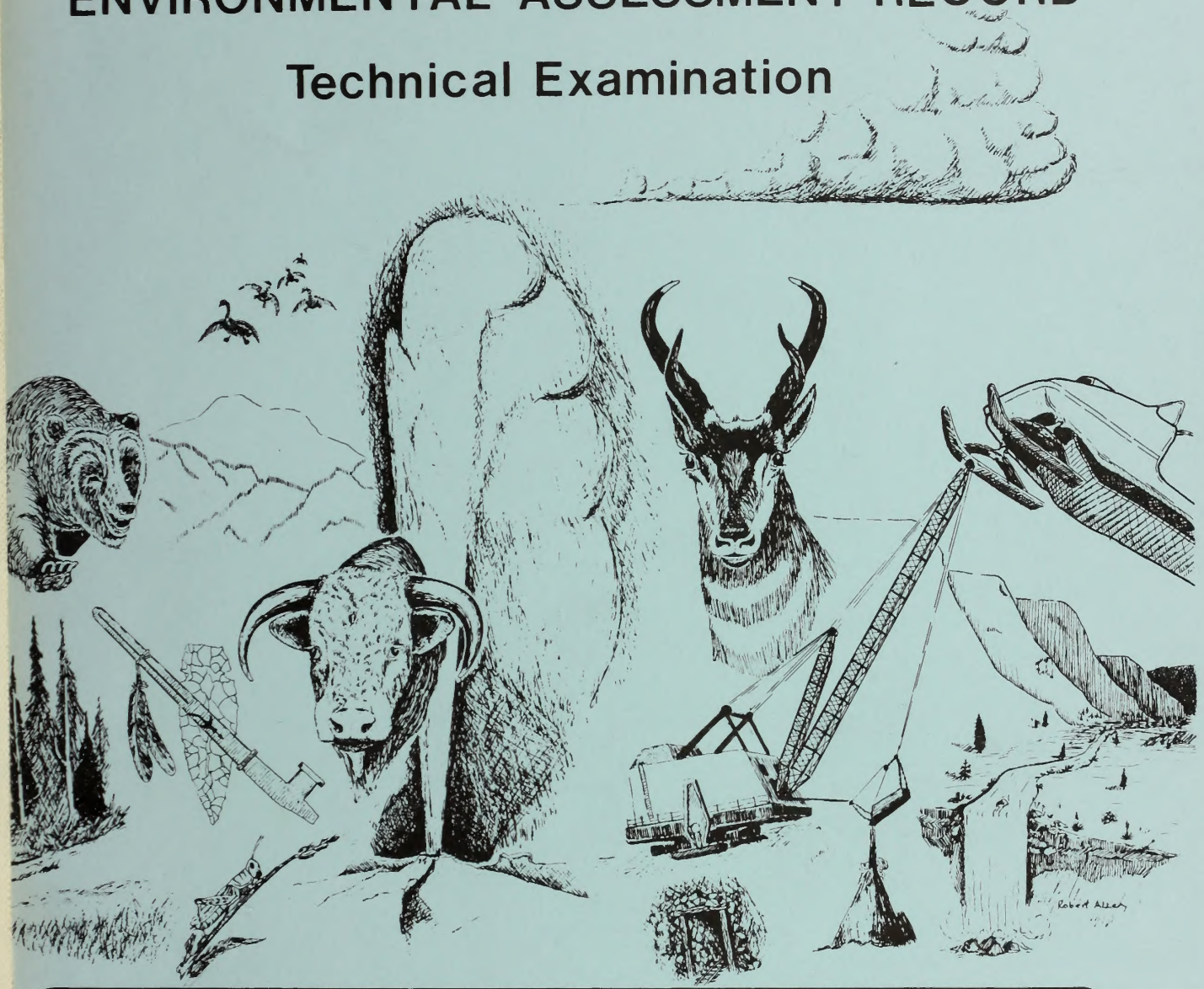
LAND USE ANALYSIS

ENVIRONMENTAL ASSESSMENT RECORD

Technical Examination



NORTH AMERICAN COAL COMPANY

Coal Lease Application

M-34980 (ND)

DICKINSON DISTRICT OFFICE

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MT-030-58-8-2

LAND USE ANALYSIS/TECHNICAL EXAMINATION/ENVIRONMENTAL ASSESSMENT RECORD

NORTH AMERICAN COAL COMPANY LEASE APPLICATION M-34980(ND)

March 1978

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PREFACE

The Bureau of Land Management, U.S. Department of Interior is the federal agency responsible for the management of the federal coal reserves in North Dakota and other states. As the managing agency, the Bureau of Land Management (BLM) pursues the coal development objectives established by the Executive, Congress, and Secretary of Interior. Through laws, policy, and directives the BLM is pursuing a program that will make coal available to help meet the energy needs of the nation.

At present the BLM is being constrained from doing any major leasing. This has resulted from the Secretary of Interior's decision to reassess the Department of Interior's coal leasing procedures. Also, a Federal Court Order has required BLM to cease leasing activities until a new Coal Programmatic Environmental Impact Statement is prepared and the Secretary reviews the leasing procedures in light of the findings of the impact statement. Both the Secretary and the Court, however, recognized the need for providing federal coal to maintain existing operations and to allow companies to meet contractual commitments. To provide for these "short term" needs some exceptions to the delay were made. Standards for short term leasing were set out by the Court which were modifications of criteria which the Secretary had earlier developed. The Department of Interior, through the BLM, is attempting to respond to critical industry needs where individual coal leasing actions conform with the Court directed criteria.

In August 1976, North American Coal Company (NACCO) applied for a lease of 441 acres of federal coal to supplement its ongoing Indian Head Mine near Zap, North Dakota. The application was submitted under short term criteria. The company is mining private coal immediately to the northeast of the 441 acre tract. They desired the federal coal to extend the life of the mine. Additionally, obtaining the federal coal would allow them to mine a small tract of private coal west of the federal tract.

The BLM did not take immediate action on the application because they were in the process of doing land use planning and, jointly with the State of North Dakota, a regional coal environmental impact statement (EIS) in the area. It was desirable to complete the planning and EIS prior to any leasing.

During the planning process BLM made a recommendation not to lease anymore coal in the coal deposit on which the applied for federal tract laid. This recommendation was based on low potential for reclamation and a high potential for adverse impact to the hydrology of the area. During public review of the planning, North American Coal Company in part, opposed BLM's recommendation. The company agreed with the environmental concerns on all of the federal coal areas except for the tract on which they had applied. They felt that successful reclamation could be achieved and that there would not be a degradation to the hydrologic components in the area.

Another concern that North American has is that they have an immediate need for more coal to maintain and extend the life of the Indian Head Mine. The coal will have to be acquired sooner than the anticipated completion date of the planning and EIS being done by BLM and the State of North Dakota. Not being able to mine a tract of private coal unless they have the federal coal is also a concern of NACCO.

Responding to North American's concerns, the BLM agreed to make an assessment of the specific application area to determine reclamation potential and hydrologic impacts of mining. The assessment was made and a report written (Appendix 1, TE/EA). Conclusions reached were that reclamation could be achieved and that adverse impacts to the hydrology of the area would be minimal under existing State and Federal requirements for reclamation and environmental protection.

Since the conclusions of BLM's assessment were positive toward leasing, and there was an immediate need for the coal, it was decided that site specific planning, a total environmental assessment, and a technical examination be accomplished to determine whether or not the tract should be leased.

As the applied for federal coal is under private surface and other federal coal is widely dispersed, the BLM opted to do a Land Use Analysis instead of a comprehensive land use plan to meet planning requirements. A land use analysis is provided for in the Federal Coal Leasing Amendment Act of 1975 (Sec. 3-(3)(A)(i). This Act provides that where the Department of Interior finds that non-federal surface or insufficient federal coal resources do not justify the cost of a comprehensive land use plan, lease sales may be held if the State has prepared a land use plan or if Interior (BLM) prepares a "land use analysis."

An "Environmental Assessment Record" (EAR) is the documentation of environmental assessments BLM makes on proposed actions. A "Technical Examination (TE) is documentation of environmental and other technical analyses made on mineral disposal actions. Since there are only minor differences between the two processes, the TE can be easily merged with the EAR. Such has been done in this analysis.

To meet the requirement of a Land Use Analysis, the environmental assessment record and technical examination have been supplemented with the following:

1. An analysis and statement of "suitability for reclamation"
2. Development of "initial land use conclusions"
    a. Lease or not to lease recommendation (with criteria)
    b. Statement on surface owner consent and opinion on reclamation and post mining use
    c. Discussion on relationships to state and local planning
    d. Discussion of special stipulations which may go into a lease

Following public review (including State and local governments) of the EAR, TE, and initial conclusions, a "decision statement" will complete the land use analysis. This statement will include the final recommendation to lease or not lease, a review and discussion of use of public input, reiteration of criteria from initial conclusions, and a negative or positive declaration for an environmental impact statement.

Upon completion of the land use analysis with a recommendation for leasing, the case file will be forwarded through channels to the Secretary of Interior for approval. The Secretary will confer with the Governor of the State prior to making a decision to lease.

The foregoing discussion explains the process being used for the North American application. The following text is the documentation of the process. This publication of the text will not include the decision statement. The statement will be done as a supplement to this document. Public comment received will be used in making the final decision and will be discussed in the decision statement.

In addition to doing a land use analysis, environmental assessment, and technical examination, the BLM had to make a determination as to whether or not the application met short term criteria. It was determined in October of 1977, that the application met the criteria for short term leasing as defined in the Court's ruling of September 27, 1977.

There are requirements other than those discussed here that must be met before a lease can be issued. They are primarily adjudicative in nature and not part of this record.

TECHNICAL EXAMINATION/ENVIRONMENTAL ASSESSMENT RECORD

INTRODUCTION

This Technical Examination and Environmental Assessment Record documents the technical and environmental assessments required in the processing of a coal lease application (described in Chapter 1). The primary purpose of the document is to describe the proposed action, describe the existing environment (physical, social, and economic), discuss the impacts of the action on the environment, and to propose actions to mitigate adverse impacts. It is used to aid the resource manager in making his or her decision.

The relationship of the Technical Examination and Environmental Assessment Record to the total Land Use Analysis is discussed in the Preface of this report.

The analysis of the physical environment in this report is primarily centered on the specific tract requested for lease. The area of influence away from the tract is quite small, requiring little extension of analysis.

Normally, social and economic analyses take in a much larger area than just the specific action site. The influence of an action on the social and economic environments are often a considerable distance away. However, in this particular case where the action is ongoing, social and economic impacts do not occur or are nearly negligible and are, therefore, not analyzed in great detail.

Although all chapters of this document are important, the first five are the more significant. Chapter one describes the proposed action in enough detail to allow the impact analyzer (professional or citizen) to have a full picture of the action. Chapter two then describes to the analyzer the existing environment by components. Chapter three then discusses the impacts (beneficial or adverse) of the action on the existing environment, and in chapter four recommendations are made for mitigation of the identified impacts. Chapter five lists the residual adverse impacts that will accompany the project.

Contents of the remaining chapters are well reflected by the chapter titles.

SUMMARY

The finding of this assessment is that adverse impacts of the proposed action are insignificant. Most physical resource impacts are short term and can be mitigated through proper reclamation practices. Social and economic impacts are minimal.

Primary concern is with the groundwater. An aquifer will be partially destroyed which could reduce or stop the flow of springs in the immediate area. Reclamation potential is good. Redistribution of soils could increase overall productivity of the area.

CHAPTER 1

DESCRIPTION OF THE PROPOSED ACTION

The proposed action to be analyzed is a pending federal coal lease application from North American Coal Corporation to lease, under short term criteria, 440.96 acres of federal coal. The coal is located in Mercer County, North Dakota near the communities of Beulah and Zap (Figure 1). The area consists of the following tract:

Lots 1 and 2, S½NE¼, S½NW¼, NW¼SE¼, SW¼, Section 2
T143N, R89W, 5th P.M. - 440.96 Acres

Of this acreage, Geological Survey has determined that only 195 are strippable (Figure 2).

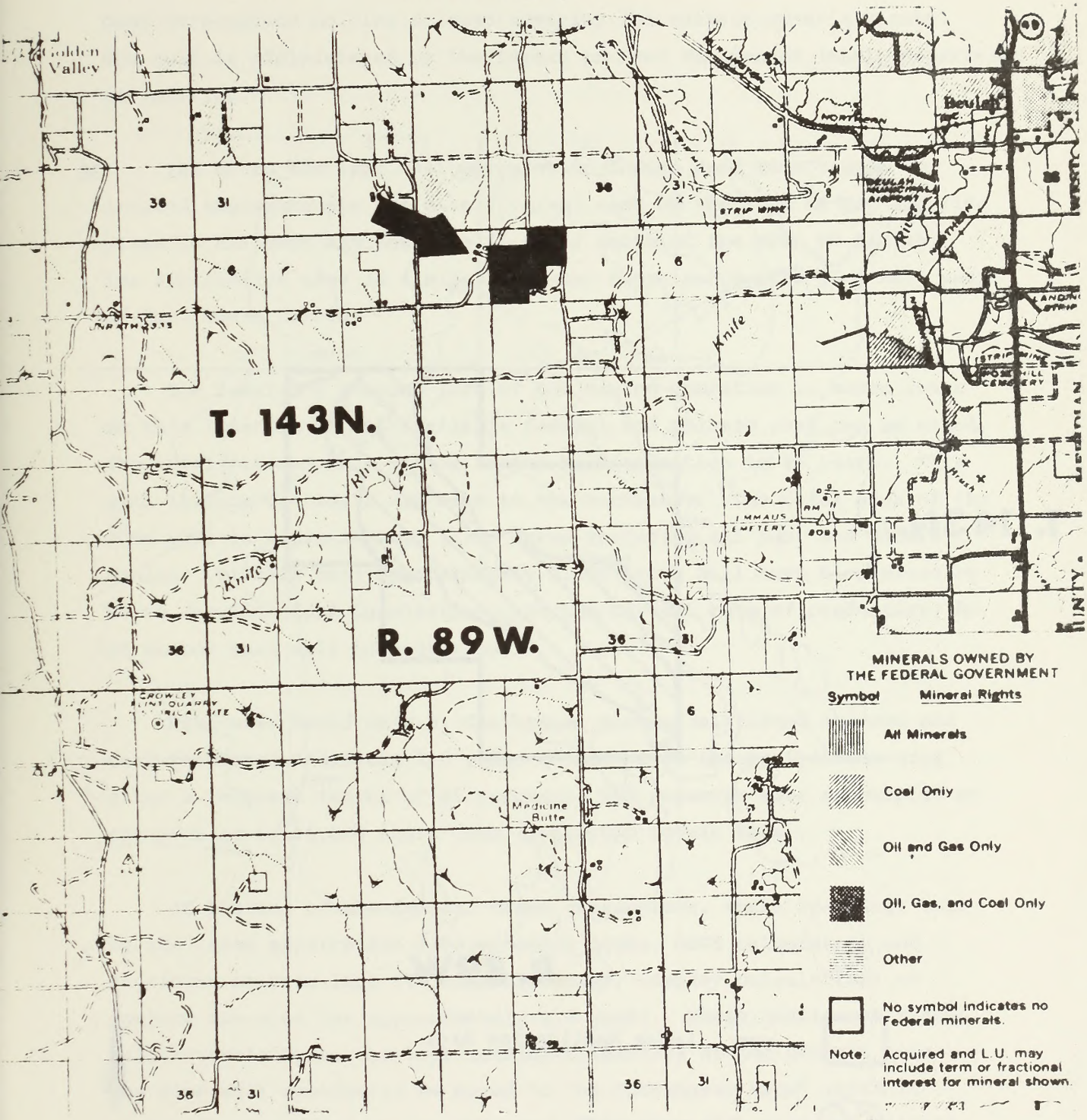
The North American Coal Corporation (NACCO) has been mining in the vicinity for 20 years. Mining actually began in the area in 1917 with the Lucky Strike Mine located at the site of the present Indian Head Mine. The Mine passed through various ownerships until purchased by NACCO in July 1957 and renamed the Indian Head. The current mine production is approximately 1,000,000 short tons (907,000 metric tons) per year. Most (800,000 short tons or 726,000 metric tons) is contracted by United Power Association for use in their 180 megawatt electric generating facility at Stanton, North Dakota. NACCO renegotiated this contract with United Power Association effective April 1, 1977 resulting in a 15 year contract for up to 21,000 tons of lignite per week. The remaining tonnage has been delivered to power companies, state institutions, and domestic consumers. The North American Coal Corporation (NACCO) currently holds federal coal leases in this deposit totaling 1,357.44 acres. The coal within this acreage has been depleted. The Coteau Properties Company, a subsidiary of NACCO holds federal leases and has a pending lease application in a deposit north of the existing operation. These reserves are committed to gasification and generation plants soon to be constructed.

FIGURE 1

VICINITY MAP

Coal Lease Application - NACCO

(Mercer County)



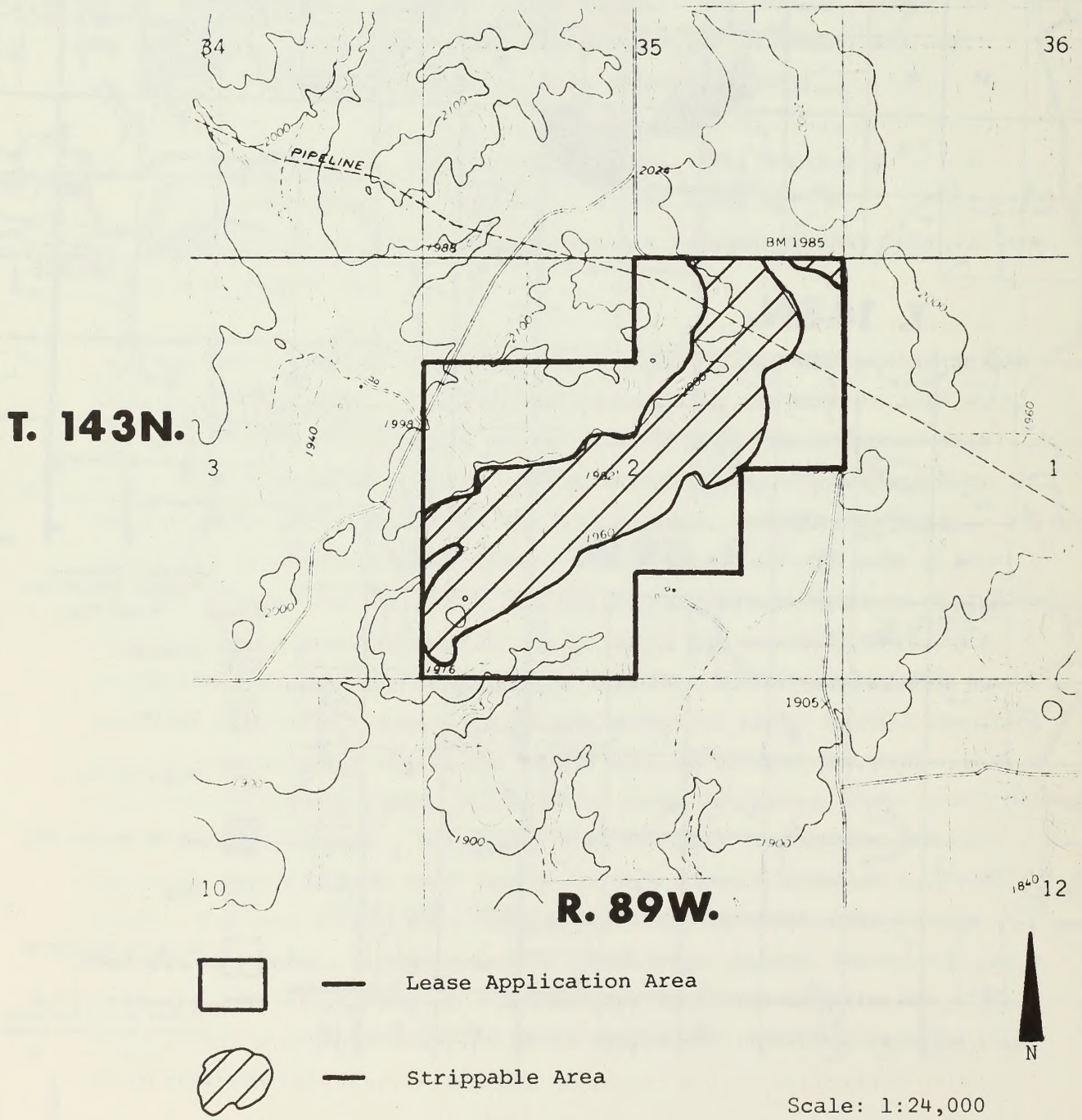
Scale

½"=1 mile

FIGURE 2

STRIPPABLE COAL AREA

Coal Lease Application - NACCO



The federal government does not own any surface rights in the lease application. The surface is under private ownership with North American Coal Corporation holding a lease covering the surface owner's rights. The coal is administered by the Bureau of Land Management (BLM), Department of Interior.

The North American Coal Corporation Indian Head Mine tipple is located approximately one mile (1.6 km) east of the town of Zap and five miles (8 km) west and one mile (1.6 km) north of the town of Beulah. The application area is 4 miles (6.4 km) south and 1 mile (1.6 km)) east of Zap, North Dakota.

The remaining planned life of the mining operation is seven years at this location if all available federal and private coal can be mined. The total planned life of the Inaian Head operation is 15 years. This will include opening a new mine to the northeast. The total area of the mine will be approximately 2,390 acres including all past and future mining. Of this area approximately 1,700 acres will have been mined by North American Coal Corporation. At the current rate of production, 80 acres per year will be disturbed.

Estimates based on U.S. Geological Survey calculated acreage and coal thickness indicates 2.6 years of mining on the application area given a recovery factor of 85 percent. The reserves were calculated by the USGS as 2,610,000 short tons (2,368,000 metric tons).

If leasing of the federal tract takes place, there is enough coal on the lease application (195 mineable acres, USGS calculated) and adjoining private land (70 mineable acres, company calculation) to operate the mine for approximately 3.5 years. These contiguous tracts will essentially be the last remaining reserves at the present site. The mine will eventually be moved to the "northeast area" which is partially controlled by the company. This move will also necessitate federal action as the federal coal in this area is not under lease.

Current technology and economics dictate that the area be developed by strip mining techniques. The operation at the Indian Head Mine is now at the point where, within the immediate future, the federal coal in the lease application must either be leased or bypassed. If leased, the coal mining activity, specifically removal of topsoil, would be started by mid-1980, if bypassed the likelihood of it ever being mined is remote. If this tract is bypassed, an adjoining private tract will also be bypassed and NACCO will be required to move operations seven miles to the northeast. The cost of returning to this federal tract of coal within a mined area is currently prohibitive.

Reclamation on the lease area should be completed within three years after termination of the mining permit according to North Dakota State law. The company must be given two 1-year extentions by the State upon request. Further extensions, on a year-to-year basis, may be made at the discretion of the State. This means that if leased immediately, the time frame for the action would begin in 1980 and could be completed, including reclamation, by 1988. It would be realistic to assume some delays in reclamation and this would require extensions.

The mining takes place in two stages of implementation. Each will be discussed in detail. Because the mine is presently in existence, minimal new road construction will occur. No new facilities will be required. The two stages analyzed are mining and reclamation. These stages contain several discrete operations which, even when described separately, may occur simultaneously.

Mining

Removal and Stockpile of Soils

Following classification and mapping by a state registered soils classifier, the soils are removed in two steps. Step one is removal of topsoil by heavy equipment. The topsoil is either stockpiled in a

specified area for later use during reclamation, or spread on reshaped spoil piles and subsoil for reclamation. The second step is removal of subsoil. The subsoil is stockpiled separately from the topsoil in order to prevent mixing of topsoil and subsoil then respread during reclamation or placed directly on reshaped spoil piles.

Wind and water erosion of the stockpiles are controlled by proper positioning and accepted erosion control procedures. The erosion control procedures must be approved by the U.S. Geological Survey (USGS), BLM, and the North Dakota Public Service Commission.

Removal of Remaining Overburden

The remaining overburden (all materials between subsoil and coal seam) is removed with an electric powered Bucyrus Erie Model 800W, 28 cubic yard (21.4 cubic meters) dragline. The 28 yard dragline is capable of removing overburden to a depth of 75 feet (22.9 meters). The overburden is piled adjacent to the cut. Each succeeding cut's overburden is placed in the immediately preceding trench. This operation continues 24 hours a day, 6 days a week with dragline availability of 85 percent. An 834 rubber tired dozer follows the dragline removing loose clay from the top of the coal bed.

Blasting, Excavation, and Loading

The coal bed is drilled on 10 foot centers with a Schroeder Brothers drill and blasted with Anfo (ammonium nitrate and fuel oil mixture) and dynamite.

The coal is loaded with a 10 cubic yard (7.6 cubic meters) Bucyrus Erie model 150B loading shovel. The coal is loaded into 120 ton (109 mt) K.W. Darts (2), or 60 ton (54 mt) Euclids (4) for transportation.

Transportation, Delivery, and Crushing

The coal is transported from the pit up a maximum 12 percent grade ramp road, to main haul roads which join the mine to coal preparation facilities. The main haul roads are surfaced with clinker (scoria-procellainite) and watered. At the preparation facilities it is dumped, crushed to less than 1.5 inch, and loaded in hopper cars. It is then transported by unit train approximately 30 miles (48.3 km) to the UPA plant at Stanton.

Reclamation

Reclamation is accomplished according to state and federal law which requires the following:

Regrading

During reclamation, the overburden piles are reshaped to the approximate original contour unless otherwise approved by the USGS, BLM and North Dakota Public Service Commission. This includes the final highwall, or last cut, which normally has little overburden put back into it. The highwall is cut back and graded to blend with the adjacent terrain. An 834 rubber tired dozer and a Fiat Allis 41B crawler dozer are normally used in the reshaping process. Reshaping is usually done two to three spoil piles behind the mining operation, depending on weather and working conditions.

Topsoiling

Following the reshaping process, subsoil is spread on the graded overburden. Topsoil is then spread over the subsoil. The topsoiling operation is normally performed by 3 model 637 tractor scrapers during dry seasons of the year.

Revegetation

The seeding operation involves site preparation and seeding with approved vegetative species. Equipment is normally limited to farm tractors and implements.

If this project proceeds as proposed, all existing federal and state laws and regulations pertaining to coal strip mining and its associated affects on the environment would apply.

All federal leases will be subject to all stipulations or performance standards included in 30 CFR 211 and 43 CFR 3000 in effect at the time of lease issuance (CFR is Code of Federal Regulations). The 30 CFR 700 regulations issued on December 13, 1977 will apply to all surface mining, but it is uncertain at this time how they will be specifically included in future federal leases. They will be applied as appropriate.

Technical Examination Addendum

The following subjects and comments are required in a Technical Examination (43 CFR 23.5 and 43 CFR 3041.2), but are not covered elsewhere in the text.

Fire and Fire Hazards

There would be no additional fire hazards if the subject tract is leased.

Toxic Materials

It is assumed that no toxic materials will be used during mining. If any toxic material is used or encountered, state law dictates that it be isolated and buried several feet below the vegetative rooting zone so as not to interfere with the establishment of vegetation.

Landslide Potential

The only potential problem area would be the highwall in the event of extremely heavy rainfall. This is not a significant problem in this area.

Hazardous Exploration or Mine Workings

There are no known hazards or underground mine workings in this area.

Bonding Requirements

Bonding as required in 43 CFR 3041.3 and 3504.2-1(b) will be determined by the authorized officer in consultation with USGS. The minimum bond in 3504.2-1(b) is $1,000 for coal leases. State bonding is also required.

CHAPTER 2

DESCRIPTION OF THE ENVIRONMENT

CLIMATE

The climate of Mercer County is continental in nature with hot summers, cold winters, and low relative humidity. The climate is characterized by large annual and day-to-day temperature changes, light to moderate precipitation, plentiful sunshine, and nearly continuous air movement. The mean annual temperature is 40 degrees F, and extremes of 108 degrees F and -42 degrees F have been recorded at Beulah.

The average growing season is 120 days. The average annual precipitation is 16 inches of which most is in the form of rain, and falls during the growing season of April through September. June is usually the wettest month.

The prevailing wind is from the northwest and the average wind speed is 11 miles per hour.

AIR QUALITY

Air quality monitoring stations have been established throughout the State of North Dakota by the Department of Health. Two of these stations are located at Beulah approximately 6 miles east of the proposed lease site. Pollutants monitored are suspended particulates, sulfation rate, sulfur dioxide (SO_2), nitric oxide, nitrogen dioxide (NO_2), coefficient of haze, dustfall, suspended flourides, pH and Beta radiation.

The State of North Dakota has established ambient air quality standards. Based on the 1975 North Dakota Air Quality Report published by the North Dakota State Department of Health pollutant concentrations did not exceed these standards. Based on available data, dust is currently the largest pollutant.

GEOLOGY

Stratigraphy

Geologic formations ranging in age from Precambrian basement to Holocene alluvium are present in the area of the Indian Head Mine, but only the Paleocene Sentinel Butte is involved in mining. Mining would only affect the materials from the base of the coal bed upwards and any discussion of underlying materials would be irrelevant. A detailed description of the geology may be found in North Dakota Geological Survey Bulletin 56, Part 1.

The Sentinel Butte Formation of Paleocene age is the oldest formation exposed in the mine area. The Sentinel Butte consists of interbedded sand, silt, clay, shale, limestone, and lignite all of non-marine origin. The Sentinel Butte Formation contains the lignite deposit at the Indian Head Mine.

The glacial Coleharbor Formation is presently overlying the Sentinel Butte in the area of the mine, but will probably not be encountered in mining. Holocene alluvial deposits are present in valley bottoms surrounding the deposit.

Structure

The Indian Head Mine area is located in the southeastern part of the central Williston Basin. The center of this basin is situated south and east of Williston, North Dakota. No major structural features are recognized in the mine area.

Coal Beds

The Beulah-Zap bed of the Sentinel Butte Formation is the major commercial lignite bed in this area. This bed is approximately nine feet thick and is overlain by a maximum of 90 feet of overburden in the projected mine area. The lignite currently being mined in the area averages 7,074 BTU, 0.8 percent sulfur, 35.3 percent moisture, 26.6 percent volatile, 31.3 percent fixed carbon, and 6.7 percent ash. The reserves of federal coal in the lease application area are listed below.

440.96	Total Acres in Application
195	Strippable Acres (1)
3,071,000	S.T. Strippable Reserves (2)
2,610,000	S.T. Recoverable Reserves (3)

(1) Figure supplied by The U.S. Geological Survey

(2) Calculated by: Multiplying the average lignite thickness of nine feet by 1,750 tons/acre foot (the average weight of lignite coal - Averitt, 1974). The result is the tons of lignite per acre. This figure is multiplied by the strippable acres to give total reserve tonnage.

(3) This tonnage is obtained by multiplying the total strippable reserves by a recovery factor of 85 percent.

Paleontology

There are no known significant fossil sites in the application area. Gastropods are abundant in some light colored beds of the Sentinel Butte Formation in this area.

TOPOGRAPHY

Mercer County lies within the glaciated Missouri Coteau section of the Great Plains province. The site is in the Knife River-Spring Creek drainage. This is a rolling upland with an elevation varying from 1,900 to 2,100 feet. There are 2 major drainages dissecting the section. One drainage lies within the proposed mining area. The drainages flow in a southwesterly direction. See Figure 3 showing the relief of the area.

SOILS

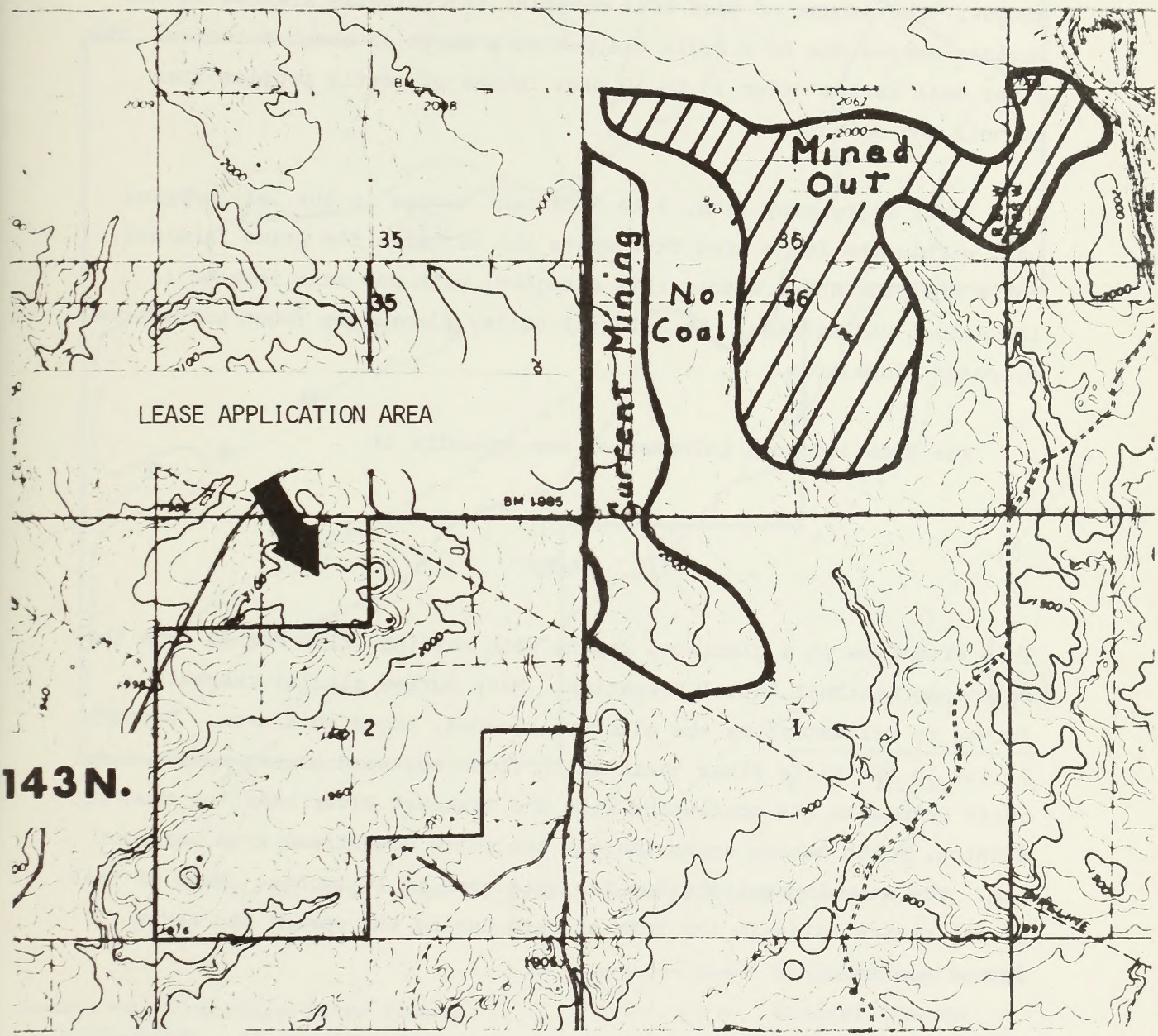
The soils of Section 2 have formed from the Sentinel Butte Formation of the Paleocene Era. The parent material is generally dull gray layers of silt, clay, and sand with interbedded sandstone, lignite, baked clay, and limestone.

Much of the soils information in this report is from the unpublished "Soil Survey of Mercer County, North Dakota," by the U.S. Department of Agriculture, Soil Conservation Service (SCS). The report has undergone final correlation and is awaiting publication in 1979. The soils in Section 2 were mapped by the SCS during 1974. They were identified and mapped at the series and type level, which is the most specific level of soil identification. Seventeen mapping units comprised of 16 major soil series were identified and described within the lease area. Of the 17 mapping units, 12 comprised of 13 major soil series are found within the proposed mining area. These 12 mapping units would be the ones most directly affected by the mining process. Other mapping units would

FIGURE 3

TOPOGRAPHIC RELIEF MAP

Coal Lease Application - NACCO



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be affected to some degree because of haul roads, stockpiling sites, etc., and others may not be affected at all. Most all the soils have material which would be suitable for use as final cover of strip mined land. The Ringling series typically has very little usable soil material due to its shallowness to porcellainite and high percentage of channery stones. The amount of good soil material is typically limited in the Rhoades series due to a sodic claypan at a depth of about 5 inches. The other soil series offer 10 to 30 plus inches of mostly problem-free topsoil and subsoil.

Grail silty clay loam, 3 to 6 percent slopes is the only mapping unit within the lease area that meets the criteria for prime farmland. There are nine acres within this category, with one acre located in the actual mining area. No alluvial valley floors are found within the proposed lease area.

For detailed soil information see Appendix II.

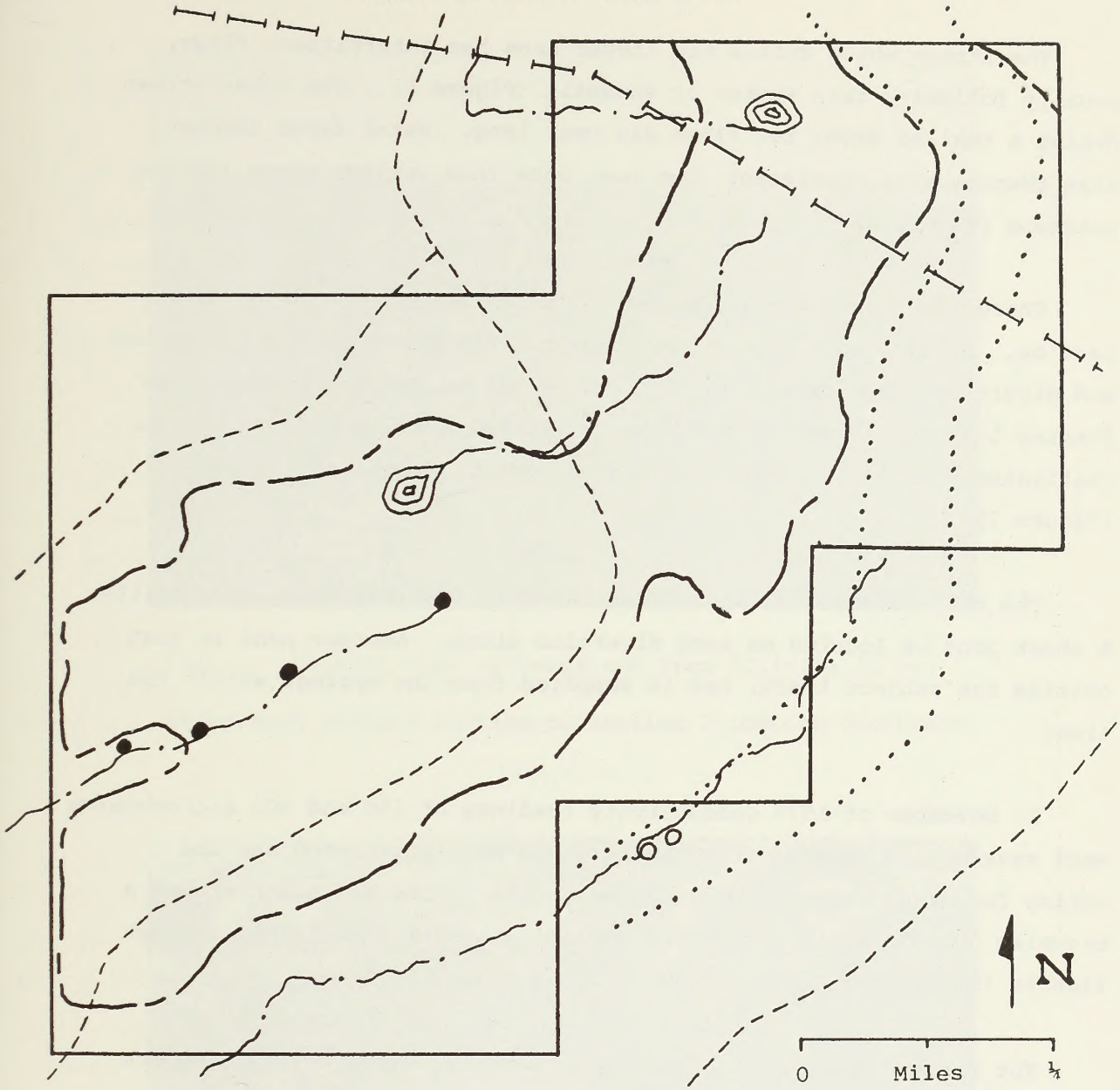
WATER

This area lies in a glaciated region with rolling hills formed from the Paleocene Sentinel Buttel Formation. Many buried glacial channels, formed by meltwaters as the glaciers receded, cross this area. Section 2 lies in the Knife River basin which flows eastward across west central North Dakota to its confluence with the Missouri River near the town of Stanton, North Dakota approximately ten miles downstream from Garrison Dam. The annual precipitation for this area is 16 inches. Most of this precipitation falls in the form of rain during the spring and early summer months.

The lease area is located on two watersheds (Figure 4). Water which comes off of these watersheds flows to the Knife River about two miles away through a series of intermittent streams.

FIGURE 4

PRESENT HYDROLOGY CONDITIONS



T143N, R89W, Sec. 2, Mercer County, North Dakota

Surface Water Channel

Stock Water Pond

Surface Watershed Divide

Surface Lease Boundary

Minable Lignite Bed

Glacial Channel

Major Seep or Spring

Water Well

Underground Pipeline

The stream which drains the larger area has intermittent flows, usually following rain storms or snowmelt (Figure 5). The other stream drains a smaller area, but flows all year long. Water flows through this channel at a consistent, but low, rate from springs along lignite outcrops (Figure 6).

There is a large knoll located in the northwest corner of the section. Ditches were dug on two sides of this higher area to intercept and divert overland flow into stock ponds and to prevent gullies from forming in the cultivated land below. Waterways which run through the cultivated land in the northeast quarter of the section are grassed (Figure 7).

The only on-site use of surface water is for livestock and wildlife. A stock pond is located on each diversion ditch. Another pond is just outside the subject tract, but is supplied from the springs within the tract.

In November of 1977 conductivity readings of 150 and 900 micromhos/cm were measured on samples from the northern most stock pond and the spring fed creek respectively. Water in the spring fed creek showed a brownish organic matter, coloring typical of water which flows through lignite in the area.

The surface geology of the area is Sentinel Butte Formation which has been dissected by both present and glacial streams. This creates an interconnecting shallow aquifer system between the lignite and sandstone seams of the Sentinel Butte Formation and the sand and gravel layers in the buried glacial channels. The intermittent stream channel is underlain by a buried glacial meltwater channel, and seeps along an outcrop of the coal seam which would be mined are the source of the spring fed creek. The coal seam is higher than the intermittent stream channel and so there is not direct interchange between the two systems within Section 2.

Fig. 5. General view of rangeland from hillside in extreme west central portion of section 2 looking Southeast.

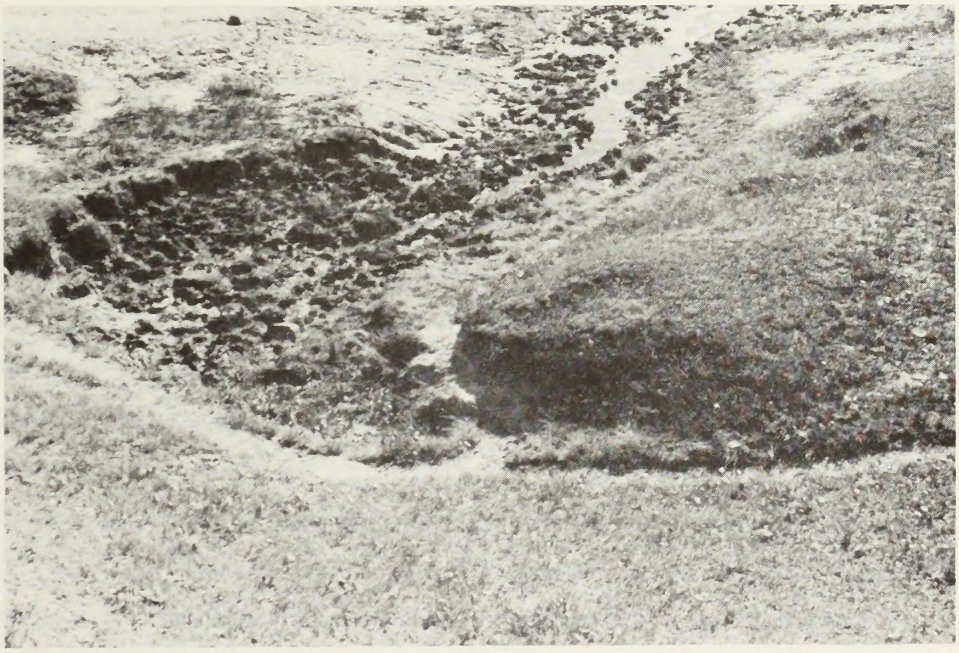


Fig. 6. A view of one of the springs in the area. Note deteriorated range conditions due to heavy livestock use.

The recharge for this system comes from lignite and glacial deposits that lie to the northeast and some local precipitation percolation. There are no data available which describe this aquifer system in Section 2. From data taken in surrounding areas, the lignite transmissivity is shown to be quite variable and the glacial deposits seem to be recharging the lignite veins.

The present on-site use of groundwater consists of two wells used for stock and domestic water supplies. The two wells are located near the farmstead in the southeast corner of the section and are not in the leased area. One well taps a lower and thinner lignite layer than the mineable lignite and the other taps a sand lense along the drainageway. The water flowing through the lignite which potentially could be mined is not tapped by a well, but is the source of the spring water which fills one of the stock ponds.

VEGETATION

The Indian Head proposed lease has a vegetative cover consisting of native range land and cropland. The vegetative cover is typical of that found on the Mixed Grass Prairie of the Missouri Plateau region of North Dakota (Figure 5).

Approximately 95 acres of the proposed mine area is still in native range. The range sites consist of thin claypan, clayey, silty, shallow and very shallow sites. The dominating vegetation is grass. Wheat grasses, green needle grass, blue grama, and little bluestem are the important species. Present range condition is fair to good. Over half the area is composed of low yield (700 to 800 average annual pounds of forage per acre) range sites caused by soil limitations such as claypan and very shallow sites. The rest of the area is composed of range sites with a potential yield of 1,600 to 2,000 pounds per acre.

The cropland portion of the area is a combination of tame hay, forage crops, and small grains (Figure 7). Small grain yields on most of the cropland would be low to medium. ASC soil survey has rated most of the mapping units as unsuitable for small grain production. Hay yields should run from 2,000 to 3,000 pounds per acre under good management. Probably the best use of the land would be in tame grass and/or alfalfa. Some of the cropland is submarginal for small grain production. Approximately 105 acres are presently into crop or hayland.

There is no endangered or threatened plant species list for the State of North Dakota according to the proposed Rules of the Federal Register dated July 16, 1976. However, Bill Barker, plant taxonomist at North Dakota State University, has developed a list of "rare and unique plants of North Dakota." Mr. Barker indicated a very remote chance of there being any rare plants on this location. An extensive field examination would be required to be absolutely sure they were not present. None were noted in the field examination for this analysis.

ANIMALS

The 440-acre tract is in the southwestern slope physiographic region of North Dakota. This region is characterized by broad, rolling uplands (Figure 5) which are interrupted only by streams and scattered buttes (Stewart, 1975). Two drainages run to the southwest through the proposed lease tract (Figures 8 and 9). Native prairie grassland complexes of vegetation stands cover about 60 percent of the tract. The remaining acreage is cropland.

Fig. 7. Northwest view from road on east side of section 2. Note cropland and grassed waterway.

Fig. 8. View of small butte in southwestern corner. Looking to Southwest from larger butte.

Fig. 9. West view over cropland toward large butte in the north and west of the tract. Sign indicates crude oil pipeline.

Fig. 10. Looking North along upper part of the intermittent drainway in the NE quarter of section 2. Note spoil piles in section 1.

The native prairie grasslands are mostly in the western part of the tract and are currently being used for cattle rangeland (Figure 1). Its productivity is estimated to be about 0.3 animal unit months (AUM) per acre, based on soil types and a general fair condition status (Shaver, 1977). About 95 acres of this rangeland type overlies mineable coal, and its total grazing productivity is 28 AUMs.

The drainages are parallel through the tract. The draw farthest south has the larger watershed and its flow is intermittent. In the lower portion of the drainage there are trees and shrubs on both sides. Although overgrazing has diminished the value of the buffaloberry shrubs, this woody draw is potentially valuable to wildlife. The other drainage has a few scattered, small stands of buffaloberry and a few springs which emanate from the coal seams. These springs provide a source of water for both wildlife and livestock. Heavy cattle use in and around the springs has removed potential habitat for wildlife (Figure 6). Below the springs just outside the tract there is a small reservoir used by both domestic and wild animals.

A small butte (Figure 8) between the two streams near the west boundary of the tract overlies mineable coal seams. It is important to wildlife. Field inspection indicated coyotes or red foxes have dens in the sides; a buteo hawk uses a rock on top for a perch; deer utilize it; and ground squirrels and other rodents live on it.

CULTURAL RESOURCES

The entire Section 2 was surveyed for cultural resources. Most of the acreage in the direct-impact corridor has undergone cultivation. The section had previously been surveyed by the North Dakota State Historical Society (Dill, 1976).

Two sites were recorded in Section 2. They were 32ME217 and 218 (Figures 11 and 12). Site 217 is a possible kill site situated within the direct impact zone. Site 218 is a lithic scatter and possible rock alignments on a prominent point outside (north) of the direct impact area. The material remains on both sites are sparse and surface evidence does not suggest much depth or extent of deposit in either site. See Appendix IV for details.

The site files of the North Dakota State Historical Society lists 12 archaeological and nine historic sites in T143N, R89W; T144N, R89W; and T144N, R88W. The archaeological sites are primarily tipi ring/rock cairn and rock alignments. One lithic scatter was recorded. Historic sites include coal mines, rock foundations, farmstead buildings, and a railroad bed. No especially noteworthy sites have been recorded in this immediate area.

Sites 217 and 218 are located within two miles of the Knife River. This valley is significant as the postulated hub of a prehistoric trade network involving a local variety of lithic raw material. It is also well known for a series of settled villages at the mouth of the Knife River about 30 miles downstream.

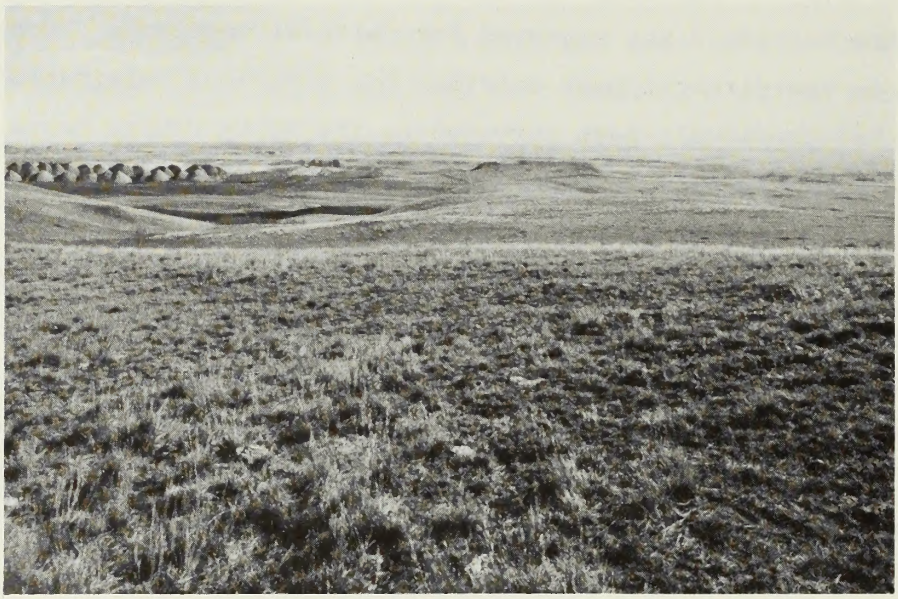


Fig. 11. Archeological Site ME 218 Lithic Scatter Site

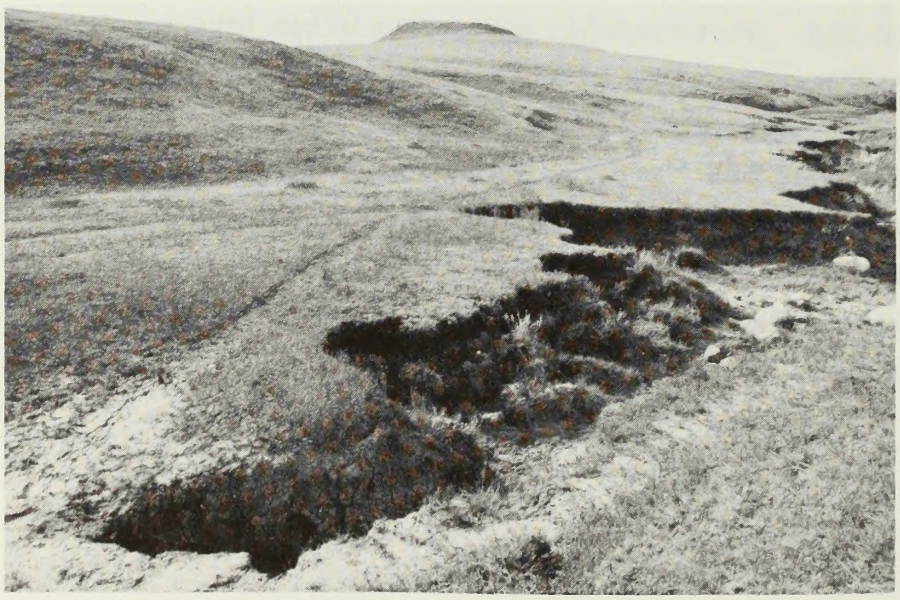


Fig. 12. Archeological Site ME 217 Possible Kill Site

AESTHETICS

The 440 acre tract proposed for federal coal lease is in a physiographic region of North Dakota characterized by broad rolling uplands which are interrupted by streams and scattered buttes (Stewart 1975). Although this region is largely unglaciated, two glaciated streams run through the middle of the tract beneath two buttes. Native prairie vegetal complexes which cover about 60 percent of the tract enhance its scenic quality, and the remaining acreage is cropland.

The aesthetics of the tract was rated and evaluated for scenic quality according to established procedures and criteria in BLM Visual Resources Management Manual 6310. The scoring of five BLM raters indicates that the overall scenic quality of the tract and surrounding landscape is low to moderate (See Appendix III).

RECREATION

All 441 surface acres of the federal coal tract proposed for leasing are privately owned and do not have any developed recreational sites. Some upland game bird and white-tailed deer hunting may occur, but this activity would be very minor. Even though most vegetation is native prairie, it is doubtful that antelope would be in huntable numbers. Because shelterbelts and wetlands are non-existent and shrubby vegetation is sparse, hunting opportunities in these habitats are limited. The stock ponds are not capable of supporting a fishery resource. The farmed acreage (about 40 percent of the tract) would provide hunting for upland game birds (pheasants, gray partridge, and sharptail grouse).

No attempt was made to inventory and evaluate the recreational demand and supply because the proposed leasing would not increase the local labor supply.

SOCIAL CONDITIONS

Initial analysis indicated that there would be no impact on the social environment from this action. Since there will be no increase in the rate of production there will be no change in the social state. Therefore, a detailed description of the social environment, i.e., schools, hospitals, housing, etc., was not done.

ECONOMIC CONDITIONS

Employment

Annual average employment in Mercer County, the site of the proposed action, has increased steadily from 1973 to 1975 (Table 2-1). Although Mercer County is in a predominantly agricultural area, only one out of every four employees in the county was employed by the agricultural sector in 1974. The sectors in Mercer County contributing the greatest amount to total county employment in 1974 were contract construction (15 percent) and wholesale/retail trade (13 percent). Employment in the contract construction sector has grown significantly (constituting only 6 percent of total county employment in 1972) in the last several years, due primarily to increased building activity in Mercer County's larger communities as well as construction activities associated with existing energy development.

Average annual unemployment rates in Mercer County are somewhat higher than those for the State (Table 2-2). It is expected that, without any further significant long-term economic developments in the area, the annual employment level in Mercer County would continue to grow moderately over the long term.

TABLE 2-1

ANNUAL AVERAGE EMPLOYMENT

	1973	1974	% Change ('73-'74)	1975	% Change ('74-'75)	1976	% Change ('75-'76)
Mercer County	2,801	3,219	+ 14.9	3,353	+ 4.2	3,542	+ 5.6
North Dakota	247,050	256,110	+ 3.7	265,840	+ 3.8	279,980	+ 5.3

SOURCE: North Dakota Employment Security Bureau: North Dakota Labor Force 1976

TABLE 2-2

ANNUAL AVERAGE UNEMPLOYMENT RATES
(UNEMPLOYED AS PERCENTAGE OF LABOR FORCE)

	1973	1974	1975	1976
Mercer County	5.8	4.9	5.9	5.5
North Dakota	5.1	5.0	5.2	5.1

SOURCE: North Dakota Employment Security Bureau

Population

Mercer County has experienced a reduction in population of approximately 9 percent during the period 1960 to 1970. Recent population estimates indicate that population levels in Mercer County have increased somewhat from 1970 to 1975 (Table 2-3). During the 1960s, the percentage of people living in incorporated communities rose from 54 percent to 60 percent; reflecting a trend toward increased urbanization. Mercer County had no individuals residing in "urban" areas in 1970 (i.e., communities of 2,500 or more people), and only 34 percent of its inhabitants lived on rural farms. The remaining 66 percent lived in rural, non-farm residences; places defined by the United States Census Bureau as towns of less than 2,500 people and persons living on ten acres or less with farm product sales of less than $50 per year.

Income

Total personal income in Mercer County increased by 107 percent from 1970 to 1974. In 1974, Mercer County's leading sectors with respect to personal income were contract construction (25 percent of county total), farming (20 percent), and wholesale and retail trade (17 percent). Mercer County's 1974 personal income in the mining industry constituted 14½ percent of the State's total personal income for that industrial activity.

Mercer County's level of total retail sales in incorporated places increased by 36 percent from 1973 to 1975 (Table 2-4). This reflects the increased economic activity in Mercer County associated with annual increases in employment for the same period shown in Table 2-1.

TABLE 2-3

MERCER COUNTY AND INCORPORATED COMMUNITY POPULATION

	1960	1970	1975[1]	% Change 1960-1970
Mercer	6,805	6,175	6,213	- 9.3
Beulah	1,318	1,344		2.0
Golden Valley	286	235		-17.8
Hazen	1,222	1,240		1.5
Pick City	101	119		17.8
Stanton	409	517		26.4
Zap	339	271		-20.1
Incorporated Community As % of County Total	54	60		

SOURCE: U.S. Census Bureau, Department of Commerce 1971

[1]Population estimate provided by North Dakota Regional Environmental Assessment Program 1977

TABLE 2-4

TOTAL SALES FOR INCORPORATED PLACES
(DOLLARS)

	1973	1974	1975	% Change 1973-1975
Mercer County				
Beulah	12,957,210	16,278,171	16,258,063	+25
Golden Valley	335,533	339,709	418,776	+25
Hazen	9,985,003	12,632,982	14,304,985	+43
Pick City	63,073	72,458	87,116	+38
Stanton	4,308,057	4,805,364	6,607,916	+53
Zap	389,793	339,818	457,001	+17
TOTAL	28,038,669	34,588,502	38,133,857	+36

SOURCE: North Dakota Tax Department, North Dakota Sales & Use Tax Statistical Report, Annual 1973, 1974, 1975.

TABLE 2-5

1970 INCOME DISTRIBUTION

	% Families in Poverty	% Families Earning in Excess of $15,000
Mercer County	17.7	7.1
North Dakota	12.4	12.8
United States	10.7	20.6

SOURCE: USDA Census 1971

*Poverty levels vary by several factors. For example, the level in 1969 for an unrelated female living on a farm and over 65 years old was $1,487. The level for a male-headed household not living on a farm with seven or more persons was $6,116. The "average" poverty level established, for a male-headed household with four persons not living on a farm, was $3,745 in 1969.

Census Bureau data on 1970 income distribution in Mercer County, the most recent data available, shows that a greater percentage of Mercer County families were in poverty than in either North Dakota or the United States. Similarly, in 1970, Mercer County had a smaller percentage of families earning over $15,000 than did North Dakota or the nation (Table 2-5). Median family income in Mercer County was significantly less than that for the State as a whole ($6,714 vs. $7,838) in 1970. However, Mercer County showed signs of closing this income gap during the period 1960 to 1970 as its median family income figure grew slightly faster than that of North Dakota (83 percent vs. 80 percent).

Indian Head Mine currently produces 1.1 million tons of coal per year. At the current coal severence tax rate of $.66 per ton (which increases by one cent for each one point increase in the Wholesale Price Index measured from June 1977), approximately $726,000 per year in coal severence taxes are paid to the State of North Dakota due to operation of the Indian Head Mine. This money is disbursed in the following manner: 30 percent to the State general fund, 35 percent to the North Dakota Impact Office, 15 percent to the State trust fund, and 20 percent to coal-producing counties according to their percent of total state coal production.

LAND USE

The surface over the proposed lease area is owned by John Buechler. He is using the land for row crops, hay meadow, and pasture land. Approximately 60 percent of the proposed lease area is grazed and the remaining part is cultivated. Two small stockwater ponds are also constructed on this tract. Wildlife utilize this tract along with the adjoining lands. The surrounding area is divided approximately equally between crops and pasture.

North American is currently mining to the northeast in the adjacent sections (Figures 3 and 10). The anticipated mining progression from the present location is to the south and west.

Access to the area is good. A well maintained county road system traverses the general area. One of the county roads borders the proposed lease area on the north and east sides. The proposed area is approximately three and one half miles south of Zap and eight miles southwest of Beulah.

Burlington Northern's railroad and tipple are located four and one-half miles to the northeast.

AMOCO has a petroleum pipeline across the north portion (Lots 1 and 2) of the proposed lease area (Figure 2). The pipeline location is identified on the ground by signs, such as the one shown in Figure 9. The pipeline is 16 inches in diameter and averages two to three feet in depth. Crude oil is transported through the line from Tioga to Mandan refinery.

The proposed tract does not have the qualities that are needed for a wilderness area. The closest wilderness areas are more than one hundred miles away.

CHAPTER 3

ENVIRONMENTAL IMPACTS

CLIMATE

The vegetative cover would be destroyed through the removal and stockpiling of top soil. Vegetation normally has a cooling effect by shading the surface. Air temperature would increase and air flow would be altered due to the change in land form created by the overburden piles. Impacts would only alter the micro climate.

AIR QUALITY

Mining of this tract would result in a negative low impact due to the increase in particulate matter. Ambient air standards would be exceeded locally during periods of high winds, but would not be increased in the area monitored as mining this tract is just moving from a mined out area to a new area. State Air Quality standards must be met in order to continue operations.

Exhaust emissions from heavy equipment would not be increased as the same equipment presently operating in the mine will be working on this site. This would result in a low negative impact and would be insignificant outside of the proximity of the operation of the engines.

Fugitive dust would increase locally during the mining operation, but will not increase over the general area.

GEOLOGY

The primary impact of strip mining on the geologic component of the environment would occur during overburden and coal removal. The integrity of the coal bed and the overlying strata is completely destroyed during these operations. The paleontological values, which are negligible, would also be destroyed.

TOPOGRAPHY

The major impact to the topography would occur during the removal of overburden. The natural topography would be somewhat modified.

SOILS

The soils would be affected in various ways by the mining process. Presently there is a wide variation in depth of topsoil and subsoil between the different soil series. Removal and stockpiling would be in response to these variations in depth. However, when the material is respread there would be a much more uniform condition existing in regard to depth. This would be a positive impact on such areas as the present Ringling soils. Since it is a very shallow soil as mentioned in Chapter 2, it would be improved by the reduction in slope and respreading of more soil material than originally existed. Some of the areas would have less soil material after respreading than exists in the natural state. This may or may not be a negative impact depending on the quality of the material respread.

Mixing the different types of soil will alter the composition of the material respread during reclamation. This may improve some of the areas of present soils. During a conversation with Drs. Power and Sandoval at ARS, Mandan, North Dakota, they stated that some soils with a sodic claypan such as Rhoades and Belfield can be improved by deep plowing. These soils have a layer of gypsum below the sodic B horizons. By deep plowing, the gypsum is mixed into the profile. Through chemical reaction with the gypsum, the sodium forms salts which can be leached out of the soil profile. This process may take two to three years depending on precipitation amounts and patterns. The reclamation process may have some of the same effects as deep plowing.

Soil structure will be temporarily disturbed, or altered, depending upon degree of mixing. In some cases this disturbance may be beneficial, such as where a claypan now exists. In other cases, it may have negative effects on soil drainage, infiltration, and permeability, especially if the soil is disturbed, or compacted when wet.

The present nutrient cycle would be disrupted since organic matter, micro and macro organisms, and the mineral fraction would be disturbed and mixed.

Stripping off the vegetative cover and stockpiling the surface layers of soil increases the probability of erosion. This, along with handling operations would cause the unavoidable loss of some soil material.

Soils to the east and south of the proposed mining area might be impacted indirectly. Analysis of surrounding overburden would indicate that substrata of Section 2 will be high in excess sodium. Should this material be stockpiled along the south and east side of the proposed mining area, rainstorms will wash excess sodium along with fine particles onto the soils down slope. This could result in higher sodium contents in topsoils not located in the mined area.

The one acre of prime farmland within the proposed mining area is adjacent to a county road and restrictions on mining near roads would preclude this area from actual mining.

WATER

Removal of the vegetation, topsoil and overburden will destroy the rooting system and soil structure which holds the soil in place. When the topsoil and overburden is stockpiled it will be exposing a larger surface area of material with a higher level of salinity, steeper slopes, and less soil erosion resistance to wind and water. Access to the area will have to be provided for the various pieces of equipment used in the mining operation. Areas where haul roads are built will be highly compacted by the heavy vehicles and will experience a larger amount of surface runoff.

In addition to the natural salinity of the topsoil and overburden, the oxidation reaction of pyrite, which normally occurs throughout the Fort Union Group, will form additional salts readily available to be dissolved by water. The oxidation reactions occur when pyrite buried in a reducing environment is exposed at the surface in an oxidizing environment. The pyrite is oxidized by oxygen and water to an acid which then reacts with calcite and dolomite to form sulfate and bicarbonate salts.

As a result of the above, surface runoff will increase and have a higher concentration of both dissolved and suspended solids.

Mining activity will destroy a large part of the watershed area and channel which drains into the spring fed creek and a small portion of the intermittent stream's drainage area. The effect of destroying the spring fed basin and channel will be lessened by the reduction in flow brought about by removing the aquifer material which is its source of water.

Parts of the intermittent stream channel are within the lease area. Disruptions such as roads, stockpiling, or digging in or close to this channel will result in a large increase in the suspended solids concentration of the intermittent stream and lengthen the time required for reclamation.

The variability in the transmissivity of the lignite aquifer is dependent on the amount of fracturing. Any blasting done in the lignite could increase the amount of fracturing and therefore increase the transmissivity of the unmined lignite beneath the high area in the northwest corner of the section. Water will still be moving through this remaining lignite and so new springs may form along its southern edge.

When the area has been topsoiled, graded and revegetated, soil erosion and stream sediment will stabilize. If fertilizers, herbicides, pesticides, insecticides, etc. are applied too heavily during revegetation, some undesirable chemicals may be introduced into groundwater or surface water.

The overburden and topsoil will be more porous and so will allow oxygen and water to move through it more easily. Recharge to the groundwater by rainfall percolation may increase a little and oxidation of pyrite and the dissolving of salts by groundwater will continue, but at a slower rate than when the mine pit was open.

Due to the extent of mining activity in the surrounding area, the impact on water from mining in Section 2 will be minor. The two wells located near the farmstead will not be impacted.

VEGETATION

The mining process will destroy all existing vegetation in the proposed mine area and, on adjacent land that is used for haul roads and other mining activity. This will be a short time loss until reclamation is achieved.

ANIMALS

Removal of topsoil and mining operations will eliminate opportunities for domestic and wild animals during the mining and reclamation phases. Domestic animals will lose at least 95 acres of rangeland which yields about 28 AUMs and an additional 100 acres of cropland will be taken out of the production of feed grains. Virtually all wildlife value will be lost during mining and reclamation phases. Mobile animals (deer, grouse, songbirds, etc.) will be able to physically relocate to other habitat, but most will be lost to the population since other niches are usually at carrying capacity. Sedentary wildlife (invertebrates, mice, etc.) will be destroyed as the surface soils are removed.

Since only one tree and just a sparse stand of buffaloberry will be destroyed, very little wildlife habitat will be lost. With little or no aquatic habitat on the tract, aquatic animals and their habitat will not be affected.

Two stock watering ponds will be removed for the purpose of extracting coal. Both livestock and wildlife will be without water for drinking until these ponds are replaced. Mobile wildlife species will be able to obtain drinking water from the settling pond and the reservoir in Section 3 near the west boundary.

CULTURAL RESOURCES

One site was recorded within the direct impact zone. This is site 32ME217, located in the bottom of a gully cut in the SE¼NW¼SW¼. If the area is strip mined this site will be totally destroyed.

Site ME218 is situated in the NW¼ on an elevated location approximately 150 to 200 meters north of the proposed strip mine area. The site extends over much of the top of the bench, and along a spur ridge. The site may be far enough outside of the strip mine corridor that it can be avoided. If roads are constructed for earth moving equipment across these elevated prominences, or if talings and earth are piled up against this bench, the site will be disturbed.

AESTHETICS

Spoil piles, draglines, mining facilities, and reclamation equipment will temporarily dominate the landscape. These intrusions will significantly lower the overall scenic quality. The mining and reclamation operations will be noisy and will diminish the aesthetics further. Effects from visual intrusions and noise will be acute but short-lived, and they will be mostly a carryover from similar operations on adjacent mining tracts.

Removal of the small butte between the two streams near the west boundary will significantly change the landscape and will constitute a large loss in scenic quality. The change in vegetal composition from native prairie to tame grasses will only have a low-moderate effect on scenic and aesthetic values.

RECREATION

Direct and indirect impacts upon recreational opportunities are expected to be low because (1) there are no recreational sites on the tract; (2) no increase in labor supply is expected; and (3) little high value wildlife habitat for hunting would be directly affected.

SOCIAL CONDITIONS

No significant social impacts are anticipated should the proposed action take place. Included are effects on local housing, educational institutions, social services, public safety, and public health conditions. The reason for this scarcity of significant impacts attributable to the proposed action is that the operation is on-going and community changes generated by the operation have transpired in the past. No population increases are anticipated which would alter the existing social environment.

ECONOMIC CONDITIONS

Leasing of Section 2 will not result in any short-term changes in the economic structure of Mercer County or the surrounding area. Although no immediate changes are forecasted, it is expected that the proposed action would extend the life of the Indian Head Mine by approximately 3.5 years. This estimate utilizes a mining rate of 1.0 million tons per year and a strippable reserve figure in Sections 2 and 3 of approximately 3.5 million tons. Consequently, those economic conditions existing in Mercer County and the State, attributable to the Indian Head Mine, would be extended for approximately 3.5 years if the proposed action was implemented.

The leasing of Section 2 would result in the payment of federal coal royalties to the State of North Dakota. The State would receive one-half of the total federal royalty payment, an amount as yet undetermined. Section 2 contains approximately 2.9 million tons of strippable federal coal. A severance tax rate of $.66/ton would generate approximately $1.7 million in revenue to the state from mining the coal in Section 2. There is also another 0.9 million tons of private coal adjacent to Section 2 (i.e., in Section 3) that could be mined only if the federal lease is obtained by the North American Coal Company. Severence tax revenue from this coal (approximately $600,000) would also be generated in the event that Section 2 is leased. Consequently, the mining of 3.5 million tons of coal in Sections 2 and 3 would result in approximately $2.3 million to the state in coal severance taxes.

LAND USE

Mining will take place on approximately 195 acres of the 440.98 acre tract. A working fringe around the 195 acres will be needed. This area may be used for service roads and stockpile sites. The remaining portion of the 440.98 acre tract will not be disturbed.

The current uses, farming, haying, livestock grazing, and wildlife habitat, will be interrupted as mining progresses through the tract. Losses of the current land uses will continue until the area has been reclaimed.

AMOCO's crude oil pipeline is within the proposed mining area. Federal coal lies under the pipeline and right-of-way. Removal of coal from under the pipeline would suspend the pipeline which would result in its breaking. Heavy equipment travel over the pipeline out of the lease area may cause drainage from vibrations.

CHAPTER 4

MITIGATING OR ENHANCING MEASURES

CLIMATE

Since impacts on climate are very minimal, no mitigations are recommended.

AIR QUALITY

Keep mining equipment properly maintained to minimize the level of exhaust emissions. Water or oil haul roads to reduce the amount of particulate matter.

GEOLOGY

There are no feasible mitigating or enhancing measures applicable to the geologic components of the environment.

TOPOGRAPHY

Disposition of any highwall shall be determined after consultation with USGS, BLM, North Dakota Public Service Commission, and the landowner.

All spoils will be graded to the approximate original land topography.

SOILS

Follow all regulations in regard to removal and stockpiling of soil material, handling of overburden, and prime farmland if impacted.

Construct a berm or diversion ditch along the eastern and southern edges of the area affected by mining to prevent spoil material high in excess sodium from being carried onto topsoils down slope during periods of rainfall. Use in other locations where necessary to reduce erosion.

Leave slopes more gentle where steep slopes now exist if this is more advantageous to reduce erosion and improve farming and grazing.

Re-establish the two diversion ditches and stock ponds to pre-mining conditions compatible with the post-mining topography as they help control erosion.

Use proper types and amounts of fertilizers on reclaimed areas to insure the restoration of a good nutrient cycle.

Use mulches on reclaimed areas to reduce wind and water erosion.

WATER

No disturbance or stockpiling within 200 feet of the intermittent stream channel. The most severe erosion and sedimentation problems occur when disturbances are made where water flow is the most concentrated.

Locate a sediment catchment basin on each stream leaving the lease area. This will eliminate any sediment which does get to the stream channel.

Construct diversion ditches to prevent any surface water from entering or leaving the mining area. Place a berm or diversion trench around the rim of the mine pit to prevent surface water from entering the pit. Water which does get into the pit will pick up the salts which result from the oxidation reactions. Pump this relatively salty water into holding ponds to be evaporated or treated as necessary.

Install a water quantity and quality monitoring system to assess the mining impacts on water. Monitor the spring fed creek and if its water quantity or quality is below that which exists at the present time, provide an alternate source of water at that location. Also monitor the intermittent stream, two farmstead wells, water in the mine pit, lignite aquifer, and glacial channel aquifer.

Protect the surface water and groundwater from contamination by materials such as undesirable previously buried overburden and pesticides, herbicides, fertilizers, insecticides, etc. used during the revegetation phase of reclamation by applying only the appropriate amount needed.

Re-establish grassed waterways, diversion trenches, and stockponds around the knoll in the northwest corner of the section to their premining condition and location compatible with the post-mining topography.

VEGETATION

Range land portion: Restore vegetation to a native grass cover. Wheat grasses and green needle grass are recommended. Prior to reclamation the BLM, USGS, PSC, landowner, and mining company should work up seed and planting stipulations. There are several grasses and legumes that grow well on reclaimed lands.

Cropland: The cropland will be ready for planting as soon as the topsoil is returned. Normal farm practices will be adequate to produce a good yield. In areas where the plant material is highly compacted it will be necessary to pre-rip.

ANIMALS

Continuation of livestock grazing on the rangeland in the northwest corner of Section 2 will require temporary replacement of the two stock ponds. Temporary stock tanks or ponds will also benefit wildlife.

Since the loss of wildlife habitat is minimal and the land will be reclaimed for agricultural purposes, mitigation is not necessary.

CULTURAL RESOURCES

If site 32ME218 can be avoided, no further work will be necessary. If the site is going to be impacted, the site should be tested for depth. Testing can be accomplished with a series of perhaps three test pits, which can be excavated in three days by two workers.

Controlled surface collection at the site will not be necessary as surface materials are too sparse to yield significant information.

Site 32ME217 will be destroyed, and while material indications at the site are meager, the sites must be tested for depth and extent. The site may be tested by digging three or four backhoe trenches. An archaeologist can then quickly determine whether or not there are further deposits at the site. If deeper deposits are encountered, further mitigation studies may be required if they prove to be significant.

AESTHETICS

If the small butte between the two streams near the west boundary is disturbed or removed, it should be reclaimed. Replacement can be accomplished by creating a small, steep-sided hill which shall have exposed boulders or large rocks.

Return most disturbed acreage to grassland of mixed tame (including tall wheatgrass) and native species. (Since removal of the overburden will probably result in increased elevation of the mined area, either the slopes into or bed gradient of the north stream will consequently be increased.) Plant native shrub species, i.e., buffalo berry, along the stream and contributary draws to replace the present stands and enhance the quality of the reclaimed vegetation.

Remove surface buildings, supporting facilities, haul roads, and all other structures.

RECREATION

Recreation opportunities are so limited and impacts so minimal that no mitigations are recommended.

ECONOMIC AND SOCIAL CONDITIONS

No mitigation would be required with respect to economic and social conditions as a result of the proposed action.

LAND USE

The applicant is committed to full compliance with federal, state, and local laws and permit regulations.

In the mining and transportation of the coal within the proposed lease area, AMOCO's right-of-way must be honored.

CHAPTER 5

RESIDUAL ADVERSE IMPACTS

Residual adverse impacts are those remaining after application of those mitigations found in Chapter 4 and those the applicant legally commits himself to.

GEOLOGY

The integrity of the coal bed, the overlaying strata, and enclosed paleontological values are destroyed by mining. Lignite is a non-renewable resource.

SOILS

Even with careful procedures, a small amount of soil loss would be unavoidable during handling operations and through erosion.

Chemical and physical properties characteristic to each type of soil would be mixed. This would be desirable in some cases and detrimental in others.

WATER

The lignite in Section 2 which would be mined is an aquifer and most of it within Section 2 will be gone and replaced with overburden material which will yield less water. There are other lignite seams which would yield similar amounts of water and there are no wells which presently tap this lignite, but the mineable coal does supply water to the spring fed creek which is used to water livestock.

By removing the lignite, the nature of the spring fed creek's flow will be altered. This flow will probably be reduced and contain a higher concentration of dissolved solids. Due to the oxidation reactions and mixing of overburden, the total dissolved solids of groundwater and stream baseflows will be higher. There is no data available at the present time to quantify these impacts.

ANIMALS

The native prairie complexes of vegetation can never be restored to regain all the original niches of the indigenous wildlife species. Some wildlife species which have very specific and narrow habitat requirements won't be able to adapt to a tame grass environment and will cease to exist.

AESTHETICS

There will be permanent changes in both land form and vegetal composition. These changes will have low-moderate impact on scenic and aesthetic values.

CHAPTER 6

SHORT TERM VS LONG TERM PRODUCTIVITY

Coal strip mining on this site will extend the Indian Head Mine life in this area by about 2.5 years. Including premining tests, production, and reclamation the short term use of this area will be about seven to twelve years.

During the short term use time frame, the economic viability of the area in terms of employment and income from the operation of the mine will be maintained. The geology from the base of the coal bed to the soil materials, the opportunity to develop surface or subsurface water in the section and the soil structure necessary to support vegetation will be in use for coal mining. The aesthetics of the area and any cultural resource remains not removed or documented will be disrupted. The vegetation, wild and domestic animal habitat and use, and any recreational, grazing, or farming opportunities will be unavailable for use. Water diverted into holding ponds and evaporated will not be available for downstream use.

In the long term the coal bed will be lost to future mining, however, the coal may also be lost to man's use even though not mined. The reduction of slopes, alteration of soils such as the Rhoades and Ringling, and management oriented toward practices that control erosion and maintain organic matter content and fertility could make the long term productivity of the soil better than that prior to mining. Any buried cultural resources not recovered or documented during mining will be lost. Mining would remove a local and presently untapped aquifer and thus remove the opportunity to develop a well in the aquifer. There are however, other aquifers, both shallow and deep, which will still be available. The remaining environmental components (geology below the mined coal, vegetation, wild and domestic animal habitat and use, aesthetics, surface water patterns and recreation, grazing and farming opportunities) will return and the land will again be productive for the future.

CHAPTER 7

IRRETRIEVABLE RESOURCE COMMITMENTS

The purpose of this chapter is to identify impacts that would cause irreparable damage or permanent (or exceptionally long term) changes to the environment.

There are several permanent changes or losses that will be sustained by the environment. The coal is a non-renewable resource and once mined is not replaced. This removal will also destroy the coal seam as an acquifer.

There will be a loss of forage and crop production on cropland and domestic livestock grazing on rangeland during the period mining and reclamation are taking place.

Some wildlife species which are habitat specific will be lost because of the destruction of present vegetative communities. However, successful reclamation will create habitat which could enhance both wildlife species diversity and numbers.

The mining process and subsequent landscaping and seeding during reclamation will change the appearance of the land, i.e., general topography and vegetation.

Economically, energy (in the form of electricity and fossil fuels), labor, and capital will be committed to the project.

The soil units and vegetative communities are lost as they now exist. They will return in a new form with reclamation.

CHAPTER 8

ALTERNATIVES TO THE PROPOSED ACTION

The only viable alternative to leasing the coal is to not lease. Since the tract is relatively small, mining only a portion of it would not be at all practical. Analysis of different energy conversion, i.e., solar, wind, etc., is not within the scope of this analysis, nor could such a conversion take place in the time frame in which the subject coal is required.

Not mining the coal would not have any serious adverse environmental impacts. The existing physical environment would not change. Impacts to the environment on this tract would then be from mining occurring on adjacent land. Since the company would move to another site in the immediate area, there would be no change in employment and payroll. Therefore, there would be no change in the local social and economic environment.

Adverse economic impact would be felt by the company which purchased the surface lease in anticipation of mining the federal coal. The company would also lose private coal that they would be unable to economically mine. Royalties from the sale of the coal would be lost to the Federal and State treasuries.

If not leased at this time the coal in all likelihood would never be mined and utilized.

CHAPTER 9

CONSULTATION AND COORDINATION

The following persons and organizations were contacted during the preparation of this report.

SCS — Ken Rye, District Conservationist, Hazen,ND to discuss soils at Indian Head location.

Ken Thompson, Area Soil Scientist, Dickinson to discuss soils at Indian Head and their reclamation potential.

Sylvester Ekart, Soil Scientist, State Office in Bismarck for identification of prime farm land.

ARS — J.F. Power, Soil Scientist, Mandan, ND

F.M. Sandoval, Soil Scientist, Mandan, ND to discuss reclamation research.

USF&WS — James Nelson, Biologist, Bismarck, ND, to discuss endangered species and their habitats in relation to Section 7 of the Endangered Species Act of 1973.

USGS — Douglas Hileman, Area Mining Supervisor, Billings to discuss total and strippable reserves, lignite thickness, strippable acreage, overburden limit.

Randy Heiser, Mining Engineer, Billings, MT for Technical Exam.

North Dakota State

Jim Deutsch, PSC, Soil Scientist, Bismarck to discuss soils at Indian Head and their reclamation potential

Dean Peterson, PCS, Bismarck.

William Lynott, Biologist, and Robert Morgan Chief of Lands and Development, ND Game & Fish, Bismarck to discuss concerns of wildlife habitat on the Indian Head location.

North Dakota State, cont'd

Dana Mount, ND Public Health Department, Bismarck.

Karen Thompson, ND Outdoor Recreation Agency, Mandan to discuss recreation and aesthetics in the Indian Head Mine area.

Chris Dill, State Historical Society, Bismarck to discuss cultural resources.

North American Coal Company

Robert Murray, President, Bismarck

Peter Nielsen, Spec. Project Engineer, Bismarck

Jim Brown, Reclamation Manager, Bismarck

Joe Mitzel, Indian Head Mine Superintendent

Clayton Gerboth, Geologist

Discussed proposed action and the mining methods.

Ray Butler, Hydrologist, Bismarck discussed lignite and buried glacial valley aquifer system water levels and recharge.

AMOCO Dave Erickson, Tioga, ND to discuss pipeline.

Landowners

John Buechler, Zap to discuss proposed mining on his land. Discussed water impoundments, grassed waterways, spring flows, farmstead wells, and other water related features in the area of Section 2.

Melvin Rodenburg, Beulah to discuss the fishing opportunities of the reservoir on his property (Section 3) to the west of the Indian Head Mine lease (Section 2).

APPENDIX I

REASSESSMENT OF PLANNING RECOMMENDATION FOR

COAL LEASING IN AREA S-2

Section 2, T143N, R89W

November 23, 1977

Prepared By:

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Surface Protection Specialist

Charles W. Pettee
Hydrologist

Concurrence By:

Charles E. Steele
District Manager

Donald W. Rufledt
Soil Scientist

APPENDICES

APPENDIX I - REASSESSMENT OF PLANNING RECOMMENDATION FOR COAL LEASING IN AREA S-2

APPENDIX II - SOILS INFORMATION

APPENDIX III - VISUAL RESOURCES

APPENDIX IV - PREHISTORIC AND HISTORIC FEATURES

I. INTRODUCTION

II. HYDROLOGY

- SURFACE WATER CONDITIONS
- GROUNDWATER CONDITIONS
- IMPACTS
- RECOMMENDATIONS FOR MITIGATIONS

III. SOILS

- DESCRIPTION
- IMPACTS
- RECOMMENDATIONS FOR MITIGATIONS

IV. RECOMMENDATIONS

REASSESSMENT OF COAL LEASING

Section 2, T143N, R89W

I. INTRODUCTION

In the BLM planning process for the West-Central North Dakota Land Use Analysis, it was determined that no further leasing should occur in the areas designated as S-2. (See Map #1)

The entire S-2 area south of Highway 200 was recommended for no further leasing because of poor reclamation potential and a high possibility of degradation of Knife River, Spring Creek, and their associated underground aquifers.

Through the public participation process in July of 1977, North American Coal Corporation partially disagreed with our recommendation. They felt that Section 2, T143N, R89W within the S-2 area should be leased and requested that BLM re-evaluate that portion of the recommendation area. They agreed that it is not feasible to mine the area northwest of Section 2 due to environmental and reclamation concerns.

The purpose of this report is to discuss the results of the re-evaluation of the reclamation potential and hydrological and soils concerns in Section 2, T143N, R89W.

The assessment covered an area of 440.96 acres described as:

Section 2, Lots 1 and 2, S½N½, NW¼SE¼, SW¼

T143N, R89W, 5th P.M., Mercer County, North Dakota

According to North American Coal Company estimates, Section 2 contains 1,870,000 tons of recoverable coal.

The present land use of the area is farming and pasture land as indicated on Map #2.

II. HYDROLOGY

The subject area lies in a glaciated region with rolling hills formed from the Paleocene Sentinel Butte Formation. Many buried glacial channels, formed by meltwaters as the glaciers receded, cross this area. Section 2 lies in the Knife River basin which flows eastward across west central North Dakota to its confluence with the Missouri River near the town of Stanton, North Dakota approximately 10 miles downstream from Garrison Dam. The annual precipitation for this area is 16 inches. Most of this precipitation falls in the form of rain during the spring and early summer months. Map #3 shows the major surface and subsurface hydrologic features on Section 2.

Surface Water Conditions

The lease area is located on two watersheds. Water which comes off of these watersheds flows to the Knife River about 2 miles away through a series of intermittent streams.

The stream which drains the larger area has only intermittent flows, usually following rain storms or snowmelt. Most of the runoff through this channel is over the surface, but a substantial amount of ground water base flow is received from the glacial channel buried below the stream.

The other stream drains a much smaller watershed area, but flows year long. Most of this flow is a result of springs, which flow from lignite outcrops along the stream. While the stream flows year round, the flow rate is very slow and probably never exceeds 1 cfs. This lignite layer is the one proposed to be mined.

There is a large knoll located in the northwest corner of the section where ditches were dug on two sides to divert overland flow into stock ponds and to prevent gullies from forming in the cultivated land below.

The only on-site use of surface water is for stock watering. Two of the stock ponds are located on the diversion ditches and another on the spring fed creek.

Groundwater Conditions

The two major shallow subsurface hydrologic features on the section are the lignite vein to be mined and a glacial meltwater channel underlying the stream channel on the east side of the section, both of which transmit water.

The lignite which would be mined is located in the Sentinel Butte Formation which has been dissected by both present and glacial streams creating an interconnecting shallow aquifer system between the lignite and glacial channels. In this section the lignite which is proposed to be mined is a major aquifer for which the recharge area is lignite and glacial deposits that lie to the northeast. There are no data available which describes this aquifer system in Section 2. From data taken in surrounding areas, the lignite transmissivity is shown to be quite variable and the glacial deposits seem to be recharging the lignite veins.

The present on-site use of groundwater consists of two wells used for stock and domestic water supplies. The two wells are located near the farmstead in the southeast corner of the section and are not in the leased area. One well taps a lower and thinner lignite layer and the other taps a sand lense along the drainageway. The water flowing through the lignite which potentially could be mined is not tapped by a

well, but does supply the spring water which fills one of the stock reservoirs mentioned in the surface water section.

Impacts

Removal of the topsoil, overburden and lignite will have several impacts on the hydrology of the area.

The vegetative cover will be destroyed and the overburden materials will be exposed at the surface of spoils piles. Topsoil stockpiles can be temporarily seeded, but overburden material will not support vegetation.

A temporary system of haul roads must be installed. Soils in these areas will be highly compacted by the heavy equipment and infiltration will be reduced significantly.

Water which does find its way into the mining pits will have to be pumped out periodically.

All three of the above surface water impacts will cause the sediment loading of the two streams of the area to increase. In addition to this, the runoff from the stockpiled overburden material and exposed lignite, which were previously protected from exposure to precipitation and surface runoff, will increase the dissolved solids concentration of the two streams.

These sedimentation and total dissolved solids impacts will be only a short term problem. With replacement of topsoil, vegetation and topography the intermittent stream will return to approximately its pre-mining conditions. The spring fed stream will carry less water and thus will carry less sediment and dissolved solids.

The impact on the groundwater system will be more significant. The lignite which is proposed to be mined forms an aquifer from which springs flow. This water is then used by the land owner to water livestock. The mining operation would remove this aquifer material which will reduce or dry up the springs. The entire lignite aquifer within this section would not be mined due to depth of overburden in the northwest corner of the section. There would be a possibility of springs forming in this area during and after the reclamation phase.

These impacts are mostly local in nature. Mining activity currently exists in adjoining sections and if sedimentation is controlled, no further impact would occur upon the Knife River, Spring Creek, or their aquifer systems. The two wells located near the farmstead will not be impacted.

Recommendations for Mitigations

No disturbance or stockpiling within 200 feet of any stream channel shall be allowed. This recommendation is made with the exception of the spring fed stream since this stream will probably be dry once the aquifer is mined. The most severe erosion problems occur when the stream channel itself is disturbed and sedimentation problems become less significant the further away from the channel the disturbance occurs.

A sediment catchment basin should be located on each stream leaving the lease area. This will help eliminate any sediment which does get to the stream channel.

Water which is pumped from the pit should not be discharged directly into the stream channel. This water should be spread over the grassy waterway above the channel or directly into a sediment basin.

The spring fed stream should be monitored for water quality and quantity. If the area does not supply enough water or water of sufficient quality to support the amount of stock it had previously supported, a well will have to be drilled to a deeper aquifer to supply this water.

III. SOILS

Description

The largest mapping unit within the proposed mining area is Rhoades-Daglum complex, 1 to 9 percent slopes. Rhoades makes up about 60 percent and Daglum 25 percent of the complex. They are medium and fine textured soils. Most of this mapping unit is in rangeland although a small portion is under cultivation. These soils typically contain excess sodium in B horizons and the Daglum salt accumulations in the C horizons. There is a microrelief of "scabspots." These are small areas where the surface soil has been eroded to the sodic claypan. Rhoades has probably about 5 inches of sodium free or low sodium topsoil and Daglum about 10 inches. They are best suited to rangeland.

Belfield-Daglum silt loams, 3 to 6 percent slopes make up the largest mapping unit under cultivation within the proposed mining area. Belfield makes up 50 percent of the mapping unit and Daglum 30 percent. These soils also contain excess sodium, but usually at a depth below 18 inches.

Another large unit under cultivation within the proposed area is the Amor-Werner loams, 9 to 15 percent slopes. Amor comprises 55 percent and Werner 35 percent of the mapping unit. These soils do not have excess sodium, but are typically moderately deep and shallow respectively. The Amor often grades into soft bedrock at depths of about 30 inches and the Werner at 17 inches.

Cabba loam, 15 to 35 percent slopes are all under pasture. They are typically shallow soils with gravely and cobbly textures common. Depth to soft bedrock is commonly 10 to 20 inches.

The Regent-Rhoades complex, 6 to 9 percent slopes, occurs in the rangeland. Regent silty clay loam comprises 60 percent and Rhoades silt loam 30 percent of the mapping unit. There is a microrelief of scabspots. Rhoades soils contain excess sodium below depths of 5 inches as mentioned previously. Regent typically has soft shale bedrock at a depth of 30 to 40 inches.

Amor-Werner loams, 6 to 9 percent slopes, are under cultivation. They are on gentler slopes than the Amor-Werner soils mentioned previously, but are otherwise the same. Amor soils comprise about 60 percent and Werner soils 30 percent of the mapping unit.

Ringling-Cabba complex, 9 to 35 percent slopes, is all under rangeland. Ringling channery loam comprises 60 percent and Cabba loam 30 percent of the complex. Ringling soils have very little if any usable soil material for reclamation because of the shallowness to porcellanite and high percent of channery stones. Cabba soils commonly have soft bedrock at depths of 10 to 20 inches.

Regent-Rhoades complex, 1 to 6 percent slopes, is a small area under cultivation. It is the same as the Regent-Rhoades complex mentioned before, but on gentler slopes.

There is a small area of Sen-Rhoades complex, 6 to 9 percent slopes, which is under cultivation. Sen silt loam makes up 60 percent and Rhoades silt loam 30 percent of the complex. Rhoades soils again contain excess sodium below depths of 5 inches. Sen typically has soft bedrock at 30 to 40 inches.

Cohagen-Vebar fine sandy loams, 9 to 35 percent slopes, make up a small portion in rangeland. Cohagen soils comprise 55 percent and Vebar 25 percent of the mapping unit. The depth to soft sandstone is typically 18 inches for Cohagen soils. Vebar soils typically have soft sandstone at a depth of 20 to 40 inches.

Shambo loam, 3 to 6 percent slopes is a small unit under cultivation. Shambo loam typically has usable soil material to a depth of 40 to 60 inches.

Most soils in Section 2 have a severe or very severe water erosion hazard and a slight wind erosion hazard (Cohagen-Vebar soils have a severe wind erosion hazard). Effects of water erosion can be observed in the southwest quarter where scabspots and small gullies are common.

Management of the soils should be oriented toward practices that control erosion and maintain organic matter content and fertility. Mr. Buechler, the surface owner, has put in two diversion trenches with a stock pond on each one. He also has a grassed waterway. These features help control erosion on his cultivated land and should be re-established if mining is done. He also stated that he has no saline seeps or sodic problems on his cultivated land.

Overburden analysis from surrounding sections indicate that Section 2 will have mostly highly sodic substrata.

Surrounding soils data from Mr. Howey, professional soil classifier, and analysis of soil mapping units as mapped by the Soil Conservation Service would indicate that over most of the proposed mining area, 10 to 30 inches of mostly sodium free soil is available for stockpiling and subsequent reclamation.

See Map #4 for the locations of these soils within Section 2.

Impacts of Mining

Cropland production will be lost during mining.

The overburden material is high in excess sodium. Should this material be stockpiled along the south side of the proposed mining area, rainstorms will wash sodium salts and fine particles onto the soils down slope. This could result in higher sodium contents in topsoils not located in the mined area.

Some of the soils may be improved by mining. During a conversation with Drs. Power and Sandoval at ARS, Mandan, they stated that some soils with a sodic subsoil such as Rhoades and Belfield can be improved by deep plowing. These soils have a layer of gypsum below the sodic B horizons. By deep plowing the gypsum is mixed into the profile. Through chemical reaction with the gypsum the sodium forms salts which can be leached out of the soil profile. Reclamation after mining might have the same effect as deep plowing.

With the reduction of slopes and depending on the average amount of soil materials available for respreading, the Ringling soils could also be improved by mining.

Recommendations

Stockpile soils according to State law.

Minimize erosion of spoil piles on south side of proposed mine area to avoid damage to soils there and pollution of water moving down drainageway during rains.

Leave slopes more gentle where steep slopes now exist if this is more advantageous to reduce erosion and improve farming.

IV. RECOMMENDATIONS

Reclamation potential is good and degradation of Knife River, Spring Creek, and their associated underground aquifers should not be significant.

Mining this area can be done and successful reclamation can be accomplished provided that the following precautions are made:

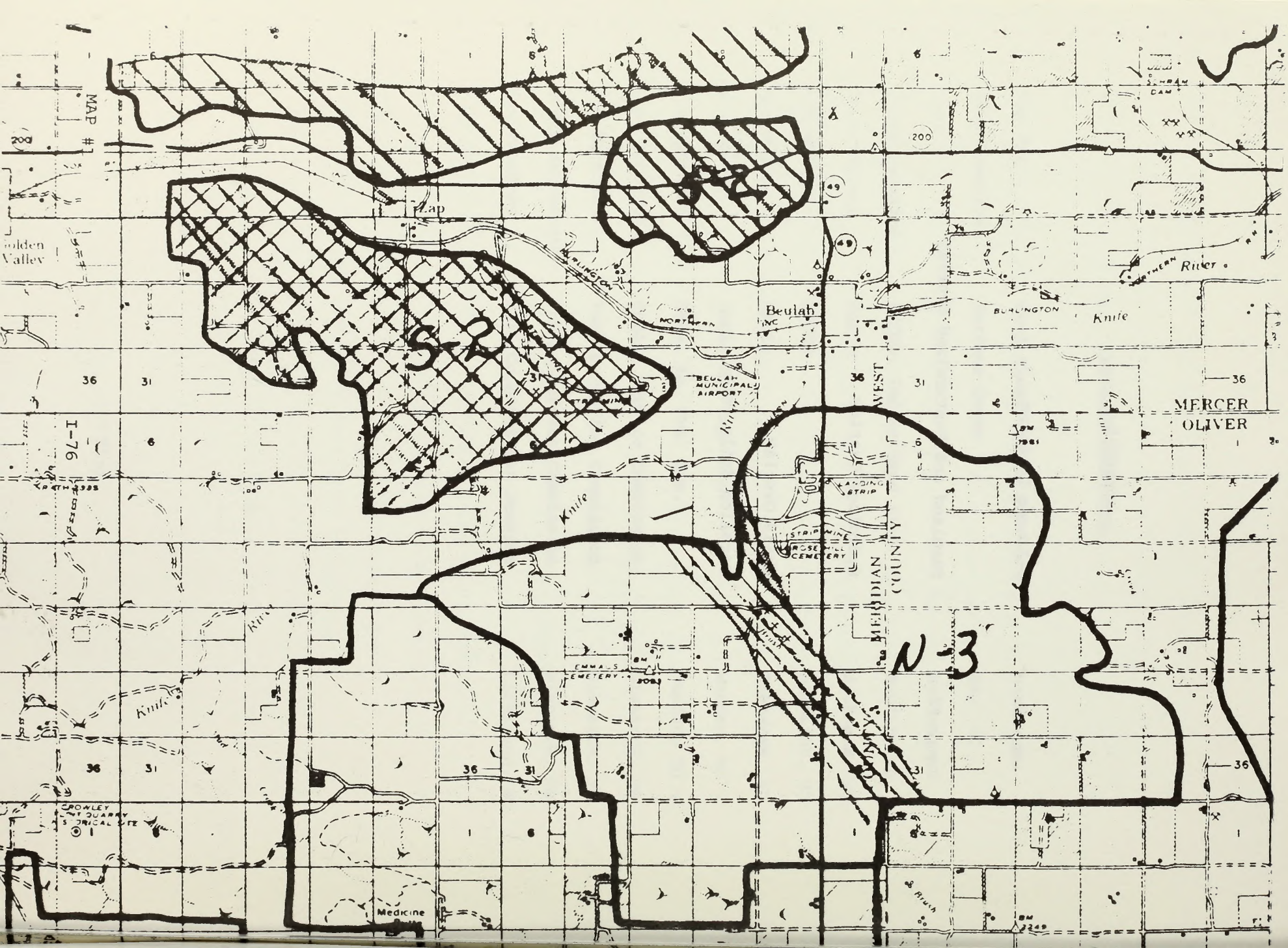
1. That no disturbance or stockpiling is allowed within 200 feet of the main stream channel.
2. That sediment catchment basins be installed on all drainage ways leaving the lease area.
3. That a berm or diversion ditch should be constructed along the eastern and southern edges of the area that would be affected by mining to prevent runoff water carrying sediment from entering the main drainage.
4. That the spring fed creek shall be monitored and a substitute water supply provided if the water quantity or quality is not equal to or improved upon pre-mining conditions.
5. That the groundwater in the lignite and in the glacial channel adjacent to the proposed mining area be monitored for possible mining related effects on water quality and quantity. This monitoring should include the two wells near the farmstead in the southeast corner of the section.
6. That slopes be left more gentle where steep slopes now exist to reduce the erosion hazard.
7. That diversion trenches and stock ponds be re-established to pre-mining conditions compatible with the post mining topography.

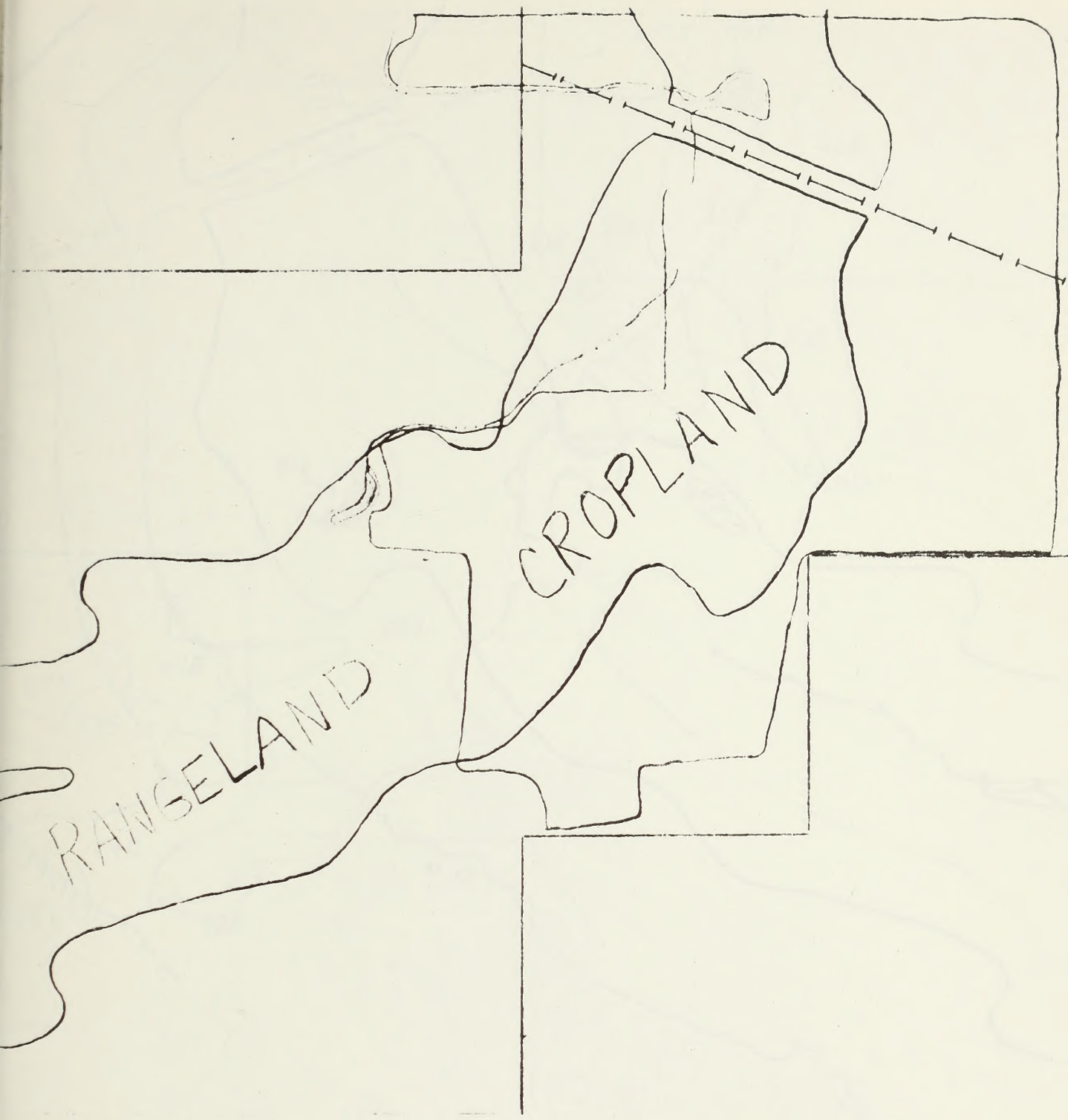
PERSONS CONTACTED

Ken Rye	Soil Conservation Service	Hazen, ND
John Buechler	Surface owner	Zap, ND
ASCS		Beulah, ND
Bruce DeMarcus	NACCO, Indian Head Mine	Beulah, ND
Pete Nielson	NACCO	Bismarck, ND
Jim Brown	NACCO	Bismarck, ND
Ray Butler	NACCO	Bismarck, ND
J.F. Power	USDA, Ag. Exp. Sta.	Mandan, ND
F.M. Sandoval	USDA, Ag. Exp. Sta.	Mandan, ND
Dean Peterson	Public Service Commission	Bismarck, ND
Jim Deutsch	Public Service Commission	Bismarck, ND
Ervin Barchenger	Public Service Commission	Bismarck, ND
Ken Thompson	Soil Conservation Service	Dickinson, ND

APPENDIX

Map #1	S-2 Area Location
Map #2	Farmland and Pastureland Overlay
Map #3	Hydrology Overlay
May #4	Soils Overlay
	Detailed Soils Data

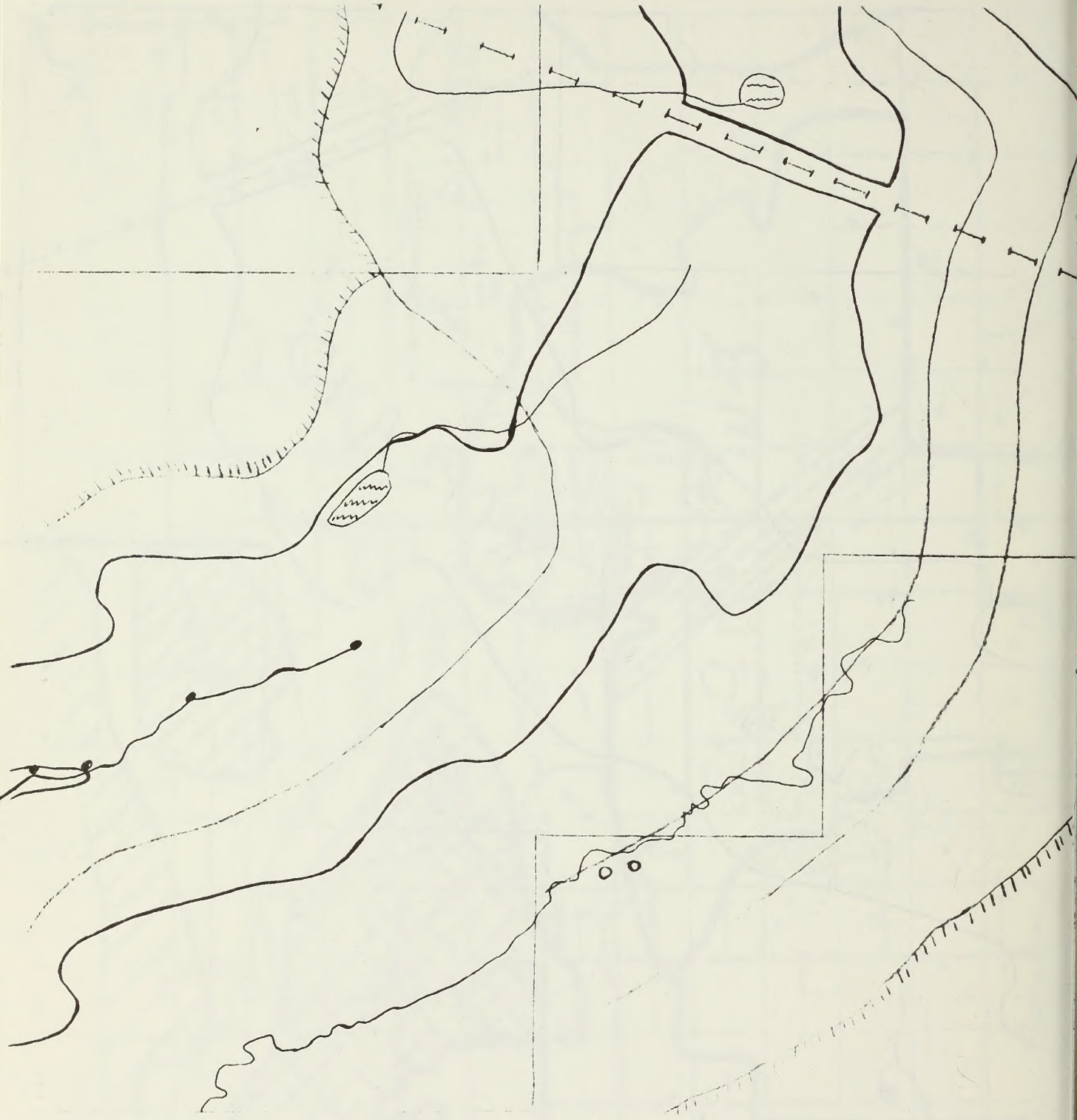

MAP #
I-76
Zap
Beulah
Knife
MERCER
OLIVER
MEDICINE
N-3
Medicine



MAP #2

PRESENT LAND USE
T143N, R89W, Section 2, Mercer County, North Dakota

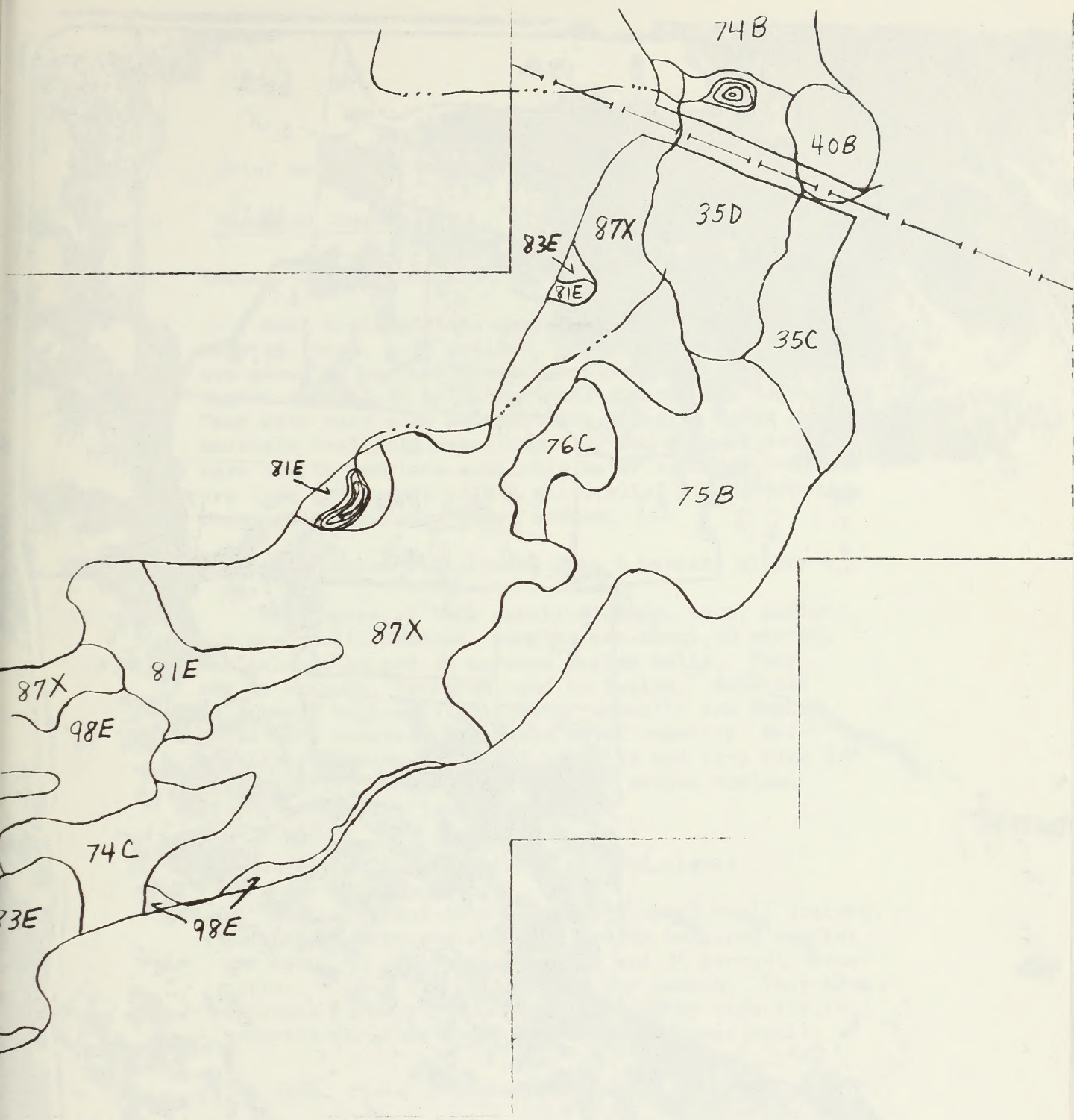
Diversion Ditch
Stock Water Pond
Underground Pipeline
Surface Lease Boundary
Minable Lignite Beds
Cropland Boundary



MAP #3

T143N, R89W, Sec. 2, Mercer County, North Dakota
CURRENT HYDROLOGY CONDITIONS

- Surface Water Channel
- Stock Water Pond
- Surface Water Divide
- Disturbed Watersheds Boundary
- Surface Lease Boundary
- Minable Lignite Beds
- Glacial Channel
- Major Seep or Spring
- Water Well
- Underground Pipeline



P #4 SOILS MAP
T143N, R89W, Section 2
Mercer County, North Dakota

(87X) Soil Mapping Unit

Diversion Ditch

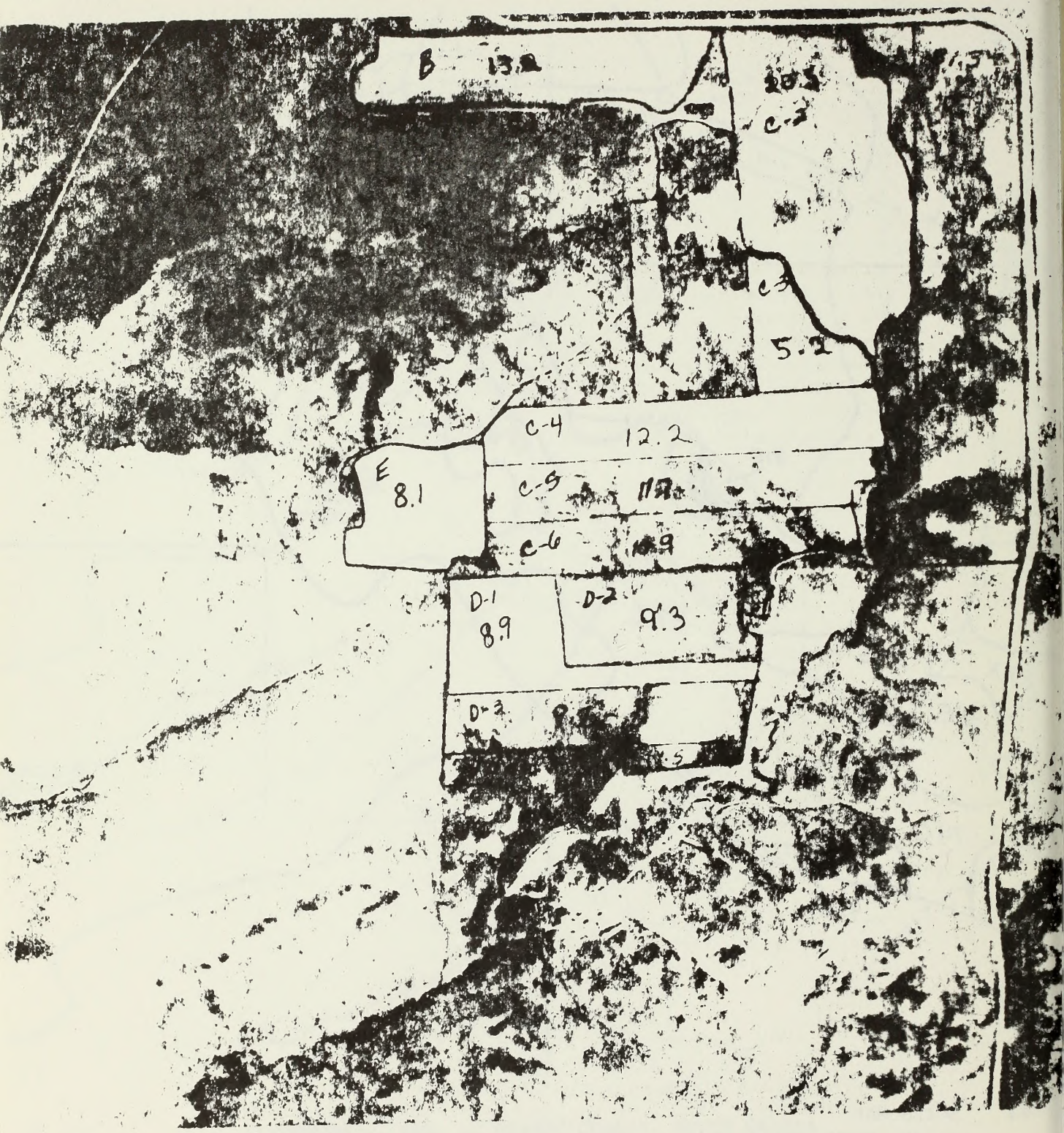
Stock Water Pond

Underground Pipeline

Surface Lease Boundary

LEGEND

87X Rhoades-Daglum complex, 1-9% slopes
75B Belfield-Daglum silt loams, 3-6% slopes
35D Amor-Werner loams, 9-15% slopes
81E Cabba loam, 15-35% slopes
74C Regent-Rhoades complex, 6-9% slopes
35C Amor-Werner loams, 6-9% slopes
98E Ringling-Cabba complex, 9-35% slopes
74B Regent-Rhoades complex, 1-6% slopes
76C Sen-Rhoades complex, 6-9% slopes
83E Cohagen-Vebar fine sandy loams 9-35% slopes
40B Shambo loam, 3-6% slopes


B
C-4
12.2
E
8.1
C-5
C-6
D-1
8.9
D-2
9.3
D-3

Page 6 -- Brief Mapping Unit Descriptions

Symbol	Name and Description
87X,87C	**Rhoades-Daglum complex, 1 to 9 percent slopes** **Most areas of this nearly level to moderately sloping, deep, well drained, medium textured complex are about 60 percent Rhoades soils and 25 percent Daglum soils. It is on residual uplands and terraces. They have very slow permeability. Daglum soils have moderate available water capacity and Rhoades soils have low to moderate available water capacity. Slopes are long and smooth with a microrelief of "scabspots". These soils contain excess sodium.**
75B	Belfield-Daglum silt loams, 3 to 6 percent slopes Most areas of this gently sloping, deep, medium textured, well drained, complex are about 50 percent Belfield soils and 30 percent Daglum soils. They are on uplands, terraces, and in swales. Belfield soils have high available water capacity and Daglum soils have moderate available water capacity. Permeability is slow for Belfield soils and very slow for Daglum soils. These soils contain excess sodium. Slopes are mostly long and smooth.
35D	Amor-Werner loams, 9 to 15 percent slopes Most areas of this strongly sloping, well drained, moderately deep and shallow, medium textured complex are about 55 percent Amor soils and 35 percent Werner soils. Slopes are mostly long and smooth. They have moderate permeability. Available water capacity is moderate for Amor soils and low for Werner soils.
81E	Cabba loam, 15 to 35 percent slopes This moderately steep to steep, shallow, well drained, medium textured soil is on residual uplands. Slopes are mostly long and smooth. It has low available water capacity and moderate permeability.

74C Regent-Rhoades complex, 6 to 9 percent slopes

Most areas of this moderately sloping, moderately deep and deep, well drained, moderately fine and medium textured complex are about 60 percent Regent silty clay loam and 30 percent Rhoades silt loam. These soils are on residual uplands. Slopes are long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Regent soils and low to moderate for Rhoades soils. Permeability is slow for Regent soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

35C Amor-Werner loams, 6 to 9 percent slopes

Most areas of this moderately sloping, well drained, moderately deep and shallow, medium textured complex are about 60 percent Amor soils and 30 percent Werner soils. Slopes are mostly long and smooth. They have moderate permeability. Available water capacity is moderate for Amor soils and low for Werner soils.

98E Ringling-Cabba complex, 9 to 35 percent slopes

Most areas of this strongly sloping to steep, shallow, excessively and well drained, medium textured complex are about 60 percent Ringling Channery loam and 30 percent Cabba loam. Slopes are mostly long and smooth. Ringling soils have very low to low available water capacity and Cabba soils have low available water capacity. Ringling soils have very rapid permeability and Cabba soils have moderate permeability.

74B Regent-Rhoades complex, 1 to 6 percent slopes

Most areas of this nearly level to gently sloping moderately deep and deep, well drained, moderately fine and medium textured complex are about 60 percent Regent silty clay loam and 30 percent Rhoades silt loam. These soils are on residual uplands. Slopes are mostly long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Regent soils and low to moderate for Rhoades soils. Permeability is slow for Regent soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

76C Sen-Rhoades complex, 6 to 9 percent slopes

Most areas of this moderately sloping, moderately deep and deep, well drained, medium textured complex are about 60 percent Sen silt loam and 30 percent Rhoades silt loam. Slopes are mostly long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Sen soils and low to moderate for Rhoades soils. Permeability is moderate for Sen soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

83E Cohagen-Vebar fine sandy loams, 9 to 35 percent slopes

Most areas of this strongly sloping to steep, shallow and moderately deep, somewhat excessively and well drained, moderately coarse textured complex are about 55 percent Cohagen soils and 25 percent Vebar soils. Slopes are mostly long and smooth. This complex is on residual uplands. Available water capacity is low for Vebar soils and very low for Cohagen soils. These soils have moderately rapid permeability.

LOB Shambo loam, 3 to 6 percent slopes

This gently sloping, deep, well drained, medium textured soil is on terraces and fans. It has high available water capacity and moderate permeability. Slopes are long and smooth.

CAPABILITY CLASSIFICATION EXPLANATION

1. Land Capability Classes

These capability classes express a relative degree of limitation and erosional hazards of our soil resources.

a. Land suitable for cultivation and other uses:

Class I - Soils with few limitations that restrict their use. Class I land occurs in North Dakota only on irrigated land with adequate water supply.

Class II - Soils with some limitations that reduce choice of crops or require moderate conservation treatments.

Class III - Soils with severe limitations for cropland use that reduce choice of crops and require special conservation treatments, particularly for erosion control.

Class IV - Soils with very severe limitations for cropland use which limit choice of crops and require very careful management, particularly in controlling erosion.

b. Land with limitations that make them unsuitable for cultivation but suited for grassland or other uses:

Class V - Soils with natural limitations, such as wetness, which limit their use to grassland, wildlife, or recreation.

Class VI - Soils with severe limitations which limit their use largely to grassland, wildlife, or recreation.

Class VII - Soils with very severe limitations and restricted to carefully managed range, wildlife, or recreational uses.

c. Soils and land forms with limitations that make them unsuitable for commercial plant production:

Class VIII - Soil areas which have value only for wildlife, recreation, or esthetic use.

USDA-SCS-North Dakota
Rev. March 1975

2. Land Capability Subclasses

These capability subclasses express the dominant kind of limitation. Land classes may have more than one kind of subclass listed. A subclass may also be divided to express different degrees of limitation. The following subclasses and symbols are recognized nationwide:

e - Dominant limitation is susceptibility to water erosion or wind erosion.

w - Dominant limitation is excess water, such as seepage, high water table, or flood hazard

s - Dominant limitation is an unfavorable soil characteristic, within rooting zone, such as low moisture capacity, very high density, gravel, stone, shallow effective depth, salinity, etc.

c - Dominant limitation is climate, chiefly low precipitation or limiting temperature. In North Dakota 'c' is used only on deep level heavy loam and light clay loam soils in Class II which do not have other more significant limitations.

3. Land Capability Unit or Soil Management Group

A capability unit is a grouping of soils that are nearly alike in suitability for plant growth and respond to the same kinds of management.

Since all upland soils in North Dakota are subject to the same climatic limitation, so are all cultivated soils subject to seasonal exposure to our periodic high winds. All cultivable soils, therefore, carry a relative wind erodibility factor based on surface soil textures. Each land capability unit has been classified according to wind erodibility group and these descriptions will be found in Section III-A.

On soils poorly suited for cropland or limited to grassland use, the abbreviated range site symbol follows the subclass.

The land capability table shows two land capability classes on soils where water interferes with crop production. The class of soil when drained is indicated by Roman numeral, and undrained by Arabic numeral. The soil and capability map placed in the conservation plan will show only one of these classes, depending on drainage feasibility determined during the planning process. The following final capital letter further defines the groupings into capability units.

M - Indicates a medium textured substrata under a sandy soil which increases its water-holding capacity.

P - Indicates slow permeability, limited effective root depth, and the presence of a sodic claypan in the subsoil.

L - Indicates that the soil is calcareous to the surface.

G - Indicates limited effective root depth due to sand and gravel.

Capability Unit VIsTCp

This unit consists of deep, nearly level to moderately sloping, well drained soils. They are silt loam to silty clay soils on uplands, terraces, fans and in swales.

These soils are moderate in organic matter content, have low to moderate available water capacity and low fertility. They have very slow permeability. These soils have a moderate wind erosion hazard and a moderate water erosion hazard on long slopes over 3 percent. Rooting is restricted by a very shallow or shallow claypan.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are suited to native range and poorly suited to hay and cultivated crops.

Mapping Units Included are:

87X, 87C - Rhoades-Daglum complex, 1 to 9 percent slopes

Capability Unit IIIe6

This unit consists of deep or moderately deep, gently sloping, or moderately sloping, well drained soils. They are loam or silt loam soils on uplands, terraces, fans and in swales. Bowdle soils have sand and gravel at 20 to 40 inches.

These soils are moderate or high in organic matter content, have high or moderate (except Werner and Rhoades soils have low) available water capacity, and high to low fertility. They have moderate to very slow permeability. These soils have a slight wind erosion hazard and a severe water erosion hazard.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are well suited to grasses and legumes, fairly well suited to small grains and poorly suited to corn.

Mapping Units Included are:

28C - Temvik-Williams silt loams, 6 to 9 percent slopes

35C - Amor-Werner loams, 6 to 9 percent slopes

36C - Williams loam, 6 to 9 percent slopes

38C - Williams-Zahl loams, 6 to 9 percent slopes

44C - Arnegard loam, 6 to 9 percent slopes

75B - Belfield-Daglum silt loams, 3 to 6 percent slopes

76B - Sen-Rhoades complex, 3 to 6 percent slopes

Capability Unit IVe6

This unit consists of shallow to deep, nearly level to strong sloping, well to excessively drained soils. They are loam and silt loam soils on uplands, terraces and fans.

These soils are moderate in organic matter content, have moderate to very low available water capacity, and moderate or low fertility. They have rapid to very slow permeability. These soils have a slight wind erosion hazard and a severe water erosion hazard.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are fairly well to poorly suited to small grains and well suited to grasses. They are fairly well suited to legumes and poorly suited to corn.

Mapping Units Included are:

11C - Cherry silty clay loam, gullied, 3 to 9 percent slopes

35D - Amor-Werner loams, 9 to 15 percent slopes

71C - Bearing-Ringling loams, 6 to 9 percent slopes

75C - Belfield-Daglum silt loams, 6 to 9 percent slopes

76C - Ben-Rhoades complex, 6 to 9 percent slopes

77C - Bowdle-Wabek complex, 6 to 9 percent slopes

92B - Noonan-Williams loams, 1 to 6 percent slopes

Capability Unit VIIeSW

This unit consists of shallow and moderately deep, strongly sloping to very steep, well and somewhat excessively drained soils and soft rock outcrops. They are fine sandy loam to silty clay loams soils on uplands.

The soils in this unit are low or moderate in organic matter content, have low available water capacity and low (except Vebar has moderate) fertility. They have moderately rapid or moderate permeability. These soils have a seyere to slight wind erosion hazard and a very severe water erosion hazard.

The main management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are only suited to native range.

Mapping Units Included are:

81E - Cabba loam, 15 to 35 percent slopes

82E - Cabba-Badland complex, 15 to 50 percent slopes

83E - Cohagen-Vebar fine sandy loams, 9 to 35 percent slopes

84E - Cohagen-Vebar-Rock outcrop complex, 9 to 50 percent slopes

Capability Unit IVe7

This unit consists of deep, moderately sloping, well and moderately well drained soils. They are silty clay loam soils on uplands.

These soils are moderate in organic matter content, have moderate or low available water capacity, and moderate fertility. They have moderately slow to very slow permeability. These soils have a severe water erosion hazard.

The major management practices needed are those that control erosion, maintain and improve tilth, and maintain organic matter content and fertility.

These soils are well suited to grasses, fairly well to poorly suited to small grains and legumes and poorly suited to corn.

Mapping Units Included are:

74C - Regent-Rhoades complex, 6 to 9 percent slopes

Capability Unit VIIeVS

This unit consists of very shallow or shallow, strongly to steep, excessively drained soils. They are channery loam and laom to silty clay loam soils on uplands.

These soils are low or moderate in organic matter content, have low available water capacity, and low fertility. They have moderate or very rapid permeability. These soils have a slight wind erosion hazard and a very severe water erosion hazard..

The main management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are only suited to native range.

Mapping Units Included are:

98E - Ringling-Cabba complex, 9 to 35 percent slopes

Capability Unit IIIe7

This unit consists of deep and moderately deep, nearly level to moderately sloping, well drained soils. They are silty clay loam soils on uplands, terraces, fans and inswales.

These soils are high or moderate in organic matter content, have high or moderate (except Rhoades soils have low) available water capacity, and high or moderate (except Rhoades has low) fertility. They have moderately slow to very slow permeability. These soils have a severe water erosion hazard.

The major management practices needed are those that control erosion, maintain and improve tilth, and maintain organic matter content and fertility.

These soils are well suited to grasses and fairly well suited to small grains, legumes and poorly suited to corn.

Mapping Units Included are:

8C - Grail silty clay loam, 6 to 9 percent slopes

9C - Regent silty clay loam, 6 to 9 percent slopes

74B -Regent-Rhoades complex, 1 to 6 percent slopes

Capability Unit IIe6

This unit consists of deep and moderately deep, gently sloping or undulating, well drained soils. They are loam and silt loam soils on bottomlands, uplands, terraces, fans and in swales.

These soils are high or moderate in organic matter content, hav high or moderate available water capacity, and high or moderate fertility. They have moderate or moderately slow permeability. These soils have a slight wind erosion and a moderate water erosion hazard.

The main management practices needed are those that maintain organic matter content and fertility and control erosion.

These soils are well suited to all crops commonly grown in the county.

Mapping Units Included are:

28B - Temvik-Williams silt loams, 3 to 6 percent slopes

36B - Williams loam, 3 to 6 percent slopes

40B - Shambo loam, 3 to 6 percent slopes

44B - Arnegard loam, 3 to 6 percent slopes

91B - Straw loam, 3 to 6 percent slopes

96B - Grassna silt loam, 3 to 6 percent slopes

97B - Sen silt loam, 3 to 6 percent slopes

100B - Amor loam, 3 to 6 percent slopes

109B-Bowbells-Zahl loams, 3 to 6 percent slopes

IN REPLY REFER

United States Department of the Interior

AHC:DDO
3042

BUREAU OF LAND MANAGEMENT

Dickinson District Office
P.O. Box 1229
Pulver Hall
Dickinson, ND 58601

Memorandum

To: File

From: Al Caldwell, Surface Protection Specialist

Subject: Field Trip to Gather Data for Reassessment

A field trip to Beulah, Mandan, and Bismarck was made by Don Rufledt, Chuck Pettee, and myself to gather data and to make an on-the-ground inspection of Section 2, T143N, R89W. The purpose of this trip was to gather data for the reassessment of this tract of land for coal leasing. Following is the schedule of contacts which we made:

9-21 Met with Ken Rye, SCS, Hazen. Obtained soil survey information and made copies of said survey and maps. Obtained copy of ASC aerial photo of Section 2.

9-22 Visited with John Buechler surface owner of Section 2, T143N, R89W. Discussed prior and present surface use and obtained information on surface soils and water data. A discussion with Mr. Buechler revealed the following testimony about the hydrology and soils of Section 2. Mr. Buechler has a couple of wells at or near his house which yield water at a rate from three to ten gallons per minute. The quality of the well water is "good." There are springs flowing from lignite outcrops along a drainage way located in the west central part of Section 2. This stream runs all year. The stream which goes by Mr. Buechler's house runs only after rain storms. Sufficient runoff is received from the knoll in the NW¼ to cause gullies to form in the cultivated portion of Section 2. A diversion ditch was built ringing the knoll to collect this runoff and divert it to stock ponds. While seeps were evident, Mr. Buechler has never had salinity or sodium problems on his cultivated land. Walked over Section 2 and took several photos of the area.

9-23 Visited with Dr. Powers and Dr. Sandoval of ARS Research Center at Mandan. Obtained excellent information and materials regarding soils and mining reclamation in the Zap and Beulah areas. Visited with Dean Peterson, Jim Duetsch, and Ervin Barchenger of ND Public Service Commission, Reclamation and Siting Division on reclamation etc. in the vicinity of Section 2 and obtained a copy of reclamation rules and regulations. We discussed what information they had on soils and hydrology. They did not have a copy of the ground water study conducted by NDGS.

Visited with Pete Nielsen and Jim Brown of North American Coal Corporation in regard to information on Section 2 and surrounding sections. They will send us soils, hydrological, and reclamation information on areas adjacent to Section 2. They are only interested in Section 2 of the S2 Area as they have rejected mining in the northwest area of the S2 Area because of terrain and lack of reclamation potential.

cc: Chuck Pettee
Al Caldwell
Don Rufledt
Chuck Steele
Jerry Pittman

-- Brief Mapping Unit Descriptions

Symbol	Name and Description
*8B	Grail silty clay loam, 3 to 6 percent slopes

This gently sloping, deep, well drained, moderately fine textured soil is in upland swales, on valley fans and footslopes and terraces. Slopes are long and smooth. The available water capacity is high and permeability is slow.

8C Grail silty clay loam, 6 to 9 percent slopes

This moderately sloping, deep, well drained moderately fine textured soil is on fans and footslopes below steeper soils. Slopes are short and smooth. The available water capacity is high and permeability is slow.

*35C Amor-Werner loams, 6 to 9 percent slopes

Most areas of this moderately sloping, well drained, moderately deep and shallow, medium textured complex are about 60 percent Amor soils and 30 percent Werner soils. Slopes are mostly long and smooth. They have moderate permeability. Available water capacity is moderate for Amor soils and low for Werner soils.

* 35D Amor-Werner loams, 9 to 15 percent slopes

Most areas of this strongly sloping, well drained, moderately deep and shallow, medium textured complex are about 55 percent Amor soils and 35 percent Werner soils. Slopes are mostly long and smooth. They have moderate permeability. Available water capacity is moderate for Amor soils and low for Werner soils.

* 40B Shambo loam, 3 to 6 percent slopes

This gently sloping, deep, well drained, medium textured soil is on terraces and fans. It has high available water capacity and moderate permeability. Slopes are long and smooth.

44C Arnegard loam, 6 to 9 percent slopes

This moderately sloping, deep, well drained, medium textured soil is on lower sideslopes below steeper soils. Slopes are mostly short and smooth. It has high available water capacity and moderate permeability.

58B Flaxton-Williams complex, 3 to 6 percent slopes

Most areas of this undulating, deep, well drained, moderately coarse and medium textured complex are about 60 percent Flaxton fine sandy loam and 30 percent Williams loam. Slopes range from short and uneven to long and smooth. They have high available water capacity. Flaxton soils have moderately rapid permeability through the fine sandy loam materials and moderately slow below. Williams soils have moderate over moderately slow permeability.

*74B Regent-Rhoades complex, 1 to 6 percent slopes

Most areas of this nearly level to gently sloping moderately deep and deep, well drained, moderately fine and medium textured complex are about 60 percent Regent silty clay loam and 30 percent Rhoades silt loam. These soils are on residual uplands. Slopes are mostly long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Regent soils and low to moderate for Rhoades soils. Permeability is slow for Regent soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

*74C Regent-Rhoades complex, 6 to 9 percent slopes

Most areas of this moderately sloping, moderately deep and deep, well drained, moderately fine and medium textured complex are about 60 percent Regent silty clay loam and 30 percent Rhoades silt loam. These soils are on residual uplands. Slopes are long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Regent soils and low to moderate for Rhoades soils. Permeability is slow for Regent soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

*75B Belfield-Daglum silt loams, 3 to 6 percent slopes

Most areas of this gently sloping, deep, medium textured, well drained, complex are about 50 percent Belfield soils and 30 percent Daglum soils. They are on uplands, terraces, and in swales. Belfield soils have high available water capacity and Daglum soils have moderate available water capacity. Permeability is slow for Belfield soils and very slow for Daglum soils. These soils contain excess sodium. Slopes are mostly long and smooth.

*76C Sen-Rhoades complex, 6 to 9 percent slopes

Most areas of this moderately sloping, moderately deep and deep, well drained, medium textured complex are about 60 percent Sen silt loam and 30 percent Rhoades silt loam. Slopes are mostly long and smooth with a microrelief of "scabspots". Available water capacity is moderate for Sen soils and low to moderate for Rhoades soils. Permeability is moderate for Sen soils and very slow for Rhoades soils. Rhoades soils contain excess sodium.

81D Cabba loam, 9 to 15 percent slopes

This strongly sloping, shallow, well drained, medium textured soil is on residual uplands. Slopes are mostly long and smooth. It has low available water capacity and moderate permeability.

*81E Cabba loam, 15 to 35 percent slopes

This moderately steep to steep, shallow, well drained, medium textured soil is on residual uplands. Slopes are mostly long and smooth. It has low available water capacity and moderate permeability.

* 83E Cohagen-Vebar fine sandy loams, 9 to 35 percent slopes

Most areas of this strongly sloping to steep, shallow and moderately deep, somewhat excessively and well drained, moderately coarse textured complex are about 55 percent Cohagen soils and 25 percent Vebar soils. Slopes are mostly long and smooth. This complex is on residual uplands. Available water capacity is low for Vebar soils and very low for Cohagen soils. These soils have moderately rapid permeability.

84E Cohagen-Vebar-Rock outcrop complex, 9 to 50 percent slopes

Most areas of this strongly sloping to very steep complex are about 55 percent Cohagen fine sandy loam, 20 percent Vebar fine sandy loam and 20 percent Rock outcrops. Rock outcrops is a landtype consisting of hard sandstone outcrops. Cohagen soils are shallow, moderately coarse textured and somewhat excessively drained. Vebar soils are moderately deep, well drained and moderately coarse textured. Available water capacity is low for Vebar soils and very low for Cohagen soils. Vebar and Cohagen soils have moderately rapid permeability. Slopes are mostly long and smooth. This complex is on residual uplands.

*87X,87C Rhoades-Daglum complex, 1 to 9 percent slopes

Most areas of this nearly level to moderately sloping, deep, well drained, medium textured complex are about 60 percent Rhoades soils and 25 percent Daglum soils. It is on residual uplands and terraces. They have very slow permeability. Daglum soils have moderate available water capacity and Rhoades soils have low to moderate available water capacity. Slopes are long and smooth with a microrelief of "scabspots". These soils contain excess sodium.

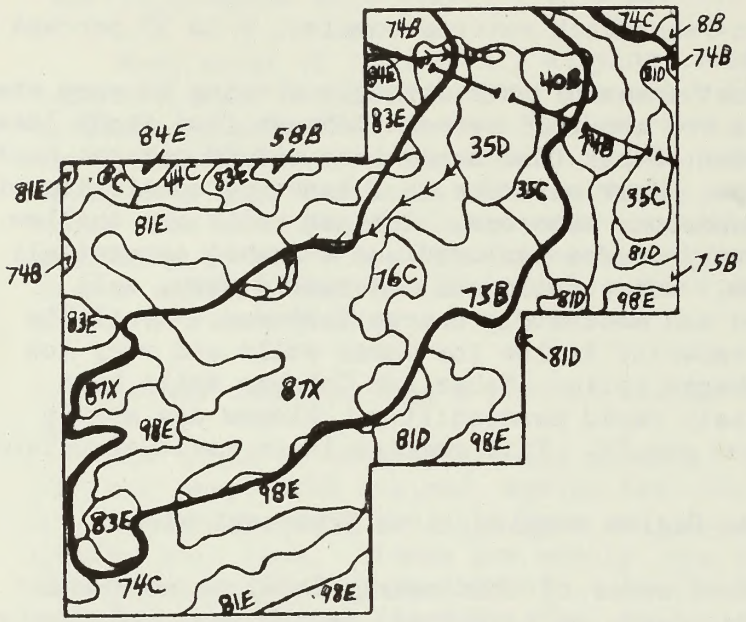
*98E Ringling-Cabba complex, 9 to 35 percent slopes

Most areas of this strongly sloping to steep, shallow, excessively and well drained, medium textured complex are about 60 percent Ringling Channery loam and 30 percent Cabba loam. Slopes are mostly long and smooth. Ringling soils have very low to low available water capacity and Cabba soils have low available water capacity. Ringling soils have very rapid permeability and Cabba soils have moderate permeability.

* Denotes mapping unit within proposed mining area.

SOILS MAP

Section 2, Lots 1 and 2, S½N½, NW¼SE¼, SW¼
T143N, R89W, 5th P.M.
Mercer County, North Dakota - 440.96 Acres



Scale

1:20,000

0.6" = 1,000 feet

3.168" = 1 mile

Legend

76C — Soil Mapping Unit

Diversion Ditch and Catchment Pond

Underground Pipeline

Proposed Mining Area

Map Symbol	Mapping Unit and Slope	*Acres Within Proposed Mine Area	*Acres Within Entire Lease Area
8B	Grail silty clay loam, 3-6%	1	9
8C	Grail silty clay loam, 6-9%	--	4
35C	Amor-Werner loams, 6-9%	9	25
35D	Amor-Werner loams, 9-15%	17	17
40B	Shambo loam, 3-6%	5	6
44C	Arnegard loam, 6-9%	--	4
58B	Flaxton-Williams complex, 3-6%	--	2
74B	Regent-Rhoades complex, 1-6%	7	25
74C	Regent-Rhoades complex, 6-9%	15	38
75B	Belfield-Daglum silt loams, 3-6%	28	46
76C	Sen-Rhoades complex, 6-9%	7	7
81D	Cabba loam, 9-15%	--	22
81E	Cabba loam, 15-35%	16	64
83E	Cohagen-Vebar fine sandy loams, 9-35%	6	20
84E	Cohagen-Vebar-Rock outcrop complex, 9-50%	--	4
87X	Rhoades-Daglum complex, 1-9%	69	90
98E	Ringling-Cabba complex, 9-35%	15	58
		195	441

*Acreage calculated by dot-grid method

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR MERCER COUNTY MINED LAND RECLAMATION [1/]

Map Symbol	Soil Name	Land Cap. Class & Subclass	Parent Material	Natural Soil Drainage Class	Depth of Rooting Zone	Available Water Capacity	Permeability (Least Permeable Layer)	Erodibility	Inherent Fertility	Degree of Limitation For & Soil Features Affecting Final Cover For Mined Land	
										Depth(")	Suitability
*8B	Grail silty clay loam, 3-6% slopes	IIe	Loamy and clayey alluvium	Well Drained	60"	High	Moderately Slow	Low	High	0-18 18-26 26-60	Fair; clayey Poor; clayey Fair; clayey
8C	Grail silty clay loam, 6-9% slopes	IIIe	Loamy and clayey alluvium	Well Drained	60"	High	Moderately Slow	Medium	High	0-18 18-26 26-60	Fair; clayey Poor; clayey Fair; clayey
*35C	Amor-Werner loams, 6-9% slopes Amor Part	IIIe	Interbedded sandstone, siltstone and loamy shales	Well Drained	31"	Moderate	Moderate	Medium	Medium	0-31 31-60	Good Unsuitable; soft bedrock
	Werner Part		Interbedded sandstone, siltstone and loamy shales	Well Drained	18"	Low	Moderate	Medium	Low	0-7 7-18 18-60	Good Fair; low ferti Unsuitable; soft bedrock
*35D	Amor-Werner loams 9-15% slopes Amor Part	IVe	Interbedded sandstone, siltstone and loamy shales	Well Drained	31"	Moderate	Moderate	Medium	Medium	0-31 31-60	Good Unsuitable; soft bedrock
	Werner Part		Interbedded sandstone, siltstone and loamy shales	Well Drained	18"	Low	Moderate	Medium	Low	0-7 7-18 18-60	Good Fair; low ferti Unsuitable; soft bedrock
*40B [2/]	Shambo loam, 3-6% slopes	IIe	Loamy alluvium	Well Drained	60"	High	Moderate	Low	High	0-19 19-60	Good Fair; medium lime

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR MERCER COUNTY MINED LAND RECLAMATION 1/

Map Symbol	Soil Name	Land Cap. Class & Subclass	Parent Material	Natural Soil Drainage Class	Depth of Rooting Zone	Available Water Capacity	Permeability (Least Permeable Layer)	Erodibility	Inherent Fertility	Degree of Limitation For & Soil Features Affecting Final Cover For Mined Land	
										Depth(")	Suitability
44C	Arnegard loam 6-9% slopes	IIIe	Loamy alluvium	Well Drained	60"	High	Moderate	Medium	High	0-55 55-60	Good Fair; medium lime
58B	Flaxton-Williams complex, 3-6% slopes Flaxton Part	IIIe	Eolian sandy and loamy deposits over glacial till	Well Drained	60"	High	Moderately Slow	Medium; Severe wind erosion	Medium	0-28 28-36 36-60	Good Fair; clayey Fair, clayey; Medium lime
	Williams Part		Loamy glacial till	Well Drained	60"	High	Moderately Slow	Low	High	0-7 7-26 26-60	Good Fair; clayey Fair; clayey, Medium lime
*74B	Regent-Rhoades complex, 1-6% slopes Regent Part	IIIe	Interbedded clayey & silty shales	Well Drained	39"	Moderate	Slow	Low	Medium	0-10 10-39 39-60	Fair; clayey Poor; clayey Unsuitable; Excess sodium, Soft bedrock
	Rhoades Part		Interbedded clayey & silty shales	Moderately Well Drained	4"	Low	Very slow	Medium	Low; High Alkalinity	0-4 4-60	Good Unsuitable; excess sodium

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR MERCER COUNTY MINED LAND RECLAMATION 1/

Map Symbol	Soil Name	Land Cap. Class & Subclass	Parent Material	Natural Soil Drainage Class	Depth of Rooting Zone	Available Water Capacity	Permeability (Least Permeable Layer)	Erodibility	Inherent Fertility	Degree of Limitation For & Soil Features Affecting Final Cover For Mined Land	
										Depth(")	Suitability
*74C	Regent-Rhoades complex, 6-9% slopes	IVe									
	Regent Part		Interbedded clayey & slity shales	Well Drained	39"	Moderate	Slow	Medium	Medium	0-10 10-39 39-60	Fair; clayey Poor; clayey Unsuitable; Excess sodium, Soft bedrock
	Rhoades Part		Interbedded clayey & silty shales	Moderately Well Drained	4"	Low	Very slow	High	Low; High Alkalinity	0-4 4-60	Good Unsuitable; Excess sodium
*75B	Belfield-Daglum silt loams, 3-6% slopes	IIIe									
	Belfield Part		Silty alluvium shales & siltstone	Well Drained	60"	High	Moderately Slow	Medium	Medium	0-16 16-52 52-60	Good Poor; clayey Unsuitable; Excess Sodium
	Daglum Part		Silty and clayey alluvium	Moderately Well Drained	9"	Moderate	Very slow	Medium	Medium; High Alkalinity	0-9 9-60	Good Unsuitable; Excess sodium
*76C	Sen-Rhoades complex, 6-9% slopes	IVe									
	Sen Part		Soft siltstone & silty shales	Well Drailed	31"	Moderate	Moderate	Low	Medium	0-22 22-31 31-60	Good Fair; medium lime Unsuitable; soft bedrock
	Rhoades Part		Interbedded silty & clayey shales	Moderately Well Drained	4"	Low	Very slow	High	Low; High Alkalinity	0-4 4-60	Good Unsuitable; Excess sodium

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR MERCER COUNTY MINED LAND RECLAMATION 1/

Map Symbol	Soil Name	Land Cap. Class & Subclass	Parent Material	Natural Soil Drainage Class	Depth of Rooting Zone	Available Water Capacity	Permeability (Least Permeable Layer)	Erodibility	Inherent Fertility	Degree of Limitation For & Soil Features Affecting Final Cover For Mined Land	
										Depth(")	Suitability
81D	Cabba loam 9-15% slopes	VIe	Interbedded loamy and silty stone and shales	Well Drained	16"	Low	Moderate	Very High	Low	0-16 16-60	Fair; low fertil Unsuitable; soft bedrock
*81E	Cabba loam, 15-35% slopes	VIIe	Interbedded loamy and silty stone and shales	Well Drained	16"	Low	Moderate	Very High	Low	0-16 16-60	Fair; low fertil Unsuitable; soft bedrock
*83E	Cohagen-Vebar, fine sandy loams 9-35% slopes	VIIe									
	Cohagen Part		Soft sandstone	Well Drained	18"	Very Low	Moderately Rapid	Very High; Severe wind Erosion	Low	0-18 18-60	Fair; low fertil. Unsuitable; soft bedrock
	Vebar Part		Soft sandstone	Well Drained	34"	Moderate	Moderately Rapid	Very High; Severe wind Erosion	Medium	0-34 34-60	Good Unsuitable; soft bedrock
84E	Cohagen-Vebar-Rock outcrop complex 9-50% slopes	VIIe									
	Cohagen Part		Soft sandstone	Well Drained	18"	Very Low	Moderately Rapid	Very High; Severe wind Erosion	Low	0-18 18-60	Fair; low fertil. Unsuitable; soft bedrock
	Vebar Part		Soft sandstone	Well Drained	34"	Moderate	Moderately Rapid	Very High; Severe wind Erosion	Medium	0-34 34-60	Good Unsuitable; soft bedrock
	Rock outcrop Part		Unweathered, soft sandstone (not soil)								Unsuitable; soft bedrock

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR MERCER COUNTY MINED LAND RECLAMATION [1/]

Map Symbol	Soil Name	Land Cap. Class & Subclass	Parent Material	Natural Soil Drainage Class	Depth of Rooting Zone	Available Water Capacity	Permeability (Least Permeable Layer)	Erodibility	Inherent Fertility	Degree of Limitation For & Soil Features Affecting Final Cover For Mined Land	
										Depth(")	Suitability
*87X	Rhoades-Daglum complex, 1-9% slopes	VIs									
	Rhoades Part		Interbedded clayey and silty shales & alluvium	Moderately Well Drained	4"	Low	Very Slow	Medium	Low; High Alkalinity	0-4 4-60	Good Unsuitable; Excess sodium
	Daglum Part		Silty and clayey alluvium	Moderately Well Drained	9"	Moderate	Very Slow	Medium	Medium; High Alkalinity	0-9 9-60	Good Unsuitable; Excess sodium
*98E	Ringling-Cabba complex, 9-35% slopes	VIIe									
	Ringling Part		Soft loamstone over scoria	Excessively Drained	15"	Very Low	Moderate	Very High	Low	0-7 7-15 15-60	Fair; coarse fragments Poor; coarse fragments Unsuitable; fractured hard bedrock
	Cabba Part		Interbedded silty and loamy stone and shales	Well Drained	16"	Low	Moderate	Very High	Low	0-16 16-60	Fair; low fertil Unsuitable; soft bedrock

1/ From "Soil Interpretations For Strip Mined Land In Mercer County, North Dakota." A special report by USDA-SCS, March 1974.
2/ Data from SCS-Soil Series Description and Ken Thompson, Soil Scientist, SCS, Dickinson, North Dakota.
* Denotes mapping unit within proposed mining area.

CAPABILITY CLASSIFICATION EXPLANATION

1. Land Capability Classes

These capability classes express a relative degree of limitation and erosional hazards of our soil resources.

a. Land suitable for cultivation and other uses:

Class I - Soils with few limitations that restrict their use. Class I land occurs in North Dakota only on irrigated land with adequate water supply.

Class II - Soils with some limitations that reduce choice of crops or require moderate conservation treatments.

Class III - Soils with severe limitations for cropland use that reduce choice of crops and require special conservation treatments, particularly for erosion control.

Class IV - Soils with very severe limitations for cropland use which limit choice of crops and require very careful management, particularly in controlling erosion.

b. Land with limitations that make them unsuitable for cultivation but suited for grassland or other uses:

Class V - Soils with natural limitations, such as wetness, which limit their use to grassland, wildlife, or recreation.

Class VI - Soils with severe limitations which limit their use largely to grassland, wildlife, or recreation.

Class VII - Soils with very severe limitations and restricted to carefully managed range, wildlife, or recreational uses.

c. Soils and land forms with limitations that make them unsuitable for commercial plant production:

Class VIII - Soil areas which have value only for wildlife, recreation, or esthetic use.

2. Land Capability Subclasses

These capability subclasses express the dominant kind of limitation. Land classes may have more than one kind of subclass listed. A subclass may also be divided to express different degrees of limitation. The following subclasses and symbols are recognized nationwide:

e - Dominant limitation is susceptibility to water erosion or wind erosion.

w - Dominant limitation is excess water, such as seepage, high water table, or flood hazard

s - Dominant limitation is an unfavorable soil characteristic, within rooting zone, such as low moisture capacity, very high density, gravel, stone, shallow effective depth, salinity, etc.

c - Dominant limitation is climate, chiefly low precipitation or limiting temperature. In North Dakota 'c' is used only on deep level heavy loam and light clay loam soils in Class II which do not have other more significant limitations.

3. Land Capability Unit or Soil Management Group

A capability unit is a grouping of soils that are nearly alike in suitability for plant growth and respond to the same kinds of management.

Since all upland soils in North Dakota are subject to the same climatic limitation, so are all cultivated soils subject to seasonal exposure to our periodic high winds. All cultivable soils, therefore, carry a relative wind erodibility factor based on surface soil textures. Each land capability unit has been classified according to wind erodibility group and these descriptions will be found in Section III-A.

On soils poorly suited for cropland or limited to grassland use, the abbreviated range site symbol follows the subclass.

The land capability table shows two land capability classes on soils where water interferes with crop production. The class of soil when drained is indicated by Roman numeral, and undrained by Arabic numeral. The soil and capability map placed in the conservation plan will show only one of these classes, depending on drainage feasibility determined during the planning process. The following final capital letter further defines the groupings into capability units.

M - Indicates a medium textured substrata under a sandy soil which increases its water-holding capacity.

P - Indicates slow permeability, limited effective root depth, and the presence of a sodic claypan in the subsoil.

L - Indicates that the soil is calcareous to the surface.

G - Indicates limited effective root depth due to sand and gravel.

Capability Unit IIe6

This unit consists of deep and moderately deep, gently sloping or undulating, well drained soils. They are loam and silt loam soils on bottomlands, uplands, terraces, fans and in swales.

These soils are high or moderate in organic matter content, have high or moderate available water capacity, and high or moderate fertility. They have moderate or moderately slow permeability. These soils have a slight wind erosion and a moderate water erosion hazard.

The main management practices needed are those that maintain organic matter content and fertility and control erosion.

These soils are well suited to all crops commonly grown in the county.

Mapping Units Included are:

28B - Temvik-Williams silt loams, 3 to 6 percent slopes

36B - Williams loam, 3 to 6 percent slopes

*40B - Shambo loam, 3 to 6 percent slopes

44B - Arnegard loam, 3 to 6 percent slopes

91B - Straw loam, 3 to 6 percent slopes

96B - Grassna silt loam, 3 to 6 percent slopes

97B - Sen silt loam, 3 to 6 percent slopes

100B - Amor loam, 3 to 6 percent slopes

109B-Bowbells-Zahl loams, 3 to 6 percent slopes

Capability Unit IIe7

This unit consists of deep and moderately deep, gently sloping, well drained soils. They are silty clay loam soils on uplands, fans and in swales.

These soils are high or moderate in organic matter content, have high or moderate available water capacity and high or moderate fertility. They have slow permeability. These soils have a moderate water erosion hazard.

The main management practices needed are those that maintain organic matter content and fertility, and control erosion,

These soils are well suited to all crops commonly grown in the county.

Mapping Units Included are:

*8B - Grail silty clay loam, 3 to 6 percent slopes

9B - Regent silty clay loam, 3 to 6 percent slopes

Capability Unit IIIe3

This unit consists of deep and moderately deep, nearly level, to gently sloping or undulating, well drained soils. They are fine sandy loam soils (except for Williams loam in Flaxton-Williams complex, 3 to 6 percent slopes) on uplands, terraces, bottomlands, fans and in swales.

These soils are high to moderate in organic matter content, have low to moderate available water capacity, and low to high fertility. They have rapid to moderate permeability ghrough the subsoil and very rapid to moderately slow permeability in the substratum. These soils have a severe wind erosion hazard and a moderate water erosion hazard on long slopes over 3 percent.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are poorly to well suited to most crops commonly grown in the county.

Mapping Units Included are:

57B - Flaxton fine sandy loam, 1 to 6 percent slopes

58B - Flaxton-Williams complex, 3 to 6 percent slopes

59B - Parshall fine sandy loam, 1 to 6 percent slopes

62B - Velva fine sandy loam 1 to 6 percent slopes

Capability Unit IIIe6

This unit consists of deep or moderately deep, gently sloping, or moderately sloping, well drained soils. They are loam or silt loam soils on uplands, terraces, fans and in swales. Bowdle soils have sand and gravel at 20 to 40 inches.

These soils are moderate or high in organic matter content, have high or moderate (except Werner and Rhoades soils have low) available water capacity, and high to low fertility. They have moderate to very slow permeability. These soils have a slight wind erosion hazard and a severe water erosion hazard.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are well suited to grasses and legumes, fairly well suited to small grains and poorly suited to corn.

Mapping Units Included are:

28C - Temvik-Williams silt loams, 6 to 9 percent slopes

* 35C - Amor-Werner loams, 6 to 9 percent slopes

36C - Williams loam, 6 to 9 percent slopes

38C - Williams-Zahl loams, 6 to 9 percent slopes

44C - Arnegard loam, 6 to 9 percent slopes

* 75B - Belfield-Daglum silt loams, 3 to 6 percent slopes

76B - Sen-Rhoades complex, 3 to 6 percent slopes

Capability Unit IIIe7

This unit consists of deep and moderately deep, nearly level to moderately sloping, well drained soils. They are silty clay loam soils on uplands, terraces, fans and in swales.

These soils are high or moderate in organic matter content, have high or moderate (except Rhoades soils have low) available water capacity, and high or moderate (except Rhoades has low) fertility. They have moderately slow to very slow permeability. These soils have a severe water erosion hazard.

The major management practices needed are those that control erosion, maintain and improve tilth, and maintain organic matter content and fertility.

These soils are well suited to grasses and fairly well suited to small grains, legumes and poorly suited to corn.

Mapping Units Included are:

8C - Grail silty clay loam, 6 to 9 percent slopes

9C - Regent silty clay loam, 6 to 9 percent slopes

* 74B -Regent-Rhoades complex, 1 to 6 percent slopes

Capability Unit IVe6

This unit consists of shallow to deep, nearly level to strong sloping, well to excessively drained soils. They are loam and silt loam soils on uplands, terraces and fans.

These soils are moderate in organic matter content, have moderate to very low available water capacity, and moderate or low fertility. They have rapid to very slow permeability. These soils have a slight wind erosion hazard and a severe water erosion hazard.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are fairly well to poorly suited to small grains and well suited to grasses. They are fairly well suited to legumes and poorly suited to corn.

Mapping Units Included are:

11C - Cherry silty clay loam, gullied, 3 to 9 percent slopes

* 35D - Amor-Werner loams, 9 to 15 percent slopes

71C - Bearing-Ringling loams, 6 to 9 percent slopes

75C - Belfield-Daglum silt loams, 6 to 9 percent slopes

* 76C - Sen-Rhoades complex, 6 to 9 percent slopes

77C - Bowdle-Wabek complex, 6 to 9 percent slopes

92B - Noonan-Williams loams, 1 to 6 percent slopes

Capability Unit IVe7

This unit consists of deep, moderately sloping, well and moderately well drained soils. They are silty clay loam soils on uplands.

These soils are moderate in organic matter content, have moderate or low available water capacity, and moderate fertility. They have moderately slow to very slow permeability. These soils have a severe water erosion hazard.

The major management practices needed are those that control erosion, maintain and improve tilth, and maintain organic matter content and fertility.

These soils are well suited to grasses, fairly well to poorly suited to small grains and legumes and poorly suited to corn.

Mapping Units Included are:

* 74C - Regent-Rhoades complex, 6 to 9 percent slopes

Capability Unit VIeSw

This unit consists of shallow or moderately deep, strongly sloping, excessively to well drained soils. They are loam, silt loam and silty clay soils on uplands.

These soils are low or moderate in organic matter content, have low to very low available water capacity, and low fertility. They have slow or moderate permeability. These soils have a slight to moderate wind erosion hazard and a severe water erosion hazard.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are well suited to native range and poorly suited to hayland.

Mapping Units Included are:

79D - Wayden-Moreau silty clays, 9 to 15 percent slopes

81D - Cabba loam, 9 to 15 percent slopes

Capability Unit VIsTCp

This unit consists of deep, nearly level to moderately sloping, well drained soils. They are silt loam to silty clay soils on uplands, terraces, fans and in swales.

These soils are moderate in organic matter content, have low to moderate available water capacity and low fertility. They have very slow permeability. These soils have a moderate wind erosion hazard and a moderate water erosion hazard on long slopes over 3 percent. Rooting is restricted by a very shallow or shallow claypan.

The major management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are suited to native range and poorly suited to hay and cultivated crops.

Mapping Units Included are:

* 87X, 87C - Rhoades-Daglum complex, 1 to 9 percent slopes

Capability Unit VIIeSW

This unit consists of shallow and moderately deep, strongly sloping to very steep, well and somewhat excessively drained soils and soft rock outcrops. They are fine sandy loam to silty clay loams soils on uplands.

The soils in this unit are low or moderate in organic matter content, have low available water capacity and low (except Vebar has moderate) fertility. They have moderately rapid or moderate permeability. These soils have a severe to slight wind erosion hazard and a very severe water erosion hazard.

The main management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are only suited to native range.

Mapping Units Included are:

* 81E - Cabba loam, 15 to 35 percent slopes

82E - Cabba-Badland complex, 15 to 50 percent slopes

* 83E - Cohagen-Vebar fine sandy loams, 9 to 35 percent slopes

84E - Cohagen-Vebar-Rock outcrop complex, 9 to 50 percent slopes

Capability Unit VIIeVS

This unit consists of very shallow or shallow, strongly to steep, excessively drained soils. They are channery loam and laom to silty clay loam soils on uplands.

These soils are low or moderate in organic matter content, have low available water capacity, and low fertility. They have moderate or very rapid permeability. These soils have a slight wind erosion hazard and a very severe water erosion hazard..

The main management practices needed are those that control erosion and maintain organic matter content and fertility.

These soils are only suited to native range.

Mapping Units Included are:

* 98E - Ringling-Cabba complex, 9 to 35 percent slopes

* Denotes mapping unit within proposed mining area.

Underlined mapping units are within entire lease area.

Scenery Quality Inventory Chart

KEY FACTORS	RATING CRITERIA AND SCORE		
(1) LAND FORM	Vertical or near vertical cliffs, spires, highly eroded formations, massive rock outcrops, severe surface variation. 4	Steep canyon walls, mesas, interesting erosional patterns, variety in size & shape of land forms. 2	Rolling hills, foothills, flat valley bottoms. 1
(2) COLOR	Rich color combinations veriety or vivid contrasts in the color of soil, rocks, vegetation or water. 4	Some variety in colors and contrast of the soil, rocks & vegetation, but not dominant. 2	Subtle color variations, little contrast, generally muted tones. Nothing reelly eye-catching. 1
(3) WATER	Still, chance for reflections or casceding white weter, e dominant factor in the landscepe. 4	Moving and in view or still but not dominant. 2	Absent, or present but seldom seen. 1
(4) VEGETATION	A hermonious variation in form, texture, pattern, and type. 4	Some veriation in pattern and texture, but only one or two major types. 2	Little or no veriation, contrast lacking. 1
(5) UNIQUENESS	One of a kind or very rare within region. 6	Unusual but similar to others within the region. 2	Interesting in its setting, but fairly common within the region. 1
(6) INTRUSIONS	Free from aesthetically undesirable or discordant sights and influences. 2	Scenic quality is somewhat depreciated by inharmonous intrusions but not so extensive that the scenic quelities are entirely negated. 1	Intrusions are so extensive that scenic qualities sre for the most part nullified. -4

Scenery A = 15-24

Scenery B = 10-14

Scenery C = 1-9

EXPLANATION OF RATING CRITERIA

(1) Land Form of topography becomes more interesting as it gets steeper end more massive. Examples of outstanding land forms are found in the Grand Canyon, the Sawtooth Mountain Range in Idaho, the Wrangle Mountain Range in Alaska, and the Rocky Mountain National Park.

(2) Color. Consider the overall color of the basic components of the landscape (i.e., soil, rocks, vegetetion, etc.) as they appeer during the high-use season. Key factors to consider in rating "color" era variety, contrast, and harmony.

(3) Water is the ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating scora.

(4) Vegetetion. Give primary consideration to the variety of patterns, forms, end textura created by the vegetation.

(5) Uniqueness. This fector provides an opportunity to give added importance to one or ell of the scenic feetures that appeer to be relatively unique within any one physiographic region. Thera may also be ceses where e seperate eveluation of eech of the key factors does not give a true picture of the overell scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing scenery - the uniqueness factor can be used to recognize this type of area and give it the edded emphasis it needs.

(6) Intrusions. Consider the impact of man-made improvements on the aesthetic quality. These intrusions can hsve a positive or negative aesthetic impact. Rate accordingly.

INSTRUCTIONS (See .1 for general procedures.)

Purpose: To rate the aesthetic quality of the scenic resource on all BLM lands.

How to Identify Scenery Value: All Bureau lands have scenic value.

How to Determine Minimum Suitability: All BLM lands are rated for scenic values. Also rate adjacent or interminglingnon-BLM lands.

How to Delineate Rating Areas: Consider the following factors when dalineating rating areas:

1. Like physiogrephic characteristics (i.e., land form, vagetation, etc.)
2. Similar visual patterns, texture, color, variety, etc.
3. Areas which have a similar impact from intrusions (i.e., roads, structures, mining operations, or other surface disturbencas).

The following is a brief description of the four basic elements of landscape character and how they are perceived in the landscape (BLM Visual Resources Management Manual 6310):

Form — Form is generally considered as the mass or shape of an object. It is most strongly expressed in the shape of the land surface, usually the result of some type of erosion, but may also be reflected on the shape of the openings or changes in vegetation, or in the structures placed on the landscape.

Line — Lines found in the natural landscape are usually the result of an abrupt contrast in form, texture, or color. Lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

Color — A phenomenon of light or visual perception that enables one to distinguish between otherwise identical objects. A hue, as contrasted with black, white, or gray. Color as perceived in the landscape is usually most prominent in the vegetation, but may be expressed in the soil, rocks, water, etc., and may vary with the time of day, time of year, and the weather.

Texture — Texture is the result of the size, shape, and placement of parts, their uniformity, and the distance from which they are being observed. Texture, as it is perceived in the landscape, is usually the result of the vegetation or vegetative patterns on the landscape. Texture may also be the result of the erosive patterns in rocks or soil.

1. Date: NOVEMBER 1977
2. Rater:
3. State: NORTH DAKOTA
4. District: DICKINSON
5. Plan Unit: NORTH AMERICAN COAL CO.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

QUALITY EVALUATION SCORESHEET

6. Recreation Activity: INDIAN HEAD MINE SIGHT-SEEING SCENERY

CLASS	SCORE RANGE
	7
A	15-24 (HIGH)
B	10-14 (MODERATE)
C	01-09 (LOW)

8. KEY FACTORS

9. RATING AREA NO. (a)	NAME (b)	LANDFORM	COLOR	WATER	VEGETATION	UNIQUENESS	INTRUSIONS			11. TOTAL SCORE	12. CLASS	13. REMARKS
		10. POINT MAXIMUM										
		4	4	4	4	6	2					
	RATER NO. 1	2	1	1	2	1	1					
	RATER NO. 2	1	2	1	1	1	1					
	RATER NO. 3	2	2	2	2	1	1					
	RATER NO. 4	1	2	1	1	1	1					
	RATER NO. 5	2	2	1	2	1	1					
	TOTAL	8	9	6	8	5	5					
	AVERAGE	1.6	1.8	1.2	1.6	1	1					
	SUMMARY RATING	2	2	1	2	1	1			9	C	

(Instructions on reverse)

Form 6110–10 (August 1972)

1974 INVENTORY OF NORTH DAKOTA OUTDOOR RECREATION FACILITIES

STATE OUTDOOR RECREATION AGENCY, 900 EAST BOULEVARD, BISMARCK, NORTH DAKOTA 58505 701/224-2430

MERCER COUNTY NAME OF AREA	LOCATION	OWNERSHIP	TOTAL ACRES	SURFACE WATER ACRES	FISHING ACRES	RAMPS	DOCKS	BOATING, WATER SKIING ACRES	HUNTING ACRES	BEACHES	POOLS	POOL AREA (SQ FT)	HIKING, HORSEBACK MILES	BICYCLE MILES	MOTORCYCLE, SNOWMOBILE MILES	CAMPING ACRES	CAMPING TENT SITES	CAMPING TRAILER SITES	CAMPING ELECTRIC OUTLETS	PICNICKING ACRES	PICNICKING TABLES	PICNICKING SHELTERS	GOLFING ACRES	GOLFING GRASS GREENS	GOLFING SAND GREENS	DIAMONDS BASEBALL AND SOFTBALL	COURTS HORSESHOE	COURTS VOLLEY BALL	COURTS BASKETBALL	COURTS TENNIS	PLAYGROUNDS	RANGES TRAP, SKEET	RANGES ARCHERY
					FISHING					SWIMMING			TRAILS			CAMPING				PICNICKING			GOLFING				COURTS						RANGES	
Little Missouri River **	County	F	2,388	2388	1672			1672																									
Garrison Dam Tailwaters	6-146-85	F	260	**	**	1	1													2	18												
Lake Sakakawea *	County		36,240	36240	25362			25362																									
Camp Dominic Savio	West of Pick City	P	98	*	*			*												2	8												
Beulah Bay Recreation Area	8-146-87	M	102	*	*	2	5	*										4	4		15	5											
Hazen Recreation Area	Sakakawea	M	80	*	*		1	*													4												
Intake Picnic Area	31-147-84	F	103	*	*			*												50	35												
Sakakawea State Park	25-147-85	S	661	*	*	1	4	*		1					3	300		75	75	35	177	10										1		
Red Butte Bay	17-147-90	F	*	*	*	1	1	*																									
Sakakawea Park	Stanton	M	112	100	100	1	1			1										5	8	1										2		
Hazen Country Club	Hazen	P	50																				50		9								
Horse Show Arena	E. of Hazen	P	5																														
Hazen City Park	City	M	10								1									5	12												
Hazen-Burlington North Park	City	M	2																	1	4	1											
Riveraide & City Center Park	Beulah	M	120	50	50		5			1						5		6	6	35	15	3	175		9	1	1		3	1	2		
Beulah Swimming Pool & Park	City	M	4								1																						
Zap Sportsman Club	City	P	10																												1		
Zap Municipal Park	City	M	7																	1	4	1											
Beulah Mine Pond	N. of Beulah	S	25	3	3																												
BLM Areas (16)	County	S	459						459																								
Leonard Sailer Campground	Beulah	P	20													20		20															
Jacob Weidner Campground	Beulah	P	15													15		30															
Hazen Trailer Camper Park	City	M	4													4		6	6														
Beaver Creek GMA	R89-T146	S/F	163						163																								
Beulah Mine GMA	162-87-144	S/F	1,174						1,174																								
Mille GMA	F87-T146	S/F	924						924																								
TOTAL			43,036	38,781	27,187	6	18	27,034	2,720	3	2				3	349		141	91	136	300	21	225		18	1	1		3	1	5	1	

FEWS — U.S. FISH AND WILDLIFE SERVICE
BLM — BUREAU OF LAND MANAGEMENT
WPA — WATERFOWL PRODUCTION AREA
GMA — G.M. MANAGEMENT AREA
MA — MANAGEMENT AREA
PR — OPERATED FOR PROFIT
NP — NON PROF.
F.M.C.S — FEDERAL, MUNICIPAL, COUNTY OR STATE
P — PRIVATELY OWNED

rm 6230-2
ne 1968)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANTIQUITIES SITE INVENTORY

[X] Archeological [ ] Paleontological [ ] Historical

1. Site number	2. Type of site
ME 217	Kill Site

State	County	District	4. Map reference
orth Dakota	Mercer	Dickinson	USGS Medicine Butte-1:24,000

. Location

n the bottom of a draw in the SE¼NW¼SW¼ of the section. The Knife River s less than two miles to the south.

Section	Township	Range	Meridian
2	143N	89W	

6. Land ownership status	7. Other site designations
Private	

8. Cultural affiliation; Geologic Age and/or formation; dates of use

Unknown

9. Site description, position, surrounding terrain, and importance

'his is a possible kill site in a gully cut. Material evidence at the ;ite is meager. A single long bone and a knife - river flint biface were ioted in the muddy bed of the gully. Some other long bone fragments were ioted in places downstream. There is no artifactual material anywhere on .he bank surrounding the site, and there is nothing eroding out of the 'alls of the gully. Another site, a light lithic scatter and possible ock alignments, was recorded on a hill approximately 650 meters to the iorth of the site.

10. Area of occupation	11. Present condition
Approx. 200 square meters	good - no evidence of erosion. The site may be impacted by future stripmining.
12. Photo numbers	

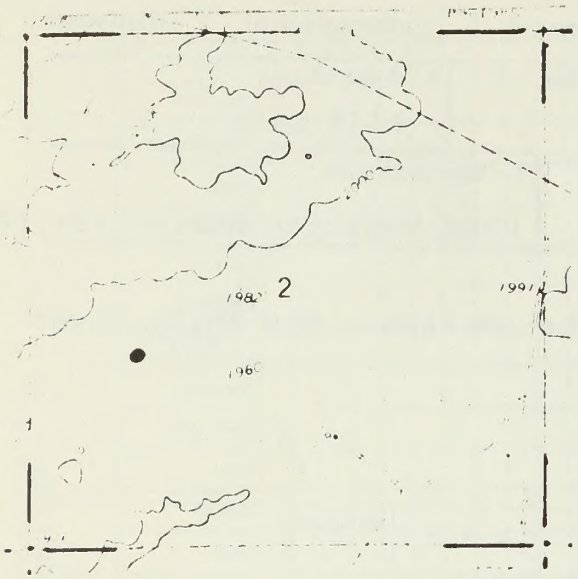
13. Informants and references

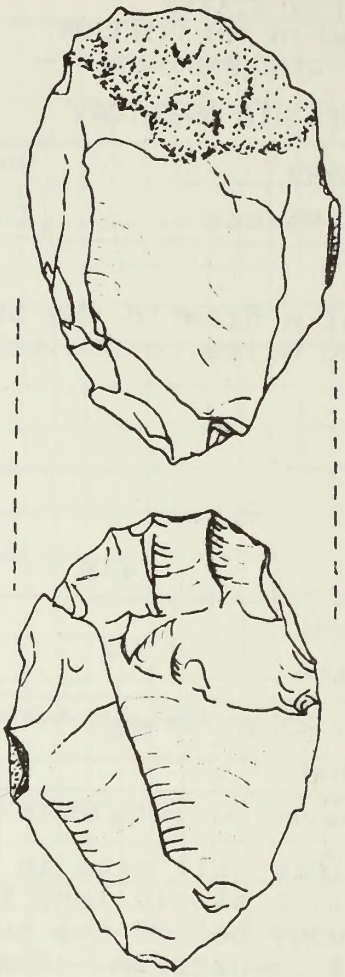
This site was recorded as part of an Environmental Assessment Report for proposed strip-mining by the North American Coal Mining Co, Indian Head Min

14. Recorded by	Date
Dave Siegel	10-30-77

(continued on reverse)

15. Sketch and/or remarks





EVALUATION

16. Does site have recreation value? ☐ Yes ☒ No If "yes," has the Recreation Inventory Form 6110–3 been completed? ☐ Yes ☐ No

17. Does site have sufficient value to justify preservation and/or development? ☒ Yes ☐ No If "yes," specify type of preservation or development.

The site should be tested for depth. This may be accomplished very easily with perhaps three backhoe trenches. The depth and extent of the site, if any, can be determined in a matter of two or three hours.

18. Reviewed by *(Signature of District Manager)*	Date

Coding Sheet for Data Bank 1

Scale: 1:24000
Map Reference: MEDICINE BUTTE

State (1)	County (2)	Site or Serial Number (3)	Township (4)	Range (5)	Section (6)	Quarter/Quarter (7)
32	ME	217	143N	89W	2	12

Latitude (8)	Longitude (9)	U.T.M. (10)	Elevation (11)
		14782834 90	1950 feet

Surface Owner (12)	Managing Agency (13)	Mineral Owner (14)	Managing Agency (15)	Partial Mineral Ownership (16)	Existing Lease 1 (17)	Existing Lease 2 (18)	Mining Claim Patent (19)
1	9	2	1				

Physiographic Damage (20)	Extent of Physio damage (21)	Future Physio damage (22)	Vandalism (23)	Cultivation damage (24)	Construction damage (25)	Grazing damage (26)	Logging damage (27)
6		1				1	1

Future land damage (28)	Importance (29)	Landform 1 (30)	Landform 2 (31)	General Topography (32)	Relief (33)	Exposure (34)
2		11		2	2	9

Regional Vegetation (35)	Soil Series 1 (36)	Soil Series 2 (37)	Geologic Strata (38)

Drainage Direction (39)	Direction to stream (40)	Distance to stream (41)	Stream Name (42)
	4	2800	KNIFE RIVER

Distance to Water Source (43)	Direction to Water Source (44)	Water Type (45)
0		5

Cultural Depth (46)	Site Area (47)	Surface Collection (48)
14	1	2

Test Hole (49)	Excavation (50)	Further work (51)	Reporter (52)	Date of Work (53)	Midden, refuse (54)	Caches, Storage pits (55)	Hearths, Camp sites (56)
1	1	2	2	1977	1	1	1

Tipi rings, house sites (57)	Trails, Portages (58)	Chipping station, workshops (59)	Graves (60)	Gardens, Fields (61)	Game pitfalls, quarries (62)	Earthworks (63)	Stone alignments (64)
1	1	1	1	1	1	1	1

Pictographs Petroglyphs (65)	Lookouts (66)	Chipped Stone work (67)	Wood work (68)	Bone work (69)	Shell work (70)	Skin, hair (71)	Wood fiber (72)
1	1	2	1	1	1	1	1

Clay work (73)	Ground stone work (74)	Metal work (75)	Faunal remains (76)	Fossil remains (77)	Charcoal (78)	Dating (79)
1	1	1	2	1	1	1

Kill, jump (80)	Butchering (81)	Rockshelter (82)	Fire cracked rock (83)	Visionquest (84)	Prehistoric (85)	Early Prehistoric (86)	Early Middle Prehistoric (87)	Late Middle Prehistoric (88)
2	1	1	1	1	2	1	1	1

Late Prehistoric (89)	Historic (90)	Unknown (91)	Site View (92)	Site Lookout (93)	Site Forms (94)	Site Photo (95)	Site Maps (96) (CR)
1	1	2	1	5	2	2	2 *

Comments, Problems:

Date of Field Work: 10-30-77
Coder: Dave Siegel
Date coded:

Form 6230-2
(June 1968)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANTIQUITIES SITE INVENTORY

[X] Archeological [ ] Paleontological [ ] Historical

1. Site number	2. Type of site
ME 218	Lithic Scatter

3. State	County	District	4. Map reference
North Dakota	Mercer	Dickinson	USGS Medicine Butte-1:24,000

5. Location

On a small bench and ridge in the NW¼ of the section. The site extends over most of the eastern portion of the bench. The appropriate center of concentrated material is in a small blowout in the SE¼NE¼NW¼.

Section	Township	Range	Meridian
2	143N	89W	

6. Land ownership status	7. Other site designations
Private	

8. Cultural affiliation; Geologic Age and/or formation; dates of use

Unknown

9. Site description, position, surrounding terrain, and importance

A light scatter of knife - river flint lithic debris, plus four possible rock alignments, atop a bench and spur ridge. The lithic material is sparse, and includes primary flakes, primary cortical flakes, unutilized flakes, and a few flakes and scrapers with retouch. Most of the material is in a small blowout on the eastern rim of the bench. There are numerous patches of rock in the area, and four features resembling hearth-like circles and tipi rings were noted, but they are questionable (see map). A 32-40 centerfire cartridge was noted along the ridge-spur (see map, reverse).

10. Area of occupation	11. Present condition
700 meters N-S X 1000 meters E-W	good - The site is just outside of a proposed stripmine corridor.
12. Photo numbers: 1 photo	

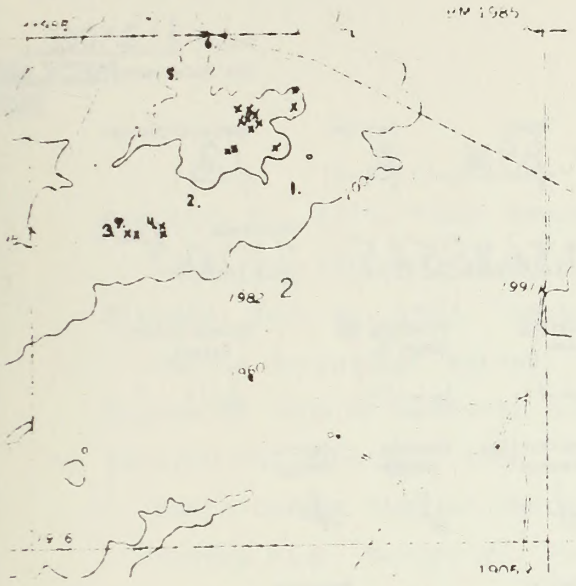
13. Informants and references

This site was recorded as part of the cultural resources input to an Environmental Assessment Report for proposed North American Coal Mining Co. Indian Head Mine stripmining activity.

14. Recorded by	Date
Dave Siegel	10-30-77

(continued on reverse)

15. Sketch and/or remarks



x - lithic debris - flakes, scrapers
1. projectile point tip
2. possible tipi ring
3. rock alignment (possible) cairn
4. possible hearth-like rock alignment
5. possible hearth-like rock alignment
6. possible rock alignment.
7. historic cartridge

EVALUATION

16. Does site have recreation value? ☐ Yes ☒ No If "yes," has the Recreation Inventory Form 6110–3 been completed? ☐ Yes ☐ No

17. Does site have sufficient value to justify preservation and/or development? ☒ Yes ☐ No If "yes," specify type of preservation or development.

If the site is going to be directly impacted, it should be tested for depth. A series of test pits could be excavated by two workers in three days. Controlled surface collection would not be necessary, as the amount of material present is too sparse. However, no further work is recommended at the site if it is not going to be directly impacted.

18. Reviewed by *(Signature of District Manager)*	Date

☆GPO 777-276

mber _____ Coding Sheet for Data Bank 1 Scale: 1:24000

Map Reference MEDICINE BUTTE

State (1)	County (2)	Site or Serial Number (3)	Township (4)	Range (5)	Section (6)	Quarter/Quarter (7)
32	ME	218	143N	89W	2	12

Latitude (8)	Longitude (9)	U.T.M. (10)	Elevation (11)
		14786835650	2120 feet

Surface Owner (12)	Managing Agency (13)	Mineral Owner (14)	Managing Agency (15)	Partial Mineral Ownership (16)	Existing Lease 1 (17)	Existing (CR) Lease 2 (18)	Mining Claim Patent (19)
1	9	2	1				

Physiographic Damage (20)	Extent of Physio damage (21)	Future Physio damage (22)	Vandalism (23)	Cultivation damage (24)	Construction damage (25)	Grazing damage (26)	Logging damage (27)
6	1	1	1	1	1	1	1

Future lend damage (28)	Importance (29)	Landform 1 (30)	Landform 2 (31)	General Topography (32)	Relief (33)	Exposure (34)
1		28	2	2	2	10

Regional Vegetation (35)	Soil Series 1 (36)	Soil Series 2 (37)	Geologic Strata (38)

Drainage Direction (39)	Direction (CR) to stream (40)	Distance to stream (41)	Stream Name (42)
	4	3300	KNIFE RIVER

Distance to Water Source (43)	Direction to Water Source (44)	Water Type (45)	Cultural Depth (46)	Site Area (47)	Surface Collection (48)
650	5	5	14	16	1

Test Hole (49)	Excavation (50)	Further work (51)	Reporter (52)	Date of Work (53)	Midden, refuse (54)	Caches, Storage pits (55)	Hearths, Camp sites (56)
1	1	2	2	1977	1	1	1

Tipi rings, house sites (57)	Trails, Portages (58)	Chipping station, Workshops (59)	Graves (60)	Gardens, Fields (61)	Game pitfalls, quarries (62)	Earthworks (63)	Stone alignments (64)
1	1	2	1	1	1	1	2

Pictographs Petroglyphs (65)	Lookouts (66)	Chipped Stone work (67)	Wood work (68)	Bone work (69)	Shell work (70)	Skin, hair (71)	Wood fiber (72)
1	1	2	1	1	1	1	1

Clay work (73)	Ground (CR) stone work (74)	Metal work (75)	Faunal remains (76)	Fossil remains (77)	Charcoal (78)	Dating (79)
1	1	1	2	1	1	1

Kill, jump (80)	Butchering (81)	Rockshelter (82)	Fire cracked rock (83)	Visionquest (84)	Prehistoric (85)	Early Prehistoric (86)	Early Middle Prehistoric (87)	Late Mid Prehisto (88)
1	1	1	1	1	2	1	1	1

Late Prehistoric (89)	Historic (90)	Unknown (91)	Site View (92)	Site Lookout (93)	Site Forms (94)	Site Photo (95)	Site Maps (CR) (96)
1	1	2	4	1	2	2	2 *

Comments, Problems: _____

Date of Field Work: 10-30-77

Coder: Dave Siegel

Date coded: _____

REFERENCES

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STATEMENT OF SUITABILITY FOR RECLAMATION

STATEMENT OF SUITABILITY FOR MINING AND RECLAMATION

The lease area has been evaluated for determination of suitability for mining and found to be suitable. No factors that would make the area unsuitable, i.e., areas of critical environmental concern, were present.

The proposed mining area is suitable for reclamation to native rangeland and tame pasture or hayland. The existing combinations of slope, soils, and climate provide a good potential for reclamation. Present low producing rangesites will be improved through the reclamation process. A similar rolling land form will be reestablished which will blend with the surrounding area.

INITIAL LAND USE CONCLUSIONS

CONCLUSION STATEMENT AND CRITERIA

The initial conclusion to the proposed action is to lease the coal as applied for with stipulations on the lease to insure reclamation of the site and return it to a condition for agricultural use.

This conclusion is based on the following criteria:

1. The coal will contribute to the energy needs of the State and the nation.
2. Beneficial use will be made of the coal.
3. The coal facilitates the continued operation of a long established mine.
4. The applicant meets the legal requirements for leasing.
5. Development of the coal will not have any adverse social impacts.
6. There will be beneficial economic impacts to the State and Federal governments through the collection of taxes, rentals, and royalties.
7. Good reclamation potential exists; however, it is recognized that a good reclamation plan must be developed and carried out for complete success.
8. Most physical adverse impacts will be of short term and mitigated over time. There may be a reduction or cessation of flow of springs, but alternative sources of water are available to the lessee to substitute for lost water.
9. Irreversible impacts are not significant.
10. The area is recommended to be returned to a condition to support agriculture because it is the desire of the surface owner and is the most productive use of the land.
11. If not leased at this time, the resource will be left and not mined as the remaining deposit of coal will be too small to be economically mined.

STATEMENT ON SURFACE OWNER CONSENT AND OPINION ON RECLAMATION

On December 8, 1973 Johnny and Lorine Buechler, surface owners, entered into a lease with A.G. Golden giving the lessee the right to conduct mining operations on the parcel of land in question. This lease is taken as evidence that the surface owner consents to the use of his surface for purposes of mining the underlying federal coal. A.G. Golden has assigned this lease to North American Coal Corporation.

In Johnny Buechler's discussion with BLM on reclamation and post-mining use of the proposed lease area, Buechler expressed the desire to have the land revert to farm use. If at all possible he wants to increase the amount of cash crop acres, thereby reducing the pasture acres. He wants the water diversion ditches and all other improvements that may be destroyed by mining replaced in the reclamation process.

RELATIONSHIP TO STATE AND LOCAL PLANNING

The State of North Dakota does not have any planning organization which has powers within the Mercer County area. North Dakota Century Code (NDCC) has impowered the County Board of Commissioners to enact planning and zoning within their county. The Mercer County Planning Commission has been set up to advise the County Commissioners on all planning and zoning matters.

An Energy Development Board funded by ERDA works with the Mercer County Planning Commission to advise in energy related matters.

The Lewis and Clark 1805 Regional Council for Development is an advisory agency which works with Mercer County Commissioners, Mercer County Planning Commission, and the Energy Development Board in planning matters.

There is no state and local planning in conflict with the proposed action.

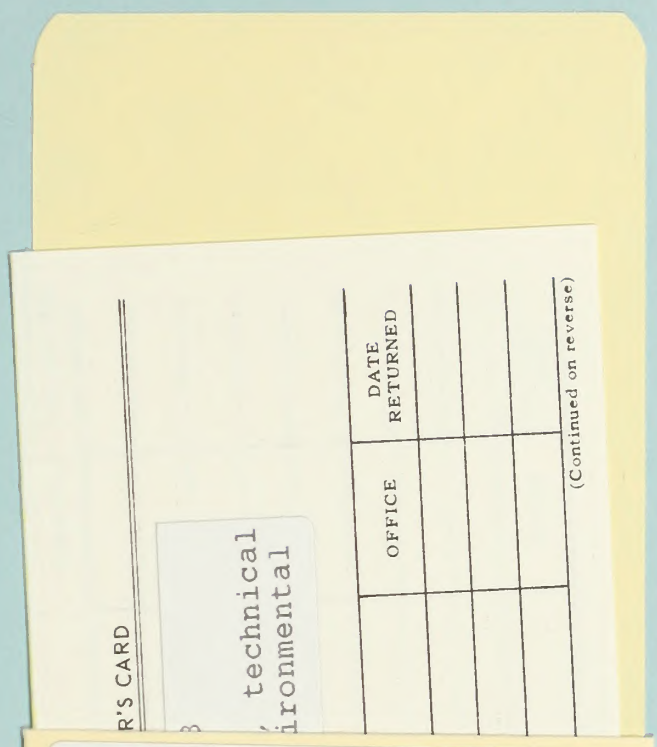
SPECIAL STIPULATIONS

The lessee will be required to comply with all applicable State and federal laws and regulations concerning coal mining. At least two weeks prior to beginning operations on subject lands, the lessee must have in his possession an approved exploration and/or mining and reclamation plan. The plan must be approved by the Area Mining Supervisor of the United States Geological Survey, North Dakota Public Service Commission, and the District Manager of the Bureau of Land Management.

The operation shall comply with the reclamation standards as set forth in 43 CFR 3041.2-21, 30 CFR 211, 30 CFR 700, and North Dakota Century Code (NDCC 38-14).

Special stipulations for this lease will be: (Special stipulations are requirements that are in addition to existing law and regulation or make general requirements more specific.)

1. Reestablish diversion ditches and ponds.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Dickinson District Office
P.O. Box 1229
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