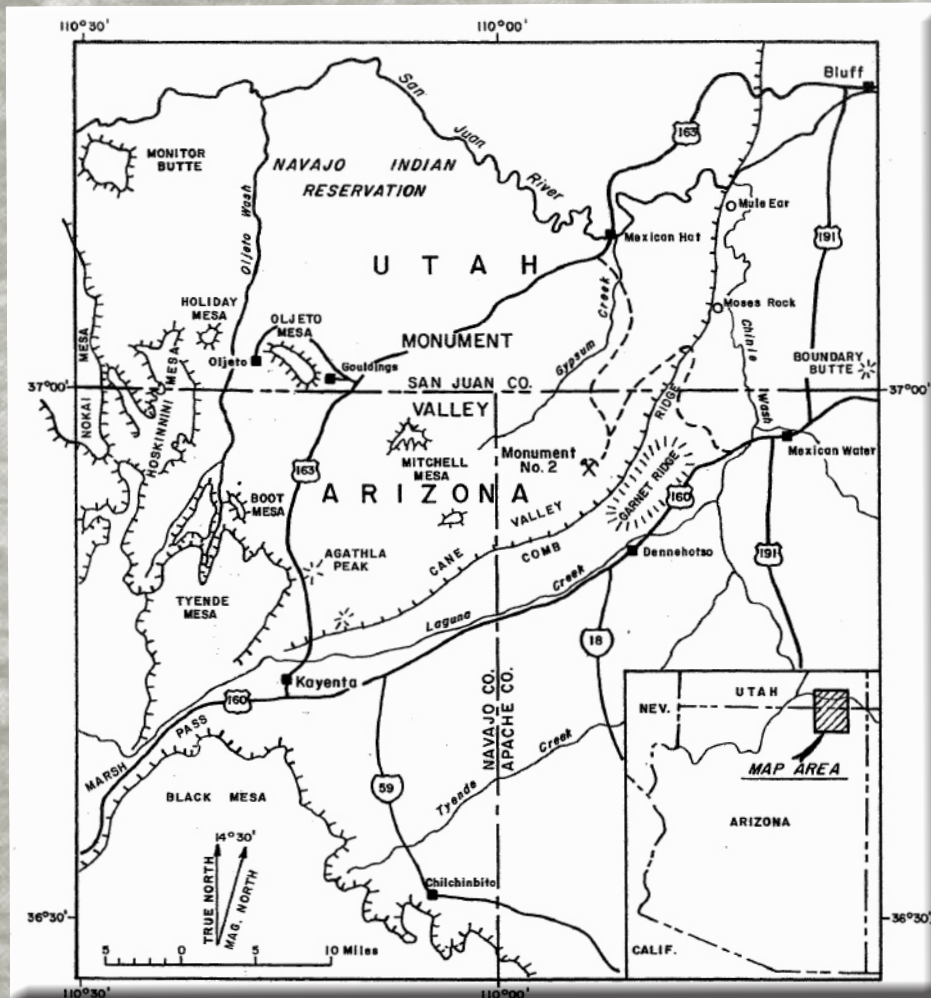


## CONTRIBUTED REPORT CR-11-F

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### THE EXPLORATION AND PRODUCTION HISTORY OF THE CATO SELLS URANIUM-VANADIUM MINES, MONUMENT VALLEY, APACHE COUNTY, ARIZONA

August 2011

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ARIZONA GEOLOGICAL SURVEY

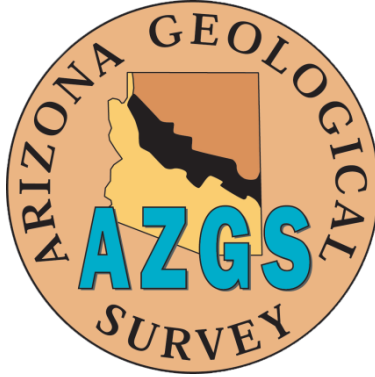
# Arizona Geological Survey Contributed Report CR-11-F

## The Exploration and Production History of the Cato Sells Uranium-Vanadium Mines, Monument Valley, Apache County, Arizona

August 2011

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Note: Originally prepared for the Arizona Department of Mines and Mineral Resources  
and the Navajo Abandoned Mine Lands Reclamation Project



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## **INTRODUCTION**

In 1950, Cato Sells, a Navajo businessman, obtained three tracts (claims) adjacent to the Vanadium Corporation of America's (VCA) 1943 Monument No. 2 lease in northeastern Apache County, Arizona. This lease was originally mined for vanadium and was now being mined for uranium and vanadium. Exploration drilling by the U.S. Atomic Energy Commission (AEC) located orebodies on Cato Sells' tracts. This report is to document the production history of those tracts.

### **Location**

The Monument No. 2 mine area is located in the extreme northwestern area of Apache County, Arizona (Figure 1). The mine is in the Cane Valley on the eastern flank of the Monument Uplift. Access to the mine area was via a 19-mile dirt road that headed south from U.S. Highway 163 one mile south of the bridge over the San Juan River at Mexican Hat, Utah. Another access road went from the mine, over Comb Ridge, and connected to U.S. Highway 160 near Mexican Water, Arizona.

The Monument No. 2 open pit mine is shown at the center of the right margin of Rooster Rock topographic quadrangle (USGA, 1988).

### **Land Status**

The area of the Monument No. 2 mine is located within the Navajo Indian Reservation. Mining permits and leases were issued by the Navajo Tribal Council and approved by the Bureau of Indian Affairs (BIA), U.S. Department of the Interior. Mining permits could be obtained by individual Navajos only. Permit holders could assign the mining rights to another individual or a company; like the permits, these assignments had to be approved by the Tribal Council and the BIA. Leases could be issued directly by the BIA. Permits were issued for a 2-year period and could be renewed for an additional 2 years. Leases were issued for periods up to 10 years. No more than 960 acres of tribal land could be held by any one company or individual. Both the permittee and the tribe received royalties from ore production.

### **Previous Studies**

The geology and mineralogy of the Monument No. 2 area have been described by Witkind and Thaden (1963). The mining and upgrading of the ore at the Monument No. 2 mine is given in a guidebook on uranium deposits of the western United States (AEC, 1959). Gregg and Evensen (1989) mapped the underground workings of the Monument No. 2 and adjacent mines and described the early mining history of the area.

### **Sources of Information**

Most of the information presented in this report was obtained while the author was employed by the U.S. Atomic Energy Commission and succeeding agencies: the U.S. Energy Research and Development Administration and the U.S. Department of Energy. Information on

the Mining Permits and the Lease was obtained from the Navajo Tribal Mining Department, Window Rock, Arizona. The U.S. Atomic Energy Commission ore production data is now in the National Archives, Rocky Mountain Region, Denver, Colorado, Record Group 434-00-287. In some records, the pre 1954 production is not separated by year.

## **GEOLOGIC SETTING**

The Monument No. 2 ore deposit is in the basal Shinarump Member of the Triassic Chinle Formation. The Shinarump here is unusually thick, filling a large and deep erosional depression in the underlying Moenkopi Formation and, at the deepest point, extending down through the Moenkopi to the Permian De Chelly Sandstone. The "paleochannel" or "scour", apparently with closed ends, extends at least 2 miles along the axis of a wider depression. The wider depression is about 3 miles wide and 50 feet deep; the narrower, inner scour is about 30 feet deeper and about 700 feet wide.

The host rock is "trashy", cross-bedded, conglomeratic sandstone, containing considerable clay and fossil wood. The wood is partly carbonized, but much has been replaced by silica, tyuyamunite, limonite or uraninite.

The principal ore minerals are tyuyamunite and carnotite; others include the oxides montroseite, uraninite, navajoite and the hydrous oxides becquerelite and fourmarieite; the vanadates rauvite, volborthite, steigerite, hewettite and corvusite; the silicate uranophane; the phosphate torbernite; and the arsenate metazeunerite. For additional details on the ore occurrences and mineralogy the reader is referred to a report by Witkind and Thaden (1963).

## **VANADIUM CORPORATION OF AMERICA'S LEASE**

During the 1940s, the carnotite deposits in the Four Corners area were being sought for their vanadium content, used to harden steel. As the result of a find by Luke Yazzie in Cane Valley, the Office of Indian Affairs advertised an exploration lease sale for carnotite and related minerals on July 21, 1943. The area in Apache County, Arizona, was described as follows: "beginning at a point south 32°28' east, 28,949.78 feet from mile post 227 on the Utah-Arizona line and running thence north 25°00' east one mile; thence east one and one quarter miles; thence south 25°00' west one mile; thence south one and one quarter miles; thence west one and one quarter miles; thence north one and one quarter miles to the point of beginning, containing approximately 1,845 acres."

When the bids were opened on August 3, 1943, Vanadium Corporation of America (VCA) was the only bidder with a bonus bid of \$3,000.00. Lease I-149-IND-6204 with VCA was executed on August 6, 1943, effective September 23, 1943, for a period of ten years. The lease was named Monument No. 2 by VCA.

On March 6, 1944, the exploration lease was reduced to a permanent operating lease with two plots (claims) totaling 42.09 acres selected to be retained. Plot 1, about 39 acres, covered the

mineralized Shinarump channel on the Main Ridge, and Plot 2, about 3 acres, covered the projection of the channel on South Ridge (Figure 2).

During the period October 1943 through January 1946, small underground mines and open pits produced 489 tons of ore containing 13,737 pounds of  $V_2O_5$  (Chenoweth, 1985). This ore was processed at the vanadium mill at Monticello, Utah.

## **CATO SELLS' MINING PERMIT**

About 1950, in response to the developing uranium boom, the Navajo Tribal Council adopted a series of resolutions dealing with uranium which were approved by the Commissioner of Indian Affairs. These resolutions developed regulations for prospecting and mining permits, mining leases, and royalty schedules. All prospectors needed to obtain permits for prospecting. Mining permits were granted to only Navajos who could then assign them to non-Navajos. Mining leases were no longer the subject of competitive bidding, but were negotiated with the Tribal Council, subject to approval of the Bureau of Indian Affairs. As a result of these new rules, several Navajos obtained mining permits on the land adjacent to VCA's lease.

One of the first to apply for a mining permit was Cato Sells of Farmington, New Mexico. On June 6, 1950, he was issued an unnumbered Navajo Tribal Mining Permit for three tracts (claims) adjacent to VCA's lease (Figure 2). On June 19, 1950, Mr. Sells signed an operating agreement with the Climax Uranium Company of Grand Junction, Colorado to operate mines on his permit. This unnumbered permit was reissued as Mining Permit No.55 on March 15, 1952.

### **Tract No. 1 North**

This tract consists of 38.3 acres adjacent to the east boundary of VCA's Plot 1 (Figure 2). This was an area where AEC drilling in 1951 and 1952 had located several orebodies.

Climax began shipments from an underground mine near the center of the tract in January 1951. The company continued shipments from this and other mines on the tract through 1955. Shipments in 1951 and 1952 went to the AEC ore buying station at Monticello, Utah and the Climax mill in Grand Junction, Colorado. Beginning in 1952, shipments were made to the AEC ore buying station at Shiprock, New Mexico. In 1955, a new mill at Shiprock, operated by Kerr-McGee Oil Industries, Inc. began purchasing ore from independent operators.

In 1955, Sells signed a new operating agreement with the Uranium Reserve Company of Salt Lake City, Utah. This new operator continued to ship ore to the Kerr-McGee mill at Shiprock, New Mexico until February 1958. Uranium Resources cancelled their assignment on March 1, 1958. In early 1959, Cato Sells made a final shipment from this tract. This ore was sent to its mill at Mexican Hat, Utah operated by Texas-Zinc Minerals Corporation.

Total production from several underground mines in this tract was 17,958 tons that averaged 0.29 percent  $U_3O_8$  and 1.18 percent  $V_2O_5$  (Table 1). AEC records show that in early 1952, Climax Uranium shipped 804 tons that averaged 1.02 percent  $U_3O_8$  and 3.66 percent  $V_2O_5$ .

### **Tract No. 1 South**

This tract consisted of 156.9 acres surrounding the VCA's Monument Valley Lease Plot 2, which is located on South Ridge (Figure 2). Drilling by the AEC in 1951 and 1952 located orebodies on both the VCA lease and Cato Sells tract No, 1 South. Climax Uranium Company developed a mine on a tract which connected to VCA's mine (Figure 3). Climax mined on this tract in 1952 and 1953 and Cato Sells' employees in 1953 and 1954. Total production was 8,049 tons that averaged 0.40 percent  $U_3O_8$  and 1.52 percent  $V_2O_5$  (Table 2). Shipments by Climax went to their mill in Grand Junction, Colorado and those by Sells went to the AEC ore buying station at Shiprock, New Mexico. Sells dropped this tract from his Mining Permit No. 55 shortly after the mining ceased in 1954. Adits of both the VCA mine and the Sells' mine are shown on the Rooster Rock quadrangle (USGS, 1988).

### **Tract No. 2**

This tract consists of 61.6 acres located adjacent to the west boundary of VCA's Plot 1 (Figure 2). A small underground mine on this tract was operated by Cato Sells' employees in 1955 and in 1957 and 1958. A mine inspector report indicated that Gilbert Shumway of Blanding, Utah did the mining in 1955. Shipments went to the mill in Shiprock, New Mexico. In 1957, a small shipment was delivered to the mill at Mexican Hat, Utah operated by Texas-Zinc Minerals Corporation.

Total production from this small mine was 295 tons that averaged 0.30 percent  $U_3O_8$  and 0.49 percent  $V_2O_5$  (Table 3). A survey of the underground workings indicated that at least 30 tons of ore were mined from the adjacent Plot 1 of VCA (Figure 4). The miners apparently did not know where the boundary was underground.

## **WILLIE WATERS' MINING PERMIT**

Shortly after Cato Sells cancelled the portion of his mining permit covering Tract No. 1 South, in 1954, Willie Waters applied for a new mining permit. On September 20, 1954, Waters was issued Navajo Tribal Mining Permit No. 188. This permit covered 160 acres in the area of former Tract No. 1 South.

The mining rights to the permit were approved to Bee-Sho-Shee Mining Company, of Shiprock, New Mexico, on November 19, 1954. The company drilled south of the old workings and located a small orebody which they mined via an open pit. Additional ore was produced by clean up mining in the old mine.

Bee-Sho-Shee reduced their assigned acres to only 20. During 1954 and 1955, the company shipped 1,990 tons of ore that averaged 0.23 percent  $U_3O_8$  and 1.23 percent  $V_2O_5$  (Table 4). This ore was sent to the mill at Shiprock, New Mexico. The open pit is shown on the Rooster Rock quadrangle (USGS, 1988).

## LATER DEVELOPMENTS

On July 20, 1959, VCA modified their original 1943 lease to include the adjacent mining permits held by individual Navajos. These permits include the following:

### **Yazzie Mesa**

Chee Nez MP-189

John Yazzie and Thomas Clani MP-37

### **Main Ridge**

Cato Sells MP-55 Tract No. 1 North

Cato Sells MP-55 Tract No. 2

Jessie Black and Harvey Blackwater MP-47

### **South Ridge**

Willie Waters MP-188

The amended lease would later be known as VCA's Mining Unit No. 66 (Figure 5) for the AEC's allocation program that began in 1962. Any ore produced from these former mining permits would now be credited to the Monument No. 2 mine.

## SUMMARY

During the years 1951 through 1959, the mines on Cato Sells' Navajo Tribal Mining Permit produced 26,300 tons of ore averaging 0.32 percent  $U_3O_8$  and 1.28 percent  $V_2O_5$  (Table 5). All of the uranium recovered at the four mills involved was purchased by the AEC. Vanadium was recovered at the Monticello and Grand Junction mills and sold to the steel industry. The Shiprock mill paid for vanadium but it was not recovered. The mill at Mexican Hat did not have a vanadium circuit (Albrethsen and McKinley, 1982).



## REFERENCES

- Albrethsen, H., Jr. and McKinley, F.E., 1982, Summary history of domestic uranium procurement under U.S. Atomic Energy Commission contracts, final report: U.S. Department of Energy Report GJBX-220 (82), 162 p.
- Chenoweth, W.L., 1985, Early vanadium-uranium mining in Monument Valley, Apache and Navajo Counties, Arizona and San Juan County, Utah: Arizona Bureau of Geology and Mineral Technology Open-File Report 85-15, 13 p.
- Gregg, C.M., and Evensen, C.S., 1989, Maps of the underground workings, Monument No. 2 mine, Apache County, Arizona with a text by W.L. Chenoweth: Arizona Geological Survey Contributed Report CR-89-D, 33 p.
- U.S. Atomic Energy Commission, 1959, Monument Valley district, in Guidebook to uranium deposits of western United States: Raw Materials Exploration Report RME-141, p. 2-55 – 2-64.
- U.S. Geological Survey, 1988, Rooster Rock quadrangle, Arizona-Utah, 7½ minute series (topographic) provisional, scale 1:24,000.
- Witkind, I.J., and Thaden, R.E., 1963, Geology and uranium deposits of the Monument Valley area, Apache and Navajo Counties, Arizona: U.S. Geological Survey Bulletin 1103, 171 p., 7 plates.

**Table 1. Ore Production, Cato Sells Tract No. 1 North Monument Valley, Apache County, Arizona**

YEAR	OPERATOR	TONS OF ORE	POUNDS U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	POUNDS V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1951	Climax Uranium	6,281	50,602	0.40	215,343	1.71
1952	Climax Uranium					
1953	Climax Uranium					
1954	Climax Uranium	1,537	7,982	0.26	30,067	0.98
1955	Climax Uranium	4,837	20,481	0.21	80,795	0.84
1955	Uranium Reserves	721	3,558	0.25	10,792	0.75
1956	Uranium Reserves	2,923	14,469	0.25	55,444	0.95
1957	Uranium Reserves	1,576	6,712	0.21	30,529	0.97
1958	Uranium Reserves	67	304	0.23	839	0.63
1959	Cato Sells	16	48	0.15	---	---
TOTAL		17,958	104,156	0.29	423,809	1.18

Source: Unpublished AEC records.

**Table 2. Ore Production, Cato Sells Tract No. 1 South Monument Valley, Apache County, Arizona**

YEAR	OPERATOR	TONS OF ORE	POUNDS U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	POUNDS V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1952	Climax Uranium	4,891	46,266	0.47	147,543	1.50
1953	Climax Uranium					
1953	Cato Sells	2,132	13,057	0.31	77,163	1.81
1954	Cato Sells	1,026	5,069	0.25	19,985	0.97
TOTAL		8,049	64,392	0.40	244,690	1.52

Source: Unpublished AEC records.

**Table 3. Ore Production, Cato Sells Tract No. 2  
Monument Valley, Apache County, Arizona**

YEAR	OPERATOR	TONS OF ORE	POUNDS		POUNDS	
			U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1955	Cato Sells	158	944	0.30	1,583	0.50
1957	Cato Sells	177	707	0.30	1,111	0.47
1958	Cato Sells	20	119	0.30	197	0.49
TOTAL		295	1,770	0.30	2,891	0.49

Source: Unpublished AEC records.

**Table 4. Ore Production, Willie Waters Mining Permit  
Monument Valley, Apache County, Arizona**

YEAR	OPERATOR	TONS OF ORE	POUNDS		POUNDS	
			U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1954	Bee-Sho-Shee	500	1,910	0.14	11,622	1.16
1955	Bee-Sho-Shee	1,490	7,252	0.24	37,374	1.25
TOTAL		1,990	9,162	0.23	48,996	1.23

Source: Unpublished AEC records.

**Table 5. Summary of Ore Production, Cato Sells  
Mining Permit No. 15**

TRACT	TONS OF ORE	POUNDS		POUNDS	
		U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
No. 1 North	17,958	104,156	0.29	423,809	1.18
No. 1 South	8,047	64,392	0.40	244,690	1.52
No. 2	295	1,770	0.30	2,891	0.49
TOTAL	26,300	170,318	0.32	671,390	1.28

Source: Unpublished AEC records.

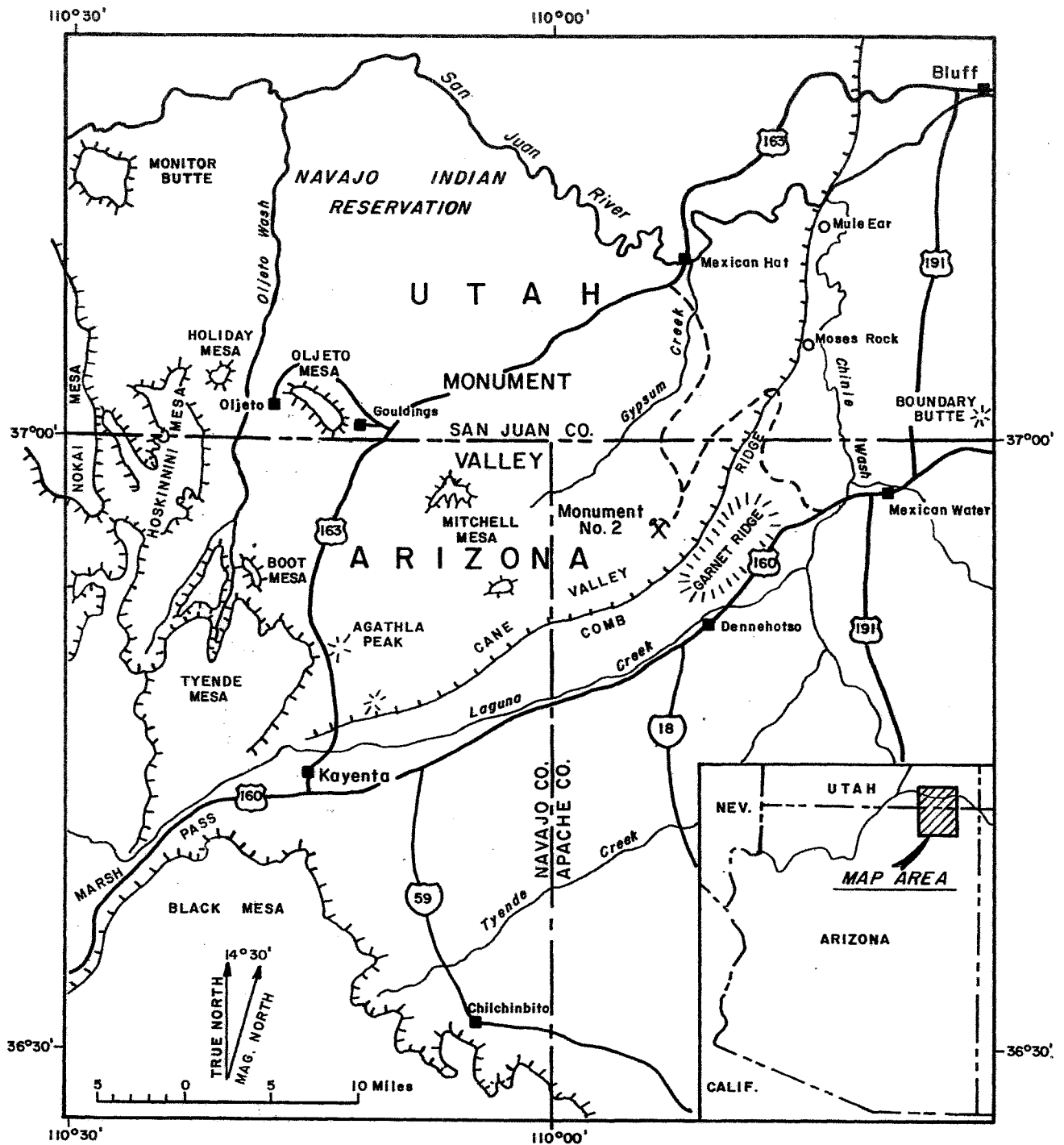
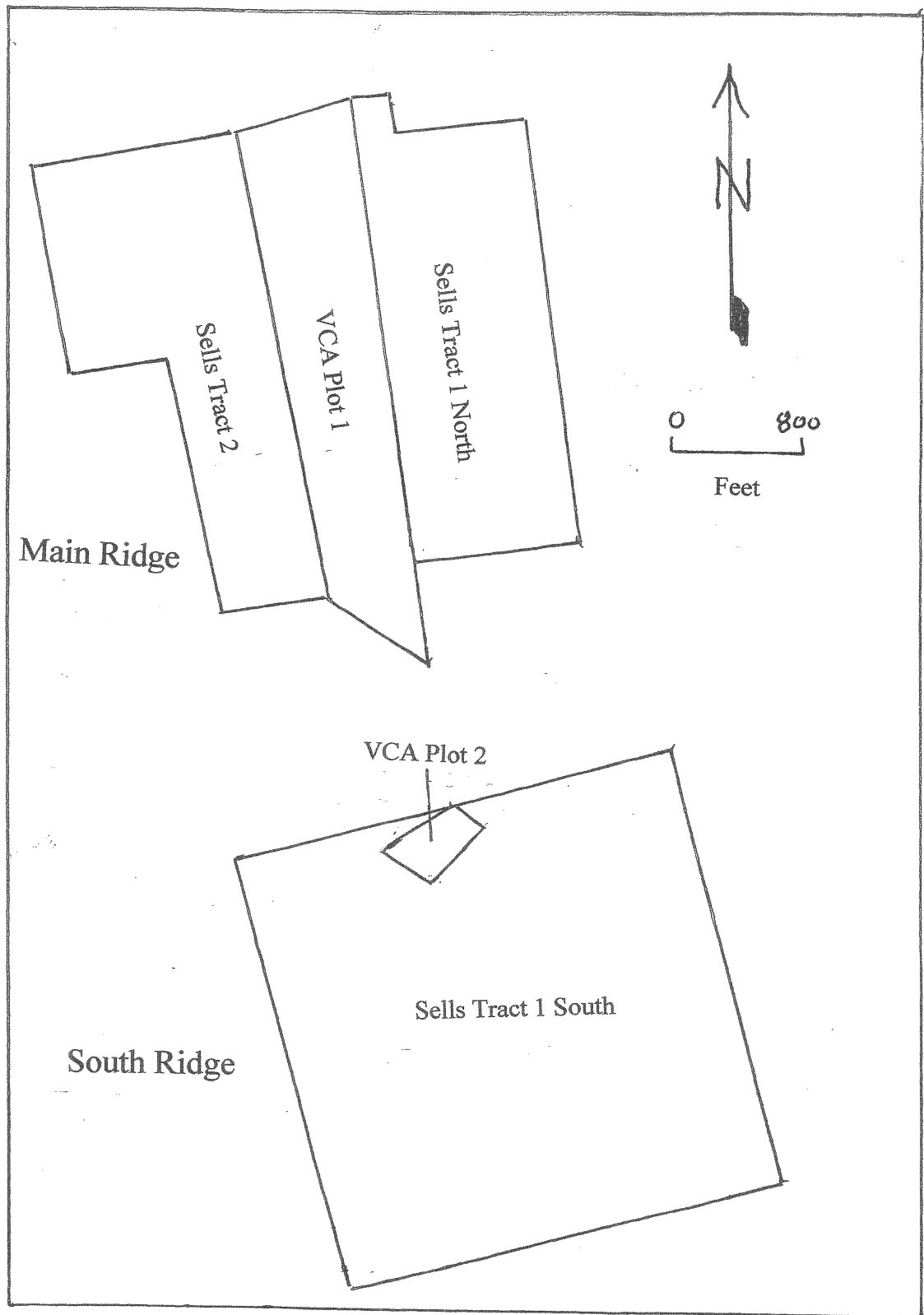
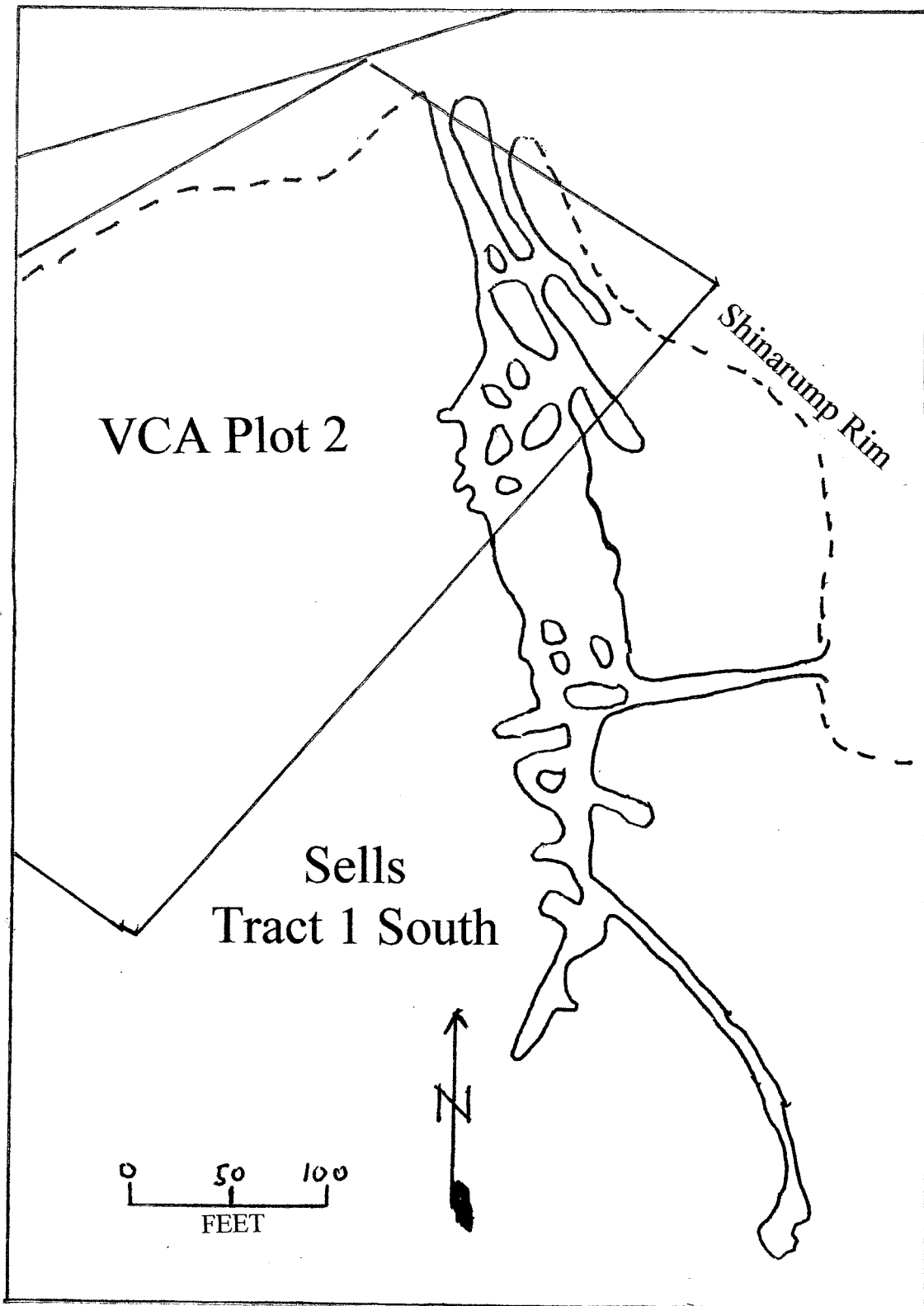


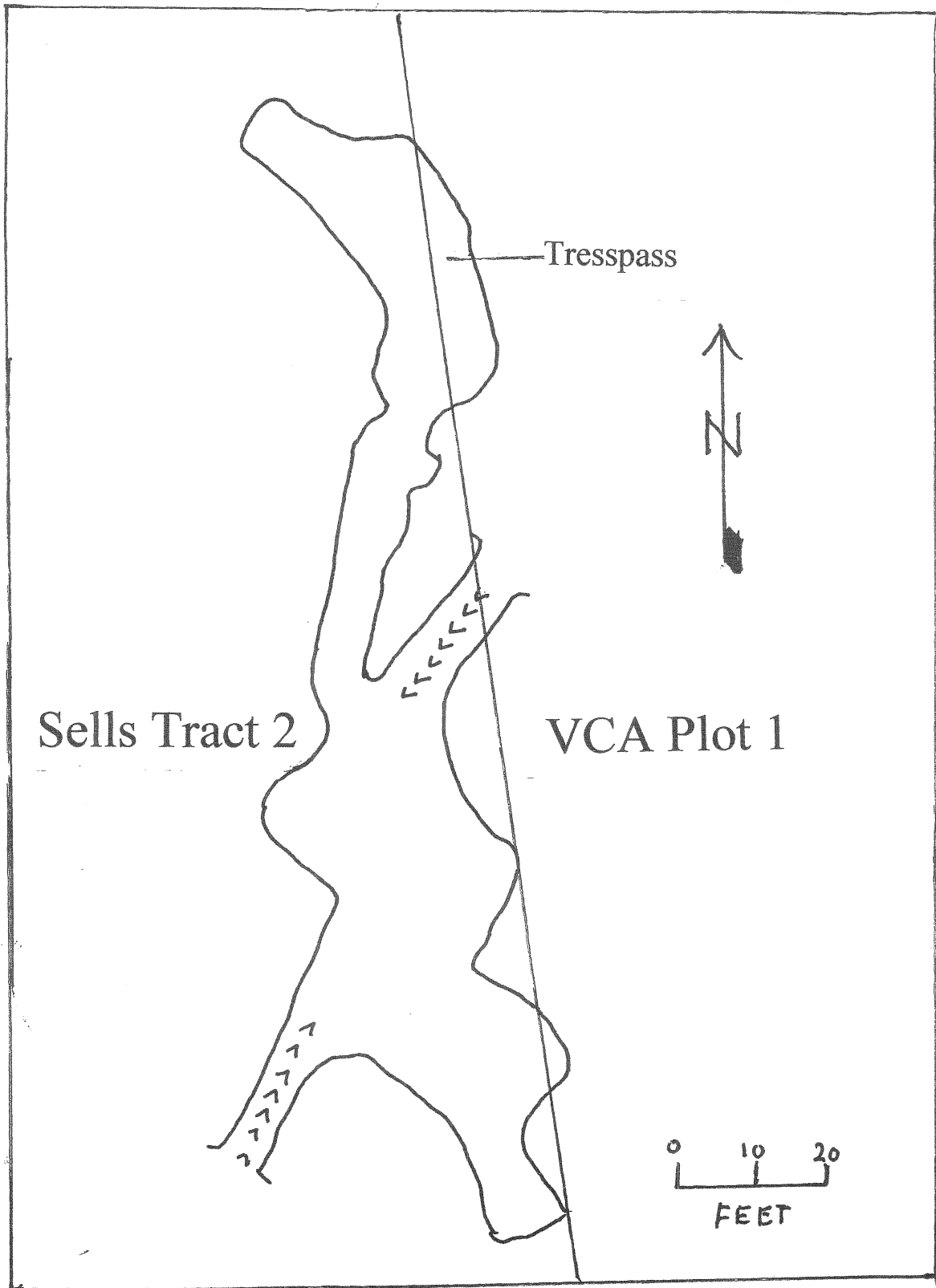
Figure 1 Index map of the Monument Valley area showing the location of the Monument No. 2 mine.



**Figure 2** Map of VCA's Plots 1 and 2, and Cato Sells' Tracts No. 1 North, 1 South and 2. From AEC files.



**Figure 3** Map of the underground working, VCA's Plot 2 and Cato Sells' Tract No. 1 South mines. From Gregg and Evensen, 1989.



**Figure 4** Map of the underground workings of Cato Sells' Tract No. 2 mine. From Gregg and Evensen, 1989.

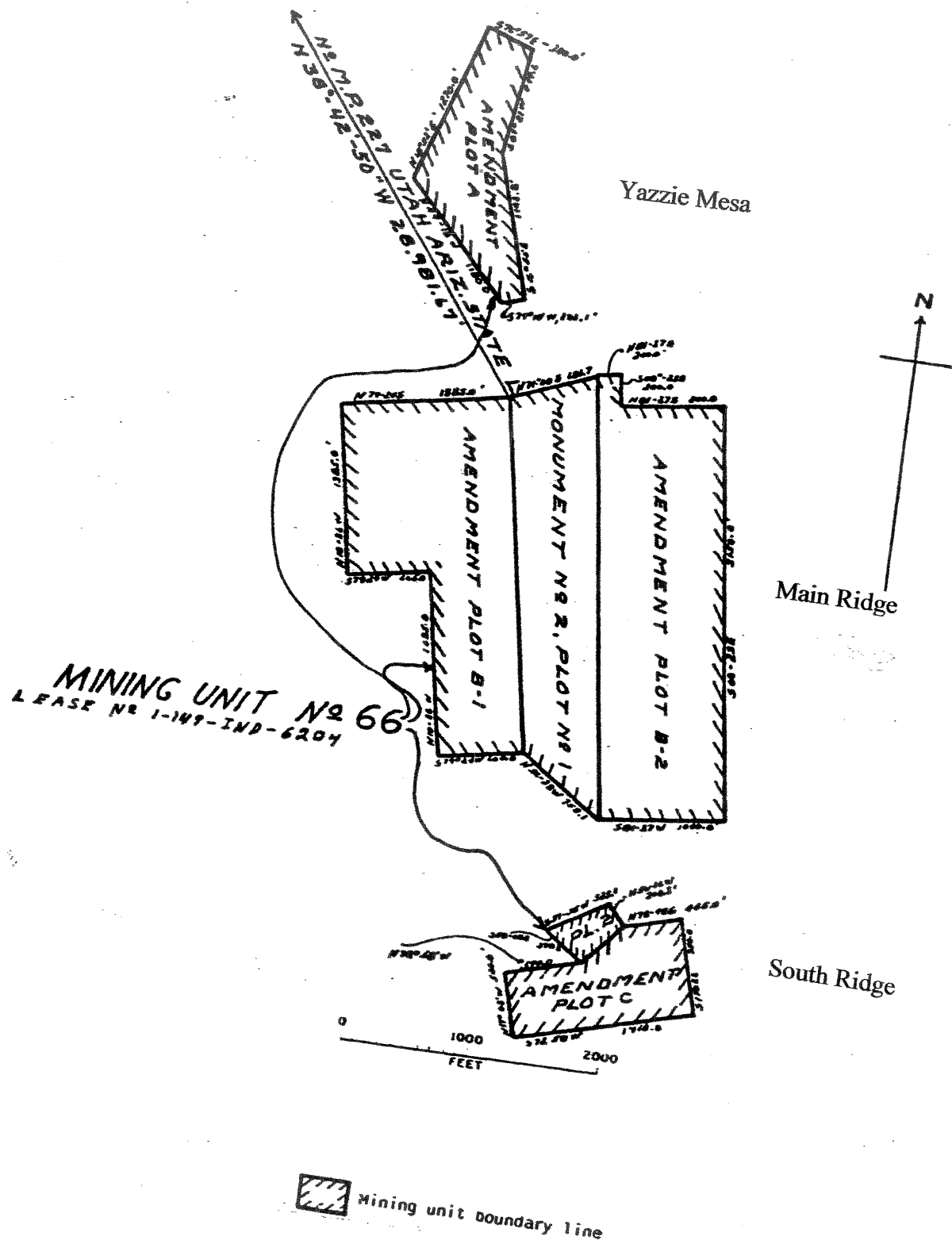


Figure 5  
 Map of the Monument No. 2 Lease, Amended. From AEC files.