

SIX-MILE FOLD
Management Plan

DRAFT

LOCATION

Six-Mile Fold is a 20-acre parcel located approximately six miles north of downtown Boulder on U.S. Highway 36. The area can be accessed from U.S. Highway 36, immediately west of the Neva Road junctions.

Six-Mile Fold is 6 miles from Buckingham Park, the nearest patrolled area, 6 miles from the Courthouse Annex and 10 miles from the Walden Field Station.

ENVIRONMENT

Six-Mile Fold is part of the southeast one-quarter of Section 25, Township 2 North, Range 71 West. This property is a steep northwest-facing slope rising to a plateau which comprises most of the area. The elevation is 5500 feet above sea level at the southeast corner and 5694 feet above sea level on the western boundary. Most of the property is drained by the north fork of an unnamed ravine that carries water to Lefthand Reservoir. The north fork of the ravine passes through the southwest corner of the property. The extreme northern portion of the property drains into another ravine that also flows into Lefthand Reservoir.

Characteristic weather patterns for this region are mild winters and hot summers; mean annual air temperature is 48° to 52°F and the frost-free season is about 140 to 155 days. Most of the average annual precipitation of 12" to 18" occurs during the months of March to June. Wind speeds are high, peaking at 60-80 m.p.h. during the chinook season of late winter and early spring.

A long, asymmetrical anticline and syncline on the lower slope of the foothills is the attribute that resulted in the name "Six-Mile Fold".

"The foothills paralleling Highway 36 northbound are an expression of the upturned western edges of the sedimentary beds which dip eastward to the Great Plains. As the Front Range of the Rocky Mountains uplifted during the Cretaceous period, the overburden of thousands of feet of sedimentary rocks were forced to yield from their former horizontal position. Accompanying this uplift, frequent folding and warping occurred within the sedimentary strata. In this manner, Six-Mile Fold was formed. Where the stress of the slow continuous uplift exceeded the elasticity of the rocks, faults and fractures resulted."

Ulman and Key, 1970

The Niobrara formation with a thickness of 400 feet, resistant to erosion, maintains the integrity of the fold which is easily distinguished from an aerial view. Underlying the Niobrara formation is the Benton Shale formation. This easily eroded shale is often exposed in the ravines of the area as well as the road-cuts along U.S. 36.

The Niobrara and Benton formation were formed as sedimentary beds from Cretaceous seas. Fossils of oysters and other shelled marine life from the late Cretaceous period are numerous in the area: Inoceramus labiatus, Metoicoceral whitei, Inoceranus deformus and Ostrea congesta.

The geologic features of Six-Mile Fold, while not unique to the Front Range, are considered to be an important area because these representative features resulting from the Rocky Mountain Uplift are easily viewed and thus studied. The low density of vegetation and the integrity of the property, which has been maintained through time, allow the features of Six-Mile Fold to be investigated.

BIOTA

Several plant communities exist at Six-Mile Fold: short-grass grassland, riparian shrub, willow riparian. The crest of the "fold" is dominated by yucca (Yucca glauca), starvation cactus (Opuntia polyacantha) and skunkbrush (Rhus trilobata). Plant density is low in this area where soil development over the Niobrara limestone is poor. The slopes on either side of the fold are a mix of buffalo grass (Buchloe dactyloides), blue grama (Bouteloua gracilis) and cheatgrass (Bromus tectorum). Yucca is common as well as starvation cactus (Opuntia polyacantha). The ravine and north-facing slopes adjacent to the ravine are dominated by wild plum (Prunus americana), chokecherry (Prunus virginiana) and skunkbrush (Rhus trilobata). Willows (Salix sp.) with an undergrowth of aquatic emergent plants are common at the source of the ravine.

As well as being an important geologic resource, Six-Mile Fold is floristically diverse and unique. Several plants such as Physaria bellii (Bell's Twinpod) and Hedysarum boreale (a legume) are restricted to shales. Physaria bellii is listed by the Colorado Natural Areas Inventory as a "Plant Species of Special Concern" with a G2S2 rank. This ranking indicates that this species is imperiled globally with 6 to 20 occurrences and is endangered and vulnerable throughout the species' range. Physaria bellii is considered to be vulnerable to extirpation from Colorado.

Other species are also restricted to the Six-Mile Fold area including Stanleya pinnata (Prince's plume), Opuntia phaeacantha (Mexican prickly pear), Erigeron canus (a daisy fleabane) and Eriogonum braevicaule (a sulphur flower). The following floristic list is incomplete, and efforts should be made to conduct a complete inventory of this unique area.

Plants Occurring at Six-Mile Fold

Anacardiaceae

Rhus trilobata Nutt.

Sumac Family

skunkbrush

Asclepiadaceae

Asclepias speciosa Torr.

Milkweed Family

showy milkweed

Boraginaceae

Lithospermum incisum Lehm.
Mertensia lanceolata (Pursh) A.D.C.

Borage Family

narrow-leaved puccoon
narrow-leaved mertensia

<u>Cactaceae</u>	<u>Cactus Family</u>
<u>Echinocereus viridiflorus</u> Engel.	hen and chicks
<u>Opuntia phaeacantha</u> Engel.	Mexican prickly pear
<u>Opuntia polyacantha</u> Haw.	starvation cactus
<u>Caryophyllaceae</u>	<u>Pink Family</u>
<u>Cerastium arvense</u> L.	field mouse ear
<u>Compositae (Asteraceae)</u>	<u>Sunflower Family</u>
<u>Artemisia campestris</u> L. spp. caudata (Michx) Hall & Clem.	fringed sagebrush
<u>Artemisia frigida</u> Willd.	pasture sagebrush
<u>Cirsium</u> sp.	thistle
<u>Erigeron canus</u> Gray	daisy fleabane
<u>Gutierrezia sarothrae</u> (Pursh) Br. & Rusby	snakeweed
<u>Liatris punctata</u> hook	blazing star
<u>Senecia</u> sp.	golden ragwort
<u>Sonchus arvensis</u> L.	
<u>Taraxacum officinale</u> L.	dandelion
<u>Townsendia hookeri</u> B.	Easter daisy
<u>Tragopogon pratensis</u> L.	salsify
<u>Cruciferae (Brassicaceae)</u>	<u>Mustard Family</u>
<u>Alyssum minus</u> (L.) Rothmaler	shepherd purse
<u>Capsella bursa-pastoris</u> (L.) Medic	blue mustard
<u>Chorispora tenella</u> (Pall.) DC	western wallflower
<u>Erysimum aspernum</u> (Nutt) DC	peppergrass
<u>Lepidium</u> sp.	slivery bladder-pod
<u>Lesquerella ludoviciana</u> (Nutt) Wats	double bladder-pod
<u>Physaria bellii</u> Mulligan	prince's plume
<u>Stanleya pinnata</u> (Pursh) Britt	fanweed
<u>Thlaspi arvense</u> L.	
<u>Geraniaceae</u>	<u>Geranium Family</u>
<u>Geranium caespitosum</u> James.	common wild geranium
<u>Grossulariaceae</u>	<u>Currant Family</u>
<u>Ribes aureum</u> Pursh.	golden currant
<u>Ribes cereum</u> Dougl.	wax currant
<u>Hypericaceae</u>	
<u>Hypericum perforatum</u> L.	klamath weed
<u>Leguminosae (Fabaceae)</u>	<u>Pea Family</u>
<u>Astragalus</u> spp.	milk vetch
<u>Astragalus racemosus</u> Pursh.	milk vetch
<u>Astragalus shortianus</u> Nutt. ex T&G	milk vetch
<u>Astragalus tridactylus</u> Gray	milk vetch
<u>Hedysarum boreale</u> Nutt.	
<u>Lupinus argenteus</u> Pursh.	common lupine
<u>Psoralea tenuiflora</u> Pursh.	scurf pea
<u>Thermopsis divaricarpa</u> Nels.	golden banner
<u>Vicia americana</u> Muhl	vetch

Polygonaceae	Buckwheat Family
<u>Eriogonum brevicaulis</u> Nutt.	false buckwheat
<u>Fallopia convolvulus</u> (L.) A. Love	black bindweed
<u>Rumex crispus</u> L.	curly dock
Rosaceae	
<u>Prunus americana</u> marsh	wild plum
<u>Prunus virginiana</u> L.	chokecherry
<u>Rosa</u> cf. <u>arkansana</u> Porter.	rose
Salicaceae	Willow Family
<u>Salix</u> sp.	willow
Santalaceae	Sandalwood Family
<u>Comandra umbellata</u> (L.) Nutt.	bastard toadflax
Schrophulariaceae	Figwort Family
<u>Castilleja sessiliflora</u> Pursh.	plains paintbrush
Umbelliferae (Apiaceae)	Parsley Family
<u>Aletes acaulis</u> (Torr.) C.&R.	mountain caraway
<u>Cymopterus montanus</u> Nutt.	
Violaceae	Violet Family
<u>Viola canadensis</u> L.	
<u>Viola nuttalli</u> Pursh.	
Cyperaceae	Sedge Family
<u>Carex</u> sp.	
Graminae (Poaceae)	Grass Family
<u>Agropyron smithii</u> Rydb.	western wheatgrass
<u>Andropogon gerardii</u> Vitm.	big bluestem
<u>Aristida fendleriana</u> Steud.	three-awn
<u>Bouteloua curtispindula</u> (Michx) Torr.	side-oats grama
<u>Bouteloua gracilis</u> (H.B.K.) Lag.	blue grama
<u>Bromus tectorum</u> L.	cheat-grass
<u>Buchloe dactyloides</u> (Nutt.) Engelm.	buffalo-grass
<u>Hordeum jubatum</u>	foxtail barley
Graminae (Poaceae) continued	Grass Family
<u>Panicum virgatum</u> L.	switchgrass
<u>Poa</u> sp.	bluegrass
<u>Schizachyrium scoparium</u> (Michx) Nash.	little bluestem
<u>Spartina pectinata</u> Link	cordgrass
<u>Sporobolus cryptandrus</u> (Torr) Gray	sand dropseed
Liliaceae	Lily Family
<u>Leucocrinum montanum</u> Nutt.	sand lily
<u>Yucca glauca</u>	yucca
<u>Zigadenus venenosus</u> Wats.	death camas

Since the area provides little cover and water for wildlife, use of the area by mammal and bird species appears to be minimal. A prairie dog town (Cynomys ludovicianus) exists on the property and may provide a food source

for several raptor species which frequent the area: red-tailed hawk (Buteo jamaicensis), Swainson's hawk (Buteo swainsoni) and golden eagle (Aquila chrysaetos). Other bird species documented from the site include black-billed magpie (Pica pica), common crow (Corvus brachyrhynchos) and dark-eyed juncos (Junco hyemalis). This bird list is incomplete. Other bird species including western meadowlark (Sturnella neglecta), pipits (Anthus spinoletta) and sparrow species are to be expected.

Other wildlife observed on the site include mule deer (Odocoileus hemionus) and cottontail rabbit (Sylvilagus floridanus). Prairie rattlesnake have been reported from Six-Mile Fold.

HISTORY AND ACQUISITION

Six-Mile Fold has been an important outdoor laboratory for earth science classes and for botanists for many years. The University of Colorado has used the area for classes in physical geology, physical geography, as well as advanced courses in structural geology, sedimentation, stratigraphy and geologic mapping. The University of Colorado strongly supported the County's acquisition of Six-Mile Fold in 1979.

Boulder County acquired the twenty acres of Six-Mile Fold in September of 1979 for a total payment of \$50,000. The three-acre parcel and a conservation easement over approximately 0.75 acres were purchased from Anna Best Joder for \$7,500. Under separate deed and by a process of unlitigated condemnation, the County purchased another 17 acres from Robert and Eloise Joder; the purchase price was \$34,000 plus a payment of \$8,500 in lieu of severance damages which might have been required had litigation been required.

No water rights were included in the purchase of the Six-Mile Fold property. The County did, however, acquire one-half of the mineral rights on both parcels, the other half having been reserved by Thomas and Mazie Ashton, prior grantors.

MANAGEMENT RECOMMENDATIONS

Six-Mile Fold has been established as a unique geologic and botanical area. Boulder County Comprehensive Plan designates for the area as a rare plant site (for Physaria bellii) and as a natural landmark. There are approximately 250 individual plants of Physaria bellii on the southern half of the property. Most of the population of Physaria bellii is on Beech Aircraft Corporation property to the south of the County open space. It is recommended that State Natural Area designation be pursued for both the county land and appropriate lands owned by Beech Aircraft Corporation.

Since this area is frequently used by geology and geography classes from the University of Colorado, the Boulder County Parks and Open Space Department should require a research/educational permit from users in order to better monitor the use. There is no indication that a limitation should be placed on the number of permits at this time, but frequent use by large groups of people may prove damaging to the plant resource. This research permit system is already in place for the entire Boulder County Park system.

Six-Mile Fold was preserved for research and educational purposes. The area should not be developed in any way. Fencing should be maintained on the perimeter of the property with minimal signage.

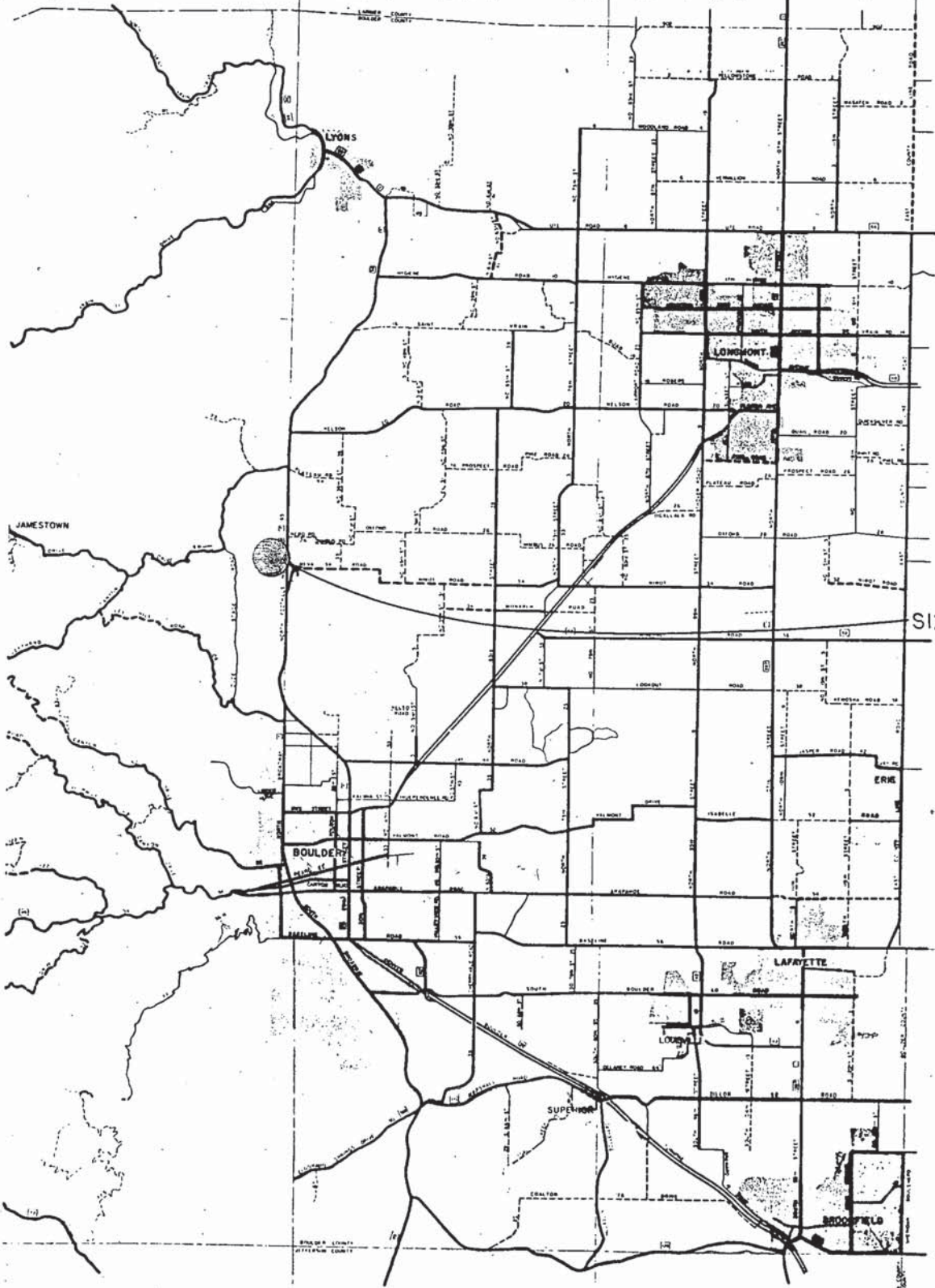
The prairie dog town on the property must be managed so as not to destroy the unique vegetation of the area.

Since the area is not used by the general public to any great extent, the area need not be included in the regular patrol schedule but should be checked approximately once per month.

R71W

R70W

R69W



T3N

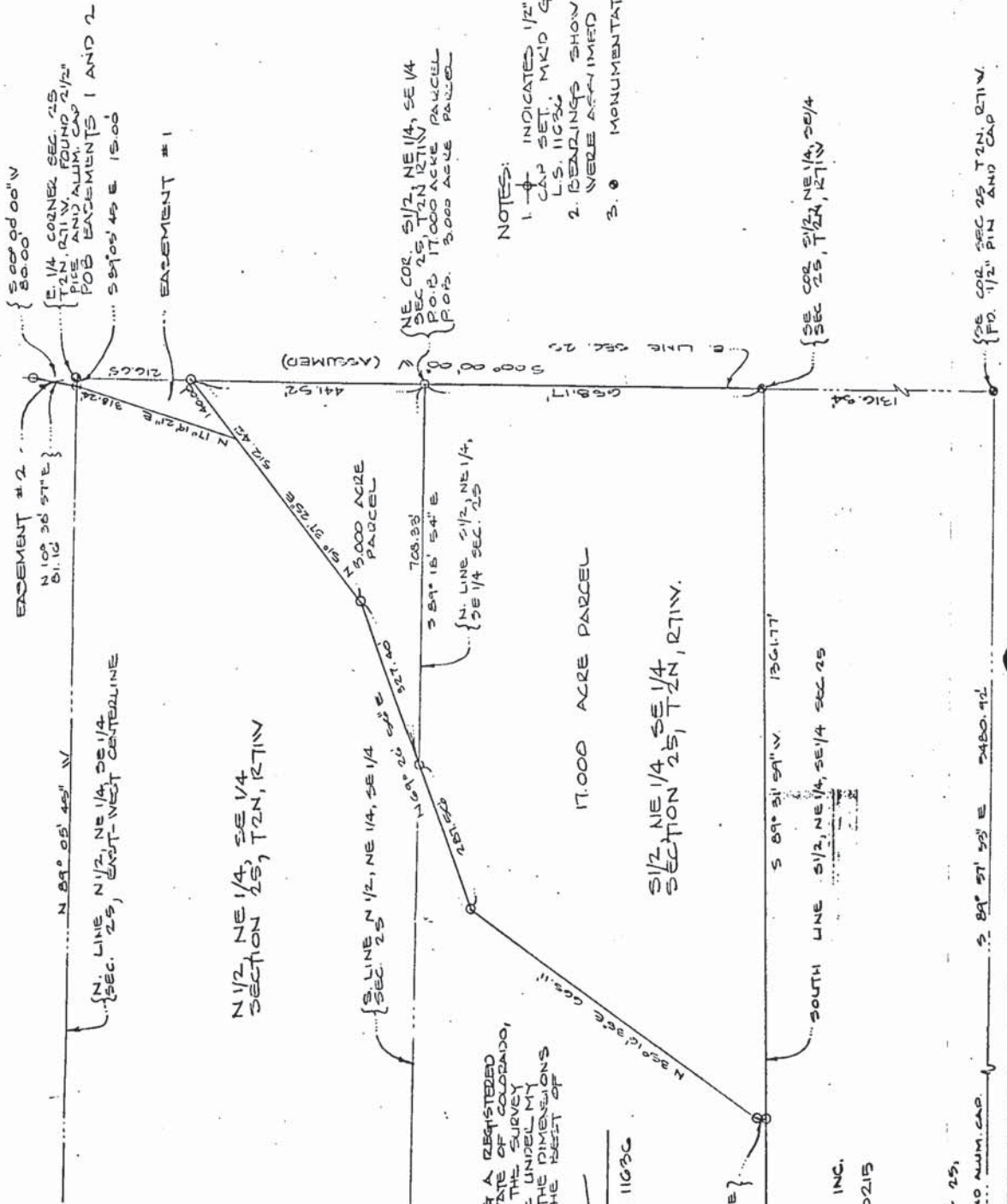
T2N

SIX MILE FOLD

T1N

T1S

NE 1/4, SE 1/4, SECTION 25, T2N, R71W, G&P.M.
BOULDER COUNTY, COLORADO



EASEMENT # 2
N 102° 36' 57\"/>

EASEMENT # 1

NE COR. S 1/2, NE 1/4, SE 1/4
SEC 25, T2N, R71W
POB 17,000 ACRE PARCEL
P.O.B. 3,000 ACRE PARCEL

- NOTES:
- INDICATES 1/2\"/>

SEC 25, T2N, R71W, SE 1/4

SEC 25, T2N, R71W, POB 1/2\"/>

(N. LINE N 1/2, NE 1/4, SE 1/4
SEC. 25, EAST-WEST CENTERLINE

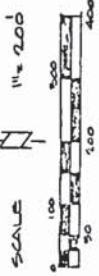
N 1/2 NE 1/4, SE 1/4
SECTION 25, T2N, R71W

(S. LINE N 1/2, NE 1/4, SE 1/4
SEC. 25

17,000 ACRE PARCEL

S 1/2 NE 1/4, SE 1/4
SECTION 25, T2N, R71W.

SOUTH LINE S 1/2, NE 1/4, SE 1/4 SEC 25



CERTIFICATE OF SURVEY

I, PAUL A. LEVRENI, BEING A REGISTERED LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THE SURVEY SHOWN HEREON WAS DONE UNDER MY DIRECT SUPERVISION AND THE DIMENSIONS SHOWN ARE CORRECT TO THE BEST OF MY KNOWLEDGE.

PAUL A. LEVRENI, L.S. 11033C
S/2/1179



PREPARED BY:
GOLDEN WEST SURVEYING, INC.
1949 W. 1/2 NORTH BLVD.
LAKEWOOD, COLORADO 80215
303-235-1515

SEC 25, T2N, R71W, POB 1/2\"/>