ENVIRONMENTAL ASSESSMENT RECORD

GAS SERVICE PIPELINE TO OIL SHALE TRACT C-b

of the

WESTERN SLOPE GAS COMPANY

October 23, 1978

Gaea Corporation
235 East Broadway
Salt Lake City, Utah 84111

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FOREWORD

This Environmental Assessment Record (EAR) was prepared principally from information available in the records of the Meeker Office of the White River Resource Area of the Craig District of the U. S. Bureau of Land Management.

This EAR supplements the 1973 Environmental Statement for the Prototype Oil Shale Leasing Program, in 5 volumes. The reader is specifically referred to discussions within this reference to the needs for and impacts of a natural gas pipeline:

Volume I,	Page I- 90	Volume III,	Page IV- 24
	Page III- 12		Page IV- 39 to 40
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In the development of Tract C-b, a large number of studies have been prepared for the purposes of environmental analysis. This work is voluminous and an extensive library of reports is available in the Office of the Area Oil Shale Supervisor, 131 N. 6th Street, Suite 300, Grand Junction, Colorado 81501.

The principal references for this EAR are:

Reference A. White River Management Framework Plan, Volume I, Steps I, II, & III - Lands, Minerals, Forest Products.

Reference B. White River Management Framework Plan, Volume II, Steps I, II, & III - Range Management, Wild Horses, and Water Shed.

Reference C. White River Management Framework Plan, Volume III, Steps I, II, & III - Wildlife, Recreation, Fire, Access.

Reference D. Piceance Basin Planning Unit Resource Analysis, Volume I, General Information Step I, Physical Profiles, Step II, Present Status Step II, Land Step III, Mineral Step III, Forest Products Step III, Range Management Step III, Wild Horses Step III, Physical Profile Step II, Minerals Step II, Soils Step II, Vegetation Step II, Animals Step II.

Reference E. Piceance Basin Planning Unit Resource Analysis, Volume II, Watershed Step III, Wildlife Step III, Fisheries Step III, Recreation Step III.

Reference F. Piceance Basin Planning Unit Resource Analysis, Volume III, Lands Step IV, Minerals Step IV, Forest Management Step IV, Wild Horses Step IV, Watershed Opportunities Step IV, Wildlife Step IV, Recreation Step IV.

Reference G. Piceance Basin Wildlife Management Plan (Sikes Act), Colorado Division of Wildlife and BLM, February 9, 1977.

Reference H. Oil Shale Tract C-b Detailed Development Plan and Related Materials, Volume II; C-b Shale Oil Project, Ashland Oil, Inc., Shell Oil Co., Operator, February 1976.

Reference I. Oil Shale Tract C-b Environmental Baseline Program Final Report (Nov. 1976 through October 1976), Executive Summary; C-b Shale Oil Venture, Ashland Oil Inc., Occidental Oil Shale, Inc., Operator.

Reference J. Detailed Development Plan and Related Materials, Volume 2 of 2, February 1976, Section XIII, Scenic and Archaeological Values.

Reference K. Supplemental Material to Detailed Development Plan Modifications, July 21, 1977.

Large segments of this EAR are direct quotations or paraphrased from these works and are not set in quotes to provide continuity of text. References from outside of these works are given. Inputs from Western Slope Gas Company (WSGC) are identified by an asterisk (*). Inputs from Western Slope's environmental consultant, Gaea Corporation, are identified by a double asterisk (**).

In this EAR, considerations of the environment which are specific to the site area of the gas service pipeline to Oil Shale Tract C-b are discussed in the main text. Considerations of the regional environment are discussed under Appendix A. The outlines of the site specific and regional discussions are parallel. Should the reader need to compare site data to regional characteristics he need only to compare the two discussions. Should the reader be familiar with the regional background, he need not be burdened with reading this material in his evaluation of the site data.

The reader will note that there are three plates in the pocket attached to the back cover of the report. These plates combined, constitute the detailed survey map of the projected pipeline right-of-way.

I. DESCRIPTION OF THE PROPOSED ACTION*

A. Background Data

The Western Slope Gas Company (WSGC) owns and operates a gas transmission pipeline system in the western Colorado counties of Routt, Moffat, Rio Blanco, Garfield and Mesa (See Figure 1a). Western Slope Gas Company is an intrastate company regulated by the Public Utilities Commission of the State of Colorado and engaged in the business of transporting natural gas. This system is referred to by WSGC as their Western System Transmission Facilities. This system receives natural gas from several large producing gas fields in the area. The gas is transported to residential, commercial and industrial users in the communities of Grand Junction, Rifle, Meeker, Craig, Steamboat Springs and smaller towns in parts of the five counties.

The region is currently the target of oil, gas and oil shale exploration and development. The area contains many oil and gas fields each with numerous producing wells. These wells are serviced by extensive underground pipeline systems owned and operated by several different companies of which WSGC is one. Within the Piceance Basin in central Rio Blanco County are two oil shale tracts which have been leased from the federal government by private companies for exploration, development and eventual production of shale oil. The two tracts, C-a and C-b, each encompasses 5120 acres of public land. The development of these tracts is governed by the terms and conditions of the Federal Oil Shale Prototype Leasing Program administered by the Area Oil Shale Supervisor, U. S. Geological Survey. The public land surrounding the tracts is administered by the Craig District of the U. S. Bureau of Land Management.

Western Slope Gas Company now applies for usage of public land for a right-of-way on which to construct a gas service pipeline from its main transmission line in the Piceance Basin to a point within Oil Shale Tract C-b.

B. Action Purpose

The action purpose is to provide natural gas for the energy needs of exploring and developing the oil shale resources within Tract C-b. The gas will be transported from the West Douglas Gas Field by way of the West Douglas to Black Sulphur gas transmission line to Piceance Basin. From the main transmission line in Piceance Basin a gas service pipeline will be constructed to Oil Shale Tract C-b. See Figure 1b.

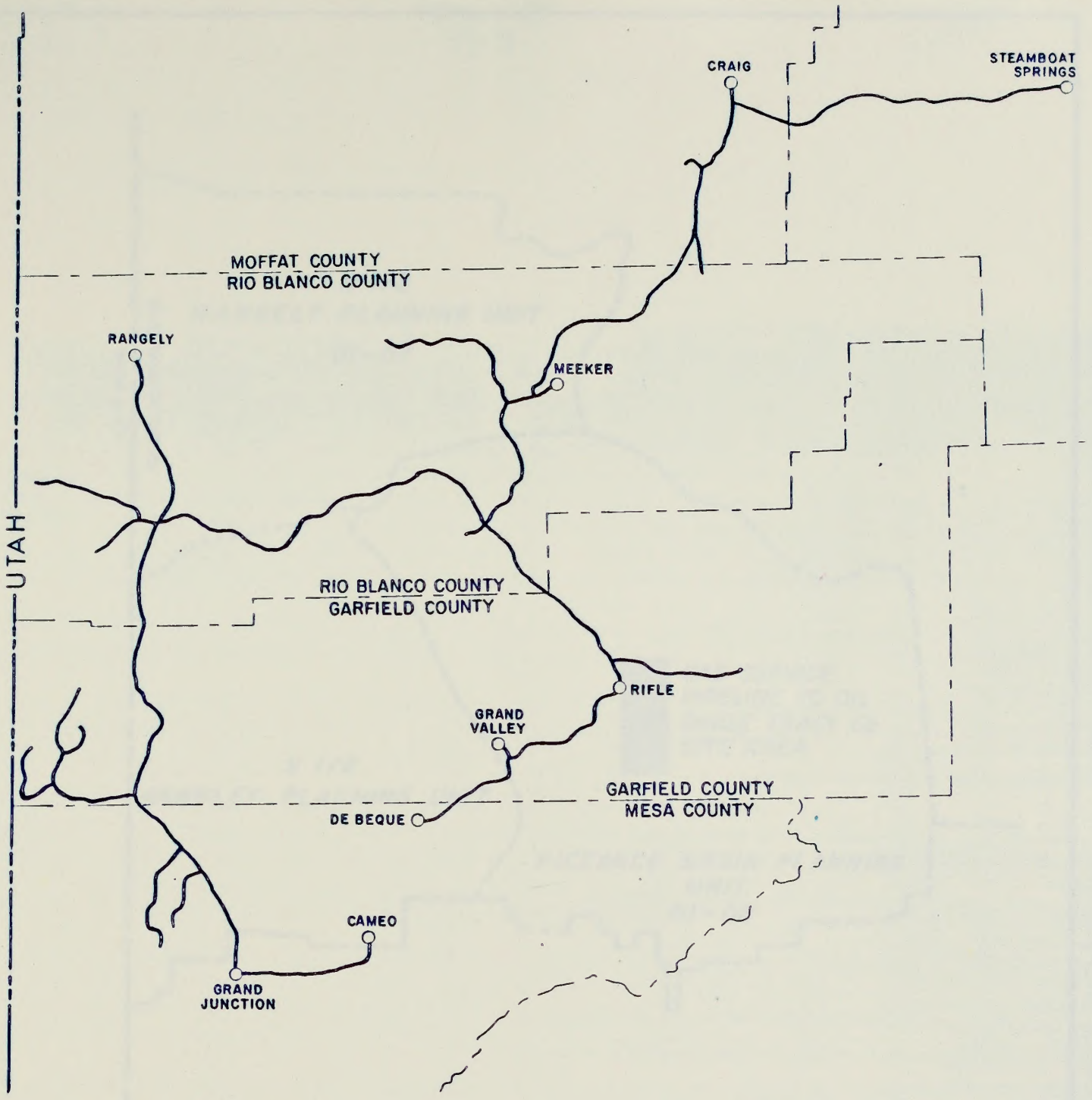


Figure 1a

REGIONAL LOCATION MAP AND WESTERN SYSTEM TRANSMISSION FACILITIES

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

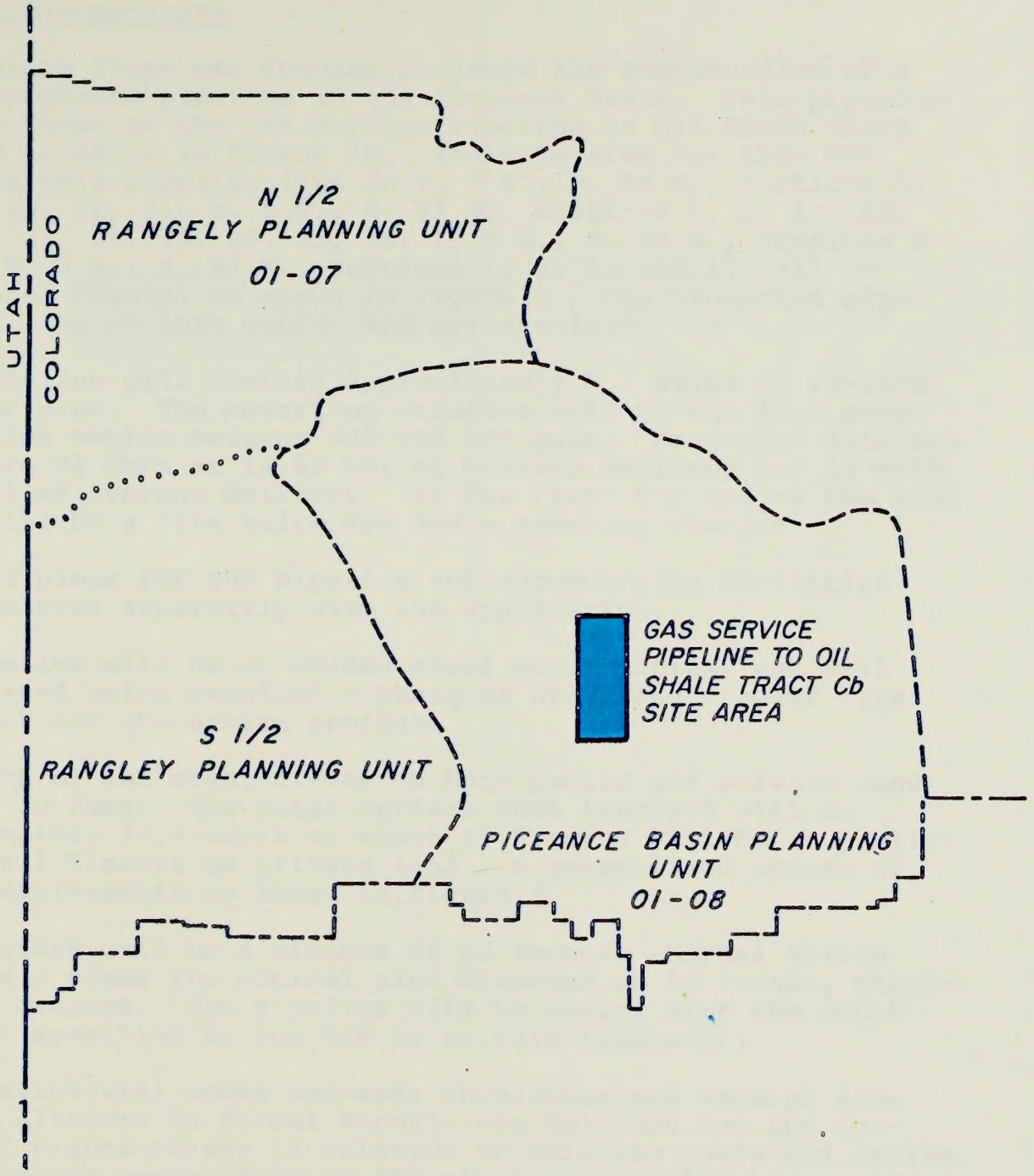


Figure 1b

WHITE RIVER RESOURCE AREA
PICEANCE BASIN PLANNING UNIT
GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb
Western Slope Gas Company

C. Action Components

The Western Slope Gas Company projects the construction of a new underground pipeline in the Piceance Basin. This pipeline will be known as the Gas Service Pipeline to Oil Shale Tract C-b and is shown in Figure 1b. The site area for this EAR covering this pipeline lies in T. 2 S., R. 96 W., Sections 6, 7, 18, 19, 30, 31; T. 2 S., R. 97 W., Sections 1, 2, 11, 12, 13, 14, 23, 24, 25, 26, 35, 36; T. 3 S., R. 96 W., Sections 6 and 7; T. 3 S., R. 97 W., Sections 1, 2, 11 and 12, all in Rio Blanco County, as shown in Figure 2. The projected pipeline will be on both public and private land.

This pipeline will contain approximately 5.5 miles of 4½-inch diameter pipe. The operating pressure will be the line pressure which varies between 400 and 800 psig. Projected delivery rates are 91 Mcfh at 14.65 psi at maximum delivery and 32 Mcfh at 14.65 at average delivery. At the Tract C-b end of the line there will be a fire valve set and a metering station.

Detailed plats for the pipeline and accompanying facilities are submitted separately with the application.

The pipeline will be of welded steel construction, and will be emplaced using standard techniques utilizing crawler type equipment for the entire project.

The width of the right-of-way on both public and private land will be 50 feet. The total surface area involved will be approximately 33.3 acres of which 31.8 acres will be on public land and 1.5 acres on private land. A generalized sketch of space requirements is shown in Figure 3.

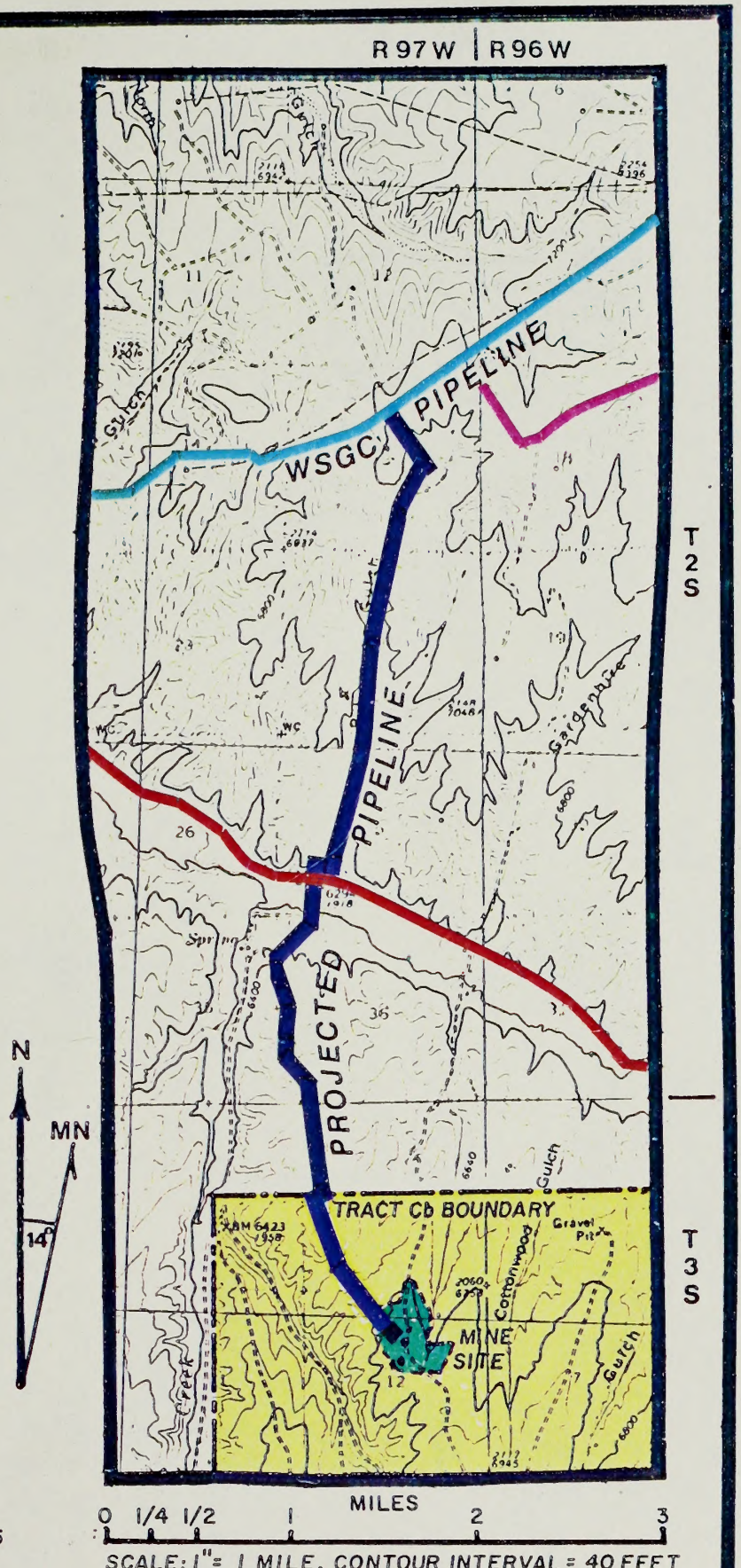
Trench width will be a minimum of 12 inches. Normal trench width is 2 times the nominal pipe diameter or 12 inches, whichever is greater. The pipeline will be buried with the depth of cover specified by the BLM or private landowner.

The pipeline will cross man-made structures and natural features. Although no formal formula was followed for the location of rights-of-way in relation to existing roads and trails, generally the center line of the pipeline will lie to one side of the road or another. These relationships are given in detail in Plates 1, 2 and 3. One crossing of a paved county road will be made as well as several crossings of dirt roads. Where the pipeline crosses County Road 5, the crossing will be made by boring under the roadway and installing casing pipe. Wherever dirt roads are crossed by an open cut, trenches will be backfilled and restored by proper grading, careful compacting, backsloping, and the emplacement of culverts and waterbars where necessary to prevent erosion and promote proper drainage. Piceance Creek, irrigation ditches, several dry washes and at

EXPLANATION

- Existing WSGC pipeline
- Projected WSGC pipeline
- Metering station
- County Road 5
- County Road 76
- Oil Shale Tract Cb

ALSO SEE PLATES 1, 2, & 3



BASE MAP FROM USGS MAP N3941.25-W10755.75 RIO BLANCO COUNTY COLORADO, 1975, 1:50,000, SHEET 6 OF 6.

SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

Figure 2

RIGHT-OF-WAY & SITE MAP

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

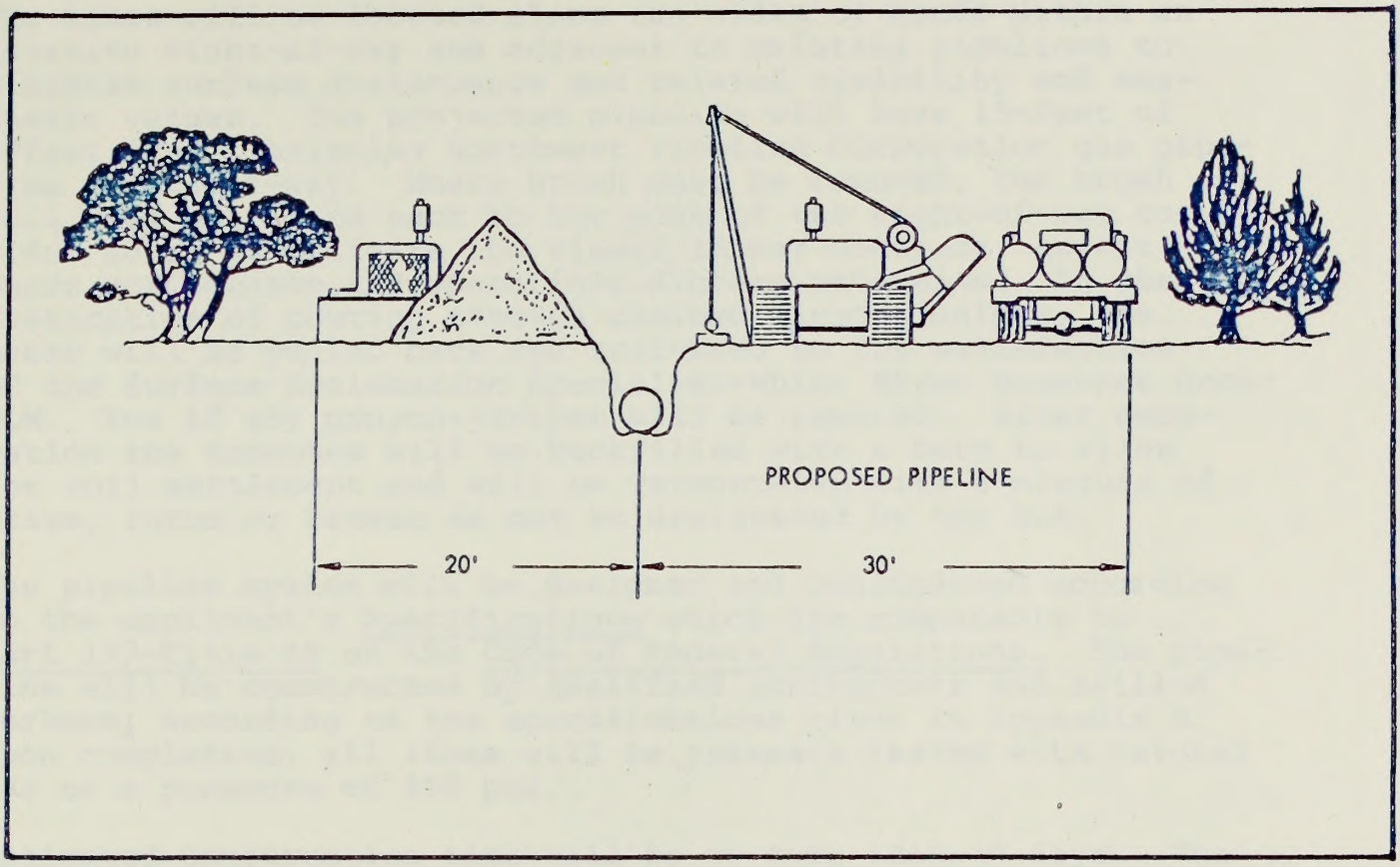


Figure 3

SPACE REQUIREMENTS FOR RIGHT-OF-WAY

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

least one existing pipeline will also be crossed at three locations. The pipeline will be buried with 5-feet of cover under the bed of Piceance Creek.

The lines will be located along the sides of roads within an existing right-of-way and adjacent to existing pipelines to minimize surface disturbance and related visibility and aesthetic values. The projected pipeline will have 15-feet of offset from 2 existing Northwest Pipeline Corporation gas pipeline rights-of-way. Where brush must be removed, the brush fall will be pushed back to the edge of the right-of-way corridor so as to mitigate the visual linear contrast, except where maintenance and operations dictate otherwise. In the restoration of routing through chained pinyon-juniper, the brush will be pulled back and scattered to the satisfaction of the Surface Reclamation Specialist-White River Resource Area-BLM. Few if any pinyon-juniper will be removed. After excavation the trenches will be backfilled with a berm to allow for soil settlement and will be revegetated with a mixture of grass, forbs or browse as may be designated by the BLM.

The pipeline system will be designed and constructed according to the applicant's Specifications which are comparable to Part 192-Title 49 of the Code of Federal Regulations. The pipeline will be constructed by qualified contractors and skilled workmen, according to the specifications given in Appendix B. Upon completion, all lines will be pressure tested with natural gas to a pressure of 950 psi.

Estimated construction time will be no more than 30 days. The applicant will attempt to locate staging areas at yards or pads of existing facilities.

At the end of the useful life of the lines, below ground components will be abandoned in place and above ground facilities will follow jurisdictional requirements in force at that future time.

II. DESCRIPTION OF THE ENVIRONMENT AFFECTED

The most visible effects of the construction and operation of the projected service pipeline to Tract C-b are those on the local environment. Adverse effects will be felt in the area immediately adjacent to the pipeline, while, as discussed in Appendix A, beneficial effects will accrue to pipeline employees and their families and to the natural gas user at Tract C-b. This gas will be used to provide the energy necessary to continue the exploration and development of the oil shale resources underlying the tract.

National goals and international ramifications are discussed on Page A-1 of Appendix A.

This section will describe the environment at the site area of the Gas Service Pipeline to Oil Shale Tract C-b.

A. Non-Living Components

1. Physiography

a. Site physiography

The site area of the proposed action of this EAR lies in the heart of the Piceance Basin. The topography and related fluvial cycle are in late youth. The trellis drainage pattern of the principal streams is modified to a subordinate dendritic pattern in the upper dry washes. The relief is from an elevation of about 6,240 feet at the bottom of Piceance Creek at the western edge of the site area to 7,400 feet on top of a broad ridge in the northeast corner.

Piceance Creek is the principal drainage of the area. It enters the eastern edge of the site area at an elevation of about 6,300 feet. It flows about 3½ miles in a northwesterly direction beyond the western border of the site area.

Topography at lower elevations is steep near the valley bottoms, whereas at the higher elevations the upper slopes are convex and rounded. The physiography north of Piceance Creek is controlled by the uplift along the Piceance Creek Anticline, as is evidenced by the fact that all drainages flow away from the crest of this tructural feature in all directions in a roughly radial pattern.

2. Access, utilities, rights-of-way and communications

The site area is located in a relatively remote sector of northwestern Colorado. Principal access to the site is from Rio Blanco County Road 5, which runs from Colorado Highway 13 at Rio Blanco Store to White River City on Colorado Highway 64. Rio Blanco County Road 5 is situated in the valley of Piceance Creek. The site area crosses County Road 5 and Piceance Creek about 15 miles west of Rio Blanco Store.**

A utility line, probably electricity and telephone, parallels County Road 5.**

A private landing strip is located adjacent to the northeast corner of the site area. These are used by corporate aircraft servicing the gas field. The closest airport is at Meeker. The closest commuter airline service is at the airport at Craig and

the closest full commercial airline service is at Grand Junction.**

A system of utility corridors exists within the Piceance Basin. Existing corridors within this site area are:

- Piceance Creek Corridor - A road, power and telephone lines follow the valley bottom of Piceance Creek across the site area.

- Oil Shale Tract C-b Corridor - A short corridor connects the Piceance Creek Corridor with Oil Shale Tract C-b to provide services to this development.

3. Gaseous emissions and air quality**

Air quality throughout the region is high because of a lack of population and associated industry.

Site area air quality is of concern due to the anticipated development of the oil shale projects. As a result, the developers of these projects are currently performing extensive data acquisition and analysis to project future effects upon site quality.

4. Geology

The site area lies within the Piceance Basin which is the major structural feature of the region. The local structure is dominated by the Piceance Creek Dome--an anticline whose axial crest trends N 35° S and which plunges both to the northwest and southeast. Most dips around the structure are shallow. From 2 to 5 miles south of the anticline is a fault as shown on Figure 4 which forms a small graben. (Ref. D) South of Piceance Creek in the site area is a northwest trending syncline which is part of the series of synclines and anticlines within the Piceance Basin.

A well developed sequence of sediments underlies the site area. The shallower sediments of interest include 4,000 to 5,000 feet of the Cretaceous Mancos Shale, up to 5,600 feet of the Cretaceous Mesa Verde Group, 5 to 50 feet of the Tertiary Ohio Creek Conglomerate, an unnamed sequence of brown sandstone and dark shale varying in thickness from 0 to 500 feet, about 1,675 feet of the Tertiary Fort Union combined upper and lower members, about 3,400 feet of the Tertiary Wasatch Formation, up to 3,000 feet of the oil-shale bearing Green River Formation, and up to 1,250 feet of the Tertiary Uinta Formation.

Quaternary alluvium occurs along all of the major and minor drainages. (Ref. D)

As shown on Figure 4, the Tertiary Uinta Formation crops out exclusively within the site area. The only other formation

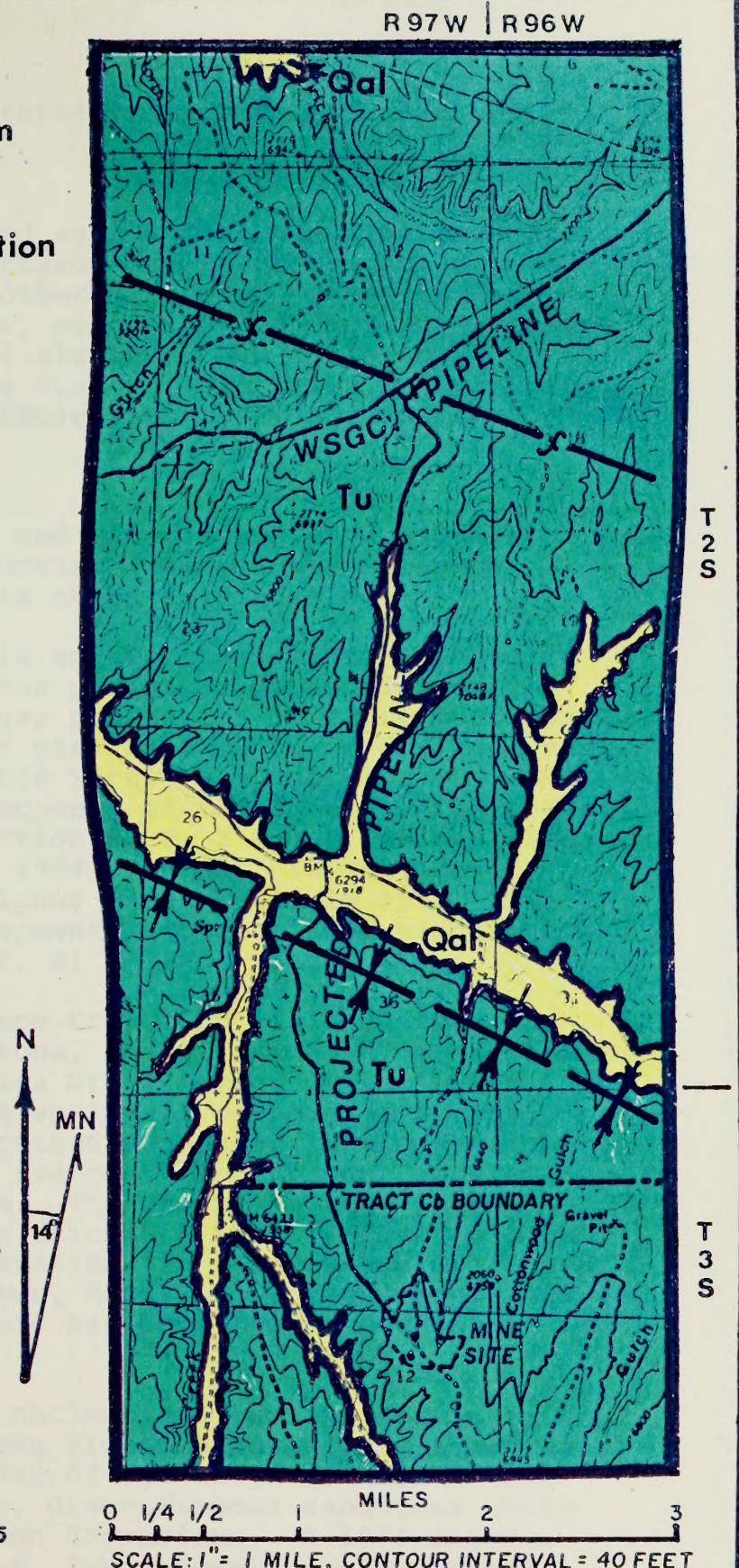
EXPLANATION

Qal — Quaternary alluvium

Tu — Tertiary Uinta Formation

—f— Fault

Axis of syncline



BASE MAP FROM USGS MAP N3941.25-W10755.75
RIO BLANCO COUNTY COLORADO, 1975, 1:50,000,
SHEET 6 OF 6.

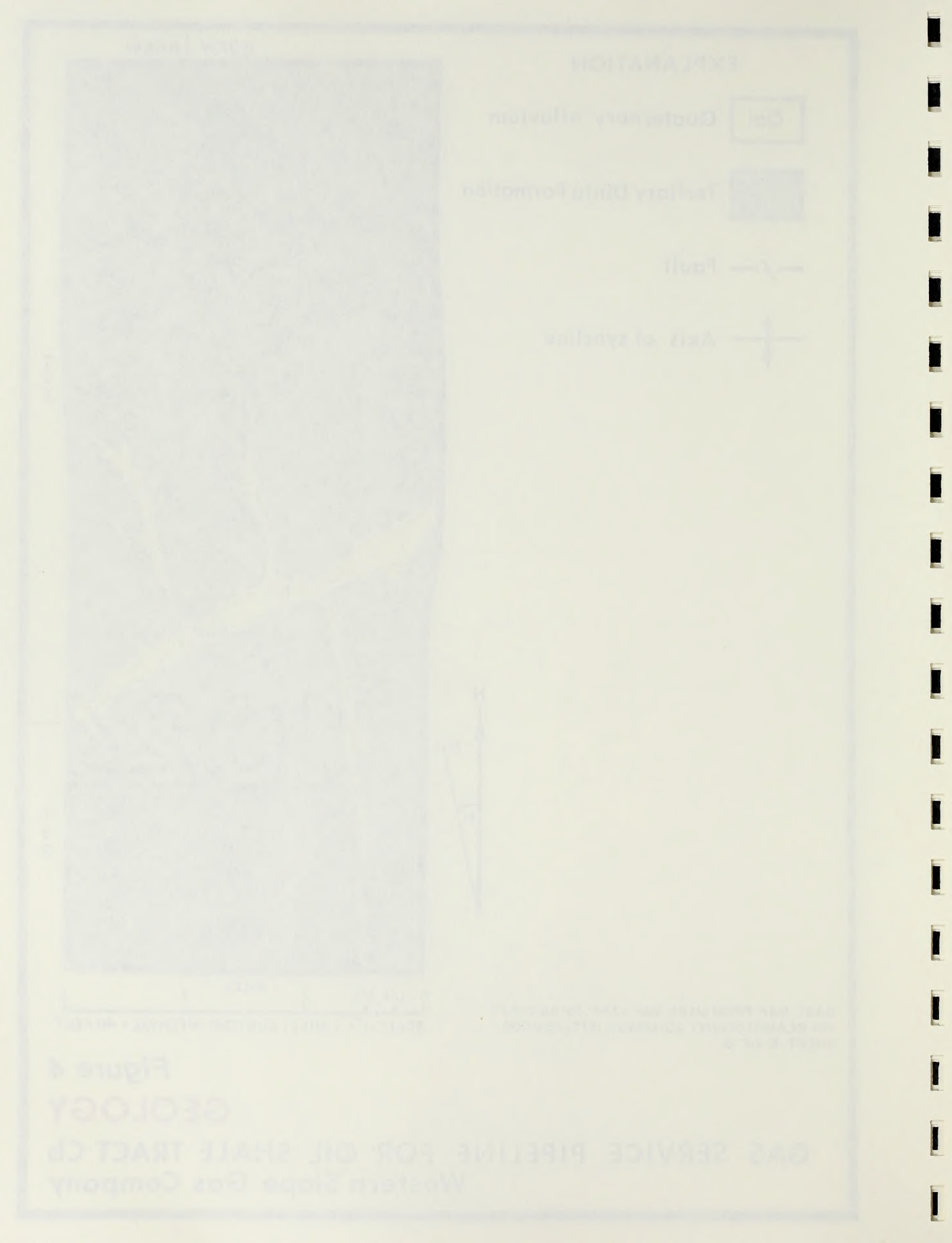
SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

Figure 4

GEOLOGY

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company



exposed on the surface is Quaternary alluvium.

5. Mineral resources

The sediments underlying and surrounding the site area are of considerable economic importance due to their contained deposits of various energy and other minerals. These include natural gas and oil, oil shale, nahcolite and dawsonite--saline minerals containing sodium and aluminum, and asphaltum. Coal measures probably underlie the area but lie below a depth of 3,000 feet and are not recoverable with today's technology.**

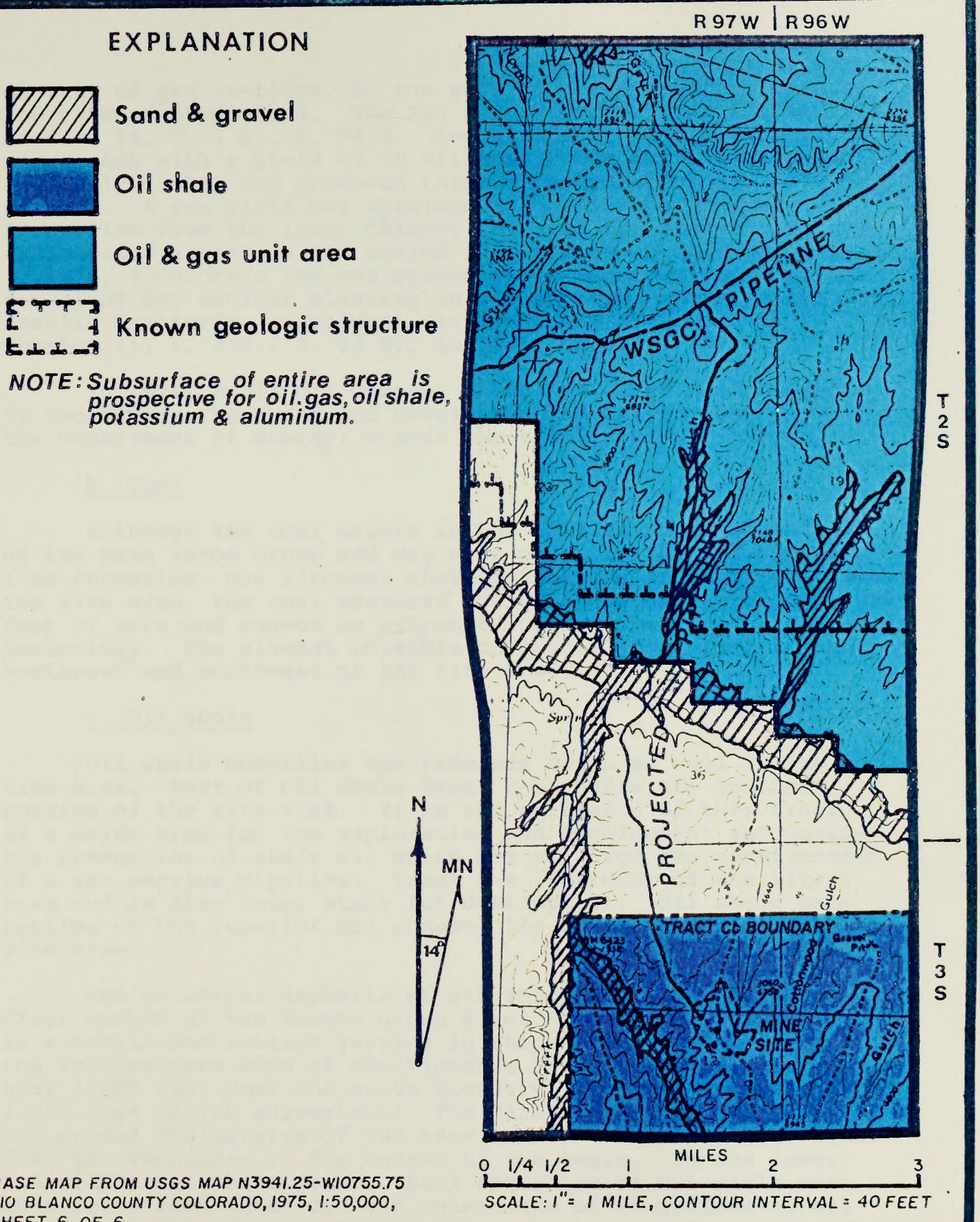
a. Natural gas and oil

Reserves of natural gas and minor associated oil lie within the Known Geologic Structure (KGS) of the Piceance Creek Gas Field. This field is shown in Figure 5.

Oil and gas extraction is an important mineral industry in the Unit. Natural gas is the principal production of the Piceance Basin. Most of the gas production is stratigraphically entrapped, and vast amounts of gas in place await drilling and development. The first sizeable Tertiary production was established in 1930 with the discovery of the Piceance Creek Gas Field by a well drilled in Section 9, T. 2 S., R. 96 W. Piceance Creek South was discovered in 1954 by a well in Section 18, T. 3 S., R. 95 W., and the Sulphur Creek Field in 1959. Oil and gas exploration and development have continued since then, and is still very active. (Ref. D)

Production in the Piceance Creek Gas Field is from a sequence of alternating sandstone, shale, and sandy shale beds in the lower part of the Douglas Creek member of the Green River Formation; and from massive lenses or pods of porous, permeable, medium to coarse grained sandstone in the Wasatch Formation. These sand bodies are scattered through several thousand feet of the formation. The producing zone in the Douglas Creek member varies in thickness from 12 feet to about 25 feet. Pools at various elevations in the Wasatch are named "A", "F" and "G" by the operator, Mobil Oil Corporation. All of the oil produced in the field has come from the Wasatch "G" pool. (Ref. D)

In 1973, 1975 and 1976, nuclear and massive hydraulic fracturing (MHF) projects in the Piceance Basin were aimed at recovering appreciable fractions of the large volumes of gas in-place in lower permeability, discontinuous sandstone units of the Mesa Verde and Fort Union Formations. A 1973 report, National Gas Survey of the U. S. Power Commission estimates that the total proven and inferred tight gas sand reserves in the Piceance Basin are 207.1 trillion cubic feet of gas. Successful massive fracturing projects could connect these enormous



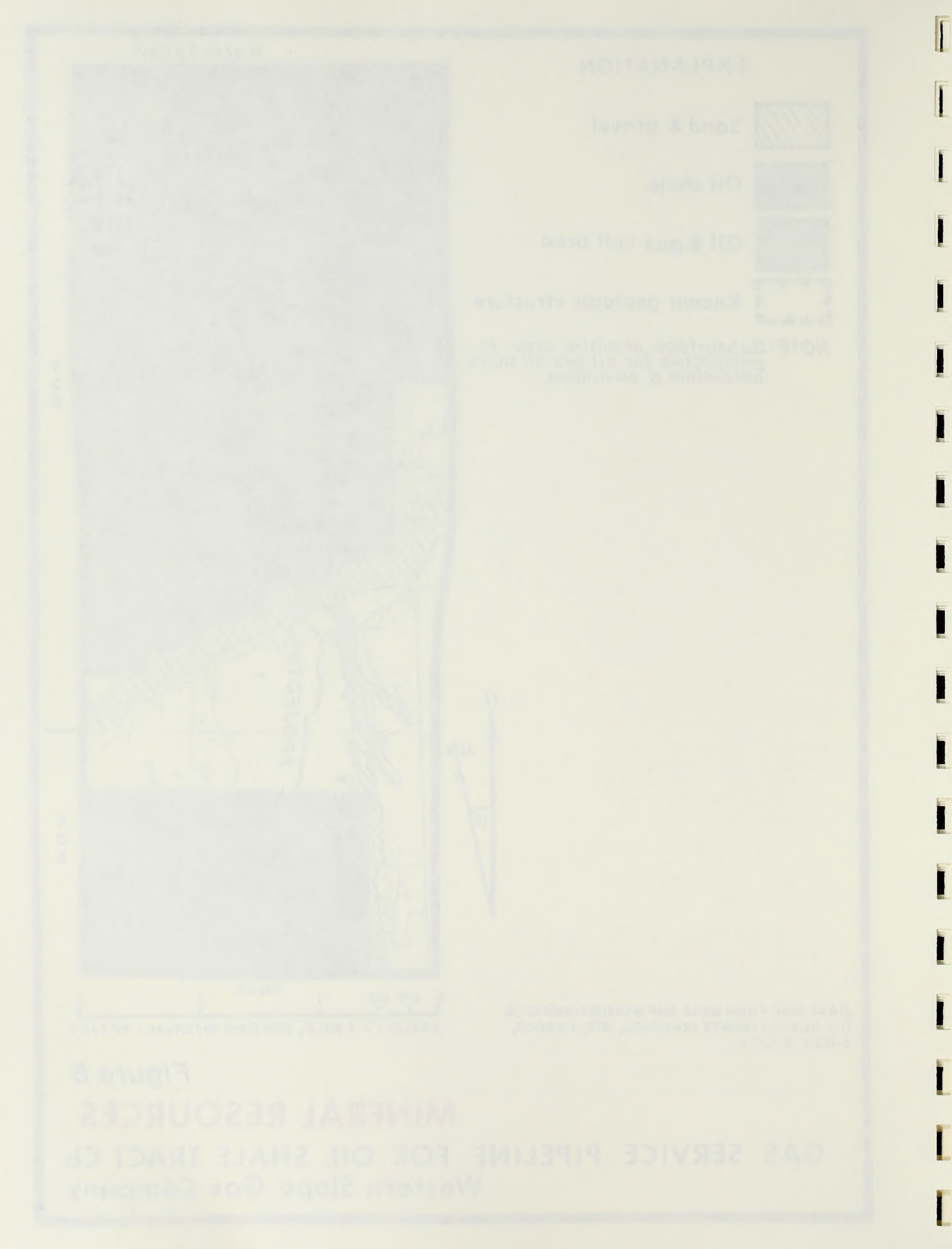
BASE MAP FROM USGS MAP N3941.25-W10755.75 RIO BLANCO COUNTY COLORADO, 1975, 1:50,000, SHEET 6 OF 6.

Figure 5

MINERAL RESOURCES

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company



amounts of gas in-place, to the well bore and greatly increase the rate of production. The Rio Blanco Project was located in Section 14, T. 3 S., R. 98 W., and utilized three nuclear devices each with a yield of 30 kilotons. The shots were made on May 17, 1973, and produced three chimneys which did not connect. A gas yield was obtained from the upper chimney. Production from the lower chimney revealed the presence of radioactive strontium and cesium in water produced with gas. In 1974, a Colorado law was passed which requires voter approval of any nuclear blasting in the state. A massive hydraulic fracturing experiment was conducted in a well in Section 11, T. 3 S., R. 98 W., in 1975. (Ref. D)

In 1976, Mobil Oil Company performed a MHF test financed by the Energy, Research and Development Administration (now the Department of Energy) within the site area.

b. Coal

Although the coal occurs in the Williams Fork Formation of the Mesa Verde Group and may also occur in the underlying Iles Formation, and although these formations probably underlie the site area, the coal measures would lie below depths of 3,000 feet of more and cannot be extracted commercially with today's technology. The closest possible commercial coal lies to the northwest and southwest of the site area.

c. Oil shale

Oil shale underlies the Piceance Basin as well as the site area. Part of Oil Shale Tract C-b covers the southern portion of the site area. It is the existance of this tract as a prime area for the exploration and development and possible production of shale oil which has required the construction of a gas service pipeline. Tract C-a lies west of the site area and is also under study for development. Oil shale properties of the Superior Oil Company lie to the north of the site area.

The principal deposits of oil shale occur in the Parachute Creek Member of the Eocene Green River Formation. This member is a continuous section varying in thickness from 500 feet on the northeastern edge of the Piceance Basin Planning Unit to near 1,200 feet near the south boundary. It reaches up to 1,900 feet in the subsurface. The Parachute Creek Member crops out around the margins of the area and is covered by over 1,000 feet of overburden in the center of the basin. In the lower and middle oil shale zones, thick sequences of oil shale more than 1,000 feet thick contain an average of 25 gallons of oil per ton in the north central part of the basin. From this area of maximum grade toward the margin of the basin, the combined lower zones become thinner and their oil content decreases.

The upper oil shale zone contains the richest and most important oil shale in the Green River sequence. The zone has a maximum subsurface thickness of about 610 feet with the outcrop ranging from 300-680 feet thick. (Ref. D) At Tract C-b the Mahogany zone lies below overburden which ranges from 800 to 1,250 feet and averages 1,000 feet. Estimated reserves within the tract area are approximately 3.71 billion barrels of oil in mineable beds containing 30 gallons or more per ton. (Ref. D) According to the Office of the Area Oil Shale Supervisor (personal communication to BLM, October 1978), 3 billion barrels are estimated as being recoverable by the rubbleized in situ extraction-rise method.

It has been estimated that inferred and indicated reserves for the Piceance Basin Unit have a combined total of over 2.5 million million tons of oil shale containing from 15 to 45 gallons per ton of shale oil. This would contain about 900 billion barrels of shale oil at 100% recovery. (Ref. D)

The U. S. Bureau of Mines has drilled a large diameter shaft to a depth of 2,371 feet at a location in Horse Draw about 5½ miles northwest of the northwest corner of the site area. This shaft will provide access to the oil shale horizons for the purposes of studying rock mechanics, groundwater hydrology, and underground mining (personal communications, USGS and USBLM, October 19, 1978).

Development of oil shale near the site area is being intensively pursued by both industry and government. Details of this development and the importance of the resource are being reported currently from a wide variety of sources. The reader is referred to these for further detail.

d. Asphaltum

Rock asphalt occurs in deposits located about 12 miles to the east of the site area, along the west side of Colorado Highway 13-789. These deposits crop out intermittently along the east side of the Petrolite Hills and trend north-south. These deposits are in sandstone beds near the base of the Green River Formation which dip westward into the Piceance Basin. They are reported as layers between the beds and also as veins and seeps in the sandstone. There is no known production from these deposits. They are unexplored and no quantitative estimate of the resource can be made. The deposits in the Petrolite Hills and north into the Gray Hills are probably the largest in Colorado. (Ref. D)

e. Saline minerals - nahcolite and dawsonite

The saline minerals dawsonite, nahcolite and halite are found interbedded and intermingled with oil shale in the deeper

parts of the Piceance Basin and are believed to underlie the site area. In some areas these saline minerals might become important to the development of oil shale as by-products. Oil shale containing the minerals nahcolite and dawsonite can be developed in an integrated process producing four products. These are shale oil, nahcolite, aluminum compounds, and sodium carbonate.

According to the Piceance Unit Resource Analysis (Reference D), the ore reserves of nahcolite are estimated at 500 million tons per square mile in the Basin's center of deposition and contains a total of approximately 29 billion tons within the Piceance Planning Unit.

Nahcolite, after processing, can be used to absorb sulphur dioxide in gaseous emissions, and thus may prove useful in environmental pollution control.

Dawsonite is a potential source of aluminum. It is estimated that the total amount of dawsonite in place in the Piceance Planning Unit is 19 billion tons, or about 3 times the world's reserves of bauxitic alumina. The successful development of an integrated oil shale process could produce metallurgical grade alumina. As an alternative, aluminum trihydrate can be produced from dawsonite and combined with sodium sulfate to form combined products of sodium aluminate and aluminum sulfate. These compounds can be used very efficiently in removal of phosphorous and colloidal particles from waste waters. (Ref. C)

The Mineral Development Area for saline minerals includes the Superior Oil Company development and the existing issued sodium leases in the area. These sites are the location of current active exploration and formal proposals have been made for development. The Piceance Planning Unit includes four proposed sodium leases (preference right lease application). If these leases are issued and exploration justified development, these sites will be upgraded to development areas.

The four sodium preference right lease applications have been identified in priority ranking. The priority was established by the location of the thickest, highest grade saline deposits near the center of deposition.

The first two leases, having the highest priority lie just to the north of the Piceance Creek Gas Field and south of the Little Hill Game Experiment Station. Thus, the prime two leases for sodium lie about 5 miles north of the site area. The third and fourth areas lie 5 and 10 miles west of the western edge of the site area in the vicinity of Ryan Gulch.

f. Salable minerals

Sand and gravel is available from the aluvium which occurs in the stream beds and valley bottoms of the area. With the

exception of sand and gravel which has been excavated for road construction, no large scale use has been made of sand and gravel in the site area.

It is not anticipated that continuing development of oil shale in this area will result in any significant demand for sand and gravel from sources within or near this site area. At present, free use permits are granted to county and state highway departments for road construction.

Although moss rock has been noted near Meeker and in other parts of the Planning Unit, none has been noted within the site area.

Large amounts of common stone are available for use in construction and as rip-rap; however, no particularly noteworthy varieties have been noted within the site area.

g. Locatable minerals

Metallic minerals are known to exist within the Piceance Basin in trace amounts; however, lands in the Piceance Basin are presently withdrawn from minerals entry under the 1872 mining law (personal communication BLM, October 19, 1978).

h. Water and water quality

Water in the site area is derived largely from snowpack melt water in the spring which results both in surface water run-off and in ground water recharge. The ground water in turn contributes to surface flows of Piceance Creek, and its tributaries.

Piceance Creek is the principal stream flowing through the site area. According to 7 years of flow measurements at Station 102, USGS 09306200, below Ryan Gulch, the average discharge flow is 15.6 cfs, or 11,300 acre-feet per year. During the period of record from October 1964, through the present, the historic maximum discharge was an estimated 400 cfs on March 9, 1966, and the minimum daily flow was 0.80 cfs for several days in 1966. Surface runoff is greatest during the spring season through May and June, when the major streams and discharges reach maximum flow. This flow is caused by rapid melting of the winter pack snows as temperatures rise. Usually by late July, streams have subsided to near a base flow which prevails until the cycle is repeated again the following spring. (Ref. D) Most of the smaller gulches tributary to Piceance Creek on the northern bank are dry washes, as they lack significant catchment areas. Surface water flows and flood irrigation support highly productive meadows and pastures which lie in the bottom of Piceance Creek Valley. All surface water flows into the White River at the confluence near White River City.

The White River, in turn, flows into the Green River, and contributes to the flow of the main Colorado River System.

Ground water in the area is very important because it is the principal source of rural domestic water supplies, and provides 80 percent of the charge to the surface flow of Piceance Creek.

Rural habitations in the Unit are widely dispersed and water quantities are generally adequate. Most areas have moderately hard water, but the quality is good otherwise. Wells which tap unconsolidated alluvial deposits along streams are the major sources. Yields normally range from 25-500 gallons per minute. Wells are also drilled into consolidated rocks, principally sandstone, to tap confined water sources. Water from deep wells, springs, and seeps are used primarily for rural domestic consumption and livestock and wildlife watering needs. There are no known irrigation wells in the site area. (Ref. D)

The Green River Formation and the Evacuation Creek Member of the Uinta Formation are the best potential sources of ground water in the northern part of the Piceance Creek Basin (personal communication from the USGS as reported by the BLM, October 19, 1978). There are many flowing wells and the maximum depth to water is about 200 feet. The leached zone contains water in fractures and solution openings and is considered the principal bedrock aquifer in the northern part of the Piceance Creek Basin because it has the greatest areal extent, permeability, and storage capacity. It contains 2.5 million acre-feet or more of water in storage. The transmissivity of the zone ranges from less than 3,000 gpd per ft (gallons per day per foot) in the margins of the basin to 20,000 gpd per ft in the center of the basin. Tests indicate that the potential yield of a well tapping the leached zone may be as much as 1,000 gpm (gallons per minute). The artesian storage coefficient of the leached zone is estimated to be about 10^{-4} but when not confined, the storage coefficient would be about 10^{-1}.

The dissolved-solids concentration of water in the Green River Formation ranges from 250 to 63,000 mg/l. Water near the edges of the basin contains less than 2,000 mg/l dissolved solids and the dominant ions are calcium, magnesium, and bicarbonate. About halfway between the edges of the basin and the center, dissolved-solids are about the same as at the edges but dominant ions are sodium and bicarbonate. Near the center of the basin, the water has dissolved considerable amounts of saline minerals and the dissolved solids average 25,000 mg/l and the principal constituents are sodium and bicarbonate. Chloride concentration ranges between 500 and 2,500 mg/l. (Ref. D)

Alluvium is a source of ground water along Piceance and Yellow Creeks. The alluvial aquifer is capable of storing and

transmitting more water per unit volume than any other aquifer in the basin. However, the areal extent of the deposits is small compared to that of the bedrock aquifers. The alluvium is confined to belts less than 1 mile wide along the creeks.

Along the major drainages, the alluvium ranges from 0 to 140 feet thick and the saturated thickness may be as much as 100 feet in a few places (Coffin and other, 1968). Water in the alluvium occurs under both water table and artesian conditions. (Ref. D)

An aquifer test in the alluvium of Piceance Creek showed that after pumping a few hours, the hydrologic boundaries of the alluvium will affect draw-downs and well yields (Coffin and others, 1968). The storage coefficient probably averages about 0.20. In places where the alluvium contains clay beds, the transmissivity may be as low as 20,000 gpd per ft. Thus, well yields vary widely from place to place according to variations in lithology of the alluvium at the well and proximity of the well to the hydrologic boundaries. Initial yields from properly located, developed and constructed wells are estimated to be as much as 2,000 gpm. (Ref. D)

The alluvial aquifer is recharged by precipitation, by applied surface water, by streams, and by infiltration from the Green River Formation. The aquifer discharges to streams, springs, wells, and to the atmosphere by evapotranspiration. (Ref. D)

The dissolved-solids concentration of water in the alluvium ranges from 250 to 25,000 mg/l. Water in alluvium in the upper reaches of the major drainages contains less than 700 mg/l dissolved-solids. In general, the principal ions in the alluvial water are calcium, magnesium, and bicarbonate. Ions in the water in the alluvium of Piceance Creek are predominately calcium, magnesium, sodium, and bicarbonate; the dissolved-solids concentration increases downstream.

Additional livestock and wildlife needs are usually supplied by the development and use of surface water sources, although some live water springs are developed, and a few ponds have ground water augmentation from springs and seeps. (Ref. D)

i. Soils

Soils within the site area consist basically of dark colored, cool climate associations. These soil associations are shown on Figure 6 and discussed below according to the coding system of the Soil Conservation Service. (Ref. D):

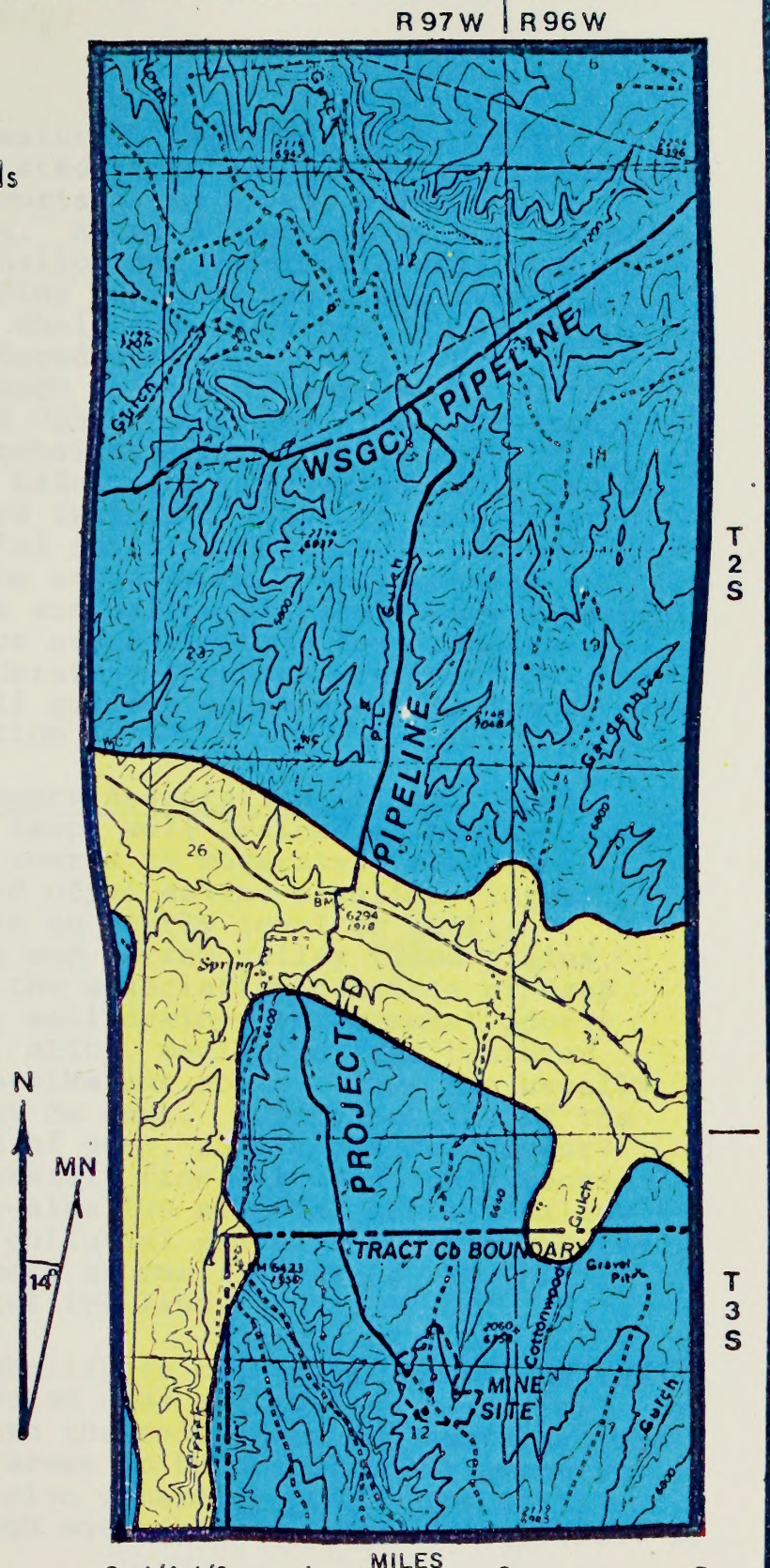
Haploborolls-Camborthids-Argiborolls Association (#115):

Cool, shallow to deep, well drained, shaly medium to moderately fine, and gravelly or cobbly medium and

EXPLANATION

Argiborolls–
Haploborolls–Camborthids

Ustifluvents–Fluvaquents



SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

BASE MAP FROM USGS MAP N3941.25-W10755.75
RIO BLANCO COUNTY COLORADO, 1975, 1:50,000,
SHEET 6 OF 6.

Figure 6

SOILS

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

moderately coarse textured, light and dark colored soils on sloping to steep mountain slopes and ridges. This association comprises the higher elevations within the site area. About 60 percent of the association consists of shallow and moderately deep, well drained, medium to fine textured soils with varying amounts of channery shale and sandstone. They generally have dark colored surfaces. Ten percent of the association is made up of rock outcrop of shale and sandstone of the Uinta Formation. Twenty percent of the association consists of moderately deep to deep, well drained, calcareous, gravelly cobbly medium and moderately coarse textured, light to dark colored colluvial and alluvial soils. There is 10 percent inclusions within the association. They consist mainly of areas that are saline-alkaline, have fluctuating water tables or are moderately deep reddish-brown, medium to moderately fine textured wind deposited soils. Small gullied areas are also found within this association.

Ustifluvents-Fluvaquents Association (#132): Cool, deep and moderately deep, well drained to poorly drained, moderately coarse to moderately fine textured, calcareous and often saline-alkaline, light to dark colored soils on nearly level to gently sloping low terraces and narrow valley flood plains. About 70 percent of the association consists of deep and moderately deep, well drained to somewhat poorly drained, calcareous, silty, medium to fine textured and generally saline-alkaline soils. They are usually light colored but may be dark. Twenty percent of the association consists of deep, poorly drained, moderately coarse to moderately fine textured, calcareous and generally saline-alkaline alluvial soils; shallow and moderately deep colluvial gravelly to stony medium textured soils, as well as small areas of wet, highly alkaline soils and gullied land.

The soil moisture availability is only fair throughout the Planning Unit. The shales located near the surface allow for very poor water percolation into the soils from the surface. The ability of the soils in these areas to hold sufficient amounts of water for plant growth are also generally poor. The soils are not condusive to having high water holding capacities. (Ref. D)

6. Geological hazards and other limiting factors

No significant landslides or unstable slopes have been noted within the site area along the proposed ROW. There are some mantle stability problems in the Planning Unit. However, none have been identified at this time on range lands. The mantle

instability (potential for landslides) is high due to generally steep slopes and layered shale soils in the Unit. (Ref. D)

The site area has only one mapped fault, that associated with the long graben structure south of the Piceance Creek Anticline. There is no indication that this fault is active. Further, the site area is located in Seismic Risk Zone 1, which is defined as a zone susceptible to minor damage in which distant earthquakes may cause damage to structures. The entire state of Colorado has been tentatively classified as a "minor seismic risk area of the United States." This is based in part on the fact that no major earthquakes have occurred in this region in the past 100 years. (Ref. D)

Although, it has been noted on Page pp-86 of Ref. D that:

> "Subsidence is common where man has pumped large volumes of fluids out of weakly consolidated sediments and where he has mined out mineral deposits without leaving support in the workings (underground mines and in situ processes). Other causes exist but are negligible in the unit.",

the discussion does not identify the existence of subsidence within the site area. Although some amount of subsidence might be expected over a major oil and gas field such as the Piceance Creek Field, such subsidence would not necessarily be perceptible, or necessarily deleterious where structures have not been built upon the surface. A field inspection of the site failed to note any evidence of possible subsidence.**

7. Climatology

The climate of the site area can be classified as arid steppe and is characterized by abundant sunshine, generally low precipitation, warm summer temperatures, low relative humidity and cool nights. In midwinter, air temperatures are often low, but strong solar radiation and the dry air combine to provide a generally pleasant environment.

The local climate is strongly influenced by microclimatic features such as slope aspect, elevation, soil type, soil moisture content and vegetation.

Aside from private meteorological stations which exist as a result of studies at Tract C-b, there are two long term data gathering stations in the area. These are at Little Hills Game Experimental Station about 6 miles north of the site area and at Rifle about 25 miles to the southeast.

The following summary shows precipitation, temperatures and extremes recorded at these two stations.

TABLE 1

SUMMARY OF CLIMATOLOGICAL DATA
1959 to 1973*

ITEM	STATION	
	Little Hills	Rifle
Elevation (feet)	6,140	5,400
Temperature (°F.) Mean	43	46
Average Maximum	65	70
Average Minimum	20	21
Extremes	-48 to 97	-38 to 99
Precipitation (inches)	13	11

*not inclusive

a. Precipitation

The Piceance Basin Planning Unit is characterized by a dry continental climate which when combined with the irregular topography results in a variable precipitation pattern. Average annual precipitation is 12 inches along the northern edge of the Unit compared to 24 inches in the southern portion where the elevation is considerably higher. Most of the precipitation occurs as rain, falling during early spring, late summer and fall. Summer precipitation generally occurs in the form of thunderstorms moving across the Unit in a east-northeasterly direction. Usually thunderstorms are of short duration with frequent, high intensity storms occurring.

Recorded amounts of less than 0.5 inches are usually considered ineffective for plant growth. Fewer than 10 days a year have precipitation greater than 0.5 inches. Drought years or years of rainfall below normal trends occur 3 or 4 years out of 10. (Ref. D)

b. Snowpack

The remainder of the precipitation occurs as snow, falling anytime from October to April. Snow depths at lower elevations may reach 2 to 3 feet but due to high solar radiation, snow seldom persists for long periods at exposed locations below 7,000 feet. Strong solar radiation results in frequently high midsummer afternoon temperatures. Daytime readings above 100 degrees F. are not uncommon with nighttime readings in the mid 40's. July appears to be the hottest month. Low midwinter temperatures are common due to the cold air drainage associated with the topography of the lower valleys. December and January

appear to be the coldest months with -35 degree F. readings being common.

On the average, elevations below 5,500 feet have approximately 124 frost free days compared to 30 - 50 days at elevations above 6,000 feet.

c. Winds

Geostrophic winds at higher altitudes control the surface winds resulting in reduced velocity and a mild surface flow. Above 8,500 feet elevation, wind flow is predominently from the southwest throughout most of the year. Topography strongly influences local wind circulation and the dynamics which govern the transport and diffusion of air contaminants. The two main effects of topography are well developed valley wind patterns and a frictional effect induced by the mountains. Valley wind patterns follow diurnal variations. Generally wind velocities are lowest at about dawn when there is little vertical thermal mixing of air, and are greatest in the early afternoon when, due to the heating of the earth's surface by the sun, vertical mixing of air is highest. During warm afternoons, the heated air expands causing light winds to move vertically and up the valleys causing upslope winds. At night, the cold, dense air at higher elevations moves into the valleys and causes a downslope wind.

Mountains and rough terrain can significantly modify the flow of upper level air because of frictional effects. In valleys with broad floors such as Piceance Creek, inversions usually form at night. Air movement beneath these inversions is minimal and wind direction is determined by the local downslope circulation. These inversions are usually dissipated by surface heating during the day, but may persist for portions of the day. (Ref. H)

The frequency of measurable winds averages 12 percent for the year. Winds seldom reach an intensity where they can be considered to have an influence on the resources in the Unit. (Ref. D)

B. Living Components

1. Demography

There are 4 dwellings with permanent residents within the site area. Two of these are permanent structures and 2 are housetrailers. These house four family units with 2 adults each and an average of 4.5 people per family. Thus, within the site reside 8 adults and 10 children for a total population of 18.

These residences lie in the valley of Piceance Creek and are accessible from Rio Blanco County Highway 5 between

mileages 18 and 21.5 west from Rio Blanco Store.

An ambient population of workers will be employed for the production of shale oil within the boundaries of Tract C-b within the mine service area and underground. It is projected (Reference K) that 1600 workers will be employed. As a rough estimate, under 3-shift operation approximately a third--or 533 of these workers will be on the tract at any given time and twice this amount--or 1066-- will be on the tract at shift changeover time.

An unknown number of visitors is expected to the site, and a temporary population of hunters may be expected to visit the site area during hunting season. No estimates have been made for these ambient populations.

2. Land use

Historically, the principal uses for the land within the site area have been for ranching, livestock grazing, hunting, and the production of oil and gas.

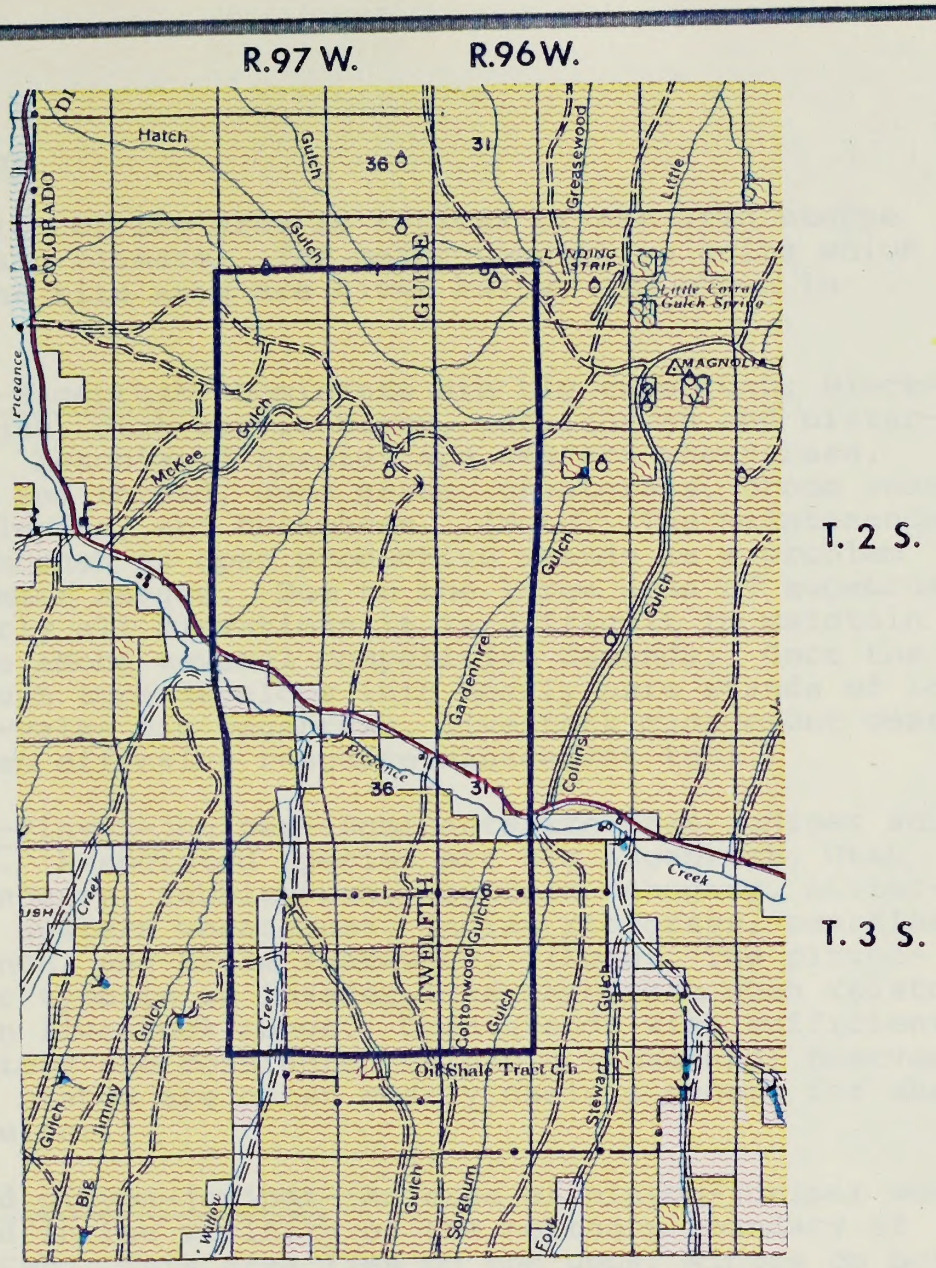
With the inception of activity for the exploration and development of oil shale and related saline minerals, it may be expected that the character of land use is changing. Thus, although at present ranching and hunting have generally been compatible with the production of oil and gas, it may be anticipated that development of large underground or in situ mines, will result in conflicts of land use.

The area which was designated as the site area for the purpose of preparing this EAR, and which is shown in Figure 2 and outlined on Figure 7, contains approximately 22.5 square miles or roughly 14,400 acres. Figure 7 shows the land ownership pattern and Table 2, following, gives the acreages and percentages of the ownership categories.

TABLE 2

SURFACE OWNERSHIP OF THE GAS SERVICE PIPELINE TO OIL SHALE TRACT C-b SITE AREA

Ownership	Acres	Percentage
Private Land	1,240	8.6
Public Land (includes 40 acres of Public Water Reserve)	13,160	91.4
TOTAL	14,400 Acres	100.0%



Scale: 1/2 inch=1 Mile

FROM USBLM MEEKER COLORADO OWNERSHIP MAP

Private Land

Public Land

State wildlife, parks, outdoor recreation area

Federal agency protective withdrawal

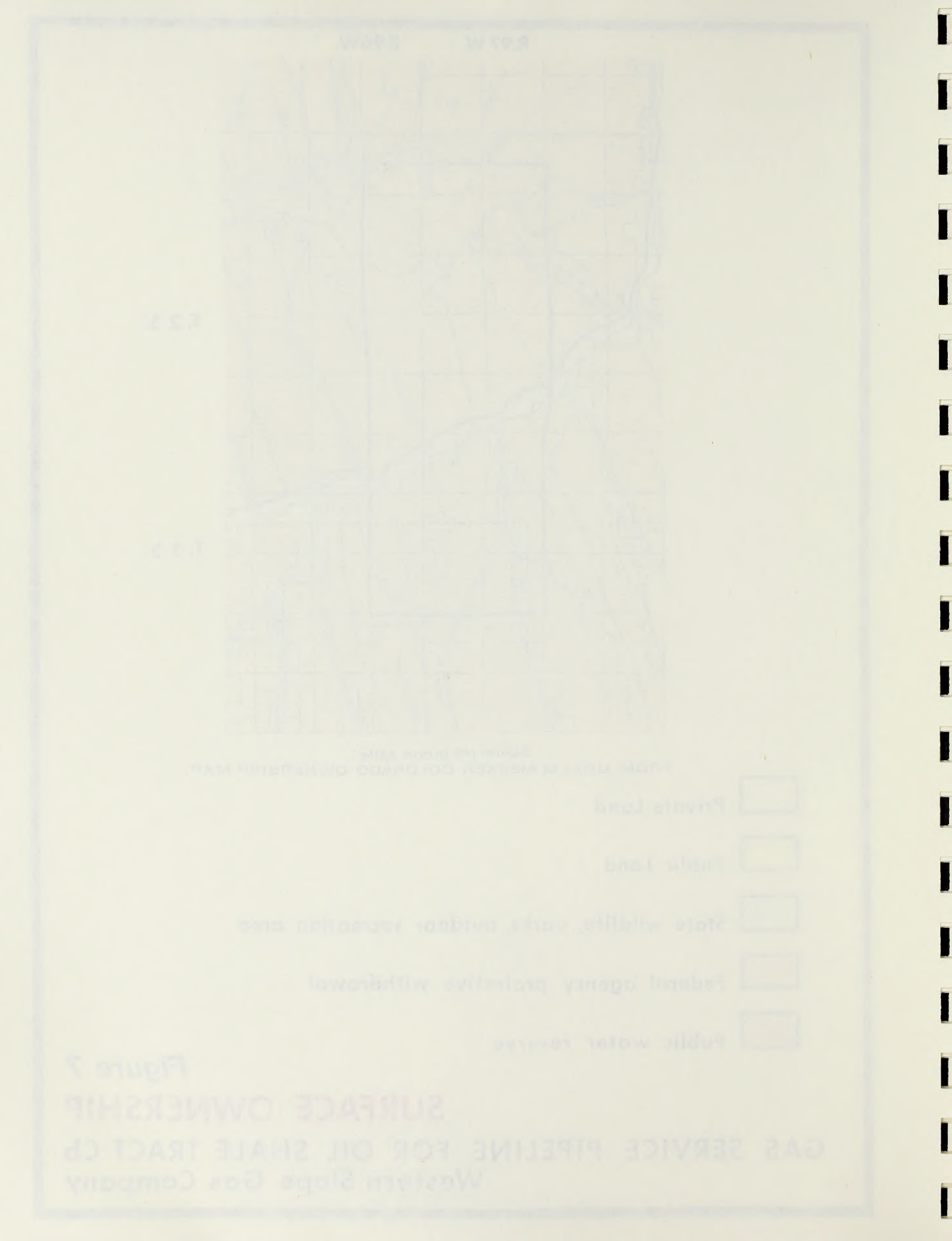
Public water reserve

Figure 7

SURFACE OWNERSHIP

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company



3. Vegetation

The vegetation of the area is typical of the arid steppe and arid mountain climate. The major vegetative units which are found in the site area are given below, and shown in Figure 8.

Type 4-Sagebrush--Dominants are big sagebrush, black-sagebrush, Utah serviceberry, rabbitbrush and bitter-brush. Associated species are western wheatgrass, needle and thread, June grass, cheatgrass, broom snake-weed, lupine, and buckwheat. (Note: The maintenance of sagebrush as open productive stands is a problem for summer ranges. Due to the large area of sagebrush at nearly all elevations it is difficult to maintain a balance among several competitive demands. Once the sagebrush type develops into nearly pure stands of low-forage-value big sagebrush, livestock management ceases to be an effective resource management tool.)

Type 9-Pinyon-juniper--Dominants are Utah juniper and pinyon. Associated species are big sagebrush, Utah serviceberry, rabbitbrush, mountain mahogany, bitter-brush, western wheatgrass, Indian ricegrass, beardless bluebunch, and broom snakeweed. (Note: The pinyon-juniper type is an invader-like sagebrush when related to open livestock range. Open stands with sufficient understory are considered valuable rangeland; however, closed stands are often nearly useless except for shade and shelter.)

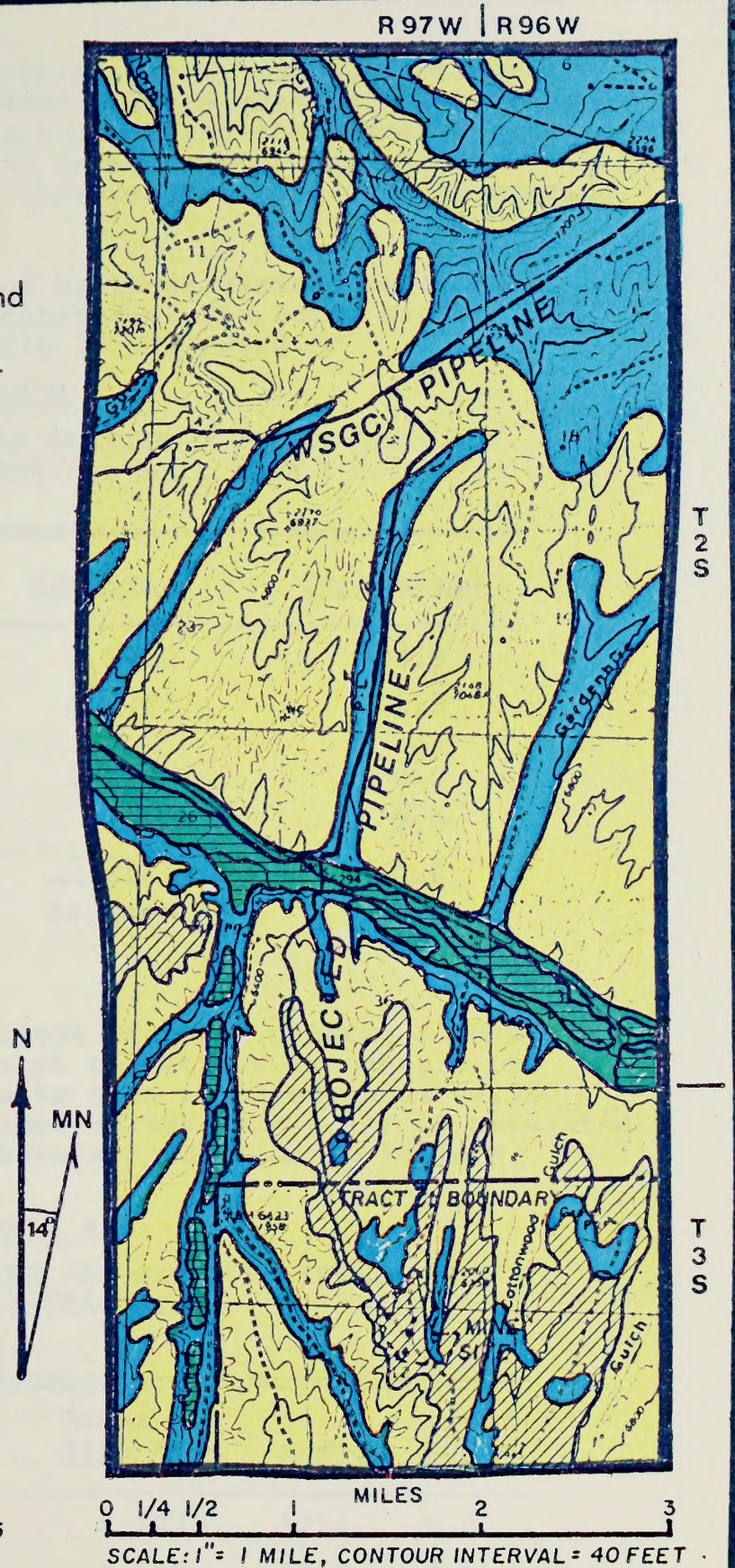
Chained pinyon-juniper--An area of pinyon-juniper was chained in the vicinity of the northern boundary of Tract C-b. This area lies on the upper slopes on both sides of the access road and around the mine service area.

Dominants are big sagebrush, bitterbrush and saplings of pinyon pine and Utah juniper. Snowberry may occur locally as a dominant species. Associated species are the perennial grasses; Indian ricegrass, squirreltail grass and western wheatgrass. Annual grass species include cheatgrass, goosefoot, stickseed and tansy mustard. (Note: The chained rangelands constitute ecologically unstable communities. Destruction of the woodlands has greatly altered the original vegetation and has initiated successional changes which will continue until the woodlands become re-established.) (Ref. H)

Type 20-River bottom--Open to dense stands of shrubs, young trees, occasional large trees and open marshy or sub-irrigated bottomlands. Dominants are willow, dogwood, carex, cottonwood, and cattail. Associated species are beardless bluebunch, wheatgrass, bottlebrush, squirreltail, cheatgrass, needle and thread, and June grass.

EXPLANATION

- 4 — Sagebrush
- 9 — Pinyon–juniper woodland
- 9 — Chained pinyon–juniper rangeland
- 20 — River bottom
- Agricultural meadow



SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

BASE MAP FROM USGS MAP N3941.25-W10755.75
RIO BLANCO COUNTY COLORADO, 1975, 1:50,000,
SHEET 6 OF 6.

Figure 8

VEGETATION

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb
Western Slope Gas Company

Agricultural meadows--This type is composed primarily of alfalfa and introduced pasture grasses. The areas are used for hay production during the summer months when cattle are kept on native summer rangelands. During winter months, these meadows are used as grazing areas.

The areas of surface covered by these various vegetation types and their relative percentages of the total area of the site area are shown in Table 3, following.**

TABLE 3

VEGETATION TYPES-GAS SERVICE PIPELINE TO OIL SHALE TRACT C-b SITE AREA

Vegetation Type	Acreage	Percentage
Sagebrush	3,594	24.9
Pinyon-juniper woodland	8,826	61.3
Chained pinyon-juniper rangeland	1,174	8.2
River bottom	294	2.0
Agricultural meadow	512	3.6
TOTALS	14,400	100.0%

4. Livestock and grazing

The site area contains portions of three grazing allotments as shown on Figure 9. Nine ranch operations run cattle on these three allotments. The site area contains about 14,400 acres from which have been allocated 2864 AUM's (+) or permitted grazing capacity. The allotments are detailed in Table 4, following.

TABLE 4

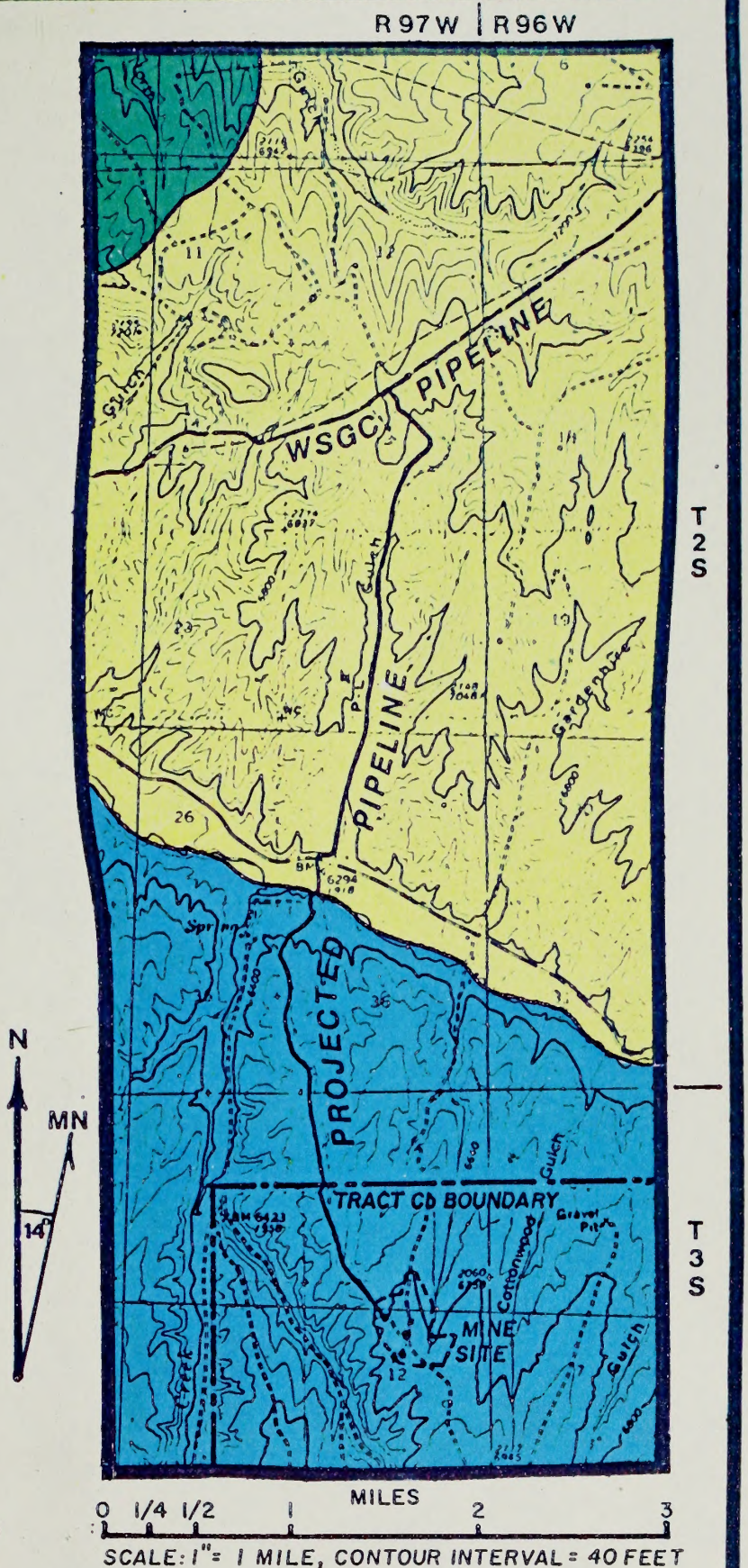
GRAZING ALLOTMENTS IN THE GAS SERVICE PIPELINE TO OIL SHALE TRACT C-b

Allotment Number	Allotment Name	Acres in Site Area	AUM's	Acres/ AUM
6006	Little Hills	8,272	1216	6.8
6023	Piceance Mtn.	5,636	1610	3.5
6028	Hatch Gulch	492	38	12.9
TOTALS		14,400	2864	

(+) One Animal Unit Month (AUM) is the forage required to support one 1000-pound cow with one under-6-months-of-age calf for a total period of one month (personal communication BLM, Oct. 19, 1978).

EXPLANATION

6006	Little Hills
6023	Piceance Mountain
6028	Hatch Gulch



BASE MAP FROM USGS MAP N3941.25-W10755.75 RIO BLANCO COUNTY COLORADO, 1975, 1:50,000, SHEET 6 OF 6.

SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

Figure 9

GRAZING ALLOTMENT

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

Although sheep do graze some portions of the area, the allotments within the site area are for cattle.

Past livestock use was extremely heavy; however, modern grazing systems and range improvements have been implemented so as to improve the condition of the range (personal communication BLM, October 19, 1978).

5. Wildlife

A variety of wildlife are abundant throughout the White River Resource Area. The mule deer herd that winters in the Piceance Basin, has been advertised as the "largest migrating mule deer herd in the world." Numbers in past years have been estimated at 50,000 and higher. (Ref. A)

No attempt has been made to survey the site area to obtain a complete species list. Such species lists have been compiled in several sources for the site and nearby areas and it may be reasonably assumed that these lists represent species which might be expected to occupy or visit the site area. In addition to the many environmental reports which have been prepared for the oil shale developments for the region, the reader may refer to the comprehensive list shown in Reference E as Piceance Basin Planning Unit URA Step II, Animals (1605.36) Table 1, and in Reference G, Appendix 2, Species List - Game Species - Wildlife Management Unit 22.

The site area lies entirely within Game Management Unit 22, of the Colorado Division of Wildlife.

a. Mule deer

Mule deer are the most prominent wildlife inhabitants of the site area. As shown on Figure 10, a large portion of the site area is covered by deer concentration areas. These areas are largely coincident with the pinyon-juniper and river bottom habitats which occupy moderately rugged terrain in the dry washes and gulches that lie on both sides of Piceance Creek.

The mule deer that use the site area are members of the Piceance Basin deer herd, which is described as the largest migrating deer herd in Colorado. Population estimates of this herd have been variable. Historical data is not clear and the herd was decimated by a high winter kill in the 1972 and 1973 severe winter seasons. Under the best estimates now available, the present herd is believed to have a population of about 35,000 animals.

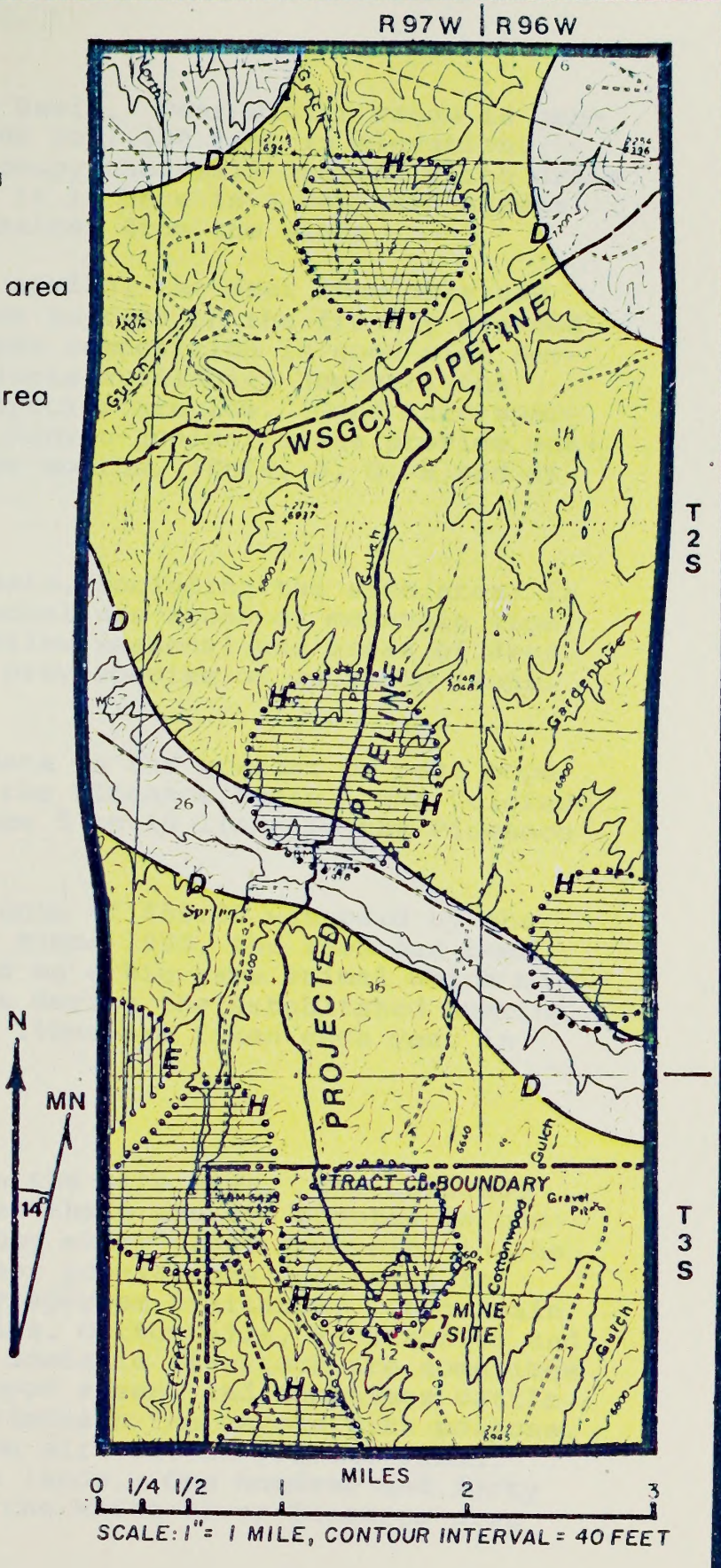
Mule deer are found throughout the entire Planning Unit. Density varies with season with the largest concentrations occurring during winter and spring. Summer populations are generally low, with prime summer range being a small area

EXPLANATION

D — Deer concentration area

H — Red-tailed hawk nesting area

E — Golden eagle nesting area



BASE MAP FROM USGS MAP N3941.25-W10755.75
RIO BLANCO COUNTY COLORADO, 1975, 1:50,000,
SHEET 6 OF 6.

SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

Figure 10

HABITAT

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

around the upper rim of the basin. Deer winter range is generally in an area below 6,800 to 7,400 feet in elevation. During winter months deer occupy the small canyons which drain south into Piceance Creek. It is here in a southern aspect that they find warmth and shelter from the winds.

During the winter and spring, the deer regularly use the meadows in Piceance Creek to feed on the freshly greened vegetation. Generally, browse composition is good with several species of preferred plants available; however, the vigor and density of these species are low. Good interspersion of sagebrush parks and pinyon-juniper areas provide adequate cover during the winter months. (Refs. D, G, E and H)

b. Mountain lion

All of the Piceance Basin, including the site area, is mountain lion habitat. Seasonal use areas of mountain lion in the site area probably follow seasonal use areas of deer, as deer are one of the main prey species of mountain lions. (Ref. E)

There is no existing data on the present or past population of mountain lions in the Piceance Basin. The Colorado Division of Wildlife estimates 5 to 15 lions in the Piceance Basin. (Ref. E)

Until March 1968, a bounty of $50.00 was paid by the state for each lion killed. Since 1965, the lion has been protected by being classified as a big game animal which may be killed by licensed hunters during the established hunting season. An estimated 1 or 2 lions are taken each year in the Piceance Basin. (Ref. F)

c. Coyote

The coyote is common in the site area. The Colorado Division of Wildlife estimates there are 450 coyotes in the Piceance Basin. Coyotes occupy every plant community in the Piceance Basin, with the hither populations occurring in areas that have abundant prey species available. Their main food supply appears to be voles, cottontails, jackrabbits and winter-killed deer; however, domestic livestock are sometimes taken. As the coyote preys upon sheep, and sometimes cattle, livestock operators try to eliminate the coyote with poisons, cynaide guns, and hunting from aircraft on private lands. Trapping is allowed on public lands. One hundred and forty coyotes were so harvested in the White River Resource area in 1974. (Ref. E & H)

d. Bobcat

The bobcat is most common in the rimrock areas of the site, although signs of bobcat activity may be seen in other

habitats. Prey species which are most important to bobcats include cottontail, jackrabbits, wood rats and various birds. The bobcat unlike the coyote, is a more specialized predator and does not usually feed on carion. Populations are probably down from the early 1900's due to trapping, hunting and poisoning. During the past three years, fur prices for these animals have been quite high; which in turn, has increased the trapping and hunting demand. There are no current data for population estimates. (Ref. E & H)

e. Small animals and furbearers

Small animals and furbearers in the site area include raccoons, striped skunks, desert cottontails, muskrats, white-tailed jackrabbits, shrews, ground squirrels, chipmunks, gophers, wood rats, mice and voles. The reader is referred to the species lists cited in Reference D as Piceance Basin Planning Unit URA Step II, Animals (1605.36) Table 1, in Reference G, Appendix 2, Species List - Game Species - Wildlife Management Unit 22 and in Reference H, Table XI-10, Mammals Found On and Around Tract C-b, as being typical of the small animal assemblage which may be expected to inhabit the site area.

Rabbits are probably the most abundant medium sized mammal in the site area. Cottontails may reach a high of 150 to 200 rabbits per square mile in the Piceance Basin Planning Unit and drop to a low of 15 to 20 per square mile. The species is non-migratory and is more abundant in sage-brush and shrub communities where cover and food are plentiful. (Ref. E)

Raccoons are common along Piceance Creek and sometimes tracks are observed on adjacent ridges. According to local residents, raccoons are increasing in population numbers and are more common now than in the past. This is a semi-aquatic species that commonly feeds on aquatic organisms, although it regularly moves far from water and will feed on a variety of terrestrial plants and animals. (Ref. H)

Striped skunks have been observed near the agricultural meadows and riparian areas and in the pinyon-juniper woodlands. (Ref. H)

Muskrats are common in Piceance Creek and in nearby ponds and irrigation ditches. They tend to be most numerous in areas with appreciable riparian vegetation, especially cattails and bullrushes. (Ref. H)

Small mammals are relatively abundant in the site area. Mice and chipmunks are the most abundant of the small mammals. Seasonal activity is exhibited in all small mammals and is

influenced by climatic conditions. Ground squirrels, chipmunks and some mice hibernate or become inactive in the winter. In contrast the deer mouse and the vole are active throughout winter and do not hibernate. (Ref. H)

f. Fish

Piceance Creek and Willow Creek are the only perennial streams in the site. Piceance Creek flows east-southeast to west-northwest through the site area and Willow Creek flows northward through the southwest quarter of the site to its confluence with Piceance Creek. All other streams are highly intermittent.

Piceance Creek is generally characterized by a meandering stream channel, fluctuating flows, high levels of dissolved solids, high turbidity, silted rock and gravel substrates at certain times of the year, and infrequent pool and shelter areas for fish. These factors make much of the habitat unsuitable for large game fish populations. This aquatic environment favors the less desirable but more highly adaptable non-game species such as mountain sucker and speckled dace. Willow Creek is a small spring fed stream similar to Piceance Creek in terms of water quality and substrate. (Ref. H)

Mountain suckers and speckled dace are found throughout Piceance Creek and are also the most numerous. Brook trout are the predominant trout species in Piceance Creek but their number is small. A few rainbow and brown trout have been noted. (Ref. H)

g. Birds

The site area provides habitat for a wide variety of birds. Approximately 136 bird species have been observed in the vicinity. These include songbirds, upland gamebirds, waterfowl and shorebirds. and raptors. The species sighted in the region may be considered as residents or visitors of the site area. A list of these species may be found in Reference D under Table 1, Piceance Basin Planning Unit URA Step II, Animals (1605.36) and in Reference H under Table XI-12, Species of Birds Observed on Tract C-b During the First Year's Investigations. (Ref. D & H)

At least 64 songbirds or songbird-like species apparently nest in the area. Substantial seasonal variations in density occur for most habitats. This is due primarily to the migratory behavior of songbirds. Less than one-fourth of the songbird species which nest in the area remain through the winter. Most of these species leave the Piceance Basin by late October and do not reappear until April or May. It has been suggested that this high migratory propensity is generally typical of shrub steppe avifaunas due to low supplies

of winter food-principally seeds. The pinyon-juniper and riparian meadow habitats support the greatest numbers of songbirds. (Ref. H)

Two species of upland gamebirds, the mourning dove and sage grouse, inhabit the site area. Mourning doves have been found occupying all habitats in the site area. Their preferred nesting habitat is pinyon-juniper with flocking behavior during the fall occurring in the riparian meadow habitat. (Ref. H) The preferred habitat of the sage grouse is the sagebrush-grass type. The highest densities of this bird occur where these types are closely associated with irrigated lands, dryland farms and river bottoms. (Ref. F) A special three-year study of the sage grouse will be conducted by the Colorado Division of Wildlife in order to locate breeding, nesting, brooding, and wintering areas, and determine measures for the protection of this species. (Ref. G)

About 24 waterfowl and shorebird species have been observed in the area and half of which are winter residents or migrants. The mallard and green-winged teal are the most abundant permanent residents. During the winter the mallard, green-winged teal and American wigeon are the most abundant residents. In the summer the spotted sandpiper, Wilson's phalarope and cinnamon teal are common. Waterfowl populations tend to be concentrated along Piceance Creek; however, the scarcity or absence of open water and aquatic vegetation limits densities and usage in this area. (Ref. H)

Many raptors, both iurnal and nocturnal, can be found in the site area at various times of the year. During mid-winter and late winter, rough-legged hawks, common ravens, golden eagles, bald eagles, American kestrels, great-horned owls, snowy owls, red-tailed hawks and long-eared owls have been observed. During the summer the most common raptors are the great-horned owl, the red-tailed hawk, the turkey vulture, American kestrel, goshawk, Cooper's hawk and sharp-shinned hawk. The golden eagle and red-tailed hawk have nesting areas within the site area as shown on Figure 10. The prairie falcon, a species designated as "threatened" by the U. S. Fish and Wildlife Service, has been sighted within the Piceance Basin. Nesting areas are believed to be south of the site area in the vicinity of Parachute Canyon. Although there have been recent sightings of the peregrine falcon, an "endangered" species over Oil Shale Tract C-a, none have been reported in this site area. Like the prairie falcon, the most suitable nesting habitat for the peregrine falcon lies along the cliffs of the Parachute Canyon complex to the south. (Ref. E, G & H)

h. Amphibians, reptiles and invertebrates

Two amphibian species observed in the site area are the leopard frog and the Utah tiger salamander. Lizards found

in the site area are the sagebrush lizard, which is the most abundant, the short-horned lizard, eastern fence lizard and the tree lizard. Three species of snakes are common in this area and are the western garter snake, the coach whip snake and the diamondback rattlesnake. (Ref. H)

Invertebrates are an integral part of any biotic community. They provide food sources for larger animals, act as scavengers, decomposers, herbivores and predators and, in many cases, as parasites on other organisms. Invertebrates include nematodes, worms both aquatic and terrestrial, insects both aquatic and terrestrial and those numerous creatures commonly referred to as "bugs." Tables XI-19 and XI-21 in Reference H list those invertegrates found in and around Oil Shale Tract C-b.

i. Wild horses

Wild horse ranges lie in the vicinity of the site area but are not found within it.

j. Threatened and endangered species

No threatened or endangered species are known to inhabit the site area.

C. Ecological Relationships

Please refer to the discussion of ecological relationships in Appendix A.

1. Environmental education

Among various field trips conducted by schools both at Meeker and Rangely to visit regional natural features, field trips to the site of the Rio Blanco Nuclear Shot area have been very popular with the students. This site lies in Fawn Creek in Section 14, T. 3 S., R. 98 W., about 5 miles southwest of the site area.

Occidental provides free bus guided tours on a regular basis to Tract C-b from Meeker and Rifle.

2. Fire hazard and protection

As discussed under the section on Fire under Forest Production, the vegetation of the area is susceptible to fire during dry summer months, particularly during years of drought. The occurrence of construction activity and the related welding of steel pipe can be considered to increase the risk of fire under such conditions.

Fire protection is provided by county, state and federal agencies as is discussed in Appendix A.

D. Human Values

Please refer to the discussion of human values in the regional discussion in Appendix A.

1. Landscape character

The projected ROW and pipeline will cross Piceance Creek Valley at almost a right angle. The pipeline starts at its northern end with a connection to the main pipeline of the WSGC on the top of the high rolling mesa where the Piceance Creek Dome Oil and Gas Field is found. Typical terrain is shown in Figure 11a. This area has been the scene of oil and gas production since the 1930's. The vegetation--largely of the pinyon-juniper assemblage--shows the locations of older pipelines by the presence of straight edges. Although the revegetation of the older rights-of-way has been successful, the presence of the pipelines is revealed by these straight edges through the brush. The projected pipeline will adjoin these older rights-of-way and will add no incremental visual impact.

The projected pipeline and ROW will cross over a ridge at the south edge of the mesa and will descend into the bottom of P-L Gulch. Figure 11b shows where the projected line will adjoin and parallel an existing pipeline ROW. A typical view of P-L Gulch is shown in Figure 11c. The valley is v-shaped indicating a youthful topography and descends from the top of the mesa almost in a straight line to Piceance Creek Valley. The vegetation consists of sagebrush and grass in the narrow valley bottom and of the pinyon-juniper assemblage on the side slopes. A dirt road occupies the valley bottom and an existing ROW and pipeline descends P-L Gulch parallel to the road to serve a well located about half way down the valley.

As the projected pipeline leaves P-L Gulch, it turns to the west along the northern side of Rio Blanco County Road 5 for a short distance and then turns southwards to cross the highway and the meadowlands of Piceance Creek Valley. This crossing is shown in Figure 11d. The ROW and deeply buried pipeline will cross the meadowland area immediately to the west of the main access road to Tract C-b and through a fenced-in area which is used for the stacking and storage of baled hay. As seen in the picture, the meadowland is flat, verdant and lush due to the presence of ample irrigation water in Piceance Creek.

South of Piceance Creek the ROW and pipeline will ascend the long gentle slope which rises towards the mine service area at Tract C-b. The ROW lies well to the west of the new access road and follows the older and now abandoned access

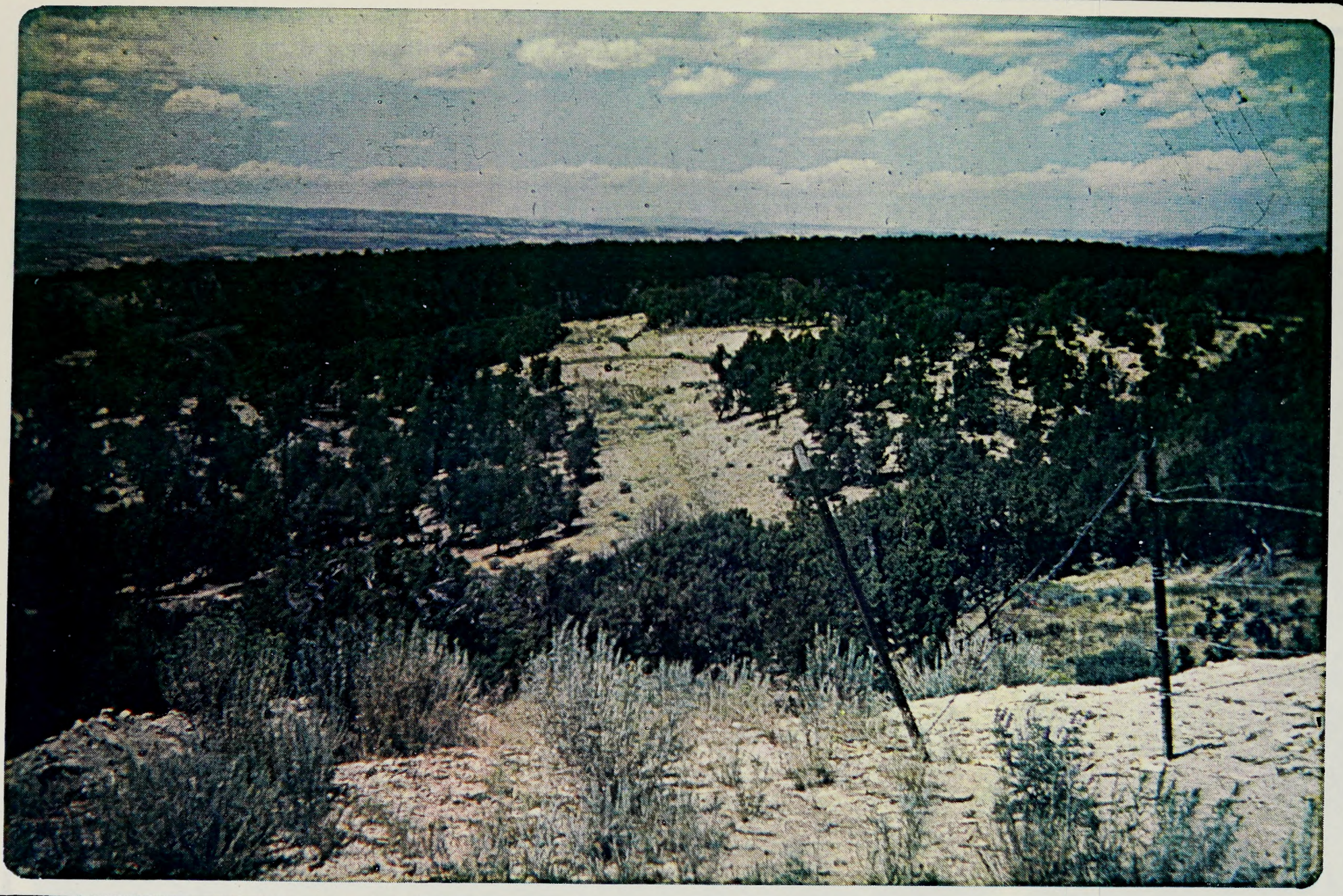


Fig. 11a Photograph with the point of projected connection with WSGC main pipeline in the middleground. The new service pipeline will follow the pre-existing ROW which has been revegetated. The view is towards the northwest.

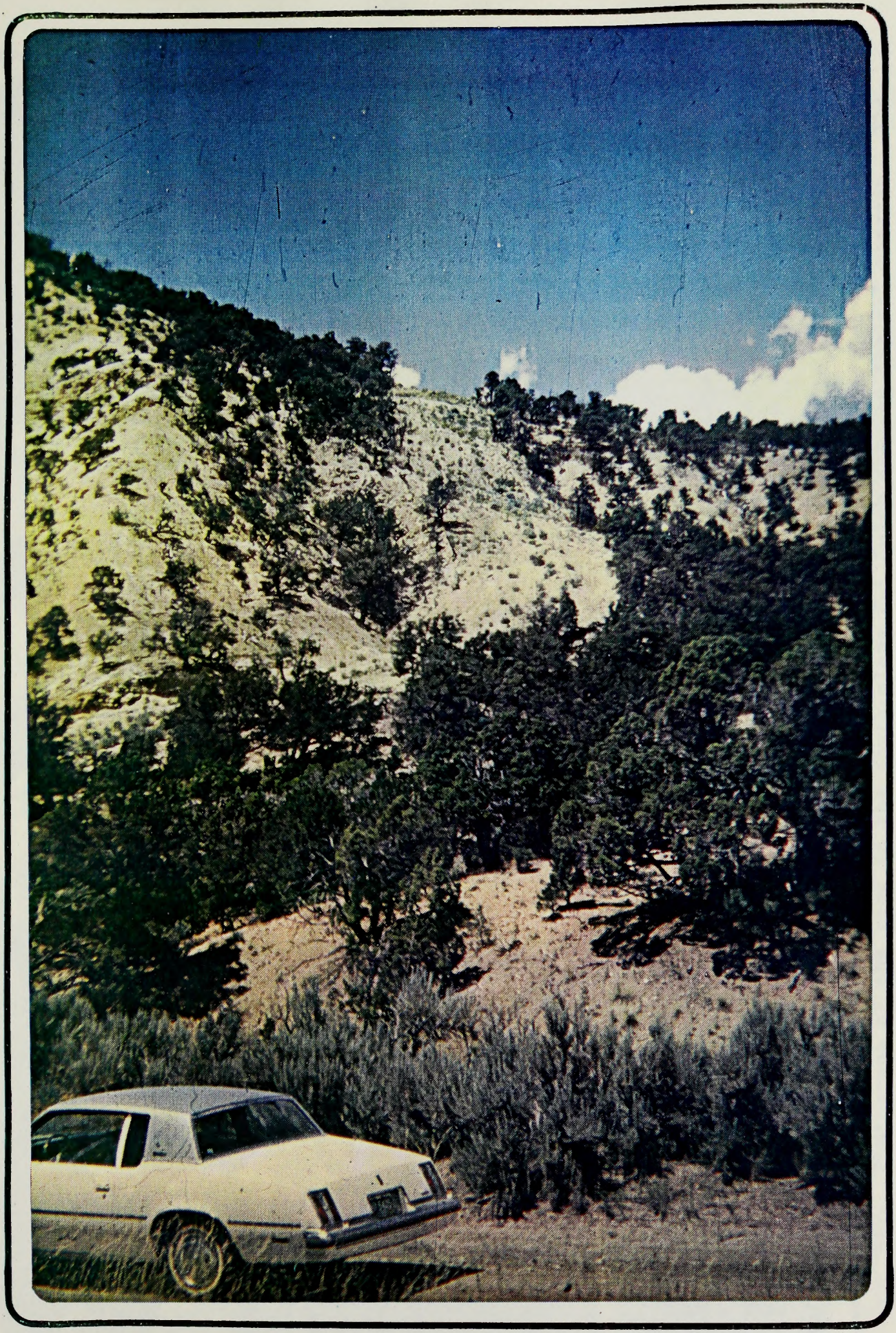


Fig. 11b. Photograph of the route where the new pipeline will descend from the mesa into P-L Gulch along an existing pipeline ROW. View is towards the northwest.

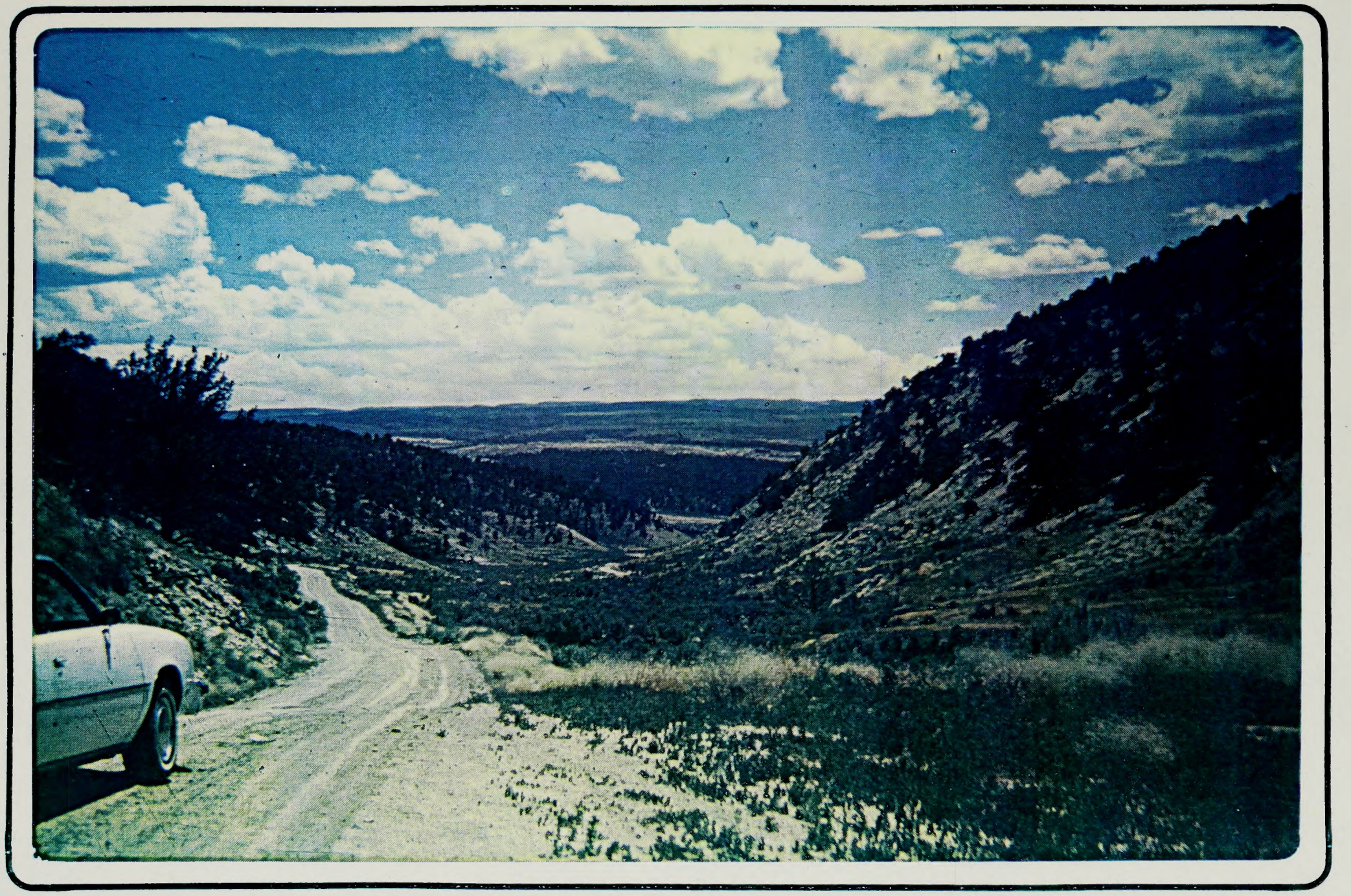


Fig. 11c. Photograph of the view to the south along P-L Gulch showing typical terrain. The pipeline will lie along the side of the road.

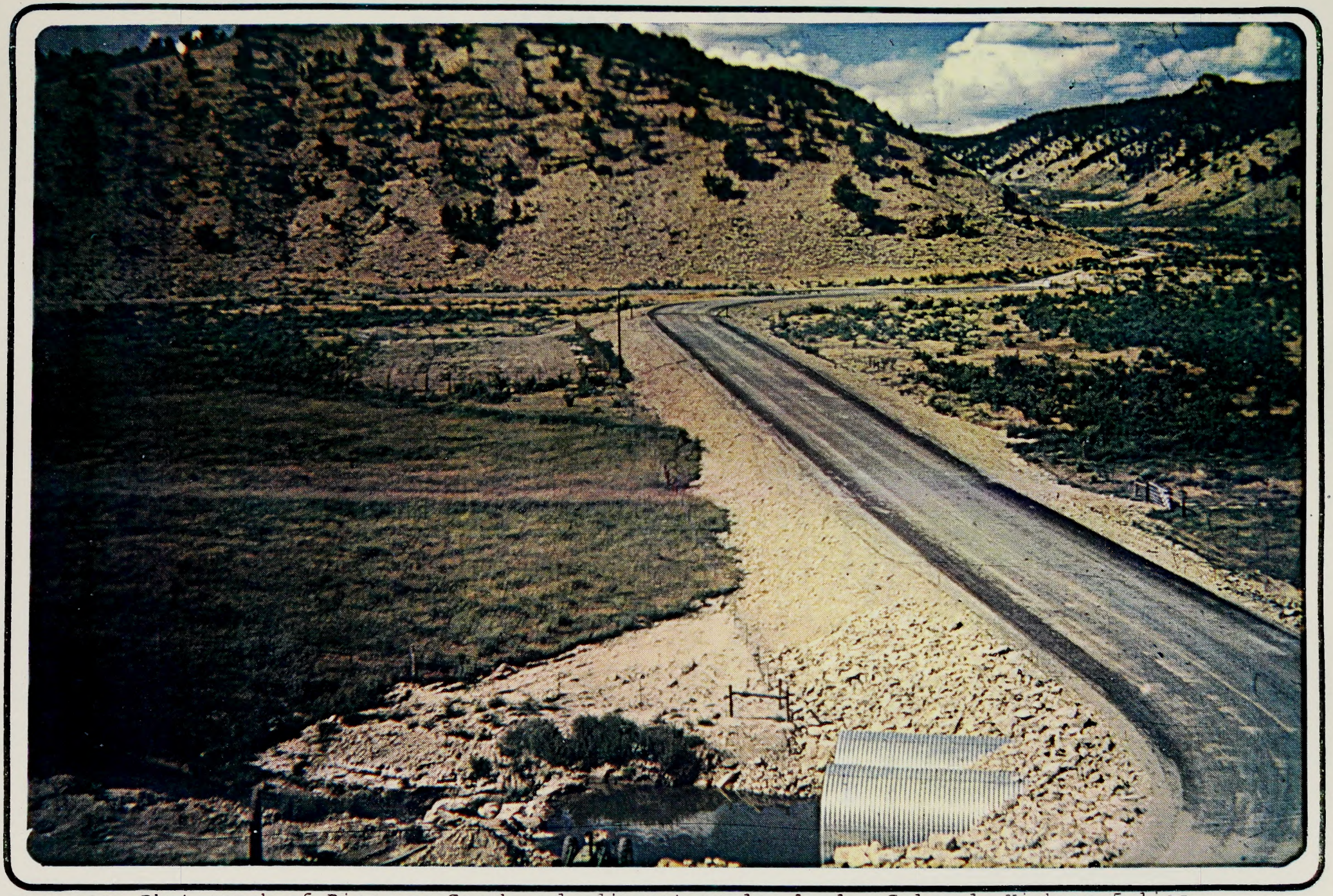


Fig. 11d. Photograph of Piceance Creek and adjacent meadow land. Colorado Highway 5 lies immediately beyond the meadow. The black top road is the main access road to Tract Cb. The projected gas service pipeline will lie west (left) of and parallel to this road.

trail. The cuesta surface has in the past been chained to remove pinyon-juniper for range improvement. The access road and the projected pipeline cross this chained area where the remaining slash offers a rough and jumbled texture of the unremoved vegetation. (See Figure 11e.)

The projected ROW and pipeline follows along the western side of the access road where it passes the site of the projected visitors center for Tract C-b, at the northern boundary of the Tract, and further south past the new security check point and guardhouse. The ROW and pipeline will terminate at its southern end in a metering station which lies at the northeast corner of the site of the mine service area. The site itself is clearly industrial in character. A large area has been cleared to provide space for construction of administration buildings and for headframes and hoist houses for the sinking of shafts to serve the underground oil shale mine. Space also has been provided for the emplacement of mine waste and for the storage of produced shale. (See Figure 11f.)

The access road, where it crosses the top of the cuesta, has a widespread view of the surrounding country. Deeper portions of gullies both at the northern and southern ends of the projected pipeline site area cannot be seen from any area normally visited by the general public.

2. Visibility Study**

A reconnaissance visibility study was prepared by Gaea Corporation for this EAR. Although more detailed visibility studies were prepared for Tract C-b and are reported elsewhere (Ref. J), the new study followed the methodology of the Visual Resources Management (VRM) System of the USBLM. The results of the visibility study and the related VRM analysis are shown in Figure 11g, and discussed further below.

The visibility study revealed the presence of six general viewsheds within the site area of this EAR. As shown in Figure 11g, these are the views from:

1.) Rio Blanco County Road 5;

2.) Tract C-b Road (foreground in immediate vicinity of road);

3.) Tract C-b Road (middleground view of slopes north of Rio Blanco County Road 5);

4.) County Road 76 (foreground in immediate vicinity of road);

5.) County Road 76 (background view of slopes south of Rio Blanco County Road 5 of Tract C-b);

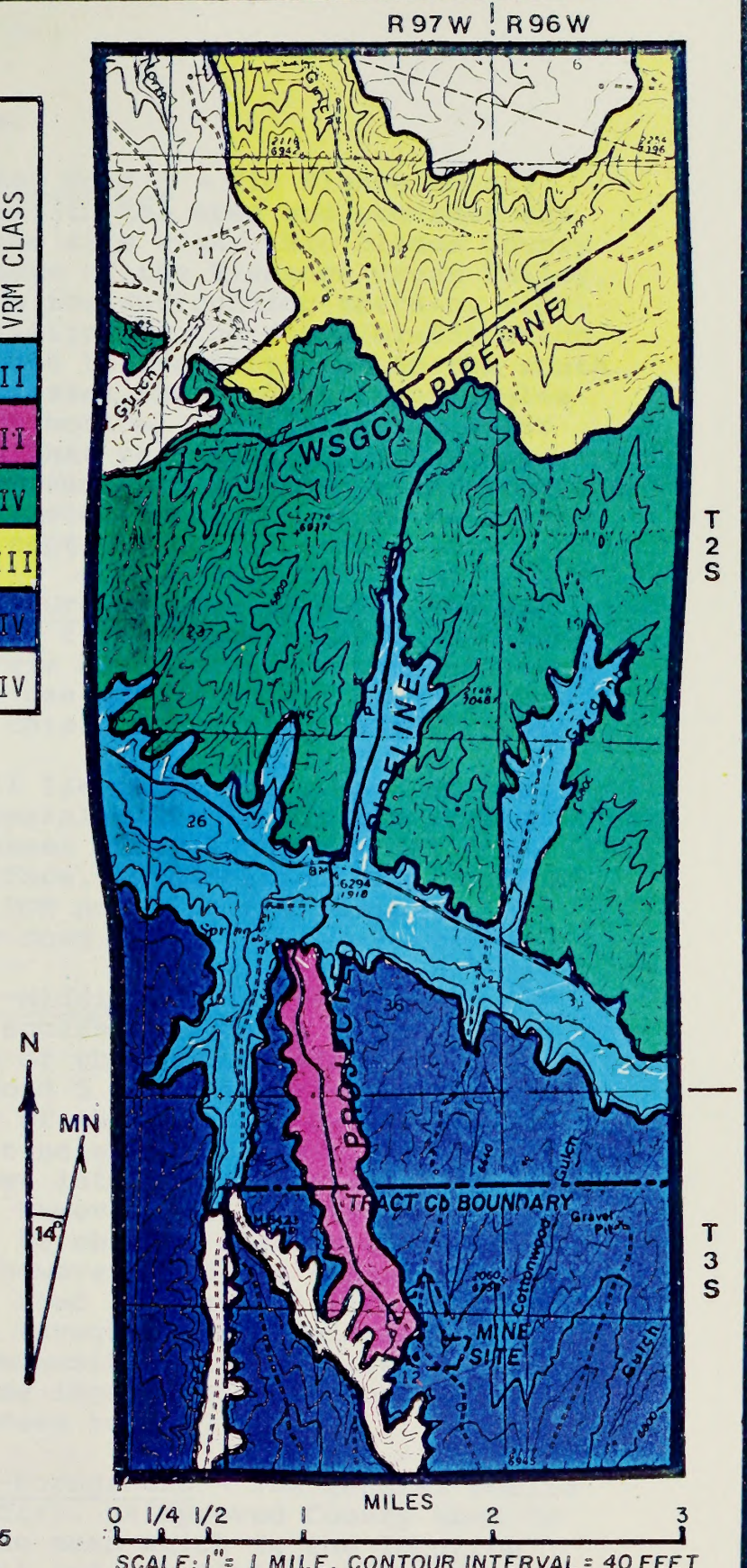
6.) Seldom seen areas.

Fig. 11e. Photograph of the main access road to Tract Cb. The view is from a point just north of the northern tract boundary, and is looking north. P-L Gulch is in the right central portion of the view. The ROW will parallel the west (left) side of the road.

Figure 11f. Photograph looking south towards the main site for mine surface facilities at Tract Cb. The projected gas service pipeline will parallel the west (right) side of the road and ending at at a gas metering station which will be located at the northwest corner of the site.

EXPLANATION

VIEW FROM	VISUAL ZONE	SENSITIVITY	SCENIC QUALITY	VRM CLASS
COUNTY ROAD 5	FG	HIGH	B	II
TRACT Cb ROAD	FG	HIGH	B	II
TRACT Cb ROAD	MG	MEDIUM	C	IV
COUNTY ROAD 76	FG	MEDIUM	B	III
COUNTY ROAD 76	BG	MEDIUM	B	IV
SELDOM SEEN	SS	SS	C	IV



BASE MAP FROM USGS MAP N3941.25-W10755.75
RIO BLANCO COUNTY COLORADO, 1975, 1:50,000,
SHEET 6 OF 6.

SCALE: 1" = 1 MILE, CONTOUR INTERVAL = 40 FEET

Figure 11g

VISIBILITY

GAS SERVICE PIPELINE FOR OIL SHALE TRACT Cb

Western Slope Gas Company

These are discussed below.

View from Rio Blanco County Road 5 - Rio Blanco County Road 5 is the principal access to the area and provides the principal viewpoint within the site area. Rio Blanco County Road 5 traverses the north edge of the Piceance Creek Valley. As the valley is incised into the surrounding terrain, travelers have a view which is limited by the steep bluffs which rise from the valley floor both to the north and to the south. The projected pipeline ROW crosses the road at right angles and only ½ mile of the valley bottom. As irrigation water is available, it is expected that revegetation of the disturbed ROW will have an early success, and that with stringent efforts towards routing and restoration, the pipeline should neither be significantly perceptible nor adverse.

View from Tract C-b Road--Foreground - Although the BLM VRM analysis considers viewing from Federal, State, or County maintained roads, this analysis also considers that visitors to Tract C-b will make heavy use of the access road to the site and that viewing along this route will be significant.

Although the pipeline will lie immediately west of the access road and will run subparallel to it for a distance of about 2 miles, the ROW passes through the chained area. After restoration of the surface, revegetation, and replacement of slash or brush, the ROW and pipeline should be virtually invisible from the road.

View from Tract C-b Road--Middleground - The traveler leaving Tract C-b along the access road has a view to the north of the general terrain of the rounded slopes which lie north of Rio Blanco County Road 5 and which rise to meet the mesa surface in the vicinity of the Piceance Creek Dome Oil and Gas Field. The viewer at selected points along the access road will be able to look down into the valley floor of P-L Gulch and the projected ROW; however, at a distance of 2 to 3 miles, the viewer will not be able to discern any detail. Gross features can be seen, however, and the emplacement of the ROW adjacent to the dirt road at that location, together with surface restoration and revegetation should make the pipeline difficult, if not impossible, to perceive and should not have a significant adverse impact upon viewing from vantage points along the C-b access road.

View from County Road 76--Foreground - The general public usually does not travel the dirt, unimproved County Road 76 which traverses the top of the mesa which is the location of the Piceance Creek Dome Oil and Gas Field. General traffic consists of oil and gas field workers, their families, and working ranchers. In any case, the view from County Road 76 is very limited to the foreground due to the slight convexity of the crown of the mesa and the screen provided by tall

pinyon-juniper and other scrub brush near the road. The viewer will see the projected pipeline and ROW only at its crossing with the County Road 76. This is further mitigated by the fact that in this area the projected ROW will adjoin the older rights-of-way and will not add significantly to any adverse incremental impact.

View from County Road 76--Background - At a few of the higher points of the mesa, where the County Road 76 lies near its southern edge, the higher slopes which rise south of Rio Blanco County Road 5 towards Tract C-b can be seen from certain vantage points. The BLM is considering the possibility of establishing viewpoints or campgrounds at one of two such vantage points (personal communication BLM, October 19, 1978). It is possible that the pipeline ROW in its approach to the northern boundary of Tract C-b could be seen from this area of County Road 76; however, the distance is about 5 to 6 to 8 miles, and the view lies in the middleground or background. Details of the ROW or pipeline could not be seen from this distance. Viewing of the pipeline route will be mitigated by restoration of the surface, revegetation, and replacement of the chained slash.

View of Seldom Seen Areas - Areas which normally cannot be seen by the visitors to the site area lie at the northern and southern ends of the study area. These lie at the bottom of a steep gulch in the southwest, and an area of rolling hills at the north end which are beyond easy access by roads. The projected ROW and pipeline cross none of these Seldom Seen Areas.

3. Visual Resources Management (VRM) Analysis

The visibility of the site area and project has been analyzed by the Visual Resource Management System of the BLM. The results of this analysis are shown in Figure 11g.

In the initial studies for Tract C-b it was concluded (Ref. J) that,

> "The Piceance Creek Basin was found to have low scenic value when compared to other landscape types of the region. It contains marginal strength of form and line when compared to such areas as the Book Cliffs, Roan Cliffs, Grand Mesa and the Flattops. It rates about equally with these in regard to color and texture. On a regional basis the Piceance Creek Basin has an extremely low visual character."

This is largely confirmed by the VRM analysis for this EAR.

The assignment of Scenic Quality Values to each of the 6 viewsheds discussed above provides the Scenic Quality Ratings as shown in Table 5. It is to be noted that the scenic

TABLE 5

Tabulation of Scenic Quality Evaluation Before and After Construction of Project

Scenic Quality Factors	Colo. Highway 5		Tract C-b Road Foreground		Tract C-b Road Middleground		County Road 76 Foreground		County Road 76 Middleground		76 Seldom Seen	
	Before Const.	After Const.	Before Const.	After Const.	Before Const.	After Const.	Before Const.	After Const.	Before Const.	After Const.	Before Const.	After Const.
1) Land forms & rock Outcroppings	2	2	1	2	1	1	1	1	1	1	2	2
2) Vegetation patterns	2	2	1	1	1	1	1	1	1	1	1	1
3) Water features	2	2	0	0	0	0	0	0	0	0	0	0
4) Land uses	Communications & ranching		Mining		Oil & gas Prod. & ranching		Oil & gas Prod. & ranching		Mining		Ranching	
5) Intrusions	0	0	0	0	0	0	1	1	2	2	2	2
6) Landmarks	1	1	1	1	1	1	1	1	1	1	1	1
7) Special enclosure	2	2	0	0	0	0	0	0	0	0	0	0
8) Panoramic exposure	0	0	2	2	2	2	2	2	2	2	0	0
9) Cultural features	2	2	2	2	1	1	2	2	1	2	0	0
10) Visual uniqueness	0	0	0	2	0	0	0	0	0	2	0	0
Totals before construction	11		7		6		8		8		7	
Scenic Quality Class	B		B		C		B		B		C	
Totals After Construction		11		10		6		8		11		6
Scenic Quality Class		B		B		C		B		B		C

value of the view from Rio Blanco County Road 5, the access road to Tract C-b--foreground view, and the middleground view from County Road 76, lie in Class B or Characteristic Scenery. Two of the viewsheds, the middleground view from Tract C-b Road, and the Seldom Seen areas lie within Class C and have minimal scenic value.

It is to be noted that the construction of the project will not depreciate these qualities when restoration is completed, and may indeed help the historic development of Tract C-b to achieve greater scenic value by increasing the rating points through the enhancement of diversity to the region.

Landscape Description Worksheets used in this VRM analysis are included herein as Appendix C. The results of the VRM analysis are shown in Table 6 following.

TABLE 6

Summary of VRM Analysis

VIEW FROM	VISUAL ZONE	SENSITIVITY	SCENIC QUALITY	VRM CLASS
Colorado 5	FG	High	B	II
Tract C-b Road	FG	High	B	II
Tract C-b Road	MG	Medium	C	IV
County Road 76	FG	Medium	B	III
County Road 76	BG	Medium	B	IV
Seldom Seen	SS	SS	C	IV

4. Sociocultural values and lifestyle

Please refer to the regional discussion on Page A-34 of Appendix A.

a. Archaeological and historic values and viewing

In accordance with the requirements of the Antiquities Act, the ROW was examined by an archaeological team from the Laboratory of Public Archaeology at Colorado State University in Fort Collins. The preliminary report on the archaeological reconnaissance states that no new sites were identified.

Details of cultural sites known within the site area are on file with the White River Resource Area Office of the BLM in Meeker

b. Recreation

The site area offers opportunities for recreation. These include hunting, fishing--to a limited extent,--and viewing of wildlife, geological areas of interest, cultural sites and scenery.

1.) Hunting--The site area lies within the Colorado Division of Wildlife Game Management Unit 22. This Unit supports the nation's largest migrant herd of mule deer and deer hunting is the most important recreational use of this area. Other game species such as mountain lion are also hunted in this area.

2.) Fishing--Although some fishing might be pursued in the waters and small ponds associated with Piceance Creek and its tributaries, the fishery is not particularly noteworthy or significant.

3.) Scenic values and viewing--The site area has some merit for its scenic quality values. These values may also attract hikers. The valley of Piceance Creek offers a rustic rural setting with pleasant, but limited views. Views from the ridges and mesas within the Piceance Creek Gas Field sweep from the north, to the west, and to the south, but are limited towards the east. A viewpoint in Section 18, T. 2 S., R. 96 W., offers a good panoramic view of Oil Shale Tract C-b and the southern part of the Piceance Basin beyond. The BLM is considering the possible development of parking and day-use facilities to utilize this site as an overlook and interpretive point.

Occidental (oil shale lessee) is developing a projected Visitor's Center near the north boundary of Tract C-b adjacent to the access road.

4.) Wildlife and viewing--Several areas within the site area provide opportunities for the viewing of wildlife. The most notable opportunities for viewing are for deer and for raptors such as the golden eagle and the red-tailed hawk.

5.) Geology and viewing--The area in and around Dudley Bluffs in the northwest sector of the site area reveal outcrops of the Uinta Formation which have been faulted to form a small graben structure. The area is accessible from County Road 5 over an unimproved jeep trail.

6.) Recreational riding--The roads and trails of the site area offer considerable opportunity for riding and

sightseeing by off-road vehicles or horseback. Open space and scenic values are good and offer a valuable recreational potential.

7.) Existing recreational facilities--No organized or formal recreational facilities exist within the site area.

III. ANALYSIS OF PROPOSED ACTIONS AND ALTERNATIVES

A. Proposed Action

The project will consist of three phases--construction, operation and abandonment. The environmental impact will be at three levels--local, regional and national.

The environmental costs will accrue to the land, wildlife, and to some individuals who have a highly developed aesthetic sensibility.

The environmental benefits will accrue through the use of natural gas at Tract C-b to aid in the production of shale oil to the general populace of the United States; to workers of Oil Shale Tract C-b at the local level, to manufacturers and suppliers of pipeline materials and heavy construction equipment and their employees and families, and to the construction workers.

1. Unmitigated impacts

a. Effects of construction

1.) Effects at the site area--The principal effect of construction upon the local environment of the site will be the temporary surface disturbance of 33.5 acres of vegetation on land required for the pipeline ROW.* This acreage lies on private and public lands. Although it may take three to five years for reseeding to achieve success this may be a long term benefit because a portion of this change will be an actual increase of prime grassland for forage. Even though revegetation in other places has failed due to premature grazing by livestock and wildlife, revegetation within the Piceance Creek Gas Field is a success and revegetation as a benefit is visibly proved in this field.**

Pinyon-juniper ecosystems are often inefficient users of water, soil and nutrients as far as providing useable resources for man of nutrients to the food chain. Thees often compete with, and crowd out desirable grass, shrubs, and browse species; thus reducing habitat and forage for wildlife and lifestock. In many cases pinyon-juniper have been chained or burned to enhance more desirable values. Indiscriminate removal of pinyon-juniper on visible sites can be adverse to

aesthetic qualities. (Ref. A)

The temporary surface disturbance and the loss of productivity related to any loss of grasses which have been revegetated within the older and existing rights-of-way will only be of a duration until new surface restoration and revegetation is successful. The possible effects of this loss are mitigated by the pipeline's being located wherever possible along previously disturbed rights-of-way and adjacent to existing roads and trails. A small amount of disturbance of pinyon-juniper will be caused south of Rio Blanco County Road 5, but this is not considered significant due to the large acreage of this climax habitat type which is pervasive throughout the immediate area and region.

In the case of the ROW crossing and removing pinyon-juniper it must be noted that there is an obvious abundance of pinyon and juniper woodland to supply special forest product needs for fenceposts and cord wood for years to come. The loss of this woodland type would not cause any shortage in pinyon-juniper woodland products as they are known today. (Ref. A)

All pinyon-juniper cut from the ROW will be disposed of in the manner specified by the BLM. The BLM usually stipulates that slash be returned to the ROW for reasons of visibility aesthetics, and provision of cover for small mammals and upland game birds. If loss of wood productivity were significant, the slash alternatively could be sold for use as cord wood or fenceposts.

It may reasonably be expected that revegetation of lands within the site area, disturbed by the emplacement of pipelines, will be successful, and that there will be an actual improvement in forage and habitat for both livestock and wildlife.

To place the significance of this small vegetation change into perspective, the change of 33.3 acres of habitat (rated at the average allocated grazing capacity of about 5.7 acres per AUM) would be in the order of 6 AUMs. This low value of change probably is beyond the precision of the grazing allotment evaluation system presently used. Thus, the change quantitatively does not appear to be significant.**

Small mammals and lower order life forms will either be displaced or lost due to the disruption of habitat along the ROW. Revegetation procedures and replacement of slash will largely mitigate any lasting long-term effect. It is not expected that any species will be jeopardized; however, individuals will be displaced, lost, or will have productivity diminished until vegetation and cover have been re-established.

Any loss of individuals, or productivity must be considered as an unavoidable environmental cost.

The new ROW will cross some lands containing sagebrush--the principal habitat of the sage grouse. About 3,594 acres of sagebrush are within the site area. Upon revegetation of the ROW a minor loss of the sagebrush habitat to sage grouse might occur. Considering the large amount of sagebrush within the site area, the region, the rapid encroachment and regrowth of sagebrush (which ultimately may occur), this loss--or rather change of vegetation--does not appear to be significant.

Waterfowl are visitors to the site area, but this is limited to the waters of Piceance Creek. As no substantial bodies of surface water exist within the site area, it is not expected that waterfowl will be adversely affected by the construction or operation of the projected line. No data is available for land bird species, but since they are mobile, and disturbance will be intermittent and of short duration, no significant adverse effects are expected.

One golden eagle nesting area has been mapped as occurring within this site area. This area is shown on Figure 10. This nesting site lies near the projected service line. The construction and operation of the new line is not expected to have any significant adverse effect upon the golden eagle, or its productivity. The red-tailed hawk has been noted as having 6 nesting areas in the site area. These areas are shown on Figure 10. The exact locations of the nesting sites are not known, and therefore, the relative location of the connecting ROW to the nesting area is not known. The red-tailed hawk is a common species in western Colorado and has a relatively abundant population. This species is relatively tolerant to human intrusion and activity. As gas field activities already have intruded upon this habitat for a considerable length of time, it is doubtful that the construction of the projected line will have any lasting or long term effect upon individual hawks or the species. Some short-term nesting productivity may be lost during the short season of construction, and this must be considered as an unavoidable effect. If construction is done in the fall, no such nesting related loss in productivity is anticipated.

Movement patterns of cattle and wildlife might be expected to be affected slightly by construction activity; however, construction of the project should be done in three to four weeks. Such disruption would be temporary and is not considered to be significant.

The projected line will follow existing trails wherever possible to minimize any tendency towards adverse effects.

These include loss of vegetation, promotion of erosion, incremental sedimentation, cumulative reduction of water quality due to non-point sources, and the ultimate effects upon wildlife and domestic users located downstream.

Although the trenching for the pipeline might be considered as a surface disturbance which could promote or encourage the existing downward range condition trend, the efficacy of historic revegetation practice in the Piceance Gas Field indicates that the range condition will be improved. Thus, the construction of the pipeline is considered as tending to be beneficial towards range conditions even though the amount of improvement is relatively small.

Some soils will be diluted through excavation and backfill.

During the period of construction, there will be a temporary period of low level exhaust emissions from the engines of construction equipment. As these vehicles will meet all legal and regulatory standards for such emission, it is judged that such low levels of emissions will not be significantly adverse.

The activity and noise of construction for a 30 day period will cause certain amount of avoidance to the more sensitive species of wildlife. As the past field activity may have contributed to the conditioning of local wildlife, and as the construction will be short-term and localized, the disruption does not appear to be significantly adverse.

During the short construction period, some degradation to the scenic quality due to surface disturbance of the area will be apparent to some viewers. The site area is seen from County Road 5, the principle travel route through the area. But the construction period will be only a few weeks; and as the gas producing character of the area has been established for 37 years, and any short-term impacts will be greatly exceeded by long-term productivity and benefits to the public through the development of the oil shale resource, any aesthetic distress suffered by individuals must be considered as an environmental cost.

The construction of the pipeline will provide work for a crew of approximately 25 workers and will provide income for sustenance for themselves and their families. Portions of the income will be infused into the local economy at Rangely, Meeker, Grand Junction and elsewhere. Portions of this income will provide taxes at all government levels.

An archaeological survey over the rights-of-way for the projected lines has indicated no evidence that they will cross over archaeological or historical sites.

Present data indicates that rich deposits of oil shale and the highest grade deposits of the saline minerals are expected to lie within the center, or deepest part of the Piceance Basin. This is roughly coincident with the projected service pipeline ROW.

The scope of the proposed project includes the addition of one short connecting line from an existing pipeline to the user, and simply requires the transport of gas to that user. The construction of the line is essentially a project on the surface. Construction, use, and abandonment of the line will have no real or significant effect upon the oil shale or saline mineral resource in the long term. The projected action, therefore, is not considered to have an adverse significant effect upon the future development of the underlying minerals. There will be a beneficial impact in that the projected action will provide energy for the exploration and development of oil shale.

2.) Effects at the regional level--The effects at the regional level will be:

Construction of the pipeline will utilize materials and supplies which have been manufactured and distributed from other locations. The income from this sector will provide jobs at other locations for workers and sustenance for their families.

Construction of the pipeline will provide jobs to local construction workers and their families.

Increased taxes will flow into local, county and state treasuries.

b. Effects of operation

1.) Effects at the site area--Natural gas will be pumped from the various well heads and into the pipeline for distribution to user at Oil Shale Tract C-b.

The production of gas will provide incremental work for the pipeline operating staff; however, it is not anticipated that the operation will result in any significant increase in the number of production personnel. The transportation and sales of the natural gas, together with lease payments for the ROW, will contribute taxes to several levels of government.

The scenic quality of the area might be diminished to some extent by the presence of the pipeline, evidence of the right-of-way by linear geometric patterns through brush, and perception of the metering station, the location of which may be exposed to view or whose camouflage is ineffective due to lighting or strong shadow.

Some infrequent disturbance of wildlife will occur when the buried pipeline is inspected periodically. Such intrusion will be relatively minor and the wildlife may be expected to quickly return to their habitat.

Vehicle travel for the operation and maintenance of the connecting line and related surface components will utilize existing trails. Forage will not be diminished by such road use. The area is remote so that the intrusion of visitors is now minimal. Direct observation of the cattle in the site area indicates that they have become accustomed to gas field activities. Consequently, disturbance of livestock and wildlife attributable to the operation of the connecting line is not projected as being significantly adverse.

Significant impact will be felt within the site region from the cumulative effects of an incremental addition to oil and gas transmission facilities. The already existing oil and gas producing character of the region will be augmented; however, regard for environmental protection will allow harmonious land use with the currently existing agrarian land use.

The Piceance Creek Gas Field has been operative since 1930, and has long since been assimilated into the economy of Rio Blanco County. Only a few operating employees live and work at the field and have long since been accommodated within the socioeconomic structure of the county. It is difficult to assess what socioeconomic interaction might obtain in the future development of oil shale and saline minerals. There is strong local and state concern about socioeconomic aspects of these future developments and the ability of local government to resolve such problems. Any socioeconomic problems which might result from the immigration of construction workers will be small in comparison to that which will occur as a result of other large scale energy developments in the area. Thus, it is expected that no significant adverse impacts to the socioeconomic character of Rio Blanco County will result from the short-term employment of construction workers for the new connecting pipeline of this project.

Some potential always exists for accidental rupture of, or sabotage of the pipeline. The installation meets all safety regulations set forth in the applicant's Specifications which are comparable to Part 192- Title 49 of the Code of Federal Regulations. Automatic and manual blowoffs and valves provide safety to the limits of the existing state of art.

2.) Effects at the regional level--The use of natural gas generates income which is used to provide sustenance for workers and their families. Taxes at all levels are paid at incrementally higher levels.

3.) Effects at the national level--This natural gas will be used to explore for, develop and help produce shale oil. The addition of another energy source will increase the national sufficiency of energy, enhance basic economic activity and will be essential to the national defense.

Taxes paid will provide funding for governmental operations.

4.) Implications at the international level--The incremental addition of energy to the national supply enhances the nation's self-sufficiency and tends to improve the nation's trade balance.

Self-sufficiency in energy improves this country's strength in diplomatic relations and thus enhances the national defense.

c. Effects of abandonment

Upon abandonment at some future time, all aboveground facilities will be removed. The surface will be restored and revegetated according to jurisdictional requirements which may exist at the time. Below surface facilities will be abandoned in place.

d. Effects considered under the Organic Act

Under the Organic Act, consideration is made herein for possible effects upon, or in relationship to the following factors.

1.) Threatened and endangered species and their habitats--As discussed under Section II B. 5. j. Threatened and endangered species on Page 25 of this EAR, no threatened or endangered species are known to inhabit the site area. Consequently, no adverse or significant effect is forecast as the result of the proposed project.

2.) Cultural resource values--Cultural resource values have been considered under several sections of this EAR, however, the principal discussion is contained under Section II D. 4. Sociocultural values and lifestyle. The values related to cultural resource relationships are of scientific and educational value. As siting of the proposed pipelines has avoided routes which would physically damage cultural sites, no effect is anticipated upon cultural resources from the proposed project. The presence of the pipeline will be evidenced by certain features which tend to diminish those aesthetic values which might be related to an otherwise undisturbed site. Such disturbance is mitigated to some degree by the provisions for the project contained

in Section III A. 2. b. BLM stipulations. Principal amongst these are the provisions which promote camouflage and the reduction of visibility of the above ground components of the system and any earth scars of the ROW. The project will tend to have a cumulative effect with other existing oil, gas, and other energy projects in the area and region such that the industrial activity will be perceived in the same area with these cultural values. Nevertheless, modern industrial development of the region was begun as early as the 1880's and has co-existed with the prehistoric archaeological values without any apparent denigratory effect through the present. Although potential conflict exists between development of archaeological values with other land use development, the application of appropriate development criteria for all resources may yield compatible utilization of all.

3.) Flood plain and flood hazard evaluation--The topography of the site area indicates that the fluvial cycle of the physiography is in the stage of mature youth. This is discussed in Section II A. 1. Physiography. At this stage, the valleys have V-shaped profiles, with narrow valley bottoms up to ¼-mile wide. The alluvial filling of the valleys consists of modern sands, gravels, and silts which are incised by deep washes caused by intense short-term precipitation. Due to the youth of the fluvial cycle, no true flood plains have developed. The valleys are susceptible, however, to flash-flooding. There is no historic or geomorphological evidence to indicate that such flash-flooding might pose any serious threat to the existing communications route which is in the valley bottom of Piceance Creek. Although it is conceivable that flash-flooding might occur, the small catchment area precludes the possibility that flash-flooding other than low-flow volume of short duration might occur. Based upon calculations of a 100-year flood, the access road to Tract C-b passes over Piceance Creek on two large culverts. It is unlikely that the proposed pipeline will be breached by flash flooding because it will be buried under a minimum of 5 feet of cover under the bed of Piceance Creek. Due to the small catchment areas for the dry gulches in the area it is doubtful that local intense precipitation could cause sufficient surface run-off to threaten the pipeline where it crosses these small dry washes. If such an unlikely event occurred, pipeline patrols would discover any damage and shut off the damaged segment of line. No adverse effects are expected.

4.) Areas of critical environmental concern, and roadless areas-5000 acres or more--Although BLM criteria are yet to be defined for that which constitutes an environmental concern, no environmental situation related to new pipeline construction in the site area appears to be of critical concern.

No roadless areas have been identified or defined within the site area.

5.) Wilderness resources--According to the Piceance Basin Planning Unit Resource Analysis, and the White River Management Framework Plan, no area in or near the site area has been designated as having wilderness quality.

2. Possible mitigating measures

The possible measures which could be used to mitigate adverse significant impacts which will arise from construction, operation, and abandonment of the pipeline have in large measure been incorporated in siting criteria, in the consideration of alternative right-of-way routes, and in the stipulations generally imposed by the BLM in lease permits and agreements.

a. Siting criteria

The siting of the right-of-way has been made according to the following criteria: The right-of-way was sited so as to minimize visibility. In the site area this was done primarily by routing the greatest portion of the pipeline along existing roads and trails. This minimized disturbance of vegetation and habitat and places the pipeline and ROW at an existing feature having linear contrast and visibility. The addition of the pipeline simply coincides with an already existing feature and the diminishment of visual values is minimized.

Siltation caused by ground breakage will be mitigated by the construction of waterbars where needed.

Special use areas of significant habitat were to be avoided. The ROW unavoidably passes through a red-tailed hawk nesting area and is within ½ mile of a golden eagle nest, however, the species are relatively tolerant to the activities of man. Moreover, construction will be in autumn whereas nesting normally occurs from mid-March through July. No losses of productivity are expected.

The right-of-way was examined by a qualified archaeologist. This examination was conducted by intensively inspecting the right-of-way. No previously unrecorded archaeological or historical sites were located in the surface inspection. The archaeologist's findings were that the service line should be considered clear of exposures of surface manifestations of prehistoric cultural material.

Unless constrained by topographical relationships, the route was selected so as to avoid landslides or unstable slopes wherever possible. Where such features cannot be avoided because of physiographical relationships, design

and construction of the pipeline will take into account measures for protection. Surveillance by patrol will be frequent and other monitoring measures might be implemented commensurate with the hazard.

b. BLM stipulations

The Bureau of Land Management stipulations imposed upon lessees include the following:

Disturbance of the surface will be minimal and commensurate with good construction practice.

Construction will not be pursued during nesting of the red-tailed hawk or the golden eagle. The nesting period for these species is normally from mid-March through late July. No construction will be pursued during mule deer winter stress period as determined by the BLM.

All disturbed areas will be restored as near as possible to the original condition and seeded by drill with a mixture and at a seeding rate to be stipulated by the BLM.

All existing improvements, including, but not limited to, fences, gates, cattleguards, roads, culverts, pipelines, bridges, monuments, water developments and control structures, wherever altered by construction of the projected system, will be left in good serviceable condition equivalent to, or better than, the condition prior to construction disturbance. Fence integrity will be maintained by construction and operating personnel through gate closure, emplacement of temporary cattleguards, or by the presence of personnel during construction. Improvements which are damaged, destroyed, or significantly worn by construction or use will be restored to serviceable condition to the degree practicable, or otherwise replaced.

Soil disturbing operations will be conducted so as not to significantly adversely affect or change the character of, or cause pollution or sediment load to any fresh water sources, streams or lakes, ponds, waterholes, seeps, marshes, etc. Contaminants, pollutants, and sediment loads will be controlled and not allowed to enter streams, ponds, springs, or wells without written consent of the landowner and/or manager.

Any and all roads approved by BLM for construction will be constructed and maintained in such a manner as to control and minimize channeling and other erosion. Roads will be constructed to BLM standards.

Drainages will not be blocked with loose fill or debris. All drainage crossings will be properly excavated and/or

will have a culvert of sufficient size installed to adequately carry the peak flow of the drainage.

Use of the land will comply with federal and state laws, regulations, and standards relating to air, water and land pollution.

After the pipeline trench has been backfilled, shaped and seeded, shrubs, and pinyon and juniper trees, which have been cut from the right-of-way will be replaced so as to prevent passage by casual vehicles, provide cover for wildlife and to reduce linear contrasts which might render the ROW visible.

All aboveground facilities will be painted with colors which will make the facilities blend with their background.

Waterbars will be placed in and along the right-of-way, newly constructed access trails, or existing trails which have been altered by construction, to reduce water runoff velocity in order to reduce sediment load and erosion.

Should antiquities, objects of noticeable historic, prehistoric or scientific interest be discovered by excavations, the BLM will be notified immediately, and the objects will be left in the condition and position at the time of discovery.

All stream crossings will be excavated at low or no flow conditions. The BLM will be notified in advance of crossing conditions so that compliance personnel may be present.

3. Adverse impacts which cannot be avoided

During construction adverse impacts which cannot be avoided will include:

- The activity and noise of construction which might cause a temporary loss of wildlife.
- Temporary decrease of air quality due to emissions from gasoline, diesel, or other portable hydrocarbon fueled engines, and dust.
- Some loss or dilution of topsoil.
- The loss of productivity along the pipeline prior to the establishment of new vegetation.
- Diminishment of aesthetic viewing values due to incremental and cumulative change in landscape character caused by increased industrialization even after mitigating siting and camouflage criteria have been applied.

- The sedimentation which occurs even after the application of mitigating measures.

- The diminishment of water quality due to the tendency of disturbed soil to increase suspended and dissolved solids.

- The diminishment of scenic quality where rights-of-way are still visible when even the best siting and revegetation techniques are utilized.

- Because of the presence of high pressure gas lines, human activity, heavy equipment working in the area, and dense vegetation, the fire hazard is increased to some extent.

4. Relationship of short-term use and long-term productivity**

Natural gas may be expected to be transported through the pipeline for the life of the Tract C-b mine. It is projected that reserves are sufficient for a mine production life of 57 years, projected to begin in 1985 (personal communication Occidental Petroleum, October 12, 1978). The construction activity for the gas pipeline will take place within a span of 30 days. Upon completion of the useful life of the pipeline the aboveground facilities will be dismantled and the surface restored for other use.

The period of construction and operation for the pipeline will be a relatively short-term use in comparison to the limitless time of use of the land after the site is decommissioned.

As the principal effects at the site are related to the disturbance of vegetation or habitat, and since vegetation tends to restore itself with the passage of time, most, if not all, of the adverse impacts associated with the project will be self-mitigating through time. Thus, it is anticipated that construction, operation and abandonment of the pipeline will have no appreciable or lasting adverse effect upon productivity of the site area.

5. Irreversible and irretrievable commitments of resources**

The operations of the pipeline will contribute to the reduction of the reserves of natural gas in the site region.

The construction of the pipeline will commit the use of pipeline materials, buildings, facilities, and machinery. These probably will have some salvage value at that future time but will have been fully depreciated.

The commitment of the use of energy, human resources and other material resources in the conception, design, construction, and operation of the pipeline will be irretrievable.

B. Alternative of No Action**

If serious consideration of no action were to result in denial of a permit for right-of-way, the following adverse effects would result to the development of the oil shale at Tract C-b.

Any problem in completing the pipeline could delay shaft sinking operations (personal communications from USGS as reported by BLM, October 19, 1978).

The energy needs which otherwise would be served by natural gas would have to be supplied by the importation of No. 2 diesel fuel until such time as an electrial transmission line would be completed into the Tract. This would entail trucking in of large amounts of fuel from the most economical refinery sources. At present, the closest refineries are located at Fruita and Denver, Colorado, Salt Lake City, Utah and Sinclair, Wyoming. Transportation by tank truck would result in increased traffic on all highways with all attendent adverse environmental and economic considerations. Serious consideration was given to such use; however, preliminary analysis favored the use of natural gas because of the close proximity of gas reserves and main transmission pipelines just a few miles distant.

The use of diesel oil for fuel implies that some small percentage of sulphur will be burned and added to the atmosphere, whereas the combustion of natural gas does not.

Thus the use of diesel fuel with increased traffic along local highways appears to offer more adverse environmental impact than does the construction of a pipeline for the use of natural gas. The alternative of no action, therefore, would result in the use of diesel fuel, which in turn would have more adverse environmental impact than would construction and operation of the projected service pipeline.

C. Alternative A-Alternate Routes**

Alternative routings were considered during the siting process and utilized the criteria discussed previously. Consideration of a possible routing from the Northwest Pipeline Corporation Compressor to Collins Gulch and then along County Road 5 to the Tract C-b was rejected as a viable alternative due to the presence of a paved road down Collins Gulch, the probable greater disturbance of agricultural lands in Piceance Creek Valley, and increased denegration of aesthetics at crossings. The route now projected was found to be the best alternative due to its shortest length, which in turn minimized disturbance of habitat, and tended to reduce overall environmental costs.

D. Alternative B-Use of Alternate Energy Sources

It is projected that after completion of high voltage transmission lines from a substation of the White River Electric Association near Meeker, the consumption of natural gas will be reduced to serve Tract C-b needs which can be filled only by the distribution and combustion of gas. Thus, natural gas will be used for environmental heating and for process needs. The natural gas and the associated electrical generators will serve as a standby source of electricity in the event of curtailment of transmitted power.

Thus, the energy sources are interchangeable with electrical transmission facilities providing the bulk of energy to Tract C-b, and with natural gas best serving selected energy requirements. The use of diesel fuel is a poor alternate choice due to increased air pollution and economic considerations--principal among which is increased undesirable truck traffic to the site.

APPENDIX A

DESCRIPTION OF THE ENVIRONMENT AFFECTED BEYOND THE SITE AREA.

APPENDIX A

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APPENDIX A

II. DESCRIPTION OF THE ENVIRONMENT AFFECTED BEYOND THE SITE AREA

The construction and operation of the gas delivery pipeline will affect the environment beyond the immediate site area. In fact, it is the impact to the environment elsewhere which defines the need and justification for the project. While some adverse effects may be felt in the area immediately near the projected pipeline, beneficial effects will accrue to the users of the natural gas at Tract C-b, to the future users of shale oil which will be produced at Tract C-b, and to those employed in the construction and operation of the gathering system. The latter benefits flow through to the local communities-which constitutes a secondary benefit.

At a higher level, the production of shale oil is critical to the pursuit of national goals, economic health, and the national defense. These goals in turn have significant effect upon international trade and world events.

Since it is not possible in this limited EAR to consider all implications of this nation's energy supply at the national and international levels, no such consideration is herein made. Nevertheless, it must be remembered that this projected gas delivery system in concert with other components of the projected shale oil producing capacity will contribute to the total energy producing capability of the United States--which is critical.

Thus, the following discussion is limited to effects upon the local and regional sectors surrounding the site area.

The site area for the projected gas delivery system is located in northwestern Colorado in Rio Blanco County. The site area lies about 46 road miles southeast of the town of Rangely and about 31 road miles southwest of the town of Meeker.

The region is semi-arid and sparsely populated. The region has an economy based upon the agricultural production of cattle by grazing, and upon the production of oil and gas. The region has large resources of energy mineral; oil shale, oil, gas, coal, bitumens, and uranium. Recreation is based upon open space values derived from hunting, camping, to a minor extent fishing, and to other outdoor activities.

A. Non-Living Components

1. Physiography

The entire region, which is the Piceance Basin, is located within the White River drainage. This is a mountain basin ranging in elevation from about 5,400 feet near Rangely, Colorado to over 8,500 feet in the Roan Plateau area. The region is somewhat unique in that it is almost entirely drained by Piceance Creek which is a tributary to the White River.

The region is bounded on the north by the White River. On the south the region has the Roan Plateau as its boundary. The eastern boundary is the Grand Hogback and on the west Cathedral Bluffs form the boundary.

Cathedral Bluffs, which is on the west side of the basin, is a long ridge of steep bluffs which extends from about the White River to the Roan Plateau. The bluffs have a few high points exceeding 8,000 feet in elevation.

The southern end of the basin is closed in with the Roan Plateau which extends generally east and west from Douglas Pass to the Grand Hogback. A few places along this area exceed 8,500 feet in elevation.

The east side of the region is composed of moderately high mesas with incised valleys extending over to about the Grand Hogback--a northsouth ridge which parallels the east side of Colorado State Highways 13 and 789.

The rest of the basin is characterized by echelon drainages cutting their way through to Piceance Creek leaving fairly narrow stream valleys which are sediment laden. These drainages radiate clockwise from the southeast corner around to the northwest corner of the region.

The major drainage for the region is the White River. Two tributaries to the White River drain approximately 90% of the basin. The largest of these tributaries for which the basin has its name is Piceance Creek. Piceance Creek heads up in the southeast corner of the basin and flows generally northwesterly to about the center of the basin where it flows northward to its confluence with the White River about 18 miles west of Meeker, Colorado.

The other tributary is Yellow Creek which heads up along the Cathedral Bluffs. Yellow Creek flows generally to the northeast from Cathedral Bluffs then changes direction and flows northerly to its confluence with the White River about half way between Meeker and Rangely, Colorado. (Ref. D)

Prominent features throughout the region include Calamity Ridge, Cathedral Bluffs, Roan Plateau, Joe Bush Mountain, and Segar Mountain. (Ref. D)

2. Access, utilities, rights-of-way and communications corridors

The major highways to the site region are Colorado State Highways 13 - 789 along the east boundary of the basin and 64 along the White River. Highways 13 - 789 are two-lane north-south roads connecting the region to the major east-west transportation corridor along the Colorado River at Rifle which includes Interstate Highway 70 and the Denver and Rio Grande Western Railroad. Grand Junction can be reached to the west via Interstate 70. Grand Junction is the largest community in western Colorado and is the rail, truck, air, and highway transportation center for the region. State Highways 13 - 789 extend north to Meeker and 64 is a major internal route connecting Meeker with Rangely. Rio Blanco County Road #5 intersects Colorado State Highway 64 at the confluence of Piceance Creek and White River. County Road #5 is a paved all-weather road along Piceance Creek in the heart of the region.

The volume of traffic using Colorado Highway 64 is relatively light. In 1972, the average daily traffic count (ADT) was 500 vehicles per day. Of these, 430 vehicles were automobiles and pickup trucks which made up 86% of the traffic, and 70 vehicles were heavier trucks which made up 14% of the traffic.

An extensive system of natural gas pipelines leads from the oil and gas production facilities of the region. Many of these are located in the vicinity of the producing Piceance Creek Oil and Gas Field which lies a few miles north and northeast of Oil Shale Tract C-b. Tract C-b will be served by a projected gas pipeline which will connect the main line of the Western Slope Gas Company which crosses the Piceance Creek Field with an east-west main line. Other large gas pipelines include one operated by Northwest Pipeline Corporation which leads northerly from the field toward Rangely. A 14-inch line constructed by Cascade Natural Gas Company leads westerly from the field. Many other production facilities and gas pipelines lie on public lands but are not discussed here. Many of these were constructed under access rights which accompany oil and gas leases (Ref. D).

There is only one major power transmission line in the unit - the Bureau of Reclamation's Hayden-Curecanti 230 KV line. To date, there are relatively few electrical distribution lines and telephone lines. (Ref. D)

A few radio and microwave facilities have been established within the region and are increasing. Radio relay facilities have recently been constructed near Magnolia and Cathedral Bluffs.

With the exception of utility lines serving ranches and isolated industrial facilities, most of the major communications routes fall within fairly well defined corridors. These corridors generally follow valley bottoms. The Rangely-Meeker Corridor follows the White River and the Piceance Creek Corridor follows Piceance Creek. The Meeker-Rifle Corridor does not follow a major valley bottom.

3. Climatology and air quality

The region has an arid steppe type climate. Year long temperatures are mild. At Rangely, historic data indicates that the extreme temperatures have ranged from a low of -33°F to a high of 102°F. The average stistical maximum is 73°F and the minimum is 15°F. At Meeker the extreme temperatures range from a low of -43°F to a high of 96°F. The recording station at Little Hills which is within the basin and between Rangely and Meeker, has had extremes of 97°F and -48°F. The average statistical maximum has been 65°F and the low 20°F.

In general, the area of higher elevations to the south average annual precipitation as much as 24 inches; however, fewer than 10 days a year have precipitation greater than 0.5 inches. Drought years may be expected to occur 3 or 4 out of every 10 years.

According to the data base of the BLM, in the higher elevations to the south, more than half of the average precipitation may occur as snowfall. Snow normally falls beginning in November and ending in April. The greatest accumulations fall during the period of December through February. Snow depths range from 12" to several feet at the higher elevations.

The air quality of the atmosphere of the region is high because of a general lack of population and associated human industry and commerce.

4. Geology

The region is in the Piceance Basin which lies in the Colorado Plateau Province. The basin is bordered on the north by the White River, on the east by the Grand Hogback, the west by Cathedral Bluffs and the south by the Roan Cliffs. The Douglas Arch and the Uinta Basin lie to the west. The structural history of the area has influenced the deposition of the sediments which in turn has determined the locus for oil and gas accumulation and the deposition or emplace-

ment of other economic minerals.

Numerous small subparallel northwest-trending folds are present within the basin, of which the Piceance Creek Dome is the most prominent. A number of normal faults have been mapped in this region. These faults, like the folds, trend northwest.

The sedimentary record for the region is relatively complete with deposition having been recorded for most geological epochs since the Pre-cambrian. A complete composite log of the stratigraphic section was presented in the Piceance Basin Unit Resource Analysis, as was originally published by Amuedo and Mott, 1962, in the Rocky Mountain Association of Geologists Guidebook Exploration for Oil and Gas in Northwestern Colorado. This detailed log is not reproduced here and may be examined in the references. In general, however, the thickness of the sedimentary rocks ranges from 11,000 feet in areas of persistent uplift to over 23,000 feet and more in the Tertiary Uinta and Piceance Basins.

5. Mineral resources

The region contains a very large potential for the development of mineral resources--particularly for the mineral fuels--oil, gas, shale oil, and bitumens. There also is a potential for new discoveries of uranium. Some potential exists for the development of evaporite minerals associated with the oil shale section.

Although the region contains limitless quantities of common rock-forming minerals which might be used for crushed aggregate, for construction, or for rip-rap, natural aggregates are scarce. Nevertheless, these materials have low unit values and must be used close to the deposit because they cannot bear transportation costs for any significant distance.**

Even though no Tertiary intrusives are in evidence in this immediate region, there is always the possibility that syngenetic stratiform deposits might underlie some portion of the region. There is a possibility that hydrothermal deposits might be trapped in deep-seated structures; however, it is doubtful that these could be extracted commercially for a very long time to come.**

a. Oil and gas

The known oil and gas fields and the recently drilled productive wells have been classified as Mineral Development Areas. Many of these wells are not currently producing because of a lack of transportation facilities. The entire Piceance Planning Unit is considered to be prospectively

valuable for oil and gas and has been classified as an Indicated Mineral Area. This is consistent with the criteria of the U. S. Geological Survey which considers that an area of sedimentary rock at least 1,000 feet thick is prospectively valuable for oil and gas. The Planning Unit has up to 23,000 feet of sedimentary rock containing numerous rich oil and gas fields both within and nearby the Rangely Planning Unit. Indicated Mineral Areas also include the residual crude oil remaining underground after the known oil fields have been depleted using the most advanced production methods.

The opportunities and potentials for developments of oil and gas production in the unit are significantly good. Present and projected future shortages of refined petroleum products and natural gas, coupled with rising prices for crude oil and gas, have stimulated exploration drilling. The increased number of notices of intent to conduct oil and gas exploration and drilling, and drilling plans received by the BLM are clear indications of expanding interest in this area for oil and gas development. It is reasonable to expect a 10% increase for oil and gas activity per year in this area for at least the next few years.

Oil and gas are the major mineral commodities now being produced. Rio Blanco County is the leading producer of oil and is second in the production of gas in Colorado. Production in Rio Blanco County in 1975--the last year for which statistics are published--was 21,555,616 barrels of oil and 27,782,798 mcf (thousand standard cubic feet) of natural gas. This was 56.6% of all the oil and 15.9% of all the gas which was produced in Colorado during that year.

The cumulative production from Rio Blanco County since oil and gas were first produced in 1903 through 1975 is 611 million barrels of oil and 1.016 billion mcf of natural gas. (Ref. 1)

There is undoubtedly undiscovered oil and gas resource within the Unit and continuing oil and gas exploration and development can be expected. Exploration targets presently are peripheral to existing fields. The deeper Paleozoic beds offer good potential targets for exploration.

Gas is being produced from the lower part of the Douglas Creek member of the Green River Formation and from the Wasatch Formation. Production is from stratigraphic traps. Nuclear and massive hydraulic fracturing projects are in process to recover gas from the low permeability sandstone units of the Mesa Verde and Fort Union Formations. The results of the 1973 nuclear fracturing attempt, the Rio Blanco Project, are being evaluated; however, problems of radionuclides in the production stream appear to have mitigated against such stimulation.

b. Coal

Coal is another major mineral resource of the Unit and is subject to current investigations. The U. S. Geological Survey and the U. S. Bureau of Mines have made resource estimates for the area in three categories of Measured, Indicated, and Inferred coal. The estimates include beds down to a thickness of 14" and to a limiting depth of cover of 3,000 feet. Thus, it is estimated that the resource potential for coal within the Piceance Basin Planning Unit is approximately 11 billion tons of bituminous and subbituminous coal. This resource is imputed to the Williams Fork Member of the Mesa Verde Group. Coal is also known to occur in the Iles Formation, but no resources estimate has been made for that stratigraphic unit.

In all but the northwestern edge and eastern edge of the region, the coal is deeply buried below 3,000 feet of overburden. Approximately 51 million short tons of stripable coal have been identified near the White River Coal Mine of the Stanley-Gordon Coal Company of Rangely. This mine is located in the NW¼ of Section 11, T. 2 N., R. 101 W., which lies outside this region. There is no record of past coal production from this region and no development activities are currently in progress. (Ref. D)

c. Oil shale

Oil shale has been known to exist in the Piceance Basin since before the turn of the century. The principal deposits occur in the Parachute Creek member of the Eocene Green River Formation. This member is a near continuous section varying in thickness from 500 feet on the northeastern edge of the basin to near 1,200 feet near the south boundary. It reaches up to approximately 1,900 feet in the subsurface. The Parachute Creek member crops out around the margins of the area and is covered by over 1,000 feet of overburden in the center of the basin. This member underlies about 90% of the land area of the basin. (Ref. D)

In the lower and middle oil shale zones, thick sequences of oil shale more than 1,000 feet thick contain an average of 25 gallons of oil per ton in the north central part of the basin. From this area of maximum grade toward the margin of the basin, the combined lower zones become thinner and their oil content decreases. The upper oil shale zone contains the richest and most important oil shale in the Green River sequence. The zone has a maximum known subsurface thickness of about 620 feet with the outcrop ranging from 300-680 feet thick. (Ref. D)

Estimates of reserves for indicated and inferred tons of oil shale and barrels of shale oil are numerous and varied. For the Piceance Basin a good working figure would be 2.5 million million tons of oil shale containing 15 to 45 gallons per ton of shale oil. This tonnage containing about 900 million barrels of shale oil is assuming 100% recovery.

Most of the oil shale resources in this region are covered by mining claims. Many were located prior to 1920 for oil shale, oil and gas, asphaltic sands and other hydrocarbons, Other claims were located mostly during the 1960 decade, reportedly for dawsonite. Efforts toward clearing title to the oil shale resources were assigned to a State Office Task Force which has recently been dissolved. Title to about 4,847 claims has been cleared in Rio Blanco County and 204 claims in Garfield County through June of 1974.

Current activity in the region includes development of the two Federal oil shale lease Tracts Ca and Cb and several projects on private land. Lease Tract Ca near the western border of the Piceance Planning Unit is currently being developed by a modified in situ extraction process. Lease Cb is located about a mile south of Piceance Creek and 18 miles west of Rio Blanco Store. The oil shale in this Tract averages 1,100 feet of overburden, which limits mining to an underground method. Two headframes have just been completed preparatory to shaft sinking. These are shown in Figure A-1. Private land with oil shale development programs in various stages of progress include the Colony Development operation on Parachute Creek; Union Oil Company, also on Parachute Creek; Superior Oil Company along the lower Piceance Creek and now in the process of negotiating exchange lands with the BLM; and Occidental Petroleum Corporation on patented land north of the town of Debeque. Fenix & Scisson, Inc., under an oil shale mining research contract with the U. S. Bureau of Mines, drilled a large diameter shaft in Horse Draw about a mile and a half from Piceance Creek. The shaft is 96-inches in diameter and has been completed and cased to a depth of 2371 feet. When completed, the shaft will provide access to the oil shale section for data gathering purposes. Figure A-2 is a photograph of the specially built drilling rig for sinking the shaft.

There are no oil shale areas in actual production that could be classified as Mineral Development Areas other than those on existing federal leases. The two federal oil shale lease tracts and the other projects on private lands are classified as Mineral Resource Areas. Since these properties are not in actual production but have definite proposals for development they are identified as Mineral Resource Areas.

The outcrop of the Green River Formation is classified as

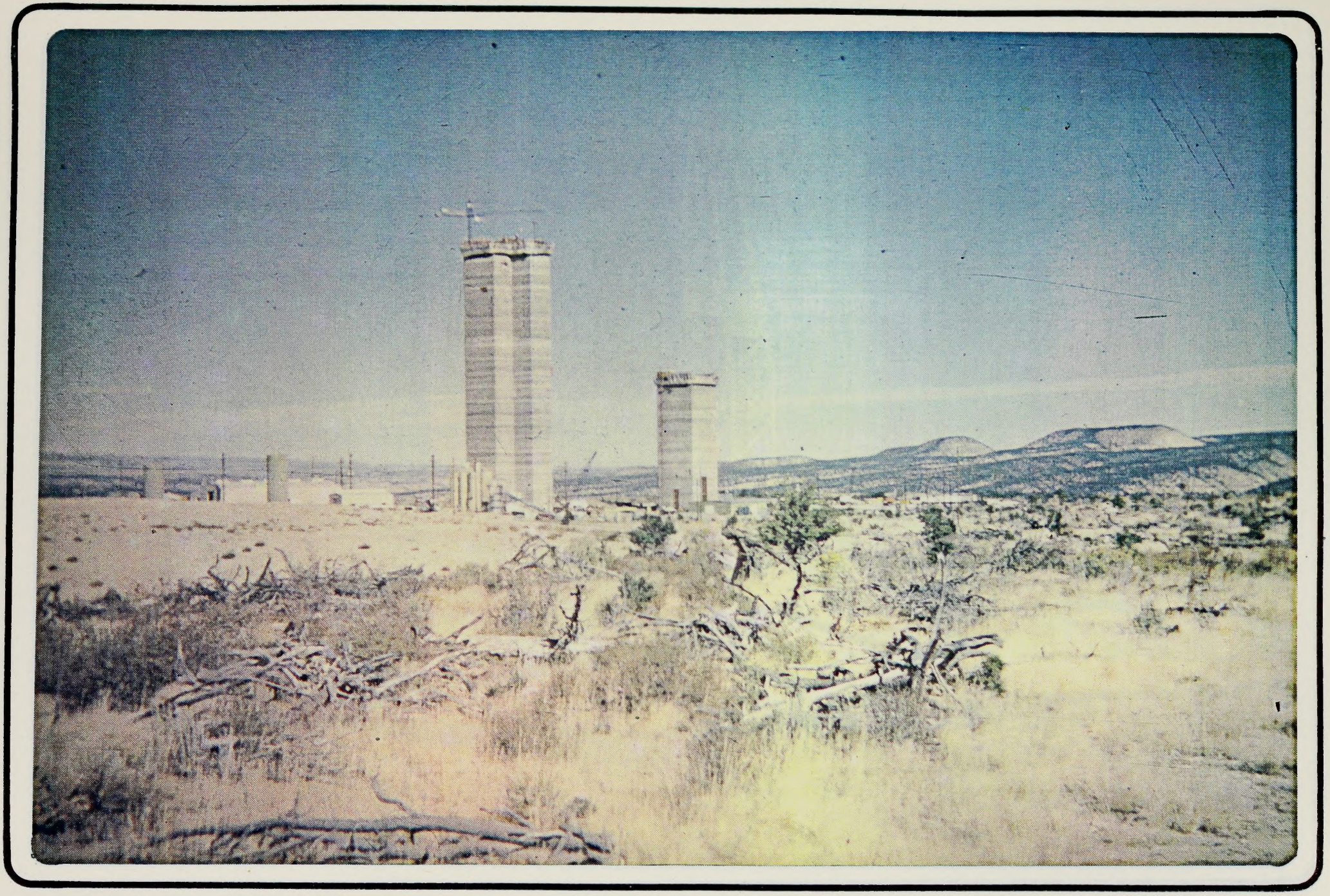


Figure A-1 - Photograph of headframes in Mine Service Area at Oil Shale Tract C-b. Looking towards northwest. Hills along right skyline lie north of Piceance Creek and along the northwest end of the Piceance Dome(anticline).

Figure A-2 - Photograph of the specially built drilling rig operated by Fenix and Scisson Inc. to drill a 96-inch diameter shaft at Horse Draw for the U. S. Bureau of Mines.

an Indicated Mineral Area because it does contain oil shale of various grades, thickness, and depth.

d. Asphaltum

A small area of rock asphalt potential lies on the east side of the Meeker-Rifle corridor in T. 2 S., R. 94 W. The area is about 800 acres, on mostly private surface in the Petrolite Hills. Rock asphalt is also known as bituminous sand, oil sand, or tar sand. It contains petroleum products. It is an asphaltic bitumen that does not flow freely at atmospheric temperatures or pressures. As such, it must be mined. (References-A,D)

These deposits are in sandstones at the base of the Green River Formation. The beds dip westward into the Piceance Basin. They occur as layers between the beds and as veins. There has been no known production from these deposits. There is no known quantitative estimate of this resource.

e. Saline minerals-nahcolite and dawsonite

The saline minerals nahcolite and dawsonite occur with the oil shale in the deeper parts of the Piceance Basin. These saline minerals may provide by-products of economic importance. Nahcolite is a sodium carbonate which can eliminate the sulphur oxide from air pollution. Dawsonite is a sodium-aluminum-carbonate which is a potential source of aluminum.**

The nahcolite bearing section of the Green River Formation has a maximum in the Piceance Basin of over 1000 feet in the eastern portion of T. 1 S., R. 98 W. This section thins outwardly from this location in all directions. An estimate of the total amount of nahcolite in the basin is approximately 29 billion tons. Next to the Wyoming trona deposits of 103 billion tons, this is the second largest known deposit of sodium carbonate in the world. (Ref. D.)

Dawsonite in the basin also has its thickest section in the east half of T. 1 S., R. 98 W. It is evenly distributed vertically and thins out toward the basin's margins. In its thickest interval it contains more than 120 million tons per square mile, thinning to less than 20 million tons near the margins. The estimate of the total amount of dawsonite in place is 19 billion tons. The total potential reserves in this basin are about 3 times the world's reserves of bauxite alumina. (Ref. D)

Four sodium leases for these minerals have been issued by the U. S. Bureau of Land Management for lands within the Basin and four preference right lease applications are pending. The Superior

Oil Company plans to produce nahcolite and dawsonite as part of their oil shale development on the northern edge of the basin. The issued sodium leases and the Superior Oil Company property where a proposed oil shale-nahcolite-dawsonite complex is located will be classified as Mineral Resource Areas. No active development or mining is taking place at this time for saline minerals in the Unit. The Indicated Mineral Area for saline minerals will be the lateral extent of the nahcolite-dawsonite bearing intervals within the basin of deposition. (Ref. D)

f. Salable minerals

Various common rock materials have been sold within this region for construction purposes. These have included sand and gravels, moss rock, building stone and rip-rap. Sand and gravel deposits occur primarily along the White River both in and near the stream bed and in benches above the valley floor. Other gravel pits are scattered throughout the region. The major users have been the State of Colorado and Rio Blanco County, both for road construction. With the exception of road construction where these materials are used very close to the quarry from which they are mined, it is not expected that this region has any significant potential for the production of such materials. (Ref. D)

Moss rock has become popular as building facing stone, in fireplace chimney construction and rock gardens. This material is not overly abundant in this region. Some old foundations and even small cabins have been built using Mesa Verde and Green River Formations sandstones. Stone for rip-rap is plentiful but the demand is very small. There are possible sources of clay for structural clay products in the Wasatch and Mesa Verde Formations; however, no specific sites have been identified.

g. Locatable minerals

Although it is not expected that any locatable minerals will be found to underlie the site area, minerals are often discovered in unlikely geological terranes. The area lies within a uranium bearing province. As uranium occurs within sandstones, the possibility exists that uranium might be discovered within the locale. Other metallic minerals might also be found in a subsurface stratiform deposit.**

h. Water and water quality

The White River is the largest perennial stream in the region. It flows westerly through the northern portion of the region into Utah to its confluence with the Green River, which ultimately flows into the Colorado River. Piceance Creek is the

second largest perennial stream and it drains most of the interior of the basin and empties into the White River. All other streams are intermittent. The water supply comes principally from melting of winter snowpacks, augmented by summer precipitation. On an average, 42 percent of the annual stream discharge occurs in the months of May and June. Approximately 32,900 acre feet per year originates in the Piceance Basin.

The principal implications of runoff are to the surface, where storm or snow-melt runoff causes deeply incised erosion and considerable sediment transport. The major portion of the watershed is experiencing moderate erosion. Because of increasing soil disturbing activities in the area, the erosion trend is on the increase. Piceance Creek is a drainage which is considered to contribute highly to sediment yield from erosion. Much of this is from the erosion of gullied and abandoned irrigated land on tributaries to Piceance Creek. The sediment content of the Upper White River is generally low; however, below the confluence of Piceance Creek it increases rapidly.

The Piceance drainage is underlain mainly by sedimentary rocks of Tertiary age which contain readily soluble minerals, and results in high amounts of dissolved solids being carried by the streams. A large contributor to this dissolved salt load is the artesian aquifer underlying the Piceance Creek Basin. This aquifer, bearing warm mineralized water, allows seepage of highly saline water to the surface. Concentrations are highest during late summer and winter flows.

Piceance Creek has been sampled for a full suite of water quality parameters. An abstract of the dissolved solids in Piceance Creek, near the White River, follows in Table A-1.

Table A-1

Dissolved Solids in Piceance Creek

Date of Measurement	Mean Discharge in cfs	Dissolved Solids in ppm	Dissolved Solids tons/acre ft.	Dissolved Solids tons/day
March 19, 1947	---	439	0.40	---
September 19, 1947	---	1,330	1.81	---
August 25, 1954	4	5,740	7.81	62
September 25, 1954	8	3,360	4.57	73
October 26, 1957	21	1,310	1.78	74
May 9, 1958	19	361	.49	19
August 9, 1958	26	1,450	1.99	102

In the immediate region, intermittent streams go dry during hot summer months and longer during years of drought. The only standing waters are those contained in beaver ponds and stock ponds. As a consequence, there is a general lack of surface water for cattle and other uses and ground water remains as an important future potential source.

There are a few formations within the immediate region of interest which have a potential for ground water development. These are listed in Table A-2, following:

Table A-2

Potential Aquifers

Green River Formation-	Intertonguing lenses of siltstone, marlstone, sandstone, limestone, and shale. Sandstones are practically impermeable, but wells from fractures in shale derive as much as 1,000 gpm.
Wasatch Formation-	Clay, shale and lenses of sandstone, limestone and conglomerate. Produces water for stock and domestic wells. Yields as large as 900 gpm have been reported from 2 irrigation wells.
Middle Park Formation-	Sandstones, shales, coal, cross-bedded sandstones. Sources of water to many springs. Yields to 800 gpm.

The aquifers of the Green River Formation in the Oil Shale Tracts C-a and C-b have received considerable study and are reported elsewhere. Other aquifers are not known to have received comparable study within the immediate site region and might provide considerable ground water if they were to be developed.

i. Soils

The center of the Piceance Basin is overlain by shallow rocky, and deep moderately dark colored soils of the uplands. Soil parent materials are mainly limy sandstones and shales, along with reworked valley fill derived from sandstone and shale. Much of the fill material is stony or gravelly. Eolian deposits mantle portions of the folling upland divides. Recent alluvium is of minor extent. Alluvial valleys have been markedly influenced at many places by sediments and colluvium

from nearby slopes.

The high west, east, and south rims of the basin are overlain by moderately deep and deep dark colored soils of the uplands. The landscape consists of steep lower mountain slopes of rugged relief dissected by narrow valleys and streams. Steep slopes with gradients between 10 and 60 percent are most common. Parent materials consist of mixed alluvium, colluvium, and outwash deposits. Gravelly and stony valley fill is extensive along the lower mountain slopes. Parent rocks are chiefly sandstones and shales. They have furnished the source for much reworked material in which soils have formed.

In general, the area of the Piceance Basin is rated at á medium limiting soil factor. The soil moisture availability is generally good at the higher elevations and very poor in the lower elevations.

The erosion condition of the area is: barren- 0 acres; stable- 9,756 acres; slight erosion- 145,986 acres; moderate erosion- 425,593 acres; critical erosion- 20,565 acres; severe erosion-0 acres.

Current erosion of soil and vegetative loss are attributable to hunting, oil and gas exploration and development, rights-of-way construction, access road construction, past overgrazing of livestock and wildlife etc. These factors and uses contribute to surface disturbance and vegetative loss which allows increased erosion by wind and water.

6. Geological hazards and other limiting factors

Land slides occur at the western edge of the Planning Unit, along the Cathedral Bluffs. No landslides occur in the interior. The potential for landslides is high due to generally steep slopes and layered shale soils in the Unit. (Ref. D).

There are a number of northwest trending faults;however, there is no indication that they are active. Further, the entire Unit is situated in Seismic Risk Zone 1, which is defined as a zone susceptible to minor damage in which distant earthquakes may cause damage to structures. The entire state of Colorado has been tentatively classified as a "minor seismic risk area of the United States". This is based in part on the fact that no major earthquakes have occurred in this region in the past 100 years. (Ref. D)

Subsidence due to the extraction of large columes of fluids from weakly consolidated sediments and underground mines in which no support structures were left has been mentioned in

the BLM's resource analysis. The discussion does not identify the existence of subsidence within the Unit. Although some amount of subsidence might be expected over a major oil and gas field such as the Piceance Creek Field, such subsidence would not necessarily be perceptible, or necessarily deletarious where man made structures have not been built upon the surface.**

B. Living Components

1. Demography and socioeconomics

Rio Blanco County, with an area of about 3,700 square miles, was estimated in 1977 to have a population of 5,103 people. Estimates for previous years are shown below in Table A-3.

Table A-3

Trends in populations for Rio Blanco County (and the towns of Meeker and Rangely)

	1960[a]	1970[a]	1975
Rio Blanco County	5,150	4,842	5,080[b]
Meeker	1,655	1,597	1,772[c]
Rangely	1,464	1,591	1,784[d]

Sources: As reported in Rio Blanco Oil Shale Project, March 1976, Social and Economic Impact Statement Tract C-a:

a. U. S. Bureau of Census, 1960, 1970
b. Worksheets from Colorado Division of Employment, April 1975
c. Estimate of Rio Blanco Planning Office
d. Based on information from Rangely Community Survey.

The population of Rio Blanco County represents roughly about 0.2% that of the State of Colorado. The towns of Meeker and Rangely represent each about 0.1% of the population of the State. The median age of the population of Meeker is about 32.0, about 10 years older than that of Rangely which has an average of 22.3 years.

Both Rangely and Meeker have adequate schooling facilities. The campus of Colorado Northwestern Community College is located at Rangely. All housing units in Meeker are filled.

Both towns have modern hospital facilities. Both towns' water systems are approaching capacity and together with sewage facilities are in planning for modernization.

The dominant sources of income to Rio Blanco County are earned from the production of oil and gas and from the agricultural production of cattle and sheep. The relationship of the two is best demonstrated from the statistics for 1969 when the value of oil and gas production was $47 million (Ref. 2) while that of agricultural production was $5.6 million (Ref. 3).

In 1967, the last year for which census figures are available, the oil and gas industry in Rio Blanco County consisted of 49 establishments and employed 400 workers with an annual payroll of $4,700,000. The cost of supplies and materials was $17.6 million (Ref. 4).

In 1969, the last year for which the data was available for this study, there were 556, 564 acres of farms reported within Rio Blanco County. This represented 26.7% of the 2,088,384 acres lying within the county. There was a total cropland of 54,319 acres on 148 farms, of which 33,811 acres on 139 farms were harvested. There were 100 hired farm workers with annual wages of $500,040. Of 135 farms reporting, 124 had cattle; and 111 farms reported having 32,896 head of cattle. One hundred and thirteen farms reported sales of 19,066 cattle and calves. The 148 farms of Rio Blanco County represented less than 1% of those in Colorado, but produced about 2.5% of the value of agricultural production for the state (Ref. 3). The trend of agriculture has since increased. By 1973, the census of cattle and calves had increased to 50,000, milk cows and heifers totaled 150 while stock sheep totaled 59,000 (Ref. 5).

During the same period government services have grown. In 1969 Rio Blanco County had 414 employees with an approximate monthly payroll of $144,000. By 1972 these had increased to 484 with an approximate monthly payroll of $229,000. Revenues to Rio Blanco County in 1972 totaled $1,541,500; of which the 3% sales tax collected a net of $298,254 to the county(Ref. 7). Retail sales in 1972 were as follows (Ref. 8):

County	$14,066,963 -	100.00%
Meeker	5,644,516 -	40.13%
Rangely	6,959,052 -	49.37%
Remainder	463,395 -	10.41%

By 1974, the work force in Rio Blanco County had grown to 2,070. Of these, 1,627 were non-agricultural workers, 393 were employed by agriculture and 50 were unemployed (Ref. 9).

In 1973, the mining industry, including oil and gas production, had 145 reporting units within the county and had 1,076 employees with a taxable payroll of over $2 million (Ref. 10).

The assessed valuation of property in Rio Blanco County for 1972, 1973, and 1974 is shown on Table A-4. This indicates that the taxable property owned by the Natural Resources Industry--which includes oil and gas--represents about 80% of the taxable property within the county (Ref. 11).

The characteristics of the economic sectors excluding agricultural and mineral production is indicated by the retail sales by business class, for Rio Blanco County in 1974 as shown in Table A-5 on the next page.

Table A-4

RIO BLANCO COUNTY: County Property Tax Valuation 1972-1974 (by Classes of Property)

Residential	$ 2,433,970	2,682,480	4,452,430
Commercial	1,493,090	1,539,190	1,926,710
Industrial	375,580	369,400	369,740
Agricultural	5,117,790	5,149,650	5,500,740
Mineral Resources	40,868,610	49,839,670	77,781,270
State Assessed	7,007,720	7,291,630	7,417,310
Assessed Total	57,286,760	66,872,020	97,448,200

Source: Division of Property Taxation, State of Colorado. 1972,1973,and 1974. 2nd, 3rd, and 4th Annual Report, 1972, 1973,and 1974. Denver, Colorado.

2. Land use

Due to the aridity of the region, the lands are suitable principally for grazing of cattle; for the production of mineral resources, and for recreational purposes based upon open space values. The land supports a varied wildlife community which provides good hunting opportunity, but poor fishing.

Table A-5

RIO BLANCO COUNTY

Sales Tax: Retail Sales By Business Class
Fiscal Year Ended June 30, 1974

	1974 --Thousands of Dollars--
Agriculture, Forestry & Fisheries	Ø
Mining	Ø
Contract Construction	554
Manufacturing	334
Transportation, Communication, Electric, Gas & Sanitary Services	2,343
Wholesale Trade	2,635
Building Materials & Farm Equipment	1,331
General Merchandise	831
Food Stores	2,382
Auto Dealers & Service Stations	2,108
Apparel and Accessory	222
Furniture & Home Furnishings	152
Eating & Drinking Places	730
Miscellaneous Retail	1,636
Finance Insurance & Real Estate	4
Hotels & Other Lodging	345
Services Other Than Lodging	1,330
Government Facilities	174
Nonclassifiable Establishments	6
Total:	17,119

Source: Colorado Department of Revenue. 33rd Annual Report. 1974-Denver, Colorado

As the population is sparse, only the lands in Rangely and Meeker are urbanized and the remainder of the residents live on widely scattered ranches. Various projections made for the energy developments indicate that growth may be expected in the future and that new communities might be built to support energy minerals extraction and processing. Such expectations have resulted in considerable planning and zoning activity at the county and local levels.

Federal oil shale lease tracts Ca and Cb are under development within the Unit. There are no towns within the Unit. Except for oil and gas related facilities, there are no other highly developed industrial areas. Lands devoted to residential use are limited to individual ranch houses, and a couple of residences at the Magnolia Compressor Station and Little Hills Experimental Station (Ref. D).

Very little land is under agricultural production. Small irregularly shaped fields along the White River, Piceance Creek, and other wet drainages produce hay and some small grains under irrigation. Irrigation is from the streams and various ditch systems. The total acreage cultivated is approximately 17,000 acres, most of which is in native hay with an average of about 1.8 tons/acre. Most of the hay produced is used locally for winter livestock feed.

Historically, lands away from drainages have been used for livestock grazing rather than farming. Because of rough topography, limited precipitation (13 inches annually at Little Hills Experimental Station), and short growing season (about 110 days), there is practically no dry-land agricultural farming (Ref. D).

Exploration and development activities for oil and gas make widespread use of the land surface; however, the actual acreage used is small and is limited to drill sites, access roads, and rights-of-way for pipelines, utilities, and microwave communications. Oil and gas production facilities are concentrated around Magnolia Dome and scattered along Piceance Creek. Other wells and exploration activities are dispersed throughout (Ref. D).

There are no lands in the unit specifically dedicated to open space, and very little land has been set aside for use for public purposes (Ref. D.).

The area supports a varied wildlife community which provides recreation through hunting and to a limited extent fishing. Of major importance is the mule deer, which constitutes one of the largest migratory deer herds in North America. Deer use is principally for winter range, except at the higher elevations along the south edge on the divide between the White River and the Colorado River. Although populations are presently small, but on the increase, elk also come down from the Roan Plateau to winter in the southern portion of the unit. There are no major fisheries in the area. Fifteen bands of wild horses containing a total of approximately 143, roam over a 275,000 acre area in the Piceance Basin adjacent to the east side of Cathedral Bluffs.

The land ownership within the planning unit is summarized in Table A-6.

Table A-6

Land Ownership-Piceance Basin Planning Unit

Ownership	Acres	% of Total
Private	101,900	14.1
Colorado State Land Board	-0-	-0-
Colorado Div. of Wildlife	31,344	4.3
Public Lands	589,083	81.6
Total:	722,327	100.0%

3. Vegetation

The vegetation of the area is typical of the arid steppe and accompanying mountain climate. The major vegetative units are discussed below:

Type 1-Grassland-Western wheat grass, needle and thread, June grass, bluegrass, carex and indian ricegrass.

Type 4-Sagebrush-Dominants are big sagebrush, black sagebrush, Utah serviceberry, rabbit brush and bitterbrush. Associated species are western wheatgrass, needle and thread, June grass, cheatgrass, broom snakeweed, lupine and buckwheat. Large areas of sagebrush at all elevations dominate the habitat

of the region. Sagebrush at climax or in pure stands has low forage value and reduces grazing productivity except for limited wild species.

Type 5-Mountain shrub-Dominants are Utah serviceberry, serviceberry, Gambel oak, and mountain mahogany. Associated species are snowberry, big sagebrush, common chokecherry, bitterbrush, western wheatgrass, mountain brone, June grass, bluegrass, western yarrow, aster, carex and fleabane.

Type 6-Conifer-Dominants are Douglas fir, Engelmann spruce, and subalpine fir. Associated species are quaking aspen, snowberry, huckleberry, mountain mahogany, elk sedge, and meadow rue.

Type 7-Waste-Lack of significant vegetation.

Type 9-Pinyon-juniper-Dominants are Utah juniper, and pinyon. Associated species are big sagebrush bitterbrush, Utah serviceberry, rabbitbrush, mountain mahogany, western wheatgrass, indian ricegrass, beardless bluebunch, and broom snakeweed. The pinyon-juniper type like sagebrush, has limited grazing productivity. Open stands with sufficient understory are considered valuable rangeland; however, closed stands are often nearly useless except for shade and shelter.

Type 10-Broadleaf-The dominant is quaking aspen. Associated species are snowberry, mountain ninebark, mountain brome, pinegrass, bluegrass, columbine, geranium, buckwheat and lupine. The broadleaf does not cover sufficient acreage to affect livestock management and--for the most part--exists on steep, inaccessible slopes.

Type 13-Saltbush-Found on lower slopes or in valleys.

Type 14-Greasewood-The dominants are greasewood, rabbitbrush, fourwing saltbush, Nuttal saltbush, and big sagebrush. Associated species are western wheatgrass, bottlebrush, squirreltail, slender wheatgrass, Kentucky bluegrass, and cheatgrass. Greasewood is regarded as a low value winter forage for sheep. Under certain range conditions it is a poisonous plant. Livestock management in the greasewood type is complicated by increased soil

losses due to overgrazing as the understory vegetation is crowded out.

Type 20-Riverbottom-The dominants are willow, dogwood, carex, cottonwood, and cattail. Associated species are beardless bluebuch, wheatgrass, bottlebrush, squirrel tail, cheatgrass, needle and thread, and Junegrass.

Type-Noxious Plant-The only significant noxious weed or poisonous plant is houndstongue. It is found over a large area near the south end of Piceance Basin in high elevation summer range country. The area involved is around 1,786 acres in the sagebrush vegetative type; 2,234 acres in the mountain shrub vegetative type; and 691 acres in the broadleaf vegetative type. While the plant is reported to cause dermatitis in sheep and its barbed nutlet will readily damage fleece, the basic problem lies in its rapid expansion in disturbed range areas. The plant occupies large acreages that should and could be producing valuable livestock forage.

The relative abundance of these principal vegetative types is shown by the acreage occupied by each within the Rangely Planning Unit given in Table A-7.

Table A-7

Vegetation Types in the Piceance Basin Planning Unit

Vegetation Types	Acreage	Percentage
Grassland	32,190 acres	4%
Sagebrush	256,670 "	32%
Mountain Shrub	203,660 "	25%
Conifer	3,245 "	trace
Waste	9,110 "	1%
Pinyon-juniper	272,220 "	34%
Broadleaf	16,100 "	2%
Greasewood	920 "	trace
Half Shrub	1,790 "	trace
Riverbottom	12,520 "	2%
Totals:	808,425 acres	100%

4. Forest Products

Forested lands comprise 250,265 acres or about 43% of the 585,173 acres of public lands in the Piceance Planning Unit.

Of these, pinyon-juniper (PJ) constitutes the principal forest type in the planning unit. It makes up 96% or 239,140 acres of the total forested area. Approximately 60% of the PJ in this unit has potential for being managed as woodland. Douglas fir occupies about 2,530 acres, or about 1% of the forested lands in the planning unit. Of the Couglas fir type, 745 acres are defined as those which are capable of producing 20 cubic feet of commercial wood per acre per year.

Pinyon-juniper is found in stands in practically all forest sub-compartments of the planning unit. The conifers--Douglas and Spruce-- and the few broadleafs which are found in the area such as aspen, are generally limited to higher elevations and north-facing slopes where more water is available for growth.

a. Fire

No large fires have occurred in the unit. Most of those fires which have occurred have been small and predominantly in the pinyon-juniper type. Several small fires have burned in Douglas fir. When protected from recurring fires, both grassland and shrub stages will be restocked naturally and the pinyon-juniper climax will recur.

b. Past cutting practices

The cutting that has occurred has been mainly of the PJ type, of which 2,674.8 MBF of wood products have been sold. These products consist of fuelwood and fenceposts. Most of the wood so harvested has been deadwood from chained PJ areas and pipeline right-of-way. No forest development practices have been used to improve and protect forest sites and stands. Table 2-5 in Volume I of the Piceance Basin Resource Analysis lists timber transactions for the years 1967 to 1977 as follows in Table A-8.

Table A-8

Timber Transactions in the Piceance Basin Planning Unit: 1967-1977

Year	Value	No. of Sales
1967	$ 70.00	2
1968	138.75	4
1969	115.00	4
1970	379.50	15
1971	114.50	8
1972	279.00	12
1973	1,761.00	55
1974	3,342.00	90
1975	2,092.00	66
1976	1,850.50	53
1977	5,686.80	61*
TOTALS:	$13,737.05	372

*This is an approximate number.

The 372 sales above contained 2,674.8 MBF. The average annual transaction for this period was 34 sales valued at $1,248.82 for 243.2 MBF.

Christmas tree sales for approximately the same years were:

Table A-9

Christmas Tree Sales: 1968-1977

Year	Species	No.	Unit Value	Total Value	Sales
1968	Juniper	50	0.25	$ 12.50	1
1973	Pinyon	10	1.00	10.00	1
1974	Pinyon	42	1.50	63.00	42
1975	Pinyon	136	1.00	136.00	49
1976	Pinyon	200	1.00	200.00	2
1977	Pinyon	92	1.00	92.00	92
	Pinyon	75	1.50	112.50	1
	Pinyon-juniper	15	1.00	15.00	15

According to a forest inventory reported in the Piceance Basin Unit Resource Analysis of 2530 acres of Douglas fir forest only 745 acres are considered productive.

5. Livestock and grazing

The Piceance Basin Planning Unit has 42 grazing allotments which are used by 32 operators. The public lands provide forage for approximately 12,000 cattle and 11,500 sheep for a total grazing use of 61,207 AUM's (animal-unit-month--the amount of forage consumed by one cow and one calf in one month). Of the 42 allotments 13 are in satisfactory condition and 29 are in an unsatisfactory condition. The unit has two basic operations, the grazing of summer sheep, and the grazing of cattle all year long.

There are six sheep operators in the Unit which use the area for late spring, summer and early fall range. The sheep are either wintered near Meeker on private lands or on allotments in the Rangely Unit. Sheep move to the Rangely area by way of the White River Trail.

Twenty-six cattle operators use the Piceance Basin in a basic year around operation. The cattle winter in the center of the basin moving toward the edges as the season progresses.

The base lands are somewhat unique in this area due to the fact that many are owned by oil companies and leased to stockmen. These ranges have, in the past, been very stable operations but with the advent of oil shale production these could be terminated, in order to make way for other uses.

Also, one ranch, "Square S", is owned by the Colorado Division of Wildlife, which leases the property back to the rancher.

Management is made more complex by the fact that there are so many land owners. These include: Naval Oil Shale Reserve, Colorado Division of Wildlife, Other oil companies plus the individual owners.

The major competing wildlife species are deer and elk. Small bunches of elk are found in the southeast corner of the Unit; however, due to their small numbers there are not any wide spread conflicts at this time. A very large deer herd winters in the low and middle elevations of the Unit. Past use has caused extensive damage to the range; however, due to large hunter kills and the extreme winters of 1972 and 1973 the problem is not as critical (Ref. D.).

There are an estimated 143 wild horses in the northwest portion of the Unit. At the present time the dual use on these allotments is not a serious problem. However, with an anticipated increase of 15 to 20% per year, the problem must be corrected in the very near future. (Ref. D).

Predation by the coyote is the main problem. A few cases of lion and bear predation on sheep have been recorded over the years. In 1975, losses were reported at 341 lambs and 10 ewes, all attributed to coyotes. Cattle losses in the same year were smaller, with only 5 calves reported lost to predation.

6. Wildlife

The region abounds in wild game and other animals. As a result, hunting represents a heavy use of the environment. Although some sport fishing exists the fishery is poor, and is not significant.

The Piceance Planning Unit includes all of the Colorado Division of Wildlife's Game Management Unit (GMU) 22.

Of the many species that inhabit the unit, elk are found with the largest concentrations in the Meeker area. Mule deer are found throughout the area, with large migrations into Piceance Basin to spend the winter months. Other large mammals include mountain lion and black bear. Small mammals are numerous throughout the Unit, including cottontail rabbits, jackrabbits, coyotes, bobcats, ground squirrels, beaver, and prairie dogs. Over $2,000,000 are spent annually on hunting. The black-footed ferret, a rare and endangered species, has been reported but has not been observed in recent years. A variety of birds are resident or migrate through the area. These include raptors, songbirds, upland game birds, waterfowl, peregrine falcon, golden eagles and bald eagles.

a. Mule deer

The mule deer is the most important large game animal within the Piceance Basin Planning Unit by the size of harvest and by the number of recreation man-days expended in the hunt for this species. The estimated population for GMU 22 is 26,000 deer which now winter in this unit.

The Piceance deer herd, once considered the largest migratory deer herd on the North American Continent, has in recent years suffered a drastic population reduction. This is generally believed to be attributable to a series of severe winters in the early 1970's rather than to any major loss or degradation of mule deer habitat.

The planning unit contains winter and summer range. Mule deer may be found throughout the area yearlong. Summer range normally consists of the higher elevations where there is a greater abundance and variety of forage, water and cover. At the higher elevations, temperatures are cooler and insects are less bothersome. Summer range habitat in this unit is about 300,790 acres. Winter range is usually found at lower elevations where snow is less deep. Winter range habitat is about 338,530 acres.

Deer are primarily browsers; however, significant amounts of grass and forbs are eaten during spring and summer months. The average deer consumes between 0.4 and 1.0 gallons per day, and thus, the deer population of the unit utilizes about 3,276,000 gallons of water each year. Principal habitat for the mule deer is the pinyon-juniper vegetation. Winter range is the most crucial habitat for mule deer in this area.

b. Elk

A small portion of the White River elk herd, which winters in the planning unit, provides the greatest hunter pressure and highest total harvest in the state. Elk summer habitat occupies about 124,500 acres and winter habitat about 123,000 acres. This herd has been steadily increasing in recent years, and concern is growing that eventually the herd will reach a point where competition with mule deer will occur on the limited winter range.

Summer range lies at elevations generally above 8,000 feet. During the summer, elk are commonly found in open parks, meadows, and forested areas of the valleys. During the winter, elk migrate to lower elevations to avoid deep snow. Elk prefer dense vegetation for cover.

c. Mountain lion

The Colorado Division of Wildlife estimates up to 15 lions in the Piceance Basin. All of the unit is considered to be mountain lion habitat.

Mountain lions roam widely, males 75 to 125 miles, and females 25 to 35 miles. Such movement is normal within their territories and is not considered to be migratory. Lions are active yearlong and seasonal use areas are not known. Nevertheless, since deer are their principal food, the movements and habitat of the mountain lion is related to those of deer. Rabbits, rodents and livestock are also taken for food..

With the projected increase in population for this area, these people will use lion habitat range for recreation,thus increasing the human conflict. Lions are intolerant of human activity and usually restrict themselves to the more rugged and remote areas of the basin. Lions are important to the ecosystem because of their predatory nature--one of the few large predators found within the planning unit.

Since 1965, the mountain lion has been managed as a game species. The occurrence of the mountain lion within this region is of importance to recreational hunting.

d. Black bear

Black bear live in the higher elevations of the southern and eastern parts of the Planning Unit. Historically, bear have roamed over most of the area; however, human disturbance has forced this relatively shy species into the more mountainous and remote areas.

Black bear are active only in the warmer months and in winter go into a state of semi-hibernation. Bears generally are found in timber or heavy brush. They are omniverous and will feed on carrion, rabbits, insects, nuts, berries or other forms of vegetation.

The black bear is a large game species hunted in this area under the Colorado Division of Wildlife Game Management Unit 22. Black bear are an important part of the planning unit's ecosystem. Few bears presently inhabit the planning unit and their habitat and use areas are constantly shrinking.

e. Coyote

The entire region is considered as coyote habitat. As this animal is a predator of cattle and sheep, it is hunted by ranchers and others. The coyote is not protected by any legislation. The coyote is hunted for its pelt which is

becoming increasingly valuable. It is classified by the Colorado Division of Wildlife as a varmint and is hunted year long under license.

f. Small animals and furbearers

Small animals and furbearers in this unit are primarily rabbits. The most common is the cottontail. The desert cottontail prefers habitat below 7,000 feet and Nuttalls cottontail that which is above 7000 feet. The cottontails are believed to be at a low point in their population cycle and are now on an upward trend.

The snowshoe hare is found in the southern and southwestern portions of the unit in Douglas fir and aspen ecosystems above 7,500 feet. This is primarily along the Roan Plateau and southern Cathedral Bluffs. The population here is not very large and any disturbance of their limited habitat would have serious effects upon it.

The red squirrel is believed to have a small stable population in this area. No special use areas have been designated within the region.

Beaver occur within the region. There are no important or special use areas defined for the beaver within the area.

g. Fish

As the streams in the area are intermittent, most cannot support a recreational fishery, except during spring runoff. In addition, water quality at low volumes of flow over alkaline soils tends to be low, and the low type of vegetation (sagebrush, wheatgrass,etc.) does not support the riparian vegetation essential to establishment of a sustained yield recreational fishery.

Water quality conditions in the White Rover, while tolerable for trout, generally deteriorate to the west of Meeker. The White River and Rio Blanco Lake should provide sufficient habitat for large populations of channel catfish.

h. Birds

The region is inhabited by various birds, water fowl and raptors. Only a few species are discussed here.

Sage grouse inhabit the region and several strutting grounds have been identified.

There is a small population of blue grouse in the upper elevations along the Roan Plateau and the Cathedral Bluffs.

Chukar partridges were introduced as an exotic species. Two small habitat areas have been identified in the northwest along the White River.

The Piceance Basin Planning Unit provides both summer and winter habitat for ducks. Summer populations include mallards. blue winged teal, green winged teal, cinnamon teal, gadwell, pintails and mergansers. These birds use the White River, Piceance Creek and the many small stock reservoirs in the basin. These birds are very susceptible to water pollution and vegetative cover next to the water. Important use areas include any place where standing water is found, but no special use areas have been designated.

Raptors which are reported as inhabiting the area include golden eagles, southern bald eagle, prairie falcon, peregrine falcon and red-tailed hawks. The golden eagles and falcons nest and inhabit rocky cliffs and steep canyon walls. Bald eagles prey on water birds and water fowl and as such are found in trees along the White River. The peregrine falcon is an endangered species--has been observed in the Piceance Basin only rarely. There is the possibility that nesting may occur in the Parachute Canyon area in the south of the planning unit.

i. Amphibians, reptiles and invertebrates

Although no habitat descriptions are available, it may be expected that a wide variety of amphibians, reptiles, and invertebrates occupy the region and site areas. These would include common species of salamanders, frogs, toads, lizards and snakes.

j. Wild horses

A herd of 240 wild horses roams freely in the northern third of the Piceance Basin Planning Unit west of Piceance Creek. The decision has been made to manage wild horses with wildlife and livestock and that they will be managed in their present range. Studies will be made to determine the impact of existing fences on their movement.

Two generations of wild horses have been identified in the West. The first was the horses which were introduced to the western region during the period of Spanish exploration. The second was during the depression of the 1930's when ranchers released domestic horse stock onto open range.

The Piceance Basin herd is protected by Public Law 92-195 which prohibits capture and selling of wild horses found on public lands. As the wild horse herd competes for habitat with cattle and big game, the carrying capacity of the lands has posed a problem to management of land use in the area.

k. Threatened and endangered species

Several threatened and endangered species are either known to inhabit the area or have been observed in the area.

The black footed ferret is probably the rarest mammal in North America. Two unconfirmed reports of sightings in Skull Creek Basin and Dinosaur National Monument in 1975 suggest that the black footed ferret may still be present in northwestern Colorado. Prairie dog habitat is also prime habitat for the ferret.

Peregrine falcons have been sighted in this unit. The most suitable nesting habitat lies along the cliffs of the Parachute Canyon complex. Unfortunately, the majority of the suitable cliff nesting habitat and riparian hunting habitat in the drainage are controlled by private land owners, making protection and management of this species and its habitat extremely difficult for the Division of Wildlife and BLM.

The southern bald eagle, which was discussed under Birds, is also an endangered species.

In late April, 1975, a number of greater sandhill cranes, an endangered species were sighted on 84 Mesa. The birds were engaged in foraging and dancing activities, but it is not known whether they nested in the area or moved northward to nest. Cranes have been known to nest in Rio Blanco County; however, in recent years there have been no reports of nesting cranes in northwestern Colorado other than those that traditionally nest in northern Routt County.

There is a possibility that two endangered species of cutthroat trout exist in this area. These are the greenback cutthroat and the Colorado cutthroat. Not enough is known about the area's fisheries resource to delineate any endangered species habitat.

A revegetative analysis by the Colony Development Company has identified four plant species that are possible rare or endangered. Yellow columbine, Aquilegia micrantha, and Sullivantia purposii, have been found in seep areas and around waterfalls in Parachute Creek and near Rifle Gap. White checkermallow, Sidaleca candida, has been found in aspen groves, white yellow rock milkvetch, Astragalus hitea, has been found only in several areas on cliff tops in very well drained, gravelly soils.

C. Ecological Relationships

The population of Rio Blanco County and of the Cities of Meeker and Rangely use the lands and environment surrounding the site area to earn sustenance, rest, recreation and other aesthetic rewards. The local human population subsists mainly upon the importation of general foodstuffs produced elsewhere and comsumes some quantity of meats produced locally as well as some amount of game meat hunted nearby. The local populace in turn produces domestic cattle by animal husbandry and grazing and exports cattle for processing and consumption in other areas of the state and nation.

The people of the area also produce the energy fuels oil, gas, and coal which are exported from the area for use by the regional and national populations. The area is noteworthy in that the Rangely area contains a surplus of oil and gas which can be extracted at a high level of productivity and work efficiency.

A transient population utilizes portions of the area and region for recreational activities such as hunting and sightseeing, which are based largely upon aesthetic considerations.

Supporting the local population in its production at the top of the food chain are the lower-order animal life of the ecosystem. The grazing of domestic cattle and sheep convert the bio-energy stored in the vegetation of the grazing lands into meat which in turn is consumed by man. As these domestic cattle are herbiverous, they are not particularly dependent upon the lower orders of animal life for their productivity.

A parallel but subordinate food chain follows the passage of solar energy from the vegetation and lower order small animals up through the small game animals and to the big game animals.

Mule deer is the principal large game animal which provides food to man through this second food chain. Due to their low numbers within the area, elk do not have a high productivity from the area and are not significant in the food chain. The use of the wildlife foodchain by man is subordinate to the recreational values obtained by hunting. Even though large amounts of game meat are wasted because the population prefers the taste of domestic meat, hunting has a value for the pleasure provided hunters. Local fishing does not rank high in importance for either food or for recreational pleasure in the area due to the poor fishery.

Although beaver at one time provided materials for protective clothing, new technology and styles relegated the

beaver to a non-useful species, and it is now protected by law. The viewing of beaver in its natural habitat has a value as recreation. Other furbearing animals such as rabbit, muskrat and coyote have value for ornamental use on clothing.

Wild horses of the area are offspring of domestic varieties which at one time were useful to man as work animals. The quality of these animals is now degraded and they are only useful for the color they provide to the western landscape.

Predators and raptors are useful to man in that they remove carrion from the lands, and may control rodent populations.

Vegetation lies at the bottom of the food chain, and is important in the conversion of solar radiation to food energy for animals at all levels of the food chain, and for the production of oxygen. Certain vegetal forms provide pleasure to man by their beauty. In this area, the Douglas Fir-Aspen community provides such aesthetic value. Utility is also obtained by the limited production of forest products such as firewood from the juniper-pinyon community.

1. Environmental education

Various field trips are conducted by schools at both Meeker and Rangely to visit regional natural features. Field trips to visit the site of the Rio Blanco nuclear shot site have been very popular with the students. This site lies in Fawn Creek in Section 14, T. 3 S., R. 98 W.

Occidental Petroleum conducts free public tours to Oil Shale Tract C-b on a regular basis.

2. Fire hazard and protection

In the last 30 years ending in 1972 there were 23 fires which burned a total of 3,717 acres in this unit. The vegetative type most often burned was PJ. These fires occurred usually in the dry summer months of June, July and August. The only industry related problems on record are those of agricultural burning. With the increased activity of oil, gas, and mineral exploration industry related problems may be expected in the future.

Protection of the area is provided by daily pumper patrols and by fire observation flights by aircraft. Agreements among the BLM, the Colorado State Forest Service, and the County of Rio Blanco--who provides heavy equipment when needed--are in effect for joint cooperation to fight fires in the area. Fire retardant airplanes are stationed at Grand Junction and can reach the Piceance area in about an hour after an alert is received. Fires are also attacked in their initial stage by "helitack" crews who can respond within 5 minutes after an alert.

Access in the Rangely Unit for the fighting of fires has been enhanced by the complex system of roads and trails which were built or improved for mineral development.

3. Ecologically unique areas

Four areas within the Piceance Basin Planning Unit have been depicted as possible ecologically unique areas. Two of these areas are classified as Pinyon-Juniper "relic areas" and two are small stands of Ponderosa pine. The Ponderosa pine stands were designated as possibilities because they are the only known location of living Ponderosa pine trees in the Planning Unit and are apparently out of the normal range.

The first Pinyon-Juniper relic area is located at T. 1 N., R. 99 W. parts of Sections 12, 13, 14 and T. 1 N., R. 98 W. Sections 7-18. This area is found on a ridge between Middle and North Barcus Creeks. A Pinyon-Juniper inventory plot taken near this area contained a Juniper with a diameter at stump heighth of 37.0 inches and an age of 500 years. The area is bounded on one side by a large burned area and on another by a chained area. Some of the trees in the area indicated evidence of past fires.

The second area is found at T. 3 S., R. 97 W. Sections 7-8, -18. This area found between Hunter Creek and Dry Gulch. A Pinyon-Juniper inventory plot was taken in the area with tree diameters at stump heighth ranging to near 40 inches and ages in excess of 400 years. Evidence of past fires was found in the area with a large burn west of the area.

The possibility exists that in one of these such "relic Areas" the oldest tree in Rio Blanco County may be found.

The two small stands of Ponderosa pine are in the NW¼ of Section 9, T. 3 S., R. 97 W., and in the SW¼ NW¼ of Section 24, T. 1 N., R. 98 W.

D. Human Values

The projected actions of constructing and operating various energy producing facilities of this area is born of human need, is interactive with the local community, has some small effect upon travelers or visitors to the area, and is of prime significance to the group of users of natural gas elsewhere in the region. Thus the range of human values which will be affected varies greatly in impact and kind dependent upon the group considered.

There are two local communities which are the regional population and trading centers: Meeker and Rangely.

Meeker is the County Seat of Rio Blanco County. The founding of Meeker and its growth to the present time has been based

upon the pioneering effort of settlers in the 1870's and 1880's. These settlers cleared and tilled agricultural lands in the valley bottoms. With time and use of lands for the grazing of domestic cattle it became the dominant agricultural product and remains as such to the present time. Present day Meeker grows in the fore of the nearby energy developments, but retains the direction and flavor of its pioneer heritage.

The town of Rangely has a population of 1650. The character of the town derives from the needs of an oil producing area superimposed upon a local trading center for ranching. Its economy is based upon the production of oil and gas from the Rangely and other nearby fields. Families living in the community earn incomes derived from petroleum and gas production and related supporting trades from the production and export trades, from the production and export of cattle, and from the mercantile, retail, and related trades and professions which provide a moderate level and amount of food, goods, utilities and services. For the families living on the surrounding ranches whose income derives from cattle raising and to a lesser and diminishing extent from raising sheep, the town is the trading center. To all of these people, who directly or indirectly will be engaged in the project, the gathering system will provide work or cash flow which will be part or all of their support.

Rangely and the surrounding area is remote and the population lives within a mood and lifestyle based upon out-of-doors living in a vast region characterized by open spaces and long travel distances to neighboring communities. Recreation generally is outdoors based and has an indirect relationship through justaposition and opportunity for out-doors living. The local people utilize the recreational facilities available to them, and generally in this area will be more likely to engage in hunting and fishing than will their counterparts who live in metropolitan areas. These workers also may be expected to have an aesthetic appreciation of the immediate environment of the area, including the physical plant of the oil and gas field's operations.

To the traveler and visitor to the area, who may either pass through casually, or who may come a few days to hunt, the project will probably not even be noticed, and thus he will be affected only to the extent that he might see some portion of the project's facilities.

1. Landscape character

The character of the landscape of the region and the site area are basically those of an arid mountain steppe. Broad

intermontaine basins are surrounded by rugged plateus and highlands. Contrasts are sharp and the profiles of hills and mountains are strongly delineated. In the lowland deserts vegetation is sparse and in some areas the land is barren.

Locally, dissected streams cut through shale and marlstone forming a badland topography in an early stage. From the valleys, the land surface rises to form low hilly areas. The land forms are those created by a youthful erosional cycle superimposed upon geological structure. From Rangely and Meeker southward, the deeply incised Piceance Creek and Yellow Creek drainage area rises from the foothills to meet the northerly sloping Roan Plateau surface.

As the land rises from the valleys through the foothills to the lower mountains, the vegetation changes character. In the lower elevations near the White River, the native grasses and brush are those species which are tolerant to alkaline waters. In the foothills, the vegetation is a mixture of sparse to moderately thick grass and low scattered desert brush. As the elevations rise from the foothills, the areas of grass thin and the brush thickens. At intermediate and higher elevations brush covers broad slope areas to form monotonous unbroken scrub cover. As the intermediate slopes break to meet the cliffs formed by the steep sides of the eroded high buttes and mesas, the vegetation changes in response to the moisture present on the protected northerly facing slopes. In the high valleys formed by this line of break are found forest stands of conifers mixed with quaking aspen. These stands grow in and among other vegetative types of grasses and brush along the divide of the Roan Cliffs.

The landscape changes character with the time of day, the cloud cover and the resulting tone of light. In the early morning and in late evening, a low sun will cast brilliant warm diffracted colors over the desert, and the hills. In winter, mid-day lighting frequently is overcast and sullen and can emphasize the mountain cold.

2. Sociocultural values and lifestyle.

As the sociocultural values and lifestyles of the visitors who live elsewhere will be as varied as that of the population of the United States as a whole, this discussion will be limited to the residents of Rio Blanco County.

The sociocultural values and life style of the local community are rooted in climate, physiography, availability of water, and in the capacity of the land in the Rangely area to produce and to provide a domicile for each family unit.

Thus the pre-historical and historical events which led to the present settlement of this area provides the base upon which to discuss the cultural aspects of this community.

a. Archaeological and historical background

This region of western Colorado may have been occupied by man as early as 10,000 B.C., but no archaeological sites have been identified definitely with this early period. The earliest known peoples included the representative Plano Cultures who occupied successively from about 7,500 B.C. to about 3,000 B.C. These perhistoric peoples lived by hunting and gathering. Environmental factors including the extinction of certain large animals forced a change in sustenance to one based upon the hunting of small animals and the gathering of nuts and vegetables.

This mobile existance continued until at least 900 A.D. when a horticultural people called the Fremont began to cultivate corn in selected valley bottoms. The Fremont gave up these practices, or moved out of the area, for unknown reasons about 1,250 A.D. and life in northwestern Colorado reverted to the previous archaic hunting and gathering system. From this lifeway derived the Ute Culture present at the time of the Dominguez and Escalante Expedition of 1776.

In 1776, Fathers Escalante and Domingues traveled over present day Book Cliffs, down East Douglas Creek, into White River Basin. In Douglas Creek, Father Escalante noted the pictographs on the canyon walls and named the wash the "Canyon Pintado".

Trappers entered the region in their search for beaver and other fur-bearing animals and in 1825, William H. Ashley of Rocky Mountain Fur Company fame travelled up the White River and Douglas Creek, reversing the route of Escalante and Dominguez. Trapping and trading were well established by the late 18th and early 19th centuries but died suddenly about 1840 with the change in European hat styles.

The region was further explored in 1844 by John C. Fremont, and in 1861 by Captain Edward L. Berthoud, both of whom pioneered transmountain routes for roads. In 1868 a government agency was founded near Meeker and settlers entered the area. Conflicts arose between the settlers and the Indians and resulted in the Meeker Massacre of 1879, the arrest and trial of Chief Douglas and the removal of the Utes to their reservation in Utah.

The Town of Rangely was established as a trading center for nearby ranches. Cattle were trailed into the area from Wyoming and Texas to take advantage of excellent grazing conditions. In 1882 a crude road was built over

Douglas Pass to Grand Junction. In 1885 the "Second Ute War" resulted in the final resolution of the Indian conflicts, the stationing of federal troops in a buffer zone between Utah and Colorado, and the loss by Rangely of its former trade with the Indians. By the late 1880's ranching dominated the growth of the area.

In the 1860's the black mineral which later was named Gilsonite was discovered west of Rangely. This black bitumen was first mined commercially in1889 and during the 1890's was hauled by wagon to rail at Rifle and Fruita. In 1903 a narrow gauge railroad was built from Mack, Colorado to Watson, Utah-just south of present day Bonanza to haul Gilsonite and supplies.

Coal was first discovered in the area and was mined at some time prior to 1906.

Petroleum was first noted before 1876 by Dr. F. M. Endlish, who reported seeps of oil along the banks of the White River near the present site of Rangely. In 1901 exploration was begun and by 1903 three shallow wells were producing oil from fracture zones in the Mancos shale. Enough production was obtained to permit construction in 1919 of a refinery in Rangely. In 1933 a second wave of exploration was started when deeper oil was discovered in the Weber Sandstone, which saw production of 1,000 barrels per day from below 6,000 feet. A third phase of development was begun to satisfy the demands in World War II for oil. Between 1943 and 1947, 295 producing wells were drilled.

In 1943, commercial natural gas was discovered along the crest of the Douglas Arch. From that time to the present, continuing discoveries and expansion of known fields have made Rio Blanco County a premier producer of oil and gas in Colorado.

b. Local lifestyle**

Today, the residents of Rangely and Meeker continue a way of life which is rooted in history. Present day lifestyles have a deep sense of open space even though due to modern communications the community is no longer isolated. Rangely still retains the mood of a frontier town of the western tradition. The parallel threads of ranching and mineral development continue as they have since the time the Utes left for their reservation in Utah.

Superimposed upon this frontier setting, modern amenities have raised the quality of life for the community so that mere survival no longer serves as a constraint for enjoyment of the desolate desert landscape. Instead, leisure time of the residents is now spent in large measure in recreation centered

upon the outdoors. While four-wheel drive vehicles may be used for the production of oil and gas during the week, this same vehicle is used to reach isolated hunting, fishing and camping areas over the weekend.

c. Recreation

The region offers many opportunities for recreation. These include hunting, fishing, recreational riding, and viewing of scenery, wildlife, and geological features. A developed recreational site exists in the region.

1.) Hunting-Hunting of big game is the most noteworthy recreational opportunity within the unit. The Colorado Division of Wildlife's Game Management Unit 22 consists of 1,033 square miles centered upon the Piceance Creek drainage area. The hunting is excellent for deer and elk and fair for mountain lion and black bear. The following table gives the last available statistics for the game year 1975 (Ref.4).

Table A-10

Big Game Statistics for GMU 21-1975

Game animal	Harvest	Hunters	Recreational Days
Deer-archery	21	127	852
rifle	2,191	4,347	18,138
Elk-archery	0	28	156
rifle	175	843	4,503
Black bear	2	27	211
Mountain lion	4	*	*
Totals:	2,393	5,372	23,860 man-days (65.4 man-years)

It has been estimated that the average resident hunter spends about $101 per day of hunt, and that the average non-resident spends about $137 per day. In 1973, 1,916 resident and 1,951 non-resident hunters spent $543,797 or an average of $140 per person per day for big game hunting.

In the hunting of small game in Small Game Unit 22 in 1973, 4,245 hunters harvested 26,869 Nutalls cottontail and spent 28,858 man-days or 73.6 man-years in the hunt.

Bird hunting in the region includes sage grouse, blue grouse, and waterfowl.

There are 15 guides licensed by the Colorado Division of Wildlife to operate in GMU 22.

2.) Fishing-The recreational fishing situation in this planning unit is poor. White River and Piceance Creek are the

only perennial streams. Channel catfish in the White River probably offers the best recreational fishing in the unit.

3.) Scenic values and viewing- The higher elevations of the area have merit for scenic quality; however, with the exception of County Road #5 in the valley of Piceance Creek, the area is not accessible to the general public and therefore is considered as lying in a seldom seen visual zone. When considered in full, the scenic value of this particular viewshed is surpassed by others in Colorado not too distant from the site area region. Under BLM criteria no areas at the site could be classified as Primitive Areas.

The Piceance Basin's main scenic characteristic is one of monotony. The Unit contains essentially two parts; 1.) the periphery lying outside the Basin Rim(i.e. north and east along the White River and along Colorado 13 respectively) and 2.) the Basin itself.

Both the White River and the Sheep Creek (adjacent to Colorado 13) portions of this area lie inside the scenic corridors of Colorado 64 and Colorado 13. Colorado 64 follows the White River and provides scenic views into irrigated hay meadows and riparian streamside vegetation. This landscape lies against a series of high wooded ridges that form the northern lip of the Basin. A similar situation exists above Sheep Creek, however, the riparian vegetation is lacking and Sheep Creek's flow is only intermittent. Some agricultural meadows line Colorado 13, but the overall landscape is more arid.

Piceance Creek follows irrigated meadows about one-quarter mile wide as it dissects the Basin into two halves. On the east lies the Piceance Dome, drained largely by the Dry Fork of Piceance Creek. A sagebrush landscape mixed with pinyon and juniper trees covers most of the hillsides. The rolling topography effectively blocks views from all but the highest promontories. The most notable vantage point for viewing is the Piceance Dome site near Magnolia Camp. Panoramic views extend into adjacent portions of the Basin, especially of the activity at Oil Shale Tract Cb.

North and east of the Dry Fork of Piceance Creek, good views extend into Sheep Creek and into the White River Valley; though these are very frequently restricted by a heavy brush cover.

South and west of Piceance Creek lie a series of rounding ridges and intervening flat-bottomed drainages. Essentially each drainage is sagebrush covered, adjacent hillsides are speckled with pinyon and juniper types and the ridgetops contain scattered intermingling pinyon-juniper stands and sagebrush parks.

Views from the drainages are generally restricted as are those from the ridgetops. However, at the higher elevations where trees do not obstruct the view, one can view the eastern portion of the Unit as well as the mountains in White River National Forest lying low on the horizon.

On the extreme western edge, views extend into the Rangely Unit. On the south, equally spectacular views extend into Roan Creek , Carr Creek, Brushy Creek, Clear Creek and Parachute Creek canyons. Distant views reveal portions of the White River National Forest as far east as Carbondale, portions of Grand Mesa and the La Sal Mountains in Utah.

4.) Archaeological and historic values and viewing-Archaeological resources in the Piceance Planning Unit are represented predominantly by campsites and lithic scatter. The area appears on the basis of currently available data to be peripheral and supportive of activity in the Rangely Planning Unit. This area also contains the highest incidence of wickiyup structures of all the Planning Units. Proposed research in the lower Piceance Creek area has the potential of yielding information on the substance base and temporal occupancy of this area. Historic resources in the Piceance Planning Unit are predominantly in the form of log structures related to the homesteading era. Most of these sites are found along the meadows and benches associated with permanent streams and agricultural lands. There is only one cultural site in this planning unit which has been nominated to the National Register of Historic Places. This is the Duck Creek Wickiyup Village. All cultural resources on public lands are protected under antiquities legislation. The Antiquities Act of 1906 prohibits removal and/or defacing destruction of cultural objects by any individual or group unless granted a specific permit for scientific purposes by the Federal Agency administering the land.

5.) Wildlife and viewing-The area contains a variety of wildlife which offers an attractive potential for viewing. Opportunities for viewing mule deer vary according to season. During the fall, the large "Piceance Basin Migratory Deer Herd" migrates from the Flattops area east of Meeker into the Piceance Basin. During this time, the deer move through areas where they can be viewed with little difficulty. Upon reaching the Piceance Basin in the fall the deer concentrate into small herds, after the hunting season. During late spring, the deer migrate back to the Flattops and then the small herds break up again until after the fall migration. During the winter, deer can normally be viewed in the Yellow Creek, Pinto Gulch, Barcus Creek chainings, Yellow Creek bottoms, Black Sulphur Creek, the entrance to Cb Tract, and between Black Sulphur and Cow Creek. Good viewing opportunities for viewing deer also include from Meeker south to Rio Blanco along Colorado Highway 13 and 789, and along Colorado Highway 64 from Meeker to Rangely, particularly in Powell Park, on Blair and Steadman Mesas, and in the Yellow Creek Area.

Elk populations are thought to be small within this Unit, thereby limiting viewing opportunities. Small herds of elk do concentrate at the head of Hunter Creek and Stewart and Twin Gulches during the winter. Another small herd is said to winter along Skinner Ridge.

Other big game wildlife viewing opportunities include big horn sheep, bear, and mountain lion. Approximately 10 big horn sheep are kept in a pen just past the Little Hills Experimental Station. Viewing opportunities for bear and mountain lion are rather poor due to relatively low numbers, dispersion and general wariness.

Small game viewing opportunities include sage grouse strutting grounds, ducks, chukar, partridge, blue grouse, snowshoe hare and beaver.

Non-game viewing opportunities exist for sighting wild horses, golden eagles, bald eagles and falcons.

6.) Geology and viewing-**The stratigraphic column which is exposed roughly from the Wasatch Formation in the bottoms of valleys to the Douglas Creek member of the Green River Formation on tops of the mesas is easily seen. Such features are common in the general region and aside from the economic implications of oil, gas, coal, and oil shale, are of no special merit when compared with other geologic oddities which exist elsewhere in other nearby areas.

Various semi-precious varieties of agate and related amorphous quartz minerals are found in the White River Valley north of Rangely. Generally, the rocks of the area are common. Coal does not make a good mineral for collection, because it decrepitates with exposure to the air. Oil shale similarly oxidizes upon exposure to air and turns a chalky white unless protected by spray plastic or lacquer.

7.) Recreational riding- The area offers some opportunity for use in recreational off-road travel by horse, 4-wheel drive vehicle, trail bike or snowmobile.

No riding stables or liveries are known to be in the area. It is assumed that some recreational riding on horseback is pursued on an individual and private basis in the area.

The many trails and roads around the area would be suitable for 4-wheel drive and trailbike travel; however, these roads are not accessible to the general public. Although the high

areas do accumulate some snow pack during the winter, the depth of accumulation apparently is not adequate to attract the snowmobiles of the region.

8.) Existing recreational facilities-Rio Blanco Lake on the White River near its confluence with Piceance Creek is a developed recreation site. It is operated by the Colorado Division of Wildlife and offers fishing, camping, and picnicking. No other developed recreational sites exist in the Planning Unit.

LIST OF REFERENCES FOR APPENDIX A

Ref. 1 Colorado Oil and Gas Conservation Commission. 1975 Oil and Gas Statistics. Denver, Colorado.

Ref. 2 Colorado Bureau of Mines. 1969. A Summary of Mineral Statistics in Colorado. Denver, Colorado.

Ref. 3 U. S. Bureau of Census. 1969. Census of Agriculture, Vol. 1 Area Reports, Part 41, Colorado, Section 2, County Data. Washington, D. C.

Ref. 4 U. S. Bureau of Census. 1969. Census of MIneral Industries. Washington, D. C.

Ref. 5 Colorado Crop and Livestock Reporting Service. 1973 Colorado Agricultural Statistics. Denver, Colorado.

Ref. 6 Colorado Department of Commerce and Development. 1972. Meeker Community Profile. Denver, Colorado.

Ref. 7 Colorado Division of Local Government. 1972. Local Government Financial Compendium. Denver, Colorado.

Ref. 8 Colorado Department of Revenue. 1972 31st Annual Report. Denver, Colorado.

Ref. 9 Colorado Department of Labor. 1972.

Ref. 10 U. S. Department of Commerce. 1973 County Business Patterns. Washington, D.C.

Ref. 11 Colorado Division of Preperty Taxation. 1972. 2nd, 3rd, and 4th Annual Reports, Denver, Colorado

Ref. 12 Colorado Department of Revenue. 1974. 33rd Annual Report. Denver, Colorado.

Ref. 13 Colorado Department of Natural Resources. 1976. 1975 Colorado Big Game Harvest. Denver, Colorado

APPENDIX B

INDEX TO GENERAL CONDITIONS

GENERAL CONDITIONS

In accordance with Article EIGHTH of the Agreement, all expenses incurred by Contractor in meeting the requirements of these General Conditions are included in the unit prices contained in the Bid Proposal and no extra or additional payments will be made by the Company therefor, with the sole exception of those expenses which are set forth in these General Conditions to be assumed by the Company, which shall be authorized and paid for as provided in Article VI of these General Conditions.

I. Correlation of Documents

The Contract Documents are complementary each to the other. Any stipulation made in any of them shall be as binding as if made in each of them. In the case of any conflict or inconsistency between the Agreement and any of the other Contract Documents, the Agreement shall control.

II. Examination of Site

The Contractor shall determine the character of the soil, the contour of country, the nature of any crossings and other conditions, surface and subsurface, to be encountered by him in the work.

III. Right of Way

Company shall provide all necessary rights of way, railway crossing permits, federal, state and county highway permits, and all other rights of way or crossing permits which shall be necessary for the said work. The right of way to be furnished by the Company is defined in the Specifications for all purposes of this Contract.

In clearing the right of way and in the performance of the work, Contractor shall give due consideration to the interests and property of landowners and tenants wherever involved and shall carry out and perform his work in a manner which shall cause the minimum of inconvenience, injury or damage. Company shall furnish Contractor information as to the easements and other permits acquired by Company for right of way purposes. Contractor shall familiarize himself with such easements and permits and comply with all requirements thereof. Contractor shall restore all property damaged in connection with the work to as good condition as before damage occurred.

IV. Inspection

All work performed and materials furnished by Contractor under this Contract shall be subject to such inspection as is considered necessary by the Project Engineer. The decisions of Project Engineer shall be conclusive upon Contractor as to compliance or noncompliance with the terms, provisions, Specifications, and Drawings of this Contract. Notwithstanding anything to the contrary herein contained, it is understood and it is the intent of the parties hereto that the right of inspection accorded herein to Project Engineer is and shall be confined, however, to inspection to determine whether the results of the work are in compliance with the Specifications, Drawings, these General Conditions and other terms of the Contract.

Contractor shall furnish to the Project Engineer safe access at all times to work in progress, the Contractor shall provide him every reasonable facility for the purpose of inspection, even to the extent of dismantling or exposing portions of the finished work. If in the judgment and discretion of Project

Engineer, any work performed by Contractor or materials furnished by him hereunder are defective or fail to comply with the requirements of this Contract, then Contractor shall immediately repair or replace the work or materials found to be defective in a manner complying with said requirements and to the satisfaction of the Project Engineer. Where the Project Engineer requests dismantling or exposing finished work, the Contractor shall receive compensation for the work involved only if the dismantled or exposed finished work meets the requirements of this Contract. Such compensation shall be authorized only as provided for in Article VI of these General Conditions.

If the material furnished by the Company is defective, but the defect was not apparent at the time Contractor gave Company receipt for material, then the Contractor shall provide the labor necessary to replace said material and Contractor shall be paid for such work as provided for in General Conditions Article VI. If Contractor installs obviously defective Company furnished material, he shall provide at his cost the labor necessary to replace said material. The Company will provide replacement for defective material furnished by Company. Company will replace material damaged by Contractor and charge cost thereof to Contractor.

If Contractor fails to replace any defective work or materials after ten (10) days' notice, the Project Engineer may cause such defective work or materials to be replaced by another and the expense thereof shall be deducted from the amount to be paid Contractor if chargeable to him as set forth above.

A copy of this Contract and all amendments shall at all times be in the possession of Contractor's representative on the job.

Failure on the part of the Project Engineer to discover or reject work or materials furnished by Contractor which are not in accordance with the requirements of this Contract, prior to final payment, shall not be construed to imply an acceptance of such work or materials; also, no payment or partial or entire occupancy of the work by Company shall be construed to be an acceptance of the work or materials which are not strictly in accordance with the Specifications and Drawings.

V. Correction of Work After Final Payment

Neither the final payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty workmanship or faulty Contractor furnished material which shall appear within a period of one year from the date of final payment. Contractor shall remedy any defects due thereto and pay for any damage resulting therefrom. The Company shall give notice of observed defects with reasonable promptness.

VI. Changes in the Work and Extra Work

The Company shall have the right, at any time before completion of Contract to order Contractor to perform extra work, or to make changes by altering, adding to or deducting from the work or by altering the methods, materials or equipment to be used in performing the work. If any such change involves increased or decreased costs to the Contractor, the payment or credit shall be effected by the use of a CHANGE ORDER form as attached hereto. CHANGE ORDERS must be signed by Contractor or his authorized representative and by Company's Project Engineer and if the payment reflected on the CHANGE ORDER is more than $ 1000.00, it shall be countersigned by Mr. John Peters and if more than $10,000.00 by Mr. John M. Hassoldt and if more than $50,000.00 by Mr. Robert E. Kelly .

No payment shall be made to Contractor for any kind of additions, changes, alterations, omissions, expenses, costs, extra work, extra materials or equipment or any other claim by Contractor unless authorized on a duly executed CHANGE ORDER form. A CHANGE ORDER shall not extend the completion date of the Contract unless such extension is specifically set forth in the CHANGE ORDER.

The Contractor's compensation for changes or extra work shall be agreed upon before work on such change or extra work is commenced and shall be based on one of the following methods:

A. A lump sum payment as set forth on the CHANGE ORDER.

B. Unit Prices incorporated by reference to the Bid Proposal.

C. Unit Prices as set forth on the CHANGE ORDER.

D. The sum of (a) labor costs as shown on the WAGE RATE SCHEDULE attached to this Contract, subject to the conditions set forth thereon and (b) charges for the use of equipment as shown on the EQUIPMENT RATE SCHEDULE attached to this Contract, subject to the conditions set forth thereon.

The Company shall have the right to select which of the above methods shall be applicable to each CHANGE ORDER. A description of the change or extra work and the method of payment selected therefor shall be set forth on each CHANGE ORDER. In each case where method D above is used, Contractor upon completion of the work shall submit to Company the fully completed Change Order Detail and Company shall have the right to examine the Contractor's records relating to the labor and equipment time applicable to the work on such Change Order Detail, and Contractor shall furnish and make available to the Company's designated representatives, payroll records, material and equipment invoices, and all other records and information necessary or convenient to such examination. Company shall give Contractor written notice of its desire to make such an examination and shall arrange a convenient time therefor.

All payments made pursuant to CHANGE ORDERS shall be made at the times and subject to the conditions set forth in the Contract for regular contract payments except that any payment subject to examination as provided for above shall not be made until such examination is satisfactorily completed.

No compensation will be paid pursuant to any CHANGE ORDER if the work thereon is required of Contractor under the terms of the Contract or any amendment, if any, hereto.

All additional expenses which the Company agrees to assume under the terms of the Contract, although not involving a change in the work, shall be authorized and allowed only when submitted on a CHANGE ORDER form.

VII. Control of the Work

Unified operations are essential to the efficiency and control of the work, to the limitation of hazards and to general public relations.

Whenever the work is in progress the Contractor shall have a duly authorized representative at the work site who shall control the work. The Project Engineer shall advise said representative when the work does not comply with the provisions of the Contract. Instructions given to said representative by Project Engineer shall be considered as having been given to Contractor.

Work shall be performed only during daylight hours unless otherwise authorized by the Project Engineer.

VIII. Workmanship

Contractor shall do the work in a workmanlike manner using only qualified, careful and efficient workers and in strict conformity with the Specifications and Drawings. Company shall have the right to require Contractor to remove from the work any employee of Contractor or of its subcontractors who, in the Project Engineer's opinion, is careless, or who does not perform the work assigned to him in conformity with the Specifications and Drawings, or who may be otherwise insubordinate or guilty of improper conduct. Any employee so removed shall not perform any further work under this Contract without the written approval of the Project Engineer.

IX. Safe Practices

The Contractor, his supervisors, and his personnel shall conduct the job in a safe manner. The Contractor shall take all necessary safety precautions, and shall comply with all applicable provisions of federal, state and local safety laws.

The Contractor shall provide all necessary warning devices, flagmen, and watchmen.

Conditions for inspection by the Project Engineer shall be such that inspection may be made safely. If any piece of equipment appears to be likely to endanger any Company employee in the course of inspection, use of such equipment shall be discontinued until equipment is repaired or replaced, or inspection is completed.

X. Employee Necessities

The Company shall not be responsible for providing food, water, shelter, transportation, sanitary facilities, or any other necessities needed for Contractor's employees under this Contract. The Contractor shall keep the right of way and surrounding area cleared of all papers, cans, garbage, expended welding rod and all other trash for which his employees on the work are responsible.

XI. Material

Contractor shall furnish and supply all material necessary to complete the work under this Contract unless specifically set forth herein to be provided by Company, including but not limited to, all welding materials including welding rods, oxygen and acetylene; skids and pads; timbers, lumber, heat source required to apply field coating, barricades, lanterns and flares, fuel for lanterns and flares, concrete, reinforcing material, base course material, gravel, temporary paving materials, padding material, paint, explosives, breaker materials, nails; fencing, fence gates and bracing; and all A-frame material except pipe.

Company shall furnish and supply all carrying pipe, casing material, valves, pipe coating materials, anodes and anode installation material including thermite welding equipment, insulating material, flanges, and other line fittings, prefabricated drips, river weights, weld marking materials, gas line marker signs and posts, rock shield materials and pipe for A-frames.

Company shall make permanent repair of pavement cuts after satisfactory backfill, base course and temporary repairs have been completed by Contractor unless specified in the Bid Proposal.

The material specified herein to be furnished by the Company will be located at: Tiffany Compressor Station 1 mile Northwest of Allison , Colorado, Western Slope Gas Company Storage Area Durango office, Durango, Colorado Railroad Siding Farmington, Colorado

Any excess material shall be returned by Contractor to: Western Slope Gas Company Storage Area Durango office, Durango, Colorado

All material drawn or returned must be accounted for by properly signed receipt or return forms.

The Company will consider the Contractor's recommendations, which shall be in writing, as to shipping points in addition to the above. If the Contractor requests in writing a diversion of the material after it has been shipped or it is enroute to the designated material sites, any additional cost involved in the diversion will be charged to the Contractor and deducted from the amounts retained pursuant to Article NINTH of the Agreement.

All materials furnished by the Company shall be checked by the Contractor for quantity and condition prior to signing receipt form. Lack of inspection by the Contractor shall not relieve him of the obligation to return defective material to the nearest material site as the Project Engineer may direct.

Upon completion of the work, Contractor shall account to the Company for all materials not incorporated in the work but for which a receipt has been issued. Such material not returned to the Company nor incorporated in the work shall be charged to the Contractor unless, in the opinion of the Project Engineer, the loss of such materials was due to force majeure as defined in Article XVIII hereof.

All material furnished by Contractor must be satisfactory to the Project Engineer, and any material that is not satisfactory shall be removed and satisfactory material substituted therefor.

The Contractor shall unload from carriers all material, including that furnished by Company, at material sites. There shall be no additional compensation for unloading except as provided in the Bid Proposal.

The Contractor shall load, haul, and string all materials, including those furnished by the Company, upon the right of way provided by the Company or at places designated by the Project Engineer. The Contractor shall perform all work in a manner that will avoid damage to materials.

Contractor shall string the pipe in a manner that will cause the least interference with the normal use of the land crossed by the right of way.

XII. Equipment

Contractor shall furnish all equipment required for the performance of the work in the time specified herein; such equipment shall be serviceable and shall be kept in good operating condition. If in the opinion of the Project Engineer, the condition of any piece of equipment is such that it would adversely affect the workmanship of the completed job or unduly retard progress, it shall be repaired or replaced with equipment satisfactory to the Project Engineer.

XIII. Protection of Finished Work

The Contractor shall be responsible for all finished work and be required to remedy or bear the expense of any injury or damage which the work may sustain from any source or cause whatever before the final acceptance of the work or any portion thereof.

XIV. Personnel

Contractor shall subscribe to and act in accordance with the requirements of Company's current agreement with Local No. 111 and Local No. 925 of International Brotherhood of Electrical Workers with respect to clauses in said Agreement as follows:

Article XIX General Working Rules

9. Contract Work

(a) Company agrees that it will not contract any work which is ordinarily done by its regular employees for the specific purpose of laying off or demoting such employees. Company further agrees that prior to the awarding of a contract for any major project of a type that has ordinarily not been contracted in the past, it will advise Contractor that the employees of such Contractor having the same job classification as those covered herein shall be paid not less than the wage scale provided herein for such job classification.

(b) In all new construction work where outside contractors may be employed, it will be the established policy of the Company to have such work done under Union conditions if possible.

Contractor shall make no claim for damages, extra costs, or extra time or any other claim of any kind whatsoever which might arise as a result of Contractor's failure to include the above requirements in his bid prices.

XV. Indemnity and Claims

The Contractor shall save and hold harmless the Company, its officers, agents, and employees against all liability resulting from damage to property or injury or death of any person or persons arising out of, or in any way connected with, or resulting from the work to be performed hereunder, including but not limited to such liability arising out of, or in any way connected with, or resulting from the acts, negligence or alleged negligence of the Company, its officers, agents, and employees in connection with the work to be performed hereunder; provided, however that such liability arising out of the sole and exclusive acts or negligence of the Company, its officers, agents, and employees shall be the responsibility of the Company. Without limiting the foregoing, the Contractor is specifically notified that the cost of damage done to or by stock escaping through fences or gates left open or insecurely closed, or otherwise occasioned or caused in the course of the work, shall be borne by the Contractor. The cost of normal land damage or damage to vegetation, including but not limited to crops, trees, and shrubs, necessarily incident to the execution of the work under this Contract shall be borne by the Company when such damage is within the bounds of the right of way or within the bounds of any easement or licensed route of ingress or egress specified by the Company.

In settling claims for damages to be borne by the Contractor hereunder, the Contractor shall either authorize the Company in writing to settle for him, or appoint a representative who shall accompany a Company representative to make settlement. The receipt for the settlement shall run in favor of the Company and the Contractor, or be approved by the Contractor if made only in favor of the Company. If the Contractor fails to appoint a representative to settle any claim for damages, the Company, after ten days' written notice, shall have the right to make settlement thereof and charge the same to the Contractor.

In an emergency affecting the safety of life or of the work or of the adjoining property, the Contractor, without special instruction or authorization from the Company, is hereby permitted to act at his discretion to prevent such threatened loss or injury. Compensation on account of emergency work or actions not due to his negligence may be claimed by the Contractor. If compensable hereunder, the amount thereof shall be determined by the mutual agreement of the Contractor and the Project Engineer, and shall be billed and paid for in accordance with the General Conditions Article VI.

XVI. Insurance

The Contractor shall procure and maintain in full force and effect at all times during the performance of the work under this Contract Workmen's Compensation Insurance in the amount of the statutory limits, irrespective of the number of employees in the work, and including Contractor if individual or working partner. Such insurance is to be procured from reliable insurance companies authorized to do business in the state in which the work is to be performed and acceptable to the Company, or the State Compensation Fund.

The Contractor shall submit to the Company a certificate of such insurance and of such other insurance as Contractor may carry for inspection by the Company. Contractor shall not commence work hereunder until the required Workmen's Compensation Insurance is in full force and effect.

Irrespective of the requirements as to insurance to be carried, the insolvency, bankruptcy, or failure of any insurance company carrying insurance for Contractor, Contractor agrees to save and hold harmless Company against all liability for damage, loss, or expense as provided for in the General Conditions entitled "Indemnity and Claims."

XVII. Bond

The Contractor shall furnish and Company shall pay for a bond or bonds, subject to Company approval, in the amount of $ 180,000.00 The Contractor shall furnish said bond or bonds in a form and with sureties to be approved by the Company and which shall be payable to the Company, its successors or assigns. The bond or bonds shall provide that the Contractor shall faithfully perform each and all of the covenants and agreements in the Contract to be performed by the Contractor and that the Contractor shall faithfully comply with each and all of the terms and provisions including all the undertakings, obligations, and liabilities of the Contractor contained in the Contract. Said bond shall protect Company against any and all liability for unpaid claims including, but not limited to, claims for liens. The said bond to be provided by Contractor shall continue and remain in full force and effect until the expiration of the warranty period provided for herein, and shall provide for the protection of the Company against claims after the Company may have made payment to the Contractor pursuant

to the terms of the Contract. In the event the Contractor fails for any reason to furnish a bond or bonds which are satisfactory to the Company within ten (10) days from the day the Contractor is notified of the acceptance of his bid, the Company may at its election cancel the Contract without notice if executed; and if the Contract is not executed, the Company may refuse to execute the same and at its option proceed forthwith to award the Contract to another bidder.

Any changes or adjustments made pursuant to the terms of this Contract shall not relieve any surety or guarantor from full liability on any bond or undertaking given in connection with the Contract. Any surety or guarantor by guaranty in performance of the Contractor waives all rights to notice of any change or adjustment made under the provisions of the Contract. (See Article V - Correction of Work After Final Payment for warranty)

XVIII. Force Majeure

It is agreed that in the event of either party being rendered unable wholly or in part by force majeure to carry out its obligations under this Contract, other than its obligations to make payments of money due hereunder, then on such party's giving notice and full particulars of such force majeure in writing on the other party as soon as possible after the occurrence of the cause relied on, then the obligation of the party giving such notice, so far as it is affected by such force majeure, shall be suspended during the continuation of any inability so caused, but for no longer period; and such cause shall, as far as possible, be remedied with all reasonable dispatch.

The term "force majeure" as employed herein shall mean acts of God, strikes, lockouts or other industrial disturbances, acts of the public enemies, wars, blockades, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, storms, floods, washouts, arrests and restraints of rulers and people, civil disturbances, explosions, inability with reasonable diligence to obtain materials, and any other causes not within the control of the party claiming a suspension, which by the exercise of due diligence such party shall not have been able to avoid or overcome.

XIX. Equal Opportunity Clause

If applicable to this Contract under the terms of Executive Order No. 11246 dated September 24, 1965, and any amendments thereto, or the rules, regulations or orders of the Secretary of Labor as authorized therein, or if otherwise provided by law, the Contractor shall comply with the provisions of Section 202 or said Executive Order and any amendments thereto, which section is incorporated herein by reference.

XX. Familiarity with the Work

No pleas of ignorance of conditions that exist or hereafter may exist, or of conditions or difficulties that may be encountered in the execution of the work under this Contract will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all requirements of said Contract Documents, or will be accepted as a basis for any claim whatsoever for extra compensation.

XXI. Change of Length, Route and Materials

The Company shall have the right to make such changes in the length of the gas line, route of the gas line, or in the Specifications relating to the size of the pipe to be installed or materials to be furnished by the Company as the Company may determine to be necessary or advisable regardless of the effect such change may have upon the total quantities of work involved. No other condition or provision of the Contract shall be construed to deny this provision.

The Company reserves the right to make any changes in routing made necessary by inability to obtain adequate rights of way or any other difficulties, and such changes shall not alter any term or condition of the Contract not in conflict therewith. No changes are to be made in the routing by the Contractor for any reason without the prior approval of the Project Engineer.

If a change is made in the total length of the gas line not in excess of twenty-five percent (25%) of the total miles of line estimated to be constructed hereunder, either by an addition or reduction, then the unit bid prices herein will apply to the length specified.

If a change is made in the total length of the gas line by an addition in excess of twenty-five percent (25%) of miles of line estimated to be constructed hereunder, such additional gas line shall not be included within this Contract.

In the event that the Company should decide to abandon a portion of the project in excess of twenty-five percent (25%) but less than fifty percent (50%) of the total miles of line estimated to be constructed hereunder, Company will pay Contractor in addition to amounts paid for work completed, equipment move out costs calculated as provided in the General Conditions Article VI.

In the event that the Company should decide to abandon a portion of the project in excess of fifty percent (50%) of the total miles of line estimated to be constructed hereunder, Company will pay Contractor, in addition to amounts paid for work completed, ten percent (10%) of the Item I Bid Proposal price provided herein, applied to the footage of the work abandoned as determined from preliminary survey. The above payments and any change in completion date shall be authorized on forms provided in Article VI of these General Conditions.

XXII. Company Caused Delays

A. Materials

The Company shall endeavor to furnish materials to be supplied by it to the Contractor at a rate that will not delay the work under this Contract. Company will make a reasonable allowance for the Contractor's expense occasioned by delay in receiving materials to be furnished by the Company. No such allowance will be permitted unless at the time any such delay is encountered the Contractor and the Project Engineer mutually agree in writing as to the allowance to be made for such a delay. Any such allowance shall be authorized and paid for as provided in Article VI of these General Conditions. No allowance shall be made for delays in furnishing material even though furnished after the time fixed for completion of the work unless the Contractor is actually delayed thereby and prevented from completing work within the time prescribed by this Contract.

B. Right of Way

The Company shall endeavor to obtain the right of way for the gas line so the Contractor will not be delayed in the work. In places where the right of way has not been obtained, or delay is caused the Contractor by reason of injunction against the Company or other legal obstacles in crossing certain right of way, and it is necessary for Contractor to move around portions of the right of way, the Company will make Contractor a reasonable allowance for Contractor's expense occasioned by such delays or moving. No such allowance will be made unless at the time any such delay is encountered the Contractor and the Project Engineer mutually agree in writing as to the allowance to be made for such delay. Any such allowance shall be authorized and paid for as provided in Article VI of these General Conditions. No allowance shall be made for delays in furnishing right of way even though furnished after the time fixed for completion of the work unless the Contractor is actually delayed thereby and prevented from completing work within the time prescribed by this Contract.

C. In the event of any delay caused by the Company under Paragraphs A or B of this General Condition, Contractor and the Project Engineer shall, at the time such delay is encountered, mutually agree in writing as to the number of days, if any, to be allowed to Contractor for completion of the work beyond the time for completion provided for in the Agreement. If no such written agreement is made, it shall be conclusively presumed that no extension of the time for completion has been granted to Contractor.

XXIII. CERTIFICATION OF NONSEGREGATED FACILITIES

The Contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit employees to perform their services at any location, under his control, where segregated facilities are maintained. The Contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this Contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants, and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, religion or national origin, because of habit, local customs, or otherwise. The Contractor further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000.00 which are not exempt from the provisions of the Equal Opportunity Clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods).

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities, as required by the May 9, 1967 order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000.00 which is not exempt from the provisions of the Equal Opportunity Clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

FORM (A) 404-10-1952

CHANGE ORDER
REPORT OF LABOR, MATERIAL, EQUIPMENT

PAGE _____ OF _____

Contractor		DATE THIS REPORT	/ /	DOCUMENT NO.	
Company		PERIOD COVERED FROM	THRU	PURCHASE ORDER NO.	
Locotion		/ /	/ /	CHANGE ORDER NO.	

This Chonge Order constitutes the authority for the following chonge as provided for in the Contract, Document No. _____

Doted _____ Job Order or Account Number _____

Poyment for the above chonge sholl be: (A) Lump Sum $_____ ☐ (B) Controct Unit Prices ☐

(C) Above Unit Prices ☐ (D) Labor ond Equipment ☐ Estimoted Cost $_____

This Chonge Order shall not supersede the Controct above described between the porties thereto, but shall be considered os supplementory hereto, and oll of the terms, conditions and covenants of the soid Controct not modified hereby shall remoin in full force ond effect.

This authorizotion is to be made out by duly outhorized Compony representotive ond verified by Controctor.

By _____ CONTRACTOR'S REPRESENTATIVE By _____ PROJECT ENGINEER By _____ MUST BE COUNTERSIGNED IF MORE THAN $ _____

CHANGE ORDER DETAIL

This portion to be completed by Controctor when work is done ot labor ond equipment rotes.

EMPLOYEE–NAME	CLASS.	DATE DAY	MON.	TUE.	WED.	THUR	FRI.	SAT.	SUN.	TOTAL HOURS	RATE	LABOR COST
TOTAL LABOR COST	* * * *										* *	

EQUIPMENT USED	DATE DAY	MON.	TUE.	WED.	THUR	FRI.	SAT.	SUN.	TOTAL HOURS	RATE	EQUIPMENT COST
TOTAL EQUIPMENT COST										* *	

MATERIAL FURNISHED BY CONTRACTOR

BOUGHT FROM	QUANTITY AND DESCRIPTION	MATERIAL COST
TOTAL MATERIAL COST	* * *	

This report is to be mode out in quintuplicate by outhorized Contractor representotive ond verified by outhorized Company representotive.

TOTAL COST

By _____ CONTRACTOR'S AUTHORIZED REPRESENTATIVE By _____ PROJECT ENGINEER

ORIGINAL - DOCUMENTS
1ST COPY - CONTRACTOR
2ND COPY AND COPY OF INVOICE TO PROPERTY ACCOUNTING
3RD COPY & ORIGINAL OF INVOICE TO PURCHASING
4TH COPY - PROJECT ENGINEER

INDEX TO SPECIFICATIONS

I. WORK REQUIRED AND ADDITIONAL PAYMENT

A. In accordance with Article EIGHTH of the Agreement, the work required by these Specifications includes the furnishing of all supervision, labor, materials, equipment, and services, (except those specified herein to be furnished by Company) necessary for and incidental to the installation of the gas lines and related equipment and appurtenances in accordance with all applicable local, state and federal laws, rules and regulations and all terms and conditions of this Contract in a manner satisfactory to the Project Engineer.

B. All work of every nature required by these Specifications, including but not limited to additional work, optional or alternative work, testing and corrective work, is included in the unit prices contained in the Bid Proposal and no extra or additional payments will be made by the Company therefor, with the sole exception of those situations wherein it is specifically set forth in these Specifications that the Company will assume additional costs when authorized in accordance with Article VI of the General Conditions.

II. PREPARATION OF RIGHT OF WAY

A. Right of Way

1. Company shall procure the gas line right of way and the rights of ingress and egress to and from said right of way for the purpose of construction of said gas line. The routes of ingress and egress will be specified by the Project Engineer, and Contractor shall use only routes specified. Such routes shall be limited to a strip of land not in excess of twenty feet (20') in width. Should Contractor require additional routes or width, request shall be made to Project Engineer who will take such action as is possible under the circumstances, provided that if additional routes or width are not obtained, Contractor shall have no claim by reason thereof.

2. The right of way shall be a strip of land fifty feet (50') in width except in those locations where Company's easements or permits restrict the same to a lesser width, or the particular circumstances at specific locations necessitate restrictions to a lesser width. All work done hereunder by Contractor shall be performed within the right of way provided by Company.

B. Route of the Line

1. The gas line will follow the route shown on the maps furnished by Company and shall be laid as staked by the Project Engineer.

C. Fences and Gates

1. Contractor, having first ascertained from Project Engineer that permission has been secured from the property owner, shall furnish materials for and shall install a gate or gap in every fence at the point of intersection of the proposed gas line for access to land crossed by the line and for passage of construction equipment. Gates shall be installed where indicated by the Project Engineer. Before cutting the fences to make these gates or gaps, Contractor shall

C. Fences and Gates (Continued)

provide braces in accordance with the attached Drawings at the point of cutting to prevent slack in fence. Materials for braces, fences and gates shall match the existing fence material. Gates or gaps shall be so constructed that they can be readily and securely closed.

2. Upon completion of construction of the line, and where in the opinion of the Project Engineer gates are not necessary, fences or other improvements taken down by the Contractor shall be promptly restored to the condition existing before being taken down.

D. Clearing Right of Way

1. Before clearing operations are started, Contractor shall familiarize himself with all revelant provisions included in the easements, licenses and permits secured by Company; and Contractor shall comply with these provisions.

2. Where the right of way passes over, through or across farm lands, groves, orchards, gardens, lawns, timber lands, stone walls, ditches, canals, springs, or similar valuable property or structures, the Contractor shall perform the work so as to minimize to the greatest degree the damages to be occasioned by the work.

3. In wooded areas the right of way shall be cleared to a minimum width of twenty feet (20')unless a narrower right of way is provided or a lesser width is permitted by the Project Engineer. Contractor may clear additional width if required for his equipment, but in no case in excess of the right of way width or in excess of the clearing width restrictions if any are provided in the right of way document. Brush, trees, and other woody growth including branches overhanging the cleared right of way shall be felled within the right of way to minimize damages to trees and structures adjacent to the right of way to be cleared. The stumps of brush, trees, and other woody growth felled shall not project more than four inches (4") above the ground. Such stumps and other loose debris shall be cleared from the line of trench and a sufficient distance from its sides so that the spoil bank from the trenching operations will not fall on any foreign matter that might be mixed with the excavated soil during backfilling. In addition, prior to trenching operations, the right of way shall be cleared of rock and made sufficiently smooth to permit normal operation of a one-half ton standard sized pickup truck. All brush, branches, trees, stumps, rocks, and other debris resulting from clearing operations shall be burned, chipped, or otherwise disposed of by the Contractor in conformity with any requirements applying to the tract of land involved, all rules of any federal, state, or municipal authority that may apply, and the directions of the Project Engineer. When burning debris, Contractor shall exercise caution to prevent fire hazards and smoke damage.

E. Grading Right of Way

1. Contractor shall do such grading as is necessary to minimize the necessity of abrupt over-bends or sag-bends. The line shall not be laid in grading fill. The right of way shall be graded uniformly across its cleared width. Two-toning is not permitted. The maximum degree of slope across the cleared right of way shall be determined by the Project Engineer.

F. Easements and Permits

1. Contractor shall do no work in areas requiring special permits such as Forest Service land, Bureau of Land Management land, railroad rights of way, public streets or roadways until notified by Company that it has obtained the necessary permits. Construction permits shall be on the job whenever construction is taking place.

III. HAULING, STRINGING AND HANDLING OF PIPE

A. Hauling Pipe

1. When coated pipe is furnished and is to be hauled by trucks, the pipe shall be supported on wide cradles or on wide timbers which are suitably spaced and padded. All chains, cables, or other equipment used for fastening coated pipe to trucks during transit shall be carefully padded. All handling and hauling equipment shall be approved by the Project Engineer before use.

B. Stringing Pipe

1. Where requested by the Project Engineer, landowners, tenants, or wherever gaps in strung pipe are obviously necessary to facilitate the movement of vehicles or other traffic, Contractor shall string the pipe so as to leave gaps across the right of way.

C. Handling Pipe

1. Coated pipe shall be lifted, lowered, or suspended by the use of rubber or canvas belt slings with removable pin and clevis on one end to permit removal of belt without injury to the coating, or other means approved by the Project Engineer. Slings shall provide sufficient bearing surface to protect the coating from damage. The use of unpadded pinch bars, chain slings, rope slings without canvas covers, canvas or composition belt slings with protruding rivets, pipe hooks without proper padding, or other devices that will damage the pipe coating is prohibited.

2. All handling of coated pipe shall be in a manner to protect the coating from damage. At no time shall the coated pipe be dropped, allowed to roll freely, allowed to rest on any object that will damage the coating, or be placed in a location or in such a position that it may be subject to damage either by traffic or otherwise. Coated pipe shall not be dragged on the ground.

3. Skids upon which coated pipe is placed shall be adequately padded to prevent damage to the coating.

4. Stepping on or walking on the coated pipe will not be permitted at any time.

IV. TRENCHING

A. Trench Depth

1. Contractor shall employ such equipment and methods as may be required to maintain the depth of cover at the level established by Project Engineer regardless of the type of soil encountered.

2. Contractor shall carefully preserve all survey stakes set by Project Engineer during all phases of the work for use in reporting the progress of the work. When Contractor's operation will destroy these stakes, they shall be relocated at the side of the right of way in line as much as possible with the original location. Cost of replacing survey stakes which have been destroyed will be charged to the Contractor and deducted from the amounts retained pursuant to Article NINTH of the Agreement.

3. The line shall be buried with the depth of cover specified in the Bid Proposal unless otherwise specified by the Project Engineer. The Project Engineer may orally specify a lesser depth of cover of Thirty (30) inches, but Contractor shall have written authority for any depth of cover less than the above minimum. The Contractor shall receive payment for extra depth of cover as follows:

(a) Where the Project Engineer has specified extra depth of cover at the approach to or the crossings of roads and highways which are not bored, irrigation and drainage ditches, canals, water course crossings, drainage tiles, culverts, pipelines, or other obstructions encountered along the line, Contractor shall receive only the applicable bid price for conventional trenched gas line construction unless said specified cover is in excess of four feet (4'). Where the specified cover is in excess of four feet (4'), the Contractor shall receive only the applicable bid price for conventional trenched gas line construction plus the extra depth of cover bid price for that length of trench for which the specified cover is in excess of four feet (4'). No extra depth payment will be allowed for that length of gas line which is bored, including approaches.

(b) Where a depth of cover in excess of the normal depth of cover is specified by the Project Engineer to cross greater distances such as farm lands, irrigated fields, or similar places, Contractor shall receive the applicable bid price for conventional trenched gas line construction plus the extra depth of cover bid price for that length of trench which is installed at the specified extra depth of cover. When the specified depth of cover for such greater distances is less than four feet (4') but greater than the normal depth of cover, Contractor shall be paid the extra depth of cover bid price for four feet (4').

4. Where the depth of cover specified by the Project Engineer exceeds those depths which are given in the Bid Proposal, General Conditions Article VI will apply. Depth of cover measurements shall be taken from the top of the pipe to ground level as graded for right of way.

B. Trench Width

1. Trenches shall be of sufficient width to allow for raising and lowering pipe, or otherwise handling pipe therein without damage to pipe coating. The minimum width of trench shall be two (2) times the nominal pipe diameter, but in no case less than twelve inches (12"). The maximum width of any trench shall be thirty-six inches (36") unless a greater width is specifically approved by the Project Engineer.

C. Trench Bottom

1. Trench bottoms shall be clean and free of rock or other hard objects that might damage coating.

2. Necessity for raising grade of trench bottom shall be minimized by originally digging trenches to proper depth so that pipe will rest on solid, undisturbed earth; but in the event trench bottom is too deep, backfill prior to installation shall be thoroughly compacted to meet approval of the Project Engineer.

D. Grading

1. The trench shall be graded so the gas line, when laid, will pass under all pipelines, road and railroad crossings, trenches, ditches, canals, streams, and any other obstructions unless otherwise specified by the Project Engineer.

2. An excavation shall be made around and underneath valve settings and other fittings to allow the body of the pipe to lie on the bottom of the trench.

3. Trenches shall be excavated and graded in such a manner as to provide clearance between the gas line and obstructions in accordance with Specification Article No. XI "OBSTRUCTIONS."

E. Shoring

1. Contractor shall meet local, state, and federal excavation requirements. Contractor shall provide and install shoring when necessary and shall make no claim in the event of trench cave-in. The Project Engineer may prescribe shoring and cribbing if at any time it appears to him that the absence of such shoring and cribbing may result in cave-in and damage to the trench or when absence of shoring may endanger other structures. Failure of the Project Engineer to prescribe shoring or cribbing shall not relieve Contractor of his responsibility hereunder.

F. Solid Rock Excavation

1. Solid rock shall include rock in its original formation and masses of rock which require blasting in order to be removed in trenching for the gas line. Solid rock is also defined as rock which cannot be ripped with the equivalent of 300 draw bar horsepower, using a Kelley or similar type single-tooth ripper of a size and model corresponding to the tractor.

2. The payment for solid rock excavation shall be determined by the length of trench from which solid rock was actually and necessarily excavated to complete the trench to the depth and width required in these Specifications. This payment will be in accordance with the bid price for solid rock and will be in addition to the applicable bid price for conventional trenched gas line construction. No payment will be made for solid rock excavation except that which has been previously authorized in writing by the Project Engineer and no payment will be made for that part of solid rock excavation which exceeds authorized trench dimensions. Where the authorized depth of solid rock excavation exceeds that given in the Bid Proposal, the provisions of the General Conditions Article VI will apply.

G. Rock Excavation

1. Rock excavation will be defined as rock or a rock and soil combination which cannot be trenched through by trenching machine alone; does not require blasting; and can be removed by backhoe without ripping.

2. The payment for rock excavation shall be determined by the length of trench from which rock and soil were actually and necessarily excavated to complete the trench to the depth and width required in these Specifications. This payment will be in accordance with the bid price for rock excavation and will be in addition to the applicable bid price for conventional trenched gas line construction. No payment will be made for rock excavation except that which has been previously authorized in writing by the Project Engineer and no payment will be made for that part of the rock excavation which exceeds authorized trench dimensions. Where the authorized depth of rock excavation exceeds that given in the Bid Proposal, the provisions of the General Conditions Article VI will apply.

H. Blasting

1. Extreme caution shall be exercised by Contractor prior to and during blasting to prevent injury or damage to personnel or property. At Company's option, the Contractor may be required to use matting to minimize the scattering of rock debris. All rock scattered during blasting which will interfere with the normal use of the surface shall be removed to the satisfaction of the Project Engineer.

2. No blasting shall be done until permission has been obtained from the Project Engineer. The Contractor shall inform the Project Engineer of the specific time at which blasting will occur and obtain Project Engineer's approval of such time. Project Engineer may direct blasting to be halted at any time and it shall not be resumed until all safety precautions and measures specified by the Project Engineer are instituted. Such permission or safety measures shall not relieve the Contractor of liability for damage as set forth in General Conditions Article XV.

I. Attachments

1. Unless otherwise specified by the Project Engineer, the trenching machine used shall have a suitable attachment that will place all rocks larger than two inches (2") in diameter out of the spoil bank and away from the trench.

J. Frost

1. In the event Contractor encounters frost while excavating trenches, Company shall reimburse Contractor as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

K. Excavating in Graveled Roadways

1. Prior to excavating in graveled roads, Contractor shall remove gravel from the trench and spoil earth area. Gravel so removed shall be replaced upon final backfill so as to leave road in a satisfactory condition, at least equal to its condition before work was begun.

L. Excavating in Hard Surfaced Roadways

1. Prior to excavating in streets or roadways that are hard surfaced with oil, asphalt, concrete, or combinations thereof, such surfacing shall be scored or marked. In oil and asphalt surfaced roadways, such scoring shall be done with a jackhammer equipped with an asphalt cutter blade or other acceptable equipment. Concrete surfaces shall be scored to a minimum depth of 1½" using a concrete saw. Concrete roadways that have been topped with an asphaltic material need not be scored with the concrete saw. This work shall be included in Contractor's bid price for separation and removal of pavement materials.

M. Bell Holes

1. Contractor shall locate the gas line as directed by Project Engineer before the bell hole is started. Bell holes shall be dug a minimum of eighteen inches (18") below the bottom of the gas line, unless otherwise directed by Project Engineer. Project Engineer shall designate the size of bell hole to be dug by Contractor.

2. Equipment used to dig bell holes which will expose gas lines or other obstructions shall be subject to the approval of the Project Engineer.

N. Traffic Roadways and Passages

1. Contractor shall make provisions to allow for movement of vehicular and other traffic with as little restriction to such movement as is reasonably possible.

2. Contractor shall not block off highways or major roadways unless Contractor provides a suitable detour. No public street or roadway shall be completely blocked off for periods in excess of approximately two (2) hours. Private roadways or driveways may be blocked provided such blocking will not unduly inconvenience the owner or tenant of such blocked property. Any of the above actions or deviations therefrom shall be subject to the approval of the Project Engineer. In the event a street or roadway must be closed to traffic, proper warning signs shall be placed at the entrance or entrances to the blocked roadway, and Contractor shall notify the appropriate police and fire departments of such closing and again when the roadway is reopened for traffic.

3. Methods for providing traffic crossings will be left to the Contractor, but the Project Engineer will specify the width and number of traffic lanes to be provided.

O. Open Trench

1. No trench shall be left open for more than 72 hours without written approval of the Project Engineer, and in no case shall it remain open longer than fourteen (14) days. Such permission shall not relieve the Contractor of liability for damage as set forth in General Conditions Article XV. Where open trench creates evident hazards, the Project Engineer may reduce the above time limits.

V. WELDING

A. Procedure

1. The kind and character of the weld applied shall be in accordance with the requirements of the Minimum Federal Safety Standards and API Standard 1104 latest Edition. They shall be subject to the approval of the Project Engineer. Types of welds which will be permitted are butt welds and fillet welds. The shielded metal-arc (arc) welding process using a manual technique may be used for all types of weld joints on pipe of all sizes and is the required process when one or both of the joint components are particularly massive. Arc welding shall be used to attach slip-on flanges and for butt welds used to join pipe and fittings which are greater than two inches (2") in diameter. Subject to the approval of the Project Engineer, the oxygen-acetylene (gas) welding process using a manual technique may be used to join pipe two inches (2") and smaller in diameter.

2. No welding shall be done on any pipe, fitting or other material that becomes a part of the completed gas line by welders who have not demonstrated their competency by tests as set forth in paragraph D, page S-11 of this Specification.

3. In addition to API Standard 1104, latest Edition, and the Minimum Federal Safety Standards, the following additional requirements shall be met.

   a. Each length of pipe shall be visually inspected and all foreign material shall be removed from the inside of the pipe immediately preceding welding. Surfaces to be welded shall be free from loose scale, slag, rust, grease, paint, and other foreign materials. The surfaces shall also be smooth, uniform, and free from fins, tears, and all other defects which adversely affect proper welding.

   b. Should laminations or split ends be discovered in the pipe during the process of welding, the full joint containing such defect shall be removed from the line and immediately identified by suitable marking and returned as specified by the Project Engineer to insure that it will not be used again.

   c. When welding under field conditions, all welds begun on a particular day shall be completed on that same day. When arc welding butt joints, the time lapse between passes shall be held to a minimum.

   d. Joint components welded under field conditions shall be properly aligned and supported during the welding operation. The ends of pipe-to-pipe, pipe-to-fitting, and pipe-to-valve joints shall be aligned as accurately as possible in order to provide the most favorable conditions for depositing the root bead. The root opening should be approximately one-sixteenth inch (1/16"). In the alignment of the abutting ends, if eccentricities in the pipe and variations in wall thickness exist, the pipe joints shall be adjusted so as to divide and minimize any unevenness. Where eccentricities exist that are major enough to prevent a strong joint, they shall be removed. In no case shall an offset be permitted to exceed one-sixteenth inch (1/16").

   e. Tack welding shall not be done without the prior approval of the Project Engineer. When permission is given for tack welding, they shall be made as follows: After the pipe is properly aligned, on pipe of eight inches (8") diameter or less, tack welds shall be placed at not less than three (3) points spaced equally around the circumference of the pipe. Each tack shall have a thickness of not over two-thirds (2/3) of the pipe wall and shall be of length sufficient only to maintain alignment. Tack welds shall be free from pin holes, or other defects, so that the completed welds will have not less than one hundred percent (100%) of the pipe strength at the points of tacking. All tack welds shall be cleaned of scale and oxide before making the main weld. Bead starts and high points in the root bead may be removed by grinding.

   f. Following the completion of each pass, all scale and slag shall be removed from the remaining groove and from the surface of the bead. Small cracks or blow holes which appear on the surface of any bead shall be removed by mechanical brushing and grinding before depositing the next bead of welding. The method of cleaning the weld shall be approved by the Project Engineer.

g. On pipe sixteen inches (16") and larger in diameter, after the root bead has been completed and cleaned, the second bead shall be applied immediately. On pipe sizes smaller than sixteen inches (16"), the second bead shall follow the root bead as closely as possible.

h. Arc welding electrodes furnished and used by the Contractor shall be the AWS-ASTM classification E60 Series or E70 Series electrode best suited for the physical, mechanical and chemical properties of the material being welded and shall provide the best possible X-ray quality of weld. Contractor shall protect electrodes from any deterioration prior to use. Contractor shall at all times use the proper amperage for the size and classification of electrode used in accordance with the recommendations of the manufacturer.

i. Ground leads from the welding machine shall be fastened securely during all welding. No arcing between the ground lead and the pipe will be permitted.

j. The completed weld shall be cooled only by the surrounding air. Quenching with water or other liquid mediums shall not be permitted.

k. Contractor shall remove any sharp projections and thoroughly brush and clean the finished weld prior to applying coating.

B. Identification

1. Each welder shall identify his work in the manner prescribed by the Project Engineer.

C. Testing

1. The Company reserves the right to examine the test welds, as selected and designated by the Project Engineer, by non-destructive methods and/or by destructive methods. These welds will be qualified under API Standard 1104, latest Edition. These tests shall be in addition to the visual examinations as given under the welding specifications.

2. Where non-destructive testing is specified, it shall consist of radiographic examination. Where defective welds are indicated by non-destructive tests, they shall be repaired in accordance with API Standard 1104, latest Edition or removed from the line and the line repaired in a manner approved by the Project Engineer. Non-destructive testing will be done by the Company or others; however, in connection therewith: (1) the Contractor shall clear adequate right of way and access for testing vehicles, including towing of testing vehicles if necessary; (2) the Contractor shall provide adequate clearance around the pipe for testing as needed; and (3) the Contractor shall provide sufficient time for complete examination of welds by non-destructive testing.

3. Where destructive testing is specified, the entire weld shall be removed from the line for testing. These welds will be qualified under the above API Standard using the test weld requirements. The line shall be repaired in a manner approved by the Project Engineer.

4. The Contractor shall at the Project Engineer's request cut out for testing four (4) welds per mile and shall repair such cuts at no additional cost to Company. The Contractor shall cut out additional welds as requested by the Project Engineer for destructive testing provided that if such additional welds meet the qualifications specified herein, the Company shall bear the cost of removing said welds and repairing the line. Such cost shall be billed and paid for by the Company as provided in the Bid Proposal. In all cases, the coupons shall be prepared by Contractor as specified by the above API Standard.

5. The Company shall be the final authority for determining if welds meet the specified requirements.

D. Welder Qualification

1. The Company reserves the right to qualify welders under API Standard 1104, latest Edition, prior to any welding of gas lines or appurtenances. This testing may be done by non-destructive tests and/or by destructive test. The Project Engineer will give the time and details of the test.

2. The making of the welds and the preparing of coupons, if necessary, shall be done by the Contractor. The actual testing of the weld will be done by the Company.

VI. PIPE BENDS AND FITTINGS

A. General

1. The Project Engineer shall specify the type of pipe bend to be constructed at any location. Contractor shall make all necessary pipe bends required in the construction of the gas line. Company may, at its option, provide fabricated factory fittings for installation at points where, in the judgement of the Project Engineer, the use of such fittings is preferable.

B. Bending

1. All bends shall be made before any cleaning or wrapping operations have occurred on that portion of the pipe which is to be bent.

2. All bending shall be done by a cold, smooth bending method and shall be made by the use of a machine having a bending shoe producing a smooth, symmetrical bend. The bending method and machine shall be approved by the Project Engineer prior to any bending operations.

3. Contractor shall use whatever means may be necessary in the bending process to prevent flattening or distortion of the pipe ends.

4. Bends shall be free from buckling, cracks or other evidence of physical damage.

5. Circumferential welds are prohibited within a bend or within four feet (4') of a bend.

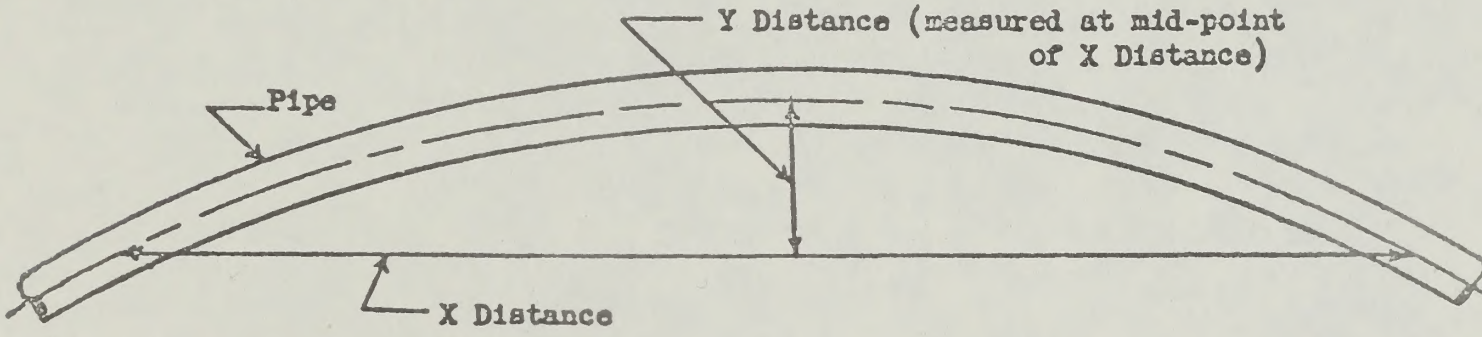
6. Wrinkle or mitered bends are prohibited.

7. All bends shall be subject to the approval of the Project Engineer.

8. At no time shall a cold bend be made when the curvature is such that it produces a distance "Y" greater than that given in the following table for a given distance "X" measured from the pipe center to pipe center as shown in the following drawing.

Nominal Size Pipe (Inches)	"X" Distance (Feet)	Maximum "Y" Distance (Inches)
2"	6'	9"
3"	6'	6"
4"	6'	4"
6"	6'	3"
8"	6'	2"
10"	12'	7"
12"	12'	5-1/2"
14"	12'	4-3/4"
16"	12'	4-1/4"
20"	12'	3-1/2"

a. Where the "Y" measurement is exceeded for the given "X" distance, such bend shall be removed from the line. The measurements above shall be made as follows:



b. These measurements shall be made at the point of most severe bend.

c. The longitudinal weld of the pipe shall be near the neutral axis of the bend. When bending 12 inch nominal and larger pipe, the longitudinal weld must be as near as practicable to the neutral axis of the bend unless the diameter to wall thickness ratio is less than 70 or an internal bending mandrel is used.

C. Factory Fabricated Fittings

1. Factory fabricated welding elbows or transverse segments cut therefrom may be used for changes in direction provided that the arc length measured along the crotch is at least one inch (1") on pipe sizes two inches (2") and larger.

VII. MACHINE APPLIED FIELD COATING

A. Surface Preparation

1. The surface of the pipe to be coated shall be thoroughly cleaned of all foreign substances. Oil and grease shall be removed by swabbing with a totally volatile substance such as naphtha or benzine before mechanical cleaning. Kerosene or other oily solvents shall not be used. All frost and moisture shall be removed by wiping with a rag or by heating or by both methods. Apply heat with an acetylene or butane torch.

2. Weld splatter, burrs, and slag shall be removed by suitable methods.

3. All contaminants shall be removed from pipe surfaces by use of approved mechanical combined cleaning-coating-wrapping machinery equipped with a suitable combination of counter-rotating knives, cutters, scrapers and wire cup brushes, or equivalents. Frequent adjustments of tension on knives, cutters, scrapers and wire brushes and prompt repair or replacement of such units as they become worn or clogged shall be made. On all such combined cleaning-coating-wrapping equipment there shall be a suitable forward dust blower or a vacuum device, and a dustshield shall be provided to separate the cleaning and wrapping heads from each other. The driving and cleaning mechanisms of travel-type equipment shall be such that they will not scar or burr the pipe surfaces. If pipe has been held in storage under conditions which have produced corrosion beyond the capability of the single machine to adequately prepare the pipe for coating, a preliminary cleaning by a suitable separate machine shall precede that of the combined cleaner-coater-wrapper, in which case additional compensation will be authorized under the terms of General Conditions Article VI.

B. Application of Cold Tape

1. Apply cold primer to clean pipe.

2. Cold coating shall normally be applied at a roll body temperature above 40°F and at an ambient temperature above 30°F. Additionally, when the ambient temperature is 10°F - 30°F, the cold coating shall be stored up to the point of application under such conditions and for a sufficient period of time that the roll body temperature shall be above 50°F at the time of application.

3. Cold coating shall be spirally wrapped by an approved mechanical combined cleaning-coating-wrapping machine onto suitably cleaned, dry and frost-free pipe in accordance with the following data:

Pipe Size, Inches	WIDTH AND LAP SPECIFICATIONS, INCHES			
	Single Tape Spindle		Double Tape Spindle	
	Lap		Lap	
	Min.	Max.	Min.	Max.
3/4 - 1	1/4	1/2	-	-
1-1/2	1/4	1/2	-	-
2 - 3	1/4	1/2	-	-
4	1/4	1/2	-	-
6 - 10	1/2	1	-	-
12	1/2	1	1/2	1
14	-	-	1/2	1
16 - 20	-	-	1/2	1
22 - over	-	-	1/2	1

The end-lap of each new roll shall overlap the end of the preceding roll by a minimum of one-third (1/3) of the tape width. The end-lap shall be hand-applied without tension and shall be pressed into position by several wiping strokes of the hand. Its spiral angle shall parallel the previously applied spiral and it shall be smoothly applied without twist or distortion.

4. Operators shall make necessary manual or machine adjustments including spindle-brake tension adjustments to continuously accomplish a uniform, tight coating.. A smooth, taut coating accomplished with a tape-width reduction not in excess of one-half percent (½%) shall be considered adequate. Coating shall be free of wrinkles, puckers, voids, fish mouths, breaks and similar imperfections.

5. Simultaneously with coating application, an outer wrap as specified shall be spirally applied. Operators shall make necessary adjustments to achieve a uniform, tightly applied outer wrap essentially free of wrinkles, puckers, and voids with a lap width identical to that specified for the coating.

6. Outer wrap roll ends shall be anchored by a narrow-width tape band obtained from cut-down line-travel stub rolls of cold coating, according to the requirements of the Project Engineer.

7. The Project Engineer may specify double-coating at cased, water course and other type crossings. Contractor shall perform such double-coating as heretofore described with one of the following modifications, as directed by the Project Engineer:

   (a) Both coating and outer wrap spindles may be utilized to deliver coating alone at the standard lap specification.

   (b) Supplementary coating spindles may be added as required, so double coating and outer wrap may be simultaneously applied at the standard lap specification.

C. Coating Inspection

1. Final inspection of the coating shall include visual lap observation and the passage of a spark discharge holiday detector over the pipe immediately after coating application. The output voltage of the holiday detection instrument shall be adjustable. The Project Engineer may request a test of the holiday detection instrument at any time to verify output voltage. Contractor shall provide a holiday detection instrument with either an integral voltmeter or a separate voltmeter for the purpose of properly setting and testing the voltage output. Voltages used for testing the coating shall comply with the recommendations of the coating manufacturer.

2. In no instance shall the detector voltage exceed that which is just necessary to cause sparking to the pipe from the detector electrode as it is moved across a half-lapped, double-coated and outer wrapped calibration section artificially punctured for test purposes.

3. The travel rate of the holiday detector shall not exceed one foot per second, nor shall it be allowed to remain stationary with the circuit on.

4. Defective locations shall be clearly indicated by a circular chalk mark or cross immediately upon discovery. Any and all coating defects shall be repaired.

D. Repairs to Field Coating

1. All coating defects shall be repaired. After cleaning and priming, the field coating shall be applied as directed by the Project Engineer in patch form or by complete wrapping of the pipe.

2. All coating repairs shall be electrically tested for holidays and defects repaired.

VIII. HAND APPLIED FIELD COATINGS

A. Surface Preparation

1. Outer wrap material shall be removed from the field, mill or yard wrapped pipe at all points where hand applied field coating is to overlap field, mill or yard wrapping including areas where coating is to be repaired. Remove sufficient outer wrap to overlap the good field, mill or yard wrapping by a minimum of two inches (2"). Any coating not firmly bonded to the pipe shall be removed.

2. The entire area to be coated shall be thoroughly cleaned of all foreign substances. Oil and grease shall be removed by swabbing with a totally volatile substance such as naphtha or benzine. Kerosene or other oily solvents shall not be used. All frost and moisture shall be removed by wiping with a rag or by heating or by both methods. Apply heat with an acetylene or butane torch.

3. Weld splatter, burrs and slag shall be removed by suitable methods.

B. Primer Application

1. Stir primer, then apply with a brush to the metal surface and to the existing coating where the outer wrap has been removed. Primer thinner shall not be used unless the primer has thickened to the degree that it cannot be readily applied with a brush without leaving voids or too thick a coating. If primer thinning is necessary, add thinner gradually to the primer while stirring. In no case shall thinner be added in quantities exceeding one pint of thinner for each gallon of primer.

C. Application of Cold Applied Tape Coatings

1. Coating shall be applied to the pipe while the primer is still wet. During the wrapping process the coating shall be applied under slight tension to place it in firm contact with the surface being wrapped, and shall overlap the adjacent wrap by one-half inch (1/2"). Stretching of the tape shall be avoided. The final wrap of hand coating at the finish of each application shall be applied under less tension to prevent tape pull-back before the primer has dried. To help prevent tape pull-back due to its elasticity, primer shall be applied to the underside of the last few inches of tape to be applied.

D. Application of Hot Applied Tape Coatings

1. Coating shall be applied to the pipe only after the primer has become at least tacky dry. Do not dry the primer by using a flame directly on the primer. When temperatures are low, drying of primer may be speeded up by warming the pipe prior to application of primer.

2. Application of coating after priming shall be accomplished by unrolling a sufficient length of coating material to make one wrap around pipe, heating the inner surface of the unrolled coating by quick passes of the propane torch until the material becomes pliant, and then applying it immediately to the primed surface. Care shall be taken in all phases of hand coating not to overheat the material.

3. Direct flame contact shall be avoided. Use only enough heat during wrapping to soften the material sufficiently to assure a good contact with the surface being wrapped. During the wrapping process the tape shall be pulled and pressed firmly against the surface of the pipe or fitting and shall overlap the adjacent wrap by fifty percent (50%) forming a double coating. After the wrapping is completed, the entire surface of the hand applied coating shall be heated lightly by quick passes of the propane torch until the laps have fused.

E. Application of Flood Coaters

1. Coating shall be applied to the pipe only after the primer has become at least tacky dry. Do not dry the primer by using a flame directly on the primer. When temperatures are low, drying of the primer may be speeded up by warming the pipe prior to application of the primer.

2. Application of coating after priming shall be accomplished by holding the flood coater loosely in position around the bare joint so as not to interfere with the flow of hot coal tar enamel when it is poured. Quickly pour hot coal tar enamel across the top of the pipe permitting it to run down both sides of the pipe to the bottom. Exert pressure on the bottom of the flood coater by pulling upwards on each side. Move the flood coater a few inches in an up-and-down motion to permit the flood coater to become both flexible and adhesive so the flood coater bonds tightly to the hot coal tar enamel. To seal the flood coater on top of the pipe, daub the overlap with hot coal tar enamel.

3. Conforming to the manufacturer's instructions, the hot coal tar enamel must be so applied that it thoroughly covers all surfaces of the pipe and be free from all imperfections that might later permit corrosion of the pipe surface.

F. Wraps

1. The hand applied field wrapping shall overlap field, mill or yard wrapped coating by a minimum of two inches (2") at the ends of each hand coated joint.

2. The cigarette wrap method shall be used for the installation of flood coaters. The cigarette wrap, straight spiral wrap or a combination wrap using both methods may be used for the installation of hand applied cold and hot field coatings.

G. Coating Inspection

1. Final inspection of the coating shall include visual lap observation and the passage of a spark discharge holiday detector over the pipe immediately after the coating application. The output voltage of the holiday detection instrument shall be adjustable. The Project Engineer may request a test of the holiday detection instrument at any time to verify voltage output. Contractor shall provide a holiday detection instrument with either an integral voltmeter or a separate voltmeter for the purpose of properly setting and testing the output voltage. Voltages used for testing the coating shall comply with the recommendations of the coating manufacturer.

2. In no instance shall the detector voltage exceed that which is just necessary to cause sparking to the pipe from the detector electrode as it is moved across a half-lapped, doubly-coated and outer wrapped calibration section artificially punctured for test purposes.

3. The travel rate of the holiday detector shall not exceed one foot per second, nor shall it be allowed to remain stationary with the circuit on.

4. Defective locations shall be clearly indicated by a circular chalk mark or cross immediately upon discovery. Any and all coating defects shall be repaired.

H. Repairs to Field, Mill or Yard Wrapping

1. All coating defects shall be repaired. After cleaning and priming, the field coating shall be applied as directed by the Project Engineer in patch form or by complete wrapping of the pipe.

2. All coating repairs shall be electrically tested for holidays and defects repaired.

IX. ABOVE GROUND CONSTRUCTION

A. Installation

1. Above ground construction of gas lines shall be permitted only with the prior approval of the Project Engineer and when conditions of terrain or geography require such construction.

B. Humping

1. When humping is permitted or required, the gas line shall be laid and dirt humped over the top to provide a depth of cover comparable to that of the normal trench depth of cover. When coated pipe is installed, care shall be taken to prevent damage to coating when humping. Humping is prohibited where it will interfere with normal drainage and at all crossings subjected to possible traffic, vehicular or otherwise.

2. For that portion of the gas line which is humped the Contractor shall be paid for the installation of the gas line as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

C. Exposed Construction

1. Exposed above ground gas lines constructed with bare or coated pipe shall be installed using all applicable provisions of these Specifications. When exposed gas lines are constructed, the gas lines must be anchored as directed by the Project Engineer. Steel or concrete supports or both may be required to anchor exposed gas lines to solid rock. Steel, concrete or wooden supports or all of these may be required to anchor exposed gas lines to the ground. The gas line shall be electrically insulated from such supports.

2. When exposed above ground gas line construction is required, the Contractor shall be paid for the installation of the gas line as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

X. BARE CONSTRUCTION

A. Procedure

1. Bare pipe construction shall be permitted only with the prior approval of the Project Engineer and when conditions of terrain or geography require such construction.

2. Buried gas lines constructed with bare pipe shall be installed using all applicable provisions of these Specifications. When buried bare gas lines are installed, the Contractor shall be paid for its installation as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

3. Above ground gas lines constructed with bare pipe shall be installed using all applicable provisions of these Specifications. When above ground gas lines are installed, the Contractor shall be paid for its installation as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

XI. OBSTRUCTIONS

A. Procedure

1. At any point where the gas line being installed crosses over or under another metallic structure, there shall be a minimum clearance of six inches (6").

2. Gas lines, when installed parallel and adjacent to other metallic structure, shall be laid upon undisturbed earth in a trench located at least two feet (2') horizontally from the other structure.

3. A lesser clearance will be allowed in extreme circumstances only with prior approval of the Project Engineer. Where it is impossible to achieve the above clearances or whenever there is a possibility that the gas line will make electrical contact with another metallic structure, a casing insulator(s) shall be installed on the gas line as directed by the Project Engineer.

XII. OBSTRUCTIONS IN THE PIPE

A. Cleaning Pipe

1. Dust, dirt, rocks, weld metal, mill scale or other foreign material shall be cleaned from the pipe by swabbing or scraping out pipe interiors prior to installation. In the event Contractor using reasonable effort is unable to clean pipe that has been furnished by Company, Contractor shall return such pipe to Company storage yard as directed by Project Engineer.

2. Any obstruction which may occur in the line shall be removed by the Contractor to the satisfaction of the Project Engineer. The gas line must permit the passage of a pipeline scraper or "pig" and must be delivered to the Company entirely free from water, dirt or other foreign matter or obstructions. Where the Project Engineer designates, Contractor shall pig line. The Company shall provide the pig. The Contractor shall make all preparations and shall provide all other necessary equipment for proper pigging including the connections required to launch and receive the pig. The Company shall not be obligated to furnish gas for pigging; however, if Company gas is available, Company will furnish same to Contractor at existing pressures. If gas is used, Contractor shall compress to increase the pressure of such gas if necessary.

B. Openings

1. The open end of the gas line or any other openings in it shall be securely closed at the end of each half day's work to prevent the entrance of small animals and foreign matter, and shall not be re-opened until the work commences again. A plug or cap satisfactory to the Project Engineer shall be used for this purpose. Sections which have been welded but not tied into the line will be closed at both ends in a similar manner.

XIII. PADDING

A. Installation

1. Padding shall be installed where indicated by the Project Engineer. Padding material may consist of earth, sand or rock shield, whichever is specified by the Project Engineer.

2. Where earth or sand padding is specified, the earth or sand shall be free of any material which, in the opinion of the Project Engineer, might be injurious to the pipe coating. The padding to protect the bottom half of the pipe shall be evenly distributed, at least six inches (6") in depth, and so applied to make a square bottomed trench. The cover to protect the top half of the pipe shall consist of six inches (6") of select backfill material.

3. Padding shall be obtained from the spoil bank when available from sorted material. When sufficient padding material is not available from the sorted spoil bank, Contractor shall supply earth or sand padding, as directed by the Project Engineer, which shall be paid for as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

4. Where rock shield padding is specified, it shall be installed securely around the pipe. The method of securing the rock shield and the amount of lap used shall be in accordance with the manufacturer's specifications and shall be approved by the Project Engineer. Rock shield materials shall be supplied by the Company, and Contractor shall be paid for its installation as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

XIV. LOWERING PIPE

A. Procedure

1. Coated pipe shall not be dragged over or dropped upon rough surfaces or sharp edges, but shall be carefully lifted and lowered into position.

2. Any acceptable means of lowering pipe may be used, provided that such means secure the necessary slack and do not injure the pipe coating.

3. The line shall be lowered into the ditch in such a manner that the maximum amount of slack is attained. The maximum use shall be made of the ditch width and the line shall be laid in the ditch alternately from side to side.

4. Slack loops shall be placed in the line where indicated by the Project Engineer. These slack loops shall be obtained by laying the pipe on padded skids which are placed across the ditch. Before lowering slack loops, the ditch shall be backfilled to a point no closer to center of loop than one hundred fifty feet (150') on each side for pipe twelve inches (12") in diameter and smaller. Slack loops shall be lowered in the morning between early daylight and sunrise, except at such other times as the Project Engineer may direct. The Contractor shall cut out any extra slack from the line and bevel and weld the resulting two ends of the line together. If excess slack results from directions by the Project Engineer, then the cost of extra cuts, bevels and welds necessary to remove such excess slack and repair the line shall be paid for by the Company at the applicable bid price.

5. All lateral bends shall be bent and placed so as to lay near the outside wall of the trench bottom. All lateral bends and vertical bends shall conform to the contour of the trench. For method of bending, refer to Article VI of these Specifications.

6. Pipe shall be anchored as specified by the Project Engineer. The necessary anchoring material shall be furnished by the Company with the exception of concrete if needed. Contractor shall be paid for the installation of anchoring material as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

XV. BACKFILLING

A. Procedure

1. Backfilling procedures shall conform to the requirements, if any, of appropriate governmental agencies and/or private right of way agreements. Consistent with governmental requirements or private right of way agreements and economy of operation, the method of backfill shall be as specified by the Project Engineer.

2. All backfilling shall be kept as close to the pipe lowering operation as possible. Care shall be taken that pipe coating is not damaged by the initial backfill. Initial backfill shall be closely followed by the remaining backfill so that a minimum amount of trench will be open. Stones or other hard objects shall not be thrown against nor placed in contact with coated pipe nor close enough so that subsequent compaction will cause it to contact or damage coating. No skids, brush, stumps, trees, boulders, welding rod or debris shall be backfilled into the trench.

3. All backfill in traveled roadways and streets shall be mechanically compacted as specified by the Project Engineer. Backfill in such areas will be placed in lifts which shall not exceed six inches (6").

4. Backfilled trenches in gravel or dirt roads shall be left in a surface condition equal to or better than the original surface condition by replacing the surface material taken up during excavation or by replacing with select road base material paid for by Company when specified by the Project Engineer.

5. Spoil to be hauled away shall be kept at a minimum by adequate compaction so that earth to be hauled off will not exceed the volume displaced by the pipe or fittings installed. All backfilled trenches shall be left neatly rounded with a two-inch (2") maximum crown except at points where the gas line crosses traveled roadways, irrigation and drainage ditches, or water courses. At traveled roadways the trench shall be finished off level with the road surface, except in the event pavement repairs are being placed immediately following the tamping operations; then allowance for paving material shall be made. At irrigation and drainage ditches or water courses the gas line shall be covered so that the pipe coating will be adequately protected and then the remaining trench tamped and filled with broken rock of a size and in a manner satisfactory to the Project Engineer. Contractor shall properly dispose of excess spoil.

6. All over-bends, side-bends and sag-bends are to be backfilled immediately, and in no case later than the evening of the day on which they were made.

7. Contractor shall backfill a sufficient amount of the trench to prevent floating of the gas line in case water enters the trench from any cause. When backfilling across irrigated fields, Contractor shall adequately compact the backfill in order not to impede or divert water from its original course. In no case shall a condition exist where water will enter and follow the gas line trench.

8. When backfilling on hillsides or sloping ground, furrows, water bars or terraces as specified by the Project Engineer shall be provided across the gas line trench to divert the flow of water into the natural drainage courses and away from the gas line trench. In no case is surface drainage to be diverted into channels other than the ones they followed before the gas line was laid.

XVI. TEMPORARY PAVEMENT REPAIRS

A. Procedure

1. Contractor shall use paving materials as specified by the federal, state, county or municipal authority having jurisdiction.

2. Particular care shall be taken with the edges of the excavation to see that they are vertical and to assure that the patching material is a minimum of two inches (2") thick. A binder oil shall be applied to the edges in such a manner that the completed job will be waterproof.

3. The backfill shall be left down or cut down to a minimum of two inches (2") and a maximum of four inches (4") below the road surface. The paving materials shall be placed in the excavation and spread by rakes, shovels, or other satisfactory means that will not tend to segregate it. The materials shall be higher than the surrounding road surface so that when it is rolled, the finished surface will be flush with the existing road surface.

4. Contractor shall be liable for maintenance of the temporary repairs for a period of thirty (30) days. In the event the repair fails beyond the thirty (30) day period due to settlement of the backfill, Contractor shall repair faulty backfill and make pavement repairs; but in the event such failure is not due to settlement of backfill, then the Company shall make the repairs. Contractor's obligation hereunder shall terminate at the end of the warranty period provided in this Contract.

XVII. RAILROAD CROSSINGS

A. Procedure

1. Railroad crossings or any other construction in railroad right of way shall be constructed in accordance with the requirements of the railroad company, but in no case to a lesser standard than the design shown on the attached Drawings. On all construction within railroad right of way where casing is required, the line shall be laid in a steel casing which has welded joints.

2. The railroad must be kept safe for rail traffic at all times. Contractor shall start no work on railroad right of way before obtaining permission from the Project Engineer. It will be the duty of the Project Engineer to notify the proper railroad personnel that work is going to start at a specified time, such notification to be given at least three (3) days in advance of any actual proposed work. The Project Engineer will notify the Contractor when it is satisfactory to proceed with the construction on railroad right of way.

3. Railroad crossing shall be bored as directed by the Project Engineer. The casing shall be coated in the same manner as the gas line only if required by the railroad company; otherwise it shall be installed bare. That portion of the gas line extending through the casing shall be pressure tested prior to installation as specified under Article XXV of these Specifications.

XVIII. ROADWAY CROSSINGS

A. Procedure

1. Where the gas line crosses under public highways or other designated roadways, the Contractor shall bore under same and shall install casing pipe where required to do so by any federal, state, county, municipal or other public or private authority having jurisdiction over such highways or roadways and as directed by the Project Engineer. At crossings where casing is required, the line shall be laid in a steel casing which has welded joints. In no event shall such installation be constructed to a lesser standard than the design shown on the attached Drawings.

2. Contractor shall start no work on highway crossings before obtaining permission from the Project Engineer. It will be the duty of the Project Engineer to notify the proper highway official that work is going to start at a specified time, such notification to be given at least three (3) days in advance of any actual proposed work. The Project Engineer will notify the Contractor when it is satisfactory to proceed with the construction of highway crossings.

3. The highway must be kept safe for vehicular or other traffic at all times. Whenever an excavation crosses a highway, roadway or driveway, a bridge or some other means must be provided by the Contractor for the safe crossing of the excavation. Only with specific approval of the Project Engineer may the highway, roadway or driveway be completely blocked to vehicular or other traffic. Such approval shall not relieve Contractor of liability for damage as set forth in General Conditions Article XV.

4. When bored, the highway crossing shall be bored as directed by the Project Engineer. When casing is installed, it shall be coated in the same manner as the gas line only if required by the proper highway or roadway officials; otherwise it shall be installed bare. That portion of the gas line extending through the casing shall be pressure tested prior to installation as specified under Article XXV of these Specifications.

5. On all roadway crossings which are open cut, trenches shall be backfilled and temporarily surfaced as required to the entire satisfaction of the proper highway or roadway officials as well as to the satisfaction of the Project Engineer.

XIX. WATER COURSE CROSSINGS

A. Procedure

1. The determination of how to cross water courses will be indicated on the attached Drawings or Addenda to this Contract, or will be specified by the Project Engineer.

2. Where the gas line crosses under a water course, the trench shall be excavated and the pipe laid so that the top of the gas line shall not be less than thirty-six inches (36") below the bottom of the water course and as much deeper as the Project Engineer may specify to protect the gas line. Approaching the water course, the trench shall be gradually deepened so that the gas line may be laid with a minimum of deviation from the straight line and with a minimum of bending of the pipe. That portion of the gas line which is below the normal flood plane shall be loaded with a sufficient number of river weights as shown on the Drawings, or as specified by the Project Engineer, to maintain negative buoyancy.

3. Particular attention shall be given to the location of sag-bends so that they are located back in the bank beyond any points where erosion might occur. At all crossings where specified by Project Engineer the Contractor shall riprap the bank with rock or other satisfactory riprapping material to a depth and width sufficient to properly protect the bank from erosion.

4. The Contractor shall make every effort not to impede the flow of water, especially irrigation water.

5. Trenching through dry water courses will be paid the applicable bid price for conventional trenching.

6. Any payment in addition to the applicable bid price for the underground crossing of water courses normally flowing which is not included in the Bid Proposal shall be agreed to in advance of the work and paid for as provided in General Conditions Article VI.

7. The maximum unsupported pipe span which may be used to make an overhead crossing will be limited as shown on the Drawings or as specified by the Project Engineer. For unsupported overhead crossings the Contractor shall be paid only the applicable bid price for gas line installation.

8. When "A" frames are required to support the gas line, Contractor shall fabricate and install such "A" frames as shown on the Drawings or as specified by the Project Engineer. Contractor shall be paid for the fabrication and installation of "A" frames as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

9. Overhead crossings which are suspended or supported on bridges or other similar structures shall be constructed as shown on the Drawings or as specified by the Project Engineer. Contractor shall be paid for the installation of a suspended or supported overhead bridge crossing as provided for in the Bid Proposal. If no applicable price is given in the Bid Proposal, the provisions of General Conditions Article VI shall apply.

10. Overhead crossings in excess of eighty feet (80') span, other than those suspended or supported on existing structures, shall be considered as special construction and may be separately contracted by the Company.

XX. IRRIGATION AND DRAINAGE DITCH CROSSINGS

A. Procedure

1. The determination of how to cross irrigation and drainage ditches will be as specified by the Project Engineer.

2. Where the gas line crosses under an irrigation or drainage ditch, the trench shall be excavated and the pipe laid so that the top of the gas line shall not be less than twenty-four inches (24") below the bottom of the ditch or as much deeper as the Project Engineer may specify to protect the gas line. The crossing shall be made as shown on the attached Drawings or as specified by the Project Engineer. When cut, the banks of the irrigation or drainage ditches shall be restored to the original height and thickness. Backfill on ditch crossings shall be tamped, puddled with water or reinforced with concrete or sack breakers, the method being specified by the Project Engineer.

3. When irrigation and drainage ditches cannot be cut and it is necessary to cross beneath the ditch, Contractor shall bore or bore and case the crossing as specified by the Project Engineer.

4. The Contractor shall make every effort not to impede the flow of water and shall install culverts or provide a bypass unless otherwise specified by the Project Engineer.

5. When irrigation and drainage ditches are dry and the crossing can be trenched, the Contractor will be paid the applicable bid price for conventional trenching.

6. Any payment in addition to the applicable bid price for the underground crossing of irrigation and drainage ditches which cannot be cut or trenched and which is not included in the Bid Proposal shall be agreed to in advance of the work and paid for as provided for in General Conditions Article VI.

7. The construction of and payment for overhead crossings of irrigation and ditch crossings shall be as specified under "WATER COURSE CROSSINGS" and as shown on the attached Drawings.

XXI. VALVES, DRIPS AND FITTINGS

A. Installation

1. The Contractor shall install valve settings, valve boxes, drips, fittings and similar appurtenances in accordance with the attached Drawings at locations specified by the Project Engineer.

XXII. GAS LINE MARKER AND TEST LEAD INSTALLATION

A. Inscallation

1. The Contractor shall install gas line markers and test leads in accordance with the attached Drawings at locations specified by the Project Engineer.

XXIII. INSULATION

A. Procedure

1. The Contractor shall install insulation materials in accordance with the attached Drawings at locations specified by the Project Engineer. The insulation of the gas line from other structures shall be made by the Contractor as directed by the Project Engineer.

XXIV. ANODE INSTALLATION

A. Installation

1. The Contractor shall install anodes in accordance with the attached drawings at locations specified by the Project Engineer.

B. Equipment and Material

1. Materials to be used for installation of anode lead wire connections by the thermite welding process shall be furnished by Company and consist of (1) thermite welder consisting of handle, frame, mold and mold cover; (2) thermite welding powder cartridge, metal sleeve and disk; and (3) flint gun.

C. Procedure Using Thermite Welding Equipment

1. Clean pipe surface thoroughly with a metal file and wire brush. A two-inch (2") square bare surface on top of the pipe will accommodate the welder. Weld shall not be made until pipe surface is bright, clean and dry.

2. Remove approximately one inch (1") of the insulation from the end of the #12 wire and insert wire into metal sleeve.

3. Select mold which best conforms with the pipe surface curvature. The mold seat should fit well against the pipe surface. Assemble mold and welder frame.

4. Place welder with mold cover open on top of cleaned pipe surface. Insert bare end of copper wire with metal sleeve through mold seat cavity between mold and pipe into and across the circular opening in the mold seat. The bare copper wire with metal sleeve should be completely visible through the vertical opening in the mold.

5. Place cup-like metal disk in mold over vertical hole in the mold; dump powder into mold over metal disk; close mold cover; hold welder in position with handle; stand clear and ignite powder with flint gun. Be sure mold has not slipped away from the clean pipe surface before powder is ignited. The powder should always be dumped in one continuous movement to avoid mixture of the fine and coarse powders. If the powders become mixed, it will be difficult, sometimes impossible, to ignite the powder. The cartridge is packaged so that the fine powder will be on top when the cartridge material is dumped.

6. Hold welder in position for a minute after the powder has been ignited. Remove and clean slag from mold.

7. Test cooled weld by firm taps with a hammer. If the test dislodges the weld material and wire from the pipe, the weld process must be repeated.

D. Care of Powder Cartridge

1. The powder cartridge should be handled and stored with care to avoid waste. They should be stored with the "red top" side up in a dry place. Excessive vibration with the "blue bottom" side up will mix the fine and coarse powders.

XXV. PRESSURE TEST

A. Preliminary Test

1. Sections of pipe extending across water courses, irrigation and drainage ditches or swamps, sections of pipe extending beneath highways, roads or railroads, and any section of pipe where, in the opinion of the Project Engineer, a failure in the pipe, welds, or connections would be dangerous to the public or would be difficult and expensive to repair after installation will, at the option of the Project Engineer, be preliminary pressure tested as specified under Paragraph B below prior to installation. The details of the test will be given by the Project Engineer. Contractor shall supply equipment and make all preparations and connections necessary to properly test the section of line.

B. Final Test

1. Each section of line, when completed, shall be given a pressure test of not less than Nine Hundred and Fifty (950) pounds per square inch gauge, or such other lesser pressure as Project Engineer may designate. The time and the details of the test shall be designated by the Project Engineer. Contractor shall supply equipment and make all preparations and connections necessary to properly test the line. If the Project Engineer requires an inert gas pocket before purging the lines with natural gas, such inert gas shall be furnished by Company. The pressure test medium to be used shall be Natural Gas. If natural gas is specified to be used as the test medium, it shall be provided by the Company at approximately Nine Hundred and Fifty (950) pounds per square inch gauge pressure. Contractor shall compress to increase the pressure of such gas as necessary.

2. Defects found in the preliminary pressure test or the final pressure test shall be promptly corrected to the satisfaction of the Project Engineer and the gas line shall then be retested.

XXVI. CLEANUP

A. Procedure

1. The Contractor shall at all times keep the premises free from accumulations of waste materials or rubbish caused by his employees or the work. As soon as the pipe is laid and the trench backfilled, the Contractor shall clear the right of way and surrounding grounds of any rubbish, material, or equipment remaining from the work. Unused Company furnished materials shall be returned to Company storage yards pursuant to Article IX of the General Conditions and as directed by the Project Engineer. Unused Contractor furnished material shall be removed from the right of way and surrounding areas. When rock or shale is encountered below the surface of cultivated land and hay fields, the Contractor shall be responsible for the disposal of all said rock or shale in such a manner that it will not interfere with any future cultivation. Should Contractor fail to complete cleanup, the Company may remove the rubbish and charge the cost to the Contractor. Ruts due to equipment or other ground damage shall be repaired by Contractor.

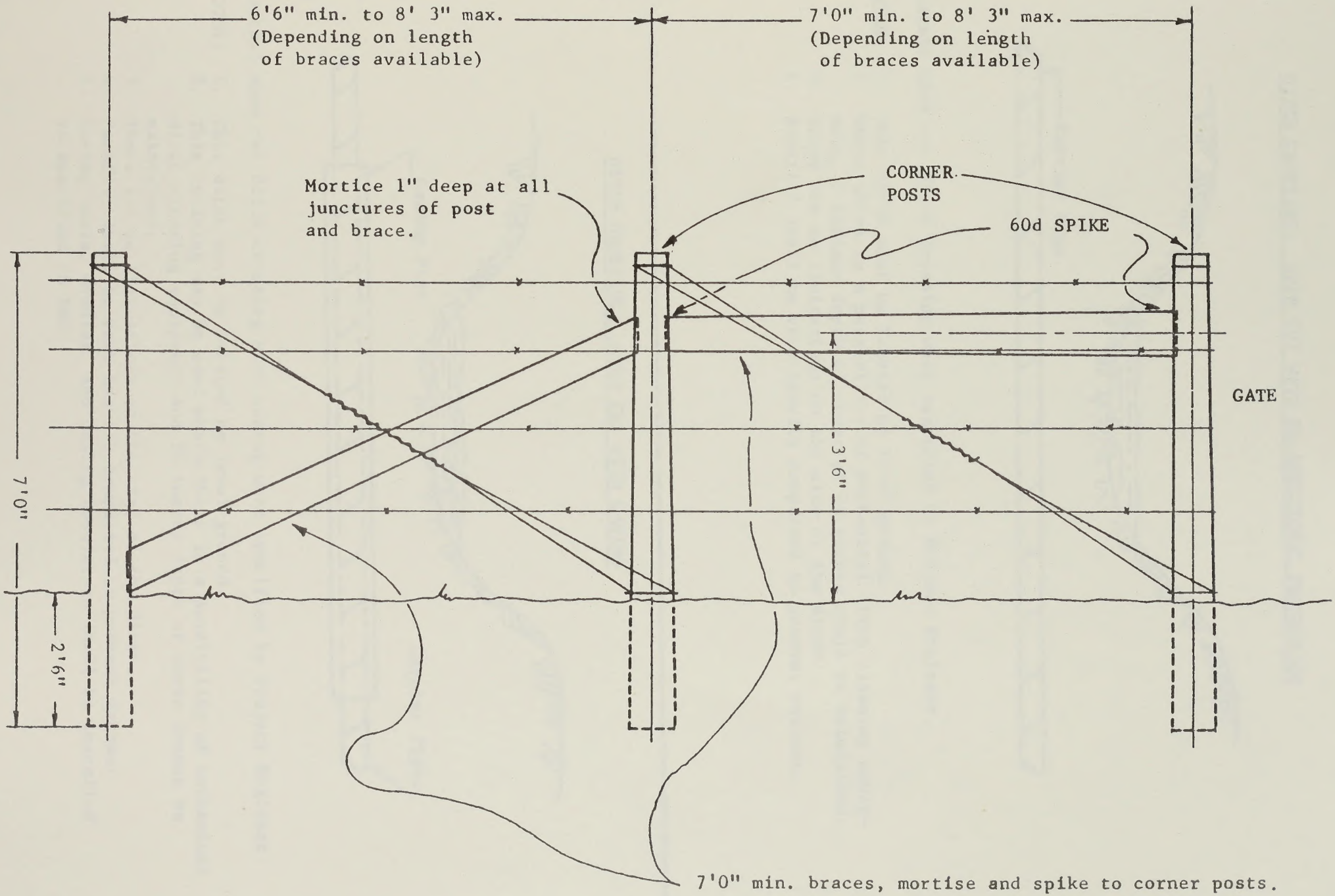
2. Gas line right of way shall be left passable for vehicles after the construction is completed. Creek banks shall be ramped to the original stream bed, or culverts installed when directed by the Project Engineer. Such culverts shall be furnished by the Company. No extra payment shall be made for the installation of such culverts.

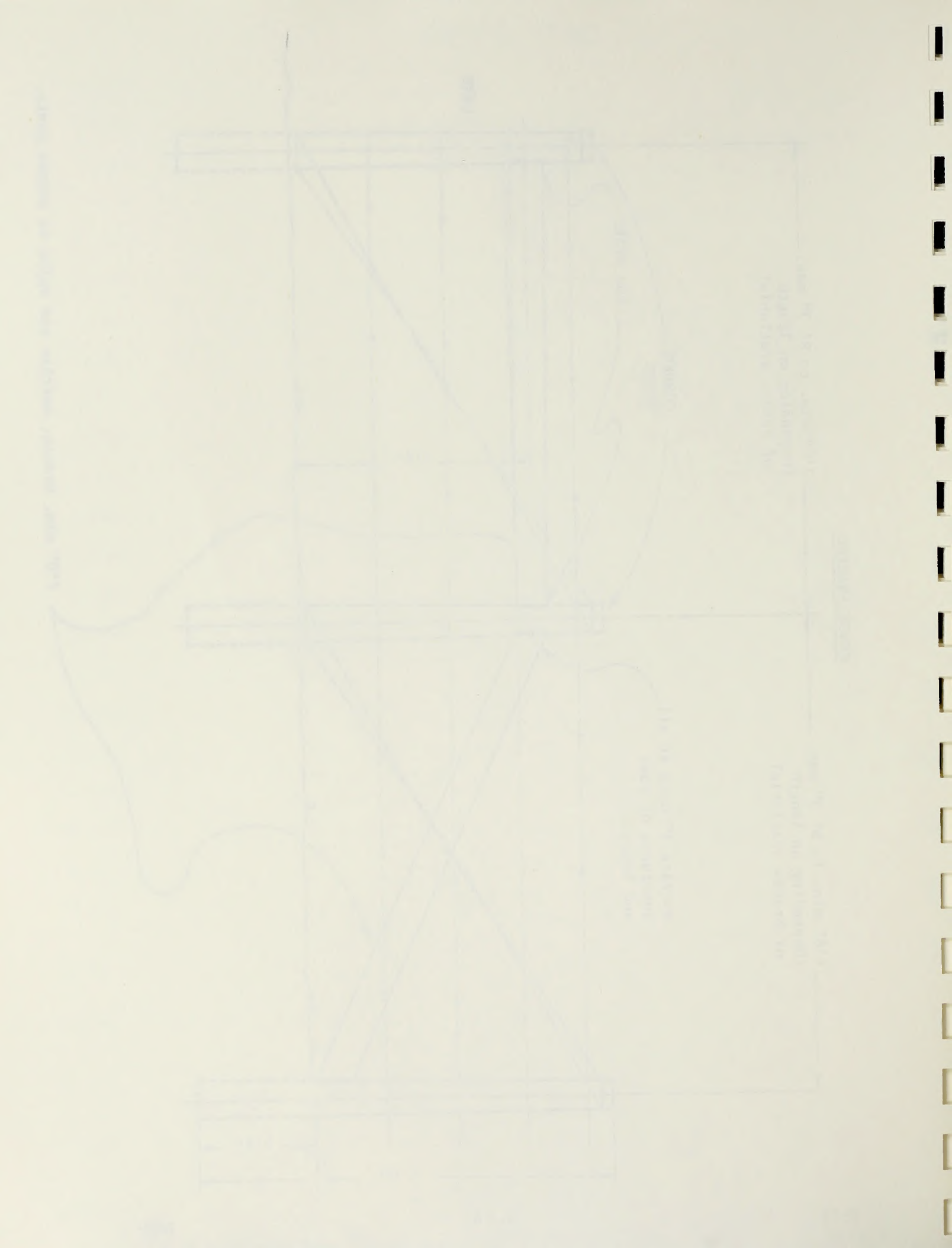
3. All fences, bridges and culverts, or any other piece of property, whether public or private, that are damaged by the Contractor's equipment or operations during the construction of the gas line shall be repaired at the Contractor's expense to the entire satisfaction of the property owner or the federal, state, county, or private authorities having jurisdiction over same, and also to the satisfaction of the Project Engineer.

4. The "good will" of the property owners or tenants being served by the gas line is a valuable asset to the Company. Care taken by the Contractor in repairs and cleanup will make a lasting impression on property owners and tenants affected by the construction. Accordingly, the Contractor and the Project Engineer shall cooperate in all matters concerning public relations.

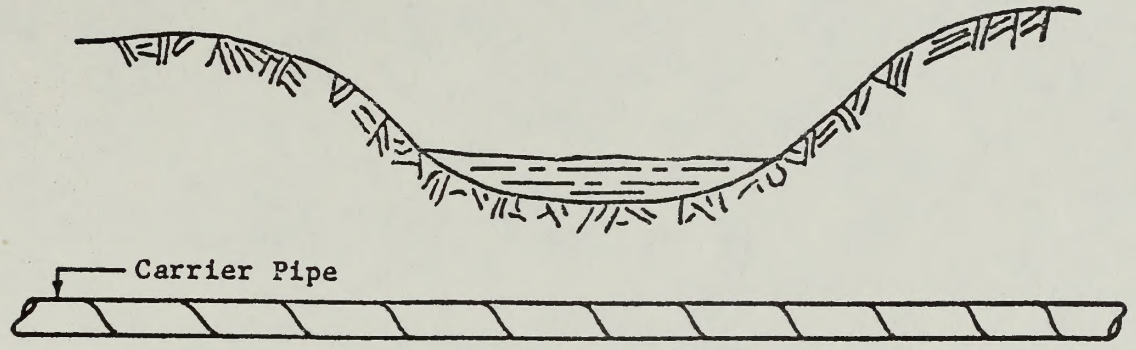
INDEX TO DRAWINGS

FENCE BRACING





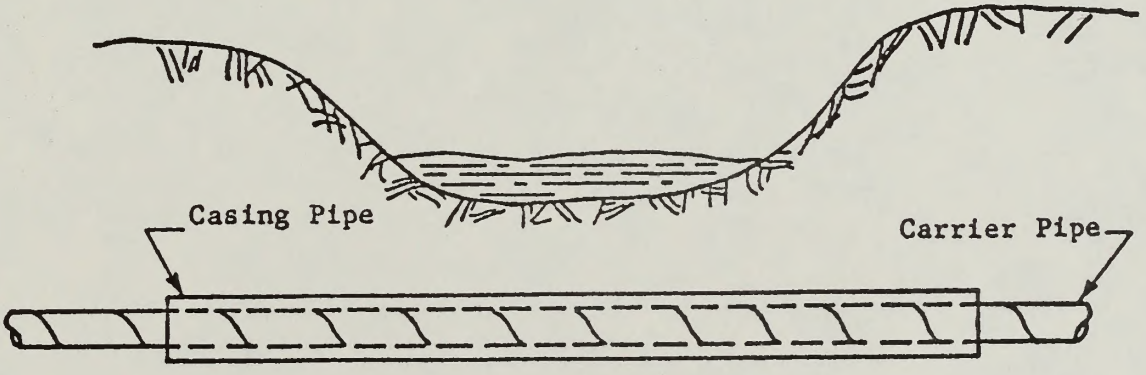
DITCH CROSSING: OPEN CUT WITH NO ADDITIONAL PROTECTION



Install open cut ditch crossing when specified by Project Engineer.

NOTES:
1. This ditch must be located on level ground.
2. Where there is a possibility of mechanical ditch cleaning equipment, a minimum depth of cover of 24 inches shall be maintained.
3. There are no limitations on the size of the ditch.
4. Backfill shall be very heavily compacted to prevent washout.

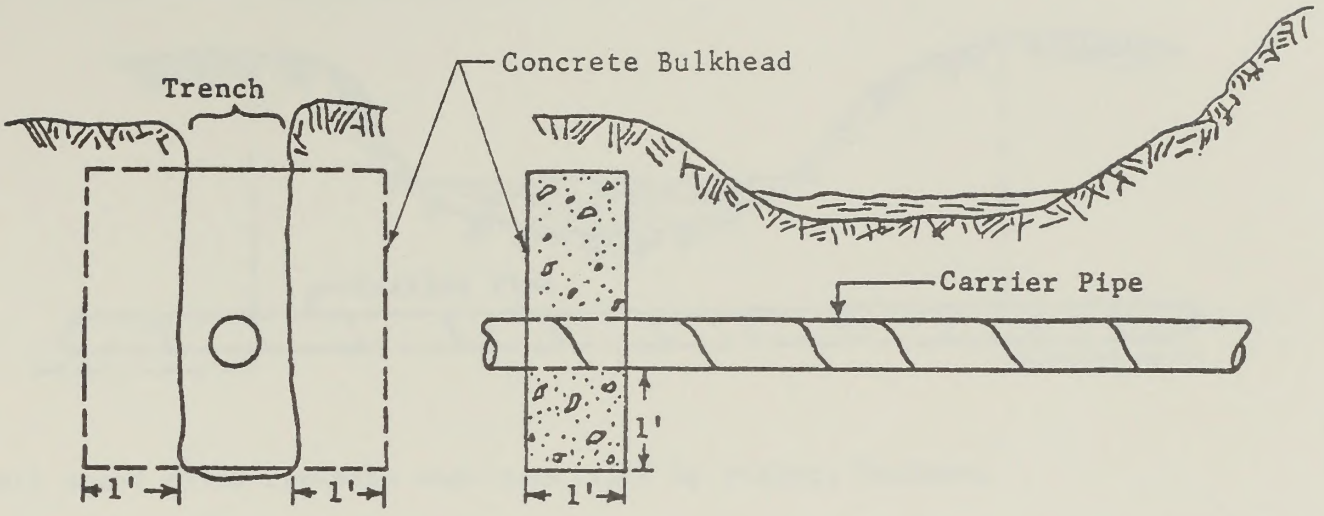
DITCH CROSSING: OPEN CUT WITH CASING



Install open cut ditch crossing with casing when specified by Project Engineer.

NOTES:
1. This ditch must be located on level ground.
2. This crossing may be used where there is a possibility of mechanical ditch cleaning equipment and 24 inches depth of cover cannot be maintained.
3. There are no limitations on the size of the ditch.
4. Backfill shall be very heavily compacted to prevent washout.
5. Casing seals, cradles, and casing insulators shall be installed as specified in DWG-

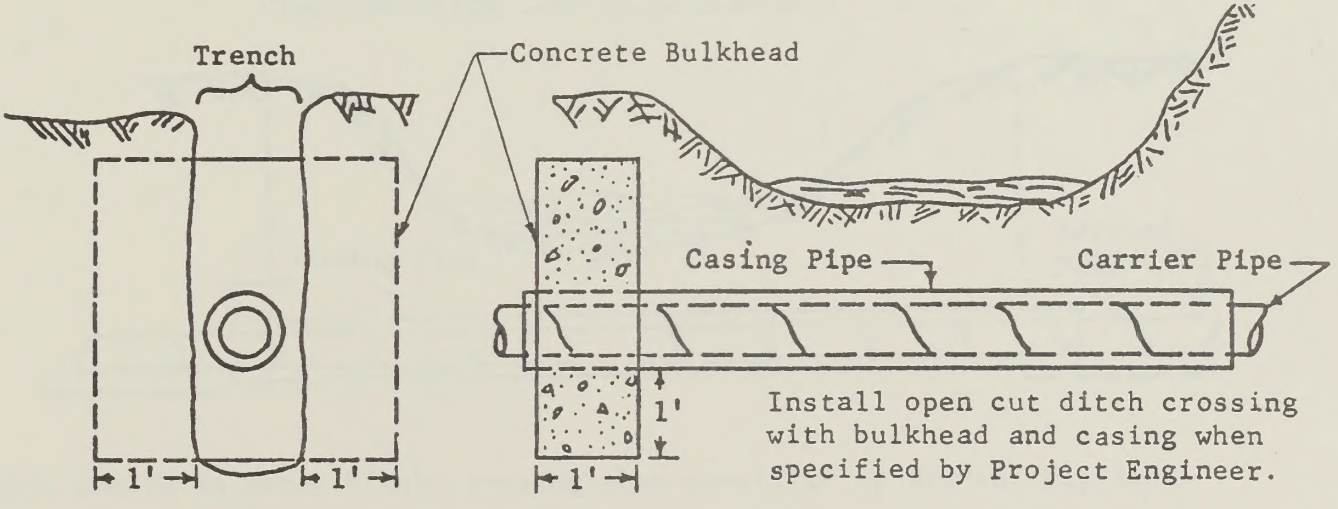
DITCH CROSSING: OPEN CUT WITH BULKHEAD



Install open cut ditch crossing with bulkhead when specified by Project Engineer.

NOTES: 1. This ditch crossing may be used if it is on sloping ground; and
- a. Twenty-four (24) inches depth of cover is maintained.
- b. The ditch is three (3) feet deep by five (5) feet wide or larger at the high water line.
- c. A concrete bulkhead is poured in undisturbed and uncribbed excavation on the low side of the ditch, and
- d. The top of the bulkhead is a minimum of one (1) foot above high water line.

DITCH CROSSING: OPEN CUT WITH BULKHEAD AND CASING

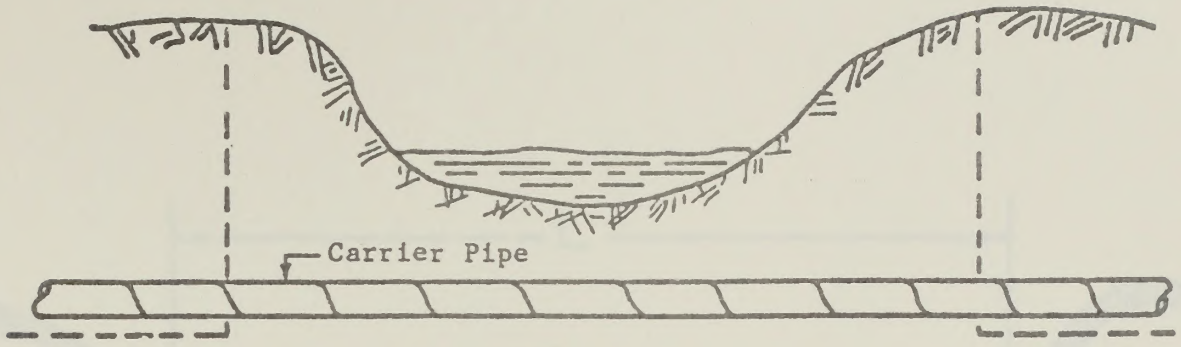


Install open cut ditch crossing with bulkhead and casing when specified by Project Engineer.

NOTES: 1. This ditch crossing may be used when the ditch is located on sloping ground; and
- a. Twenty-four (24) inches depth of cover cannot be maintained.
- b. The ditch is three (3) feet deep by five (5) feet wide or larger at the high water line.
- c. A concrete bulkhead is poured in undisturbed excavation on the low side of the ditch, and
- d. The top of the bulkhead is a minimum of one (1) foot above the high water line.

2. Casing seals, cradles, and casing insulators shall be installed as specified in DWG-

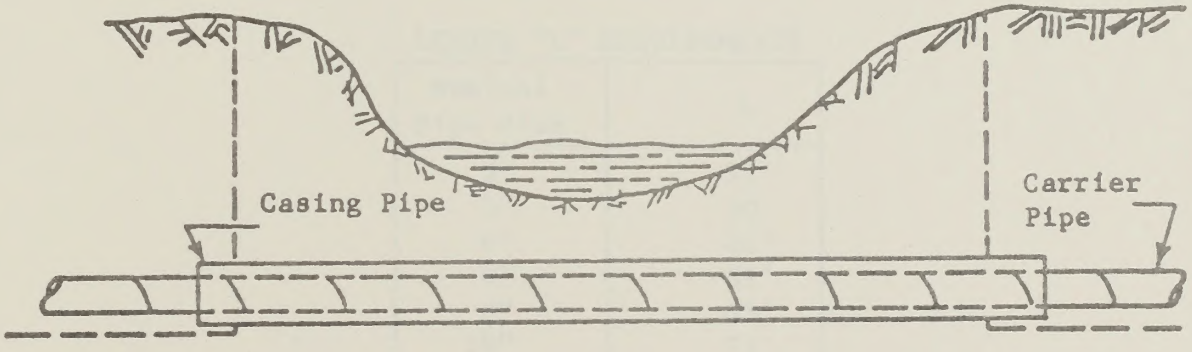
DITCH CROSSING: BORED WITH NO ADDITIONAL PROTECTION



Install bored ditch crossing when specified by Project Engineer.

NOTES: 1. This ditch crossing may be used, with no limitations to its size, if
(a) It is located on level ground and 24 inches depth of cover is maintained between the top of the carrier pipe and the flow line of the ditch.
(b) It is located on sloping ground and 24 inches depth of cover is maintained between the top of the carrier pipe and the flow line of the ditch when there is a possibility that a washout may occur or mechanical ditch cleaning equipment will be used.

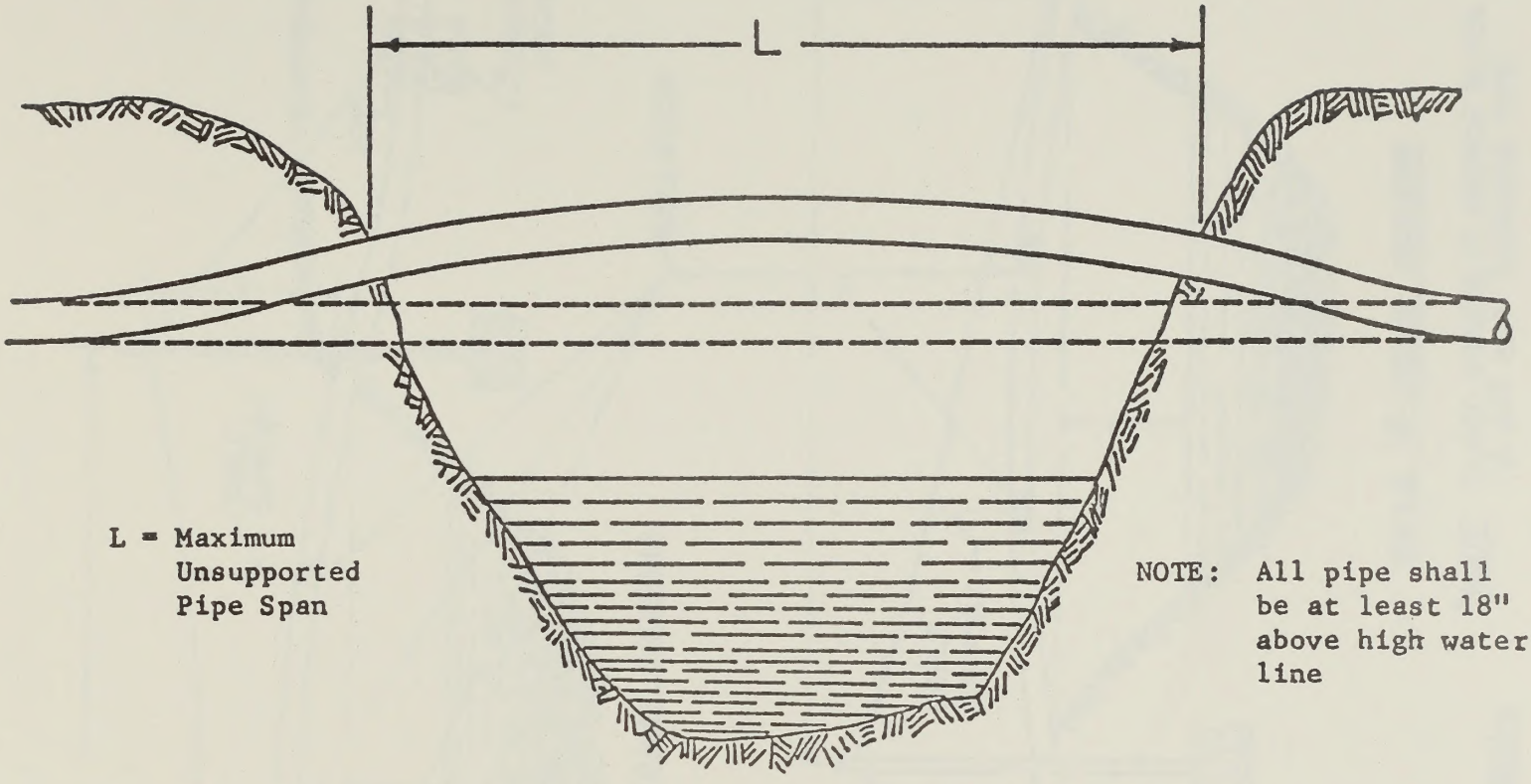
DITCH CROSSING: BORED WITH CASING



Install casing in bored ditch crossing when specified by Project Engineer

NOTES: 1. This ditch crossing may be used, with no limitations to its size, if
(a) It is located on level ground and 24 inches depth of cover cannot be maintained between the top of the carrier pipe and the flow line of the ditch; and, there is a possibility that mechanical ditch cleaning equipment may be used.
2. Casing seals, cradles, and casing insulators shall be installed as specified in DWG-

DITCH CROSSING: UNSUPPORTED



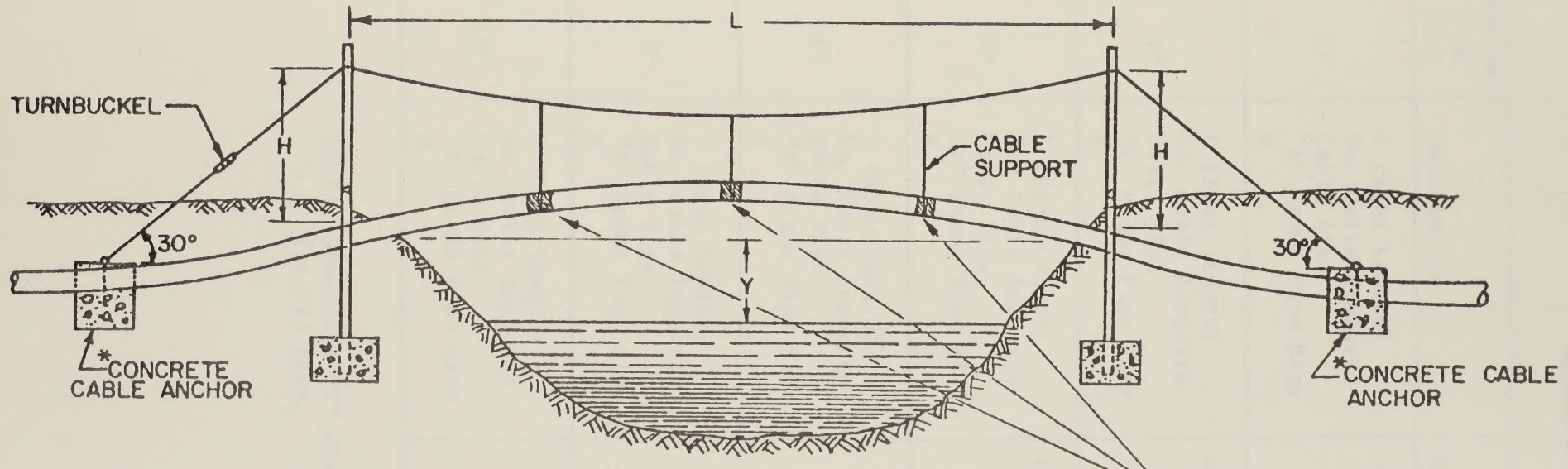
L = Maximum Unsupported Pipe Span

NOTE: All pipe shall be at least 18" above high water line

Install unsupported ditch crossing when specified by Project Engineer.

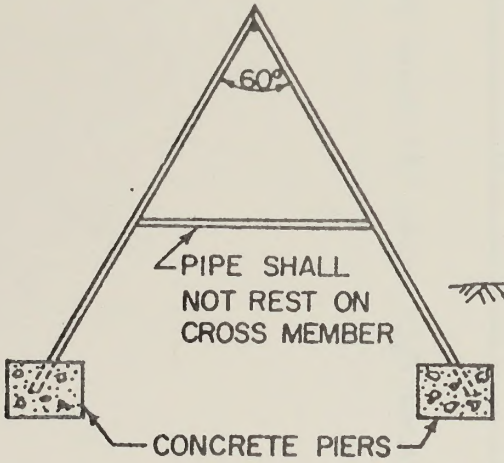
LENGTH "L" REQUIREMENTS

Nominal Pipe Size	L
2"	23'
3"	30'
4"	40'
6"	52'
8"	63'
10"	71'
12"	77'
16"	84'
20"	101'

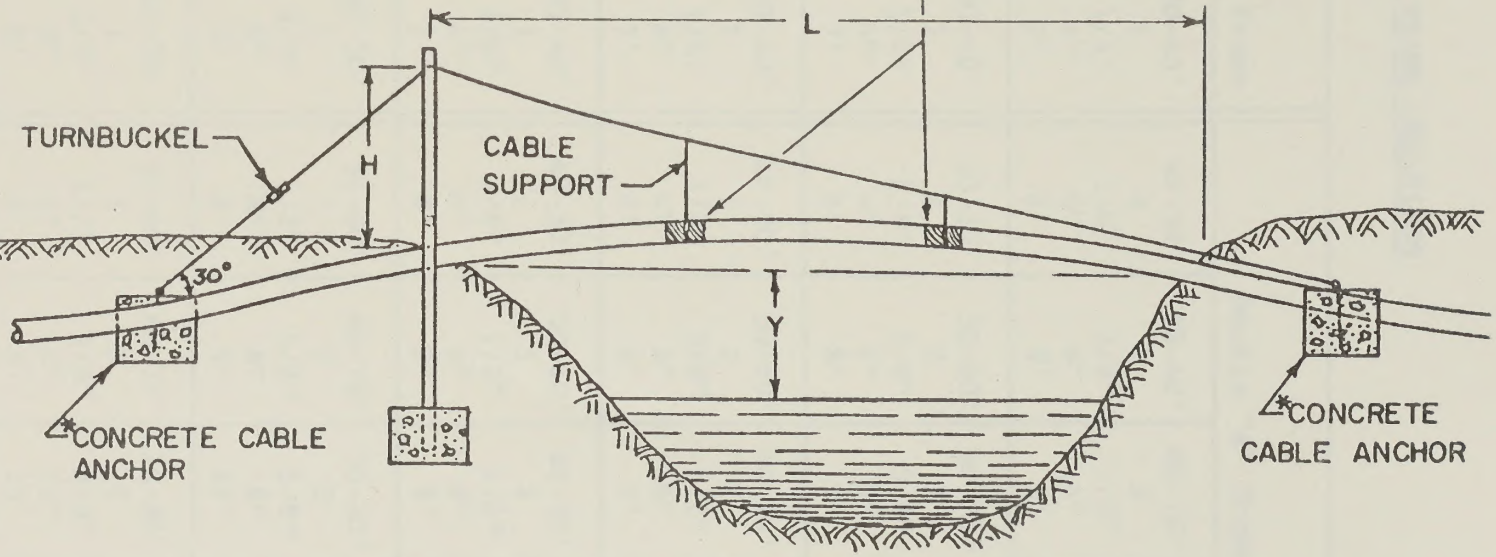


DOUBLE "A"- FRAME CROSSING

INSULATION



"A"- FRAME



SINGLE "A"- FRAME CROSSING

REFER TO NEXT PAGE FOR DIMENSIONS

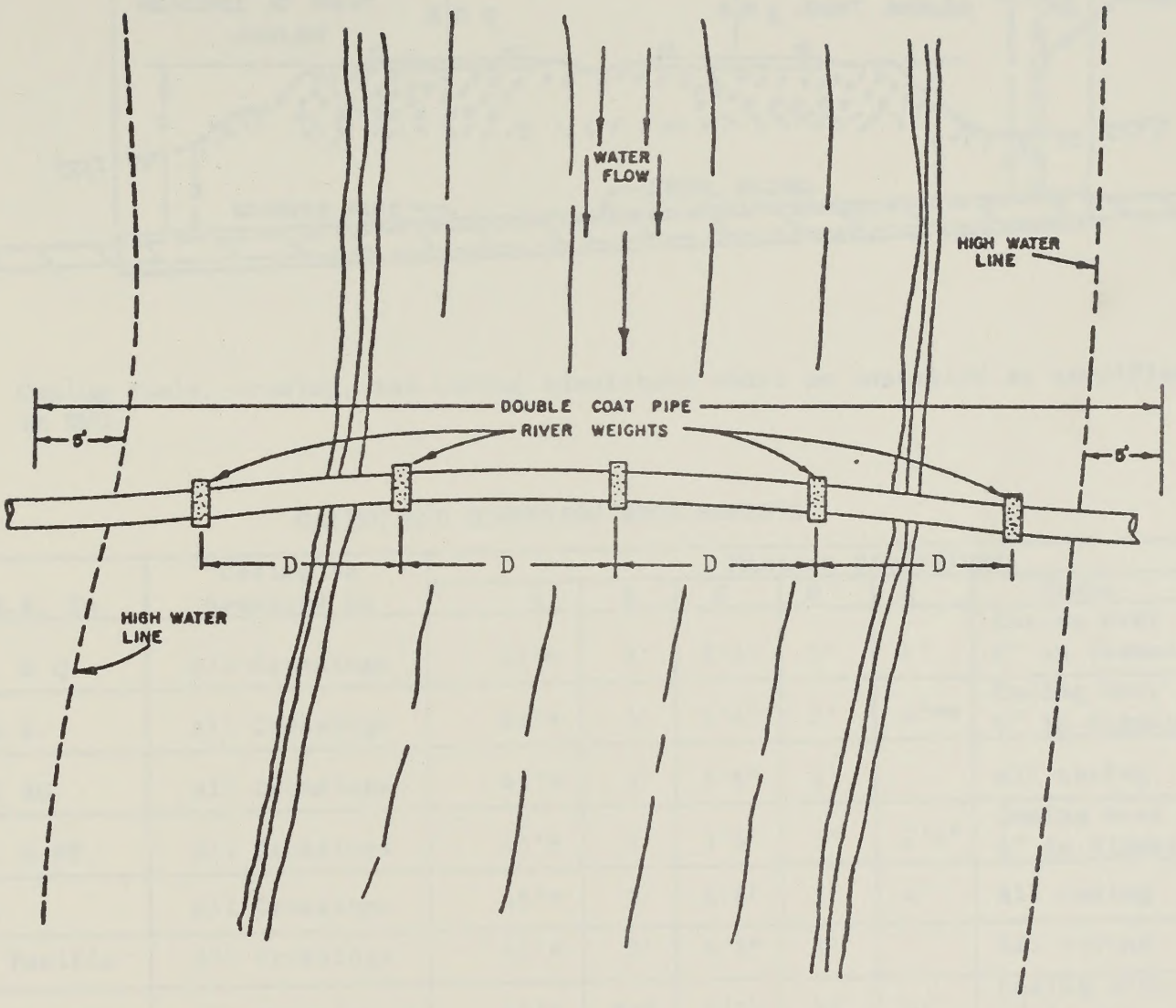
*NOTE: PLACE CONCRETE ANCHOR BLOCK ADJACENT TO BUT NOT TOUCHING PIPE.

DIMENSIONS FOR "A" FRAME CROSSINGS

Nominal Pipe Size	Description	Single "A" Frame		Double "A" Frame			
2"	L (Span Length)	20-30'	30-40'	40-50'	50-60'	60-70'	70-80'
	No. Cable Supports	1	1	2	2	3	3
	Cable Size	1/4"	1/4"	1/4"	3/8"	3/8"	3/8"
	"A" Frame Pipe Size	3"	4"	4"	6"	6"	6"
	H	6'	7'	8'	8'	9'	10'
3"	L (Span Length)	20-30'	30-40'	40-50'	50-60'	60-70'	70-80'
	No. Cable Supports	1	1	2	2	3	3
	Cable Size	1/4"	1/4"	1/4"	3/8"	3/8"	1/2"
	"A" Frame Pipe Size	3"	4"	4"	6"	6"	6"
	H	6'	7'	8'	8'	9'	10'
4"	L (Span Length)	25-30'	30-40'	40-50'	50-60'	60-70'	70-80'
	No. Cable Supports	1	1	1	2	2	3
	Cable Size	1/4"	1/4"	3/8"	3/8"	1/2"	1/2"
	"A" Frame Pipe Size	4"	4"	4"	6"	6"	8"
	H	6'	7'	8'	8'	9'	10'
6"	L (Span Length)		35-40'	40-50'	50-60'	60-70'	70-80'
	No. Cable Supports		1	1	1	2	2
	Cable Size		3/8"	3/8"	1/2"	1/2"	1/2"
	"A" Frame Pipe Size		4"	6"	6"	8"	8"
	H		7'	8'	8'	9'	10'
8"	L (Span Length)		40-50'	50-60'	60-70'	70-80'	
	No. Cable Supports		1	1	2	2	
	Cable Size		3/8"	1/2"	1/2"	5/8"	
	"A" Frame Pipe Size		6"	8"	8"	8"	
	H		8'	8'	9'	10'	
10"	L (Span Length)		45-50	50-60'	60-70'	70-80'	
	No. Cable Supports		1	1	2	2	
	Cable Size		1/2"	1/2"	5/8"	5/8"	
	"A" Frame Pipe Size		8"	8"	10"	10"	
	H		8'	8'	9'	10'	

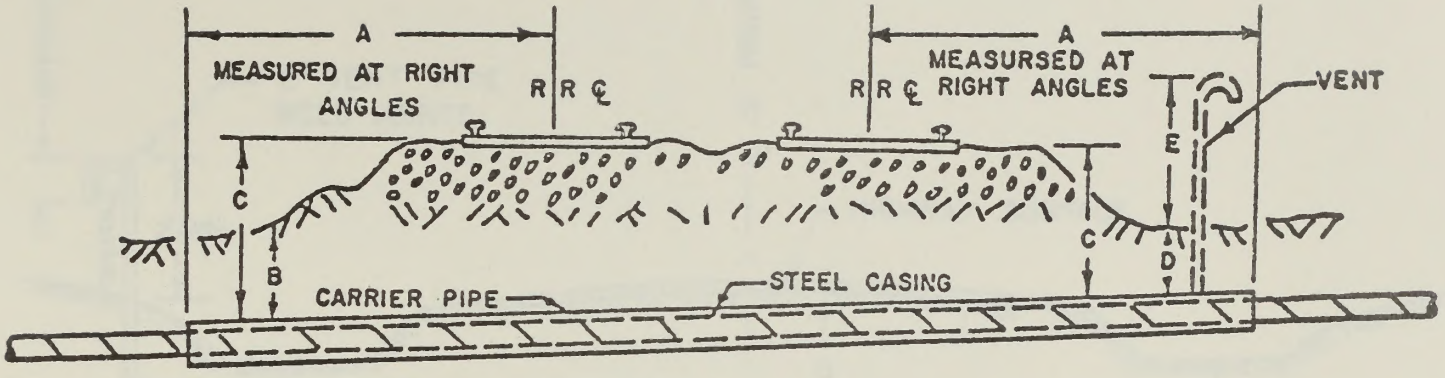
NOTE: Dimension "Y" shall be at least 18" above high water line for all pipe.

WATER COURSE CROSSING



NOTE: Dimension "D" shall be specified by the Project Engineer. In no event shall the river weights be spaced more than twenty feet (20') apart.

RAILROAD CROSSING



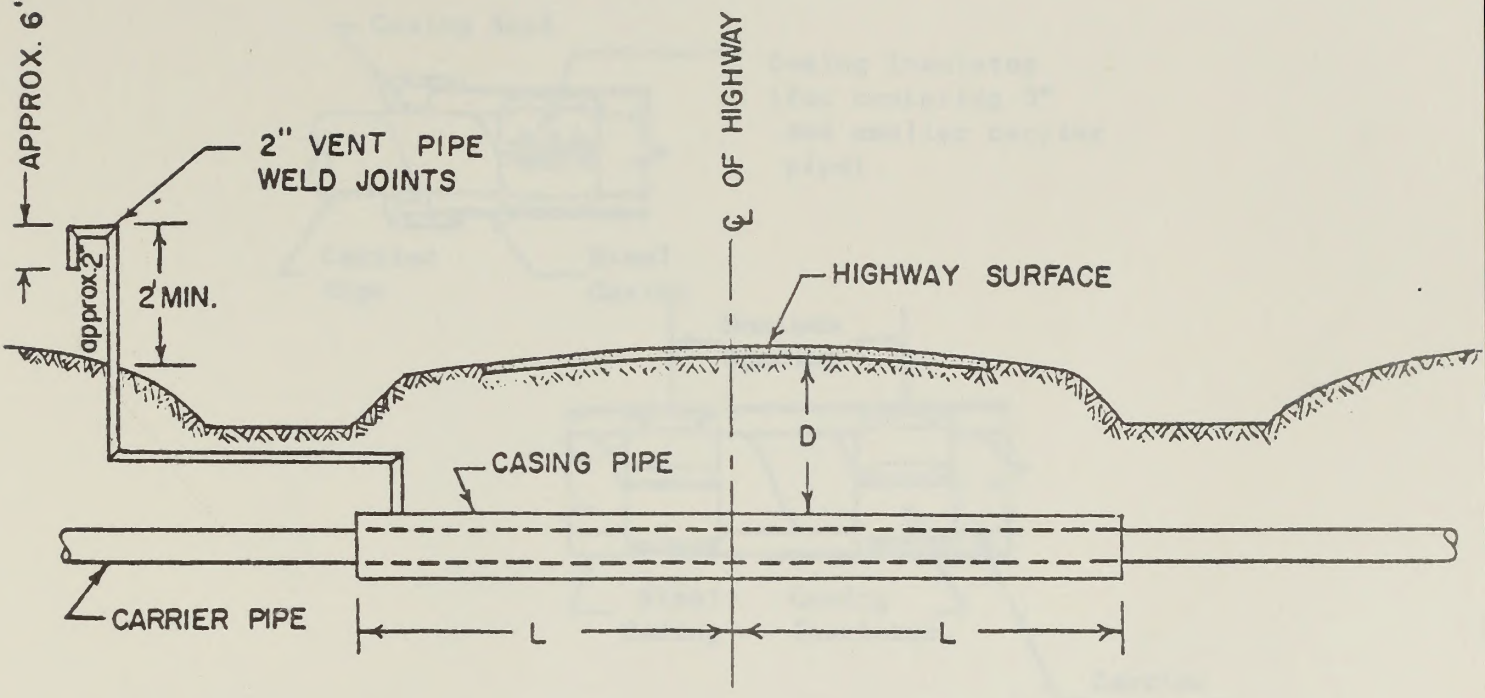
NOTE: Casing seals, cradles, and casing insulators shall be installed as specified in DWG-

CASING AND DIMENSION REQUIREMENTS

R.R. Co.	Casing is Required On	Minimum Dimensions					
		A	B	C	D	E	Vents
C.B. & Q.	All Crossings	45'*	3'	5'6"	3'	4'	Casing over 6" in diameter
C. & S.	All Crossings	45'*	3'	5'6"	3'	4'**	Casing over 6" in diameter
D. & RG.	All Crossings	45'*	3'	5'6"	3'		All casing
A.T. & SF.	All Crossings	45'*	3'	5'6"	3'	2'6"	Casing over 6" in diameter
U.P.	All Crossings	45'*	3'	4'6"	3'	4'	All casing
Mo. Pacific	All Crossings	45'*	3'	4'6"	3'		All casing
C.R.I. & P.	All Crossings	45'*	***	4'6"	3'	4'	Casing over 6" in diameter

*Greater distance may be specified by Chief Engineer or Railroad.
**If casing terminus is not on ROW, vent is optional.
***Below frost line.

ROADWAY CROSSING WITH CASING

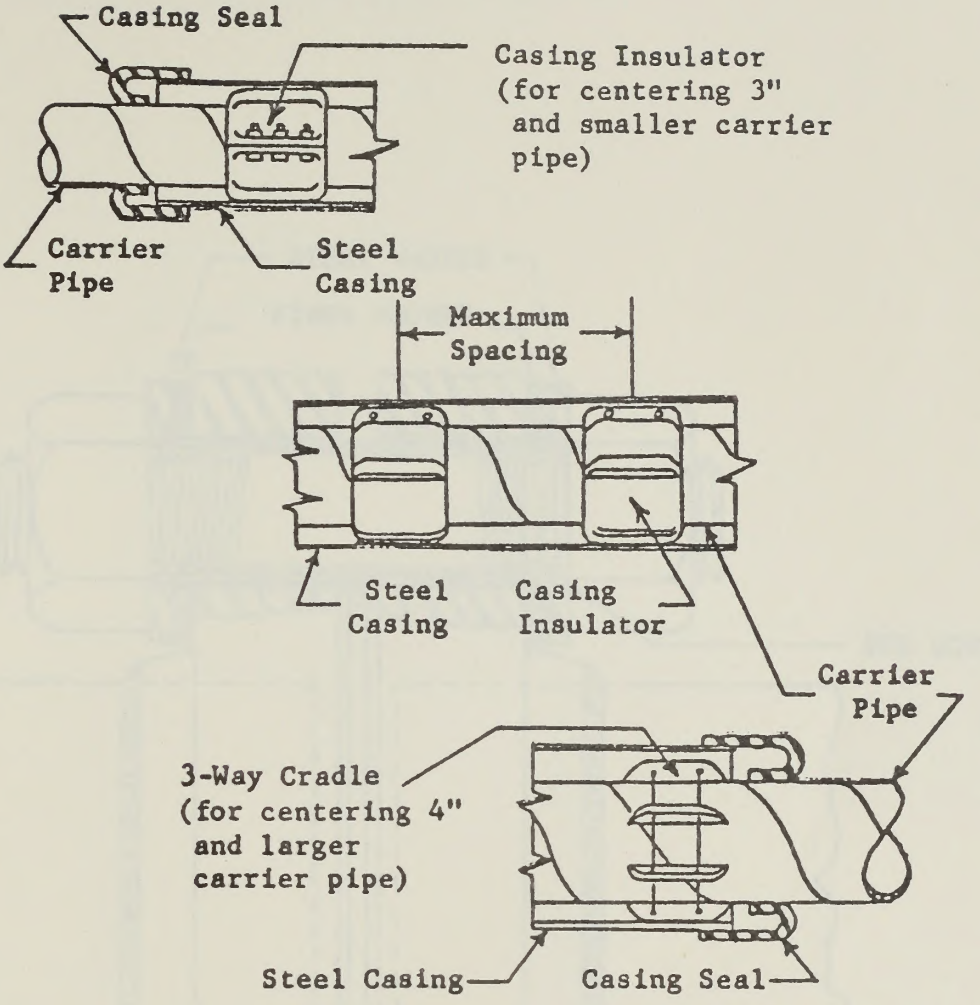


NOTES:
1. Lengths "L" shall be specified by the Project Engineer.
2. Depth "D" shall be specified by the Project Engineer, but in no case shall be less than three feet (3'). Four and one-half feet (4½') is required on State Highways.
3. Casing seals, cradles, and casing insulators shall be installed as specified in DWG-

CASING PIPE REQUIREMENTS

Carrier Pipe	Casing Pipe
2"	4"
3"	6"
4"	8"
6"	10"
8"	12"
10"	16"
12"	16"
16"	20"
20"	24"

CASING REQUIREMENTS



NOTES:

1. Casing insulators shall be used to center 2" and 3" pipe only.

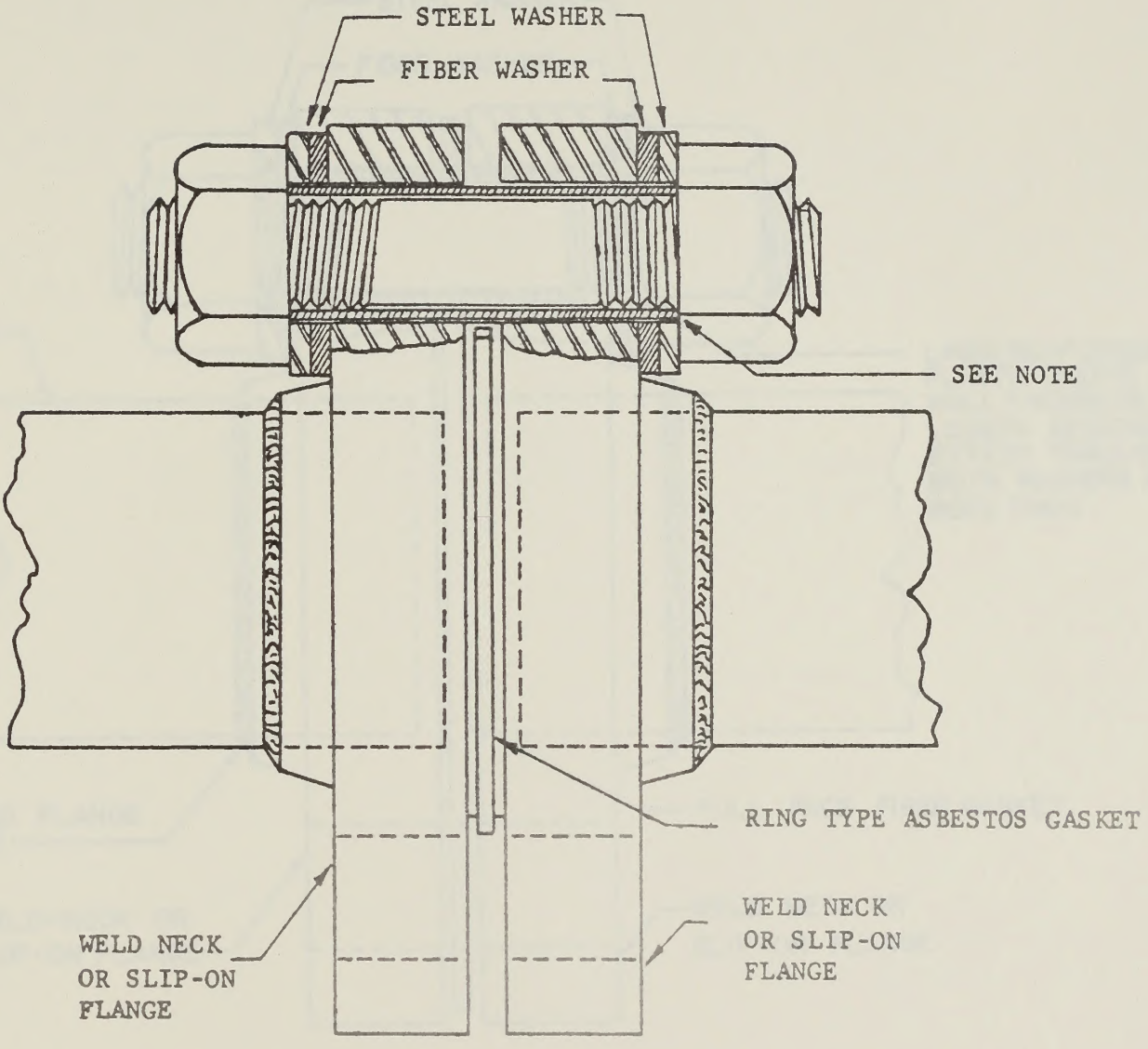
2. Casing cradles shall be used to center all 4" and larger pipe.

3. The wall thickness of casing pipe shall be such that the design pressure of the casing pipe shall be equal to or greater than the maximum allowable operating pressure of the carrier pipe.

SPACING REQUIREMENTS

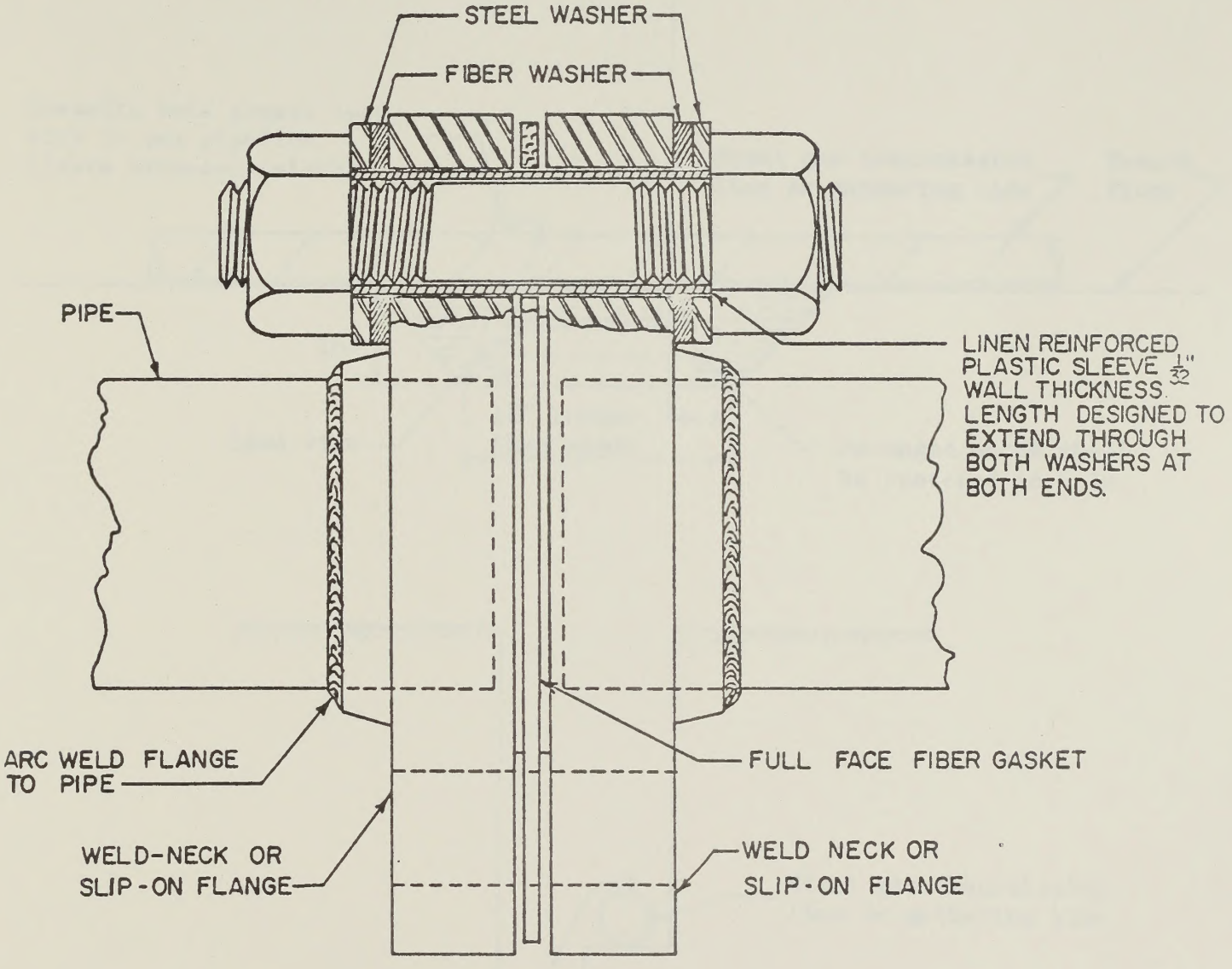
Nominal Pipe Size		Maximum Spacing
Carrier Pipe	Casing Pipe	
2"	4"	13'
3"	6"	15'
4"	8"	15'
6"	10"	15'
8"	12"	15'
10"	16"	15'
12"	16"	15'
16"	20"	15'
20"	24"	15'

INSULATING FLANGE INSTALLATION

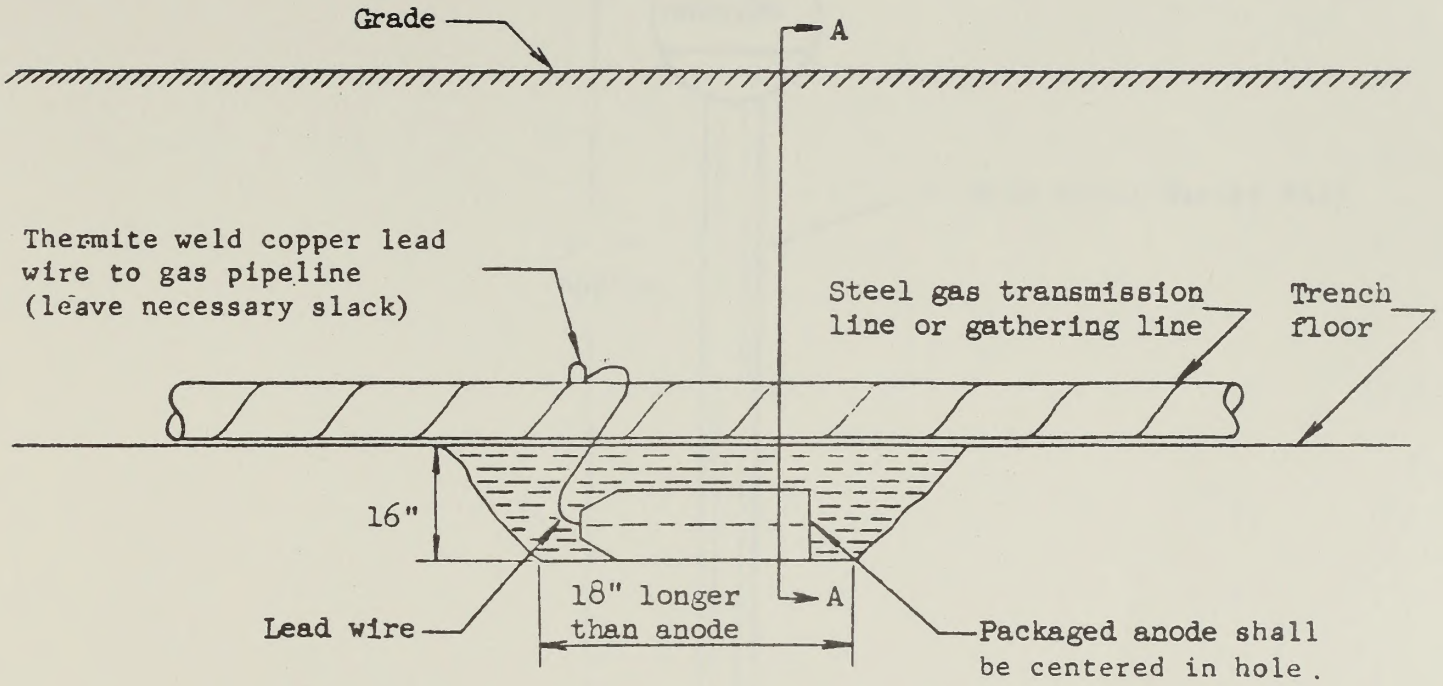


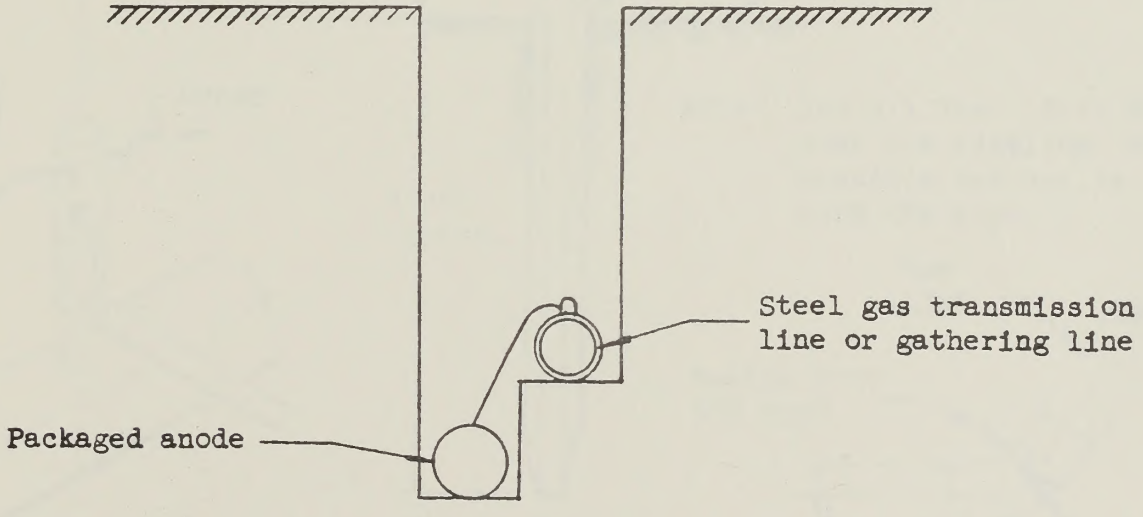
NOTE: Linen reinforced plastic sleeve 1/32" wall thickness. Length designed to extend through both washers at both ends.

TYPICAL ASSEMBLY FOR INSULATING FLANGES



ANODE INSTALLATION

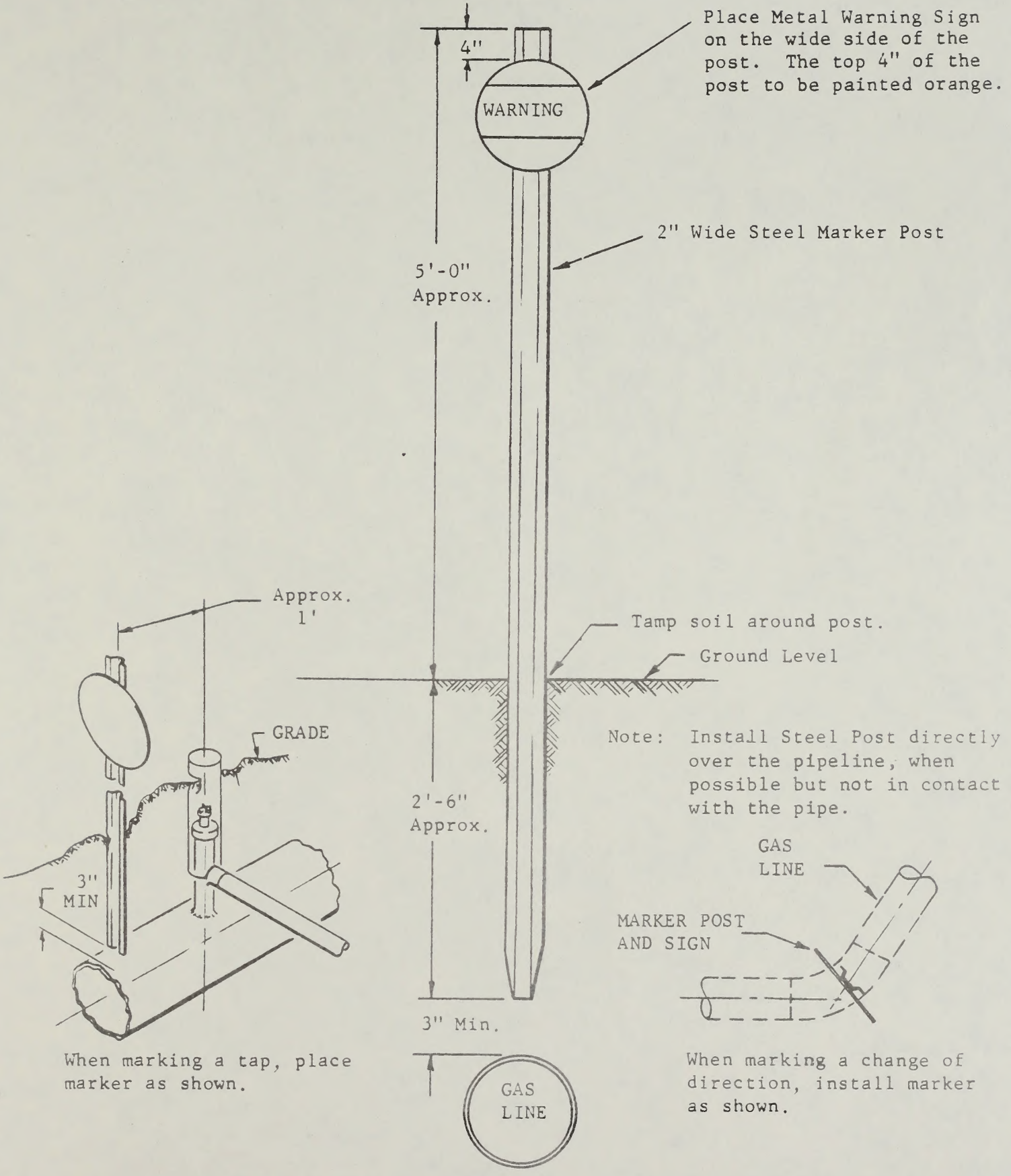




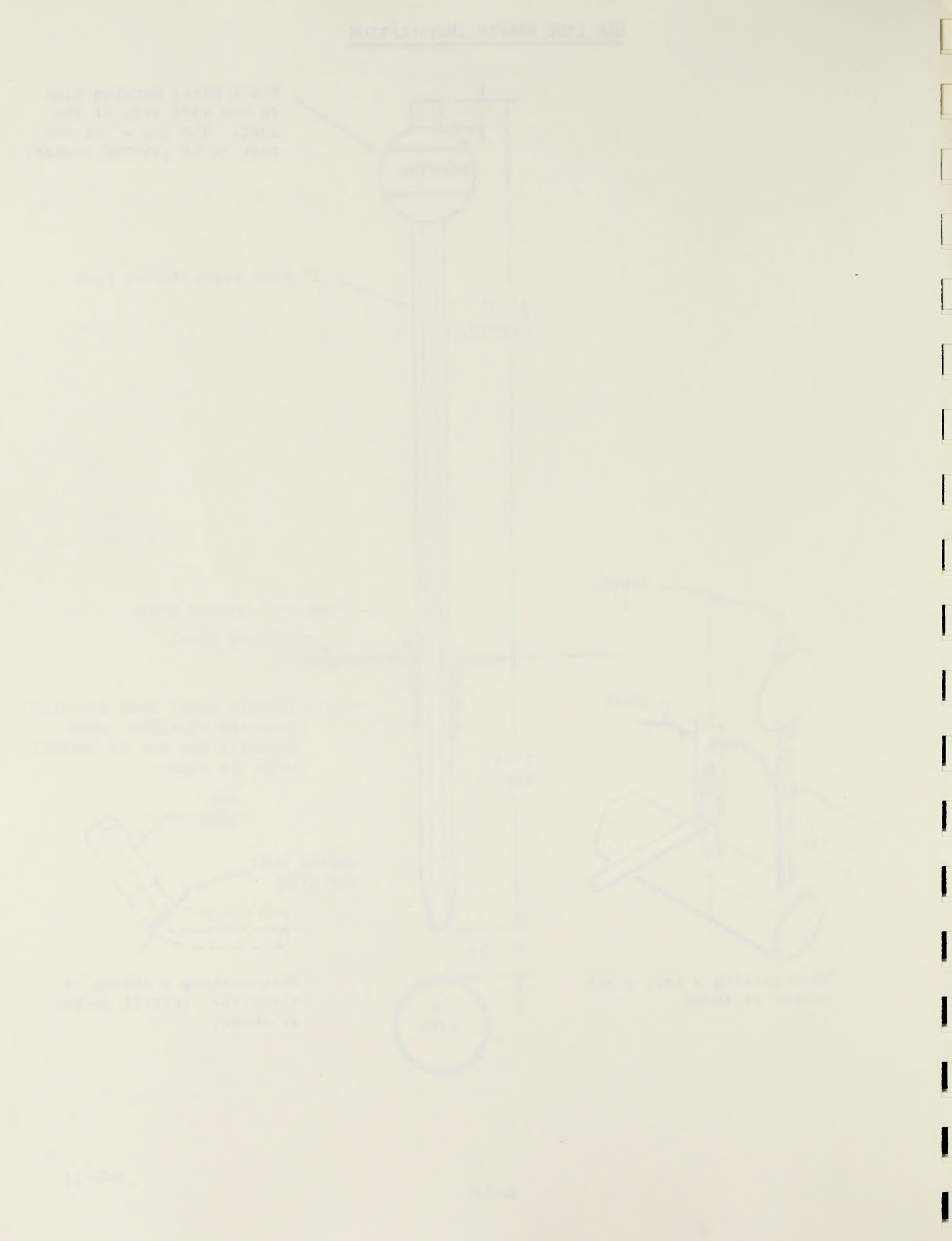
SECTION A-A

Note: The thermite weld shall be coated with mastic. All bare pipe, copper lead wire, and the thermite weld shall then be completely field wrapped.

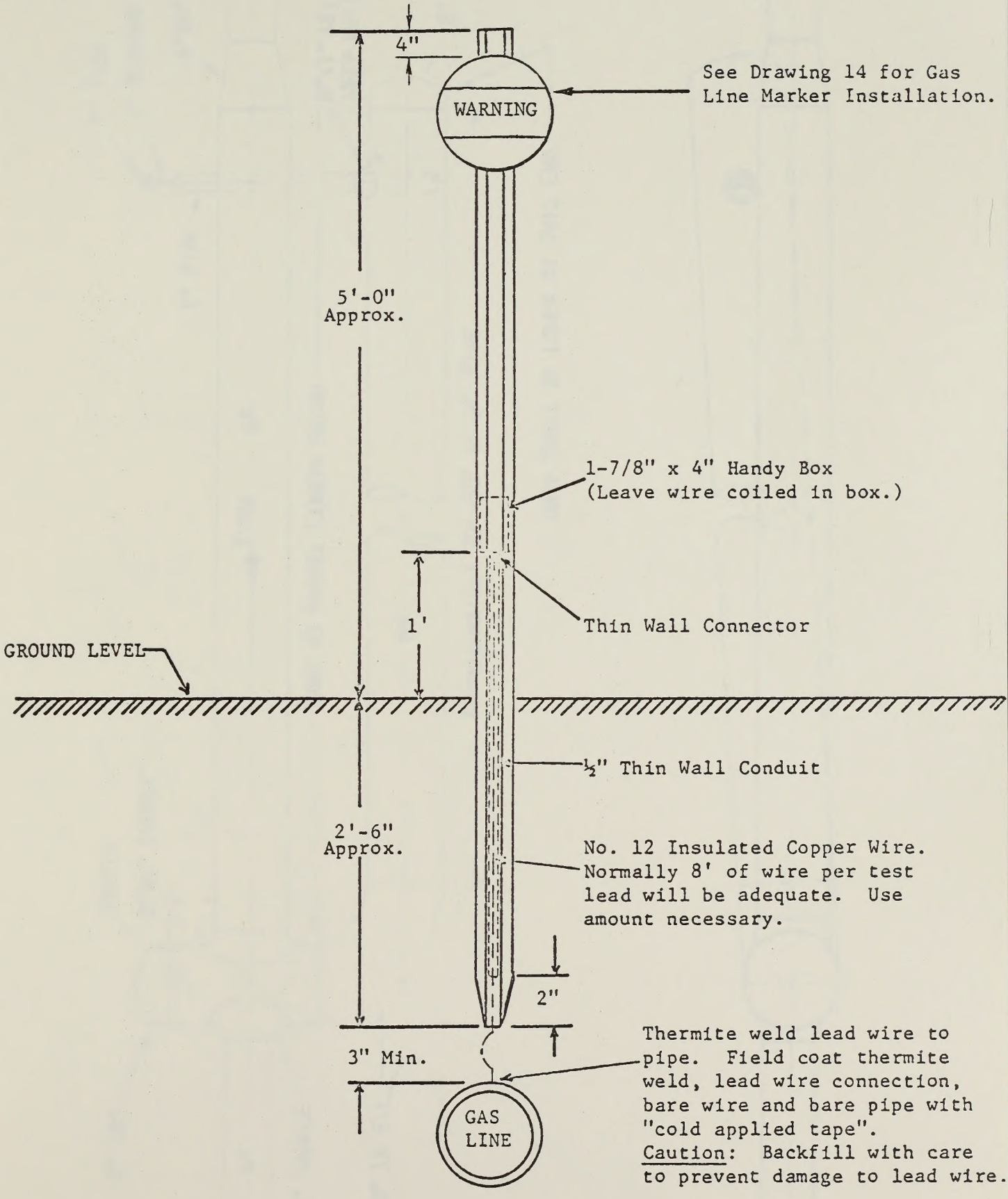
GAS LINE MARKER INSTALLATION



DWG-14

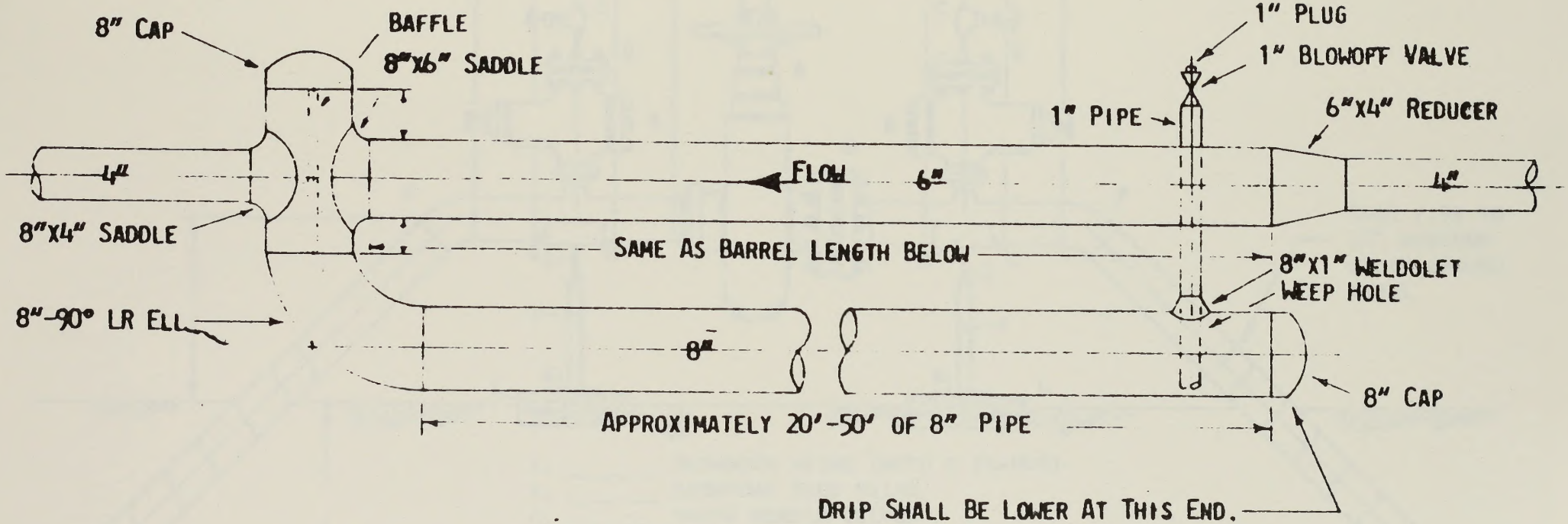


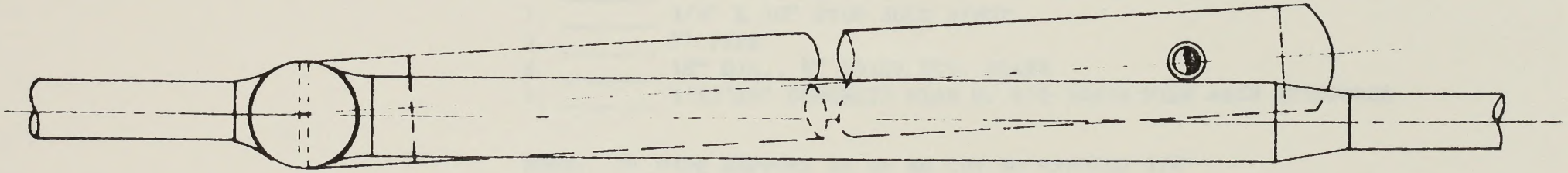
TEST LEAD INSTALLATION ON GAS LINE MARKER

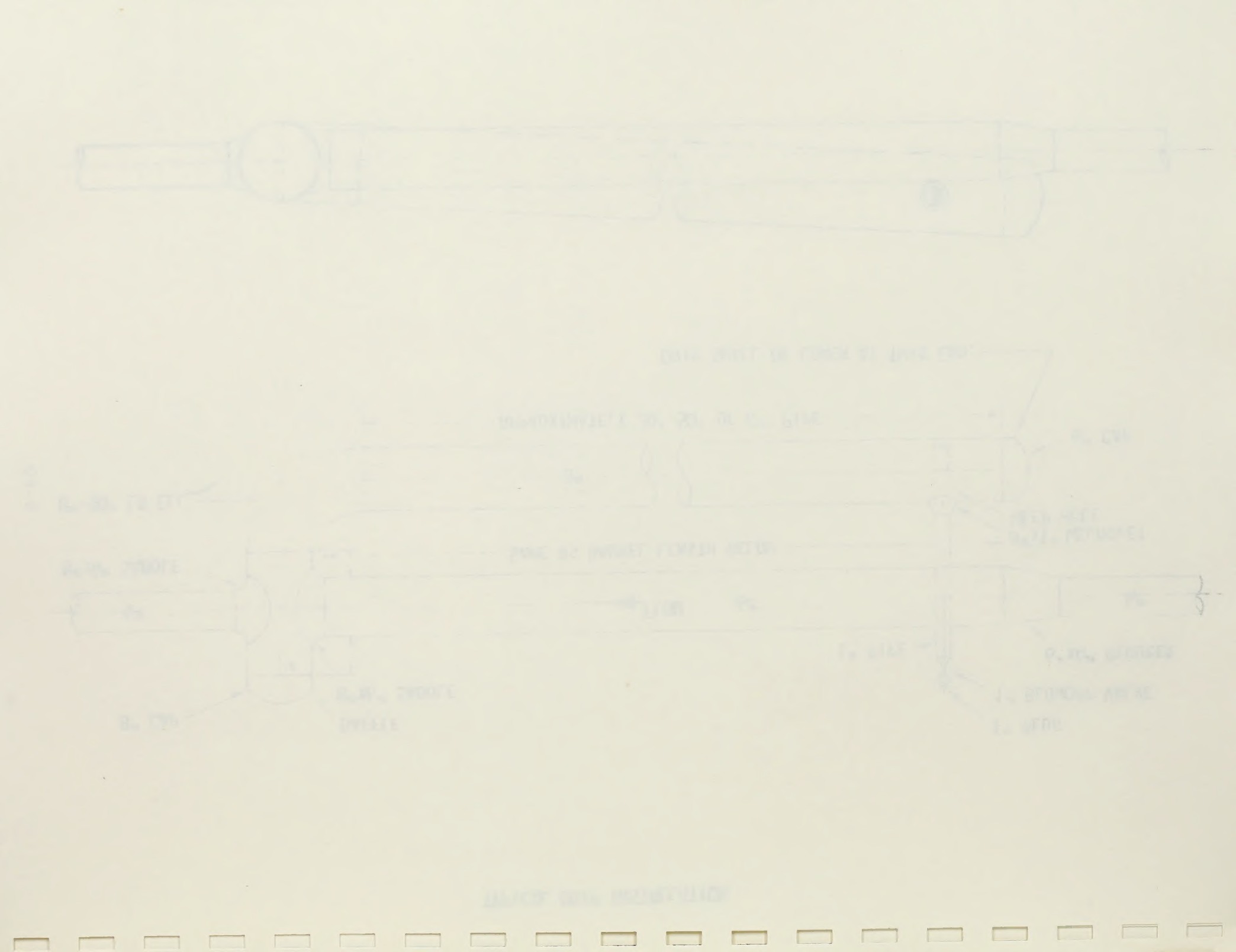


DWG-15

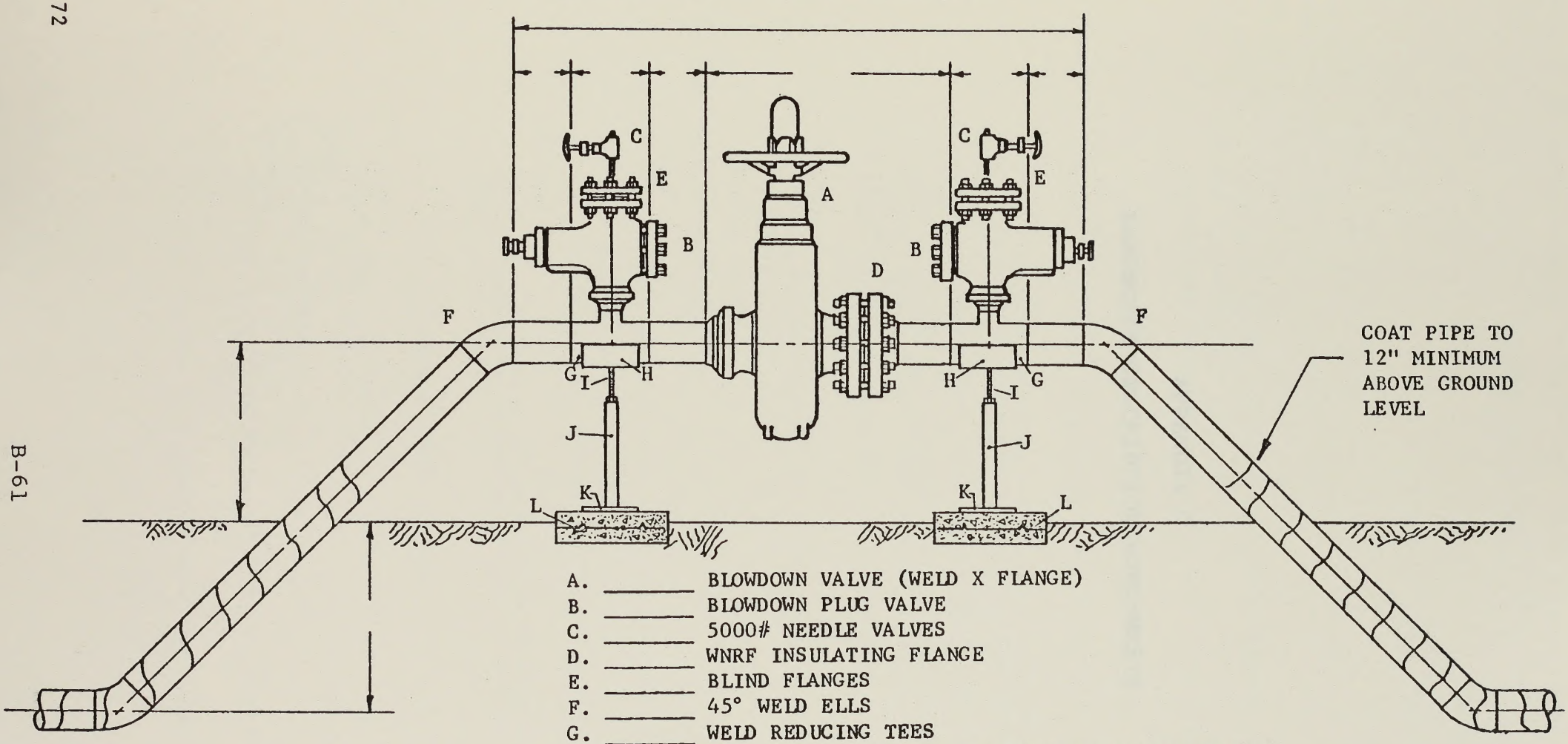
TYPICAL DRIP INSTALLATION





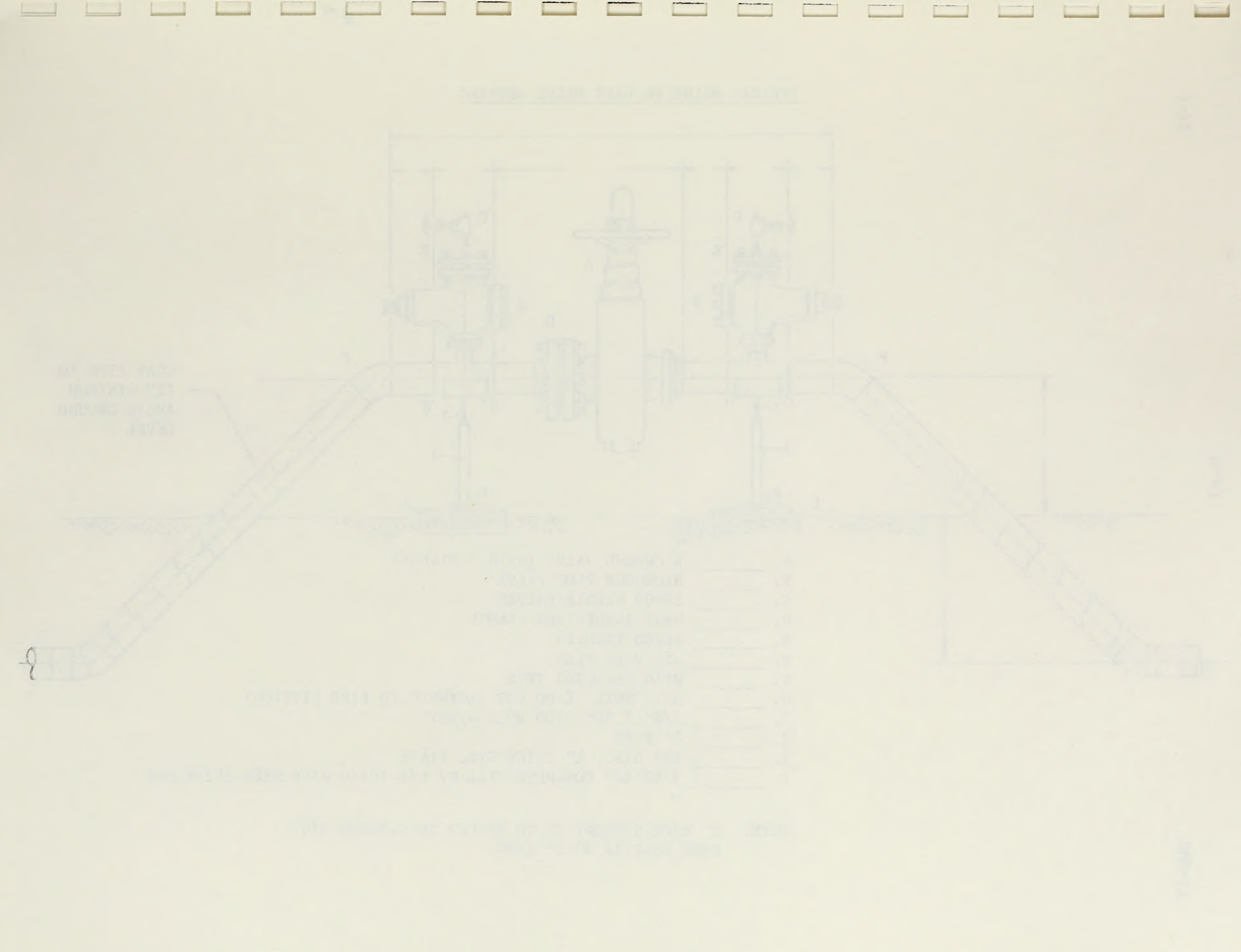


TYPICAL MAINLINE GATE VALVE SETTING



A. _____ BLOWDOWN VALVE (WELD X FLANGE)
B. _____ BLOWDOWN PLUG VALVE
C. _____ 5000# NEEDLE VALVES
D. _____ WNRF INSULATING FLANGE
E. _____ BLIND FLANGES
F. _____ 45° WELD ELLS
G. _____ WELD REDUCING TEES
H. _____ HALF SOLE (DO NOT TACKWELD TO PIPE FITTING)
I. _____ 3/4" X 10" STUD BOLT W/NUT
J. _____ 2" PIPE
K. _____ 18" DIA., ¼" THICK STL. PIATE
L. _____ 3'X3'X4" CONCRETE SLAB W/ 6/6-10X10 WIRE MESH REINFORCE

NOTE: 2" PIPE SUPPORT IS TO BE CUT SO EXPOSED 3/4" STUD BOLT IS 3"-5" LONG



APPENDIX C

LANDSCAPE DESCRIPTION WORKSHEETS

LANDSCAPE DESCRIPTION WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

#__ View from Rio Blanco County Road 5

a. Landform

(1) Form

Incised, flat valley bottom with steep bluffs along both sides

(2) Line (note direction)

Valley, Piceance Creek has strong linear trend towards West-northwest

(3) Color

In summer, bright green from irrigated vegetation

(4) Texture

Smooth meadows along valley bottom, rough and irrgular bluffs to sides

(5) Presence of water

A thin ribbon of Piceance Creek, and in spring, flooded meadows reflect sunlight so that they can be seen intermittently from Rio Blanco County Road 5.

b. Vegetation

Meadowland in valley bottom, scrub brush and sparse grass along side slopes.

(1) Form

Ribbon of smooth bright green meadow ¼-mile wide along bottom, and irregular, patchy patterns along side slopes of valley.

(2) Line (note direction)

Meadows follow line of valley and Rio Blanco County Road 5

(3) Color

Bright green in meadowland and dark brownish, readdish, to gray-green on sideslopes of valley.

(4) Texture

Rough to mottled

c. Man-made Structures

(1) Form

Geometric ranch buildings, linear fences, highways, roads and power lines.

(2) Line (note direction)

Most lines trend parallel to direction of valley--west-northwest

(3) Color

Black topping on highway, black browns of poer and fence posts, grays of concrete bridge structures and metallic silver of culverts.

(4) Texture

Smooth

PROPOSED ACTION DESCRIPTION

(1) Form

Linear before revegetation.

(2) Line

Northerly-southerly

(3) Color

Will blend with earth and vegetative colors after revegation.

(4) Texture

Will blend with earth and vegetative textures after revegetation.

LANDSCAPE DESCRIPTION
WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

Foreground view from Tract Cb Road

a. Landform

(1) Form

Mesa top

(2) Line (note direction)

Not discernable from road

(3) Color

Dark and light greens of vegetation superimposed upon buffs, tans, yellows, of sedimentary formations.

(4) Texture

Rough

(5) Presence of water

No water present or visible except where Tract Cb road approcahes Piceance Creek.

b. Vegetation

(1) Form

Pinyon-juniper has been chained near road and is rough jumbled and chaotic and irrgular in form.

(2) Line (note direction)

linears are not particularly evident with the exception of the road.

(3) Color

Dark brown to dark green.

(4) Texture

Rough textured.

c. Man-made Structures

(1) Form

Linear roads, and geometric buildings of guard house and future visitor's center--as well as the surface mine plant buildings now under construction.

(2) Line (note direction)

Northerly-southerly road, and future nearby transmission lines.

(3) Color

Browns, tans, and metallic silvers.

(4) Texture

Smooth or metallic.

PROPOSED ACTION DESCRIPTION

(1) Form

Linear before revegetation.

(2) Line

Northerly-southerly

(3) Color

Will blend with earth and vegetation colors after restoration.

(4) Texture

Will blend with earth and vegetation colors after restoration.

LANDSCAPE DESCRIPTION WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

1/ Middleground view from Tract Cb Road

a. Landform

(1) Form

Mesaland(north of County Rd. 5), rounded, low,with incised drainages.

(2) Line (note direction)

Irregular lines of bedded sedimentary formations curving around hills.

(3) Color

Sparse greens of vegetation superimposed upon buffs, tans, and yellows of the sedimentary Uinta Formation.

(4) Texture

Mottled

(5) Presence of water

No perennial streams ponds or reversoirs. Only water is the irregular runoff of rain and meltwater from snow.

b. Vegetation

(1) Form

Irregular

(2) Line (note direction)

No prominant or consistant linears

(3) Color

Dark brownish-greens to light grayish-greens.

(4) Texture

Mottled

c. Man-made Structures

Dirt roads, buried pipelines, and oil and gas well surface installations

(1) Form

Linear and geometric.

(2) Line (note direction)

Southwest-northeast and northwest-southeast.

(3) Color

Browns, tans, and metallic silvers.

(4) Texture

Smooth

PROPOSED ACTION DESCRIPTION

(1) Form

Linear

(2) Line

northerly-southerly.

(3) Color

Will blend with earth and vegetative colors after revegation.

(4) Texture

Will blend with earth and vegetative texture after restoration of surface.

LANDSCAPE DESCRIPTION WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

1 Foreground view from County Road 76

a. Landform

(1) Form

Flat to slightly convex mesa-top, breaking into low round hills to northwest.

(2) Line (note direction)

No specific linear other than gentle curves of land surface.

(3) Color

Light brown and green od vegetation superimposed upon buffs, tans, and yellows of geological formations.

(4) Texture

Texture of sediments which forms smooth landsurface is hidden and dominated by the texture of vegetation.

(5) Presence of water

No water present except for rain and snowmelt, which is sparse and intermittent.

b. Vegetation

(1) Form

Irregular

(2) Line (note direction)

Edges of contrasting plant communities are irregular.

(3) Color

Dark green to light greens.

(4) Texture

Mottled

c. Man-made Structures

(1) Form

Roads, pipelines(buried), and surface installations for oil and gas wells.

(2) Line (note direction)

Linear trend mostly northeast-southwest and northwest-southeast.

(3) Color

Browns, tans, and metallic silvers.

(4) Texture

Smooth

PROPOSED ACTION DESCRIPTION

(1) Form

Linear, northwesterly-southeasterly along very short stretch of mesa-top.

(2) Line

northwesterly-southeasterly.

(3) Color

Will blend with earth and vegetation colors after restoration and revegetation.

(4) Texture

Will blend with easth and vegetation texture after restoration.

LANDSCAPE DESCRIPTION
WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

#__ Background view from County Road 76

a. Landform
Low, rounded mesas and plateau lands south of Rio Blanco County Road 5

(1) Form
low rounded mesas and plateau lands, dissected with intermittent streams and gulleys.

(2) Line (note direction)
Northerly flowing parallel incised drainages.

(3) Color
The browns, tans and yellows of the earth colors are subordinated to the color of vegetation.

(4) Texture
Irregular.

(5) Presence of water
Only intermittent streams from rainfall and snowmelt. No large perennial streams or large lakes or ponds. Water is essntially absent.

b. Vegetation

(1) Form
Irregular patches of chained pinyon-juniper.

(2) Line (note direction)
No persistent linears or edges to vegetation, other than a rough northerly-southerly trend.

(3) Color
Dark green to light gree.

(4) Texture
Mottled

c. Man-made Structures

(1) Form
Linears of roads and geometrics of building related to construction of the surface mine plant for Oil Shale Tract Cb.

(2) Line (note direction)
The road is the principal and most noriceable liner which leads to Tract Cb and trends southerly.

(3) Color
The road is black-topped, and the buildings are various shades of browns, tans, grays, and metallic silver.

(4) Texture
At this backgroun distance, the buildings subtend a small soild angle and are difficult to describe in terms of texture other than "rough".

PROPOSED ACTION DESCRIPTION

(1) Form
Linear

(2) Line
Northerly-southerly

(3) Color
Will blend with earth and vegetative colors when revegetated and restored.

(4) Texture
Will blend with earth and vegetative textures when revegetated and restored.

LANDSCAPE DESCRIPTION WORKSHEET

Definition of Landscape Type: the overall impression of the landscape created by its unique combination of visual features (landform, water, vegetation, and man-made structures) as seen in terms of the basic elements: form, line, color, texture

#__ Seldom seen zones(at northern and southern ends of site area.)

a. Landform

(1) Form

Side slopes along streams--bothe upper and lower slopes.

(2) Line (note direction)

Sloping gently

(3) Color

Earth colors, browns, tans, and yellows of Uinta Formation..

(4) Texture

Rough

(5) Presence of water

Water flows in the inermittent drainages only after rainfall and snowmelt.
No ponds or lakes.

b. Vegetation

(1) Form

Irregular

(2) Line (note direction)

Irregular edges.

(3) Color

Dark to light green.

(4) Texture

Mottled.

c. Man-made Structures

(1) Form

Linear dirt-roads

(2) Line (note direction)

Northwest-southeastly in northern end of site area; and,
northerly-southerly in southern end of site area.

(3) Color

Earth tones.

(4) Texture

Rough.

PROPOSED ACTION DESCRIPTION

(1) Form

Proposed action crosses none of hte seldom seen zones within the EAR Site area.

(2) Line

NA

(3) Color

NA

(4) Texture

NA

SURVEYOR'S CERTIFICATE

I hereby certify that the survey for TRACT C-b PIPELINE is accurately represented upon this map, or maps, this 9th day of September 1978.

Millard W. Eldridge
Colorado Registered Land Surveyor No. 11980
AIR PHOTO SURVEYS & GLOBAL ENGINEERING, INC.

ENGINEER'S STATEMENT

Millard W. Eldridge states he is by occupation a Land Surveyor employed By Western Slope Gas Company to make the survey of Tract C-b Lateral as described and shown on this map; that the survey of said works was made by me or under my supervision and under authority commencing on the 7th day of August, 1978, and ending on the 18th day of August, 1978, and that such survey is accurately represented upon this map.

Millard W. Eldridge
AIR PHOTO SURVEYS & GLOBAL ENGINEERING, INC.

APPLICANT'S CERTIFICATE

This is to certify that Millard W. Eldridge who subscribed the statement hereon is the person employed by the undersigned applicant to prepare this map, which has been adopted by the applicant as the approximate final location of the works thereby shown; and that this map is filed as a part of the complete application, and in order that the applicant may obtain the benefits of Section 28 of the Act of February 25, 1920 (41 STAT. 449), as amended by the Act of August 21, 1935, and August 12, 1953, and November 16, 1973, (49 STAT. 678; 67 STAT. 557; 87 STAT. 576; 30 U.S.C. 185), and I further certify that the right of way herein described is for a natural gas transmission pipeline.

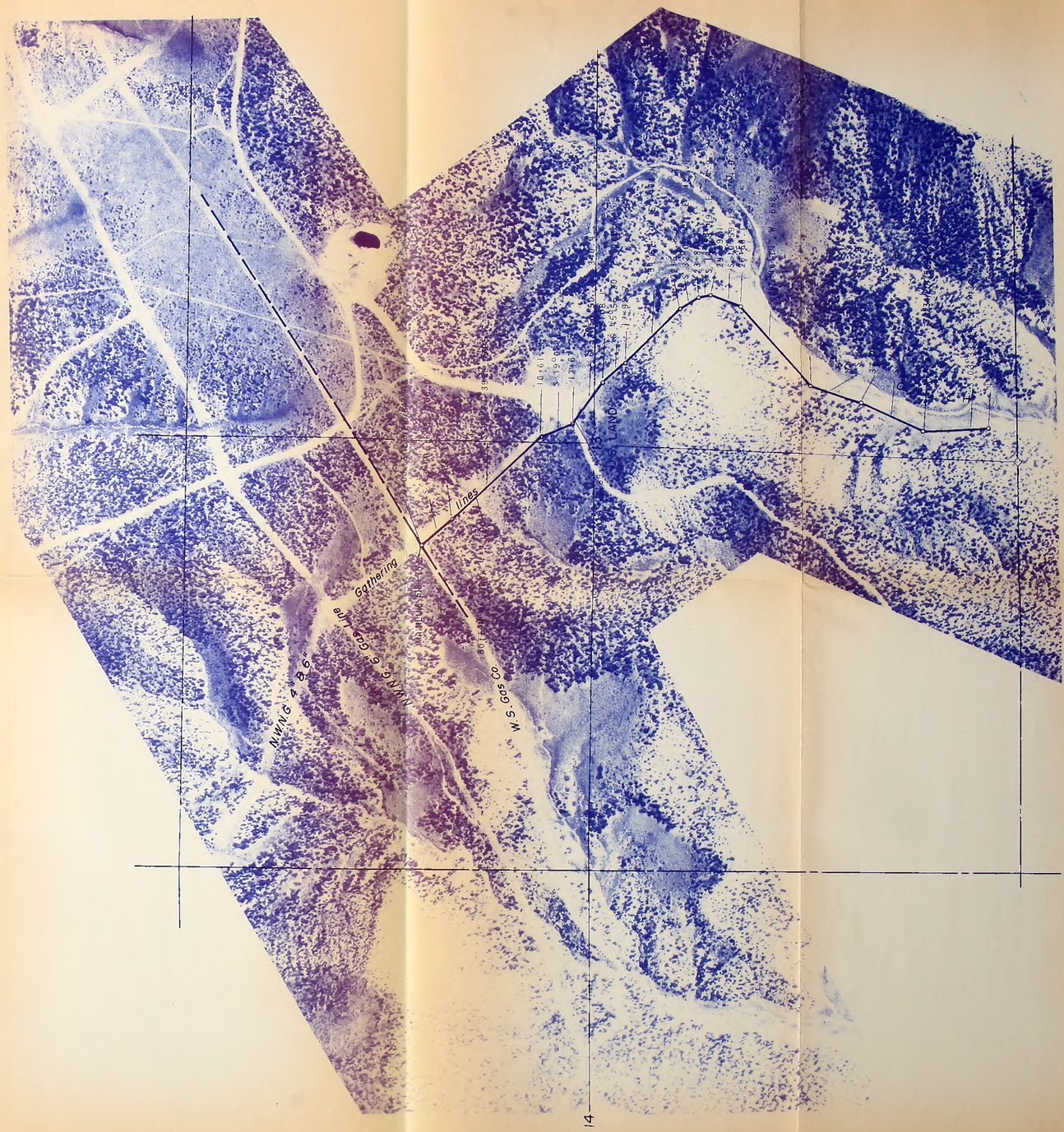
ATTEST:

WESTERN SLOPE GAS COMPANY

Assistant Secretary

Vice President and General Manager

NOTE
1. STATION 0+00 TO 41+51.2 EQUALS 4219.00 SLACK CHAIN DISTANCE



T. 2 S., R. 97 W., 6th P.M.
RIO BLANCO COUNTY

N

400 200 0 400 800

PLATE I

CONSTRUCTION SURVEY

REVISIONS	SIGNATURE	APPROVAL	WESTERN SLOPE GAS COMPANY	SHEET
	PROJ. ENG.	PROJ. COORDINATOR	WESTERN DIVISION	
	ROW DEPT.	DRAFTING DEPT.	TRACT C-b LATERAL TRANSMISSION LINE	1
			DRAWN BY A.P.S. SCALE 1" = 400' DATE SEPT. 1978	

Prepared by AIR PHOTO SURVEYS & GLOBAL ENGINEERING INC., GRAND JUNCTION, COLORADO

SURVEYOR'S CERTIFICATE

I hereby certify that the survey for TRACT C-b LATERAL is accurately represented upon this map or maps, this 9 th day of SEPTEMBER 1978.

Millard H. Eldridge
Colorado Registered Land Surveyor No. 11960
AIR PHOTO SURVEYS & GLOBAL ENGINEERING INC.

MATCH SHEET 2

MATCH SHEET 3

NOTE
1. STATION 41+51.2 TO 166+67.2 EQUALS 12,544.58 SLACK CHAIN DISTANCE
2. U.S. LAND STA 41+51.2 TO 144+21.6 EQUALS 10,291.0 SLACK CHAIN DISTANCE

T. 2 S., R. 97 W., 6th P.M.
RIO BLANCO COUNTY

400 200 0 400 800

PLATE 2

CONSTRUCTION SURVEY

REVISIONS	SIGNATURE	APPROVAL
	PROJ. ENG.	PROJ. COORDINATOR
	ROW DEPT.	DRAFTING DEPT.

WESTERN SLOPE GAS COMPANY
WESTERN DIVISION

TRACT C-b LATERAL
TRANSMISSION LINE

SHEET 2

DRAWN BY A.P.S. | SCALE 1"=400' | DATE SEPT 1978

Prepared by AIR PHOTO SURVEYS & GLOBAL ENGINEERING INC., GRAND JUNCTION, COLORADO

TRACT C-b LATERAL

9th SEPTEMBER

Millard N. Eldridge

MATCH SHEET 2

PICEANCE

WILLOW CREEK

36

35

2

T. 2 S., R. 97 W., 6th P.M.
T. 3 S., R. 97 W., 6th P.M.

RIO BLANCO COUNTY

BURIED POWER CABLE

SECTION LINE

TIE

NOTE:
1. STATION 166+67.2 TO 287+99.9 EQUALS 12,168.36 SLACK CHAIN DISTANCE
2. U.S. LAND STA. 162+38.0 TO 249+26.7 EQUALS 8,714.3 FEET SLACK CHAIN DISTANCE
3. TRACT C-b STA. 249+26.7 TO 287+99.9 EQUALS 3887.14 SLACK CHAIN DISTANCE

N

400 200 0 400 800

PLATE 3

CONSTRUCTION SURVEY

REVISIONS	SIGNATURE	APPROVAL
	PROJ. ENG.	PROJ. COORDINATOR
	ROW DEPT	DRAFTING DEPT

WESTERN SLOPE GAS COMPANY
WESTERN DIVISION

TRACT C-b LATERAL
TRANSMISSION LINE

SHEET 3

DRAWN BY A.P.S. | SCALE 1"=400' | DATE SEPT 1978

Prepared by AIR PHOTO SURVEYS & GLOBAL ENGINEERING INC., GRAND JUNCTION, COLORADO