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CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Western States Minerals Corporation
J. B. King Mine
INA/015/002, Emery County, Utah

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I. Introduction

The purpose of this report is to provide a Cumulative Hydrologic Impact Assessment (CHIA) for Western States Minerals Corporation's J. B. King Mine located in Emery County, Utah. The assessment encompasses the probable cumulative impacts of all anticipated coal mining in the general area on the hydrologic balance and whether the operations proposed under the application have been designed to prevent damage to the hydrologic balance outside the proposed mine plan area. This report complies with federal legislation passed under the Surface Mining Control and Reclamation Act (SMCRA) and subsequent Utah and federal regulatory programs under UMC 786.19(c) and 30 CFR 784.14(f), respectively.

Western States Minerals Corporation's J. B. King Mine is located within the Emery Coal Field approximately 10 miles south of Emery, Utah (Figure 1). The J. B. King Mine is adjacent to Dog Valley in the east-central portion of the Emery Coal Field. Elevations range from 6,000 to 7,000 feet over most of the Emery Coal Field. To the south, along Paradise Valley elevations are somewhat higher and exceed 8,500 feet.

Outcropping rocks of the Emery Coal Field range in age from Lower Cretaceous to Quaternary in age. The rock record reflects oscillating transgressive and regressive sequences that include, in ascending order, fluvial through littoral (Dakota Sandstone), marine (Cununk Shale), fluvial and lagoonal (Ferron Sandstone) and marine (Blue Gate Shale, Emery Sandstone, Masuk Shale) depositional environments. Unconformably overlying Cretaceous sedimentary rocks are Tertiary volcanics and Quaternary deposits. The major coal-bearing unit in the Emery Coal Field is the Ferron Sandstone.

Precipitation varies from 16 inches along the western border of the coal field to less than 8 inches eastward.

There are two major vegetation types present in the area. Pinyon-juniper woodland occupies the upland areas of Castle Valley and benches along the Fish Lake Mountains and the lower areas of Castle Valley support the desert shrub-vegetation type. Interspersed between these two types is the sagebrush shrubland.

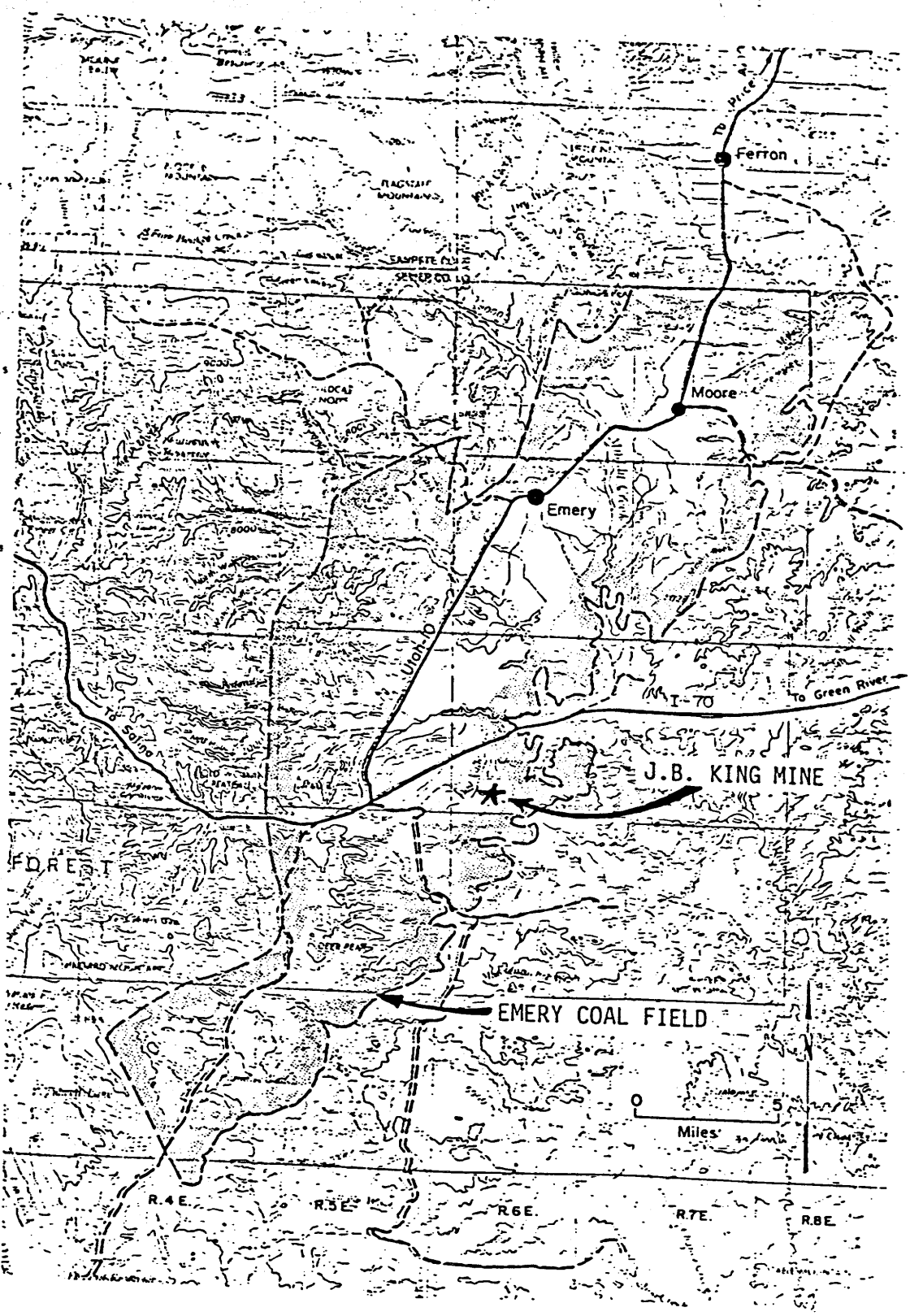

Figure 1. Emery Coal Field (from Doelling 1972).

The Emery Coal Field is a part of the Muddy Creek drainage system which drains to Lake Powell within the Colorado River system. The major streams in the region (Price River, San Rafael and Muddy Creek) all have been dry in their lower reaches sometime during the period of record. Drainage from the CIA is ephemeral and flows only in direct response to snowmelt or precipitation. Stream flow is the greatest during late spring and early summer decreasing to a minimum flow in early autumn through mid-winter for larger streams. Intense rainfall causes heavy flooding mainly in localized areas with runoff dissipating quickly due to the small areas affected by the storms.

II. Cumulative Impact Area (CIA)

Figure 2 delineates the CIA for the J. B. King Mine. The CIA includes the SE1/4 of Section 30, S1/2 of Section 29, SW1/4 of Section 28, E1/2 of Section 31, Section 32 and W1/2 of Section 33, Township 23 South, Range 6 East and the NE1/4 of Section 6, N1/2 of Section 5 and NW1/4 of Section 4, Township 24 South, Range 6 East. The CIA encompasses 2,560 acres.

III. Scope of Mining

Mining within the study area began in 1930 and continued until 1970 at the Dog Valley Mine. Western States Minerals Corporation acquired the Dog Valley Mine in 1976 and renamed it the J. B. King Mine. Mining was terminated and the J. B. King Mine was designated inactive in 1985.

The permit area encompasses 320 acres. Mining occurred in the Ferron "I" seam. Production was from room and pillar mining methods with secondary pillaring. Overburden thickness range from 80 to 135 feet.

IV. Study Area

A. Geology

Stratigraphic units outcropping within the study area include, from oldest to youngest, the Tununk Shale, Ferron Sandstone, Blue Gate Shale and Quaternary deposits. Lithologic descriptions and unit thicknesses are given in Figure 3.

Rocks in the study area strike generally north and dip one to two degrees to the west. Principal coal accumulations occur within the Ferron Sandstone Member of the Mancos Shale. Two coal seams with economic potential have been identified and are termed, in ascending order, the Ferron "F" and "I" seams. Approximately 170 feet of interburden separate the two seams. Mining has not occurred in the Ferron "F" seam and this resource may be a target for future development.

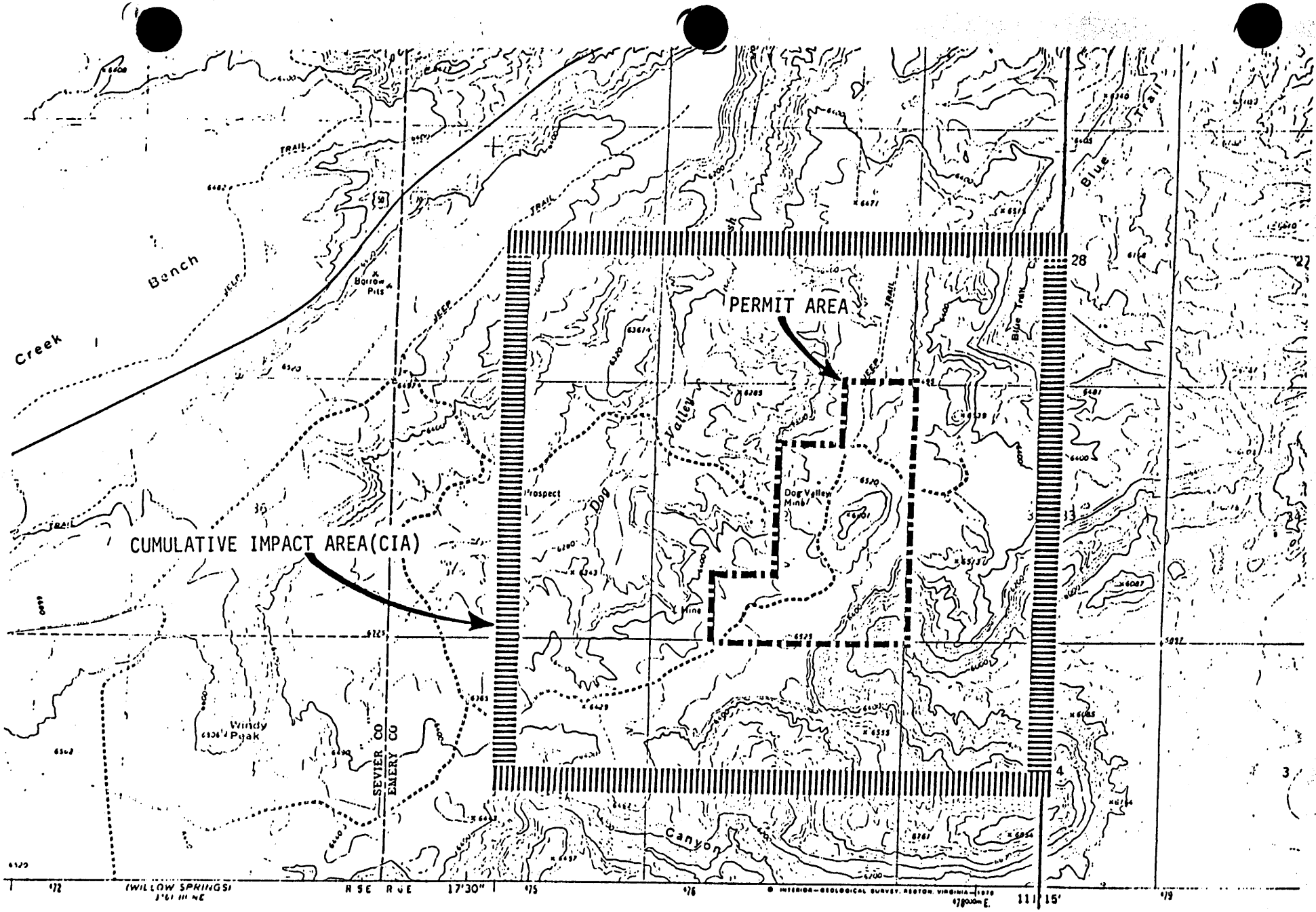

Figure 2. Cumulative Impact Area (CIA).

System	Series	Stratigraphic Unit	Thickness (feet)	Description
Quaternary	Holocene Pleistocene	Quaternary Deposit	Variable	Surficial stream terrace and channel and alluvial fan deposits.
Upper Cretaceous	Coniacian	Blue Gate Shale Member	1,600	Pale blue-gray, modular and irregularly bedded marine mudstone and siltstone.
	Tuconian	Ferron Sandstone Member (major coal seams)	400-500	Alternating yellow-gray sandstone, sandy shale and gray shale with important coal beds of Emery Coal Field.
	Cenomanian	Tununk Shale Member	600-700	Blue-gray to black sandy marine mudstone.

Figure 3. Stratigraphy of the J. B. King Mine Area (modified from Doelling 1972).

B. Topography and Precipitation

Topography ranges from less than 6,000 feet to over 6,500 feet in the CIA.

The study area is characterized by a northerly and easterly system of small ephemeral drainages.

Average annual precipitation is 12 inches. The CIA may be classified as semiarid.

There are basically two vegetation types on the permit area; shadscale-snakeweed shrubland and pinyon-juniper woodland. The shadscale-snakeweed shrubland occurs on approximately 30 percent of the permit area. It generally occupies the flat to moderately sloping terrain. Total vegetation cover in this type is around 10 percent.

The pinyon-juniper woodland occurs on approximately 60 percent of the permit area. It occupies areas along the escarpments and ridges found throughout the site. It has a very sparse understory and low vegetative ground cover.

V. Hydrologic Resources

A. Ground Water

The ground-water regime within the CIA is dependent upon climatic and geologic parameters that establish systems of recharge, movement and discharge.

Springs do not occur within and adjacent to the CIA. Exploration drilling (63 boreholes) within the permit area did not encounter subsurface water above the Ferron "I" seam. Moreover, mining development did not intercept sufficient ground water to warrant discharge.

Six boreholes, located within and adjacent to the permit area, were completed and developed for the purpose of accessing water resources. An aquifer located approximately 200 feet below the Ferron "I" seam was identified and utilized in mine operations.

B. Surface Water

The J. B. King Mine site and CIA drain to the Dog Valley Wash which in turn drains to Ivie Creek in the Muddy Creek drainage. The watershed within the CIA is ephemeral in nature responding only to major precipitation events and snowmelt (Figure 1). The chemical quality of surface water in this area is relatively good but deteriorates downstream due to a gradual increase in total dissolved

solids (TDS) concentration as the flow continues downstream. Suspended sediment levels during major storm events is significant based on the erosive nature of the soils in the region. The concentration of dissolved solids in streams is usually inversely proportional to the flow. The chemical quality of water is usually best during high flow and worst during low flow.

VI. Potential Hydrologic Impacts

A. Ground Water

The only identifiable ground-water resource within the CIA is the aquifer located approximately 200 feet below the Ferron "I" seam. Inasmuch as mining did not intercept sufficient water to warrant discharge, and exploration drilling did not encounter subsurface water, a natural system of recharge from the surface above the workings to the aquifer below is not thought to be existent. Accordingly, a mining induced dewatering impact is determined to have a low probability.

Subsidence related to mining has the greatest potential for impacting ground-water resources in the CIA. Subsidence impacts are largely related to extension and expansion of the existing fracture system and upward propagation of new fractures. Surface infiltration and vertical migration may increase if surface tension fractures propagate to the surface.

Subsidence monitoring above the abandoned workings has identified zones of mining induced tension fractures above and adjacent to outcrop barrier pillars along the eastern boundary of the permit area. The zones of tensional fracturing are up to several tens of feet wide and hundreds of feet long. Individual tension fractures have not naturally healed and remain open. One small, circular shaped subsidence depression has also been identified. The remaining surface area has uniformly subsided a maximum of seven feet.

The surface tension fractures may readily divert surface runoff into the subsurface and thereby increase the natural system of recharge. However, this potential impact is considered temporary since the operator has committed to sealing all open tension fractures prior to bond release. The semiarid climate within the CIA will serve to limit temporary impacts to the ground-water regime and are hereby determined to be minimal. Similarly, potential hydrologic impacts related to impounding water in the depressed area are determined to be minimal because the proportion of water that may infiltrate into subsurface is considered insignificant.

B. Surface Water

The area influenced by surface disturbance is of limited areal extent. Surface sediment controls currently are in place and will continue to be in place during reclamation. The water quality impacts associated with reclamation will be minimal or nonexistent due to the fact all drainage from the disturbed area will be routed through sediment controls and treated prior to any release if a release does occur. Site-specific erosion control practices, such as riprap, silt fences, contour furrows and energy dissipators will be used to control erosion of small areas within the disturbed area.

The operational design proposed for reclamation of the J. B. King Mine is herein determined to be consistent with preventing damage to the hydrologic balance outside the mine plan area.

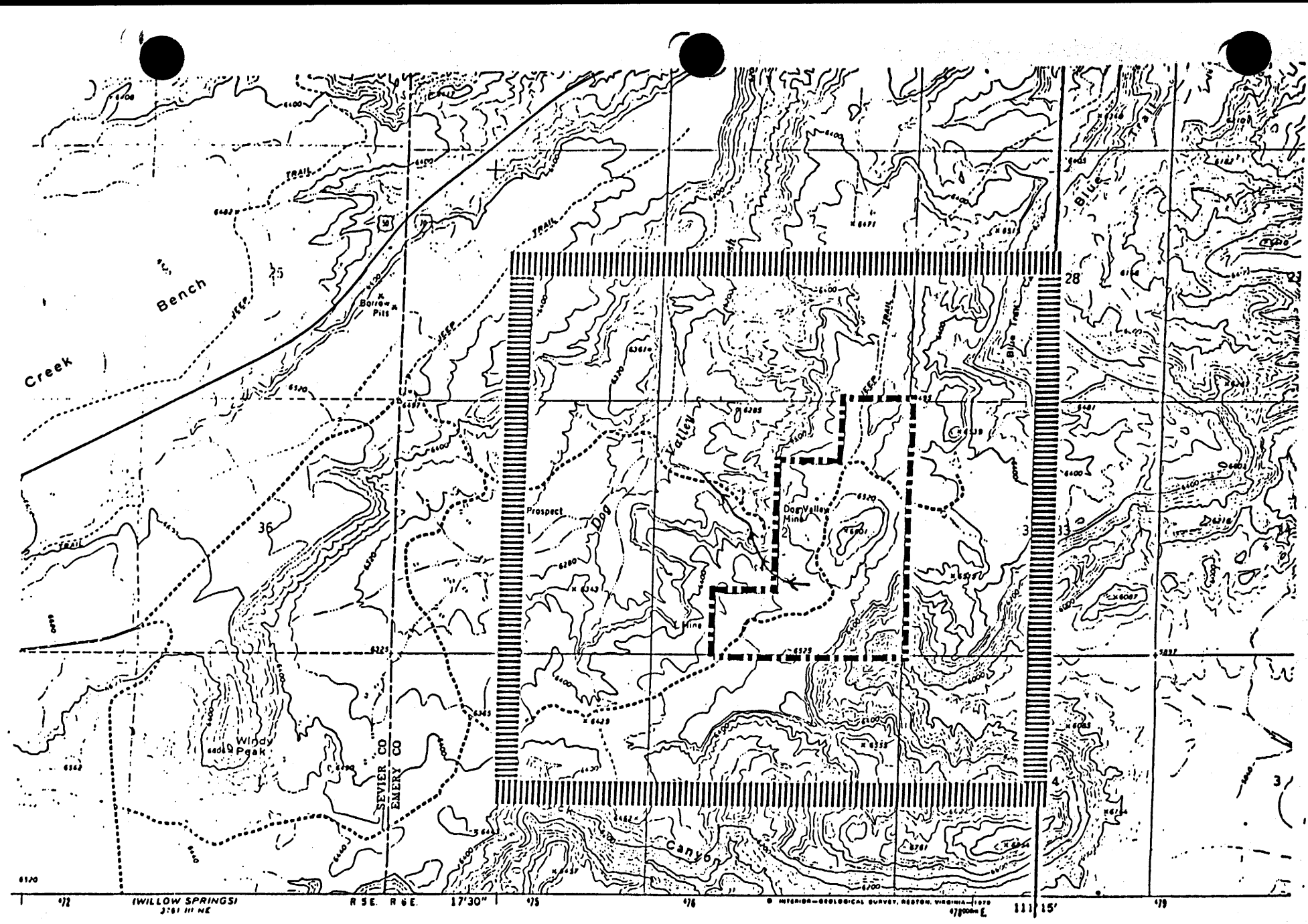

Figure 4. Surface Water Drainage Area

REFERENCES

Doelling, H. H. 1972. Central Utah coal fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery: Utah Geol. and Mineral Surv., Monograph Ser. No. 3.

Western States Minerals Corporation, Consolidated Mining and Reclamation Plan, May 1, 1985, J. B. King Mine, Emery County, Utah

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