APPENDIX H
GENERIC MINE SCENARIO

The purpose of this appendix is to present the major probable impacts of mining. This analysis forms the basis of summaries of coal-related impacts presented in Chapter Four. More detailed analyses of specific coal development can be found in the Fort Union Regional Coal DEIS (USDI 1982) and the related Fort Union logical mine-size tract site specific analyses.

The generic mine considered is a 5.5 MM ton per year surface mine with a 40 year mine life. Mine operation is expected to disturb land at a rate of 475 acres per year or 19,000 acres over 40 years. It would take approximately 10-13 years for completion of the full cycle from initial disturbance through mining, reclamation, and bond release for each acre. In full production, the total area out of production in any year would be 4,800 to 6,175 acres. Soils would be continuously replaced on mined-out areas and brought back into production during the life of the mine.

The uncertainty of the mine location and size will limit this analysis to a general treatment. This analysis is based on numerous assumptions and reasonable values for important variables. Some of the assumptions and variables are based on best estimates. Others are based on existing literature, research studies, and input from industry sources. This analysis is not meant to substitute for detailed, site-specific evaluations, EISs, or analyses that come later when mining projects are actually proposed. Nor will it preclude any federal, state, local, or private decisions concerning actual mine siting, mining methods, or mine reclamation.

ENVIRONMENTAL CONSEQUENCES

Air Quality

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that production emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, the emissions are counted against the PSD increment.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National AAQSs. Areas within the active mining area, such as the mine facilities, pit areas, and reclamation areas, are not subject to these standards. The mine would emit an estimated 2610 tons per year of particulate matter.

The highest annual concentration at a location off the mine site would be 6.2 ug/m^3. Adding the annual background concentration of 24 ug/m^3 this level would consume the allowable Class II PSD annual increment for particulates of 19 ug/m^3. This level does not exceed the State or Federal AAQSs of 60 ug/m^3.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. The predicted highest 24-hour values associated with the proposed action during peak production is 47 ug/m^3. This level would consume the allowable Class II PSD 24-hour increments for particulates of 30 ug/m^3. With the estimated 24-hour background concentration of 100 ug/m^3 added, the ambient level would be 147 ug/m^3. This level does not exceed the State and Federal AAQSs.

Because a new mine would consume the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (5 ug/m^3 — 24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations. During peak production, these emissions are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

Topography

The natural contour of the land would be modified during surface mining. Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls. The reshaped land would not be steep enough to cause slope failures and related hazards.

Soils and Reclamation Potential

Mining would result in the disruption of the present soil bodies with temporary loss of productivity, erosion, compaction, and instability.

The alteration of soil structure and porosity would affect permeability, infiltration rates, soil-air and soil-water relationships, and bulk density. The natural fertility would be reduced by disruption of the nutrient cycle and a decrease in organic matter content. Soil erosion and compaction would increase during soil handling activities but decrease during other stages of mining.

Some instability problems are usually associated with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenewold and Rehm 1980). The gentle to moderate slopes over most of the land remaining in the CSAs after application of the coal screens would aid in the workability of material and make corrective measures on problem spots easier to conduct. Until natural vegetation can be established, accelerated erosion resulting in unsightly scars on the land would be a potential problem. However, if the regulations and required stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, these impacts would be minimal.

The mining company would be under bond for at least ten years, or as long as necessary to prove (at a 90 percent confidence level) that agricultural production had been restored to equal or better than it was before mining (NDPSC 1986). Reclamation research by such agencies as the USDA

Agricultural Research Service and North Dakota State University-Agricultural Experiment Station (NDSU-AES) indicates that optimism for the restoration of land to agricultural production is justified. It is not certain how long it would be before all mined land would be judged to be as fully restored as the law requires.

In the reestablishment of native-type range, it is likely some introduced species would be used. The laws require introduced species be of the same seasonal variety and of equal or superior utility to the native species. Some of the more sensitive plant species may have difficulty in becoming established on some of the less suitable soils. Forbs, woody plants, and trees (woodlands) also must be reestablished.

Hydrology

Surface Water

Coal mining would, in the short term, disturb areas that would be susceptible to accelerated erosion. Runoff may be routed around active mine areas or to sediment control impoundments where excessive sediment loads and objectionable chemical concentrations would be improved.

Infiltration rates of the mine area should not be significantly different than premining. North Dakota rules governing the reclamation of surface-mined land require that topsoil and subsoil be respread over the spoil material. However, certain sites show a reduction in infiltration rates immediately following reclamation, and it may take 10-15 years to regain prior infiltration capacity (Arnold and Dollhopf 1977).

Impacts to surface water quality may be significant in isolated areas where ground water from a mined area is the major contributor to the surface water drainage. Ground water discharging from mined areas carries an increased salt load from leaching and would significantly add to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase would depend on the geology of the area. These salts would typically include sulfates, calcium, magnesium, and bicarbonates.

Ground Water

During mining, impacts to the local ground water would be significant. Overburden and coal seams would be disrupted and replaced by spoil material. Springs, seeps, and shallow wells in the immediate mine area would dry up or have lower water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles from the mined site (Hardaway and Kimball 1979; Van Voast et al. 1978; Dollhopf et al. 1978). The influence would vary with the direction of ground water flow and would typically be greater in the down-gradient direction (Van Voast et al. 1977).

After reclamation, the coal aquifer and overburden aquifer would be replaced by a spoil aquifer. Ground water flow characteristics and water quality of the spoils would be different than the aquifers prior to mining. Studies have shown that a "mine floor aquifer" may be formed due to an increase in hydraulic conductivity, storage capacity, and vertical permeability of the spoil materials (Van Voast 1981, Van Voast et al. 1977).

The unweathered surfaces of spoil material contain significant quantities of leachable salts and minerals that readily dissolve. Mining may cause changes in the chemical quality of the local ground water. Increases in sodium, sulfates, and total dissolved solid concentrations have been reported (Groenewold et al. 1979). The magnitude of increases is variable and dependent on the overburden characteristics and reclamation practices. This will result in the degradation of ground water that is tapped by shallow wells within the affected mine area and may move through the ground water system away from the mine.

The movement of degraded ground water from mined areas is difficult to predict. Extent of movement will vary depending upon the local hydrology and overburden. Areal extent of the degradation is modified by absorption, geochemical reactions, and dilution (Van Voast et al. 1980, Ahern and Frazier 1981). The extent of the degradation may be limited to a few hundred yards from pit boundaries (Van Voast et al. 1980, Ahern and Frazier 1981) or may extend several miles down gradient (Moran et al. 1979, Rahn 1976).

PSC regulations state that all coal processing wastes including ash will be placed in excavated pits approved by the commission, so that these materials will not adversely affect ground water quality and flow, create public health hazards, and cause instability in the disposal areas.

North Dakota State regulations (NDPSC 1986) require a surface coal mine operator to replace the water supply of an owner of interest in real property who obtains all or part of his/her water supply for domestic, agricultural, industrial, or other legitimate use from an underground or surface source where such supply has been affected by contamination, diminution, or interruption proximately resulting from the surface mining activities.

Vegetation and Agricultural Production

The major use of the land in the planning area is for crop and livestock production. Pre-mine levels of agricultural production would be restored in approximately ten years. The land would be reclaimed to the premining type of agricultural production or other premining uses (e.g., wildlife habitat, woodlands, rights-of-way) that the landowner and Public Service Commission agree upon. Vegetation reestablishment would occur during the first appropriate season topography is restored and topsoil is replaced (Table H-1).

Loss in wheat production is used as a gauge to measure impacts to agriculture caused by a mine of this size. At the peak production of the mining activity, there would be an average annual loss of 24,000 bushels of wheat.

Recreation

Recreation throughout the CSAs consists of seasonal hunting of big and small game, sight-seeing, and other dispersed uses. The development of a mine facility would impact recreation by placing additional pressure for these uses on surrounding lands. However, with development of a mine, the population of the area would increase, resulting in the probable creation of new indoor recreational facilities. Outdoor recreational facilities at Lake Sakakawea and Theodore Roosevelt National Park would experience increased demand.

Aesthetics

Mining activity along major highways would be highly visible. The appearance of mining activity is common in

TABLE H-1
TYPICAL RECLAMATION TIME TABLE

Year	Rangeland	Cropland	Woody Draws	Comments
1	Strip and remove topsoil, remove overburden, commence mining	Strip and store topsoil, remove overburden, commence mining	Strip and store topsoil, remove overburden, commence mining	
2	Mining continues	Mining continues	Mining continues	Non-Productive Time Period
3	Mining ends, overburden replaced, recontouring begins	Mining ends, overburden replaced, recontouring begins	Mining ends, overburden replaced, recontouring begins	
4	Recontouring completed, topsoil replaced, seeded to native vegetation	Recontouring completed, topsoil seeded with nurse crop of grasses and legumes	Recontouring completed, topsoil replaced, seeded back to woody plants	
5	Native vegetation established	Nurse crop established	Woody plant reestablishment continues	
6	Native vegetation growth	Nurse crop growth	Woody plant reestablishment continues	
7	Light grazing	Cropping begins	Woody plant reestablishment continues	
8	Light grazing	Cropping continues	Woody plant reestablishment continues	Productivity returns to normal
9	Light grazing	Cropping continues	Woody plant reestablishment continues	
10	Light grazing	Cropping continues	Woody plant reestablishment continues	
11	Moderate grazing	Cropping continues	Woody plant reestablishment continues	
12	Moderate grazing	Cropping continues	Woody plant reestablishment continues	
13	Moderate grazing	Cropping continues	Woody plant reestablishment continues	
14	Eligible for bond release	Eligible for bond release	Eligible for bond release	

This table is based on a mining operation that is consuming land at the rate of 475 acres per year. It would require a 13-year time period for each 475 acres to complete the full cycle from initial disturbance through mining, reclamation and bond release. By the 14th year, land would be returning to full production at the same rate it was being taken out of production. The last 475 acres to be mined would not be eligible for bond release until ten years after mining is completed. Facilities and haul roads take out an additional 600 acres for the life of the mine. In this example, during the height of mining activity as much as 36 percent of the 6775 acres could be removed from agricultural production.

local areas of North Dakota. The presence of mining likely would be considered as a normal part of activity on the land. Some of the public view mines as a blight on the landscape, whereas others find them interesting. From an aesthetic stand point, provided State and Federal law is complied with, impacts can be considered unavoidable but reversible.

Wildlife

On-site effects to wildlife resources result from the degradation and short-term loss of native prairie and the long-term loss of wooded draws. Of the 19,000 acres that would be disturbed by a mine about 4,750 acres would be native prairie and 570 acres would be wooded draws. The rest of the disturbed habitat would be agricultural land. Because the structural features and productivity of prairie can be reclaimed the 1,544 acres out of production at any one time would have the most direct effects on prairie wildlife. However, it is also likely that once the topography of rougher prairie habitats is smoothed during reclamation, some acreages would then be suitable for conversion to agricultural uses. Therefore, mining of native prairie could constitute a long-term significant negative impact and an irretrievable commitment of wildlife resources on up to 4,750 acres.

Wooded draw habitats would be disturbed at the rate of 14 acres per year. Loss of woodlands may become a permanent loss because the ability to reclaim this habitat has not been demonstrated. In all instances, reclamation would not be completed in the short term. Thus, mining of wooded draws would constitute a long-term significant negative impact and an irretrievable commitment of wildlife resources on an additional 570 acres.

Mobile wildlife such as birds and large mammals may leave the mine area, but nonmobile species such as reptiles and amphibians would likely be destroyed. The limited availability and distribution of woodlands would restrict, and in many cases preclude, the accommodation of disturbed wildlife requiring these habitats. Replacement of lost wildlife habitat within 12 to 18 months after mining would reduce a few of the impacts to wildlife. However, human presence may prevent reoccupation of these habitats for the life of the mine.

It is possible to mitigate some of the loss of woody draws during reclamation if all participating parties agree. For example, previously level native prairie can be reclaimed to have more topographic relief or even wetland basins. Along with the proper seeding of grass and forb species, and planting of woody species, the acreage might support greater habitat diversity and productivity than it presently does.

In addition to the potential direct loss of habitat are the secondary impacts of mining. These include erosion, sedimentation and contamination of water, which has short- and long-term impacts on the quality of aquatic habitats. Serious long-term impacts would result from an increased human presence in the mine area and in the entire region surrounding development. Important factors degrading these habitats are increased harassment by people and domestic dogs, poaching, hunting pressure, noise, access roads, and urban development (USDI 1982). These all have significant short- and long-term impacts on a variety of wildlife populations. Although some of these impacts can be mitigated in extreme cases (USDI 1982), they are generally too dispersed in time and space to be readily offset.

Cultural Resources

There are two types of impacts to cultural resources anticipated for a typical mine: (1) direct adverse impacts resulting from ground disturbance that can damage or destroy sites, artifacts, their environmental context, and the data they contain, and (2) indirect adverse impacts, including vandalism (increased by improved access), data loss as a result of erosion, or degradation resulting from disruption of natural setting.

In the event of a lease and mine proposal, stipulations covering cultural resources would be developed. These stipulations would require the identification and evaluation of cultural resources that may be adversely impacted by mine development.

Preservation is the preferred form of mitigation for eligible cultural resources subject to direct impacts. However, if preservation is not possible, the adverse impacts to significant cultural resources would be reduced by data recovery methods. It is estimated that four sites per year or 152 sites for 40 years (i.e., expected life of mine) would be directly impacted by mining. In general, direct adverse impacts to eligible cultural resources could be successfully mitigated through data recovery methods.

Paleontological Resources

Common and rare fossil sites are located within the boundaries of some CSAs. Direct adverse impacts to significant paleontological resources may occur within a typical mine facility. Indirect adverse impacts to paleontological resources may also occur due to an increase in population in the mine area and improved access to fossil resources near the mine.

Direct adverse impacts to paleontological resources would be avoided or mitigated by a data recovery program. In most cases the loss of data would be minimal. Indirect adverse impacts are uncontrollable and it is anticipated that some loss of data would occur.

Economic and Social Conditions

Economic and social impacts of mine development have been combined with impacts resulting from construction and operation of a coal-fired end-use facility presented in Appendix I.