0980 0004

SP 856

NORTH CARSON SINK

1ST DRAFT.

(PERSONAL COPY)

DRE. 4/12/83

Southern Pacific Land Company

North Carson-Sink Block

Twps. 23-24N--Rges. 32-33E
Churchill County, Nevada

AN ANALYSIS

Foreword:

Intent is to consider the still-dormant possibilities of the captioned block, consisting of 19,429.35 acres. A consideration, based on the property's immediate geological detail, affected by and possibly down-graded by a deep, dry test, plugged in October 1974 by Chevron and Amoco, has been found "wanting". In view of the writer's close association with Railroad Valley through studies dating from 1971, and Dixie Valley mapping and evaluations starting in 1963, as well as a growing belief in Basin and Range uniformity, a regional approach ~~has become~~ APPEARS a "must".

For that reason text is supported by a ~~series~~ SET of plates, consisting of Index maps and a series of cross-sections which provide the details of Railroad Valley and its production, Dixie Valley and a promising geothermal program (and possibly oil), and the north Carson Sink with still unresolved possibilities.

Nevada's oil/gas possibilities were first taken seriously at the turn of the century. Gas "shows" in the Fallon area provided a lively-boom and promotion in 1920-1921 which was short-lived, after many, scattered, shallow tests. Interest in gas persisted, however, especially in the basin's margin ~~at Stillwater~~ NEAR FALLON where, on the Jones and Jewell ranch in 1957, gas for cooking, heating and lighting was still being provided by a well drilled in 1940 (Lintz-1957).

Fallon basin exploration ~~continued~~ PERSISTED, according to the Oil and Gas Journal (August 20,1973). For the period 1959-1962, fourteen tests were drilled with seven exceeding 2000 feet, two over 4000 feet and one to 7673 feet. All bottomed in recent sediments, with occasional week gas "shows" and one reported ~~an~~ oil "show."

It was not until 1954 that the State acquired its first oil field, with the Shell Eagle Springs discovery in Railroad Valley. Twenty-two years later, in 1976, Northwest Exploration's Trap Springs discovery, also in Railroad Valley, became the second producing area. Two minor (with several dry offsets since discovery) FIELDS have been addedto the list since March 1981.

Statistics since 1948 indicate that 304 tests have produced four discoveries, two of them very minor. The two discoveries, of consequence, provide a ratio of 1 per 152 tests. Personal notes ~~contribute the conclusion~~ CONCLUDE that "tried and true geological methods have been a failure." Such is well expressed by H.D. Duey (1979) who notes that the lack of "conventional traps in Nevada may partly explain past failures."

Railroad Valley Traps:

Pre-1976 conventional thinking, consisting of a simple wedge or pinch-out of locally porous ash in an otherwise impervious unit of welded tuff, has been completely changed by Trap Springs development.

Today's thinking replaces a welded tuff and local porosity with massive Ignimbrite (a silicic volcanic rock, forming thick, massive compact lava-like sheets; rock is chiefly a fine grained rhyolitic volcanic ash, formed mainly of glass particles) which has been fractured; the fractures providing the openings for a reservoir. Fractured areas are close to the major faults making the edge of the basin. The existence of such faults, AND ignimbrites, or other well-welded ash units, become prerequisites. Too, the prescence of geothermal activity, which exists in Railroad Valley, may be pertinent; as, too, a source, which remains to be determined.

The following comments by others are of merit:

(1) "Eagle Springs oil is trapped in a truncated wedge of Oligocene volcanic rocks - - the wedge underlain by upper Paleozoic rocks forming a bottom seal - - seal on east provided by bo(n)dary fault zone between Basin and Grant Range, and the field limited to the north and west by water beneath the oil column."
L.C.Bortz & D.K.Murray (1979)

(2) "Trap Springs - - a combination structural and "strat" trap in Tertiary Ignimbrite - - reservoir mainly in fractures caused by both cooling of ignimbrite and local faulting - - ".
H. D. Duey (1979)

(3) "The reservoir rock, ie: Pritchards Station tuff, has cooling joints, as porosity, which has been enhanced by Basin and Range faulting. Densely welded ash-flow tuffs may be expected to be suitable traps for gas and oil accumulations when associated with post-emplacement faulting and interbedded with altered ash and clay beds"
D.E.French & K.J. Freeman (1979)

(4) "Primarily Railroad Valley oil production is from Cretaceous-Eocene and Oligocene reservoirs in combination with fault/truncation traps in synclinal embayments on down thrown sides of major basin bounding faults".
D.J.Guion & W.C.Pearson (1979)

Plate E, a cross-section through the center of Railroad Valley production presents the details listed above. Urged is a comparison of Carson Sink (Plate C) and Dixie Valley (Plate D) sections with this type section of Railroad Valley.

Carson Sink Area:

Plate B, an index map of the Fallon basin, flanked on the east by the Dixie Valley graben, shows the north Carson Sink, its 12000 * of Pleistocene-Tertiary section and controlling major faults. Carson sink detail is from D.D.Hastings (1979), a product of reconnaissance-seismic and gravity surveys. R.C.Speed gravity studies (1976) provide Dixie Valley countouring.

Sections CS-1 and CS-2 (Plate C), 6.8 miles apart and crossing the Southern Pacific block provide the relationships of Pleistocene lake fill, atop the Tertiary section and the basement Triassic-Jurassic complex. Details are from Hastings (1979) who, in turn, availed himself of earlier studies by Speed (1976) and Page (1965).Structural interpretation is by the writer.

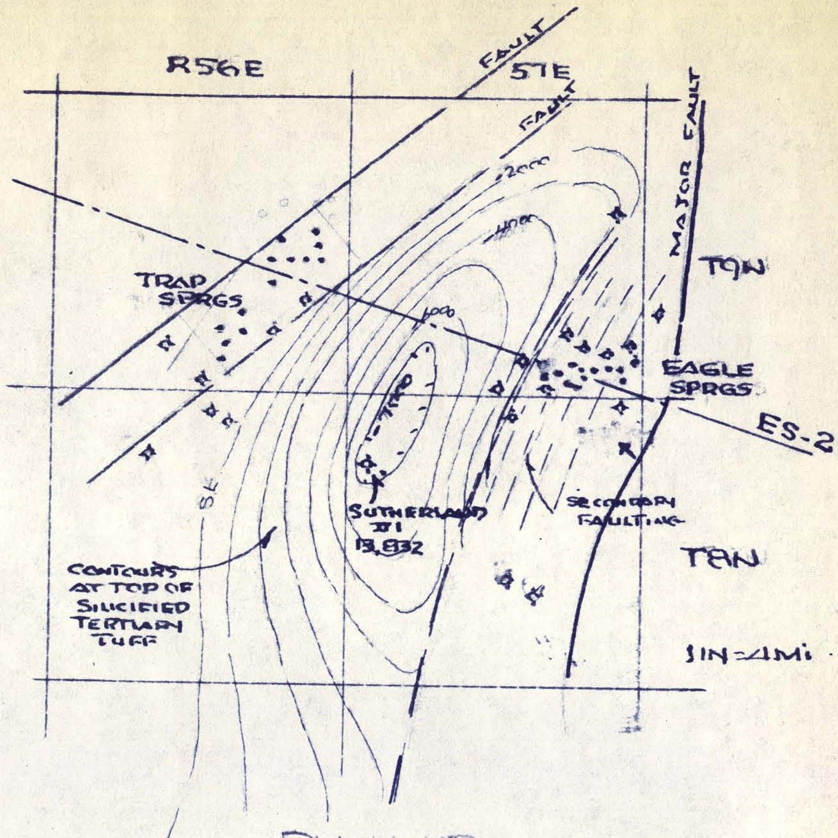
Pleistocene (stippled) consists of "highly organic playa-lake sediments." Reported were "strong methane shows in the drilling mud from 1000 to 4200 feet" in the Standard - Amoco test.

The Tertiary section starts with a capping basalt (TCB), which is followed by a middle, non-marine, sedimentary unit (TMS; Miocene) and a lower volcanic member at the base (TLV; Oligocene). TLV (check symbols) is described as consisting of cal-alkaline flows, tuffs and welded tuffs, with a thickness of 3600 feet in the Stillwater Range area.

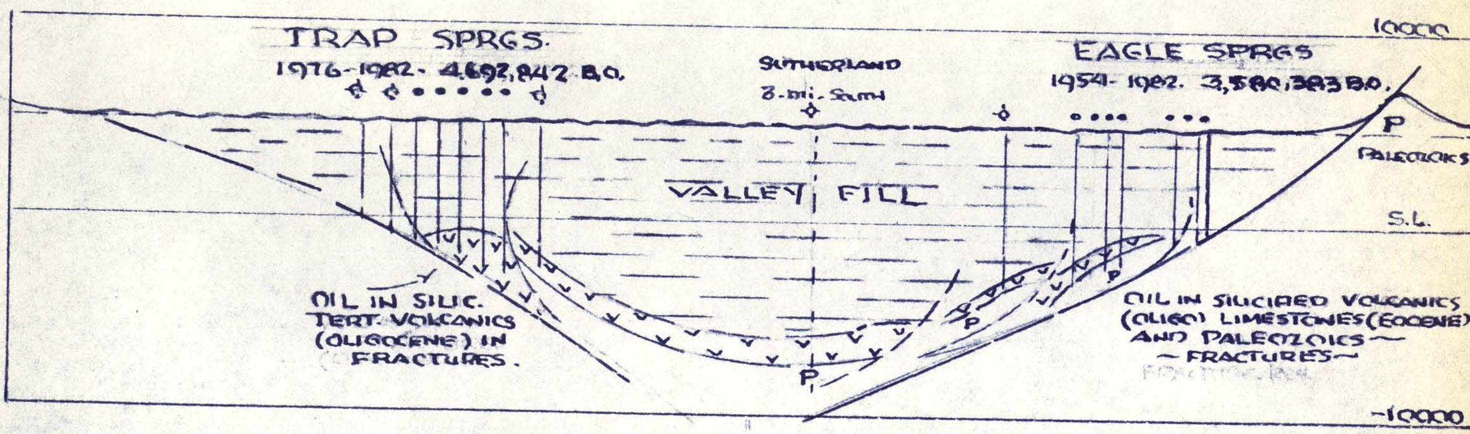
The pre-Tertiary basement units consist of Mesozoic- Triassic and Lower Jurassic metasediments (JTrS--closely spaced fine lines) and gabbro extrusives (JV x-symbols) probably sub-ducted under the JTrS as ocean-plate. The JTrS, consisting of mud-stones and siltstones has been deformed and experienced flat thrusting. Railroad Valley, on the other hand, is underlain and flanked by Paleozoic assemblages.

The partially-penetrated lower Tertiary section of massive siliceous volcanics (Ignimbrites in Railroad Valley) consists of dense volcanic flows, welded

E



PLAN MAP



1" = 10000'

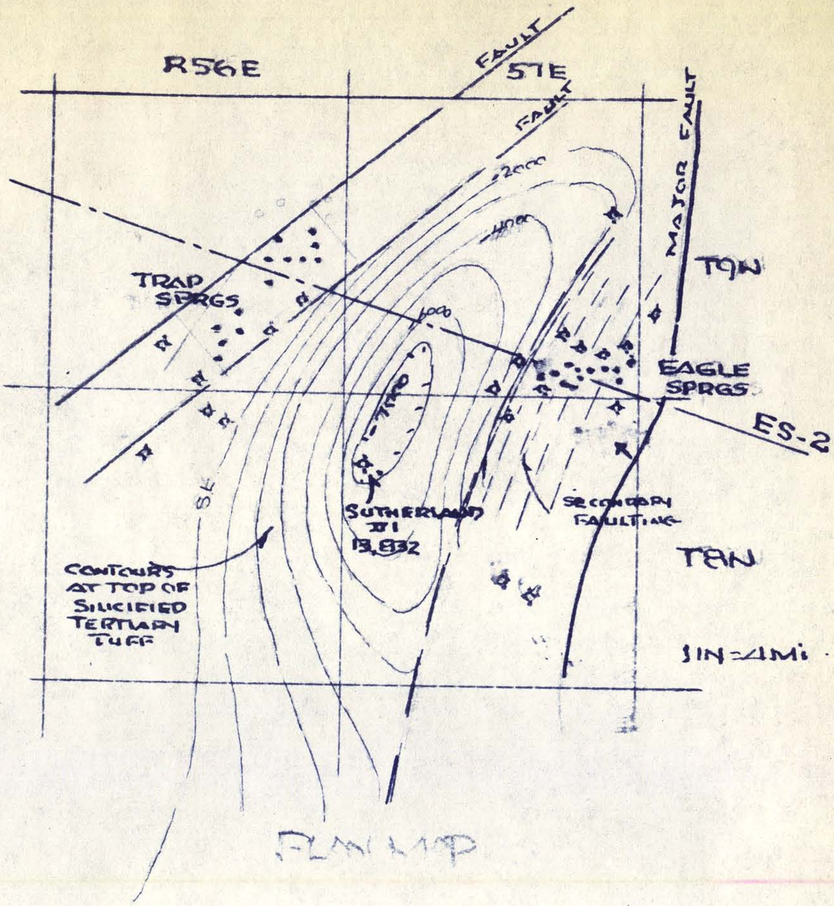
RAILROAD VALLEY

CROSS SECTION

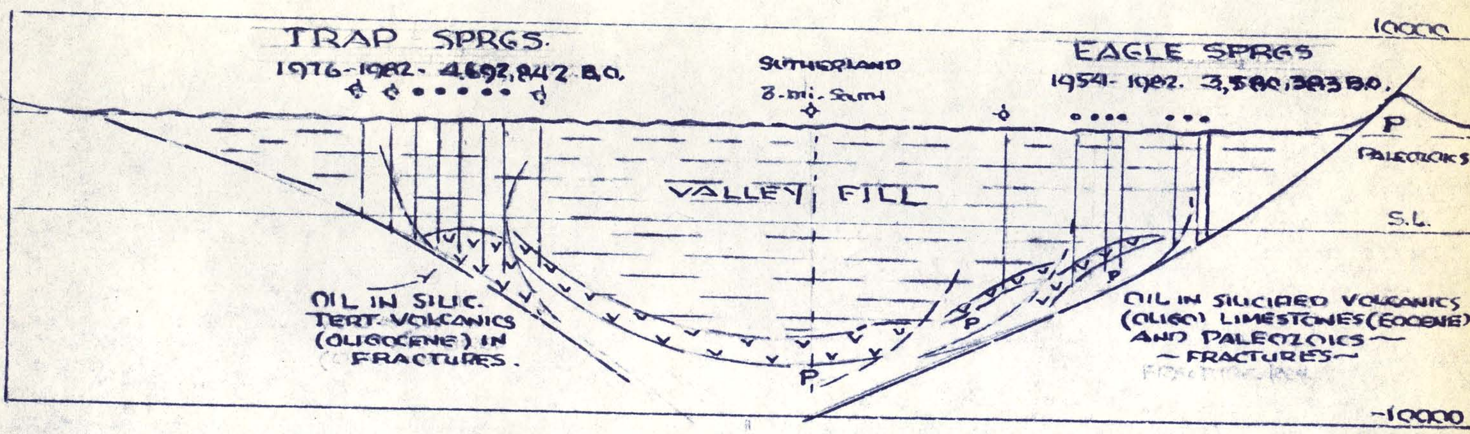
1" = 10000'

Apr. 1983

E



PLAN MAP



1" = 10000'

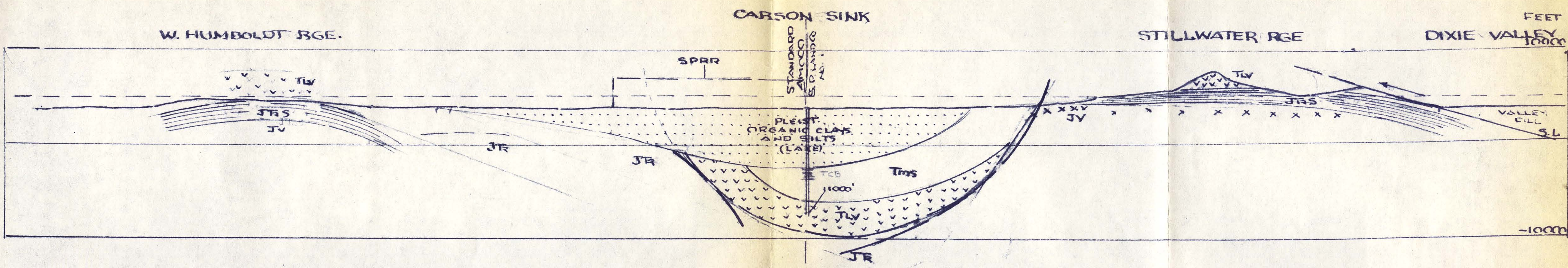
RAILROAD VALLEY

CROSS SECTION

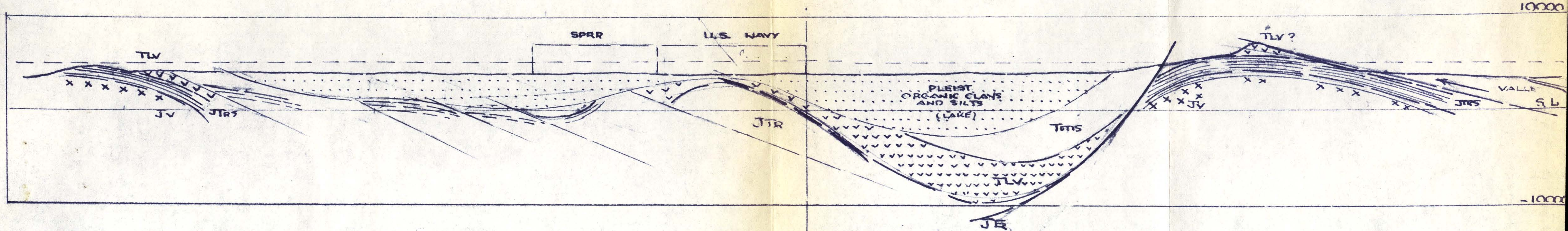
1" = 10000'

DE
Apr. 1983

C



CS-1



CS-2

CARSON SINK
NORTH AREA
CHURCHILL CO., NEVADA

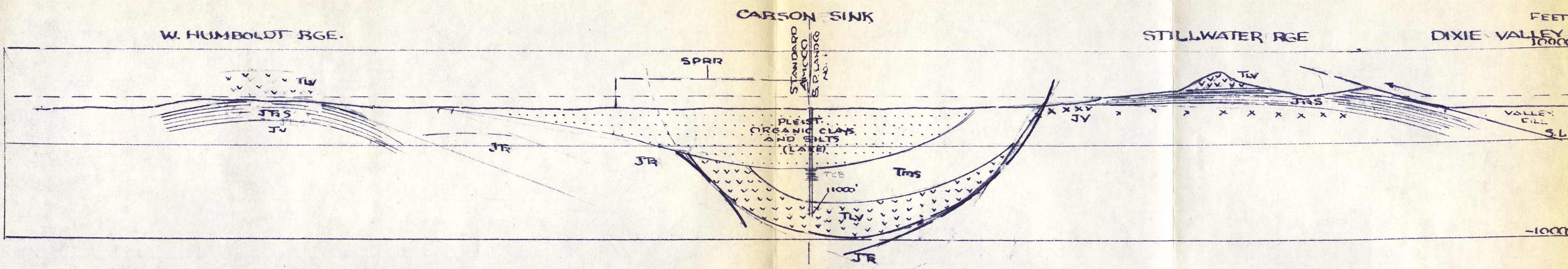
CROSS SECTIONS
1" = 10000'

STRUCTURAL ANALYSIS

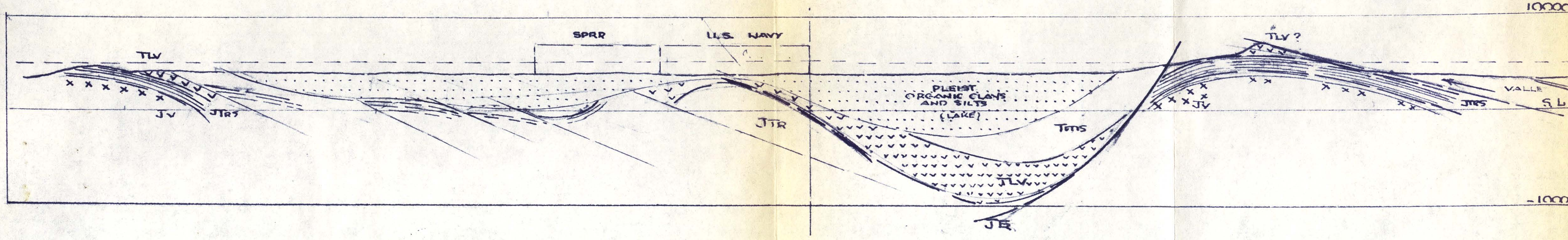
SOUTHERN PACIFIC BLOCK
AND
USN BOMBING RANGE

DL EVANS
APRIL-1983

C



CS-1



CS-2

CARSON SINK
NORTH AREA
CHURCHILL CO., NEVADA

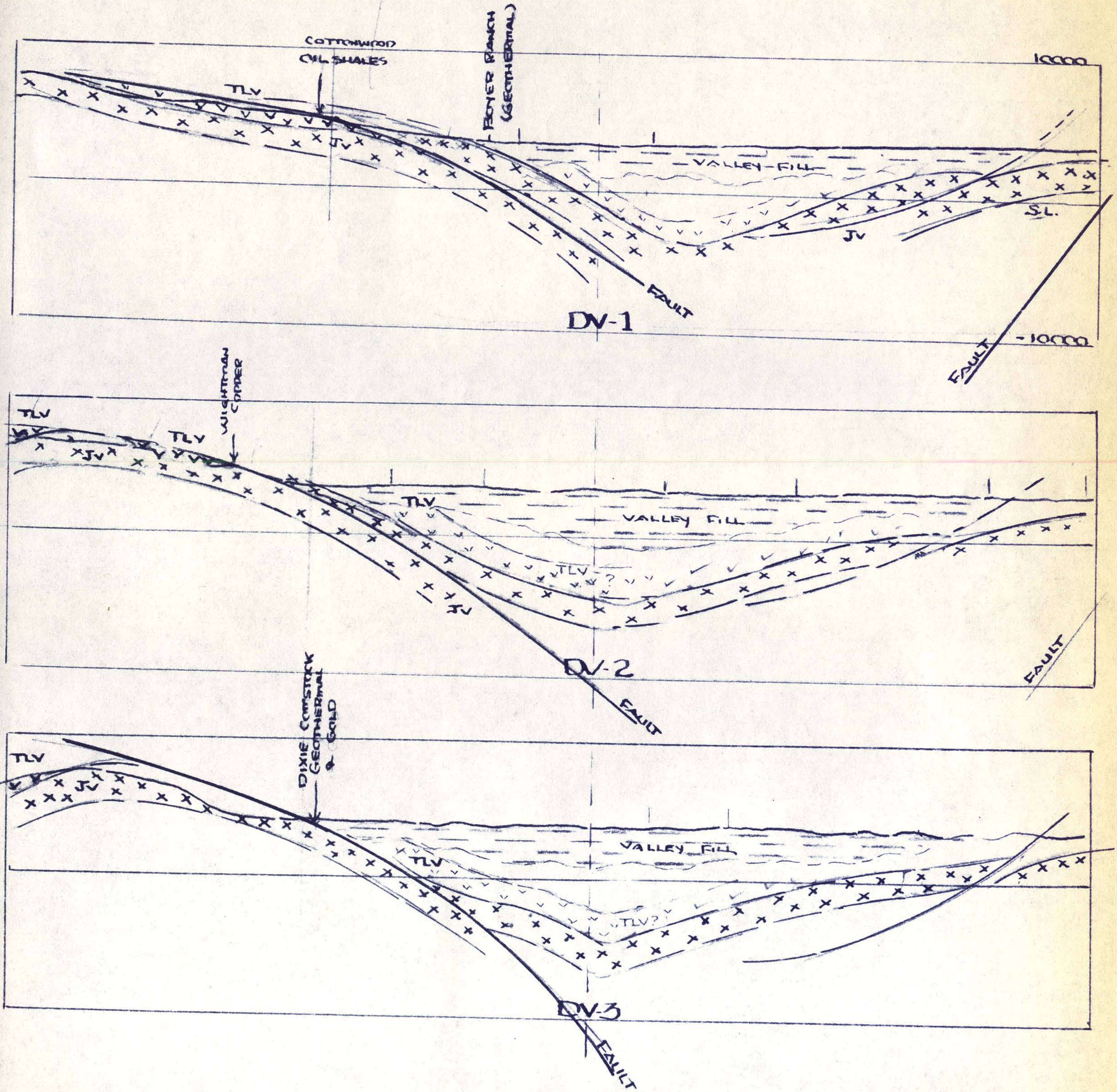
CROSS SECTIONS
1" = 10000'

STRUCTURAL ANALYSIS

SOUTHERN PACIFIC BLOCK
AND
USN BOMBING RANGE

D. EVANS
APRIL-1983

D

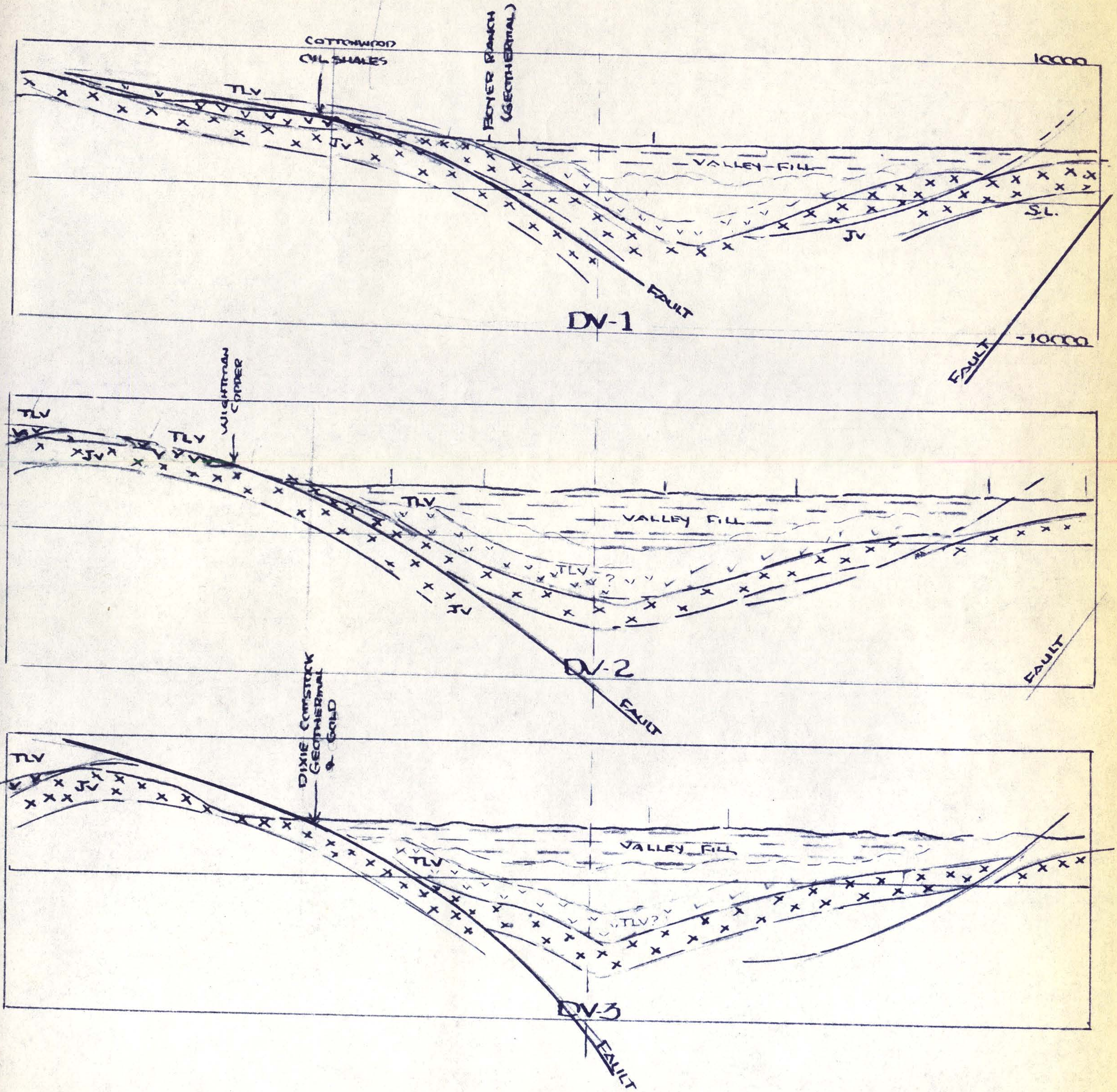


DIXIE VALLEY

TRE
APR. 1983

CROSS SECTIONS
1" = 10000'

D



DIXIE VALLEY

CROSS SECTIONS
1" = 10000'

TRE
APR. 1983

(silicified) tuffs, and plain ash which might offer some porosity, all of which should be fractured in areas close to major faulting.

Geothermal flows abound at Eagle Springs and Trap Springs. Plate B shows geothermal occurrences (Black Triangles) throughout the Fallon and Dixie basins. A source in the Paleozoics beneath Railroad Valley has yet to be determined. Regarding the Carson Sink we agree with Hastings that the thick lacustrine section with its organic content does not appear to be a source.

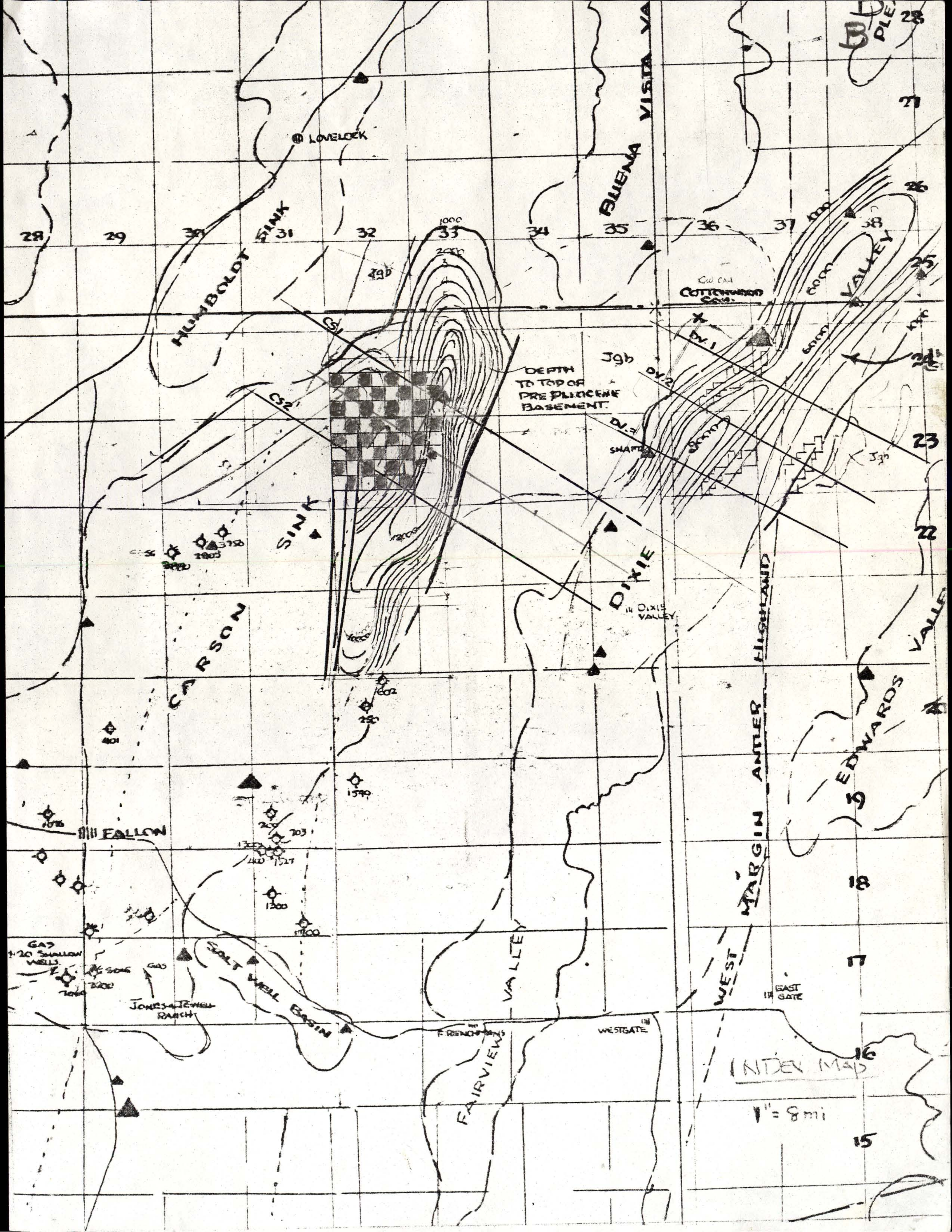
On the other hand, with reference to Plate B, note "Cottonwood Canyon" (west side of Dixie Valley), where oil shales, probably upper-Triassic mudstones, were recognized and reported by F.C.Lincoln (1922) as follows:

> "Oil shales occur in Cottonwood Canyon; surface material yields 6 gallons of oil per ton on distillation."

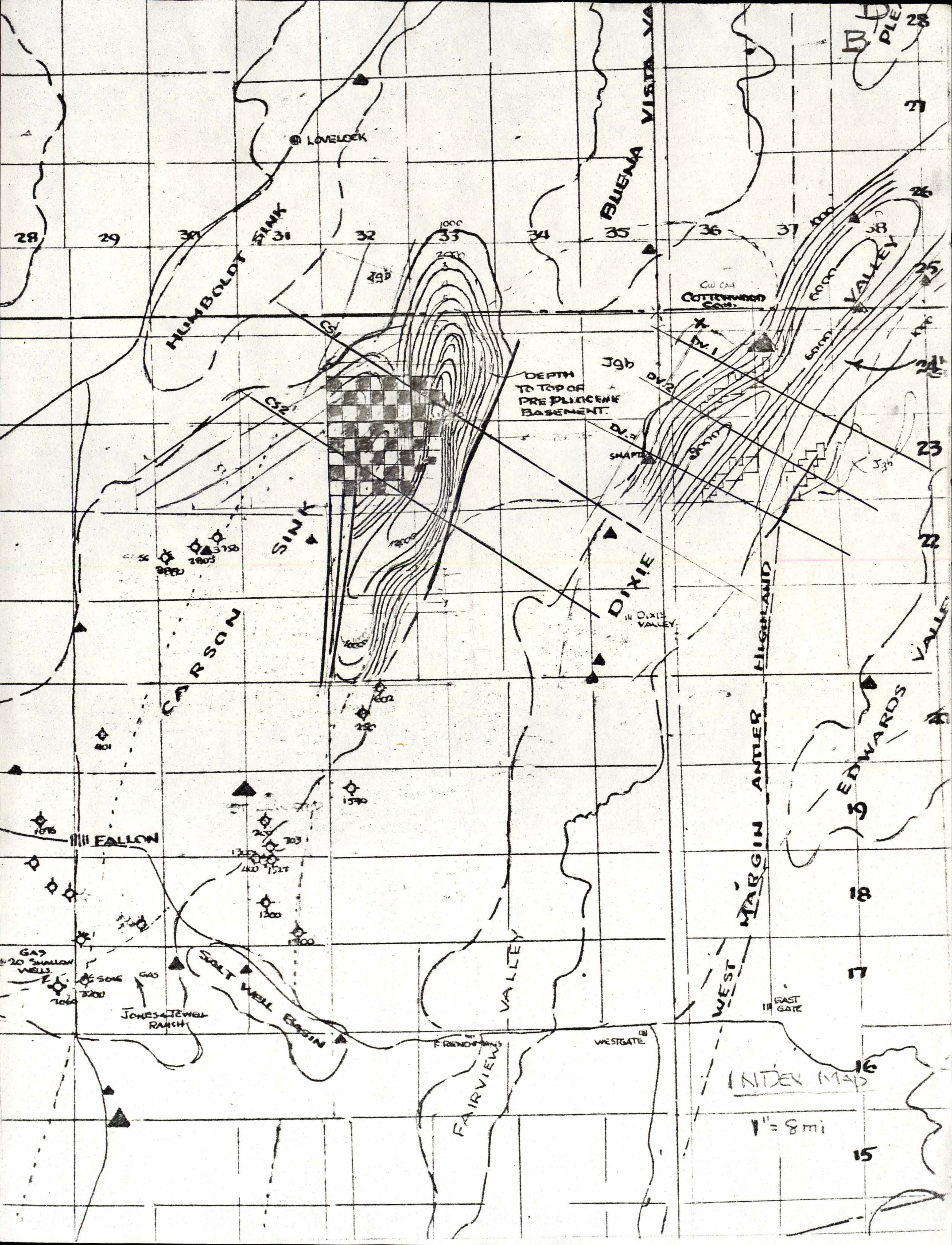
Recapitulation:

The Standard-Amoco S. P. Land Co. No. 1 "drilled to 11,000 feet as a stratigraphic test of the Tertiary section" was, certainly at the deepest part of the basin, away from any fracturing help. It resembles, in many ways, the Sutherland No. 1 (1971) drilled at the center of Railroad Valley and still in barren Tertiary volcanics at a total depth of 13,830 feet. Despite the deep dry hole, production occurs on both flanks.

Plan and sections suggest the possibilities of the "conventional" target, as expressed by the sharp basement high, under the Bombing Area (see U.S.Navy on Section CS-2), and the "unconventional" trap possibility, so clearly developed in Railroad Valley. The former, even if available, would not be considered favorably. The latter, expressed by the closely spaced contours flanking the basin center, would merit testing on the Southern Pacific flank of the basin, as well as on the east side which is outside of the area of concern. Specifically, sections 19, 29, and 31 of Twp.24N, Rge.33E; sections 23, 25 and 35 of Twp.24N, Rge.32E, the N/2 and SW/4 of section 17, T23N.,Rge33E, and sections 25 and 27, T23N, Rge.32E should be considered seriously. The 8.75 sections represent 5600 acres.



LOVELOCK
HUMBOLDT SINK
BUENA VISTA VA
28
29
30
31
32
33
34
35
36
37
38
1000
2000
Jgb
CS1
CS2
DEPTH TO TOP OF PRE PLIOCENE BASEMENT
COTTONWOOD CAN.
DV.1
DV.2
DV.3
SHAFT
VALLEY
CARSON SINK
DIXIE
Dixie VALLEY
HIGHLAND
WEST MARGIN ANTLER
EDWARDS
VALLE
FALLON
GAS
GAS
1-20 SHALLOW WELLS
JONES-JEWELL RANCH
SALT WELL BASIN
FAIRVIEW VALLEY
FRENCHMANS
WESTGATE
EAST GATE
NIDEV Map
1" = 8 mi
27
26
25
24
23
22
19
18
17
16
15



LOVELOCK
HUMBOLDT SINK
BUENA VISTA
CARSON SINK
DIXIE
DIXIE VALLEY
DEPTH TO TOP OF PRE PLIOCENE BASEMENT
Jgb
COTTONWOOD CAN.
DV.1
DV.2
CS1
CS2
SHAFT
VALLEY
FALLON
GAS ±20 SHALLOW WELLS
JONES & JEWELL RANCH
SALT WELL BASIN
FAIRVIEW VALLEY
WESTGATE
EAST GATE
WEST MARGIN ANTLER HIGHLAND
EDWARDS VALLEY
28
29
30
31
32
33
34
35
36
37
38
27
26
25
23
22
19
18
17
16
15
INDEX MAP
1" = 8 mi

Township 22 North, Range 31 East is not of interest. On the other hand, adjoining sections on the "checker board", the southeast quarter of Twp.24N, Rge.31E, and the areas between the major fault and basin center should be considered in any program.

<u>Present Value</u> provides the to-be-expected problems. Located, as it is, some 170 miles from production, the block is in a very wildcat category. With the 5600 acres in fee and not a BLM lease, we assume that Southern Pacific Land Company would use the lease-approach for the blocks exploration and development. Factors to be considered are:

1. With good luck, consider the finding of one field, similar to the Trap Springs on the west side of the basin.
   (a) Trap Springs production covers 826 acres;
   (b) Production to date amounts to 4,692,842 B.O. and a reasonable guess suggests a final total of 6,000,000 barrels of oil;
   (c) Recovery to date is 5,681 barrels of oil per acre. The 6,000,000 total increases the per acre to 7,263 barrels of oil. .03 218
2. A recent (1978) deal in Dixie Valley provided the lessor with 3% of total production, which, applied to the S.P. possibility in this case, ~~amounts to~~ would amount to 180,000 barrels of oil. (Assuming - one Trap type field)

Results, admittedly, become astronomical and since the basis for such is an across-counties comparison, the figure cannot be recommended. Better, by far, would be an evaluation based on the fair land-value for the 19,429 acres with oil, gas and geothermal rights reserved.

The conclusion is repeated that the block, and especially those 5600 acres enumerated above, merits more development than one deep hole.

Respectfully submitted,

D. L. Evans

David LeCount Evans

This report was prepared by Whitney & Whitney staff and associates under the direction of Dr. John W. Whitney. The oil and gas portion of the report was written by Mr. David LeCount Evans.

Section 3

OIL AND GAS POTENTIAL AND VALUATION

In this section of the report the possibilities for development of oil and gas deposits on the subject lands in the northern portion of the Carson Sink are analyzed to provide an estimate of the present value of the oil and gas rights. The appraisal of these rights is predicated on analysis of: 1) the regional setting of the area, 2) specific geological features of this portion of the Carson Sink and comparison with productive oil and gas districts elsewhere in Nevada, 3) available geophysical and oil and gas drilling results from on and adjacent to the property, and 4) the status of current oil and gas leasing activity in the area.

In the regional context, the Carson Sink is a major downdropped fault block or graben contained within the basin and range physiographic province. Figure 2 shows the relationship of the subject lands to surrounding oil and gas fields and related tectonic features. The Northern Carson Sink shares many similarities with productive oil and gas areas such as Railroad Valley, Nevada; portions of the Sacramento-San Joaquin Valleys, California; and the Harney Basin, Oregon. These similarities include the presence of suitable source rocks and reservoir rocks as well as favorable stratigraphic traps. These are discussed in more detail subsequently in this report.

Nevada's oil/gas possibilities were first taken seriously at the turn of the century. Gas "shows" in the Fallon area provided a lively boom and promotion in 1920-1921 which was short-lived after many, scattered, shallow tests. Interest in gas persisted, however, especially near the margin of the Carson Sink near Fallon where, on the Jones and Jewell ranch in 1957, gas for cooking, heating and lighting was still being provided by a well drilled in 1940 (Lintz, 1957).

Fallon basin exploration persisted, according to the Oil and Gas Journal (August 20, 1973). For the period 1959-1962, fourteen tests were drilled with seven exceeding 2,000 feet, two over 4,000 feet and one to 7,673 feet. All bottomed in recent sediments, with occasional weak gas "shows" and one reported oil "show".

It was not until 1954 that the State acquired its first oil field: the Shell Eagle Springs discovery in Railroad Valley. Twenty-two years later, in 1976, Northwest Exploration's Trap Springs discovery, also in Railroad Valley, became the second producing area. Two minor fields have been added to the list since March 1981.

Statistics since 1948 indicate that 304 tests have produced four discoveries, two of them very minor. The two discoveries of consequence provide a ratio of 1 success per 152 tests. H. D. Duey (1979) notes that the lack of "conventional traps [emphasis added] in Nevada may partly explain past failures." Consideration of the Railroad Valley traps illustrates why "conventional" geologic wisdom, largely based on Gulf Coast exploration, is not entirely adequate for exploration in the basin and range area.

Pre-1976 conventional thinking, utilizing the concept of a simple wedge or pinchout of locally porous ash in an otherwise impervious unit of welded tuff, has been completely changed by Trap Springs development.

Current understanding of basin and range petroleum geology replaces a welded tuff and local porosity with massive ignimbrite (a silicic volcanic rock, forming thick, massive compact lava-like sheets; rock is chiefly a fine grained rhyolitic volcanic ash, formed mainly of glass particles) which has been fractured; the fractures provide the openings for a reservoir. Fractured areas are close to the major basin and range faults marking the edge of the basin. The existence of such faults, and ignimbrites, or other well-welded ash units, become prerequisites. Also, the presence of geothermal activity, which exists in Railroad Valley, may be pertinent as a heat source for creating oil from hydrocarbon precursors present in sedimentary rocks.

The following comments by others are relevant to a comparison of the Carson Sink and Railroad Valley areas.

(1) "Eagle Springs oil is trapped in a truncated wedge of Oligocene volcanic rocks -- the wedge underlain by upper Paleozoic rocks forming a bottom seal -- seal on east provided by boundary fault zone between Basin and Grant Range, and the field limited to the north and west by water beneath the oil column."

L. C. Bortz & D. K. Murray (1979)

(2) "Trap Springs -- a combination structural and 'strat trap' in Tertiary ignimbrite -- reservoir mainly in fractures caused by both cooling of ignimbrite and local faulting --."

H. D. Duey (1979)

(3) "The reservoir rock, i.e.: Pritchards Station tuff, has cooling joints, as porosity, which has been enhanced by Basin and Range faulting. Densely welded ash-flow tuffs may be expected to be suitable traps for gas and oil accumulations when associated with post-emplacement faulting and interbedded with altered ash and clay beds."

D. E. French & K. J. Freeman (1979)

(4) "Primarily Railroad Valley oil production is from Cretaceous-Eocene and Oligocene reservoirs in combination with fault truncation traps in synclinal embayments on downthrown sides of major basin bounding faults."

Figure 3, a geologic map and cross-section through the center of the Railroad Valley oil and gas field, presents the details listed above.

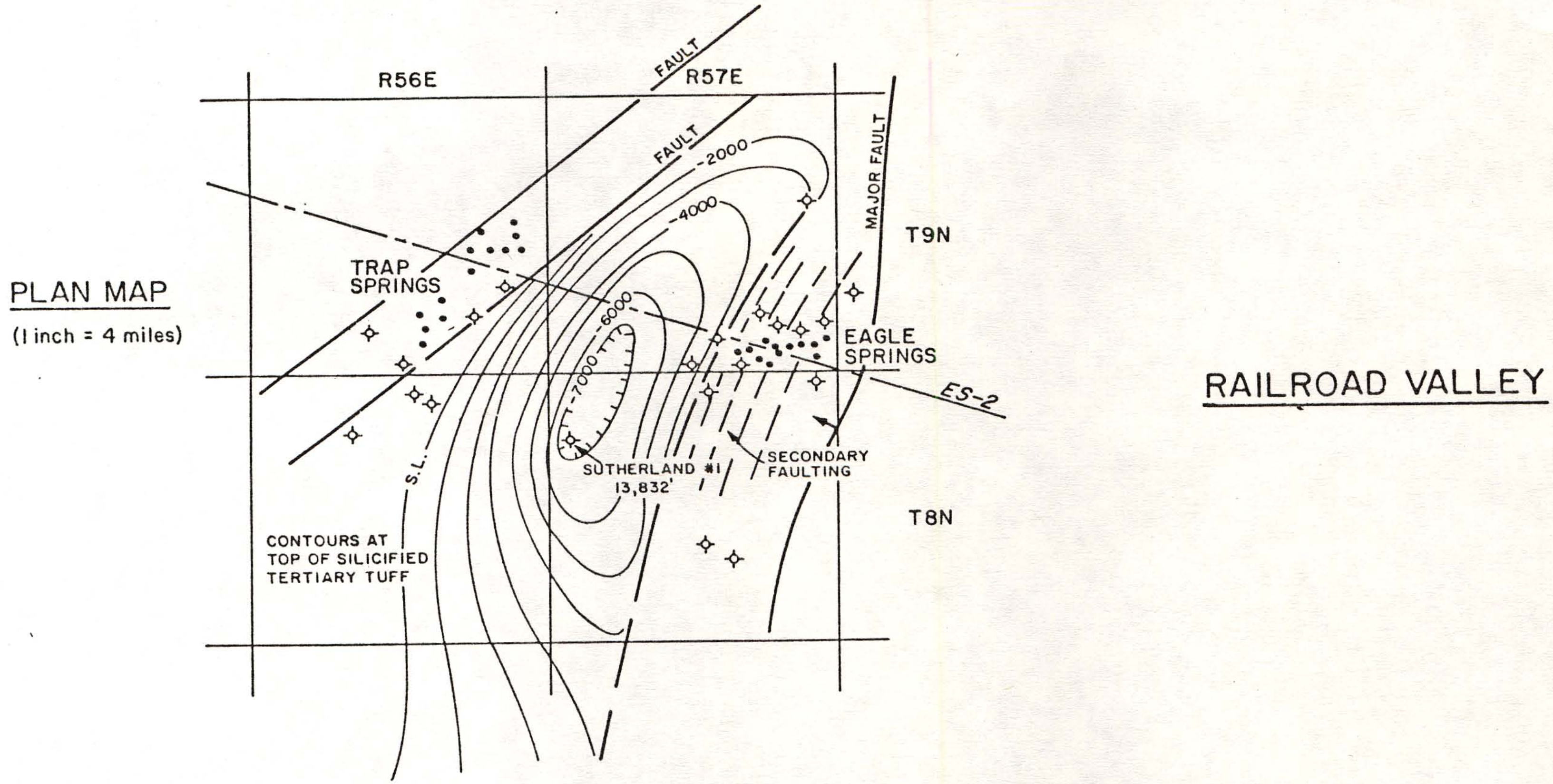
Figure 4 shows two geologic cross-sections through the Northern Carson Sink and the subject lands. The locations of these two sections are shown on Figure 1; this map also shows the structural contours in the basin. The Carson Sink area shows striking similarities to the oil producing Railroad Valley.

Carson Sink Area

Figure 1 is an index map showing the Fallon basin which is flanked on the east by the Dixie Valley graben. This figure shows the north Carson Sink with its 12,000 feet of Pleistocene-Tertiary stratigraphic section and controlling major faults. Carson Sink detail is from D. D. Hastings (1979), a product of reconnaissance-seismic and gravity surveys.

Sections CS-1 and CS-2 (Figure 4), 6.8 miles apart and crossing the Southern Pacific block, illustrate the relationships of Pleistocene lake fill, atop the Tertiary section and the basement Triassic-Jurassic complex. Details are from Hastings (1979) who, in turn, availed himself of earlier studies by Speed (1976) and Page (1965). Structural interpretation is by D. LeCount Evans.

FIGURE 3 GEOLOGIC PLAN MAP AND CROSS-SECTION THROUGH RAILROAD VALLEY OIL FIELD



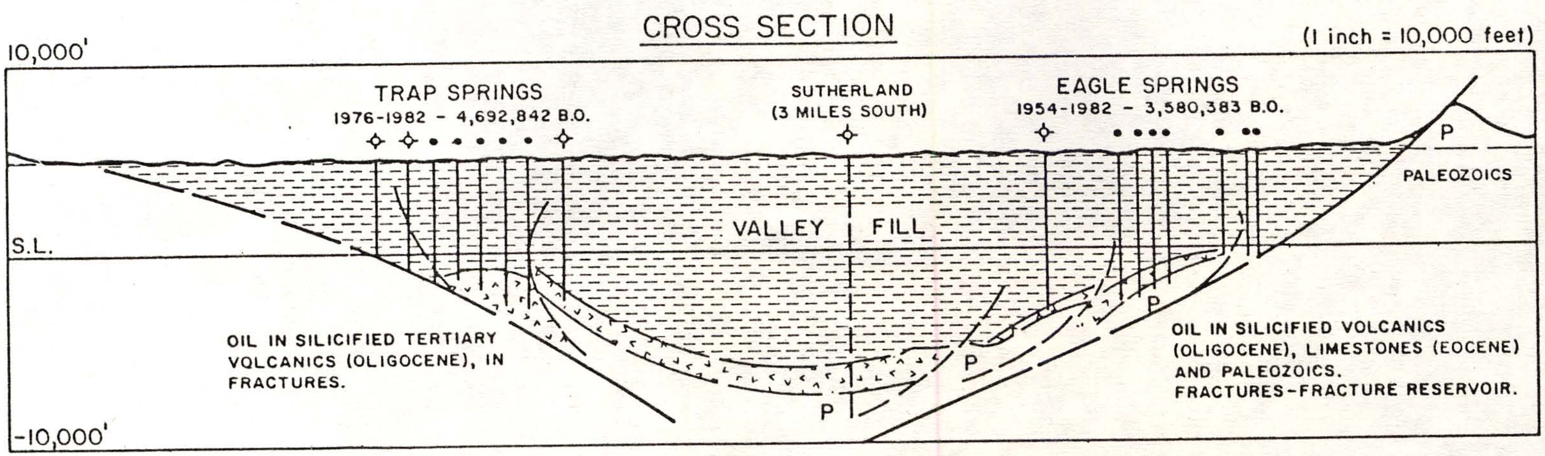
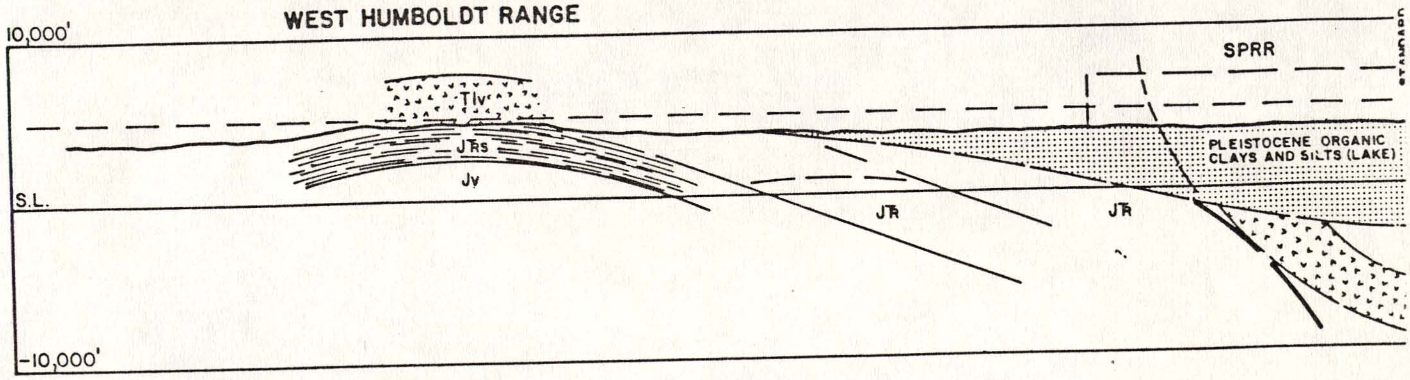
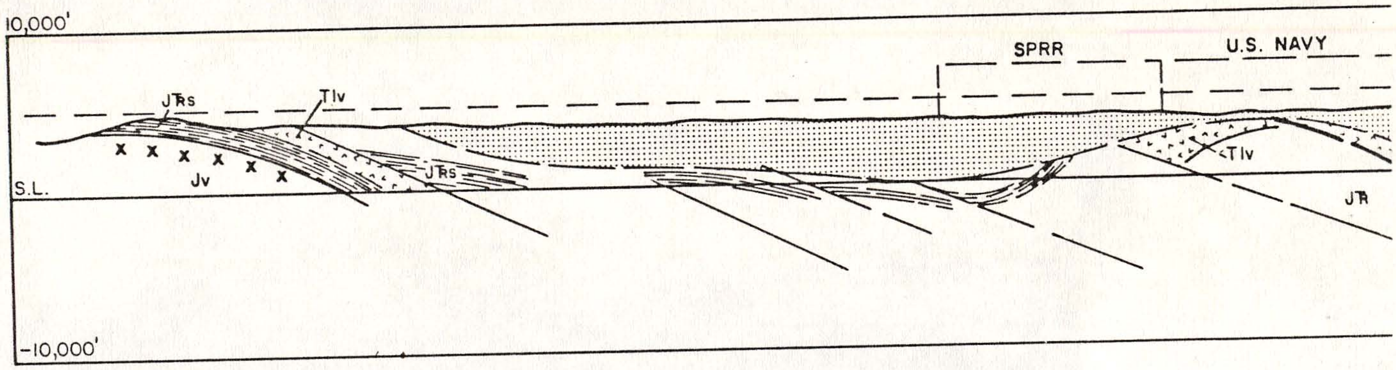


FIGURE 4   GEOLOGIC CROSS-SECTIONS THROUGH THE NORTHERN CARSON SINK

CARS(

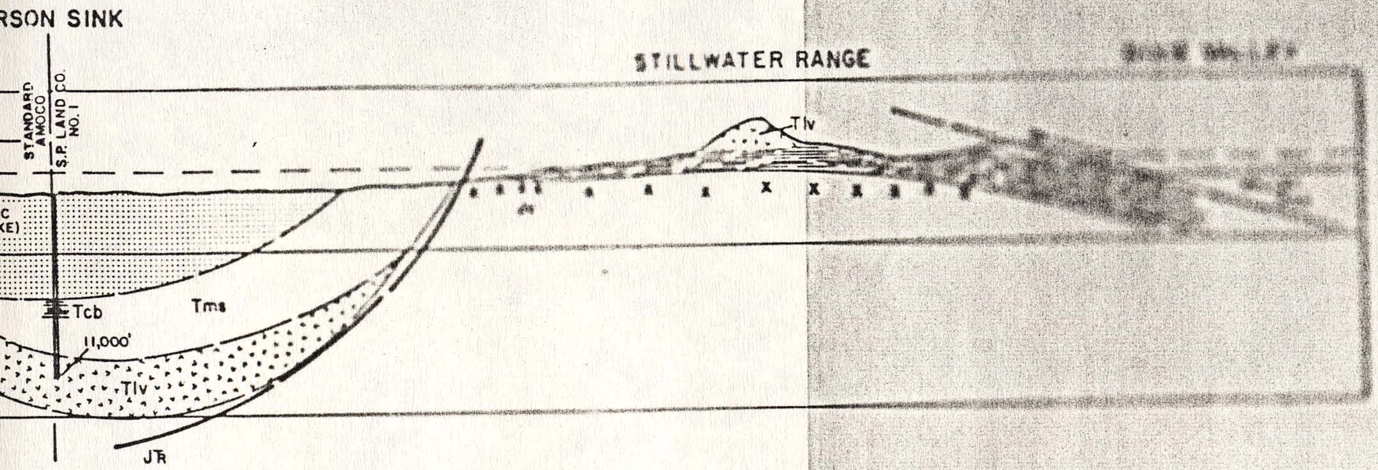


CROSS S

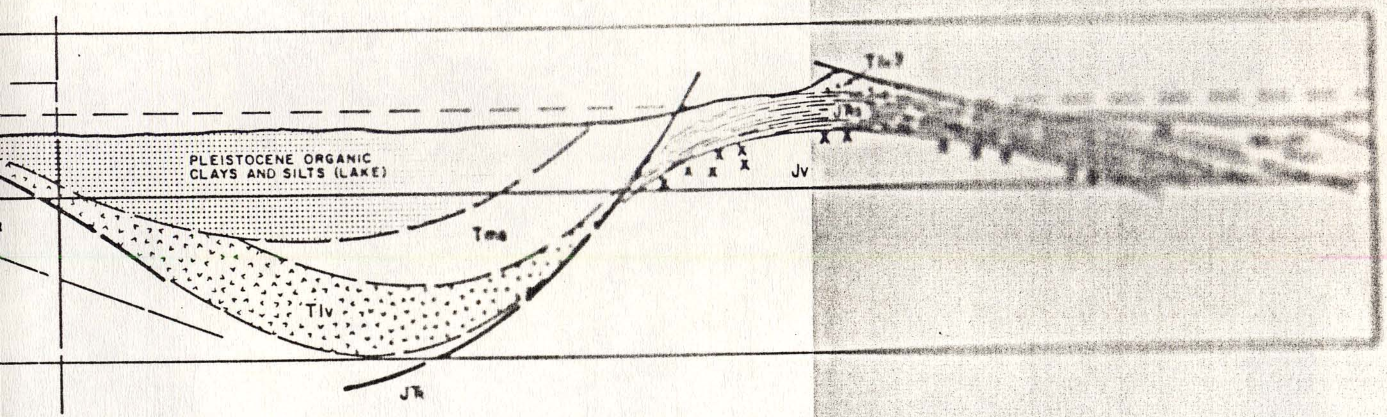


CROSS

Tcb	Tertiary 'capping basalt'
Tms	Tertiary non-marine middle sedimentary unit
Tlv	Tertiary lower volcanic unit
Jv	Jurassic intrusive gabbro and associated mafic extrusives
JTR / JTRs	Upper Triassic and Lower to Middle Jurassic, mainly marine sediments



S SECTION I



S SECTION 2

The Pleistocene section (stippled) consists of "highly organic playa-lake sediments." Reported were "strong methane shows in the drilling mud from 1,000 to 4,200 feet" and free oil in vugs in basalt from the Standard - Amoco test well (Hastings, 1979).

The Tertiary section starts with a capping basalt unit (TCB), which is followed by a middle, non-marine, sedimentary unit (TMS; Miocene) and a lower volcanic member at the base (TLV; Oligocene). TLV (check symbols) is described as consisting of calc-alkaline flows, tuffs and welded tuffs, with a thickness of 3,600 feet in the Stillwater Range area.

The pre-Tertiary basement units consist of Mesozoic-Triassic and Lower Jurassic metasediments (JTrS--closely spaced fine lines) and gabbro intrusives (JV x-symbols) probably subducted under the JTrS as ocean-plate. The JTrS, consisting of mudstones and siltstones has been deformed and experienced flat thrusting. Railroad Valley, on the other hand, is underlain and flanked by Paleozoic assemblages.

The partially-penetrated lower Tertiary section of massive siliceous volcanics (corresponding to ignimbrites in Railroad Valley) consists of dense volcanic flows, welded (silicified) tuffs, and plain ash which might offer some porosity, all of which should be fractured in areas close to major faulting.

Geothermal shows abound at Eagle Springs and Trap Springs in the Railroad Valley area. The anomalous heat flow may be important in creating petroleum from hydrocarbon bearing sediments. Plate 3 shows geothermal occurrences throughout the Fallon and Dixie basins. Possible source rocks for hydrocarbons in the Carson Sink area include the thick, highly organic rich Tertiary lacustrine section in the sink area, oil shales in the adjacent Stillwater Range or Paleozoic rocks at depth. Lincoln (1922) reports an occurrence in Cottonwood Canyon on the west side of Dixie Valley of oil shales, probably upper-Triassic mudstones as follows:

> "Oil shales occur in Cottonwood Canyon; surface material yields 6 gallons of oil per ton on distillation."

The Standard-Amoco S. P. Land Co. No. 1 "drilled to 11,000 feet as a stratigraphic test of the Tertiary section" (Hastings, 1975) was, certainly at the deepest part of the basin, away from any fracturing help. It resembles, in many ways, the Sutherland No. 1 (1971) drilled at the center of Railroad Valley and still in barren Tertiary volcanics at a total depth of 13,830 feet. Despite this deep dry hole, production occurs on both flanks of the basin.

Plan and sections suggest the possibilities of the "conventional" petroleum target, as expressed by the sharp basement high, under the Bombing Area (see U.S. Navy on Sections CS-2), and the "unconventional" trap possibility, so clearly developed in Railroad Valley. The former, even if available, would not be considered favorably. The latter, expressed by the closely spaced contours flanking the basin center, would merit testing on the Southern Pacific flank of the basin, as well as on the east side which is outside of the area of concern. Specifically, sections 19, 29, and 31 of Twp.24N. Rge.33E; sections 23, 25, and 35 of Twp.24N, Rge.32E, the N/2 and SW/4 of section 17, T23N., Rge33E, and sections 25 and 27, T23N, Rge.32E probably have the highest potential. The 8.75 sections represent 5,600 acres. All of the 19,429 acres of subject lands have considerable potential, however.

A precise present value for the oil and gas rights on the subject lands is difficult to obtain. We feel that the absolute minimum value of the oil and gas rights is the discounted value of the future returns from the oil and gas leases, assuming no oil was located. Plate 2 shows that virtually all areas surrounding the subject land have been leased for oil and gas. The current Federal lease rate is $1.00 per acre. As shown previously, this equates to a minimum present value of $10.00 per acre for the future stream of lease income. However, a reasonable possibility exists that a significant oil field may exist on the subject lands.

The probability that an oil field may exist on the subject lands should be considered, as this could very significantly affect the valuation of the oil and gas rights.

1. In our opinion, there is about a 5% probability of discovering one relatively small field, similar to the Trap Springs on the west side of the Railroad Valley basin.

(a) Trap Springs production covers 826 acres;

(b) Production to 1982 amounts to 4,692,842 barrels of oil and a reasonable guess suggests a final total of 6,000,000 barrels of oil;

(c) Recovery to date is 5,681 barrels of oil per acre. The 6,000,000 total increases the per acre recovery to 7,263 barrels of oil.

2. A recent (1978) deal in Dixie Valley provided the lessor with 3% of total production, which in this case, applied to the SP possibility would amount to 180,000 barrels of oil.

The value of a 3% production royalty to Southern Pacific, at current oil prices, is calculated as follows:

180,000 barrels x $29/barrel = $5.22 million

Assuming, pessimistically that the probability of locating this field is only 5%, the risk adjusted present value to Southern Pacific is $5.22 million x .05 = $261,000, which equates to about $13.43 per acre <u>premium</u> above the basic lease value of $20.00 per acre.

In summary, the minimum present value of the oil and gas rights on the subject land should be between $20.00 and $33.43 per acre.

From Proposal to S.P.

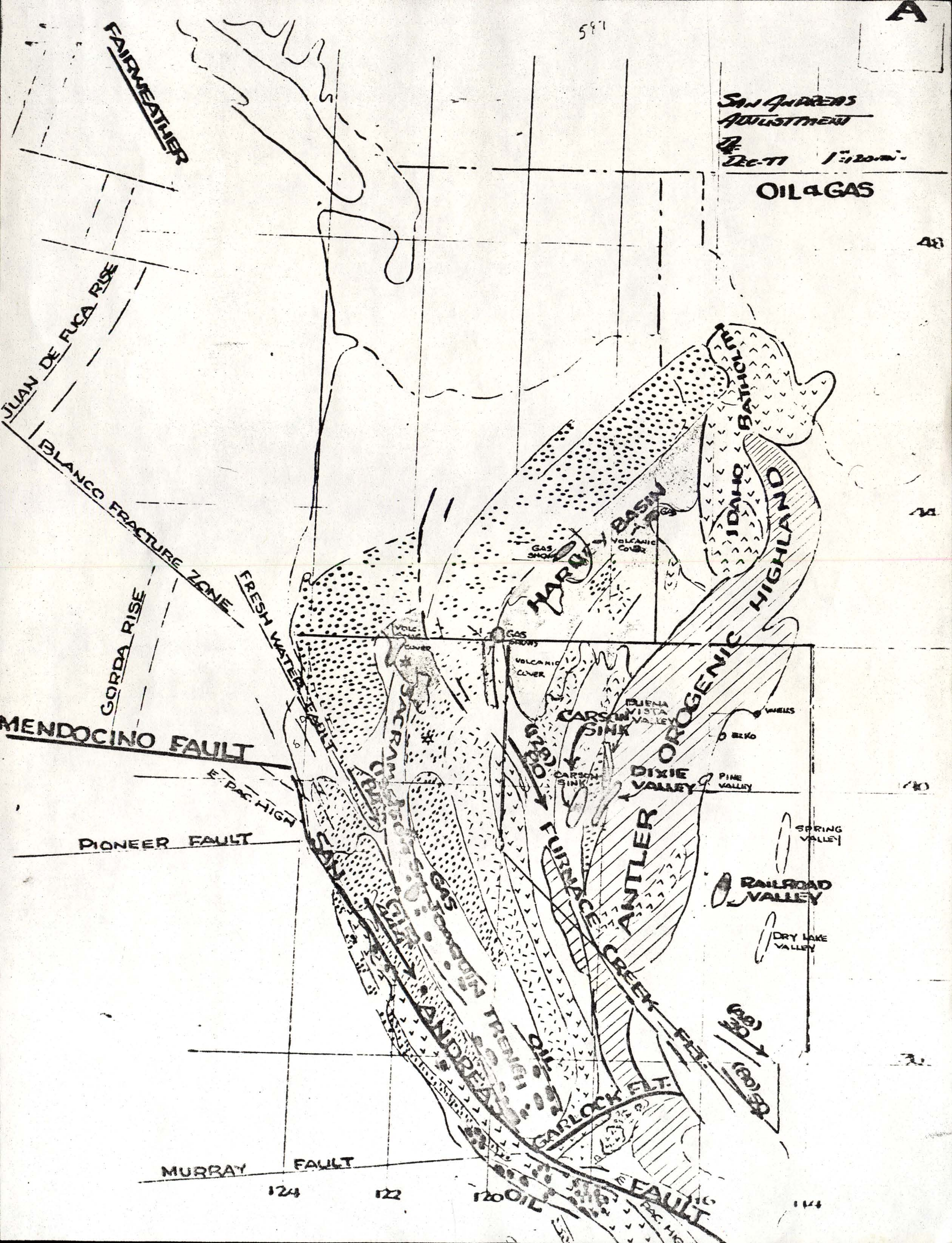
STATEMENT OF WORK

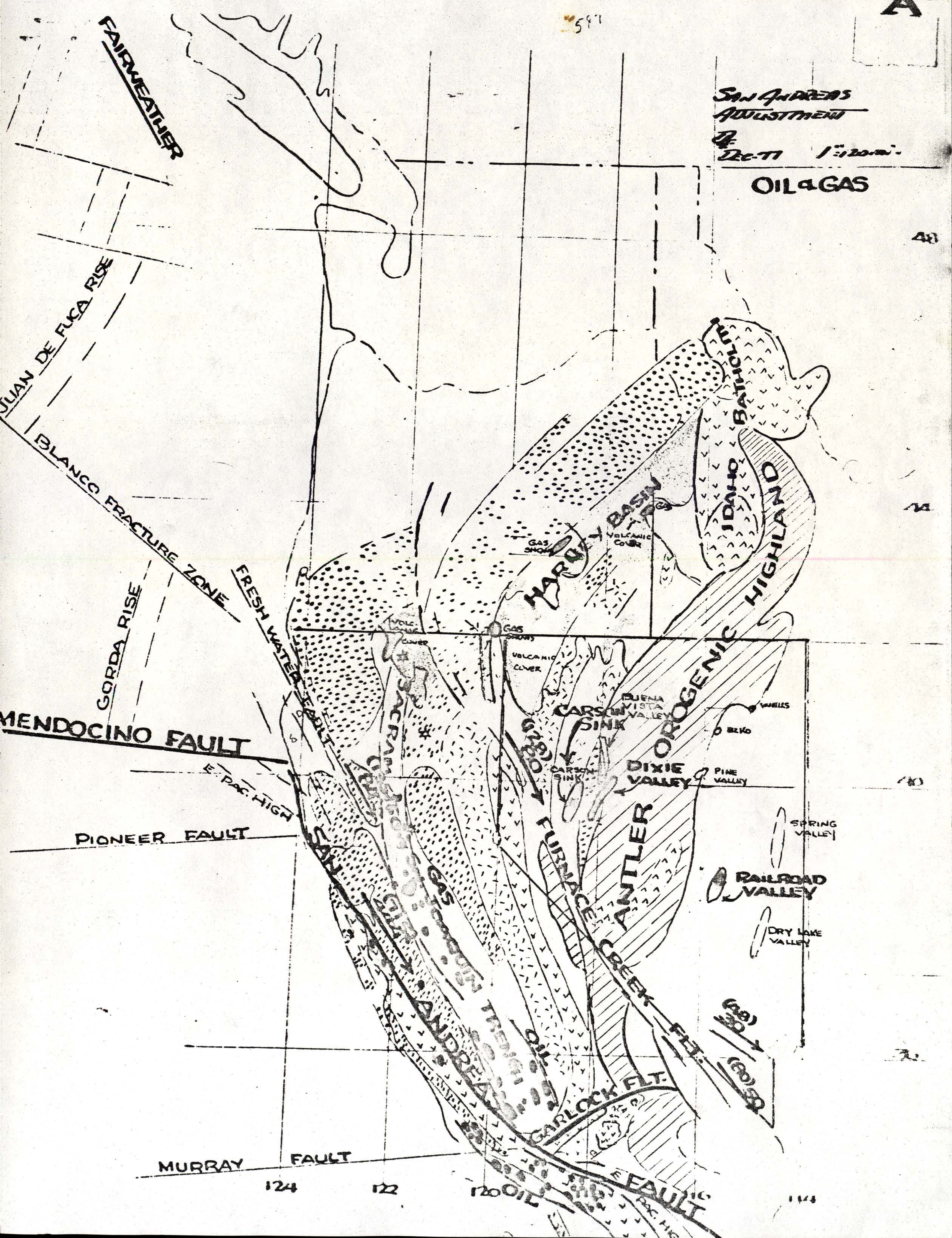
We are recommending a program that will furnish you with specialized mineral industry data on the potential of the Southern Pacific Land Company's lands in the law suit.

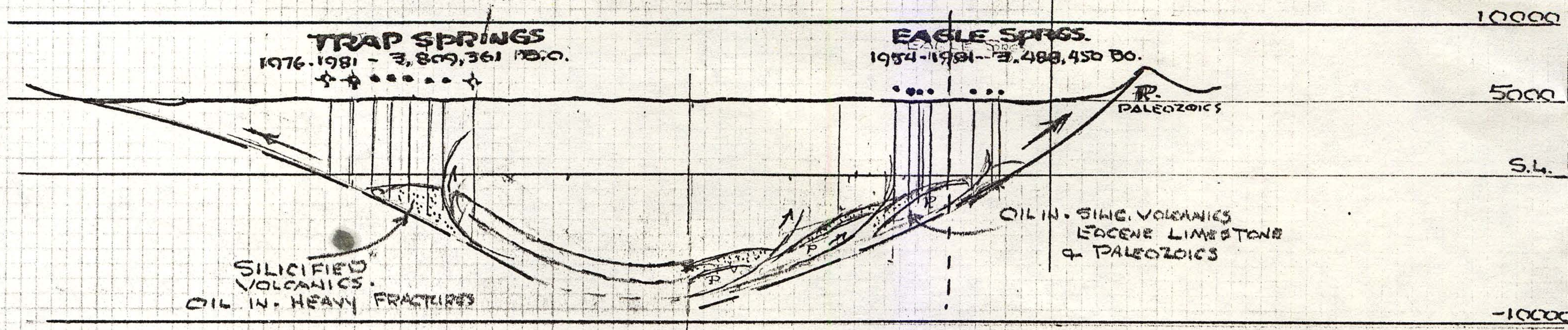
Whitney & Whitney, Inc. will do a study on the potential resource value of the Southern Pacific Land Company lands for the categories of saline minerals, geothermal application, oil and gas; and locateable minerals. The significance of the word "locateable" in the latter category is that rights to mineral entry on federal land are gained by leasing, and some by claim location. Generally, non-metallic minerals are leaseable and metallics, i.e. base metals and precious metals, are owned by overlaying the mineralized ground with mineral claims and recording the same in the county courthouse and with the Bureau of Land Management.

The potentials of each category will be defined as to the types of geological environments where the minerals are expected to be found, and with analogous examples of actual mineral deposits, geotherm, oil and gas wells. Two days time for the definitions will be allotted to each category. The saline minerals, geothermal, and locateable mineral potential will be described by Whitney & Whitney, Inc.'s senior geologist. The oil and gas potential will be defined by Mr. David LeCount Evans, an associate of Whitney & Whitney, Inc. Mr. Evans served on the State of Nevada's Oil and Gas Commission from 1970 to 1977. A copy of Mr. Evan's professional resume is enclosed.

Whitney & Whitney, Inc.'s senior geologist will make a one-day field trip to the site. The trip will be arranged by Southern Pacific Land Company. The data developed and testimony presented will be better qualified by the field trip.


A
587
SAN ANDREAS
ADJUSTMENT
DEC-77
1"=120mi
OIL & GAS
FAIRWEATHER
JUAN DE FUCA RISE
BLANCO FRACTURE ZONE
GORDA RISE
MENDOCINO FAULT
FRESH WATER FAULT
E. PAC. HIGH
PIONEER FAULT
MURRAY FAULT
HARNEY BASIN
GAS SHOW
VOLCANIC COVER
GAS SHOWS
IDAHO BATHOLITH
ANTLER OROGENIC HIGHLAND
CARSON SINK
BUENA VISTA VALLEY
DIXIE VALLEY
PINE VALLEY
ELKO
WELLS
SPRING VALLEY
RAILROAD VALLEY
DRY LAKE VALLEY
SACRAMENTO BASIN
SAN JOAQUIN TRENCH
GAS
OIL
SAN ANDREAS FAULT
FURNACE CREEK FLT.
GARLOCK FLT.
48
44
40
36
124
122
120
116
114

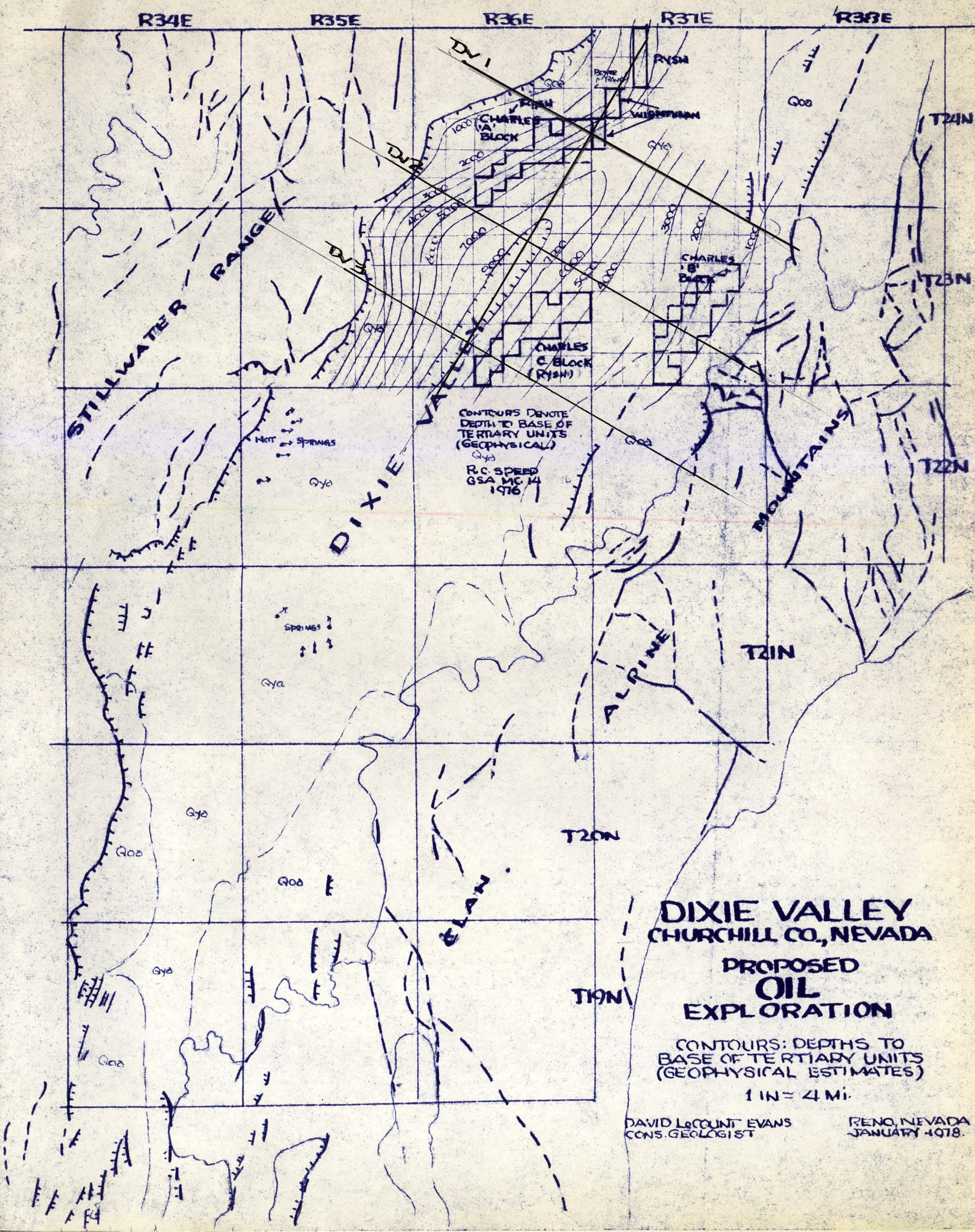

A
OIL & GAS
FAIRWEATHER
JUAN DE FUCA RISE
BLANCO FRACTURE ZONE
GORDA RISE
FRESH WATER FAULT
MENDOCINO FAULT
E. PAC. HIGH
PIONEER FAULT
MURRAY FAULT
SAN ANDREAS FAULT
GARLOCK FLT.
FURNACE CREEK FLT.
ANTLER OROGENIC HIGHLAND
IDAHO BATHOLITH
HARNEY BASIN
GAS SHOW
VOLCANIC COVER
GAS SHOWS
CARSON SINK
BUENA VISTA VALLEY
DIXIE VALLEY
PINE VALLEY
ELKO
SPRING VALLEY
RAILROAD VALLEY
DRY LAKE VALLEY
GAS
OIL
48
44
40
124
122
120
116



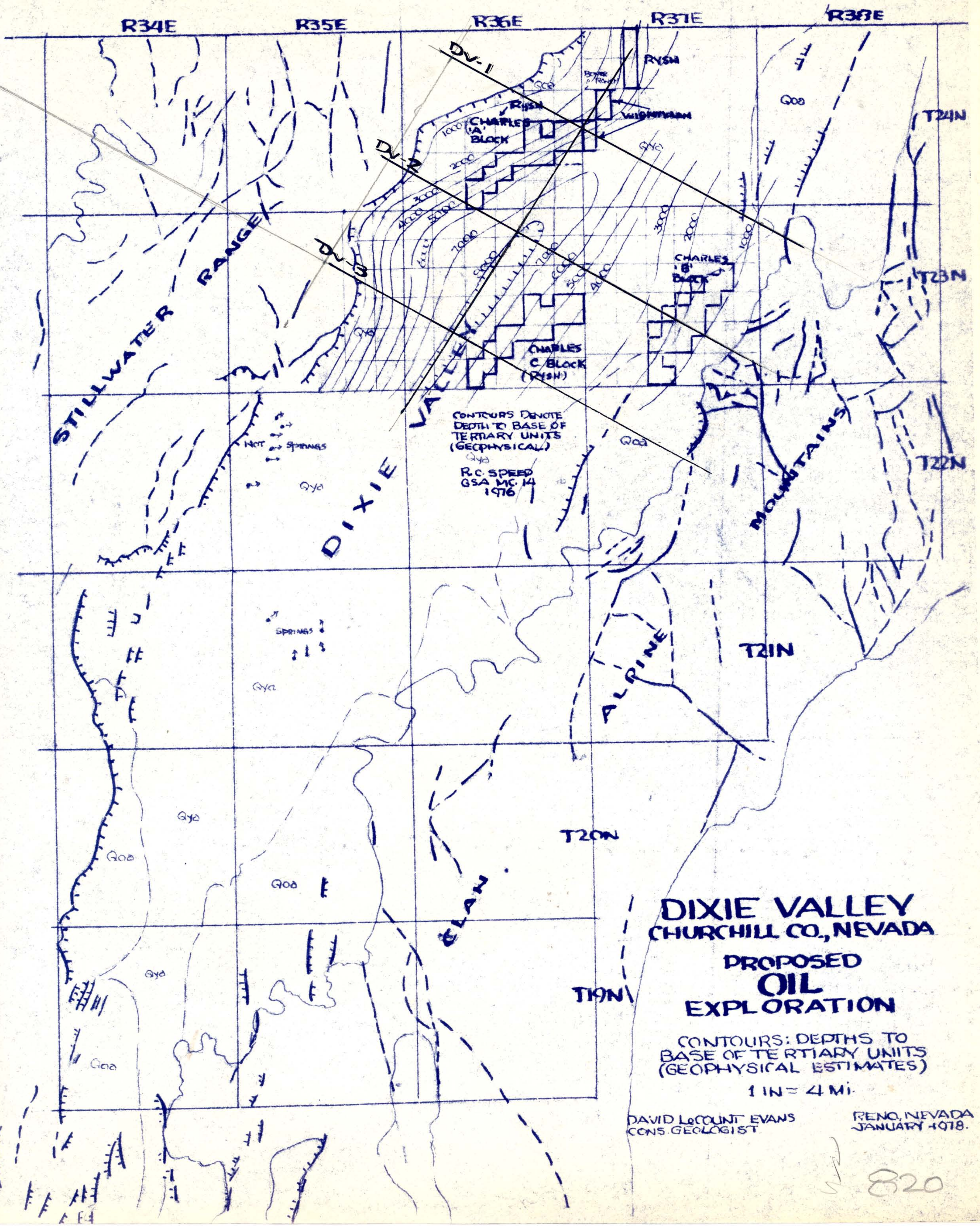
RAILROAD VALLEY
CROSS SECTION
1" = 10000'

JULY. 1981

C

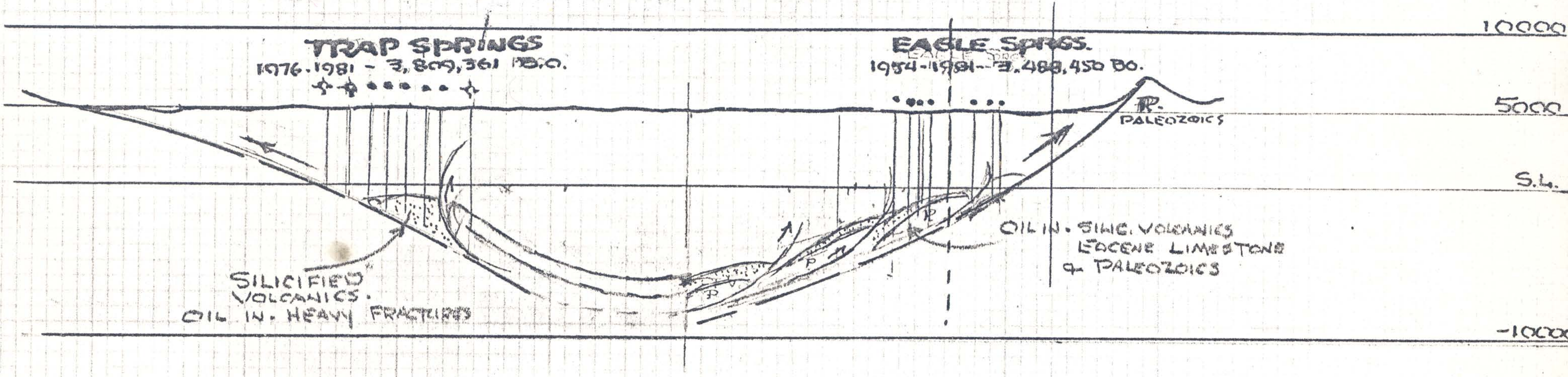

R34E
R35E
R36E
R37E
R38E
T24N
T23N
T22N
T21N
T20N
T19N
DV 1
DV 2
DV 3
RYSH
BOYER RANCH
WIGHTMAN
CHARLES 'A' BLOCK
CHARLES 'B' BLOCK
CHARLES C BLOCK (RYSH)
1000
2000
3000
4000
5000
6000
7000
8000
STILLWATER RANGE
DIXIE VALLEY
MOUNTAINS
ALPINE
CLAN
HOT SPRINGS
SPRINGS
Qoa
Qya
CONTOURS DENOTE DEPTH TO BASE OF TERTIARY UNITS (GEOPHYSICAL)
R.C. SPEED GSA MC 14 1976
DIXIE VALLEY
CHURCHILL CO., NEVADA
PROPOSED
OIL
EXPLORATION
CONTOURS: DEPTHS TO BASE OF TERTIARY UNITS (GEOPHYSICAL ESTIMATES)
1 IN = 4 Mi.
DAVID LeCOUNT EVANS
CONS. GEOLOGIST
RENO, NEVADA
JANUARY 1978.

C



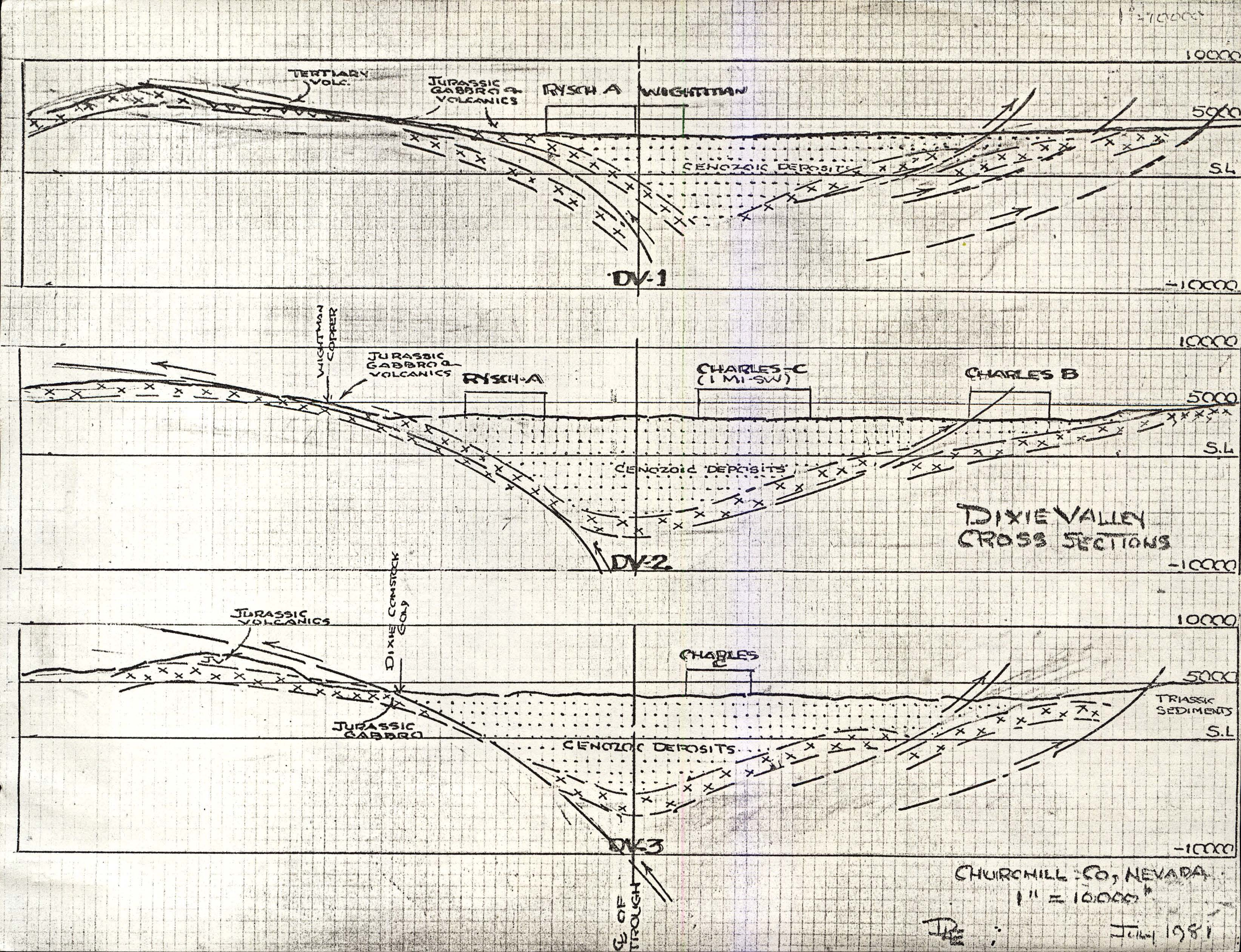
R34E
R35E
R36E
R37E
R38E
T24N
T23N
T22N
T21N
T20N
T19N
DV-1
DV-2
DV-3
RYSH
WIDHIMANN
CHARLES 'A' BLOCK
CHARLES 'B' BLOCK
CHARLES C BLOCK (RYSH)
STILLWATER RANGE
DIXIE VALLEY
MOUNTAINS
ALPINE
CLAN
HOT SPRINGS
SPRINGS
CONTOURS DENOTE DEPTH TO BASE OF TERTIARY UNITS (GEOPHYSICAL)
R.C. SPEED GSA MC. 14 1976
Qya
Qoa
DIXIE VALLEY
CHURCHILL CO., NEVADA
PROPOSED
OIL
EXPLORATION
CONTOURS: DEPTHS TO BASE OF TERTIARY UNITS (GEOPHYSICAL ESTIMATES)
1 IN = 4 Mi.
DAVID LeCOUNT EVANS
CONS. GEOLOGIST
RENO, NEVADA
JANUARY 1978.

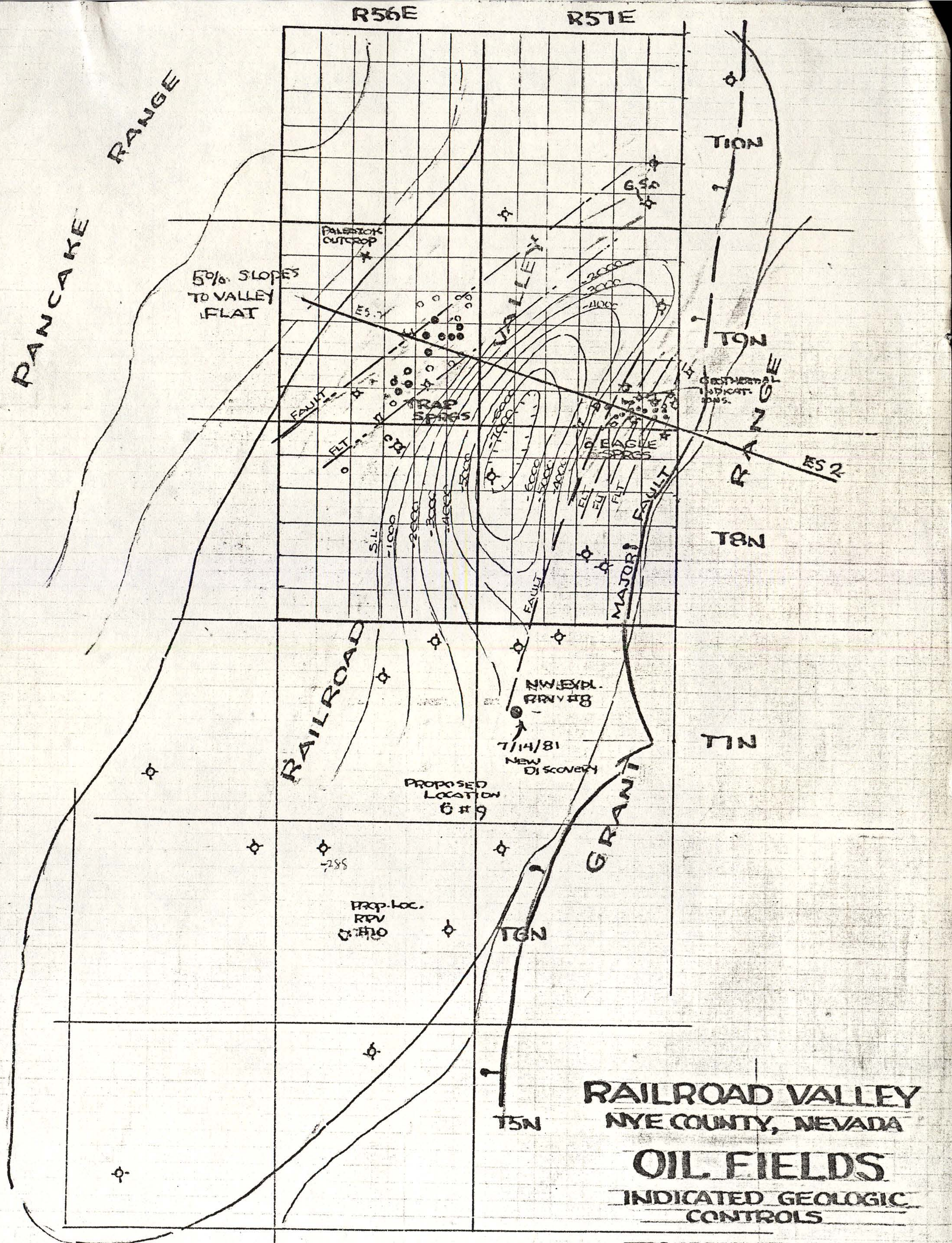
820



RAILROAD VALLEY
CROSS SECTION
1" = 10000'

JULY 1981


1" = 10000'
10000
5000
S.L.
-10000
TERTIARY VOLC.
JURASSIC GABBRO & VOLCANICS
RYSCH A
WIGHTMAN
CENOZOIC DEPOSITS
DV-1
WIGHTMAN COPPER
RYSCH-A
CHARLES-C (1 MI-SW)
CHARLES B
DV-2
DIXIE VALLEY CROSS SECTIONS
JURASSIC VOLCANICS
JV
DIXIE COMSTOCK GOLD
CHARLES C
TRIASSIC SEDIMENTS
JURASSIC GABBRO
DV-3
℄ OF TROUGH
CHURCHILL CO, NEVADA
1" = 10,000'
JULY 1981



RAILROAD VALLEY
NYE COUNTY, NEVADA
OIL FIELDS
INDICATED GEOLOGIC CONTROLS

CONTOURS AT TOP OF SILICIFIED VOLCANICS

1 IN = 4 Mi

DAVID LeCOUNT EVANS
CONS. GEOLOGIST

RENO, NEVADA
JANUARY 1978
July - 1981

July 13, 1981

Dear Theo and Bob:

I have been playing around, making cross sections of Dixie Valley and bringing up to date the old section for Railroad Valley; thought you might like to have copies for your oil files.

Certainly in some ways there is a similarity. Dimensions are about the same, although indicated depth of the center of the trough is greater for Railroad Valley; on the other hand the basin configuration is by geophysivs, and the same survey was two to three ~~hundred~~ thousand feet shallower than the actual depth as determined by a Standard oil wildcat hole, drilled a few years ago at the north end of the Carson Sink. So Dixie may be slightly deeper if the same error can be applied.

Note that both valleys are bounded by over-thrust faults, the fault on the west side dipping to the east, and the series of faults on the east side dipping towards the west. Dixie Valley, by someone's calculation is spreading; no one has come up with that dream for Railroad Valley.

As for the underlying formations, Dixie is without doubt underlain by the Jurassic Gabbro (and possibly) Jurassic volcanics which dominate in the Stillwater range. Similar, (but younger) Upper Jurasic-Cretaceous ocean-plate material underlies the Sacramento-San Joaquin Valley of California, not because of faulting, but because of the basin at the start of a sub-duction zone. Railroad Valley is underlain by Paleozoic formations of some sort.

The Railroad valley or trough is filled with a great thickness of very recent valley-fill, covering Miocene volcanics, Eocene limestone and probably nothing else. Dixie, if we are lucky, under valley fill, willpossibly have pliocene and Miocene sedimentsmas potential reservoir material.

Note the blocks which are on plan and sections. I am not sure of any arrangements you might have had with Ben were for real or not. Was it each to a solid block or were you each taking an half interest in the two blocks, shown as A and C?

No word from either Chevron or Freeport; I am going down to Yerrington for three days, leaving Saturday. If any word comes thru I will call.

Our best, Taffy.

July 13, 1981

Dear Ben:

I have been playing around , making cross sections of Dixie Valley and bringing up to date the old section for Railroad Valley; thought you might like a set for your oil files.

Certainly in some ways there is a similarity; Dimensions are about the same, although indicated depth at the center of the trough is greater for Railroad Valley; on the other hand, the basin configuration for Dixie is by geophysics and the same survey was two to three thousand feet shallower than the actual depth determined by a Standard Oil wildcat hole, drilled a few years ago at the north end of the Carson sink. So Dixie may be slightly deeper if the same error is applied.

Note that both valleys are bounded by over-thrust faults, the fault on the west side dipping to the east, and the series of faults on the east side dipping to the west.

As for the underlying formations, Dixie, without doubt, underlain by the Jurassic gabbro and, possibly, Jurassic volcanics which dominate the Stillwater Range, and are also a part of the Clan Alpine range on the east. Similar, but younger, ocean plate (Upper Jurassic-Cretaceous) underlies California's Great Valley, but not because of faulting but because of the inner-arc basin at the start of the subduction zone moving under the Sierra. Railroad Valley is underlain by Paleozoics of some sort.

The Railroad Valley trough is filled with a great thickness of recent valley fill (rubble) lying atop Miocene volcanics, Eocene limestone, and perhaps Paleozoic limes, all of which have provided oil in the Eagle Springs field. Dixie, if we are fortunate, will have, beneath valley rubble, Pliocene and Miocene sedimentaries as potentialmreservoir material.

Note the blocks on Dixie plan and sections. I am not sure what the arrangements were with Bob Rysch (after my error and the adding of another block to the picture to make up for it). We all were pleased when Bob moved in and applied for the additional Block ("A" on exhibits. Did this make a Rysch Block A and a Charles Block C, or were you both taking an half interest in the two resulting blocks. I have posed the same question to Rysch?

After many delays, I am returning to Yerrington on Saturday to complete the sampling and mapping on the Tertiary channel. The copper program has been submitted both to Chevron and Freeport, and reactions are awaited.

Best to you and Jibba.

Taffy.

July 14, 1981

Ben:

Yesterday's letter must be up-dated.

The attached Xerox deals with Northwestern Exploration's new discovery. Position is shown on the included map of Railroad Valley; note, too, the other future locations to the southwest of Railroad Valley #8.

Obvious seems to be the fact that Northwest has extended the Eagle Springs trend down the east margin of Railroad Valley. Sometime ago it was becoming apparent that Northwest was running out of locations in the Trap Springs field; they had been drilling 160 acre locations, which was granted them by the Commission, despite the fact that all others were preaching 40 acre locations, which had proved to be in order for Eagle Springs, and which would probably double the oil to be recovered.

As a result, Northwest has been going to wildcat drilling, and after a number of dry ones, has finally come up with a discovery.

The result should be to stimulate others. At least, I hope so, and may Amoco get off its duff.

T