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ECONOMIC GEOLOGY OF THE ADELAIDE CROWN MINE, HUMBOLDT CO., NEVADA

Victor F. Hollister

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Introduction

The Adelaide Crown mine area of the Gold Run district in Humboldt Co., Nevada, was examined in December 1987, and again on March 7 and 8, 1988, as part of an evaluation of that mine as an open pit, heap leach producer of gold and silver. This report summarizes only the geology of the mineral deposit as it pertains to the feasibility of developing and exploiting vein systems exposed and explored on ground held by Grand Teton on March 8, 1988. Mineralization described in this report therefore includes exploration in the Cumberland, Recovery, Margarite and Crown veins and the areas of stockwork veining near these veins. Geologic data are derived from the 32-hole program completed December 21, 1987, by Grand Teton as well as by preceding exploration programs.

Regional Geologic Setting

The Gold Run district in Humboldt Co., Nevada, is underlain by Cambrian Preble marine clastics, Ordovician Vinini marine clastics and carbonates, Tertiary dike rocks, and local thin accumulations of post-mineral pediment gravels.

All important mineralization is found within the Preble Formation near Tertiary dike rocks injected into it. The Preble includes massive tan quartzite, quartzite interbedded with arenaceous siltstone, siltstone interbedded with slate, and shale and chert. Chert can be interbedded with slate, and locally calcareous shale is present. Veins seem to cut all rock types in the Preble, and mineralization occurs without regard to wall rock composition, as noted on the attached geologic map.

The Preble is unconformably overlain by the Ordovician Vinini Formation. The contact very likely has been a fault plane for tectonic adjustments related to the Roberts thrust, but stratigraphic relationships in the Gold Run district are normal. The Vinini consists of silicified limestone, calcareous chert, limestone, chert, interbedded chert and slate, massive quartzite, and well bedded quartzite.

The Tertiary dikes mostly intrude the Preble Formation, and these consist of a variety of rocks. The oldest seem to be mostly granodiorite, andesite, or basalt, and they are all sheared and altered. The youngest are pyritized and argillized rhyolite.

Metamorphism to lower greenschist facies affected the sediments prior to dike intrusion. Locally a tremolite skarn has developed, mostly in Vinini limey units, and this may be related to dike intrusion. For the most part, the rocks reacted to stress by brittle fracture, and the basin-range tectonics of the Tertiary resulted in veining in the Preble. The mineralized fractures developed during active normal faulting.

Local Geology

The ground explored by Grand Teton includes the Cumberland, Recovery, Margarite, and Crown epithermal vein systems. These occur in weakly pyritized and clay altered Preble and Vinini rocks, near fault controlled Tertiary dikes.

Alteration: Pervasive but weak pyritization and concommitant argillization occur broadly in the walls of the veins. The pyrite content originally probably averaged under two percent total sulfide, but it now has been entirely oxidized to limonite. The argillization was probably dominated by hypogene montmorillonite, but supergene alteration has now likely converted this to kaolin. No primary alunite has been found, but supergene alunite occurs rarely in scattered outcrop.

Areas of stronger argillic alteration that also carry sericite mixed with the clays have been distinguished and are shown on the attached map as areas of argillic alteration. In these zones, the rocks are bleached; they have a stronger pyrite content, and the presence of sericite separates them from the more regional weaker argillization.

Within the broad halo of weak clay and adjacent to the veins is a small but variable zone of silicification. The silicification occurred when quartz replaced the vein walls, or when

jasper replaced limey sediments. Silicification is accompanied by pyritization and numerous veinlets, small breccias and irregular stockworks of quartz. Although the jasper bodies are large enough to be mapped and are shown on the attached geologic map, silicification in the vein walls is too restricted to be used as a map unit. Oxidation has affected the outcrop of all varieties of altered rocks.

The dominant mineralogy of material to be mined is therefore quartz, kaolin, sericite, and limonite, and none of these are large cyanide or lime consumers.

Mineralization: The vein system explored by Grand Teton is a north-trending, west dipping, branching structure that has numerous splits and stockwork zones. Two shoots have been defined by the sum of all past exploration, and these are the sites of the proposed north and south pits. The vein system in the south pit consists of the Margarite, the Recovery, the veinlets between these, and the Cumberland vein which is a split from the Recovery. The north pit has the Crown vein, which is the northward combination of the Margarite and the Recovery veins.

The veins consist mostly of quartz. Very little chalcedony is present, and no opal was seen. Rare adularia (?) occurs with calcite in sporadic lenses in the quartz-rich veins. Barite is also believed to be present. Replacements of quartz after calcite and barite are prominent in all of the veins. The total sulfide content of the veins in the two pits probably did not exceed 5% originally, but oxidation to at least a depth of 300 feet has converted the sulfide to limonite and jarosite. Remnant silver sulfide is still identifiable, but other sulfide is scarce.

Gold occurs native as a very fine grained dissemination in the veins and in areas of silicification. The gold is so finely divided that a nugget effect was not detected in a study of sample assay results. The separation of gold from silver into distinct minerals is substantially complete, and therefore the

two metals behave independently in a cyanide bath. Electrum may be present but cerargyrite is believed to be the most important secondary silver mineral. The proposed heads are .57 opt Au and 1.38 opt Ag.

Geochemical studies show low but erratic levels of arsenic (rarely above 100 ppm), antimony, and mercury to 2 ppm. Base metals do not occur significantly within the proposed pits, but traces of lead, zinc, and copper are present.

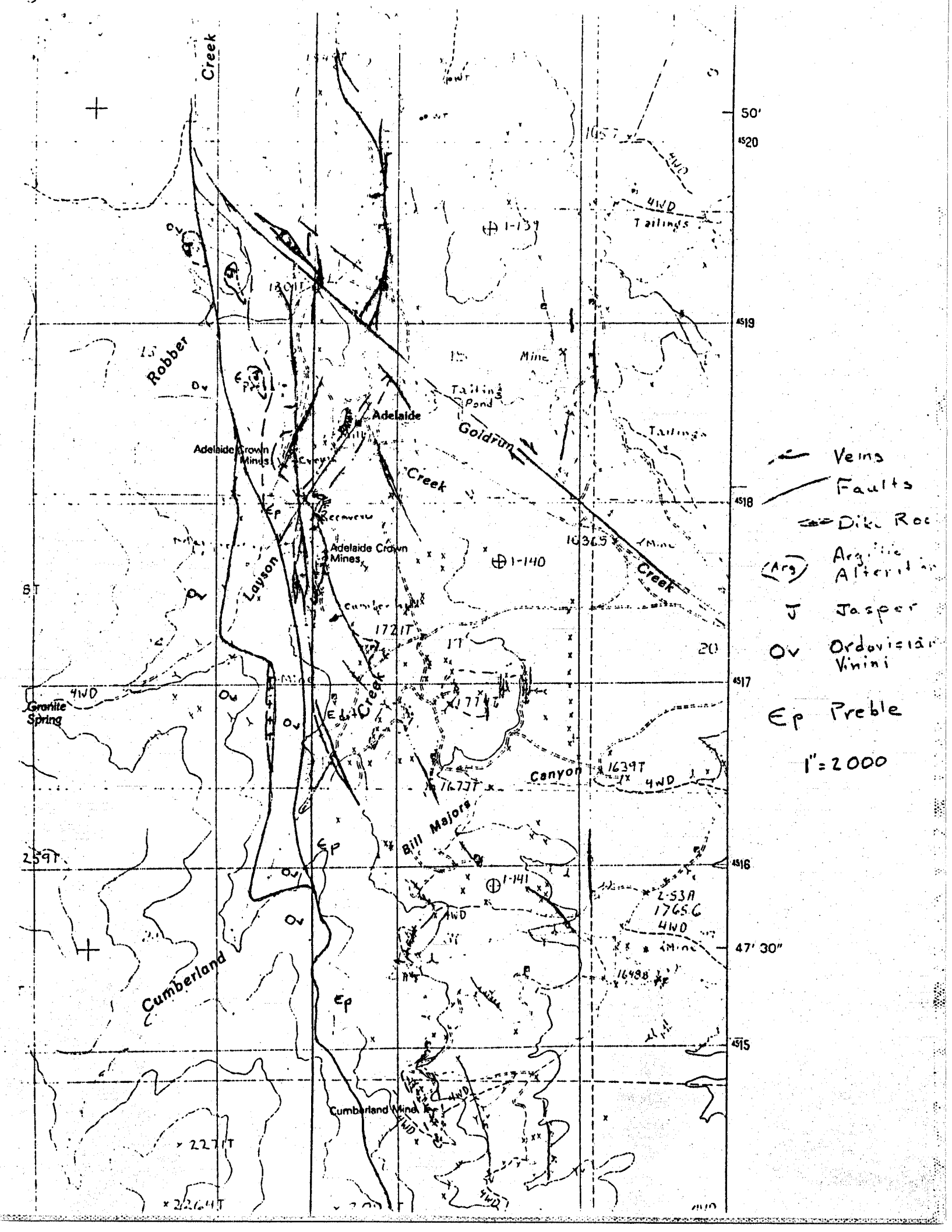
The absence or low-level presence of cyanide consumers in the oxidized ore supports metallurgical test results that show low NaCN loss in a proposed heap leach operation.

The grain size, textural features and simple but diagnostic mineralogy of the ores is consistent with their having formed deep in an epithermal system. The gold therefore is unlikely to be encapsulated by other minerals, and its recovery in a properly prepared heap is compatible with metallurgical test results. The low silver recovery may reflect silvers presence as the silver sulfide, although detailed studies on the silver mineralogy were not made.

Geologic Inference for Ore Reserve Calculation

The simple mineralogy, fracture control of the gold and silver, and dissemination of these metals in well altered vein walls can be seen in the pattern of values shown by the past drilling. The gold and silver show a statistically simple and easily treatable set of assays, and it is therefore anticipated that ore reserve calculations correctly reflect the precious metal content of the orebody. The reserve calculations are consistent with the absence of a nugget effect observable in the ores as now exposed.

V.F. Hollister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4515
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Mine
Tailings Pond
Adelaide
Goldrun
Adelaide Crown Mines
Creek
Layson
Adelaide Crown Mines
Creek
Granite Spring
Canyon
Bill Majors
Cumberland
Cumberland Mine
Tailings
4WD
1-139
1-140
1-141
2-53A
1765C
1639T
1677T
1721T
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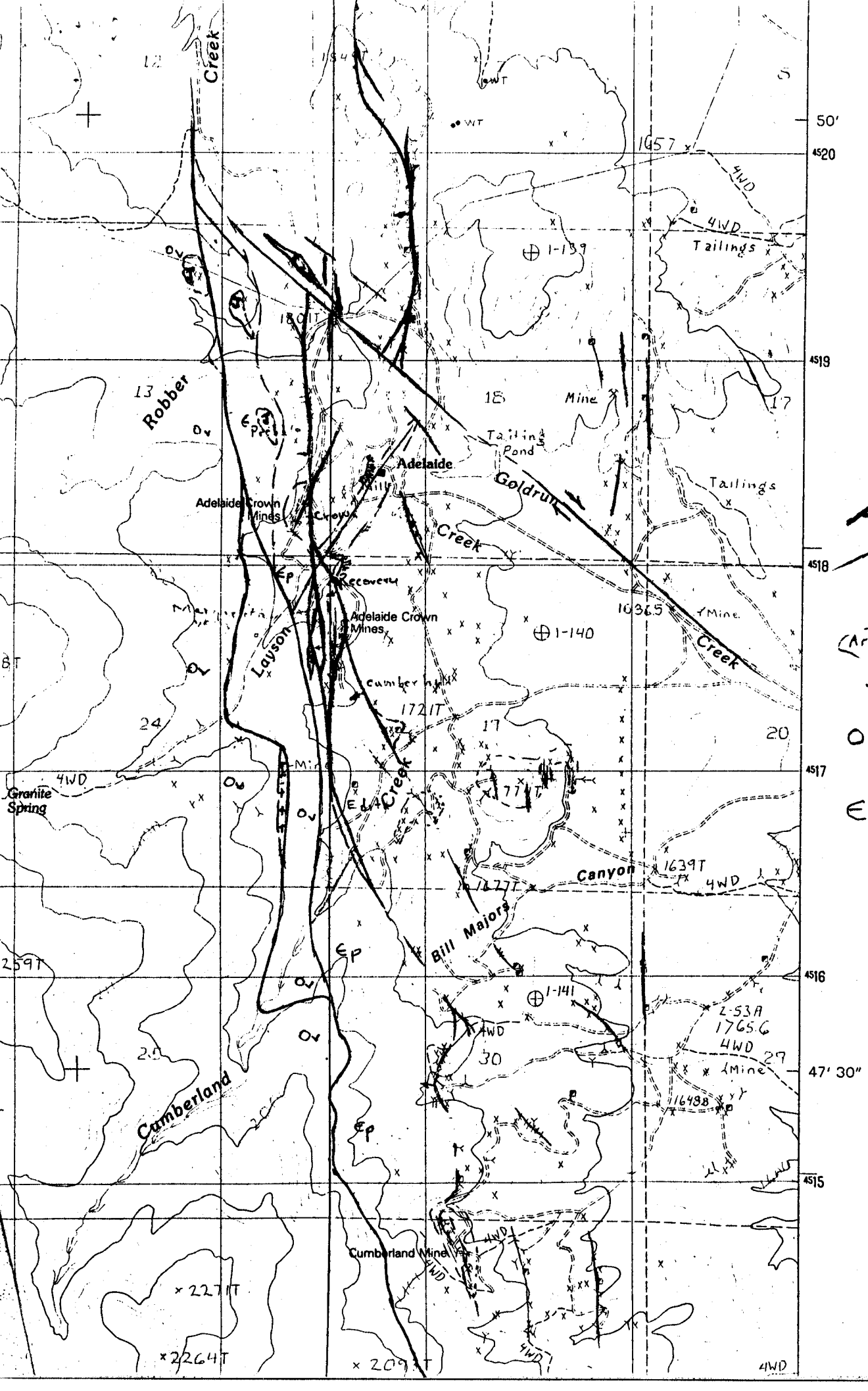
Veins
Faults
Dike Rock
Argillic Alteration
J Jasper
Ov Ordovician Vinini
Ep Preble
1" = 2000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Robber
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Ov
Mine
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Tailing Pond
Adelaide
Goldrun
Tailings
Adelaide Crown Mines
Creek
4518
Ep
Recovery
Adelaide Crown Mines
1-140
Mine
Creek
Lawson
Cumberland
24
17
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Granite Spring
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El Creek
Canyon
1639T
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Bill Majors
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Cumberland Mine
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Veins
Faults
Dike Rock
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J Jasper
Ov Ordovician Vinini
Ep Preble
1"=2,000'