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HISTORICAL REVIEW OF URANIUM-VANADIUM IN THE EASTERN CARRIZO MOUNTAINS, SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA

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PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado

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Resource Division

HISTORICAL REVIEW OF URANIUM-VANADIUM PRODUCTION
IN THE EASTERN CARRIZO MOUNTAINS, SAN JUAN COUNTY,
NEW MEXICO AND APACHE COUNTY, ARIZONA

By

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With

Production Statistics

Compiled By

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March 1980

Grand Junction, Colorado

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HISTORICAL REVIEW OF URANIUM-VANADIUM PRODUCTION IN
THE EASTERN CARRIZO MOUNTAINS, SAN JUAN COUNTY
NEW MEXICO AND APACHE COUNTY, ARIZONA

Introduction

This report is a brief review of the uranium and/or vanadium mining in the eastern Carrizo Mountains, San Juan County, New Mexico and Apache County, Arizona. It was prepared at the request of the Navajo Tribe, the New Mexico Energy and Minerals Department, and the Arizona Bureau of Geology and Mineral Technology.

As this report deals only with historical production data, the reader is referred to reports by Blagbrough and Brown (1955), Masters and others (1955), and Stokes (1951, 1954) for descriptions of the geology and ore deposits. Figure 1 shows the locations of the mines and the production is summarized in Table 1 and Figure 2.

A separate report (Chenoweth and Learned, 1980) covers the production history of the northern and western Carrizo Mountains.

Early Prospecting

Outcrops containing uranium/vanadium minerals in the Carrizo Mountains were discovered by John Wade of Sweetwater, Arizona, about 1918. By 1920, Wade, operating as the Carriso Uranium Company, had leased 41 claims astride the New Mexico-Arizona state line in the vicinity of Milepost 16.

In April 1921 the area was examined by W. H. Staver, a consulting mining engineer. He estimated that 2,900 tons of probable ore could be

developed at the property and 37 sacks of high-grade ore were stored at Beclabito Trading Post (Staver, 1921). The sacked material was later shipped to Colorado for its radium content. This would constitute the first shipment of uraniferous material from the Carrizo Mountains. Also, the vanadium market Wade had anticipated never developed as there was little demand for domestic vanadium due to imports from Peru. As a result, the Carrizos remained inactive until the early 1940s.

Vanadium Mining

Due to the uncertainty of foreign supplies and the need for vanadium for war armaments, the federal government formed the Metals Reserve Company in 1942. The company began an ore-purchasing program and increased the base price paid for vanadium ore. Mills at Monticello, Utah and Durango, Colorado were built and operated for Metals Reserve by Vanadium Corporation of America (VCA) and U.S. Vanadium Corporation (USV), respectively. The Metals Reserve's program was the stimulus to revive mining in the Carrizos.

Early in 1942 Curran Brothers and Wade (CB&W), of Farmington, New Mexico, obtained a prospecting lease from the U.S. Indian Service, Navajo Agency, covering 168 square miles in the Carrizo Mountains. Excluded from the lease were plots (claims) already, or in the process of being, leased by VCA. In the eastern Carrizo Mountains, CB&W selected two plots, Syracuse and Valley View, for mining. These plots were located in Arizona west of Milepost 16 and covered the most favorable area previously developed by the Carrizo Uranium Company.

On July 14, 1942, VCA finalized Navajo lease 1-149-IND-5705 with the U.S. Indian Service, for 12 plots in the eastern Carrizo Mountains. Total

acreage contained in this lease was 436.79 acres. Six of the plots were located on King Tutt Mesa, two near Oak Springs, and four near Milepost 16. Three of the plots near Milepost 16 (9, 11, and 12) covered the remainder of the area previously developed by the Carriso Uranium Company. Lease 1-149-IND-5705 commonly was referred to as the "East Reservation Lease" by VCA.

During the summer of 1942, Wade, Curran and Company began mining on the Syracuse plot and made the first shipment of vanadium ore from the Carrizo Mountains. Production continued until early 1944 (Wade, John, 1955, personal communication). VCA prospected its plots in the eastern Carrizo Mountains and produced a small amount of ore during 1943 and 1944. Ore mined by Wade, Curran and Company was shipped by truck and rail to the Metals Reserve's mill at Durango, Colorado and that by VCA was trucked to the mill at Monticello, Utah.

The Metals Reserve's program terminated in March 1944, at which time all vanadium mining ceased in the Carrizo Mountains.

Manhattan Engineer District Studies

To evaluate the uranium resources of the Salt Wash Member of the Morrison Formation of the Colorado Plateau, the Army Corps of Engineers, as part of the Manhattan Project, contracted with Union Carbide and Carbon Corporation to create a raw-materials appraisal group. This group, known as Union Mines Development Corporation (UMDC) was formed in 1943 and was active through 1946.

Geologic studies for the eastern Carrizo Mountains are contained in a report by Coleman (1944). All of the known outcrops of uranium/vanadium minerals, prospects, and mines were mapped and described by UMDC geologists.

The UMDC geologists mapped the Syracuse Mine of CB&W and described small adits on VCA's Plots 9 and 12, five small open pits and an adit on Plot 7, two open cuts and an adit on Plot 3, and a small adit on Plot 1. Although the eastern Carrizo Mountains were reputed to have produced 12,000 tons of ore, UMDC geologists (Coleman, 1944) estimated the 1942-1944 production was 1,500 tons averaging 0.27 percent U_3O_8 and 3.00 percent V_2O_5 , with the majority having come from the Syracuse Mine. Much of this uranium was recovered by reprocessing the vanadium tailings at Durango under the Manhattan Project.

As part of their investigations, UMDC geologists recommended areas that should be acquired by the Federal government for the development of uranium resources. In the Carrizo Mountains, UMDC selected 12 plots from the CB&W exploration lease. The acquisition was finalized as Navajo lease 1-149-IND-6197 dated February 22, 1944. Total acreage included in these 12 plots was 959.7 acres. The Syracuse and Valley View plots were not acquired by UMDC due to the 960-acre limitation on total land that could be held by one organization. This was in spite of the fact that Coleman (1944, p. 20) considered the Syracuse property to be the best prospect for developing reserves in the area.

Uranium Mining

The Atomic Energy Commission (AEC) was created in 1947, and began a raw materials procurement program on the Colorado Plateau. In May 1947, the first domestic contract for the purchase of uranium concentrates was signed with VCA at Naturita, Colorado. As a result, VCA began prospecting and mining on their East Reservation Lease. In April 1948, shipments began from the

lease, mainly Plot 3 (Edwards, Page, 1955, personal communication).

Production in 1948 amounted to 1,303 tons containing 7,614 pounds U_3O_8 (Fig. 2).

In February 1949, the AEC signed a contract with VCA to purchase concentrates produced by the company's mill at Durango, Colorado. The re-opening of the Durango mill resulted in a shorter haulage for the mines in the Carrizo Mountains.

Production increased in 1949 with mining expanding on the East Reservation Lease mainly on Plot 3 but also on Plots 1, 2, 4, 6 through 9, 11, and 12. It was not until mid-1950 that VCA differentiated the numbers of the individual plots on ore receipts to the AEC. Hence, the exact source of the 6,758 tons containing 29,786 pounds U_3O_8 listed as East Reservation Lease (Table 1) cannot be determined. Also in 1949, Cato Sells made initial shipments from mineralized outcrops near Oak Springs, Arizona.

During 1950, VCA's operations continued to expand on Plot 3. Also, numerous small non-VCA operations commenced throughout the eastern Carrizo Mountains. Among the properties that contributed significantly to the year's production were Cato Sells' Upper Canyon Mine, Nakai Chee Begay's Red Wash Mine, and Hosteen S. Begay's Canyon View Mine. During this year, production reached a peak of 5,080 tons of ore containing 27,511 pounds U_3O_8 (Fig. 2). Of the total uranium, 65 percent came from the East Reservation Lease. The 1950 production represented the all-time yearly record for uranium produced in the eastern Carrizos.

After reaching a peak in 1950, production declined to a low of 1,504 tons of ore containing 8,718 pounds U_3O_8 in 1952 (Fig. 2). This decline

was largely due to the fact that all of the exposed ore in outcrops and in the old mines was depleted and no exploration had occurred.

In January 1952, the AEC opened an ore-buying station at Shiprock, New Mexico. This station provided a nearby market for independent producers in the Four Corners area. Also, during the first half of 1952, the AEC conducted an extensive exploration drilling project throughout the eastern Carrizos. This drilling project discovered ore on King Tutt Mesa and in the Oak Springs area (Masters and others, 1955).

In 1953, mining commenced at the Begay No. 1 Mine, which was discovered by AEC drilling, and increased on Plot 3 where AEC and VCA drilling discovered additional ore. Mining resumed at the old Syracuse Mine and was renamed the RF&R Mine. During the spring and summer of 1953, the AEC conducted two more drilling projects in the eastern Carrizos. These drilling projects discovered several small orebodies and the extension of others on Plot 3 and in the Oak Springs and Syracuse Mine areas (Blagbrough and Brown, 1955).

During 1954, sustained production began at Cato Sells' Oak Springs Mine and at VCA's Plot 7. Late in 1954 the new Kerr-McGee mill at Shiprock, New Mexico began operating and purchasing ore from independent producers. The AEC buying station was closed.

Production from VCA's Plot 10 Mine and Texas Mining Company's Tent Mine and Begay Incline began in 1955. Ore production during that year was 4,481 tons containing 23,592 pounds U_3O_8 ; the second highest year for the eastern Carrizos (Fig. 2).

After reaching a peak in 1955, production gradually declined to a low in 1961 when only 324 tons of ore containing 1,446 pounds U_3O_8 were produced (Fig. 2). The depletion of the known orebodies resulted in this decline. The anomaly in the declining trend seen in 1960 (Fig. 2) was due to production from the new Lookout Point Incline on Plot 3.

Production in 1962 increased to 1,933 tons containing 8.124 pounds U_3O_8 (Fig. 2) as mining commenced at the Begay No. 2 Mine which had been developed in the vicinity of earlier AEC ore holes.

In March 1963, VCA closed its Durango mill and acquired the Kerr-McGee mill at Shiprock. In the eastern Carrizos, material which was previously considered uneconomical because of the long haulage to Durango could now be mined.

After reaching a small peak in 1962, production gradually declined to a low of 344 tons containing 1,363 pounds U_3O_8 in 1965 (Fig. 2). This drop occurred because the Begay No. 2 Mine was being depleted and other small operations were running out of ore.

The discovery of some additional ore at the Begay No. 2 boosted the 1966 production to 964 tons containing 4,215 pounds U_3O_8 (Fig. 2). In a final clean-up effort in 1967, VCA produced 740 tons of ore containing 2,089 pounds U_3O_8 (Fig. 2) from the Begay 1, Begay 2, and Nelson Point Mines. The final shipment was made in August 1967.

Summary

Forty-seven properties in the eastern Carrizo Mountains have produced 46,523 tons of ore containing 217,950 pounds U_3O_8 and averaging 0.23 percent U_3O_8 since 1948. In addition, these ores contained 2,262,284 pounds V_2O_5

averaging 2.43 percent V_2O_5 . It is interesting to note that 112,354 pounds U_3O_8 or 52 percent of the total uranium produced in the eastern Carrizo Mountains came from VCA's East Reservation Lease; lands that were acquired in 1942 for vanadium. Six plots of this lease were located on King Tutt Mesa, an area of 1.4 square miles. Production from these plots plus the other mines on the mesa totaled approximately 127,100 pounds U_3O_8 or 58 percent of the region's total. On King Tutt Mesa, Plot 3, containing 145 acres, produced at least 72,400 pounds, or 33 percent of the total uranium produced in the eastern Carrizos.

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TABLE 1
Details of Uranium/Vanadium Production in the Eastern Carrizo Mountains,
San Juan County, New Mexico and Apache County, Arizona

Index No.	Mine Name	Tons Ore	Pounds U_3O_8	% U_3O_8	Pounds V_2O_5	% V_2O_5	Periods of Production/ Operator(s)
59.	Harvey Begay 3	21	49	0.12	860	2.05	1956- Troy Rose Mining Co.
60.	Tony Tuc	407	1,379	0.17	26,074	3.20	1953- Charles Ashcroft; 1956-57- Titan Uranium Corp.; 1962- W.D. Tripp; 1966- Sam Harvey
61.	Upper Red Canyon	26	134	0.26	1,695	3.26	1950,1951- Tony Garnonez
62.	King 6	54	114	0.11	773	0.72	1955,1957-Troy Rose Mining Co
63.	Barton & Begay (Beclabito Lease)	254	740	0.15	11,311	2.23	1950- Barton and Begay; 1950-51 Lewis Barton; 1953- Caylor & Neeley
64.	Rocky Flats 1,2 (Rocky 1,2)	698	2,214	0.16	34,154	2.45	1950-52- Barton and Lee; 1953,55- Barrett Smith Mining Co.
65.	Canyon 1	97	206	0.11	3,974	2.05	1951,1953- Pete Atcitty
66.	John John 1	25	97	0.19	1,392	2.78	1955- John John
67.	King 2	557	1,761	0.16	31,424	2.82	1950-54- Jimmie King
68.	Cottonwood Butte (Plot 8)	----- 250	----- 1,245	----- 0.25	----- 15,013	----- 3.00	1949-VCA 1950, 1954-VCA 1951 Alfred Nelson
69.	Lone Star (Plot 9)	-----	-----	-----	-----	-----	1943,1949-VCA

Table 1 (cont)

Index No.	Mine Name	Tons Ore	Pounds U ₃ O ₈	% U ₃ O ₈	Pounds V ₂ O ₅	% V ₂ O ₅	Periods of Production/ Operator(s)
69.	Lone Star (Plot 9) (cont)	276	1,814	0.33	16,852	3.05	1950, 1962-VCA; 1950- Raymond Marshall; 1950-51- Harry Russell; 1952- Leroy Pettigrew
70.	Syracuse (Plot 12)	-----	See Footnotes 1 and 2 -----			-----	1943, 1949-VCA
		225	1,203	0.27	13,321	2.96	1950-52- Leroy Pettigrew
71.	Hazel	36	112	0.16	1,357	1.88	1955, 1957- Leroy Pettigrew
72.	White Cap (Plot 11)	-----	See Footnote 1 -----			-----	1949-VCA
73.	Syracuse (R, F, & R, Sam Harvey)	-----	See Footnote 2 -----			-----	1942-44- Wade, Curran and Co.
		1,967	11,051	0.28	102,491	2.60	1954-56- Andrew A. Fry; 1956-58- Titan Uranium Co.; 1964-66- Sam Harvey
74.	Valley View	73	135	0.09	3,338	2.29	1950- Cato Sells
75.	Upper and Lower Canyon	2,809	9,526	0.17	115,917	2.06	1950, 1955-56, 1961- Cato Sells 1962-63- Tripp Mining Co.; 1963-64- W.D. Tripp
76.	Leroy (MP-552)	25	96	0.19	1,230	2.46	1961- Davis Mining Co.
77.	Oak Springs (Gravel Top)	5,112	23,289	0.23	233,362	2.28	1950, 1954-59- Cato Sells; 1962, 1966- W.D. Tripp
78.	Oak Springs (Plot 10)	1,979	9,389	0.24	111,458	2.82	1949-50- Cato Sells; 1955-57- VCA

Table 1 (cont)

Index No.	Mine Name	Tons Ore	Pounds U ₃ O ₈	% U ₃ O ₈	Pounds V ₂ O ₅	% V ₂ O ₅	Periods of Production/ Operator(s)
78.	Oak Springs (Plot 10)(cont)						1957-58-Tanner and Thomas
79.	Lower Oak Creek (Plot 7)		See Footnotes 1 and 2				1943-44, 1948-50-VCA
		3,373	17,345	0.26	138,398	2.05	1954-57, 1961-64-VCA; 1955-59-Kennedy and McGee; 1960-C.H. Corey Jr.; 1961- William George
80.	Salt Canyon	93	331	0.18	4,473	2.41	1950- Cato Sells; 1953- Shorty and Tutt; 1954- Hosteen S. Begay; 1955- Kennedy and McGee
81.	Franks Point (Plot 6)		See Footnote 1				1949-VCA
82.	Upper and Lower Salt Rock	107	358	0.17	4,122	1.93	1950-51- Eugene Tapahonso; 1961-62- Davis Mining Co.
83.	Williams Point (Plot 4)		See Footnote 1				1949-VCA
84.	Sunnyside and Lookout Point		See Footnotes 1 and 2				1942, 1948,-50-VCA
		2,556	16,327	0.32	144,337	2.82	1950, 1956, 1959-VCA 1950-54- Paul Shorty
85.	Lookout Point Incline	506	2,713	0.27	28,485	2.81	1960- C.H. Corey Jr.; 1960-61- William George
86.	Shadyside 2		See Footnotes 1 and 2				1942,1948-50-VCA

Table 1 (cont)

Index No.	Mine Name	Tons Ore	Pounds U ₃ O ₈	% U ₃ O ₈	Pounds V ₂ O ₅	% V ₂ O ₅	Periods of Production/ Operator(s)
86.	Shadyside 2 (cont)	809	6,183	0.35	66,842	3.76	1951, 1953-54 Harry Russell; 1954-55, 1966-VCA
87.	Shadyside, Shadyside Incline	-----	See Footnotes 1 and 2			-----	1942, 1948-50-VCA
		1,728	8,841	0.26	108,589	3.14	1950-51, 53, 56, 1964-65-VCA 1950-51- Tutt and Tanner; 1951-Harry Russell; 1952-King Tutt
88.	Nelson Point	-----	See Footnotes 1 and 2			-----	1942-43, 1948-50-VCA
		2,684	13,364	0.25	211,347	3.94	1950-58, 1961 Paul Shorty; 1965-67-VCA
89.	Tent	1,198	5,303	0.22	54,156	2.26	1955-Texas Mining Co.; 1956-57-Eugene Tapahonso; 1963-Hazel Bryant
90.	Begay 2	4,515	18,450	0.20	190,638	2.11	1962-Davis Mining Co.; 1963-64-Hazel I. Davis; 1965-66-Fritz-Ericson Co.; 1967-VCA
91.	Begay Incline	655	3,475	0.27	38,215	2.92	1955-56-Texas Mining Co.
92.	Carrizo 1	828	3,426	0.21	21,917	1.32	1956-58-Spafford and Sons
93.	Begay 1	3,921	16,491	0.21	127,499	1.63	1953-54 Walter Duncan, Jr.; 1966-1967-VCA
94.	King Tutt Point (Plot 2)	-----	See Footnotes 1 and 2			-----	1942, 1948-50-VCA

Table 1 (cont)

Index No.	Mine Name	Tons Ore	Pounds U ₃ O ₈	% U ₃ O ₈	Pounds V ₂ O ₅	% V ₂ O ₅	Periods of Production/ Operator(s)
94.	King Tutt Point (Plot 2)(cont)	294	1,900	0.32	15,222	2.59	1950, 1953, 1956-VCA; 1950-51- Carl Thomas
95.	King Tutt 1	290	1,060	0.18	8,257	1.42	1951, 1953- Shorty and Tutt; 1956- Sylvania Mining Co.; 1958- Charles N. Pickens
96.	Red Wash Point (Plot 1)	See Footnotes 1 and 2					1942, 1948-50-VCA
		305	2,244	0.37	18,230	2.99	1950-VCA; 1950-52- Sam Harvey; 1950, 52- Harry Russell
97.	Junction	18	38	0.11	153	0.43	1953- Walter Duncan
98.	Alongo	27	76	0.14	76	0.14	1956- E.J. Alongo
99.	Canyon View	497	3,669	0.37	32,870	3.31	1950-53- Hosteen S. Begay
100.	Upper Red Wash	3/378	1,656	0.22	10,897	1.44	1950-51-Nakai Chee Begay; 1950,1952-Hosteen S. Begay; 1953-Pershing Mining Co.
101.	Rocky Spring	11	3	0.01	62	0.28	1951- Jerome Chee
102.	East Reservation Lease <u>4</u> /	6,758	29,786	0.22	311,503	2.30	1948-50-VCA; 1950- John Joe

1/ Early production shipped as East Reservation Lease, see footnote 4.

2/ Production during 1942-44 in the eastern Carrizo Mountains is estimated as 1,500 tons of ore containing 90,000 pounds V₂O₅ and averaging 3.00 percent V₂O₅. The uranium content is estimated at 8,100 pounds U₃O₈ and averaging 0.27 percent U₃O₈. The majority of the ore was produced from the Syracuse Mine (No. 73).

3/ An additional 442 tons of no-pay ore was shipped from this property.

4/ Early production from Plot 3 also includes minor production from Plots 1, 2, 4, 6, 7, 8, 9, 11, and 12.

Source: Union Mine Development Corporation reports, AEC production records, AEC field notes, and Bureau of Indian Affairs records.

Figure 2.

Uranium production, eastern Carrizo Mountains,
San Juan County, New Mexico, and Apache County, Arizona.

INDEX OF MINES

NO.	MINE NAME
1.	Barton 3
2.	Tom Morgan 1
3.	John Lee Benally
4.	Phillip Dee 1
5.	Johnny McCoy 1
6.	Brodie 1
7.	John Kee 4
8.	Capitan Benally 4A
9.	Block K
10.	Silentman 1
11.	McKenzie 3
12.	Plot 1 (Hogan Mine)
13.	Plot 2
14.	Plot 4 (Gila Mine)
15.	Pope 1
16.	Hoskie Henry
17.	Plot 6 (Rattlesnake Mines)
18.	Black Rock Point Mines
19.	Plot 8
20.	Sandy K
21.	Jimmie Bileen 1
22.	Plot 9
23.	Plot 10 (Horse Mine)
24.	Plot 11 (Two Level Mine)
25.	Plot 7 (Rattlesnake No. 5 Mine)
26.	Tsowie 1
27.	Grover Cleveland 1
28.	Plot 12 (Rattlesnake No. 8 Mine)
29.	North Martin (AEC Plot 2)
30.	Martin (AEC Plot 1); Geo. Simpson 1
31.	George Simpson 1 Incline
32.	Last Chance
33.	Carson
34.	Plot 13
35.	Saytah
36.	Melvin Benally 1
37.	Saytah Canyon (AEC Plot 4)
38.	School Boy
39.	CBW-MC (AEC Plot 5)
40.	Eurida Mines (AEC Plot 6)
41.	Eurida Mesa (Plots 14, 15, 16)
42.	Sunnyside
43.	Mildred 1
44.	Chester Mud 1
45.	Sheepskin Mesa (Hanley)
46.	Tree Mesa (Clani)
47.	Kinusta Mesa (AEC Plot E)
48.	Tohe Thlany Begay
49.	Cove Mesa Mines (Sells)
50.	Cove Mesa Mines (AEC Plot 7)
51.	East Mesa Mines
52.	West Mesa
53.	Rattlesnake 1 (Shorty)
54.	Bettie 1
55.	Zona 1
56.	Ruben 1
57.	Jim Lee 1; Richard King 1
58.	Todakonzie 1
59.	Harvey Begay 3
60.	Tony Tuc
61.	Upper Red Canyon
62.	King 6
63.	Beclabito Lease (BB)
64.	Rocky Flats 1, 2 (Rocky 1, 2)
65.	Canyon 1
66.	John John 1
67.	King 2
68.	Cottonwood Butte (Plot 8)
69.	Lone Star (Plot 9)
70.	Syracuse (Plot 12)
71.	Hazel
72.	White Cap (Plot 11)
73.	Syracuse (R, F & R)
74.	Valley View
75.	Upper, and Lower Canyon Mines
76.	Leroy (MP-552)
77.	Oak Springs (Gravel Cap)
78.	Oak Springs (Plot 10)
79.	Lower Oak Creek Mines (Plot 7)
80.	Salt Canyon
81.	Franks Point (Plot 6)
82.	Upper and Lower Salt Rock
83.	Williams Point (Plot 4)
84.	Sunnyside and Lookout Point
85.	Lookout Point Incline
86.	Shadyside 2
87.	Shadyside
88.	Nelson Point
89.	Tent
90.	Begay 2
91.	Begay Incline
92.	Carrizo 1
93.	Begay 1
94.	King Tutt Point (Plot 2)
95.	King Tutt 1
96.	Red Wash Point (Plot 1)
97.	Junction
98.	Alongo
99.	Canyon View
100.	Upper Red Wash (Nakai Chee Begay)
101.	Rocky Spring

Figure I. Mine Location Map, Carrizo Mountains Uranium Area, Apache County, Arizona and San Juan County, New Mexico.