UTAH POWER AND LIGHT CO.
MINING DIVISION
HUNTINGTON, UTAH 84528

ASSESSMENT OF MINING RELATED IMPACTS IN NEWBERRY CANYON

COTTONWOOD COAL MINE
EMERY COUNTY, UTAH

DECEMBER 1987

ASSESSMENT OF MINING RELATED IMPACTS IN NEWBERRY CANYON COTTONWOOD COAL MINE EMERY COUNTY, UTAH

UTAH POWER & LIGHT COMPANY

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SUMMARY/CONCLUSIONS

An assessment was made of longwall mining related subsidence and its impacts on environmental resources in Newberry Canyon, Sixth and Seventh East panels in Cottonwood mine. Specifically, the impacts of cliff spalling on golden eagle nests and nesting behavior was monitored from February, 1986, to the present, and will continue. Data was evaluated, impacts to eagles and other resources were assessed and a prediction made as to the potential for impacts to occur in Miller Canyon, Ninth and Tenth West, Cottonwood Mine. The following is concluded:

- Longwall mining beneath the Castlegate sandstone escarpment does result in subsidence impacts.
- The impacts result from surface cracking, escarpment failure and talus deposition.
- Escarpment failure is influenced by the geologic characteristics of the formation and the orientation of the longwall panels to the escarpment.
- Escarpment failure occurs in three (3) modes; rock falls, toppling and foundation failure.
- Subsidence can occur without associated escarpment failure.
- Escarpment failure can impact nest sites of cliff nesting golden eagles.
- Escarpment failure need not have a negative impact on eagle nesting behavior.
- Escarpment failure results in talus deposition which impacts other environmental resources.
- Intensive monitoring can reduce mining related impacts.
- Potential mining related impacts associated with Miller Canyon are substantially less than in Newberry Canyon.

INTRODUCTION

As stated in the Utah Power and Light Company 1986 Cliff Subsidence and Eagle Monitoring Report (see Appendix A), "The effects of underground longwall coal mining on Golden Eagle (Aquila chrysaetos) cliff nesting sites were studied at the UP&L Cottonwood Mine, in 1986." The objectives of the study were as outlined in the Golden Eagle Nesting/Cliff Subsidence Monitoring Plan (see Appendix B).

The study was designed to collect subsidence and eagle nesting data over a period of several years. The data would then be used to assess the potential impact of future mining operations under similar conditions. However, it has become necessary for the company (UP&L) to modify the previously proposed mine plan sequence, thereby reducing the time available for further data collection and analysis prior to mining in another area of potential impact.

This information was presented to representatives of various state and federal agencies at a multiple agency/ UP&L meeting on July 9, 1987. Resulting from that meeting was a request, from the agencies, that an interim report be prepared based on present data collected during mining of the Sixth and Seventh East longwall panels.

This report provides an evaluation of current data and an assessment of subsidence/cliff spalling impacts on various environmental resources in the Newberry Canyon area (Sixth and Seventh East panels). This report also assesses the potential environmental impacts associated with proposed mining in the Miller Canyon area (Ninth and Tenth West panels).

NEWBERRY CANYON AREA

LOCATION

Newberry canyon is located on the southeastern edge of East Mountain, a portion of the Wasatch Plateau. It occupies portions of Sections 27, 28, 33, and 34, Township 17 South, Range 7 East in Northwest Emery County, Utah (Figure 1).

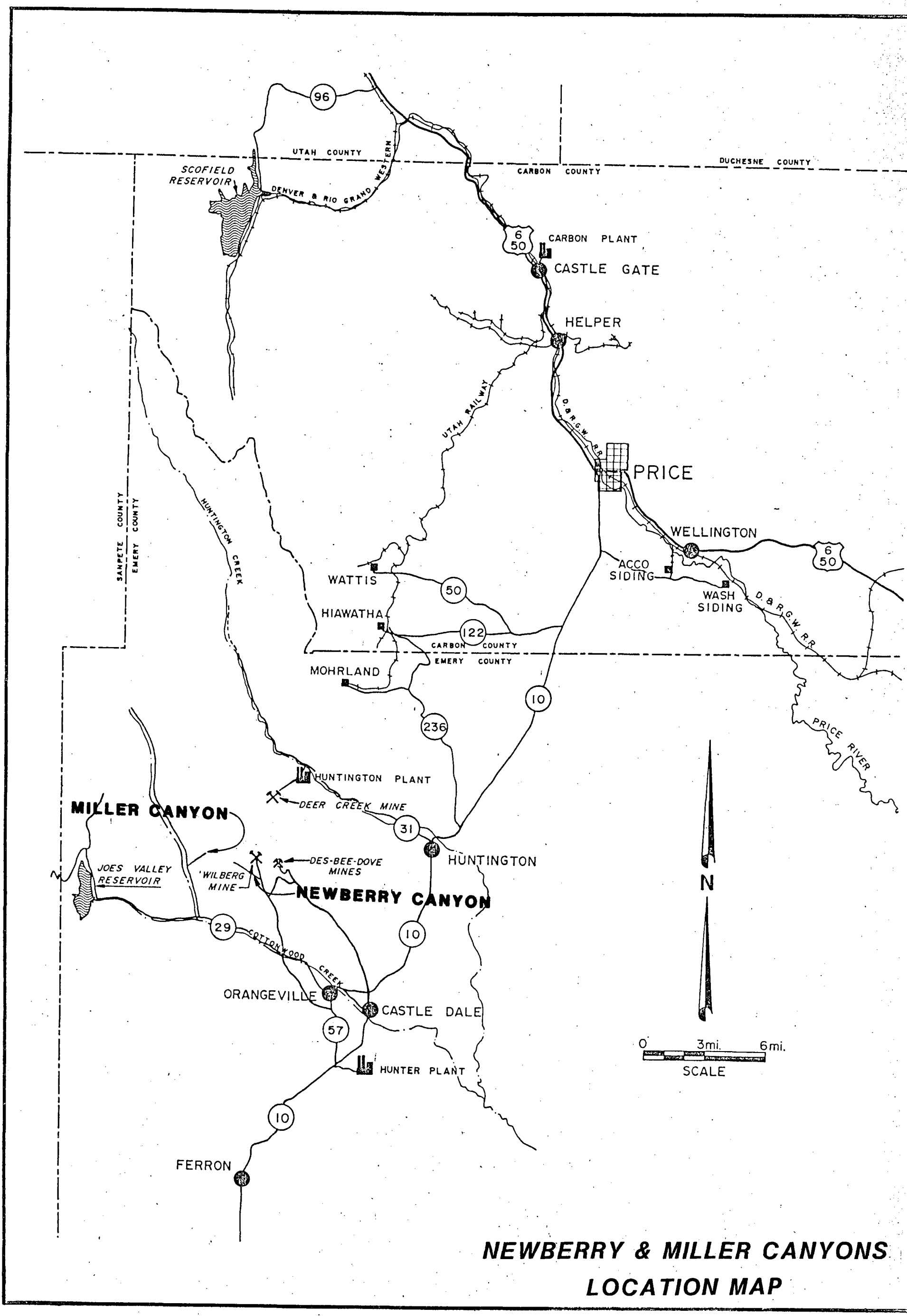
TOPOGRAPHY

The canyon is moderately wide at the rim (5,000 feet), but narrows dramatically to a bottom width of ten (10) feet in some areas. It is characterized by vertical sandstone cliffs interspersed with steep (60 percent) talus slopes. The total vertical relief is approximately 2100 feet, from 9100 to 7000 feet elevation. The length of the canyon from the mouth to the Castlegate Sandstone cliffs at the head is approximately 7200 feet.

GEOLOGY

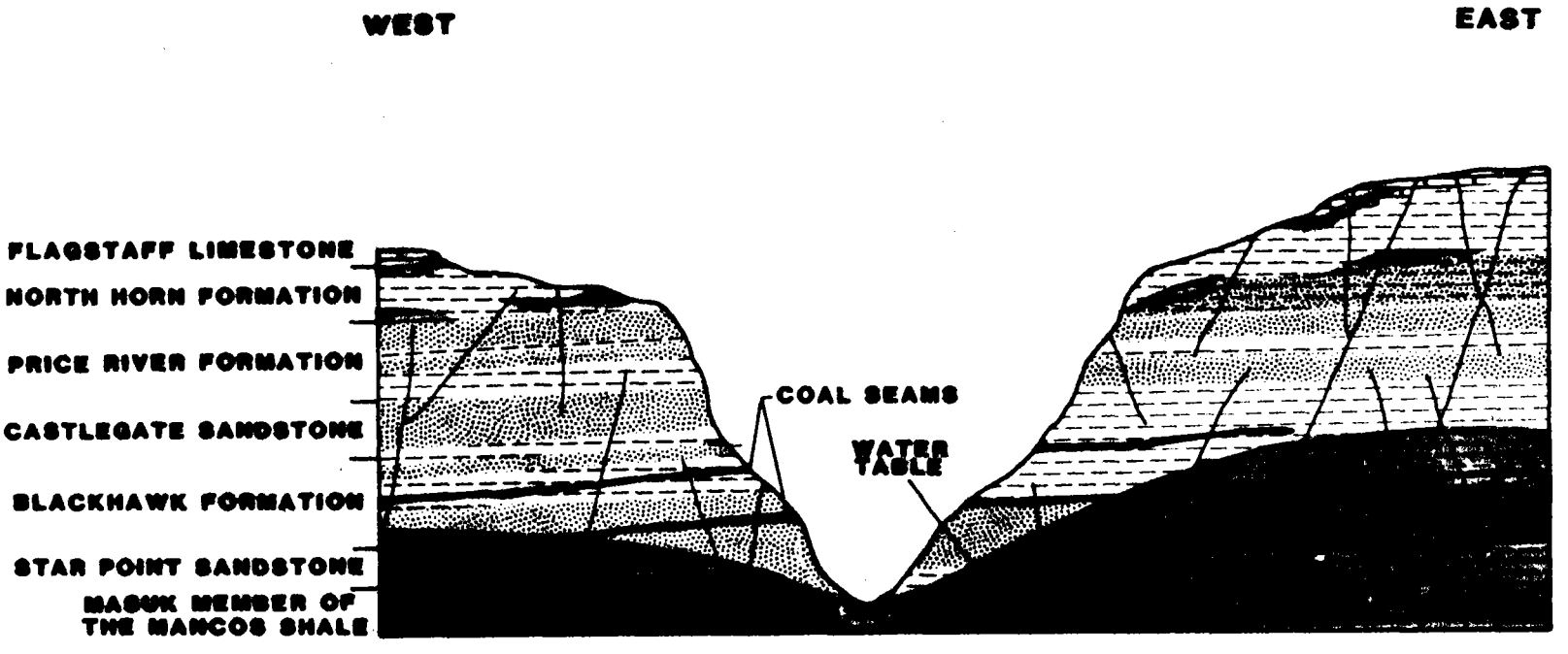
The general stratigraphic formations (Figure 2) associated with the East Mountain area are, in ascending order, as follows (Semborski, 1968):

Masuk Shale. The Masuk Shale is the upper member of the Mancos Shale. It consists of light to medium gray marine mudstones. Because of its marine origin, this formation contains beds of gypsum and other associated



NEWBERRY & MILLER CANYONS
LOCATION MAP

FIGURE 1



(ADAPTED FROM SEMBORSKI, 1986)

WASATCH PLATEAU COAL FIELD	
UTAH POWER & LIGHT COMPANY MINING DIVISION	
DATE: 11-26-87	BY: KJL
SCALE: NONE	FIGURE 2

evaporites. Usually, this formation weathers readily, forming slopes which are often covered by debris.

Starpoint Sandstone. Overlying and intertonguing with the Masuk Shale is the Starpoint Sandstone, also of marine origin. The Starpoint consists of cliff-forming, massive sandstones, generally fine to medium-grained and moderately well-sorted. The grains are mostly well cemented with carbonate or sulfate minerals.

Blackhawk Formation. The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are restricted to the lower 150 feet of the formation. In ascending order they include the Hiawatha and Blind Canyon. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation.

Castlegate Sandstone. The Castlegate Sandstone consists of about 250 feet of light gray, fluvial sandstones, pebble conglomerates, and subordinate zones of mudstones.

Price River Formation. The Price River Formation overlies the Castlegate Sandstone. The formation is about 500 feet thick and forms slopes which extend upward from the Castlegate escarpment. Fine-grained, poorly sorted sandstones dominate the Price River Formation, but some mudstones are present.

North Horn Formation. The North Horn Formation is about 850 feet to 900 feet thick. Mudstones dominate the existent rock types. These mudstones are generally gray to light brown in color. Localized, lenticular sandstone channels are present throughout this formation. These sandstone beds are more common near the upper and lower contacts of the formation.

Flagstaff Formation. The youngest formation exposed in the East Mountain area is the Flagstaff Formation. It consists of white to light gray, lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains, forming a cap on the highest plateaus of the area.

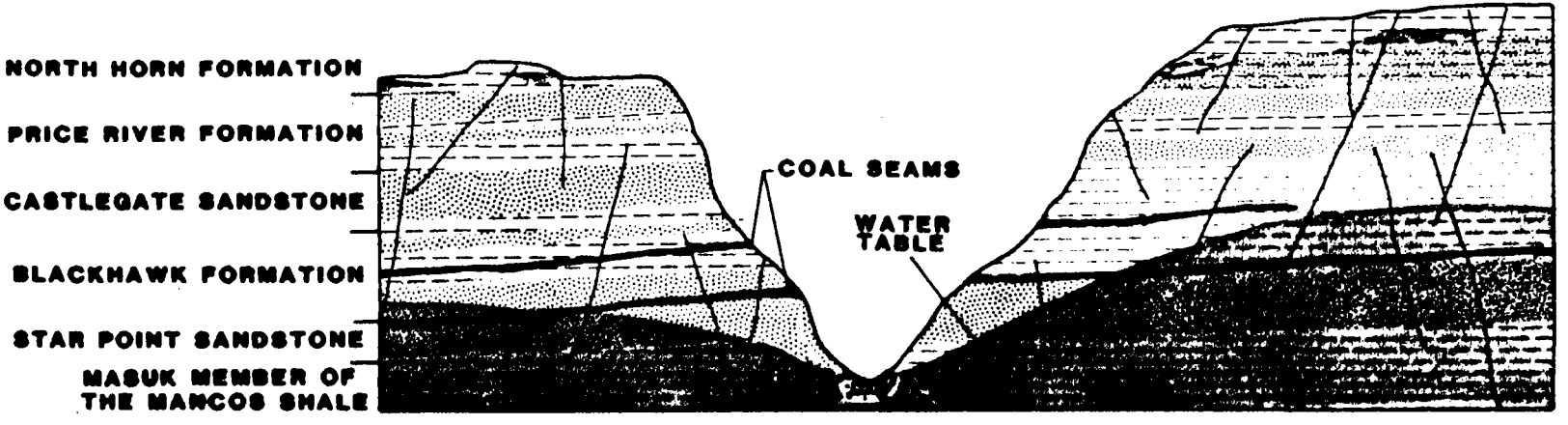
The stratigraphic formations in Newberry Canyon conform to this general description. However, the Flagstaff Formation is not present, and the North Horn Formation is approximately 250 feet thick and forms the cap in this area. (see Figure 3).

In order to identify possible factors contributing to the failure of the Castlegate Sandstone in connection with underground mining, two semi-independent geologic studies were conducted. (Fry, Semborski and Snider, 1987 and Seegmiller, 1987).

The Fry, Semborski and Snider study is incorporated into the Seegmiller report (Appendix C). However, portions of that study are included here to further describe the Castlegate Sandstone Formation.

SOUTH

NORTH



(ADAPTED FROM SEMBORSKI, 1986)

NEWBERRY CANYON STRATIGRAPHY

UTAH POWER & LIGHT COMPANY
MINING DIVISION

DATE: 11-26-87	BY: KJL
SCALE: NONE	FIGURE 3

The Castlegate Sandstone is a very competent, massive unit. Therefore, where it is exposed on outcrop, it yields to stress only along joints within the rock.

The Castlegate Sandstone is the upper member of the Mesa Verde Group and overlies the Blackhawk Member unconformably...its lower contact is gradational and variable. The thickness of the Castlegate Sandstone is variable and ranges from 260 feet to 380 feet... This unit is comprised predominantly of medium to fine-grained, moderately sorted, sandstone having trough cross stratification interbedded with thin, lenticular, discontinuous beds of pebble conglomerate and mudstone. The entire sequence was deposited in a braided stream environment so that none of the individual units is continuous. However, the predominance of sandstone allows for several troughs to be deposited in succession to form what appears from a distance to be a massive unit.

The presence of thin lenticular beds of mudstone within the Castlegate Sandstone appears to play an important role in the stability of the cliff. Cliff exposure and drill hole data were inspected to identify the distribution of mudstone units within the Castlegate Sandstone. The mudstone beds present in Newberry Canyon are located 80 to 120 feet down from the top of the Castlegate Sandstone and are eight to 15 feet in thickness. On outcrop they appear to continue for distances of up to one-fourth of a mile.

The strata present on East Mountain contain joints or natural fractures induced by tectonic stresses to which they are subject. Normally, joints are found as sets of two fractures at nearly right angles to each other. Most of the joints are vertical or near vertical and extend from well below the coal seams through the Flagstaff Limestone present on the highest portions of the plateau. These joints form natural planes of weakness in the Castlegate Sandstone whereby blocks of the sandstone can move vertically or settle near the outcrop.

HYDROLOGY

Surface flow in Newberry Canyon occurs primarily during snow melt and storm events. However, "alkali" seeps,

originating in the Mancos Shale, near the Starpoint contact, have been observed at the location indicated in Plate C1. Accumulation of alkali, around the perimeter of the seeps and along the associated stream path, indicates a high level of dissolved solids. A recent study by UP&L personnel indicates that waters originating from the Starpoint/Mancos contact area may exhibit TDS levels in excess of 4,000 mg/l (Semborski, C.A. 1986).

Flow from the Newberry Canyon seeps is less than one (1) gallon per minute and terminates within approximately 800 feet of the point of origin. No groundwater sources, seeps or springs, are located above the Newberry Canyon longwall panels.

SOILS

Soils within Newberry Canyon, described in the Carbon-Emery Soil Survey (USDA, SCS, 1970), are of three types:

> Kenilworth Very Stony Sandy Loam, 0-20 percent slopes, eroded (KeE2).
>
> This Kenilworth soil is well drained and is moderately permeable. Runoff is medium, and the susceptibility to erosion is slight to moderate. The root zone is shallow or moderately deep. Depth of root penetration is restricted by limy layers and stones. This soil retains about 4.5 inches of water, but only about 3.5 inches of water is readily available to plants.
>
> This soil is used mainly as spring and fall range. Deer use it also for winter range. In places juniper is cut for fence posts. (Capability unit VIIs-SX, nonirrigated; Semi-Desert Stony Loam (Pinon-Juniper) range site)

Rock Land (Ry)

Rock land is a miscellaneous land type having a surface 50 to 70 percent covered by stones, boulders, and outcrops of shale and sandstone. Most of this land type is moderately eroded, but many areas are severely eroded. Soil characteristics are almost obscured by the stones and boulders. The slopes are very steep to perpendicular, but typically they are between 50 and 80 percent.

Small areas are accessible to livestock and wildlife, but most of the land type is too steep and rocky for grazing (Capability unit VIIIs-3, nonirrigated; not rated for other uses).

Shaly Colluvial Land (Sn)

Shaly colluvial land is a mixture of soil material, cobblestones, and fragments of rock. It has accumulated on moderately steep and steep slopes and at the bases of slopes, primarily as the result of gravity. This colluvium is variable in thickness, and in some places it is as much as 3 feet thick over shale...From 20 to 40 percent of the surface is shale outcrops. Because of the steep slopes, the lack of precipitation to establish plants and the unconsolidated nature of the colluvium, moderate to severe erosion is active.

The dominant vegetation is galletagrass and shadscale. Some of the gentler slopes have a good cover of galletagrass. This land type is used for spring and fall range. (Capability unit VIIs-DX, nonirrigated; Desert Cobbly Loam range site)

VEGETATION

The lower portion of Newberry Canyon supports vegetation associated with the Semi-Desert Stony Loam (Pinyon-Juniper) range site described in the Carbon-Emery Soil Survey (USDA, SCS, 1970) as follows:

Juniper trees makes up from 60 to 80 percent of the overstory; the rest is pinon. The annual precipitation is 10 to 12 inches.

The original vegetation in the understory is so badly depleted that remnants of grass are hard to

find in most places. Erosion is active as indicated by weak pediceled shrubs and exposed roots of juniper and pinon trees. Roots of the present vegetation spread through the soil and use moisture that once was available to palatable range plants.

This vegetation community extends to the talus slopes which are representative of the submontane (Transition life zone) ecological association. Vegetation in this area, on the north side of the canyon, is characterized by a mixed community including a Pinyon-Juniper dwarf forest, mountain brush and grasses. Range site designation has not been made for this area. The Capability unit description (VIIIs-3) for this type of land reads:

> This capability unit consists only of bare, steep ledges of Rock land on which plants do not grow. The only uses is for wildlife habitat, water supply, and esthetic purposes.

The talus slopes and associated vegetation extend upward to the base of the Castlegate Sandstone.

Above the Castlegate Sandstone, the Transition life zone vegetation is replaced by Mixed-Conifer and sagebrush-grass communities of the montane ecological association.

The south side of the canyon also supports the mixed vegetation community. However, the Mixed-Conifer community is also present, extending from the canyon rim down the talus slopes approximately to the Starpoint Sandstone. Additionally, a narrow strip continues

approximately 2,000 feet from the Starpoint Sandstone along the bottom of the canyon.

A riparian habitat type (approximately 0.1 acre), of marginal quality, exists in association with the alkali seeps discussed previously (see Plate C1). The community is characterized primarily by grass (Elymus sp.) and rushes (Juncus sp.), and occupies a narrow strip of land, approximately five (5) feet in width, adjacent to the perimeter of the seep area and approximately 700 feet along the stream channel.

FISH AND WILDLIFE

Wildlife habitats or use areas for "high interest" species, in the Wasatch Plateau Biogeographic area, have been ranked into four (4) levels of importance by the Utah Division of Wildlife Resources (UDWR).

High interest wildlife are defined as all game species; any economically important species; and any species of special aesthetic, scientific or educational significance. This definition includes all federally listed, threatened and endangered species of wildlife. Habitat rankings, in the order of their relative importance are: critical, high-priority, substantial and limited.

Critical Value Areas. Critical wildlife areas are "sensitive use areas" necessary to sustain the existence and perpetuation of one or more species of wildlife during crucial periods in their life cycles. These areas are

restricted in area and lie within high-priority wildlife use areas. Biological intricacies dictate that significant disturbances cannot be tolerated by the members of an ecological assemblage on critical sites. Wetlands and riparian habitats are ranked as being of critical value to all wildlife.

High-priority Value Areas. High-priority wildlife use areas are "intensive use areas" for one or more species of wildlife. "Intensive use areas" are not restricted in area and in conjunction with limited value use areas form the substantial value distribution for a wildlife species.

Substantial Value Areas. Substantial value wildlife use areas are "existence areas" for one or more species of wildlife. "Existence areas" represent a herd or population distribution and are formed by the merging of high-priority and limited value wildlife use areas for a species.

Limited Value Areas. Limited value wildlife use areas are "occasional use areas" for one or more species of wildlife. "Occasional use areas" are part of the substantial value wildlife use area for a species.

Newberry Canyon contains habitat of all four (4) rankings for various wildlife species.

Sections 27 and 28, portions of which are within Newberry Canyon, have been ranked as high-priority value habitat for wildlife. Additionally, all cliffs and their associated talus slopes within the Transition life zone are ranked as high-priority wildlife habitat.

No habitat exists in Newberry Canyon to support a fish species. Also, seasonal flows from the canyon do not directly enter a fishery supporting stream.

Wildlife species associated with the major habitat types found in Newberry Canyon are listed in Table I. It is assumed that the potential exists for them to occur in the area; however, as indicated in the table, only a few species have been observed. This is based on casual observation, not actual species inventories.

Although a small area of riparian habitat is also found in Newberry Canyon, (see Plate C1), species associated with this habitat type have not been listed. Because the habitat appears marginal in both quantity and quality, it seems likely that it does not support those species associated strictly with riparian habitats. Also, it appears that no aquatic biological community as defined by UMC 817.57 is present. This is probably due to the apparently high TDS level and the intermittent nature of the flow.

Game Species

Mule Deer (Odocoileus hemionus) - Mule deer range throughout all habitats in the general area, and have been observed in Newberry Canyon. The area is ranked as being of high-priority deer range. A major seasonal migration route is located along the south side of the canyon.

Elk (Cervus canadensis) - Elk inhabit the sagebrush and forest areas at the upper elevations on East

Mountain, but do not ordinarily range into pinyon-juniper habitat. However, the bench above the Castlegate Sandstone cliffs provides critical valued winter range and high-priority summer range for this species.

Cougar, Mountain Lion (Felis concolor) - This species inhabits rugged mountains and forest areas. The substantial valued use area for the cougar extends from the submontane into the montane ecological association. Due to the dependency of the cougar upon mule deer as a prey source, a ranking of the lion's seasonal distribution parallels that of the deer.

Snowshoe Hare (Lepus americanus) - This species occurs in forested portions of mountainous areas in the region. It inhabits higher elevations on East Mountain. Newberry Canyon is ranked as substantial value habitat for this species.

Desert Cottontail (Sylvilagus audubonii) - Desert cottontails have been observed in Newberry Canyon. They are year-long residents of the area which is ranked as substantial value habitat.

Blue Grouse (Dendragapus obscurus) - A plucked carcass of a Blue Grouse was observed in Newberry Canyon. Portions of the canyon are ranked as critical value, providing breeding territories and nesting areas.

Chukar Partridge (Alectoris graeca) - This species prefers steep, rocky, semiarid slopes with low shrubs and rock outcrops. Other than free water, Newberry Canyon

appears to provide the habitat requirements for this species. However, no individuals have been observed in the area.

Mourning Dove (Zenaidura macroura) - This is an important game bird in many parts of North America. Mourning doves prefer open field and forest edge habitat, but occur over a broad range of vegetation types. Other than free water, the Newberry Canyon area appears to provide suitable habitat for this species, but none have been observed.

Other Species

No endangered or threatened species or critical habitat for threatened or endangered wildlife species are known to occur in Newberry Canyon. However, the area is ranked as substantial value habitat to wintering bald eagles (Haliaeetus leucocephalus).

Newberry Canyon serves as a nesting territory for a single pair of golden eagles (Aquila chrysaetos). The territory was active during the 1987 nesting season (February to July). One young was produced and fledged.

The Newberry Canyon area is ranked as substantial or limited value for a variety of the species listed in Table I.

LAND USE

As previously stated, the primary land use in Newberry Canyon is wildlife habitat. This is not only due

to the topography of the area, but also soil characteristics and climate.

Summer livestock grazing occurs on East Mountain above the canyon and in the valley below, but the steepness of the canyon precludes this use within the canyon.

Trapping The primary recreational activity associated with the area is hunting. This also occurs primarily above the canyon on top of East Mountain or along the bench just below the top.

The Bureau of Land Management (BLM) visual resource management system rates the area as Class III, which allows for modification of the land through man's activities. The U.S. Forest Service also rates this area as partial retention, a scenic value similar to BLM's Class III.

The Newberry Canyon area is not designated for recreation development, timber sales or oil and gas wells.

No cultural resource materials nor activity sites are known to exist in the Newberry Canyon area (see Appendix F).

TABLE I
KEY

Status - Population

C	-	Common, Widespread and Abundant
U	-	Uncommon, Widespread but not Abundant
R	-	Rare, Seldom Seen
E	-	Endangered, Candidate for Extinction
T	-	Threatened, Candidate for Endangered
L	-	Limited, Restricted to a Specific Habitat
K	-	Status Unknown

Habitat

S	-	Sagebrush
G	-	Grassland
SD	-	Salt Desert Shrub
R	-	Riparian
P-J	-	Pinyon-Juniper Forest
MC	-	Mixed Conifer (Includes Aspen Groves)

TABLE I

VERTEBRATE SPECIES OF THE WASATCH PLATEAU
WHICH PROBABLY OCCUR IN NEWBERRY CANYON
(Adapted from Wilberg Mine MRP, Volume 2)

Reptiles:

Species	Status	Habitat	Observed in the Area
Eastern Fence Lizard	C	SD,P-J	
Sagebrush Lizard	C	SD,P-J	
Tree Lizard	C	P-J	
Short-horned Lizard	C	SD,P-J,S,MC	
Rubber Boa	C	MC	
Striped Whipsnake	C	SD,P-J	
Racer	C	S,MC	
Ringneck Snake	K	R,MC	
Gopher Snake	C	SD,P-J,S	
Milk Snake	K	MC	
Sonora Mountain Kingsnake	K	R,P-J,MC	
Western Terrestrial Garter Snake	C	R,P-J,MC	
Midget Faded Rattlesnake	C	P-J	
Birds:			
Turkey Vulture	C	All	
Goshawk	C	MC	
Sharp-shinned Hawk	U	MC,S	
Cooper's Hawk	C	R,MC,P-J	
Red-tailed Hawk	C	All	X
Swainson's Hawk	U	S,P-J	
Golden Eagle	C	All	X

Birds Continued

Species	Status	Habitat	Observed in the Area
Bald Eagle	E	All	X
Praire Falcon	C	P-J	X
Peregrine Falcon	E	All	
Merlin	C	P-J	
American Kestrel	C	R,SD,P-J	X
Blue Grouse	C	MC	Plucked carcass (Raptor kill)
Ruffed Grouse	C	MC	
Band-tailed pigeon	U	MC	
Rock Dove	C	P-J	X
Mourning Dove	C	All	
Barn Owl	K	P-J	
Flammulated Owl	K	MC	
Great Horned Owl	C	All	
Pygmy Owl	K	R,P-J	
Long-eared Owl	C	P-J	
Saw-whet Owl	K	MC	
Poor-Will	C	P-J	
Black Swift	U	MC	
White-throated Swift	C	P-J	X
Broad-tailed Hummingbird	C	All	X
Rufous Hummingbird	C	MC	
Calliope Hummingbird	C	MC	
Common Flicker	C	MC	X
Yellow-bellied Sapsucker	C	MC	

Birds Continued

Species	Status	Habitat	Observed in the Area
Northern Three-toed Woodpecker	U	MC	
Cassin's Kingbird	U	P-J	
Says Phoebe	C	SD,P-J	
Hammond's Flycatcher	U	MC	
Dusky Flycatcher	C	MC	
Gray Flycatcher	K	S,P-J	
Western Flycatcher	C	MC	
Western Wood Peewee	C	MC	
Olive-sided Flycatcher	U	MC	
Violet-green Swallow	C	All	
Barn Swallow	C	P-J	
Cliff Swallow	C	P-J	X
Purple Martin	U	MC	
Steller's Jay	C	MC	X
Gray Jay	R	MC	
Scrub Jay	C	R,P-J	
Black-billed Magpie	C	R,P-J	X
Common Raven	C	All	X
Pinion Jay	C	S,P-J	X
Clark's Nutcracker	C	MC	X
Black-capped Chickadee	C	MC	
Mountain Chickadee	C	MC	
Plain Titmouse	C	P-J	
Bushtit	C	MC	

Birds Continued

Species	Status	Habitat	Observed in the Area
White-breasted Nuthatch	C	MC	
Red-breasted Nuthatch	C	MC	
Pygmy Nuthatch	C	MC	
Brown Creeper	C	MC	
House Wren	C	MC	
Rock Wren	C	SD,P-J	
Canyon Wren	C	P-J	X
Bewick's Wren	C	P-J	
American Robin	C	R,MC	X
Hermit Thrush	C	MC	
Swainson's Thrush	C	MC	
Western Bluebird	U	MC,P-J	
Mountian Bluebird	C	S,MC	
Townsend's Solitaire	C	MC,P-J	
Golden-crowned Kinglet	U	MC,P-J	
Ruby-crowned Kinglet	C	MC	
Bohemian Waxwing	U	R,MC	
Starling	C	All	
Solitary Vireo	U	R,P-J	
Orange-crowned Warbler	C	MC	
Nashville Warbler	U	MC	
Virginia's Warbler	C	P-J	
Magnolia Warbler	U	MC	
Yellow-rumped Warbler	C	MC	
Black-throated Gray Warbler	C	P-J	

Birds Continued

Species	Status	Habitat	Observed in the Area
Townsend's Warbler	U	MC	
Western Tanager	C	MC	
Green-tailed Towhee	C	S,P-J	
Dark-eyed Junco	C	MC	
Gray-headed Junco	C	MC	
Chipping Sparrow	C	MC,P-J	X
Harris Sparrow	U	P-J	
White-crowned Sparrow	C	P-J	
Black-throated Sparrow	U	S,P-J	
Evening Grosbeak	C	MC	
Cassin's Finch	C	MC	
House Finch	C	All	
Pine Grosbeak	U	MC	
Pine Siskin	C	MC	
American Goldfinch	C	R,P-J	
Lesser Goldfinch	C	P-J	
Red Crossbill	U	MC	
Mammals:			
Merriam Shrew	U	S,MC	
Dusky Shrew	C	MC	
Little Brown Myotis	C	P-J	
Fringed Myotis	U	SD,P-J	
Long-eared Myotis	C	MC	
Long-legged Myotis	C	P-J	

Mammals Continued

Species	Status	Habitat	Observed in the Area
Yuma Myotis	U	P-J	
Silver-haired Bat	C	MC	
Western Pipistrelle	C	P-J	
Red Bat	U	MC	
Western Big-eared Bat	C	P-J	
Pika	C	MC,P-J	
Snowshoe Hare	C	MC	
Black-tailed Jackrabbit	C	SD,P-J	
Desert Cottontail	C	SD,P-J	X
Red Squirrel	C	MC	
Rock Squirrel	C	SD,P-J	X
Golden-mantled Ground Squirrel	C	S,MC	
Yellow-bellied Marmot	C	S,MC	
Northern Flying Squirrel	C	MC	
Least Chipmunk	C	S,SD,P-J	
Uintah Chipmunk	C	MC	
Cliff Chipmunk	U	P-J	
Valley or Botta Pocket Gopher	C	G,S,P-J	
Ord Kangaroo Rat	C	SD,P-J	
Canyon Mouse	C	P-J	
Deer Mouse	C	All	
Brush Mouse	C	P-J	
Pinion Mouse	C	P-J	
Desert Wood Rat	C	SD,P-J	

Mammals Continued

Species	Status	Habitat	Observed in the Area
Bushy-tailed Wood Rat	C	MC,P-J	
Porcupine	C	MC	
Coyote	C	All	
Red Fox	C	MC	
Gray Fox	C	P-J	
Black Bear	C	MC	
Ring-tailed Cat	C	P-J	
Short-tailed Weasel	R	P-J	
Marten	R	MC	
Badger	C	S,MC,P-J	
Striped Skunk	C	P-J	
Bobcat	C	MC,P-J	
Cougar	C	MC,P-J	
Mule Deer	C	All	X
Rocky Mountain Elk	C	MC	

IMPACT ASSESSMENT AND MITIGATION

Longwall mining began in the Newberry Canyon area September 8, 1986, in the Sixth East panel. The panel was completed April 1, 1987. Extraction of a second panel, Seventh East, began April 6, 1987 and was completed September 4, 1987 (See Map KS970D and Plates A thru C1).

Prior to longwall mining, a monitoring plan (Appendix B) was developed and implemented (see Appendix A). The purpose of the monitoring program, as stated in the plan, is to collect data whereby the impacts of subsidence and cliff spalling upon eagle nesting can be assessed. The methodology involved is described in Appendix A.

Eagle activity monitoring began February 28, 1986. Monitoring of subsidence (prism observations) and cliff spalling began in August of 1986; however, reliable data was not generated until October of that year. Prism observations, spalling photography and eagle activity monitoring have continued through 1987. An aerial nesting survey was again conducted within approximately a 300 square mile (10 mile radius) area centered at Newberry Canyon (see Map CM-10680-EM, Appendix A). Biologists from U. S. Fish and Wildlife Service, Utah State Division of Wildlife Resources and UP&L, using a Jet Ranger helicopter, completed the survey May 18 and 19, 1987. Results of the survey indicate the productivity of the area breeding population is stable (six (6) young observed each year).

Additional to the above data, geologic data collection and assessment was conducted in August and

September, 1986, by UP&L geologists and Seegmiller International Mining Geotechnical Consultants/Engineers. The resulting report is provided in Appendix E.

Mining related impacts to the environmental resources in Newberry Canyon associated with longwall coal mining result from three (3) effects; surface cracking, escarpment failure (cliff spalling) and talus deposition.

SURFACE CRACKING. Surface tension cracks were discovered in July 1987. They occurred at two locations above the Sixth East panel: (1) on top of the Castlegate Sandstone, and (2) parallel to the panel on top of the north ridge of Newberry Canyon (see Plate C and Photos 14 and 15, Appendix D).

The cracks on the ridge top extend discontinuously, approximately 2,000 feet, in a general east-west direction. Vertical and horizontal displacement ranges from only inches to approximately five (5) feet at some locations.

The cracks located directly above the panel and the Castlegate Sandstone generally parallel the escarpment and are similar in appearance to cracks found in unmined areas along the south end of East Mountain. Further description of surface cracks is found in Appendix E.

The major impact resulting from formation of surface cracks is to land use, primarily grazing and recreation (hunting). Approximately 4.5 acres of land suitable for these uses is directly affected by surface cracks. An additional 13 acres is potentially impacted

resulting from possible decreased accessibility. The impact to use of the area by wildlife appears to be minimal.

The company (UP&L) proposed fencing the area to prevent access by the public and livestock; however, USFS personnel determined this action was not needed unless a "significant change" occurs in the area. (Letter from John Niebergall, August 25, 1987.)

Proposed mitigation, when subsidence ceases, includes recontouring and backfilling the areas which are accessible. Materials at the site will be used for this purpose. Following backfilling and recontouring, the disturbed areas will be revegetated.

ESCARPMENT FAILURE (CLIFF SPALLING). Spalling of the Castlegate Sandstone cliffs is a natural phenomenon. This is evidenced by the presence of talus slopes along the base of the formation and spalled arches on the cliff face, present before mining occurred in the area. The absence or sparseness of trees in some areas is also an indication that spalling occurred in the recent past at various locations along the cliffs (see Plates A and A1, and Appendix D Photos 1, 19 and 22). Longwall mining has accelerated the rate of spalling in the Newberry Canyon area.

Mine related spalling occurred within one month following the start-up of longwall mining in Sixth East. Within this period of time, approximately 750 feet of the panel had been extracted (see Map KS970D). Spalling first occurred in October and November, 1986, in the portion of cliffs directly above the eastern end of the Sixth East

panel. Spalling again occurred in this area during April, May and June of 1987 during extraction of the Seventh East panel (see Plates B and C).

Spalling within Newberry Canyon first occurred in December, 1986, as indicated in Appendix A, Photo 8; and progressed ~~almost~~ continually through May, 1987, above the western portion of the Sixth East panel (Plate C1). Surface spalling lagged behind the location of the extraction face approximately 400 feet (one month).

Spalling associated with extraction of the Seventh East panel began in early June, 1987, and continued intermittently through mid-September. The same relationship of extraction face location and spalling was observed.

The modes of cliff spalling are explained in Appendix E. These include (1) rock falls, (2) toppling failure, and (3) foundation failure. These failure modes are the result of certain geologic characteristics of the Castlegate Sandstone including the presence of joints and their orientation to the escarpment and the presence of shaly (mudstone) interbeds within the sandstone. Toppling and foundation failure explanations are supported by prism survey data (Appendix C) and field observations of escarpment failure.

Toppling. Prism survey data indicates significant horizontal movement prior to and sometimes in the absence of downward vertical movement. This seems to indicate movement of the strata in relation to jointing, at times resulting in toppling escarpment failure. Prism data, coupled with

spalling observations, also indicates that significant horizontal and vertical movement can occur without major spalling occurring.

Survey data indicates movement of prisms 3 and 4 during the period of mining (October, 1986, to September, 1987), as follows:

Prism #	Net Horizontal Movement	Net Vertical Movement
3	S9°53'44" W 6.85 ft.	Downward 4.41 ft.
4	S13°05'00" W 7.17 ft.	Downward 4.62 ft.

The portion of cliff face which spalled in the area of prisms 3 and 4 is estimated to be approximately 29 percent. However, spalling in the area of prisms 1 and 2 is estimated at 63 percent with associated prism movement as follows:

Prism #	Net Horizontal Movement	Net Vertical Movement
1	S9°56'17" W 0.95 ft.	Upward 0.39 ft.
*2	S6°54'21" W 0.32 ft.	Downward 0.09 ft.

*Note: Movement prior to loss of prism 2 in February, 1987

Total spalling of the undermined cliff area is estimated to be ~~51 percent~~.

Foundation failure has been observed in the field. Bands of mudstone were observed to "crush out" of the escarpment prior to spalling. Following the crushing of the mudstone, blocky sections of sandstone above the mudstone fall vertically in mass. Escarpment failure which resulted in the loss of Prism 2 and nest 61A was due to foundation failure. This appears to be the failure mode in the majority of the area where extensive spalling occurred.

Rock Falls. Rock falls, the third failure mode identified, occurred where portions of the escarpment are unsupported or unconfined. This was the condition in the area of nest 61B. As photos 1, 3 and 16, Appendix D, indicate, nest 61B was located in an area where natural escarpment failure had occurred in the past (spalled arch). This spalling resulted in massive sections of unsupported sandstone remaining as overhanging members. Minor movement of the Castlegate formation, associated with extraction of the Seventh East panel (refer to Appendix C, Prism 1 data, and Map KS970D), resulted in these unsupported members being freed, and thus allowed to fall.

The major impact associated with escarpment failure in Newberry Canyon is the loss of raptor (golden eagle) nests and/or suitable nest sites.

The impact of lost nests or nest sites on eagle nesting behavior and reproduction within Newberry Canyon will be assessed during successive breeding seasons. Concern exists that disturbance, such as cliff spalling, will have a negative impact on eagle nesting behavior. However, initial data indicates this type of disturbance may not create a significant impact.

Major spalling occurred in Newberry Canyon during the entire 1987 breeding season. Including the phases when disturbance would be most disruptive; nest selection, breeding, egg laying and incubation. Although spalling was in progress, successful nesting occurred at nest 61C. The area of major spalling is within approximately 2,000 feet

and in direct view of nest 61C (see plate C1). Fledging occurred on July 9, 1987 and the fledgling was subsequently observed in the area through mid-August.

However, spalling did impact inactive nests in the canyon. As stated previously, two nests were destroyed when escarpment failure occurred. Nest 61A was destroyed in early February and nest 61B in mid-September; however, two (2) nests still remain (61C and 62; Photos 4 and 5, Appendix D).

Mitigation will be based on the reaction of the breeding pair to the loss of the nests. This will be determined following subsequent breeding seasons. If it is determined that, as a result of nest losses, nesting does not occur; or alternate natural nest sites are not selected to replace the lost nests, the feasibility of creating artificial nest sites will be examined. This would include pole-mounted platforms and/or artificially created cavities on the cliff face.

TALUS DEPOSITION. Talus deposition is the result of escarpment failure. The areas impacted by mining-related talus deposition are indicated in Plates C and C1. Approximately 32 acres of talus slope have been impacted by mining-related talus deposition.

As stated previously, this area supports a Pinyon-Juniper, mountain brush and grass mixed vegetation community, with an associated land use of wildlife habitat for the species previously discussed.

Mitigation for the resulting impacts through talus removal is unfeasible and revegetation is of only limited feasibility. Therefore, mitigation can be accomplished most effectively through improvement of habitat for the impacted species in another area, or enhancement of habitat for another selected species.

Improvement of habitat for impacted species may be applicable in areas near the mouth of the canyon. Clearing small areas of pinyon-juniper forest and seeding with desirable vegetation may be an effective habitat improvement technique. However, improved habitat in this area is not likely to be effective for all impacted species.

It appears that the lack of available, potable water is a major habitat limiting factor in the area. Development of watering sites, through the installation of guzzlers may be an effective mitigation measure.

If mitigation through habitat improvement cannot be achieved, consideration should be given to developing the existing habitat, talus deposition sites, for another desirable species.

As discussed in the Fish and Wildlife portion of this report, the area appears to provide many of the habitat needs for Chuckar Partridge. Again it appears the major limiting factor is available water. Thus, a possible effective mitigation approach would include development of watering sites (guzzlers) and introduction of a desirable, compatible species.

The mining-related talus extends to the canyon floor at one location (see Plate C1). At this point, the flow channel from the alkali seep has been impacted. Boulders of varying sizes have been deposited in and along the stream channel for a distance of approximately 50 feet. The channel is not blocked by the debris and water flow is not impeded.

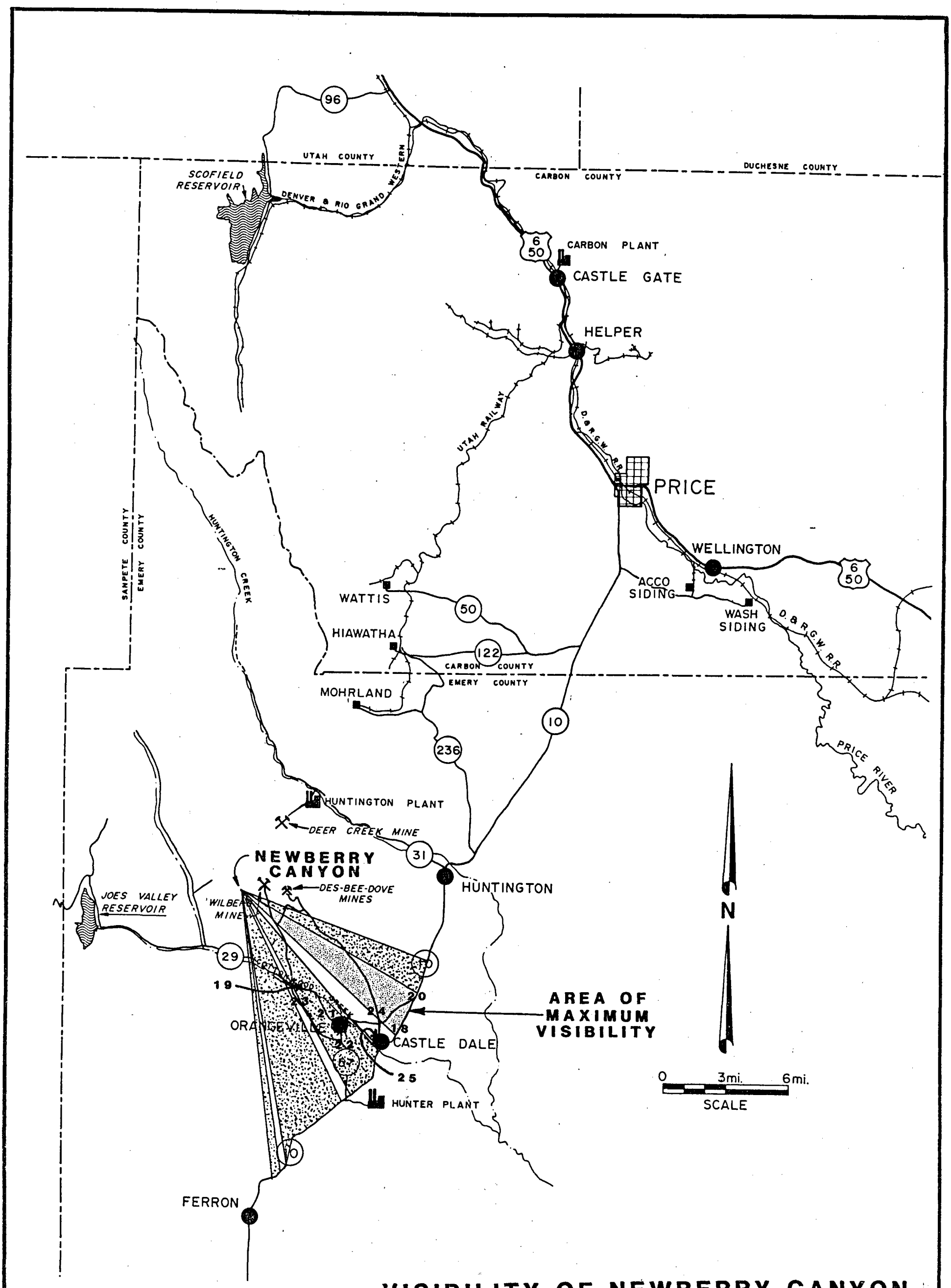
Because of the marginal quality of the associated riparian habitat and ~~the small extent~~ and area of impact (approximately 250 square feet) mitigation is not proposed for this area. However, development of riparian habitat, in conjunction with proposed water source development, may be feasible.

An additional land use impact resulting from talus deposition in Newberry Canyon is that of visual impact.

The Newberry Canyon area is visible from public roads including State Roads 10, 29 and 57, several county roads and three (3) of the communities within Emery County (see Figure 4).

Maximum visual impact is experienced along the Cottonwood/Wilberg mine access road. This road does not receive substantial public use; therefore, maximum visual impact to the general public does not occur.

The visual impacts at various locations, within the area of visibility, are documented by photographs 18 through 25 in Appendix D. Corresponding location numbers are included in Figure 4. The photographs illustrate the visual impact to which the public is most likely to be



VISIBILITY OF NEWBERRY CANYON FROM HIGHWAY 10

FIGURE 4

exposed. These include areas of general public activity, the major north-south travel route in the county and routes to recreation areas (Straight Canyon and Joe's Valley Reservoir).

As previously stated, cliff spalling is a natural phenomenon which occurs throughout the Wasatch Plateau. The visual impact of the talus deposition in Newberry Canyon is significant when this is the area of focus viewed at close proximity. However, the significance of the visual impact diminishes when the area is viewed in relationship to the surrounding area.

MILLER CANYON AREA

LOCATION

Miller Canyon is located due west of Newberry Canyon, on the southwestern edge of East Mountain. It occupies portions of Sections 29 and 30, Township 17 South, Range 7 East and Sections 25 and 36, Township 17 South, Range 6 East (Figure 1).

TOPOGRAPHY

The canyon is narrow and steep in the lower portion, 3600 feet rim-to-rim at the mouth with a vertical displacement of 1700 feet. The length of the lower area from the mouth to the Castlegate Sandstone cliffs is approximately 4300 feet. The lower portion is characterized by vertical sandstone cliffs interspersed with steep (60 percent) talus slopes.

The canyon forks just above the Starpoint Sandstone to form two separate drainages.

Above the Castlegate Sandstone formation, the canyon widens to approximately 5500 feet. This area is characterized by gentler slopes (40 percent) and fewer rocky outcrops.

GEOLOGY

The general stratigraphic formations are the same as identified in Newberry Canyon. However, significant differences exist in the characteristics of the Castlegate

Sandstone found in the two areas. One of these differences, discussed in the Fry, Semborski and Snider study follows:

> The presence of the thin lenticular beds of mudstone within the Castlegate Sandstone appears to play an important role in the stability of the cliff. Cliff exposure and drill hole data were inspected to identify the distribution of mudstone units within the Castlegate Sandstone. It was determined that the mudstone beds are more prevalent on the east side of East Mountain in Newberry Canyon than on the west side in Miller Canyon. The mudstone beds present in Newberry Canyon are located 80 to 120 feet down from the top of the Castlegate Sandstone and are eight to 15 feet in thickness. On outcrop they appear to continue for distances of up to one-fourth of a mile. In Miller Canyon the mudstone beds are much less prevalent than to the east, and they are less continuous laterally. In some locations within the Castlegate Sandstone no mudstone beds could be identified.

A second major difference between the Castlegate Sandstone in Miller Canyon and the same formation in Newberry Canyon is related to joint patterns. This is discussed in the Seegmiller report found in Appendix E.

HYDROLOGY

Surface flow in Miller Canyon is also associated primarily with storm events and spring runoff. However, a mine water discharge point exists at the Fourth South portals (NPDES Permit UT-0022896, Site 004). This discharge point intermittently contributes to flow in the canyon.

Additionally, an alkali seep also exists in the floor of the canyon at the Moncos-Starpoint contact zone. No significant quantity of water has been observed to be produced in this area.

Springs are present on top of East Mountain in the area at the head of Miller Canyon. They are included in the UP&L Hydrologic Monitoring Program.

SOILS

According to the Carbon-Emery Soil Survey (USDA, SCS, 1970), the same soils are found in both canyons.

VEGETATION

Vegetation in Miller Canyon differs from that found in Newberry Canyon.

elk use

The vegetation community associated with the talus slopes on the north side of Miller Canyon, is composed primarily of grasses, few mountain brush and a very sparse stand of Pinyon-Juniper.

elk use

The Mixed-Conifer community is the major vegetation type in Miller Canyon. It extends from the rim of the south ridge to the floor of the canyon and from the mouth of the canyon to the top of East Mountain.

A population of Western Sweetvetch (Hedysarum occidentale var. canone) exists in Miller Canyon. This species is presently Federally listed as a sensitive plant, candidate category 2 species. This designation means that the U.S. Fish and Wildlife Service "...is in possession of information that proposing to list the species as endangered or threatened species may be appropriate, but for which conclusive data on biological vulnerability and threats are not currently available to support proposed rules."

Forest Service objectives for management of sensitive plants are:

1. Develop management practices to ensure that species do not become threatened or endangered.

2. Maintain viable populations of all native and desired non-native wildlife, fish and plant species in habitats throughout their geographical range on National Forest System lands.

3. Develop and implement management objectives for populations and/or habitat of sensitive plants.

It is Forest Service policy to:

1. As part of the National Environmental Policy Act process, review programs and activities through a biological evaluation to determine their potential effect on sensitive plants.

2. Avoid or minimize impacts to species whose viability has been identified as a concern.

3. If impacts cannot be avoided, analyze the significance of potential adverse impacts on the population or its habitat within the area of concern and on the species as a whole. The decision to proceed with a specific impact must not result in loss of species viability or create significant trends toward Federal listing as a threatened or endangered species. (Letter from W. H. Boley, September 11, 1987.)

As part of the above stated management objectives and policy, UP&L is required to conduct surveys to determine the extent of this species, within the mine permit area. The company is also required to map populations, when found, and conduct population trend studies.

The survey of the Miller Canyon population was designated as having to be completed this field season. Results of the required survey are presented in Plate E.

An area of riparian habitat also exists in Miller Canyon as indicated on Plate D. This area is similar to that found in Newberry Canyon in that it, also, is associated with an alkali seep originating at the Mancos/Starpoint contact zone. The area is a wet meadow type site rather than a flowing stream, estimated to cover less than 0.1 acre.

FISH AND WILDLIFE

Section 29 is ranked as high-priority value to wildlife. Miller Canyon is ranked as both high-priority value winter and summer range for deer but only high-priority value summer range for elk. Other than this, the fish and wildlife information presented for Newberry Canyon is essentially the same for Miller Canyon. However, because the mixed-conifer habitat is more extensive in Miller Canyon, it is likely that a greater number of associated wildlife species are present also.

Seven (7) golden eagle nests and three (3) stick nests are located in Miller Canyon(see Map CM-10770-CW, Plate D; and Photos 26 through 32, Appendix D). The area is the nesting territory for a single pair of eagles and has been included in the 1986 and 1987 aerial surveys.

Active nests have been observed during both surveys. Alternate nests were used each year but both were

in the 98 cluster. Nesting success was not verified in 1986 and the 1987 nesting attempt failed for unknown reasons.

The stick nests (classified as such by USFWS biologists) located in Miller Canyon were inactive in 1986 and 1987. The nest identified as "stick nest" was designated as old and dilapidated during the 1986 survey. It's condition was unchanged when observed in 1987.

LAND USE

Land use information for Miller Canyon is the same as was discussed for Newberry Canyon, with the exception of Forest Service Land Use Rating. A small portion of the mouth of Miller Canyon has been rated Modification.

IMPACT ASSESSMENT AND MITIGATION

Conditions in Miller Canyon differ from those in Newberry Canyon; therefore impacts resulting from mining ~~will differ also.~~

Geologic conditions relating to the Castlegate Sandstone differ substantially in discontinuity and geotechnical characteristics. This is discussed in Appendix E.

The mining plan is different in that the amount of escarpment to be undermined in Miller Canyon is much less than was undermined in Newberry. Also, the orientation of the longwall panels in relation to the escarpment is different.

These factors result in a substantial decrease in the potential for any impact to the escarpment.

Some conditions, however, are similar. There are environmental resources in Miller Canyon that must be considered, possibly from a worst case scenario. That being; If escarpment failure occurs, what would the impact be?

Two (2) eagle nests (97A and 97B) are located on the Castlegate escarpment overlying proposed mining areas and a third, a stick nest, is located in close proximity to the set-up entries. If escarpment failure occurred, the nests would possibly be impacted. The magnitude of the impact is somewhat minimized by the presence of at least seven (7) other nests within the canyon. Neither of the two eagle nests is known to have been active in the last two breeding seasons, and the stick nest is old and dilapidated, apparently not having been used for several years.

It is known that eagles maintain and use alternate nests from year to year. This has been observed in Miller Canyon as discussed previously. Therefore, if nests 97A, 97B, and the dilapidated stick nest were unavailable for use, additional nests are available.

The worst case scenario involving eagle nests is an active nest being impacted. This situation has been prevented in Newberry Canyon by implementation of intensive monitoring of eagle nesting activities (see Appendices A and B). This monitoring enabled the company to observe the

status of nests, within areas of potential impact, throughout the breeding season.

A similar monitoring program is proposed for Miller Canyon. Monitoring of both eagle activity and subsidence would be implemented prior to mining. Map CM-10770-CW shows the proposed locations of prisms to be used in subsidence monitoring. Eagle nests are observable from various locations within the canyon (see Appendix D, Photos 26 and 27).

If necessary to prevent use of a nest, deterrent measures could be implemented to keep a nest from becoming active during periods of potential impact. This might include "fencing off" the nest as was recently done by Cyprus/Plateau Mining Company.

If nests are destroyed as a result of mining, mitigation similar to that proposed for Newberry Canyon would be implemented.

Impacts to other environmental resources would be similar to those occurring in Newberry Canyon, but to a much lesser extent. Therefore, mitigation would also be similar to that proposed for Newberry. However, in-canyon development of habitat improvement projects, other than small water development sites, would be restricted due to the steep and narrow nature of the canyon.

No cultural resources are known to exist in Miller Canyon (see Appendix F).

Visual impacts in Miller Canyon, resulting from possible spalling, would be minimal because of the

inaccessibility of the canyon. The area is not visible from any major roads, communities or other areas of activity within the county. It is only easily visible from a 100 foot section of the Cottonwood Canyon road (see Plate F).

BIBLIOGRAPHY

Fry, R., Semborski, C. A., and Snider K., 1987; Castlegate Sandstone Cliff Stability; Utah Power & Light Company Mining Division Report.

Hauck, F.R., 1987; Cultural Resource Evaluation of Potential Subsidence and Escarpment Failure Areas in the East Mountain Locality of Emery Coutny, Utah.

Payne, V. E., 1986; Golden Eagle Nesting/Cliff Subsidence Monitoring Plan.

Payne, V. E., 1987; Cottonwood Mine 1986 Cliff Subsidence and Eagle Monitoring Report.

Seegmiller, B. L., 1987; Surface Stability Evaluation 6E/7E and 9W/10W Panels Cottonwood Mine Emery County, Utah; Seegmiller International Report to Utah Power & Light Company.

Semborski, C. A., 1986; TDS Study of Company Owned Coal Mines, Emery County, Utah; Utah Power & Light Company Mining Division Report.

AERIAL PHOTOGRAPH PLATES

5TH EAST

PR3

NEST #62

6TH EAST

PR4

PERCH

7TH EAST

1 ST SOUTH

NEWBERRY CANYON

NCC

PLATE A

SEPT. 1985

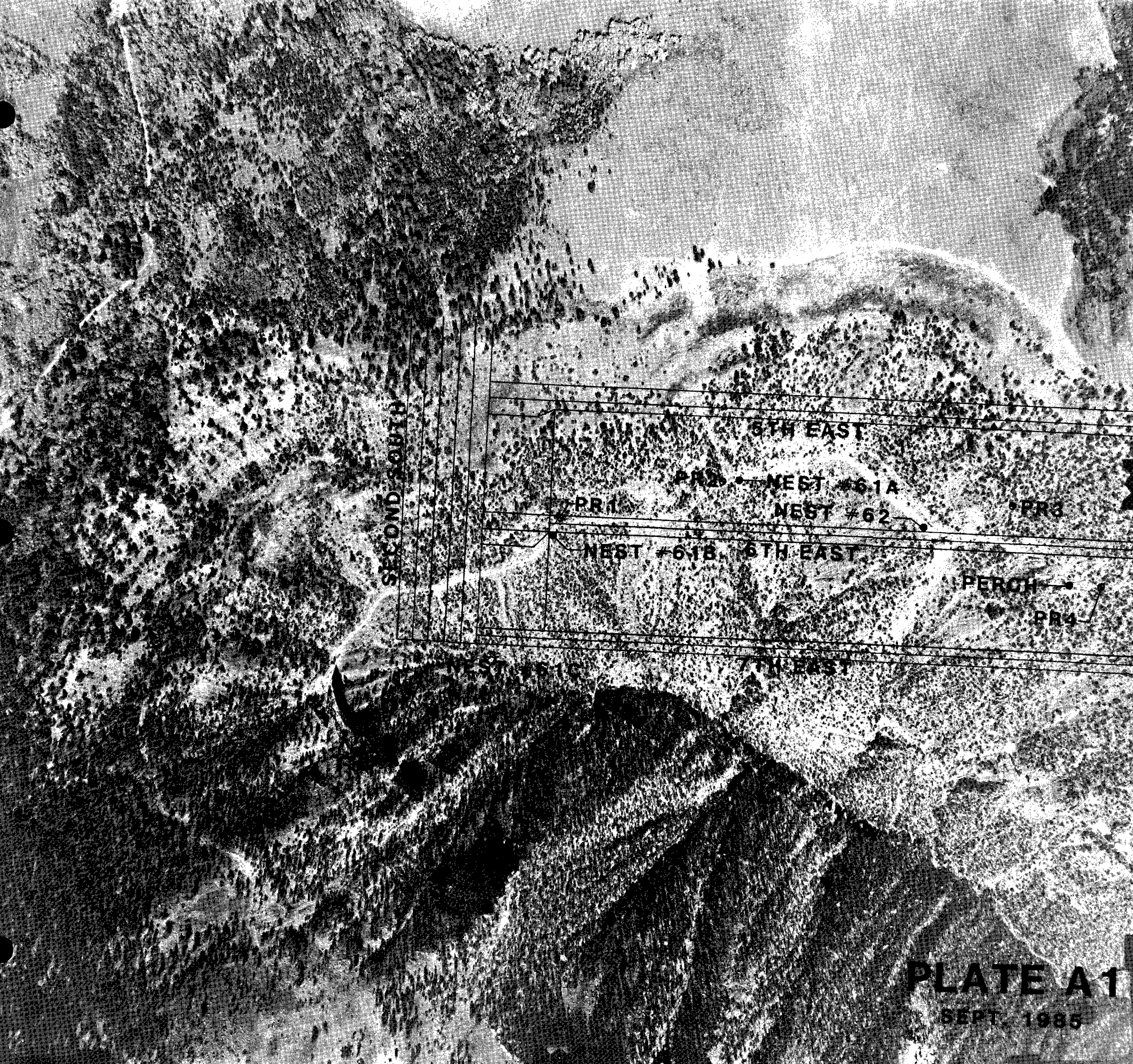


PLATE A1

SEPT. 1985

5TH EAST

NEST #62

PR3

6TH EAST

PR4

PERCH

7TH EAST

SOUTH

TALUS

PLATE B

OCT. 1986

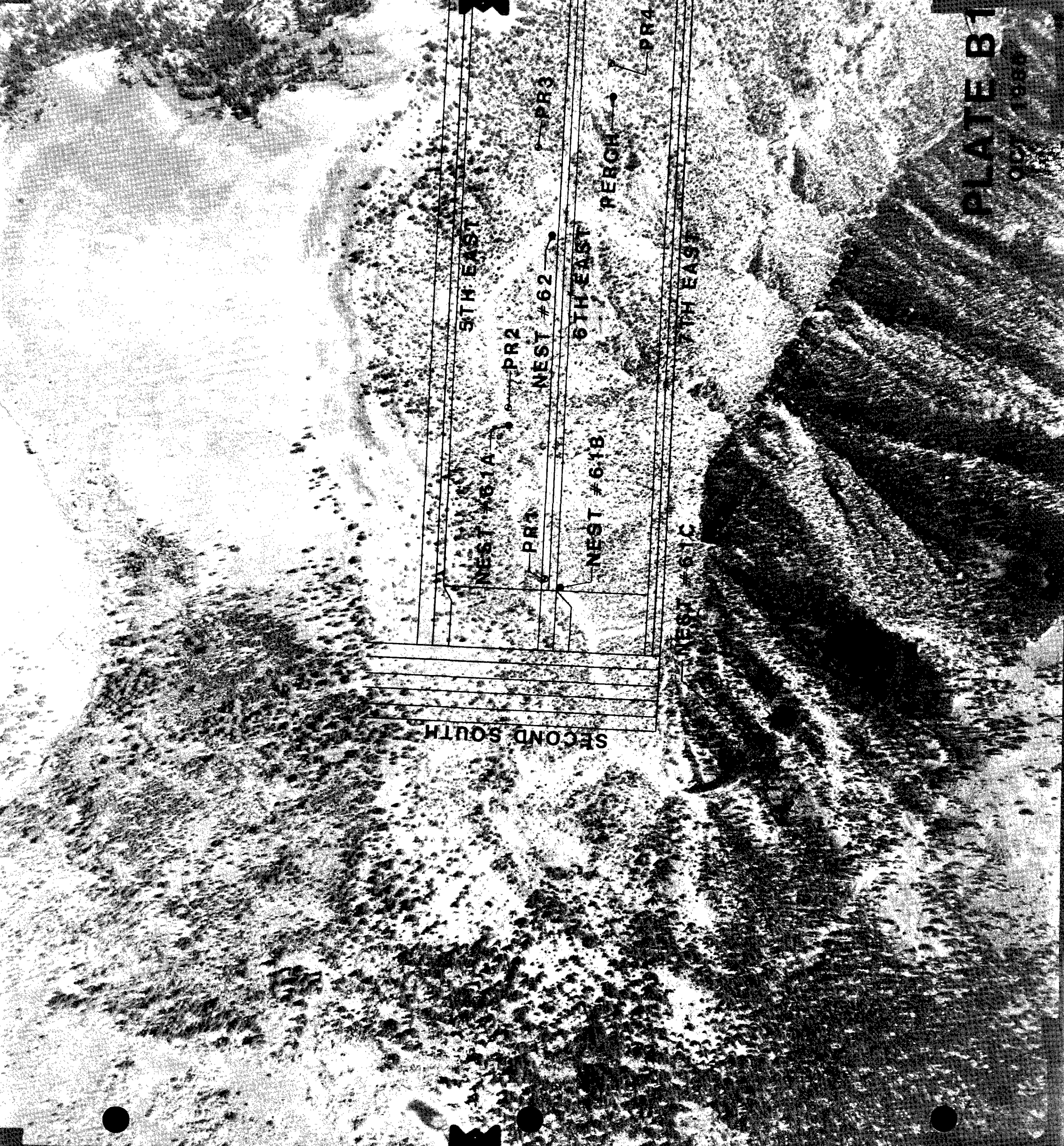


PLATE B
SECOND SOUTH
5TH EAST
6TH EAST
7TH EAST
NEST #6 1A
NEST #6 1B
NEST #6 1C
NEST #6 2
PR1
PR2
PR3
PR4
PERCH

SURFACE CRACKS

5TH EAST

6TH EAST

7TH EAST

1ST SOUTH

TALUS

PR3

NEST #62

PERCH

PR4

WATERFALL CANYON

PLATE C

SEPT. 1987