DEVELOPMENT OF A PROCEDURE FOR LAND USE POTENTIAL EVALUATION FOR SURFACE-MINED LAND

Appendix I: Eastern U.S. Surface Mine Case Study

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The potential usefulnuss of reclaimed surface-mined land has received much attention in recent times. This attention is partially due to the establishment of federal environmental reclamation standards but concern for achieving better land uses has also been shown by interested members of the mining industry. In an effort to develop a procedure for evaluating postmining land use potentials, specific mines in various regions of the U.S. were studied to determine the extent of current mined-land planning and to discover characteristics that are regional in nature. As part of this investigation, a 430-acre surface mine in Clearfield County, Pennsylvania has been studied. Established site planning principles have been applied to the case study site including formation of a data base, development of alternate land use plans, and evaluation of the economic, environmental, and social impacts of the land use alternatives. Key factors affecting site realization have been identified along with positive suggestions for applying land use planning processes to mined-land planning.

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Foreword

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TABLE OF CONTENTS

Chapter | Page

LIST OF FIGURES

LIST OF TABLES

Chapter 1

INTRODUCTION

1.1 Report Objective

Federal legislation now requires surface mine operators to declare, in their permit applications, what the proposed postmining land use will be for the area to be mined. In addition, the applicant is required to include a discussion of the utility and capacity of the reclaimed land to support a variety of alternative uses (P.L. 95-87, Sec. 508.A.3.). The objective of this research project is to develop guidelines and procedures by which mine planners can evaluate the potential of surface-mined land for various land uses. Such procedures should include not only those areas typically handled in premine planning, but also those matters, such as environmental planning and comprehensive planning, which have traditionally been in the realm of public planning. Historically, the interaction and cooperation between premine planners and public planners have been more on an informal basis than on a formal, rational basis. To obtain maximum usefulness of reclaimed land, these relationships must be established in a detailed manner.

Another problem that complicates the issue of surface-mine land potential evaluation is the wide range of surface mining, reclamation, and land use planning practices observed across the United States. In an effort to establish procedures that would have applicability in the various regions of the U.S., it is necessary to look at several of these regions individually. This report is concerned with a specific surface mining operation in the eastern United States.

This project is based upon the hypothesis that a study of reclamation and postmining land use practices can lead to valuable conclusions concerning the practicality of postmining land use planning and the effectiveness of current planning methods in achieving satisfactory utilization of reclaimed lands. The investigations centers around identifying the planning steps that were taken, why and how the various practices were applied, who was involved in the planning process, and what are the results of the planning efforts to the present time. The information gathered from this study will contribute to the development of a procedure for surface-mined land use potential evaluation.

1.2 Scope of Work

The scope of this case study is to thoroughly investigate the reclamation and postmining land use planning processes of a typical eastern surface mine. The information gathered will be used to aid in developing a procedure for surface-mined land use potential evaluation. The surface mine selected for this study is Simca Mining Company's Spingola No. 1 Mine. Simca Mining is a subsidiary of the Bradford Coal Company located in Clearfield County, Pennsylvania. Although the eastern U.S. exhibits a wide range of surface mining operations with respect to size and mining methods, it is believed that the Spingola No. 1 Mine can be classified as typical for several reasons. First, the total area affected is 430 acres which falls well within the range of the five-to-ten acre two-man operations oftentimes found in the east and the large mountaintop removal operations affecting thousands of acres. Secondly, the size of the company is somewhat typical. Bradford Coal Company, the parent firm, handles approximately two million tons per year although the actual mining is subcontracted to subsidiaries. Finally, the site includes some previously mined unreclaimed areas which are also common of conditions in parts of the east.

Because of the great number of factors involved with land use planning decisions, the scope of this study is necessarily very broad. Due to time limitations, primary data collection by the investigators was impractical and generally unnecessary. Environmental data (soils, geology, hydrology, vegetation, etc.), demographic data (population, employment), and economic data (real estate value), were gathered from federal, state, local and company sources. Discussions were held with the mine operators, their consultants, county planners, and regulatory officials to determine the present level of planning effort. Land use planning principles were applied to the case in question to develop and evaluate several alternate postmining land use plans. Finally, based upon land use planning principles, an evaluation of site potential realization was conducted.

Chapter 2

REGIONAL SETTING

2.1 Physical Setting

The Spingola No. 1 Mine is located in Jordan Township of Clearfield County, Pennsylvania (Figure 2.1). Clearfield County is located just west of the Pennsylvania's geographic center and has the fourth largest area of all counties of the state. The mine itself is approximately 20 mines southeast of Clearfield and ten miles west of Houtzdale. The 430-acre property is adjacent to the small village of McCartney. Legislative Route (L.R.) 17024 bisects the site and the mine is only two miles from Pennsylvania Route 53 (Figure 2.2).

Clearfield County is situated near the southeast edge of the Appalachian Plateau physiographic province. Much of the county is located in a broad basin between the Allegheny Front to the southeast and the extension of Chestnut Ridge to the northeast. The southern part of the county, including the study site, is characterized by gently rolling uplands interrupted by narrow steep-sided valleys. In some places the uplands are nearly flat-topped and in most instances, the valleys have very little bottom land. The uplands, noted for their evenness, generally range between 1,700 and 2,000 feet above mean sea level. The major valleys lie between 1,100 and 1,350 feet above sea level. Local relief varies from 200 feet to 500 feet difference between valleys and adjacent uplands (Ashley, 1940).

A major drainage divide separating the Allegheny River system from the Susquehanna River system is located in Clearfield County. The case study area drains to the Susquehanna River, however, there is a minor drainage divide which traverses the site and divides the Potts Run watershed from the Buck Run watershed. This minor divide nearly coincides with L.R. 17024. Since the study area is near the head of two small drainage basins, there are no large streams in the immediate vicinity.

Geologically, the Middle and Lower Pennsylvanian rocks form the top of bedrock in this region. These are known as the "Coal Measures" and include the basal Permian, the Monongahela, Conemaugh, Allegheny, and Pottsville groups. They consist of sandstone, shale, coal, clay, and limestone deposited in cyclical patterns (Ashley, 1940). At the mine site, the Allegheny group is present including the Upper Freeport coal (E seam), the Lower Freeport coal (D seam), the Upper Kittanning coal (C' seam), and the Middle Kittanning coal (C seam). The Allegheny group is overlain in places by the Conemaugh group which is made up of mainly shale and sandstone at this location. Structurally, the strata have been gently folded. The study area is located nearly on top of the Laurel Hill Anticline. Dips in this area are within a few degrees of horizontal.

The climate in this region is typical of the humid East. The average annual rainfall is 42 inches at Clearfield. The annual mean

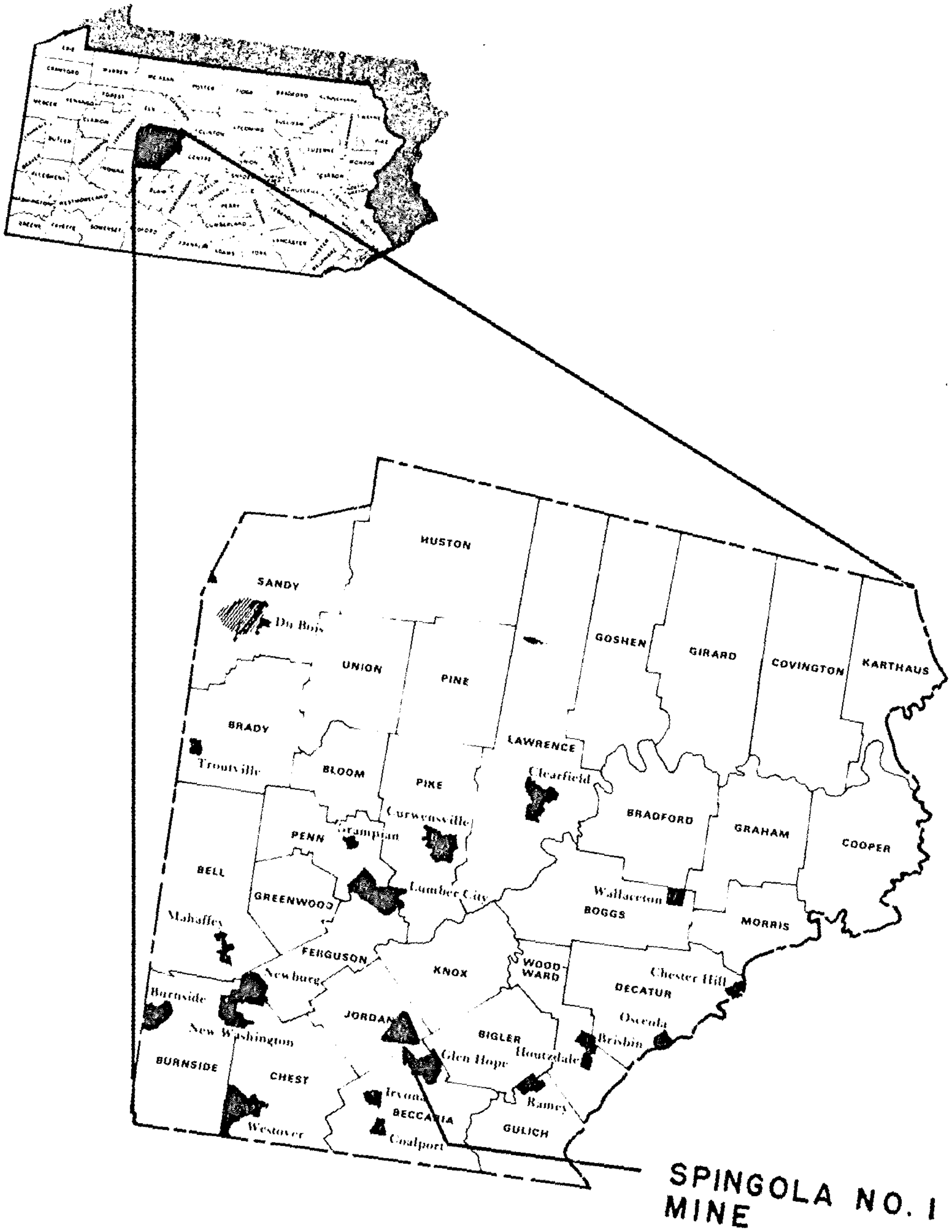
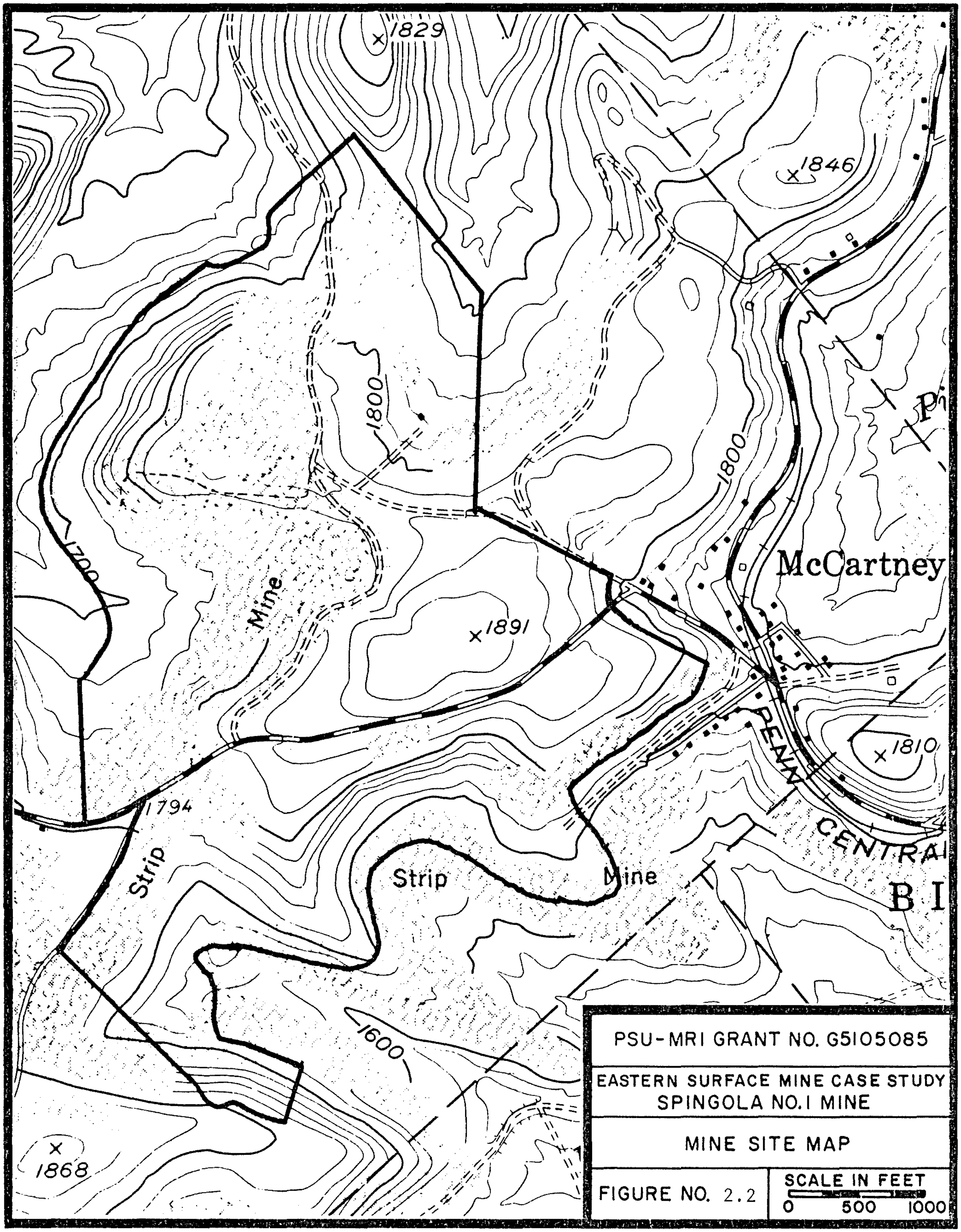


Figure 2.1 Spingola No. 1 Mine General Location Map.


1829
1846
1800
1800
McCartney
1700
Mine
1891
1810
PENN
CENTRAL
B I
1794
Strip
Strip
Mine
1600
1868
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
MINE SITE MAP
FIGURE NO. 2.2
SCALE IN FEET
0 500 1000

temperature is 49°F and the average annual snowfall is about 60 inches (Clearfield County Planning Commission, 1980).

2.2 Social and Cultural Setting

In 1980 the total population of Clearfield County was 83,578. It was estimated that 29% of the population lived in urban areas, while the remaining 71% lived in rural areas of the county. Based on a county-wide average, the population density was approximately 70 persons per square mile. Jordan Township had a 1980 population of 580 inhabitants. The township therefore had a population density of only 25 persons per square mile.

Although the county is generally rural in nature, the manufacturing industry is the leading employer in the county. Most of the manufacturing firms are located in either Clearfield or DuBois. However, some manufacturers can be found in the smaller towns such as Curwensville. Following wholesale and retail trade, the next largest county employer is the mineral industries. Approximately 2,500 persons are involved in producing annually 9.3 million tons of bituminous coal. Clearfield County has the third highest production in the state. An additional 820 persons are employed in producing brick, stone, clay, glass, and concrete products (Clearfield County Planning Commission, 1980).

Agriculture does not play a significant role in Clearfield County. The terrain is generally not well suited for row crops or pasture. Those upland areas with more favorable terrain often do not have satisfactory soil characteristics. This limits the usefulness of such areas for agricultural purposes.

Due to the county's rural nature, outdoor recreation plays an important role in the lives of its citizens. Hunting and fishing are very popular not only with the local residents but also with many outsiders who own camps in the area. Deer, bear, and wild turkey can be found in the area along with many small game species. The county has 70 miles of fishing streams and several lakes open to the public. Boating, camping, picnicing, and hiking opportunities are available at three state parks located in the county. Some parks also offer winter recreational activities such as snowmobiling and ice skating.

2.3 Land Use

Eighty-three percent of the county's land area is forested. About 22% of the forest land is owned by the public and the remainder is privately owned. Only about 8% of the county is in crops or pastures. State game lands account for 25,194 acres.

The major land use planning agency is the Clearfield County Planning Commission. The effectiveness of the County Planning Commission has been limited due to its small staff. Only a few town-ships near Clearfield and DuBois have planning boards or zoning ordinances. The County Planning Commission is presently in the process of having a county-wide subdivision ordinance adopted. The last county comprehensive plan was prepared in 1969. A new comprehensive plan may be developed after the complete data from the 1980 census become available. Jordan Township, which includes the Spingola No. 1 Mine, has no planning board and no zoning ordinances.

Clearfield County is also served by the North Central Pennsylvania Regional Planning and Development Commission. This regional advisory council serves a six-county area including Clearfield, Cameron, Elk, Jefferson, McKean, and Potter counties. Although the Commission may prepare plans and make recommendations, it has no authority to regulate land use decisions. An example of the Commission's work is the Regional Energy Plan (NCRPDC, 1979) prepared for the North Central Pennsylvania Region. This plan combines information on coal, oil and gas, organic waste, solar energy, wind, water power, electricity, and conservation into an organized informative document. The plan concludes with several policy statements and recommendations directed to local, state, and federal authorities.

2.4 Mining Operations

Coal mining in Clearfield County dates back to 1840 or earlier. The term 'Clearfield coal' was applied to a very high grade bituminous coal discovered in a basin traversed by the Moshannon Creek. In 1874 the Second Geological Survey of Pennsylvania surveyed the bituminous coal region of Clearfield County. Franklin Platt was in charge of the expedition and his 1874 report states (Ashley, 1940):

> "The coal shipped east to market from the Clearfield steam coal basin is widely and favorably known and there is already an extended and growing demand for the coal on account of its high steam generating power and its value in working iron. Besides supplying large quantities to iron and steel works on the Susquehanna and Schuylkill, much coal reaches tide level at Greenwich Point and Amboy. Some idea of the stability of the trade and it growing hold upon the market may be inferred from the fact that in 1874, a year of almost unparalleled business depression, the shipment of Clearfield coal amounted to 658,315 tons. In 1873 it was 620,300 tons, showing a gain of 38,000 in 1874. The basin is well located, geographically; the coal lies favorable for economic mining, and the production can at any time be largely and suddenly increased to supply any extra demand."
>
> "Though with only some ten years of reputation upon them, these coals now rank in the market with the best known and esteemed iron and steam coals; with the analyses given in the body of this report, with the description of the mines shows the average excellent character of the coal, both from the mines working coal bed 'B' and those working coal bed 'D'."

Coal mined in Clearfield County is mainly medium volatile bituminous with the percentage of fixed carbon increasing from west to east. The highest fixed carbon percentage are found in the Moshannon basin where local mining began. The coal in this area is relatively shallow, generally less than 400 feet from the surface. As steam coal, there are few seams of better value in the United States. However, much of the coal is metallurgical quality and has been used extensively in the iron and steel industry. Because of the coal fields position to the northeast of the Pittsburgh, Ohio, and West Virginia fields, Clearfield County initially found a market for much of its coal in New York and New England.

Up until the time of the Second World War, almost all of the coal mined in Clearfield County came from underground mines. Around that time, however, increased demand coupled with better earthmoving equipment caused a switch from underground mining to surface mining. Steel was needed to support the war effort and metallurgical quality coal was in demand. The emphasis at that time was on rapid production at any cost. This era has left the county with many unreclaimed strip mines. It was recently estimated that Clearfield County has approximately 20,000 acres of unreclaimed lands, second only to Indiana County. After the end of the war and the replacement of coal-fired locomotives, coal mining declined in general. From a low point in 1970, growth in production has been rapid (Figure 2.3).

In 1975, approximately 8.27 million tons of coal were produced in Clearfield County. Of this total, 92 percent came from surface mines. Table 2.1 breaks down the production by both seam and method. It is estimated that there are still 1,203 million tons of reserves in Clearfield County. This reserve includes seven seams with thicknesses in excess of 24 inches. Only about nine percent, or 103 million tons are expected to be surface mineable. Table 2.2 lists the deep and strippable reserve base for each seam found in the county. Also included in this table is a summary of the coal's quality characteristics.

Table 2.1 Clearfield County Coal Production by Seam and Method for 1975 (NCPRPDC, 1979)

	Production (Tons)	
Seam	Deep (x 10^3)	Strip (x 10^3)
Clarion-Brookville	0	447.22
Lower Kittanning	446.99	1875.09
Middle Kittanning	204.46	1641.11
Upper Kittanning	0	1238.54
Lower Freeport	0	1485.24
Upper Freeport	0	925.73
TOTAL	651.45	7613.93

Total Production - 8265.38
Deep - 8%
Strip - 92%

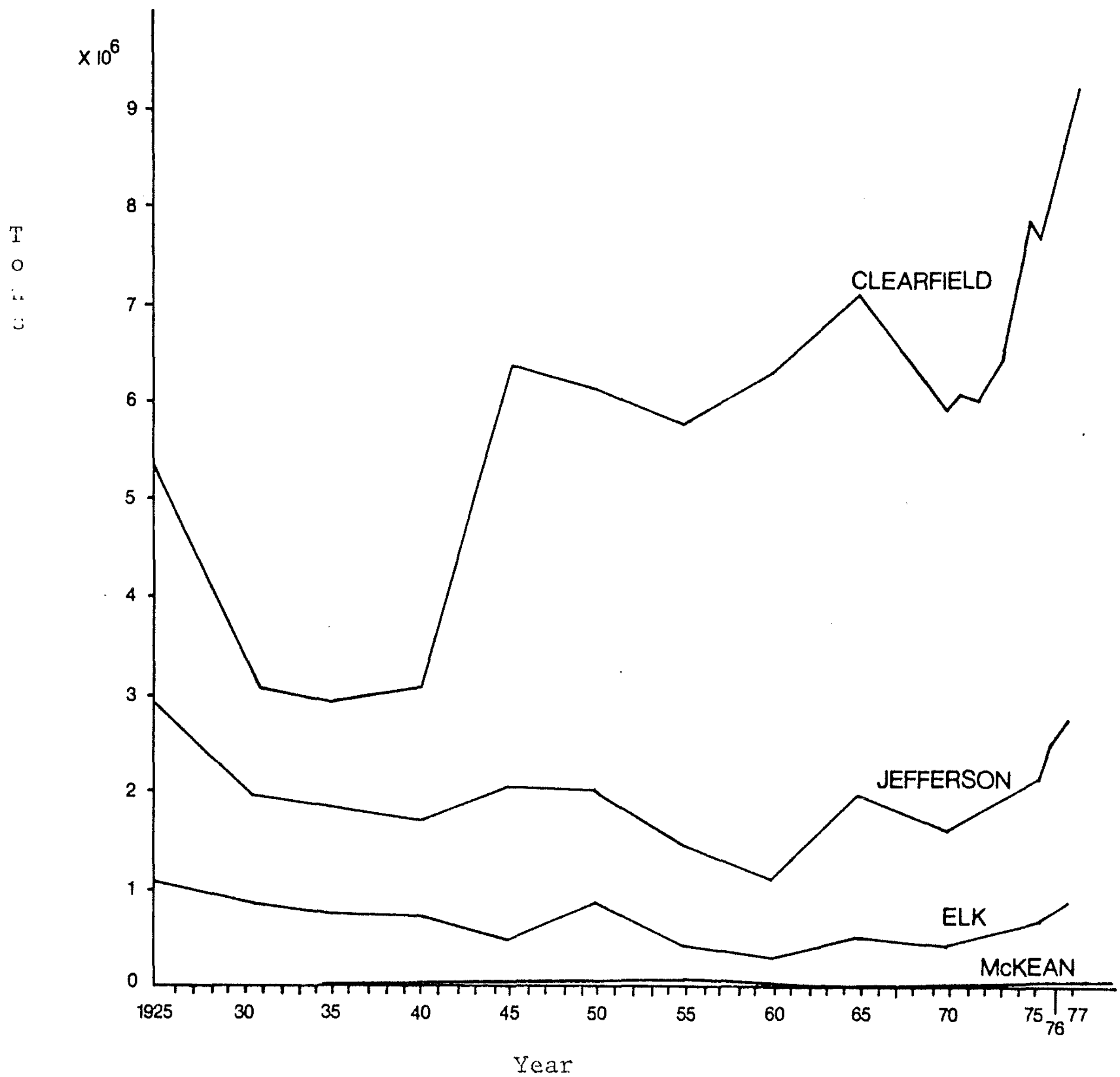


Figure 2.3 Graph of Annual Production for Clearfield County.
SOURCE: NCPRPDC, 1979.

Table 2.2 Quantity and Quality of Reserve Base for Clearfield County (NCPRPDC, 1979)

Seam	Deep Reserve (10^6 tn)	Strip Reserve (10^6 tn)	Fixed Carbon (%)	Moisture (%)	Average Seam Thick- ness	Ash (%)	Sulfur (%)	BTU's lb
Clarion-Brookville	311.86	19.02	72.14	3.15	31"	14.50	2.60	12,610
Lower Kittanning (A)	143.02	0.00	72.14	3.15	30"	9.60	2.10	13,230
Lower Kittanning (B)	227.85	21.08	72.14	3.15	30"	9.60	2.10	13,230
Middle Kittanning	73.80	18.43	72.14	3.15	32"	10.30	2.00	13,290
Upper Kittanning	118.42	19.87	72.14	3.15	27"	10.30	1.30	13,280
Lower Freeport	170.21	18.50	72.14	3.15	35"	8.90	1.40	13.700
Upper Freeport	54.76	6.08	72.14	3.15	31"	10.40	1.20	13,340
Total	1,099.92	102.98						

The Bureau of Reclamation of the Pennsylvania Department of Environmental Resources has established surface mine inspection districts throughout the state. Clearfield County is subdivided into four components as shown in Figure 2.4. The 1977 surface mine production figures for these four districts are shown in Table 2.3. The case study site is located in District 43 which had the highest production in 1977.

Table 2.3 Clearfield County Coal Production by Surface Mine Inspection Districts (NCPRPDC, 1979)

District	Production (tons)
43	2,832,803
44	2,813,015
45	2,023,842
45-A	1,274,398

Figure 2.5 indicates that in 1976 there were 120 licensed surface mines operators in Clearfield County. Although District 43 had slightly higher production, its total of 31 operators was second to District 44 which had 45 operators. The same pattern is true for the number of permits in effect for the entire county. District 44 had the largest number with 99, while District 43 had 82. The total number of permits in effect should not be confused with the total number of operating surface mines since permits must be maintained on mined-out areas until the success of the reclamation effort is assured (NCPRPDC, 1979).

Due to the hilly terrain, various forms of contour mining are practiced in this area. Although outslope disposal is no longer practiced, there are still many instances in the county where evidence of past stripping practices is visible. Many of the current operations are using the block-cut method or variations of this method. All of the current methods provide for in-pit spoil disposal and concurrent reclamation (Ramani et al., 1980).

Since most of the operations in Clearfield County are relatively small and have a short life, coal preparation and loading for shipment to the market is generally not done at the mine. Instead, when the coal is removed from the mine, it is hauled over public roads to one of several centrally-located tipples for eventual shipment by rail or truck. Before the coal is shipped to the point of consumption, it is generally cleaned at one of the local coal preparation plants. There are approximately 24 tipples and four preparation plants in Clearfield County. Their locations are shown in Figure 2.6 (NCPRPDC, 1979).

Coal trucks are the sole means of transportation from the mine to the tipple or preparation plant. Movement of coal from the shipment point to the point of consumption, however, utilizes rail transportation. Table 2.4 summarizes the mode of shipment for coal that leaves

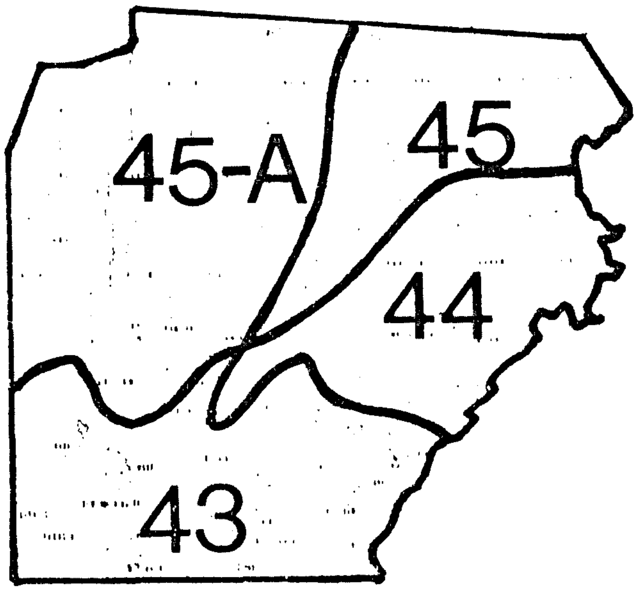


Figure 2.4 Surface Mine Inspection Districts in Clearfield County.

Source: NCPRPDC, 1979.

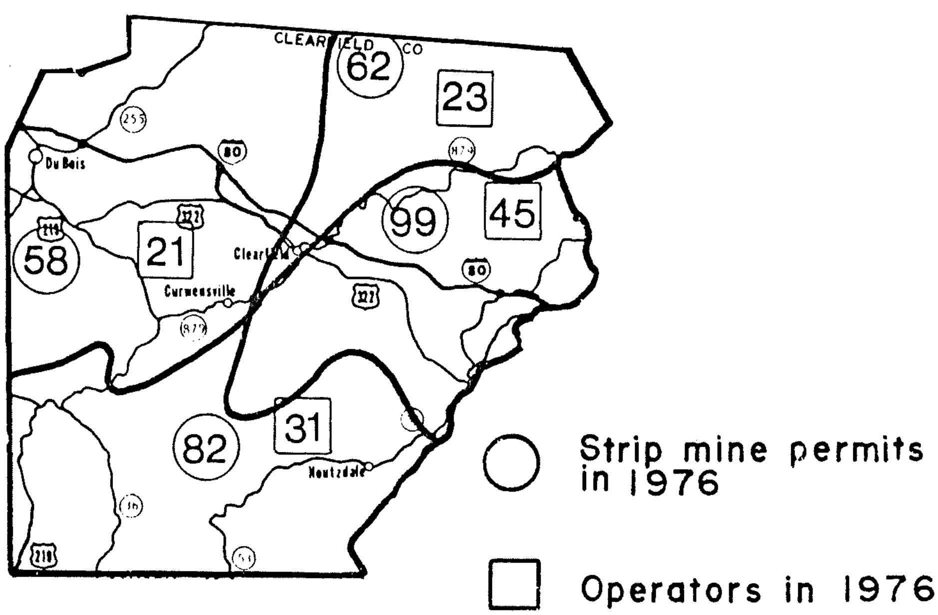


Figure 2.5 Number of Surface Mines and Operators in Clearfield County Surface Mine Inspection Districts.

Source: NCPRPDC, 1979.

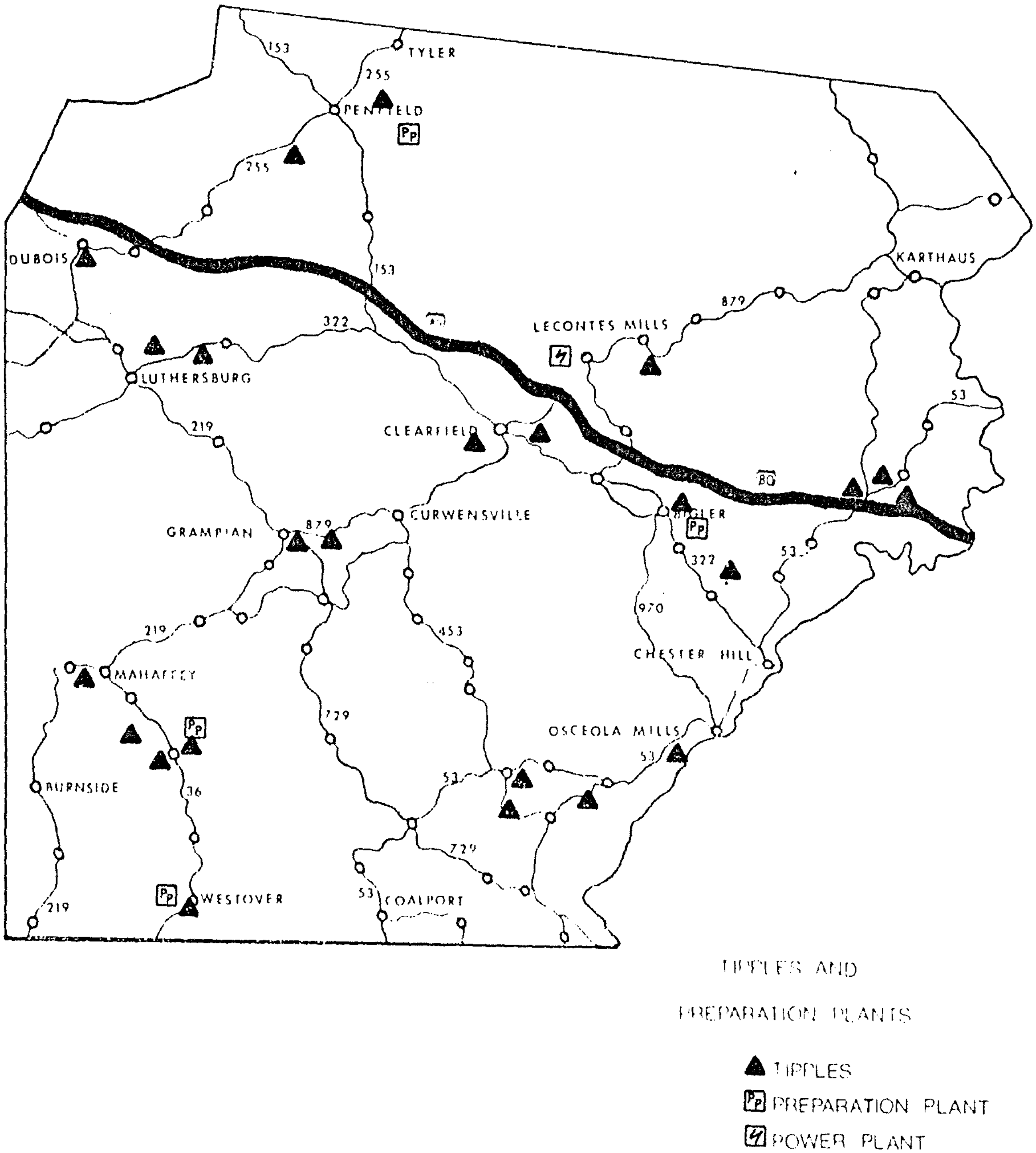


Figure 2.6 Location of Tipples and Coal Preparation Plants in Clearfield County.

SOURCE: NCPRPDC, 1979.

Tipples
Preparation Plant
Power Plant

each of the inspection districts located in Clearfield County. Figure 2·7 illustrates the volumes of coal truck haulage within the county.

Table 2.4 Clearfield County Coal Shipment by Mining District (NCPRPDC, 1979)

	Rail		Truck		Local	
District	Tons	%	Tons	%	Tons	%
43	1,973,996	69.7	858,657	30.3	150	*
44	478,505	17.0	2,318,399	82.4	16,111	0.6
45	740,928	36.6	1,282,914	63.4	0	0.0
45-A	740,213	58.1	510,054	40.0	24,130	1.9

Although the Springola No. 1 Mine is located in District 43, the coal is hauled from this mine by truck to the preparation plant operated by the Bradford Coal Company which is located in District 44. From here, the coal is hauled either by truck or rail to the market areas.

Concerning reclamation and postmining land use planning, the most common practice in this area is to return the land to its original use. In must cases, the sites are undeveloped woodlands, cleared lands, or unreclaimed strip mines. The reclamation plan generally amounts to grading, returning stockpiled topsoil, establishing permanent vegetation with grasses and, if trees are called for, going back in a year or two to plant seedlings. Provisions are made for erosion and sediment control. Since woodland in this area is not at a premium and since many of the mines are in fairly remote locations, higher intensity uses of reclaimed land is the exception rather than the rule.

Another key factor which influences the postmining use of land in Clearfield County is the land ownership pattern. Generally, in this area, the mining companies do not own the land. The lands are leased for a period of time under a contractural agreement with the landowner for the expressed purpose of mineral extraction. It is also typical for one permit area to include parcels owned by several different individuals. After the coal has been mined and the land reclaimed, the mining company no longer has any control over the land. The surface mine operator may consider alternate postmining land use if the owner makes a special request.

2.5 Comparisons

Surface mining operations in the East exhibit a great deal of variation. This is due largely to the differences in terrain which can be observed throughout the Eastern Coal Province which includes parts of Pennsylvania, Ohio, West Virginia, Virginia, eastern Kentucky, Tennessee, and Alabama. The mine chosen for this case study is typical

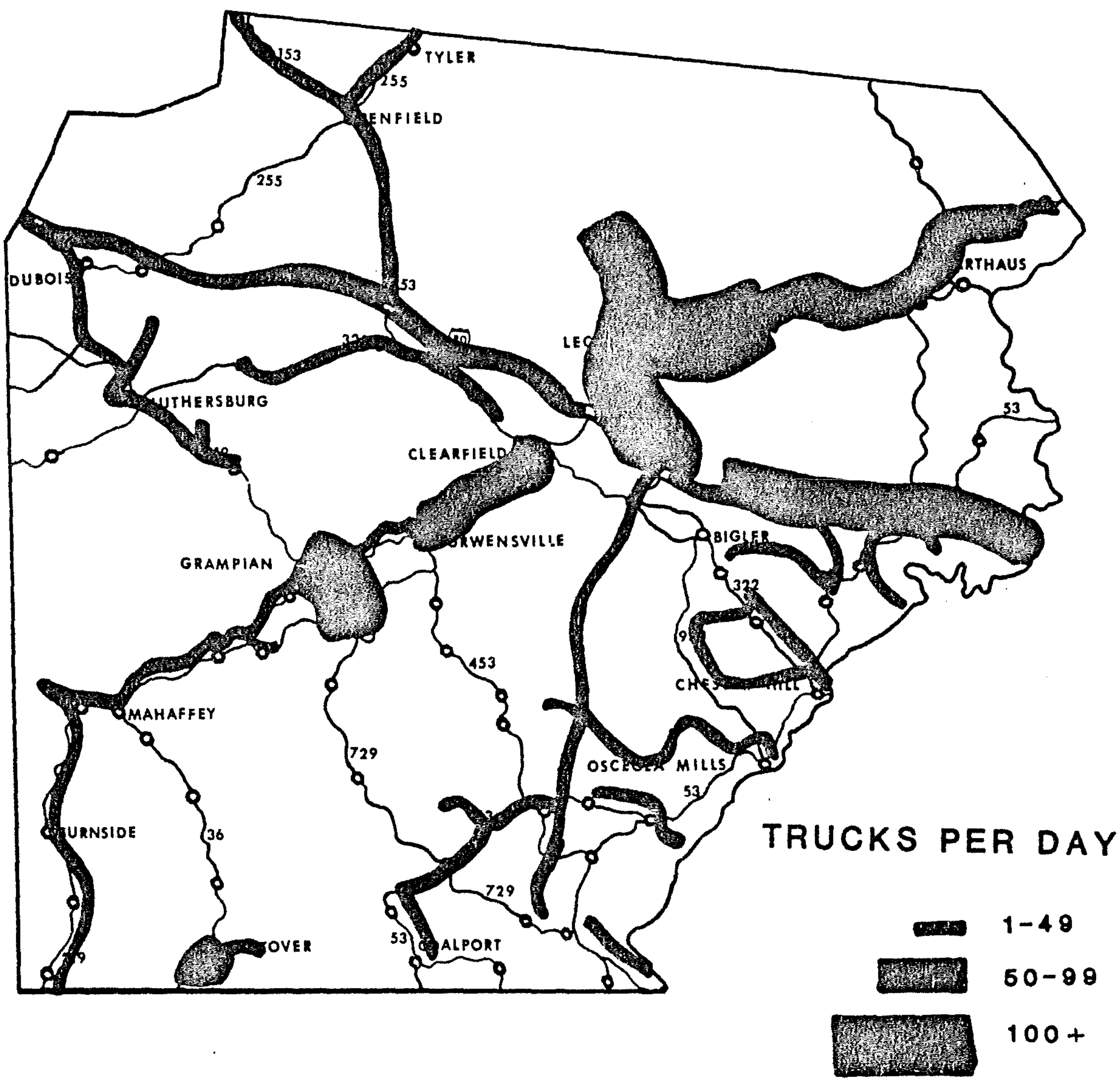


Figure 2.7 Coal Haul Truck Volume in Clearfield County.

SOURCE: NCPRPDC, 1979.

of operations in central and western Pennsylvania, as well as northern West Virginia. It would be impossible to find one operation which would be typical of all Eastern surface mines.

Within the Eastern region there is considerable variation of mining methods, size of operations, mined-land ownership, and postmining land use practices. The contour mining method, as employed at the case study site, with a return to permanent grasses and some reforestation is typical of small operations in hilly or mountainous terrain where the land is leased only for the life of the mine. In other parts of the East, however, such as eastern Ohio, the terrain is flatter, area mining is commonly used, the mining firms are much larger, and there is a greater possibility that the company will own the land. This type of operation will often lead to different postmining land use practices than a small contour mine in central Pennsylvania. Still another set of circumstances existing in the East can be found in southern West Virginia. Here the terrain is extremely steep and mountaintop removal operations are becoming popular. These operations are generally conducted by fairly large companies which may or may not own the land. Regardless of the ownership, the final land use will be somewhat different from the premining land use.

Chapter 3

CASE STUDY DETAILS

3.1 Parent Firm

Bradford Coal Company, with offices located in Bigler, Pennsylvania, employs approximately 250 people. Although the parent firm does not actually operate any mines, it is associated with several small operators from whom they purchase raw coal. The coal is taken, by the small operator, to Bradford Coal Company's preparation plant where it is prepared and sold to market. In 1979, Bradford handled approximately 1.5 million tons of coal. The annual tonnage should increase over the next few years with the opening of a new larger preparation plant. Bradford Coal employs a chief engineer who oversees the operations of the various small operations, however, the company does not employ a staff for preparing permit applications or making reclamation plans. This work is contracted to one of several consulting firms.

3.2 Contractor

The office of Simca Mining Company is located in rural Clearfield County near the village of Ansonville. The company employs 29 people and is presently operating two producing surface mines. All of the coal mined by Simca is handled by Bradford Coal Company. The Spingola No. 1 Mine is in the latter stages of reclamation and is not producing at this time. It is possible that a small section of the mine drainage permit area will be mined in the future. Simca's annual production for 1978 was 111,165 tons. The parent firm is responsible for acquisition of surface mining permits, therefore, Simca does not employ an environmental staff.

3.3 Consultant

The surface mining permits and mine drainage permit applications for the Spingola No. 1 Mine were prepared by Hess and Fisher Engineers, Inc., located in Clearfield, Pennsylvania. The consulting firm employs mining engineers, geologists, and other environmental specialists. Hess and Fisher Engineers also operates an analytical laboratory for water quality analysis.

3.4 History of Mining Operation

Simca Mining Company first began operations at the case study site in 1976. The area had been heavily mined in the past. A previous surface mine operator had stripped along the outcrops approximately 20 years ago using small equipment. Of the area previously mined, only about 25 acres had been reclaimed. Simca Mining is now responsible for reclaiming any unreclaimed areas on their entire permit area. In addition to past strip mining, much of the site was deep mined approximately 30 to 40 years ago.

Simca has produced coal intermittently at this mine from March, 1976 through 1979. There were at least two prolonged layoffs (six to nine months) due to poor market conditions. At times of full operation, the mine produced about 6,000 tons per month. The Spingola No. 1 Mine was mined under two separate surface mining permits. The mining company is presently completing the reclamation on both permit areas. Some areas have been seeded and final grading is proceeding in other areas. Partial bond release is anticipated in the near future.

3.5 Land Ownership

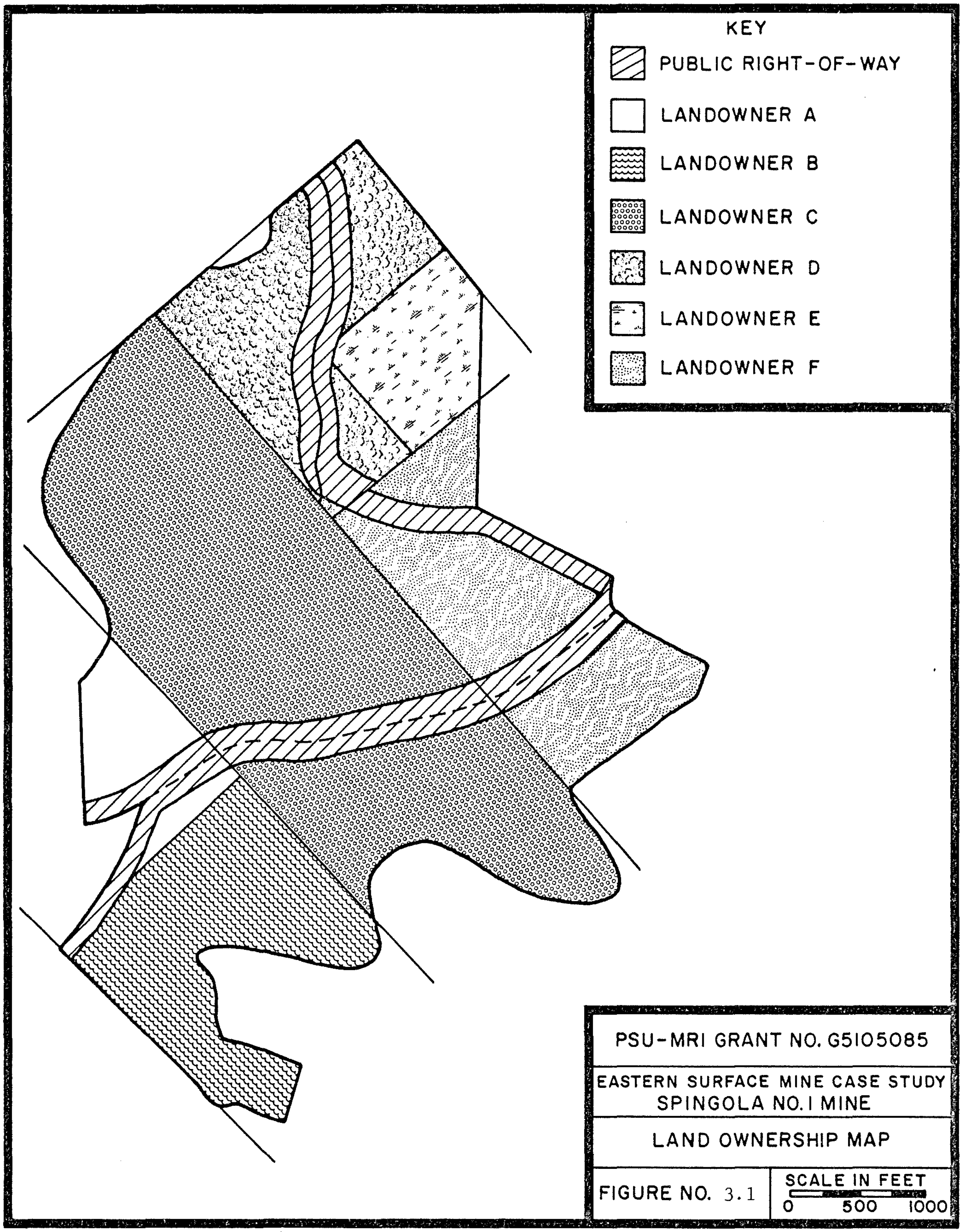
None of the land included in the 430-acre mine drainage permit area is owned by either Bradford Coal Company or Simca Mining Company. The land is leased from six private landowners. Figure 3.1 illustrates the present ownership pattern. Most of the recent mining by Simca has been on the property of Landowner C, as indicated in Figure 3.1. After partial bond release, the landowners will again assume control of their property. The mining company does, however, retain the right to enter the property for a period of five years to perform any remedial reclamation work that may be required by the regulatory authorities.

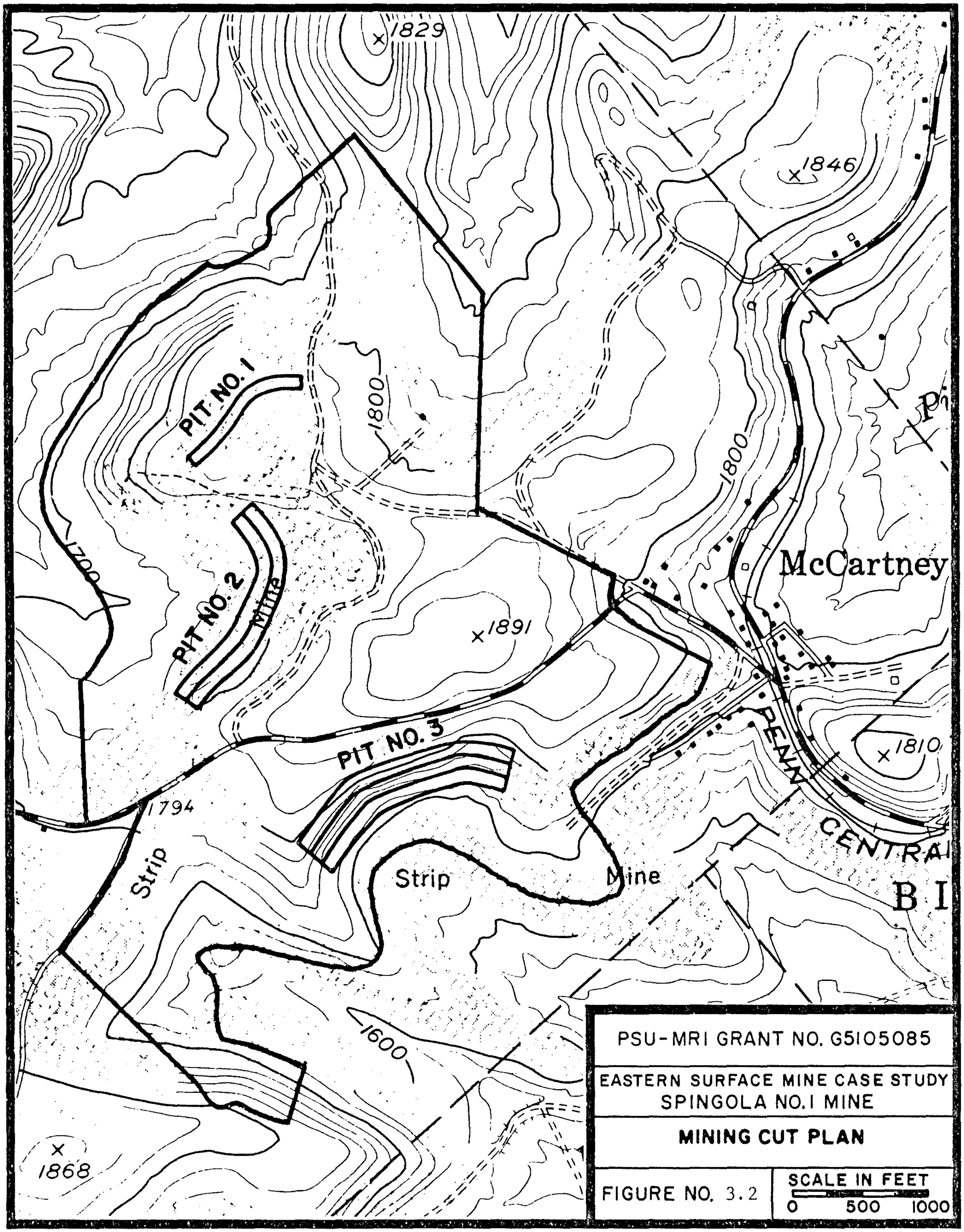
3.6 Mining Engineering

The mining company employed a seven-cubic yard Lima 2400 dragline in a simple contour operation. Approximately 75 percent of the operation was conducted by the dragline and the remaining 25 percent used loaders, dozers, trucks, and pans. The seven-cubic yard dragline was used to remove 55 to 58 feet of overburden and maintained a pit width of approximately 60 feet. Three separate pits were opened during the course of the operation. Their general locations are shown in Figure 3.2. Pit No. 1 consisted of a single 1000-foot long cut and was mined in 1976 and 1977. In this pit, only the 24-inch Lower Freeport seam was recovered. Pit No. 2 was also mined in 1976 and 1977. Two cuts, approximately 1500 feet long were made to remove the Lower Freeport seam. A small amount of coal from the 18-inch thick Upper Freeport seam was also removed in this area with small equipment. Pit No. 3 was mined intermittently from 1977 through 1979. Three cuts approximately 1500 feet in length were made to remove the Upper Kittanning seam. In the final cut, coal recovery diminished to about 50 percent as a result of the previous underground operations.

3.7 Regulatory Control

There are no local or county land use plans in effect and therefore, no ordinances requiring local approval of surface mining operations. The only issue requiring approval by township officials is


KEY
PUBLIC RIGHT-OF-WAY
LANDOWNER A
LANDOWNER B
LANDOWNER C
LANDOWNER D
LANDOWNER E
LANDOWNER F
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. I MINE
LAND OWNERSHIP MAP
FIGURE NO. 3.1
SCALE IN FEET
0 500 1000



PSU-MRI GRANT NO. G5105085

EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. 1 MINE

MINING CUT PLAN

FIGURE NO. 3.2

closure of a township road. Such approval has been obtained for the temporary closure of T-768 which borders a portion of the northeast side of the site.

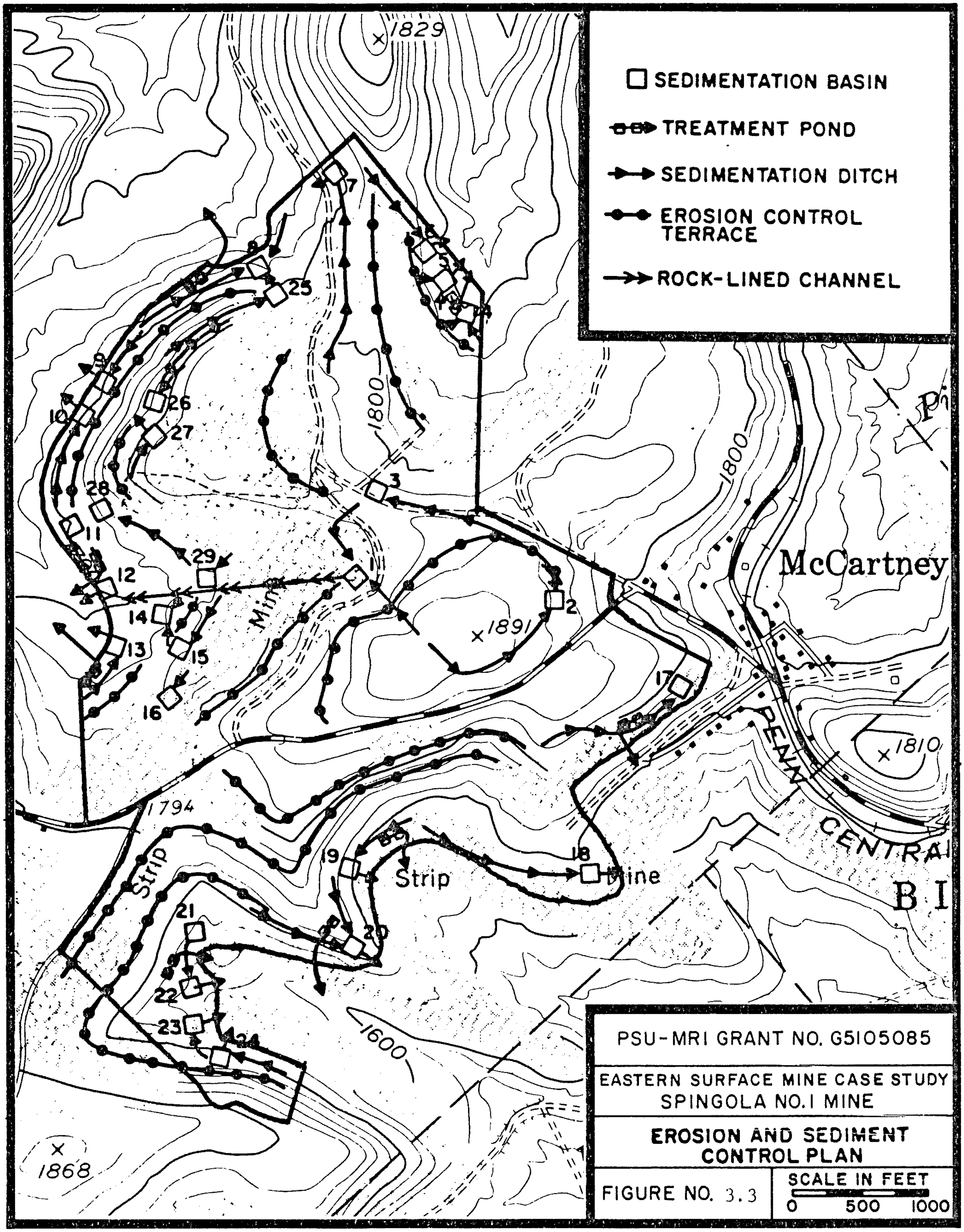
The major permits required for the mine in question are the surface mining permit for each section to be mined and the mine discharge permit for the entire 430-acre area obtained from the Pennsylvania Department of Environmental Resources. These permit applications must include the provisions set forth by OSM in the Interim Regulatory Program under PL 95-87. The other major permit that was obtained is the National Pollutant Discharge Elimination System (NPDES) permit issued by EPA.

Included in these permit applications are technical data on the mining operation, background water quality data, soils and overburden information, and an outline of a water monitoring program. A very important aspect of the mine drainage permit application is the erosion and sediment control plan. Figure 3.3 shows the major elements of this plan for the Spingola No. 1 Mine. The company is also required to submit a mining plan, a blasting plan, and a reclamation plan including revegetation and postmining land use.

3.8 Reclamation and Postmining Land Use

The site will be reclaimed to permanent grasses. There are no immediate plans to reforest the site, at least not until permanent grasses have been established. Topsoil has been saved and stockpiled from areas that were not affected by previous surface mining. Not enough topsoil is available to cover the entire site. Therefore, weathered shale overburden will be used as a cap in areas where topsoil is not available. The soil amendment requirements will be determined after the cap has been placed.

The mine drainage permit application lists the highest and best use of the land as forest land, wildlife habitat, and haylands. The application also indicates that the final land use will some combination of these uses.


SEDIMENTATION BASIN
TREATMENT POND
SEDIMENTATION DITCH
EROSION CONTROL TERRACE
ROCK-LINED CHANNEL
1829
1800
1891
1810
1794
1600
1868
McCartney
PENN CENTRAL
Strip
Mine
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
EROSION AND SEDIMENT CONTROL PLAN
FIGURE NO. 3.3
SCALE IN FEET
0 500 1000

Chapter 4

LAND USE PLANNING

4.1 Methodology

Land use planning is a nonspecific term that can be applied to two distinct levels of planning. Macro-scale land use planning, also known as comprehensive or regional planning, is directed toward guiding growth, development, and land use for an entire region through the formulation of a comprehensive plan. Micro-scale planning generally referred to as site planning, is concerned with obtaining a site plan which satisfies the given performance standards and is in concert with the overall comprehensive plan for the area. Macro-scale planning is generally conducted at the county or multi-county level by public planners. It can be conducted on a state or federal level in some instances. Although surface mine planners are not engaged in this process, they are affected by the results. Site planning is generally a function of the private sector, particularly land developers and, to a lesser extent, mine planners as well.

The processes used for both types of land use planning are essentially the same but the level of efforts may vary significantly. Ideally, comprehensive planning should precede site planning and provide input to the site planning process. It is not uncommon, however, for site planning to be conducted in an area which has no comprehensive plan. This places the burden on the site planner to consider the regional objectives and determine how much effort should be directed toward evaluating these objectives. The land use planning process illustrated in Figure 4.1 is essentially the regional planning model given by Chapin (1979) with some slight modifications for site planning purposes. Some of the steps that are central to the regional planning process and that consume much of regional planners time may become less significant or routine at the site-specific level. For example, once a mining company has defined the scope of its reclamation and land use planning program, this scope will not change drastically for each successive operation. Scope definition would include specifying the type of output required from the planning process (e.g., conceptual plan, final design, etc.), assigning responsibilities, and structuring a planning organization to accomplish the task.

Design of the information system is a major task for the regional planner, however, at the site planning level, the degree of complexity should be suited to the specific operation. This task can be as simple as opening a file or as complicated as developing a computerized land data system to store and manipulate planning information. Most mining companies limit their information system to a basic filing system. Some companies, however, presently having computer capabilities for storing portions of their environmental information on data files could make better use of their facilities by integrating them into the planning process.

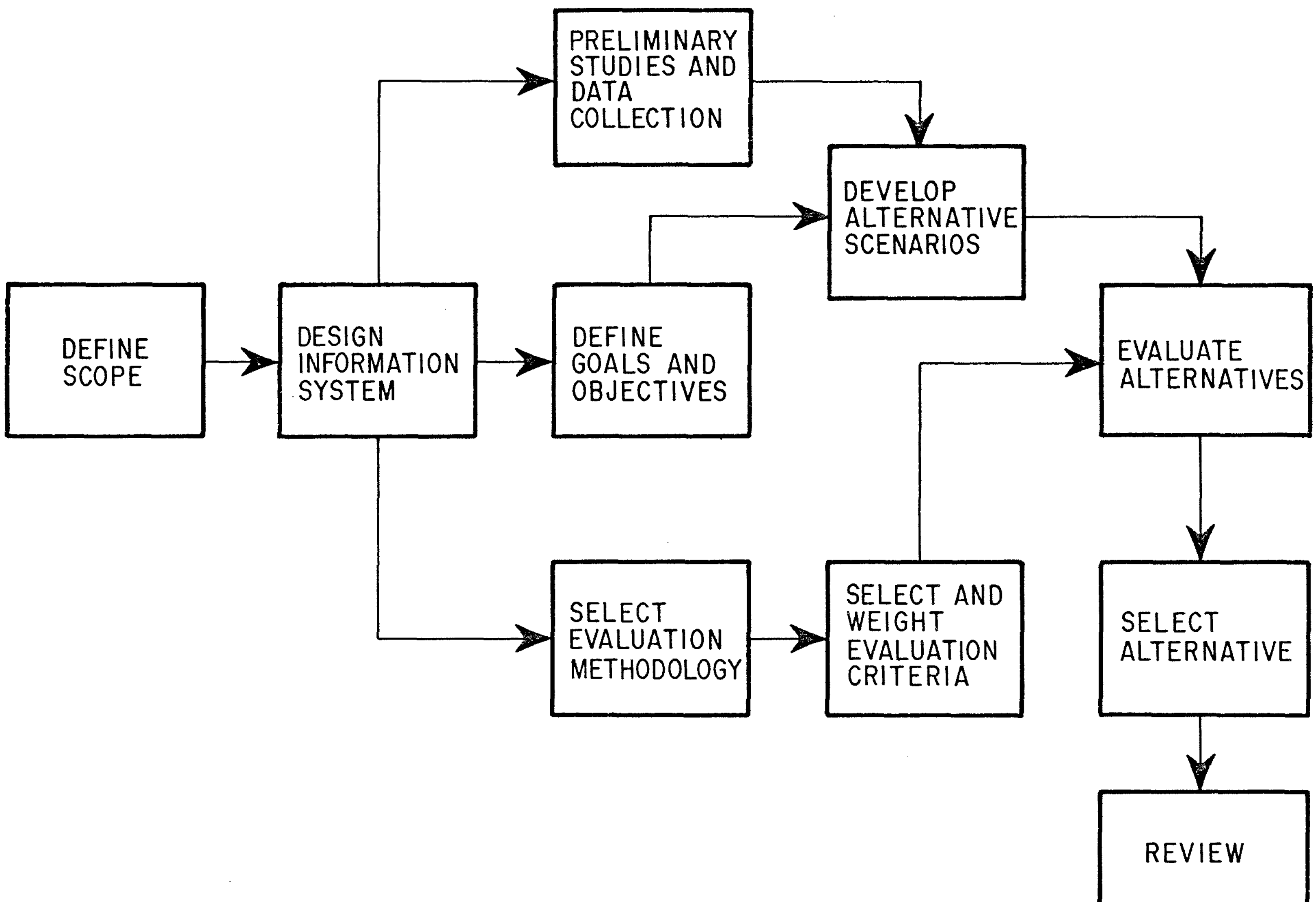


Figure 4.1 Land Use Planning Process.

The preliminary studies and data collection phase of the planning process is typically the most expensive and time-consuming. Mining companies can exercise some discretion in determining what information will be pertinent to their postmining land use plans but much of the environmental baseline data collection is mandated by Part 779 of the Permanent Regulatory Program (OSM, 1979). The list of baseline data specifications which can be required by the regulatory authority includes the following:

- geology description
- ground water information
- alternative water supply information
- climatological information
- vegetation information
- fish and wildlife resources information
- soil resources information
- land use information

In addition to the environmental baseline and premining land use studies, the mine planners may choose to collect information and analyze aspects of the local economy, population trends, transportation network, and location of public utilities. Because of the expense involved, the preliminary studies and data collection should be planned very carefully so that only pertinent information is gathered. Besides meeting the regulatory requirements, it should be emphasized that the data gathered will be used later in the planning process to help evaluate alternate postmining land use plans.

The definition of local goals and objectives is basically a function of the public planners. This is an area where the mine planners should interact with local and regional planners to insure that the proposed postmining land use plan is compatible with the overall plan of the area. In addition to satisfying local goals and objectives, the mining company may wish to establish other goals for itself such as improving the value of the land or promoting good public relations. In the absence of formalized goals and objectives by a planning agency, the mine planners can either rely solely on company goals or make a limited survey of local goals by contacting neighboring landowners and local elected officials.

A number of evaluation techniques are available to the site planner for evaluating alternate land use plans. These techniques can be divided into three categories: economic analysis, environmental impact analysis, and social impact analysis. Once again, care should be exercised in selecting one or several methodologies since complex evaluations can result in considerable expense. The level of effort should be proportional to the size of the operation and the potential for creating benefits. Economic analysis of alternate land uses can range from discussions with informed individuals to detailed benefit - cost accounting or estimation of returns through increased land values. Although traditional engineering economic analyses alone will not satisfy all evaluation requirements, they have a place and should be considered along with environmental and social impact analyses. There is also a range of complexity in evaluating environmental and social impacts starting with checklists which qualitatively address the various impacts and continuing on to detailed schemes for quantitatively estimating impacts of the various land use plans. One such example is the Leopold Matrix for evaluating the environmental impacts of a proposed action (see Figure 4.2).

Evaluation criteria should be selected and weighted based upon the evaluation methodologies chosen. A combination of criteria which reflects the economic, environmental, and social aspects of the plan is desirable. Economic criteria may include a minimum profitability or a benefit-cost ratio which exceeds unity. Environmental criteria would be directed toward meeting various performance standards. Social impact criteria are more difficult to establish since social impacts are more difficult to quantify. Various techniques such as cost effectiveness analysis have been developed, however, which attempt to subjectively quantity social impacts. Minimum standards can be set based upon one of these techniques.

After the evaluation methodologies and criteria have been selected, several site plans can be proposed for the reclaimed area. The ideal number of alternatives is open to discussion. Certainly, one alternative to be considered is returning the land to its premining use. Only viable scenarios should be evaluated. Plans which are obviously unacceptable for economic, environmental, or social reasons need not be subjected to the evaluation process. Since the premining condition and postmining land use plan most likely combine two or more land uses, the number of alternatives that can be generated is limitless. The alternative scenarios should be kept to a manageable number. In practice, by the time the mine planner begins formulating alternate land use plans it should be fairly obvious that certain land uses are unacceptable and certain others are potentially acceptable. The challenge to the planner is to design three or four plans incorporating the acceptable uses but varying the design sufficiently to allow for adequate evaluation.

Once the alternate scenarios have been completed, they are subjected to the evaluation methodologies selected earlier. The result of this process is the selection of the desired alternative either by elimination of less desirable plans or ranking all of the plans in order of acceptability. The final step of the process is review by company management and regulatory personnel. In addition to the review made immediately after the plan has been selected, there should be periodic review by the mine planners and company management up until the time that the plan is realized to insure that the land use plan is still workable. Unforeseen changes in the economic, environmental, or social conditions may require modification of the land use plan before it is put into use.

4.2 Regional Planning

As stated previously, there is a definite and obvious relationship between site planning and regional planning. Basically, they follow the

ENVIRONMENTAL CHARACTERISTICS

PROPOSED ACTION WHICH MAY CAUSE ENVIRONMENTAL IMPACT

			PHYSICAL AND CHEMICAL CHARACATERISTICS							
			WATER							
			SURFACE	OCEAN	UNDERGROUND	QUALITY	TEMPERATURE	RECHARGE	SNOW & ICE	
RESOURCE RENEWAL	REFORESTATION							+2 / +4		
	WILDLIFE STOCKING AND MANAGEMENT									
	GROUND WATER RECHARGE					3 / 5		+9 / +5		
	FERTILIZATION APPLICATION					6 / 8				
	WASTE RECYCLING		+2 / +3			+1 / +7				

Figure 4.2 Example of the Leopold Matrix Environmental Impact Assessment.

same procedures and site planning can be aided by input from the regional planning process. The regional plan may, however, impose limitations or constraints on the site planner which otherwise would not exist. A regional comprehensive plan can be especially useful to a site planner in determining local or regional objectives. These objectives can often be translated into future demand for various types of land use.

The components of the regional planning structure for the case study region were addressed briefly in Section 2.3. Since the township has no organized planning body, public planning is limited to the county and multi-county level. The county has a planning commission but the comprehensive plan that was prepared in 1969 is partially outdated because it was based upon the faulty assumption that population would decline from 1969 through the present time. The North Central Pennsylvania Regional Planning and Development Commission, one of ten uniform districts set up by the state, is mainly concerned with economic growth and spends most of its time processing applications for federal grants or providing technical assistance to the six counties in its region. The regional commission has prepared a general land use element as part of its regional development plan. Such general plans, however, are difficult to adopt or implement.

The Western Pennsylvania Conservancy proposed in 1978 that another level of regional planning be created in the project area (WPC, 1978). They proposed the formation of a Northcentral Highlands Council made up of local officials in a ten-county region for the purposes of preserving the existing character of the region, shaping economic development, and aiding local government with land use planning. No such council has yet been formed.

From the foregoing discussion, it can be concluded that regional planning is in a rather formative stage in the case study area and does not provide a great deal of direction to the mine planner. The most specific direction that can presently be obtained in published form is a 1975 update of the Clearfield County goals and objectives. This information is available from the County Planning Commission and includes the following provisions (Clearfield County Planning Commission, 1975):

General Goals

1. To provide a reasonable diversity for residential uses, industrial employment, agricultural development and recreational use. To maximize the choice of location and minimize the conflict for individuals, groups, institutions or establishments.

2. To guide the physical development and encourage the economic development of the County to produce an efficient, attractive and healthful environment in which to visit, to work, to live and to rear a family.

3. To solve County problems so as to allow each municipality to function successfully as an integral part of the rapidly changing economy.

<u>Objectives</u>

1. To provide for the orderly growth and development of the County while preserving a measure of diversity among its component parts.

2. To allocate land in the County in accordance with the physical capabilities of the land and the locational need for various uses. This will eliminate conflicts in land use and will facilitate the providing of public services and facilities.

3. To satisfy the multiple needs of residents with increasing amounts of leisure time and preserve the County's "open character."

4. To serve the housing needs of the County population by providing a wide selectivity in choice of residences.

5. To help promote sound economic and industrial development and assure the needed economic base of the County.

6. To channel growth into areas around sub-county population centers, as opposed to further scatteration about the County. This results in building up suburban areas where public utilities and community facilities and other services can be established most economically.

7. To select and reserve prime industrial sites with close proximity to community facilities and labor.

8. Several commercial densities should be encouraged where various circulation methods may be used. Clustering of business should be encouraged rather than linear growth. New merchandising structures or design should be encouraged to develop greater densities of dollar sales per foot of store space and these developments should be related to the class of street systems.

9. Certain areas, because of their topography, water conditions and/or soil properties, should be preserved for continued agricultural activity.

10. Because of location and physical characteristics certain land should be preserved as conservation areas for future development of water resources and related open space activities.

11. The rich historical lore of the County should be preserved by use of markers at historical or interesting sites. The restoration of old homes, inns, mills, churches or other historical buildings should be encouraged.

12. To provide adequate educational facilities to accommodate future requirements.

13. To provide adequate County-owned facilities to meet changing conditions and increased needs. Major public facilities frequently exert a long-term influence on a community. They are fixed in position, relatively expensive, and usually built to serve the community for a long time. Moreover, adequate community facilities are increasingly viewed as prerequisites to community growth and development. Consequently, the plan should seek to encourage a coordinated development pattern to encourage the development, extension and/or upgrading of basic community facilities toward acceptable standards. Future development should be designed to promote efficient installation of desired community facilities.

14. To promote the development of adequate public services and utilities to accommodate future requirements.

15. To provide adequate transportation facilities to meet growing needs of the County. An integrated system of federal, state and local highways should be established that will serve existing and anticipated patterns of residential, industrial and commercial uses. The proposed highway network should be based on a functional classification designed to serve both local and through traffic needs. County residents depend primarily on private motor vehicles for personal transportation and may be expected to continue to do so. Other modes of transportation utilized locally are provided by private concerns except for the case of air travel, in which case public investments are made in basic facilities. The future need for airport facilities should be considered in the development plan.

Even though many of the 15 county objectives are subdivided into several components, the direction offered to a mine planner in determining postmining land uses is rather limited. Without a plan that predicts quantitatively and geographically the need for various types of land use, the mine planner must make postmining land use decisions based primarily upon his own investigations.

Chapter 5

APPLICATION OF PLANNING PROCESS

5.1 Scope Definition

The scope of this case study is to develop several applicable land use plans for the mining site discussed in Chapter 3 using the principles outlined in Chapter 4. Pertinent information from the county and regional planning agencies are considered; however, no effort will be made to formulate a land use plan for any area outside of the Spingola No. 1 Mine permit area. The objectives to be satisfied in the development of the post-mining land use plan will include satisfying all regulatory requirements, enhancing property values, and improving the environmental and aesthetic characteristics of the site. These objectives will be met through inventorying the local environmental and social conditions, formulating alternative postmining land use plans and evaluating the alternatives in light of the regional planning framework and the economic, environmental, and social feasibility of the plans themselves.

Although the investigators are cognizant of the fact that the mining company does not own the land on which the mine is located, the site planning process will basically be applied without regard for ownership. The results, therefore, must be viewed as hypothetical or subject to the assumption that the mining company can dispose of the land as it sees fit. The value of such an exercise, then, is in the demonstration of a process rather than in a critique of any work done by the company or its consultant. In addition to the hypothetical plans that will be formulated, one land use plan will be designed to reflect current ownership patterns. All plans will be formulated after the baseline data has been collected. Therefore the ownership assumption will not impact the inventory process.

5.2 Information System

The major sources of information were the mining company's environmental consultant, the county soil survey, the county planning commission, the six-county regional planning commission, the Agricultural Stabilization and Conservation Service, and selected maps from the Pennsylvania Geological Survey and the U.S. Geological Survey. Since the body of the information collected was not excessive, a simple alphabetical filing system was adequate to handle the data.

5.3 Preliminary Studies and Data Collection

No extensive primary data collection was required for the case study since a substantial amount of secondary information was available from the permit application and other public sources. Ideally, primary data would be collected to aid in the planning process. It is not uncommon, however, particularly when dealing with relatively small sites, for baseline data collection to be rather limited due to the cost of such investigations. In many instances mine planners will have to rely on permit application data coupled with information published by government agencies, as the investigators did in this case. For this reason, care should be exercised in planning the permit baseline data collection program so that maximum usefulness can be obtained for planning purposes.

Socioeconomic data will not generally be collected by the mine planners. Rather, it will be obtained from public agencies. The data obtained in this manner may not be in a form which is useful to the planner and may require manipulation or extrapolation before it can be applied to postmining land use decisions.

5.3.1 Topography

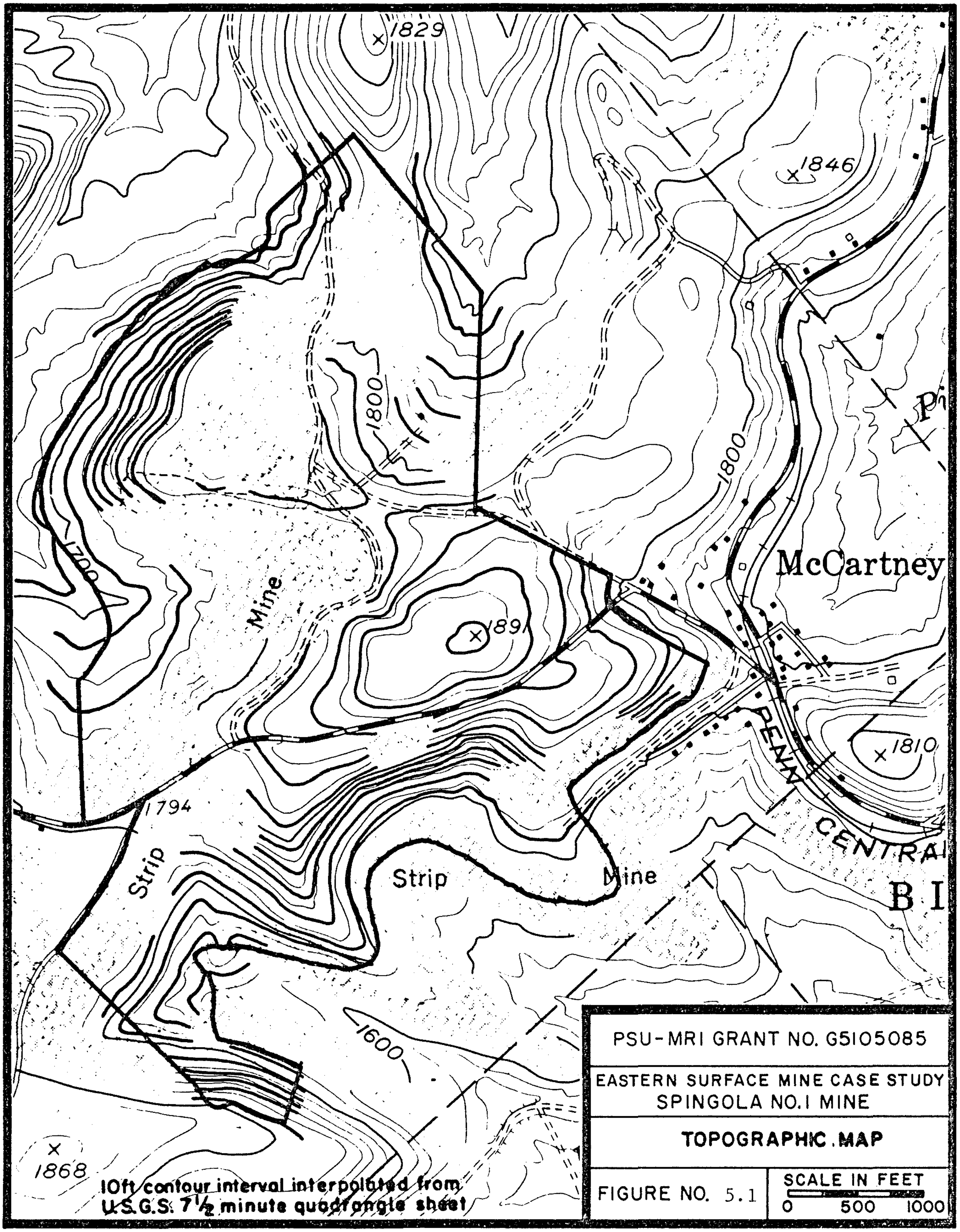
The 430-acre Spingola No. 1 site is shown in Figure 5.1. The highest point at the site is 1,891 feet above sea level and is located in the east central portion of the area, just north of L.R. 17024. The slope generally falls away from this point in all directions. There is another high point (approximately 1,840 feet above sea level) to the northwest of the 1,891 elevation, creating a saddle between the two points. The lowest elevation is approximately 1,640 feet above sea level which is reached at points along the southern and northwestern boundaries of the site. The resulting maximum relief is approximately 250 feet.

The central portion of the site can be described as rolling or hilly. It is basically a hilltop with some minor undulations. Slopes in this part of the site range from 3% to 15%. Along the northern and southern boundaries, the terrain is much more rugged with slopes generally in excess of 15%, and greater than 25% in some places.

The topographic map shown in Figure 5.1 is taken from the Irvona, PA - 7½ minute U.S.G.S quandrangle sheet. Contour lines are not shown on the topographic map for areas that have been disturbed by previous mining operations. Figure 5.2 shows a proposed grading plan for the areas which seeks to mold the disturbed areas into the existing contours in as uniform a fashion as possible. Using this proposed grading plan, the slope map shown in Figure 5.3 was constructed. This map illustrates the steepness of the extreme northern and southern portions of the site and the rolling nature of the central portion.

5.3.2 Geology

The general geologic map shown in Figure 5.4 indicates that both the Conemaugh and Allegheny Groups outcrop at the Spingola No. 1 site. At this location, the Conemaugh consists entirely of weathered sandstone overlying the Upper Freeport Coal which is the uppermost formation of the Allegheny Group. Other coal seams located at the site are the Lower Freeport Split, the Lower Freeport, the Upper Kittanning and the Middle Kittanning. All of these are part of the Allegheny Group and are



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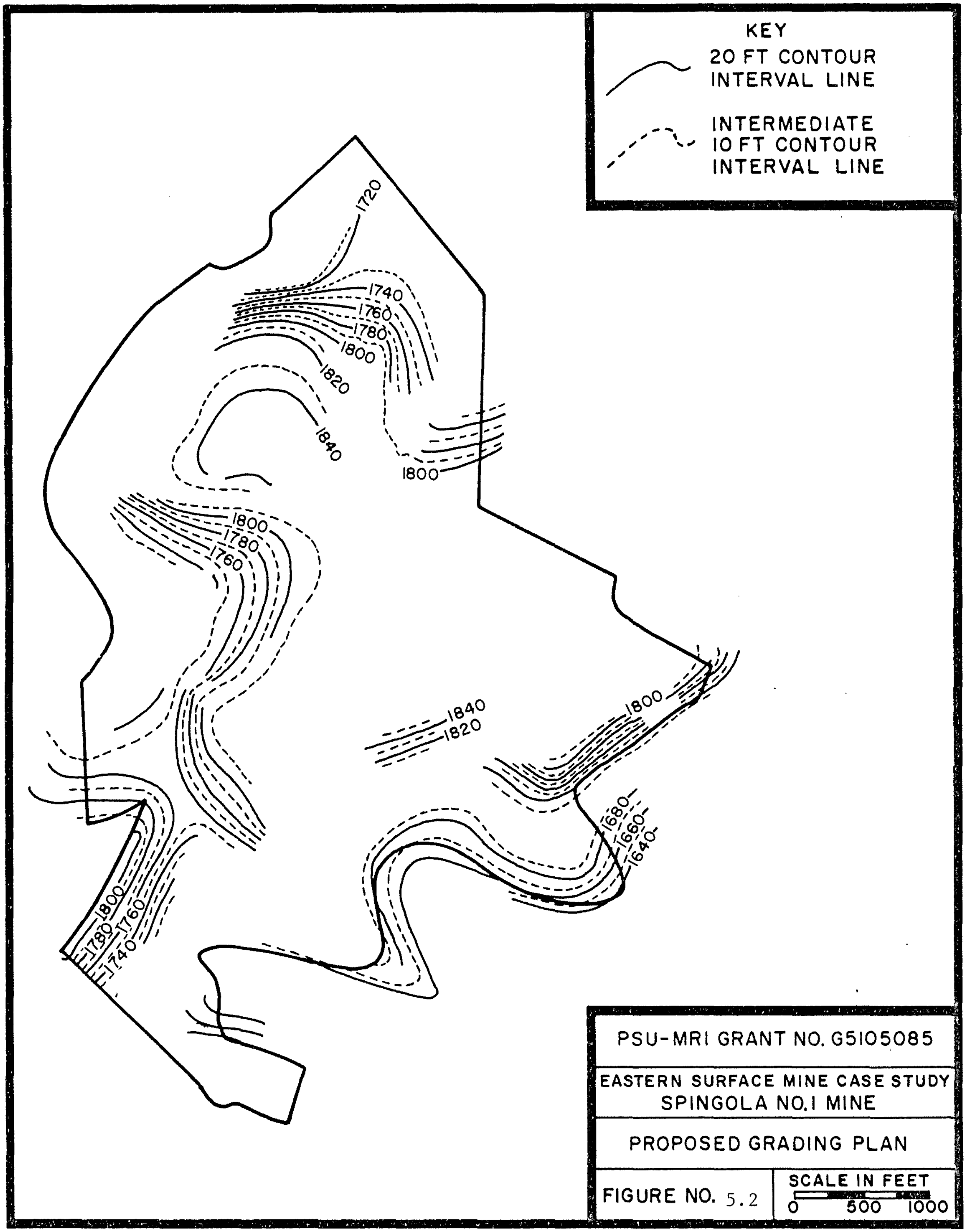
SPINGOLA NO.1 MINE

TOPOGRAPHIC MAP

FIGURE NO. 5.1



PSU-MRI GRANT NO. G5105085

EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. 1 MINE

PROPOSED GRADING PLAN

FIGURE NO. 5.2

SCALE IN FEET
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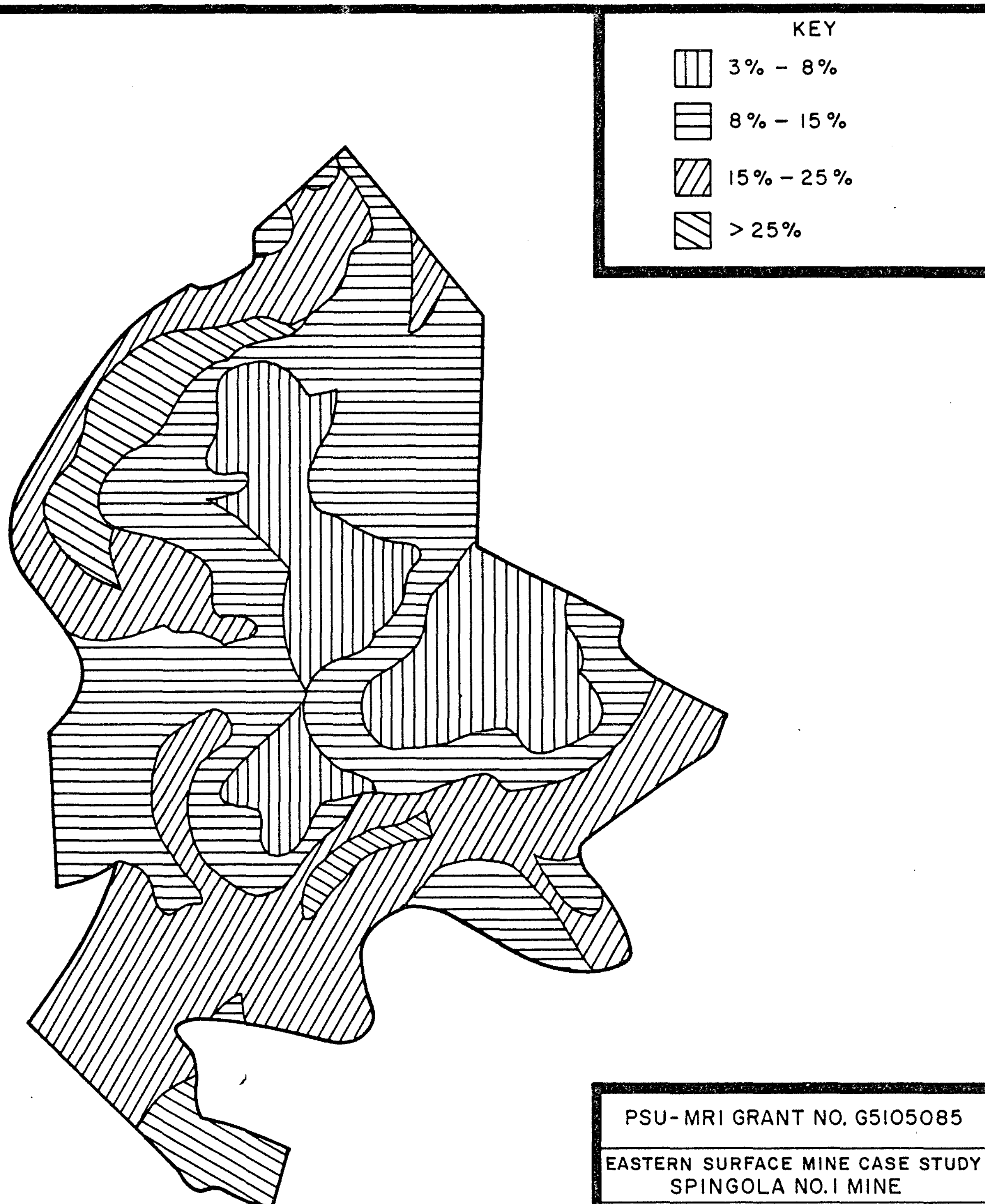


PSU-MRI GRANT NO. G5105085

EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. 1 MINE

SLOPE MAP

FIGURE NO. 5.3

SCALE IN FEET
0 500 1000

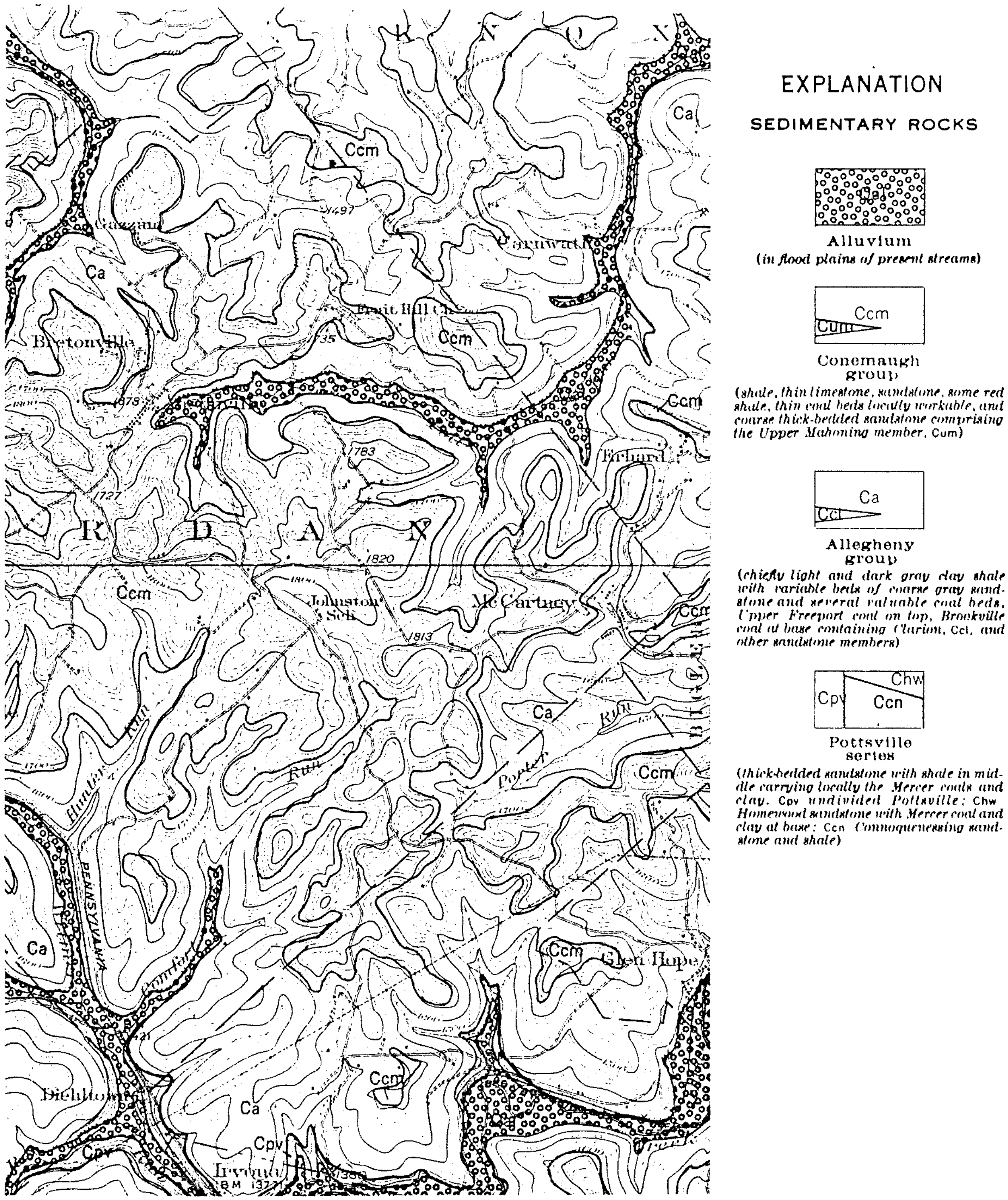


Figure 5.4 General Geological Map.

SOURCE: Ashley, 1940.

generally separated by alternating beds of sandstone, shale, and underclay. The attitude of the strata are nearly horizontal with dips averaging one degree or less.

A generalized stratigraphic column constructed from the drilling log data given in Table 5.1 is shown in Figure 5.5.

5.3.3 Hydrology

A minor drainage divide separating the Potts Run watershed from the Buck Run watershed cuts diagonally across the site from northeast to southwest (Figure 5.6). Surface water flow measurements corresponding to the stations shown on Figure 5.6 are listed in Table 5.2. Since these measurements were one-time readings taken at various times of the year, it is difficult to draw any conclusions from them. Also, since there are no continuous monitoring stream gages in the area, no stream hydrographs or flood frequency data are available.

The mine site is basically a groundwater recharge area due to its location on the Laurel Hill Anticline. General groundwater flow patterns are illustrated on Figure 5.6. The company's consultant reports that the site is characterized by several perched water tables. The closest unit that could be considered a major aquifer is the Homewood Sandstone of the Pottsville Series. This unit is approximately 150 feet below the Middle Kittanning coal seam (Ashley, 1940). Most nearby private water supply wells, particularly those in the village of McCartney, tap perched water tables below the Lower Freeport coal seam.

Results of the water quality samples at the locations indicated on Figure 5.6 are summarized in Table 5.3. These samples were taken from both surface and underground sources. Considering the amount of previous mining conducted in the area, the background water quality in the vicinity of the mine is generally good. It is believed that there is some limestone present beneath the Upper Freeport underclay and calcite fillings in some of the joints, although drilling records do not verify this assumption. There apparently are some very localized acid-producing strata which account for isolated low pH values. Sample #9, for example, had a pH of 3.68. However, Sample #7 receives water from the same side of the hill where the same seam had been mined and this sample had a pH of 7.41 indicating the possible presence of localized acid-producing material.

5.3.4 Soil Characteristic

The Soil Conservation Service (SCS) is presently in the process of preparing an updated soil survey for Clearfield County. Although the report is not complete, preliminary soils maps and interpretations were obtained from the county SCS office. Figure 5.7 shows the soils at the case study site as they have been mapped by the SCS. The soil types, percent slopes, and area of coverage are listed in Table 5.4. The SCS has identified both the Gilpin Channery silt loam (14B) and the Wharton silt loam (57B) as prime farmland soil. However, due either to previous stripping, forest cover, or lack of agricultural activity, these soils have been exempted from prime farmland standards.

Table 5.1

Drilling Log Data

Test Hole #1
Surface Elevation: 1740'

Strata	Thickness
Brown shale	20'
UPPER KITTANNING COAL	1.4'
Total overburden	20'
Total coal thickness	1.4'

Test Hole #2
Surface Elevation: 1724'

Strata	Thickness
Brown shale	10'
LOWER FREEPORT SPLIT COAL	1.3'
Clay	1'
Brown Shale	8'
UPPER KITTANNING COAL	1.3'
Total overburden	19'
Total coal thickness	2.6'

Test Hole #3
Surface Elevation: 1720'

Strata	Thickness
Old spoil	15'
Brown shale	24'
UPPER KITTANNING COAL	1.3'
Total overburden	39'
Total coal thickness	1.3'

Highwall Section #4
Surface Elevation: 1700'

Strata	Thickness
Surface	2'
Shale	21'
Brown soft rock	4'
Gray shale	17'
MIDDLE KITTANNING COAL	2.0'
Total overburden	44'
Total coal thickness	2.0'

Highwall Section #5
Surface Elevation: 1690'

Strata	Thickness
Surface	2'
Shale	17'
Brown soft rock	4'
Gray shale	5'
MIDDLE KITTANNING COAL	2.0'
Total overburden	28'
Total coal thickness	2.0'

Highwall Section #6
Surface Elevation: 1680'

Strata	Thickness
Surface	2'
Shale	28'
Brown soft rock	5'
Gray shale	13'
MIDDLE KITTANNING COAL	2.0'
Total overburden	48'
Total coal thickness	2.0'

Test Hole #7
Surface Elevation: 1820'

Strata	Thickness
Surface	2'
Brown shale	33'
Gray rock	21'
LOWER FREEPORT COAL	3.0'
Total overburden	56'
Total coal thickness	3.0'

Test Hole #8
Surface Elevation: 1829'

Strata	Thickness
Surface	2'
Shale	28'
Brown soft rock	5'
Gray shale	12'
LOWER FREEPORT SPLIT COAL	2.0'
Gray rock	17'
LOWER FREEPORT COAL	3.9'
Total overburden	64'
Total coal thickness	5.9'

Table 5.1 (Cont.)

Highwall Section #9
Surface Elevation: 1805'

Strata	Thickness
Surface	2'
Brown shale	31'
Broken sandstone	9'
LOWER FREEPORT COAL	3.1'
Total overburden	42'
Total coal thickness	3.0'

Highwall Section #10
Surface Elevation: 1835'

Strata	Thickness
Surface	2'
Broken sandrock	11'
UPPER FREEPORT COAL	2.1'
Total overburden	13'
Total coal thickness	2.1'

Highwall Section #11
Surface Elevation: 1840'

Strata	Thickness
Surface	2'
Broken Sandrock	11'
UPPER FREEPORT COAL	2.0'
Total overburden	13'
Total coal thickness	2.0'

Highwall Section #12
Surface Elevation: 1835'

Strata	Thickness
Surface	2'
Brown shale	7'
Broken sandrock	9'
UPPER FREEPORT COAL	2.2'
Total overburden	18'
Total coal thickness	2.2'

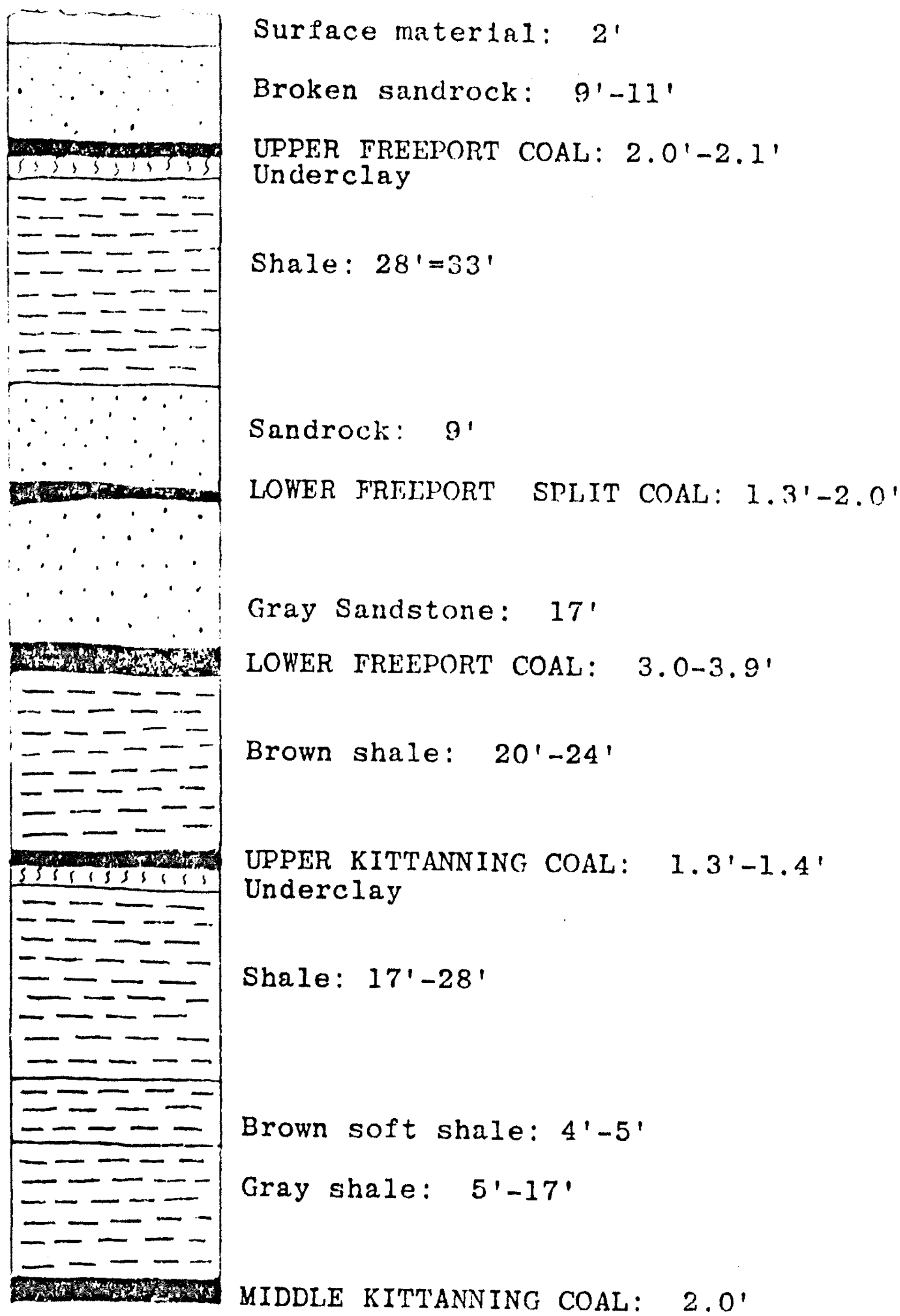


Figure 5.5 Stratigraphic Column.

SOURCE: Hess and Fisher Engineers.

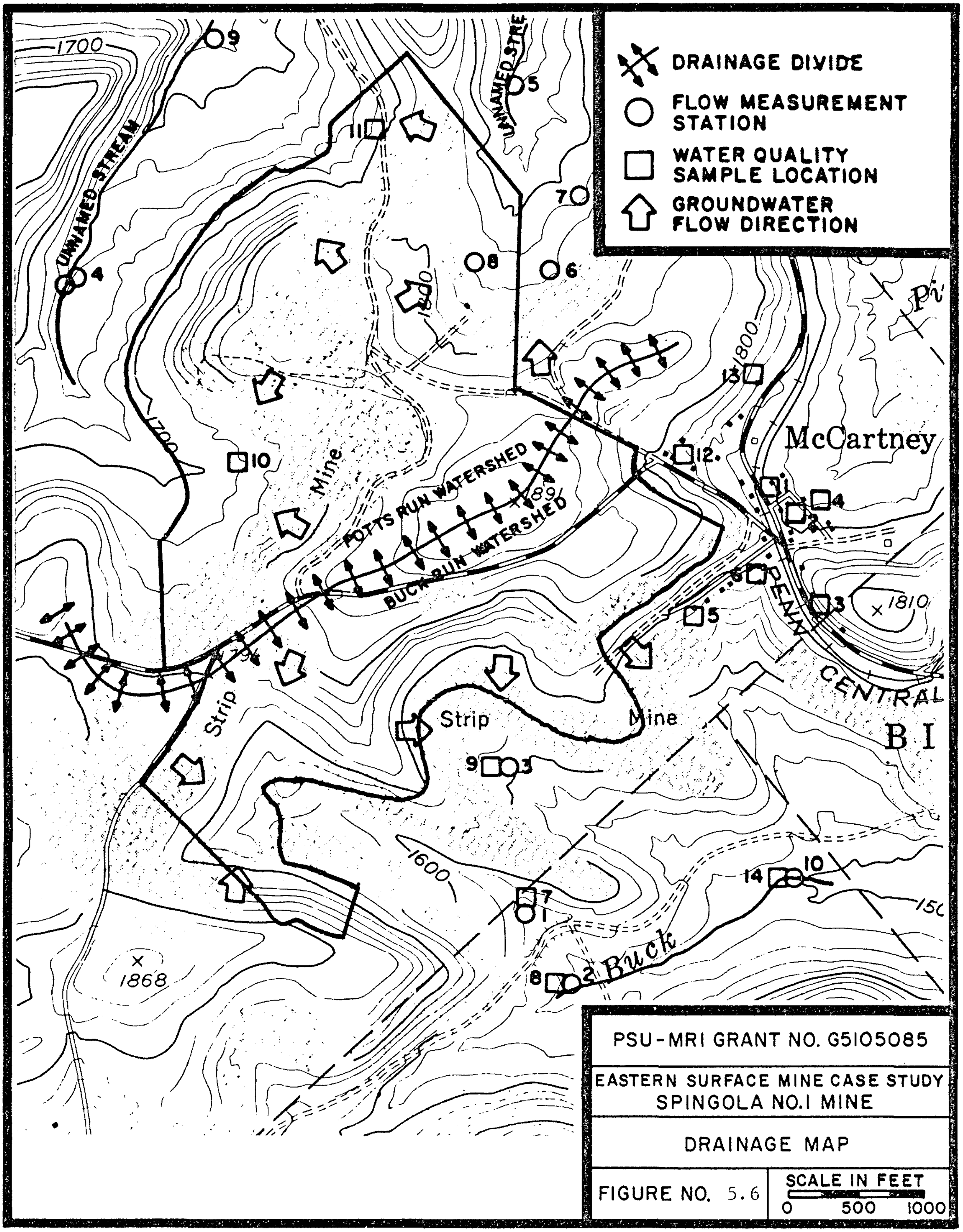

DRAINAGE DIVIDE
FLOW MEASUREMENT STATION
WATER QUALITY SAMPLE LOCATION
GROUNDWATER FLOW DIRECTION
UNNAMED STREAM
POTTS RUN WATERSHED
BUCK RUN WATERSHED
McCartney
Mine
Strip
Strip
Mine
Buck
1700
1700
1800
1600
1868
1810
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
DRAINAGE MAP
FIGURE NO. 5.6
SCALE IN FEET
0 500 1000

Table 5.2

Flow Measurements

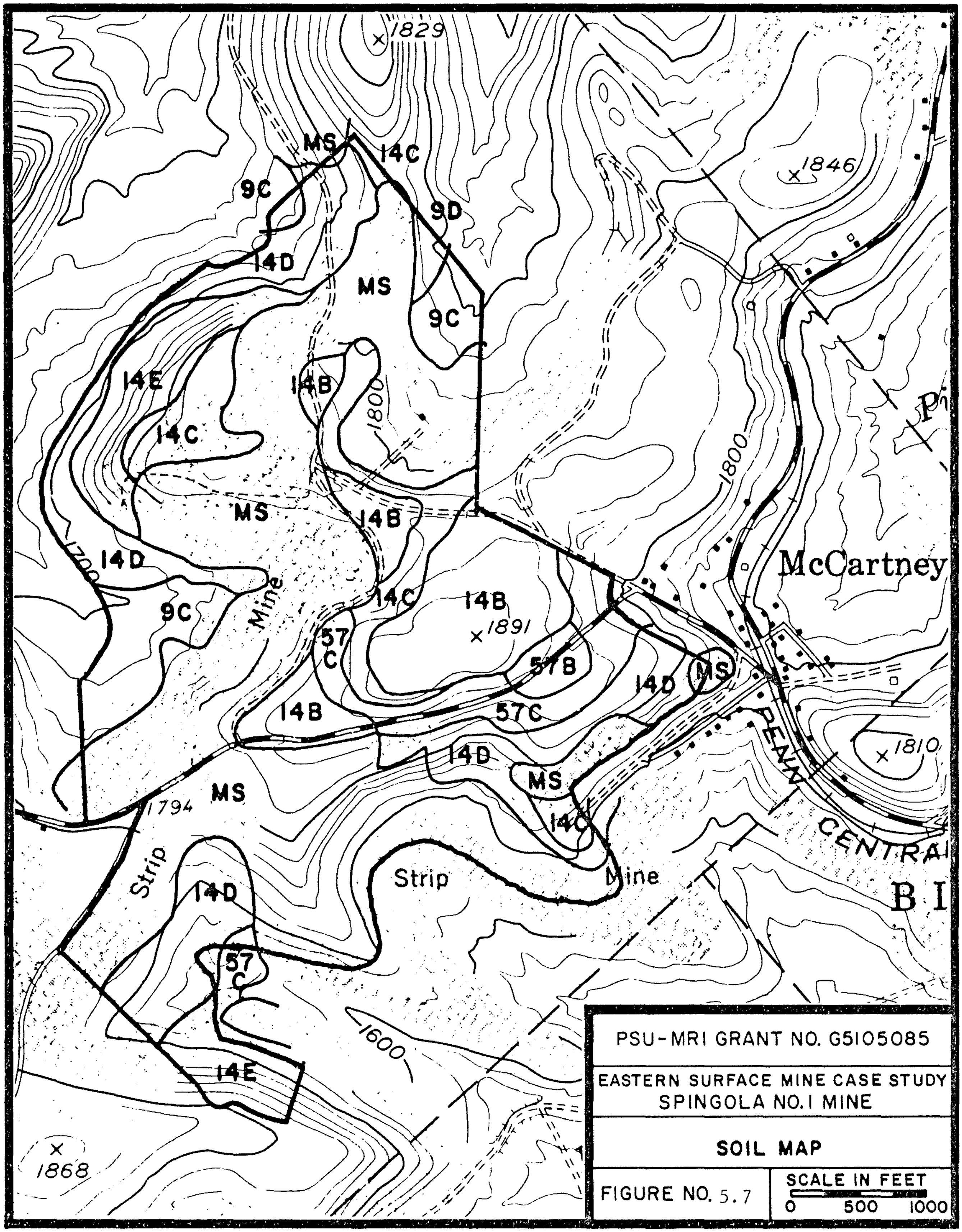
Sample No.	Date	Location (relative to site)	Elevation (MSL) (FT)	Source	Depth (FT)	Flow or Estimated Yield (GPM)
1	11/16/79	South	1525 [1]	Impound-ment		8
2	11/16/79	South	1504 [1]	Buck Run		358 [2]
3	11/16/79	South	1625	Seep		<1
4	10/14/80	West	1617 [1]	Unnamed Stream	0.1	10
5	10/14/80	North	1598 [1]	Unnamed Stream	0.1	10
6	10/15/80	North	1693 [1]	Seep	0.1	2
7	10/15/80	North	1694 [1]	Seep	0.1	3
8	10/15/80	North	1724 [1]	Seep	0.1	3
9	2/24/81	North	1555	Unnamed Stream	0.4	1000
10	2/24/81	South east	1500	Buck Run	0.4	1200

Footnotes: 1. Aneroid Barometer Survey 2. Determined by Area-Velocity Method, Marsh-McBirney Model 201, Water Current Meter.

Table 5.3

Water Quality Data

Sample No.	pH	Alkalinity (mgCACO$_3$/l)	Acidity (mgCaCO$_3$/l)	Sulfates (mg/l)	Specific Conductance (μmhos/cm)	Total Iron (mg/l)	Total Manganese (mg/l)	Non-Filterable Residue (mg/l)
1	6.52	77	-55	47	340	0.2	<0.1	
2	6.1	52	18	41	354	0.1	<0.1	<1
3	5.23	2	9	422	600	<0.1	0.9	<1
4	7.65	191	8	56	520	0.1	0.2	<1
5	8.41	115	-127	159	450	0.2	0.1	
6	6.4	27	7	45	120	0.1	<0.1	
7	7.41	20	-6	298	580	1.7	1.6	
8	7.42	25	-13	118	250	0.2	0.1	2
9	3.68	0	80	900	1200	2.9	11.0	
10	7.17	29	-14	584	930	0.7	5.1	0
11	6.84	25	-7	197	520	0.2	1.9	
12	6.36	24	53	36	196	1.2	0.5	
13	6.93	59	8	57	209	0.1	<0.1	<1



PSU-MRI GRANT NO. G5105085

EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. 1 MINE

SOIL MAP

FIGURE NO. 5.7

Table 5.4

Soil Conservation Service
Soil Units

Soil Type	Map Symbol	Percent Slope	Area in Acres
Ernest Silt Loam	9C	8-15	14.25
Ernest Silt Loam	9D	15-25	2.00
Gilpin Channery Silt Loam	14B	3-8	53.50
Gilpin Channery Silt Loam	14C	8-15	30.00
Gilpin Channery Silt Loam	14D	15-25	68.00
Gilpin Channery Silt Loam	14E	25-35	24.50
Wharton Silt Loam	57B	3-8	4.75
Wharton Silt Loam	57C	8-15	23.75
Strip Mine Spoil	MS	Var.	210.00

One of the functions of a soil survey is to interpret the soil information as it relates to various land uses and land covers. The use of these interpretations for areas that are to be strip mined is questionable since removal, stockpiling, and rehandling of the soil will greatly affect its characteristics. In this case, such interpretations may have some usefulness for two reasons: (1) certain portions of the site will not be mined, therefore the soils will not be disturbed; (2) since the surface mine operator wishes to reduce topsoil haulage, it is likely that the topsoil will be returned to the same general area from which it was stripped although the exact contact lines between the various soil types will not be restored.

Table 5.5 evaluates the potential of each soil unit to support a variety of wildlife habitat elements. This information is then combined in Figure 5.8 to illustrate the wildlife habitat potential based upon the existing soil types. Note that no interpretation is given for the old strip mine spoil since its characteristics are much too variable to predict.

Figures 5.9 and 5.10 are also derived from the SCS soil interpretations and illustrate the limitations on building site development and recreational development, respectively. It can be seen from comparison of these two maps that the building site limitations are more severe. The reasons for this is that the building sites require a higher standard than recreational development with respect to such factors as erodibility, slope, wetness, and bearing capacity.

No soil testing has been done at the site either for engineering or agricultural purposes. After the site has been regraded and topsoil has been replaced, soil tests will be performed to determine the soil amendments required for revegetation.

5.3.5 Climate

The Environmental Data Service of the National Climatic Center records climatological data at Madera, located approximately four miles from the case study site. Daily temperature and precipitation measurements are made and published annually by the Environmental Data Service. Data for the ten-year period of 1968 through 1977 have been compiled and tabulated in Tables 5.6, 5.7, and 5.8.

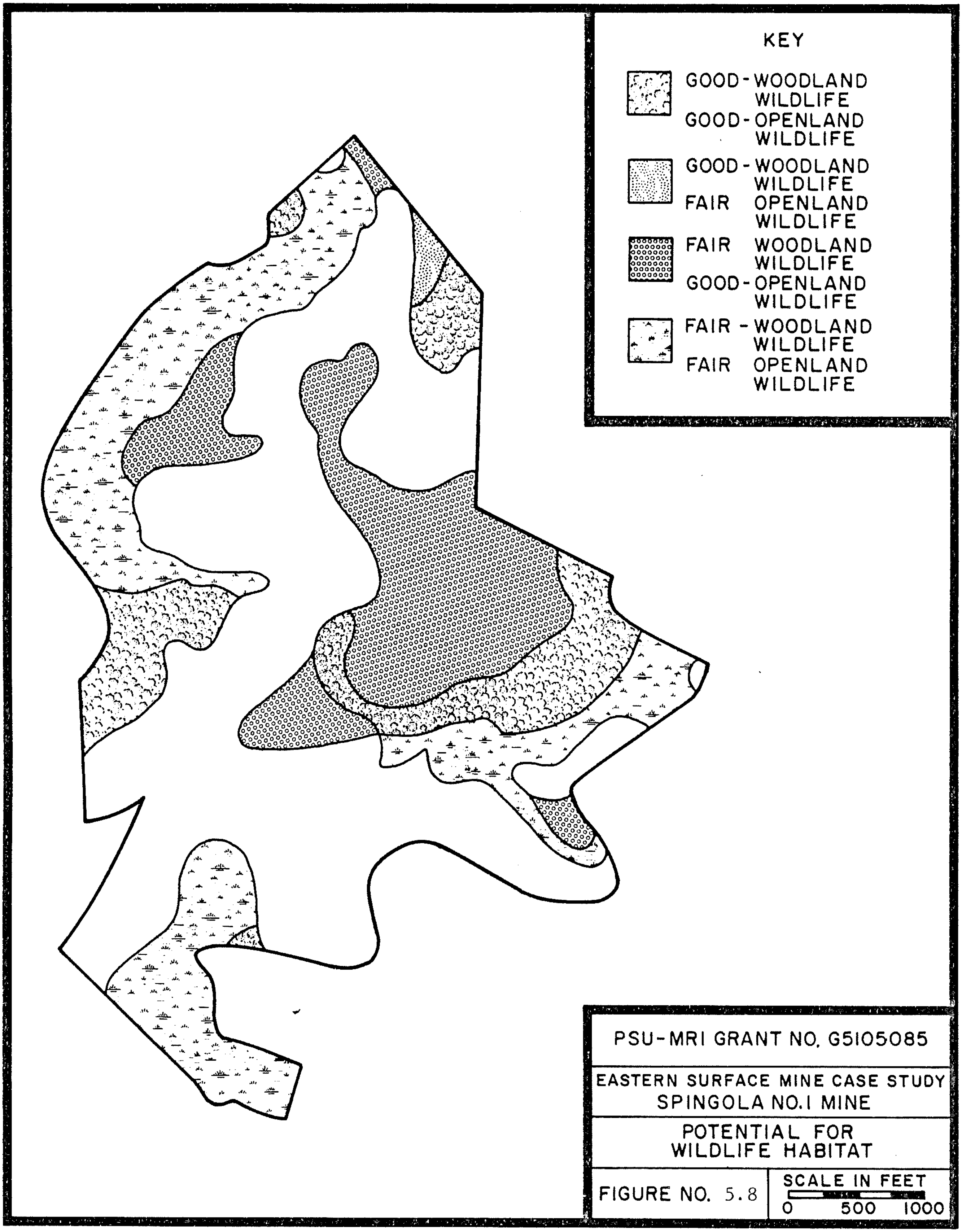
The average daily temperatures, average maximum temperatures, and average minimum temperatures are listed in Tables 5.6. The average annual temperature for the ten-year period was 45.1°F with July being the hottest month and January the coldest. The average maximum temperature for July was 79.8°F and the average minimum temperature for January was 10.9°F.

Table 5.7 is important from an agricultural standpoint. It shows the number of days in each month that experienced temperatures less than or equal to 32°F. This table indicates that in the ten years surveyed, two years had freezing temperatures in June and five years had freezing temperatures in September. The last column on the right lists the

Table 5.5

Soil Conservation Service
Soil Potential for Habitat Elements

Soil Type	Map Symbol	Potential for Habitat Elements							
		Grain & Seed	Grass & Legume	Wild Herb	Hardwd Trees	Conifer Plants	Shrubs	Wetland Plants	Shallow Water
Ernest Silt Loam	9C	Fair	Good	Good	Good	Good	--	V.Poor	V.Poor
Ernest Silt Loam	9D	Poor	Fair	Good	Good	Good	--	V.Poor	V.Poor
Gilpin Channery Silt Loam	14B	Fair	Good	Good	Fair	Fair	--	V.Poor	V.Poor
Gilpin Channery Silt Loam	14C	Fair	Good	Good	Fair	Fair	--	V.Poor	V.Poor
Gilpin Channery Silt Loam	14D	Poor	Fair	Good	Fair	Fair	--	V.Poor	V.Poor
Gilpin Channery Silt Loam	14E	V.Poor	Fair	Good	Fair	Fair	--	V.Poor	V.Poor
Wharton Silt Loam	57B	Fair	Good	Good	Good	Good	--	Poor	V.Poor
Wharton Silt Loam	57C	Fair	Good	Good	Good	Good	--	V.Poor	V.Poor
Strip Mine Spoil	MS	Var.	Var.	Var.	Var.	Var.	Var.	Var.	Var.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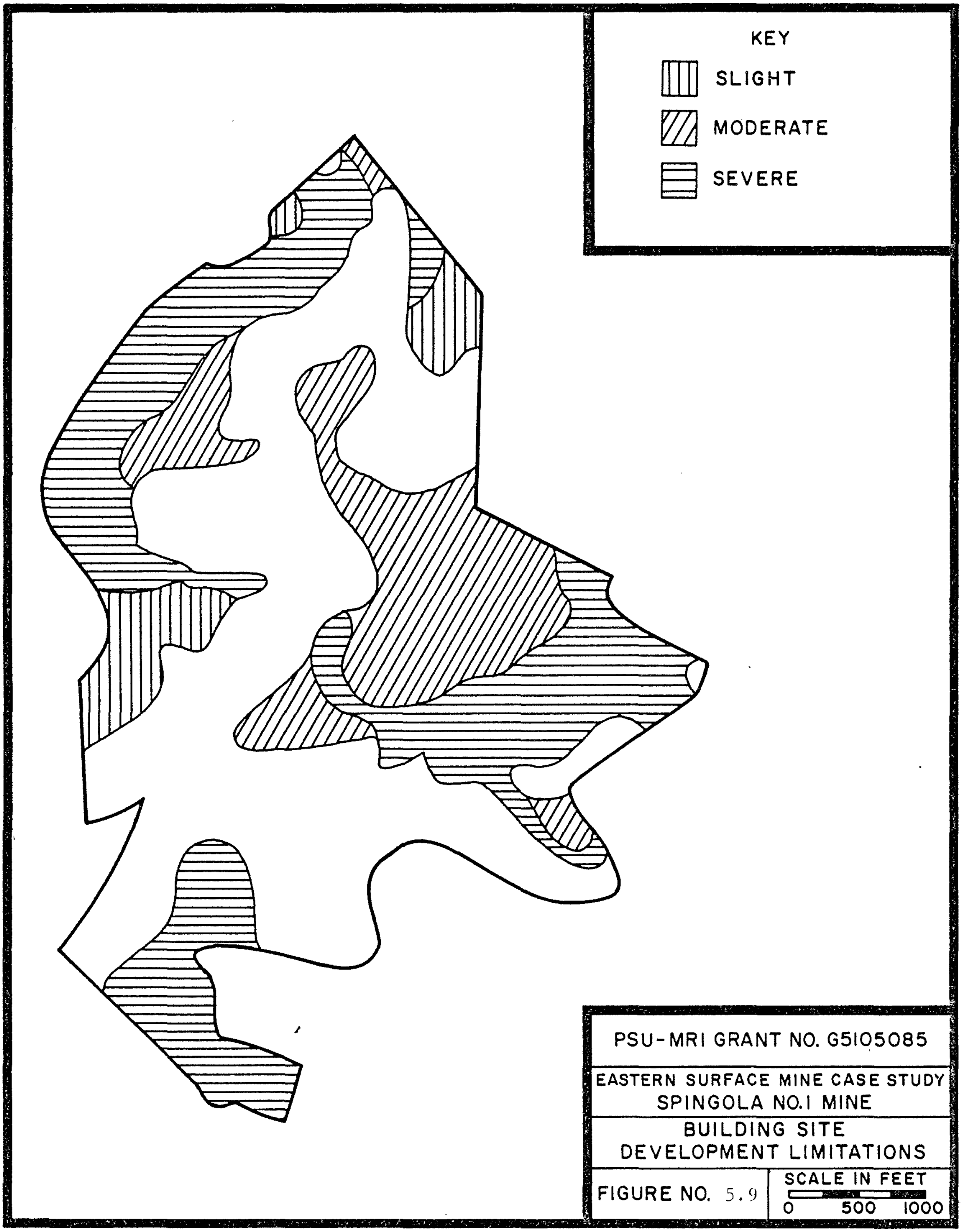
GOOD-OPENLAND WILDLIFE
GOOD-WOODLAND WILDLIFE
FAIR OPENLAND WILDLIFE
FAIR WOODLAND WILDLIFE
GOOD-OPENLAND WILDLIFE
FAIR-WOODLAND WILDLIFE
FAIR OPENLAND WILDLIFE
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
POTENTIAL FOR WILDLIFE HABITAT
FIGURE NO. 5.8
SCALE IN FEET
0 500 1000


KEY
SLIGHT
MODERATE
SEVERE
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
BUILDING SITE
DEVELOPMENT LIMITATIONS
FIGURE NO. 5.9
SCALE IN FEET
0 500 1000

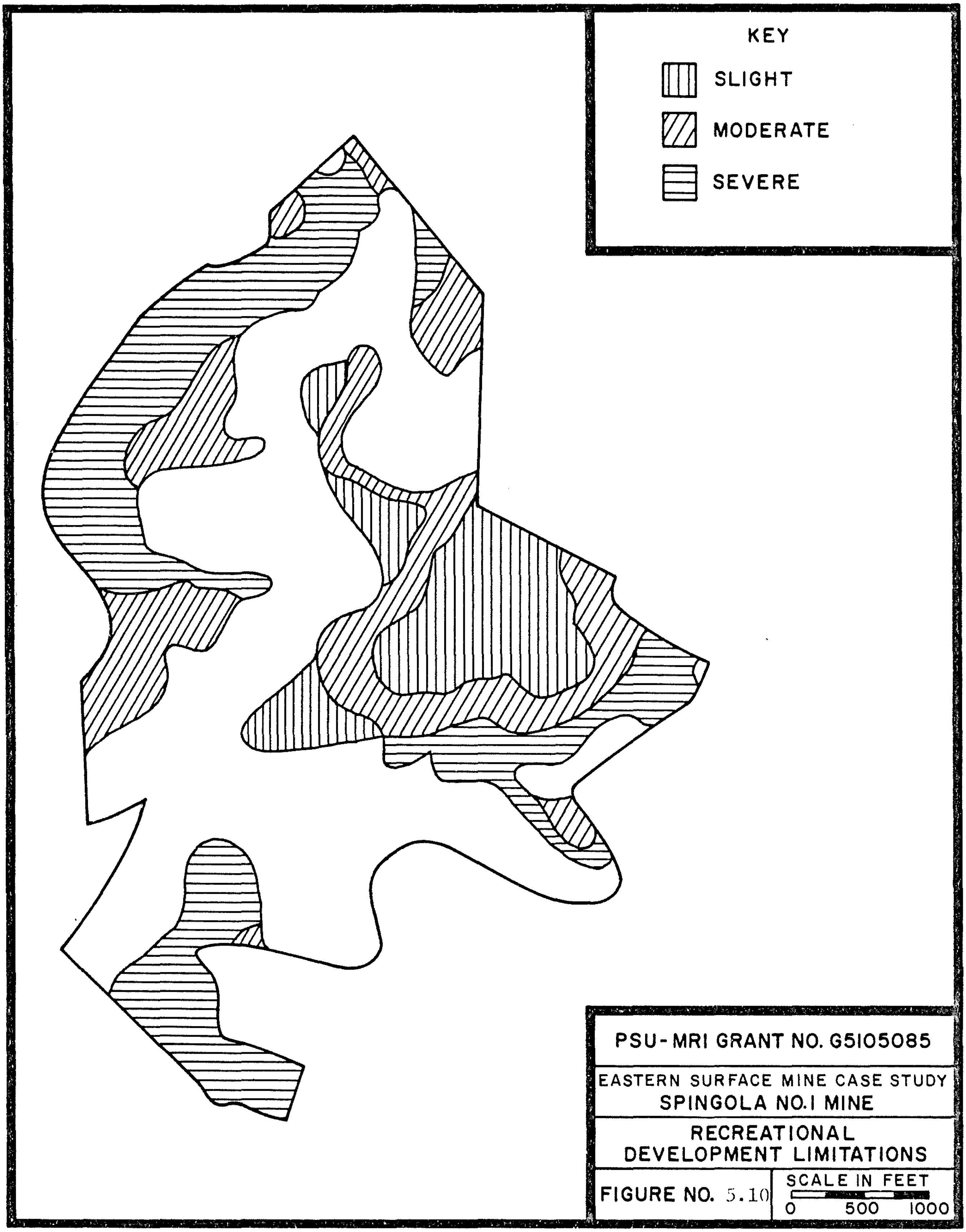

KEY
SLIGHT
MODERATE
SEVERE
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
RECREATIONAL
DEVELOPMENT LIMITATIONS
FIGURE NO. 5.10
SCALE IN FEET
0 500 1000

Table 5.6

Average Temperature Data
for Madera, Pennsylvania

Average Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	17.6	18.9	34.9	46.3	50.7	61.9	67.0	66.6	58.6	48.4	37.8	23.0	44.3
1969	20.9	23.9	28.5	45.1	55.9	63.0	67.5	65.4	58.5	45.3	35.5	21.8	44.3
1970	15.1	21.4	27.9	45.1	58.1	62.5	66.7	66.9	62.1	51.3	40.1	28.3	45.5
1971	19.7	24.5	28.6	41.1	51.1	66.2	65.2	64.1	63.8	53.1	36.8	33.2	45.6
1972	26.9	19.1	30.4	42.0	56.4	59.4	67.9	64.7	60.7	43.2	(37.7)	32.4	(45.1)
1973	24.9	22.6	39.9	45.0	51.3	65.6	67.8	67.7	60.0	49.5	39.2	28.5	46.8
1974	28.6	23.3	34.0	44.5	53.2	60.5	65.5	65.3	56.3	42.8	38.2	28.0	45.0
1975	26.2	25.1	30.2	38.4	57.6	63.5	67.9	67.2	54.5	49.9	41.3	27.1	45.7
1976	18.0	29.8	38.9	46.2	51.7	65.7	64.7	63.5	54.5	42.1	30.2	18.5	43.7
1977	8.7	21.6	37.6	46.4	58.1	60.8	68.0	65.5	60.3	44.4	40.0	24.0	44.6
AVE	20.7	23.0	33.1	44.0	54.4	62.9	66.8	65.7	58.9	47.0	37.7	26.5	45.1

Average Maximum Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	28.6	29.1	47.6	62.8	62.4	75.3	81.3	79.0	72.0	59.9	46.3	31.9	56.4
1969	29.3	33.8	41.2	60.7	71.6	76.9	79.0	79.5	71.6	59.8	44.3	30.2	56.5
1970	25.3	33.4	37.2	58.4	72.5	76.7	79.5	80.4	75.8	60.7	47.0	35.6	56.9
1971	28.8	33.3	39.1	55.8	66.6	79.7	79.4	77.0	73.1	64.6	46.0	42.9	57.2
1972	35.8	30.3	41.9	56.6	71.5	70.5	78.5	77.6	73.2	53.9	(46.7)	38.2	56.2
1973	34.7	33.2	51.0	55.6	62.6	78.6	79.8	79.5	72.3	61.3	48.2	36.2	57.8
1974	37.3	34.3	44.9	58.7	68.3	73.2	79.6	77.4	68.4	56.8	47.9	35.8	56.9
1975	35.5	34.5	40.5	50.7	71.6	75.2	81.1	79.6	65.5	62.6	52.9	35.4	57.1
1976	28.5	41.2	51.2	61.2	66.1	79.0	77.2	77.2	68.8	52.9	40.4	30.3	56.2
1977	19.5	32.9	50.6	62.0	75.6	75.0	82.2	77.7	71.7	56.0	47.3	33.2	57.0
AVE	30.3	33.6	44.5	58.3	68.9	76.0	79.8	78.5	71.2	58.9	46.7	35.0	56.8

Average Minimum Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	6.6	8.7	22.2	29.8	39.0	48.4	52.7	54.2	45.1	36.9	29.3	14.0	32.2
1969	12.5	13.9	15.8	29.5	40.1	49.0	55.9	51.2	45.3	30.8	26.7	13.4	32.0
1970	4.9	9.4	18.5	31.7	43.7	48.2	53.8	53.4	48.3	41.9	33.2	20.9	34.0
1971	10.5	15.7	18.1	26.4	35.6	52.6	50.9	51.5	54.5	41.6	27.5	23.5	34.0
1972	18.0	7.9	18.9	27.3	41.3	48.3	57.2	51.8	48.2	32.5	(28.6)	26.5	33.9
1973	15.0	11.9	28.7	34.4	40.0	52.6	55.7	55.9	47.7	37.7	30.2	20.8	35.9
1974	19.8	12.2	23.0	30.2	38.0	47.8	51.3	53.1	44.1	28.7	28.4	20.2	33.1
1975	16.8	15.7	19.8	26.0	43.5	51.7	54.6	54.7	43.5	37.2	29.7	18.8	34.3
1976	7.4	18.4	26.5	31.1	37.2	52.3	52.2	49.7	40.2	31.2	20.0	6.6	31.1
1977	-2.1	10.3	24.6	30.8	40.6	46.5	53.8	53.3	48.8	32.7	32.7	14.7	32.2
AVE	10.9	12.4	21.6	29.7	39.9	49.7	53.8	52.9	46.6	35.1	28.6	17.9	33.3

Values in parentheses are average monthly values.

Compiled from: Environmental Data Service, Climatological Data. Vol. 73, No. 1 - Vol. 82, No. 12.

Table 5.7

Number of Days with Minimum Temperature
Less Than or Equal to 32°F
at Madera, Pennsylvania

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	No. of Days Between Last Spring Frost and First Fall Frost
1968	29	28	26	21	7	0	0	0	1	9	19	31	143
1969	29	28	30	16	6	0	0	0	1	19	20	31	115
1970	31	28	31	15	3	0	0	0	0	6	14	30	150
1971	31	25	30	26	11	0	0	0	0	6	26	22	133
1972	29	29	30	22	6	2	0	0	0	14	(21)	23	120
1973	30	27	18	14	8	0	0	0	0	11	19	28	151
1974	28	28	26	21	12	0	0	0	3	23	20	29	117
1975	31	27	29	24	2	0	0	0	3	10	20	30	128
1976	31	24	22	18	12	0	0	0	4	18	28	31	122
1977	31	27	26	18	10	3	0	0	0	20	19	30	118
AVE	30.0	27.1	26.8	19.5	7.7	0.5	0	0	1.2	13.6	20.6	28.5	129.7

Compiled from: Environmental Data Service, Climatological Data, Vol. 73, No. 1 - Vol. 82, No. 12.

Table 5.8

Precipitation Data
for Madera, Pennsylvania

Total Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	1.51	.36	2.23	1.42	7.53	4.41	4.10	2.20	2.64	2.18	3.92	3.37	35.87
1969	1.83	.60	.62	2.64	2.61	3.51	6.24	4.65	1.01	2.19	2.54	4.09	32.53
1970	1.25	1.71	2.38	5.70	3.71	3.87	5.37	5.65	2.23	4.75	4.10	3.50	44.22
1971	2.53	4.29	2.72	.88	3.05	2.13	6.20	2.99	4.53	1.92	2.35	3.84	37.43
1972	2.19	2.75	1.87	4.76	4.38	13.80	3.09	1.67	4.16	1.74	4.70	2.86	47.97
1973	1.39	1.98	1.95	3.89	4.71	4.81	5.31	3.24	4.85	2.80	2.99	2.58	40.50
1974	E2.07	.86	3.98	1.64	3.53	5.50	4.13	3.77	4.20	1.05	1.38	2.32	E34.43
1975	3.00	2.93	1.98	1.81	5.08	4.68	3.83	5.96	6.71	2.67	2.10	1.55	42.30
1976	1.36	2.24	2.96	1.74	2.70	5.88	2.73	4.20	5.18	5.54	.56	1.00	36.09
1977	.76	1.59	4.23	4.08	2.23	3.59	9.39	3.58	4.50	4.05	2.45	1.68	42.13
AVE	1.79	1.93	2.49	2.86	3.95	5.22	5.04	3.79	4.00	2.89	2.71	2.68	39.35

Number of Days with Precipitation ≥ 0.10 Inch

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	4	1	5	5	15	7	3	8	5	8	9	7	77
1969	7	2	1	9	5	8	12	9	5	4	9	10	81
1970	2	5	6	11	8	8	12	5	6	7	11	8	89
1971	8	10	5	4	7	6	10	9	11	6	5	8	89
1972	7	8	5	12	12	15	10	6	10	3	(7)	8	103
1973	4	4	7	10	13	9	8	8	8	5	6	9	91
1974	9	2	10	5	11	11	10	9	7	2	6	6	88
1975	7	6	5	6	11	8	9	9	13	6	7	6	93
1976	5	5	9	5	9	11	8	7	8	12	2	3	84
1977	3	4	11	7	6	5	11	7	9	9	7	6	85
AVE	5.6	4.7	6.4	7.4	9.7	8.8	9.3	7.7	8.2	6.2	6.9	7.1	88.0

Number of Days with Precipitation ≥ 0.50 Inch

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann
1968	1	0	2	1	6	4	2	0	2	1	3	2	24
1969	0	0	0	1	2	3	4	3	0	2	0	4	19
1970	0	1	1	4	2	3	5	4	2	4	3	3	32
1971	1	3	2	0	1	0	5	2	3	1	2	3	23
1972	0	3	1	2	3	8	2	0	4	1	(1)	2	27
1973	0	1	1	3	4	3	5	3	5	1	2	2	30
1974	1	0	2	0	2	6	4	2	4	0	0	1	22
1975	1	1	0	1	3	3	2	6	7	2	1	1	28
1976	0	1	1	1	1	5	1	2	5	4	0	0	21
1977	0	1	1	1	1	2	3	2	3	4	1	0	19
AVE	0.4	1.1	1.1	1.4	2.5	3.7	3.3	2.4	3.5	2.0	1.3	1.8	24.5

Values in parentheses are average monthly values.

Compiled from: Environmental Data Service, Climatological Data. Vol. 73, No. 1 - Vol. 82, No. 12.

number of days between the last freezing temperature of the spring and the first freezing temperature of the fall for each year. The value defines the growing season for that particular year. The ten-year average is approximately a 130-day growing season. For comparison, a growing season of 140 to 150 days is generally desired for corn (Clar and Ramani, in press), however, some corn is grown in the project vicinity. Although the growing season is somewhat short, other factors such as topography and soils, have a more important role in limiting local agricultural productivity.

Table 5.8 indicates that the average annual precipitation for the period was 39.35 inches per year. The annual total ranged from 32.53 inches in 1969 to 47.97 inches in 1972. Over 13 inches were received in June of that year when a tropical storm passed through the area causing serious flooding. The monthly averages indicate that the precipitation is fairly well distributed throughout the year with the highest monthly values occurring over the summer growing months. The number of days with total precipitation greater than or equal to 0.10 inch and 0.50 inch are also recorded in Table 5.8. On the average, 88 days per year, or nearly one out of every four, had at least 0.10 inch of precipitation. However, only 24.5 days had precipitation in excess of 0.50 inch. This is further indication that the precipitation is well distributed throughout the year and not dependent upon a few isolated storm events.

Wind and solar radiation records were not kept for this locality, however, these are factors that can vary significantly due to site conditions. Understanding of the microclimatic features at the site becomes very important when building site development is being considered. Figure 5.11 shows the south-facing slopes at the case study site. These locations would offer the maximum of solar radiation and the best protection from cold northerly or northwesterly winds.

5.3.6 Vegetation

Ehrle (1958) reports that nearly all of the virgin timber in Clearfield County has been removed by the logging industry. Second-growth vegetation consists of two main forest types. The first type is the White Oak-Red Oak communities typical of those found in the Ridge and Valley Physiographic Province to the southeast. The other major forest type is Hemlock stands and the Beech-Birch-Maple communities typical of the northern forests. These two communities are somewhat intermingled in this location, and it is not peculiar to find plants from both groups growing side-by-side.

In addition to the natural reforestation, Norway spruce, pitch pine, and Japanese larch have been used extensively in reforestation efforts. Larch has shown a particular adaptibility to strip mine spoils.

In a more detailed description of the two major community types, Ehrle (1958) divides the plant communities into four layers: (1) canopy layer, (2) understory, (3) shrub layer, and (4) herbaceous layer. The


KEY
DIRECTION OF DOWNWARD SLOPE GRADIENT
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
SOUTH-FACING SLOPES
FIGURE NO. 5.11
SCALE IN FEET
0 500 1000

canopy layer of the White Oak-Red Oak communities consists of white oak, red oak, scarlet oak, chestnut oak, and pitch pine. The understory includes choke cherry, dogwood, and pitch pine. The understory includes choke cherry, dogwood, june-berry, and sassafras. The shrub layer has blueberries, huckleberries, and various willows. The herbaceous layer is made up mainly of ferns, clubmosses, violets, and sedges.

The canopy layer of the Hemlock stands and Beech-Birch-Maple communities includes sugar maple, sweet birch, beech, eastern hemlock, and gray birch. The understory consists mainly of choke cherry, American hornbeam, striped maple, American chestnut, and june-berry. In the shrub layer squashberry, Benjamin bush, mountain laurel, and honeysuckle can be found. The herbaceous layer includes various ferns, clubmosses, boxberry, and wood sorrel.

Ehrle (1958) has identified a third plant community type of minor importance called the Shady Roadside and Shale Bank communities. These plants are particularly typical of the volunteer growth found on old strip mine spoils. Two groupings are identified within this community type. The first group is the herbaceous pioneer migrants consisting of milkweed, evening primrose, golden rod, daisies, and thin grass. The second group consists of shrubs and small trees including quaking aspen, black locust, choke cherry, blueberry, bramble, and willows.

The Atlas of the Flora of Pennsylvania (Wherry and others, 1979) indicates that several of the canopy-layer trees from both major community types are present in the vicinity of the case study site. These observations verify the earlier hypothesis that southern Clearfield County, and the mine site in particular, are located in a transition zone or contact zone between two distinctly different vegetative zones. This results in a complex mix of native vegetation, often controlled by microclimatic variations and recently introduced plants which have been used to reforest previously mined areas.

5.3.7 Wildlife

Not a great deal of information is available about the wildlife that inhabits the study site. No investigations have been conducted to inventory the various types of wildlife present. In general terms, however, it is known that the site is located in an area where hunting is very popular. There is reported to be a good supply of deer, bear, and wild turkey, as well as an abundance of small game animals such as squirrel, grouse, woodcock, and rabbit (Clearfield County Planning Commission, 1975).

There are no streams or permanent bodies of water on the site. The nearest fishable stream is Potts Run, located less than a mile from the northern boundary of the mine. It has been reported by local residents that this stream is capable of supporting trout.

5.3.8 Accessibility

The Spingola No. 1 Mine, like many eastern surface mines, is located in a remote rural area and is accessible only by two-lane roads.

The state road, LR. 17024, that traverses the site is narrow, winding, and not heavily traveled. The permit area is adjacent to the small community of McCartney, however, it does not lie along L.R. 17036 which is the main route through the village. The site is approximately 2.0 miles from the intersection of L.R. 17036 and PA route 53.

Distances to major transportation arteries, public utilities, places of employment, shopping centers, public transportation terminals, parks, and other recreational areas play a large part in determining the suitability of a site for various uses (Clar and Ramani, in press). Figure 5.12 shows the relationship of the case study site to the population centers and transportation arteries of the county.

Any type of industrial development is highly dependent upon easy access to major transportation networks. Interstate 80, the main east-west corridor between New York City and Chicago, crosses Clearfield County. However, the case study site is located approximately 23 miles to the south of the nearest interchange and much of this distance must be traveled over secondary roads. The site is also 13 miles from U.S. 219, a primary north-south route but, again, connecting roads are not adequate to meet industrial demands. The nearest major city is Pittsburgh, located 120 miles to the southwest. Although there are other socioeconomic factors that would discourage industries from locating at the mine site, the inaccessibility along precludes any further consideration of typical industrial land uses.

Residential development is strongly influenced by proximity of places of employment, commercial centers, and recreational facilities. One of the main sources of employment for this part of the county is the mining and forestry industries which are compatible with the remoteness. The nearest growth area for industrial, commercial, and services employment, however, is Clearfield, located 20 miles to the north. Other towns which offer some employment opportunities are Curwensville (14 miles), Houtzdale (10 miles), and Philipsburg (20 miles). The town of Glen Hope is only 3.5 miles away but does not have a good potential for employment. Most services and retail goods would also have to be obtained at one of the previously mentioned towns. Another factor influencing residential development is the availability of public utilities. There are no public water or sewer systems near the mine, however, telephone and electric services are readily available. The lack of water and sewer service would discourage high density residential development but would have no impact or rural homes built on large acreages. In fact, the remoteness of the site may add an aesthetic quality to the location that some people desire.

Another factor that influences residential development and recreational development, such as campgrounds and vacation homes, is the nearness to parks, bodies of water, and gamelands. The two major parks in the area with large bodies of water for fishing and boating are Curwensville State Park, approximately 19 miles to the north, and Prince Galitzin State Park, approximately 14 miles to the south. The nearest state gamelands are approximately 10 miles away from the mine.

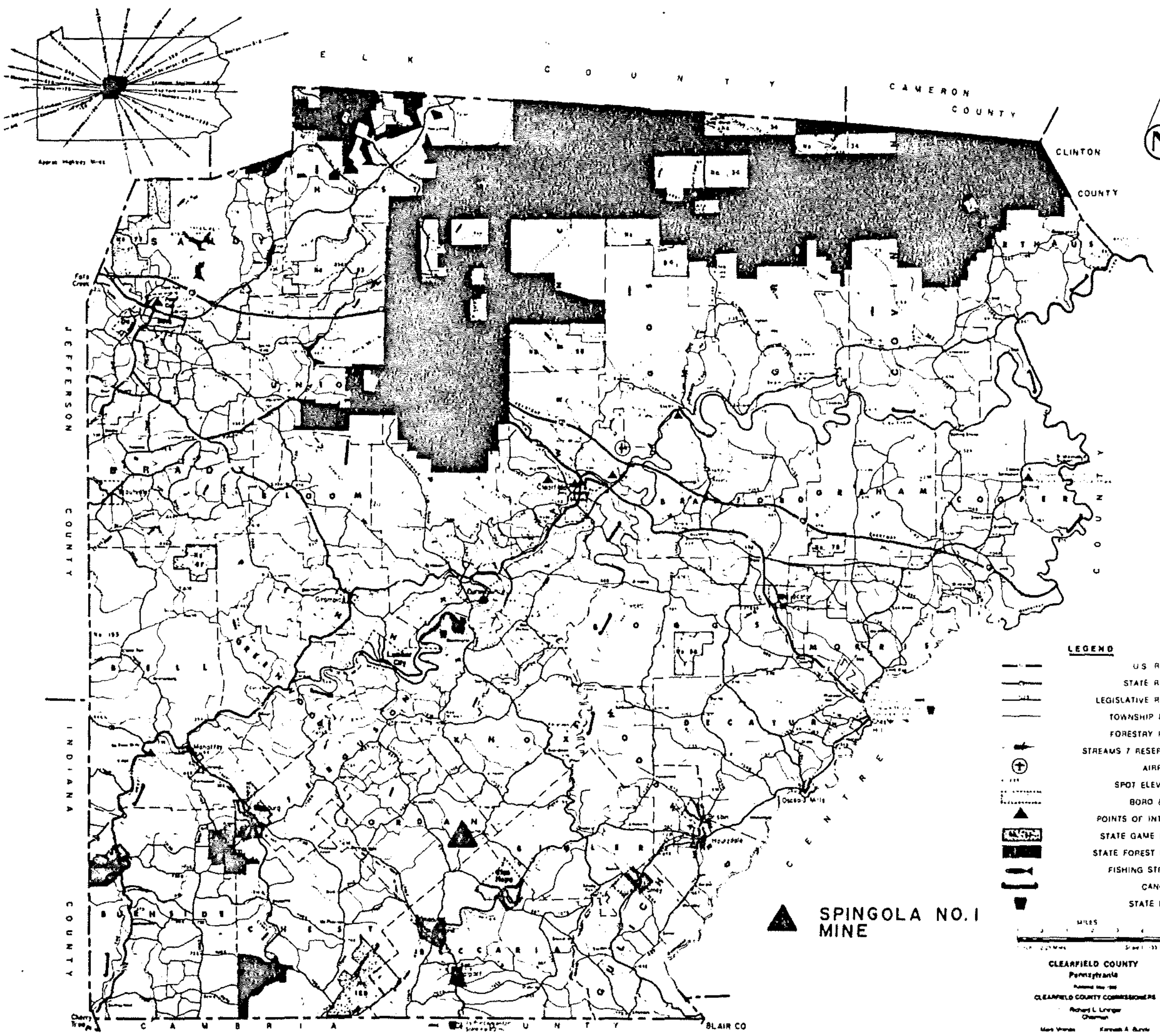


Figure 5.12 Relationship to Population Centers and Transportation Network.

5.3.9 Land Use

Approximately one half of the Spingola No. 1 site has been disturbed by previous surface mining operations. The mine drainage permit application states that the present use of the undisturbed area is forest land and wildlife habitat and that the disturbed areas have been reclaimed to grasses and natural vegetation.

The premining land uses and land covers, shown in Figure 5.13, have been interpreted from a 1977 aerial photograph. This photograph was taken around the time that the present mining operation commenced. The aerial photograph makes it possible to distinguish three basic land covers or uses. These are forest land, open field, and active or unreclaimed surface mines. At the time the photograph was taken, there were approximately 75 acres of unreclaimed land at the site.

From information concerning historic land use at the Spingola Mine, though limited, it can safely be assumed that the entire site was forested in the past. The relatively few acres of open fields that are not associated with previous mining operations can, most likely, be attributed to some timbering or possible agricultural use in the past. The permit application states that prior to mining there had been no land use changes for at least five years.

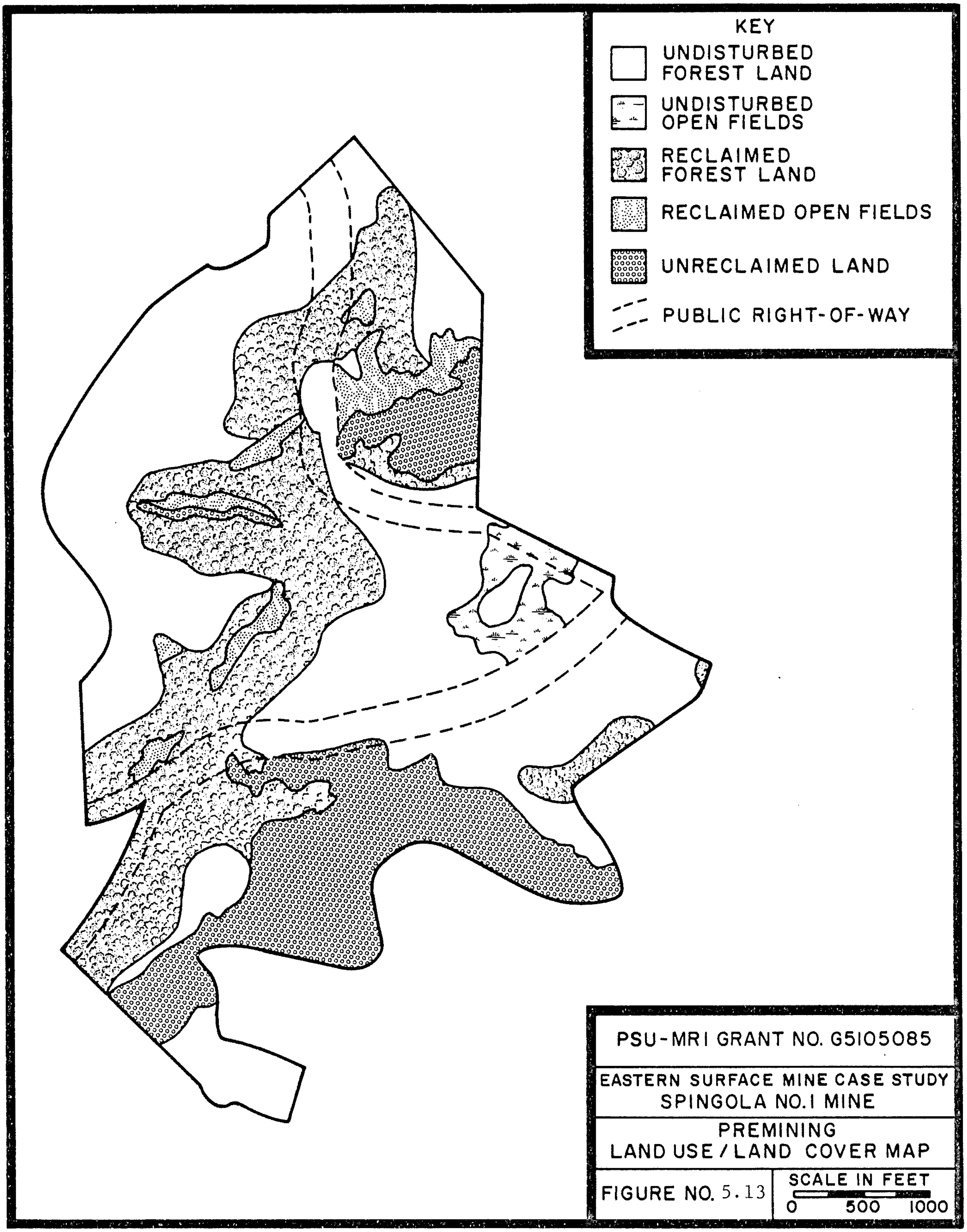
Surrounding land uses are basically identical to those found on the site with the exception of a small residential community located immediately to the east of the permit area. Figure 5.14 indicates that the major portion of the mine is bounded by forest land, active or inactive surface mines, and a few open fields.

The small village of McCartney that borders the permit area covers approximately 55 acres. In this 55-acre area, 46 homes or other buildings are shown on the 1971 U.S.G.S. topographic map. The presence of this community presents no obstacles to alternate postmining land uses. It may, in fact, provide justification for uses that would not otherwise be considered if there were no people living nearby.

5.3.10 Demographic Characteristics

A comparison between the 1980 population and housing unit counts for each municipality and the 1970 figures gives a good indication of growth trends within the county. These statistics are listed in Table 5.9. In this table, a specific study area around the mine has been defined for comparison to the trend within the entire county. The study area includes Jordan Township, all of the five adjoining townships, and all of the boroughs within the six-township area. This area covers 179 square miles and constitutes 15.6% of the total county area.

The data show that in the ten-year period from 1970 to 1980, the total county population increased from 74,619 to 83,578 or 12.0%. This increase is significant since population estimates made in 1969 predicted a net decline in population for the entire county (Byers, personal communication). Housing units also increased by 25.3% for the



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SPINGOLA NO.1 MINE

PREMINING
LAND USE / LAND COVER MAP

FIGURE NO. 5.13

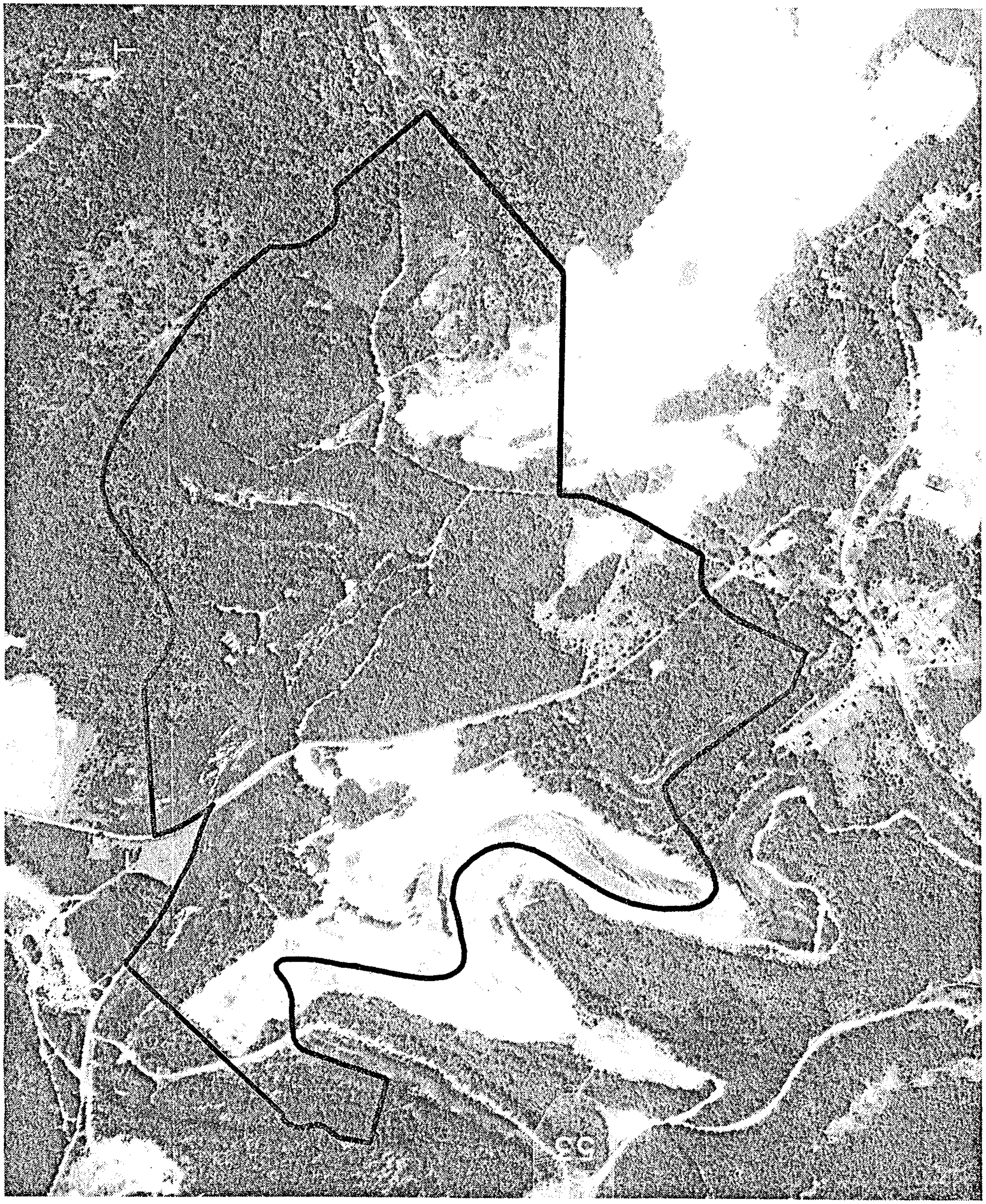


Figure 5.14 Aerial Photograph of Mine Site.

Table 5.9

Population and Housing Unit Counts
for Case Study Area

	Population			Housing Units		
	1980	1970	% Change	1980	1970	% Change
Clearfield County	83,578	74,619	12.0	33,209	26,496	25.3
Townships						
Jordan	580	509	13.9	225	188	19.7
Knox	784	601	30.4	310	219	41.6
Bigler	1,604	1,474	8.8	665	568	17.1
Beccaria	2,102	1,877	12.0	832	677	22.9
Chest	611	469	30.3	239	152	57.2
Ferguson	411	356	15.4	162	120	35.0
Boroughs						
Glen Hope	206	163	26.4	64	53	20.8
Irvona	644	714	-9.8	232	252	-7.9
Lumber City	117	57	105.3	41	20	105.0
Newburg	132	151	-12.6	54	52	3.8
Coalport	739	796	-7.2	308	279	10.4
Westover	517	501	3.2	196	164	19.5
Study Area	8,447	7,668	10.2	3,328	2,744	21.3

same period. The modest growth in population can possibly be attributed to two factors. The first one is an increase in industrial and commercial employment spurred by the presence of I-80 in the county. Secondly, the surface mining industry has grown rapidly in the last ten years, recovering from a sharp decline experienced in the early 1960s.

Looking at the defined study area in particular, one can see a similar modest increase in both population and housing units. During the 1970-1980 decade, population increased 10.2% and housing units increased 21.3%, only slightly less than the country-wide figures. These increases may be related to the mining industry, as stated earlier, or they may be indicative of a general trend in the U.S. toward rural living.

Unfortunately, sufficient data on population characteristics such as age distribution, educational attainment, and family incomes are not available to allow extrapolation of current trends into the future. If the current trends were to continue, the population of Jordan Township would increase by 81 persons over the next ten years and there would be a demand for 45 new housing units.

5.3.11 Cultural, Historical, and Archeological Characteristics

The first white settlers in Clearfield county arrived in 1783. Prior to that time the area had been inhabited by North American Indians. Following the Revolutionary War most of the land that now makes up Clearfield County was divided into large tracts and given to soldiers of the Pennsylvania Line for their participation in the War (Clearfield County Planning Commission, 1975).

No archeological survey has been conducted for the mine site and such a survey is beyond the scope of the present case study. A review of the planning commission information gives no indication of any significant historical, cultural, or archeological resources in the immediate area of the mine.

5.4 Define Local Goals and Objectives

A rather extensive listing of goals and objectives for Clearfield County was presented in Section 4.2 (Clearfield County Planning Commission, 1975). Some of the specific objectives and their impact on the case study site are discussed in the following paragraphs.

One of the objectives is to "allocate land in the County in accordance with the physical capabilities of the land and the locational need for various uses." To accomplish this the county planning commission is presently seeking the adoption of a subdivision ordinance by the local municipalities. If such an ordinance is adopted, tighter controls may be imposed on potential residential development at the site. Another manner in which the county hopes to achieve this objective is through designating areas for public use, open space, or tourist-oriented development. This would seem to indicate that outdoor recreational uses of the land such as hiking, picnicing, hunting, and camping are compatible with the county's objectives.

The objective of the county with respect to residential development is to "serve the housing needs of the County population by providing a wide selectivity in choices of residences." This involves development of a variety of neighborhoods providing a variety of economic, social, and aesthetic characteristics. Creation of residential areas that are exclusively reserved for single, double, and multi-family use have been proposed. A new residential community meeting these standards could be considered for the case study site.

One of the other county objectives that would discourage a major residential development for the reclaimed mine site is the desire of the county planners to "channel growth into areas around sub-county population centers, as opposed to further scatteration about the County." This approach will result in growth around existing suburban areas in order to make best use of public utilities and community facilities. Applying this principle to the site in question does not necessarily eliminate the possibility of any residential use. However, it does hinder its use for high intensity development requiring expansion or creation of new public facilities.

A final pertinent objective states that "because of location and physical characteristics, certain land should be preserved as conservation areas for future development of water resources and related open space activities." Although the site in question may not be ideal for water resource development, its physical characteristics may be best suited for open space activities such as wildlife management and may achieve the county objective in this manner.

5.5 Select Evaluation Methodologies

The potential for economic benefits due to alternate post-mining land uses in the Spingola No. 1 site does not warrant a detailed benefit-cost analysis. The preliminary studies and data collection phase has indicated that there is very little demand in the area for industrial, commercial, or high density residential uses. For example, the housing unit statistics predicted a need for 45 new homes in Jordan Township over the next ten years, if the current growth rate is maintained. If all 45 homes were built on the Spingola Mine property, a very unlikely occurrence, each house could be situated on nearly ten acres of land. Such reasoning would lead one to conclude that various combinations of low intensity land uses such as rural residential, wildlife management, agriculture, or outdoor recreation will be the most feasible. Since all of these uses will result in the reclaimed land being returned to approximate original contour, there will not be a great deal of difference in reclamation costs between the alternatives.

Traditional economic analyses are not practical for evaluating the benefits of many land uses, particularly, low intensity uses like wildlife management where it is nearly impossible to quantify the benefits and determine who is the beneficiary. For this reason, the economic analysis of the various postmining land use alternatives was limited to discussions with local planners and realtors to assess the economic feasibility of the various proposals and to estimate the value of the land for each.

The environmental impacts of the viable alternate postmining land use plans will be evaluated using the environmental matrix method. Since the area in question is sparsely populated and the viable alternatives are basically low intensity uses, the social impacts will be addressed only in a qualitative manner.

5.6 Select and Weight Evaluation Criteria

Instead of a detailed benefit-cost analysis, the criterion that is used to evaluate the economic aspects of the alternate postmining land uses is simply land values expressed in dollars per acre. It must be understood that there is no inherent correlation between land use and land value. The market determines this relationship. For example, one can say that commercial land is more valuable than residential land but this is only true in an area where there is real competition between land uses. For all practical purposes, the value of the case study site as commercial land is negligible since there is essentially no need for commercial use in the immediate area. From interviewing people who are familiar with land value in this area, a reasonable figure was assigned to each of the potential uses and a composite value for the entire site is calculated.

The environmental evaluation considers four basic factors found in Leopold's list of environmental characteristics and conditions. The relationship of the proposed land use to soil characteristics is considered. Of particular importance are the engineering characteristics such as compaction, settling, and stability. The land use plans are evaluated with respect to groundwater recharge and erosion control. In addition, the extent of wildlife corridors are used in the environmental evaluation process.

The qualitative social impact evaluation of the postmining land use alternatives includes aesthetic values, impact on adjacent landowners, the village of McCartney, and the county in general. The evaluation also considers public utilities or services and the stated county objectives.

It has been assumed that there will not be a great difference in mining or reclamation costs between the alternatives. Therefore, the deciding factors in selecting a postmining land use plan is land value and satisfactory handling of the environmental characteristics that have already been mentioned. Specifically, the following order of importance is assigned to the environmental factors:

(1) groundwater infiltration and recharge;
(2) erosion control;

(3) wildlife corridors;
(4) engineering soil properties.

The alternate postmining land use plans are ranked according to both land value and environmental impact. Social impact is used to resolve any discrepancies between the two rankings.

5.7 Development of Alternative Scenarios

Four alternate postmining land use scenarios have been developed. In the first three cases, the present ownership pattern of the land was disregarded in accordance with the scope that was defined in Section 5.1. In the final land use alternative, present ownership was used as a controlling factor.

Earlier phases of the land use planning process have indicated that economically feasible postmining land use alternatives are basically limited to low intensity uses. Many times land use plans evolve through common sense and reason during the data collection and preliminary studies. In this case, it is obvious that a large portion of the 430-acre site will be preserved as open space. The open space could be designed with limitless combinations of revegetated fields and forests. The purpose of this case study is not to generate a large number of plans for seeding and planting. Rather, this investigation is intended to draw attention to a process that will consider all of the major site characteristics and result in a final land use plan that integrates a number of potential uses into one acceptable preliminary site design. Therefore, the following plans are presented for the purpose of comparison and are not intended as alternatives to the work that has already been done by the mining company and its consultant.

5.7.1 Alternative A - Recreational Development

Alternative A, illustrated in Figure 5.15, features a 56-acre campground along with 253 acres of forest land and 121 acres of open fields designed to provide a desirable habitat for wildlife. The forested areas are connected by nearly 11,000 linear feet of hedges and tree rows to provide corridors for wildlife movement. The area selected for the campground site has slopes that vary from 3.0% to 15.0% and was designated on the recreational development limitations map as having only slight or moderate limitations.

A conceptual design of the campground itself is also shown in Figure 5.15. The plan shows a one-way circulation pattern with 100 angled campsites to accommodate recreational vehicles. The office and support buildings, such as a store, bathhouse, recreation building, and other facilities are located near the entrance which is accessible from L.R. 17024. Other outdoor facilities like tennis courts, hiking trails, horseback riding trails, and a pool could be considered as part of the overall recreational facility. It would be anticipatesd that such a campground would serve not only summer vacationers, but also hunters throughout the fall hunting season.


KEY
CAMPGROUND
FOREST
PERMANENT GRASSES AND LEGUMES
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
ALTERNATIVE A
RECREATIONAL DEVELOPMENT
FIGURE NO. 5.15
SCALE IN FEET
0 500 1000

5.7.2 Alternative B - Large Acreage Residential Development

This plan, shown in Figure 5.16, also combines forest land and open fields in such a manner as to encourage wildlife habitation. The unique aspect of this proposal is that it provides for nine large building lots (at least 10.0 acres) that are accessible from existing roads. A minimum of 10.0 acres was chosen because lots larger than 10.0 acres are exempted from certain on-lot septic system requirements.

The major criteria used to select the building locations were minimum slopes (mostly 3.0% to 8.0% with a maximum of 15.0%) and southward sloping orientations to encourage maximum use of solar radiation. The areas selected have only moderate building site limitations, as indicated on the soil interpretation map (Figure 5.9).

It is assumed that this plan would help satisfy a demand in the area for rural housing that provides a considerable amount of privacy and open space. In addition, the plan would be relatively easy to construct. Beyond revegetation, only wells and septic tanks would be required before the plan could be developed.

5.7.3 Alternative C - New Community Residential Development

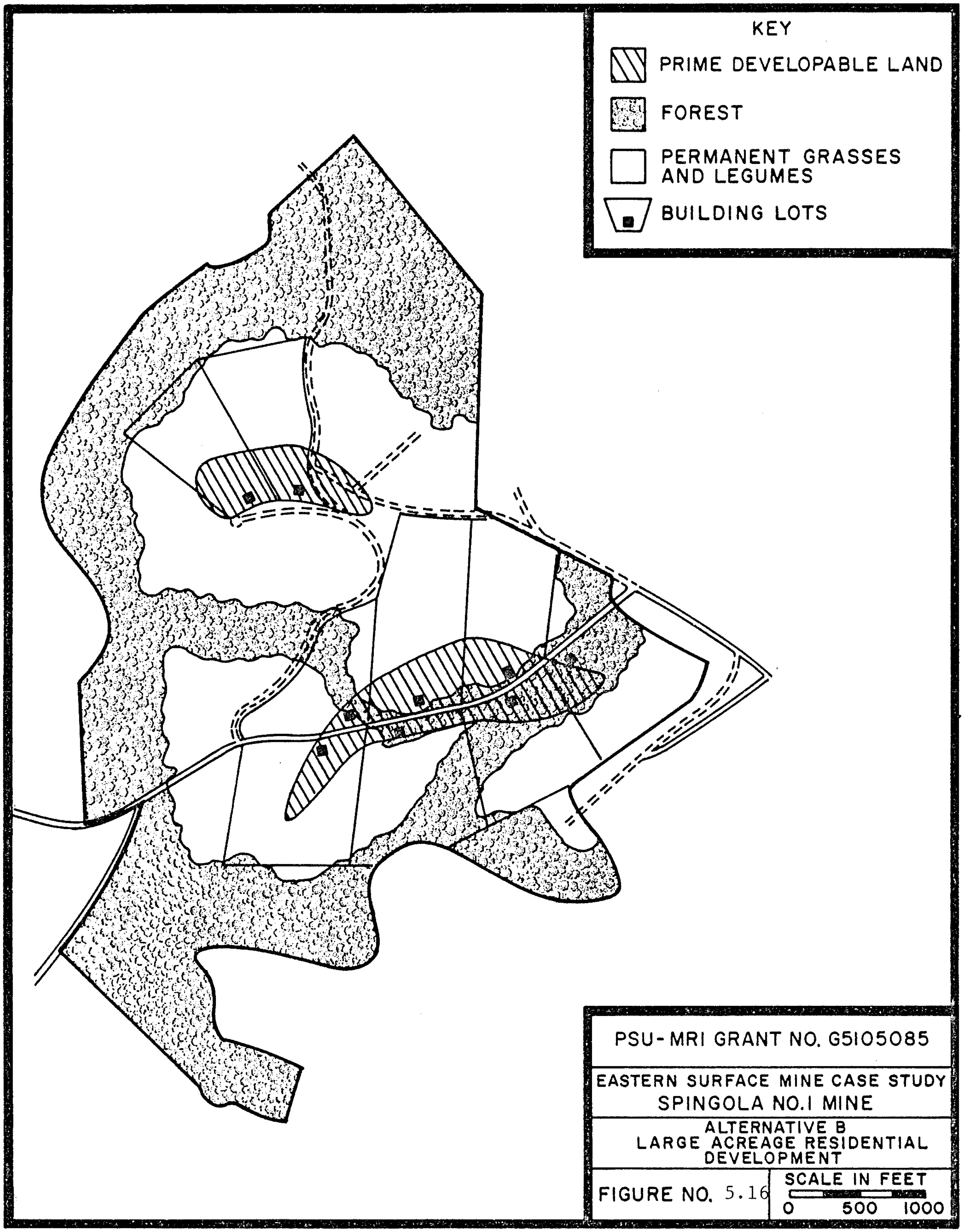
Although the socioeconomic conditions do not warrant such a development, this alternative is offered as an example of the site potential if a different set of conditions existed. Figure 5.17 illustrates a conceptual design for a residential community based upon the assumption that there is a demand for 100 new homes in the area.

The 90-acre development is intended to fit well into the rural surroundings by having the homes built off the main access road and providing for extensive open space on at least one side of the property. The development would also be given a rural community atmosphere by limiting the number of entrances from L.R. 17024 to two locations.

Basically, the same criteria were used for locating the new community residential development as were used for siting the large acreage building lots. The areas selected represent the most favorable slopes and only moderate soil limitations. The septic suitability soil limitation need not be considered since a development of this density would most likely require a central sewage treatment package plant. In addition, a water system consisting minimally of a few wells and a distribution system would be required.

5.7.4 Alternative D - Existing Ownership Land Use Plan

This plan basically incorporates the elements proposed by the environmental consultant in the mine drainage permit application. The alternative is illustrated in Figure 5.18 and consists mainly of revegetating the land to a combiantion of open fields (permanent grasses and legumes) and forest land. Proper design of this plan still presents a


KEY
PRIME DEVELOPABLE LAND
FOREST
PERMANENT GRASSES AND LEGUMES
BUILDING LOTS
PSU-MRI GRANT NO. G5105085
EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO.1 MINE
ALTERNATIVE B
LARGE ACREAGE RESIDENTIAL DEVELOPMENT
FIGURE NO. 5.16
SCALE IN FEET
0 500 1000

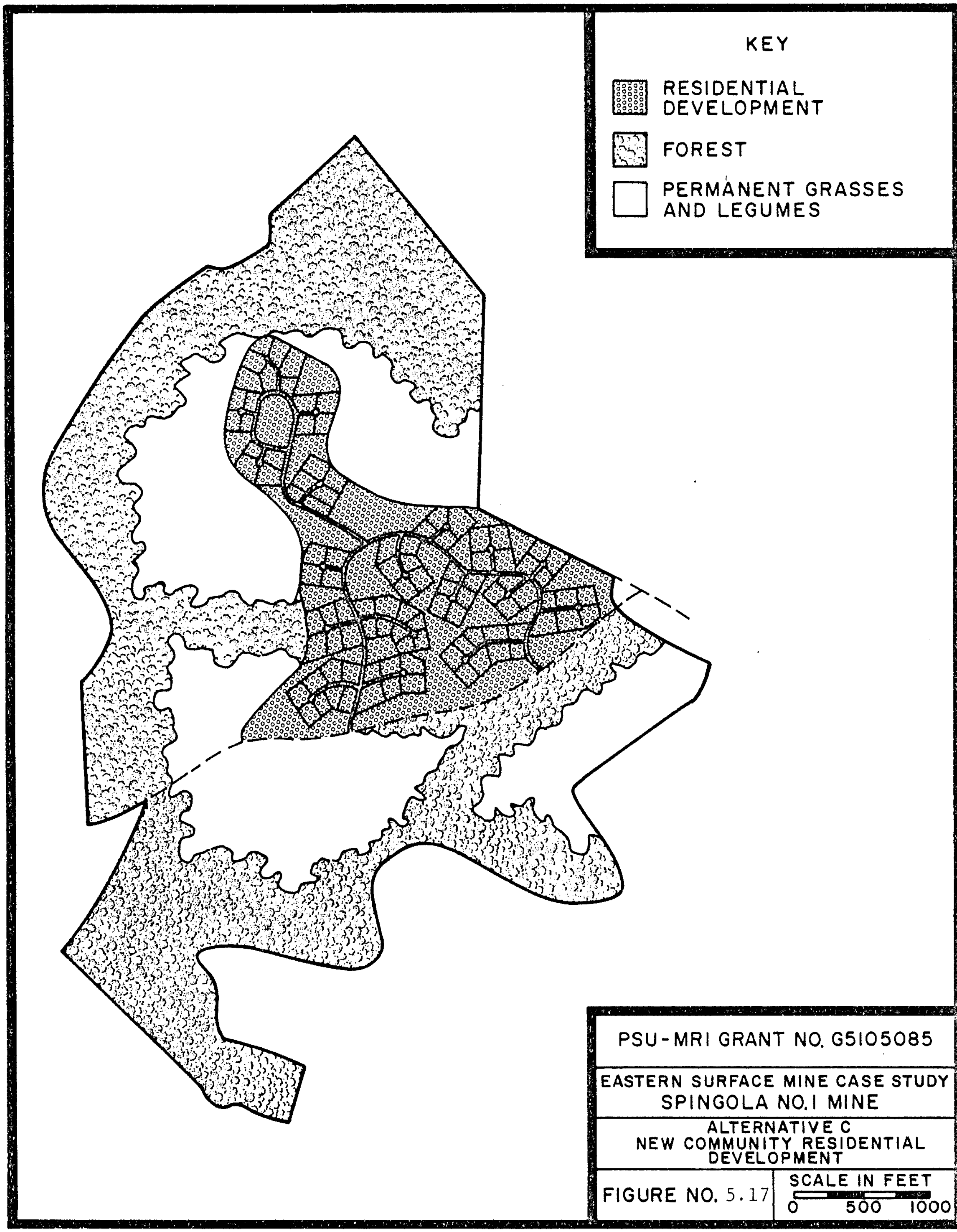
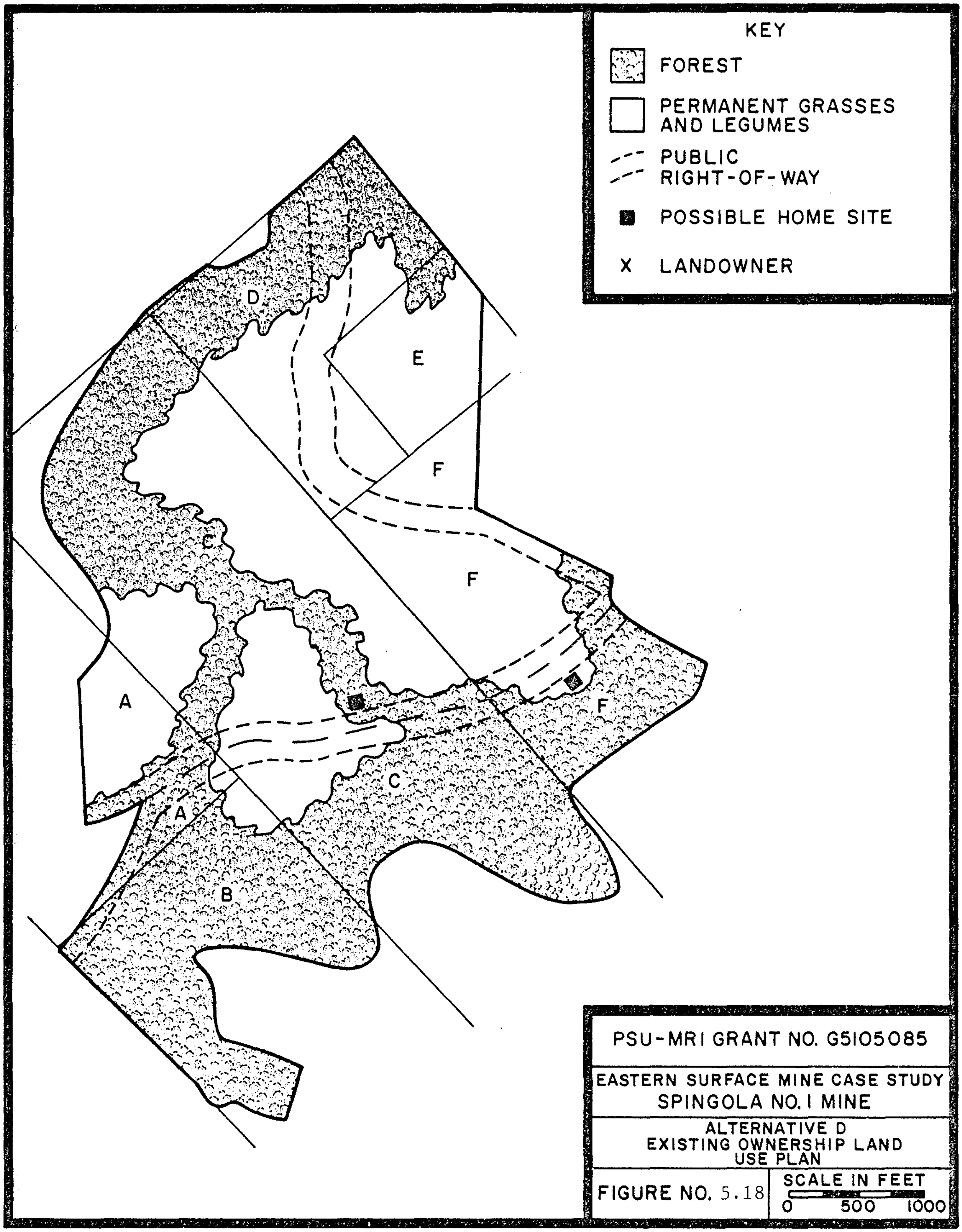


FIGURE NO. 5.17



PSU-MRI GRANT NO. G5105085

EASTERN SURFACE MINE CASE STUDY
SPINGOLA NO. I MINE

ALTERNATIVE D
EXISTING OWNERSHIP LAND USE PLAN

FIGURE NO. 5.18

SCALE IN FEET
0 500 1000

significant opportunity to increase plant diversification and improve the wildlife habitat. The open fields, which are restricted to less steep slopes, have the potential to be cultivated or used for grazing at the owners' discretion. Wildlife habitation would be encouraged through the provision of wooded corridors and increasing the amount of forest edge.

In addition to the vegetation and wildlife benefits, at least two building sites could be developed on prime developable land (moderate slopes and south-facing orientation) with access to L.R. 17024. These sites would be located on adjacent properties and would require no subdivision of the existing tracts.

5.8 Evaluation of the Alternatives

In this section, each of the postmining land use plan alternatives are evaluated from an economic, environmental, and social point of view. Quantitative analyses are performed for the economic and environmental considerations, and the social implications of each plan are discussed.

5.8.1 Economic Evaluation

Estimates of the total reclaimed land values based on the various land use plans are calculated in Table 5.10. The unit prices for each land use were determined with the aid of experienced realtors operating in Clearfield County.

In Table 5.10, the values enclosed in parentheses indicate that, in the authors' opinion, sufficient demand does not exist to justify that type of land use. This assumption is based on the discussion earlier that if there is no demand for a particular use, the actual value of the land for that use is negligible. The values in parentheses are inlcuded for comparison although it is extremely unlikely that the alternatives employing those uses could ever be realized.

The unit value of land for a commercial campground is estimated at $2000 per acre. It is difficult to assess the actual value of this land use since no similar campgrounds have been sold recently in the area. In fact, realtors have been unable to sell a commercial campground that had a much more desirable location (closer to I-80 and several state parks) than the case study site. The estimated value is based upon a reduction of the asking price for the existing commercial campground.

The other value given in parentheses is the estimate for new community residential land. Again, in the authors' opinion, the demand does not exist to justify this level of development, however, the estimate of $1000 per acre is indicative of building lost prices (no sewer or public water) in the more developed areas surrounding Clearfield.

The values for large acreage building lots, forest land, and open fields are based upon sales in the immediate vicinity of the mine. In

Table 5.10

Land Value Estimation
For Land Use Alternatives

	Number of Acres	Unit Price of Land ($/Ac.)	Land Value ($)
Alternative A			
Campground	56	(2000)	(112,000)
Forest	253	270	68,310
Open Fields	121	200	24,200
Total			(204,510)
Alternative B			
Building Lots	153	500	76,500
Forest	193	270	52,110
Open Fields	84	200	16,800
Total			145,410
Alternative C			
Residential Develop.	90	(1000)	(90,000)
Forest	220	270	59,400
Open Fields	120	200	24,000
Total			(173,400)
Alternative D			
Forest	232	270	62,640
Open Fields	198	200	39,600
Total			102,240

the past few years, ten to twelve large lots (larger than 10 acres) have been sold near the study site for building lots at approximately $500 per acre. Also, a 100 plus-acre parcel of combined forest land and open fields was sold in 1977 for approximately $200 per acre. Nearly one half of the parcel had been strip mined and reclaimed to a combination of permanent grasses and trees. Allowing for modest appreciation, it can be assumed that the present value of similar land is approximately $235 per acre. Also, the assumption has been made that forested or reforested land is slightly higher in value than open fields due to the potential for timbering. Therefore, the values of open fields and forest land were estimated at $200 per acre and $270 per acre, respectively.

Based upon the economic values shown in Table 5.10, the alternatives are ranked as follows:

(1) Alternative A .... ($204,510)
(2) Alternative C .... ($173,400)
(3) Alternative B $145,410
(4) Alternative D $102,240

Since Alternatives A and C are presumed to be infeasible due to the market conditions, Alternative B would be selected based upon the economic analysis and the assumption that present ownership presents no barrier to such development. Alternative D, based upon the existing ownership pattern, demonstrates that initial ownership can act to constrain higher land use realization.

5.8.2 Environmental Evaluation

The results of the environmental evaluation are summarized in the environmental impact assessment matrix given in Table 5.11. This technique follows the format of the Leopold Matrix where a slash is entered in each cell if an impact is anticipated. The number above the slash is an estimate of the magnitude of the impact and the other number is an estimate of its importance. All values range between 1.0 and 10.0 and unsigned values are taken to mean negative impacts.

The first environmental consideration is groundwater infiltration and recharge. The major negative impact would result from creating impervious cover by the paving of streets. A higher percentage of forest land is desirable since open fields tend to accelerate runoff. Alternative C would have the greatest negative impact due to the paving that would be required for community development. Also, runoff from yards and housetops would be much higher than undeveloped land. Alternative A would have a slight negative impact since a paved road and possibly paved campsites would be created. Alternatives B and D would have virtually no impact on infiltration and recharge since no new roads would be constructed and the area covered by buildings would be insignificant.

The next environmental concern is that of erosion control. The impacts of each alternative would be proportional to the impacts upon

Table 5.11

Matrix of
Environmental Impacts for
Land Use Alternatives

	Groundwater Infiltration and Recharge	Erosion Control	Wildlife Corridors	Engineering Soil Characteristics
Alternative A	2* / 9	2 / 7	+6 / +5	3 / 1
Alternative B			+3 / +5	3 / 1
Alternative C	5 / 9	5 / 7	2 / 5	7 / 1
Alternative D			+3 / +5	

*Unsigned values are assumed to be negative.

infiltration since it follows that if water does not infiltrate the ground, it must run off, thereby increasing the erosion potential. Erosion creates a problem not only at its source, but also in the streams where sediment degrades the water quality and contributes to the flood potential as well.

The third major environmental consideration is the impact of the alternatives on wildlife corridors. One of the specific objectives of Alternative A is to improve the wildlife habitat, thereby improving the quality of the land for hunting. It is assumed that this alternative would have a significant positive impact on wildlife corridors. Alternative B and D, although no designed specifically for wildlife management, do provide some forested corridors and endeavors to increase the amount of forest edge by an irregular tree planting pattern. These alternatives would have a slight positive impact as indicated in Table 5.11. Alternative C, due to the presence of a rather large developed area in the middle of the site, would have a slight negative impact on wildlife corridors. Irregular planting of trees, to increase the amount of forest edge, could somewhat mitigate this impact.

The final issue of environmental concern is that of engineering soil characteristics. It is difficult to assess the importance of this issue because data on the compaction and stability of reclaimed spoils are not conclusive. This issue is not assigned a high importance since it is assumed that proper engineering design can overcome most soil problems. Alternative C would have the most serious impact on soil characteristics due to the large number of homes, streets, and utility lines that would be constructed. Alternatives A and B would have a lesser impact because the number of buildings and roads to be constructed as part of these alternatives is considerably less. The impact of Alternative D would be negligible.

Reviewing the matrix of environmental impacts, the proposed alternatives would be ranked in the following order, based upon their environmental acceptability:

(1) Alternative D
(2) Alternative B
(3) Alternative A
(4) Alternative C

It can be concluded that Alternative D is the most acceptable plan environmentally since it involves the least amount of change from the premining condition. In fact, there would be a slight improvement in that some previously unreclaimed land would be reclaimed as part of the plan. This statement could be made for each of the alternatives, however. Alternative B also represents a very small change from premining conditions and the only foreseen difficulty could be some stability problem with building foundations. The negative impacts of Alternative A are estimated to be slight but there would be some decrease in infiltration and a slight increase in erosion. Alternative C would have the greatest negative impact due to the high level of development. Many of the negative impacts could be mitigated through construction measures engineered to enhance recharge or improve the soil properties. However, these measures would require additional expenditures on the part of the developer or landowners.

5.8.3 Social Impact Evaluation

Alternative A represents significant improvement to the county, as a whole, and is in line with the county objective of providing outdoor recreational facilities. Possible negative social impacts could be experienced by adjacent landowners and the residents of McCartney in the form of traffic and transients that may be considered undesirable by the local residents. These inconveniences may be offset by the local economic benefits. Aesthetically, a campground could be designed in such a way so as not to detract from the rural atmosphere.

Alternative B is consistent with the local desire for rural living. This plan could be aesthetically pleasing if the homes are properly designed and oriented on the lots. There should be no negative social impact on the adjacent landowners or the village of McCartney since a maximum of nine homes is being considered.

Alternative C would result in the greatest social impact due to the addition of 250 to 300 new residents. This increase would cause a strain on community facilities such as schools, medical centers, police, and fire protection. This plan would also likely result in conflict with the existing local residents. However, the negative aesthetic impacts of such a community could be significantly mitigated through additional and proper planning.

Alternative D is viewed as having no social impact in that it essentially calls for no changes in the existing social conditions.

5.9 Selected Alternative

Based upon the economic analysis, Alternative B is considered to be the most feasible of the three alternatives that are not influenced by the existing ownership pattern. Although the calculated land value is not as high as those estimated for Alternative A and Alternative C, it is believed that these values are unattainable in light of the local real estate market. If Alternative D is disregarded, as stated at the outset, the environmental analysis also indicates that Alternative B is the most desirable. Finally, the social impact analysis does not indicate that Alternative B poses any threat to the social conditions. Therefore, it is determined that Alternative B is the selected postmining land use alternative.

5.10 Review

Reviewing the local objectives stated in Section 5.4 it can be seen that Alternative B is consistent with these objectives for several reasons. With regard to the desire to allocate land in accordance with the physical capabilities and the locational need for various uses, this plan is formulated on sound principles of environmental site design while satisfying a demonstrated demand for rural living. Also, in accordance with physical capabilities and the desire to preserve open space, this alternative designates 277 acres as undeveloped forest land and open fields for the purpose of improving the wildlife habitat.

As completion of the mining operation would approach, a final review of the evaluation process should be conducted to ensure that the proposed land use plan is still workable and consistent with local objectives.

Chapter 6

CONCLUSIONS

Based upon established land use planning principles, serveral postmining land use plans were developed that are suited to the site characteristics and are consistent with local objectives. The selected plan is responsive to the observed demand for rural private dwellings and the desire of local residents to preserve a wilderness atmosphere through partial reforestation and wildlife management techniques. The evaluation process that was followed to analyze the various alternatives attempted to systematically balance the economic, environmental, and social aspects of each plan.

Environmental characteristics, such as poor soil conditions, have influenced the postmining land use practices at this mine and in the surrounding region. It is, however, socioeconomic conditions and geographic characteristics, such as the inaccessibility of the site, that have most severely limited any alternative postmining land uses.

This case study also indicates that land ownership patterns and regulatory controls have a major impact on site realization. The example postmining land use plan that was developed was based upon the assumption that ownership was not a factor in the decision-making process. The resulting plan was different from that obtained with due consideration given to current ownership. Regulations tend to constrain site realization because of the justifications and commitments required for approval of an alternate postmining land use plan.

Because of the limitations already mentioned, postmining land use planning has assumed a rather insignificant role in this region. This fact is evidenced by the brief handling it received in the permit application. Land use planning for the study region by the public sector is also in a very formative stage. County and regional planners have had essentially no impact on the current land uses or on the proposed postmining land uses. In general, site planning for surface-mined land and comprehensive land use planning are conducted completely independently of each other.

Although public planning agencies in rural areas are generally understaffed, if existent, the mine planner may benefit from interaction with the local planners. Particularly, interaction can aid in determining the demand for various types of land use. In addition, the public planners benefit from such a relationship because they develop a better appreciation for the mining industry, its problems, and its value to local economic development. Finally, public planners can also learn of methods in which they can assist the mining industry, particularly, as a source of information for the mine planners.

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