10.5 Mitigation and Management Plans

The mitigation and management plans focus on minimizing impacts related to continued mining activities and facilitating rapid return of the site to suitable habitat after decommissioning.

Many of the mitigation and impact avoidance procedures utilized in the following sections have been drawn from information provided to Blue Blaze Coal Company by DWR (1981). A number of these measures also were prepared by Blue Blaze Coal Company in their attempt to comply with the DWR's recommendations.

In taking all necessary precautions for the animals and the habitat we find it in the best interest of everything surrounding the poject to fulfill and carry out ever recommendation and then some in order to protect and maintain a well balanced environment.

In order to take extra precautions the following actions will be taken in order to minimize disruption to the wildlife and the habitat surrounding the project:

(1) Land effected for installation of surface facilities will be sloped to allow passage by wildlife.

(2) Personnel will be educated in the welfare of all wildlife and not to harass or take wildlife, and that disturbance can cause adverse effects.

(3) Employees will be cautioned against disturbing young animals or females with young.

(4) When driving vehicles, it will be necessary not to stop to observe wildlife for it further disturbs them.

(5) Revegetation will be done where wildlife habitats are disturbed.

(6) Planting will be done in late fall if possible for reclamation projects guided under the appropriate agencies.

(7) No pesticides will be used on the mine site.

(8) Toxic materials will not be allowed to be kept on the mine site. They will be hauled to a proper disposal place. Any such toxic materials will be fenced to keep wildlife out, until at which time it can be removed.

(9) Native plants and/or ornamental berry producing shrubs and target species, sunflower or blazing star will be planted for avian species, if available with the seed distributors.

(10) Nesting of any avifauna will be protected during the crucial periods from disturbance.

(11) Raptors are indicated more than a half mile away from the area and will not be disturbed.

(12) Electrical and other transmission lines will be designed in accordance with the guidelines in "Environmental Criteria for Electrical Transmission System" published by the USDA and USD; in 1970 and/or the REA Bulletin 61-10 "Powerline Contacts by Eagles and Other Large Birds."

(13) Lodges, dens and nests will be protected especially during prime times of the season that they are used.

(14) Coal haulage will be planned to not effect wildlife using schooling of personnel and controlled speed limits.

(15) Due to the length of conveyors there should be no barriers. If so, cross unders can be installed along the belt lines.

10.5.1 Terrestrial Habitats and Wildlife

DWR (1981b) emphasized three basic aspects to migitation and impact avoidance for the terrestrial habitats at the Blue Blaze No. 1 and No. 2 Mines: habitat and wildlife protection, reclamation, and wildlife management.

Habitat protection measures center on avoiding especially important or sensitive areas, such as riparian zones, and not using persistant pesticides, which would diminish the long-term health of an ecosystem.

Reclamation is particularly important as a means of controlling erosion and restoring disturbed areas to productive wildlife habitat. Recommended procedures in achieving the reclamation goal include (1) planting a diverse mixture of native grasses, forbs, and (where appropriate) woody specdies, (2) using seedling stock rather than relying solely on seeds for trees or shrubs, (3) planting vegetation to create an edge effect by clumping selected shrub or tree species, (4) actually transplanting stock or turf from new disturbed sites to reclaimed sites, and (5) leaving islands of natural vegetation in new disturbed sites.

Wildlife management is important for minimizing harmful effect (e.g., fencing animals out of areas containing toxic substances) and preventing damage to newly reclaimed areas (e.g., excluding large herbivores and possibly controlling rodents).

Direct impacts on springs and seeps on or adjacent to the permit area are not expected based on past mining experiences in the area. However, if mining operations negatively impact these features, Blue Blaze Coal plans to provide measures for replacement because of necessity for wildlife that can't migrate to other water sources. For alternative water sources in the vicinity. See Section 3.4.3 and Section 7 for a discussion of the permit area hydrology.

Specific types of mitigation, impact avoidance, and wildlife management procedures recommended by DWR (1981b).

10.5.1.1 Mammals

For small mammals, most of which are secretive and have small home ranges, mitigation will be almost totally related to habitat protection and reclamation i.e., ways of minimizing short and long-term habitat loss. For larger species, such as big game carnivores and ungulates, the problem is complicated by their large home ranges, seasonal movements, and sensitivity to disturbance.

Disturbance-related impacts will be mitigated to a significant extent by Blue Blaze Coal Company policies against harassing or hunting wildlife in the permit area. These policies will containue throughout the operation of the mine. Further, "employee awareness" programs will specifically inform mine personnel of especially sensitive periods or habitats, such as deer fawning seasons and areas, bear dens, critical winter areas, and so forth. In addition, these sensitive aspects of the ecosystem will be avoided during future exploration, operation, and reclamation activities.

Roadkills will be minimized by an employee awareness program, including speed limits, game crossing signs, and reminders at critical seasons(e.g., late winter).

10.5.1.2 Birds

Like small mammals, songbirds and other small species are most sensitive to habitat loss, and mitigation will therefore focus on habitat protection and reclamation. In addition, active nests or nest trees will not be disturbed.

For raptors and gamebirds, which like large mammals are more wide-ranging and susceptible to disturbance, an employee awareness program will ensure that active nests or other "crucial-critical" use areas are avoided during the sensitive season and that the birds are not harassed or killed. The potential raptor electrocution hazard posed by some powerline pole configurations has been determined by U.S. Fish and Wildlife Service raptor biologist Ron Joseph to not require corrective modification (See Section 10.4). However, the monitoring program will continue to address this concern. The raptor nesting area located is Sec. 8, T13S, R8E SLM will not have any pillar extraction only development work within 200 ft of the nesting sites. This will eliminate any chance of subsidence under this area. Also see

10.7 for monitoring these areas and 3.4.8.4 for subsidence and angle of draw.

10.5.1.3 Reptiles and Amphibians

Besides minimizing habitat loss and restoring native vegetation, the principal mitigation measures for herptiles will be to avoid killing individuals and to not disturb or destroy snake dens, amphibian breeding ponds, and other sensitive use areas.

10.5.2 Aquatic Habitats and Organisms

Habitat loss or deterioration of the Gordon Creek aquatic ecosystem will be limited by constructing sediment ponds to protect the stream from an increased sediment load from the mine affected area in the North Fork Gordon Creek. Additional details of these procedures for 1protecting stream quality are provided in Section 3.2.8, 3.2.9, and 7.2.3 of the mine permit application.

10.6 Stream Buffer Zone Determination

The Blue Blaze No. 1 and No. 2 Mines will be located along an intermittent, stream, which is a tributary to the Gordon Creek. This tributary meets the Gordon Creek within the permit area. The Gordon Creek does not support other game or non-game fish. This slight contribution from the improved haul/access road (which is effectively being controlled by watering) and the natural soil erosion contribution will not adversely affect the stream's value to terrestrial species. All runoff from the disturbed area will be directed around this stream and treated in a sedementation pond before being allowed to enter the stream. A buffer zone will be along this rechanneled stream to eliminate any disturbance to the stream See Plate 7-5. If visual inspection indicates that this stream is being contaminated the culvert will be extended downstream past the sedimentation pond to remedy any problem.

Beaver Creek is an important stream, since it supports at least a limited Cutthroat Trout fishery. The mining operation will not have but a small impact if any on the Beaver Creek, nor should it do so in the future since surface disturbance is limited to the Gordon Creek Drainage. There will be buffer zones in this area.

10.7 Fish and Wildlife Monitoring

Blue Blaze Coal Company will conduct wildlife monitoring throughout the operational life of the mining operations. The monitoring will utilize the services of a full time environmental specialist and, as necessary, professional consultants to evaluate the ongoing success of operational mitigation measures, ensure that threatened or endangered species and sensitive or critical use areas remain undisturbed by future activities, deal with any unforeseen difficulties which might arise, and participate in reclamation efforts upon completion of the project.

Three aspects of the monitoring program which will be initated by Blue Blaze Coal Company are already initiated by Beaver Creek Coal Company: (1) monthly observations of specific stations along the streams to monitor sediment load, (2) routine reporting by coal selected personnel of any roadkills along the access corridor, and (3) spring surveys of the site conducted by the operator to identify any potentially active raptor nests.

These spring surveys will be utilized by the company to identify nesting activity within the permit area. Any necessary mitigation will be handled in cooperation with the U.S. Fish and Wildlife Service and DWR. Future surveys will also continue to evaluate the raptor electrocution hazard, especially along the lower portions of the access/haul road east of the permit area during the winter and early spring.

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Appendix Table 1. Mammals in or near the mine permit Area, Carbon County, Utah (1980-1981).

Species	Status	Relative Abundance*	Habitat Preference*
SORICIDAE			
Northern Water Shrew			
Sorex palustris	potential	uncommon	riparian
Merriam's Shrew			
S. merriami	potential	uncommon	ubiquitous
Vagrant Shrew			
S. vagrans	likely	common	riparian, meadows
Masked Shrews			
S. cinereus	likely	common	moist sites
Dusky Shrew			
S. obscurus	likely	common	conifers, meadows
VESPERTILIONIDAE			
Little Brown Myotis			
Myotis lucifugus	likely	common	caves, riparian
Small-footed Myotis			
M. leibii	likely	uncommon	caves, cliffs
Long-legged Myotis			
M. volans	likely	common	cliffs, trees
Long-eared Myotis			
M. evotis	likely	common	conifers
Fringed Myotis			
M. thysanodes	likely	uncommon	caves, cliffs
Yuma Myotis			
M. yumanensis	likely	uncommon	caves
California Myotis			
M. californicus	likely	common	caves, cliffs
Silver-haired Bat			
Lasionycteris noctivagans	likely	common	conifers
Western Pipistrelle			
Pipistrellus hesperus	likely	common	caves, cliffs
Big Brown Bat			
Eptesicus fuscus	likely	common	caves, cliffs
Red Bat			
Lasiurus borealis	likely	uncommon	conifers, riparian
Hoary Bat			
L. cinereus	likely	uncommon	conifers, riparian
Western Big-eared Bat			
Plecotus townsendii	likely	common	caves, cliffs

*Includes onsite observation and DWR regional information

Appendix Table 1 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
LEPORIDAE			
White-tailed Hare			
Lepus townsendii	potential	common	sagebrush, grassland
Snowshoe Hare			
L. americanus	likely	common	conifers, aspen
Black-tailed Hare			
L. californicus	potential	common	sagebrush, grassland
Mountain Cottontail			
Sylvilagus nuttallii	observed	common	conifers
Desert Cottontail			
S. audubonii	potential	common	sagebrush, brushland
SCIURIDAE			
Red Squirrel			
Tamiascuirus hudsonicus	observed	common	conifers
Rock Squirrel			
Spermophilus variegatus	observed	common	ubiquitous
Uintah Ground Squirrel			
S. armatus	observed	common	dry meadows
Golden-mantled Ground Squirrel			
S. lateralis	observed	common	ubiquitous
Northern Flying Squirrel			
Glaucomys sabrinus	potential	common	conifers
Yellow-bellied Marmot			
Marmota flaviventris	likely	common	rocky areas
Least Chipmunk			
Eutamius minimus	observed	common	ubiquitous
Uintah Chipmunk			
E. umbrinus	observed	common	ubiquitous
Cliff Chipmunk			
E. dorsalis	likely	common	pinyon/juniper
GEOMYIDAE			
Northern Pocket Gopher			
Thomomys talpoides	present	common	meadows
Valley Pocket Gopher			
T. bottae	potential	common	meadows
HETEROMYIDAE			
Great Basin Pocket Mouse			
Perognatuus parvus	potential	common	pinyon/juniper
Ord's Kangaroo Rat			
Dipodomys ordii	potential	common	pinyon/juniper

Appendix Table 1 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
CASTORIDAE			
Beaver			
Castor canadensis	potential	common	aquatic
CRICETIDAE			
Western Harvest Mouse			
Reithrodontomys megalotis	potential	common	sagebrush, grassland
Deer Mouse			
Peramyscus maniculatus	likely	abundant	ubiquitous
Canyon Mouse			
P. crinitus	likely	common	rocky areas
Brush Mouse			
P. boylii	likely	common	brushlands
Pinyon Mouse			
P. truei	likely	common	pinyon/juniper
Bushy-tailed Wood Rat			
Neotoma cinerea	likely	common	ubiquitous
Muskrat			
Ondatra zibethicus	likely	common	aquatic
Meadow Vole			
Microtus pennsylvanicus	likely	common	meadows
Mountain Vole			
M. montanus	likely	common	meadows
Richardson's Vole			
M. richardsoni	likely	common	meadows
Long-tailed Vole			
M. longicaudus	likely	common	meadows, brushland
MURIDAE			
Norway Rat			
Rattus norvegicus	potential	common	mine areas
House Mouse			
Mus musculus	potential	common	mine areas
ZAPODIDAE			
Western Jumping Mouse			
Zapus princeps	likely	common	riparian, meadows
ERETHIZONTIDAE			
Porcupine			
Erethizon dorsatum	observed	common	wooded areas

Appendix Table 1 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
CANIDAE			
Coyote			
Canis latrans	present	common	ubiquitous
Red Fox			
Vulpes vulpes	likely	common	ubiquitous
Gray Fox			
Urocyon cinereoargenteus	likely	common	riparian, conifers
URSIDAE			
Black Bear			
Ursus americanus	present	common	ubiquitous
PROCYONIDAE			
Ring-tailed Cat			
Bassariscus astutus	potential	common	riparian, brushland
Raccoon			
Procyon lotor	potential	irregular	riparian
MUSTELIDAE			
Short-tailed Weasel			
Mustela ermineae	potential	uncommon	ubiquitous
Long-tailed Weasel			
M. frenata	potential	uncommon	meadows, riparian
Marten			
Martes caurina	likely	uncommon	conifers
Wolverine			
Gulo luscus	potential	common	sagebrush, meadows
Badger			
Taxidea taxus	potential	common	sagebrush, meadows
Spotted Skunk			
Spilogale putorius	likely	common	riparian, brushlands
Striped Skunk			
Mephitis mephitis	likely	common	ubiquitous
FELIDAE			
Bobcat			
Lyns rufus	present	common	ubiquitous
Canada Lynx			
L. canadensis	potential	rare	conifers, aspen
Dougar			
Felis concolor	likely	uncommon	ubiquitous

Appendix Table 1 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
CERVIDAE			
Mule Deer			
Odocoileus hemionus	observed	common	ubiquitous
Moose			
Alces alces	potential	uncommon	meadows, aquatic
American Elk			
Cervus elaphus	observed	common	ubiquitous

Appendix Table 2. Birds in or near the mine permit Area, Carbon County, Utah (1980-1981).

Species	Status	Relative Abundance*	Habitat Preference*
PODICIPEDIDAE			
Pied-billed Grebe			
Podilymbus podiceps	potential, summer	uncommon	wet areas
ANATIDAE			
Mallard			
Anas platyrhynchos	observed, summer	uncommon	wet areas
Green-winged Teal			
A. discors	observed, summer	uncommon	wet areas
CATHARTIDAE			
Turkey Vulture			
Cathartes aura	observed, summer	common	ubiquitous
ACCIPITRIDAE			
Goshawk			
Accipiter gentilis	observed, resident	common	conifers, aspen
Sharp-shinned Hawk			
A. striatus	observed, resident	uncommon	wooded areas
Cooper's Hawk			
A. cooperii	potential,resident	uncommon	wooded areas
Red-tailed Hawk			
Bueteo jamaicensis	observed,resident	common	ubiquitous
Swainson's Hawk			
B. swainsoni	likely, summer	uncommon	ubiquitous
Rough-legged Hawk			
B. lagopus	likely, winter	uncommon	ubiquitous
Golden Eagle			
Aquila chrysaetos	observed,resident	common	ubiquitous
Bald Eagle			
Haliaeetus leucocephalus	potential, winter	irregular	ubiquitous
Northern Harrier			
Circus cyaneus	likely, resident	uncommon	open areas
FALCONIDAE			
Prairie Falcon			
Falco mexicanus	likely, resident	uncommon	open areas
Peregrine Falcon			
F. peregrinus	potential, migrant	irregulal	open areas

*Includes onsite observation and DWR regional information.

Appendix Table 2. Birds in or near the mine permit Area, Carbon County, Utah (1980-1981)

Species	Status	Relative Abundance*	Habitat Preference*
Merlin			
F. columbarius	potential,winter	uncommon	open areas
American Kestrel			
F. sparverius	observed,resident	uncommon	open areas
TETRAONIDAE			
Blue Grose			
Dendragapus obscurus	observed,resident	common	conifers,aspen
Ruffed Grouse,brushlands			
Bonasa umbellus	observed,resident	common	aspen
Sage Grouse			
Centrocercus urophasianus	potential,resident	uncommon	sagebrush
PHASIANIDAE			
California Quail			
Lophortyx californicus	potential,resident	common	brushlands
Chukar Partridge			
Alectoris chukar	potential,resident	common	rocky areas
Ring-necked Pheasant			
Phasianus colchicus	potential,resident	common	agricultural
ARDEIDAE			
Great Blue Heron			
Ardea herodian	potential,summer	uncommon	wet areas
Snowy Egret			
Egretta thula	potential,summer	irregular	wet areas
Black-crowned Night Heron			
Nycticorax mycticorax	potential,summer	irregular	wet areas
GRUIDAE			
Sand hill Crane			
Grus canadensis	potential,migrant	irregular	meadows
RALLIDAE			
Sora Rail			
Porzana carolina	potential,resident	uncommon	meadows
American Coot			
Fulica americana	observed,summer	uncommon	wet areas
SCOLOPACIDAE			
Common Snipe			
Capella gallinago	observed,summer	uncommon	meadows

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
CAPRIMULGIDAE			
Whip-poor-will			
Phalaenoptilus nuttalli	potential,resident	uncommon	wooded areas
Common Nighthawk			
Chordelies minor	observed,summer	uncommon	ubiquitous
APODIDAE			
Black Swift			
Cypseloides niger	potential,summer	uncommon	rocky areas
White-throated Swift			
Aeronautes saxatalis	observed,summer	common	rocky areas
TROCHILIDAE			
Black-chinned Hummingbird			
Archilochus alexandri	observed,summer	uncommon	brushlands
Broad-tailed Hummingbird			
Selasphorus platycercus	observed,summer	common	ubiquitous
Rufous Hummingbird			
Selasphorus rufus	likely,summer	common	ubiquitous
Calliope Hummingbird			
Stellula calliope	likely,summer	common	conifers,aspen
ALCEDINIDAE			
Belted Kingfisher			
Megaceryle alcyon	potential,resident	uncommon	aquatic
PICIDAE			
Common Flicker			
Colaptes auratus	observed,resident	common	wooded areas
Yellow-bellied Sapsucker			
Sphyrapicus varius	observed,resident	common	riparian,aspen
Williamson's Sapsucker			
S. thyroideus	observed,summer	uncommon	aspen,conifers
Hairy Woodpecker			
Picoides villosus	observed,resident	common	conifers,aspen
Downy Woodpecker			
P. pubescens	observed,resident	common	riparian,aspen
Northern Three-toed Woodpecker			
P. tridactylus	observed,resident	uncommon	conifers

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
TYRANNIDAE			
Eastern Kingbird			
Tyrannus tyrannus	potential,summer	common	agricultural
Western Kingbird			
T. verticalis	likely,summer	common	pinyon/juniper
Cassin's Kingbird			
T. vociferans	potential,summer	uncommon	pinyon/juniper
Ash-throated Flycatcher			
Myiarchus cinerascens	observed,summer	uncommon	pinyon/juniper, riparian
Willow Flycatcher			
Empidonax traillii	observed,summer	uncommon	riparian
Hammond's Flycatcher			
E. hammondii	observed,summer	common	conifers
Dusky Flycatcher			
E. obserholseri	observed,summer	common	aspen, brushlands
Gray Flycatcher			
E. wrightii	potential,summer	irregular	dry wooded areas
Western Flycatcher			
E. difficilis	observed,summer	common	moist wooded areas
Olive-sided Flycatcher			
Nuttallornis borealis	observed,summer	uncommon	conifers
Western Wood Pewee			
Contopus sordidulus	observed,summer	common	aspen
Say's Phoebe			
Sayornis saya	likely,resident	uncommon	open areas
ALAUDIDAE			
Horned Lark			
Eremophila alpestris	potential,resident	uncommon	open areas
HIRUNDINIDAE			
Violet-green Swallow			
Tachycineta thalassina	observed,summer	common	wooded areas
Tree Swallow			
Iridoprocne bicolor	observed,summer	common	wooded areas
Rough-winged Swallow			
Stelgidopteryx ruficollis	potential,summer	common	wet areas
Barn Swallow			
Hirundo rustica	potential,summer	common	ubiquitous

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
Cliff Swallow			
Petrochelidon pyrrhonata	observed,summer	common	rocky areas
Purple Martin			
Progne subis	potential,summer	uncommon	open forests
CORVIDAE			
Steller's Jay			
Cyanocitta stelleri	observed,resident	common	conifers,aspen
Gray Jay			
Perisorius canadensis	potential,resident	irregular	conifers
Scrub Jay			
Aphelocoma coerulescens	potential,resident	common	pinyon/juniper
Black-billed Magpie			
Pica pica	observed,resident	uncommon	ubiquitous
Common Raven			
Corvus corax	observed,resident	common	ubiquitous
Common Crow			
C. brachyrhynchos	likely	irregular	ubiquitous
Pinyon Jay			
Gymnorhinus cyanocephalus	observed,resident	common	pinyon/juniper
Clark's Nutcracker			
Nucifraga columbiana	observed,resident	common	conifers
PARIDAE			
Black-capped Chickadee			
Parus atricapillus	observed,resident	common	wooded areas
Mountain Chickadee			
P. gambeli	observed,resident	common	conifers,aspen
Plain Titmouse			
P. inoranatus	observed,resident	uncommon	pinyon/juniper
Bushtit			
Pslatriparus minimus	likely,resident	common	pinyon/juniper
SITTIDAE			
White-breasted Nuthatch			
Sitta carolinensis	observed,resident	common	woodded areas
Red-breasted Nuthatch			
S. canadensis	observed,resident	uncommon	conifers
Pygmy Nuthatch			
S. pygmae	observed,resident	uncommon	conifers
CERTHIDAE			
Brown Creeper			
Certhia familiaris	observed,resident	common	wooded areas

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
American Coot			
Fulica americana	observed,summer	uncommon	wet areas
SCOLOPACIDAE			
Common Snipe			
Capella gallinago	observed,summer	uncommon	meadows
Spotted Sandpiper			
Actitis maculata	observed,summer	uncommon	wet areas
PHALAROPODIDAE			
Wilson's Phalarope			
Steganopus tricolor	observed,migrant	uncommon	wet areas
Northern Phalarope			
Lobipes lobatus	potential,migrant	uncommon	wet areas
COLUMBIDAE			
Band-tailed Pigeon			
Columba fasciata	potential,summer	irregular	brushland
Mourning Dove			
Zenaida macroura	observed,summer	uncommon	ubiquitous
CUCULIDAE			
Yellow-billed Cuckoo			
Coccyzus americanus	potential,summer	irregular	riparian
STRIGIDAE			
Screech Owl			
Otus asio	likely,resident	uncommon	riparian
Flammulated Owl			
Otus flammeolus	potential,resident	irregular	conifers
Great Horned Owl			
Bubo virginianus	observed,resident	common	ubiquitous
Pygmy Owl			
Galucidium gnoma	potential,resident	irregular	wooded areas
Long-eared Owl			
Asio otus	observed,resident	uncommon	wooded areas
Short-eared Owl			
A. flammeus	potential,resident	uncommon	open areas
Saw-whet Owl			
Aegolius acadicus	potential,resident	irregular	conifers

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
CINCLIDAE			
Dipper			
Cinclus mexicanus	potential,resident	uncommon	riparian
TROGLODYTIDAE			
House Wren			
Troglodytes aedon	observed,summer	common	aspen,conifers
Rock Wren			
Salpinctes obsoletus	observed,resident	common	rocky areas
Canyon Wren			
Catherpes mexicanus	observed,resident	uncommon	rocky areas
Bewick's Wren			
Thryomanes beiwckii	potential,resident	common	pinyon/juniper
Marsh Wren			
Cistothorus palustris	potential,migrant	irregular	wet meadows
MIMIDAE			
Mockingbird			
Mimus polyglottos	potential,migrant	irregular	brushlands
Gray Catbird			
Dumetella carolinensis	observed,summer	uncommon	riparian
Sage Thrasher			
Oreoscoptes montanus	potential,resident	common	sagebrush
TURDIDAE			
American Robin			
Turdus migratorius	observed,resident	common	ubiquitous
Hermit Thrus			
Catharus gattatus	observed,summer	common	conifers
Swainson's Thrush			
C. ustulatus	observed,summer	uncommon	riparian,aspen
Veery			
C. fuscenscens	likely,summer	uncommon	riparian
Mountain Bluebird			
Sialia currucoides	observed,resident	uncommon	open woodlands
Western Bluebird			
S. mexicana	potential,resident	uncommon	open woodlands
Townsend's Solitaire			
Myadestes townsendii	observed,resident	common	wooded areas
SYLVIDAE			
Blue-gray Gnatcatcher			
Polioptila caerulea	observed,summer	uncommon	pinyon/juniper

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
Golden-crowned Kinglet			
Regulus satrapa	likely,resident	uncommon	conifers
Ruby-crowned Kinglet			
R. Calendula	observed,resident	common	wooded areas
BOMBYCILLIDAE			
Bohemian Waxwing			
Bombycilla garrulus	likely,winter	uncommon	ubiquitous
Cedar Waxwing			
B. cedrorum	likely,winter	uncommon	ubiquitous
LANIIDAE			
Northern Shrike			
Lanius excubitor	likely,winter	uncommon	open areas
Loggerhead Shrike			
L. ludovicianus	likely,resident	common	open areas
STURNIDAE			
Starling			
Sturnus vulgaris	potential,resident	common	agricultural
VIREONIDAE			
Solitary Viero			
Vireo solitarius	observed,summer	uncommon	conifers
Warbling Vireo			
V. gilvus	observed,summer	common	aspen,riparian
PARULIDAE			
Orange-crowned Warbler			
Vermivora celata	observed,summer	uncommon	wooded areas
Nashville Warbler			
V. ruficapilla	likely,migrant	uncommon	riparian, brushlands
Virginia's Warbler			
V. virginiae	likely,summer	common	riparian, brushlands
Yellow Warbler			
Dendroica petechia	observed,summer	common	riparian
Yellow-rumped Warbler			
D. coronata	observed,summer	common	conifers, riparian
Black-throated Gray Warbler			
D. nigrescens	observed,summer	uncommon	pinyon/juniper
Townsend's Warbler			
D. townsendi	likely,migrant	uncommon	conifers

Appendix Table 2 (cont.)

Sepcies	Status	Relative Abundance*	Habitat Preference*
MacGillivray's Warbler *Oporornis tolmiei*	observed,summer	uncommon	riparian, brushlands
Common Yellowthroat *Geothylpis trichas*	likely,summer	uncommon	wet areas
Yellow-breasted Chat *Icteria virens*	likely,summer	common	riparian, brushlands
Wilson's Warbler *Wilsonia pusilla*	observed,summer	common	riparian
American Redstart *Setaphaga ruticilla*	likely,migrant	uncommon	riparian
PLOCIEDAE			
House Sparrow *Passer domesticus*	potential,resident	common	agricultural
ICTERIDEA			
Western Meadowlark *Sturnella neglecta*	potential,resident	uncommon	open areas
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	potential,migrant	uncommon	wet areas
Red-winged Blackbird *Agelaius phoeniceus*	potential,resident	uncommon	wet areas
Brewer's Blackbird *Euphagus cyanocephalus*	potential,resident	uncommon	agricultural
Common Grackle *Ouiscalus quiscula*	potential,migrant	irregular	agricultural
Brown-headed Cowbird *Molothrus ater*	likely,resident	uncommon	wooded areas
Northern Oriole *Icterus galbula*	likely,summer	common	riparian
THRAUPIDEA			
Western Tanager *Piranga ludoviciana*	observed,summer	common	wooded areas
FRINGILLIDAE			
Black-headed Grosbeak *Pheucticus melanocephalus*	observed,summer	common	riparian, brushlands
Evening Grosbeak *Hesperiphona vespertina*	likely,resident	uncommon	wooded areas

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
Lazuli Bunting *Passerina amoena*	observed,summer	uncommon	riparian
Indigo Bunting *P. cyanea*	potential,summer	irregular	riparian
House Finch *Carpodacus mexicanus*	likely,resident	uncommon	conifers
Cassin's Finch *C. cassinii*	observed,resident	uncommon	conifers
Pine Grosbeak *Pinicola enucleator*	likely,resident	uncommon	conifers
Rosy Finch *Leucosticte arctoa*	likely,winter	irregular	ubiquitous
American Goldfinch *Carduelis tristis*	liekly,resident	common	riparian, agricultural
Lesser Goldfinch *C. pslatria*	likely,resident	common	riparian, brushlands
Pine Siskin *C. pinus*	observed,resident	common	conifers, riparian
Red Crossbill *Loxia curvirostra*	observed,resident	common	conifers
Rufous-sided Towhee *Pipilo erythrophthalmus*	observed,resident	uncommon	riparian
Green-tailed Towhee *P. chlorura*	observed,summer	common	brushlands
Dark-eyed Junco *Junco hvemalis*	observed,winter	common	ubiquitous
Gray-headed Junco *J. caniceps*	observed,resident	common	conifers,aspen
Savannah Sparrow *Passerculus sandwichensis*	potential,summer	uncommon	wet meadows
Vesper Sparrow *Pooecetes gramineus*	potential,summer	uncommon	open areas
Lark Sparrow *Chondestes grammacus*	potential,summer	uncommon	brushlands
Black-throated Sparrow *Amphispiza bilineata*	potential,summer	uncommon	brushlands
Sage Sparrow *A. belli*	potential,summer	uncommon	sagebrush
Tree Sparrow *Spizella aborea*	likely,winter	uncommon	brushlands

Appendix Table 2 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
Chipping Sparrow *S. passerina*	observed, summer	common	conifers
Brewer's Sparrow *S. breweri*	potential, summer	irregular	sagebrush
Harris' Sparrow *Zonotrichia querula*	potential, winter	irregular	brushland, riparian
White-crowned Sparrow *Z. leucophrys*	observed, resident	common	conifers, riparian
Fox Sparrow *Z. iliaca*	potential, resident	irregular	riparian
Lincoln's Sparrow *Melospiza lincolnii*	likely, resident	uncommon	wet meadows
Song Sparrow *M. melodia*	observed, resident	common	riparian

Appendix Table 3. Reptiles and Amphibians in or near the mine permit area, Carbon County, Utah (1980-81)

Species	Status	Relative Abundance*	Habitat Preference*
AMBYSTOMATIDAE			
Tiger Salamander			
Ambystoma tigrinum	likely	common	aquatic
PELOBATIDAE			
Great Basin Spadefoot Toad			
Sacphiopus intermontanus	likely	common	ubiquitous
BUFONIDAE			
Western Toad			
Bufo boreas	observed	uncommon	ubiquitous
Woodhouse Toad			
B. woodhousei	likely	common	ubiquitous
HYLIDAE			
Western Chorus Frog			
Pseudacris triseriata	observed	uncommon	aquatic,wet meadows
RANIDAE			
Leopard Frog			
Rana pipiens	likely	common	aquatic
IGUANIDAE			
Collared Lizard			
Crotaphytus collaris	likely	common	rocky areas
Leopard Lizard			
C. wislizenii	potential	common	rocky areas
Eastern fence Lizard			
Sceloporus undulatus	likely	common	rocky areas
Sagrbrush Lizard			
S. graciosus	potential	commo	brushland
Tree Lizard			
Urosaurus orantus	likely	common	brushland
Side-blotched Lizard			
Uta stansburiana	potential	common	open areas
Short-horned Lizard			
Phryonosoma douglassi	observed	common	open areas
TEIDAE			
Western Whiptail			
Cnemidophorus tigris	likely	common	open areas

Includes onsite observation and SWR regional information.

Appendix Table 3 (cont.)

Species	Status	Relative Abundance*	Habitat Preference*
BOIDAE			
Rubber Boa			
Charina bottae	likely	common	ubiquitous
COLUBRIDAE			
Striped Whipsnake			
Masticophis taeniatus	likely	common	ubiquitous
Racer			
Coluber constrictor	likely	common	open areas
Ring-necked Snake			
Diadophis punctatus	potential	irregular	moist areas
Bullsnake			
Pituophis melanoleucus	likely	common	ubiquitous
Milk Snake			
Lamproteltis triangulatum	potential	irregular	ubiquitous
Sonora Mountain Kingsnake			
L. pyromelana	potential	irregular	wooded areas
Wandering Garter Snake			
Thamnophis elegans	likely	common	ubiquitous
Common Garter Snake			
T. sirtalis	potential	irregular	moist areas
Night Snake			
Nypsiglena torquata	potential	common	brushlands
CROTALIDAE			
Western Rattlesnake			
Crotalus viridis	likely	common	rocky or open areas

Section 11

CLIMATOLOGY AND AIR QUALITY

11.1 Existing Environment

11.1.1 Climate

The climate of the Price, Utah area is varied and strongly influenced by topography. The climate can be characterized as arid, specifically dry continental. The prevailing local low-level meteorological influences are mountain-valley breeze systems. The low amount of annual precipitation is a result of the Sierra Nevada and Cascade Ranges which act as natural barriers and prevent moist maritime air from the North Pacific from reaching the interior basins to the east.

On a more local scale the Wasatch Mountains to the west of Castle Valley and the Tavaputs Plateau to the north provide a shelter from storms associated with westerly and northerly winds. Areas on the east side of the Wasatch Range generally receive less than 10 inches of precipitation annually.

Tables 11-1 and 11-2 contain monthly and annual totals of temperature and precipitation, respectively, for four stations: Hiawatha, Soldier Summit, Emery and Price. jkAverage annual temperature at Emery and Price are 46.2 degrees F. and 49.6 degrees F, respectively. The temperature ranges from a mean minimum monthly value of 24.3 degrees F. at Price. Annual precipitation averages 7.22 inches at Emery and 9.25 inches at Price. At Hiawatha and Soldier Summit, January is the coldest month (23.1 degrees F. and 17.4 degrees F, respectively) and July the warmest (69.4 degrees F. and 61.4 degrees F. respectively). Annual precipitation is higher at these sites due to their proximity to mountainous terrain (12.98 and 15.92 inches, respectively).

TABLE 11-1
Mean Monthly Temperatures (of) 1931-1955[1]

Location	Elevation (feet)	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Hiawatha	7,230	23.1	26.6	33.5	45.7	52.6	61.6	69.4	67.2	60.3	48.6	34.1	26.1	45.7
Soldier Summit	7,477	17.4	20.3	27.6	37.6	46.1	53.3	61.4	59.9	52.3	42.0	28.6	21.0	39.0
Emery	6,200	24.0	28.2	36.3	45.6	53.7	61.3	68.4	66.2	59.3	48.7	35.5	27.0	46.0
Price	5,567	23.3	29.6	39.2	49.5	58.6	66.9	74.3	72.2	64.4	52.1	37.0	27.8	49.6
Castle Dale	5,680	Annual mean temperature = 45.8°F												
Ferron	5,295	Annual mean temperature = 47.7°F												

TABLE 11-2
Mean Monthly Precipitation (Inches) 1931-1955 [2]

Location	Elevation (feet)	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Hiawatha	7,230	1.00	0.85	1.03	.083	1.04	1.02	1.27	1.88	0.99	1.27	0.73	1.07	12.98
Soldier Summit	7,477	1.69	1.54	1.47	1.11	1.04	0.97	1.361	65.9	0.98	1.24	1.20	1.67	15.92
Emery	6,200	0.51	0.38	0.47	0.36	0.50	0.55	0.80	1.26	0.73	0.76	0.32	0.58	7.22
Price	5,567	0.74	0.59	0.69	0.61	0.66	0.73	0.95	1.10	0.83	0.91	0.48	0.96	9.25
Castle Dale	5,680													8.39
Ferron	5,295													7.92

Winters in the area are cold and dry with total snowfall averaging between 10 to 20 inches. The area averages 225 days per year of clear skies, 105 days partly cloudy, and 35 days cloudy. The growing season ranges from 110 to 135 days.(3)

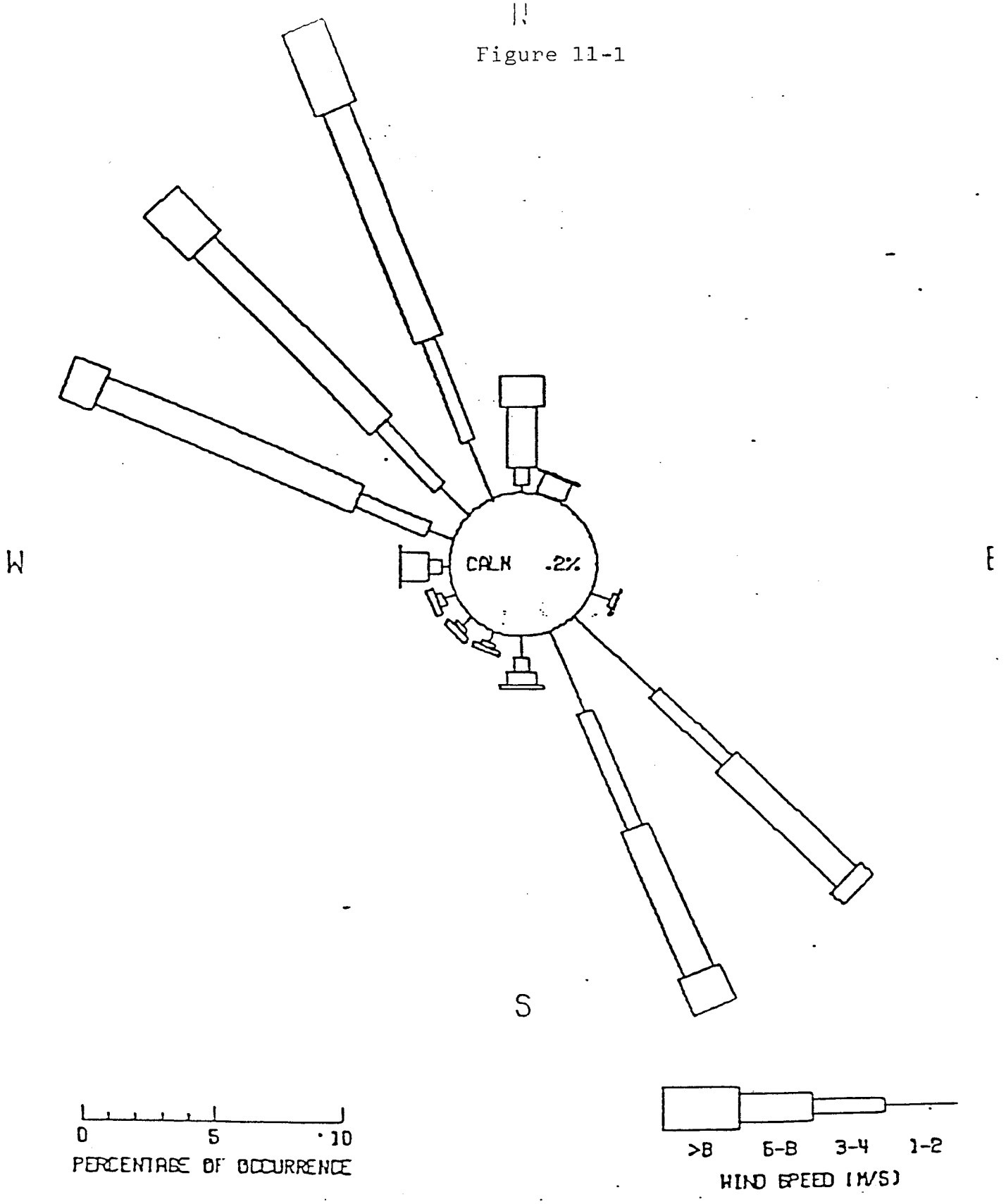
Winds are generally light to moderate all seasons of the year. Strongest winds generally occur in the spring with moderate to strong southerly flow for several days at a time. The prevailing Castle Valle area winds are from the north through north-northwest during autumn, winter and early spring months with a shift to the south-southeast during late spring and summer. (4) Depending on the proximity to the mountain and canyons a particular location in Castle Valley may experience pronounced diurnal wind flow patterns. Daytime flow may be influenced by upslope easterly winds caused by greater heating of the eastern face of the Wasatch Plateau than in the valley. At night the northwesterly drainage flow from the mountains to the valley may prevail. In summary, no one wind direction or diurnal wind flow pattern is applicable for all locations in Castle Valley. The further a location is from a canyon or mountain the weaker the diurnal wind flow patterns to be expected.

Utah Power & Light Company has recorded continuous meteorological data at three sites in Huntington Canyon near the Huntington Station Power Plant. The 1978 wind roses from Wild Horse Ridge, Valley Floor, and Meetinghouse Ridge are contained in Figures 11-1, 11-2, and 11-3, respectively. The elevation, distance, and direction of each site from the Huntington Power Plant (elevation 6,400 feet) follows:

Meteorological Network	Approximate Elevation	Distance and Direction from Huntington Power Plant
Wild Horse Ridge	7,500 feet	2.5 km NNW
Valley Floor	6,500 feet	2.5 km NW
Meetinghouse Ridge	7,500 feet	2.8 km WNW

Relative humidity is highest in the Castle Valley during winter and lower in summer. The average relative humidity is 75% and 40% in winter and summer months, respectively. Mean annual relative humidity is 55%.(5) As a result of low annual precipitation totals, low mean annual relative humidity, high percentage of sunshine (absence of cloud cover), and moderate solar insolated intensity, evaporation rates are expected to be rather high in this plateau desert region.

Figure 11-1



WILD HORSE RIDGE JAN-DEC 1978

ALL TIMES

Figure 11-1 Wind Rose for Wild Horse Ridge

Figure 11-2

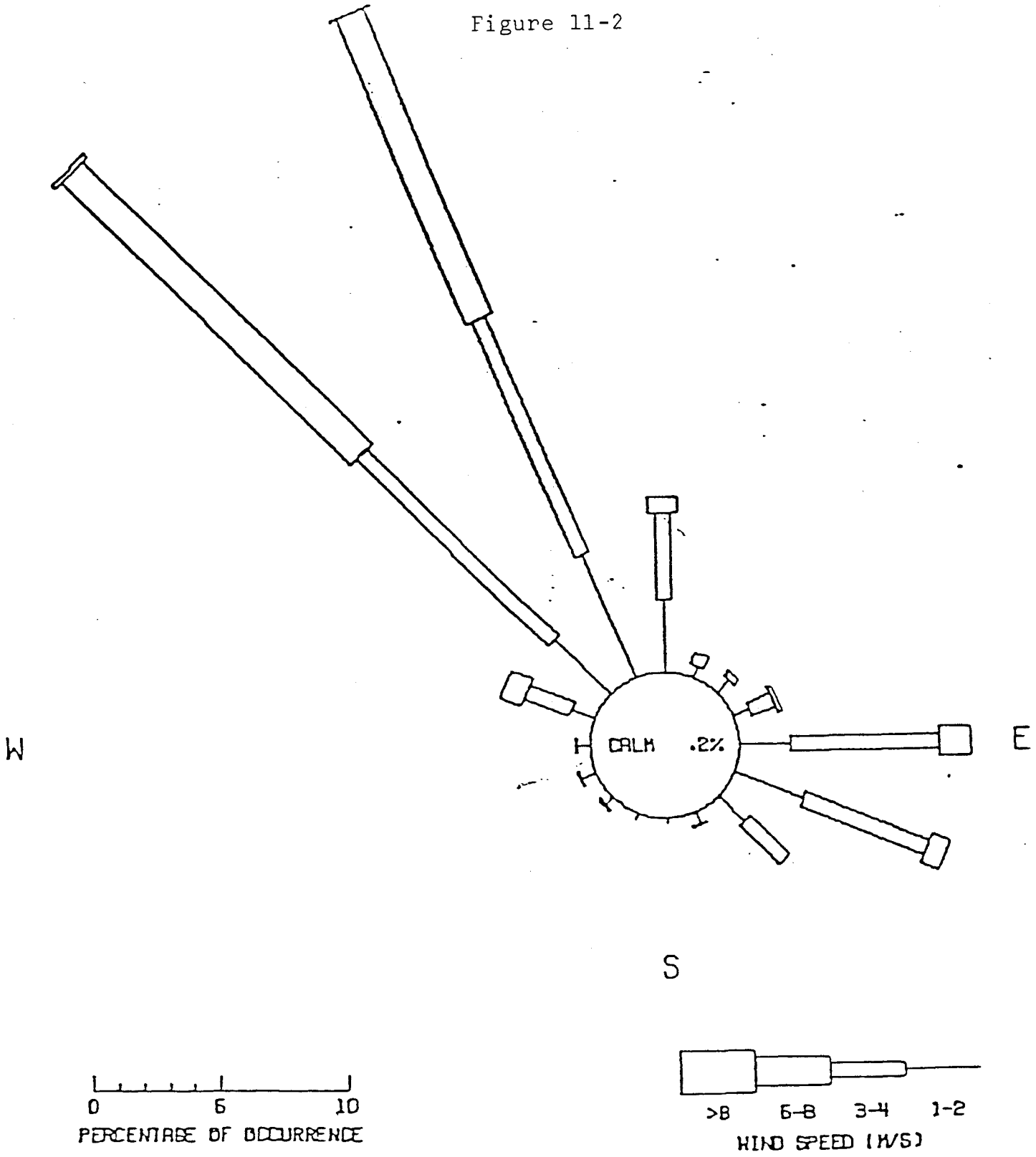


Figure 11-2 Wind Rose for Valley Floor

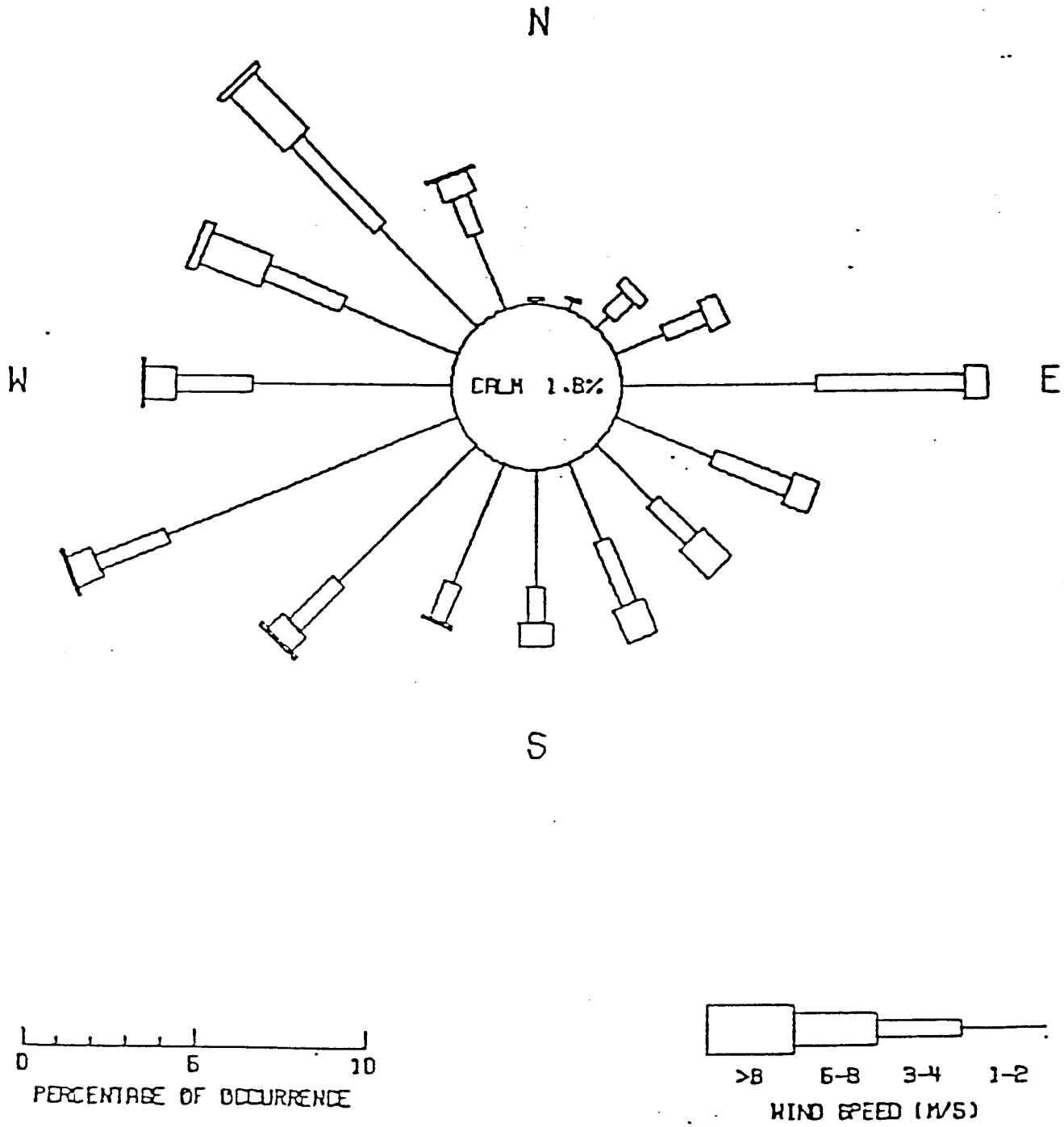


Figure 11-3 Wind Rose for Meetinghouse Ridge

11.1.2 Air Quality

Regional impacts from coal mining operations on particulate air quality is expected to be minimal due to the rapid fallout of particles with distance from the source and the existence of relatively small mining operations in Castle Valley. The closest Class I air quality and visibility protection area is the Capital Reef National Park. The closest mining source to the northern boundary of Capital Reef is approximately 40 km to the north. Sites such as Hunter Power Plant, Castle Dale, Huntington Station Power Plant and Price are about 70 km, 80 km, and 94 km, and 120 km north-northeast of the northernmost boundary of Capital Reef National Park, respectively.

The regional annual particulate impact from coal development in Castle Valley on Capital Reef National Park is expected to be less than the Class I increment standard of 10 ug/m3. Tables 11-3 and 11-4 contain regional total suspended particulate air quality data over a five year period from both State of Utah and Utah Power & Light operated networks, respectively. The regional annual particulate concentration (including background) is generally low at all sites, except for Price, where the annual standard (60 ug/m3) has been exceeded each year (1975 - 1978). Price represents an urban monitoring location and higher concentrations are caused by human activity and traffic on roadways leading to proposed new mines in Castle Valley. Since Price has no major industries located within or near the city air quality standards are exceeded as a result of background sources such as transported dust.

Reduction in visibility in Castle Valley results from light scattering by particles suspended in air. Since particulate concentration in Castle Valley is significant at times, the contribution of various particles was measured by an integrating nephelometer from August 1970 through August 1972. A scanning electro microscope determined the contribution of various particle to light scattering. Results are soil dust (63%), soot (31%), fly ash (3%), and particle-X (3%).(9) The high percentage of soil dust indicate that dust is easily transported throughout the Castle Valley area.

TABLE 11-3

State of Utah Total Suspended Particulate Monitoring Sites in Castle Valley[7]

Station	Year	Annual Geometric Mean (ug/m^3)	24-Hour Maximum Concentration (ug/m^3)
Price	1975	72	181
(east edge of	1976	74	306
College of	1977	69	406
Eastern Utah	1978	61 (3/4 year of data recovery)	303
Huntington	1974	22	183
Canyon Site	1975	22	191
(between	1976	28	150
Huntington	1977	34	150
Canyon & City	1978	33 (½ year of data recovery)	150
of Huntington)			
Castle Dale	1977	49	*665
(about 65 Km	1978	40	170
SSW of Price)	1979	44	121
	1980	38	125

Exceedences of the total suspended particulate 24-hour standard were due to locally high wind speeds transporting particulates. Each site had daily Hi-Vol readings.

TABLE 11-4

Total Suspended Particulate Readings at Stations in Castle Valley (operated by Utah Power & Light)[8]

Period Observation	Station Location	Annual Geometric Mean (mglm^3)	Notes and Comments
1974	Hunter Station, UT	25	1) 6 year average Geometric Mean = 26.2 ug/m^3
1975	(2-3 miles west	25	
1976	of Power Plant)	34	
1977		34	
1978		19	2) Extreme value 106 ug/m^3 (1979)
1979		20	
1975	Meetinghouse Canyon, UT	12	Site moved from a location near the HUntington
1976	(approximately 1.0 mile	16	Canyon Station Power Plant up towards Huntington
1977	from Huntington Canyon	---	Canyon in late 1974.
1978	and WNW of Huntington	20	
1979	Station)	18	
1975 (Aug.-Dec.)	West Station (West	39	1) Site moved in August 1975 from previous location in the City of Huntington to a site west of the city where traffic does not influence concentrations
1976 (Jan.-Dec.)	of city of Huntington,	35	
1977	UT.)	---	
1978		35	
1979		30	2) Hi-Vol 24-hour concentration of 200 ug/m^3 in April 1978.
		30	

1 = National Ambrient Air Quality Standard for maximum 24-hour primary and secondary standards are 150 ug/m^3 and 60 ug/m^3, respectively.

2 = National Ambrient Air Quality Standard for the Annual Geometric Mean in 60 ug/m^3 for the primary standard.

11.2 Effects of Mining Operations on Air Quality

11.2.1 Estimate of Uncontrolled Emissions

Particulate matter is the only one pollutant which might degrade air quality at the mine sites. The particular matter is predominantly fugitive dust and increases in concentrations of other pollutants such as sulfur dioxide, nitrogen oxides, carbon monoxide, and photochemical oxidants are insignificant. The source of fugitive dust will be from construction equipment to be used during reclamation.

11.2.2 Description of Control Measures

To minimize fugitive dust emissions, a watering schedule will be devised in which the frequency of application will be determined by visual observation of the degree of road dustiness. The amount of watering will be based upon levels which will control dust without creating muddy or slippery conditions. Estimated control efficiencies of 75% - 85% would result from application of water and chemical stabilizers to the road surface. Administrative controls such as strict speed limits (25 miles per hour) will further reduce the fugitive dust potential.

11.2.3 Estimate of Controlled Emissions

The control efficiencies for the mining processes listed in Section 11.4.2 are contained in Table 11-5. The most significant control measure is the 80% - 85% reduction in coal haulage emissions resulting from the application of water and chemical stabilizers to the gravel road surface leading to the mine.

11.2.4 Estimated Cost of Emission Control

The major expense in emission control would result from the application of water and chemical dust suppressants to the 8.5 mile segment of gravel road. The cost of applying chemical dust suppressants to road surfaces is dependant upon the type of chemicals used, and dilution rate and frequency of application.

Table 11-5

Source of Emision	Estimated Fugitive Emission Control Efficiency
Conveyor (N/A)	50% - water spraying of coal
Pile Wind Erosion (N/A)	50% - 75% with water spraying of pile
Pile Loadout (N/A)	50% - 75% with water spraying of pile
Coal Haulage	80% - 85% with 1 reduced vehicular speed and water application and chemical stabilization of road surface.

11.3 Bibliography

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7 State of Utah Bureau of Air quality, 1981: Personal Communication with Robert Dalley, February 19.

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12-23-91

APPENDIX 1

Filed Water Rights

FILED WATER RIGHTS
IN THE
GORDON CREEK AREA
(see Appendix 1 map)

File No.	Class	Use	Owner	Quantity
257	Gordon Creek	Cattle	Utah Division Wildlife Resources	1.62af
330	Underground Mine	Mining	Sweets Coal Company	0.557cfs
348	Gordon Creek	Cattle & Horses	Pete Frandsen Tooele, Utah	0.095af
353	Spring	Mining	Sweets Coal Company	0.015cfs
398	Coal Canyon Creek	Cattle	Utah Division Wildlife Resources	1.62af
* 487	Spring Stream	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
488	Spring	"	"	0.22af
777	North Fork Gordon Creek	Cattle & Irrigation	Utah Division Wildlife Resources	1.56cfs
778	"	"	"	0.15cfs
779	Beaver Creek	"	"	2.00cfs
1401	Sado Gulch Spring	Sheep, Cattle and Horses; Domestic	Clarance Anderson Estate Price, Utah	0.37af
1402	Spring	"	"	0.37af
1404	Gordon Creek	Sheep and Horses; Domestic	Helper State Bank Helper, Utah	0.37af
1405	Spring Stream	"	"	0.37af
1406	Trib. To Beaver Creek	"	"	0.37af
1407	Beaver Creek	Sheep and Horses	"	1.30af
1414	Single Fork Beaver Creek	"	"	1.30af
1464	Beaver Creek	Sheep, Cattle and Horses	Catherine Jewkes 1/3int. Price, Utah	0.06af

1465	Beaver Creek	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1466	Beaver Creek	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1467	Stream	"	Catherine Jewks 1/3int. Price, Utah	0.06af
1468	Stream	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1469	Stream	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1470	Spring	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1471	Spring	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1472	Spring	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1473	North Fork Gordon Creek	"	E.E.Peirce, Jr. Price, Utah	0.34af
1675	Coal Canyon Creek	Sheep and Horses	John Marakis Estate Price, Utah	0.22af
1676	Spring	"	John Marakis Estate Price, Utah	0.22af
1926	Spring	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1927	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1928	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
* 1929	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
* 1930	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
* 1931	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1932	"	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1933	Spring	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af

1934	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1935	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1936	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1937	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1938	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1939	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1940	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1941	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1943	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1944	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1945	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1946	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1947	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1948	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1949	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1950	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1954	Stream	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1955	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1956	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af

2697	Gordon Creek	Sheep, Cattle and Horses	John Marakis Estate Price, Utah	0.22af
3614	Spring	Cattle & Horses	Della Simonsen Tooele, Utah	0.17af
3616	"	"	"	0.17af
3618	"	"	"	0.17af
3669	"	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
3670	"	"	"	0.22af
3671	"	"	"	0.22af
* 3672	"	"	"	0.22af
3681	Gordon Creek	"	Calvin K. Jacob Pleasant Grove, Utah	0.33af
3682	"	Cattle	R.L. Bird Company Salt Lake City, Utah	0.14af
3683	"	Sheep, Cattle	Milton A. Oman Salt Lake City Utah	0.45af
3686	"	Cattle & Sheep	Bureau of Land Management	3.67af
3687	Coal Canyon Spring	Sheep & Horses	Calvin K. Jacob Pleasant Grove, Utah	0.33af
3688	Gordon Creek	Sheep, Cattle and Horses	E.E. Peirce, Jr. Price, Utah	0.34af
* 3881	Spring	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
4095	"	"	Calvin K. Jacob Pleasant Grove, Utah	0.33af
4096	"	"	"	0.33af

Total Water Rights located in the Gordon Creek area 19.085af
..... 4.282cfs

Total Water Rights that could be impacted by Blue Blaze Mining... 0.84af

* Rights that could possibly be impacted by the Blue Blaze No. 1 & No. 2 Mine operations.

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SINCE 1908
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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84521
TELEPHONE: (801) 653-231

June 21, 1989

Job No.: 59 9720

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.
#1
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	405	mg/l HCO3	Fluoride	0.64	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	568	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.02<	mg/l
Anions, Total	11.13	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	52.90	mg/l
Boron	0.25	mg/l	Manganese	0.01<	mg/l
Cadmium	0.005<	mg/l	Mercury	0.002<	mg/l
Calcium	140.2	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	11.78	meq/l	Nickel	0.02<	mg/l
Chloride	20.0	mg/l	Nitrogen, Ammonia	0.01<	mg/l
Chromium	0.04<	mg/l	Nitrogen, Nitrate	0.09	mg/l

ANALYST: D. Igoe

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 21, 1989

Job No.: 59 9720

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

#1
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Nitrite	0.02	mg/l	Solids, Dissolved	517.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfate	195.0	mg/l
Potassium	3.50	mg/l	Sulfide	0.01<	mg/l
Selenium	0.002<	mg/l	Zinc	0.01<	mg/l
Sodium	7.90	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 21, 1989

Job No.: 59 9721

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

#2
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	338	mg/l HCO3	Fluoride	0.48	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	423	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.06	mg/l
Anions, Total	9.26	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	44.50	mg/l
Boron	0.20	mg/l	Manganese	0.01<	mg/l
Cadmium	0.005<	mg/l	Mercury	0.002<	mg/l
Calcium	96.1	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	9.02	meq/l	Nickel	0.02<	mg/l
Chloride	25.0	mg/l	Nitrogen, Ammonia	0.01<	mg/l
Chromium	0.04<	mg/l	Nitrogen, Nitrate	0.37	mg/l

ANALYST: R. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 21, 1989

Job No.: 59 9721

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

#2
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Nitrite	0.02	mg/l	Solids, Dissolved	538.0	mg/l
Phosphorus, Total	0.10	mg/l	Sulfate	150.0	mg/l
Potassium	5.20	mg/l	Sulfide	0.01<	mg/l
Selenium	0.002<	mg/l	Zinc	0.01<	mg/l
Sodium	10.00	mg/l			

ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 8452
TELEPHONE: (801) 653-231

June 21, 1989

Job No.: 59 9719

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

#3
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Acidity	16	mg/l CaCO3	Chromium	0.04	mg/l
Aluminum	0.24	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	287	mg/l HCO3	Fluoride	0.59	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	358	mg/l CaCO3
Arsenic	0.004	mg/l	Iron	0.08	mg/l
Anions, Total	7.53	meq/l	Iron, Dissolved	0.08	mg/l
Barium	0.03<	mg/l	Lead	0.050<	mg/l
Boron	0.24	mg/l	Magnesium	43.10	mg/l
Cadmium	0.005 <	mg/l	Manganese	0.01<	mg/l
Calcium	72.4	mg/l	Mercury	0.002<	mg/l
Cations, Total	7.73	meq/l	Molybdenum	0.10<	mg/l
Chloride	30.0	mg/l	Nickel	0.04	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 21, 1989

Job No.: 59 9719

Date Rec'd: June 2, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

#3
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Ammonia	0.01<	mg/l	Sodium	11.00	mg/l
Nitrogen, Nitrate	0.17	mg/l	Solids, Dissolved	799.0	mg/l
Nitrogen, Nitrite	0.08	mg/l	Solids, Settleable	1.0<	mg/l
Oil and Grease	2.5	mg/l	Solids, Suspended	5.0	mg/l
Phosphorus, Total	0.08	mg/l	Sulfate	100.0	mg/l
Potassium	3.80	mg/l	Sulfide	0.01<	mg/l
Selenium	0.002<	mg/l	Zinc	0.01<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9981

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #3
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chromium	0.02<	mg/l
Aluminum	0.01<	mg/l	Conductivity	600	umhos/cm
Alk., Bicarbonate	332	mg/l HCO3	Copper	0.010<	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.46	mg/l
Arsenic	0.002<	mg/l	Hardness, Total	333	mg/l CaCO3
Anions, Total	7.34	meq/l	Iron	0.14	mg/l
Barium	0.03<	mg/l	Lead	0.050<	mg/l
Boron	0.18	mg/l	Magnesium	43.80	mg/l
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
Calcium	61.0	mg/l	Mercury	0.003	mg/l
Cations, Total	7.12	meq/l	Molybdenum	0.10<	mg/l
Chloride	20.0	mg/l	Nickel	0.02<	mg/l

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9981

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #3
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
Nitrogen, Nitrate	0.12	mg/l	Sodium	9.00	mg/l
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	283.0	mg/l
Oil and Grease	2.0	mg/l	Solids, Settleable	1.0<	mg/l
Oxygen, Dissolved	7.0	mg/l	Solids, Suspended	10.0	mg/l
pH	8.40	Units	Sulfate	70.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfide	7.60	mg/l
Potassium	3.50	mg/l	Zinc	0.00<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9983

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #5
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chromium	0.02<	mg/l
Aluminum	1.50	mg/l	Conductivity	550	umhos/cm
Alk., Bicarbonate	354	mg/l HCO3	Copper	0.010<	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.40	mg/l
Arsenic	0.002<	mg/l	Hardness, Total	350	mg/l CaCO3
Anions, Total	7.80	meq/l	Iron	0.51	mg/l
Barium	0.03<	mg/l	Lead	0.050<	mg/l
Boron	0.10	mg/l	Magnesium	40.10	mg/l
Cadmium	0.002<	mg/l	Manganese	0.05	mg/l
Calcium	74.2	mg/l	Mercury	0.002<	mg/l
Cations, Total	7.80	meq/l	Molybdenum	0.10<	mg/l
Chloride	15.0	mg/l	Nickel	0.02<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9983

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #5
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
Nitrogen, Nitrate	0.10	mg/l	Sodium	15.70	mg/l
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	198.0	mg/l
Oil and Grease	1.0<	mg/l	Solids, Settleable	1.0<	mg/l
Oxygen, Dissolved	6.5	mg/l	Solids, Suspended	65.0	mg/l
pH	8.40	Units	Sulfate	75.0	mg/l
Phosphorus, Total	0.12	mg/l	Sulfide	1.80	mg/l
Potassium	5.00	mg/l	Zinc	0.00<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9979

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #1
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Aluminum	0.01<	mg/l	Conductivity	415	umhos/cm
Alk., Bicarbonate	300	mg/l HCO3	Copper	0.010<	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.35	mg/l
Arsenic	0.002<	mg/l	Hardness, Total	254	mg/l CaCO3
Anions, Total	5.30	meq/l	Iron	0.46	mg/l
Barium	0.03<	mg/l	Lead	0.050<	mg/l
Boron	0.09	mg/l	Magnesium	18.00	mg/l
Cadmium	0.002<	mg/l	Manganese	0.04	mg/l
Calcium	72.1	mg/l	Mercury	0.009	mg/l
Cations, Total	5.29	meq/l	Molybdenum	0.10<	mg/l
Chloride	5.0	mg/l	Nickel	0.02<	mg/l
Chromium	0.02<	mg/l	Nitrogen, Ammonia	0.00	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9979

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #1
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Nitrate	0.18	mg/l	Sodium	3.90	mg/l
Nitrogen, Nitrite	0.02	mg/l	Solids, Dissolved	310.0	mg/l
pH	8.10	Units	Sulfate	17.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfide	1.40	mg/l
Potassium	1.40	mg/l	Zinc	0.00<	mg/l
Selenium	0.002<	mg/l			

ANALYST: D Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9980

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #2
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Aluminum	0.01<	mg/l	Conductivity	750	umhos/cm
Alk., Bicarbonate	501	mg/l HCO3	Copper	0.010<	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.40	mg/l
Arsenic	0.002<	mg/l	Hardness, Total	476	mg/l CaCO3
Anions, Total	10.25	meq/l	Iron	0.10	mg/l
Barium	0.03<	mg/l	Lead	0.050<	mg/l
Boron	0.09	mg/l	Magnesium	48.90	mg/l
Cadmium	0.002<	mg/l	Manganese	0.02	mg/l
Calcium	110.1	mg/l	Mercury	0.002<	mg/l
Cations, Total	10.15	meq/l	Molybdenum	0.10<	mg/l
Chloride	20.0	mg/l	Nickel	0.02<	mg/l
Chromium	0.02<	mg/l	Nitrogen, Ammonia	0.00	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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SAMPLE POINT #2
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Nitrate	0.17	mg/l	Sodium	11.40	mg/l
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	515.0	mg/l
pH	8.10	Units	Sulfate	80.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfide	3.00	mg/l
Potassium	5.70	mg/l	Zinc	0.00<	mg/l
Selenium	0.002<	mg/l			

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9982

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #4
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Aluminum	0.61	mg/l	Conductivity	450	umhos/cm
Alk., Bicarbonate	323	mg/l HCO3	Copper	0.010<	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.37	mg/l
Arsenic	0.002<	mg/l	Hardness, Total	334	mg/l CaCO3
Anions, Total	7.09	meq/l	Iron	0.33	mg/l
Barium	0.23	mg/l	Lead	0.050<	mg/l
Boron	0.12	mg/l	Magnesium	45.20	mg/l
Cadmium	0.002<	mg/l	Manganese	0.02	mg/l
Calcium	59.1	mg/l	Mercury	0.002<	mg/l
Cations, Total	7.03	meq/l	Molybdenum	0.10<	mg/l
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
Chromium	0.02<	mg/l	Nitrogen, Ammonia	0.00	mg/l

ANALYST: D. Tyson

Respectfully submitted,
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TELEPHONE: (801) 653-2311

September 19, 1989

Job No.: 59 9982

Date Rec'd: September 5, 1989

Date Sampled: September 4, 1989

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

SAMPLE POINT #4
Rec'd 0930 hr.
No Sampling Time

BLUE BLAZE COAL CO.
Box 784
Price UT 84501
Roger Skaggs

WATER ANALYSIS

Nitrogen, Nitrate	0.11	mg/l	Sodium	6.00	mg/l
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	190.0	mg/l
pH	8.40	Units	Sulfate	70.0	mg/l
Phosphorus, Total	0.02	mg/l	Sulfide	1.80	mg/l
Potassium	4.40	mg/l	Zinc	0.00<	mg/l
Selenium	0.002<	mg/l			

ANALYST: D. Lyson

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10136

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#1

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	292	mg/l HCO3	Fluoride	0.46	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	249	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.51	mg/l
Anions, Total	5.27	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	19.80	mg/l
Boron	0.37	mg/l	Manganese	0.01<	mg/l
Cadmium	0.002<	mg/l	Mercury	0.002<	mg/l
Calcium	67.1	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	5.16	meq/l	Nickel	0.02<	mg/l
Chloride	5.0	mg/l	Nitrogen, Ammonia	0.25	mg/l
Chromium	0.02<	mg/l	Nitrogen, Nitrate	0.10	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10136

Date Rec'd: November 6, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

Sample ID: BLUE BLAZE COAL CO.
#1

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	266.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfate	29.0	mg/l
Potassium	1.00	mg/l	Sulfide	1.20	mg/l
Selenium	0.002<	mg/l	Zinc	0.00<	mg/l
Sodium	3.60	mg/l			

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10137

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#2

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	479	mg/l HCO3	Fluoride	0.49	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	444	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.02<	mg/l
Anions, Total	10.36	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	48.30	mg/l
Boron	0.08	mg/l	Manganese	0.01<	mg/l
Cadmium	0.002<	mg/l	Mercury	0.002<	mg/l
Calcium	98.2	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	9.40	meq/l	Nickel	0.02<	mg/l
Chloride	40.0	mg/l	Nitrogen, Ammonia	0.24	mg/l
Chromium	0.02<	mg/l	Nitrogen, Nitrate	0.12	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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November 17, 1989

Job No.: 59 10137

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#2

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	270.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfate	75.0	mg/l
Potassium	4.70	mg/l	Sulfide	0.80	mg/l
Selenium	0.002<	mg/l	Zinc	0.00<	mg/l
Sodium	9.50	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10138

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#3

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chromium	0.02<	mg/l
Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	317	mg/l HCO3	Fluoride	0.49	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	291	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.49	mg/l
Anions, Total	6.30	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	33.20	mg/l
Boron	0.14	mg/l	Manganese	0.03	mg/l
Cadmium	0.002<	mg/l	Mercury	0.002<	mg/l
Calcium	61.6	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	6.16	meq/l	Nickel	0.02<	mg/l
Chloride	10.0	mg/l	Nitrogen, Ammonia	0.19	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10138

Date Rec'd: November 6, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

Sample ID: BLUE BLAZE COAL CO.
#3

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrate	0.14	mg/l	Solids, Dissolved	335.0	mg/l
Nitrogen, Nitrite	0.05	mg/l	Solids, Settleable	1.0<	mg/l
Oil and Grease	1.2	mg/l	Solids, Suspended	46.0	mg/l
Phosphorus, Total	0.06	mg/l	Sulfate	45.0	mg/l
Potassium	3.20	mg/l	Sulfide	15.20	mg/l
Selenium	0.002<	mg/l	Zinc	0.00<	mg/l
Sodium	6.30	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10139

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#4

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum	0.85	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	353	mg/l HCO3	Fluoride	0.46	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	382	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	1.78	mg/l
Anions, Total	7.97	meq/l	Lead	0.050<	mg/l
Barium	0.03<	mg/l	Magnesium	46.30	mg/l
Boron	0.10	mg/l	Manganese	0.15	mg/l
Cadmium	0.002<	mg/l	Mercury	0.002<	mg/l
Calcium	76.5	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	8.01	meq/l	Nickel	0.02<	mg/l
Chloride	13.0	mg/l	Nitrogen, Ammonia	0.22	mg/l
Chromium	0.02<	mg/l	Nitrogen, Nitrate	0.01<	mg/l

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10139

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#4

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	399.0	mg/l
Phosphorus, Total	0.17	mg/l	Sulfate	65.0	mg/l
Potassium	5.50	mg/l	Sulfide	0.80	mg/l
Selenium	0.002<	mg/l	Zinc	0.02	mg/l
Sodium	5.70	mg/l			

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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November 17, 1989

Job No.: 59 10140

Sample ID: BLUE BLAZE COAL CO. #5

Date Rec'd: November 6, 1989

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chromium	0.02<	mg/l
Aluminum	0.01<	mg/l	Copper	0.010<	mg/l
Alk., Bicarbonate	384	mg/l HCO3	Fluoride	0.52	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	399	mg/l CaCO3
Arsenic	0.002<	mg/l	Iron	0.90	mg/l
Anions, Total	8.57	meq/l	Lead	0.050<	mg/l
Barium	0.50	mg/l	Magnesium	42.10	mg/l
Boron	0.08	mg/l	Manganese	0.08	mg/l
Cadmium	0.002<	mg/l	Mercury	0.002<	mg/l
Calcium	90.2	mg/l	Molybdenum	0.10<	mg/l
Cations, Total	8.39	meq/l	Nickel	0.02<	mg/l
Chloride	23.0	mg/l	Nitrogen, Ammonia	0.21	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

November 17, 1989

Job No.: 59 10140

Sample ID: BLUE BLAZE COAL CO.

Date Rec'd: November 6, 1989

#5

Date Sampled: ------

Sampled By: BLUE BLAZE COAL COMPANY

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrate	0.08	mg/l	Solids, Dissolved	411.0	mg/l
Nitrogen, Nitrite	0.01<	mg/l	Solids, Settleable	2.0	mg/l
Oil and Grease	1.4	mg/l	Solids, Suspended	170.0	mg/l
Phosphorus, Total	0.18	mg/l	Sulfate	85.0	mg/l
Potassium	4.40	mg/l	Sulfide	21.40	mg/l
Selenium	0.002<	mg/l	Zinc	0.00<	mg/l
Sodium	7.40	mg/l			

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10397

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 1
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 05-18-90	0.01<	mg/l	Copper 05-15-90	0.010<	mg/l
Alk., Bicarbonate 05-15-90	309	mg/l HCO3	Fluoride 05-15-90	0.27	mg/l
Alk., Carbonate 05-15-90	1<	mg/l CaCO3	Hardness, Total	299	mg/l CaCO3
Arsenic 05-16-90	0.002<	mg/l	Iron 05-17-90	0.25	mg/l
Anions, Total	5.96	meq/l	Lead 05-15-90	0.050<	mg/l
Barium 05-18-90	0.03<	mg/l	Magnesium 05-17-90	14.70	mg/l
Boron 05-16-90	0.18	mg/l	Manganese 05-17-90	0.02	mg/l
Cadmium 05-15-90	0.002<	mg/l	Mercury 05-15-90	0.002<	mg/l
Calcium 05-17-90	95.4	mg/l	Molybdenum 05-18-90	0.10<	mg/l
Cations, Total	6.13	meq/l	Nickel 05-15-90	0.02<	mg/l
Chloride 05-15-90	10.0	mg/l	Nitrogen, Ammonia 05-22-90	0.20	mg/l
Chromium 05-18-90	0.02<	mg/l	Nitrogen, Nitrate 05-24-90	3.90	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Counsell by Dr

Manager, Huntington Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10397

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 1
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 05-24-90	0.06	mg/l	Solids, Dissolved 05-14-90	229.0	mg/l
Phosphorus, Total 05-15-90	0.01	mg/l	Sulfate 05-24-90	35.0	mg/l
Potassium 05-17-90	0.00<	mg/l	Sulfide 05-14-90	1.00<	mg/l
Selenium 05-16-90	0.002<	mg/l	Zinc 05-15-90	0.00<	mg/l
Sodium 05-17-90	3.68	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connelly UT
Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10398

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 2
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 05-18-90	0.01<	mg/l	Copper 05-15-90	0.010<	mg/l
Alk., Bicarbonate 05-15-90	439	mg/l HCO3	Fluoride 05-15-90	0.44	mg/l
Alk., Carbonate 05-15-90	1<	mg/l CaCO3	Hardness, Total	514	mg/l CaCO3
Arsenic 05-16-90	0.002<	mg/l	Iron 05-17-90	0.20	mg/l
Anions, Total	10.87	meq/l	Lead 05-15-90	0.050<	mg/l
Barium 05-18-90	0.03<	mg/l	Magnesium 05-17-90	44.70	mg/l
Boron 05-16-90	0.28	mg/l	Manganese 05-17-90	0.01<	mg/l
Cadmium 05-15-90	0.002<	mg/l	Mercury 05-15-90	0.002<	mg/l
Calcium 05-17-90	132.2	mg/l	Molybdenum 05-18-90	0.10<	mg/l
Cations, Total	10.83	meq/l	Nickel 05-15-90	0.02<	mg/l
Chloride 05-15-90	25.0	mg/l	Nitrogen, Ammonia 05-22-90	0.38	mg/l
Chromium 05-18-90	0.02<	mg/l	Nitrogen, Nitrate 05-24-90	0.16	mg/l

ANALYST: D. Tipton

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell Mgr Dr

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10398

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 2
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 05-24-90	0.02	mg/l	Solids, Dissolved 05-14-90	477.0	mg/l
Phosphorus, Total 05-15-90	0.16	mg/l	Sulfate 05-24-90	150.0	mg/l
Potassium 05-17-90	3.55	mg/l	Sulfide 05-14-90	7.60	mg/l
Selenium 05-16-90	0.002<	mg/l	Zinc 05-15-90	0.00<	mg/l
Sodium 05-17-90	10.68	mg/l			

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell by DT

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10394

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

STREAM 3
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 05-18-90	0.01<	mg/l	Copper 05-15-90	0.010<	mg/l
Alk., Bicarbonate 05-15-90	318	mg/l HCO3	Fluoride 05-15-90	0.38	mg/l
Alk., Carbonate 05-15-90	1<	mg/l CaCO3	Hardness, Total	417	mg/l CaCO3
Arsenic 05-16-90	0.002<	mg/l	Iron 05-17-90	0.68	mg/l
Anions, Total	9.11	meq/l	Lead 05-15-90	0.050<	mg/l
Barium 05-18-90	0.03<	mg/l	Magnesium 05-17-90	41.70	mg/l
Boron 05-16-90	0.14	mg/l	Manganese 05-17-90	0.01	mg/l
Cadmium 05-15-90	0.002<	mg/l	Mercury 05-15-90	0.002<	mg/l
Calcium 05-17-90	98.2	mg/l	Molybdenum 05-18-90	0.10<	mg/l
Cations, Total	9.02	meq/l	Nickel 05-15-90	0.02<	mg/l
Chloride 05-15-90	50.0	mg/l	Nitrogen, Ammonia 05-22-90	0.51	mg/l
Chromium 05-18-90	0.02<	mg/l	Nitrogen, Nitrate 05-24-90	0.14	mg/l

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Councilley Dr

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10394

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

STREAM 3
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 05-24-90	0.04	mg/l	Solids, Dissolved 05-14-90	432.0	mg/l
Oil and Grease 05-15-90	1.0<	mg/l	Solids, Settleable 05-14-90	1.0<	mg/l
Phosphorus, Total 05-15-90	0.01	mg/l	Solids, Suspended 05-14-90	22.0	mg/l
Potassium 05-17-90	11.56	mg/l	Sulfate 05-24-90	125.0	mg/l
Selenium 05-16-90	0.002<	mg/l	Sulfide 05-14-90	1.00<	mg/l
Sodium 05-17-90	9.00	mg/l	Zinc 05-15-90	0.00<	mg/l

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Courcelly Dr

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10396

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 4
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 05-18-90	0.01<	mg/l	Copper 05-15-90	0.010<	mg/l
Alk., Bicarbonate 05-15-90	380	mg/l HCO3	Fluoride 05-15-90	0.17	mg/l
Alk., Carbonate 05-15-90	1<	mg/l CaCO3	Hardness, Total	424	mg/l CaCO3
Arsenic 05-16-90	0.002<	mg/l	Iron 05-17-90	0.33	mg/l
Anions, Total	9.07	meq/l	Lead 05-15-90	0.050<	mg/l
Barium 05-18-90	0.03<	mg/l	Magnesium 05-17-90	44.00	mg/l
Boron 05-16-90	0.43	mg/l	Manganese 05-17-90	0.02	mg/l
Cadmium 05-15-90	0.002<	mg/l	Mercury 05-15-90	0.002<	mg/l
Calcium 05-17-90	97.3	mg/l	Molybdenum 05-18-90	0.10<	mg/l
Cations, Total	8.88	meq/l	Nickel 05-15-90	0.02<	mg/l
Chloride 05-15-90	55.0	mg/l	Nitrogen, Ammonia 05-22-90	0.46	mg/l
Chromium 05-18-90	0.02<	mg/l	Nitrogen, Nitrate 05-24-90	0.12	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Churchill Hydr

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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May 25, 1990

Job No.: 59 10396

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

UNDERGROUND 4
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 05-24-90	0.02	mg/l	Solids, Dissolved 05-14-90	544.0	mg/l
Phosphorus, Total 05-15-90	0.01<	mg/l	Sulfate 05-24-90	78.0	mg/l
Potassium 05-17-90	2.08	mg/l	Sulfide 05-14-90	1.00<	mg/l
Selenium 05-16-90	0.002<	mg/l	Zinc 05-15-90	0.00<	mg/l
Sodium 05-17-90	8.31	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell by DT
Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10395

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

STREAM 5
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 05-18-90	0.01<	mg/l	Copper 05-15-90	0.010<	mg/l
Alk., Bicarbonate 05-15-90	372	mg/l HCO3	Fluoride 05-15-90	0.38	mg/l
Alk., Carbonate 05-15-90	1<	mg/l CaCO3	Hardness, Total	511	mg/l CaCO3
Arsenic 05-16-90	0.002<	mg/l	Iron 05-17-90	0.05	mg/l
Anions, Total	10.29	meq/l	Lead 05-15-90	0.050<	mg/l
Barium 05-18-90	0.03<	mg/l	Magnesium 05-17-90	42.40	mg/l
Boron 05-16-90	0.24	mg/l	Manganese 05-17-90	0.09	mg/l
Cadmium 05-15-90	0.002<	mg/l	Mercury 05-15-90	0.002<	mg/l
Calcium 05-17-90	134.8	mg/l	Molybdenum 05-18-90	0.10<	mg/l
Cations, Total	10.66	meq/l	Nickel 05-15-90	0.02<	mg/l
Chloride 05-15-90	20.0	mg/l	Nitrogen, Ammonia 05-22-90	0.48	mg/l
Chromium 05-18-90	0.02<	mg/l	Nitrogen, Nitrate 05-24-90	0.15	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Councell Ly Dr

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

May 25, 1990

Job No.: 59 10395

Date Rec'd: May 14, 1990

Date Sampled: ------

Sampled By: BLUE BLAZE COAL CO.

Sample ID: BLUE BLAZE COAL CO.

STREAM 5
Rec'd 1000 hr.
No Sampling Time

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 05-24-90	0.07	mg/l	Solids, Dissolved 05-14-90	448.0	mg/l
Oil and Grease 05-15-90	1.0<	mg/l	Solids, Settleable 05-14-90	1.0	mg/l
Phosphorus, Total 05-15-90	0.01<	mg/l	Solids, Suspended 05-14-90	190.0	mg/l
Potassium 05-17-90	3.93	mg/l	Sulfate 05-24-90	180.0	mg/l
Selenium 05-16-90	0.002<	mg/l	Sulfide 05-14-90	1.00<	mg/l
Sodium 05-17-90	8.00	mg/l	Zinc 05-15-90	0.00<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dane Councell Mgr Dr

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

July 15, 1991

Job No.: 59 11209

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Blue Blaze
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 06-12-91	366	mg/l HCO3	Magnesium 06-11-91	12.80	mg/l
Alk., Carbonate 06-12-91	1<	mg/l CaCO3	Manganese 06-11-91	0.27	mg/l
Calcium 06-11-91	198.0	mg/l	Potassium 06-11-91	0.71	mg/l
Cations, Total	11.10	meq/l	Sodium 06-11-91	3.13	mg/l
Chloride 05-28-91	40.0	mg/l	Solids, Dissolved 05-28-91	334.0	mg/l
Hardness, Total	547	mg/l CaCO3	Sulfate 06-17-91	23.0	mg/l
Iron 06-11-91	1.30	mg/l			

ANALYST: _____

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

July 15, 1991

Job No.: 59 11210

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#2 Underground
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 06-12-91	425	mg/l HCO3	Magnesium 06-11-91	46.40	mg/l
Alk., Carbonate 06-12-91	1<	mg/l CaCO3	Manganese 06-11-91	0.03	mg/l
Calcium 06-11-91	133.2	mg/l	Potassium 06-11-91	5.76	mg/l
Cations, Total	10.99	meq/l	Sodium 06-11-91	8.81	mg/l
Chloride 05-28-91	35.0	mg/l	Solids, Dissolved 05-28-91	541.0	mg/l
Hardness, Total	524	mg/l CaCO3	Sulfate 06-17-91	120.0	mg/l
Iron 06-11-91	0.02<	mg/l			

ANALYST: _____

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 18, 1991

Job No.: 59 11211

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Stream #3
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 05-29-91	1<	mg/l CaCO3	Iron 05-29-91	0.02<	mg/l
Alk., Bicarbonate 05-29-91	320	mg/l HCO3	Magnesium 05-29-91	36.00	mg/l
Alk., Carbonate 05-29-91	1<	mg/l CaCO3	Manganese 05-29-91	0.01<	mg/l
Alk., Total 05-29-91	263	mg/l CaCO3	Oil and Grease 05-29-91	2.8	mg/l
Anions, Total	7.72	meq/l	Potassium 05-29-91	3.33	mg/l
Calcium 05-29-91	88.0	mg/l	Sodium 05-29-91	10.60	mg/l
Cations, Total	7.89	meq/l	Solids, Dissolved 05-28-91	441.0	mg/l
Chloride 06-06-91	25.0	mg/l	Solids, Settleable 05-28-91	1.0<	mg/l
Hardness, Total	368	mg/l CaCO3	Solids, Suspended 05-28-91	7.0	mg/l
			Sulfate 05-29-91	90.0	mg/l

ANALYST: Lois Stefko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

July 15, 1991

Job No.: 59 11212

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#4 Underground
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 06-12-91	209	mg/l HCO3	Iron 06-11-91	1.40	mg/l
Alk., Carbonate 06-12-91	1<	mg/l CaCO3	Magnesium 06-11-91	43.10	mg/l
Alk., Total 06-12-91	263	mg/l CaCO3	Manganese 06-11-91	0.24	mg/l
Anions, Total	9.78	meq/l	Oil and Grease 06-03-91	5.0	mg/l
Calcium 06-11-91	171.2	mg/l	Potassium 06-11-91	5.83	mg/l
Cations, Total	12.57	meq/l	Sodium 06-11-91	7.53	mg/l
Chloride 05-28-91	110.0	mg/l	Solids, Dissolved 05-28-91	481.0	mg/l
Hardness, Total	605	mg/l CaCO3	Sulfate 06-17-91	75.0	mg/l

ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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June 18, 1991

Job No.: 59 11213

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Stream #5
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 05-29-91	15	mg/l CaCO3	Iron 05-29-91	1.19	mg/l
Alk., Bicarbonate 05-29-91	368	mg/l HCO3	Magnesium 05-29-91	34.60	mg/l
Alk., Carbonate 05-29-91	1<	mg/l CaCO3	Manganese 05-29-91	0.14	mg/l
Alk., Total 05-29-91	302	mg/l CaCO3	Oil and Grease 05-29-91	1.0<	mg/l
Anions, Total	8.76	meq/l	Potassium 05-29-91	4.73	mg/l
Calcium 05-29-91	122.9	mg/l	Sodium 05-29-91	8.75	mg/l
Cations, Total	9.48	meq/l	Solids, Dissolved 05-28-91	460.0	mg/l
Chloride 06-06-91	50.0	mg/l	Solids, Settleable 05-28-91	1.0<	mg/l
Hardness, Total	449	mg/l CaCO3	Solids, Suspended 05-28-91	245.0	mg/l
			Sulfate 05-29-91	70.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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July 15, 1991

Job No.: 59 11214

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#7
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 07-11-91	0.01<	mg/l	Chromium 07-11-91	0.02<	mg/l
Alk., Bicarbonate 06-12-91	176	mg/l HCO3	Copper 07-11-91	0.024	mg/l
Alk., Carbonate 06-12-91	1<	mg/l CaCO3	Fluoride 06-03-91	0.21	mg/l
Alk., Total 06-12-91	145	mg/l CaCO3	Hardness, Total	187	mg/l CaCO3
Arsenic 07-11-91	0.002<	mg/l	Iron 06-11-91	0.11	mg/l
Anions, Total	3.91	meq/l	Lead 07-11-91	0.050<	mg/l
Barium 07-11-91	0.03<	mg/l	Magnesium 06-11-91	8.00	mg/l
Boron 06-11-91	0.01<	mg/l	Manganese 06-11-91	0.04	mg/l
Cadmium 07-11-91	0.041	mg/l	Mercury 05-31-91	0.002<	mg/l
Calcium 06-11-91	61.5	mg/l	Molybdenum 07-11-91	0.10<	mg/l
Cations, Total	3.84	meq/l	Nickel 07-11-91	0.02<	mg/l
Chloride 05-28-91	25.0	mg/l	Nitrogen, Ammonia 06-03-91	0.02	mg/l

ANALYST: M CY

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M CY
Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIE

TERMS AND CONDITIONS ON REVERSE

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FAX: (801) 653-2479

July 15, 1991

Job No.: 59 11214

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#7
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrate 06-12-91	0.01<	mg/l	Solids, Dissolved 05-28-91	216.0	mg/l
Nitrogen, Nitrite 06-12-91	0.01<	mg/l	Solids, Settleable 05-28-91	1.0<	mg/l
Oil and Grease 06-03-91	1.0<	mg/l	Solids, Suspended 05-28-91	9.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfate 06-17-91	18.0	mg/l
Potassium 06-11-91	0.42	mg/l	Sulfide 06-17-91	21.80	mg/l
Selenium	0.002<	mg/l	Zinc 07-11-91	0.14	mg/l
Sodium 06-11-91	2.19	mg/l			

ANALYST: M CH

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M CH

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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July 15, 1991

Job No.: 59 11215

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#8 Stream
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Nitrate 06-12-91	0.01<	mg/l	Solids, Dissolved 05-28-91	233.0	mg/l
Nitrogen, Nitrite 06-12-91	0.01<	mg/l	Solids, Settleable 05-28-91	1.0<	mg/l
Oil and Grease 06-03-91	1.0<	mg/l	Solids, Suspended 05-28-91	5.0	mg/l
Phosphorus, Total	0.01<	mg/l	Sulfate 06-17-91	31.0	mg/l
Potassium 06-11-91	0.97	mg/l	Sulfide 06-17-91	5.20	mg/l
Selenium 07-11-91	0.002<	mg/l	Zinc 07-11-91	0.06	mg/l
Sodium 06-11-91	2.30	mg/l			

ANALYST: M M

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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FAX: (801) 653-2479

July 15, 1991

Job No.: 59 11215

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: May 28, 1991

Date Sampled: ------

Sampled By: Blue Blaze

#8 Stream
Rec'd 1000 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 07-11-91	0.01<	mg/l	Chromium 07-11-91	0.02<	mg/l
Alk., Bicarbonate 06-12-91	189	mg/l HCO3	Copper 07-11-91	0.010<	mg/l
Alk., Carbonate 06-12-91	1<	mg/l CaCO3	Fluoride 06-03-91	0.20	mg/l
Alk., Total 06-12-91	155	mg/l CaCO3	Hardness, Total	222	mg/l CaCO3
Arsenic 07-11-91	0.002<	mg/l	Iron 06-11-91	0.08	mg/l
Anions, Total	4.79	meq/l	Lead 07-11-91	0.060	mg/l
Barium 07-11-91	0.03<	mg/l	Magnesium 06-11-91	9.06	mg/l
Boron 06-11-91	0.01<	mg/l	Manganese 06-11-91	0.02	mg/l
Cadmium 07-11-91	0.027	mg/l	Mercury 05-31-91	0.003	mg/l
Calcium 06-11-91	73.8	mg/l	Molybdenum 07-11-91	0.10<	mg/l
Cations, Total	4.56	meq/l	Nickel 07-11-91	0.02<	mg/l
Chloride 05-28-91	40.0	mg/l	Nitrogen, Ammonia 06-03-91	0.00	mg/l

ANALYST: M M

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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October 16, 1991

Job No.: 59 11577

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#1 Underground
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 10-03-91	339	mg/l HCO3	Hardness, Total	324	mg/l CaCO3
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Iron 10-03-91	0.58	mg/l
Alk., Total 10-03-91	278	mg/l CaCO3	Magnesium 10-03-91	19.40	mg/l
Anions, Total	6.32	meq/l	Manganese 10-03-91	0.11	mg/l
Calcium 10-03-91	97.9	mg/l	Potassium 10-03-91	0.00<	mg/l
Cations, Total	6.63	meq/l	Sodium 10-03-91	3.38	mg/l
Chloride 10-08-91	15.0	mg/l	Solids, Dissolved 10-03-91	266.0	mg/l
			Sulfate 10-01-91	23.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Cousinell

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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October 16, 1991

Job No.: 59 11576

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#2 Underground
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 10-03-91	522	mg/l HCO3	Hardness, Total	521	mg/l CaCO3
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Iron 10-03-91	0.05	mg/l
Alk., Total 10-03-91	428	mg/l CaCO3	Magnesium 10-03-91	51.70	mg/l
Anions, Total	11.29	meq/l	Manganese 10-03-91	0.06	mg/l
Calcium 10-03-91	123.2	mg/l	Potassium 10-03-91	4.67	mg/l
Cations, Total	10.98	meq/l	Sodium 10-03-91	10.74	mg/l
Chloride 10-08-91	30.0	mg/l	Solids, Dissolved 10-03-91	480.0	mg/l
			Sulfate 10-01-91	100.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Council

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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October 16, 1991

Job No.: 59 11575

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#4 Underground
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 10-03-91	372	mg/l HCO3	Magnesium 10-03-91	50.10	mg/l
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Manganese 10-03-91	0.01<	mg/l
Alk., Total 10-03-91	305	mg/l CaCO3	Potassium 10-03-91	3.70	mg/l
Anions, Total	8.22	meq/l	Sodium 10-03-91	5.61	mg/l
Calcium 10-03-91	83.9	mg/l	Solids, Dissolved 10-03-91	354.0	mg/l
Cations, Total	8.64	meq/l	Solids, Settleable 10-02-91	1.0<	mg/l
Chloride 10-08-91	25.0	mg/l	Solids, Suspended 10-03-91	114.0	mg/l
Hardness, Total	416	mg/l CaCO3	Sulfate 10-01-91	75.0	mg/l
Iron 10-03-91	0.62	mg/l			

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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October 16, 1991

Job No.: 59 11574

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#5 Stream
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 10-03-91	369	mg/l HCO3	Magnesium 10-03-91	33.99	mg/l
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Manganese 10-03-91	0.01<	mg/l
Alk., Total 10-03-91	303	mg/l CaCO3	Oil and Grease 10-03-91	1.0<	mg/l
Anions, Total	7.80	meq/l	Potassium 10-03-91	2.11	mg/l
Calcium 10-03-91	91.7	mg/l	Sodium 10-03-91	6.74	mg/l
Cations, Total	7.72	meq/l	Solids, Dissolved 10-03-91	364.0	mg/l
Chloride 10-08-91	15.0	mg/l	Solids, Settleable 10-02-91	1.0<	mg/l
Hardness, Total	369	mg/l CaCO3	Solids, Suspended 10-03-91	56.0	mg/l
Iron 10-03-91	0.70	mg/l	Sulfate 10-01-91	70.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Council

Manager, Huntington Laboratory JK

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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October 22, 1991

Job No.: 59 11573

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#7 Stream
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 10-02-91	1<	mg/l CaCO3	Chloride 10-08-91	10.0	mg/l
Aluminum 10-17-91	0.01<	mg/l	Chromium 10-17-91	0.02<	mg/l
Alk., Bicarbonate 10-03-91	402	mg/l HCO3	Copper 10-17-91	0.069	mg/l
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Fluoride 10-08-91	0.12	mg/l
Alk., Total 10-03-91	330	mg/l CaCO3	Hardness, Total	321	mg/l CaCO3
Arsenic 10-09-91	0.002<	mg/l	Iron 10-03-91	0.06	mg/l
Anions, Total	7.09	meq/l	Lead 10-17-91	0.050<	mg/l
Barium 10-17-91	0.03<	mg/l	Magnesium 10-03-91	17.80	mg/l
Boron 10-02-91	0.04	mg/l	Manganese 10-03-91	0.01<	mg/l
Cadmium 10-17-91	0.002<	mg/l	Mercury 10-08-91	0.002<	mg/l
Calcium 10-03-91	99.2	mg/l	Molybdenum 10-17-91	0.10<	mg/l
Cations, Total	6.56	meq/l	Nickel 10-17-91	0.27	mg/l

ANALYST: ul ul

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

ul ul

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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October 22, 1991

Job No.: 59 11573

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#7 Stream
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Ammonia 10-09-91	0.25	mg/l	Sodium 10-03-91	3.21	mg/l
Nitrogen, Nitrate 10-01-91	0.01<	mg/l	Solids, Dissolved 09-30-91	288.0	mg/l
Nitrogen, Nitrite 10-01-91	0.01<	mg/l	Solids, Settleable 09-30-91	1.0<	mg/l
Oil and Grease 10-03-91	1.0<	mg/l	Solids, Suspended 09-30-91	5.0	mg/l
Phosphorus, Total 10-08-91	0.24	mg/l	Sulfate 10-09-91	18.0	mg/l
Potassium 10-03-91	0.00<	mg/l	Sulfide 10-02-91	4.00	mg/l
Selenium 10-09-91	0.002<	mg/l	Zinc 10-17-91	0.00<	mg/l

ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]

Manager, Huntington Laboratory

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October 22, 1991

Job No.: 59 11572

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#8 Stream
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 10-02-91	1<	mg/l CaCO3	Chloride 10-08-91	15.0	mg/l
Aluminum 10-17-91	0.01<	mg/l	Chromium 10-17-91	0.05	mg/l
Alk., Bicarbonate 10-03-91	333	mg/l HCO3	Copper 10-17-91	0.010<	mg/l
Alk., Carbonate 10-03-91	1<	mg/l CaCO3	Fluoride 10-08-91	0.08	mg/l
Alk., Total 10-03-91	273	mg/l CaCO3	Hardness, Total	325	mg/l CaCO3
Arsenic 10-09-91	0.002<	mg/l	Iron 10-03-91	0.02<	mg/l
Anions, Total	5.83	meq/l	Lead 10-17-91	0.050<	mg/l
Barium 10-17-91	0.03<	mg/l	Magnesium 10-03-91	15.10	mg/l
Boron 10-02-91	0.06	mg/l	Manganese 10-03-91	0.01<	mg/l
Cadmium 10-17-91	0.002<	mg/l	Mercury 10-08-91	0.002<	mg/l
Calcium 10-03-91	105.1	mg/l	Molybdenum 10-17-91	0.10<	mg/l
Cations, Total	6.69	meq/l	Nickel 10-17-91	0.20	mg/l

ANALYST Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

October 22, 1991

Job No.: 59 11572

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: September 30, 1991

Date Sampled: September 27, 1991

Sampled By: Blue Blaze

#8 Stream
Rec'd 0830 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Nitrogen, Ammonia 10-09-91	0.28	mg/l	Sodium 10-03-91	4.55	mg/l
Nitrogen, Nitrate 10-01-91	0.01<	mg/l	Solids, Dissolved 09-30-91	309.0	mg/l
Nitrogen, Nitrite 10-01-91	0.01<	mg/l	Solids, Settleable 09-30-91	1.0<	mg/l
Oil and Grease 10-03-91	1.0<	mg/l	Solids, Suspended 09-30-91	4.0	mg/l
Phosphorus, Total 10-08-91	0.01<	mg/l	Sulfate 10-09-91	4.0	mg/l
Potassium 10-03-91	0.00<	mg/l	Sulfide 10-02-91	4.00	mg/l
Selenium 10-09-91	0.002<	mg/l	Zinc 10-17-91	0.00<	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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FAX: (801) 653-2479

November 13, 1991

Job No.: 59 11675

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Blue Blaze #1
Rec'd 0800 hr.

Sampled By: Blue Blaze

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 11-07-91	342	mg/l HCO3	Iron 11-11-91	0.26	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Magnesium 11-11-91	21.40	mg/l
Alk., Total 11-07-91	281	mg/l CaCO3	Manganese 11-11-91	0.01<	mg/l
Anions, Total	6.40	meq/l	Potassium 11-11-91	4.51	mg/l
Calcium 11-11-91	97.7	mg/l	Sodium 11-11-91	4.79	mg/l
Cations, Total	6.96	meq/l	Solids, Dissolved 11-04-91	313.0	mg/l
Chloride 11-08-91	15.0	mg/l	Solids, Suspended 11-04-91	6.0	mg/l
Hardness, Total 11-11-91	332	mg/l CaCO3	Sulfate 11-12-91	24.0	mg/l

ANALYST: Lois Stofko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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FAX: (801) 653-2479

November 13, 1991

Job No.: 59 11676

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Blue Blaze #2
Rec'd 0800 hr.

Sampled By: Blue Blaze

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 11-07-91	342	mg/l HCO3	Iron 11-11-91	0.26	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Magnesium 11-11-91	21.40	mg/l
Alk., Total 11-07-91	281	mg/l CaCO3	Manganese 11-11-91	0.01<	mg/l
Anions, Total	6.40	meq/l	Potassium 11-11-91	4.51	mg/l
Calcium 11-11-91	97.7	mg/l	Sodium 11-11-91	4.79	mg/l
Cations, Total	6.96	meq/l	Solids, Dissolved 11-04-91	513.0	mg/l
Chloride 11-08-91	15.0	mg/l	Solids, Suspended 11-04-91	6.0	mg/l
Hardness, Total	332	mg/l CaCO3	Sulfate 11-12-91	24.0	mg/l

ANALYST: Ron Stefko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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November 15, 1991

Job No.: 59 11677

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Blue Blaze #3
Rec'd 0800 hr.

Sampled By: Blue Blaze

(AMENDED ID)

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 11-07-91	35	mg/l CaCO3	Iron 11-11-91	0.25	mg/l
Alk., Bicarbonate 11-07-91	364	mg/l HCO3	Magnesium 11-11-91	39.36	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Manganese 11-11-91	0.01<	mg/l
Alk., Total 11-07-91	299	mg/l CaCO3	Oil and Grease 11-05-91	4.2	mg/l
Anions, Total	8.24	meq/l	Potassium 11-11-91	6.94	mg/l
Calcium 11-11-91	101.3	mg/l	Sodium 11-11-91	8.32	mg/l
Cations, Total	8.83	meq/l	Solids, Dissolved 11-04-91	425.0	mg/l
Chloride 11-08-91	35.0	mg/l	Solids, Settleable 11-04-91	1.0<	mg/l
Hardness, Total	415	mg/l CaCO3	Solids, Suspended 11-04-91	9.0	mg/l
			Sulfate 11-02-91	68.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

November 15, 1991

Job No.: 59 11678

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Blue Blaze #4
Rec'd 0800 hr.

Sampled By: Blue Blaze

(AMENDED ID)

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Alk., Bicarbonate 11-07-91	370	mg/l HCO3	Iron 11-11-91	0.65	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Magnesium 11-11-91	39.06	mg/l
Alk., Total 11-07-91	303	mg/l CaCO3	Manganese 11-11-91	0.01<	mg/l
Anions, Total	8.35	meq/l	Potassium 11-11-91	5.85	mg/l
Calcium 11-11-91	91.5	mg/l	Sodium 11-11-91	5.84	mg/l
Cations, Total	8.18	meq/l	Solids, Dissolved 11-04-91	405.0	mg/l
Chloride 11-08-91	40.0	mg/l	Solids, Suspended 11-04-91	1.0<	mg/l
Hardness, Total	389	mg/l CaCO3	Sulfate 11-02-91	63.0	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
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Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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FAX: (801) 653-2479

November 13, 1991

Job No.: 59 11679

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Blue Blaze #5
Rec'd 0800 hr.

Sampled By: Blue Blaze

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Acidity 11-12-91	42	mg/l CaCO3	Iron 11-11-91	0.50	mg/l	
Alk., Bicarbonate 11-11-91	380	mg/l HCO3	Magnesium 11-11-91	41.00	mg/l	
Alk., Carbonate 11-11-91	1<	mg/l CaCO3	Manganese 11-11-91	0.02	mg/l	
Alk., Total 11-11-91	312	mg/l CaCO3	Oil and Grease 11-05-91	16.7	mg/l	RE-TESTED 11-14-91
Anions, Total	7.73	meq/l	Potassium 11-11-91	4.62	mg/l	
Calcium 11-11-91	84.9	mg/l	Sodium 11-11-91	6.70	mg/l	
Cations, Total	8.02	meq/l	Solids, Dissolved 11-04-91	400.0	mg/l	
Chloride 11-08-91	25.0	mg/l	Solids, Settleable 11-04-91	1.0<	mg/l	
Hardness, Total	381	mg/l CaCO3	Solids, Suspended 11-04-91	87.0	mg/l	
			Sulfate 11-12-91	45.0	mg/l	

ANALYST: Ron Stofko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

November 19, 1991

Job No.: 59 11700

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 14, 1991

Date Sampled: November 14, 1991

Sampled By: Blue Blaze

Blue Blaze Sample
Rec'd 1500 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Oil and Grease 11-15-91	2.2	mg/l

ANALYST: M U

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M U

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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PLEASE ADDRESS ALL CORRESPONDENCE
P.O. BOX 1020, HUNTINGTON, UT 8
TELEPHONE: (801) 653-
FAX: (801) 653-

November 21, 1991

Job No.: 59 11680

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Blue Blaze #7
Rec'd 0800 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 11-14-91	0.50	mg/l	Chromium 11-14-91	0.02<	mg/l
Alk., Bicarbonate 11-07-91	319	mg/l HCO3	Copper 11-14-91	0.010<	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Hardness, Total	314	mg/l CaCO3
Alk., Total 11-07-91	262	mg/l CaCO3	Iron 11-11-91	0.14	mg/l
Arsenic 11-14-91	0.002<	mg/l	Lead 11-14-91	0.050<	mg/l
Anions, Total	5.99	meq/l	Magnesium 11-11-91	15.20	mg/l
Barium 11-14-91	0.68	mg/l	Manganese 11-11-91	0.02	mg/l
Boron 11-06-91	0.05	mg/l	Mercury 11-18-91	0.002<	mg/l
Cadmium 11-14-91	0.005	mg/l	Molybdenum 11-14-91	0.31	mg/l
Calcium 11-11-91	100.7	mg/l	Nickel 11-14-91	0.21	mg/l
Cations, Total	6.55	meq/l	Nitrogen, Nitrate 11-05-91	0.01<	mg/l
Chloride 11-08-91	15.0	mg/l	Nitrogen, Nitrite 11-05-91	0.01<	mg/l

ANALYST: Lois Stofko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

November 21, 1991

Job No.: 59 11680

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Blue Blaze #7
Rec'd 0800 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Oil and Grease 11-05-91	1.0<	mg/l	Solids, Dissolved 11-14-91	300.0	mg/l
Phosphorus, Total 11-11-91	0.02	mg/l	Solids, Settleable	1.0<	mg/l
Potassium 11-11-91	3.83	mg/l	Solids, Suspended 11-14-91	1.0<	mg/l
Selenium 11-11-91	0.002<	mg/l	Sulfate 11-12-91	22.0	mg/l
Sodium 11-11-91	3.86	mg/l	Sulfide 11-08-91	0.00	mg/l
			Zinc 11-14-91	0.33	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

November 21, 1991

Job No.: 59 11681

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Blue Blaze #8
Rec'd 0800 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Aluminum 11-14-91	0.50	mg/l	Chromium 11-14-91	0.02<	mg/l
Alk., Bicarbonate 11-07-91	342	mg/l HCO3	Copper 11-14-91	0.010<	mg/l
Alk., Carbonate 11-07-91	1<	mg/l CaCO3	Hardness, Total	357	mg/l CaCO3
Alk., Total 11-07-91	281	mg/l CaCO3	Iron 11-11-91	0.09	mg/l
Arsenic 11-15-91	0.005	mg/l	Lead 11-14-91	0.050<	mg/l
Anions, Total	6.72	meq/l	Magnesium 11-11-91	17.50	mg/l
Barium 11-14-91	0.09	mg/l	Manganese 11-11-91	0.01<	mg/l
Boron 11-06-91	0.01<	mg/l	Mercury 11-18-91	0.002<	mg/l
Cadmium 11-14-91	0.005	mg/l	Molybdenum 11-14-91	0.10<	mg/l
Calcium 11-11-91	114.2	mg/l	Nickel 11-14-91	0.02<	mg/l
Cations, Total	7.16	meq/l	Nitrogen, Nitrate 11-05-91	0.01<	mg/l
Chloride 11-08-91	15.0	mg/l	Nitrogen, Nitrite 11-05-91	0.01<	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

November 21, 1991

Job No.: 59 11681

Sample ID: BLUE BLAZE COAL COMPANY

Date Rec'd: November 4, 1991

Date Sampled: ------

Sampled By: Blue Blaze

Blue Blaze #8
Rec'd 0800 hr.

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

WATER ANALYSIS

Oil and Grease 11-05-91	1.4	mg/l	Solids, Dissolved 11-04-91	353.0	mg/l
Phosphorus, Total 11-11-91	0.01<	mg/l	Solids, Settleable	1.0<	mg/l
Potassium 11-11-91	0.76	mg/l	Solids, Suspended 11-04-91	7.0	mg/l
Selenium 11-15-91	0.018	mg/l	Sulfate 11-12-91	39.0	mg/l
Sodium 11-11-91	0.00<	mg/l	Sulfide 11-08-91	0.00	mg/l
			Zinc 11-14-91	0.10	mg/l

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 26, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#1
Rec'd 0800 hr.

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12181

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	244	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	200	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Anions	4.80	----	meq/l	---------	---------- ----- --
Calcium	78.4	.1	mg/l	EPA 215.1	05-26-1992 13:40 JS
Cations	5.50	----	meq/l	---------	---------- ----- --
Chloride	15.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 JS
Hardness, Total	266	1	mg/l $CaCO_3$	---------	05-26-1992 13:40 JS
Iron	0.19	.02	mg/l	EPA 236.1	05-26-1992 13:40 JS
Magnesium	17.00	.01	mg/l	EPA 242.1	05-26-1992 13:40 JS
Manganese	0.00	.01	mg/l	EPA 243.1	05-26-1992 13:40 JS
pH	8.00	----	Units	EPA 150.1	05-18-1992 08:30 LS
Potassium	0.00	.01	mg/l	EPA 258.1	05-26-1992 13:40 JS
Sodium	4.38	.01	mg/l	EPA 273.1	05-26-1992 13:40 JS
Solids, Total Dissolved	269.0	.5	mg/l	EPA 160.1	05-20-1992 15:30 LM
Sulfate	23.0	.1	mg/l	EPA 375.4	05-27-1992 09:00 LS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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FAX: (801) 653-2479

October 23, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

Underground #1
Rec'd 1700 hr.
Sampled No Time Given

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received September 29, 1992

Analysis report no. 59-12541

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	358	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Total	294	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Anions	6.54	----	meq/l	---------	---------- ----- --
Calcium	80.1	.1	mg/l	EPA 215.1	10-20-1992 10:00 LS
Cations	6.53	----	meq/l	---------	---------- ----- --
Chloride	10.0	.1	mg/l	EPA 325.3	10-06-1992 10:05 JS
Hardness, Total	306	1	mg/l $CaCO_3$	---------	10-20-1992 10:00 LS
Iron	0.31	.02	mg/l	EPA 236.1	10-15-1992 09:15 JS
Magnesium	25.83	.01	mg/l	EPA 242.1	10-15-1992 08:30 JS
Manganese	0.02	.01	mg/l	EPA 243.1	10-15-1992 09:15 JS
Potassium	4.62	.01	mg/l	EPA 258.1	10-15-1992 08:30 JS
Sodium	6.64	.01	mg/l	EPA 273.1	10-15-1992 08:30 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	09-30-1992 10:00 LS
Solids, Total Dissolved	299.0	.5	mg/l	EPA 160.1	10-01-1992 08:00 LM
Solids, Total Suspended	18.0	.5	mg/l	EPA 160.2	10-01-1992 08:00 LM
Sulfate	25.0	.1	mg/l	EPA 375.4	10-13-1992 13:00 JS
Cation/Anion Balance	-0.02	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

June Komar

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 13, 1993

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#1 Underground
Rec'd 1045 hr.

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received December 28, 1992

Analysis report no. 59-12794

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	357	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Total	293	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Anions	6.62	----	meq/l	---------	---------- ----- --
Calcium	98.2	.1	mg/l	EPA 215.1	01-08-1993 13:00 LDS
Cations	7.05	----	meq/l	---------	---------- ----- --
Chloride	10.0	.1	mg/l	EPA 325.3	01-04-1993 14:00 LM
Hardness, Total	344	1	mg/l $CaCO_3$	---------	01-08-1993 13:00 LDS
Iron	0.06	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Iron, Dissolved	0.00	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Magnesium	24.00	.01	mg/l	EPA 242.1	01-08-1993 13:00 LDS
Manganese	0.00	.01	mg/l	EPA 243.1	01-09-1993 14:10 JK
Potassium	0.51	.01	mg/l	EPA 258.1	01-08-1993 13:00 LDS
Sodium	3.80	.01	mg/l	EPA 273.1	01-08-1993 13:00 LDS
Solids, Total Dissolved	233.0	.5	mg/l	EPA 160.1	12-30-1992 08:30 LM
Sulfate	30.0	.1	mg/l	EPA 375.4	01-04-1993 14:00 LS
Cation/Anion Balance	3.17	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Larry Stout

Manager, Huntington Laboratory JK

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 3, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by

Kind of sample reported to us WATER

#2
Time Rec'd 8:00 hr.
No Time Sampled

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12081

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	434	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	356	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Anions	9.21	----	meq/l	---------	---------- ----- --
Calcium	99.7	.1	mg/l	EPA 215.1	05-26-1992 13:40 JS
Cations	9.45	----	meq/l	---------	---------- ----- --
Chloride	30.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Iron	0.03	.02	mg/l	EPA 236.1	05-26-1992 13:40 JS
Magnesium	47.50	.01	mg/l	EPA 242.1	05-26-1992 13:40 JS
Manganese	0.02	.01	mg/l	EPA 243.1	05-26-1992 13:40 JS
Potassium	2.13	.01	mg/l	EPA 258.1	05-26-1992 13:40 JS
Sodium	11.99	.01	mg/l	EPA 273.1	05-26-1992 13:40 JS
Solids, Total Dissolved	471.0	.5	mg/l	EPA 160.1	05-20-1992 15:30 LM
Sulfate	68.0	.1	mg/l	EPA 375.4	05-27-1992 09:00 JK

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES
F-465
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TERMS AND CONDITIONS ON REVERSE

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#3
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12082

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Acidity	0	1	mg/l $CaCO_3$	EPA 305.1	06-01-1992 15:00 LS
Alkalinity, Bicarbonate	385	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	316	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Anions	8.08	----	meq/l	---------	---------- ----- --
Calcium	77.4	.1	mg/l	EPA 215.1	05-26-1992 13:40 JS
Cations	8.85	----	meq/l	---------	---------- ----- --
Chloride	25.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Hardness, Total	414	1	mg/l $CaCO_3$	---------	05-26-1992 13:40 JS
Iron	0.13	.02	mg/l	EPA 236.1	05-26-1992 13:40 JS
Magnesium	53.50	.01	mg/l	EPA 242.1	05-26-1992 13:40 JS
Manganese	0.05	.01	mg/l	EPA 243.1	05-26-1992 13:40 JS
Oil & Grease	0.9	1	mg/l	EPA 413.1	05-20-1992 09:00 LM
Potassium	0.51	.01	mg/l	EPA 258.1	05-26-1992 13:40 JS
Sodium	13.45	.01	mg/l	EPA 273.1	05-26-1992 13:40 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	05-18-1992 10:00 LM
Solids, Total Dissolved	431.0	.5	mg/l	EPA 160.1	05-27-1992 15:00 LM
Solids, Total Suspended	2.0	.5	mg/l	EPA 160.2	05-27-1992 15:00 LM
Sulfate	58.0	.1	mg/l	EPA 375.4	05-27-1992 09:00 JK

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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FAX: (801) 653-2479

June 3, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by

Kind of sample reported to us WATER

#4
Time Rec'd 8:00 hr.
No Time Sampled

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12083

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	337	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	277	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Anions	7.36	----	meq/l	---------	---------- ----- --
Calcium	67.0	.1	mg/l	EPA 215.1	05-26-1992 13:40 JS
Cations	7.86	----	meq/l	---------	---------- ----- --
Chloride	25.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Hardness, Total	372	1	mg/l $CaCO_3$	---------	05-26-1992 99:99 reh
Iron	0.19	.02	mg/l	EPA 236.1	05-26-1992 13:40 JS
Magnesium	49.80	.01	mg/l	EPA 242.1	05-26-1992 13:40 JS
Manganese	0.03	.01	mg/l	EPA 243.1	05-26-1992 13:40 JS
Potassium	1.13	.01	mg/l	EPA 258.1	05-26-1992 13:40 JS
Sodium	9.29	.01	mg/l	EPA 273.1	05-26-1992 13:40 JS
Solids, Total Dissolved	394.0	.5	mg/l	EPA 160.1	05-26-1992 15:00 LM
Sulfate	60.0	.1	mg/l	EPA 375.4	05-28-1992 14:26 JK

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

October 19, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Water

Underground #4
Rec'd 1700 hr.
Sampled No Time Given

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: September 29, 1992

Analysis report no. 59-12540

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
lkalinity, Bicarbonate	386	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Total	317	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Anions	9.82	----	meq/l	---------	---------- ----- --
Calcium	98.0	.1	mg/l	EPA 215.1	10-12-1992 14:35 JS
Cations	10.92	----	meq/l	---------	---------- ----- --
Chloride	25.0	.1	mg/l	EPA 325.3	10-12-1992 08:00 LS
Hardness, Total	523	1	mg/l $CaCO_3$	---------	10-12-1992 14:35 JS
Iron	13.20	.02	mg/l	EPA 236.1	10-12-1992 14:35 JS
Magnesium	67.50	.01	mg/l	EPA 242.1	10-12-1992 14:35 JS
Manganese	0.12	.01	mg/l	EPA 243.1	10-12-1992 14:35 JS
Potassium	11.82	.01	mg/l	EPA 258.1	10-12-1992 14:35 JS
Sodium	4.14	.01	mg/l	EPA 273.1	10-12-1992 14:35 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	09-30-1992 08:00 LS
Solids, Total Dissolved	407.0	.5	mg/l	EPA 160.1	10-05-1992 09:00 LM
Solids, Total Suspended	253.0	.5	mg/l	EPA 160.2	10-05-1992 09:00 LM
Sulfate	140.0	.1	mg/l	EPA 375.4	10-12-1992 10:20 LS
Cation/Anion Balance	5.33	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

June Komar

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 13, 1993

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#4 Underground
Rec'd 1045 hr.

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received December 28, 1992

Analysis report no. 59-12792

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	436	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Total	358	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Anions	9.92	----	meq/l	---------	---------- ----- --
Calcium	128.0	.1	mg/l	EPA 215.1	01-08-1993 13:00 LDS
Cations	10.60	----	meq/l	---------	---------- ----- --
Chloride	15.0	.1	mg/l	EPA 325.3	01-04-1993 14:00 LM
Hardness, Total	507	1	mg/l $CaCO_3$	---------	01-08-1993 13:00 LDS
Iron	0.05	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Iron, Dissolved	0.00	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Magnesium	45.40	.01	mg/l	EPA 242.1	01-08-1993 13:00 LDS
Manganese	0.00	.01	mg/l	EPA 243.1	01-09-1993 14:10 JK
Potassium	2.81	.01	mg/l	EPA 258.1	01-08-1993 13:00 LDS
Sodium	9.30	.01	mg/l	EPA 273.1	01-08-1993 13:00 LDS
Solids, Total Dissolved	399.0	.5	mg/l	EPA 160.1	12-30-1992 08:30 LM
Sulfate	120.0	.1	mg/l	EPA 375.4	01-04-1993 14:00 LS
Cation/Anion Balance	3.31	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Larry Stout

Manager, Huntington Laboratory JK

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#5
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12084

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
[illegible]ty	6	1	mg/l $CaCO_3$	EPA 305.1	06-01-1992 15:00 LS
Alkalinity, Bicarbonate	360	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	316	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Anions	8.75	----	meq/l	---------	---------- ----- --
Calcium	88.1	.1	mg/l	EPA 215.1	06-03-1992 08:00 JS
Cations	8.13	----	meq/l	---------	---------- ----- --
Chloride	25.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Hardness, Total	385	1	mg/l $CaCO_3$	---------	06-03-1992 08:00 JS
Iron	1.52	.02	mg/l	EPA 236.1	05-26-1992 12:45 JS
Magnesium	40.00	.01	mg/l	EPA 242.1	05-26-1992 12:45 JS
Manganese	0.10	.01	mg/l	EPA 243.1	05-26-1992 12:45 JS
Oil & Grease	3.0	1	mg/l	EPA 413.1	05-20-1992 09:00 LM
Potassium	0.70	.01	mg/l	EPA 258.1	05-26-1992 12:45 JS
Sodium	9.92	.01	mg/l	EPA 273.1	06-03-1992 08:05 JS
Solids, Settleable	0.1	.5	mg/l	EPA 160.5	05-18-1992 10:00 LM
Solids, Total Dissolved	393.0	.5	mg/l	EPA 160.1	05-27-1992 15:00 LM
Solids, Total Suspended	209.0	.5	mg/l	EPA 160.2	05-27-1992 15:00 LM
Sulfate	90.0	.1	mg/l	EPA 375.4	06-04-1992 09:00 JS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

October 19, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

Stream #5
Rec'd 1700 hr.
Sampled No Time Given

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received September 29, 1992

Analysis report no. 59-12542

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Alkalinity, Bicarbonate	385	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Alkalinity, Total	316	1	mg/l $CaCO_3$	EPA 310.1	10-01-1992 08:00 LS
Anions	7.84	----	meq/l	---------	---------- ----- --
Calcium	99.5	.1	mg/l	EPA 215.1	10-12-1992 14:35 JS
Cations	7.12	----	meq/l	---------	---------- ----- --
Chloride	15.0	.1	mg/l	EPA 325.3	10-02-1992 08:00 LS
Hardness, Total	343	1	mg/l $CaCO_3$	---------	10-12-1992 14:35 JS
Iron	0.91	.02	mg/l	EPA 236.1	10-12-1992 14:35 JS
Iron, Dissolved	0.07	.02	mg/l	EPA 236.1	10-12-1992 14:35 JS
Magnesium	23.00	.01	mg/l	EPA 242.1	10-12-1992 14:35 JS
Manganese	0.05	.01	mg/l	EPA 243.1	10-12-1992 14:35 JS
Oil & Grease	0.3	1	mg/l	EPA 413.1	10-08-1992 13:00 LM
Potassium	3.34	.01	mg/l	EPA 258.1	10-12-1992 14:35 JS
Sodium	3.97	.01	mg/l	EPA 273.1	10-12-1992 14:35 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	09-30-1992 08:00 LS
Solids, Total Dissolved	340.0	.5	mg/l	EPA 160.1	10-01-1992 08:00 LM
Solids, Total Suspended	43.0	.5	mg/l	EPA 160.2	10-01-1992 08:00 LM
Sulfate	60.0	.1	mg/l	EPA 375.4	10-13-1992 13:00 JS
Cation/Anion Balance	4.83	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

June Kosman

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 13, 1993

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#5 Stream
Rec'd 1045 hr.

Sample taken at Blue Blaze

Sample taken by Blue Blaze

Date sampled ------

Date received December 28, 1992

Analysis report no. 59-12793

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Acidity	6	1	mg/l $CaCO_3$	EPA 305.1	12-28-1992 13:00 LS
Alkalinity, Bicarbonate	420	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Alkalinity, Total	345	1	mg/l $CaCO_3$	EPA 310.1	12-28-1992 13:00 LS
Anions	8.20	----	meq/l	---------	---------- ----- --
Calcium	124.0	.1	mg/l	EPA 215.1	01-08-1993 13:00 LDS
Cations	9.57	----	meq/l	---------	---------- ----- --
Chloride	15.0	.1	mg/l	EPA 325.3	01-04-1993 14:00 LM
Hardness, Total	457	1	mg/l $CaCO_3$	---------	01-08-1993 13:00 LDS
Iron	0.07	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Iron, Dissolved	0.00	.02	mg/l	EPA 236.1	01-09-1993 14:10 JK
Magnesium	35.90	.01	mg/l	EPA 242.1	01-08-1993 13:00 LDS
Manganese	0.02	.01	mg/l	EPA 243.1	01-09-1993 14:10 JK
Oil & Grease	0.0	1	mg/l	EPA 413.1	12-30-1992 09:30 LM
Potassium	0.63	.01	mg/l	EPA 258.1	01-08-1993 13:00 LDS
Sodium	9.60	.01	mg/l	EPA 273.1	01-08-1993 13:00 LDS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	12-29-1992 08:00 LS
Solids, Total Dissolved	378.0	.5	mg/l	EPA 160.1	12-30-1992 08:30 LM
Solids, Total Suspended	7.0	.5	mg/l	EPA 160.2	12-30-1992 08:30 LM
Sulfate	50.0	.1	mg/l	EPA 375.4	01-04-1993 14:00 LS
Cation/Anion Balance	7.79	----	%	---------	---------- ----- --

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Larry Stout

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300

CE 1908

Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#7
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12085

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Acidity	8	1	mg/l $CaCO_3$	EPA 305.1	06-01-1992 15:00 LS
Alkalinity, Bicarbonate	296	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	243	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Aluminum	0.00	.5	mg/l	EPA 202.1	05-21-1992 10:40 JS
Anions	5.50	----	meq/l	---------	---------- ----- --
Arsenic	0.000	.002	mg/l	EPA 206.3	05-29-1992 09:00 JS
Barium	0.00	.03	mg/l	EPA 208.1	05-21-1992 10:40 JS
Boron	0.02	.01	mg/l	EPA 212.3	06-02-1992 14:00 JS
Cadmium	0.000	.005	mg/l	EPA 213.1	05-21-1992 10:40 JS
Calcium	85.0	.1	mg/l	EPA 215.1	05-26-1992 12:45 JS
Cations	5.42	----	meq/l	---------	---------- ----- --
Chloride	10.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Chromium	0.00	.02	mg/l	EPA 218.1	05-21-1992 10:40 JS
Copper	0.000	.01	mg/l	EPA 220.1	05-21-1992 10:40 JS
Fluoride	0.05	.01	mg/l	EPA 340.2	05-27-1992 13:00 LS
Hardness, Total	264	1	mg/l $CaCO_3$	---------	05-26-1992 12:45 JS
Iron	0.20	.02	mg/l	EPA 236.1	05-26-1992 12:45 JS
Lead	0.000	.05	mg/l	EPA 239.1	05-21-1992 10:40 JS
Magnesium	12.60	.01	mg/l	EPA 242.1	05-26-1992 12:45 JS
Manganese	0.05	.01	mg/l	EPA 243.1	05-26-1992 12:45 JS
Mercury	0.000	.002	mg/l	EPA 245.1	05-20-1992 15:00 JS
Molybdenum	0.00	.1	mg/l	EPA 246.1	05-21-1992 10:40 JS
Nickel	0.00	.02	mg/l	EPA 249.1	05-21-1992 10:40 JS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

F-465
Original Watermarked For Your Protection

TERMS AND CONDITIONS ON REVERSE

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#7
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12085

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Nitrogen, Ammonia	0.49	.01	mg/l	EPA 350.3	06-01-1992 08:30 LS
Nitrogen, Nitrate	0.21	.01	mg/l	EPA 353.3	05-18-1992 08:00 LM
Nitrogen, Nitrite	0.00	.01	mg/l	EPA 354.1	05-18-1992 08:00 LM
Oil & Grease	0.3	1	mg/l	EPA 413.1	05-20-1992 09:00 LM
Phosphorus, Total	0.00	.01	mg/l	EPA 365.2	05-27-1992 11:30 LM
Potassium	0.00	.01	mg/l	EPA 258.1	05-26-1992 12:45 JS
Selenium	0.000	.002	mg/l	EPA 270.3	05-29-1992 09:00 JS
Sodium	3.17	.01	mg/l	EPA 273.1	05-26-1992 12:45 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	05-18-1992 10:00 LM
Solids, Total Dissolved	292.0	.5	mg/l	EPA 160.1	05-27-1992 15:00 LM
Solids, Total Suspended	6.0	.5	mg/l	EPA 160.2	05-27-1992 15:00 LM
Sulfate	23.0	.1	mg/l	EPA 375.4	05-28-1992 14:26 JK
Sulfide	5.20	.1	mg/l	EPA 376.1	05-19-1992 09:00 LS
Zinc	0.07	.01	mg/l	EPA 289.1	05-21-1992 10:40 JS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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1908

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FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#8
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12086

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
[illegible]ity	0	1	mg/l $CaCO_3$	EPA 305.1	06-01-1992 15:00 LS
Alkalinity, Bicarbonate	278	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Carbonate	0	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Alkalinity, Total	228	1	mg/l $CaCO_3$	EPA 310.1	05-29-1992 10:30 LS
Aluminum	0.00	.5	mg/l	EPA 202.1	05-21-1992 10:40 JS
Anions	5.73	----	meq/l	---------	---------- ----- --
Arsenic	0.000	.002	mg/l	EPA 206.3	05-29-1992 09:00 JS
Barium	0.00	.03	mg/l	EPA 208.1	05-21-1992 10:40 JS
Boron	0.02	.01	mg/l	EPA 212.3	06-02-1992 14:00 LM
Cadmium	0.000	.005	mg/l	EPA 213.1	05-21-1992 10:40 JS
Calcium	90.1	.1	mg/l	EPA 215.1	05-26-1992 12:45 JS
Cations	5.77	----	meq/l	---------	---------- ----- --
Chloride	25.0	.1	mg/l	EPA 325.3	05-28-1992 13:30 LS
Chromium	0.00	.02	mg/l	EPA 218.1	05-21-1992 10 40 JS
Copper	0.000	.01	mg/l	EPA 220.1	05-21-1992 10:40 JS
Fluoride	0.05	.01	mg/l	EPA 340.2	05-27-1992 13:30 LS
Hardness, Total	279	1	mg/l $CaCO_3$	---------	05-26-1992 12:45 JS
Iron	0.26	.02	mg/l	EPA 236.1	05-26-1992 12:45 JS
Lead	0.000	.05	mg/l	EPA 239.1	05-21-1992 10:40 JS
Magnesium	13.20	.01	mg/l	EPA 242.1	05-26-1992 12:45 JS
Manganese	0.08	.01	mg/l	EPA 243.1	05-26-1992 12:45 JS
Mercury	0.000	.002	mg/l	EPA 245.1	05-20-1992 15:00 JS
Molybdenum	0.00	.1	mg/l	EPA 246.1	05-21-1992 10:40 JS
Nickel	0.00	.02	mg/l	EPA 249.1	05-21-1992 10:40 JS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

June 9, 1992

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us Water

#8
Rec'd 0800 hr.
Sampled No Time

Sample taken at Blue Blaze

Sample taken by BLUE BLAZE COAL COMPANY

Date sampled ------

Date received May 18, 1992

Analysis report no. 59-12086

Parameter	Result	MDL	Units	Method	Analyzed Date/Time/Analyst
Nitrogen, Ammonia	0.60	.01	mg/l	EPA 350.3	06-01-1992 08:30 LS
Nitrogen, Nitrate	0.25	.01	mg/l	EPA 353.3	05-18-1992 08:00 LM
Nitrogen, Nitrite	0.00	.01	mg/l	EPA 354.1	05-18-1992 08:00 LM
Oil & Grease	0.1	1	mg/l	EPA 413.1	05-20-1992 09:00 LM
Phosphorus, Total	0.00	.01	mg/l	EPA 365.2	05-27-1992 11:30 LM
Potassium	0.00	.01	mg/l	EPA 258.1	05-26-1992 12:45 JS
Selenium	0.000	.002	mg/l	EPA 270.3	05-29-1992 09:00 JS
Sodium	4.20	.01	mg/l	EPA 273.1	05-26-1992 12:45 JS
Solids, Settleable	0.0	.5	mg/l	EPA 160.5	05-18-1992 10:00 LM
Solids, Total Dissolved	309.0	.5	mg/l	EPA 160.1	05-27-1992 15:00 LM
Solids, Total Suspended	4.0	.5	mg/l	EPA 160.2	05-27-1992 15:00 LM
Sulfate	28.0	.1	mg/l	EPA 375.4	05-28-1992 14:26 JK
Sulfide	6.00	.1	mg/l	EPA 376.1	05-19-1992 08:00 LS
Zinc	0.05	.01	mg/l	EPA 289.1	05-21-1992 10:40 JS

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

APPENDIX 2

UTAH ANTIQUITIES SITE REPORTS AND PHOTOS

Isolated Artifact 4W/x1

Utah Antiquities Site Form
developed by cooperative agreement by:
Bureau of Land Management
Division of State History
University of Utah Archeological Center

1. Site No. [I/1-10] 42Cb209
2. County Carbon
3. Temp. No. 4W/1

4. Class: ___Prehistoric X Historic ___Paleontologic
5. Cultural Site Type (interpreted function): cabin
6. Paleontological Site Type: ___Invertebrate; ___Vertebrate; ___Flora
7. Elevation [I/11-15] 8700 ft.
8. UTM Grid: [I/16-30] zone 12; 492600 m E 4399600 m N
9. [II/1-16] SE¼ of NW¼ of NE¼ of Section 13 T. 13S, R. 7E
10. Map Reference: Scofield, Utah Series: 15' Date: 1923
11. Aerial Photo Data:
12. Site Location: The site is located in a small tributary canyon of Beaver Creek approximately 1500 feet south of the junction of the Beaver Creek road and the main dirt road between Scofield and Price.

13. Land Owner [II/17-18]: PR; BLM District/Forest [II/19]:
14. Site Name/Previous Designations: Pete Frandsen Cabin
15. Description of Site: The site consists of a collapsed one room log cabin located on the east side of a small tributary creek of Beaver Creek. It is made of round logs standing 9 courses high in places. The roof is collapsed and the entire cabin is in poor condition. There are very few artifacts associated with the site. The cabin faces WNW. The cabin probably dates to the early 1920's.

16. Artifacts: Artifacts should be described/drawn on a continuation sheet and their locations plotted on the site map

CLASS	QUANTITY	CLASS	TYPE	QUANTITY
Debitage [II/30]		Ceramics [III/10-21]		
Bifaces [III/1-9]		Projectile Pnt [III/1-9]		
Scrapers [III/1-9]		Ground Stone [II/22-29]		
Utilized Flakes		Other [II/22-29]	stove	5

Description: fragments of an old cast iron stove are scattered in front of the cabin.

17. Non-Structural Features: (describe and locate on site map) [III/22-27]

_hearth/firepit(HE) _rubble mound(RM) _earthen mound(EM) _petroglyph(PE) _other(OT)
_midden(MD) _stone circle(SC) _burial(BU) _trail(TR)
_depression(DE) _rock alignment(RA) _pictograph(PI) _water control(WC)

Description:

18. Structural Features: (describe and locate on site map) [III/28-IV/6]

CLASS	MATERIAL	QUANTITY	CLASS	MATERIAL	QUANTITY
Single rm	Wood	1	Tower		
Multiple rm			Cairn		
Granary			Corral		
Cist			Dugout		
Pithouse			Kiln		
Kiva			Monument		

Description: The structure consists of a simple one room, rectangular log cabin made of quaking aspen logs. It measures 10 m by 5m with the long axis being E-SW.

Site No. 42B209

19. Cultural Affiliation [IV/7-14]: EA How Determined? informant
20. Site Dimensions : 10 m X 5 m; Area [IV/17-21]: 50 sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used .
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; X No (Include location of test on site map)
Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat.Register Potential[V/1]: __Significant(C); __Non-Significant(D)
Justification: The site is fairly recent and is in poor condition. It was only a temporary habitation.
25. Research Potential:
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : W / 5 m
Type/Name of Water Source [V/11] : stream/unnamed
Distance to Cultivatable Soil [V/12-14] : 500m
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
_mountain spine(A)
_hill/butte(B)
_tableland/mesa(C)
_ridge(D)
_valley(E)
_plain(F)
X canyon(G)

POSITION ON LANDFORM
_top/crest/ridge(A)
_edge(B)
_slope(C)
X toe/foot/bottom(D)
_saddle/pass(E)
_bench/ledge(F)
_rimrock(G)
_interior(H)

DEPOSITIONAL ENVIRONMENT
_fan(A)
_talus(B)
_dune(C)
_stream terrace(D)
_playa(E)
shore feature
_extinct lake(F)
_extant lake(G)
X alluvial plain(H)
_colluvium(I)
_moraine(J)
_flood plain(K)
_marsh(L)
_landslide/slump(M)
_delta(N)
_island(O)
_cliff(P)
_outcrop(Q)
_stream bed(R)

SECONDARY POSITION
_top/crest/ridge(A)
_edge(B)
X slope(C)
_toe/foot(D)
_cutbank(E)
_detached monolith(F)
_interior(G)
_step(H)
_riser(I)
_detached monolith(J)
_spring mound/bog(K)
_cave(M)
_alcove/shelter(N)
_patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 8° West
30. Vegetation COMMUNITY and association [V/24-25]

_ALPINE GRASSLAND(AA)
_SPRUCE FIR(BZ)
_krummholz(BA)
_white fir-spruce(BB)
X ASPEN DOUGLAS FIR(CZ)
_limber pine(CA)
_douglas fir(CB)
_lodgepole pine(CC)
_bristlecone pine(CD)
_aspen(CE)
_streamside(CF)
_meadow grassland(CG)

_YELLOW PINE-OAK(DZ)
_ponderosa pine(DA)
_oakbrush(DB)
_mountain brush(DC)
_maple(DD)
_streamside(DE)
_PLAINS/PRAIRIE(EZ)
_grasslands(EA)
_pinyon-juniper(EB)
_streamside(EC)

_COLD DESERT SHRUB(FZ)
_sagebrush(FA)
_small sagebrush(FB)
_little rabbitbrush(FC)
_shadscale(FD)
_horsebrush(FE)
_winter-fat(FF)
_hop-sage/bikbrush(FG)
_bud sagebrush(FH)
_mat saltbrush(FI)
_gray molly(FJ)
_streamside(FK)

_SALT DESERT SHRUB(GZ)
_greasewood(GA)
_greasewood-shadscal(GB)
_seepweed(GC)
_pickleweed/samphire(GD)
_saltgrass(GE)
_alkali sacaton(GF)
_rabbitbrush(GG)

_WARM DESERT SHRUB(HZ)
_desert saltbrush(HA)
_creosote bush(HB)
_creosote/bursage(HC)
_joshua tree(HD)
_MARSH COMMUNITY(IA)
_ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KZ)
_CULTIVATED LAND(JZ)

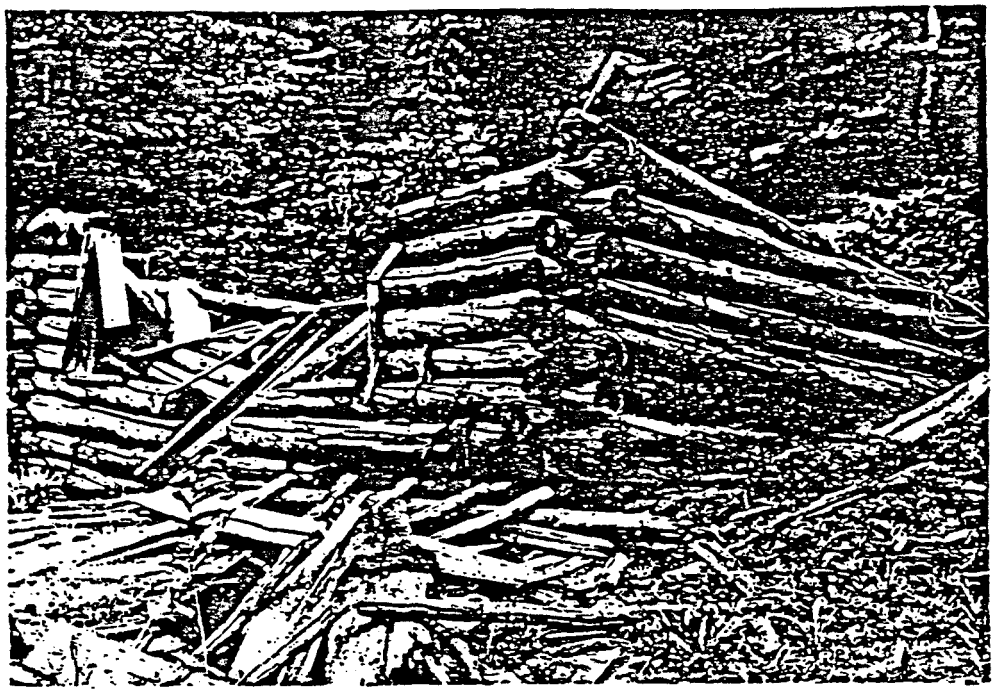
(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered by aspen and Douglas Fir. The canyon bottom is covered by stands of aspen and grasses.

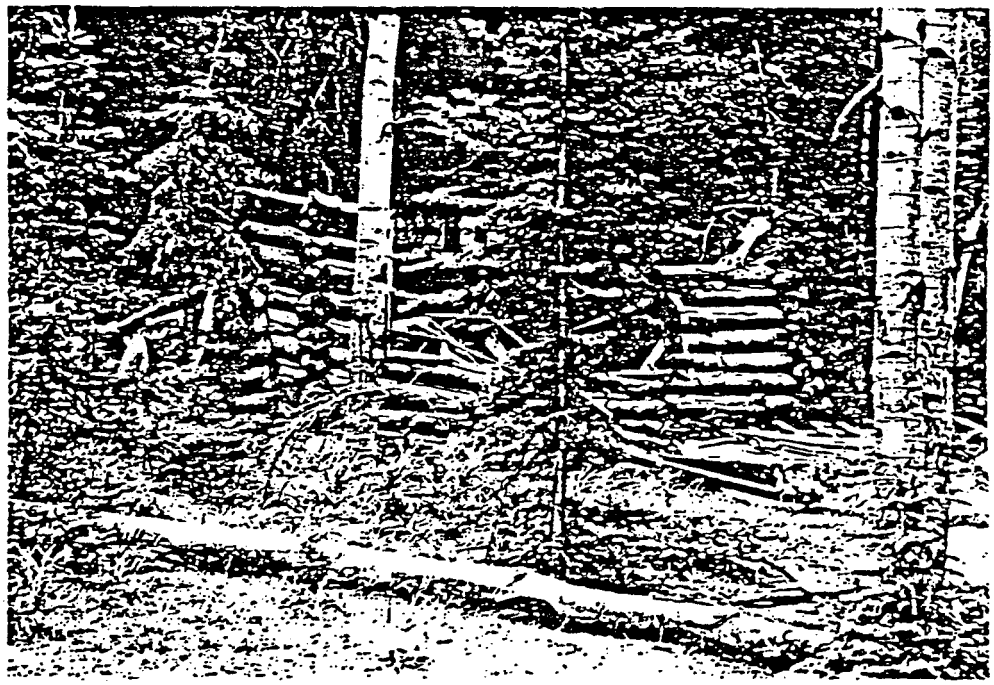
31. Next nearest plant association/distance: streamside/500m
32. Photograph Numbers [V/26] : 4W-1:1,2
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/22/80
Assisting Crew Members:
34. Sponsoring Agency: ARCO Coal Company Contract No.
35. Encoding Form: (all entries are right justified)

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31
I	4 2	C b			2 0 9	8 7 0 0		1 2	4 9 2 6 0 0			4 3 9 9 6 0 0				
II	SE	N W	N E	13	1 3	S	7 E		P R	6 D A	H T					A
III	A A				A A A										B B	
IV				E A				H		5 0	A Z	C D	E R			
V	D	0 0 5	2 7 5	0 0 5	B	0 5	G D H C		0 8	2 7 5	C E	C	P R			
VI																

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)



42Cb209 looking NE

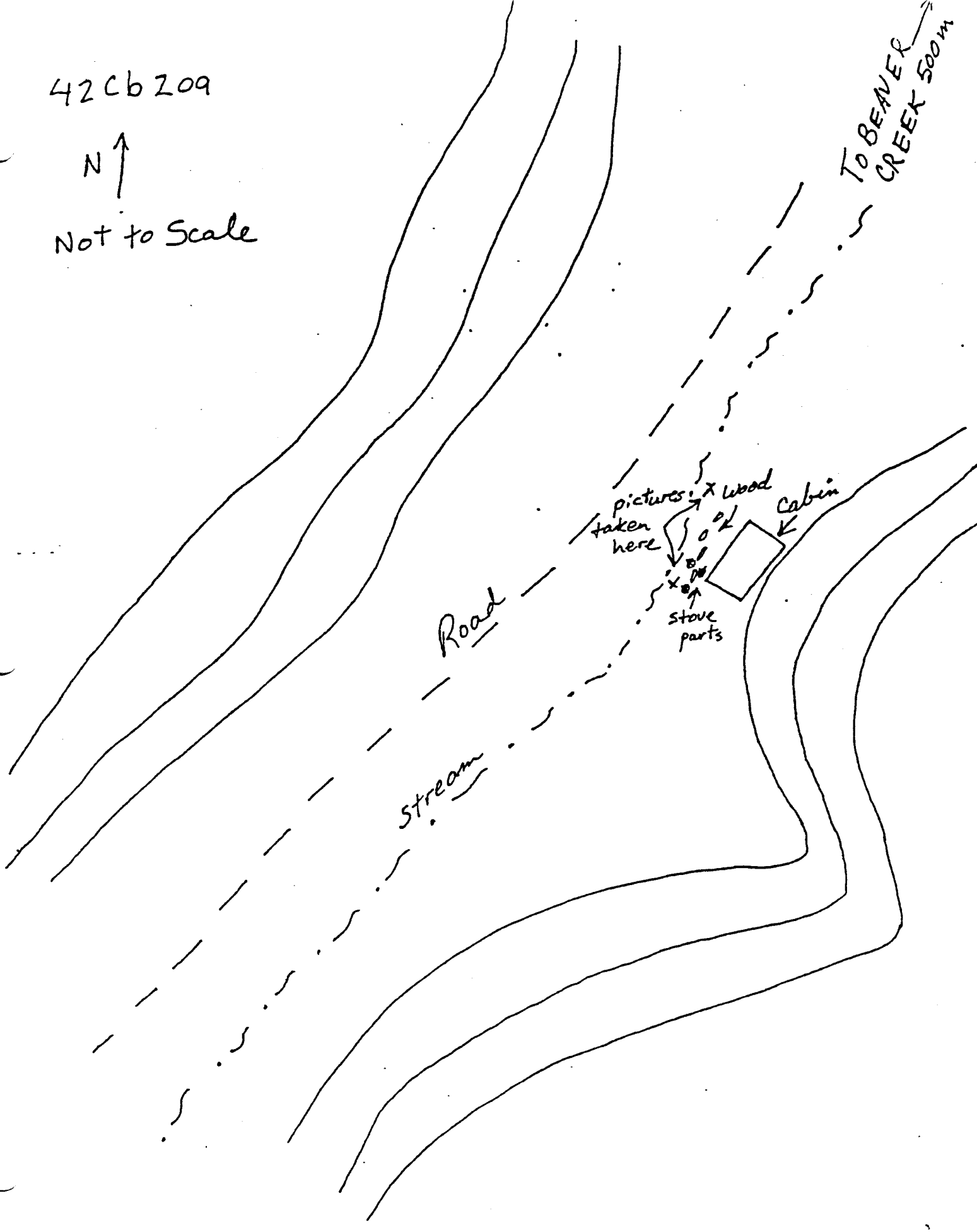


42Cb290 looking SE

42Cb209

N ↑

Not to Scale



Utah Antiquities Site Form
developed by cooperative agreement by:
Bureau of Land Management
Division of State History
University of Utah Archeological Center

1. Site No.[I/1-10] 42Cb210
2. County Carbon
3. Temp. No. 4W/2
4. Class: __Prehistoric X Historic __Paleontologic
5. Cultural Site Type (interpreted function): cabin
6. Paleontological Site Type: ___Invertebrate; ___Vertebrate; ___Flora
7. Elevation [I/11-15] 7840 ft.
8. UTM Grid: [I/16-30] zone 12 ; 494000 m E 4392000 m N
9. [II/1-16] NW¼ of NW¼ of SE¼ of Section 19 T. 13S , R. 8E
10. Map Reference: Scofield, Utah Series: 15' Date: 1923
11. Aerial Photo Data: ____
12. Site Location: The site is located on the west side of Gordon Creek approximately 5000 feet south of where the creek turns south from the road in Section 17.

13. Land Owner [II/17-18]: PR; BLM District/Forest [II/19]: ____
14. Site Name/Previous Designations: none
15. Description of Site: The site consists of a collapsed log cabin constructed of round quaking aspen logs. The cabin is approximately 5m x 8m and faces north easterly. An area with several old car parts, wood, and metal fragments is located to the south of the cabin site. Very few artifacts are scattered around the site. A road passes immediately to to the west of the cabin. The site probably dates to the late 1920's or early 1930's.

16. Artifacts: Artifacts should be described/drawn on a continuation sheet and their locations plotted on the site map

CLASS	QUANTITY	CLASS	TYPE	QUANTITY
Debitage [II/30]	____	Ceramics [III/10-21]	____	____
Bifaces [III/1-9]	____	Projectile Pnt [III/1-9]	____	____
Scrapers [III/1-9]	____	Ground Stone [II/22-29]	____	____
Utilized Flakes	____	Other [II/22-29]	historic trash	____

Description: Historic trash, consisting of metal fragments, car parts, and wood.

17. Non-Structural Features: (describe and locate on site map) [III/22-27]

_hearth/firepit(HZ) _rubble mound(RM) _earthen mound(EM) _petroglyph(PX) _other(OT)
_midden(MD) _stone circle(SC) _burial(BU) _trail(TR)
_depression(DE) _rock alignment(RA) _pictograph(PI) _water control(WC)

Description: ____

18. Structural Features: (describe and locate on site map) [III/28-IV/6]

CLASS	MATERIAL	QUANTITY	CLASS	MATERIAL	QUANTITY
Single rm	wood	1	Tower	____	____
Multiple rm	____	____	Cairn	____	____
Granary	____	____	Corral	____	____
Cist	____	____	Dugout	____	____
Pithouse	____	____	Kiln	____	____
Kiva	____	____	Monument	____	____

Description: The structure consists of a well made log cabin of round quaking aspen logs. Tje walks stand courses high in places. The cabin has a door to the NE and windows to the SE and NW. The roof was of logs with tar paper.

Site No. 42Cb210

19. Cultural Affiliation [IV/7-14]: EA How Determined? Informant
20. Site Dimensions : 20 m X 50 m; Area [IV/17-21]: 1000 sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used .
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; X No (Include location of test on site map)
Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat.Register Potential [V/1]: __Significant(C); X Non-Significant(D)
Justification: The site is fairly recent and in poor condition.

25. Research Potential:
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : E / 5 m
Type/Name of Water Source [V/11] : stream/Gordon Creek
Distance to Cultivatable Soil [V/12-14]. :
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
- _mountain spine(A)
- _hill/butte(B)
- _tableland/mesa(C)
- _ridge(D)
- _valley(E)
- _plain(F)
- X canyon(G)

POSITION ON LANDFORM
- _top/crest/ridge(A)
- _edge(B)
- _slope(C)
- X toe/foot/bottom(D)
- _saddle/pass(E)
- _bench/ledge(F)
- _rimrock(G)
- _interior(H)

DEPOSITIONAL ENVIRONMENT
- _fan(A)
- _talus(B)
- _dune(C)
- _stream terrace(D)
- _playa(E)
- snore feature
  - _extinct lake(F)
  - _extant lake(G)
- X alluvial plain(H)
- _colluvium(I)
- _moraine(J)
- _flood plain(K)
- _marsh(L)
- _landslide/slump(M)
- _delta(N)
- _island(O)
- _cliff(P)
- _outcrop(Q)
- _stream bed(R)

SECONDARY POSITION
- _top/crest/ridge(A)
- _edge(B)
- X slope(C)
- _toe/foot(D)
- _cutbank(E)
- _detached monolith(F)
- _interior(G)
- _step(H)
- _riser(I)
- _detached monolith(J)
- _spring mound/bog(K)
- _cave(M)
- _alcove/shelter(N)
- _patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 5° east
30. Vegetation COMMUNITY and association [V/24-25]

- _ALPINE GRASSLAND(AA)
- _SPRUCE FIR(BZ)
  - _rubbolis(BA)
  - _white fir-spruce(BB)
- X ASPEN DOUGLAS FIR(CZ)
  - _limber pine(CA)
  - _douglas fir(CB)
  - _lodgepole pine(CC)
  - _bristlecone pine(CD)
  - _aspen(CE)
  - _streamside(CF)
  - _meadow grassland(CG)
- _YELLOW PINE-OAK(DZ)
  - _ponderosa pine(DA)
  - _oakbrush(DB)
  - _mountain brush(DC)
  - _maple(DD)
  - _streamside(DE)
- _PLAINS/PRAIRIE(EZ)
  - _grasslands(EA)
  - _pinyon-juniper(EB)
  - _streamside(EC)
- _COLD DESERT SHRUB(FZ)
  - _sagebrush(FA)
  - _small sagebrush(FB)
  - _little rabbitbrush(FC)
  - _shadscale(FD)
  - _horsebrush(FE)
  - _winter-fat(FF)
  - _hop-sage/bikbrush(FG)
  - _bud sagebrush(FH)
  - _mat saltbrush(FI)
  - _gray molly(FJ)
  - _streamside(FK)
- _SALT DESERT SHRUB(GZ)
  - _greasewood(GA)
  - _ironwood-shadscal(GB)
  - _seepweed(GC)
  - _pickleweed/samphire(GD)
  - _saltgrass(GE)
  - _alkali sacaton(GF)
  - _rabbitbrush(GG)
- _WARM DESERT SHRUB(HZ)
  - _desert saltbrush(HA)
  - _creosote bush(HB)
  - _creosote/burrsage(HC)
  - _joshua tree(HD)
- _MARSH COMMUNITY(IA)
- _ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KZ)
- _CULTIVATED LAND(JZ)

(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas fir and aspen and the canyon bottom has grasses and willows and aspen.

31. Next nearest plant association/distance: streamside/5m
32. Photograph Numbers [V/26] : 4W-2:1,2
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members:
34. Sponsoring Agency: ARCO Coal Company Contract No.
35. Encoding Form: (all entries are right justified)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I	4	2	C	b				2	1	0		7	8	4	0	1	2	4	9	4	0	0	0	4	3	9	2	0	0	0	
II	N	W	N	W	S	E	1	9	1	3		S		8		E		P	R	6		D	A	H	T	O	T				A
III	A	A								A	A	A												N	T					C	B
IV							E	A							I				1	0	0	0	A	Z	C	D	E	R			
V	D	0	0	5		9	0	0	0	5		B	9	9	9	G	D	H	C		0	5		0	9	0	C	E	C		P	R
VI																															

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)

Site No. _____

19. Cultural Affiliation [IV/7-14]: EA How Determined? Informant
20. Site Dimensions : 20 m X 50 m; Area [IV/17-21]: ~~1000~~ sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used .
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; X No (Include location of test on site map)
Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat.Register Potential [V/1]: __Significant(C); X Non-Significant(D)
Justification: The site is fairly recent and in poor condition.

25. Research Potential: _____
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : E / 5 m
Type/Name of Water Source [V/11] : stream/Gordon Creek
Distance to Cultivatable Soil [V/12-14]. : _____
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
- _mountain spine(A)
- _hill/butte(B)
- _tableland/mesa(C)
- _ridge(D)
- _valley(E)
- _plain(F)
- X canyon(G)

POSITION ON LANDFORM
- _top/crest/ridge(A)
- _edge(B)
- _slope(C)
- X toe/foot/bottom(D)
- _saddle/pass(E)
- _bench/ledge(F)
- _rimrock(G)
- _interior(H)

DEPOSITIONAL ENVIRONMENT
- _fan(A)
- _talus(B)
- _dune(C)
- _stream terrace(D)
- _playa(E)
- shore feature
  - _extinct lake(F)
  - _extant lake(G)
- X alluvial plain(H)
- _colluvium(I)
- _moraine(J)
- _flood plain(K)
- _marsh(L)
- _landslide/slump(M)
- _delta(N)
- _island(O)
- _cliff(P)
- _outcrop(Q)
- _stream bed(R)

SECONDARY POSITION
- _top/crest/ridge(A)
- _edge(B)
- X slope(C)
- _toe/foot(D)
- _cutbank(E)
- _detached monolith(F)
- _interior(G)
- _step(H)
- _riser(I)
- _detached monolith(J)
- _spring mound/bog(K)
- _cave(M)
- _alcove/shelter(N)
- _patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 5° east
30. Vegetation COMMUNITY and association [V/24-25]

ALPINE GRASSLAND(AA)
- _FUCCE FIR(BZ)
- _krummholz(BA)
- _white fir-spruce(BB)
- X ASPEN DOUGLAS FIR(CC)
- _limber pine(CA)
- _douglas fir(CB)
- _lodgepole pine(CC)
- _bristlecone pine(CD)
- _aspen(CE)
- _streamside(CF)
- _meadow grassland(CG)

- _YELLOW PINE-OAK(DZ)
- _ponderosa pine(DA)
- _oakbrush(DB)
- _mountain brush(DC)
- _maple(DD)
- _streamside(DE)

- _PLAINS/PRAIRIE(EZ)
- _grasslands(EA)
- _pinyon-juniper(EB)
- _streamside(EC)

- _COLD DESERT SHRUB(FZ)
- _sagebrush(FA)
- _small sagebrush(FB)
- _little rabbitbrush(FC)
- _shadscale(FD)
- _horsebrush(FE)
- _winter-fat(FF)
- _hop-sage/blkbrsh(FG)
- _bud sagebrush(FH)
- _mat saltbrush(FI)
- _gray molly(FJ)
- _streamside(FK)

- _SALT DESERT SHRUB(GZ)
- _greasewood(GA)
- _greasewood-shadscal(GB)
- _seepweed(GC)
- _pickleweed/samphire(GD)
- _saltgrass(GE)
- _alkali sacaton(GF)
- _rabbitbrush(GG)

- _WARM DESERT SHRUB(HZ)
- _desert saltbrush(HA)
- _creosote bush(HB)
- _creosote/bursage(HC)
- _joshua tree(HD)
- _MARSH COMMUNITY(IA)

- _ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KZ)

- _CULTIVATED LAND(JZ)

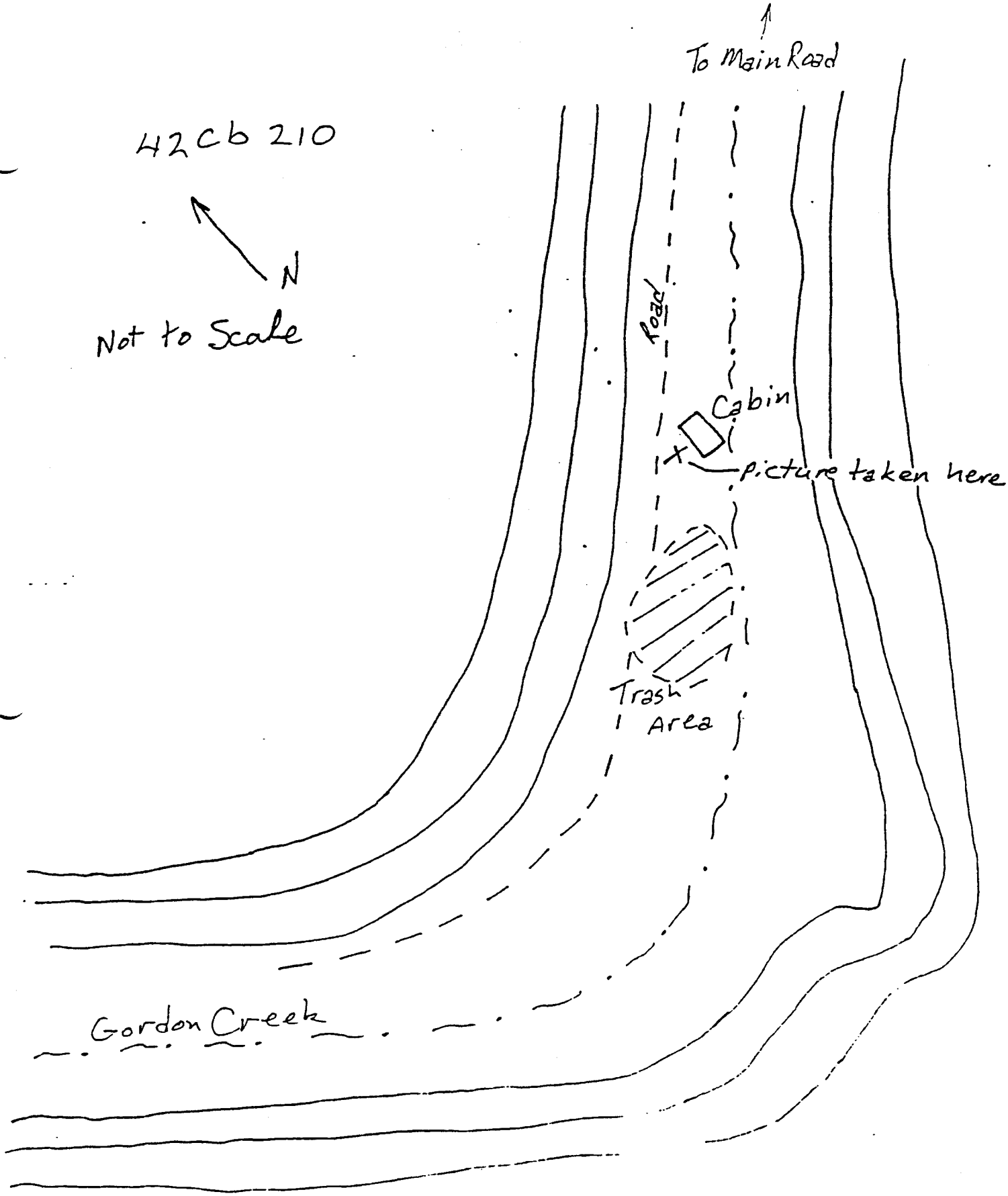
(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas fir and aspen and the canyon bottom has grasses and willows and aspen.

31. Next nearest plant association/distance: streamside/5m
32. Photograph Numbers [V/26] : 4W-2:1,2
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members: _____
34. Sponsoring Agency: ARCO Coal Company Contract No. _____
35. Encoding Form: (all entries are right justified)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I	4	2	C	b				2	1	0	7	8	4	0	1	2	4	9	4	0	0	0	4	3	9	2	0	0	0		
II	N	W	N	W	S	E	1	9	1	3	S		8		E	P	R	6	D	A	H	T	O	T						A	
III	A	A								A	A	A										N	T						C	B	
IV							E	A							I			1	0	0	0	A	Z	C	D	E	R				
V	D	0	0	5		9	0	0	0	5		B	9	9	9	G	D	H	C	0	5	0	9	0	C	E	C		P	R	
VI																															

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)


To Main Road
42Cb 210
N
Not to Scale
Road
Cabin
picture taken here
Trash Area
Gordon Creek

42Cb210 looking NE

SITE ANTIQUITIES SITE FORM
developed by cooperative agreement by:
Bureau of Land Management
Division of State History
University of Utah Archeological Center

1. Site No. [I/1-10] 42Cb211
2. County Carbon
3. Temp. No. 4W/3

4. Class: ___Prehistoric X Historic ___Paleontologic
5. Cultural Site Type (interpreted function): cabin
6. Paleontological Site Type: ___Invertebrate; ___Vertebrate; ___Flora
7. Elevation [I/11-15] 7760 ft.
8. UTM Grid: [I/16-30] zone 12; 194400 m E 4392400 m N
9. [II/1-16] NW¼ of SW¼ of NE¼ of Section 19 T. 13S, R. 8E
10. Map Reference: Scofield, Utah Series: 15' Date: 1923
11. Aerial Photo Data: ___
12. Site Location: The site is located on the West side of Gordon Creek approximately 3500 feet south of where the creek turns south from the road in Section 17.

13. Land Owner [II/17-18]: PR; BLM District/Forest [II/19]: ___
14. Site Name/Previous Designations: none
15. Description of Site: The site consists of a small one room cabin made of poorly fitted quaking aspen logs. The site is approximately 7m x 5m and faces to the NE. The roof was made of corrugated tin. No artifacts were found in or near the cabin.

16. Artifacts: Artifacts should be described/drawn on a continuation sheet and their locations plotted on the site map

CLASS	QUANTITY	CLASS	TYPE	QUANTITY
Debitage [II/30]		Ceramics [III/10-21]		
Bifaces [III/1-9]		Projectile Pnt [III/1-9]		
Scrapers [III/1-9]		Ground Stone [II/22-29]		
Utilized Flakes		Other [II/22-29]		

Description: ___

17. Non-Structural Features: (describe and locate on site map) [III/22-27]

_hearth/firepit(HE) _rubble mound(RM) _earthen mound(EM) _petroglyph(PE) _other(OT)
_midden(MD) _stone circle(SC) _burial(BU) _trail(TR)
_depression(DE) _rock alignment(RA) _pictograph(PI) _water control(WC)

Description: ___

18. Structural Features: (describe and locate on site map) [III/28-IV/6]

CLASS	MATERIAL	QUANTITY	CLASS	MATERIAL	QUANTITY
Single rm	wood		Tower		
Multiple rm			Cairn		
Granary			Corral		
Cist			Dugout		
Pithouse			Kiln		
Kiva			Monument		

Description: The structure consists of a one room log cabin made of relatively small quaking aspen logs. Upright posts are located at the four corners of the structure and one on each side of the doorway.

Site No. 42UB211

19. Cultural Affiliation [IV/7-14]: EA How Determined? Informant
20. Site Dimensions : 7 m X 5 m; Area [IV/17-21]: 35 sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used .
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; X No (Include location of test on site map)
Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat.Register Potential [V/1]: __Significant(C); X Non-Significant(D)
Justification: The site is fairly recent and is in poor condition.

25. Research Potential:
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : E / 5 m
Type/Name of Water Source [V/11] : stream-Gordon Creek
Distance to Cultivatable Soil [V/12-14] :
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
_mountain spine(A)
_hill/butte(B)
_tableland/mesa(C)
_ridge(D)
_valley(E)
_plain(F)
X canyon(G)

POSITION ON LANDFORM
_top/crest/ridge(A)
_edge(B)
_slope(C)
X toe/foot/bottom(D)
_saddle/pass(E)
_bench/ledge(F)
_rimrock(G)
_interior(H)

DEPOSITIONAL ENVIRONMENT
_fan(A)
_talus(B)
_dune(C)
_stream terrace(D)
_playa(E)
shore feature
_extinct lake(F)
_extant lake(G)
X alluvial plain(H)
_colluvium(I)
_moraine(J)
_flood plain(K)
_marsh(L)
_landslide/slump(M)
_delta(N)
_island(O)
_cliff(P)
_outcrop(Q)
_stream bed(R)

SECONDARY POSITION
_top/crest/ridge(A)
_edge(B)
X slope(C)
_toe/foot(D)
_cutbank(E)
_detached monolith(F)
_interior(G)
_step(H)
_riser(I)
_detached monolith(J)
_spring mound/bog(K)
_cave(L)
_alcove/shelter(M)
_patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 5°/E
30. Vegetation COMMUNITY and association [V/24-25]

_ALPINE GRASSLAND(AA)
_SPRUCE FIR(BZ)
_trembleb(BA)
_white fir-spruce(BB)
X ASPEN DOUGLAS FIR(CZ)
_limber pine(CA)
_douglas fir(CB)
_ledgepole pine(CC)
_bristlecone pine(CD)
_aspen(CE)
_streamside(CF)
_meadow grassland(CG)

_YELLOW PINE-OAK(DZ)
_ponderosa pine(DA)
_oakbrush(DB)
_mountain brush(DC)
_maple(DD)
_streamside(DE)

_PLAINS/PRAIRIE(EZ)
_grasslands(EA)
_pinyon-juniper(EB)
_streamside(EC)

_COLD DESERT SHRUB(FZ)
_sagebrush(FA)
_small sagebrush(FB)
_little rabbitbrush(FC)
_shadscale(FD)
_horsebrush(FE)
_winter-fat(FF)
_hop-sage/bikbrush(FG)
_bud sagebrush(FH)
_mat saltbrush(FI)
_gray molly(FJ)
_streamside(FK)

_SALT DESERT SHRUB(GZ)
_greasewood(GA)
_greasewood-shadscal(GB)
_seepweed(GC)
_pickleweed/samphire(GD)
_saltgrass(GE)
_alkali sacaton(GF)
_rabbitbrush(GG)

_WARM DESERT SHRUB(HZ)
_desert saltbrush(HA)
_creosote bush(HB)
_creosote/burrsage(HC)
_joshua tree(HD)
_MARSH COMMUNITY(IA)

_ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KZ)

_CULTIVATED LAND(JZ)

(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas Fir and Aspen and the Canyon bottom has grasses, willows, and aspen.

31. Next nearest plant association/distance: streamside/5m
32. Photograph Numbers [V/26] : 4W-2:3,4
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members:
34. Sponsoring Agency: Arco Coal Company Contract No.
35. Encoding Form: (all entries are right justified)

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31
I	4 2	C b		2 1	1	7 7	6 0	1 2	4 9	4 4	0 0	4 3	9 2	4 0	0	
II	N W	S W	N E	1 9	1 3	S	8	E	P R	6 D	A N	I				
III	A A	A A	A								N I			C B		
IV				E A				H		3 5	A Z	C D	E R			
V	D	0 0 5	0 9 0	0 0 5	B	9 9 9	G D H	C	0 5	0 9 0	C E	C	P R			
VI																

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)

Site No. 42Cb211

19. Cultural Affiliation [IV/7-14]: EA How Determined? Informant
20. Site Dimensions : 7 m X 5 m; Area [IV/17-21]: 35 sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used .
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; X No(Include location of test on site map)
Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat.Register Potential[V/1]: __Significant(C); X Non-Significant(D)
Justification: The site is fairly recent and is in poor condition.

25. Research Potential:
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : E / 5 m
Type/Name of Water Source [V/11] : stream-Gordon Creek
Distance to Cultivatable Soil [V/12-14] :
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
_mountain spine(A)
_hill/butte(B)
_tableland/mesa(C)
_ridge(D)
_valley(E)
_plain(F)
X canyon(G)

POSITION ON LANDFORM
_top/crest/ridge(A)
_edge(B)
_slope(C)
X toe/foot/bottom(D)
_saddle/pass(E)
_bench/ledge(F)
_rimrock(G)
_interior(H)

DEPOSITIONAL ENVIRONMENT
_fan(A)
_talus(B)
_dune(C)
_stream terrace(D)
_playa(E)
shore feature
_extinct lake(F)
_extant lake(G)
X alluvial plain(H)
_colluvium(I)
_moraine(J)
_flood plain(K)
_marsh(L)
_landslide/slump(M)
_delta(N)
_island(O)
_cliff(P)
_outcrop(Q)
_stream bed(R)

SECONDARY POSITION
_top/crest/ridge(A)
_edge(B)
X slope(C)
_toe/foot(D)
_cutbank(E)
_detached monolith(F)
_interior(G)
_step(H)
_riser(I)
_detached monolith(J)
_spring mound/bog(K)
_cave(L)
_alcove/shelter(M)
_patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 5°/E
30. Vegetation COMMUNITY and association [V/24-25]

ALPINE GRASSLAND(AA)
_SPRUCE FIR(SF)
_krummholz(BA)
_white fir-spruce(BB)
X ASPEN DOUGLAS FIR(CF)
_limber pine(CA)
_douglas fir(CB)
_lodgepole pine(CC)
_bristlecone pine(CD)
_aspen(CE)
_streamside(CD)
_meadow grassland(CE)

_YELLOW PINE-OAK(DE)
_ponderosa pine(DA)
_oakbrush(DB)
_mountain brush(DC)
_maple(DD)
_streamside(DE)

_PLAINS/PRAIRIE(EE)
_grasslands(EA)
_pinyon-juniper(EB)
_streamside(EC)

_COLD DESERT SHRUB(FE)
_sagebrush(FA)
_small sagebrush(FB)
_little rabbitbrush(FC)
_shadscale(FD)
_horsebrush(FE)
_winter-fat(FF)
_hop-sage/blkbrush(FG)
_bud sagebrush(FH)
_mat saltbrush(FI)
_gray molly(FJ)
_streamside(FK)

_SALT DESERT SHRUB(GE)
_greasewood(GA)
_grayood-shadscal(GB)
_seepweed(GC)
_pickleweed/samphire(GD)
_saltgrass(GE)
_alkali sacaton(GF)
_rabbitbrush(GG)

_WARM DESERT SHRUB(HE)
_desert saltbrush(HA)
_creosote bush(HB)
_creosote/bursage(HC)
_joshua tree(HD)
_MARSH COMMUNITY(IA)

_ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KE)

_CULTIVATED LAND(JE)

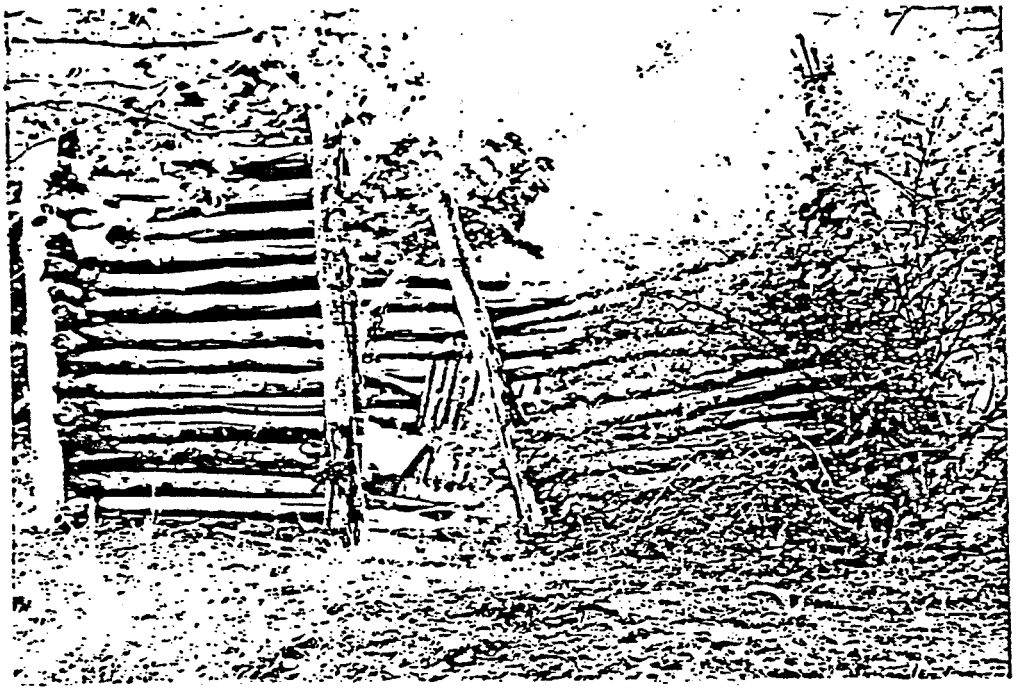
(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas Fir and Aspen and the Canyon bottom has grasses, willows, and aspen.

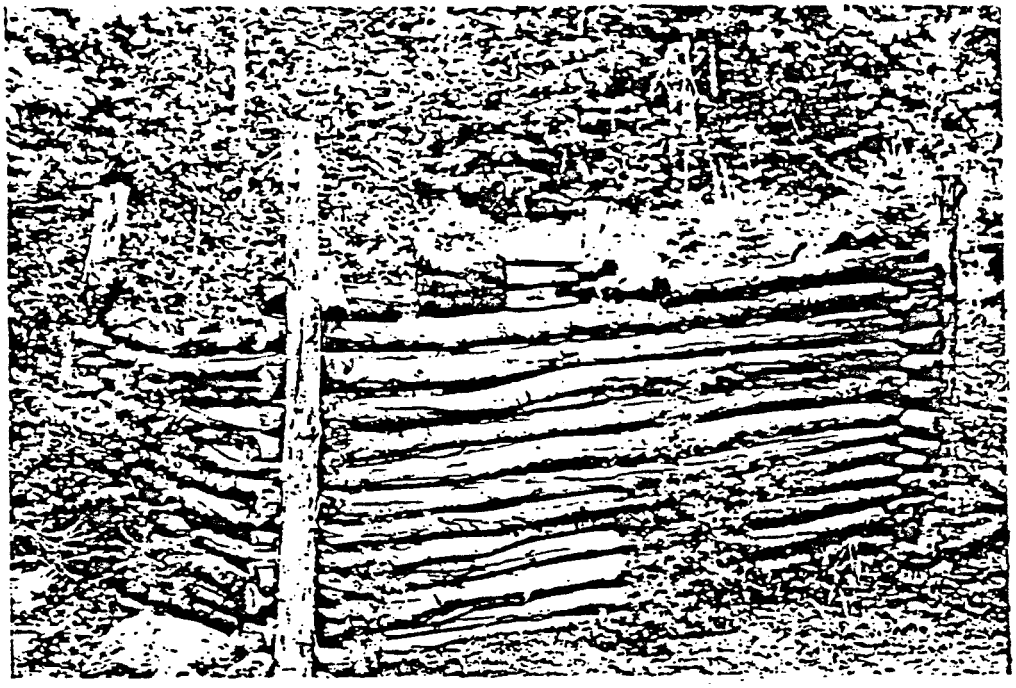
31. Next nearest plant association/distance: streamside/5m
32. Photograph Numbers [V/26] : 4W-2:3,4
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members:
34. Sponsoring Agency: Arco Coal Company Contract No.
35. Encoding Form: (all entries are right justified)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I	4	2	C	b				2	1	1		7	7	6	0	1	2	4	9	4	4	0	0	4	3	9	2	4	0	0	
II	N	W	S	W	N	E	1	9	1	3		S		8		E		P	R	6	D	A		N	I						
III		A	A		A	A	A																N	I					C	B	
IV								E	A						H						3	5	A	Z	C	D		E	R		
V	D	0	0	5	0	9	0	0	0	5	B	9	9	9	G	D	H	C	0	5	0	9	0	C	E	C	P	R			
VI																															

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)

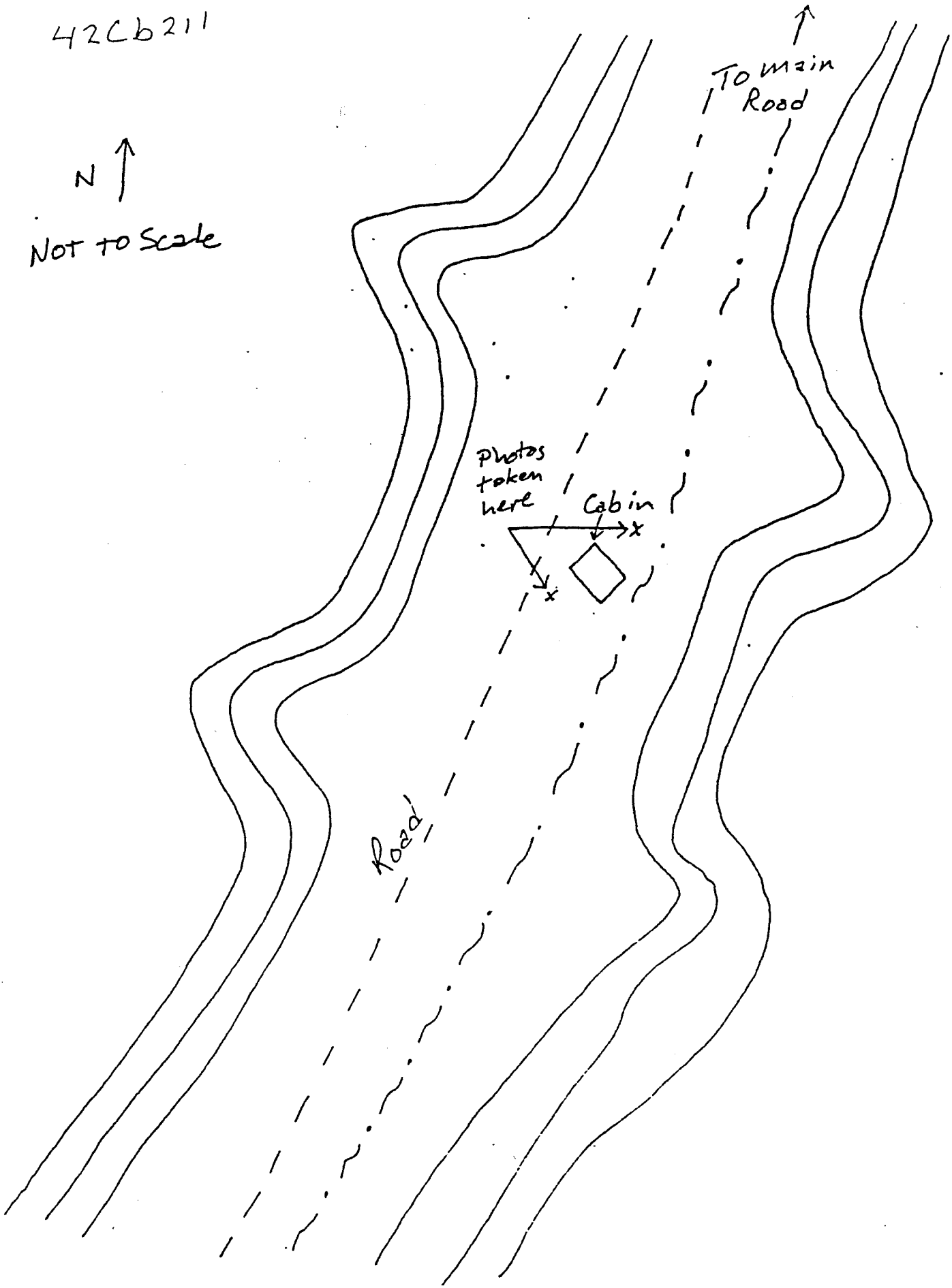


42Cb211 looking SW



42Cb211 looking NE

42Cb211



Developed by cooperative agreement by:
Bureau of Land Management
Division of State History
University of Utah Archeological Center

1. Site No. [I/1-10] 42Cb212
2. County Carbon
3. Temp. No. 4W/4

4. Class: ___Prehistoric X Historic ___Paleontologic
5. Cultural Site Type (interpreted function): habitations
6. Paleontological Site Type: ___Invertebrate; ___Vertebrate; ___Flora
7. Elevation [I/11-15] 7760 ft.
8. UTM Grid: [I/16-30] zone 12; 494500 m E 4392750 m N
9. [II/1-16] CT of NE¼ of NE¼ of Section 19 T. 13S, R. 8E
10. Map Reference: Scofield, Utah Series: 15' Date: 1923
11. Aerial Photo Data:
12. Site Location: The site is located on the west side of Gordon Creek approximately 2250 feet south of the main road through Section 17.

13. Land Owner [II/17-18]: PR; BLM District/Forest [II/19]:
14. Site Name/Previous Designations: none
15. Description of Site: The site consists of 4 or 5 collapsed log lean-to structures and areas of scattered historic garbage associated with them. Some of the structures had rock rock foundations. The site area extends over approximately 75 meters and appears to have been a habitation area for several domestic units. The site was probably innabited in the late 1920'2 - early 1930's.

16. Artifacts: Artifacts should be described/drawn on a continuation sheet and their locations plotted on the site map.

CLASS	QUANTITY	CLASS	TYPE	QUANTITY
Debitage [II/30]		Ceramics [III/10-21]	historic	25-100
Bifaces [III/1-9]		Projectile Pnt [III/1-9]		
Scrapers [III/1-9]		Ground Stone [II/22-29]		
Utilized Flakes		Other [II/22-29]	historic trash	

Description: historic ceramics, glass, metal fragments, nails, wire, an oven sole of a shoe

17. Non-Structural Features: (describe and locate on site map) [III/22-27]

_hearth/firepit(HZ) _rubble mound(RM) _earthen mound(EM) _petroglyph(PE) _other(OT)
_midden(MD) _stone circle(SC) _burial(BU) _trail(TR)
_depression(DE) _rock alignment(RA) _pictograph(PI) _water control(WC)

Description:

18. Structural Features: (describe and locate on site map) [III/28-IV/6]

CLASS	MATERIAL	QUANTITY	CLASS	MATERIAL	QUANTITY
Single rm	wood	4 or 5	Tower		
Multiple rm			Cairn		
Granary			Corral		
Cist			Dugout		
Pithouse			Kiln		
Kiva			Monument		

Description: 4 or 5 simple lean-to like structures made of small quaking aspen logs. All were poorly constructed. Only one is left standing.

19. Cultural Affiliation [IV/7-14]: ___ Now Determined: Anasazi
20. Site Dimensions : 75 m x 30 m; Area [IV/17-21]: 2250 sq m
21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used.
22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; __No (Include location of test on site map)
23. Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion
24. Nat. Register Potential [V/1]: __Significant (C); X Non-Significant (D)
Justification: The site is fairly recent and is in poor condition.

25. Research Potential: ___
26. Recommended Mitigation: avoidance
27. Direction/Distance to Water [V/5-10] : E / 20 m
Type/Name of Water Source [V/11] : stream/Gordon Creek
Distance to Cultivatable Soil [V/12-14] : unknown
28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
- _mountain spine(A)
- _hill/butte(B)
- _tableland/mesa(C)
- _ridge(D)
- _valley(E)
- _plain(F)
- X canyon(G)

POSITION ON LANDFORM
- _top/crest/ridge(A)
- _edge(B)
- _slope(C)
- X toe/foot/bottom(D)
- _saddle/pass(E)
- _bench/ledge(F)
- _rimrock(G)
- _interior(H)

DEPOSITIONAL ENVIRONMENT
- _fan(A)
- _talus(B)
- _dune(C)
- _stream terrace(D)
- _playa(E)
- _shore feature
- _extinct lake(F)
- _extant lake(G)
- X alluvial plain(H)
- _colluvium(I)
- _moraine(J)
- _flood plain(K)
- _marsh(L)
- _landslide/slump(M)
- _delta(N)
- _island(O)
- _cliff(P)
- _outcrop(Q)
- _stream bed(R)

SECONDARY POSITION
- _top/crest/ridge(A)
- _edge(B)
- X slope(C)
- _toe/foot(D)
- _cutbank(E)
- _detached monolith(F)
- _interior(G)
- _step(H)
- _riser(I)
- _detached monolith(J)
- _spring mound/bog(K)
- _cave(L)
- _alcove/shelter(M)
- _patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 80 East
30. Vegetation COMMUNITY and association [V/24-25]

- _ALPINE GRASSLAND(AA)
- _SPRUCE FIR(BC)
- _cumbania(BA)
- _white fir-spruce(BB)
- X ASPEN DOUGLAS FIR(CC)
- _limber pine(CA)
- _douglas fir(CB)
- _ponderosa pine(CC)
- _bristlecone pine(CD)
- _aspen(CE)
- _streamside(CD)
- _meadow grassland(CE)
- _YELLOW PINE-OAK(DE)
- _ponderosa pine(DA)
- _oakbrush(DB)
- _mountain brush(DC)
- _maple(DD)
- _streamside(DE)
- _PLAINS/PRAIRIE(EE)
- _grassland&(EA)
- _canyon-juniper(EB)
- _streamside(EC)
- _COLD DESERT SHRUB(FE)
- _sagebrush(FA)
- _small sagebrush(FB)
- _little rabbitbrush(FC)
- _shadscale(FD)
- _horsebrush(FE)
- _winter-fat(FF)
- _hop-sage/blkbrush(FG)
- _bud sagebrush(FH)
- _mat saltbrush(FI)
- _gray molly(FJ)
- _streamside(FK)
- _SALT DESERT SHRUB(GE)
- _greasewood(GA)
- _greasewood-shadscale(GB)
- _seepweed(GC)
- _pickleweed/samphire(GD)
- _saltgrass(GE)
- _alkali sacaton(GF)
- _rabbitbrush(GG)
- _WARM DESERT SHRUB(HE)
- _desert saltbrush(HA)
- _creosote bush(HB)
- _creosote/bursage(HC)
- _joshua tree(HD)
- _MARSH COMMUNITY(IA)
- _ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(KE)
- _CULTIVATED LAND(JE)

(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas Fir and Aspen and the canyon bottom has grasses, willows and cottonwoods.

31. Next nearest plant association/distance: streamside/20 m
32. Photograph Numbers [V/26] : 4W-2; 5,6,7,8
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members: ___
34. Sponsoring Agency: ARCO Coal Company Contract No. ___
35. Encoding Form: (all entries are right justified)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I	4	2	C	b				2	1	2		7	7	6	0	1	2	4	9	4	5	0	0	4	3	9	2	7	5	0	
II	C	T	N	E	N	E	1	9	1	3		S		8			E	P	R	6	D	A	H	T							
III	A	A									D	H	Z																	B	C
IV							E	A							H			2	2	5	0	A	Z	C	D	E	R				
V	D	0	2	0	0	9	0	0	2	0	B	9	9	9	G	D	H	C	0	8	0	9	0	C	E	C	P	R			
VI																															

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)

19. Cultural Affiliation: _____

20. Site Dimensions : 75 m X 30 m; Area [IV/17-21]: _____

21. Were surface artifacts collected? __Yes; X No; [IV/22] If yes, attach a continuation sheet describing sampling method used.

22. Estimated depth of fill [IV/23] : unknown
Subsurface test? __Yes; __No (Include location of test on site map)

23. Site Condition [IV/25] : __Excellent; __Good; __Fair; X Poor
Agent of Impact: erosion

24. Nat.Register Potential [V/1]: __Significant(C); X Non-Significant(D)
Justification: The site is fairly recent and is in poor condition.

25. Research Potential: _____

26. Recommended Mitigation: avoidance

27. Direction/Distance to Water [V/5-10] : E / 20 m
Type/Name of Water Source [V/11] : stream/Gordon Creek
Distance to Cultivatable Soil [V/12-14] : unknown

28. Topographic Location (check one under each heading) [V/15-18]

PRIMARY LANDFORM
- _mountain spine(A)
- _hill/butte(B)
- _table land/mesa(C)
- _ridge(D)
- _valley(E)
- _plain(F)
- X canyon(G)

POSITION ON LANDFORM
- _top/crest/ridge(A)
- _edge(B)
- _slope(C)
- X toe/foot/bottom(D)
- _saddle/pass(E)
- _bench/ledge(F)
- _rimrock(G)
- _interior(H)

DEPOSITIONAL ENVIRONMENT
- _fan(A)
- _talus(B)
- _dune(C)
- _stream terrace(D)
- _playa(E)
- shore feature
  - _extinct lake(F)
  - _extant lake(G)
- X alluvial plain(H)
- _colluvium(I)
- _moraine(J)
- _flood plain(K)
- _marsh(L)
- _landslide/slump(M)
- _delta(N)
- _island(O)
- _cliff(P)
- _outcrop(Q)
- _stream bed(R)

SECONDARY POSITION
- _top/crest/ridge(A)
- _edge(B)
- X slope(C)
- _toe/foot(D)
- _cutbank(E)
- _detached monolith(F)
- _interior(G)
- _step(H)
- _riser(I)
- _detached monolith(J)
- _spring mound/bog(K)
- _cave(M)
- _alcove/shelter(N)
- _patterned ground(O)

29. Degree/Aspect of slope [V/19-23] : 80° East

30. Vegetation COMMUNITY and association [V/24-25]

- _ALPINE GRASSLAND(AA)
- _SPRUCE FIR(BC)
- _krummholz(BA)
- _white fir-spruce(BB)
- X ASPEN DOUGLAS FIR(CC)
- _limber pine(CA)
- _douglas fir(CB)
- _lodgepole pine(CC)
- _bristlecone pine(CD)
- _aspen(CE)
- _streamside(CF)
- _meadow grassland(CG)
- _YELLOW PINE-OAK(DE)
- _ponderosa pine(DA)
- _sagebrush(DB)
- _mountain brush(DC)
- _maple(DD)
- _streamside(DE)
- _PLAINS/PRAIRIE(EE)
- _grassland&(EA)
- _pinyon-juniper(EB)
- _streamside(EC)
- _COLD DESERT SHRUB(FZ)
- _sagebrush(FA)
- _small sagebrush(FB)
- _little rabbitbrush(FC)
- _shadscale(FD)
- _horsebrush(FE)
- _winter-fat(FF)
- _hopsage/bitbrush(FG)
- _bud sagebrush(FH)
- _mat saltbrush(FI)
- _gray molly(FJ)
- _streamside(FK)
- _SALT DESERT SHRUB(GZ)
- _greasewood(GA)
- _greasewood-shadscale(GB)
- _seepweed(GC)
- _pickleweed/samphire(GD)
- _saltgrass(GE)
- _alkali sacaton(GF)
- _rabbitbrush(GG)
- _WARM DESERT SHRUB(HZ)
- _desert saltbrush(HA)
- _creosote bush(HB)
- _creosote/burrage(HC)
- _joshua tree(HD)
- _MARSH COMMUNITY(LA)
- _ALKALI FLATS/MUD FLATS/DRY LAKE/ WASTELAND(EZ)
- _CULTIVATED LAND(JZ)

(Check COMMUNITY only if association cannot be determined)

Description: The slopes of the canyon are covered with Douglas Fir and Aspen and the canyon bottom has grasses, willows and cottonwoods.

31. Next nearest plant association/distance: streamside/20 m

32. Photograph Numbers [V/26] : 4W-2: 5,6,7,8

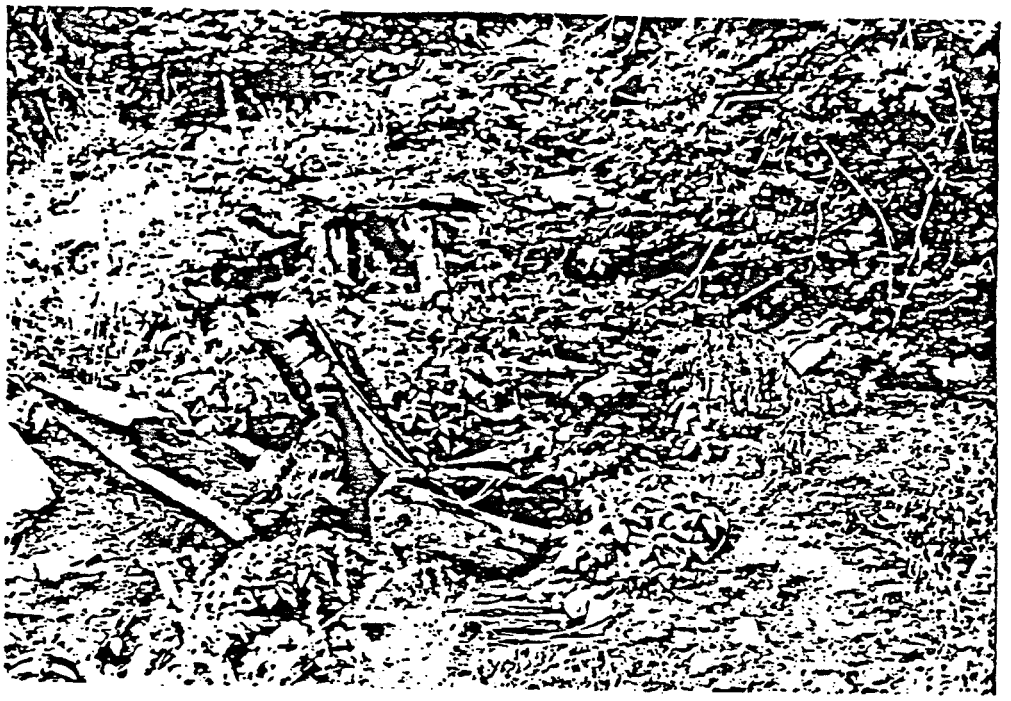
33. Recorded by: Wayne Howell Survey Org. [V/27-28]: UTARC Date: 7/25/80
Assisting Crew Members: _____

34. Sponsoring Agency: ARCO Coal Company Contract No. _____

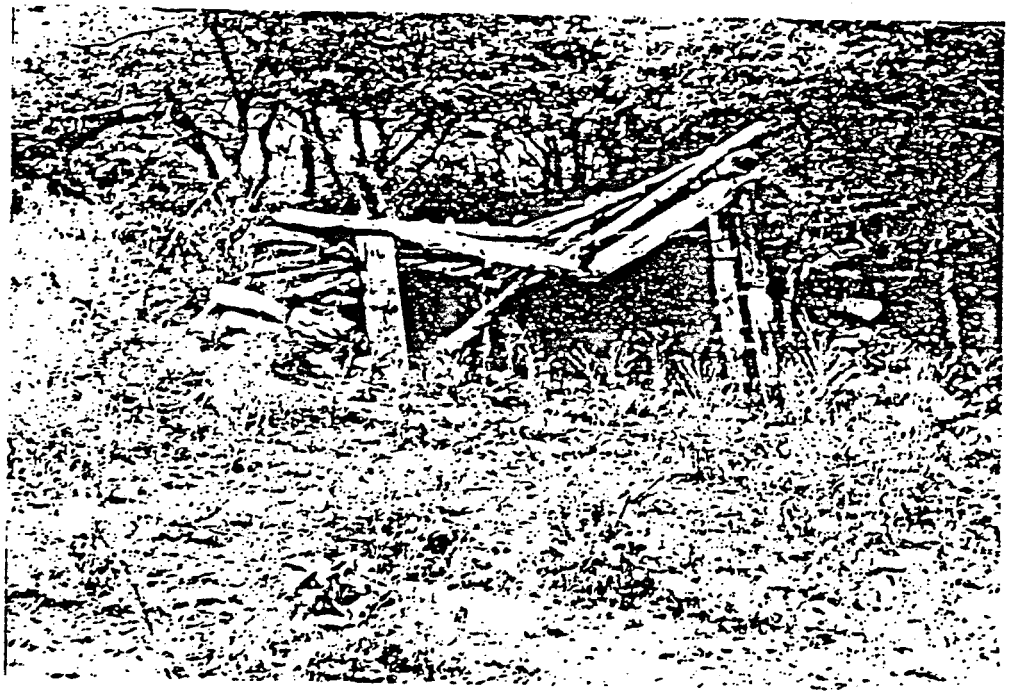
35. Encoding Form: (all entries are right justified)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I	4	2	C	b				2	1	2		7	7	6	0	1	2	4	9	4	5	0	0	4	3	9	2	7	5	0	
II	C	T	N	E	N	E	1	9	1	3		S		8			E	P	R	6	D	A	H	T							
III	A	A									D	H	Z																	B	C
IV							E	A							H			2	2	5	0	A	Z	C	D	E	R				
V	D	0	2	0	0	9	0	0	2	0	B	9	9	9	G	D	H	C	0	8	0	9	0	C	E	C	P	R			
VI																															

Form must be accompanied by a site map; photocopy of U.S.G.S. topo map with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable)



42Cb212 looking W
Component 1

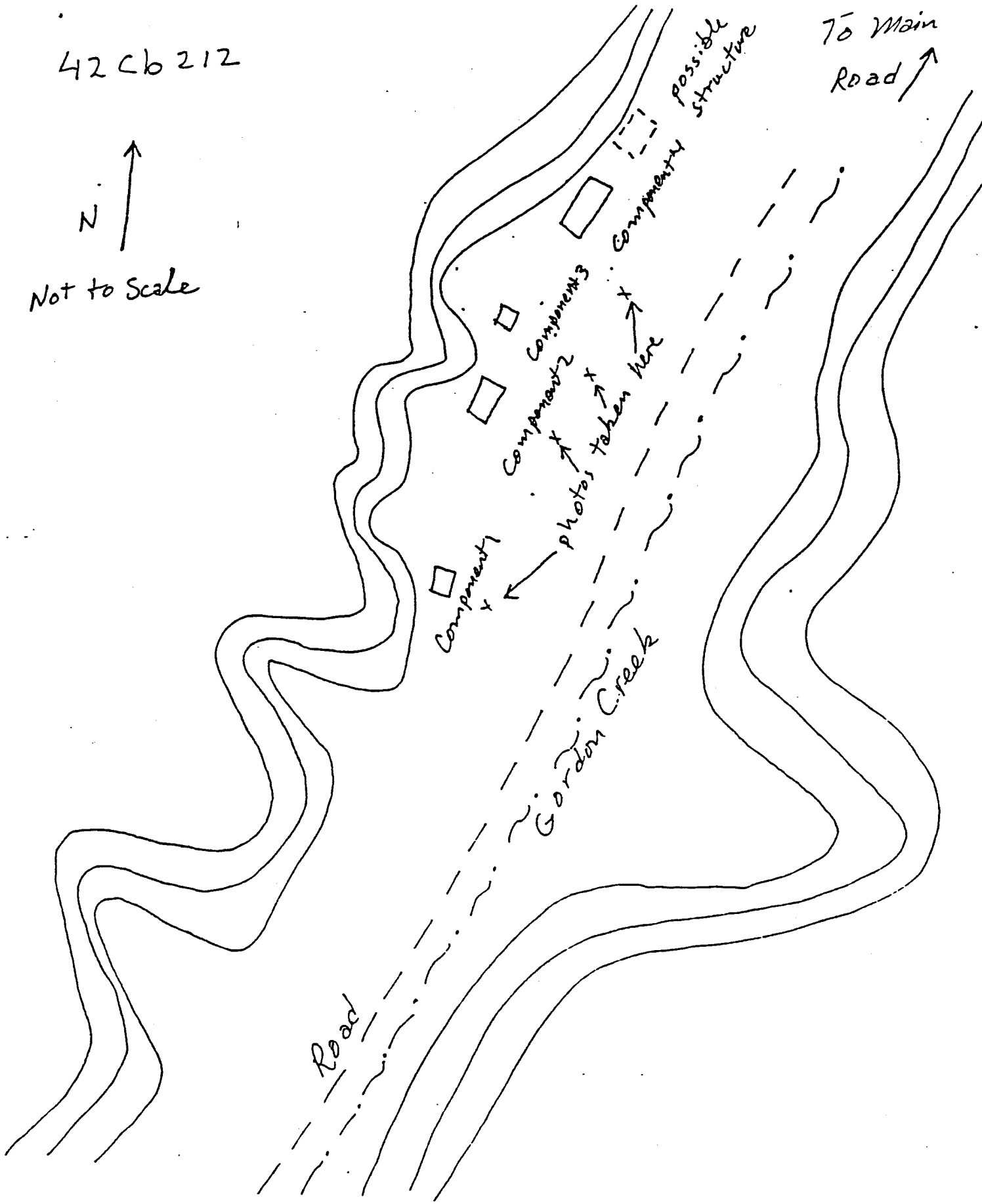


42Cb212 looking W
Component 2

42Cb212 looking W
Component 3

42Cb212 looking W
Component 4

42 Cb 212


N
Not to Scale
To Main Road
possible structure
Component 4
Component 3
Component 2
Component 1
photos taken here
Gordon Creek
Road

APPENDIX 3A

DRILL HOLE LOGS

REGISTERED PROFESSIONAL ENGINEER
5/21/92
No. 7102
RICHARD B. WHITE
STATE OF UTAH

Richard B. White

The information contained in this appendix is true and correct to the best of my knowledge. RBW

UNIAXIAL COMPRESSION DATA

TABLE I

MINING RESEARCH DEPARTMENT
GEOMECHANICS LAB REPORT
UNIAXIAL STRENGTH TEST RESULTS
PROJECT: 'BEAVER CREEK'

SAMPLE ID	DEPTH INTERVAL FEET		DIAM. IN.	LENG. IN.	DESCRIPTION	COMPRESSIVE STRENGTH PSI	YOUNGS MODULUS PSI X 1000000
GCD-10	83.00	84.30	1.85	3.86	SHALE	14327	1.3994
GCD-11	76.20	76.00	1.84	3.74	SHALY SANDSTONE	8448	2.9047
GCD-13	20.00	20.50	1.86	3.64	SHALY SANDSTONE	16394	2.4763
GCD-13	29.70	30.20	1.86	3.75	SHALY SANDSTONE STAINED WITH RED OXIDE	N/A	5.0163
GCD-13	35.80	36.30	1.85	3.75	SHALY SANDSTONE	15977	2.3718
GCD-13A	26.40	27.60	1.85	3.67	SHALE	7772	1.1169
GCD-13B	26.40	27.60	1.85	3.71	SHALE	16631	1.753
GCD-4	364.03	366.00	2.39	5.23	ROOF ROCK, SANDSTONE INTERBEDDED W/SHALE (5131)	5138	1.1977
GCD-4	366.03	368.00	2.48	4.71	ROOF ROCK, SANDSTONE INTERBEDDED W/SHALE (5131)	5860	1.0731
GCD-4	369.03	370.00	2.41	4.91	ROOF ROCK, SANDSTONE INTERBEDDED W/SHALE (5131)	10606	1.9143
GCD-4	381.00	382.00	2.40	4.93	FLOOR ROCK, SHALE (2781)	10616	1.7817
GCD-7	122.00	122.50	1.85	3.80	SANDSTONE INTERBEDDED WITH SHALE	11247	1.4076
GCD-7	124.40	125.10	1.86	3.74	SANDSTONE INTERBEDDED WITH SHALE	7795	1.2613

FACTOR OF SAFETY

CALCULATIONS

No. 22 Section

Roof Rock Strength Calculations

Criteria: Coal

H = Coal Height = 8.5'

A = Minimum Pillar (C-C) = 40'

L = Entry Width or X-cut Width = 20' = 240"

E_p = Young's Modulus = 0.5×10^6

Regular Pattern

Rock

Fine-Grained Sandy Shale

q = Uniform Load on Beam = 4.2 psi,

where: $q = \gamma d$; γ = density = 100 lbs/ft.^{3}

d = Depth of Beam = 6' (Roof Bolted to 6')

E_s = Young's Modulus = 1.5×10^6

v = Poisson Ratio = 0.2

C = Axial Compressive Strength = 10,900 psi

S = Stress from Overburden -

1.1 psi x depth = 1.1 x 550' = 605 psi

NOTE: Stress and Safety Factor calculated for intersections.

* Calculations:

1. M_N = Maximum Negative Moment =

   $-1/12\ q\ L^2 = 1/12 \times 4.2 \times 240^2 = -20{,}160$ in. lb./in. (Used; Maximum)

   M_r = Maximum Positive Moment =

   $1/24\ q\ L^2 = 1/24 \times 4.2 \times 240^2 = 10{,}080$ in. lb./in. (Not Used)

2. C = Pillar Factor =

$$\frac{3}{4}\ (1 - v^2)\ \frac{E_p}{E_s}\ \frac{A^4}{Hd^3}$$

$$= \frac{3}{4}\ (1 - .2^2)\ \frac{0.5}{1.5}\ \frac{(40 \times 12)^4}{(8.5 \times 12)(6 \times 12)^3} = 334.64$$

*3. Factor I = 1 for Negative Moment, Regular Pattern. (From Fig. 13-70)

4. $\frac{L}{A} = \frac{\text{Room Span}}{\text{Pillar Span}} = \frac{20}{40} = 0.5$

   * Factor II = 1 for Negative Moment, Regular Pattern (From Fig. 13-71)

5. $\frac{\text{x-cut Span}}{\text{Room Span}} = \frac{20}{20} = 1$

   * Factor III = 1 (From Fig. 13-72)

6. σ = Maximum Beam Stress = $\frac{\pm\ 6M_N}{d^2}$

$$= \frac{\pm\ 6(-20{,}160)}{(6 \times 12)^2} = \pm\ 23.3 \text{ psi}$$

7. F.S. = Factor of Safety = $\frac{\text{Compressive Strength}}{\text{Total Stress}}$

$$F.S. = \frac{C}{S + \sigma} = \frac{10{,}900}{605 + 23.3} = \underline{\underline{17.36}}$$

*Taken from: "S.M.E. Mining Engineering Handbook," Volume 1, Sec. 13.7.5 (p. 13-87 to 13-89)

CALCULATIONS

Cp = Pillar Strength

C = Compressive Strength of 1 to 1 Width to Height Coal Sample

W = Width of Pillar

H = Height of Pillar

R = Recovery Factor

A_1 = Area of Entry

A_2 = Total Area

S = Vertical Stress

F.S. = Factor of Safety

PILLAR STRENGTH

$$Cp = C \left[.778 + .222 \left(\frac{W}{H}\right)\right]$$

$$Cp = 3200 \left[.778 + .222 \left(20/8.5\right)\right]$$

$$Cp = 4161 \text{ psi}$$

RECOVERY FACTOR

$$R = \frac{A_1}{A_2} \qquad R = 1800/2800 \qquad R = .64$$

VERTICAL STRESS

$$S = 1.11 \text{ (overburden)} \qquad S = 1.11(550) = 610 \text{ psi}$$

SAFETY FACTOR

$$F.S = C_p (1-R)/S$$

$$= 4161(1-.64)/610$$

$$= 2.4$$

MINE BENCH CONSTRUCTION
ROAD EMBANKMENT
and
SEDIMENTATION POND

Static Safety Factors

Mine Bench Construction (See Section 3.3.1.2)

The mine bench construction will be accomplished using cut-and-fill methods with conventional heavy equipment. The design of the excavation and access road, balances cut-and-fill so that no waste rock disposal is required.

A thorough investigation of geologic conditions and rock properties present at the proposed exploration site was performed. Rock compressive strengths were determined using point load testing (Table 1). Table 1a lists the major and minor jointing trends in the area. Figure 1 shows a lithologic section with descriptions and highwall design. This cross section was compiled as a composit from geologic logs of drill holes.

Based on an analysis of jointing and of rotational shear, a highwall slope of 1V:.33H (72 degree dip) will be used. Highwall faces at the site dip to the north, northeast, east, southeast, south, and southwest. The highwall face must be of less slope than the jointing present in order to avoid planar or wedge slope failure. The shallowest dipping joints of concern strike N50 W and dip 75 degrees SW. The proposed highwall angle of 72 degrees will eliminate the possibility of planar or wedge type failure.

A rotational shear analysis using the Hoek method was performed. Compressive strengths in Table 1 range from 20,600 PSI for a light sandstone, to 290 PSI for dark soft shale. Based on the relative proportions of rock units, a conservative average value of 5000 PSI was used.

Figure 1

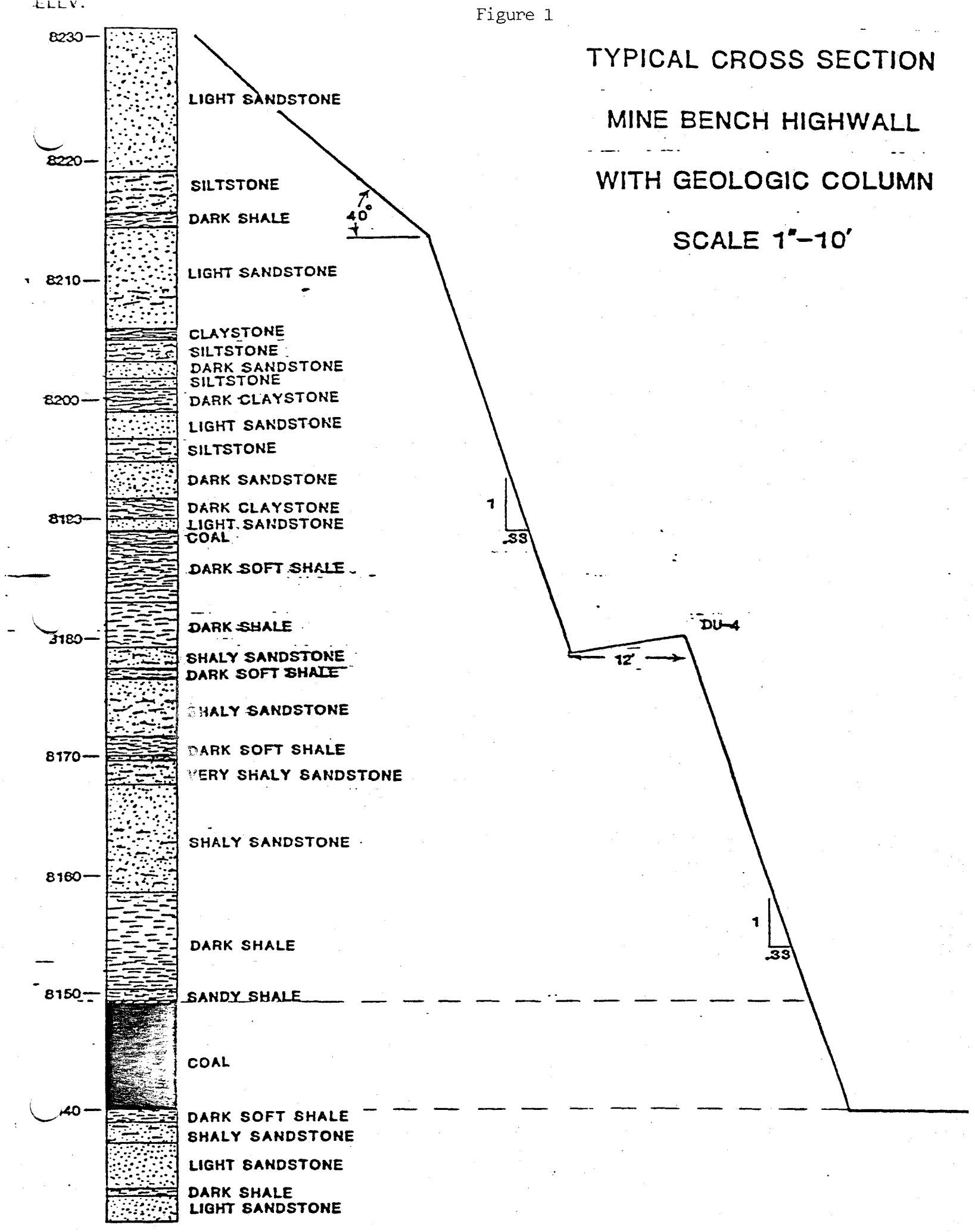

TYPICAL CROSS SECTION
MINE BENCH HIGHWALL
WITH GEOLOGIC COLUMN
SCALE 1"-10'
8230
8220
8210
8200
8180
8170
8160
8150
LIGHT SANDSTONE
SILTSTONE
DARK SHALE
LIGHT SANDSTONE
CLAYSTONE
SILTSTONE
DARK SANDSTONE
SILTSTONE
DARK CLAYSTONE
LIGHT SANDSTONE
SILTSTONE
DARK SANDSTONE
DARK CLAYSTONE
LIGHT SANDSTONE
COAL
DARK SOFT SHALE
DARK SHALE
SHALY SANDSTONE
DARK SOFT SHALE
SHALY SANDSTONE
DARK SOFT SHALE
VERY SHALY SANDSTONE
SHALY SANDSTONE
DARK SHALE
SANDY SHALE
COAL
DARK SOFT SHALE
SHALY SANDSTONE
LIGHT SANDSTONE
DARK SHALE
LIGHT SANDSTONE
40°
1
.33
12'
DU-4
1
.33

Table 1

Point Load Compressive Strengths - Rock Units at Portal Site in psi

Light Sandstone	Shaley Sandstone	Siltstone	Sandy Shale	Dark Shale	Dark Soft Shale	Coal
14,000	6400	5300	6330	930	290	1200
15,700	3500	5400		2300		1700
20,600	6900	8200		970		1500
6,400	13200	9600		3600		1200
9,500	11100	11000		860		1500
7,300	8220 avg.	15700		1000		1700
6,000		15400		400		1200
11,100		3400		5800		700
9,700		10700		1900		1500
3,000		10700		6700		1350 avg
10,700		9540 avg.		3300		
10,200				9000		
10,350 avg.				6500		
				3300		
				1800		
				2100		
				3150 avg.		

Table 1a

JOINT MEASUREMENTS

	Strike	Dip	Spacing
Top of Road/ Mine Bench	N-S	70°W	Major Joints 3-5'
	N50°W	75°SW	Major Joints 5'
First Bend	N-S	80°W	
	N60°W	80°SW	
	N-15E	80SW	Closely Spaced
Second Bend	N-S	80W	5'+
	N60°W	75SW	5+
Bottom of Road	N10E	80E	5'-10'
	N80E	V	3'+

Intact rock shear strength or cohesion can be related to compressive strength by:

$$C_i = \frac{Co}{2} \tan \left(45 - \frac{0'}{2}\right)$$

C_i = intact rock shear strength or cohesion

C_o = intact rock compressive strength

$0'$ = internal friction angle.

Using a typical internal friction angle of 45 degrees for Wasatch Plateau sandstones, siltstones, and claystones, and 5000 PSI for compressive strength, an intact rock shear strength or cohesion of approximately 1000 PSI was calculated.

The relationship of fracture intensity and cohesion has been developed by Stimpson and Ross-Brown ("Estimating the Cohesive Strength of Randomly Jointed Rock Masses". Mining Engineering, Vol. 31, No. 2, pp. 182-188.). Using a conservative figure of 4 joints per meter yields a .065 factor relating C_i and C_m (rock mass cohesion). With a 1000 psi intact rock mass cohesion calculates at 65 psi.

An accepted value (slightly conservative) for rock mass sliding friction angle in western sedimentary deposits of 31 degrees was used in the analysis. Also, a typical value of 155 lbs./cu. ft. for rock mass bulk density was used.

In summary, the following parameters were used with the Hoek slope chart (Hoek, E., and J.W. Bray, 1981, Rock Slope Engineering, Revised Third Edition, IMM, London).

Maximum Slope Height = 100'
Slope Angle = 72 degrees
Rock Mass Cohesion = 65 psi
Rock Mass Friction Angle = 31 degrees
Rock Mass Bulk Density = 155 lb./cu. ft

Results show that the 72 degree angle highwall has a static safety factor of 2.94 for dry conditions, and 2.62 for saturated conditions. This is well within the 1.3 safety factor guidline. From a rotational shear standpoint, highwall angles approaching 90 degrees for dry, and 85 degrees for saturated would be acceptable while still maintaining a safety factor of 1.3.

The mine bench embankment will be constructed primarily at a slope of 1V:1.5H, except that a 1V:1.35H slope will be used if the fill material has a minimum of 85 percent rock. The fill will be placed in maximum 36 inch thick lifts, and shall be distributed and mechanically compacted. Compaction will be maintained at 95% of original as determined by a Modified Proctor Analysis ASTM D-1557, AASHO T-180.

The final bench configuration will provide drainage to the disturbed drainage ditch D-1.

Access Road (See Section 3.2.10)

The access road will be designed as an primary road. The road will be maintained at 20 ft. wide. The actual distance may vary slightly due to road drainage maintenance and grading. The road to the mine openings will be 20 ft. and allow sufficient distance for placement of the conveyor belt along the edge of the road. The road will not exceed a 6% vertical grade.

The access road highwalls are designed using two criteria for stability - jointing and rotational shear. The highwall face angle must be less than the jointing present to avoid slippage along the joint planes. Refering to Table 1a, the minimum join dip present along the road from the first bend to the bottom is 75 degrees. The proposed highwall angles of 71.5 degrees (1v:.33H) and 40 degrees (1v:1.2H) eliminate the possibility of failure due to slipping.

The rotational shear analysis for highwall stability with a cut slope of 1v:.33H has been performed in the previous section. The majority of the access road highwall will be cut at the lesser 40 degree slope to better match the topography and allow for removal of loose soil material.

The Hoek method was used in performing the rotational shear analysis. Based on the relative proportion of rock units along the access road highwall (15% shale, 38% sandstone, 38% shaley sandstone, and 9% misc.,) a conservative average compressive strength of 5000 psi will be used. See Table 1. As before for the mine bench highwall, using a conservative joint spacing of 4 joints per meter, the rock mass cohesion calculates out at 65 psi. A rock mass sliding friction angle of 31 degrees and a bulk density of 155 lb./cu. ft. were also used (See preceding section for Mine Bench Construction).

Summarizing the parameters for input:

Maximum Slope Ht.	= 100′
Slope Angle	= 40 degrees
Rock Mass Cohesion	= 65 psi
Rock Mass Sliding Friction Angle	= 31 degrees
Rock Mass Bulk Density	= 155 lb./cu.ft.

Using the circular failure charts (Figures 1a and 1b) results in a safety factor of 4.01 for saturated ground conditions.

When a road embankment is placed on slopes exceeding 1V:3H, the existing ground will be plowed or stepped. Embankment material will be placed in maximum 36 inch lifts, and shall be compacted as described for the mine bench. The embankment slope will not exceed 1V:1.5H unless the material contains a minimum of 85% rock, in which case the embankment slope may be increased to 1V:1.35H.

A rotational shear analysis using the Hoek method was performed to determine embankment stability. The maximum embankment height approaches 50′ along the lower portion of the access road. Typical values for cohesion in the expected fill material consisting of excavation sandstones and shale, along with a minor proportion of clayey soils, is 3.5 psi. A conservative 30 degree friction angle for this material will also be used. Compaction tests of the materials that will be used for fill indicate a range of density values from 100 lb./cu.ft. to 130 lb./cu.ft. An average 115 lb./cu.ft. bulk density will be used.

Summarizing the parameters for input:

H =	Embankment Height	=	50′	
	Slope angle (1V:1.6H)	=	32	degrees
c =	Soil Cohesion	=	3.5	psi
ϕ =	Friction Angle	=	30	degrees
Y =	Rock Mass Bulk Density	=	115	lb./cu.ft.
F =	Static Safety Factor	=	1.92	Dry
		=	1.37	Saturated

Using the Circular Failure Charts (Figure 1a & 1b) Results indicate a safety factor of 1.92 for dry conditions and 1.37 for saturated conditions. This meets the acceptable safety factor requirement. A monitoring program and proposed mitigation measures to detect excessive movement along the access road highwall, along with proposed mitigation measures, is described in detail under the Geologic Hazards Section, 3.4.8.3.

The road surface shall be sloped outward toward the disturbed drainage ditches. This will direct any sediment towards the sedimentation pond.

The road cuts will be revegetated with a temporary seed mix. Listed in Section 3.

<u>Sedimentation Pond</u> (See Section 7.2.3.2)

Static Embankment Safety Factor:

H =	Embankment Height	=	11′	
	Slope Angle (1V:2H)	=	26.56	degrees
c =	Soil Cohesion	=	3.5	psi
0 =	Friction Angle	=	30	degrees
Y =	Rock Mass Bulk Density	=	115	lbs./cu.ft.
F =	Static Safety Factor	=	4.81	Dry
		=	4.44	Saturated

Using the circular failure charts (Figure 1a & 1b) results in a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions is well within the 1.5 safety factor required.

Figure 1a

(DRY CONDITIONS)

CIRCULAR FAILURE CHART NUMBER 1

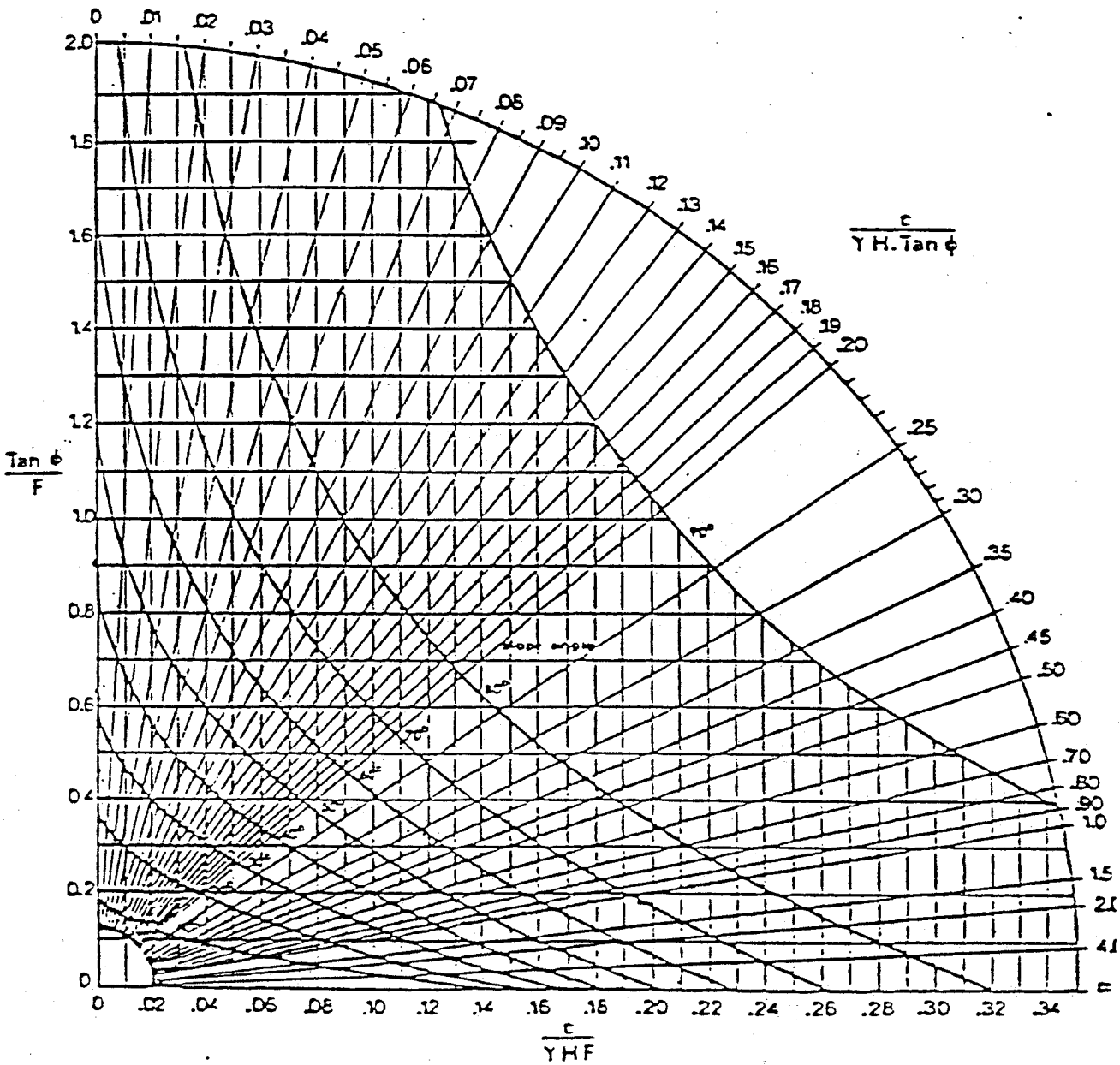
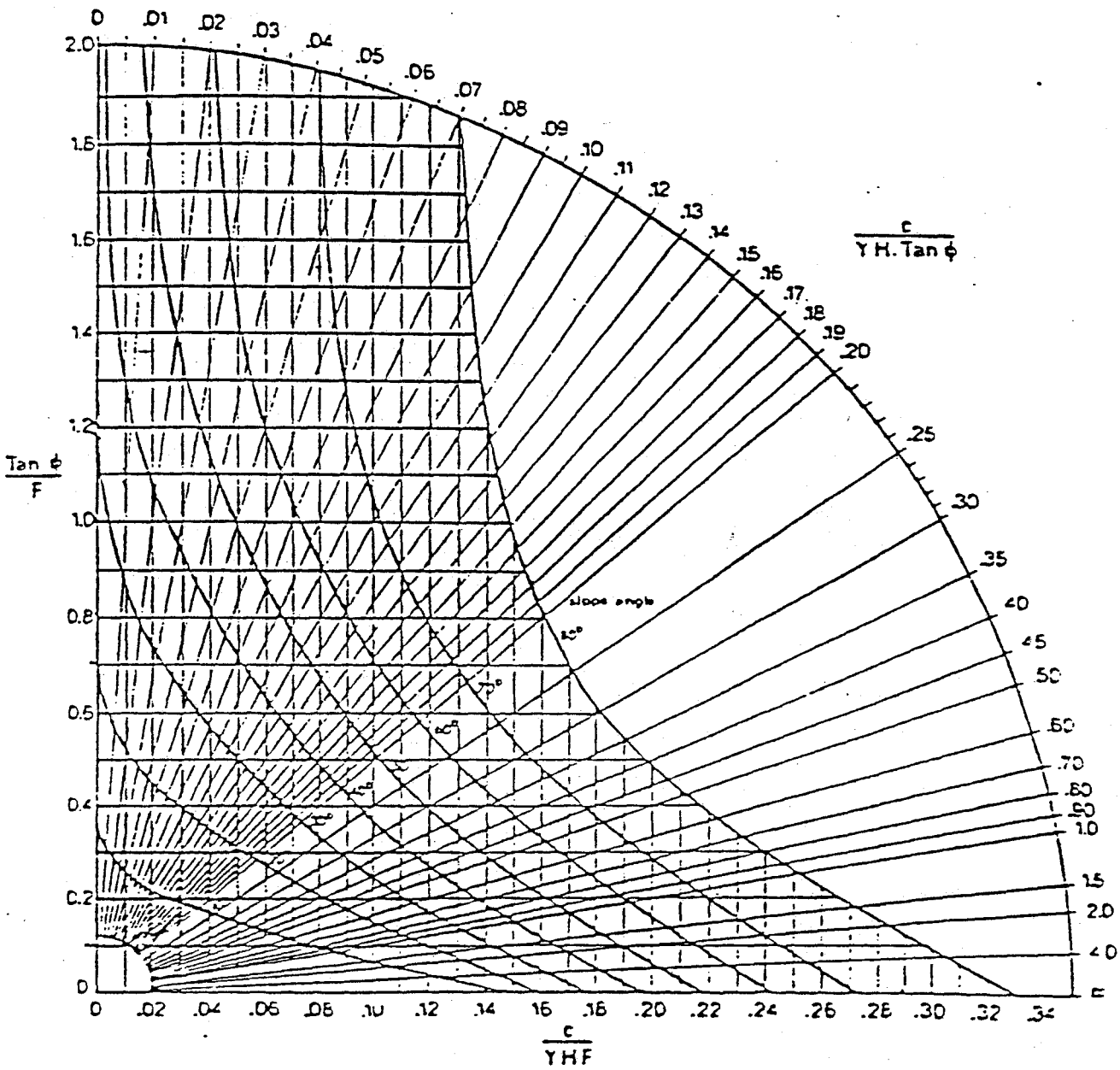


Figure 1b

(SATURATED CONDITIONS)

CIRCULAR FAILURE CHART NUMBER 5



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APPENDIX 3A

DRILL HOLE LOGS

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		0 - 100': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		0 - 200': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
110			
120			
130			
140			
150			
160			
170			
180			
190			
200			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (ft): 899' Well Depth (ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		0 - 279': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
210			
220			
230			
240			
250			
260			
270			
280		279 - 280.5': COAL: No lithology log. 280.5 - 300': SANDSTONE, SILTSTONE, SHALE: No Lithology log.	
290			
300			

Project Name: BLUE BLAZE COAL Owner/Client: ROBER BKABBB	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 999' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300		280.5 - 400': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
310			
320			
330			
340			
350			
360			
370			
380			
390			
400			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400		280.5 - 500': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
410			
420			
430			
440			
450			
460			
470			
480			
490			
500			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKABBS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
500		280.5 - 600': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
510			
520			
530			
540			
550			
560			
570			
580			
590			
600			

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Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
600		280.5 - 700': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
610			
620			
630			
640			
650			
660			
670			
680			
690			
700			

Project Name: BLUE BLAZE COAL Owner/Client: ROBER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
700		280.5 - 750': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
710			
720			
730			
740			
750		750 - 752': COAL: 752 - 793: SANDSTONE, SILTSTONE, SHALE: No lithology log.	
760			
770			
780			
790		793 - 798.4': COAL: No lithology log.	Castlegate "A" Upper Split
800		798.4 - 799': SHALE: 799 - 800': COAL: No lithology log.	

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
800		800 - 804' : COAL: No lithology log.	
		804 - 805' : SHALE: No lithology log.	
		805 - 806.5 : COAL: No lithology log.	Castlegate "A" Lower Split
		806.5 - 856': SANDSTONE, SILTSTONE, SHALE: No lithology log.	
810			
820			
830			
840			
850			
		856 - 860': COAL:	Gordon Coal Seam
860		860 - 899': SANDSTONE, SILTSTONE, SHALE: No lithology log.	
870			
880			
890			
900			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (ft): 568' Well Depth (ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 568' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		0 - 169': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
110			
120			
130			
140			
150			
160			
170		169 - 170': COAL: Possibly shaley.	Local Coal Group
		170 - 172.5': SHALE: Carbonaceous, silty.	Local Coal Group
		172.5 - 173': COAL: Shaley.	Local Coal Group
		173 - 194.9': SANDSTONE: Massive.	Local Coal Group
180			
		194.9 - 195': COAL:	Local Coal Group
		195 - 319': SANDSTONE: Shaley.	
200			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (ft): 568' Well Depth (ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		195 - 319.4': SANDSTONE: Shaley.	BLACKHAWK FORMATION
210			
220			
230		Interbedded massive sandstone at 231 - 244'.	
240			
250			
260			
270			
280		Interbedded massive sandstone at 288 - 312'.	
300			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 568' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300		195 - 319.4': SANDSTONE: Shaley. Interbedded massive sandstone at 288 - 312'.	BLACKHAWK FORMATION
310			
320		319.4 - 319.5': COAL: Possibly <0.5% shaley coal present.	Local Coal Group
		319.5 - 322.9': SHALE: Carbonaceous, silty.	Local Coal Group
		322.9 - 323': COAL: Possibly <0.5% shaley coal present.	Local Coal Group
		323 - 343': SHALE: Sandy.	
330			
340			
		343 - 366.5': SANDSTONE: Massive.	
350			
360			
		366.5 - 369.9': SHALE: Carbonaceous, silty.	
370		369.9 - 370': COAL: Castlegate Coals replaced with channel deposit.	Local Coal Group
		370 - 380.4': SHALE: Carbonaceous, silty. Castlegate Coals replaced with channel deposit.	Local Coal Group
380		380.4 - 380.5': COAL: Castlegate Coals replaced with channel deposit.	Local Coal Group
		380.5 - 393.4': SHALE: Carbonaceous, silty. Castlegate Coals replaced with channel deposit.	Local Coal Group
		393.4 - 393.5': COAL: Castlegate coals replaced with channel deposit.	Local Coal Group
		393.5 - 402': SHALE: Carbonaceous, sandy. Channel deposit?	
400			

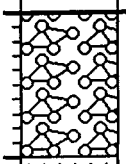
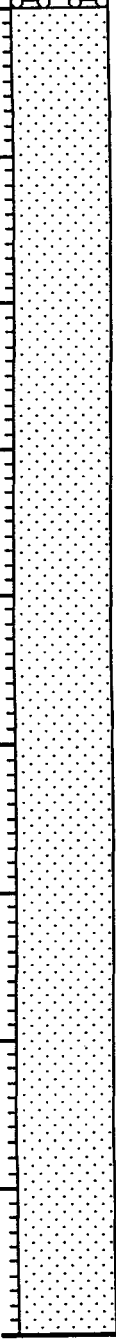
Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 568' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400		393 - 402': SHALE: Carbonaceous, sandy. Channel deposit?	BLACKHAWK FORMATION
		402 - 415': SANDSTONE: Shaley.	
410			
		415 - 421': SHALE: Carbonaceous.	
420		421 - 433': SANDSTONE: Shaley. Remnant of Aberdeen Deposit?	
430			
		433 - 435': SHALE: Carbonaceous.	
		435 - 535.1': COAL:	
		435.1 - 456': SHALE: Sandy.	
440			
450			
		456 - 475.5': SANDSTONE: Silty.	
460			
		Shaley zone 467 - 470'.	
470			
		475.5 - 518': SHALE: Sandy.	
480			
500			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 568' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
500		475.5 - 518': SHALE: Sandy.	BLACKHAWK FORMATION
510		Sandstone roof rock at 510.5 - 518'.	
520		518 - 522': COAL: 4.0' on geophysical log.	Castlegate "A"?
		522 - 529.5': SHALE: Carbonaceous, silty. *Floor unit.	
530		529 - 568': SANDSTONE: Shaley, silty. Lithofacies equivalent of the massive Spring Canyon Sandstone?	Aberdeen Sandstone?
540			
550			
560			
570			
580			
600			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): --

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		0 - 10': SOIL: No lithology log available.	QUATERNARY
10		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
20			
30			
40			
		Massive sandstone at 47 - 53'.	
50			
60			
70			
80			
90			
100			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER BKA888	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
110			
120			
130		Massive sandstone at 131 - 143'.	
140			
150			
160			
170			
180			
190			
200			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER BKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): --

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
210		Massive sandstone at 214 - 226'.	
220			
230			
240			
250			
260			
270			
280			
290			
300			

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Project Name: BLUE BLAZE COAL Owner/Client: ROBER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): --

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	
310			
320			
330			
340			
350			
360			
370		Massive sandstone at 370 - 396'.	
380			
390			
400			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKABEB	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
410		Massive sandstone at 412 - 426'.	
420			
430			
		432.9 - 433': COAL:	Local Coal Group
		433 - 441.9': SHALE: Carbonaceous, sandy.	Local Coal Group
440			
		441.9 - 442': COAL:	Local Coal Group
		442 - 455.5': SHALE: Carbonaceous, sandy.	Local Coal Group
450			
		455.5 - 456': COAL: Shaley.	Local Coal Group
		456 - 582.5': SANDSTONE: Shaley.	
460			
470			
480			
490			
500			

Project Name: BLUE BLAZE COAL Owner/Client: ROBER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): --

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
500		456 - 582.5': SANDSTONE: Shaley.	BLACKHAWK FORMATION
510			
520			
530			
540		Massive sandstone at 539 - 557'.	
550			
560			
570			
580			
		582.5 - 586.5': COAL:	Bob Wright Group
		586.5 - 594.5': SHALE: Carbonaceous, sandy.	Bob Wright Group
590			
		594.5 - 595': COAL: Shaley.	Bob Wright Group
		595 - 606': SHALE: Carbonaceous, silty.	
600			

Project Name: BLUE BLAZE COAL Owner/Client: ROBER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 6290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
600		595 - 606': SHALE: Carbonaceous, silty.	BLACKHAWK FORMATION
		606 - 625.5': SANDSTONE: Silty.	
610			
620			
		625.5 - 630': SHALE: Carbonaceous, silty. carbonaceous silty shale, next 5.5'=silty sandstone.	
630		630 - 635.5': COAL:	Castlegate A
		635.5 - 642': SHALE: Carbonaceous, silty.	
640		642 - 648.2': COAL:	Castlegate A
650		648.2 - 651.4': SHALE: Carbonaceous, silty. IM FLR=3.2' carbonaceous silty shale, next 3.0'=coal.	
		651.4 - 654.4': COAL:	Castlegate A
		654.4 - 658.5': SHALE: Carbonaceous, sandy.	
660		658.5 - 667': SANDSTONE: Shaley. Remnant of channel sandstone?	
		667 - 668.2': COAL: Local coal seams of limited extent.	
670		668.2 - 671': SHALE: Carbonaceous.	
		671 - 676.9': COAL: Shaley. Shale parting 673.0 - 674.4'. Shaley coal 674 - 675.5'.	
680		676.9 - 691': SANDSTONE: Shaley, silty. Top 3' shaley remnant of channel. Sandstone = Aberdeen Sandstone?	Aberdeen Sandstone
690		691 - 701.9': SHALE: Sandy.	
700			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
700		691 - 701.9': SHALE: Sandy.	BLACKHAWK FORMATION
		701.9 - 705': COAL:	Gordon Coal
		705 - 725.5': SHALE: Sandy.	
710			
720			
		725.5 - 734.5': SANDSTONE: Massive.	
730			
		734.5 - 781': SANDSTONE: Shaley.	
740			
750			
760			
770			
780			
		781 - 791': SANDSTONE: Shaley. IM RF = 3.0' carbonaceous shale, next 2.0' = shaley sandstone, next 5.0' = silty sandstone.	
		791 - 798.2': COAL:	Hiawatha coal seam
		798.2 - 803.2': SHALE: Carbonaceous, silty.	BLACKHAWK-STAR POINT GROUP
800			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKABBB	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 836' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
800		798.2 - 803.2': SHALE: Carbonaceous, silty.	BLACKHAWK-STAR POINT GROUP
		803.2 - 836': SANDSTONE: Massive.	Upper Spring Canyon Sandstone
810			
820			
830			
840			
850			
860			
870			
880			
890			
900			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER BKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 430' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		NO LITHOLOGICAL LOG 0 - 55'	
10			
20			
30			
40			
50			
60		? - 56': SANDSTONE: Massive. Channel sandstone remnant?	BLACKHAWK FORMATION
		56 - 59.9': SANDSTONE: Carbonaceous, shaley. Uncertain.	
		59.9 - 60': COAL: Castlegate Coals replaced with channel dep.	Castlegate A
		60 - 63.9': SILTSTONE: Carbonaceous, sandy. Castlegate Coals replaced with channel deposit.	Castlegate A
		63.9 - 64': COAL: Castlegate Coals replaced with channel deposit.	Castlegate A
		64 - 68.9': SILTSTONE: Carbonaceous, sandy. Castlegate Coals replaced with channel deposit.	Castlegate A
70		68.9 - 69': COAL: Castlegate Coals replaced with channel deposit.	Castlegate A
		69 - 74': SILTSTONE: Carbonaceous, sandy. Red color in log = baked? By what coal?	
		74 - 100': SANDSTONE: Remnant of channel sandstone? BTM 5' = sandy siltstone	
80			
90			
100			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 430' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		100 - 100.7': COAL: Shaley.	BLACKHAWK FORMATION
		100.7 - 105.2': SANDSTONE: Carbonaceous, shaley. coal seams of limited extent.	
		105.2 - 112': COAL: Shaley. Shale partings 108.2 - 109.6'.	Castlegate A
110			
		112 - 128': SANDSTONE: Shaley, silty. Shaley 112 - 119'. Remnant of Aberdeen Sandstone?	Aberdeen Sandstone
120			
130		128 - 139.2': SHALE: Carbonaceous, silty.	
		139.2 - 139.9': COAL:	Gordon Coal
140		139.9 - 140.9': SHALE: Carbonaceous, sandy.	Gordon Coal
		140.9 - 143.3': COAL:	Gordon Coal
		143.3 - 165': SHALE: Carbonaceous, coaly, sandy. Coals at 146.4 - 147'.	
150		Coals at 151.4 - 152.5'.	
160		Coals at 159 - 159.7'.	
		Coals at 162.6 - 163.3'.	
		165 - 175': SANDSTONE: Carbonaceous.	
170			
		175 - 203.1': SHALE: Sandy.	
180			
190			
200			

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Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 430' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		175 - 203.1': SHALE: Sandy.	BLACKHAWK FORMATION
		203.1 - 205.3': COAL: No gamma response on geophysical log.	Hiawatha coal seam
		205.3 - 215.3': SANDSTONE: Shaley. IM RF = 5.5' massive	Hiawatha coal seam
210			
		215.3 - 227': COAL: Old works--top 6.0 - 6.5' mined out ? rubble (old National Mine workings).	Hiawatha coal seam
220			
		227 - 232': SANDSTONE: Carbonaceous, silty. IM floor = 5'	
230		232 - 233+': SANDSTONE: Massive.	Upper Spring Canyon Sandstone
		LITHOLOGY (CORE) DESCRIPTION ENDS AT 233.0'.	
240			
250			
260			
270			
		274 - 293': SILTSTONE: Shaley.	
280			
		293 - 324.5': SANDSTONE: Massive	Lower Spring Canyon Sandstone
300			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (ft): 430' Well Depth (ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300			
310			
320			
		324.5 - 367.9': SHALE: Silty.	
330			
340			
350			
360			
		367.9 - 368': COAL:	Lower O'Conner
370		368 - 420': SANDSTONE: Silty. Massive.	Storrs Sandstone
380			
390			
400			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 430' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400		400 - 430': SANDSTONE: Silty. Massive.	Storrs Sandstone
410			
420			
430			
440			
450			
460			
470			
480			
490			
500			

APPENDIX 3B

LABORATORY ANALYSIS OF COAL, OVERBURDEN AND UNDERBURDEN

CHRIS HANSEN

PART II

COAL QUALITY AND PETROGRAPHIC ANALYSES

F-462

COMMERCIAL TESTING & ENGINEERING CO.

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WESTERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

PLEASE ADDRESS ALL CORRESPONDENCE TO:
10775 EAST 51st AVE., DENVER, COLO. 80239
OFFICE TEL. (303) 373-4772

SINCE 1908

SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February 14, 1980

Sample identification by

Sanders Exploration, Limited

Castle Gate "A" Seam
105.2' - 108.2'
109.6' - 111.6'
112.0' - 114.0'

Kind of sample reported to us	Coal
Sample taken at	xxxxx
Sample taken by	Sanders Exploration, Limited
Date sampled	xxxxx
Date received	1-22-80

Analysis report no. 72-89855 Page 1

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	6.52	XXXXX
% Ash	18.54	19.83
% Volatile	36.26	38.79
% Fixed Carbon	38.68	41.38
	100.00	100.00
Btu/lb.	10189	10900
% Sulfur	0.61	0.65

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = ½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gail D. Palmer

G. D. PALMER, Manager, Denver Laboratory

GDP/md/vt

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Charter Member

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SINCE 1908

SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February 21, 1980

		Sample identification by
Kind of sample reported to us	Coal	Sanders Exploration, Limited
Sample taken at	xxxxx	3' Above Hiawatha 214.0' - 217.0'
Sample taken by	Sanders Exploration, Limited	
Date sampled	xxxxx	
Date received	1-22-80	

Analysis report no. 72-89851

ACIDITY pH

1:1 Equipotential	1:5	1:20
7.12	8.00	8.54

% PYRITIC SULFUR (Dry Basis) = 0.24

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gail D. Palmer

G. D. PALMER, Manager, Denver Laboratory

GDP/pm

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OFFICE TEL. (303) 373-4772

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SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February 14, 1980

Sample identification by

Kind of sample reported to us	Coal	Sanders Exploration, Limited
Sample taken at	xxxxxx	Hiawatha "A" Seam 224.0' - 227.5'
Sample taken by	Sanders Exploration, Limited	
Date sampled	xxxxx	
Date received	1-22-80	

Analysis report no. 72-89852 Page 1

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.38	XXXXX
% Ash	7.63	8.06
% Volatile	42.51	44.93
% Fixed Carbon	44.48	47.01
	100.00	100.00
Btu/lb.	12488	13198
% Sulfur	0.47	0.50

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = ½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gordon D. Palmer

G. D. PALMER, Manager, Denver Laboratory

GDP/md/vt

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WESTERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

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SINCE 1908

SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February 7, 1980

		Sample identification by
Kind of sample reported to us	Coal	Sanders Exploration, Limited
Sample taken at	xxxxx	102.0' - 105.2' 3' Above Castle Gate "A" Seam
Sample taken by	Sanders Exploration, Limited	
Date sampled	xxxxx	
Date received	1-22-80	

Analysis report no. 72-89854

ACIDITY, pH

1:1	1:5	1:20
8.03	8.92	9.29

% Pyritic Sulfur (Dry Basis) = 0.04

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gail D. Palmer

G. D. PALMER, Manager, Denver Laboratory

GDP/vt

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WESTERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

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OFFICE TEL. (303) 373-4772

SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February, 7, 1980

		Sample identification by
Kind of sample reported to us	Coal	Sanders Exploration, Limited
Sample taken at	xxxxx	114.0' - 117.0' 3' Below Castle Gate "A" Seam
Sample taken by	Sanders Exploration, Limited	
Date sampled	xxxxx	
Date received	1-22-80	

Analysis report no. 72-89856

ACIDITY, pH

1:1	1:5	1:20
5.05	5.72	6.62

% Pyritic Sulfur (Dry Basis) = 0.02

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

G. D. PALMER, Manager, Denver Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.

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STERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

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OFFICE TEL. (303) 373-4772

SINCE 1908

SANDERS EXPLORATION, LIMITED
10 West Center
Kaysville, Utah 84037

February 7, 1980

		Sample identification by
Kind of sample reported to us	Coal	Sanders Exploration, Limited
Sample taken at	xxxxx	227.3' - 230.5' 3' Below Hiawatha "A" Seam
Sample taken by	Sanders Exploration, Limited	
Date sampled	xxxxx	
Date received	1-22-80	

Analysis report no. 72-89853

ACIDITY, pH

1:1	1:5	1:20
8.09	8.69	9.22

% Pyritic Sulfur (Dry Basis) = 0.05

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Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gail D. Palmer

G. D. PALMER, Manager, Denver Laboratory

Charter Memb

Castlegate "A" Seam Analyses

Blue Blaze No. 3 - McGowan Mine

Sample No.	Mine or Prospect Coal Bed	PROXIMATE ANALYSES					Sulfur %	Btu/lb.
		AN	M	VM	FC	Ash		
4	McGowan Mine	A	5.3	43.8	45.9	5.0	.5	12,830
		C	-	46.2	48.5	5.3	-	13,540
5	McGowan Mine	A	.59	44.1	43.9	6.1	.4	12,700
		C	-	46.9	46.6	6.5	-	13,500
6	McGowan Mine	A	4.5	44.1	44.4	7.0	.4	12,730
		C	-	46.2	46.5	7.3	-	13,330
7	McGowan Mine	A	6.1	42.2	45.1	6.7	.6	12,330
		C	-	44.9	48.0	7.1	-	13,130
8	McGowan Mine	A	4.1	44.2	45.3	6.4	.4	12,840
		C	-	46.1	47.2	6.7	-	13,390

Note: Above information taken from Central Utah Coal Fields, Monograph Series 3, H. H. Doelling (U.G.M.S. 1972), page 117.

Table II-1

PETROGRAPHIC ANALYSIS
FOR

IAD BATCH #: 97-D889-003-03

SAMPLE #: 89855, 89852

February 11, 1980

Anne Verity Oldham

Anne Verity Oldham
Coal Petrographer

Approved by:
M. L. Jacobs, Ph.D., Mngr.
Instrumental Analysis Div.

Gail D. Palmer

Gail D. Palmer, Manager, Denver Branch

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IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855,89852

PYRITE/MARCASITE ANALYSES

Summary of Procedures:

A representative split of each sample was crushed to minus 20 mesh, mixed with epoxy and pelletized. Sample pellets were then polished to create a planar surface suitable for microscopic examination in incident light.

Differentiation of Pyrite and Marcasite was based on slight differences in optical properties. Pyrite is isotropic and Marcasite is anisotropic. Crossed-polarized light with a gypsum compensating plate was used during the analysis to intensify the optical differences.

Since the distinction is not always absolute, particularly on small particles, the percentage values reported for Pyrite and Marcasite should be considered to be semi-quantitative values.

In most instances, Marcasite occurred in close association with Pyrite. Approximately 60 occurrences were recorded for each sample.

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SANDERS EXPLORATION, LIMITED
IAD Batch #: 97-D889-003-03

Hiawatha "A" Seam
224.0' - 227.5'

Report of Analysis on Sample: 89852

PYRITE/MARCASITE ANALYSIS

Total Weight % Pyritic Sulfur (Dry Basis) by Standard Chemical Analysis:	0.04%
Weight % Pyrite as determined petrographically:	0.038% (96.0% of Total Pyritic Sulfur)
Weight % Marcasite as determined petrographically:	0.002% (4.0% of Total Pyritic Sulfur)

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PETROGRAPHIC ANALYSIS
FOR

IAD BATCH #: 97-D889-003-03

SAMPLE #: 89855, 89852

February 11, 1980

Anne Verity Oldham
Coal Petrographer

Approved by:
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IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855,89852

PYRITE/MARCASITE ANALYSES

Summary of Procedures:

A representative split of each sample was crushed to minus 20 mesh, mixed with epoxy and pelletized. Sample pellets were then polished to create a planar surface suitable for microscopic examination in incident light.

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Hiawatha "A" Seam
224.0' - 227.5'

Report of Analysis on Sample: 89852

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PETROGRAPHIC ANALYSIS
FOR

IAD BATCH #: 97-D889-003-03

SAMPLE #: 89855, 89852

February 11, 1980

Anne Verity Oldham
Coal Petrographer

Approved by:
M. L. Jacobs, Ph.D., Mngr.
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IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855,89852

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Summary of Procedures:

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In most instances, Marcasite occurred in close association with Pyrite. Approximately 60 occurrences were recorded for each sample.

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SANDERS EXPLORATION, LIMITED
IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855

Castle Gate "A" Seam
105.2' - 108.2'
109.6' - 111.6'
112.0' - 114.0'

PYRITE/MARCASITE ANALYSIS

Total Weight % Pyritic Sulfur (Dry Basis) by Standard Chemical Analysis:	0.04%
Weight % Pyrite as determined petrographically:	0.039% (97.5% of Total Pyritic Sulfur)
Weight % Marcasite as determined petrographically:	0.001% (2.5% of Total Pyritic Sulfur)

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PETROGRAPHIC ANALYSIS
FOR

IAD BATCH #: 97-D889-C03-03

SAMPLE #: 89855, 89852

February 11, 1980

Anne Verity Oldham
Coal Petrographer

Approved by:
M. L. Jacobs, Ph.D., Mngr.
Instrumental Analysis Div.

Gail D. Palmer, Manager, Denver Branch

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IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855,89852

PYRITE/MARCASITE ANALYSES

Summary of Procedures:

A representative split of each sample was crushed to minus 20 mesh, mixed with epoxy and pelletized. Sample pellets were then polished to create a planar surface suitable for microscopic examination in incident light.

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In most instances, Marcasite occurred in close association with Pyrite. Approximately 60 occurrences were recorded for each sample.

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SANDERS EXPLORATION, LIMITED
IAD Batch #: 97-D889-003-03

Report of Analysis on Sample: 89855

Castle Gate "A" Seam
105.2' - 108.2'
109.6' - 111.6'
112.0' - 114.0'

PYRITE/MARCASITE ANALYSIS

Total Weight % Pyritic Sulfur (Dry Basis) by Standard Chemical Analysis:	0.04%
Weight % Pyrite as determined petrographically:	0.039% (97.5% of Total Pyritic Sulfur)
Weight % Marcasite as determined petrographically:	0.001% (2.5% of Total Pyritic Sulfur)

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Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

Oct. 5, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	9A 3' above seam
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-119543

pH	7.3 units
Electrical conductivity	1.9 mmhos/cm
Saturation %	57.4
PARTICLE SIZE:	
% Sand	30
% Silt	51
% Clay	19
SOLUBLE CATIONS:	
Calcium	4.72 meq/l
Magnesium	10.18 meq/l
Sodium	5.43 meq/l
Sodium Adsorption Ratio	1.98
Selenium, total available	<0.1 mg/kg
Boron, total available	1.61 mg/kg
Total Nitrogen	0.09 %
Nitrate-nitrogen	2.32 mg/kg
Organic carbon	3.5 %
Rock fragments	9.7 %
Available water capacity*	14.7 (1/3)
(%ATM)	6.7 (15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

HIAWATHA

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

Oct. 5, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	9B 3' below seam
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-119544

pH	7.9	units
Electrical conductivity	7.6	mmhos/cm
Saturation %	31.5	
PARTICLE SIZE:		
% Sand	53	
% Silt	36	
% Clay	11	
SOLUBLE CATIONS:		
Calcium	22.05	meq/l
Magnesium	89.88	meq/l
Sodium	7.79	meq/l
Sodium Adsorption Ratio	1.04	
Selenium. total available	<0.1	mg/kg
Boron. total available	<0.1	mg/kg
Total Nitrogen	0.05	%
Nitrate-nitrogen	0.8	mg/kg
Organic carbon	3.95	%
Rock fragments	9.7	%
Available water capacity*	11.1	(1/3)
(%ATM)	3.8	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIE

F-464
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TERMS AND CONDITIONS ON REVERSE

CASTLEGATE "A"

COMMERCIAL TESTING & ENGINEERING CO.

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FAX: (801) 653-2479

Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

Oct. 5, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	10A 3' above seam
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-119545

pH	8.2 units
Electrical conductivity	0.4 mmhos/cm
Saturation %	57.6
PARTICLE SIZE:	
% Sand	0
% Silt	63
% Clay	37
SOLUBLE CATIONS:	
Calcium	1.63 meq/l
Magnesium	2.32 meq/l
Sodium	1.29 meq/l
Sodium Adsorption Ratio	0.91
Selenium, total available	<0.1 mg/kg
Boron, total available	<0.1 mg/kg
Total Nitrogen	0.09 %
Nitrate-nitrogen	0.64 mg/kg
Organic carbon	3.72 %
Rock fragments	8 %
Available water capacity*	23.7 (1/3)
(%ATM)	12.4 (15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

CASTLEGATE "A"

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Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

Oct. 5, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	10B 3' below seam
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-119546

pH	8.2 units
Electrical conductivity	0.3 mmhos/cm
Saturation %	30.3
PARTICLE SIZE:	
% Sand	57
% Silt	30
% Clay	13
SOLUBLE CATIONS:	
Calcium	1.31 meq/l
Magnesium	0.74 meq/l
Sodium	1.33 meq/l
Sodium Adsorption Ratio	0.52
Selenium, total available	<0.1 mg/kg
Boron, total available	<0.1 mg/kg
Total Nitrogen	0.04 %
Nitrate-nitrogen	1.2 mg/kg
Organic carbon	0.71 %
Rock fragments	8.8 %
Available water capacity*	11.8 (1/3)
(%ATM)	4.8 (15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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Date sampled	----------	
Date received	----------	

Analysis report no. 59-119546

pH	8.2	units
Electrical conductivity	0.3	mmhos/cm
Saturation %	30.3	
PARTICLE SIZE:		
% Sand	57	
% Silt	30	
% Clay	13	
SOLUBLE CATIONS:		
Calcium	1.31	meq/l
Magnesium	0.74	meq/l
Sodium	1.33	meq/l
Sodium Adsorption Ratio	0.52	
Selenium, total available	<0.1	mg/kg
Boron, total available	<0.1	mg/kg
Total Nitrogen	0.04	%
Nitrate-nitrogen	1.2	mg/kg
Organic carbon	0.71	%
Rock fragments	8.8	%
Available water capacity*	11.8	(1/3)
(%ATM)	4.8	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

APPENDIX 4

Drainage Report

NOV 3 1981
Utah Dept. of
Environmental Health

C&W Coal Properties

drainage report

June 1980

prepared by The Land Group

Landscape Architects, Engineers, Land Surveyors · suite 304, 205 West 700 South Salt Lake City, Utah

ABSTRACT

A storm drainage study of the area surrounding the C & W Coal Properties Mine Site in Carbon County, Utah was done, resulting in the design of a drainage and settlement pond system. The results of that study, and the details of the drainage system are presented in this report.

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Site Map	Sheet 2
"	Sheet 3
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STORM DRAINAGE REPORT

for

C & W COAL PROPERTIES

June 10, 1980

INTRODUCTION:

This report represents a study of the storm runoff conditions at the C & W Coal Properties mine site in Carbon County, Utah, and describes the proposed methods for controlling the runoff. The design of sedimentation ponds to settle out particulate material from the site runoff is also discussed. The supporting data and methods of the study are included.

The study was completed for C & W Coal Properties Corp. by The Land Group, Engineering Department, 205 West 700 South, Salt Lake City, Utah 84101.

CURRENT DRAINAGE CONDITIONS:

As can be seen on the "Outside Facilities Plan" and as illustrated in photographs of the area, much of the surface area which is drained by the North Fork of Gordon Creek is covered by coal waste and debris from old, long abandoned mining operations. This makes it impossible under current conditions for surface drainage to not come into contact with possible contaminants. It is therefore felt that any proposed burial measures could only be beneficial to the

environmental balance of the area, as well as removing possible pollutants which currently flow into Gordon Creek less than a mile away.

The drainage in the side canyon where the proposed mine is to be operated is subject to similar conditions as the North Fork drainage. The entire loading, stockpile, and office area is covered by a layer of coal and other debris from the previously mentioned abandoned operations. There is also a mine dump further up the canyon across from the proposed portals, as is shown on the "Outside Facilities Plan". An existing drill road cuts the hillside on the east side of the canyon and the topography in the center of the canyon has been greatly disrupted. Much of the current surface drainage in the area of the proposed facilities flows across this coal waste and is probably contaminated to some degree. The culvert which at one time carried the canyon drainage through the old haulage road is buried under several feet of material and doesn't allow any flow. This creates a small pond behind the haulage road. The proposed establishment of drainage patterns and the scrapping and burial of surface coal waste are felt to be of benefit to the immediate area and entire downstream Gordon Creek drainage both in the short term and long term time frames.

METHODS AND DISCUSSION:

The drainage study was separated into three parts:

1. The evaluation of storm runoff from the area above the mine site in order to select culvert sizes and route the runoff through the site.

2. The evaluation of runoff from the site itself to facilitate the design of sedimentation ponds.

3. The evaluation of runoff above the haulage road and the placement of culverts along the road to drain the runoff.

The storm runoff for this study was calculated using the "Rational Method", Q = CiA, where "Q" is the peak flow runoff in cubic feet per second (cfs), "C" is an empirical runoff coefficient representing ground slope and imperviousness, "i" is the average rainfall intensity for the storm duration in inches per hour, and "A" is the contributing drainage area in acres. This formula assumes that the runoff coefficient remains constant from storm to storm, and that the maximum rate of runoff for a given intensity occurs when all parts of the drainage area are contributing, a phenomenon which takes place after a critical time, t_c, into the storm.

The values used for the various factors in the Rational Method equation were determined through the use of topography maps, local weather statistics, and prior experience in the area.

The area above the mine site is considered undisturbed, and the runoff therefrom needs to be routed through the site in such a way that it does not become contaminated. To insure that this is the case, drainage ditches will be constructed around the site perimeter to collect storm runoff from the undisturbed areas. The runoff will be routed through the site, bypass the sedimentation ponds, and drain into the natural drainage channel, as shown on the site map. (see Appendix) It is necessary, at the lower end of the site, to place a culvert to carry the runoff flow from the undisturbed area. In order to size this culvert, the runoff was evaluated for the 100-year and 1000-year storm return periods. A critical time of 15-minutes, a "C" value of 0.20, and a contributing drainage area of 160 acres

were used for the evaluation. Based on the estimated runoff, which is shown in Table 1, a 60-inch diameter culvert was selected. Located as shown on the site map, this culvert will safely pass the runoff from storms up to the 1000-year event. In most studies of this type the runoff from snow melt is evaluated and compared with that from rainfall. In this situation, however, the site is located on the dry side of the mountain range where the snowpack is generally light. It is assumed, therefore, that the critical runoff situation is from rainfall rather than snowmelt.

In order to protect the hydrologic balance of natural streams, federal regulation requires that runoff from disturbed areas meet certain water quality standards. Runoff from the mine site will therefore be routed through a sedimentation pond system, allowing for the removal of particulates from the water before it enters the natural stream. Berms will be constructed around the perimeter of the mine site, and the area will be graded so that runoff flows overland to the bottom end of the site and into the sedimentation ponds, as can be seen on the site map. After sedimentation, the water will flow into the natural drainage channel.

Storm runoff from the disturbed area was evaluated for the 10-year precipitation event. The drainage area contains 2.9 acres, and a "C" factor of 0.70 was used. The maximum flow resulting from this drainage area will be from a short duration, 5-minute storm, and is estimated to be 3.9 cfs.

The sedimentation ponds were designed for a minimum detention time of 24-hours. The pond size is dictated by two criteria: The capacity to store runoff from a 10-year, 24-hour precipitation event, and the capacity to accommodate a three-year accumulation of sediment.

The volume of runoff produced by a 24-hour duration storm was determined to be 16,000 cubic feet, and the two ponds were designed to retain this volume. Shorter storms will produce smaller volumes of water and will therefore have adequate detention times. Sufficient sediment storage volume is provided by allocating 0.1 acre-feet of storage for each acre of disturbed area in the drainage basin. With 2.9 acres of disturbed area, 12,600 cubic feet of storage volume is required.

The layout and design of the sedimentation ponds is shown on the detail sheet, and is in accordance with federal regulation. The ponds provide for 13,300 cubic feet of sediment storage and 16,400 cubic feet of storm retention capacity. (See Table 2) In addition, a permanent water level in each pond will provide for more efficient settlement and improve asthetics. The permanent water depth will fluctuate according to the sediment in the pond bottom, being at a maximum when there is no sediment, and at a minimum of one foot when sediment storage is at design capacity. When sediment accumulates beyond design capacity, then it will be necessary to clean the ponds out.

The inlet-outlet structures and transfer structure between the ponds are designed to prevent any floating oil and debris from contaminating the effluent. (See detail sheet) The 24-hour detention time should be adequate to settle out all suspended solids.

A twenty-foot wide emergency spillway on each of the settling pond dams has been designed so as to minimize damage in the event of a large storm. The design was based upon a 1000-year frequency storm. The spillways shall be rocked with 12-inch median size rock to prevent erosion.

Federal regulation requires that culverts be placed along the haulage road for storm runoff drainage. The road, which extends from Gordon Creek Road to the mine site is a class I road, and cross drains must handle a 10-year precipitation event. In addition, the road crosses the drainage channel for an adjacent canyon, and a culvert must be placed to allow for this drainage.

Runoff from the adjacent canyon was evaluated for the 100-year and 1000-year storms. A drainage area of 340 acres, a critical time of 20-minutes, and a "C" value of 0.20 was used to determine the runoff values, which are shown in Table 1. A 60-inch culvert will be more than sufficient to carry the flow from this canyon.

The haulage road below the 60-inch culvert extends 1500 feet to Gordon Creek road. With an average slope of 4-6% a culvert is required every 800 feet, so two cross drains will need to be placed along this road, one at the intersection with Gordon Creek Road, and one about 750 feet above that point. The size of these culverts was determined based on the estimated runoff from a 10-year storm. With a critical storm of 15 minutes, and an area of 12 acres, a 12-inch diameter culvert was selected.

Before any construction in the area is begun, a silt fence should be installed across the stream at a location near Gordon Creek Road as shown on the site map. The fence will retain any material that the stream picks up as it flows through the construction area. The fence should be cleaned periodically to prevent the stream from flowing around it. See the detail map for fence details.

CONCLUSIONS:

Based on the analysis of storm runoff conditions, a storm drainage and sedimentation pond system has been designed for the C & W Coal Properties mine site. The design is according to Federal Surface Mining Regulations. Storm runoff from undisturbed areas above the site will be routed through the site and into the natural drainage channel. Runoff from the site will be routed through a sedimentation pond system designed to settle out the suspended solids. Cross-drains will be placed along the haulage road to allow for drainage from the area above the road. A silt fence will be placed to protect the watershed downstream from the adverse effects of construction. Details of the system and results of calculations are given in the appendices.

As a result of this system, the storm runoff will be adequately controlled with little danger of flooding, and the effects of the mining operation on the natural stream flow and water quality should be minimized.

APPENDIX A

TABLE 1: STORM RUNOFF

	C	i (in/hr)	A (acres)	Q (cfs)	Culvert Diameter (inches)
Undisturbed Drainage Area:					
10-year, 15-minutes	0.2	1.25	160.	40	42
100-year, 15-minutes	0.2	2.4	160	77	48
1000-year, 15-minutes	0.2	3.5	160	112	54
Disturbed Drainage Area:					
10-year, 5-minute	0.7	1.92	2.9	3.9	n/a
10-year, 24-hour storm	0.7	0.09	2.0	0.18	n/a

Total runoff volume from 24-hour storm:

V = Qt = (0.18 cfs) (24 hours) (3600 sec./hour) = 15,785 cubic feet

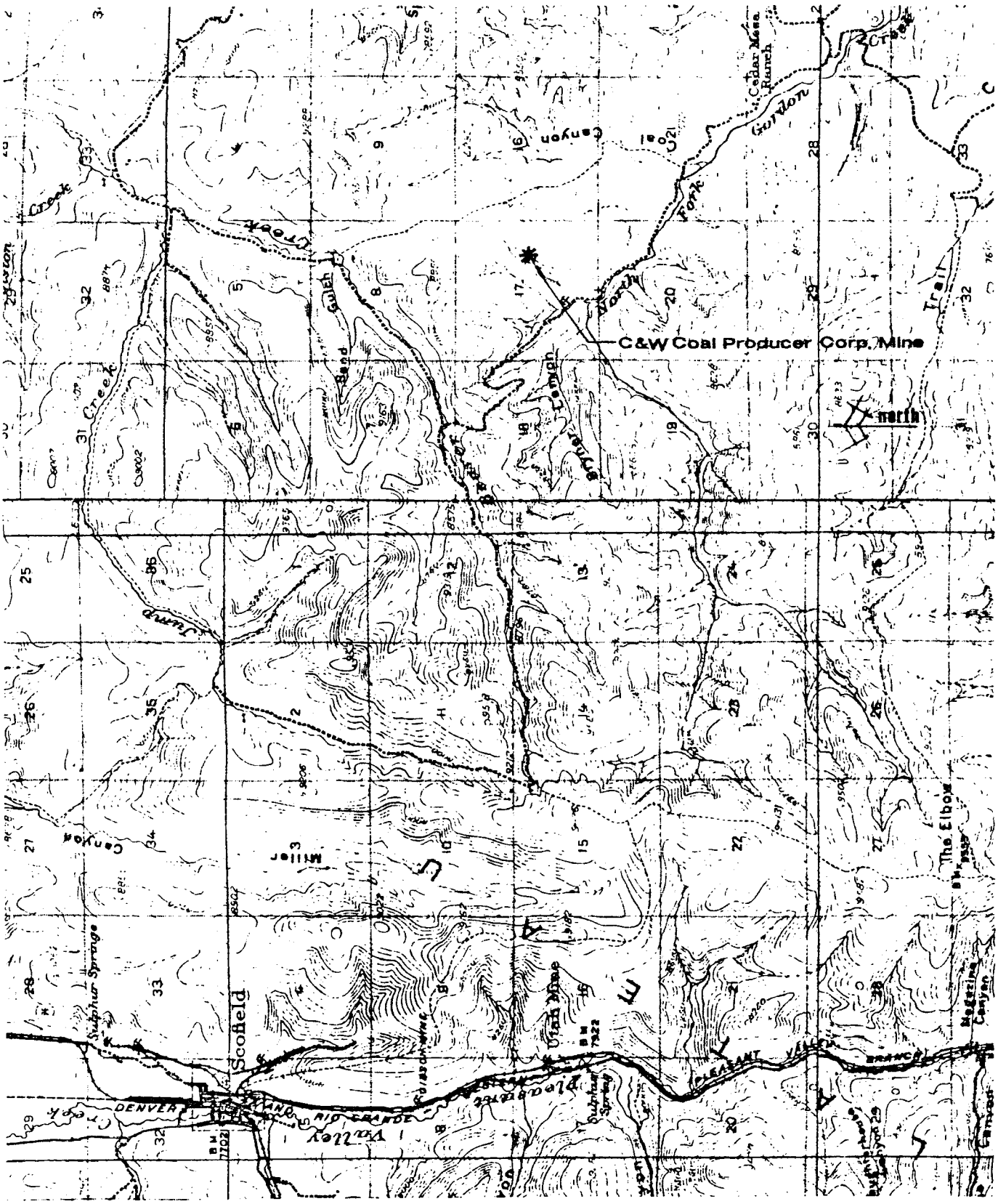
North Fork Drainage Area:					
(adjacent canyon)					
25-year, 20-minutes	0.2	1.5	337	101	43"
100-year, 20-minutes	0.2	2.1	337	141	54"
1000-year, 20 minutes	0.2	3.0	337	202	60"

TABLE 2: POND CAPACITIES

UPPER POND:	Elevations (ft)	Volume (cubic feet)
Bottom	7609	-
Sediment	7609-7614	6400
Permanent Water	7612-7615	7900
Storm Retention	7615-7617	7900
Emergency Spillway	7618	-
Top	7619	-
LOWER POND:		
Bottom	7591	-
Sediment	7591-7595	6900
Permanent Water	7593-7596	7600
Storm Retention	7596-7598	8500
Emergency Spillway	7599	-
Top	7600	
TOTAL:		
Sediment	-	13,300 (need 12,600)
Permanent Water	-	14,300
Storm Retention	-	16,400 (need 16,000)

APPENDIX B

vicinity map



784.24

Provide the additional information listed above and pertaining to road drainage and cut/fills pursuant to 30 CFR 784.24. Geotechnical and analyses of the stability of any cuts or fills pursuant to 817.152 will be required since the area is considered a "steep slope" area. Provide an analysis of culvert headwalls if pursuant to 30 CFR 784.24(d). Provide complete description of the entire truck haul route to the coal loadout. Provide evidence from the appropriate governmental agencies with authority for road maintenance and safety that the proposed truck haul traffic is acceptable. Provide evidence the the coal loadout is permitted and/or approved under the authority of Public Law 95-87 and complies with 30 CFR Part 827.

784.24

§ 784.24 Transportation facilities.

Each application shall contain a detailed description of each road, conveyor, and rail system to be constructed, used, or maintained within the proposed permit area. The description shall include a map, appropriate cross sections, and the following:

(a) Specifications for each road width, road gradient, road surface, road cut, fill embankment, culvert, bridge, drainage ditch, and drainage structure.

(b) A report of appropriate geotechnical analysis, where approval of the regulatory authority is required for alternative specifications or for steep cut slopes under 30 CFR 817.150(d), 817.152(c), 817.160(d) or 817.162(c).

(c) A description of each measure to be taken to obtain approval of the regulatory authority for alteration or relocation of a natural drainageway under 30 CFR 817.153(d), 817.163(d), or 817.173(c).

(d) A description of measures, other than use of a rock headwall, to be taken to protect the inlet end of a ditch relief culvert, for approval by the regulatory authority under 30 CFR 817.153(c)(2)(vi) and 817.163(c)(2)(vi).

(e) Each plan shall contain a general description of each road, conveyor, or rail system to be constructed, used, or maintained within the proposed mine plan area.

The coal shall be transported from the mine via a 42 inch covered conveyor a distance of 75 feet and be dumped into a crusher. From the crusher the coal will travel along 630 feet of 42 inch covered conveyor to be dumped into a 2,000 ton open stockpile as shown on Enclosure 13. Trucks will be loaded on the east side of the stockpile by a large front-end loader. Trucks will then proceed to the scale house and down the 26 foot wide compacted gravel roadway as shown on Enclosure 13. Cuts and fills and grades for the proposed access/haul road are illustrated on the "Road Profile", Enclosure 18.

A study of the stability of the road cuts, etc. was done by Sidney W. Smith P.E., and is included following.

The plan is revised to state that there will be no coal loadout at this time at any location other than the mine site. Trucks will either purchase coal at the mine or be contracted by the purchaser to haul coal for their needs.

Included herein is a letter from Carbon County regarding use of U-139 for additional truck traffic.

OPERATION PLAN: MAPS AND PLANS - 784.23

See Access and Haulage Road Design, Enclosure 8. Certified by Sidney W. Smith P.E.

Disturbance areas are shown on all surface area maps, also see reclamation map, 784.13.

The plan is revised to completely remove and reclaim the Class I Access and Haulage Road after cessation of mining operations and return the area occupied by the road to the same standards as for the rest of the proposed disturbed area as was outlined previously.

CARBON COUNTY
PRICE, UTAH 84501

February 6, 1989

William Roger Skaggs
P.O. Box 784
Price, Utah 84501

Dear Mr. Skaggs,

This is in response to your request concerning the impact your company would have in hauling coal down the Gordon Creek Road. It is our opinion that the impact would not be too severe, and your company hauling coal on that road would be permissible.

There is one problem, however, Beaver Creek Coal has been maintaining that road for the last few years and there would have to be an agreement between Beaver Creek Coal and Carbon County as to the upkeep of the road. If you need more information, please call me.

Very truly yours,

BOARD OF CARBON COUNTY
COMMISSIONERS,

Emma R. Kuykendall

Emma R. Kuykendall
County Commissioner

EK/rp

C & W COAL MINE REPORT

SLOPE STABILITY REQUIREMENT:

The surface of the C & W Coal Mine site was examined on February 27. 1980 for the purpose of determining existing site conditions with regard to the stability of natural slopes and the stability of artificial slopes formed as a result of past mining activity.

Natural slopes in the general vicinity of the proposed coal mine are convex upwards with slopes ranging from 20 to 70%. The stream bottoms, both perennial in Gordon Creek and ephemeral in the mine area, are incised as a result of regional uplift in pre-pleistocene time. Artificial slopes consisting of mine spoil and sandstone and shale are stable at slopes up to 70% (35°), the maximum observed. The stability and resistant of these slopes channeling and sliding may be due to partial cementation in a process analogous to caliche formation in sediments in arid or semi-arid climates.

The coal haulage road entering the mine canyon from U-139 in Gordon Creek will be cut in sandstone. This sandstone stands nearly vertical in natural exposures. No stability problems will result from completing the cut in accordance with regulations of IV:25H for cuts in consolidated materials.

The concrete ruins from past mining that lie along or near the haulage roadway could be disposed of by burial. Alternatively they could be used as silt barriers along the course of the present ephemeral stream bed.

The 40 foot radius curve about 1600 feet north of the mine canyon mouth, crosses an ephemeral drainage channel with culvert designed to withstand a 100 year, 24 hour precipitation event. The inlet and discharge ends will need to be rip-rapped to avoid bank erosion during spring runoff or heavy annual thunderstorms. Rock from the cut near the haulage road mouth could be used for this purpose and could be permitted to stand at a slope of IV:1·35H in accordance with regulations.

The uphill sides of cuts for Class I and II roads, mine portals and ancillary structures and buildings in the mine area may be cut at slopes of IV:.25H in the consolidated rock formations in accordance with regulations. The outslopes must meet a regulatory requirement of IV:2H (50%) and should be seeded as soon as completed even if watering is required, for the purpose of further reducing erosion and fostering slope stability.

The soil structure and the rock formations of the mine and road areas were studied carefully in relation to slope stability. The underlying rock formations do not show any signs of slopes that would slip with pressure changes due to construction of mine facilities and there are no springs or seeps to decrease slope stability. The soils at the site include a fair amount of sands and sandstone gravels and provide stable slopes under standard construction techniques.

In summary, sediment and soils stability should not be problems at the C & W mine site during mining or reclamation operations. This is due to the fact that natural slopes at the site are equal to or greater than slopes mandated by regulatory authorities for the various natural materials existing at the site.

Sidney W. Smith P.E./L.5420

March 4, 1980
Date

REGISTERED PROFESSIONAL ENGINEER
SIDNEY W. SMITH
STATE OF UTAH

ENGINEERING REPORT

by

SIDNEY W. SMITH P.E., L.S.

State of Utah

Department of Natural Resources

Division of Oil, Gas and Mining

1588 West North Temple

Salt Lake City, Utah

RE: Engineering Report - Consolidated Comments of UDOGM and OSM for the C&W No. 1 Mine, Carbon County, Utah

This letter is an answer to specific statements in the comments made for the C&W No. 1 Mine. The specific items are those that apply to the Civil Engineering of the project. Paragraph numbers refer, in order, to paragraphs under specific title and regulation number in the Consolidated Comments of UDOGM and OSM.

SURFACE WATER INFORMATION 783.16.

Paragraph 4.

Engineering experience has shown that a 12 inch culvert is the smallest practical culvert size from a maintenance standpoint. The Nomographs prepared by the National Corrugated Steel Pipe Association, in their technical manual, show that a 12 inch culvert carry 2.6 cfs to 3.0 cfs on a minimum slope of 5% and with end sections, with less than 1.25 head water (less than 3 inchs over crown of pipe). Experience also shows that a storm duration of less than 15 minutes is not necessary in that the storm is dissipated in local depressions and is too

short to do any damage to roadways. Therefore, we found that we do not need to delineate and calculate drainage areas less than 12 acres since a 12 inch culvert will provide ample capacity for drainage areas less than 12 acres.

As requested, we have delineated the drainage areas on Exhibit and the results of the calculations are as follows:

	C x	I x	A =	Q	D
		In/Hr	Acres	cfs	Culvert Size
Area A Upper Culvert 10 year 15 min. storm Triangle Ave Dimensions 600' x 1,000'	.2	1.25	7.0	1.75	12"
Area B Middle Culvert 10 year 15 min. storm Rectangle 600' x 750'	.2	1.25	10.3	2.6	12"
Area C Lower Culvert 10 year 15 min. storm Rectangle 600' x 750"	.2	1.25	10.3	2.6	12"

It is our opinion that the 12 inch culverts are large enough to carry the storm runoff.

Paragraph 5.

The hydrology of the surface runoff, showing total flow rate is shown, with flow rates for the various areas, in Table 1, Appendix A.

The upper 60" culvert south of the proposed bath house will be required to carry 112 cfs for a 1,000 year 15 min. storm. The downstream channel and slope is sufficient to insure no tailwater accumulation. The nomographs prepared by the "National Corrugated Steel Pipe Association" include the entrance

losses for a projecting pipe with no headwall, which is the worst case. The entrance loss coefficient Ke is 0.5. The 60" culvert is capable of carrying 115 cfs. Therefore, the 60" culvert provides for normal entrance and exit losses and a sizeable safety factory particularly in light of the 1,000 year 15 minute storm.

The middle 60" culvert next to the proposed substation has the same circumstances as above.

The lower 60" culvert on the North Fork drainage has a larger drainage area but also a longer critical duration time of 20 minutes. The 25 year 20 minute storm produces 101 cfs. The 60" culvert will carry more than this as shown above. The site grading is such that a headwater depth of two times the culvert diameter is reasonable and probable. The 60" culvert will carry 250 cfs with the double headwater depth. Therefore, the culvert and the projecting entrance will carry the design flows.

The 12" roadway culverts have been disucssed previously and their designs also include standard entrance losses.

The roadway culverts will drain onto riprap pads where the flows will be spread to slow the flows and reduce erosion. Wherever ditches are required the minimum cross section will be a V with side slopes two horizontal to one vertical or flatter. Wherever the channel slope exceeds 10% the channel will be covered with riprap to prevent erosion. A one foot deep ditch will carry over

4 cfs on a minimum slope of 1%. The minimum depth will be 16 inches. The channel realignment for the flows from the undisturbed areas will have a minimum cross section of four foot bottom width and side slopes that are two horizontal to one vertical or flatter. The minimum channel depth will be three feet. The minimum channel bottom slope will be .5% or greater. Whenever the bottom slope is greater than 1% the channel will be covered with riprap for erosion protection. This channel will carry a flow in excess of 100 cfs, which is more than ample with freebroad for the maximum 100 year 24 hour event.

No channel changes are expected for the North Fork drainage. Should changes be necessary the channel cross section used would be a six foot bottom width, side slopes two horizontal to one vertical and a four foot minimum depth. This channel will carry 150 cfs on minimum grade and three foot depth which is sufficient for the maximum 100 year 24 hour event.

All channel sections will be covered with 12" median size riprap except for minimum channel slopes. Channels with slopes over 15% will be covered with 18" median size riprap. Where channel slopes are steep the flow depth will be sufficiently shallow, that the riprap will dissipate the energy and prevent erosion. Riprap will also be provided at all culvert exit locations to provide erosion protection.

These channel capacities are computed using the Manning Equation with an "n" valve of .04.

Paragraph 6.

The oil skimmer and riser specifications were included on Land Group Drawing No. 4, except that the weir plate should be five feet in diameter and three feet high. The fiberglass manhole sections provide an easy economical installation that holds up well to freeze-thaw action and is easily replaceable. The four two inch holes are designed to release the retained water over a long period of time automatically at a maximum rate of .5 cfs total. An orifice "C" factor of .6 is assumed. The slow exit rate coupled with the permanent retention will provide more than the required 24 hour retention.

Should a storm larger than the 10 year 24 hour event occur or should the two inch drain holes become plugged, the water would overflow the riser. The riser will pass up to 10 cfs and still maintain the skimming action. The 12" "Armco Truss Pipe" between ponds has a recommended "n" valve of 0.009 and with the given head conditions will carry up to 10 cfs. Therefore, the riser and skimmer will carry two and one-half times the maximum 10 year flow rate and still remain operational.

OPERATIONAL PLAN: GENERAL REQUIREMENTS - 784.11.

Paragraph 2.

The retention pond cut slopes and embankment have been designed within the standards of the State and Federal Codes. The enclosed Detail Map shows the exterior slopes to be 2÷1 and the interior slopes are 3÷1. These slopes are stable and within

good design practice. The earthwork will be constructed according to the attached specifications.

The ponds are designed to be self operating. The only operation and maintenance required is the occasional removal of silt and debris. See reclamation plan for removal plans.

The roadway has been designed in accordance with the provisions of UMC Paragraphs 817.152 c&d, see the road profiles and the typical cross section shown on Enclosure 18, following this report. The road will also be constructed according to the attached earthwork specification.

Paragraph 5.

The sanitary wastewater disposal system will be designed to serve 30 people. The system will consist of a septic tank and drainfield. Plans will be submitted to the Southeast District Health Department prior to drainfield construction as some of the site excavation will be required to do proper percolation tests at the proposed location. Preliminary soil studies indicate that the expected percolation rate will be within acceptable limits. The drainfield will be relocated, if necessary, to find acceptable soils.

Paragraph 6.

The stream diversion will generally be an excavated channel as described previously and shown on details following this report. Wherever practical the steeper channel sections will be flattened. Riprap has been specified where necessary to

control erosion. Some banks may require fill which will be constructed according to the attached specifications. Very little maintenance is required for the diversion channels. The debris may need to be removed occasionally. Should some erosion occur then riprap would be added to repair the erosion. Restoration is addressed elsewhere. However, since native soils and rock are the construction materials, restoration will be simple. The channels to be relocated are dry intermittent channels without habitat dependent on flowing water. The affected drainage can be classed as ephemeral.

Paragraph 7.

The discharge structures are relatively small in size and discharge flow rates. The discharge point will commence within a riprap channel and sufficient riprap will be used to prevent erosion. Since the discharge is into a dry channel the hydrologic balance will not be upset and no additional mitigation measures should be necessary. Standard engineering practice will be used in ground layout and construction of all structures.

RECLAMATION PLAN: PROTECTION OF HYDROLOGIC BALANCE 784.14.

The Land Group Report details the runoff volumes and peak flows. The C factor used for undisturbed areas of .2 was selected from Table 21-16 of the "Standard Handbook for Civil Engineers" as being conservative since unimproved areas are listed as .10 to .30, lawn and grass areas were listed as .050

to .20. The C factor for the disturbed area was chosen as .70 which is conservative since railyards are listed as .2 to .4 and light industrial areas are listed as .5 to .8.

RECLAMATION PLAN - PONDS, IMPOUNDMENTS, BANKS, DAMS AND EMBANKMENTS 784.16.

The sedimentation ponds and embankments, the diversion facilities, and other drainage facilities and the roadways have been designed by an experienced competent engineer licensed in the State of Utah, see certification at the end of this report.

The ponds will be lined with a one foot thick layer of decomposed Mancos shale or a one foot thick layer of native fine silts with 2% bentonite. These treatments will provide near zero percolation from the ponds.

Cut-off collars have been added to the Land Group Plans which constitute final design of the sedimentation ponds, see new design following this report. Exact horizontal location may be adjusted slightly at the time of construction staking.

DIVERSIONS 784.22.

There are three small diversions to separate the runoff from undisturbed areas and route the undisturbed runoff around the disturbed areas. All three areas are less than 6.0 acres each. All three ditches will be constructed at minimum grades for most of their lengths and will have only short sections of

moderate grades where they enter the main channel. Riprap will be used wherever necessary to prevent erosion and particularly at steep sections and entrances to the main channel.

	C	x	I	x	A	=	Q
Area D North of the Bath House 10 year 15 min. storm	.2		1.25		5.5 acres		1.4 cfs
Area E South of Water Storage 10 year 15 min storm	.2		1.25		2.75 acres		.7 cfs
Area D	.2		1.25		3.2 acres		.8 cfs

These flows will be carried
10 year 15 min. storm

The ditch will be a simple V ditch with one vertical and two horizontal side slopes and a minimum of 16" deep. The V ditch will carry four cfs at 1% slope and one foot deep which provides ample capacity and freeboard. Riprap will be used in all areas where the slope exceeds 10%.

All diversions will carry the maximum 10 year 24 hour event and any permanent diversions will carry the maximum 100 year 24 hour event.

The diversion around ponds at the outlet of the lower pond are large enough to accommodate the maximum 100 year event which is far in excess of Section 817.46(4)(i) undisturbed area CZ .7, I=4, A=2.9, Q=8 cfs. The diversions are capable of 10 cfs. In addition, emergency spillways are provided that will carry even greater flows.

TRANSPORTATION FACILITIES 784.24.

Paragraph 1.

The roads have been designed under the supervision of a competent Registered Professional Engineer. (See State of Certification).

Paragraphs 3 and 4.

The typical cross section shown on Enclosure 18 notes that the cut and fill slopes are within the standards set by Section 817:150 to 817:152. Rock cuts will not exceed IV:0.25 horizontal.

Paragraph 5.

The roadway drainage is in compliance with 817:153 as noted earlier in this report.

ENGINEER'S CERTIFICATE

I hereby certify that I designed or supervised all of the designs and calculations represented in this report and the original application. The designs and calculations are in accordance with UMC regulations and Standard Engineering Practice. I am duly registered to practice engineering in the State of Utah and hold Utah License No. 3420.

Sidney W. Smith Date Aug. 18, 1981

Sidney W. Smith

REGISTERED PROFESSIONAL ENGINEER
No. 3420
SIDNEY W. SMITH
STATE OF UTAH

SIDNEY W. SMITH
PROFESSIONAL ENGINEER & LAND SURVEYOR
PHONE 867-5153 1206 NORTH MAIN FARMINGTON, UTAH 84025

Appendix A.

Material for engineered fills above water table should meet the following recommendations. The material should be granular, and free of organic materials and other delterious matter. The fines should have a plastic index less than 10 and meet the following limitations on gradations:

a.	Maximum size of particles	4 inch
b.	Retained on the 3/4" sieve	30% maximum
c.	Passing the No. 100 sieve	45% maximum
d.	Passing the No. 100 sieve	10% minimum
e.	Passing the No. 200 sieve	12% maximum

The grading shall be in accordance with ASTM C117 and C136. The subgrade shall be prepared by stripping topsoil, organic matter, rubbish and debris. The surface to receive fill shall be compacted so that the top six inches meets the specifications for compacted fill. Compacted fill or engineered fill shall be placed in layers not greater than 8 inches uncompacted and at a moisture content slightly drier than optimum moisture. Each layer shall be compacted to not less than 95% of the maximum density determined in accordance with ASTM Standard specifications D1557, for all fill under structures. Paved areas and others should be compacted to 92% of maximum density. Fill should not be placed when wet or frozen nor should it be placed on wet or frozen subgrade. All material sources should be approved by the soils engineer. Tests of the compacted soils should be made under the direction of a qualified soils engineer to insure proper compaction.

SIDNEY W. SMITH
PROFESSIONAL ENGINEER & LAND SURVEYOR
PHONE 867-5153 1206 NORTH MAIN FARMINGTON, UTAH 84025

Appendix B.

Materials for engineered fills below the water table should meet the following recommendations: The material should be granular, free draining and should be free of organic matter or other deleterious matter. The fine should have a plastic index less than 10 and meet the following limitations on gradation:

a.	Maximum particle size	12 inch
b.	Passing the 3/4" sieve	75% maximum
c.	Passing the 3/4" sieve	25% minimum
d.	Passing the 100 sieve	45% maximum
e.	Passing the 200 sieve	5% maximum

Some allowance can be made in the above gradation for good quality bank run gravel. What is desired is a coarse rock material with enough finer portions to fill all the big voids but to allow for a free movement of water.

A layer of fill just thick enough to support equipment should be placed and worked until a firm surface is developed or until any soft existing soil is squeezed into the voids in the fill. Material can then be added in 6 to 12 inch layers, each layer being compacted and worked until a firm, unyielding surface is developed. When the level of the water table is reached then engineered fills for above the water table and footings must be placed on firm unyielding surfaces. The water should be removed from the excavation until after the fill is placed and compacted. All material sources should be approved by the soils engineer. Tests of the compacted soils should be made under the direction of a qualified soils engineer to insure proper compaction.

SIDNEY W. SMITH
PROFESSIONAL ENGINEER & LAND SURVEYOR
PHONE 867-5153 1206 NORTH MAIN FARMINGTON, UTAH 84025

Appendix C.

Materials and workmanship for engineered fills should be modified as described below when they are placed on ground too soft to support equipment, particularly below the water table.

A compaction base should be established by placing a layer of cobble rock several inches thick over the bottom of the excavation. This layer should be just thick enough to support the equipment without difficulty. The layer should then be worked with compaction equipment until the cobbles are worked into the soft soils in such a manner that the void in the cobbles are filled with soil. The excavations should be free from water during the process, and work should proceed in such a manner that proper drainage is maintained and mud does not develope. The cobbles should be as large as practical (up to 12 inches) and should be free from moisture or fines.

All material sources and workmanship should be approved by the soils engineer.

After a compaction base is established then the placement of engineered fill should proceed according to the recommendations of the applicable appendix A or B.

APPENDIX 5

SOILS REPORTS

SOIL SURVEY AND INTERPRETATIONS
VEGETATION SURVEY
for
C & W Coal Producers
May 19, 1980

George Cook, Range Conservationist
Earl Jensen, Soil Scientist
Gary Moreau, District Conservationist

The proposed C & W Coal Producers Mine area is located at Consumers, Utah in Western Carbon County. At the request of Joe Harvey representing C & W Coal Producers and the Price River Watershed Soil Conservation District, the Soil Conservation Service performed a detailed soil survey and vegetation inventory on the proposed mining site. The survey was designed to comply with the Permanent Regulatory Program, Office of Surface Mining Reclamation and Enforcement, Department of Interior.

The survey covers approximately six acres near Consumers, Utah in Section 17, T.13S.,R.8E.,SLBM. The soils are shown on the attached map. Each soil is identified with a three letter symbol, and the pattern and extent denoted by the soil boundary lines on the map. All areas having the same symbol are essentially the same kinds of soils. There may be small areas of included soils that are slightly different. When the overall county survey is completed, small areas may become inclusions in other map units. None of the soils have been correlated and some of them have not been named. The soils that have not been named are outside the range in characteristics for existing series and thus investigation does not supply adequate information for new series. Following the soil descriptions is a table pointing out limitations of the soils for a variety of uses.

The vegetation was analyzed using the range site methods of the Soil Conservation Service. Range sites are shown on the attached map. Present vegetation was inventoried in the fall of 1979 and spring of 1980 and recorded by percentage air dry weight. Where available potential vegetation was presented for range site description with potential productivity according to favorable and unfavorable precipitation years.

More detailed information is on file in the Price Field Office of the Soil Conservation Service.

SOIL LEGEND

Soil Symbol	Soil Mapping Unit Name
FIA	FIA loam, 0 to 1 percent slopes
GIG	Macar Variant, very bouldery loam, 55 to 65 percent slopes
HIG	HI silt loam, 50 to 70 percent slopes
JIB	Brycan loam, 4 to 6 percent slopes
DM	Mine Dumps

DESCRIPTIONS OF THE SOILS

FIA FI loam, 0 to 1 percent slopes

This FI soil is very deep and somewhat poorly drained. It occurs in the pond areas at elevations of about 2,342 meters (7,680 feet). This soil formed in alluvium derived mainly from sandstone and shale.

The average annual precipitation is 16 to 20 inches. Mean annual air temperature is 5 to 6 degrees C. (41 to 43 degrees F.), mean annual soil temperature is 6 to 7 degrees C. (43 to 45 degrees F.), and the average freeze-free season is 60 to 70 days. This soil occurs in the pond area back of the coal dike. Slopes are 0 to 1 percent.

Vegetation is dominantly salina wildrye, muttongrass, and western wheatgrass.

Included in mapping are small areas of a soil with 61 to 97 centimeters (24 to 38 inches) of dark brown loam underlain by very gravelly loamy sand. This soil is on side fans and flood plains of 1 to 4 percent slopes. Also, the FI soil, back of the old rock dam, has about 10 to 15 percent coal and rock fragments that are about .1 to 15 centimeters (¼ to 6 inches) in size.

In a typical profile the surface layer is pale brown loam about 38 centimeters (15 inches) thick. The underlying material is pale brown loam about 64 centimeters (25 inches) thick. The next layer is brown loam

about 51 centimeters (20 inches) thick. The 0 to 102 centimeters (0 to 40 inch) layers have 5 to 8 centimeters (2 to 3 inch) layers of silty clay loam; and the 51 to 152 centimeters (20 to 60 inch) layer has common distinct mottles. This area is flooded frequently and the water table is at about .6 meters (2 feet) at times.

Permeability is slow. Available water capacity is high, [25 centimeters (10 inches)/profile]. Organic matter content in the surface layer is low (1 to 3 percent). Effective rooting depth is about 152 centimeters (60 inches). Surface runoff is very slow and erosion hazard is slight as long as the coal dike is holding.

Erodibility is moderate. This soil is used for wildlife habitat.

Taxonomic classification is fine-loamy mixed (calcareous) Aquic Ustifluvents.

A typical pedon of FI loam, 0 to 1 percent slopes was described in the pond area in the drainage at a point about 653 meters (2,140 feet) north 30 meters (100 feet) east of the south ¼ corner of Section 17, T.13S.,R.8E.

C_1 — 0 to 38 centimeters (0 to 15 inches); pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; 5 to 8 centimeters (2 to 3 inch) layers of silty clay loam; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.0).

C_2 -- 38 to 102 centimeters (15 to 40 inches); pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; few distinct strong brown (7.5YR 5/6) mottles; soft, friable, slightly sticky and slightly plastic; 5 to 8 centimeter (2 to 3 inch) layer of silty clay loam; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.0).

A_{1b} — 102 to 152 centimeters (40 to 60 inches); brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) when moist; common distinct strong brown (7.5YR 5/6) mottles; soft, friable, slightly sticky and slightly plastic; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.0).

GIG Macar Variant very bouldery loam, 55 to 65 percent slopes.

This Macar Variant soil is very deep and well drained. It occurs on mountain sideslopes at elevations of 2,333 to 2,379 meters (7,650 to 7,800 feet). This soil formed in local alluvium and residuum derived mainly from sandstone over shale.

The average annual precipitation is 41 to 51 centimeters (16 to 20 inches). Mean annual air temperature is 5 to 6 degrees C. (41 to 43 degrees F.), mean annual soil temperature is 6 to 7 degrees C. (43 to 45 degrees F.), and the average freeze-free season is 60 to 70 days. This soil occurs in the area of the abandoned mines on the north exposure south of the drainage.

Slopes are 55 to 65 percent and north facing. They are medium in length and even in shape.

Vegetation is dominantly salina wildrye and snowberry.

Included in mapping are small areas of rock outcrop (2 percent).

In a typical profile the surface layer is brown, very bouldery loam about 18 centimeters (7 inches) thick. The subsoil is brown, cobbly fine sandy loam about 36 centimeters (14 inches) thick. The upper substratum is pale brown, stony fine sandy loam about 23 centimeters (9 inches) thick. The lower substratum is gray and pale yellow, clay loam and silty clay loam about 89 centimeters (35 inches) thick. The 76 to 152 centimeter (30 to 60 inch) layer has shale fragments that slake in water.

Permeability is moderately rapid to a depth of 76 centimeters (30 inches) and moderately slow below. Available water capacity is moderate (14 centimeters (5.5 inches)/profile). Organic matter content in the surface layer is low (1 to 3 percent). Effective rooting depth is about 165 centimeters (65 inches). Surface runoff is rapid and erosion hazard is moderate under potential native vegetation and high if vegetation is removed and the soil is left bare. Erodibility is moderate. This soil is used for wildlife habitat and range.

Taxonomic classification is fine-loamy, mixed, frigid, Typic Ustochrepts. This unnamed soil is similar to the Macar series except it has 15 to 20 percent rock fragments in the 25 to 102 centimeter (10 to 40 inch) layer and lacks the horizons of carbonate accumulation and segregation.

A typical pedon of Macar Variant very bouldery, fine sandy loam, 55 to 65 percent slopes was described about 455 meters (1,500 feet) N.E. of the North Fork of Gordon Creek, on the south side of an unnamed drainage, by an abandoned mine, 670 meters (2,200 feet) north and 670 meters (2,200 feet) west of the S.E. corner Section 17, T.13S.,R.8E.

A_1 — 0 to 18 centimeters (0 to 7 inches); brown (7.5YR 5/4) very bouldery fine sandy loam, brown (7.5YR 4/2) when moist; moderate medium granular structure; loose, nonsticky and nonplastic; many very fine and fine roots; 10 percent gravel, 10 percent cobble and 1 percent boulder; mildly alkaline (pH 7.8); clear, wavy boundary.

B_2 — 18 to 53 centimeters (7 to 21 inches); brown (7.5YR 5/4) cobbly fine sandy loam, brown (7.5YR 4/4) when moist; weak medium subangular blocky structure that parts to moderate medium granular; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; 10 percent gravel, 10 percent cobble and 1 percent boulder; moderately alkaline (pH 8.2): clear, wavy boundary.

C_1 — 53 to 76 centimeters (21 to 30 inches);pale brown (10YR 6/3) stony fine sandy loam, grayish brown (10YR 5/2) when moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; 15 percent gravel, 5 percent cobble and 10 percent stone; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); abrupt, wavy boundary.

II C_2 — 76 to 102 centimeters (30 to 40 inches); gray (10YR 6/1) clay loam, gray (10YR 5/1) when moist; shale structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; shale fragments slake in water; strongly alkaline (pH 8.6); abrupt, wavy boundary.

III C_3 — 102 to 165 centimeters (40 to 50 inches); pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) when moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.8).

The Macar Variant soils differ from the Macar series because it lacks a horizon of carbonate accumulation.

HIG <u>HI silt loam, 60 to 70 percent slopes</u>.

This HI soil is very deep and well drained. It occurs on very steep mountain slopes at elevations of 2,300 to 2,438 meters (7,600 to 8,000 feet). This soil formed in colluvium derived mainly from sandstone and shale.

The average annual precipitation is 41 to 51 centimeters (16 to 20 inches). Mean annual air temperature is 5 to 6 degrees C. (41 to 43 degrees F.), mean annual soil temperature is 6 to 7 degrees C. (43 to 45 degrees F.), and the average freeze-free season is 60 to 70 days. This soil occurs in the area of the drill test site.

Slopes are 50 to 70 percent and north facing. They are medium in length and concave-convex in shape.

Vegetation is dominantly oak, salina wildrye, and white fir.

Included in mapping are small areas of rock outcrop on 70 to 80 percent slopes.

In a typical profile the surface layer is grayish brown silt loam and dark grayish brown loam about 48 centimeters (19 inches) thick. The subsurface is very pale brown clay loam, about 28 centimeters (11 inches) thick. The subsoil is pale brown gravelly silty clay loam and light yellowish brown. Cobbly silty clay loam to a depth of more than 152 centimeters (60 inches).

Permeability is moderately slow. Available water capacity is 23 to 25 centimeters (9 to 10 inches). Organic matter content in the surface layer is 3 to 5 percent. Effective rooting depth is more than 152 centimeters (60 inches). Surface runoff is rapid and erosion hazard is moderate under potential native vegetation and very high if vegetation is removed and the soil is left bare. Erodibility is moderate. This soil is used for range and wildlife habitat.

Taxonomic classification is fine-loamy, mixed, Pachic Argiborolls. This unnamed soil is similar to the Detra Series except for hue of 10YR in the B_2t horizon.

A typical pedon of HI silt loam, 60 to 70 percent slopes was described near the drill hole on the east part of the survey at a point about 707 meters (2,320 feet) south and 213 meters (700 feet) east of the north ¼ corner of Section 17, T.13S.,R.8E.

O_2 — 3 to 0 centimeters (1 to 0 inches);duff (decomposed leaves and twigs).

A_{11} — 0 to 23 centimeters (0 to 9 inches), grayish brown (10YR 5/2) silt loam; very dark grayish brown (10YR 3/2) when moist; moderate medium granular structure; soft, friable, sticky and slightly plastic; many fine to coarse roots; 5 percent gravel; slightly calcareous; mildly alkaline (pH 7.4); clear, smooth boundary.

A_{12} — 23 to 48 centimeters (9 to 19 inches); dark grayish brown (10YR 4/2) loam; very dark grayish brown (10YR 3/2) when moist; weak medium subangular blocky structure that parts to moderate medium granular; very hard, very firm, sticky and plastic; many fine to coarse roots; common fine pores; 5 percent gravel; neutral reaction (pH 6.8); clear smooth boundary.

$B_{21}t$ — 48 to 76 centimeters (19 to 30 inches); pale brown (10YR 6/3) clay loam; brown (10YR 4/3) when moist; moderate medium subangular blocky structure; very hard, very firm sticky and plastic; common fine to coarse roots; common fine pores; few thin clay films in pores; 10 percent gravel; neutral reaction (pH 6.8); clear, smooth boundary.

$B_{22}t$ — 76 to 127 centimeters (30 to 50 inches); pale brown (10YR 6/3) gravelly silty clay loam; dark grayish brown (10YR 4/2) when moist; strong medium and coarse subangular blocky structure; extremely hard, extremely firm, sticky and plastic; few fine and medium roots; few fine pores; many moderately thick clay films on faces of peds; 15 percent gravel and 5 percent cobblestone; neutral reaction (pH 6.8); abrupt, wavy boundary.

$B_{23}t$ — 127 to 160 centimeters (50 to 63 inches); light yellowish brown (10YR 6/4) cobbly silty clay loam; brown (10YR 5/3) when moist; strong medium and coarse subangular blocky structure; extremely hard, extremely firm, sticky and plastic; few fine roots; few fine pores; many moderately thick clay films on faces of peds; 15 percent gravel, 15 percent cobblestone; mildly alkaline (pH 7.4).

JIB <u>Brycan loam, 4 to 6 percent slopes</u>.

This Brycan soil is very deep and well drained. It occurs on alluvial fans in valley bottoms at elevations of 2,329 meters (7,640 feet). This soil formed in alluvium derived mainly from sandstone and shale.

The average annual precipitation is 41 to 51 centimeters (16 to 20 inches). Mean annual air temperature is 5 to 6 degrees C. (41 to 43 degrees F.), mean annual soil temperature is 6 to 7 degrees C. (43 to 45 F.), and the average freeze-free season is 60 to 70 days. This soil occurs below the coal dike.

Slopes are 4 to 6 percent and on all aspects. They are short in length and concave-convex in shape.

Vegetation is dominantly big sagebrush and rabbitbrush.

In a typical profile the surface layer is brown loam about 71 centimeters (28 inches) thick. The underlying layer is pale brown silty clay loam and loam about 41 centimeters (16 inches) thick. The next layer is pale brown sandy clay loam and silty clay loam to a depth of more than 145 centimeters (57 inches).

Permeability is slow. Available water capacity is 27 centimeters (10.5 inches). Organic matter content in the surface layer is 3 to 5 percent. Effective rooting depth is about 152 centimeters (60 inches). Surface runoff is medium and erosion hazard is moderate under potential native vegetation and high if vegetation is removed and the soil is left bare. Erodibility is moderate.

A typical pedon of Brycan loam, 4 to 6 percent slopes was described on the fan below the coal dike, 625 meters (2,050 feet) north and 45 meters (150 feet) west of the south ¼ corner of Section 17, T.13S.,R.8E.

A_{11} — 0 to 15 centimeters (0 to 6 inches); brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) when moist; hard, firm, slightly sticky, plastic, mildly alkaline (pH 7.8).

A_{12} — 15 to 71 centimeters (6 to 28 inches); brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) when moist; mildly alkaline (pH 7.8).

C_1 — 71 to 91 centimeters (28 to 36 inches); pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) when moist; mildly alkaline (pH 7.8).

C_2 — 91 to 112 centimeters (36 to 44 inches); light yellowish brown (10YR 6/4) loam, dark brown (10YR 3/3) when moist; mildly alkaline (pH 8.0).

A_{1b} — 112 to 119 centimeters (44 to 47 inches); yellowish brown (10YR 5/4) loam, very dark grayish brown (10YR 3/2) when moist; mildly alkaline (pH 7.8).

C_3 — 119 to 145 centimeters (47 to 57 inches); pale brown (10YR 6/3) sandy clay loam and silty clay loam, stratified, brown (10YR 5/3) when moist; mildly alkaline (pH 7.8).

DM <u>Mine Dumps</u>

These are piles of waste rock and coal from abandoned coal mines. This material consists mostly of coal, hard shale and sandstone fragments. The fragments are about 1 to 18 centimeters (½ to 7 inches) in size and angular in shape.

Most of this material is not vegetated at the present time. Some areas have a 15 to 20 centimeter (6 to 8 inch) surface layer of mixed soil and fragments. These areas have sparse vegetation of snowberry, salina wildrye, rabbitbrush and some annuals.

Glossary

Alluvium--Soil materials, such as sand, silt, or clay and rock fragments that have been deposited on land by streams or moved and redeposited due to the surface movement of water.

Boulders--Rock fragments greater than 3 feet in diameter.

Colluvium--Soil materials and rock fragments moved and redeposited primarily under the influence of gravity.

Depth, soil--In this report the following terms and their meanings are used to describe the depth of the soil over bedrock:

very deep	More than 60"
deep	40-60"
moderately deep	20-40"
shallow	10-20"

Gravel--Rock fragments from 2 millimeters to 3 inches in diameter.

Leaching--The removal of soluble material from soils or other material by percolating water.

Pedon--A three dimensional unit with its lateral dimension being the smallest size necessary to represent the variability in soil properties of the soil being described.

pH value--a numerical means of designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value--alkalinity; and lower value--acidity.

Residuum--Soil materials weathered from the parent material in place.

Stones--Rock fragments between 10 inches and 3 feet in diameter.

Soil Analysis

Two collecting trips were made to take soil samples. The first trip was in April 1981, the second in August 1981. The first group of soils (numbers 1-10) the following physical and chemical tests and their respective symbols are as follows: (1) Calcium (CaSol. %), (2) conductivity (umhos/cm), (3) magnesium (Mg %), (4) nitrogen (N %), (5) phosphorus (P %), (5) potassium (K %), (6) sodium absorption ratio (SAR), (7) sodium (Na %) and pH units. See Table 1 for the results of these analyses.

A few more tests and different units were used for the analyses of the second group of soils (numbers 11-24). The tests taken and their respective units and symbols are as follows: (1) phosphorus (ppm P), (2) potassium (ppm K), (3) nitrogen (% N), (4) lime (% lime), (5) pH units (pH), (6) conductivity (Ec x 10^3), (7) sodium absorption ratio (SAR), (8) sand (% sand), (9) silt (% silt), (10) clay (% clay), (11) texture class (texture) and (12) total acidity (meq/100g H+). The results for these soils are listed.

Table 4

SOIL LABORATORY REPORT FOR C & W NO. 1 MINE.*

Sample	ppm P	ppm K	% N	% Lime	pH	Ec$\times 10^3$	SAR	% Sand	% Silt	% Clay	meq/100g H+	Texture
11S**	4.3	83.2	.087	25.0	8.5	.63	.55	28.5	50.7	20.8	.75	Silt Loam
12T***	8.4	320	.142	14.4	7.8	.65	.10	36.2	34.7	29.1	1.75	Clay loam
14T	8.4	376	.155	9.8	7.5	.94	.11	35.4	33.5	31.1	23.80	Clay Loam
15T	6.7	328	.196	5.5	7.4	1.26	.10	30.7	37.8	31.5	1.25	Clay Loam
16T	11.2	310	.143	2.8	6.7	1.18	.11	66.0	20.2	13.8	16.60	Sandy Loam
17T	7.2	334	.153	7.5	7.6	.69	.13	31.0	28.5	41.5	3.00	Clay
18T	12.8	290	.170	4.2	7.3	1.24	.17	37.4	37.5	25.1	14.50	Loam
19S	5.4	110	.039	14.4	7.9	.49	.19	17.4	55.5	27.1	2.25	Silt Loam
20T	25.7	318	.212	6.5	7.6	1.04	.09	36.7	40.2	23.1	12.80	Loam
21T	21.1	416	.129	3.5	7.3	1.29	.10	45.4	35.5	19.1	.50	Loam
22T	15.2	99.2	.312	5.1	7.6	.76	.12	73.4	17.5	9.1	4.50	Sandy Loam
23T	27.0	523	.212	6.3	7.6	1.46	.11	43.4	35.5	21.1	45.0	Loam
24T	17.9	101	.128	6.0	7.9	.69	.13	73.4	17.5	9.1	38.3	Sandy Loam

* Soil analyses done at BRIGHAM YOUNG UNIVERSITY SOIL LABORATORY, Provo, Utah.

** S = Subsoil

*** T = Topsoil

Table 3

SOIL LABORATORY REPORT FOR THE C & W NO. 1 MINE.*

Sample	Ca Sol.%	umhos/ cm	Mg%	N%	P%	K%	SAR	Na%	pH
1	.025	190	.014	.250	.032	.051	24.496	.195	8.10
2	.035	158	.018	.188	.025	.055	17.546	.162	9.10
3	.022	144	.020	.086	.015	.066	13.511	.115	9.20
4	.029	180	.025	.211	.023	.049	9.876	.095	9.20
5	.024	164	.022	.178	.030	.037	15.709	.140	9.10
6	.025	174	.010	.125	.022	.037	5.139	.038	9.10
7	.040	28	.012	.095	.014	.050	4.506	.040	9.10
8	.032	150	.020	.150	.010	.044	3.782	.035	9.10
9	.030	140	.024	.124	.016	.050	11.488	.110	8.60
10	.033	155	.023	.285	.022	.039	15.515	.150	8.30

* Soil analyses at FORD CHEMICAL LABORATORY, INC., Salt Lake City, Utah.

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Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#1 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116704

pH	8.0	units
Electrical conductivity	1.07	mmhos/cm
Saturation %	29.6	
PARTICLE SIZE:		
% Sand	80.1	
% Silt	9.4	
% Clay	10.5	
SOLUBLE CATIONS:		
Calcium	4.43	meq/l
Magnesium	2.49	meq/l
Sodium	2.93	meq/l
Sodium Adsorption Ratio	1.57	
Total Nitrogen	0.27	%
Nitrate-nitrogen	0.37	mg/kg
Organic carbon	2.75	%
Rock fragments	50.5	%
Available water capacity*	31.5	(1/3)
(%ATM)	16.7	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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Manager, Huntington Laboratory

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#1 15-30
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116705

pH	7.8	units
Electrical conductivity	1.25	mmhos/cm
Saturation %	26.2	
PARTICLE SIZE:		
% Sand	51.5	
% Silt	32.7	
% Clay	15.8	
SOLUBLE CATIONS:		
Calcium	4.93	meq/l
Magnesium	3.33	meq/l
Sodium	0.46	meq/l
Sodium Adsorption Ratio	0.23	
Total Nitrogen	0.25	%
Nitrate-nitrogen	0.35	mg/kg
Organic carbon	2.65	%
Rock fragments	70.5	%
Available water capacity*	29.2	(1/3)
(%ATM)	14.5	(15)

(*analysis by Utah State Univ.)

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#1 30-45
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116706

pH	7.8	units
Electrical conductivity	1.08	mmhos/cm
Saturation %	28.8	
PARTICLE SIZE:		
% Sand	53.9	
% Silt	33.4	
% Clay	12.7	
SOLUBLE CATIONS:		
Calcium	5.99	meq/l
Magnesium	3.90	meq/l
Sodium	2.72	meq/l
Sodium Adsorption Ratio	1.22	
Total Nitrogen	0.19	%
Nitrate-nitrogen	0.36	mg/kg
Organic carbon	2.80	%
Rock fragments	61.3	%
Available water capacity*	27.5	(1/3)
(%ATM)	12.7	(15)

(*analysis by Utah State Univ.)

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#2 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116707

pH	7.7	units
Electrical conductivity	0.71	mmhos/cm
Saturation %	24.5	
PARTICLE SIZE:		
% Sand	47.2	
% Silt	37.0	
% Clay	15.8	
SOLUBLE CATIONS:		
Calcium	3.72	meq/l
Magnesium	1.32	meq/l
Sodium	0.94	meq/l
Sodium Adsorption Ratio	0.59	
Total Nitrogen	0.26	%
Nitrate-nitrogen	0.07	mg/kg
Organic carbon	8.13	%
Rock fragments	6.2	%
Available water capacity*	17.2	(1/3)
(%ATM)	9.8	(15)

(*analysis by Utah State Univ.)

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#2 15-30
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116708

pH	7.7	units
Electrical conductivity	0.7	mmhos/cm
Saturation %	25.0	
PARTICLE SIZE:		
% Sand	60.8	
% Silt	30.9	
% Clay	8.3	
SOLUBLE CATIONS:		
Calcium	4.05	meq/l
Magnesium	1.50	meq/l
Sodium	2.93	meq/l
Sodium Adsorption Ratio	1.76	
Total Nitrogen	0.23	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	6.95	%
Rock fragments	12.4	%
Available water capacity*	17.9	(1/3)
(%ATM)	9.4	(15)

(*analysis by Utah State Univ.)

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#2 30-45
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116709

pH	7.8	units
Electrical conductivity	0.68	mmhos/cm
Saturation %	26.2	
PARTICLE SIZE:		
% Sand	68.1	
% Silt	27.1	
% Clay	4.8	
SOLUBLE CATIONS:		
Calcium	4.32	meq/l
Magnesium	1.49	meq/l
Sodium	0.90	meq/l
Sodium Adsorption Ratio	0.53	
Total Nitrogen	0.15	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	17.91	%
Rock fragments	12.1	%
Available water capacity*	11.2	(1/3)
(%ATM)	6.7	(15)

(*analysis by Utah State Univ.)

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Blue Blaze Coal Co.
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#3 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116710

pH	7.8	units
Electrical conductivity	0.84	mmhos/cm
Saturation %	23.7	
PARTICLE SIZE:		
% Sand	50.0	
% Silt	37.5	
% Clay	12.5	
SOLUBLE CATIONS:		
Calcium	6.13	meq/l
Magnesium	1.16	meq/l
Sodium	0.99	meq/l
Sodium Adsorption Ratio	0.52	
Total Nitrogen	0.15	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	2.51	%
Rock fragments	26.2	%
Available water capacity*	16.1	(1/3)
(%ATM)	7.1	(15)

(*analysis by Utah State Univ.)

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#3 15-30
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116711

pH	7.8	units
Electrical conductivity	0.8	mmhos/cm
Saturation %	22.4	
PARTICLE SIZE:		
% Sand	57.9	
% Silt	33.7	
% Clay	8.4	
SOLUBLE CATIONS:		
Calcium	4.94	meq/l
Magnesium	0.45	meq/l
Sodium	2.42	meq/l
Sodium Adsorption Ratio	1.48	
Total Nitrogen	0.11	%
Nitrate-nitrogen	0.06	mg/kg
Organic carbon	1.87	%
Rock fragments	31.4	%
Available water capacity*	13.4	(1/3)
(%ATM)	6.4	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#3 30-45
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116712

pH	7.8	units
Electrical conductivity	0.59	mmhos/cm
Saturation %	24.3	
PARTICLE SIZE:		
% Sand	59.6	
% Silt	30.3	
% Clay	10.1	
SOLUBLE CATIONS:		
Calcium	3.31	meq/l
Magnesium	0.37	meq/l
Sodium	1.26	meq/l
Sodium Adsorption Ratio	0.93	
Total Nitrogen	0.11	%
Nitrate-nitrogen	0.08	mg/kg
Organic carbon	1.60	%
Rock fragments	24.5	%
Available water capacity*	13.4	(1/3)
(%ATM)	6.1	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#3 45-75
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116713

pH	7.8	units
Electrical conductivity	0.64	mmhos/cm
Saturation %	21.3	
PARTICLE SIZE:		
% Sand	49.3	
% Silt	59.5	
% Clay	10.2	
SOLUBLE CATIONS:		
Calcium	3.82	meq/l
Magnesium	1.26	meq/l
Sodium	0.60	meq/l
Sodium Adsorption Ratio	0.38	
Total Nitrogen	0.09	%
Nitrate-nitrogen	0.08	mg/kg
Organic carbon	1.20	%
Rock fragments	26.90	%
Available water capacity*	13.6	(1/3)
(%ATM)	6.3	(15)

(*analysis by Utah State Univ.)

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P.O. Box 784
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#4 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116714

pH	8.1	units
Electrical conductivity	0.62	mmhos/cm
Saturation %	22.8	
PARTICLE SIZE:		
% Sand	58.8	
% Silt	33.8	
% Clay	7.4	
SOLUBLE CATIONS:		
Calcium	7.80	meq/l
Magnesium	1.62	meq/l
Sodium	0.64	meq/l
Sodium Adsorption Ratio	0.29	
Total Nitrogen	0.15	%
Nitrate-nitrogen	0.10	mg/kg
Organic carbon	2.18	%
Rock fragments	27.2	%
Available water capacity*	15.1	(1/3)
(%ATM)	6.8	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#5 15-30
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116716

pH	8.1	units
Electrical conductivity	0.6	mmhos/cm
Saturation %	23.8	
PARTICLE SIZE:		
% Sand	56.7	
% Silt	63.7	
% Clay	7.0	
SOLUBLE CATIONS:		
Calcium	3.17	meq/l
Magnesium	0.86	meq/l
Sodium	0.57	meq/l
Sodium Adsorption Ratio	0.40	
Total Nitrogen	0.16	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	1.99	%
Rock fragments	24.10	%
Available water capacity*	16.7	(1/3)
(%ATM)	7.3	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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Blue Blaze Coal Co.
P.O. Box 784
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#5 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116715

pH	7.2	units
Electrical conductivity	0.59	mmhos/cm
Saturation %	24.5	
PARTICLE SIZE:		
% Sand	57.9	
% Silt	33.7	
% Clay	8.4	
SOLUBLE CATIONS:		
Calcium	7.72	meq/l
Magnesium	3.81	meq/l
Sodium	0.33	meq/l
Sodium Adsorption Ratio	0.14	
Total Nitrogen	0.15	%
Nitrate-nitrogen	0.18	mg/kg
Organic carbon	2.18	%
Rock fragments	27.2	%
Available water capacity*	17.8	(1/3)
(%ATM)	8.9	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#6 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116717

pH	7.6	units
Electrical conductivity	0.65	mmhos/cm
Saturation %	24.4	
PARTICLE SIZE:		
% Sand	62.5	
% Silt	31.4	
% Clay	6.1	
SOLUBLE CATIONS:		
Calcium	6.12	meq/l
Magnesium	1.25	meq/l
Sodium	0.28	meq/l
Sodium Adsorption Ratio	0.15	
Total Nitrogen	0.12	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	2.48	%
Rock fragments	77.3	%
Available water capacity*	13.9	(1/3)
(%ATM)	6.6	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#7 0-15
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116718

pH	7.8 units
Electrical conductivity	0.64 mmhos/cm
Saturation %	24.9
PARTICLE SIZE:	
% Sand	61.2
% Silt	27.7
% Clay	11.1
SOLUBLE CATIONS:	
Calcium	5.16 meq/l
Magnesium	0.93 meq/l
Sodium	0.30 meq/l
Sodium Adsorption Ratio	0.17
Total Nitrogen	0.27 %
Nitrate-nitrogen	0.06 mg/kg
Organic carbon	7.70 %
Rock fragments	70.0 %
Available water capacity*	17.6 (1/3)
(%ATM)	7.6 (15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#7 15-30
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116719

pH	7.7	units
Electrical conductivity	0.24	mmhos/cm
Saturation %	23.4	
PARTICLE SIZE:		
% Sand	64.6	
% Silt	24.9	
% Clay	10.5	
SOLUBLE CATIONS:		
Calcium	1.54	meq/l
Magnesium	2.33	meq/l
Sodium	0.57	meq/l
Sodium Adsorption Ratio	0.41	
Total Nitrogen	0.05	%
Nitrate-nitrogen	0.05	mg/kg
Organic carbon	0	%
Rock fragments	12.7	%
Available water capacity*	18.5	(1/3)
(%ATM)	8.4	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#7 30-45
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116720

pH	7.4 units
Electrical conductivity	0.73 mmhos/cm
Saturation %	17.2
PARTICLE SIZE:	
% Sand	64.4
% Silt	25.5
% Clay	10.1
SOLUBLE CATIONS:	
Calcium	3.89 meq/l
Magnesium	2.43 meq/l
Sodium	0.89 meq/l
Sodium Adsorption Ratio	0.50
Total Nitrogen	0.12 %
Nitrate-nitrogen	0.05 mg/kg
Organic carbon	1.81 %
Rock fragments	9.8 %
Available water capacity*	20.5 (1/3)
(%ATM)	10.2 (15)

(*analysis by Utah State Univ.)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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FAX: (801) 653-2479

Blue Blaze Coal Co.
P.O. Box 784
Price, UT 84501

June 25, 1990

		Sample identification by
Kind of sample reported to us	Soil	
Sample taken at	----------	#7 45-75
Sample taken by	----------	
Date sampled	----------	
Date received	----------	

Analysis report no. 59-116721

pH	7.1	units
Electrical conductivity	2.44	mmhos/cm
Saturation %	23.1	
PARTICLE SIZE:		
% Sand	69.5	
% Silt	20.3	
% Clay	10.2	
SOLUBLE CATIONS:		
Calcium	18.37	meq/l
Magnesium	3.64	meq/l
Sodium	1.50	meq/l
Sodium Adsorption Ratio	0.45	
Total Nitrogen	0.13	%
Nitrate-nitrogen	0.06	mg/kg
Organic carbon	0.73	%
Rock fragments	6.9	%
Available water capacity*	17.7	(1/3)
(%ATM)	8.9	(15)

(*analysis by Utah State Univ.)

Respectfully submitted,
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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

No. 8
0-12 Inches

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

Analysis report no. 59-126546

ACID BASE POTENTIAL

Neutralization Potential	129.8	tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	3.1	tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	126.7	tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 8452[illegible]
TELEPHONE: (801) 653-2311
FAX: (801) 653-247[illegible]

February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

No. 8
10-11 Feet

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

Analysis report no. 59-126547

ACID BASE POTENTIAL

Neutralization Potential	70.4	tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	7.9	tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	62.5	tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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FAX: (801) 653-2479

February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

No. 9A
0-3 Feet Above

Analysis report no. 59-126548

ACID BASE POTENTIAL

Neutralization Potential	134.40 tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	.01 tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	134.39 tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
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FAX: (801) 653-2479

February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

No. 9B
0-3 Feet Below

Analysis report no. 59-126549

ACID BASE POTENTIAL

Neutralization Potential	76.4	tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	3.3	tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	73.1	tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
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February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

No. 10A
0-3 Feet Above

Analysis report no. 59-126550

ACID BASE POTENTIAL

Neutralization Potential	59.46 tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	.03 tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	59.43 tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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February 22, 1991

BLUE BLAZE COAL COMPANY
BOX 784
PRICE UT 84501

Sample identification by
BLUE BLAZE COAL COMPANY

Kind of sample reported to us: Dirt

Sample taken at: Blue Blaze

Sample taken by: Blue Blaze

Date sampled: ------

Date received: February 11, 1991

No. 10B
0-3 Feet Below

Analysis report no. 59-126551

ACID BASE POTENTIAL

Neutralization Potential	6.00 tons $CaCO_3$ equivalent/1000 tons
Maximum Acid Potential	.03 tons $CaCO_3$ equivalent/1000 tons
Net Acid Base Potential	5.97 tons $CaCO_3$ equivalent/1000 tons

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory