate 25).

Remarks: Very good potential for disposal site.



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Site 100-1: Hatch 100 Fig 20

PRELIMINARY SITE

Site Designation: 101-1 San Andres Mountains (Rincon Mesa)

County: Dona Ana

Location: T.18S., R.1W., and parts of adjacent townships

Land Form: Tableland, level to gently undulating with numerous, shallow, undrained depressions.

Geology: Camp Rice Formation (Upper Santa Fe Group) ancient river deposits (interbedded gravelly sand, clay and loam, with local carbonate cemented zones and indurated caliche caprock (2-5 ft thk). Camp Rice about 350 ft thk.

Water: Water table more than 300 ft below land surface; zone of saturation at base of Camp Rice and in underlying Lower Santa Fe playa facies (Rincon Valley Fm). No integrated surface drainage system except flow into small playa depression.

Minerals: Unknown.

Precipitation: Approx. 9" (Hatch)

Evaporation: Approx. 97" Class A Pan (Las Cruces)

Soils: Aridisols with strong horizons of clay and/or carbonate.

Erosion: Water erosion-sedimentation hazard--none to slight. Local wind erosion-sedimentation hazard--slight.

Land Status: BLM and state, range use.

Accessibility: Excellent from Upham Interchange on Interstate 25 ATSF RR about 2 miles west of area.

Remarks:

Site 101-1: San Andres Mountains

PRELIMINARY SITE

Site Designation: 113-1 Las Cruces (Fillmore Pass)

County: Dona Ana

Location: T.25S., R.3-4E.

Land Form: Tableland, level to gently undulating

Geology: Camp Rice Formation (Upper Santa Fe Gp) ancient river deposits on interbedded sand and gravel, sand, and silt-clay, with partly indurated caliche caprock (2-5 ft thk). Formation at least 350 ft. thk.

Water: Water table more than 300 ft below land surface; zone of saturation in lower Camp Rice and underlying Fort Hancock Formations of Santa Fe Group. Surface drainage absent or poorly integrated.

Minerals: Unknown, gypsum mined from Paleozoic bedrock nearby in Franklin Mtns.

Precipitation: 8.4" (Las Cruces)

Evaporation: 97" Class A Pan (Las Cruces)

Soils: Aridisols with strong horizons of clay and/or carbonate accumulation. Local discontinuous dune sand cover.

Erosion: Water erosion-sedimentation hazard--none to slight
Wind erosion-sedimentation hazard--slight.

Land Status: BLM and military (SW edge of Fort Bliss Range-not impact area).

Accessibility: Fair to good; on graded road 3 to 4 miles east of Vado Interchange I 10.

Remarks:

Site 113-1, Las Cruces

Fig 2

48

PRELIMINARY SITE

Site Designation: 113-2 Las Cruces (West Mesa)

County: Dona Ana

Location: T.25S.-T.26S., R.1E. and parts of adjacent townships

Land Form: Tableland, level to gently undulating with numerous, shallow undrained depressions.

*Geology: Camp Rice Formation (Upper Santa Fe Group) ancient river deposits composed of interbedded sand, loam and clay, with local carbonate-cemented zones and indurated caliche caprock (>1,000 ft thk.)

Water: Water table more than 300 ft below land surface; zone of saturation in Upper Santa Fe Group basin fill. No integrated surface drainage system, except overland and shallow channelized flow into small playa depressions.

Minerals: Unknown

Precipitation: 8.4" (Las Cruces)

Evaporation: 97" Class A Pan (Las Cruces)

Soils: Aridisols, with strong (indurated) horizons of carbonate accumulation, with local weak soils on thin sand dune cover.

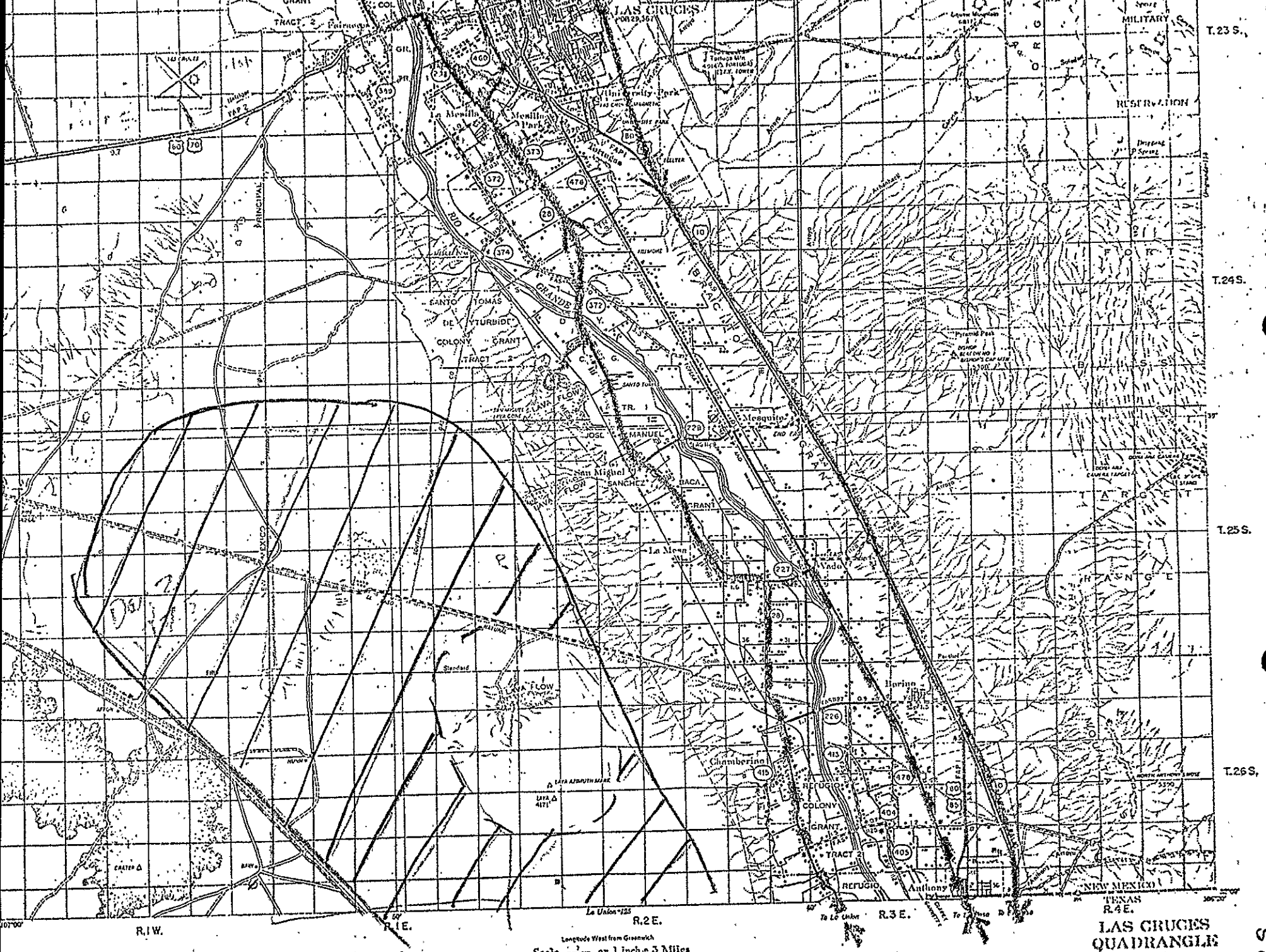
Erosion: Water erosion-sedimentation hazard--none to slight
Local small sand dunes mostly stabilized by mesquite vegetation.

Land Status: BLM and state, with several small private holdings. Range use.

Accessibility: Fair to good (1 paved road to Aflon Pumping Station (El Paso) Natural Gas) from Mesilla Valley NM28.

Remarks:

* Basalt flows locally present should be excluded from site consideration.



Control by U.S. Coast and Geodetic Survey; U.S. Geological Survey, U.S. Forest Service; Bureau of Land Management and Planning Division—Modified Conic Projection Standard Parallel 34½° North American Datum

Site 113-2: Las Cruces

Fig 23

05

PRELIMINARY SITE

Site Designation: 115-1 Hueco Mountains

County: Otero

Location: T.23S., R13E.

Land Form: Plain (caliche at or near surface)

Geology: Caliche caprock over Yeso Formation (limestone, shale, and siltstone).

Water: Fresh to saline 500' deep

Minerals: Caliche

Precipitation: 9"/yr

Evaporation: 70"+/yr

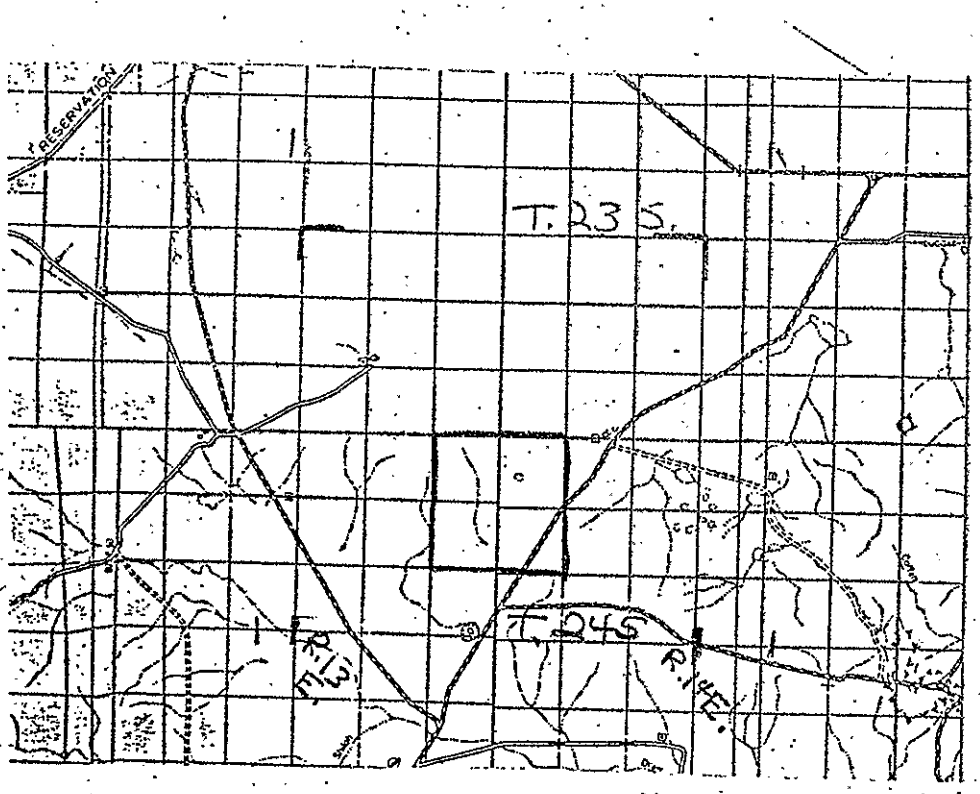
Soils: Gypsiferous and sandy

Erosion: 0.2-0.5 Acre ft/ mi^2/yr

Land Status: 3 mi^2 - BLM, 1 mi^2 - State; used as rangeland

Accessibility: Good-improved road across SE corner, but far from highway.

Remarks:



Site 115-1 Hueco Mountains

Fig 24

PRELIMINARY SITE

Site Designation: 118-1 Carlsbad

County: Eddy

Location: T.25S., R.25E.

Land Form: Gypsum plain

Geology: Castile Formation-gypsum, anhydrite, and limestone of considerable thickness.

Water: Slightly saline to brine at less than 200'.

Minerals: Gypsum

Precipitation: $\sim$12"/yr.

Evaporation: 75-80"/yr

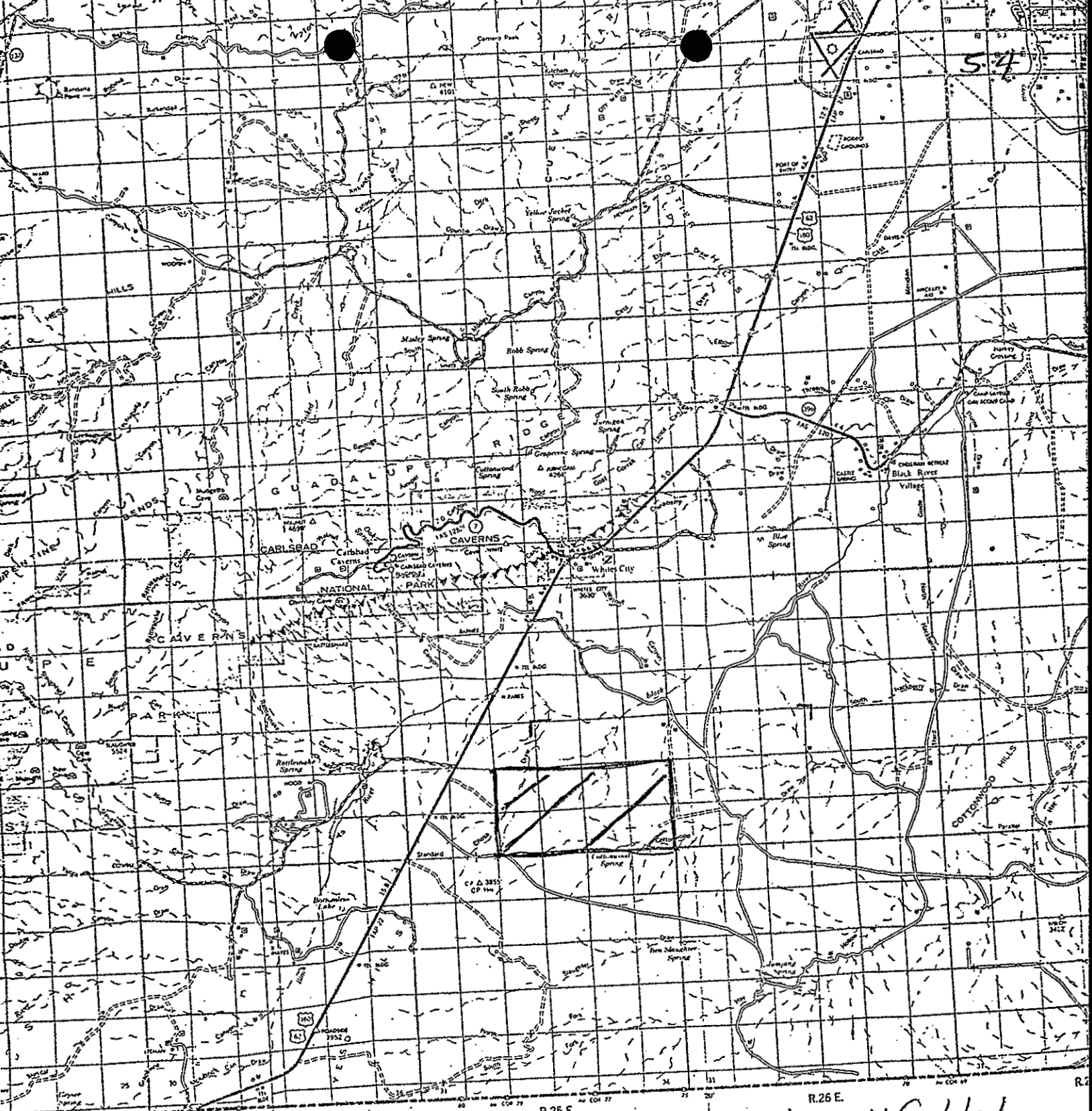
Soils: Gypsiferous and sandy

Erosion: 0.5-1.0 acre-ft/mi^2/yr

Land Status: 7 sq mi BLM & 1 sq mi state

Accessibility: Good-unimproved roads within site with U.S. highway within 1 mi of NW corner.

Remarks:



Site 118-1; Carlsbad

E R S O N C O U N T

T E X

Figs

PRELIMINARY SITE

Site Designation: 119-1: Potash

County: Eddy

Location: T.25S., R.29-30E.

Land Form: Plain

Geology: Hard caliche over Permian and/or Triassic shale, siltstone and sandstone.

Water: Moderately saline to brine, ~200' depth

Minerals: Caliche

Precipitation: 12-14"/yr

Evaporation: 80-85"/yr

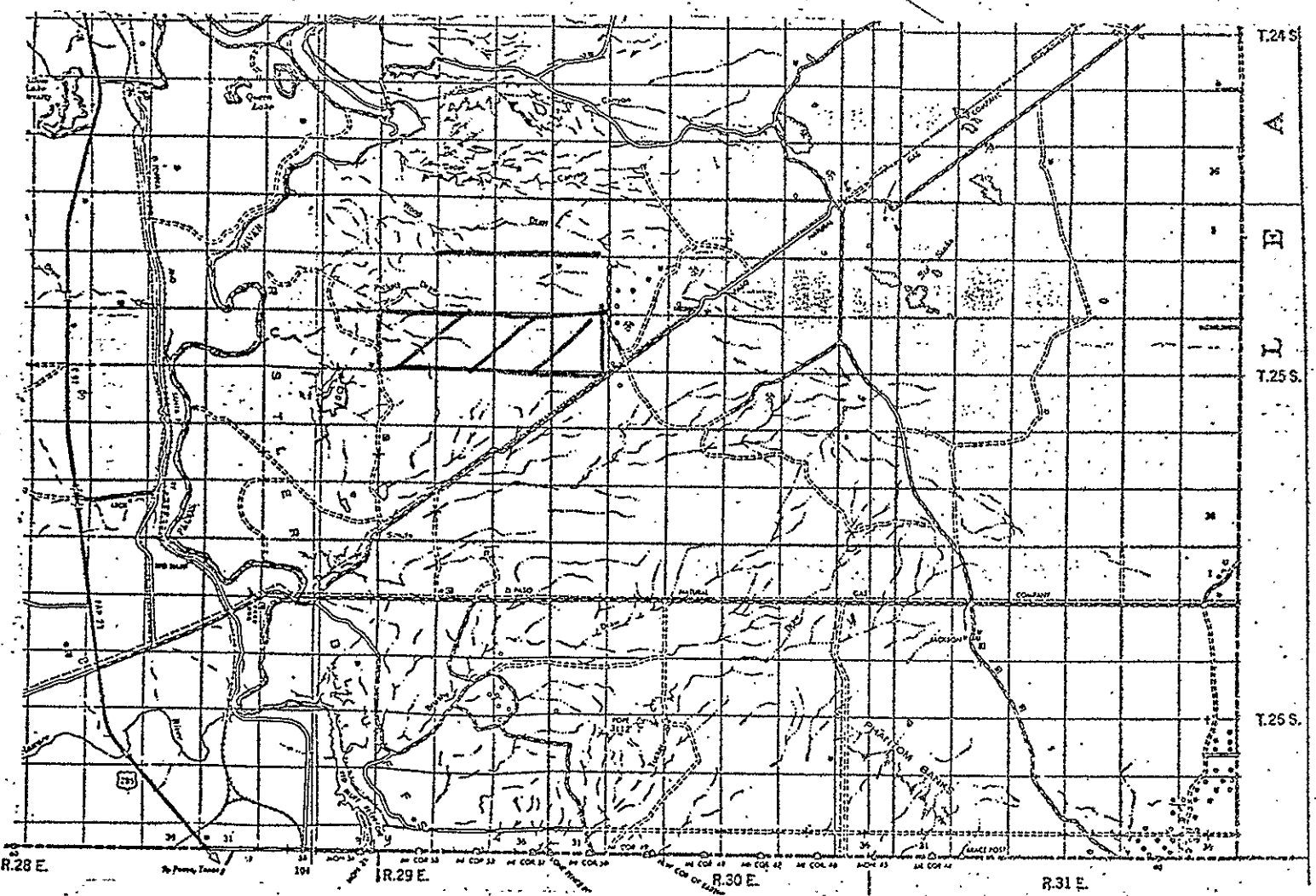
Soils: "Camborthids-Calciorthids"

Erosion: 0.2-0.5 acre ft/mi^2/yr

Land Status: BLM; used as rangeland

Accessibility: Poor, only unimproved roads

Remarks:



Site 119-1; Potash

Figure

PRELIMINARY SITE

Site Designation: 119-2: Potash

County: Eddy

Location: T.26S., R.31E.

Land Form: Plain

Geology: Caliche caprock over Triassic dockum sandstone, siltstone, and shale.

Water: Slightly saline to brine; 200-500' deep

Minerals: Caliche

Precipitation: 12-14"/yr

Evaporation: 75-80"/yr

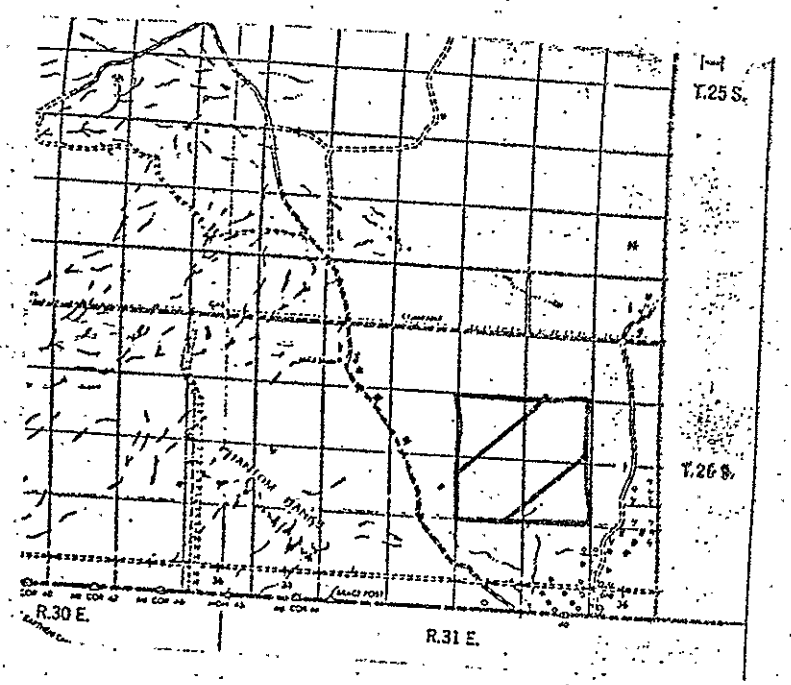
Soils: Limey, gypsiferous, sandy

Erosion: 0.2-0.5 acre ft/mi^2/yr

Land Status: BLM owner; used as rangeland

Accessibility: Fair to good, unimproved roads in site; hard surface road 3 mi SE

Remarks:



Site 119-2; Potash

Fig 27

PRELIMINARY SITE

Site Designation: 124-1 Mt. Riley

County: Luna County (possible adjacent sections in Dona Ana Cty)

Location: T.28S., R.5W., SE part and possibly adjacent sections in R.4W.

Land Form: Moderately dissected tableland adjacent to Indian Basin, a large closed depression (volcanic?).

*Geology: Local eolian sand deposits over: Upper Gila Group-ancient river and lake deposits composed of interbedded sand and silt-clay layers, with local soft caliche cap (1-4 ft thk).

*Water: Water table estimated to be more than 300 feet below land surface; zone of saturation in Upper Gila Group basin fill. Surface drainage network poorly developed with small and large closed depressions.

Minerals: Unknown.

Precipitation: 8.9 inches (Columbus)

Evaporation: 92" Class A Pan (Florida)

Soils: Aridisols with strong horizons of clay and carbonate accumulation, with local weak soils on sand dune cover.

Erosion: Water erosion-sedimentation hazard slight to moderate. Local active and stabilized sand dunes.

Land Status: BLM and state, range use.

Accessibility: Poor, 18 miles east of Columbus on former SP RR Grade

Remarks: About 6 miles north of international boundary.

*Local bedrock outcrops (Cretaceous and Paleozoic) at south edge of area.

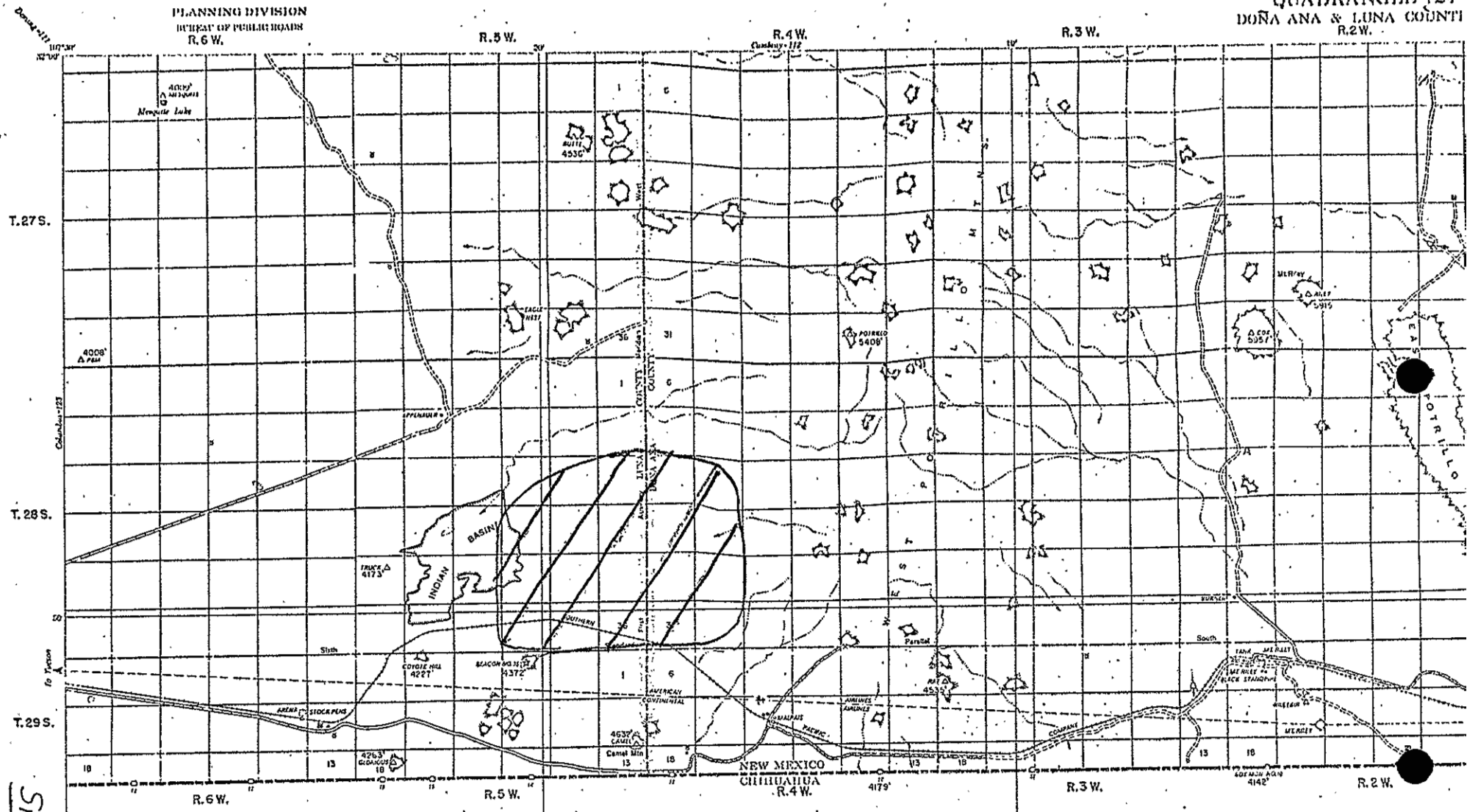
NEW MEXICO STATE HIGHWAY DEPARTMENT

PLANNING DIVISION

BUREAU OF PUBLIC ROADS

QUADRANGLE-124

DOÑA ANA & LUNA COUNTI



REPUBLIC OF MEXICO

Site 124-1; Mt. Riley

Figure 8

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PRELIMINARY SITE

Site Designation: La Union (125-1)

County: Dona Ana

Location: T.27-29S., R.1-2E.

Land Form: Tableland, level to gently undulating with numerous shallow, undrained depressions.

Geology: Camp Rice/Ft. Hancock Formation (Upper Santa Fe Group) ancient river and deltaic deposits composed of interbedded sand, loam, and clay with local carbonate-cemented zones and indurated caliche caprock (> 1,000 ft thk).

Water: Water table more than 300 ft below land surface; zone of saturation in Upper Santa Fe Group basin fill. No integrated surface drainage system, except overland and shallow channelized flow into small closed depressions (playas).

Minerals: Unknown

Precipitation: @ 8" (El Paso)

Evaporation: @ 100" estimated Class A Pan (El Paso)

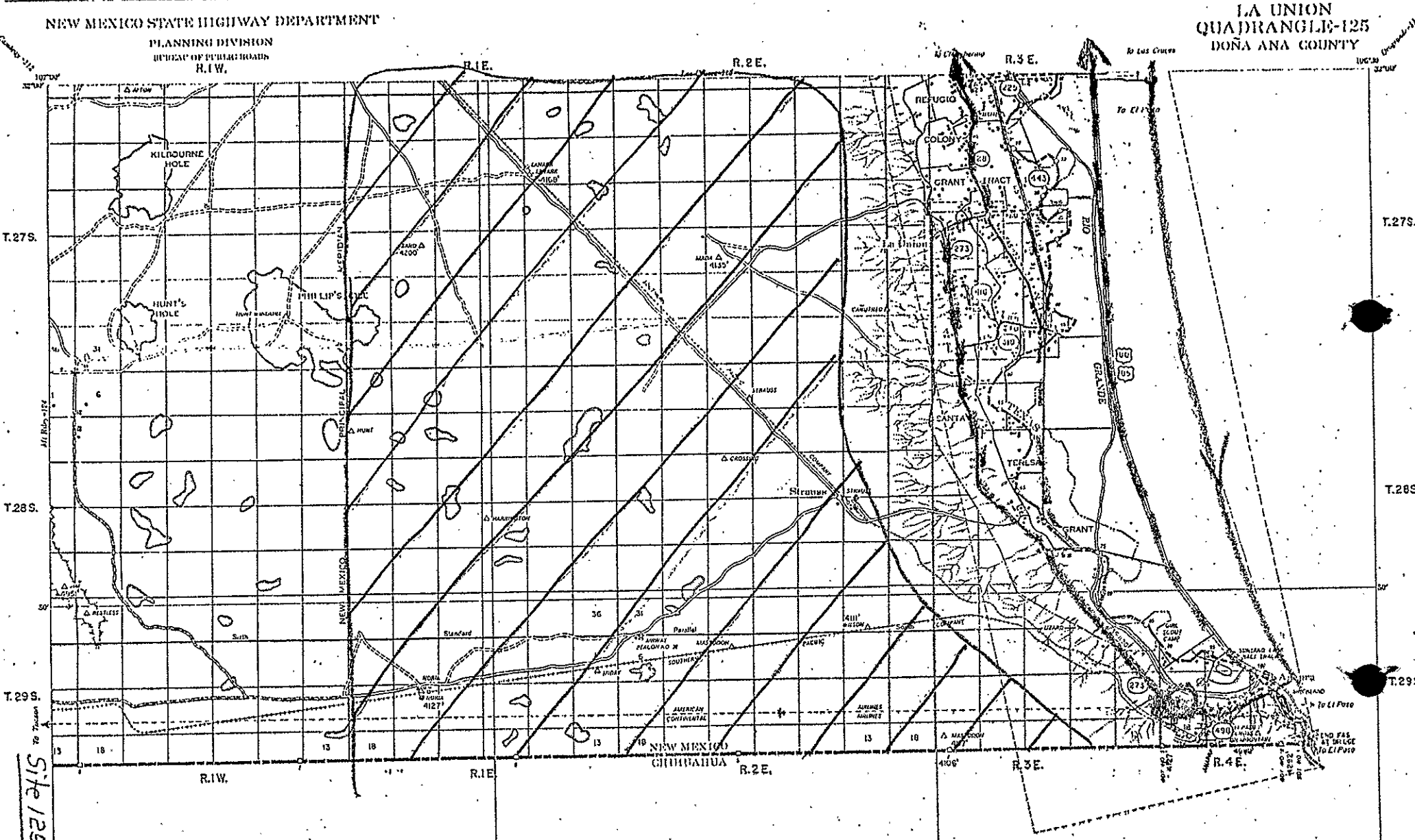
Soils: Aridisols with strong (indurated) horizons of carbonate accumulation, with local weak soils on thin sand dune cover.

Erosion: Erosion-sedimentation hazard (water)--none to slight. Local small sand dunes mostly stablized by mesquite vegetation.

Land Status: BLM and state, with several small private holdings, range use.

Accessibility: Fair, good graded roads from Mesilla Valley (NM273) at east edge of site area. SPRR also crosses area.

Remarks: South edge of potential site area is the International Boundary.



Site 125-1; La Union

Fig. 29

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