PART VI

ANALYSIS OF PROPOSED ACTION

WYODAK RESOURCES DEVELOPMENT CORP.

CHAPTER I

DESCRIPTION OF THE PROPOSED ACTION

Background and History

The Wyodak mine is located 5 miles east of Gillette, Wyoming on U.S. Highway 14-16 (Figure 1). The highway and the main line of the Burlington Northern Railroad divide the mine into a North Pit and a South Pit. It is operated by the Wyodak Resources Development Corp., a subsidiary of the Black Hills Power and Light Company.

The Wyodak Coal and Manufacturing Company opened a mine in 1925 on privately owned coal in what is presently called the North Pit at the Wyodak mine. By 1927 it was producing 300 tons daily. In 1959, the company leased 240 acres of federal coal land south of the highway (W-073289) (Figure 2) and moved the mining operation to this South Pit in the same year. The company was awarded an 80-acre federal lease north of the highway in 1961 (W-0111833). The North Pit was placed on a standby basis in case the South Pit should ever be flooded by Donkey Creek. In 1965 the company was awarded a federal lease of 2,200 acres (W-0313666) adjacent to the North Pit as a reserve for their mining operation. The acreage was reduced in 1972 to 1,560 acres on this lease. The company paid only one dollar per acre bonus for the first and second lease but was required to bid $25.55 per acre for the third lease.

The lease (W-073289) is a continuing lease subject to reasonable readjustment of terms on a 20-year basis. The first 20-year period will end on May 1, 1979. The terms for the first 20 years provide for a royalty of 10 cents a ton for coal mined for the first 10 years of the lease and 12½ cents a ton

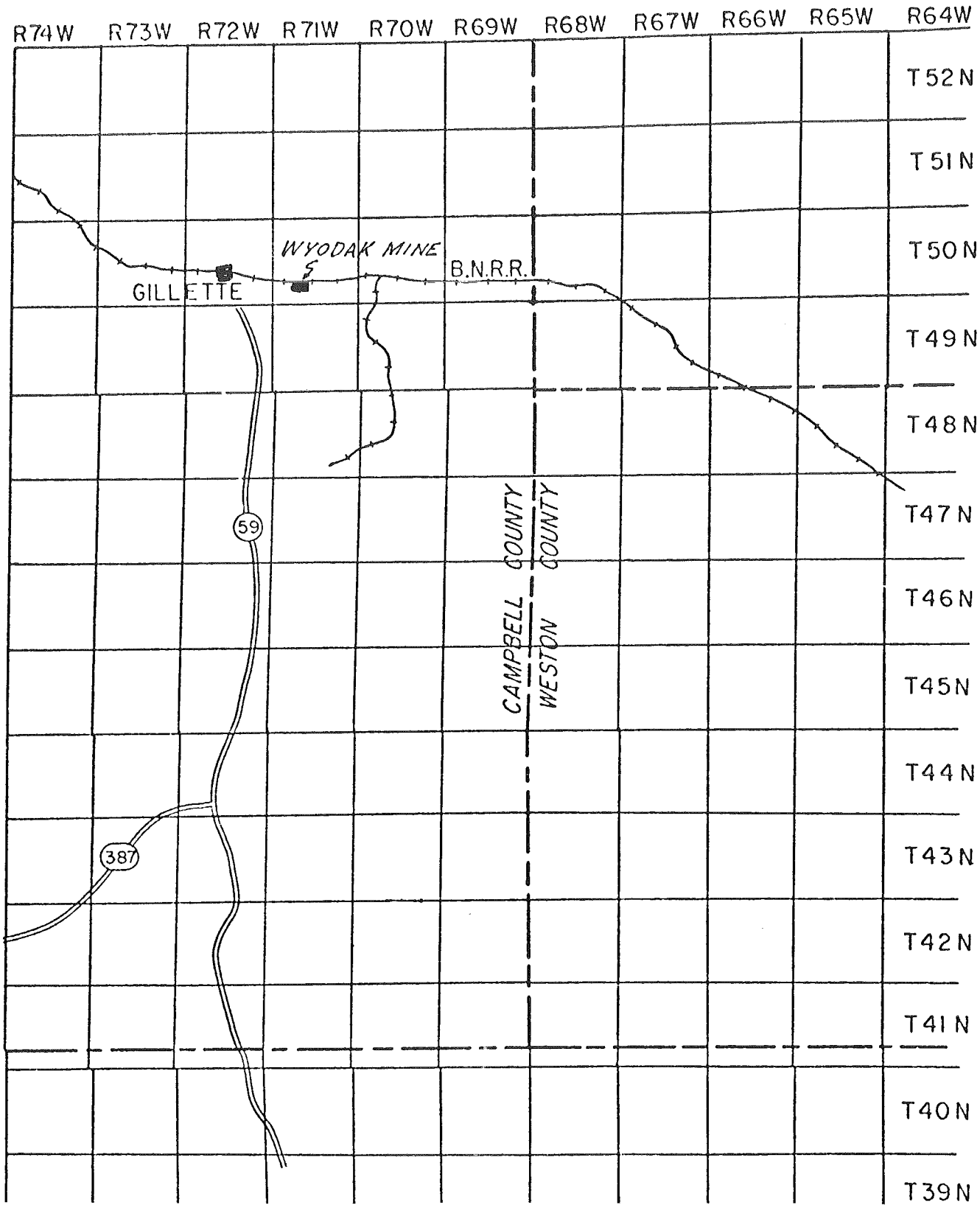

Figure 1

Location of the Wyodak Coal Property of the Wyodak Resource Development Corporation, Campbell County, Wyoming.

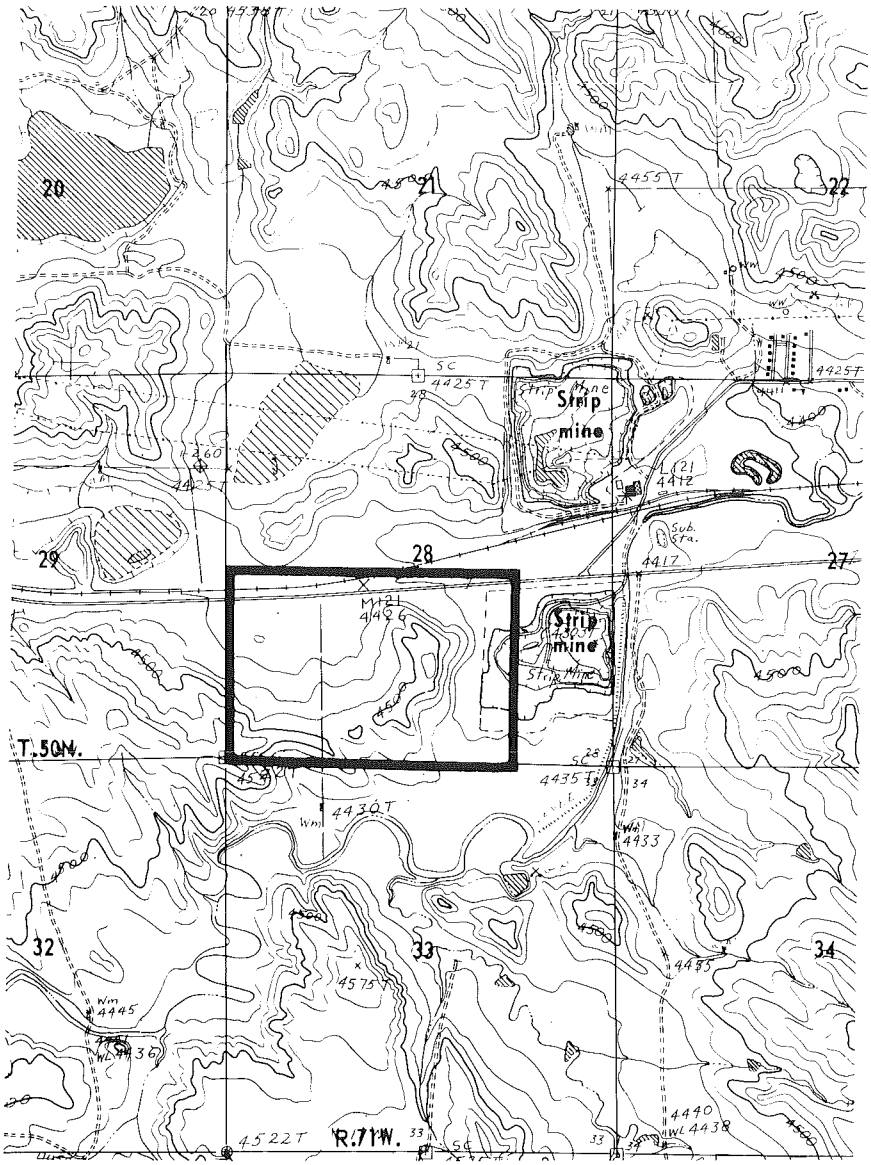

Figure 2
Wyodak Resources Development Corp. Federal Coal Lease W-073289
Showing Location of Existing Pits.

during the next five years and 15 cents a ton during the remainder of the first 20-year period of the lease. The annual rental per acre, or fraction thereof, is set at $0.25 per year for the first year; $0.50 for the second, third, fourth, and fifth years; and one dollar per acre for the sixth and each succeeding year during the continuance of the lease, such rental for any year to be credited against the first royalties as they accrue under the lease during the year for which the rental was paid. A minimum annual production requirement is based on an annual royalty value of one dollar per acre or fraction thereof starting the sixth year of the lease.

The company submitted a mining plan on November 16, 1973, for the South Pit of their Wyodak mine (Figure 3). It outlines their proposed activities through 1988 when mining will be completed in the South Pit and will move to the North Pit. The plan outlines details for mining 160 acres of coal land leased from Homestake Mining Company, 40 acres of coal land owned by Wyodak, and 240 acres of coal land under federal lease W-073289. The plan is available for public inspection in the office of the area mining supervisor (USGS), Billings, Montana, and is presently being reviewed for adequacy by the U.S. Geological Survey and the Bureau of Land Management.

Surface and coal ownership of the mining area in acres is given below:

	Surface	Coal
United States	0	240
Wyodak	280	40
Other Private	160	160
Total	440	440

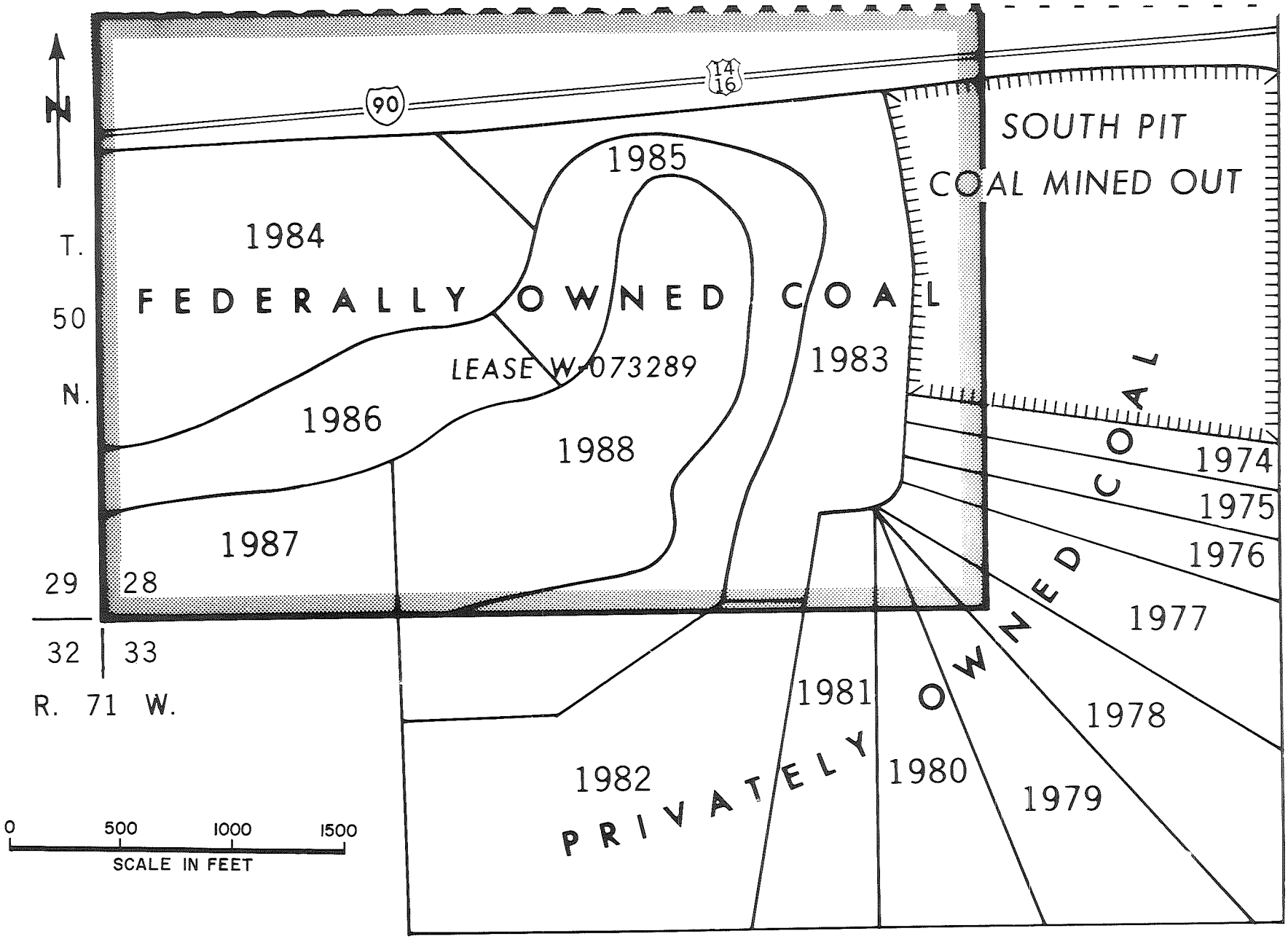

Figure 3

Wyodak Resources Development Corp. Areas to be Mined Per Year

The lease presently contains no special stipulations for reclamation but under section 5 of the lease, which covers protection of the surface, reclamation of the land is required. When the terms of the lease are readjusted in 1979, special stipulations covering detailed reclamation requirements will be included in the new terms. Under the present terms of the lease, no mining plan will be approved which does not provide for adequate reclamation. A copy of the lease is contained in Appendix D.

Mining is being done presently in the NE¼SE¼ of section 28 which is called the South Pit. The coal is being loaded from a strip about 1,700 feet wide. Approximately 1,300 feet of this strip is on coal land owned by Homestake and 400 feet is on land included in the federal lease.

The Wyodak mine is presently mining 700,000 tons of coal per year for power plants of the Black Hills Power and Light Company in Wyoming and South Dakota. About 400 tons of coal per day are burned in a 20-megawatt air-cooled plant at the mine. Construction started in the spring of 1974 on a mine mouth plant which will be the world's largest air-cooled power plant (330 megawatts) and will be located adjacent to the existing power plant. The proposed unit will consist of a coal-fired steam generator and a direct turbine-drive electric generator.

All buildings will be enclosed, while all conveyors will be enclosed in galleries and the storage bin will be roofed. The plant facilities will cover approximately 10 acres. The plant is scheduled to start generating power in 1977 and will burn 1½ million tons of coal per year.

Tentative plans call for completion of another mine mouth power plant in 1982 at this same location. It is proposed that this plant will have a 450-megawatt generating capacity although the final size could vary from 450 to 660 megawatts.

Purpose of proposed project

Development of the Wyodak mining operation and related power plant facilities is planned to meet the increased electrical loads of the area. The coal production required to supply the existing and proposed power plants is as follows:

Year	Tons
1974 - 1976	700,000 per year
1977 - 1981	2,500,000 per year
1982 - 1988	5,000,000 per year

A mining and reclamation plan for this proposed mine as well as power plant and surface facility plans was submitted on November 16, 1973.

Site location

The Wyodak Mine operated by Wyodak Resources Development Corp. is located in T50N, R71W, in Campbell County, Wyoming (Figure 2). For a more detailed description see Appendix D.

Gillette, the county seat of Campbell County, is five miles west of the mine site. A main line of the Burlington Northern Railroad serves the town of Gillette and runs east-west, passing near the mine site. Interstate Highway 90 is partially completed across northeastern Wyoming with U.S. Highway 14-16 connecting the completed sections. This interstate route is the main east-west highway serving northeastern Wyoming. Interstate Highway 25 is partially completed with U.S. Highway 87 connecting the completed sections. This interstate route is the main north-south highway serving eastern Wyoming.

Stages of Implementation

Proposed mining procedures

The following description of mining and reclamation activities is taken, with modification, from the mining and reclamation plan submitted by Wyodak Resources Development Corp.

The present mining operation will continue southward through 1977 and then will swing westward until the mining face is north-south. By 1982 all of the coal land leased from Homestake Mining Company will be mined (E½SE¼ of sec. 28 and N½NE¼ of sec. 33). Mining in 1982 will be on the private coal owned by Wyodak. From 1983 through 1988 the mining will be mostly from the federal lease. Beyond 1988, mining will be concentrated on Wyodak's holdings north of the power plant and adjacent to the presently inactive north pit. This area contains most of Wyodak's reserves, and from the existing pit, mining will most probably proceed to the north onto its largest federal lease.

Soil material removal

The first step in the mining operation is to remove the uppermost material defined as soil material and spread it over spoil that has been re-shaped. In this case the soil material will be spread over land that will be above the water level of a potential lake to be created by mining.

According to a study conducted in 1969 by the U.S. Department of Agriculture, Soil Conservation Service, the topsoil depth ranges from two inches on knolls or hills to several feet in the valleys of the coal lease. Soil material would include a thicker zone than that classified as topsoil. Soil material could be defined as oxidized and weathered material in the root zone that is capable of supporting plant growth under existing conditions. Approval of the mining plan will probably be based on the condition that the company recover at least the top 12 inches of overburden as soil material. This material will be recovered and spread with wheel scrapers.

Overburden removal

The overburden has been removed with scrapers in the South Pit and has averaged about 30 feet in thickness. In 1982 stripping operations will be moved from along Donkey Creek to the W½SE¼ of sec. 28 where the overburden is 50 to 60 feet thick. At that time the company plans to use a shovel and trucks to remove the overburden.

Company officials believe a dragline will be needed when the overburden averages more than 70 feet in thickness. In 1986 or 1987 they plan to start using a dragline with about a 40-yard bucket. The overburden mined during this period will average over 100 feet thick and attain a maximum thickness of 145 feet.

Enough coal has been stripped with scrapers to last the loading operation through 1976. For reclamation purposes, scrapers are ideal to remove overburden. The scraper is loaded with overburden from one zone and the contents can be placed on spoil piles so that undesirable material is buried. The spoil piles can be shaped as the material is unloaded from the scrapers.

Coal removal

The coalbed presently being mined in the South Pit is about 70 feet thick with a 10-to 16-inch parting 34 feet from the base of the coal. The bed is presently mined in two benches. The top bench is generally maintained from 200 to 400 feet ahead of the lower bench. This practice has varied according to the market demand for the quality of coal found in each coalbed.

Coal in each bench is prepared for blasting by drilling 5-inch holes on 25-foot centers. Each hole is loaded with 125 pounds of ammonium nitrate-fuel oil prills.

All blasting is done in accordance with applicable safety regulations. Broken coal is loaded with a 14-yard front-end loader into trucks. The company is presently using two 70-ton capacity trucks and five trucks having a capacity of 30 tons. The trucks dump into a hopper at the primary crusher in the North Pit. The coal is carried to the preparation plant by a 36-inch conveyor belt 1,340 feet long.

Part of the coal goes to a preparation plant where it is sized and oiled for the domestic market. Some of this coal is shipped according to customer specifications in railroad cars and some is sold and trucked to local markets.

When production approaches 2.5 million tons of coal per year, the company will need an additional front-end loader having a 14- to 20-yard capacity. They will also purchase additional dump trucks, each having a capacity of 100 to 120 tons.

Coal will be delivered to the new power plant over a 54"-wide belt, which will extend from the South Pit to the new plant, or it will be stored in a 15,200-ton silo for use at a later time. The belt line will be about 3,300 feet long.

Reclamation

Pursuant to Interior Department policy, all reclamation activity on federal coal lands will conform to the mining plan approved for the federal lease (W-073289), all applicable federal operating regulations, and to requirements of the Wyoming Environmental Quality Act of 1973. Before any mining is started in Wyoming, the operator must obtain a permit from the state which entitles the operator to mine in conformance with an approved reclamation plan. The state may agree to a lake in the reclaimed area but will probably insist that any land

not included in the lake be returned to low undulating topography suitable for grazing and that native or better quality grass be planted.

Usual reclamation procedures will not be practical in the thick coal bed and thin overburden found at the Wyodak mine. If the overburden were returned uniformly to the pit after mining and the land returned to its original surface contours, a depression in the earth of 60 to 80 feet would exist over all of the mine area. Where the overburden is less than the thickness of the coal, the surface level would be lower than the water table and unwanted lakes having swamplike edges would form. The practical approach is to plan in advance for a lake and use the available spoil to reclaim land exclusive of the lake area. In the area of the south pit a lake could approximate 200 acres in size.

Spoil reclamation

The company has reclaimed five acres of land in the northwest corner of the South Pit by filling it with spoils to the level of the original surface. This reclaimed land has been planted with grass. They have also reclaimed a four-acre tract near the northeast corner of the pit by grading the spoils on a 5:1 (11°) slope from the top of the coalbed for a distance of 450 feet toward the center of the pit. This area is being used for experimental purposes. Part of it has been covered with topsoil and seeded, part of it has been covered with topsoil and was not seeded to experiment with natural reseeding, and part of the tract was seeded on spoil without topsoil.

The coalbed in abandoned areas must be covered to prevent spontaneous combustion of the coal. This is especially true in the Gillette area where the coal ignites easily. With the small amount of overburden available during the first nine years of the operation, most of the available spoil material will be needed to cover this exposed coal.

The proposed reclamation plan calls for using available overburden to form a bench around the edge of the pit level with the top of the coal. The eastern and southern edge of the pit will be on privately owned coal. It is proposed that the bench on the eastern edge will be 24 feet lower than the original surface and will be level for 280 feet before it is sloped off on a 35° angle. If the reclamation is successful on the experimental tract, it is likely that the reclamation plan will be changed from the 35° slope to the 11° slope used in the experimental area.

The highwall along the western edge of the pit will be on federal-owned coal through 1982. During 1983 the coal along this highwall will be mined, therefore, any reclamation done here will be temporary and only to prevent the coal from igniting until it is mined. The reclamation plan calls for a bench 50 feet wide to be formed level with the coal along this temporary highwall and the edge of this bench will slope toward the center of the pit on a 35° angle.

During 1983, the first highwall on federal coal will be permanently abandoned. At that time the overburden will be 50 to 60 feet thick and enough spoil will be available to start reclaiming part of the land into a rolling topography blended into the highwall. It will still be necessary to include part of the land mined at this time in the proposed lake.

Drainage control

Donkey Creek originally flowed through all five of the 40-acre tracts of private coal included in the mining plan. This perennial stream has been diverted around the present mine and further diversion will be needed to mine the proposed area. Company officials recognize that an unusually large flood might overflow banks of diversion ditch and flood the active pit area. Employees in the pit would probably have ample warning to avoid danger but the damage could

be very expensive to clean up. A flood would do no permanent damage to the mine.

Studies by geologists and consulting engineers for Black Hills Power and Light report that the potential for drawing any large amount of water from shallow wells (400 to 600 feet deep) is extremely poor. This low potential would indicate that the coalbed does not contain large volumes of underground water. Most of the water entering the pit from the coalbed probably seeps in from Donkey Creek. This water is pumped back into Donkey Creek. Water analyses reported by the company in the area are as follows:

	Ditto Lake	Donkey Creek	Wyodak Pit	Wells (by formation) Wasatch	Fort Union	Fox Hills
Silica, ppm as SiO_2	30	31	8	-	-	20
Total Dissolved Solids, ppm	1,490	3,000	1,450	2,734	330	1,150
Total Alkalinity, ppm as $CaCO_3$	250	560	240	-	280	-
Total Hardness ppm as $CaCO_3$	947	1,210	780	1,978	48	16
pH	7.3	7.5	7.5	6.8	7.1	8.2

Seeding

The center of the pit will not be seeded because it will be a working area during the mining operations and will be flooded as the pit fills with water. The company proposes to cover the spoils which will be above the water level with available topsoil and to seed them with crested wheatgrass.

Surface facilities

Wyodak power plant

Two companies are building a 330 megawatt (MW), coal fired power plant at Wyodak, five miles east of Gillette, Wyoming. Pacific Power and Light Co.

and Black Hills Power and Light Co. will locate their new facility adjacent to the 20-MW Neil Simpson plant operated by Black Hills Power. The 330-MW plant is scheduled for operation in 1977. It will use air cooling technology, proven successful at the Neil Simpson generating station. Air cooling is necessary because sufficient water is not available. The companies also have tentative plans for a third plant at this site expected to produce 450-MW of electricity in 1982.

According to documents filed with the Wyoming Public Service Commission, Black Hills Power will require 169 MW of power by December 1977 with resources of 87 MW without the Wyodak plant described here. Pacific Power projects a requirement of 165 MW to service Wyoming loads by the winter of 1977-1978. Both companies will also need reserve capacity to meet future growth. These needs will be met by the plant under construction.

About ten acres of land are required for each power plant with some 30 acres disturbed during construction. Existing highway access from U.S. Highway 14-16 will be used to reach the site and less than one-half mile of temporary railroad spur will be needed to construct both plants.

Coal for the power plants will come from expanding production from the Wyodak mine now operated by a subsidiary of Black Hills Power. Coal will be delivered to the new plant over a 54-inch conveyor belt extending from a truck hopper and crusher in the South Pit to the new plant. Coal can be diverted to a 15,200-ton silo for storage from a transfer point on the belt. It can then be returned to this transfer point for use in the plant. When in full production the 330-MW plant will consume 1.5 million tons of coal per year; the second plant about 2 million tons annually. The coal averages 0.5 percent sulfur content, according to company analysis.

By selecting the air cooling process, water requirements for the 330-MW plant are quite low. About 200 to 300 gallons per minute will be obtained from

a combination of sources, including wells in the vicinity, Ditto Lake, and effluent from the proposed Gillette sewage plant. Domestic water will be obtained from wells drilled to the Fort Union or Fox Hills Formations.

The general processes involved in generating electricity from fossil fuel have been described previously. The technology at the Wyodak plant includes:

1. A coal fired steam generator designed to produce 2,600,000 lbs. of steam per hour at 1,000°F superheat and 1,000°F reheat.
2. A turbine rated at 330-MW.
3. An air cooled condenser to convert steam to water and to release the unrecovered heat produced to the atmosphere.

Bottom ash and all other solid products from the power plant will be interlayered with overburden and returned to mined-out areas. All sewage wastes will be treated at the site to meet state and federal water quality standards.

Air pollution control equipment, including electrostatic precipitators with provisions for wet scrubbers for sulfur removal, if necessary, have been designed and tested to comply fully with Wyoming and federal air quality standards. Fly ash collected in the pollution control system will be buried in the mined-out areas. Airborne emissions from a 400-foot stack include: 206 pounds per hour of total particulates (ash), 4,410 pounds per hour of sulfur dioxide and about 2,910 pounds per hour of nitrogen dioxide. These emissions are based on consuming 245 tons of coal per hour for the generation of 330 MW; coal having about 6 percent ash, 0.5 percent sulfur, and a heat value of 7,800 Btu. The electrostatic precipitator has an efficiency of collecting 99.3 percent of the ash and may entrain 10 percent SO_2 with the ash. Both the Wyoming Public Service Commission and the Environmental Protection Agency have reviewed plans for the plant and have issued necessary construction permits.

To deliver the power produced, Pacific Power will build a 230-kv transmission line west to Buffalo, Wyoming; Black Hills will build a corresponding line from the plant site to Spearfish, South Dakota. Another 230-kv line from Wyodak south to Glenrock may also be tied into the distribution system.

Roads

All haul roads will be constructed on the bottom of the pit. They will be used to move coal from the loading shovel to the truck hopper located in the bottom of the pit. The roads into the pit will be used only for access to the mining operation.

Railroad spur

A railroad loop and rail car loading facilities will not be needed at this operation. Although production will be substantially increased, the annual amount of coal shipped by rail will not be changed. A 700-foot railroad siding and 1100-foot spur track will be constructed and used in the operation of the power plant.

Power

Electric power for the mine shops, electric shovels, crushing station, and loading facilities will be supplied from the existing power plant located adjacent to the mine.

Office and shop

Office and shop facilities will be required at the mine site but specifications as to size and type of structures have not been finalized at present.

Mining, loading, and reclamation equipment

The following equipment will be used during the mining, coal loading and reclamation operations:

No. of Units	Equipment	Capacity	Manufacturer's Trade Name
1	Front-end Loader	14 yards	Hough "400"
5	Trucks	30-ton	Euclid
2	Trucks	70-ton	Caterpillar "768"
2	Scrapers		Caterpillar "621"
1	Coal Drill	5-inch hole	Salem
2	Tractors		Caterpillar "D-8"
1	Tractor		Caterpillar "D-7"

The following additional equipment will be needed before mining is completed in the area outlined in the plan: Front-end loader (20-yard bucket), several additional trucks (100-ton), an overburden drill and an overburden shovel (16-yard). Also a shovel and/or dragline may be needed when the overburden increases to a depth of 70 feet or more.

Mining sequence

The company is mining a 1,700-foot working face in the South Pit. Mining extends across fee-owned SE¼SE¼ of sec. 28 and 400 feet into the SW¼SE¼ of sec. 28 which is included in the federal lease. This working face will be advanced about 175 feet each year from 1974 through 1976. Starting in 1977 the east end of the mining face will be advanced much faster than the west end in order to rotate the mining face in a fan-like turn. When the turn is completed by the end of 1980 the mining face will be in a north-south direction.

The fee-owned coal in the NE¼NE¼ of sec. 33 will be completely mined during this period and the working face will extend 450 feet into the federal lease.

The operation will mine about 40 acres of coal land each year to produce the projected five million tons annually after 1981. During 1982 all of the remaining fee coal will be mined except for 10 acres to be mined in 1985.

The thickest overburden forms a ridge which lies diagonally across the federal lease. The coal underlying this ridge will be mined during 1987 and 1988, the last two years covered by the plan. After 1988 mining will be concentrated in the area north of the power plant.

Transporation and marketing

Except for a few thousand tons sold on the commercial market, all of the coal produced at the Wyodak mine is burned at four power plants owned by the company in Wyoming and South Dakota.

The mine is currently producing about 700,000 tons of coal per year. About 450,000 tons of the production are shipped by rail to power plants in Osage, Wyoming; Rapid City, South Dakota; and Lead, South Dakota. The remainder of the production is used at the 20-megawatt air-cooled plant at the mine or sold on the commercial market. All of the projected additional tonnage to be produced at the mine will be burned in two new units of the power plant to be constructed near the mine site. The rail shipments during the period of the mine plan should remain constant at about 450,000 tons per year.